

# Carrier Grade Linux and VxWorks

A Complete Solution for Next Generation Telecom Systems based on ATCA and AMC Hardware

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Wind River Systems



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# Telecom Market Pressures

Companies are supporting multiple OSes and multiple development environments

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Shorter development cycles driven by requirements of Service Providers, but fewer staff

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Rapid updating of in-service equipment to address new service demands and security threats



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## The Development Process is Broken

When teams working on same project use processes, tools and vendors that are incompatible with other teams, it impacts 3 critical areas:

COST	TIME	QUALITY
<ul style="list-style-type: none"> <li>Increased training, IT support and integration</li> <li>Multiple licenses, vendors and contracts</li> <li>Increased headcount</li> </ul> <p><b>62%</b> R&amp;D budget spent on software and vendor management</p>	<ul style="list-style-type: none"> <li>Delays due to integrating and troubleshooting incompatible tools sets</li> <li>QA time multiplied</li> </ul> <p><b>24%</b> Projects canceled due to unrecoverable slip in schedule</p>	<ul style="list-style-type: none"> <li>Cannot efficiently share code and track errors</li> <li>Difficult to track multiple projects at different phases</li> </ul> <p><b>33%</b> Produced devices <i>do not</i> meet functionality or performance requirements</p>



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## The Development Squeeze

- Crossover competition driving short market windows
  - ISPs, cable MSOs, mobile, & wireline carriers
- But, many TEMs and NEPs downsized engineering staff during the downturn
- COTS hardware allows vendors to focus on differentiating value add
  - Advanced Telecom Computing Architecture (ATCA)
  - Advanced Mezzanine Card (AMC)
- But software is still the critical path!



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## Quick to Market, Quick to Upgrade

- Bit transport is a zero-margin business
  - The profits are in advanced services, which are heavily software based
- Carriers demand the ability to quickly deploy new service features on existing network equipment
- Security threats demand immediate patches to ensure network integrity
- Vendors must supply easily upgradeable software platforms



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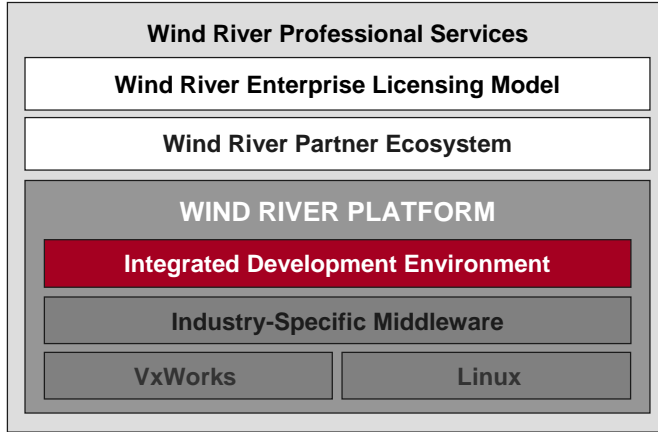
## Wind River Mission

Wind River enables companies  
to **develop** and **run**  
telecom software  
**faster, better, at lower cost**  
**and more reliably**



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# Wind River's DSO Offering

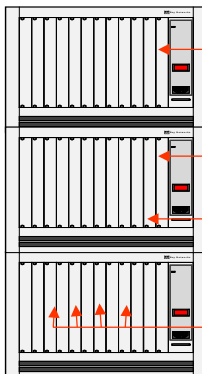


Wind River enables companies to develop and run device software faster, better, at lower cost, and more reliably.



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# Enabling Advanced Telecom Systems



**OA&M Card**  
- Platform NE – Linux Edition  
- Legacy UNIX management app support; HA; advanced file systems

**Shelf Controller Cards**  
- Platform NE – Linux Edition  
- SMP scalability, UNIX apps, HA, advanced file systems

**Backplane Switch Fabric Card**  
- Platform NE – VxWorks Edition  
- Footprint; responsiveness

**Line Cards and Modules**  
- Platform NE – VxWorks Edition  
- Smaller footprint, reduced cost; responsiveness; legacy application re-use

