

Next Generation Datacenter

Part : Datacenter Lifecycle Service

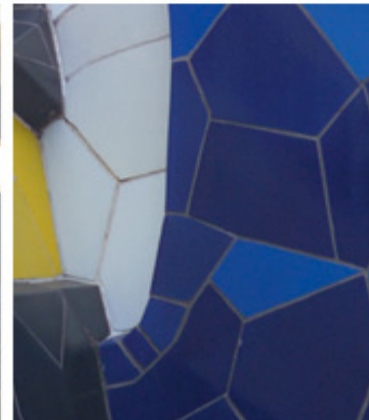
Kim Han Kyoul

Datacenter Lifecycle Team



Contents

- ✓ HP Strategy & Consolidation Story
- ✓ HP Korea Datacenter Lifecycle Service
- ✓ What is Next Generation Datacenter?



HP Strategy & Consolidation Story



The strategy roadmap

Making the shift to a service center



techno-centric

service-centric

**business
centric**

**business
view
of IT**

.. a problem

.. a solution

.. a partnership

**IT as a
COST center**

**IT as SERVICE
center**

**IT as an
BUSINESS
innovation
center**

- Control costs and infrastructure assets
- Operates and manages technology assets

- Understands the business
- Enables business change
- Infrastructure optimization
- Offers, manages and automates IT services
- Service centric IT process and organization optimisation
- Works with internal and external customers

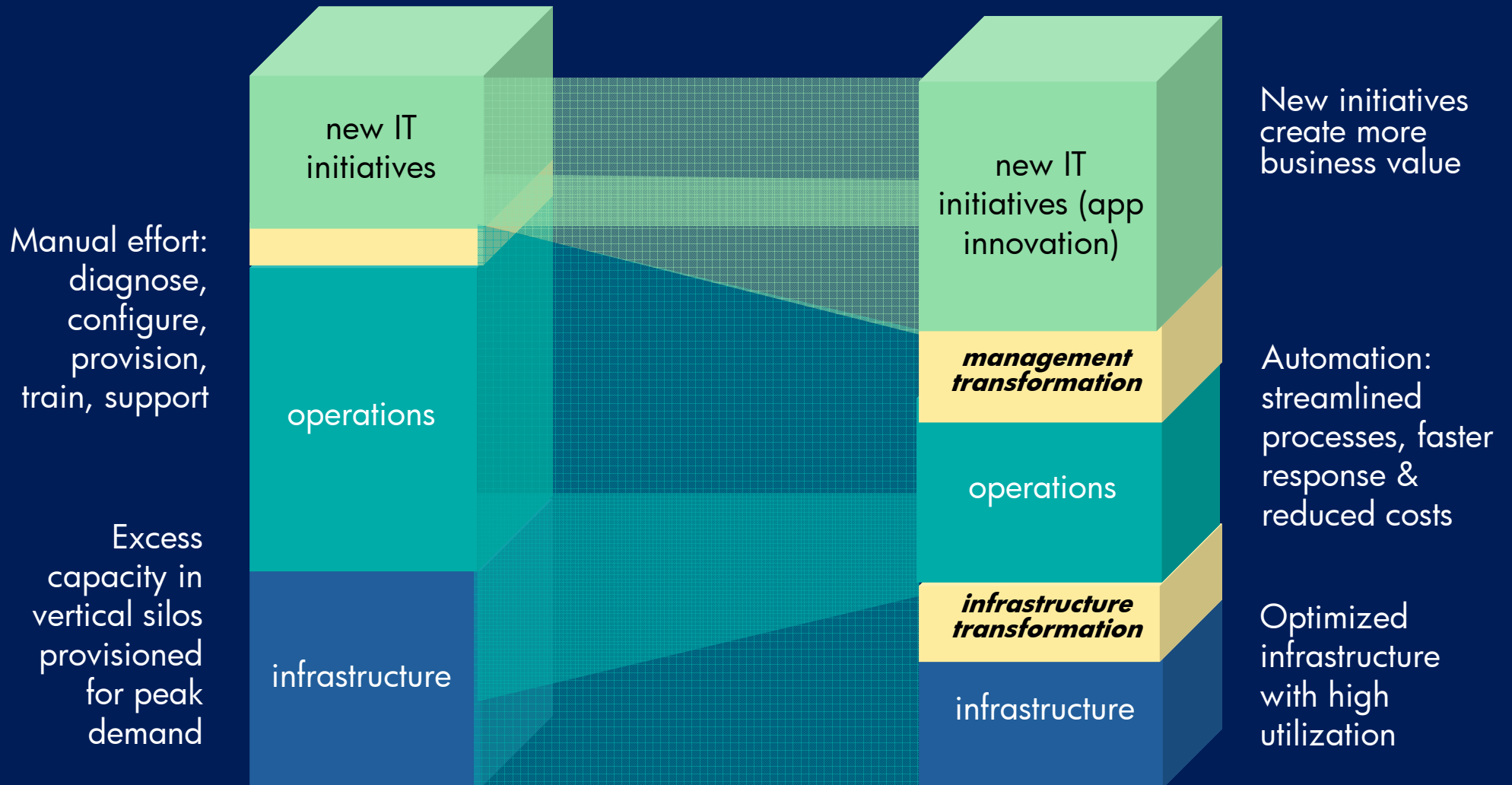
- Totally aligned with the business
- Business innovation through IT
- Optimized application portfolio, information and business processes

point solutions

integrated solutions

Infrastructure solution & Services

Automating management and infrastructure improves RoIT and enables IT to deliver more value



The HP IT journey



Pre-merger	Today	Target
7,000+ applications	4,000 applications	1,500 applications
25,000 servers	19,000 servers	10,000 servers
300 Data Centers	85 Data Centers	11 Data Centers
IT cost = 4.6% of revenue	IT cost = 3.6% of revenue	IT cost = <3.0% of revenue
Innovation = 28% of IT spend	Innovation = 34% of IT spend	Innovation = 50% of IT spend

Compaq Merging

FY02 ~ 04

Five steps to datacenter consolidation

STANDARDIZE

- Facilities designed and outfitted in accordance with industry standards (TUI)
- Rationalize & apply the technology standards for platforms
- Simplify the application portfolio and eliminate redundancy
- Revisit license agreements with ISVs

VIRTUALIZE

- Deploy virtual network, server and storage solutions
- Make shared environments the default choice for new applications

UTILITIMIZE

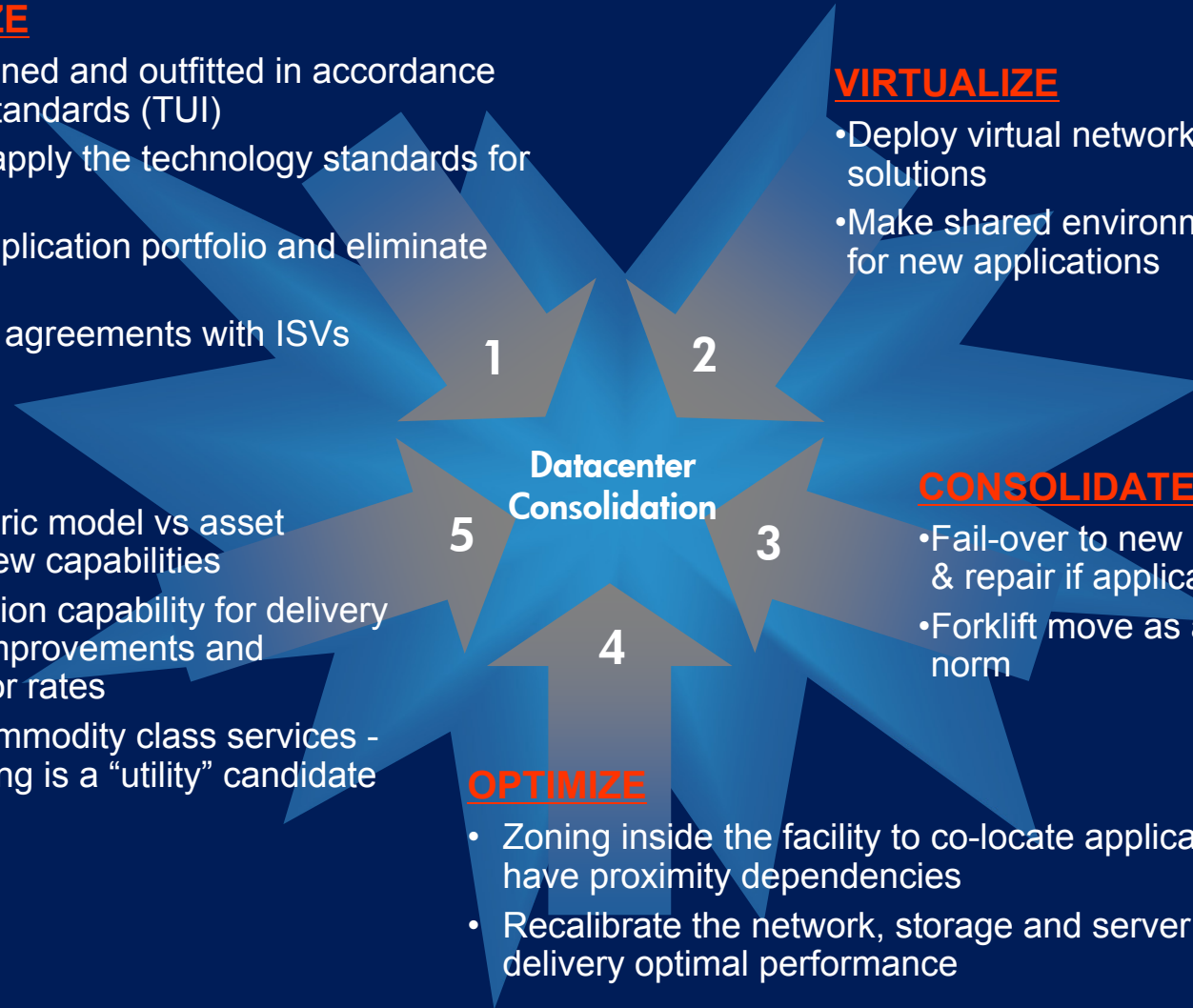
- Service centric model vs asset centric for new capabilities
- Full automation capability for delivery cycle time improvements and reduced error rates
- Aimed at commodity class services - Not everything is a “utility” candidate

