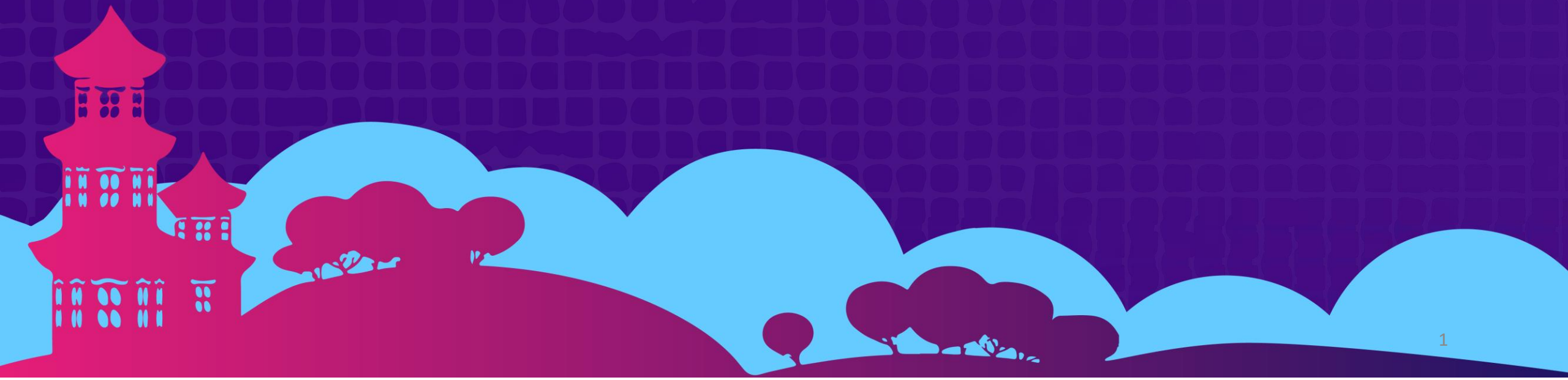# Virtualization, Automation and DevOps
– Why it's Taking so long for Telcos?

Anuradha Udunuwara

25th June 2019, Shanghai

Agenda

- Sri Lanka and Sri Lanka Telecom
- Telco transformations
- Reasons for delay
    - Hardware mindset
    - Open source complexity
    - Vendor role
    - NFV and MANO complexity
    - Skills
- Current status of Telcos
- Accelerating the transformation
- Summary

Sri Lanka

Area (sq. km)	65,610
Population (mil)	21.444
GDP (USD bn)	87.3
GDP per Capita (USD)	4,073

Source :
Source: Department of Census and Statistics Sri Lanka – Q3 2018
Central Bank of Sri Lanka – Q3 2018

Fixed Access Telephone service	3 operators
Cellular Mobile phones	5 operators
Data Communications & ISP's	7 operators
Fixed line Penetration	11.5 %
Mobile Penetration	150 %
Broadband Penetration (F+M)	34 %

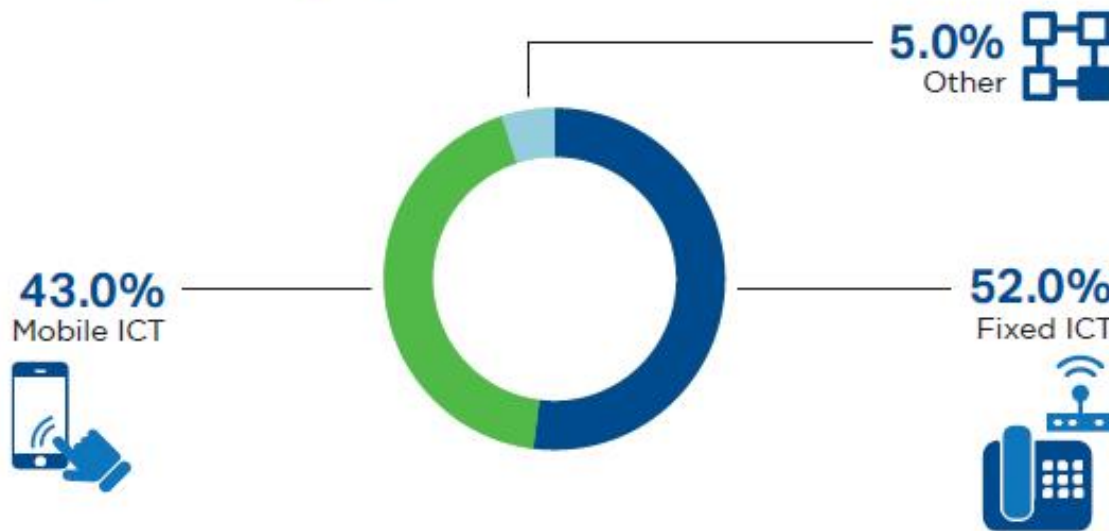*Source : Telecommunications Regulatory Commission of Sri Lanka- Statistics December 2018*

