INTELLIGENT NETWORKING AND VISUALIZATION IN CONTROL ROOMS
Modern visualization and network technology for the flexible application of control rooms

While a lack of technological possibilities in the past only allowed for control rooms with comparably inflexible and limited areas of responsibility, the consistent development of AV technology and data transmission makes more efficient and more complex control rooms possible. In the past years the complexity in depiction has been sinking due to the constant improvement of display technology and signal distribution. With that, the need for communication between operating forces and risks of operating errors decreased. At the same time the improved overview allowed for faster reaction times in emergency situations. Since operation and surveillance in control rooms became easier in this way, the complexity of control centre could be consistently increased. Today especially the increasing integration of IT technology in the area of AV provides a more complex and more flexible use of control centres.

In the area of security single control rooms are more and more combined to integrated control centres. In the state capital Stuttgart for instance, the control centre consists of traffic surveillance, fire department and emergency calls. Similar cases can be found in other sectors. A major German energy supplier for example has put together the control of all hydroelectric power stations in southern Germany in a single control centre. In this control centre more than 100 hydroelectric power stations, around 300 machines and 600 weir fields are controlled and monitored. These combinations allow for a better coordination of all involved, faster decisions and coordinated actions between single institutions.

With the increasing complexity of those control centres the requirements for AV technology obviously grow in the same manner. If single control rooms in the security sector for instance are combined into an integrated control centre, the AV technology has to be able to manage additional tasks and an increasing number of different signal sources. Often times during such a combination heterogeneous local control technology systems have to be standardized and brought to a common denominator. Thereby, data has to be made available and comparable on a standardized platform. Only in this way a central presentation is possible.

In addition there are increased requirements of operators for the control rooms. Often times dynamic working conditions through free assignment of workstations or the application of ‘Bring Your Own Device’ (BOYD) technology for fast integration of external audio and video sources. At the same time ergonomic matters such as large windows that provide daylight for the control room or logistic matters like the separation of control rooms and control centres from objects that are actually monitored, the planning and technology of control rooms.
Therefore it is advisable to specifically consider future deployment scenarios and the corresponding requirements during construction or renovation of control centres. But not only visualization and network technology have to be considered. Especially for the combination of control rooms with different data structures the conflation of data and a standardized presentation has to be clarified in advance.

In order to achieve that, control centre systems, visualization solutions and network architectures that transmit, process and display diverse input signals are required. High quality video wall and display systems like seamless rear projection cubes and LCD displays with LED backlight for high brightness, full HD resolution, brilliant color representation and 24/7 capacity are already standard. But modern control centres require more than just high quality visualization systems. Complete systems which allow for an uncomplicated installation and flexible enhancement are necessary. The basis for that is the network architecture for signal distribution and the control of video walls and single displays. This control has to be flexibly adjustable to changing demands and must be easily expandable if necessary. Especially in larger control centres and when the centres were separated from the monitored objects, a simple real time transmission of data through networks, the internet or the cloud has to be possible.

Network architecture and signal input provide flexibility

The possibility of centralization and the combination of control rooms depends on the available hardware and network architecture. In this way multiple signal sources are often used in the security sector. This includes the signals of security cameras, often times analog and digital, as well as wiring diagrams and layout plans. In addition, process signals of facilities have to be registered and visualized through SCADA systems. Inside the control room those signals have to be collected and presented on a video wall in a standardized way. In order to flexibly position and scale the input signals on the video wall according to the demands, the application of a graphic controller like the new netPIX 4900 with an according wall management software such as the new eyeCON V5.1 is necessary. The netPIX 4900 generates

Project example:

ASSESSMENT CENTRE INSIDE THE NEW BUILDING OF BADEN WÜRTTEMBERG’S INTERIOR MINISTRY, GERMANY

Inside the new building of the ministry of the interior of Baden Württemberg in Stuttgart an extensive assessment centre was integrated. The centre is the central information and communication point of the state for all security-related questions. It is the central contact for police stations, offices and ministries of state, for assessment centres in highest security authorities of other states and the country, for other offices and organizations with safety functions and for the media. Moreover, the centre serves as a subsidiary of the German Search and Rescue Service (SAR) and as state traffic warning service.

