Dublin City Council Traffic Department

Traffic Control Rooms

Audio Visual technology upgrade project

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Revision History

Contents

1. Introduction

This document forms the basis for the pricing of the project detailed in subsequent sections of this document and also forms part of the contractual agreement for the project.

It describes the functionality required in each space and location, and it is this functionality that you're committing to provide in your bid response. If contradictions are found between the additional provided information and the Functional Narrative, the Functional Narrative takes precedence.

You must provide a fully compliant response to this document, and state as such in your return. Any recommendations or changes must be detailed in a covering letter, and priced separately.

Please note in relation to all documents, where reference is made to a particular standard, make, source, process, trademark, type or patent, that this is not to be regarded as a de facto requirement. In all such cases it should be understood that such indications are to be treated strictly and solely for reference purposes only, to which the words "or equivalent" will always be appended.

While we have included manufacturers and models these are to illustrate an example design, and tenderers may propose alternative manufacturers / models of equipment.

Where the tenderer is proposing an alternative, they must clearly outline the proposed alternative and explain why it meets or exceeds the requirements, in addition to the required standards, and how it provides the same functionality or performance as the specified example.

Where an alternative system is proposed, tenderers must demonstrate previous experience implementing and installing the alternative system.

Where a tenderer is proposing an alternative system, they must give full information and demonstrate that it has worked effectively in a similar environment.

Dublin City Council reserves the right to do a reference check where a tenderer is proposing an alternative system.

2. Project overview

Dublin City Council Traffic Department are undertaking a Traffic Management Control Room project, for the creation of a brand new main control room, secondary control room, and conference room in the NTCC Heuston, Dublin

The programme covers the supply, installation and configuration of new Audio Visual technology and furniture, plus the on-going support and maintenance of this new technology.

3. Functional Narrative

The new Heuston NTCC control room will be constructed in a space within the National Train Control Centre building located alongside Heuston Station in Dublin. The purpose built NTCC houses a number of different bodies, including the local Guarda and Irish Rail.

DCC's new control space features a number of different areas:

- Main Control Room (15 workstations)
- Secondary Control Room (4 workstations)
- Conference Room
- Break-out space

There is no existing technology to decommission or dispose of.

The use of the Heuston NTCC control spaces is primarily traffic monitoring and control. However, the space must also double as a planned and unplanned event management space; this includes unplanned incidents such as natural disasters, flooding and civil unrest, or planned events such as concerts, sports games and festivals.

DCC is undertaking structural changes to the space including the creation of dividing walls, suspended ceiling and computer flooring changes, HVAC system changes, lighting system changes, and general decorating.

A selection of visual renders have been provided as part of the documentation set to give an understanding of how the final spaces will look.

Main Control Room

Workstation furniture

Fifteen (15) individual workstation consoles must be arranged as shown in the provided layout drawings. Each workstation console must be identical.

Console Frame

The console frame must be 2150mm wide by 1000mm deep and manufactured from steel, aluminium & timber. The frame must be designed as a single unit with back-to-back connection facilities to suit floor plan layouts and incorporate common component parts for either configuration. Side-to-side connection must be achieved using ganging panels and bolt connections.

The console frame must be flexible, fulfilling a variety of applications from the same family of components, and accommodate multiple PCs within a ventilated, locking technology enclosure.

Removal of consoles from rows or blocks of desks must not require the removal of equipment or the dismantling of adjacent desks. There must be no shared frame componentry between desks other than modesty panels on back-to-back desks.

Electric Height Adjustment

The console must, as a minimum, meet IS EN 527-1:2011 Type A (or equivalent) legroom guideline with a required height adjustment range of 650-1250mm and reach a height of 1300mm starting from a 650mm position.

Please provide copies of your IS EN 527-1:2011 (or equivalent) certificates.

The electronic height-adjustable mechanism must include PIEZO (or equivalent) built-in anti-collision features. The anti-collision system must be integrated within the lifting system and react to an obstruction when raising or lowering the desk. If an obstruction is met, the system must halt and reverse to prevent damage. The system must work independently of load and temperature.

The console controller must have an LED display and be tilt-activated with 4 no. pre-set memory positions which can be set by the user. The controller, as standard, must also incorporate Bluetooth wireless connectivity and come with its own iOS / Android app-based system. When paired with the controller, the app must allow the user to keep track of their personal desk usage statistics on a smart device and be notified when to stand.

The console requires a minimum lift capacity of 240kg

Desktop

The console worktop must be manufactured from a single piece of high-pressure laminate. The worktop must be fully encapsulated with polyurethane edging and incorporate raised side/rear polyurethane edging to prevent liquid spillages from entering the console. The front edge requires a profiled straight front edge with an integral finger pull below. The worktop must be fully removable without the use of tools and without impacting any other components within the console.

A slide & lock worktop operation must be incorporated into the worktop as standard. The mechanism, when released, must allow the worksurface to slide forward and back to provide ease of access to the technology enclosure below the worksurface and allow for the passing of plugs, IEC connectors, and monitor cables. When the worktop is forward and fully open, it must lock to prevent accidental closure. A finger gap is required between consoles

Monitor Rail

Personal power/connectivity units and monitor arms must be mounted to a structural aluminium rail at the rear of each console. This rail must enable component fixing at any point along the entire width of the console.

As standard, the monitor rail must incorporate a full-width brush strip along its front face to neatly cover cables passing between the worktop and the underside of the console. With the strip running along the whole width of the console, cables must continue to have an unrestricted route to the underside of the console at any point along the rail.

Power sockets must be mounted to the underside of the monitor rail and within the technology enclosure. The sockets must be accessible when the desktop is slid forward and locked in an open position.

Technology Enclosure

Each console requires a technology enclosure to accommodate PCs/KVM switches. The enclosure must be suspended from the underside of the console and move up and raise/lower with the desktop.

The enclosure must include cable management trays, equipment mounting shelves, ventilation, and an upwardly hinged locking access door.

The enclosure is required to be fully compliant with IS EN 527-1:2011 Type A (or equivalent) and must not encroach on the operator's legroom or knee space when seated. The enclosure must be free of sharp edges.

Cable Management and Termination Board

Under-floor to worktop cabling must be routed and considered within the framework of the console. Vertical timber termination mounting boards must be fitted to both left and right-hand sides of the leg frames, with each board accommodating up to 2 isolation switches and a 6-outlet GOP box. The termination boards require lift-off metal covers to hide and protect equipment.