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Sri Lanka Telecom

- National ICT solutions provider and the leading broadband and backbone infrastructure service provider in Sri Lanka
- To become Sri Lanka's preferred digital lifestyle provider by 2022
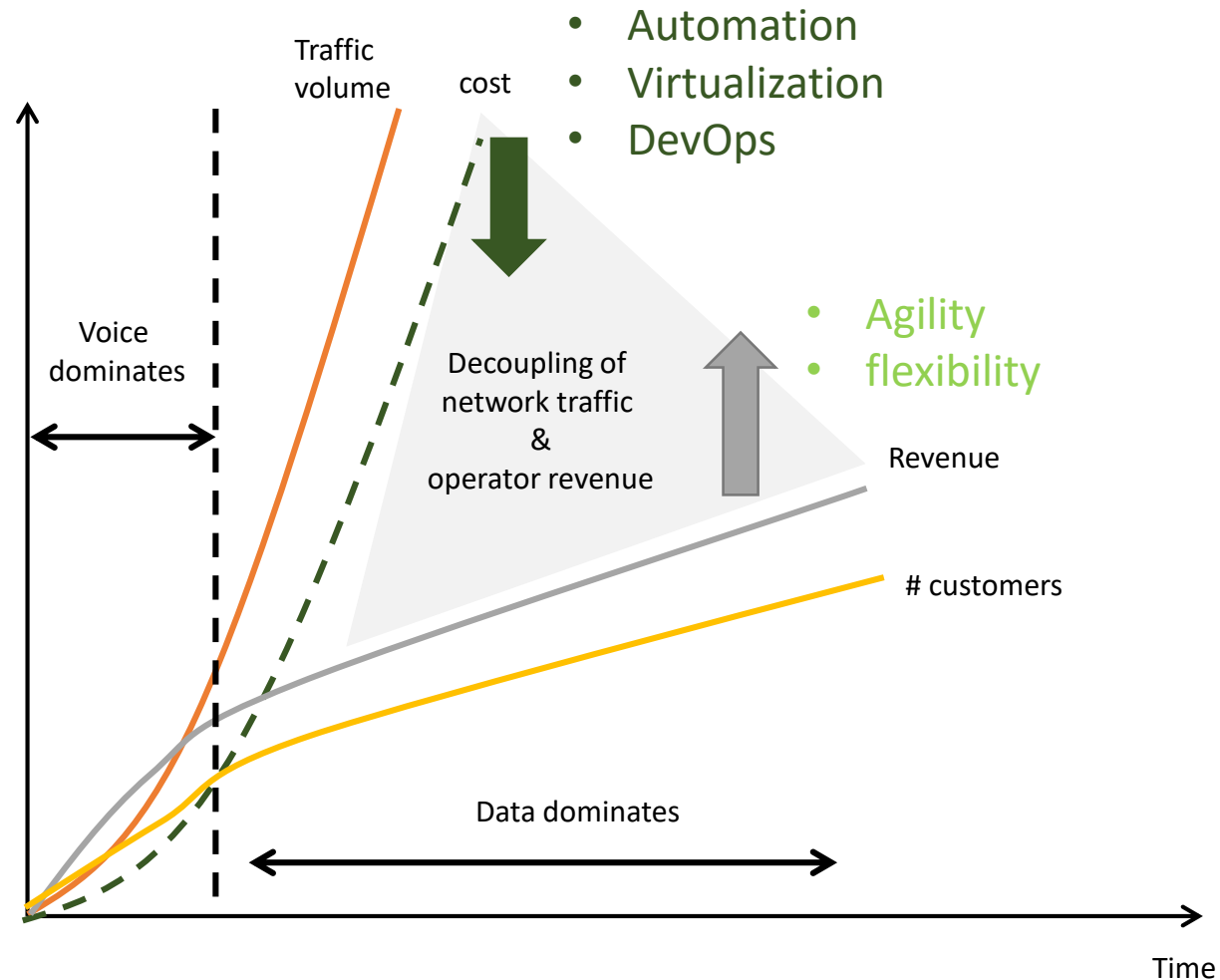

