ComponentOne

Xamarin.Android Controls

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Getting Started with Xamarin.Android Controls

ComponentOne Xamarin.Android is a collection of Android UI controls developed by GrapeCity. Xamarin.Android Edition has been optimized for Android development with outstanding built-in features and superior flexibility. It allows you to design views in XML and develop applications similar to the pre-built UI controls in Android.

For existing Xuni new users, the new architecture brings many new features:

- **Enhanced performance**
  The new controls should generally perform better than the old controls (sometimes doubling performance). By specifically focusing on the Xamarin architecture, the controls cut out some intermediary logic and are optimized for the platform. Since they're entirely in C#, so you can also expect a more consistent experience.
- **Designer support**
  The new controls should also support Xamarin's designers for iOS and Android applications. This makes it much easier to construct your Android XML or iOS Storyboards using these controls.
- **New control features**
  The controls have been rethought for the new architecture with the combined experience of Xuni, Wijmo, as well as ComponentOne controls. Some controls have a number additional features (such as FlexGrid).

Breaking Changes for Xuni User

New Package Names

The packages have changed their prefix if you're coming from Xuni. For instance,

Xuni.Android.Calendar now corresponds to **C1.Android.Calendar**

We have also moved to a more consistent naming scheme for our controls based on the following pattern:

C1.[Platform].[ControlName]

For example, FlexGrid is available in **C1.Xamarin.Forms.Grid**

Additionally, FlexChart, FlexPie, and ChartCore have all been consolidated into one single package instead of three different packages. To use FlexChart or FlexPie, you now need to add a single package developed for the platform of your choice:

C1.Android.Chart

Namespace Changes

We've made some changes to the namespace of the current controls, which are in line with the changes in package names. For example, Xuni.Android.FlexGrid now corresponds to C1.Android.Grid.

Minor API Changes

There are some minor changes in API between ComponentOne Xamarin Edition and Xuni. These should mostly amount to additions, slight change in syntax, and use of prefix 'C1' instead of 'Xuni' in class and object names. For FlexChart, however, the control is very actively growing in terms of API, so missing features are intended to be added in the future.

NuGet Packages

The following NuGet packages are available for download:

Package Name	Description
C1.CollectionView	This is the dependency package for CollectionView and is automatically installed when any dependent package is installed.
C1.Android.CollectionView	This is the dependency package to use CollectionView with a native RecyclerView on Android.
C1.Android.Calendar	Installing this NuGet package adds all the references that enable you to use the Calendar control in your Xamarin.Android application.
C1.Android.Core	This is the dependency package for the control NuGet packages and is automatically installed when any dependent package is installed.
C1.Android.Chart	Installing this NuGet package adds all the references that enable you to use the FlexChart and FlexPie controls in your Xamarin.Android application.
C1.Android.Grid	Installing this NuGet package adds all the references that enable you to use the FlexGrid control in your Xamarin.Android application.
C1.Android.Gauge	Installing this NuGet package adds all the references that enable you to use the Gauge controls in your Xamarin.Android application.
C1.Android.Input	Installing this NuGet package adds all the references that enable you to use the Input controls in your Xamarin.Android application.

Redistributable Files

Xamarin.Android Edition, developed and published by GrapeCity, inc., can be used to develop applications in conjunction with Microsoft Visual Studio, Xamarin Studio or any other programming environment that enables the user to use and integrate controls. You may also distribute, free of royalties, the following redistributable files with any such application you develop to the extent that they are used separately on a single CPU on the client/workstation

side of the network.

Control	Redistributable File
Calendar	C1.Android.Calendar.dll
CollectionView	C1.CollectionView.dll, C1.Android.CollectionView.dll
Core	C1.Android.Core.dll
FlexChart	C1.Android.Chart.dll
FlexGrid	C1.Android.Grid.dll
Gauge	C1.Android.Gauge.dll
Input	C1.Android.Input.dll

System Requirements

ComponentOne Xamarin.Android can be used in applications written for the following mobile operating systems:

Requirements

- Xamarin Platform 3.0.0.482510 and above
- Visual Studio 2017
- Android 4.2 and above (API 17)

Windows System Requirements

- Windows 8.1 and above

Mac System Requirements

- Visual Studio for Mac
- MacOS 10.12
- Android 7 SDK (API 24)

Creating a New Xamarin.Android App

This topic demonstrates how to create a new Xamarin.Android app in Visual Studio or Xamarin Studio. See the System Requirements before proceeding. To download and install Xamarin Studio, visit http://xamarin.com/download.

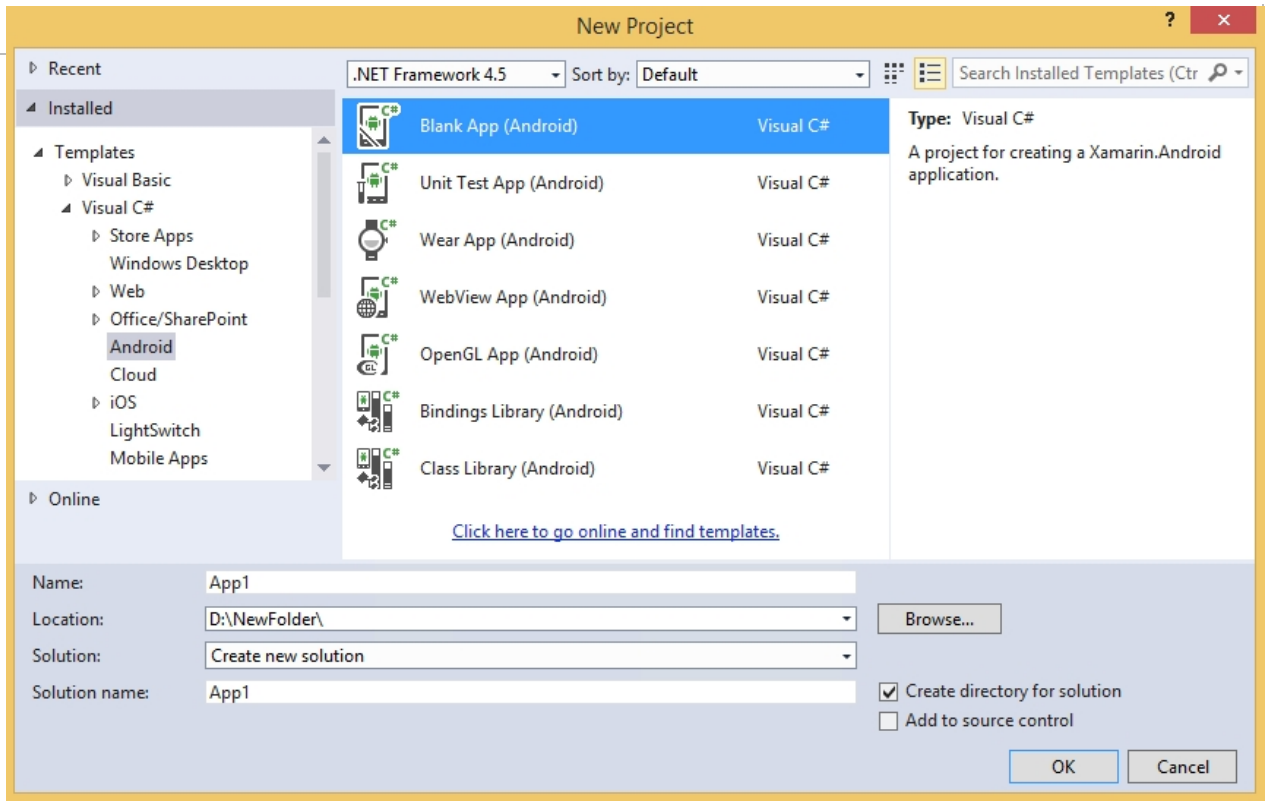
To know more about Xamarin.iOS, visit:

https://developer.xamarin.com/guides/ios/getting_started/

Complete the following steps to create a new Xamarin.Android app:

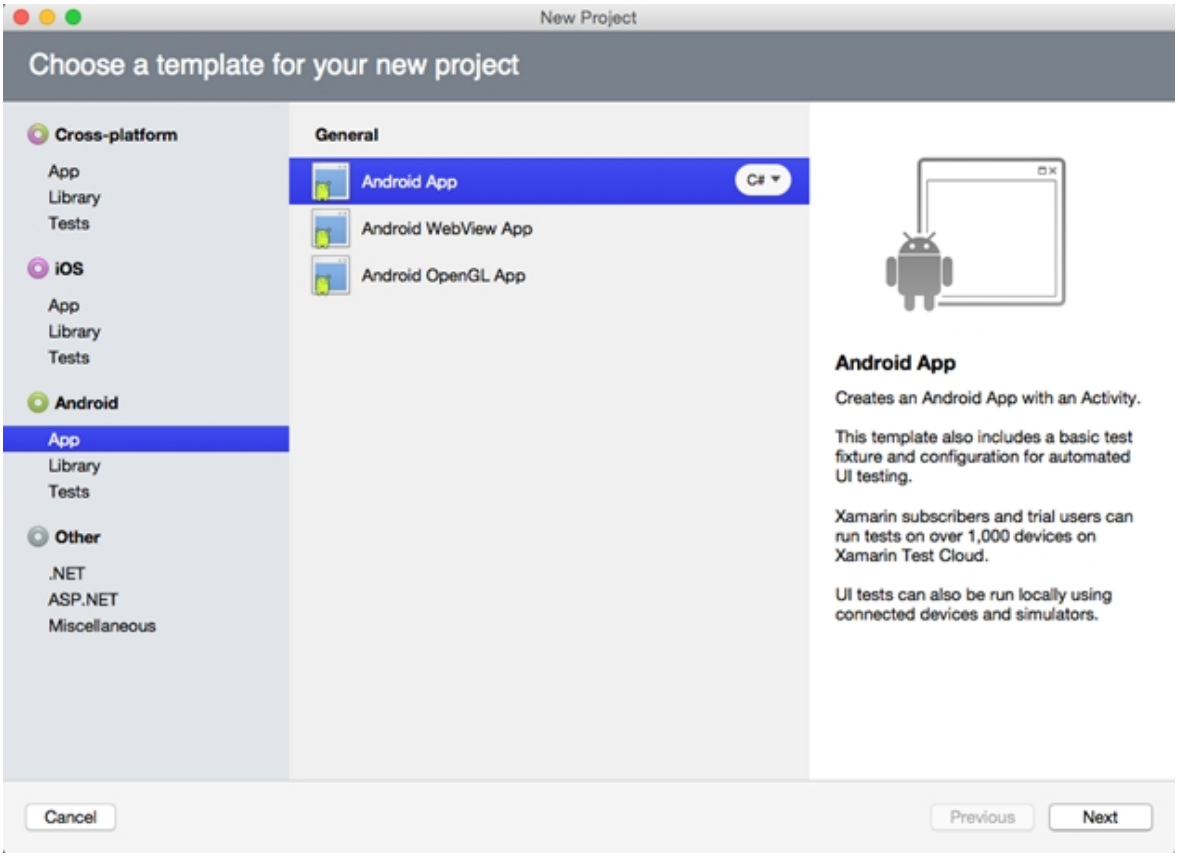
Visual Studio (Windows)

1. Select File | New | Project.
2. Under installed templates, select Visual C# | Android.
3. In the right pane, select Blank App.
4. Type a name for your app and select a location to save it.
5. Click OK.



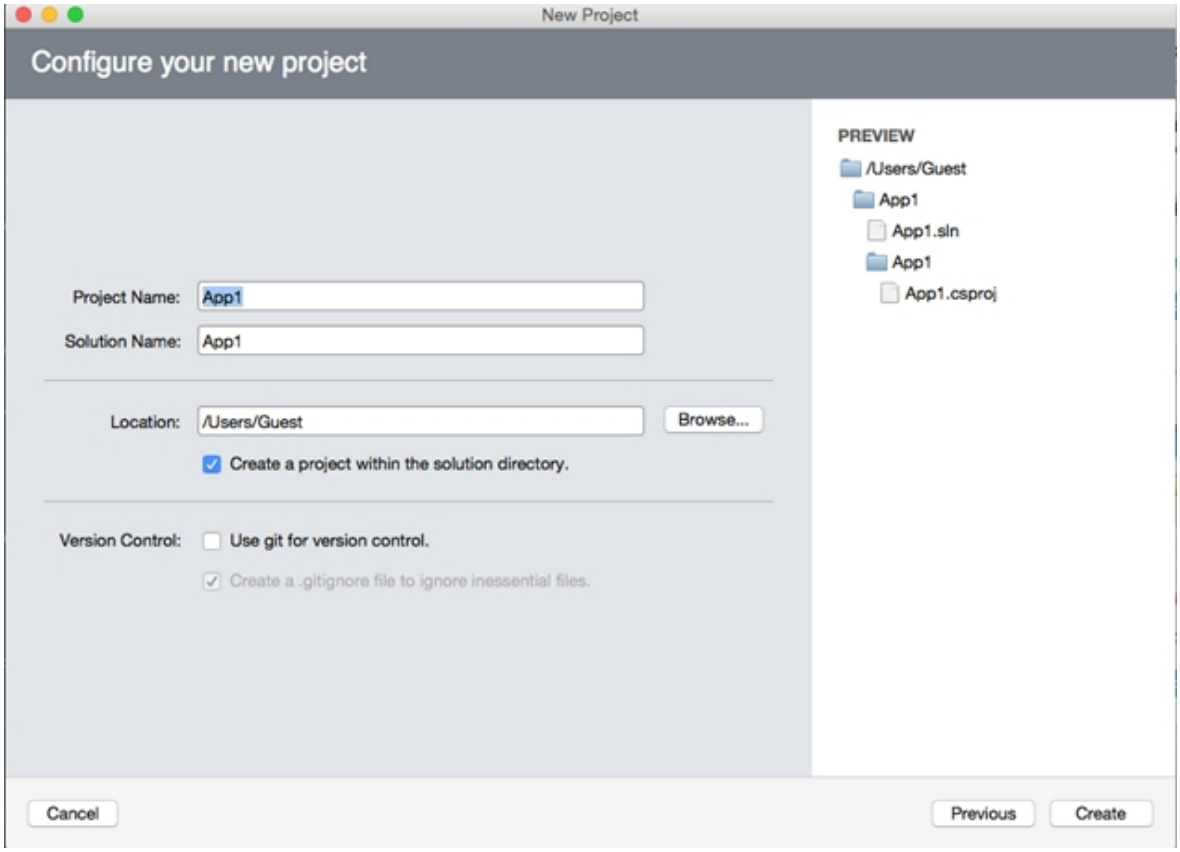
Visual Studio for Mac (macOS)

1. Select **File** | **New Solution**.
2. Select **Android** | **App**.
3. In the right pane, select **Android App**.
4. Type a name for your app and select a location to save it.
5. Click **OK**.



6. Add a name for your app and select a location to save it.

7. Click **Next**.



8. Click **Create**.

Adding NuGet Packages to your App

To install Installing NuGet

1. Go to http://nuget.org/ and click Install NuGet.
2. Run the **NuGet.vsix** installer.
3. In the Visual Studio Extension Installer window, click **Install**.
4. Once the installation is complete, click **Close**.

To add Xamarin References to your App

In order to use Xamarin controls on Android platform, related references need to be added to your project. Complete the following steps to add Xamarin references to your project.

Visual Studio (PC)

1. Open an existing or a new Xamarin.Android App.
2. In the **Project** menu, select **Manage NuGet Packages.**
3. In the **Manage NuGet Packages** dialog, click **Online** and then click **GrapeCity**.
4. Click **Install** next to C1.Android.ControlName (eg. C1.Android.Chart). This adds the references for Xamarin control.
5. Click **I Accept** to accept the license and then click **Close** in the Manage NuGet Packages dialog.

Visual Studio for Mac

1. Open an existing or a new Android app.
2. In the **Solution Explorer**, right-click the project and select **Add | Add NuGet Packages**. The **Add NuGet Packages** dialog appears.
3. From the drop down menu in the top left corner, select GrapeCity. The available Xamarin packages are displayed.
4. Select the package C1.Android.Control and click the Add Package button. This adds the references for the Xamarin control.

To manually create a Xamarin feed source

Visual Studio (PC)

1. In the Tools menu, select **NuGet Package Manager | Package Manager Settings**. The **Options** dialog appears.
2. In the left pane, select **Package Sources.**
3. Click the **Add (+)** button in top right corner to add a new source under **Available package sources.**
4. Set the **Name** of the new package source. Set the source as http://nuget.grapecity.com/nuget/.
5. Click **OK.** The Xamarin feed has now been added as another NuGet feed sources.

To install Xamarin using the new feed:

1. Open an existing or a new Android app.
2. Select **Project | Manage NuGet Packages.**
3. In the **Manage NuGet Packages** dialog, go to the **Online** drop down and select Xamarin. The available Xamarin packages get displayed in the right pane.
4. Click **Install** next to the NuGet package (for example, C1.Android.Chart). This updates the references for the Xamarin control.
5. Click **I Accept** to accept the ComponentOne license for Xamarin and then click Close in the Manage NuGet Packages dialog.

Visual Studio for Mac

1. In the Projects menu, select **Add Packages.**
2. In the **Add Packages** dialog, open the drop-down menu in the top left corner and select **Configure Sources**. The **Preferences** dialog appears.
3. In the left pane, expand **Packages** and select **Sources.**
4. Click the **Add** button to open the **Add Package Source** dialog.
5. Set the Name of the new package source as Xamarin and the URL as http://nuget.grapecity.com/nuget/.
6. Click **Add Source** button to add the Xamarin feed as a new feed source.
7. Click **OK**.

To install Xamarin using the new feed:

1. Open an existing or a new Android app.
2. In the **Solution Explorer**, right-click the project and select **Add | Add Packages**. The **Add Packages** dialog appears.
3. In the **Add Packages** dialog, open the drop-down menu in the top left corner and select Xamarin. The available packages are displayed.

4. Select the package (for example C1.Android.Chart) and click the **Add Package** button. This adds the references for the Xamarin control.

Licensing

ComponentOne Xamarin Edition contains runtime licensing, which means the library requires a unique key to be validated at runtime. The process is quick, requires minimal memory, and does not require network connection. Each application that uses ComponentOne Xamarin Edition requires a unique license key. This topic gives you in-depth instructions on how to license your app. For more information on GrapeCity licensing and subscription model, visit https://www.grapecity.com/en/licensing/grapecity/.

To know the licensing process in details, see the following links

- Licensing App using GrapeCity ComponentOne Extension
- Licensing App using Website

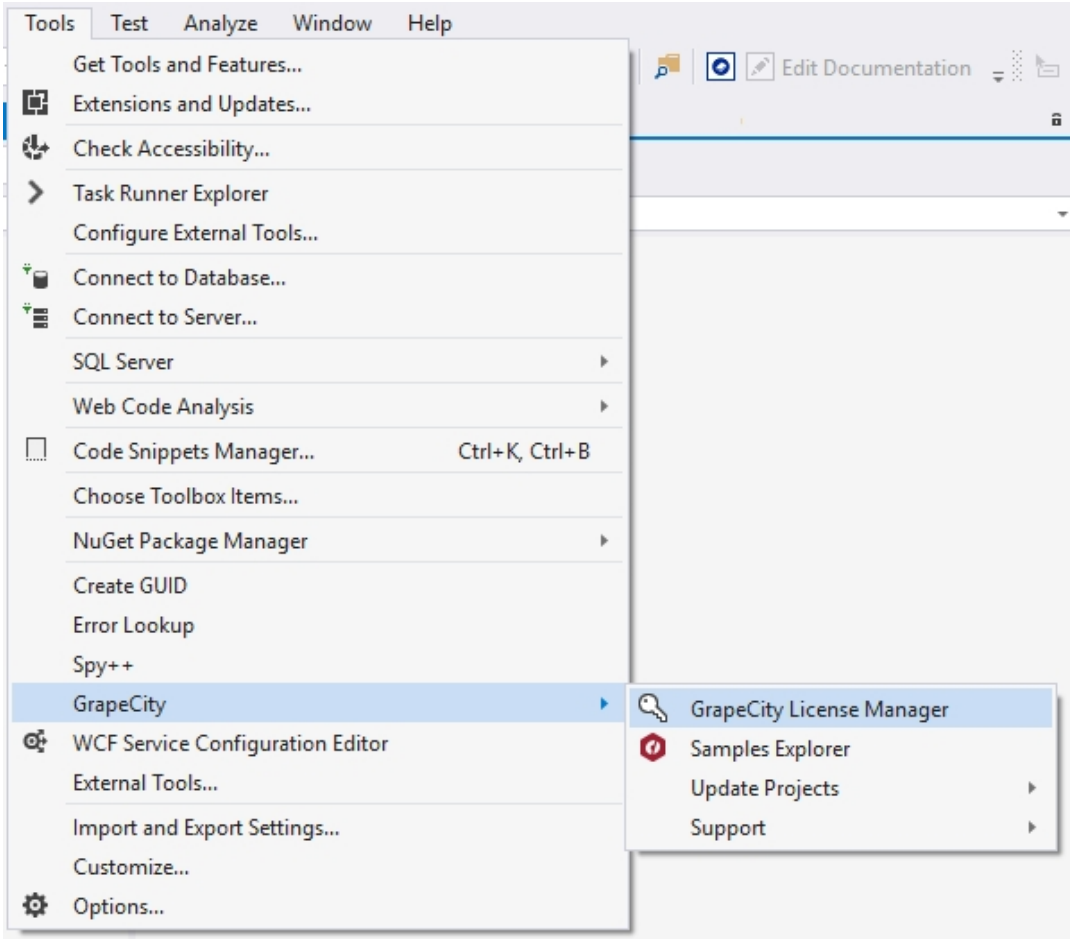
License App using GrapeCity ComponentOneMenu Extension

If you are using ComponentOne controls with Visual Studio 2017 or above, you can use the GrapeCity ComponentOneMenu Extension to **License applications**, open **Sample Explorer**, **update projects** and contact **Technical Support**. After installation, it gets available with various options as shown below.

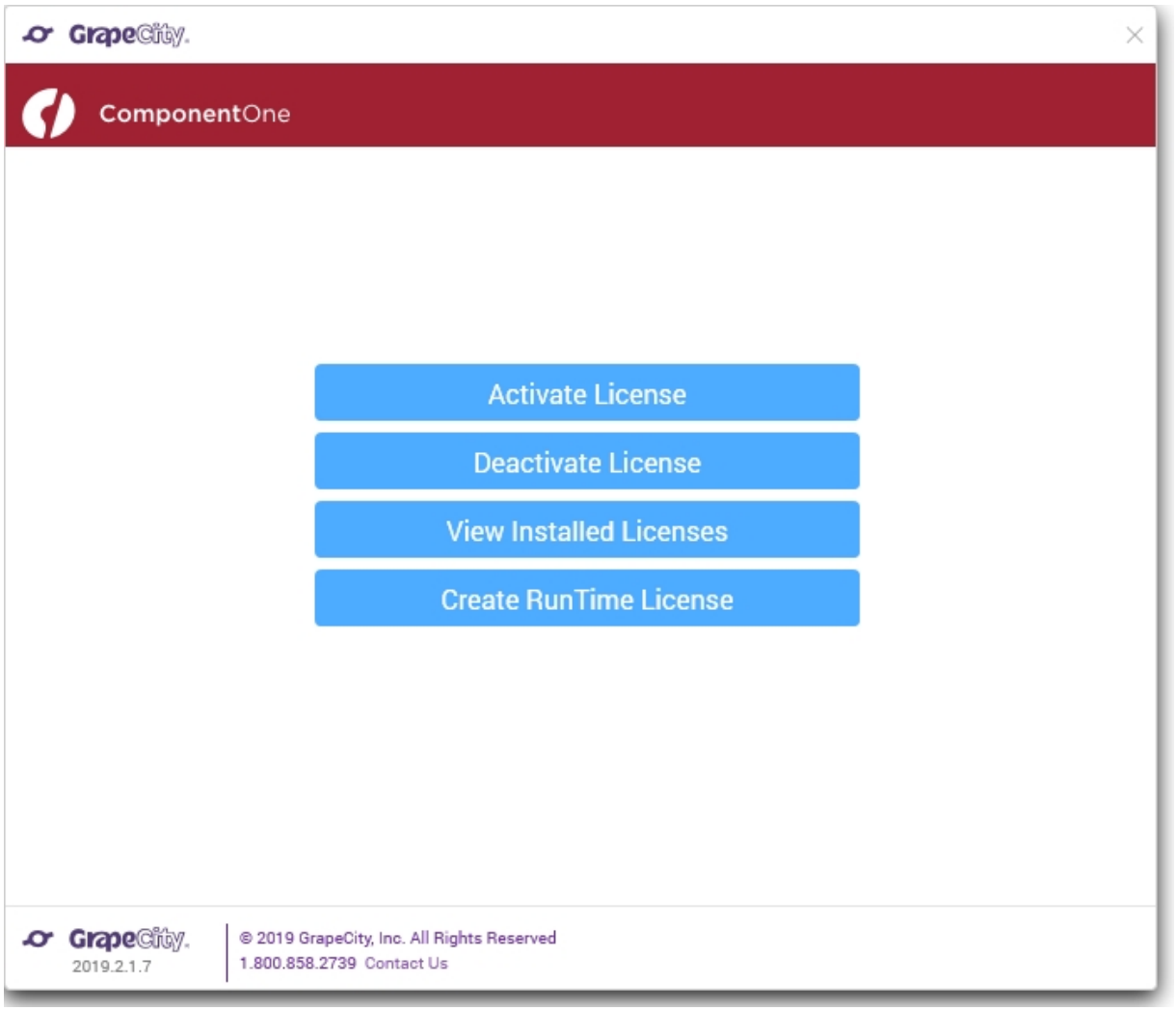
GrapeCity License Manager Extension for Visual Studio

To use GrapeCity License Manager Extension, follow these steps:

1. From the **Tools** menu, select **GrapeCity**. You will see four options as shown in the image below.

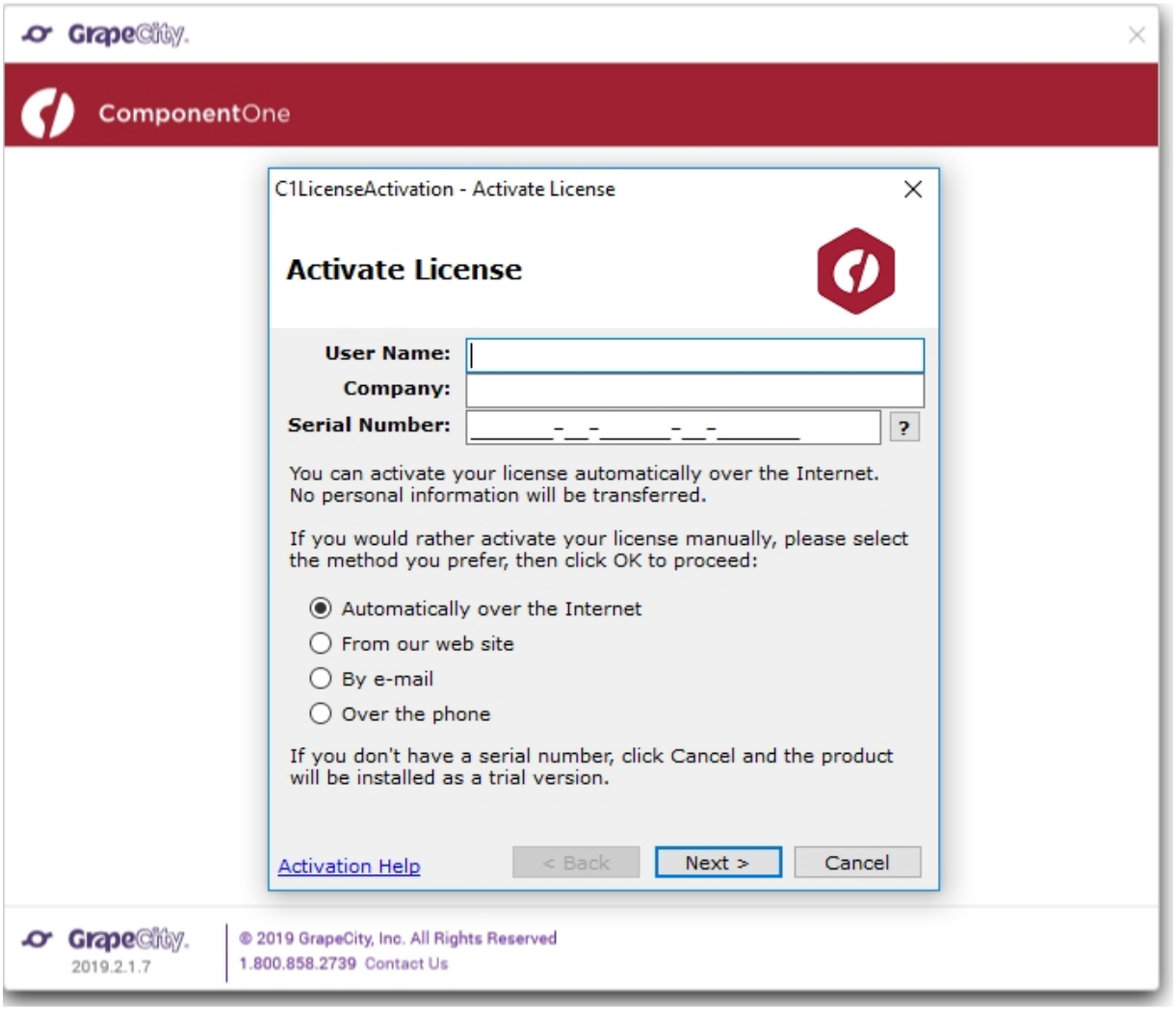


2. Select **GrapeCity License Manager**. The License Manager window appears as shown in the image below:

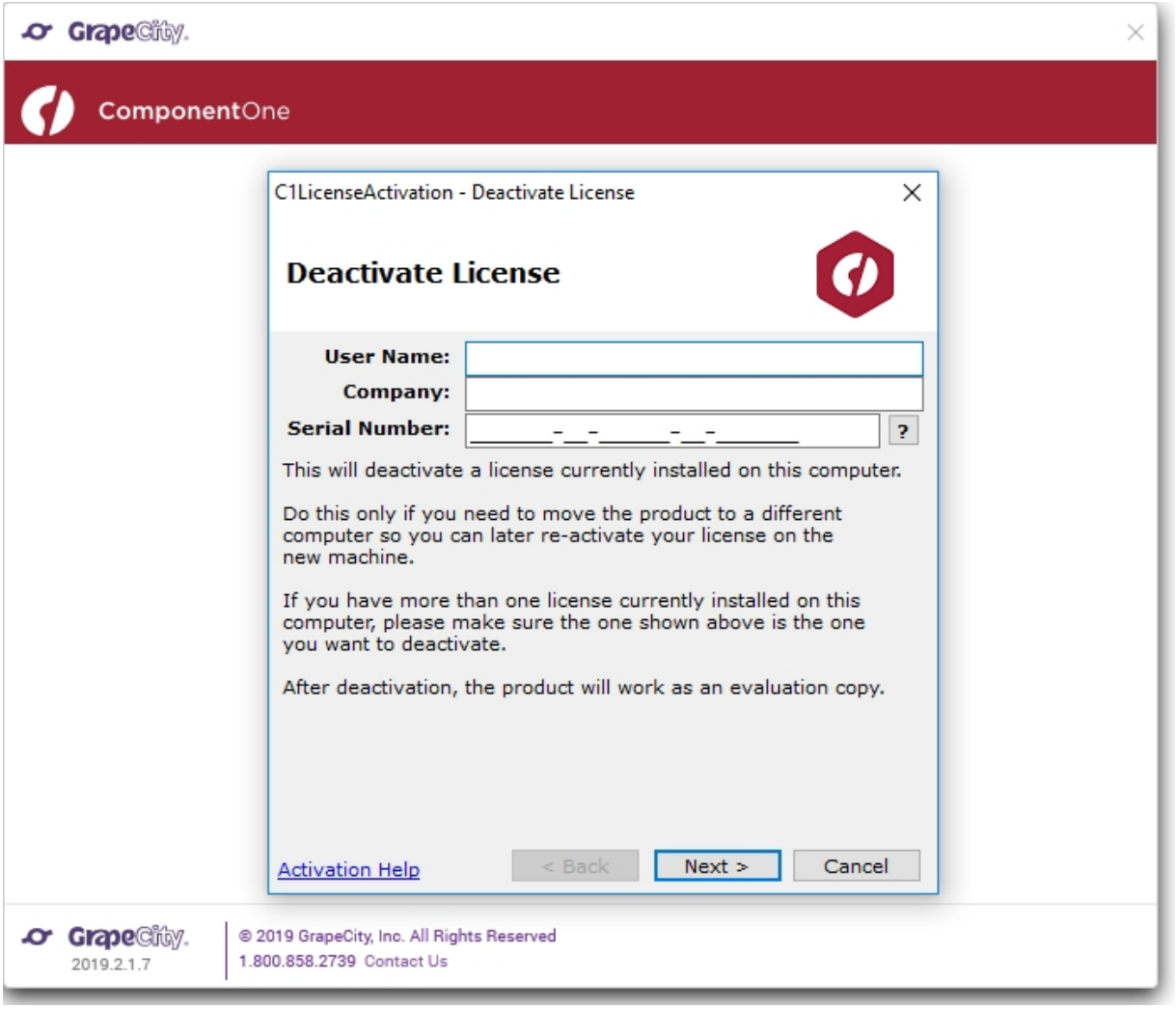


The **GrapeCity License Manager** displays the following options:

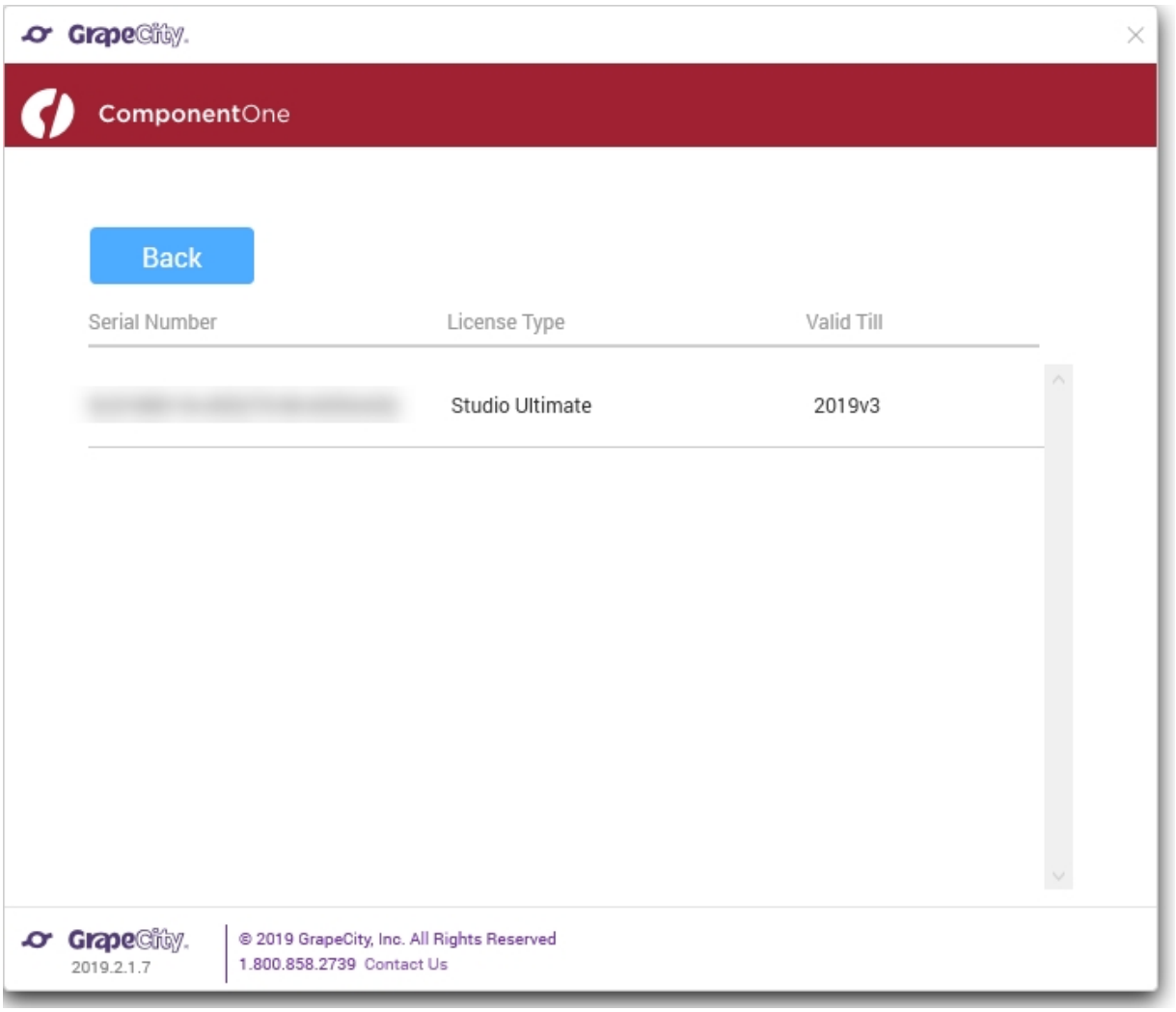
- **Activate License -** It allows the users to activate the License (**Serial Number**) using the Internet, ComponentOne website, e-mail, or over phone. On clicking this option, **C1LicenseActivation - Activate License** application window appears as shown below. Users can follow the wizard to do the license activation.



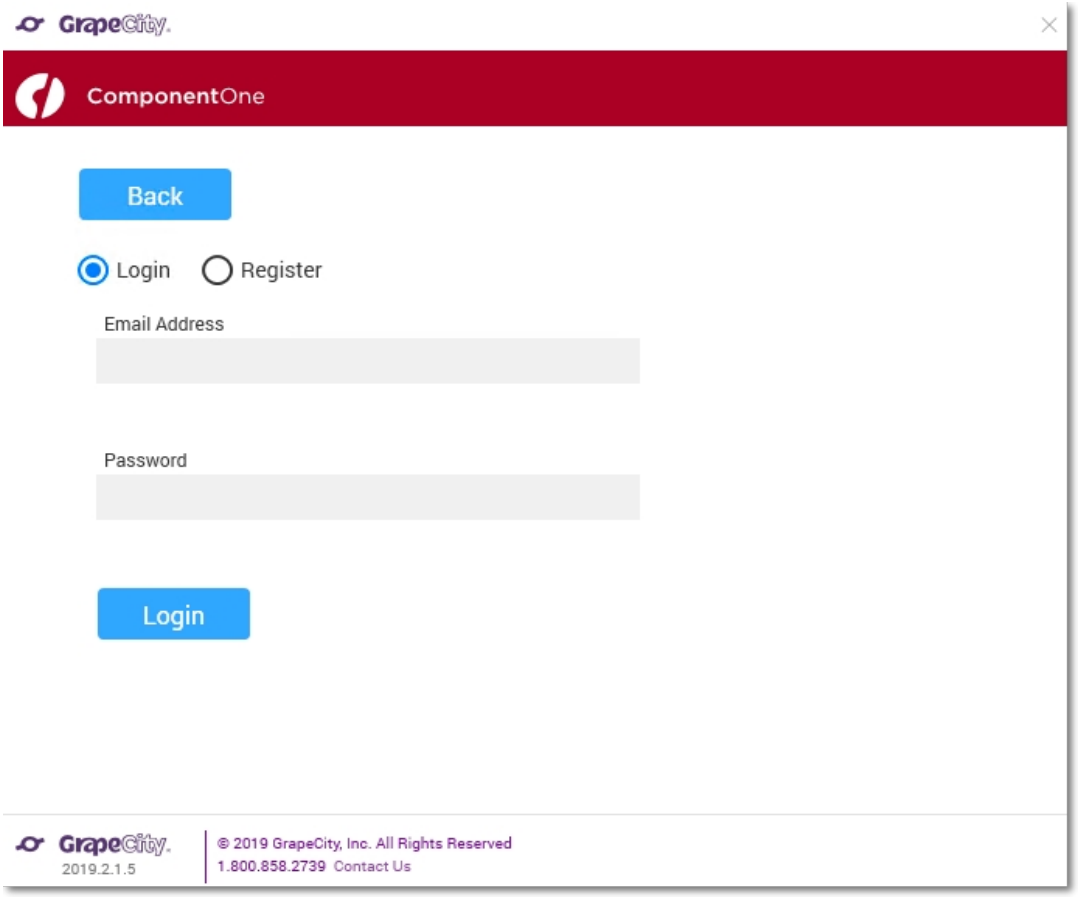
- **Deactivate License** – It allows the users to deactivate the License (**Serial Number**) using the Internet, ComponentOne website, e-mail, or over phone. On clicking this option, **C1LicenseActivation - Deactivate License** application will appear as shown below. Users can follow the wizard to do the license deactivation.



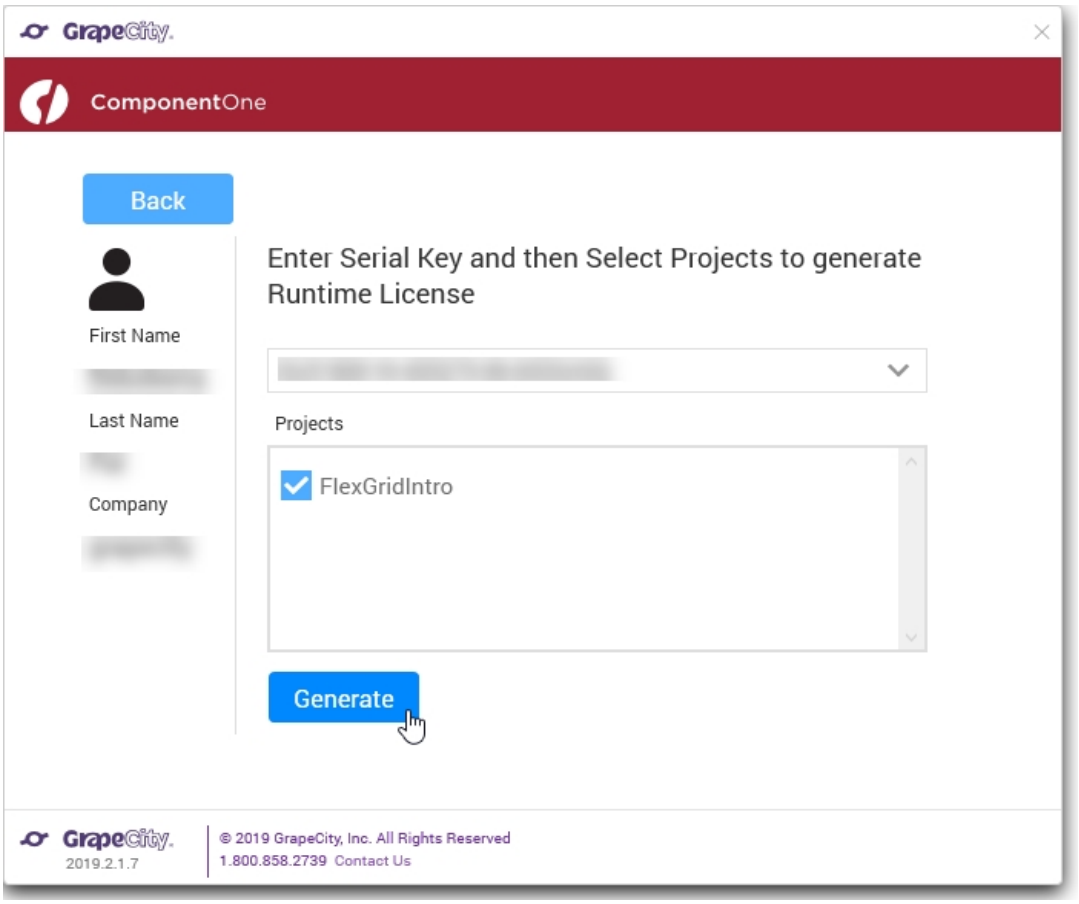
- **View Installed Licenses** - It allows the users to view the **Serial Number**, **License Type**, and **Validity** of the installed licenses on the system. The license can be viewed as shown below:



- **Create RunTime License** - It allows the users to generate runtime license for the project(s). On clicking this option, the following window appears:



To use this option, you need to **login** the **GrapeCity Account**. In case you don't have a GrapeCity Account, you can create it using the **Register** option. Once you Sign in, the following window appears:

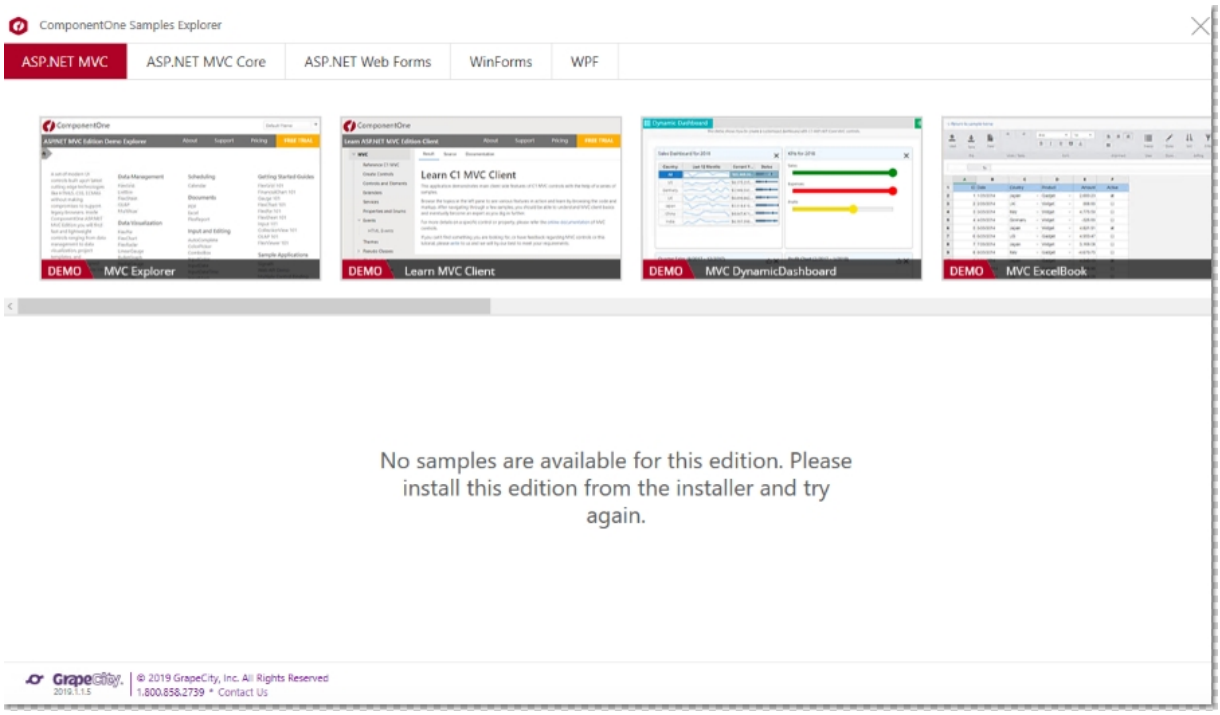


From the above window, you can select the license and the project for which license needs to be generated. On clicking the **Generate** button, a success message appears and a license file **GCDTLicenses.xml** is generated.

Samples Explorer

To view sample explorer, follow these steps:

1. From the **Tools** menu, select **GrapeCity**.
2. Select **Samples Explorer**. **ComponentOne Samples Explorer** window appears as shown in the image below:

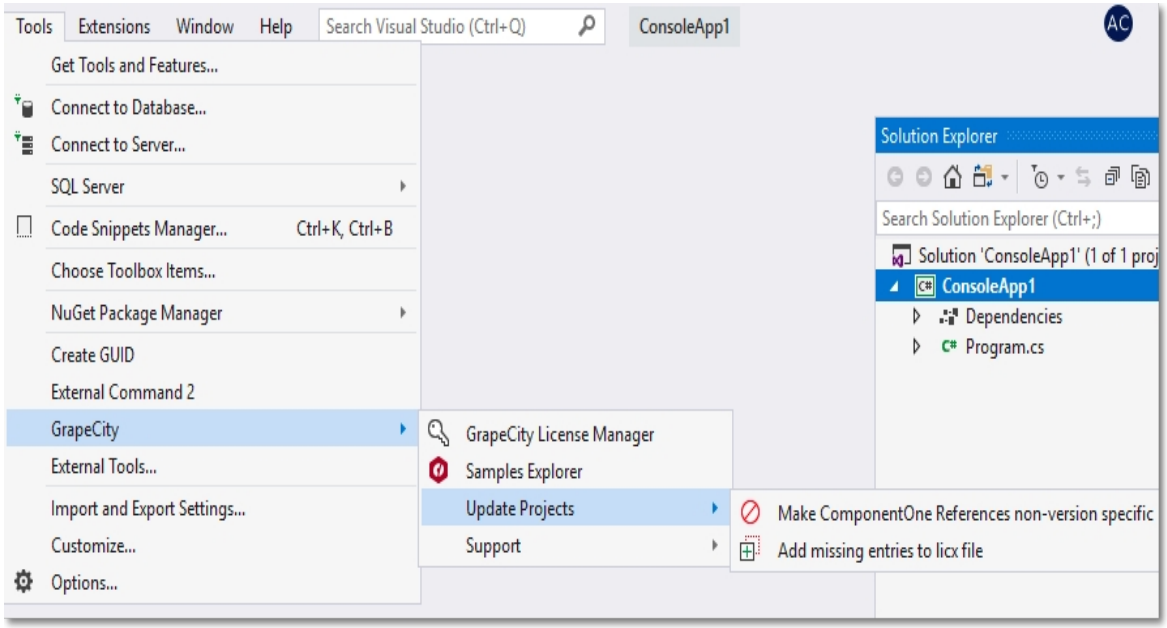


This option allows the users to open the Sample Explorer that has been installed on the system with the installer. From the displayed window, you can open any of the required samples or demos.

Update Projects

To update existing projects, follow these steps:

1. From the **Tools** menu, select **GrapeCity**.
2. Select **Update Projects**. Update Projects provides two options to update the project(s) as shown and listed below:

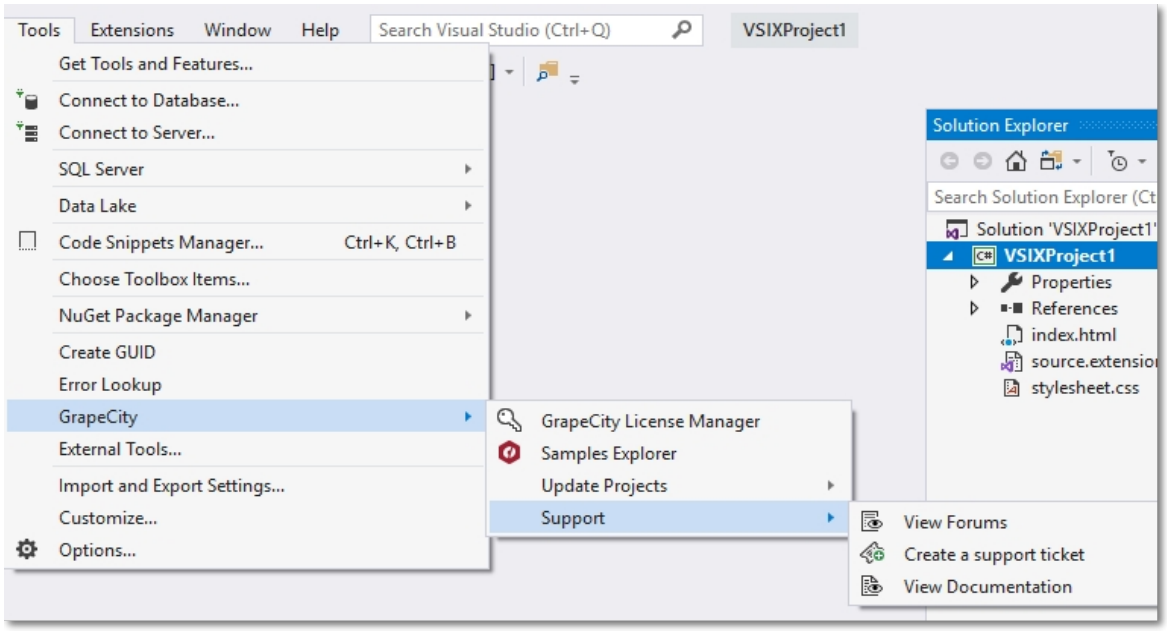


- **Make ComponentOne References non-version specific** - This option removes the version information from the Licenses.licx file and sets the **Specific Version** property of ComponentOne assemblies in the project(s) to **false**. On clicking this option, a window appears where you can select the **Project,** click **Update**, and click **Finish** to complete the update process.
- **Adding missing entries to Licx file -** This option adds missing license information to the license file (*. licx) in the project(s). On Clicking, a window appears where you can select the **Project,** click **Update**, and click **Finish** to update the license files.

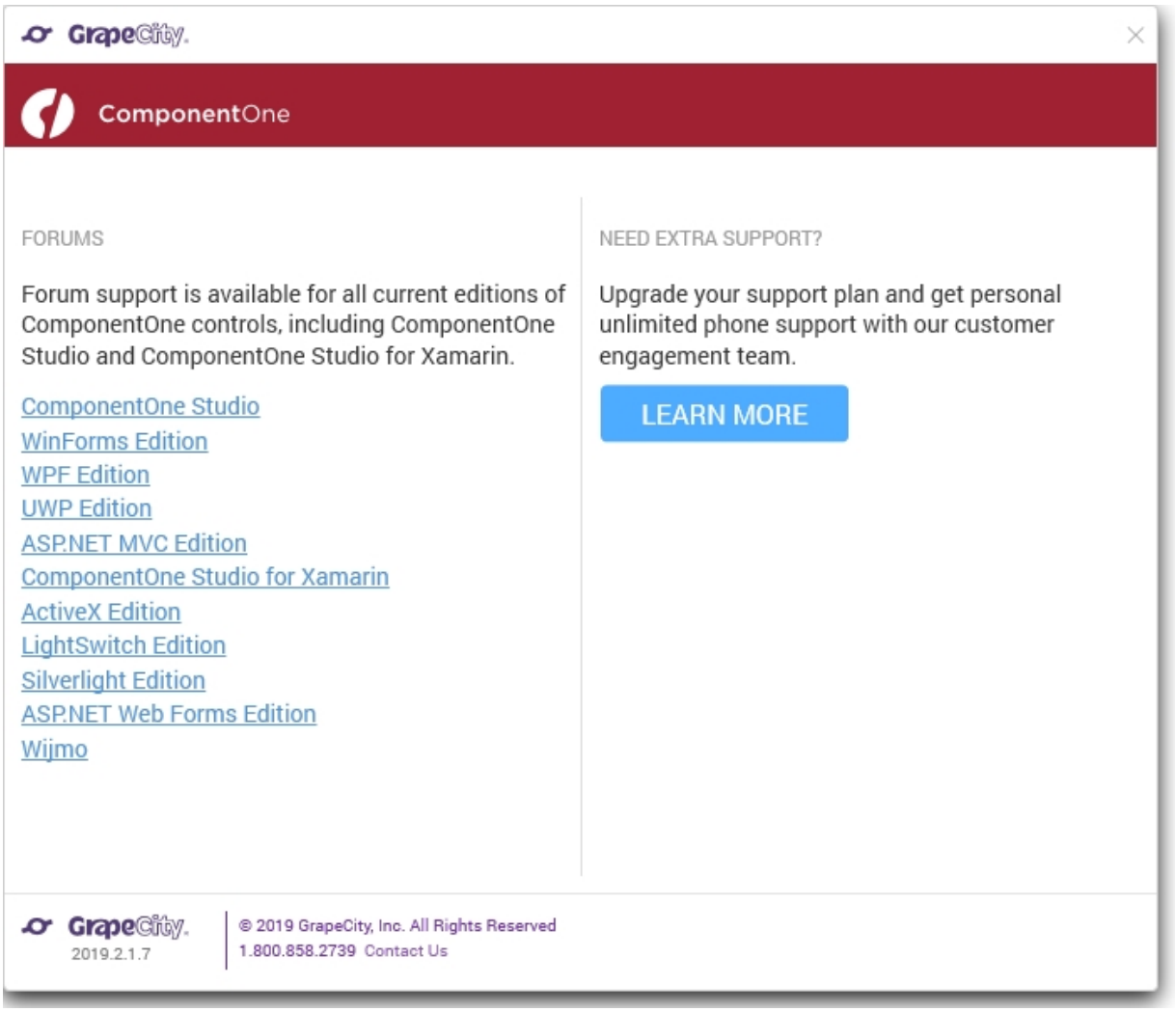
Support

To contact the Technical Support and view Documentation, follow these steps:

1. From the **Tools** menu, select **GrapeCity**.
2. Select **Support**. Support provides three options as shown and listed below.



- **View Forums** - This option opens the window shown below, which has the redirecting links to the GrapeCity ComponentOne Forums.



You can login to access the community forums for all GrapeCity products and post queries/doubts related to the products. You can also find information on how to contact the support team by clicking **Learn More**.

