MASSACHUSETTS GENERAL HOSPITAL
Biomedical Engineering

MUSE V9 SYSTEM OVERVIEW

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July 30, 2020

MGH Department of Biomedical Engineering

Created by Ketaki Muthal; Nov 2019
Revised by Nehal Kapadia; July 2020

MUSE - Marquette Universal Storage for Electrocardiographs

- MUSE is a system that stores ECGs and Stress studies:
  - Cardiologists to view and interpret/read/confirm
  - Clinicians to view/print as needed
  - EKG Lab to review EKG and direct to appropriate basket for processing

- MUSE V9
  - Installed on the MUSE Application Server
  - Win 2012 R2 server

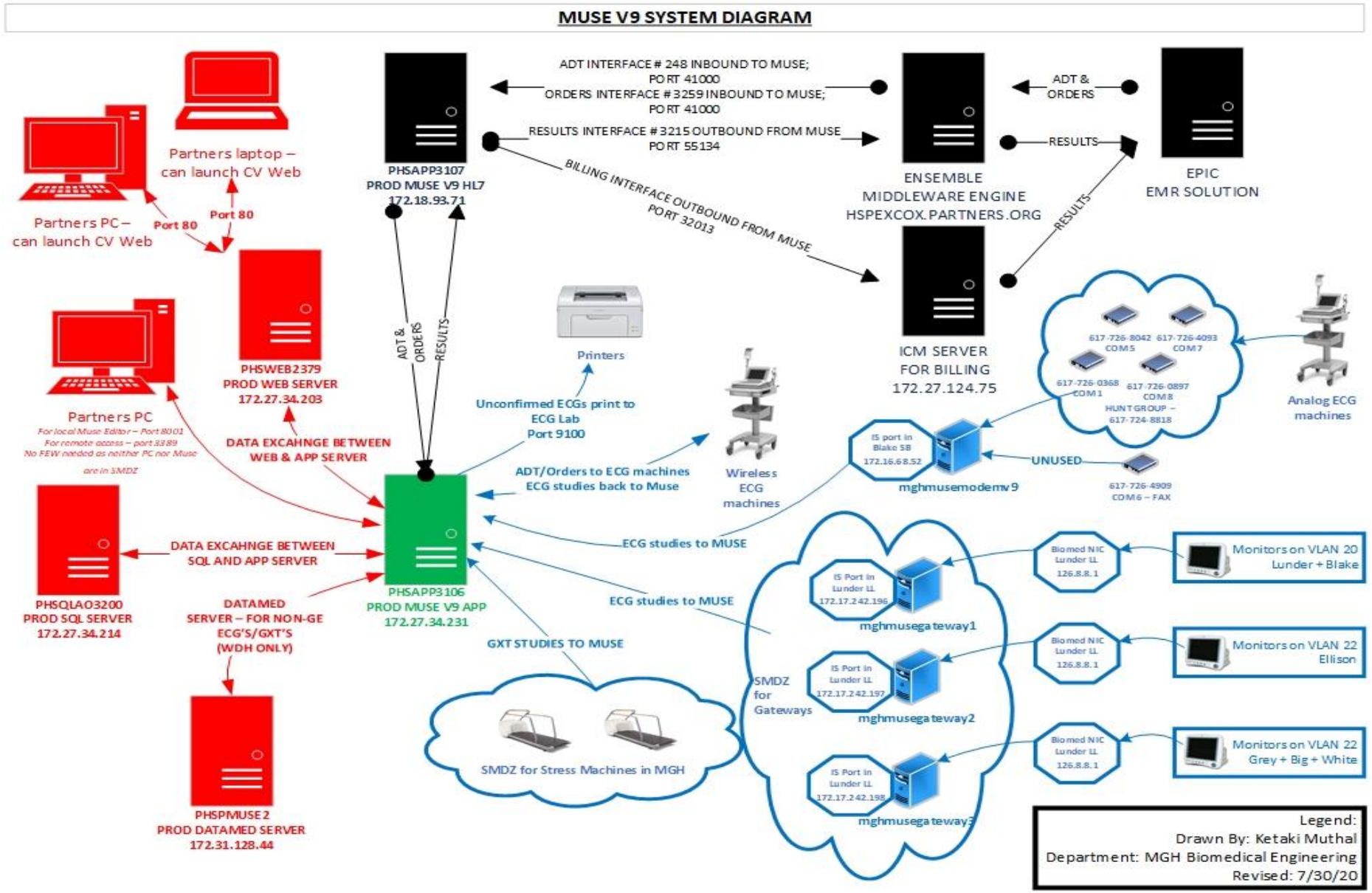
- Service Accounts: SQ7, SQ23, SI846
  - SQ7 (Museadmin) - This account is responsible to run all Muse services
  - SQ23 (Musebkgnd)- This account is responsible for configurations within the application
  - SI846 – Created for MUSE test server

- Passwords for service accounts are managed by CyberArk.
  - Working on password change.

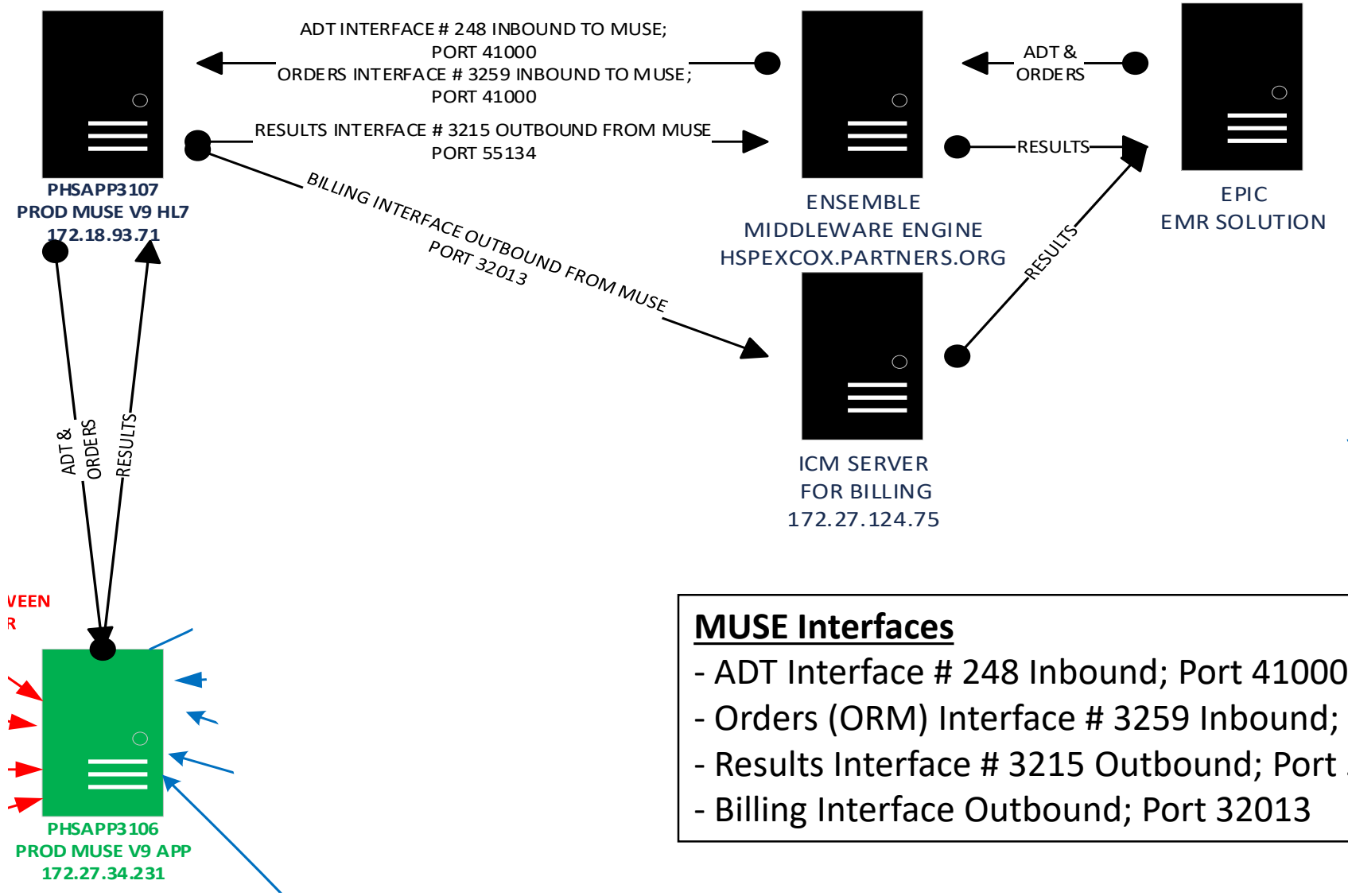
MUSE - Marquette Universal Storage for Electrocardiographs

