Top 10 Ways to Boost Capacity with Better Data Center Power and Networking Management

Presenters:

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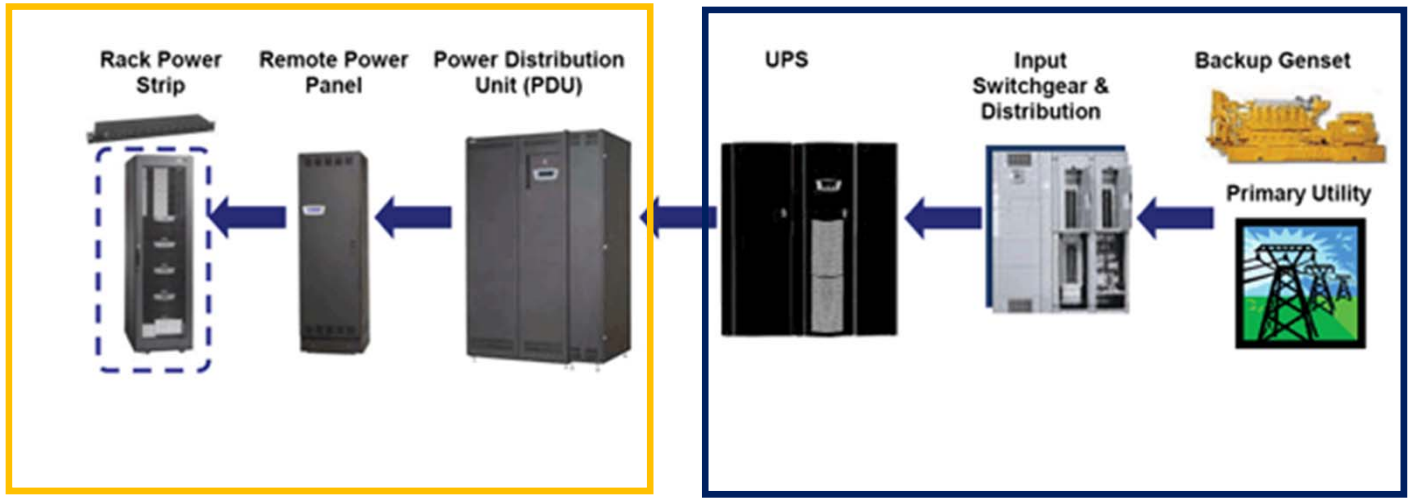
Agenda and Timeline

Introductions (CEC, agenda, breaks, speakers contact info)	4 minutes
Ashish Moondra (Power)	40 minutes
Power Q & A	7 minutes
Break	10 minutes
Duke Robertson (Cable Management)	30 minutes
Cable Management Q & A	7 minutes
Break	10 minutes
Justin Capone (DCIM)	40 minutes
DCIM Q @ A	7 minutes
Local Session Demo	20 minutes
Final Thoughts with final Q & A	5 minutes

What Are The 10 Ways to Boost Capacity?

1. Use Busway Systems & Preinstalled Cabinet Solutions
2. Bring 3-ph Power to the Cabinet
3. Integrate PDU's with Phase-Balanced Locking Outlets & IP Consolidation
4. Invest in DCIM Software Solutions
5. Follow Industry Standards & Regulatory Guidelines
6. Plan for Future Growth
7. Evaluate & Select High-Quality Cable Management Infrastructure
8. Install & Organize Your Cables Right—the First Time
9. Commit to Maintaining Your Installation for the Long-term
10. Consider Airflow Management When Installing Cable and Power Solutions

