BlackBerry 10 Cascades UI FW: A Different Take

Markus Landin, Product Manager, Research In Motion TAT

November 19, 2012

Session absctract:

"Cascades is the new native UI Framework on BlackBerry 10 Platform. It is built with Qt as the foundation and while it has many similarities to the QtQuick UI Framework there are also many fundamental architectural differences between the two.

The session will present an overview of Cascades *and discuss the* design choices *made when architecting the new framework."*

BlackBerry 10 UI

Be more than an app, be a platform

Cinematic Experience

Efficient Ergonomics

Communication at its core

Fluid Workflow

Content is king

Performance is fundamental

Moments of Charm

BlackBerry 10 UI

Be more than an app, be a platform

Cinematic Experience

Efficient Ergonomics

Communication at its core

Fluid Workflow

Content is king

FLOW

Performance is fundamental

Moments of Charm

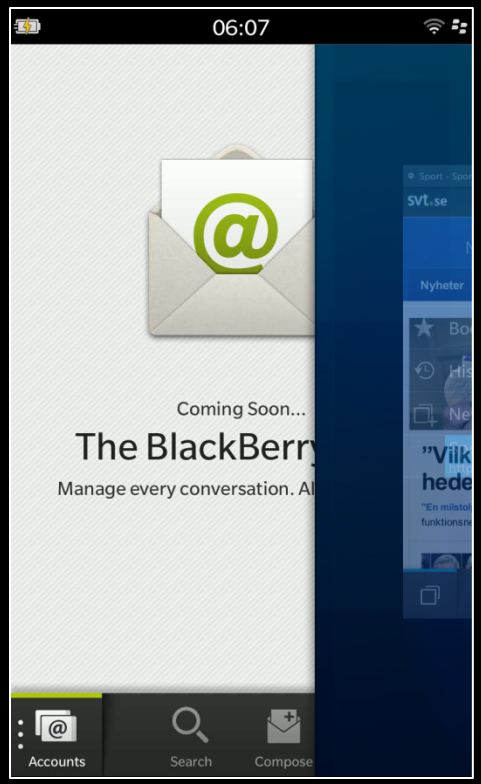

MIHALY CSIKSZENTMIHALYI
Das flow-Erlebnis
Klett-Cotta
Jenseits von Angst
und Langeweile:
im Tun aufgehen
8. Auflage
Konzepte der
Humanwissenschaften

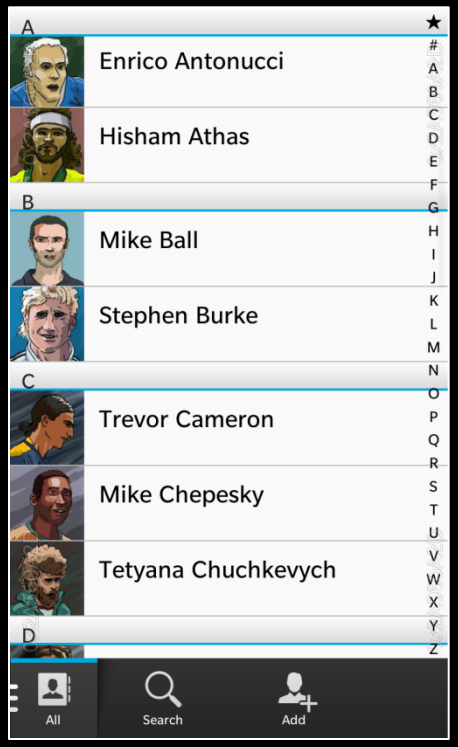
"Flow is the mental state of operation in which a person performing an activity is fully immersed in a feeling of energized focus, full involvement, and enjoyment in the process of the activity." *[Wikipedia]*

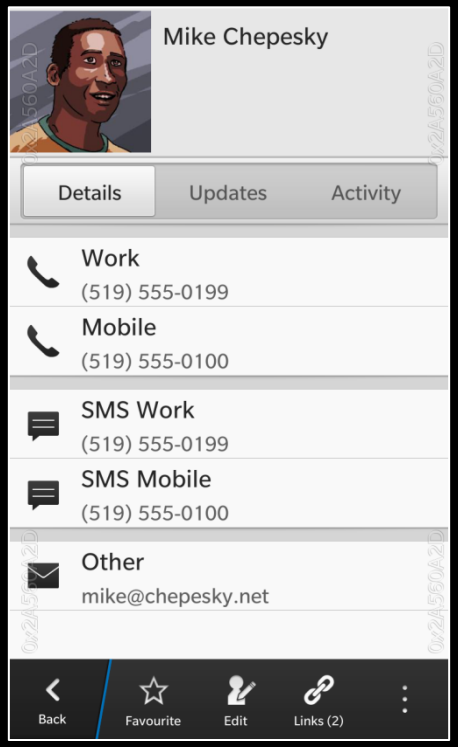
"BlackBerry Flow is a seamless user experience *which provides* full control *and flexibility in every moment and every touch. Flow* keeps the momentum going *so that user goals can be achieved quick and efficiently"*

