Remove Two Or More Things And Replace It With One

Wachovia Corporate & Investment Banking

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When is it Worthwhile to Adopt a New Technology?

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When is it Worthwhile to Adopt a New Technology?

Add one thing, remove nothing = no real benefit

Add one thing, remove one thing = potential benefit

Add one thing and remove two things = Significant Benefit!

* Answers provided by Mark Cates / Wachovia

The “Vision”

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Remove Two Or More Things And Replace It With One

- ✓ Two or More Monitoring Programs with One
- ✓ Managing One Grid OS installation instead of 4000
- ✓ Two or more device drivers w/ one driver
- ✓ Replace Ethernet and Fiber Channel with Infiniband
- ✓ Two or More Reporting Tools with One Tool
- ✓ Two Clustering programs with one program
- ✓ Two or more Watts of Power for One Watt of Power
- ✓ Two servers with one server
- ✓ Two Hours of Labor for One Hour of Labor
- ✓ 10us of Latency with 2us
- ✓ Two or More I/O devices with one I/O device
- ✓ Two or More Switches with One Switch

Agenda

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- Background
- Our Platform Direction
- What We Need from Vendors

Background - About Wachovia

- **Headquarters**
  - Charlotte, NC
- **Employees**
  - ~110,000 Employees Worldwide
- **Financial**
  - The annual technology budget is approximately $2 billion, with two thirds allocated to infrastructure
- **Key Focus for the Corporate and Investment Bank**
  - Time to Market is our #1 priority (Innovation is a Key)
  - Technology Performance Translates to Profit in our Business
- **Facts**
  - In 2006 Wachovia was named “IDG's InfoWorld 100” for our Innovative Application Virtualization project
  - Sept, 2007 - Wachovia recognized by ComputerWorld for best practices in 2 categories: Virtualization & IT Operations
  - Fall 2007 Wachovia starts opening its first eight “green” financial centers in California. This is only the beginning…

Background - Platform Challenges

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To many “things” get in the way of progress and opportunity

- Long Procurement Time
- Complex Configuration
- Low Innovation Rate
- No End to End Visibility
- Reoccurring Costs High
- Vendor Lock-In
- Expensive
- High Cost of Switching

- Lost Opportunities / High Opportunity Cost
- Slower Response to Changes in Market Conditions

Background – Low Latency is Required

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- On July 19 the DJIA hit a record high of 14,000.41
- On Aug 16 the DJIA intraday low was 11% below the record

Algorithmic trading applications need low latency market data feeds & every microsecond counts

- FIX = 20,000 msg/sec
  (2K each = 315 Mbps)
- OPRA = 450,000 msg/sec
  (80 bytes each = 300 Mbps)
- ITCH = 100,000 msg/sec
  (40 bytes each = 31 Mbps)

Applied Queuing Theory
Remember Little's Law

$$N = \lambda T$$

PS. Network latency impacts NTP time sync accuracy too

* Slide provided by: Ryan Bagnulo

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Our Vision for the Unified Platform Fabric

