Considerations for Benchmarking VNFs and their Infrastructure

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Current WG 01 Additions

COMMENTS on the bmwg-list:

- Addressed Ramki Krishnan's comments on section 4.5, power, see that section (7/27 message to the list).

- Addressed Saurabh Chattopadhyay's 7/24 comments on VNF resources and other resource conditions and their effect on benchmarking, see section 3.4.

- Addressed Marius Georgescu's 7/17 comments on the list (sections 4.3 and 4.4).

AND, comments from the extended discussion during IETF-93 BMWG session:

- Section 4.2: VNF footprint and auxilliary metrics (Maryam Tahhan),

- Section 4.3: Verification affect metrics (Ramki Krishnan);

- Section 4.4: Auxilliary metrics in the Matrix (Maryam Tahhan, Scott Bradner, others)

Charter and Next step

- **VNF and Related Infrastructure Benchmarking**: Benchmarking Methodologies have reliably characterized many physical devices. This work item extends and enhances the methods to virtual network functions (VNF) and their unique supporting infrastructure.
- **A first deliverable** from this activity will be a document that considers the new benchmarking space to ensure that common issues are recognized from the start, using background materials from industry and SDOs (e.g., IETF, ETSI NFV). … (Milestone in Aug 2015)
- This draft is **Referenced** in ETSI NFV GS, OPNFV specs.
- **WGLC?**

Backup

Current WG 00 Additions

- Using "General Purpose" computing
- Motivated complete desc. of test context: <u>User Story</u> (what's in the Black Box?)
- Sec3: SUT description = platform and VNFs and...
- Barry Constantine's comments on the list:
    - "concurrent" VNFs, how many can platform support?
- Sec3.4 Consider interactions/dependencies (placement, HA, VM or Bare Metal)
- Sec 4.1 Scale and capacity benchmarks still needed.
- Sec 4.4 Resolved the question of Scale and the 3x3 Matrix
- new 4.5, Power consumption (need metric(s))

Assess Benchmark Coverage 3x4

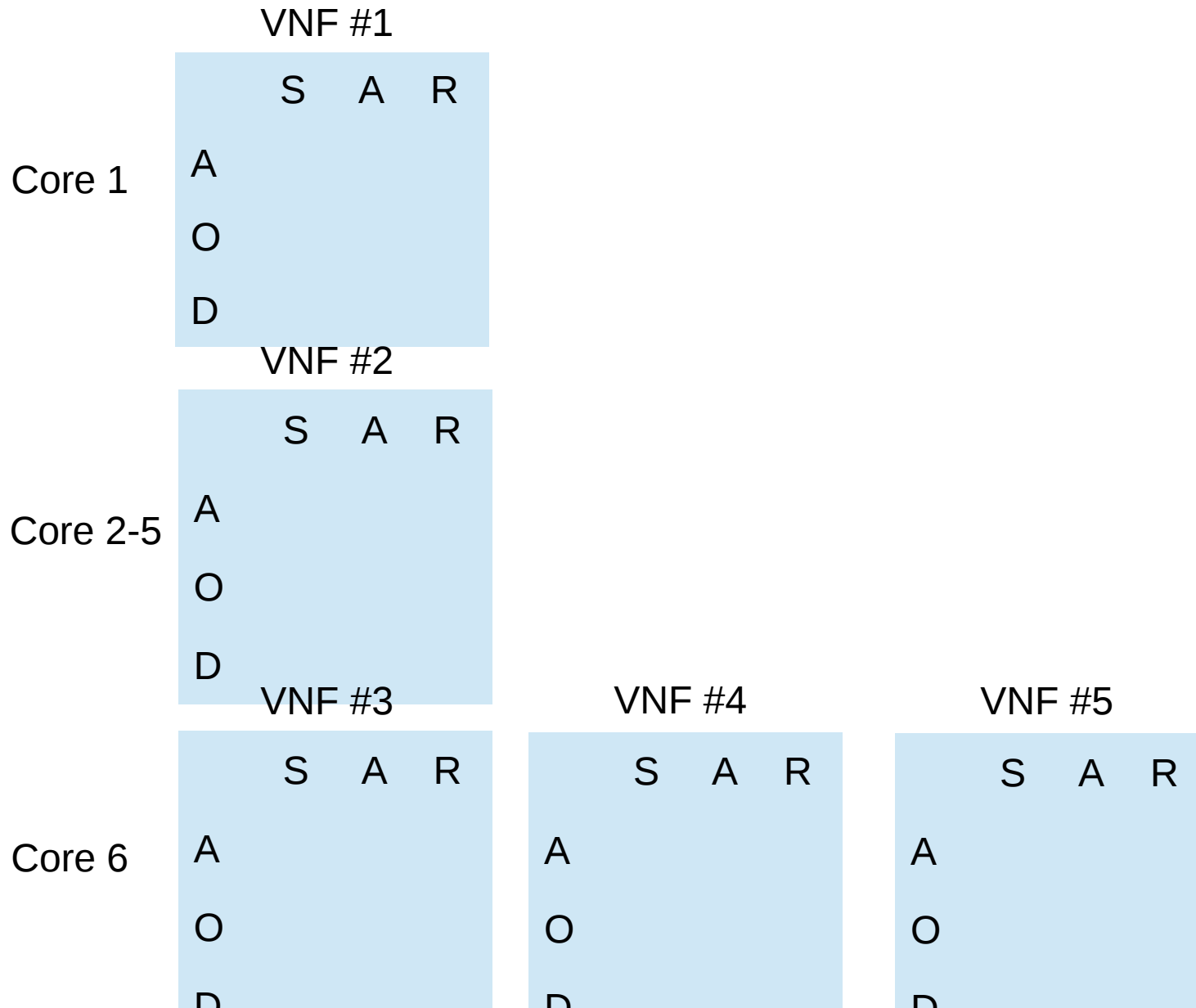|	SPEED	ACCURACY	RELIABILITY	SCALE
Activation/ Creation/Setup				
Operation				
De-Activation/ Deletion/Take -Down				

