Developer Days
Automation

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NSO Performance and Scale Tests

Reference Use Cases NFVO and T-SDN (NSO 6.0)

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Objectives

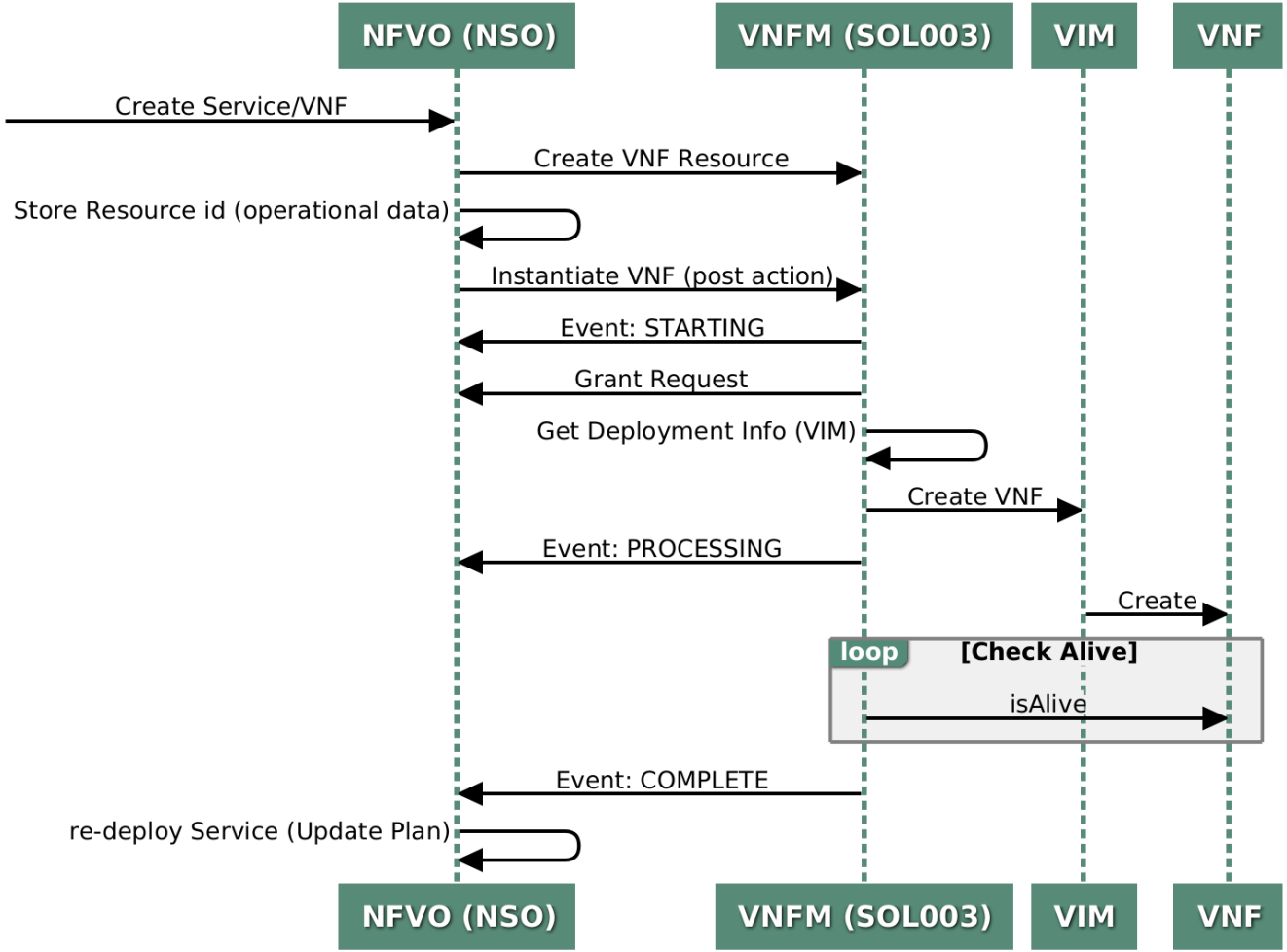
- NSO Scale and Performance capabilities for
  - Virtualization (or RFM based) use case – **NFVO Core FP**
  - Physical device configurations use case – **T-SDN Core FP**
- Help users of NSO understand
  - What to expect from NSO in terms of **Scale and Performance** for their use case(s)
  - **Resource requirements** for large scale use cases with different deployment scenarios
  - Deployment options and how **different deployment options** can help achieve Scale and Performance goals

