Unified Physical Networking in Real Estate and Infrastructure Developments

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Abstract

Today's network has to be able to deal with the challenge of many different data streams ranging from data base access and telecommunication systems to building information management. Designing and implementing these data streams on separate networks will be very costly both in terms of capital and operational expenditure. A Unified Physical Infrastructure is new and very cost-effective approach which allows centralising all systems, thereby increasing reliability and maintainability of the systems.

Unified Physical Infrastructure Explained

In modern real estate and infrastructure developments, whether it is a high rise building, a road or an industrial facility, there is an ever increasing dependency on data networking.

In a modern development it is common to see networks for:

1. The user/occupier
2. Telecommunications
3. Mobile telecommunications
4. Wireless networks
5. Building management and control (electrical, HVAC, water, …)
6. Security and access control
7. Lift management
8. Lighting
9. Cable Television
10. Facade control systems (especially in areas like the Middle East)

The above list is not exhaustive and some developments may have more demanding networking requirements. The most common way of designing and implementing the variety of networks in any development today is to have a separate physical network and the necessary devices for each different use as shown in figure 1.

From a client's perspective designing and implementing these separate networks will be very costly both in terms of capital and operational expenditure. Replication of cabling and replication of network devices are the major cost items, while the cost of design, implementation and operation of segregated trays/ducts and (often) risers should also not be underestimated.

Therefore a more cost effective approach is called for, the so-called Unified Physical Infrastructure (UPI). Figure 2 shows a concept for a UPI, where the different networks are integrated into one single network.

In the UPI all horizontal (or local) connectivity goes back to a single network device, which may be fault-tolerant, if required, and which is located as closely as possible to the endpoint devices to avoid unnecessary horizontal cabling. It is the function of the network device to multiplex the different data streams on to the UPI.

