Modular Communications Platforms

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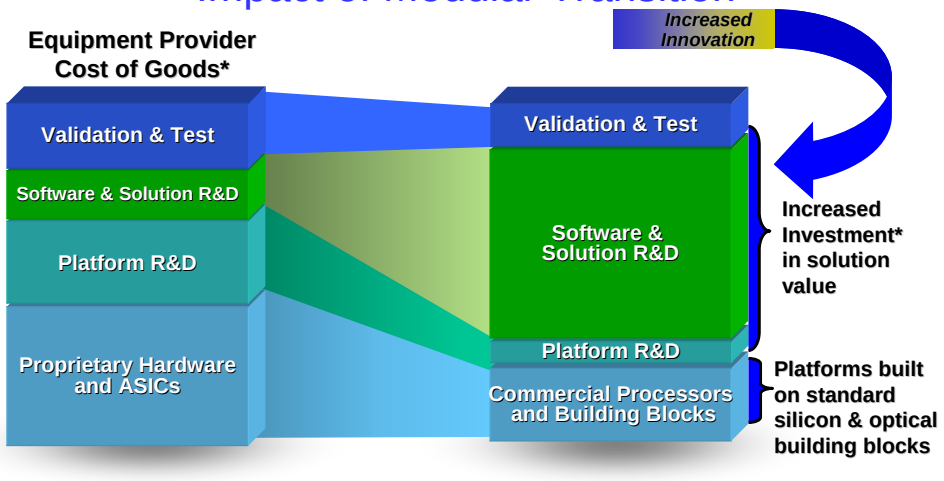
Impact of Modular Transition



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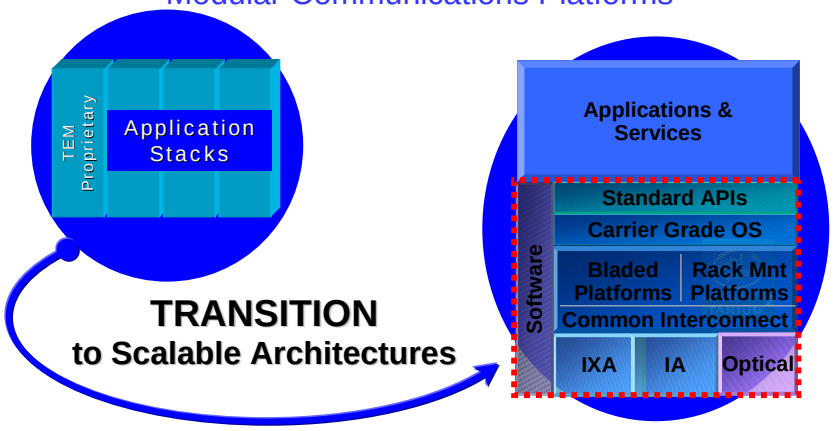
*Actual Investment will vary –
conceptual chart based on Yankee Group report, 2/03

Modular, Scalable, Flexible

Modular Communications Platforms



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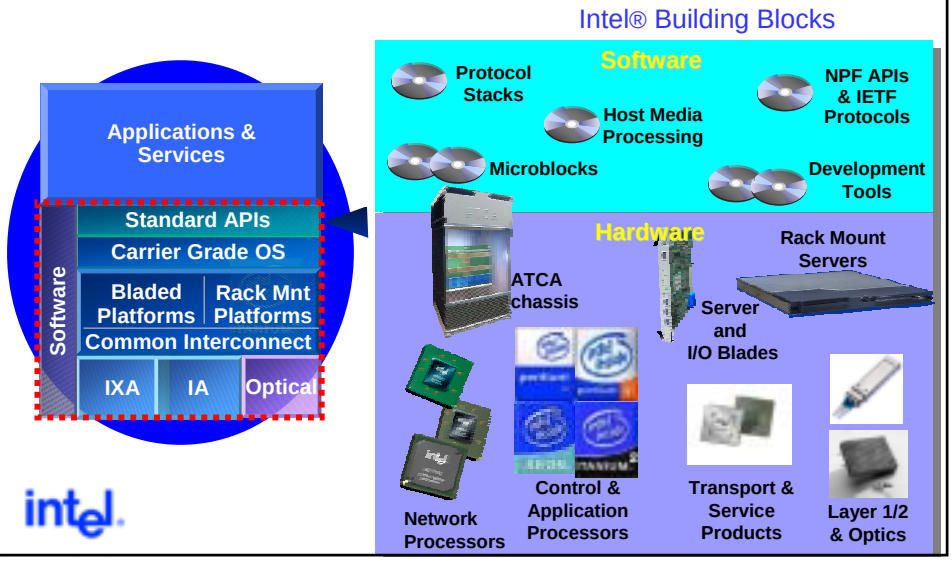
Modular Platform Building Blocks



