

T1A Tutorial: Software Solutions for Carrier Grade Open Platforms

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Need for a Open Carrier Grade Platform

2x

Software content in devices and equipment is doubling every two years.

IDC

66%

Device software projects are completed over budget.

EMF

33%

Deployed devices do not meet functional, performance or robustness requirements.

EMF

25%–50%

Deployed devices failures are due to software faults.

Network Strategy

Advantages of a Carrier Grade Open Platform

- Gives Equipment Providers a head start
- Reduce development cycles and costs, and extend platform life
- Enable the R&D shift from network equipment 'plumbing' to high-value applications
- Provide the foundation for:
 - high availability
 - low maintenance costs
 - secure and high performance NGN equipment

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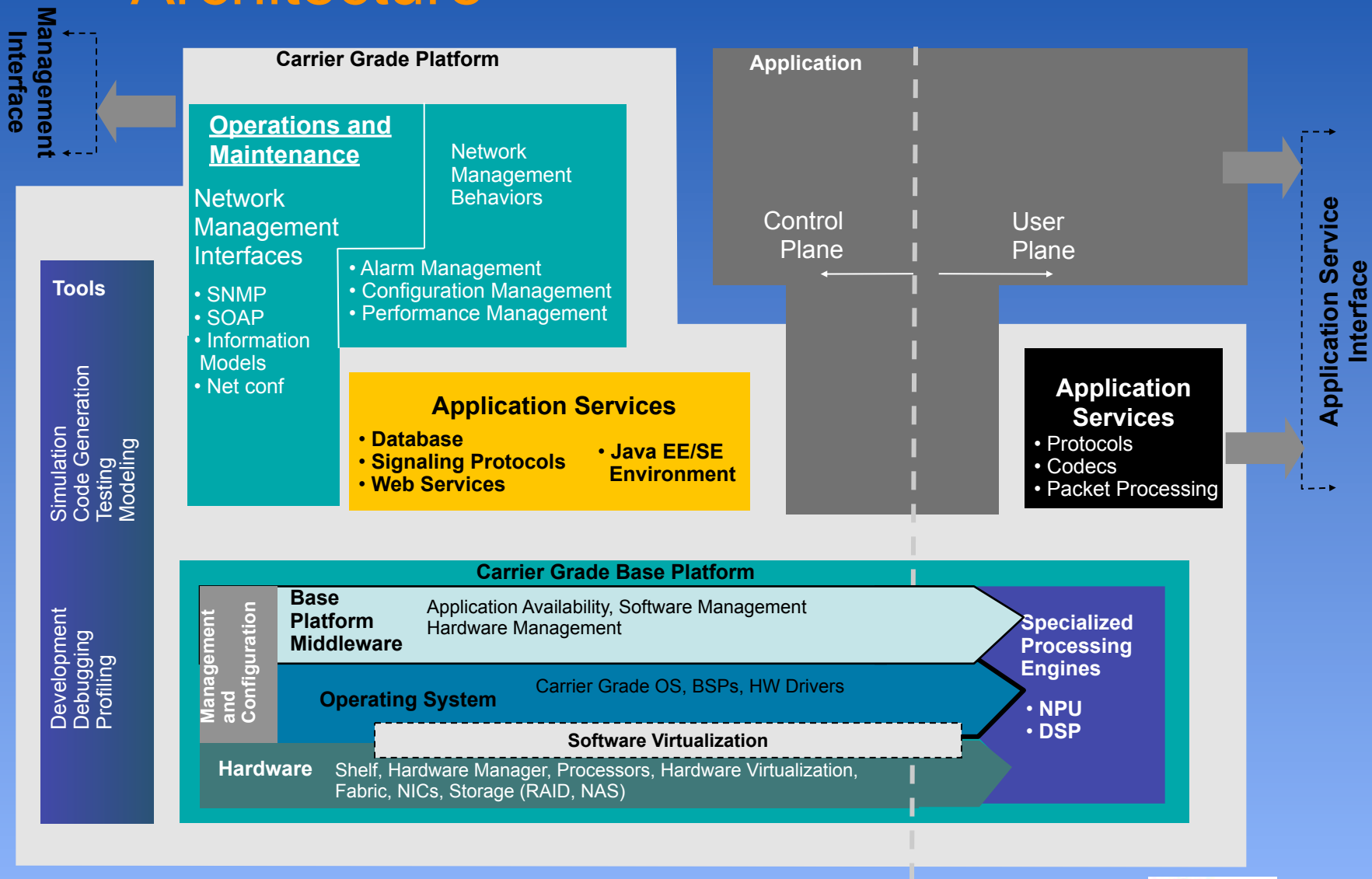
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- High Performance
- Secure

