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Mobile Architecture & Security

Introduction

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Checking in

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Lecture Time

Saturday, 11am-1pm

JJ R4.08

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Tutorial Time

Saturday, 2pm-4pm

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CAs

Allocation of Marks	
Project	50%
Exam	50%

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Overview

Brief History of Computing

What is Mobile?

Mobile Applications

Mobile Strategy

Software Architecture

Designing Mobile Apps

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Brief History of Computing

1960's – Mainframe systems using punched cards

- Nightly batch processing jobs
- Systems' data may lag manually held records

1970's – Mainframe systems with data entry performed at dumb terminals

- ISAM/VSAM filesystems used to store data

1980's – Mainframe systems accessed by PCs

- Data held in SQL relational databases
- Some work performed on client PCs

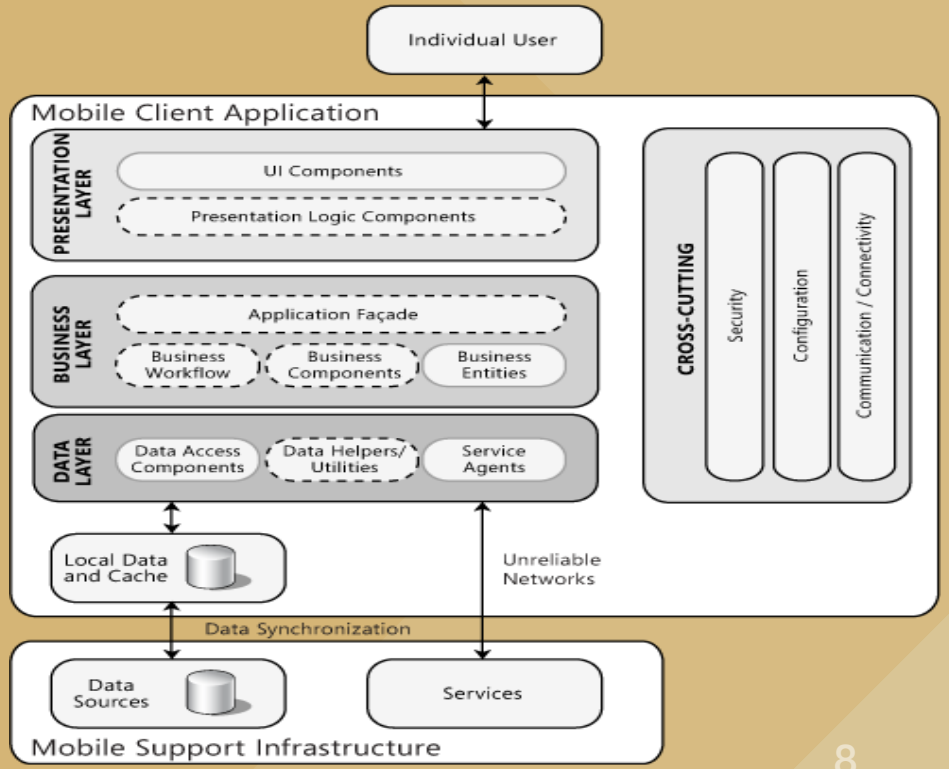
1990's – 2-Tier Client-Server

- 2-Tier systems in which clients hold UI and application code usually accessing a SQL relational database
- Costly to support client software
- Transaction throughput low

2000's – N-Tier

- Java EE EJB, DCOM or CORBA
- LAMP
- Web

Brief History of Computing



N-tier Architecture

Presentation Layer
- Choice of UI
- Model-View-Presenter, Model-View-Controller

Business Logic Layer
- Entities, Workflows, Rules

Data Access Layer
- Storage, Integration

Service Layer
- Interfaces, patterns
- REST, SOAP

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What is Mobile?

Back in 1990 (yes, you read that right), Bill Gates gave a keynote talk at Comdex titled “Information at Your Fingertips”…

For the last 20 years, we pretended we really had information at our fingertips…

But we only had that information at hand…

How long it took us to cover the short distance from hand to fingertips?

When things became truly “mobile”?

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What is Mobile?