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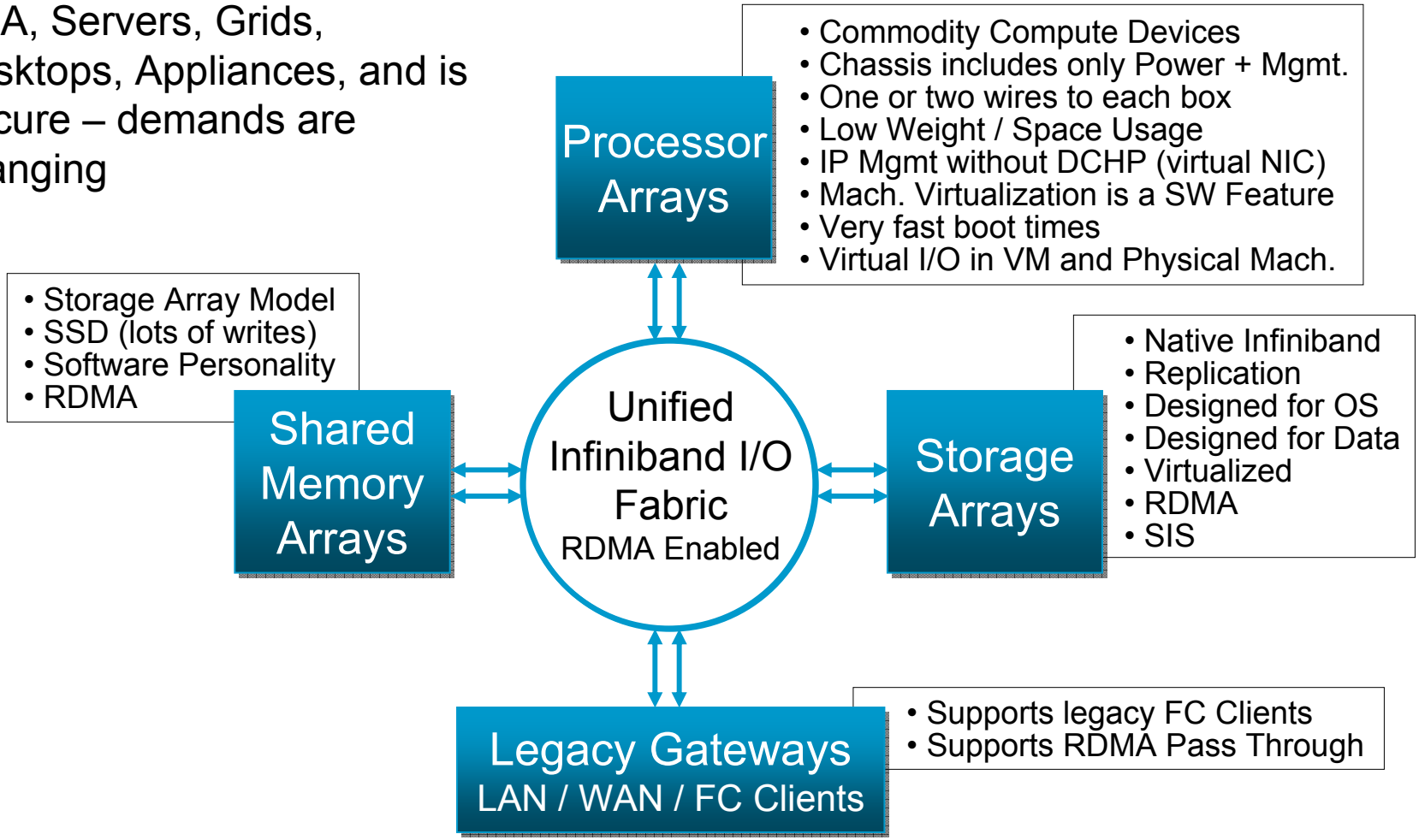
It Supports…

