Customer Experience Center - Catalyst Center / SD-Access (Software Defined Access) Knowledge Base paper

Understanding and Troubleshooting the Philips IntelliVue MX40 Telemetry to Pic iX Server over SD-Access

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Document Conventions

Caution—Alerts readers to be careful. In this situation, you might do something that could result in equipment damage or loss of data.

Note—Alerts readers to take note. Notes contain helpful suggestions or references to material not covered in the document.

Timesaver—Alerts the reader that they can save time by performing the action described in the paragraph affixed to this icon.

Tip—Alerts the reader that the information affixed to this icon will help them solve a problem. The information might not be troubleshooting or even an action, but it could be useful information similar to a Timesaver.

Warning—Alerts readers of a situation that could cause bodily injury. They need to be aware of the hazards involved with electrical circuitry and familiarize themselves with standard practices for preventing accidents.

1 Introduction

1.1 Document Purpose

This document has been put together based on the learnings from the field and is intended to provide a general overview Philips Patient MX40 Telemetry communicating with Monitoring Server in a Cisco SD-Access Wireless/Wired Environment to assist anyone in understanding, isolating and troubleshooting/resolution of the issues.

1.2 Audience

The primary audience of this document is anyone working on SD-Access and Wireless Technology.

1.3 Assumptions

Good solid understanding of Cisco SD-Access deployment and IP multicast routing technology with SD-Access Fabric.

1.4 Related Documents

- SD-Access LISP Deployment Using Cisco Catalyst Center (CVD)
- BRKENS-2820 Demystifying IP Multicast in SD-Access
- Philips Patient Monitoring Network Specification Ed1 1.pdf
- Philips Patient Information Center iX document

2 Philips MX40 Telemetry and Patient Information Center iX (PIC iX) Central Server

2.1 General Overview of Philips MX40 Telemetry and Patient Information Center iX (PIC iX)

The Philips MX40 Telemetry is a wearable device that wirelessly monitors patients' vital signs (ECG Electrocardiography) in real time, supporting mobility within hospital facilities. It transmits continuous data to the Patient Information Center iX Central Monitoring System, a platform that consolidates and displays patient information to enable efficient monitoring of multiple patients simultaneously, using Cisco networking technology including Software-Defined Access (SDA).

Figure 1: MX40 connection over Wireless (Red) and Wired (Green) connecting to PIC iX (Patient Information Center iX Central Server)
(Source: Philips Patient Monitoring Network Specification Ed1 1.pdf

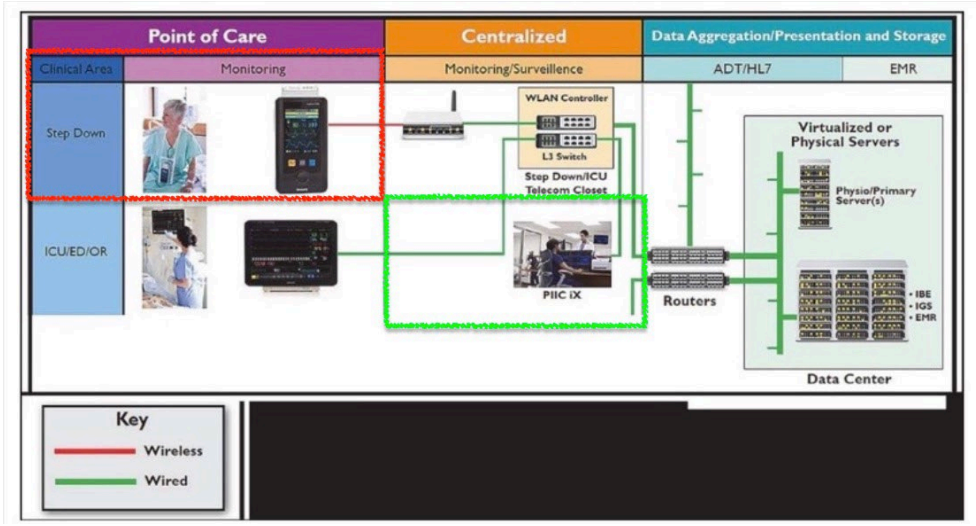


Figure 2: Photo of Philips MX40 Telemetry in use
(Source Philips Information Center (PIC iX) – Navigation)

Figure 3: Patient Information Center iX Central (PIC iX) monitoring system showing patient ECG monitoring
(Source Philips Information Center (PIC iX) – Navigation)

2.2 Reference Philips Wired and Wireless Devices Network Implementation Requirements

Following table illustrates the Wired and Wireless Network Requirements stated in Philips Patient Monitoring Network Specification Ed1 1.pdf document.