CONSOLIDATE

- Fail-over to new environment, fall back & repair if application doesn't work
- Forklift move as an exception not the norm

OPTIMIZE

- Zoning inside the facility to co-locate applications that have proximity dependencies
- Recalibrate the network, storage and server farms to delivery optimal performance



Datacenter Consolidation - Considerations



Consolidated Infrastructure

- Secure facilities
- Wide area Network
- Redesign of DRP & BCP
- Shared infrastructure
- Site Location
- Building & Physical Environment
- Consolidated service helpdesk
- How many Datacenter

Moving Equipment

- Physically consolidated datacenter
- Remained equipment & resource
- Down time

Investment plan

- Expected budget
- Expected ROI (Return on Investment)
- ROI Measurement system

IT governance model

- Ensure business alignment
- Proper balance of cost, service levels, risk and agility for the business
- Must support standards and shared infrastructure

IT processes

- Many processes will need to change because of shared infrastructure, and to maintain the efficiencies from consolidation

IT organization

- Reorganization may be warranted given other changes, especially with collocation
- HR Planning (retention, reduction etc)

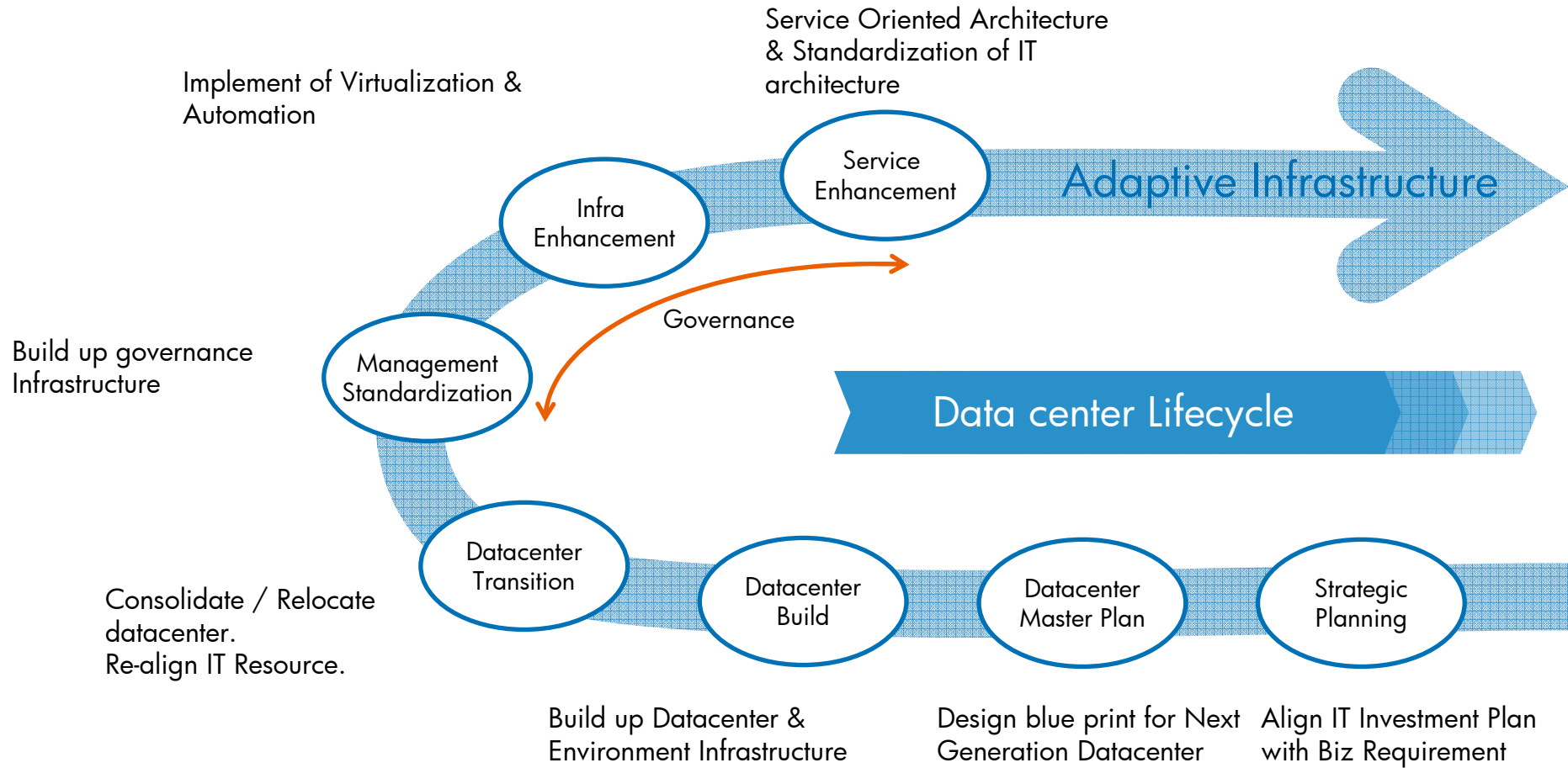
Human impact

- Consolidation means change for your staff
- May mean role change, retooling, relocation or redeployment
- Retention and buy-in may be factors

HP Datacenter Lifecycle Service



HP Datacenter Lifecycle Service



HP Datacenter Lifecycle Solution Framework

Strategic Planning

- Datacenter Visioning Workshop
- IT Strategy Planning for DC
- Reference Benchmarking
- World Class Datacenter Classification

Datacenter Master Plan

- DC Cost Model Analysis
- DC Reference Model Design
- Five 9 Center Design

Datacenter Build

- Environment Assessment
- Smart Cooling
- Site Planning Consulting
- Construction
- Command Center
- Network Integration
- Integrated facility management

Datacenter Transition

- On/Offline Relocation
- Transportation
- Datacenter Consolidation
- Change Management

Standardization

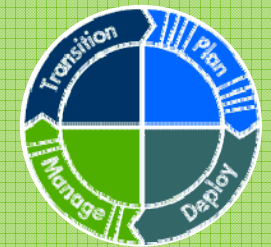
- Datacenter Operation
- IT Operation Governance
- ITSM Consulting & Implementation
- IT Certification Consulting
- Methodology implementation

Infra Enhancement

- IT Consolidation / Optimization
- IT Shared Service
- Business Continuity Planning / Implementation
- Security

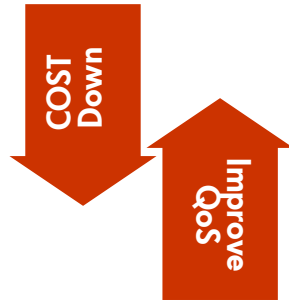
Service Enhancement

- Solution Modernization
- Real Time Infrastructure for SOA
- Information Lifecycle Management
- Software Consulting & Implementation



Strategic Planning IT Strategy Planning IT Vision IT Business Plan IT Investment Plan IT Risk Management	Enterprise Build IT Architecture IT Security IT Compliance IT Governance IT Service Management IT Change Management IT Incident Management IT Problem Management	Standardization IT Standards IT Best Practices IT Reference Architecture IT Frameworks IT Templates IT Tools IT Processes
Business Model Plan IT Business Model IT Revenue Model IT Cost Model IT Profit Model	Enterprise Transition IT Migration IT Integration IT Consolidation IT Rationalization IT Optimization IT Innovation	Info Enhancement IT Data Management IT Content Management IT Knowledge Management IT Collaboration IT Social Media IT Analytics IT Business Intelligence
	Service Enhancement IT Service Management IT Incident Management IT Problem Management IT Change Management IT Configuration Management IT Asset Management	