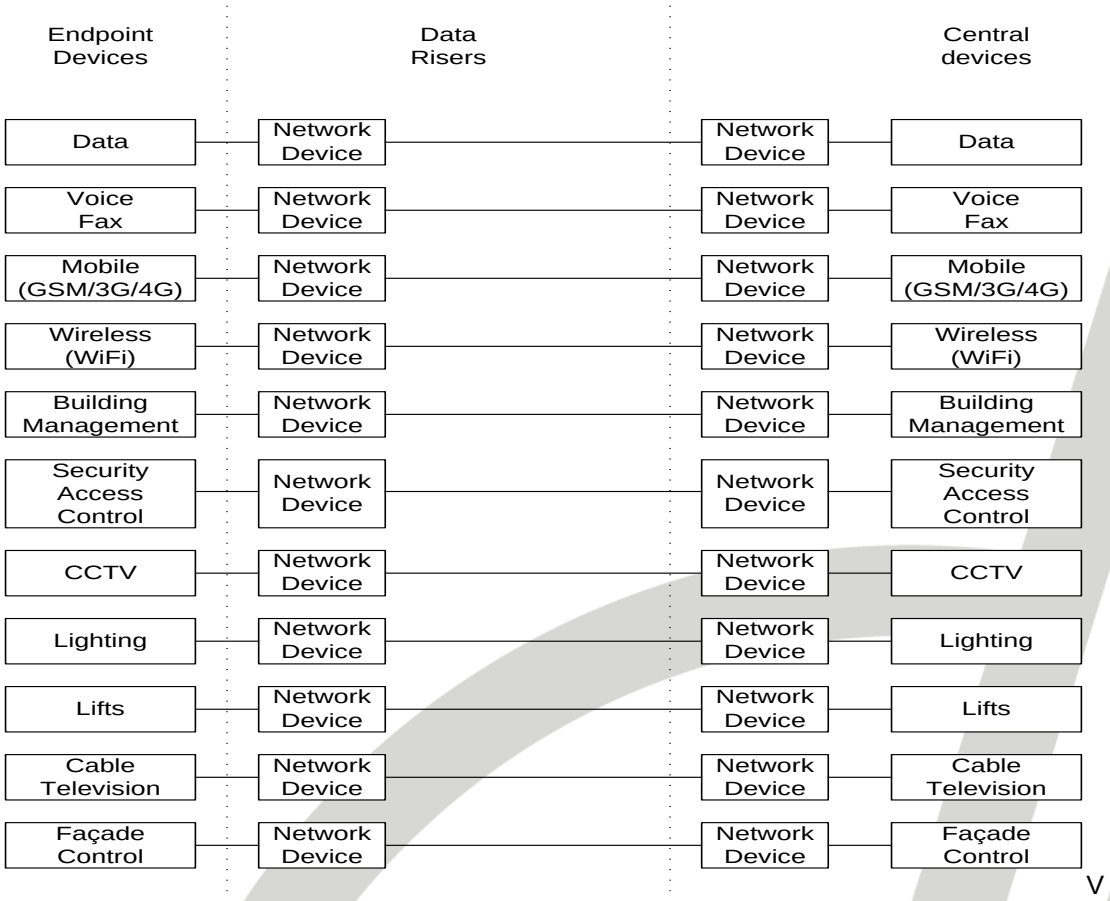

Figure 1

Vertical (or long distance) connectivity is concentrated on a single physical infrastructure, which leads from the single network device close to the endpoint devices back to a data centre/control room. In the data centre/control room the different data streams are de-multiplexed from the UPI and fed to the individual systems (cf. *Related Publications* below).

2024Sight staff, while working for Arcapita Bank, introduced the concept of a UPI at very early stages of design of the bank's new headquarters. The networking infrastructure at Arcapita's new Headquarters in Bahrain combines the traffic of at least 10 different systems onto a single physical infrastructure, resulting in very light and effective cabling solution, using a fraction of one tray for its vertical cabling and using very short cable runs to achieve all horizontal connectivity.

Advantages

The advantages of a UPI are many, including but not limited to:

1. A single tray/duct system and a single set of risers, leading to space savings on each floor as well underneath raised floors and in ceiling voids.
2. Reduced capital and operational expenditure for the different systems as they now all use common, shared network infrastructure components, which are only installed once and which are cheaper to maintain and operate. Please observe that as

distances get larger, the UPI becomes increasingly cost-effective in comparison to the traditional, segregated infrastructure.

3. Centralisation of systems, i.e. all systems end up being central control room or (preferably) a data centre, which in turn will also increase reliability and maintainability of the systems and therefore reduce cost.

