

5G Market Status | Experiences

Continuous Intelligence for a Continuously Evolving Network

Kishore Kumar
5G | Business Head

The logo for the Spirent Connect Forum, featuring the word "spirentconnect" in a lowercase, sans-serif font with "spirent" in white and "connect" in green, and the word "FORUM" in a bold, uppercase, sans-serif font below it. A large green arrow points from the logo towards the center of the slide.

Spirent | A Leading Test & Measurement Company

>1,800 5G ENGAGEMENTS TO DATE

>800 NEW 5G ENGAGEMENTS IN 2021
>250 UNIQUE 5G CUSTOMERS

OEMs

NEPs

CSPs

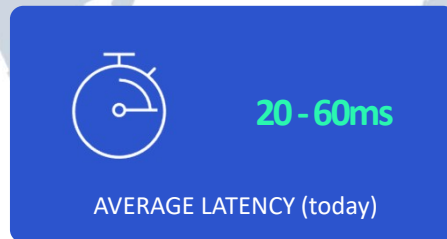
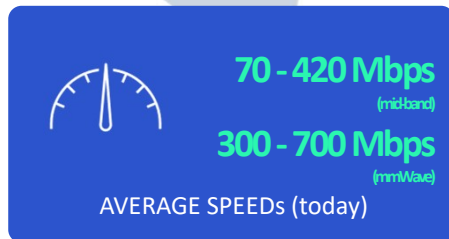
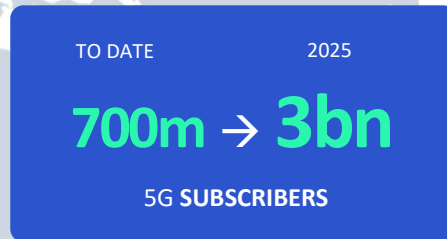
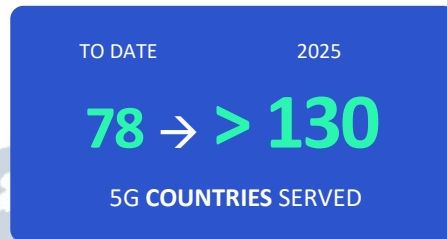
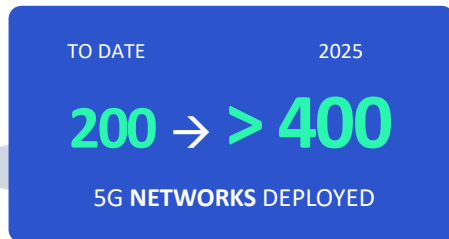
Gov/Mil & Academia

Cloud & Enterprise



FIERCE TELECOM PRESS RELEASE

Current state of the 5G market



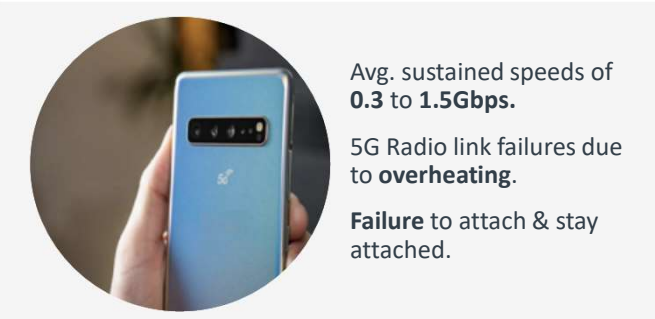
5G is still in its infancy | technology



NR **not** field optimized:

- Beam management
- Utilization & efficient use of 5G radio channels
- Timing & Synchronization

Un-optimized 5G Radio

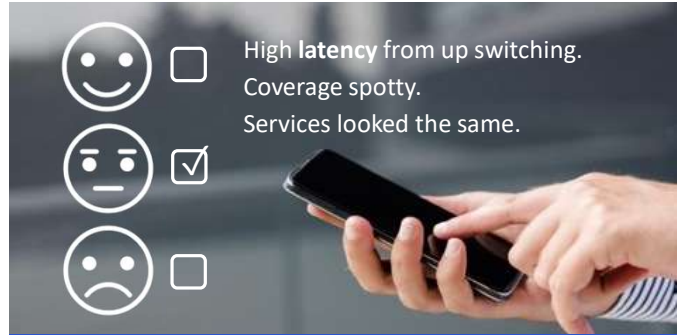


Avg. sustained speeds of **0.3 to 1.5Gbps.**

5G Radio link failures due to **overheating.**

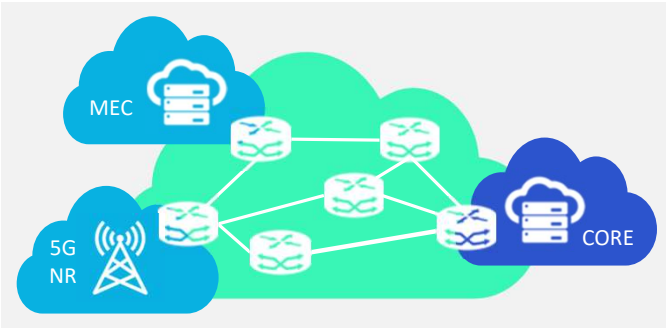
Failure to attach & stay attached.

Maturity of 5G Devices



High **latency** from up switching.
Coverage **spotty.**
Services looked the same.