Phase 1 - Planning



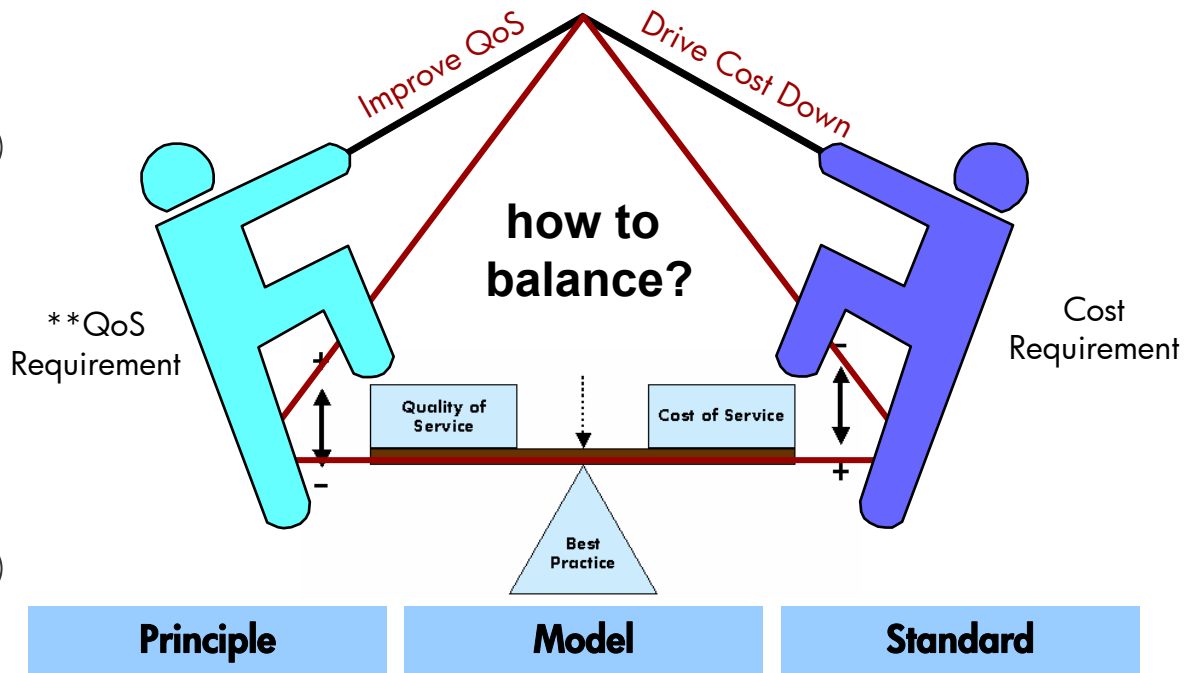
- **Consideration Points**
- Communicates needs and priorities
- Defines business Goal and IT Vision
- Determines how/where investments should be made
- Defines Technical Architecture / Transition Plan

Business View

Functional View

Technical View

Implementation View

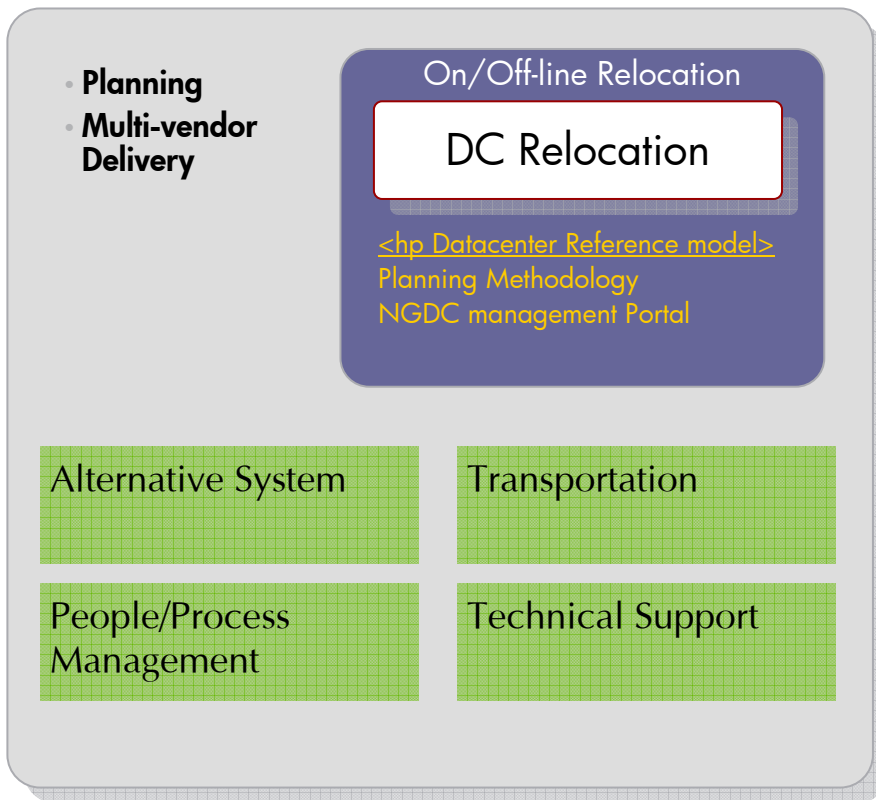


**QoS Target Scope : Datacenter Infrastructure (Facility, System, IT Process etc)

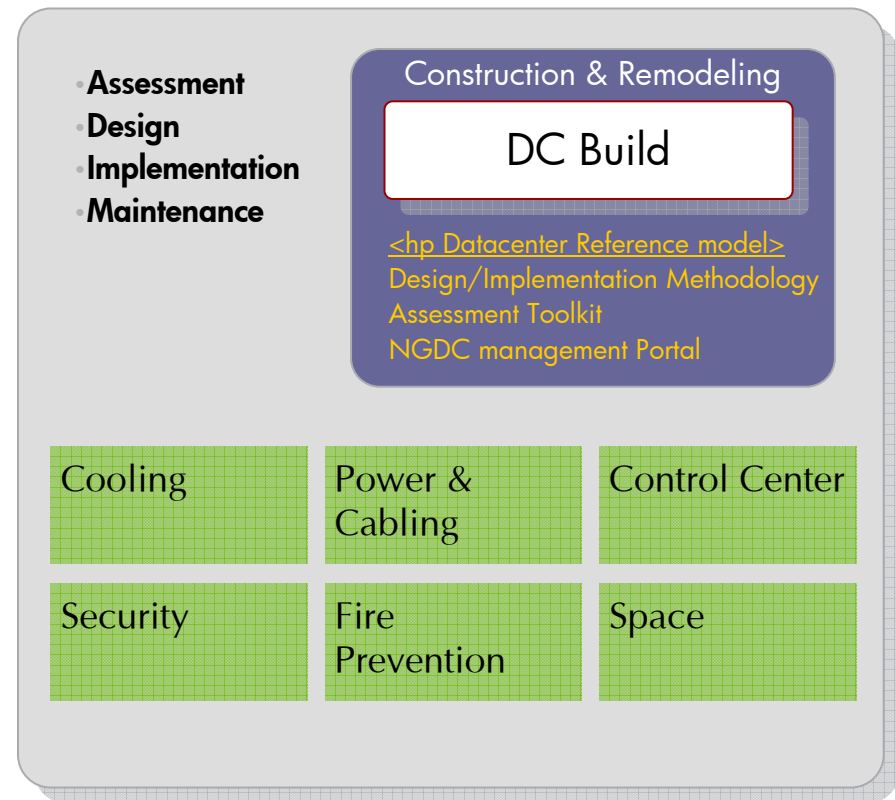
Strategic Planning • Business Strategy • IT Strategy • Datacenter Strategy • Physical Design • Operations	Datacenter Build • Business Architecture • Design • Construction • Commissioning • Operations	Manufacturing • Production • Quality Control • Logistics • Customer Support • Sustainability
Datacenter Move/Relocation • Business Architecture • Design • Construction • Commissioning • Operations	Datacenter Transition • Business Architecture • Design • Construction • Commissioning • Operations	Service Enhancement • Business Architecture • Design • Construction • Commissioning • Operations

Phase 2 – DC Build & Transition

Quick & Minimum downtime Datacenter Relocation



Optimize Datacenter base on the Customer needs



Strategic Planning IT Strategy IT Planning IT Budgeting IT Risk Management IT Governance	Enterprise Build IT Infrastructure IT Security IT Compliance IT Service Management IT Change Management	Standardization IT Standards IT Best Practices IT Reference Architecture IT Policy Management IT Audit Management
Enterprise Model Plan IT Cost Model IT Performance Model IT Risk Model	Enterprise Transition IT Migration IT Integration IT Decommissioning IT Archiving	IT Education IT Training IT Certification IT Awareness IT Literacy

Phase 3 – IT Shared Service & ITC



Consolidation

Reduce IT environment complexity while lowering cost and freeing resources for innovation throughout the solution lifecycle

Simplification

+

Standardization

+

Modularity

+

Integration

Goal : Adaptive Infrastructure

•IT Shared Service

- ❖ System/Process/Apl. Consolidation
- ❖ Virtualization
- ❖ Automation

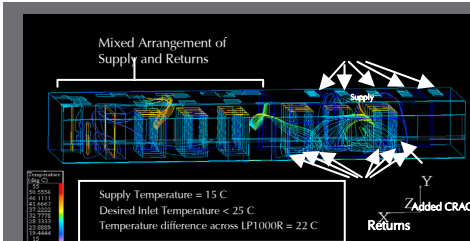
Co-work with Other Business

- ITSM(IT Service Management)
- ILM (Information Lifecycle Management)
- BC&A (Business Continuity & Availability)
- C&I Industry Solution



End2End Service Portfolio : Assessment + Design + Implementation + Maintenance + Education

Datacenter Thermal Assessment (3D Cooling)



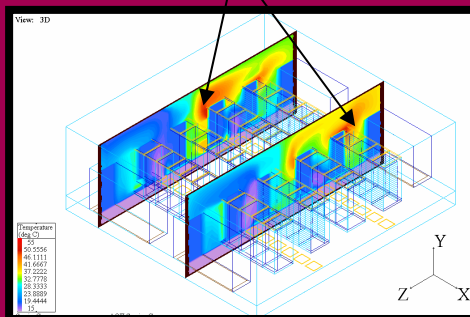
What is Thermal Assessment? :
 전산장애의 주 원인인 공조 시스템에
 대한 전문 분석 솔루션을 기반으로 한
 분석 개선 방안을 도출합니다.

Duration :
 4 weeks. (비 상주 기준)
 100평 이하의 전산실 기준

수행 배경

어플리케이션의 성능 요구 증가에 따라
 고밀도 / 고성능 시스템에 대한 도입이
 증가에 따라 공조 설비 용량 및 디자인에
 대한 검증이 필요하게 되었습니다.

