



# Imagination

**VoLTE or VoIP over LTE –  
Who Is the Ultimate Winner?**

IEEE Santa Clara Valley Consumer Electronics Society

Saraj Mudigonda

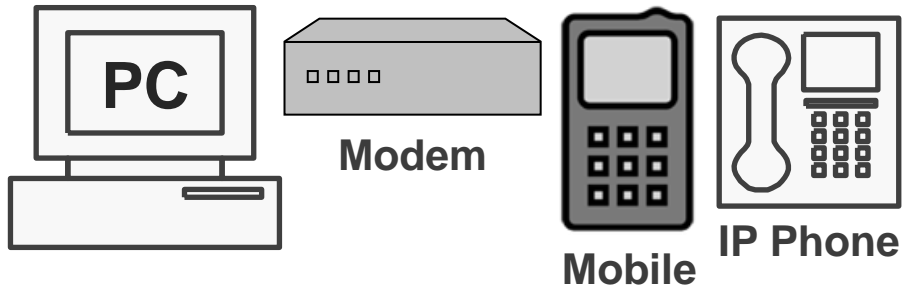
26<sup>th</sup> March, 2013

# Outline

- VoIP Applications
- Market Opportunity
- Requirements of V.VoIP Applications
- VoLTE vs VoIP over LTE
- Operators Super-App
- Roadmap
- Q & A

# Background

Pre-2007



- Limited tools for developers
- Limited processing power on the mobile devices
- Dedicated CPU for the real-time applications
- Embedded- centric applications

Post-2007



- Abundant Tools/APIs available for developers
- Multiple CPUs with GHz processing power
- Multiple OTT applications
- Multiple challenges

# VoIP OTT Apps

Google play voip

SHOP MY MUSIC MY BOOKS MY

Android Apps All prices SafeSearch: Off Sort by: Releva

**Android Apps** At least 1000 results

- WiCall : VoIP call, wifi call**  
ZENITALK VOIP, CALL WITH US / COMMUNICATION  
★★★★★ (9,427)  
INSTALL  
Make cheap calls using your wifi / 3 cheapest VOIP service on the Andro
- VoX Mobile VoIP / SIP Phone**  
VOX COMMUNICATIONS / COMMUNICATION  
★★★★★ (936)  
INSTALL
- MobileVOIP Cheap Calls**  
FINAREA / COMMUNICATION  
★★★★★ (12,342)  
INSTALL
- 3CXPhone for VoIP Providers**  
3CX / COMMUNICATION  
★★★★★ (3,340)  
INSTALL  
Free SIP phone to make VoIP calls is an Android SIP Softphone that w
- Zoiper IAX SIP VOIP Softphone**  
SECURAX LTD. / COMMUNICATION  
★★★★★ (343)  
INSTALL  
Zoiper is a FREE IAX and SIP softp are NO ADVERTISEMENTS. Zoiper

Showing results for "voip"

**iPad Apps**

- Talkatone - free phone calls and... Social Networking Free
- MobileVOIP Social Networking Free
- Tango Text, Voice, and Video Social Networking
- Skype for iPad Social Networking Free
- textPlus Free Text + Calls : Free... Utilities Free
- ooVoo Video Call, Text and Voice Social Networking Free
- Line2 - A new phone line with... Productivity Free
- fring Social Networking Free
- imo messenger for iPad Social Networking Free
- VPN Fire - Bypass Internet... Social Networking Free
- Walkie Talkie Free Entertainment Free
- EZdial VoIP Social Networking Free
- VPn One Click Professional Utilities Free
- iTunnel VoIP Social Networking Free
- Bria - iPad Edition VoIP SIP Phone... Productivity \$12.99
- netTALK-Free Calling + Low... Social Networking Free
- NorthEast Voip Phone Social Networking Free
- iGVoice - Google VOIP... Productivity \$4.99
- Pingm | free phone calls Social Networking Free
- sipgate Social Networking Free

At least couple of hundred VoIP/Video/Messaging apps on Android and iOS Store available for free!!! But, at what cost?

# Options for Mobile Applications

## Over-the-top (OTT) applications

- Best-effort services offered by 3<sup>rd</sup> party (non-operator)
- Can be downloaded from the Apple Store/Google Play/Amazon

## Web-based applications

- Runs directly from the Web browser
- Cloud-based services running thin applications on the device platform

## Pre-loaded Applications

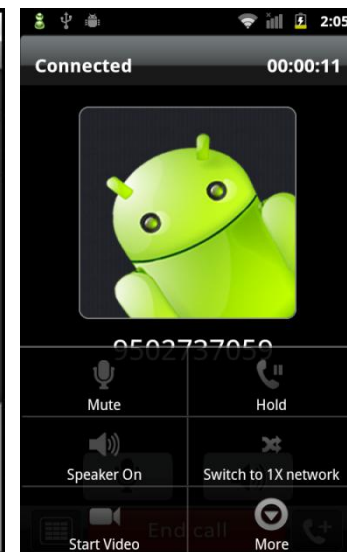
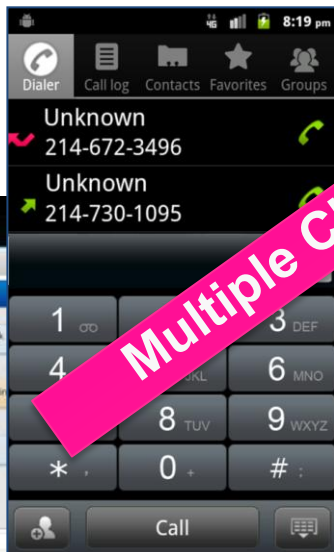
- Bundled with the platform
- Cannot be deleted or disabled
- Camera, maps, mail, calendar applications

## Embedded Applications

- Deeply integrated applications
- Part of the Native Dialer
- VoLTE falls in this category