NFVO Core FP (NFV Orchestration)

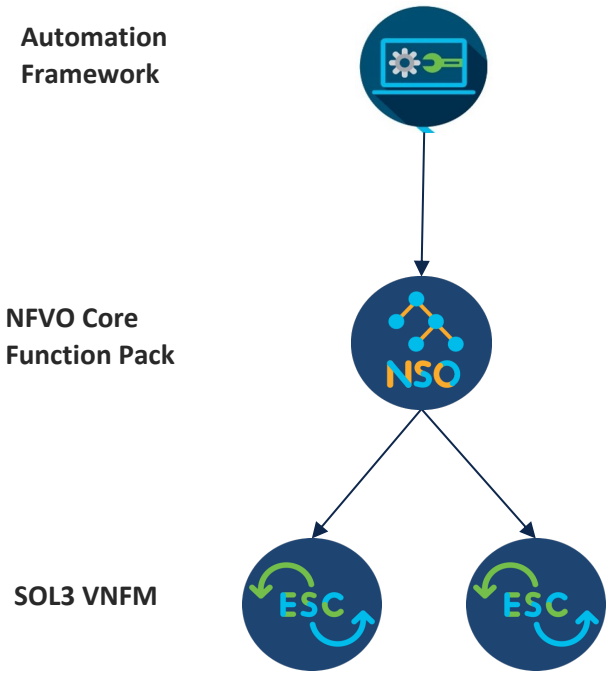
NFVO Core FP Overview

- Cisco’s version of ETSI MANO stack NFVO Component
- Function Pack to
  - Instantiate and Manage lifecycle of VNF/VM on VIM via VNFM (Cisco ESC or SOL003 VNFM)
  - Allocate resources on a VIM (OpenStack, VMWare, AWS, etc.) for the VNF/VM

NFVO Service Flow



Infrastructure and Methodology



Infrastructure

- Version - *NSO: v*6.0.0, *NFVO: v*4.7.2
- System Configuration

  CPU: 8 vCPU, *Memory:* 32 GB, *Disk:* 1 TB

Methodology: Create (10K) Services

- Single Service in commit
  - No sleep b/w commits i.e., commit executed after previous commit returns
- SOL3 VNFM netsim/mock
  - netsim/mock configured to send VNF Instantiation complete after ~ 5 mins

*CSR VNF configuration used for tests

Test Results Summary: 10K Service Create

Seq	Number of VNFs	Number of VDUs/VMs	VNFs per Txn	No. of Threads	SOL003	Managed VNF	LSA	Commit Queue	HA
1	10K	1	1	1-5	Yes	No	No	No	No

Time Based Statistics

	NSO 5.4 (Single Thread)	NSO 6.0 (Single Thread)	NSO 6.0 (5 Threads)
Total Time to converge	14 hr 36 min	6 hr 6 min	5 hr 27 min
Average Time per Service	11 services per min	27 services per min	30 services per min
Average Commit Time	2.8 seconds	2 seconds	10 seconds