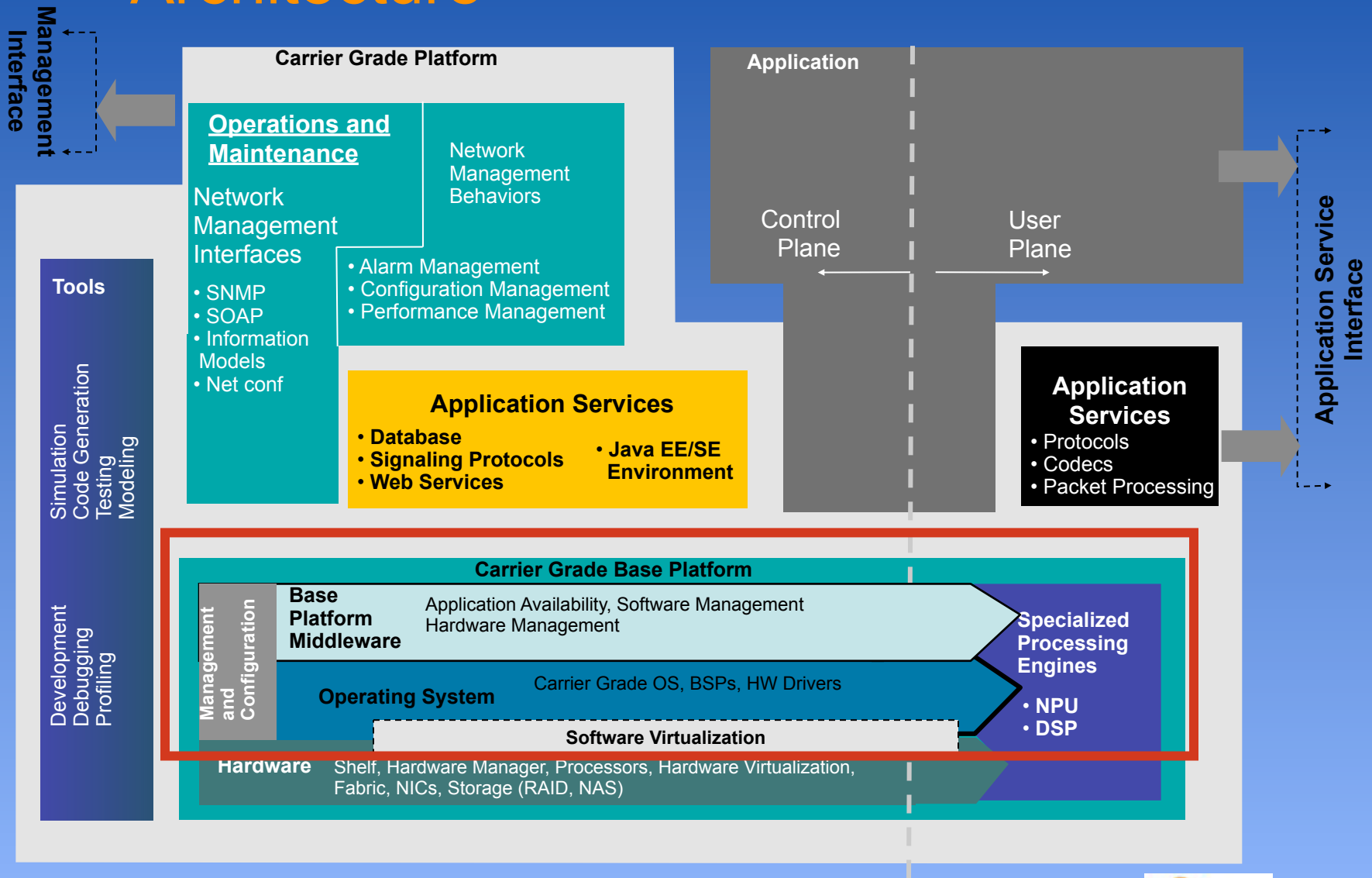
SCOPE-Alliance Reference Architecture



SCOPE Alliance Carrier Grade Platform Reference Architecture Version 1.4, April 2007