# Market Opportunity

*Need for single integrated clients to address multi- platform challenge*



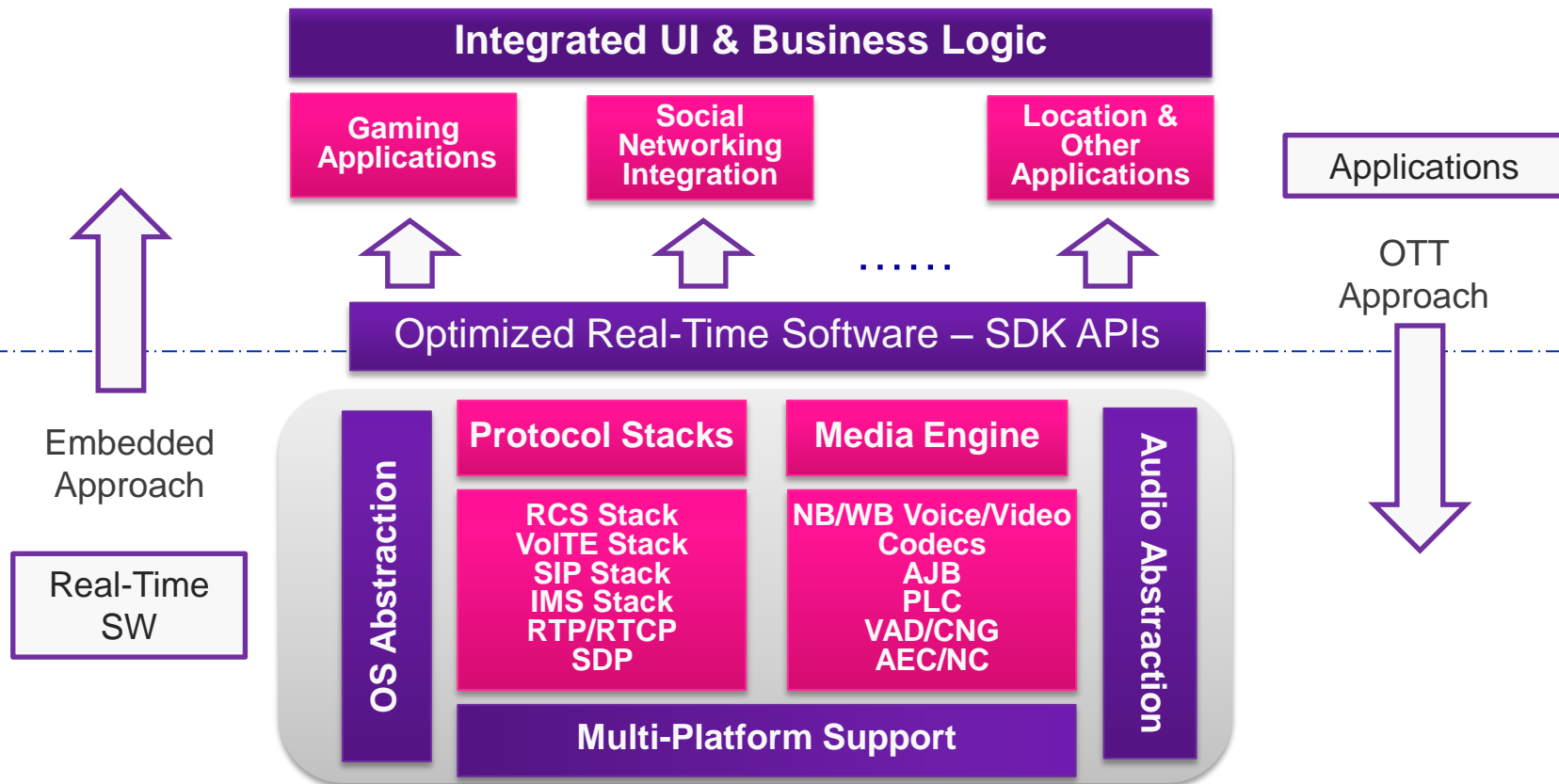
Messaging

VoLTE/  
VoIP on LTE

VoWiFi

VCC  
Seamless HO

# Embedded vs OTT Approach



# Requirements of Real-Time V.VoIP Applications

- Guaranteed QoS
- Low latency
- Low-power consumption
- Bandwidth optimization
- Network integration
- Standards support
- Integrated native application
- Multi-platform support
- Interoperability
- Customer satisfaction



# Guaranteed QoS

Voice + Video Packets/ Data Packets/ Steaming/Web Browsing



OTT – VoIP over LTE



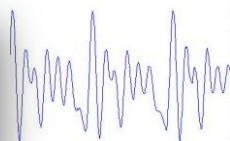
Single Pipe for both Data and Real-time Voice



