

## Laerdal Network Requirements

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|          |   |          |
|----------|---|----------|
| <b>1</b> | <b>INTRODUCTION .....</b>                                     | <b>3</b> |
| 1.1      | BANDWIDTH ASSUMPTIONS.....                                    | 3        |
| <b>2</b> | <b>HIGH-LEVEL NETWORK ARCHITECTURE .....</b>                  | <b>3</b> |
| <b>3</b> | <b>DEVICES CONNECTIVITY.....</b>                              | <b>4</b> |
| 3.1      | LOCAL CABLED NETWORK .....                                    | 4        |
| 3.2      | LOCAL WIRELESS NETWORK .....                                  | 4        |
| 3.3      | COMMUNICATION OVER INTERNET .....                             | 5        |
| 3.3.1    | <i>Connectivity to cloud services .....</i>                   | <i>5</i> |
| 3.3.2    | <i>Connectivity for Laerdal technical support .....</i>       | <i>5</i> |
| <b>4</b> | <b>IP ADDRESSING .....</b>                                    | <b>5</b> |
| <b>5</b> | <b>NETWORK SERVICES, PROTOCOLS AND APPLICATIONS .....</b>     | <b>6</b> |
| 5.1      | DEVICES AND SERVICES DISCOVERY .....                          | 6        |
| 5.1.1    | <i>Discovery using Bonjour services.....</i>                  | <i>6</i> |
| 5.2      | APPLICATION TCP/UDP PORTS AND NETWORK SECURITY POLICIES ..... | 6        |
| 5.2.1    | <i>Traffic inside the simulation network .....</i>            | <i>7</i> |
| 5.2.2    | <i>Traffic to the cloud services.....</i>                     | <i>8</i> |

## 1 Introduction

This document describes the main settings of the network required by Laerdal equipment to perform medical simulations.

The Laerdal simulation software and simulation equipment require a local area network (LAN) to exchange data and commands.

In addition, Laerdal's products require a connection to Internet for software maintenance, security upgrades, telemetry reporting, use of other cloud services and remote technical support.

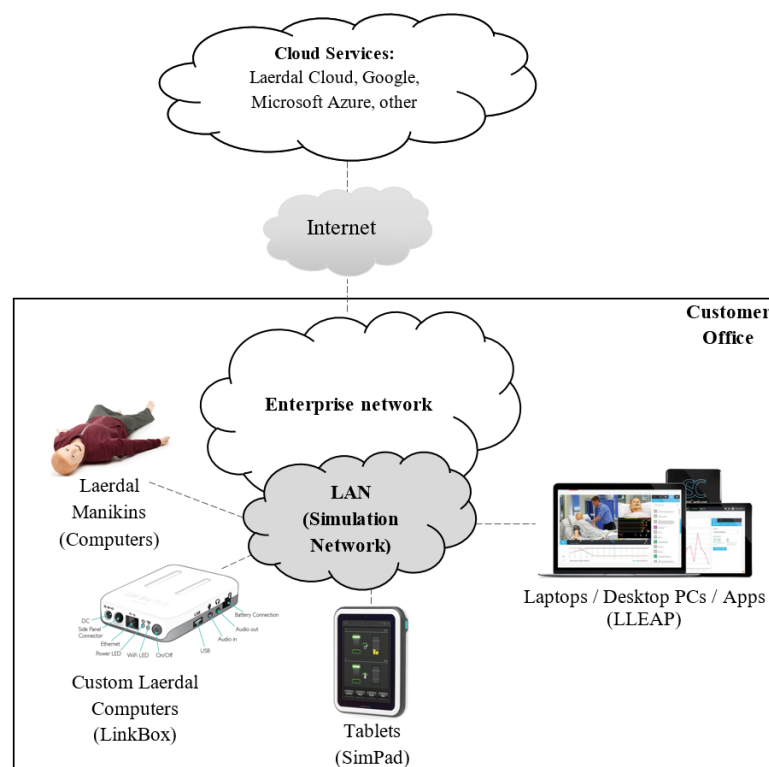
### 1.1 Bandwidth assumptions

Each Laerdal simulation device requires a minimum 1 Mbps bandwidth capacity across the network that is used for simulations. During different phases of application execution devices may produce peaks of traffic exceeding 1 Mbps.

