



Software-Defined Cloud Interconnect

A new breed of interconnect
services accelerating
infrastructure modernization

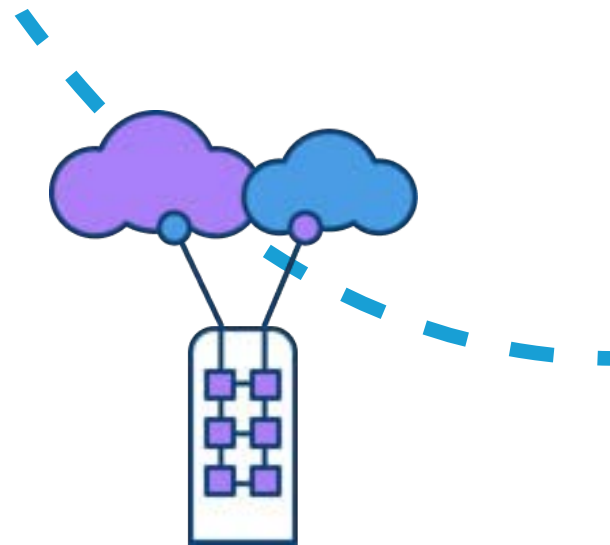


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Infrastructure & Operations (I&O) leaders know it only too well: these past few years have widened the gap between fastpaced cloud innovation and slow modernization of network infrastructure.

A decade of enterprise cloud adoption and the ensuing massive move out of on-premise data centers have transformed interconnectivity needs. Monolithic applications have exploded into microcomponents that are scattered among multicloud environments and integrated in continuous DevOps lifecycles.

These granular IT resources now require to simplify, accelerate and scale interconnections without soaring network costs. How do I&O departments deal with this network infrastructure transformation to increase agility while guaranteeing its reliability?

As a matter of fact, a new generation of cloud networking experts has emerged that brings unparalleled network flexibility to interconnect all types of cloud resources while offering strong service engagements and cost predictability.

End of 2018, Gartner identified these experts offering "hubs to connect an enterprise to a wide variety of cloud, network and internet service providers" as Software-Defined Cloud Interconnect (SDCI) providers.

InterCloud is acknowledged by the analyst firm as one of the dozen players in this emerging market. Building on a ten-year experience of supporting dozens of large companies with global footprints in their cloud networking journeys, we want to share our vision on:

- Why granularity of service based on traffic segmentation is the cornerstone of future-proof SDCI offerings;
- How managed cloud networking hubs support infrastructure modernization strategies in the long run;
- How software-driven orchestration and automation bring the network agility required to interconnect complex multi-cloud environments.

This white paper will explore these topics and demonstrate how these combined capabilities can answer large companies' needs when accelerating their cloud transformation journeys



As part of a corporate multicloud strategy, the road to successfully reaching a growing number of Cloud Providers (CSPs) is paved with management complexity and technical challenges.

A decade of cloud innovation has transformed IT production and considerably shortened time-to-markets: modern applications based on microservices are spread across multicloud environments to benefit from the best features.

From a networking standpoint, the soaring connectivity needs between all these microcomponents require a new breed of application-aware and usage-driven interconnect services that can be implemented quickly and managed easily through a self service platform.



“ Adopting a leading Cloud Provider such as AWS, Microsoft Azure or Google Cloud Platform requires a real effort; although they seem similar from a helicopter view, once you get into the details, they reveal to be quite different which makes it very tricky to master each one. ”

- Enterprise Architect, Global I&O, Industry and Health

>> Seamless interconnection at scale

It is a best practice for large companies that need to guarantee the performance, security and compliance of their business-critical traffic to bypass the Internet and choose private connectivity, but implementations are often slowed down or even fail due to hidden complexity.

When connecting to CSPs, dynamic routing is always needed and the implementation is specific to each CSP in terms of workflows, parameters, responsibilities, etc. In addition, CSP offerings constantly evolve thus impacting dedicated connection services, making it extremely complex for a company to manage the implementation without any support.

To enable efficient and fast interconnection to a new CSP or a new region within an existing one, an SDCI hub is pre-connected to all major CSPs.

Leveraging networking technology partnerships with these providers enable SDCI providers to guarantee a seamless integration with each of them. This allows enterprises to fully take advantage of each CSP's offering.

