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i2basque Replaces MPLS Backbone with Disaggregated Networking and VXLAN

10x bandwidth at half the cost: Basque region research and academic network upgraded with Pluribus Netvisor ONE and Dell PowerSwitch Open Networking Switches using VXLAN

i2basque
Research and Academic Network

I2basque was founded in 2005 by the Basque Government Department of Education to deliver high-speed connectivity for state and public universities, science & technology centers, hospitals & biomedical research organizations, and R&D management entities in the Basque region. These campuses -- with thousands of individual endpoints between them -- depend on the i2basque research and academic network for low-latency connectivity between campuses and access to resources such as the RedIRIS Academic Network.

As a result of a significant increase in bandwidth consumption on the network, i2basque realized they needed to upgrade their MPLS network backbone. The existing MPLS backbone offered 10Gbps speeds with 1Gbps links to each campus. To future-proof the network and continue to deliver a seamless end-user experience, i2basque wanted to upgrade to a 100Gbps backbone with 10Gbps access links to each campus. Additionally, as part of the upgrade, i2basque aimed to resolve challenges their existing MPLS infrastructure had with complex management and limited network visibility.

Upgrading the backbone to 100Gbps with the existing vendor required a significant capital costs for new chassis-based MPLS routers featuring proprietary hardware and software and would entail remaining locked-in to expensive service and support contracts for years to come. i2basque decided to consider open and disaggregated networking solutions alongside competing MPLS vendors.

After comparing solutions, i2basque selected the Pluribus Netvisor® ONE network operating system, along with the Adaptive Cloud Fabric™ (ACF) SDN automation software, and Dell EMC PowerSwitch Open Networking Switches. With Dell EMC PowerSwitch the new backbone was deployed at 40Gb and was designed to be easily upgradeable to 100Gb as bandwidth and pluggable optics costs were reduced. Additionally, by taking this disaggregated networking approach and switching from MPLS to VXLAN, i2basque was able to leverage whitebox switches and cut hardware costs in half as well as moving to a scale-out architecture that does not incur the scale limitations associated with chassis-based platforms.

Key Objectives of the Network Upgrade

1. Increase backbone bandwidth by up to 10x to improve overall network performance and throughput
2. Increase access link speeds to each campus by up to 10x to improve individual end-user experience
3. Use VXLAN and disaggregated networking technologies to avoid the unnecessary cost, operational complexity and the vendor lock-in found with traditional vertically integrated solutions featuring custom hardware and tightly intertwined software
4. Fully automate the new core and aggregation network to simplify day 0, 1 and 2 operations by leveraging software defined networking (SDN) and a modern network fabric approach
5. Leverage vNETs to enable network segmentation and simplify management by providing each campus network administrator with self-service network management capabilities for their network segment
6. Improve network visibility and simplify network provisioning, management, troubleshooting, and analysis by leveraging SDN to provide per-flow application layer telemetry and analytics

Outcomes

Network performance improvement

i2basque replaced their existing MPLS-based hardware and network design with Dell EMC PowerSwitch Open Networking Switches and the Pluribus Netvisor ONE operating system featuring a VXLAN fabric to upgrade their network backbone. As a result, available bandwidth increased from 10Gb to 100Gb, significantly improving throughput across the network. Additionally, individual campuses now have 10Gb links, a 10x improvement over the old network.
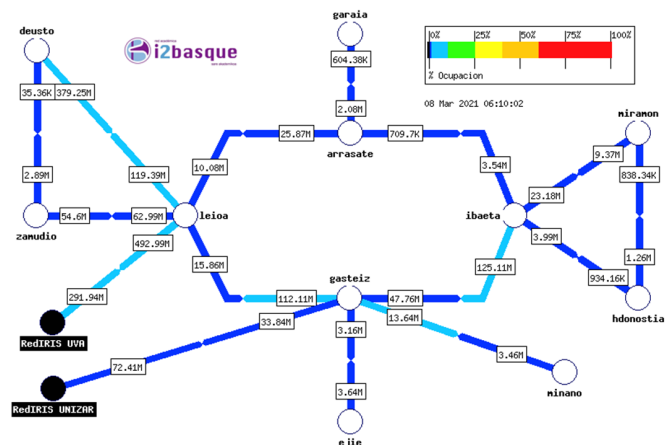

Figure 1: I2basque Network

Simplified management

Pluribus Netvisor ONE OS and ACF take a fabric-based approach by automatically creating a fully automated network "underlay" and virtualized network "overlay". The underlay provides simple but scalable IP transport but is not configured to deliver complex services. New policies, such as ACLs, can be simply added via ACF with a single "fabric-scope" command. The overlay is automatically created by ACF by establishing a set of VXLAN tunnels in i2basque's new backbone. This overlay abstracts the service delivery from the underlying hardware and all networking services are delivered from this overlay. As a result, a new Layer 2 or Layer 3 network service or tenant segment can be easily instantiated across all switches in the fabric using a "fabric-scope" command.

