



# Centralising AV systems Understanding the move towards a centralised Comms room

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## 1. Centralising AV systems: An Introduction

Since the late 1990s one of the major themes in the development of AV solutions has been the increased importance placed on the centralisation of all AV connected products within a commercial setting. Typically, this has taken the form of a room or floor of a building set aside to contain all the necessary sources like video servers, set top boxes, switchers, splitters, matrices and distribution equipment required within the building.

This set-up was originally popularised by network architecture and has since become a standard among many industries because of the many benefits it brings; namely increased security, easy access for repairs and maintenance, and improved reliability of products, together with the long-term cost savings that come from a reduced need for maintenance staff.

#### 1.1 Purpose of this Document

This white paper is intended to inform potential customers, particularly those who are currently moving to larger premises, about why they should consider installing a centralised AV solution.

It gives a basic historical overview of how centralised AV systems came to be and why they are now the industry standard, in addition to giving a comprehensive look at the benefits associated with a centralised system compared with a decentralised one.



## 2. Centralising AV systems: A History

Before beginning our discussion of the benefits of a centralised AV system, it is worth looking at the history of computer networking in order to understand why centralisation has become such a huge part of the modern tech industry.

#### 2.1 Token Ring

It is very easy in this age of centralised AV and computer systems to forget that the early days of computer communication worked in different ways. Prior to the standardisation of Ethernet, the major commercial source of connections between computers was through what was known as a 'token ring', a system of coaxial cables that would connect all the computers in a network together in a circular or 'ring' network.



This early form of computer networking was first released in 1984 by IBM, and from the start faced a variety of problems, the largest being that if a single connection or computer on the network failed, then the entire ring would fail along with it. Being connected via coaxial cables not only limited the potential bitrate a system could work to, but also made the installation complicated and difficult to maintain.

#### 2.2 Ethernet

While technically developed in the 1970's at Xerox PARC, Ethernet cabling did not become the dominant form of network cabling until well into the 1980's. This was because it faced stiff competition from the Token Ring and other forms of networking and lacked a unique selling point until the development of Ethernet over twisted pair in 1984. The ability to use unshielded twisted pair cabling in an Ethernet network drastically reduced its cost and gave Ethernet the edge over its competitors. By the late 1980's Ethernet had become the market dominator in network connectors and remains so to this day.

This is important for our purposes because it explains the need for centralised computer systems that pre-dates the push for centralised AV systems. The development of Ethernet led to the standardisation of the 'Star' network, a form of networking that involves a single control hub

transmitting and controlling data to all the hosts in the network. In this system if a single host fails or is unexpectedly removed from the network the hub will isolate it, preventing a total network failure.



This was a breakthrough in terms of network design and led to an obvious need for a secure location in which to store the network control hub. Thus, the necessity of a centralised computer network was born, and decades later when the AV market became more mainstream, this basic principle was found to work just as well in our industry as it had for computing back in the late 80's.



## 3. Centralising AV systems: Changes in the AV Industry

As mentioned above, the centralisation of modern AV systems was based heavily on the knowledge and experience gained in the computer networking sector during the 1980's. AV solutions were not always as centralised as they are now, and it's worth going over what other options existed before the move to centralisation.

#### 3.1 Decentralised AV Systems

Prior to the popularisation of a centralised AV system, most companies would set their screens up with the source device situated beneath each screen. The input device would be connected via coaxial or VGA cabling to the screen and would transmit it the required image or video display. While this basic set-up was workable, and it did provide an easy way for companies to use their screens with minimal fuss, it didn't take long for problems to develop.



Security became an obvious issue, since a PC or other input device left in the open could be damaged or sabotaged very easily. Attempting to solve this problem by locking the device up within a cabinet solved the security issue to a certain extent, but also led to devices overheating within their cabinets and made it much more difficult to access them for repair or maintenance.

In addition to this, having the input device situated in the area where the screen was to be used meant that any repairs or modifications to the device itself would cause disruption in the workspace, not only putting the screen out of action but also causing noise and distracting those working in the same room.

