CSCE 4623 Mobile Programming – Midterm Study Guide

# Introduction

What is mobile computing?

Why is it different than traditional computing?

What are some design considerations and constraints that are different?

# Dimensions of Mobile Computing

Multimodal and Variant UIs

Large Variety of Platforms

Active Behavior

Limited Device Capabilities

Limited Power Supply

Location Awareness

Wireless Connectivity

# Condition of the Mobile User

Moving between locations known & unknown

* Context Awareness

Not focused on completing task

* Active Transactions

Requires immediacy and responsiveness

* What are some rules of thumb for time limits?

Changes tasks frequently and abruptly

* Handle notifications and transitions

Require access anytime and anywhere

# MV\* Design Patterns

Why? Separation of concerns.

MVC – Model View Controller

* Model – components that do the work
* View – Display aspects
* Controller – Send messages to model and interface between views and models

MVP – Model View Presenter

Data Management/User Interface

How do I manage my data? How does my user interact with my data?

* Model – The data
* Selections – How to specify data
* Commands – How do I change my data
* View – How do I display my data
* Interactors – How do events map into changes
* Presenter – How do I put it all together
  + Responsible for main/event loop
  + Creates models, selections, commands, views, interactors
  + Enables business logic

MVVM – Model View Viewmodel

* View – Responible for structure, layout, appearance
  + Typically in markup language
* Model – Application domain model
  + Business logic & validation logic
* ViewModel – Intermediary between view and model

# Android OS Architecture

Based on Linux kernel

* Maintain standard security practices
* Consistent functionality across devices (reduce platform proliferation)

Hardware Abstraction Layer

* Standard interface to work with hardware resources
* Abstract to remove need to understand exact hardware modules

Android Runtime

* Each app runs in its own process
* Each process runs in its own virtual machine

Native C/C++ Libraries

* Provide APIs to common C/C++ libraries

Java API Framework

* Android OS features available through Java APIs

System Applications

* Base applications provided for consistent use

Principle of Least Privilege

* Each app has access only to components that it requires & nothing more

# Android Fundamental Components

## Activity

Combination of a view and business logic

Multiple activities can come together to create application

Activity Lifecycle

* onCreate(), onStart(), onResume(), onPause(), onStop(), onDestroy(), onRestart()

Must be declared in manifest

Can be started by other activities

## Services

Component to perform long-running operations, often in background

* No user interface

Foreground Services

Background Services

Bound Services

Service lifecycle

## Broadcast & Broadcast Receiver

Broadcast – Event message to convey information to receiving objects

## Content Provider

Consistent access to a central repository of data

# Tasks & Back Stack

Task – Collection of activities created during operation

Back stack – Tasks organized into a stack

Started activities are added to backstack

There may be more than one instance of a particular activity on the backstack

The whole task stack is moved to the background when a separate application is brought to the foreground

# Alarms & Alarm Manager & Job Scheduler

Alarm – used to wake Android system to perform operation

Scheduled through alarm manager

Enables “Active behavior”

Alarms wrap an intent to perform an activity, creates a pendingIntent so that Android can service the Intent, and schedules with the alarm manager

Intent object may have extras that can be received by the broadcast receiver

Often used in conjunction with a broadcast receiver

Job Scheduler, Firebase JobDispatcher, & Sync adapter may be used to perform other computation at scheduled or future times

# Notifications

Message displayed to the user outside of the normal interface

Toast Notification – Small popup of text with short duration

Status bar notification – Message in the notification area that has a title, content, icon, channel, and may have associated actions

May be updated

Often create an artificial backstack to a deeper activity

May launch to a special activity that does not have parent activities

# Location Services

Location important because user is mobile

Location API (deprecated) and Google Play Services location (preferred)

Location object has Longitude/Latitude

Converting from address to long/lat = Geocoding

Converting from long/lat to address = Reverse Geocoding

Geofencing – Combine user’s location with area of interest

Composed of a longitude/latitude/and radius

Events – Enter/Exit/Dwell