- **Create a support ticket -** This option redirects you to the Support Portal where you can login and get in touch with the support team directly. You can also post queries/doubts related to the products to get personalized support.
- **View Documentation -** This option redirects you to the Documentation page where you can access all the documents related to all the GrapeCity products.

Note: If you are using Visual Studio 2015 or previous versions of Visual Studio, you can use the GrapeCity License Manager add-in. The add-in is available in Tools menu in Visual Studio. For detailed information on using the GrapeCity License Manager add-in, see Generate License using GrapeCity License Manager Add-in.

Licensing your app using website

ComponentOne Xamarin Edition users can license their app via the ComponentOne website. If you are using ComponentOne Xamarin Edition with Visual Studio on PC, you have the option to use the **GrapeCity License Manager Add-in**. For more information, see Licensing your app using GrapeCity License Manager Add-in.

How to License your app using the website

1. Open a pre-existing mobile application or create a new mobile application.
2. Add the required Xamarin Edition NuGet packages to your application through the NuGet Package Manager.

3. Visit https://www.grapecity.com/en/my-account/create-app-key.

   > You must create a GrapeCity account and login to access this web page.

4. If you are generating a full license, select your serial number from the drop-down menu at the top of the page. If you are generating a trial license, leave it selected as **Evaluation**.
5. Select C# for the language.
6. In the **App Name** text box, enter the name of your application. This name should match the Default Namespace of your application. See Finding the Application Name to know how to find the name of your application.
7. Click the **Generate** button. A runtime license will be generated in the form of a string contained within a class.
8. Copy the license and complete the following steps to add it in your application.
   1. Open your application in Visual Studio or Xamarin Studio.
   2. In the **Solution Explorer**, right-click the project YourAppName.
   3. Select **Add | New**. The **Add New Item** dialog appears.
   4. Under installed templates, select **C# | Class**.
   5. Set the name of the class as **License.cs** and click **OK**.
   6. In the class License.cs, create a new string to store the runtime license inside the constructor as shown below.

      C#

      ```
      public static class License
      {
          public const string Key = "Your Key";
      }
      ```

   7. From the Solution Explorer, open **MainActivity.cs** and set the runtime license inside the **OnCreate()** method as shown below.

      C#

      ```
      C1.Android.Core.LicenseManager.Key = License.Key;
      ```

If you are generating a trial license, your application is now ready to be used for trial purposes. You can repeat this process for any number of applications. You must generate a new trial license for each app because they are unique to the application name.

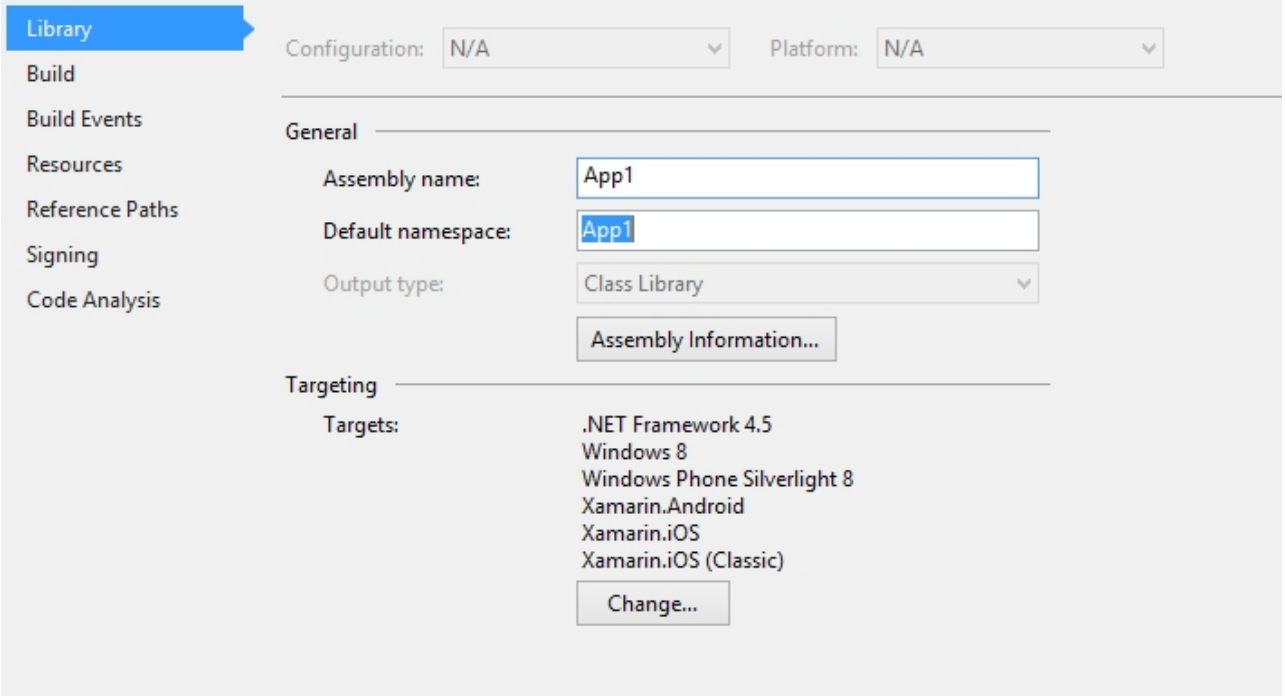
> The trial period is limited to 30 days, which begins when you generate your first runtime license. The controls will stop working after your 30-day trial period is over.

Finding the Application Name

ComponentOne Xamarin Edition licenses are unique to each application. Before you can generate a runtime license, you need to know the name of the application where the license will be used.

Visual Studio

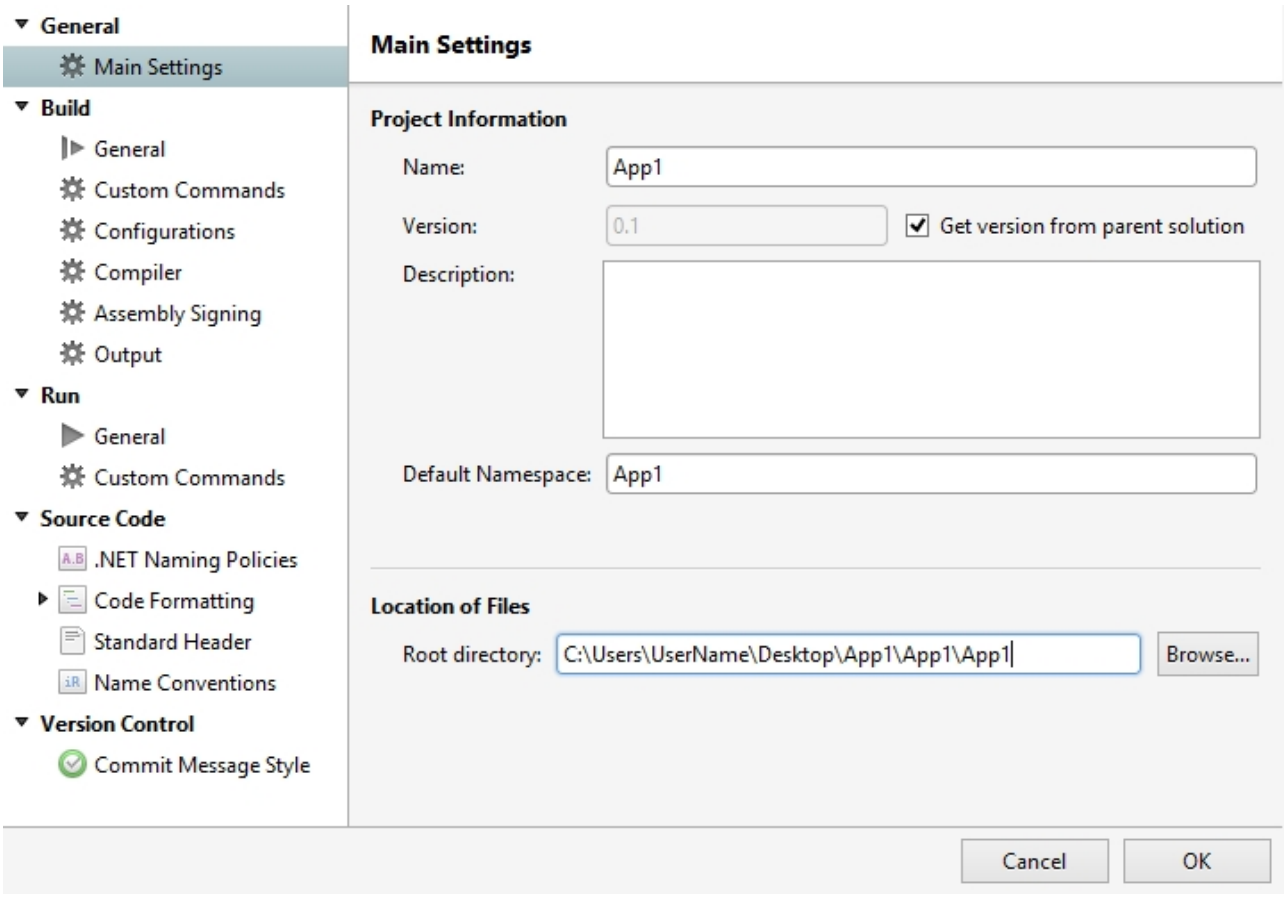
1. Open a pre-existing mobile application.
2. In the Solution Explorer, right-click the project **YourAppName** and select **Properties**.
3. Open the **Library** tab.
4. The application name is the same as the displayed **Default namespace**.



You need to generate a new runtime license in case you rename the assembly later.

Visual Studio for Mac

1. Open a pre-existing mobile application.
2. In the **Solution Explorer**, right click the project **YourAppName** and select Options.
3. The application name is displayed on the **Main Settings** tab.



About this Documentation

Acknowledgements

Microsoft, *Windows*, *Windows Vista*, and *Windows Server* are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

Contact Us

If you have any suggestions or ideas for new features or controls, please call us or write:

GrapeCity US
GrapeCity
201 South Highland Avenue, Suite 301
Pittsburgh, PA 15206
Tel: 1.800.858.2739 | 412.681.4343
Fax: 412.681.4384
https://www.grapecity.com/en/

Technical Support

ComponentOne offers various support options. For a complete list and a description of each, visit the ComponentOne website to explore more.

Some methods for obtaining technical support include:

- **Online Resources**

ComponentOne provides customers with a comprehensive set of technical resources in the form of Licensing FAQs, samples, demos, and videos, searchable online documentation and more. We recommend this as the first place to look for answers to your technical questions.

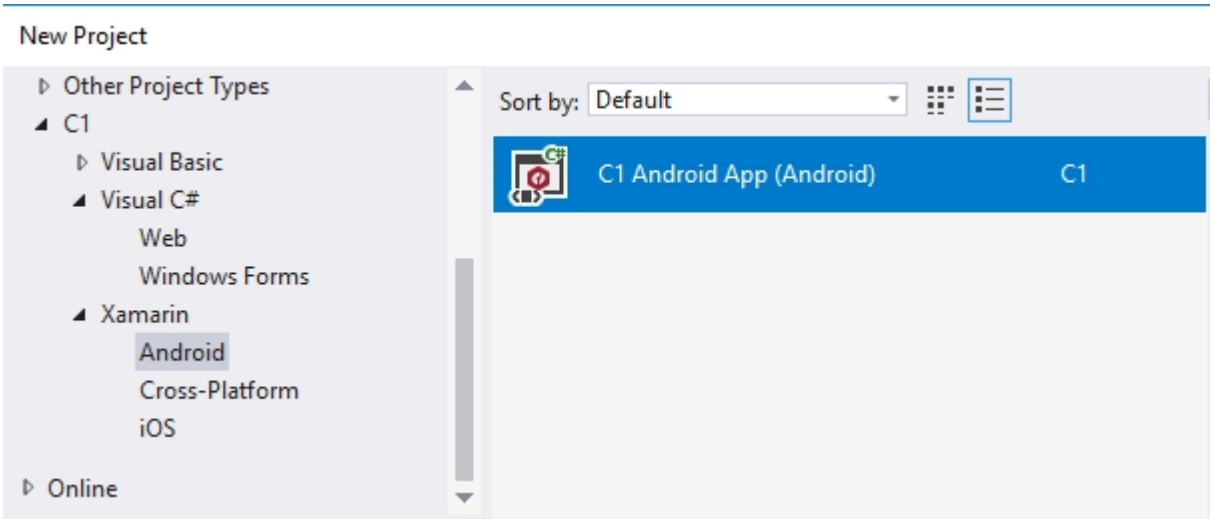
- **Online Support**
  The online support service provides you direct access to our Technical Support staff via Submit a ticket. When you submit an incident, you immediately receive a response via e-mail confirming that the incident is created successfully. This email provides you with an Issue Reference ID. You will receive a response from us via an email within two business days.
- **Product Forums**
  Forums are available for users to share information, tips, and techniques regarding all the platforms supported by the ComponentOne Xamarin Edition, including Xamarin Forms, Xamarin.iOS and Xamarin.Android. ComponentOne developers or community engineers will be available on the forums to share insider tips and technique and answer users' questions. Note that a user account is required to participate in the Forums.
- **Installation Issues**
  Registered users can obtain help with problems installing Xamarin Edition on their systems. Contact technical support by using the online incident submission form or by phone (412.681.4738). Please note that this does not include issues related to distributing a product to end-users in an application.
- **Documentation**
  ComponentOne documentation is available online and PDF files can be downloaded for offline viewing. If you have suggestions on how we can improve our documentation, please send feedback to support forum.

> **Note:** You must create a user account and register your product with a valid serial number to obtain support using some of the above methods.

Xamarin.Android Project Templates

When you install **C1StudioInstaller.exe** on your system, we provide different project templates that are available for Xamarin.Forms, Android, and iOS. These templates help you to easily create a Xamarin project with renderer initializers already in place to make use of controls to make development easier. These templates will also help the new users to get started with Xamarin.Forms using C1 Xamarin controls.

- **Xamarin.Forms**
  - Android
  - Cross-Platform
  - iOS



These project templates are similar to the Xamarin.Forms template available in Visual Studio. However, our templates provide a simple mobile application that includes our control references. These generated applications contains all the

necessary project files and assembly references to reduce manual work in project creation.

The table below list the C1 Xamarin.Forms project templates.

Project Template (Visual C#)	Description
C1 Android App (Android)	Creates a Xamarin.Android application using ComponentOne Studio for Xamarin. It includes the necessary project files, assembly references, and license information.
C1 Cross-Platform App (Xamarin.Forms Portable)	Creates a Xamarin.Forms application using a Portable Class Library and ComponentOne Studio for Xamarin. It includes the necessary project files, assembly references, and license information.
C1 EntityFramework App	Creates a Xamarin.Forms project using a data grid, Entity Framework, and a SQLite database that allows adding, removing, and updating records.
C1 iOS App (iOS)	Creates a Xamarin.iOS application using ComponentOne Studio for Xamarin. It includes the necessary project files, assembly references, and license information.

Controls

Calendar

The C1Calendar control provides a calendar through which you can navigate to any date in any year. The control comes with an interactive date selection user interface (UI) with month, year and decade view modes. Users can view as well as select multiple dates on the calendar.

The C1Calendar provides the ability to customize day slots so that users can visualize date information on the calendar. In addition, you can also customize the appearance of the calendar using your own content and style.

Key Features

- **Custom Day Content**: Customize the appearance of day slots by inserting custom content.
- **View Modes**: Tap header to switch from month mode to year and decade mode.
- **Appearance**: Easily style different parts of the control with heavy customizations.
- **Date Range Selection**: Simply tap two different dates to select all the dates in between.
- **Orientation**: Toggle the scroll orientation to either horizontal or vertical.
- **Animation**: By default, Calendar confers fast, animated transitions for enhanced user experience.

Quick Start: Display a C1Calendar Control

This section describes how to add a C1Calendar control to your android application and select a date on the calendar at runtime. This topic comprises of two steps:

- **Step 1: Add a Calendar control**
- **Step 2: Run the project**

The following image shows how C1Calendar appears after completing the above steps.

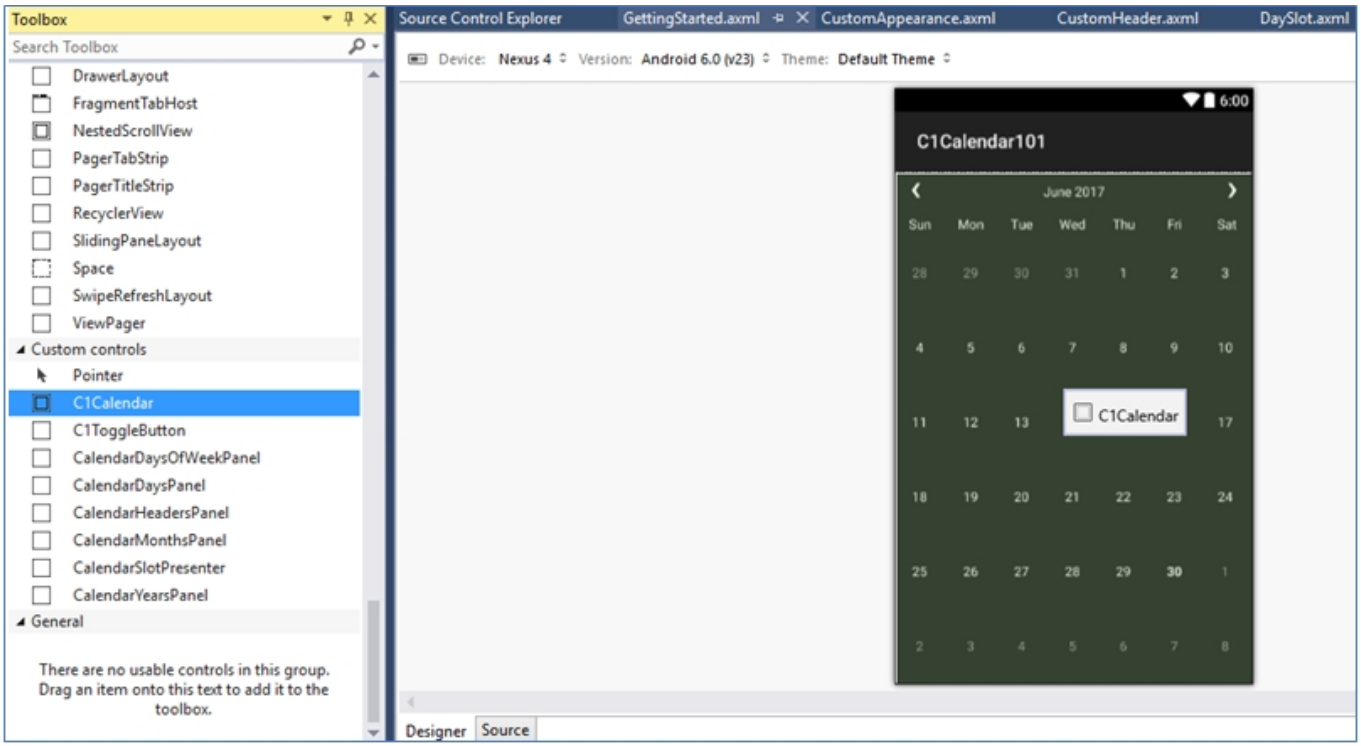
Step 1: Add a Calendar control

To add C1Calendar control to your layout, open the .axml file in your layout folder from the Solution Explorer and replace its code with the code below.

XML

```
<?xml version="1.0" encoding="utf-8"?>
<C1.Android.Calendar.C1Calendar
xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:id="@+id/Calendar" />
```

Alternatively, you can drag a C1Calendar control from the Toolbox within the custom control tab onto your layout surface in designer mode.



Then, inside your activity, add the following code to the OnCreate method to initialize your layout.

C#

```
protected override void OnCreate(Bundle bundle)
        {
            base.OnCreate(bundle);
            ActionBar.SetDisplayHomeAsUpEnabled(true);

            SetContentView(Resource.Layout.GettingStarted);
        }
```

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Step 2: Run the project

Press **F5** to run the application.

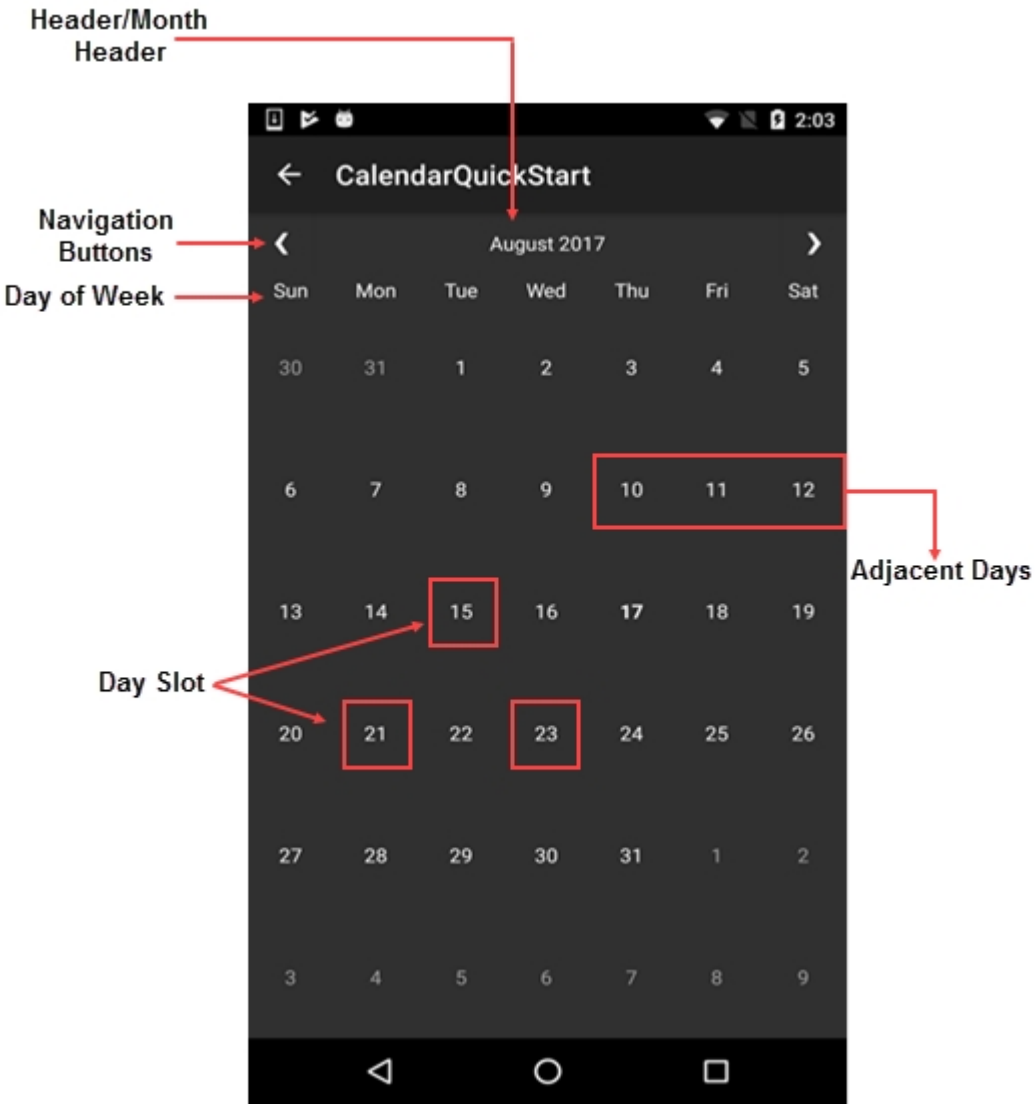
Interaction Guide

The C1Calendar control comprises of various functional parts such as Header, Day of Week, Day Slot, etc. These functional parts are illustrated below.

- **Header** - The Xamarin Calendar comprises a header that displays the current month, year or decade along with navigation buttons. Users can hide the default header and create their own headers as illustrated in Customizing Header.
- **Day Slot** - The Xamarin Calendar features day slots which can be customized to display custom content. See Customizing Day Content to understand how day slots can be used to insert and display custom content.
- **Day of Week -** The Xamarin Calendar's user interface displays seven days of week corresponding to respective

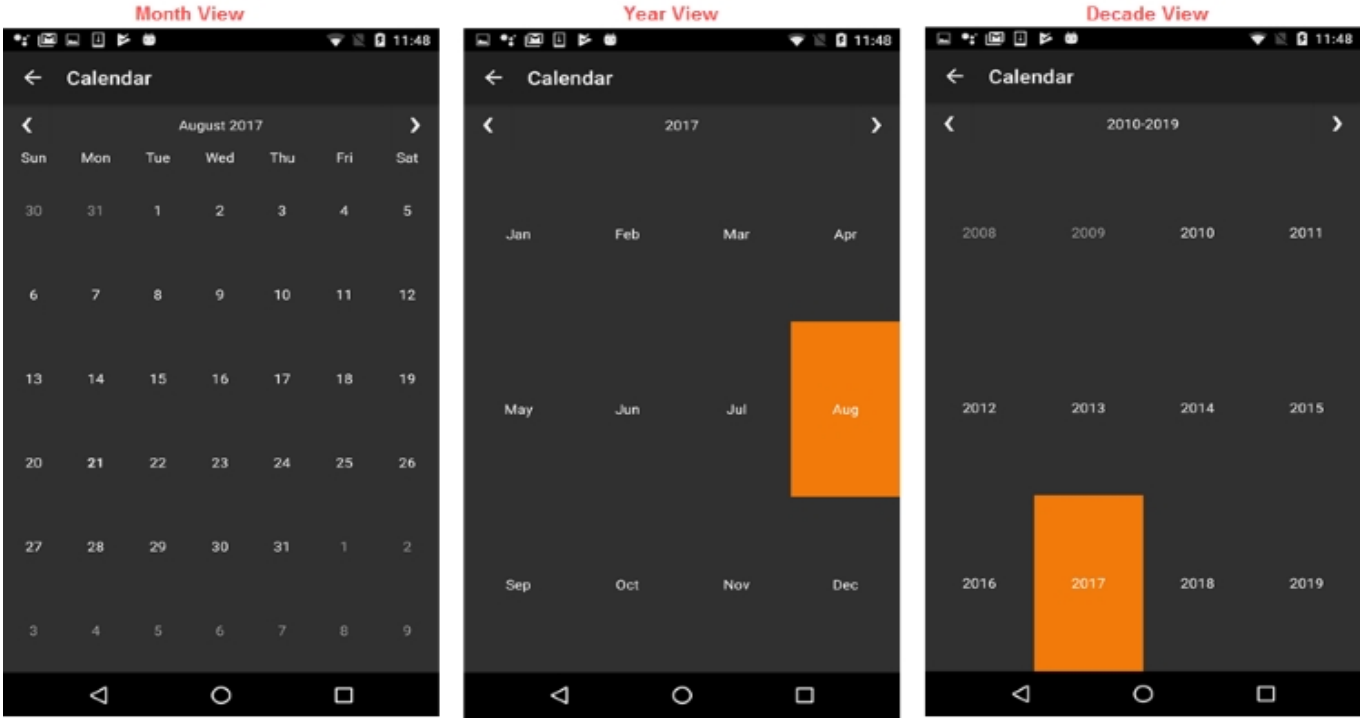
dates.

- **Navigation Buttons -** The navigation buttons enable users to traverse the selected month or year, forward or backward.



View Modes

The C1 Calendar for Android supports month, year and decade views as shown in the image below. The calendar switches from month to year view when the user taps the month header. On tapping the year header, the calendar switches to decade view. The calendar switches back to the month view on tapping the header on the decade view, completing a full circle from Month>Year>Decade>Month view.



Features

Customizing Appearance

The C1Calendar provides various built-in properties to customize calendar's appearance. You can use these properties to set calendar's background color, text color, header color, font size, header font size, selection background color, etc.

The image below shows a customized Xamarin Calendar after setting these properties.

The following code example demonstrates how to set these properties in Java and C#. This example uses the sample created in the Quick Start section.

MainActivity.cs

```
public class MainActivity : Activity
    {
        protected override void OnCreate(Bundle bundle)
        {
            // Set our view from the "main" layout resource
            // SetContentView (Resource.Layout.Main);
            base.OnCreate(bundle);
            ActionBar.SetDisplayHomeAsUpEnabled(true);
            SetContentView(Resource.Layout.Main);
            var calendar = FindViewById<C1Calendar>(Resource.Id.Calendar);
            calendar.ViewModeAnimation.AnimationMode =
CalendarViewModeAnimationMode.ZoomOutIn;
            calendar.ViewModeAnimation.ScaleFactor = 1.1;
            calendar.SetBackgroundColor(Android.Graphics.Color.AliceBlue);
            calendar.TextColor = Color.Black;
        }
        public override bool OnOptionsItemSelected(IMenuItem item)
        {
            if (item.ItemId == global::Android.Resource.Id.Home)
```

```
            {
                Finish();
                return true;
            }
            else
            {
                return base.OnOptionsItemSelected(item);
            }
        }
    }
```

Customizing Header

The C1 Calendar control shows a default header that displays the current month or year and navigation buttons. However, users can hide or remove the default header by setting the ShowHeader property to False, and apply a custom header.

The following image shows a Xamarin Calendar with a custom header.

On tapping the **Month** label, the calendar provides option to switch to month or year mode. The **Today** label navigates the calendar to the current day.

The following code example demonstrates how to create and apply a custom header in Xamarin Calendar control in C#. This example uses the sample created in Quick Start section.

In Code

Complete the following steps to customize the header for the Xamarin Calendar control.

1. Add the following import statements in the **MainActivity** class.

MainActivity.cs

```
using Android.App;
using Android.Content.PM;
using Android.OS;
using Android.Views;
using Android.Widget;
using System;
```

2. Replace the existing code in the MainActivity class with the code given below.

MainActivity.cs

```
public class MainActivity : Activity
    {
        private TextView monthLabel;
        private Spinner viewModeSpinner;
        private Button todayButton;
        private C1Calendar calendar;

        protected override void OnCreate(Bundle bundle)
        {
            base.OnCreate(bundle);
            ActionBar.SetDisplayHomeAsUpEnabled(true);

            SetContentView(Resource.Layout.CustomHeader);
            viewModeSpinner = FindViewById<Spinner>
(Resource.Id.ViewModeSpinner);
            todayButton = FindViewById<Button>(Resource.Id.TodayButton);
            calendar = FindViewById<C1Calendar>(Resource.Id.Calendar);
            monthLabel = FindViewById<TextView>(Resource.Id.MonthLabel);

            todayButton.Click += OnTodayClicked;
            var items = new CalendarViewMode[] { CalendarViewMode.Month,
CalendarViewMode.Year, CalendarViewMode.Decade };
            var adapterItems =
Resources.GetStringArray(Resource.Array.viewModeSpinnerValues);
            viewModeSpinner.Adapter = new ArrayAdapter(BaseContext,
global::Android.Resource.Layout.SimpleListItem1, adapterItems);
            viewModeSpinner.ItemSelected += OnModeChanged;
            calendar.ViewModeChanged += OnViewModeChanged;
            calendar.DisplayDateChanged += OnDisplayDateChanged;

            UpdateMonthLabel();
        }

        private async void OnModeChanged(object sender,
AdapterView.ItemSelectedEventArgs e)
        {
```

```
            switch (viewModeSpinner.SelectedItemPosition)
            {
                case 0:
                    await calendar.ChangeViewModeAsync(CalendarViewMode.Month);
                    break;
                case 1:
                    await calendar.ChangeViewModeAsync(CalendarViewMode.Year);
                    break;
                case 2:
                    await calendar.ChangeViewModeAsync(CalendarViewMode.Decade);
                    break;
            }
        }

        private async void OnTodayClicked(object sender, System.EventArgs e)
        {
            await calendar.ChangeViewModeAsync(CalendarViewMode.Month,
DateTime.Today);
            calendar.SelectedDate = DateTime.Today;
        }

        private void OnViewModeChanged(object sender, EventArgs e)
        {
            switch (calendar.ViewMode)
            {
                case CalendarViewMode.Month:
                    viewModeSpinner.SetSelection(0);
                    break;
                case CalendarViewMode.Year:
                    viewModeSpinner.SetSelection(1);
                    break;
                case CalendarViewMode.Decade:
                    viewModeSpinner.SetSelection(2);
                    break;
            }
        }

        private void OnDisplayDateChanged(object sender, EventArgs e)
        {
            UpdateMonthLabel();
        }

        private void UpdateMonthLabel()
        {
            monthLabel.Text = calendar.DisplayDate.ToString("Y");
        }
        public override bool OnOptionsItemSelected(IMenuItem item)
        {
            if (item.ItemId == global::Android.Resource.Id.Home)
            {
                Finish();
```

```
                return true;
            }
            else
            {
                return base.OnOptionsItemSelected(item);
            }
        }
    }
```

3. Add the following XML code in the Main.axml, to render the control onto the device.

Main.axml

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:calendar="http://schemas.android.com/apk/res-auto"
    android:orientation="vertical"
    android:weightSum="1"
    android:layout_width="match_parent"
    android:layout_height="match_parent">
    <LinearLayout
        android:orientation="horizontal"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:layout_weight="0">
        <Spinner
            android:layout_width="match_parent"
            android:layout_height="match_parent"
            android:layout_weight="0.5"
            android:id="@+id/ViewModeSpinner" />
        <Button
            android:text="Today"
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:layout_weight="0.5"
            android:id="@+id/TodayButton" />
    </LinearLayout>
    <TextView
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:layout_weight="0"
        android:id="@+id/MonthLabel"
        android:gravity="center"
        android:text="July 2016"
        android:textSize="20dip"
        android:layout_margin="4dip" />
    <c1.android.calendar.C1Calendar
        android:layout_width="match_parent"
        android:layout_height="match_parent"
        android:layout_weight="1"
        android:id="@+id/Calendar"
        calendar:c1_showHeader="false" />
</LinearLayout>
```

Customizing Day Content

The C1 Calendar control allows users to add custom content to day slot. For this, all you need to do is subscribe to the **DaySlotLoading** event and apply custom content such as images in the background of these slots. This feature allows users to display weather related information on the calendar.

The image below shows a Xamarin Calendar after adding custom content to day slots. The calendar displays weather related information through various icons.

The following code example demonstrates how to add custom content to day slots on the calendar using C#. This example uses the sample created in Quick Start section.

> Add the image icons as resource files at **YourProject\Resources\drawable** location in your VisualStudio project. By default, you can find these images at *C:\<User>\Documents\ComponentOne Samples\Xamarin\Android\C1Calendar101\Resources\drawable*

In Code

Complete the following steps to add custom content to day slots.

MainActivity.cs

```
public class MainActivity : Activity
    {
        protected override void OnCreate(Bundle bundle)
```

```
        {
            base.OnCreate(bundle);
            ActionBar.SetDisplayHomeAsUpEnabled(true);
            SetContentView(Resource.Layout.CustomDayContent);
            var calendar = FindViewById<C1Calendar>(Resource.Id.Calendar);
            calendar.DaySlotLoading += OnDaySlotLoading;
        }
        private void OnDaySlotLoading(object sender, CalendarDaySlotLoadingEventArgs
e)
        {
            // add weather image for certain days in the current month
            if (e.Date.Year == DateTime.Today.Year &&
                e.Date.Month == DateTime.Today.Month &&
                e.Date.Day >= 14 && e.Date.Day <= 23)
            {
                var slot = LayoutInflater.Inflate(Resource.Layout.DaySlot, null);
                var iv = slot.FindViewById<ImageView>(Resource.Id.Image);
                var tv = slot.FindViewById<TextView>(Resource.Id.Day);

                tv.Text = e.Date.Day.ToString();

                switch (e.Date.Day % 5)
                {
                    case 0:
                        iv.SetImageResource(Resource.Drawable.Cloudy);
                        break;
                    case 1:
                        iv.SetImageResource(Resource.Drawable.PartlyCloudy);
                        break;
                    case 2:
                        iv.SetImageResource(Resource.Drawable.Rain);
                        break;
                    case 3:
                        iv.SetImageResource(Resource.Drawable.Storm);
                        break;
                    case 4:
                        iv.SetImageResource(Resource.Drawable.Sun);
                        break;

                }
                e.DaySlot = slot;
            }

        }

        public override bool OnOptionsItemSelected(IMenuItem item)
        {
            if (item.ItemId == global::Android.Resource.Id.Home)
            {
                Finish();
                return true;
```

```
            }
            else
            {
                return base.OnOptionsItemSelected(item);
            }
        }
    }
```

Orientation

The C1Calendar appears in default horizontal orientation. However, you can change the orientation of the calendar to Vertical by using the Orientation property. The CalendarOrientation enumeration can be used to set Vertical orientation as shown in the code below.

The following code example demonstrates how to set the Orientation in C#. This code example uses the sample created in the Quick Start section.

MainActivity.cs

```
calendar.Orientation = CalendarOrientation.Vertical;
```

Selection

The C1Calendar control allows users to select a day on the calendar by tapping a date. However, you can set the number of days that you wish to select by using the MaxSelectionCount property in code. For instance, on setting the MaxSelectionCount property to 5, you can select a maximum of 5 days on the calendar as illustrated in the image below.

In Code

The following code example illustrates how to set maximum selection in C#. The following code example uses the sample created in the Quick Start.

C#

C#

```
// setting maximum selection
calendar.MaxSelectionCount = 5;
```

Customizing Selection

You can also customize the default behavior of the C1Calendar control to select specific dates. For instance, consider a scenario where you wish to select only weekdays on tapping two dates in different workweeks. For this, you simply need to subscribe the getSelectionChanging event and apply selection condition in the handler.

The following image shows a Xamarin Calendar that selects weekdays and deselects weekends on tapping two different dates in different workweeks.

The following code example demonstrates how customize selection in C#. The following code example uses the sample created in the Quick Start.

1. Add the following import statements in the MainActivity class of your project.

C#

```
using Android.App;
using Android.Widget;
using Android.OS;
using C1.Android.Calendar;
using System;
using Android.Views;
```

2. Add the following code to select only weekdays between two dates in two different weeks.

C#

```
public class MainActivity : Activity
    {
        C1Calendar calendar;
        protected override void OnCreate(Bundle savedInstanceState)
        {
            base.OnCreate(savedInstanceState);

            // Set our view from the "main" layout resource
            SetContentView(Resource.Layout.Main);
            calendar = FindViewById<C1Calendar>(Resource.Id.calendar);
            calendar.SelectionChanging += OnSelectionChanging;
        }
```

```
        private void OnSelectionChanging(object sender,
CalendarSelectionChangingEventArgs e)
        {
            foreach (var date in e.SelectedDates.ToArray())
            {
                if (date.DayOfWeek == DayOfWeek.Saturday || date.DayOfWeek ==
DayOfWeek.Sunday)
                    e.SelectedDates.Remove(date);
            }
        }

        public override bool OnOptionsItemSelected(IMenuItem item)
        {
            if (item.ItemId == global::Android.Resource.Id.Home)
            {
                Finish();
                return true;
            }
            else
            {
                return base.OnOptionsItemSelected(item);
            }
        }
```

CollectionView

CollectionView is a powerful cross-platform data management component that is designed to perform common data transformations and virtualization operations like sorting, grouping, filtering, editing, incremental-loading and refreshing. It provides a series of interfaces which are consumed and manipulated by the controls, such as grid, and these interfaces are implemented by collection views. CollectionView provides the interfaces so that the built-in features of the control are available for you to provide the data in a straightforward way without needing to synchronize the sources.

C1CollectionView library provides two implementations of ICollectionView, namely C1CollectionView and C1CursorCollectionView. **C1CollectionView** is an in-memory collection view and **C1CursorCollectionView** is an abstract base class for a range of remote-source collections.

Key Features

- Provides filtering, grouping and sorting on a data set.
- Can be used with the data collection controls, such as grid.
- Provides currency for master-detail support for Xamarin.Android apps.
- Based on the .NET implementation of ICollectionView.
- Performs on demand incremental loading and refreshing of data using C1CursorCollectionView.

The **C1CollectionView** implements several interfaces to provide current record management, custom sorting, filtering, grouping, editing, incremental loading, and refreshing.

Quick Start

This section describes how to add a **FlexGrid** control to your Xamarin.Android application and add data to it using the

CollectionView class. For more information on how to create a new Xamarin.Android application, see Creating a New Xamarin.Android App.

This topic comprises of three steps:

- **Step 1: Create a data source for FlexGrid**
- **Step 2: Add a FlexGrid control**
- **Step 3: Run the project**

The following image shows how the FlexGrid appears, after completing the steps above.

Step 1: Create a data source for FlexGrid

1. Add a new class file to the Xamarin.Android application (Name: `Customer.cs`).
2. Add the following code to the `Customer.cs` file. We are using **Customer** class to represent data in the FlexGrid control.

Customer.cs

```
public class Customer
```

```
    {
        int _id, _countryID;
        string _first, _last, _address, _postalCode, _email;
        static Random _rnd = new Random();
        static string[] _firstNames =
"Gil|Oprah|Xavier|Herb|Charlie|Larry|Steve".Split('|');
        static string[] _lastNames =
"Orsted|Frommer|Jammers|Krause|Neiman".Split('|');
        static string[] _countries = "Brazil|Colombia|Egypt|United
States|Japan|Thailand".Split('|');
        static string[] _emailServers = "gmail|yahoo|outlook|aol".Split('|');
        static string[] _streetNames =
"Main|Broad|Grand|Panoramic|Green|Golden|Park|Fake".Split('|');
        static string[] _streetTypes = "ST|AVE|BLVD".Split('|');
        static string[] _streetOrientation = "S|N|W|E|SE|SW|NE|NW".Split('|');

        public Customer()
            : this(_rnd.Next(10000))
        {
        }
        public Customer(int id)
        {
            ID = id;
            First = GetString(_firstNames);
            Last = GetString(_lastNames);
            Address = GetRandomAddress();
            PostalCode = _rnd.Next(100000, 999999).ToString();
            CountryID = _rnd.Next() % _countries.Length;
            Email = string.Format("{0}@{1}.com", (First + Last.Substring(0,
_rnd.Next(1, Last.Length)).ToLower()), GetString(_emailServers));
        }
        public int ID
        {
            get { return _id; }
            set
            {
                if (value != _id)
                {
                    _id = value;
                }
            }
        }
        public string Name
        {
            get { return string.Format("{0} {1}", First, Last); }
        }

        public string Address
        {
            get { return _address; }
            set
```

```
        {
            if (value != _address)
            {
                _address = value;
            }
        }
    }
    public string Country
    {
        get { return _countries[_countryID]; }
        set { _countries[_countryID] = value; }
    }

    public int CountryID
    {
        get { return _countryID; }
        set
        {
            if (value != _countryID)
            {
                _countryID = value;
            }
        }
    }
    public string PostalCode
    {
        get { return _postalCode; }
        set
        {
            if (_postalCode != value)
            {
                _postalCode = value;
            }
        }
    }
    public string First
    {
        get { return _first; }
        set
        {
            {
                _first = value;
            }
        }
    }

    public string Last
    {
        get { return _last; }
        set
        {
```

```
                if (_last != value)
                {
                    _last = value;
                }
            }
        }
        public string Email
        {
            get { return _email; }
            set
            {
                {
                    _email = value;
                }
            }
        }

        static string GetString(string[] arr)
        {
            return arr[_rnd.Next(arr.Length)];
        }
        // Provide static list.
        public static ObservableCollection<Customer> GetCustomerList(int count)
        {
            var list = new ObservableCollection<Customer>();
            for (int i = 0; i < count; i++)
            {
                list.Add(new Customer(i));
            }
            return list;
        }
        private static string GetRandomAddress()
        {
            if (_rnd.NextDouble() > 0.9)
            {
                return string.Format("{0} {1} {2} {3}", _rnd.Next(1, 999),
GetString(_streetNames), GetString(_streetTypes),
GetString(_streetOrientation));
            }
            else
            {
                return string.Format("{0} {1} {2}", _rnd.Next(1, 999),
GetString(_streetNames), GetString(_streetTypes));
            }
        }
    }
```

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Step 2: Add a FlexGrid control

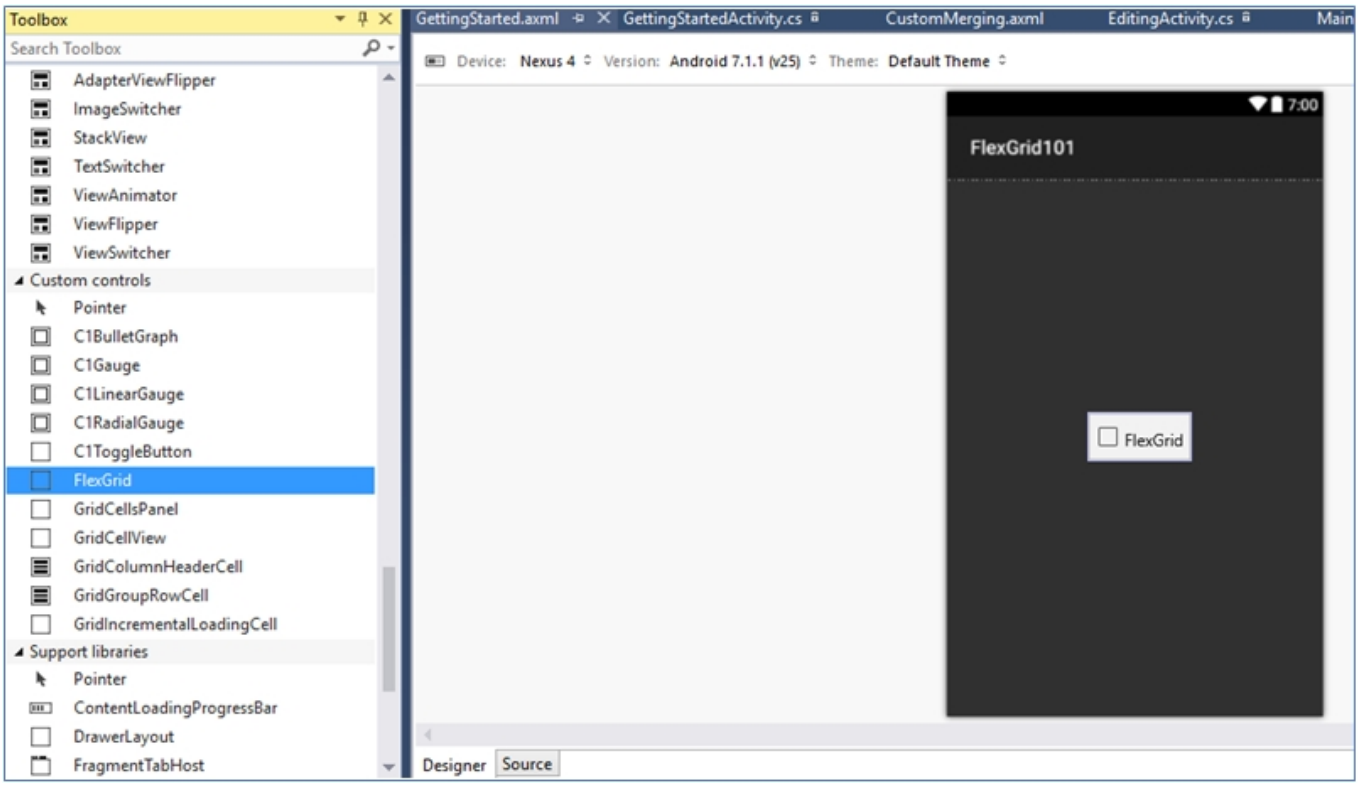
Initialize FlexGrid control in code

To add the FlexGrid control to your layout, open the .axml file in your layout folder from the Solution Explorer and replace its code with the code below.

XML

```
<?xml version="1.0" encoding="utf-8"?>
<C1.Android.Grid.FlexGrid xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:id="@+id/Grid" />
```

Alternatively, you can drag a FlexGrid control from the Toolbox within the custom control tab onto your layout surface in designer mode.



Then, inside your activity, add the following code to the OnCreate method to initialize your layout.

C#

```
using Android.App;
using Android.OS;
using Android.Content.PM;
using Android.Support.V7.App;
using C1.Android.Grid;
using C1.CollectionView;

namespace CollectionView.Android
{
    public class QuickStart : AppCompatActivity
    {
        protected override void OnCreate(Bundle savedInstanceState)
        {
```

```
            base.OnCreate(savedInstanceState);

            // Create your application here
            SetContentView(Resource.Layout.QuickStart);

            Gird = (FlexGrid)FindViewById(Resource.Id.grid);
            var data = Customer.GetCustomerList(250);

            _collectionView = new C1SortCollectionView<Customer>(data);
            Gird.ItemsSource = _collectionView;

            Gird.SelectionMode = GridSelectionMode.Cell;
            Gird.AutoSizeColumns(0, Gird.Columns.Count - 1);
        }
        private FlexGrid Gird;
        private C1SortCollectionView<Customer> _collectionView;
    }
}
```

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Step 3: Run the project

Press **F5** to your application.

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Features

Filtering

Filtering refers to refining data sets into simply what a user needs, without including other data that can be repetitive or irrelevant. The ISupportFiltering interface enables support for filtering in data controls, such as grids. It implements the FilterAsync method so that you can call the filtering operation in the collection view without having to cast to the specific interface. The **FilterAsync** method filters the data according to the filter value provided with the help of filter button.

The following image shows filtering in the FlexGrid control using CollectionView class.

The following code example shows how to implement filtering in the FlexGrid control.

C#

```
using Android.App;
using Android.Widget;
using Android.Graphics;
```

```
using Android.OS;
using Android.Support.V7.App;
using C1.Android.Grid;
using C1.CollectionView;
namespace FlexGridFiltering
{
    public class MainActivity : AppCompatActivity
    {
        private FlexGrid _grid;
        private FullTextFilterBehavior _fullTextBehavior;
        private EditText _textbox;
        protected override void OnCreate(Bundle savedInstanceState)
        {
            base.OnCreate(savedInstanceState);

            // Set our view from the "main" layout resource
            SetContentView(Resource.Layout.activity_main);

            _grid = (FlexGrid)FindViewById(Resource.Id.grid);
            _textbox = (EditText)FindViewById(Resource.Id.textEntry);

            var data = Customer.GetCustomerList(100);
            _grid.ItemsSource = data;
            ((C1CollectionView<object>)_grid.CollectionView).FilterAsync("Jammers");

            _fullTextBehavior = new FullTextFilterBehavior();
            _fullTextBehavior.HighlightColor = Color.Blue;
            _fullTextBehavior.Attach(_grid);
            _fullTextBehavior.FilterEntry = _textbox;
        }
    }
}
```

Grouping

Grouping refers to combining rows based on column values. When grouping is applied to a grid, it automatically sorts the data, splits it into groups, and adds collapsible group rows above or below each group. Similarly, the ISupportGrouping interface enables support for grouping within data controls, such as grids. It implements GroupAsync method so that you can call the grouping operation in the collection view without having to cast to the specific interface. The **GroupAsync** method groups the collection view according to the specified group fields, group path, or group descriptions.

The image below shows how the FlexGrid appears, after the grouping is applied to column **Country**.

3

The following code examples demonstrate how to set this property in C#. These examples use the sample created in the Quick Start section.

In Code

C#

```
using Android.App;
using Android.OS;
using C1.Android.Grid;
using Android.Support.V7.App;
using C1.CollectionView;
namespace CollectionView.Android
{
    [Activity(Label = "Grouping")]
    public class Grouping : AppCompatActivity
    {
        protected override void OnCreate(Bundle savedInstanceState)
```

```
        {
            base.OnCreate(savedInstanceState);

            // Create your application here
            SetContentView(Resource.Layout.Grouping);
            _groupingGrid = (FlexGrid)FindViewById(Resource.Id.grid);
            var data = Customer.GetCustomerList(250);

            _collectionView = new C1GroupCollectionView<Customer>(data, false);
            _collectionView.GroupAsync("Country");
            _groupingGrid.ItemsSource = _collectionView;

            _groupingGrid.SelectionMode = GridSelectionMode.Cell;
            _groupingGrid.ShowMarquee = true;
            _groupingGrid.AutoSizeColumns(0, _groupingGrid.Columns.Count - 1);
            _groupingGrid.RowHeaders.Columns.Clear();
            _groupingGrid.Columns["Country"].IsVisible = false;
        }
        private FlexGrid _groupingGrid;
        private C1GroupCollectionView<Customer> _collectionView;
    }
}
```

Incremental Loading

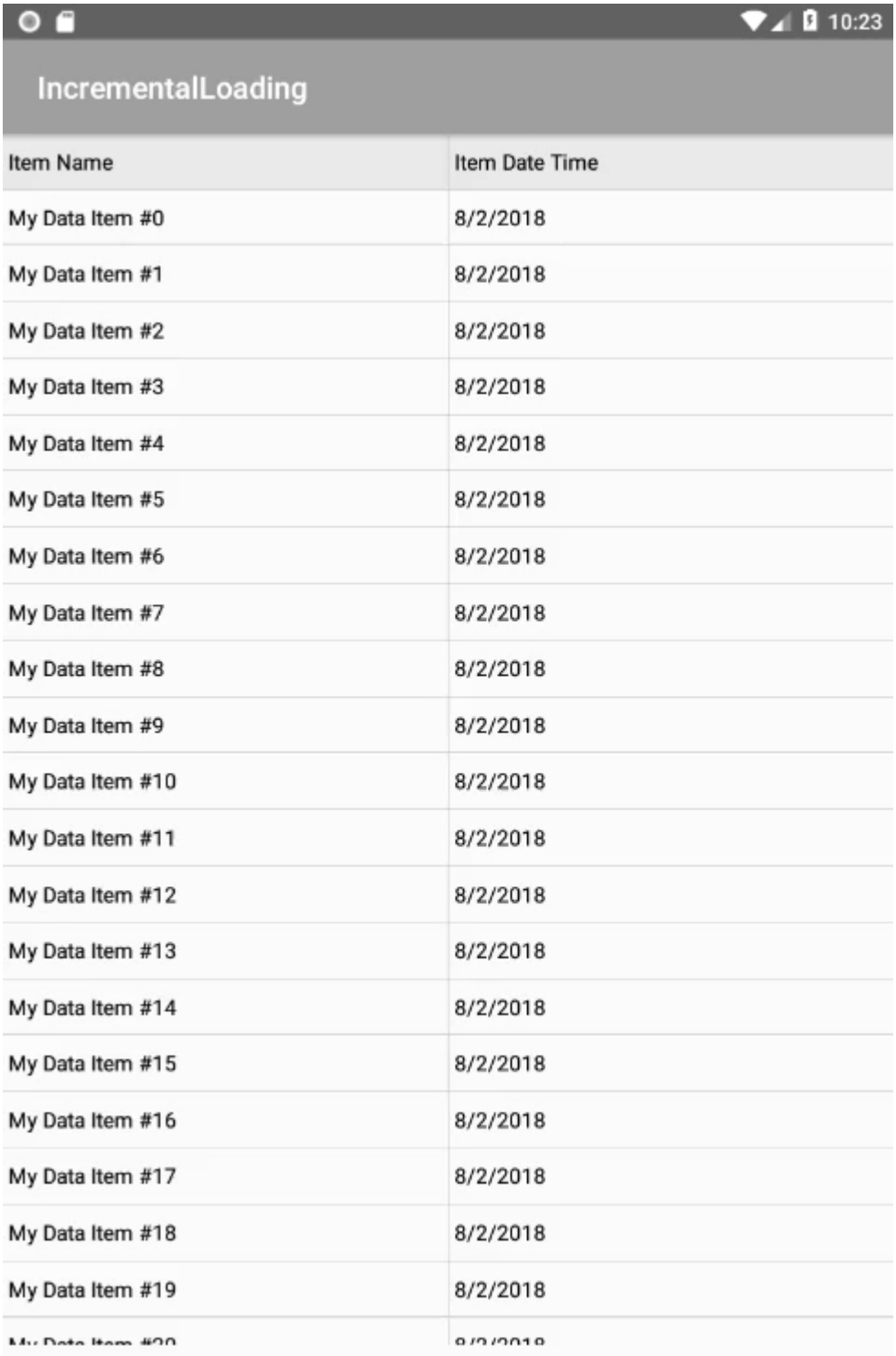
Incremental loading or on-demand loading is a powerful feature for mobile applications where data is loaded in chunks as the user scroll down a list in real time. Xamarin CollectionView supports incremental loading for data bound controls, such as FlexGrid and RecyclerView.

Adding incremental loading to ListView control is accomplished in two basic steps.

1. Implement your own collection view class, for example, OnDemandCollectionView, that extends C1CursorCollectionView class and overrides GetPageAsync. Once, this is completed you need to add logic that loads the data in pages or chunks.

2. Extend RecyclerView, FlexGrid, or another UI control to determine when the user has reached the bottom of a page.

The following GIF image shows incremental loading in FlexGrid control.



The following code demonstrates how to implement incremental loading using CollectionView class.

C#