## 2 High-level network architecture

Figure 1 shows the high-level architecture of a network which provides local and Internet connectivity for Laerdal simulation equipment. The simulation network is a separate subnet inside customer's enterprise network. Certain Laerdal simulation applications require access through the enterprise network over Internet to Laerdal cloud and third-party cloud services.

**Figure 1:** The high-level architecture of a simulation network



All devices used in a simulation must be connected to the same subnetwork.

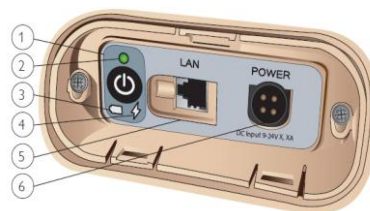
### 3 Devices Connectivity

#### 3.1 Local cabled network

The manikins and other Laerdal simulation devices are equipped with Ethernet network interface cards (NIC) which can be used to connect the devices to a local-area network switch or hub using minimum category 5 UTP (CAT5) copper cables.

Figure 2 shows the side panel found in several manikin devices which includes an Ethernet interface, a power on/off button and a power plug. The side panel provides external access to manikin's internal operating system (Windows or Linux) for network configuration and applications traffic.

**Figure 2:** Manikin's side panel with RJ45 port



The NIC interfaces of the simulation devices are compatible with 100BASE-TX standard and support maximum 100 Mbps. The interfaces are configured to automatically negotiate the speed and duplex mode settings.

If the enterprise network uses virtual LAN (VLAN) capability for optimization and flexibility, then all Laerdal equipment must be connected to network interfaces allocated to the same VLAN identifier (VLAN ID).

#### 3.2 Local wireless network

Several Laerdal simulation devices can be connected to an enterprise network over wireless local-area networks (WLANs) as shown in Figure 2.b.

The WLAN devices used by Laerdal devices are compatible with the protocol specifications of the Wi-Fi standards (802.11).

The recommended topology for the Wi-Fi simulation network is the network infrastructure mode (i.e., BSS mode). In the Wi-Fi architecture Laerdal devices are clients of the Wi-Fi network.

Laerdal manikins have inside their torso installed a wireless communication equipment which can be configured locally over an RJ45 port connection. Dependent on the manikin model, these Wi-Fi network devices can be a router, a dongle or a built-in circuit module.

The following table lists the main features of the wireless devices used by Laerdal simulation equipment:

| Wi-Fi   | Compatible Simulation Devices   |
|---|---|
| 2.4-Ghz channels 1-11   | All   |
| 5-Ghz channels 36, 40, 44, 48   | All devices except: SimPad or LinkBox Classic based models<br>(Some devices may support additional 5-Ghz channels)            |
| Release 4 (Wi-Fi 4, 802.11N)  | SimPad Plus, LinkBox PLUS, SimBaby, SimNewB, Nursing Anne Simulator, SimMan 3G with WRN500 router, Laerdal provided computers |
| Release 5 (Wi-Fi 5, 802.11AC)   | SimMan 3G model equipped with a Wi-Fi dongle<br>(LM Technologies dongle)  |
| WPA-2 Personal or Enterprise <sup>1</sup> Encryption with user authentication | All. Some older manikin models require a hardware upgrade.  |

### 3.3 Communication over Internet

#### 3.3.1 Connectivity to cloud services

The simulation network must be connected to Internet for device and application communication with cloud services.

#### 3.3.2 Connectivity for Laerdal technical support

For technical support, the enterprise customer shall provide VPN access to the simulation network. The computers with Laerdal Learning Application (LLEAP) include TeamViewer application which is used for remote technical support.

## 4 IP addressing

The Laerdal devices used in simulations must be assigned private IPv4 addresses. All allocated IP addresses must belong to the same subnet range to facilitate device discovery and stability of the simulation session.

