HP Utility Data Center:

What is it?
How does it work?

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HP
Session ID: 3234

HP WORLD 2004
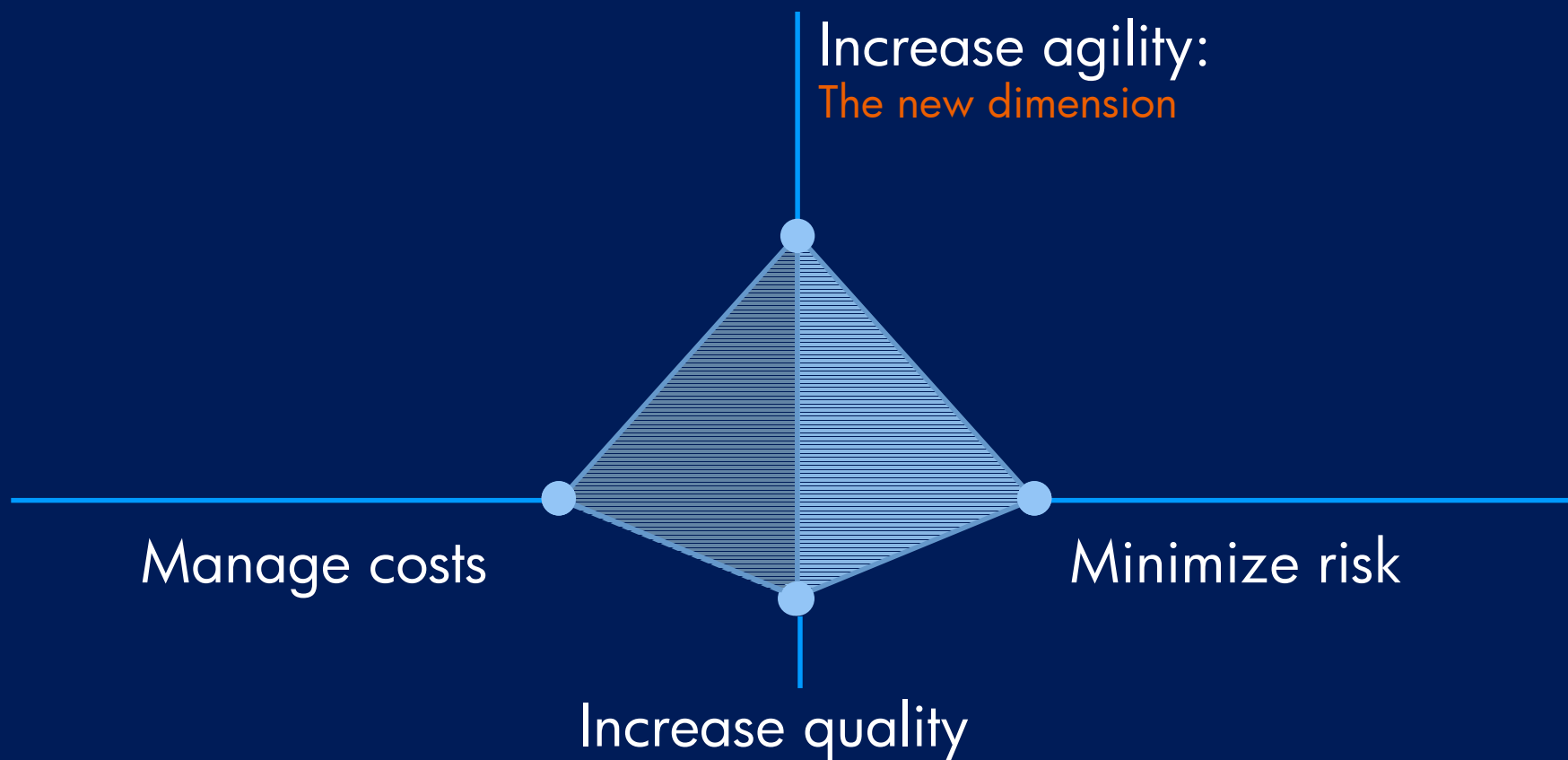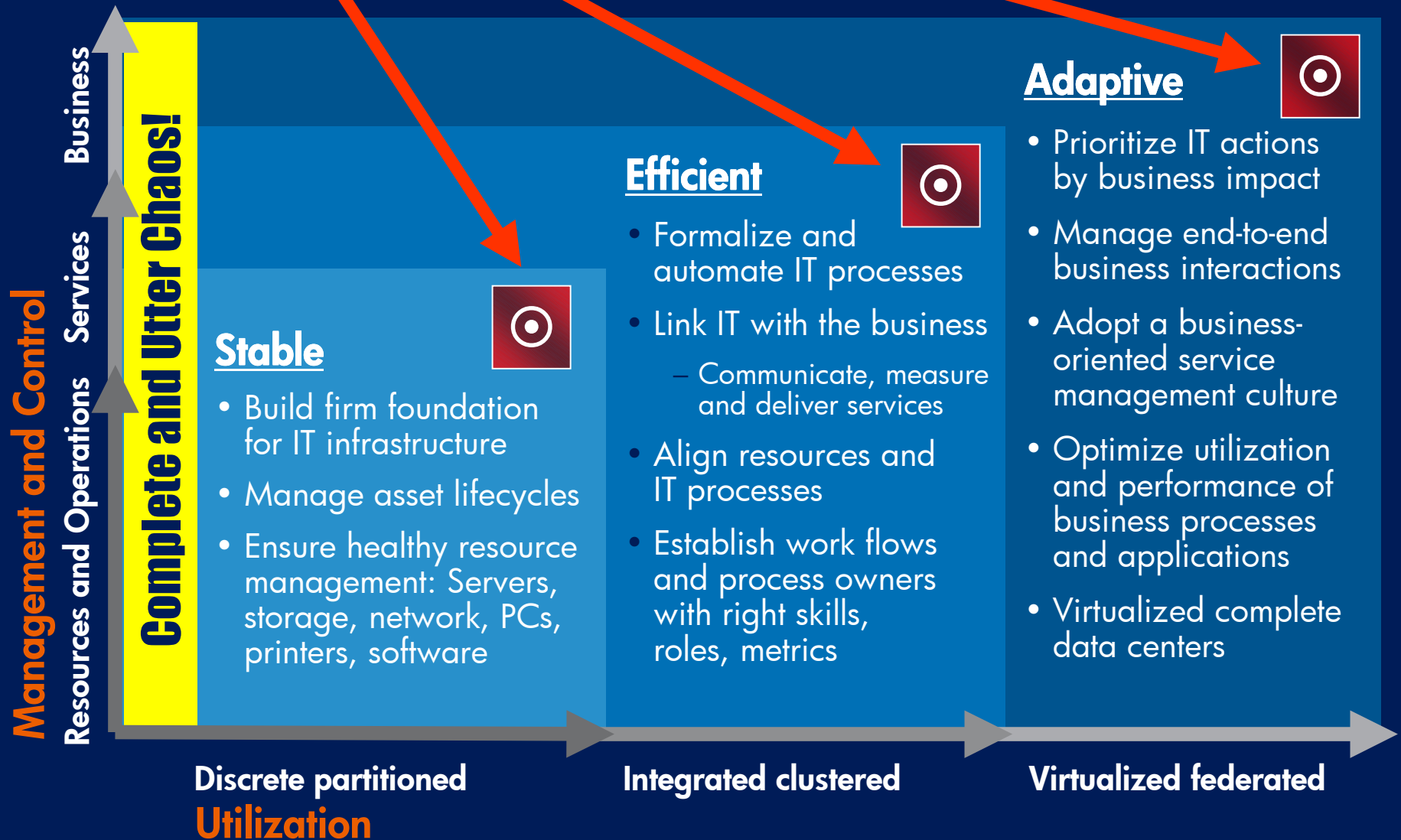Solutions and Technology Conference & Expo

The big shifts

→ It's a horizontal, heterogeneous, networked world. Standards are about connection and common language.

→ The demand for simplicity, manageability and adaptability will change how customers work and organize, buy and use technology.

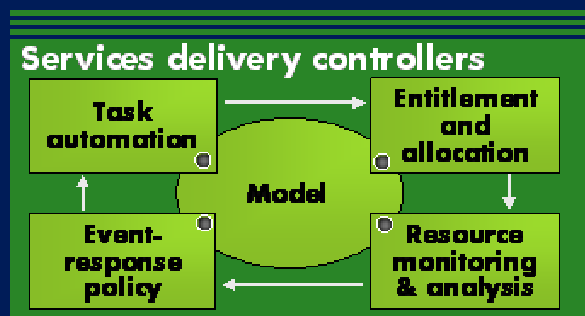→ All processes and content will be transformed from physical and static to digital, mobile and virtual.
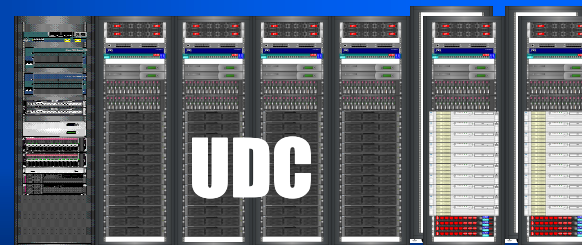
The balancing act

Increase agility:
The new dimension

Manage costs

Minimize risk

Increase quality

You are Where ?