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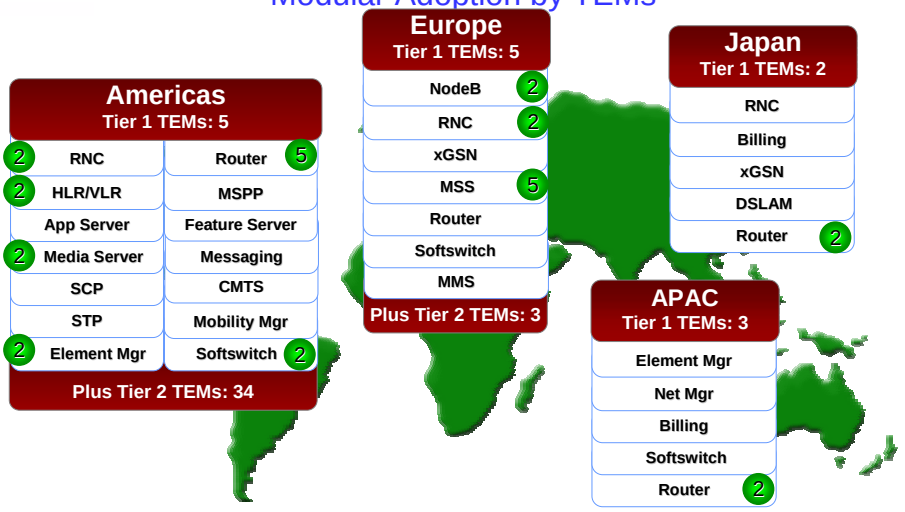
Modular Adoption by TEMs



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Modularity Support from Service Providers

"A platform based on standardized components can be from 30 to 60 percent less expensive…and there is more software available from third parties."
Ismael Cortazar
Director
*Telefonica**
Telefónica

"Network processors are reprogrammable, and that's one of the most important aspects of this concept in addition to the basic modularity ideas."
Vint Cerf
*VP, MCI**
MCI

Modular Communications

"The modular framework is an essential ingredient and those that choose to ignore it will die a fast death at the wrong time. We will not sit back and just let it drive over us like a tidal wave."
Eugene Roman
CIO/CTO
Bell Canada
Bell

"It's so important that we get maximum value out of our investments, so that's why modularity helps us with this flexibility and future proofing."
Fred Harrison
Head of Standards
*mmO2**
mmO2

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Common Interconnects:
For Convergence & Modularity

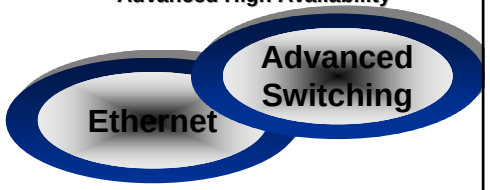
Local Interconnect Model

PCI Express

- Management, control, data & I/O traffic
- Between devices on a board
- 100% PCI software compatible
- High/scalable bandwidth
- Simple topology
- Advanced RASM

System Fabric Model

- Data and/or control traffic
- Between blades across a backplane
- Supported by Tier 1 fabric vendors
- High, scalable bandwidth
- Congestion mgmt, QoS, Redundancy
- Multiple protocols & topologies
- Advanced High Availability



Different requirements, modularity essential in all

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Carrier Grade Linux Momentum

"MontaVista Software Advances Enhanced Linux Platform for Telecommunications and Networking … announced MontaVista® Linux® Carrier Grade Edition 3.1 (CGE)... "
October 13, 2003

"Over 750 Applications Now Certified on Red Hat Enterprise Linux "
April 5, 2004

"Thousands of New Partners Join Novell in Linux Push "
May, 21, 2004

"Turbolinux Releases PowerCGL Solutions Delivering Carrier Grade Linux "
July 10, 2003

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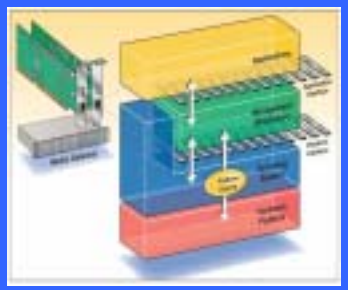
Standard High Availability Interfaces