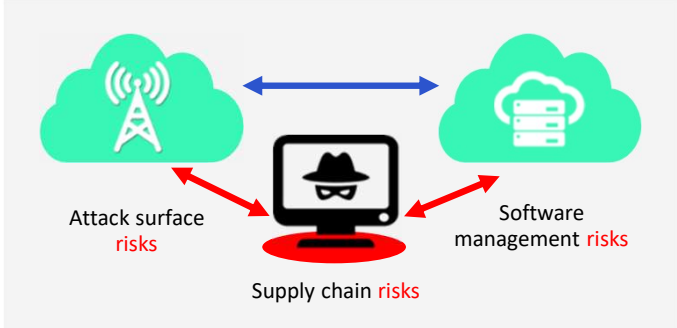
Customer perception



New deployment challenges

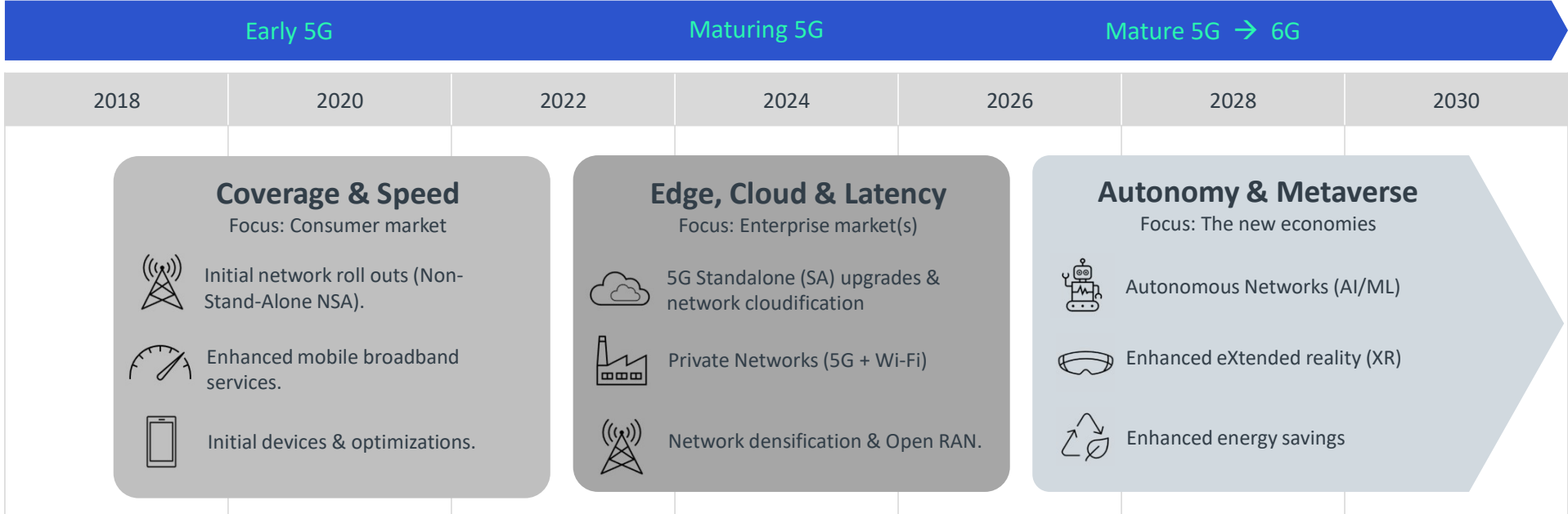
Vendor independent 5G CORE VNFs	ERICSSON NOKIA HUAWEI ZTE NEC SAMSUNG affirmed MAVENIR ORACLE CISCO
Virtualization SW	openstack redhat KVM Microsoft Azure WIND RIVER vmware COWRIOL aws f
NFV Infrastructure	CISCO hp intel IBM DELL Google Cloud Alibaba Cloud

Multi-vendor complexity
Interoperability | Performance | SW updates | SLAs



Heightened Security Risks

5G is still in its infancy | industry



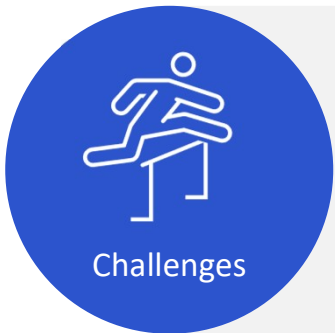
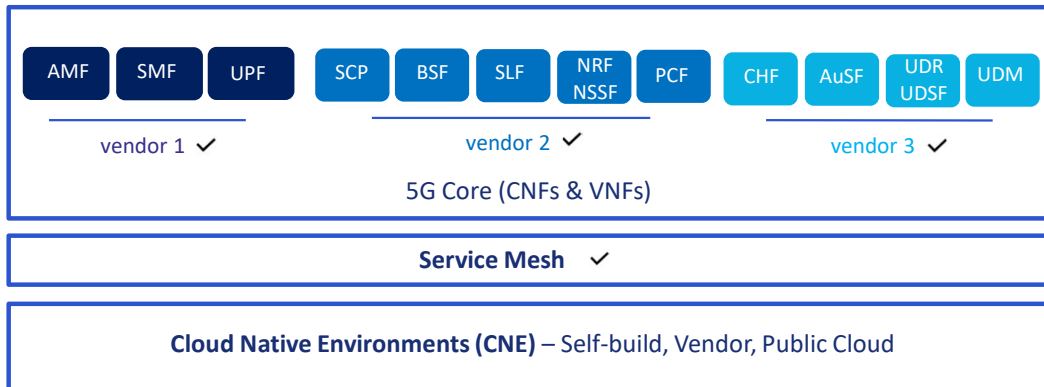
TO DATE 2025
\$70bn → >\$190bn
 5G RAN & CORE INFRA SPENDING