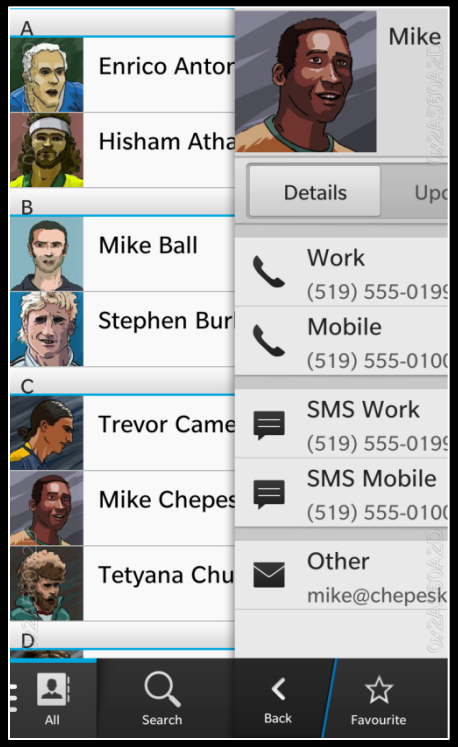

Sport - Sport | SVT.se
svt.se
Meny
Sök
svt Nyheter
Sport
Nyheter
Sport
Kultur
Mer
”Vilken ära och heder”
”En milstolpe” Flera idrottare med funktionsnedsättning nominerade till Idrottsgalan.
Alla nominerade
svt.se/sport/


06:07
Sport - Sport | SVT.se
svt.se
Meny
Sök
svt Nyheter
Sport
Nyheter
Sport
Kultur
Mer
”Vilken ära och heder”
”En milstolpe” Flera idrottare med funktionsnedsättning nominerade till Idrottsgalan.
Alla nominerade
svt.se/sport/

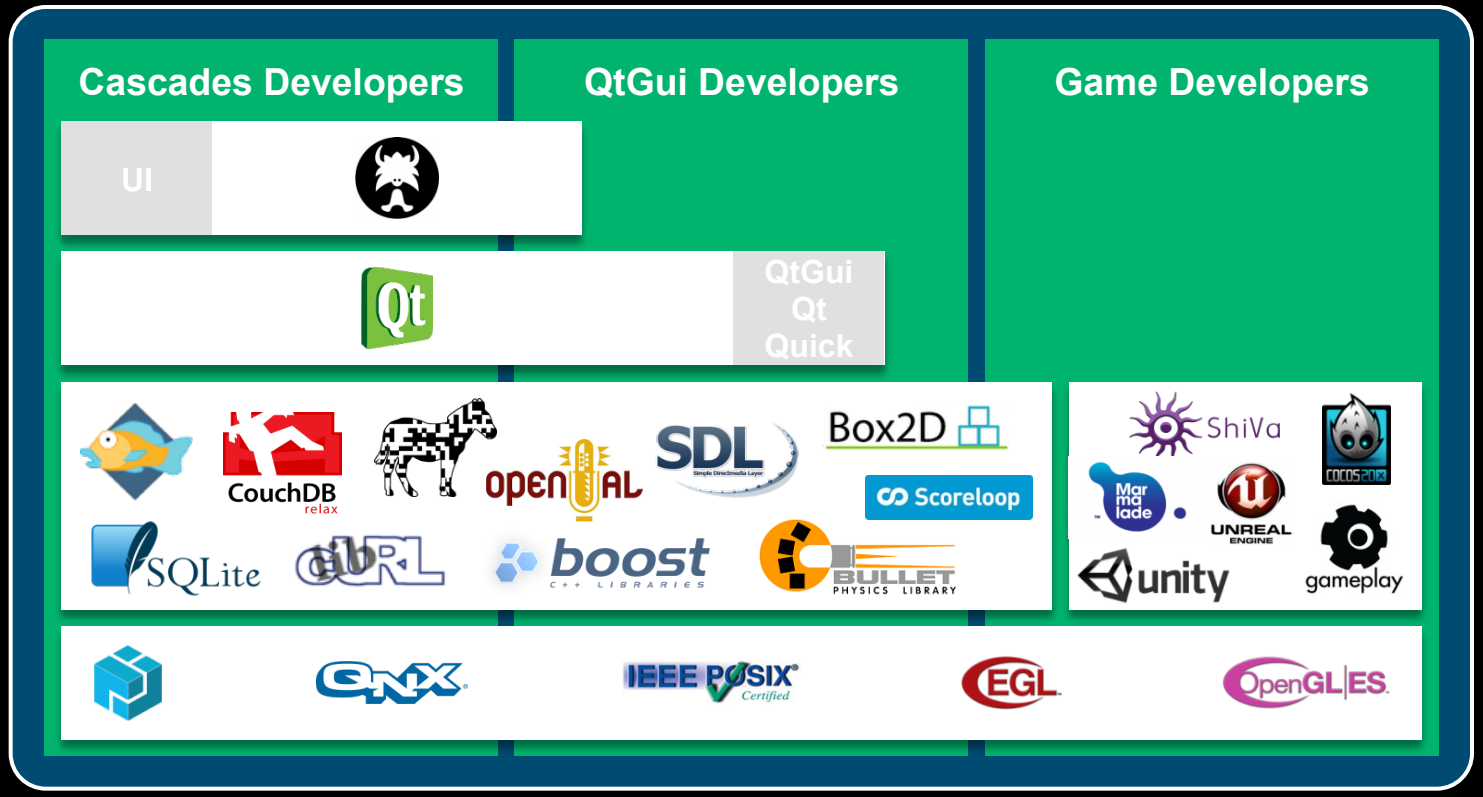

06:07
Coming Soon...
The BlackBerry
Manage every conversation.
Accounts
Search
Compose


A
Enrico Antonucci
Hisham Athas
B
Mike Ball
Stephen Burke
C
Trevor Cameron
Mike Chepesky
Tetyana Chuchkevych
D
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
All
Search
Add


Mike Chepesky
Details
Updates
Activity
Work
(519) 555-0199
Mobile
(519) 555-0100
SMS Work
(519) 555-0199
SMS Mobile
(519) 555-0100
Other
mike@chepesky.net
Back
Favourite
Edit
Links (2)


A
Enrico Anto
Hisham Atha
B
Mike Ball
Stephen Bur
C
Trevor Came
Mike Chepes
Tetyana Chu
D
Mike
Details
Work
(519) 555-0199
Mobile
(519) 555-0100
SMS Work
(519) 555-0199
SMS Mobile
(519) 555-0100
Other
mike@chepesk
All
Search
Back
Favourite

What is Cascades?




