

## Whitepaper

# Intelligent Traffic Management for Service Monetization and Operational Efficiency for Mobile Providers

The communications industry is changing at a rapid pace. As the market moves to an always-connected existence, the insatiable demands from customers for new services, matched by the innovative delivery of new applications and devices, require the industry to transform itself. Cyberspace which was once some place that you went to your desk to visit is now something that you carry in your pocket. With the convergence of communications, entertainment, and leisure accessible across any device, mobile communications is less about telephony and more about wireless data. While this paradigm shift has certainly increased the average revenue per user (ARPU), the corresponding traffic flowing through the network has also soared.

With Over-The-Top (OTT) applications piggybacking a huge amount of data, the massive demand for data does not always correlate to the revenue it generates. Service providers have become victims of their own success, with networks staggering under the weight of these bandwidth-intensive services. Monetizing new services while providing subscribers with a personalized and enhanced customer experience represents an important competitive advantage for any telecommunications organization.

The move to high-speed Long Term Evolution (LTE) networks will foster further innovation along with the development of services and applications. In addition to reducing deployment and operational costs, the transition to IP enables LTE to support Quality of Service (QoS) for real-time packet data services like VoIP and live video streaming. Service providers will be able to provide much higher capacity on an all-IP network which developers can exploit to create new entertainment-related services for consumers and productivity enhancement services for business customers. The high level of interaction and rich user experience offered by these services places a real-time requirement on the supporting delivery and accounting systems. An operator must therefore rise to these challenges by making the systems environment more flexible and extensible so that it does not present any technical or economic barriers to change. Indeed, the new LTE ecosystem will drive the development of rich new broadband services and coupled with the need for a cost-effective delivery mechanism. These will have profound implications on service billing, provisioning, and subscription management.

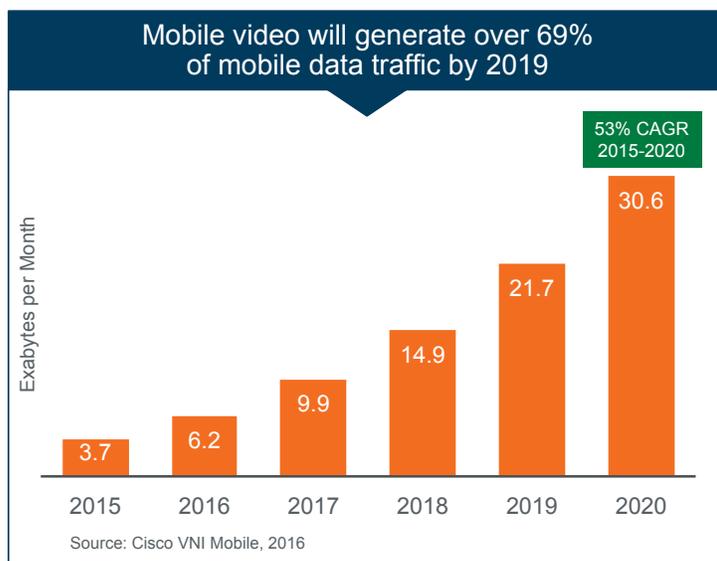


Figure 1: Increase in global mobile data traffic from 2015 to 2020

Business priorities to increase revenue, enhance customer experience and reduce operating expenses (OPEX) have spawned customer-focused initiatives including:

- Transparent real-time accounting, billing, and enhanced subscriber management
- Service automation: rapid service provisioning and deployment, flexible and extensible system infrastructure enabled by virtualization

## Transparent Accounting, Billing, and Subscriber Management

### Monetizing Services:

The ability to effectively and efficiently charge for the consumption of resources represents an important competitive advantage for any telecommunications organization. As the flood of mobile data continues to put a tremendous strain on the MSP's ability to balance cost-to-earnings equation, operators must look beyond broadband connectivity and tiered plans for sustainable differentiations.

This would require a better understanding of the traffic at a subscriber level and take proactive steps to find new ways to monetize in-house applications and advertising. Unfortunately with the complexity and volume of information confronting today's mobile service provider networks, legacy traffic visibility solutions that are built around rudimentary port-based services are not capable of supporting this granular subscriber level visibility.