- MUSE contains 5 Sites; Multiple locations per site
- MUSE receives ADT and Orders for an ECG or Stress study from hospital EMR (EPIC)
- MUSE receives ECGs and sends confirmed ECG messages as results for viewing/filing/charting to hospital EMR (EPIC)
- MUSE sends a message to its billing solution partners (ICM) which in turn sends a message to hospital EMR solution (EPIC)

MUSE – System Diagram



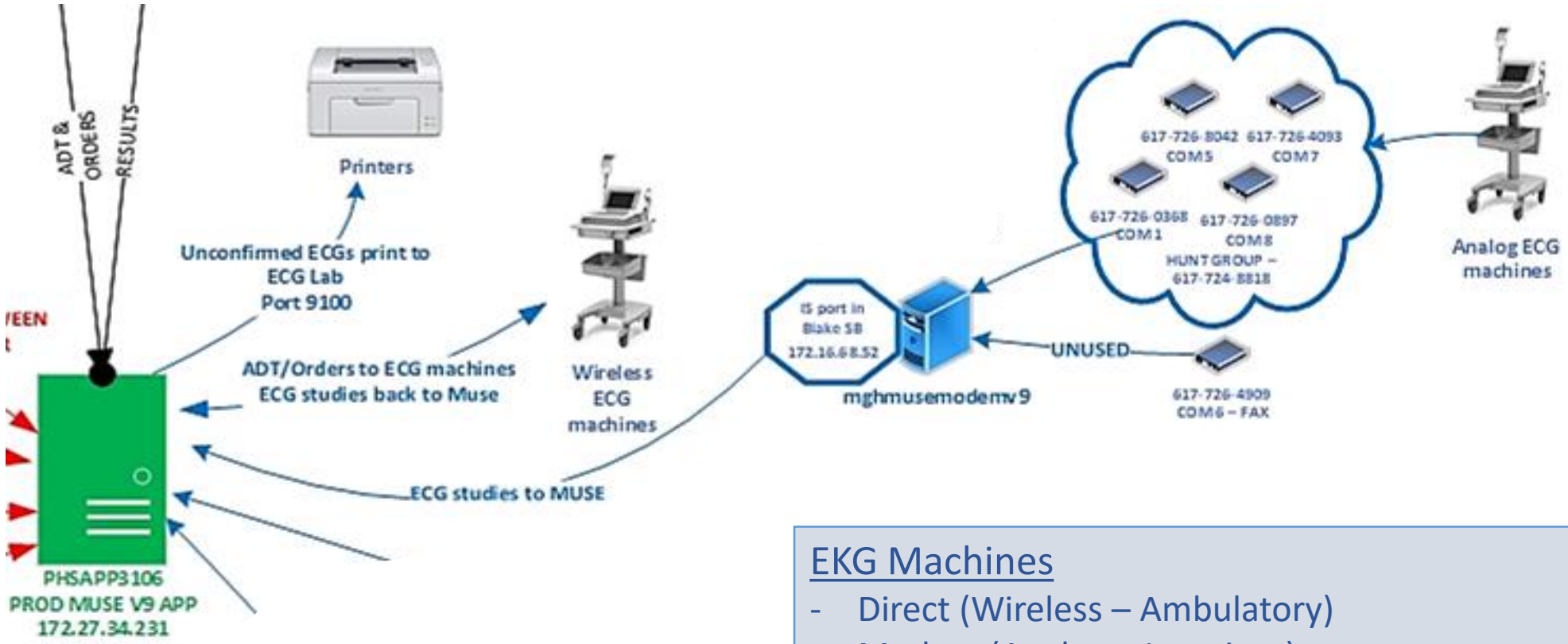
MUSE – EPIC Integration



MUSE Interfaces

- ADT Interface # 248 Inbound; Port 41000
- Orders (ORM) Interface # 3259 Inbound; Port 41000
- Results Interface # 3215 Outbound; Port 55134
- Billing Interface Outbound; Port 32013

