WHITE PAPER

Communications Service Providers
Service Assurance

Anritsu vProbe Lowers Processing Overhead

Anritsu's vProbe service assurance virtual network function de-risks move to network functions virtualization. Tests show vProbe consumes less than 21% of CPU capacity while processing 30 Gbps of data.[1]

The Move to Virtual

Network functions virtualization (NFV) brings new challenges for communications service providers (CommSPs) to assure service on their networks. Data collection and processing strategies need to advance to derive the same customer and network performance insights. Virtual network elements can be implemented at many more points in the network, so data collection needs to mirror those elements' locations to ensure all the data is available to network probes.

The Anritsu vProbe is a virtual network function (VNF) that can be deployed in virtualized servers to match closely where the virtual network elements appear. CPU performance in these servers is a critical resource, so Anritsu tested the vProbe on servers using 2nd generation Intel® Xeon® Scalable processors to demonstrate how much CPU processing power the vProbe consumed at various levels of throughput.

Challenges of Hidden Traffic and Scalability

NFV gives CommSPs an unprecedented ability to scale their networks up or down depending on demand, but it is not without risk. Service assurance has hidden data in large virtualized networks and data centers. Much of the data traffic is so-called "east-west" traffic, which goes between two servers, as opposed to north-south traffic, which is generated by, or goes to, a user. This east-west traffic may not hit a physical network connection and could be hidden from the view of a traditional probe. Without visibility, the hidden traffic means a service assurance system won't have enough data to understand network performance and won't be able to track malicious data.

Service assurance has traditionally used engineers with handheld probes (and later, automated probes) to sample data at various points in the network. This doesn't scale in a virtualized network where network elements are disparate with locations in central offices, points of presence, a cloud data center, or edge server. A manual approach doesn't let CommSPs see the service data at scale. Sampling also doesn't provide the full picture of services subscribers use and sampling won't track malicious behavior.

Mobile network operators (MNOs) are on the front lines of the growth in data services as subscribers increasingly use mobile networks for video streaming and internet browsing. MNOs are moving to 5G services to accommodate this increase in data consumption. From a service assurance perspective, 5G's support of network slicing, where the physical network connection can be partitioned into slices each with unique performance features and levels, will enhance the need for flexible service assurance data collection and real-time processing.

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Anritsu vProbe

The Anritsu vProbe is the virtual network data collection and analysis component of Anritsu's MasterClaw service assurance solution. vProbe is a cloud-ready virtual network probe that enables MasterClaw users to optimize and troubleshoot their virtualized networks. The vProbe is an NFV troubleshooting component of Anritsu's MasterClaw Customer Experience Assurance solution. MasterClaw provides complete network, service, application, and customer visibility and troubleshooting.

Deployment
The Anritsu vProbe can be deployed as a VNF on a bare metal server or in a variety of virtualization environments, including VMware vSphere and Linux KVM. The vProbe VNF supports multiple deployment models, including working alongside already installed physical network probes.

Compatibility
Supporting generic routing encapsulation (GRE) tunnel termination, the vProbe receives port mirrored traffic from vTaps from a number of suppliers, including the Ixia Phantom Virtualization Tap.[2] The vProbe software can be controlled by the most widely used software defined network (SDN) controllers, including OpenDaylight and OpenContrail.

The vProbe can monitor advanced network topologies such as VoLTE, VoWi-Fi, EPC, and IMS. Many other network functions such as authentication, authorization, and accounting (AAA), policy and charging rules function (PCRF), policy and charging enforcement function (PCEF), signal transport (SIGTRAN), and other legacy network services and functions are monitored. To improve packet capture rates, Anritsu has optimized data plane performance by embedding the open source Data Plane Development Kit (DPDK) software drivers into the vProbe.

The vProbe is built using a control plane and user plane separation (CUPS) architecture that allows independent scaling of either plane in response to the network data load. Support of CUPS is one reason the vProbe VNF can be deployed remotely.

Business Benefits of the MasterClaw Solution with vProbe

- Saves virtual infrastructure resources and costs (vCPU, RAM, power, cooling) with industry-standard technologies such as DPDK.
- Reduces troubleshooting time with a correlated view (RAN to core, PNF to VNF) of hybrid network deployments with the help of MasterClaw applications.
- Reduces OSS administration costs with an orchestrated, resilient, horizontally scalable, and highly available architecture that is cloud ready.
- Reduces complexity in virtualized telecommunications networks by giving access to the right data, in the right tools, in real-time to all stakeholders in planning, operations, and engineering teams.

