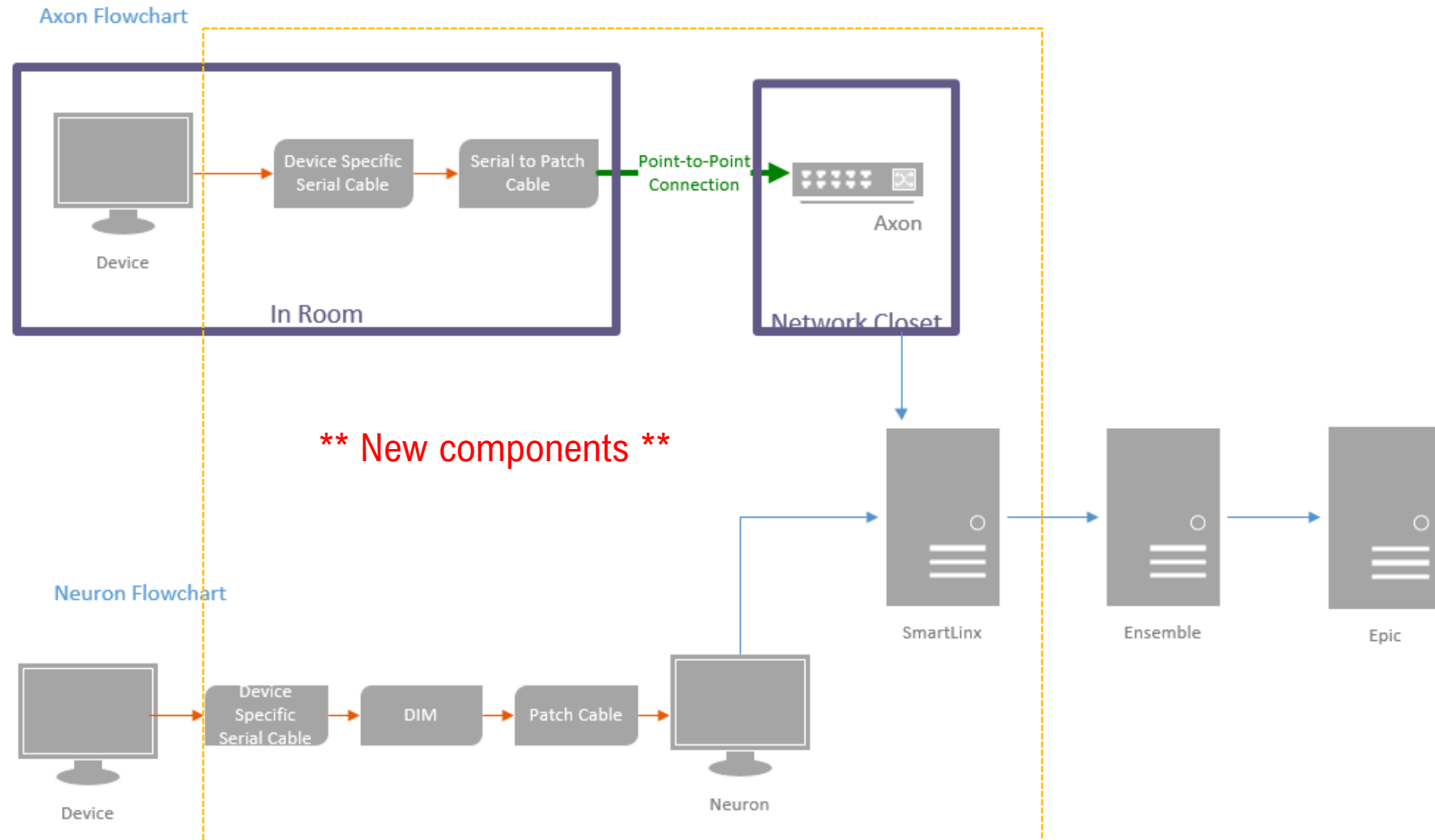


Capsule Biomedical Device Integration

Biomedical Engineering Technician Training

Data flow to Epic in Capsule



Device Identification Module (DIM)

