

Organizing and Managing Equipment Rooms

How you organize and maintain your equipment room can be just as important as maintaining the operating systems on the boxes themselves. Although many companies are content with a “rack and stack” approach, having a proper equipment room management strategy (ERMS) for maintaining where your servers are located and the cables that connect them are properly labeled and bundled can have positive, far-reaching benefits including higher up-time, increased performance, and improved network efficiency, faster fault diagnostics and recovery

What’s Your Rack Strategy?

Free-standing? Wall-mounted? Wall-anchored? There are a number of different types of racks that you can use depending upon the physical considerations of your server room but figuring out what’s best for your specific equipment room needs is the first step in your ERMS.

Regardless of the type of rack you chose, securing it (whether to wall or floor) is a critical component of the installation process to prevent rack movement (i.e., anything from someone bumping into the rack to an earthquake) which could disrupt or damage the servers inside. Keep in mind the following points when considering rack size, location, and mounting options:

- Load—you should always load your rack from the bottom up. A top heavy-rack could tip or cause stress on the mounting.
- Server screws—use the front-plate server screws (in a 1U or 2U box) to secure the server in place within the rack, preventing accidental sliding on the rails in case the cabinet tips.

The table below provides a description of the different types of racks and their anchoring strategies.

Rack size	Description	How to Secure
Free-standing Racks	Free-standing racks in complete enclosures (otherwise known as cabinet racks) have a front and back door and are fully contained, greatly reducing noise, clutter, and air-borne	These racks can be secured by bolting them onto the concrete floor using a Rotary hammer (to drill the hole) and something like a Powers

	particulates coming into contact with the servers as well as providing access security through locks on both the front and back doors. These containers, in 42u size, are perfect for larger areas and provide easy access to servers through slide-out rail systems from both the front and back door.	Power Bolt for each bolt hole on the rack's base.
Wall-anchored racks	These racks, such as an open 7' rack, are perfect for smaller areas such as a server equipment closet where there may not be room to open a front or back door. Their open design, although nosier, provides for easy server access with or without rails.	These racks can be secured by bolting them onto the concrete floor using a Rotary hammer (to drill the hole) and something like a Powers Power Bolt for each bolt hole on the rack's base. In addition, some models provide a straight metal arm that connects the top of the rack to the wall by lag-bolting to a stud.
Wall-mounted cabinets	Finally, wall-mounted enclosures are ideal for areas where a free-standing rack wouldn't be accessible due to space constraints but the servers need to be contained within fully enclosed units for security purposes (i.e., a lockable front door)	These racks are secured to the wall by lag-bolting to studs. The width of the enclosure is a standard 24" spacing to match industry stud spacing in most commercial buildings.

Which rack is right for me? The right rack is dependent upon what you are going to use it for—data storage, processing, backup. But once you've identified what kinds of racks will accomplish each task, build out the perfect rack or cabinet. Make sure you have enough power outlets (either directly integrated into the rack or in rack-mountable power units), and create a standard layout for patch panels and cable management brackets. The goal is to make sure you can accommodate the power, network, and cooling needs so you can put the most computing power into your enclosure. If you have questions about how to select or setup your racks to meet your needs, contact a professional.

Raising the Floor

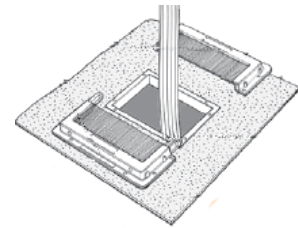
One additional consideration for the physical setup of your server room is whether or not to raise the floor. There are many advantages to providing a raised:

- Better distributes cold air delivered into the room

- Provides a hidden place for tracks, conduits, cables (power and data) and/or supports for data cabling
- Provides conduits for power cabling
- Provides a copper ground grid for grounding of equipment



Raised floors are traditionally 12-15" off the physical floor. They are constructed of interlocking metal chassis and struts with removable tiles and grommets. The grommets (pictured to the right) provide