Congestion of Packets, Packet losses, Out of sequence packets



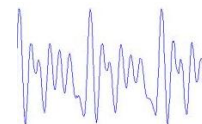
Poor Voice + Video Quality



Voice + Video Packets



Dedicated Bearer for Voice + Video



Superior Voice + Video Quality



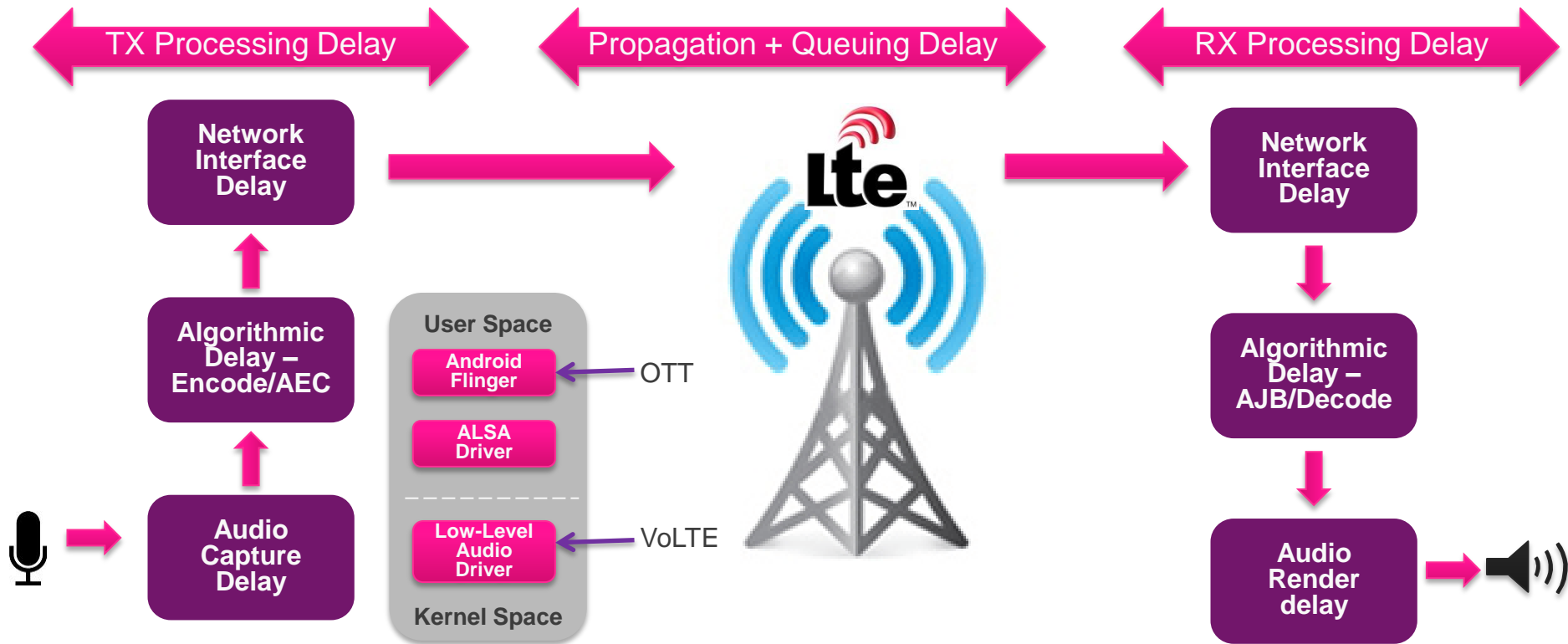
Data Packets/ Steaming/Web Browsing

VoLTE



Data Packets

# Low Latency



OTT end-end latency is ~3x more than embedded VoLTE

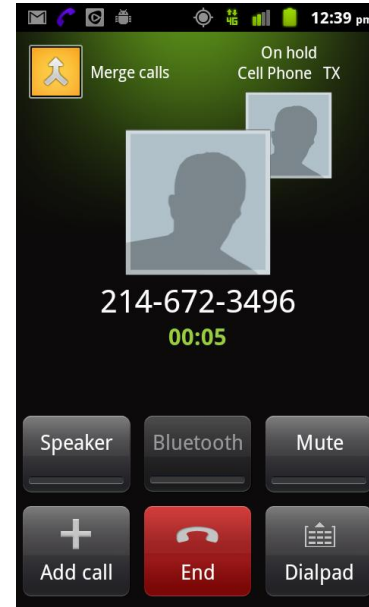
# Integrated Native Application



Native Dialer for  
CS Calls



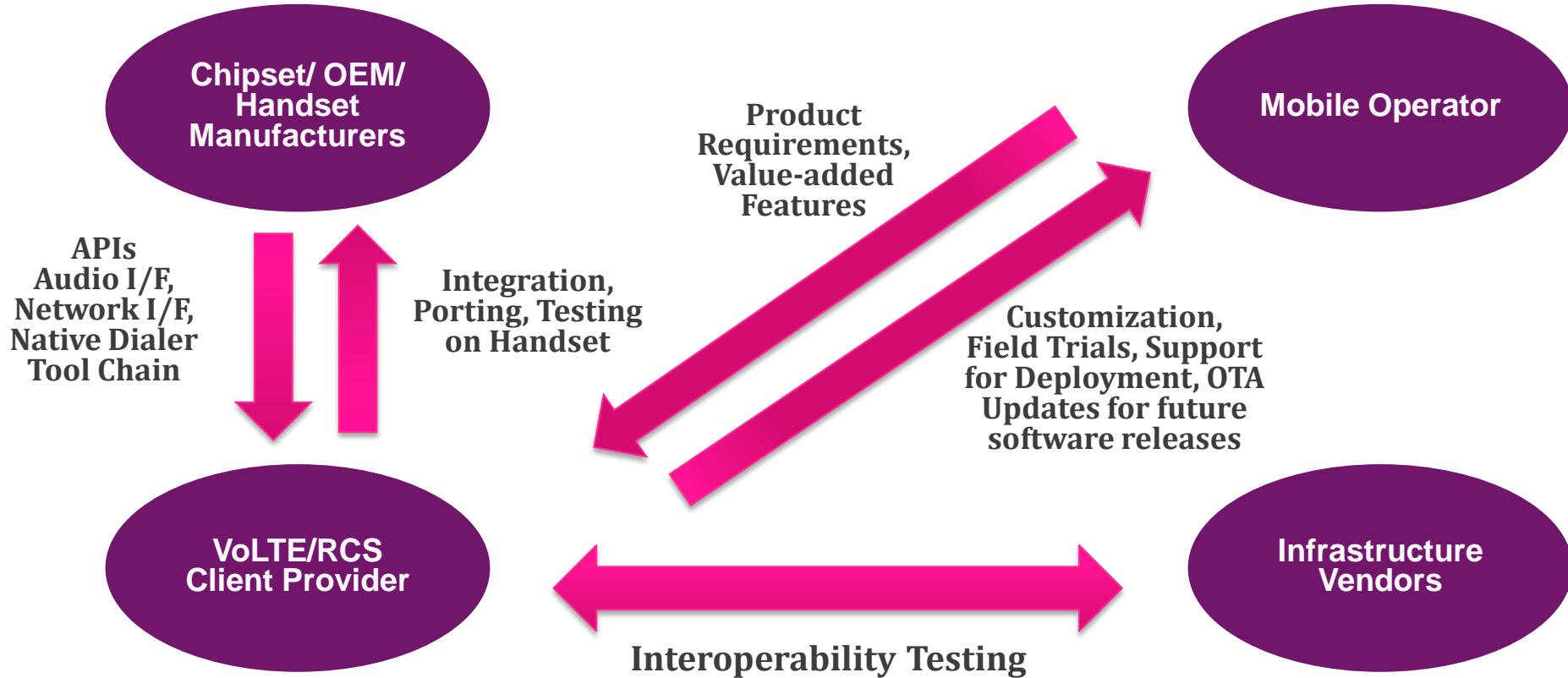
OTT Client for VoWiFi/  
VoIP Over LTE Calls



