



ECO-FRIENDLY COMPUTING

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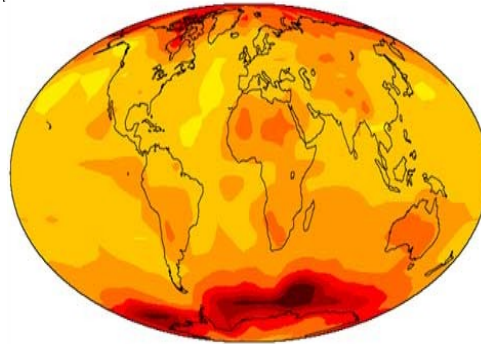


Customer Motivations for Eco-Computing



Save Money

- Lower operating costs
- Greater efficiency



Help the Environment

- Decrease CO₂ emissions



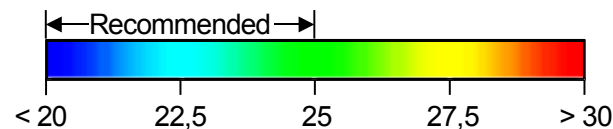
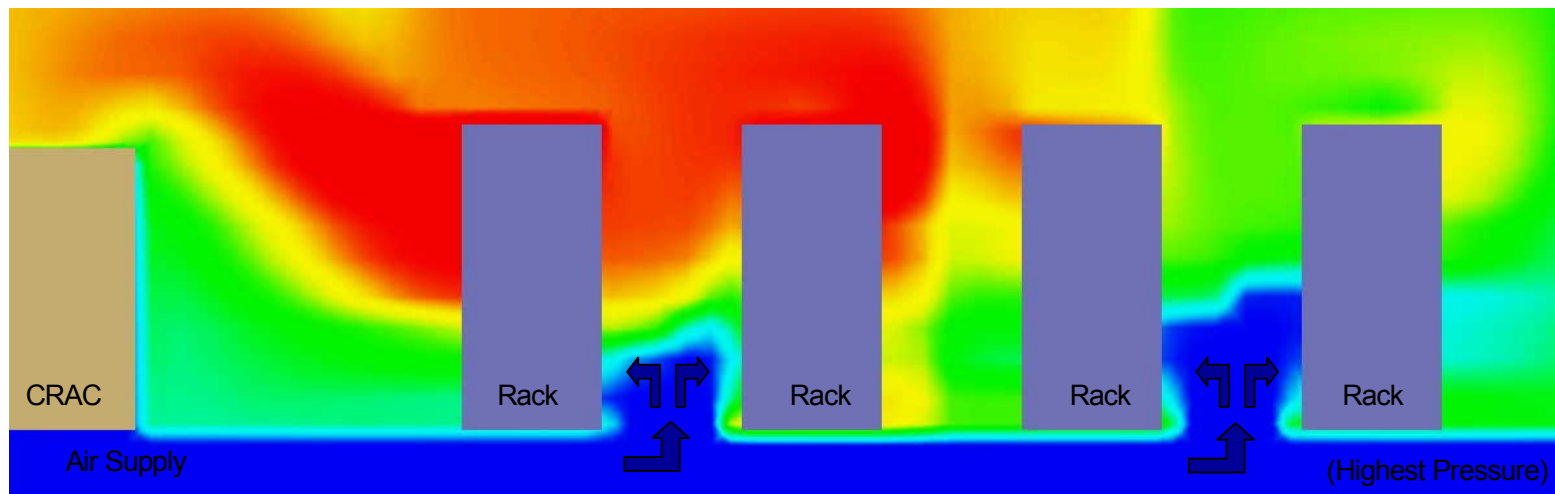
Business Continuity

