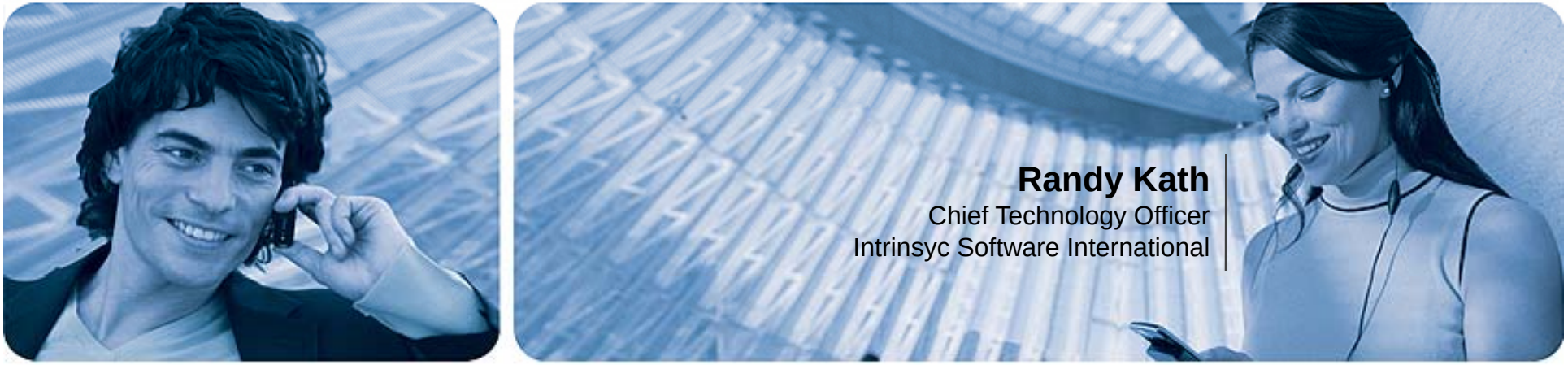

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Chief Technology Officer
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Next Generation User Interface and Application Frameworks

Market Requirements and Performance Considerations

December 04, 2007

Major Market Disruption Events

Wall Street Journal, Front Page, November 6, 2007

> *"Google, Inc. is trying to shake up the wireless industry's model by helping to create cheaper phones that can support advanced Internet services and serve as a vehicle for its lucrative advertising."*

- Google's Open Handset Alliance is trying to change the game
  - Creates an open platform for mobile application development
  - In theory, any ISV can build applications able to run on multiple phones without modification
  - Google's ecosystem of Internet ISVs are likely early adopters
- iPhone delivered stunning new UI innovations and Web application experiences
  - HTTP browsing, one click access to YouTube, Weather, Stocks – R.I.P. WAP
- Nokia buys Navteq, rolls out OVI
  - Focus on Internet service oriented applications and user experiences
- Verizon Wireless to allow open access to 3rd party applications beginning late 2008

UI Market Requirements

- Rich UI functionality and support for new third-party web-based applications are fast becoming the primary feature differentiators on new handsets
  - **Customized Phone Screens** – Users will choose the icons and information they see when they turn on their phones – like streaming news feeds or weather or updates from their social community sites – like themes today, only richer and deeper customization options
  - **Software Widgets** – Facebook, Myspace, YouTube and other social networking sites are focusing on mobile offerings for their users – this trend will undoubtedly lead to consumer demand for third-party web-applications on phones[1]
  - **New Interface Technologies –** Apple iPhone raised the bar with its gesture-based interface. The ability flick the screen to start scrolling, or pinch to zoom in and out of photos and incorporation of MEMS sensor input are suddenly must have UI features.
- However, the need to get products to market quickly and cost-effectively is greater than ever

An innovative User Interface

[1] 12.3 million consumers in the US and Europe accessed a social networking site with their mobile handset during June 2007 (source: M:Metrics).

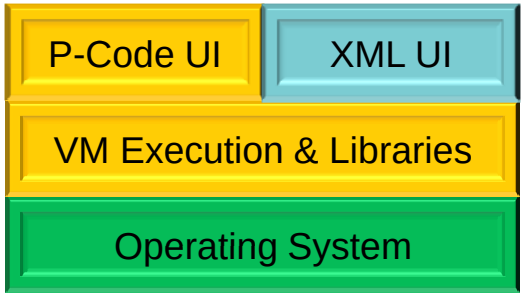
UI Market Requirements

What constitutes a rich UI experience today… and tomorrow?