Integrated Single Native Dialer for  
VoLTE/VoWiFi & CS Calls

# Interoperability

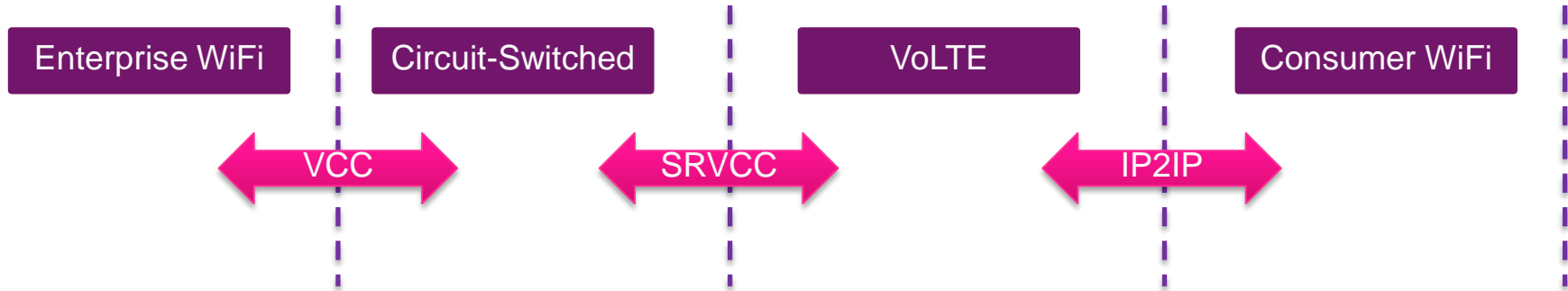
*Ecosystem collaboration is key*



# Low Power Consumption & Bandwidth Optimization

- Integration with hardware accelerators such as Video
- Hand-coding assembly for CPU intensive algorithms (media engine) as the power consumption increases for every MHz used
- Discontinuous Reception (DRX) in connected mode – stopping the transmission during silence packets and aggregation of packets
- Semi-persistent Scheduling (SPS) – assignment of predefined chunk of radio resources for VoIP users with interval of 20ms so that UE is not required to request resources each TTI (Transmission Time Interval)
- RoHC (Robust Header Compression) - For VoIP packets, the size of headers (IP/UDP/RTP) is usually larger than the data itself. For IPv4, UDP and RTP, the amount of overhead due to headers is 40 bytes while RoHC can compress this to 2 or 3 bytes

# Network Integration



- Handover to legacy 2G/3G networks with SRVCC
- Handover to WiFi with IP2IP and ANDSF (Access Network Discovery and Selection Function)
- WiFi complements cellular technologies for improved experience indoors

Preferred Network Policies –

1. WiFi
2. VoLTE
3. CS

# Standards Support

- GSMA PRD IR.92 – IMS Profile for Voice and SMS
- GSMA PRD IR.94 – IMS Profile for Conversational Video Service
- Rich Communication Suite 5.1 Advanced Communications Services and Client Specification
- 3GPP Release 8/9/10/11