MUSE – EKG Transmission



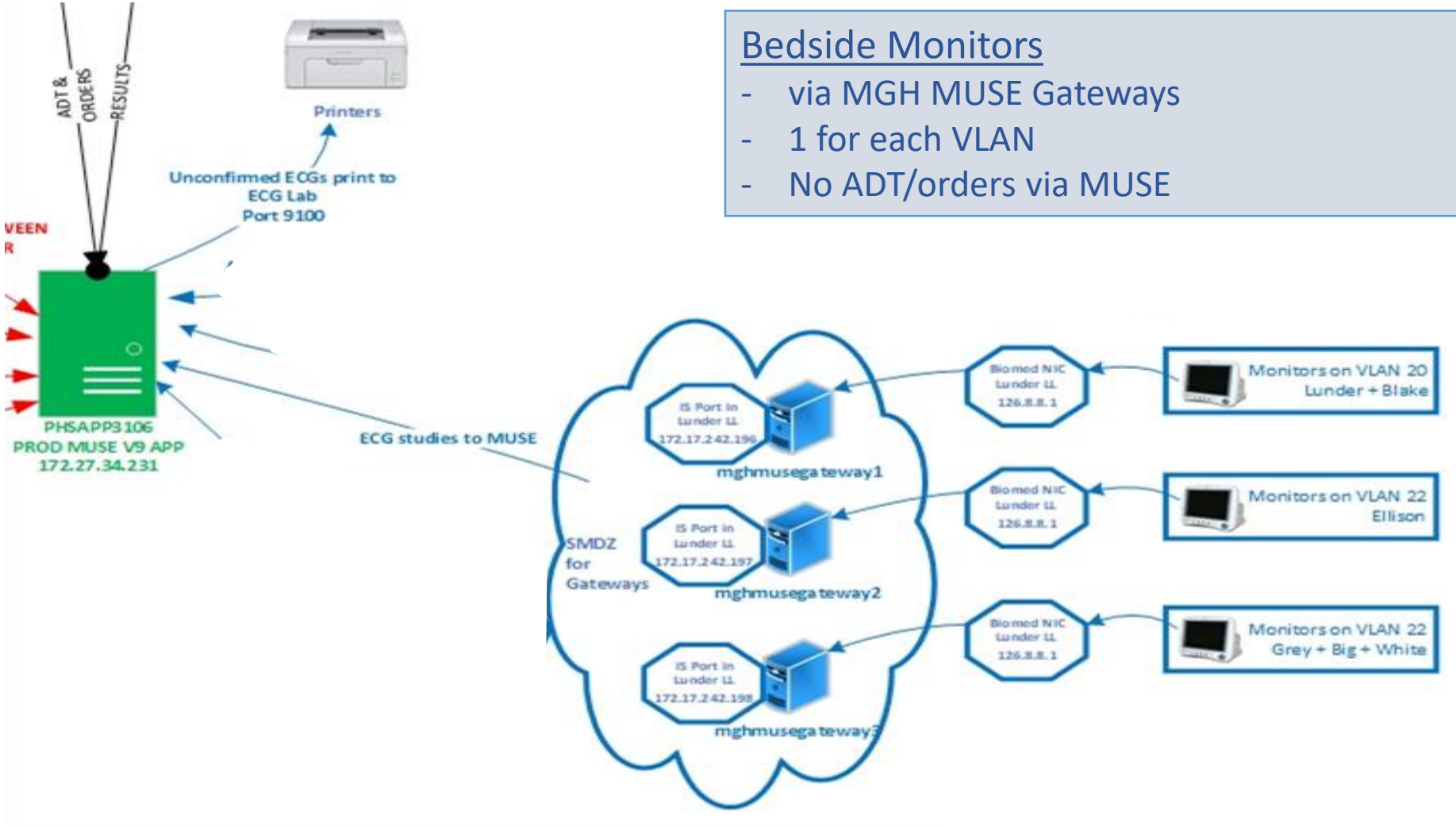
EKG Machines

- Direct (Wireless – Ambulatory)
- Modem (Analog – Inpatient)

ADT/Orders

- Wireless EKG machines only

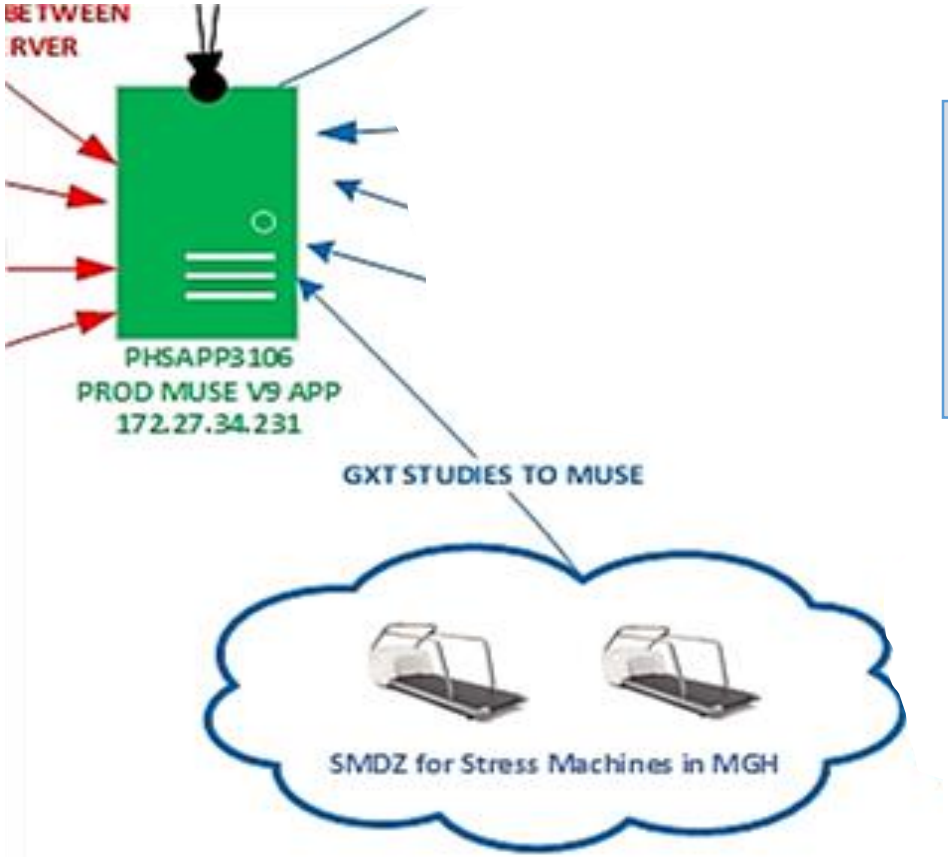
MUSE – EKG Transmission



Bedside Monitors

- via MGH MUSE Gateways
- 1 for each VLAN
- No ADT/orders via MUSE

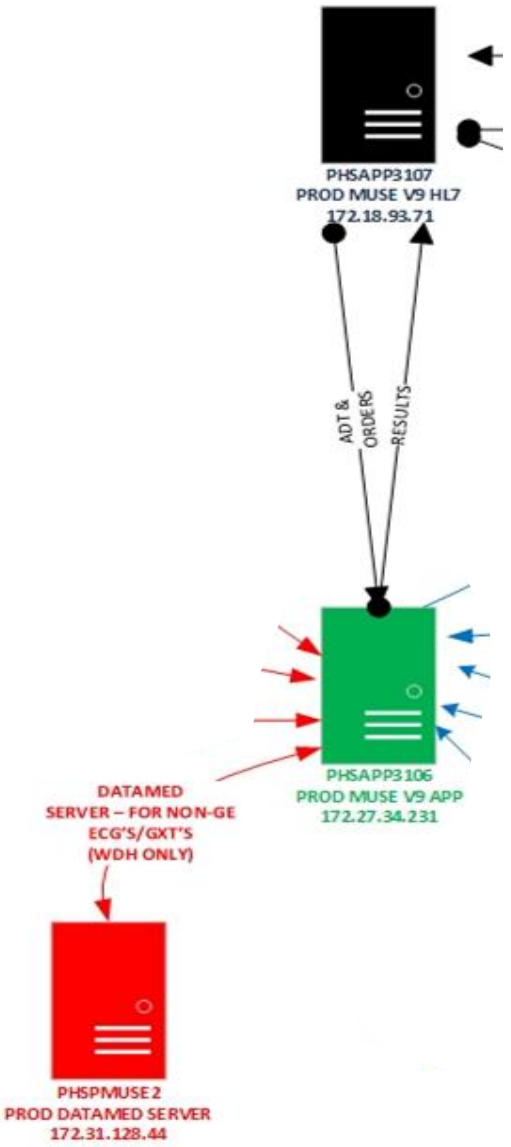
MUSE – Stress Tests



Stress Carts

- Case 8000
- GXT Studies in MUSE
- SMDZ (Blake 260, Yawkey 5, MGH Danvers)
- No ADT/Orders