Report Results (Capacity = N units)

	SPEED	ACCURACY	RELIABILITY
Activation/ Creation/Setup			
Operation			
De-Activation/ Deletion/Take-Down			

Report Results (Concurrent VNFs)

VNF #1

	S	A	R
A			
O			
D			

Core 1

VNF #2

	S	A	R
A			
O			
D			

Core 2-5

VNF #3

	S	A	R
A			
O			
D			

VNF #4

	S	A	R
A			
O			
D			

VNF #5

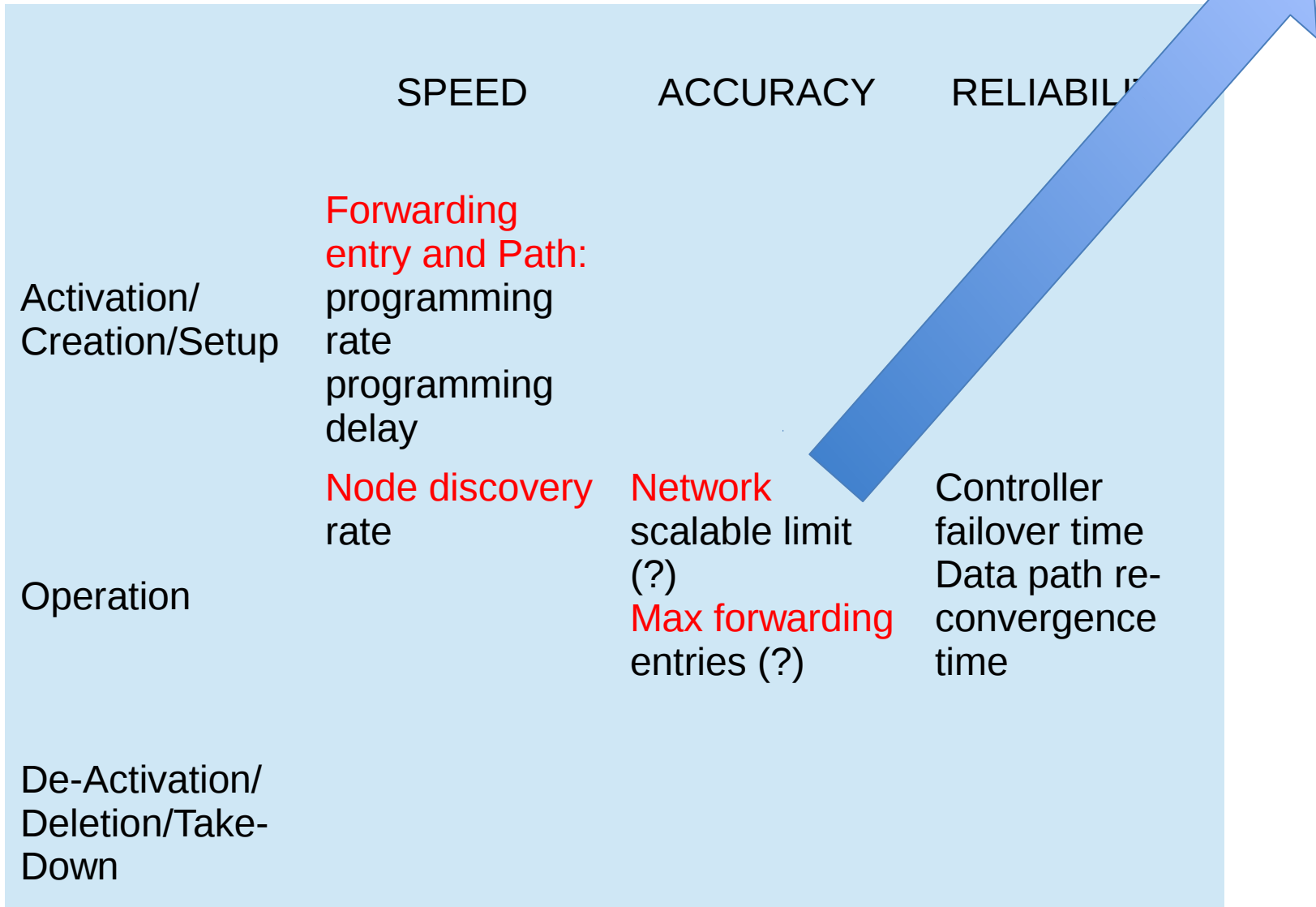|	S	A	R
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Core 6