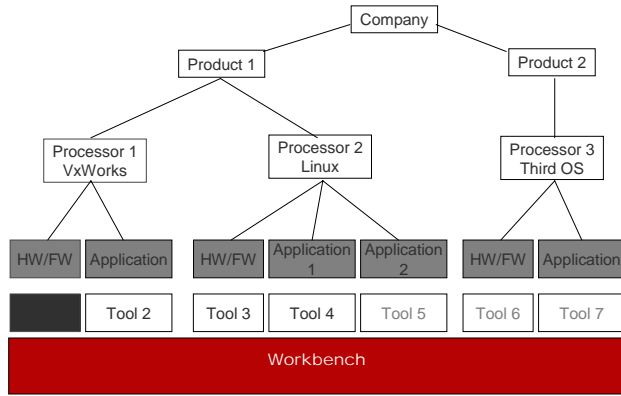
**ALL DEVELOPED AND TESTED WITH A COMMON DEVELOPMENT ENVIRONMENT - WORKBENCH**



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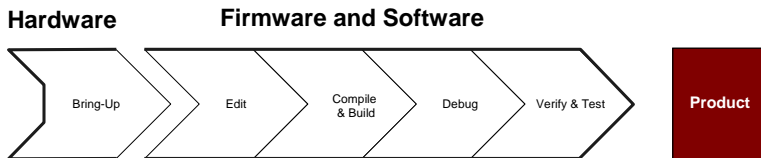
# Standardization Across the Enterprise

- The Workbench Solution**
- Appropriate capability for each developer, task and phase
  - Capabilities to bridge gaps between tasks
  - Extensibility and scalability
  - Increased collaboration, reuse, and flexibility
  - Increased return on acquisition and training investments
  - Requires broad target task, OS and processor support



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# Wind River Workbench



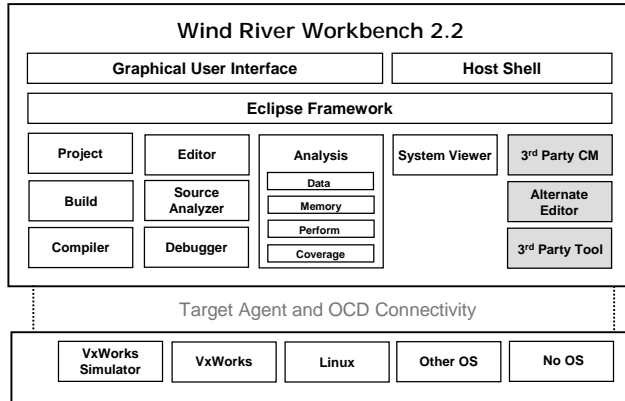
- Bring-Up**  
High performance On-Chip Debug with specialized views, and full access to processors, peripherals, and buses
- Edit**  
Full-featured editor, integrated with powerful code analysis and debugging; or use any Eclipse integrated editor
- Compile and Build**  
Open, flexible, and scalable build environment with Eclipse-based CM integration and support for compiler choices
- Debug**  
Multiple context device SW debug with bit, assembly, source, object, and target OS specific capability operating in kernel and user mode
- Verify and Test**  
Dynamic, interactive views of system events, data, memory use, performance, SW execution, and test coverage



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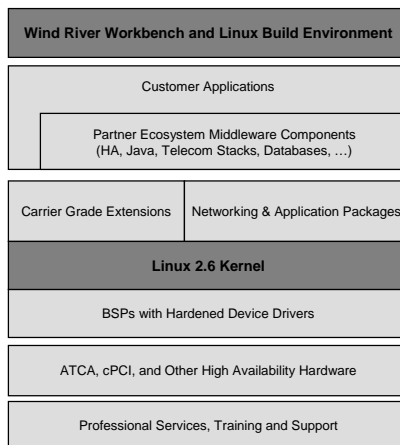
# Wind River Workbench

- Highly optimized environment for developing VxWorks 6.0 and Linux device software
- Makes debugging, porting and bring-up of VxWorks 6.0 and Linux devices more efficient
- Easily customizable and extensible with 3rd party plug-ins via the Eclipse framework



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# Platform for Network Equipment - Linux Edition