Resource Utilization

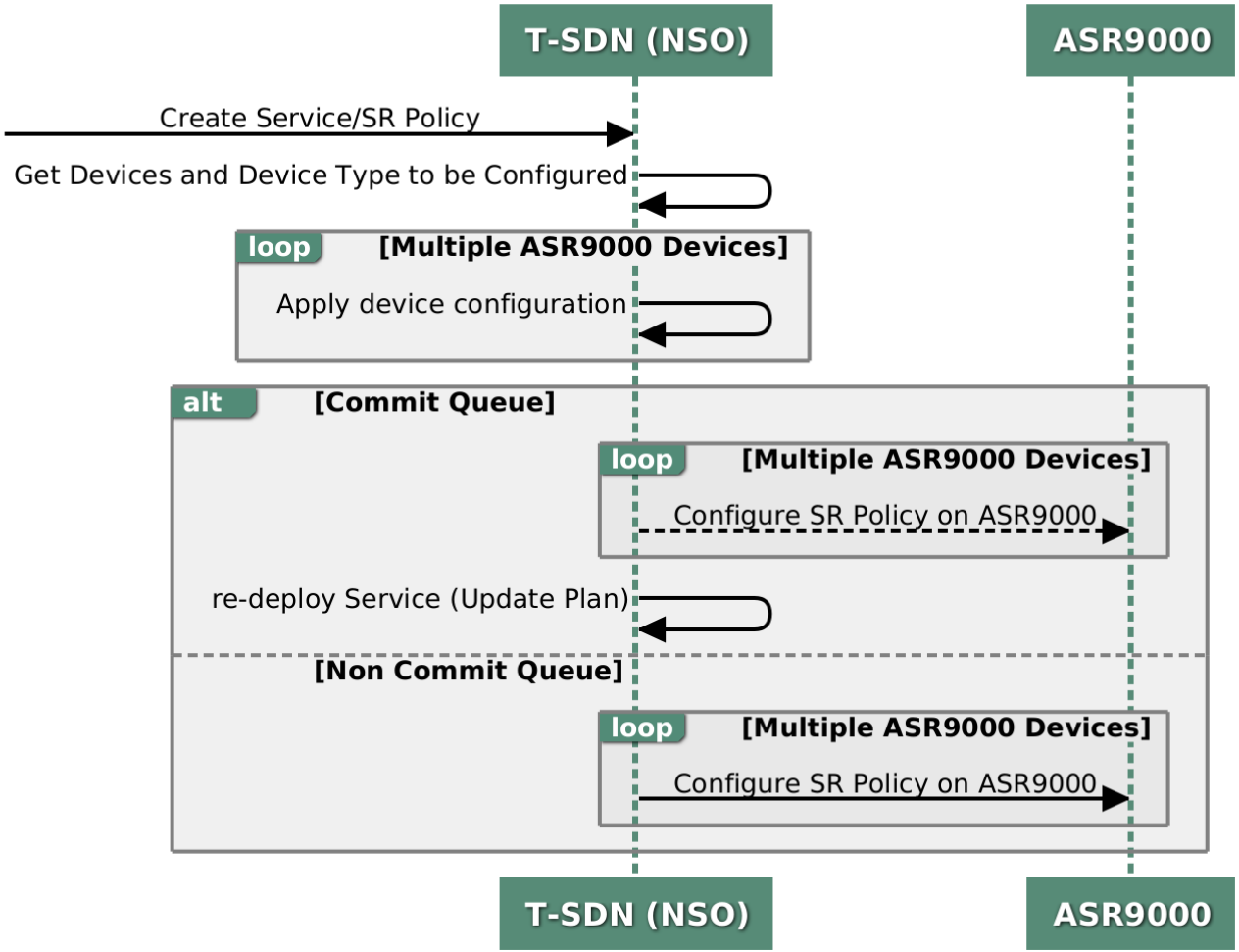
	NSO 5.4 (Single Thread)	NSO 6.0 (Single Thread)	NSO 6.0 (5 Threads)
Memory	3.4 GB (1.1 GB → 4.5 GB)	4.1 GB (1.5 GB → 5.6 GB)	4.1 GB (1.5 GB → 5.6 GB)
Disk	4 GB (125 GB → 129 GB)	2.9 GB (38.1 GB → 41 GB)	2.9 GB (38.3 GB → 41.2 GB)
CDB	1.01 GB (8.4 MB → 1.02 GB)	588.71 MB (13.13 MB → 601.8 MB)	585.82 MB (13.08 MB → 598.9 MB)

T-SDN Core FP
(PNF Orchestration)

