SDN ANALYTICS FOR ELEPHANT FLOW MARKING

AN INHERENT, SCALABLE SOLUTION FOR THE ENTERPRISE

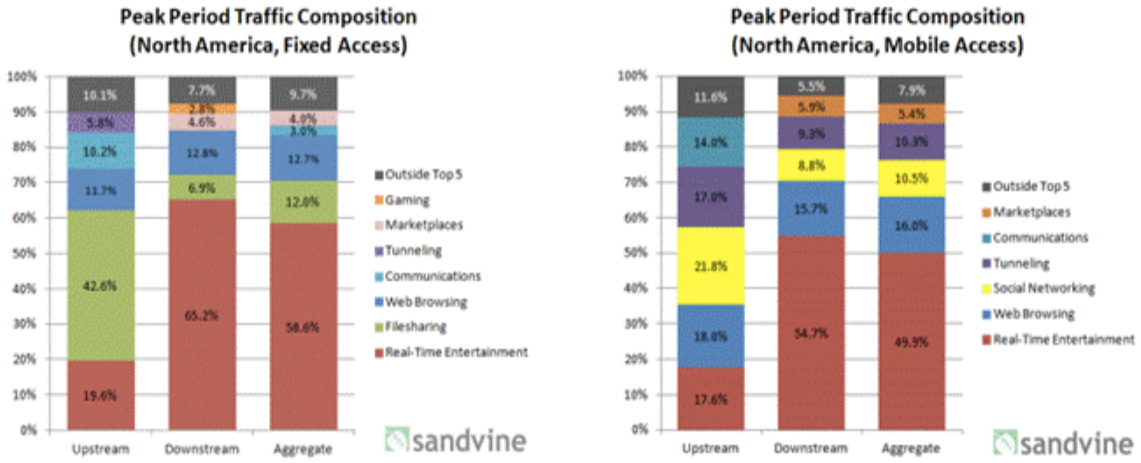
APPLICATION NOTE

Alcatel·Lucent Enterprise

SDN Analytics for Elephant Flow marking – An inherent, scalable solution for the Enterprise

Rapid adoption of smart devices and the demand to make applications available from anywhere anytime are changing the Enterprise datacenter consumption model. Most network traffic flows are short lived occupying little bandwidth and lasting less than 10 seconds while most bandwidth is consumed by a small number of long-lived flows – flows with a duration between 10 seconds and several minutes.[1]

Short-lived flows are also referred to as mice and long-lived flows as elephants. Mice flows tend to be bursty and often latency sensitive, whereas elephant flows normally perform transfers of large blocks of data, with packet latency of less concern. Without intelligent traffic engineering, elephant flows may fill network pipes causing latency and or service disruption for mice flows.



The left figure above shows that 72% of peak period downstream bandwidth consists of large flows comprised of real-time entertainment such as Netflix, Hulu, YouTube, etc. including file sharing. The figure on the right shows that 55% of peak period downstream bandwidth consists of large flows.[2]

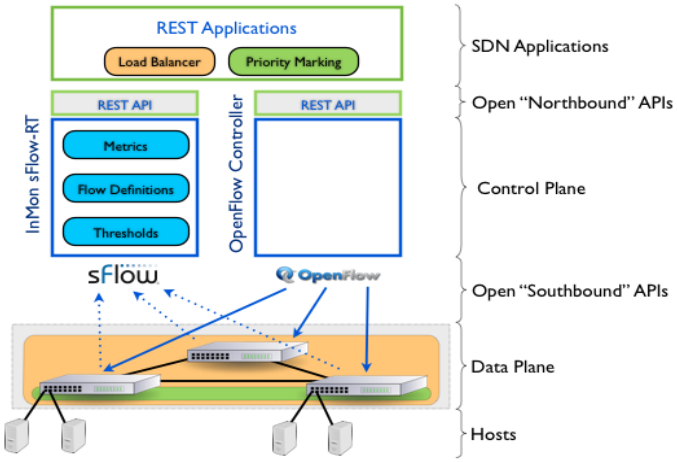
Traditional network architectures are static requiring significant operational resources to keep up with the demands placed on them. And, most don't meet the business needs of controlling costs and improving agility. Enterprises need and are demanding solutions that improve their operational efficiency and business agility.

Software Defined Networks (SDN) is an industry initiative that enables the transformation of the network infrastructure from an IT perspective. The goal of SDN initiative is to virtualize network services and provide benefits that include:

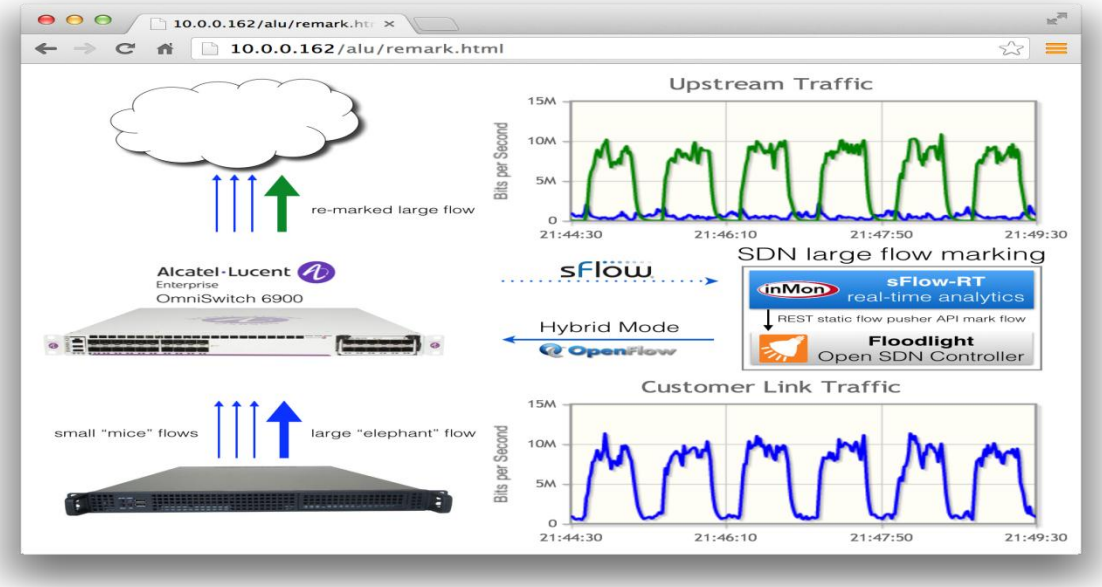
- Intelligent, dynamic, application-tuned network provisioning and performance
- Multipath and multi-tenant networks
- Network-layer abstraction offering programmable services to ease application deployment and migration
- Evolution from vendor-specific command line interfaces (CLIs) to a generic programmable interface