Management and Control

Business

Services

Resources and Operations

Complete and Utter Chaos!

Stable

- Build firm foundation for IT infrastructure
- Manage asset lifecycles
- Ensure healthy resource management: Servers, storage, network, PCs, printers, software

Efficient

- Formalize and automate IT processes
- Link IT with the business
  - Communicate, measure and deliver services
- Align resources and IT processes
- Establish work flows and process owners with right skills, roles, metrics

Adaptive

- Prioritize IT actions by business impact
- Manage end-to-end business interactions
- Adopt a business-oriented service management culture
- Optimize utilization and performance of business processes and applications
- Virtualized complete data centers

Discrete partitioned

Integrated clustered

Virtualized federated

Utilization

A variety of service delivery controllers available to meet specific customer needs

Services delivery controllers

- Task automation
- Entitlement and allocation
- Model
- Event-response policy
- Resource monitoring & analysis

Complete Heterogeneous Solution

UDC

Policy Based Software

HP OPENVIEW

SYCHRON

NOVADIGM

CONSERA SOFTWARE™
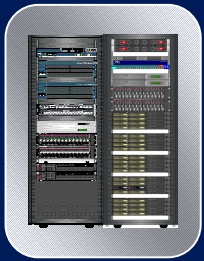
Hardware Platform Specific
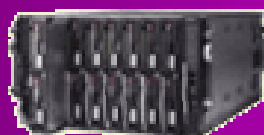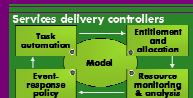
Blades - SIM

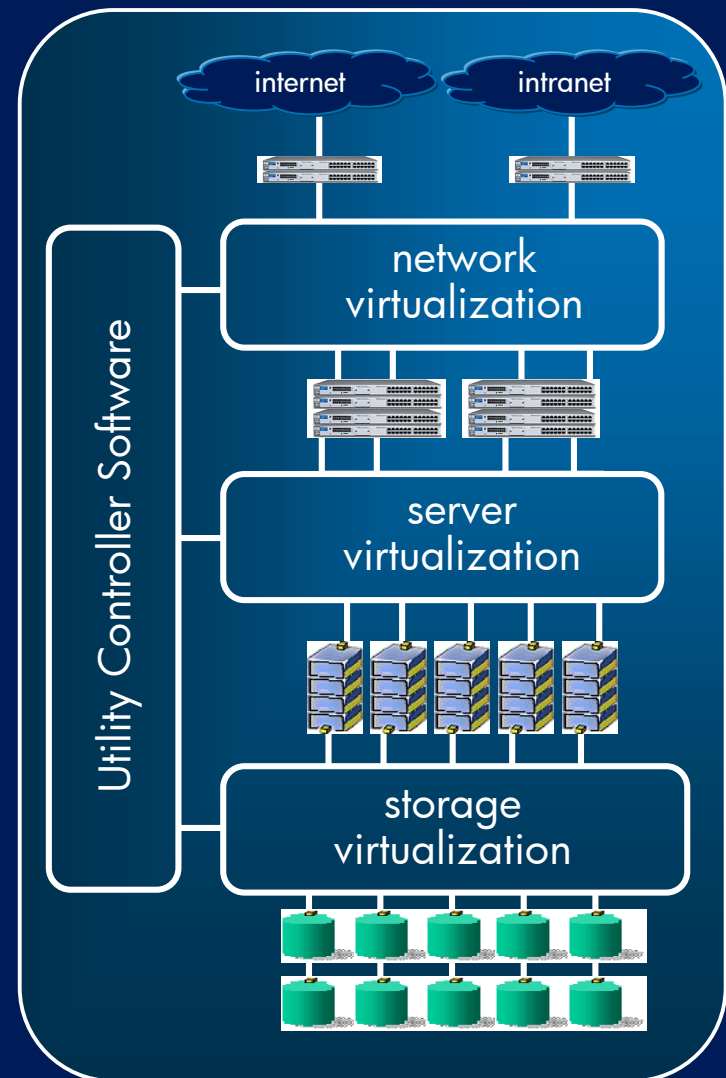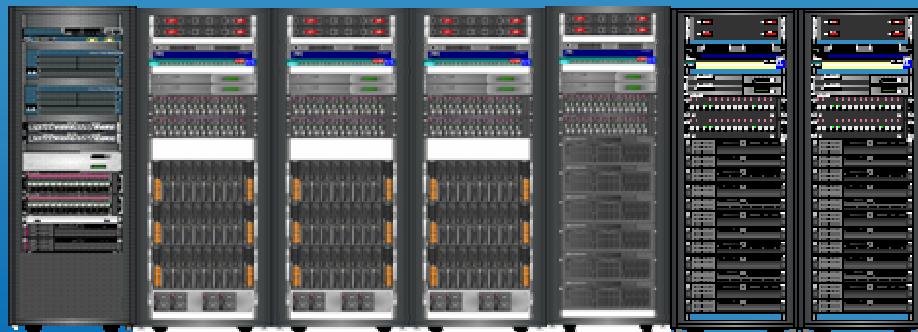SuperDome - GWLM

Storage – Blah, blah

Non-Stop – Blah, blah

What is HP's Utility Data Center?

A turnkey solution consisting of virtualized pools of resources, connected by a wire-once fabric, available for instant ignition in complex multi-tier architectures.

internet   intranet

Utility Controller Software

network virtualization

server virtualization

storage virtualization

hp utility data center

is a fully integrated software and hardware solution that enables virtual provisioning of application environments to optimize asset utilization and reduce administrative staff
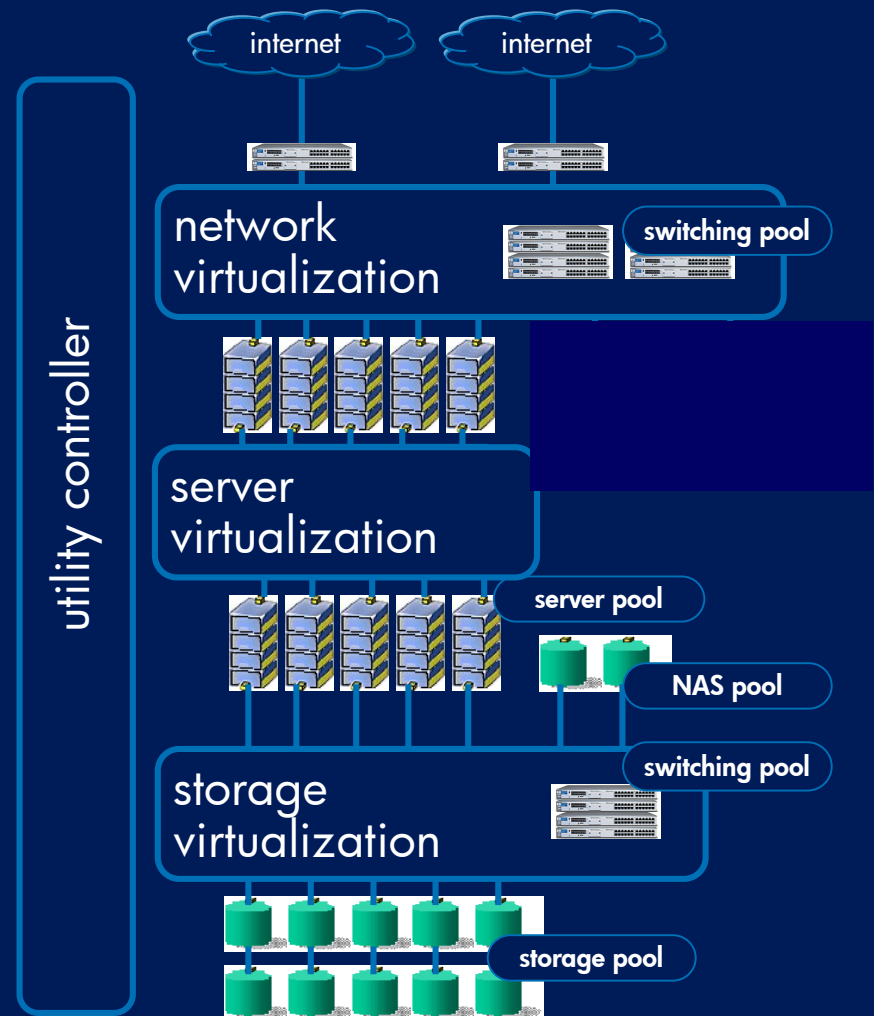
1. **wire once**

   all components are wired once to support virtual allocation of resources for the entire system