```
using System;
using System.Collections.Generic;
using System.Threading.Tasks;
using System.Threading;
using Android.App;
using Android.Content.PM;
using Android.OS;
```

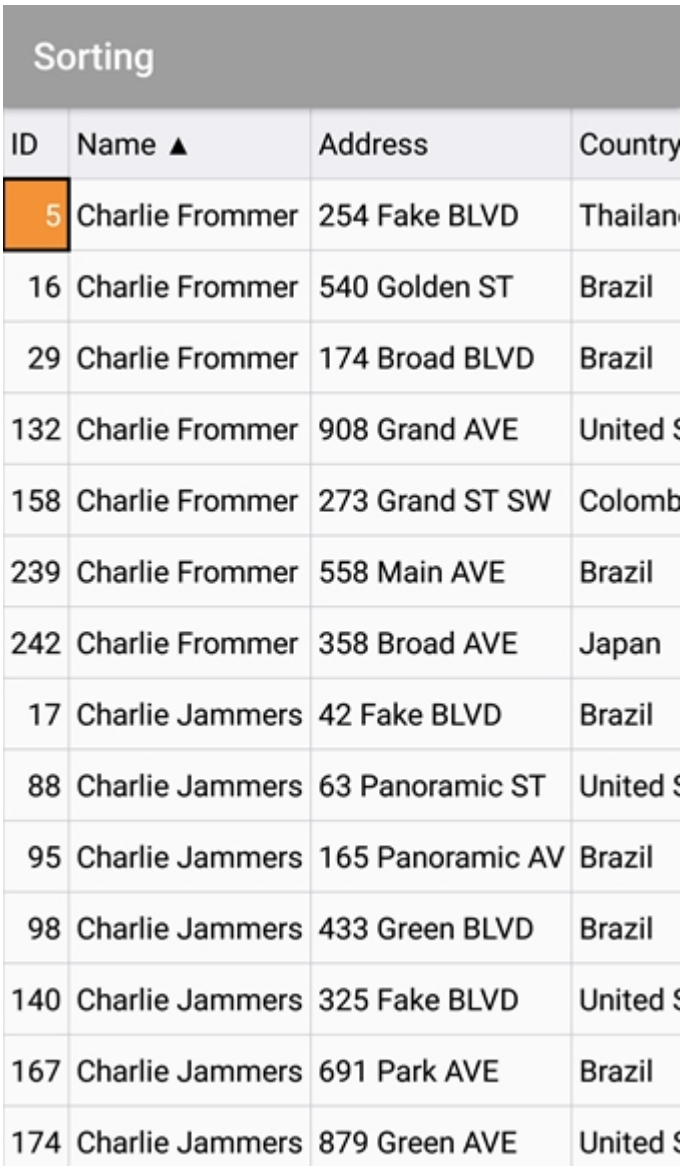
```
using C1.Android.Grid;
using Android.Support.V7.App;
using C1.CollectionView;

namespace CollectionView.Android
{
    public class IncrementalLoading : AppCompatActivity
    {
        protected override void OnCreate(Bundle savedInstanceState)
        {
            base.OnCreate(savedInstanceState);

            //アプリケーションを作成します

            SetContentView(Resource.Layout.IncrementalLoading);

            var _grid = (FlexGrid)FindViewById(Resource.Id.grid);

             _collectionView = new OnDemandCollectionView();
            _grid.ItemsSource = _collectionView;
            for (int _column = 0; _column <= _grid.Columns.Count - 1; _column++)
            {
                _grid.Columns[_column].Width = GridLength.Star;
            }
            _grid.AllowDragging = GridAllowDragging.Both;
            _grid.AllowResizing = GridAllowResizing.Both;
            _grid.RowHeaders.Columns.Clear();
            _grid.LoadItemsOnDemand(_collectionView);
        }
        OnDemandCollectionView _collectionView;
    }
    public class OnDemandCollectionView : C1CursorCollectionView<MyDataItem>
    {
        private bool hasMoreItems = true;

        public override bool HasMoreItems
        { get { return hasMoreItems; } }

        const int MAX = 100;
        int current;
        public int PageSize { get; set; }
        public OnDemandCollectionView()
        {
            PageSize = 20;
        }
        protected override async Task<Tuple<string, IReadOnlyList<MyDataItem>>>
        GetPageAsync(int startingIndex, string pageToken, int? count = null,
        IReadOnlyList<SortDescription> sortDescriptions = null, FilterExpression
                filterExpression = null, CancellationToken cancellationToken =
default(CancellationToken))
        {
```

```
            if (startingIndex + PageSize >= MAX)
            {
                hasMoreItems = false;
            }

            var newItems = new List<MyDataItem>();
            await Task.Run(() =>
            {
                for (int i = 0; i < this.PageSize; i++)
                {
                    //To mimic a long operation,e.g fetching data from a web service
                    Thread.Sleep(100);

                    newItems.Add(new MyDataItem(startingIndex + i));
                    current++;
                }
            });
            return new Tuple<string, IReadOnlyList<MyDataItem>>("token not used",
newItems);
        }
    }
    public class MyDataItem
    {
        public string ItemName { get; set; }
        public DateTime ItemDateTime { get; set; }
        public MyDataItem(int index)
        {
            this.ItemName = "My Data Item #" + index.ToString();
            this.ItemDateTime = DateTime.UtcNow;
        }
    }
    public static class ListViewEx
    {
        public static void LoadItemsOnDemand<T>(this FlexGrid _flexGrid,
         C1CursorCollectionView<T> collectionView) where T : MyDataItem
        {
            if (collectionView.HasMoreItems)
            {
                collectionView.LoadMoreItemsAsync();
            }
        }
    }
}
```

Sorting

The ISupportSorting interface supports ascending and descending sorting for data controls, such as grids. It implements SortAsync method to allow you to call the sorting operation in the collection view without having to cast to the specific interface. The SortAsync method sort the CollectionView according to the specified sort path and direction. To sort columns at run time, you can simply tap the column header of a particular column when using the FlexGrid control.

The image below shows how the FlexGrid appears, after you set the **SortAsync** method.



The following code examples demonstrate how to set the **SortAsync** method in C#. These examples use the sample created in the Quick Start section.

In Code

C#

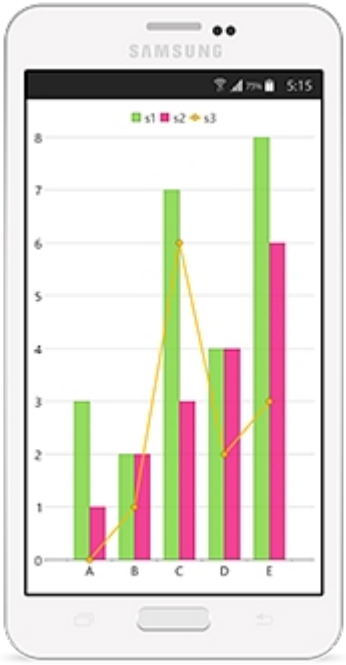
```
using System.Linq;
using Android.App;
using Android.OS;
using Android.Content.PM;
using Android.Support.V7.App;
using C1.Android.Grid;
using C1.CollectionView;
namespace CollectionView.Android
{
    public class Sorting : AppCompatActivity
    {
```

```
        protected override void OnCreate(Bundle savedInstanceState)
        {
            base.OnCreate(savedInstanceState);

            // Create your application here
            SetContentView(Resource.Layout.Sorting);

            _sortingGrid = (FlexGrid)FindViewById(Resource.Id.grid);
            var data = Customer.GetCustomerList(250);

            _collectionView = new C1SortCollectionView<Customer>(data);
            var sort = _collectionView.SortDescriptions.FirstOrDefault(sd =>
sd.SortPath == "Name");
            var direction = sort != null ? sort.Direction : SortDirection.Descending;
            _collectionView.SortAsync("Name", direction == SortDirection.Ascending ?
SortDirection.Descending : SortDirection.Ascending);
            _sortingGrid.ItemsSource = _collectionView;

            _sortingGrid.SelectionMode = GridSelectionMode.Cell;

            _sortingGrid.AllowSorting = false;
            _sortingGrid.ShowMarquee = true;
            _sortingGrid.AutoSizeColumns(0, _sortingGrid.Columns.Count - 1);
            _sortingGrid.RowHeaders.Columns.Clear();
        }
        private FlexGrid _sortingGrid;
        private C1SortCollectionView<Customer> _collectionView;
    }
}
```

FlexChart

The **FlexChart** control allows you to represent data visually in Android mobile applications. Depending on the type of data you need to display, you can represent your data as bars, columns, bubbles, candlesticks, lines, scattered points or even display them in multiple chart types.

FlexChart manages the underlying complexities inherent in a chart control completely, allowing developers to concentrate on important application specific tasks.

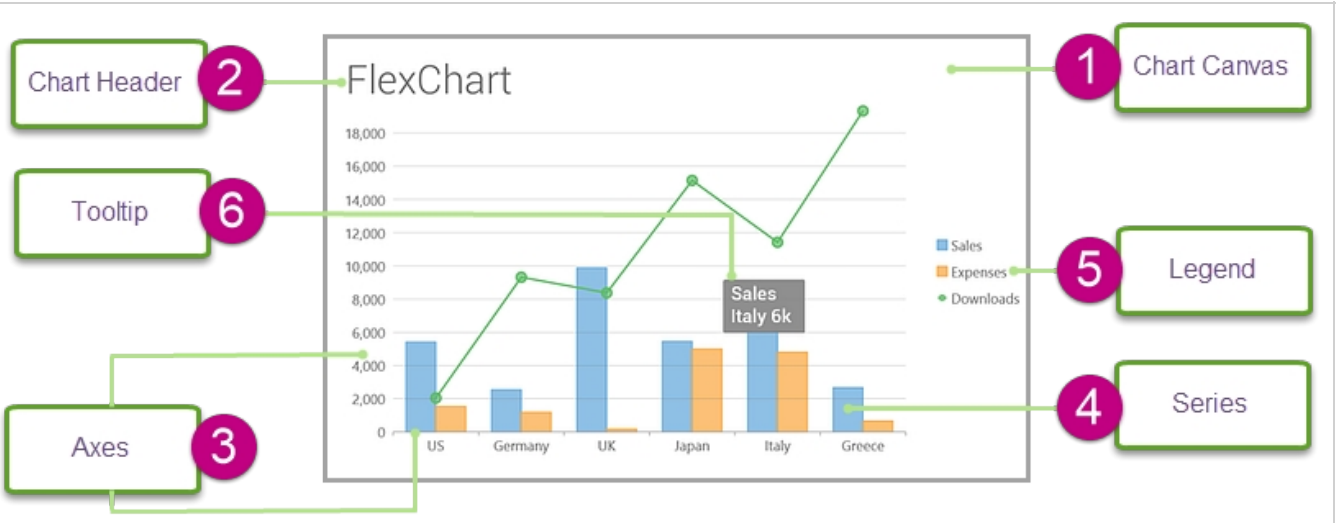


Key Features

- **Chart Type**: Change a line chart to a bar chart or any other chart type by setting a single property. FlexChart supports over ten different chart types.
- **Touch Based Labels**: Display chart values using touch based labels.
- **Multiple Series**: Add multiple series on a single chart.

Chart Elements

FlexChart is composed of several elements as shown below:



1	**Chart Canvas**	Area on which all chart elements including the series, axes title and legend are placed.

2	**Chart Header**	Text that you want to display at the top of your chart, basically a title that serves as a heading for your chart.
3	**Axes**	Two primary axes, X and Y. Although in some cases you may add secondary axes as well.
4	**Series**	Collection of data that is plotted on the chart.
5	**Legend**	Name of the series added in the chart along with predefined symbols and colors used to plot data for that series.
6	**Tooltip**	Tooltips or labels that appear when you hover on a series.

Chart Types

You can change the type of the FlexChart control depending on your requirement. Chart type can be changed by setting the **ChartType** property of the FlexChart control. In case of adding multiple series to FlexChart, each series of the chart are of the default chart type selected for that chart. However, you can set chart type for each series in code.

In Code

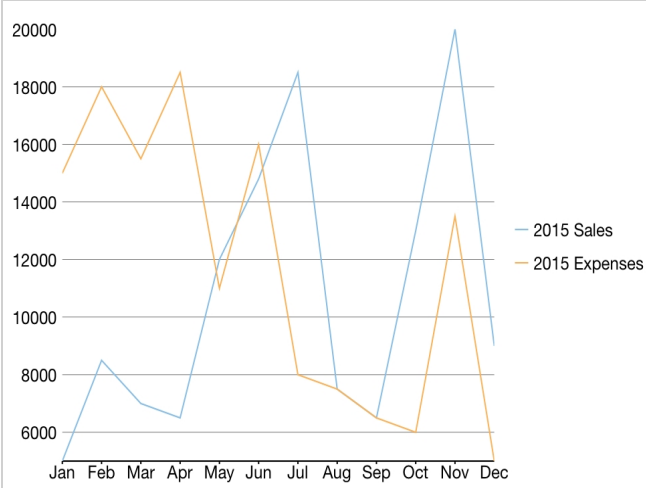
C#

```
chart.ChartType = ChartType.Area;
```

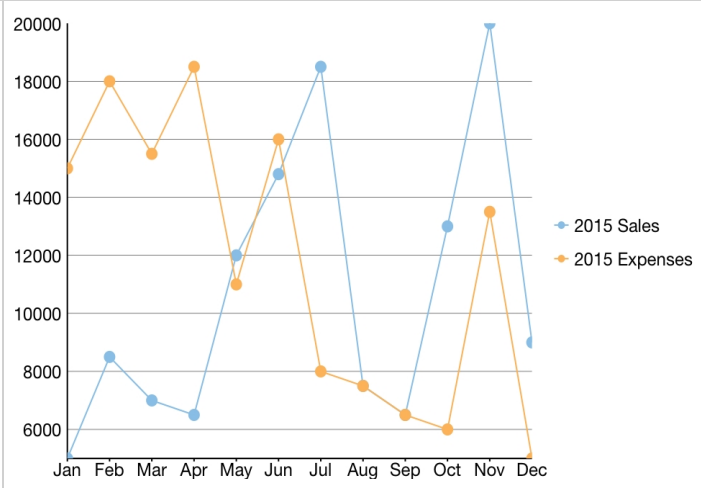
Line and LineSymbol chart

A Line chart draws each series as connected points of data, similar to area chart except that the area below the connected points is not filled. The series can be drawn independently or stacked. It is the most effective way of denoting changes in value between different groups of data. A LineSymbol chart is similar to line chart except that it represents data points using symbols.

These charts are commonly used to show trends and performance over time.



Line Chart

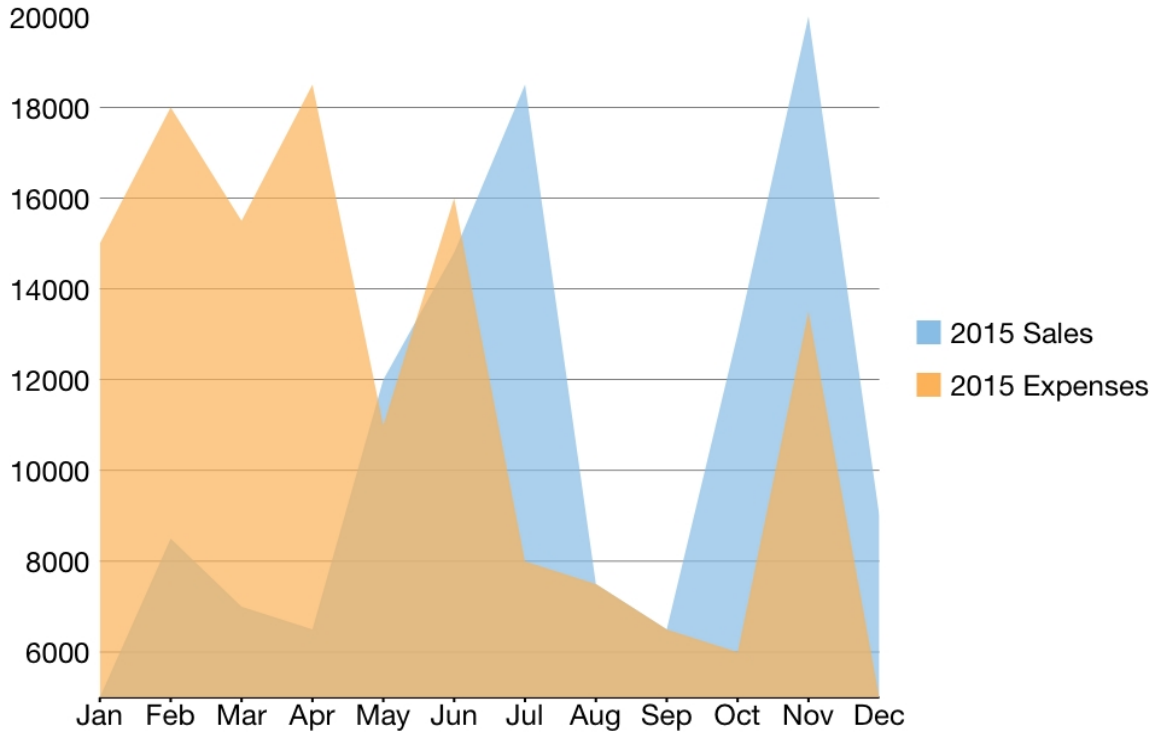


LineSymbol Chart

Area chart

An Area chart draws each series as connected points of data and the area below the connected points is filled with color to denote volume. Each new series is drawn on top of the preceding series. The series can either be drawn independently or stacked.

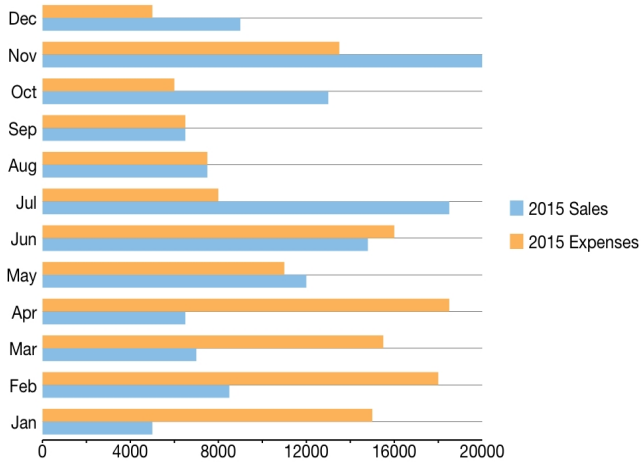
These charts are commonly used to show trends between associated attributes over time.



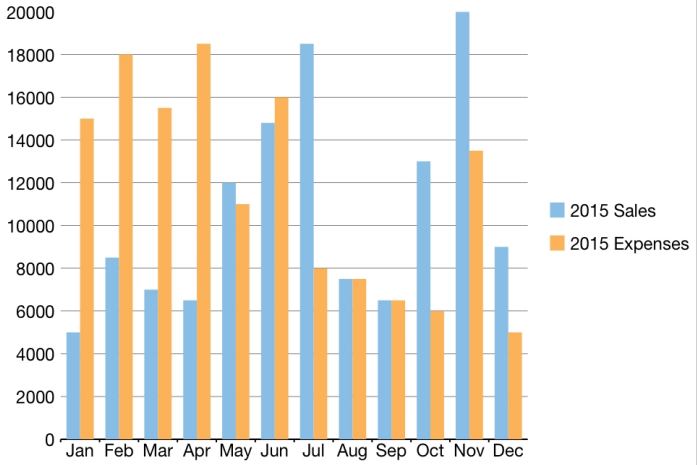
Bar and Column chart

A Bar chart or a Column chart represents each series in the form of bars of the same color and width, whose length is determined by its value. Each new series is plotted in the form of bars next to the bars of the preceding series. When the bars are arranged horizontally, the chart is called a bar chart and when the bars are arranged vertically, the chart is called column chart. Bar charts and Column charts can be either grouped or stacked.

These charts are commonly used to visually represent data that is grouped into discrete categories, for example age groups, months, etc.



Bar Chart

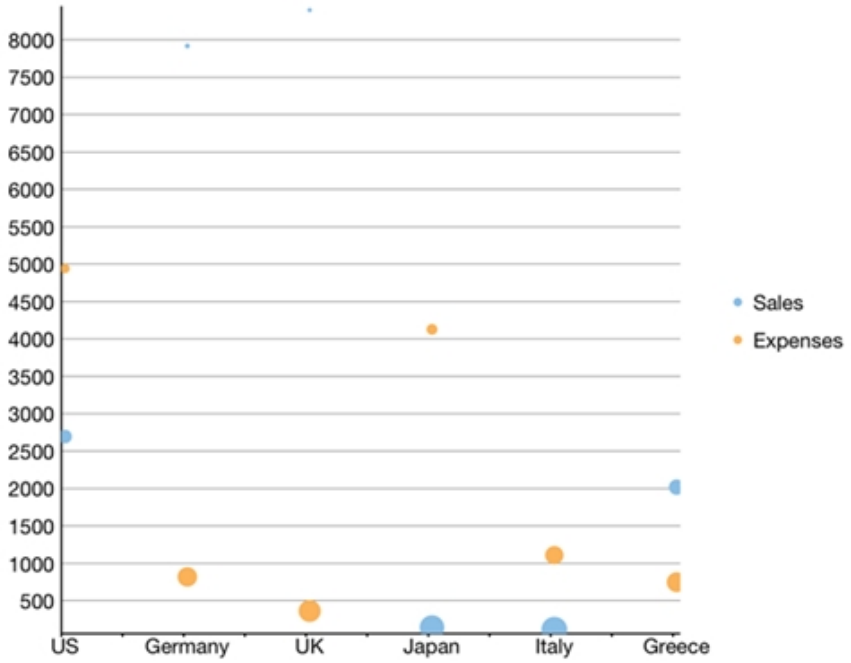


Column Chart

Bubble chart

A Bubble chart represents three dimensions of data. The X and Y values denote two of the data dimensions. The third dimension is denoted by the size of the bubble.

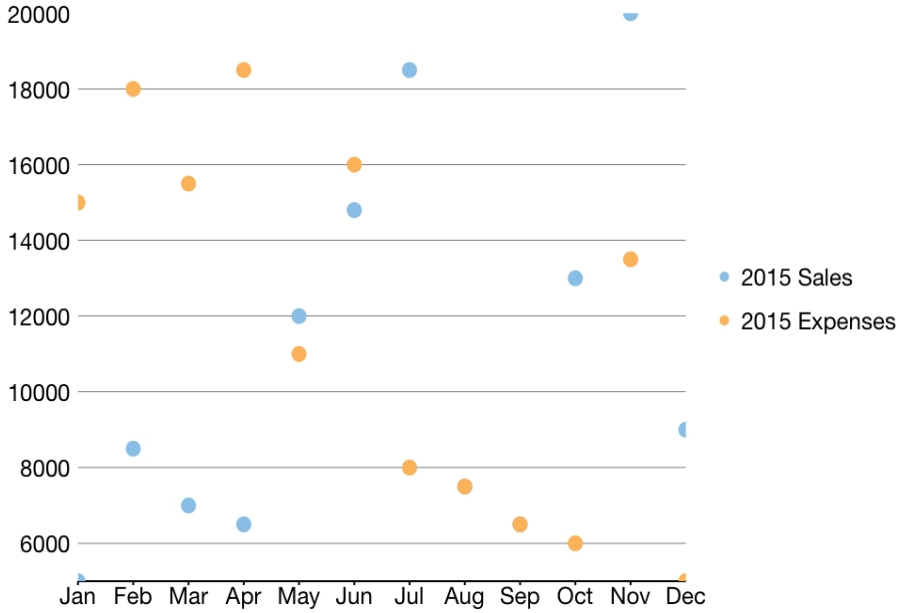
These charts are used to compare entities based on their relative positions on the axis as well as their size.



Scatter

A Scatter chart represents a series in the form of points plotted using their X and Y axis coordinates. The X and Y axis coordinates are combined into single data points and displayed in uneven intervals or clusters.

These charts are commonly used to determine the variation in data point density with varying x and y coordinates.



Candlestick chart

A Candlestick chart is a financial chart that shows the opening, closing, high and low prices of a given stock. It is a special type of HiLoOpenClose chart that is used to show the relationship between open and close as well as high and low. Candle chart uses price data (high, low, open, and close values) and it includes a thick candle-like body that uses the color and size of the body to reveal additional information about the relationship between the open and close values. For example, long transparent candles show buying pressure and long filled candles show selling pressure.

Elements of a Candlestick chart

The Candlestick chart is made up of the following elements: **candle**, **wick**, and **tail**.

- **Candle**: The candle or the body (the solid bar between the opening and closing values) represents the change in stock price from opening to closing.
- **Wick and Tail**: The thin lines, wick and tail, above and below the candle depict the high/low range.
- **Hollow Body:** A hollow candle or transparent candle indicates a rising stock price (close was higher than open). In a hollow candle, the bottom of the body represents the opening price and the top of the body represents the closing price.
- **Filled Body:** A filled candle indicates a falling stock price (open was higher than close). In a filled candle the top of the body represents the opening price and the bottom of the body represents the closing price.

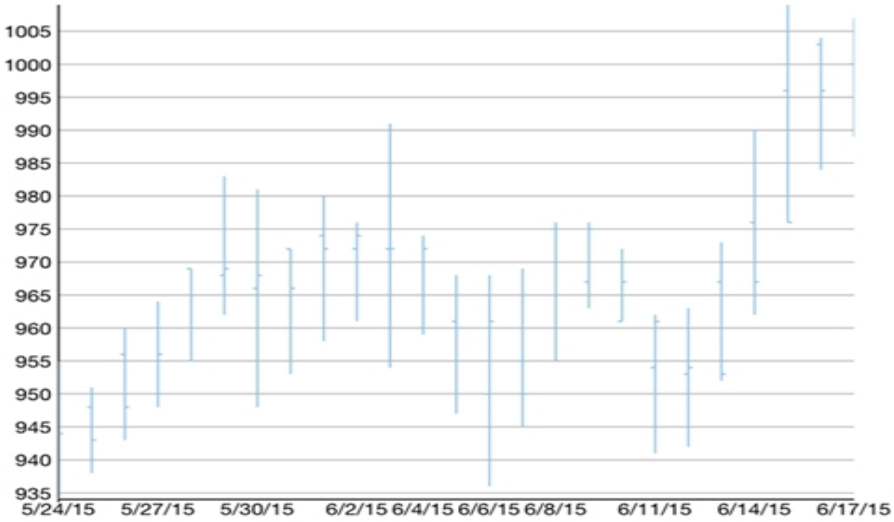
In a Candlestick there are five values for each data point in the series.

- **x:** Determines the date position along the x axis.
- **high:** Determines the highest price for the day, and plots it as the top of the candle along the y axis.
- **low:** Determines the lowest price for the day, and plots it as the bottom of the candle along the y axis.
- **open:** Determines the opening price for the day.
- **close:** Determines the closing price for the day.

The following image shows a candlestick chart displaying stock prices.

High Low Open Close chart

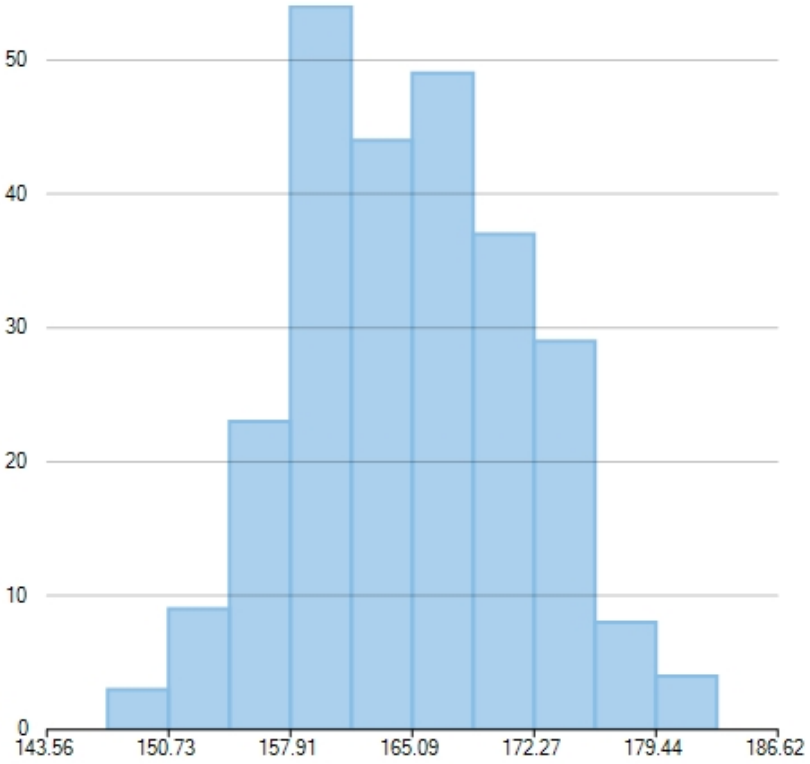
HiLoOpenClose are financial charts that combine four independent values to supply high, low, open and close data for a point in a series. In addition to showing the high and low value of a stock, the Y2 and Y3 array elements represent the stock's opening and closing price respectively.



Histogram Chart

Histogram chart plots the frequency distribution of data against the defined class intervals or bins. These bins are created by dividing the raw data values into a series of consecutive and non-overlapping intervals. Based on the number of values falling in a particular bin, frequencies are then plotted as rectangular columns against continuous x-axis.

These charts are commonly used for visualizing distribution of numerical data over a continuous, or a certain period of time.



Step Chart

Step charts use horizontal and vertical lines to present data that show sudden changes along y-axis by discrete amount. These charts help display changes that are sudden and irregular but stay constant till the next change. Step charts enable judging trends in data along with the duration for which the trend remained constant.

Consider a use case where you want to visualize and compare weekly sales and units downloaded of a software. As both of these values vary with discrete amounts, you can use step chart to visualize them. As shown in the image below, apart from depicting the change in sales these charts also show the exact time of change and the duration for which sales were constant. Moreover, you can easily identify the magnitude of respective changes by simply looking at the chart.

FlexChart supports Step chart, StepSymbols chart, and StepArea or filled step chart. The following table gives detailed explanation of these chart types.

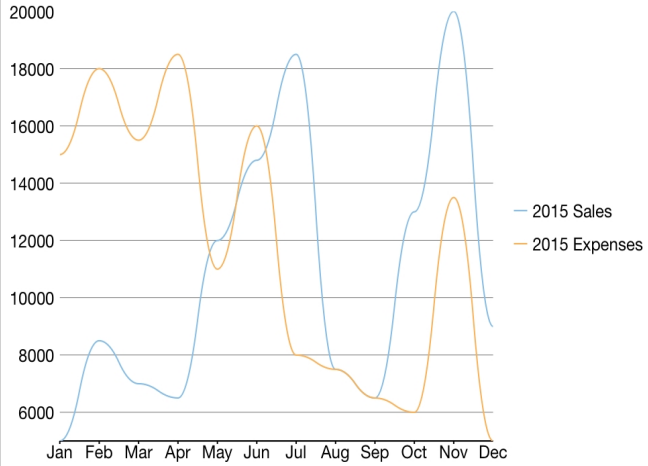
Step Chart	Step chart is similar to the Line chart, except that Line chart uses shortest distance to connect consecutive data points, while Step chart connects them with horizontal and vertical lines. These horizontal and vertical lines give the chart step-like appearance. While the line charts depict change and its trend, the Step charts also help in judging the magnitude and the intermittent pattern of the change.
StepSymbols Chart	StepSymbols chart combines the Step chart and the Scatter chart. FlexChart plots data points by using symbols and connects those data points with horizontal and vertical step lines. Here, the data points are marked using symbols and, therefore, help mark the beginning of an intermittent change.
StepArea Chart	StepArea chart combines the Step chart and the Area chart. It is similar to Area chart with the difference in the manner in which data points are connected. FlexChart plots the data points using horizontal and vertical step lines, and then fills the area between x-axis and the step lines. These are based on Step charts, and are commonly used to compare discrete and intermittent changes

	between two or more quantities. This gives the chart stacked appearance, where related data points of the multiple series seem stacked above the other. For example, number of units downloaded and sales of a software for a particular time duration can be easily compared as shown in the image.

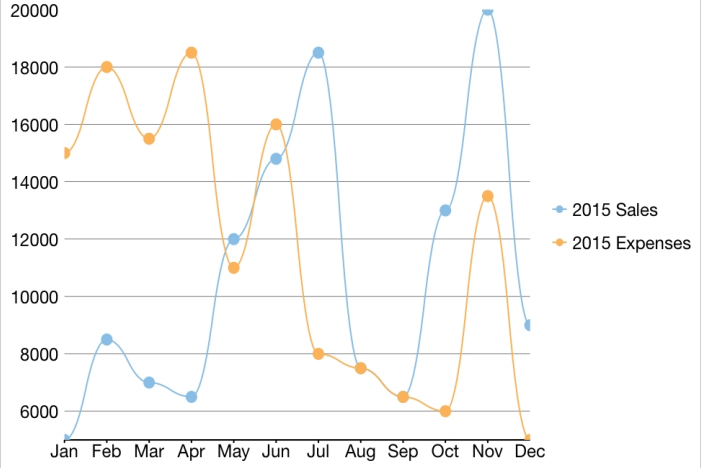
Spline and SplineSymbol chart

A Spline chart is a combination of line and area charts. It draws a fitted curve through each data point and its series can be drawn independently or stacked. It is the most effective way of representing data that uses curve fittings to show difference of values. A SplineSymbol chart is similar to Spline chart except that it represents data points using symbols.

These charts are commonly used to show trends and performance over time, such as product life-cycle.



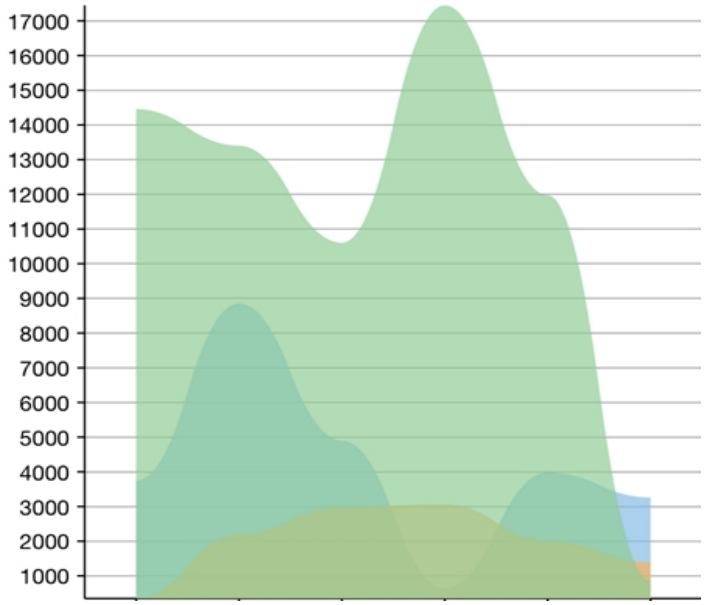
Spline Chart



SplineSymbol Chart

SplineArea chart

SplineArea charts are spline charts that display the area below the spline filled with color. SplineArea chart is similar to Area chart as both the charts show area, except that SplineArea chart uses splines and Area chart uses lines to connect data points.



SplineArea Chart

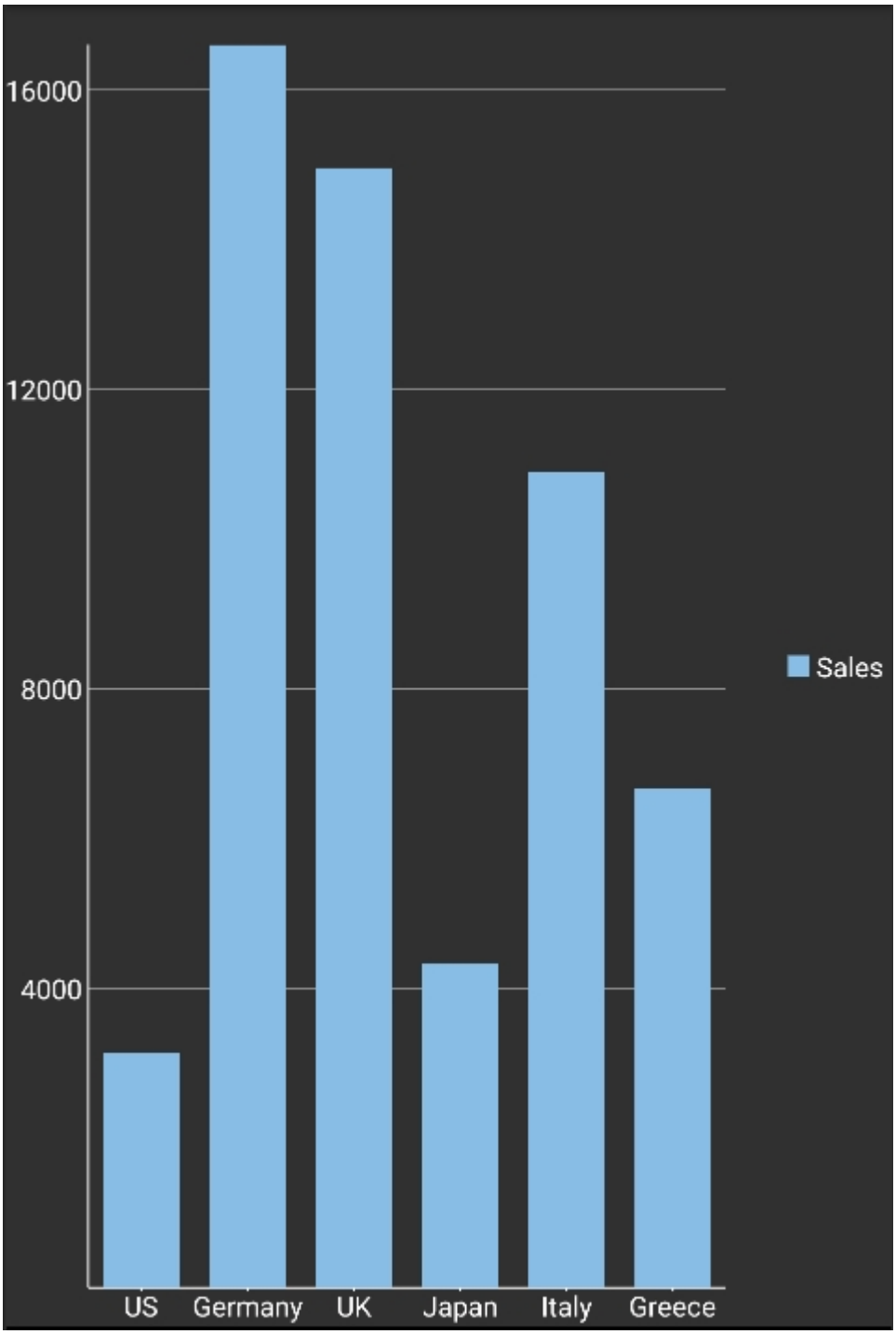
Quick Start: Add Data to FlexChart

This section describes how to add a FlexChart control to your android application and add data to it.

This topic comprises of three steps:

- **Step 1: Create a data source for FlexChart**
- **Step 2: Add a FlexChart control**
- **Step 3: Run the project**

The following image shows how the FlexChart appears, after completing the steps above.



Step 1: Create a Data Source for FlexChart

Add a new class,ChartPoint.cs, to serve as the data source for FlexChart control.

C#

```
public class ChartPoint : Java.Lang.Object
{
    static Random random = new Random();
    private const long serialVersionUID = 1L;

    private String name;
    private int sales;
    private int expenses;
    private int downloads;

    public string Name
    {
        get
        {
            return name;
        }
        set
        {
            name = value;
        }
    }

    public int Sales
    {
        get
        {
            return sales;
        }
        set
        {
            sales = value;
        }
    }

    public int Expenses
    {
        get
        {
            return expenses;
        }
        set
        {
            expenses = value;
        }
    }

    public int Downloads
    {
        get
```

```
        {
            return downloads;
        }
        set
        {
            downloads = value;
        }
    }

    public ChartPoint()
    {
    }

    public ChartPoint(String name, int sales, int expenses, int downloads)
    {
        this.Name = name;
        this.Sales = sales;
        this.Expenses = expenses;
        this.Downloads = downloads;
    }

    // a method to create a list of random objects of type ChartPoint
    public static IList<object> GetList()
    {
        List<object> list = new List<object>();
        int n = 6; // number of series elements
        String[] countries =
        { "US", "Germany", "UK", "Japan", "Italy", "Greece", "India", "Canada" };

        for (int i = 0; i < n; i++)
        {
            list.Add(new ChartPoint(countries[i], random.Next(20000),
random.Next(20000), random.Next(20000)));
        }
        return list;
    }

    public static ObservableCollection<ChartPoint> getLogList()
    {
        ObservableCollection<ChartPoint> list = new ObservableCollection<ChartPoint>
();

        int n = 6; // number of series elements
        String[] countries =
        { "US", "Germany", "UK", "Japan", "Italy", "Greece", "India", "Canada" };
        Random random = new Random();

        for (int i = 0; i < n; i++)
        {
            int scale = random.Next(14);
            scale = (int)Math.Exp((double)scale);
```

```
            list.Add(new ChartPoint(countries[i], random.Next(scale),
random.Next(scale), random.Next(scale)));
        }
        return list;
     }

    /**
     * a method to create a list of random objects of type ChartPoint with a fixed
element size;
     *
     * @param size
     *            - size of element of series.
     * */
    public static IList<object> GetList(int size)
    {
        IList<object> list = new List<object>();
        Random random = new Random();

        for (int i = 0; i < size; i++)
        {
             list.Add(new ChartPoint(i + "", random.Next(20000), random.Next(20000),
random.Next(20000)));
        }
        return list;
    }
}
```

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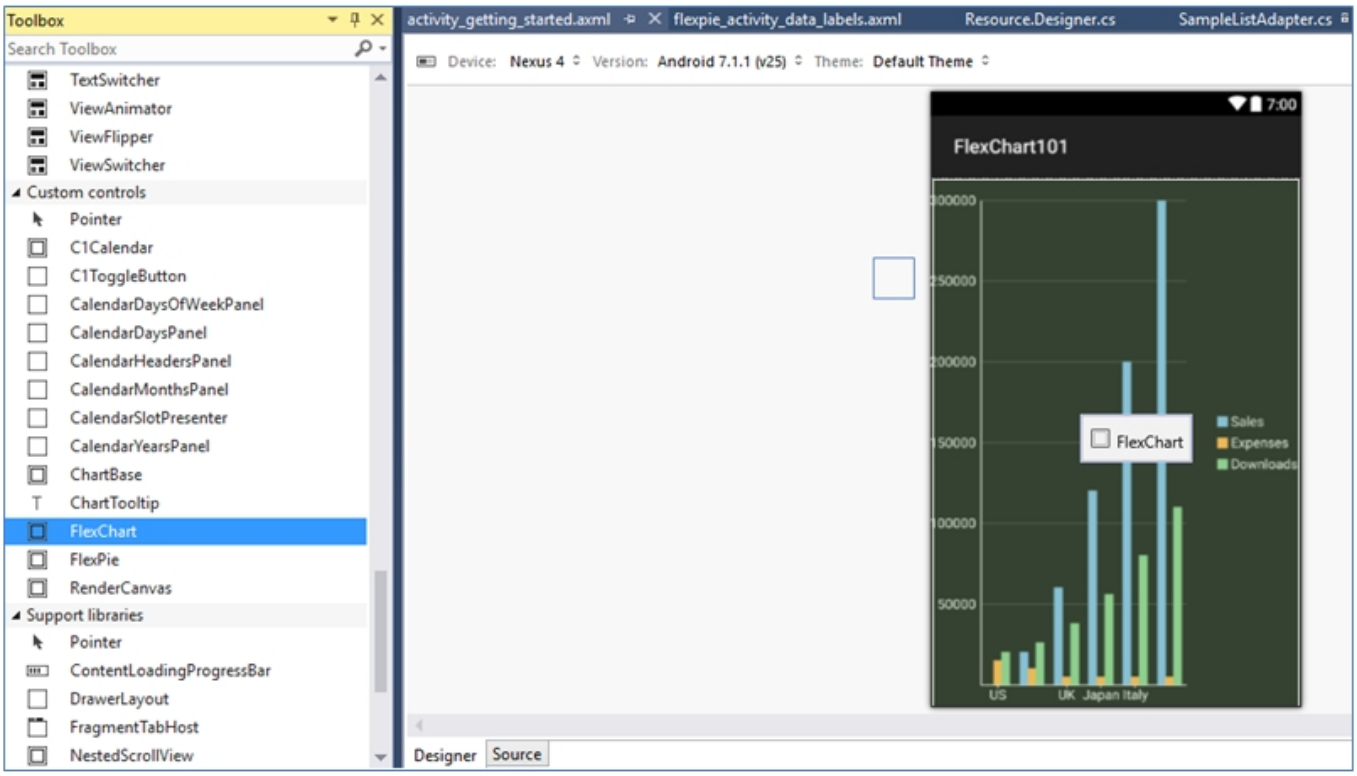
Step 2: Add a FlexChart control in code

To add FlexChart control to your layout, open the .axml file in your layout folder from the Solution Explorer and replace its code with the following code.

XML

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="match_parent">
    <C1.Android.Chart.FlexChart
        android:id="@+id/flexchart"
        android:layout_width="match_parent"
        android:layout_height="match_parent" />
</LinearLayout>
```

Alternatively, you can drag a FlexChart control from the Toolbox within the custom control tab onto your layout surface in designer mode.



Then, inside your activity, add the following code to the OnCreate method to initialize your layout.

C#

```
public class GettingStartedActivity : Activity
{
    private FlexChart mChart;

    protected override void OnCreate(Bundle savedInstanceState)
    {

        base.OnCreate(savedInstanceState);
        SetContentView(Resource.Layout.activity_getting_started);

        // initializing widget
        mChart = this.FindViewById<FlexChart>(Resource.Id.flexchart);
        // set the binding for X-axis of FlexChart
        mChart.BindingX = "Name";

        // initialize series elements and set the binding to variables of
        // ChartPoint
        ChartSeries seriesSales = new ChartSeries();
        seriesSales.Chart = mChart;
        seriesSales.SeriesName = "Sales";
        seriesSales.Binding = "Sales,Sales";
        mChart.Series.Add(seriesSales);
        mChart.ItemsSource = ChartPoint.GetList();
    }

}
```

Step 3: Run the project

Press **F5** to run your application.

Features

Animation

FlexChart allows you to enable animation effects using one of the two ways, either on loading when the chart is drawn or on updating when the chart is redrawn after modifications. It supports animation in charts through C1Animation class available in the C1.Android.Core namespace.

You can also set the duration of animation in chart using Duration property of the C1Animation class and interpolate the values of animation using Easing property of the C1Animation class, which accepts values from the C1Easing class. This class supports a collection of standard easing functions such as CircleIn, CircleOut, and Linear.

- **CircleIn:** Easing function that starts slow and speeds up in the form of a circle.
- **CircleOut:** Easing function that starts fast and slows down in the form of a circle.
- **Linear:** Easing function with constant speed.

C#

```
C1Animation animate = new C1Animation();
// set update animation duration
animate.Duration = new TimeSpan(3000 * 10000);
// interpolate the values of animation
animate.Easing = C1Easing.Linear;
```

In addition to easing functions of C1Easing class, FlexChart supports built in easing functions of Xamarin.Forms.Easing class. For more information, refer Xamarin Easing Class.

You can show animation while loading or updating a chart. To show animation while loading, use LoadAnimation property of the ChartBase class. This property gets the load animation from the object of C1Animation class to display the animation at the time of loading chart. Similarly, to animate the chart when underlying data collection changes on adding, removing, or modifying a value, you can use UpdateAnimation property of the ChartBase class.

C#

```
// set the loading animation
flexchart.LoadAnimation = animate;
```

You can apply loading animation effect by setting AnimationMode property which accepts values from AnimationMode enumeration. This enumeration supports four different animation modes: All, None, Series, and Point.

- **All**: All plot elements animate at once from the bottom of the plot area.
- **None**: Does not display any animation.
- **Series**: Each series animates one at a time from the bottom of the plot area.
- **Point**: The plot elements appear one at a time from left to right.

C#

```
// set the animation mode
flexchart.AnimationMode = AnimationMode.Series;
```

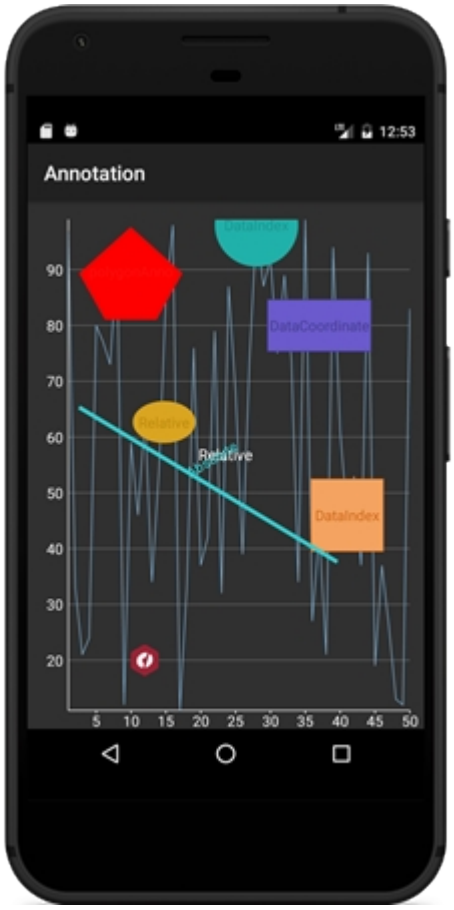
Annotations

Annotations are used to mark important news or events that can be attached to a specific data point on FlexChart. Annotations can also be used to place arbitrary elements such as images, shapes and text onto the chart. The FlexChart control supports various built-in annotations such as Polygon, Line, Ellipsis, Rectangle, Image and Text.

You can specify the position of an annotation on FlexChart by setting the Position property to Bottom, Center, Left, Right or Top. To specify the type of annotation on FlexChart, you can use the Attachment property and set its value to:

- Absolute: The coordinates of the annotation are specified by the annotation's shape data in pixels.
- DataCoordinate: The coordinates of the annotation are specified in data coordinates.
- DataIndex: The coordinates of the annotation are specified by the data series index and the data point index.
- Relative: The coordinates of the annotation are specified as a relative position within the control, where (0, 0) is the top left corner and (1, 1) is the bottom right corner.

The following image shows how FlexChart control appears after applying annotations to it.



Complete the following steps to apply annotations to the **FlexChart** control:

1. Add the following import statements in the MainActivity class.

C#

```
using System;
using System.Collections.Generic;
using Android.App;
using Android.OS;
using Android.Views;
using C1.Android.Chart.Annotation;
```

```
using C1.Android.Core;
using C1.Android.Chart;
using Android.Graphics;
```

2. Replace the code in the MainActivity file with the following code.

C#

```
public class AnnotationViewModel {
 List < DataItem > _data;
 List < DataItem > _simpleData;
 Random rnd = new Random();

 public List < DataItem > Data {
  get {
   if (_data == null) {
    _data = new List < DataItem > ();
    for (int i = 1; i < 51; i++) {
     _data.Add(new DataItem() {
      X = i,
       Y = rnd.Next(10, 100)
     });
    }
   }

   return _data;
  }
 }

 public List < DataItem > SimpleData {
  get {
   if (_simpleData == null) {
    _simpleData = new List <DataItem> ();
    _simpleData.Add(new DataItem() {
     X = 1, Y = 30
    });
    _simpleData.Add(new DataItem() {
     X = 2, Y = 20
    });
    _simpleData.Add(new DataItem() {
     X = 3, Y = 30
    });
    _simpleData.Add(new DataItem() {
     X = 4, Y = 65
    });
    _simpleData.Add(new DataItem() {
     X = 5, Y = 70
    });
    _simpleData.Add(new DataItem() {
     X = 6, Y = 60
    });
   }

   return _simpleData;
```

```
  }
 }
}

public class DataItem {
 public int X {
  get;
  set;
 }
 public int Y {
  get;
  set;
 }
}
[Activity(Label = "@string/annotation", Icon = "@drawable/icon")]
public class AnnotationActivity: Activity {
 private FlexChart mChart;

 protected override void OnCreate(Bundle savedInstanceState) {
  base.OnCreate(savedInstanceState);
  SetContentView(Resource.Layout.activity_annotation);

  // initializing widgets
  mChart = this.FindViewById < FlexChart > (Resource.Id.flexchart);
  mChart.ChartType = ChartType.Line;
  mChart.BindingX = "X";
  mChart.Series.Add(new ChartSeries() {
   SeriesName = "Base dataList", Binding = "Y,Y"
  });
  mChart.ItemsSource = new AnnotationViewModel().Data;
  mChart.LegendPosition = ChartPositionType.None;

  Text text = new Text() {
   Content = "Relative", Location = new C1Point(0.5, 0.5), Attachment =
AnnotationAttachment.Relative
  };
  text.AnnotationStyle = new ChartStyle() {
   FontSize = 15, FontFamily = "GenericSansSerif"
  };

  Ellipse ellipse = new Ellipse() {
   Content = "Relative", Location = new C1Point(0.4, 0.45), Width = 60, Height =
40, Attachment = AnnotationAttachment.Relative
  };
  ellipse.AnnotationStyle = new ChartStyle() {
   Fill = Color.Goldenrod, Stroke = Color.Argb(1 * 255, (int)(0.75 * 255), (int)
(0.55 * 255), (int)(0.06 * 255)), FontAttributes = TypefaceStyle.Bold, FontSize
= 10, FontFamily = "GenericSansSerif"
  };

  Circle circle = new Circle() {
```

```
    Content = "DataIndex", Radius = 40, SeriesIndex = 0, PointIndex = 27,
Attachment = AnnotationAttachment.DataIndex
  };
  circle.AnnotationStyle = new ChartStyle() {
    Fill = Color.LightSeaGreen, Stroke = Color.Argb((int)(1.0 * 255), (int)(0.13
* 255), (int)(0.58 * 255), (int)(0.58 * 255)), FontFamily = "GenericSansSerif",
FontAttributes = TypefaceStyle.Bold
  };

  Rectangle rectangle = new Rectangle() {
    Content = "DataCoordinate", Width = 100, Height = 50, Location = new
C1Point(37, 80), Attachment = AnnotationAttachment.DataCoordinate
  };
  rectangle.AnnotationStyle = new ChartStyle() {
    Fill = Color.SlateBlue, Stroke = Color.Argb((int)(1.0 * 255), (int)(0.29 *
255), (int)(0.25 * 255), (int)(0.57 * 255)), FontFamily = "GenericSansSerif",
FontSize = 10
  };

  Square square = new Square() {
    Content = "DataIndex", Length = 70, SeriesIndex = 0, PointIndex = 40,
Attachment = AnnotationAttachment.DataIndex
  };
  square.AnnotationStyle = new ChartStyle() {
    Fill = Color.SandyBrown, Stroke = Color.Chocolate, FontAttributes =
TypefaceStyle.Bold, FontFamily = "GenericSansSerif"
  };

  Polygon polygon = new Polygon() {
    Content = "polygonAnno", Attachment = AnnotationAttachment.Absolute
  };
  polygon.Points = CreatePoints();
  polygon.AnnotationStyle = new ChartStyle() {
    Fill = Color.Red, StrokeThickness = 3, Stroke = Color.Argb((int)(1.0 * 255),
(int)(0.98 * 255), (int)(0.06 * 255), (int)(0.05 * 255)), FontAttributes =
TypefaceStyle.Bold, FontFamily = "GenericSansSerif"
  };

  Line line = new Line() {
    Content = "Absolute", Start = new C1Point(50, 200), End = new C1Point(300,
350), Attachment = AnnotationAttachment.Absolute
  };
  line.AnnotationStyle = new ChartStyle() {
    StrokeThickness = 4, FontSize = 10, FontAttributes = TypefaceStyle.Bold,
Stroke = Color.Argb((int)(1.0 * 255), (int)(0.20 * 255), (int)(0.81 * 255),
(int)(0.82 * 255)), FontFamily = "GenericSansSerif"
  };
  Image image = new Image() {
    Location = new C1Point(12, 20), Attachment =
AnnotationAttachment.DataCoordinate, Width = 30, Height = 30
  };
```

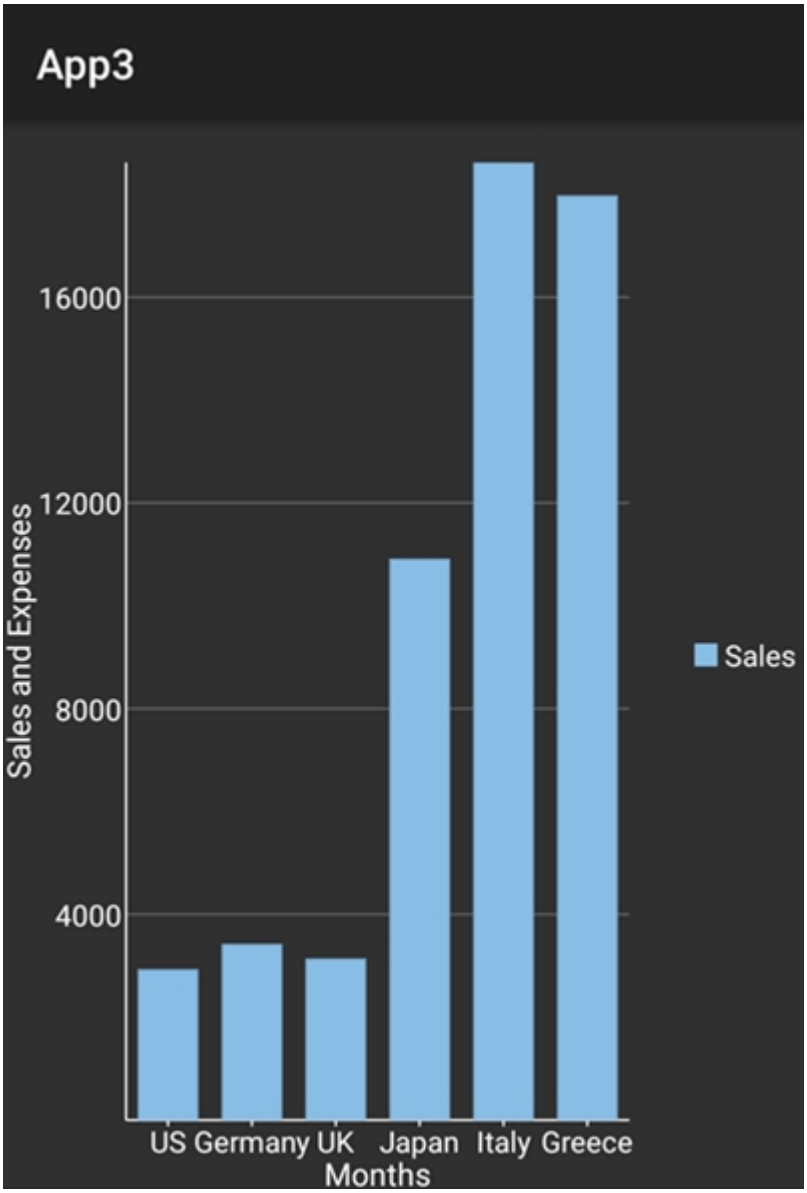
```
  image.Source = BitmapFactory.DecodeResource(this.Resources,
Resource.Drawable.xuni_butterfly);
  AnnotationLayer layer = new AnnotationLayer(ApplicationContext);
  layer.Annotations.Add(text);
  layer.Annotations.Add(ellipse);
  layer.Annotations.Add(circle);
  layer.Annotations.Add(rectangle);
  layer.Annotations.Add(square);
  layer.Annotations.Add(polygon);
  layer.Annotations.Add(line);
  layer.Annotations.Add(image);
  mChart.Layers.Add(layer);
 }
 private System.Collections.ObjectModel.ObservableCollection <C1Point>
CreatePoints() {
  System.Collections.ObjectModel.ObservableCollection <C1Point> points = new
System.Collections.ObjectModel.ObservableCollection <C1Point> ();
  points.Add(new C1Point(100, 25));
  points.Add(new C1Point(50, 70));
  points.Add(new C1Point(75, 115));
  points.Add(new C1Point(125, 115));
  points.Add(new C1Point(150, 70));
  return points;
 }
}
```

Axes

An axis is composed of FlexChart that let you customize these elements, for both X and Y axes. Some of the important properties are listed below.

