Monitoring the Data Explosion in LTE

Technical Brief

Swedish mobile telephone manufacturer Ericsson recently estimated that 38% of U.S. mobile phone subscribers owned smart phones with data plans. According to Nielsen, that figure has grown to almost 50% of subscribers.[1]

As early as 2009, broadband data traffic had overtaken voice traffic on mobile networks, and industry experts expect data traffic volume to double each year through at least 2014 and possibly through 2017.[2,3]

“With the number of mobile subscribers standing at 3.2 billion people, nearly half of the world’s population now uses mobile communications. It is expected that a further 700 million subscribers will be added by 2017 and the 4 billion-subscriber milestone will be reached in 2018,” reported the GSM Association in their 2013 report on the state of the mobile communications industry.[3]

This whirlwind growth rate has implications for virtually every facet of modern life, and the telecommunications services companies are busy building out the infrastructure to handle the coming demand for LTE broadband mobile data.

What is LTE?

LTE or 4G/LTE is the fourth generation and Long Term Evolution of cellular telephone technology. The standard was developed by the 3GPP partnership among leading telecommunications and technology companies as a means of increasing data transmission speeds well beyond older 3G (third generation) and prior technologies. Notable members of the 3GPP include AT&T, Verizon, Cisco Systems, Intel, and Qualcomm, as well as European and Asian interests.

One key difference between LTE networks and its predecessor telephone systems is that LTE supports only packet-switched IP traffic. Voice calls using the GSM, UMTS and CDMA2000 networks are circuit switched, so carriers were forced to re-engineer their voice call networks as well as their data networks with the advent of the new standard. The monitoring system in the telecommunications data center must therefore support LTE data as well as VoLTE (Voice over LTE), IMS (Internet Multimedia Subsystem) and VoIP (Voice over Internet Protocol).

“The shift to all-IP introduces a variety of security considerations for signaling networks, particularly with external network interfaces. This includes a variety of threats such as denial of service attacks and fraud,”says telecomasia.net.[4]

Because telecommunications services are a commodity with intense competition on price and performance, creating an LTE network is no longer optional for wireless telecommunications providers. The modern generation of smart phones and tablets is built for LTE and companies that do not offer the service cannot expect to survive. The primary challenge in building an LTE network is to create the infrastructure necessary to assure top-tier service and maintain maximum uptime.

“The shift to all-IP introduces a variety of security considerations for signaling networks, particularly with external network interfaces. This includes a variety of threats such as denial of service attacks and fraud” — telecomasia.net

Challenges of Maintaining an LTE Network

One challenge of monitoring any mobile data and voice network is the need to monitor signaling traffic as well as user data. The GPRS (General Packet Radio Service) core network provides mobility management, session management, the transport for IP packet services in the GSM and WCDMA networks as well as additional functions such as billing and lawful intercept and inspection. To gain complete end-to-end visibility, it is necessary to monitor multiple interfaces such as Gi, Gn and Gb around the GGSN (Gateway GPRS Support Node) and SGSN (Serving GPRS Support Node) in the GPRS core network.

Telecommunications Data centers must be able to observe all network activity in real time to maintain a first-rate customer experience and prevent quality degradation. In addition to all the points in a modern LTE network that must be monitored, a variety of network monitoring tools are needed to perform Global Call Tracing, Performance Analysis, Roamer Analysis, Statistics Alarming, Troubleshooting via Protocol Analyzer, Surveillance via Deep Packet Inspection, Accurate CDR/xDRs Generation, and Billing Verification.

It is prohibitively expensive to purchase a tool for every possible function at every monitoring point in a modern LTE network, and manually moving tools and repatching is prohibitively dangerous in terms of cabling errors as well as time-consuming for data center staff. To connect all these tools in real-time to the various points in the network requires an intelligent traffic monitoring system capable of aggregating, directing, and filtering data streams to the required tools instantly when specified through a desktop application.

APCON Intelligent Data Traffic Management switches provide high port density, data stream aggregation, packet filtering and multicast replication to meet the needs of the modern LTE data center. As mobile data services gain more traction through the use of smartphone and new innovative services, network operators have deployed 10G and 40G network infrastructure to handle the increased bandwidth requirements. With a family of enterprise-class offerings supporting 10G Ethernet at up to 288 ports per chassis and 40G Ethernet at up to 64 ports per chassis, APCON switches provide the connectivity, scalability and features required to implement complete end to end network monitoring and security.