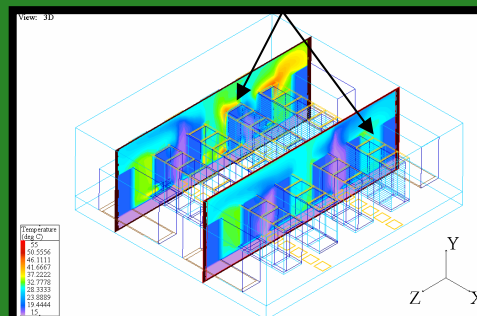
AS-IS : Hot Spot Zone



수행 방안

HP CFD 모델링 툴을 기반으로 한 상면
 하부 및 상부, 천정 상단까지 전체
 공간에 대한 모델링 분석

To-BE : 권고안 적용 시
 Ex) Airflow Layout 조정안 적용
 CRAC 용량 증설 안 적용



개선 사항

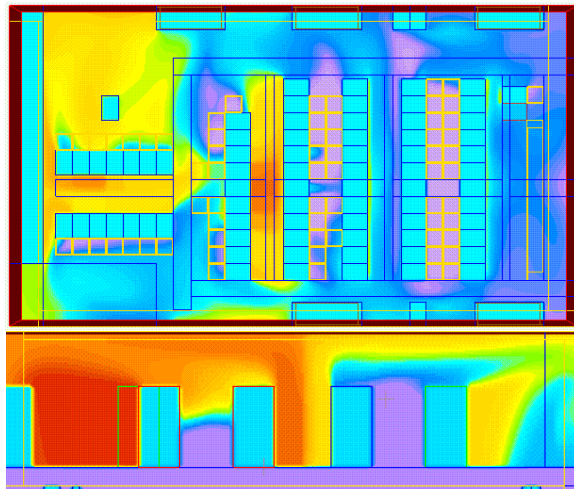
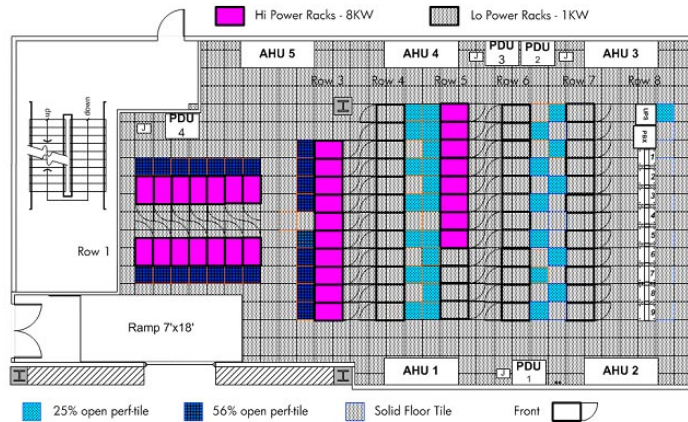
Best Practice

- 공조 설비에 대한 선진 방안 제시

Benefit

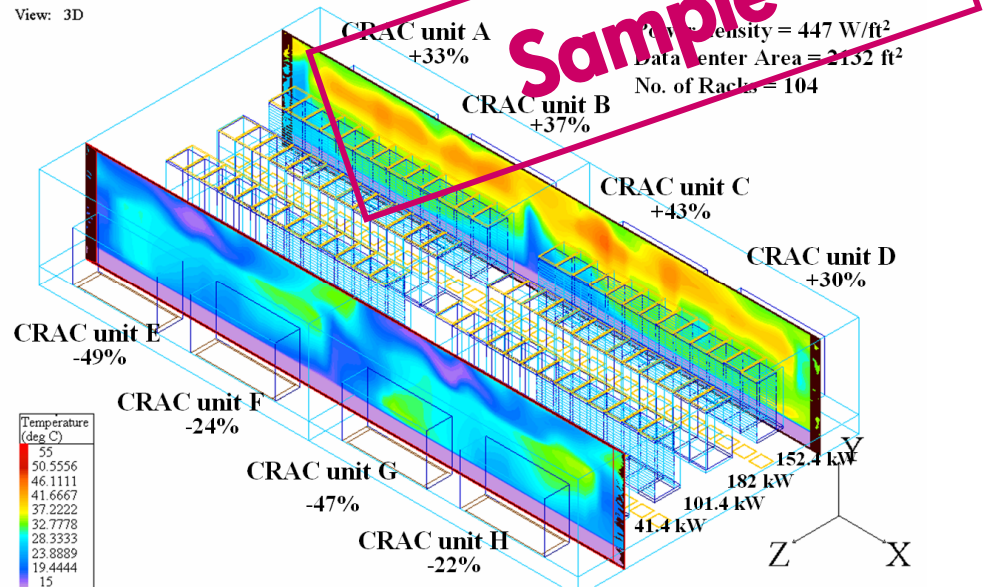
- 공조설비 효율성 증대를 통한 투자 효과 극대화
- Hot Spot 제거를 통한 잠재적 장애요인 제거

Datacenter Thermal Assessment (3D Cooling)

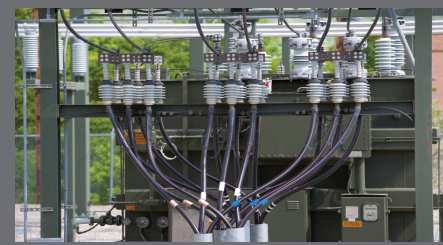


Cooling / Airflow Assessment Part

- 상태 : Hot Spot Zone 발생
- 향후 예상 되는 장애 요소 : CRAC 증설 및 Blank Panel 추가
Airflow Design 방안 제시



Datacenter Power Assessment



What is Power Assessment? :
전산장애의 주 원인인 전원 시스템에
대한 전문 분석 솔루션을 기반으로 한
분석 개선 방안을 도출합니다.

Duration :
4 weeks. (비 상주 기준)
100평 이하의 전산실 기준

수행 배경



어플리케이션의 성능 요구 증가에 따라
고밀도 / 고성능 시스템에 대한 도입이
증가에 따라 공조 설비 용량 및 디자인에
대한 검증이 필요하게 되었습니다.

수행 방안



모니터링 장비 기반하의 전원 품질 평가

- 전압 변동률
- 전원 파형 (SIN)
- 위상차
- 고조파

전원 설비(수배전, 접지, 분전, UPS
등)에 대한

- Availability
 - Scalability
 - Capacity
 - Operation /Maintenance
- 측면의 전문 컨설턴트의 분석

개선 사항

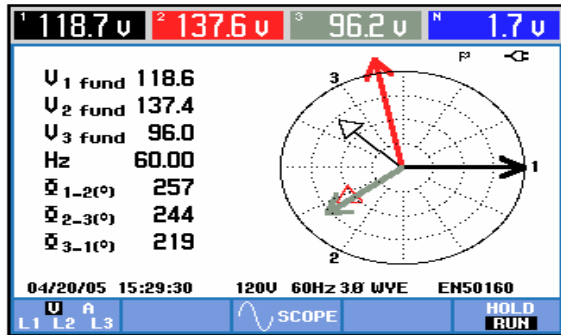
Best Practice

- 전원 설비에 대한 선진 방안 제시

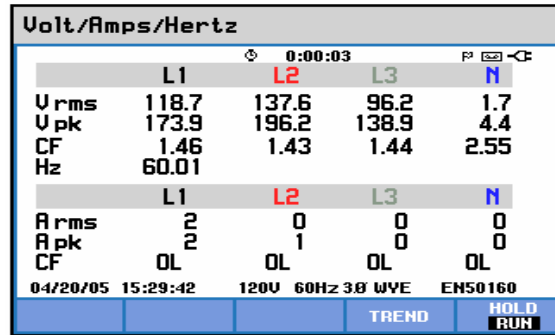
Benefit

- 전원설비 효율성 증대를 통한 투자 효과 극대화
- 전원 설비의 가용성 증대 방안 도출
- 장애를 유발할 수 있는 위험 요소 사전 제거 안 도출

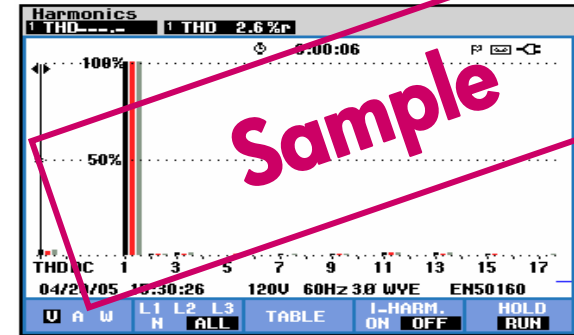
Power Quality Assessment Sample



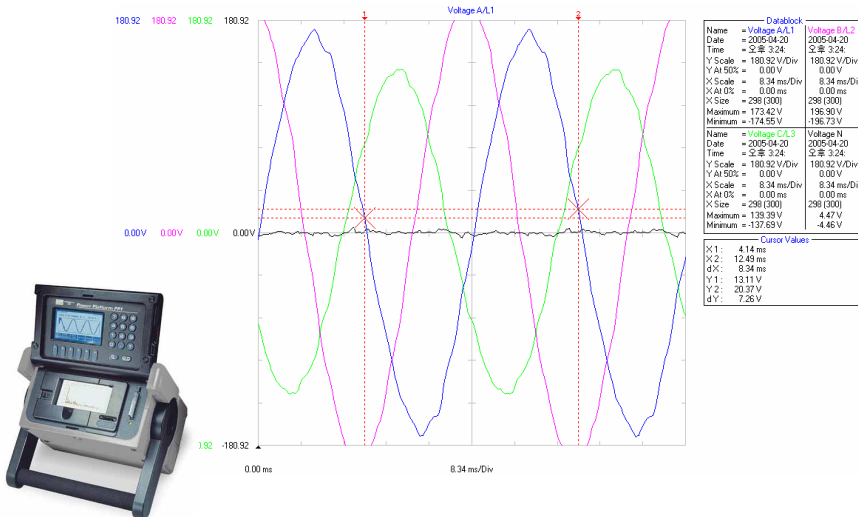
위상차: 위상차가 불규칙하며 변동이 심함



고조파: 5%이내이나 상당 수준의 고조파가 발생하고 있음



전압: 상별 편차가 최고 40V 이상 발생하며 변동이 심함



Power Quality Assessment Part

- 진단 대상 전원 : TR 이후 2차 전원
- 상태 : 전압의 불안정과 불균형이 나타나고 있습니다.
- 향후 예상 되는 장애 요소 : 기존 시스템은 **UPS 4대**가 설치되어 전압보상 기능을 통해 보완하고 있습니다. 그러나 이러한 상태가 지속되면 **UPS**나 기타 장비에도 매우 **안좋은** 영향을 끼칠 것으로 예상됩니다.
- 개선 요구 사항 : **UPS** 이중화 작업 및 분리된 분전반 설치 필요
접지 계통도 개선 필요.