### Leveraging Big Data for Enhanced Subscriber Management

To stave off commoditization and better monetize new services, mobile providers need to offer an enriched quality of experience (QoE) by taking into account subscriber usage, location, device, time and date, and network resources. Real-time and historical usage across a spectrum of measurable parameters to identify and optimize subscriber-level QoE can only be enabled through end-to-end visibility across traffic flows. Equipped with this information, service providers can not only provide a more personalized and enhanced user experience, but also make optimal use of network resources thereby reduce Total Cost of Ownership (TCO), identify high-value, roaming and/or "data-hungry" subscribers thereby unlocking opportunities for monetization and marketing partnerships.

However, the lack of state and session awareness in legacy portlevel replication and aggregation solutions render them effectively incapable of providing comprehensive subscriber-level visibility. Furthermore, in these Big Data environments, where monitoring tools simply can't keep up with the incoming traffic volumes, operators are always struggling to get a representative view of subscriber level application usage patterns in a cost-effective fashion. Active sampling of subscriber data inside these Big Data pipes while preserving the integrity of the individual flows would go a long way in gleaning critical insights into subscriber usage patterns.

To summarize, real-time, subscriber-level visibility into traffic patterns is required to facilitate:

- Future-proofing revenue management and personalized customer-focused services that balance price and performance
- Avoid bill shock and improve overall credit control with personal services such as policies, warnings, and alerts
- Incorporating self-care to reduce operational expenditure and increase customer satisfaction

## Service Automation

### Rapid Service Provisioning and Deployment

As providers work with new technologies and partners, acquire new business, and develop more complex services and packages to attract and retain subscribers, the complexity of launching services has increased exponentially.

Time to market is a key differentiator for service providers. As with other consumer-oriented industries, network services that can be assembled and personalized by customers in both consumer and enterprise markets add to customer loyalty. To remain competitive today, service providers therefore require a service-fulfillment environment that enables the rapid, simplified, and automated creation and management of complex services and service bundles.

### Elastic and Extensible Infrastructure Enabled by Virtualization

Adoption of virtualization is converting standard infrastructure silos into cohesive, dynamic, and efficient data centers enabling rapid responsiveness to changing business demands. A service being delivered from a service provider's data center is multi-faceted—composed of compute, storage, and network elements all working together. Automation enabled by virtualization links multiple workflows, allowing service providers to complete service requests in a competitive period of time. Simply put, virtualization provides a very real and very tangible return that can be easily quantified into dollars and cents.

Many of the problems in the service fulfillment domain, including the inability to identify bottlenecks and proactively deal with fulfillment failures, can be traced to a lack of subscriber-level traffic visibility. Greater visibility will reduce the number and severity of errors, expedite failure resolution in the delivery chain, improve the speed and reliability with which customer orders get converted into active services, accelerate cycle times, lower costs, greatly enhance the customer experience, and may be a critical differentiator in the rapidly evolving telecommunications market. Service providers therefore need the pervasive visibility to troubleshoot across technology boundaries and offer one complete-stack SLA.

## A New Approach to Providing Pervasive Visibility

As the subscriber driven bandwidth and service demands continues to rise, a different approach is required to ensure that the management and monitoring of these networks scale in capability and also enable a transition of management from reactive to proactive.

Legacy visibility solutions which treat packets in isolation based on Layer 2/Layer 3/Layer 4 header parameters, are simply not able to scale to the tsunami of information bombarding today's mobile service provider networks.

Gigamon created the Unified Visibility Fabric™—the architecture for mobile operators to build a monitoring infrastructure that is designed for the new world of Big Data, providing pervasive visibility, awareness, and control from the converged edge to the cloud. It intelligently manages and delivers the relevant data from various networks under an administrative domain, including campus networks, branch/remote office networks, private cloud, or SDN\* islands that a service provider may have, to a centralized set of tools that are connected to the Unified Visibility Fabric. The fabric consists of distributed network appliances that provide the volume, scale, and port density needed for today's mobile operator networks along with the traffic intelligence of patented Flow Mapping® and GigaSMART® packet modification technology including GTP stateful subscriberaware filtering and FlowVUE™ to address the Big Data challenges mobile operators face.

