Converged Networks Explained

If you Google the phrase “Converged Network” you’ll discover that it has many different meanings, but for our purposes here we’ll discuss how network convergence has affected building networks, and some of the potential gains and pitfalls of the higher levels of convergence.

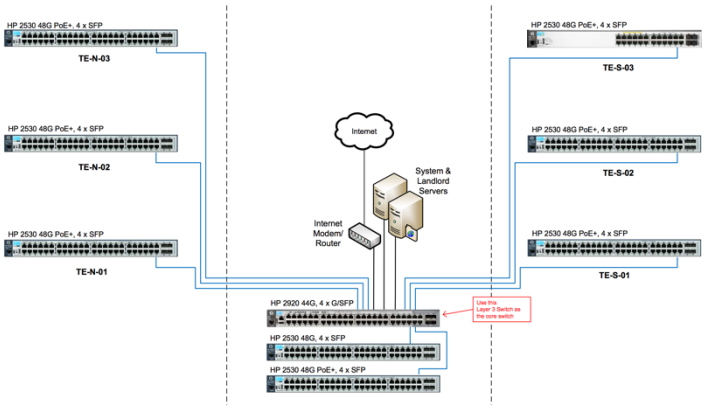
Level 1 – Physical Level

The first level of network convergence is structured cabling, one that has been with us for some decades. This is where multiple services and subsystems share the same generic cabling infrastructure. Each subsystem may use its own dedicated physical cables, achieved by using patch leads to flexibly connect links as required. To achieve this, the cabling system must be planned to provide sufficient links and outlets to serve all the likely services, both for the current and future requirements.

To allow this to happen, structured cabling uses standardised cables and connectors. The most common copper standards are Cat5e, Cat6 and Cat6a, all with RJ45 connectors. The most common fibre standards are OM3, OM4 and OS2, typically with LC connectors. Although these cable standards are designed specifically to support TCP/IP networking, they may also be used to support a range of other communication scheme such as telephone, RS232 and HDMI.

Level 2 – Network Equipment

The next level of convergence is where the same network equipment is used to support multiple subsystems. This is instead of each subsystem having its own communication or network hardware. As subsystems increasingly use TCP/IP as their method of internal communication, this level of convergence has become increasingly attractive, both for cost and maintainability reasons.



However, multiple subsystems on the same network can interfere with each other. For example, if not properly managed, it is very easy to suffer IP address clashes. So, for example, a perfectly functioning subsystem could be ‘brought down’ by a rogue node being connected to the same network. Methods to protect against this have become possible with a networking standard, 802.1Q first introduced about 10 years ago. The main feature is that it enables different networks or Virtual LANs (VLANS) to be carried along the same wires, between the same network switches, securely without interfering with one another. A further benefit is the ability to assign a priority to a data packet based on its VLAN; so although the quality of voice data (from VOIP telephones) would deteriorate if slowed, this can be avoided by assigning that VLAN a higher priority.

In this way, CCTV cameras and NVR can be on their own network, but still use all the same networking hardware as the other building services. This represents not only an opportunity for direct cost savings by sharing network equipment, but also greater flexibility of future expansion of

the network – a network device can be reprogrammed to add a new service, or to adjust the allocation of the share of device between different services.

The only negatives to this kind of convergence is the set up takes longer (requiring a little more skill), and good record keeping is important to avoid getting things very muddled as each switch and router on the network is, in effect, operating as several independent devices within a single physical device. Having said this, it's a small price to pay for the considerable benefits to be gained.

Level 3 – IT Convergence

With each of the buildings services running on the same network an obvious next step would be share any IT services. For example, a centralised authentication service could be used to check usernames and passwords. Or a file server to provide a centralised file system or database. If every service were to implement its own version of these services there'd be duplication and associated costs.

However, in some cases IT convergence is not required as sharing IT resources in this way is not required. The various building services are not themselves configured to use them – so providing them is potentially a waste of money. Even if they can be used, they can increase the complexity of the implementation phase by introducing interdependencies between the different service providers and the IT contractor. This is not to say that it's a bad idea; only that the advantages may not outweigh the costs at least in a relatively simple project.

The one service that almost always makes sense to share is access to the Internet. It is easily possible to configure one gateway to the Internet, which all subsystems can share for Internet access and provide secure and segregated remote support/diagnostics. This clearly save costs (only one Internet connection required) and reduces management costs (as subsystem are added or taken away, no Internet connections need to change).

Level 4 – Application Convergence

So far, we've seen how convergence delivers cost savings, and enable a more flexible network design or both. At the next level, application convergence offers the promise of providing new features by allowing different systems to interoperate - perhaps improving safety and security, reducing energy use or simply making life more convenient for inhabitants and workers.

For this to happen will require a re-think of the way in which services are operated within our buildings. New standards will be needed to bring down costs – or else a small number of suppliers will control the market and stifle competition and innovation.

Much of the necessary technological advances are already with us today, the "Internet of Things", Smart Meters, Artificial Intelligence and personal computing devices. However, examples of applications working together are still limited. Certainly, we see CCTV systems being activated when a visitor is detected at perimeter door – perhaps allowing a concierge to quickly identify the visitor and

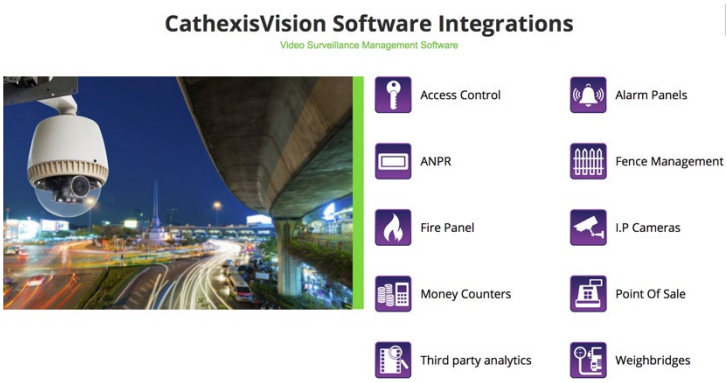


Figure 1 Cathexis CCTV - Integrates with Access Control & Other subsystems

permit entry. But we don't yet see systems perform facial recognition to determine whether to automatically open the door and summon an elevator to the appropriate level.

Such innovations will start to dissolve the traditional boundaries between different building systems. Perhaps in the future we'll reach the stage where we no longer think of convergence at all–the original services have become so intertwined that the building itself becomes a single 'thinking' system which predicts our needs and adapts our environment accordingly. Whenever this happens the underlying network technology that underpins the network will still play a vital role – albeit on that is hidden from view.

However, by implementing Convergence at Levels 1 to 3, the system will be ready for adoption of Level 4 convergence as and when such features become available.