Next Generation Datacenter



Datacenter Trends (1/3)

- Densification of Power in racks because of smaller “boxes”
- Greater demand for “light’s out” centres
- Tiering, what’s best?
 - Most hardware is “dual cord”, hence “Tier III” good enough
 - TUI Tiering levels focused on “legacy” hardware
 - 36” raised floors, Floor loads, support space required
 - Bandwidth availability, application redundancy and lower costs may make “high density” Tier IV centers obsolete
 - DC Owners must do a Density vs.. Cost analysis (hardware vs. cost of space)
- End to End Consolidated Management Architecture

Datacenter Trends (2/3)

- Rack Mount opens new opportunities:
 - “computer-floorless” datacenters
 - “On-rack” cable management
- Gas inerting less of a requirement
 - VESDA detection w/on-site staff can eliminate need for traditional fire protection
 - Protected “wet pipe” for Underwriter or code requirement only
 - Remote vaulting of data
 - More “pre configured systems, lower per system power requirements”
 - “Inert gas suppression is generally overkill. Factory Mutual research in the early 1990's found that data center fires occurred due to one of three reasons: electrical in nature and generally self extinguishing, people functions on the raised floor (coffee pots, trash containers, etc), or fire migrates from adjacent non data center space.”

Datacenter Trends (3/3)

- Directions:
 - Hyper-dense racks (up to 32kw possible)
 - liquid/gas cooled CPU's
 - Virtualization
 - Modularization
 - Data mirroring, dark fibre connectivity
 - “Post 9-11 Syndrome”
 - “Lights-out data centers” : Everything remote
 - Remote management
 - Security
 - Provisioning

Datacenter Consolidation Planning – Classification framework

Class Criteria



- High volume, low impact
- Minimum 2 because of DRP
- Driven by economy of scale and customer intimacy
- Might be near- or off-shore



- Low volume, high impact
- Driven by customer proximity (language, culture) for trustful cooperation: change, projects, problem mgmt



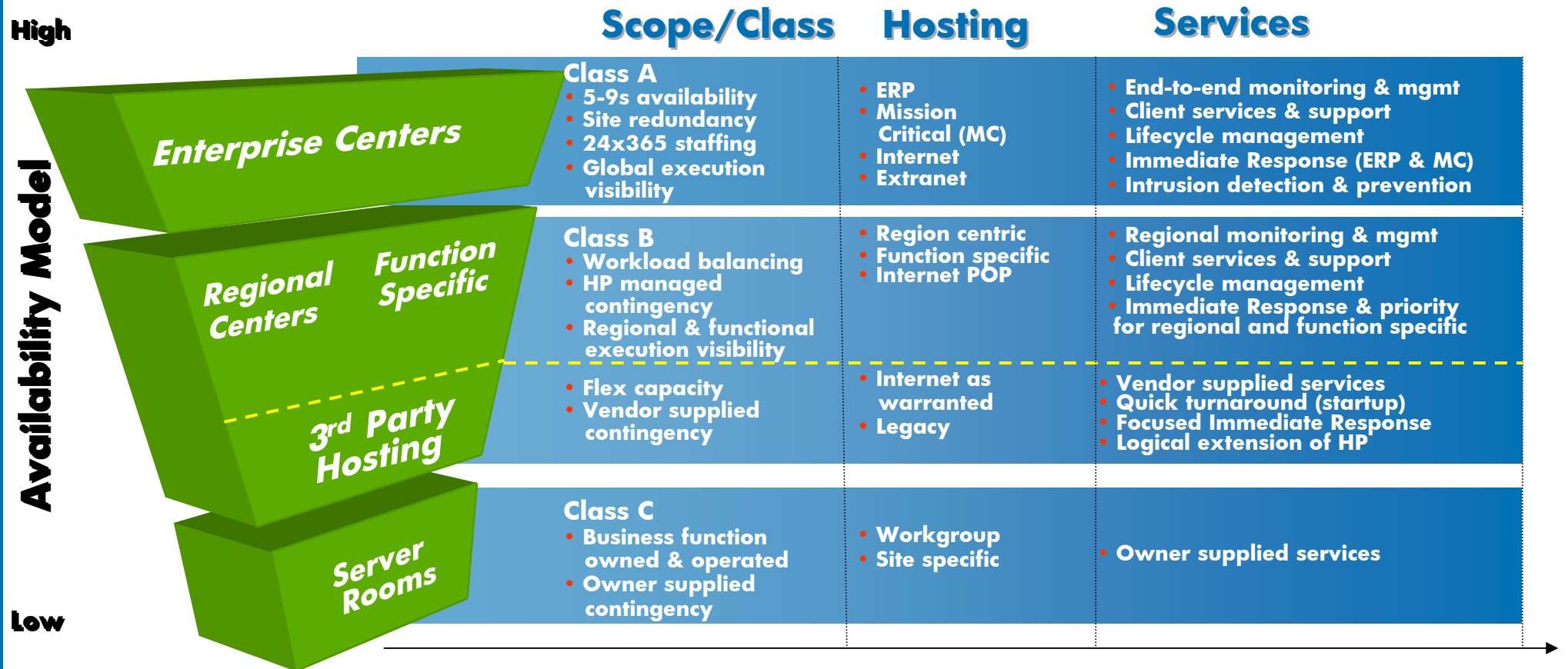
- Data center (class A)
 - Global center with multiple tier levels (n, n+1, ...)
 - Strategic, continuously available (DRP)
- Data Center (class B)
 - Regional center
 - Driven by function, business, specific operation
- Data Center (class C)
 - Workgroup/site specific sites
 - Technology driven, limited strategic importance

Tier Level Criteria

- Availability level defined by [uptime institute](#)
- Power density for cooling

Datacenter Consolidation Planning – Classification framework

Enterprise Infrastructure Data Centers



Tier Classification

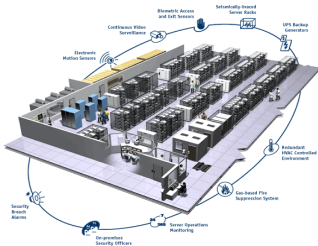
Tier 1 - 4 은 Datacenter의 고가용성 수준을 기준으로 구분되어지며 일반적인 최상급 Datacenter는 평균 Tier3 / 일부 부분에 대한 Tier4 형태의 구조로 구축이 됩니다.

Tier 1 = N

Tier 2 = N+1

Tier 3 = 2N (1 active / 1 passive)

Tier 4 = 2N (2 active)

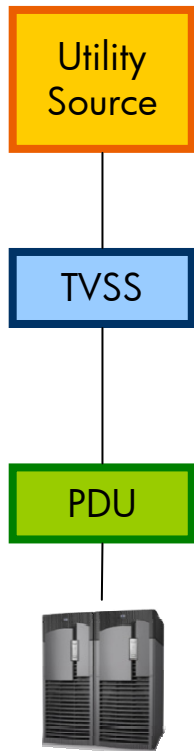


Uptime Institute Classification

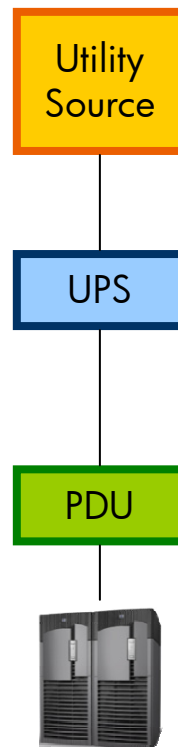
Item	Tier 1	Tier 2	Tier 3	Tier 4
Number of power delivery paths	Only 1	Only 1	1 active 1 passive	2 active
Redundant components (generators/ups's, chillers)	N	N+1	N+1	2 (N+1)
Initial watts/sf	20-30	40-50	40-60	40-80
Ultimate watts/sf	20-30	40-50	100-150	100-150+
Raised floor height	12"	12"-18"	18"-24"	>24"
Floor loading pounds/sf	85	100	150	150+
Utility feeder voltage (minimum)	208,480	208,480	12-15kV	12-15kV
Annual IT downtime due to site (hours)	28.8	22	1.6	0.4
Site availability	99.67%	99.75%	99.98%	99.995%

Component Tier Classification (Power Part)