Service Availability Forum Initiative

- Fostering an ecosystem to enable the use of commercial off-the-shelf building blocks in the creation of high availability network infrastructure products, systems and services

Key interfaces within telecom equipment stack



Hardware Platform Interface Specification

- Launched 10/7/02, New version released 5/3/04
- Separates the hardware from the management middleware and makes each independent of the other

Application Interface Specification

- Launched 4/14/03
- Standardizes the interface between Service Availability Forum compliant High Availability middleware and service applications

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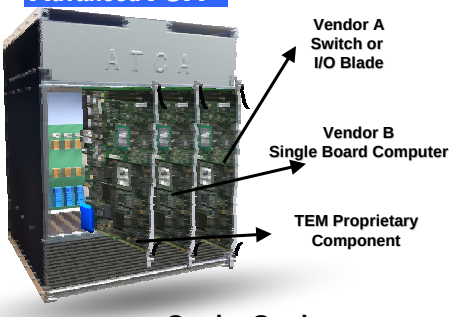
Modular Platform Choice

AdvancedTCA™



Carrier Grade
Rack Mount Servers

Platform Characteristics

- **Standard architecture**
- **Lower cost, reusable hardware and software**
- **Upgradability, ease of maintenance**
- **Standards-based fabrics**
- **Managed as distributed elements**
- **Broad ecosystem of solutions providers**

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AdvancedTCA* Platform Basics

Standard Platform
Standard Blade
Standardized OS
Standardized API
Equipment Provider Software

OpEx Reductions
TTM Improvements
New Service Delive

25% OpEx Reduction**

12-18 month Time-to-Market Improvement**

choice
efficiencies
standards

Like Push-to-Talk or Video on Demand

ATCA enables service providers to cost-effectively expand their networks and quickly deliver new services

** Yankee Group 2/03

As of 6/16/04

PICMG 3.x Series of Specifications

PICMG 3.0	PICMG 3.1 PICMG 3.2	PICMG 3.3 PICMG 3.4	PICMG 3.0 ECR	Classification Working Group	Advanced Mezzanine Card
Ratified 12/02	Ratified 01/03	Ratified 05/03	Ratified 01/04	Began 01/04	Began Q2'04

Intel processor-based
ATCA solutions are available today.

0 Companies 0 Products

*33 Companies ** 122 Products*

Design Develop Deploy

2002 2003 2004

Specification completion	Interop & critical component enabling	Products to market & Pilots	Greater interop	Cost reduction

Ecosystem Development Focus

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**Based on product roadmaps and stated product plans from ecosystem companies, which are subject to change. Ecosystem growth is a directional estimate. *Other brands and names may be claimed as the property of others.

Modular Communications Platforms

Recommendations for Equipment Vendors

Embrace standardization and modularization of infrastructure. It is already happening and will change the competitive forces and market opportunities for the wireless equipment market.

Yankee - Oct '03

"Early adoption [for ATCA] is proceeding well… "If COTS suppliers can meet and beat the price points required to trigger a second wave of adoption, it could be **well on its way to changing the way the telecom equipment industry works." *est. $3.7B Market***

RHK – Oct '03

"Fortunately, it seems that the advent of the AdvancedTCA … will likely provide a large benefit to vendors of merchant silicon, if they jump on the opportunity."

In-Stat/MDR– Mar '04

"**We believe ATCA will be a major driver for raising the telecom industry from the current slump, and fueling future growth – for the entire value chain. ...**

Metz/Crystal Cube – Dec '03

Intel Network Processors

Intel captured the top market share spot in the net processor market.
InStat – Jan '04

"Keep pace with Intel: With a wide processor portfolio and hundreds of design wins, Intel is the NPU vendor to beat"
Forrestor– Feb '04

intel Analyst Support for Intel & Modularity

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AdvancedTCA™

Telecom Equipment Manufacturers

"Once we employ ATCA, future migration will become much easier for our carriers. The multiple companies utilizing ATCA will assure the establishment of technological advancements needed in the future."

Yoshite Matsuo
*VP, NEC**

NEC

"This is a revolutionary step toward lower capital and operational expenditures for operators, while at the same time opening up new sources of revenue. We are demonstrating this here in Cannes for the first time. And we're pleased to announce that parts of this modular communication platform are being developed in partnership with Intel."