A key step of implementation is the migration. This was the case for Sodexo that decided to migrate half of its 2,000-2,500 applications to Microsoft Azure. Building its hybrid cloud, the challenge was to guarantee a seamless migration of on-premises applications to the Cloud as Florent Trecourt, Global and Telecoms Manager of Sodexo explains: "Ideally, our users shouldn't notice any difference between applications hosted on-premises and those hosted on Azure."



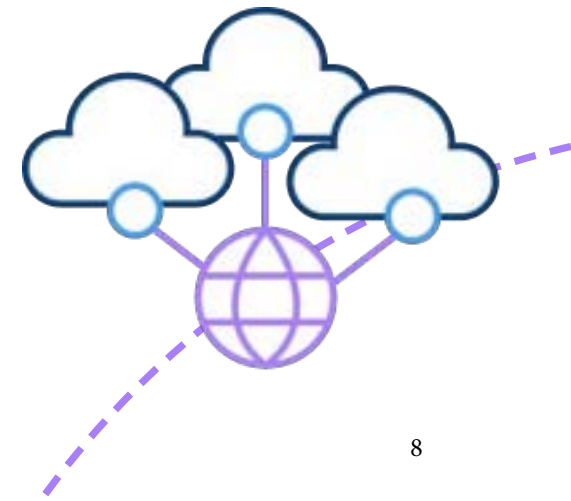
>> The case for end-to-end visibility

Private connectivity de facto offers end-to-end traffic isolation between the on-premise environment and the customer environment within the CSP using its dedicated connectivity service. However, traffic isolation is not enough to empower network managers with end-to-end visibility and control over application traffic.

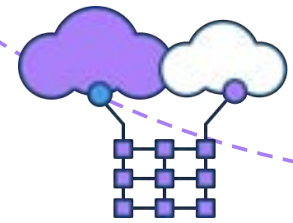
For the past two years, the feedback we received from network managers using traditional networking services to access the Cloud was the same: they felt completely blind on their traffic exchange once it was out of their premises and before it reached the CSP. InterCloud has turned this operational feedback into action to develop a brand new interconnect model based on traffic segmentation.

"InterCloud enabled our team to create the granular network metrics needed to extend the visibility and control over the application traffic we had on our MPLS up to the Cloud Provider's network."

- Lionel MARIE, Network Innovation Leader, Schneider Electric



>> Granular traffic segmentation



This new model relies on a simple, but crucial question: Which resources does the organization need to interconnect? Traffic segmentation is the ability to segment and isolate the precise resources that need to be interconnected to deliver a seamless and secure service, thus guaranteeing an enterprise-grade quality of experience to all corporate users.

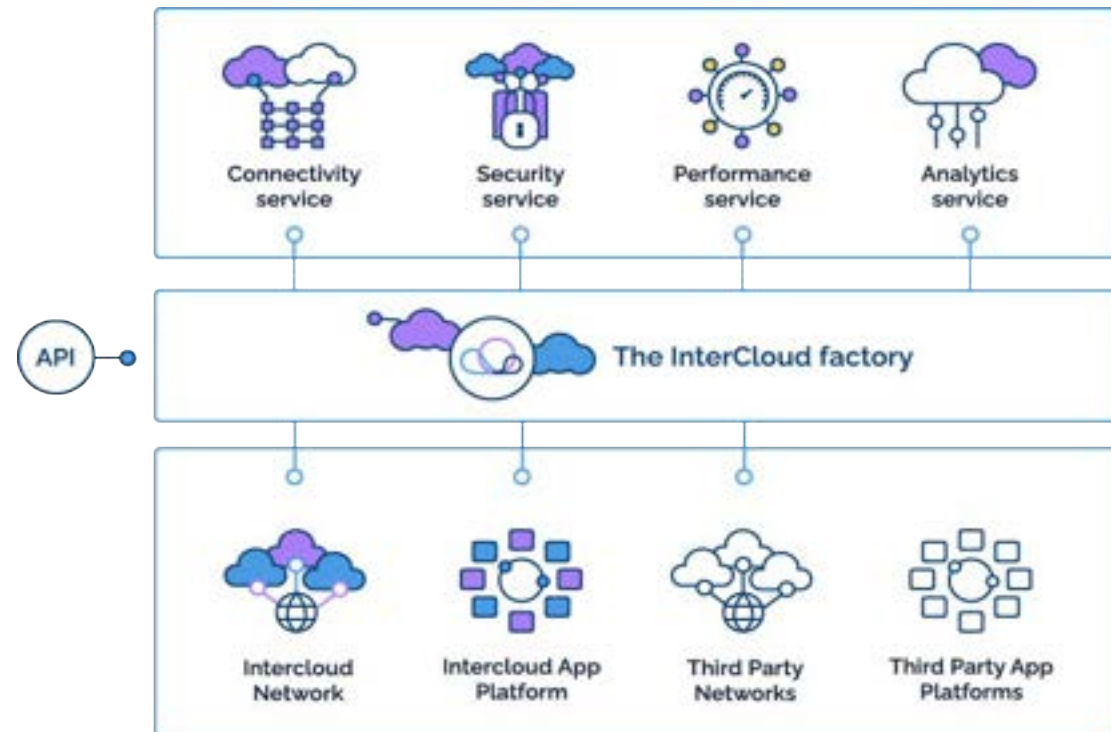
Granular traffic segmentation is a native capability of the InterCloud platform which allows to tailor each interconnect service to its final usage requirements, and potentially enrich it with advanced security and performance features. As a result, the corporate traffic going through our platform is segregated according to the criticality and specific requirements of each application workload.