A cable chain is required to connect the base frame to the technology enclosure. The cable chain must move in a controlled manner as the console is lowered/raised. The cable chain must require tool-free gates providing access to cables within the chain.

The cable chain requires the flexibility to mount on either the left or right-hand side of the enclosure, and must be a minimum of 110mm wide x 40mm deep to adequately manage cables.

Heat Management

The console requires a natural convection heat management system to avoid overheating of PCs within the console. The console must be tested to the criteria below with CFD (or equivalent) modelling to support.

- Manage a continuous PC thermal load of 1300 watts.
- PC air intake not to exceed a temperature of 35°C at any time.
- Air speed in the user's knee well not to exceed a velocity of 0.15 m/s.
- User's knee well temperature not to exceed +2°C from ambient

Monitor Arms

Monitor arms must be durable, suitable for control room environments, be certified to IS EN ISO 9241-5:1999 (Ergonomic requirements for office work with visual display terminals) or equivalent, with FIRA (or equivalent) certification for ergonomic excellence.

The monitor arrangement must be 4 x 27” monitors per console. The monitor arms must include the following features.

- dynamic vertical & horizontal arm adjustment
- up to 11kg per monitor
- up to 40kg post weight load
- horizontal monitor sliders
- cable management
- aluminium construction, quick release VESA (or equivalent) plate
- quick release monitor beam fixing bracket/interface
- flexibility to adapt to future reconfiguration.

2–Drawer Mobile Cushioned Pedestal

Each console requires a lockable 2-drawer mobile under-desk steel pedestal with over-sailing drawer front, cushion top, pull handle, and must include the following;

- 505mm high x 420mm wide x 570mm deep (excluding cushion)
- 1 x 100% extension stationery drawers (20kg carrying capacity per drawer)
- 1 x 100% extension file drawer, file hanging frame for A4 files (40kg carrying capacity)
- drop-in pen tray
- anti-tilt mechanism
- combination locks

- FIRA (or equivalent) certified
- upholstered seat cushion (mid-range fabric)

Above Worktop Connectivity Unit

Each console requires a desktop connectivity module, mounted to the monitor rail at the rear of the console and include the following features:

- 1no. power (3.15A),
- 1no. USB C-outlet + 1.8m fly leads to plug
- 2m lead to male GST 18/3
- 1no.USB Type A & C fast charge

In-Desk Electrics

Power units beneath the desk must be modular with rotational fused sockets and include the following:

- 2no. 16A 5 metre feed modules with 13A plugs
- 2no. RCD protection modules
- 1no. 4 gang rotational sockets with individual 3.15A fuse
- 1no. 4 gang rotational sockets with individual 3.15A fuse & GST connector to end
- All Interconnecting cables

Monitor Cabling

'Y' power cables are required for monitors, which allow two monitors to be powered from one power outlet. Each cable must have a 13A plug on the single lead end and 2 no. IEC connectors on the opposite ends.

The vendor must install these as part of their installation.

Back/End & Modesty Panels

Single consoles require a 2150mm wide, high-pressure MDF (or equivalent) laminated timber back panel. To the ends of runs, all consoles must have end panels. All panels require adjustable levelling feet and ABS (or equivalent) edging on all sides.

Back-to-back console configurations must have a modesty panel of timber construction between users.

Certification

The console proposed must have been tested and comply with the following British & European Standards, or their equivalents:

IS EN ISO 9241: 1999 Ergonomic requirements for office work with visual display terminals (VDT's) Part 5: Workstation layout and postural requirements

IS EN 527-1: 2011 Office Furniture - Work Tables and Desks Part 1: Dimensions

IS EN 527-2: 2002 Clause 3: General Design Requirements

IS EN 527-2: 2002 Clause 4: Structural Safety Requirements

IS EN 527-3: 2003 Test methods for the determination of Stability and Mechanical Strength

BS 6396: 2008 Electrical Systems in Office Furniture and Office Screens

FIRA PP045: 2003 Severe Use (Overload Only), Safe Working Load – minimum 25Kg

BS 5940: 1980 Office Furniture Part 1: Specification for design and dimensions of office workstations, desks, tables and chairs

BS 5459: 1977 Part 1: Performance Requirements for Desks and Tables

BS 5459: 1983 Part 3: Performance Requirements for Storage Furniture

BS 4875: 1985 Parts 5, 6 and 7: Strength and Stability of Desks and Tables

BS 4875: 1985 Part 8: Strength and Stability of Storage Furniture

Operator Chair

- Controller chair in leather with fabric centre section
- 200kg weight rating
- controller headrest
- fixed cushion
- high backrest
- adjustable armrests
- tilt/rocker

Peripheral Furniture

Ø1200 x 730H Breakout Room Table

- 2 no. 4-person circular laminate table with RAL9005 (or equivalent) black powder coated base

Breakout Chair

- black aluminium sled base
- polyamide shell
- upholstered seat cushion (mid-range fabric)
- stacking height (5 pieces)

Storage Lockers

- bank 1 - 1000H 6 over 6
- bank 2 - 1000H 8 over 8

- combination lock
- MFC (or equivalent) finish to match console worktops
- Each locker 300W x 300D

Storage Shelves

- 1000W x 1800H c 700D metal frame
- 4no. Adjustable shelves
- laminate finish to match console worktops

Technology

Each workstation must have the following at the desktop:

- 4 x 27” monitors mounted on desk mounted arms providing height, lateral, and twist adjustment.
    - Monitor dimensions are key to ensuring 4 monitors fit within the desk width, in the arrangement detailed on the provided layout drawings
    - Each monitor must support native 4k resolution at 60Hz via a single HDMI connection
- Wired USB keyboard and mouse
- Laptop connection point (USB-C and HDMI)
- Telephone handset (Client Furnished Item)
- Bluetooth headset with charger for MS Teams calling
- USB webcam located on top of centre monitor for MS Teams calling

Each workstation must have the following mounted within it:

- Quad video output operator tower PC (Client Furnished Item)
- Video wall/KVM system encoders and decoders
- Power management

Video Wall

9680mm x 1365mm | 10240 x 1440 pixels | 1600 nits max | 0.9mm pixel pitch with remote power supplies

The video wall is the main display screen in the control room. It is used to give oversight and a contextual view for all in the control room. The image ratio of the video wall is 64:9, or 4 x 16:9 wide images.

The video wall must be mounted onto the existing wall structure, with necessary strengthening and support of the wall being provided as part of the DCC fit-out works. The contractor must allow for applying corrective measures to ensure the wall is flat enough to take the video wall.