Caution— This is a high-level list of specifications extracted from the **Philips Patient Monitoring Network Specification Ed1 1.pdf** to be used as a reference only. Please collaborate with the Philips vendor representative to validate and complete the comprehensive set of requirements based on the specific deployment scenarios.

***Table 1:** Philips Layer 2 Reference Network Requirements and Recommendations (Source: Philips Patient Monitoring Network Specification Ed1 1.pdf)*

Section	Requirement / Recommendation	Key Points
4.2.1 IGMP & IGMP Snooping	IGMP Snooping requires an active IGMP querier	Usually L3 VLAN interface is querier; if no L3, configure static querier or disable snooping
4.2.2 Patient Information Center iX (PIC iX) Central Server	Requires IGMP v2	Enable IGMP Snooping
4.2.3 Redundancy Protocol Convergence	L2 redundancy must converge < 10s	Multiple uplinks; fast convergence to prevent loops
4.2.4 Spanning Tree Protocol	Use Rapid PVST+ or MSTP/RSTP	Enable PortFast for Philips devices; ensure proper STP root design
4.2.5 Link Aggregation Protocol	Use EtherChannel or LACP	Provides redundancy with minimal convergence delay
4.2.6 Asymmetric Routing	Avoid asymmetric routing	Prevents packet flooding issues

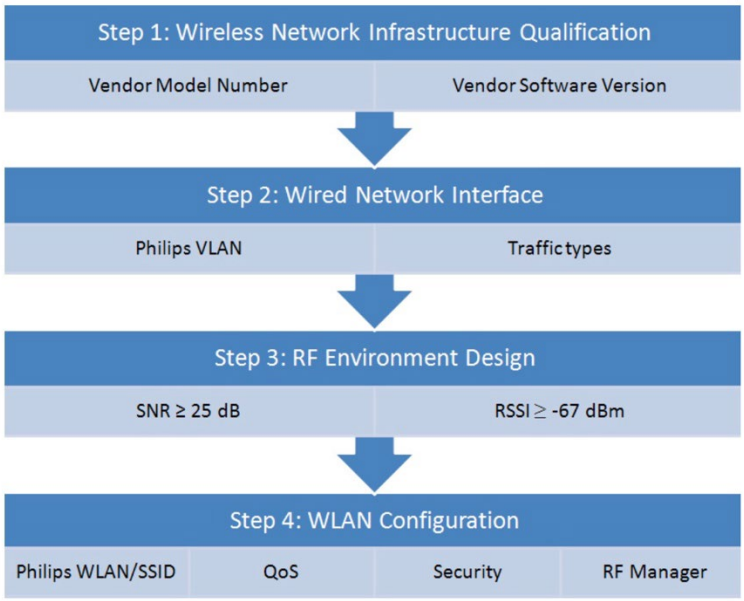
Section	Requirement / Recommendation	Key Points
4.2.7 VLAN Guidelines	VLAN isolation for Philips devices	No mixing with non-approved devices; recommended VTP Transparent mode; avoid misconfigured VTP Server mode
4.2.8 Dynamic VLAN Assignment	Supported if no IPM interaction required	Philips devices support Cisco BNAC
4.2.9 Cisco SD-Access	Allowed with isolation & multicast pass-through	Must meek11t delay/jitter/performance requirements
4.2.10 802.1X Support	Not supported on PIC iX & IPM	Do not enable 802.1X for these devices
4.2.11 Trunked Uplink Ports	VLANs can share trunks if conditions met	Load balancing, QoS end-to-end, monitor trunk < 80% utilization; ideally implement all three
4.2.12 PIC iX Location Mapping (LLDP)	Requires LLDP-MED & stable Chassis-ID	Supports alphanumeric port IDs; Chassis-ID changes on stack master change or switch replacement; uses SNMP for mapping
4.2.13 Device Speed/Duplex	Prefer auto-negotiation	Configure switch port to auto-negotiate; manual config only if required