- Mitigate risk from government regulation
- Availability and uptime

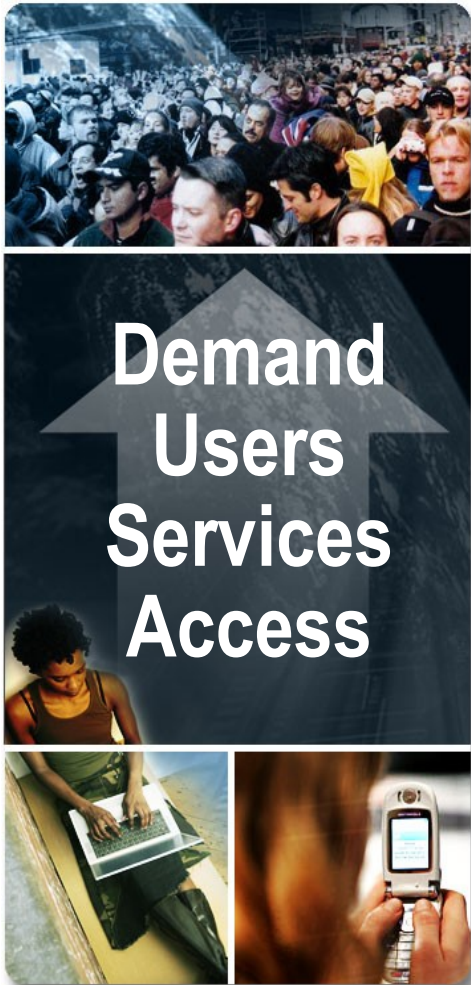
More Heat = Lower Service Levels

The Uptime Institute reports that:

- > “For every increase of 10 degrees above 21° Celsius, long-term electronics reliability falls by 50%”
- > “Equipment located in the top third of a datacenter rack fails twice as often as equipment in the bottom two thirds of the same rack”



Growing Demand, Shrinking Resources



“By 2008, 50 percent of current data centers will have insufficient power and cooling capacity to meet the demands of high-density equipment”* --Gartner

“Energy bills traditionally have accounted for less than 10% of an overall IT budget but soon could account for more than half” --Gartner

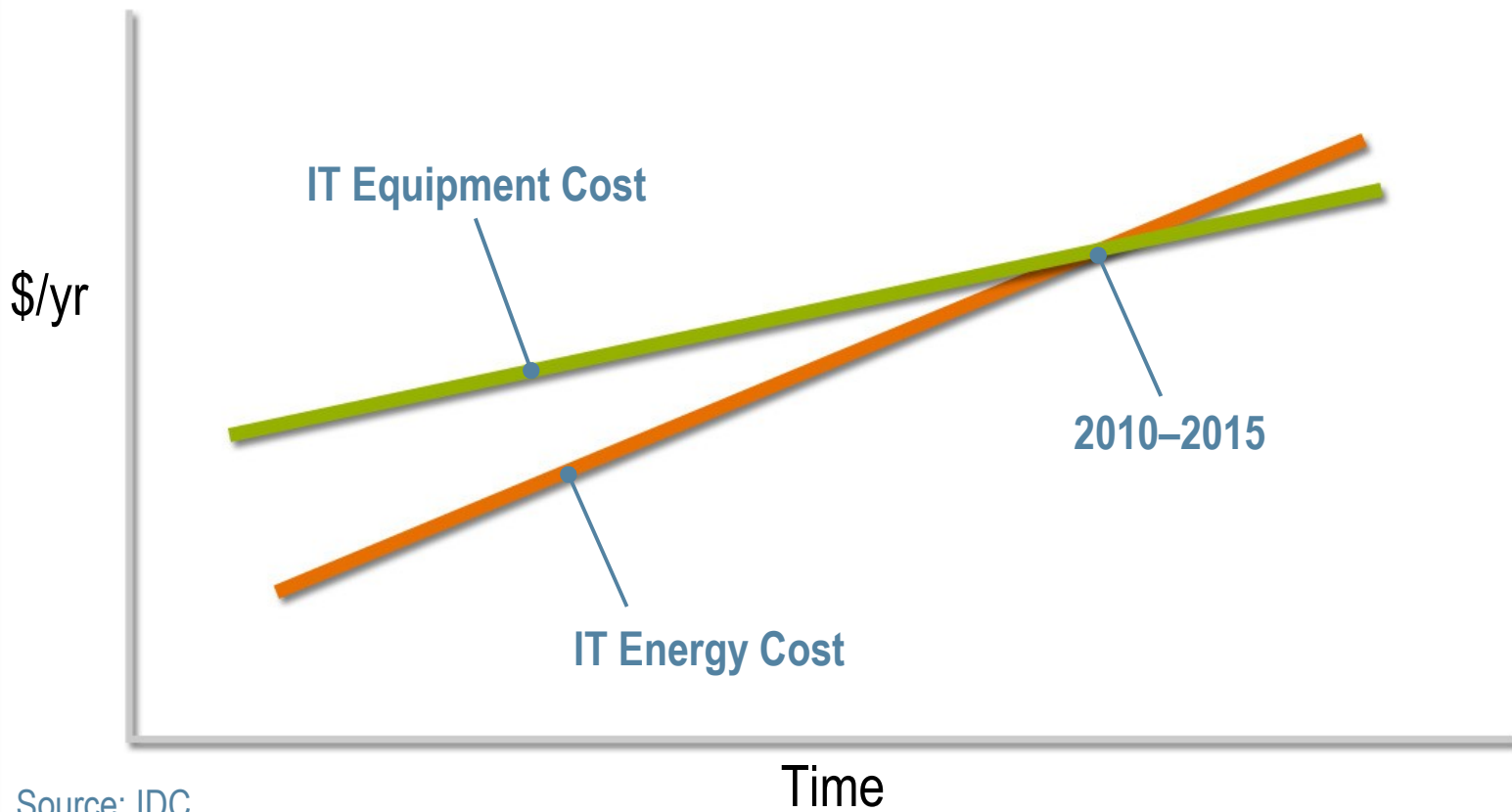
IDC estimates that 60% of datacenters are already out of power, space, and cooling.