- TitleStyle - Gets or sets the axis title style.
- AxisType - Lets you select the axis type.
- Style - Lets you select the axis style..
- LabelAngel - Lets you get or set the rotation for axis labels.
- MajorTickColor - Lets you select the color for major tick marks.
- MajorTickWidth - Lets you select the thickness of major tick marks.
- MajorUnit - Lets you set the major unit of the axis.
- Origin - Lets you set the origin.
- Title - Lets you add a title to the axis.
- Fill- Lets you select the color for the axis title.

The image below shows a FlexChart with customized axes titles.



The following code examples demonstrate how to customize the axes of the FlexChart control in C#. This examples uses the sample created in the Customize Appearance section.

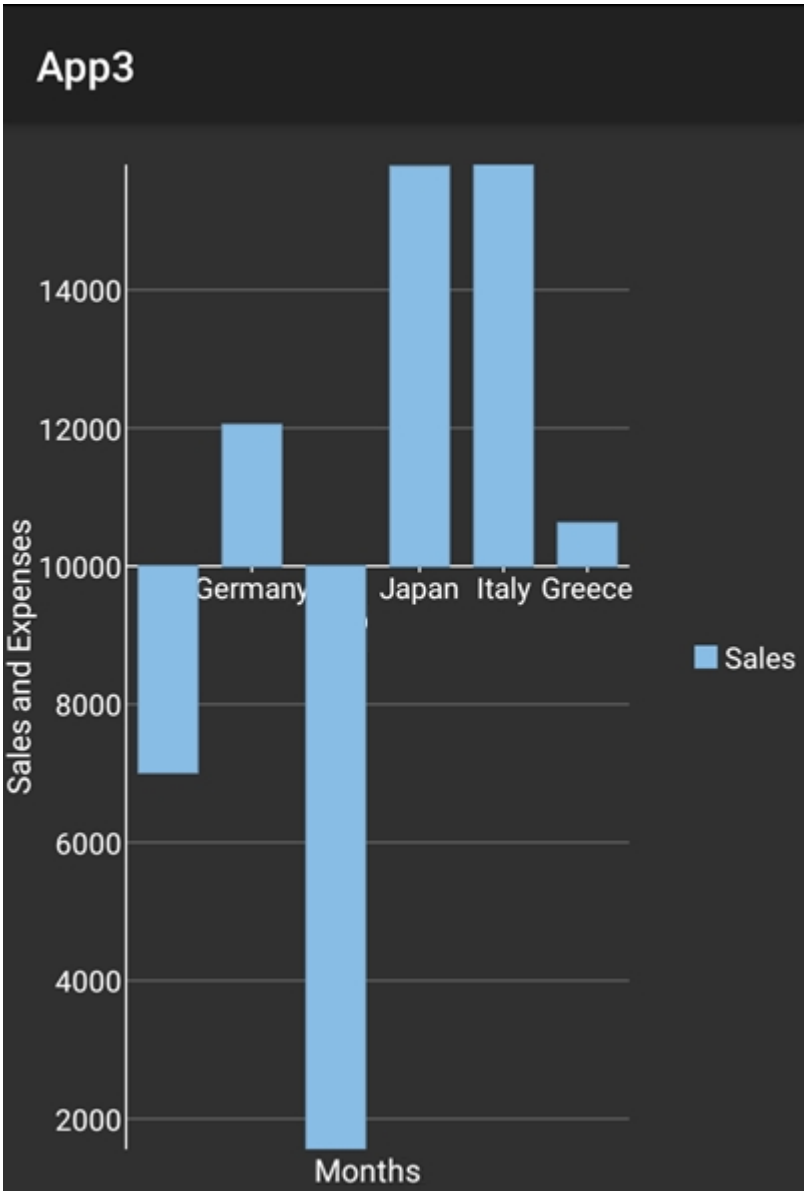
In Code

C#

```
mChart.AxisX.Title = "Months";
mChart.AxisX.TitleStyle.FontSize = 15;
mChart.AxisX.TitleStyle.Fill = Color.White;
mChart.AxisY.Title = "Sales and Expenses";
mChart.AxisY.TitleStyle.FontSize = 15;
mChart.AxisY.TitleStyle.Fill = Color.White;
```

Customizing Axis Origin

Users can customize the origin to plot the data points in two quadrants. You can use Origin method to set the origin for both the axes at a particular point. The image given below shows the origin of X axis set to 10,000.



In Code

The following code example illustrates how to customize the X-axis origin in C#. This example uses the sample created in Customize Appearance section. You can also set Y-axis origin in code behind in a way similar to that given in code below.

C#

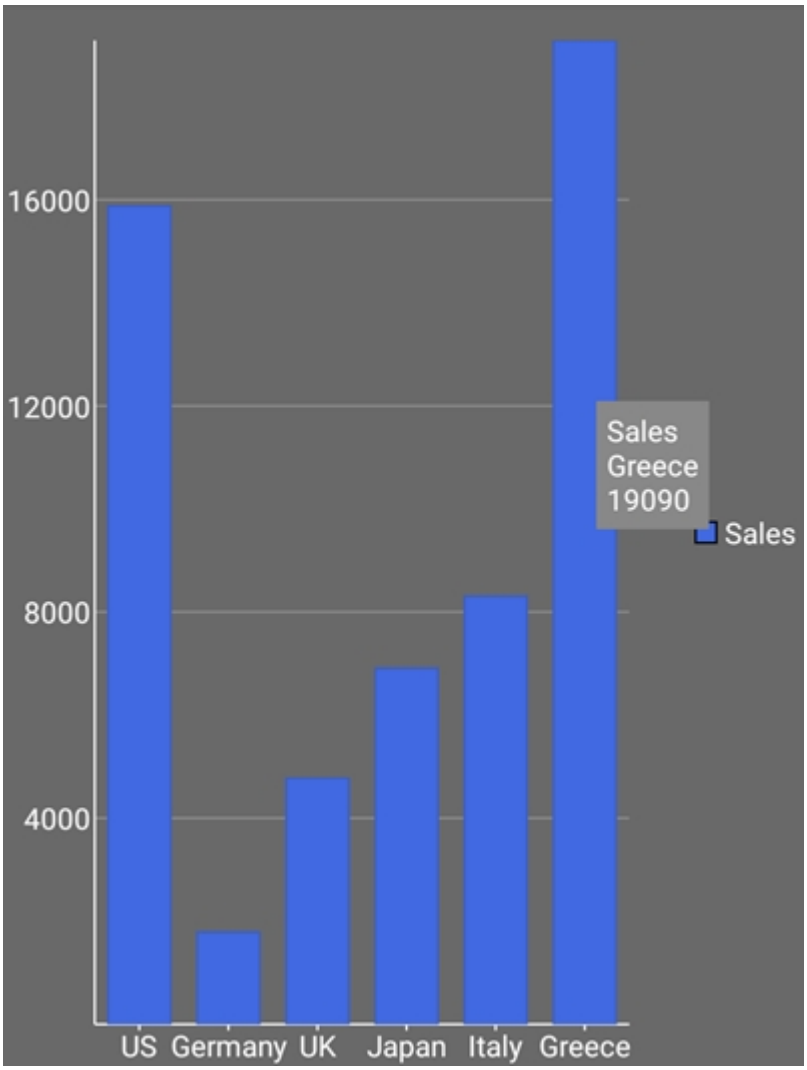
```
//set X axis Origin
mChart.AxisX.Origin = 10000;
```

Customize Appearance

C1 Xamarin controls match the native controls on all three platforms by default and are designed to work with both: light and dark themes available on all platforms. However, developers can choose to customize the appearance of the FlexChart control by setting some of the properties at design time. You can change the background color of the chart plot area, set the color of the series, add colored borders of specified thickness to charts as well as series; and do

much more to enhance the appearance of the control.

The image below shows a customized FlexChart control.



The following code example demonstrates how to customize the appearance of series appearing on the FlexChart control. This example uses the sample created in the Quick Start section with series added to the FlexChart control.

In Code

C#

```
mChart.BackgroundColor = Color.DimGray;seriesSales.Style.Fill =
Color.RoyalBlue;seriesSales.ChartType = ChartType.Column;
```

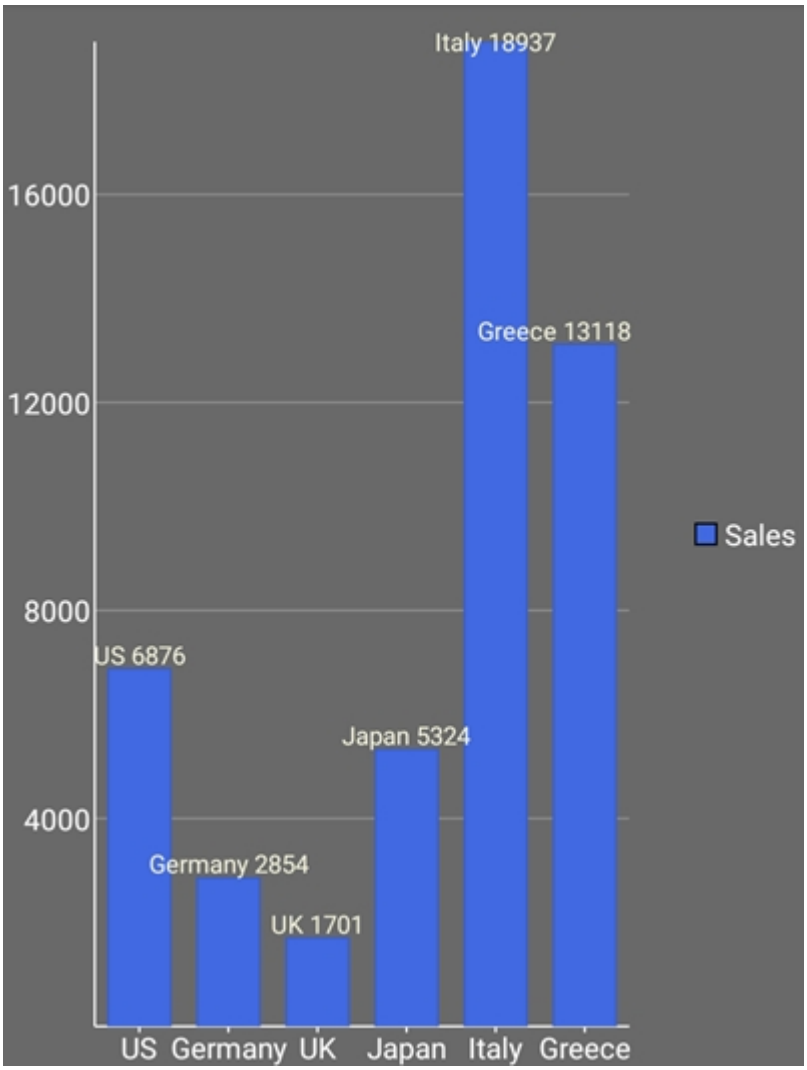
Data Labels

You can add data labels in the FlexChart to show the exact values corresponding to a particular column, bar or point in the chart area. All you have to do is set the Position property and set the required position using ChartLabelPosition enumeration. Users can set data labels at the following positions.

- **TOP**: on the top of the column, bar or point in the chart area

- **BOTTOM**: below the edge of the column, bar or point in the chart area
- **RIGHT**: to the right side of the column, bar or point in the chart area
- **LEFT**: to the left side of the column, bar or point in the chart area
- **CENTER**: to the center of the column, bar or point in the chart area

The image given below shows a FlexChart control that displays sales and expenses with data labels corresponding to months.



The following code example shows how to set data labels for FlexChart control. The example uses the sample created in the Quick Start section.

C#

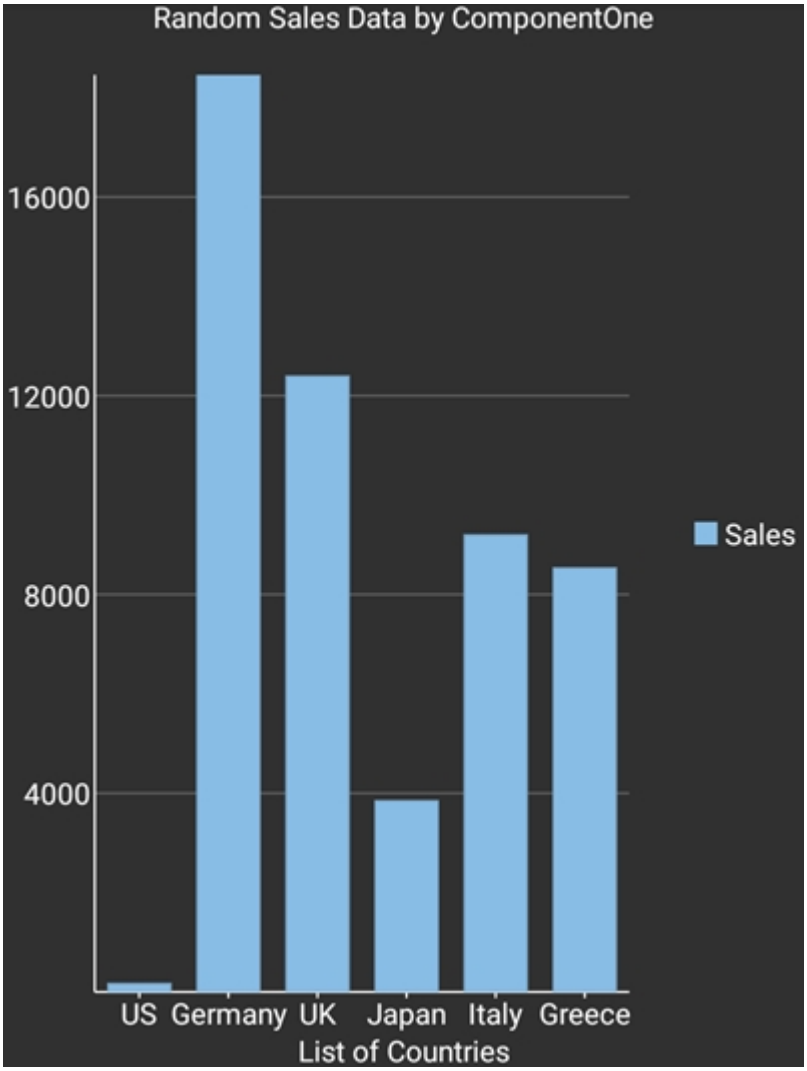
```
//Set the data labelsmChart.DataLabel.Content = "{x} {y}";

mChart.DataLabel.Position = ChartLabelPosition.Top;mChart.DataLabel.BorderStyle = new
ChartStyle { Stroke = Color.Blue, StrokeThickness = 1 };mChart.DataLabel.Style = new
ChartStyle { Stroke = Color.Beige, FontSize = 12 };
```

Header and Footer

You can add a title to the FlexChart control by setting its Header property. Besides a header, you may also set a footer

for the chart by setting it Footer property. There are some additional properties that are to be used to customize the header and footer text in a FlexChart.

The image below shows how the FlexChart appears, after these properties have been set.



The following code examples demonstrate how to set these properties in C#. These examples use the sample created in the Quick Start section.

In Code

C#

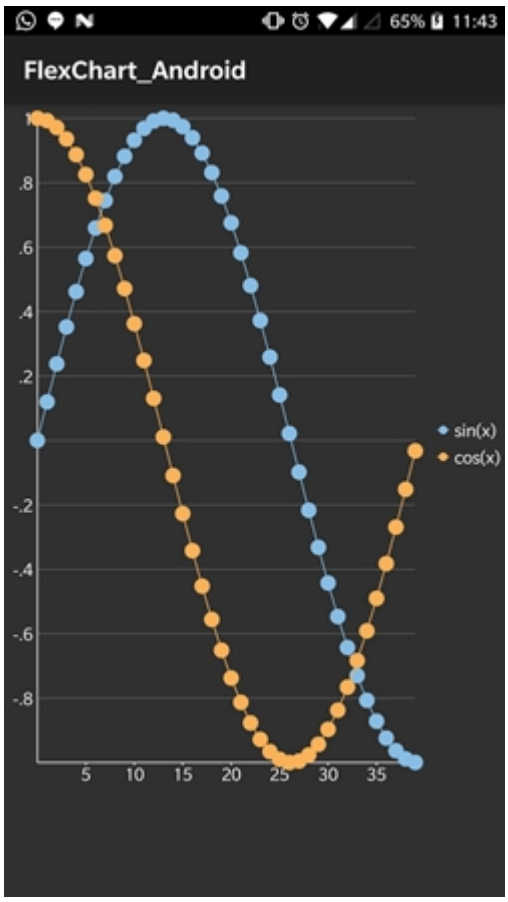
```
//Set Header
mChart.Header = "Random Sales Data by ComponentOne";mChart.HeaderAlignment =
Android.Views.GravityFlags.Center;
//Set FootermChart.Footer = "List of Countries";mChart.FooterAlignment =
Android.Views.GravityFlags.Center;
```

Hit Test

Hit Test feature enables users to determine the X and Y coordinates, as well as the index of any point on the FlexChart on tapping. This method is helpful in scenarios such as displaying tooltips that lie outside the series of the FlexChart.

The following code examples demonstrate how to define the **MChart_Tapped** event. This event invokes the HiTest method to retrieve the information of the tapped point in the FlexChart region.

The image below shows how the FlexChart appears, after defining the HitTest feature.



To initialize the FlexChart control and use HitTest() method, open the MainActivity.cs and replace its content with the code below. This overrides the **OnCreate** method of the activity.

CS

```
public class MainActivity : Activity
{
    int count = 1;
    private FlexChart mChart;
    private TextView mHitTestInfo;

    private string chartElement;
    private string chartElementNone;
    private string pointIndex;
    private string seriesName;

    protected override void OnCreate(Bundle savedInstanceState)
    {
        base.OnCreate(savedInstanceState);

        // Set our view from the "main" layout resource
        SetContentView(Resource.Layout.Main);
```

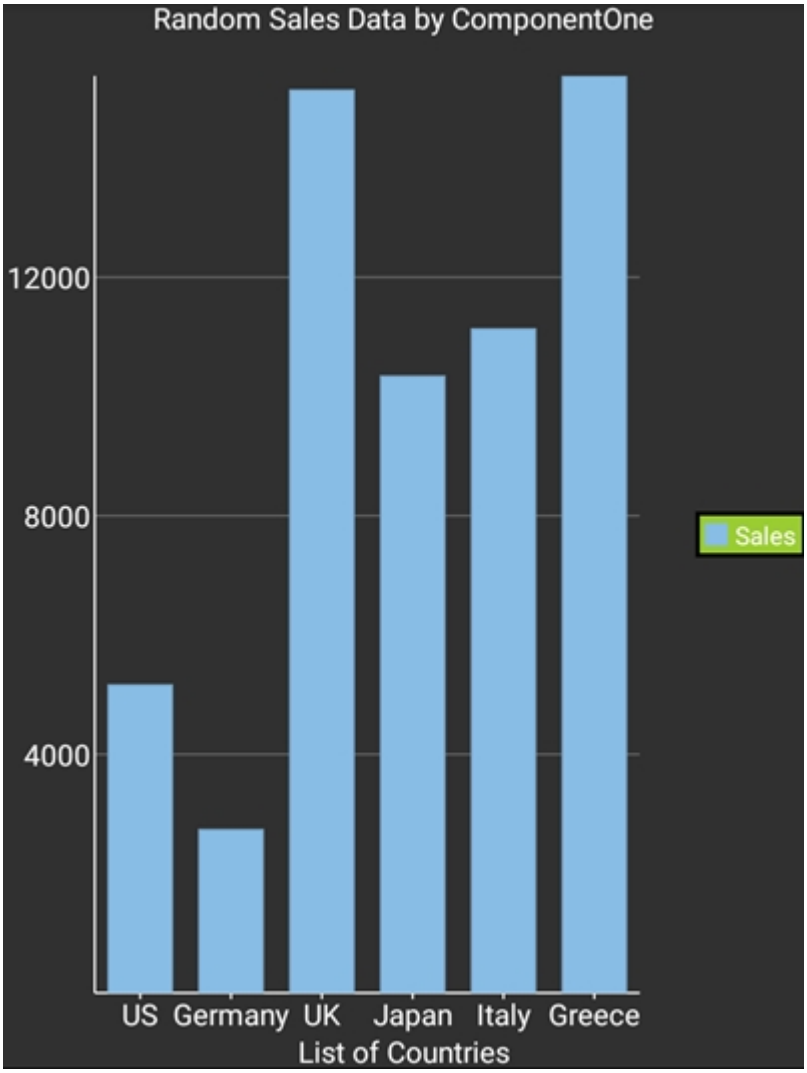
```
        // initializing widgets
        mChart = this.FindViewById<FlexChart>(Resource.Id.flexchart);
        mHitTestInfo = (TextView)FindViewById(Resource.Id.hitTestInfo);

        // set the binding for X-axis of FlexChart
        mChart.BindingX = "Count";

        mChart.AxisY.Format = "#.##";

        chartElement = this.Resources.GetString(Resource.String.hitTestChartElement);
        chartElementNone =
this.Resources.GetString(Resource.String.hitTestChartElementNone);
        pointIndex = this.Resources.GetString(Resource.String.hitTestPointIndex);
        seriesName = this.Resources.GetString(Resource.String.hitTestSeriesName);

        // initialize series elements and set the binding to variables of
        // ChartPoint
        ChartSeries seriesSine = new ChartSeries();
        seriesSine.Chart = mChart;
        seriesSine.SeriesName = "sin(x)";
        seriesSine.Binding = "Sine";

        ChartSeries seriesCosine = new ChartSeries();
        seriesCosine.Chart = mChart;
        seriesCosine.SeriesName = "cos(x)";
        seriesCosine.Binding = "Cosine";

        // setup individual series item source
        int len = 40;
        List<object> list = new List<object>();

        for (int i = 0; i < len; i++)
        {
            list.Add(new ChartPoint(i, (float)Math.Sin(0.12 * i),
(float)Math.Cos(0.12 * i)));
        }
        mChart.ItemsSource = list;

        // add series to list
        mChart.Series.Add(seriesSine);
        mChart.Series.Add(seriesCosine);

        mChart.Tapped += MChart_ChartTapped;
    }

    private void MChart_ChartTapped(object sender, C1TappedEventArgs e)
    {
        C1Point point = e.GetPosition(mChart);
        ChartHitTestInfo info = mChart.HitTest(point);
        // display hitTestInfo for each touch event
        string displayText = string.Empty;
```

```
        if (info != null)
        {
            displayText = chartElement + (info.ChartElement == null ?
chartElementNone : info.ChartElement.ToString());
            if (info.Item != null)
            {
                displayText += "\n" + seriesName + info.Series.Name + "\n" +
pointIndex + info.PointIndex;
                ChartPoint data = (ChartPoint)info.Item;

                displayText += "\nX : " + data.Count;
                if (info.Series.Name.Equals("sin(x)"))
                {
                    displayText += " sin(x) : " + data.Sine;
                }
                else
                {
                    displayText += " cos(x) : " + data.Cosine;
                }
            }
        }
        else
        {
           displayText = "Well, this is not happening..";
        }
        mHitTestInfo.Text = displayText;
    }
}
```

Legend

You can select where and how to display the legend on your FlexChart by using the LegendPosition property of the legend. You can also set the LegendStyle, LegendTitleStyle, and LegendOrientation properties to customize the legend.

The image below shows how the legends appear on the FlexChart control after these properties have been set.



Note: To hide the legend, set the LegendPosition property to **None**.

The following code example demonstrates how to set legend for FlexChart control in C#. This examples uses the sample created in the Customize Appearance section.

In Code

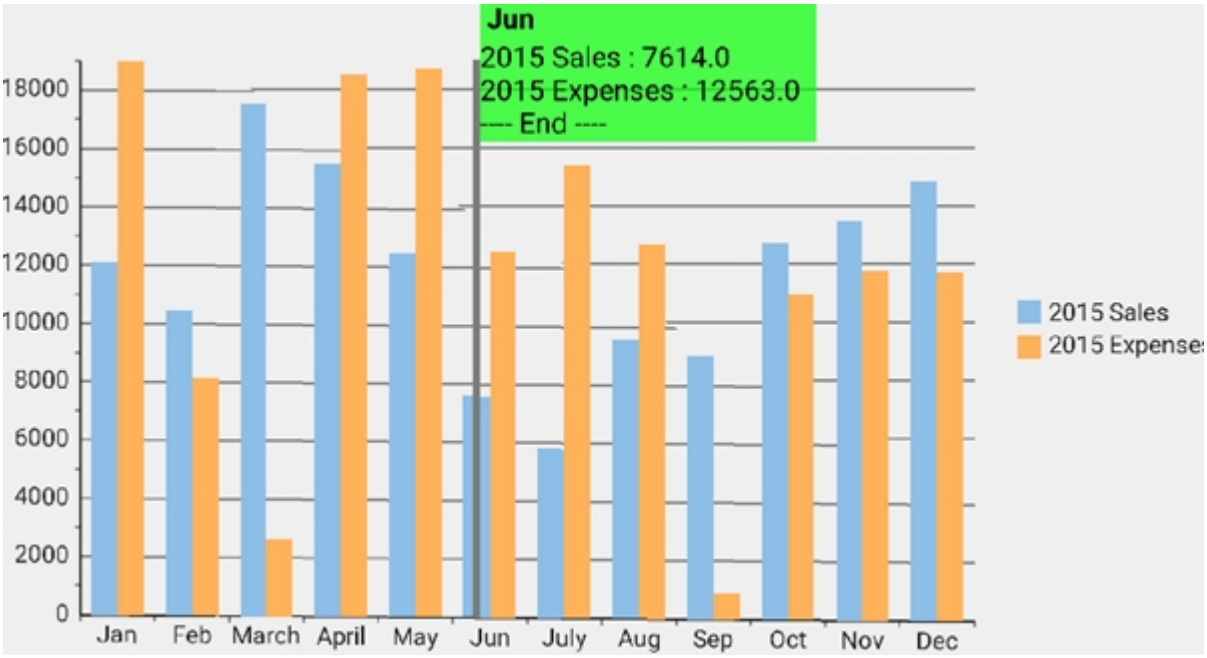
C#

```
mChart.LegendPosition = ChartPositionType.Right;
mChart.LegendItemStyle.FontSize = 12;
mChart.LegendStyle.Fill = Color.YellowGreen;
```

Line Marker

C1FlexChart enables users to show a line marker in the chart area that displays precise data values for a specific point or position. The Line Marker draws horizontal or vertical lines over the plot area with relative data values displayed near by. Users can set these lines as static or interactive by using Interaction method. To customize the direction in which the line marker displays the data values, use the Alignment method and set it to LineMarkerAlignment.Auto. You can also set the orientation of the lines using Lines method.

The following image shows an interactive line marker aligned at Auto position and its line set to Vertical position.



The code given below illustrates how to set the Line Marker feature.

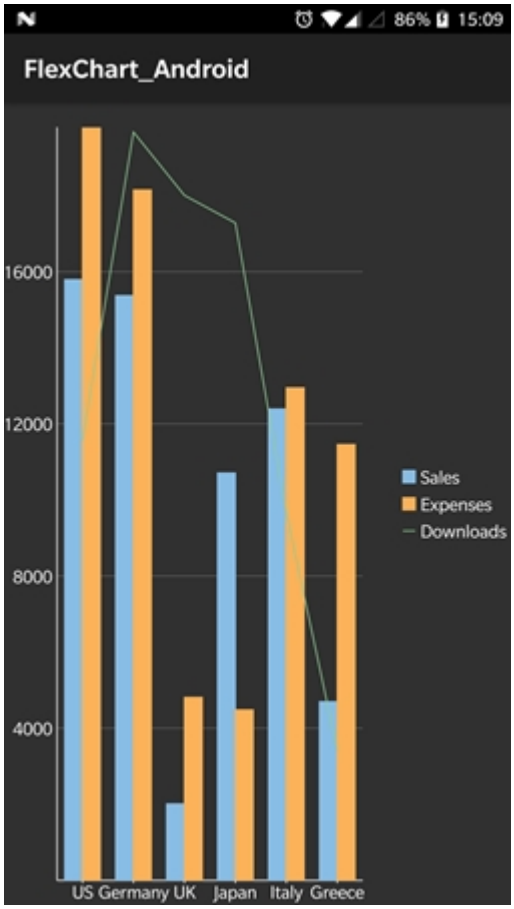
C#

```
//setting the Line Marker
mChart.Marker.Visible = true;
mChart.Marker.Interaction = ChartMarkerInteraction.Drag;
mChart.Marker.Alignment = ChartMarkerAlignment.Auto;
mChart.Marker.VerticalPosition = 1d;
mChart.Marker.Lines = ChartMarkerLines.Vertical;
```

Mixed Charts

You can add multiple series to FlexChart and set a different chart type for each series. Such charts are helpful in analyzing complex chart data on a single canvas. The same data can be used with different visualizations or related data can be displayed together to convey trends.

The following image shows a FlexChart with multiple series.



The following code examples demonstrate how to create multiple instances of charts with different chart types and add them to the FlexChart.

1. Add a new class, ChartPoint.cs, to the DataModel folder of the application that encapsulates and manipulates series data.

CS

```
public class ChartPoint : Java.Lang.Object
{
    static Random random = new Random();
    private const long serialVersionUID = 1L;

    private String name;
    private int sales;
    private int expenses;
    private int downloads;

    public string Name
    {
        get
        {
            return name;
        }
        set
        {
            name = value;
        }
```

```
    }

    public int Sales
    {
        get
        {
            return sales;
        }
        set
        {
            sales = value;
        }
    }

    public int Expenses
    {
        get
        {
            return expenses;
        }
        set
        {
            expenses = value;
        }
    }

    public int Downloads
    {
        get
        {
            return downloads;
        }
        set
        {
            downloads = value;
        }
    }

    public ChartPoint()
    {
    }

    public ChartPoint(String name, int sales, int expenses, int downloads)
    {
        this.Name = name;
        this.Sales = sales;
        this.Expenses = expenses;
        this.Downloads = downloads;
    }

    // a method to create a list of random objects of type ChartPoint
```

```
    public static IList<object> GetList()
    {
        List<object> list = new List<object>();
        int n = 6; // number of series elements
        String[] countries =
        { "US", "Germany", "UK", "Japan", "Italy", "Greece", "India", "Canada"
};

        for (int i = 0; i < n; i++)
        {
            list.Add(new ChartPoint(countries[i], random.Next(20000),
random.Next(20000), random.Next(20000)));
        }
        return list;
    }

    public static ObservableCollection<ChartPoint> getLogList()
    {
        ObservableCollection<ChartPoint> list = new
ObservableCollection<ChartPoint>();

        int n = 6; // number of series elements
        String[] countries =
        { "US", "Germany", "UK", "Japan", "Italy", "Greece", "India", "Canada"
};
        Random random = new Random();

        for (int i = 0; i < n; i++)
        {
            int scale = random.Next(14);
            scale = (int)Math.Exp((double)scale);
            list.Add(new ChartPoint(countries[i], random.Next(scale),
random.Next(scale), random.Next(scale)));
        }
        return list;
     }

    /**
     * a method to create a list of random objects of type ChartPoint with a
fixed element size;
     *
     * @param size
     *            - size of element of series.
     * */
    public static IList<object> GetList(int size)
    {
        IList<object> list = new List<object>();
        Random random = new Random();

        for (int i = 0; i < size; i++)
        {
```

```
            list.Add(new ChartPoint(i + "", random.Next(20000),
random.Next(20000), random.Next(20000)));
        }
        return list;
    }
}
```

2. Add the following code to the MainActivity.cs to create mixed charts.

CS

```
public class MainActivity : Activity
{
    private FlexChart mChart;

    protected override void OnCreate(Bundle savedInstanceState)
    {
        base.OnCreate(savedInstanceState);

        // Set our view from the "main" layout resource
        SetContentView(Resource.Layout.Main);

        // initializing widget
        mChart = (FlexChart)FindViewById(Resource.Id.flexchart);

        Chartinitialization.InitialDefaultChart(mChart, ChartPoint.GetList());
        (mChart.Series[2] as ChartSeries).ChartType = ChartType.Line;
    }
}

public class Chartinitialization
{
    public static void InitialDefaultChart(FlexChart flexChart,IList<object>
itemsSource)
    {
        ChartSeries seriesSales = new ChartSeries();
        seriesSales.Chart = flexChart;
        seriesSales.SeriesName = "Sales";
        seriesSales.Binding = "Sales";

        ChartSeries seriesExpenses = new ChartSeries();
        seriesExpenses.Chart = flexChart;
        seriesExpenses.SeriesName = "Expenses";
        seriesExpenses.Binding = "Expenses";

        ChartSeries seriesDownloads = new ChartSeries();
        seriesDownloads.Chart = flexChart;
        seriesDownloads.SeriesName = "Downloads";
        seriesDownloads.Binding = "Downloads";

        flexChart.BindingX = "Name";
        // add series to list
        flexChart.Series.Add(seriesSales);
        flexChart.Series.Add(seriesExpenses);
```

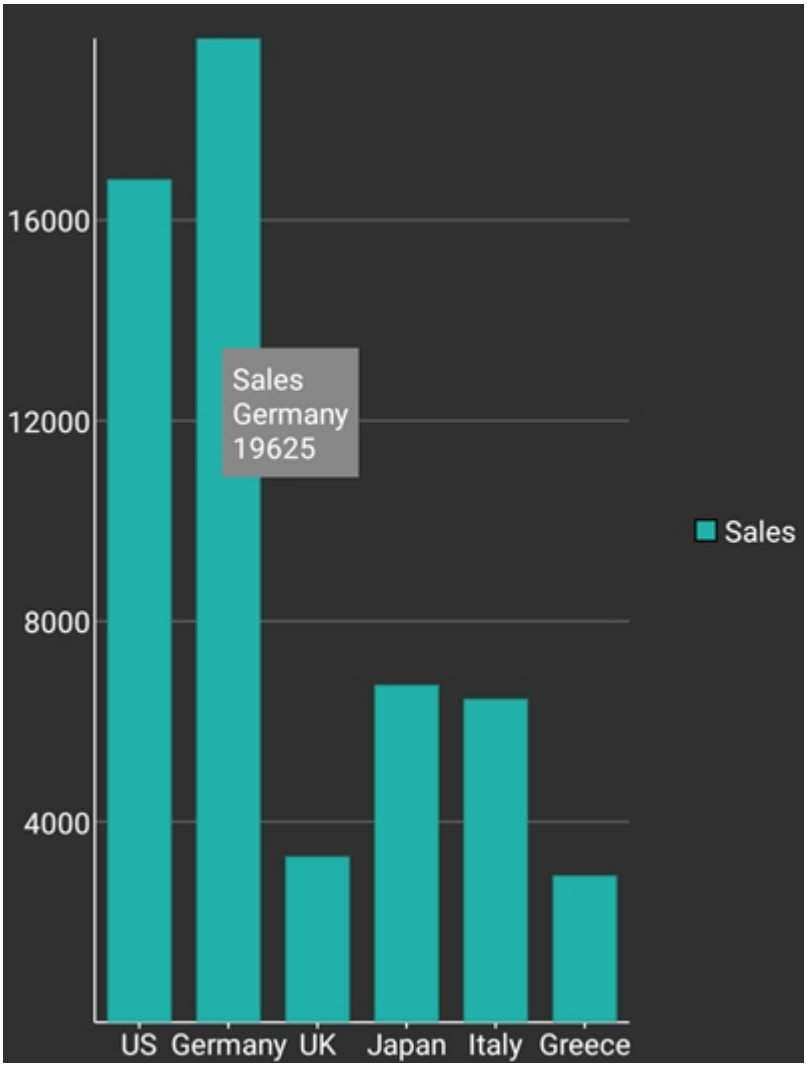
```
        flexChart.Series.Add(seriesDownloads);

        flexChart.ItemsSource = itemsSource;
        flexChart.AxisX.MajorGridStyle.FontSize = 0;
        flexChart.AxisX.MinorGridStyle.FontSize = 1;
    }
}
```

Selection

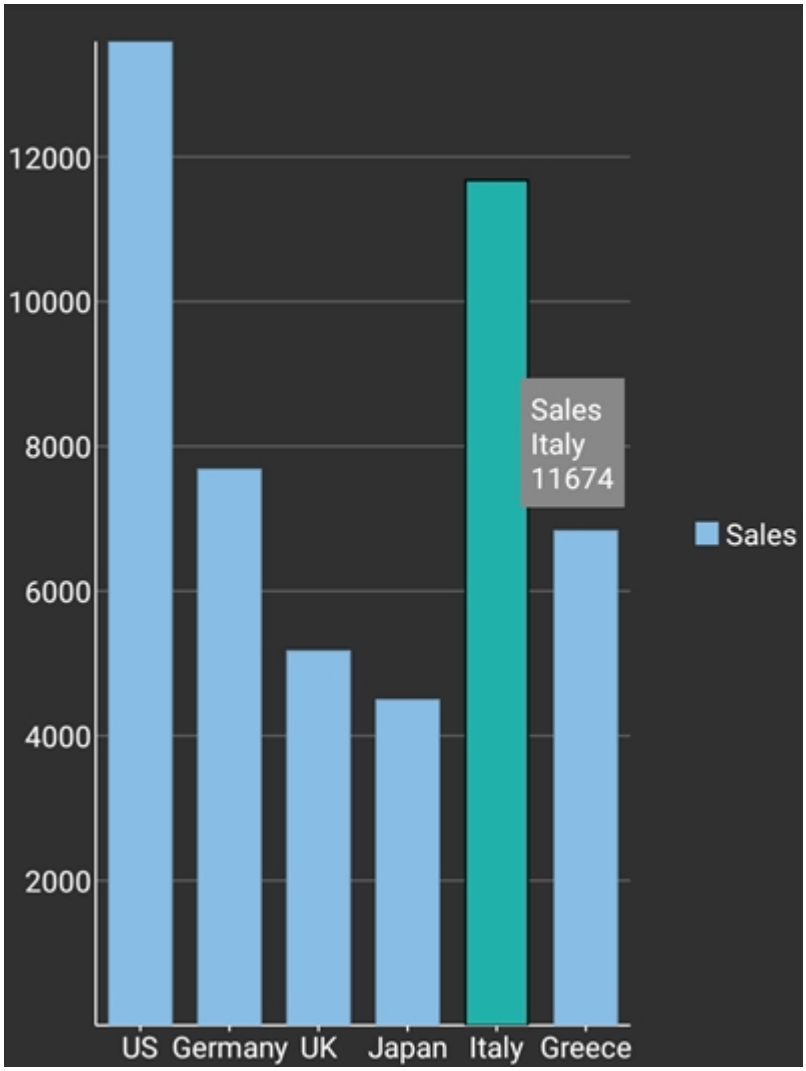
You can choose what element of the FlexChart should be selected when the user taps on any region in a FlexChart by setting the SelectionMode property and ChartSelectionModeType enumeration. This property provides three options:

- **None**: Does not select any element.
- **Point**: Highlights the point that the user taps.
- **Series**: Highlights the series that the user taps.

The images below shows how the FlexChart appears after these properties are set.



When SelectionMode is set to **Series**



When SelectionMode is set to **Point**

The following code examples demonstrate how to set these properties in C#. These examples use the sample created in the Quick Start section.

In Code

C#

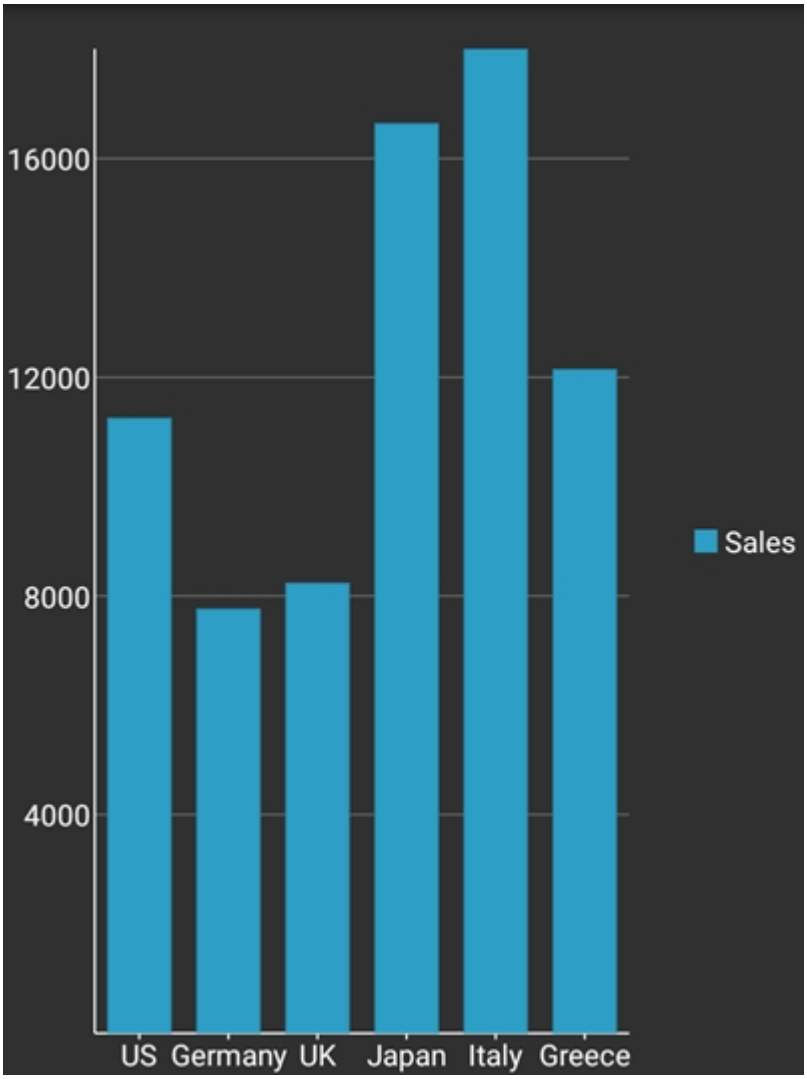
```
mChart.Selected = true;mChart.SelectionMode =
ChartSelectionModeType.Series;mChart.SelectionStyle.Fill = Color.LightSeaGreen;
```

Themes

An easy way to enhance the appearance of the FlexChart control is to use pre-defined themes instead of customizing each element. The Palette property is used to specify the theme to be applied on the control.

Note: Remove the Palette property from code to revert to the default theme.

The image below shows how the FlexChart control appears when the **Palette** property is set to **Modern**.



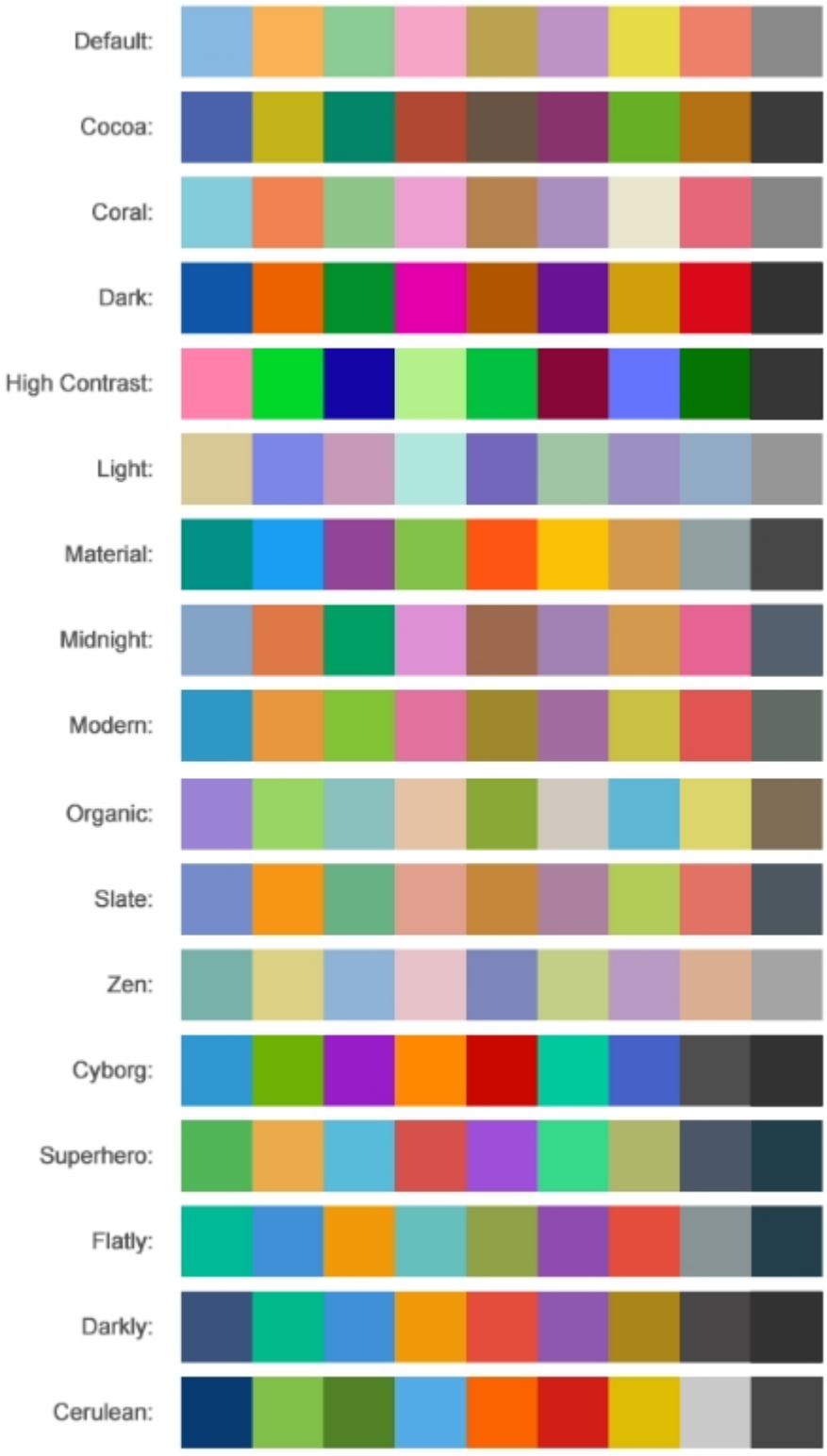
The following code example demonstrates how to set a theme in C#.

In Code

C#

```
mChart.Palette = Palette.Modern;
```

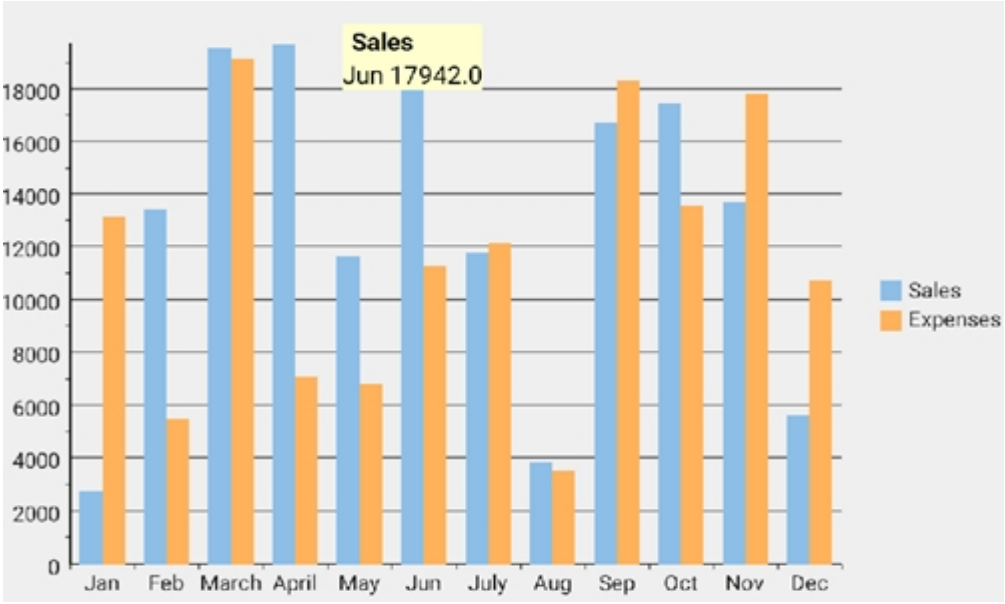
FlexChart comes with pre-defined templates that can be applied for quick customization. Here are the 17 pre-defined templates available in the Palette enumeration.



Tooltip

By default, a tooltip generally displays the name of the legend along with the X and Y values when the user taps at any point on the FlexChart control. C1 FlexChart control also allows you to customize the tooltip's background color, text color, etc.

The image below shows how a tooltip appears on FlexChart.



The following code examples demonstrate how to customize the tooltip using C#.

In Code

The following example uses the sample created in the QuickStart section.

1. Add the following code in **MainActivity.cs** file.

C#

C#

```
public class MyToolTip : ChartTooltip
    {
        TextView mTitle;
        TextView mContent;
        String mParentPackage;
        public MyToolTip(FlexChart flexChart, Context context) :
base(context)
        {

            mParentPackage = context.PackageName;
            //SetPadding(10, 10, 10, 10);
            // create custom layouts
            LinearLayout customLayout = new LinearLayout(Context);
            customLayout.SetBackgroundColor(Color.ParseColor("#FFFFCA"));
            customLayout.Orientation = Android.Widget.Orientation.Vertical;

            LinearLayout childLayout = new LinearLayout(Context);
            childLayout.Orientation = Android.Widget.Orientation.Horizontal;

            // initialize layout elements
            mTitle = new TextView(Context);
            mContent = new TextView(Context);

            // set element properties
```

```
            mTitle.SetTextColor(Color.Black);
            mTitle.SetTypeface(mTitle.Typeface, TypefaceStyle.Bold);
            mTitle.SetPadding(10, 10, 10, 10);
            mContent.SetTextColor(Color.Black);
            mContent.SetPadding(5,5,5,5);
            childLayout.SetBackgroundColor();

            // add layouts
            childLayout.AddView(mTitle);
            customLayout.AddView(childLayout);
            customLayout.AddView(mContent);
            AddView(customLayout);
        }
```

2. Now, set the custom tooltip in your **MainActivity.cs** class by adding the following line of code.

C#

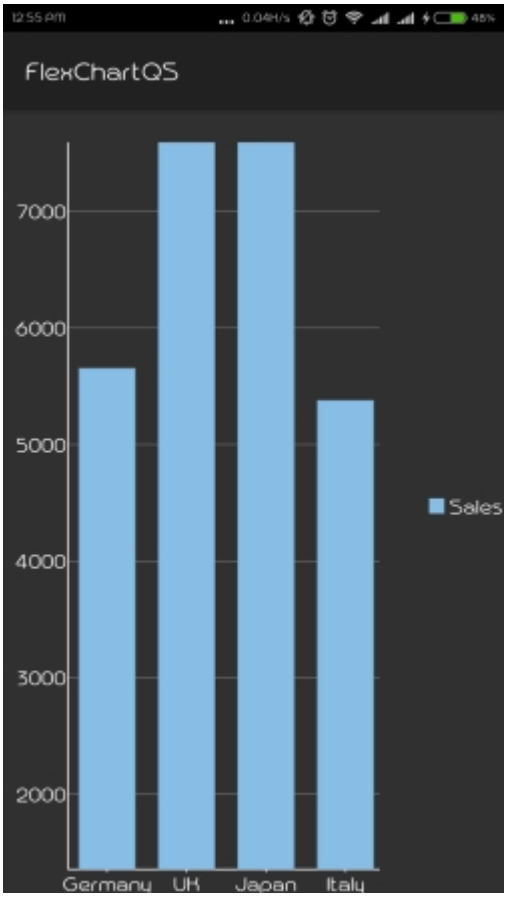
```
// customize tooltip
mChart.Tooltip.Content = new MyTooltip(mChart, mChart.Context);
```

Zooming and Panning

Zooming can be performed in FlexChart chart using ZoomBehavior class. To implement zooming, you need to create an object of ZoomBehavior class available in the C1.Android.Chart.Interaction namespace and pass it as a parameter to the Add method. This method adds zoom behavior to the behavior collection by accessing it through Behaviors property of the ChartBase class. In addition, you can use the ZoomMode property to enable touch based zooming in FlexChart. This property sets the gesture direction of zoom behavior through GestureMode enumeration which provides four zoom modes as given below:

- **None -** Disables zooming.
- **X -** Enables zooming along x-axis.
- **Y -** Enables zooming along y-axis.
- **XY -** Enables zooming along x and y axes.

The image below shows how the FlexChart appears on zooming and panning.



The following code examples demonstrate how to implement zooming in C#. These examples use the sample created in the Quick Start section.

C#

```
ZoomBehavior z = new ZoomBehavior();
z.ZoomMode = GestureMode.X;
flexchart.Behaviors.Add(z);
```

Similarly, panning can be implemented in FlexChart chart by creating an object of TranslateBehavior class available in the C1.Android.Chart.Interaction namespace and passing it as a parameter to the Add method. This method adds translation behavior to the behavior collection by accessing it through Behaviors property of ChartBase class. In addition, you can use the TranslationX and TranslationY property of VisualElement class to set the translation x and translation y delta for the chart.

The following code examples demonstrate how to implement panning in C#. These examples use the sample created in the Quick Start section.