Table 2: *Philips Layer 3 Reference Network Requirements and Recommendations (Source: Philips Patient Monitoring Network Specification Ed1 1.pdf)*

Section	Requirement / Recommendation	Key Points
4.3.1 Routing Protocol Convergence	Use L3 routing protocol with convergence ≤ 10s	Examples: OSPF, EIGRP
4.3.2 Layer 3 Routing Requirements	Isolate Philips routes; ensure redundancy	Use hospital routing or independent (VRF, static, route maps, PBR); min 2 L3 interfaces per subnet; require HSRP/VRRP or equivalent; meet all L2 requirements; Philips devices must ping L3 interfaces
4.3.3 Philips Multicast Processing	Multicast usage is low	Within industry norms
4.3.4 Rendezvous Point (RP) Engineering	Correct RP mapping required	All PIM routers must map same group to same RP
4.3.5 Multicast TTL	Choose TTL appropriate for network	Too low TTL causes drops before destination
4.3.6 PIC iX Multicast Processing	Specific multicast configuration needed	Supports **224.0.23.63** & **224.0.23.173** (only one required); L2 multicast per RFC 1112; enable multicast routing (PIM Sparse/Sparse-

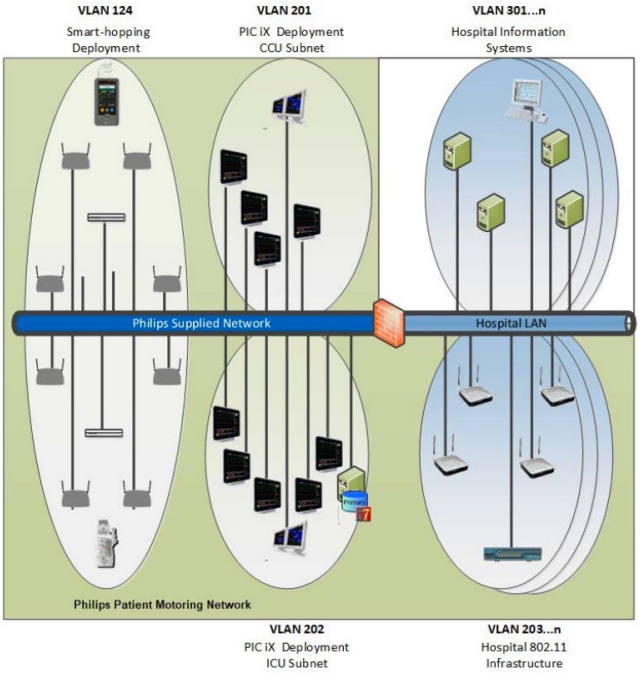
Section	Requirement / Recommendation	Key Points
		Dense) on VLANs; supports multicast zones; reserve unique multicast address block for alarm reflector feature; default block 239.255.0.0; number of addresses based on clinical units

Figure 4: Reference RF Environment Design Requirements
(Source: Philips Patient Monitoring Network Specification Ed1 1.pdf)



Once all, once the Wired and Wireless requirements have been met, customer can deploy the Philips MX40 Telemetry and Patient Information Center iX (PIC iX) Central Server on the infrastructure as outlined in the diagram below (Source Figure 2-4 for an example of deploying PIC iX equipment on a customer supplied 802.11 network).