- DIM connects the medical device to Capsule Neuron
- DIM is programmed with:
 - Medical Device Type
 - Free-Text label for identifying the device called “ID Tag”
 - Baud Rate
 - Parity / Data / Stop



Neurons

- Connects to Smartlinx server via PHS IS wired and wireless networks
- Collects parameters, alarms and waveforms
- Configuration contains drivers needed for device data
- Typically configured for specific OR, Bed or location
- Displays connected devices and current data transmission
- Can buffer data collected during loss of network
- Inputs:
 - Medical device data from DIMs
 - ADT info for current patient, if applicable
- Outputs
 - Medical device data to Smartlinx



Neuron Locations

- ORs
- Anesthesia Endo Workstations
- PACUs
- IVF
- Perfusion
- NORAs

Device to Neuron Connectivity



Device

Serial Cable

Connects to
medical
device

DIM

Identifies
device
connected

Patch Cable

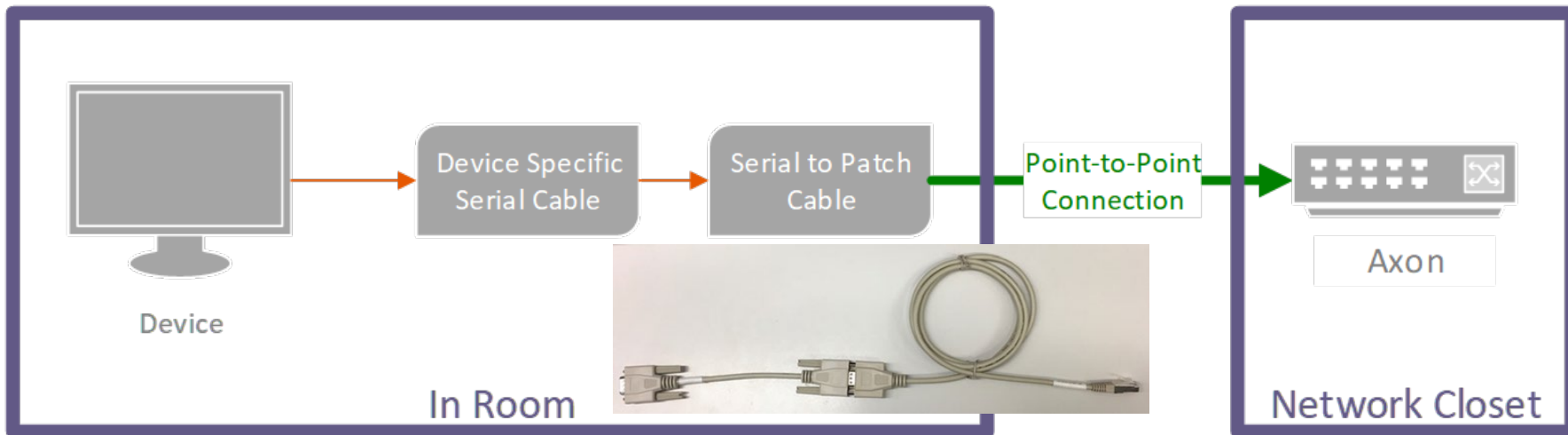
Connects
DIM to
Neuron

Neuron

Manages
device
connectivity
at the bedside,
sends data to
server

Axons

- CPC, Endo Nursing Workstations, Waltham/Danvers PACUs;
- Located in network closets.
- Capsule's equivalent of the Lantronix.
- 8-Port, 4-Port, & 1-Port Configurations
- Wired connection
- Each port is programmed to a specific room & device type
- Only collects parameters from devices (no waveforms)



