Leveraging Open Compute Technologies to Build a Portable NOS for Telco Networks

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Networking Software Solutions

**Architecture**
- Linux
- NETCONF / CLI / etc.
- Yang Model Manager
- Protocols
- Control Plane Management Services
- Hardware Abstraction Layer
- Silicon SDK
- Data-Plane

**Protocols**
- **Layer 2**
  - LLDP
  - LACP
  - STP
  - ERPS
  - L2VPN
  - SyncE
  - ELMI
  - EVPN
- **Layer 3**
  - BGP
  - OSPF
  - IS-IS
  - RIP
  - EIGRP
  - PIM
  - CSPF
  - RTM
  - L3VPN
- **MPLS**
  - LDP
  - RSVP
  - LMP
- **OAM**
  - BFD
  - LSP-Ping
  - Fault Management
  - Perf Management
  - RSVP-TE
  - ETH-CC
  - ETH-LB
  - ETH-T
  - ETH-DM
  - ETH-LM

**OCP Engagements**
- SAI Demo at OCP 2016
- SAI Tunnel Proposal (w/ Mellanox)
- SAI Fast Reroute Proposal

**Sample Customers**
- Datacom
- Infinera
- ADVA
- Calix
- Ciena
- Cisco
- Extreme Networks
- Palo Alto Networks
- Huawei
- Snaproute
- Mellanox Technologies
- Aviat
- Versa Networks

www.metaswitch.com/stacks
Disaggregation Today

**Compute**
- Standard, swappable HW
- Open OS
- Vibrant App Ecosystem
- Automated
- Flexible

**Data Center Networking**
- Standard swappable HW with abstraction: P4, SAI, SDK-LT
- Open NOS: Sonic, OPX
- Vibrant App Ecosystem

**Telco Networking**
- Integrated s/w and h/w
- Proprietary, closed NOS
- No App Ecosystem
- Vendor lock-in
Open & Disaggregated Networking Moving outside of the Data Center

AT&T is Deploying White Box Hardware in Cell Towers to Power Mobile 5G Era

Over 60,000 White Box Routers Will Be Installed Over the Next Several Years, Enabling New Customer Experiences at Lower Cost

AT&T plans to be the first to mobile 5G in the United States. To power our new network this year and beyond, we’re building our towers and small cells in a radically new way.
## Network Solution Requirements

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<th>Feature</th>
<th>Data Center CLOS Fabric</th>
<th>Data Center Interconnect</th>
<th>Disaggregated Cell Site Gateway / BNG</th>
<th>Access / Aggregation Router</th>
<th>Core Network Switch</th>
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### Key Features

- **Open Hardware Available?**
  - **Data Center CLOS Fabric**: ✓
  - **Data Center Interconnect**: ✓
  - **Disaggregated Cell Site Gateway / BNG**: ✓
  - **Access / Aggregation Router**: ✓
  - **Core Network Switch**: ✗

- **Open NOS Available?**
  - **Data Center CLOS Fabric**: ✓
  - **Data Center Interconnect**: ✓
  - **Disaggregated Cell Site Gateway / BNG**: ✓
  - **Access / Aggregation Router**: ✓
  - **Core Network Switch**: ✗

- **Open Source Control Plane?**
  - **Data Center CLOS Fabric**: ✓
  - **Data Center Interconnect**: ✗
  - **Disaggregated Cell Site Gateway / BNG**: ✗
  - **Access / Aggregation Router**: ✗
  - **Core Network Switch**: ✗

- **High Availability Required?**
  - **Data Center CLOS Fabric**: ✗
  - **Data Center Interconnect**: ✗
  - **Disaggregated Cell Site Gateway / BNG**: ✓
  - **Access / Aggregation Router**: ✓
  - **Core Network Switch**: ✓
Architecture of a Portable Telco NOS

YANG-based management, as well third party monitoring and other tools

Control plane services separately runnable, multi-instantiable, restartable

Key network router databases and control plane modelling services

ONL provided abstraction layer

Linux kernel

Platform hardware

ONL Platform Abstraction Layer
ONL Platform Code
Platform Dependent Code
ONL Linux LTS Kernel (v4.9+)

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NOS Cookbook

Step-by-Step guide to building a Portable NOS for Telcos

Leverages OCP Technologies
  - ONIE, ONL, SAI etc.

Standard, Flexible Architecture
  - Portability built-in from inception

Provides modern and open interfaces
  - Automation, Orchestration etc.

Supports open & closed source components
PC6 May overlay front page of the cookbook on this slide once available.
Paul Carter, 27/02/2019
Case Study - MPLS Forwarding

- Metaswitch NOS Toolkit components integrated with ONL running on Edgecore AS5712
- PoC only - supporting MPLS packet forwarding
- Only ~3 months effort to build this.
Disaggregation Networking has brought undeniable benefits to the Data Centers. Telco Networks want to have the same benefits. The requirements for Telco Networks are much greater than those for Data Centers. OCP Technologies meet some but not all of those requirements. Metaswitch are contributing the NOS Cookbook to help guide the creation of Portable, Disaggregated Network Operating Systems for Telco networks. The Metaswitch NOS toolkit provides many of the components required to create a NOS for Telcos.
OCP SAI –
Join the project & help add MPLS support

Download NOS Cookbook today from
http://www.metaswitch.com/cookbook

Metaswitch NOS Toolkit info:
www.metaswitch.com/networking-software
To be completed but likely to include:
Push silicon vendors to extend SAI to support Service Provider use cases (e.g. MPLS)
NOS toolkit availability == today
Also, links for more information (e.g. NOS cookbook) via MSw website.
Paul Carter, 16/01/2019

Are there any issues with providing the toolkit/spec/ref design without “approval?” Refer back to their statement on slide #2
Joseph Skinner, 16/01/2019