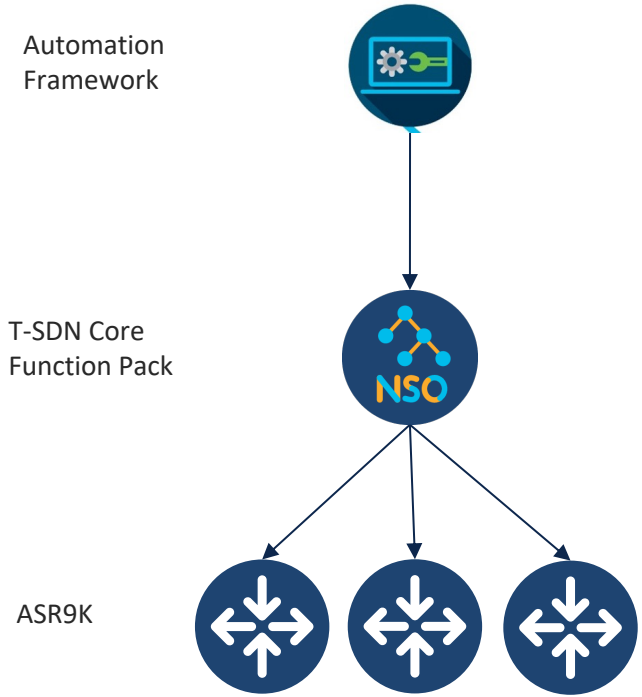
T-SDN Core FP Overview

- Transport SDN Automation Solution
- Function pack that automates
  - Segment Routing (SR) Policy Configurations
  - L2/L3 VPN Configurations

T-SDN Service Flow



Infrastructure and Methodology



Infrastructure

- Version - *NSO: v*6.0.0, *T-SDN: v*4.0.0
- System Configuration

  CPU: 24 CPU, *Memory:* 98 GB, *Disk:* 6 TB

Methodology: Create (10K) Services

- Single Service in commit
  - No sleep b/w commits i.e., commit executed after previous commit returns
  - Each service instance configures 4 out of a total of **300 devices** in a round-robin fashion
- IOS XR CLI Netsim

Test Results Summary: 10K Service Create

Seq	Number of Services	Services per Txn	No. of Threads	Number of Devices	Devices per Service	LSA	Commit Queue	HA
1	10K	1	1/5	300	4	No	Yes	No

Time Based Statistics

	NSO 5.4 (Single Thread)	NSO 6.0 (Single Thread)	NSO 6.0 (5 Threads)
Total Time to converge	18 hr 39 min	10 hr 12 min	7 hr 17 min
Average Time per Service	9 services per min	16 services per min	22 services per min
Average Commit Time	6.7 seconds	3.65 seconds	13.08 seconds

Resource Utilization

	NSO 5.4 (Single Thread)	NSO 6.0 (Single Thread)	NSO 6.0 (5 Threads)
Memory	7.6 GB (4.4 GB → 12 GB)	5.8 GB (11.7 GB → 17.5 GB)	7.0 GB (12.19 GB → 19.19 GB)
Disk	10 GB (35 GB → 45 GB)	7.7 GB (183.2 GB → 190.9 GB)	7.6 GB (183.3 GB → 190.9 GB)
CDB	9.24 GB (3.7 GB → 9.25 GB)	6.32 GB (3.73 GB →10.05 GB)	6.3 GB (3.72 GB → 10.09 GB)

Recommendations and Summary

Recommendations

- Scale and Performance results shared provide guidance on what to expect from NSO, results will **vary based on use case and environment**, NSO users should perform Scale and Performance tests to determine precise results/numbers for their use case
- **Bulk operations** (1000s of creates/deletes/updates) should be planned. Also, mixing bulk operations with other changes should be avoided.
- Start planning on consuming NSO 6.0 for significant performance gains
  - Ensure service code is **Thread-safe**
  - Use **multiprocessing** callpoint-model for python packages
  - Service code needs to be idempotent; service callbacks can re-run (conflicts)
  - Expect NSO to use more CPU cores, more RAM
  - Expect little higher commit response times for multiple thread executions

Results Summary

NSO Scales and Performs well for virtualization and physical device configuration use cases

- ***Total and Service time:*** Thousands of services can be created in few hours
  - 2x-3x improvement with NSO 6.0 (vs NSO 5.4)
  - About **20-30** converged services per min (good parallelization)
  - Significant performance improvements when committing services in parallel (multiple threads)
- ***Resource utilization:*** Optimal resource utilization i.e., linear growth with services.

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