Figure 5: Deploying PIC iX equipment on a customer supplied 802.11 network infrastructure (Source: Philips Patient Monitoring Network Specification Ed1 1.pdf)

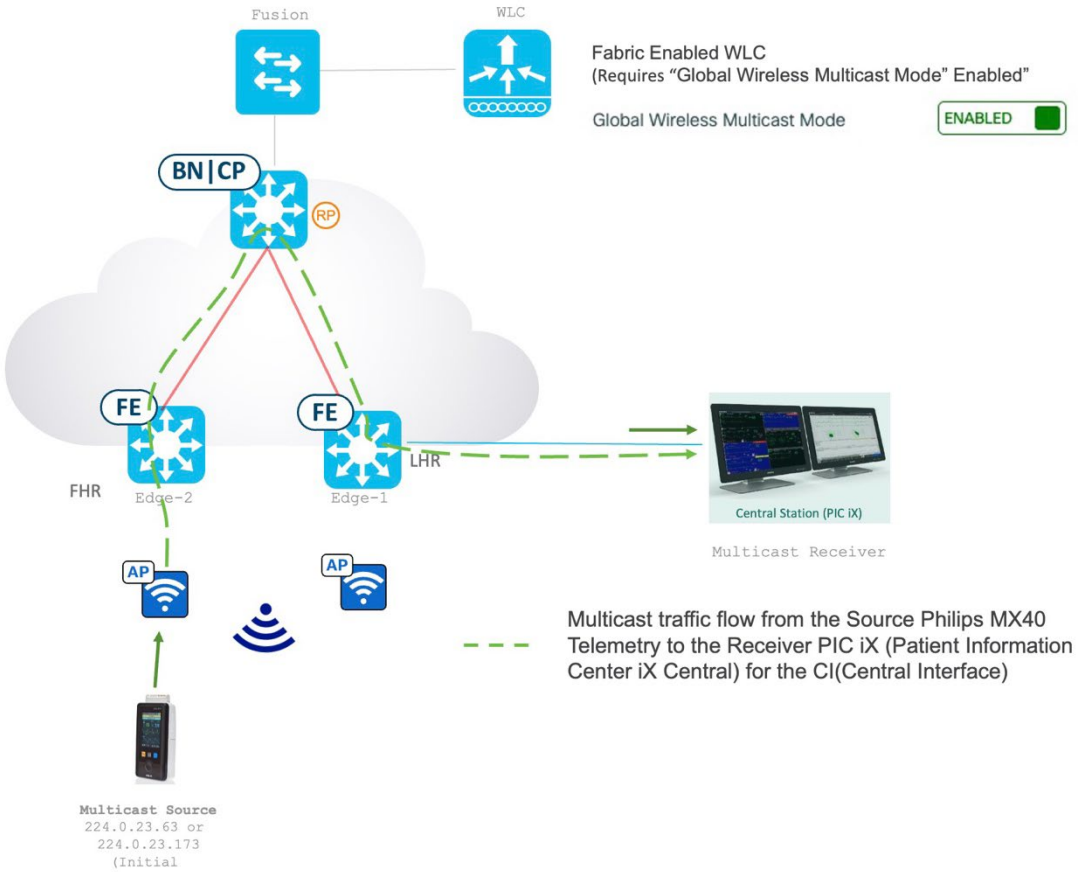


3 Troubleshooting Philips MX40 Telemetry and Patient Information Center iX Central Server (PIC iX) in Cisco SD-Access Network

With the increasing adoption of Cisco SD-Access by customers, there has been a corresponding rise in the number of hospitals deploying Philips Patient Monitoring Systems over Cisco SD-Access architecture.

Following is a traffic flow diagram illustrating the initial multicast traffic stream from the Source **IntelliVue Patient (E.g MX40 telemetry)** to the Receiver **CI Master(Central Interface Master)** using a Native multicast with ASM where the traffic is forwarded down to the receiver using a Shared Tree (RPT) for the initial discovery to allow for bidirectional UDP traffic operation.

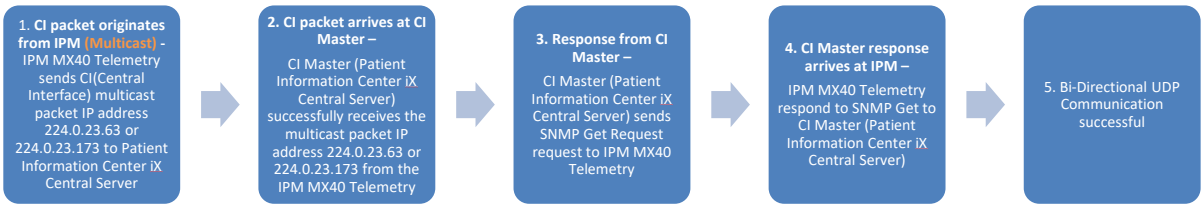
Figure 6: Philips MX40 Telemetry and Patient Information Center iX Central Server (PIC iX) connected over Cisco SD-Access Fabric network.



