

Driving Innovation Through the Information Infrastructure

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Creating High Density, Energy Efficient Data Centers for Today's Virtualized Environments

Lance M. King, MBA Systems Services Manager O.C. Tanner Co.



O.C. Tanner Co. Overview





Technology Environment

- APC by Schneider Electric (infrastructure)
- Xsigo Systems (network virtualization)
- Vmware (server virtualization)
- Hitachi Data Systems (storage virtualization)
- Panduit (cabling)
- Quest Software (monitoring systems)
- Dell (servers)
- Server Technology (rack PDUs)

Main Point

 Done correctly, high density, high efficiency data centers are *less expensive* to build and maintain than traditional data centers.



Room for Improvement

- 60,000,000 megawatt hours of electricity is wasted in data centers each year that doesn't power equipment
- Average PUE according to the EPA is 2.04
- It is relatively easy today to reach a PUE of 1.2 to 1.3

Consultants

- Most data center consultants understand power and cooling, but they don't understand data centers. In other words, they see the trees but not the forest.
- Virtually every decision in a data center affects the whole data center.



Simulation

http://forio.com/simulate/lanceking/

Data Center Size Simulation





Table 1 (Untitled Table)													
Years	Initial												-
Annual Revenue	\$350												Ι
Server Demanda	8,550												
Total Server Capacity	0												≣
Capacity per New Server	100												
total Servera	0												
													F
required data center sq footage	0												
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by Lance M. King, MBA and Corey Peck



Total Server Capacity 5

Total Server Capacity

1,600

9,000 8,615 11,652 15,226 19,613

34,052 43,289 54,696 71,068 91,452 115,305 145,746

25,896

Simulation Model



188,948 240,995 304,057



Design Principles

Enemy	Cure			
Human error	Simplify & standardize			
Entropy	Modularization & processes			
Equipment failures	Redundancy			
Low cost	High value			



Density & Virtualization

- You can't be green without high density
- Traditional 5kW per rack
- HD can provide 20-50kW per rack
- Without virtualization you can't reach HD
- Virtualization changes everything: servers, networking, storage, power, cooling, monitoring—but it is worth it.
- Modularize for simplicity & efficiency



Density & Virtualization





Power

- Traditional: two UPSes, each running at less than half capacity
- Smarter: consider using a scalable, internally redundant UPS, to provide A & B bus power running closer to capacity to improve efficiency









Cooling

- Traditional: CRACs and pressurized floor cooling are inefficient, low density, and difficult to manage air flow. Hot and cold aisle separation.
- Smarter: close coupled, high density, high efficiency, self regulating. Hot aisle containment.



Cooling







Cabling & Networking

- Traditional: single run or top of rack switches, separate Ethernet and Fibre Channel networks
- Smarter: virtualized, unified fabric (using Ethernet or InfiniBand), dramatically reduced port and cable counts. Faster and more flexible, and it costs less too.



Cabling







Cabling







Cabling







Management/Monitoring





Management/Monitoring





Q & A and Resources

- www.SmarterDataCenter.com
- www.forio.com/simulate/lanceking/