SOA, Servers, Grids, Desktops, Appliances, and is Secure – demands are changing



3 Maneuvers Define Our Platform Direction

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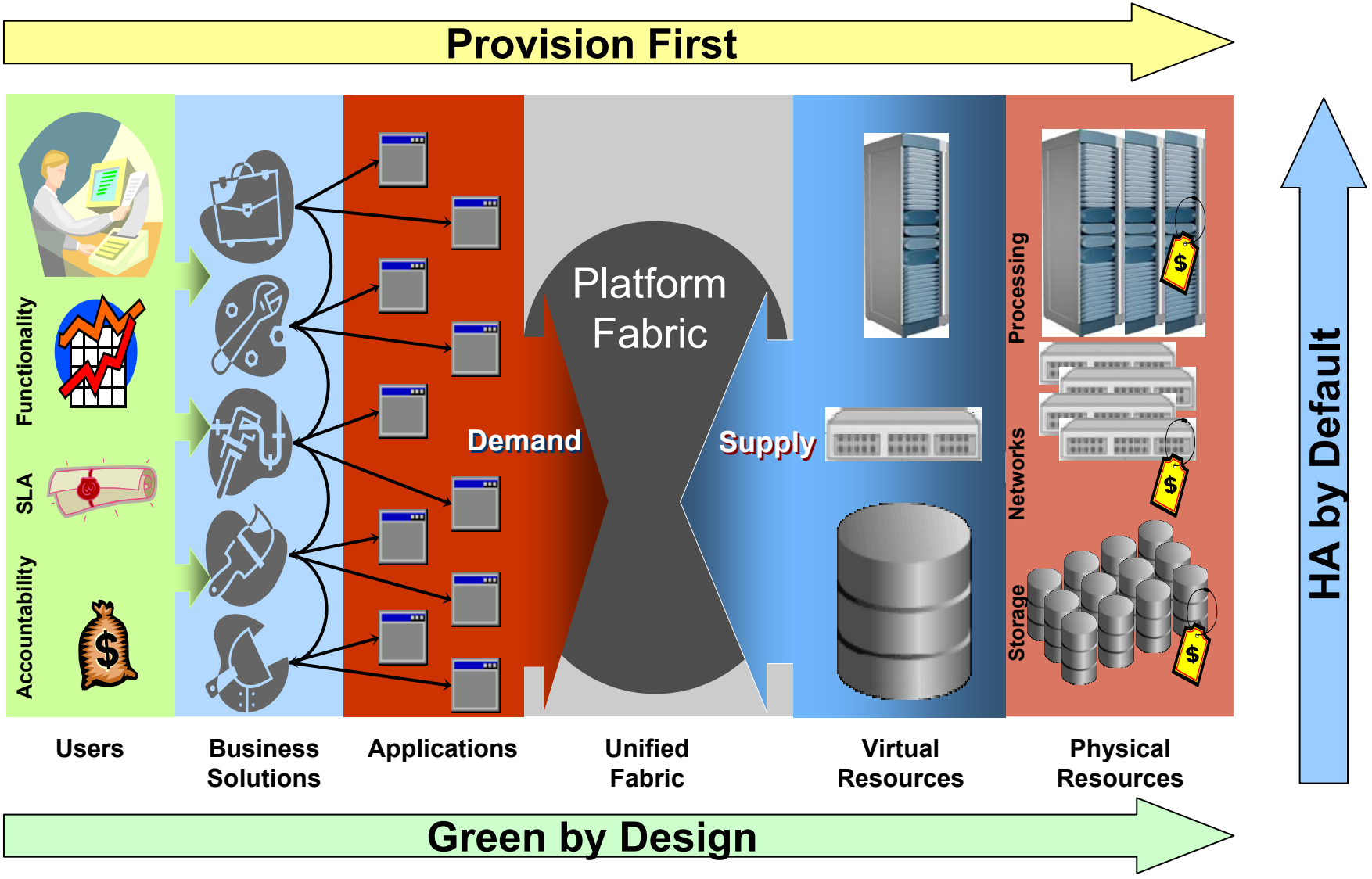

