

# Blades—An Emerging System Design Model for Economic Delivery of High Performance Computing

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# Agenda

Agenda

Introduction / Definitions

Origins of the Blade Server

Limitations of First Generation Designs

Second Generation Design

Future Directions



# A Blade is ...

## Definitions

An inclusive computing system that includes processor, memory, network connections and associated electronics on a single motherboard.

The server blade typically is associated with an enclosure system that allows multiple blades to be housed in a standard server 'sub-rack' or enclosure that share resources such as power supplies and cooling fans.

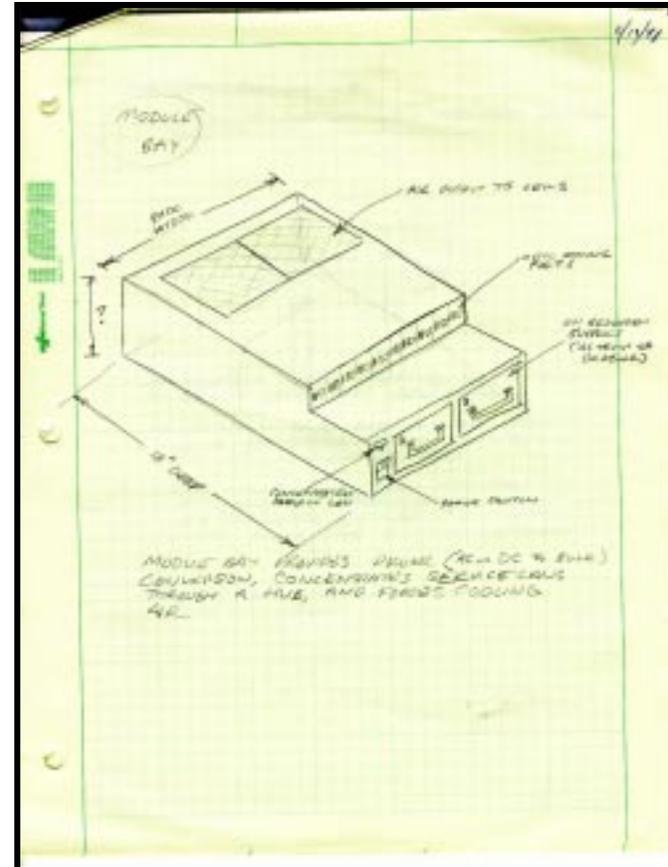
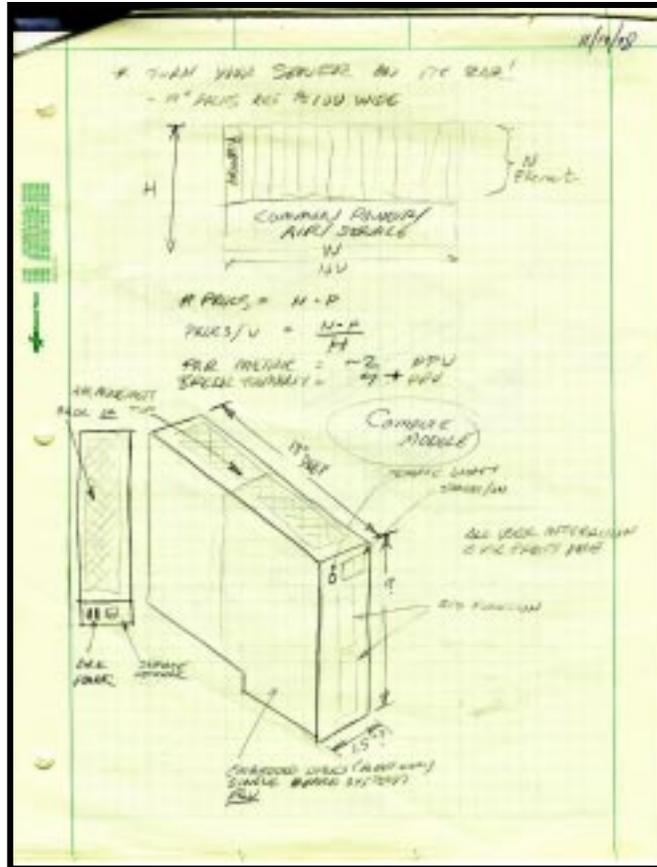
Blades ...