The DC power supplies for the video wall must be located in the nearby comms room to aid maintenance and to remove a heat source from the control room.

The video wall must be fed from the central video wall processing system via the video wall controllers, providing windowing, scaling and image ratio management across the display. All image signal cabling must be resilient to distance through correct signal and cable management, or through signal extension devices as appropriate.

Sources

Any of the sources that are connected to the central video wall processing system must be displayable on the wall.

Available sources must be:

- all of the 456 traffic monitoring cameras distributed through the city. All cameras are native IP network cameras. IP streams are a combination of H264 and RTSP protocols,
- Two outputs from each of the control room and secondary control room's 19 (in total) workstation computers, derived as a copy of the workstation computer's 3rd and 4th display screen output.
- The laptop HDMI or USB-C input at each of the control room workstation desks.
- A pair of centrally located client computers with dual 4K outputs
- A Microsoft Teams Room device that provides Teams conferencing for the whole control room space
- Off-air TV in the form of a set-top box providing aerial based terrestrial digital television

It must be possible to turn on and off naming of the sources shown on the wall as an overlay to the image itself, via the control touchpanels or VMS controls app integration, to enable easy identification of the source being shown.

Source selection and arrangement

The system must provide source selection and arrangement controls in the following three ways:

Method 1: A pair of control touchpanels with password protected access located on key desks within the control room, anticipated as being the supervisor desk plus one other. Preset video wall layouts must be provided on the touchpanel, with the ability to route any of the available sources to any window. Key preset video wall window layouts including predefined sources must be established with the client team during the project, that can be quickly and easily available to operators via the touchscreen. The integrator must allow for the iterative design process of this GUI, including changing and updating layouts during the first 3 months of control room operation.

Method 2: It must also be possible to manipulate the layout of camera feeds and other sources on the video wall using a plug-in application that runs within the control room VMS (Video Management System). This application must provide preset layouts, with easy drag and drop routing of sources to windows. This must also include sources not directly viewable within the VMS, such as Teams and off-air TV.

Method 3: KVM (Keyboard Video Mouse) operation (defined as the ability to operate remote computers using a workstation's keyboard and mouse) must be integrated into the video wall

processing system. By the operator moving their mouse to the top of their video wall connected personal screen and pushing beyond the boundary, the mouse must appear on the video wall and must be able to expand windows by double-clicking on them, and interact with the content of the window if that source is KVM enabled.

Central computers

The centrally located quad output computers can be used to provide content onto the video wall without tying up user's workstation computers. In order to be able to administer them and adjust the content prior to showing on the video wall, it must be possible for the operators to use the KVM functionality to bring two of the central computers quad outputs onto two of their workstation's 4 x monitors, and operate them using the workstation's keyboard and mouse. This must be easily achievable through workstation KVM connected keyboard shortcuts and pop-up on screen menus.

MS Teams

The client's existing conferencing platform is Microsoft Teams. The control room must be equipped with a dedicated Microsoft Teams Room device that provides audio and video out of and into the space via the MS Teams platform.

Control of the MTR must be via a standard and separate MTR touchpanel located on the supervisor's desk. The exact location of the supervisor's desk is yet to be agreed.

Cameras

The MTR device must be paired with a comprehensive PTZ camera switching system that must capture anyone within the control room speaking whilst on the call. Using the XYZ positioning information provided by the multiple ceiling mounted array microphones, it must select the most appropriate camera and move the camera to the correct view capturing the person speaking. Importantly, there must be no camera PTZ movement visible by the far end of the MS Teams call.

Microphone audio

Microphone audio must be provided by ceiling mounted array microphones. The microphones must be mounted through the suspended ceiling. The microphones must be configured to provide the best quality speech audio possible. The microphone coverage across the space must be split into multiple zones; these zones must be controllable via the room touchpanel such that they can be activated and deactivated depending on the areas of the control room that must and must not be involved in the MS Teams call. This must reduce background audio from those not involved in the call. (For personal calls, the room users have the ability to call from their workstation PCs using the headset and webcam).

Teams audio reproduction

Far end Teams audio must be played into the space via the array of ceiling loudspeakers, also zone selectable and volume controllable via the room touchpanels.

Control

A pair of control touchpanels must be located on two workstations within the control room. One must be on the supervisor's desk (the location of which is to be agreed), and the second must be at a strategically convenient location, likely the opposite side of the control room to provide access to other users.

The control touchpanel must provide access to the following controls, as a minimum:

- System on/off
- Video wall on/off (genuine off, not just black)
- Videowall layout presets
- Videowall window source selection
- Active audio source selection
- Active audio source volume control
- Loudspeaker zone controls
- Microphone zone controls
- Off-air TV channel controls
- Lighting controls

Secondary Control Room

The Secondary Control Room is designed to allow traffic management to continue to be undertaken if the rest of the control space (ie Main Control Room) is being used for a planned or unplanned event.

It is divided from the Main Control Room by a glass wall with sliding door access. This acoustically isolates the two control rooms, but allows a visual connection and awareness to remain.

It must be possible to operate both control rooms as one large space with the glass doors open, if the event demands it.

Workstations

Four (4) individual workstations and chairs must be arranged as shown in the provided layout drawings. Each workstation must be identical in terms of desk and chair as those within the Main Control Room.

Technology

Each workstation must have the following at the desktop:

- 4 x 27” monitors mounted on desk mounted arms providing height, lateral, and twist adjustment.
    - Monitor dimensions are key to ensuring 4 monitors fit within the desk width, in the arrangement detailed on the provided layout drawings
    - Each monitor must support native 4k resolution at 60Hz via a single HDMI connection
- Wired USB keyboard and mouse
- Laptop connection point (USB-C and HDMI)
- Telephone handset (Client Furnished Item)
- Bluetooth headset with charger for MS Teams calling
- USB webcam located on top of centre monitor for MS Teams calling

Each workstation must have the following mounted within it:

- Quad video output operator tower PC
- Video wall/KVM system encoders and decoders
- Power management

Video Wall

5440mm x 1360mm | 5760 x 1440 pixels | 1600 nits max | 0.9mm pixel pitch with remote power supplies

The video wall is the main display screen in the secondary control room. It is used to give oversight and a contextual view for all in the control room. The image ratio of the video wall is 36:9, or 2.25 x 16:9 wide images.

