



WHITE PAPER

The Importance of Subscriber-Aware Visibility

As a mobile network operator, you are responsible to your subscribers to guarantee their quality of experience (QoE). Mobile networks are increasingly difficult to manage as demand for services grow, which means you need a complete picture of subscriber activity across the radio access and core networks. As your network expands to support 5G and other new services such as voice carried over data links or voice over LTE (VoLTE), you cannot afford only partial network visibility. You need subscriber-aware end-to-end visibility. Complete network visibility will improve mean time to repair (MTTR) and helps IT troubleshoot problems faster.

When the network is down or impaired, seconds matter. This is especially critical as the predication for global mobile data traffic will increase sevenfold between 2017 and 2022. Over 70 percent of the world's population will have mobile connectivity by 2023. The total number of global mobile subscribers will grow from the 2018 figure of 5.1 billion — 66% of the population, to 5.7 billion, 71% of the population by 2023.¹



Research shows that global mobile data traffic will increase sevenfold between 2017 and 2022, reaching 77.5 EB per month by 2022, to over 200 EB per month by 2026.²

¹ Cisco. 2021 Global Networking Trends Report. 2020. <https://www.cisco.com/c/dam/en/us/solutions/enterprise-networks/2021-networking-report.pdf>.

² Cisco. Cisco Visual Networking Index (VNI) Complete Forecast Update, 2017–2022. 2018. <https://www.cisco.com/c/dam/en/us/solutions/enterprise-networks/2021-networking-report.pdf>.

A 4G connection generates about three times more data traffic than 3G connections. This increased traffic is a result of various factors including a higher usage rate of 4G and the fact that 3G devices cannot support today's smartphone applications which require higher bandwidth and processing capabilities. As mobile technology evolves, the average 5G connection will generate nearly three times more traffic than a 4G connection. Even though 4G or LTE currently hold the primary share of the market, 5G is coming fast, and mobile operators must prepare for the heavy demands 5G is starting to place on their networks.



A subscriber-aware visibility solution helps alleviate these concerns. There are three fundamental questions to consider when selecting a subscriber-aware visibility solution:

1. Can it provide a complete picture of subscriber activity on the network?
2. Would the solution lower MTTR?
3. Is it possible to gain big data visibility for subscriber management?

Other considerations to include in the selection of a new visibility solution:

- monitors more subscriber sessions without purchasing additional probes
- pools the probes more efficiently for different performance profiles
- provides selective filtering to monitor specific types of traffic or subscribers
- minimizes data loss during a probe outage
- creates more value from your existing monitoring solution investment

Most importantly, you need to choose a subscriber-aware visibility solution that will enable you to maintain customer QoE without negatively impacting your budget.

Monitoring subscriber activity in the network

The 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 once a basic cell phone has evolved into a smartphone and then a smartphone-tablet hybrid (phablet). Now we are witnessing machine-to-machine (M2M) connections from asset tracking systems, to connected cars, to medical applications.

Demand for capacity continues to increase. Data-intensive devices are increasing wireless throughput requirements at a massive rate, putting a strain on networks that cannot cope with this data traffic growth.

The key challenge for mobile operators is delivering the much-needed capacity precisely to areas where a large majority of users rely on the network. Advanced mobile services are also placing enormous pressure on mobile operators to reevaluate their network architectures. It is difficult to keep pace with network growth for capacity demands at



Video will account for 77% of all mobile data traffic by 2026.

work, at home, and at play. To support new devices and subscribers, operators need the right tools to be successful.

As subscribers continue to use more advanced services and applications — such as video conferencing, Voice over Internet Protocol (VoIP), and Voice over LTE (VoLTE), the operator must quickly resolve any performance issues and problems. Monitoring network data for each type of subscriber behavior and application usage for customer care purposes is necessary for accurate problem resolution. Correlating user sessions, as users roam from network to network, is also a critical need.

Traditionally, carriers have monitored QoS by feeding the traffic of the mobile core network to specialized monitoring probes. Analyzing subscriber data from a subscriber's Long-Term Evolution (LTE) and 4G / 5G sessions in real time is demanding and resource intensive. Multiple probes are essential to scale and accurately monitor the entire subscriber base to build an accurate picture of your network health.

Figure 1 shows the complicated situation 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.



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



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

A service provider's monitoring solution must operate at high data processing rate levels to ensure no data packets drop. Dropped packets are a sign of a degraded network performance. This high level of performance is increasingly important as core network speeds move from 10 Gigabit Ethernet (GE) to 40 GE to 100 GE and beyond to 400 GE. The monitoring solution must support all these speeds intrinsically at full speed so data access, network packet brokers (NPBs), and monitoring tools can all operate at peak performance.

