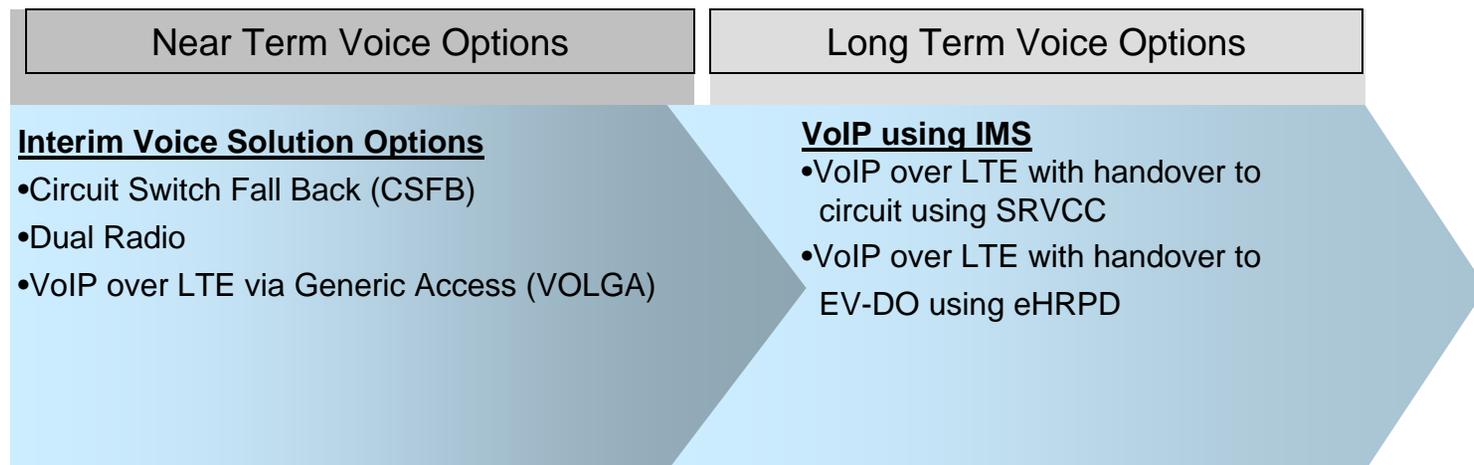


LTE – Voice Options

December 2009

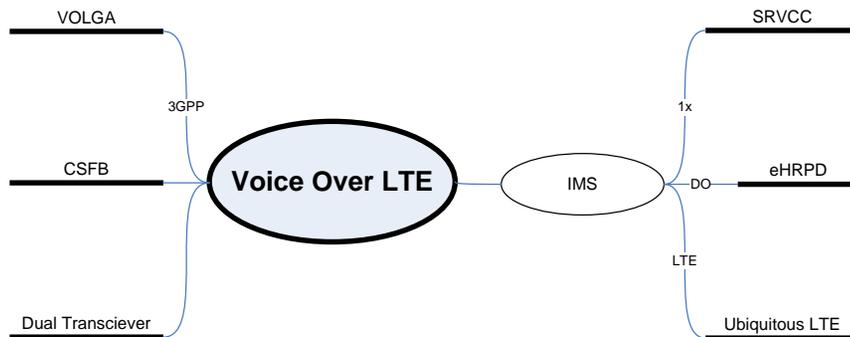
Supporting Voice with an LTE Overlay Deployment

- Near term voice options consist of solutions that utilize the existing circuit switched network
 - Circuit Switch Fallback: Call termination notification is communicated to the device through the LTE network and then connected through the CDMA network
 - Dual Radio: The handset radios simultaneously monitor the LTE and CDMA networks, with voice supported by the CDMA system and data supported by the LTE system
 - VOLGA: VoIP over the LTE network then through an Interworking Function to be routed by the circuit switch
 - Roaming will work for Circuit Switch Fallback and VOLGA only if roaming partners implement the respective functionality in their network
- Long Term voice options will be implemented with VoIP using IMS



