



WHITE PAPER

The Importance of Subscriber-Aware Visibility

Mobile networks are increasingly challenging to manage as the number of subscribers and demand for services grows. As a mobile operator, you own the relationship with your subscribers. Therefore, a fundamental challenge involves ensuring the network is constantly monitored for subscriber quality of experience. This means you need a complete picture of subscriber activity across the radio access and core networks. As your network expands to support new services such as voice carried over data links or voice over LTE (VoLTE), you cannot afford partial network visibility. You need subscriber-aware end-to-end visibility.

When the network is down or impaired, seconds matter. This is especially critical as global mobile data traffic is expected to increase sevenfold between 2016 and 2021. Better network visibility can improve mean time to repair (MTTR) by helping pinpoint problems.

A subscriber-aware visibility solution helps alleviate these concerns. However, there are three fundamental questions to consider when picking a subscriber-aware visibility solution:

- Can it provide a complete picture of subscriber activity on the network?
- Does the solution lower MTTR?
- Is it possible to gain big data visibility for subscriber management?



Research shows global mobile traffic levels will increase sevenfold between 2016 and 2021 to reach 49 exabytes per month (one exabyte is equivalent to one billion gigabytes), according to the Cisco Visual Network Index, Forecast and Methodology: 2015-2020.

Monitoring Subscriber Activity In The Network

Growth of diverse user equipment (UE) is what drives mobility today. Devices are evolving rapidly with different form factors, increased capabilities, and intelligence. What was a basic cellphone has evolved into a smart phone and then a phablet and now we are witnessing machine-to-machine (M2M) connections from asset tracking systems, to connected cars, to medical applications.

Demand for capacity has increased. Data-intensive devices are driving wireless throughput requirements upwards at an alarming rate, putting a massive strain on networks that cannot cope with this increase in data traffic.

Mobile operators are challenged, as well. In particular, operators are challenged with delivering the much-needed capacity precisely when and where it is required to areas where a large majority of users rely on the network. Advanced mobile services are also putting huge pressure on mobile operators to reevaluate their network architectures. It is difficult to keep pace with network growth for capacity demands at work, at home, and at play. To support new devices and subscribers, operators need tools to be successful.

Also, as subscribers start to use more advanced services and apps—such as video conferencing, Voice over Internet Protocol (VoIP), and Voice over LTE (VoLTE), which are set to skyrocket by 2021, the operator must be able to quickly resolve any performance issues and problems. Monitoring network data for each type of subscriber behavior and application usage for customer care purposes is required for accurate problem resolution. Correlating user sessions, as users roam from network to network, has become a critical need, as well.

Traditionally, carriers have monitored quality of service (QoS) by feeding all the traffic of the mobile core network to specialized monitoring probes. But, analyzing subscriber data from a subscriber's Long-Term Evolution (LTE) and 4G sessions in real time is very difficult and resource intensive. Multiple probes are required to scale and accurately monitor the entire subscriber base and to build an accurate picture of network health. The situation is further complicated by the fact that, during load balancing, a single subscriber's data can end up on multiple probes, forcing the probes to use valuable resources to correlate the data between them (see figure 1).



Video will account for 70% of all mobile data traffic by 2021: Ericsson Mobility Report, Nov. 2015.



Figure 1. Probes can spend 50% of their capacity to correlate user data between themselves.

Also, a service provider's monitoring solution needs to operate at high levels. This includes processing data at line rate such that no data packets get dropped, as dropped packets will be interpreted as a sign of degraded network performance. This level of performance is increasingly important as core network speeds move from 10 GE to 40 GE and 100 GE. The monitoring solution needs to support these speeds natively at full speed. This means the data access, network packet brokers (NPBs), and monitoring tools all need to operate at peak performance.

Monitoring equipment needs to be able to handle weekly, daily, and transitory fluctuations in traffic load so that you can capture the proper data. Otherwise, you can miss critical data regarding the network health and subscriber quality of service.

Another performance need involves creating a non-blocking architecture that can process packets irrespective of packet size. Most NPBs use network processors or general purpose processors that are limited in throughput by the CPU. This shortcoming is even more pronounced when having to deal with a lot of small packets, like the ones resulting from data streams for technologies like VoIP or VoLTE.

Thankfully, there are superior monitoring solutions available that satisfy the requirement of no dropped packets and that analyze performance and provide detailed and accurate information from all parts of the network. For instance, there are field-programmable gate array (FPGA)-based NPB systems that can support line rates with minimal latency and no dropped packets.

