



SOFTWARE-DEFINED NETWORKING (SDN)

# USHERING IN A NEW ERA OF NETWORK AS A SERVICE (NaaS)

## Contents

How we got here.....	1
Truly value-add .....	3
Extensible SDN-enabled NaaS .....	3
The Equinix Fabric™ delivers NaaS on a global scale ..	4
Practical application—agency use cases .....	4

As collaboration and private interconnection continue to change the digital communication landscape, federal government agencies are discovering the extended utility, mission agility and cost-effective SDN-enabled alternative to traditional networks.

Much like the continuously emerging cloud and broader digital services they enable access to, networks have evolved significantly over the past 10 years or so. The notion of near-instantaneous, on-demand customer portal-provisioned network transport is now a reality. More importantly, modern SDN-enabled networks are decidedly more application-centric than their predecessors, with application programming interface (API) integration providing adaptive symmetry between consumers and a wide array of geo-disparate, targeted digital services.

SDN-enabled “fabrics” form regionally distributed co-terminus endpoints (hubs) with a multitude of digital service providers (DSPs) and peripheral services—many of which are now enabled with a growing number of virtual network functions that collectively comprise globally-expansive digital marketplaces whose services are now largely subscription-based and essentially a few mouse clicks away, again via secure portal access.

## How we got here

There are a number of technical resources available for a deep dive analysis into these new concepts. One of the better (and technically detailed) versions can be found in the book “**MPLS in the SDN Era – Interoperable Scenarios to Make Networks Scale to New Services,**” authored by **Antonio Sanchez-Monge and Krzysztof Grzegorz Szarkowicz**. While the book provides an insightful journey into the continued evolution of MPLS, NFV and related technologies, this excerpt effectively summarizes the key relevant points:

“In the early 2010s, some people claimed that Software-Defined Networking (SDN), specifically, OpenFlow would replace MPLS. However, after realizing the many challenges of the first OpenFlow version, SDN was redefined into a paradigm (SDN 2.0) that shares many of the principles that have made MPLS a very successful service provider technology for decades.

“Looking at SDN and MPLS as competing technologies is fundamentally wrong. MPLS is a key SDN enabler. This statement holds particularly true if you look at MPLS as an architectural paradigm (not as an encapsulation).”



Looking at SDN and MPLS as competing technologies is fundamentally wrong. MPLS is a key SDN enabler.

In a nutshell, this is the MPLS model, per the authors:

- Decoupling the control plane from the forwarding plane.
- Decoupling service from transport.
- Decoupling the overlay from the underlay.
- A layered architecture with a feature-rich edge and a fast transport core; this approach can be applied to the WAN, data centers and so on.
- Building overlay networks at the edge to support multitenancy and multiservice.
- Minimizing the forwarding state on the core.
- Advanced packet steering by either signaling forwarding paths and/or by stacking instructions on the packet headers.

To draw an analogy of the points made above, a civil engineer designs and builds an interstate highway (a digital service provider-rich, carrier-neutral interconnection platform) that comprises pre-determined routes (provided by resilient, integrated underlying Tier 1 carriers for each route) between various interconnected endpoints, or hubs (Equinix data centers), along the highway. Each hub on the platform represents a digital services outlet where private on-ramps to hundreds of proximally adjacent cloud service providers (CSPs who have, by design, built their XaaS facilities within close proximity to corresponding Equinix locations) along with a plethora of peripheral and cloud-adjacent DSPs that can be seamlessly accessed via SDN/API integration with the underlying fabric.

Customers establish a “last mile” connection from their respective headquarters, regional offices and/or data centers to a corresponding Equinix hub to get onto the platform and access desired digital services. In the interest of solving for latency-sensitive applications and ensuring equitable distribution of services across all geo-disparate users, customers find it far more advantageous to establish a geo-strategic “digital edge,” providing seamless, physical proximity to DSPs

at various Equinix locations to deploy aggregated, private, high speed, low latency ingress/egress to targeted service providers for their geo-disparate user communities. Hybrid multicloud interconnection is also far more simplified with an implied “local hairpin” to various IaaS, PaaS and SaaS clouds at Equinix.



To further the analogy a bit, that highway might initially be built by the civil engineer with two, four or more lanes (10s or 100s of Gbit of capacity) that can be expanded as demand dictates for all travelers. Some measure of highway traffic during certain periods (overprovisioning) is implied but eased with capacity expansion as warranted, further explained momentarily. As travelers depart their respective digital edge enclaves to establish a connection/private peering relationship with a digital service provider, mission partner, supply chain vendor, etc., they traverse this shared backbone to move traffic between origin and destination. Each user “lane” on the highway “backbone” is logically and securely isolated to each traveler but is variable in overall capacity based on the number of active travelers and the size of their payloads. The platform provider continuously monitors these factors closely to ensure adequate overall capacity and performance, expanding upon it as requirements dictate.