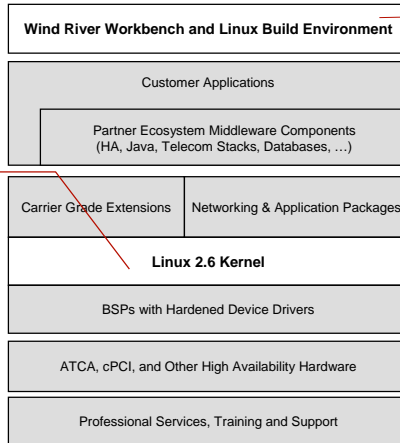


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## Platform for Network Equipment - Linux Edition

### Linux 2.6 Kernel

- Stable, pre-built & validated 2.6 kernel
- O(1) scheduler with SMP CPU affinity
- Preemptive kernel
- Native Posix Thread Library (NPTL)
- High-Resolution Timers
- Fast User-Space Mutexes
- Security module interface for fined grained security



### IDE

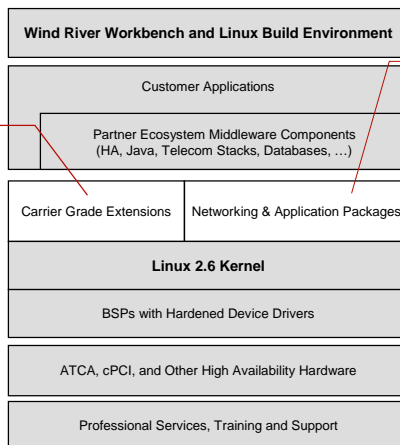
- Eclipse 3.0 Framework
- Fully integrated, open and extensible
- Innovative debugging infrastructure
- Facility and configuration tools
- Source code analysis
- Target Manager
- Integrated Editor
- GNU GCC cross-tool chain and utilities
- Cross-development package collection, build, management
- Root File system Creation tools
- Kernel and package configuration tools
- Automated package updates



## Platform for Network Equipment - Linux Edition

### Carrier Grade Extensions

- POSIX CGL features
- Persistent device naming and device hot-plug
- Panic handler enhancements and event logging
- Intelligent Platform Management Interface (IPMI)
- Hardware Platform Interface (HPI)
- Heartbeat monitor
- Ethernet link aggregation and failover