Composition of group revenue

- 5.0% Other
- 43.0% Mobile ICT
- 52.0% Fixed ICT

Source: SLT Annual report 2018

SLT VisionCom (Private) Limited — 100%
IPTV support services

Sri Lanka Telecom (Services) Limited — 99.99%
Network solutions for corporate customers and small businesses

Mobitel (Private) Limited — 100%
Mobile service provider

SLT Digital Info Services (Private) Limited — 100%
Directory information, event management & activations and digital services

eChannelling — 87.59%
Software development and ICT service provider – Healthcare industry

Sky Network (Private) Limited — 99.94%
Wireless broadband operations

SLT Human Capital Solutions (Private) Limited — 100%
Total HR solutions provider

SLT Campus (Private) Limited — 100%
Higher education services

SLT Property Management (Private) Limited — 100%
Managing SLT's real estate resources

Galle Submarine Cable Depot (Private) Limited — 40%
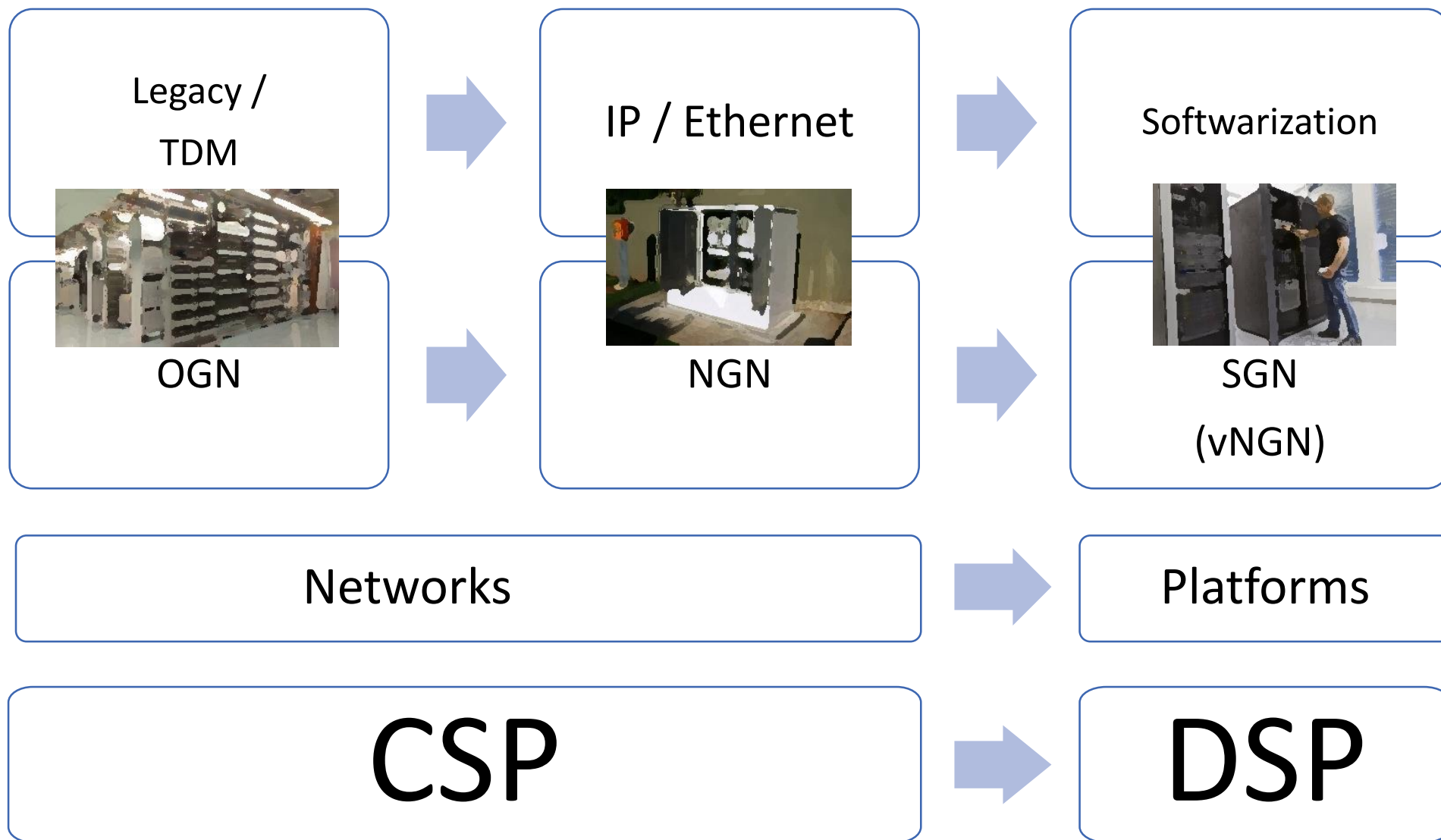Submarine cable depot service provider

