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The rack pack

You'd probably think that a 19 inch rack is a fairly standard item. These days that couldn't be further from the truth. Most data centres have their idiosyncrasies – and so does most 19 inch active equipment. **Mark Hirst of Cannon Technologies** explains how to cope.

In the data centre industry, everyone seems to be doing their bit to take the heat off the embattled managers, who need to save on their power bills.

Playing a part

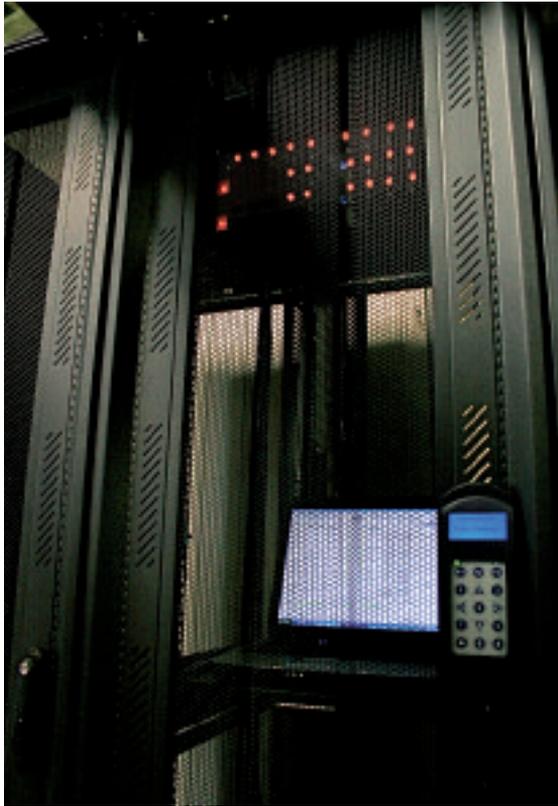
Server manufacturers for example, are creating new models that don't need to be chilled quite so religiously. Other vendors are working out ways

to stop fans running needlessly. Fans account for 15 per cent of a server's power usage, so by reconfiguring the algorithms that control them massive power savings can be made without any loss in processing power.

In Facebook's data centres they have discovered that heat and humidity rarely coincide in its environments, which means they can save power by using cheaper water vapour cooling techniques.

Switches. A load of hot air?

One handbrake on progress, oddly enough, has been the lack of help from networking vendors. Yes, they are wonderful at communicating on almost every level of the seven layer ISO model, from applications through protocols to the data link layer. But at the physical level, something goes amiss on one tiny area. Airflow is a case in point.



In-rack power density has gone up by 63 per cent as a global average.

It seems odd that network equipment, for all its multiple features, has to be improved upon by its 19 inch rack. But sadly that is the case. This is only possible because a good 19 inch rack is now far more sophisticated than most people could imagine.

Take the problem of airflow and heat exchange. No two vendors ever seem to agree on the best way to make the air flow over a piece of networking equipment. In fact, no two systems seem to be alike, even when the models are made by the same company. So even if you standardise with all your networking kit from a single manufacturer, you might find they all have different air outlets and different mountings. Making them



all fit into one standard rack could be a big pain in the assets. But, as we shall see, the insertion of clashing kit may be a mounting problem, but it's not an insurmountable one.

So let me tell you what a rack manufacturer should do to work around the limitations of the equipment – to make your data centre efficient and effective. Airflow isn't the only consideration; there are also some rather fussy vendor specifications to worry about. For example, there is one vendor which specifies 1,000mm width cabinets to house certain models of its switches. But this is not always necessary because I have known people who manage to house such kit in a 600mm cabinet, and we can certainly manage it properly with an 800mm wide rack.

To accommodate all of the quirky not-quite-so-standard 19 inch equipment, your rack manufacturer needs to have all kinds of instruments and tools that can be applied. To cater for all kinds of air inlets and outlets, to police the cold aisle and the hot aisle and to keep their separate contents truly away from each other.

To achieve that you ideally need to have all your boxes facing the same direction, with the fascia at the front and the cables coming out the back and still have a consistent flow of air. Of course in reality they don't – so your rack manufacturer needs to have rack components that divert airflow and cables so that both end up in the right place.

The major switch vendors all have seriously powerful switching platforms that would delight a network manager with their multiple fabric switches. But while the warp speed data flows they deliver on the backplane are astonishing, the lack of cohesion on airflow that they offer undermines some of their progress.

Many of these switches are magnificent pieces of engineering from a data comms perspective. But without rack air management the hot air they would channel back into the cold aisle of a data centre increases the workload of the cooling systems.

The money that these network vendors save for companies – by improving the flow of data and making them more productive – is counter balanced by the money that's lost by inefficient heat management and users often have to spend more on electricity, to maintain the cold aisle temperature.

So, your rack manufacturer needs to be able to do 'magic'. They need to make air go in from the front and come out at the back even if that reverses the

current situation. This requires specialist air diverters that will channel all the hot air from the various equipment into one harmonious airflow.

