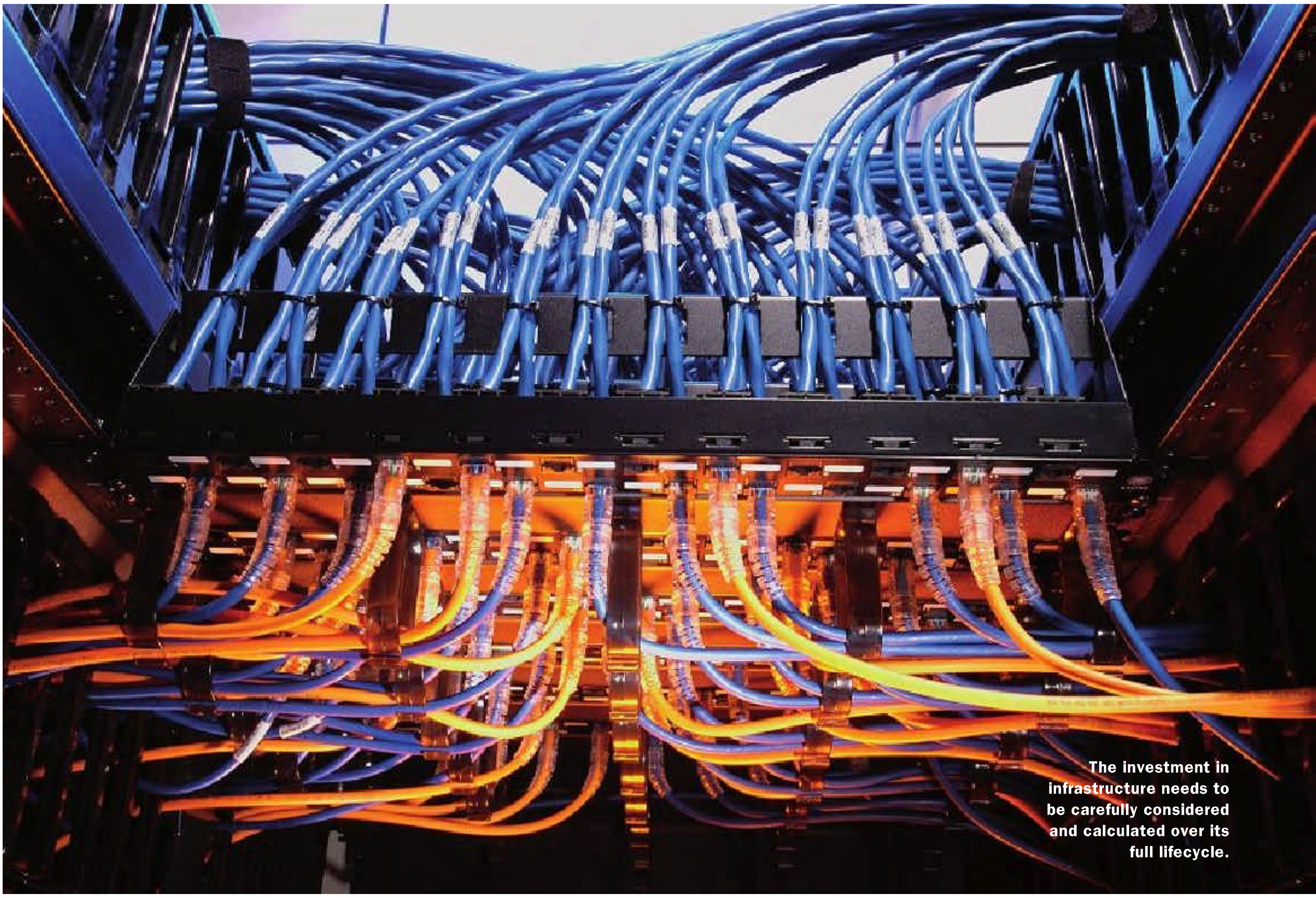


The investment in infrastructure needs to be carefully considered and calculated over its full lifecycle.

Get connected

Jan Piet Wielenga of **ADC Krone** explains why quality of connectivity is so vital for VoIP applications.

As discrete voice networks continue to make way for an integrated digital IP approach to telephony, network managers cannot afford to lose sight over quality and reliability.

An integrated digital system makes day to day operations simpler for obvious reasons – reduced training requirements, improved ease of access to data and simpler maintenance being immediate benefits. However, digital data remains susceptible to data quality and corruption if not handled correctly.

The quality of connectivity is extremely important for the performance of Voice over IP (VoIP) applications. The main reason for this is the fact that VoIP is a real time application and relies upon the ability of voice data to travel through a network unimpeded – without restriction or alteration.

In stark contrast with packet data networks, traditional switched voice networks rely upon dedicated network resources that are idle for most of the time, making them relatively inflexible and cost intensive.

However, as packet data or IP networks are a 'shared resource' – there is no dedicated, physical end to end connection between sending and receiving devices – all information sent and received by these devices is split up into 'packets'. These packets, together with all the other packets are transferred over the network. At the receiving end, relevant packets are picked out and reassembled to recreate the data.