Filtering
Using advanced filtering, the vProbe captures only the relevant traffic from the virtual network to reduce the use of server resources and to deliver only relevant metrics.

vProbe Test Setup

Anritsu designed a series of tests to measure the vProbe's processing impact on the CPU at various data levels. The vProbe tests were conducted on a KVM virtualized server powered by dual Intel® Xeon® Gold 6230N processors running at 2.30 GHz. The Intel Xeon Gold 6230N processor is part of the 2nd generation Intel Xeon Scalable processor family. It is a 20-core processor fabricated using 14 nm process and features a 3.5 GHz maximum frequency using Intel® Turbo Boost Technology.

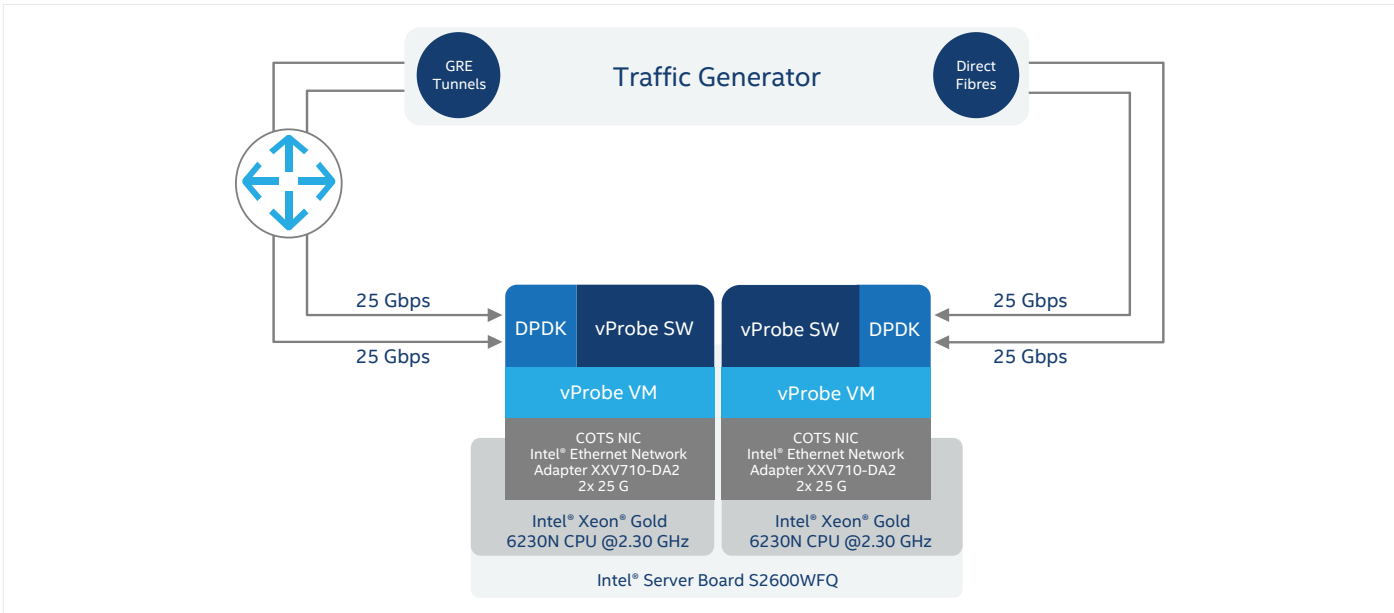

Figure 1. Anritsu vProbe test setup

2nd Generation Intel Xeon Scalable Processors

The 2nd generation Intel Xeon Scalable processors power the servers that Anritsu recommends for its Anritsu vProbe deployments. These processors provide extensive platform convergence and capabilities across compute, storage, memory, network, and security. The CPU offers additional processing headroom to deliver enhanced VM/VNF capacity and density. As seen in the test results documented below, 2nd generation Intel Xeon Scalable processors are designed for data-rich and innovative use cases where analytics are important.

