



DEUTSCHE TELEKOM TERASTREAM: A NETWORK FUNCTIONS VIRTUALIZATION (NFV) USING OPENSTACK

“ IPv4-over-IPv6 Softwire is the first example of a high-volume, data-plane-oriented network function that was virtualized.”

Axel Clauberg | Vice President Aggregation, Transport, IP and Fixed Access
Deutsche Telekom AG



CASE STUDY

COMPANY

Deutsche Telekom

INDUSTRY

Telecom

NETWORK SOLUTION

A10 Thunder CGN

CRITICAL ISSUES

- Build a new, elastically scalable model for the core central-office data center optimized for performance, low latency and cost
- Deliver IPv4 services to customers in a native IPv6 network
- Automatically provision IPv4 and other L4-7 services quickly and efficiently
- Architect in compliance with core ETSI NFV documents
- Maintain prime directive of simplicity and openness

RESULTS

- Increased business agility with virtual carrier-grade networking service and pay-as-you-go licensing based on A10 Networks aCloud Services Architecture
- Differentiated services on a per-subscriber basis
- Reduced time-to-deploy IPv4 over IPv6 Softwire service with highly responsive partners



DEUTSCHE TELEKOM TERASTREAM VIRTUALIZES IPV4 SERVICES WITH VTHUNDER CGN

EXECUTIVE SUMMARY

Deutsche Telekom is piloting TeraStream, an all-IP network that delivers triple-play and other services from the cloud, as a model for next-generation operator networks. TeraStream also is a proving ground for software-defined networking (SDN) and network functions virtualization (NFV), as Deutsche Telekom looks to automate and orchestrate cloud services to launch new revenue-generating services and adapt to customer needs more quickly.

Deutsche Telekom has partnered with A10 Networks® to develop a carrier-grade, IPv4-over-IPv6 Softwire solution as a virtualized network function, enabling Deutsche Telekom to differentiate and scale cloud services.

A10 Networks' software-based and API-driven architecture, commitment to open standards like OpenStack, and a willingness to create innovative solutions were key to helping Deutsche Telekom develop what is widely regarded as one of the most innovative service provider networks today.

Today's hyper-connected world has not been kind to service providers. The demand for broadband has exploded, as customers want always-on connectivity for work and play, but don't want to pay a premium for their growing bandwidth consumption. In fact, fierce competition among traditional telcos, cable operators and mobile operators is driving average revenue per user (ARPU) lower and lower. Capturing new market growth, such as over-the-top (OTT) video and cloud services, requires innovation and speed. Yet many service providers are hampered by the complexity of their networks, which drives up lead time and cost, while their more nimble competitors and OTT service providers deliver services that are faster, cheaper and better. Traditional service delivery times, which require weeks or months to configure using conventional networking technologies, are no longer competitive.

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A NEW NETWORK DESIGN FOR INNOVATION AND AGILITY

Deutsche Telekom is on the vanguard of this change. As a leader in next-generation operator networks, Deutsche Telekom is piloting TeraStream, an all-IP cloud-enabled network, at Hrvatski Telekom in Croatia. In TeraStream, Deutsche Telekom has re-imagined the network to deliver all services, including voice, IPTV and Internet access, as cloud services that are provisioned on demand.

Deutsche Telekom has taken bold steps to fundamentally change how it delivers new services faster, at a lower cost and with a better user experience. TeraStream is an integrated packet-optical network that runs IPv6 in the core and is built on an infrastructure cloud model. TeraStream has drastically simplified network architecture and embraces the concepts of software-defined networking (SDN) and network functions virtualization (NFV), including software appliances, common-off-the-shelf (COTS) hardware, and automated provisioning and service orchestration.

“We designed TeraStream as an architecture that breaks many of the rules on the operator side,” said Axel Clauberg, Vice President of Aggregation, Transport, IP and Fixed Access at Deutsche Telekom AG. “The attitude of ‘things-were-always-done-this-way’ doesn’t exist here. We questioned all layers and all protocols in today’s network, and asked ‘how would you run an efficiently managed IP network moving forward?’ We realized that if we truly wanted to change our cost base, we needed to change the model.”

TeraStream is an open multivendor network, which allows for greater innovation and avoids vendor lock-in. “It is really key for operators to build a foundation based on an open platform,” said Clauberg. “We don’t want a dependency on a single vendor in our critical infrastructure.”