Voice Options for LTE and Legacy Networks

- Voice options for LTE are diverse and could fragment the ecosystem
 - Unique operator device requirements
 - Impacts to roaming
 - Impacts to spectrum utilization
- Two distinct paradigms, each with multiple options
 - Utilize legacy circuit switched infrastructure
 - ▶ VoLGA
 - ▶ CSFB
 - ▶ Dual Transceiver
 - VoIP using IP Multimedia Subsystem (IMS)
 - ▶ VoIP over ubiquitous LTE deployment, w/o legacy inter-RAT handover
 - ▶ VoIP over LTE, w/ inter-RAT handover to 1xEV-DO Rev. A using eHRPD
 - ▶ VoIP over LTE, w/ inter-RAT handover to 1xRTT circuit using SRVCC
- Need to consider support for:
 - Simultaneous voice and data
 - SMS and emergency services



Voice Options for LTE and Legacy Networks

❏ Circuit Switch Fallback (CSFB)

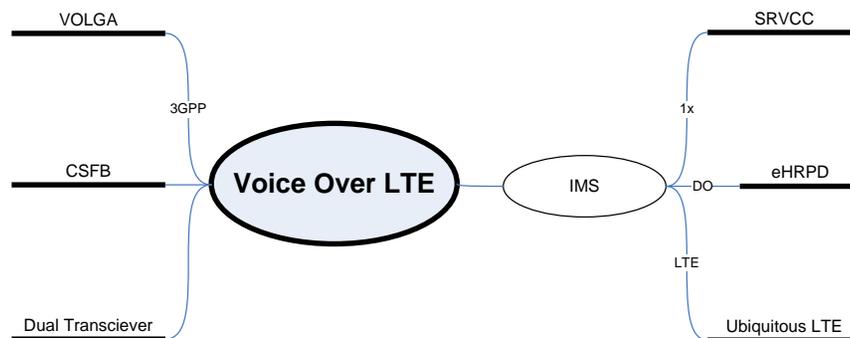
- Use 1x for voice services
- Single transceiver
- Pre-registration, message exchange, and page notification enabled via the S102 interface
 - ▶ Interface LTE MME and the MSC IWS
- Needs:
 - ▶ Upgrade to MSCs to support interface
 - ▶ IWF (either at MSC or MME)
 - ▶ Device support
- No simultaneous voice and data
- Supports SMS and emergency services

❏ Dual transceiver

- Use 1x for voice services
- Dual transceiver
- Device monitors 1x for pages and other messaging
- Needs:
 - ▶ No network interfaces needed
 - ▶ Device support
- Reduction in idle and active battery life
- Supports simultaneous voice and data
- Supports SMS and emergency services

❏ VoLGA

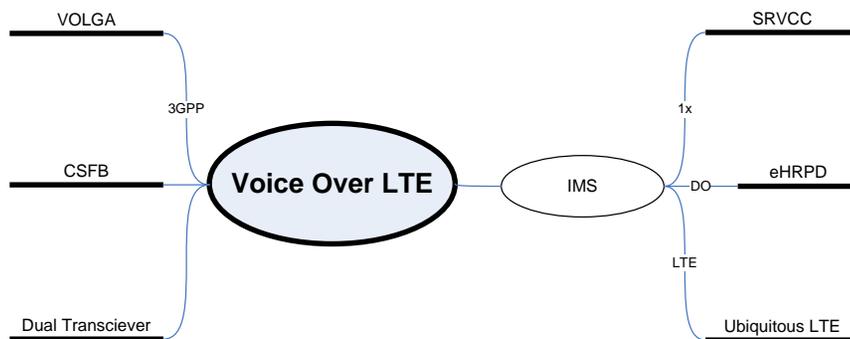
- Similar to UMA technology used for tunneling WiFi traffic
- Specific to 3GPP operators
- Supports simultaneous voice and data
- Supports SMS and emergency services