3.1.1 IntelliVue Patient (E.g MX40 telemetry) to the Receiver CI Master (Central Interface Master) Communication Flow

The following traffic flow can be observed by performing a packet captures on both the IPM (IntelliVue Patient Monitor MX40 telemetry) and the CI Master (Central Interface Master) Patient Information Center iX central monitoring system, with the key points summarized below:

1. CI (Central Interface) packet is originated from IPM (IntelliVue Patient Monitoring MX40 Telemetry).
2. CI (Central Interface) packet arrives at CI Master.
3. Response from CI (Central Interface) Master.
4. CI (Central Interface) Master response arrives at IPM (IntelliVue Patient Monitoring MX40).



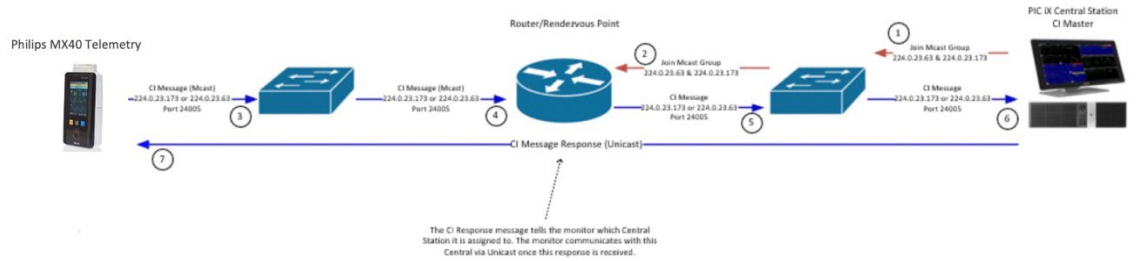
Tip— Following information has been shared by the Vendor (Philips)

1. The IPM (IntelliVue Patient Monitoring MX40 Telemetry) will immediately send the CI (Central Interface) packet via multicast packet either on 224.0.23.63 or 224.0.23.173.
2. CI Master (CI Master (Patient Information Center iX Central Server) will listen to this multicast traffic to send SNMP GET response to the IPM MX40.The IPM (IntelliVue Patient Monitoring MX40 Telemetry) will initiate a multicast to the CI Master (Patient Information Center iX Central Server) if the connection is lost for more than 10 seconds, specifically at the 11th second.
3. With the IPM(IntelliVue Patient Monitoring MX40 Telemetry) in Association mode, the multicast to the CI Master (Patient Information Center iX Central Server) will be sent out every 5~6 seconds.

Caution— There has been a new defect identified where a specific multicast group packets are dropped has been found to be due to **CSCwq54741** 9800 SDA Failing to Forward Multicast Traffic From Phillips MX-40 Client, which is currently being investigated at the time of this writing.

Below is the communication sequence between a Philips MX40 patient telemetry device and the Philips Patient Information Center iX (PIC iX) with the initial multicast announcement followed by bidirectional unicast traffic flow upon successful delivery of the Multicast CI Message to CI Master.

Figure 7: Reference MX40 to Patient Information Center iX Central Communication Overview



1. Multicast is used only during the discovery/assignment phase.
2. Unicast is used for ongoing clinical data exchange.
3. The process relies on IGMP snooping and PIM Sparse/Sparse-Dense mode for proper multicast delivery in routed networks.
4. The multicast group address (224.0.23.63 or 224.0.23.173) is Philips-specific and must be allowed across the network.
    - [Option and please check with the Vendor]VLAN and QoS configurations are critical to ensure low latency and reliable packet delivery.