- are easily accessible
- offer increased computing density
- have modular architecture that ensures flexibility and scalability.

Source: Provisioning the Internet Infrastructure: Server Blades and Dynamic Workload Management IDC Document # 24155

# Initial Blade Sketches

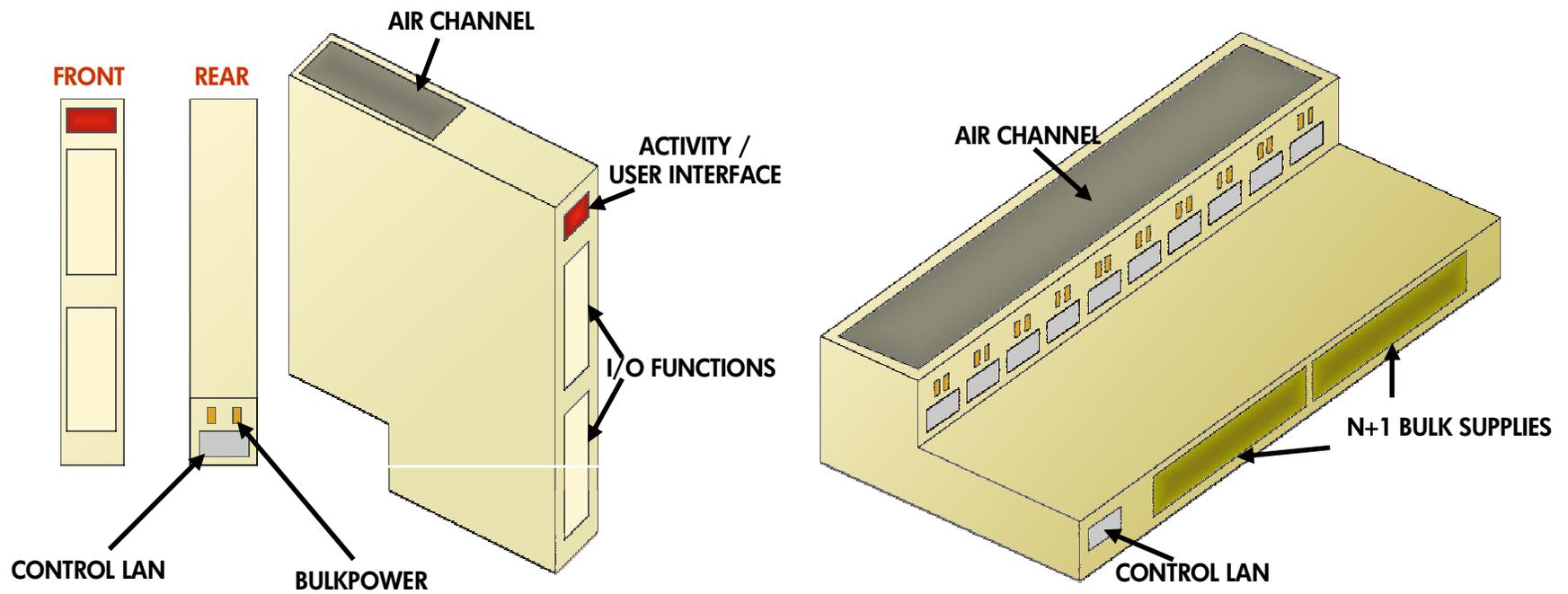
Origins



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# Initial Blade Sketches

Origins



## Dominant xSP Concerns – Circa 1999

Origins

**Time-to-Deployment** - Competition is cut-throat. How quickly can a new service be deployed in the physical plant?

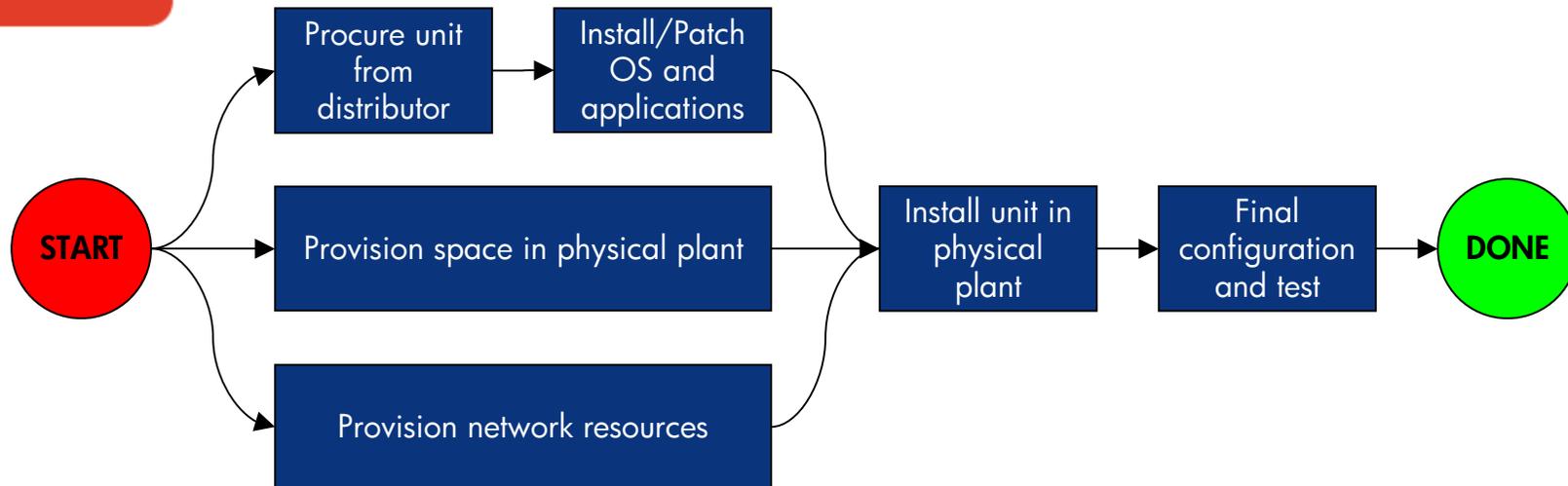