TeraStream uses OpenStack for cloud orchestration, allowing it to control the compute, storage and network resources in its data centers, while empowering customers to provision resources easily. TeraStream virtualizes network functions so they can be chained together to create customized communications services quickly and as needed.

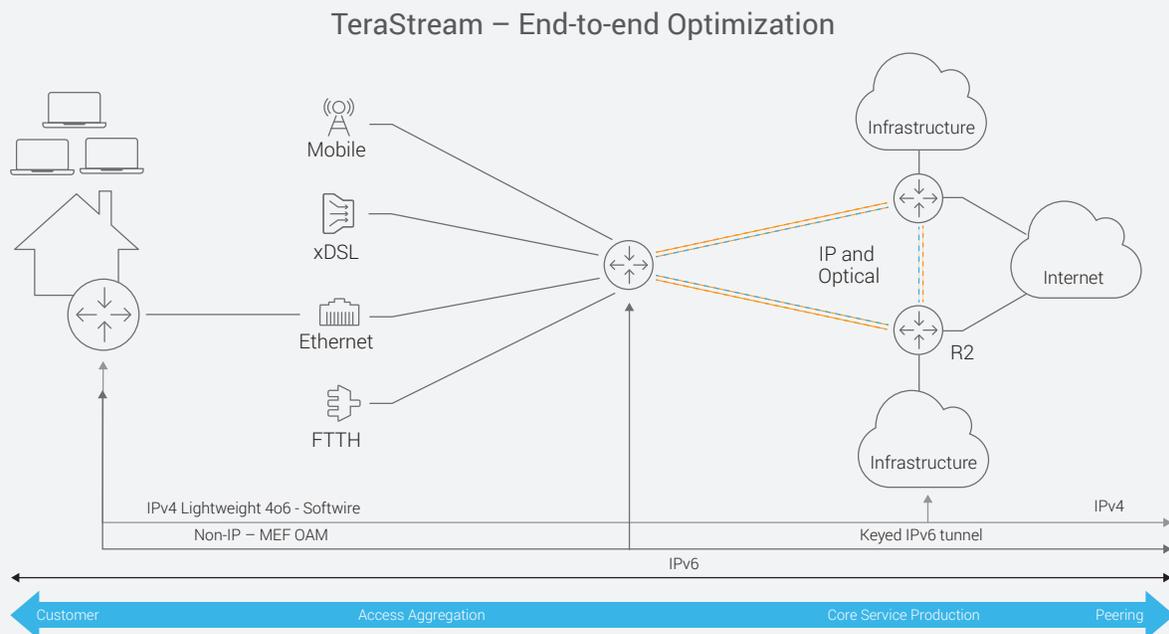


Figure 1: TeraStream is a model for next-generation operator networks – an IPv6 network that’s built on an infrastructure cloud model.

VIRTUALIZING NETWORK FUNCTIONS

As an IPv6 network, TeraStream does not have native support for IPv4. Yet it must still deliver IPv4 as a service to its customers to support legacy applications.

“There is an expectation that IPv4 traffic will go down significantly by the end of the decade, but we’ll need to deliver that function for some time,” said Clauberg. “Producing IPv4 as a service is ideal, because we can react based on our current load and we don’t need to drastically overprovision the way you might in a physical appliance scenario.”

The TeraStream team looked for a partner that could drive a scalable, virtualized Software encapsulation service in its data centers. There are multiple ways to transport IPv4 traffic over IPv6, and the team considered Mapping Address over Port (MAP) as well as Lightweight 4 over 6 (LW4o6), an emerging IETF standard that’s an extension of Dual-Stack Lite (DS-Lite). In DS-Lite, address translation is done at the operator, while LW4o6 moves this translation to the customer premise equipment. The team decided that the LW4o6 approach would scale more efficiently and allow tenants to be managed individually.

The search for a virtualized Software solution led the TeraStream team to A10 Networks. “We were looking for a partner who could develop LW4o6 Softwires and prove that it works,” said Clauberg. “We felt there was common ground with A10 Networks.”

A10 moved quickly to implement LW4o6 in its A10 Thunder™ Series CGN, and TeraStream deployed vThunder as a virtual service. With vThunder, TeraStream has a high-performance, highly transparent and scalable solution for its customers, which is delivering a strong return on investment.

The Thunder CGN product line is part of the A10 aCloud Service Architecture, which enables cloud operators to dynamically provision Layer 4-7 tenant services while improving agility and reducing cost. In addition, aCloud on-demand licensing helps operators in providing cloud services consistent with cloud consumption model. The aCloud Services Architecture integrates with OpenStack, SDN network fabrics and cloud orchestration platforms, so operators can dynamically deliver application and security services and policies per tenant.