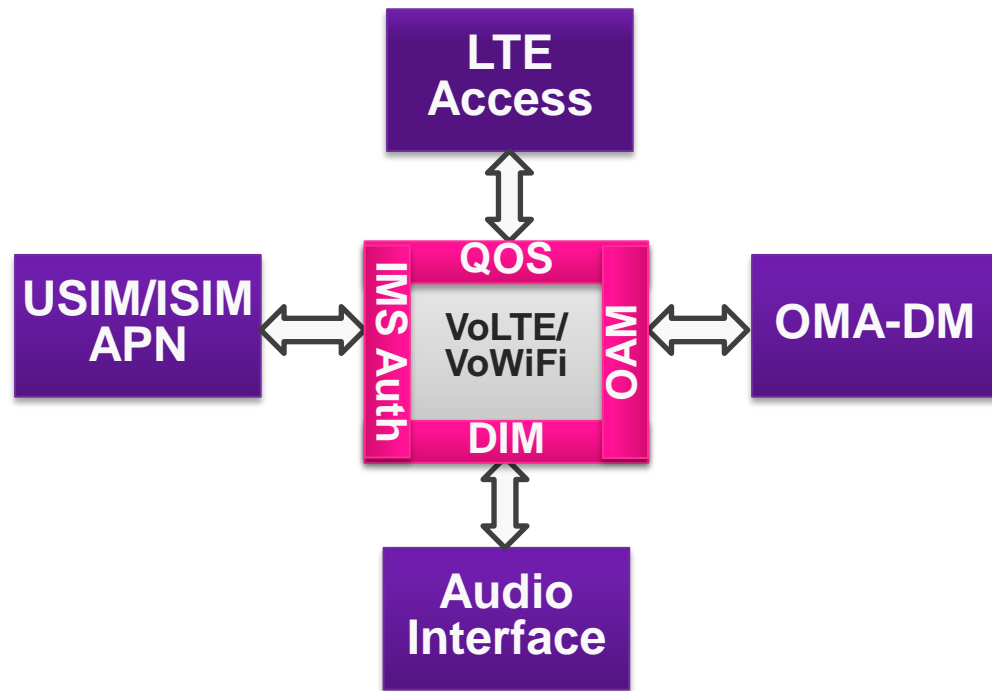
# VoLTE vs Circuit-Switched

- Supports all circuit-switched features
  - Voice calling
  - Call Supplementary Features – Call waiting, transfer, forwarding...
  - E911 Emergency Calling
  - SMS
- Supports improved features
  - HD Voice (AMR-WB) and HD Video
  - Call setup time is less than 0.25 to 2.5 seconds, two to 20 times shorter than 3G voice calls that require an average of five seconds to connect a call
  - Voice quality is 40 percent better than over 3G due to using a wider bandwidth (50–7000 Hz instead of 300–2400 Hz)