A virtual machine (VM) was established for both CPUs. Each VM was pinned to a NUMA (non-uniform memory access) node (see Figure 1) and assigned its own 25 GbE network controller using PCI Passthrough. PCI Passthrough was utilized to bypass the embedded layer 2 switch in the network controller, alleviating an issue caused by using SR-IOV (single-root input/output virtualization) in test applications. The vProbe relies on copies of traffic where the MAC addresses in the traffic are different from the MAC addresses of the SR-IOV VFs. Because of this, SR-IOV switch discards the vProbe's copy of the traffic and it doesn't reach the vProbe VNF. The GPRS Tunneling Protocol (GTP) traffic was replayed simultaneously to both VM instances. Huge pages memory backing was also turned on to reduce the time needed for memory mapping. One physical core (2 threads) and 28 GB of RAM were left reserved for hypervisor usage on each NUMA node.

The data flow configuration was set at 30,000 separate user devices, which is the maximum for the vProbe. Each simulated user device was configured to have three active sessions for a total of 90,000 active sessions. This number was held steady throughout the test, with a starting data load of 10 Gbps per VM (that is, each active steam was passing just over 11 kbps of data). The amount of data passed was increased at 5 Gbps increments until it reached 30 Gbps. By narrowing down on the throughput value where the vProbe would not lose any monitored packets, the testers determined that the system maintained zero packet loss up to 32 Gbps, so results from this throughput level were included in the test. Packet size was set at 782 bytes, which was the average real-world packet size based on Anritsu testing in live networks.

vProbe Has Low CPU Processing Requirements

With correct tuning and using the advanced virtualization technology provided by 2nd generation Intel Xeon Scalable processors, the impact of probe traffic on the CPU is small.[1] As can be seen in Table 1, the CPU resource consumed at 10 Gbps totaled 13.25% of the total processing power. As the traffic tripled, the processing overhead only increased to 20.16%.

THROUGHPUT IN GBPS (EACH VM)	10	15	20	25	30	32
Average packet size	782	782	782	782	782	782
Packets/s mil	1.6	2.4	3.2	4.0	4.8	5.1
VM1 CPU %	13.25 %	15.65%	17.50%	19.19%	20.16%	21.63%
VM1 average GHz/core	2.3	2.3	2.3	2.3	2.3	2.3
VM2 CPU%	13.21%	15.60%	17.45%	19.24%	20.11%	21.58%
VM2 average GHz/core	2.3	2.3	2.3	2.3	2.3	2.3

Table 1. Anritsu vProbe processor load test results[1]

Anritsu vProbe: Ready to Assure the Entire Network

The test results highlight the low CPU consumption of the vProbe, which is a critical metric for its wide-scale deployability. At the network edge, the vProbe VNF doesn't consume very many resources, and thus it requires fewer network cores to cope with the traffic passing through the site. The solution can also scale to large sites, allowing the CommSP to get the efficiency advantage of a single service assurance tool across their entire network. As CommSPs expand their NVF services and embrace 5G networks to meet increased data consumption, these tests show they can expand the vProbe along with those deployments, enabling better network visibility due to network-wide service assurance.

Learn More

Anritsu vProbe:
https://www.anritsu.com/en-us/service-assurance/vprobe

Intel® Xeon® Scalable processors: http://intel.com/xeon

Anritsu is a member of the Intel® Network Builders ecosystem: http://networkbuilders.intel.com

Notices & Disclaimers

[1] Tests conducted by Anritsu in January 2020. Hardware configuration included server with dual 2.30 GHz Intel® Xeon® Gold 6230N CPUs (microcode: 0x500002b) with Intel® Hyper-Threading Technology and Intel® Turbo Boost Technology turned on. BIOS version was SE5C620.86B.0D.01.0395.022720191340, system DDR memory totaled 384 GB of DDR4 2666 MHz RAM. Network interface card was a 25 GbE Intel® Ethernet Network Adapter XXV710-DA2. Software configuration included Anritsu vProbe MC 8.0.1, KVM hypervisor: qemu v1.5.3 and libvirt v4.5.0, DPDK v19.11.

[2] https://www.anritsu.com/en-us/service-assurance/news/news-releases/2016/2016-11-22-gb02

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