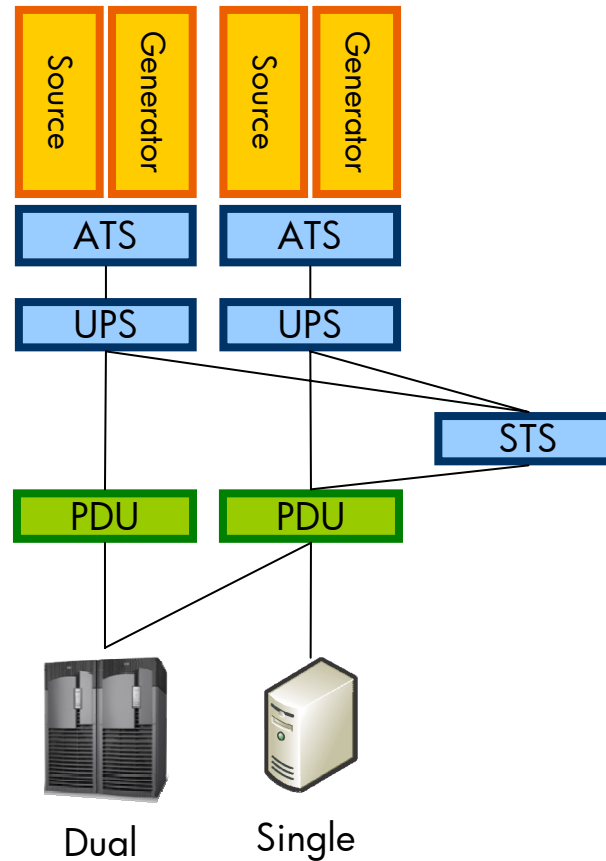
Tier 1
Protect Hardware



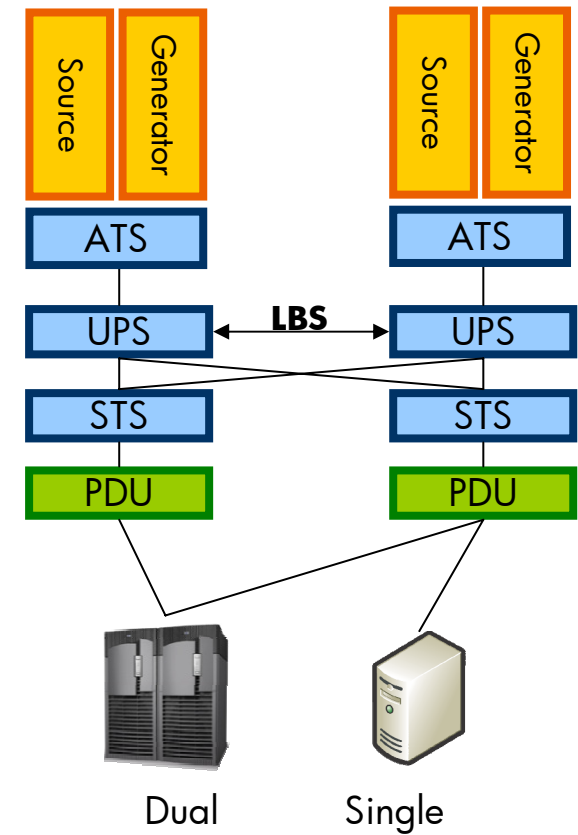
Tier 2
Data Preservation



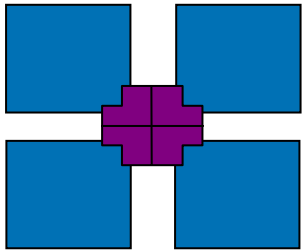
Tier 3 (+)
Uptime Increase



Tier 4
No Downtime

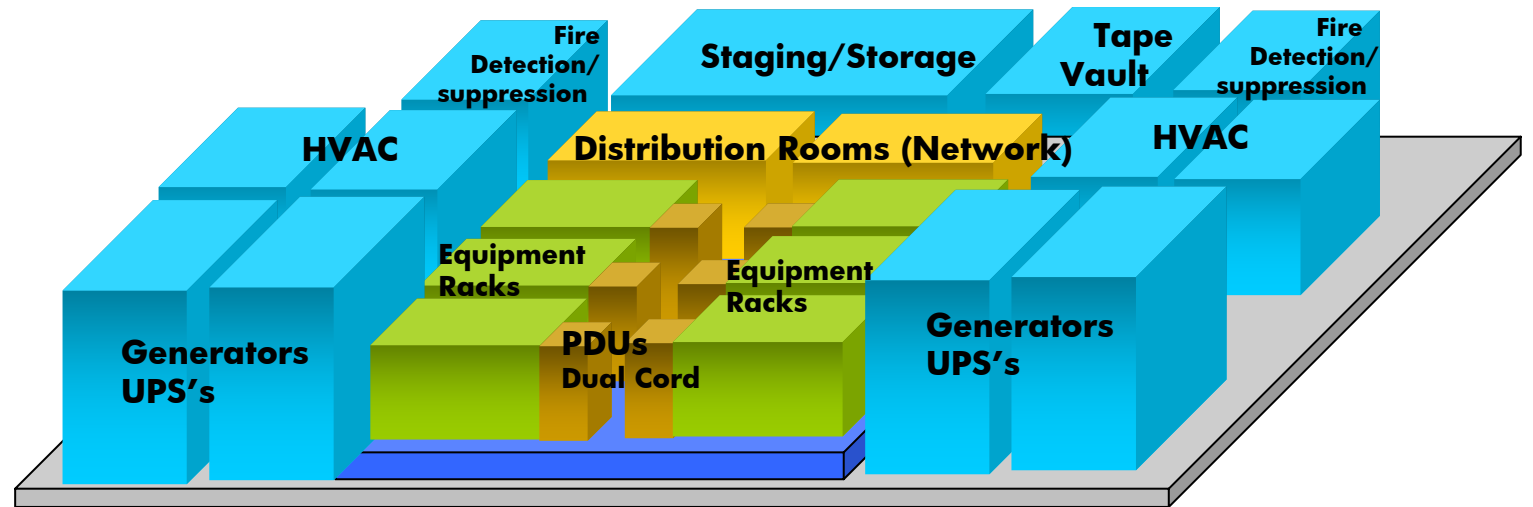


NGDC Design Model : Modular Datacenter



Tier III – Concurrently Maintainable

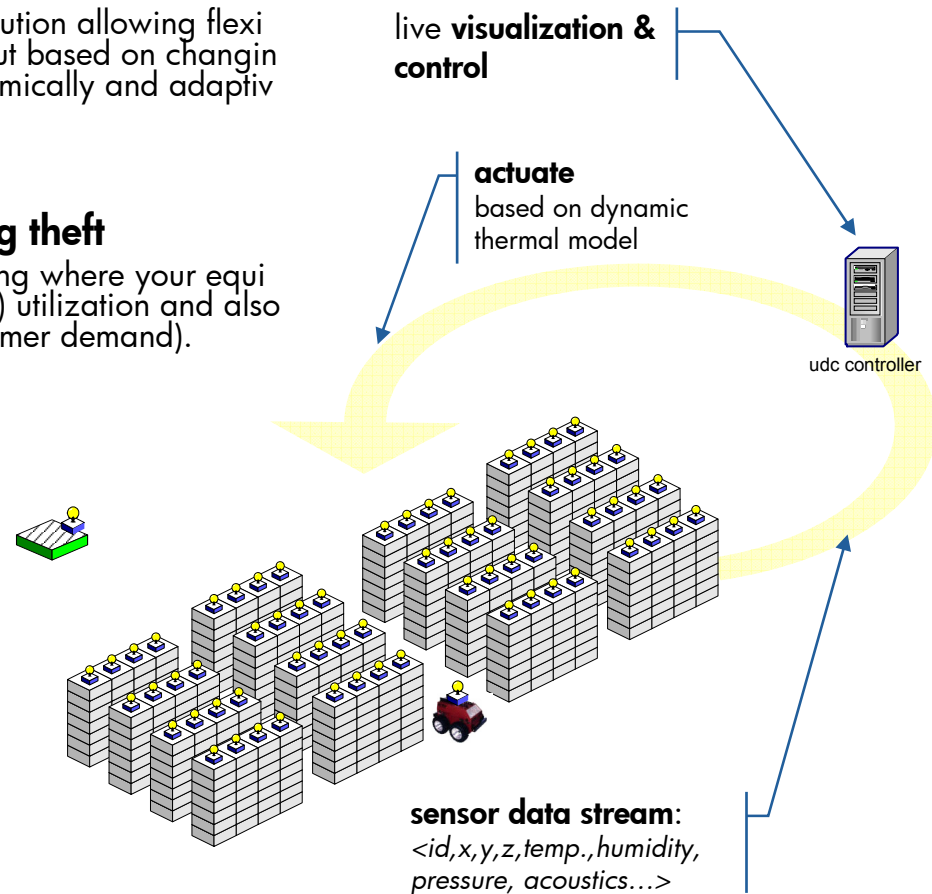
Note, 2 N+1 “containers” with common floor becomes a Tier III Container



Smart Data Center

location aware, adaptive distributed sensing for dynamic Inventory management*

- layout immovable, planned at design time
 - **lack of mobility in the data-center**
 - designed for 30+ years of operation: need a solution allowing flexibility in adding racks and remodeling floor layout based on changing needs (with the thermal model computed dynamically and adaptively)
- inventory tracking problems
 - **serviceability, space utilization & preventing theft**
 - **location, location, location**: automatically knowing where your equipment is, allows for much better space (resource) utilization and also significantly improves serviceability (strong customer demand).

