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radisys

MRF Media Processing in 4G/LTE Networks

Overview

For many years, the telecommunications industry has been enhancing network architecture in ways that ease the convergence of wireline, wireless, data and video services - as in the acclaimed quadruple play. In 1999, this vision was advanced by the IP Multimedia Subsystem (IMS) specification, which created a foundation for delivering converged services to a wide variety of end-customer devices and evolving access networks. Since then, carriers worldwide have added IMS systems to 3G networks, giving them the ability to offer new services more cost-effectively than legacy systems alone.

Now, the focus is on emerging 4G/LTE networks that will enable a ubiquitous all-IP network and ultimately make it easier to develop and deploy new converged services. Fortunately, existing IMS infrastructure can remain intact (with minor changes) since its flexible architecture was designed to work with nearly any access network.

This paper focuses on how media processing functions, such as full media processing support for Voice over LTE (VoLTE), voice mixing, streaming audio or video ringback tones and conferencing with live video share, will migrate as IMS evolves from 3G to 4G/LTE. The migration also includes the support for all-IP based multimedia telephony services as defined by MMTel. These services are provided by the Media Resource Function (MRF) via IP media servers designed from the outset to support IP packet-based voice and video communications services. As such, Radisys media servers, performing the role of an MRF, are already field-proven for 4G/LTE deployments. It is proposed that transitioning MRF media processing to LTE will occur in phases, while overcoming a set of challenges when moving away from circuit-switched (2G/3G) to packet-switched (4G/LTE) technologies.

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The Transition from 3G to 4G/LTE

Simply put, mobile video and data demand is exploding, corroborated by predictions of global mobile data traffic increasing 26-fold between 2010 and 2015.[1] Mobile video traffic could reach 66 percent of all mobile data traffic by 2015, as shown by the Cisco forecast in Figure 1. Traffic generated by smartphones, laptops and tablets is already clogging up the network, resulting in service degradation. This is primarily due to the higher usage profile of a smartphone, such as an iPhone or Android device, which generates more data traffic than 24 basic-feature cell phones.[1]

The convergence of telecom and IP networking, along with the persistent growth of bandwidth hungry services and applications, has driven the need for new standards, technologies and platforms. This trend prompted the development of the LTE standard, which supplies the bandwidth needed for delay sensitive applications, like voice and video streaming. These, and many other innovative rich media applications, will benefit from uplink and downlink data speeds on the order of 50 Mbps to 100 Mbps.

LTE provides much higher throughput (i.e., four times more downlink and almost eight times more uplink) than its predecessor, High Speed Packet Access (HSPA), as shown in Figure 2. HSPA is the family of high-speed 3G digital data services delivered by cellular carriers worldwide using GSM. Furthermore, LTE has better cell edge performance, improved latency and lower cost per gigabyte, while servicing more users with a higher quality of service (QoS).

LTE, and the associated transition to an all-IP network, can lower hardware cost by facilitating equipment consolidation and eliminating expensive circuit-switching technology. Still, the higher bandwidth (4-8 times) from LTE isn't sufficient to satisfy growing subscriber demand (26 times by 2015), and other steps are needed to reduce the stresses on networks. For example, bandwidth consumption can be lowered by transrating and transcoding video streams, a function of the MRF in IMS architecture, which is described later in the paper. The transition from today's 3G networks to 4G/LTE will be gradual, and a coexistence approach will ensue for a number of years.

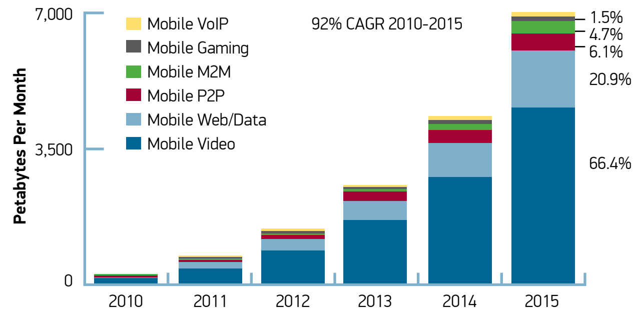

Figure 1. *Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2010–2015*[1]

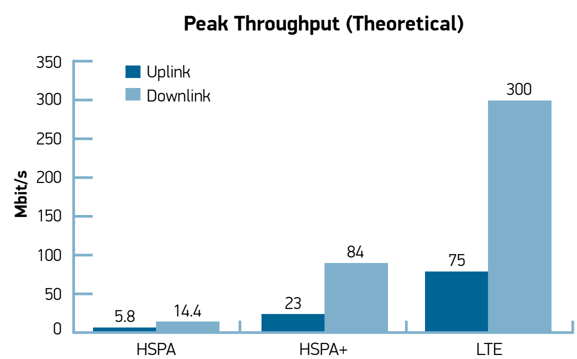

Figure 2. *Peak Throughput of 3G and 4G Mobile Networks*

Mobile Services in 4G/LTE

The move to 4G/LTE creates opportunities for service providers to offer more value to subscribers. With more bandwidth, it will be possible to deliver data-hungry services and applications, like high-definition video on mobile devices, to the masses. Furthermore, the greater throughput opens the door for independent software vendors (ISVs) and other ecosystem members to develop innovative services that aren't practical today due to 3G network bandwidth constraints. Moreover, service providers will establish new partnerships for delivering content and applications that expand their mobile broadband business model.