## Intelligent Traffic Visibility

With the complexity and volume of information hitting today's mobile service provider networks, visibility needs to be at a subscriber/session level to provide a complete picture of the subscribers' activities.

### GTP Stateful Correlation:

#### Stateful Subscriber-Aware Filtering and Forwarding:

GPRS Tunneling Protocol (GTP) is commonly used to carry mobile data across service provider networks and includes the control plane (GTP-c) and a user-data plane (GTP-u) traffic. Therefore, visibility into a subscriber's activity requires the ability to understand the stateful nature of GTP (v1 and/or v2) and to correlate subscriberspecific control and data sessions to gain an accurate view of the subscriber's session.

Gigamon's GTP correlation feature helps carriers gain access to the subscriber's data in these GTP tunnels. Gigamon's GTP feature reliably correlates and passes all of the identified subscriber sessions (both control and data sessions) to the same analytics/monitoring probes and billing subsystems to ensure an accurate view of the monitored session.

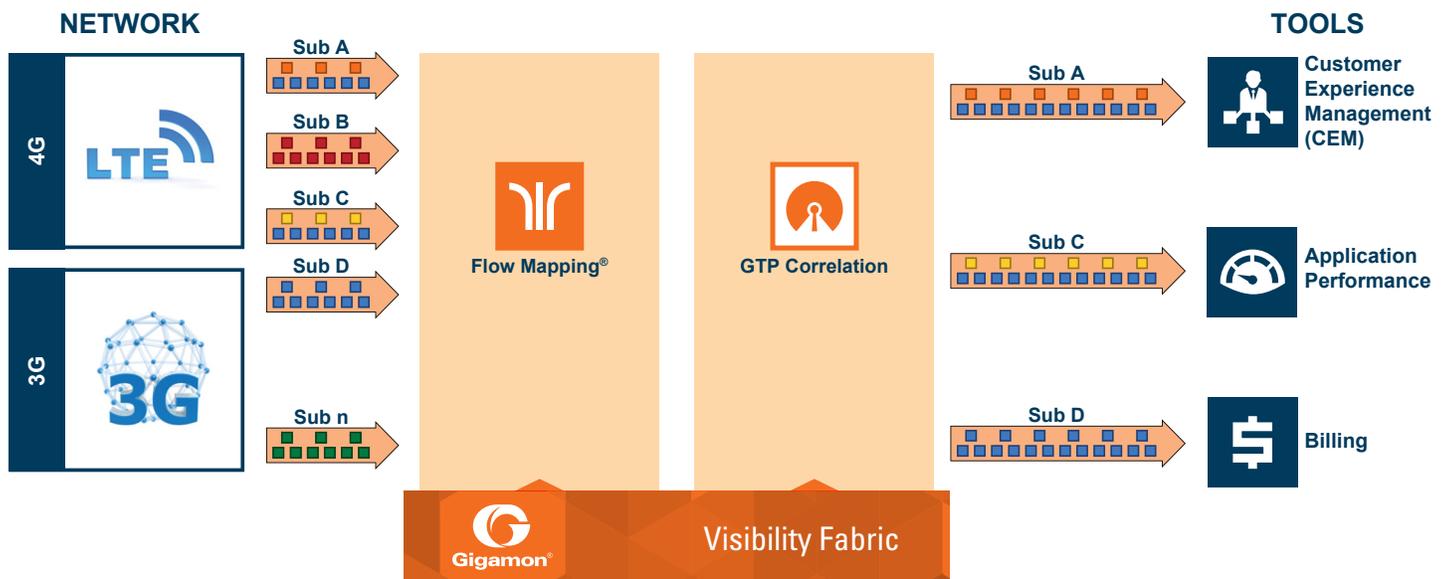


Figure 2: GTP Stateful subscriber-aware filtering and forwarding

\* Future availability

Further, given the volume of information traversing through the mobile service provider networks, the tools infrastructure is not able to scale at the same rate. It is often cost-prohibitive to proliferate the tools to monitor millions of subscribers. With Gigamon's GTP Correlation feature, service providers can intelligently filter, replicate, and forward specific subscriber sessions to the specific tools. To achieve this, Gigamon® correlates the subscriber-id's (IMSI's) exchanged as part of the control sessions to the corresponding tunnel endpoint IDs (TEID) that are part of the user data plane traffic. This optimizes their current investments in the tools infrastructure while increasing subscriber traffic visibility.

**Key Benefits:**

- Optimize the Tools Infrastructure
