# Voice and Video over LTE: The Cisco Solution

## The Next Generation of Mobile Voice and Video

Mobile operators have begun migrating to fourth-generation (4G) architectures based on the Long-Term Evolution (LTE) standard, including the Evolved Packet Core (EPC) architecture defined by the 3rd Generation Partnership Project (3GPP). According to a recent report from the Global mobile Supplies Association (GSA), LTE has become the fastest-developing mobile communications systems technology.

To offer voice and video over an LTE-standard network, operators must migrate from circuit-switched voice to packet voice. This requires an architectural vision that supports voice and short message service (SMS) using the existing third-generation (3G) network, while providing a clear path to networks based on Session Initiation Protocol (SIP). This architecture enables newer services, such as optimized conversational video, presence, and instant messaging.

Cisco provides a complete Voice and Video over LTE ($V^2$oLTE) solution that includes the industry's highest-performing Call Session Control Function (CSCF), unique Mobile Packet Core and IP Multimedia Subsystem (IMS) deployment flexibility, and a comprehensive application layer portfolio. The portfolio includes Circuit Switched Fall Back (CSFB) and CSFB Interworking Function (CSFB IWF), which eliminate the need to upgrade traditional circuit-switched networks to support 3GPP's One Voice Initiative. The Cisco® $V^2$oLTE solution meets 3GPP standards, provides seamless continuity within the IMS and circuit domains, and is cost-optimized for performance. Because video is the fastest-growing component of mobile traffic, Cisco has made video a central part of the initial IMS offering.

## Challenge

The move to 4G LTE comes at a time when mobile data traffic volumes are growing so fast that they threaten to overwhelm network resources. The mobile operator is therefore challenged with delivering mobile broadband services, lowering costs and latency, while being able to flexibly introduce new services. The all-IP network architecture of LTE provides the intelligence to do all this and more.

Previous cellular telecommunications standards, such as Global System for Mobile Communications (GSM), have had dedicated channels for circuit-switched telephony. With LTE, however, instead of a circuit-based network there is an all-IP, end-to-end connection from mobile handsets or other devices to the core network and back. A voice and video service can use the low latency and quality of service (QoS) features defined within LTE and made available on Cisco's EPC and IP Radio Access Network (IP RAN) solutions.

The mobile industry has been debating the best way to provide continuity for traditional circuit-switched services while the network migrates to LTE, and has now reached consensus around a long-term strategy based on IMS, including CSFB for operators that choose to allow roaming from non-IMS subscribers or to delay their $V^2$oLTE and IMS deployments. Cisco's solution addresses both architectural choices, and provides a CSFB IWF migration path for operators faced with upgrading Mobile Switching Centers (MSCs) to support IP.

## Operational Benefits

Cisco's $V^2$oLTE offering is a comprehensive, end-to-end solution that meets 3GPP's IMS and CSFB standards and includes CSFB IWF, which can eliminate the need for operators to undertake costly upgrades to existing circuit-switched equipment.

Benefits of the solution include:

- **Cost-optimized performance** for $V^2$oLTE, plus additional services such as converged messaging and Rich Communications Suite (RCS)
- **Video integration** from the outset, including video sharing (such as See What I See), Cisco Mobile Videoscape™, and Cisco TelePresence®; all components of the Cisco solutions support both voice and video calling, including support for inter-user-equipment transfer for services
- **The ability to integrate specific functions**, including the reduction of interfaces, with LTE functions, IMS functions, and policy functions
- **The ability to take full advantage of the intelligence within the LTE core** to provide an optimal service experience over IMS (for example, optimal QoS bearers, location, and presence)
- **Support for regulatory services** within the IMS domain
- **Seamless continuity** both within the IMS domain and between the IMS and circuit domains, including CSFB and CSFB IWF features
- **Support for all crucial $V^2$oLTE functions**, including:
  - Mobility Management Entity (MME) SGs and Sv interfaces
  - Proxy/Interrogating/Serving/Emergency Call Session Control Function (P/I/S/E-CSCF), Policy and Charging Rules Function (PCRF), and Breakout Gateway Control Function (BGCF) functionality on the Cisco ASR 5000 Series multimedia core platform
  - Single Radio Voice Call Continuity (SR-VCC), and Session Centralization and Continuity Application Server (SCC AS) on the Cisco Converged Services Platform (CSP)
  - A/I Session Border Controller (A/I-SBC) in the Cisco ASR 1000 Series Aggregation Services Routers
  - Home Subscriber Server (HSS), Media Resource Function (MRF), and Media Gateway Controller Function (MGCF) through Cisco's $V^2$oLTE Solution ecosystem partners