Cascades!?
You don't like
Quick 2?
http://www.flickr.com/photos/kalavinka/4617897952/

We do like QtQuick2 but…

- Qt 5 won't be ready in time for BlackBerry 10
- QML only
- No set of native controls
- UI thread can block rendering
- We already have TAT's Cascades engine

Prevailing principles in Cascades Design

- Very limited time for implementation
- Locked down so can be extended later
- Uniform look for built in controls
- Minimum Developer Effort for Maximum Effect
- Built-in controls first, custom controls later
- Parity between QML and C++ API

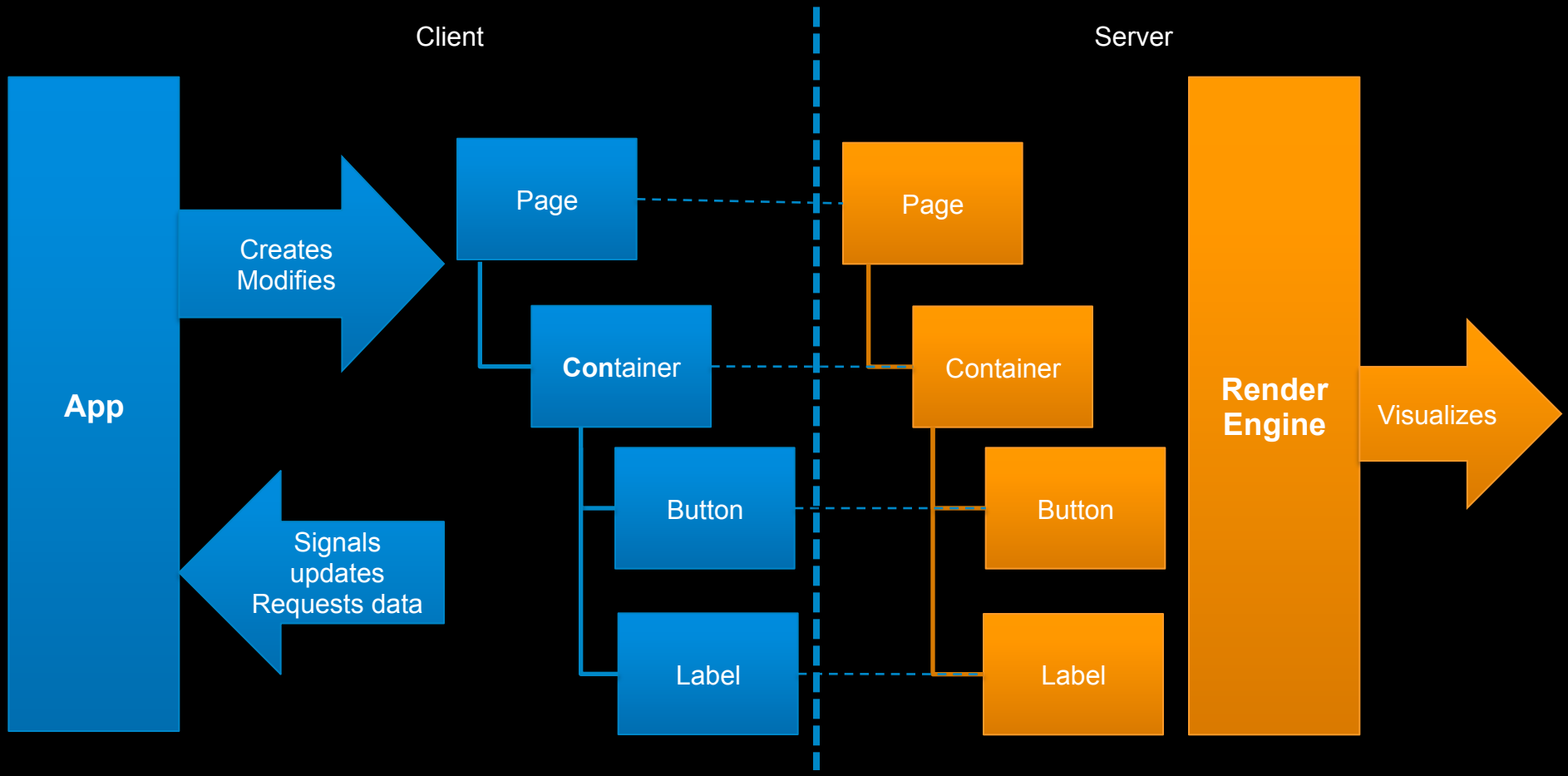
Designed for BlackBerry 10 platform from the start

- Cross-platform API is not the focus
- Rich set of controls designed and optimized for BlackBerry 10
- No legacy to be supported
- Simplifies the requirements

QtQuick2 and Cascades: Similarities

- Scene Graph
- Use of QML
- Rendering in a separate thread

Cascades Architecture



Client-Server Architecture

- Fully asynchronous
- Client side “pushes” data to server
- Server to client communication is limited
- Client and server scene graphs can be different
- Implementation complexity is hidden on the server