IPv4 as a Service – Lightweight 4o6 Softwires

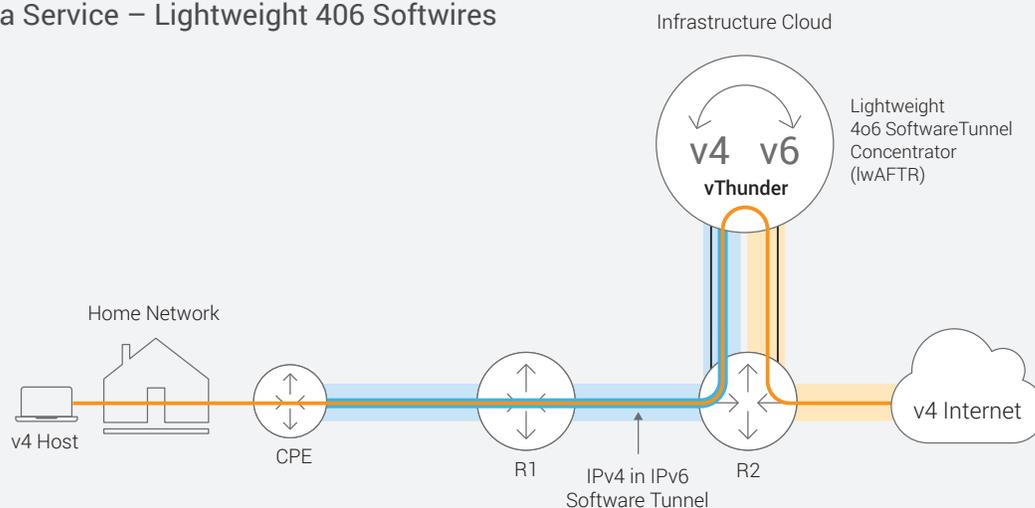


Figure 2: TeraStream is a proving ground for network functions virtualization. It uses Lightweight 4o6 Softwires to elastically scale the delivery of IPv4 traffic to customers.

Automation through OpenStack and integration with aCloud on-demand licensing makes it possible to turn up new services for customers as they are needed, and tear them down once they're no longer needed.

A10 tuned vThunder to use LW4o6 and deliver optimal performance, scalability and automation, which allows TeraStream scale elastically to support more customers and to deliver a better experience. "When you virtualize a network function coming from hardware, there is a lot of potential for optimization and automation," said Clauberg. "A10 was very helpful to optimize the performance so we could serve our customers without burning hardware resources."

"IPv4-over-IPv6 Softwire is the first example of a high-volume, data-plane-oriented network function that was virtualized," said Clauberg. "When people talk about NFV today, they are focusing on the control plane, not the data plane. But if we truly want to change our cost basis, we have to look at virtualizing network services also touching the data plane."

A BUSINESS MODEL BUILT FOR THE CLOUD

TeraStream is taking advantage of A10's Pay-as-You-Go licensing model so it can offer on-demand cloud services to customers on a subscription basis. With the Pay-as-You Go licensing model, TeraStream can offer and deliver IPv4 and other advanced L4-7 networking tenant services with automated metering, reporting, billing and license management, as is necessary in a cloud environment.

"A10's pay-as-you-go licensing is key," said Clauberg. "A flexible licensing scheme is win-win, because it makes the vendor profitable and it makes us profitable."

ABOUT DEUTSCHE TELEKOM

Deutsche Telekom is one of the world's leading integrated telecommunications companies with over 142 million mobile customers, 31 million fixed-network lines and over 17 million broadband lines (as of December 31, 2013). The Group provides fixed-network, mobile communications, Internet and IPTV products and services for consumers, and ICT solutions for business and corporate customers. Deutsche Telekom is present in around 50 countries and has approximately 229,000 employees worldwide. The Group generated revenue of 60.1 billion euros in the 2013 financial year - over half of it outside Germany.

ABOUT A10 NETWORKS

A10 Networks (NYSE: ATEN) provides Reliable Security Always™ through a range of high-performance solutions that enable intelligent automation with deep machine learning to ensure business critical applications are protected, reliable and always available. Founded in 2004, A10 Networks is based in San Jose, Calif., and serves customers globally with offices worldwide.

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