Device Configurations

| Device | Baud Rate | Parity/Data Bits/Stop Bits | Protocol |
|--------------------|-----------|----------------------------|----------|
| Solar | 9600 | N81 | NA |
| Invivo | 9600 | N81 | Invivo |
| Carescape B series | 19200 | N81 | NA |
| Dash | 9600 | N81 | NA |
| Fresenius 2008T | | | |

**Bold devices have different settings than the device defaults*

Device Specific Serial Cables

- Devices have specific serial cables that are connected to the serial output on the device. The cable is then connected to a DIM for Neurons or serial to patch cable for Axons.
- The serial cable will have a label for identification.

| Device | Serial Cable | Additional Adapters |
|-----------|--------------|-------------------------|
| Solar | B1-CFB | |
| Invivo | B1-CFA | |
| Carescape | B1-CFT | USB to serial converter |
| Dash | B1-CAQ | |
| Fresenius | | |



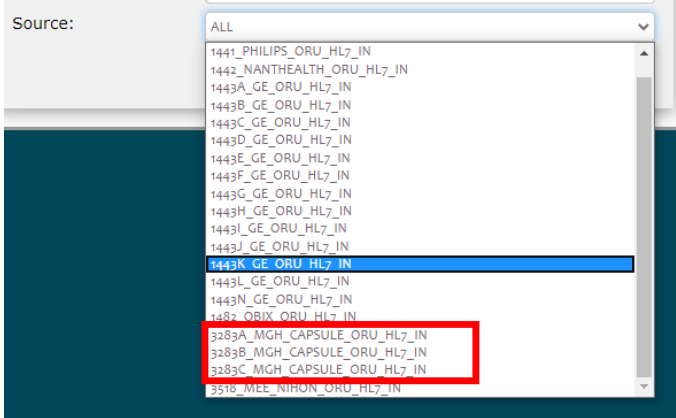
Smartlinx Server

- Connects to Ensemble for Epic integration
- Configured in clusters of 3 servers
- Raw medical device data → Smartlinx Server → Filtered and transformed device data as HL7 messages
- Currently 3 Smartlinx Servers for Nanthealth replacement
 - PHSWEB1511
 - PHSWEB2464
 - PHSWEB1551



Searching for Data in Ensemble

- <http://ensutils.partners.org/MDEV/Recipients.aspx>
- Since there are multiple Smartlinx servers sending data to Epic, you will notice that there are multiple Capsule sources in Ensemble. For this reason, do not select a source.
- Search by Neuron name in the filter string.



Basic Settings

Environment:

Application:

Source:

Basic Settings (Cont.)

Event Type:

Target:

Status:

Dates/Filters

Start Date:

End Date:

Filter String:

Search

| Source | Application Service EventType | Target | Date/Time | Pat_Name_(PID-5) Pat_Id_List_(PID-3) Device | Recipient_Message_Status |
|----------------|--|--|--|---|--------------------------|
| Source Message | MGH Capsule 3283a_MGH_Capsule_ORU_HL7_in ORU^R01 | 541359_Epic_HL7_TCP_out Target Message Target Response | 5/27/2020 8:47:00 AM 5/27/2020 8:47:00 AM | N/A N/A MGHOR_53**ANES1 | "Sent" |
| Source Message | MGH Capsule 3283a_MGH_Capsule_ORU_HL7_in ORU^R01 | 541359_Epic_HL7_TCP_out Target Message Target Response | 5/27/2020 8:46:00 AM 5/27/2020 8:46:00 AM | N/A N/A MGHOR_53**ANES1 | "Sent" |

