Gain Control and Visibility into Your Amazon Web Services Hosted Applications

Gigamon®

Introduction

If, as part of digital transformation, your organization is migrating existing applications and initiating new born-in-the-cloud workloads to public cloud vendors' Infrastructure as a Service (IaaS) offerings, you're not alone.

According to RightScale, 69 percent of surveyed organizations are using public or hybrid clouds as they make their digital transformation, with a third of their workloads now located in these clouds.[1]

The advantages of these moves are well known: economies of scale and access to a shared pool of resources that can be provisioned and deployed quickly and easily are two examples. Because compute resources are owned and hosted by the IaaS provider and offered to customers on demand, you can effectively outsource IT operations and minimize CapEx. But a migration to the cloud brings network and application visibility challenges along with it — and you're still responsible for your own security in this new hybrid environment.

Challenges: Obtaining, Processing, and Distributing Cloud-Based Traffic

As part of this transition, CloudOps teams scale their deployments with an ever-growing number of applications and services; the servers and virtual machines they run on are dispersed and compute nodes continually relocated throughout multiple virtual private clouds. IT routinely adds various security and monitoring tools and leverages container technologies. The result is a labyrinth of traffic sources and destinations.

There are a variety of methods for accessing network data in on-premises infrastructure, including SPAN sessions and physical and virtual TAPs. But because they need to ensure privacy in a multi-tenant environment, IaaS providers do not allow customers to deploy their own virtual TAP functions outside of their assigned VM or containers. In that scenario, you're forced to use the vendor's virtual network TAP services, if they are both offered and available with the specific type compute instances you're using, to acquire and send raw packets directly to your cloud or on-premises-located security and network monitoring tools.

Administrators need full packet and application visibility in the cloud for both North-South and East-West traffic. This requirement extends to multiple public cloud and hybrid deployments with the ability to simultaneously support any such scenario.

While on-premise topologies benefit from network packet brokers (NPB) that acquire, aggregate, process, and distribute traffic to the proper security and networking tools, cloud vendors do not offer NPB functionality. Nor can cloud solutions identify and filter content based on applications and generate advanced L4–7 metadata as their on-premises cousins can. This leads to complex network designs, excessive bandwidth usage, overwhelmed tools that lose effectiveness, and needless scaling. As a result, your IT staff will be limited in its ability to analyze network traffic and customer experience, and will have difficulty evaluating infrastructure health.

In addition to granular application visibility, organizations must deploy a solution that not only solves the aforementioned challenges but overcomes many varied demands including:

- Complete security for their apps and data, operating systems, firewall configurations, etc.
- Maximum security and monitoring tool efficiency and accuracy
- Infrastructure automation with deep integration into orchestration tools
- Generation of NetFlow and advanced metadata attributes
- Network traffic consolidation and elimination of duplicated data flows
- Backhauled traffic when security and/or monitoring tools are on-premise

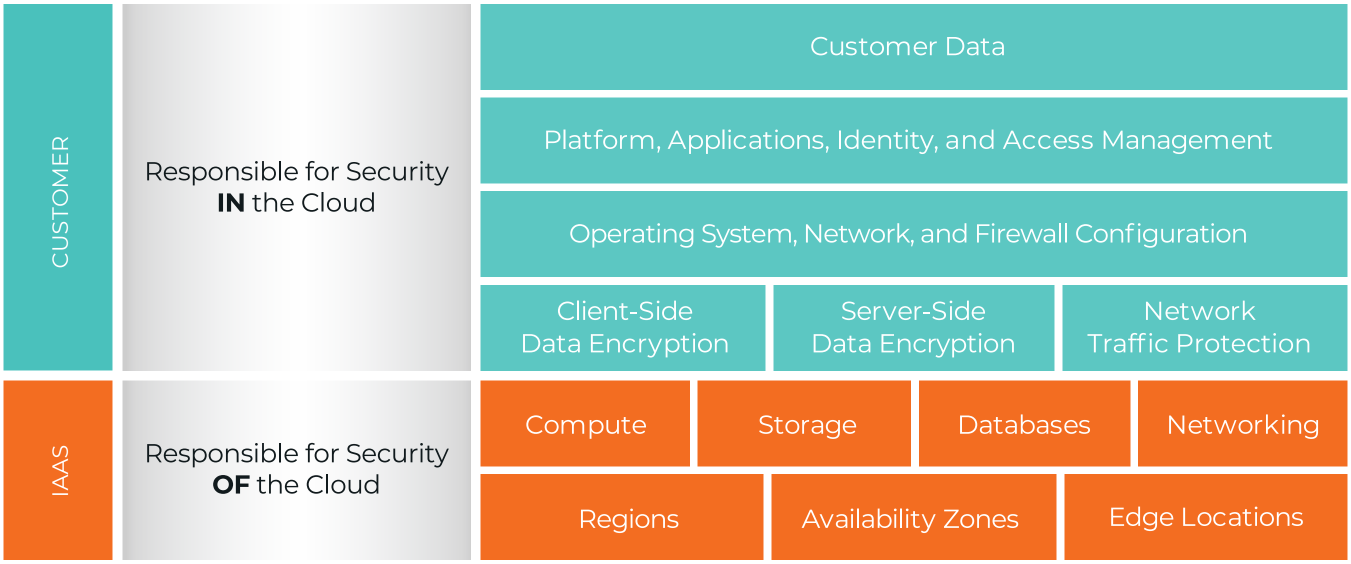
Challenges: Ensure Security of Enterprise Cloud-Based Resources