  - Optimize tools processing by accurate filtering, replicating, and forwarding of monitored subscriber sessions
  - Reliably correlate subscriber sessions (control and data) to increase analytics accuracy
- Pervasive Visibility into Subscriber Traffic
  - Extended visibility facilitates proactive identification of serviceimpacting issues and offending subscribers
  - Facilitate drilldowns into roaming users across peer networks
- Maximize Quality of Experience (QoE) and Monetizing Services
  - Pervasive subscriber-level visibility allows monitoring tools to gauge end-user QoE and facilitates customer retention and loyalty
  - Real-time stateful visibility enables reliable accounting, billing, and subscription management

**Active Subscriber-Aware Sampling with Gigamon's FlowVUE Application:**

*Turning Big Data into a Competitive Asset Versus an Overwhelming Burden*

Driven by Big Data, it is becoming more difficult for the current tools' infrastructure to sustain the levels of incoming traffic volumes to perform accurate analysis. Operators have been struggling with the scalability of their tool rail and tool processing throughput. They either have to invest in prohibitively expensive tools, or remain subject to the current tools which may pose limiting visibility into subscriber traffic.

Gigamon's FlowVUE is a new subscriber-based IP sampling paradigm which helps carriers turn Big Data into manageable data—allowing existing tools to connect to the latest high speed pipes and provide a representative visibility and diagnostic coverage. FlowVUE allows for active sampling of subscriber's device IPs (UE IPs) across GTP-u tunnels. The integrity of the subscriber flows is preserved by forwarding all the flows associated with the sampled UE IPs to the probes. It provides a means to capture a statistically accurate representation of the state of the network by sampling a selected set of flows. In contrast, traditional methods randomly samples packets without any correlation to the flows.