#### 3.2 The Move Towards a Centralised System

After these problems became known, many companies started to look for ways in which to remove the input devices from the workspace entirely. The most obvious way of doing this was to set aside part of the company building to host the input devices and connect those to the screens via Cat 5\* cable (a recent innovation at the time). While the set-up cost was more expensive, the benefits to security and reliability far outweighed this issue and many companies began to install these control rooms in their buildings.

This switch from a distributed to a centralised AV network became more and more attractive as the number of screens and other AV products required within large companies became greater and greater, and the amount of wiring required to connect them all grew at the same rate. Rather than having to individually wire and rewire everything within cramped security cabinets, companies could now set all their input devices within a single room or floor of their building (known as a 'comms' or communications room), and have a single wire connecting from the required device to a screen anywhere within their building.



## 4. Centralising AV systems: Benefits of a Communications Room

Centralising their AV system brings many benefits to any business, some obvious and some not so obvious. Here is a comprehensive overview of the advantages of a centralised comms room versus a decentralised local input approach.

#### 4.1 Security

Since a comms room contains all of the input devices for an installation, that means that no one can directly tamper with the system without having access to the room itself. A comms room can be as securely guarded as a customer deems appropriate, and indeed is much easier to guard then a disparate collection of individual input devices scattered across the building.

Additionally, a centralised system can be wired completely separately from a businesses' network, meaning that there is no point of access for viruses or security leaks from the AV system. This level of data security is often not found in a decentralised system, where all sorts of cross contamination between the network and the AV system can take place.

#### 4.2 Maintenance

As mentioned above, a decentralised system means that all maintenance must take place in the room the input device is situated in, often with the device itself placed under a table or screen. This means that every time a device needs to be repaired or inspected a technician has to either work with it within its cramped space or remove it entirely from the system. Both options make life difficult for the technician and can lead to long delays in getting the system working again.

A centralised system allows for all necessary repairs and monitoring to be done from the comms room, meaning that a technician can get their job done quickly and efficiently in a closed environment without risk of being disturbed.

Furthermore, in a decentralised system if an input device fails then the screen will simply cut to black until the device is repaired, or a new device is manually inserted. This looks ugly and unprofessional in a digital signage environment and can be incredibly frustrating or even disastrous in a monitoring or entertainment environment. Meanwhile, in a centralised system, it would be the work of a moment to quickly enter the comms room and switch out the damaged product.

#### 4.3 Workforce Disruption

One of the most obvious problems with having local inputs to screens is that if one fails then the person using it must call the technicians directly into their working area. Not only does this prevent the person who is using the screen from working, it can also create a larger disturbance and distract everyone else in the room. By keeping all the input devices within a centralised space, the disruption to the rest of the workforce is minimised when repairs are taking place.

Noise can be another serious disruption issue when it comes to decentralised systems, as the heat that is created by high end signage or monitoring products requires a lot of cooling. These fans can be extremely distracting for workers, which in turn may affect their concentration.

#### 4.4 Temperature

The amount of input devices required to provide for a floor of office computers is significant, and as such the devices produce a significant amount of heat. This problem not only necessitates the noisy fans touched on earlier, but also means that air conditioning must be provided for the whole floor to

stop the workforce from overheating. In addition to this, if the local devices are placed within protective cases to prevent damage, they run the risk of overheating themselves.

All products with electronic components are susceptible to degradation due to excessive heat which will reduce their lifetime. Installing equipment in a controlled area with correct temperature and maintenance conditions will extend the working life of all products and help increase ROI. In a centralised system the comms room can be air conditioned more efficiently to deal with the heat generated by the devices, allowing the AV system to be kept constantly at the best possible temperature.



