

Network Virtualization and vOLT

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Abstract

The proliferation of mobile devices, especially smart phones and tablets, and OTT (over-the-top) content service and distribution of contents over Internet imposes a continuous challenge to all the Telecommunications Carriers. The phenomena associated with the forever-increased high demand for bandwidth and un-proportionally low increase of revenue pushes all the service providers to a point, whereby they could not keep the business as usual. They have to make their network agile and efficient in order to meet the challenges of these exponential bandwidth demands and also be able to create revenue streams with innovative services and new business models.

Software Defined Network (SDN) is the technology of choice to enable mobility, virtualization and the Cloud. The key concept of SDN is the separation of control plane and data plane in vertically integrated network devices. This separation allows network hardware and software to evolve independently and facilitate the replacement of expensive, proprietary hardware and firmware with commodity hardware and open source software.

The Open Network Operating System (ONOS) is the first open source SDN network operating system which is capable to manage network resources and provide the abstraction and APIs for managing, monitoring, and programming network devices. As such, it greatly simplifies the creation of innovative and beneficial network applications and services that operate across a wide range of hardware.

OpenCon Systems Inc. (OCS), a New Jersey based US company, has been working with Fujitsu Limited to participate and contribute to an ONOS project – the ONOS controlled, virtualized Optical Line Termination (vOLT) Proof of Concept (PoC) project. As depicted in figure 1 below, the ONOS vOLT PoC project virtualizes the three key components in broadband access, namely Optical Line Terminal (OLT), Customer Premises Equipment (CPE) and Broadband Network Gateway (BNG), into three virtualized entities -- vOLT, vCPE and vBNG, respectively.

The ONOS vOLT system uses three open source packages – Open Network Operating System (ONOS), XaaS Operating System (XOS) and Open Stack. ONOS serves as a SDN controller with the features such as high availability that are critical to a telecom service provider. XOS provides service framework to manage infrastructure as a service and orchestrate the steps need to be executed to deliver the services to a subscriber. Open Stack works in a cloud based setting to create and provision the virtual machines and virtual networks need to deliver the services to a subscriber.

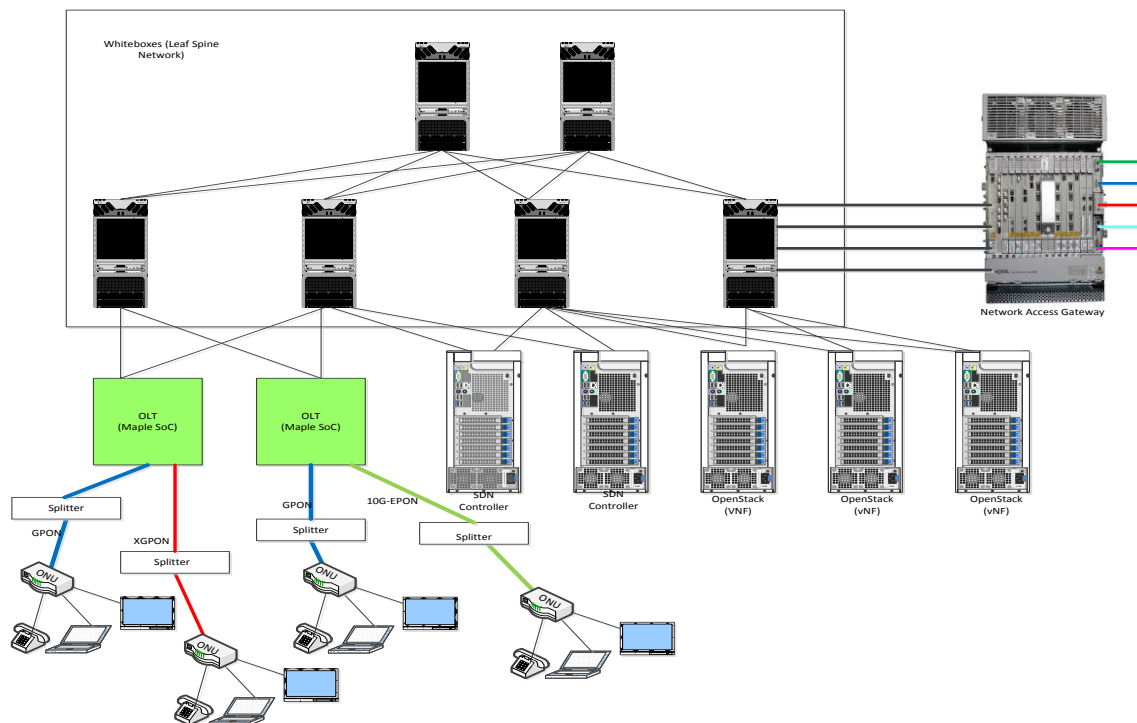


Figure 1: ONOS and vOLT

Biography:

Dr. Jonathan Ma has over 25 years of extensive business and technology experience. Dr. Ma pioneered breakthroughs in SONET, OSI, and various next generation telecommunications products.

As a veteran senior executive in the telecommunications industry, Dr. Ma is part of a small group of engineers/entrepreneurs worldwide who have consistently proven their ability to take telecommunications and data communications standards and apply them to solutions well ahead of the marketplace. Dr. Ma founded OpenCon Systems, Inc. (OCS) in 1991, leading the company from a startup to a highly profitable middle-market company.

OCS has been working with Fujitsu Limited and its subsidiaries since 1991 to provide Data Communication Channel (DCC) solution for Fujitsu's SONET/SDH-based next generation access and transmission products. OCS' contribution has supported the emergence of Fujitsu as a market leader in the North America SONET market. OCS was recognized by *Inc. Magazine* as one of the 500 fastest and most successful growth-oriented companies ("*Inc. 500*") in the United States.

For the past few years, OCS has entered into Gigabit-capable Passive Optical Network (GPON) business by offering Optical Network Termination (ONT) Management and Control Interface (OMCI) stack for both Optical Line Termination (OLT) and ONT equipment. In addition, OCS also offers the ONT total solution and OLT turnkey solution.

Recently, OCS has participated and contributed to an Open Network Operating System (ONOS) project – the ONOS controlled, virtualized Optical Line Termination (vOLT) Proof of Concept (PoC) project. The ONOS vOLT PoC project virtualizes the three key components in broadband access, namely Optical Line Terminal (OLT), Customer Premises Equipment (CPE) and Broadband Network Gateway (BNG), into three virtualized entities -- vOLT, vCPE and vBNG, respectively.

Dr. Ma was recognized as a finalist of Ernst and Young *Entrepreneurs of the Year*. Dr. Ma was also elected as one of the *50 Outstanding Chinese Americans in Business*. He has spoken and participated in numerous panel discussions at key technical forums worldwide.

Dr. Ma holds a Ph.D. in Computer Science from University College London and a bachelor's degree in Electrical Engineering from the Chinese University of Science and Technology.