MUSE – Non-GE Machines



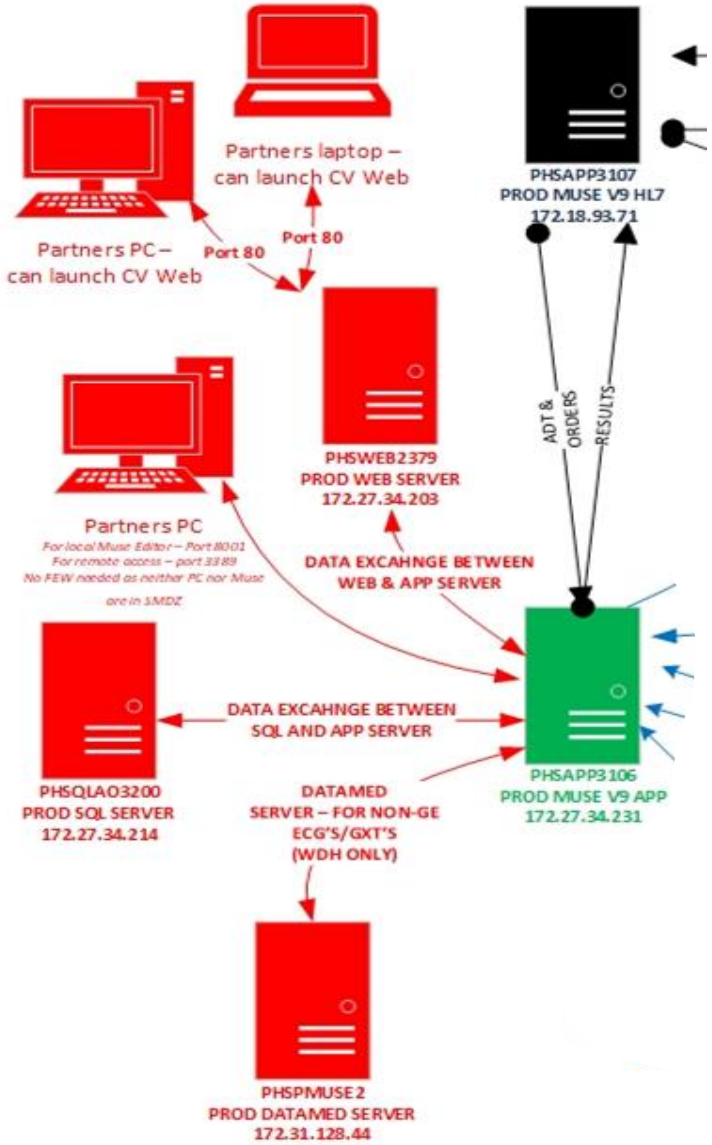
Wentworth Douglas Hospital

- Mortara EKG Machines
- Datamed Server (phspmuse 2)
- Intermediate server between non-GE modalities and Muse App Server
- 2 softwares hosted
  - DataMed
  - Eli Link

- DataMed - software for data translation. 2 services:
  - DataMed FT – data format translation
  - DataMed WL – worklist (orders)

- Eli Link
  - software for WelchAllyn/mortara carts
  - Collects ECGs and sends to specific folder on DataMed Server

MUSE - Servers



MUSE Application Server*
- Win 2012 R2
- Muse software
- Needham Data Center

HL7 Server
- Interfaces with ADT, orders, billing and results services

Web Server
- Hosts CV Web application
- Can view EKGs through CV Web website

SQL Servers*
- File/database server
- Win 2012 R2
- Active Primary server – Needham Data Center
- "Always on" Backup – Marlboro Data Center

*On Group 2 of server patching schedule

MUSE - Servers

- Production servers (CEs can login using your Partners credentials)

Server Name	Partners IS IP Address	Description	Location
PHSAPP3106	172.27.34.231	Application and wireless cart server	Needham data center
PHSAPP3107	172.18.93.71	HL7 and interface server	Needham data center
PHSQLAO3200(SQL CLUSTER)	172.18.93.141	SQL database	-
PHSQLAO3200A	172.18.93.73	SQL database	Needham data center
PHSQAO3200B	172.27.34.155	SQL database	Marlboro data center
PHSWEB2379	172.27.34.203	Web server for ECG viewing	Needham data center
PHSPMUSE2	172.31.128.44	DataMed server for non-GE data	Needham data center

- Test servers (CEs can login using your Partners credentials)

Server Name	Partners IS IP Address	Description	Location
PHSAPP3105	172.18.93.204	Application, HL7 and cart server	Needham data center
PHSSQL2246	172.27.34.50	SQL database	Needham data center
PHSWEB2378	172.18.93.206	Web server for ECG viewing	Needham data center

