SIA Workshop
Business Continuity Planning

Shrinking the

Size and Cost
of
Back-Up Data Centers

Oct 31, 2006

Network Services Division
North American Access Technologies. Inc.

This workshop will explore how to avoid over-sizing the requirements and costs of a back-up data center, without giving up the flexibility for future growth.

It will cover the challenges, as well as the techniques and solutions to design, locate and budget for a back-up data center in today's constantly changing computing environment.

All in 60 minutes ???

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In deciding how to best and most cost-effectively, implement a Business Continuity strategy for critical data systems, the Back-Up Data Center is usually the number one item on the list.

This is usually followed by the next logical question:

"Where should it be located?"

Then of course:

"How large does it have to be?"

And the last but not least, question:

"How much will it cost?"

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Design Goals of Building a Back-up Data Center

1. High Density
2. Flexibility
3. Expandability
4. Infrastructure Redundancy
   - Power & Cooling
   - – Back-up Power
5. *Lower Build & Operation Costs*

Back-Up Data Center Basics

– Physical

- Secure Space
- Equipment Racked
- Cabling Organized

– Power

- Normal Utility
- UPS > Battery Back Up (Runtime = 5-60 Minutes)
- Back-Up Generator (Runtime = 1-7 Days >Refuel)

– Environmental

- Precision Cooling
- Humidity Controlled

Scaling Ratios

- **Primary Data Center**
  - Support Full User Loads
  - Contains Data for All systems
- **Back-Up Site**
  - Critical Systems Only
  - Support Fraction of User Loads
    - Full Images of Data
    - Server Count XX% of Primary

Back-up Site Critical Infrastructure

External Factors

- **Communications**
  - Data
  - Voice
- **Utility Power**
  - Back-Up Power
- **Related Issues**
  - Habitable Space
  - Area Secure
- **Physical Security**

Most organization's data centers that were designed before 2000 were we built based on technologies did not exist or were not commonplace such as:

- ***Bladeservers and 1U Low Profile***
- ***Servers w/ Dual Core Processors***
- ***VM Virtual Machines***
- ***SAN & NAS Storage Arrays***

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The result is that these design criterion and performance metrics have radically changed, directly affecting data center design factors such as:

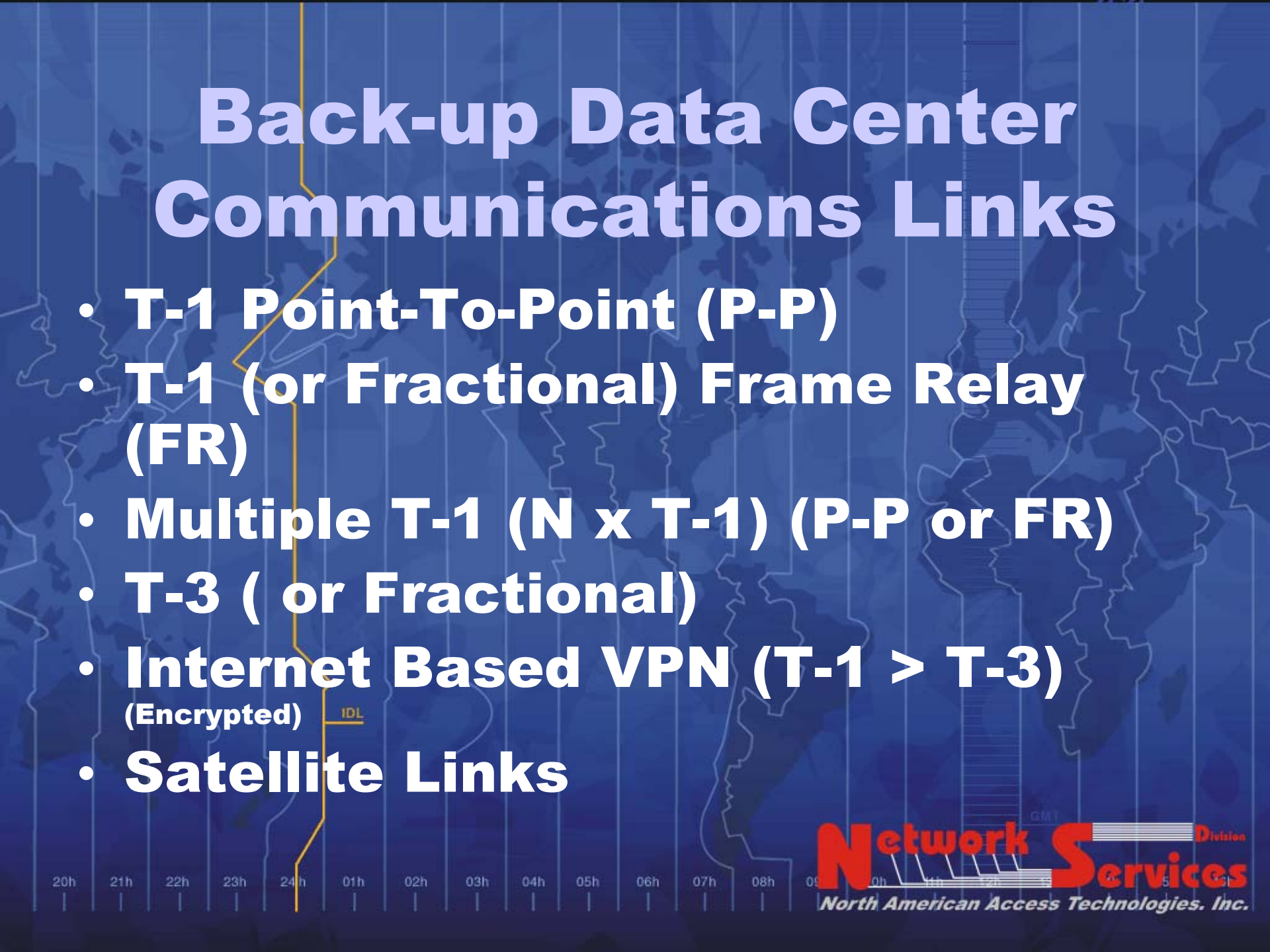
Computing Capability per sq ft (i.e. MPS processing power)
Storage per sq ft (Gigabytes – Terabytes)
Power & Cooling per sq ft (Watts)
Infrastructure Scalability - Designing with the ability to scale up or down with constantly changing systems and demand while maintaining energy efficiency