When enterprises first started leveraging IaaS, they began by migrating Tier 2, test/dev, or other infrequently used applications that consumed expensive resources when run on-premises. But now, in the next stage of digital transformation, organizations want to move Tier 1 or mission-critical applications to IaaS. These applications deal with sensitive data and information that needs to be safeguarded and protected from unauthorized access and potential cybersecurity attacks.

IaaS providers emphasize mutual responsibility in the cloud: The provider is responsible for the security of the cloud infrastructure itself, but the customer is responsible for assets within the cloud. See Figure 1.

The assets that the customer's IT, cloud, and security architects must protect include data and applications; these teams are also charged with organizational and regulatory compliance. They must ensure that applications and workloads are being deployed securely by everyone within the organization. Enterprises that migrate to the cloud typically rely on techniques such as workload security, perimeter security, prevention-only solutions including access lists or security groups, and identity and access management to mitigate security risks.

Today's evolving threat landscape has rendered prevention-only security techniques insufficient. Over 80 percent of network traffic is now East-West — that is, between VMs or containers — so malware can more easily spread undetected. Any solution needs to be complemented with additional detection and response techniques to uncover early signs of security anomalies and deviations from expected behavior. For this to happen, organizations need to implement a multi-tiered security model and have accurate visibility into virtual machine network traffic. Without such visibility, moving mission-critical applications to the cloud jeopardizes their safekeeping.



CUSTOMER

Responsible for Security **IN** the Cloud

Customer Data

Platform, Applications, Identity, and Access Management

Operating System, Network, and Firewall Configuration

Client-Side Data Encryption

Server-Side Data Encryption

Network Traffic Protection

IAAS

Responsible for Security **OF** the Cloud

Compute

Storage

Databases

Networking

Regions

Availability Zones

Edge Locations

Figure 1. Shared responsibility model for public cloud.

Legacy Approach to Visibility and Security

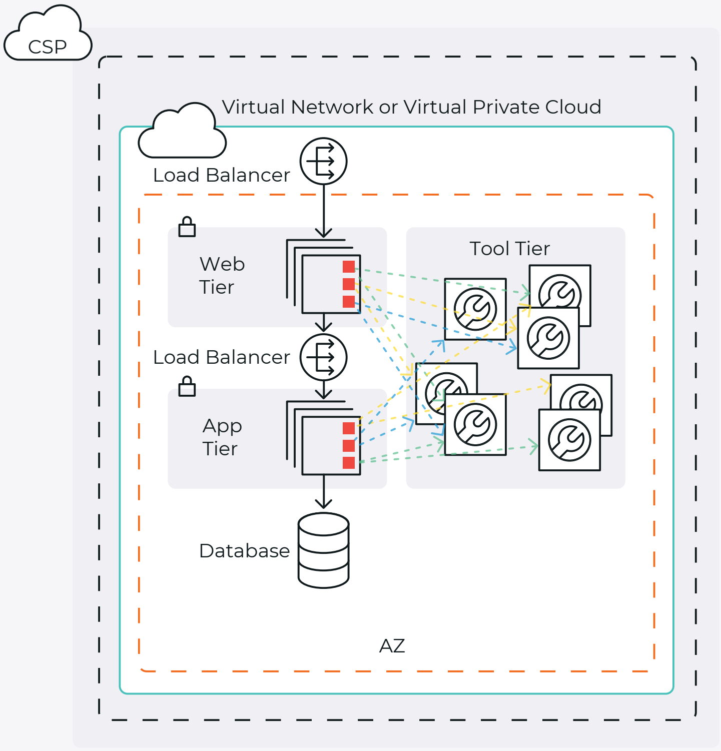
Historically, cloud customers were simply unable to obtain copies of traffic and direct it as desired. Recently, several cloud vendors have introduced virtual network TAPs, such as AWS's traffic mirroring service. These tools provide raw, unprocessed packets with minimal filtering, which can be distributed only to the end security and monitoring tools. However, these services do not allow packet replication and thus can only send a copy of one packet to one tool, not to multiple tools. In mirroring traffic from multiple locations, packets can be duplicated with no ability to remove this superfluous content that needlessly floods the network. These vendor offerings also don't support all compute node types and don't enable secure tunneling such as with IPsec.