**System Density** - The data center incurs costs in \$/area and recovers costs in systems/area. How many systems can be burdened on each square foot of data center?

**Moving Customers up the price list** - Currently shared hosting only sells at the introductory service level. Moving customers up the price list requires dedicated hardware

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# ASP Deployment Timeline – Circa 1999

Origins



Time to Deploy : 5 Days



## Dominant xSP Concerns – Circa 1999

Origins

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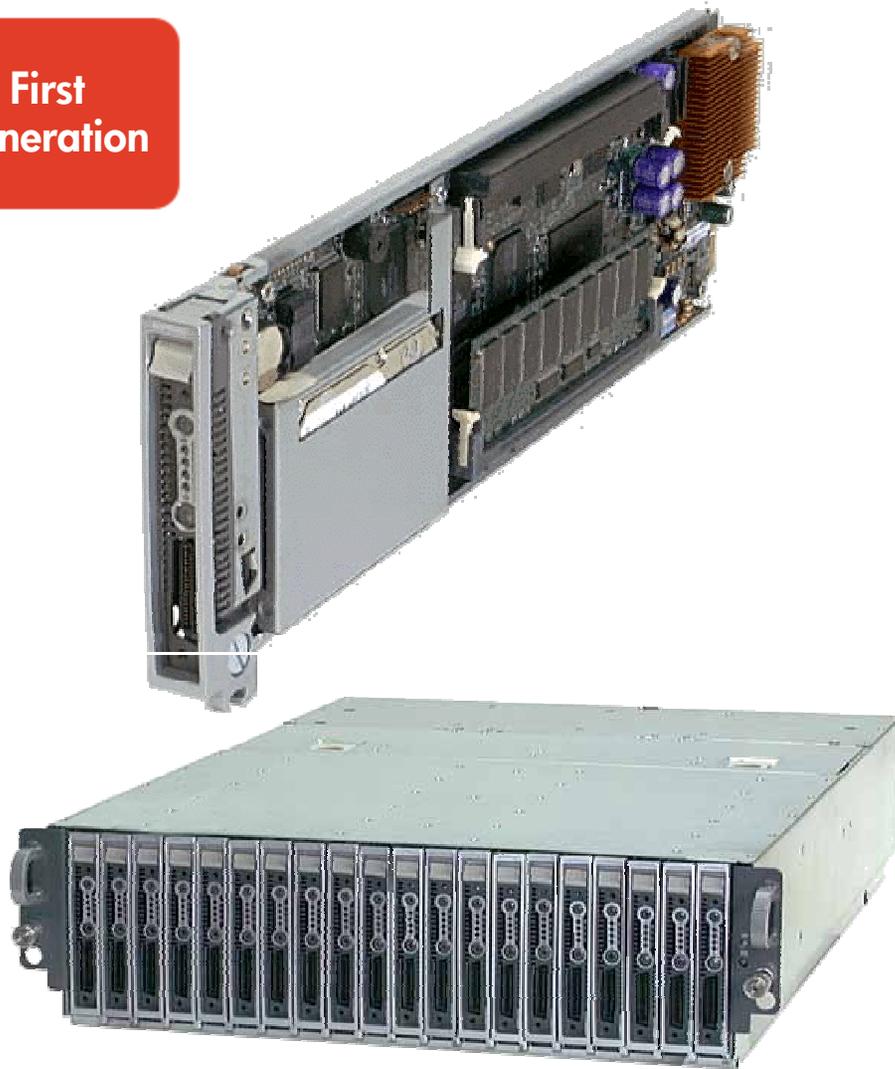
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# First Generation Blade