Elements of Data Center Power Distribution



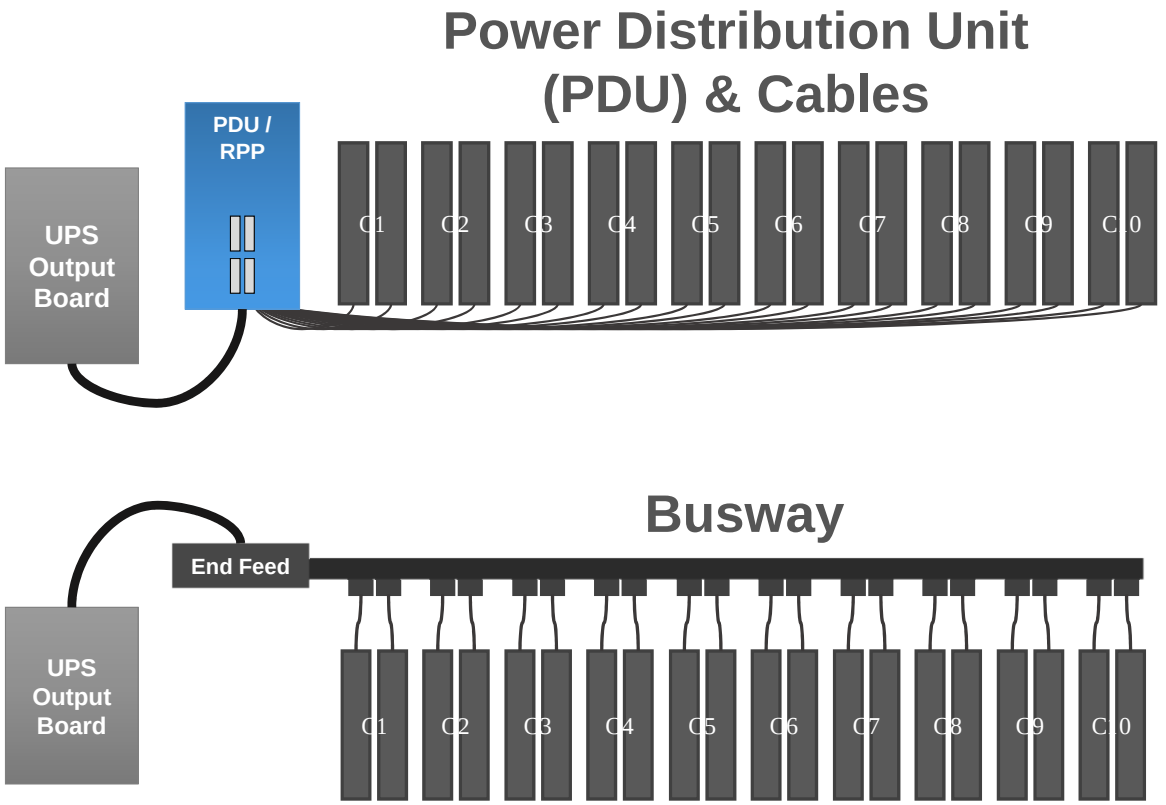
Data Center White Space

Data Center Grey Space

Data Center Power Distribution Considerations

- Flexibility and speed of deployment
- Rising cabinet power densities
- Ability to power all equipment within cabinets
- High availability
- Optimize usage of infrastructure
- Manageability and integration
- Datacenter Infrastructure Management (DCIM)

Flexibility and Speed – Busway Systems



Cables vs. Open Channel Busway

Busway

- Does not utilize any data center floor space leaving room for more IT equipment.
- No raised floor required
- Additional circuits can be added by any authorized personnel.
- Circuit protection at point of use
- Tap-off boxes are above the rack and easy to trace
- New circuits can be added or removed on energized bus. (Busway must be UL 857 Listed) No “Approach Boundaries”
- Tap-off boxes can be “Shelf Stock”
- Average cost of adding a new 30A circuit (L630R 10kAIC): $300.00

PDU/RPPs Cabling

- Takes up valuable white space better utilized by IT equipment or tenant in CoLo facility
- Requires raised floor environment
- New circuits must be installed by licensed electrician.
- Circuit protection at panelboard
- Cables are beneath raised floor and difficult to trace
- NFPA 70E Recommends de-energizing panelboards by licensed electrician with appropriate PPE gear to install new circuits. Governed by appropriate “Approach Boundaries”
- Average cost of adding a new 30A circuit (L630R 10kAIC) by union electrician: $875.00

Speed of Deployment – Pre-installed Solutions

- Saves significant deployment costs, time and effort
- Solution tested as a system prior to shipment
- Helps promote Green image with minimal packaging

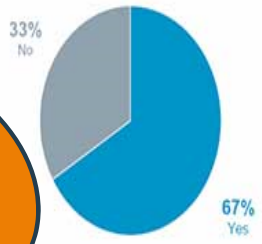
Rack Density is Increasing
Over 5 kW Per Rack (cabinet) is Typical

Consolidation and Virtualization means higher density in each rack

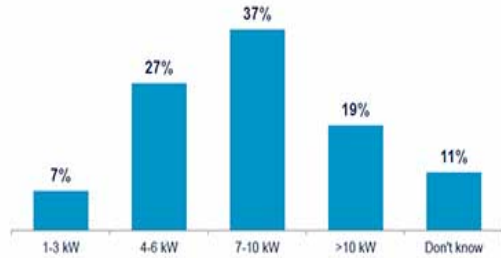
Changes in Rack Power Density

The majority of respondents report rack power density is increasing. The estimated mean target rack power density is 7.3 kW.

