VoLTE AND PERFORMANCE MONITORING.

Worldwide, Service Providers are adopting IP Multimedia Subsystem (IMS) architectures to reduce operating expenses. As a result, they are gaining the flexibility to rollout new IP services like Voice over Long-Term Evolution or VoLTE.

VoLTE offers many benefits, including:

- Lower bandwidth consumption (uses about 50% of the spectrum bandwidth required by 3G calls)
- Enhanced Quality of Service settings that reduce latency and jitter for better call quality
- Reduced power consumption by idle handsets.

However, with these benefits come additional performance monitoring challenges. SevOne delivers a solution for monitoring VoLTE deployments, built on the following architectural fundamentals:

- LTE and IMS multi-vendor network element support
- Path visibility
- Handset visibility
- Support for VoLTE KPIs
- Scalability to support monitoring of 75,000+ cell sites from a single pane of glass

LTE AND IMS MULTI-VENDOR NETWORK ELEMENT SUPPORT.

LTE and IMS implementations require performance management systems to support a growing array of network elements. SevOne helps track the performance of LTE network devices, regardless of vendor or equipment type. It provides metrics from Alcatel-Lucent, Cisco, Ericsson, Mavenir, Nokia Siemens Networks, Oracle, Samsung and more – all in a single pane of glass.

Service Providers typically group LTE elements into one of the following types:

- LTE Radio Access Network (RAN)
- Backhaul
- Evolved Packet Core (EPC)
- MME (Mobility Management Entity)
- SGW (Serving Gateway)
- PGW (PDN Gateway)
- HSS/AAA (Home Subscriber Server)
- Transport
- IMS core

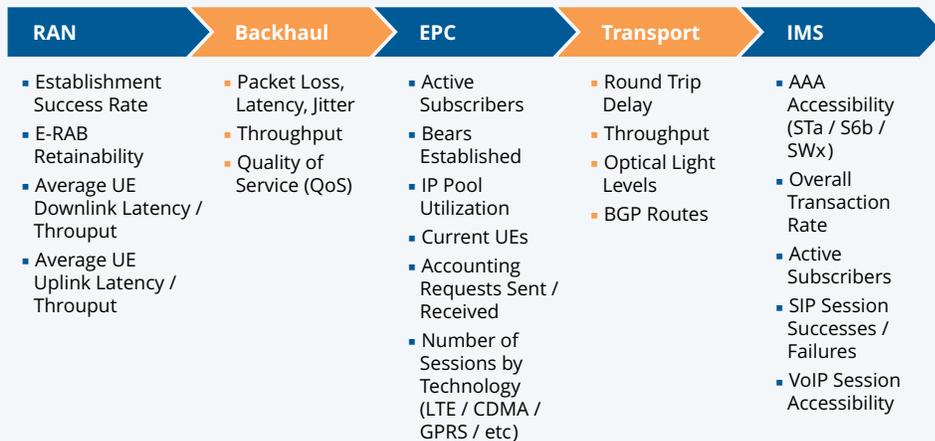## SUPPORT FOR VOLTE KEY PERFORMANCE INDICATORS (KPIS).

SevOne supports the data collection and reporting necessary for monitoring the lifecycle of a VoLTE call. It automatically baselines each of the VoLTE KPIs below (and many others) and sends an alert when they deviate from their historically "normal" state. This method provides a more reliable predictor of service-impacting events and degradation of user experience.

With SevOne, users are able to answer the following questions based on a broad range of KPIs from across the VoLTE infrastructure:

- Can the user make a call?
- Can the user uphold a call?
- How long does it take for a call to ring?
- What is the quality of a call?
- Is there delay in hearing the call?
- Is the call choppy?
- Does the voice go "in and out"?

KPIs Supported by SevOne include:

Complete End-to-End 4G Network Performance Visibility

RAN	Backhaul	EPC	Transport	IMS
▪ Establishment Success Rate	▪ Packet Loss, Latency, Jitter	▪ Active Subscribers	▪ Round Trip Delay	▪ AAA Accessibility (STa / S6b / SWx)
▪ E-RAB Retainability	▪ Throughput	▪ Bears Established	▪ Throughput	▪ Overall Transaction Rate
▪ Average UE Downlink Latency / Throuput	▪ Quality of Service (QoS)	▪ IP Pool Utilization	▪ Optical Light Levels	▪ Active Subscribers
▪ Average UE Uplink Latency / Throuput		▪ Current UEs	▪ BGP Routes	▪ SIP Session Successes / Failures
		▪ Accounting Requests Sent / Received		▪ VoIP Session Accessibility
		▪ Number of Sessions by Technology (LTE / CDMA / GPRS / etc)		

PATH VISIBILITY.

SevOne interfaces with a carrier's inventory management system to automate the grouping of VoLTE devices, based on device location. This enables carriers to scale their network infrastructures based on business needs and ensures performance visibility over their growing VoLTE networks.

HANDSET VISIBILITY.

Carriers often deploy specialized 3rd party management agents on carrier-owned handsets to assess the coverage and capacity of a VoLTE network. They use these handsets during drive tests to collect performance metrics and determine quality of user experience. SevOne supports the collection and reporting of handset agent data for cases such as geography-specific call quality reporting that require a professional services engagement.

Example data sets collected from handset agents may include:

• Signal intensity and quality
• Cell site handover information
• GPS location coordinates

SCALABILITY TO SUPPORT MONITORING 75,000+ CELL SITES FROM A SINGLE PANE OF GLASS.

Most tier-one wireless carriers have anywhere between 20,000 and 75,000+ cell sites. Each one pairs with a backhaul router, aggregates to larger backhaul routers numbering in the hundreds, and connects to a core/distribution network comprising 25,000 or so additional devices. Scalability and the length of time it takes to run reports are key issues in regard to performance monitoring. Without a comprehensive view of performance, it becomes difficult to identify the source of a spike in traffic or dropped calls. A minor configuration change on an LTE/IMS network can have a major impact on traffic flows, dropped connections and failed authentications.

High-level visibility into how the different components/devices and applications are performing within the LTE/IMS infrastructure must be available -- in near real-time -- throughout the enterprise. With the SevOne Cluster Architecture™, peer-to-peer performance management appliances create a distributed performance management system that provides a central reporting view of data across the multiple silos of core/distribution, access and edge networks, and at regional and/or national level. Collected data can be available for alerts and reports in seconds, rather than many minutes, and stored locally in the event of an outage to provide 'back-fill' performance metrics in monthly reports.

About SevOne.

SevOne provides the world's most scalable infrastructure performance monitoring platform to the world's most connected companies. The patented SevOne Cluster™ architecture leverages distributed computing to scale infinitely and collect millions of objects. It provides real-time reporting down to the second and provides the insight needed to prevent outages. SevOne customers include seven of today's 13 largest banks, enterprises, CSPs, MSPs and MSOs. SevOne is backed by Bain Capital Ventures. More information can be found at www.sevone.com. Follow SevOne on Twitter at @SevOneInc.