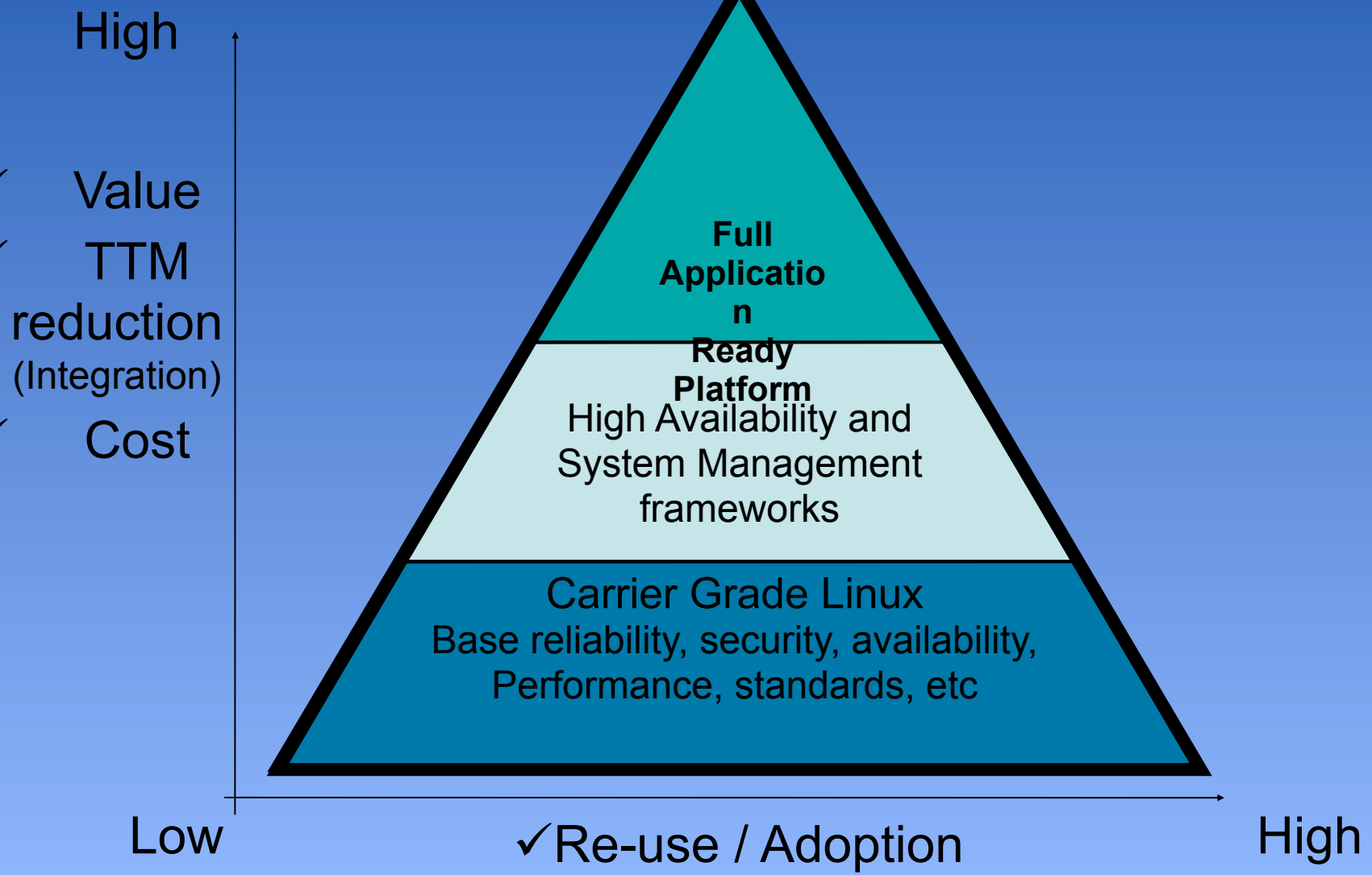


SCOPE-Alliance Reference Architecture

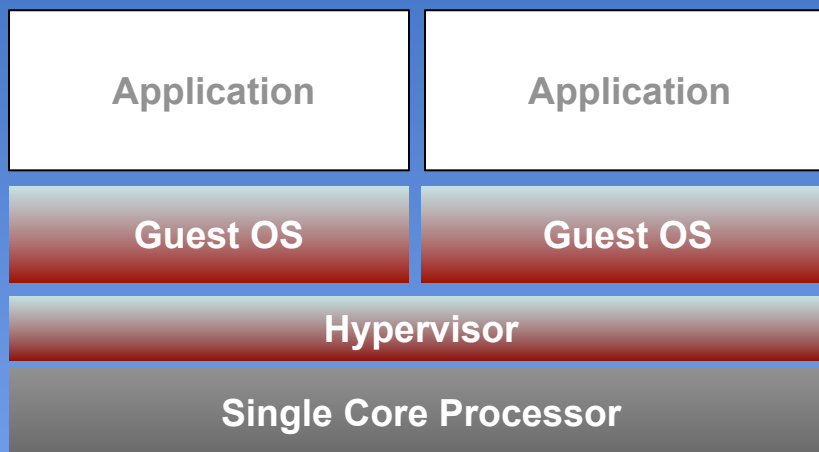


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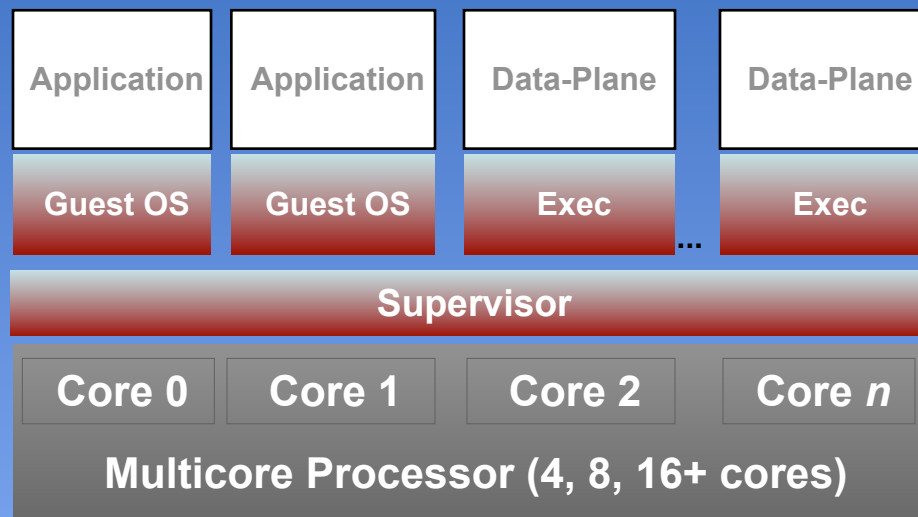




Consolidation



Performance



Carrier Grade Linux

- Cross-Build System
- GNU GGC 4.x cross toolchain
- Automated patching and packaging
- Open and extensible build system framework

IDE, Development Tools And Build System

Development Tools

- Source-code analysis
- Cross debugging
- Target management
- Advanced source-code analysis
- Advanced editor
- System analysis, trace, profiling
- Root FS package composition
- Root FS deployable image creation
- JTAG on-chip debugging
- Linux core file analysis
- Wind River Diagnostics (optional)

CGL and SAF High Availability

- evlog, heartbeat, ifenslave,
- ipmitool, openipmi, openhpi,
- openais

Carrier Grade File System

Storage and File Systems

- RAID-0 and RAID-1
- High Performance File Systems
- Journaling file systems

CGL Kernel

- Up-to-date Linux kernel
 - O(1) scheduler
 - SMP CPU affinity
 - Preemptive kernel
- Preempt real-time
- Robust mutex support
- High-resolution timers
- Priority Inheritance and Fast user-space mutexes
- Persistent device naming
- TIPC messaging
- USAGI IPv6 & MIPv6

Carrier Grade Linux Kernel

IP Networking

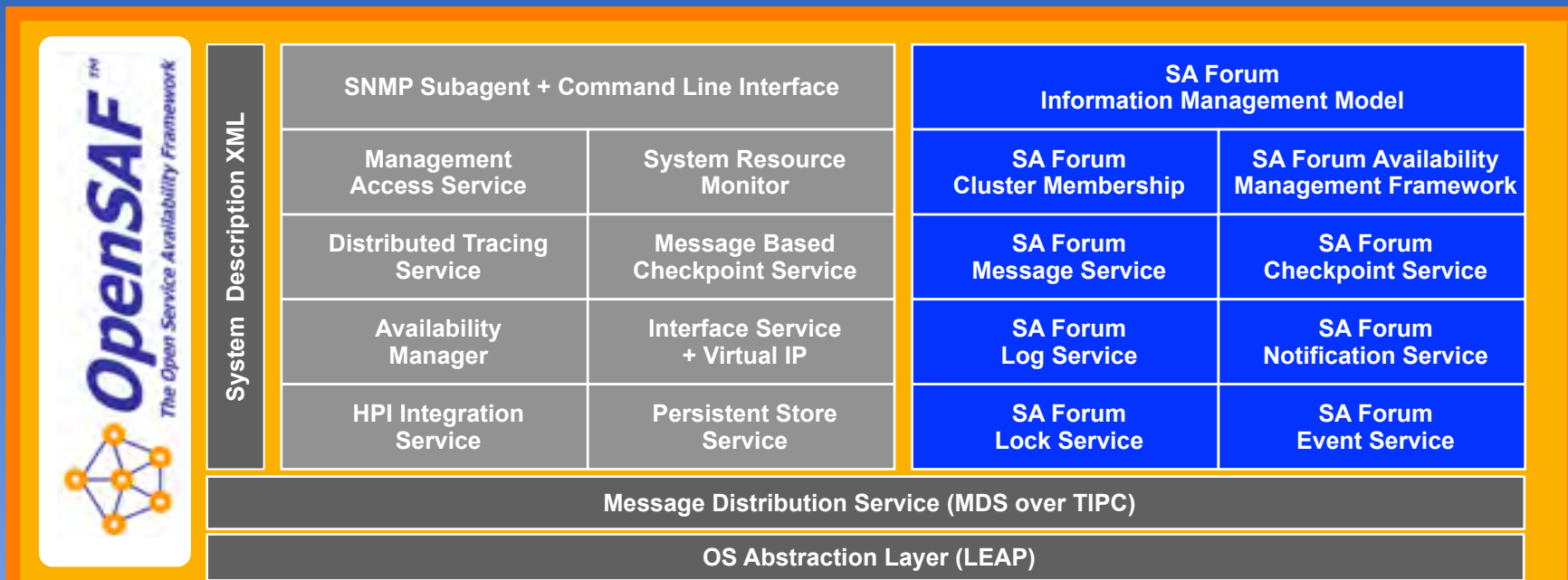
- Full-featured IPv4/IPv6 platform
- BGP, DHCP, FTP, HTTP, NFS, NTP,
- RARP, RIP, SCTP, Telnet, TFTP,
- OSPF, PPP, PPPoE, VLAN, SNMP
- v1/v2c/v3, HTTP server