It is a **paradigm shift**

Mobile enables new business scenarios and new ways of doing the same business

Mobile affects nearly everybody—users, professionals, and clearly developers

Writing mobile apps is a challenge that the vast majority of developers will face in the near future

Mobile apps are simpler than desktop or web applications—but that's true only if you count just the number of functions

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What is Mobile?

The hardest part of mobile development is to identify the right set of use-cases and the right user experience and interaction model

Typical mobile application user is much less forgiving than the average user of web or desktop applications

Software developers are forced users to play by the rules of software for decades

In contrast, mobile developers will be forced to play by the rules of user experience and conform to user expectations

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What is Mobile?

The definition of a mobile solution is not craved in stone

- The mobile industry never sleeps, so any current definition can change in a year or two
- A mobile solution applies to a particular business scenario: what if business has social network implications?

Going mobile is **more than just simply writing an iPhone app**

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Mobile Apps

Development and Costs

- Neither expensive nor quick
- Different programming frameworks, different languages
- Need to produce different interfaces for different devices

Phones, Tables and even Phablets!

Targeting Multiple Platforms

The most popular platforms today are iPhone, iPad, Android, Windows Phone, and BlackBerry

The list of platforms, however, doesn't end here: Symbian, Windows Mobile, Meego, Bada, QT, webOS…

And how about tablet-specific OS? Android Honeycomb, BlackBerry PlayBook, Windows 10…

Each platform has:

- operating system
- application programming interface (API)
- own set of programming guidelines
- platforms require apps to be written in specific languages (Java, Objective-C, C#, or C++)

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Mobile Apps

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Mobile Apps

Device Fragmentation Issue

- Each device…
- Has its own browser…
- Each browser has its own user agent string…
- Which changes for each version and operating system update!

Tactics to tackle Device Defragmentation:

- Group devices in classes based on their capabilities
- Build a version of the site for each class of devices that you intend to support
- Define a strategy to serve the right site for each connected device

That's easy to say, but…

- How can you determine the capabilities of a given device…
- Know the size of the screen… OS type…
- The quality of video codecs… If it supports GPU…
- Certain HTML features… The accuracy of GPS features…
- And can even simply display page-embedded images (Base64-encoded)?

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Mobile Apps

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Mobile Apps

About 10 years ago, Luca Passani had the vision of starting a community-driven project aimed at collecting reliable information about the effective behavior of mobile devices

He created the **WURFL** project, short for "Wireless Universal Resource File"

WURFL is a centralized database that stores detailed information (more than 500 different capabilities) about more than 15,000 mobile devices and mobile browsers

Today, **WURFL** is managed by ScientiaMobile and made available through both commercial and open-source licenses

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Mobile Strategy

You need a **strategy** before you need a mobile site or an app

Three Mobile Axioms

1. Provide your services through multiple channels
2. Look for new opportunities and new ways to provide your services
3. Aim at making your customers' lives easier

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Mobile Strategy

1. Multiple Channels

How many different devices we have nowadays?

How many platforms?

How about your existing back end?

Is it cloud-based?
Is it scalable?
Is it secure?

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Mobile Strategy

2. New Ways to Provide Services

Mobile is about **bringing existing services** to people's fingertips…

Plus **creating brand-new services**

What is an advantage of an mobile app compared to a desktop app?

It potentially has exactly what a user needs
It is almost instant

What impact GPS chips had on modern mobile apps?

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Mobile Strategy

3. Simplify Customer's Lives

Mobile applications are more personal than desktop applications

Simpler in terms of logic and complexity, and they often consume smaller amounts of information

Users want **focus**

Effective mobile application should be able to **give users what they need** at **any particular moment**

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Mobile Strategy

How would you define a Mobile Strategy?

Each business has its own mission expressed as purposes and activities

Mobile strategy revisits and extends these purposes and activities in light of new devices and a new lifestyle

With a strategy defined in terms of expectations and requirements (covering growth, profitability and markets), you can look at your overall mobile strategy

2 possible expectations:

Reaching the largest possible audience

Improving the experiences of existing users by building a jaw-dropping app

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Mobile Strategy

Reach Out to Users

- Which devices are your customers using?
- How do you make your app available to them?

Offer Rich Applications

- Know your audience – maybe they have preferences already?
- Should you address all the major mobile platforms at the same time?