Ixia's high performing Vision series of NPBs enables monitoring solutions to scale. The Ixia solution can deliver all network packets from both physical and virtual networks to analytics and monitoring tools. The solution scales up to 100G and can deliver wire-speed performance.



Monitoring equipment needs to be able to handle weekly, daily, and transitory fluctuations in traffic load.

Scaling offers another challenge for monitoring fast-growing mobile networks. For architectures built on top of general purpose processors, scalability is achieved by adding more monitoring probes to handle the increasing traffic volume. But monitoring probes have not been able to keep up with the data traffic explosion. In some cases, probes spend 50% of their capacity to correlate user data between themselves (see figure 01). With this approach, network growth due to increasing demand for data leads to the need for more probes, and a resulting increase in capital expenditure (CAPEX) costs.

Benefits Of GTP Session Controllers

Ixia's General Packet Radio Service (GPRS) Tunneling Protocol (GTP) Session Controller, is a special type of NPB that enables mobile network monitoring solutions to scale. Using intelligent filtering capabilities, Ixia's solution can deliver all the network packets or a single subscriber to the same analytics and monitoring probes eliminating the need for the probe to recreate session context. This can cut CAPEX by offloading the correlation of sessions from the network monitoring probes, thereby allowing them to focus on monitoring tasks and to scale as traffic grows (see figure 2).



Figure 2. GTP Session Controller offloads session correlation from monitoring probes and supports scaling by distributing subscribers across multiple probes.

The solution can filter and forward specific subscriber sessions. Using a monitoring tool to isolate the required packets and discard the others is a wasteful use of an expensive resource and is also processor intensive. By filtering and forwarding selected subscriber sessions to specific tools, the monitoring tool is freed to perform the work that it was purchased to do, resulting in more useful work being done by the monitoring tool.

The GTP Session Controller can be used to identify a subscriber or group of subscribers based on their International Mobile Subscriber Identity (IMSI). IMSI is used to identify the user of a cellular network and is exchanged in GTP-control (GTP-C) sessions. The solution keeps track of the IMSIs that a mobile provider is interested in monitoring and correlates these to the corresponding data/user-plane sessions for the subscriber and/or group of subscribers.

When the amount of data increases in a network, network teams often find that the network data flow increases faster than the capabilities of their monitoring tools. A single monitoring tool that previously performed well is now out of capacity. The GTP Session Controller effectively identifies and tracks mobile subscribers and load balances the network probes by enforcing capacity and rate limits for each customer, even as mobile traffic rates fluctuate.



Big Data by itself is not sufficient. Service providers must have visibility into all segments of their networks.

Sampling Simplifies Subscriber Management

Additionally, because the GTP Session Controller is truly subscriber-aware, it can further optimize traffic and reduce costs by allowing operators to sample only a specific percentage of subscriber activity. With the help of big data, service providers can create a single subscriber view across their systems to deliver greater service personalization, tailor marketing communications, identify Next Product to Buy, service more profitable customers, and blend multiple services to create richer customer experiences to increase ARPU and reduce the risk of customer churn.

To ensure accurate data processing and analysis, network analysis tools must have visibility into all the segments of their networks. The data itself should be correlated to the subscribers and their applications. However, the sheer scale of mobile network activity—in terms of volume, velocity, and variety—makes it difficult to manage all of this data, leading to blind spots in understanding the relationship between traffic, network load, and subscriber experience.

With the ability to understand the characteristics of mobile traffic, Ixia GTP Session Controllers support subscriber-aware data sampling, to reduce the total volume of processing, while focusing in on the traffic of most interest. Some operators have been able to successfully manage their networks by sampling as low as 60% of their subscriber base. Sampling, of course, means you lose visibility to some portion of your network activity, so the GTP Session Controller can complement sampling with whitelist filtering, allowing operators to make sure all traffic for high value subscribers, such as VIP customers, senior management (C-level executives, senior vice presidents/vice presidents), or first responders (emergency services), is always delivered to monitoring probes, irrespective of sampling percentage applied (see figure 3).

- **Sample** 40% of subscribers
- Always **track** VIP customers (whitelist by IMSI or device IMEI)
- **Filter** to only send VoLTE traffic or filter by user in specific locations



Figure 3. With Ixia's GTP Session Controller, subscriber-aware sampling can turn big data into manageable data..

Further, the solution's filtering capabilities can reduce the volume of monitored data by allowing probes to focus on specific portions of the network or on types of traffic, as for example with sensitive VoLTE or Wi-Fi calls.