First  
Generation



Each blade contains:

- 700MHz PIII 512K LV
- 512MB/1GB PC133 SDRAM
- 30GB Mobile IDE Drive
- Dual 10/100 NICs
- Integrated Management

Each 3U chassis contains:

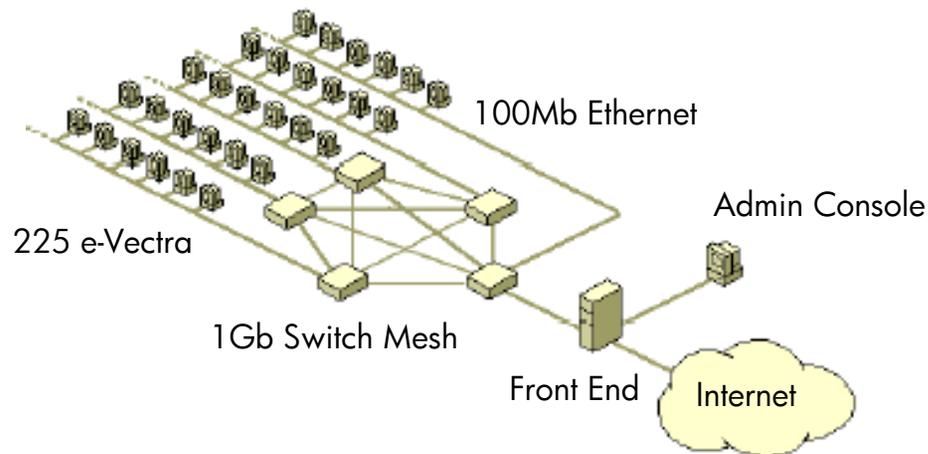
- 20 Server blades
- N+1 Power
- Dual Ethernet Switches



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# Mainstream Technology Clusters

First Generation



Cluster Topology



Cluster Racking

Mainstream Technology Cluster achieved rank of 385th on TOP500 as of 06/21/2001



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# Rapid Deployment Tools

First  
Generation

```
[root@imageserver]# getimage -g my-golden-client -image web_server_image_v1
This program will get the "web_server_image_v1" system image
from "my-golden-client"
making the assumption that all filesystems considered part
of the system image are using ext2, ext3, or reiserfs.
This program will not get /proc, NFS, or other filesystems
not mentioned above.
See "getimage -help" for command line options.
Continue? ([y]/n): y
Retrieving /etc/systemimager/mounted_filesystems from mygolden-
client to check for mounted filesystems...
----- my-goldenclient
mounted_filesystems RETRIEVAL PROGRESS -----
receiving file list ... done
/var/spool/systemimager/images/web_server_image_v1/etc/systemimager/mounted_wrot
e 132 bytes read 294 bytes 852.00 bytes/sec
total size is 180 speedup is 0.42
----- my-goldenclient
mounted_filesystems RETRIEVAL FINISHED -----
Retrieving image web_server_image_v1 from my-golden-client
----- web_server_image_v1 IMAGE RETRIEVAL PROGRESS --
-----
receiving file list ... done
```