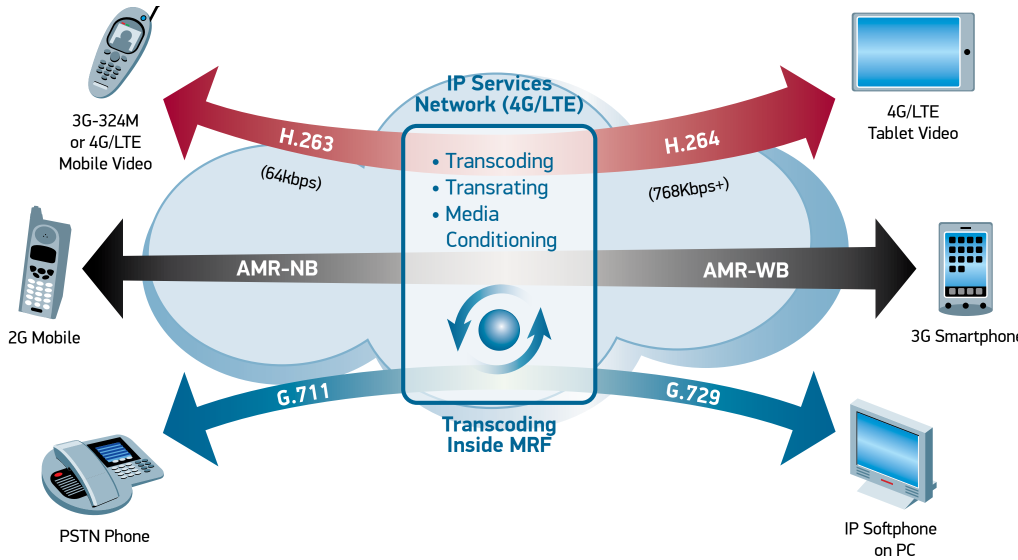

Figure 3. *Transcoding in the MRF can reduce overall network complexity and media processing costs in the LTE IMS architecture*

Imagine a world where ubiquitous broadband connectivity brings people and devices together, enabling unparalleled experiences and capabilities. Fast 4G/LTE networks will cost-effectively support a wide-range of consumer devices (e.g., smartphones, laptops and tablets), plus emerging wireless applications such as connected cars, surveillance cameras and machines. Automotive navigation systems will preview places of interest, digital signs will display targeted advertising based on the demographics of passersby and telehealth will establish secure video conferences between doctors and patients in real-time across continents. Such scenarios can translate into revenue-generating opportunities for service providers, in that the rise of machine-to-machine (M2M) applications is creating a new breed of connected device that needs to be managed and supported over the Internet.

At the center of this convergence is the MRF. It is the translator for a wide range of devices and their associated technologies, enabling them to communicate with each other reliably and efficiently. With the huge expansion in the number and variety of audio and video codecs used in modern telecommunication networks, the MRF performs the codec conversion, called transcoding, which allows diverse devices to share information.

Increasing network efficiency, the MRF re-encodes video streams to a lower bit-rate, known as transrating, without changing its content, which ultimately saves a significant amount of bandwidth. For example, transrating is used to convert high-resolution video clips to a lower resolution (i.e., lower bandwidth) video stream suitable for a handheld device with a small screen or limited available bandwidth. Therefore, video transrating, transcoding and other media conditioning are important functions for successfully deploying the industry's 3-screen strategy for television, PC desktop and mobile devices, as illustrated in Figure 3.

MRF/IP Media Server Value Add

Supporting higher levels of media convergence, next-generation networks will deliver services across multiple modes of communication: voice, fax, e-mail, instant messaging, web, images and video. As such, MRFs will combine all these communication channels over a cost-efficient IP network, thereby providing a new avenue to deliver rich new features, while simultaneously lowering telecommunication costs. At the same time, the MRF will optimize the content by transcoding media streams, and adjusting content size and bit rate.

Simplifying the migration from 3G to 4G/LTE, MRFs were defined from the outset to support packet communication services. For example, ringback tones in 3G networks are delivered as a circuit-switched audio media stream; with 4G/LTE, an IP-based call requires a ringback tone media clip sent as an RTP media stream. This use case and call model is already supported in IP media server deployments today. The same concept holds true for Interactive Voice and Video Response (IVVR), except it uses video clips, instead of audio-only, for prompts or menu choices. The MRF provides all the media plane processing functions and exposes these functions through standards-based interfaces, allowing control by end user applications in a generic multipurpose framework.

The MRF/IP media server is a fundamental element in an IP-based services infrastructure, processing and integrating real-time audio and video media streams along with data and fax. This role is the foundation for many value-added services, including customer service, multimedia service demos, surveillance applications, tele-voting while watching mobile TV, and playback controls for video streams (e.g., pause, fast-forward and rewind).

MRF in IMS Architecture

A detailed discussion of the IMS architecture can be quite extensive and beyond the scope of this whitepaper. So the objective of this section is to focus on the role of the MRF in the IMS architecture, and its interfaces with key adjacent elements in an IMS.

The 3rd Generation Partnership Project (3GPP) standards body developed IMS to facilitate converged IP-based services, while providing a migration from mobile GSM networks. The objective was to enable the delivery of rich services to any device and across any access network—essentially services to everyone, everywhere. The standard promotes cost-effective infrastructure by ensuring components (hardware and software) are compatible and interoperable, regardless of the manufacturer.