Speaker's active involvement since

- Speaker at TM Forum Digital Transformation World, Nice (May 2019)
- Panelist at Telecoms World Asia 2019, Bangkok (Mar 2019)
- Speaker at PTC'19, Honolulu (Jan 2019)
- Chair, moderator and Speaker at Network Virtualization and SDN Asia, Singapore (Sep 2018)
- Speaker & Panelist at 15th APT Telecommunication/ICT Development Forum (ADF-15), Colombo (Jun 2018)
- Keynote speaker and Panelist at Telco Next, Colombo (May 2018)
- Speaker at PTC'18, Honolulu (Jan 2018)
- Chair, Speaker & Panelist at BBWF, Berlin (Oct 2017)
- Speaker at PTC'17, Honolulu (Jan 2017)
- Speaker & Panelist at NGON USA, Palo Alto (Oct 2016)

- Speaker & Panelist at Network Virtualization & SDN Asia 2016, Singapore (Sep 2016)
- Speaker at ESCaPe 2016 Project Symposium, Colombo (Sep 2016)
- Speaker & Panelist at NGON EMEA, Nice (Jun 2016)
- Speaker at Inaugural Network Virtualization & SDN MENA 2016, Dubai (May 2016)
- Speaker & Panelist at WDM & NGON Africa 2016, Cape Town (Feb 2016)
- Speaker & Panelist at Network Virtualization Forum Asia, Singapore (Dec 2015)
- Panelist at BBWF, London (Oct 2015)
- Speaker at NGON EMEA, Nice (Jun 2015)
- Speaker at SDN & OF APAC Congress, Singapore (May 2015)
- Speaker & Panelist at VNF Management & Orchestration, Barcelona (Apr 2015)

Business problem has been consistent

- Automation
- Virtualization
- DevOps

- Agility
- flexibility

Traffic volume

cost

Voice dominates

Decoupling of network traffic & operator revenue

Revenue

customers

Data dominates

Time

Legacy / TDM → IP / Ethernet → Softwarization

OGN → NGN → SGN (vNGN)