BCP Options

- Outsource to Commercial DR Provider
  - Lower Upfront Costs
  - Higher Long Term Recurring Costs
- Use your Organization's Existing Sites
  Build Back-up data Center
  - Higher Up Front Cost
  - Lower Long Term Costs
- Hybrid Plan
  - Primary - Internal Resources
  - Secondary - Outsource

Back-up Data Center Communications Links

- T-1 Point-To-Point (P-P)
- T-1 (or Fractional) Frame Relay (FR)
- Multiple T-1 (N x T-1) (P-P or FR)
- T-3 (or Fractional)
- Internet Based VPN (T-1 > T-3) (Encrypted)
- Satellite Links



Sample Transmission Data Throughput

Estimated Theoretical Transmission Speeds						
Type	MBits/Sec	MBytes/Sec	MB/Min	GB/Hr	10 Hrs	12 Hrs
T-1	1.54	0.19	12	0.695	7	8
T-3	45	6	338	20	203	243
10-Base-FL	10	1	75	5	45	54
100-Base-FX	100	13	750	45	450	540
OC-3	155	19	1,163	70	698	837
1000-Base-LX	1,000	125	7,500	450	4,500	5,400

Note: Actual throughput will be about 75-80% of above due to protocol overhead.

Latency will impact throughput and is not factored in the above.

BCP Geographic Issues

- Outsource to Commercial DR Provider
  - Logistics of Distance to DR Site
- Use your Organization's Existing Sites
  (Build Back-up data Center)
  - Size & Number of Personnel at Alternate Site
- Hybrid Plan
  - Internal Resources – Primary
  - Outsource – Last Resort

Sample Back-up Data Center Payloads

			Low - Med Density	HI Density
			2U-5U	1U & Blade
Size in Ft.	Sq. Feet	Cabinets	Servers	Servers
18 x 20	360	10-12	60-200	100-500
18 x 30	540	15-20	100-300	150-800
25 x 30	750	25-35	200-600	250-1000+
35 x 30	1000	40-50	300-900	400-2000+
50 x 30	1500	60-70	500-1400	600-3000 +

Sample Back-up Data Center Power

	Low Density 1-2 KVA	Med Density 3-5 KVA	HI Density 6-10 KVA	EXT Density 12-20 KVA+
Cabs	Total KVA			
5	5-10	15-25	30-50	60-100+
8	8-16	24-40	48-80	100-160+
15	15-30	45-75	90-150	180-300+
25	25-50	75-125	150-250	300-500+