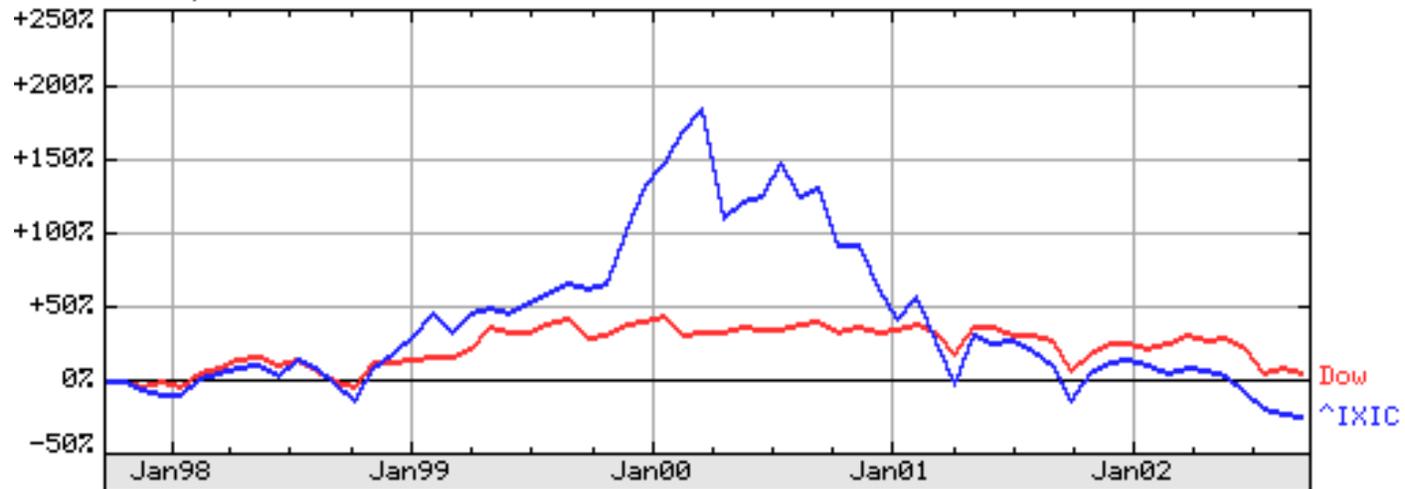


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# What New Economy?