Provision First

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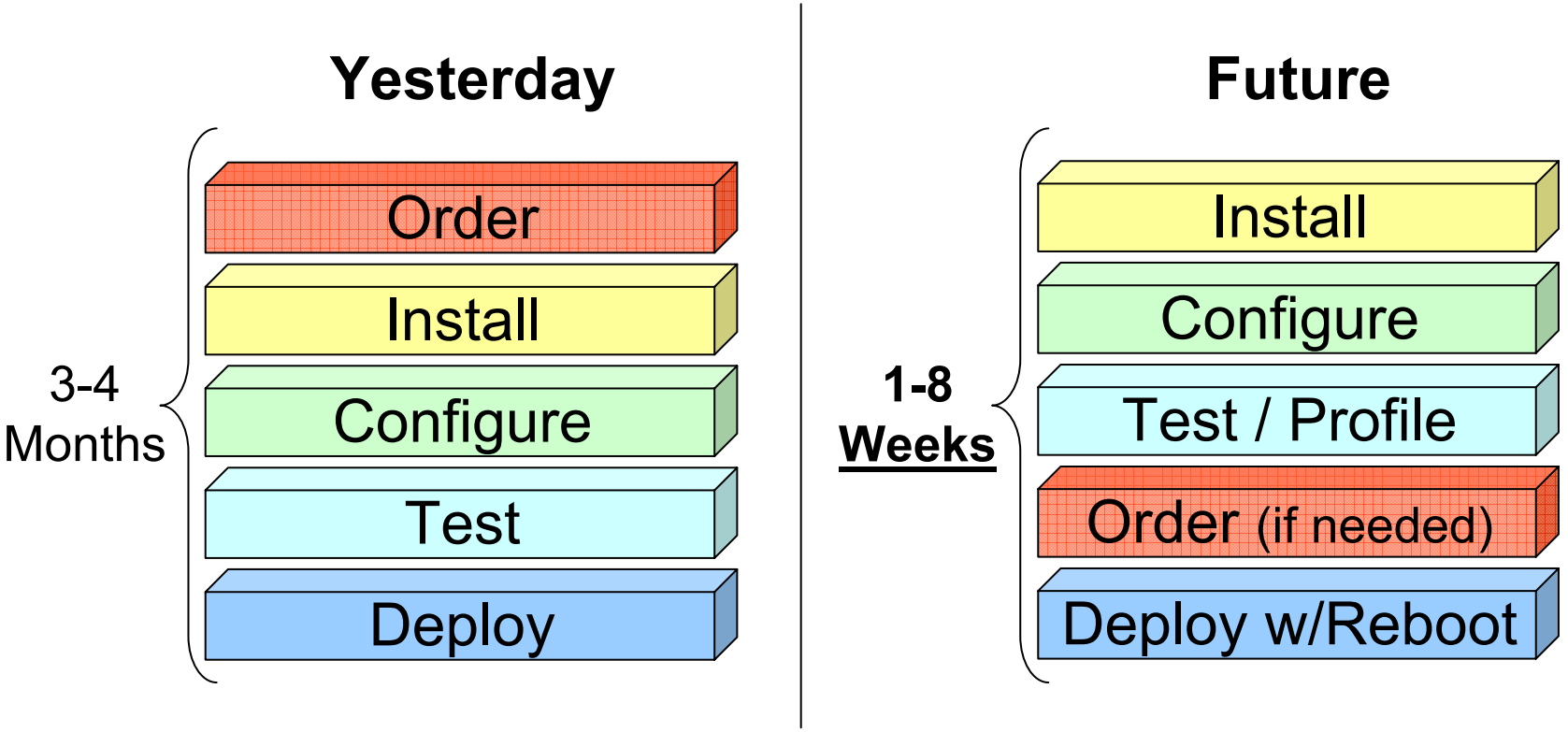
What Is It?



* We will know what we need and how to scale it

** We will managed IT instead of it managing us

Provision First

Why Do We Want It?
How Do We Get It?

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Business Demands → **Platform Direction** → **Solution**

TIME TO MARKET → **P R O V I S I O N F I R S T**

Processor Array with machine Virtualization

- ❑ Lower Latency to Provision
- ❑ Lower Latency to Re-Provision
- ❑ New Troubleshooting Options
- ❑ Virtualized Everything w/ Fabric Management
  - Processor Array
  - Virtualized I/O Fabric (V-NICS, V-HBAS)
  - Storage Array
- ❑ OS's will still run on bare metal

Virtual to Physical to Virtual with a reboot – minimal impact on I/O configuration – no disk import / export utilities