The video wall must be mounted onto the existing wall structure, with necessary strengthening and support of the wall being provided as part of the DCC fit-out works. The contractor must allow for applying corrective measures to ensure the wall is flat enough to take the video wall.

The DC power supplies for the video wall must be located in the nearby comms room to aid maintenance and to remove a heat source from the control room.

The video wall must be fed from the central video wall processing system via the video wall controllers, providing windowing, scaling and image ratio management across the display. All image signal cabling must be resilient to distance through correct signal and cable management, or through signal extension devices as appropriate.

Sources

Any of the sources that are connected to the central video wall processing system must be displayable on the wall. Controls must be available to manage the accessibility of sources if they are already in use by another space, particularly for KVM interactivity.

Available sources must be:

- all of the 456 traffic monitoring cameras distributed through the city. All cameras are native IP network cameras. IP streams are a combination of H264 and RTSP protocols, depending on the camera.
- Two outputs from each of the control room and secondary control room's 19 workstation computers, derived as a copy of the workstation computer's 3rd and 4th display screen output.
- The laptop HDMI or USB-C input at each of the control room workstation desks.
- The pair of centrally located client computers with dual 4K outputs
- A Microsoft Teams Room device that provides Teams conferencing for the whole control room space
- Off-air TV in the form of a set-top box providing aerial based terrestrial digital television

It must be possible to turn on and off naming of the sources shown on the wall as an overlay to the image itself, via the control touchpanels or VMS controls app integration, to enable easy identification of the source being shown.

Source selection and arrangement

The system must provide source selection and arrangement controls in the following three ways:

Method 1: A pair of control touchpanels with password protected access located on key desks within the control room, anticipated as being the supervisor desk plus one other. Preset video wall layouts must be provided on the touchpanel, with the ability to route any of the available sources to any window. Key preset video wall window layouts including predefined sources must be established with the client team during the project, that can be quickly and easily available to operators via the touchscreen. The integrator must allow for the iterative design process of this GUI, including changing and updating layouts during the first 3 months of control room operation.

Method 2: It must also be possible to manipulate the layout of camera feeds and other sources on the video wall using a plug-in application that runs within the control room VMS (Video Management System). This application must provide preset layouts, with easy drag and drop routing of sources to windows. This must also include sources not directly viewable within the VMS, such as Teams and off-air TV.

Method 3: KVM (Keyboard Video Mouse) operation (defined as the ability to operate remote computers using a workstation's keyboard and mouse) must be integrated into the video wall processing system. By the operator moving their mouse to the top of their video wall connected personal screen and pushing beyond the boundary, the mouse must appear on the video wall and must be able to expand windows by double-clicking on them, and interact with the content of the window if that source is KVM enabled.

Central computers

The same pair of client supplied, centrally located quad 4k output computers must be accessible by the secondary control room. They can be used to provide content onto the video wall without tying up user's workstation computers. In order to be able to administer them and adjust the content prior to showing on the video wall, it must be possible for the operators to use the KVM functionality to bring the central computers quad outputs onto their workstation's 4 x monitors, and operate them using the workstation's keyboard and mouse. This must be easily achievable through workstation KVM connected keyboard shortcuts and pop-up on screen menus.

MS Teams

The client's existing conferencing platform is Microsoft Teams. The control room must be equipped with a dedicated Microsoft Teams Room device that provides audio and video out of and into the space via the MS Teams platform.

Control of the MTR must be via a standard and separate MTR touchpanel located on the supervisor's desk. The exact location of the supervisor's desk is yet to be agreed.

Cameras

The MTR device must be paired with a comprehensive PTZ camera switching system that must capture anyone within the control room speaking whilst on the call. Using the XYZ positioning information provided by the multiple ceiling mounted array microphones, it must select the most appropriate camera and move the camera to the correct view capturing the person speaking. Importantly, there must be no camera PTZ movement visible by the far end of the MS Teams call.

Microphone audio

Microphone audio must be provided by a ceiling mounted array microphone. The microphone must be mounted through the suspended ceiling. The microphone must be configured to provide the best quality speech audio possible. The microphone coverage across the space must be split into multiple zones; these zones must be controllable via the room touchpanel such that they can be activated and deactivated depending on the areas of the control room that must and must not be involved in the MS Teams call. This must reduce background audio from those not involved in the call. (For personal calls, the room users must be able to call from their workstation PCs using the headset and webcam).

Teams audio reproduction

Far end Teams audio must be played into the space via the array of ceiling loudspeakers, also zone selectable and volume controllable via the room touchpanels.

Control

A pair of control touchpanels must be located on two workstations within the control room. One must be on the supervisor's desk (the location of which is to be agreed), and the second must be at a strategically convenient location, likely the opposite side of the control room to provide access to other users.

The control touchpanel must provide access to the following controls, as a minimum:

- System on/off
- Video wall on/off (genuine off, not just black)
- Videowall layout presets
- Videowall window source selection
- Active audio source selection
- Active audio source volume control
- Loudspeaker zone controls
- Microphone zone controls
- Off-air TV channel controls
- Lighting controls

Conference Room

The Conference Room adjoins the Main Control Room, and is used both for regular scheduled meetings and unplanned event gatherings. It is also used by event management to develop strategic plans outside the bounds of the Control Rooms.

Furniture

The Conference Room must be equipped with a new conference table with integrated cable and power management, plus 12 new chairs.

Conference Table

3500W x 4250L boardroom table complete with laminate worksurface and 4 x power docks each consisting of:

- 2 x UK power sockets (3.15A)
- 1 x USB-C outlet + 1.8m fly leads to plug
- 1 x HDMI outlet + 1.8m fly leads to plug

Conference Room Chairs

- cantilever frame with armrests
- mesh back
- upholstered (mid-range fabric) seat cushion
- stacking height (4 pieces)

Technology

The conference table must have the following at the table top:

- Wireless USB keyboard and mouse connected to the conference room KVM system

There must also be two cable cubbies with the following in each:

- Laptop connection point (USB-C and HDMI)
- 2 x power sockets
- 1 x USB-A and 1 x USB-C charging sockets

And a further two cable cubbies (making four in total) with the following in each:

- Network port for Teams MTR device touchpanel
- Network port for control system touchpanel
- 1 x USB-A and 1 x USB-C charging sockets

The conference table must have the following mounted within it:

- Video wall/KVM system encoders
- USB extender
- Power management

Video Wall

5440mm x 1360mm | 5760 x 1440 pixels | 1600 nits max | 0.9mm pixel pitch with remote power supplies

The video wall is the main display screen in the secondary control room. It is used to give oversight and a contextual view for all in the control room. The image ratio of the video wall is 36:9, or 2.25 x 16:9 wide images.