Limitations

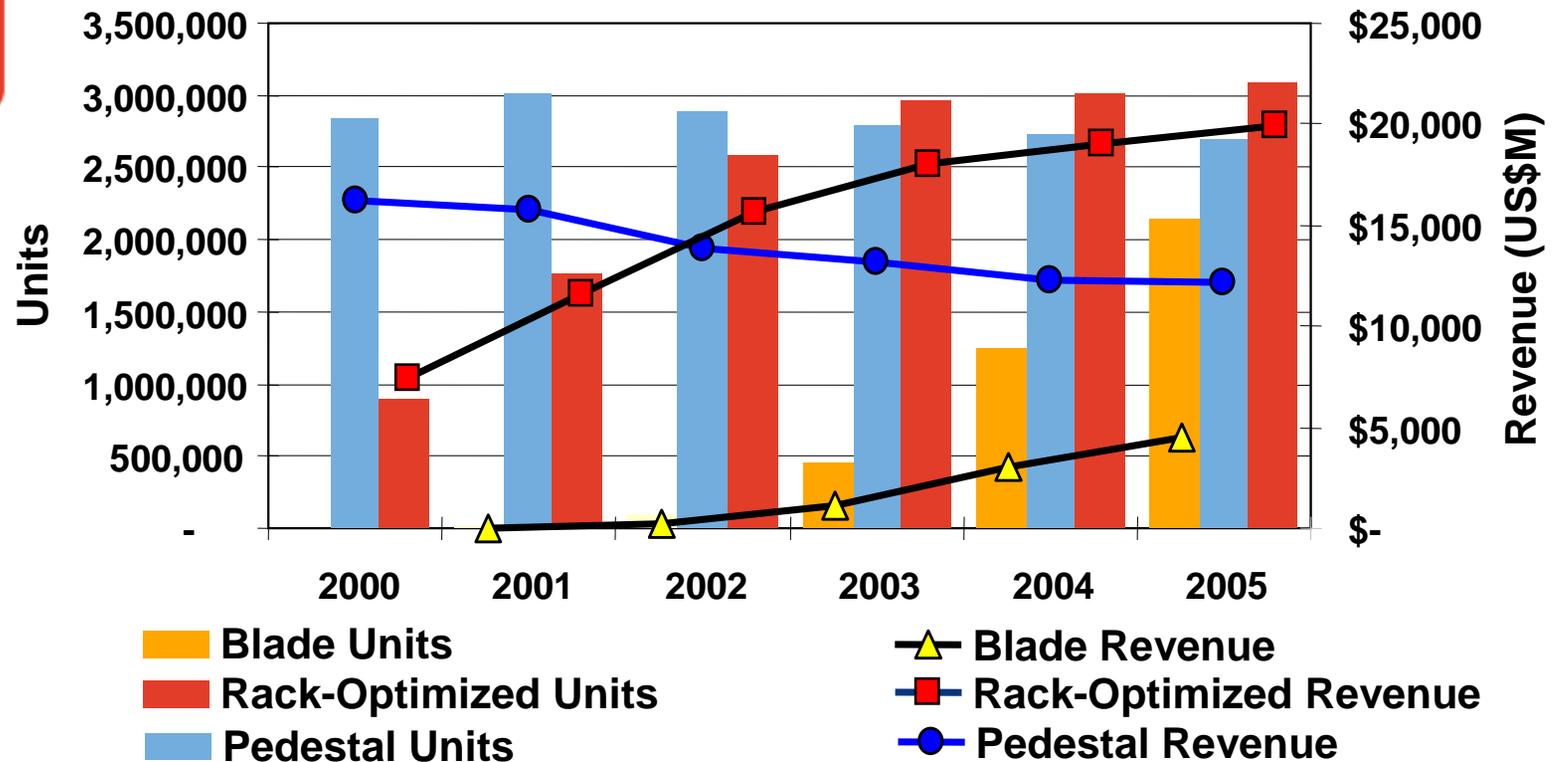
NAS/NMS COMPOSITE (NASDAQ Stock Exchange)  
as of 18-Sep-2002



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# Bladed Architectures: What's the Opportunity?

Second  
Generation



By 2005, IDC believes the blade form factor will capture approximately 27% of entry server unit sales and 12% of entry server revenue.