The following range of IP addresses which are used internally by Laerdal manikins should not be used in the simulation network (wired or wireless): 192.168.168.\*.

The allocation of the IP addresses should be performed by an enterprise DHCP server, which should reserve permanently the addresses to the simulation devices.

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<sup>1</sup> Requires LLEAP or SimPad PLUS using software version 7.3.0 or newer.

## 5 Network services, protocols and applications

### 5.1 Devices and services discovery

Laerdal applications use Bonjour services (multicast Domain Name Services – mDNS – and DNS Service Discovery – DNS-SD) and a proprietary method (named hereafter ‘Legacy’) to discover manikins, simulation devices, services and other computers connected over the simulation network.

The Bonjour services must be enabled in the enterprise network devices (wireless routers, wired routers, firewalls, any network devices used in the simulation network which block the Bonjour services).

Laerdal Learning Application (LLEAP) can use both methods for device discovery - Bonjour and ‘Legacy’. Only Bonjour is supported for the discovery of Laerdal LinkBox devices while only Legacy is supported for updating SimMan3G simulators.

#### 5.1.1 Discovery using Bonjour services

Laerdal applications use Bonjour services (multicast Domain Name Services – mDNS – and DNS Service Discovery – DNS-SD) and a proprietary method (named hereafter ‘Legacy’) to discover manikins, simulation devices, services and other computers connected over the simulation network.

The following Bonjour services names must be enabled in the network devices used to build the simulation network.

```
_simbridge._tcp  
_simmonitor._tcp  
_simlink._tcp  
_simse._tcp  
_simvca._tcp  
_simventures._tcp
```

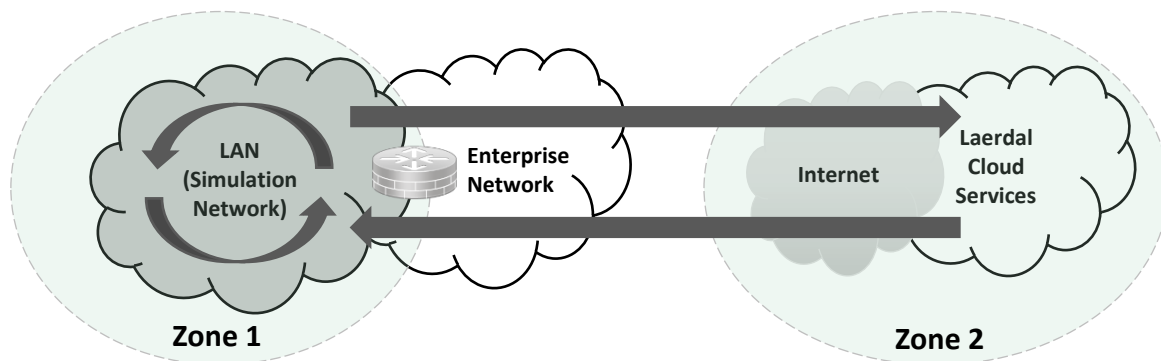
```
_http._tcp  
_workstation._tcp  
_ssh._tcp  
_lleaphost._tcp  
_ctgserver._tcp  
_lleapsimupdate._tcp
```

Note that, for certain network equipment manufacturers, the above service names must be added, configured and enabled in the network devices (routers, wireless controllers, other Layer 3 devices) following the instructions included in the vendor manuals.

### 5.2 Application TCP/UDP ports and network security policies

This section describes the protocols and the ports used by Laerdal simulation devices which must be considered when implementing the security policies in the enterprise network.

The traffic generated by Laerdal devices flows within and between two main network zones as shown in Figure 3.

**Figure 3:** Traffic flow zones

The security control measures (access control lists, ACLs, and firewall filtering) implemented in the network equipment in Zone 1 and Zone 2 shall not restrict the traffic flows and shall not block the TCP/UDP ports used by the simulation devices and applications.

Sections 5.2.1 and 5.2.2 describe the ports used by Laerdal devices and applications inside Zone 1 and between the two zones, respectively.