Monitoring equipment must be able to handle daily, weekly, transitory, or seasonal fluctuations in traffic load to capture the correct data. Otherwise, critical data to effectively monitor the network's health and subscriber's QoS may be missing.

Creating a non-blocking architecture that includes a network packet broker (NPB) that can process packets irrespective of packet size is also critical to ensure top performance. Most NPBs use network processors or general-purpose processors that have throughput limitations by the CPU. This processing shortcoming occurs when working with many small packets from data streams for technologies like VoIP or VoLTE.

Fortunately, there are superior zero-loss visibility solutions on the market that do not drop packets. These platforms analyze performance to provide detailed and accurate information across the entire network. Field-programmable gate array (FPGA) based NPBs use accelerated hardware processing that can reliably support line rates with minimal latency and no dropped packets even during peak traffic volumes.

Keysight's Vision Series of high-performing NPBs enable monitoring solutions to scale. These NPBs support up to 100G and delivers wire-speed performance.

Scaling is another challenge for monitoring fast-growing mobile networks. With architectures built on general-purpose processors, scalability is achievable by adding more monitoring probes to handle the increasing traffic volume. But monitoring probes have not kept up with the data traffic explosion. Figure 1 shows in some cases, probes spend 50% of their capacity correlating user data between each other. The increasing demand for data requires the mobile operator to buy more probes, increasing capital expenditure (CapEx) costs.

Benefits of MobileStack GTP Session Correlation on Vision X

Keysight's MobileStack on Vision X provides general packet radio service (GPRS) tunneling protocol (GTP) session correlation which enables mobile network monitoring solutions to scale. The MobileStack software delivers added value to the Vision X network packet broker by providing subscriber-level traffic visibility inside mobile core networks. MobileStack enables your monitoring probes to work more efficiently as you gain greater control of your mobile network.

MobileStack on Vision X helps your probes withstand the tidal wave of mobile data by enabling out-of-band data filtering, subscriber sampling, and load balancing, allowing you to make better, more efficient use of probes. Figure 2 shows how network management can reduce your CapEx by offloading session management from the network monitoring probes. This process enables the system to focus on monitoring tasks with the ability to scale as traffic increases.

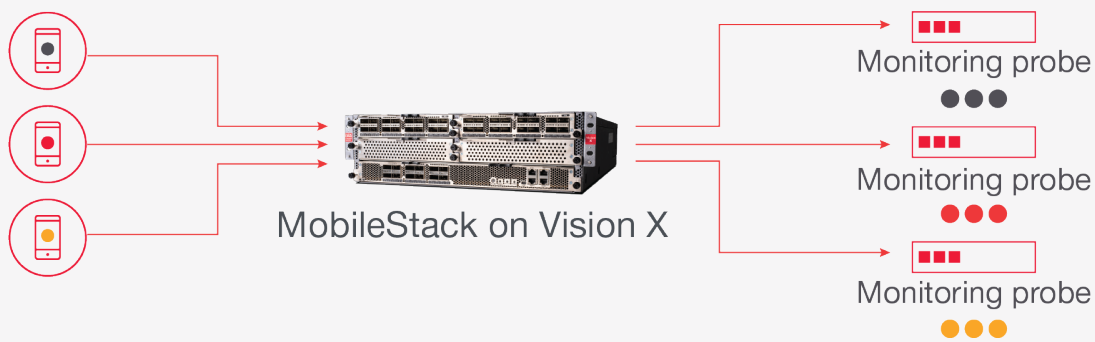


Figure 2. MobileStack software on Vision X reduces load on monitoring probes and supports scaling by distributing subscribers across multiple probes

MobileStack on Vision X can identify a subscriber or group of subscribers based on their International Mobile Subscriber Identity (IMSI). You can use IMSI to identify a cellular network user, and the exchange typically occurs during the GTP-control (GTP-C) sessions. This process tracks the IMSIs that a mobile provider is interested in monitoring and associates these to the corresponding data / user plane traffic sessions for the subscriber or group of subscribers.

When data traffic increases in a network, IT teams often find that the data flow increases faster than their monitoring tools' capabilities. A single monitoring tool that previously performed well now runs out of capacity. MobileStack on Vision X effectively identifies and tracks mobile subscribers and load balances network probes by enforcing capacity and rate limits for each customer, even as mobile traffic rates fluctuate.

Sampling simplifies subscriber management

Because MobileStack on Vision X is subscriber-aware, it can optimize traffic and reduce costs by enabling 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 more personalized services. This single view allows them to tailor marketing communications or identify what product the subscriber will buy next. Service providers can prioritize service to their most profitable customers and blend multiple services that deliver richer experiences to increase the average revenue per user (ARPU) and reduce customer churn.