<u>Detailed communication sequence between Philips MX40 patient telemetry device and the Philips Patient Information Center iX (PIC iX) server</u>

Note:- Both Philips MX40 patient telemetry device and Philips Patient Information Center iX (PIC iX) server are connected on two different Fabric Edges. IPs and MAC addresses quoted are just indicative details.

Philips MX40 patient telemetry device details

IP = 10.144.72.99

MAC = 00:09:fb:a5:71:f5

Philips Patient Information Center iX (PIC iX) Server details

IP = 10.144.72.15

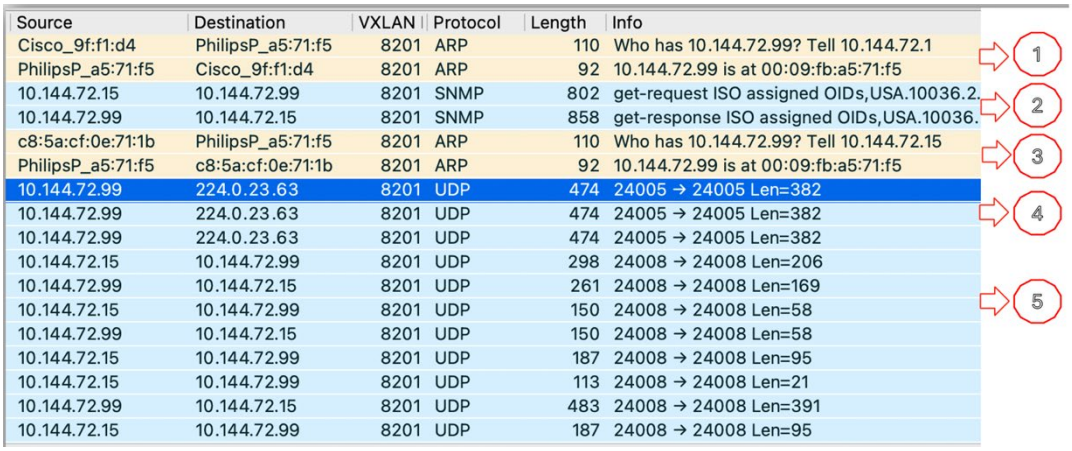
MAC = c8:5a:cf:0e:71:1b

Anycast Gateway details for the corresponding pool present on the Fabric Edge device where Philips MX40 patient telemetry device is connected.

IP = 10.144.72.1

MAC = 00:00:0c:9f:f1:d4

Figure 8: Detailed communication sequence between a Philips MX40 patient telemetry device and the Philips Patient Information Center iX (PIC iX). Please find the details w.r.t serial number 1 to 5 below.



Source	Destination	VXLAN	Protocol	Length	Info
Cisco_9f:f1:d4	PhilipsP_a5:71:f5	8201	ARP	110	Who has 10.144.72.99? Tell 10.144.72.1
PhilipsP_a5:71:f5	Cisco_9f:f1:d4	8201	ARP	92	10.144.72.99 is at 00:09:fb:a5:71:f5
10.144.72.15	10.144.72.99	8201	SNMP	802	get-request ISO assigned OIDs,USA.10036.2.
10.144.72.99	10.144.72.15	8201	SNMP	858	get-response ISO assigned OIDs,USA.10036.
c8:5a:cf:0e:71:1b	PhilipsP_a5:71:f5	8201	ARP	110	Who has 10.144.72.99? Tell 10.144.72.15
PhilipsP_a5:71:f5	c8:5a:cf:0e:71:1b	8201	ARP	92	10.144.72.99 is at 00:09:fb:a5:71:f5
10.144.72.99	224.0.23.63	8201	UDP	474	24005 → 24005 Len=382
10.144.72.99	224.0.23.63	8201	UDP	474	24005 → 24005 Len=382
10.144.72.99	224.0.23.63	8201	UDP	474	24005 → 24005 Len=382
10.144.72.15	10.144.72.99	8201	UDP	298	24008 → 24008 Len=206
10.144.72.99	10.144.72.15	8201	UDP	261	24008 → 24008 Len=169
10.144.72.15	10.144.72.99	8201	UDP	150	24008 → 24008 Len=58
10.144.72.99	10.144.72.15	8201	UDP	150	24008 → 24008 Len=58
10.144.72.15	10.144.72.99	8201	UDP	187	24008 → 24008 Len=95
10.144.72.15	10.144.72.99	8201	UDP	113	24008 → 24008 Len=21
10.144.72.99	10.144.72.15	8201	UDP	483	24008 → 24008 Len=391
10.144.72.15	10.144.72.99	8201	UDP	187	24008 → 24008 Len=95