The video wall must be mounted onto the existing wall structure, with necessary strengthening and support of the wall being provided as part of the DCC fit-out works. The contractor must allow for applying corrective measures to ensure the wall is flat enough to take the video wall.

The DC power supplies for the video wall must be located in the nearby comms room to aid maintenance and to remove a heat source from the control room.

The video wall must be fed from the central video wall processing system via the video wall controllers, providing windowing, scaling and image ratio management across the display. All image signal cabling must be resilient to distance through correct signal and cable management, or through signal extension devices as appropriate.

Sources

Any of the sources that are connected to the central video wall processing system must be displayable on the displays in the conference room.

Available sources must be:

- all of the 456 traffic monitoring cameras distributed through the city. All cameras are native IP network cameras. IP streams are a combination of H264 and RTSP protocols,
- Two outputs from each of the control room and secondary control room's 19 workstation computers, derived as a copy of the workstation computer's 3rd and 4th display screen output.
- The laptop HDMI or USB-C input at each of the control room workstation desks.
- The pair of centrally located client computers with dual 4K outputs
- A Microsoft Teams Room device that provides Teams conferencing for the whole control room space
- Off-air TV in the form of a set-top box providing aerial based terrestrial digital television

It must be possible to turn on and off naming of the sources shown on the displays as an overlay to the image itself, via the control touchpanels or VMS controls app integration, to enable easy identification of the source being shown.

Source selection and arrangement

The sources shown and the arrangement of these sources must be controlled via a conference table-top located touchpanel with password protected access. Key preset video wall window layouts including predefined sources must be established with the client team during the project, that must be quickly and easily available via the touchscreen, along with the ability to route any of the available sources to any window. The integrator must allow for the iterative design process of this GUI, including changing and updating layouts during the first 3 months of control room operation.

Central computers

The same pair of client supplied, centrally located quad 4k output computers must be accessible by the conference room. These computers can be used to provide content onto the video wall, along with (through hierarchical KVM access controls) any of the connected workstation computers and laptops. This must be easily achievable through the tabletop KVM connected keyboard shortcuts and pop-up on screen menus.

MS Teams

The client's existing conferencing platform is Microsoft Teams. The conference room must be equipped with a dedicated Microsoft Teams Room device that must provide audio and video out of and into the space via the MS Teams platform.

Control of the MTR must be via a standard and separate MTR touchpanel that must be located on the conference room table.

Cameras

The MTR device must be paired with a comprehensive PTZ camera switching system that must capture anyone within the conference room speaking whilst on the call. Using the XYZ positioning information provided by the multiple ceiling mounted array microphones, it must select the most appropriate camera and move the camera to the correct view capturing the person speaking. Importantly, there must be no camera PTZ movement visible by the far end of the MS Teams call.

Microphone audio

Microphone audio must be provided by a ceiling mounted array microphone. The microphone must be mounted through the suspended ceiling. The microphone must be configured to provide the best quality speech audio possible.

Teams audio reproduction

Far end Teams audio must be played into the space via the array of ceiling loudspeakers, volume controllable via the room touchpanel.

Control

A control touchpanel must be located on the conference room table.

The control touchpanel must provide access to the following controls, as a minimum:

- System on/off
- Displays on/off
- Display windows layout presets
- Display windows source selection
- Active audio source selection
- Active audio source volume control
- Off-air TV channel controls
- Lighting controls (tbc)

National Transport Authority offices

As part of this project, the NTA need a display that can show traffic related information, in particular bus route operations, located at their offices at Haymarket, Smithfield, Dublin.

A single wall mounted 65” display must be mounted to a wall outside the NTA’s boardroom, driven by an NTA supplied PC, located within the office area adjacent to the boardroom. The exact location must be defined by the contractor with the NTA.

To facilitate the video connection from the PC to the display, a HDMI over CATx transmitter/receiver pair must be provided and installed by the contractor. These devices must transmit up to 4K resolution 30Hz at 4:4:4 up to 100 metres.

Technology Equipment List

The following technology forms part of the example design for all the Control Room spaces:

Please note in relation to all documents, where reference is made to a particular standard, make, source, process, trademark, type or patent, that this is not to be regarded as a de facto requirement. In all such cases it should be understood that such indications are to be treated strictly and solely for reference purposes only, to which the words "or equivalent" will always be appended.

HEUSTON - MAIN CONTROL ROOM

Qty	Item	Manufacturer	Model Number
	Control Room Equipment		
	Video Wall		
1	LED Wall: DLS 0.9pp (Microled) | 32x2 cabinet format | 10240*1440px | 9.68m x 1.36m | 384.7" (5% spares, wall mount and trims, remote power included) (LEYARD Quote 00154977 - 10) or equivalent	Leyard or equivalent	DirectLight Slim 0.9mm or equivalent
1	Gold Install Service for 1 20x2 DL S|AT UK or equivalent	Layard Planar or equivalent	Gold Install 32x2 or equivalent
	Workstations		
60	27" UHD 4K and up to 144Hz refresh rate monitor	LG or equivalent	27GR93U-B or equivalent
60	Monitor mount brackets - come as part of workstation furniture package	Note	
30	Single HDMI IP-KVM Encoder (For Operator PC)	VuWall or equivalent	VuStream-350 or equivalent
15	Operator Workstation Decoder Node (4 Output - 2 x HDMI 2.0b & 2 x DP 1.4a)	VuWall or equivalent	PAK-40-2 or equivalent
15	Single Channel H.264 Encoder (For Operator Laptop)	VuWall or equivalent	VuStream-150-3 or equivalent
15	Desktop PC with 4-output 4K HDMI card	CFI	
15	1080p Full HD @ 30 fps Local desk webcam	Huddly or equivalent	One or equivalent
15	4×3 MultiStream USB-C / HDMI 2.0 Matrix Switcher	Lightware or equivalent	UCX-4X3-HCM40 or equivalent
	Camera system		