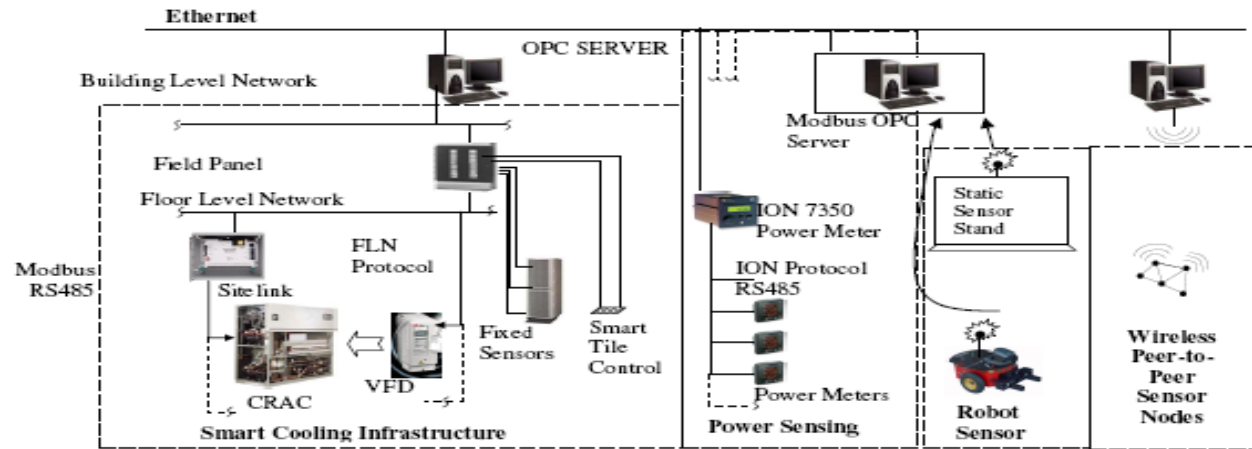


Technologies also applicable for precise indoor tracking of large assets

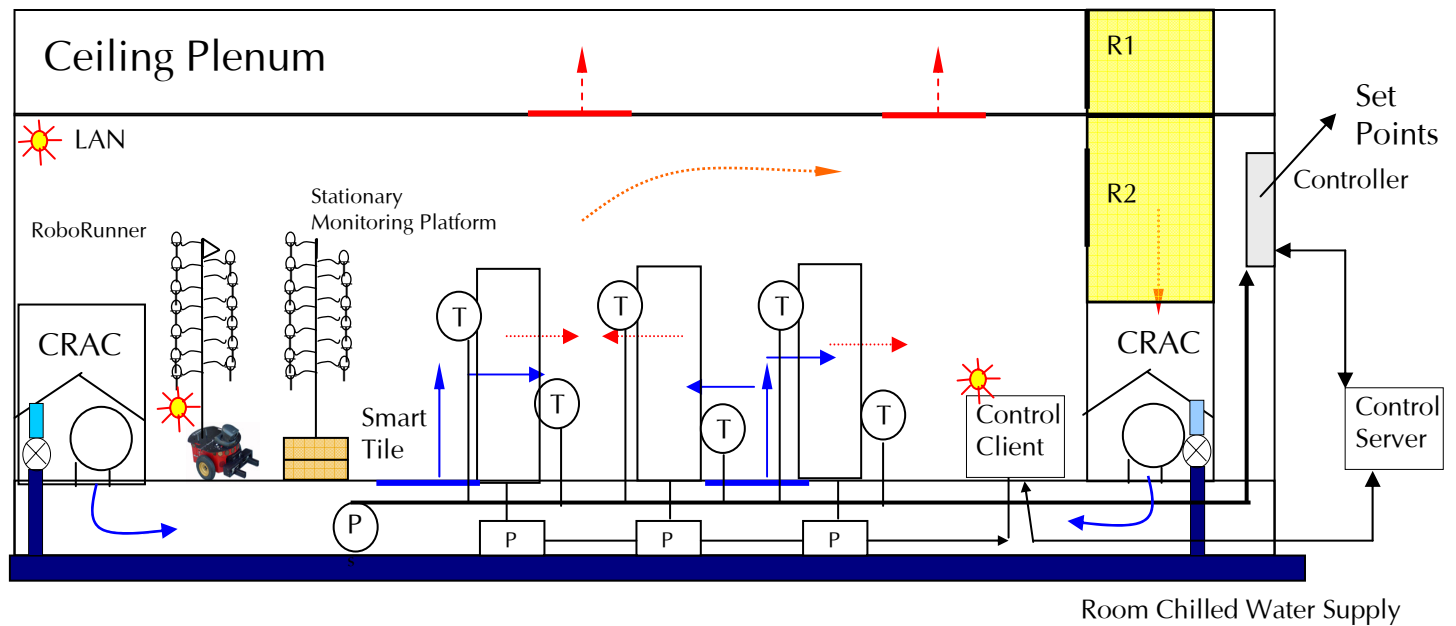
*with thermo mechanical arch. research team

HP Vision – SMART Datacenter

Sensing
Control
Infrastructure



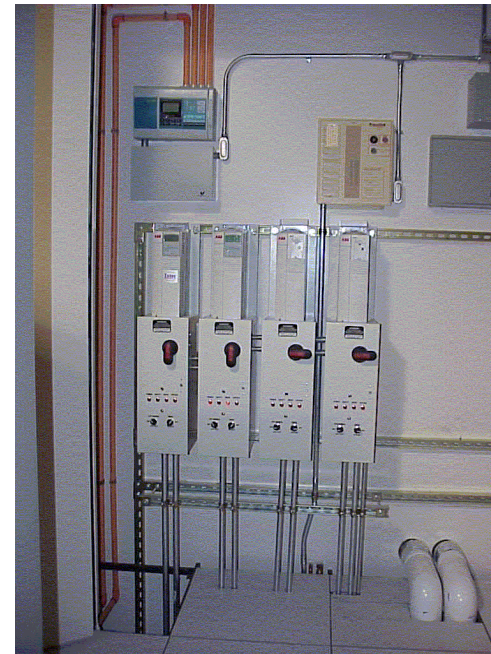
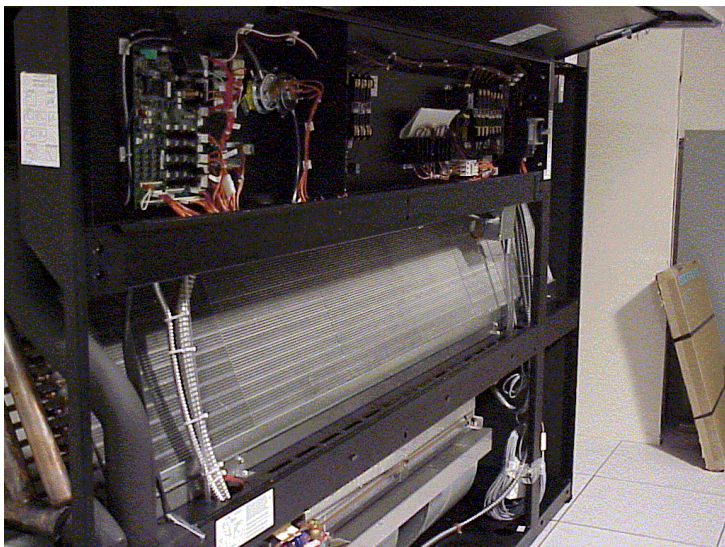
Energy Efficiency &
Compaction



HP Vision – SMART Datacenter



- Ceiling or Room Return (min. infiltration)
- Smart Tile – Vent Flow Control
- CRAC: Blower and Liquid flow control
- Data Center Energy Manager Server Control