To ensure accurate data processing and analysis, network monitoring and security tools must have visibility into all network segments. The data itself should relate to the subscriber and their applications. However, the sheer scale of mobile network activity —

in terms of volume, velocity, and variety — makes it difficult to manage all this data and understand the relationship between traffic, network load, and subscriber experience. Eliminating blind spots across your network is critical.

Keysight's MobileStack on Vision X understands the characteristics of mobile traffic and supports subscriber-aware data sampling. This sampling reduces the total volume of data that requires processing while focusing on the traffic of most interest. Some operators can successfully manage their networks by sampling as low as 60% of their subscriber base. Sampling means you lose visibility into a portion of your network activity, so the MobileStack on Vision X complements sampling with allowlist filtering. With this solution, operators can ensure that all traffic for high-value subscribers, such as VIP customers or emergency first responders, is always delivered to monitoring probes, irrespective of the sampling percentage applied (Figure 3).

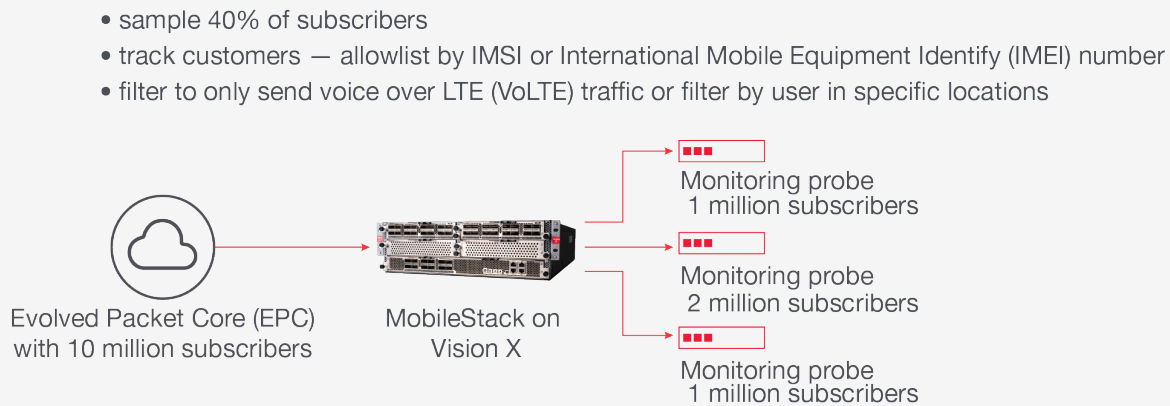


Figure 3. With MobileStack on Vision X NPB, subscriber-aware sampling turns big data into intelligent, manageable data

The solution's filtering capabilities can also reduce the volume of monitored data by allowing your probes to focus on specific portions of the network or types of traffic such as sensitive VoLTE or Wi-Fi calls.

Summary

As mobile networks grow increasingly large, they become more complex to monitor, so choosing a secure, reliable, and scalable visibility solution is paramount. But not all network visibility solutions are equal in their offerings. Keysight NPBs and MobileStack on Vision X e work together to capture and analyze mobile traffic in a scalable solution that accurately and efficiently monitors networks of any size.

MobileStack on Vision X provides flexible configurations of GTP-C and GTP-U capacities up to 1600 Tbps of correlated user plane data and supports a staggering 512 million separate subscribers – more than the entire U.S. population.

Traffic aggregates from all required access points and provides comprehensive end-to-end visibility. The subscriber-aware MobileStack on Vision X offloads the subscriber data from your monitoring probes, and load balances traffic evenly across multiple probes while keeping subscriber sessions intact. Keysight NPBs use hardware acceleration to process data at line rate speed without packet loss. An integrated and intuitive drag-and-drop GUI interface makes managing them easy. Setting up hundreds of filters is fast and simple and does not require coding or any advanced programming skills. Each connection validates automatically.

Because Keysight NPBs understand the details of GTP messages, you can filter traffic based on subscribers, regions, traffic type, and other characteristics. This process makes your probes operate more efficiently. Traffic sampling further increases efficiency and reduces your monitoring costs. Keysight NPBs improve your return on investment (ROI) by accelerating troubleshooting, detecting security breaches faster, reducing the burden on monitoring and security tools, extending the life of tools during upgrades, and streamlining regulatory compliance. You really can have it all. Enhancing the subscriber experience while keeping capital expenses (CapEx) under control doesn't have to be a trade-off.

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