*Source: <http://www.gartner.com/it/page.jsp?id=499090>

Economic Impact

Increasing Power Density is Shifting the Balance of Cost



Source: IDC

Example as per 2008

Energy Cost Calculation

Dell PowerEdge 1950-III



1x 1,86GHz Intel Xeon CPU (E5320)
 2 GB memory
 1x 80GB SATA disk drive
 3 Yr. Basic Support

Unit List Price: \$ 1,727 *

Energy Budget

Watts/system: 0.203kW **
 Watts/year: 1773 kW
 System heat = system power
 Cost/kWatt (ex. Moms): Kr. 1,20

* Source: www.dell.com; ** Source: Dell Datacenter Capacity Planner

Example as per 2008

Energy Cost Calculation

Dell PowerEdge 1950-III



- 1x 1,86GHz Intel Xeon CPU (E5320)
- 2 GB memory
- 1x 80GB SATA disk drive
- 3 Yr. Basic Support

Unit List Price: Kr. 8.721,- *

Energy Budget

Watts/system: 0.203kW **

Watts/year: 1773 kW

System heat = system power

Cost/kWatt (ex. Moms): Kr. 1,20

Example as per 2008

Energy Cost Calculation

Dell PowerEdge 1950-III



1x 1,86GHz Intel Xeon CPU (E5320)
 2 GB memory
 1x 80GB SATA disk drive
 3 Yr. Basic Support





Net Price, 10% discount: Kr. 7.849,- *

Energy Budget

Watts/system: 0.203kW **
 Watts/year: 1773 kW
 System heat = system power
 Cost/kWatt (ex. Moms): Kr. 1,20

Energy Cost / Yr: Kr. 4.255,-

Low Wattage per Thread and Core

	 3th gen. Opteron™	 Xeon® 5300	 POWER6	 UltraSPARC T2
Threads per CPU	4	4	4	64
Watts per thread	26	30	33	1.5
Cores per CPU	4	4	2	8
Watts per core	26	30	65	12
10 GbE*	N/A	N/A	N/A	Integrated
Crypto accelerator*	N/A	N/A	N/A	Integrated
PCI-Express*	N/A	N/A	N/A	Integrated
Wattage	105	120	130	94
*Additional watts required	22	22	22	0
Total wattage	127	142	152	94

SWaP - The New Metric for Servers

Space, Watt & Performance



Performance

Space*Watts

“SWaP is an objective three-dimensional metric that provides a more comprehensive and realistic way to assess today’s servers.”



