Software-Defined Networking from Serro Solutions Enables Global Communication Services in Near Real-Time

Service providers gain a competitive advantage by responding to customer requests in minutes rather than weeks

Background

Enterprises with a global footprint have unique and challenging networking communication needs. Such companies have a presence in the largest cities of the world, but quite often they also have facilities in developing countries and remote locations. Regardless of where these companies operate, they have a need to collaborate among workers and send and receive video, data and voice content. The networking options can be quite limited in some of their operating locations. Consequently they occasionally need to turn up new services or temporarily increase the capacity of existing services for “bursts” of communication, such as a quick transmission of a large amount of data from the field to a regional office.

The typical process for an enterprise to arrange for changes or enhancements to its global networking communication is cumbersome and time consuming. It’s quite likely the company will need to go to multiple service providers, make multiple requests, and then wait weeks or even months for service. For example, consider the enterprise that wants to have new service provisioned between Los Angeles and Beijing. The company might have to contact two different service providers – one in the U.S. and one in China – to turn up the required service, and then wait weeks for each provider to fulfill its end of the request. By that time, the enterprise’s need for the specified service might no longer exist.

Clearly there is a business demand for single providers to deliver networking communication services around the globe in near real-time. New technologies, including medium earth orbit (MEO) satellites, can make this possible. Nevertheless, it’s a significant challenge for providers to fulfill those service requests in near real-time. This kind of immediate delivery of a service absolutely requires automation, but the typical backend provisioning process today has too many human interface points that are time consuming and error prone.

Serro Solutions has developed a cloud-based software-defined networking (SDN) controller that can communicate with terrestrial and satellite infrastructures. Serro’s SDN controller enables these kinds of infrastructures to deliver near real-time services. End users of these services, the global enterprises, have a simple user interface where they can choose their desired locations on a map to automatically secure the resources to turn up a service or increase capacity in minutes rather than weeks or months. For the service provider, Serro’s application eliminates the need for manual tasks and the coordination among different groups (or even among different service providers) who have a hand in managing the infrastructure. Serro’s solution enables providers to better utilize their networking resources while filling an urgent need for their commercial customers.
This white paper describes the SDN solution Serro has created to control complex global networking infrastructure. We describe how this solution has already been deployed by one service provider that controls a network of MEO satellites. Serro’s solution can be replicated for many other types of other companies that need software-defined networking on a global scale.

A Service Provider Success Story

Serro’s client is a service provider that operates a global network of medium earth orbit satellites. The satellites can be directed to relay network communications for commercial enterprise customers around the world. This company commissioned Serro Solutions to implement a solution that (1) allows these enterprise customers to easily schedule the use of the satellite resources, and (2) controls the actions of the satellites such that the end customers’ communication needs can be met in near real-time through a high level of automation.

The Business Challenge

The service provider’s main challenge was to automate the complex internal tasks to fulfill a customer’s service request. A typical customer request to turn up a service or to temporarily add bandwidth to an existing service could take weeks to fulfill due to cumbersome processes. Numerous detailed tasks were being performed manually by different teams within the company, occasionally resulting in errors and/or delays in completing the tasks. For example, one team would evaluate the customer’s request to determine what resources it would affect and what configuration changes it would require. Another team looked at policies to determine what impact, if any, the configuration changes would have on policies that govern the satellites’ operation. Yet another team would actually make the configuration changes to fulfill the request.

All in all, there were many manual steps and points of hand-off of responsibility. It’s easy to see how this complicated process could take considerable time – sometimes weeks – and be prone to mistakes by well-intentioned humans. Occasionally the service provider was unable to capitalize on business opportunities due to the long lead time necessary to fulfill some of the customer requests.

The Business Solution

The service provider approached Serro Solutions from the perspective of wanting to automate the process so that when requests are made, human beings are not having to act on the requests. This is entirely feasible because the actions that need to be taken are predefined actions that are limited in scope. For example, there are only about a dozen actions that can be taken to direct a satellite to do something. These actions can be programmed using software-defined networking so that a person doesn’t have to perform the tasks involved. Other tasks, such as reviewing policies for conflicts and collecting relevant network statistics, can be automated as well.

Serro’s application begins with a simple web-based user interface (UI) that is utilized by the service provider’s customers to request their desired service. The web page includes a limited choice of actions the customer wants to take; for example, “I want to use the satellite now.” The customer chooses the source and destination locations from a map. So the action becomes, “I want to use the satellite now to turn up a connection between Los Angeles and Beijing.” This request is submitted to the service provider for automated fulfillment.
Serro’s SDN solution takes that request and performs a number of tasks without human intervention:

- Based on the source and destination points of the communication request and other relevant parameters, the application determines a primary and alternative paths for the traffic. This determines which resources should be scheduled.

- A resource management component tracks and manages utilization of all the network resources. The resources for the primary path, as well as a secondary “backup” path, are reserved to create the complete connection.

- The application employs analytics for use in policy decisions. Data points such as traffic statistics, telemetry, line usage, weather conditions and more go into the decision making process. For example, weather data from the U.S. National Oceanic and Atmospheric Administration (NOAA) is used to project any impact that weather might have on satellite use during the anticipated transmission period. If it looks like weather will be a factor for the primary path, the secondary path may be scheduled instead.