Lothar Pauly
Member of the Board,
*Siemens Mobile**

"We firmly believe that modular platform technology standards are key to a faster time to market, yielding significant value to both Huawei and our customers. For that reason, we are developing our next generation infrastructure platforms with such standards as carrier-grade Linux and AdvancedTCA based equipment running Intel compute and network processors for delivery later this year."

Wei Ai, Senior VP
*And CTO, Huawei**

AdvancedTCA™

"Faster time-to-market is essential to implement AdvancedTCA as the new platform standard for upcoming next-generation infrastructure solutions."

Chris Williams
*VP, Force Computers**

"...the most ...m management ...ssfully tested ...functionality..."

Joe Pavlat
*President, PICMG**

Platform Solutions Vendors

"One of the key standards we are incorporating in our product plans is in fact ATCA. ATCA is beneficial for the entire industry."

Sebastiano Tevarotto
*VP, Hewlett-Packard**

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TEMs Launch Modular Platforms based on ATCA

Faster Time to Market

New Service Deployments

Lower Operating Costs

Next Gen Telecom Architecture

SIEMENS mobile

- Common infrastructure platform
- AdvancedTCA, CGL, SA Forum APIs
- "...saving operators capital and operational expenditures especially with the introduction of new network services."
- New Push-to-Talk services

AdvancedTCA for xGSN

NEC

- 2/3 reduction in development time
- 10x packet transmission capability
- 80% footprint reduction

Huawei AdvancedTCA strategy

- Platform announcement planned in Q4

Both solutions based on Intel® processors

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Service Providers Pilot Modular Architectures

Telefonica I+D and Intel sign a Collaboration Agreement under the Terms of which Telefonica I&D will use Intel® Techology to Develop Solutions for the Telecoms Market

-Madrid, October 16 2003

KT and Intel to Jointly Develop Next Generation Network Pilot System based on Intel's Modular Communication Platform

- Seoul, Korea, Dec 15, 2003

NTT Joins OSDL
World's largest telecommunications company joins Linux consortium to accelerate development of Linux for enterprise datacenters and carrier grade applications

Beaverton, OR and Tokyo, February 3, 2004

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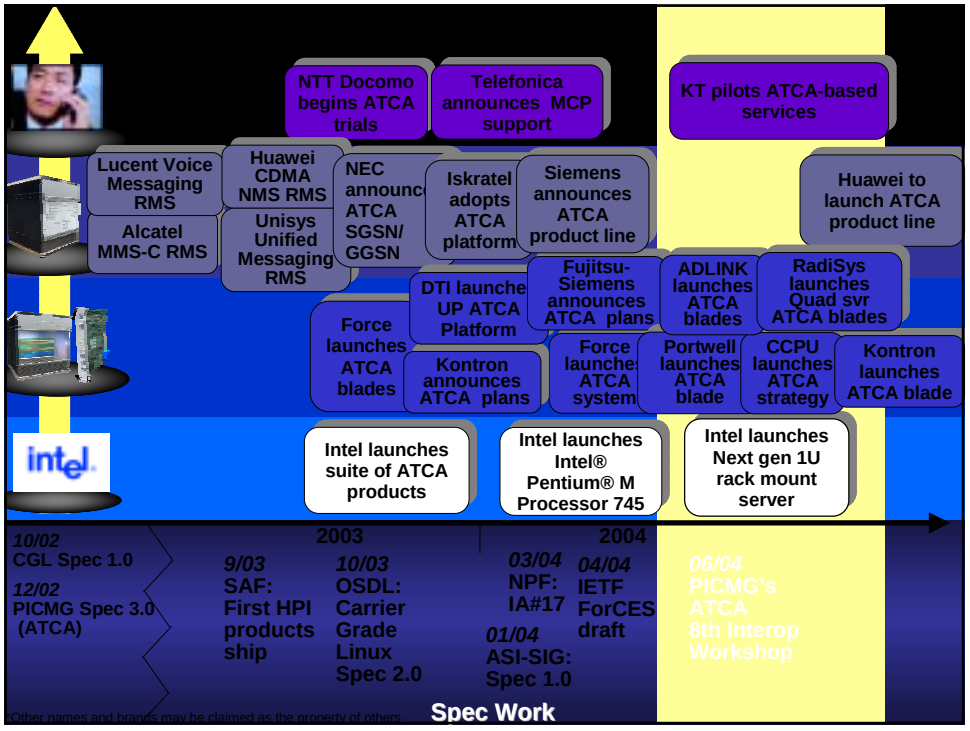
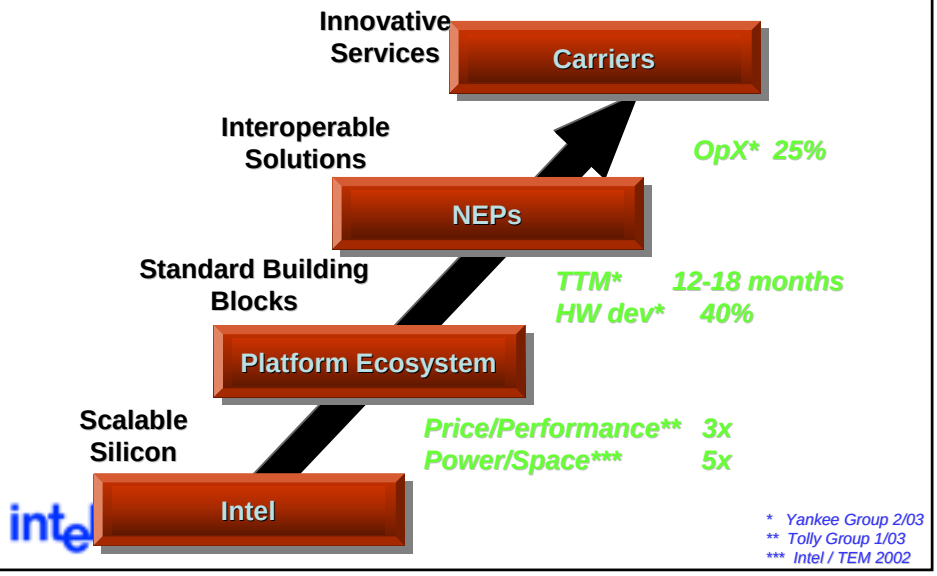


