Achieving Data Center Availability along with Efficiency by Management Systems

המצגת הוצגה ע"י שמעון כץ, מנהל פרויקט רותם מטעם בנק הפועלים
במסגרת כנס ELECTRICITY 2012 – Eilat

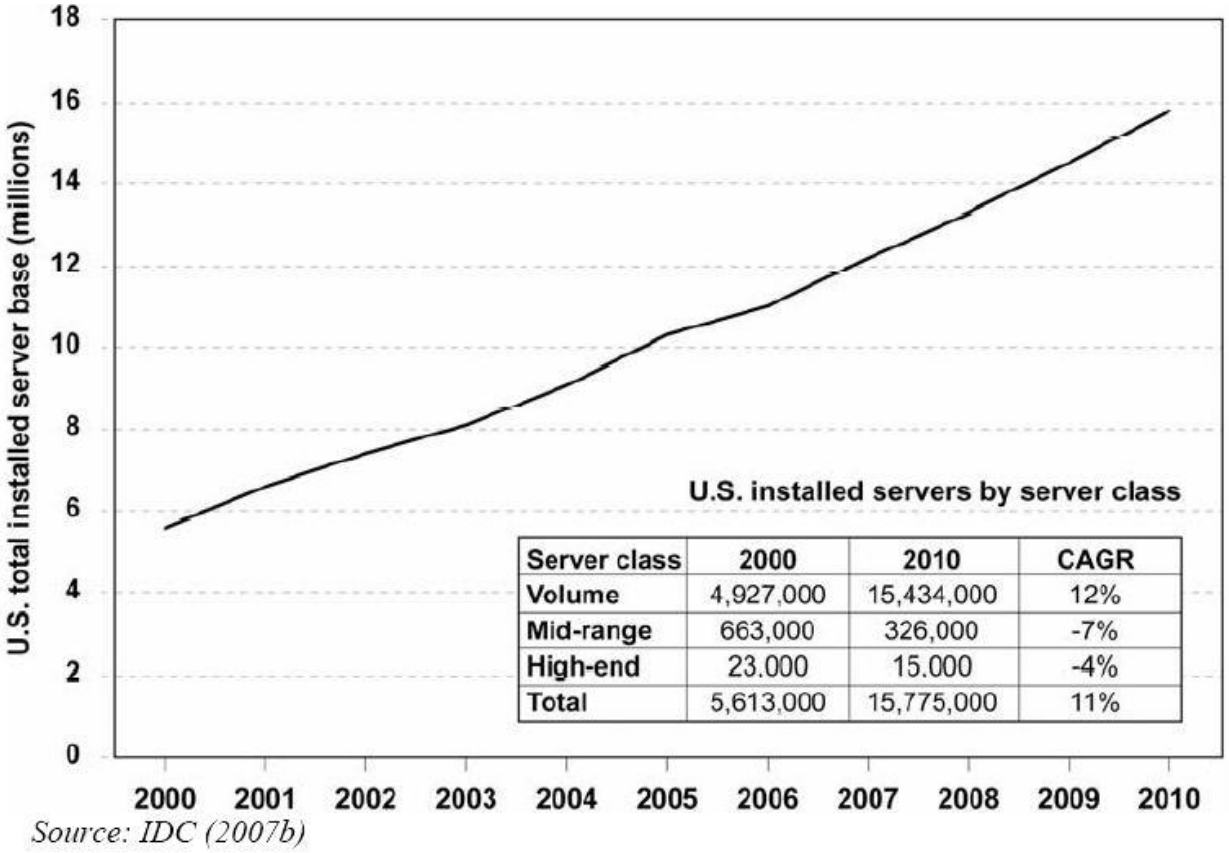
MISSION CRITICAL ENGINEERING

Agenda

- Data center trends
- DCIM – Data Center Infrastructure Management
- The Uniqueness of data center projects in Israel

