eHealth Queensland

ieMR
Centre of Excellence

ieMR Infrastructure Guidance

ieMR Centre of Excellence

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Purpose

The purpose of this document is to provide infrastructure guidance to a facility planning to rollout the ieMR solution. The document focuses on infrastructure needs and implications for items ranging from printers to networks.

The guidance is directional in nature to assist in determining the localised infrastructure scope for implementing the total ieMR solution. The ieMR Centre of Excellence and partners can provide site specific guidance upon request.

The information provided does not replace a thorough site survey and other related activities which will occur as part of an ieMR rollout project. It also does not lessen the need for the site project team to consult with clinicians and other stakeholders to ensure the equipment placement and volume supports the workflows in each hospital setting; clinical and non-clinical.

Cerner Certification

Peripherals such as printers, hand-held scanners and document scanners, and biomedical devices must be certified by Cerner to be used with Cerner Millennium.

The current list of supported peripherals is located on the DAS- ieMR portal:

http://iemrportal.health.qld.gov.au/Devices

Note: The inclusion of a device in the Cerner supported list does not guarantee the device will work as expected within the ieMR environment.

ieMR Device Validation

Peripherals and biomedical devices must be validated for use with ieMR irrespective of whether the device is certified by Cerner.

A summarised list of biomedical devices currently integrated with ieMR is maintained by QH Biomedical Technology Services (BTS). That list can be found here: https://qheps.health.qld.gov.au/__data/assets/pdf_file/0025/2124736/biomedical-devices-iemr.pdf. In all cases, BTS must be consulted to confirm the exact device model, firmware, modules, configuration etc are currently used with ieMR.

Contact the ieMR CoE for information to validate biomedical devices and peripherals not currently integrated with ieMR.

1.   Printers

All printers must be certified by Cerner for use with Cerner Millennium.

DAS ieMR has preferred printer vendors and models which are known to work successfully with ieMR.

1.1   Wristband Printer

- Used to print patient wristbands displaying patient information and barcodes for URN and encounter ID.
- Model recommended by DAS ieMR: Zebra HC100
- Data Communications: WiFi
- Power: wall socket
- Support: local IT Services

1.1.1   Example site: Logan

Logan Hospital has approximately 450 beds. 140 wristband printers are configured in ieMR.

An example of the distribution at Logan Hospital is (this is not a complete list):

- Generally, one located at reception desks in each ward.
- 4 in Medical Imaging
- 4 in Birth Suites
- 14 in Paediatrics
- 40 in Emergency Department

1.2   Specimen Label Printer

- Used for printing specimen labels. Portable, small form-factor printers improve ability to print and label specimens at bedside.
- Common model: Sato MB200i
- Data Communications: WiFi
- Power: wall socket
- Support: local IT Services

1.2.1   Example site: Logan

Logan Hospital has approximately 450 beds. 158 specimen label printers are configured in ieMR for Logan.

An example of the distribution at Logan Hospital is (this is not a complete list):

- Generally, one located at reception desks in each ward.
- 13 in Birthing Suites
- 4 in Paediatrics
- 2 in Medical Imaging

- 21 in Pathology
- 49 in ED

1.3 Single Patient Label Printer

- Used for printing adhesive labels displaying patient information for attachment to documents
- Common models: Zebra GK420T; SATO MB400i
- Data Communications: Ethernet
- Power: wall socket
- Support: local IT Services

1.3.1 Example site: Logan

Logan Hospital has approximately 450 beds. 59 single label printers are configured in ieMR.

An example of the distribution at Logan Hospital is (this is not a complete list):

- Generally, one located at reception desks in each ward.
- 1 in Birthing Suites
- 9 in Medical Imaging
- 4 in Paediatrics
- 9 in ED

1.4 Prescription Printer

- Prescription Printers, also called Tamper-proof Printers, are served through the front-end print servers.
- More often than not, a dedicated tamper-proof tray is configured on a printer also used for general printing.
- Prescription printers are associated with a physical location which is configured in Cerner
- Canon printers do not work successfully as prescription printers due to the printer overriding the chosen tray from which to print from; i.e. the printer may choose to print a prescription on paper from a tray different to that specified in the print job resulting on a prescription on plain paper stock.
- Common Model: HP 402dn
- Data Communications: Ethernet
- Power: wall socket
- Support: local IT Services

1.4.1 Example site: Princess Alexandra Hospital

PAH has approximately 780 beds and use tamper-proof trays on general printers. The distribution of tamper-proof trays on general printers at PAH is generally:

- Approximately 240 tamper-proof trays configured for the hospital

- 1 located in majority of consult, examination and clinic rooms for specialty clinics/departments, e.g. Renal, Radiation Oncology, Dermatology, etc.
- 1 per nurse station in Emergency Department
- 1 in locations such as ICU, MAPU and CCU

1.4.2 Example site: Logan

Logan Hospital has approximately 450 beds. 137 PBS printers are configured in ieMR.