The data flow — either between corporate premises and the CSP or Cloud-to-Cloud — is logically and physically isolated thanks to granular connectivity services.

Leveraging this Edge-to-Edge network visibility brings network operations the control needed to comply with industry and corporate policies.

According to each organization's rationale, network managers can create consistent groups of resources (per application, environment, line of business, region, etc.) that are completely isolated from others.

It helps keep operations as simple as possible. By closely monitoring resource usages by group, rather than by origin or destination or provider, corporate I&O departments can better understand the trends and specific issues of each internal stakeholder. This traffic segmentation feature also facilitates internal billing to different branches and lines of business.



“ Switching from a point to point offer to a platform with multiple accesses to the backbone is a really useful evolution. It simplifies both the consumption of services and their design; it used to be a headache to design a network architecture with these point to point connections, now we just have to connect our sites to your platform and you take care of service implementation. ”

- Philippe Lasky, Head of Production and Infrastructures, Médiamétrie

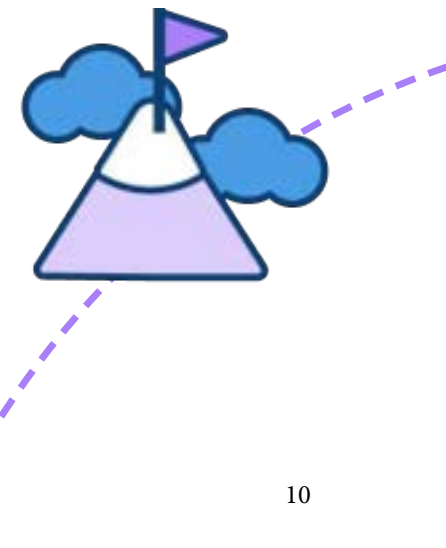
>> Ease of use and scalability via a platform

SDCI platforms are purposely built to support multicloud architectures that can flex and scale as cloud strategies evolve. A key added value to implement multicloud is to natively support cloud-to-cloud architectures. For instance, with the InterCloud platform users can directly link cloud resources to one another, thus interconnecting resources within two separate Cloud Providers without tromboning through the customer WAN. Cloud-to-cloud direct connectivity is vital for multinationals to improve technical and commercial efficiency.

The platform model is another innovation brought by SDCI providers which considerably simplifies cloud adoption throughout a global group. Indeed, corporate Infrastructure and Operations (I&O) departments can integrate these innovative interconnect services into their global cloud platform or service catalog which facilitates branch adoption, daily usages but also corporate monitoring and support.

When introducing our new platform model to existing customers, we got the following feedback:

InterCloud strongly believes a key value for a Software-Defined Cloud Interconnect (SDCI) provider is to cater its cloud networking expertise through managed solutions that cover all types of cloud interconnect needs. The second part of this white paper details how service hubs support infrastructure modernization strategies in the long run.





>> Service hubs to support infrastructure modernization



>> Multiple connectivity flavors

As explained above, the point of traffic segmentation is to offer the right connectivity mode and associated level of service for each type of workload according to its criticality, usage or requirement.