Within the 3GPP standards, a role has been clearly defined for the Media Resource Function (MRF), to provide real-time IP media processing functions such as media play, record, collect digits and mix audio/video against IP media streams. An MRF is sometimes further decomposed into a Media Resource Function Processor (MRFP), which terminates and processes the media streams, and the Media Resource Function Controller (MRFC), which selects and controls MRFPs. The role of the MRF in the IMS architecture is highlighted in Figure 3, with key interfacing elements and interfaces briefly described in the remainder of this section.

The 3GPP has defined the Mb interface as the bearer traffic terminated on the MRF, or more specifically the MRFP. Bearer traffic includes the growing volume of Real Time Protocol (RTP) packets, along with associated Real Time Control Protocol (RTCP) information in the bearer plane.

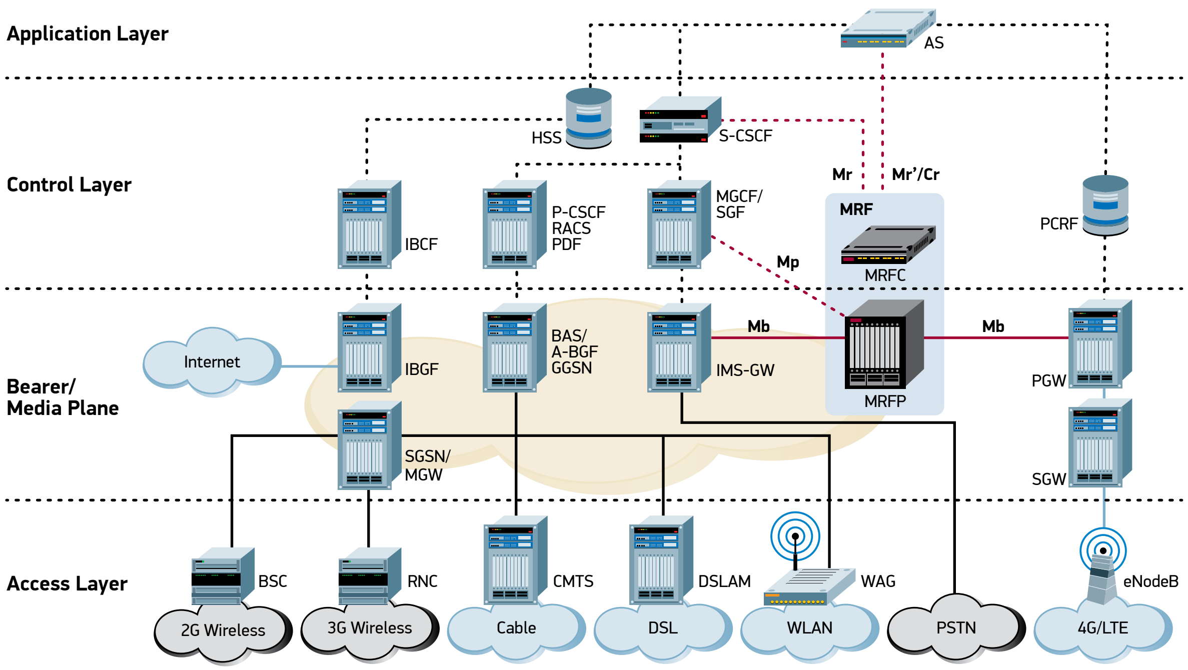

Figure 4. *MRF in IMS Architecture*

In a 4G/LTE network, the Mb packet streams interface with the Packet Gateway (PGW), which provides connectivity between the user equipment and external packet data networks, manages quality of service (QoS) and provides deep packet inspection (DPI). The PGW also performs routing, allocates IP addresses, provides access for non-3GPP access networks and enforces policy. For legacy networks, the Mb packet streams interface with the IMS Media Gateway (IMS-GW), which converts packet-based bearer traffic (e.g., RTP) for backwards compatibility with circuit-switched bearer paths (e.g., T1's).

The MRF is an important and powerful IMS network element, however it requires command and control by other elements in the IMS architecture, such as Application Servers or Call State Control Functions (CSCFs). Session Initiation Protocol (SIP) is the predominant standard for controlling MRF equipment in an IMS architecture. The Serving Call Session Control Function (S-CSCF) is a SIP server that is the central node for session control, basic call control, and policy enforcement in an IMS, which uses the Mr (SIP) interface to control MRF media processing functions. When a value-added service (VAS), enhanced service, or more complex call processing is required, the CSCF will hand-off call control to an Application Server (AS), which would use the Mr' (SIP) interface along with the Cr interface (media control requests) to control the MRF in order to create the desired service, such as ringback tones, multimedia streaming, or multimedia conferencing.

In the 3GPP, Mr and Mr' interfaces are based on SIP. In addition to basic SIP, media control requests are defined by the Cr interface between AS and MRF. The media control interface includes supplementary languages like VoiceXML or Media Server Markup Language (MSML–RFC 5707[2]) for feature rich MRF control.

IMS is designed such that multiple AS elements can all use and share a single (or smaller number) of MRF nodes in a network. It is this reuse of MRF resources across dozens of applications that drives the CapEx and operational savings in an IMS architecture.