Other traffic acquisition methods include approaches such as AWS CloudWatch, which triggers packet capture on specific events; but this is a reactive technique, primarily intended for troubleshooting. CloudWatch also provides VPC Flow Logs. Users of such tools must accept a lack of advanced NetFlow/IPFIX metrics and suffer from reduced network efficiency and traffic insights. When faced with these limitations, some users may decide that the cloud isn't ready for mission-critical applications and will choose to run those on-premises; this leads to expensive backhauling of all cloud traffic to on-premise tools.

Another approach is to deploy custom agents on every compute node for each and every tool (see Figure 2). But workloads that deploy numerous agents may suffer from agent overload as a result. As each agent copies traffic, more compute cycles and network bandwidth are used. Bandwidth ceilings limit the number of compute instances allowed in a given virtual cloud, which means you'll incur additional expense as you need ever more virtual cloud-based resources. This technique also results in a significant performance impact and requires manual intervention when new tools are added.

Ensuring security can be equally daunting. Cloud-native security services commonly deployed in the public cloud include identity and access management (IAM), security groups, logs, and web application firewalls (WAF). But these have limitations:

+ IAM: Once an attacker has successfully hacked credentials, they won't need to undertake noticeable activity that gets alerted by cloud dashboards; they could sit there silently and do just enough to not trigger any alerts. The time to detection in this case is many weeks or months.
+ Security groups: Despite opening access to only necessary ports, security group configurations have no application context and no visibility into higher layers (beyond L4). Attacks could happen on those ports in the application layer and could result in malware being deployed or data exfiltrated.
+ Logs: Logs only convey high-level metrics about conversations and application access points: You'll know who communicated with whom, but won't have a record of what the communication was about. No packets or payload are included. In case of silent attacks where attackers use the infrastructure and try to operate within limits of threshold violations, logs are of no help.
+ WAF: Cloud-native WAFs are very limited in their functionality when compared to industry-leading WAFs, and only protect apps from the OWASP top ten attacks.



DRAWBACKS INCLUDE:

- Inability to access all traffic
- Discrete vendor monitoring agents per instance
- Excessive loads placed on compute instances
- Excessive duplication of identical network traffic flows
- Cannot process traffic prior to sending to tools
- No ability to replicate and send packet to multiple tools at once

Figure 2. Legacy traffic acquisition in public clouds by installing an agent on every VM for every security and monitoring tool.

Network and Application Traffic Visibility in the Cloud: The Missing Link

Organizations with on-premise operations have successfully deployed next-generation network packet brokers (NGNPB), in both physical and virtual form factors, for many years. These platforms help NetOps and SecOps teams obtain the necessary visibility into traffic throughout their data center. IT can only ensure superior security and network performance while minimizing costs if they have full access to all data in motion, including from VMs and containers, along with an ability to properly identify applications, filter and distribute traffic to the right tools and shield tools from needless processing. Public cloud customers can achieve the same results by leveraging cloud-native versions of the on-premise NGNPBs they rely on.

Vendor-certified and Marketplace-listed solutions enable CloudOps and DevOps teams to have the same NGNPB capabilities for the cloud that they depend on in their own environments. With these tools, IT won't have the baggage of running this infrastructure, but can enjoy complete North-South and East-West traffic visibility — including at the application layer. Cloud-hosted NGNPBs can be automatically scaled to any level required and provide the packet processing critical to removing superfluous content and easing the burden on security and monitoring solutions. Automation of the infrastructure is ensured with deep API integration into the cloud vendor's orchestration tools, minimizing manual efforts and errors. NetFlow, IPFIX and advanced metadata can now be generated and used to feed SIEM solutions and other tools. With a critical mass of cloud-based security tools, traffic need not be expensively backhauled to on-premise infrastructure, but instead will continue to reside in the cloud.

Organizations often use multi-cloud or regional deployments, so NGNPB vendors' orchestration tools must support simultaneous multiple public or hybrid clouds. Centralized management, monitoring and control can be simplified through a single-pane-of-glass GUI. This is important as cloud vendors may have dozens of regions and availability zones spread over dozens of countries and geographic regions. Typically, enterprises distribute their cloud infrastructure across these multiple regions and accounts. Having a security policy for such a distributed infrastructure — let alone enforcing that policy — is challenging. In such a scenario, an inconsistency in security configurations anywhere could lead to a weak spot that can be attacked and compromised.