The InterCloud platform offers two main types of connectivity with different service engagements. The first option is end-to-end private connectivity designed to guarantee the performance, security and compliance of business-critical applications. This solution includes all the routing services, as well as the delivery of the local loops to attach the corporate premises when needed.

The second option is IX connectivity, an alternative to IP transit for some bandwidth-consuming applications such as communication and collaboration. It provides the best possible path to the destination while reducing the Internet Access bandwidth required.

InterCloud designs and implements IX connectivity as part of a wider strategy to cope with this model's weaknesses and offers enterprise-grade engagements.

InterCloud's customer Schneider Electric has typical use cases for both interconnect modes. In 2014, it started with private connectivity to deliver its business-critical Salesforce application traffic to worldwide users and solve performance issues. As a result, the latency was improved by 30% and the jitter has been reduced by up to 80%. Later on, the global leader innovated again with direct connectivity to SaaS providers to connect O365, Box or Webex.

"The challenge was to prove that peering was a cheap, simple and sustainable way to upgrade our global network to access cloud resources," comments Schneider Electric's Network Innovation Leader.

>> Fully managed and customizable solutions

“ The biggest advantage of InterCloud is its advanced technical skills on the Cloud Providers' connectivity offerings. Delivering a high level of service is also quite unique in the market; competitors have rather bare or build-it-yourself offerings. ”

- Enterprise Architect, Global I&O, Industry and Health

Cloud application deployments usually involve a complex transition that includes partial or full migration from onprem to one or many clouds. A managed SDCI provider is best positioned to handle this tricky transition and adjust the solution at each step of this transition to deliver the required agility.

Whether the solution is private connectivity or managed peering, InterCloud takes care of implementing all the routing requirements from end-to-end. We strongly believe that delivering fully managed solutions is the only suitable level of service for corporate cloud-based applications. It offers the strongest guarantees to deal with the technical challenges of complex multicloud implementations.

When it comes to IX connectivity, delivering customized technical designs and fully managed peering services guarantees performance and reliability. Otherwise the hidden complexity of IX peering may lead to significant waste of time and money if not handled properly. The main challenges are related to BGP routing onfiguration especially when building resiliency.

As companies move forward with their cloud networking journeys, the need for tailored connectivity solutions that improve network agility prevails.





>> Improved infrastructure agility with service hubs

Leveraging this innovative technical design, global companies can better control all their worldwide traffic and bring more predictability and flexibility to their networking costs. All networking services are gathered within regional service hubs hosted on the edge of the InterCloud platform to allow technology and integration partners to plug in.

The service hubs are designed to support infrastructure modernization strategies in the long run. Whether the enterprise needs to move out of an on-premise datacenter, connect to a new CSP or a new location, it is easier and quicker to implement both strategic and minor changes in the network infrastructure.

The advantages of tailored service hubs are multiple:

- No need to worry about the ever-changing underlay or the complexity of multi-modal connectivity (private, IX peering, IP transit, etc.);
- I&O departments can focus on network infrastructure modernization and treat network services separately from other IT functions;
- A global overview and central management of various network topologies and technologies facilitate the transition from ageing WAN services to SDN;

- Service hubs are fully managed by InterCloud experts, thus freeing I&O teams from time and resource-consuming network operations;
- "Bring Your Own" security policies and appliances within the service hubs allows to comply with ZTNA best practices;
- Built-in security enables implementing the right level of security for each connectivity service

Building on the granular traffic segmentation allowed by the InterCloud platform, service insertion, such as security, performance, and data analytics enables compliance with the company's policies as well as mutualizing services.

Coming back to Schneider Electric's example, the energy management leader uses the InterCloud platform to host a dozen regional service hubs worldwide. Schneider Electric's Network Innovation Leader further explains: "Beyond using the InterCloud platform to centralize and control our network traffic, we use it to mutualize some key functions such as firewalls. Instead of having one firewall per VPC/VNET, we can scale firewalls for multicloud, multiple regions while filtering cloud-to-cloud traffic."



**Enable network agility
with automation
and orchestration**





From day 1, cloud services were designed to be usage-driven and interoperable with other environments as well as technologies. Unfortunately, most legacy connectivity solutions are lacking the necessary features to deliver on these promises or, at least, they would involve complex operations and additional costs.

Software-Defined Cloud Interconnect services can contribute to achieve some of the most challenging goals in modern IT such as network infrastructure automation and scalability or seamless integration in shortened and continuous application lifecycles.