Source: IDC August 2001

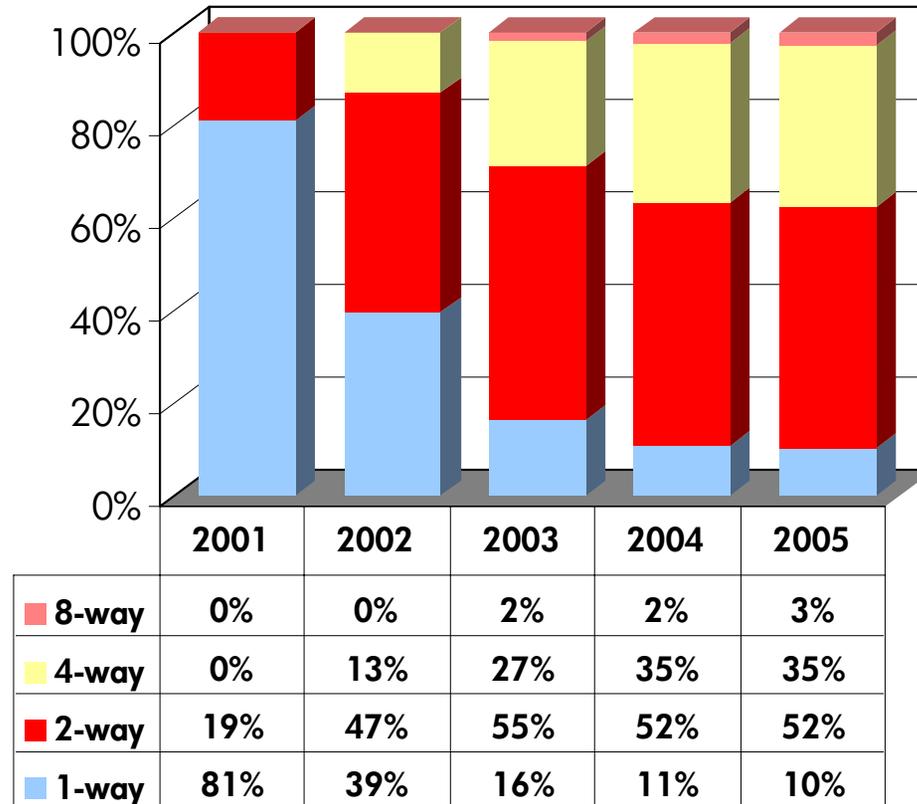


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# Bladed Architectures: Where Are the Sweet Spots?

Second  
Generation



2005  
\$4.5 billion

Share of bladed server revenue quickly migrates to the 2 & 4 processor "flavors" as volume ramps and commoditization occurs

Source: IDC August 2001



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# Second Generation Blade

Second  
Generation



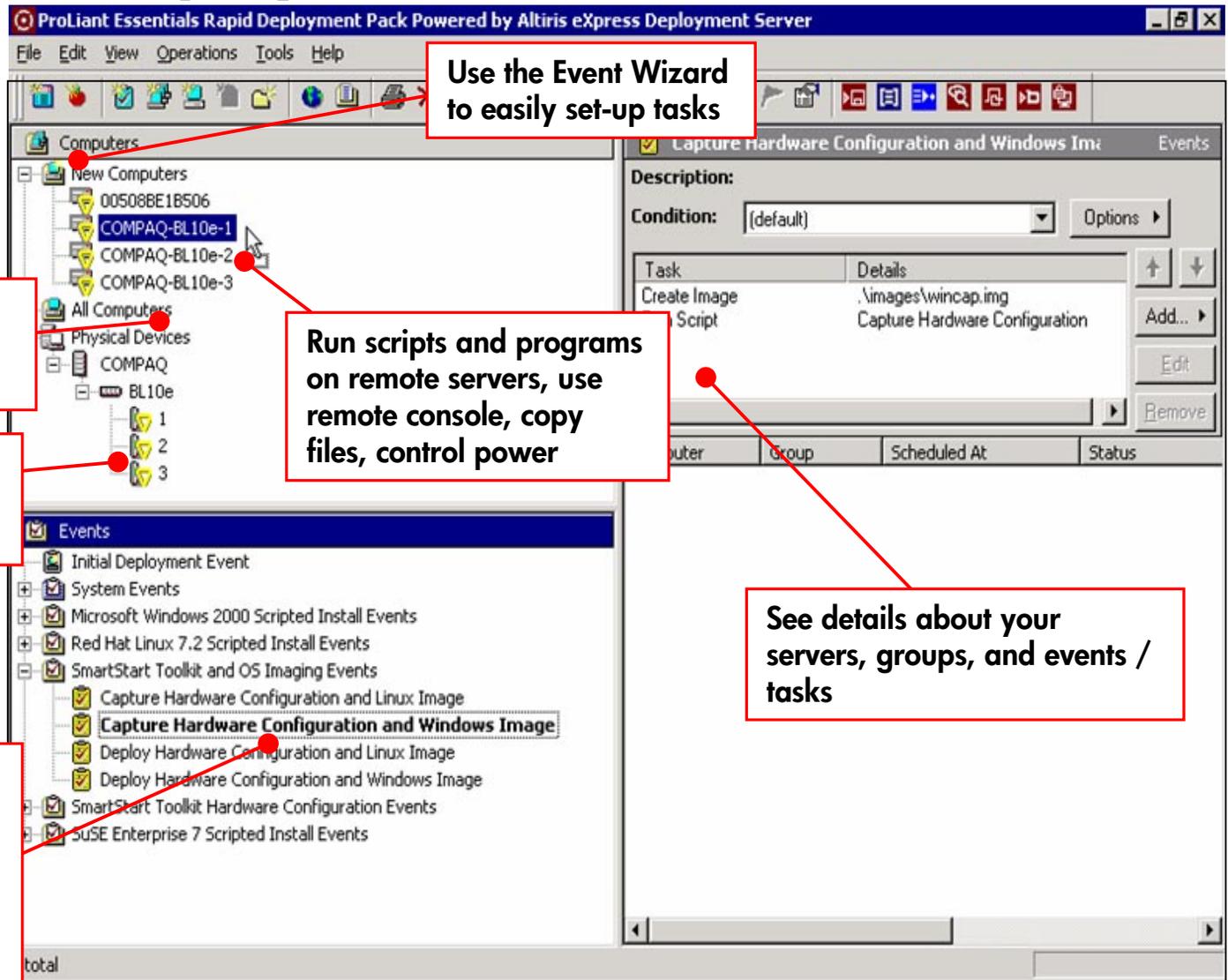
- Processors: Mobile/LV/ULV → Mainline server Processors
- SMP: Single → Dual (or more) Processors
- Memory sizes: Sub-1GB per processors → Greater than 1GB per processor
- Ethernet NICs: Dual 10/100 → Multiple 10/100/1000
- Manageability: rack-optimized server leveraged → blade-aware
- Local Storage: low performance mobile → high performance, high reliability server storage
- Remote Storage: Low performance NAS → high performance NAS or SAN
- Chassis form factor: 3U → 6U
- Blades form factor increase in depth, width, and height