TO DATE 2025
\$6bn → >\$35bn
 TELCO CLOUD SPENDING

TO DATE 2025
\$1bn → >\$25bn
 PRIVATE NETWORK SPENDING

TO DATE 2025
\$1.5bn → >\$23bn
 OPEN RAN SPENDING

Acceleration towards Standalone 5G



- Multi-Vendor interoperability, perf & security.
- Multiple CNE options & architectures
- Lack of internal expertise (CNF's, CNE's)
- Volume & velocity of vendor releases **>10X**
- **1000s** test case iterations compared to 100s for 4G Core (needs AUTOMATION)

Spirent

1. New service offerings
2. Agility
3. NSA perf/cost

Main drivers for deploying 5G Core?

Single or multi-vendor make-up?

2021 H1 Survey: >70 MNO responses

5G Network - 12 Month View

Vendors 1 & 2
5G Core

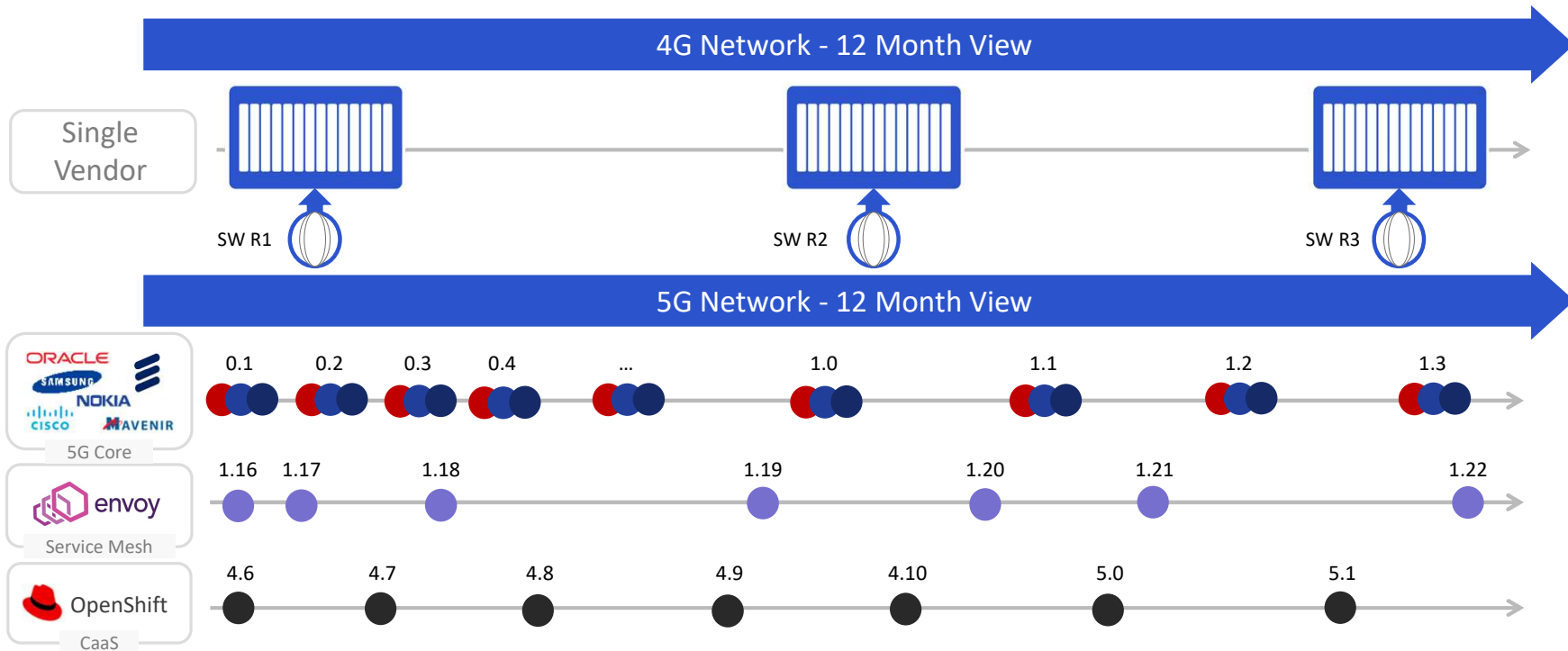
Vendor 3
Service Mesh

Vendor 4
CNE

Spirent Promise Assured 6

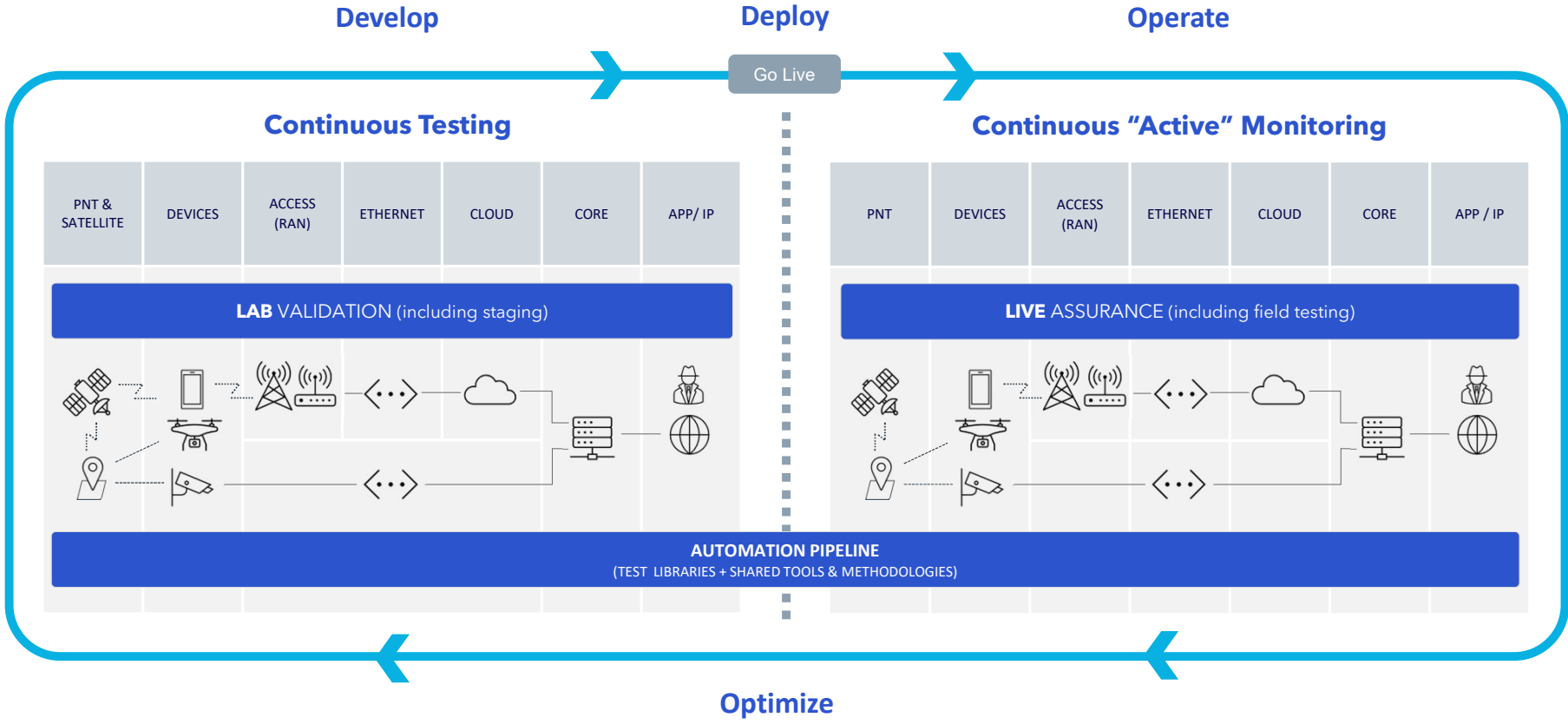
Change & Complexity

The multi-vendor, massively virtualized 5G world requires an evolution in testing methodologies