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Sample Back-up Data Center Cooling

Cooling Requirements

			Low Density	HI Density
Size in Ft.	Sq. Feet	Cabinets	Tons Cool	Tons Cool
10 x 12	120	4-5	1.5-3	3-5
10 x 18	180	6-8	2-5	5-10
18 x 20	360	12-15	10-15	15-25
18 x 30	540	20-25	20-30	25-50

Sample Power & Cooling Requirements

High Density 1 U Servers

1U Servers	Each 1 U Server		U	Rack of 40 Servers		COOLING
Model	WATTS	BTUs	1	WATTS	BTUs	TONS
Dell Power Edge 850	345	1,173	1	13,800	46,920	3.9
IBM eServer X306	350	1,190	1	14,000	47,600	4.0
HP Proliant DL360	275	935	1	11,000	37,400	3.1
Sun Fire X2100 Server	300	1,020	1	12,000	40,800	3.4
			1			
Dell Power Edge 1850	550	1,870	1	22,000	74,800	6.2
IBM eServer X336	585	1,989	1	23,400	79,560	6.6
HP Proliant DL360R4	535	1,819	1	21,400	72,760	6.1
Sun Fire X4100 Server	550	1,870	1	22,000	74,800	6.2

Challenge … *Scotti, I need More Power*

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Sample Power & Cooling Requirements

High Density Blade Servers

Blade Servers						COOLING
Model	WATTS	BTUs	U	WATTS	BTUs	TONS
Dell	Rack of 4 Chassis			(40 Blades)		
DELL PowerEdge 1855	5,000	17,000	7U	20,000	68,000	5.7
IBM	Rack of 4 Chassis			(56 Blades)		
IBM BladeCenter=H Class	8,000	27,200	9U	32,000	108,800	9.1
HP	Rack of 5 Chassis			(40 Blades)		
HP BladeSystem p-Class	4,500	15,300	6U	22,500	76,500	6.4
SUN	1 Server			(72Proc)		
Sun Fire E25K Server	25,000	85,000	~	25,000	85,000	7.1
Weber Genesis Silver Barbeque					26,000	2.2

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Challenge … Scotti, It's Very Very Hot in here

I Need More Cooling

Heat Load Per Cabinet

14 Servers@550W =7.5KW
=26,000 BTUs = 1 Weber Grill !!

28 Servers@550W =15KW
=52,000 BTUs = 2 Weber Grills !!

42 Servers@550W =22.5KW
=78,000 BTUs = 3 Weber Grills !!

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IBM BladeCenter

H Class

9U = 14 Blades

Power=8,000VA

Heat=27,200 Btu/hr

with 4 per 42U rack

=32,000KVA Power

=105,000 Btu/hr

=9 Ton Cooling!!

Compact Four-Way Supremacy is Here

NOW WITH 550 WATTS OF POWER !!!

High Power Density

Watts per Rack ~

2KW-5KW-10KW~+30KW !!!!!

Watts per Sq. Foot ~

100W-150W-200W~+300W!!!!

Challenge...

Scalable UPS Power & COOLING !!

