Telephony Package, APIs and Applications
Nov. 12, 2014

package android.telephony, https://developer.android.com/reference/android/telephony/package-summary.html

- Provides APIs for monitoring the basic phone information such as network type and connection state, plus utilities for manipulating phone number strings
- **Classes**
    - CellIdentdityCdma – Represents unique CDMA (code division multiple access) cell
    - CellIdentityGsm – Represents GSM (Global System for Mobile Communication) cell
    - CellIdentityLte – Represents LTE cell
    - CellIdentityWcdma – UMTS (Unified Mobile Telephone Service) cell
    - CellInfo – Immutable cell information from a point in time
    - CellInfoCdma – Immutable CDMA cell information from a point in time
    - CellInfoGsm – Immutable GSM cell information from a point in time
    - CellInfoLte – Immutable LTE cell information from a point in time
    - CellInfoWcdma – Immutable UMTS cell information from a point in time
    - CellLocation – Abstract class that represents the location of the service
    - CellSignalStrength
    - CellSignalStrengthCdma
    - CellSignalStrengthLte
    - CellSignalStrengthWcdma
    - IccOpenLogicalChannelResponse
    - NeighboringCellInfo – Represents the neighboring cell information, including Receiving Signal Strength and Cell ID location
    - PhoneNumberFormattingTextWatcher – Watches a TextView and If a phone number is entered will format it
    - OhoneNumberUtils – Various utilities for dealing with phone number strings
    - **PhoneStateListener** – A listener class for monitoring changes in specific telephony states on the device, including service state, signal strength, message waiting indicator (voicemail), etc;
    https://developer.android.com/reference/android/telephony/PhoneStateListener.html
    - ServiceState – Contains phone state and service related information
    - **SmsManager** – Manages SMS operation such as sending data, text, and pdu SMS (Pdu – Protocol Description unit)
    - SmsMessage – A Short Message Service message
    - SmsMessage.SumbitPdu
    - **TelephonyManager** – Provides access to information about the services on the device, https://developer.android.com/reference/android/telephony/TelephonyManager.html

public final class telephony extends Object,
https://developer.android.com/reference/android/provider/Telephony.html

- The Telephony provider contains data related to phone operation, specifically SMS and MMS messages and access to the APN list, including the MMSC to use.
- Note: These APIs are not available on all Android-powered devices. If your app depends on telephony features such as for managing SMS messages, include a <uses-feature> element in

your manifest that declares the "android.hardware.telephony" hardware feature. Alternatively, you can check for telephony availability at runtime using either hasSystemFeature(PackageManager.FEATURE_TELEPHONY) or getPhoneType().

- Nested Classes

interface	Telephony.BaseMmsColumns	Base columns for tables that contain MMSs.
interface	Telephony.CanonicalAddressesColumns	Columns for the "canonical_addresses" table used by MMS and SMS.
class	Telephony.Carriers	Carriers class contains information about APNs, including MMSC information.
class	Telephony.Mms	Contains all MMS messages.
class	Telephony.MmsSms	Contains all MMS and SMS messages.
class	Telephony.Sms	Contains all text-based SMS messages.
interface	Telephony.TextBasedSmsColumns	Base columns for tables that contain text-based SMSs.
class	Telephony.Threads	Helper functions for the "threads" table used by MMS and SMS.
interface	Telephony.ThreadsColumns	Columns for the "threads" table used by MMS and SMS.

From Prof. Lin's lecture note on "Mobile Networking Communication Infrastructures and Technologies", slides 27-35
- ■ GSM (Global System for Mobile Communication)
  - Digital mobile telephony system launched in Finland in 1991
  - Use time division multiplexing (TDMA), Digitize and compress data
  - 900 MHz or 1800 MHz frequency band
  - SIM cards (Subscriber Identity Module)
  - Capture 82.4% of all global mobile connection
  - Widely used in Europe and Asia
  - Bands
    - o 2 bands, each band 25 MHz
    - o 124 Channels of 200 kHz separated by guard bands
  - Transmission
    - o Voice channel → Digitize + Compress → 13-kbps digital signal
    - o 1 slot = 156.25 bit
    - o 1 Frame (TDMA) = 8 slots; frame duration 120 ms
    - o A Multi-frame = 26 frames (TDMA) = 270.8 kbps
    - o 26 frames = 24 traffic frames + 2 control frames
    - o 270.8 kbps → GMSK → 200 kHz signal (FDMA)