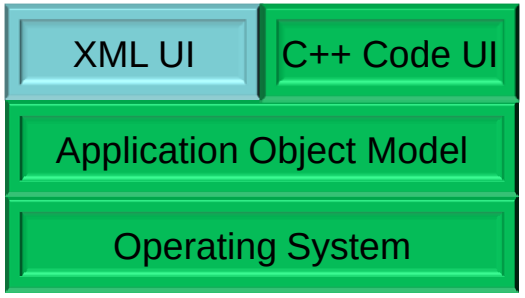
UI Element	What Exists Now	Where We Will Be Tomorrow
Design	Static, generic interfaces, limited branding/customization	Unique user interfaces that focus on specific customer experiences; deep branding and customization capabilities including views, idle screen iconography and indicator icons
Input	Keypad/keyboard, pen/stylus, limited touch-screen	Gesture recognition, voice recognition, MEMS sensor input, location-based contextual awareness
Screen	Small, boring, one-dimensional experience	Larger touch screens, high-resolution images, tailored experiences, multi-purpose usability, 3-D graphics, active animations and transitions
Multimedia	Limited music and video	Video, music, animations, complex image support, web-services
Application Framework	OEM-specific, closed, proprietary	Open platforms, easy customization, simple 3rd party integration, accelerated innovation

UI Performance Considerations

- Many UIs today rely on interpretive code such as Flash, .Net, Java, Ajax or Dalvik and use a virtual machine for application execution
  - The upside is that virtual machines are portable across operating systems and CPUs, though fragmentation does occur (e.g. Java JSRs)
  - Downside is increased memory requirement and slower performance
- UIs implemented using native code execution typically deliver superior performance while using less memory
  - But they are more cumbersome to build and are generally less portable
- Ideal solution blends the best of these two offerings
  - XML-based UI abstraction with native code application execution model



Slower, Bigger Image

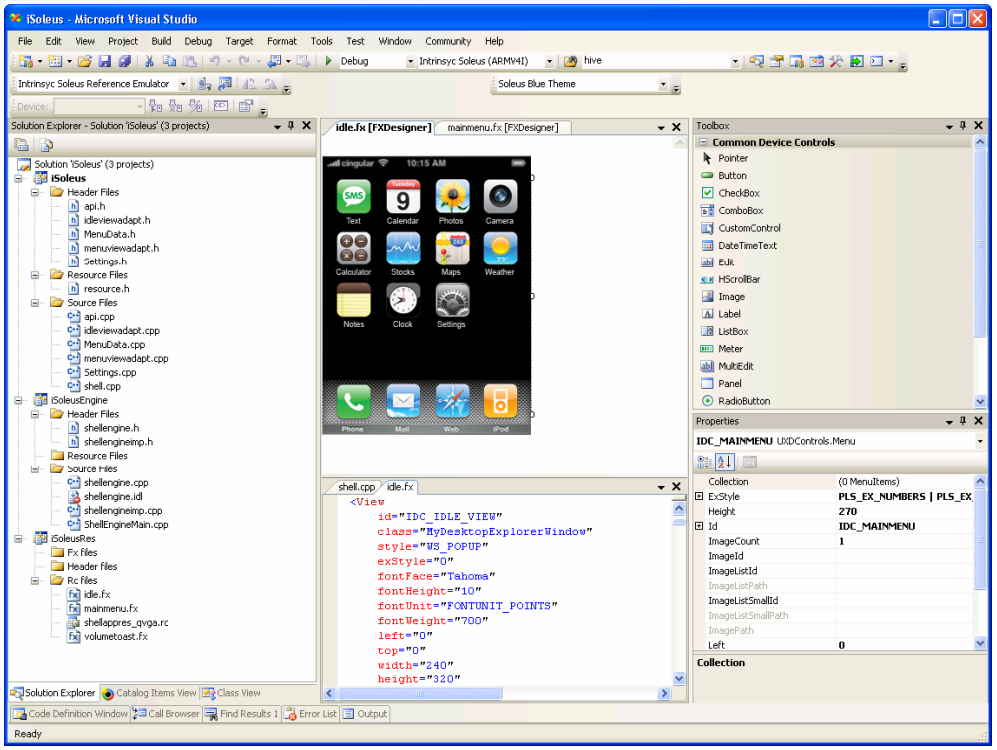


Faster, Smaller Image

UI Integration Considerations

- The goal is to achieve the best possible user experience with a rich, next-generation user interface and application framework
- Must integrate and link together the User Interface and Application Framework
  - Lots of User Interfaces are look and feel only – UI is not integrated at the application level
  - UI should be more than just skin deep – needs to go deep into how the user flows through applications.
- Requires an integration mechanism
  - An “SDK” that enables replaceable third-party software applications
  - A framework for building user interface, preferably in XML
  - An application object model providing functionality shared by multiple applications
  - Includes Web services object extensions
  - A toolset that is optimized to differentiate between application and UI layers, freeing developers to customize features in both layers

UI Tools Considerations



- To develop a rich, flexible UI, developers need a framework designed to work in the tool chain where application development is performed
- Complete customization of the end-to-end user experience: applications and services; overall look and feel of the UI; the behavior of applications; and the creation of new UI elements
- A rich application object model with support for new Web-applications and thoughtful 3rd party integration
- It includes a standard SDK that allows developers to work on designs without having to consider custom OS image configurations
- A great design environment including WYSWYG layout, emulation, an extensible library of widgets, built-in themes, support for scripted animation and a robust host platform

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Next Generation UI & Apps Framework Must Haves

- Innovative features
  - Gesture-based input, rich graphics and animation effects, web-application object model
- Performance
  - Customizable, XML-based UI abstraction with native code execution
- Integration
  - Application object model designed to support innovative new Web-based applications and integrate functionality with existing and future 3rd party applications
- Tool Chain
  - A solid tool chain with UI and Application framework features to support rapid customization and end-to-end user experience development

Thank you

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