Security

- Usagi IPsec, IKE, SELinux, SSL, SSH, Firewall

HA and System Mgmt Middleware - OpenSAF

High Availability Applications

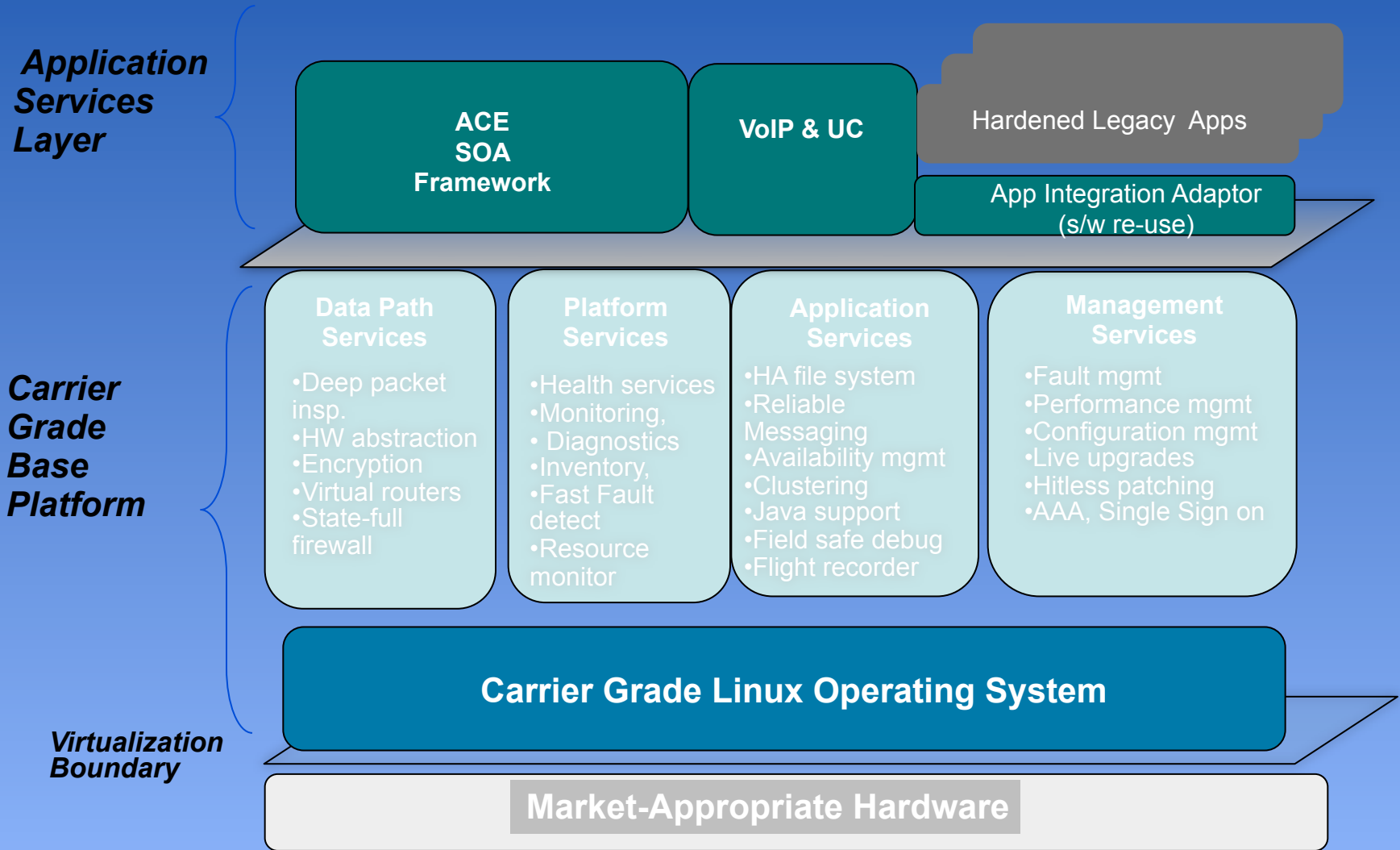


Operating Systems (Linux, Solaris, etc)

Hardware Platforms (aTCA, blade server, rack mount, etc)

Comprehensive and Evolving Solution in Open Source

Carrier Grade Application Ready Platform Example



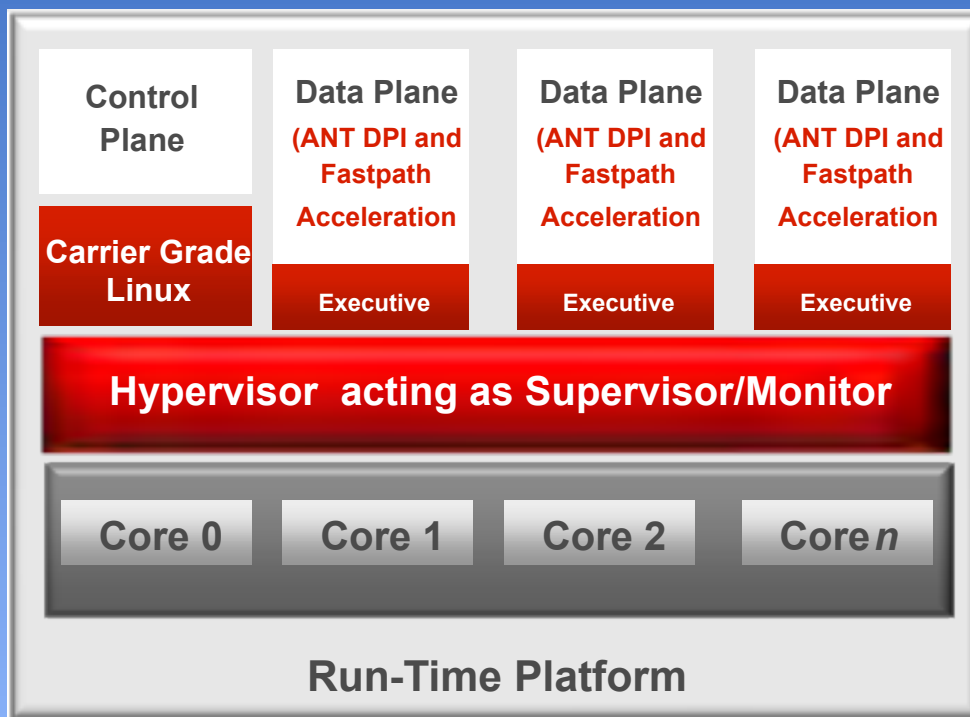
Next Generation Carrier Grade Data Plane Solution