- Reuse Factor 3
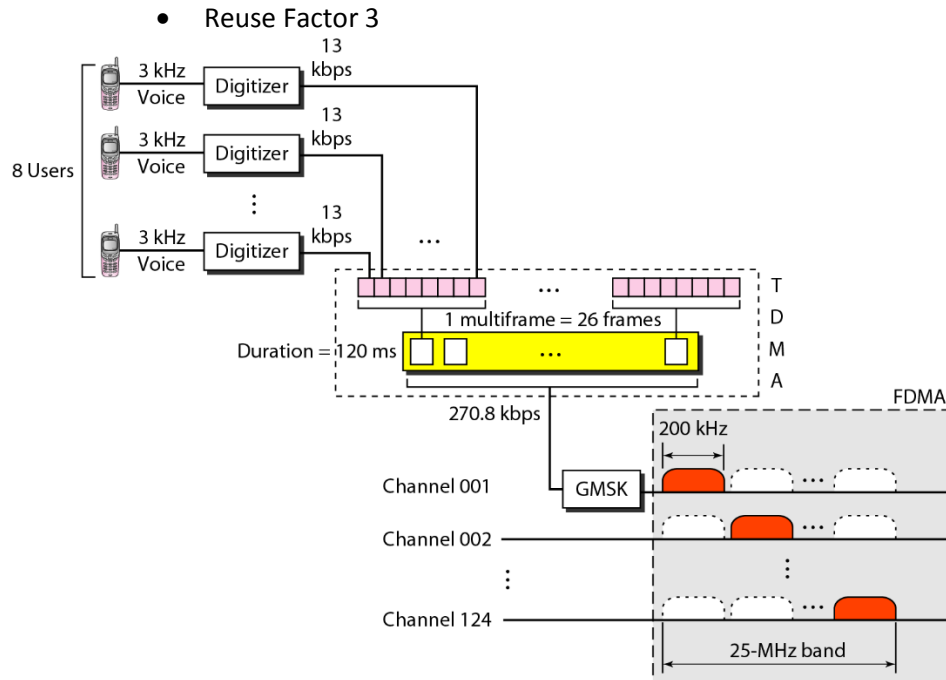
Source: **Figure 16.8 of Data Communications and Networking by Forouzan, 4th**

- **3rd Generation Technologies**
  - A Combination of Technologies
    - Audio and Video, VoIP, Still & Moving Images, Digital Data
  - UMTS (Unified Mobile Telecommunication System)
    - Enhanced multimedia: movie, images, music Internet Surfing
    - Video telephony, Video conferencing
    - Always connected infrastructure
  - WCDMA (wideband CDMA)
    - Used by most GSM cellular providers
  - CDMA2000
    - Code Division Multiple Access
    - Pioneered by Qualcomm
    - Used by most CDMA providers
    - Used by Verizon Wireless and Sprint

- 4G Technologies, http://en.wikipedia.org/wiki/4G
  - LTE (Long Term Evolution) Specification:
    http://en.wikipedia.org/wiki/LTE_(telecommunication)
    - Download link max 300 Mbits/sec, uplink peak rate 75 Mbits/sec
    - Transfer latency of less than 5 ms in the radio access network
  - 4G LTE (Long Term Evolution), based on GSM/EDGE (Enhanced Data Rates for GSM Evolution or EGPRS) and UMTS/HSPA (High Speed Downlink Packet Access) network technologies
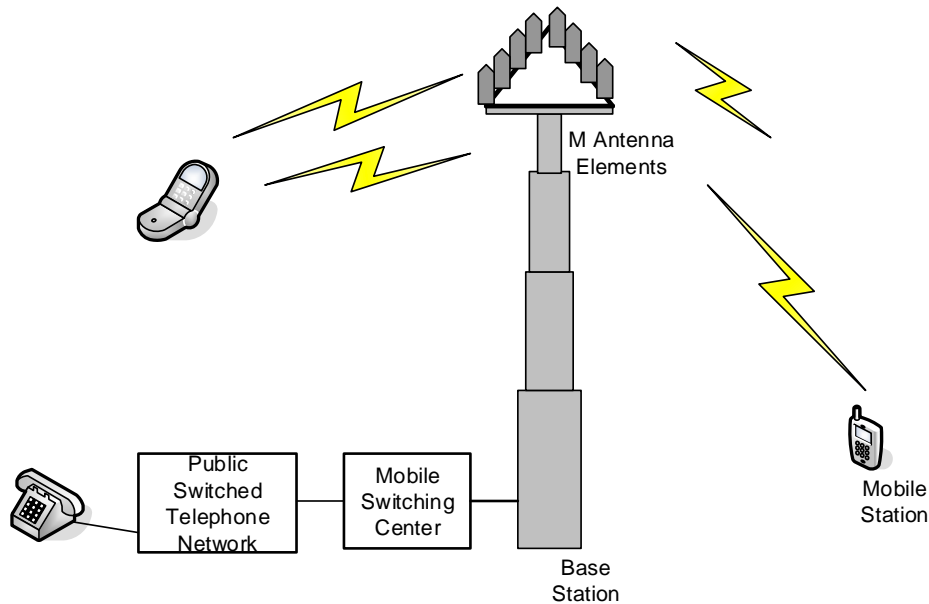
From Prof. Lin's lecture note on "Mobile Networking Communication Infrastructures and Technologies", slides 36-37