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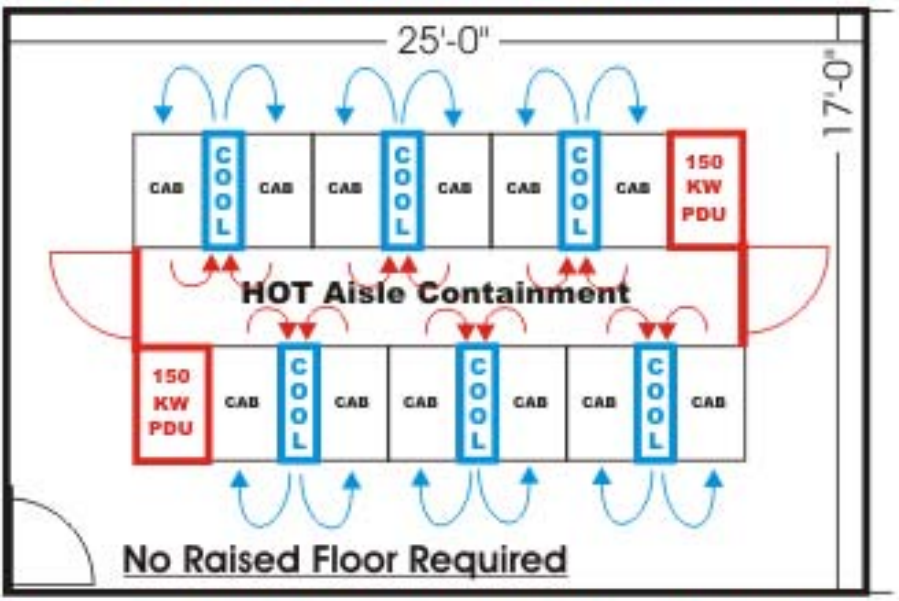
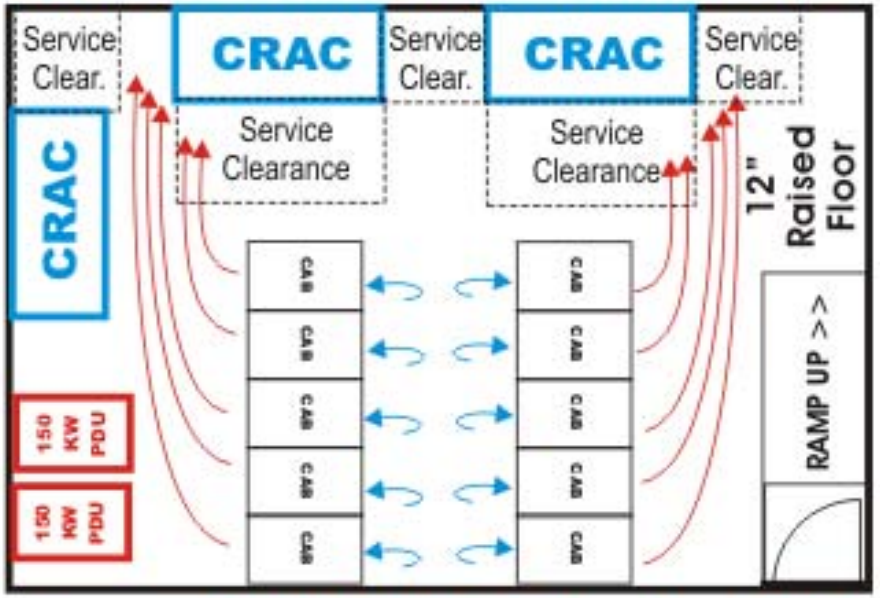
IN-ROW Cooling Technology VS Traditional Cooling Technology

High Density Hot-Aisle Containment



Power=150KW 100% Redundant (2N)
Cooling=150KW (N+1) 6 x 30KW
Payload Space=12 Cabinets=504U
Power & Cooling per Cab=12.5KW
Floorspace=17' x 25"=425 Sq. Ft.
No Raised Floor Required

Cool Air From Perforated Floor Tiles



Power=150KW 100% Redundant (2N)
Cooling=80KW (N+1) 3 x 40KW
Payload Space=10 Cabinets=420U
Power per Cab=15.0KW
Cooling per Cabinet Limited to 5KW*
Floorspace=17' x 25"=425 Sq. Ft.

UPS is External for both examples

*Cooling Limited by Airflow

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Flexibility

- Traditional- Fixed Hardwire Electrical Distribution

+ Modular – Flexible Power Whips and Plug-in PDUs

= Easy Reconfiguration for
Changing Loads & Equipment Types

Expandability & Growth

- –Pre-build for Maximum
(Traditional ~ Maximum Loads)
- +Modular = Growth On-Demand

Infrastructure Redundancy

- Power & Cooling
- (N+1) and/or (2 N)

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Sample Back-up Data Center Cost Ranges

Sample Data Center Room Size vs Cost				
Racks & Power				
Excluding Cooling System Costs			Low Density	HI Density
Size in Ft.	Sq. Feet	Cabinets	Cost $K	Cost $K
10 x 12	120	4-5	10-20	20-40
10 x 18	180	6-8	15-25	25-50
18 x 20	360	12-15	25-40	40-100
18 x 30	540	20-25	50-100	100-250

Sample Data Center Power Costs

KW Hour	Day	Month	Year	5 Years
1	24	720	8,760	43,800

Cost Per KWH	Day	Month	Year	5 Years
$ 0.10	$ 2.40	$ 72.00	$ 876.00	$ 4,380.00

Cost Per 100 KWH	Day	Month	Year	5 Years
$ 10.00	$ 240.00	$ 7,200.00	$ 87,600.00	$ 438,000.00
Save 5%	$ 12.00	$ 360.00	$ 4,380.00	$ 21,900.00