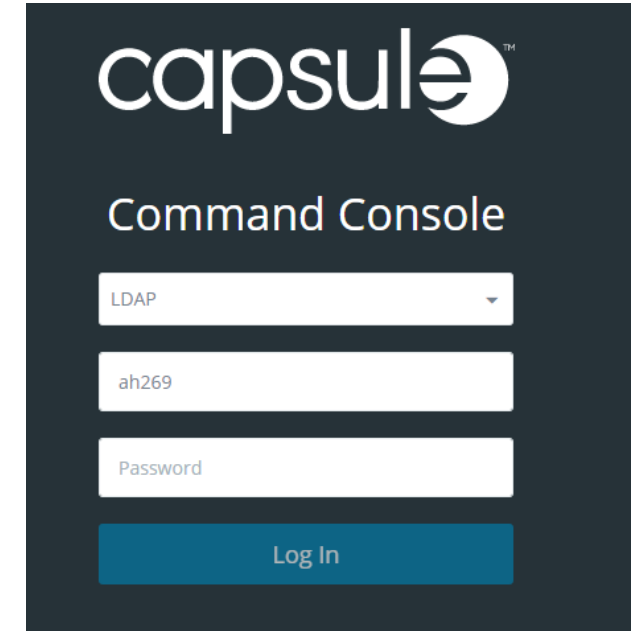
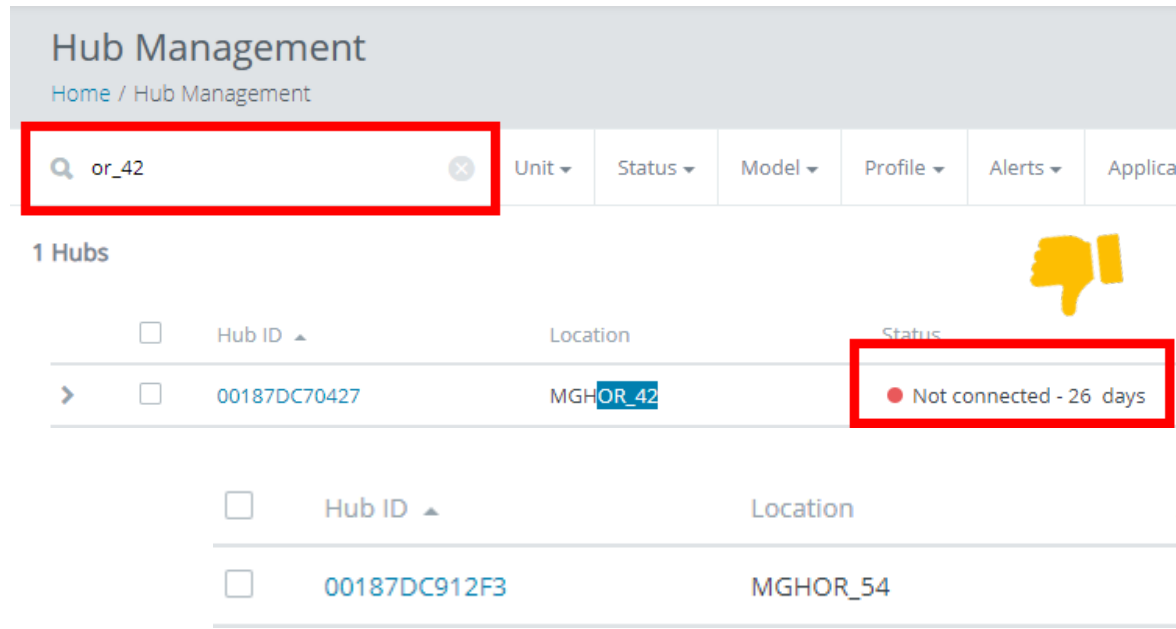
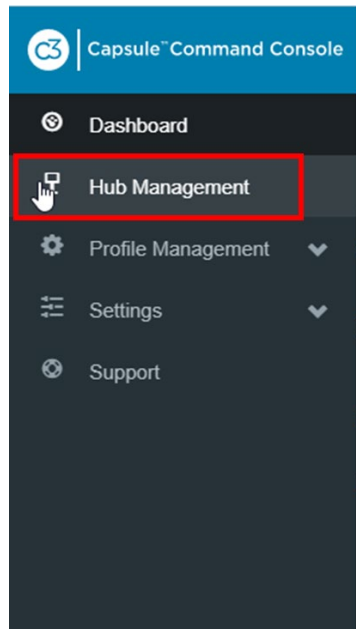