C#

```
TranslateBehavior t = new TranslateBehavior();
flexchart.Behaviors.Add(t);

flexchart.TranslationX = 10;
flexchart.TranslationY = 10;
```

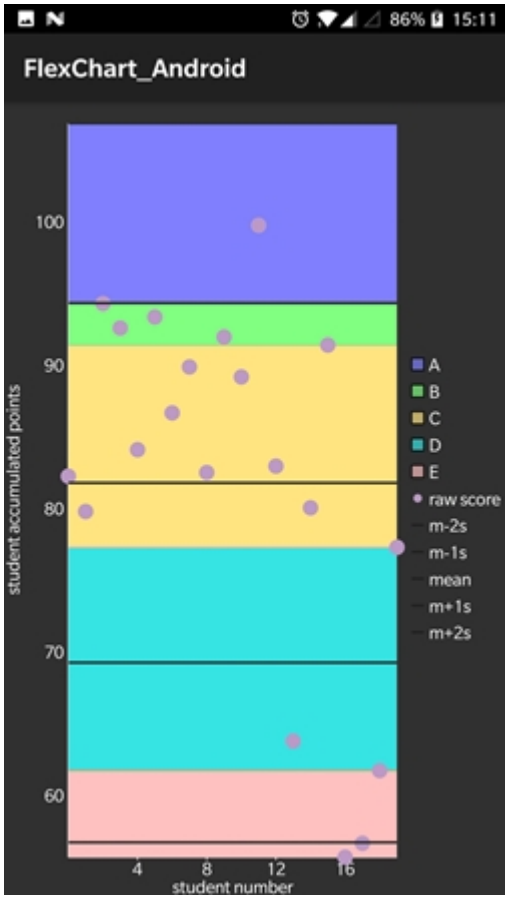
In addition to zooming and panning, FlexChart allows you to customize the relative range of values displayed in the view through Scale property, so if you set it to 0.5 it will display 50% of the axis in view (you can pan to the other 50%). Alternatively, FlexChart also allows you to set the absolute range of values displayed in the view through

DisplayRange property.

Zones

FlexChart allows you to create and apply colored regions called zones on the chart. These colored zones categorize the data points plotted on the chart into regions, making it easier for the user to read and understand the data. Users can easily identify the category in which a particular data point lies.

To explain how zones can be helpful, consider a score report of a class that aims at identifying the score zone under which the maximum number of students fall and how many students score above 90. This scenario can be realized in FlexChart by plotting scores as data points in chart and categorizing them in colored zones using area chart, separated by line type data series as follows:



In FlexChart, zones can be created as data series available through the ChartSeries class. Each zone can be created as area charts by setting the ChartType property to **Line**, highlighted in distinct colors.

Complete the following steps to create zones in FlexChart.

1. Add a new class, ZonesData, to the MainActivity.cs file to generate number of students and their scores.

CS

```
public class ZonesData : Java.Lang.Object
{
    public int Number { get; set; }
    public double Score { get; set; }

    public ZonesData(int Number, double Score)
    {
        this.Number = Number;
```

```
        this.Score = Score;
    }

    // a method to create a list of zones sample objects of type ChartPoint
    public static IList<object> getZonesList(int nStudents, int nMaxPoints)
    {
        List<object> list = new List<object>();

        Random random = new Random();
        for (int i = 0; i < nStudents; i++)
        {
            ZonesData point = new ZonesData(i, nMaxPoints * 0.5 * (1 +
random.NextDouble()));
            list.Add(point);
        }
        return list;
    }
}
```

2. Add the following code to the MainActivity class and override OnCreate method and create zones.

CS

```
public class MainActivity : Activity
{
    private FlexChart mChart;

    protected override void OnCreate(Bundle savedInstanceState)
    {
        base.OnCreate(savedInstanceState);

        // Set our view from the "main" layout resource
        SetContentView(Resource.Layout.Main);

        // initializing widget
        mChart = this.FindViewById<FlexChart>(Resource.Id.flexchart);
        mChart.BindingX = "Number";
        mChart.ChartType = ChartType.Scatter;

        int nStudents = 20;
        int nMaxPoints = 100;
        IList<object> data = ZonesData.getZonesList(nStudents, nMaxPoints);
        mChart.ItemsSource = data;

        mChart.Tapped += MChart_Tapped;
        mChart.AxisX.Title = "student number";
        mChart.AxisY.Title = "student accumulated points";

        double mean = this.FindMean(data);
        double stdDev = this.FindStdDev(data, mean);
        List<double> scores = new List<double>();
        foreach (ZonesData item in data)
        {
```

```
        scores.Add(item.Score);
    }
    scores.Sort((x, y) => y.CompareTo(x));

    var zones = new double[]
    {
        scores[this.GetBoundingIndex(scores, 0.85)],
        scores[this.GetBoundingIndex(scores, 0.75)],
        scores[this.GetBoundingIndex(scores, 0.25)],
        scores[this.GetBoundingIndex(scores, 0.05)]
    };

    Integer[] colors = new Integer[]
    {
        new Integer(Color.Argb(255,255,192,192)),
        new Integer(Color.Argb(255,55,228,228)),
        new Integer(Color.Argb(255,255,228,128)),
        new Integer(Color.Argb(255,128,255,128)),
        new Integer(Color.Argb(255,128,128,255)),
    };
    for (var i = 4; i >= 0; i--)
    {
        float y = (float)(i == 4 ? mean + 2 * stdDev : zones[i]);
        PointF[] sdata = new PointF[data.Count];

        for (int j = 0; j < data.Count; j++)
        {
            sdata[j] = new PointF(j, y);
            if (i == 0)
            {
                System.Console.WriteLine(j + "=" + y);
            }
        }

        string seriesName = ((char)((short)'A' + 4 - i)).ToString();

        var series = new ChartSeries();
        series.Chart = mChart;
        series.SeriesName = seriesName;
        series.Binding = "Y";

        series.ItemsSource = sdata;
        series.BindingX = "X";
        series.ChartType = ChartType.Area;
        series.Style = new ChartStyle();
        series.Style.Fill = new Color(colors[i].IntValue());

        mChart.Series.Add(series);
    }

    ChartSeries scoreSeries = new ChartSeries();
```

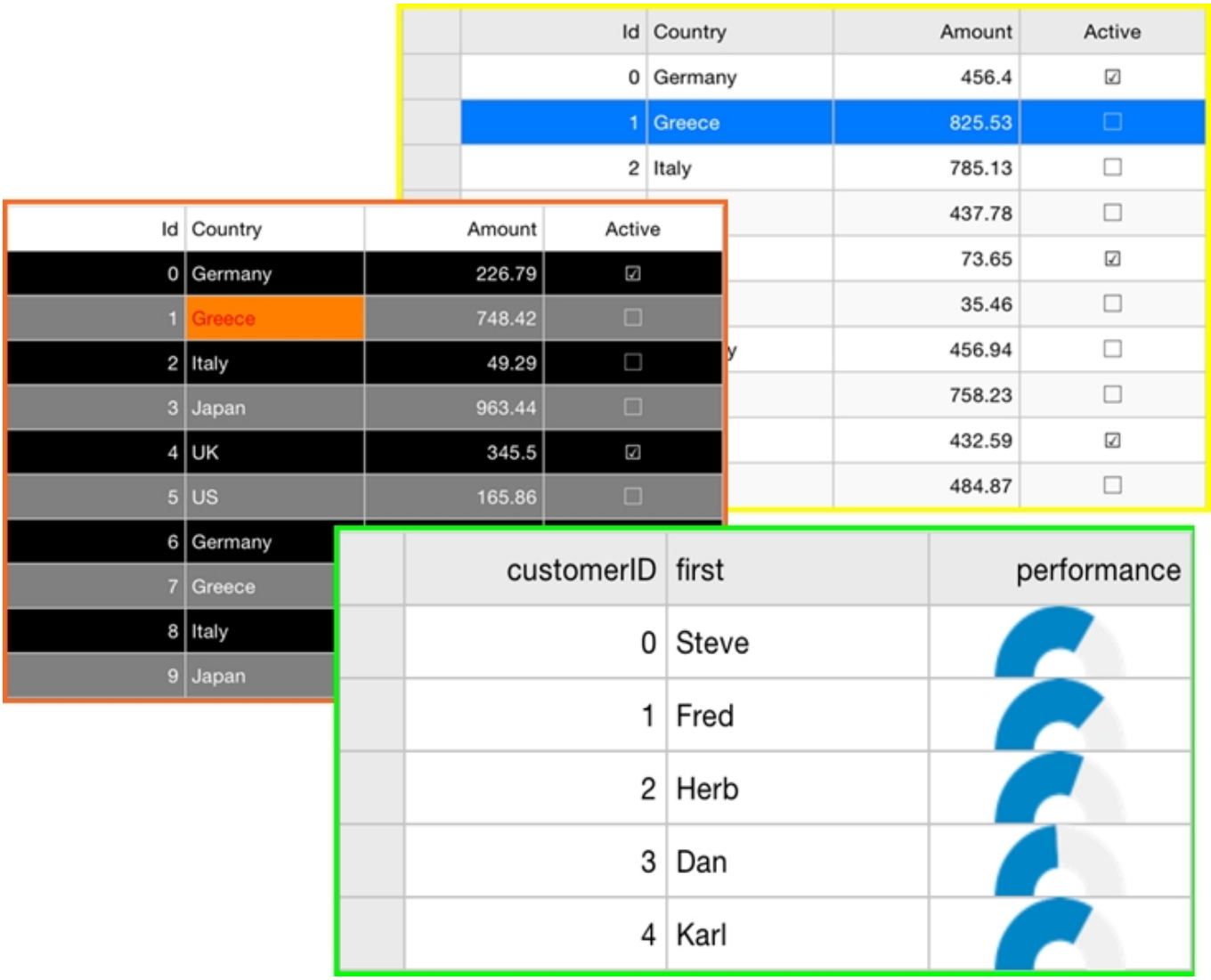
```
        scoreSeries.Chart = mChart;
        scoreSeries.SeriesName = "raw score";
        scoreSeries.Binding = "Score";
        mChart.Series.Add(scoreSeries);

        for (var i = -2; i <= 2; i++)
        {
            var y = mean + i * stdDev;
            string seriesName = string.Empty;
            if (i > 0)
            {
                seriesName = "m+" + i + "s";
            }
            else if (i < 0)
            {
                seriesName = "m" + i + "s";
            }
            else
            {
                seriesName = "mean";
            }
            PointF[] sdata = new PointF[data.Count];
            for (int j = 0; j < data.Count; j++)
            {
                sdata[j] = new PointF(j, (float)y);
            }
            var series = new ChartSeries();
            series.Chart = mChart;
            series.SeriesName = seriesName;
            series.Binding = "Y";

            series.ItemsSource = sdata;
            series.BindingX = "X";
            series.ChartType = ChartType.Line;
            series.Style = new ChartStyle();
            series.Style.StrokeThickness = 2;

            series.Style.Stroke = Color.Rgb(0x20, 0x20, 0x20);

            mChart.Series.Add(series);
        }
    }

    private double FindMean(IList<object> data)
    {
        double sum = 0;
        foreach (ZonesData item in data)
        {
            sum += item.Score;
        }
        return sum / data.Count;
```

```
    }
    private double FindStdDev(IList<object> data, double mean)
    {
        double sum = 0;
        for (var i = 0; i < data.Count; i++)
        {
            ZonesData item = (ZonesData)data[i];
            var d = item.Score - mean;
            sum += d * d;
        }
        return System.Math.Sqrt(sum / data.Count);
    }
    private int GetBoundingIndex(List<double> scores, double frac)
    {
        var n = scores.Count;
        int i = (int)System.Math.Ceiling(n * frac);
        while (i > scores[0] && scores[i] == scores[i + 1])
            i--;
        return i;
    }
    private void MChart_Tapped(object sender, C1TappedEventArgs e)
    {
        if (!mChart.ToolTip.Text.Contains("raw score"))
        {
            mChart.ToolTip.IsOpen = false;
        }
     }
}
```

FlexGrid

The FlexGrid control provides a powerful and flexible way to display data from a data source in tabular format. FlexGrid is a full-featured grid, providing various features including automatic column generation; sorting, grouping and filtering data using the CollectionView; and intuitive touch gestures for cell selection, smooth animation for rows and columns, sorting, scrolling and editing.

FlexGrid brings a spreadsheet-like experience to your Android mobile apps with quick cell editing capabilities. FlexGrid provides design flexibility with conditional formatting and cell level customization. This allows developers to create complex grid-based applications, as well as provides the ability to edit and update databases at runtime.



Key Features

- **Auto Generate Columns:** Generates grid columns automatically when set to true.
- **Data Binding:** FlexGrid allows you to bind data with business objects, and display it in rows and columns of the grid.
- **Touch-based Cell Selection, Zooming and Editing:** FlexGrid supports touch-based cell selection and editing. Double-tapping inside a cell puts it into the edit mode similar to Microsoft Excel. FlexGrid also allows smooth scrolling.
- **Format Columns:** FlexGrid supports various format options that can be used to display data with simple format strings.
- **Themes**: FlexGrid supports various application and device themes to enhance grid's appearance.
- **Pull-to-Refresh and Incremental Loading:** FlexGrid supports the ability to load data on demand via the CollectionView and refresh data by pulling down at the top of the grid.
- **Reorder Columns and Rows:** FlexGrid allows you to reorder rows and columns without using any code.

Key Features

FlexGrid provides many different features that enable the developers to build intuitive and professional-looking applications. The main features for FlexGrid are as follows:

- **Customizable appearance**

The FlexGrid control is enriched with built-in properties to customize the grid's appearance. A user can set attributes such as alternating row color, background color, text color, header color, font etc. to customize the overall look of the control. It confers granular styling capabilities that are perfectly suited for Material themes.

- **Inline editing**

  FlexGrid enables a user to perform in-line editing using the default device keyboard. The quick edit mode within the cell ensures a flawless editing experience.

- **Filtering**

  FlexGrid supports filtering that allows a user to display subsets of data out of large data sets based on the criteria defined. A user can perform custom filtering by adding a text box to enter a value and display a particular set of data.

- **Frozen columns/rows**

  FlexGrid lets you freeze columns and rows so that they are always visible upon scrolling through a grid with a big number of columns/rows.

- **Material theme**

  FlexGrid has a default appearance of material design pattern. A user can programmatically switch to the classic style.

- **Pull-to-refresh**

  FlexGrid comes with pull-to-refresh feature. This lets a user refresh the contents of the screen of a hand-held device by dragging the screen downward with the finger.

- **Sorting**

  FlexGrid enables users to sort the grid data efficiently and quickly. You can easily tap a column's header to sort the grid by that column during runtime.

- **Animation**

  By default, FlexGrid confers fast, animated transitions for enhanced user experience. This can be observed in operations like dragging/dropping and expanding/collapsing groups.

Quick Start: Add Data to FlexGrid

This section describes how to add a FlexGrid control to your Android app and add data to it.

This topic comprises of three steps:

- **Step 1: Create a data source for FlexGrid**
- **Step 2: Add a FlexGrid control**
- **Step 3: Run the project**

The following image shows how the FlexGrid appears, after completing the steps above:

	Id	First Name	Last Name	Addres
	0	Dan	Orsted	512 Pa
	1	Jack	Lehman	813 Pa
	2	Ted	Neiman	259 Br
	3	Rich	Quaid	118 Gr
	4	Ted	Richards	995 Gr
	5	Andy	Ambers	434 Ma
	6	Ted	Bishop	511 Ma
	7	Ulrich	Evers	366 Gr
	8	Ted	Cole	991 Go
	9	Larry	Trask	301 Gr
	10	Xavier	Lehman	169 Br
	11	Vic	Krause	508 Gr

Step 1: Create a data source for FlexGrid

Add a new class to serve as the data source for FlexGrid control.

Customer.cs

```
public class Customer : INotifyPropertyChanged, IEditableObject
{
    #region ** fields

    int _id, _countryId, _orderCount;
    string _first, _last;
    string _address, _city, _postalCode, _email;
    bool _active;
    DateTime _lastOrderDate;
    double _orderTotal;

    static Random _rnd = new Random();
    static string[] _firstNames =
"Andy|Ben|Charlie|Dan|Ed|Fred|Gil|Herb|Jack|Karl|Larry|Mark|Noah|Oprah|Paul|Quince|Rich|Steve|Ted|Ulrich|Vic|Xavier|Zeb".Split('|');
    static string[] _lastNames =
"Ambers|Bishop|Cole|Danson|Evers|Frommer|Griswold|Heath|Jammers|Krause|Lehman|Myers|Neiman|Orsted|Paulson|Quaid|Richards|Stevens|Trask|Ulam".Split('|');
    static KeyValuePair<string, string[]>[] _countries = "China-Beijing,Chongqing,Shanghai,Tianjin,Hong Kong,Macau,Anqing,Bengbu,Bozhou,Chaohu|India-New
Delhi,Mumbai,Delhi,Bangalore,Hyderabad,Ahmedabad,Chennai,Kolkata,Surat,Pune|United States-Washington,New York,Los
Angeles,Chicago,Houston,Philadelphia,Phoenix,San Antonio,San Diego,Dallas|Indonesia-
Jakarta,Surabaya,Bandung,Bekasi,Medan,Tangerang,Depok,Semarang,Palembang,South Tangerang|Brazil-Brasilia,San Pablo,Rio de
Janeiro,Salvador,Fortaleza,Belo Horizonte,Manaus,Curitiba,Recife,Porto Alegre|Pakistan-
Islamabad,Karachi,Lahore,Faisalabad,Rawalpindi,Gujranwala,Multan,Hyderabad,Peshawar,Quetta|Russia-Moscow,Saint
Petersburg,Novosibirsk,Yekaterinburg,Nizhny Novgorod,Kazan,Chelyabinsk,Samara,Omsk,Rostov-na-Donu|Japan-
Tokio,Yokohama,Ōsaka,Nagoya,Sapporo,Kōbe,Kyōto,Fukuoka,Kawasaki,Saitama|Mexico-Mexico
City,Guadalajara,Monterrey,Puebla,Toluca,Tijuana,León,Juárez,Torreón,Querétaro".Split('|').Select(str => new KeyValuePair<string, string[]>(str.Split('-
').First(), str.Split('-').Skip(1).First().Split(','))).ToArray();
    static string[] _emailServers = "gmail|yahoo|outlook|aol".Split('|');
    static string[] _streetNames = "Main|Broad|Grand|Panoramic|Green|Golden|Park|Fake".Split('|');
    static string[] _streetTypes = "ST|AVE|BLVD".Split('|');
    static string[] _streetOrientation = "S|N|W|E|SE|SW|NE|NW".Split('|');

    #endregion

    #region ** initialization

    public Customer()
        : this(_rnd.Next(10000))
    {
    }

    public Customer(int id)
    {
        Id = id;
        FirstName = GetRandomString(_firstNames);
        LastName = GetRandomString(_lastNames);
        Address = GetRandomAddress();
        CountryId = _rnd.Next() % _countries.Length;
        var cities = _countries[CountryId].Value;
        City = GetRandomString(cities);
        PostalCode = _rnd.Next(10000, 99999).ToString();
        Email = string.Format("{0}@{1}.com", (FirstName + LastName.Substring(0, 1)).ToLower(), GetRandomString(_emailServers));
        LastOrderDate = DateTime.Today.AddDays(-_rnd.Next(1, 365)).AddHours(_rnd.Next(0, 24)).AddMinutes(_rnd.Next(0, 60));
        OrderCount = _rnd.Next(0, 100);
        OrderTotal = Math.Round(_rnd.NextDouble() * 10000.00, 2);
        Active = _rnd.NextDouble() >= .5;
    }

    #endregion

    #region ** object model
```

```
public int Id
{
    get { return _id; }
    set
    {
        if (value != _id)
        {
            _id = value;
            OnPropertyChanged();
        }
    }
}

public string FirstName
{
    get { return _first; }
    set
    {
        if (value != _first)
        {
            _first = value;
            OnPropertyChanged();
            OnPropertyChanged("Name");
        }
    }
}

public string LastName
{
    get { return _last; }
    set
    {
        if (value != _last)
        {
            _last = value;
            OnPropertyChanged();
            OnPropertyChanged("Name");
        }
    }
}

public string Address
{
    get { return _address; }
    set
    {
        if (value != _address)
        {
            _address = value;
            OnPropertyChanged();
        }
    }
}

public string City
{
    get { return _city; }
    set
    {
        if (value != _city)
        {
            _city = value;
            OnPropertyChanged();
        }
    }
}

public int CountryId
{
    get { return _countryId; }
    set
    {
        if (value != _countryId && value > -1 && value < _countries.Length)
        {
            _countryId = value;
            OnPropertyChanged();
            OnPropertyChanged("Country");
            OnPropertyChanged("City");
        }
    }
}

public string PostalCode
{
    get { return _postalCode; }
    set
    {
        if (value != _postalCode)
        {
            _postalCode = value;
            OnPropertyChanged();
```

```
        }
    }
}

public string Email
{
    get { return _email; }
    set
    {
        if (value != _email)
        {
            _email = value;
            OnPropertyChanged();
        }
    }
}

public DateTime LastOrderDate
{
    get { return _lastOrderDate; }
    set
    {
        if (value != _lastOrderDate)
        {
            _lastOrderDate = value;
            OnPropertyChanged();
        }
    }
}

public TimeSpan LastOrderTime
{
    get
    {
        return LastOrderDate.TimeOfDay;
    }
}

public int OrderCount
{
    get { return _orderCount; }
    set
    {
        if (value != _orderCount)
        {
            _orderCount = value;
            OnPropertyChanged();
        }
    }
}

public double OrderTotal
{
    get { return _orderTotal; }
    set
    {
        if (value != _orderTotal)
        {
            _orderTotal = value;
            OnPropertyChanged();
        }
    }
}

public bool Active
{
    get { return _active; }
    set
    {
        if (value != _active)
        {
            _active = value;
            OnPropertyChanged();
        }
    }
}

public string Name
{
    get { return string.Format("{0} {1}", FirstName, LastName); }
}

public string Country
{
    get { return _countries[_countryId].Key; }
}

public double OrderAverage
{
    get { return OrderTotal / (double)OrderCount; }
}
```

```
    #endregion

    #region ** implementation

    // ** utilities
    static string GetRandomString(string[] arr)
    {
        return arr[_rnd.Next(arr.Length)];
    }
    static string GetName()
    {
        return string.Format("{0} {1}", GetRandomString(_firstNames), GetRandomString(_lastNames));
    }

    // ** static list provider
    public static ObservableCollection<Customer> GetCustomerList(int count)
    {
        var list = new ObservableCollection<Customer>();
        for (int i = 0; i < count; i++)
        {
            list.Add(new Customer(i));
        }
        return list;
    }

    private static string GetRandomAddress()
    {
        if (_rnd.NextDouble() > 0.9)
            return string.Format("{0} {1} {2} {3}", _rnd.Next(1, 999), GetRandomString(_streetNames), GetRandomString(_streetTypes),
GetRandomString(_streetOrientation));
        else
            return string.Format("{0} {1} {2}", _rnd.Next(1, 999), GetRandomString(_streetNames), GetRandomString(_streetTypes));
    }

    // ** static value providers
    public static KeyValuePair<int, string>[] GetCountries() { return _countries.Select((p, index) => new KeyValuePair(index, p.Key)).ToArray(); }
    public static string[] GetFirstNames() { return _firstNames; }
    public static string[] GetLastNames() { return _lastNames; }

    #endregion

    #region ** INotifyPropertyChanged Members

    // this interface allows bounds controls to react to changes in the data objects.
    public event PropertyChangedEventHandler PropertyChanged;

    private void OnPropertyChanged([CallerMemberName] string propertyName = "")
    {
        OnPropertyChanged(new PropertyChangedEventArgs(propertyName));
    }

    protected void OnPropertyChanged(PropertyChangedEventArgs e)
    {
        if (PropertyChanged != null)
           PropertyChanged(this, e);
    }

    #endregion

    #region IEditableObject Members

    // this interface allows transacted edits (user can press escape to restore previous values).

    Customer _clone;
    public void BeginEdit()
    {
        _clone = (Customer)this.MemberwiseClone();
    }

    public void EndEdit()
    {
        _clone = null;
    }

    public void CancelEdit()
    {
        if (_clone != null)
        {
            foreach (var p in this.GetType().GetRuntimeProperties())
            {
                if (p.CanRead && p.CanWrite)
                {
                    p.SetValue(this, p.GetValue(_clone, null), null);
                }
            }
        }
    }
    #endregion
}
```

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Step 2: Add a FlexGrid control

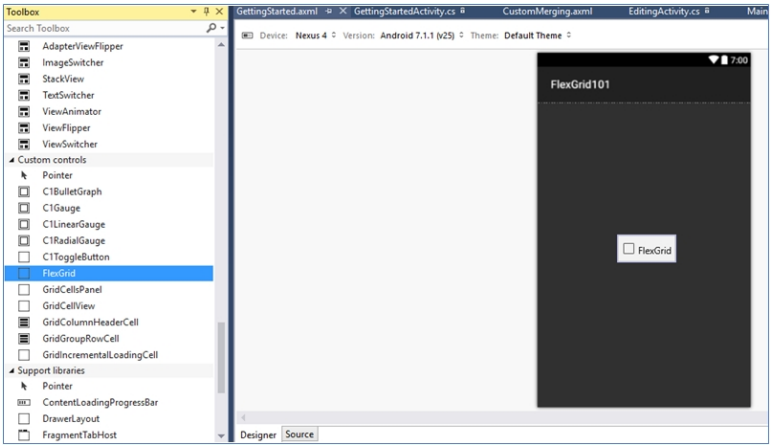
Initialize FlexGrid control in code

To add the FlexGrid control to your layout, open the .axml file in your layout folder from the Solution Explorer and replace its code with the code below.

XML

```
<?xml version="1.0" encoding="utf-8"?>
<C1.Android.Grid.FlexGrid xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:id="@+id/Grid" />
```

Alternatively, you can drag a FlexGrid control from the Toolbox within the custom control tab onto your layout surface in designer mode.



Then, inside your activity, add the following code to the OnCreate method to initialize your layout.

XML

```
protected override void OnCreate(Bundle savedInstanceState)
        {
            base.OnCreate(savedInstanceState);

            SetContentView(Resource.Layout.GettingStarted);

            var grid = FindViewById<FlexGrid>(Resource.Id.Grid);
            grid.ItemsSource = Customer.GetCustomerList(100);
        }
```

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Step 3: Run the project

Press **F5** to your application.

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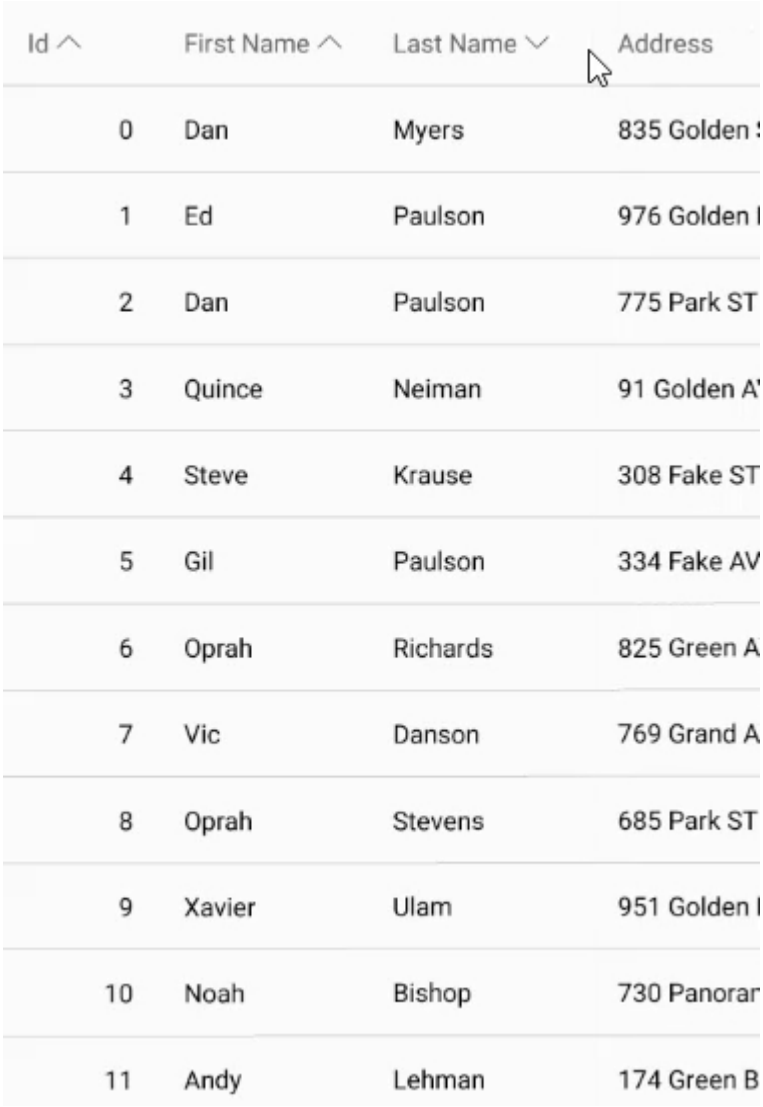
Features

Reordering Rows and Columns

Reordering of rows and columns is a very common scenario when handling and analyzing the data in a grid. FlexGrid provides reordering by dragging the header cells at run-time. The feature is available by default and user can drag and reorder the rows and columns both with a very smooth transition which is important to enhance the overall user experience.



Id	First Name	Last Name	Address
0	Dan	Myers	835 Golden
1	Ed	Paulson	976 Golden
2	Dan	Paulson	775 Park ST
3	Quince	Neiman	91 Golden A
4	Steve	Krause	308 Fake ST
5	Gil	Paulson	334 Fake AV
6	Oprah	Richards	825 Green A
7	Vic	Danson	769 Grand A
8	Oprah	Stevens	685 Park ST
9	Xavier	Ulam	951 Golden
10	Noah	Bishop	730 Panorar
11	Andy	Lehman	174 Green B

However, you can change this behavior to limit dragging only to rows, or columns or to disable it completely. This can be achieved by using the AllowDragging property of the FlexGrid class which accepts the values from GridAllowDragging enumeration. You can also disable reordering of a particular row or column by setting the AllowDragging property of the GridRow or GridColumn class respectively.

The following code snippet shows how you can disable column reordering in the FlexGrid control.

C#

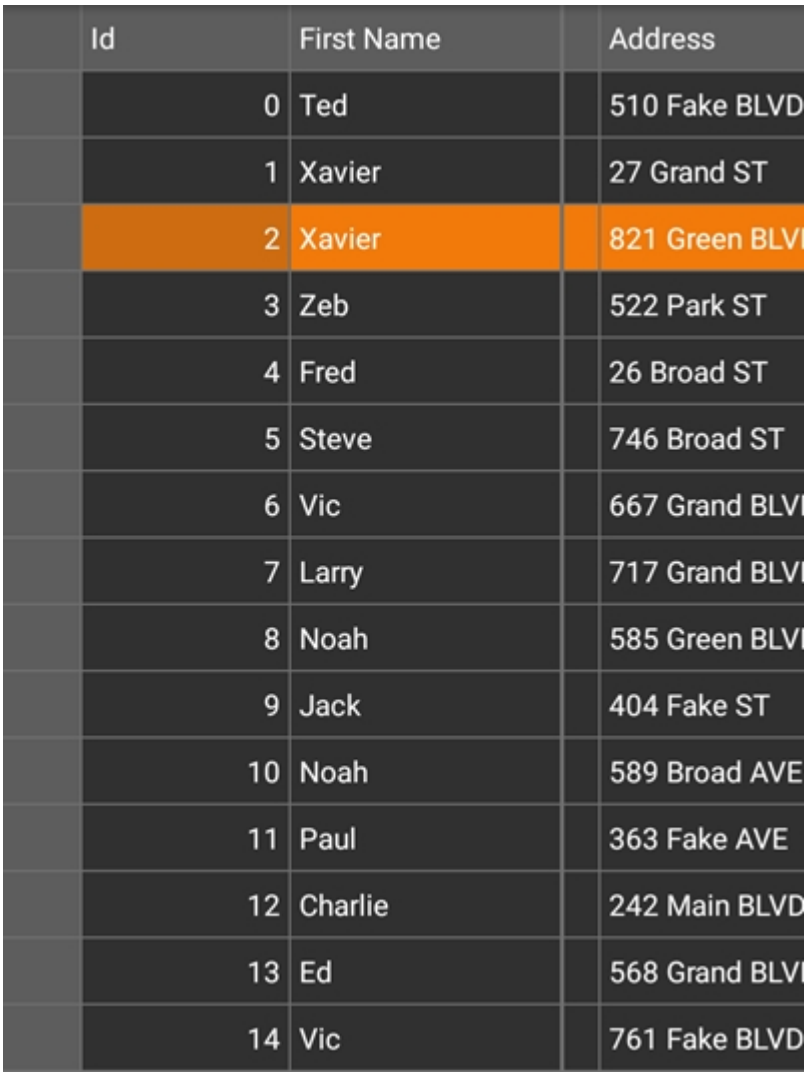
```
// Disable column reordering
grid.AllowDragging = GridAllowDragging.None;
```

Cell Freezing

You can freeze columns and rows so that they remain in the view when the user scrolls the grid forward. Users can freeze the columns appearing in a grid by using FrozenColumns method and specifying the number columns as parameter in the method. This feature enables users in displaying the identifying information in the columns that are freezed, and locking them onto the screen. Frozen cells can be edited and selected as regular cells.

The image below shows how the FlexGrid control appears when the first two cells of the grid control are frozen. The column showing ID and First name are frozen while the rest of the columns in the grid are scrollable. End users can

touch and scroll the columns forward so that the grid displays weight and country corresponding to the ID and first name (First).



Id	First Name	Address
0	Ted	510 Fake BLVD
1	Xavier	27 Grand ST
2	Xavier	821 Green BLV
3	Zeb	522 Park ST
4	Fred	26 Broad ST
5	Steve	746 Broad ST
6	Vic	667 Grand BLV
7	Larry	717 Grand BLV
8	Noah	585 Green BLV
9	Jack	404 Fake ST
10	Noah	589 Broad AVE
11	Paul	363 Fake AVE
12	Charlie	242 Main BLVD
13	Ed	568 Grand BLV
14	Vic	761 Fake BLVD

This following code example demonstrates how to freeze columns of the FlexGrid control in Java. The example uses sample created in Defining Columns.

In Code

C#

```
//Freeze first two columns
grid.FrozenColumns = 2;
```

Customize Appearance

FlexGrid has various built-in properties to customize grid's appearance. A user can set attributes such as background color, alternating row color, text color, header color, font, selection mode, selected cell color, etc to customize the overall appearance of the FlexGrid control. Moreover, it also allows you to set individual properties for RowHeaderGridLinesVisibility, ColumnHeaderGridLinesVisibility, and TopLeftHeaderGridLinesVisibility that provides more granular styling capabilities that are more suited for Material themes.

The image below shows customized appearance in FlexGrid after these properties have been set.

	Id ▲	First Name	Last Name
	0	Ed	Ambers
	1	Dan	Evers
	2	Jack	Jammers
	3	Ed	Richards
	4	Charlie	Heath
	5	Jack	Myers
	6	Zeb	Stevens
	7	Larry	Richards
	8	Zeb	Ambers
	9	Ulrich	Bishop
	10	Oprah	Quaid
	11	Fred	Richards
	12	Dan	Paulson
	13	Rich	Ulam
	14	Fred	Griswold

The following code example demonstrates how to set this property in C#. The example uses the sample created in the Quick Start section.

In Code

C#

```
grid.SelectionMode = GridSelectionMode.Cell;
grid.BackgroundColor = Android.Graphics.Color.White;
grid.AlternatingRowBackgroundColor = Android.Graphics.Color.SaddleBrown;
grid.SelectionTextColor = Android.Graphics.Color.LightSeaGreen;
grid.ColumnHeaderBackgroundColor = Android.Graphics.Color.Gray;
grid.ColumnHeaderTextColor = Android.Graphics.Color.White;
grid.RowHeaderGridLinesVisibility = GridLinesVisibility.Vertical;
```

Custom Icon

FlexGrid displays various icons during its operations such as sorting, filtering etc. These icons can be changed using various icon templates provided in the FlexGrid control. These icon templates can be accessed through following properties.

Properties	Description
SortAscendingIconTemplate	Allows you to set the template of sort icon for sorting values in ascending order.
SortDescendingIconTemplate	Allows you to set the template of sort icon for sorting values in descending order.
GroupExpandedIconTemplate	Allows you to set the template which is used to create the icon displayed when the group is expanded.
GroupCollapsedIconTemplate	Allows you to set the template which is used to create the icon displayed when the group is collapsed.
EditIconTemplate	Allows you to set the template which is used to create the icon displayed in the header when a row is being edited.
NewRowIconTemplate	Allows you to set the template which is used to create the icon displayed in the header of a new row.
DetailCollapsedIconTemplate	Allows you to set the template which is used to create the icon displayed when the detail is collapsed.
DetailExpandedIconTemplate	Allows you to set the template which is used to create the icon displayed when the detail is expanded.

You can change the icons set by these templates either to the built-in icons provided by the FlexGrid or to your own custom image, geometric figures, font etc as an icon.

FlexGrid also allows you to change the appearance of the different icons used in the control using the C1Icon class. The C1Icon class is an abstract class that provides a series of different objects that can be used for displaying monochromatic icons which can easily be tinted and resized. You can also change the position of these icons by setting the **SortIconPosition** property.

C#

```
grid.SortIconPosition = GridSortIconPosition.Left;
```

Using built-in Icons

To set the built-in icons for the abovementioned templates, you can set the following properties of the C1IconTemplate class.

Icon	Image
Edit	
Asterisk	
ArrowUp	
ArrowDown	
ChevronUp	
ChevronDown	
ChevronLeft	
ChevronRight	
TriangleNorth	

TriangleSouth	
TriangleEast	
TriangleWest	
TriangleSouthEast	
Star5	

For instance, to change the default sort ascending icon to a built-in icon, for example, TriangleNorth, use the following code:

C#

```
grid.SortAscendingIconTemplate = C1IconTemplate.TriangleNorth;
```

Using Custom Icons

FlexGrid also allows you to set your own custom image, font, or path as an icon through the respective classes.

Icon Type	Icon Class Name
Bitmap/Image	C1BitmapIcon class
Font character	C1FontIcon class
Path	C1PathIcon class (child class of C1VectorIcon class)
Vector	C1PolygonIcon class (child class of C1VectorIcon class)
Superposed	C1Composite class

For instance, to change the default sort descending icon to a custom image, use the following code:

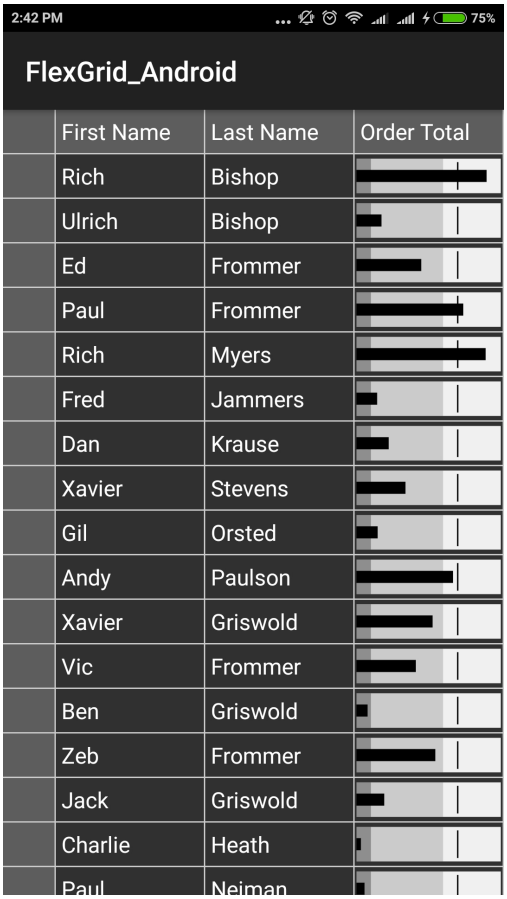
C#

```
grid.SortDescendingIconTemplate = new C1IconTemplate(() => new
C1BitmapIcon(this.ApplicationContext)
{
        Source = BitmapFactory.DecodeResource(this.Resources,
Resource.Drawable.arrow_down)
});
```

Custom Cells

FlexGrid gives you complete control over the contents of the cells. You can customize each column by modifying the cell contents using UIView class and GridCellType enumeration, allowing you to customize cell content entirely in code.

The following image shows how the FlexGrid appears on setting C1Gauge as a cell template to represent performance.



The following code example demonstrates how to add custom cell content in the FlexGrid control. The example uses the class, Customer, created in the Quick Start section.

C#

```
public class MainActivity : Activity
{
    int count = 1;

    protected override void OnCreate(Bundle savedInstanceState)
    {
        base.OnCreate(savedInstanceState);

        // Set our view from the "main" layout resource
        SetContentView(Resource.Layout.Main);

        var grid = FindViewById<FlexGrid>(Resource.Id.Grid);

        grid.AutoGenerateColumns = false;
        grid.Columns.Add(new GridColumn() { Binding = "FirstName", Width =
GridLength.Star });
        grid.Columns.Add(new GridColumn() { Binding = "LastName", Width =
GridLength.Star });
        grid.Columns.Add(new GridBulletGraphColumn() { Binding = "OrderTotal", Header
= "Order Total", Width = GridLength.Star });

        var data = Customer.GetCustomerList(100);
```

```
        grid.ItemsSource = data;

    }
}

public class GridBulletGraphColumn : GridColumn
{
    protected override object GetCellContentType(GridCellType cellType)
    {
        if (cellType == GridCellType.Cell)
        {
            return typeof(C1BulletGraph);
        }
        else
        {
            return base.GetCellContentType(cellType);
        }
    }

    protected override View CreateCellContent(GridCellType cellType, object
cellContentType)
    {
        if (cellType == GridCellType.Cell)
        {
            var gauge = new C1BulletGraph(Grid.Context);
            gauge.Max = 10000;
            gauge.Target = 7000;
            gauge.Bad = 1000;
            gauge.Good = 6000;
            gauge.IsReadOnly = true;
            return gauge;
        }
        else
        {
            return base.CreateCellContent(cellType, cellContentType);
        }
    }

    protected override void BindCellContent(View cellContent, GridCellType cellType,
GridRow row)
    {
        if (cellType == GridCellType.Cell)
        {
            var gauge = cellContent as C1BulletGraph;
            gauge.Value = (double)GetCellValue(cellType, row);
        }
        else
        {
            base.BindCellContent(cellContent, cellType, row);
        }
    }
```

```
}
```

Clipboard and Keyboard Support

FlexGrid comes with clipboard support to readily provide cut, copy and paste operations. The control also supports hardware keyboards by allowing navigation through the use of arrow keys.

The supported keystrokes and their purpose are listed alphabetically as follows:

Keystroke	**Purpose/Description**
Ctrl+C	Copies the selected text.
Ctrl+X	Cuts the selected text.
Ctrl+V	Pastes the copied text.
F2	Enters the edit mode.
Enter/Return	Leaves the edit mode.
Left	Navigates cell selection towards the left.
Right	Navigates cell selection towards the right.
Up	Navigates the cell selection upward.
Down	Navigates the cell selection downward.
Tab	Navigate the cells of the grid by moving the selection to the next column, then wrap to the next row. To enable the Tab key action, you need to set the **KeyActionTab** property. This property accepts value from the **GridTabAction** enumeration.
Shift+Left	Expands column range towards the left or decreases column range based on the context. If range has already expanded to right, this will gradually decrease range selection down to one column. After this single column threshold is hit, it will then expand the selection to the left if it continues to be pressed after this.
Shift+Right	Expands column range towards the right or decreases column range based on the context. If range has already expanded to left, this will gradually decrease range selection down to one column. After this single column threshold is hit, it will then expand the selection to the right if it continues to be pressed after this.
Shift+Up	Expands row range upwards or decreases row range based on the context. If range has already expanded downwards, this will gradually decrease range selection to one row. After this single row threshold is hit, it will then expand the selection to the upwards if it continues to be pressed after this.
Shift+Down	Expands row range downwards or decreases row range based on the context. If range has already expanded upwards, this will gradually decrease range selection to one row. After this single row threshold is hit, it will then expand the selection to the downwards if it continues to be pressed after this.

Data Mapping

Data Mapping provides auto look-up capabilities in FlexGrid. For example, you may want to display a customer name instead of his ID, or a color name instead of its RGB value. When data mapping is configured a spinner is displayed

when the user edits any cell in that column.

The following image shows a FlexGrid with Data Mapping.

The code given below assigns a DataMap to the grid's 'CountryID' column so that the grid displays country names rather than the raw IDs. The example uses the class, Customer, created in the Quick Start section. Add the following code to the OnCreate method in the MainActivity.

C#

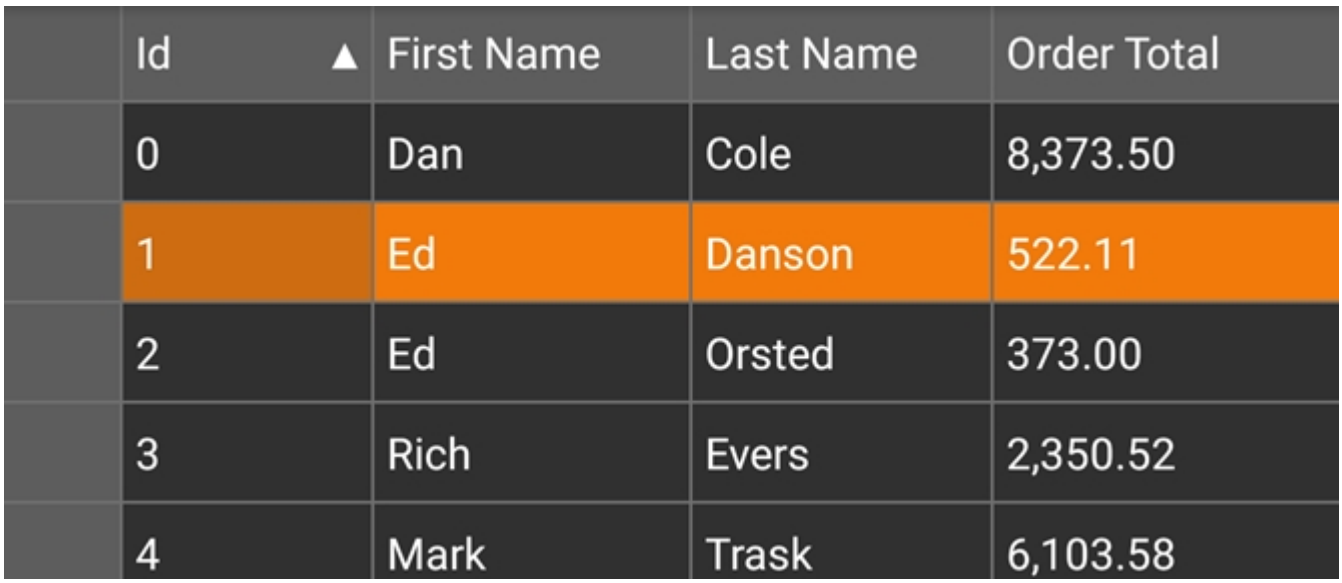
```
grid = FindViewById<FlexGrid>(Resource.Id.Grid);
grid.AutoGenerateColumns = false;
grid.Columns.Add(new GridColumn { Binding = "Active", Width = new GridLength(70) });
grid.Columns.Add(new GridColumn { Binding = "FirstName" });
grid.Columns.Add(new GridColumn { Binding = "LastName" });
grid.Columns.Add(new GridColumn { Binding = "OrderTotal", Format = "C", InputType =
Android.Text.InputTypes.NumberFlagSigned });
grid.Columns.Add(new GridColumn { Binding = "CountryId", Header = "Country" });
grid.Columns["CountryId"].DataMap = new GridDataMap() { ItemsSource =
Customer.GetCountries(),     DisplayMemberPath = "Value", SelectedValuePath = "Key"
};
grid.ItemsSource = Customer.GetCustomerList(100);
```

Defining Columns

With automatic column generation as one of the default features of FlexGrid, the control also allows you to specify the columns. FlexGrid allows you to choose which columns to show, and in what order. This gives you control over each

column's width, heading, formatting, alignment, and other properties. To define columns for FlexGrid, ensure that the AutoGenerateColumns is set to **false** (By default it is true).

The image below shows how the FlexGrid appears, after defining columns.



The following code example demonstrates how to define FlexGrid columns in C#. he example uses the sample created in the Quick Start section.

In Code

C#

```
grid.AutoGenerateColumns = false;
grid.AllowResizing = GridAllowResizing.Columns;

//Add Columns
grid.Columns.Add(new GridColumn { Binding = "Id"});
grid.Columns.Add(new GridColumn { Binding = "FirstName"});
grid.Columns.Add(new GridColumn { Binding = "LastName"});
grid.Columns.Add(new GridColumn { Binding = "OrderTotal", Format = "N"});
grid.ItemsSource = Customer.GetCustomerList(50);
```

Editing

FlexGrid has built-in support for fast, in-cell editing like you find in Excel. There is no need to add extra columns with Edit buttons that switch between display and edit modes. Users can start editing by typing into any cell. This puts the cell in quick-edit mode. In this mode, pressing a cursor key finishes the editing and moves the selection to a different cell.

Another way to start editing is by clicking a cell twice. This puts the cell in full-edit mode. In this mode, pressing a cursor key moves the caret within the cell text. To finish editing and move to another cell, the user must press the Enter key. Data is automatically coerced to the proper type when editing finishes. If the user enters invalid data, the edit is cancelled and the original data remains in place. You can disable editing at the grid using the `isReadOnly` property of the grid.

FlexGrid provides support for various types of Editing, including inline and custom cell editing.

Inline Editing

FlexGrid allows a user to perform in-line editing using the default android device keyboard. Double clicking inside a cell puts it into a quick edit mode. Once you select the content inside the cell or row, it gives you options to **Cut, Copy, Replace** etc. for a smooth editing experience.

Once you have entered the new data, click the **DONE** button, or simply press **Enter**, this automatically updates the data in the appropriate format. You can set the IsReadOnly property to **true** for the rows and columns that you want to restrict editing for.

The image below shows how the FlexGrid appears, after these properties have been set.

	Id	First Name	Last Name	Order Total
	0	Larry	Richards	4,963.67
	1	Steve	Ambers	3,785.97
	2	Herb	Danson	9,072.97
	3	Karl	Heath	9,821.91
	4	Zeb	Stevens	7,708.88

The following code example demonstrates how to set this property in C#. The example uses the sample created in the Quick Start section.

In Code

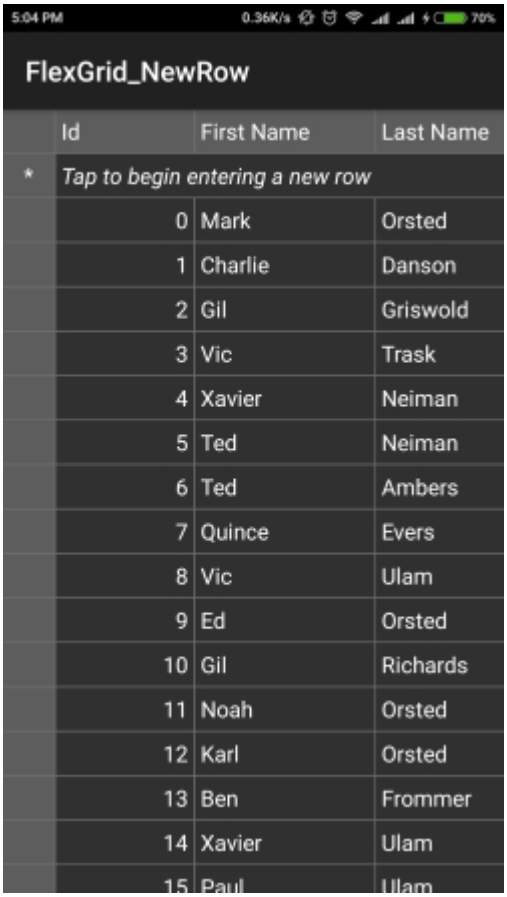
C#

```
grid.IsReadOnly = false;
```

Add New Row

FlexGrid allows you to show a new row template at the top or bottom of the grid using NewRowPosition property, which takes values from the GridNewRowPosition enumeration. You can control the text to be displayed to a user by setting the NewRowPlaceHolder property. Users may use the new row template to add items to the grid's itemsSource collection.

The image below shows how the FlexGrid appears after adding the new row.



The following code example demonstrates how to set this property in C#. The example uses the sample created in the Quick start section.

In Code

C#

```
grid.NewRowPosition = GridNewRowPosition.Top;
grid.NewRowPlaceholder = "Tap to begin entering a new row";
```

Export

FlexGrid allows you to export a file and save it to a device or a stream. You export files to text, CSV and HTML formats and save them to a file system, a Stream or a StreamWriter using **Save** method of the **FlexGrid** class. The **Save** method can save the exported file with different options of encoding and presentation of the FlexGrid data. The method has following seven overloads:

Overload	Description
Save(StreamWriter, GridFileFormat, GridSaveOptions)	Saves the contents of the grid to a System.IO.StreamWriter.
Save(Stream, GridFileFormat, Encoding, GridSaveOptions)	Saves the contents of the grid to a stream with specified memory location, format, encoding, and options.
Save(Stream, GridFormat, GridSaveOptions)	Saves the contents of the grid to a UTF8 encoded stream with specified memory location, format and options.

Save(Stream, GridFileFormat)	Saves the contents of the grid to a UTF8 encoded stream with specified memory location and format.
Save(String, GridFileFormat, Encoding, GridSaveOptions)	Saves the contents of the grid to a file a with specified name, format, encoding, and options.
Save(String, GridFileFormat, GridSaveOptions)	Saves the contents of the grid to a UTF8 encoded file with specified name, format and options.
Save(String, GridFileFormat)	Saves the content of the grid to a UTF8 encoded file with specified name and format.

The following code example demonstrates the implementation of the Save method to save the exported file. The example uses the sample created in the Quick Start section.

C# copyCode

```
string PathAndName = Path.Combine(
Environment.ExternalStorageDirectory.ToString(),
"ExportedGrid") + "." + "csv";
grid.Save(PathAndName, GridFileFormat.Csv,
System.Text.Encoding.UTF8, GridSaveOptions.SaveColumnHeaders);
```

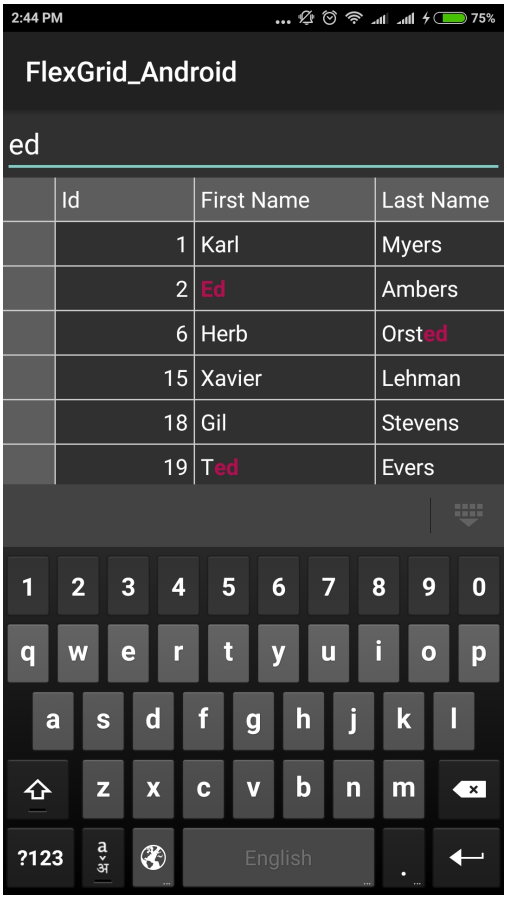
Filtering

FlexGrid supports filtering through the ICollectionView interface and FullTextFilterBehavior class. Filtering allows a user to display subsets of data out of large data sets based on the criteria defined. Collection View interface provided by FlexGrid provides a flexible and efficient way to filter and display the desired dataset.

The FlexGrid control lets a user perform custom filtering by adding a text box to enter a value and display a particular set of data. It also allows a user to use various options, such as BeginsWith, Contains, EndsWith, Equals, LessThamn, GreaterThan etc. A user can define the filtering patterns on the basis of the requirements, which can be a specific data or an approximate set of values.

Search Box Filtering

FlexGrid provides you flexibility to use a search box to filter out data. Users can add the filter search box and set its attributes, including its height, width, color, text, filtering pattern as per their requirements. This example demonstrates a simple text box that lets you type the value you want to search in the grid. For example, when you type 'ed' in the Filter text box, the FullTextFilterBehavior class can be used to filter the grid data to display all the values containing 'ed'.



The example uses the class, Customer, created in the Quick Start section. Add the following code to the OnCreate method for filtering data using search box.