Cisco is well positioned to help operators take part in the evolution of voice, video, and SMS from the circuit network to the target IMS network.

## Solution Approaches

While the mobile industry has adopted a long-term strategy for voice and SMS based on IMS, today's operators have a choice in their 4G rollouts: adopt an approach using CSFB or deploy a complete 3GPP IMS solution based on the One Voice Initiative.
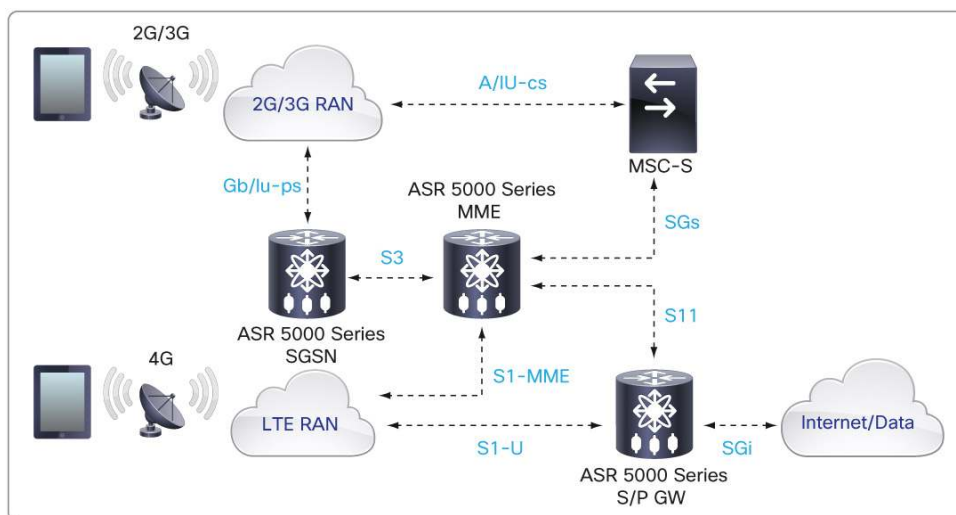
### Circuit Switched Fallback (CSFB)

V²oLTE deployments and trials are occurring at an accelerated pace. In addition, some mobile operators have chosen to deploy 4G networks alongside their existing second-generation (2G) and 3G assets using CSFB until they are ready to deploy IMS.

Cisco's V²oLTE supports CSFB, which allows the LTE user equipment to drop its LTE connection to "fall back" to a 2G or 3G radio network when a call is made or received. When the call ends, the user equipment reregisters with the LTE network. The Cisco MME, as part of the Cisco ASR 5000 Series and ASR 5500 platform, supports CSFB as a baseline capability, and also:

- Supports SMS over SGs and CSFB on Cisco MME
- Addresses interim VoLTE requirements from Next Generation Mobile Networks (NGMN)
- Provides an evolutionary option toward full IMS deployment
- Complies with 3GPP TS 23.272

The CSFB option (Figure 1) requires increased signaling and causes increased post-dial delay. It also does not provide the reduced latency features that are delivered in IMS-based V²oLTE and requires dual-mode handsets. It is important to note that LTE operators deploying CSFB may be faced with reinvestment in their existing circuit-switched core due to mandatory changes required to the MSC and SGSN. But it is an important interim solution for providers and enterprises that wish to migrate to 4G and LTE.