Searching for Data in Ensemble

| <u>Location</u> | <u>Ensemble Naming Convention</u> |
|---|-----------------------------------|
| All ORs | OR_## |
| Perfusion | PERF_## |
| NORAs | NORA_## |
| OR 86/87 Invivos | MRI## |
| Ellison 3 PACU | ELL3## |
| White 3 PACU | WHT3## |
| Lunder 2 PACU | LUN2## |
| Lunder 3 PACU | LUN3## |
| Lunder 4 PACU | LUN4## |
| Wang 3 CPC | WANG3## |
| Blake 4 Endo for Anesthesia | MGHENDO_## |
| Blake 4 Endo for Nursing | MGHENDO_PROC## |
| Blake 4 Endo (Hold, PEDI) | MGHENDO_HOLD##,PEDI## |
| Blake 4 Endo Rec. | MGHENDO_REC@ |
| CRP 9 Endo | CRP9HOLD## (HOLD,REC,PROC) |
| Blake 14 OB | LDOR_## |
| Bigelow 10 HD | HD_BAY## |
| YAW 10 IVF | YAWIVF_01 |
| YAW 8 PEDI HEME-ONC | YAWPEDI_01 |
| OMFS Wang 2 | MGHOMFS_OR## |
| OMFS Wang 2 Rec | MGHOMFS_REC## |
| Ellison 2 MRI | MRI_ELL2## |
| Lunder 6 MRI | MRI_LUN |
| White 1 MRI | ED_MRI01 |
| EP Holding Room | EP_HOLD## (01,02) |
| MGH Danvers OR | DANOR_## |
| MGH Danvers PACU | DANPERI_## |
| MGH Danvers OMFS | DANOMFS_10 |
| MGH Danvers OMFS Rec | DANOMFS_REC01 |
| MGW Preop | PERI_PRE## |
| MGW PACU | WALPERI_POST## |
| MGW OR | WALOR_## |
| MGW IR Suite 1 | WALIR_## |
| MGW Ultrasound Imaging Area | WALUS_## |
| | |
| Where ## is the two-digit number of the room | |
| Where @ is the letter of the bay | |