MUSE - Gateways and Modem PCs

- CEs and Technicians can login using SQ23 service account

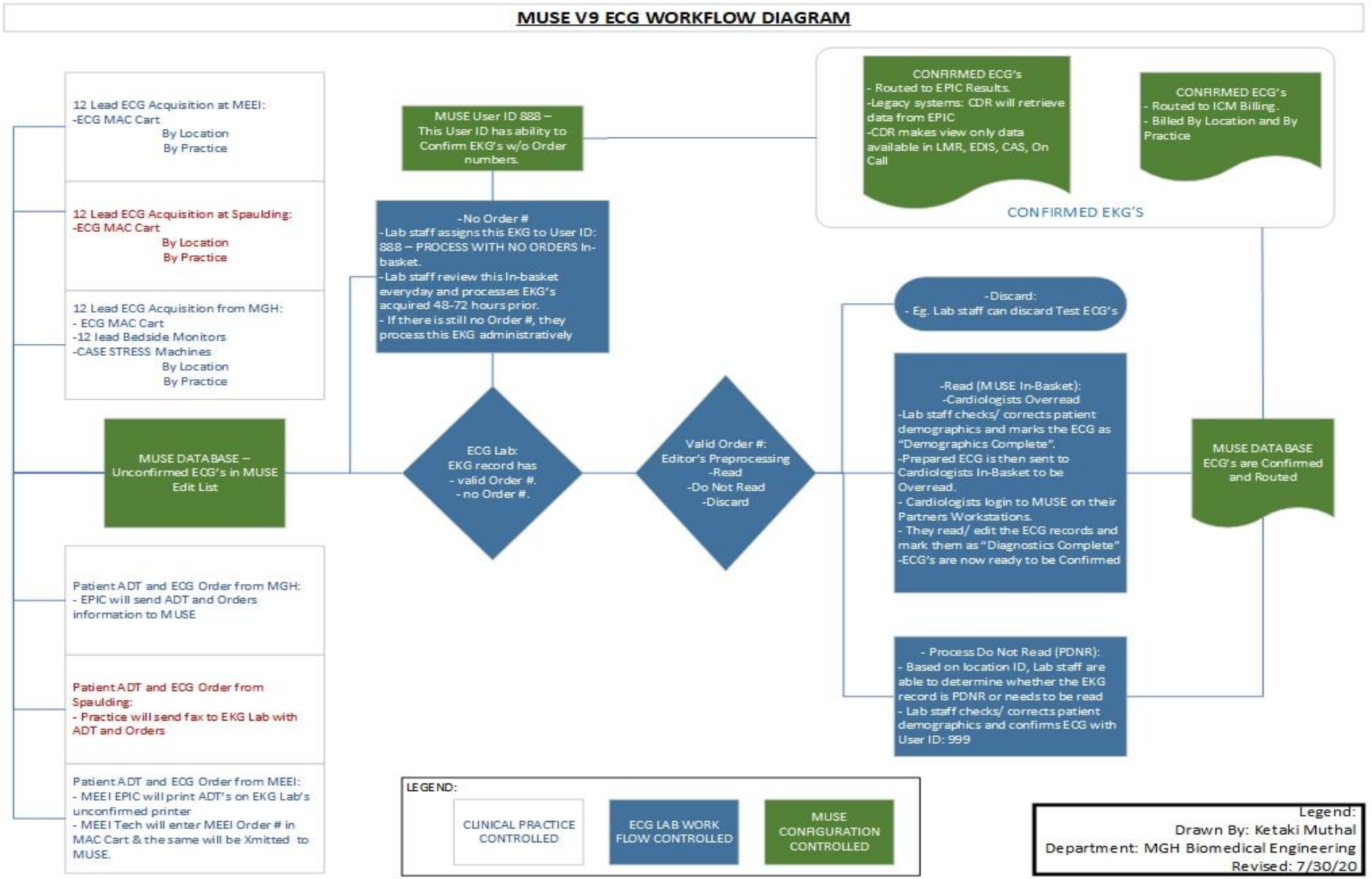
Gateway Name	Partners IS IP Address	Description	Location
mghmusegateway1	172.17.242.196	Network Gateway for ECG Transmission from Bedside monitors on VLAN20 (Blk and Lun floors)	Lunder basement LL040
mghmusegateway2	172.17.242.197	Network Gateway for ECG Transmission from Bedside monitors on VLAN21 (Ell floors)	Lunder basement LL040
mghmusegateway3	172.17.242.198	Network Gateway for ECG Transmission from Bedside monitors on VLAN22 (Wht, Gry, Big floors)	Lunder basement LL040
mghmusegtwy1	TBD	Backup to mghmusegateway1	Big 12
mghmusegtwy2	TBD	Backup to mghmusegateway2	Big 12
mghmusegtwy3	TBD	Backup to mghmusegateway3	Big 12
mghmusemodemv9	172.16.68.52	Connects to all modems listed below to send ECG's to Muse app server	Blake Sub-basement
CSIMODEM1	617-726-8024	Connected to MGHMUSEMODEM via Hunt Group Number (617-724-8818). Receives ECG's from Carts via phone line.	Blake Sub-basement
CSIMODEM2	617-726-0368		
CSIMODEM3	617-726-0897		
CSIMODEM4	617-726-4093		

- Old Legacy network MUSE gateway connected for peri-op. Located in Blake 5

MUSE – Capacity and Responsibility

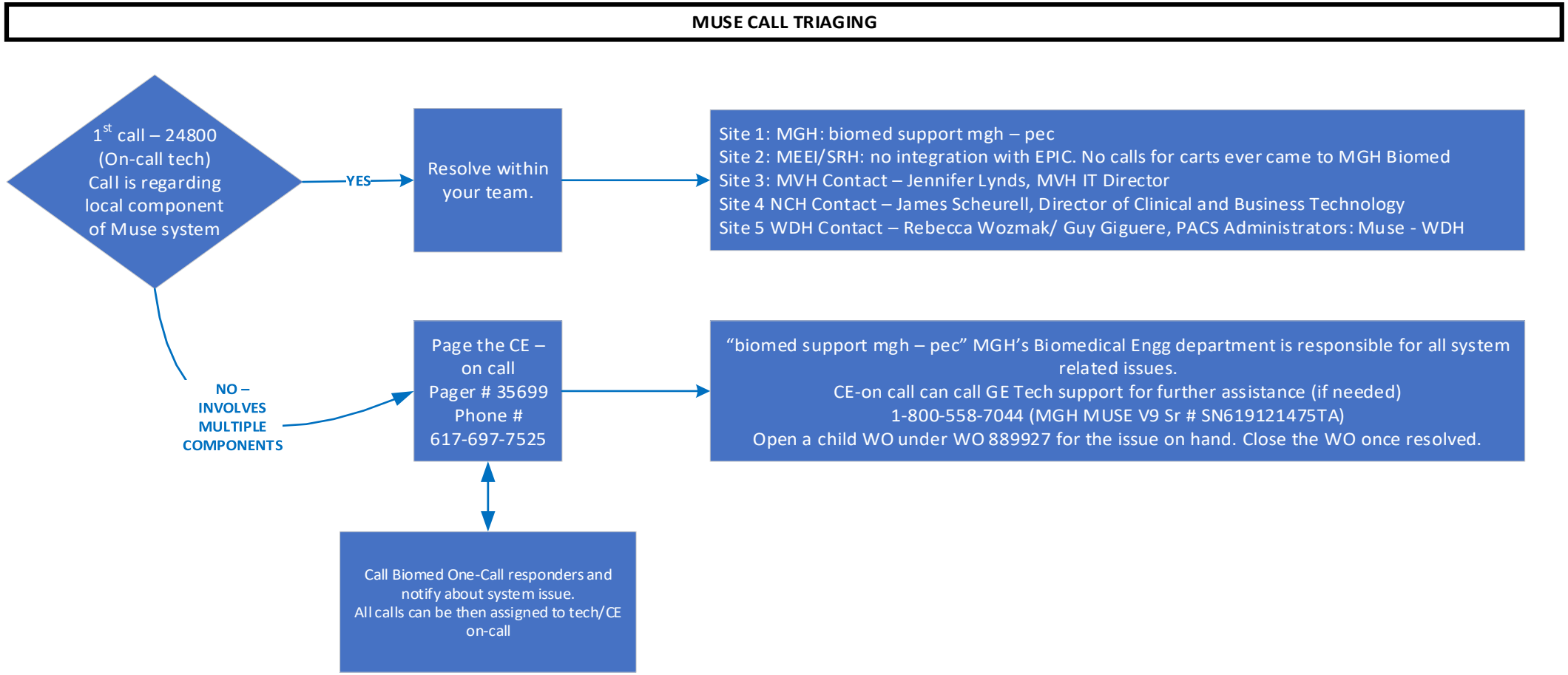
- 5 sites – each site has multiple locations
  - Site 1 – MGH (~215 locations)
  - Site 2 – MEEI and SRH (~12 locations)
  - Site 3 – MVH (~12 locations)
  - Site 4 – NCH (~4 locations)
  - Site 5 – WDH (~33 locations)
- MGH Biomedical Engineering team is responsible for all individual components of Muse for Site 1 along with all system components of Muse which includes the servers and interfaces with EPIC.
- Each individual site is responsible for their own local components of Muse.
- What are local components in a Muse system?
  - ECG Cart – battery, phone cable, any hardware on the cart, leads
  - Acquisition module; module cable
  - Stress Machines – leads, patch cable etc.
  - Wireless modules (if any), power supply
  - Barcode Scanner (if any)
- What are system components in a Muse system?
  - All servers associated with Muse system
  - All applications associated with the servers
  - All interfaces associated with the Muse system
  - All printers associated with the Muse system