An example of the distribution at Logan Hospital is (this is not a complete list):

- 2 in Birthing Suites
- 2 in Medical Imaging
- 9 in Paediatrics
- 42 in ED

1.5 General Printer

- Printer model must be on the Cerner certified list
- Printer must have Post Script enabled
- Bypass trays are not permitted
- Common and preferred vendor is HP
- DAS ieMR has universal printer drivers for HP, Fuji Xerox and Ricoh
- Data Communications: Ethernet
- Power: wall socket
- Support: local IT Services

1.5.1 Example site: Logan

Logan Hospital has approximately 450 beds. 170 general printers are configured in ieMR.

An example of the distribution at Logan Hospital is (this is not a complete list):

- 2 in Birthing Suites
- 2 in Medical Imaging
- 9 in Paediatrics
- 42 in ED

1.6 Print Servers

- Two print server farms are used for printing from ieMR.
- A print job initiated within ieMR (e.g from within PowerChart) is first sent to the *back-end* printer servers, which route the print job to the *front-end* print servers, which then send the job to the printer.
- Back-end print servers are owned and managed by Cerner as part of the Cerner Millennium product.
- The front-end print servers are owned and managed by DAS ieMR. They reside in the Queensland Health EDCs and are dedicated to ieMR.

- The single front-end print server farm caters for all digital hospital sites.
- A separate front-end print server farm exists for printing from non-production domains.
- All printers must be configured within Cerner Millennium, in the back-end printer servers and front-end printer servers.
- Support: DAS ieMR for print services

2. Document Scanners

Document scanners must be certified by Cerner.

2.1 Bulk Scanning

- Primarily for performing bulk scanning of document types: referrals, historical paper charts, old results etc.
- Cerner provides its own solution using the commercial product from KOFAX.
  - It's a component of the Cerner product Cerner ProVision Document Imaging (CPDI)
  - The end users use the KOFAX thick client to control the scanner and verify the scanned documents.
- Requires a single server, KOFAX Capture Server, to be installed at the ieMR site
  - The KOFAX Capture Server receives the data from the scanners and stages the data for transfer to the KOFAX Network Server in the Cerner data centre.
- Cerner currently uses Kofax 10.0 which is not Windows 10 compliant. Scanning and quality assurance workstations must not be Windows 10.
  - A planned upgrade to Kofax 10.2 in late 2018 will remove the Windows 10 constraint.
- Scanners provided by CoE as part of ieMR Rollout

2.2 Ad hoc Scanning

- Used for progressive or ad hoc scanning: results, referrals, letters etc.
- Cerner has own solution using the commercial product from EMC.
  - It's a component of the Cerner product Cerner ProVision Document Imaging (CPDI)
  - The EMC product, ApplicationXtender (AX), is integrated into PowerChart
- Scanning function is controlled from within PowerChart
- TWAIN driver must be installed locally on workstation
- The ICA client (Citrix) redirects the local TWAIN resource to the user session on the Citrix server.
- The image data captured directly from the scanner is transferred through the Citrix ICA session to the Citrix server on which PowerChart and the AX client are installed
- PowerChart and the AX client capture the image data and transfer it to the CAMM server, having created entries in the AX and Millennium databases.

- The scanner must be connected to the workstation directly via USB.
- Scanners provided by CoE as part of ieMR Rollout

2.3 Scanner Models

2.3.1 Bulk Scanner

- Common model: Fujitsu fi-6800
- Data Communications: Ethernet
- Power: wall socket
- Support: local IT Services

2.3.2 Ad hoc Scanner

- Common model: Fujitsu fi-6670
- Data Communications: USB
- Power: wall socket
- Support: local IT Services

3. Dictation

3.1 Dragon Medical 360 Network Edition

- Solution hosted by Cerner in their central data centre with the NMS, NMC and database hosted by Cerner.
- The speech node server is located at site and supports up to 125 users.
- The single local server per site is a member of QH Active Directory domain
- QH to provide infrastructure such as switches, racks, and PCs in the clinical environment
- The solution does not have a DR environment
- The Dragon thick client is installed on QH workstations where dictation will be performed
- Uses vSync to pass the dictated text through the Citrix channel back to Cerner applications
- The bulk of data traffic is between the Dragon client and the onsite server.
  - A user voice profile setup can be up to 450MB from client to server
  - Normal dictation is 10MB per minute of audio

4. End User Computing

4.1 Workstation

- Sites are tending to provision "all in one" workstations which have the computer and systems components integrated into the monitor. This reduces the overall footprint of the workstation.

- Workstations must be selected from the QH procurement list
- Thin or zero terminals may be preferred due to their small form-factor, no moving parts, low cost, low maintenance and some products are integrated into the video monitor.
  - Confirm with ieMR CoE and DAS ieMR before commencing.