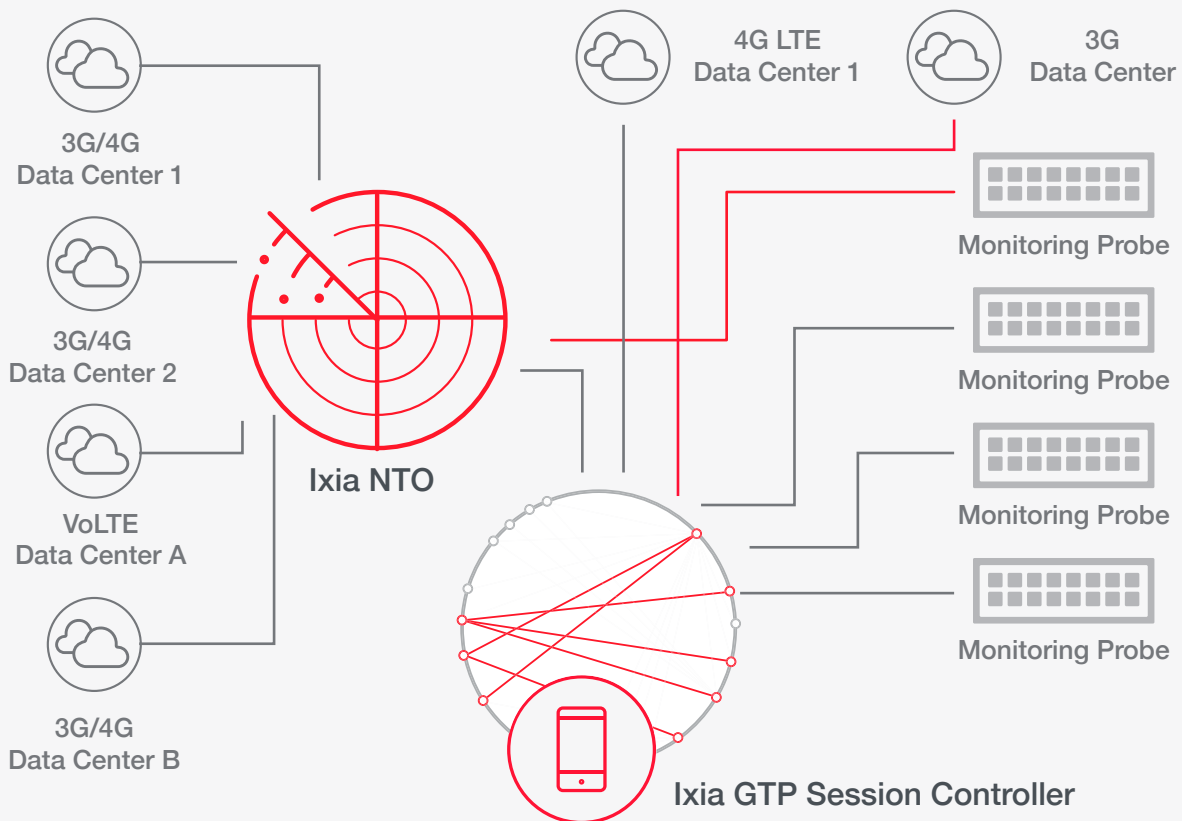


Figure 4. Highly scalable, subscriber- aware visibility provided by Ixia NPB and GTP Session Controller.

Summary

Mobile networks are growing increasingly large and complex to monitor. Not all network visibility solutions are created equal. Ixia NPBs and GTP Session Controllers work together to capture and analyze mobile traffic in a scalable solution that accurately and efficiently monitors networks of any size. Traffic is aggregated from all required access points to provide comprehensive visibility. The subscriber-aware GTP Session Controller offloads correlation of subscriber data from your monitoring probes and load balances traffic evenly across multiple probes, while keeping subscriber sessions intact (see figure 4). Ixia solutions use hardware acceleration to process data at line rate speed without packet loss and feature a fully-integrated drag-and-drop interface as well as application programming interfaces (APIs) for easy configuration and maintenance. And because Ixia solutions can understand the details of GTP messages, you can filter traffic based on types of subscribers, regions of the network, types of traffic, and other characteristics, to use your probes more efficiently. Support for traffic sampling can further increase efficiency and reduce monitoring costs. This powerful visibility architecture helps you monitor important elements of subscriber experience, accelerate network troubleshooting, and keep CAPEX costs under control.

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