

# TECHNICAL BRIEF

## Demonstration of End-to-End SDN-Enabled Enterprise Packet Transport Networks

### Broadcom OpenFlow Data Plane Abstraction (OF-DPA)

- Adaptation layer for OpenFlow 1.3.x to program Broadcom switches for SDN
- Enables OpenFlow at scale — uses ASIC tables
- Implements OpenFlow Multi-table Pipeline using ONF TTP Specifications
- Architected for portability across multiple Broadcom switch families (StrataXGS®, StrataDNX™)
- Enables OEMs and ODMs to offer OpenFlow 1.3.x support on their deployed platforms via a software upgrade
- Rich API library allowing for integration with OpenFlow 1.3.x agent and implementation of popular SDN use cases.
- Enables rich datacenter and service provider SDN use cases on a broad range of Broadcom networking platforms

### OVERVIEW

Carrier businesses are changing dramatically as operators have found it essential to increase their service velocity and reduce both capex and opex. At the same time, they must continue to provide carrier-class reliability, high levels of security, and bandwidth scalability-on-demand, particularly to business customers. Software-Defined Networking (SDN) enabled solutions promise significant benefits to operators on all these dimensions.

Next generation enterprise Packet Transport Networks (ePTN) are a particularly fertile area for introducing SDN-enabled innovations in the areas of:

- Centrally managing thousands of end points.
- Centrally managing different vendor networks.
- Automated network provisioning and management.
- Open hardware and software solutions

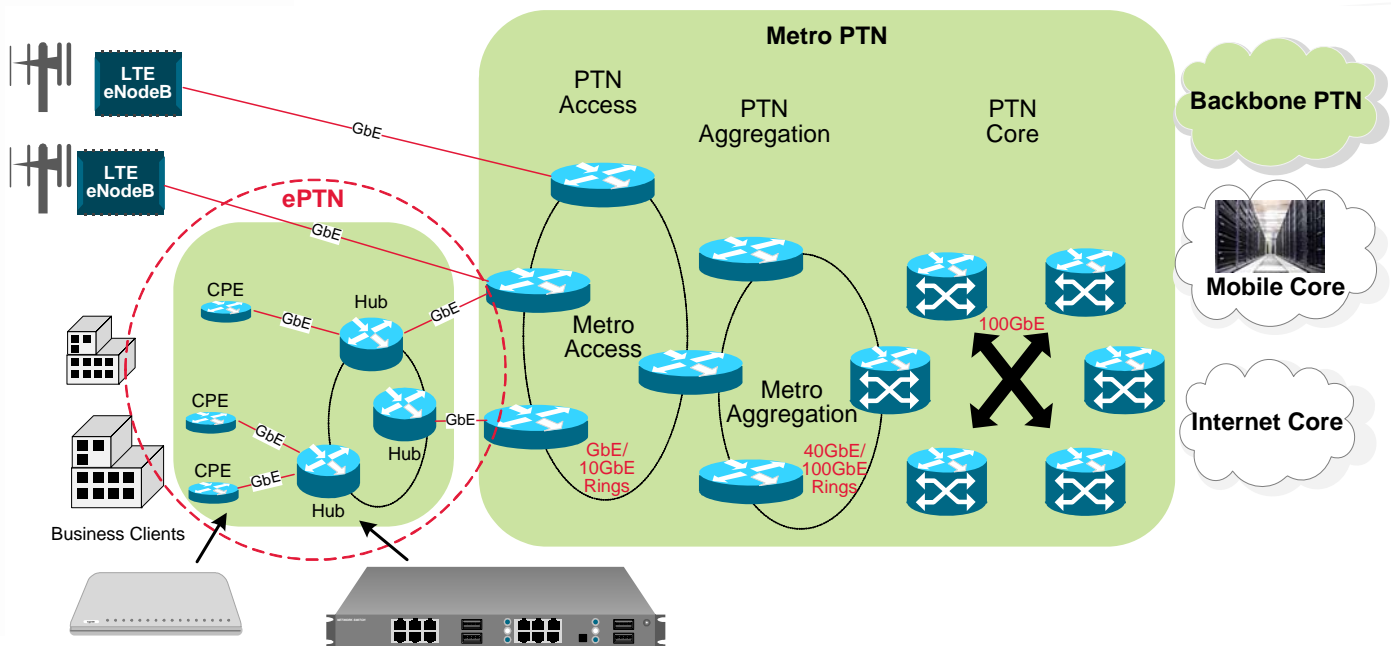
This demonstration provides an example of using Open SDN components in such a next-generation network:

- Open-source Controller (Ryu)
- Open-source Agent (Indigo)
- Open source applications
- The ONF FAWG\* compliant Table Type Patterns (TTPs)
- Network processor and switch ASICS

### BENEFITS OF OF-DPA IN THIS DEMO

- Multiple network elements, including CPE and hub nodes, can be centrally controlled in SDN-enabled backhaul networks.
- Existing CPE and hub devices using industry-leading Broadcom silicon can be repurposed as SDN-compliant nodes, allowing customers to leverage their existing hardware assets.
- Standard OpenFlow 1.3 controllers can be used to program network elements.
- OpenFlow enabled networks can leverage rich service provider features available in hardware.