For those tasks eyesis and the Jans Group equipped three situation rooms with video walls and several single displays. On the displays different analog and digital computer, image, video and TV signals are presented according to each scenario. In order to be able to cover the different areas of application and to keep high flexibility for certain situations, a flexible network architecture in the background was necessary. Several graphic controllers and more than 120 eSTREAMERs for network transmission were installed. This not only allows for the construction of a network based routing matrix but also makes the connection of extensive so called Bring Your Own Device (BYOD) technologies for a fast integration of external audio and video sources possible. In this way not only an integrated assessment centre, but also a combination of control and conference rooms was created.

Equipment used:
- 28× EYE-LCD-5500-M-USN-LD (55” Full-HD-Videowall-LCD with extra thin bezel)
- 13× 65” LCD-Monitors /Typ EYE-LCD-6500
- 5× 55” LCD-Monitors / Typ EYE-LCD-5500
- 5× netPIX Video Wall-Controllers with redundant features (High performance split computers for the presentation of video and data signals)
- 124× eS100 eStreaming Encoder/Decoder
- 1× eyeCON Wall Management Software V4 Premium + Capture-Module
a connected desktop interface for the presentation of network data, video and graphic sources out of single signals. Thereby the new controller makes the input and output processing of 4K/QHD signals and the transmission of audio through HDMI possible. Through open interfaces the computers can also be connected to SCADA applications or an alarm management. With the eyeCON V5.1 software presets for the presentation of alarms on a video wall can be deposited for instance with a pop-up window that shows detailed information about the alarm.

With the help of streaming solutions like the eSTREAMErn eS100 and eS200 or the eyeGATE input signals of video cameras for instance can be converted and transmitted over standard IP networks. Through a decoder like the IPD32HQ, a decoder board which is able to decode up to two 4K signals simultaneously, those signals can be received at any point of the network and through a graphic controller be displayed on a video wall or a desktop computer. This system can be installed on a redundant basis and in this way improves data security as well as availability. This solution is also useful if a facility should stay extendable. With streaming solutions a network based routing matrix that can optionally be extended and is significantly more cost-effective than classic signal processing. Especially for the transmission of IP camera signals the compatibility of encoder and decoder with the applied camera has to be considered. Here, decoders like the IPD32HQ which support more than 2500

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**Project example:**

**TRAFFIC CENTRE OF MOTORWAY A89 IN TARARE, FRANCE**

By completing the A89, a critical gap in Europe's motorway network has been closed. Thanks to this East-West connection, which includes numerous tunnels and viaducts, the distance between Lyon and Bordeaux can now be covered in just over five hours. The route is controlled from the newly built control centre in Tarare. The central element of the control room is a video wall made up of six LED rear projection cubes, which are flanked by two LCD video walls. There more than 300 camera signals are displayed. The system is controlled via various netPIX controllers and the eyeCON software. All sources can be displayed on the video wall in the control room and on other displays and projectors in the crisis rooms, as required.

**Equipment used:**
- 6x EC-60-LHD (60" DLP® rear projection cubes with LED technology and Full HD resolution)
- 11x EYE-LCD-4600-M-LE (46" Full HD video wall LCD with narrow bezels)
- 4x netPIX video wall controller (high-performance split controller for displaying video and data signals)
- 20x eS100 (eyevis eStreaming solution for distributing DVI signals over standard IP networks)
- 6x eyeCON wall management software premium

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**THE CONTROL ROOM OF TRANSNETBW IN WENDLINGEN, GERMANY**

TransnetBW GmbH controls approximately 3,650 kilometres of high-voltage power lines in Baden-Württemberg, which are connected with regional distribution networks through 81 transformers. At the borders of this control area, the transmission grid is directly linked with other German grids as well as with France, Austria and Switzerland. The central control tool in the control room in Wendlingen is a 8.4 x 3.15 m large video wall consisting of 18 rear projection cubes of the type EC-70-LSXT+. Thanks to their frameless design these cubes may be assembled to form nearly seamless projection screens. A netPIX controller controls the projection screen. For security reasons a second controller that runs parallel in hot stand-by mode is integrated in the system and thus guarantees the customer requirement of high availability.