- Cellular Infrastructure Network Topology
    - Fixed infrastructure with Wide Area Network coverage
    - Mobile ↔ Mobile devices
   - Mobile ↔ Fixed Computer Node
    - Mobile device ↔ Servers
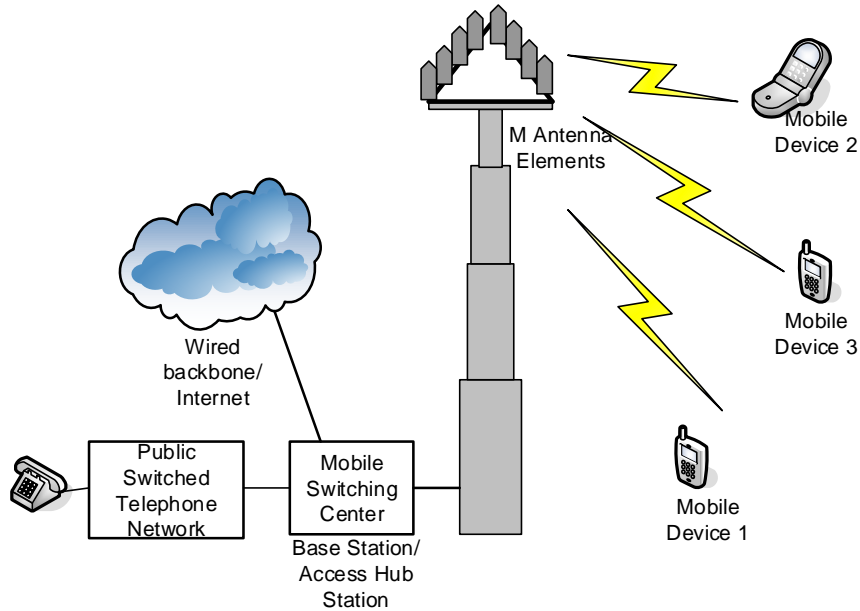
Wireless Mobile Networking Architecture
- **MS - Mobile Station**
    - ME - Mobile Equipment
    - SIM (Subscriber Identification Module)
- **BSS (Base Station Subsystem)**
    - BTS – Base Transceiver Subsystem
    - BSC – Base Station Controller
- **NSS (Network & Switching Subsystem)**
    - MSC – Mobile Switching Center
    - VLR – Visitor Location Register
    - HLR – Home Location Register
    - EIR – Equipment Identity Register
    - AuC - Authentication Center
    - OMC – Operation Management center
    - PSTN Interface (Public Switched Telephone Network)