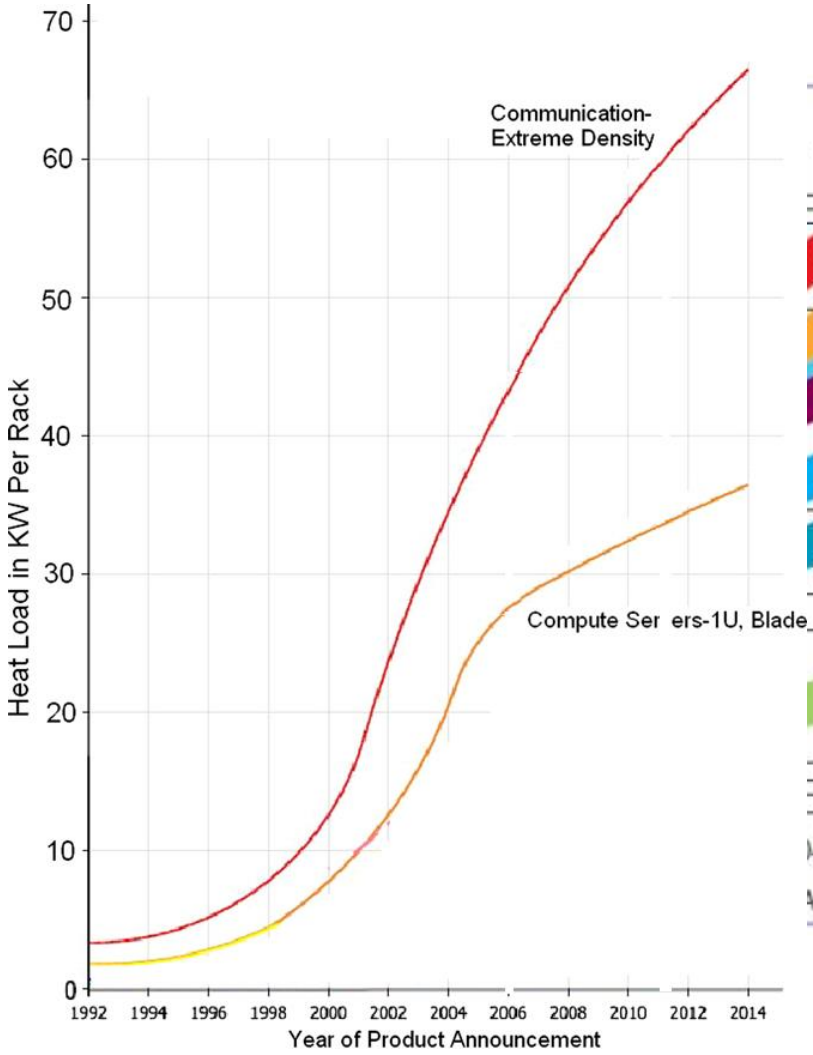
Installed IT Equipment Growth Trends

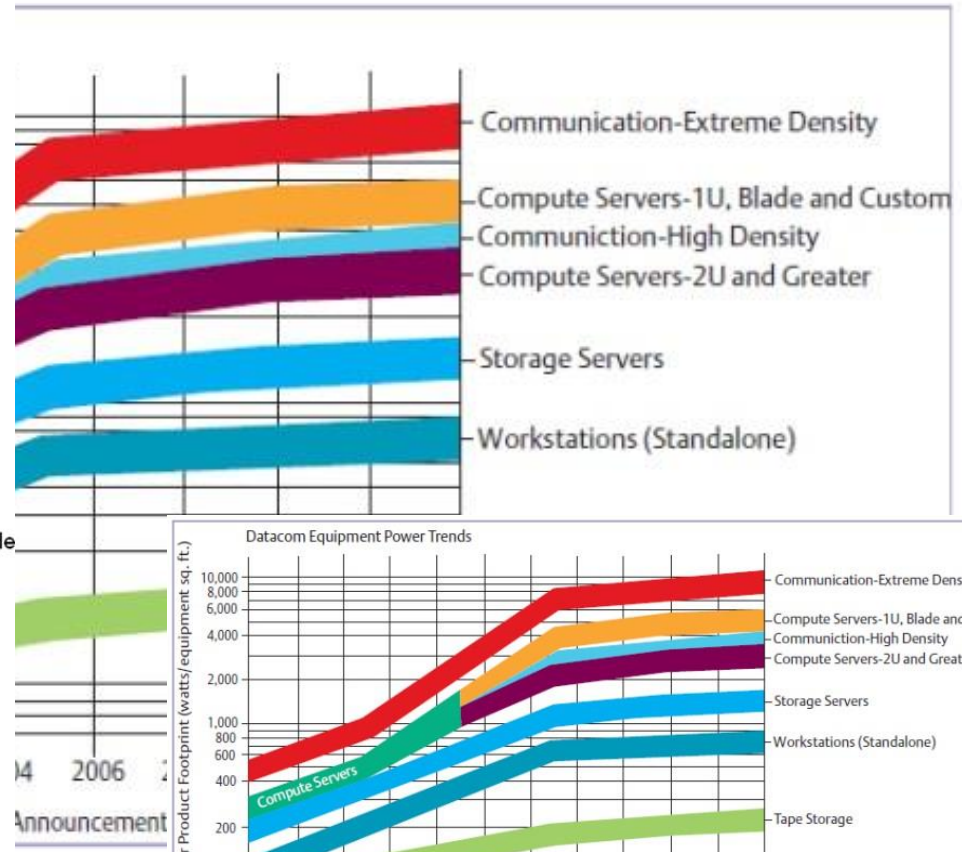
IT sector energy footprint = 2%



Source: EPA report 2007, IDC, UTI Symposium 2012 – Greenpeace presentation

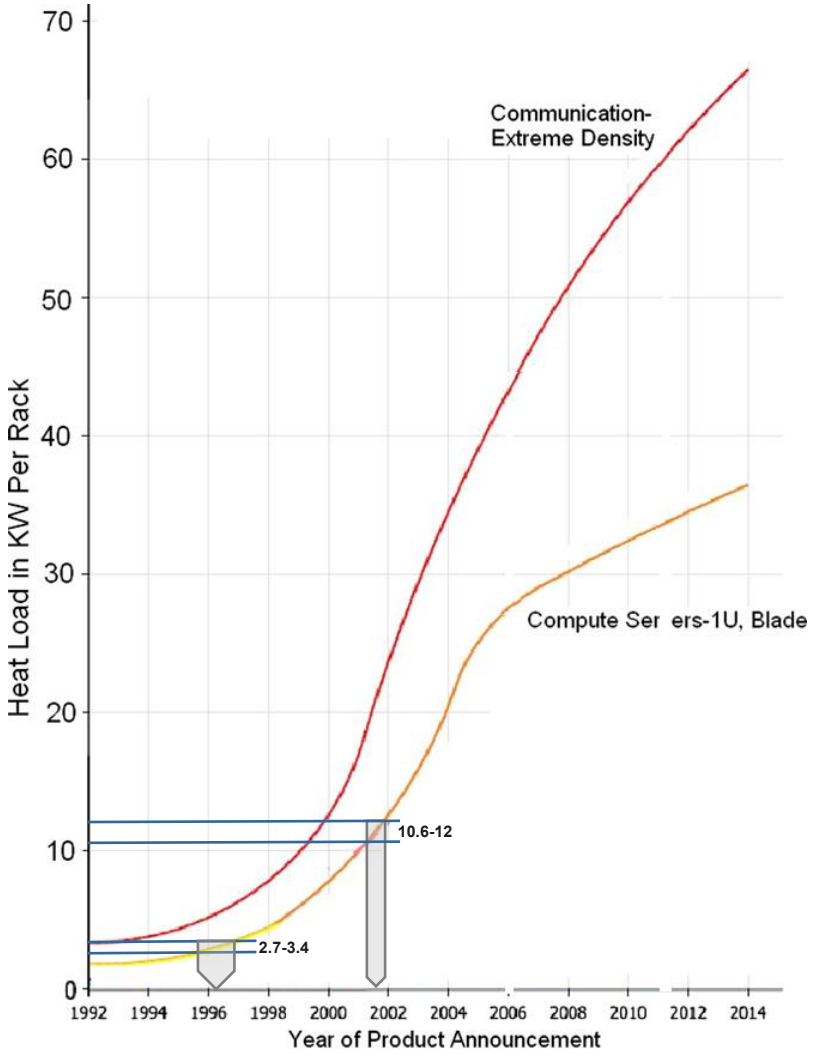
Equipment Power Density Growth

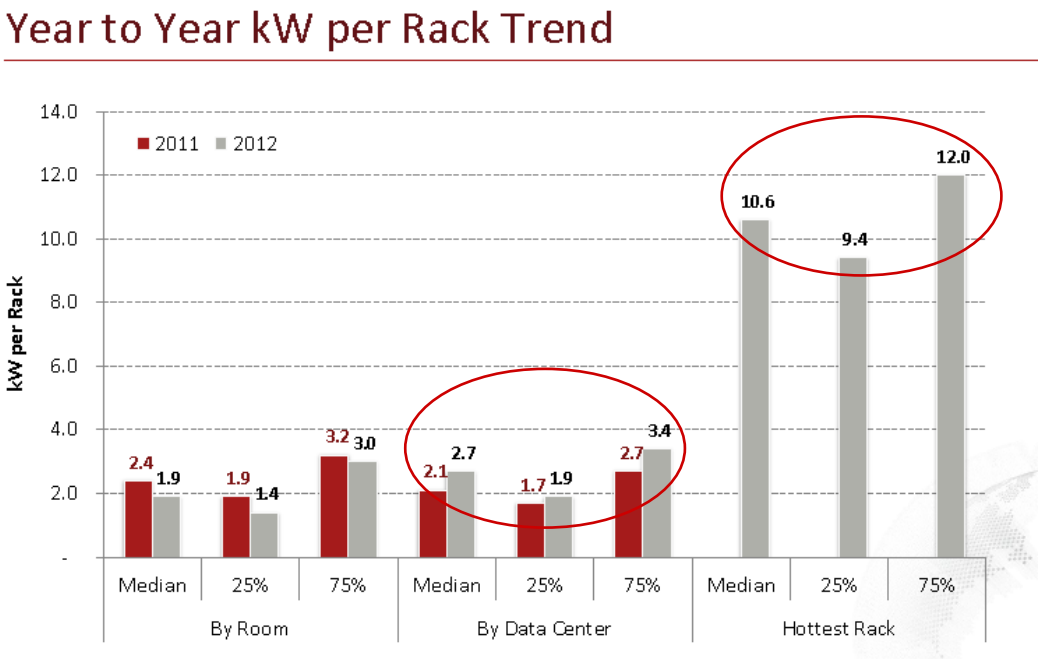




Source: ASHRAE, Thermal guidelines for data processing environment, ASHRAE, Best Practices for Datacom Facility Energy Efficiency

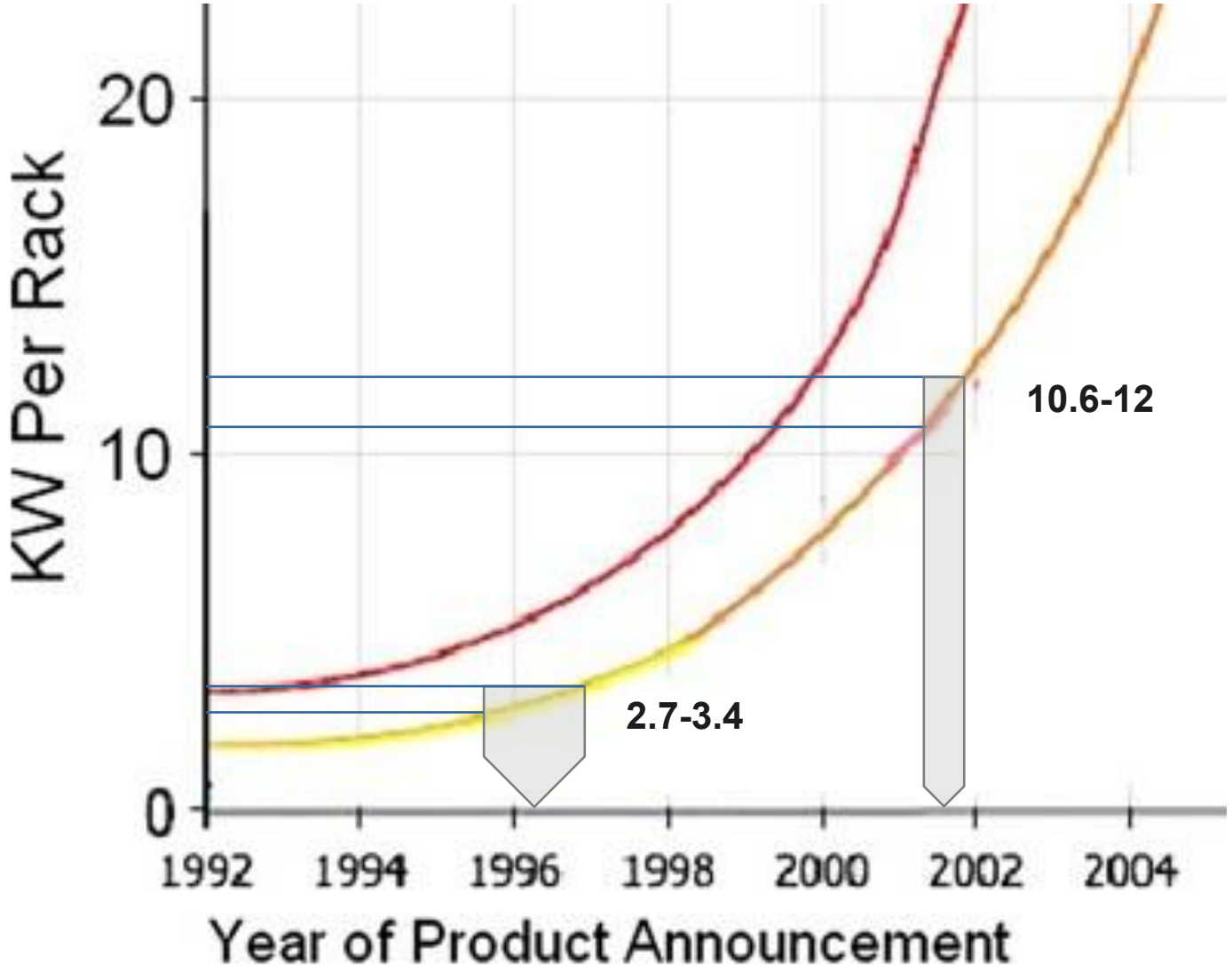
Equipment Power Density Growth





Source: ASHRAE, Best Practices for Datacom Facility Energy Efficiency, UTI , 2012 Annual Report DC Density

Equipment Power Density Growth



Source: ASHRAE, Best Practices for Datacom Facility Energy Efficiency, UTI , 2012 Annual Report DC Density

Regulation & Standardization

Financial Regulations

- Basel
- SOX
- Bank of Israel

Technical Standardization

- The Uptime Institute - Tier Classifications
- TIA/EIA 942 -
- BICSI - Data Center Design
- BRUNS-PAK, IBM…

Financial stability demands influence infrastructure demands

DATACENTER 2.0

- DC 2.0 - describes a fundamental shift in the way that datacenters are designed, built and commissioned.
- the term refers to a comprehensive, turn-key, off the shelf, datacenter that is pre-engineered, tested, fabricated , and delivered to the location of the customer's choice in modular components.
- these can be assembled into an **efficient** datacenter in a time period that is considerably **shorter** (and **cheaper**) than is achievable using normal construction methods.
- The modular components will include, at the very least, IT space, power distribution, cooling, UPS, and back up generation – **all individually scalable**.