HP Vision – SMART Datacenter



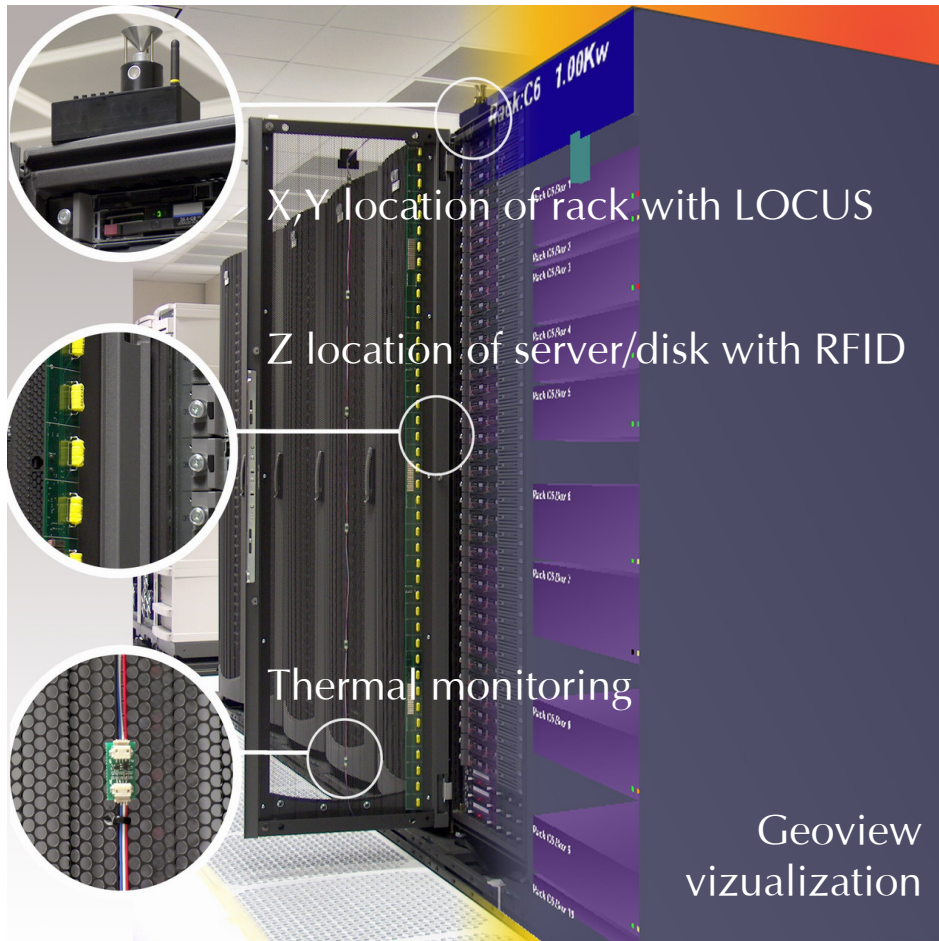
Variable AC resources



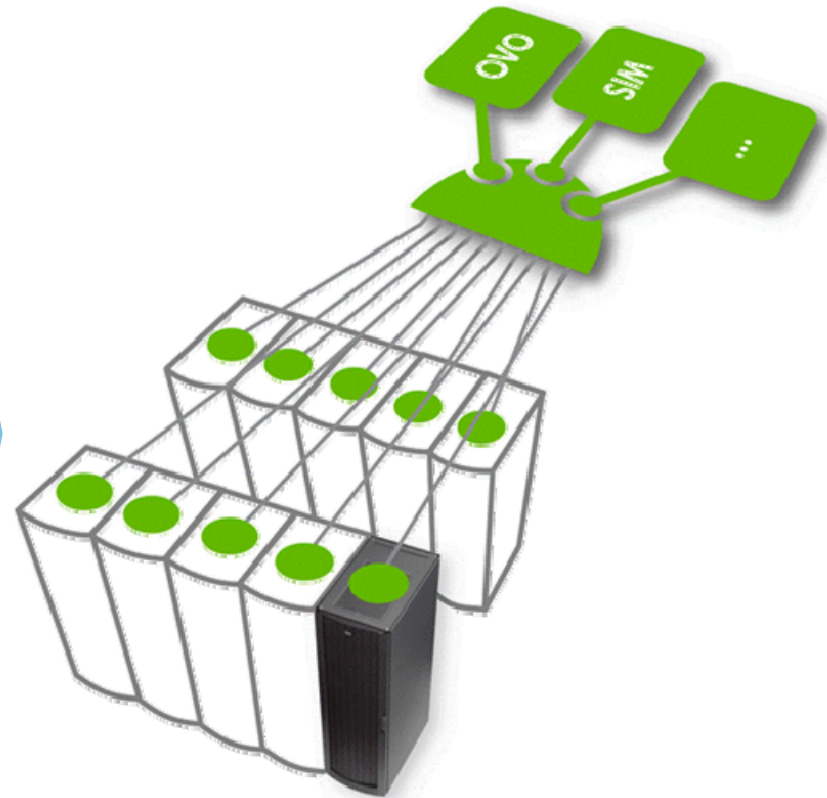
Modeling
Metrology – distributed sensing
Controls Development

HP Vision – SMART Datacenter

Asset Tracking

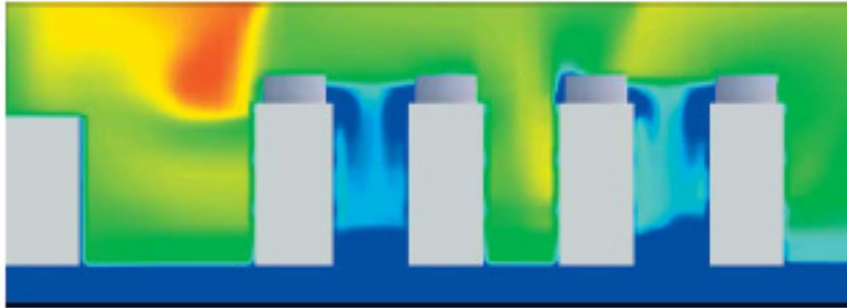


Consolidate Management



Datacenter product – Cooling (1/2)

Medium Density



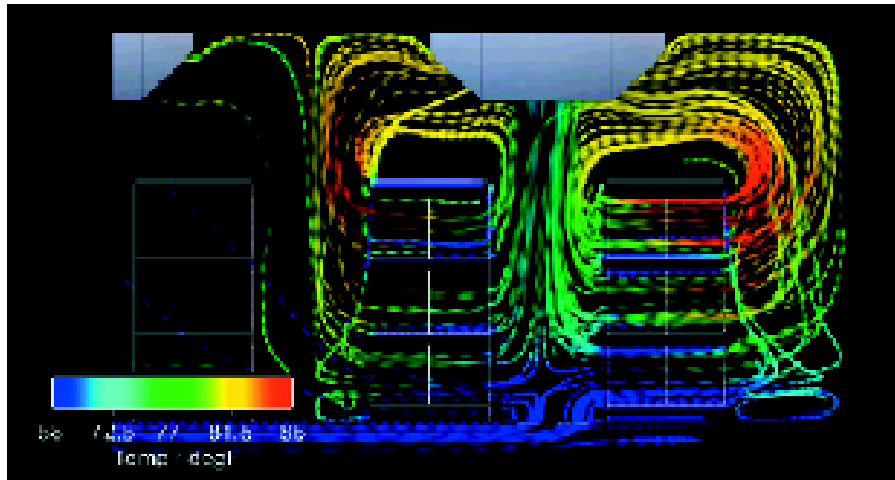
Description

The XDV is placed on top of the enclosure with the heat emitting equipment and it transfers the heat from the air to the coolant circuit. The XDV can take hot air from the enclosure and cool it before it is discharged into the room, or it can draw discharged "hot spot" air from the room through the coil and distribute it to the cold aisle. It's dual power feeds provide maximum redundancy and continuous availability. The packaged unit includes Enclosure, Coil, Fans, Controls and Piping.

Features

- Can cool more than 500W/sq. ft.
- No floorspace required
- Excellent for spot/zone cooling
- Uses XD waterless Coolant
- Highly Energy Efficient
- Perfect in Combination With Liebert's Deluxe Units
- Dual Power Cards

High Density



Description

The XDO Overhead Fan Coil provides spot/zone cooling for high density heat loads. The ceiling-installed XDO is placed horizontally above the heat emitting equipment in the room. Two air intakes draw in the hot air, which is cooled by XD waterless coolant and discharged down into the Cold Aisle.

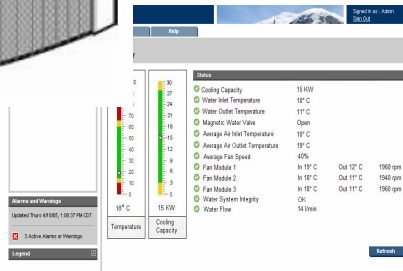
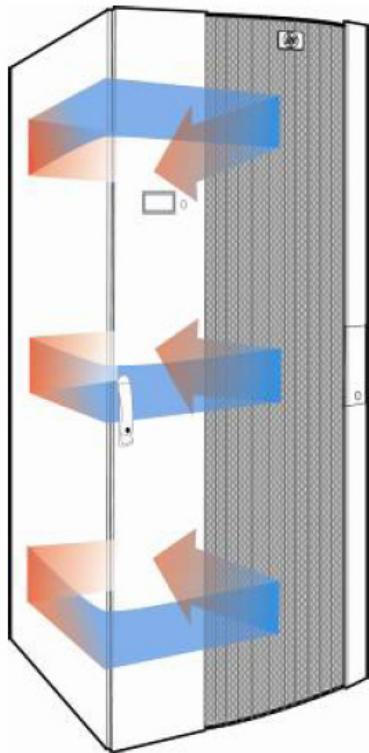
Features

- Can cool more than 500 W/sq. ft.
- No floorspace required
- Complements the precision cooling of Liebert Deluxe System/3 units
- Excellent for spot/zone cooling
- Uses XD Waterless Coolant
- Highly Energy Efficient
- Complete packaged unit includes Enclosure, Coil, Fans, Controls and Piping

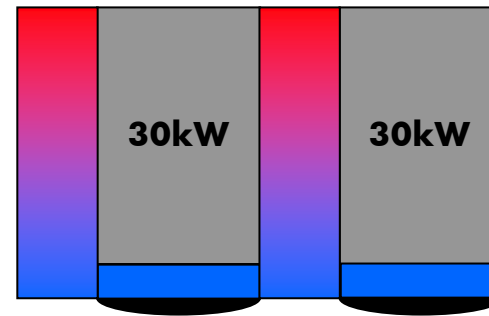
Datacenter product – Cooling(2/2)

HP Modular Cooling System

Ultra High Density

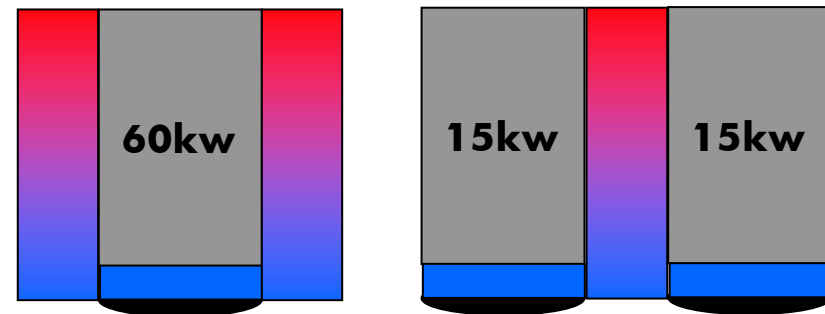


Currently Modular Cooling System



3 rack space = **60kW**

Future technologies Roadmap



2 rack space = **30kW**



i n v e n t