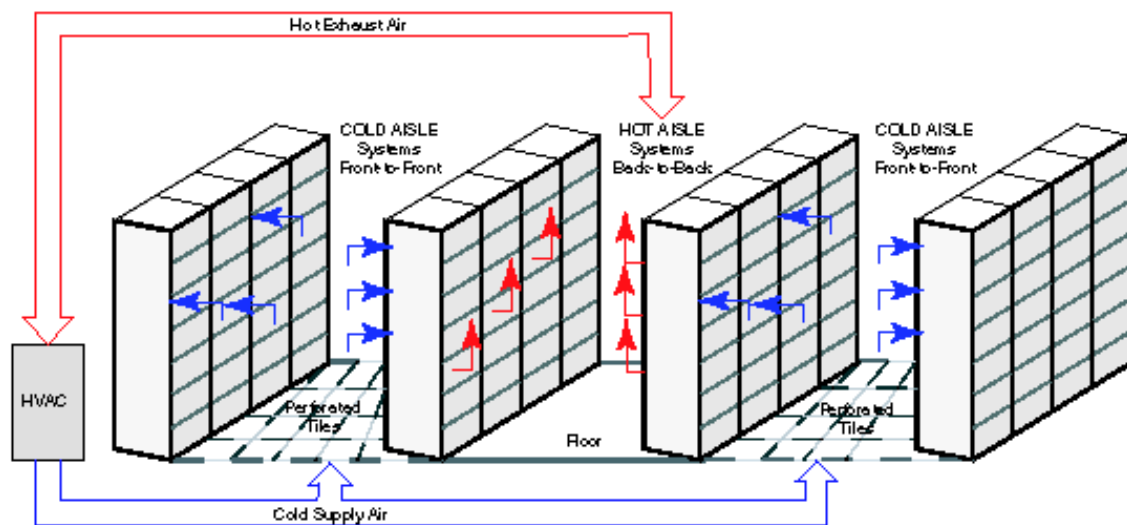


easy, in-floor access for cabling.

Note: Cables are generally routed into the under floor space through holes cut into the tiles under the cabinets/racks

Placing Your Equipment

The second step in an ERMS is to arrange your racks and enclosures to optimize accessibility and air flow

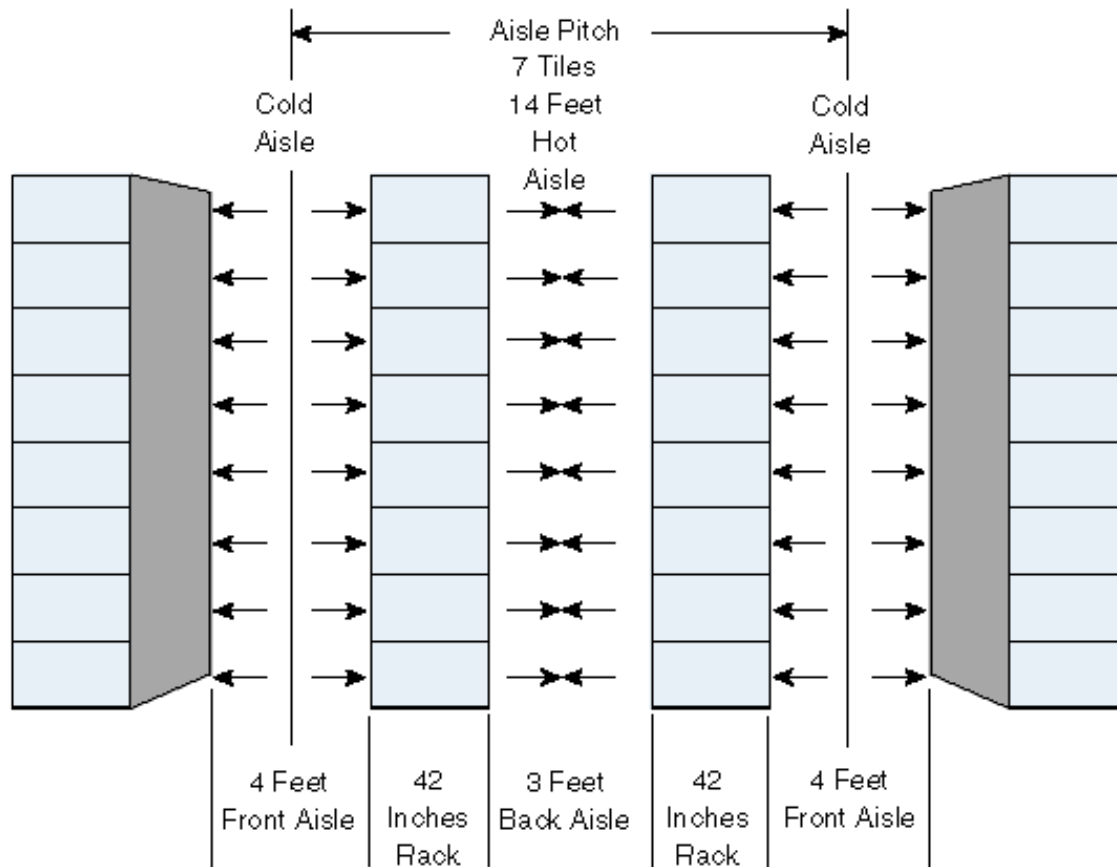


Whether it's a single rack or multiple enclosures, having proper clearance around the structures will afford you the ability to quickly service boxes whether routinely or in an emergency.