**Equipment used:**
- 18x EC-70-LSXT+ (70" DLP® rear projection cubes with LED technology and SXGA+ resolution)
- 4x netPIX video wall controller with redundancy features (high-performance split controller for displaying video and data signals)
- 1x eyeCON wall management software premium
camera models of different manufacturers through the ONVIF Profile S-Standard are suitable.

Interconnecting video walls and single displays with central control and free extension

Particularly for larger facilities that include several control rooms and adjacent conference rooms, a graphic controller is often times unable to manage all input signals and reproducers. In those cases wall management software which provides central and uncomplicated operation for the entire system beyond the limits of a single graphic controller is necessary. For this reason eyevis have equipped their eyeCON wall management software with the MetaWall feature. eyeCON MetaWall 2.0 is a flexible software-based system for signal transmission and the control of video walls and single displays. Through eyeCON MetaWall 2.0 several video walls and single displays can be interconnected to a single user interface above the limit of one graphic controller. In addition to graphic controllers of the netPIX series eyeCON MetaWall 2.0 also supports the new intelligent eyevis EPU displays of type EYE-LCD-xx00-LE-EPU. In the new EPU displays image processing electronics are integrated into the display through through the eyeProcessingUnit (EPU).

In combination with the eyevis streaming solutions, graphic controllers, the new intelligent EPU display series as well as standard displays setup and operation of almost unlimited video wall and display installations is possible. Thereby, input signals are transmitted via network, internet or cloud and are pulled out of the network according to the installation of graphic controllers or intelligent EPU displays. Management, scaling and assignment of all input signals is controlled through eyeCON V5.1. The software visualizes all sources on a desktop surface and in this way allows for the uncomplicated distribution of the signals to the single reproducers.

Infinite flexibility for integrators

Since the new EPU displays with direct control as well as video wall displays with operation through graphic controllers can be integrated into eyeCON MetaWall 2.0 integrators will be much more flexible. As needed, all necessary components can be combined with each other. The operation of graphic controllers for instance is especially makes sense for control rooms with SCADA applications. EPU displays on the contrary are ideal if several single displays are allotted to different rooms or for a cost-efficient extension of existing systems. Due to integrated image processing the installation becomes much easier. In addition to the power cable only a simple network cable has to be connected to the EPU display.

This guarantees highest possible efficiency and benefit for the consumer. Moreover, eyeCON MetaWall 2.0 can in this way easily be integrated into existing systems. The system still stays extensible. If for instance a control centre is to be extended with

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**Project example:**

**AIRPORT CONTROL CENTRE DÜSSELDORF AIRPORT, GERMANY**

The state-of-the-art control centre of the Düsseldorf Airport provides for the efficient and smooth collaboration of the organisations involved in air traffic operations. Approximately 15 specialists from the airport, the airlines, the Federal Police and from the handling companies work hand in hand here in one room. They are constantly in touch with Deutsche Flugsicherung (German air traffic control body) and Deutscher Wetterdienst (German meteorological service).

Key elements are a traffic control and forecast program as well as an interactive airport map that shows the current events at the airport. The systems are visualised on an eyevis video wall which is around 12 metres wide. Controlled by a netPIX controller, the ACC can additionally display the flight schedule, weather data or current camera views of the airport premises.