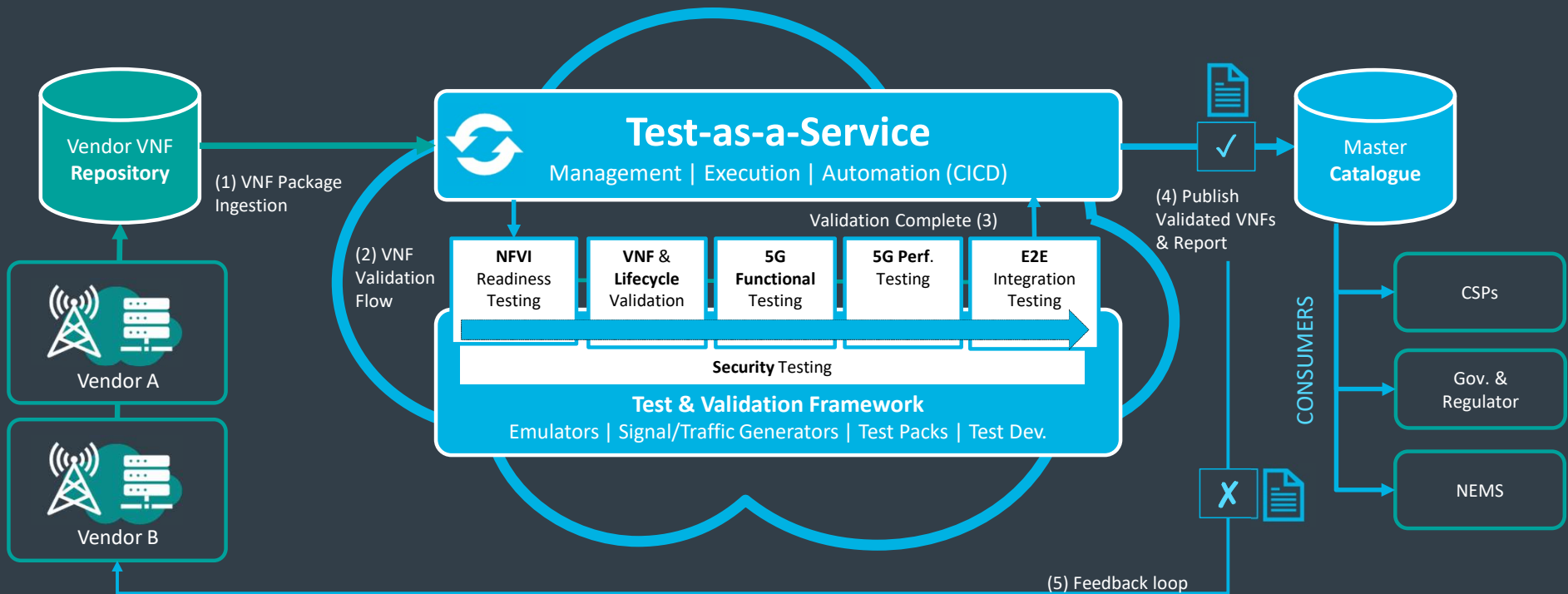


We are forced to validate SW releases, Patches & Builds at-least 60 times a month, per function

Spirent is empowering 5G through **continuous testing & monitoring**



5G | End To End Test



Validate multi-vendors | **Accelerate** time-to-market | **Reduce** capital investments
supply-chain confidence | months to minutes | >50% savings demonstrated



CASE STUDY – T1 Operator in US

Validating Compliances to 3GPP 23.501 – System Architecture for 5G

CHALLENGE

- An established operator, embarks on his journey towards deploying 5G & is over-whelmed with the tasks involved in enabling “**service-chaining**” across multiple 5G vendors thus making interoperability to 3GPP standards a challenge.