In terms of networking, addressing this corporate agility need requires an automation and orchestration engine. The InterCloud platform is open, software-driven, and built on highly customizable layers of components. This layered approach allows designing flexible solutions, based on service chaining between customers and multi-cloud destinations.

"The usual proceeding of infrastructure departments was to buy equipment and implement network functions but this model doesn't scale and ends up being costly in a fast-paced hybrid networking environment. The disruption brought by SDCI providers is to focus on the use case rather than on the equipment. Building on network intelligence, we offer a new breed of connectivity with built-in services."

- Amine Gharbaoui, Head of Infrastructure, InterCloud





>> Automated orchestration factory

Let's have a look at the engine of the InterCloud platform that dynamically designs, deploys, and monitors multi-cloud interconnections. We see this orchestration engine as a connectivity as code factory. Its role is to automatically pick the relevant underlay components from our network fabric to automatically create the tailored interconnections embedding advanced services thanks to service chaining. For instance, the InterCloud Factory allows to:

- Create a CSP connection by choosing the on-ramp (connectivity location for a specific CSP);
- Implement secure links enhanced with security functions such as next-gen firewall and manage them from the InterCloud portal / API;
- Use performance links for sensitive traffic thanks to network optimization functions Such a factory offers all DevSecOps stakeholders full visibility and control.

Such a factory offers all DevSecOps stakeholders full visibility and control over the cloud interconnect services:

- Business owners get application-level visibility and ensure a best-in-class user experience;
- Application developers leverage platform features (performance, security, analytics, automated connectivity provisioning) to shorten production cycles and reduce time-to-markets for new apps and upgrades;
- Security teams can leverage and tailor the built-in security features to comply with ZTNA best practices;
- Operational teams are able to streamline IT operations, including troubleshooting leveraging in-depth network availability and performance KPIs.

Leveraging an SDCI platform's orchestration and automation capabilities is key to optimize Turnaround Times (TAT) and resource management while driving down the overall cost of infrastructure. At the end of the day, the whole company can spend more time on strategy and innovations.

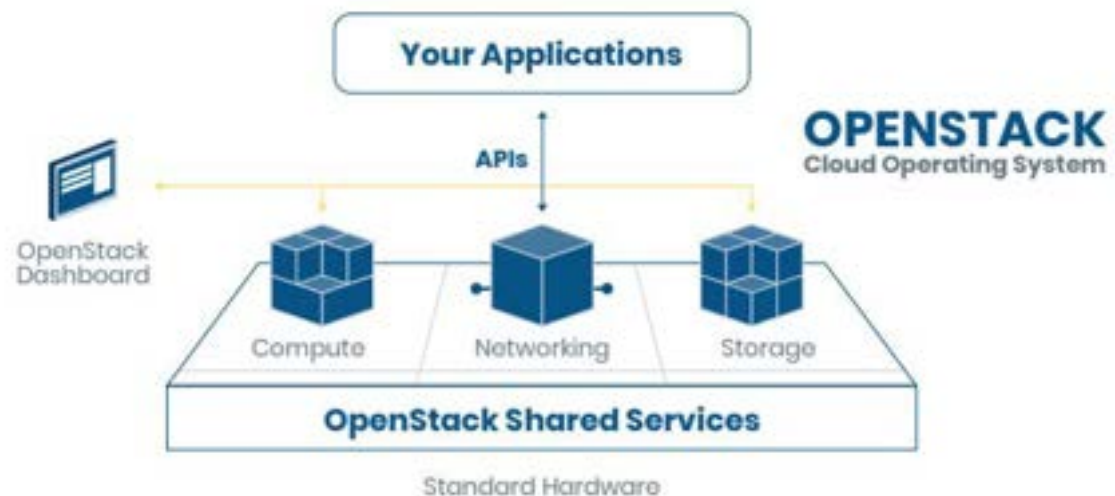
>> Software-Defined network fabric

Software Defined Networking (SDN) and Network Function Virtualization (NFV) are the two foundational technologies of an SDCI platform that bring end-to-end automation from service ordering to the underlay orchestration. Today's complex, fast-evolving, and modular infrastructure requires software automation to limit the risk of human error.

The InterCloud Fabric is composed of a global private backbone and its network intelligence capabilities from our Smart Edges.