C#

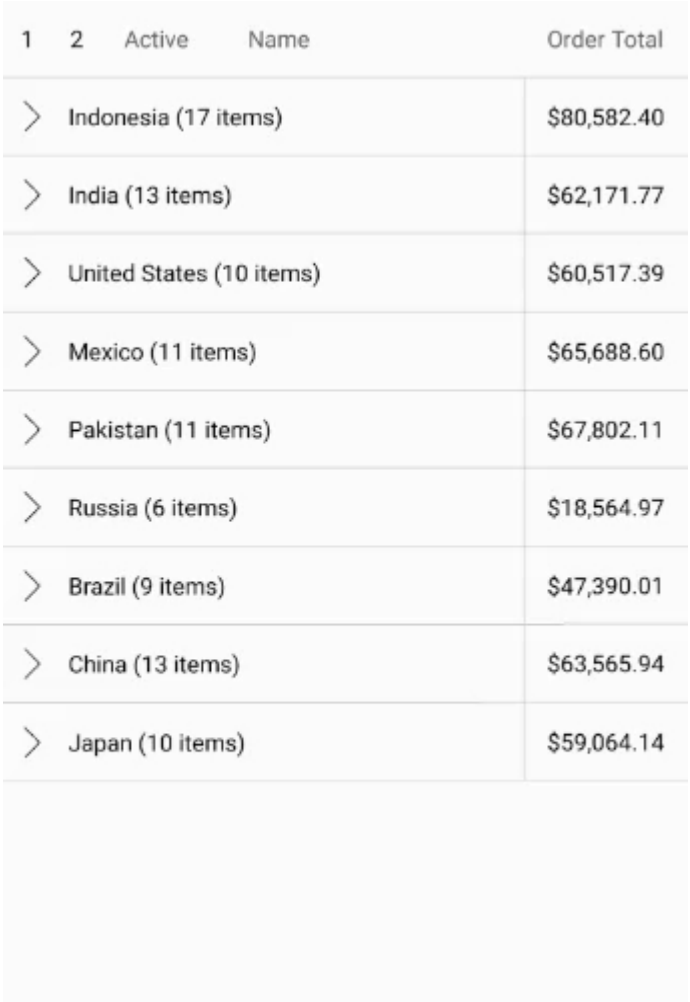
```
grid = FindViewById<FlexGrid>(Resource.Id.Grid);
var entry = FindViewById<EditText>(Resource.Id.Filter);
grid.ItemsSource = Customer.GetCustomerList(100);

var fullTextFilter = new FullTextFilterBehavior();
fullTextFilter.Attach(grid);
fullTextFilter.HighlightColor = global::Android.Graphics.Color.ParseColor("#B00F50");
fullTextFilter.FilterEntry = entry;
```

Grouping

FlexGrid supports grouping through the **ICollectionView**. To enable grouping, you can use GroupAsync method. GroupAsync method allows you to group the collection view according to the specified group path. Users can expand or collapse groups in FlexGrid by tapping anywhere within the group row.

> Users also have the option to expand and collapse groups by tapping the group rows or the expand/collapse icon.

The image below shows how the FlexGrid appears, after these properties have been set.



The following code examples demonstrate how to set this property in **C#**. The example uses the class, Customer, created in the Quick Start section. Add the following code to the MainActivity.

C#

```
public class MainActivity : Activity
    {
        public FlexGrid Grid;
        private C1CollectionView<Customer> _collectionView;

        protected override void OnCreate(Bundle savedInstanceState)
        {
            base.OnCreate(savedInstanceState);
            SetContentView(Resource.Layout.Main);

            Grid = FindViewById<FlexGrid>(Resource.Id.Grid);

            var btn = FindViewById<Button>(Resource.Id.button1);
            btn.Click += OnCollapseClicked;
            var task = UpdateVideos();
        }

        private async Task UpdateVideos()
        {
```

```
            var data = Customer.GetCustomerList(100);
            _collectionView = new C1CollectionView<Customer>(data);
            await _collectionView.GroupAsync(c => c.Country);
            Grid.AutoGenerateColumns = false;
            Grid.ShowOutlineBar = true;
            Grid.IsReadOnly = true;
            Grid.Columns.Add(new GridColumn { Binding = "Active", Width = new
GridLength(TypedValue.ApplyDimension(ComplexUnitType.Dip, 60,
Resources.DisplayMetrics)) });
            Grid.Columns.Add(new GridColumn { Binding = "Name", Width =
GridLength.Star });
            Grid.Columns.Add(new GridColumn { Binding = "OrderTotal", Width = new
GridLength(TypedValue.ApplyDimension(ComplexUnitType.Dip, 110,
Resources.DisplayMetrics)), Format = "C", Aggregate = GridAggregate.Sum,
HorizontalAlignment = Android.Views.GravityFlags.Right, HeaderHorizontalAlignment =
Android.Views.GravityFlags.Right });
            Grid.GroupHeaderFormat = "{name}: {value} ({count} items)";
            Grid.ItemsSource = _collectionView;
        }

        public void OnCollapseClicked(object sender, EventArgs e)
        {
            Grid.CollapseGroups();
        }
    }
```

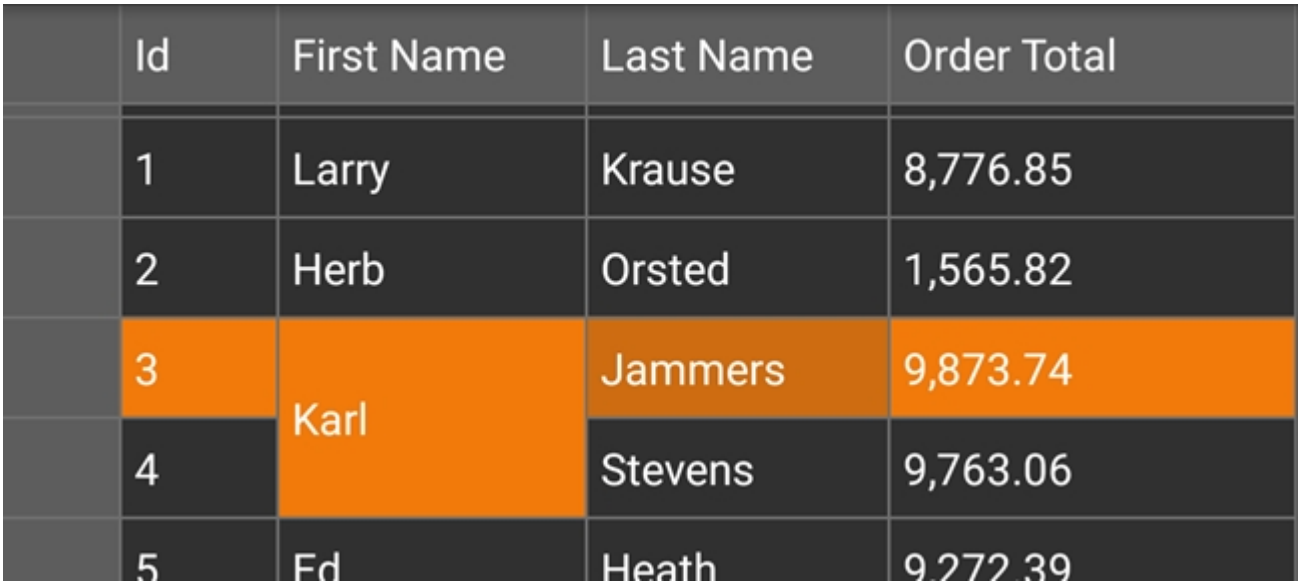
Merging Cells

C1FlexGrid control allows you to merge cells, making them span multiple rows or columns. This capability enhances the appearance and clarity of the data displayed on the grid. The effect of these settings is similar to the HTML <ROWSPAN> and <COLSPAN> tags.

To enable cell merging, you must do two things:

1. Set the grid's **AllowMerging** property to some value other than None.
2. If you wish to merge columns, set the **AllowMerging** property to true in C#for each column that you would like to merge. If you wish to merge rows, set the **AllowMerging** property to true for each row that you would like to merge.

The image below shows how the FlexGrid appears, after these properties have been set.



Merging occurs if the adjacent cells contain the same non-empty string. There is no method to force a pair of cells to merge. Merging occurs automatically based on the cell contents. This makes it easy to provide merged views of sorted data, where values in adjacent rows present repeated data.

Cell merging has several possible uses. For instance, you can use this feature to create merged table headers, merged data views, or grids where the text spills into adjacent columns.

The following code example demonstrates how to apply cell merging in FlexGrid control. The example uses the sample created in Defining Columns topic.

C#

```
grid.AllowMerging = GridAllowMerging.Cells;
```

Resizing Columns

FlexGrid's AllowResizing method lets a user resize the column by simply touching or tapping the handle between two columns. You can restrict resizing of grid columns at runtime by setting the AllowResizing to `GridAllowResizing.None`. To allow resizing of columns at runtime, set the method to `GridAllowResizing.Columns`. You can also allow resizing for specific columns instead of the entire FlexGrid. In such as case, use AllowResizing method for columns.

The resizing functionality for columns is useful when a user wants to add data in FlexGrid. Users can simply resize the column directly on the device as per their requirement, without requiring to change or set the width in code.

In Code

C#

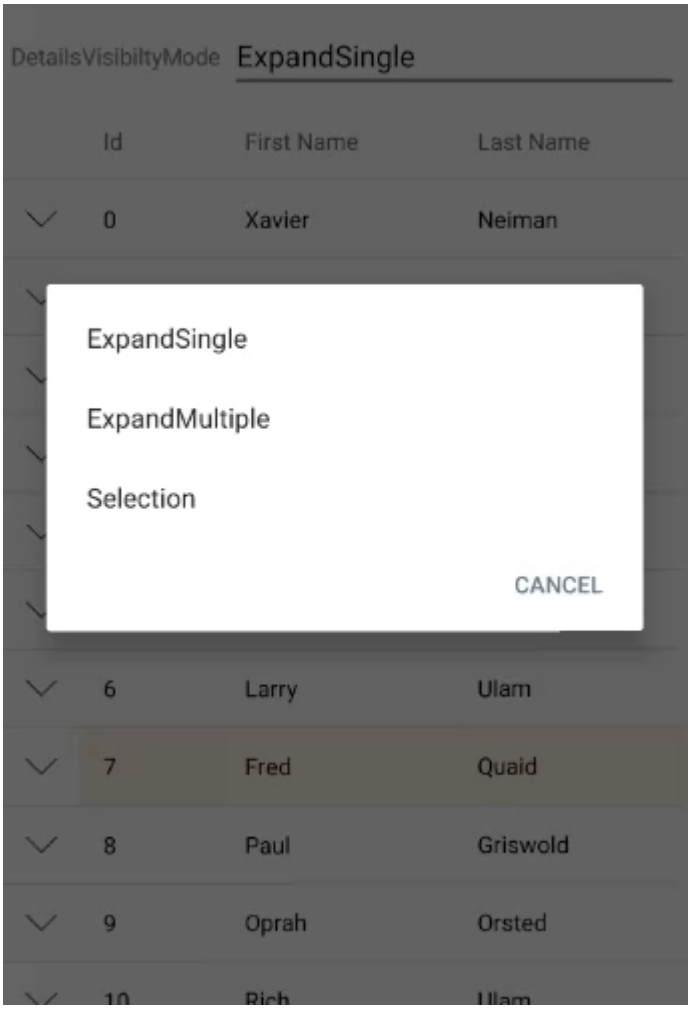
```
//set resizing on columns
grid.AllowResizing = GridAllowResizing.Columns;
```

Row Details

The C1FlexGrid control allows you to create a hierarchical grid by adding a row details section to each row. Adding a row details sections allows you to group some data in a collapsible template and present only a summary of the data

for each row. The row details section is displayed only when the user taps a row. Moreover, you can set the details visibility mode to expand single, expand multiple or selection, with the help of **GridDetailVisibiltyMode** property provided by the FlexGrid class.

The image given below shows a FlexGrid with row details section added to each row.



The following code examples demonstrates how to add row details section to the FlexGrid control in C#. The example uses the class, Customer, created in the Quick Start section. Add the following code to the MainActivity.

C#

```
public class MainActivity : Activity
    {
        public FlexGrid grid;
        //private C1CollectionView<Customer> _collectionView;

        protected override void OnCreate(Bundle savedInstanceState)
        {
            base.OnCreate(savedInstanceState);
            SetContentView(Resource.Layout.Main);

            grid = FindViewById<FlexGrid>(Resource.Id.Grid);

            var data = Customer.GetCustomerList(100);
```

```
            grid.AutoGenerateColumns = false;
            grid.Columns.Add(new GridColumn() { Binding = "Id", Width =
GridLength.Auto });
            grid.Columns.Add(new GridColumn() { Binding = "FirstName", Width =
GridLength.Star });
            grid.Columns.Add(new GridColumn() { Binding = "LastName", Width =
GridLength.Star });
            var details = new FlexGridDetailProvider();
            details.Attach(grid);
            details.DetailCellCreating += OnDetailCellCreating;
            details.Height = GridLength.Auto;
            grid.ItemsSource = data;
        }
        private void OnDetailCellCreating(object sender,
GridDetailCellCreatingEventArgs e)
        {
            var customer = e.Row.DataItem as Customer;
            var detailsView = LayoutInflater.Inflate(Resource.Layout.RowDetailsCell,
null);
            var countryLabel = detailsView.FindViewById<Android.Widget.TextView>
(Resource.Id.CountryLabel);
            var cityLabel = detailsView.FindViewById<Android.Widget.TextView>
(Resource.Id.CityLabel);
            var addressLabel = detailsView.FindViewById<Android.Widget.TextView>
(Resource.Id.AddressLabel);
            var postalCodeLabel = detailsView.FindViewById<Android.Widget.TextView>
(Resource.Id.PostalCodeLabel);
            countryLabel.Text =
string.Format(Resources.GetString(Resource.String.RowDetailsCountry),
customer.Country);
            cityLabel.Text =
string.Format(Resources.GetString(Resource.String.RowDetailsCity), customer.City);
            addressLabel.Text =
string.Format(Resources.GetString(Resource.String.RowDetailsAddress),
customer.Address);
            postalCodeLabel.Text =
string.Format(Resources.GetString(Resource.String.RowDetailsPostalCode),
customer.PostalCode);
            e.Content = detailsView;
        }
    }
```

Selecting Cells

The SelectionMode property of the FlexGrid allows you to define the selection mode of the cells by setting its value to **Row, Cell, CellRange, RowRange, or None**. This property accepts these values from the GridSelectionMode enum.

The image below shows how the FlexGrid appears after the selectionMode property is set to **Row**.

	Id ▲	First Name	Last Name	Order Total
	0	Dan	Cole	8,373.50
	1	Ed	Danson	522.11
	2	Ed	Orsted	373.00
	3	Rich	Evers	2,350.52
	4	Mark	Trask	6,103.58

The following code example demonstrates how to choose selection modes in FlexGrid. The example uses the sample created in the Defining Columns section.

C#

```
grid.SelectionMode = GridSelectionMode.Row;
```

The **SelectionMode** property also controls dictates how a deletion works for a row, cell, cell range, or row range from the FlexGrid control.

Selection Menu

The selection menu contains common actions such as, editing, selecting, and deleting text. In FlexGrid, selection menu is enabled by default. However, you can disable it by setting the **ShowSelectionMenu** property to false. In desktop applications, you can activate the selection menu with a right click over a cell or by left clicking. In mobile applications, you can activate selection menu with a long press on a cell or tapping the row header. Also, it supports custom menu actions, in case you want custom actions for the selection menu, you need to set a handler for the **CreateSelectionMenu** event.

Use the following code snippet to create custom action for the selection menu.

C#

```
grid.CreatingSelectionMenu += Grid_CreatingSelectionMenu;

 private void Grid_CreatingSelectionMenu(object sender, GridSelectionMenuEventArgs e)
 {
  e.Menu.Items.Add(new GridMenuItem("Clear", () => Clear(e)));
 }

 public void Clear(GridSelectionMenuEventArgs e) {
  for (int c = e.CellRange.Column; c <= e.CellRange.Column2; c++) {
   for (int r = e.CellRange.Row; r <= e.CellRange.Row2; r++) {
    grid[r, c] = null;
   }
  }
 }
```

```
return grid;
```

	ID	Name	Country	Country ID	Active	First	Last
	0	Charlie Jammers	Japan	4	☑	Charlie	Jammers
	1	Xavier Orsted	Congo	1	☑	Xavier	Orsted
	2	Gil Jammers	Congo	1	☑	Gil	Jammers
		Gil Orsted	Thailand	5	☐	Gil	Orsted
		Oprah Frommer	Japan	4	☐	Oprah	Frommer
		Steve Jammers	United States	3	☑	Steve	Jammers
		Xavier Orsted	Brazil	0	☑	Xavier	Orsted
	7	Herb Jammers	Egypt	2	☐	Herb	Jammers
	8	Herb Krause	Brazil	0	☑	Herb	Krause
	9	Herb Krause	Thailand	5	☑	Herb	Krause

Star Sizing

You can use star sizing to implement flexible layouts with the FlexGrid. The sample below uses star sizing specified in the Width property of the object.

This grid has four columns. The width for all the four columns is set using the GridLength, which defines the size of the columns.

The image below shows how the FlexGrid appears, after star sizing is applied to the FlexGrid control.

	Id	First Name	Last Name	Order Total
	0	Oprah	Trask	6,619.29
	1	Steve	Danson	4,068.45
	2	Gil	Richards	4,485.83
	3	Ted	Trask	6,388.24
	4	Ben	Evers	8,075.35

If a column with star sizing is resized by the end-user, the column's width changes according to the pixel measurement. This means that the column no longer behaves like a star-sized column. To disable this behavior, use AllowResizing property and set it to **None** as demonstrated in the code below.

The following code example demonstrates star sizing in the FlexGrid control. The example uses the sample created in

the Quick Start section.

In Code

C#

```
grid.AllowResizing = GridAllowResizing.None;


//Add Columns
grid.Columns.Add(new GridColumn { Binding = "Id", Width = GridLength.Star});
grid.Columns.Add(new GridColumn { Binding = "FirstName", Width = GridLength.Star });
grid.Columns.Add(new GridColumn { Binding = "LastName", Width = GridLength.Star });
grid.Columns.Add(new GridColumn { Binding = "OrderTotal", Width = GridLength.Star,
Format = "N"});
```

Word Wrap

You can use WordWrap method to display multiple lines of text in a single cell. The WordWrap method determines whether the grid should automatically break long strings containing multiple words and special characters such as spaces in multiple lines. Multiple line text can be displayed in both fixed and scrollable cells.

In Code

The code given below sets the WordWrap method to true for Country column.

C#

C#

```
// Set WordWrap property in code
column.WordWrap = true;
```

FlexPie

The FlexPie control allows you to create customized pie charts that represent a series as slices of a pie. The arc length of each slice depicts the value represented by that slice. Pie charts are commonly used to display proportional data such as percentage cover. Multi-colored slices make pie charts easy to understand and usually the value represented by each slice is displayed with the help of labels.

Key Features

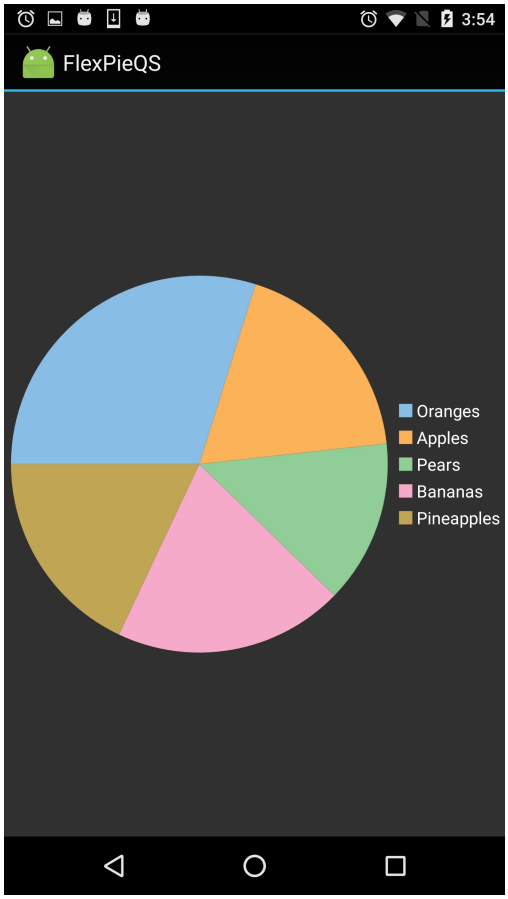
- **Touch Based Labels**: Display values using touch based labels.
- **Exploding and Donut Pie Charts**: Use simple FlexPie properties to convert it into an exploding pie chart or a donut pie chart.

Quick Start: Add Data to FlexPie

This section describes how to add a FlexPie control to your android app and add data to it. This topic comprises of three steps:

- **Step 1: Create a data source for FlexPie**
- **Step 2: Add a FlexPie control**
- **Step 3: Run the Project**

The following image shows how the FlexPie appears after completing the steps above:



Step 1: Create a data source for FlexPie

Add a new class to serve as the data source for FlexPie control.

PieChartData

```
public class PieChartData
{
    public string Name {get; set;}
    public double Value {get; set;}

    public static IEnumerable<PieChartData> DemoData()
    {
        List<PieChartData> result = new List<PieChartData> ();
        string[] fruit = new string[]
{"Oranges","Apples","Pears","Bananas","Pineapples" };

        Random r = new Random ();

        foreach (var f in fruit)
        result.Add (new PieChartData { Name = f, Value = r.Next(100) * 101});

        return result;
    }
}
```

Step 2: Add a FlexPie control

To add a FlexPie control to your layout, open the .axml file in your layout folder from the Solution Explorer and replace its code with the code below.

XML

```
<?xml version="1.0" encoding="utf-8"?>
<C1.Android.Chart.FlexPie xmlns:android="http://schemas.android.com/apk/res/android"
    android:id="@+id/flexPie"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:layout_gravity="center"/>
```

Alternatively, you can drag a FlexPie control from the Toolbox within the custom control tab onto your layout surface in designer mode. Then, inside your activity, add the following code to the OnCreate method to initialize your layout.

CS

```
public class GettingStartedActivity : Activity
    {
        private FlexPie mFlexPie;

        protected override void OnCreate(Bundle savedInstanceState)
        {
            // setting the dark theme
            // FlexPie automatically adjusts to the current theme
            SetTheme(Android.Resource.Style.ThemeHolo);

            base.OnCreate(savedInstanceState);
            SetContentView(Resource.Layout.flexpie_activity_getting_started);

            // initializing widgets
            mFlexPie = (FlexPie)FindViewById(Resource.Id.flexPie);


            mFlexPie.BindingName = "Name";
            mFlexPie.Binding = "Value";

            // setting the source of data/items and default values in FlexPie
            mFlexPie.ItemsSource = PieChartData.DemoData();
        }
    }
```

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Step 3: Run the Project

Press **F5** to run the application.

Features

Animation

FlexPie allows you to enable animation effects using one of the two ways, either on loading when the chart is drawn or on updating when the chart is redrawn after modifications. It supports animation in charts through C1Animation class available in the C1.Android.Core namespace.

You can also set the duration of the animation in chart using Duration property and interpolate the values of animation using Easing property of the C1Animation class, which accepts values from the C1Easing class. This class supports a collection of standard easing functions such as CircleIn, CircleOut, and Linear.

- **CircleIn:** Easing function that starts slow and speeds up in the form of a circle.
- **CircleOut:** Easing function that starts fast and slows down in the form of a circle.
- **Linear:** Easing function with constant speed.

C#

```
C1Animation animate = new C1Animation();
// set update animation duration
animate.Duration = new TimeSpan(1500 * 10000);
// interpolate the values of animation
animate.Easing = C1Easing.Linear;
```

In addition to easing functions of C1Easing class, FlexPie supports built in easing functions of Xamarin.Forms.Easing class. For more information, refer Xamarin Easing Class.

You can show animation while loading or updating a chart. To show animation while loading, use LoadAnimation property of the ChartBase class. This property gets the load animation from the object of C1Animation class to display the animation at the time of loading chart. Similarly, to animate the chart when underlying data collection changes on adding, removing, or modifying a value, you can use UpdateAnimation property of the ChartBase class.

C#

```
// set the loading animation easing
fpie.LoadAnimation = animate;
```

You can apply loading animation effect by setting the AnimationMode property which accepts values from AnimationMode enumeration. This enumeration supports four different animation modes: All, None, Series, and Point.

- **All**: The chart expands outward from the center point.
- **None**: Does not display any animation.
- **Series**: The chart expands outward from the center point.
- **Point**: The chart radially animates clockwise around the center point.

C#

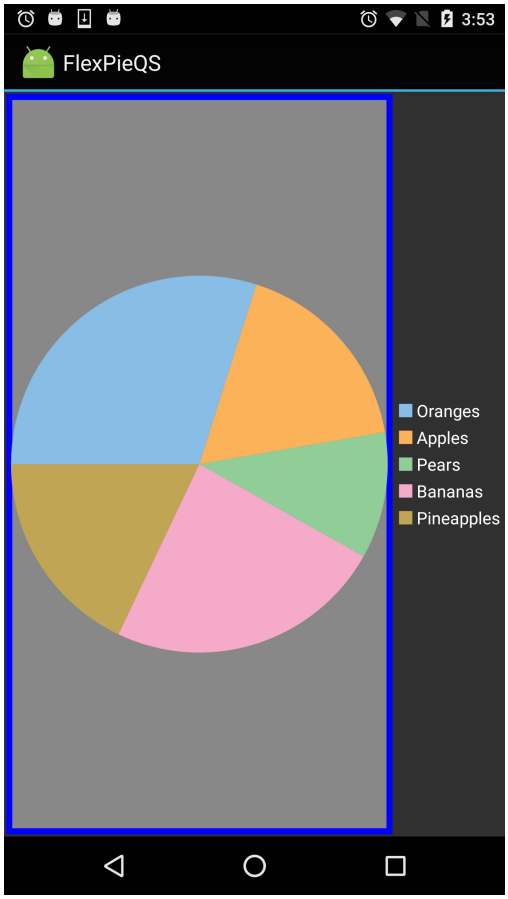
```
// set the animation mode
fpie.AnimationMode = AnimationMode.Point;
```

Customize Appearance

Xamarin controls match the native controls on all three platforms by default and are designed to work with both: light and dark themes available on all platforms. However, developers can choose to customize the appearance of the FlexPie control by setting some of the properties at design time. You can change the background color of the FlexPie, the plot area, the color and width of borders and the thickness of margins by simply setting the desired values in the following properties:

- BackgroundColor: Changes the background color.
- Stroke: Changes the color of the stroke.
- StrokeThickness: Changes the thickness of the stroke.

The image below shows the how the FlexPie appears after these properties have been set.



The following code examples demonstrate how to set these properties in C#. This example uses the sample created in the Quick Start section.

C#

```
//Customizing Appearance
fpie.BackgroundColor = Color.AliceBlue;
ChartStyle s = new ChartStyle();
s.Fill = Color.Gray;
s.StrokeThickness = 5;
s.Stroke = Color.Blue;
fpie.PlotStyle = s;
```

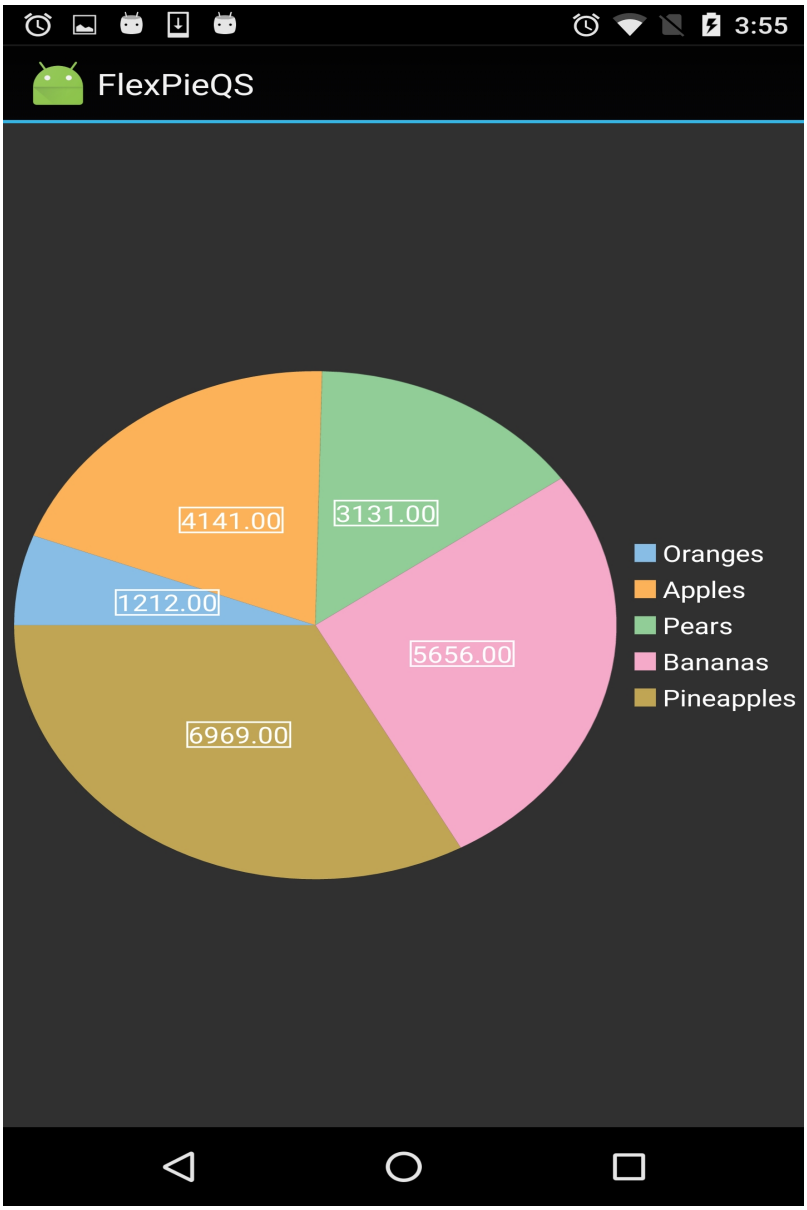
Data Labels

You can add data labels in the FlexPie to show the exact values corresponding to each section of the pie. All you have to do is use the Position property and set the position using PieLabelPosition enumeration at design time and get the data labels displayed in the plot area. In FlexPie, users can choose to set data labels at the following positions.

- **None** - No data labels.
- **Inside**- Displays data labels within the pie.

- **Center**- Displays data labels right in the center of the pie.
- **Outside**- Displays data labels outside the pie.
- **Radial**- Displays data labels inside the pie slice and depends on its angle.
- **Circular** - Displays data labels inside the pie slice in circular direction.

The following image shows a FlexPie with data labels displayed in the center.



The following code example shows how to set data labels for FlexPie control. The example uses the sample created in the Quick Start section.

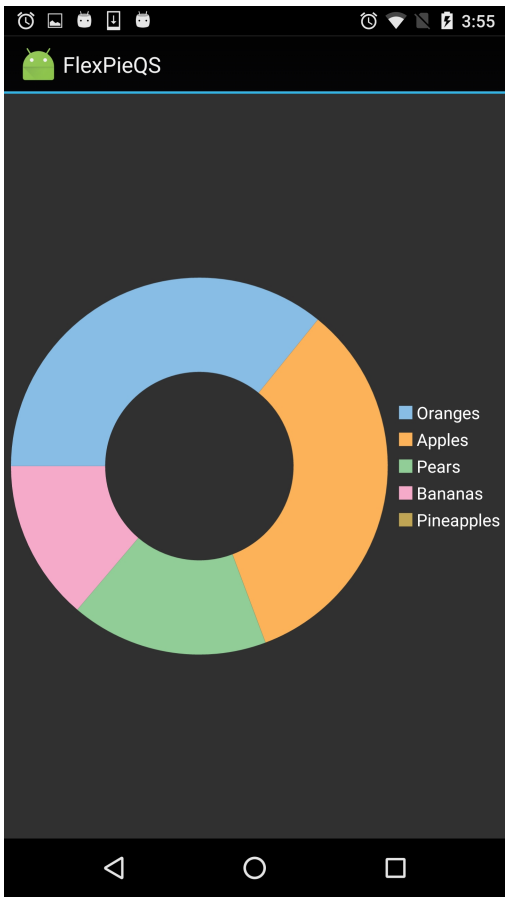
C#

```
// Set data label
fpie.DataLabel.Content = "{}{value:F2}";
fpie.DataLabel.Position = PieLabelPosition.Center;
```

Donut Pie Chart

The InnerRadius property can be used to create a donut shaped pie chart leaving a blank inner space. The blank space can be used to display additional data.

The following image shows a donut shape FlexPie.



The following code examples demonstrate how to set this property in C#. These examples use the sample created in the Quick Start section.

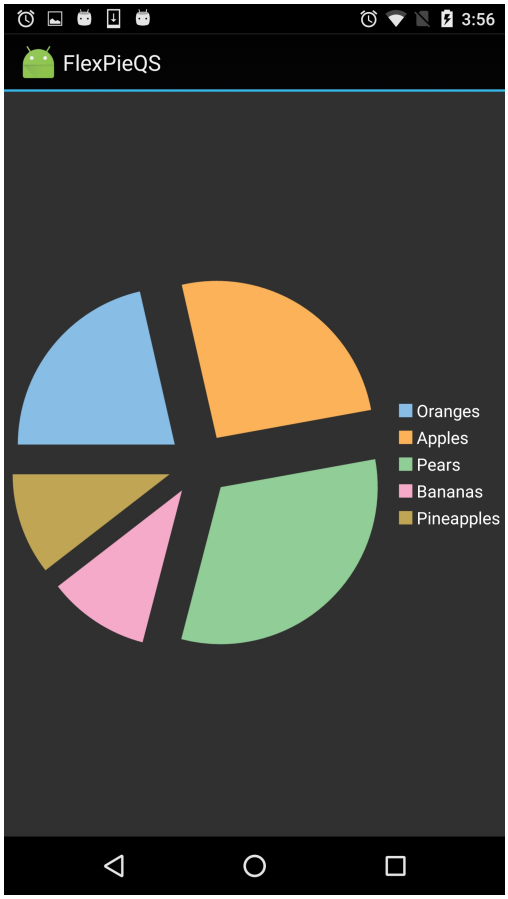
C#

```
fpie.InnerRadius = 0.5f;
```

Exploded Pie Chart

The Offset property can be used to push the pie slices away from the center of the FlexPie, producing an exploded pie chart. This property accepts a floating value to determine how far the pie slices should be pushed from the center.

The image below shows an exploded FlexPie.



The following code examples demonstrate how to set this property in C#. These examples use the sample created in the Quick Start section.

C#

```
fpie.Offset = 0.2;
```

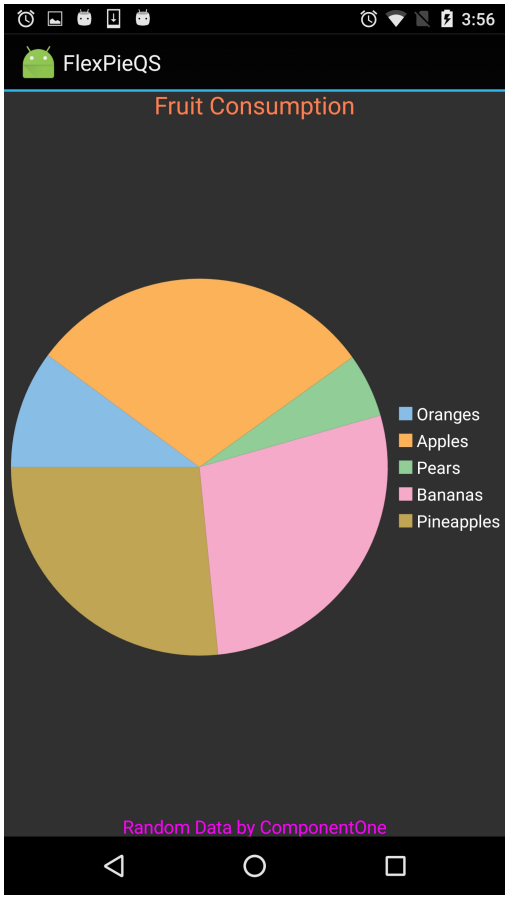
Header and Footer

You can add a title to the FlexPie control by setting its Header property. In addition, you may also set a footer by setting the Footer property for the FlexPie control.

There are also some additional properties to customize header and footer text in a FlexPie.

- HeaderStyle: Lets you select the chart header style.
- FooterStyle: Lets you select the chart footer style.

The image below shows how the FlexPie appears after these properties have been set.



The following code example demonstrates setting these properties in C#. These examples use the sample created in the Quick Start section.

C#

```
// Setting the Header and Footer
fpie.Header = "Fruit Consumption";
fpie.HeaderStyle.Fill = Color.Coral;
fpie.HeaderStyle.FontSize = 20;

fpie.Footer = "Random Data by ComponentOne";
fpie.FooterStyle.Fill = Color.Fuchsia;
fpie.FooterStyle.FontSize = 15;
```

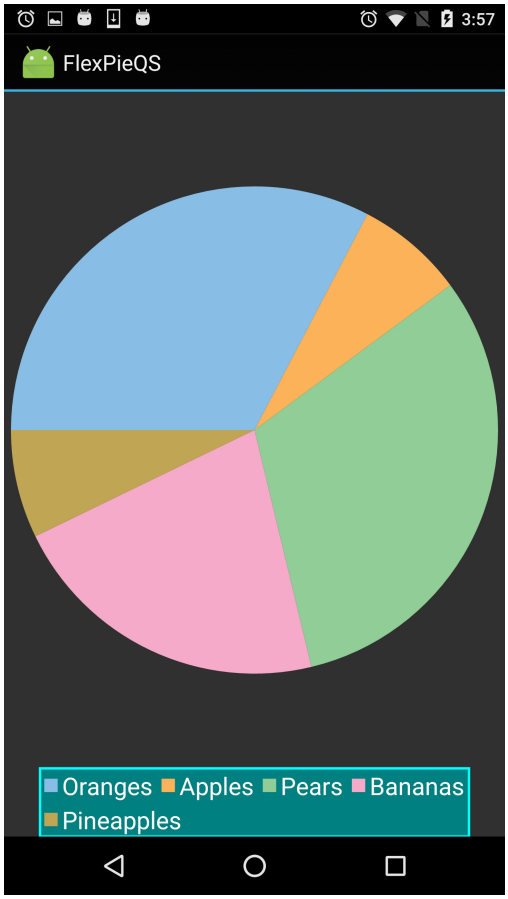
Legend

Users have the option to customize the appearance of the legend to enhance the visual appeal of the FlexPie control. To customize the legend, you can set the following properties at design time.

Property	Description
LegendPosition	This property accepts the following values from the ChartPositionType enumeration: • Auto - This is the default value that enables responsive positioning of the legend by setting it in the best possible way depending upon the space available on the plot area. • Bottom - Positions the legend at the bottom of the pie in the plot area.

	• Left - Positions the legend to the left of the pie in the plot area. • Right - Positions the legend to the right of the pie in the plot area. • Top - Positions the legend to the top of the pie in the plot area. • None - hides the legend.
LegendStyle	Sets the different styles of the legend.
LegendItemStyle	Sets the item style of the legend.

The image below shows how the FlexPie appears after these properties have been set.



The following code examples demonstrate how to set these properties in C#. These examples use the sample created in the Quick Start section.

C#

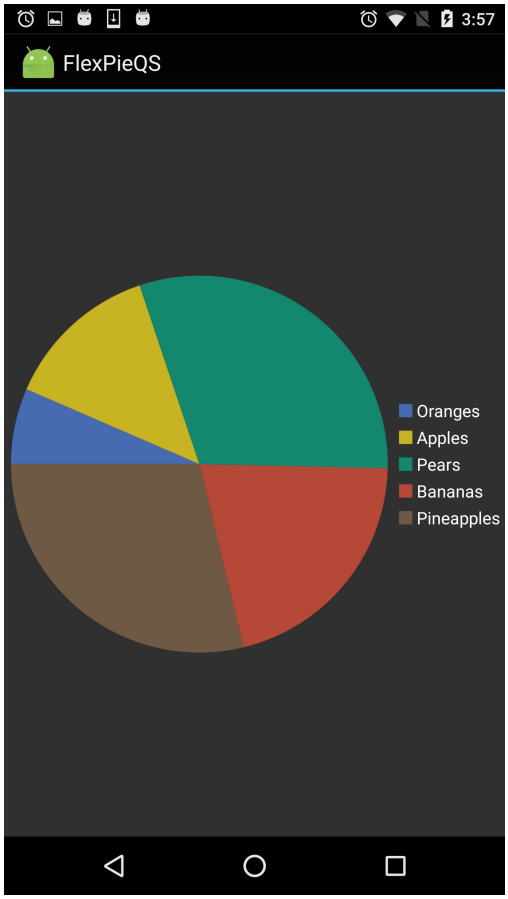
```
//Customize Legend
fpie.LegendPosition = ChartPositionType.Bottom;
fpie.LegendStyle.Stroke = Color.Aqua;
fpie.LegendStyle.Fill = Color.Teal;
fpie.LegendStyle.StrokeThickness = 2;
fpie.LegendItemStyle.FontSize = 20;
```

Themes

Enhance the appearance of the control by using pre-defined themes. The Palette property can be used to specify the theme to be applied on the control.

Note: Remove the Palette property from the code to revert to the default theme.

The image below shows how the FlexPie appears when the Palette property is set to COCOA.



The following code example demonstrates how to set a theme for the FlexPie control in C#. The example uses the sample created in the Quick Start section.

C#

```
//set palette
fpie.Palette = Palette.Cocoa;
```

FlexPie comes with pre-defined templates that can be applied for quick customization. Here are the 17 pre-defined templates available in the C1.Android.Chart.Palette enumeration.

Zooming and Panning

Zooming can be performed in FlexPie chart using ZoomBehavior class. To implement zooming, you need to create an object of ZoomBehavior class available in the C1.Android.Chart.Interaction namespace and pass it as a parameter to the Add method. This method adds zoom behavior to the behavior collection by accessing it through Behaviors property of ChartBase class.

The image below shows how the FlexPie appears on zooming.

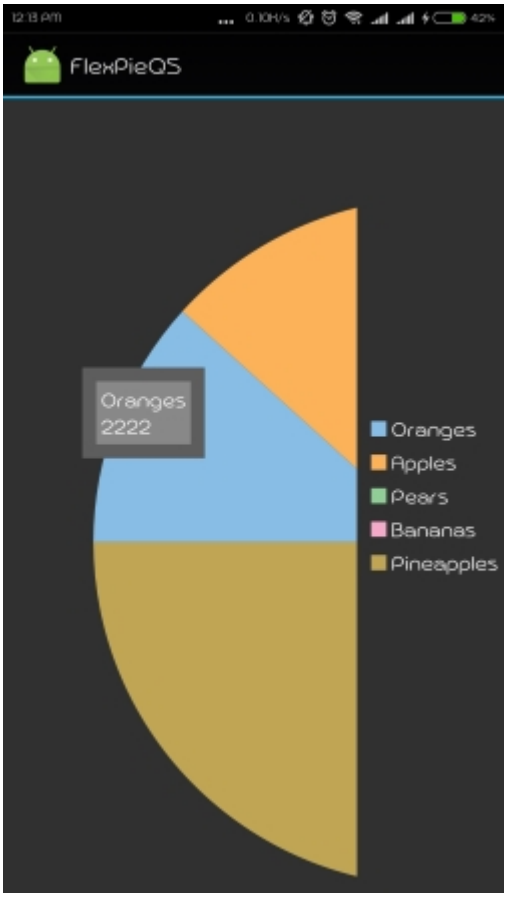
The following code examples demonstrate how to implement zooming in C#. These examples use the sample created in the Quick Start section.

C#

```
ZoomBehavior z = new ZoomBehavior();
fpie.Behaviors.Add(z);
```

Similarly, panning can be implemented in FlexPie chart by creating an object TranslateBehavior class available in the C1.Android.Chart.Interaction namespace and passing it as a parameter to the Add method. This method adds translation behavior to the behavior collection by accessing it through Behaviors property of the ChartBase class. In addition, you can use the TranslationX and TranslationY property of FlexPie class to set the translation x and translation y delta for the chart.

The image below shows how the FlexPie appears on panning.



The following code examples demonstrate how to implement panning in C#. These examples use the sample created in the Quick Start section.

C#

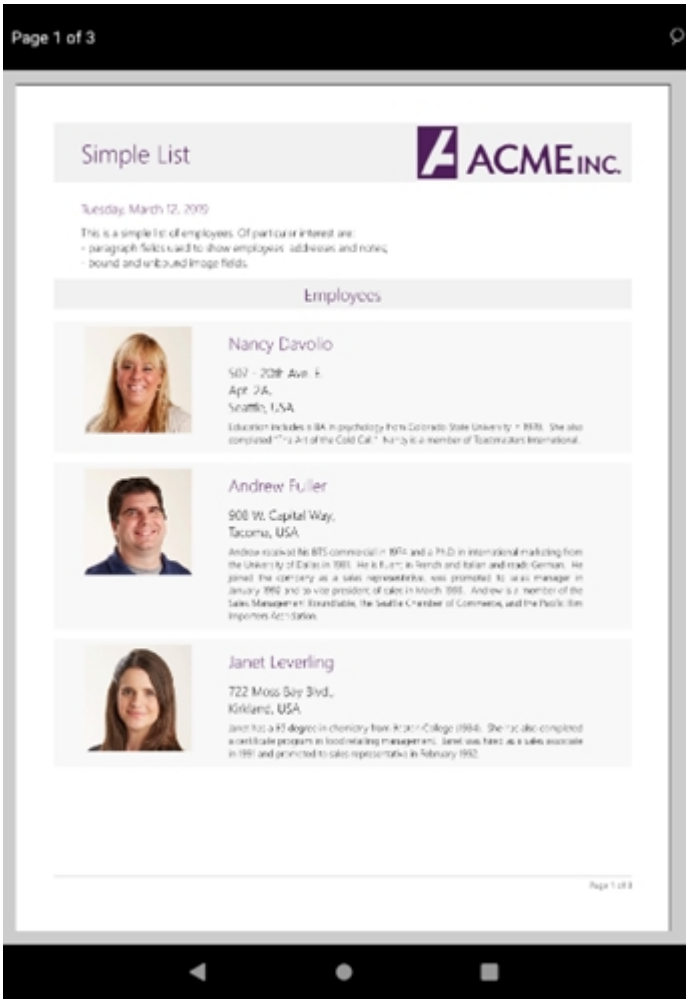
```
TranslateBehavior t = new TranslateBehavior();
fpie.Behaviors.Add(t);

fpie.TranslationX = 10;
fpie.TranslationY = 10;
```

Moreover, you can allow users to translate their custom views when pie is panning or zooming through TranslateCustomViews event handler available in FlexPie class.

FlexViewer

FlexViewer (Beta), as the name suggests, is a flexible, fast and powerful previewing control which comes with a modern, interactive and user-friendly UI. Currently, it uses GcPdf as its document source. FlexViewer allows you to view PDF documents, navigate through the PDF pages using page navigation option that let's you jump to a specific page by just typing specified page number in the Page textbox. In addition, it allows you to search text in the PDF document and zoom the PDF page from the UI itself, eliminating the need of writing any code.



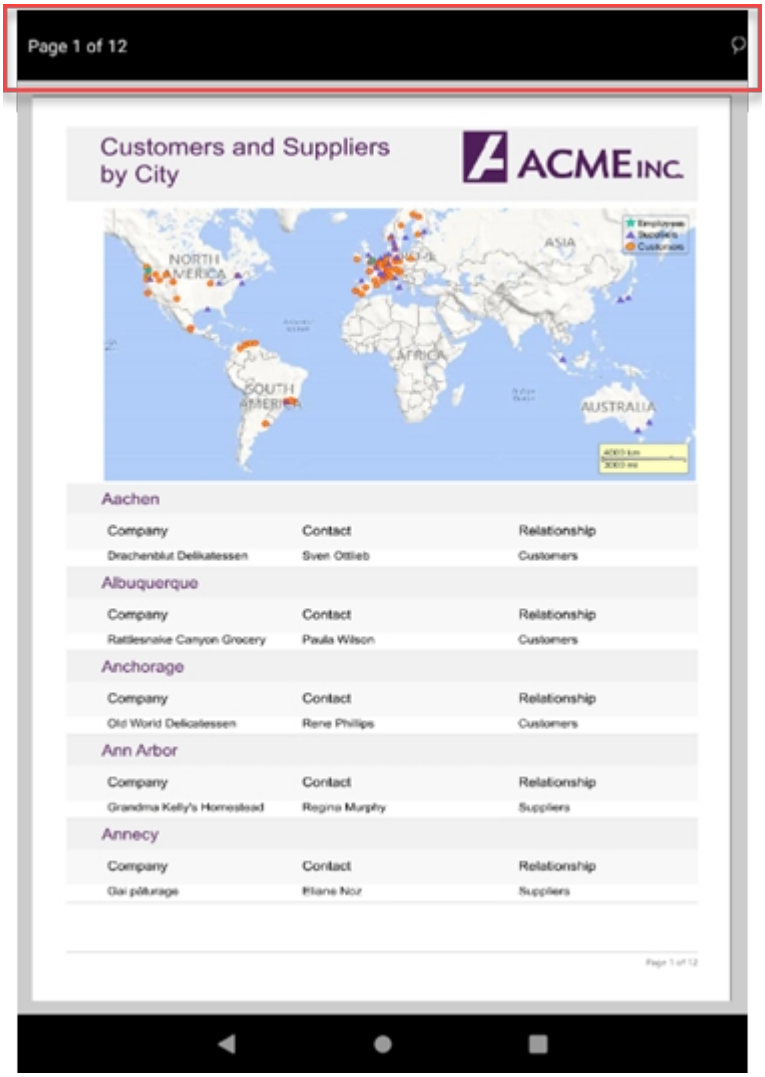
Key Features

The key features of FlexViewer are as follows:

- **Modern user-friendly UI:** Interactive and user friendly UI that helps preview PDF documents with ease.
- **View PDF documents:** Load and display PDF document content, including images and shapes, in the FlexViewer control.
- **Page navigation:** Navigate to a specific page using the page label from the FlexViewer toolbar.
- **Search text:** Find text in document using Search toolbar and get highlighted search results.
- **Export PDF:** Save PDF documents to a file, stream or as images in different formats, such as BMP, JPEG, PNG, GIF, and TIFF.
- **Zoom:** Zoom in and out of the content of PDF document pages with ease.
- **Virtualize UI:** Open large documents without going out of memory.

FlexViewer Toolbar

FlexViewer toolbar appears at the top of the FlexViewer control with two options, a Page label on the left side and search icon on the right. Clicking the Page label transitions it to a textbox allowing you to navigate through the document pages and clicking the search icon opens a search toolbar replacing the main toolbar.



The toolbar consists of the following command buttons:

Command Button	Command Button Name	Description
Page 1 of 12	Page label	Displays the current page number and the total number of pages in the PDF document.
	Search	Allows you to search text in the PDF document.

Quick Start

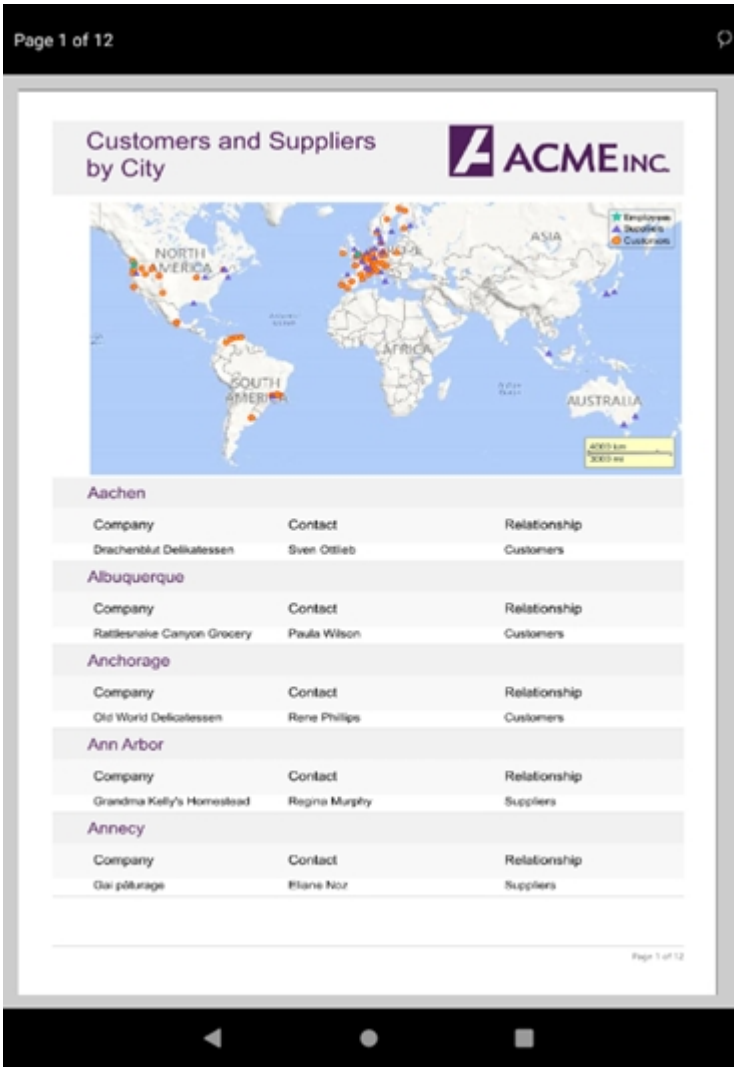
This quick start will guide you through the steps of adding FlexViewer control to the application, binding it with a document source, i.e., GcPdf, and loading the PDF in the FlexViewer control.

> Note: To use GcPdf as the document source for your application, you need to install GcPdf NuGet package to add the GcPdf references to your application.

To achieve it, follow these steps:

1. **Add FlexViewer control**
2. **Load the PDF document**
3. **Run the Project**

The following image shows how the FlexViewer control appears after completing the steps above.



Step 1: Add FlexViewer control

In the **Solution Explorer**, open the activity_main.axml file from the layout folder inside the Resources folder and replace its code with the following code:

XML

```
<c1.android.viewer.FlexViewer
      android:id="@+id/FlexViewer"
      android:layout_width="match_parent"
      android:layout_height="match_parent"/>
```

Alternatively, you can drag a FlexPie control from the Toolbox within the custom control tab onto your layout surface in designer mode.

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Step 2: Load the PDF document

Load the PDF document in the FlexViewer control using the following code. In this example, we have added a PDF document to the Assets folder to load it in the viewer.

C# copyCode

```
//#region load
var flexViewer = FindViewById<FlexViewer>(Resource.Id.FlexViewer);

using (var stream = Assets.Open("DefaultDocument.pdf",
Android.Content.Res.Access.Streaming))
{
    using (var sr = new StreamReader(stream))
    {
        memoryStream = new MemoryStream();
        sr.BaseStream.CopyTo(memoryStream);
        flexViewer.LoadDocument(memoryStream);
    }
}
```

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Step 3: Run the Project

Press **F5** to run the application.

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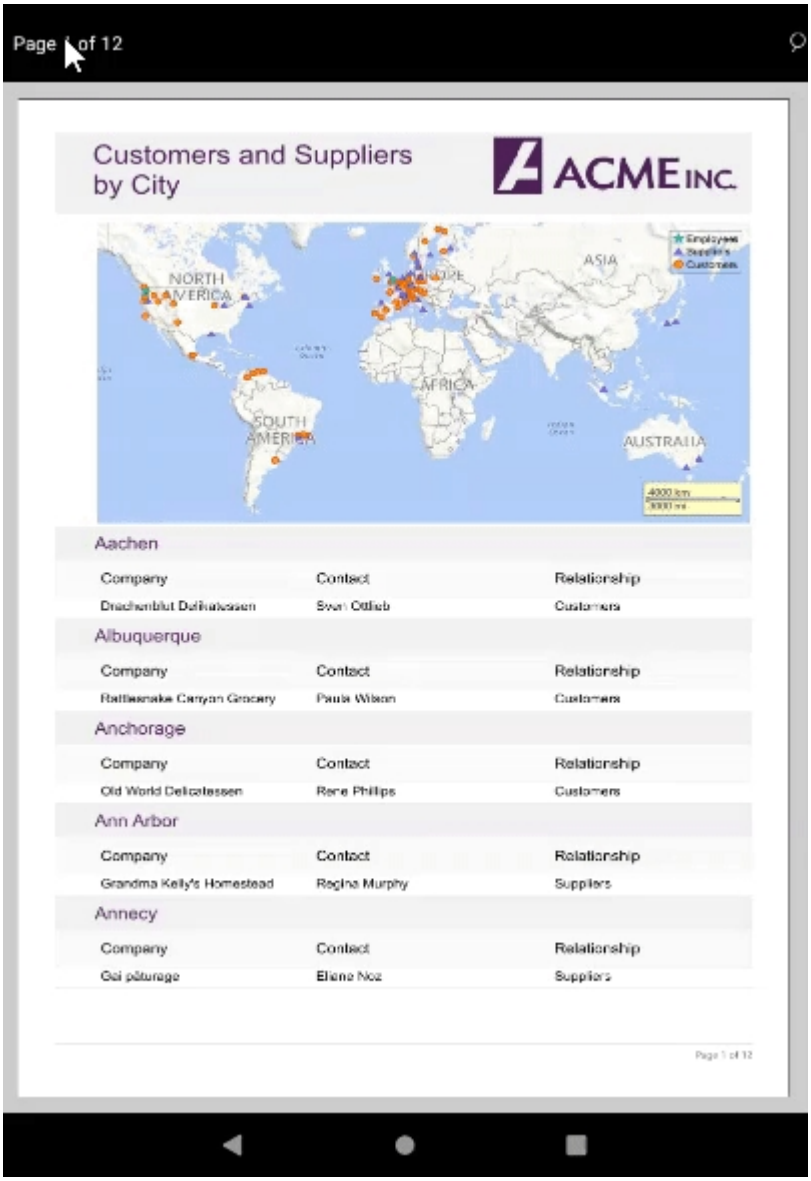
Features

Navigation

At times, depending on the document size, you might need to navigate through multiple pages in a document to view different sections in it. FlexViewer provides you with the interactive Page label that lets you move forward through the pages. On clicking the label, a text box appears allowing you to type a specific page number to jump to that particular page.