Networks → Platforms

CSP → DSP

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Hardware mindset

- Networks are built using BOXes and they need to be CONFIGURED

- Services too are delivered using BOXes and they also need to be CONFIGURED

- Evolved during the last 160+ years

BOX

CONFIG
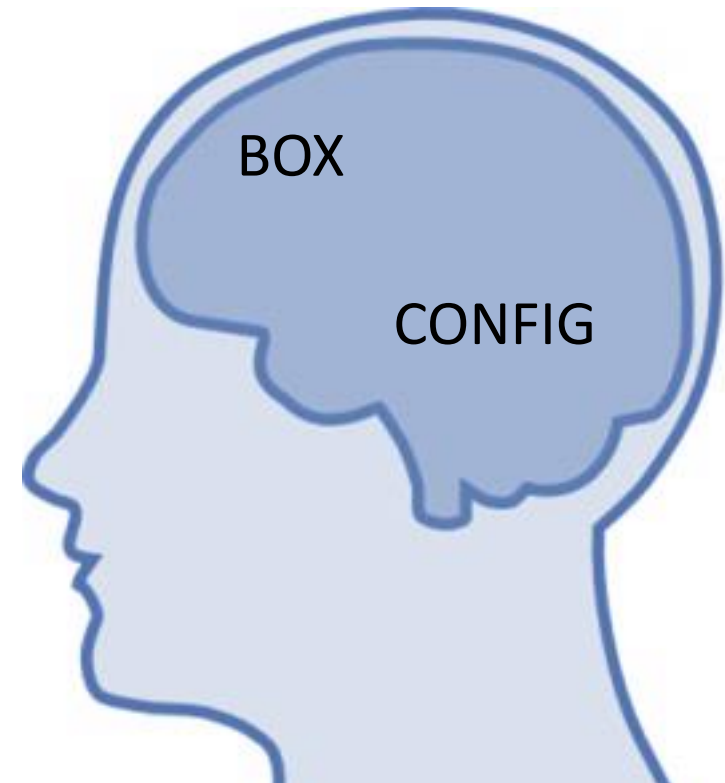
Stanford SDN (2005)

DC SDN

DC

Carrier SDN

Packet Layer

L3 | IP

T-SDN

Packet aware transport

L2.5 | MPLS-TP

L2 | Ethernet

OTN Switching

L1 | OTN

O-SDN

Metro Access

Metro Core

Long-haul

Sub-sea

Optical Layer

CDC ROADM

L0 | DWDM

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Converge - Diverge

LFNETWORKING (LFN) harmonization

Softwarization standards and Open Source Projects

SDN Standard definitions

ONF OPEN NETWORKING FOUNDATION + ON.LAB = ONF

OpenFlow
OIF SDN TRANSPORT API
IEEE SOFTWARE DEFINED NETWORKS
ITU
IETF SDNRG

NFV Standard definitions

IETF NFVRG
ETSI World Class Standards

SDN Controller implementations

Single Instance

Project Floodlight
OPENCONTRAIL
ONOS Open Network Operating System

nox
POX
tungstenfabric
OPEN DAYLIGHT

NFV implementations

TNOVA NETWORK FUNCTIONS AS-A-SERVICE OVER VIRTUALISED INFRASTRUCTURES
OPNFV
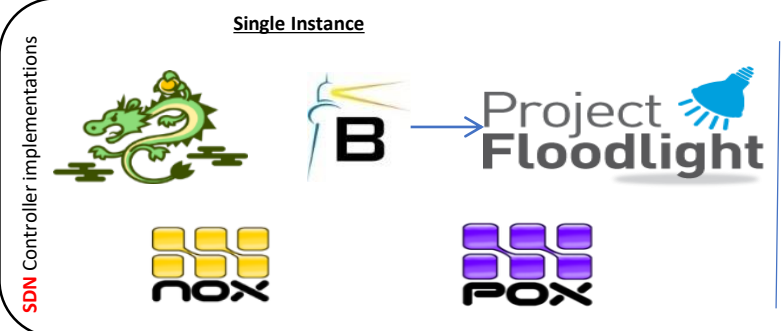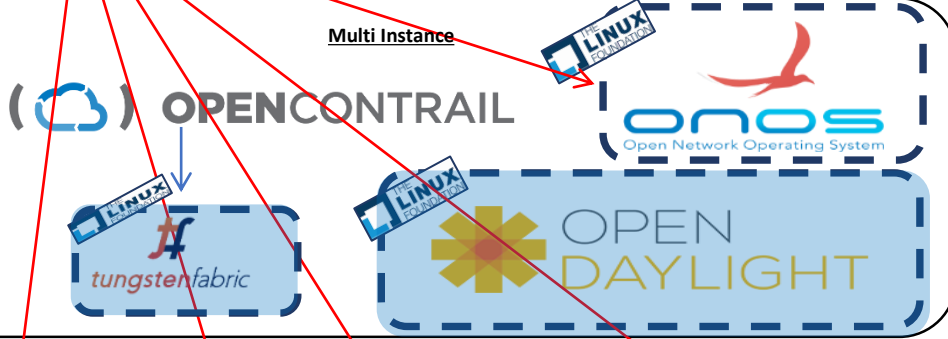
Cloud/Container Orchestration / Management tools