Fig 3. Example of a Centralised AV Solution

## 5. Centralising AV systems: Matrices

Matrices are an innovation that originated from broadcasting, where producers and directors needed to be able to switch from live to preview camera feeds and back again at a moment's notice when filming. Matrices, therefore, were designed to allow users to switch between multiple input and output devices quickly and efficiently. A matrix would be connected to all input and output devices within a broadcast set-up, and a user could control which inputs were being displayed on which outputs from the matrix, rather than having to manually attach and reattach the system wiring.

This speeded up the process of switching inputs and outputs significantly, allowed for all aspects of a system to be controlled from a central point, and prevented the need for manual device switching. With this innovation the idea of a matrix as the focal point of a broadcast system was born, and it is therefore no surprise that when the fledgling AV industry began encountering many of the same input and output issues that broadcast had decades earlier, they turned to the same remedy their predecessors had.

Matrices began being used in comms rooms early on, as it became clear that an additional benefit of having all the input devices stored in a single place was that a matrix could be used to allow for quick and easy input and output switches. Similar to the prior broadcast situation, many AV systems require fast switching between inputs and outputs, particularly those that deal with surveillance or entertainment systems. Matrices used in AV systems give all the same benefits as in broadcasting, so it's no surprise that they caught on quickly.

In the modern AV market, no comms room is complete without a matrix of some kind, and almost all commercial AV installations will have some sort of central control unit, no matter how small the installation itself. Matrices have also grown in size as the need for more AV products per installation has risen, to the point where at Smart-e we are able to provide matrix sizes up to a 144 x144 (144 inputs to 144 outputs), highlighting the demand for large scale matrices in the modern industry.



Fig 4. Example of a Matrix system using Smart-e's 4K-4x4-L

#### 5.1 Modular Matrices

In more recent years modular matrices have become very popular in comms rooms, particularly in larger or more varied installations. A modular matrix is one with removable input and output blades, meaning that the input and output types supported by a particular matrix can be customised to the consumer's satisfaction. In addition to supporting a wide variety of input/output types (HDMI, VGA, HDBaseT, DVI etc.), the removable blades mean that the number of inputs and outputs required can also be customised.

Modular matrices are useful for several reasons, the biggest being their easy customisability to virtually any given installation need. Many new AV installations have to make use of wiring and connections left over from earlier installations, meaning that older forms of connector like VGA are still in use in some modern installations. A modular matrix allows the installer to interface with legacy equipment still in use by inserting the necessary blades with older connectivity, rather than introducing unnecessary work arounds into the installation.

Additionally, buying a modular matrix helps to future proof an installation, since if you buy a 36x36 modular matrix but only use twenty of the inputs and outputs, then you have an extra sixteen that you can use to connect other units to your system later down the line.

Fig 5. Smart-e's 36x36 MDX modular matrix



## 6. Centralising AV systems: Conclusion

Centralising AV equipment in a comms room and distributing the signals via standard network cable has been proven to be the best method of providing a reliable, flexible infrastructure for many applications.

At Smart-e we have years of experience in developing all manner of centralised equipment for use in sites as diverse as airports and police control rooms. We are able to provide a personalised service to meet your specific requirements and pride ourselves on our after sales service.

## 7. About Smart-e

A UK company with over 25 years' experience in the Broadcast and AV industry, Smart-e are at the forefront of visual and audio technology.

Our technical expertise and working partnership with several universities means we are able to design and develop the most comprehensive and innovative product range for AV switching and distribution solutions over CAT 5-8 cable.

Our extensive client portfolio ranges from smaller companies wanting a one-to-one presentation solution to blue chip clients and distributors worldwide. Our adaptable products offer solutions to customer requirements from high end residences, banks, educational environments and hotels to super yachts, multi-national corporations and more. We pride ourselves in being global pioneers in AV distribution.

For more information please contact us at: <u>www.smart-e.co.uk</u>.

Authors:

William Lane BA (Hons)

Marketing Executive Smart-e Ltd www.smart-e.co.uk.

Jon Lane Bsc (Hons) MIEE

Managing Director Smart-e Ltd <u>www.smart-e.co.uk</u>.