### 5.2.1 Traffic inside the simulation network

The following table describes the ports used by Laerdal applications inside Zone 1 (that is Zone 1 to Zone 1 traffic).

| Protocol | Ports     | Devices   | Description  |
|----------|-----------|---|--|
| TCP      | 22        | SimPad, LinkBox, Client PC <sup>2</sup>                                     | Rsync, WinSCP and sFTP used to transfer files to and from the client and the manikin                               |
| TCP      | 80, 443   | SimMan3G simulators<br>SimView<br>SimCapture On-Premise<br>SimCapture Cloud | Web application access via a browser<br>Local automated health checks internally and outgoing communication        |
| TCP      | 2000-2001 | SimPad<br>Resusci Anne Plus   | Serial data communication of the ventilation and compression performed on the manikin used to calculate QCPR score |
| TCP      | 3389      | SimMan3G  | Remote Desktop   |
| UDP      | 5353      | All   | Bonjour / mDNS / DNS-SD, Zeroconf discovery<br>Udp://224.0.0.251:5353  |

<sup>2</sup> Client PCs are computers or laptops running simulation components of the Laerdal Learning Application (LLEAP) such as: Patient Monitor, Simulator Firmware and Network Wizard, Debrief Application.

| Protocol      | Ports        | Devices   | Description  |
|---------------|--------------|---|--|
| TCP           | 5671         | Client PC   | Data Analytics   |
| UDP           | 6681-6682    | SimMan3G simulators<br>Client PC<br>Debrief PC<br>SimView | For the Patient Monitor Remote Screen Capture Software   |
| UDP           | 6797-6798    | SimMan3G-family<br>Client PC                              | Used by Laerdal 'legacy' discovery   |
| UDP           | 7557-7558    | Linkbox simulators  | Laerdal VS params and unified params<br>Build on protocol buffers message subscription service                                   |
| TCP           | 9897         | SimMan3G-family   | Configuration of SimMan 3G simulator   |
| TCP           | 9898         | Simulator PC<br>Client PC                                 | Voice conferencing control   |
| UDP multicast | 11000-11006  | Simulator PC<br>Client PC<br>SimPad, LinkBox              | Voice conferencing. Binary data stream of data using OPUS encoder/decoder  |
| UPD broadcast | 13000        | Simulator PC<br>Client PC                                 | Legacy alive data  |
| TCP           | 14997        | Client PC<br>VitalsBridge                                 | VitalsBridge Communication   |
| UDP           | 14998        | Client PC<br>VitalsBridge                                 | VitalsBridge advertising   |
| UDP multicast | 15000-15007  | Simulator PC<br>Client PC                                 | Alive data   |
| TCP           | 15020-15024  | LinkBox, SimPad<br>Simulator PC<br>Client PC              | Configuration and control, file transfer. Used to communicate with Patient Monitor application using web service (wsdl) protocol |
| TCP           | 15029        | Simulator PC<br>Client PC                                 | Computers used in simulation   |
| UDP           | 15030-15033  | Simulator PC<br>Client PC                                 | CTG server stream for SimMom   |
| UDP           | 54915, 52734 | Client PC<br>ASL5000                                      | ASL 5000 device discovery  |
| TCP           | 55195, 52719 | Client PC<br>ASL5000                                      | ASL 5000 device control and data   |

### 5.2.2 Traffic to the cloud services

The following table describes the ports used by Laerdal devices and applications transferring traffic between Zone 1 to Zone 2.