2. **resource virtualization**

   all networking, storage, and server components are wired once, and can be allocated and reallocated many times without having to rewire any physical components.
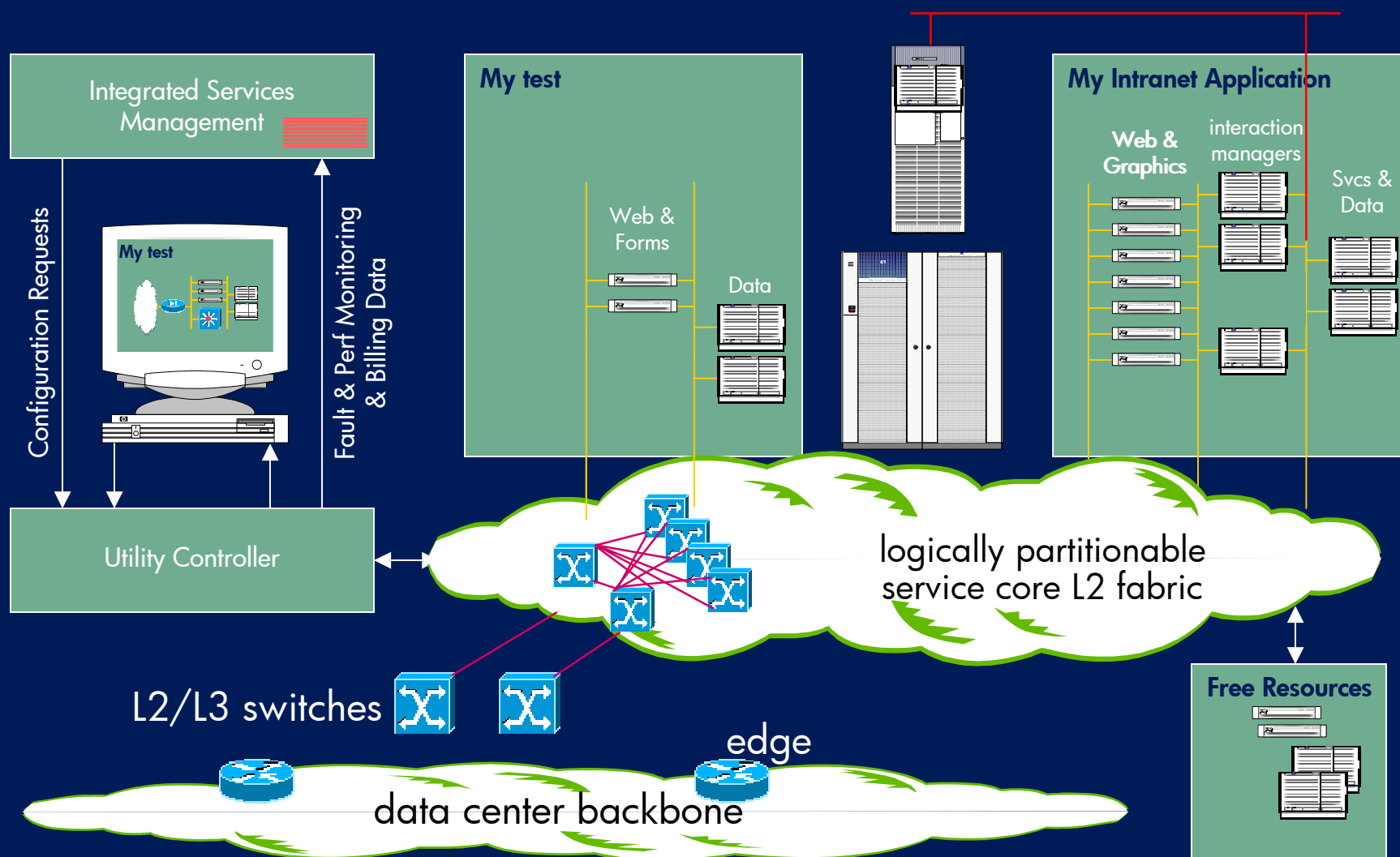
3. **utility controller**

   simple user interface allows administrators to architect new systems and activate them using available resources

internet   internet

utility controller

network virtualization

switching pool

server virtualization

server pool

NAS pool

switching pool

storage virtualization

storage pool

utility data center in action

Integrated Services Management

Configuration Requests

Fault & Perf Monitoring & Billing Data

My test

Utility Controller

My test

Web & Forms

Data

My Intranet Application

Web & Graphics

interaction managers

Svcs & Data

logically partitionable service core L2 fabric

L2/L3 switches

edge

data center backbone

Free Resources

Using a UDC

DNS

Util Controller

Network Virtualisation

VLAN101
VLAN102

Resource pool

Storage Virtualisation

Storage Pool

Active

The UDC selects and configures resources to implement the farm design:

- Allocate Devices, Storage, and VLANs
- Configure the Network Switches
- Configure the Storage
  - Copy the image(s)
  - Present the Storage
- Configure the SAN
- Configure DNS / DHCP
- Power up Devices
- Configure Devices
- Make the public subnet(s) routable
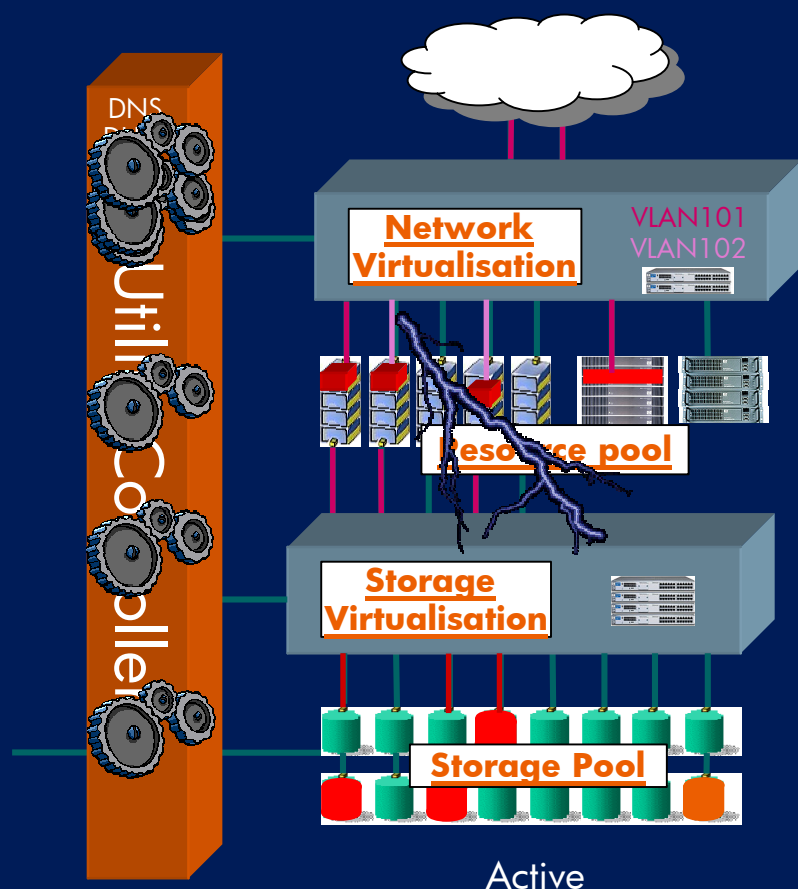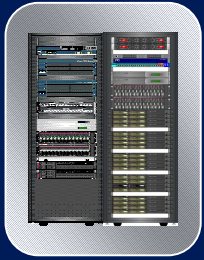
How can HP's UDC help you?

Capabilities

Customer Benefits

Dynamically allocate and retire resources as needed from a shared common pool

① **Purchase less IT equipment. Immediate and concrete cost savings**

Create complex multi-tier environments quickly

② **Respond faster to the needs of the business. Just say YES.**

Standards-based, proven server, storage, network, and cabling technology

③ **Reduced implementation risk**

Modular design

④ **Start small; Prove out cost savings and increased agility; Increase footprint over time.**