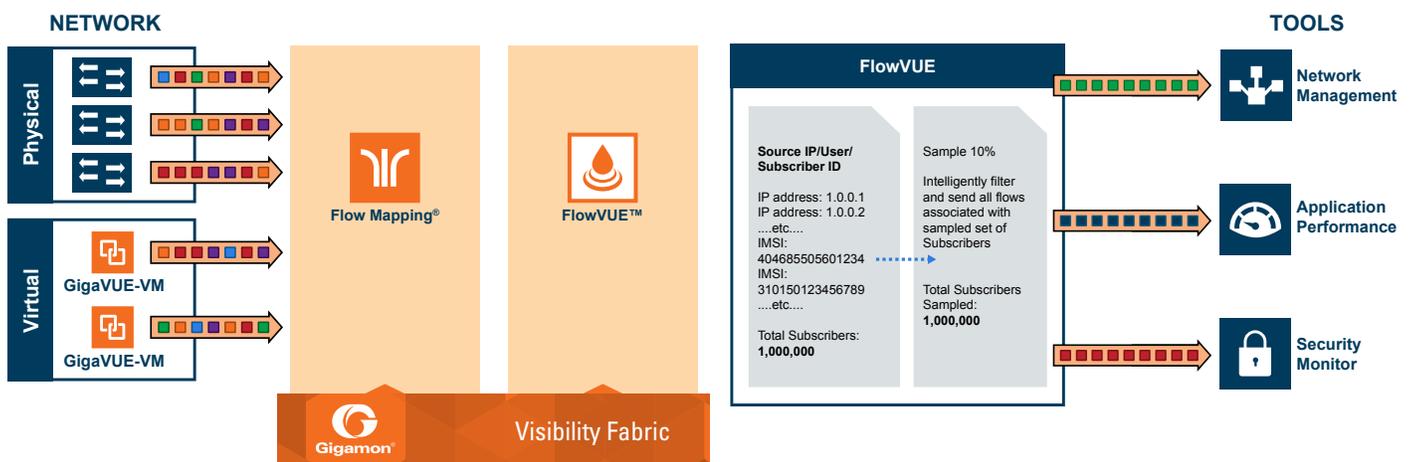


Figure 3: Gigamon FlowVUE solution

Leveraging FlowVUE, providers can enhance QoE monitoring by forwarding all of the control plane traffic to the tools infrastructure and only perform intelligent user-plane sampling (a configurable percentage of UE IPs) to get a representative view of the application usage. When combined with the advanced filtering capabilities of Gigamon's adaptive packet filtering, operators can further filter, replicate, and forward specific traffic flows of interest based on application ports and packet content-based payloads for all or a subset of the sampled subscribers. This further reduces the volume of traffic to the tool infrastructure. The ability to sample a subset of subscriber devices and transmit all the associated sessions of interest to the monitoring tools, intelligently reduces the amount of data while enabling Big Data throughput processing, with existing cost structures.

**Key Benefits:**

- Turn Big Data into Manageable Data
  - Enable carriers to selectively reduce traffic bound to monitoring and analytic tools
  - Deterministic results at a fraction of the data rate
- Maintain ROI
  - Mitigate rising tool costs by preserving or increasing tool utility based on real-time reduced data volume
- Harness Big Data as a Competitive Asset versus an Overwhelming Burden
  - Tailoring pricing strategies based on usage patterns

**A Unified Visibility Fabric Architecture**

The Unified Visibility Fabric architecture is an innovative solution that delivers pervasive and dynamic visibility of network traffic traversing communication networks. A unified monitoring fabric with centralized access is required to assure independence and segregation of the monitored data delivered to multiple organizations and tools. It enables the unification of data visibility across different network architectures including physical and virtual networks, resulting in a safe deployment within a multi-tenant setting.

**Services Tier:**

*Aggregation, Filtering, Replication, and Intelligent Packet Modification*

The Services layer consists of distributed network appliances that provide an advanced level of filtering intelligence, including traffic forwarding, manipulation, and modification. With these advanced packet manipulation and forwarding capabilities, Service Provider Operations and Management groups can now dynamically select traffic flows of interest from physical, virtual or SDN-enabled networks, modify packets to hide confidential information, add timing information, and strip out extraneous headers before they get directed to management, analysis and security tools.