4.1.1 Mobile

- Referred to as Workstation on Wheels (WoW) or Computer on Wheels (CoW).
- Power source is an Uninterrupted Power Supply (UPS)
- Requires a wall power outlet for recharging the UPS.
- Consider designating a low traffic area for recharging the WoW UPS in wards.
- Common model: WoW PCs are supplied by the same vendor as the WoW cart itself; debetrek
- Data Communications: WiFi
- Power: wall outlet for charging UPS
- Support: local IT Services

4.1.2 Fixed

- The number of fixed workstations at site will likely increase due to ieMR.
- Consult with clinicians to determine the best placement of workstations to complement the clinical workflow, for instance, in Emergency there may be a clinical preference for the workstation to be located at the foot of the bed or in a manor so the clinician will not have their back to the patient. In other settings, the clinical workflow may be more efficient having the workstation adjacent to a biomedical device, or the head of a bed.
- Sites are tending to provision "all in one" workstations which have the computer and systems components integrated into the monitor. This reduces the overall footprint of the workstation.
- Common model:
  - Recommended hardware for theatres is Dell Optiplex 7450 AIO Touch screen PC.
  - No recommendation for general PCs
- Data Communications: Ethernet
- Power: wall outlet
- Support: local IT Services

4.1.3 Example site: Logan

- 125x single screen WoWs
- 27x dual screen WoWs
- 18x mobile FetaLink workstations
- 12x laptop carts
- 186x "all in one" workstations
- 130x laptops

- As an indication of number of end-users, the number of concurrent Citrix sessions at Logan is in the vicinity of 5,600.

4.2 Rapid Access Workstation (RAWS)

- RAWS is compatible with ieMR and used at the majority of ieMR sites.

4.3 Tracking Boards

- Tracking Monitors are used to display clinical information specific to the clinical setting or other information commonly displayed to the clinical team, e.g. ED and surgery.
- The Tracking Monitors use a generic user and security group which stops the screen saver from displaying. The monitors are designed to display dynamic information without user intervention.
- Many sites use a single wall mounted video monitor at each designated location.
- The locations of tracking monitors will be site specific and should complement the clinical workflow.
- The tracking monitor solution has been developed by the DAS ieMR team.
- Recommended hardware:
    - Small form-factor PC with a minimum of 8GB RAM
    - A TV or monitor selected from the available QH procurement pathway that meets the business requirements for size and location.
- Data Communications: WiFi
- Power: wall outlet
- Support: local IT Services

4.3.1 Example site: Logan

- 8x tracking boards

4.4 FetaLink Workstation

- Only required if the Cerner FetaLink product is used for maternity settings.
- The FetaLink client is not delivered via Citrix.
- The FetaLink thick client application is installed directly on the workstation and requires workstation operating system registry changes.
- Requires a private VLAN and on same VLAN as the FetaLink iBus server (see below).
- Common model: Workstation
- Data Communications: LAN. By legislation this cannot be WiFi.
- Power: wall outlet
- Support: local IT Services

4.5 Citrix Client

- Cerner user applications are delivered to the end user using Citrix XenApp.

- XenApp displays icons of the applications available to the user in a browser based Storefront. The user selects the icon of the application to be used.
- Each workstation requires the Citrix ICA client installed.
- All Cerner traffic, including ad hoc scanning traffic initiated within PowerChart, is sent through the ICA channel.
- The Cerner FetaLink client is not delivered via Citrix.
- Expected bandwidth per session is 10Kbps per user session.
  - General estimation of data volumes per direction is 75% from Cerner to User, 25% from User to Cerner

4.5.1 Example site: Princess Alexandra Hospital

- Random sample on 13/10/17 for one hour between 15:15 – 16:15
- 1670 concurrent Citrix sessions
- 15.5 Mbps Citrix data traffic
- Equates to 9.5 Kbps per Citrix session

4.5.2 Example site: Cairns Base Hospital

- Random sample on 13/10/17 for one hour between 15:20 – 16:20
- 718 concurrent Citrix sessions
- 6.27 Mbps Citrix data traffic
- Equates to 8.9 Kbps per Citrix session

4.6 Follow Me Desktop

- Follow Me Desktop (FMD) is an eHealth Queensland solution which uses VMWare Horizon to deliver non-persistent virtual desktops. FMD may also be referred to as Virtual Desktop Infrastructure (VDI), the industry name.
- FMD is a relatively new product in Queensland Health and is the enterprise solution for virtual desktops.
- FMD desktops persist for 4 hours after last use, after which they are deleted. Changes to the desktop made by the user are lost after a user logs out or if the desktop times out.
- When first logging into a FMD desktop, the desktop itself is "booted up" and configured. This first log in can take a couple of minutes.
- After first log in, the access is immediate when moving between workstations.
- All desktop applications used at Queensland Health can be delivered through FMD; i.e. enterprise applications such as email, clinical applications such as DICOM viewers and Cerner Millennium applications such as PowerChart.
- FMD can be executed on existing workstations, laptops and on thin/zero terminals.
- ePulse, eHealth Queensland should be consulted to determine if FMD server infrastructure should be located at the ieMR facility or in the Queensland Health enterprise data centres.

- Cerner PowerChart does operate within FMD but location dependent Cerner Millennium functions, such as PBS printing, does not yet work correctly. A solution is currently being investigated with Cerner.
- Support: ePulse, eHealth Queensland
- <mark>FMD is not supported by ieMR DAS</mark>

4.6.1 Example Site: LCCH

- FMD is being used at LCCH for 1,400 nurses to access their desktop applications in acute settings.

