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Challenges, Considerations, and Best Practices for Secure SD-WAN Operationalization for Business Services

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Challenges and Solutions

- Today's complex connectivity products increasingly look more like software projects than hardware solutions
- Complexity, scale, and flexibility requirements all joined together to drive features into software
- Software-based systems operate fundamentally differently from hardware-based
- Successful software projects frequently find commonality in industry best practices on complexity, scale, and flexibility
- A few simple software industry best practices have been implemented to great effect as part of operationalization of networking services

High-Level Principles

Keep It Simple

Leverage **cloud-native architecture** and **standard technologies** like edge routers, BGP, GRE tunneling, proxies, and LBs for system integration

Automation-First & Test-Driven

Emphasis on standardization of configuration in version-control, combined w/ logical inventory in CMDB + strict change control policies to facilitate **automation-first deployment, MACD, & DR** for operations to reduce unforced errors

Embrace **test-driven development** using fully-automated unit & integration tests to ensure version-after-version quality consistency

Data-Driven Observability

Forwarding to data lake, aggregation of time-series data combined with intelligent machine learning, to achieve **observability and data-driven capacity planning**

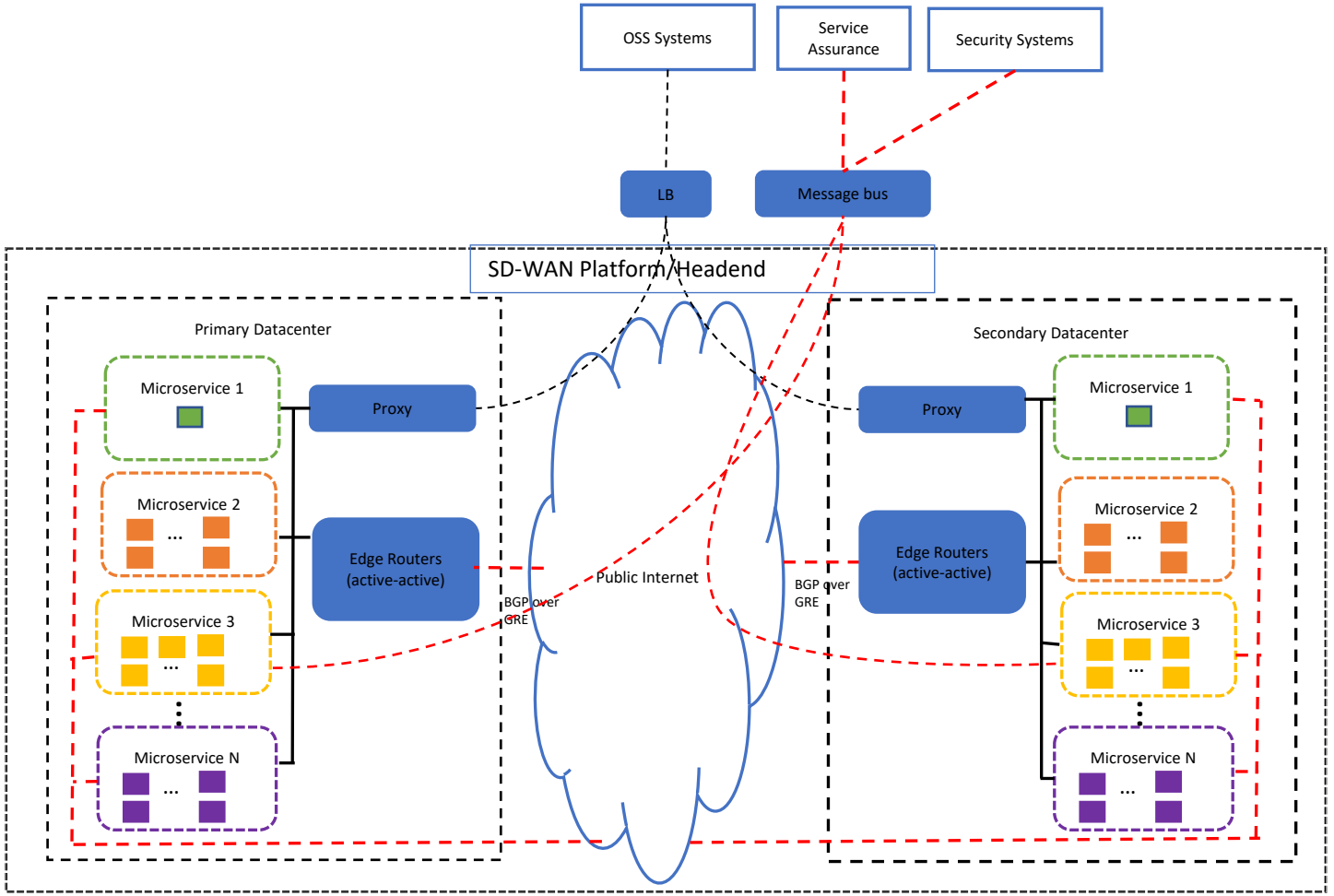
SD-WAN Platform Architecture Design

Main Goal

To integrate vendor solution seamlessly with our existing eco-systems and business strategies.

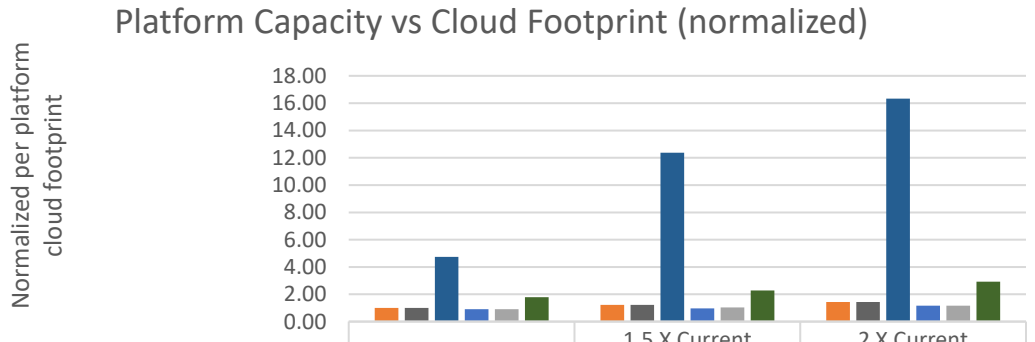
Architecture Design

- Cloud-native
  - Micro-services
  - Scale out based on workload
  - 2 Geo-diverse DCs for HA
- Standard network technologies
  - Edge Routers
  - BGP over GRE tunnels
  - Load Balancers
  - Proxies
  - etc.



SD-WAN Platform Architecture Optimization

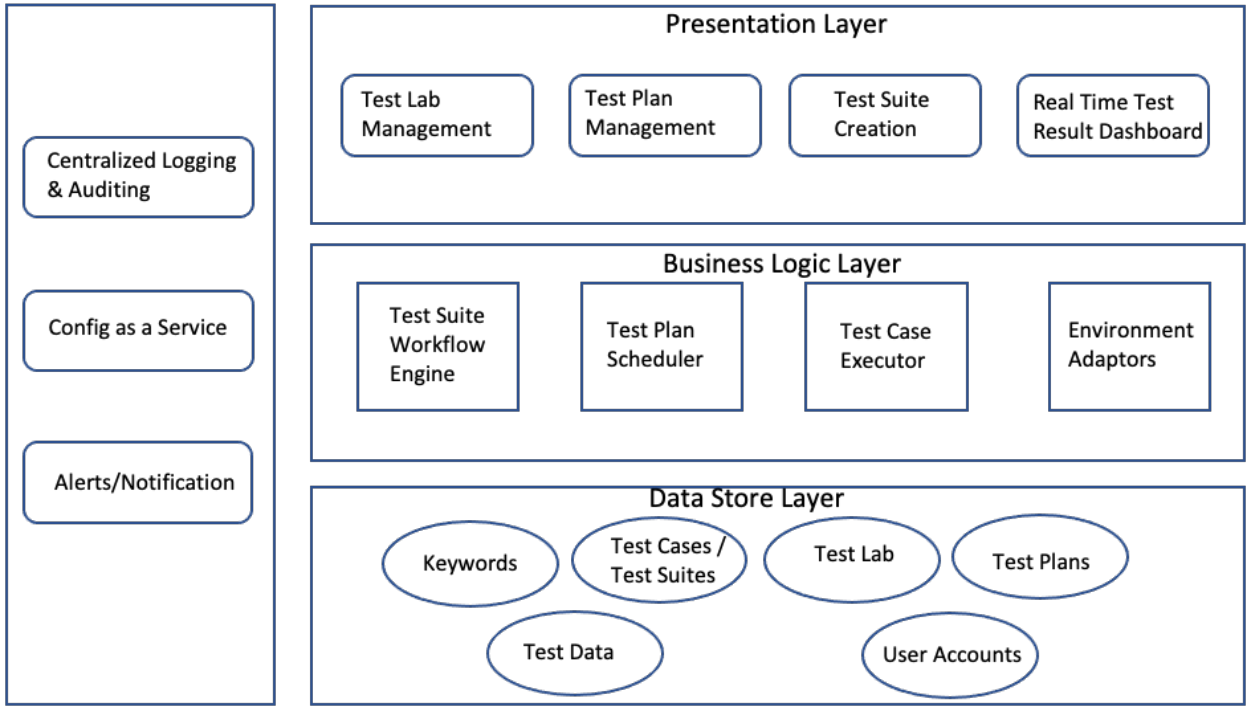
- Keep refining and optimizing our platform architecture to make it more scalable. Comparison of refined architecture with current architecture
  - ✓ Current capacity: save 9%, 9%, and 62%, respectively, for best cases, average case, and worst case.
  - ✓ 2x capacity: save 19%, 19%, and 82%, respectively, for best cases, average case, and worst case.
  - ✓ More savings with increasing platform capacity