Scene graph structure

- A bit more structured approach
- Declarative list properties per type of objects
- Visual tree is a sub-tree of ownership tree

```
Container {
  Button { } // added to default property controls
  Button { text: business.buttonText }

  animations: [
      TranslateTransition { id: anim; fromX: 0; toX: 50 }
  ]

  actions: [
     ActionItem {
       text: “Play“
       onTriggered: anim.play()
     },
     ActionItem {}
  ]

  attachedObjects: [
    MyBusinessObject { id: business }
  ]
}
```

Event Handling

- Application subscribes to events using slots
- Server can handle most events by itself
- Low and high level events
  - Low Level (Touch, Enter/Exit)
  - High Level (Button clicked)
- Sophisticated touch behaviors possible
- Event phases: capture, target, bubbling
- Gestures support

```
Container {
    Container {
        preferredWidth: 300; preferredHeight: 300; background: Color.Blue
        onTouch: {
            background = event.isUp() ? Color.Blue : Color.Green
            translationX = event.windowX - (preferredWidth / 2);
            translationY = event.windowY - (preferredHeight / 2);
        }
        touchBehaviors: [
            TouchBehavior {
                TouchReaction {
                    eventType: TouchType.Down
                    phase: PropagationPhase.AtTarget
                    response: TouchResponse.StartTracking
                }
            }
        ]
    }
    Container {
        background: Color.Red; preferredWidth: 400; preferredHeight: 400
        overlapTouchPolicy: OverlapTouchPolicy.Deny
    }
}
```

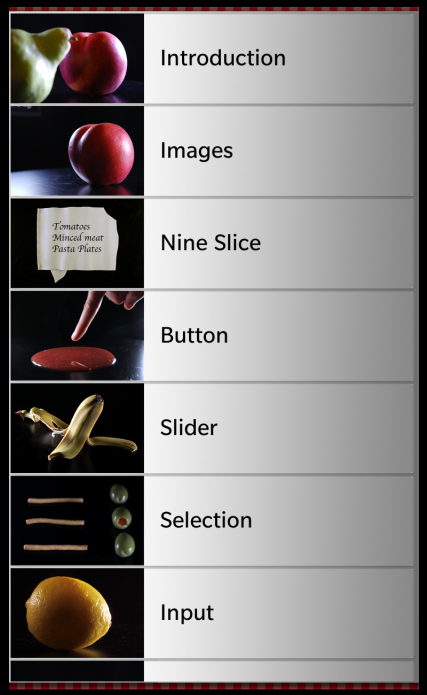
Animation

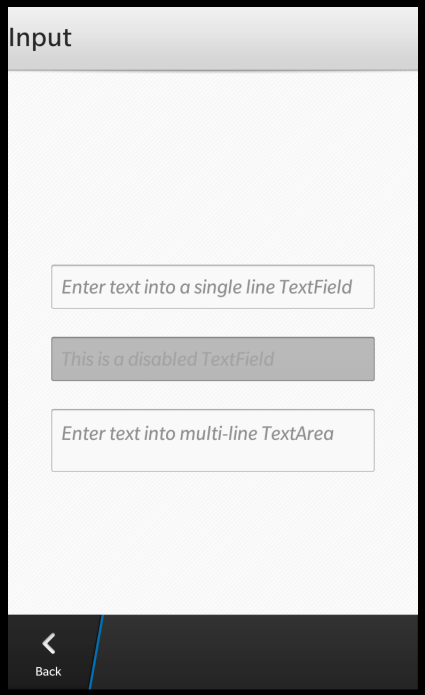
- Implicit animations are enabled by default
- All animations run on server
- No intermediate updates for animated properties
  - 99.3% of the time no one cares
  - subscribe to “*Changing()” signal to receive intermediate update

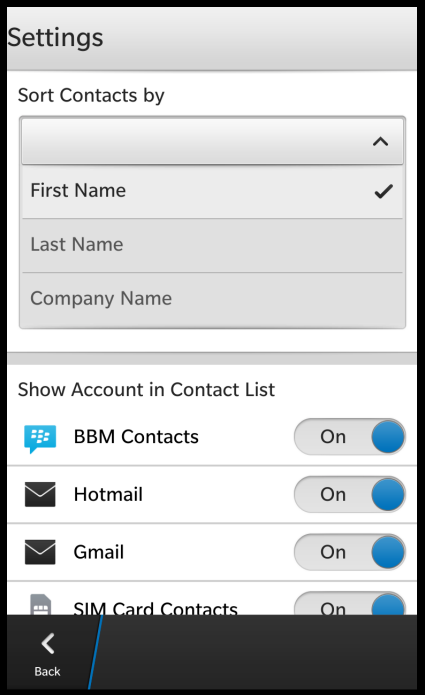
```
import bb.cascades 1.0

Page {
    content: Container {
        Button {
            text: "Click me"

            animations: [
                TranslateTransition {
                    id: anim
                    toX: 400
                    duration: 3000
                    easingCurve: StockCurve.ElasticIn
                }
            ]
            onClicked: {
                anim.play();
            }
            onTranslationXChanging: {
                console.log(translationX);
            }
        }
    }
}
```

```
import bb.cascades 1.0

Page {
    content: Container {
        Button {
            text: "Click me"

            attachedObjects: [
                ImplicitAnimationController {
                    propertyName: "translationX"
                    enabled: false
                }
            ]

            onClicked: {
                // not animated
                translationX += 20;
                // animated
                translationY += 20;
            }
        }
    }
}
```