It's draughty in here

Governments spend a lot of money trying to persuade home owners to insulate their houses. Part of the solution is to stop expensive heat leaking out and cold draughts coming in. That is another simple, but highly effective, regime that we can apply in the data centre. Properly implemented it can bring instant savings on a significant scale.

There are a few hurdles to overcome first. The key to maintaining good discipline is keeping everything tidy – which isn't always easy when there are so many complex connections and the potential for a rapid turnover of moves and changes.

In an ideal world, all cables will be dressed to one side, all space neatly allocated and the full capacity of the rack will be efficiently allocated. The 'Bobby Charlton' as it's often known.

But this does not always happen because busy cabling engineers do not always find the time to maintain that discipline. Sometimes it's more important to get the connections in place and get the job done.

Patching up

Air control can be one of the first casualties of moves and changes, because a new cable will effectively punch a hole in any carefully created barrier. The leakage of hot air through this hole, as explained earlier, can be very expensive. But plugging that gap needs to be far easier for the busy cabling engineer. We've created a simple solution that grants a cabling engineer freedom of movement and access for the cable, while blocking off the flow of air. It uses a brush system similar to those in letter boxes and (though not often enough) in under rack floor cutouts. This simple but highly effective device will save engineers valuable time and save the operations manager's power bill too.

To make the job even easier we devised a way to manage these brush strips too. Our solution is a brush strip on a hinge. This means engineers can pull the strip out when you need access, insert new cables and patch them in to the relevant connections, then rotate the whole thing back into place again once they have finished and hey presto, perfect airflow control is restored.

This sort of 'usability based approach' is particularly useful for data centres

which have to make a lot of moves and changes but want to maintain their high standards of organisational discipline and power saving practices.

BBC and QVC engineers, for example, often have to patch in audio visual feeds for broadcasting projects, then a short time later reconfigure them for the next event. In the circumstances they could be forgiven for forgetting to keep their closets tidy. But tools like ours that the top tier rack manufacturers provide, within the framework of a high quality but versatile 19 inch rack, enable data centres to keep their shape and their discipline month after month and year after year.

Some in the industry argue that patching frames are an alternative to enclosed racks. That might be fine outside the heat controlled data hall – but inside the data hall, maybe they are, but only if you don't value security. Or airflow. Or long term cable management.

management systems to control them and interface to NOC systems.

Cooling capability

In-rack power density has gone up by 63 per cent as a global average (source DCD Intelligence 2012 Census) and standard racks simply don't have the wherewithal to have suited in-row coolers let alone in-rack solutions.

A rack is a long term piece of infrastructure, very difficult to change out. Make sure it's going to be capable of adapting over its 10 or so year life.

Stay in control

Measure everything! There's a universal truth that 'if you can't measure it, you can't manage it' and nowhere is this more true than within the data centre rack. From dynamic equipment power consumption to multiple in-rack temperature and humidity sensors – to instantly identify hot spots and equipment

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Security

There's sadly not room in this article to tell you all about security – but when planning your new data centre or upgrade please think security. The value of data and service in your data centre is immense and human error is the main cause of downtime. It's now imperative to keep racks secure – so make sure your racks can accommodate a choice of key code, RFID, fingerprint and iris scanning access control. You may not need them now, but you sure need an upgrade path.

And they will probably need to be linked to NOC control so they can centrally allow or deny access; give timed access slots; or require that a supervisor also authenticates to watch over a vendor engineer.

Also ask yourself whether you might need the facility for automated photo or video on door open. Accountability and traceability are becoming far more onerous and 'standard' racks don't have these capabilities nor the inbuilt

problems before they cause outages or start fires. And to allow close control of cooling equipment so it only consumes the minimum power possible.

To consolidate all of this measurement information, make sure your rack vendor has a rack management system or DCIM to consolidate it and communicate with the NOC.

The best way to stay efficient is to plan for every eventuality and keep everything in its place. The key to this is to be well ordered, and to have a plan for where everything goes and why. Never assume anything is OK – whether it's a misplaced cable that seems to be harmless, or a rogue but invisible draft of hot air. Everything has a consequence and consequences need to be planned for.

The best way to plan is to keep everything well ordered and visible. There's an old military saying 'assumption is the mother of all foul ups'. We've learned over 30 years of designing racks to leave nothing to chance and make no assumptions.



A good 19 inch rack is now far more sophisticated than most people imagine.

With a top tier 19 inch rack, you get complete visibility, a range of tools and components to manage everything from cables to airflows whatever your mix of legacy and new equipment vendors and a well ordered system of measurability.

The once humble rack has come a long way. But beware – not all racks are created equal! 

Mark Hirst, now head of T4 Data Centre Solutions with Cannon Technologies, began his career after studying electronic control systems with an apprenticeship in industrial machinery. From then he has worked all over the world in fields as diverse as nuclear power plants and flood control – becoming expert in industrial networks, measurement and monitoring and IT.

In addition, now heading up Cannon's T4 data centre solutions portfolio, Hirst brings many additional skills including access systems, power management and control, thermo-electrics, and both water and direct exchange (DX) cooling systems to the design and build of data centres and IT infrastructure projects.