5. Biomedical Devices

A list of Cerner supported devices can be found here:
http://iemrportal.health.qld.gov.au/Devices

A list of biomedical devices currently integrated with ieMR production can be found here: https://qheps.health.qld.gov.au/__data/assets/pdf_file/0025/2124736/biomedical-devices-iemr.pdf

5.1 Cardiotocography (CTG)

- CTG devices integrated with ieMR production (as of March 2018) are:
  - Philips Avalon FM20
  - Philips Avalon FM30
  - GE Corometrics 170 series
  - GE Corometrics 250 series
- Requires FetaLink iBus servers installed locally at facility. See FetaLink iBus Server section below.
- A CTG device is normally integrated into a mobile cart with workstation (see above sections) and UPS.
- CTG data transfer is not bandwidth intensive but more sensitive to jitter and latency.
- Philips recommend 1Mbps per CTG client
- The local network between the CTG client and the CTG device should meet <=2ms latency and <=4ms jitter.

5.1.1 FMCE

- FMCE's require a dedicated wall port on the BioMed VLAN and require a special Port configuration on the switch the wall port is connected to. Please see the Fetalink_Switch_Config.txt in the Appendix for the switch configuration for a Cisco device.
- The Workstation will use the FMCE as a Bridge for connection to the network.
- Use the IP for qh-time (165.86.1.1) for the time service (ntp).

5.2   Vital signs device

- Vital signs devices integrated with ieMR production (as of March 2018) are:
  - Welch Allyn CVSM 6400 series
  - Welch Allyn CVSM 6500 series
  - Welch Allyn CVSM 6700 series
  - Welch Allyn CVSM 6800 series
  - Welch Allyn VSM 7000 series
- The infrastructure requirements for vital signs devices are dependent on the vendor and product chosen by the site.
- Vital signs devices connect to Cerner using the Cerner VitalsLink product.
- Cerner VitalsLink provides a streamlined barcode driven (positive device and patient identification) process on an integrated vital signs device for clinicians to chart vitals data directly into a patient's medical record at the point-of-care.
- Physiological observations are clinically signed and then pushed to Cerner and hence directly into the patients chart.
- When and where a mobile vital signs device or a bedside monitor is used will be dependent on the clinical workflow and existing infrastructure (e.g. if a bed already has a fixed bedside monitor).
- Does not require an ieMR workstation associated with each mobile monitor
- Cerner hosts Welch Allyn Data Catcher infrastructure to support this vendor within the VitalsLink solution.
- Data passes through the CareAware iBus servers.
- Common model: Welch Allyn, Philips
- Data Communications: WiFi; legacy equipment may require the use of a Cerner Device Adapter (DA) and Cerner Connectivity Engine (CCE) with Ethernet connectivity.
- Power: UPS. Require a wall power outlet and low traffic location for safe recharging.
- Support: BTS (device)
- Support: DAS ieMR (integration with ieMR)

5.3   Bedside Monitors

- Bedside monitoring devices integrated with ieMR production (as of March 2018) are:
  - Philips PIIC Rev B
    - MX800, MX700, MX550, MX450
    - MP70, MP50, MP30
    - MX40 Telemetry
  - GE CareScape
    - B850, B650, B450 Monitors
    - ApexPro CH, RCVR Telemetry
- The Cerner Bedside Medical Device Interface (BMDI) is used to acquire data from bedside monitor systems.

- Can have an ieMR workstation (fixed or mobile) associated with each fixed monitor. The physical location of the device and associated workstation will depend on the clinical workflow of the particular clinical setting.
- The clinician is required to associate a device to a particular patient as part of establishing patient monitoring.
- Physiological data is sent to Cerner using the BMDI and cached in the iBus server infrastructure and temporary tables within CM for clinician review.
- The clinician is required to actively pull physiological data (an observation) into the patient's electronic medical record using PowerChart. The data is saved to the chart only if/when the clinician accepts the data.
- Most BMD vendors will provide a single gateway server, e.g. Philips IBE server, and not a redundant second server.
- Data Communications:
  - Fixed monitors use Ethernet.
  - Transport/mobile monitors use WiFi
  - Gnerally, vendors require private VLANs for their biomedical device communications.
  - Wired devices need dedicated wall communications ports
  - The vendor and BTS should be engaged to determine the data communications infrastructure requirements; for instance, as part of their assurance, Philips certifies the biomedical device network.
- Power: wall outlet
- Support: BTS (device)
- Support: DAS ieMR (integration with ieMR)

5.3.1 Example site: LCCH

- 9x Medical Imaging
- 47x Emergency
- 6x Oncology
- 7x Surgical
- 26x PACU
- 28x Cardiac Inpatients
- Total 124 bedside monitors of which 13 are mobile. LCCH has approximately 360 beds.