Troubleshooting: No Data in Epic from OR

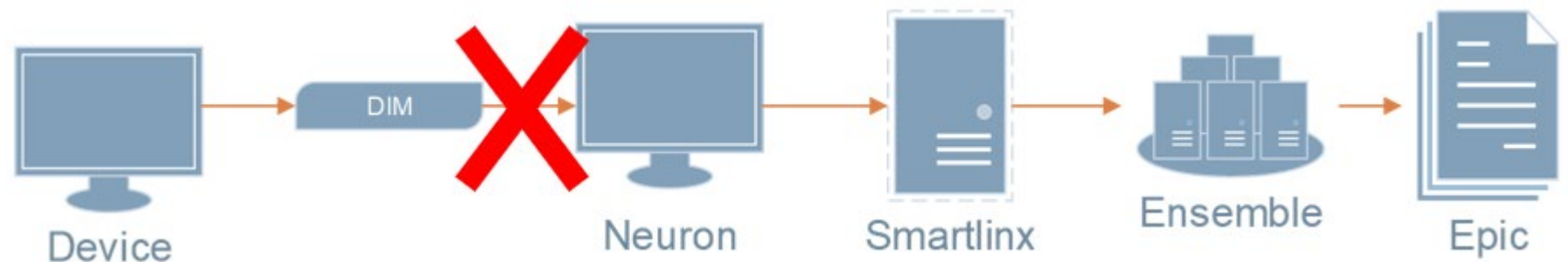
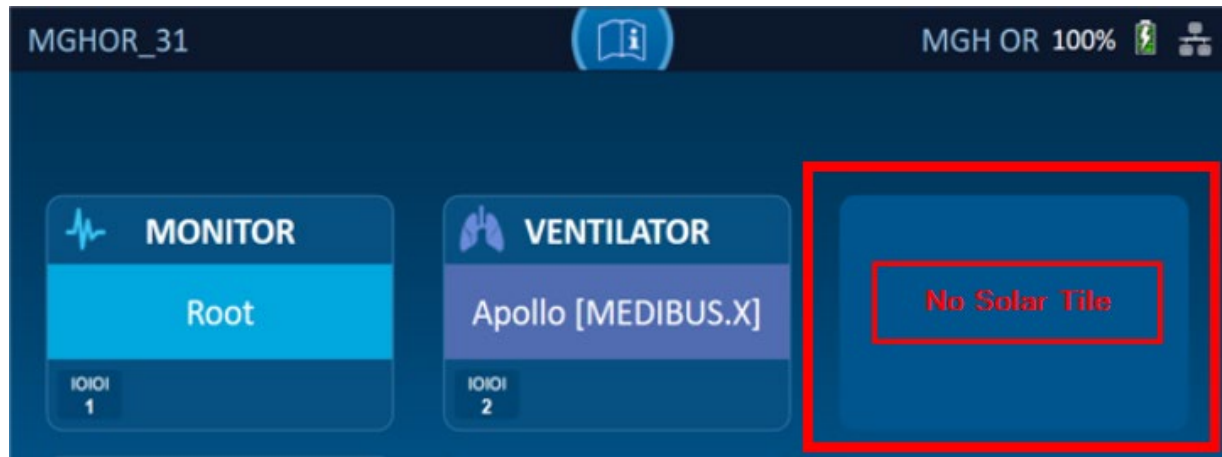
- Is the Neuron connected to the Network?
- Is the Neuron powered off?
- You see if Neurons are online through the C3 hub: <https://phsweb1517/login>
- Use Google Chrome and type <https://phsweb1517/login>. Log in with Partners credentials.
- Click on “Hub Management” on the left side of the screen.
- Search for the OR that called. Ex/ OR 42
- In the status section, you will see if the device is connected. If not connected, the device is powered off or not on the network.



If the Neuron was not on the network but powered on, it will store the data on the Neuron. Once you plug the Neuron into the network, it will send the backlogged data to Epic.