Source: UTI Symposium 2012 – Prefabricated, Modular DCs: the state of the union

DATACENTER 2.0

- Flexibility
- Speed
- Cost
- Quality
- Efficiency

Source: UTI Symposium 2012 – Drivers and barriers to modular DC deployment

GREEN IT

ORGANIZATIONS

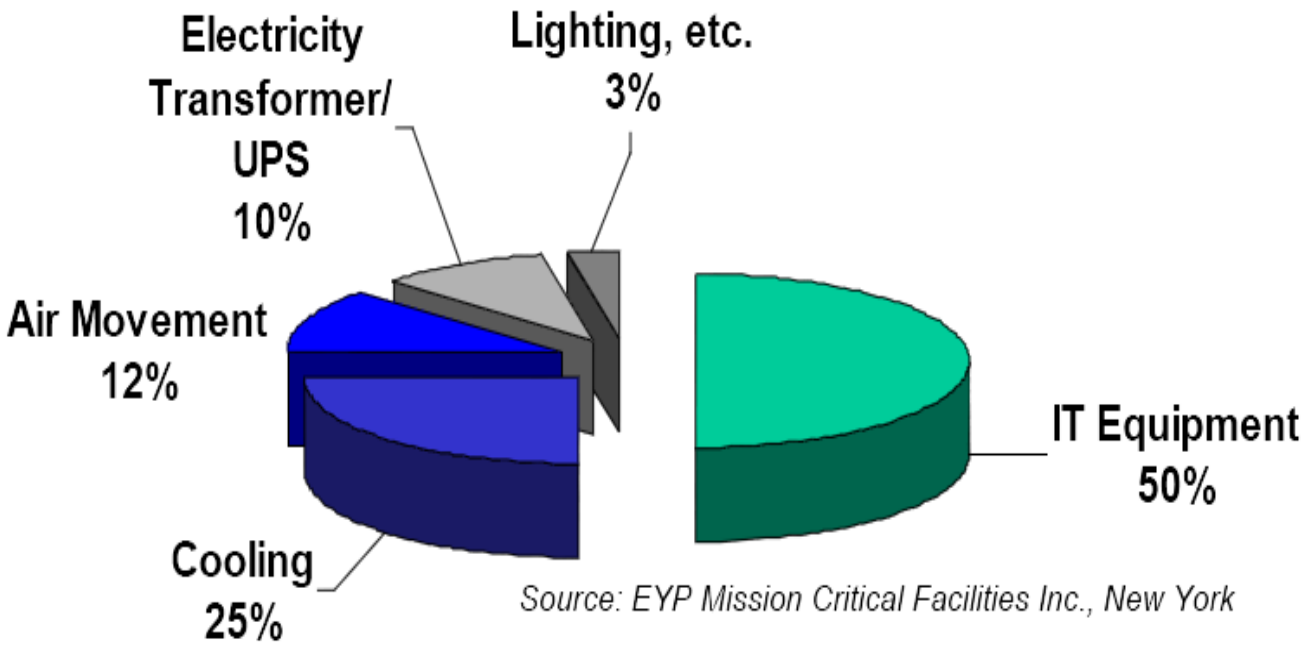
- The GREEN GRID
- EU CODE OF CONDUCT

BENCHMARCKS

- SPEC
- Storage performance

Efficiency criteria

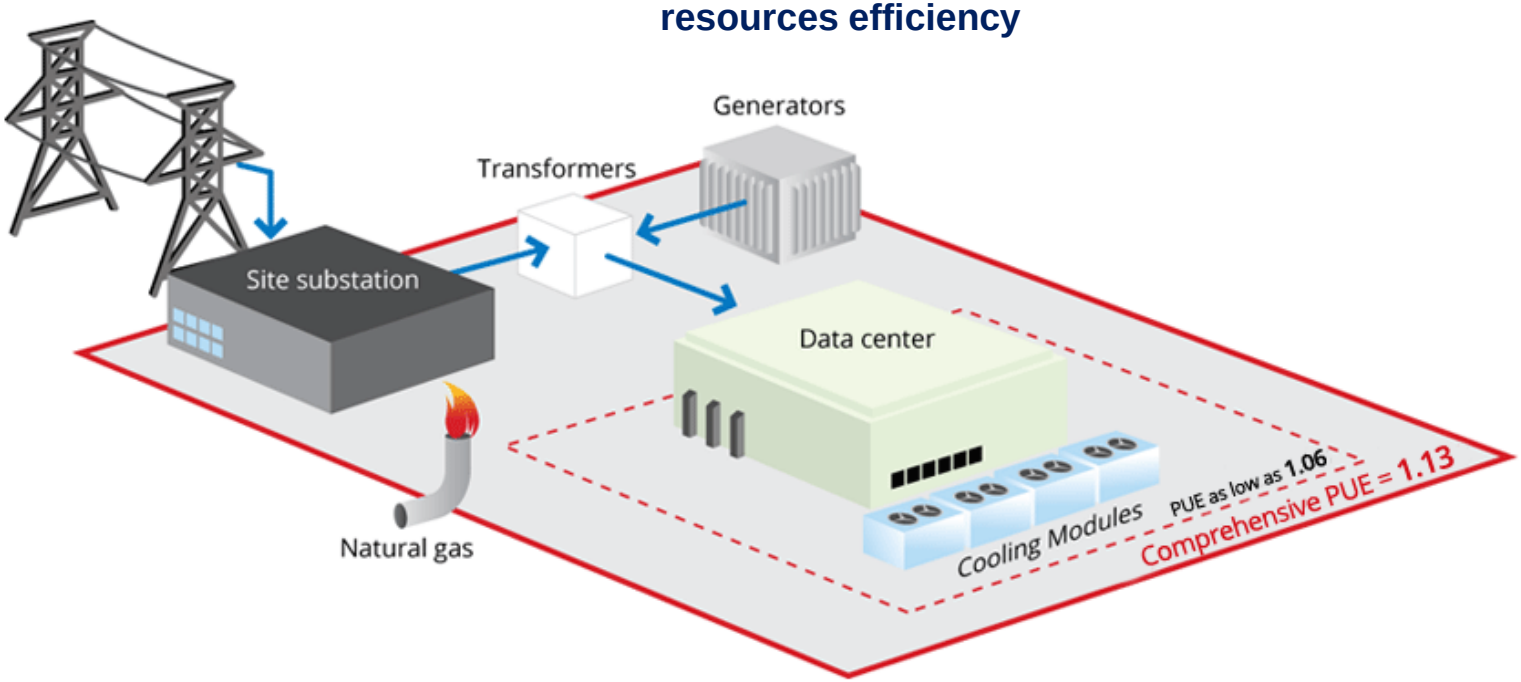
$$PUE = \frac{\text{Total DC energy consumption}}{\text{IT Load}}$$



Sources: EYP

Additional Efficiency Criteria

- **PUE – partial and misused:**
  - **doesn't include water consumption**
  - **in some cases calculate only the efficient part of the facility**
- **Additional criteria**
  - **WUE – Water Usage Efficiency**
  - **CUE – Carbon Usage Efficiency**
  - **CADE - Corporate Average Data Efficiency – PUE combined with IT resources efficiency**