**Equipment used:**

- 20× EYE-LCD-5500-M-USN-LD (55” Full HD video wall LCD with narrow bezels)
- 1× netPIX video wall controller with redundancy features (high-performance split controller for displaying video and data signals)
- 1× eyeCON wall management software basic

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Control room of ERZ Powerplant in Aubrugg-Zurich, Switzerland
a conference room, EPU displays only have to be installed and connected to the network. Through the eyeCON V5.1 software the displays can be integrated with less clicks and can easily be controlled. With the new streaming solution eyeGATE, BYOD sources can also be integrated into conference rooms. This supports the increasing connection of control and conference rooms as it can often be seen in assessment centres.

Advantages and disadvantages of visualization technologies

As soon as the network architecture is taken care of, it all comes down to the right visualization. Different systems can be applied. Projectors are not very suitable for permanent operation in control centres in the first place. Due to the projection of the contents black values, contrast and brightness are generally not as good as those of LCDs or rear projection cubes. Especially in rooms with bright ambient light the presentation of contents is suffering as does the usability of the system for the user. Moreover, the light bulbs used in many projectors have a comparably lower durability and thus have to be exchanged more often. This increases maintenance and operation costs.

Rear projection cubes and LCD displays on the contrary provide a very good colour representation, high brightness and strong contrast. Since control centres and control rooms are more and more set up in brightly arranged rooms with daylight incidence, cubes and LCDs offer significantly better characteristics than projectors. Since they are meanwhile almost exclusively equipped with LED rear lighting, those devices additionally provide lower maintenance and operation costs through a durability of 60,000 hours on average. Differences lie in the necessary space for installations. LCD displays only have a depth of up to 15 cm whereas rear projection cubes with a depth of up to 80 cm need significantly more space. Advantages of the cubes, however, are their significantly narrower bezels between active image areas. For LCD displays they have a breadth of 5.3 to 6.5 mm, th new eyevi Extra-Narrow-Bezel-LCDs of type EYE-LCD-5500-M-XSN-LD reduce the bezel to only 3.7 mm. Cubes on the contrary provide much smaller bezels of less than one millimetre. In addition, cubes through their technology are much more suitable for permanent operation. The liquid crystal layer of LCD displays can show shadow images after the presentation of static images over a longer period of time. Due to their projection technology cubes are immune to that. With resolutions of Full HD up to 4K/QHD or XGA up to WQXGA the LCD displays and rear projection cubes of eyevi offer a range of suitable resolutions for any application.

In the past years there was a trend towards the increasing application of LCD displays. To a major part this can be ascribed to the lower purchase price. Despite the lower price the LCDs do not necessarily have to be the cheaper alternative. Rear projection cubes are mostly depreciated after a period of ten years. LCD displays are usually exchanged thrice during this time. This qualifies the initially lower purchase cost. In order to achieve maximum investment security it is therefore advisable to adjust the technology to the depreciation period and to perform a complete examination of investments and operation costs. Thereby eyevi will be pleased to help and support planners and operators.
Control center for traffic monitoring at Technischen Betriebszentrum Munich, Germany
EYEVIS SOLUTIONS FOR INTELLIGENT NETWORKING AND VISUALIZATION IN CONTROL ROOMS

DECISIVE ADVANTAGE THROUGH INNOVATION AND DIVERSITY

A piece of information is completely dependent on the medium which it passes. This is particularly true for visualisations in important areas such as control rooms and security centres, where a reliable display in the highest possible image quality is indispensable. After all, important and safety-relevant data are being monitored 24 hours a day, 365 days a year here and must be optimally ascertainable and continually available.