# VoLTE Integration

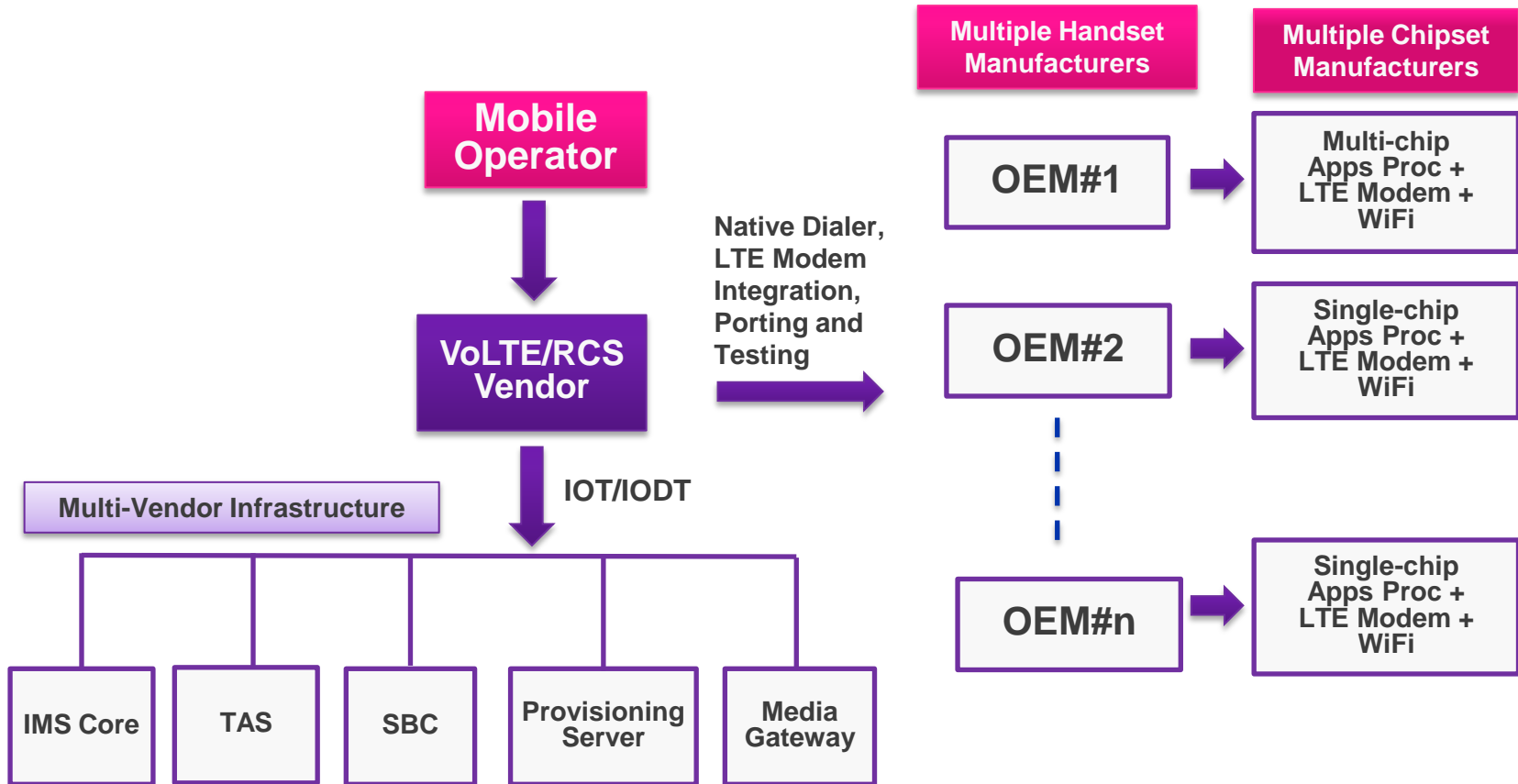
## *IR.92 Compliant Embedded Client*



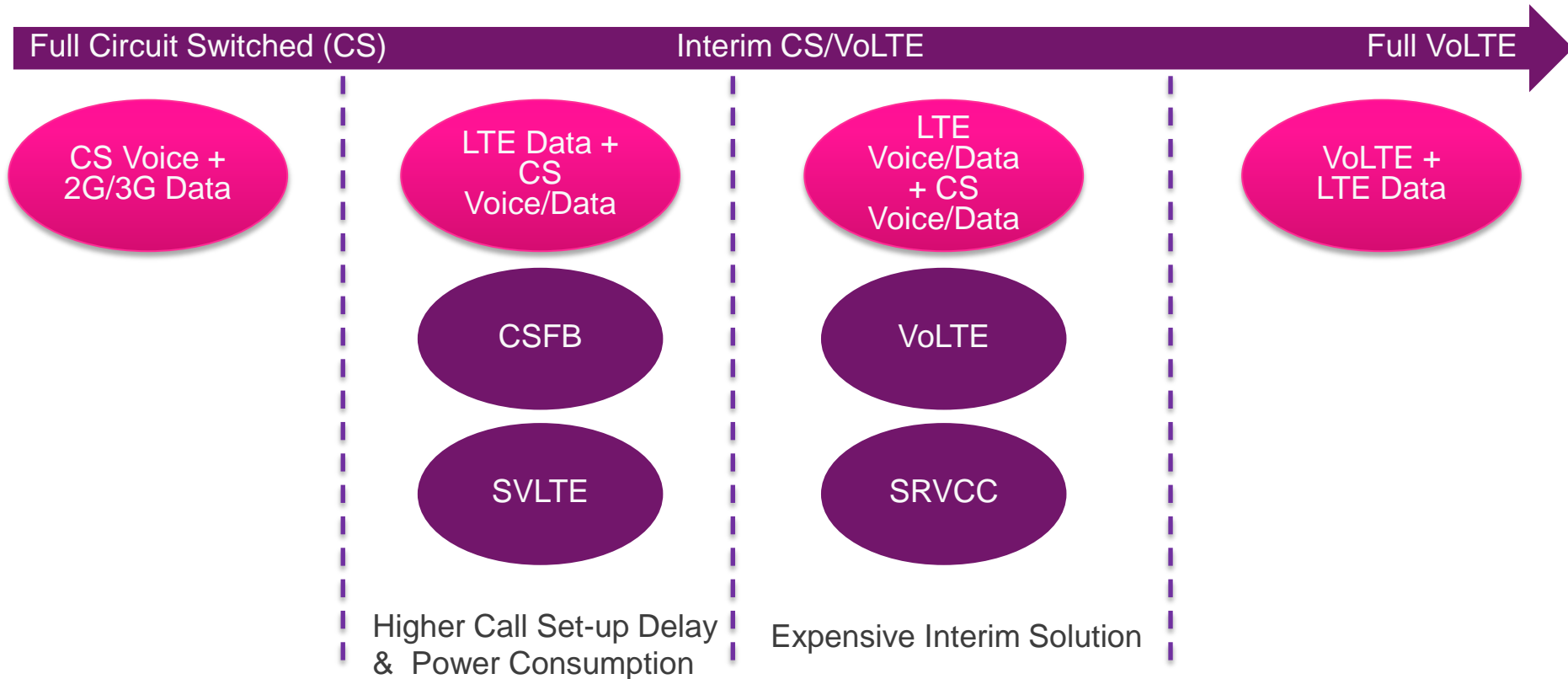
**Integration with platform low-level APIs to deliver a seamless user experience**

- DIM (Device Interface Module) integrates with the platform's low-level audio drivers to deliver low-latency
- QoS module supports GBR (Guaranteed Bit-Rate) by integrating with LTE access API to trigger resource allocation for VoIP call to deliver superior voice quality
- IMS Auth interfaces with USIM/ISIM to access the credentials for IMS authentication
- OAM module integrates with OMA - DM/CP client on the device for configuration management.
- Integrates with native dialer to provide one integrated dialer for Circuit-switched and Packet-Switched Voice (VoLTE), Video calls, SMS/MMS, & VCC

# Multi-Vendor Infrastructure



# VoLTE Deployment Stages



# VoLTE Deployments



Language English

CORPORATE | TECHNOLOGY | INVESTORS | CAREERS | CONTACT US



News » Press Releases » ZTE and Imagination Technologies announce availability . . .

## Press & News

Press Releases

In The News

Events

Imagination Blogs

Imagination  
ImaginationPR

26 February 2013

## ZTE and Imagination Technologies announce availability of VoLTE on commercial handsets

MWC, 26<sup>th</sup> February 2013 – **Imagination Technologies** (IMG.L), a leading multimedia, processor, communications and cloud technologies company, and **ZTE Corporation** ("ZTE") (H share stock code: 0763.HK / A share stock code: 000063.SZ), a publicly-listed global provider of telecommunications equipment, network solutions and manufacturer of handsets/smartphones, today announce the HelloSoft VoLTE solution is now available on commercial ZTE VoLTE-enabled handsets, powered by the MetroPCS 4G LTE network.

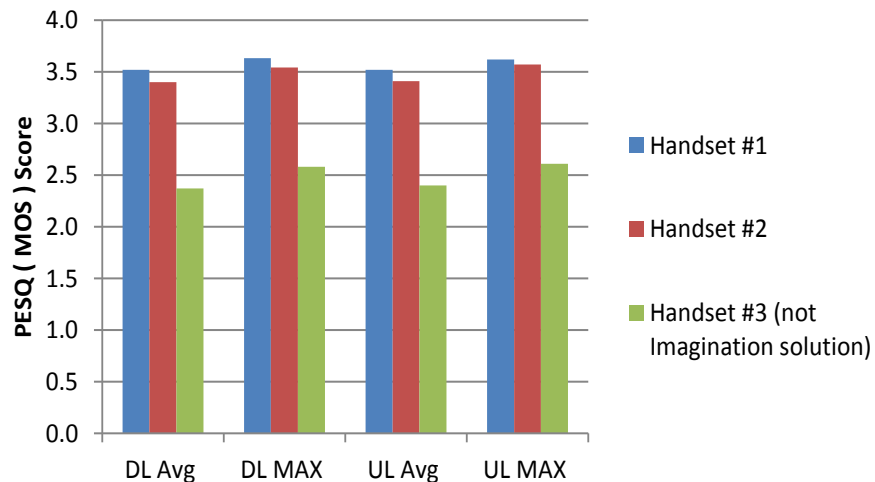


More and more number of LTE and VoLTE-enabled handsets are shipping and some of the major mobile operators are doing VoLTE trials gearing up to launch VoLTE later this year