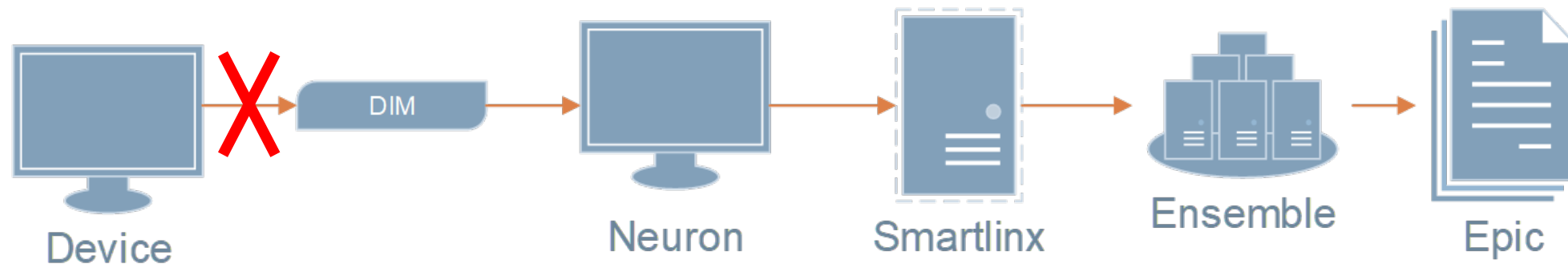
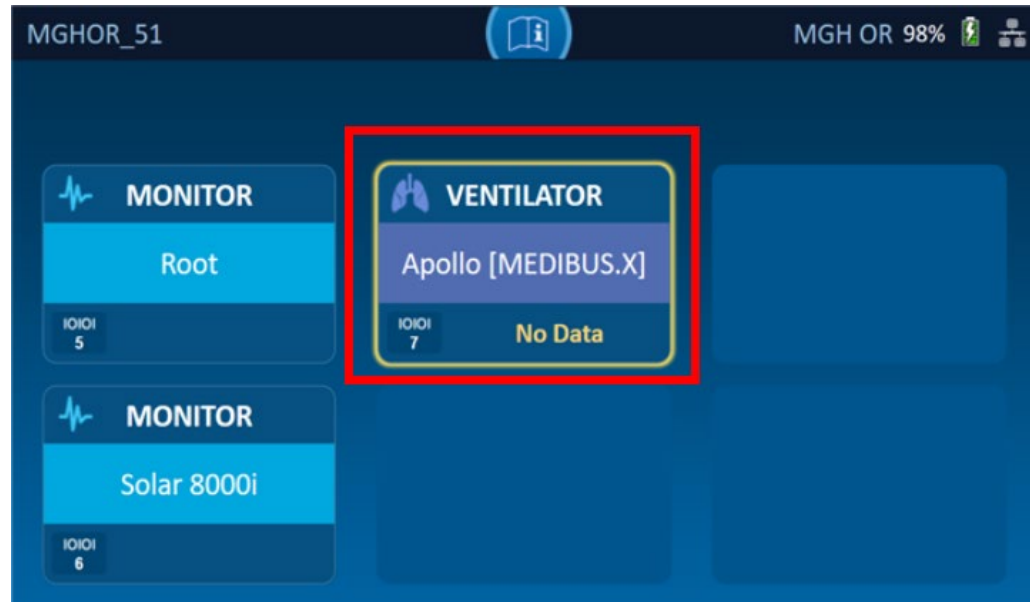
Troubleshooting: No data from one device in the OR.

- If the Clinician calls reports that they are not getting data from one device ex/ Solar but getting data from the Apollo and Root there are a few things to check.
 1. On the Neuron do you see the tile for the device? If there's no tile, the DIM is not connected to the Neuron.



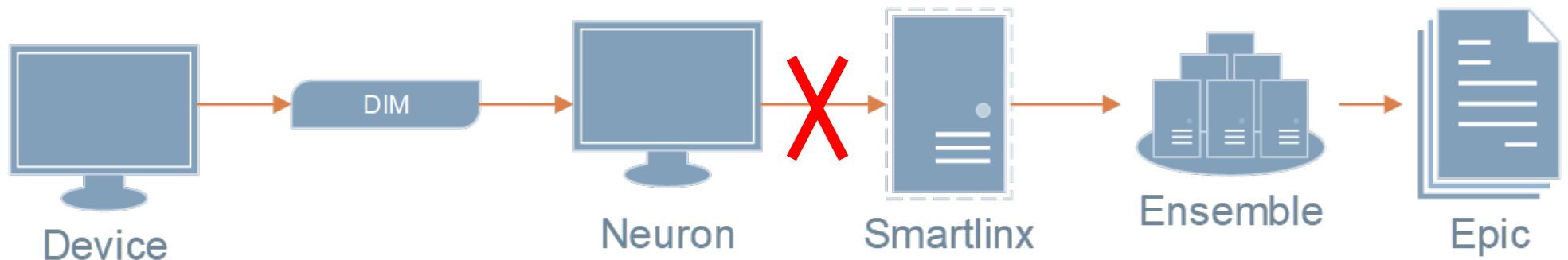
Troubleshooting: No data from one device in the OR.

2. Is there a tile that shows the device with a yellow outline and “No Data”? This means that the serial cable/DIM is not connected to the device or the device is turned off.



Troubleshooting: No data from one device in the OR.

3. Are all devices showing on the Neuron and not showing as “No Data”? The Neuron is not recognizing the DIM. Reboot the Neuron. If this does not fix the problem, escalate to analyst or CE.



Questions?