	Current Capacity	1.5 X Current Capacity	2 X Current Capacity
Baseline archiecture -- best case	1.00	1.22	1.44
Baseline archiecture -- average case	1.00	1.22	1.44
Baseline archiecture -- worst case	4.74	12.38	16.34
Refined archiecture -- best case	0.91	0.96	1.17
Refined archiecture -- average case	0.91	1.04	1.17
Refined archiecture -- worst case	1.79	2.28	2.93

Scenarios	Current Capacity	1.5 X Current Capacity	2 X Current Capacity
Best case	9%	21%	19%
Average case	9%	15%	19%
Worst case	62%	82%	82%

Test Automation Framework

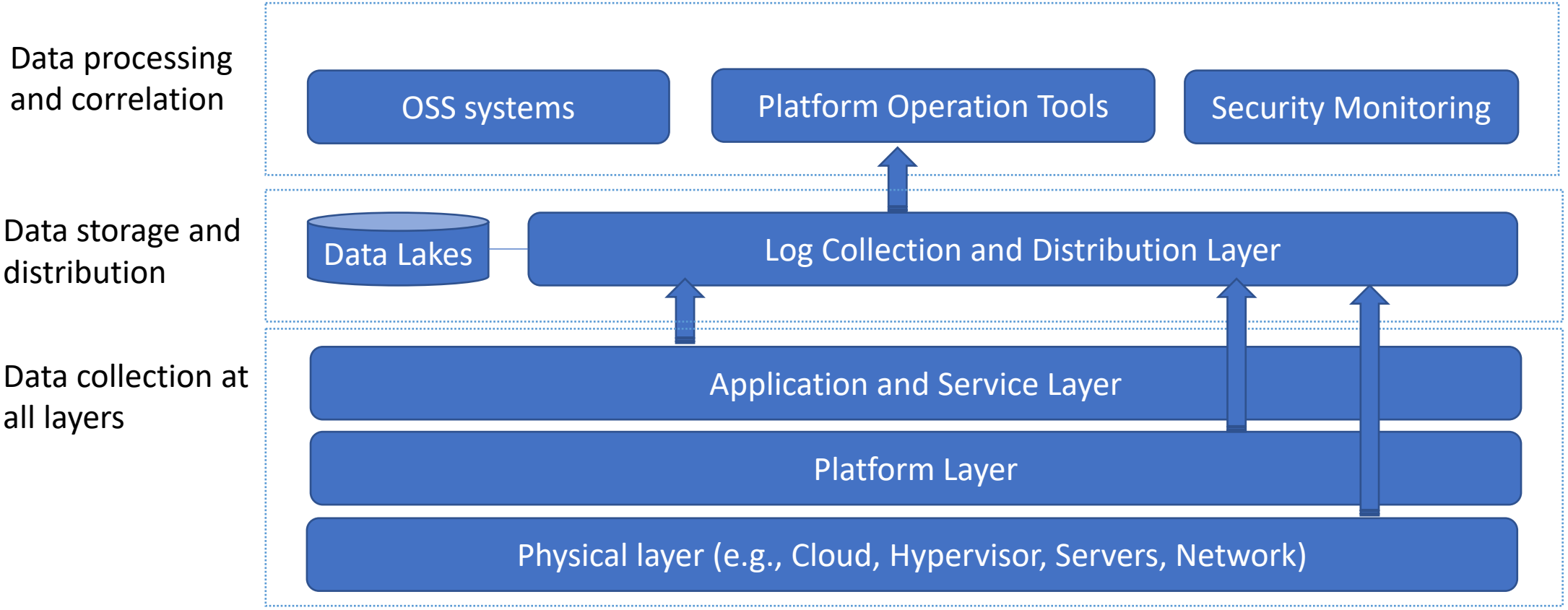


Platform Lifecycle Category	Execution Timeline Improvement with Automation
Regression Testing	>99%
VM Build / Software Deployment	92%
Disaster Recovery / High Availability Testing	>70%

- Test-driven automated framework makes it possible to reliably deploy new code at the pace of business requirements
- Environment build/deployment/administration across huge footprint of all microservices would be impossible without Day 2 platform lifecycle applications*