SOLUTION

- Spirent helped validate, benchmark & assess readiness of Telco’s NFVi to support VoLTE & data core workloads CPU, Memory, Storage, Network benchmarking tests

IMPACT

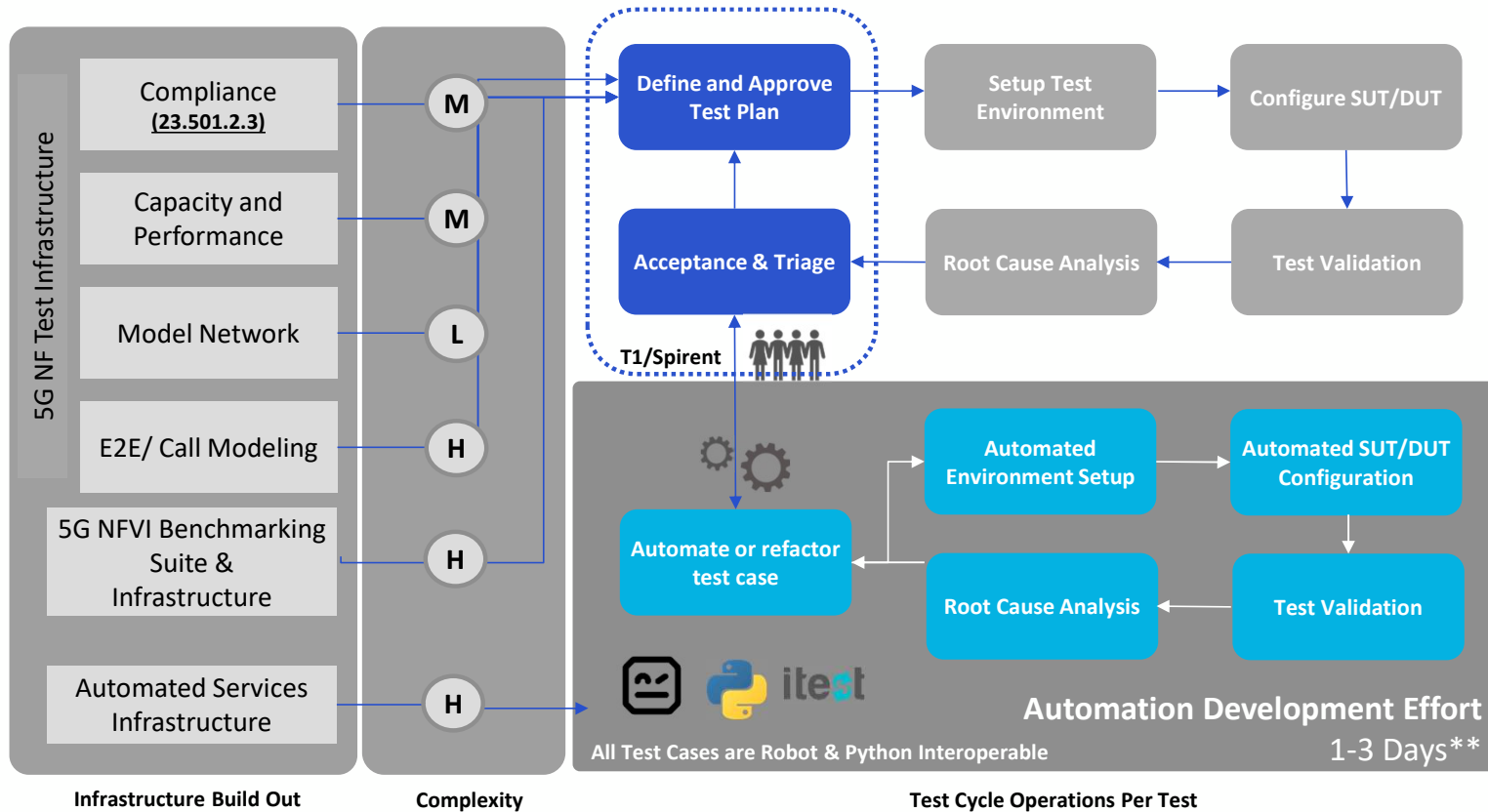
- Configuration & optimization of NFV system to ensure reliable performance
- Accelerated market deployment of 5G services:
 - TTM shortened by 6 months due to faster test cycles and quick identification of bottlenecks
 - Approx. \$2M in savings due to accelerated deployment and ability of NFVi to support millions of VoLTE and data core customers