MGH MUSE – ECG Processing Workflow



MUSE - Troubleshooting

- Determine if the Muse call is local or system call.



MUSE - MGH Contacts

- MGH EKG Lab –
  - Contact for ECG edit queries – MRN, name, date and time correction on already transmitted ECGs
  - Main Campus –
    - Names – Ping Mah and Shirley Thomas
    - Phone – 617-726-2885
    - Fax – 617-726-7439
    - Location – Emerson 2

  - Danvers –
    - Names – Pam Silva and Danielle Bowe
    - Phone – 978-882-6555
    - Location – E102-02 Nuc Cardiology

MUSE - Troubleshooting Tips

- Please refer to this document for troubleshooting tips –

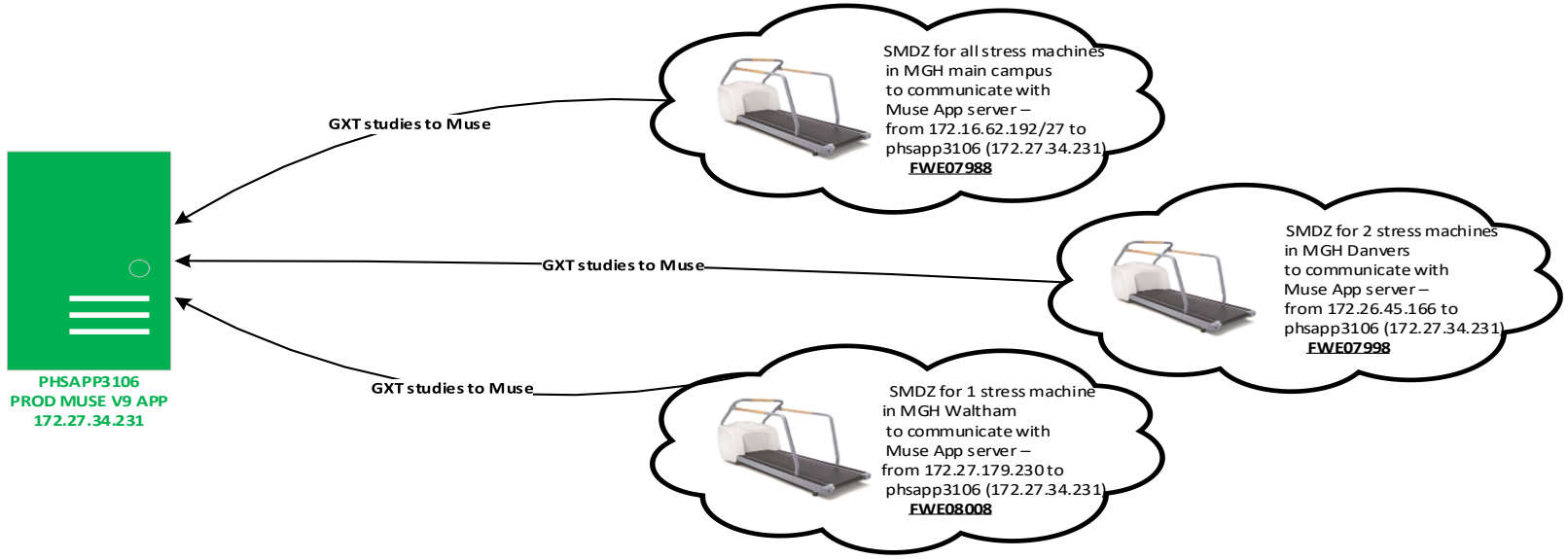
  L:\DBEMAIN\Safety\Resource Book\MGH\MGH MUSE\MUSE V9\MGH MuseV9 Troubleshooting Guide

- The same document is posted on the Biomed website under –
  - MGH Technical Resources
  - MGH Call Tech Resources
  - MGH MuseV9 Troubleshooting guide

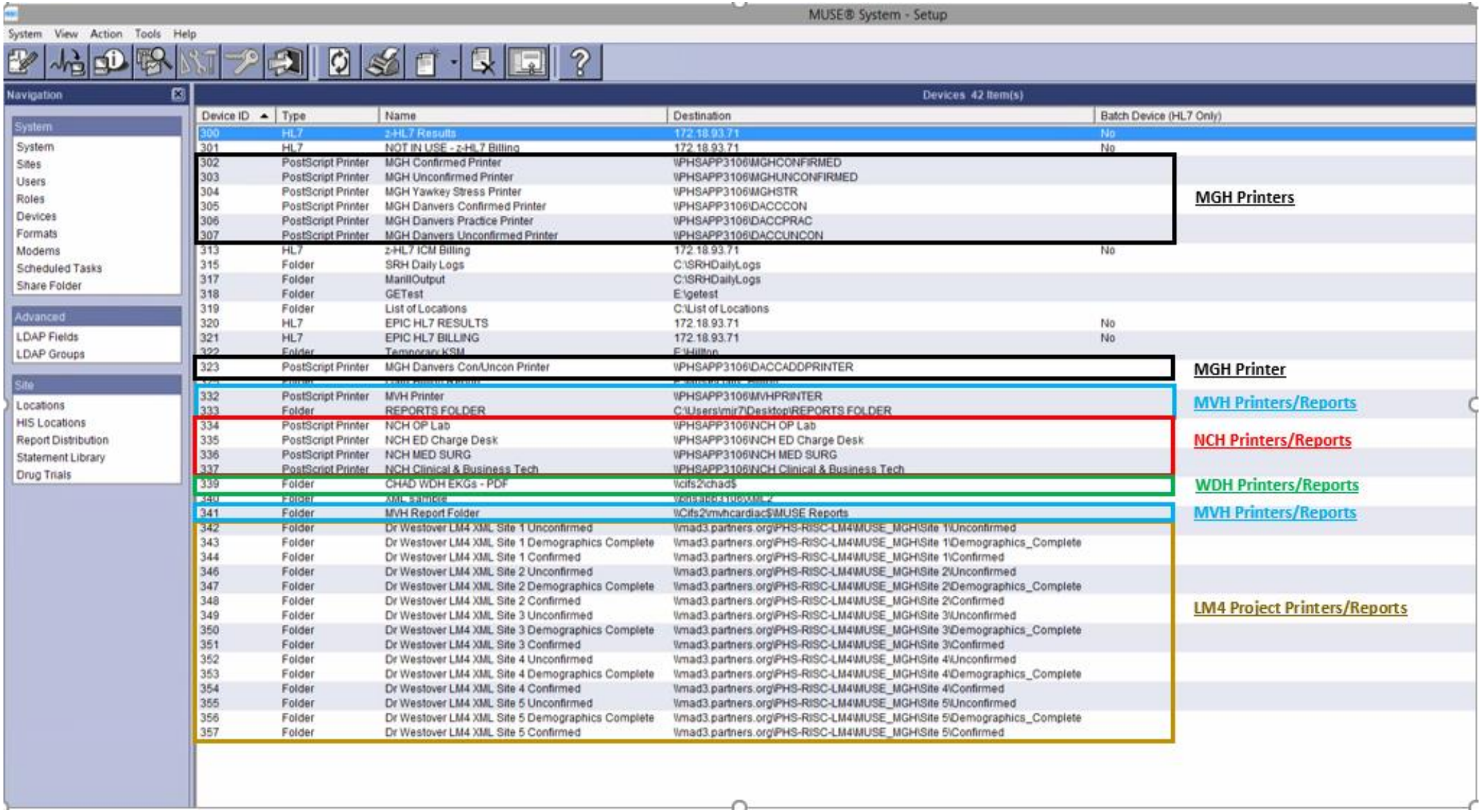
- Other documents posted on the Biomed Website –
  - MGH Muse V9 Cart Location numbers
  - MGH Muse V9 System Overview (detailed description of Muse system)
  - MGH Muse V9 System Summary (earlier version of this presentation)