Percent Indicating Rack Power Density is Increasing



Target Rack Power Density



Data from the recent AFCOM State of the Data Center Survey

DENSER EQUIPMENT requires MORE POWER which requires MORE COOLING

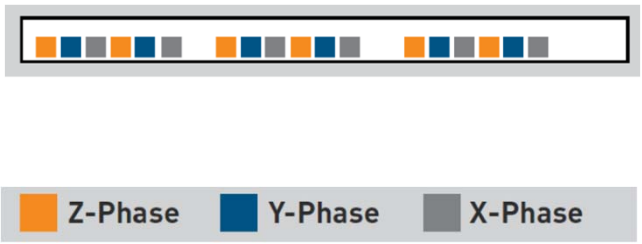
Supporting Higher Densities

- 3-ph power to the cabinet & higher voltage at cabinet level (240/415V; 208V 3ph)
  - Support higher densities
  - Balanced phases – optimize upstream infrastructure usage
  - Lower distribution costs

Region	Typical Circuit	Typical Plug Type	Max. Capacity (kW)
North America	**3-ph 60A, 208V**	**IEC 60309 3P + G**	**17.3**
	3-ph 30A, 415V	**L22-30**	**17.3**
	3-ph 50A, 208V	**CS8365C**	**14.4**
	3-ph 30A, 208V	**L21-30, L15-30**	**8.6**
	3-ph 20A, 208V	**L21-20, L15-20**	**5.7**
	1-ph 30A, 208V	L6-30	4.9
	1-ph 20A, 208V	L6-20	3.3
	1-ph 30A, 120V	L5-30	2.8
	1-ph 20A, 120V	L5-20	1.9
International	**3-ph 32A, 380/400/415V**	**IEC 60309 32A 3P+N+G**	**21 - 23**
	3-ph 16A, 380/400/415V	**IEC 60309 16A 3P+N+G**	**10.5 – 11.5**
	1-ph 32A, 220/230/240V	IEC 60309 32A 1P+N+G	7 – 7.7
	1-ph 16A, 220/230/140V	IEC 60309 16A 1P+N+G	3.5 – 3.8

Phase Balance Outlets – Rack PDU's

- Balances loads across the 3- phases
- Simplifies equipment deployment
- Better airflow with improved power cord management

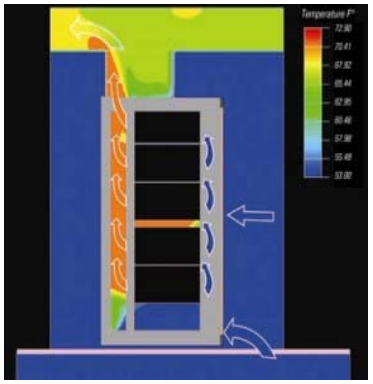


High Availability – Use of Intelligent Rack PDUs

Capability	Advantages
Basic Power Distribution	• Easily distribute power to IT loads within a cabinet / rack.
Local Metering	• Balance loads across phases and branch circuits at initial install
Remote Metering - Input	• Manage overall cabinet level power consumption • Balance loads across all input phases • Chargeback based on cabinet level power consumption
Remote Metering – Branch Circuit	• Balance loads across phases and branch circuits at all times • Notification of availability issues before problems occur • Chargebacks based on overall PDU power consumption
Remote Metering – Outlet Level	• Know power consumption of IT equipment • Justify purchase of new equipment • Help determine unused servers • Chargebacks / regulatory credits based on actual IT equipment power consumption
Remote Power Control – Outlet level	• Reboot power to hung up equipment remotely • Scheduled shut down and start up for energy savings (IT Labs) • Provisioning of outlets
Integrated Environmental Monitoring / Access Control	• Use PDU for overall cabinet level management

Ensuring Availability with High Ambient Temperature Rating

- Equipment ΔTs are increasing from 20-25°F (11–14°C) to 35-40°F (19-22°C).
- Deployment of containment solutions for higher efficiency is driving higher temperatures at the back of the rack.
- Vertical rack PDUs are located behind the server exhaust – highest temperature within data center.