Proprietary and confidential



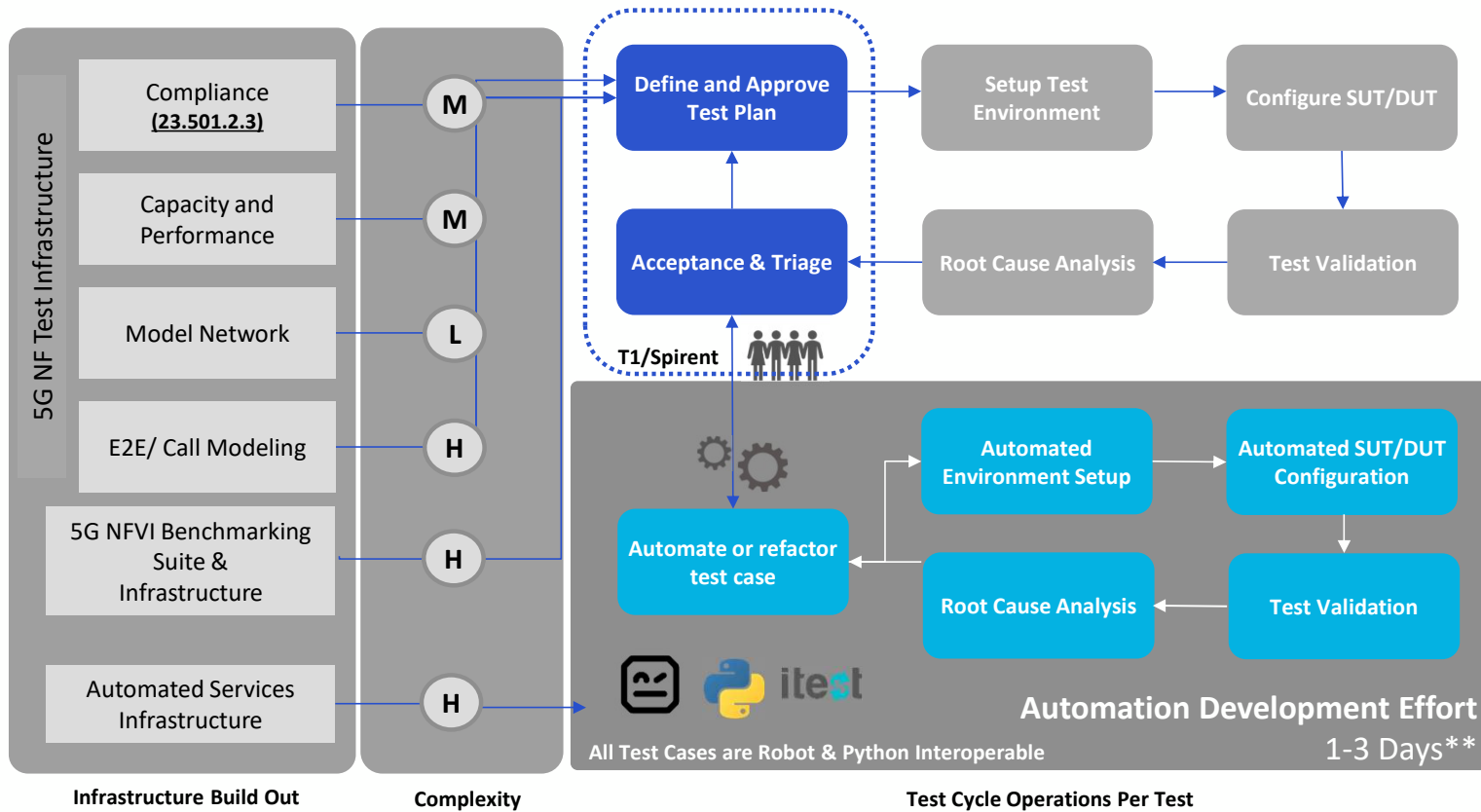
5G | Automation

Variability, Iterations, Outcomes & Risks



5G | Automation

Variability, Iterations, Outcomes & Risks



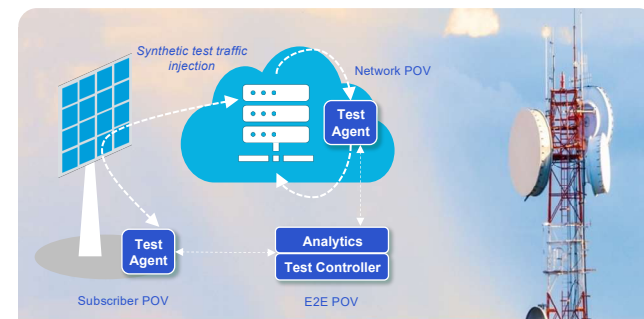
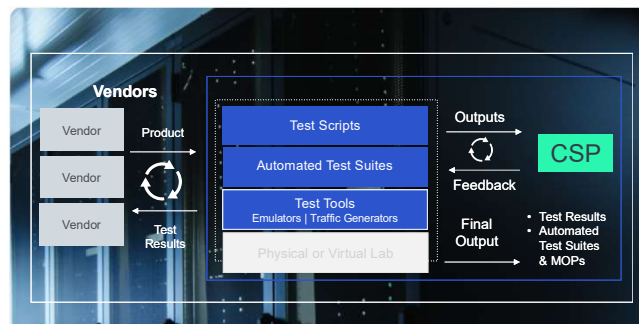
Outcomes Under Management