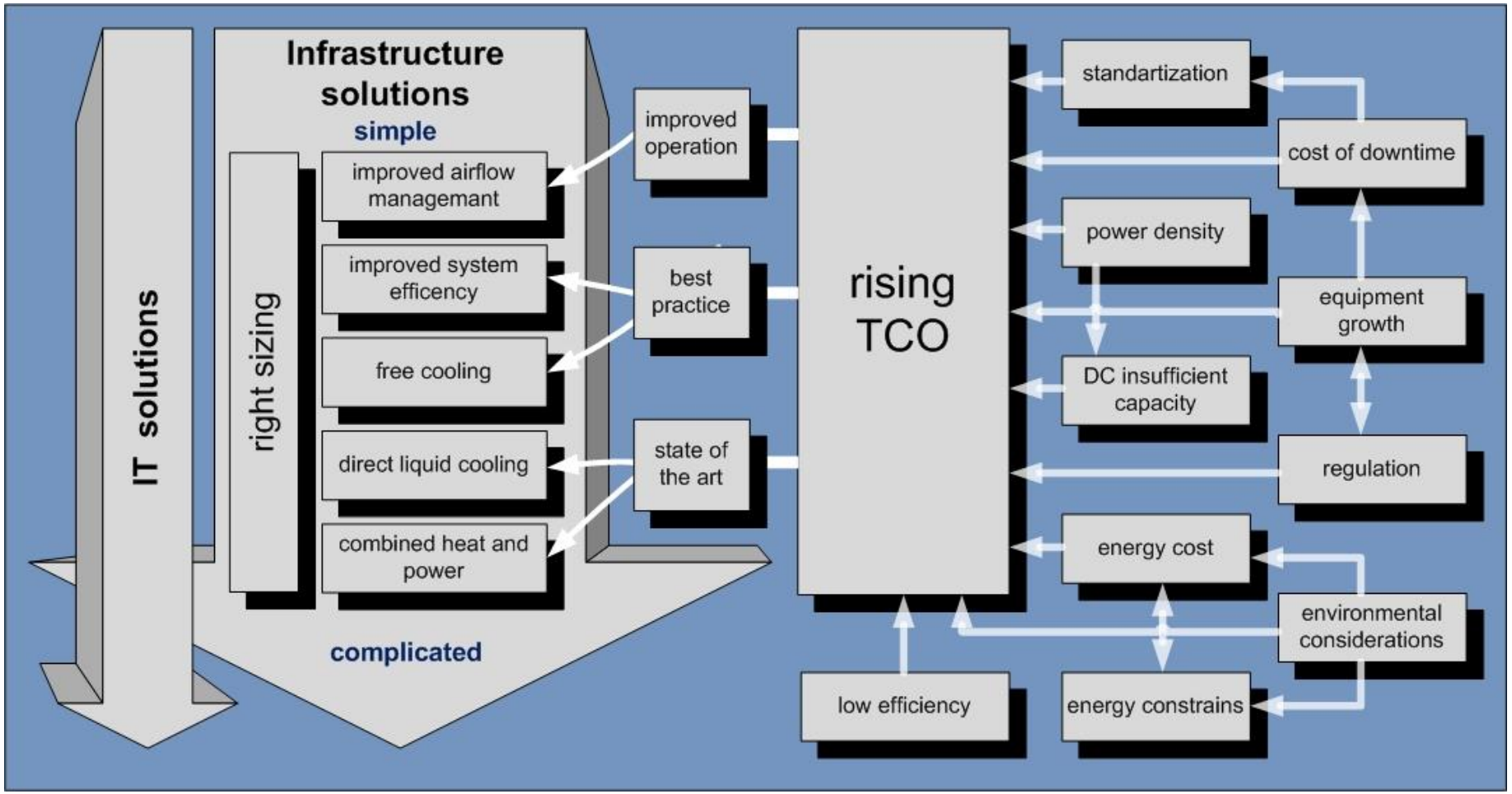


Sources: Green Grid, McKinsey, Google http://www.google.com/about/datacenters/inside/efficiency/power-usage.html#

Green Grid Maturity Model

the green grid®
get connected to efficient IT

Trends Map

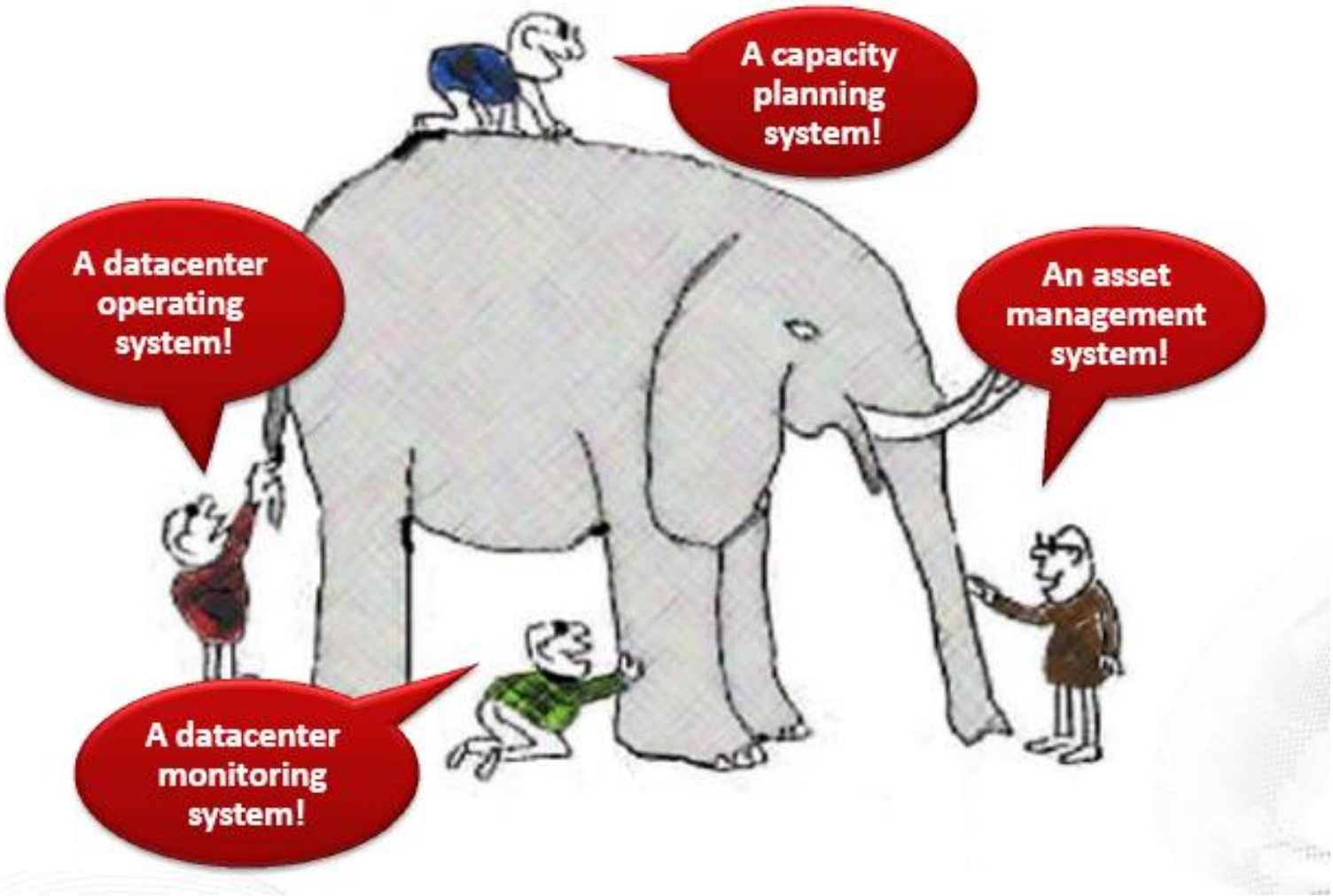

IT solutions
Infrastructure solutions
simple
right sizing
improved airflow managemant
improved system efficency
free cooling
direct liquid cooling
combined heat and power
complicated
improved operation
best practice
state of the art
rising TCO
low efficiency
standartization
cost of downtime
power density
equipment growth
DC insufficient capacity
regulation
energy cost
environmental considerations
energy constrains

IT Trends

- Consolidation
- Virtualization
- Cloud Computing

DCIM – the bridge between datacenter facility and the IT and business.