Characteristics

- Performance focused or consolidation
- Scalable protection/isolation via supervisor
- System partitioned

Benefits/Value

- Legacy reuse
- Scalability
- Multi-OS (specialized, innovation)
- Reliability (Isolation/Restart)



Business Challenges of Delivering a Carrier Grade Platform

Quality

Too many defects are getting to market

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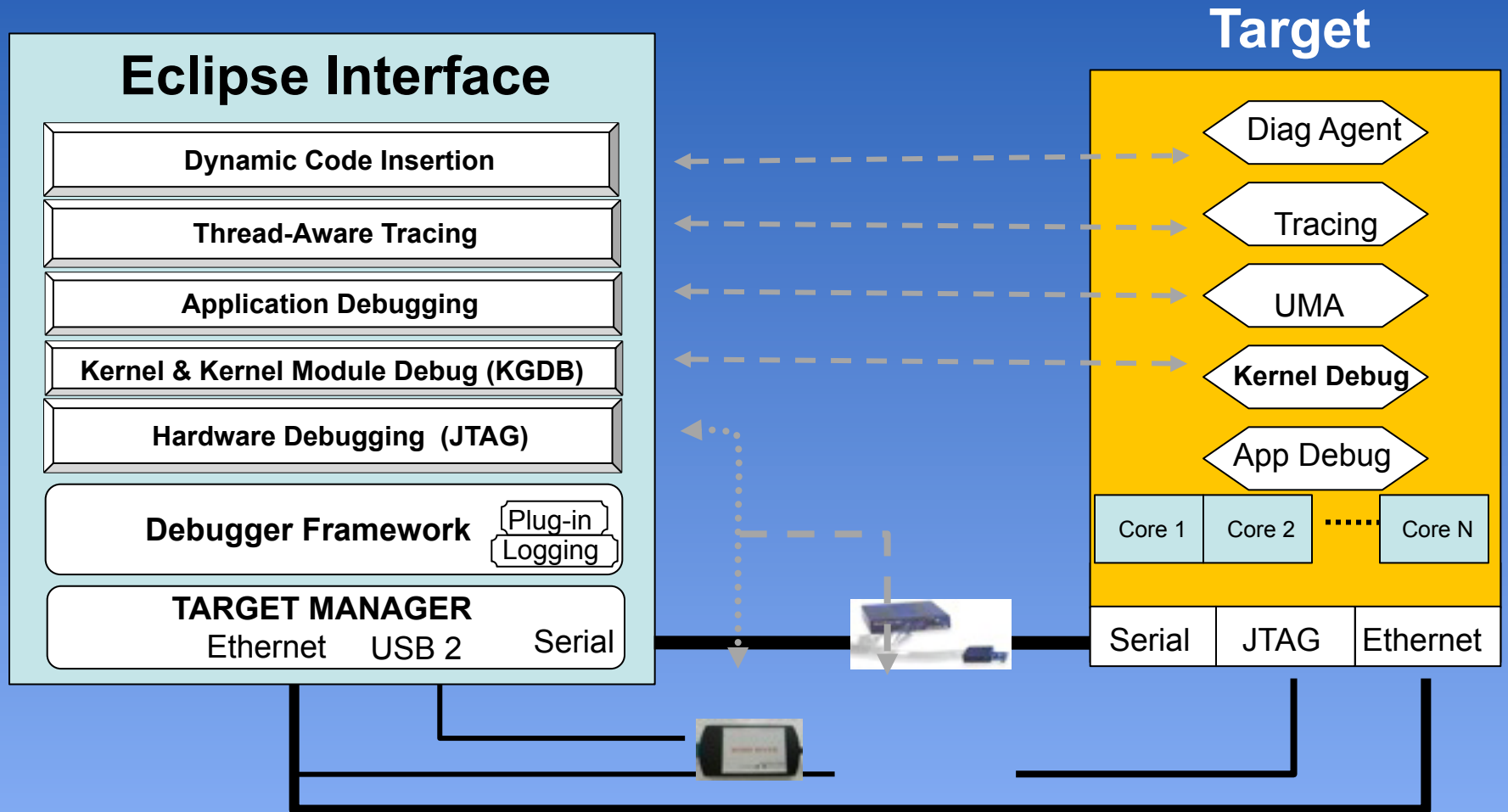
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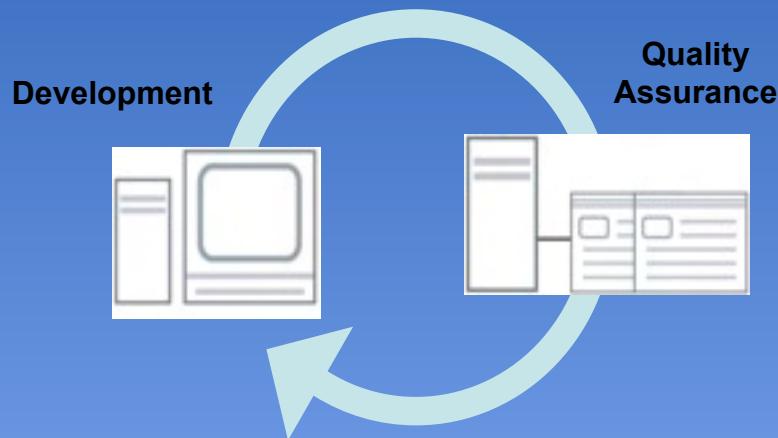
Complexity