5.4 ECG

- ECG devices integrated with ieMR production are:
  - Philips TC50
  - Philips TC70
  - Mortara ELI series
- The Cerner ECG Management solution includes:
  - DICOM Modality Worklist server

- ECG storage, using Cerner CareAware MultiMedia (CAMM) service
- PowerChart ECG and PowerChart Cardiovascular is used to view and analyse the ECG
- Cerner supplies (contract required) and hosts a Mortara ELI Link (MGate) service which is a gateway between the Mortara ECG carts and the CAMM. It transforms the ECG into DICOM.
- The Cerner certified Philips ECG devices can output a DICOM trace therefore a gateway server is not required. The trace is sent directly to the CAMM service.
- ECG traces are collected, verified and sent to Cerner by the clinician using the ECG device at point-of-care.
- ECG traces do not enter Cerner through the Cerner iBus infrastructure
- 12 Lead ECG acquisition via the Philips MX450 has been successfully integrated with ieMR.
  - The Philips IIC service sends the ECG to a DataMedFT service which translates the ECG and forwards it to the CAMM.
  - The DataMedFT service is purchased and hosted by the ieMR site.
  - This method creates unmatched ECGs in PowerChart which the clinician manually matches to a patient.
- Common model: Philips, Mortara
- Data Communications: WiFi
- Power: UPS; dependent on model and configuration
- Use the IP for qh-time (165.86.1.1) for the time service (ntp)
- Support: BTS (device)
- Support: DAS ieMR (integration with ieMR)
- Complete details of the devices into Cerner project method M and from this a QH Firewall rule request template will be completed. Also allow for a block of IP Addresses to be allocated to a Firewall rule to allow the ECG's to access the Gateway server in Cerner.

5.5   Anaesthesia

- Anaesthetic machines integrated with ieMR production (as of March 2018) are:
  - GE Aisys
  - GE Aisys CS2
  - GE S/5 Avance
  - GE Avance CS2
  - GE Aespire View
- MRI Anaesthetic patient monitors integrated with ieMR production (as of March 2018) are:
  - Philips MR400 via IP5 Remote Display
  - Medrad Veris 8600 via Veris 8600 Remote Display
- The Cerner Citrix session expiry timeout for delivering the SAA application is 6 hours. A bespoke software package created by eHealth Queensland must be installed on SAA workstations to ensure the expiry timeout is active.

- The biomedical data transverses the WAN link from the facility to the Cerner data centre requiring this data to be appropriately tagged/prioritised on the WAN.
- Data Communications: Ethernet
- Power: dependent on model and configuration
- Support: BTS (device)
- Support: DAS ieMR (integration with ieMR)
- Complete details of the devices into Cerner project method M and from this a QH Firewall rule request template will be completed.

5.5.1 Example site: LCCH

- LCCH connect their anaesthetic machines to a patient monitor directly using a serial connection. The anaesthetic machines do not integrate with Cerner directly, rather, the data output is sent to the Philips patient monitor. The Philips services forward the data as part of its HL7 traffic to the iBus.
- Models
  - 15x Draeger Tiro
  - 4x Draeger Fabius MRI
  - 16x Draeger Perseus
  - 3x Draeger Primus
- Distribution:
  - 6x Medical Imaging
  - 28x Operating Theatre
  - 1x Oncology
  - 1x Surgical/Burns

6. Cerner Infrastructure

Note: generally, any infrastructure required for the Cerner product set which does <u>not</u> reside in the Cerner data centres is <u>not</u> maintained/administered by Cerner. That infrastructure is maintained/administered by DAS ieMR and the HHS. The one exception is the FetaLink iBus service; Cerner need remote access to this service for support purposes.

6.1 FetaLink iBus Server

- Two redundant FetaLink iBus servers, in an Active/Active configuration, are required to be located at an ieMR site using FetaLink.
- For patient safety reasons it is strongly recommended that FetaLink iBus infrastructure is installed at each site using FetaLink and not as a shared asset between sites.
- The FetaLink iBus servers are managed by Cerner and used exclusively for the FetaLink application.
- The FetaLink iBus servers reside in the HHS network.

- Cerner requires remote access to the FetaLink iBus servers for administration and support purposes.
- The CTG device, FetaLink workstation and FetaLink iBus servers all reside locally to assure low latency between device and workstation.
- FetaLink iBus server forwards data to central CareAware iBus server for permanent storage in the Cerner database.
- FetaLink client accesses data from FetaLink iBus server.
- FetaLink data can be entered manually into PowerChart by clinician if required.
- Data Communications: Requires a dedicated private biomedical VLAN between CTG device, FetaLink iBus servers and FetaLink workstation. See Cardiotocography (CTG) for an example of network requirements.
- Power: require redundant power of the FetaLink iBus servers on site
- Support: Cerner

6.1.1 FetaLink iBus Server hardware (Cerner supplied)

- A single iBus server is deployed for Training.
- iBus servers are built on a baselined version of Red Hat 6.5.
- Each server will require 1 Data IP and 1 Management IP.
- The Data IP will be spread across 2 NIC's as a Team.
- Complete details of the server FQDN and IP into Cerner project method M and from this a QH Firewall rule request template will be completed. The server name will be supplied by Cerner for Prod and Test.

6.2 CareAware iBus Server

- Service supplied as part of statewide ieMR solution.
- Infrastructure located within the Cerner datacentre.
- Performs transportation, calculation, aggregation, and derivation of data between medical devices and external systems used in a clinical setting for the purpose of automating data collection and clinical information management.
- Transports discrete and waveform data from medical devices into the EMR or consuming application for viewing or verification by a clinician.
- Cerner products VitalsLink, Bedside Device Monitoring Interface (BMDI) and Cerner Connectivity Engine integrate with the iBus servers.
- ECG traces do not traverse the iBus infrastructure.
- The iBus infrastructure is shared between sites. MSHHS has two redundant iBus servers and, as of late 2017, the rest of the state has two redundant iBus servers.
- An iBus instance can accept up to 1000 concurrent connections.
- If a HHS prefers to have their own iBus infrastructure then that can be arranged directly with Cerner at cost.
- When designing iBus infrastructure, the BMDI should pull the biomedical data from the biomedical device gateway e.g. Philips IBE. This improves business continuity if an iBus server was to fail.