The 3GPP has also defined an Mp interface for direct MRFP control. The Mp interface, (H.248 or Megaco) is sometimes still used by Media Gateway Control Function (MGCF) to control media processing on the MRFP. However, the control of MRF equipment in an all-IP 4G/LTE network is based on SIP and the Mr, Mr' and Cr interface definitions.

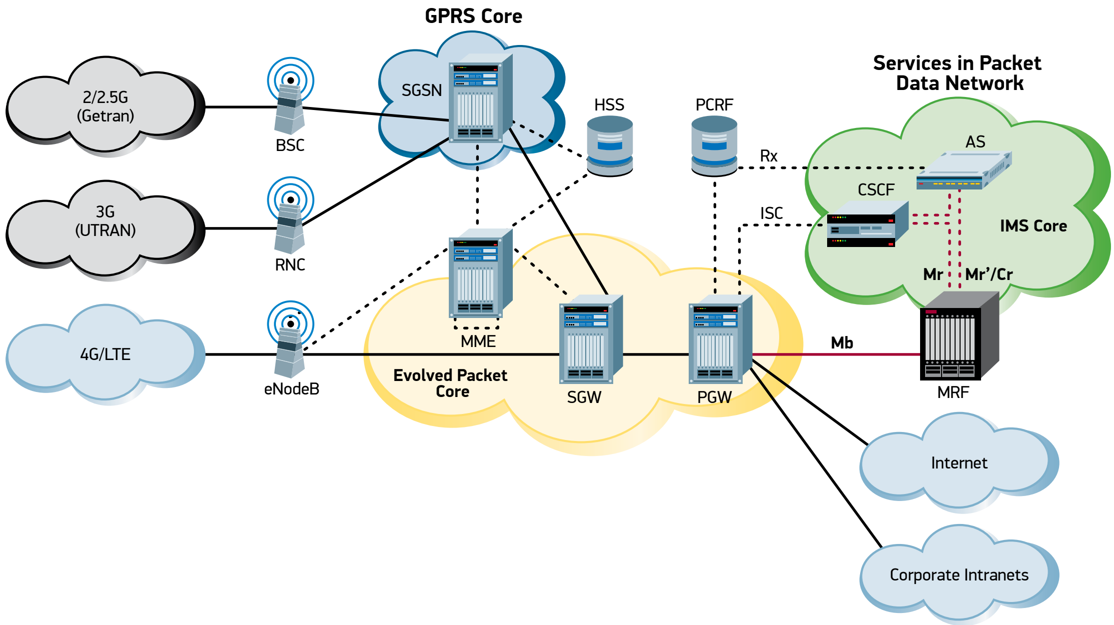

Figure 5. *LTE Radio Access Network Integration with IMS MRF*

IMS Supports 3G to 4G/LTE Transition

The foundation of an LTE radio access network is the Evolved Packet Core (EPC), as illustrated in Figure 5. In addition to the PGW and PCRF, the EPC includes the Serving Gateway (SGW), which routes and forwards user data packets, while providing a mobility anchor during inter-eNodeB handovers, and the Mobility Management Entity (MME), which manages session states, and authenticates and tracks a user across the network.

Through a distributed network of eNodeB equipment—analogous to a Radio Network Controller (RNC) in a 3G network—various LTE mobile and access devices are connected through the LTE Radio Access Network to the EPC. Backwards compatibility with 3G and 2G networks is achieved through interconnection with Serving GPRS Support Node (SGSN) equipment in existing General Packet Radio Service (GPRS) networks.

The EPC will support various services in a packet data network for LTE subscribers, including IMS. It is within the IMS where the MRF equipment will deliver the IP media processing essential for LTE telecommunication services. Again, the primary Mb bearer interface can be seen between the PGW and the MRF. The ISC interface provides signaling connectivity between the PGW and the CSCF, which interprets and applies media processing commands for the MRF using the Mr interface. The Rx interface shares policy rules and information between the Policy and Charging Rules Function (PCRF) and the AS, which then interprets and applies policy enforcement through the Mr' control interface to the MRF.

LTE Phased Rollout

Since the IMS core network and the MRF are inherently all-IP, the transition of 3G circuit access networks to 4G/LTE is already supported by the MRF within the IMS architecture. In fact, IP media servers today already support the large majority of the MRF requirements in an LTE deployment.

However, other aspects of supporting the full scope of voice services available in circuit networks today will take time. Hence, it is expected that the transition of voice/telephony services from 3G to 4G/LTE will be gradual, realized in multi-year deployments that will occur in phases, such as:

Voice over LTE (VoLTE)[3]

Over more than ten years and with the help of the 3GPP, the IMS specification has expanded to cover related functionalities. In fact, IMS now specifies different ways to complete single functions (e.g., authentication, session setup, supplementary service execution and bearer setup), which increases the complexity of IMS. With the aim of driving consistency, the Voice over LTE (VoLTE) specification was created by the One Voice Initiative, including AT&T, Orange, Telefonica, TeliaSonera, Verizon, Vodafone, Alcatel-Lucent, Ericsson, Nokia Siemens Networks, Nokia, Samsung and Sony Ericsson.

The VoLTE specification provides a common standardized IMS voice solution by defining a recommended feature set, and most importantly, it specifies just one option when multiple options exist for single functionality. More specifically, the VoLTE profile defines a minimum mandatory set of features a wireless device (the UE) and network are required to implement in order to guarantee an interoperable, high quality IMS-based telephony service over LTE radio access. The UE and network protocol stacks forming the scope of the VoLTE profile are depicted in Figure 6.