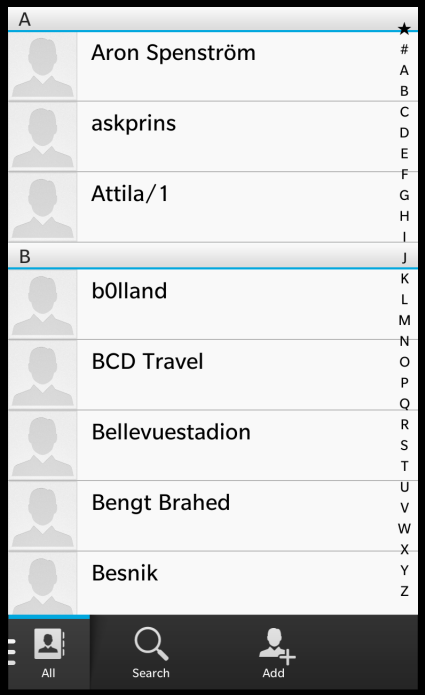
Rich set of built in controls

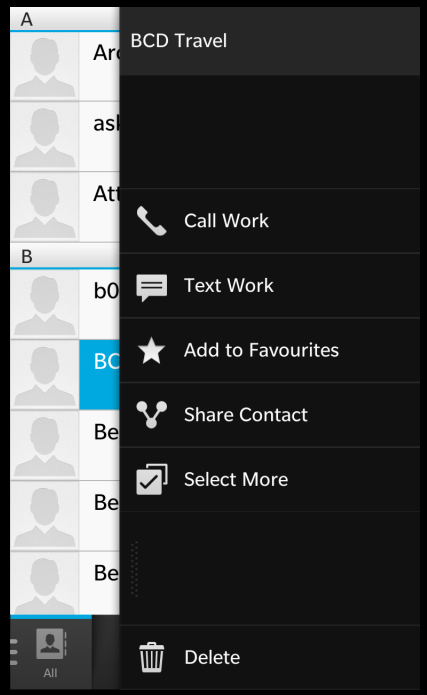




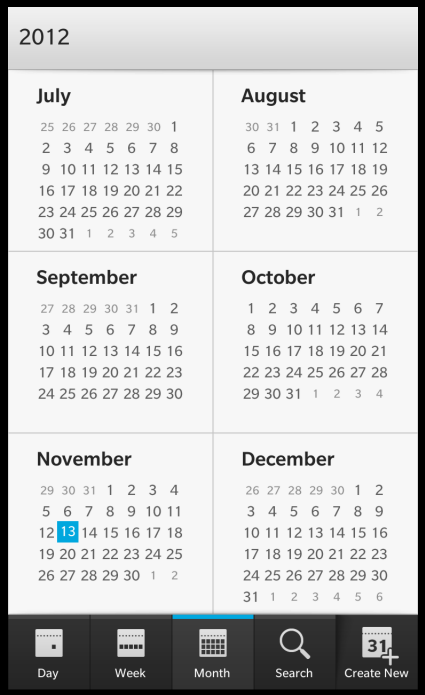


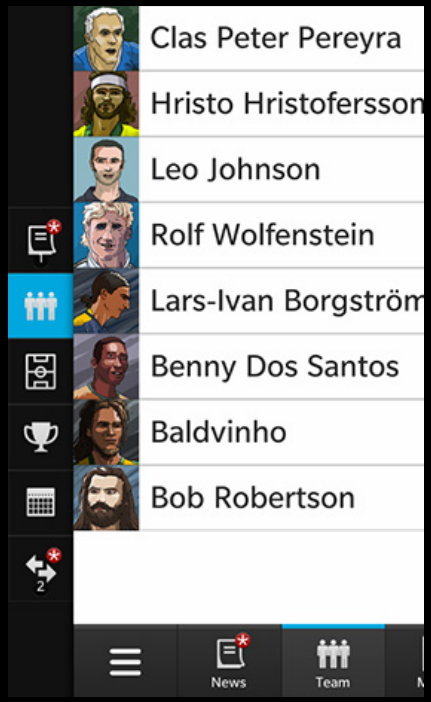
Rich set of built in controls





Rich set of built in controls





Extendibility

- Extension point: CustomControl
  - intended to be subclassed from C++
  - Root node is VisualNode
- QML files can be used as “custom controls”
- ForeignWindowControl
  - Embedding platform windows into the scene
  - Allows custom rendering

```
#include <bb/cascades/CustomControl>
#include <bb/cascades/Container>
#include <bb/cascades/Button>
#include <bb/cascades/ImageView>

// mycontrol.h
class MyControl : public CustomControl {
Q_OBJECT
public:
    MyControl() : CustomControl() {
         setRoot(Container::create()
             .add(Button::create("Custom Button!"))
             .add(ImageView::create("asset:///image.png")));
    }
    ~MyControl() {}
};
QML_DECLARE_TYPE(MyControl)

// mycontrol.cpp
// register for use in qml if we want
qmlRegisterType<MyControl>("my.module", 1, 0, "MyControl");
// can use from C++
MyControl myControl;
Container *c = Container::create().add(&myControl);
```

```
// QML custom control
// defined in MyQmlControl.qml
Container {
    Button {
        text: “Qml Custom Button“
    }
    ImageView {
        imageSource: “image.png“
    }
}

// using both controls from QML
Container {
    MyControl {
        preferredWidth: 500
        preferredHeight: 500
        opacity: 0.5
    }
    MyQmlControl {}
}
```

C++ APIs mirror QML

- C++ and QML API is identical in 95%
- Have fun with QML but can drop to C++ if needed
- Builders for ease of use

```
import bb.cascades 1.0


Page {
    content: Container {
        Button {
            text: "Click me"
            imageSource: "asset:///images/image.png"
            verticalAlignment: VerticalAlignment.Center
            opacity: 0.5
            onClicked: opacity = undefined
        }
    }
}
```

```
#include <bb/cascades/Page>
#include <bb/cascades/Button>

Button *button;

Page *page = Page::create()
    .content(Container::create()
        .add(button = Button::create()
            .text("Click me")
            .imageSource("asset:///images/image.png")
            .verticalAlignment(VerticalAlignment::Center)
            .opacity(0.5f)
            .onClicked(button, SLOT(resetOpacity()))));
```