– If the biomedical device gateway pushes data to the iBus server then work needs to be done if an iBus server were to fail.

- Support: Cerner, DAS ieMR

6.3 Cerner Device Adapter (DA)

- A Cerner branded hardware adapter.
- Used for biomedical devices which only have a serial (RS-232) connector for data.
- DA input is RS-232, output is USB.
- DAs are programmed for specific devices of the same vendor and model. They must not be switched between devices without being reconfigured. They contain the device Globally Unique Identifier GUID used by Cerner and are configured using Cerner SI Manager.
- DA sits in-line between the biomedical device and the CCE.
- DA specifications can be found on the Cerner wiki site: https://wiki.ucern.com/display/public/reference/Overview+of+CareAware+iBus+5.X+V3+CCE

6.4 Cerner Connectivity Engine (CCE)

- The CCE is a physical device hub containing several USB ports.
- If may be connected to the biomedical device directly over USB or via a DA if the biomedical device uses a serial port.
- The CCE executes a driver specific for the connected DA. The driver is uploaded from the iBus server.
- Output is to the associated workstation on cart or direct to LAN (IP address can be static or DHCP)
- Common model: Cerner provided
- Data Communications: USB (in) and Ethernet (out)
- Power: depends on biomedical device configuration but often UPS
- Support: DAS ieMR
- CCE specifications can be found on the Cerner wiki site: https://wiki.ucern.com/display/public/reference/Overview+of+CareAware+iBus+5.X+V3+CCE

7. Business Continuity

7.1 Cerner 724Access Downtime Viewer

- Downtime Viewer (DTV) is used when ieMR is unavailable due to a recognised outage such as a Cerner data centre outage or local network outage.
- Uses pre-designated workstations able to present medical records during a downtime event.
- Distribution is generally 2x DTV workstations per ward.

- Each DTV workstation is installed with a database containing an extract of patient records.
- Regularly uploaded with patient information. Data is current up to "a few minutes" prior to the downtime event.
- Access is primarily read-only with some functions read/write.
- Clinical information is a subset of the chart, for example radiology images are not available.
- If using a laptop then the battery should be used and tested regularly as they can stop retaining charge when continuously powered by mains power.
- Network bandwidth recommendations are not provided but Cerner does recommend a 1GB link between the ieMR site and the Cerner datacentre. The DTV data transfer bandwidth requirement is included in this total.
- Redundant site power should be available with ICT infrastructure related to patient care, such as the DTV workstations and associated network infrastructure.
- Due to the sensitivity of the Data contained in the DTV application, the workstation device _MUST_ be kept in a secured lockable mount. Various version are available, please discuss with your support team.

7.1.1 DAS ieMR recommended a laptop with:

- 8GB RAM.
- Minimum 100GB free disk space (50GB for Database) (Min - 7200 RPM drives, 256GB solid state drive for a DTV workstation recommended).
- 2+ GHz CPU.
- Encryption with a C Level encryption (BitLocker, McAfee, Symantec).
- Recommended to be a laptop, or UPS backed desktop, to maintain the availability of data between any loss of mains power and the start-up of the site emergency supply.
- The HHS purchases, accommodates, supports and monitors the DTV infrastructure including servers.
- Cerner will assist with DTV installation during Rollout.
- DAS ieMR will assist with supporting the DTV application.

7.1.2 Facility Pumps

The Facility Pump receives the filtered data for the site from the Mid-Tier. This is then passed onto the DTV Workstations for storage and retrieval.
The Facility Pump utilises the standard DTV software with the device being designated as a Facility Pump via the Admin Console. The Admin Console should also be installed on the Facility Pump.
All DTV software is supported by Cerner

Site will need to provision the infrastructure for the Facility Pump service
The Facility Pump server is support by normal Windows server practices for the site.
Servers can be Physical or Virtual.
The Cerner recommended requirements for the Facility Pump server is;
- Windows Server 2008 R2.

- 16GB RAM – Recommended.
- Minimum 250-300GB free disk space (C drive).
- Dual Core 2.5 GHz or Greater.
- Solid State Drives (SSD) – Recommended.
- VM is supported.

Deployed in a Pair for PROD

- Each server will require 1 Data IP and 1 Management IP.
- The Data IP will be spread across 2 NIC's as a Team in separate switches.

Deployed singularly for Testing

- The server will require 1 Data IP and 1 Management IP.
- The Data IP will be spread across 2 NIC's as a Team in separate switches.
- Complete details of the server FQDN and IP into Cerner project method M and from this a QH Firewall rule request template will be completed. The server name will be supplied be Cerner for Prod and Test.