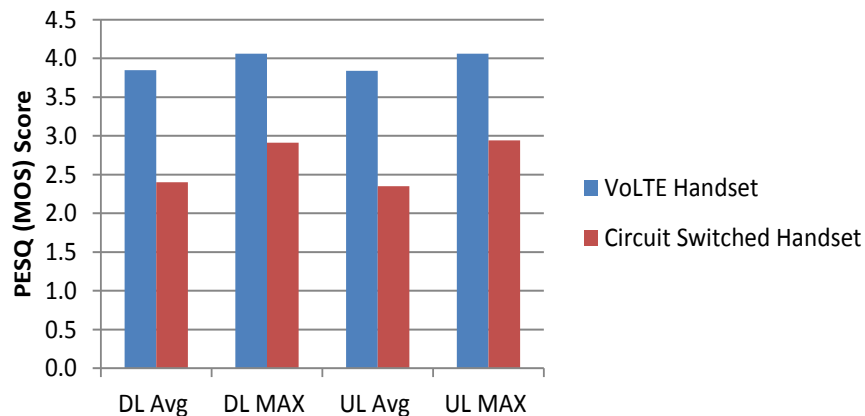
# VoLTE Performance

## Voice Quality during Drive Testing



Large difference in performance observed between VoLTE solutions

## Voice Quality for VoLTE vs. Circuit Switched



VoLTE voice quality significantly exceeds that of circuit switched

# Rich Communication Suite

## RCSe

IM – text chat

one – to – one    one – to – many

File transfer – share files

Send and receive any type of file

Rich Call – share the moment

Sharing Picture / Video (from camera or gallery) during a call

Capability Discovery

See communications options of your peers

## RCS 5.0/5.1

**Social Profile Information**

- Picture/Portrait
- Link
- Status text (Free Text)
- Availability
- Location Information
- Timezone

**Voice**

- IP Voice Call
- IP Video Call

**Messaging**

- Standalone Messaging
- One-to-One Chat
- Group Chat

**Content Sharing**

- Video Sharing
- Image Sharing
- File Transfer
- Location Sharing

Discoverable & Interoperable

'RCS 5.0 Provides an interoperable service extension to voice & messaging today'

Operators response to real-time VoIP/Video/Messaging OTT Apps

Source: GSMA

# VoIP OTT Apps vs joyn in Android

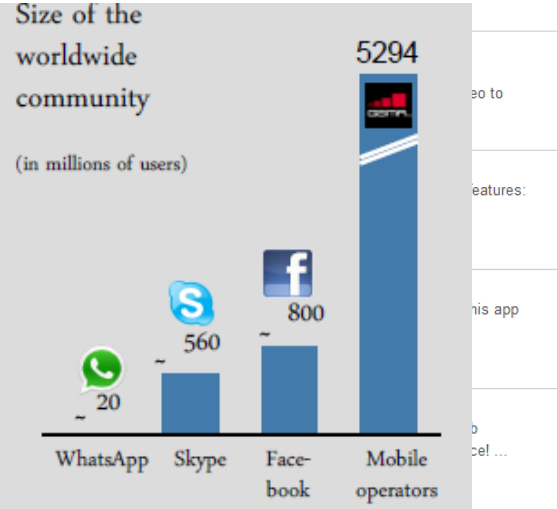
The screenshot shows two side-by-side Google Play Store search results. The left panel is for 'voip' and the right panel is for 'joyn'. Both panels show a list of apps with their icons, names, developers, ratings, and install buttons. The 'joyn' results are highlighted with a pink banner that reads 'Joyn addresses much more subscriber base than the OTT users'. Below the banner is a bar chart comparing the size of the worldwide community for WhatsApp, Skype, Facebook, and Mobile operators.

App Name	Developer	Category	Rating	Installs
WiCall : VoIP call, wifi call	ZENITALK VOIP, CALL WITH US / COMMUNICATION	COMMUNICATION	★★★★★ (9,427)	9,427
VoX Mobile VoIP / SIP Phone	VOX COMMUNICATIONS / COMMUNICATION	COMMUNICATION	★★★★★ (936)	936
MobileVOIP Cheap Calls	FINAREA / COMMUNICATION	COMMUNICATION	★★★★★ (12,342)	12,342
3CXPhone for VoIP Providers	3CX / COMMUNICATION	COMMUNICATION	★★★★★ (3,340)	3,340
Zoiper IAX SIP VOIP Softphone	SECURAX LTD. / COMMUNICATION	COMMUNICATION	★★★★★ (343)	343
joyn by MetroPCS	METROPCS WIRELESS / COMMUNICATION	COMMUNICATION	★★★★★ (432)	432
joyn by Vodafone (beta)	VODAFONE / COMMUNICATION	COMMUNICATION	★★★★★ (870)	870
joyn by Telekom (beta)	DEUTSCHE TELEKOM AG / COMMUNICATION	COMMUNICATION	★★★★★ (305)	305
joyn	WIT-SOFTWARE / COMMUNICATION	COMMUNICATION	★★★★★ (379)	379
Papa John's Pizza	PAPA JOHN'S PIZZA / LIFESTYLE	LIFESTYLE	★★★★★ (4,037)	4,037

**Size of the worldwide community (in millions of users)**

Platform	Community Size (Millions)
WhatsApp	20
Skype	560
Facebook	800
Mobile operators	5294

