



Evolution of IoT and role of Volte, over various Access technologies

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What is IoT?

- ▶ Internet Of Things is common term used for devices/appliances which are connected to internet.
- ▶ Devices can ranges from your regular mobile phone to water meter to smart watches to aircraft engines to even your notepad writing pen.
- ▶ Devices are connected to the network over various access technologies
 - ▶ Driven by power consumption
 - ▶ Signal strength and range.
 - ▶ Application type and usage requirements
 - ▶ Mobility requirements etc.

Which access technologies are “widely “ in use today for IoT applications?

- ▶ 3G
 - ▶ Mobile devices that support 3G bands.
 - ▶ Good DL and UL speeds.
 - ▶ Not best for high throughput devices.
 - ▶ Use cases would be 3G mobile phones, any fixed device with 3G support including MiFi, connected cars, alarms systems etc.
- ▶ 4G-LTE
 - ▶ High DL and UL speeds.
 - ▶ Ideal for high data speed/latency conscious based applications.
 - ▶ Use case would include MiFi support for streaming real time data, volte/Vilte calling etc.
- ▶ LTE-M (eMTC) and NB-IoT
 - ▶ IoT Only Devices connected with batteries
 - ▶ Simpler chip set and low BW requirements (1.4 Mhz for LTE–M)
 - ▶ Devices could include battery operated devices including sensors, meters etc.
 - ▶ Successful voice calls also made over LTE-M.
- ▶ Coming up is 5G

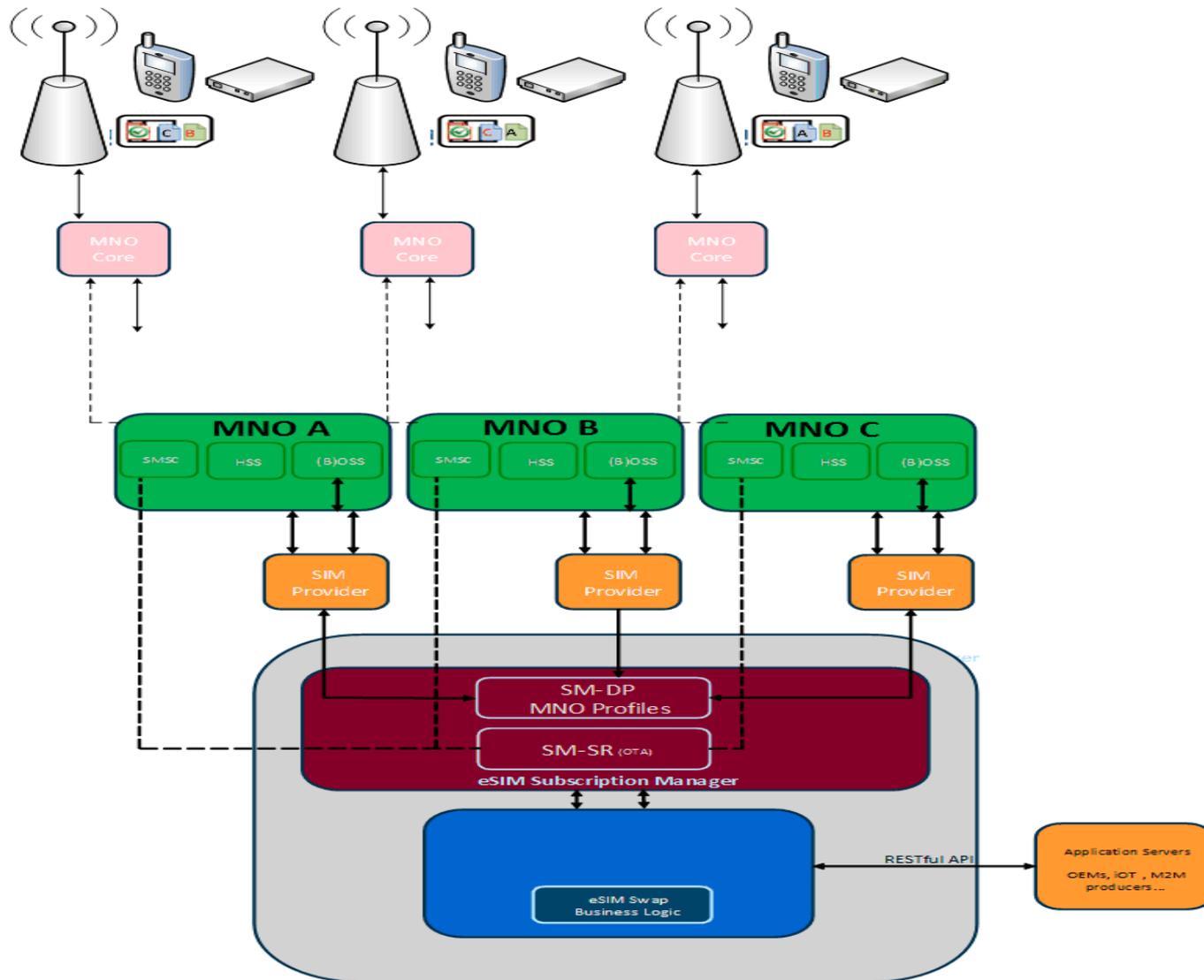
Will IoT drive the death of traditional Sim Card?

