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# Getting the Most Out of the Network Closet

## Executive summary

While network closets can take all shapes and sizes, they are essentially an arm of the data centre and as an important component of all mission-critical environments, must be organised, protected and managed efficiently and effectively. IT professionals are charged with keeping the technology infrastructure functioning, even in the face of constrained resources and increasing complexity. By selecting the correct rack and power infrastructure, paired with management hardware and software, organisations can keep their businesses up and running. In this white paper, we go beyond simple how-to advice for keeping IT equipment operational to discuss how efficiently managing, organising and operating network closets saves time and money, and avoids risk utilising the existing space and equipment.



Network Closet Rack

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## The network closet: Same components, different purpose

Whether at a small company, a mid-market organisation or a large enterprise, the components that make up a typical network closet are usually the same. Essentially, a network closet houses four primary elements; data network in terms of cabling infrastructure and network switching, data processing in the shape of servers, storage devices to hold data and finally any form of virtualisation or network management software. Power distribution has also been recognised as an essential element of the network closet, especially with the increased adoption of converged infrastructure.

What differentiates one network closet from another is its fundamental purpose. For smaller organisations, a network closet serves as a computing hub, containing all the networking, storage and computing power needed to run the business. For larger organisations, a network closet – often operated in conjunction with others – provides a connection to a centralised computing hub in the form of a server room or data centre. In effect, larger organisations rely on network closets to provide a gateway to a centralised server room and then route information to a data centre for storage.

When building out a new network closet or assessing an existing closet, it is best to think in terms of three essential purposes: organisation, protection and management.

### Organisation

Given the potential tight confines of a network closet, proper organisation of equipment is essential for efficient operation and ongoing maintenance. Having a level of flexibility and adaptability to maximise the available space and the environment is paramount. Racks of differing heights, widths and depths help to make maximum use of these spaces and can be specified to suit single use or multi-use applications. For example, cable or switching infrastructure often benefits from being deployed in wider racks whilst equipment consuming power typically operate more effectively when sufficient provision is made to dissipate excess waste heat.

Features such as fully step-less rail adjustment will aide in optimising IT equipment placement. The standardisation of accessories such as rack mount unit (RMU) markings on the rack rails, pre-installed castors, and grounding kits all help to make the system deployment faster and more efficient. The key is flexibility and, by simply moving components or adding accessories such as cable managers, rack power distribution units (PDUs), shelves and U blanking you can maintain a clean, neat, effective and efficient installation.

It is important to use racks that are compliant with the EIA/ECA 310E standard for 19" rack mounting to ensure uniformity and ease of equipment installation. Last but not least in importance is the weight capacity of the equipment rack. It is recommended that the equipment rack supports at least a 500 kg static weight capacity to ensure a secure and stable environment for your critical network infrastructure equipment.

### Protection

Reliability, continuous uptime and efficiency are critical with network closets, which is why protecting equipment will save time and money and avoid common risks. Solutions that provide protection include an uninterruptible power supply (UPS) system to provide emergency power in the event of a utility failure, rack power distribution units and hot-swap maintenance bypass units that enable power to be switched directly to equipment to perform maintenance or replace a UPS. If redundancy is a requirement, automatic transfer switches (ATS) that automatically transfer power from a primary power source to a secondary source in the event of a power anomaly should be provided. Protection can be further enhanced by the use of intelligent rack PDUs that protect equipment within a rack by monitoring and managing power at outlet level. Integration of UPS and intelligent rack PDUs with management software allows IT professionals to view and control the environment from any computer connected to the network server. If extended runtime is a requirement, additional battery modules can be added to the UPS.

### Management

Organising a network closet and protecting the equipment delivers efficiency and reliability up to a point but, to truly optimise a network closet, organisations require effective management capability. Through the use of the right hardware and software management products, IT professionals can effectively manage the network environment. Management software can provide remote proactive management capabilities at both the UPS and PDU level and for intelligent PDUs up to the outlet level. Management hardware includes outlet-level current and power meters as well as temperature and humidity probes. These meters and probes enable environmental monitoring and notify IT staff when power or temperature fluctuations fall outside of the generally accepted tolerances.

### Effective management

Even though the purpose of a network closet varies depending on the size of an organisation, the need to efficiently and effectively manage the assets in a closet is universal. For a small organisation, all the computing capacity is contained within a closet; for larger organisations, access to the enterprise network and mission-critical applications can be compromised should any problems with the network closet occur. In both circumstances, an efficiently managed network closet is critical to ongoing operations.

One of the foundations to learning how to manage a network closet effectively is monitoring and managing the equipment on a granular level. UPS-level monitoring and management can enable network administrators to keep close tabs on power supply and consumption throughout the rack. For larger organisations with multiple network closets, remote monitoring and management capabilities provide a comprehensive view of the networking environment. Intelligently managing power with software can help administrators respond effectively and efficiently in the event of power disruptions. Intelligent rack PDUs allow IT professionals to monitor and control outlet-level current and power metering – both necessary to ensure efficient operations. Also necessary is the ability to gauge environmental conditions through remote temperature and humidity monitoring.