Some Related Work

- **ETSI NFV**:
  - vSwitch Benchmarking Req (Acceleration-related)
  - Pre-deployment Testing of VNFs and Infrastructure
  - Interoperability Testing
- **OPNFV (Open Platform for NFV):**
  - Characterize vSwitch Performance for Telco NFV
  - Many other testing projects
- **OPEN DAYLIGHT:**
  - Wrapped Cbench – **WCBENCH** – **Daniel Farrell**

SDN Controller Coverage:

	SPEED	ACCURACY	RELIABILITY
Activation/ Creation/Setup	Forwarding entry and Path: programming rate programming delay		
Operation	Node discovery rate	Network scalable limit (?) Max forwarding entries (?)	Controller failover time Data path re-convergence time
De-Activation/ Deletion/Take-Down			

Example: Quality Metric Coverage for Virtual Machines

	SPEED	ACCURACY	RELIABILITY
Activation/ Creation/Setup	**<u>Successful Activation Time</u>**	Incorrect Activations per total attempts	Failed/DOA Activations per total attempts
Operation	I/O Capacity Benchmarks on CPU, Memory, Storage	Incorrect outcomes per Operation attempts	Error/Stall outcomes per Operation attempts
De-Activation/ Deletion/Take-Down	Successful De- Activation Time	Incorrect De-Activations per total att.	Failed/no-resp. De-Activations per total att.

Version 01, Benchmarking Considerations

- Comparison with Physical Network Functions
  - Re-use of existing benchmarks, with review
- Continued Emphasis on Black-Box Benchmarks
  - Internal Metrics from Open Source are tempting
  - Supply both, may provide useful OPS insight
- New Benchmarks for a Dynamic World
  - Time to deploy VNFs, Time to Migrate,
- Assessment of Benchmark Coverage

Ver 02, HW & Test Considerations

Section 4.4

- How do we reflect Scale/Capacity Benchmarks in the 3x3 Matrix? Alternatives:
  - Add a new column
  - Include Scaleability under Reliability
  - Keep Size, Capacity, and Scale separate from the matrix and present results (using the matrix) with titles that give details of configuration and scale.
- Yes, results could be organized by Matrix, too.