Keep in mind: mobile apps don't necessarily mean iPhone or Android apps… A mobile site can be as functionally rich, and it is usually more cost-effective

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Mobile Strategy

Two categories

- Business-to-Consumer (B2C)
- Business-to-Business (B2B)

B2C or B2B?

- poses different challenges
- drives different implementation choices

B2C: how to make app available and get consumers?

B2B: you have a fixed number of users to reach

Mobile Strategy: B2C

You may need to reach the largest audience possible, including holders of low-end devices

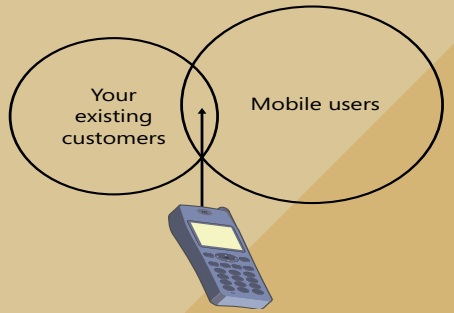
You may need to push a mobile application with certain characteristics to keep existing users and make them glad that they chose your brand

Alternatively, you may need a mobile application to attract and engage new users by offering new services or new ways of consuming existing services

Mobile Strategy: B2C

Focus on Your Audience

- Not all of your existing customers will become users of your new mobile infrastructure
- Some generic mobile users will join the universe of your customers because of the mobile framework
- This also should be read the other way around: If you don't go mobile, you may lose a share of your existing customers who are also mobile users



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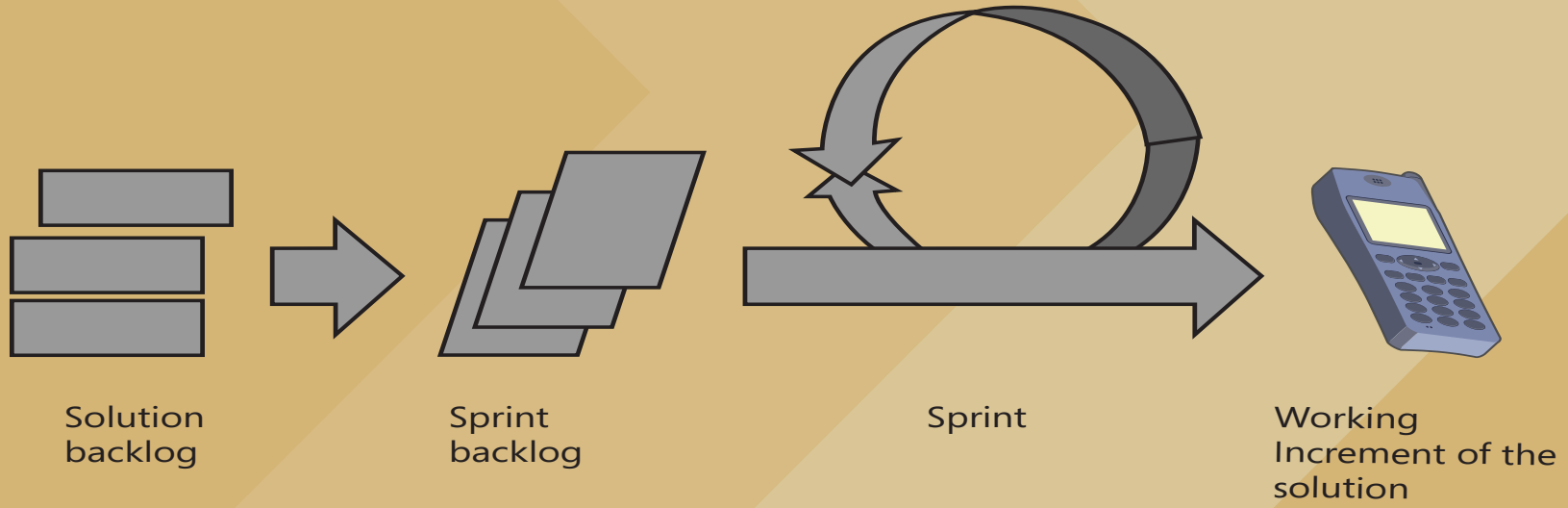
Mobile Strategy: B2C

A Scrum-like model for mobile solutions



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Mobile Strategy: B2C

Sprints can include the following:

Arranging a website that's usable by both mobile applications and sites. This means exposing the core functions of the website as easily callable, Representational State Transfer (REST) – based, HTTP endpoints.