MGH MUSE – Stress Machine Information

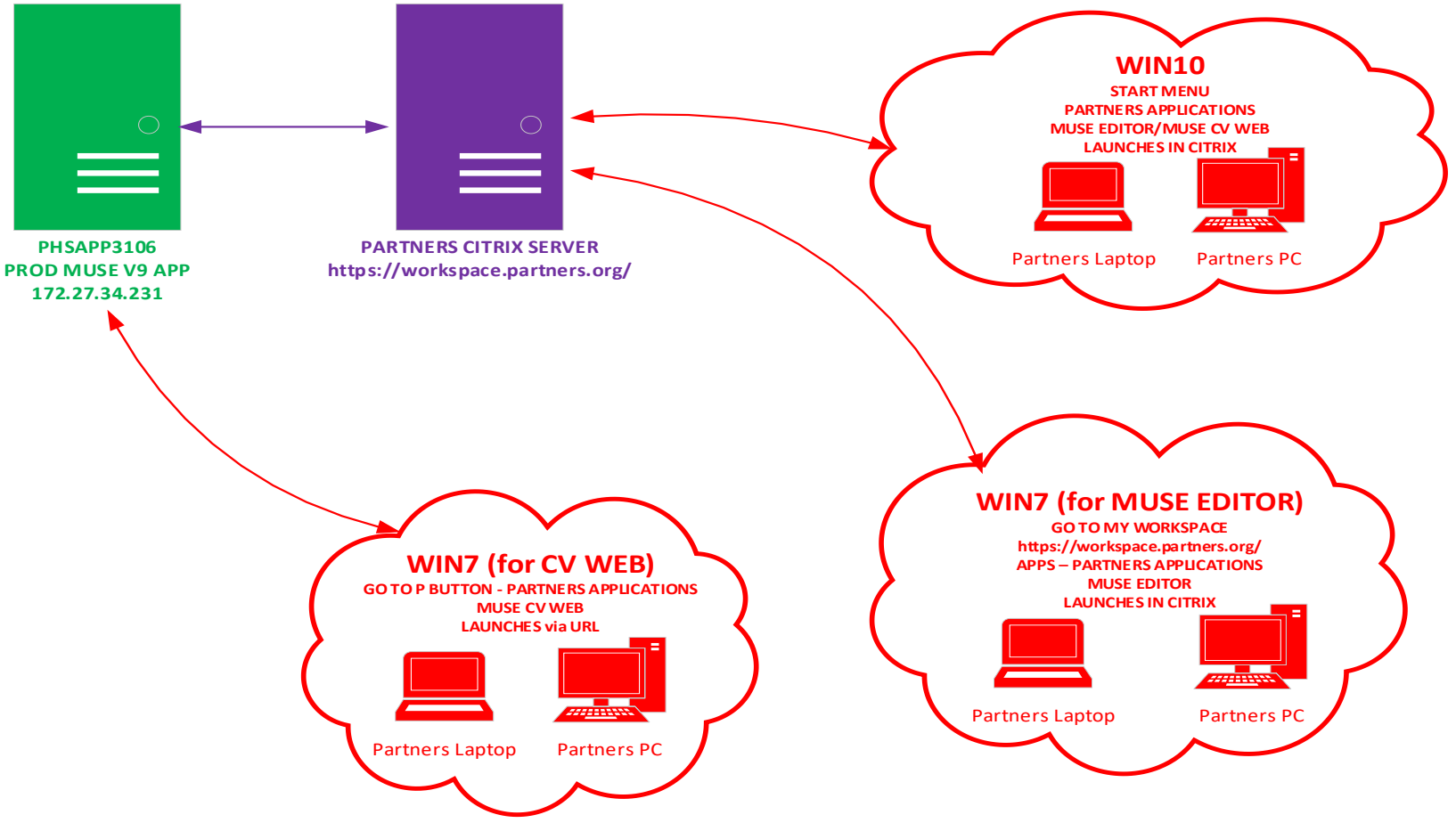
Location	Serial number	Room	Correct IP	Correct MAC	Jack no. on the wall
YAW5	SJP13471052SA	5016	172.16.62.220	00-E0-F4-2A-31-CD	YCO5C- 117
YAW5	SJP13210374SA	5017	172.16.62.215	00-E0-F4-29-A8-BE	YC05C-064-A
YAW5	SJP13471054SA	5020	172.16.62.214	00-E0-F4-2A-2F-0F	YC05C-069-A
YAW5	SJP13230463SA	5034	172.16.62.221	00-E0-F4-2F-CB-55	Not plugged in sharing port w SJP12371052SA
YAW5	SPZ18240024SA	5034	172.16.62.216	C4-00-AD-0D-0E-9E	YCO5C-102-A
YAW5	SN215461960SA	5040	172.16.62.217	00-E0-F4-2F-3B-30	YC05C-094-A
YAW5 - ECHO	SH711096729SA		172.16.62.219		
BLK260	SN215461962SA	276	172.16.62.198	00-E0-F4-2F-38-18	276-1 VD
BLK260	SN215461965SA	278	172.16.62.199	00-E0-F4-2F-38-81	278-3 VD
BLK PET	SPZ18240026SA	272	172.16.26.206	C4-00-AD-0D-0E-99	in PET/CT ROOM 274
BLK CARDIAC ECHO	SPZ19280003SA	200	172.16.62.201	C4-00-AD-25-EE-4F	200-7 VD
MGH West	SPZ19370040SA	535	172.27.179.230	C4-00-AD-38-7F-91	143/144 535-4
MGH Danvers	SPZ19370023SA	1291	172.26.45.166	C4-00-AD-38-7E-13	1B 137 1291-3
MGH Danvers	new sr. no. needed	1293			1B 149 1293-1
YAW5	**SPZ18220033SA**	**5-216**	**CANNOT FIND. RETIRED?**		**YC05C-048-A**
50 STANIFORD EXE HLTH	**SHS12110670SA**	**MACHINE NEEDS TO BE UPGRADED. GE WILL UPGRADE. UPGRADE KIT RECEIVED PRAC DOESN'T DO STRESS STUDIES ANYMORE. PATIENTS WILL GO TO YAW 5**			



MUSE - Printer Information



MUSE – How to Access MUSE V9?