EUCALYPTUS
openstack.
Open Nebula
kubernetes

Orchestration Definitions

MEF LSO LIFECYCLE SERVICE ORCHESTRATION
tmforumzoom

Orchestrator implementations

OPEN BATON
OPEN O + O-ECOMP => ONAP OPEN NETWORK AUTOMATION PLATFORM
ARIA
Tracker NFV Orchestration
ETSI Open Source MANO

Other Open Source Projects

Japanese Softwarization Projects
O3 project OKINAWA OPEN LABORATORY

Grafana → pnda
CORD Central Office Re-architected as a Datacenter
fd.io The Universal Dataplane
XOS
kata containers
PLATFORMLA
TELECOM INFRA PROJECT
OASIS Open standards. Open source.
Open SDN Core
Open ROADM

broadband forum
OPEN CONTAINER INITIATIVE
SNAS.io
STARLINGX
openSDS
OvS Open vSwitch
P4
OPENCONFIG
STRATUM
OPEN 19 Foundation
OPENAPI INITIATIVE
13
OPEN Compute Project

ONAP vs. OSM

OPEN SOURCE SUMMIT
China 2019

Published 21st January 2019

Telefónica forges ahead with OSM, lower hopes for ONAP convergence

By Caroline Gabriel

Share This

Last year, there were hopes that the two major groups aiming to set the standard for management and orchestration (MANO) of virtualized networks would converge. However, this looks less likely as the company with the greatest power to drive a rapprochement, Telefónica, has gone very qu... on the subject, and is pushing ahead with testing solutions based on its preferred would-be standard, ETSI's Open Source MANO (OSM).

Source: https://rethinkresearch.biz/articles/telefonica-forges-ahead-with-osm-lower-hopes-for-onap-convergence/

ONAP and OSM may be reconciled in 2019

18 March 2019 | PDF (2 pages)
Content type: Article
Research programme:

NAO

CAROLINE CHAPPELL
Research Director

"The industry would breathe a collective sigh of relief if interworking becomes possible between ONAP and OSM, even if they continue to be separate organisations."