2015 ASHRAE Specifications

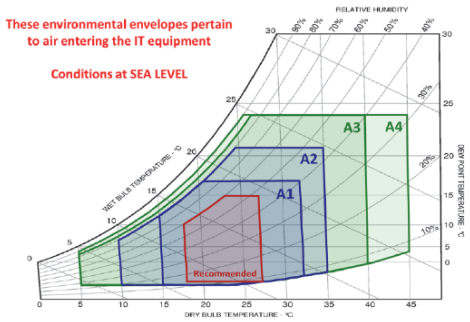


Figure 2.3 2015 recommended and allowable envelopes for ASHRAE Classes A1, A2, A3, and A4.

Source: Thermal Guidelines for Data Processing Environments –Fourth Edition; ASHRAE DataCom Series Book 1

Branch Overcurrent Protection Selection

- Breakers vs. Fuses
  - Breakers have ability to reset – Low Mean Time To Repair (MTTR)
  - Fuse replacement requires upstream circuits to be turned off – requires electrician – and inventory - High MTTR
- 100% Magnetic Hydraulic Breakers
  - Minimize nuisance tripping due to minor overloads and ambient temperature variations
- Slim profile to minimize airflow interference
- No accidental tripping
- UL® 489 Listed

Adequate Outlet Count And Type

- Modern day IT equipment uses C14 or C20 connector that can handle 100 – 250V
  - C14: 1U/2U servers / small switches
  - C20: Blade servers / enterprise switches
- Some legacy equipment / remote sites may require NEMA 5-15 or 5-20 that can handle 120V
- Cabinets filled with 1U servers will require a high count of C13 outlets on Rack PDU
- Each higher density equipment will require multiple C19's to support all power supplies
- Always, use Rack PDU's with locking receptacles
  - Consider solutions that do not require specialized power cords for lower add-on costs

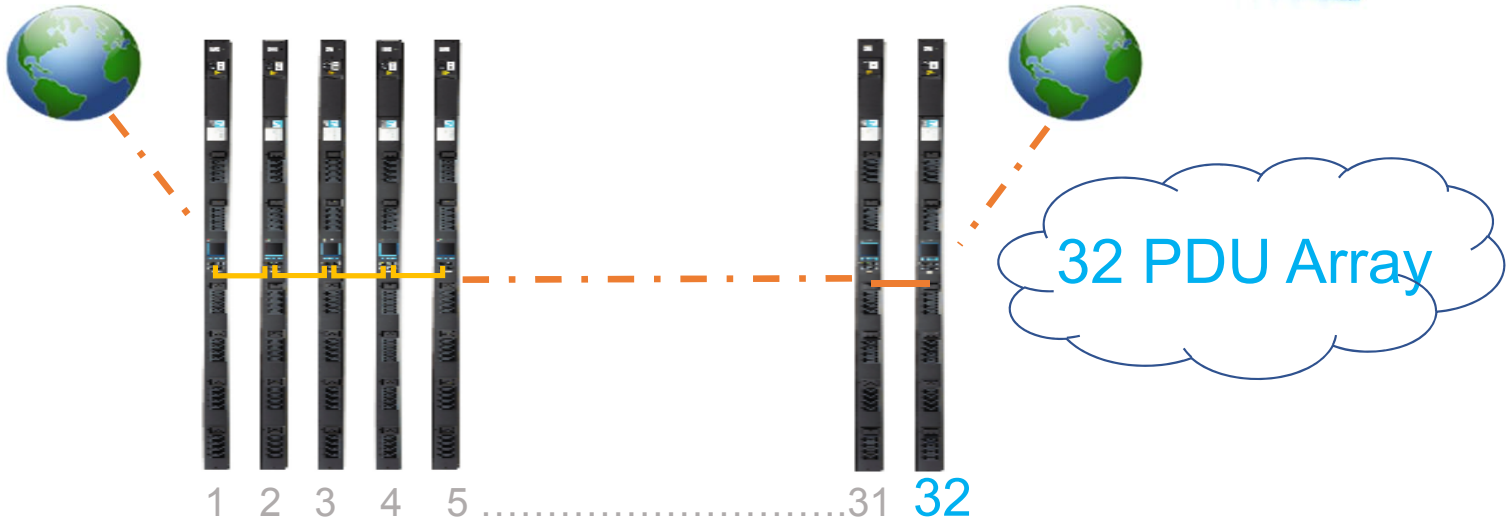
High Availability – Continual Monitoring