**Figure 1.** Cisco's V²oLTE CSFB and SMS over LTE Solution

## Circuit Switched Fallback Interworking Function

Cisco's V²oLTE solution also supports CSFB IWF (Figure 2), which allows an operator's existing circuit-switched infrastructure to serve LTE subscribers over the circuit-switched domain. Cisco's CSFB IWF facilitates the rapid deployment of LTE and CSFB by eliminating the need for MSC upgrades and reducing or eliminating ongoing operational complexities.

**Figure 2.** Cisco's V$^2$oLTE CSFB IWF Solution
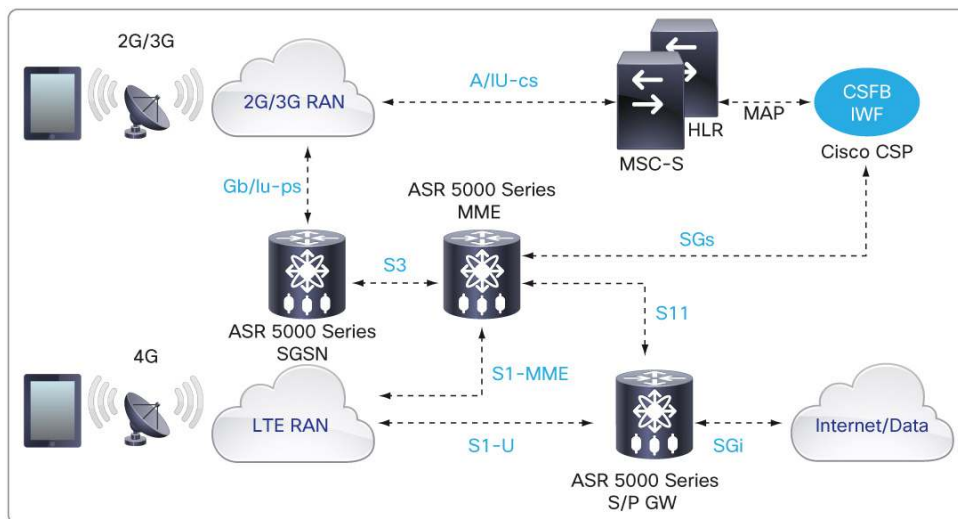


CSFB IWF supports the SGs interface from the MME in the EPC domain. It interacts with the Home Location Register (HLR) over Mobil Application Part (MAP) for location management, subscriber management, and call-handling procedures. The MAP interface between CSFB IWF and SMSC is used for mobile-originated and mobile-terminated SMS.

With CSFB IWF, LTE operators can preserve voice and SMS revenues, assure global roaming and interoperability, and get to market rapidly to compete against traditional and new over-the-top (OTT) providers.

## Voice and Video over LTE and IMS: One Voice Solution

Cisco provides a complete solution for V$^2$oLTE, based on the 3GPP IMS solution meeting the One Voice Initiative's profile requirements (Figure 3). The Cisco ASR 5000 Series and ASR 5500 support a high-performance IMS CSCF core (P/I/S/E-CSCF, PCRF, and BGCF). This functionality can be provided as a set of standalone functions or can be integrated with EPC functions to provide a lower total cost of ownership (TCO) for system operators. Additional benefits of the solution include high availability, support for SIP endpoints based on both RFC 3261 and IMS, full regulatory support (such as local number portability, emergency calling, and lawful intercept), the highest performance in the industry, and IP mobility.