IT teams are in a conundrum as to which SDN solution path to evaluate. One which takes the path of a complete revamp, demanding complete IT reengineering of the tools and infrastructure; Or the one that enables the inherent network infrastructure with application awareness and scalable SDN capabilities. Keeping the CAPEX-OPEX budget under control while meeting the business objectives is a priority, the choice for IT is clear.

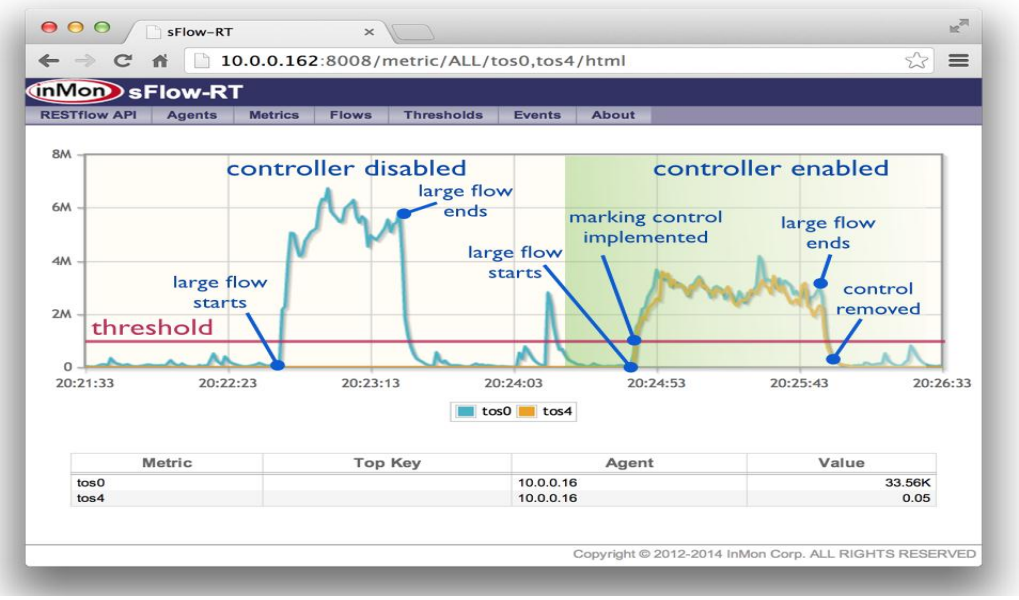
The figure below provides the high level architecture building blocks for a dynamic and agile Enterprise data center.



Standard sFlow enabled on the switches and routers provides a continuous stream of measurement data to InMON sFlow-RT, which provides real-time detection and notification of elephant flows to the SDN application. The SDN application selects a marking action and instructs the SDN controller to push the action to the selected switches (for example, using standard OpenFlow rules to assign a selected queue for traffic associated with the large flows).



By using the hybrid port OpenFlow mode, this solution is scalable. All traffic, by default, is handled by the switch's normal hardware switching and routing engine without any intervention from the controller. The OpenFlow rules are used to override the normal forwarding behavior for the selected flow. The solution uses an OPEN SDN Controller to leverage the standard sFlow and OpenFlow capabilities of existing network hardware to provide a scalable, automated, cost-effective solution that allows Enterprise networks to effectively mitigate flood attacks.



The diagram shows that implementing traffic engineering using OpenFlow and standard sFlow based analytics is shortening significantly the amount of time required to implement controls while guaranteeing uninterrupted services to short lived flows.

OpenFlow is a southbound application programming interface (API) to programmatically control both virtual and physical switches. SDN controllers have a northbound API that enables service-driven orchestration of the network fabric normally integrated with application service orchestration tools such as vCloud Director™, OpenStack™, InMON sFlow-RT, etc.

The Alcatel-Lucent OmniSwitch platform supports the OpenFlow v1.3.1 compliant agent. The agent is backwards-compatible with controllers that support OpenFlow v1.0. The platform supports the following OpenFlow modes:

- Full: All ports are managed by the controller
- Hybrid: A subset of the ports are managed by the controller and the remaining function as default AOS managed ports
- OpenFlow API mode: The port is a regular bridged port, but the controller can modify flow characteristics on these ports if required. These flow updates will be treated as remote access control list (ACL) updates.
- The ports under controller management can be split into three logical switches. Each logical switch can be managed by up to three controllers for redundancy and resiliency.

For details on the complete script please refer to sFlow blog: [OmniSwitch SDN Analytics Elephant Marking]

References:

[1] http://research.microsoft.com/en-us/UM/people/srikanth/data/imc09_dcTraffic.pdf
[2] http://www.sandvine.com/news/global_broadband_trends.asp

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