For applications and workloads in cloud IaaS, security tools need to be able to access the right data. But as organizations deploy multiple security tools across their infrastructure to ensure an effective security and performance monitoring strategy, the NGNPB needs to support the tools no matter where they reside. Scenarios include:

- Tools are in on-premises infrastructure and traffic is backhauled from the cloud to these tools
- Tools are in a cloud IaaS tool tier and traffic needs to be moved across compute instances and/or tiers
- Different users in an enterprise may have multiple virtual private cloud (VPC) instances and a common set of tools may be required to inspect traffic across these VPCs

An Application Visibility Platform for the Public Cloud

GigaVUE® Cloud Suite is a series of cloud-native network and application traffic visibility solutions dedicated to specific cloud environments, including AWS. Gigamon offers the industry's only network packet broker on those vendors' marketplaces. The software suite elements reside fully in the cloud; they acquire traffic from every compute site, either through the aforementioned native traffic mirroring services, from AWS external load balancers, or via Gigamon G-vTAP Modules, which are agent-based instances optionally provisioned on all VMs. Container content can also be acquired with agentless G-vTAP Containers deployed on each worker node, which support Amazon Elastic Kubernetes Service (EKS).

Network packets are copied and directed to GigaVUE V Series virtual appliances, where they are aggregated and processed: Duplicate packets are eliminated, irrelevant application content deleted, sensitive payload material masked, and headers transformed. Advanced L3–7 NetFlow and IPFIX attributes are generated. Optimized traffic is replicated and, along with metadata, is then load balanced and steered to the proper tools. GigaVUE-FM Fabric Manager is integrated into the cloud tool suite to provide full automation.

With GigaVUE Cloud Suites, you can now extend your security posture to the public cloud, ensuring compliance and detecting threats to crucial applications more quickly. These suites make it possible to:

+ Improve tool capacity. Virtual security and monitoring tasks are offloaded from tools and irrelevant application content dropped to improve their effectiveness, reduce scaling, and minimize costs.
+ Choose the proper traffic acquisition method. Flexibly select between your cloud vendor's traffic mirroring offerings for more simplified operations or Gigamon lightweight agents for added security and filtering.
+ Fully automate the infrastructure. Automatically identify new and relocated workloads, instantiate and scale visibility nodes and configure new traffic policies as needed.
+ Simplify operations. Centralize orchestration and management with a single-pane-of-glass visualization portal across any hybrid network.
+ Reduce risk by leveraging a common visibility fabric across your entire IT environment.
+ Empower your SIEM and monitoring tools with advanced metadata to identify and resolve security and performance issues.