**Figure 3.** Cisco V$^2$oLTE One Voice Solution
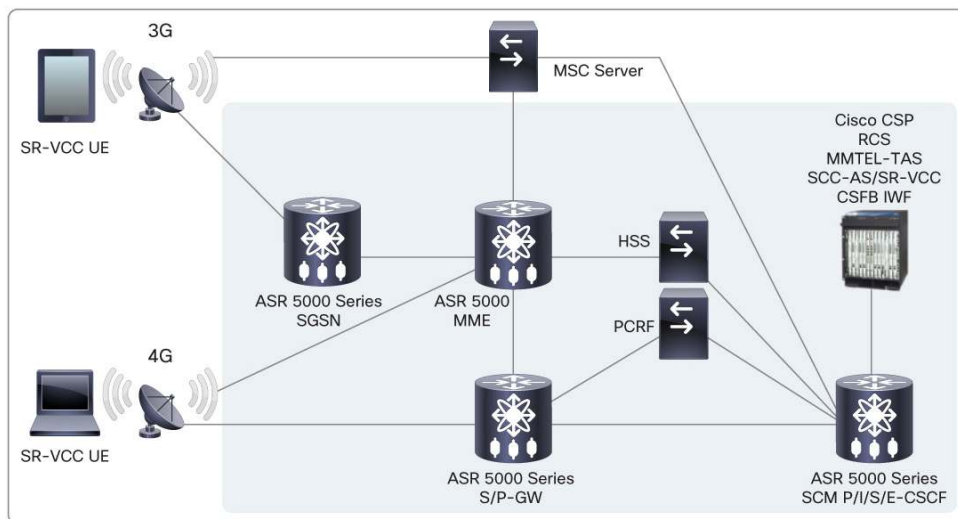


## Cisco Converged Services Platform

Cisco's Converged Services Platform (CSP) provides a complete set of functions required to provide supplementary services and handover between IMS networks and existing circuit networks, including:

- Mobility Application Server providing mobility between LTE IP and the 2G and 3G circuit network
    - Single Radio Voice Call Continuity (SR VCC)
    - Session Centralization and Continuity Control Application Server (SCC AS)
- IP Short Messaging Gateway (IP-SM-GW)
    - Support for integrated messaging between the circuit network and the packet network
- Multimedia Telephony Service Telephone Application Server (MMtel TAS)
    - Full 3GPP Project 2 (3GPP2) compliance of features
- CSFB IWF

The Cisco Converged Services Platform also allows mobile operators to provide presence, messaging, and video sharing on mobile devices.

In addition, through the Cisco ASR 1000 Series, Cisco provides a Session Border Controller (SBC) that can operate as either an access SBC or interconnect SBC. Cisco provides a complete V$^2$oLTE solution, including functions such as an HSS, PCRF, Media Gateway (MGW), Media Resource Function Controller (MRFC), and Media Resource Function Processor (MRFP) through Cisco's partner ecosystem.

## Why Cisco?

Cisco has the breadth of products, technologies, and experience to provide a scalable, high-performance V$^2$oLTE solution and the expertise to help customers implement it for measurable benefits. Cisco's expertise in video, including Mobile Videoscape and enterprise collaboration, helps operators to monetize their new LTE and IMS infrastructure.

The Cisco ASR 5000 Series and ASR 5500 provide a standards-based, market-leading EPC and LTE core solution, integrating the intelligence of the LTE control plane (including x-CSCF, PCRF, and EPC) with the scalability required to meet the performance demands of an infrastructure based on SIP and IMS. Cisco CSP supports a suite of capabilities at the application layer, including CSFB IWF. This capability, coupled with best-of-category ecosystem partners, helps to ensure a complete, interoperable, end-to-end $V^2$oLTE solution optimized for cost-performance ratio, with the integration flexibility needed to reduce the number of network elements, interfaces, call setup latency, and complexity.

## Cisco Services

- Cisco's end-to-end Mobile Internet solution allows operators to monetize, optimize, and provide high-quality voice and video experiences through their mobile networks.
- Cisco Services provide technical expertise across all phases of the network lifecycle, such as design, test, implementation, and network operations, including deployment of third-party equipment.
- Cisco Services are proven to rapidly deliver Mobile Internet solutions, resulting in top-quality voice, data, and video for a powerful customer experiences and faster realization of increased revenue and market share.
- Cisco Services leadership in deployment accelerates time to market and mitigates operational risks with service-level agreements (SLAs).
- Service providers benefit from our cumulative experience across many Mobile Internet solution deployments worldwide.

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