While all VXLAN implementations offer the benefits of network virtualization and VPN creation, traditional BGP EVPN VXLAN solutions can be complex to manage and operate with numerous CLI commands that need to be configured on every switch. Because ACF abstracts away the complexity of configuring individual switches, deployment steps can be reduced by up to 95% compared to more traditional networking approaches.

The distributed controllerless SDN approach of the Pluribus ACF not only abstracts away this complexity, enables automation, and greatly reduces configuration times but it is economical because expensive external controllers are not required. With the ACF the i2basque team can manage the network and propagate configuration changes to all switches from any switch in the network fabric. In fact, these changes can be executed using CLI or via the programmatic REST API or with Pluribus UNUM Management Platform.

With the Pluribus UNUM platform i2basque gains a robust network management portal that makes ACF even easier to use, providing a rich GUI with topology visualization and simplified templates. With UNUM, network configuration workflows are streamlined and can be completed in just a few clicks.

Secure and efficient multi-tenancy

Within the new software-defined network architecture, i2basque segmented the network into 4 discrete vNETs. Within the vNETs, each network segment was logically isolated from the others, improving network security and enabling end-users of the i2basque network to have self-service management capabilities. For example, individual campuses can now optimally configure their VLANs to suit their requirements without impacting other tenants.

Enhanced network visibility and deeper insights with network analytics

The new SDN architecture also enabled end-to-end visibility into traffic flows across the network. ACF is able to provide telemetry on every port, connected endpoint flow across the fabric. The telemetry can be exported to any desired tool or into UNUM Insight Analytics which can store up to 30 days of statistics and provides rich dashboards, alerts and a powerful search feature.

From Insight Analytics, i2basque gains forensic analysis on 100% of network flows using data generated from granular telemetry data and can view detailed metrics and trends on network traffic. With this data, Insight can then flag anomalies, outages, and potential threats in real-time for faster remediation and containment in the event a problem arises.

Lower costs and no vendor lock-in

Disaggregated networking solutions deliver wire rate performance but are 30-60% lower in cost than traditional proprietary and vertically integrated solutions. For example, by using VXLAN instead of MPLS, i2basque was able to purchase affordable whitebox switches instead of costly MPLS routers. Overall, with disaggregated networking, i2basque cut capital costs in half, while meeting or exceeding all of their performance requirements.

Furthermore, SDN can often be costly due the expense of multiple of external servers and licenses requires for the typical 3 SDN controllers. With their controllerless SDN approach, Pluribus eliminates this expense and complexity. The controllerless approach also improves network resiliency through distribution and simplifies stretching SDN across large geographies.

Another benefit of a disaggregated open networking solution is that i2basque now has flexibility and extensibility built-in to the new network. For example, their network is compatible with a wide-variety of Open Network Install Environment compliant network hardware (whitebox switches) and they can simply add new switches to scale out their infrastructure. In addition to delivering flexibility for upgrades in the future, the open networking approach inherently avoids unnecessary and expensive vendor lock-in.

Bottom line

Disaggregated networking delivers 10x bandwidth, improved visibility, streamlined management at half the cost of MPLS. SDN provides the automation to radically simplify Day 0, 1, and 2 operations, making the networking team more efficient so they can focus on strategic issues and delivering services to customers.

Since switching from a network architecture based on proprietary MPLS hardware to an open, software-defined architecture with VXLAN, Dell EMC PowerSwitch, and Pluribus Networks' Netvisor ONE operating system, i2basque has increased network capacity by 10x and achieved these performance gains at half the cost of proprietary MPLS hardware. Additionally, by adding a VXLAN software overlay to the network, i2basque has greatly improved network visibility, automated management of the network, and implemented more granular network segmentation.