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# Rapid Deployment Tools

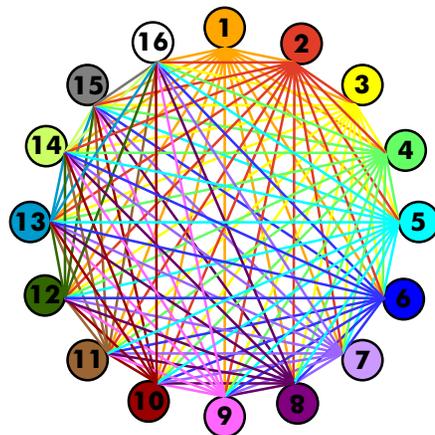
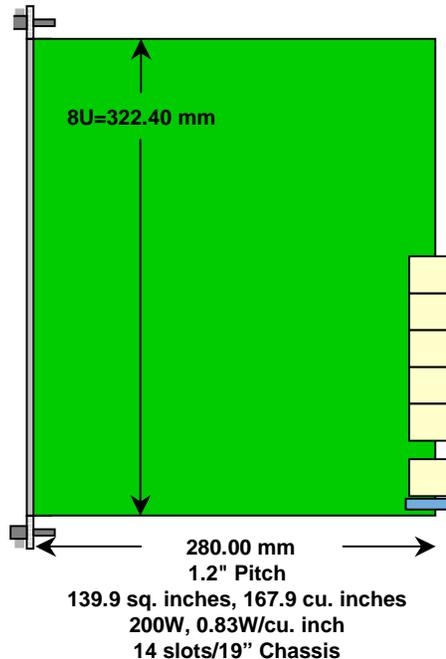
Second Generation



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Futures

# Advanced Telecom Computing Architecture



Each blade contains:

- A 200W Thermal Envelope (enables Dual slot / DP IPF or QP IA-32)
- Fully connected Mesh Data Transport Protocol Agnostic Fabric. Each Link can support, for example:
  - 1 4X Infiniband link/4 1X Infiniband links
  - 4 1000BX links
  - 1 10GbE XAUI link
  - 4 2Gpbs FC links
- Dedicated Management Dual Star 10/100/1000 Ethernet
- 10 pair Adjacent Slot Update bus
- Redundant blade-centric hardware management bus
- N+1 Redundant Power
- Cost focused module mechanical design



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# ATCA Target Serial I/O Standard Comparisons

Futures

Serial Standard	Data rate per Channel (Gbps)	Baud rate per Channel (Gbps)	Ref Clock (MHz)	Pairs/Channel Channel Configs
Infiniband	2.0	2.5	125	2 1X,2X,4X,12X
1Gb Ethernet 1000BASE-CX	1.0	1.25	62.5	2 1X
10Gb Ethernet XAUI	2.5	3.125	156.25	2 4X
Fibre Channel	0.85 / 1.7	1.06 / 2.12	53.125 / 106.25	2 1X
Serial ATA	1.2	1.5	75	2 1X
Serial RapidIO	2.5	3.125	156.25	2 1X,4X
PCI Express	2.0	2.5	125	2 1X-32X





i n v e n t