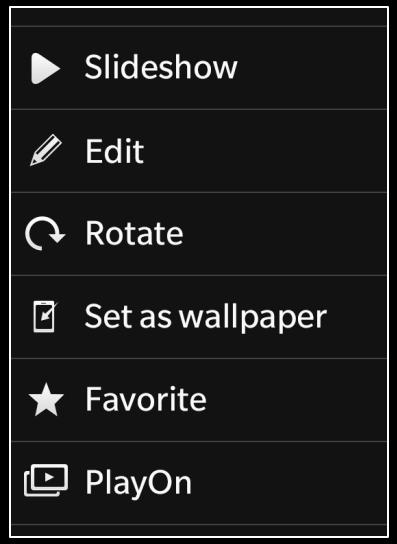
Layout

- Layout performed on server, animated
- No anchors or containers with predefined layout
- “Traditional” layout API
  - Container has a Layout, Controls have LayoutProperties
- Two kinds of layouts:
  - Container – for Controls
  - ListView – for ListView items
- Currently non-extendable

```
Container {
    layout: DockLayout {}

    Button {
        horizontalAlignment: HorizontalAlignment.Right
        verticalAlignment: VerticalAlignment.Bottom
    }

    Button {
        horizontalAlignment: HorizontalAlignment.Center
        verticalAlignment: VerticalAlignment.Center
    }
}
Container {
    layout: StackLayout {
        orientation: LayoutOrientation.LeftToRight
    }

    Button {
        layoutProperties: StackLayoutProperties {
            spaceQuota: 1
        }
    }

    Button {
        layoutProperties: StackLayoutProperties {
            spaceQuota: 2
        }
    }
}
```

Resource Handling

- Assets: loaded synchronously on render thread
- Content: loaded asynchronously, shown with effects



Simplified DataModels for ListView

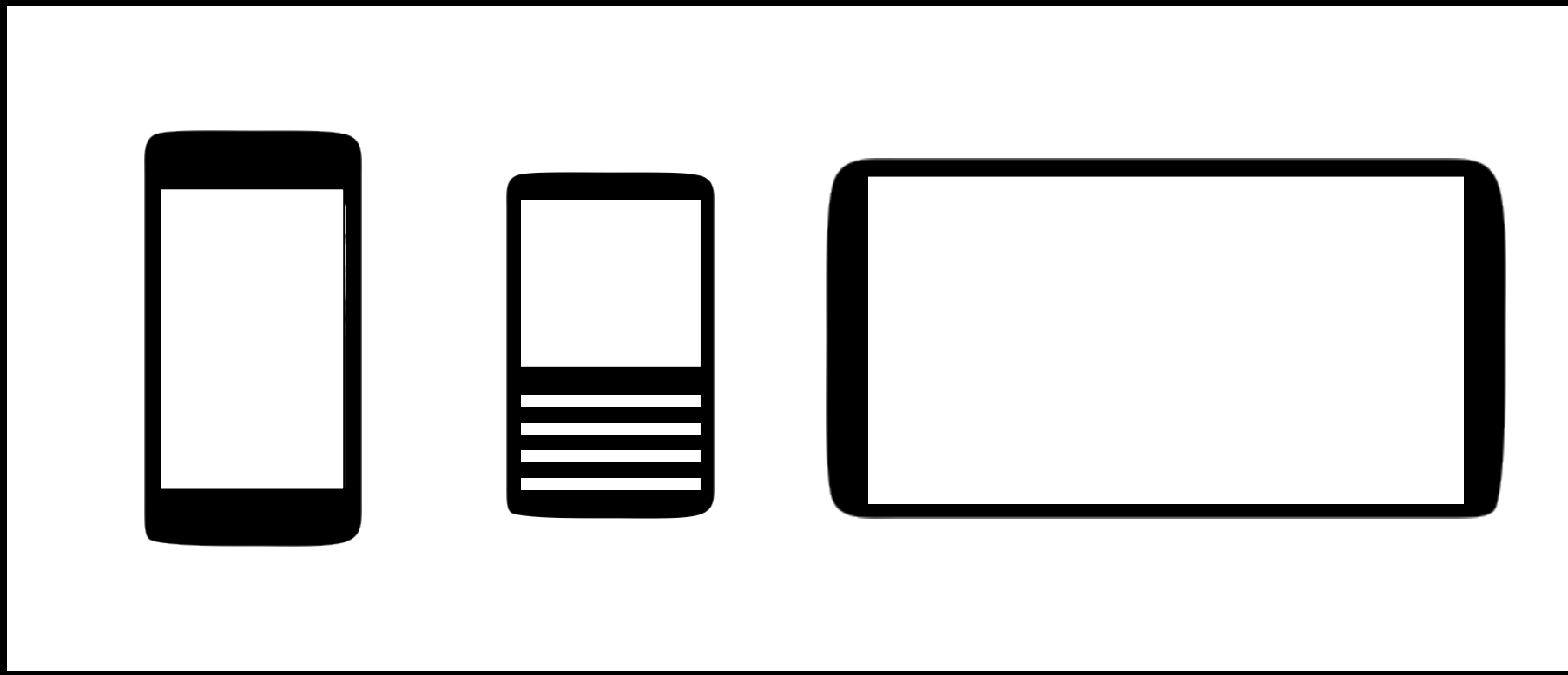
- Why not QAbstractItemModel?
  - too complicated
  - different item types not supported