HA by Default

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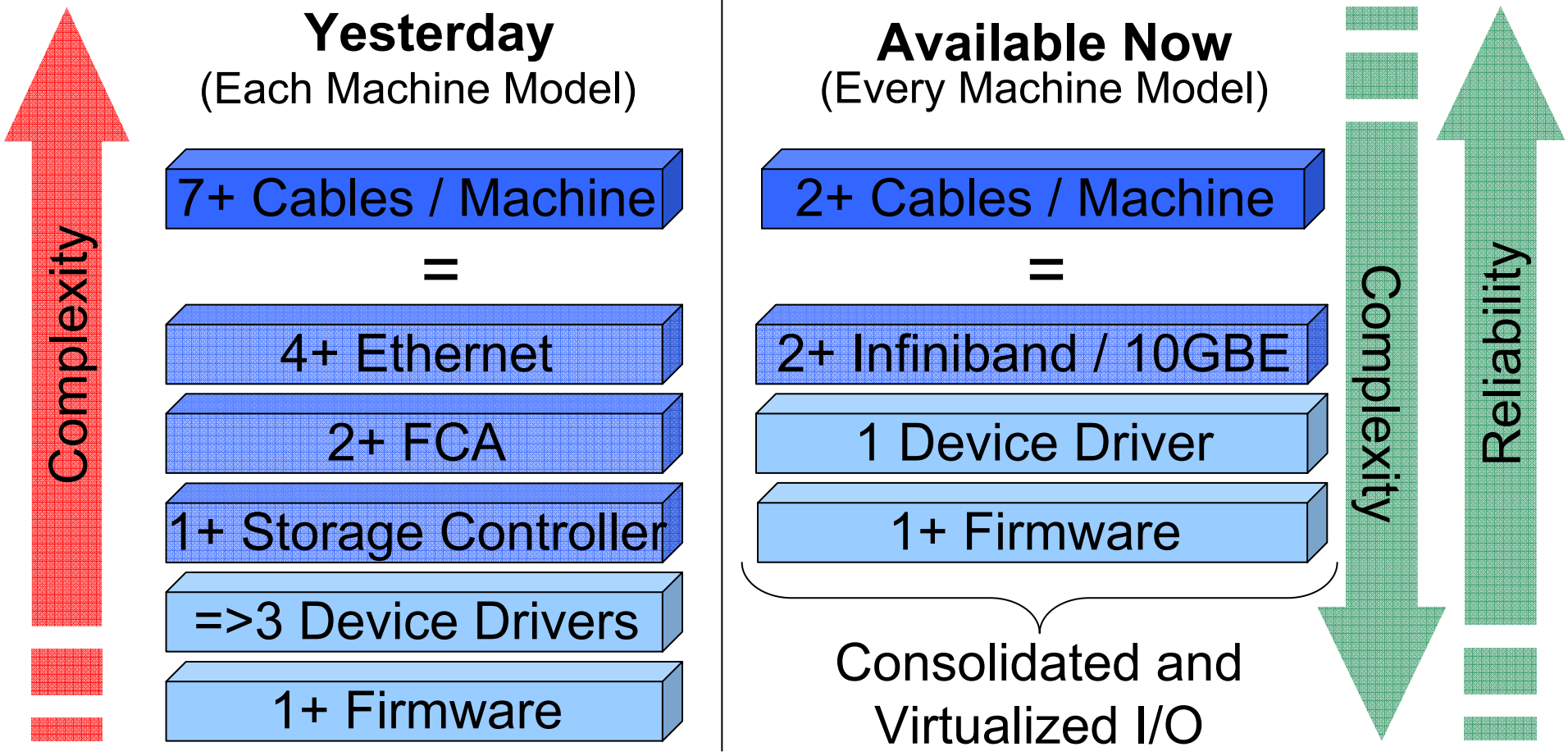
What Is It?