Voice Options for LTE and Legacy Networks

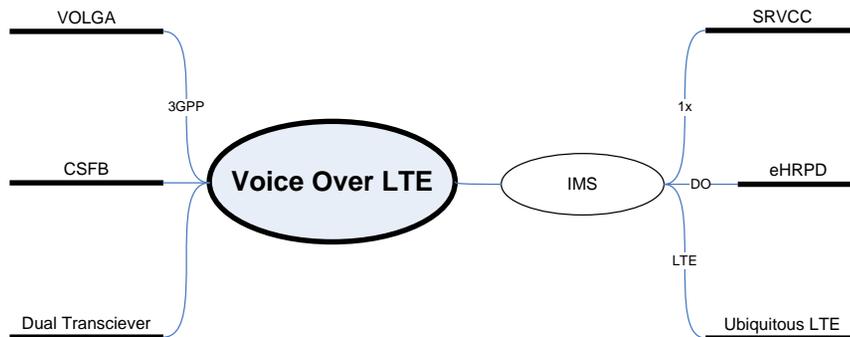
❏ Ubiquitous LTE network

- VoIP LTE using IMS without voice handover option
- Areas without LTE will not have voice service
- Supports simultaneous voice and data
- No native support for SMS
- No support for emergency services until R9



Voice Options for LTE and Legacy Networks

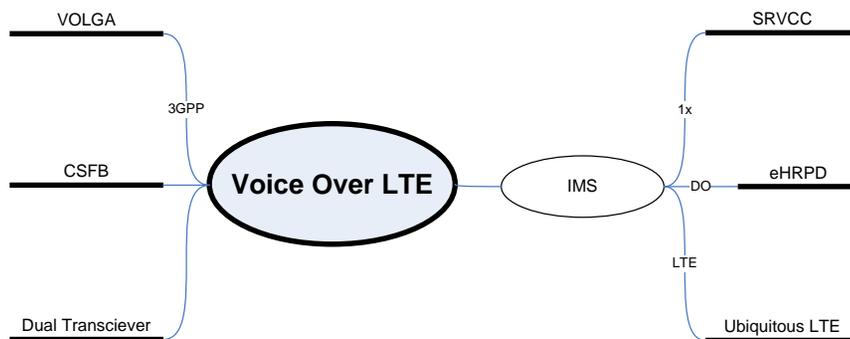
- eHRPD- Overlay with DO network
 - VoIP LTE to VoIP DO handover using IMS
 - Pre-registration, message exchange, and handover notification enabled via the S101 interface
 - ▶ Interface between the MME and RNC (eRNC)
 - Bearer tunneling enabled via the S103 interface (optional)
 - ▶ New HSGW needed between the RNC and S-GW
 - Needs:
 - ▶ Upgrade to RNC to support S101 and S103 interface (optional)
 - ▶ All IMS network elements
 - ▶ HSGW (either at RNC or S-GW)
 - ▶ Device support
 - Supports simultaneous voice and data
 - No native support for SMS
 - No support for emergency services until R9



Voice Options for LTE and Legacy Networks

SRVCC - Overlay with 1x network

- VoIP LTE to circuit 1x handover
- The call is always anchored in the VCC AS (IMS domain)
- The SRVCC procedures are used for a seamless call handover only (when the UE moves from LTE to 1x)
- The 1xCS IWS enables a single radio UE to communicate in parallel both with the source and the target system
- Needs:
 - ▶ Upgrade to MSCs to support S102 interface
 - ▶ All IMS network elements, including a VCC Server
 - ▶ IWS (either at MSC or MME)
 - ▶ Device support
- Supports simultaneous voice and data
- No native support for SMS
- No support for emergency services until R9



Voice Options Synopsis

Consideration	Simultaneous Voice and Data	Emergency Services	SMS	Additional Network 2G/3G Interfaces Required	UE Support Required	Other
VoLGA*	Yes	Yes	Yes	Yes	Yes	Only for legacy 3GPP RAN
CSFB	No	Yes	Yes	Yes	Yes	Long HO times and high infrastructure investment
Dual Transceiver	Yes	Yes	Yes	No	Yes	More costly UEs with battery life impacts
VoIP over LTE w/o inter-RAT HO	Yes	No	No	No	Yes	Need SMS and emergency services
VoIP over LTE w/ inter-RAT eHRPD	Yes	No	No	Yes	Yes	High infrastructure investment. No SMS or emergency services.
VoIP over LTE w/ inter-RAT using SRVCC	Sometimes	Sometimes	Sometimes	Yes	Yes	High infrastructure investment. No SMS or emergency services.

* VoLGA Forum: <http://www.volga-forum.com/>