- Cascades' DataModel
  - Very lightweight (4 virtual methods, 4 signals)
  - Can easily wrap QAbstractItemModel-based models

```
ListView {
    dataModel: XmlDataModel { source: "models/items.xml" }

    listItemComponents: [
        ListItemComponent {
            type: "header"
            Header {
                title: ListItemData.title
                subtitle: ListItemData.subtitle
            }
        },
        ListItemComponent {
            type: "listItem1"
            StandardListItem {
                title: ListItemData.title
                description: ListItemData.subtitle
            }
        },
        ListItemComponent {
            type: "listItem2"
            Container {
                Label { text: ListItemData.title }
            }
        }
    ]
}
```

```
// items.xml
<root>
    <header
        title="Fruits"
        subtitle="Generally sweet"/>
    <listItem1
        title="Oranges"
        subtitle="Sweet" />
    <listItem1
        title="Bananas"
        subtitle="Kinda sweet"/>
    <header
        title="Vegetables"
        subtitle="Generally not so sweet"/>
    <listItem2
        title="Broccoli"/>
    <listItem2
        title="Potatos"/>
</root>
```

UI Adaptability



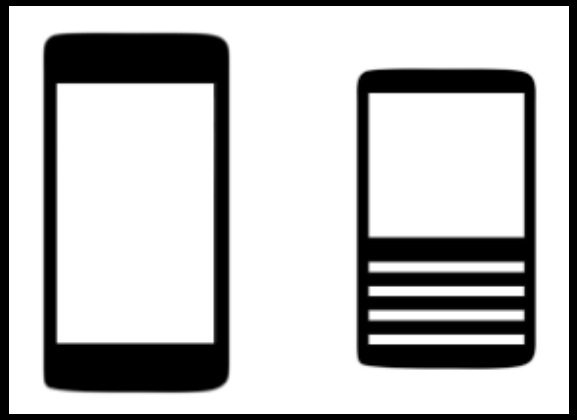
UI Adaptability

- Built in controls adapt to device type
- Smart usage of layouts
- Unique (sub)set of assets per configuration

UI Adaptability

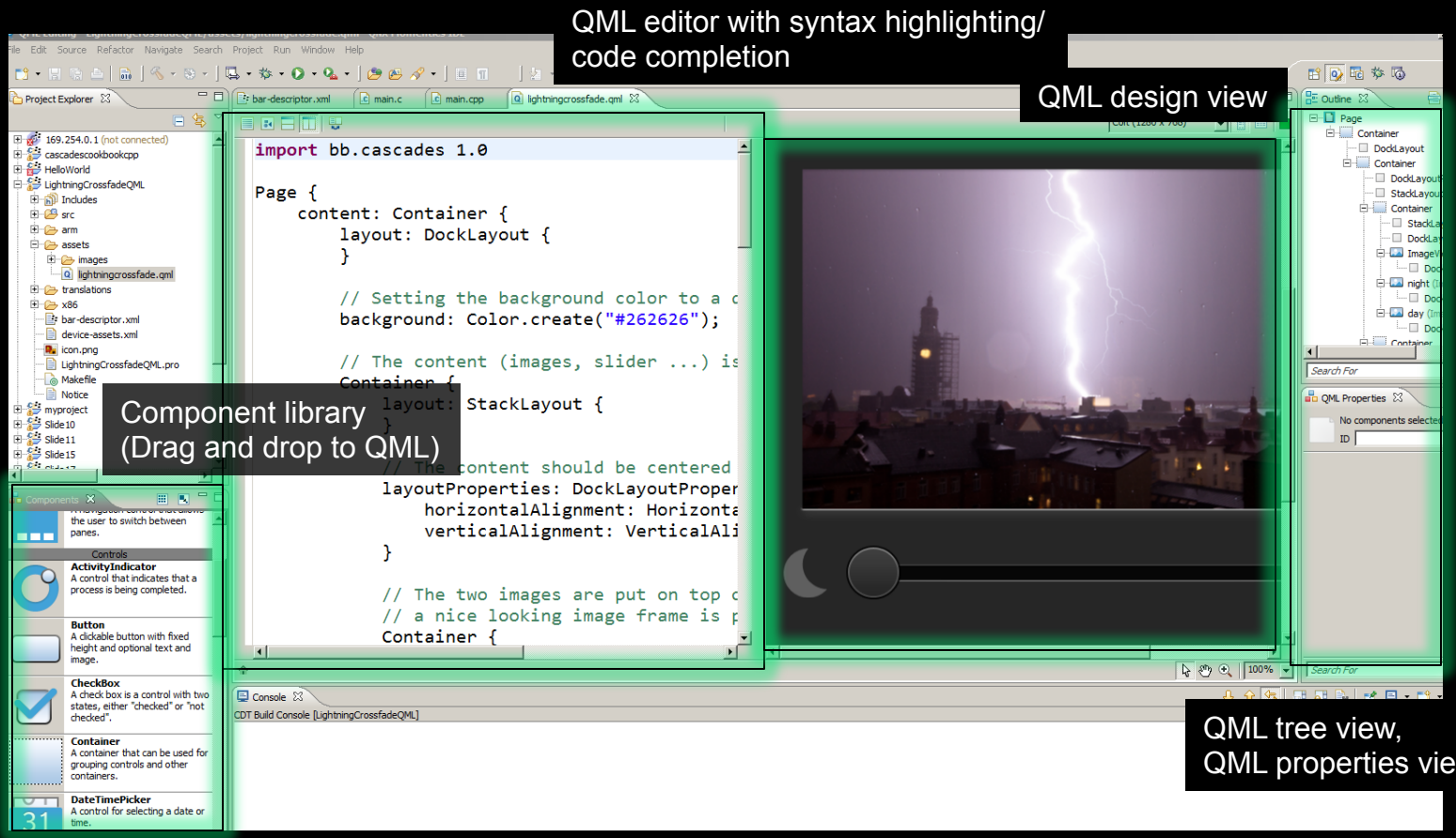
Static asset selectors and the application's assets folder structure:

```
assets/
    720x720/
        main_screen.qml
        picture.png
    main_screen.qml
    dialog.qml
    picture.png
    icon.png
```