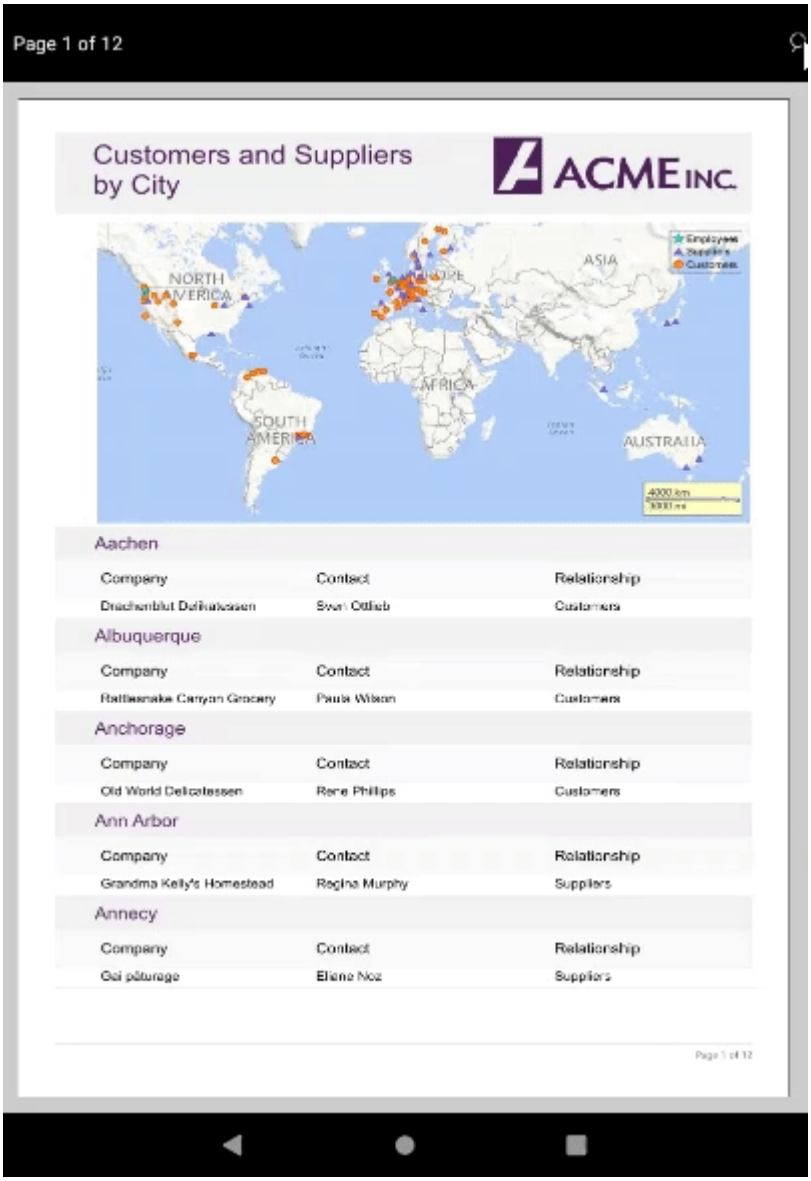
The following GIF depicts how you can navigate to a particular page using page navigation in FlexViewer.



Text Search

FlexViewer provides the flexibility to find text in a document. It provides a search icon at the top-right corner of the toolbar. On clicking the search icon, the search toolbar appears replacing the existing toolbar. In the search toolbar, you can simply type in the text and press Enter to search for it in the document. The FlexViewer control highlights all the matching instances making it easy for you to find all the occurrences of searched text in the document.

The following GIF depicts how text search can be performed in FlexViewer.

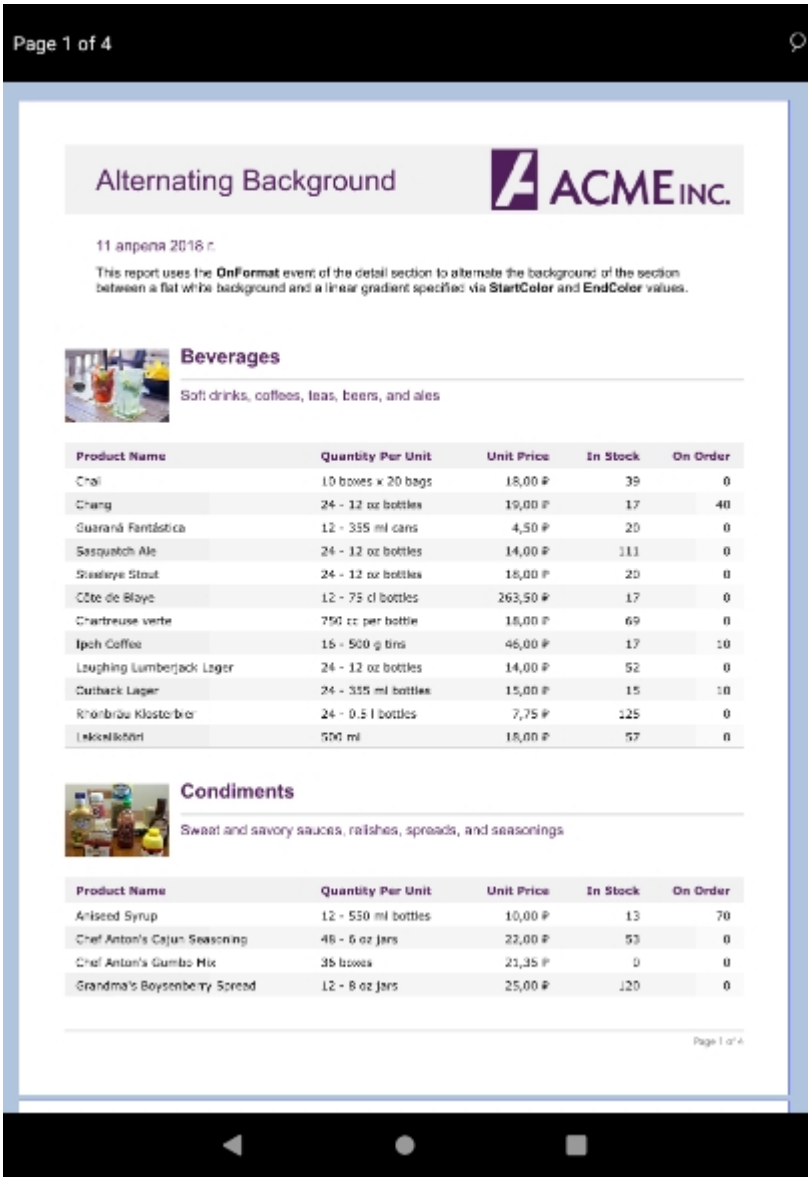


Appearance

Although Xamarin controls match the native controls on all three platforms by default and are designed to work with both, light and dark, themes available on all platforms. But, there are several properties specific to the FlexViewer control which can be used to customize the appearance of the loaded document and the area around it.
The FlexViewer class provides the following set of properties that can be used to change the overall look and feel of the document:

- **PageBackgroundColor**: Allows you to change the color for filling the page content.
- **BackgroudColor**: Allows you to change the background color of FlexViewer.
- **PageBorderColor**: Provides a brush used for drawing page borders.
- **Padding**: Sets the amount of padding between pages and the preview window edges.
- **PageSpacing**: Sets the amount of padding between pages in the preview.

The following image shows FlexViewer with the customized appearance.



To change the appearance of the loaded PDF document, use the following code. This example uses the sample code created in Quick Start section.

C# copyCode

```
flexViewer.PageBackgroundColor= Android.Graphics.Color.White;
flexViewer.BackgroundColor = Android.Graphics.Color.LightSteelBlue;
flexViewer.PageBorderColor = Android.Graphics.Color.Blue;
flexViewer.Padding = new C1Thickness(20, 20, 20, 20);
flexViewer.PageSpacing = 5;
```

Export

FlexViewer allows you to export a PDF document and save it to a file, stream or as an image(s). You can use Save method of the FlexViewer class to save a PDF document to a file or a stream. In addition, you can use various methods provided by the FlexViewer class to save a PDF document as an image. These methods are listed in the following table:

Methods	Description
SaveAsBmp	Saves the document pages as images in BMP format, i.e., one image for each page.
SaveAsGif	Saves the document pages as images in GIF format, i.e., one image for each page.
SaveAsJpeg	Saves the document pages as images in JPEG format, i.e., one image for each page.
SaveAsPng	Saves the document pages as images in PNG format, i.e., one image for each page.
SaveAsTiff	Saves the document pages as images in TIFF format, i.e., one image for each frame.

The following code illustrates how to export PDF pages to images. This example uses the sample code created in Quick Start section.

C# copyCode

```
string PathAndName = string.Empty;
PathAndName =
Path.Combine(Android.OS.Environment.ExternalStorageDirectory.ToString(),
"ExportedPdf") + "." + "png";
flexViewer.SaveAsPng(PathAndName);
```

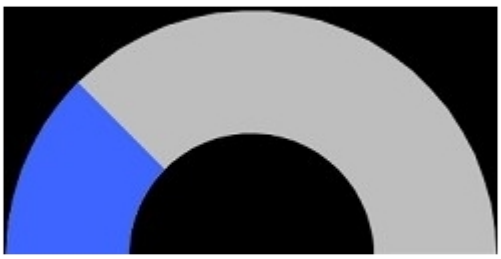
UI Virtualization

Virtualization is an optimization technique that renders page visuals only as they come into view. FlexViewer provides the ability to virtualize UI using low memory foot print to open large PDF files without going out of memory. This reduces the PDF loading time and improves performance, thus enhancing UI performance.

Gauge

The Gauge control allows you to display information in a dynamic and unique way by delivering the exact graphical representation you require. Gauges are better than simple labels because they also display a range, allowing users to determine instantly whether the current value is low, high, or intermediate.

Linear Gauge



Radial Gauge

Bullet Graph

Key Features

- **Easy Customization**: Restyle the Gauge by changing a property to create gauges with custom colors, fills and more.
- **Ranges**: Add colored ranges to the Gauge to draw attention to a certain range of values. Use simple properties to customize their start and end points, as well as appearance.
- **Direction**: Place the C1LinearGauge and C1BulletGraph horizontally or vertically.
- **Pointer Customization**: Customize the pointer color, border, origin and more to make the Gauge more appealing.
- **Animation**: Use out-of-the-box animations to add effects to the Gauge control.
- **Drag Support:** Dragging the gauge with finger touch changes the value accordingly.

Gauge Types

C1Gauge comprises of three kinds of gauges: LinearGauge, RadialGauge, and BulletGraph.

Type	Image	Usage
LinearGauge: A linear gauge displays the value along a linear scale, using a linear pointer. The linear scale can be either horizontal or vertical, which can be set using the **direction** property.		A linear gauge is commonly used to denote data as a scale value such as length, temperature, etc.
RadialGauge: A radial gauge displays the value along a circular scale, using a curved pointer. The scale can be rotated as defined by the startAngle and sweepAngle properties. It also provides IsReversed property to reorient the radial gauge so that it is drawn reversed (counter-clockwise).		A radial gauge is commonly used to denote data such as volume, velocity, etc.
BulletGraph: A bullet graph displays a single value on a linear scale, along with a target value and ranges that instantly indicate whether the value is good, bad or in some other state.		A bullet graph is a variant of a linear gauge, designed specifically for use in

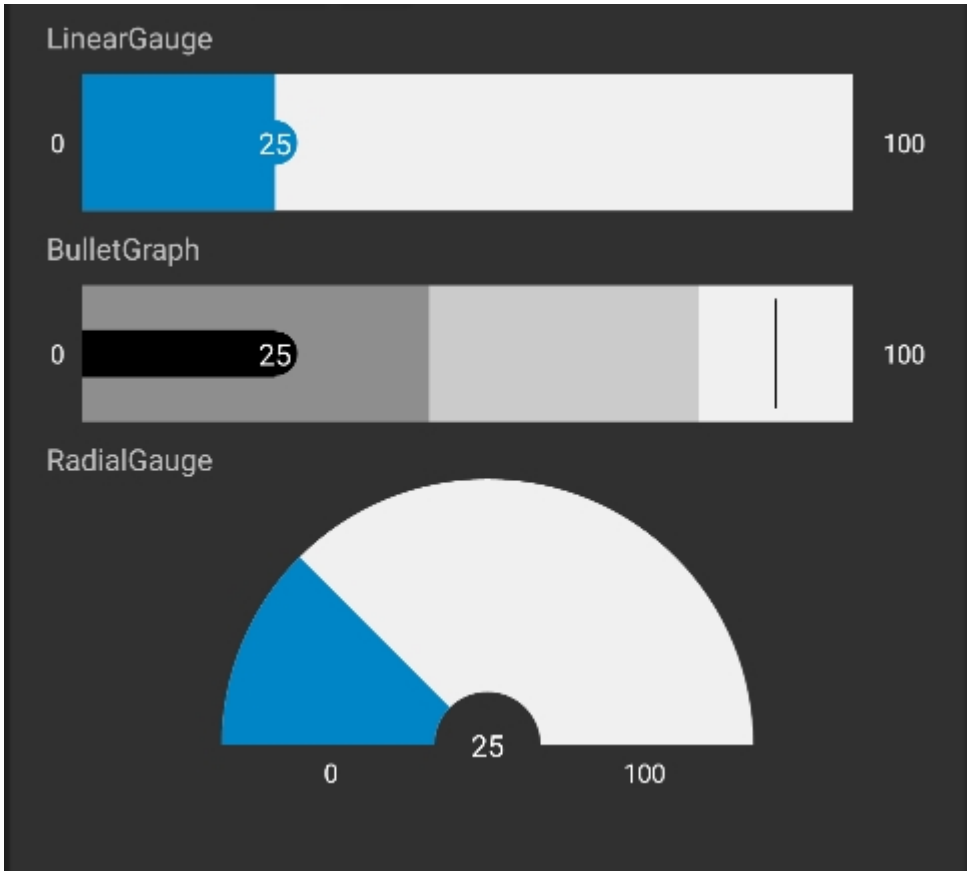
		dashboards that display a number of single value data, such as yearly sales revenue.

Quick Start: Add and Configure Gauge

This section describes how to add a C1Gauge control to your Android app. This topic comprises two steps:

- **Step 1: Add Gauge Control**
- **Step 2: Run the Project**

The following image shows how the C1Gauge appears after completing the steps above:



Step 1: Add Gauge Controls

Initialize Gauge controls in code

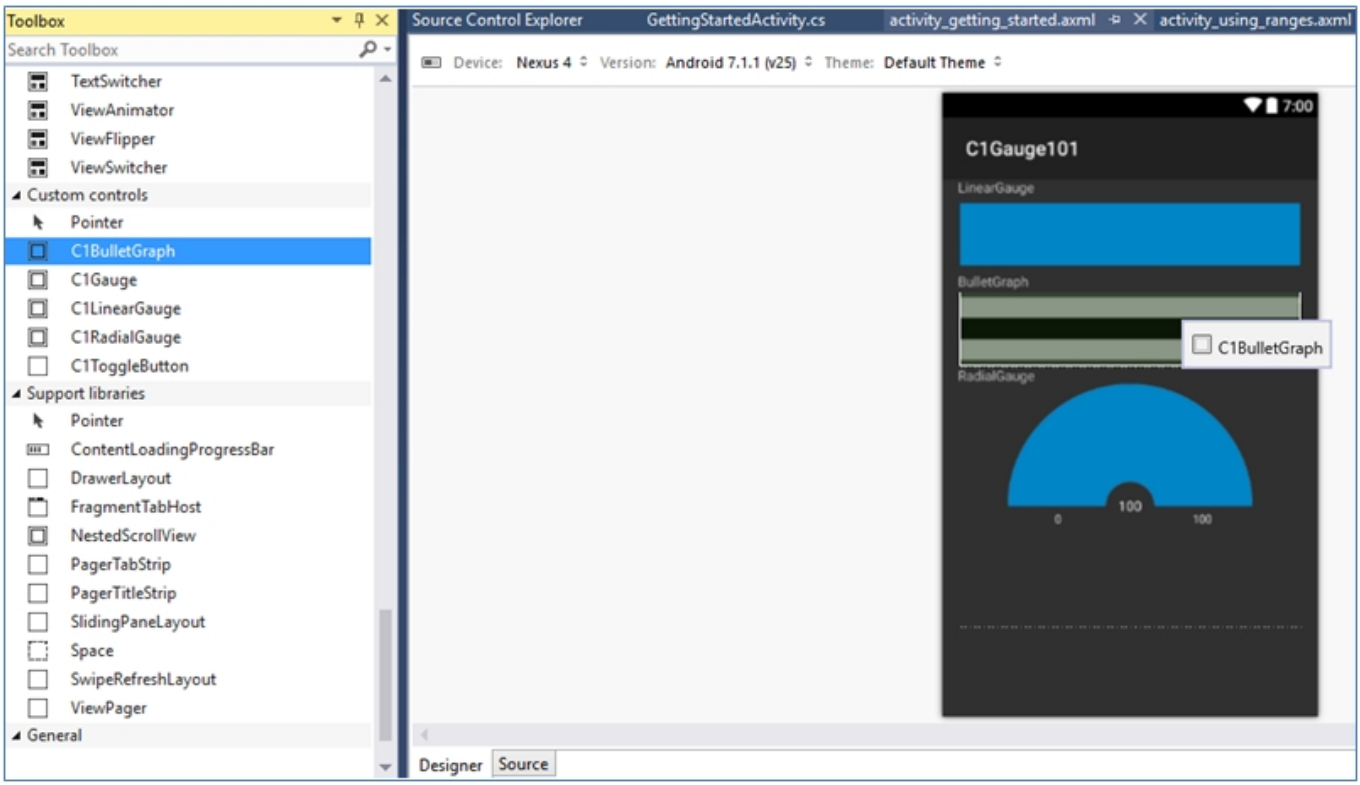
To add C1Gauge controls to your layout, open the .axml file in your layout folder from the Solution Explorer and replace its code with following code.

XML

```
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
```

```
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:orientation="vertical"
    android:paddingLeft="16dp"
    android:paddingRight="16dp">
    <TextView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="@string/lineargauge" />
    <c1.android.gauge.C1LinearGauge
        android:id="@+id/linearGauge1"
        android:layout_width="match_parent"
        android:layout_height="wrap_content" />
    <TextView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="@string/bulletgraph" />
    <c1.android.gauge.C1BulletGraph
        android:id="@+id/bulletGraph1"
        android:layout_width="match_parent"
        android:layout_height="wrap_content" />
    <TextView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="@string/radialgauge" />
    <c1.android.gauge.C1RadialGauge
        android:id="@+id/radialGauge1"
        android:layout_width="match_parent"
        android:layout_height="wrap_content" />
</LinearLayout>
```

Alternatively, you can drag the C1LinearGauge, C1RadialGauge, or C1BulletGraph control from the Toolbox within the custom control tab onto your layout surface in designer mode.



Then, inside your activity, add the following code to the OnCreate method to initialize your layout.

C#

```
public class GettingStartedActivity : Activity
    {
        private C1LinearGauge mLinearGauge;
        private C1RadialGauge mRadialGauge;
        private C1BulletGraph mBulletGraph;
        private TextView mValueText;
        private int mValue = 25;
        private int mMin = 0;
        private int mMax = 100;

        protected override void OnCreate(Bundle bundle)
        {
            base.OnCreate(bundle);
            SetContentView(Resource.Layout.activity_getting_started);

            // initializing widgets
            mRadialGauge = (C1RadialGauge)FindViewById(Resource.Id.radialGauge1);
            mLinearGauge = (C1LinearGauge)FindViewById(Resource.Id.linearGauge1);
            mBulletGraph = (C1BulletGraph)FindViewById(Resource.Id.bulletGraph1);

            // setting dafault values
            mBulletGraph.Enabled = true;
            mBulletGraph.Value = mValue;
            mBulletGraph.Bad = 45;
            mBulletGraph.Good = 80;
            mBulletGraph.Min = mMin;
```

```
            mBulletGraph.Max = mMax;
            mBulletGraph.Target = 90;
            mBulletGraph.ShowText = GaugeShowText.All;
            mBulletGraph.Step = 1;
            mBulletGraph.IsReadOnly = false;
            mBulletGraph.IsAnimated = true;

            mLinearGauge.Enabled = true;
            mLinearGauge.Value = mValue;
            mLinearGauge.Min = mMin;
            mLinearGauge.Max = mMax;
            mLinearGauge.Step = 1;
            mLinearGauge.ShowText = GaugeShowText.All;
            mLinearGauge.IsReadOnly = false;
            mLinearGauge.IsAnimated = true;

            mRadialGauge.Enabled = true;
            mRadialGauge.Value = mValue;
            mRadialGauge.Min = mMin;
            mRadialGauge.Max = mMax;
            mRadialGauge.Step = 1;
            mRadialGauge.ShowText = GaugeShowText.All;
            mRadialGauge.IsReadOnly = false;
            mRadialGauge.IsAnimated = true;
        }

    }
```

Step 2: Run the Project

In the **ToolBar** section, select the Android device and then press **F5** to view the output.

Quick Start: Add and Configure

LinearGauge Quick Start

This section describes how to add a C1LinearGauge control to your android application and set some of its properties.

This topic comprises of two steps:

- **Step 1: Add a C1LinearGauge control**
- **Step 2: Run the Project**

The following image shows how the C1LinearGauge appears after completing the steps above:

Step 1: Add a C1LinearGauge control

Complete the following steps to initialize a C1LinearGauge control in C#

In Code

1. Add the following reference in the MainActivity class file.

C#

C#

```
using C1.Android.Gauge;
```

2. Instantiate the C1LinearGauge control in the MainActivity class file and set some of its properties as follows.

C#

C#

```
using Android.App;
using Android.Widget;
using Android.OS;
using C1.Android.Gauge;

namespace AndroidGauge
{
    [Activity(Label = "AndroidGauge", MainLauncher = true)]
    public class MainActivity : Activity
    {
    private C1LinearGauge mLinearGauge;
    private int mValue = 25;
    private int mMin = 0;
    private int mMax = 100;
        protected override void OnCreate(Bundle bundle)
        {
            base.OnCreate(bundle);
            mLinearGauge =
(C1LinearGauge)FindViewById(Resource.Id.c1LinearGauge1);
            mLinearGauge.Enabled = true;
            mLinearGauge.Value = mValue;
            mLinearGauge.Min = mMin;
            mLinearGauge.Max = mMax;
            mLinearGauge.Step = 1;
            mLinearGauge.ShowText = GaugeShowText.All;
            mLinearGauge.IsReadOnly = false;
            mLinearGauge.IsAnimated = true;
            // Set our view from the "main" layout resource
            SetContentView(Resource.Layout.Main);
        }
    }
}
```

3. Add the following XML code in Main.axml in case of C#, to render the control onto the device.

C#

C#

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:orientation="vertical"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:minWidth="25px"
    android:minHeight="25px">
    <C1.Android.Gauge.C1LinearGauge
        android:minWidth="25px"
        android:minHeight="25px"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:id="@+id/c1LinearGauge1" />
</LinearLayoutradialGauge>
```

Step 2: Run the Project

In the **ToolBar** section, select the Android device and then press **F5** to view the output.

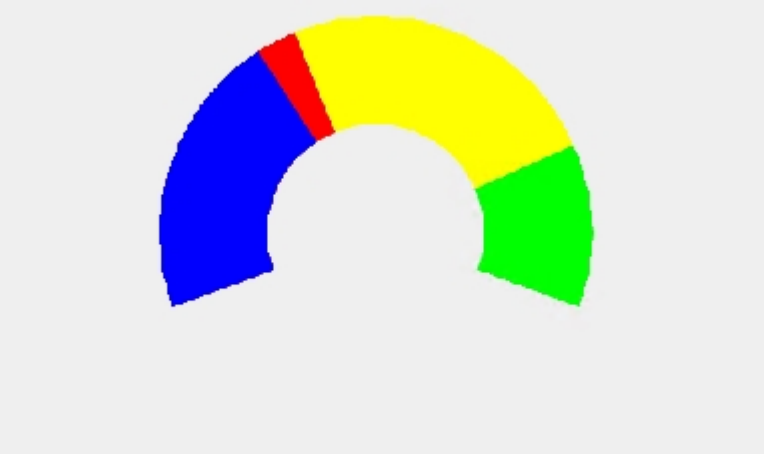
RadialGauge Quick Start

This section describes how to add a C1RadialGauge control to android application and set some of its properties.

This topic comprises of two steps:

- **Step 1: Add a C1RadialGauge control**
- **Step 2: Run the Project**

The following image shows how the C1RadialGauge appears, after completing the steps above:



Step 1: Add a C1RadialGauge control

Complete the following steps to initialize a C1RadialGauge control.

In Code

1. Add the following reference in the MainActivity class file.

C#

C#

```
using C1.Android.Gauge;
```

2. Instantiate the C1LinearGauge control in the MainActivity class file and set some of its properties as follows.

C#

C#

```
using Android.App;
using Android.Widget;
using Android.OS;
using C1.Android.Gauge;

namespace AndroidGauge
{
    [Activity(Label = "AndroidGauge", MainLauncher = true)]
    public class MainActivity : Activity
    {
    private C1RadialGauge mRadialGauge;
    private int mValue = 25;
    private int mMin = 0;
    private int mMax = 100;
        protected override void OnCreate(Bundle bundle)
        {
            base.OnCreate(bundle);
            // Set our view from the "main" layout resource
            SetContentView(Resource.Layout.Main);
            mRadialGauge =
(C1RadialGauge)FindViewById(Resource.Id.c1RadialGauge1);
            mRadialGauge.Enabled = true;
            mRadialGauge.Value = mValue;
            mRadialGauge.Min = mMin;
            mRadialGauge.Max = mMax;
            mRadialGauge.Step = 1;
            mRadialGauge.ShowText = GaugeShowText.All;
            mRadialGauge.IsReadOnly = false;
            mRadialGauge.IsAnimated = true;
        }
    }
}
```

3. Add the following XML code in the Main.axml in case of C#, to render the control onto the device.

C#

C#

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:orientation="vertical"
    android:layout_width="match_parent"
```

```
    android:layout_height="match_parent"
    android:minWidth="25px"
    android:minHeight="25px">
  <C1.Android.Gauge.C1RadialGauge
      android:minWidth="25px"
      android:minHeight="25px"
      android:layout_width="match_parent"
      android:layout_height="wrap_content"
      android:id="@+id/c1RadialGauge1" />
</LinearLayout>
```

Step 2: Run the Project

In the **ToolBar** section, select the Android device and then press **F5** to view the output.

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BulletGraph Quick Start

This section describes how to add a C1BulletGraph control to android application and set some of its properties.

This topic comprises of three steps:

- **Step 1: Add a C1BulletGraph control**
- **Step 2: Run the Project**

The following image shows how the C1BulletGraph appears, after completing the steps above.

Step 1: Add a C1BulletGraph control

Complete the following steps to initialize a **C1BulletGraph** control.

In Code

1. Add the following reference in the MainActivity class file.

C#

```
using C1.Android.Gauge;
```

2. Instantiate a C1BulletGraph control in the MainActivity class and set some of its properties as follows.

C#

```
using Android.App;
using Android.Widget;
using Android.OS;
using C1.Android.Gauge;
```

```
namespace AndroidGauge
{
    [Activity(Label = "AndroidGauge", MainLauncher = true)]
    public class MainActivity : Activity
    {
    private C1BulletGraph mBulletGraph;
    private int mValue = 25;
    private int mMin = 0;
    private int mMax = 100;
        protected override void OnCreate(Bundle bundle)
        {
            base.OnCreate(bundle);
            mBulletGraph =
(C1BulletGraph)FindViewById(Resource.Id.c1BulletGraph1);
            mBulletGraph.Enabled = true;
            mBulletGraph.Value = mValue;
            mBulletGraph.Min = mMin;
            mBulletGraph.Max = mMax;
            mBulletGraph.Step = 1;
            mBulletGraph.ShowText = GaugeShowText.All;
            mBulletGraph.IsReadOnly = false;
            mBulletGraph.IsAnimated = true;
            // Set our view from the "main" layout resource
            SetContentView(Resource.Layout.Main);
        }
    }
}
```

3. Add the following XML code in **Main.axml** in case of C#, to render the control onto the device.

C#

C#

```
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
android:layout_width="fill_parent"
android:layout_height="fill_parent"
android:orientation="vertical"
android:paddingLeft="16dp"
android:paddingRight="16dp">

<TextView
android:layout_width="wrap_content"
android:layout_height="wrap_content"
android:text="bullet graph" />
<com.grapecity.C1.gauge.C1BulletGraph
android:id="@+id/bulletgraph"
android:layout_width="match_parent"
android:layout_height="50dp" />

</LinearLayout>
```

Step 2: Run the Project

In the **ToolBar** section, select the Android device and then press **F5** to view the output.

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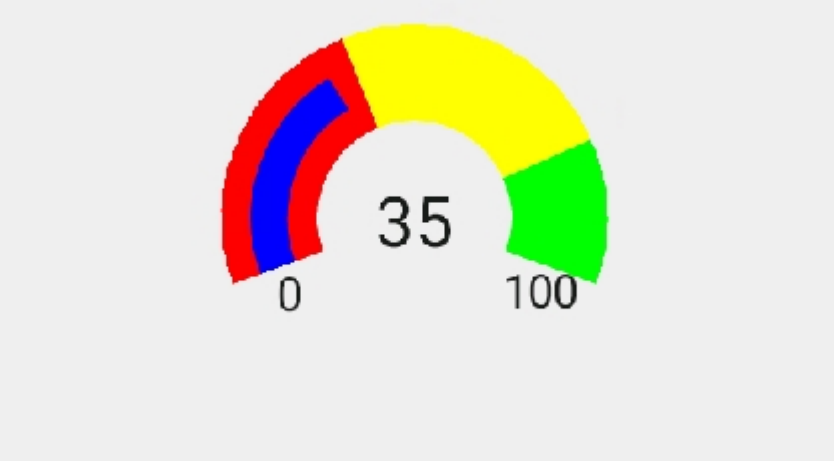
Features

Customize Appearance

Although, Xamarin controls match the native controls on all three platforms by default and are designed to work with both: light and dark themes available on all platforms. But, there are several properties available that let you customize the gauge elements to make it visually attractive. The following code example demonstrates how to set different styling properties to customize a C1RadialGauge.

The image given below shows a C1RadialGauge control with customized appearance.



The following code example demonstrates how to customize the gauge in Java. The example uses the sample created in the RadialGauge Quick Start section.

In Code

C#

```
//Customize Text Appearance
radialGauge.ShowText = GaugeShowText.All;

//Set Pointer and customize its appearance
radialGauge.Pointer.BorderColor = Color.Blue.ToArgb();
radialGauge.Face.BorderWidth = 0.5f;
radialGauge.Pointer.BorderWidth = 0.3f;
```

Direction

C1LinearGauge control provides users with the option to customize the orientation of the gauge as well as the direction in which the pointer moves. For example, users can customize the direction of the gauge using Direction

property in C#.

The following image shows how the C1LinearGauge appears after this property has been set.

The following code examples demonstrate how to set this property in C#.

In Code

C#

```
C#
linearGraph.Direction = LinearGaugeDirection.Down;
```

Range

You can add multiple ranges to a single gauge. Each range denotes a region that can help the user identify the state of the gauge's value. Every range has a Minimum and Maximum represented by **Min** and **Max** properties. These properties specify the range's position on the Gauge. Other properties such as **Color** can also be used to customize the appearance of the ranges appearing on the gauge.

The following code example demonstrates how to add ranges to a C1Gauge and customize some of the other properties to enhance their visual appeal.

In Code

Create new instances of type GaugeRange, set their properties and add the newly created ranges to the any of the gauges.

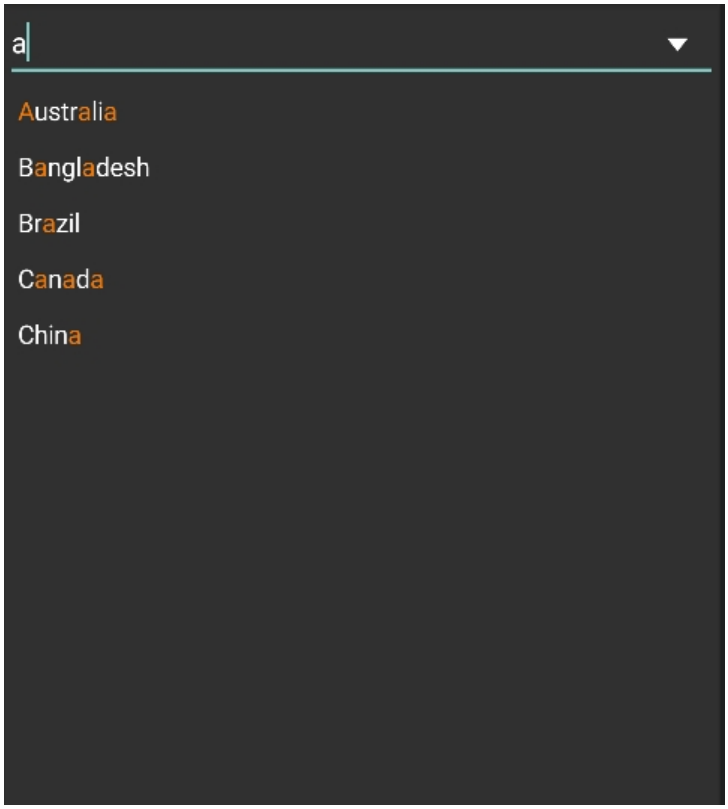
C#

```
//Create Ranges
GaugeRange low = new GaugeRange();
GaugeRange med = new GaugeRange();
GaugeRange high = new GaugeRange();

//Customize Ranges

low.Min = 0;
low.Max = 30;
low.Color = Color.Red.ToArgb();

med.Min = 30;
med.Max = 70;
med.Color = Color.Yellow.ToArgb();

high.Min = 70;
high.Max = 100;
high.Color = Color.ForestGreen.ToArgb();

//Add Ranges to the Gauge
linearGauge.ShowRanges = true;
linearGauge.Ranges.Add(low);
linearGauge.Ranges.Add(med);
linearGauge.Ranges.Add(high);
```

Input

AutoComplete

The C1AutoComplete is an editable input control designed to show possible text suggestions automatically as the user types text. The control filters a list of pre-defined items dynamically as a user types to provide suggestions that best or completely match the input. The suggestions that match the user input appear instantly in a drop-down list as shown in the image.



Key Features

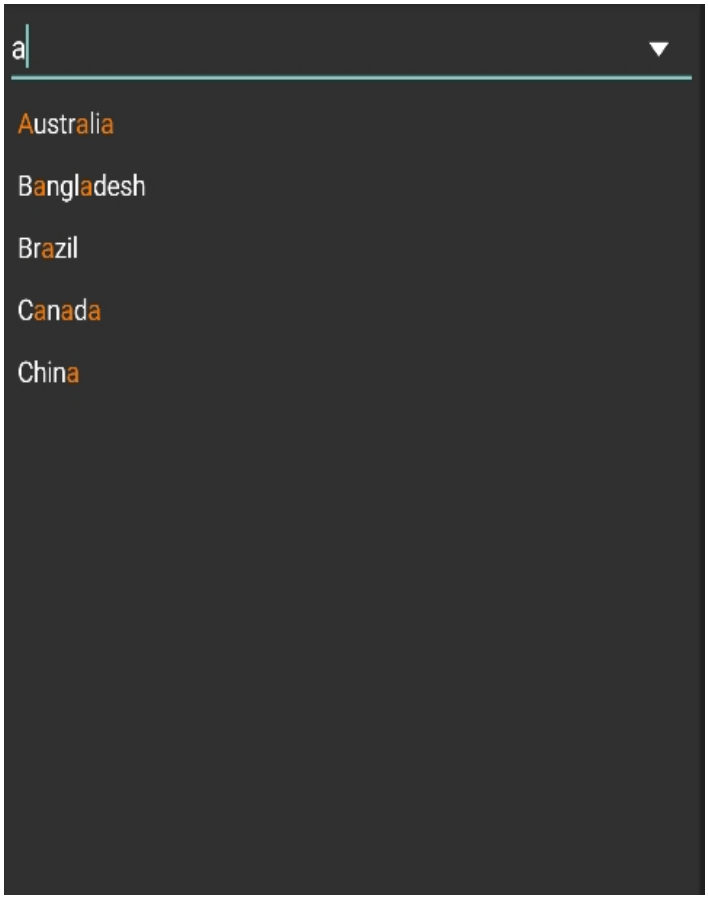
- **Customize Appearance** - Use basic appearance properties to customize the appearance of the drop-down list.
- **Delay** - Use delay feature to provide some time gap (in milliseconds) between user input and suggestion.
- **Highlight Matches** - Highlight the input text with matching string in the suggestions.

Quick Start: Populating C1AutoComplete with data

This section describes how to add a C1AutoComplete control to your Android application, and populating it with data. The data is shown This topic comprises of three steps:

- **Step 1: Add C1AutoComplete Control**
- **Step 2: Run the Project**

The following image shows a C1AutoComplete control displaying input suggestion as the user types.



Step 1: Add C1AutoComplete Control

Initialize C1AutoComplete control in code

To add C1AutoComplete control to your layout, open the .axml file in your layout folder from the Solution Explorer and replace the code with following code.

XML

```
<?xml version="1.0" encoding="utf-8"?>
<C1.Android.Input.C1AutoComplete
xmlns:android="http://schemas.android.com/apk/res/android"
    android:id="@+id/autocomplete_highlight"
    android:layout_width="match_parent"
    android:layout_height="wrap_content" />
```

Alternatively, you can drag C1AutoComplete control from the Toolbox within the custom control tab onto your layout surface in designer mode. Then, inside your activity, add the following code to initialize your layout and add data for C1AutoComplete control.

C#

```
public class AutoCompleteActivity : Activity
    {
        protected override void OnCreate(Bundle savedInstanceState)
        {
            base.OnCreate(savedInstanceState);
```

```
            SetContentView(Resource.Layout.activity_autocomplete);

            var highLightAutoComplete =
(C1AutoComplete)this.FindViewById(Resource.Id.autocomplete_highlight);
            highLightAutoComplete.ItemsSource = Countries.GetDemoDataList();
            highLightAutoComplete.DisplayMemberPath = "Name";
        }
    }
    public class Countries : object
    {
        public string Name { get; set; }
        public Countries()
        {
            this.Name = string.Empty;
        }
        public Countries(string name, double sales, double salesgoal, double
download, double downloadgoal, double expense, double expensegoal, string fruits)
        {
            this.Name = name;
        }
        public static IEnumerable<object> GetDemoDataList()
        {
            List<object> array = new List<object>();

            var quarterNames = "Australia,Bangladesh,Brazil,Canada,China".Split(',');

            for (int i = 0; i < quarterNames.Length; i++)
            {
                array.Add(new Countries
                {
                    Name = quarterNames[i]
                });
            }
            return array as IEnumerable<object>;
        }
    }
```

Step 2: Run the Project

Press **F5** to run your application.

Features

Data Binding

The C1AutoComplete control provides ItemsSource property to bind the control to data. The **ItemsSource** property lets you bind the control to a source collection of items to display data.

The following code illustrates how to set these properties in code to achieve data binding.

```
C#
```

```
highLightAutoComplete.ItemsSource = Countries.GetDemoDataList();
```

Delay

The C1AutoComplete control provides instant text suggestions by searching the best possible match for the user input. However, you can change this default behavior and add some time gap between user input and the search. For this, you need to use the Delay property and set time delay.

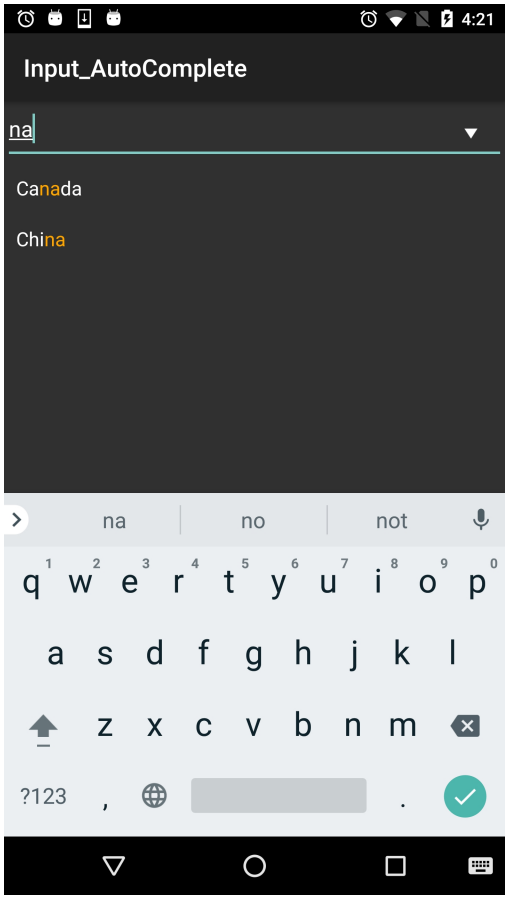
The following code example shows how you can set time delay in the C1AutoComplete control.

C#

```
//Setting time delay in milliseconds
highLightAutoComplete.Delay = TimeSpan.FromSeconds(1.5);
```

Highlight Matches

The C1AutoComplete control enables quick identification of user input in the search result by highlighting the matching text. For this, the C1AutoComplete class provides HighlightedColor property to set the highlight color for the matching characters. You can explicitly set this property to a specific color so that the user input string gets highlighted in the search results as shown in the following image.



The following code example shows how you can highlight the matching text in the search result.

C#

```
//Highlighting text match in suggestions
```

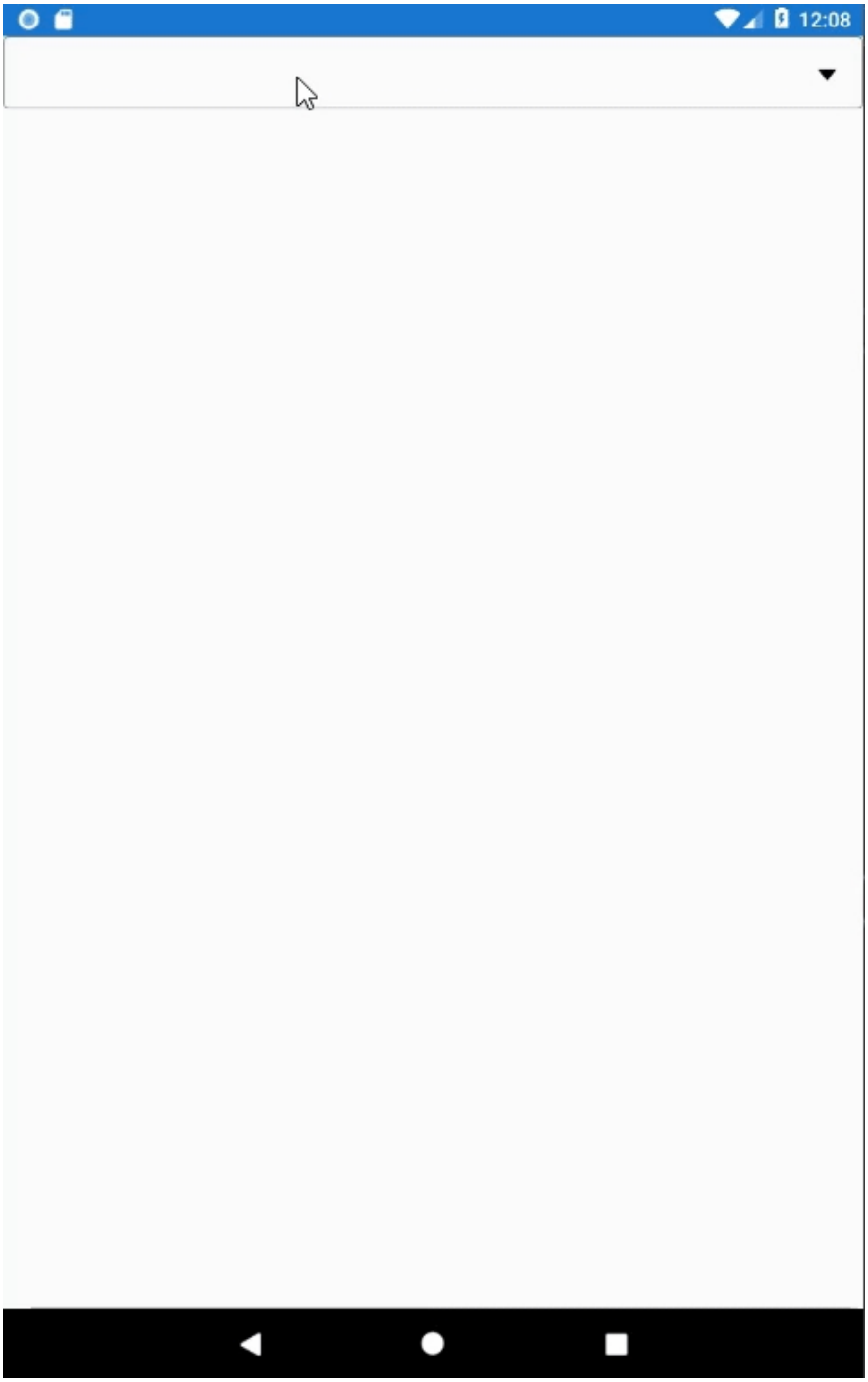
```
highLightAutoComplete.HighlightedColor = Color.Orange;
```

AutoComplete Mode

AutoComplete supports multiple filtering criteria's that can be used to filter the items list based on the user input. These filtering criteria's are defined in the AutoCompleteMode enumeration and can be set using the **AutoCompleteMode** property. The AutoCompleteMode property works as a series of flags, therefore, you can set multiple filtering criteria. The property AutoCompleteMode accepts values from **AutoCompleteMode** enumeration which specifies the mode for automatic completion in the control through following values:

1. StartsWith
2. Contains
3. EndsWith
4. MatchCase
5. MatchWholeWord

The following image shows how the AutoComplete control appears after setting the **AutoCompleteMode** property.



The following code example shows setting the auto complete mode feature in the AutoComplete control.

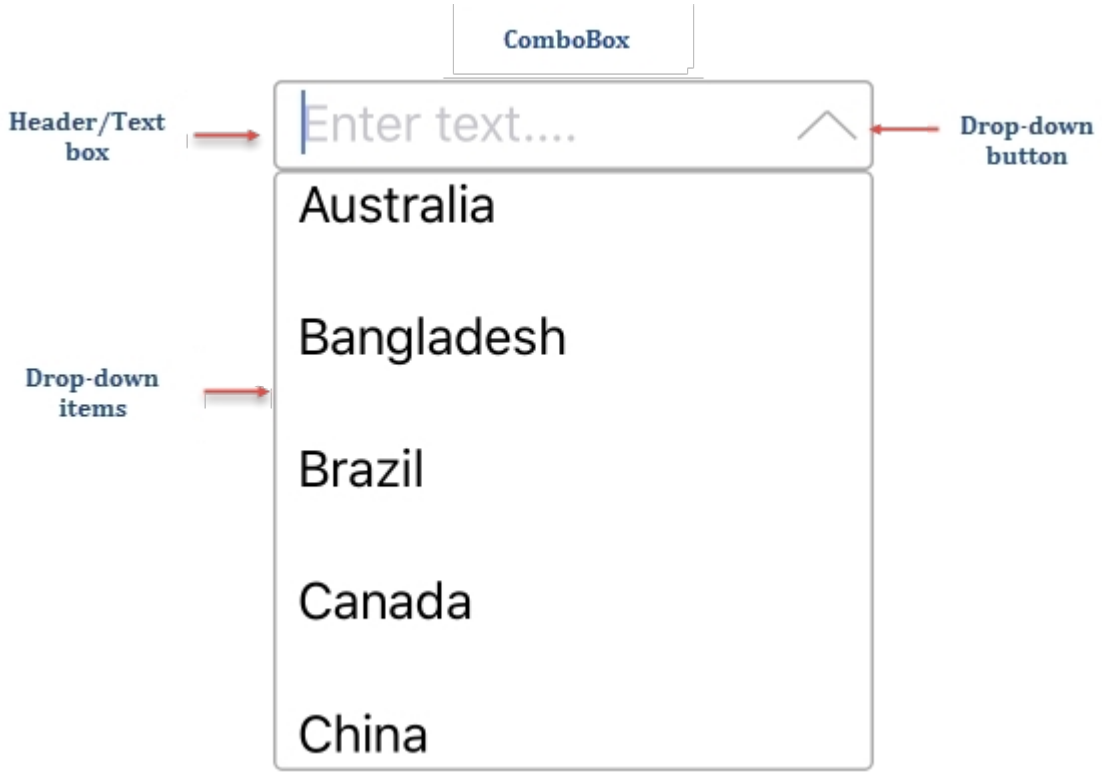
In Code

C#

```
autoComplete.AutoCompleteMode = AutoCompleteMode.Contains |
AutoCompleteMode.StartsWith;
```

ComboBox

The C1ComboBox is an input control that combines the features of a standard text box and a list view. The control is used to display and select data from the list that appears in a drop-down. Users can also type the text into the editable text box that appears in the header to provide input. The control also supports automatic completion to display input suggestions as the user types in the text box.



Key Features

- **Automatic Completion** - The C1ComboBox control supports automatic completion feature that provides relevant suggestions to user while typing the text in the text area.
- **Edit Mode** - By default, C1ComboBox control is non-editable. However, you can make it editable so that users can modify their input as well.

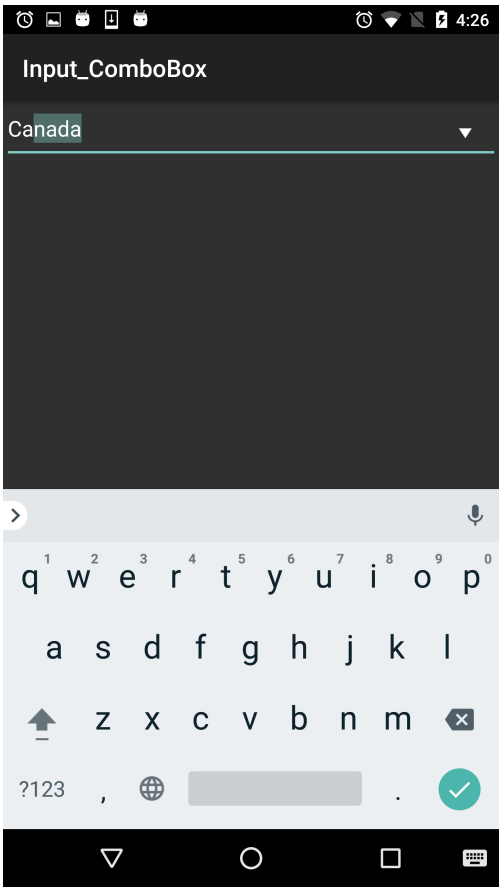
Quick Start: Display a C1ComboBox Control

This section describes adding a C1ComboBox control to your Android application and displaying a list of items in the drop-down as suggestions for users.

Complete the following steps to display a C1ComboBox control.

- **Step 1: Add C1ComboBox Control**
- **Step 2: Run the Project**

The following image shows a C1ComboBox displaying input suggestions as the user types.



Step 1: Add C1ComboBox Control

Initialize C1ComboBox Control

To add the C1ComboBox C1control to you layout, open the .axml file in your layout folder from the Solution Explorer and replace its code with the code below.

XML

```
<?xml version="1.0" encoding="utf-8"?>
<C1.Android.Input.C1AutoComplete
xmlns:android="http://schemas.android.com/apk/res/android"
    android:id="@+id/autocomplete_highlight"
    android:layout_width="match_parent"
    android:layout_height="wrap_content" />
```

Alternatively, you can drag a C1ComboBox control from the Toolbox within the custom control tab onto your layout surface in designer mode. Then, inside your activity, add the following code to initialize C1ComboBox

C#

```
public class ComboBoxActivity : Activity
    {
        protected override void OnCreate(Bundle savedInstanceState)
           {
                base.OnCreate(savedInstanceState);
                LinearLayout layout = new LinearLayout(this);
                layout.Orientation = Orientation.Vertical;
```

```
                C1ComboBox comboBox = new C1ComboBox(this);
                comboBox.DisplayMemberPath = "Name";
                comboBox.ItemsSource = Countries.GetDemoDataList();
                layout.AddView(comboBox);
                comboBox.SelectedValue = new System.Object { };
                Space emptySpace = new Space(this);
                layout.AddView(emptySpace);

                this.SetContentView(layout);
        }
    }
public class Countries : object    {        public string Name { get; set; }
public Countries()        {            this.Name = string.Empty;        }
public Countries(string name, double sales, double salesgoal, double download, double
downloadgoal, double expense, double expensegoal, string fruits)        {
this.Name = name;        }        public static IEnumerable<object> GetDemoDataList()
{            List<object> array = new List<object>();
            var quarterNames = "Australia,Bangladesh,Brazil,Canada,China".Split(',');
            for (int i = 0; i < quarterNames.Length; i++)            {
array.Add(new Countries                {                    Name = quarterNames[i]
});            }            return array as IEnumerable<object>;        }    }
```

Step 2: Run the Project

Press **F5** to run your application.

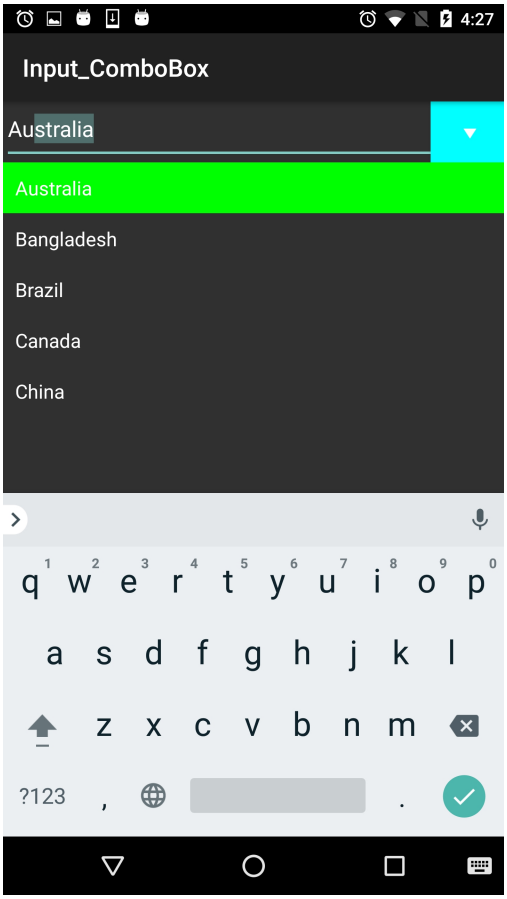
Features

Custom Appearance

The C1ComboBox control comes with various properties to customize appearance and help deliver enhanced user experience. Listed below are some of the properties that can be used to achieve customization in the control's overall look and feel.

- SelectedBackgroundColor - Sets the selected background color.
- ButtonColor - Sets the color of drop-down button.
- DropDownBorderColor - Sets the color of drop-down border color.
- DropDownMode - Sets the direction in which the drop down opens and accepts values from the DropDownMode enumeration.

The image given below shows a customized C1ComboBox control.



The given code illustrates how to set the above properties and render a customized C1ComboBox control. This code example uses the sample created in the Quick Start.

C#

```
comboBox.SelectedBackgroundColor = Color.Green;comboBox.ButtonColor=
Color.Cyan;comboBox.DropDownBorderColor = Color.Blue;comboBox.DropDownMode =
DropDownMode.ForceBelow;
```

Data Binding

The C1ComboBox control provides ItemsSource and DisplayMemberPath properties to bind the control to data. The ItemsSource property lets you bind the control to a collection of items, and the DisplayMemberPath property sets the path to a value on the source object for displaying data.

The following code snippet illustrates how to set these properties in code (MainActivity.cs) to achieve data binding.

C#

```
comboBox.ItemsSource = Countries.GetDemoDataList();
comboBox.DisplayMemberPath = "Name";
```

Editing

The C1ComboBox control allows users to input data by either selecting an item from the drop-down or by typing text into the text box. The control, however, is editable by default and allows users to input data through typing.

To change this default behavior, the C1ComboBox class provides the IsEditable property that can be set to false to disable editing in the text box.