4	12x Optical Zoom 80° Horizontal Field of View, PTZ Network Camera, PoE, with HDMI and SDI output. Includes PTZ-WMB1 wall mount bracket or equivalent	Q-SYS or equivalent	NC-12x80 or equivalent
4	Wall/Ceiling mount bracket for cameras	Q-SYS or equivalent	Included
1	NC-110 fixed-lens, ePTZ camera that features a 110° horizontal field-of-view or equivalent	Q-SYS or equivalent	NC-110 or equivalent
	Audio		
12	In-ceiling 6.5-inch, 2-way, 135° conical DMT (White colour)	Q-SYS or equivalent	AD-C6T or equivalent
4	Ceiling Array Microphone (White colour)	Shure or equivalent	MXA920 or equivalent
4	Through-ceiling mount for ceiling array microphone	Integrator	
15	Stereo Wireless PC & Bluetooth Headset	Jabra or equivalent	Evolve 65 SE or equivalent
15	IP phone unit	CFI	
	Control		
1	Wall mounted clock with day and date calendar	Wharton or equivalent	4510x.05 or equivalent
15	Corded Keyboard & Mouse Combo (for workstations)	Logitech or equivalent	920-002552 MK120 or equivalent
2	10.1” Professional-Grade Master Control Panel w/o cam and mic	Q-SYS or equivalent	TSC-101-G3 or equivalent
2	Table mount for table touchscreen	Q-SYS or equivalent	TSC-710t-G3 or equivalent
	Rack Room Equipment		

	Video		
2	Videowall Decoder Node (4 Output - 2 x HDMI 2.0b & 2 x DP 1.4a)	VuWall or equivalent	PAK-40-2 or equivalent
1	LED Wall Processor Sync Generator	AJA or equivalent	GEN-10 or equivalent
3	Single Channel H.264 Encoder (For Off-Air TV)	VuWall or equivalent	VuStream-150-3 or equivalent
3	Off-Air TV set-top-box Freeview/Freesat	Integrator	TBC
2	Rack mounted PC with quad 4K HDMI output graphics card	CFI	
8	Single HDMI IP-KVM Encoder (4 per Quad Output Rack PC)	VuWall or equivalent	VuStream-350 or equivalent
1	F119, 1U 19" 1080p LED-backlit LCD Console Drawer (Rack Mounted KVM Monitor) or equivalent	Austin Hughes or equivalent	F119E_UK or equivalent
1	Razor Mini SFF Admin PC (DVS RAZORmini MEDIA PLAYER - i5/128GB/16GB/Intel® Iris Xe Graphics) or equivalent	DVS or equivalent	Razor Mini or equivalent
1	Single HDMI IP-KVM Encoder (For Admin PC)	VuWall or equivalent	VuStream-350 or equivalent
1	Local KVM Viewer Decoder Node (4 Output - 2 x HDMI 2.0b & 2 x DP 1.4a)	VuWall or equivalent	PAK-40-2 or equivalent
1	Q-SYS UC Compute Bundle in MTR touch panel and USB Linkbox or equivalent	Q-SYS or equivalent	UC-MTR-L or equivalent
1	Q-SYS Software Feature License for Microsoft Teams Rooms (Scripting + UCI Licenses included) or equivalent	Q-SYS or equivalent	SLMST-8N-P or equivalent
1	Q-SYS NV-21 -HU (Decoder for MS Teams Camera input) or equivalent	Q-SYS or equivalent	NV-21-HU or equivalent
1	MS Teams Content Share and Camera Decoder Node (4 Output - 2 x HDMI 2.0b & 2 x DP 1.4a)	VuWall or equivalent	PAK-40-2 or equivalent
1	Single Channel H.264 Encoder (For MS Teams Room Compute)	VuWall or equivalent	VuStream-150-3 or equivalent
1	TRx Central Management Software ad TRx Appliance Server or equivalent	VuWall or equivalent	TRx-ENT-3SMC or equivalent
1	TRx CS License - Unlimited Capture - VNC Sources or equivalent	VuWall or equivalent	TRx-CS or equivalent

1	TRx VMS License - Genetec Plugin or equivalent	VuWall or equivalent	TRx-VMS or equivalent
20	TRx KVM License	VuWall or equivalent	TRx-KVM or equivalent
1	VW-Server-TRx-PAK-Config or equivalent	VuWall or equivalent	VW-Server-TRx-PAK Config or equivalent

1	VW-Server-MP-Cluster-4 - VuWall MP Appliance Servers for TRx Enterprise for Redundancy or equivalent	VuWall or equivalent	VW-Server-MP-Cluster-4 or equivalent
	Audio		
1	Audio DSP control Processor (128 networked audio channels (Q-LAN / AES67))	Q-SYS or equivalent	Q-SYS CORE-110F (V2) or equivalent
1	32x32 DANTE License expansion for Audio DSP Processor	Q-SYS or equivalent	SLDAN-32-P or equivalent
3	Four-Channel Network Amplifier (120W@100v in bridged mode) & Q-LAN	Q-SYS or equivalent	SPA-Qf 60x4 or equivalent
	Control		
1	F119, 1U 19" 1080p LED-backlit LCD Console Drawer (Rack Mounted KVM Monitor) or equivalent	Austin Hughes or equivalent	F119E_UK or equivalent
1	10.1” Professional-Grade Master Control Panel w/o cam and mic	Q-SYS or equivalent	TSC-101-G3 or equivalent
1	Bespoke rack mount for rack mounted touchscreen	Integrator	
1	Q-SYS Network I/O Expander - Fire alarm, Lighting and HVAC control interface	Q-SYS or equivalent	QIO-GP8x8 or equivalent
1	Q-SYS Network serial port expander - Fire alarm, Lighting and HVAC control interface	Q-SYS or equivalent	QIO-S4 or equivalent
	Hardware		

3	Equipment racks 42U - existing		
3	Vertical managed rack power distribution	Integrator	
1	Site cabling, connectors and consumables	Integrator	

HEUSTON - SECONDARY CONTROL ROOM

Qty	Item	Manufacturer	Model Number
1	**Secondary Room Equipment**		
1	**Video Wall**		
1	LED Wall: DLS 0.9pp (Microled) | 18x2 cabinet format | 5760*1440px | 5.44m x 1.36m | 220.9" (5% spares, wall mount and trims, remote power included) (LEYARD Quote 00154977 - 10) or equivalent	Leyard or equivalent	DirectLight Slim 0.9mm, or equivalent
1	Gold Install Service for 1 20x2 DL S|AT UK Estimated at 3.6 working days or equivalent	Leyard Planar or equivalent	Gold Install 18x2 or equivalent
	Workstations		
16	27" UHD 4K and up to 144Hz refresh rate monitor	LG or equivalent	27GR93U-B or equivalent
16	Monitor mount brackets - come as part of workstation furniture package	Note	
8	Single HDMI IP-KVM Encoder (For Operator PC)	VuWall or equivalent	VuStream-350 or equivalent
4	Operator Workstation Decoder Node (4 Output - 2 x HDMI 2.0b & 2 x DP 1.4a)	VuWall or equivalent	PAK-40-2 or equivalent
4	Single Channel H.264 Encoder (For Operator Laptop)	VuWall or equivalent	VuStream-150-3 or equivalent
4	Desktop PC with 4-output 4K HDMI card	CFI	
4	1080p Full HD @ 30 fps Local desk webcam	Huddly or equivalent	One or equivalent
4	4×3 MultiStream USB-C / HDMI 2.0 Matrix Switcher	Lightware or equivalent	UCX-4X3-HCM40 or equivalent
	Camera system		