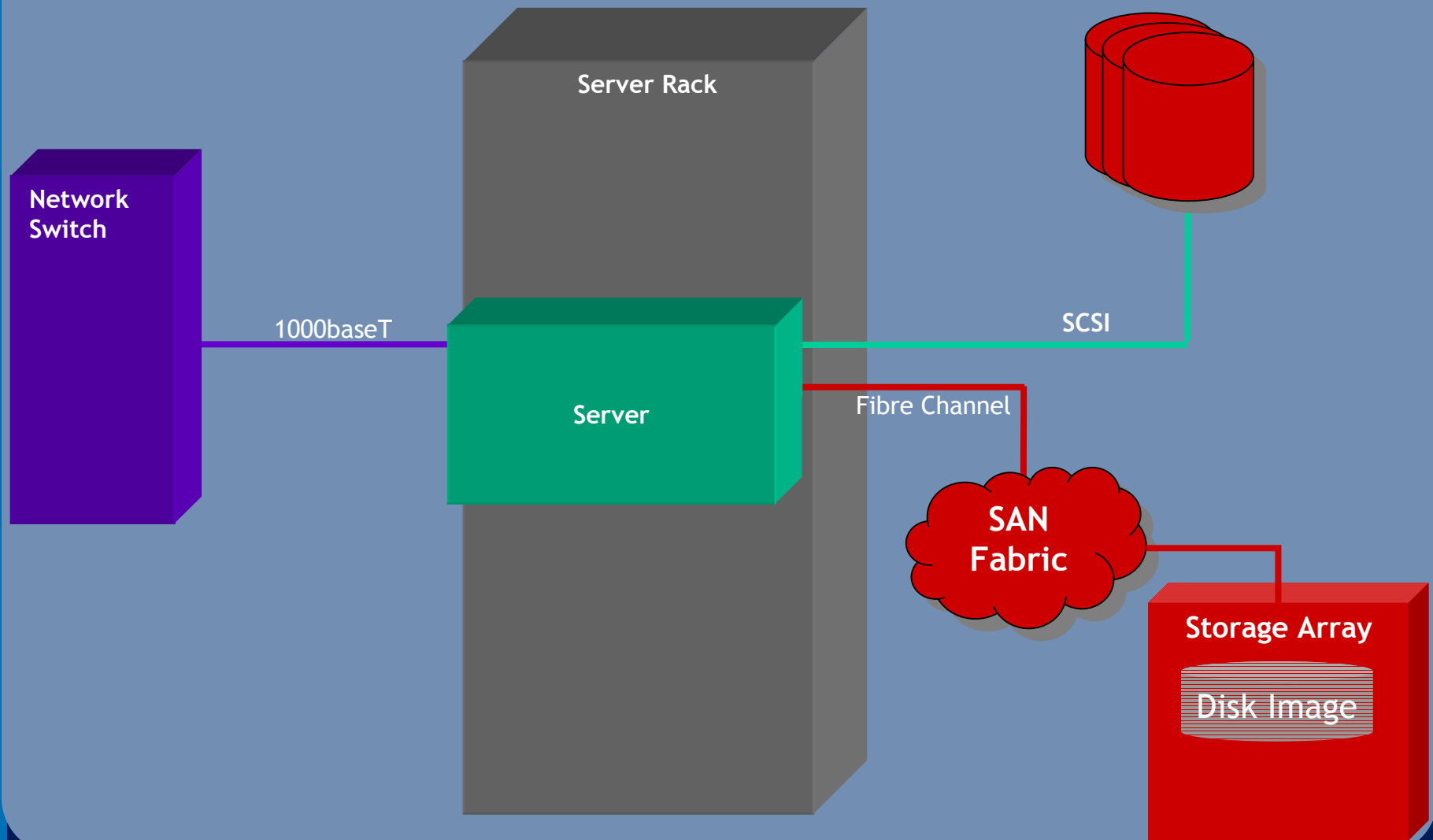**utility data center**

standardization
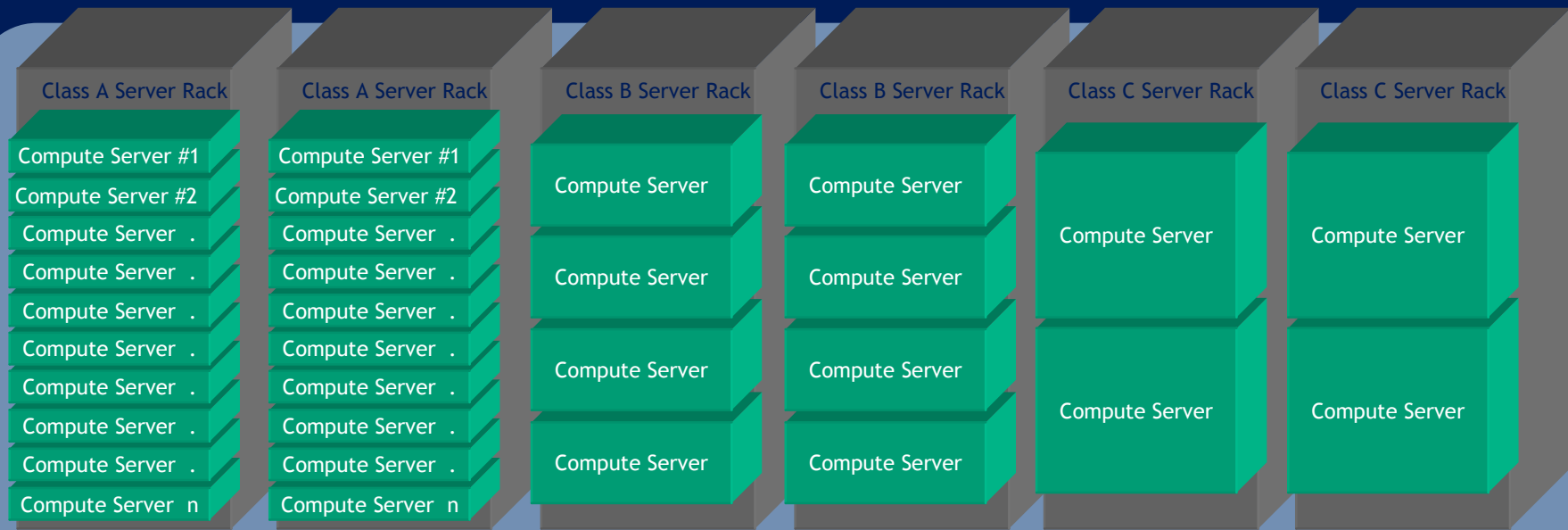-equipment
-operations

organizational change

**two key concepts
of a utility data center**

To often, today's data center operates like operators connecting telephone calls in the 1950's, with all it's problems.
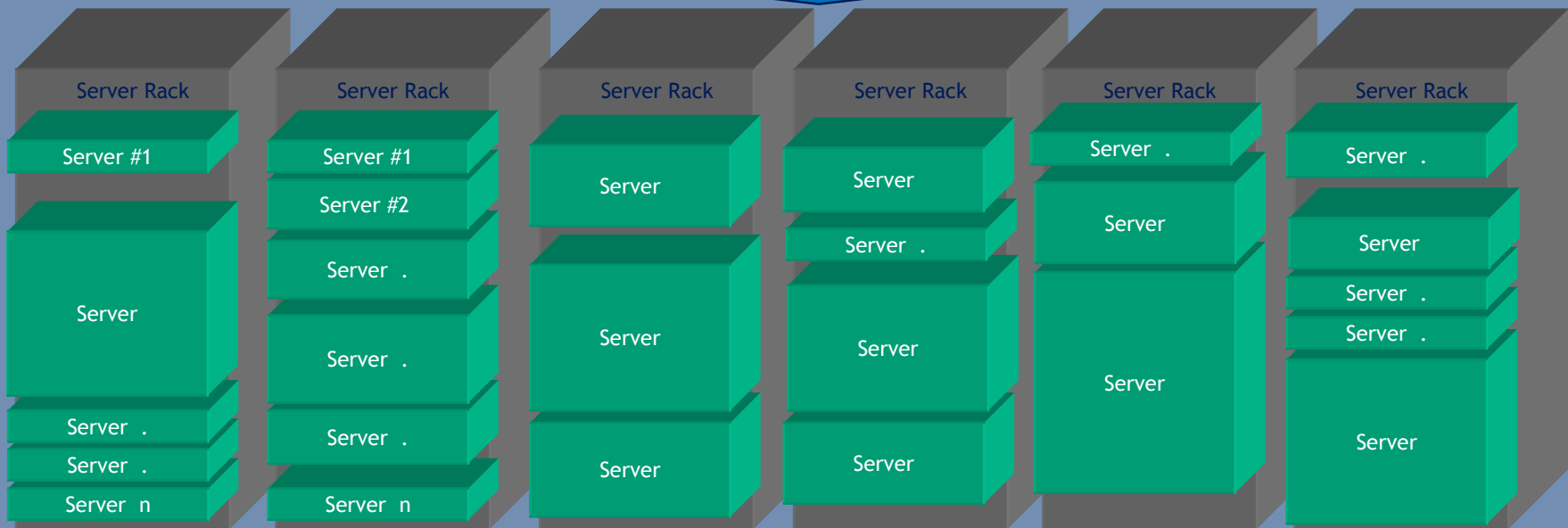
Utility Computing is about using technology to automate manual processes and offering a robust, utility-like service to your customers.

traditional approach to server sizing

Network Switch

Server Rack

Server

1000baseT

SCSI

Fibre Channel

SAN Fabric

Storage Array

Disk Image

Class A Server Rack — Compute Server #1, Compute Server #2, Compute Server ., Compute Server ., Compute Server ., Compute Server ., Compute Server ., Compute Server ., Compute Server ., Compute Server n

Class A Server Rack — Compute Server #1, Compute Server #2, Compute Server ., Compute Server ., Compute Server ., Compute Server ., Compute Server ., Compute Server ., Compute Server ., Compute Server n

Class B Server Rack — Compute Server, Compute Server, Compute Server, Compute Server

Class B Server Rack — Compute Server, Compute Server, Compute Server, Compute Server