Sample Data Center Cooling Power Costs

Cost Per 100 KWH	Day	Month	Year	5 Years
$ 10.00	$ 240.00	$ 7,200.00	$ 87,600.00	$ 438,000.00

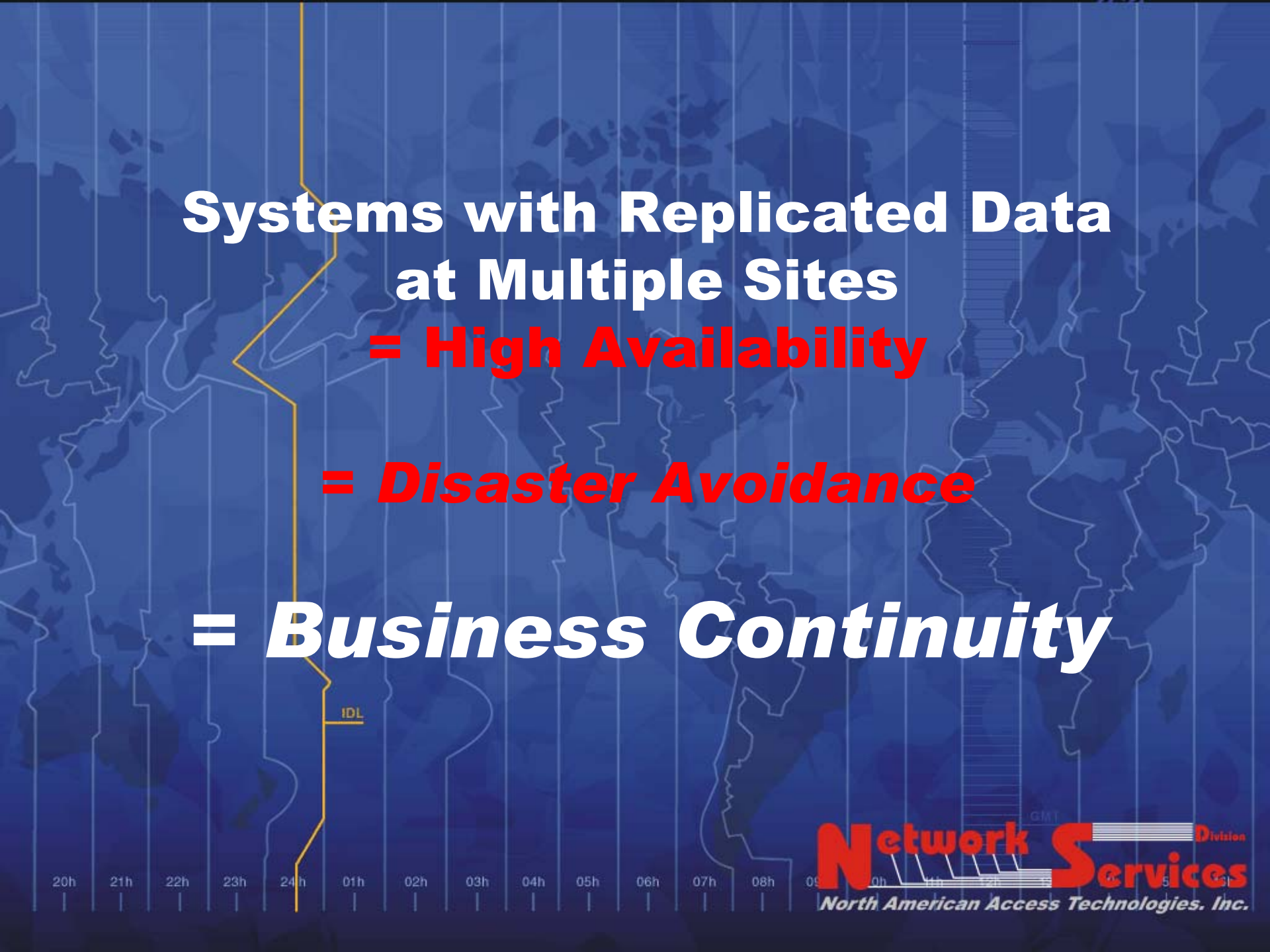
Power Cost for Cooling / percent of Electrical Load=100KW				
% of Load	KW	Month	Year	5 Years
40%	40	$ 2,880.00	$ 35,040.00	$ 175,200.00
60%	60	$ 4,320.00	$ 52,560.00	$ 262,800.00
80%	80	$ 5,760.00	$ 70,080.00	$ 350,400.00