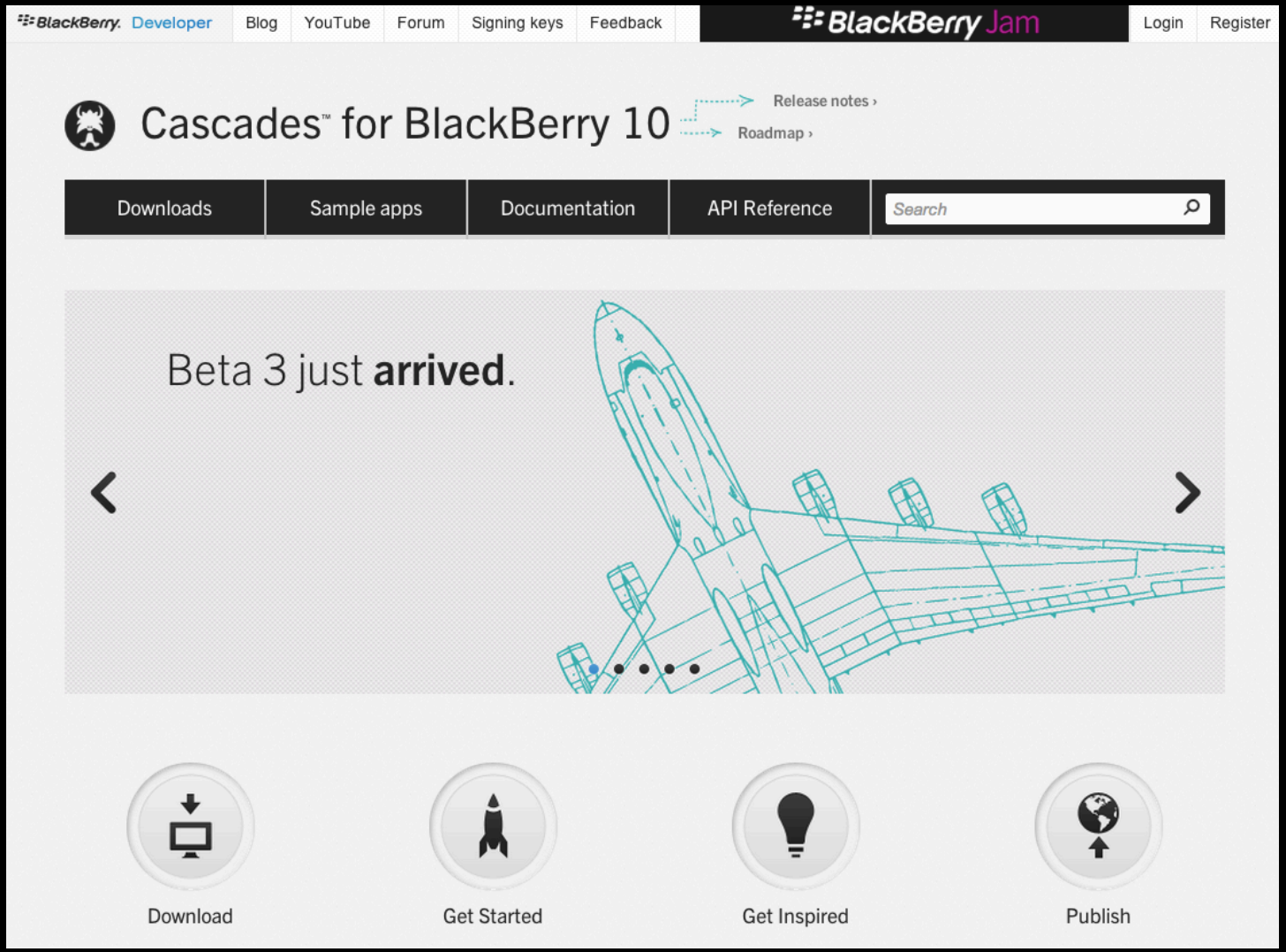
Interoperability with QtQuick

- Non-visual elements can be used in Cascades (States, Timer)
- Integration within same process would be hard
- Can interoperate as Cards
  - Transparent to the user
  - Same as other runtimes (AIR)


QML editor with syntax highlighting/
code completion
QML design view
Component library
(Drag and drop to QML)
QML tree view,
QML properties view
import bb.cascades 1.0
Page {
content: Container {
layout: DockLayout {
}
// Setting the background color to a
background: Color.create("#262626");
// The content (images, slider ...) is
Container {
layout: StackLayout {
}
// The content should be centered
layoutProperties: DockLayoutProper
horizontalAlignment: Horizonta
verticalAlignment: VerticalAli
}
// The two images are put on top
// a nice looking image frame is
Container {

Future

- More core controls
- Fun stuff (custom shaders, particles)
- Visual editor
- Moving to Qt5



http://developer.blackberry.com/cascades

Learn more at this event

Day	Time	Room	Title	Speaker
Wed	15:00	A keynote	**Qt and the upcoming BlackBerry 10 Platform**	Alec Saunders

Thank you!