And it is precisely for this purpose that eyevis offers absolutely reliable display technology in perfect quality and at the highest level of operational security. Whether it is rear projection systems or LCD video walls – in combination with our controllers and control software, we provide exactly the solution that optimally fits to the requirements, whatever they are.
Single monitor from the eyeLCD series with integrated eyeProcessing-Unit (EPU)

Video wall controller from the netPIX series and control software eyeCON V5.1 as well as eyevis eStreaming solution

Video wall with LCD monitors from the eyeLCD series with narrow or very narrow bezels

Video wall with rear projection cubes from the ecCUBE series
THE LCD MONITORS FROM THE eyeLCD SERIES

High-end monitors from the professional LCD Series by eyevis are best suited for the areas security and control, if the perfect display of moving content is required, such as live image signals of surveillance cameras or constantly changing parameter data. They combine high resolution and outstanding display characteristics with various input options for various signal sources.

From a classic professional Full HD single monitor to Ultra HD monitors with 4K resolution to displays with very narrow bezels for building seamless video walls – the spectrum of the eyeLCD series provides the right solution for every need. They are available in many different sizes between 31.5” to 90” screen diagonals and are always in compliance with the latest technological developments. Whether as a stand-alone display or combined into larger units – eyevis LCDs convince with their quality, technical know-how and longevity.

New are the seamless LCDs from the extra narrow bezel series type EYE-LCD-5500-M-XSN-LD with a smallest bezel of only 3.7mm between neighbouring displays. The robust and stackable XSN-Displays provide full HD resolution with 1920 x 1080 Pixels on a 55-inch screen, Direct-LED backlight technology for best brightness of 700 cd/m² and high contrast of 3500:1, which makes them perfectly suitable even for larger video walls in demanding applications. The robust design and the optionally available stacking frame allow for a simple and precise installation of video walls without a necessity for additional complex mounting parts.

For the first time eyevis shows the new series of intelligent EPU displays type EYE-LCD-xx00-LE-EPU. Here image processing power is integrated in the display through the eyeProcessing unit (EPU). Together with eyeCON MetaWall 2.0 the new displays permit the possibility to install flexible and unlimited video walls and single displays based on a standard network. eyeCON MetaWall 2.0 enables an uncomplicated network architecture for the signal distribution and the control of the content. Thanks to the new build in concept of the image processing which is integrated in the eyeProcessing unit (EPU) of each display a simple installation without complicated wiring or additional graphics controllers is possible.

eyevision offers the new EPU displays as stand-alone displays with screen diagonals from 46” to 65” type EYE-LCD-4600-LE-EPU, EYE-LCD-5500-LE-EPU, EYE-LCD-6500-LE-EPU as well as seamless video wall display type EYE-LCD-5500-USN-LD-FX-EPU. With full HD resolution, Edge- or direct LED backlight, high brightness up to 700 cd/m², a contrast of 4000:1 the eyevis displays are perfectly suited for demanding applications. With a minimal bezel of only 5,3 mm the EYE-LCD-5500-USN-LD-FX-EPU is also ideal for the construction of fixed modular video walls. Suitable for all fields of applications eyevis also offers three different configurations of the eyeProcessing unit.

THE REAR PROJECTION CUBES FROM THE ecCUBE SERIES

eyevis cubes, with their established DLP*-technology, are first in line in terms of professional video wall systems. They are absolutely insusceptible to image burn-in, a permanent negative interference of the image quality caused by displaying static content.

In addition, DLP* cubes provide the only option to realise practically frameless video walls for continuous operation in control rooms and security centres. In combination with their outstanding colour and brightness properties, this makes them the perfect choice for challenging video wall system applications. The latest version of our LED cubes uses innovative Cluster LEDs as light source for the projector. These do not only provide higher brightness levels but enhanced reliability and less power consumption.

Being able to incorporate so many functions, the Cubes are ideally suited for application areas depending on particularly quick and reliable capture as well as on unambiguous displays of a wide range of situations.
THE CONTROLLERS OF THE netPIX SERIES

netPIX controllers of the latest eyevis generation present the ideal, individually configurable control solution for video wall systems. The controllers produce a single coherent surface over all display modules in a video wall, so that the user has a large desktop surface available on which sources and windows of all kinds may be placed and scaled freely.