Class C Server Rack — Compute Server, Compute Server

Class C Server Rack — Compute Server, Compute Server

Utility Data Center approach to server sizing

Server Rack — Server #1, Server, Server ., Server ., Server n

Server Rack — Server #1, Server #2, Server ., Server ., Server ., Server n

Server Rack — Server, Server, Server

Server Rack — Server, Server ., Server, Server

Server Rack — Server ., Server, Server

Server Rack — Server ., Server, Server ., Server ., Server
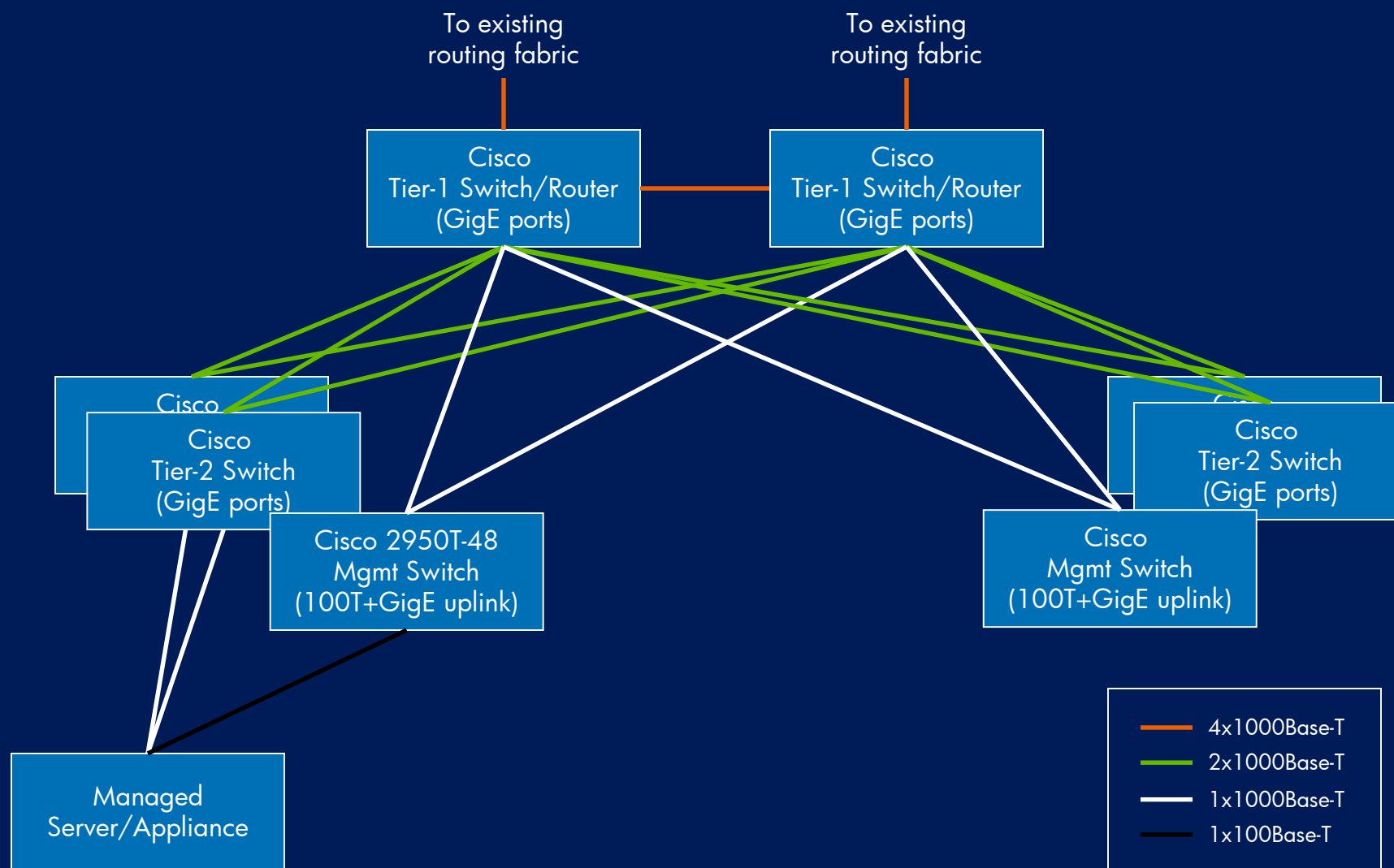
organizational change

ITSM

select a server class, not specific server configuration options

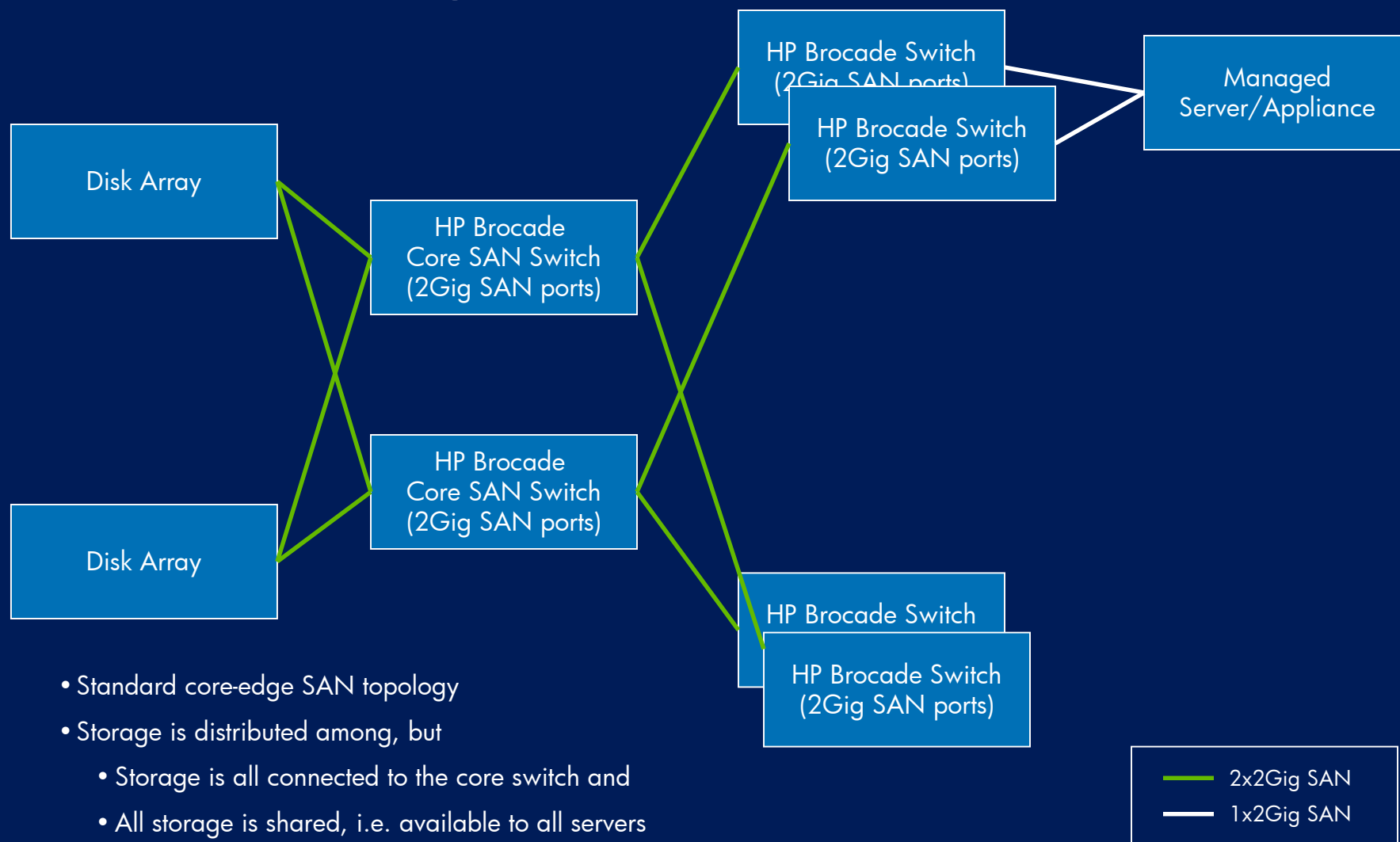**manage fewer cables and server placement, and more software delivery**

# The next level of detail

LAN Topology

To existing
routing fabric

To existing
routing fabric

Cisco
Tier-1 Switch/Router
(GigE ports)

Cisco
Tier-1 Switch/Router
(GigE ports)

Cisco

Cisco

Cisco
Tier-2 Switch
(GigE ports)

Cisco
Tier-2 Switch
(GigE ports)

Cisco 2950T-48
Mgmt Switch
(100T+GigE uplink)

Cisco
Mgmt Switch
(100T+GigE uplink)

Managed
Server/Appliance

— 4x1000Base-T
— 2x1000Base-T
— 1x1000Base-T
— 1x100Base-T

SAN Topology

HP Brocade Switch (2Gig SAN ports)

HP Brocade Switch (2Gig SAN ports)

Managed Server/Appliance

Disk Array

HP Brocade Core SAN Switch (2Gig SAN ports)

HP Brocade Core SAN Switch (2Gig SAN ports)

Disk Array

HP Brocade Switch

HP Brocade Switch (2Gig SAN ports)

- Standard core-edge SAN topology
- Storage is distributed among, but
  - Storage is all connected to the core switch and
  - All storage is shared, i.e. available to all servers