From Prof. Lin's lecture note on "Mobile Networking Communication Infrastructures and Technologies", slide 46
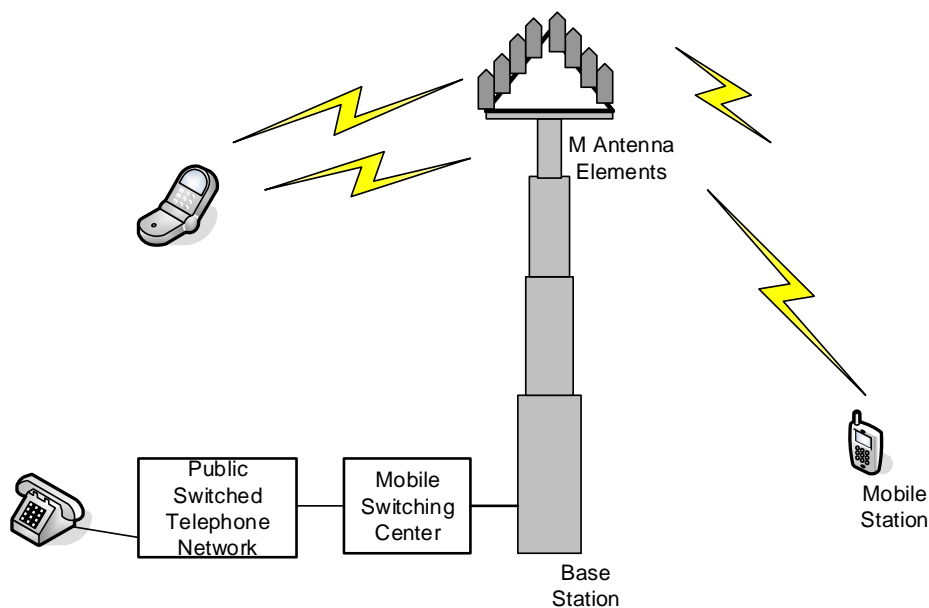
- ■ SIMO (Single Input Multiple Output) Radio Channel
  - • Complex receiver with adaptive smart antenna with M antenna elements
- ■ MIMO (Multiple Input Multiple Output) Radio Channel
  - • N mobile antenna elements
  - • M base station antenna elements

Telephony Applications/Recipe in Chapter 9 Hardware Interface of the text book The Android Developer's Cookbook, pp. 232-236.
- • **Using the TelephonyManager**
  - o Access the information about the telephony service on the device
    - ▪ Device ID, Device Software Version, Line number
    - ▪ Networking Country ISO, Network Operator, Network Operator Name

- - SIM Country ISO, SIM Operator, SIM Operator Name, SIM Serial Number
    - Subscriber ID
    - Voice Mail Alpha Tag, Voice Mail Number
  - getDeviceId(), getDeviceSoftwareVersion(), getLineNumber()
  - getNeworkCountryIso(), getNetworkOperator(), getNetworkOperatorName()
  - getSimCountryIso(), getSimOperator(), getSimOperatorName(), getSimSerialNumber()
  - getSubscriberId()
  - getVoiceMailAlphaTag(), getVoiceMailNumber()
- **Listening for Phone States (using PhoneStateListener,
  https://developer.android.com/reference/android/telephony/PhoneStateListener.html)**
  - Constants: CALL-STATE_IDLE, CALL_STATE_RING, CALL_STATE_OFFHOOK
  - LogCat, for other different states can be seen when an incoming call or outgoing call occur, http://developer.android.com/tools/help/logcat.html
- Dialing a Phone Number
  - AndroidManifest.xml file
    - <uses-permission android:name="android.permission.CALL_PHONE"/>
  - Making a call
    - ACTION_CALL or ACTION_DIALER implicit intent
    - startActivity(new Intent(Intent.ACTION_CALL, Uri.parse(tel:15102345678)));
    - startActivity(new Intent(Intent.ACTION_DIAL, Uri.parse(tel:15102345678)));

Chapter 10 Networking
- Focusing on
  - Network State
  - Short Message Services (SMS)
  - Internet-based Applications
  - Social Networking Applications
- Recipe Example Programs
  - Checking for Connectivity
  - Receiving Connectivity Changes
  - Using SMS
    - Autosending a SMS based on a Received SMS
  - Using Web Content
    - Customizing a Web Browser
    - Using an HTTP Get
    - Using HTTP Post
    - Using WebViews
    - Parsing JSON (JavaScript Object Notation)
    - Parsing XML
  - Social Networking
    - Reading the Owner Profile
    - Integrating with Twitter
    - Integrating with Facebook

Network State/Status
- ConnectivityManager class
  - Mobile (cellular) network availability
  - WiFi network availability

- import android.net.ConnectivityManager
- import android.net.NetworkInfo
  - getSystemService()
  - getNetworkInfo()
  - isAvailable()
  - isConnected()