Although a very cost effective and flexible method of communication, packet networks were never intended to be used for real time applications such as voice. First of all, different packets may take different routes to their destination, thus packets may arrive in random order, causing timing issues. Secondly, packets may be subject to interference on the way. The resulting damaged ones or zeros are known as bit errors which lead to the packet having to be re-sent again, impacting on the overall quality of the data.

Non real time applications using packet data networks don't care when and in which order packets arrive, as the application will just wait until all packets have arrived before reassembling them. When packets are damaged, a simple re-transmission of the packets will be requested.

The cost effectiveness and flexibility of IP networks makes the technology very attractive for voice but, by the nature of how information is sent across the network, certain challenges must be overcome. VoIP relies upon data to arrive on time. When voice information has too much delay, vo_ce q_al_ty wil_l be impa_red (voice quality will be impaired). Damaged packets will have the same effect on quality, as there is no time to retransmit information when dealing with real time applications.

Many vendors of active equipment, which includes routers, switches and hubs, now provide equipment that has voice at its core. These types of equipment are capable of prioritising voice traffic over less time critical data. In addition, these components also dramatically reduce packet damage, thus ensuring a level of voice quality that is on a par with traditional voice networks.

There can, however, be too much focus on active equipment. Although important, the physical connection between network components and the VoIP phone is equally significant. Inferior cable quality, poor cable management and low quality connectors, wall outlets, patch panels or even patch cables can all have a detrimental effect on the integrity of a network.

Any cabling solution is susceptible to interference and losses in connectors and outlets. This susceptibility varies significantly from solution to solution. One of the main problems is that poor quality components often cannot be visually distinguished from high quality ones. In addition, the fact that networks or components are certified to a certain standard is not always a reliable guarantee of quality. A connection may pass during installation – but a change in operating conditions, such as outside interference from power or radio frequency sources, as well as general ageing over time may cause the connection to fall outside the minimum specifications. In some cases, the impact may be so severe that a connection may completely fail, with research showing that the average network crashes 70 times a year, 59 per cent attributed to issues with the physical layer (Strategic Solutions ~2008).

Connections that are on the brink of pass and fail can cause data packets to be damaged, resulting in those packets having to be re-transmitted. In many cases such issues are masked, as non real time applications such as file transfer, email and web browsing are fairly resilient and cope well with transmission bit errors.

In comparison, bit error resilience for VoIP applications is limited due to the timing of when packets need to arrive. If they are too late then the result can translate to noticeable degradation of the data – 'clicks' and interrupted audio.

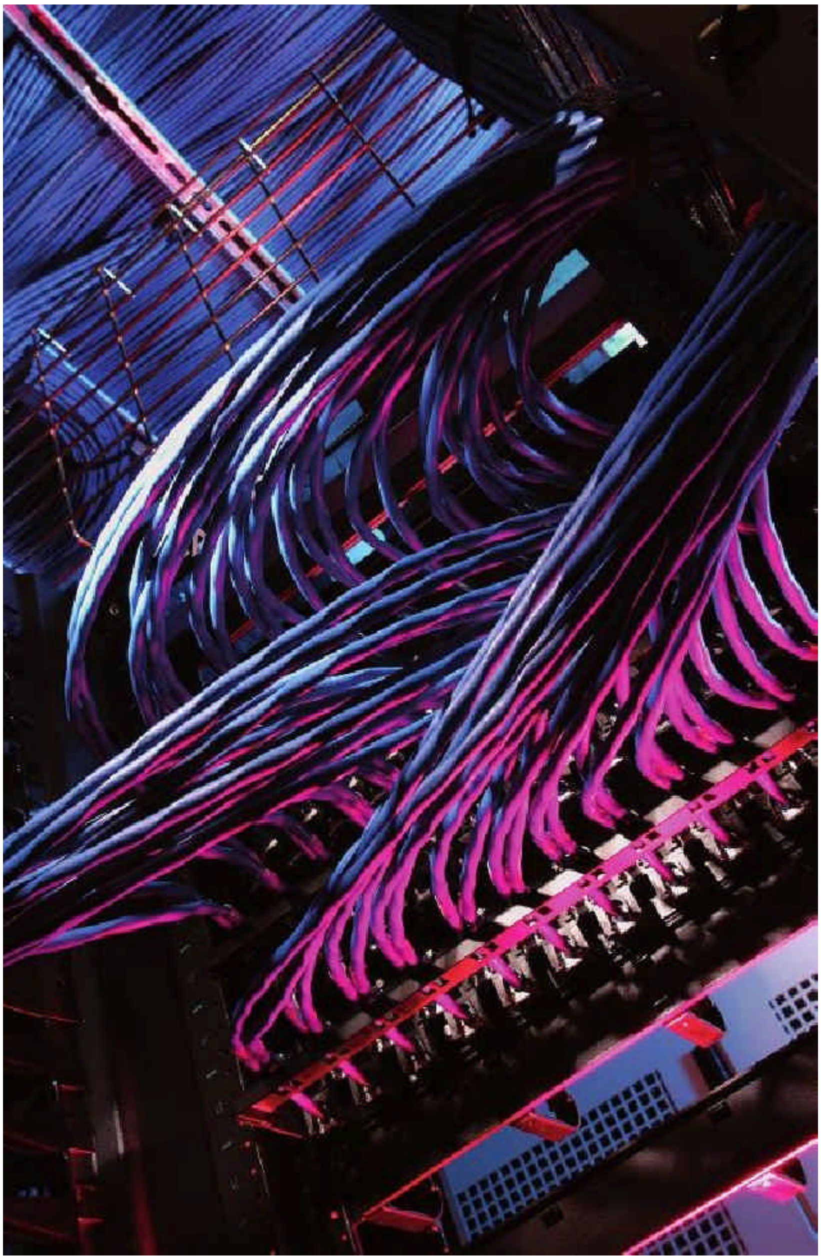
A low quality cabling infrastructure can compound the effect on the overall traffic transmitted over the network. If packets are damaged, data has to be retransmitted, eating into the available data bandwidth. This effect can increase exponentially as more data is re-sent over inferior links resulting in more bit errors, requiring more retransmission etc. It can therefore be shown that when the same infrastructure is used for voice, voice quality will likely be poor.