In addition, properly placed air ducts in a raised floor (pinpointed to high-heat areas, for example) can significantly improve server performance by maintaining optimum temperatures.

Why do servers need to be cooled? As computer chips heat up, they become less responsive. It is estimated that with every degree of temperature climb for a CPU above 72F, you lose up to 3% of processing efficiency (where that is measured in the

number of cycles the CPU can perform per second). In losing CPU cycles, it will take longer for the server to carry out normal operations, spinning its drives more, accessing memory more and, ultimately, consuming more power. Click here for an excellent article to calculate the cool requirements of your server room based on size, equipment, and other factors [URL: <http://www.openxtra.co.uk/articles/calculating-heat-load.php>]



For server locations with multiple enclosures, providing adequate space around each of the units also ensures proper ventilation and air circulation. By providing adequate circulation, you keep the overall room temperature down which improves server efficiency and also makes your air conditioner work less to keep that temperature (which saves money as well).

Finally, properly bundling and routing cabling can also reduce heat and provide for more accessible equipment.

Cable management

We've all seen it—a mass of wires so thick that finding out where they go is only half as bad as trying to move them to get to the electronics to which they are connected. And not to mention that the curtain of wires actually prevents air from circulating through the rack, retaining heat within the enclosure, and degrading server efficiency.

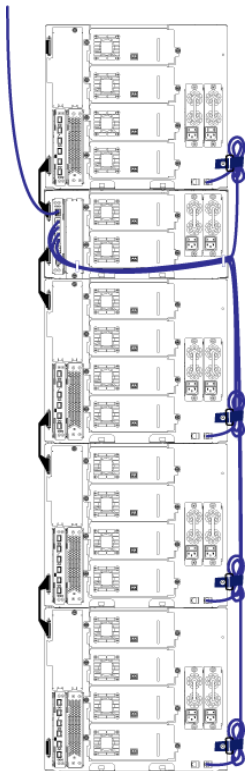
This nightmare is a result of poor cable management, and the third component of a proper ERMS.

Most racks have at least the following components:

- Switch,
- Router,
- KVM (if there is no remote consoling),
- Backup Power
- Backup Medium (i.e., tape),
- Servers,
- Patch Panels, and
- Wire Management.

With a standard 16 port switch and 16 servers, there is the possibility of over 50 cables streaming out of the back of the rack. And although server rooms were never known for their aesthetics, this situation presents a number of potential risks for any IS manager including:

- Equipment access,
- Heat dissipation, and
- Traceability.



Equipment Access

Properly bundling cables together behind equipment makes it easier to access servers either from the back or via rails. There are a variety of solutions to bundle and manage cables such as cable-management tracks, cable binders (such as A'n D Cable's CableCatch or CableWraps), Zip-Ties, and retro-fit rack equipment like the A'n D Cable Rack Organizer.

https://www.andcable.com/cableshop/cable_rackorganizer.php

Whatever the solution, the goal should be the same—to bundle and contain power cables, Ethernet cables, and video cables.

Cable Bundling best practices. When bundling your cables, it is common practice to bundle by server and then bundle the bundles together. This allows equipment managers to quickly and easily access individual servers, even removing them from the rack without disturbing other equipment.

Heat Dissipation

Allowing a “hanging curtain” of cables off the back of your racks means more than just a messy equipment room. It also adds to heat retention within the enclosure by stopping air flow

horizontally through the rack. In the illustration, we can see cables that are bundled and contained on the right-hand side of the rack. All of the equipment is clearly exposed and air can pass freely through the servers.

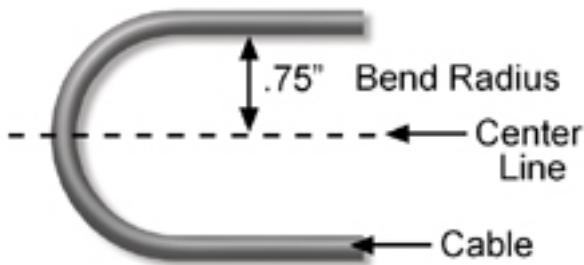
Traceability

When your network encounters problems (latency, congestion, etc), the first step you should take is in assessing the physical layer—your cabling and rack. By properly managing and labeling your cabling, it will be much easier to trace cable routes from end-point to end-point and ascertain if the physical cables are causing the problems.