- ▶ SIM cards today are typically programmed for a certain Network Operator.
- ▶ Changing from one operator to another operator requires either change of SIM cards or have a phone with dual SIM solution.
 - ▶ Some solutions are also single SIM Dual IMSI solution but are not very widely used.
- ▶ IoT applications with roaming capabilities cant evolve with single SIM based solution.
 - ▶ Roaming causes Home breakout for data causing higher latencies and less throughput.
 - ▶ Less flexibility of roaming plans.
 - ▶ Connected cars crossing geographical boundaries
 - ▶ Data access
 - ▶ Telematics etc
 - ▶ GPS
 - ▶ Mifi dongles.(roaming or domestic)

Introduction to Embedded SIM for IoT

- ▶ eSIM or eUICC is a GSMA compliant element which is designed to remotely manage multiple mobile network operator subscriptions.
 - ▶ Available in various form factors, either plugged-in or soldered.
- ▶ Remote SIM provisioning (RSP) enables/disables various MNO profiles.
 - ▶ Can be done on an OTA interface or via data connection.
- ▶ Centralized secured subscription server manages all MNO profiles (range of IMSIs) and its security parameters including security keys.
- ▶ Various business rules can trigger the switch to a MNO profile.
 - ▶ Least cost connection.
 - ▶ Premium users requiring minimal latency.
 - ▶ Enable/disable LBO/HBO, VoLTE, ViLTE, VoWiFi based on user setting by roaming region etc.

Typical RSP architecture



How does IoT and Volte fit?

- ▶ MNOs are focusing on deploying LTE or some variant of LTE for IoT applications.
- ▶ LTE based networks are widely deploying IMS infrastructure enabling voice to ride over packet based core and access network.
 - ▶ Better user of spectrum.
 - ▶ HD codecs
- ▶ IoT devices could connect to the IMS core and run a lightweight SIP stack and lower BW royalty free HD codecs like Opus

Use Case 1: Connected Cars



- ▶ Emergency calling in event of accident without human intervention using location information.
- ▶ VoWiFi calling using in-car wifi via home network IMS Core. (ePDG anchored call)
 - ▶ Provides seamless billing for subscriber.
- ▶ VoLTE calling using car's carrier network. (Esim or SIM based)
 - ▶ Person to person outbound and inbound calling
 - ▶ Diagnostics call via service center based on telematics data exchange.
- ▶ Telematics over data network.

Use Case 2: Connected Heart rate/BP Monitor

- ▶ Metrics gathering based on data network.
- ▶ Emergency event trigger in event of BP or HR falling below a certain threshold.
 - ▶ Volte or Vowifi call made without actual DSP utilization. (out of band DTMF only)
 - ▶ Event trigger based on DTMF type using RFC 2833/4733 and its duration.