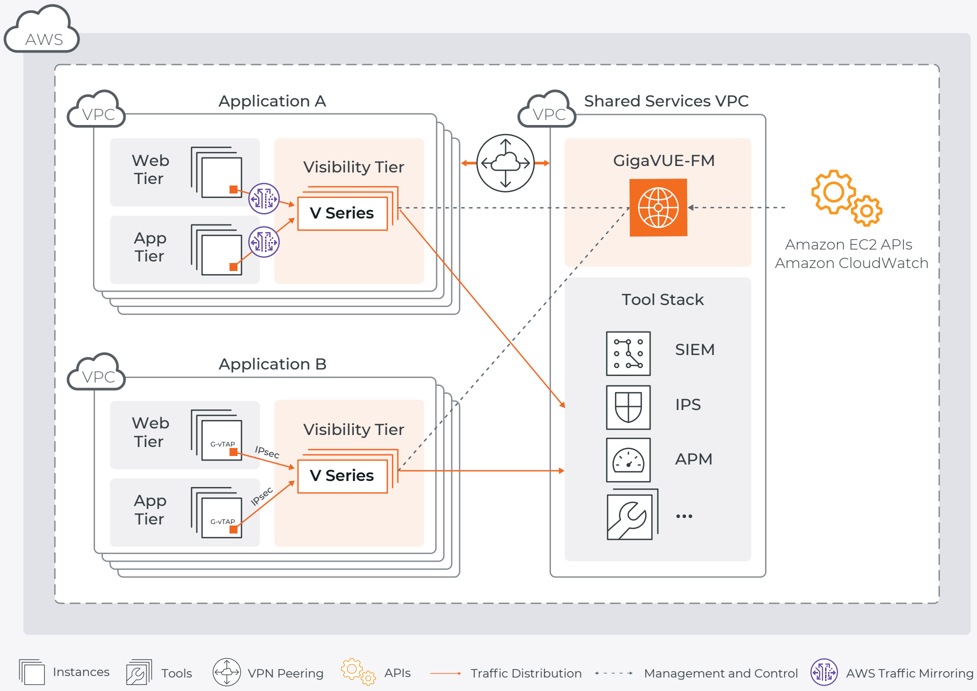
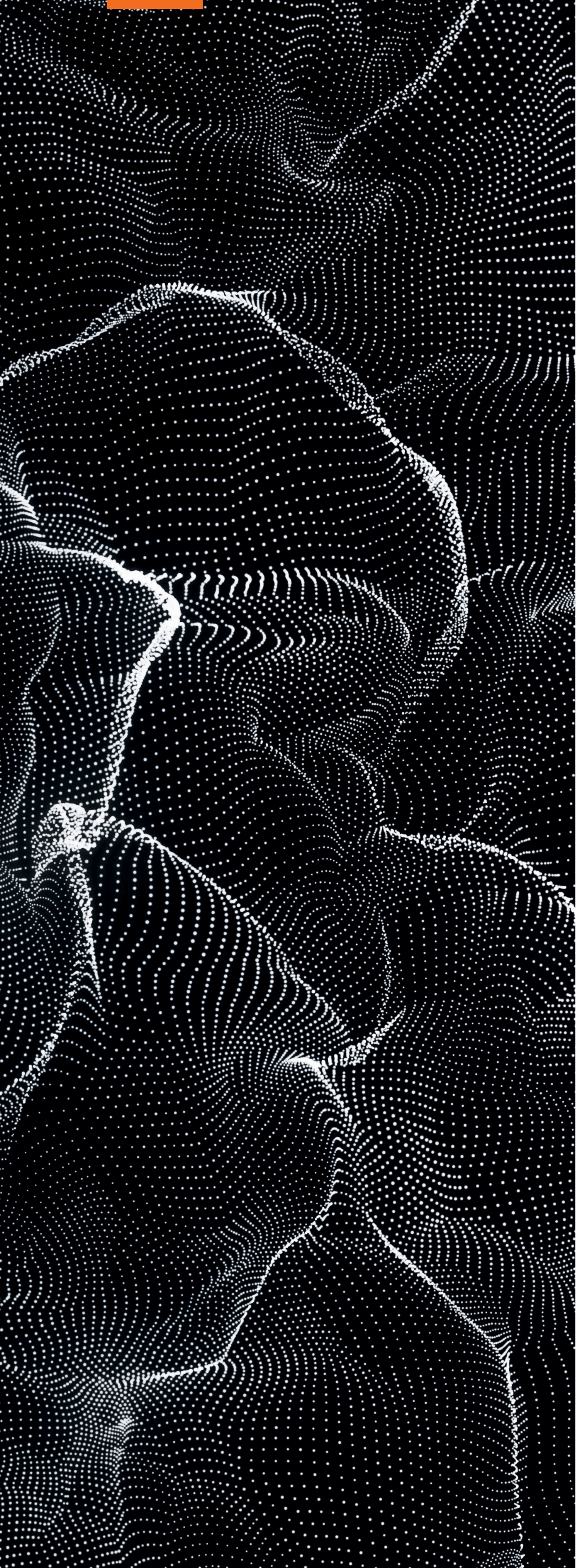


Figure 3. GigaVUE Cloud Suite for AWS supports multiple VPCs including transit gateways and has tight integration with AWS cloud management tools to enable automation. Either AWS's agentless native VPC traffic mirroring or Gigamon GigaVUE G-vTAPs can collect all traffic streams.



GigaVUE Cloud Suites Illuminate Public Clouds and Enhance Security

These suites comprise multiple elements that enable traffic acquisition, aggregation, intelligence, and distribution, along with centralized, single-pane-of-glass orchestration and management. The solution consists of these components:

G-VTAP MODULE

This lightweight agent is deployed in various compute instances to mirror production traffic and send that traffic via IPSec to GigaVUE V Series nodes. Selected lists of allowed and denied IP addresses can be optionally forwarded or pre-filtered out, respectfully.

Key features and benefits:

- Minimize agent overload. Only one agent is necessary per instance, which lowers the impact on their CPU utilization rates.
- Reduce application downtime. Modules are automatically configured to redirect copied traffic as required, which avoids the need for infrastructure redesigns when adding new tools.
- Automatic Module scaling. As new workloads are installed, GigaVUE-FM interoperates with the compute instance APIs and the cloud vendor’s management tools to instantiate new modules.
- Reduce application and data egress costs. Pass or drop rules filter traffic of interest prior to sending it to the GigaVUE V Series.

GIGAVUE V SERIES NODES

These are visibility nodes that aggregate, select, optimize, and distribute traffic to the tool tier, which may be located in the public cloud IaaS or in an on-premise data center. These nodes, usually deployed as a cluster, reside within the public cloud VPCs.