- 360 accepted test cases
- 360 accepted test runs
- 360 accepted test results
- 360 accepted automated tests
- 1000+ executions expected
- NFVI Benchmarking System
- CI/CD Automation Framework

Variability & Risks Under Management

- NF quality and stability
- NF performance
- NFVI iterations and issues
- 3GPP spec interpretation
- Vendor response times
- Vendors interface changes
- Multi-vendor triage

Spirent Continuous testing & monitoring in action



5G Automated Testing on the Public Cloud

- Agility:** Virtual labs hosted on Cloud infra.
- Speed:** Spun up in mins compared to weeks.
- Savings:** on HW, real-estate, people, training

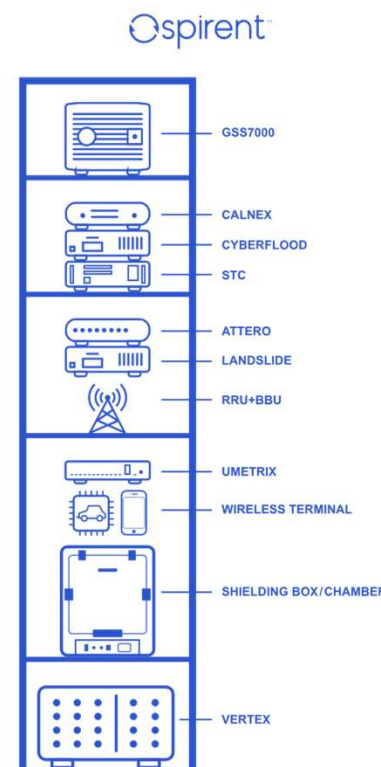
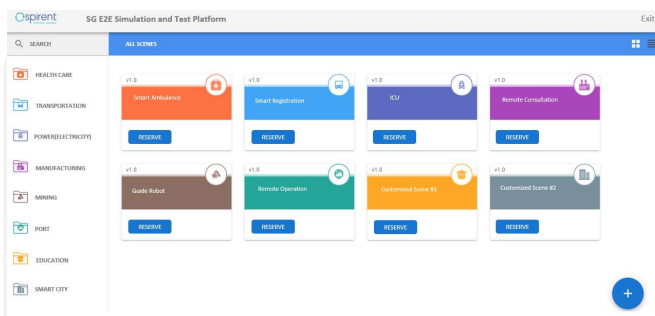
5G Continuous Testing “as a Service” for Tier-1 CSP

- 3X** ↑ acceleration in Core feature releases
- 98%** ↓ in NF regression test times (2wks to 1hr)
- 100's** of vendor defects & feature gaps identified.

5G Continuous Monitoring across Regional Tier-1 5G network

- E2E** visibility with active test agents
- Automated** troubleshooting using active tests
- 75%+** reduction in MTTR.

Empowering future innovation



5G Automated Research Lab
with Academia

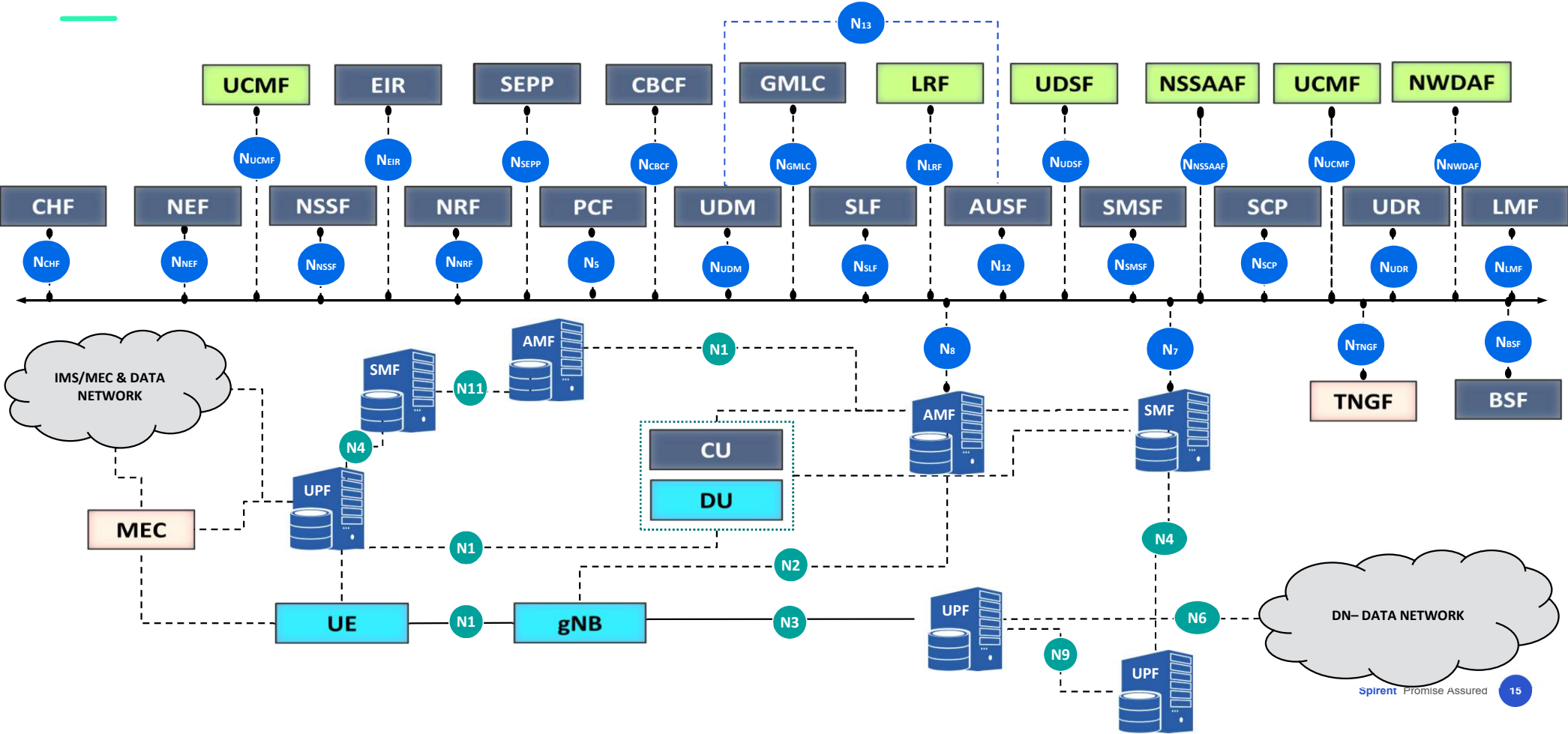
- ✓ Network slicing configs & performance
- ✓ Network load models & impairment impacts
- ✓ Wireless propagation models