The new netPIX 4900 graphic controller sets performance standards for the control of video walls and for signal transmission. With new input and output cards, a new Switch-Fabric-Backplane and an optimized housing concept the new netPIX 4900 provides the input and output processing of 4K/QHD signals and the transmission of audio over HDMI. In addition, service and maintainability was improved, which lowers downtimes.

At present the series consists of two network-based graphics controllers, the netPIX 4900 and the netPIX 4900 Plus, as well as two IP streaming video decoder, the IPD32 and the IPD32HQ. The new IPD32HQ complements the existent IPD32 and is able to decode two 4k signals, 16 HD signals or 32 D1 signals simultaneously. What is more, both the IPD32HQ and its little brother IPD32 support flexible individual Codecs as well as customised systems. As a member of ONVIF eyevis furthermore has integrated the ONVIF profile s-standard. Both eyevis decoders thus support more than 2500 camera models of various manufacturers.

THE eSTREAMING SOLUTIONS

The eStreaming solution by eyevis is a professional tool for transmitting and distributing DVI signals via standard networks (TCP/IP). Thus, the high-quality streaming solution eSTREAMER eS100 is especially suitable for demanding visualisation. For this purpose the video signal is converted into data packages by an eStreamer and fed into a network. The packages can be extracted at any desired point in the network and converted back into a video signal by another eStreamer. The eSTREAMER eS100 delivers an almost lossless transmission with JPEG compression, 4:4:4 subsampling and broadcast quality.

What is more, the new eSTREAMER eS200 is able to transfer audio signals additionally to the video signal. This solution offers important advantages compared to DVI wiring only. It can also be used in multicast mode with several senders and receivers. Thanks to the use of standard network cables there are fewer limitations concerning signal paths. In addition, it facilitates installations in safety-critical areas in which an interruption of the end systems or the internal networks is not feasible nor permissible.

Are only smaller bandwidths available for the signal transmission or is a simple solution needed to integrate BYOD sources the eyeGATE is the best solution. The eyeGATE encodes DVI and HDMI signals with a resolution of up to 1920 x 1200 pixels and 60Hz with a high quality H.264 compression and an advanced & high profile. With the integrated chroma subsampling filter, the eyeGATE achieves a transmission quality corresponding to a 4:2:2 chroma subsampling. For a transmission with the new eyeGATE a bandwidth of 1–12 MB/s is sufficient.
THE eyeCON WALL MANAGEMENT SOFTWARE V5.1

eyeCON is the universal and complete software solution for operating video walls, including all connected sources as well as the distribution and exchange of information in control and presentation rooms. Its highly simplified operating concept shortens response times and offers excellent performance.

An entirely new graphic user interface and numerous innovative features, such as MetaWall 2.0 (for realising unlimited video wall systems) and MultiMouse (for simultaneous work on the video wall by several users) expand the performance of the software to an extent not previously known. A frictionless collaboration of the individual systems and components with one another is an essential benefit in the areas of security and control. The entire configuration will be carried out in only one setup (eyeSetup) – regardless of where in the network the user is located – and can therefore be initiated from each workstation PC that has the respective system rights.

With the new active directory support eyeCON V5.1 can also better be integrated into existing network and user structures. Due to the active directory support existing user rights can directly be transferred to the rights management of the eyeCON V5.1 software. Group assignments, authorizations, hierarchical structuring or areas on the large scale video wall can be freely defined for each user. Authorized users who have registered on their computer can directly open and control eyeCON V5.1 without having to register once again.

About eyevis
eyevis, German manufacturer and installer of large screen solutions, is a leading provider of visualisation systems for professional applications in control rooms, virtual reality and simulation as well as broadcast and digital signage. eyevis has a worldwide network of subsidiaries and resellers. eyevis is one of very few manufacturers on the market providing complete systems. eyevis one-stop solutions include display systems, graphics controllers and wall management software solutions.

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