Key features and benefits:

+ Traffic aggregation. Acquire and aggregate traffic from multiple instances. The traffic is acquired from the G-vTAP™ Module using IPSec for security and transmitted via GRE or VXLAN tunnels. Also supports feeds from AWS traffic mirroring sources or AWS network load balancers.
+ Traffic intelligence:
  - Flow Mapping®: Select Layer 2–Layer 4 traffic of interest with a variety of policies, then forward that traffic to specific tools. Selection criteria can include IP addresses/subnets, TCP/UDP ports, protocols, instance tags, etc. Overlapping rules and nested conditions can be specified.
  - GigaSMART® Application Metadata Intelligence, NetFlow, and IPFIX generation: Generate flow records from network and application traffic to determine IP addresses, class of service, causes of congestion, weak cipher use, expired SSL certificates, suspicious remote access, data ex filtration, lagging SLAs and dozens of other use cases.
  - Application Filtering Intelligence: Automatically identify over 3200 applications in real time and appropriately filter and/or direct to specific tools.
  - Header transformation: Modify any monitoring session link's packet header, such as by changing the source/destination MAC or IP addresses or VLAN ID, to ensure security and segregation of sensitive information. Tunnel IDs can also be modified to allow the same packet to be sent to one endpoint destination that has multiple tool instances, each with different functions; in this case, each instance is listening on different virtual interfaces for a specified tunnel ID. Other header modifications include striping out overhead for protocols such as GRE, MPLS, and VXLAN as tools do not need this information and it can be discarded.
  - Other GigaSMART functions: Optimize traffic by applying traffic intelligence to slice and mask packets to reduce tool overload or maintain compliance.
  - Load balance and distribute optimized traffic to multiple tools anywhere.
+ Service chaining: Service chain multiple traffic intelligence operations dynamically, based on tool needs.
+ Elastic scale and performance:
  - Use automatic target selection to extract traffic of interest in the infrastructure being monitored.
  - Automatically scale based on varying number of compute instances, without impacting performance.

G-VTAP CONTROLLER AND GIGAVUE V SERIES CONTROLLER

For hybrid and multi-VPC deployments, GigaVUE uses a controller-based design to proxy the command-and-control APIs while preserving existing IP addressing schemes or Network Address Translation (NAT). G-vTAP Controller proxies commands from GigaVUE-FM to the G-vTAP Modules (see Figure 4).

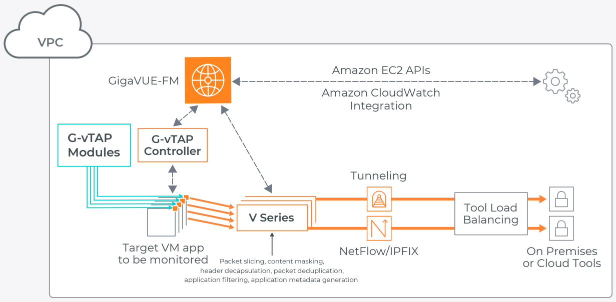

VPC
GigaVUE-FM
Amazon EC2 APIs
Amazon CloudWatch Integration
G-vTAP Modules
G-vTAP Controller
Tunneling
V Series
Tool Load Balancing
Target VM app to be monitored
Packet slicing, content masking, header decapsulation, packet deduplication, application filtering, application metadata generation
NetFlow/IPFIX
On Premises or Cloud Tools

Figure 4. GigaVUE Cloud Suite for AWS is composed of four components: G-vTAP, V Series, Controller, and Fabric Manager (FM).

GIGAVUE FABRIC MANAGER (FM)

GigaVUE-FM provides centralized orchestration and management across the entire organization, including on-premise, public, private, and multi-clouds. FM eliminates manual processes by utilizing auto-discovery methods to identify new workloads in real time and configuring the G-vTAP Module policies to copy and direct traffic to the appropriate GigaVUE V Series node. FM uses AWS APIs for detecting VM changes to dynamically scale these nodes. Further integration with third-party systems automatically adjusts received traffic and configures new traffic policies as needed.

FM generates an end-to-end topology view via a single-pane-of-glass GUI, which gives you insights into which cloud instances are or are not part of the visibility fabric. A single instance of GigaVUE-FM can manage hundreds of visibility nodes across on-premises and multi-cloud environments. Traffic policies are configured using a simple drag-and-drop user interface.

Key features and benefits:

+ Centralized orchestration and management:
  - Leverages a single-pane-of-glass GUI for end-to-end topology visualization.
  - Traffic policies are defined using a simple drag-and-drop user interface.
  - Software-defined networking constructs are used to configure traffic policies.
  - Steers packet flows from the G-vTAP Modules or cloud traffic mirroring sources to the V Series, as well as subsequently from V Series to either the monitoring and security tools or to an on-premises physical visibility node.
+ Automation:
  - Tight integration with cloud APIs provides auto-discovery of instances, detects changes in the VPC, and automatically adjusts the visibility tier.
  - Under guidance via APIs from the cloud management suite, FM automatically instantiates, configures, scales, and monitors the V Series nodes as needed based on the varying number of compute instances deployed.
  - Open REST APIs published by GigaVUE-FM can be consumed by tools to dynamically adjust traffic received or to orchestrate new traffic policies.