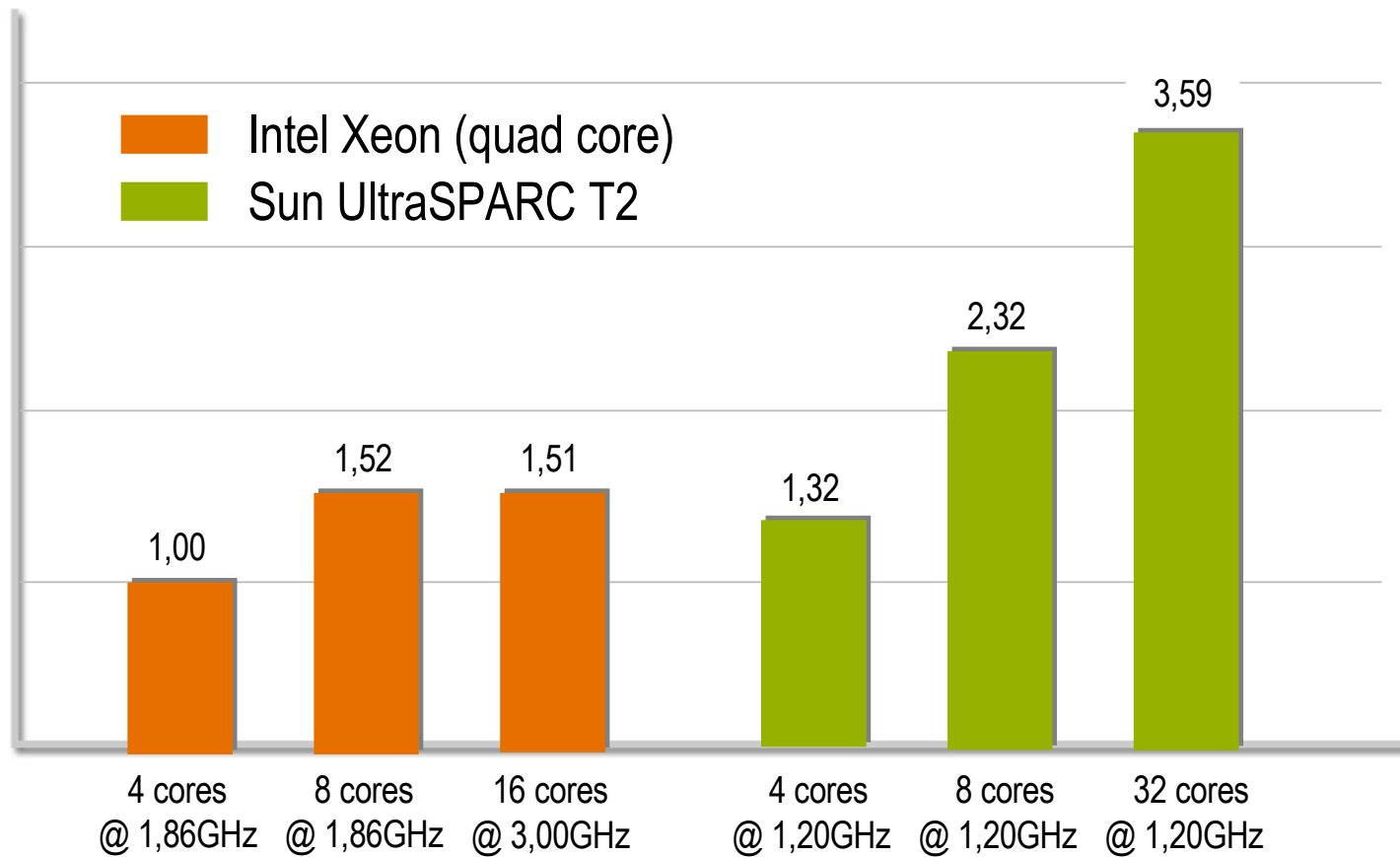
ideas
International

SPECpower_ssj2008

- Industry-standard SPEC benchmark that evaluates the power and performance characteristics of volume server class computers
- Initial benchmark addresses the performance of server-side Java
- 12 published results from 5 vendors

Performance per Watt

Reference platform: Sun Fire X4150 with Intel E5320





Eco on Storage

What About Storage

Energy cost calculation on achieve solution

- Tier 1: 146GB FC disk drives (15K rpm)
- Tier 2: 750GB SATA disk drives (7,2K rpm)
- Tier 3: Tape storage (LTO4 technology)



Power Consumption

Tier1 / Tier2 / Tier3	5TB	20TB	100TB	
100 / 0 / 0	1.200	4.800	23.600	Watt
30 / 40 / 30	750	1.280	9.300	Watt
10 / 20 / 70	550	800	3.600	Watt

What About Storage

Energy cost calculation on achieve solution

- Tier 1: 146GB FC disk drives (15K rpm)
- Tier 2: 750GB SATA disk drives (7,2K rpm)
- Tier 3: Tape storage (LTO4 technology)



Power Consumption per Year

Tier1 / Tier2 / Tier3	5TB	20TB	100TB	
100 / 0 / 0	10.483	41.933	206.170	kW/Year
30 / 40 / 30	6.552	11.182	81.245	kW/Year
10 / 20 / 70	4.805	6.989	31.450	kW/Year