HA by Default

Why Do We Want It?
How Do We Get It?

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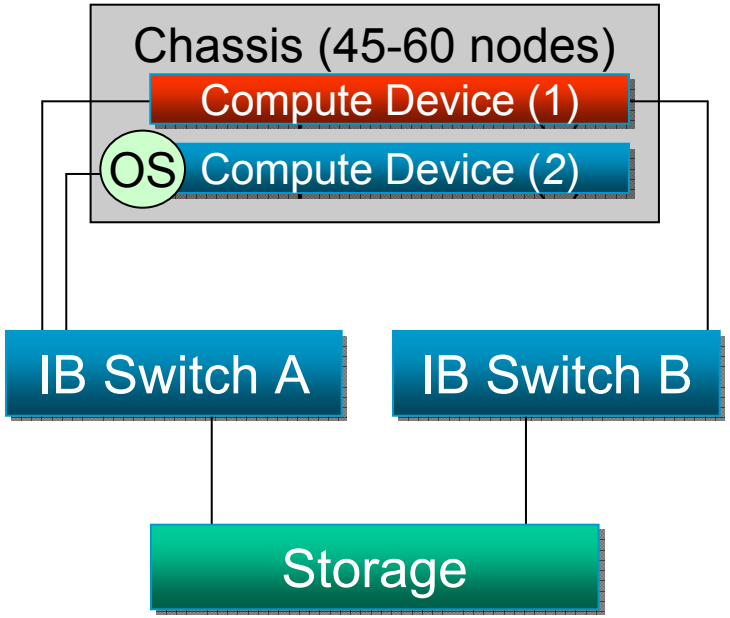
Business Demands → **Platform Direction** → **Solution**

Reliable Experience → **HA by DEFAULT** → **Virtualized I/O**, **Infiniband**

- ❑ Storage decoupled from the Processor
- ❑ Consolidated I/O
- ❑ Reduce I/O types to one
- ❑ Less wires, ports, and software
- ❑ New options for trouble-shooting