C#

```
comboBox.IsEditable = false;
```

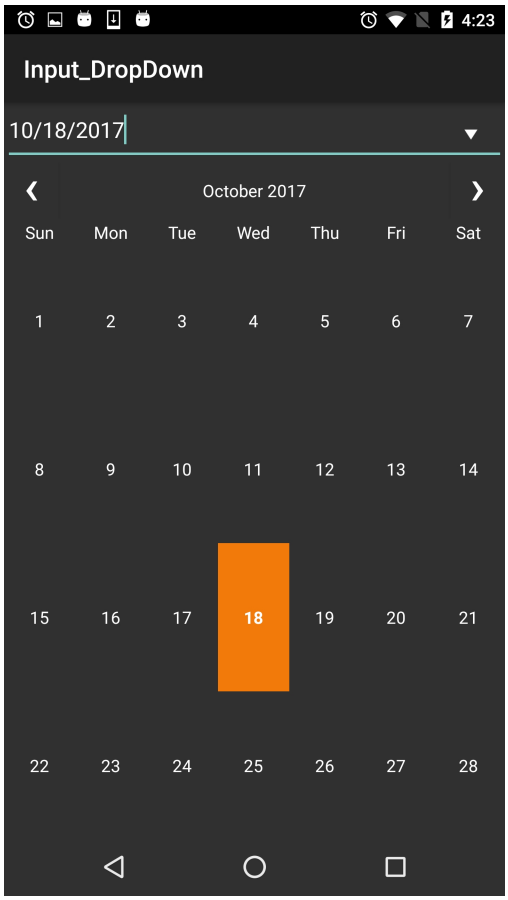
DropDown

The C1DropDown is a basic drop-down control that can be used as a base to create custom drop-down controls such as date picker, auto complete menus, etc. The control comprises three major elements including a header view, a button, and a drop-down view. The header includes the entire width of the control, while the button is placed on the top of the header, indicating that the control can be expanded. The drop-down includes the entire length of the control and gets expanded or collapsed.

Creating a Custom Date Picker using C1DropDown

This topic provides you a walkthrough to creating a custom date picker using the C1DropDown control. For this, you begin by creating an Android application, and initializing a C1DropDown, a C1Calendar control, and a C1MaskedTextField control. To create a date picker, you need to set the header property to the object of the MaskedTextField and DropDown property to the object of the C1Calendar class.

The image below shows how a custom date picker created using the C1DropDown appears.



Add the following code to the ViewController file to display the control.

C#

```
public class DropDownActivity : Activity
   {
        C1DropDown dropdown;
        C1MaskedTextView header;
        C1Calendar calendar;

     protected override void OnCreate(Bundle savedInstanceState)
      {
        base.OnCreate(savedInstanceState);
        dropdown = new C1DropDown(this);
        header = new C1MaskedTextView(this);
        header.Mask = Resources.GetString(Resource.String.date_mask_string);

        calendar = new C1Calendar(this);
        dropdown.Header = header;
        dropdown.DropDown = calendar;
        dropdown.DropDownHeight = 800;
        dropdown.IsAnimated = true;

        calendar.SelectionChanged += (object sender,
CalendarSelectionChangedEventArgs e) =>
                        {
        dropdown.IsDropDownOpen = true;
        System.DateTime  dateTime = calendar.SelectedDates[0];
        string strDate =
dateTime.ToString(Resources.GetString(Resource.String.date_mask_format));
        header.Value = strDate;
       };

       LinearLayout layout = new LinearLayout(this);
       LinearLayout.LayoutParams parameters = new
LinearLayout.LayoutParams(LinearLayout.LayoutParams.MatchParent,
LinearLayout.LayoutParams.WrapContent);
       layout.AddView(dropdown, parameters);
       SetContentView(layout);
        }
      }
```

MaskedTextField

The C1MaskedTextField control is designed to capture properly formatted user input. The control prevents users from entering invalid values in an input field, and other characters like slash or hyphen. The control also provides data validation by skipping over invalid entries as the user types. The control uses special elements called mask symbols or mask inputs to specify the format in which the data should be entered in an input field.

For example, you can use the MaskedTextField control to create an input field that accepts phone numbers with area code only, or Date field that allows users to enter date in dd/mm/yyyy format only.

Mask Symbols

The C1MaskedTextField control provides an editable mask that supports a set of special mask characters/symbols. These characters are used to specify the format in which the data should be entered in an input field. For this, all you need to do is use the mask property and specify the data format.

For example, setting the mask property for a C1MaskedTextField control to "90/90/0000" lets users enter date in international format. Here, the "/" character works as a logical date separator.

The following table enlists mask symbols supported by the C1MaskedTextField control.

Mask Symbol	Description
0	Digit
9	Digit or space
#	Digit, sign, or space
L	Letter
?	Letter, optional
C	Character, optional
&	Character, required
I	Letter or space
A	Alphanumeric
a	Alphanumeric or space
.	Localized decimal point
,	Localized thousand separator
:	Localized time separator
/	Localized date separator
$	Localized currency symbol
<	Converts characters that follow to lowercase
>	Converts characters that follow to uppercase
|	Disables case conversion

\	Escapes any character, turning it into a literal
All others	Literals.

Quick Start: Display C1MaskedTextField Controls

This section describes adding C1MaskedTextField controls to an Android application for specifying four input fields, namely ID, Date of Birth, Phone and State. The ID input field accepts a nine-digit number separated by hyphens, the Date of Birth field accepts a date in mm/dd/yyyy format, the Phone field accepts a 10-digit number with area code, and the State field accepts abbreviated postal code of a state.

The following image shows the input fields after completing the above steps.

Add the following code to initialize four input fields using C1MaskedTextField controls in you .axml file.

XML

```
<?xml version="1.0" encoding="utf-8"?>
<GridLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:columnCount="2"
    android:paddingBottom="20dp"
    android:paddingLeft="20dp"
    android:paddingRight="20dp"
    android:paddingTop="20dp"
    android:rowCount="4">
    <C1.Android.Input.C1MaskedTextView
        android:id="@+id/idMask"
        android:layout_width="300dp"
        android:layout_height="wrap_content"
        app:c1_mask="999 99-0000"
        app:c1_promptChar="_" />
    <C1.Android.Input.C1MaskedTextView
        android:id="@+id/dateMask"
        android:layout_width="300dp"
        android:layout_height="wrap_content"
        app:c1_mask="90/90/0000"
        app:c1_promptChar="_" />
    <C1.Android.Input.C1MaskedTextView
        android:id="@+id/phoneMask"
        android:layout_width="300dp"
        android:layout_height="wrap_content"
        app:c1_mask="(999)000-0000"
        app:c1_promptChar="_" />
    <C1.Android.Input.C1MaskedTextView
        android:id="@+id/stateMask"
        android:layout_width="300dp"
        android:layout_height="wrap_content"
        app:c1_mask="LL"
        app:c1_promptChar="_" />
```

```
</GridLayout>
```

Toggle Button

C1ToggleButton provides a cross-platform implementation of the ToggleButton control. The control represents a two state button that a user can select (check) or clear (uncheck). It can be used to visualize Boolean values much like a CheckBox control, and allows users to make changes in the state of the control by tapping it. Moreover, the **C1ToggleButton** control offers more style options than a Checkbox control. It provides you the ability to customize the color, text, or even a custom image or view for each state. You can change the state of the control by setting the IsChecked property. Text can be controlled with the CheckedText and UncheckedText properties, images can be controlled with the CheckedImageSource and UncheckedImageSource properties, and views can be controlled with CheckedContent and UncheckedContent properties.

Quick Start: Change State and Customize the Control

This section describes adding the C1ToggleButton control to your portable or shared application and changing color of the control on the basis of change in state of the control.

Complete the following steps to change color of the control on changing its state.

- **Step 1: Initialize C1ToggleButton in code**
- **Step 2: Run the Project**

Step 1: Initialize C1ToggleButton in code

1. Open the .axml file in your layout folder from the Solution Explorer and replace the code with following code to add C1ToggleButton control to your layout.

XML

```
<?xml version="1.0" encoding="utf-8"?>
<C1.Android.Core.C1ToggleButton
xmlns:android="http://schemas.android.com/apk/res/android"
    android:id="@+id/tb"
    android:layout_width="match_parent"
    android:layout_height="wrap_content" />
```

Alternatively, you can drag C1ToggleButton control from the Toolbox within the custom control tab onto your layout surface in designer mode. Then, inside your activity, add the following code to initialize your layout and add data for C1ToggleButton control.

C#

```
public class MainActivity : Activity
{
     protected override void OnCreate(Bundle savedInstanceState)
     {
          base.OnCreate(savedInstanceState);

          // Set our view from the "main" layout resource
          SetContentView(Resource.Layout.Main);

          // Get our button from the layout resource,
          // and attach an event to it
```

```
            C1ToggleButton tb = (C1ToggleButton)this.FindViewById(Resource.Id.tb);

            tb.Click += (o, e) =>
            {
                  // Perform action on clicks
                  if (tb.IsChecked == true)
                  {
                     tb.Color=Color.Green;
                  }
                  else if (tb.IsChecked == false)
                  {
                     tb.Color = Color.Red;
                  }
            };
      }
}
```

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Step 2: Run the Project

Press **F5** to run your application.

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Sunburst Chart

Sunburst chart is used to display hierarchical data, represented using concentric circles. The circle in the center represents the root node, with the data moving outside from the center. A section of the inner circle supports a hierarchical relationship to those sections of the outer circle which lie within the angular area of the parent section. Sunburst chart can be effectively used in scenarios where you want to display hierarchical data, represented using relationship between outer rings and inner rings.

Key Features and Properties

- **Donut Chart Support** - Specify the control's inner radius property to support donut charts.
- **Legend**: Provides a short description of data being rendered on chart and you can also change position of the legend as needed.
- **Selection**: Change the selection mode and customize the selected pie slice appearance.
- **Header and Footer**: Specifies the title header and footer text.

For more information on Sunburst Chart, see QuickStart.

QuickStart

This section describes how to add a Sunburst control to your android app and add data to it. This topic comprises of three steps:

- **Step 1: Create a data source for Sunburst**
- **Step 2: Add a Sunburst control**
- **Step 3: Run the Project**

The following image shows how the Sunburst appears after completing the steps above:

Step 1: Create a data source for Sunburst

Add a new class to serve as the data source for Sunburst control.

DataService

```
public class DataService
    {
        Random rnd = new Random();
        static DataService _default;
        public static DataService Instance
        {
            get
            {
                if (_default == null)
                {
                    _default = new DataService();
                }
                return _default;
            }
        }
        public static List<SunburstDataItem> CreateHierarchicalData()
        {
            Random rnd = Instance.rnd;
            List<string> years = new List<string>();
            List<List<string>> times = new List<List<string>>()
```

```
            {
                new List<string>() { "Jan", "Feb", "Mar"},
                new List<string>() { "Apr", "May", "June"},
                new List<string>() { "Jul", "Aug", "Sep"},
                new List<string>() { "Oct", "Nov", "Dec" }
            };

            List<SunburstDataItem> items = new List<SunburstDataItem>();
            var yearLen = Math.Max((int)Math.Round(Math.Abs(5 -
Instance.rnd.NextDouble() * 10)), 3);
            int currentYear = DateTime.Now.Year;
            for (int i = yearLen; i > 0; i--)
            {
                years.Add((currentYear - i).ToString());
            }
            var quarterAdded = false;
            foreach (string y in years)
            {
                var i = years.IndexOf(y);
                var addQuarter = Instance.rnd.NextDouble() > 0.5;
                if (!quarterAdded && i == years.Count - 1)
                {
                    addQuarter = true;
                }
                var year = new SunburstDataItem() { Year = y };
                if (addQuarter)
                {
                    quarterAdded = true;

                    foreach (List<string> q in times)
                    {
                        var addMonth = Instance.rnd.NextDouble() > 0.5;
                        int idx = times.IndexOf(q);
                        var quar = "Q" + (idx + 1);
                        var quarters = new SunburstDataItem() { Year = y, Quarter =
quar };
                        if (addMonth)
                        {
                            foreach (string m in q)
                            {
                                quarters.Items.Add(new SunburstDataItem()
                                {
                                    Year = y,
                                    Quarter = quar,
                                    Month = m,
                                    Value = rnd.Next(20, 30)
                                });
                            };
                        }
                        else
                        {
```

```
                        quarters.Value = rnd.Next(80, 100);
                    }
                    year.Items.Add(quarters);
                };
            }
            else
            {
                year.Value = rnd.Next(80, 100);
            }
            items.Add(year);
        };

        return items;
    }
    public static List<FlatDataItem> CreateFlatData()
    {
        Random rnd = Instance.rnd;
        List<string> years = new List<string>();
        List<List<string>> times = new List<List<string>>()
        {
            new List<string>() { "Jan", "Feb", "Mar"},
            new List<string>() { "Apr", "May", "June"},
            new List<string>() { "Jul", "Aug", "Sep"},
            new List<string>() { "Oct", "Nov", "Dec" }
        };
        List<FlatDataItem> items = new List<FlatDataItem>();
        var yearLen = Math.Max((int)Math.Round(Math.Abs(5 - rnd.NextDouble() *
10)), 3);
        int currentYear = DateTime.Now.Year;
        for (int i = yearLen; i > 0; i--)
        {
            years.Add((currentYear - i).ToString());
        }
        var quarterAdded = false;
        foreach (string y in years)
        {
            var i = years.IndexOf(y);
            var addQuarter = rnd.NextDouble() > 0.5;
            if (!quarterAdded && i == years.Count - 1)
            {
                addQuarter = true;
            }
            if (addQuarter)
            {
                quarterAdded = true;
                foreach (List<string> q in times)
                {
                    var addMonth = rnd.NextDouble() > 0.5;
                    int idx = times.IndexOf(q);
                    var quar = "Q" + (idx + 1);
                    if (addMonth)
```

```
                    {
                        foreach (string m in q)
                        {
                            items.Add(new FlatDataItem()
                            {
                                Year = y,
                                Quarter = quar,
                                Month = m,
                                Value = rnd.Next(30, 40)
                            });
                        };
                    }
                    else
                    {
                        items.Add(new FlatDataItem()
                        {
                            Year = y,
                            Quarter = quar,
                            Value = rnd.Next(80, 100)
                        });
                    }
                };
            }
            else
            {
                items.Add(new FlatDataItem()
                {
                    Year = y.ToString(),
                    Value = rnd.Next(80, 100)
                });
            }
        };

        return items;
    }
public class FlatDataItem
{
    public string Year { get; set; }
    public string Quarter { get; set; }
    public string Month { get; set; }
    public double Value { get; set; }
}
public class SunburstDataItem
{
    List<SunburstDataItem> _items;

    public string Year { get; set; }
    public string Quarter { get; set; }
    public string Month { get; set; }
    public double Value { get; set; }
    public List<SunburstDataItem> Items
```

```
        {
            get
            {
                if (_items == null)
                {
                    _items = new List<SunburstDataItem>();
                }

                return _items;
            }
        }
    }
    public class Item
    {
        public int Year { get; set; }
        public string Quarter { get; set; }
        public string MonthName { get; set; }
        public int MonthValue { get; set; }
        public double Value { get; set; }
    }
```

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Step 2: Add a Sunburst control

To add a Sunburst control to your layout, open the .axml file in your layout folder from the Solution Explorer and replace its code with the code below.

XML

```
<?xml version="1.0" encoding="utf-8"?>
<C1.Android.Chart.Sunburst xmlns:android="http://schemas.android.com/apk/res/android"
    android:id="@+id/Sunburst"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:layout_gravity="center"/>
```

Alternatively, you can drag a Sunburst control from the Toolbox within the custom control tab onto your layout surface in designer mode. Then, inside your activity, add the following code to the OnCreate method to initialize your layout.

XML

```
public class GettingStartedActivity : Activity
    {
        protected override void OnCreate(Bundle savedInstanceState)
        {
            base.OnCreate(savedInstanceState);
            C1Sunburst sunburst = new C1Sunburst(this);

            sunburst.Binding = "Value";
            sunburst.BindingName = "Year,Quarter,Month";
            sunburst.ToolTipContent = "{}{name}\n{y}";
            sunburst.DataLabel.Position = PieLabelPosition.Center;
```

```
            sunburst.DataLabel.Content = "{}{name}";
            sunburst.ItemsSource = DataService.CreateFlatData();
            LinearLayout layout = new LinearLayout(this);
            LinearLayout.LayoutParams param = new
LinearLayout.LayoutParams(LinearLayout.LayoutParams.MatchParent,
LinearLayout.LayoutParams.MatchParent);
            layout.AddView(sunburst, param);
            // Set our view from the "main" layout resource
            SetContentView(layout);
        }
    }
```

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Step 3: Run the Project

Press **F5** to run the application.

Features

Legend

You can specify the position where you want to display the legend using the LegendPosition property of the Sunburst chart. Legend helps in displaying the series of a chart with a predefined symbol and name of the series.

The position of legend is by default set to "**Auto**", which means the legend positions itself automatically depending on the real estate available on the device. This allows the Sunburst to efficiently occupy the available space on the device. Users have the option to customize the appearance of the legend and enhance the visual appeal of the Sunburst Chart control.

The image below shows customized legend in the Sunburst Chart control.

The following code example demonstrates how to set these properties. This example uses the sample created in the Quick Start section.

CS

```
sunburst.LegendPosition = ChartPositionType.Top;
sunburst.LegendStyle.Stroke = Color.Aqua;
sunburst.LegendStyle.Fill = Color.Teal;
sunburst.LegendStyle.StrokeThickness = 2;
sunburst.LegendItemStyle.FontSize = 20;
```

Selection

The Sunburst Chart control allows you to select data points by clicking or touching a sunburst slice. Use the SelectionMode property to specify whether you want to allow selection by data point or no selection at all(default). The three different options provided are as follows:

- None: Does not select any element.
- Point: Highlights the pie slice that the user clicks.
- Series: Highlights the entire pie.

When the SelectionMode is set to **Point**, you can change the position of the selected sunburst slice by setting the **SelectedItemPosition** property. Also, you can set the **SelectedItemOffset** property to move the selected sunburst slice away from the center. Setting the SelctionMode property to Point causes the Sunburst to update the selection property when the user clicks or touch on a sunburst slice.

The Sunburst offers two additional properties to customize the selection:

- **SelectedItemOffset**: Specifies the offset of the selected sunburst slice from the center of the control.
- **SelectedItemPosition**: Specifies the position of the selected sunburst slice. The available options are Top, Bottom, Left, Right, and None (default).

The image below show how the Sunburst chart appears after you set the SelectionMode property.

The following code example demonstrates how to set these properties using C#. This examples uses the data created in the Quick Start section.

CS

```
sunburst.SelectionMode = ChartSelectionModeType.Point;
sunburst.SelectedItemPosition = ChartPositionType.Top;
sunburst.SelectedItemOffset = 0.2;
```

Grouping

The CollectionView class supports grouping through the ICollectionView interface, similar to the one in .NET. To enable grouping, add one or more GroupDescription objects to the CollectionView.GroupDescription property. GroupDescription objects are flexible, allowing you to group data based on value or on grouping functions. The below code uses the **GroupChanged** event and **SortChanged** event for performing grouping operation on Sunburst Chart.

The image below shows how to set Grouping in Sunburst Chart control.

The following code example demonstrates how to set these properties using C#. This examples uses the data created in the Quick Start section.

CS

```
public class MainActivity : Activity
    {
        //int count = 1;
        private C1CollectionView<Item> cv;
        private C1Sunburst sunburst;

        protected override void OnCreate(Bundle savedInstanceState)
        {
            base.OnCreate(savedInstanceState);
            sunburst = new C1Sunburst(this);
            sunburst.Binding = "Value";
            sunburst.BindingName = "Year,Quarter,Month";
            sunburst.ToolTipContent = "{}{name}\n{y}";
            sunburst.DataLabel.Position = PieLabelPosition.Center;
            sunburst.DataLabel.Content = "{}{name}";
            cv = DataService.CreateGroupCVData();
            LinearLayout layout = new LinearLayout(this);
            LinearLayout.LayoutParams param = new
LinearLayout.LayoutParams(LinearLayout.LayoutParams.MatchParent,
LinearLayout.LayoutParams.MatchParent);
            layout.AddView(sunburst, param);
```

```
            cv.GroupChanged += View_GroupChanged;
            cv.SortChanged += Cv_SortChanged;

            //Sort cannot work synchronize with group in current CollectionView
            SortDescription yearSortDescription = new SortDescription("Year",
SortDirection.Ascending);
            SortDescription quarterSortDescription = new SortDescription("Quarter",
SortDirection.Ascending);
            SortDescription monthSortDescription = new SortDescription("MonthValue",
SortDirection.Ascending);
            SortDescription[] sortDescriptions = new SortDescription[] {
yearSortDescription, quarterSortDescription, monthSortDescription };
            cv.SortAsync(sortDescriptions);

            // Set our view from the "main" layout resource
            SetContentView(layout);
        }
        private void Cv_SortChanged(object sender, System.EventArgs e)
        {
            GroupDescription yearGroupDescription = new GroupDescription("Year");
            GroupDescription quarterGroupDescription = new
GroupDescription("Quarter");
            GroupDescription monthGroupDescription = new
GroupDescription("MonthName");
            GroupDescription[] groupDescriptions = new GroupDescription[] {
yearGroupDescription, quarterGroupDescription, monthGroupDescription };
            cv.GroupAsync(groupDescriptions);
        }

        private void View_GroupChanged(object sender, System.EventArgs e)
        {
            this.sunburst.ItemsSource = cv;
        }
    }
```

Zooming and Panning

Zooming can be performed in Sunburst chart using ZoomBehavior class. To implement zooming, you need to create an object of ZoomBehavior class available in the C1.Android.Chart.Interaction namespace and pass it as a parameter to the Add method. This method adds zoom behavior to the behavior collection by accessing it through Behaviors property of the ChartBase class.

The following code examples demonstrate how to implement zooming in C#. These examples use the sample created in the Quick Start section.

C#

```
ZoomBehavior z = new ZoomBehavior();
sunburst.Behaviors.Add(z);
```

Similarly, panning can be implemented in Sunburst chart by creating an object of TranslateBehavior class available in the C1.Android.Chart.Interaction namespace and passing it as a parameter to the Add method. This method adds

translation behavior to the behavior collection by accessing it through Behaviors property of ChartBase class.

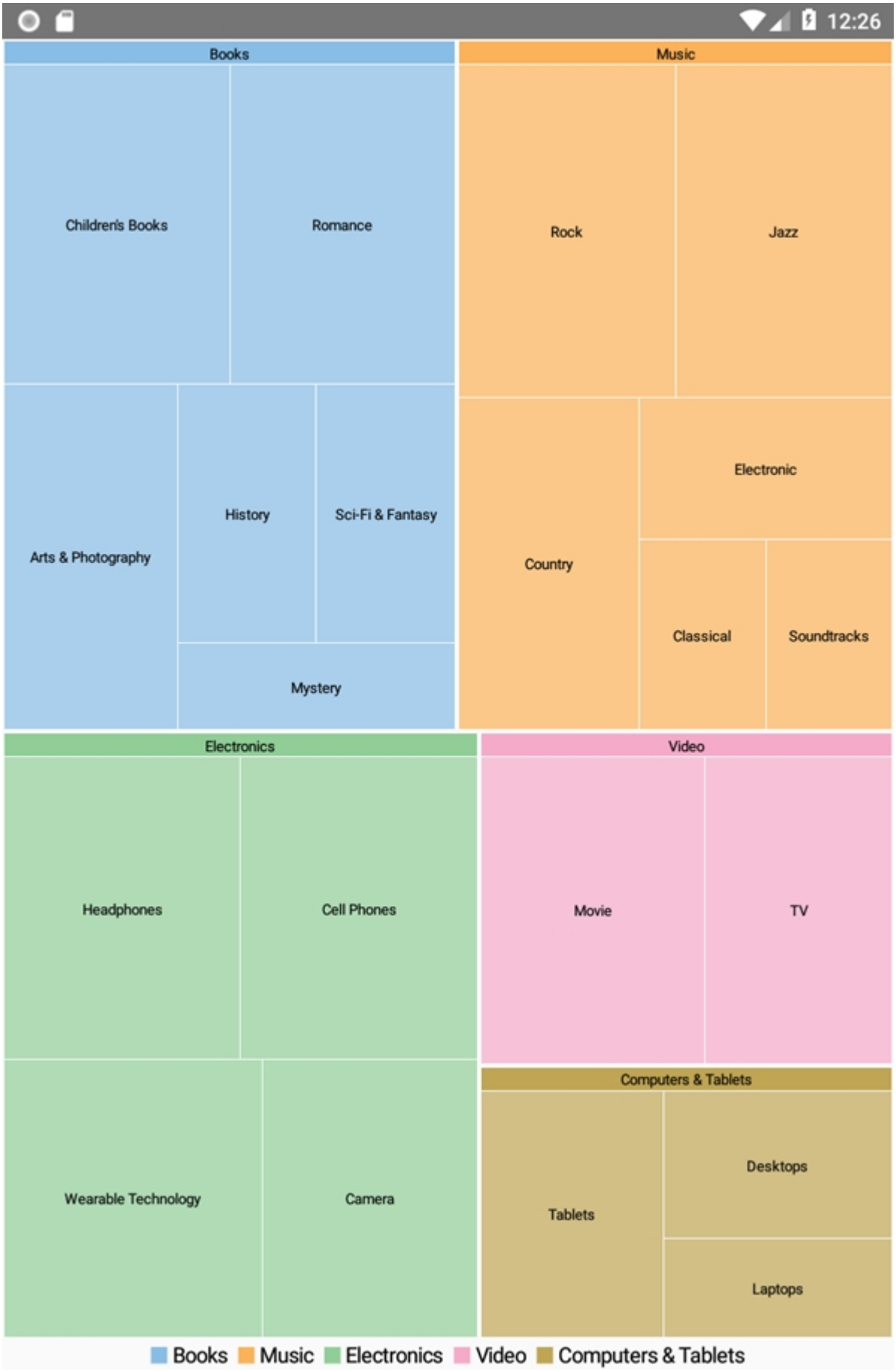
The following code examples demonstrate how to implement panning in C#. These examples use the sample created in the Quick Start section.

C#

```
TranslateBehavior t = new TranslateBehavior();
sunburst.Behaviors.Add(t);
```

TreeMap

The TreeMap control displays hierarchical data as a set of nested rectangles. Hierarchical data is useful in varied walks of life and setups, be it family tree, programming, organization structure, or directories. Visualizing such a data and spotting information in them is a difficult task, especially if the data is huge. The TreeMap control enables visualization of hierarchical data as nested rectangles on a limited space. It is useful in having a quick glimpse of patterns in large data and comparing proportions.



TreeMap control supports data binding to show hierarchy, and allows user to drill down the data further to numerous

levels for detailed analysis. The control can be customized to display data in horizontal, vertical, and squarified layouts of constituting rectangles.

Key Features

TreeMap provides many different features that enable the developers to build intuitive and professional-looking applications. The main features of TreeMap are as follows:

- **Multiple Layouts**
  TreeMap supports multiple display arrangements, where the tree branches can be shown as squares, horizontal rectangles or vertical rectangles.

- **Customize Appearance**
  TreeMap enables users to stylize the control and modify its appearance as per their preference. A set of varied color palettes are available to clearly display categories in a TreeMap.

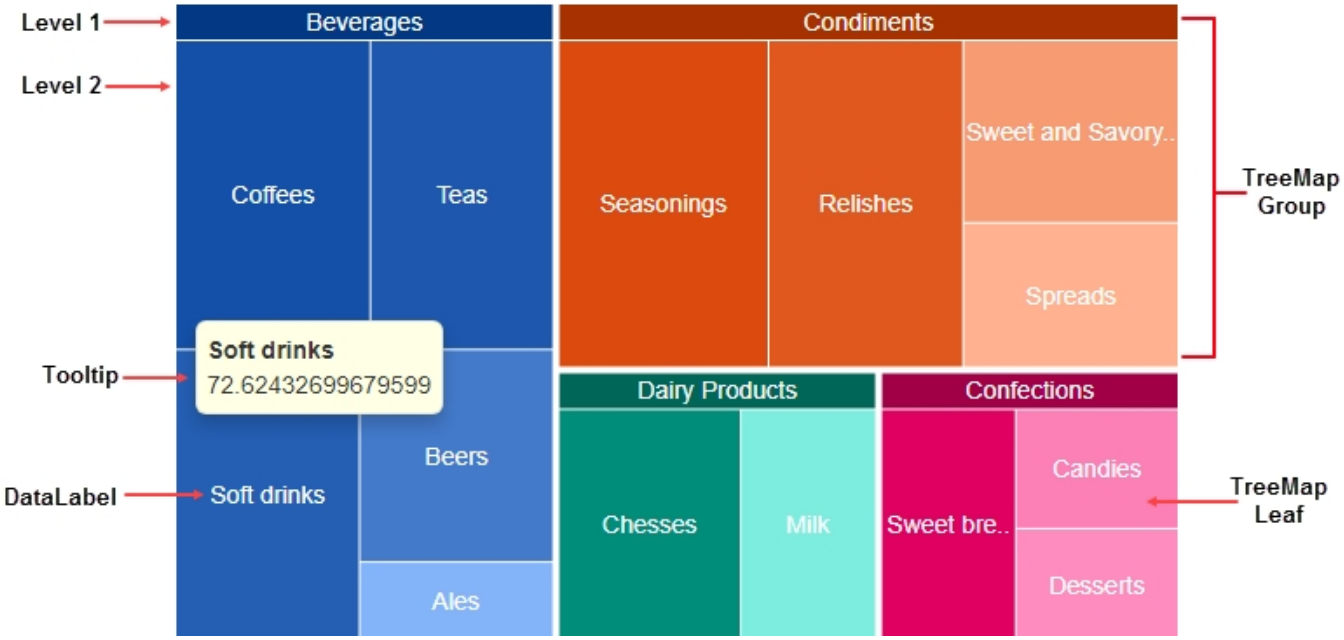
- **Custom Hierarchical Levels**
  TreeMap enables users to vary the depth of data to be visualized and further drill down (or reverse drill down) the data for analysis and comparison.

- **Space Utilization**
  TreeMap is ideal for compact display and visualization of huge data. The nested rectangles and groups constituting the TreeMap adjust their size to fit the display area.

Elements

The TreeMap control is composed of rectangles, representing individual data items, which are grouped into categories, to represent the hierarchical nature of data. The individual data items which make group are known as leaf nodes. The sizes of these nodes are proportional to the data they represent.

The following image exhibits main elements of the TreeMap control.

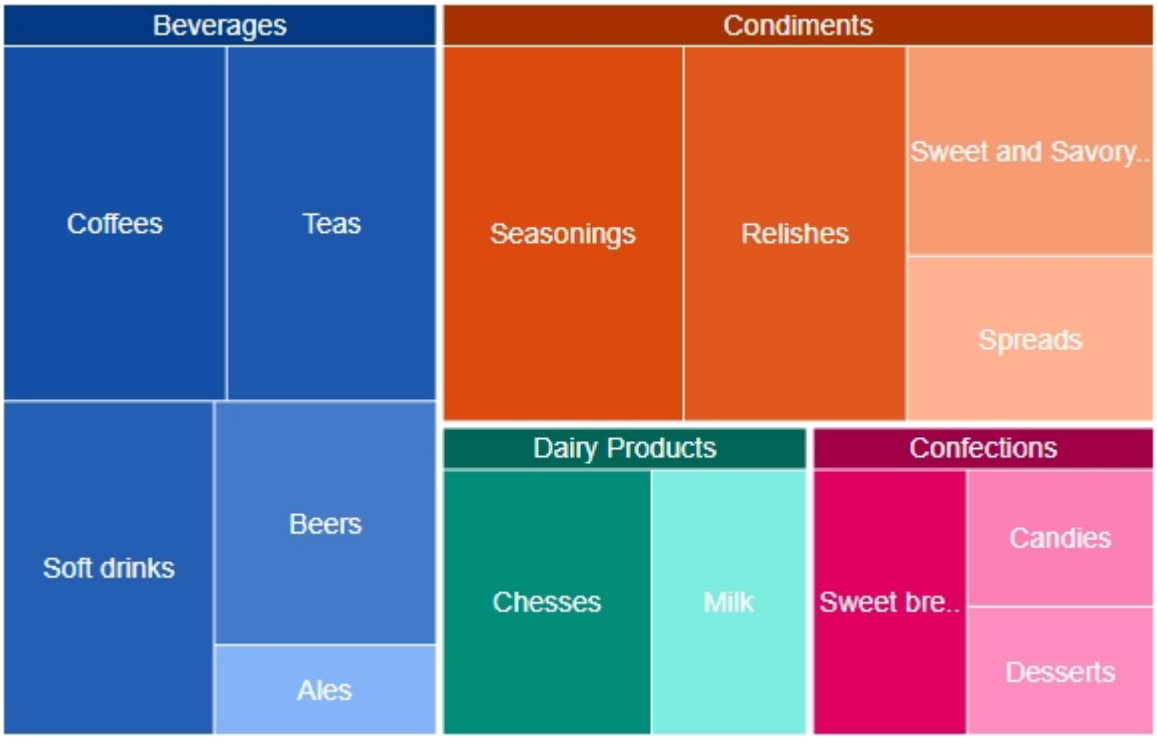


Layouts

TreeMap enables its data items and groups, represented as rectangles, to be displayed in a variety of arrangements. The tree map rectangles can be arranged into squarified, horizontal, and vertical layouts. To set the desired tree map layout, you need to use Type property of **TreeMap** class, which takes the value from TreeMapType enum. The default layout of the TreeMap control is squarified.

Squarified

The squarified layout tries to arrange the tree map rectangles (data items and groups) as approximate squares. This layout makes it easier to make comparisons and point patterns, as the accuracy of presentation is enhanced in squarified arrangement. This layout is very useful for large data sets.



Horizontal

The horizontal layout stacks the tree map rectangles one over the other as rows. Here the width of the rectangles is greater than their height.

Vertical

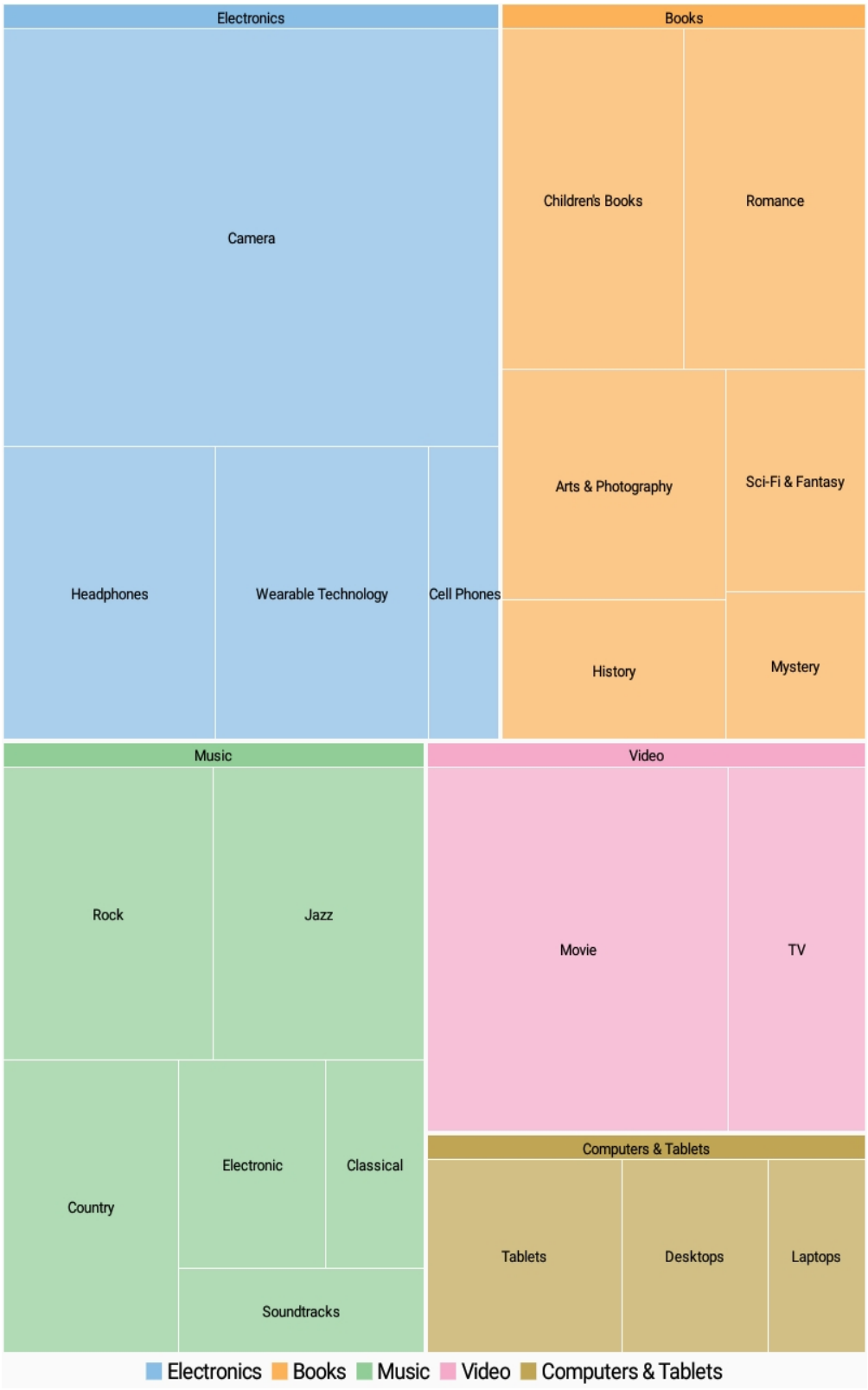
The vertical layout arranges the tree map rectangles adjacent to each other as columns. Here the height of the rectangles is greater than their width.

QuickStart

This section describes how to add a C1TreeMap control to your android app and add data to it. This topic comprises of three steps:

- **Step 1: Create a data source for TreeMap**
- **Step 2: Add a TreeMap control**
- **Step 3: Run the Project**

The following image shows how TreeMap appears after completing the steps above:



Step 1: Create a data source for TreeMap

Add a new class to serve as the data source for the TreeMap control.

C#

```
public class ThingSale
```

```
    {
        private static List<string> Categories = new List<string> { "Music", "Video",
"Books", "Electronics", "Computers & Tablets" };
        private static Dictionary<string, List<string>> AllCategories = new
Dictionary<string, List<string>>();
        public string Category { get; set; }

        public double? Sales { get; set; }
        public List<ThingSale> Items { get; set; }

        public static void EnsureInitAllCategories()
        {
            if (AllCategories.Count > 0)
            {
                return;
            }

            AllCategories.Add("Music", new List<string> { "Country", "Rock",
"Classical", "Soundtracks", "Jazz", "Electronic" });
            AllCategories.Add("Country", new List<string> { "Classic Country",
"Cowboy Country", "Outlaw Country", "Western Swing", "Roadhouse Country" });
            AllCategories.Add("Rock", new List<string> { "Hard Rock", "Blues Rock",
"Funk Rock", "Rap Rock", "Guitar Rock", "Progressive Rock" });
            AllCategories.Add("Classical", new List<string> { "Symphonies", "Chamber
Music" });
            AllCategories.Add("Soundtracks", new List<string> { "Movie Soundtracks",
"Musical Soundtracks" });
            AllCategories.Add("Jazz", new List<string> { "Smooth Jazz", "Vocal Jazz",
"Jazz Fusion", "Swing Jazz", "Cool Jazz", "Traditional Jazz" });
            AllCategories.Add("Electronic", new List<string> { "Electronica",
"Disco", "House" });

            AllCategories.Add("Video", new List<string> { "Movie", "TV" });
            AllCategories.Add("Movie", new List<string> { "Kid & Family", "Action &
Adventure", "Animation", "Comedy", "Drama", "Romance" });
            AllCategories.Add("TV", new List<string> { "Science Fiction",
"Documentary", "Fantasy", "Military & War", "Horror" });

            AllCategories.Add("Books", new List<string> { "Arts & Photography",
"Children's Books", "History", "Mystery", "Romance", "Sci-Fi & Fantasy" });
            AllCategories.Add("Arts & Photography", new List<string> {
"Architecture", "Graphic Design", "Drawing", "Photography", "Performing Arts" });
            AllCategories.Add("Children's Books", new List<string> { "Beginning
Readers", "Board Books", "Chapter Books", "Coloring Books", "Picture Books", "Sound
Books" });
            AllCategories.Add("History", new List<string> { "Ancient", "Medieval",
"Renaissance" });
            AllCategories.Add("Mystery", new List<string> { "Thriller & Suspense",
"Mysteries" });
            AllCategories.Add("Romance", new List<string> { "Action & Adventure",
"Holidays", "Romantic Comedy", "Romantic Suspense", "Western", "Historical" });
```

```
            AllCategories.Add("Sci-Fi & Fantasy", new List<string> { "Fantasy",
"Gaming", "Science Fiction" });

            AllCategories.Add("Electronics", new List<string> { "Camera",
"Headphones", "Cell Phones", "Wearable Technology" });
            AllCategories.Add("Camera", new List<string> { "Digital Cameras", "Film
Photography", "Lenses", "Video", "Accessories" });
            AllCategories.Add("Headphones", new List<string> { "Earbud headphones",
"Over-ear headphones", "On-ear headphones", "Bluetooth headphones", "Noise-cancelling
headphones", "Audiophile headphones" });
            AllCategories.Add("Cell Phones", new List<string> { "Cell Phone",
"Accessories" });
            AllCategories.Add("Accessoriess", new List<string> { "Batteries",
"Bluetooth Headsets", "Bluetooth Speakers", "Chargers", "Screen Protectors" });
            AllCategories.Add("Wearable Technology", new List<string> { "Activity
Trackers", "Smart Watches", "Sports & GPS Watches", "Virtual Reality Headsets",
"Wearable Cameras", "Smart Glasses" });

            AllCategories.Add("Computers & Tablets", new List<string> { "Desktops",
"Laptops", "Tablets" });
            AllCategories.Add("Desktops", new List<string> { "All-in-ones", "Minis",
"Towers" });
            AllCategories.Add("Laptops", new List<string> { "2 in 1 laptops",
"Traditional laptops" });
            AllCategories.Add("Tablets", new List<string> { "IOS", "Andriod", "Fire
OS", "Windows" });
        }
        public static IEnumerable<ThingSale> GetData()
        {
            EnsureInitAllCategories();
            var result = new List<ThingSale>();
            Categories.ForEach(cat =>
            {
                result.Add(Create(cat));
            });

            return result;
        }

        private static ThingSale Create(string category)
        {
            var rand = new Random(0);
            var item = new ThingSale { Category = category };
            if (!AllCategories.ContainsKey(category))
            {
                item.Sales = rand.NextDouble() * 100;
            }
            else
            {
                item.Items = new List<ThingSale>();
                AllCategories[category].ForEach(subCat =>
```

```
                {
                    item.Items.Add(Create(subCat));
                });
            }
            return item;
        }
    }
```

Step 2: Add a TreeMap control

To add a TreeMap control to your layout, open the .axml file in your layout folder from the Solution Explorer and replace its code with the code below.

XML

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:orientation="vertical"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    >
        <C1.Android.Chart.C1TreeMap
            android:id="@+id/treeMap"
            android:layout_width="match_parent"
            android:layout_height="match_parent" />
</LinearLayout>
```

Alternatively, you can drag a TreeMap control from the Toolbox within the custom control tab onto your layout surface in designer mode. Then, inside your activity, add the following code to the OnCreate method to initialize your layout.

C#

```
public class MainActivity : Activity
    {
        private C1TreeMap treeMap;
        protected override void OnCreate(Bundle bundle)
        {
            base.OnCreate(bundle);
            SetContentView(Resource.Layout.Main);
            treeMap = this.FindViewById<C1TreeMap>(Resource.Id.treeMap);
            treeMap.ChartType = C1.Android.Chart.TreeMapType.Squarified;
            treeMap.Binding = "Sales";
            treeMap.BindingName = "Category";
            treeMap.MaxDepth = 2;
            treeMap.ShowTooltip = true;
            treeMap.Palette = Palette.Zen;
            treeMap.ChildItemsPath = "Items";
            treeMap.ItemsSource = ThingSale.GetData();
            treeMap.DataLabel = new ChartDataLabel() { Content = "{name}{type}",
Position = ChartLabelPosition.Center };
        }
    }
```

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Step 3: Run the Project

Press **F5** to run the application.

Features

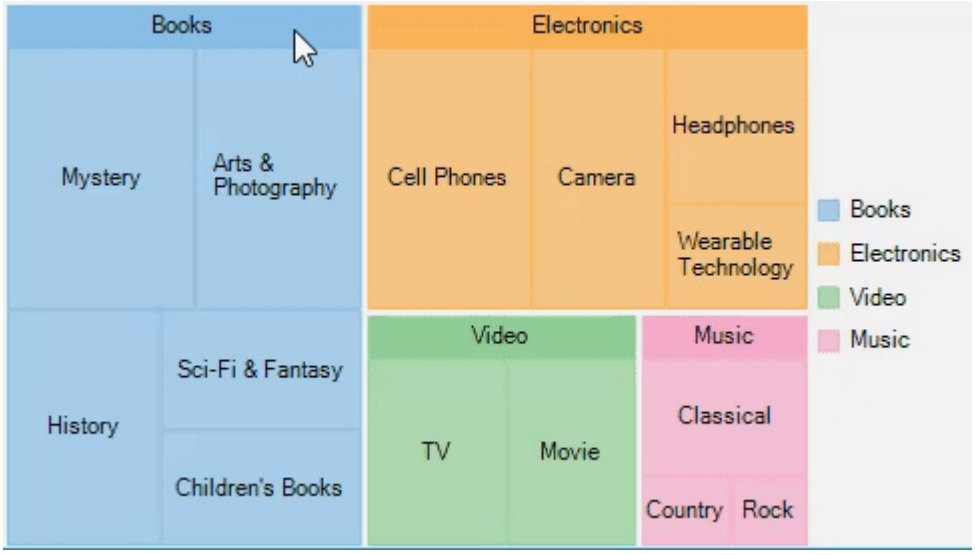
Drilldown

TreeMap allows drilling down the data items of its data further for detailed analysis. End users can access the lower levels in the data hierarchy by simply clicking the desired node. Whereas, to move back up in the hierarchy, users simply need to right-click in the plot area.

To implement the drilldown functionality in the TreeMap control, set the **MaxDepth** property to a value greater that 0. This property defines the levels of hierarchical data in the TreeMap control.

Note that the more levels you show the less understandable your TreeMap might become (depends on the levels' number and values they represent). In our example, we will set **MaxDepth** property to 2.

The following gif image demonstrates drilling-down by showing data points of the clicked TreeMap node.



The following code example demonstrates how to set the MaxDepth property of the TreeMap in C# to enable DrillDown. This example uses the sample created in the QuickStart section.

C#

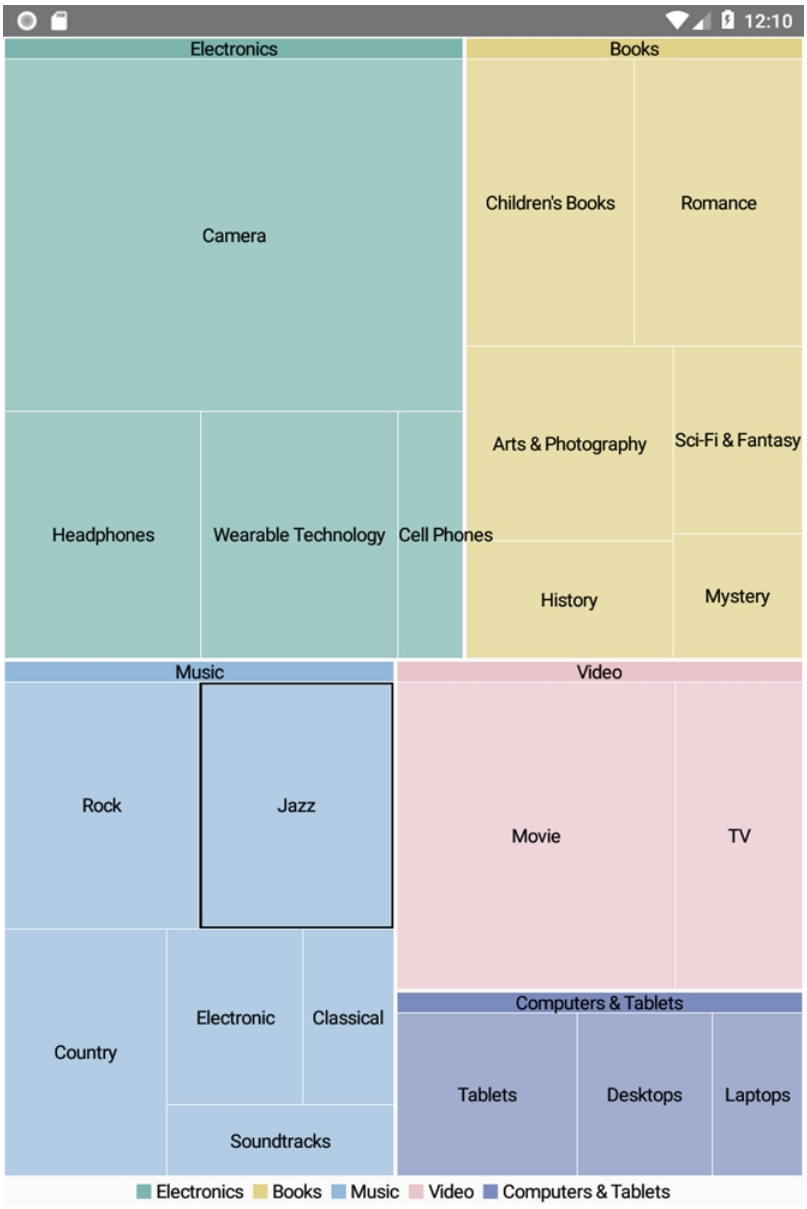
```
treeMap.MaxDepth = 2;
```

Selection

TreeMap lets you enable selection of its data items and groups. User can select a node and draw focus on it by simply clicking it. You need to set the SelectionMode property provided by the ChartBase class to either of the following values in the ChartSelectionMode enumeration:

- **None (default)**: Selection is disabled.
- **Point**: A point is selected.

The following image illustrates default selection of a data point along with its children nodes in the hierarchy.



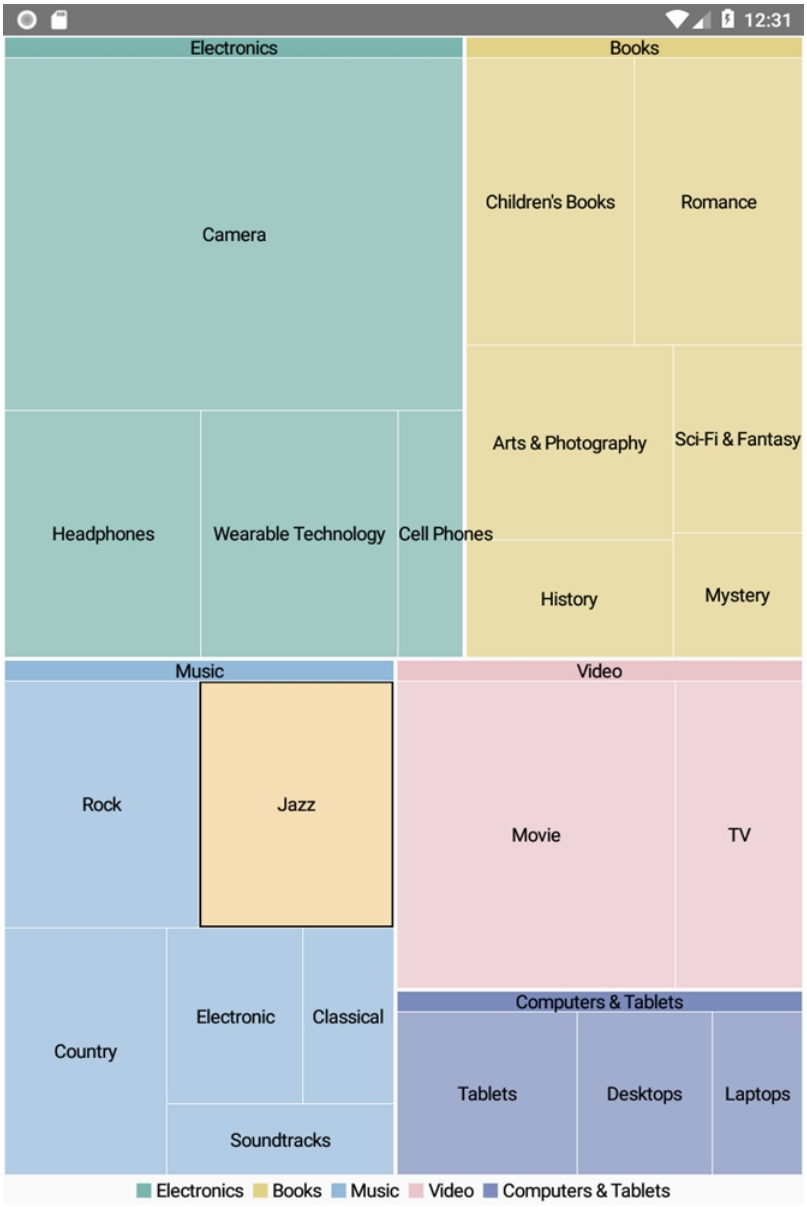
The following code snippet shows how to set the **SelectionMode** property for a tree map control.

C#

```
// Implement selection mode

treeMap.SelectionMode = ChartSelectionModeType.Point;
```

Customized TreeMap Selection

To customize the TreeMap selection, you can use SelectionStyle property and style the selected item as illustrated in the following image.



The following code snippet demonstrates using of **SelectionStyle** property to change fill color of the selected TreeMap node.

C#

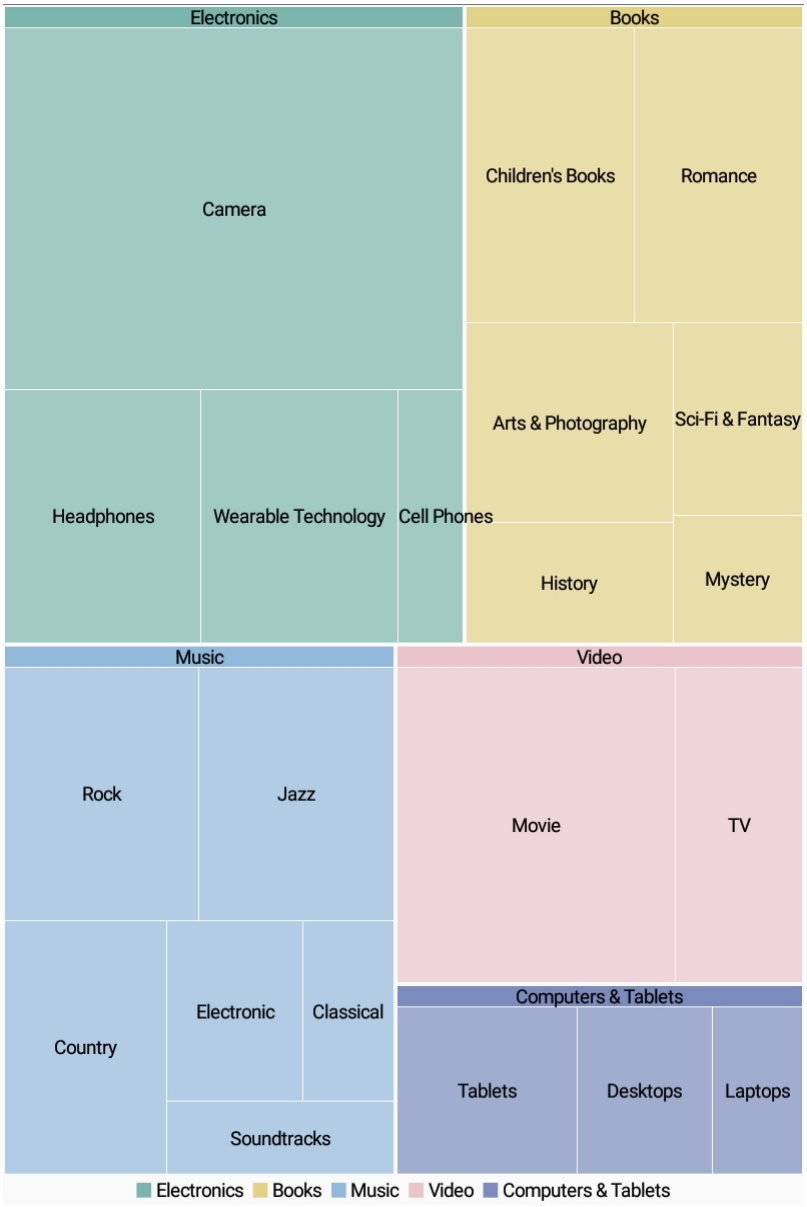
```
// Apply custom color to the selection

treeMap.SelectionStyle.Fill = Color.Wheat;
```

Additionally, you can customize the behavior of TreeMap selection by handling **SelectionChanged** event. Also, you can utilize **SelectedIndex** and **SelectedItem** properties, and reuse the obtained information in your application.

Theming

The TreeMap control allows you to customize its appearance by using the **Palette** property. This property accepts value from the **Palette** enumeration provided by the **ChartBase** class.

The following image shows how a TreeMap control appears after applying a theme using the Palette property.



The following code examples demonstrate how to set **Palette** property in C#. These examples use the sample created in the Quick Start section.

C#

```
treeMap.Palette = Palette.Zen;
```