* not shown

Pro-active monitoring – architecture design



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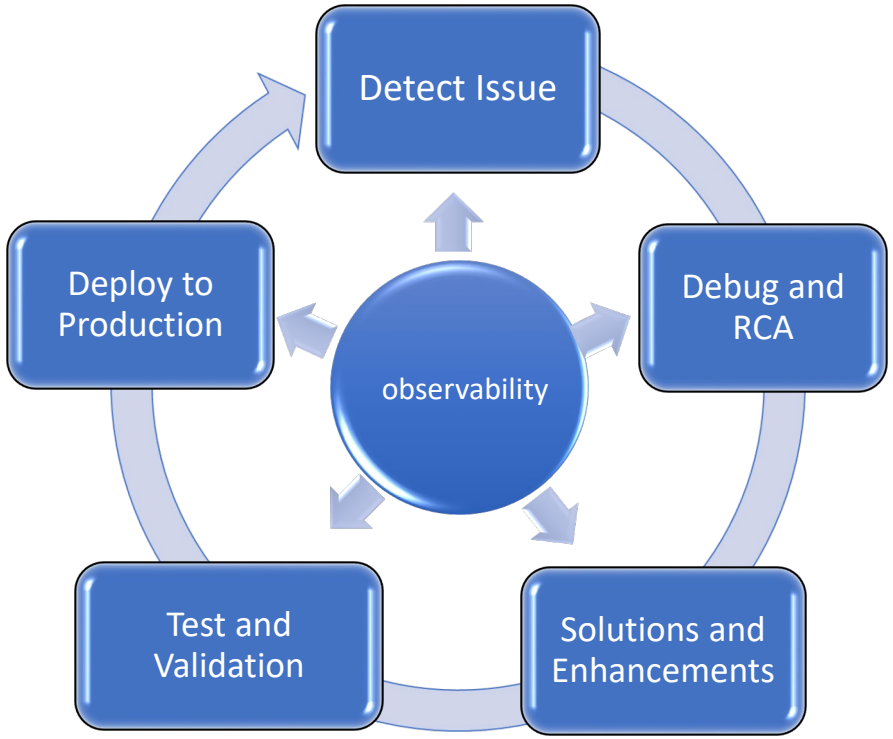
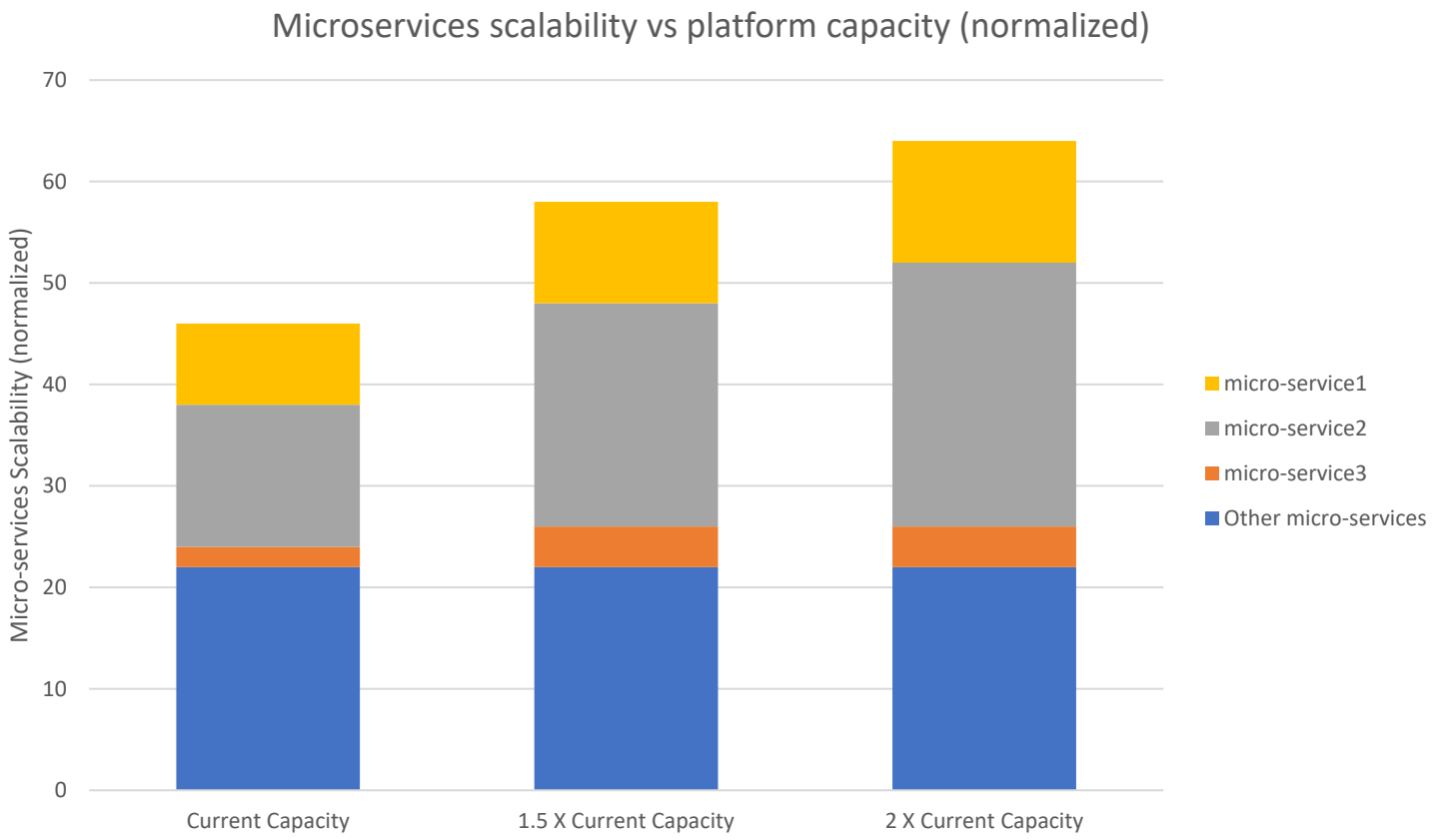
Benefits of Observability

(a) Overall Benefit

(b) Benefit to platform



Microservices Growth vs Platform Capacity



- Microservices grow independently based on own workload
  - Cluster: scale out/in
  - HA: active-active
  - HA: active-standby
- Bottleneck could be communication bandwidth or TCP throughput.

Summary

- Using standard industry techniques to manage networks provides benefits from years of experience helping software projects succeed
- Software-based networks' operationalization, in particular, can be different from that of hardware-based networks, due to the fundamental differences in approach
- We hope these real lessons learned will encourage implementers to look to these simple techniques for inspiration

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Thank You!

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