Equinix refers to this mode of transport on the platform as either local (intrametro) or remote (intermetro) virtual circuits—a Layer 2 logical connection made between endpoints on the fabric (ethernet virtual private network, or EVPN). The virtual circuit provisioned on demand by the customer is essentially a temporary or permanent “carve out” of dynamically resizable capacity across a shared backbone capacity. The provider backbone has a finite amount of capacity, typically between 100 and 400 Gbit. Customers carve out a portion of that backbone capacity along with all other customers to satisfy their network transport needs. This introduces a new economy in network transport—in many cases, a welcome departure from



static, dedicated capacity circuits that are inflexible as requirements evolve to one that can be dynamically sized and resized (and priced) to meet actual requirements.

It's important to draw this distinction, as it essentially represents a tradeoff between traditional dedicated vs. flex-capacity transport. Why is this important and how will it change the role and utility of networks of the future?

## Truly value-add

In many ways, this new SDN-enabled approach is beneficial for both the provider and the customer. The provider will find capacity and associated capital expenditure planning far more streamlined, as they are now largely focused on the aggregate consumption and subsequent capacity of the shared backbone, always ensuring that these two key metrics are as proportionately equitable as possible. Advanced artificial intelligence components are often employed to provide wholly cognizant and adaptive capacity planning. Forecasting capacity requirements is largely based on quantifiable regional and global consumption trends and/or sustained demand surges that warrant accelerated increased capacity, much like the hundreds of cloud service providers participating on the platform. This dynamic throttling of capacity becomes a game changer for transport providers.

Likewise, the agency also finds many inherently beneficial characteristics that were largely nonexistent with traditional, largely inflexible network services:

- On-demand transport, rapidly provisioned in minutes vs. weeks or months.
- Dynamically resizable transport capacity that is adaptive to emerging requirements.
- Significant cost avoidance, as underlying shared capacity transport carries a lower operating cost burden for the provider and subsequent pricing for the service to their customers.
- Persistent and/or non-persistent network transport that can quickly be spun up or spun down to control costs and ensure prescriptive usage based on actual needs; usage is billed monthly and prorated accordingly.

- The ability to quickly traverse from one provider network to another via SDN-enabled/API-integrated couplings between transport service providers, i.e., Verizon's software-defined interconnect (SDI) partnership with Equinix.
- Point-and-click access to hundreds of clouds and/or cloud-adjacent services regionally distributed across the globe.
- Point-and-click access to intra-agency and interagency collaboration via private interconnection.

## Extensible SDN-enabled NaaS

Decoupling of the forwarding plane from the control plane, as well as service from transport, and overlay (customer edge, or CE) from underlay (provider edge, or PE), enables an overlay of varied customer edge networks over the underlying pre-built, route-aware core. This abstraction enables an agency to seamlessly integrate and operate their respective agency networks over the provider's underlying global fabric.

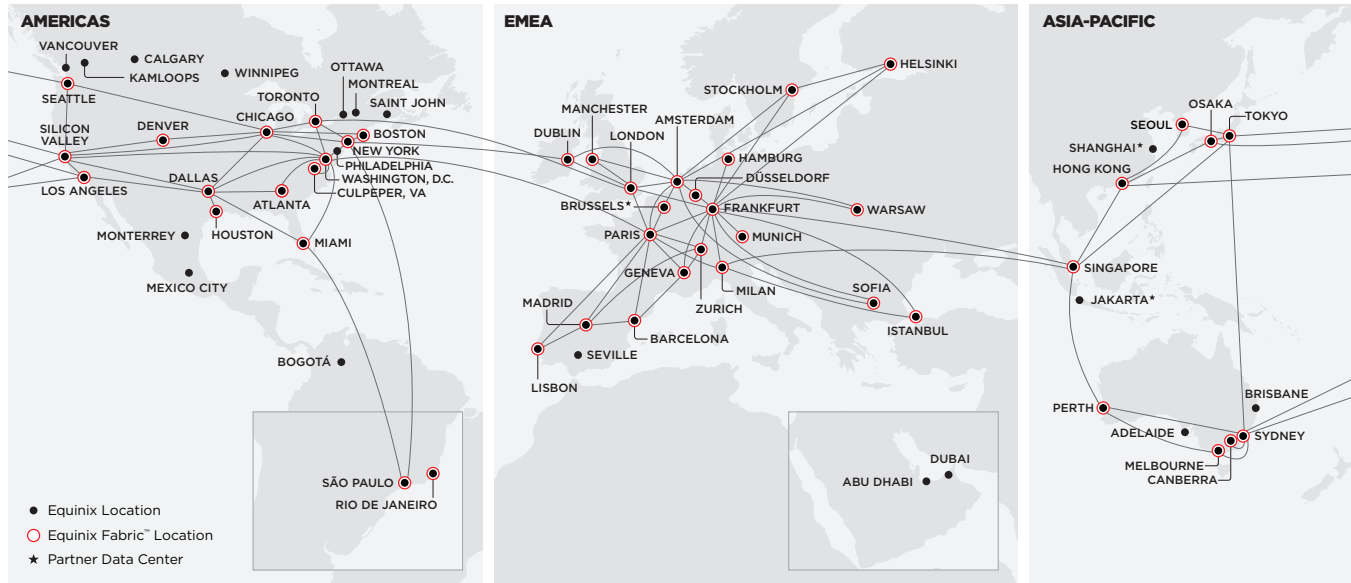
Network function virtualization, or NFV, represents an extensible functionality or augmentative service for an agency's overlay network. The provider integrates NFV functionality that an agency overlay network can leverage to, within minutes, add virtualized networking functions when and where necessary. A customer with a physical overlay network presence in Equinix/Chicago may have a near- or short-term requirement to establish a localized multicloud ingress for users on the West Coast, rather than backhauling or "tromboning" that traffic to and from their Chicago location.