- Circuit Breaker Status Monitoring
- Ability to set thresholds for overloads and low load
- Event and data log
- Notification by the method of your choice:
  - Email
  - SNMP Trap
  - Syslog

Branch	High Voltage Threshold (Volts)	Low Voltage Threshold (Volts)	Warning Overload Threshold (Amps)	Critical Overload Threshold (Amps)	Warning Low Load Threshold (Amps)
XY	0	0	0	20	0
YZ	0	0	0	20	0
ZX	0	0	0	0	0

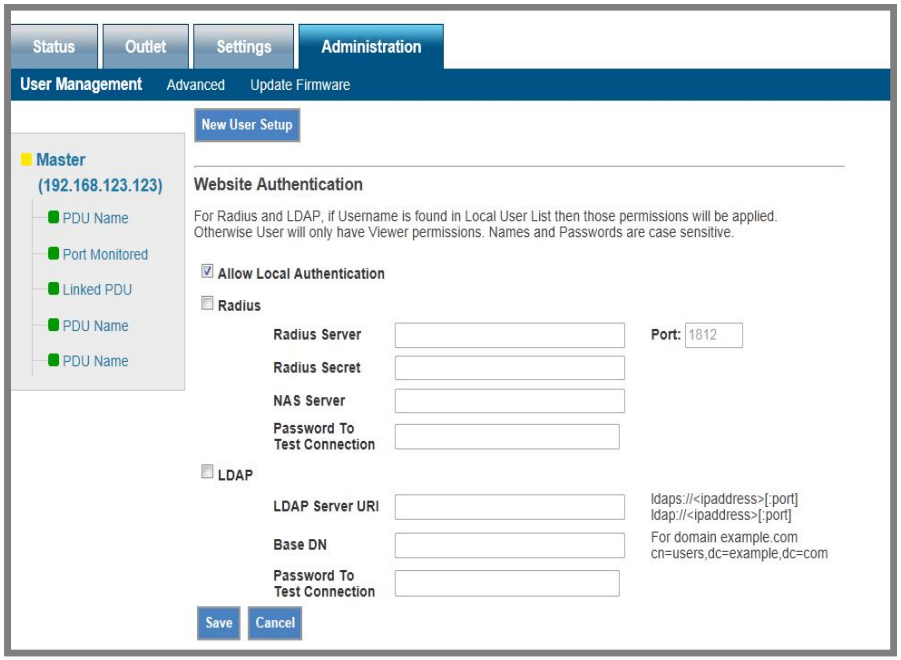
Simplifying Manageability: Secure Array® Technology

- Secure Array consolidates IP addresses of up to 32 PDUs
  - Reduce number of IP Ports
  - Deploy fewer switches/routers
  - Reduce installation time
  - Reduce Ethernet cable length



Intelligent PDU's: Security & Integration Considerations

- Security
  - HTTPS support
  - Ability to support customer's own certificate
  - LDAP and RADIUS integration
  - TLS 1.2 support
  - SNMP v3 support
  - IPv6 and IPv4 support
- Integration
  - SNMP v1, v2 and v3 support
  - API's for Bulk configuration
  - Native integration within DCIM



Make Investments in Intelligent Equipment Meaningful with DCIM

Data Collection	• Dynamic Plugin • Amps, Volts, Power Factor, Power, Energy Use, Temperature, Humidity, Door Status
Information	• Dashboard with PUE • Charge Back Reports • Capacity Forecast & Gauge • Thermal Analysis • Power Chain Failure Analysis
Controls	• Cycle Outlets • Set Sequence and Delay • Graceful Shutdown • Intelligent Door Locks
Management	• Outlet Label Naming • Event and Notification • Central Audit Log • Centralized User Management