DCIM – has many different meanings



Sources: The UTI Symposium 2012 – DCIM from fragmentation to convergence

DCIM - Definition

A Data Center Infrastructure Management (DCIM) system collects and manages information about datacenter's assets, resource use and operational statues

This Information is then distributed, integrated, analyzed and applied in ways that help managers meet business and service-oriented goals and optimize their datacenter's performance.

Sources: The UTI Symposium 2012 – DCIM from fragmentation to convergence

DCIM – Data Center Infrastructure Management

IT

Capacity & Agility

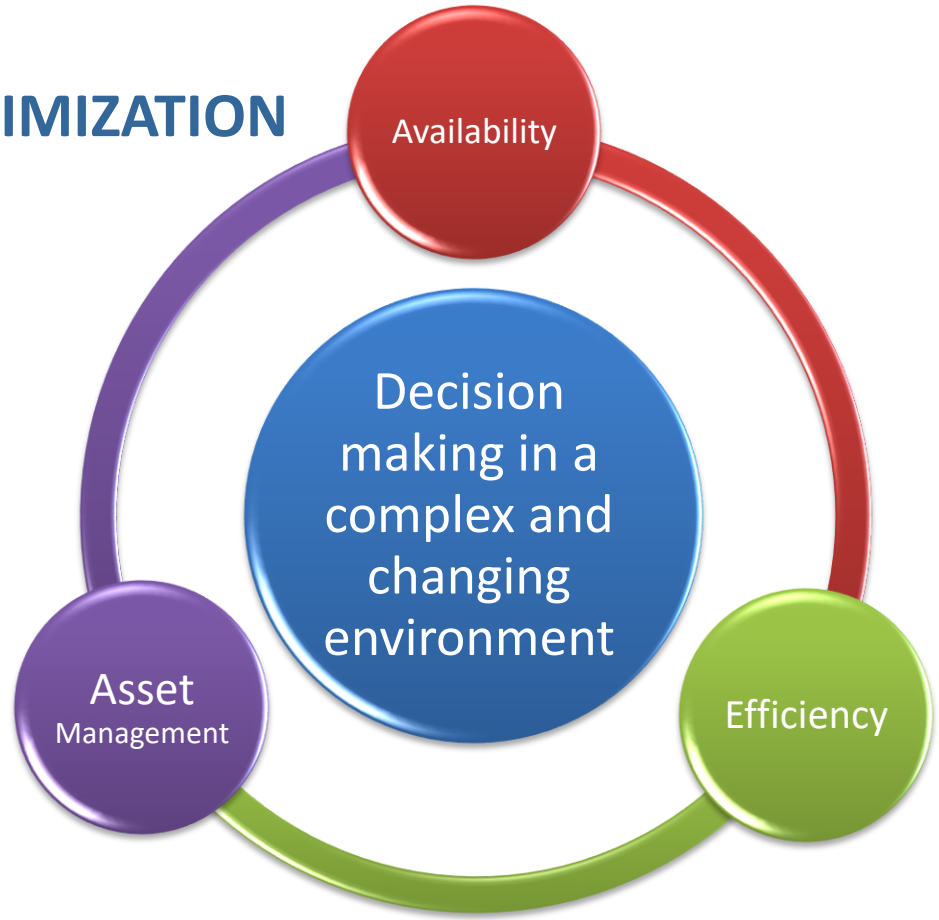
Availability & Risk

FACILITY

Design

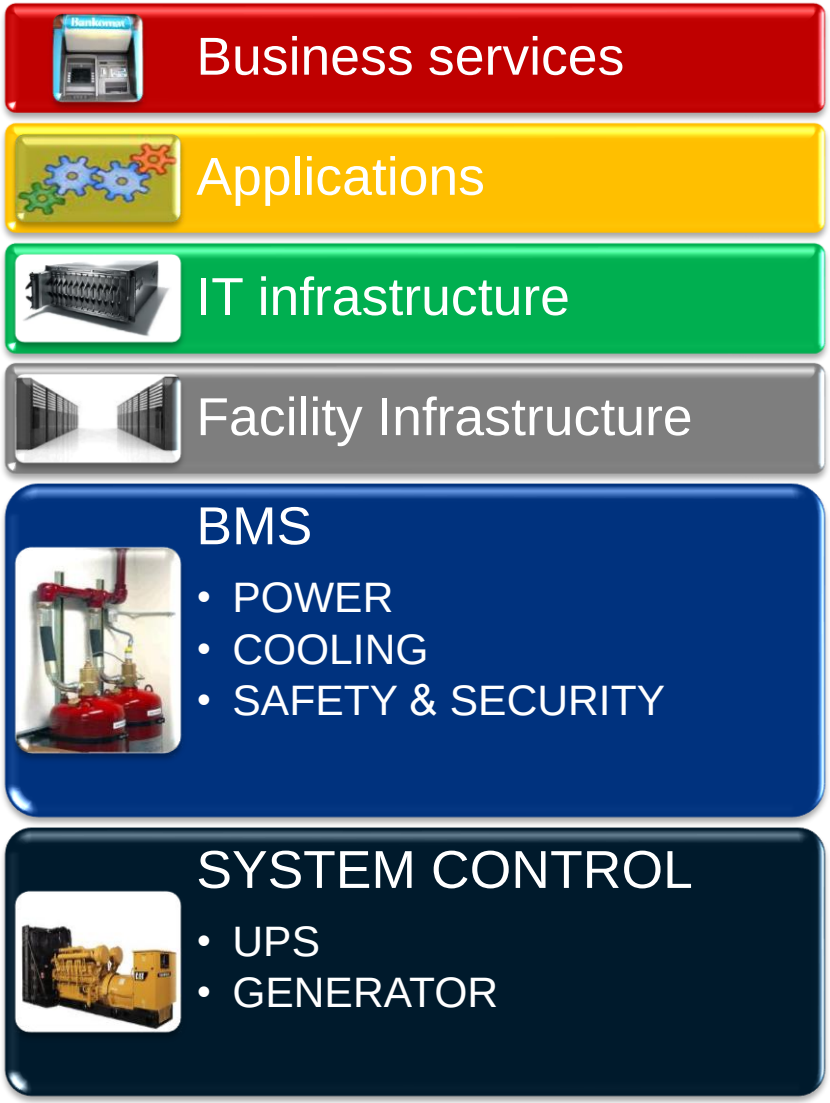
Efficiency & Cost

=OPTIMIZATION



SOURCE: The UTI Symposium 2012 - Emerson – real time optimized DCIM

DCIM – Data Center Infrastructure Management



DCIM components

Planning, simulation, Forecasting, analytics

Control and automation (cooling, power, IT)