7.1.3 Example site: Logan

- 43x DTV laptops

7.2 Disaster Recovery

- Cerner will maintain its own disaster recovery plan.
- Queensland Health entities, such as HHSs, must maintain their own disaster recovery plans.
- Disaster recovery plans should be revisited by HHSs to determine if they cater for clinical processes highly dependent on digital systems.

8. Site Infrastructure

8.1 PASLink (Contract between HHS and Vendor)

PASLink is required for FirstNet QuickReg and is used to inject ADT information into HBCIS. The system comprises of Windows based Servers running the PASLink service and a SQL Database backend, The PASLink servers are deployed in a pair for PROD and a single unit in UAT. The system consists of;

HBCIS – Re-use existing HBCIS instance for Site
PASLink – Windows 2008 R2 server for PASLink Service and Integration engine
SQL – SQL DataBase backend for PASLink service

8.1.1 HBCIS

A separate LOGON instance is required in the ITF for the deployment of the PASLink solution. The below table outlines which LOGON's are available and the Facility they are allocated to.

Account	URN (Format)	Interfaced to ESB	eGate Inbound eWay	Client Directory	CD & ieMR ADT Facility

LOGON-TEST	Manual (7 digits starting from 9000000)	✔	ew_hbcis_elvis_in	✔	PAH (00011)
LOGON-RIS** (do not use for Doctor testing as MFN messages will not contain facility code)	Manual (8 digits)	✔	ew_hbcis_ris_in[1]	✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔	**0 = RBWH (00201)** 1 = BNH (00062) 2 = QEH (00022) 3 = TPCH (00004) 4 = not used 5 = not used 6 = RKH (00141) 7 = LGH (00029) 8 = ALPH (00131) 9 = TWH (00104)
LOGON-IFACE	Auto(6 digits starting from 700150) Override On	✔	ew_hbcis_iface_in	✔	CBH (00214)
LOGON-IRUS	Manual (6 digits)?	✔	ew_hbcis_irus_in	✔	MBH (00172)
LOGON-CIS	Auto (8 digits starting from 10000000)	✔	ew_hbcis_cis_in	✔	RCH (00007)
LOGON-CISU	Auto (6)?	✔	N/A?	✔	TTH (00200)
LOGON-CORP	Auto (?[2])	✘	N/A	✘	N/A
LOGON-HQI	Auto (6)	✘	N/A	✘	N/A

8.1.2 PASLink Servers

Deployed in a Pair for PROD

- Each server will require 1 Data IP and 1 Management IP
- The Data IP will be spread across 2 NIC's as a Team in separate switches
- The PORT required for the Service in EIP is 30001

Deployed singularly for UAT

- The server will require 1 Data IP and 1 Management IP
- The Data IP will be spread across 2 NIC's as a Team in separate switches
- The PORT required for the Service in EIP is 20000
- Server can, if required, also host SQL service

8.1.3 SQL Service

The SQL can be sourced from either a dedicated SQL server or a Shared resource with a dedicated instance
A SQL Login will need to be created for HealthIQ. The detailed requirements of the account can be found in the PASLink_User_Details.txt document in the Appendix. The SQL server is the Server that will be the integrator for EIP to connect to.

8.1.4 Firewall Rules

Complete details of the server FQDN and IP into Cerner project method M and from this a QH Firewall rule request template will be completed. The server name will be supplied by TBC.

8.2 RIS (contract between HHS and Vendor)

8.2.1 Karisma

The ieMR / Karisma integration design has been based on the ieMR State Radiology OERR design (implemented for QRIS and RadNET) which:

- Enables electronic lodgement of the ieMR Radiology Order in the RIS;

- Provides visibility to the ieMR clinician of Radiology Order Status (Scheduled, Patient Arrived, Exam Started, Exam Completed) as it progresses through the Radiology workflow;

- Provides notification that a Radiology Result (Report) is available and enables viewing of the Report from the Order and/or Patient record;

- Enables electronic receipt of the RIS Radiology Report in ieMR;

The 'Ordering Model' of the state design is that it requires an ieMR Initiated Radiology Order to be **Cancelled** when the ieMR ordered Radiology Exam is **Replaced** in the RIS. The cancelled ieMR Order is then replaced with a new (RIS initiated) Radiology Order containing the replacement Exam. This provides a clear audit trail to the ieMR clinician of any changes to the ordered Radiology Exam

Karisma is a three-tier application with the following attributes the server can be physical or VM:

- A stateful, 32-bit server process

- Connection-oriented network communications

- Microsoft SQL Server database

Functionality, such as external system interfaces, is provided by agent processes separate to the Karisma server of which Kestral provides an instance of the HL7Connect messaging gateway as part of the solution.
An instance of the Karisma application consists of

- One SQL Server database

- One server process (KarismaServer.exe)

- Zero or more agent processes (KarismaAgent.exe)

- A configuration file used to specify the database location and other instance-wide properties

8.2.2 QXR (Interface only)

- ieMR is to be integrated with the Sonic Healthcare 'Apollo' Radiology Information System (RIS) to enable full digitalisation of Radiology Order Entry and Results Reporting (OERR).