The MRF provides a critical role in the IMS voice solution to support VoLTE as specified by One Voice. The MRF and the media gateway (MGW) are two entities in an IMS core network that terminate the user plane, which requires AMR-WB and AMR speech codec support and the ability to operate with any subset of the associated eight codec modes, with multiple dynamic codec modes or mode change requests.

For more information, please see GSMA PRD IR.92[4] and 3GPP TS 22.173[5]

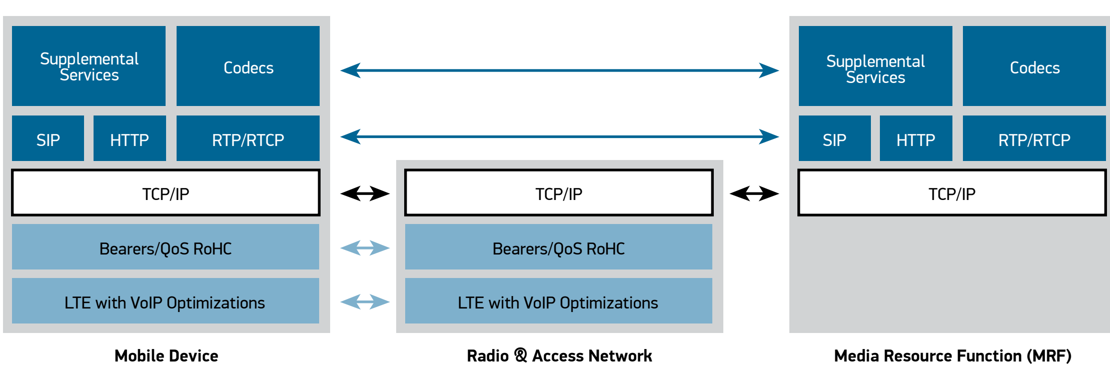

Figure 6. *Depiction of UE and Network Protocol Stacks in VoLTE*

Phase 1: Data-Only Services Over the 4G/LTE Network

- Removes a major source of congestion in 3G data networks
- Simplifies media streaming and transcoding for improved QoE (Quality of Experience)
- Increases synergy with cloud computing (e.g., virtualized and pooled real time media resources)
- Continues support for video and voice services delivered over-the-top (e.g., Skype)
- Optimizes media content streaming and applications over an LTE mobile data network using the MRF

Phase 2: Voice and SMS Services with CSFB Support (Circuit Switched Fall Back)

- Uses CSFB to allow reuse of the mobile switching center (MSC) and 2G/3G infrastructure for roaming, charging, regulatory services, such as 911, and existing voice services such as 411. This is important because initial LTE deployments may have spotty coverage, thus some existing telephony voice services may require support from existing 3G circuit infrastructure.
- Uses CSFB to enable an LTE-based voice call to revert back to existing circuit-switched infrastructure for call completion, based on LTE network coverage and footprint, as well as for certain services not yet migrated to an all-IP LTE network.

Phase 3: All Services Over 4G/LTE, Including Voice Over LTE (VoLTE)

- Achieves the end state, where a fully converged, packet-based access network provides end-to-end support for voice and data services
- Implements Voice over LTE (VoLTE) specification to simplify IMS deployments (see sidebar on page 7)
- Provides support via the MRF for VoLTE, a number of value-added Voice/Video services, as well as conventional network telephony services as defined by MMTel (see appendix on page 13 for more info on MMTel)
- Enables carrier network optimized media resources for use across a diverse set of conversational and new, innovative media content distribution applications through the MRF

4G and LTE Network Challenges and Radisys Solutions

Easing the transition to 4G/LTE, Radisys has solutions to address emerging media processing challenges for network operators and solution vendors. The Radisys IP Media Server supports the IMS architecture, which is the services delivery framework for the Evolved Packet Core. However, MRF media processing will present new challenges in 4G and LTE deployments. The following describes these key challenges and how Radisys solutions are addressing them.

1. High Variability in Access Network Quality

Although 4G/LTE increases bandwidth by up to eight fold over 3G, there may still be insufficient voice and video throughput in some locations. This localized effect may be experienced by a subscriber in a moving vehicle, who initially receives good service, but later the QoS drops dramatically after crossing a cell site boundary. Even when a subscriber is stationary, the traffic flowing through a cell site is dynamic, and the available bandwidth can change from second to second. Such quality issues can be mitigated when the MRF dynamically adjusts the media stream bandwidth in response to an oversubscribed link.

Radisys Solution: Radisys IP Media Servers support receiving RTCP messages from an endpoint, allowing the IP media server to utilize adaptive multirate encoding techniques, thereby dynamically adjusting the bitrate of media streams during periods of high congestion. For voice traffic, the bit-rate can be dynamically adjusted when using Adaptive Multi-Rate codecs (e.g., AMR, AMR-WB), which are specifically required for VoLTE deployments (see sidebar on page 7). Video bitrates may also be adjusted to adapt to RAN congestion (see sidebar on page 10). This feature is coordinated with the Policy and Charging Rules Function (PCRF), which is described in more detail in number 5.

2. Packet Loss Due to Fading

When radio fade margin falls (i.e., the difference between the received signal strength level and the receiver sensitivity), there may be packet loss that negatively impacts call quality and the user experience.