Remote management of environmental conditions from a central location is especially important for those organisations that have added network closets to scale up or scale out their existing environments. Integration of UPS and rack PDUs with management software allows IT professionals to view and control the environment from any computer connected to the network server. For example, a university may have network closets located in various buildings throughout the campus. It is not unusual for many of the network closets to be in converted spaces not initially designed for computing. Such environments are unfriendly from a temperature and humidity perspective; if no extra cooling is devoted to the network closet space, remote management helps avoid risk due to running too hot.

For larger organisations, it is particularly important to back up the network closet. As a gateway to the server room or data centre, a network closet outage can leave mission-critical applications such as corporate email systems inaccessible. Also important, for these as well as smaller organisations, is the ability to migrate and shut down virtual machines (VMs). In the event of a power outage, critical VMs can be kept online while those that run non-essential applications can be automatically shut down. This process, known as load shedding, is a critical component of effective VM migration. By turning off less critical VMs through load-shedding capability, administrators can preserve and extend battery power for their more critical applications. To perform load shedding effectively, it is recommended to install a UPS management software that integrates into the virtualised platform, to effectively provide these capabilities in a way that doesn't jeopardise mission-critical IT operations.

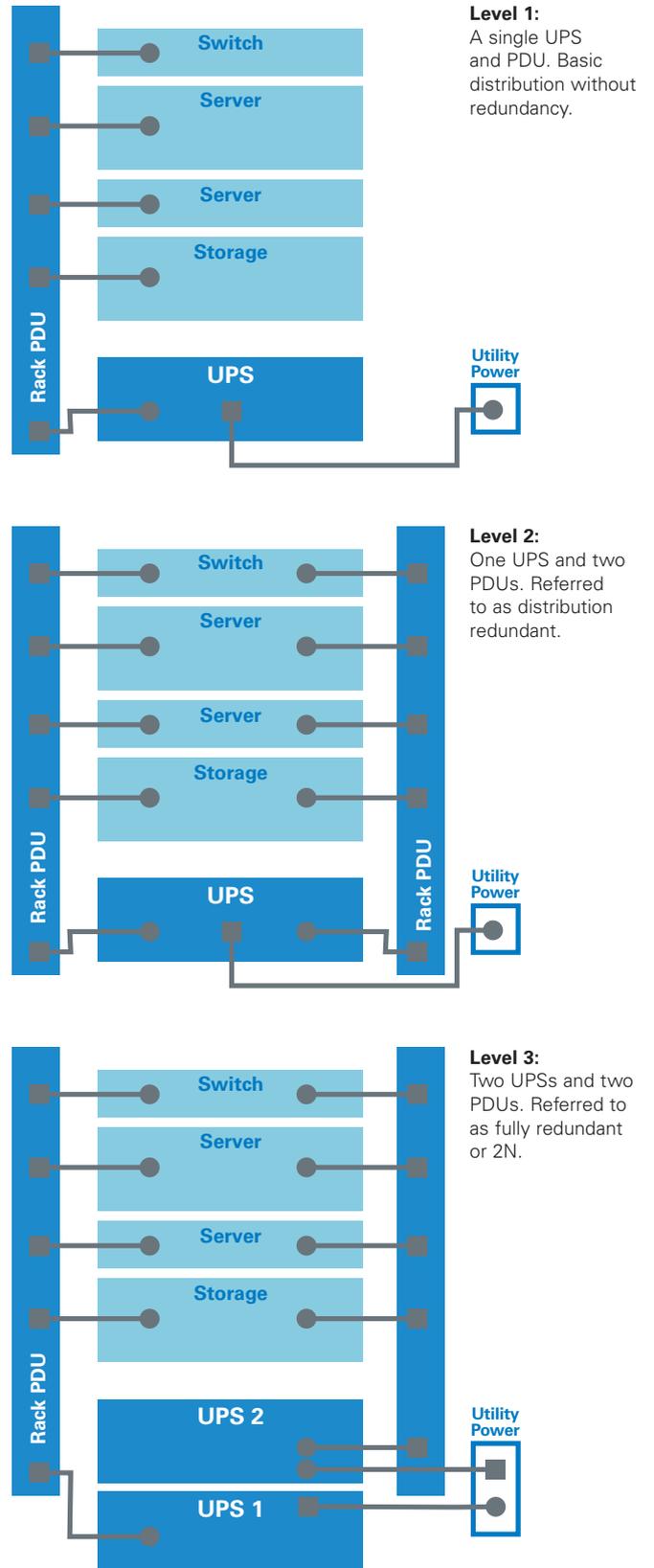
### Rack hygiene: Maximising uptime and increasing reliability