We can see the following detailed communication between the Philips MX40 patient telemetry device and the Philips Patient Information Center iX (PIC iX) Server. Refer to the sequence noted as part of Figure 8 and the following points as enumerated.

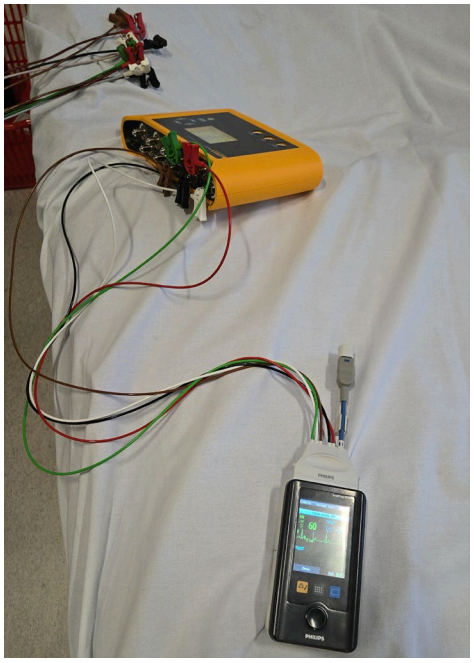
1. ARP request from Fabric Edge for the Philips MX40 patient telemetry device IP and ARP response from the connected Philips MX40 patient telemetry device happens in the first two packets. At this point in the background, once the ARP happens successfully, LISP map-register about the details of Philips MX40 patient telemetry device is initiated by the corresponding Fabric Edge device on respective Fabric site control-plane node(s).
2. SNMP get-request from the Philips Patient Information Center iX (PIC iX) server to the Philips MX40 patient telemetry device and the corresponding SNMP get-response can be seen in the next two packets
3. ARP request from Philips Patient Information Center iX (PIC iX) Server for the Philips MX40 patient telemetry device IP and ARP response from the connected Philips MX40 patient telemetry device happens in the next two packets. Sometimes, this can be in the opposite direction as well.
4. Philips MX40 patient telemetry device sends 3 packets at the multicast group 22.0.23.63 at UDP source port 24005 and destination port 24005. At this point there will be multicast routing table update on the corresponding Fabric edge where the Philips MX40 patient telemetry device is connected, and it would be a signal to the Philips Patient Information Center iX (PIC iX) server that both the devices are ready for the direct communication between them. In this case, L2 flooding is assumed to be enabled for the corresponding IP pool in the Cisco SD-Access Fabric where the Philips devices are connected.
5. Finally, there would be direct to-and-fro UDP-based communication between Philips Patient Information Center iX (PIC iX) server and Philips MX40 patient telemetry device at UDP source port 24008 and destination port 24008. In this case communication is initiated by the MX40 device, but it can be from either end in the field.

3.1.2 Recommended Setup Mode for IntelliVue Patient Monitoring MX40 Telemetry

Following is the recommended setup mode shared on the IPM (IntelliVue Patient Monitoring MX40 Telemetry) by the vendor.

1. IPM (IntelliVue Patient Monitoring MX40 Telemetry) is to be setup in a monitor mode.
2. IPM (IntelliVue Patient Monitoring MX40 Telemetry) will need the leads attached or it will run in a Demo Mode resulting in the IPM (IntelliVue Patient Monitoring MX40 Telemetry) automatically shut down after 10 minutes.

Figure 9: Photo of IPM (IntelliVue Patient Monitoring MX40 Telemetry) with correct leads attached for the simulation/testing purpose.