Radisys Solution: Radisys Voice Quality Enhancement (VQE) supports packet loss concealment, which compensates for packet loss in VoIP networks. Radisys MRF also addresses the high packet loss in mobile networks by supporting advanced media jitter buffer algorithms as well as RTP redundancy mechanisms, as per RFC 2198[6] and RFC 4867.[7]

3. Increased Delay and Echo

Compared to circuit-switched technology employed in 3G networks, packet-based communications on 4G/LTE networks is more susceptible to delay and echo, partly due to the lack of a service level guarantee with IP technology. The user impact may depend on how well the handset removes echo and local issues, such as background noise.

It is possible to improve call quality on 4G/LTE networks by implementing distributed MRFs (Figure 9) that reduce local and regional delays and increase the performance of real-time interactive services. A system of distributed MRFs at the core edge can reduce latency and backhaul traffic.

Radisys Solution: Radisys IP media servers support a distributed MRF architecture, and features of the Radisys Voice Quality Enhancement (VQE) compensate for noise and echo cancellation (AEC). The unique AEC capabilities of Radisys MRF are purpose built for all-IP networks addressing challenging issues related to network clock skews while supporting long echo tail lengths. Varying delays are also addressed by enhanced jitter buffer management, as specified in 3GPP TS 26.114[8] and GSMA IR.92[4] specs.

4. Increasing Number and Diversity of Codecs

New service models, delivered by both wireline and wireless networks, are contributing to a rapid expansion of audio and video codecs found in networks. For instance, with the increased availability of end-to-end IP broadband connectivity, the industry is seeing increased adoption of High-Definition (HD) audio codecs, like G.722 and AMR-WB, which deliver a higher fidelity audio experience, and HD video codecs such as H.264 and VP8 with high profile levels. However, the downside to codec proliferation is the network equipment that must process the codecs is growing in complexity.

Radisys Solution: Radisys MRF media servers, with high density DSP based solutions, provide automatic transcoding across many legacy and emerging audio and video codecs. As LTE mobile networks and applications evolve, Radisys plans to continue to add more audio and video transcoding/transrating and media adaptation capabilities.

5. Increasing Need for Policy Based Controls

Service providers are looking for greater flexibility to set up data plans to control the usage of data services, bandwidth and QoS for these services. The solution framework is based on defining rules and information in a Policy and Charging Rules Function (PCRF), which then shares and applies these rules in policy enforcement functions (PEF) in various points in the network.

Radisys Solution: Radisys is focused on two areas to apply policy-based controls in a 4G/LTE network.

RAN Congestion/Policy Aware Controls and Policy Enforcement in LTE

Mobile communications are increasingly focused on content-based services, which are driving data traffic growth in the 4G/LTE and IMS networks. To control this traffic growth, more and more operators are investing in traffic-monitoring and shaping applications, which require screening the huge volumes of data traversing the mobile network at wire-speed.

RAN congestion monitoring provides the network operators with vital information about available and varying radio bandwidth in the access network, which can be utilized to dynamically optimize media services and the associated media streams for effective bandwidth utilization and QoS.

Radisys Solution: The Radisys Trillium product line specializes in communications protocol software. These protocols are attuned for traffic monitoring in live mobile networks.

Traffic monitoring types:

- *Passive:* the monitor node/application only consumes packets
- *Active:* the monitor node/application receives, modifies and forwards packets

Radisys Trillium monitoring solutions enable operators to inspect key signaling messages, empowering applications to derive critical information regarding over-the-top applications, RAN congestion and usage patterns of individual users in real-time. Such visibility into the network and subscriber usage patterns enables unique and innovative solutions to apply policy. When combined with policy enforcement in the MRF, the benefits include network utilization optimization, assured quality of experience and fraud prevention.

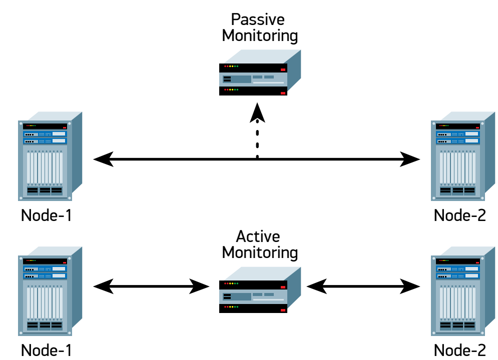

Figure 7. *Active Versus Passive Monitoring*

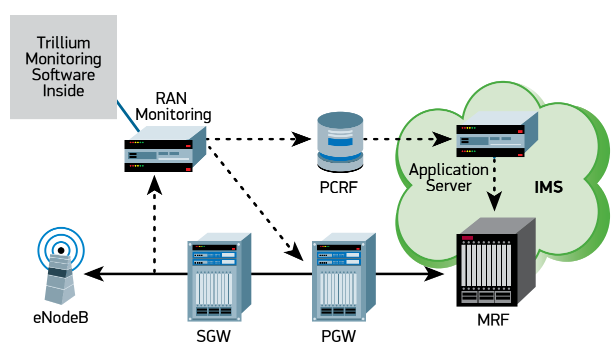

Figure 8. *RAN-Aware Traffic Shaping in LTE*

More information on policy-based control can be found in 3GPP TS 23.203.[9]