2x2Gig SAN
1x2Gig SAN

Demonstration—Utility Data Center

grid resources   CRM resources
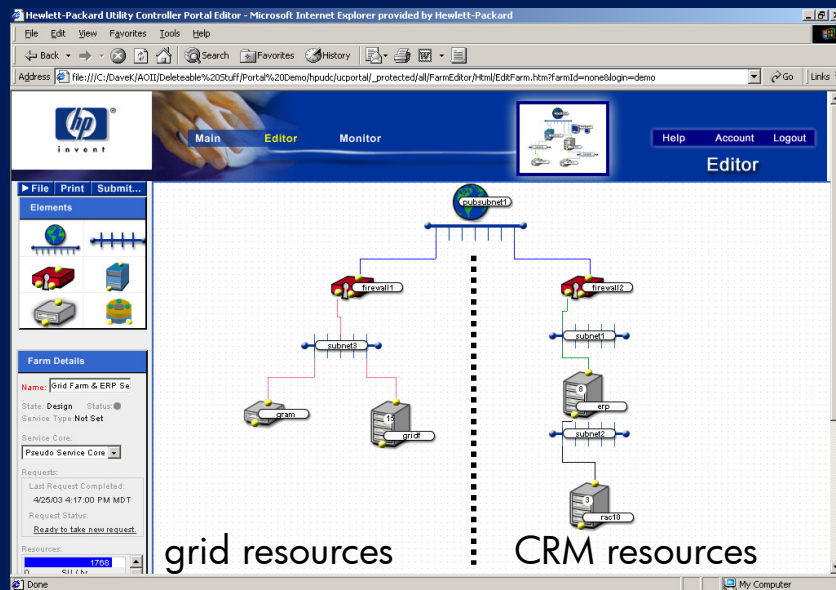
- Use of virtualized resources to create a grid and an enterprise application service

- Flexible automated resource re-allocation

- Security of resources and information between grid and other enterprise application environments

What are Farms?

- Fundamental goal of the HP UDC is to dynamically create, modify, monitor and measure multi-tier server architectures deployed in Farms

- Farms built within the HP UDC are constructed graphically

- Each server Farm is a logical entity that can be created, deployed, and destroyed as a set of resources that live on the network fabric

What are Farms (cont.)?

- A **Farm** is created by logically assembling a collection of elements, such as servers, firewalls, load balancers, and subnets, that are customized on the fly
- **Farms** can be created, increased, decreased, and deactivated as data structures, rather than by physically reallocating or rewiring

firewall1

backhaul1

host1
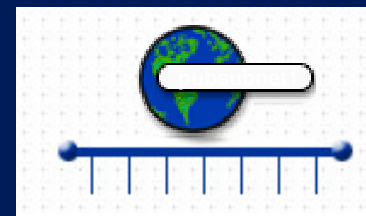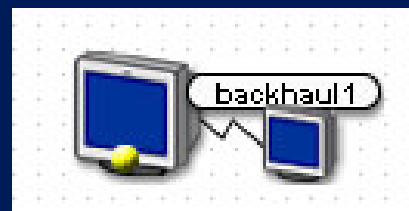
HP UDC Farms – FA Activities

- Each Farm in the HP Utility Data Center is a customer-designed and maintained compute-infrastructure implemented within the pre-wired Service Core

- HP UDC Farm Administrator uses a web-based interface called the *Utility Controller (UC) Portal* to design, update and monitor Farm resources

Farm Design Elements

Example: Complex Farm Design
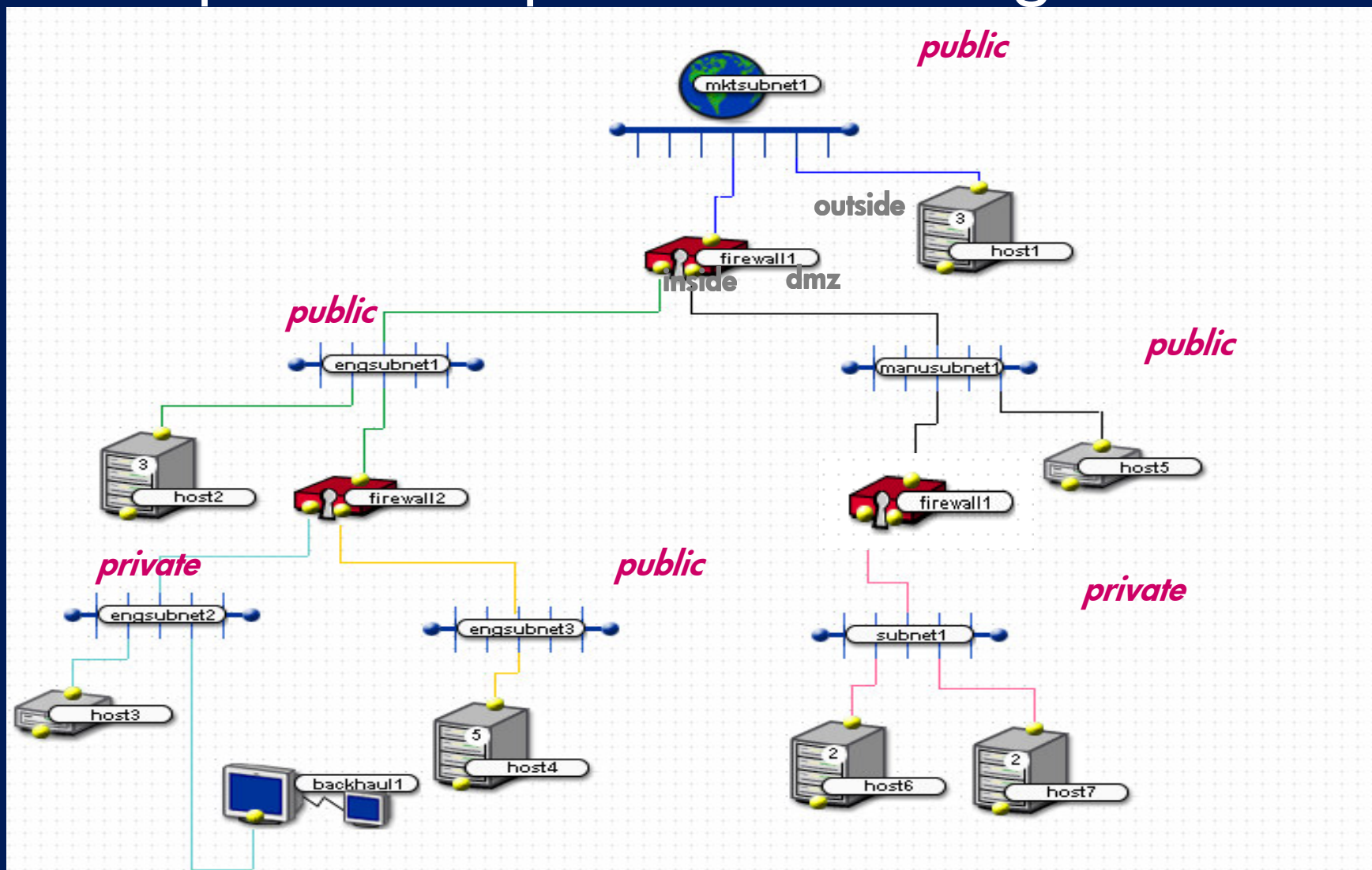
Farm Design Elements (con't.)

- Backhaul: provides a secure, private connection into the farm
  - Backhaul is the connection to the customer site
  - Several types of backhaul connections are supported, including point-to-point T1 and DS3
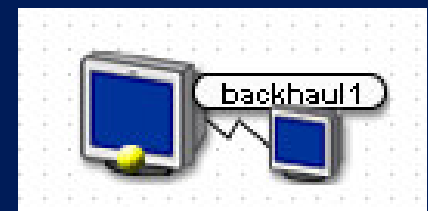
Automatic Design Validation

- Design checks
  - All required nodes configured & connected
  - No dangling references (i.e., deleted element)
  - No circular loops in the default gateway
  - Each firewall connection is to a separate internal subnet
  - Externally visible IP addresses do not exceed the requested maximum
  - The customer's service contract allows adding this farm

Farm States (1)

Design

• Initial state of the farm lifecycle. A new farm that was created (and may have been saved) through the UC Portal but that has not been submitted for approval and activation.

During this phase, you can perform pre-activation configuration on farm elements. Since no resources are actually allocated, you can have many farms in Design state.

State Diagram:

Design → Active ↔ Standby

Design → Deleted ← Inactive

Active → Inactive

Standby → Inactive
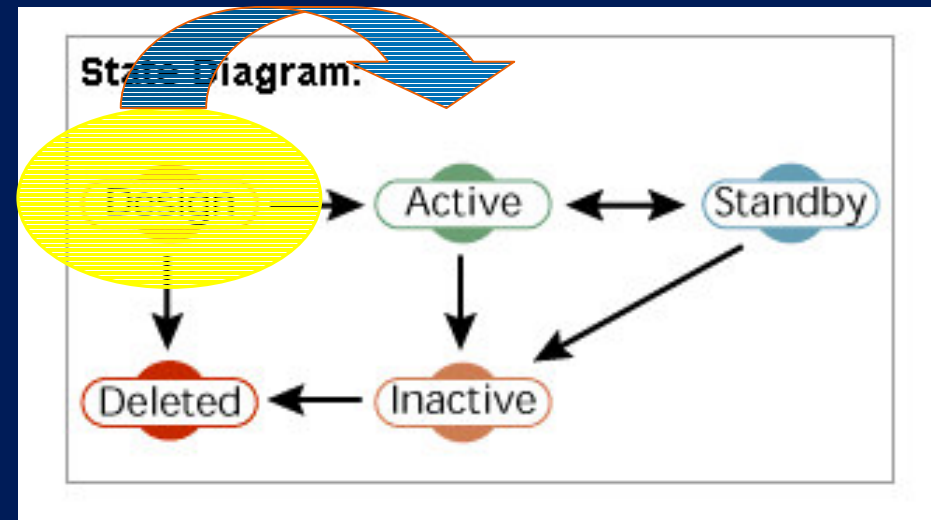
Pending

• The farm is submitted for approval and activation. During this phase, you cannot make changes to the farm. This is a transitional state between Design and Active.