Increasingly difficult to test and diagnose devices

Comprehensive Development Tools for Carrier Grade



Real-time, Dynamic Testing for Carrier Grade



- Coverage tests
 - Comprehensive testing of software
- Performance tests
 - Profile function execution
- Resiliency tests
 - Inject faults at any point in the application

- Increase product quality
 - Increasing test coverage of executing binaries
 - Tuning of software to increase performance
 - Detecting more software bugs before deployment

NOT Carrier Grade Testing

Limited Access to Device Internals at Runtime



NOT Carrier Grade Testing

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'Device'
Under
Test



'Black box' Test
Observation

Limited Analytics

Monolithic
Test Bed

Carrier Grade Tools and Testing

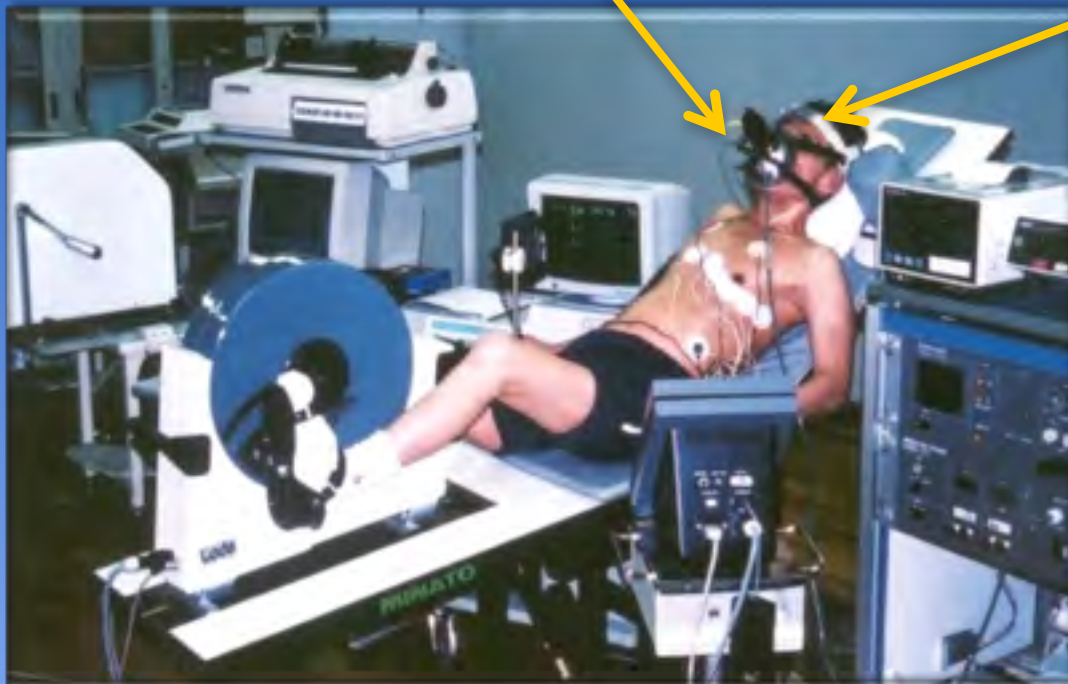


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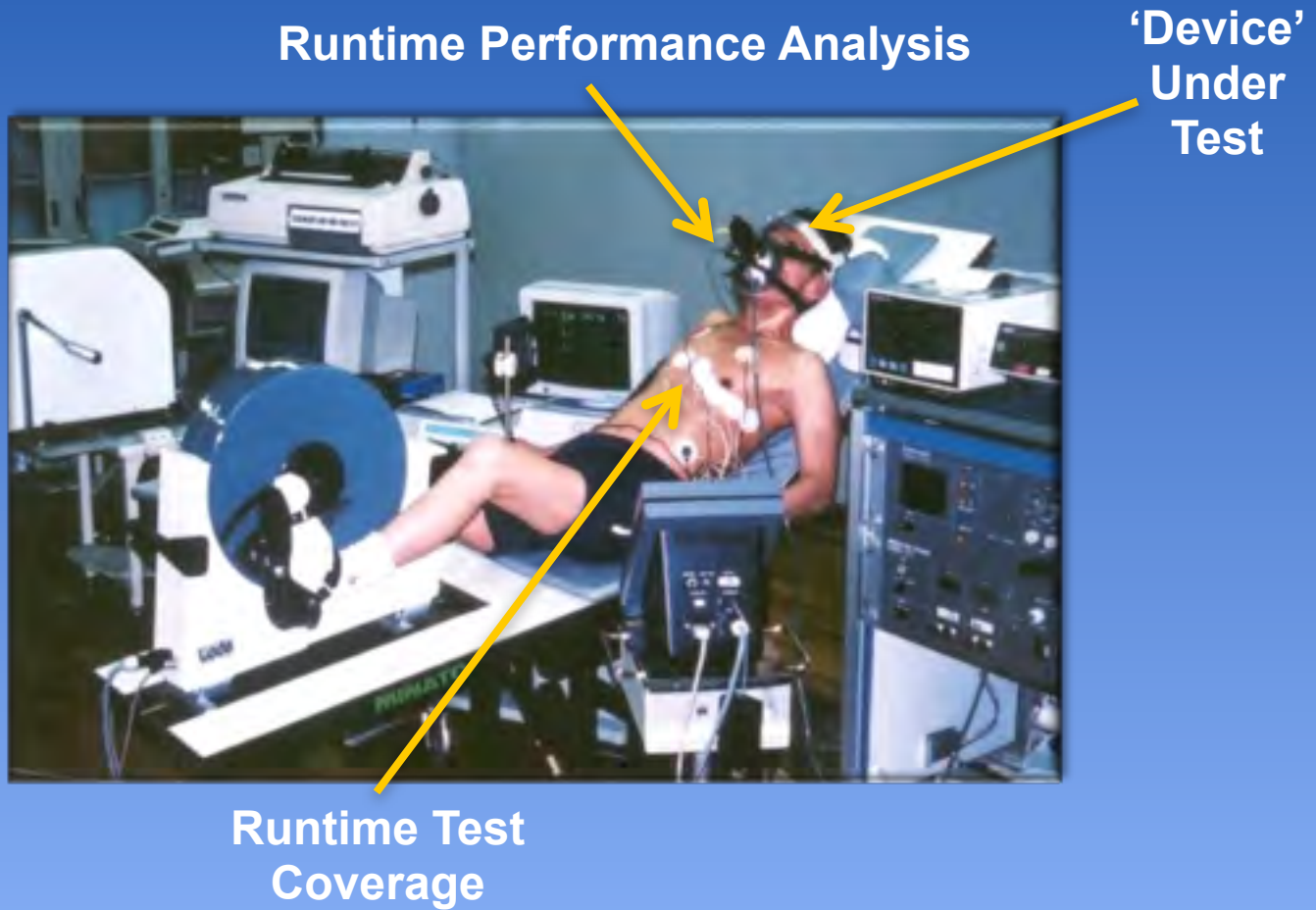
Carrier Grade Tools and Testing