Data management, aggregation, reporting

Monitoring

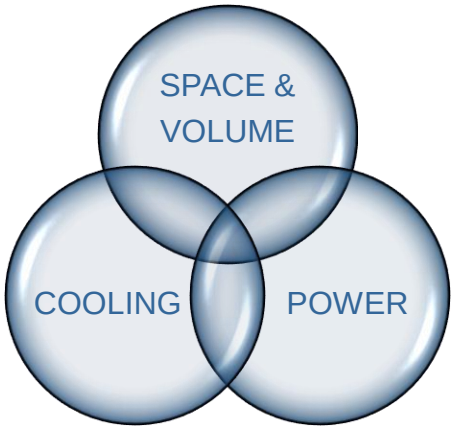
Asset, change, configuration management

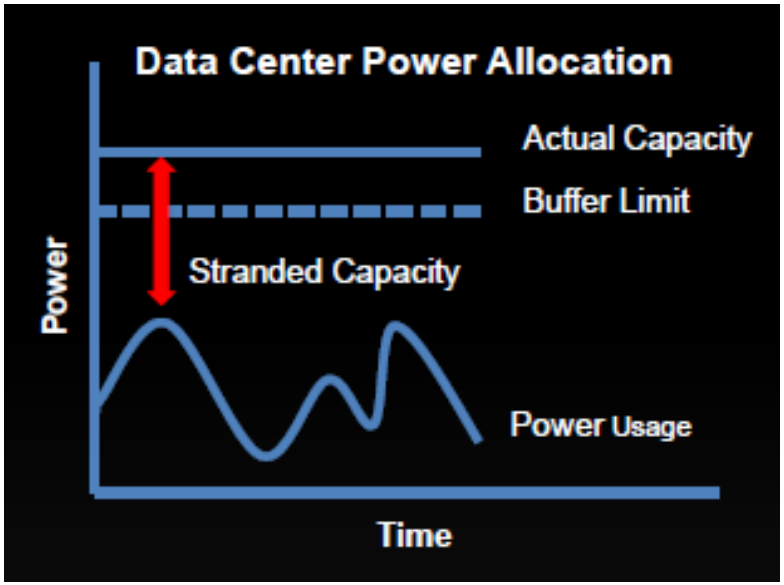
Core DCIM platform

Sources: The UTI Symposium 2012 – DCIM from fragmentation to convergence

DCIM - Implementation

- Add equipment into a rack or add a rack
- Optimization of installed capacity
- Fault prevention (overload, heat)
- Temperature rise within IT allowed limits
- CFD like tool
- IT as a sensor

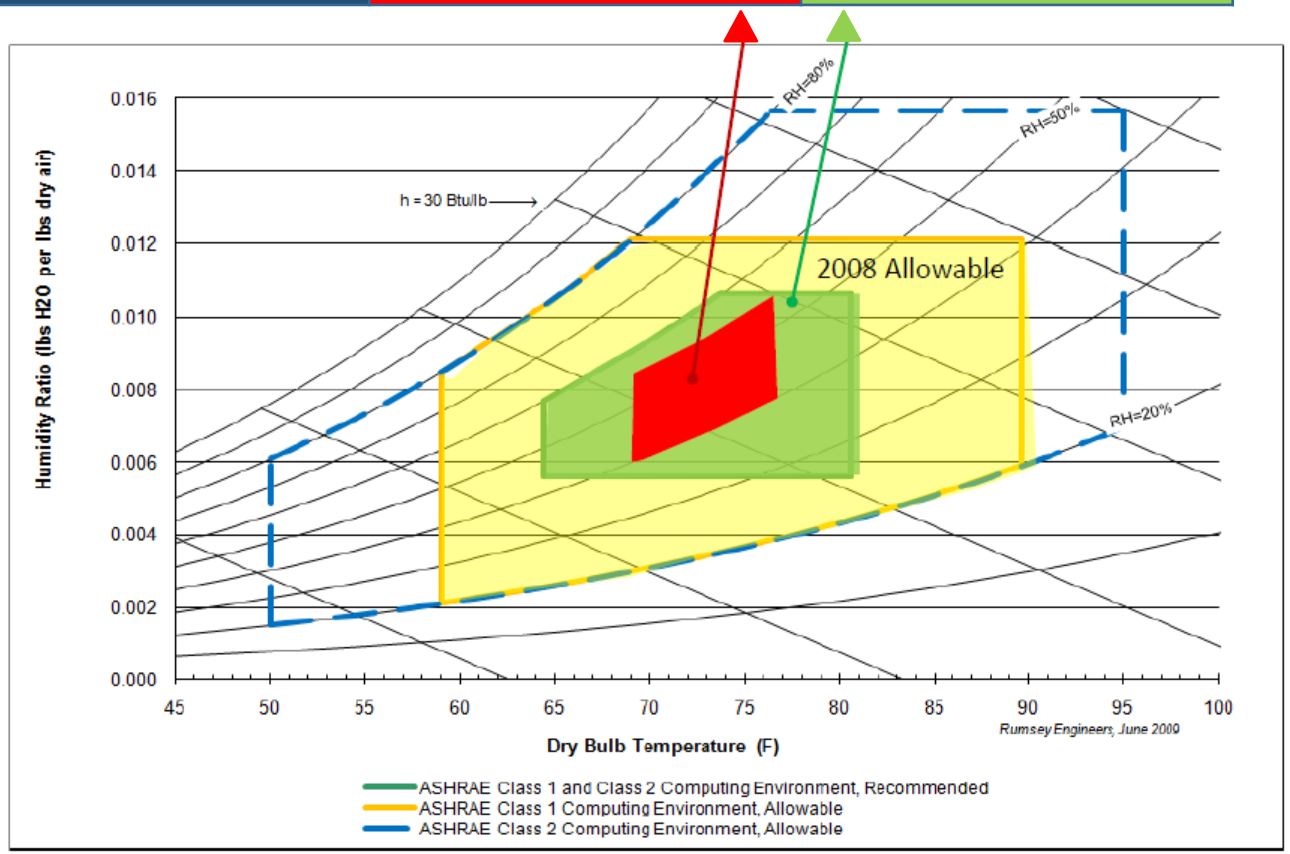




SOURCE: The UTI Symposium 2012 - Emerson – real time optimized DCIM

ASHRAE – Recommended IT Equipment Environment

	Previous (2004)	UPDATED (2008)
Temp.	20-25^{0}C	18-27^{0}C
Relative Humidity	55%	60%