We build, operate, and maintain a private resilient core network, based on multiple infrastructures and platforms to deliver end-to-end services.

Our Smart Edges are hosting the innovative network intelligence functions required to manage Layer 3 fully-meshed networks. This software-defined fabric supports resilient designs to answer complex technical and compliance requirements, like high availability designs, end-to-end traffic isolation, or service chaining.



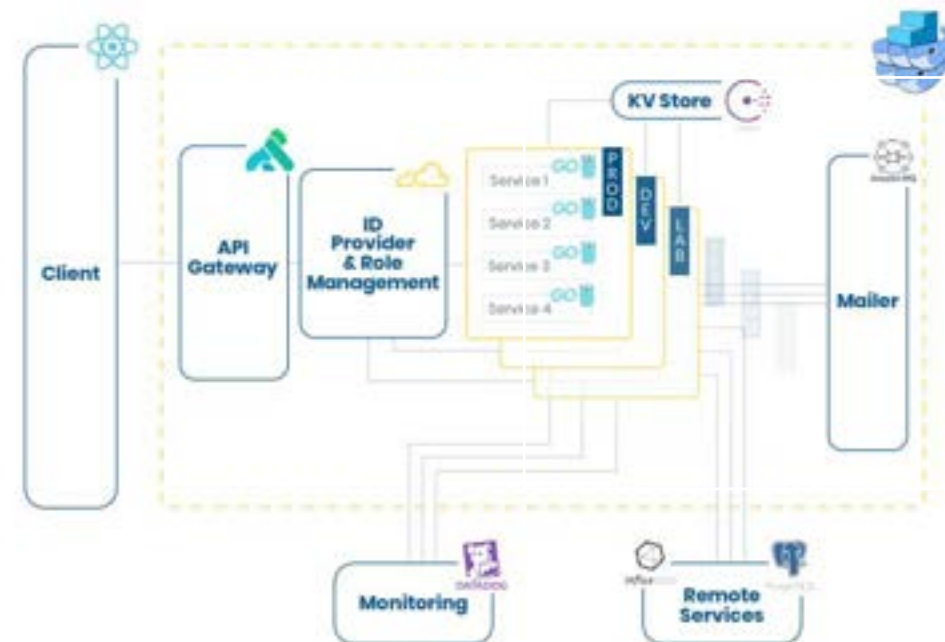
>> API-first platform

Each company has different requirements to access its interconnect services data. With intercloud.io, the monitoring information is available in dashboards within our user-friendly console, or the raw data can be retrieved and integrated with corporate governance and tools using our RESTful APIs.

From a technical standpoint, our APIs have predictable resource-oriented URLs, use HTTP response codes to indicate API errors, and work with built-in HTTP features, like HTTP authentication and HTTP verbs.

The extensive API documentation following the OpenAPI v2 specification, also known as Swagger, is available on intercloud.io.

With these APIs, users benefit from a DevOps-ready way to monitor and allocate their cloud resources: they can seamlessly retrieve InterCloud's networking KPIs and automatically provision interconnect services directly from their CI/CD pipeline. As a result, InterCloud's services can be seamlessly integrated into a continuous application lifecycle.





Use case: Service Chaining with the InterCloud Platform



The Context

A global industrial group has deployed an application server with heavy compute - very large files - in the Cloud.

The Challenge

The performance was degraded compared to the on-prem solution. Other applications, like real-time traffic, needed high-performance links for the application to perform correctly.

The Solution

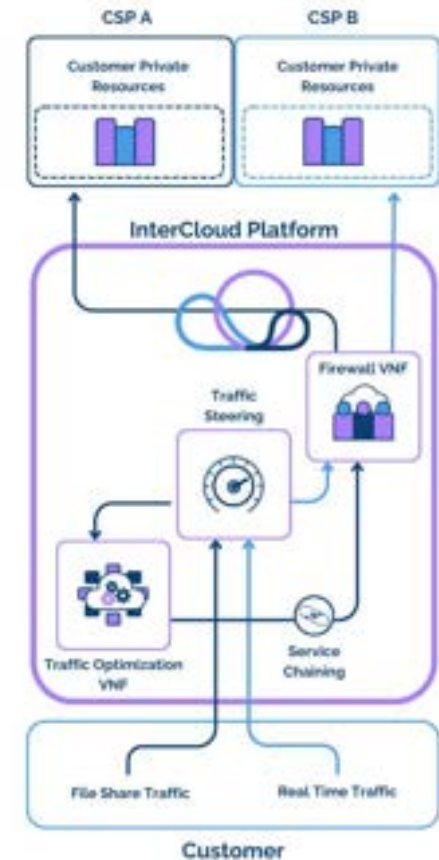
Thanks to Network Functions Virtualization and Orchestration offered by the InterCloud platform, the customer was able to apply the correct rules upon each type of traffic:

- The file share uses traffic optimization including deduplication and caching features and is chained with a firewall for policy control.
- The real-time traffic is placed in a low latency queue to minimize packet drop and latency.