Test Configuration (ver 00)

- o number of server blades (shelf occupation)
- o CPUs
- o caches
- o storage system
- o I/O

configurations that support the VNF:

- Hypervisor
- o Virtual Machine
- o Infrastructure Virtual Network

the VNF itself:

- specific function being implemented in VNF
- o number of VNF components in the service function chain
- o number of physical interfaces and links transited in the service   function chain

characterizing perf at capacity limits may change? (ver 00)

- Charac. Infrastructure support of #? VMs:
  - N when all VM at 100% Util
  - 2*N when all VM at 50% Util ??
- #? VNF profile A, VNF profile B
  - Profiles may include I/O, storage, CPU demands
- Partition VNF performance
  - from single VNF in infinite I/O loop
- System errors occur as transients (longer dur.)
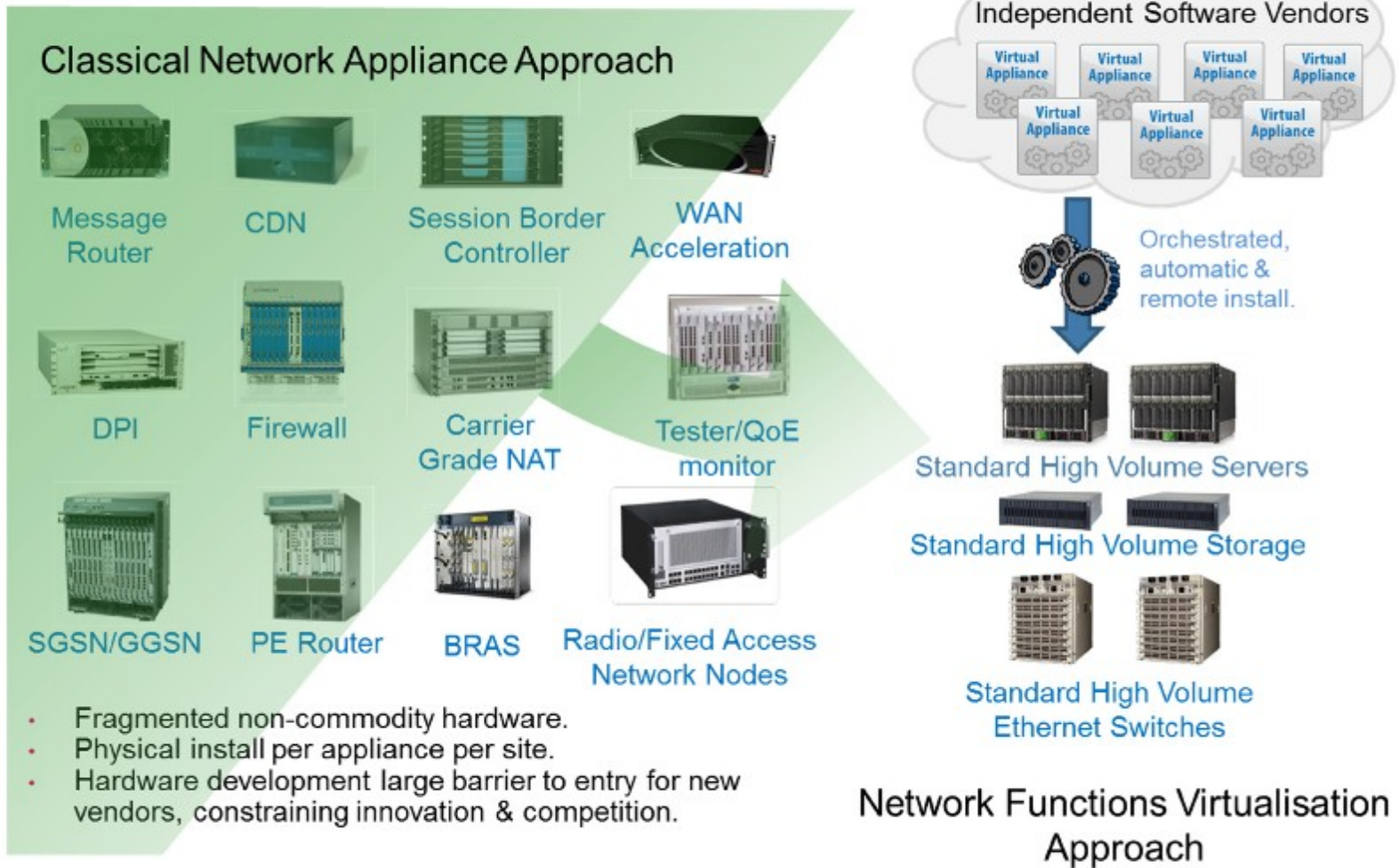- VM and VNF flux: constant change in population while characterizing performance

Figure 1: Vision for Network Functions Virtualisation

http://www.etsi.org/technologies-clusters/technologies/nfv