Systems with Replicated Data at Multiple Sites

= High Availability

= *Disaster Avoidance*

= *Business Continuity*



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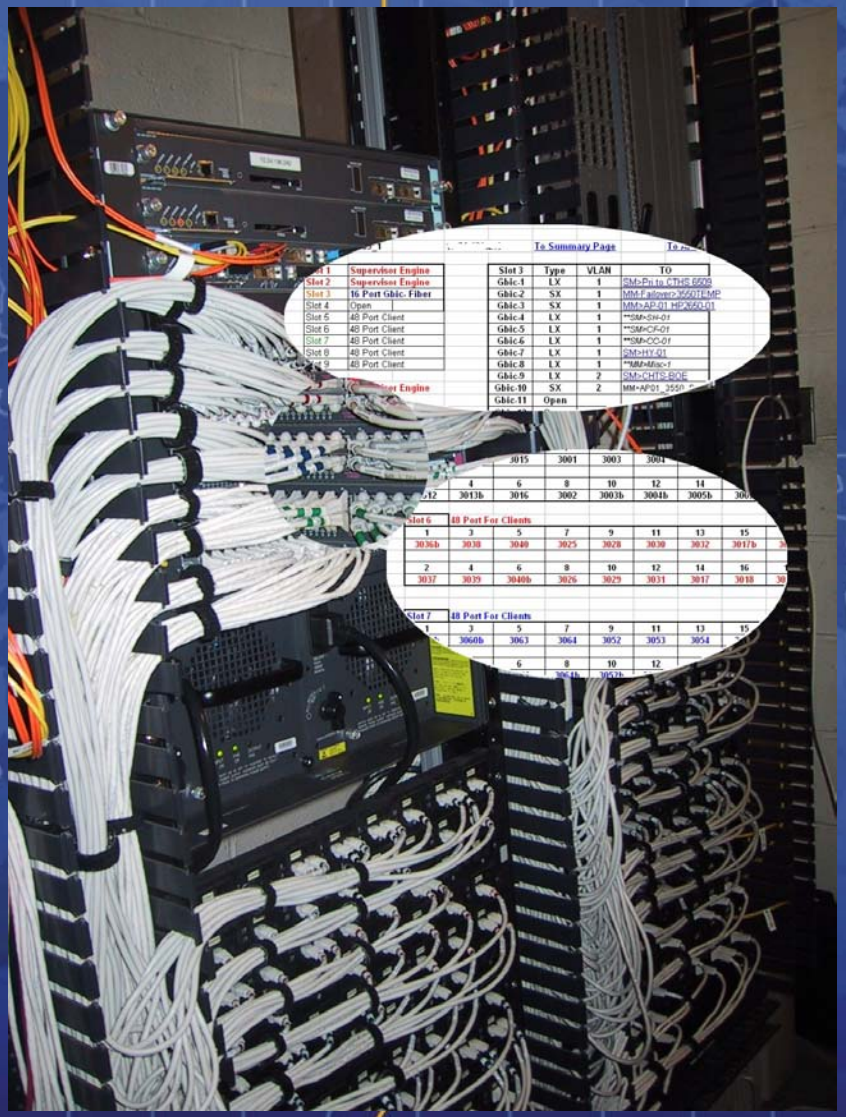
Man-Made Disaster in the Making



- **Old Network**
  - Undocumented
  - Cables – Unlabeled & Tangled
  - Switch Ports
    - Not Mapped to Drops
  - Difficult to Manage

- **New Network**
  - Fully Documented
  - Cables Labeled
  - Switch Ports
    - Mapped to Drops
  - Easy to Manage

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Be Prepared..

Data Centers *On Demand*

APC Reliability Provider CERTIFIED Gold

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Disaster Recovery

Mobile Emergency Datacenter

Government Computer News Best New Technology Awards at FOSE
Winner 2003

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20h 21h 22h 23h 24h 01h 02h 03h 04h 05h 06h 07h 08h 09h 10h 11h 12h

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- Project Management
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- Support
- Infrastructure Upgrade

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Thank you

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