PTN Network Diagram

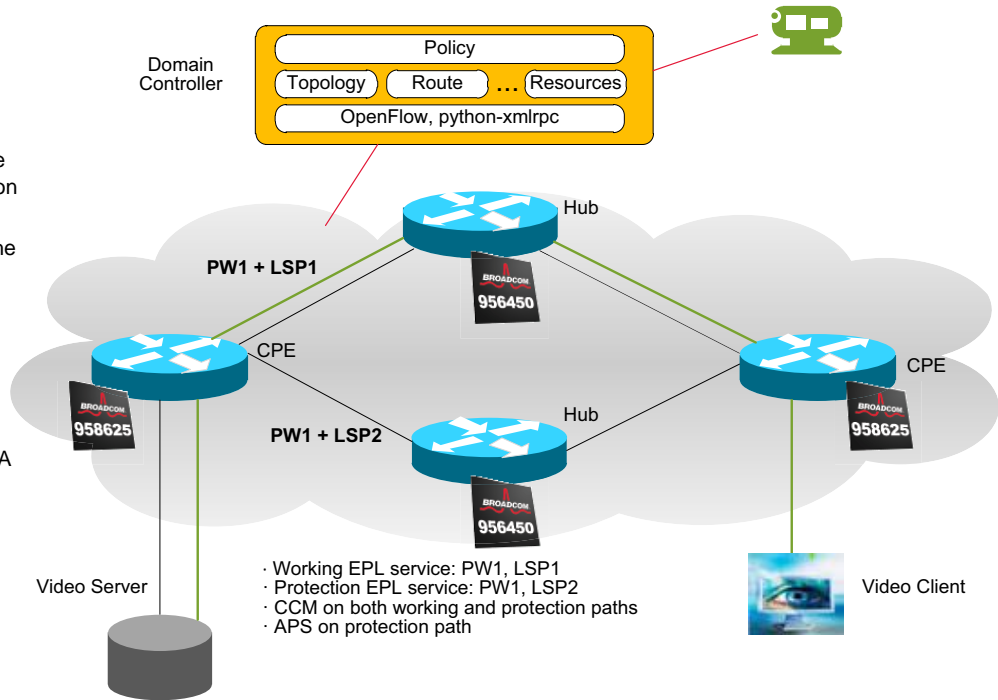


\* Open Networking Foundation (ONF) Forwarding Abstractions Working Group (FAWG)

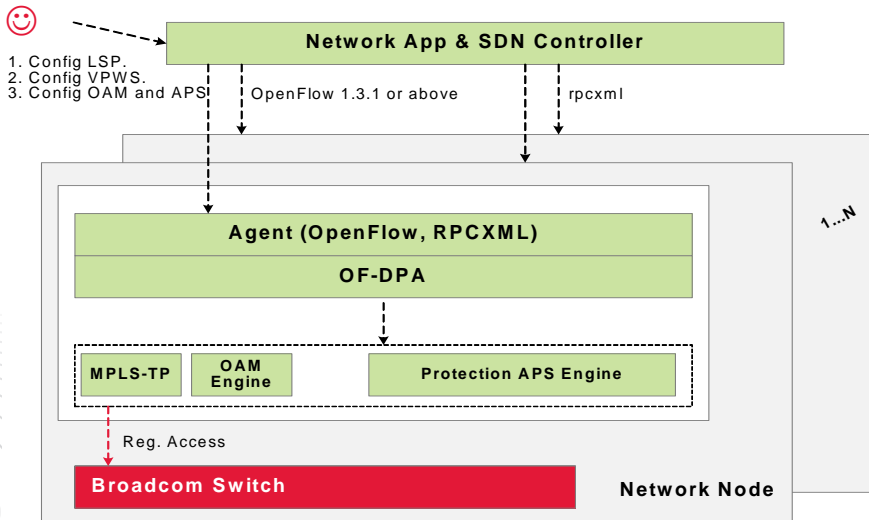
Demo Configuration

DEMO COMPONENTS

- CPE node (with Broadcom SoC)
- Hub node (with Broadcom switch ASIC)
- Ryu SDN controller supporting the OpenFlow protocol 1.3.x running on an x86 host
- Multiple applications running on the Ryu controller (provided by both Broadcom and the open source community)
- XML-RPC for configuration
- Project Floodlight – Indigo
- Broadcom-provided OpenFlow Data Plane Abstraction — OF-DPA 2.0



Demo Flow



DEMO FLOW

Demo setup is done by the Ryu controller using OpenFlow and python-xmlrpc.

- Set up a working virtual private wire service between two CPE nodes going through a hub node.
- Set up a protection service between the same two CPE nodes going through a second hub node.
- Enable OAM messages (CCM) on both working and protection paths.
- The CPE and Hub nodes are configured as OpenFlow switches running Broadcom OF-DPA software.
- Send traffic on the working path (from a video server).
- Force a fault on the working path.
- The system switches to the protection path within 50 ms.
- The protection switching event is reported via OpenFlow.

Please contact Broadcom at [SDN-team-list@broadcom.com](mailto:SDN-team-list@broadcom.com) for additional details on:

- OF-DPA 2.0 software package and documentation
- SDN-enabled ePTN and other use cases



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