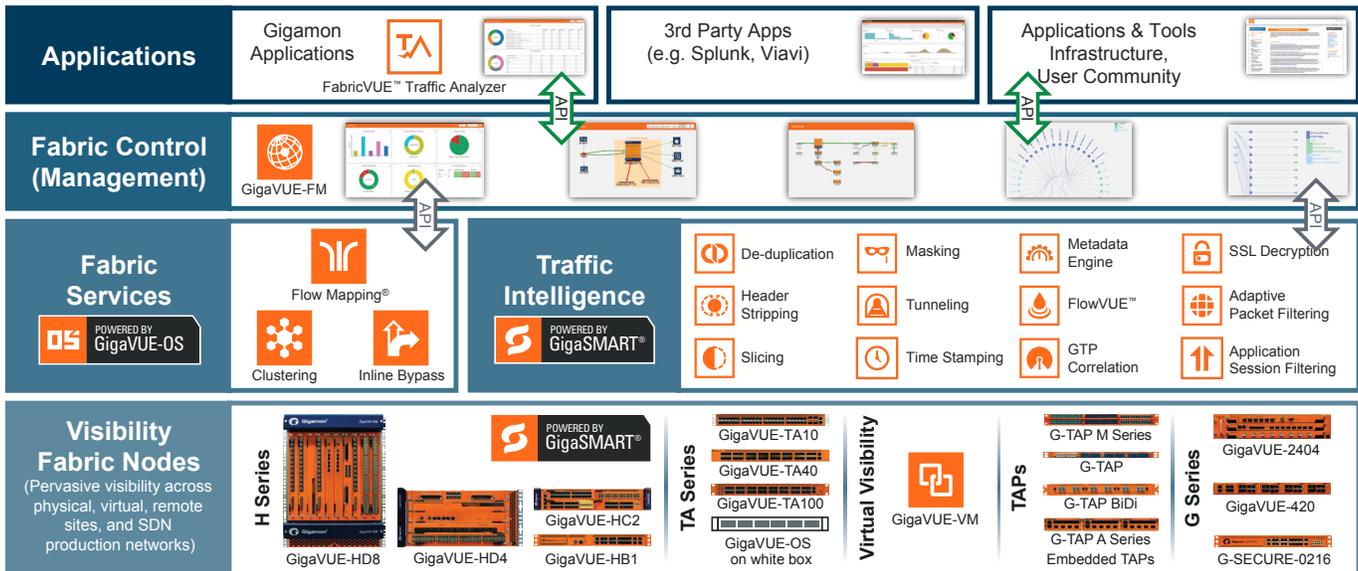


Figure 4: Gigamon's Unified Visibility Fabric architecture

## Management Tier:

### *Unified End-to-End Provisioning*

A unified configuration interface made available by GigaVUE-FM (Fabric Manager) will provide end-to-end policy management of monitored traffic from physical, virtual, and SDN networks, while enabling a full-lifecycle eco-system interface with the tools. At the heart of the Visibility Fabric architecture is the patented Flow Mapping® technology that identifies and directs incoming traffic to single or multiple tools based on user-defined rules implemented from a centralized management console. New enhancements to Flow Mapping will help address multi-tenant access and segregation of monitored traffic and policies by providing advanced role-based management thus enabling a more dynamic management of monitored traffic, while eliminating silos of operation—reducing both CAPEX and OPEX.

## Orchestration Tier:

### *Programmability, Automation, and Tool Integration through an Open Framework*

The orchestration layer offers the ability to provide “just-in-time” responsiveness to real-time events that occur within the network. The ability to turn up new monitoring services dynamically without manual intervention helps minimize reactive management of the infrastructure to more proactive management.

## Application Tier:

### *Dynamic Power to Customize Traffic Selection and Enable Subscriber Awareness*

The Unified Visibility architecture, combined with open, easily programmable interfaces makes it simple to create custom visibility applications and develop new capabilities. Monitoring tools can now perform more efficiently by eliminating duplicate content with currently available applications like de-duplication and turn Big Data in to manageable data using intelligent flow-based sampling enabled by FlowVUE. It establishes a foundation to enable enterprises and service providers alike to develop specialized and complimentary solutions, just in time for the dynamic data onslaught brought about by cloud computing, mobility, and social networking.

To summarize the key benefits of the Unified Visibility Fabric architecture:

- Bridge islands of physical, virtual, and SDN\* worlds with the tools required for end-to-end visibility across campus, cloud, and carrier
- Normalize and optimize traffic to the tools across islands of users, virtual machines, devices, and applications to enable tool optimization
- A flexible policy engine that enables parallel monitoring policies to serve multiple departments simultaneously
- “Just-In-Time” responsiveness to real-time events that occur within the network through automation and orchestration

## About Gigamon

Gigamon provides an intelligent Unified Visibility Fabric™ to enable the management of increasingly complex networks. Gigamon technology empowers infrastructure architects, managers and operators with pervasive visibility and control of traffic across both physical and virtual environments without affecting the performance or stability of the production network. Through patented technologies, centralized management and a portfolio of high availability and high density fabric nodes, network traffic is intelligently delivered to management, monitoring and security systems. Gigamon solutions have been deployed globally across enterprise, data centers and service providers, including over half of the Fortune 100 and many government and federal agencies.

For more information about the Gigamon Unified Visibility Fabric visit: [www.gigamon.com](http://www.gigamon.com)