It is generally believed that optical fibre based solutions can alleviate a lot of the problems associated with copper based solutions – fibre being less susceptible to fluctuations in temperature, electrical and electromagnetic interference etc. However, this is only partly true. The quality of the fibre, the terminations and the way the installation is managed all have a major impact on the integrity of the infrastructure, and thus bit error rates.

Establishing root cause and prevention is vital; there are anecdotal stories of companies replacing active network components with significantly more expensive alternatives, only to find that it was the cabling infrastructure that was causing the problem.

Therefore the investment in infrastructure needs to be carefully considered and calculated over its full lifecycle. It is important to look beyond the initial investment, factoring in the impact that quality and reliability have on ROI, as well as ongoing cost of ownership.

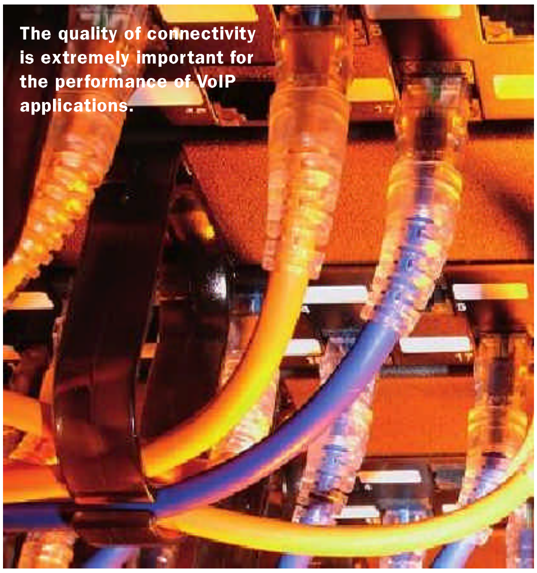
In addition, for any fibre optic based infrastructure deployment to work optimally, there are 'four elements' of management to consider that, if observed, will



The physical connection between network components and the VoIP phone is significant.

biography

Jan Piet Wielenga is product manager for ADC Krone in EMEA and is responsible for the portfolio planning and management of the entire Category 6A and enterprise hardware product range within EMEA. He has over 22 years' experience in the telecoms and datacoms sector and holds a degree in Industrial Electronics and a Post Graduate Degree in Commercial Skills for Engineers.



The quality of connectivity is extremely important for the performance of VoIP applications.

greatly reduce the chances of interference and downtime, while improving overall network performance.

Bend radius protection:
When cabling is bent it can cause transmission failures. Pathways must maintain the proper bend radius at all points where the cable makes a bend — both at initial installation and when cables are accessed or added.

Easy access to connectors and cables:
Even the smallest dust particle on fibre end faces can inhibit network performance. Proper access doesn't just provide space to work and inspect fibres for tiny particles and finger prints, it actually plays a role in keeping dirt and debris away from connectors.

Intuitive cable routing paths:
The cabling system should be seen as permanent and generic, a resource that can easily accommodate new applications and technologies. When it's designed with this in mind, additions and changes aren't difficult or disruptive.

Physical protection containment:
Exposed cables or unmanaged slack, leave the network susceptible to damage that can cause outages and increase expenses. A proper connectivity foundation eliminates accidental damage to cables by integrating physical protection that not only reduces outages but also lowers operational costs by reducing the volume of unnecessary repairs.

In conclusion, there is a great deal to consider when implementing a VoIP deployment. There are a number of drawbacks and benefits to this approach to handling voice. However, with the correct approach to specifying and managing a network infrastructure, a high performance network that requires low maintenance will deliver a real return on investment. ■