Farm States (2)

Active

• The farm has been activated, is fully provisioned, and is running. Upon activation, IP addresses are available and you can perform additional configuration and load software images.

Note that changes to an active farm may require the approval of your Data Center Administrator or service provider.

State Diagram:

Standby

• All farm devices (excluding storage) are now idle and are available for use in other farm designs. The farm can still be reactivated.
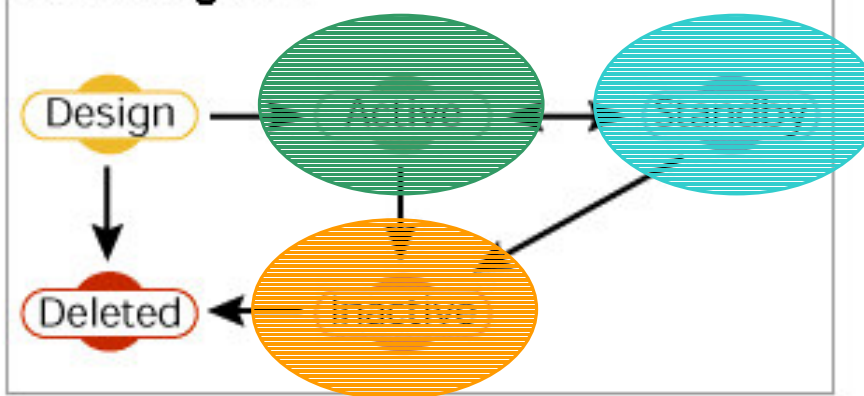
Inactive

• The farm is inactive and all hardware and storage elements are now idle and are available for use in other farm designs. The farm cannot be reactivated, although you can make a copy of the design and submit it for activation.

Farm Administration Lifecycle – Farm Design

Farm Administrator Tasks **Data Center Administrator Tasks**

UC Portal States

UC States

- Design
- Pending
- Active
- Standby
- Standby
- Inactive

Create new Farm design

Submit design to DCA

Modify design

Load applications

Set up monitors and alarms

Revise Farm design

Send design to DCA

Validate design/resources

Changes

yes

no

Verify available Service Core resources

Initiate auto-activation
- ✓ Allocate resources
- ✓ Wire Farm
- ✓ Configure Interfaces
- ✓ Activate Farm

Create report. Notify Farm Admin.

Backup Farm

Shutdown Farm

Created

Allocated
Wired
Dispatched
Active/Updated

Backup

Shutdown

UDC enables customers to:

- Physically wire once and virtually wire many times (using VLANs), eliminates issues related to human errors

- Automatically create segregated networks (@layer-2). Prevents worms/viruses from rapidly propagating from one farm to another, or from one subnet to another within a farm, if no explicit layer-3 routing exists between these networks

- Rapidly isolate virus/worm affected farms or servers in a farm, by shutting servers down or putting the infected farm in standby state

- Enforce network security policies, with re-usable farm-templates

- Rapidly provision and configure security appliances (e.g. Firewalls)

- Automatically replace security appliances upon failure, with the same configuration

- Rapidly deploy HP or 3rd party security software, by capturing and re-using secure configurations as "golden-images"

Security Features

- UDC has lockdown mechanisms for sensitive hosts
- UDC has multiple Firewalls (UC and OC)
  – Firewalls protecting farms optional
- UDC scrubs disks before re-allocating them
- UDC has network separation via VLANs
- UDC automates many operator tasks
- UDC has secure administrative access to Management Networks
- UDC has secure FA access to Farm consoles
- OpenView alerts & warnings allow UDC operators to react

Complex Networks in Farms

- Subnets and Firewalls can be configured to enable Advanced Networking Architectures.
  - Restricting network traffic into the farm to specific protocols
  - Controlling the flow of traffic between subnets within a farm

- Types of Subnets
  - Public Directly Routed – connected to Tier1
  - Public Indirectly Routed – subnet is not directly connected to tier-1. So subnet has a gateway device such as a firewall through which traffic is indirectly routed.
  - Private – no gateway, subnet not routable to/from internet.

- Firewall Configurations
  - NAT
  - PAT
  - Static Routes

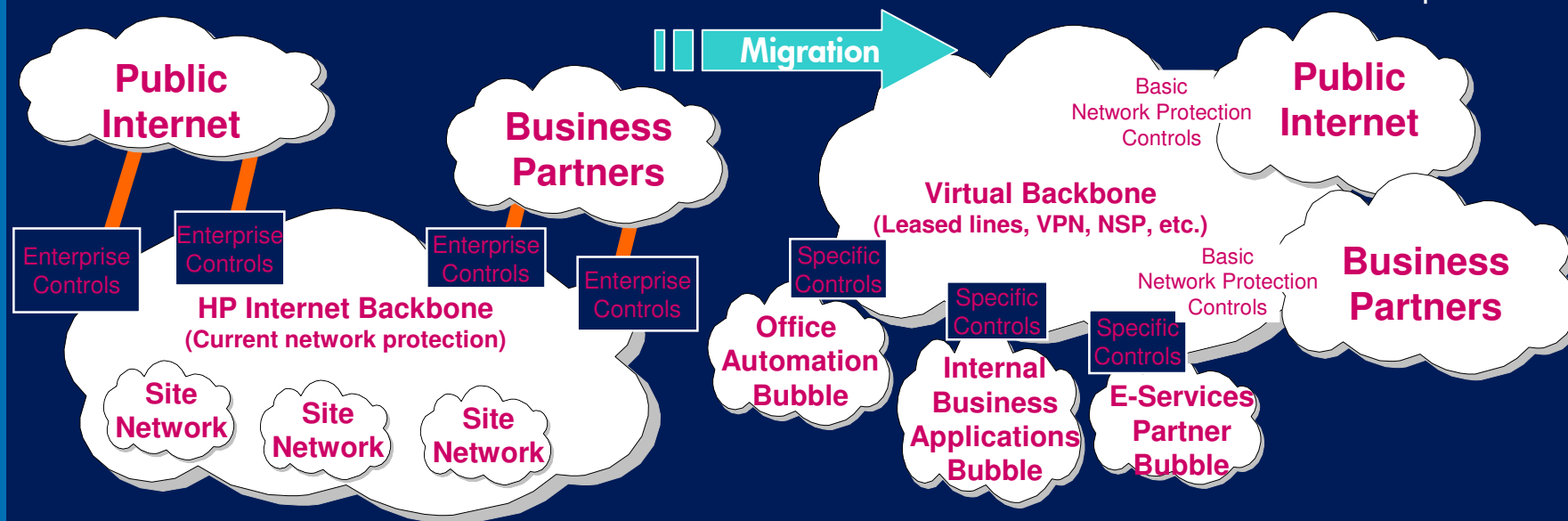# Complex Networks Advanced Networking Architecture

Networks Today:
Enterprise-wide monolithic internet security perimeter

Networks with Bubbles:
Business-function focused security perimeters that are closer to business operations

Migration

Public Internet

Business Partners

Enterprise Controls

Enterprise Controls

Enterprise Controls

Enterprise Controls

HP Internet Backbone
(Current network protection)

Site Network

Site Network

Site Network

Basic Network Protection Controls

Public Internet

Virtual Backbone
(Leased lines, VPN, NSP, etc.)

Specific Controls

Specific Controls

Specific Controls

Basic Network Protection Controls

Business Partners

Office Automation Bubble

Internal Business Applications Bubble

E-Services Partner Bubble

➢ ANA is composed of a <u>virtual backbone</u>, and multiple network compartments ("<u>bubbles</u>") connected to the backbone via Pop-routers or firewalls

➢ Each <u>network compartment</u> is preconfigured to host specific type of business applications, aggregating similar systems or workgroups.

➢ Benefit: Such a structure allows network access policies for each type of compartment to be set up-front, and make it simple and fast to add additional systems to any compartment over time.