Compute Device failure ⇨ Recovery is a reboot away

Green by Design

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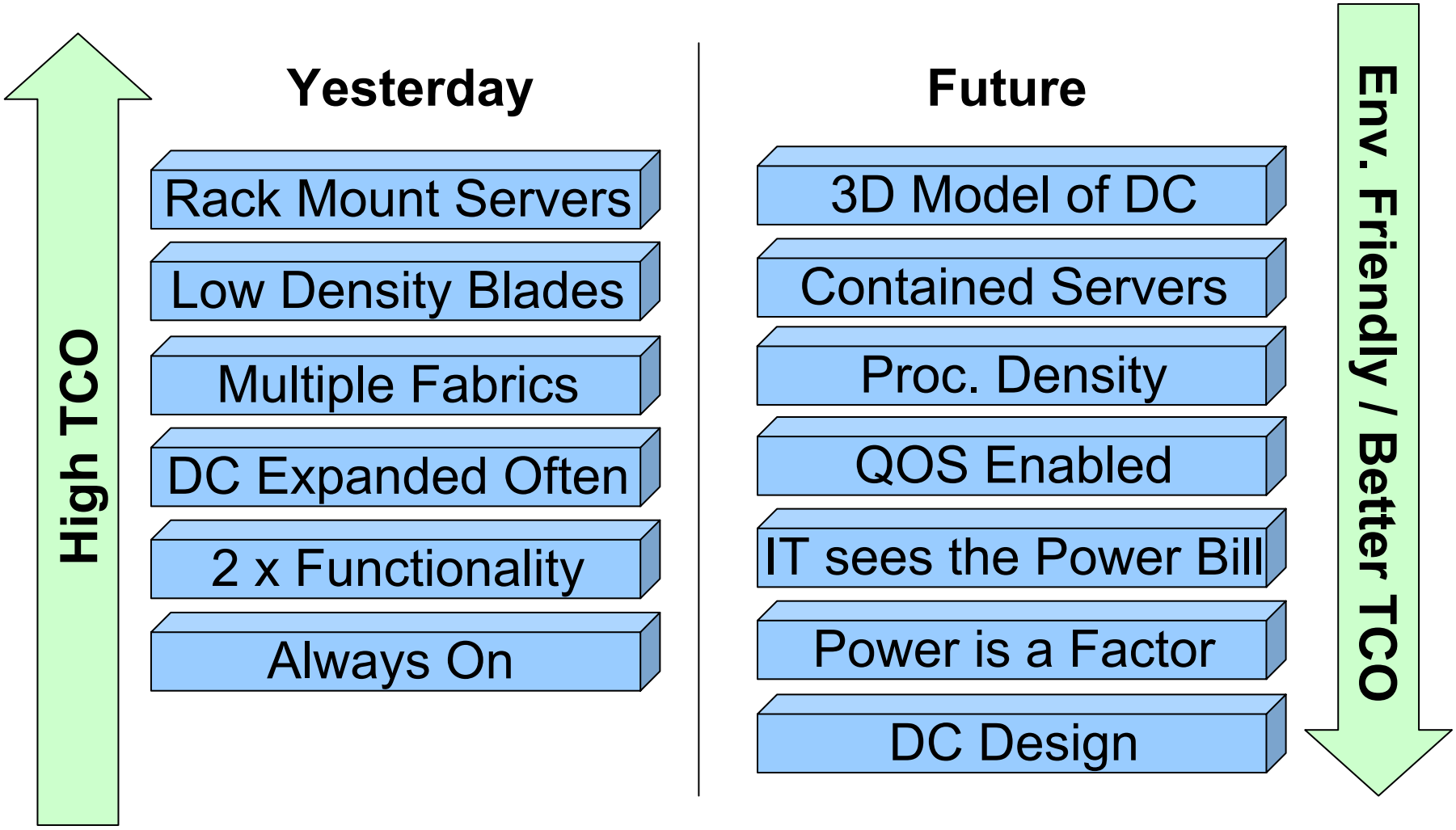
What Is It?



Green by Design

Why Do We Want It?
How Do We Get It?

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- ❑ No one has unlimited power, compute power has a price
- ❑ Energy Savings / Improved operations costs
- ❑ Relay Power Bill / Cost to the Consumer
- ❑ Encourages reuse
- ❑ Reuse before New Purchase
- ❑ Reduces # of components to power overall
- ❑ Unified I/O with Infiniband reduces power consumption
- ❑ Lower latency means processors, ram, cache are free to do more of what they do best

• Read the recent EPA data center and server power study

Think about Green First ⇨ Buy New Second

Agenda

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- Today's Challenges
- Our Platform Direction
- What We Need from Vendors

What We Need from Vendors

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Operating System Vendors

- ❑ Improved Processor and Chipset Changes w/ Hardware Change
- ❑ Formally Support Infiniband in all OS's / include IB drivers by default
- ❑ New ways to create swap files (RDMA + Shared Memory Array)
- ❑ OS Streaming

Processing Vendors

- ❑ Bios control + remote media using IB virtual NIC
- ❑ Enhance discovery of compute devices on IB fabric
- ❑ Remote management over virtual Infiniband NIC

Storage Vendors

- ❑ Native Infiniband support (SRP & iSER)
- ❑ Better solutions for OS on Storage Arrays (near file caching)
- ❑ DRAM based SSD in a 3.5" form factor (native IB on drive)
- ❑ Point to Point Disk Support

Networking & I/O Vendors

- ❑ Commit to Infiniband for Unified I/O if you have not already
- ❑ Provide more support for RDMA monitoring

Credits

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- **Thanks to**
  - Benoy Desouza
  - Jason Nash
  - Scott Haynes
  - Ryan Bagnulo
  - and others…
  - …for contributing to this presentation