3	12x Optical Zoom 80° Horizontal Field of View, PTZ Network Camera, PoE, with HDMI and SDI output. Includes PTZ-WMB1 wall mount bracket or equivalent	Q-SYS or equivalent	NC-12x80 or equivalent
3	Wall/Ceiling mount bracket for cameras	Q-SYS or equivalent	Included
1	NC-110 fixed-lens, ePTZ camera that features a 110° horizontal field-of-view or equivalent	Q-SYS or equivalent	NC-110 or equivalent
	Audio		
4	In-ceiling 6.5-inch, 2-way, 135° conical DMT (White colour)	Q-SYS or equivalent	AD-C6T or equivalent
1	Ceiling Array Microphone (White colour)	Shure or equivalent	MXA920 or equivalent
1	Through-ceiling mount for ceiling array microphone	Integrator	
4	Stereo Wireless PC & Bluetooth Headset	Jabra or equivalent	Evolve 65 SE or equivalent
4	IP phone unit	CFI	
	Control		
1	Wall mounted clock with day and date calendar	Wharton or equivalent	4510x.05 or equivalent
4	Corded Keyboard & Mouse Combo (for workstations)	Logitech or equivalent	920-002552 MK120 or equivalent
2	10.1” Professional-Grade Master Control Panel w/o cam and mic	Q-SYS or equivalent	TSC-101-G3 or equivalent
2	Table mount for table touchscreen	Q-SYS or equivalent	TSC-710t-G3 or equivalent
	Rack Room Equipment		
	Video		

2	Videowall Decoder Node (4 Output - 2 x HDMI 2.0b & 2 x DP 1.4a)	VuWall or equivalent	PAK-40-2 or equivalent
1	LED Wall Processor Sync Generator	AJA or equivalent	GEN-10 or equivalent
1	Q-SYS UC Compute Bundle inc MTR touch panel and USB Linkbox or equivalent	Q-SYS or equivalent	UC-MTR-L or equivalent
1	Q-SYS Software Feature License for Microsoft Teams Rooms (Scripting + UCI Licenses included)	Q-SYS or equivalent	SLMST-8N-P or equivalent
1	Q-SYS NV-21 -HU (Decoder for MS Teams Camera input) or equivalent	Q-SYS or equivalent	NV-21-HU or equivalent
1	MS Teams Content Share Decoder Node (4 Output - 2 x HDMI 2.0b & 2 x DP 1.4a)	VuWall or equivalent	PAK-40-2 or equivalent
1	Single Channel H.264 Encoder (For MS Teams Room Compute)	VuWall or equivalent	VuStream-150-3 or equivalent
	Audio		
1	Audio DSP control Processor (128 networked audio channels (Q-LAN / AES67)) (For secondary ctrl room and conference room)	Q-SYS or equivalent	Q-SYS CORE-110F (V2) or equivalent
1	32x32 DANTE License expansion for Audio DSP Processor	Q-SYS or equivalent	SLDAN-32-P or equivalent
	Hardware		
1	Site cabling, connectors and consumables	Integrator	

HEUSTON - CONFERENCE ROOM

Qty	Item	Manufacturer	Model Number
	Conference Room Equipment		
	Video		
1	LED Wall: DLS 0.9pp (Microled) | 18x2 cabinet format | 5760*1440px | 5.44m x 1.36m | 220.9" (5% spares, wall mount and trims, remote power included) (LEYARD Quote 00154977 - 10) or equivalent	Leyard or equivalent	DirectLight Slim 0.9mm, or equivalent
1	Gold Install Service for 1 20x2 DL S|AT UK Estimated at 3.6 working days or equivalent	Layard Planar or equivalent	Gold Install 18x2 or equivalent
4	12x Optical Zoom 80° Horizontal Field of View, PTZ Network Camera, PoE, with HDMI and SDI output. Includes PTZ-WMB1 wall mount bracket or equivalent	Q-SYS or equivalent	NC-12x80 or equivalent
4	Wall/Ceiling mount bracket for cameras or equivalent	Q-SYS or equivalent	Included
1	NC-110 fixed-lens, ePTZ camera that features a 110° horizontal field-of-view or equivalent	Q-SYS or equivalent	NC-110 or equivalent
1	AV Table Cubby	Crestron or equivalent	FT2-202-ELEC-PTL-B (6511666) or equivalent
1	AC Power Outlet Module for FT2 Series, Single, Universal	Crestron or equivalent	FT2A-PWR-UN-1-BASIC (6508440) or equivalent
1	USB Rapid Charging Module for FT2 ELEC Series, USB Type-C & Type-A High Power Charging Ports, Bus Powered	Crestron or equivalent	FT2A-CHGR-USBA/C (6508420) or equivalent
1	Pass-Through Cable for FT2 Series, HDMI? to HDMI, 18 Gbps, 8 ft (2.4 m)	Crestron or equivalent	FT2A-CBL-PT-4K-HD (6508397) or equivalent
1	Pass-Through Cable for FT2 Series, USB-C? to HDMI?, 18 Gbps, 8 ft (2.4 m)	Crestron or equivalent	FT2A-CBL-PT-4K-USBC-HD (6508408) or equivalent