Legend:
Drawn By: Ketaki Muthal
Department: MGH Biomedical Engineering

MUSE - CV Web / PHS MUSE Viewer Link

- ECGs can be viewed using Muse Web server. The link is – http://mghmuse.partners.org/

- The same link can be launched by accessing MUSE CV Web application under Partners app menu. All Biomed staff members should have access to it.

  P.S.: When you are looking for a patient's ECG using this link/app; please make sure you enter preceding "00" or "double zeros" to find a patient.

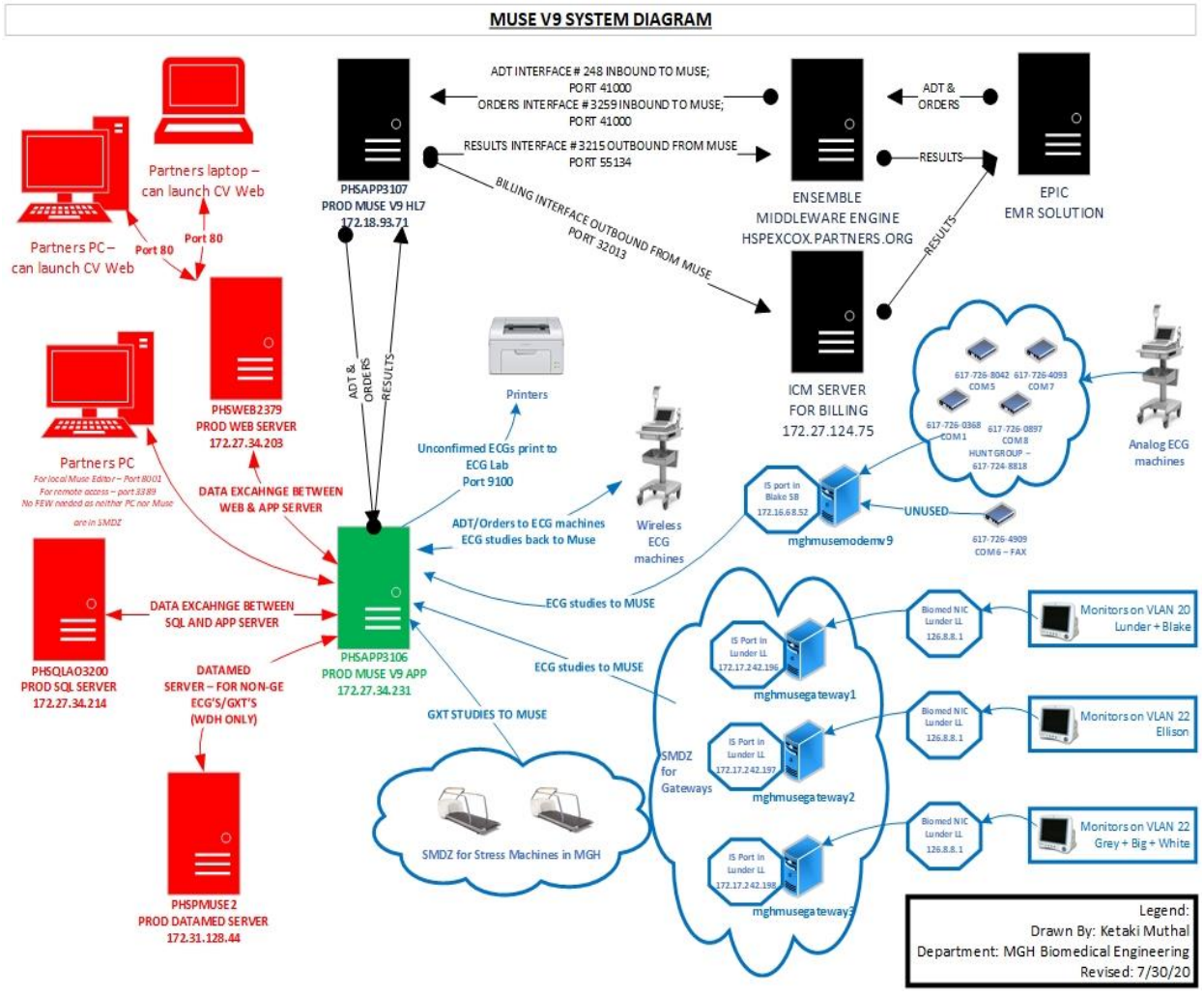
- This link is further modified by PHS-CAS (CDR) group to be - http://phsmuseviewer.partners.org/ to be used as a Web link in EPIC for that patient whose record you are within in EPIC.

- Both the link ultimately resolve to the Muse CV Web server.

- The PHS muse viewer link should refrain users to launch multiple CV Web instances for different patients, such that users can view ECG of only one patient at a time - *safety feature*.

MUSE – SMDZ

- The adjacent diagram shows Muse system architecture
- The components highlighted in the blue cloud are the only components in SMDZ
- The reason they continue to stay in SMDZ are either they connect to the Biomed Network or they cannot be patched per Partners IS schedule
- What is SMDZ ? Safe Medical Device Zone, where equipment cannot be patched, they stay untouched and hence vulnerable to cyber threats.



MUSE – Disaster Recovery

- MGH Biomed to update disaster recovery plans and steps with Partners IS – *yet to be done*
- Disaster impact – loss of data and high turn around time for recovery
- Muse prod SQL server - “always on” feature
  - 2 SQL servers - PHSQLAO3200A and PHSQLAO3200B located in NDC and MDC, respectively
  - The B server is real time back-up of the A server
  - In the event of disaster, the real time backup can be made primary and Muse can continue to function with minimal downtime and no loss of data
- No redundant app servers are provisioned at this time.
  - If Muse fails completely for an extended period, escalate it to a major incident

MUSE – Documentation

- Main folder –

  \\Sfa1\sfa\DBEMAIN\Safety\Resource Book\MGH\MGH MUSE\MUSE V9

- MUSE V9 SP 9 software –

  \\Sfa1\sfa\DBEMAIN\Safety\Resource Book\MGH\MGH MUSE\MUSE V9\Installation files from GE\Muse V9SP9 SW

Thank you!

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