3. No leads detected on the IPM (IntelliVue Patient Monitoring MX40 Telemetry) will result in the IPM (IntelliVue Patient Monitoring MX40 Telemetry) turning itself off due the Transmitter not detected/

Logs can be collected directly from the Patient Information Center iX Central Server (PIC iX) by accessing the Windows folder path: Stardate/Logs/devicedebug.logs. After gathering the logs, it is recommended to coordinate with the customer or partner to engage the vendor for further assistance and troubleshooting. This approach ensures proper handling and expert support for any issues identified in the logs.

4 Appendix A: SDA Wired and Wireless Commands

4.1 Appendix A: SDA Wired Command Validation

General Show Commands:

```
#Show tech support
#show tech lisp
#show tech ipmulticast
#show tech ipmulticast vrf <VRF>

#show tech sisf
#show tech cef
#show tech fabric

Specific to CPs:
#show lisp instance-id <L3 instance-id> ipv4 server registration-history reverse
#show lisp instance-id <L2 instance-id> ethernet server registration-history
reverse
```

General Multicast Configuration Validation on SD-Access fabric devices in the path.

```
#show ip mroute vrf <VRF> 224.0.23.63 <MX40 Telemetry IP>
#show ip mroute vrf <VRF> 224.0.23.63 <MX40 Telemetry IP> |  be Interface
#show platform software fed switch active ip mfib vrf <VRF>  224.0.23.63 <MX40
Telemetry IP> detail

#show ip mroute vrf <VRF> 224.0.23.173 <MX40 Telemetry IP>
#show ip mroute vrf <VRF> 224.0.23.173 <MX40 Telemetry IP> |  be Interface
#show platform software fed switch active ip mfib vrf <VRF> 224.0.23.173 <MX40
Telemetry IP> detail

#show platform hardware fed switch active fwd resource asic 0 rewrite-index range
<RI Index> <RI Index>
# show access-tunnel summary | i <L3_InstanceID> or # show access-tunnel summary
//Check the respective AP tunnel
#show platform software fed switch active ifm interfaces access-tunnel
```

Verify it on every stack member

```
#show platform software fed sw active ifm if-id <IF_ID>
#show platform software fed sw active ifm if-id <IF_ID> | i Name|type|Type|RI|IP
#show platform hard fed sw active fwd abs print <L2 Brdcast RI handle> 1
#show platform software fed sw active ifm interfaces l2-lisp | i <L2 Instance ID>
#show platform software fed sw active ifm if <ID> | i Flood|Instance
#show platform hardware fed switch active vlan <ID> ingress | i REP
#show platform hardware fed switch active fwd abs print <REP RI Handle> 1 | i uri
#show platform hard fed sw active fwd abs print <REP RI Handle> 1
#show platform hard fed sw active fwd abs print <L2 Broadcast RI handle index>
```

4.1.1 Appendix A: SDA Wireless Validation

- EPC (Embedded Packet Capture) from WLC.

1. RA trace (internal) and without internal.
    - AP Span Capture (on AP to which phone roams to) and the AP to which MX40 connects to and we may need to also perform a Span capture on the Central Server side.
    - Wireless OTA (Over the air) capture from a MacBook.
2. General Show Commands:

```
#Show tech
#Show tech wireless
#Show tech wireless multicast
#Support bundle from AP
```

3. AP debugs: debug client <MAC> & #show datapath command br_router/dump_mcast_stats

```
Sample output
STLD-L2-CW9166#show datapath command br_router/dump_mcast_stats
Global Multicast stats:
    MC-RX MC-Fast-TX MC-XBrg MC-Drop RootPort-Drop
190409761     181135   65102 1074528             0


IPv4 Multicast Receive stats:
   MC Address  MC-RX
    239.1.2.3  69017
    224.0.0.1 318194
  224.0.23.63  31235
224.2.127.254    449
   224.0.0.22  11725


```

5 Appendix B: Acronym Listing or Full Glossary

Term	Definition
PIC iX	Patient Information Center iX Central monitoring system
IPM	IntelliVue Patient Monitoring (e.g MX40 Telemetry)
CI Master	Central Interface Master

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