Joyn addresses much more subscriber base than the OTT users



# RCS Deployments

Spain



World's first interoperable country-wide network

Korea



Germany



T-Mobile

More and more operators across the world are joining the Joyn bandwagon

USA

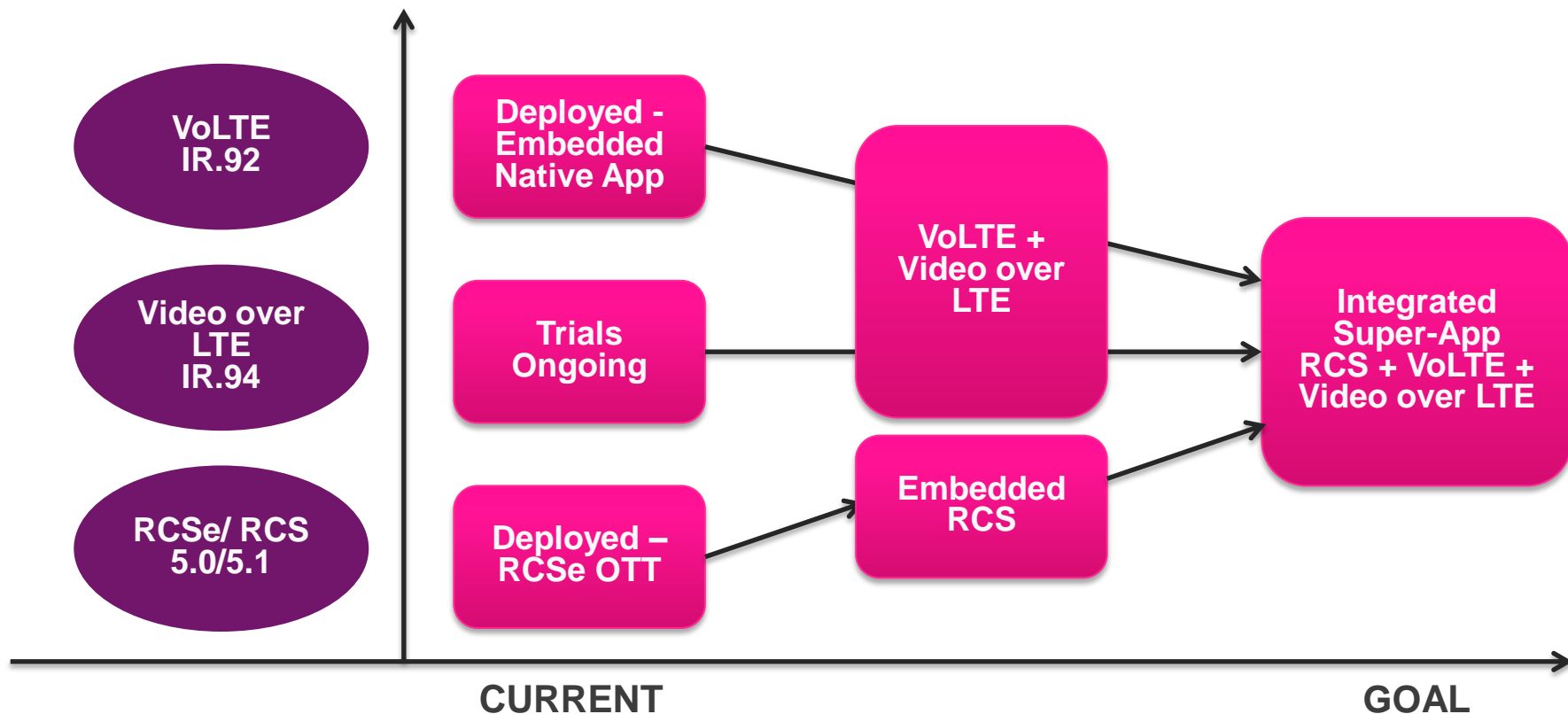


Source: GSMA



# Roadmap

*VoLTE + Video over LTE + RCS*



# APIs for integration of applications

## Social Networking



3rd Party Applications

## Gaming Engines



## RCS Application Interface

### Applications



Chat



Message



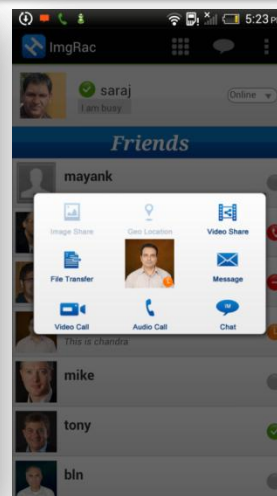
Image Share



Geo Location



File Transfer



### Real-Time Audio/Video



Video Share



Video Call



Audio Call

# Operators Super-App

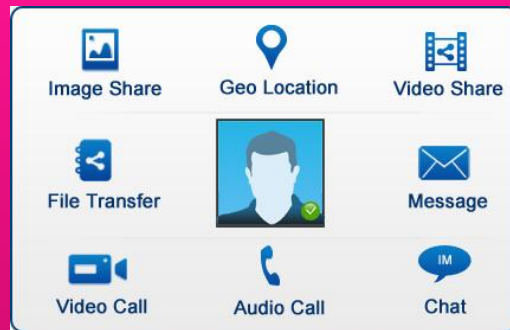
## Single Integrated Dialer

SIP  
HD Voice  
HD Video

RCS  
VoLTE  
SRVCC



**Magic Box**  
"one click to any mode of  
communication"



IMS  
IM  
Presence

SMS  
MMS

Seamless Rich Comms Experience

# VoLTE Is the Ultimate Winner!!

Requirements	VoLTE Compliance	OTT VoIP Compliance
Guaranteed QoS	YES	NO
Low Latency	YES	NO
Low-power consumption	YES	NO
Bandwidth Optimization	YES	NO
Network integration	YES	NO
Standards support	YES	NO
Integrated native application	YES	NO
Multi-platform support	YES	NO
Interoperability	YES	NO
Customer Satisfaction	YES	NO



# Imagination

**Thanks!!**

IEEE Santa Clara Valley Consumer Electronics Society  
Saraj Mudigonda  
26<sup>th</sup> March, 2013

[www.imgtec.com](http://www.imgtec.com)