5G Network Digital Twin
with Government, Military, Academia & SI's

- ✓ Network slicing configs & performance
- ✓ Network scaling & resilience models
- ✓ Security efficacy & mitigation models

Empowering test environments with **realistic** Network & Traffic Emulation to **accelerate innovation.**

5G Nodes | 3GPP



Market Challenges and Spirent's Solutions

Time to Market



The race is on to deploy 5G technology



Accelerate time-to-market by 60%, while achieving 80% savings

5G Expertise



Lack of 5G resources for core testing



Leverage Spirent's 5G expertise and experience in global 5G ecosystems

Vendor Neutral



Require objective, vendor-agnostic validation



Test with confidence to assure 5G core accurately, without vendor bias

Driving Tangible Value

60% ↓



Decrease time to revenue
for new products &
services

80% ↓



Reduce costs with pre-built
test libraries and
automation

95% ↓

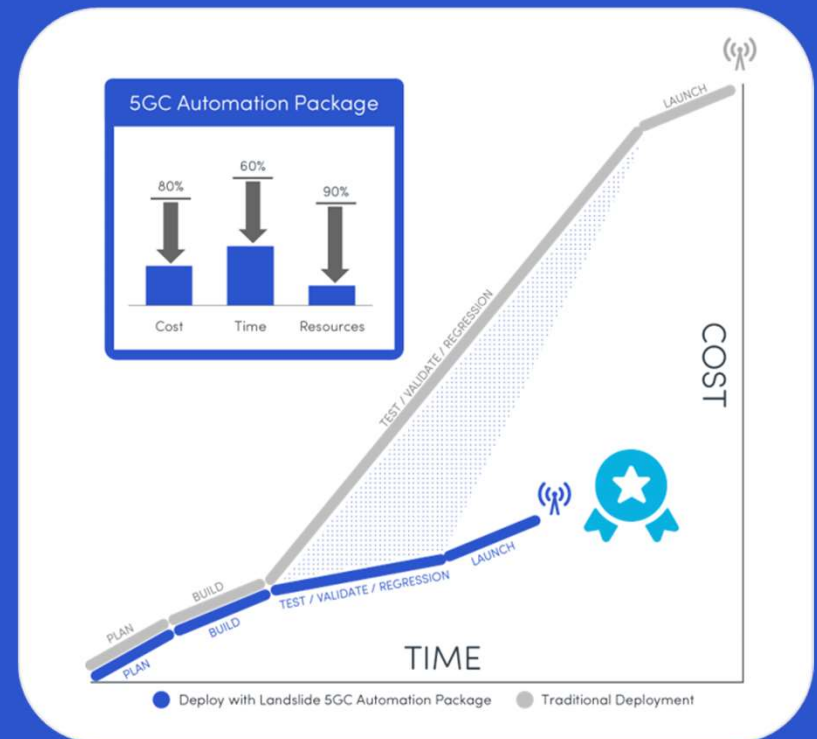


Avoid costs by finding issue
in the lab vs. the live
network

Value Delivered

- Leverage industry experts
- Accelerate test development and automation
- Develop differentiated solution offerings
- Launch quickly and with confidence
- Create new revenue streams
- Dramatically reduce costs and risk

Over an 18-month period, customers can expect to save an average of \$2.7M in resourcing and test case development and management



Spirent | Test Expertise

Our innovative solutions are built on a foundation of deep technology expertise



5G



Cloud



High-Speed Ethernet



Security



PNT



SD-WAN



Wi-Fi 6





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