While monitoring and managing the infrastructure is critical to effective network management, these activities alone are not enough to optimise network closet operations. Network administrators must also consider rack hygiene – the practice of organising cables and efficiently managing power so a racked environment is properly controlled and maintained. The right cable management solution saves time and money by increasing airflow and ease of accessibility to closet hardware for additions or changes. It also avoids risk by protecting against hardware failures due to accidental/inadvertent power cable removal. Cable management – through colour-coding and the use of vertical and horizontal cable organisers, cable spools and outlet plug retention – enables network administrators to maintain proper cable connections and streamline problem resolution. Efficient cable management through the use of vertical and side cable management channels can increase airflow in the network closet; it can also ease any moves, adds and changes made to the rack, thereby reducing the chance for disruptions due to issues with the environmental temperature or accidental dislodging of a cable. A rack PDU with IEC plug retention prevents the accidental dislodgment of a plug and can greatly enhance reliability. Essential to cable management best practice is the ability to organise cables – for example, blue data cables with blue data cables– to improve troubleshooting, eliminate clutter and reduce the potential for interference between different kinds of cables. Using dividers, it is possible to store power and networking cables within a single organiser and still maintain cable performance.



**Figure 1.** Rack PDUs with IEC outlet grips can reduce the risk of plugs getting bumped loose and leading to server shutdown.

In addition to cable management, power is also another component of rack hygiene, which is where UPSs and PDUs come in. To ensure maximum uptime and improve reliability, network closets should ideally contain redundant UPSs and PDUs to protect both primary and redundant equipment power supplies. However, not all network closets require fully redundant protection; by mixing and matching UPSs with PDUs, administrators can devise the right level of protection to suit their network closet needs. Typically, there are three levels of protection:



Another option is to use ATSs and a maintenance bypass switch. For protecting single-corded equipment, an ATS is particularly useful as it maintains redundant power distribution to equipment in a rack with one or two power supplies. An ATS transfers power from a primary source to a secondary source when problems occur, and subsequently transfers it back once the primary source is restored. In addition, a maintenance bypass switch can be highly effective as well. The maintenance bypass switch enhances power availability to the rack by routing utility power around the UPS and into the PDU. If a UPS needs maintenance or replacement, the maintenance bypass switch allows power to be switched directly to the network closet equipment, eliminating the need to shut down the equipment during any repair or maintenance procedures.

For additional backup runtime, organisations with stringent service level agreements should opt for an extended battery module to ensure more runtime during a power outage or to ensure sufficient time to migrate data in a virtualised environment. Ideally, an extended battery module designed to pair specifically with a UPS can ensure an installation that is trouble-free, while delivering a reliable backup solution.

In summary, when choosing a rack, power management and distribution solution for a network closet, keep in mind the various aspects related to return on investment (ROI). By selecting UPS and ePDU options that do not create value by saving time, money and risk avoidance, achieving efficiency and effectiveness can be compromised over time. To make the most appropriate choice, consider the following factors that affect the overall ROI:

- **Rack organisation:** Keep equipment secure and in its place to optimise the time and money spent on maintenance as well as any future planning.
- **Power rating:** Pay attention to wattage measurements, as these reveal real power.
- **Network card:** Determine whether the UPS price includes a network card.
- **Outputs:** Be sure the UPS and PDU have enough outputs to accommodate the power cords of servers and other network closet equipment.
- **Input plug:** Some UPSs and PDUs have input plugs that fit into a standard wall socket. If not, an electrician may be needed to install a new wall outlet.
- **Batteries:** Consider the cost of additional battery packs, as well as the cost and frequency of servicing UPS batteries.
- **Software:** Make sure UPS and PDU software can integrate with existing virtualisation management software.
- **User interface:** An intuitive LCD can streamline troubleshooting and save maintenance costs.

- **Mounting hardware:** For mounting a UPS in a two-post rack, look for mounting hardware that is included. Also be sure to pay attention to mounting bracket requirements for PDU installation.
- **Maintenance bypass:** Purchasing this switch can save money and avoid risk by allowing IT equipment to stay up and running in the event of a UPS failure.
- **Voltage:** From an energy utilisation point of view, a 208-volt UPS costs less than a standard 120-volt UPS, so make sure the proper voltage required is considered upfront.
- **Warranty:** Factor in the duration of the warranty and whether it covers batteries.

## Conclusion

No matter how big or small an organisation, the network closet is an important element that keeps the business running. With reliability and redundancy paramount, organisations can equip their network closets with the right hardware and software to maximise uptime, improve efficiency and reduce operating costs – goals that, when achieved, deliver the highest ROI. By selecting a rack and equipment with organisation, protection and management in mind, a network closet can deliver the reliability and performance demanded by today's computing environments.

## About Eaton

Eaton's electrical business is a global leader with expertise in power distribution and circuit protection; backup power protection; control and automation; lighting and security; structural solutions and wiring devices; solutions for harsh and hazardous environments; and engineering services. Eaton is positioned through its global solutions to answer today's most critical electrical power management challenges.

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## About the author

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