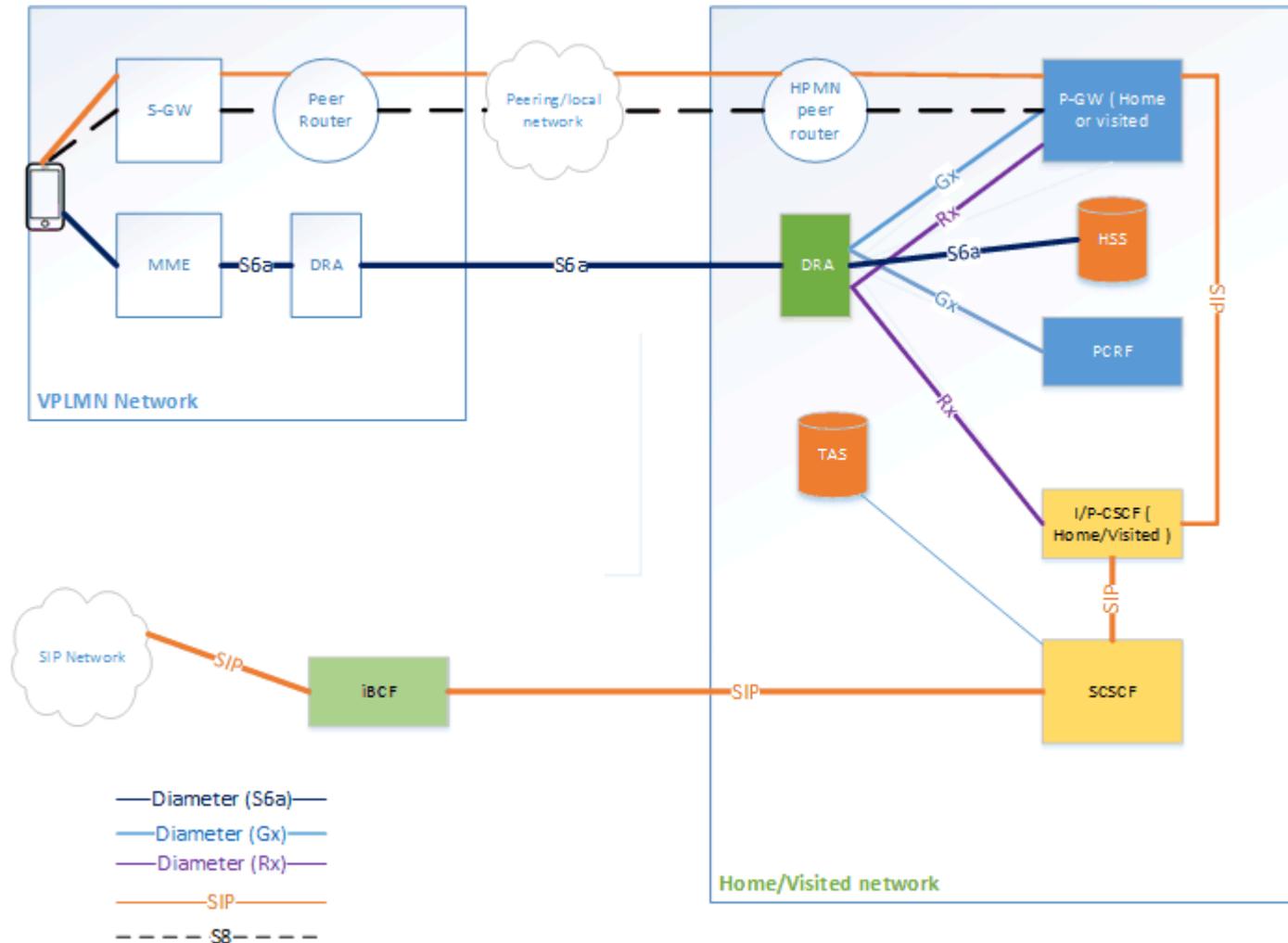


Use case 3: VoWiFi over MiFi



- ▶ Mobile WiFi hotspots connects to a mobile network using LTE/3G network.
- ▶ VoWifi enabled handsets register to home IMS over the mobile hotspot.
 - ▶ Underlying data connection can still ride over a roaming network.
- ▶ Mobile UE is registered to home network and is treated as a “home” subscriber and not in roaming.
 - ▶ Leverages user home subscription for inbound and outbound calls.
 - ▶ No roaming charges for in and out calls, seamless integration will backend billing.
 - ▶ Same logic applies to OTTs apps used for calling and other devices connected to MiFi.

High level network design



In Summary..

- ▶ Evolution of IoT devices are driving changes in to the Mobile radio access network technologies. (LTE-M, NB-IoT etc)
- ▶ IoT is also driving the adoption of Esim based solutions.
 - ▶ iPad pro, iPad Mini 4 for example.
- ▶ Voice (SIP-IMS) will stay play a vital role with the boom of IoT devices for 2 way or one way communications.

Questions?