Automated Flexing Interface
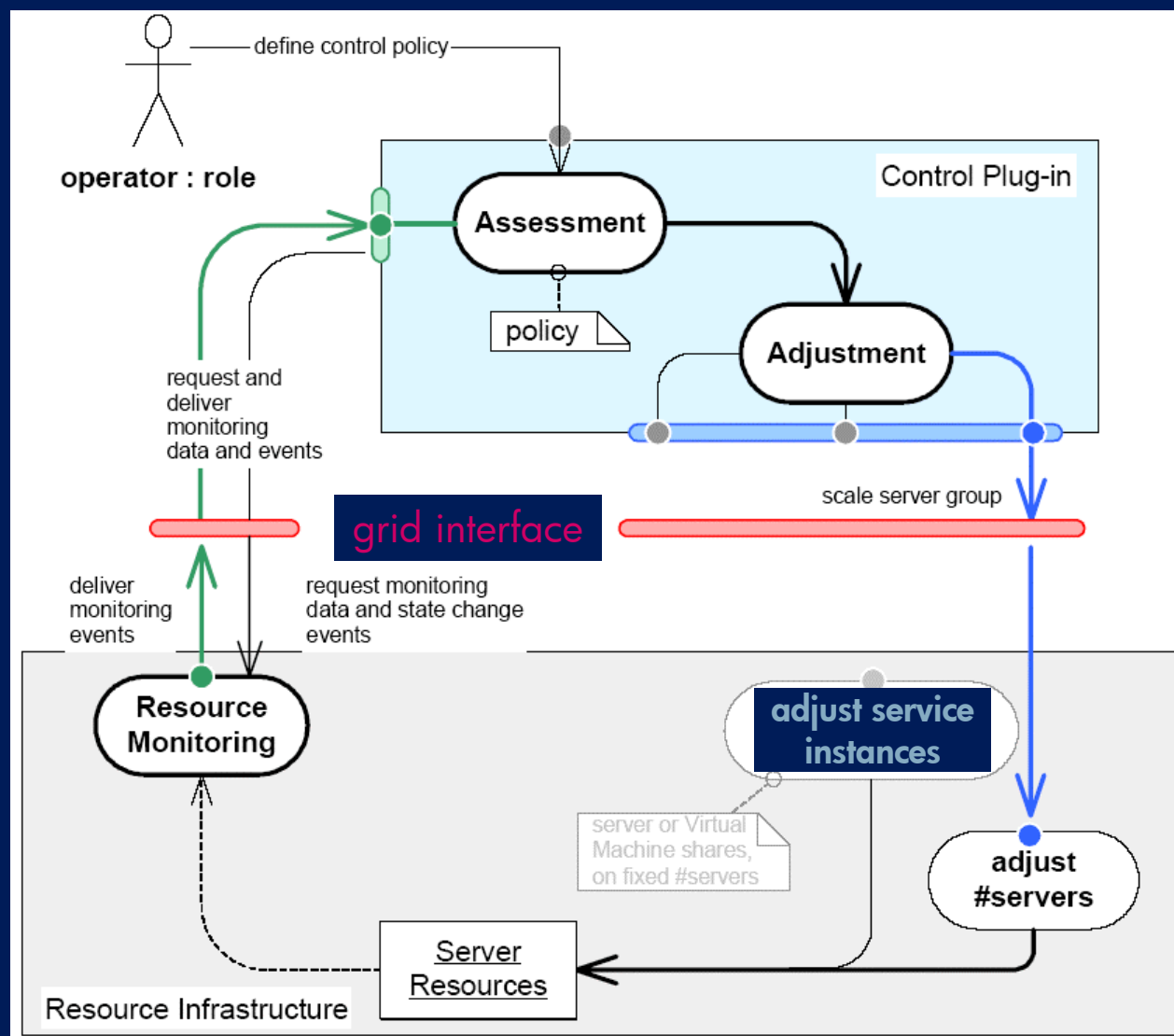
Utility Data Center Components

Integration training & support services

Optional HP consulting services

hp utility data center

hp utility controller software

processing elements

hp-ux**

solaris*

windows

linux

networking elements

Cisco

storage elements

HP Disk Array

utility fabric

HP OpenView

external backup

external storage

- ## Virtual Server Pools
  - Heterogeneous HP server environments

- ## Virtual Network Pools
  - Standards-based VLANs
  - Flexible and robust network infrastructure

- ## Virtual Storage Pools
  - HP EVA storage virtualization

- ## Utility Controller Software
  - Manages service templates
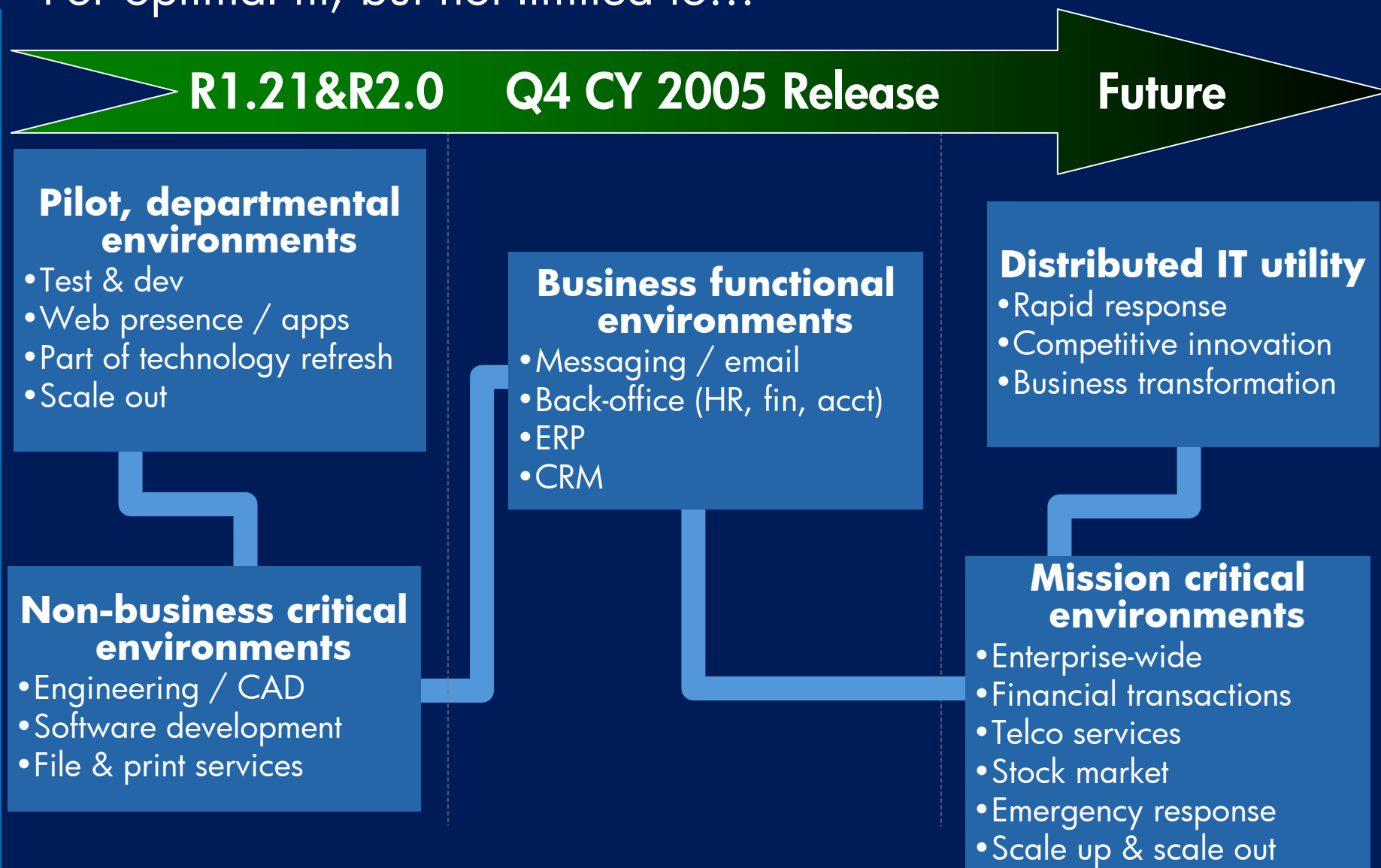
HP UDC Design Principles

simplify

+

- Increase ease of use
- Improved intelligence, policy engines
- Automate and orchestrate processes
- Consolidate applications and infrastructure
- Minimize customization

standardize

+

- Open systems: use industry-standard models, processes, technologies, interfaces, and platforms
- Enable heterogeneity through use of industry standard interfaces and SDKs

modularize

- Work with existing data center elements, tools, and processes, where appropriate – promote management / process diversity
- Virtualize resources
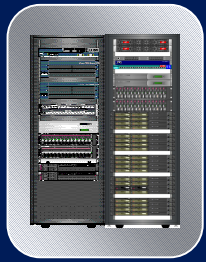- Break down complex systems into modules

HP UDC Targeted "Sweet Spots"
For optimal fit, but not limited to…

R1.21&R2.0   Q4 CY 2005 Release   Future

Pilot, departmental environments
- Test & dev
- Web presence / apps
- Part of technology refresh
- Scale out

Business functional environments
- Messaging / email
- Back-office (HR, fin, acct)
- ERP
- CRM

Distributed IT utility
- Rapid response
- Competitive innovation
- Business transformation

Non-business critical environments
- Engineering / CAD
- Software development
- File & print services

Mission critical environments
- Enterprise-wide
- Financial transactions
- Telco services
- Stock market
- Emergency response
- Scale up & scale out

UDC - A revolutionary change for your data center

Development
Factory
Sales

Silo IT – inefficient

- Fixed capacity

- Under-utilized + over-provisioned

- Complex and difficult to change

Development, Sales, and Factory

Virtual IT – agile

- Dynamic capacity

- Optimized resources

- Simplified and flexible