- A policy manager validates that the request adheres to the policies of how the resources can be utilized. The directives for the request are translated into machine language and sent to the configuration manager.

- A configuration manager component of the solution manages configuration changes based on directives from the policy manager.

The workflow of these processes is totally automated. All of these actions are enacted through machine-to-machine communication; no humans need to intervene. As a result, decisions can be made and actions taken in near real-time to provide the requestor with the necessary service very quickly.
The Service Provider’s Business Benefits

The benefits the MEO service provider has attained since deploying the Serro SDN solution are myriad:

- The company has significantly reduced its time-to-market for its services—quite literally going from weeks to minutes to provision a service for a customer.
- Taking the human element out of the process has vastly reduced the potential for errors in scheduling the use of and configuring the satellite resources. What’s more, the company expected to hire upwards of a hundred people to manage the service, but the automation enabled by the SDN solution meant that only a handful of people were needed to operate the global service.
- The solution has created ease of use for the enterprise customers, resulting in a good overall user experience.
- The service provider has increased the utilization of its resources, which in turn is providing a better ROI on the resource investment.
- The service provider now has a competitive advantage over providers of similar services that are not automated.

The Serro SDN Solution

A key technology that makes this solution possible is software-defined networking. SDN decouples the system that makes decisions about where network traffic is sent (i.e., the control plane) from the underlying systems that forward traffic to the selected destination (i.e., the data plane). This simplifies networking because the routing and switching decisions are no longer in firmware, but in software, which gives Serro’s application developers the flexibility to manipulate the resources through programming.

SDN allows Serro’s solution to control the operation of all sorts of network resources—routers, switches, optical gear, servers, firewalls, and even MEO satellites. In the case of the client discussed earlier, the service provider exposed control of the satellites to Serro’s application through Representation State Transfer (REST) application program interfaces (APIs). Using open source tools like Open Daylight, Floodlight and OpenStack, Serro can control the actions of the satellites through software programming.

Serro’s SDN solution is comprised of five tightly integrated components:

Policy Manager – This component is a set of rules which defines how traffic can flow in and out of the network. The policy manager takes an English language description of a rule and converts it to code. When a service request is made, the policy manager interfaces with the resource manager to determine if the request can be made, and if so, what resources should be used to fulfill the request. The policy manager sends its directives to the configuration manager.

Configuration Manager – This module makes the actual configuration changes on the various resources in the network. The configuration manager takes its marching orders from the policy manager.
**Resource Manager** – The resource manager is a database that keeps track of all of the devices on the network and their capacity utilization. Serro keeps track of various parameters of each resource and factors this information into a resource request. In the case of turning up the connection between Los Angeles and Beijing, for example, the resource manager can tell whether there is enough bandwidth and acceptable performance between the two locations. If conditions look good, those resources are reserved for that request.

**Collector** – This module is continually collecting network data, control plane statistics and even external data to help the application do analysis and policy enforcement. The types of information collected include latency, jitter, packet loss, round-trip delays, bandwidth usage, etc. In the case of the service provider discussed earlier, Serro collects weather data from NOAA. All of this data is fed to the analytics engine to help make dynamic routing decisions. So, for instance, if the primary path of communication experiences problems such as latency, Serro’s application can switch the traffic to an alternate path that offers better performance.

**Analytics Engine** - This component ingests a vast amount of data from the collector and performs analysis on the planned routes of communication. This helps the application select the best possible path to fulfill the customer’s requirements. For example, the analytics engine analyzes NOAA weather data to correlate weather patterns to a GPS coordinate. This sort of analysis helps determine which satellite resources are going to be affected by bad storms about 30 minutes before they are actually affected. Results from the analytics engine go to the policy manager to determine if a planned route is compliant with current policies.

All of these application components are tightly integrated so that decisions can be made and resources configured within minutes of receiving a request for service.

**Why Serro for Your Software-Defined Networking Needs**

Serro Solutions was founded by Nitin Serro in 2008 as an independent consulting firm focused mainly on service providers. Nitin Serro gained his expertise from being one of the original engineers that built out a large global search engines global network. He has shared his in-depth networking expertise to train his team. Since then, Serro Solutions has taken service provider-grade technologies and brought them to enterprise networks to provide highly robust and scalable systems.

The Serro solution architects align network goals to meet clients' business goals. Serro Solutions specializes in deploying flexible solutions that exceed current service needs and seamlessly scale to meet future needs. The company’s developers have extensive expertise with complex networking solutions. Using software-defined networking, the focus is on automation of resources and orchestration and taking humans out of the repeatable processes to save time and reduce errors. The company has successfully deployed numerous solutions in industries such as healthcare, transportation, education and aerospace.
Serro can develop a turn-key solution for its clients, and then bring them up to speed on how to operate and maintain the solution long-term. Serro believes in doing knowledge transfer to make the clients self-sufficient. The company also creates a “run book” that provides details on almost every scenario an application is intended to handle.

Would you like to talk about your company's needs? Contact Serro Solutions at 800.430.7321 or by using the form at http://www.serro.com/contact-us/. Serro's solution architects want to talk to you about automating and orchestrating your infrastructure to enable your company to deliver global networking communications services in near real-time.

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