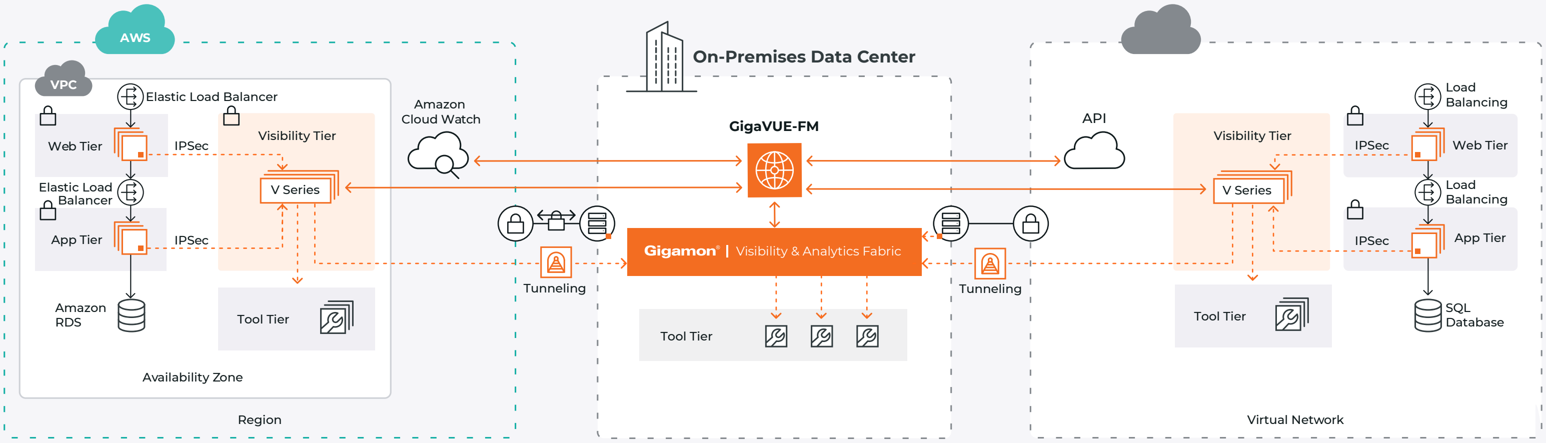


Figure 5. Multi-cloud deployment with Gigamon Fabric Manager.

Public Cloud Plus GigaVUE Cloud Suites: A Winning Combination

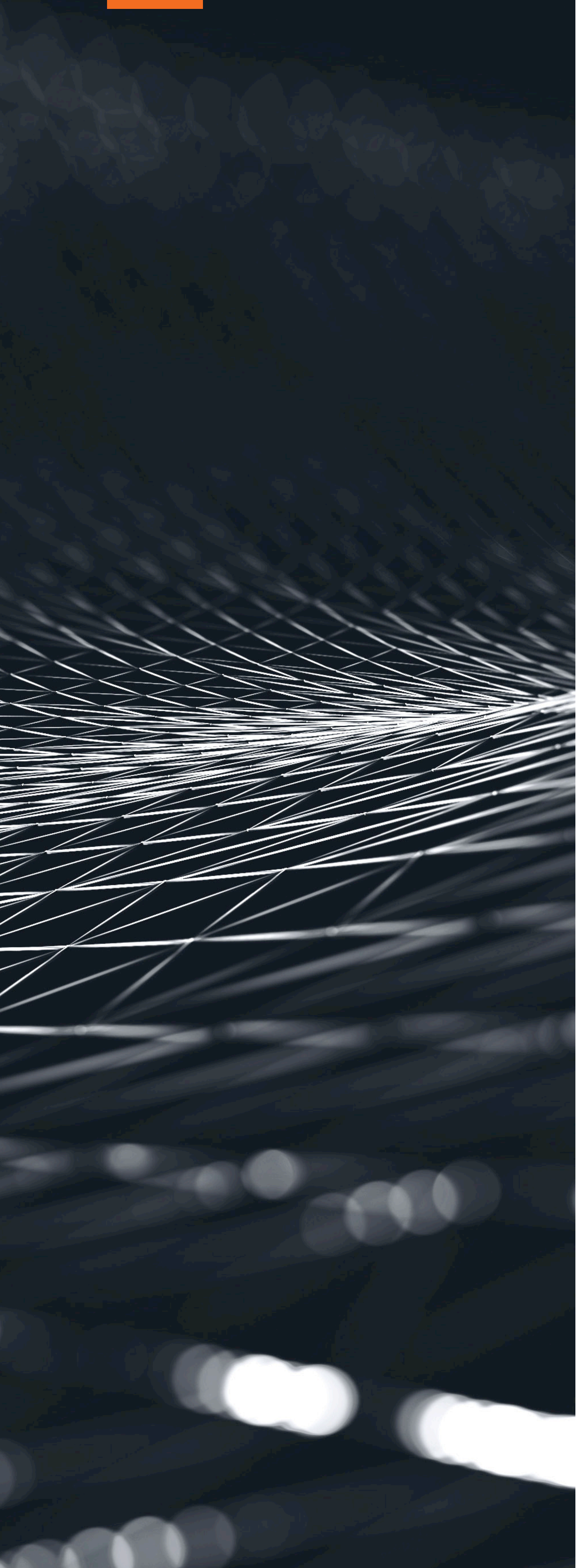
Leading IaaS vendors have developed robust public cloud environments with extensive worldwide availability and solid foundational networking, storage, and security. Some even offer limited traffic mirroring capabilities to acquire network packets, NetFlow (version 5) generation, and some rudimentary filtering. However, these platforms lack the ability to significantly process data; they cannot identify applications and appropriately filter their content, eliminate duplicated packets, drop irrelevant packet header and payload content, or mask source IP addresses for security. GigaVUE works together with cloud platforms, building on their basic functionality to add expanded visibility powers.