The ports listed in this table shall be outbound open in the security devices sitting on the communication path from Zone 1 to Zone 2.

| Protocol | Ports   | Target URL   | Devices                          | Function   | Data  |
|----------|---------|--|----------------------------------|--|---|
| TCP      | 443     | *. <a href="https://laerdal.com">laerdal.com</a>   | LLEAP PCs<br>SimPad,<br>Manikins | Online activations of licenses and Laerdal products. It is required by Laerdal products to work.<br>Software updates for Laerdal products downloaded manually.   | License keys information – REST api<br><br>Installation files for miscellaneous products. |
| TCP      | 80, 443 | <a href="https://cdn.laerdal.com">cdn.laerdal.com</a><br><a href="https://laerdalcdn.blob.core.windows.net">laerdalcdn.blob.core.windows.net</a> | LLEAP PCs<br>SimPad,<br>Manikins | Software updates for LLEAP and SimPad. Detection of needed software updates.   | Installation files / executables for Windows and Linux                                    |
| TCP      | 80, 443 | <a href="https://scenariocloud.laerdal.com">scenariocloud.laerdal.com</a>  | LLEAP PCs<br>SimPad,<br>Manikins | Online Laerdal Scenario Cloud synchronization  | Zip-archives containing xml and media files   |
| TCP      | 443     | <a href="https://laerdalmedicalb2c.b2clogin.com">laerdalmedicalb2c.b2clogin.com</a>  | LLEAP PCs<br>SimPad,<br>Manikins | Laerdal Active Directory B2C login   | Verification of user credentials  |
| TCP      | 443     | <a href="https://gigya.com">gigya.com</a>  | LLEAP PCs<br>SimPad,<br>Manikins | Identity management required for Laerdal cloud services (Scenario Cloud, Laerdal Connect)  | Verification of user credentials  |
| TCP      | 443     | <a href="https://api.ipify.org">api.ipify.org</a>  | LLEAP PCs<br>SimPad,<br>Manikins | IoT external lookup, LLEAP and SimPad  | URL Redirects & Lookup of geolocation data about users.                                   |
| TCP      | 25      | <a href="https://smtp.gmail.com">smtp.gmail.com</a>  | LLEAP PCs<br>SimPad,<br>Manikins | LLEAP and SimPad feedback forms, errors reporting and log files for debugging. Users can trigger an e-mail to be sent to Laerdal with crash logs and other forensic information for troubleshooting system errors. | E-mail  |
| TCP      | 443     | *. <a href="https://teamviewer.com">teamviewer.com</a>   | LLEAP PCs<br>SimPad,<br>Manikins | Remote desktop application used for remote support. Must be initialized by user on the local computer.   | See <a href="https://www.teamViewer.com">www.teamViewer.com</a>                           |
| TCP      | 80, 443 | *. <a href="https://SonoSim.com">SonoSim.com</a>   | LLEAP PCs                        | LLEAP software updates and content for SonoSim Ultrasound simulator  | Windows installation files + content in the form of multimedia files.                     |

| Protocol | Ports | Target URL  | Devices                          | Function  | Data                                     |
|----------|-------|---|----------------------------------|---|--|
| TCP      | 443   | SonoSim.auth0.com   | LLEAP PCs                        | LLEAP SonoSim Ultrasound Simulator authentication server  | Device (probe) ID to authenticate use    |
| TCP      | 443   | update.VitalsBridge.com   | LLEAP PCs                        | LLEAP software updates for VitalsBridge   | Installation files / executables         |
| TCP      | 443   | www.ingmarmed.com   | LLEAP PCs                        | LLEAP software updates for Ingmar ASL 5000 ventilator   | Windows installation files / executables |
| TCP      | 443   | *.googleapis.com<br>*.gstatic.com   | LLEAP PCs<br>SimPad              | Google Telemetry data<br>Anonymized data (no personal information) used for improving our products, preventive maintenance etc.   | Telemetry data                           |
| TCP      | 443   | applicationinsights.azure.com<br>applicationinsights.microsoft.com<br>services.visualstudio.com | LLEAP PCs<br>SimPad,<br>Manikins | LLEAP and SimPad, MS Application Insight Telemetry data.<br>Anonymized data (no personal information) used for improving our products, troubleshooting, preventive maintenance etc. | Telemetry data                           |
| TCP      | 443   | servicebus.windows.net  | LLEAP PCs<br>SimPad,<br>Manikins | Microsoft EventHub Telemetry data.<br>Anonymized data (no personal information) used for improving Laerdal products, troubleshooting, preventive maintenance etc.                   | Telemetry data                           |