Runtime Performance Analysis

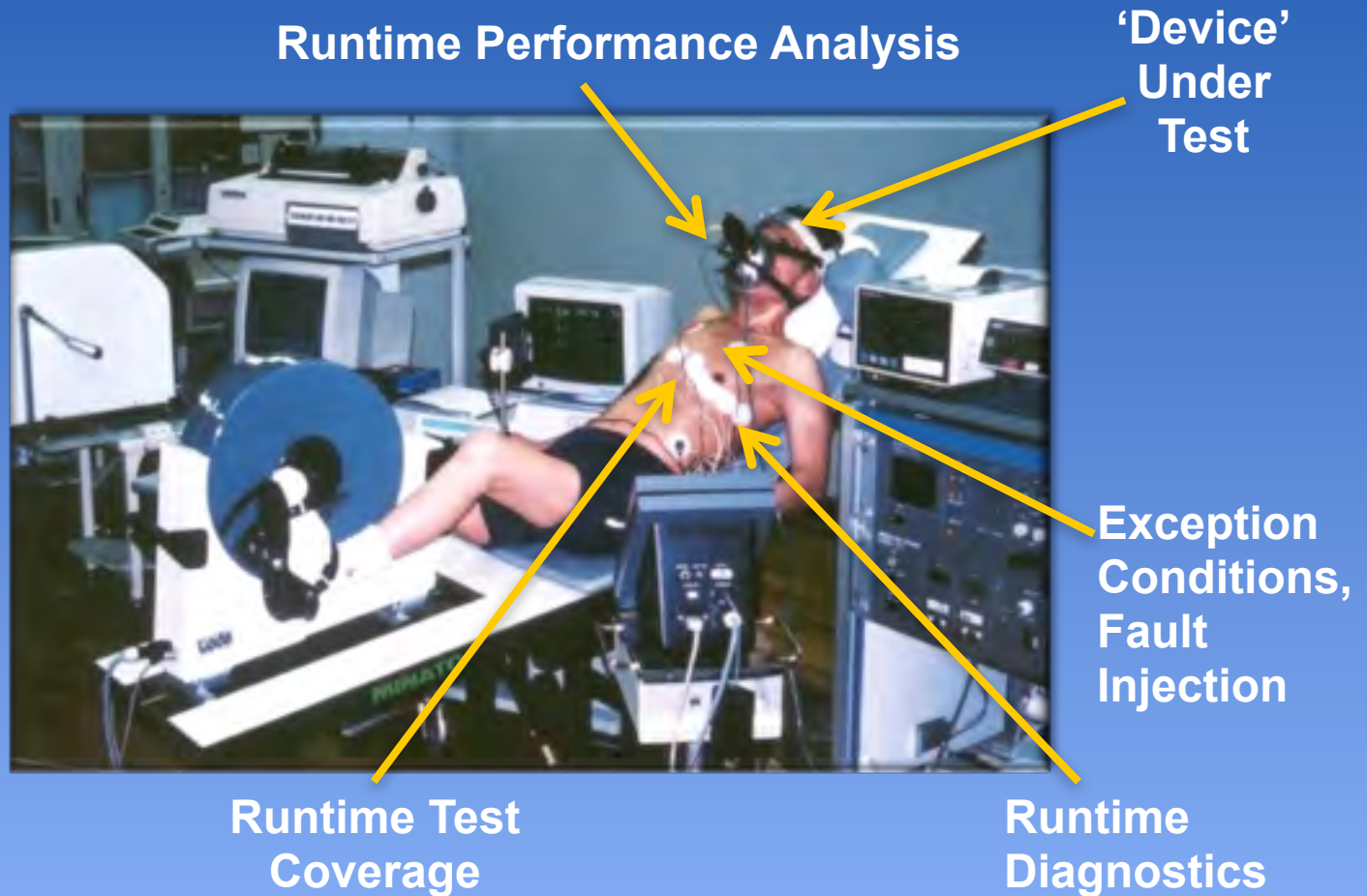
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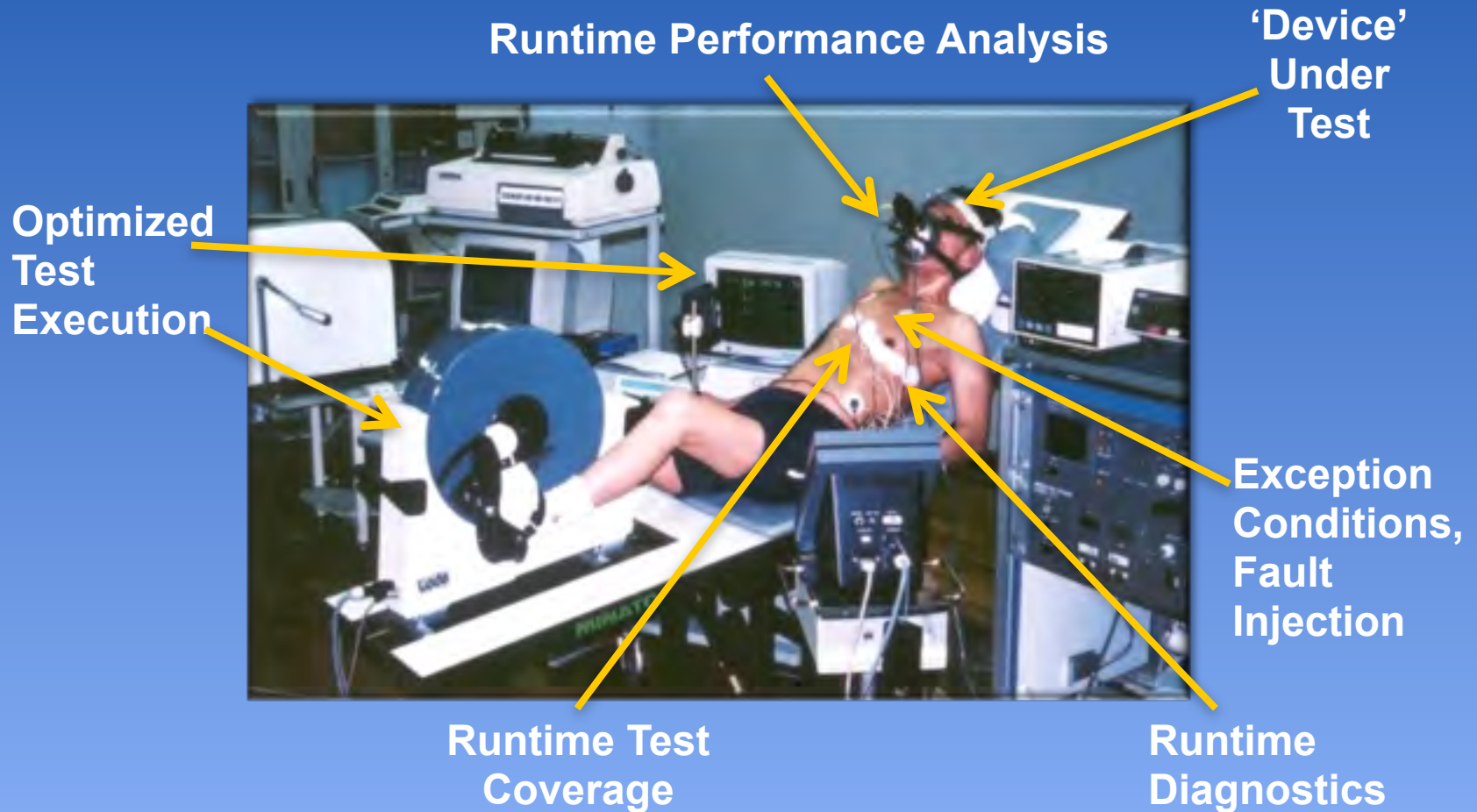
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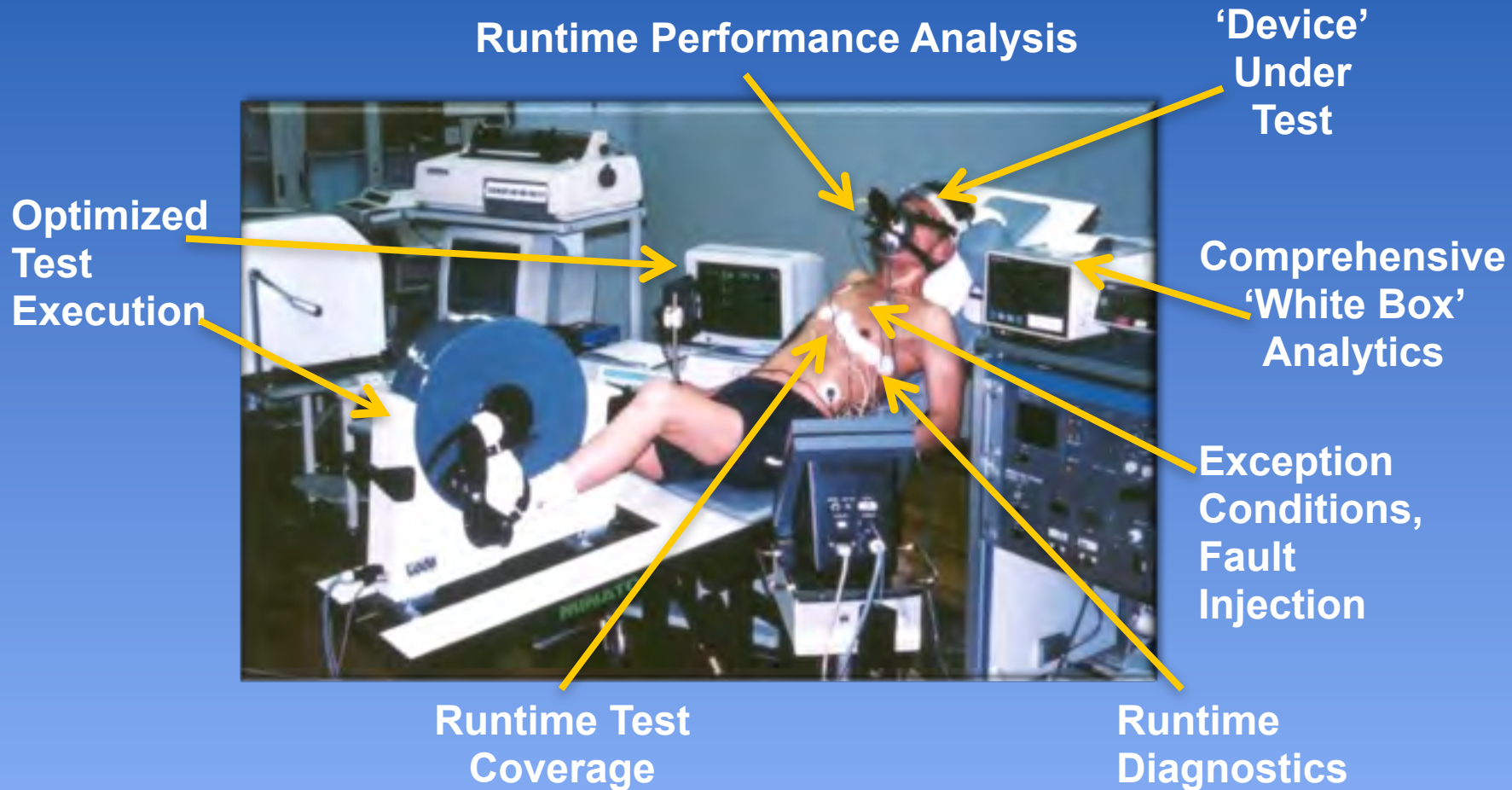
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Carrier Grade Tools and Testing



Carrier Grade Tools and Testing



Summary

Open Platforms are Key to Success

- Create Market differentiating products
 - Exploit the latest software technology to maximize performance
- Faster Time-to-Market
 - First to market creates strategic and financial advantage
 - Take advantage of pre-built, pre-tested, best of breed software
- Reduced Development Costs
 - Focus on application development, not infrastructure

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