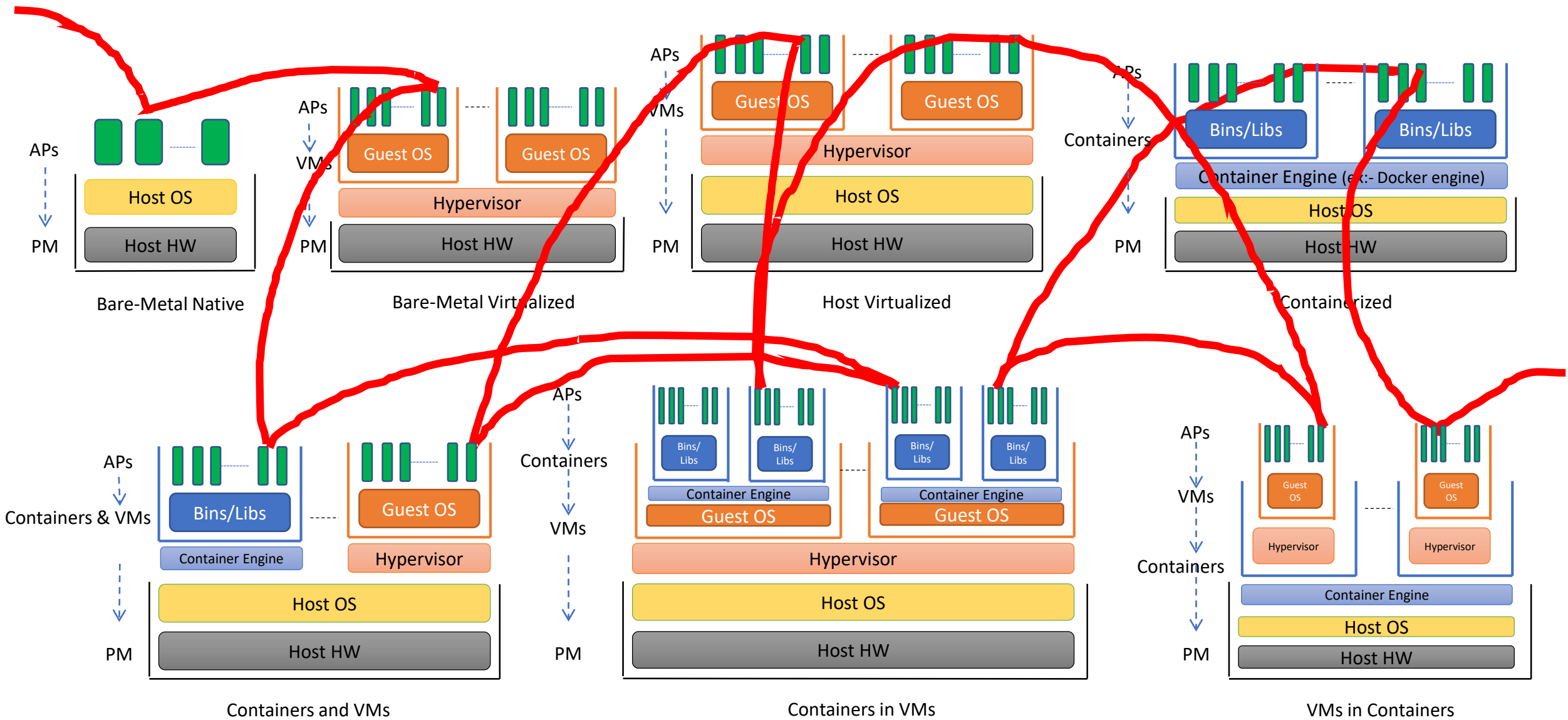Source: https://www.analysysmason.com/Research/Content/Comments/ONAP-OSM-reconciliation-RMA07/

Are vendors willing to be truly open ?

Telco (Network Function) reality

- Current network architectures are complex, yet can manage
  - Legacy PNFs with EMSs

- Adding virtualization increases complexity (migration)
  - PNFs and VNFs
  - EMSs, VIMs, VNFMs
  - Orchestrators and controllers

- Future network architectures are simple (or complex?)
  - VNFs
  - VIMs, VNFMs
  - Orchestrators and controllers

Orchestration often becomes the elephant in the room

Bare-Metal Native   Bare-Metal Virtualized   Host Virtualized   Containerized

Containers and VMs   Containers in VMs   VMs in Containers

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Skills are an issue

70% think retaining skilled employees will be a challenge

80% of CSPs think lack of employee skills as a barrier to transformation

Source: TM Forum 2017

1. **Set** clear, aligned vision and goals

2. **Change** the organizational cultural

3. **Drive** the transformation top-to bottom

4. **Understand** the RoI behaviors of softwarization related investments

5. Identify and **bridge** the skills gap

Summary

- Softwarization of networks and systems is key for telco digital transformation

- However, it's difficult to switch from hardware mindset to software mindset

- There are many challenges, mostly non-technical and they need to be solved by operators themselves

- Skills will be more important than anything else

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[8]   Udunuwara, A. (2017, May 31). **How 'Softwarization' Changes the CSP Landscape** [Blog post]. Retrieved from http://www.broadbandworldnews.com/author.asp?section_id=619&doc_id=733277

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Thank you.