For example, if you're building the website using the ASP.NET Model-View-Controller (MVC), this may mean exposing an ad hoc controller that can serve requests based on the use-cases that you implement in mobile clients

Developing a set of pages (scripts, styles, graphics, and presentation logic) for a class of mobile devices

You may want to start with high-end devices and proceed downward to enable more and more lower-end devices to access some fraction of the full site functionality

Optimising the behavior of these pages with more accurate device-detection capabilities

Developing native applications for most popular mobile platforms

At each level, you can propagate valuable user feedback through the entire stack of applications you've built thus far

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Mobile Strategy: B2C

Delivery Models

The Freemium Model

Provide the full application free and then offer users the chance to buy a few extra services

The Premium-with-Free-Sample Model

Make a significant portion of content for a small fee and leave the rest to be free

The Quid-pro-Quo Model

The free applications are entirely free; however, you need to buy or consume some other services that the publisher relies on for income

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Mobile Strategy: B2B

B2B often gives you the chance to choose one specific platform or middleware and vendor

In a **B2B** scenario, you typically choose a mobile vendor by analyzing its mobile enterprise application platform (**MEAP**)

A **MEAP** indicates the entire stack of mobile technologies, products, and services that a mobile vendor (e.g., Sybase) offers.

When building a mobile solution, you could proceed by building a few stand-alone front-end applications that are based on an existing middleware or an ad-hoc back end and storage layer

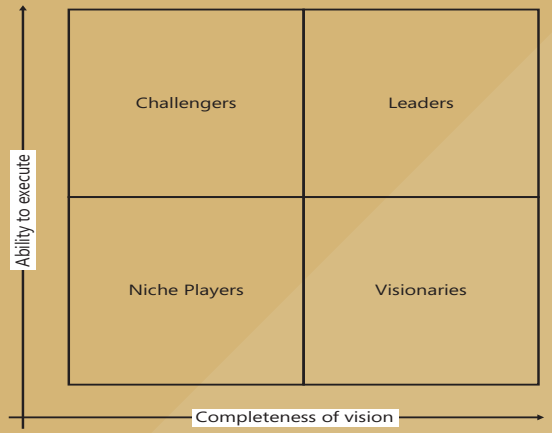
MEAP is beneficial because by choosing a particular vendor. A company can often build a single back end and front end and deploy them to a variety of devices

Mobile Strategy: B2B

Gartner's Rule of Three

According to Gartner, a company should consider a **MEAP** seriously when the implementation of its mobile strategy requires three or more mobile applications for three or more mobile operating systems to be integrated with three or more back ends

MEAP and Gartner's Magic Quadrant



2011

- Sybase
- Antenna Software
- Syclo
- RhoMobile
- Pyxis Software

Software Architecture

ANSI/IEEE standard 1471, “Recommended Practice for Architectural Description of Software-intensive Systems”, has the following definition:

Architecture *is the fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principles guiding its design and evolution.*

This standard also defines the following terms related to this definition:

*A **system** is a collection of components organized to accomplish a specific function or set of functions. The term system encompasses individual applications, systems in the traditional sense, subsystems, systems of systems, product lines, product families, whole enterprises, and other aggregations of interest. A system exists to fulfil one or more missions in its environment.*

*The **environment**, or context, determines the setting and circumstances of developmental, operational, political, and other influences upon that system.*

*A **mission** is a use or operation for which a system is intended by one or more stakeholders to meet some set of objectives.*

*A **stakeholder** is an individual, team, or organization (or classes thereof) with interests in, or concerns relative to, a system.*

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Software Architecture

What is software architecture?

- Addresses structural concerns
- Addresses behavioural concerns
- Focuses on the significant elements
- Software systems exist to meet the expectations of stakeholders
  - *Trade-offs may be required to balance stakeholder needs*
  - *Expectations expressed as functional and non-functional requirements*
- Important, key decisions are made early in the development process
- Lays out the foundations for the system
- Influenced by its environment

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Software Architecture

We are interested in the views of the application architecture

- System broken down into components and classes
- Relationships and dependencies
- Usage scenarios
- Detailed workflows

A Notation for Describing Application Architecture

- Can use UML diagrams
  - *Class diagrams*
  - *Use-case diagrams*
  - *Component diagrams*
  - *Sequence diagrams etc.*

Software Architecture

What is the boundary between architecture and implementation?