The Equinix Fabric recently added the Network Edge (NE) service to address this issue. Comprising multiple industry-established OEMs partnered with Equinix, the agency in Chicago can, in minutes via a portal session, subscribe to NE services in an à la carte fashion in Equinix/Silicon Valley, spinning up intermetro fabric connectivity, a Cisco or Juniper router, Palo Alto or Fortinet firewall and/or a growing number of software-defined wide area network (SD-WAN) services in the new metro in minutes. Equally appealing to customers is the CAPEX-avoidance nature of these services when geo-expansion is required.



## The Equinix Fabric delivers NaaS on a global scale



The bar has been raised on the responsiveness and availability of technology services. As the foundation for all of these services, the network must continue to keep pace with intuitive, frictionless, cost-effective and rapidly provisioned interconnection to provide access to a growing number of geo-disparate digital services.

Continuously expanding on a private peering pedigree that began in the late 1990s, Equinix offers the world's largest SDN-enabled NaaS platform via the Equinix Fabric, available at the date of this writing in nearly 60 metros across the globe and growing.

### Practical application—agency use cases

Many Equinix customers, particularly in the public sector (healthcare, law enforcement, first responders, accounting and finance, scientific research, etc.), have begun to leverage the Equinix platform to modernize and digitally transform their respective government agencies. While they will remain anonymous here, a cursory list of common use cases addressed by myriad federal civilian, Department of Defense and other agencies is outlined below.



**Cloud access:** With 300+ CSPs participating on the platform, privately accessing two or more clouds across nearly 60 metros globally enables regionally distributed, service distribution optimized cloud access when and where needed in a seamless process.



**WAN optimization:** Traditional architectures were based on a central core where apps and data were hosted and streamed out to geo-disparate locations, a network-centric approach that typically resulted in an inequitable service distribution model (distances from the core to each connected location varied). Platform Equinix® provides an alternative to this approach whereby regionally distributed hub locations can be established proximal to digital services and the user communities consuming them. An on-demand service consumption model also enables agencies to rapidly pivot and flex services as requirements dictate.





**Intra-agency and interagency collaboration:** In the past, collaborative agencies with federated activities often found it challenging to establish interagency network connectivity, as each respective agency network was typically saddled with the accumulation of years of often antiquated infrastructure, seemingly countless firewalls, gateways and associated components that impeded frictionless traffic flow for mission critical applications. The Equinix Fabric offers an alternative to this approach whereby agencies can rapidly establish on-demand persistent and non-persistent private peering relationships to federate activities while leveraging the proximally adjacent digital services of thousands of providers. Their respective private interconnect digital edge locations become the primary traffic intersection point for networks, clouds and collaborative agencies.



**Informatics:** Much like their private sector counterparts, government agencies are exploring new ways of data collaboration. Moving analytics and data collaboration to the digital edge implies a number of paradigm shifts, primarily as it relates to the development of suitable data use agreements, universal governance, and data custodianship that supports a seamless and secure transactional environment. Readily addressing the challenges of data gravity with globally extensible SDN-enabled data acquisition, along with access to cloud native and/or cloud adjacent informatics, will be an area of continued focus for the foreseeable future at the digital edge.

As a foundational element, software-centric, on-demand NaaS will continue to transform the digital landscape and in turn, forever change the way agencies operate and collaboratively transact. With ongoing developments and innovation ranging from healthcare to national security, the availability of secure, rapidly provisioned, cost-effective and intuitive digital services will continue to evolve with the industry's continuous pursuit of a better mousetrap.

As our roadmap continues to expand into the future, the foundation is now laid with an extensible NaaS to provide globally ubiquitous private interconnection between agencies, mission partners, civilians, clouds and networks.

## Ready to get started?

Find out what rapidly provisioned, on-demand networking that is secure and scalable can do for your agency.

[eqix.it/DESBfederal](https://eqix.it/DESBfederal)



## About Equinix

Equinix is the world's digital infrastructure company. Digital leaders harness our trusted platform to bring together and interconnect the foundational infrastructure that powers their success. We enable our customers to access all the right places, partners and possibilities they need to accelerate advantage. With Equinix, they can scale with agility, speed the launch of digital services, deliver world-class experiences and multiply their value.