The APCON Solution for LTE

Any major telecommunications company uses a variety of tools to monitor their 4G/LTE network for QoS and capacity planning. Among many tools in use today, the following are used most often:

- OPNET/Riverbed
- JDS Uniphase test and measurement devices
- Tektronix Geoprobe
- Tektronix G10 probe

Each of these tools costs up to $250,000, so telecommunications companies are looking for ways to get the most out of every tool. Beyond that cost of tools, however, is the issue of having many local facilities in widely dispersed locations – a constant challenge for all telecommunications companies.

In a standard North American telecommunications network design, Regional Operations groups perform Deep Packet Inspection (DPI) on 100% of network traffic at many (up to 100) regional data centers. At the regional level, the MME (Mobility Management Entity) is the key control node for the LTE access-network. TAPs are placed before and after the MME in the data stream.

Within the regions, over 200 local Mobile Switching Centers (MSC) also require reactive monitoring capabilities to troubleshoot localized problems before they become disruptions in service. Additionally, there are generally several national data centers. Passive TAPs throughout the 3G and 4G network in the regional and national installations provide access to the raw data traversing these data centers.

Each regional data center in a standard layout would benefit from an intelligent data traffic management switch (also known as a network packet broker) featuring about 72 ports of 10G Ethernet to gather up the data streams from the network TAPs and direct that data to the appropriate tools. These switches provide packet aggregation – the ability to merge separate data streams into one – along with effective filtering, de-duplication and packet slicing to reduce the data stream to a manageable size for the tool in question.

ABOUT APCON

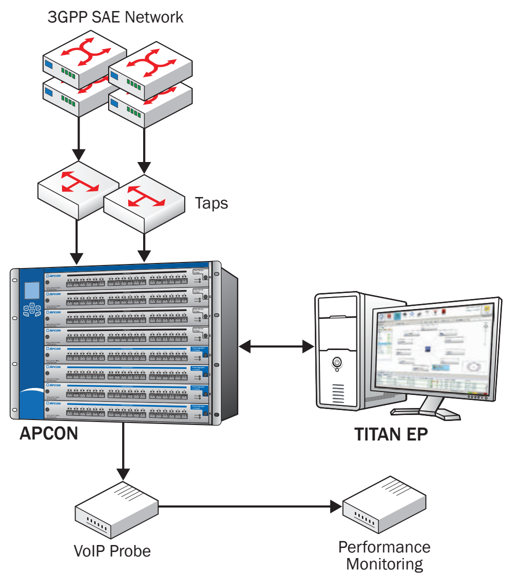
APCON develops innovative, scalable technology solutions to enhance network monitoring, support IT traffic analysis, and streamline IT network management and security. APCON is the industry leader for state-of-the-art IT data aggregation, filtering, and network switching products, as well as leading-edge management-software support. Organizations in over 50 countries depend on APCON network infrastructure solutions. Customers include Global Fortune 500 companies, banks and financial services institutions, telecommunication service providers, government and military, and computer equipment manufacturers.

Contact Us

Please email sales@apcon.com if you have any questions

Filtering, de-duplication and packet slicing also benefit data centers with a strong legacy of 1G Ethernet tools. Using data rate conversion in combination with filtering on the monitoring switch, 1G tools may be used to monitor 10G network links.

Dynamic load balancing for aggregated streams is also a benefit on an intelligent data traffic management switch, as this feature allows multiple tools to each receive a portion of the monitored traffic. In some cases, time stamping each packet as it enters the monitoring system helps monitor QoS throughout the network.



At the MSC level, each location can benefit from a small intelligent data traffic management switch for local aggregation and backhaul to the regional or national data centers.

By implementing a network monitoring solution featuring packet aggregation, filtering, load balancing, and data rate conversion – all features present in an enterprise-class intelligent data traffic management switch – telecommunications companies can save millions of dollars in tools that are currently replicated for each location and then only partially subscribed. By adding advanced services packet de-duplication and packet slicing to further reduce the data stream to the relevant information, tools to monitor VoIP activity and other transactions are made more efficient and can monitor a larger fraction of traffic.

References

1 http://blog.nielsen.com/nielsenwire/online_mobile/smartphones-account-for-half-of-all-mobile-phones-dominate-new-phone-purchases-in-the-us

2 http://www.ericsson.com/res/docs/whitepapers/wp-4g.pdf

3 http://www.gsma.com/newsroom/gsma-outlines-state-of-mobile-industry-in-new-report

4 http://www.telecomasia.net/content/diameter-lte-data-services?page=0%2C0

12107-R2-0813

APCON Solutions for Networks