Modularity Benefits the Value Chain



* Yankee Group 2/03
** Tolly Group 1/03
*** Intel / TEM 2002

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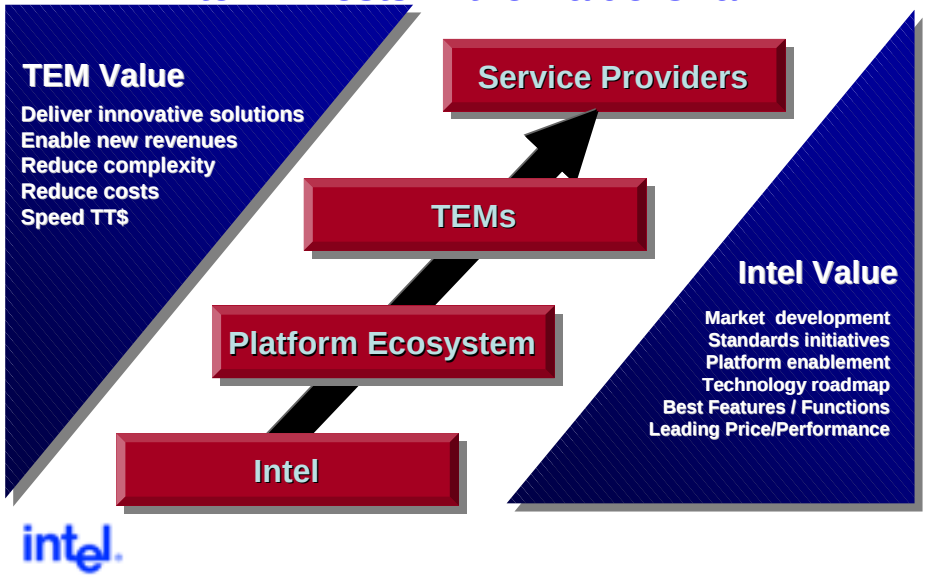
Intel® Invests in the Value Chain



Summary

- Economics of telecom infrastructure are changing
- Modular communications enables faster time-to-market and faster time-to-revenue
- Industry adoption for Modular Communications Platforms ramps through 2nd half of 2004
  - Standards ratified: CGL, AdvancedTCA*
  - Adoption by Service Providers, TEMs, and ISVs
  - Intel® Processors are the foundation
    - Intel® Architecture
    - Intel® Internet Exchange Architecture

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