Source: ASHRAE

Chilled Water Temperature Efficiency

Chilled Water Temperature ^0F	Chilled Water Temperature ^0C	Energy consumption W/Ton	% saving	Accumulated saving %
45	7.2	369		
47	8.3	346	6%	6%
49	9.4	321	7%	13%
51	10.6	301	6%	18%
53	11.7	287	5%	22%
55	12.8	275	4%	25%

Source: Datacenter Dynamics Conference, 2009

Influence of High Ambient Temp

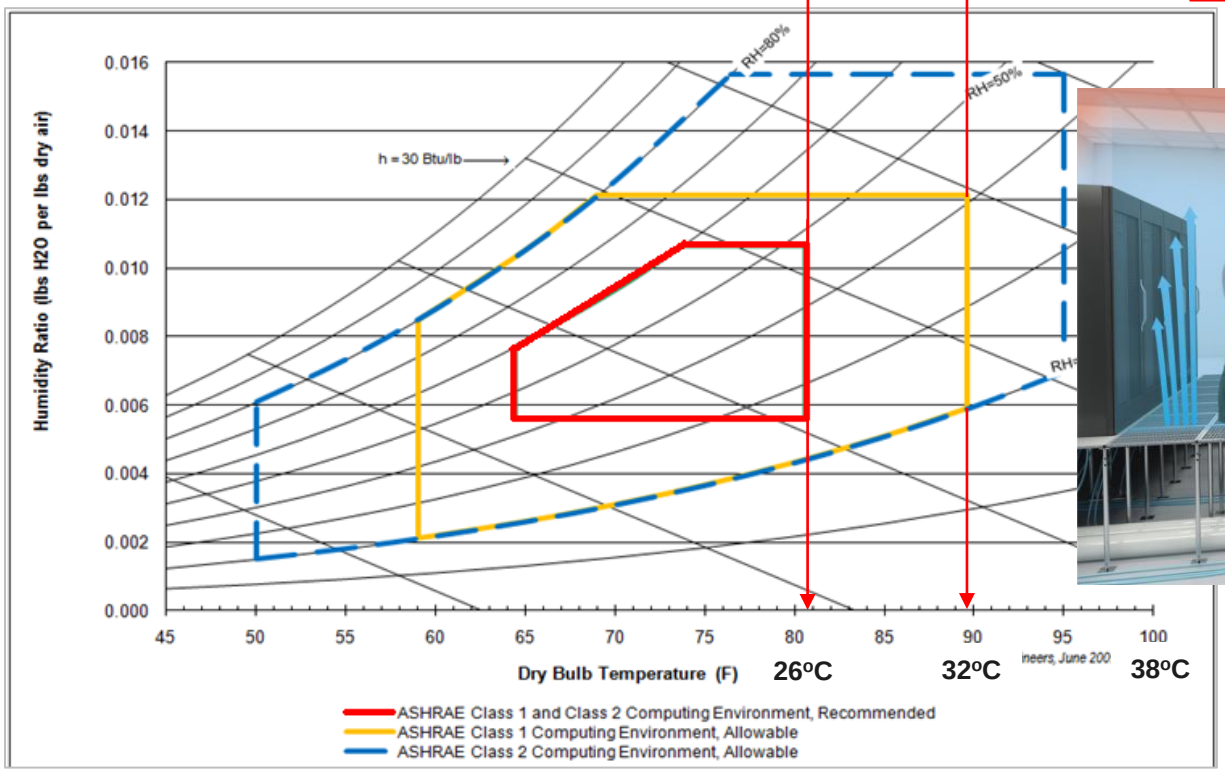
United States Department of Labor
OSHA – Occupational Safety & Health Administration

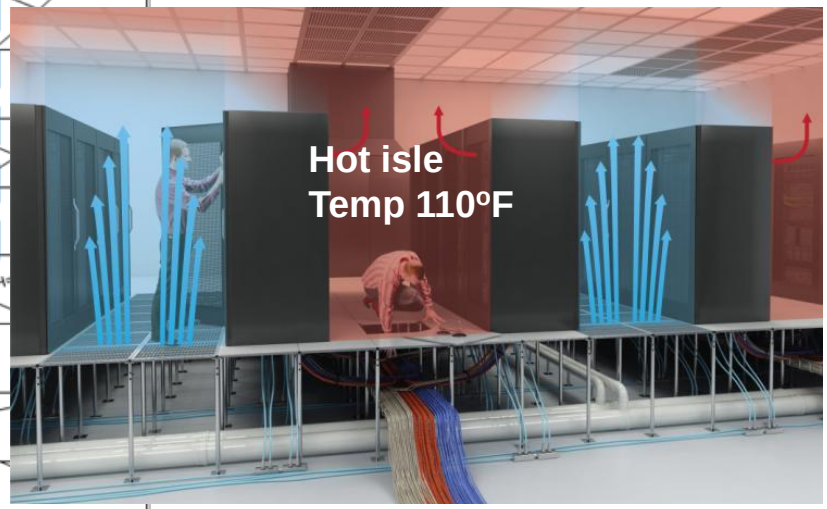
מסדרון חם
100ºF - 37ºC

OSHA – continuous moderate work limit

מסדרון חם
110ºF - 43ºC

OSHA – light work 25%, rest 75%





Sources: ASHRAE, OSHA, The UTI Symposium 2012 – DCIM from fragmentation to convergence

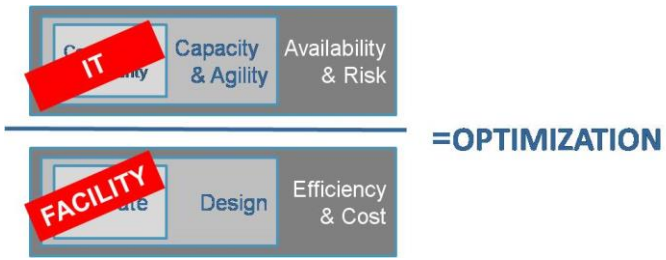
Israel – a Unique Neighborhood

- Site Selection
- Scale
- Water cost
- Geo - political situation:
  - Physical protection
  - BC protection
- Electrical island with single electrical grid
- Limited experience (size and quantity)
- Different (and mixed) standardization

Achieving Data Center Availability along with Efficiency by Management Systems

- Limited power density growth
- Regulation and standardization
- Datacenter 2.0
- Efficiency and green IT
- DCIM as optimization Tool
- Cooling optimization
- Israel - a unique vicinity

$$PUE = \frac{\text{Total DC energy consumption}}{\text{IT Load}}$$



=OPTIMIZATION