As you leverage immense, well-architected and scalable IaaS platforms and expand your use of cloud computing, your progress through your digital transformation may unfortunately also reduce traffic visibility, diminish network efficiencies, and reduce security and monitoring tool effectiveness. These issues will make it harder for you to proactively detect threats, identify deviations from organizational policies, or ensure application performance and exceed SLAs for mission-critical applications, all while minimizing TCO. And the lack of a well-defined cloud networking and security architecture may end up delaying a move to the cloud.

Gigamon is the leader in pervasive network traffic visibility, and that expertise extends to the cloud as well. With the help of Gigamon Visibility and Analytics Fabric, you can use one consistent method across on-premise or multi-cloud deployments to acquire network traffic and apply traffic intelligence — then distribute that optimized traffic to multiple tools. GigaVUE Cloud Suite is a cloud-native solution that enables you to extend your security posture to cloud IaaS, assuring compliance and helping you detect threats to mission-critical applications faster. Now is the time to ensure granular visibility to your workloads and promote an effective security posture, no matter where your data resides.

TABLE 1. GIGAMON BUILDS ON CLOUD VENDORS' PLATFORMS TO EXTEND VISIBILITY AND ENSURE INFRASTRUCTURE CONTROL.

Function	Gigamon	Public Cloud Vendor
Basic traffic acquisition	YES	YES
Traffic Direction	YES	YES
NetFlow (v5)	YES	YES
Basic filtering/elimination of traffic	YES	YES
Identify and filter content based on application	YES	NO
Automatic target selection with L4 flow mapping	YES	NO
Unified management for hybrid/multi-clouds	YES	NO
Data de-duplication	YES	NO
Packet slicing	YES	NO
Packet sampling	YES	NO
Header transformation	YES	NO
Advanced application-aware metadata	YES	NO
Advanced traffic acquisition: Pre-filtering, IPSec	YES	NO
Container visibility	YES	NO



ADDITIONAL RESOURCES:

- GigaVUE Cloud Suite for AWS Solution Brief and Datasheet
- Test Drive GigaVUE Cloud Suite for AWS
- Use Case Brief: In These Transformative Times, Take These Practical Steps to Ease the Network Burden
- Tech Brief: Optimize Your Network Across Layers with Gigamon Application Filtering Intelligence
- Tech Brief: Keep Networks Responsive and Secure with Gigamon Application Metadata Intelligence

[1] "RightScale 2019 State of the Cloud Report from Flexera." 2019. Flexera. https://resources.flexera.com/web/media/documents/rightscale-2019-state-of-the-cloud-report-from-flexera.pdf.

About Gigamon

Gigamon provides network visibility and analytics on all traffic across your physical, virtual, and cloud networks to solve critical security, performance, and business continuity needs. The Gigamon Visibility and Analytics Fabric delivers optimized network and security performance, simplified management, and accelerated troubleshooting while increasing your tools' return on investment. Our comprehensive solutions accelerate your organization's ability to detect and respond to security threats, including those hidden in encrypted traffic. Trusted by 83 percent of the Fortune 100 and 4,000 organizations worldwide, Gigamon ensures that your business can run fast and stay secure in The New Tomorrow.

Gigamon®

Worldwide Headquarters
3300 Olcott Street, Santa Clara, CA 95054 USA
+1 (408) 831-4000 | www.gigamon.com