1	Pass-Through Cable for FT2 Series, USB-C? to HDMI?, 18 Gbps, 8 ft (2.4 m)	Crestron or equivalent	FT2A-CBL-PT-4K-USBC-HD (6508408) or equivalent
1	Ranger 2304 4-Port USB 2.0 100m Cat 5e Extender System or equivalent	Icron or equivalent	RANGER 2304 or equivalent
3	4×3 MultiStream USB-C / HDMI 2.0 Matrix Switcher with mounting bracket	Lightware or equivalent	UCX-4X3-HCM40 or equivalent
3	Single Channel H.264 Encoder (For laptop inputs)	VuWall or equivalent	VuStream-150-3 or equivalent
	Audio		
6	In-ceiling 6.5-inch, 2-way, 135° conical DMT (White colour)	Q-SYS or equivalent	AD-C6T or equivalent
1	Ceiling Array Microphone (White colour)	Shure or equivalent	MXA920 or equivalent
1	Array microphone pole mount kit + pole	Shure or equivalent	A900-PM + pole or equivalent
1	IP conference phone unit	CFI	
	Control		
1	Wall mounted clock with day and date calendar	Wharton or equivalent	4510x.05 or equivalent
1	10.1” Professional-Grade Master Control Panel w/o cam and mic	Q-SYS or equivalent	TSC-101-G3 or equivalent
1	Corded Keyboard And Mouse Combo	Logitech or equivalent	920-002552 MK120 or equivalent
	Rack Room Equipment		
	Video		

2	Videowall Decoder Node (4 Output - 2 x HDMI 2.0b & 2 x DP 1.4a)	VuWall or equivalent	PAK-40-2 or equivalent
1	LED Wall Processor Sync Generator	AJA or equivalent	GEN-10 or equivalent
1	Single Channel H.264 Encoder (For MS Teams Room Compute)	VuWall or equivalent	VuStream-150-3 or equivalent
1	Single Channel H.264 Encoder (For Off-Air TV)	VuWall or equivalent	VuStream-150-3 or equivalent
1	Q-SYS UC Compute Bundle or equivalent	Q-SYS or equivalent	UC-MTR-L or equivalent
1	Q-SYS NV-21 -HU (Decorder for MS Teams Content Sharing) or equivalent	Q-SYS or equivalent	NV-21-HU or equivalent
1	MS Teams Content Share Decoder Node (4 Output - 2 x HDMI 2.0b & 2 x DP 1.4a)	VuWall or equivalent	PAK-40-2 or equivalent
	Audio		
1	Q-SYS Analog Telephony I/O Expander or equivalent	Q-SYS or equivalent	QIO-TEL2 or equivalent
	Hardware		
1	Site cabling, connectors and consumables	Integrator	

HEUSTON - FURNITURE

Qty	Item	Manufacturer	Model Number
	NTCC HEUSTON		
	Control Room		
15	Single Operator Kontrol Air Height Adjustable Console (to accommodate 4 monitor screens) with integrated cable management, modular steel equipment bay support structure, compact laminate work surface and end panel LED feature lights. ISO11064 (Part 4) compliant. Dimensions: 2030mm x 1090mm x 660mm - 1200mm (WxDxH)	LundHalsey or equivalent	Quote No. 24-07-037 or equivalent
82	Single Monitor Arm	LundHalsey or equivalent	Quote No. 24-07-037 or equivalent
15	Pull-out PC tray - rear	LundHalsey or equivalent	Quote No. 24-07-037 or equivalent
15	Pixel Power (1 power 2 USBfast charge) or equivalent	LundHalsey or equivalent	Quote No. 24-07-037 or equivalent
15	Mobile Kontrol Operator Storage (3 drawers, lockable) or equivalent	LundHalsey or equivalent	Quote No. 24-07-037 or equivalent
15	Chairs - Herman Miller - Mirra II (24/7) or equivalent	LundHalsey or equivalent	Quote No. 24-07-037 or equivalent
8	Double Locker unit	Furniture @ Work or equivalent	Probe Autumn or equivalent
2	Common area storage shelving (2.5 metres height and 0.9 metres long)	Furniture @ Work or equivalent	Rapid 2 Shelving or equivalent
4	Magnetic whiteboard with stand and castors (120x90 cms)	Furniture @	Revolving

		Work or equivalent	whiteboards or equivalent
	Secondary Room		
4	Single Operator Kontrol Air Height Adjustable Console (to accommodate 4 monitor screens) with integrated cable management, modular steel equipment bay support structure, compact laminate work surface and end panel LED feature lights. ISO11064 (Part 4) compliant. Dimensions: 2030mm x 1090mm x 660mm - 1200mm (WxDxH)	LundHalsey or equivalent	Quote No. 24-07-037 or equivalent
16	Single Monitor Arm	LundHalsey or equivalent	Quote No. 24-07-037 or equivalent
4	Pull-out PC tray - rear	LundHalsey or equivalent	Quote No. 24-07-037 or equivalent
4	Pixel Power (1 power 2 USBfast charge)	LundHalsey or equivalent	Quote No. 24-07-037 or equivalent
4	Mobile Kontrol Operator Storage (3 drawers, lockable)	LundHalsey or equivalent	Quote No. 24-07-037 or equivalent
4	Chairs - Herman Miller - Mirra II (24/7)	LundHalsey or equivalent	Quote No. 24-07-037 or equivalent
3	Double Locker unit	Furniture @ Work or equivalent	Probe Autumn or equivalent
	Conference/Incident Room		
1	Kontrol Meet Collaboration Table to accommodate 12 operators. Dimensions: 4060mm x 1555mm x 735mm or equivalent	LundHalsey or equivalent	Quote No. 24-07-037 or equivalent
2	Kontrol-Touch (2 x power 2 x USB fast charge power only) (UK Style) or equivalent	LundHalsey or equivalent	Quote No. 24-07-037 or equivalent
12	Chairs - Herman Miller - Mirra II (24/7) or equivalent	LundHalsey	Quote No. 24-

		or equivalent	07-037 or equivalent
	Kitchen Area		
2	Constant circular boardroom table	Furniture @ Work or equivalent	Constant circular Table or equivalent
8	Kitchen area chairs	Tech Desk or equivalent	Bodyflex or equivalent

NTA - BUS INFORMATION SCREEN

Qty	Item	Manufacturer	Model Number
1	65" Professional grade display. 4k UHD native, 18/7 warranty, LED backlit LCD	NEC or equivalent	M651 or equivalent
1	Slim wall mount bracket, with room for HDMI receiver behind	Integrator	
1	Dual head PC to drive display with on-line content	NTA supplied	
1	Local monitor, keyboard and mouse	NTA supplied	
1	HDMI over distance CAT6A receiver, with analogue audio de-embedder	Extron or equivalent	DTP3 R 201 or equivalent
1	HMDI 2:1 switcher with built-in CAT6A transmitter	Extron or equivalent	DTP3 T 203 or equivalent
1	Installation sundries	Integrator	

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