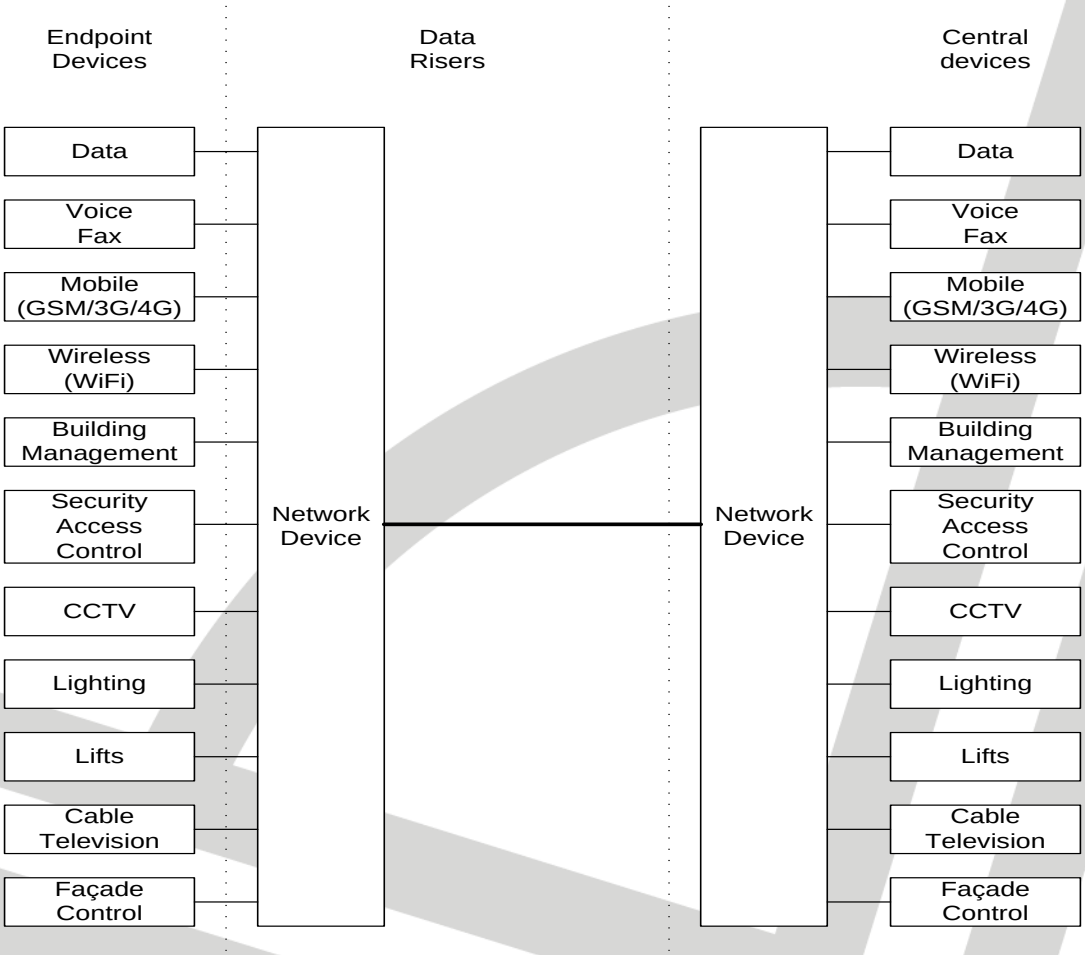

Figure 2

Challenges

As with everything, there are of course also challenges that have to be dealt with:

4. Typically data should be contained within a system and should not be visible to other systems on the same UPI. I.e. security and segregation between systems must be maintained.
5. Each system will have certain Quality Of Service (QoS) requirements. In a UPI such requirements need to be known and catered for.
6. Planning, implementation, testing and commissioning of the entire UPI should be complete before any vertical (long distance) testing and commissioning of any other systems can commence, thus creating a project milestone that does not exist in the more traditional approach.

7. The central facility, in which systems are installed, should be complete and operational at the time the UPI needs to be tested and commissioned.
8. Consulting engineers and construction contractors are typically not familiar with the IT planning and project management necessary to implement a UPI. Therefore, implementation of a UPI may experience serious setbacks and may be resisted, even if it is mandated by the client.
9. UPI's are most easily implemented, if all systems use the Internet Protocol (IP) over Ethernet to backhaul their data to the central devices. In future this will be no issue as the IP and Ethernet convergence is accelerating. However, in today's world it is still a challenge that needs to be taken into account.
10. To reap the full benefits from an UPI it should be designed into the fabric of any building or project in the very early design stages.

2024Sight and Unified Physical Infrastructures

2024Sight staff has successfully managed the UPI implementation challenges as is born witness by the Arcapita Bank Headquarters in Bahrain. By engaging 2024Sight you will be able to benefit from the experience gained.

Related Publications

A. Hofland, "Implementation of an Enterprise Access Network using PON", 2024Sight White Paper, January 2011

A. Hofland, "Combining Real Time and Enterprise Networking on a Single Infrastructure", 2024Sight White Paper, January 2011

About 2024Sight

2024Sight is a Vienna-based consultancy that focusses on specifying solutions to IT and IT-related problems that at first glance do not seem to have any obvious or elegant solution. In the recent past 2024Sight has designed and managed the implementation of a PON-based, converged building and enterprise access network for Arcapita Bank B.S.C. and the Riffa Views International School. 2024Sight also specified a high-density data centre using several innovative techniques, such as oxygen reduction to prevent fire and rack-based cooling. Subsequently, it managed and supervised the data centre's construction, testing and commissioning. Further, 2024Sight managed the deployment of a long-haul telecommunications fibre network connecting the United Arab Emirates, Saudi Arabia and Bahrain.

About the Author

Anton Hofland has more than 20 years' experience in IT, IT infrastructure and enterprise networking, gained mostly in the financial industry. Before establishing 2024Sight he was the Head of IT for Arcapita Bank in Bahrain. Previously he has worked for several major financial institutions in the City of London. He has also worked in the area of telecommunications regulation and has experience in the telecommunications industry. Anton holds a M.Sc. in mathematics and computer science from Delft University, Netherlands.