The Benefits

Implementing service chaining between performance optimization and security services was key to increasing internal user satisfaction and meeting corporate needs with the following results:

- Increased the deployment speed using software activation with orchestration policies.
- Managed the performance and access control per application.
- De-risked the cloud migration by increasing performance control and visibility with software-defined capabilities.
- Complied with corporate security objectives.



This agile architecture decouples the cloud access connectivity from the VPN through the SDCI core platform. This modular model allows for the integration of different access technologies or new services as platform add-ons. It becomes much quicker and easier to integrate the customer's cloud resources and manage its security access policies.



Case Study: Médiamétrie Chooses SDCI to Secure its Cloud Networking Journey





“ When you move to the Cloud, you want to have the same level of flexibility and control of your network and connectivity that you get with cloud services themselves. ”

In 2009, the leader of media audience measurement in France, Médiamétrie, embarked on a corporate cloud transformation journey; adopting DevOps and Infrastructure as Code allowed drastically reducing the time to market for the main audience measurement product from one to two releases a year to smaller releases every two weeks.

Paradoxically, this major achievement highlighted a growing gap between the development team and the infrastructure operations' production rhythms. Fortunately, accelerating cloud transformation proved to be the best way to bridge this gap by addressing infrastructure modernization.

Right after choosing AWS managed services to move out of its three data centers by 2021, Philippe Lasky, Head of Production and Production at Médiamétrie, and his team turned to InterCloud.

Challenges:

- Need for higher infrastructure agility to support new TV usages: streaming, on-demand, multi-devices, etc.
- Guarantee business continuity during migration to AWS.
- Ensure fully resilient interconnections to support critical traffic.
- Offer flexible bandwidth supporting audience measurement peaks.

"We soon realized that we couldn't seriously move to the public cloud without proper connectivity between our own DC and the cloud to benefit from guaranteed bandwidth, availability of the service, and of course, security."





Solution:

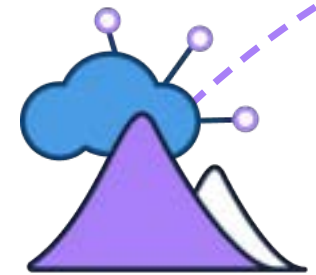
- Secure private connectivity from on-prem to AWS sites.
- Simple resiliency via VPN (2015), full resiliency via the InterCloud platform using two separate and redundant paths for each interconnection (2017).
- Monitoring and automatic deployment using the InterCloud Console (2020).

Switching from a point-to-point offer to a platform with multiple accesses to the InterCloud backbone is a really useful evolution. It simplifies both the consumption of services and their design; it used to be a headache to design a network architecture with these point-to-point connections. Now, we just have to connect our sites to your platform and you take care of service implementation.

Benefits:

- Security by design of the SDCI platform and end-to-end traffic isolation.
- Scalable and flexible bandwidth allocation supporting infrastructure modernization in the long run.
- Zero interconnection availability/performance incident during nightly audience measurement peaks from 3am to 9am since 2015.

"Our 2020 roadmap is to automate as much as possible deployments, tests and controls; we look very much forward to accessing detailed interconnection monitoring and automatic connectivity deployment."





About InterCloud

InterCloud's end-to-end global connectivity platform eliminates the complexity in deploying the cloud, giving businesses full control over the security, sovereignty, and performance of their critical data traffic with complete peace of mind.

Working with organizations to help them transform global connectivity, reduce network complexity, and accelerate growth and innovation, InterCloud is a trusted advisor to some of the world's leading brands when it comes to leveraging the cloud for future success

With offices across Europe, the company's platform is underpinned by its team of cloud experts who guide customers to implement effective strategies to leverage the power of the cloud across their organization – making global connectivity a driver for business performance.

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