What About Storage

Energy cost calculation on achieve solution

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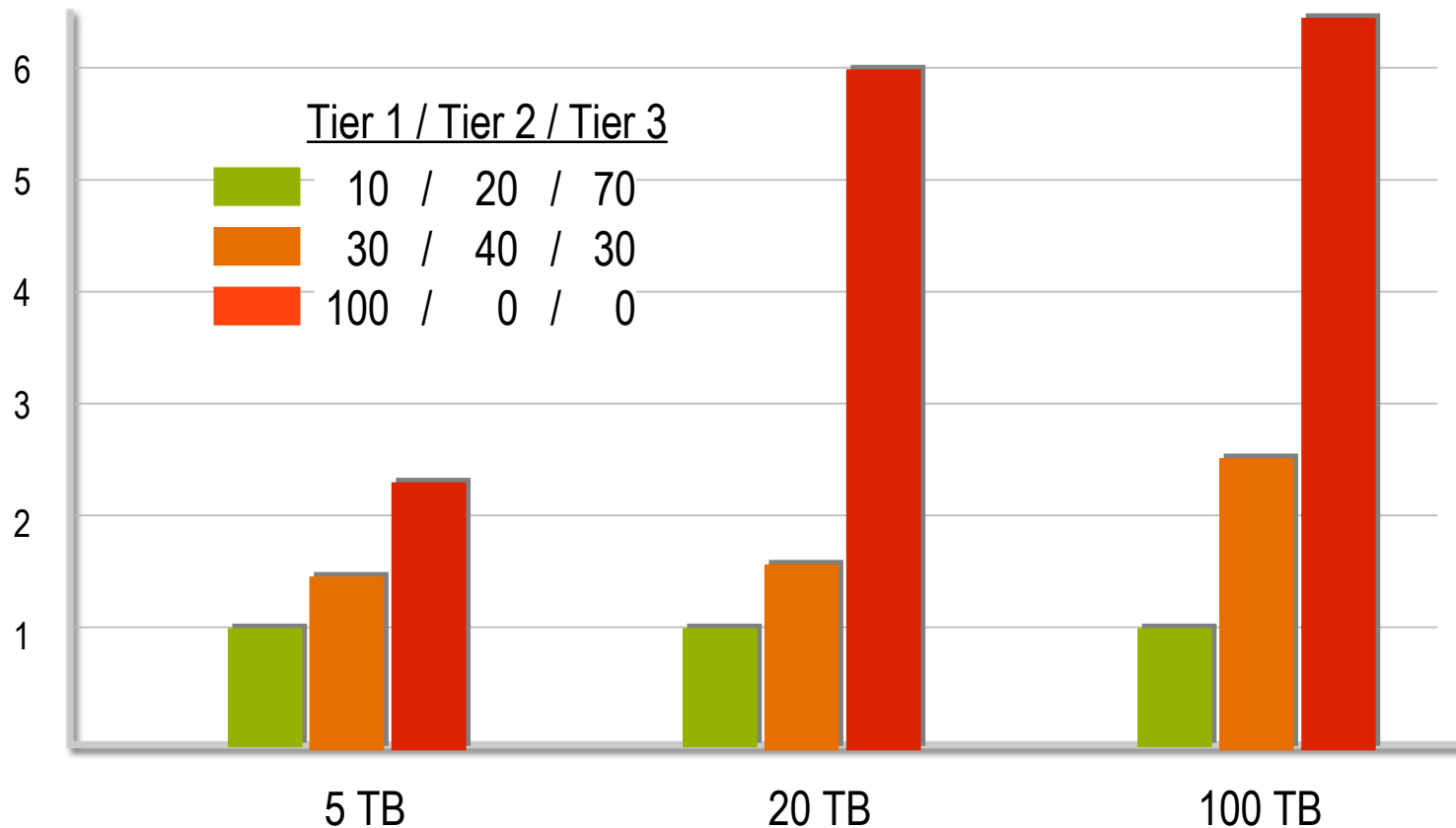


Energy Cost per Year

Tier1 / Tier2 / Tier3	5TB	20TB	100TB	
100 / 0 / 0	25.160	100.639	494.807	Kr./Year
30 / 40 / 30	15.725	26.837	194.988	Kr./Year
10 / 20 / 70	11.532	16.773	75.479	Kr./Year

Storage Achieve Energy Budget

Energy Budget relative to 10/20/70 achieve solution





Summary & QA



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