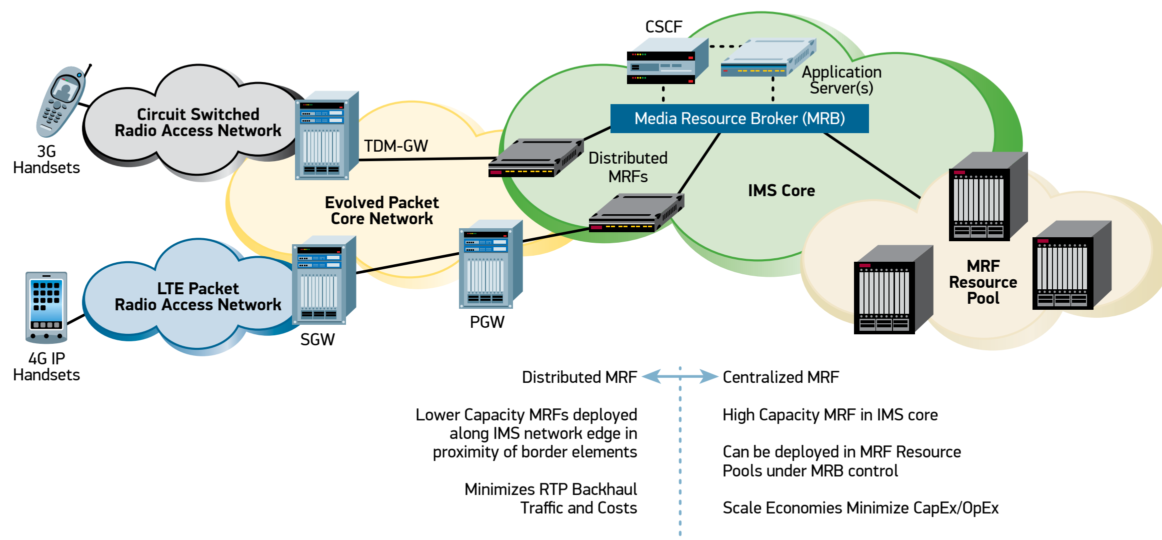

Figure 9. *Distributed MRF Architecture with Optional MRB*

Since the MRF is a source and/or sink of real-time RTP media streams terminated on 4G/LTE devices, the MRF is expected to evolve to include aspects of a policy enforcement function (PEF). Utilizing policy control information from the PCRF, the MRF could adapt media streams based on service priority, bandwidth utilization, and other policy-based services tailored to the user's subscription profile, bandwidth and QoS policies. The following are a few examples:

- Subscriber policies, such as bandwidth and content access, subscriber profiles, etc.
- Carrier policies, including adapting bandwidth based on congestion in cell networks.
- Content policies that separate and support various content types differently (e.g., internet, premium and paid).
- Service differentiation policies between carrier telephony services, legal intercept and general media consumption.

Radisys also offers technical solutions to monitor congestion in the Radio Access Network itself and uses that information to apply policy-based controls (see sidebar on page 10).

6. Increasing Density and Bandwidth Needs

The increased levels of traffic on 4G/LTE networks will drive the need for more RTP media processing. It is expected that LTE network operators will respond to increasing bandwidth needs using both distributed and large-capacity centralized MRF architectures, as shown in Figure 9. This figure also introduces the optional concept of a Media Resource Broker (MRB) function, as defined in 3GPP TS 23.218,[10] which provides additional flexibility in deploying and utilizing MRF capacity (more discussion about MRB in item 10).

Radisys Solution: Radisys is the leading supplier of carrier-class MRF products, with the highest capacity MRF in the industry, providing both high density DSP-based platforms, as well as software based platforms, with product plans for future capacity increases, along with a roadmap for integration with optional MRB elements in the network. The MRB and associated controlling interfaces to pools of MRFs will provide improved cost effective utilization of media processing resources in the network along with additional deployment and distribution flexibility.

7. Coexistence of IPv6 and IPv4 in 4G/LTE

Providing more IP addresses than its predecessor IPv4, IPv6 is a cornerstone for 4G/LTE mobile architectures. However, it will take several years before all devices are using the new standard. Consequently, protocol bridging is needed, as well as an MRF that supports IPv4/IPv6 interworking.

Radisys Solution: Radisys media servers support dual-stack IPv4 and IPv6 today, allowing for a smooth transition. The dual-stack IPv4/IPv6 capabilities of the Radisys media servers address all interfaces to the MRF, including control plane, media plane, management plane, as well as other generic network services such as NTP and NFS.

8. Managing Congestion, End-to-End

Taking action before it becomes too congested, a 4G/LTE network can proactively stem traffic flow based on an Explicit Congestion Notification (ECN) as described in 3GPP TS 23.228.[11] This mechanism enables the network to request endpoints to decrease their sending rate in order to preemptively avoid QoS issues.

Radisys Solution: Radisys media servers support Real-Time Transport Control Protocol (RTCP) in the MRF to address the ECN requirements in 4G/LTE networks, where RTCP-XR is utilized as the ECN feedback mechanism for packet loss reporting.

9. Voice Quality Enhancement (VQE)

In all-IP LTE networks, conventional circuit-packet Media Gateways (MGWs) are no longer required and are essentially removed from the network. Historically, the MGW provides some amount of voice quality treatments such as noise gating and acoustic echo and hybrid cancellation. In the LTE network, the voice quality treatments need to be provided by the MRF.