The boundary between architecture and implementation is encountered when a *black box of behaviour* is reached. This is a piece of functionality that can easily be replaced or refactored with minimal impact on the rest of the architecture.

Martin Fowler, "*Patterns of Enterprise Application Architecture*", Addison Wesley, 2002, states:

…if you find that something is easier to change than you once thought, then it's no longer architectural. In the end architecture boils down to the important stuff —whatever that is.

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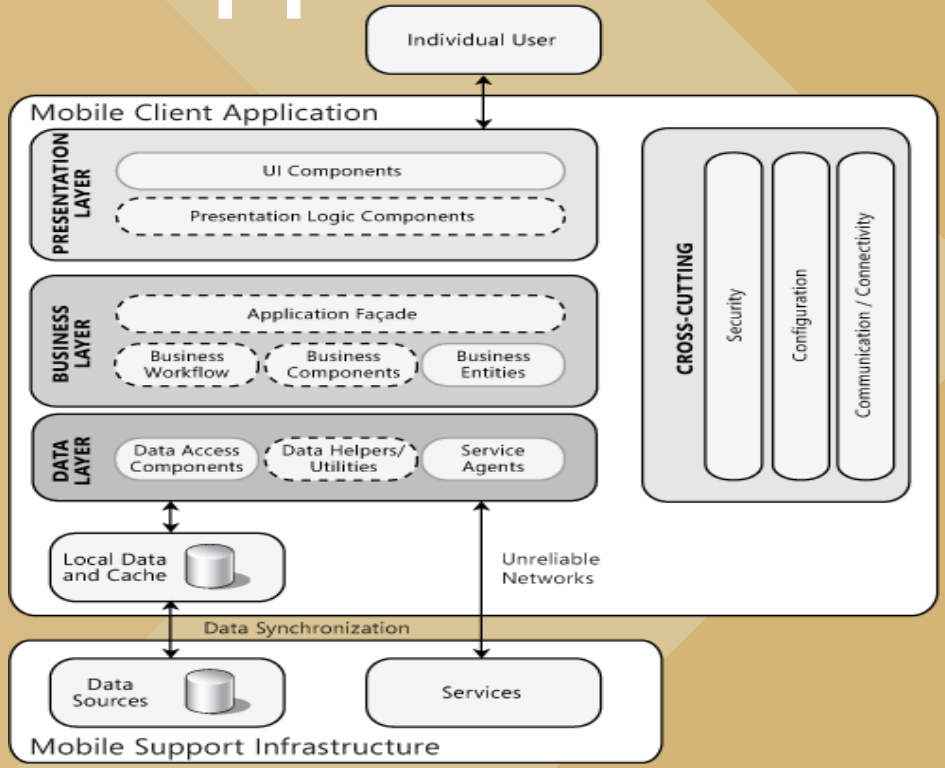
Designing Mobile Apps

A mobile application will normally be structured as a multilayered application consisting of presentation, business, and data layers

When developing a mobile application, you may choose to develop a thin Web-based client or a rich client

If you are building a rich client, the business and data services layers are likely to be located on the device itself

If you are building a thin client, all of the layers will be located on the server



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Designing Mobile Apps

General Design Considerations

- Decide if you will build a rich client, a thin Web client, or rich Internet application (RIA)
- Determine the device types you will support
- Consider occasionally connected and limited-bandwidth scenarios when appropriate
- Design a UI appropriate for mobile devices, taking into account platform constraints
- Design a layered architecture appropriate for mobile devices that improves reuse and maintainability
- Consider device resource constraints such as battery life, memory size, and processor speed

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Designing Mobile Apps

Specific Design Issues

- Authentication and Authorization
- Caching
- Communication
- Configuration Management
- Data Access
- Device Specifics
- Exception Management
- Logging
- Porting Applications
- Power Management
- Synchronization
- Testing
- User Interface
- Validation