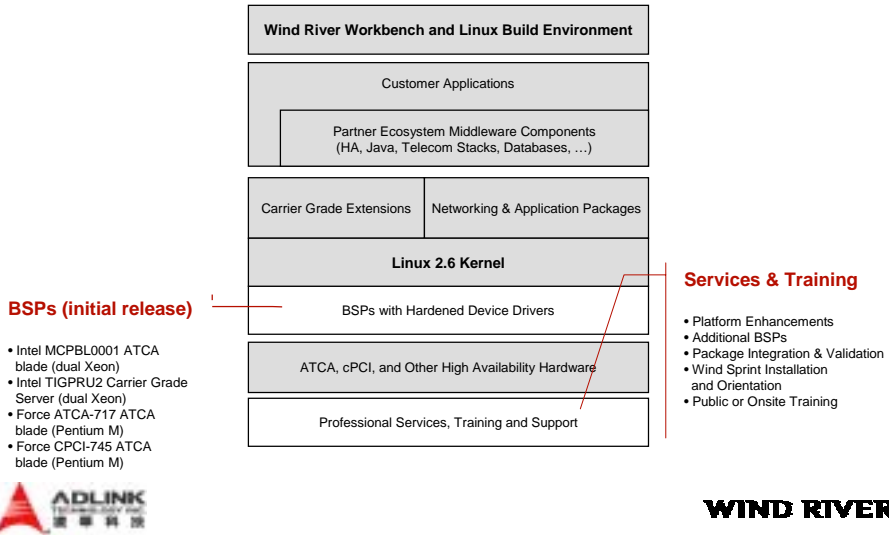


### Networking & Application Packages

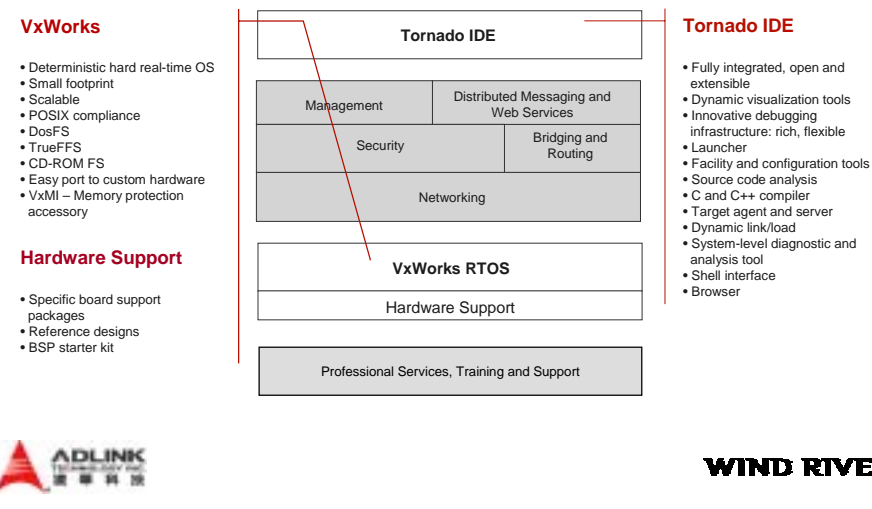
- **Storage:**
  - RAID-0 (striping) and RAID-1 (mirroring)
  - High Performance Filesystems (ext2, ReiserFS)
  - Journaling filesystems (JFFS2, ext3)
- **IP Networking:**
  - Full featured IPv4/IPv6 platform
  - DHCP, NFS, FTP, NTP, RARP, SCTP, Telnet, TFTP
  - BGP, HTTP, RIP, OSPF, PPP, PPPoE, VLAN
- **Device Management:**
  - WindManage SNMP v1/v2c/v3, Web Server
- **Security:**
  - SSL, SSH, Firewall



## Platform for Network Equipment - Linux Edition



## Platform for Network Equipment - VxWorks Edition

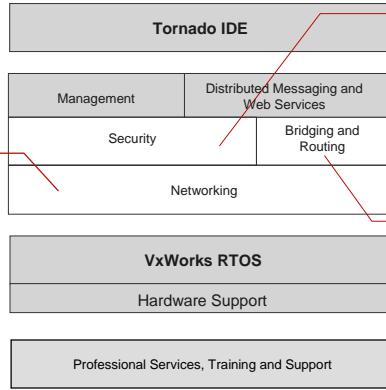




## Platform for Network Equipment - VxWorks Edition

### Networking

- IPv4/IPv6, IPv4 standalone
- Remote Access framework for multiple instances of:
  - PPP
  - PPPoE
  - Multilink PPP
- Wireless LAN
- 802.1p/Q tagging
- NAT



### Security

- IPsec and IKE
- Firewall
- SSL/TLS
- Security Libraries
  - (Crypto Library, Digital Certificates)
- RADIUS Client
- 802.1X and 802.11i

### Bridging & Routing

- Learning Bridge
- OSPFv2/v3
- RIP/RIPng

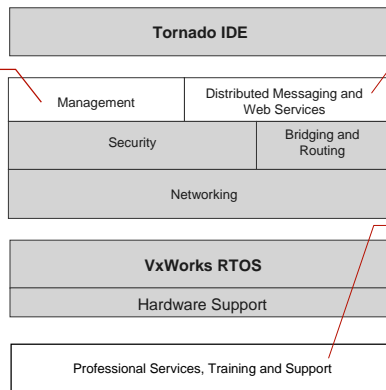


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## Platform for Network Equipment - VxWorks Edition

### Management

- Scalable, small footprint framework
- SNMP
- Web Server
- CLI
- MIBway
- Management Integration Tool



### Distributed Messaging & Web Services

- Open standard, transparent inter-process communications (TIPC)
- XML/SOAP

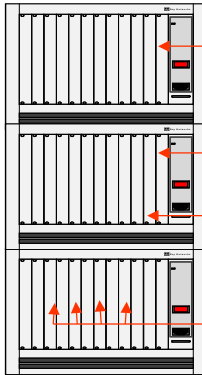
### Support & Training

- Quick start training
- On-site training
- Worldwide technical support
- Online support
- Access to updates, patches & major upgrades



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## Summary

### Device Software Optimization

Minimize the **inefficiencies** and complexities  
of the telecom software development process

Maximize the **reliability, security, and interoperability**  
of the telecom software production environment

Accelerate the **standardization** of telecom software development,  
release, and **enhancement** across **multiple environments**



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