Radisys Solution: Radisys media servers with Voice Quality Enhancement (VQE) deliver noise gating and acoustic echo cancellation in an all-IP LTE network.

10. Improving Reusability

Once fully deployed, 4G/LTE technology will fulfill the promise of a flat, all-IP network, which should usher in cost-saving benefits with respect to reuse. For instance, resource reusability across applications can be accomplished by the Media Resource Broker (MRB),[10] as depicted in Figure 9. This is a functional entity that collects published MRF information and supplies the appropriate MRF information to consuming entities such as the application server. MRB requirements exist today, but the potential for reusability will be much greater in 4G/LTE networks as they become larger.

Radisys Solution: Radisys MRF products can interwork with emerging MRB products and infrastructures for 4G/LTE networks, thus supporting the demands for resource reusability across applications.

Radisys Leadership in IP Media Processing

Radisys media servers have a proven track record in supporting IP-based media processing in 3G networks, and are already working as the MRF in IMS deployments, thanks in part to the flexibility of the IMS architecture. Along with its partners, Radisys understands the complexities of 4G/LTE networks and will deliver a wide range of new solutions and applications, like cloud services delivered over 4G/LTE access networks. Working with IMS since its inception, combined with hundreds of engineering years in telecom, Radisys has demonstrated leadership in IP media server products and technology, which establishes an excellent foundation for helping customers and partners deliver the MRF media processing essential for 4G/LTE mobile networks.

For more information, please contact your Radisys Sales Representative or go to http://www.Radisys.com/Products/Media-Servers.html

Appendix: MMTel Eases Migration to an All-IP Network[12]

MMTel, or Multimedia Telephony, is an IMS-based global standard for the next stage in the evolution of telephony, away from circuit-switched technologies and to an all-IP solution. Using IMS architecture, including the MRF for media packet processing, this interconnect specification is a service set that enables operator-to-operator communication, and it will eventually replace fixed and mobile circuit-switched telephony. MMTel offers converged fixed and mobile, real-time multimedia services that allow users to communicate using voice, video and chat, and to easily share image files and video clips. MMTel combines quality, interoperability, efficiency, regulatory and supplementary services with the rich media and dynamics of Internet community-based communications.

MMTel Benefits

- Provides subscribers a complete and seamless services offering—whether their device is mobile or fixed
- Enables access to several multimedia features, including video, chat and image sharing as well as support for a diverse set of telephony supplementary services, such as multimedia conferencing
- Gives operators a specification for replacing all current fixed and mobile telephony solutions and for consolidating their networks to reduce capital and operating expenditures
- Offers a migration path to mobile-access technologies, such as 4G/LTE and WiMAX, that do not support circuit-switched voice
- Allows operators to interconnect with one another, creating the potential for global interconnect agreements that drive global, mass-market acceptance and greater profitability
- Delivers a standard for the mass market, supporting the development of inexpensive devices

For more information on MMTel services in an IMS architecture and MRF for media processing and supplementary services, please see 3GPP TS 26.114.[8]

Glossary

3GPP: 3rd Generation Partnership Project
A-BGF: Access Border Gateway Function
AS: Application Server
BAS: Broadband Access System
BSC: Base Station Controller for 2G mobile networks
CMTS: Cable Modem Termination System
CSCF: Call State Control Function
CSFB: Circuit Switched Fall Back
eNodeB: Supports 4G/LTE radio access network
DSL: Digital Subscriber Line
DSLAM: Digital Subscriber Line Access Modem
EPC: Evolved Packet Core
GGSN: Gateway GPRS Support Node
GPRS: General Packet Radio Service
GSM: Global System for Mobile communications
HSS: Home Subscriber Server
I-BGF: Interconnection Border Gateway Function
I-CSCF: Interrogating CSCF
IBCF: Interconnect Border Control Function
IMS: IP Multimedia Subsystem
IMS-GW: IMS Gateway
IP: Internet Protocol
IPv4: Internet Protocol Version 4
IPv6: Internet Protocol Version 6
IVVR: Interactive Voice and Video Response
MGCF: Media Gateway Control Function
MGW: Media Gateway
MME: Mobile Management Entity
MMTel: Multi Media Telephony
MRB: Media Resource Broker
MRF: Media Resource Function
MRFC: Multimedia Resource Function Controller
MRFP: Multimedia Resource Function Processor
MS: Media Server
NAT: Network Address Translation
PCRF: Policy and Charging Rules Function
P-CSCF: Proxy-CSCF
PGW: Packet Gateway
PDF: Policy Decision Function
PSTN: Public Switched Telephone Network
RACS: Resource & Admission Control Subsystem
RNC: Radio Network Controller for 3G mobile networks
RTP: Real-time Transport Protocol
RTCP: Real-time Control Protocol
S-CSCF: Serving Call Session Control Function
SBC: Session Border Controller
SIP: Session Initiation Protocol
SGSN: Serving GPRS Support Node
SGW: Serving Gateway
VoIP: Voice over IP
WAG: Wireless Access Gateway
WLAN: Wireless Local Area Network

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radisys

Corporate Headquarters

5445 NE Dawson Creek Drive
Hillsboro, OR 97124 USA
503-615-1100 | Fax 503-615-1121
Toll-Free: 800-950-0044
www.radisys.com | info@radisys.com