Best Practices

Below are some best practices you should observe when setting up your racks and server room to ensure a clean and workable environment.

Best Practice	Description	Recommendation
Space	Include ample space for cable management products in your rack Limit patch panels to 48 ports and install a 2U high cable-management panel between each patch panel	Zero-U RackOrganizer®
Routing	Route all cables to the side of the rack before moving up or down to a switch. This prevents cables from over-lapping other ports.	Cable Saddle, Grommetted CinchStrap for cable routing
Length	Use the correct cable length (even if that means cutting and re-crimping). A one-size fits all strategy does not work when running patch cables.	Buy a large stock of cables in multiple lengths, breaking them down by 1ft increments (3ft, 4ft, 5ft, etc). After you've setup a few racks, you'll know what you should have in inventory.



Bend Radius. What's the bend radius on your cabling? It's critical that you know this in order to ensure proper operation of the cable (i.e., optimal data flow-through). The bend radius is the distance between the center line of the bend to the inner edge of the parallel cable.

Cable Labeling

The final piece of a solid ERMS is cable labeling. Although bundling cables together means you can quickly identify groups of cables connected to a single server, labeling the cables provides another level of mapping, allowing you to identify switch ports and outlets without having to trace the cable route.

Cable labeling options run from the high tech, such as the K-Sun® 2012 XLST-PC or 1640Ki labeling machines, self laminating laser printable wrap-around labels to the easy to use, reusable Unitag® Cable ID snap-on system. When labeling your cables, it's standard practice to include the following information: Endpoints (to and from what is the cable connected) and a cable ID (a unique ID identifying the cable). Labels should be placed on the cable close to actual ports, making them plainly visible and reducing the amount of "trace" time if the label were placed in a bundle.

Industry Standards

The most widely used standard for cable labeling is the ANSI/TIA/EIA 606a standard, put out by the American National Standards Institute (ANSI), the Telecommunications Industry Association (TIA) and the Electronic Industries Alliance (EIA).

Best Practices

Below are some best practices you should observe when labeling your cables.

Best Practice	Description
Information	Clearly indicate on the labels key information for traceability when assessing physical-layer network issues or moving hardware. Some examples are below V-2151-A2 = Voice, 2nd Floor, Room 151, Work Area A, Port 2 D-3011-B4 = Data, Third Floor, Room 011, Work Area B, Port 4 F-2151-A3 = Fax, Second Floor, Room 151, Work Area A, Port 3
Color Coding	Use color codes to identify groups of cables or ports on a panel. Users will be able to easily identify cables and their associated function. Sort the cables into groups such as LAN, Video, Voice, and HVAC for ease of management.
Unique IDs	You can utilize unique IDs for your cables in addition to labeling them directly with information. These IDs can then be put into a database where detailed information can be provided, including performance measures taken during network testing.

Looking into the Future

Whether you manually label cables or ID them (with a database), whatever cable management system you use is a manual process. If someone on the IT staff switches a cable around, it needs to be updated in the database.

These tags communicate with software to tell a user where these cables are and what they are connected to. If an IT administrator switches a cable around, the software adjusts its location and connections automatically.

Documenting Your Strategy

Finally, regardless of the strategy you use—color coding cables, rack placement, rack setup—once you've implemented the elements of your ERMS, you need to document it. Using standard room layout programs (such as Microsoft Visio), you can capture rack placement (including proper clearance around racks) and even equipment assignment (i.e., what equipment is in each rack). Finally, you can map that equipment assignment, using Microsoft Excel, for example, to specific cable labels.

Software Solutions

There are a number of software solutions (such as Microsoft Visio and www.racktables.org) that you can use to document your server room setup. From asset management to rack setup and cable location, these programs can help you maintain order and management in your server rooms.

So What Does This All Mean to Me?

As someone who manages an equipment room or a server farm, having an ERMS means you are committed to running an efficient and effective operation. By optimizing equipment placement, bundling and labeling cables, and documenting your activity, you will be able to more easily address critical equipment issues, more quickly upgrade equipment, and even enjoy cost savings associated with more optimized air flow and better-performing equipment.