- Radiology at the QEII facility is completely outsourced to Queensland XRay (QXR), which is a subsidiary of Sonic Healthcare. Other QH sites (e.g. Mackay) also utilise

QXR services where the site Medical Imaging Department manages the decision to outsource on an individual Order basis.

8.2.3 AGFA (Still in design)

8.3 Pharmaceutical Dispensing

- A list of Cerner supported devices can be found here:
  http://iemrportal.health.qld.gov.au/Devices
- The clinical workflow may require a workstation located at the dispensing unit.
- Normally deployed in wards, ED and ICU

8.3.1 Pyxis (contract between HHS and Vendor)

Pyxis is a system that allows for Prescriptions to be sorted, packaged and dispensed via a Pharmaceutical Robot. The Pyxis system receives a message via the ESB. The Pyxis system server details will be supplied by the vendor and consists of;

Pyxis Enterprise Server/s production
- Application
- Reporting
- Database
- CareFusion Coordination Engine (CCE) integrating with eMR
- Security Module

Pyxis Enterprise Server test
- Application
- CareFusion Coordination Engine (CCE) integrating with eMR

CareFusion integrated equipment
- Pyxis ES MedStation Main Tower various
- Pyxis ES Auxillary Drawers
Pyxis Smart Remote Managers

ESB
Prescription information created in iPharmacy is passed via the ESB to the Pyxis server and dispensed via the Pyxis Robot. Firewall rules are need to these messages to pass.

Firewall Rules
Complete details of the server FQDN and IP into Cerner project method M and from this a QH Firewall rule request template will be completed.

8.3.2 Example site: PAH

- Use CareFusion Pyxis MedStation
- Have Pyxis server infrastructure at PAH which also serves QEII, Redlands and Logan
  - 5x local VM servers:
    - MedStation ES

- o Pyxis Reporting
- o Knowledge Portal
- o Pyxis CCE (CareFusion Coordination Engine)
- o Security Module
- Communicates with MedStation ES Dispensing Units, Pharmacy workstation Pharmacy printer.
- Communications server specifications depends on number of messages to MedStation ES server per day; available from CareFusion.
- Number of MedStation dispensing units per site are:
  - – PAH = seven
  - – Redlands = three
  - – Logan = eight, one CIISafe
  - – QEII = two
- Data Communications: Ethernet. Potentially up to 80 MB of data per dispensing unit transmitted across the network to the Pyxis MedStation ES server.
- Power: wall outlet
- Support: ieMR Facility

9. Request for Change (RFC)

RFC's shall be raised through out the life of the project and dates will be based on your roll out schedule and Cerner Work Orders.

Item	RFC Title	RFC Requestor Provision of Initial Risk Register & Implementation Plan details	Populates the Summary of Change in Snow	RFC Manager
General RFC's				
1	Manual Build – ESM & SurgiNet	ieMR CoE	ieMR CoE	DAS ieMR
2	Manual Build (Remaining Solutions)	ieMR CoE	ieMR CoE	DAS ieMR
3	Interfaces Technical Go Live	ieMR CoE	ieMR CoE	DAS ieMR
4	ESM Go Live	ieMR CoE	ieMR CoE	DAS ieMR
5	Business Go Live	ieMR CoE	ieMR CoE	DAS ieMR
Other possible RFC's				
6	Gateway Server RFC for Anaesthetic and Bedside Patient Monitors & Systems	Site/HHS ieMR Team	ieMR CoE	DAS ieMR
7	Biomedical Device Integration iBus Server(s)	Site/HHS ieMR Team	ieMR CoE	DAS ieMR
8	FetaLink iBus Server(s)	Site/HHS ieMR Team	ieMR CoE	DAS ieMR
9	Kofax Capture Server(s)	Site/HHS ieMR Team	ieMR CoE	DAS ieMR
10	PASLink Integration Server(s) Install	Site/HHS ieMR Team	ieMR CoE	DAS ieMR
11	Pyxis Server(s) Install	Site/HHS ieMR Team	ieMR CoE	DAS ieMR
12	724 DTV - Facility Pump and Initial Load RFC	Site/HHS ieMR Team	ieMR CoE	DAS ieMR

10. Core IT Infrastructure

The rollout of Cerner to a site will require configuration changes and potentially replacement of certain core Queensland Health IT infrastructure such as routers and switches. A site survey is performed as part of an ieMR rollout project to determine the required infrastructure changes. Core infrastructure and services affected will include:

- DNS
- AD/Novell
- Routers
- Switches
- WiFi access points
- Firewalls
- NTP
- DHCP

Abbreviations

AX	EMC ApplicationXtender
BMD	Bedside Monitoring Device
BMDI	Cerner Bedside Monitoring Device Interface
BTS	Queensland Health Biomedical Technology Services
CAMM	Cerner CareAware Multi-Media server
CPDI	Cerner ProVision Document Imaging – Cerner's document scanning solution
CTG	Cardiotocography
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name Service
DTV	Cerner Downtime Viewer. Sometimes referred to 724Access.
LCCH	Lady Cilento Children's Hospital
NTP	Network Time Protocol
PAH	Princess Alexandra Hospital
SAA	Cerner SurgiNet Anaesthesia
UPS	Uninterruptible Power Supply
WoW	Workstation on Wheels

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