

Physiological Monitoring Systems on the Hospital Enterprise Network

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Assumptions

Shared Network Infrastructure

Physiological Monitoring System is deployed on the hospital's enterprise network.

Vendor:

- **Patient Monitors**
- **Central Stations**
- **Physical Servers and Software**
- **Software to be installed in physical servers or virtual machines**

Hospital IT:

- **Cable drops from Bedside/Central Location to Patch Panel**
- **Patching from Patch Panel to Network Switches**
- **Network Switches**
- **Network Routers**
- **Firewalls**
- **Physical Servers**
- **Virtual Machines**
- **Data Base Servers**
- **Operating System and SQL licenses.**
- **Wireless Network (in most cases)**

Recommendations

IEC 80001

Application of risk management for IT-networks incorporating medical devices

Part 1 to Part 6

“The overall responsibility of the Healthcare IT network belongs to the Healthcare Delivery Organisation”

Topics

- Peer to Peer Networks
- Client Server Networks
- Export of Physiological Monitoring Data to EMR
- Import of ADT Data to Physiological Monitoring Systems
- Remote Clinical Access
- Access to Clinical Information at the Bedside
- Ancillary Alarm Communication
- 12 Lead ECGs to Cardiology Information System
- Time Management
- Active Directory (LDAP)
- Virtual Machines

Out of Scope

- Telemetry Patient Monitoring Systems (WMTS and Wi-Fi)

Why network Physiological Monitoring Systems on the Hospital Enterprise Network?

Why network Physiological Monitoring Systems on the Hospital Enterprise Network?

- To exchange data with other Information Systems

Peer to Peer Network



Patient Monitor

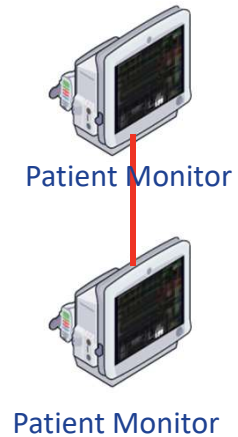


Patient Monitor

Peer to Peer Network

- Distributed application architecture that partitions tasks or workloads between patient monitors (peers).

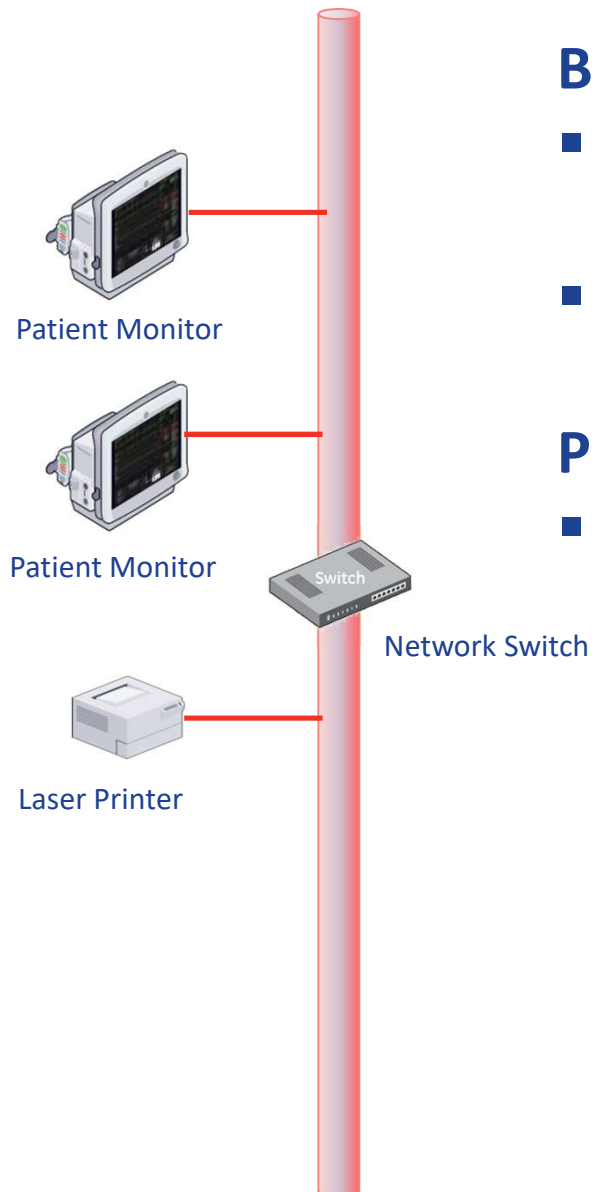
Peer to Peer Network with Direct Connection



Bed to Bed Viewing:

- view a remote patient bed under an alarm condition
- view any available bed in the network.

Peer to Peer Network with Network Switch



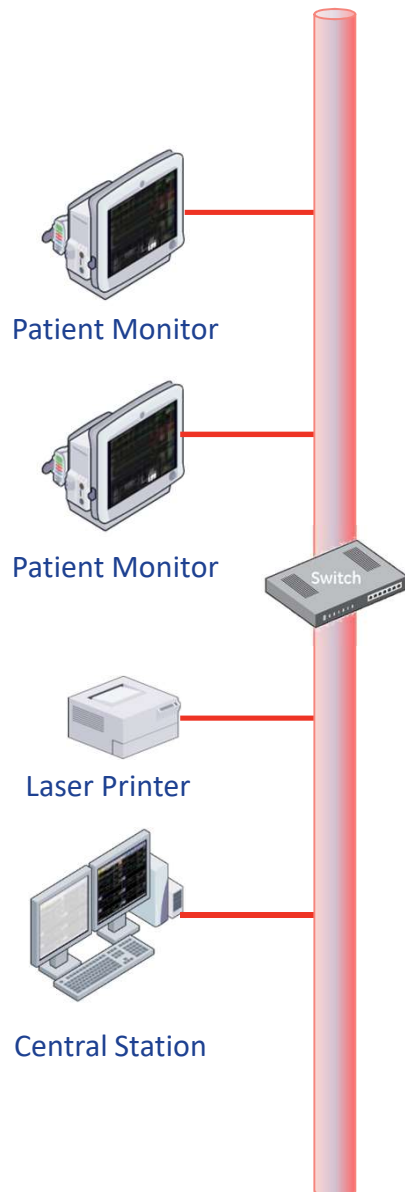
Bed to Bed Viewing:

- view a remote patient bed under an alarm condition
- view any available bed in the network.

Printing:

- Patient Monitors can print directly to Laser Printer.

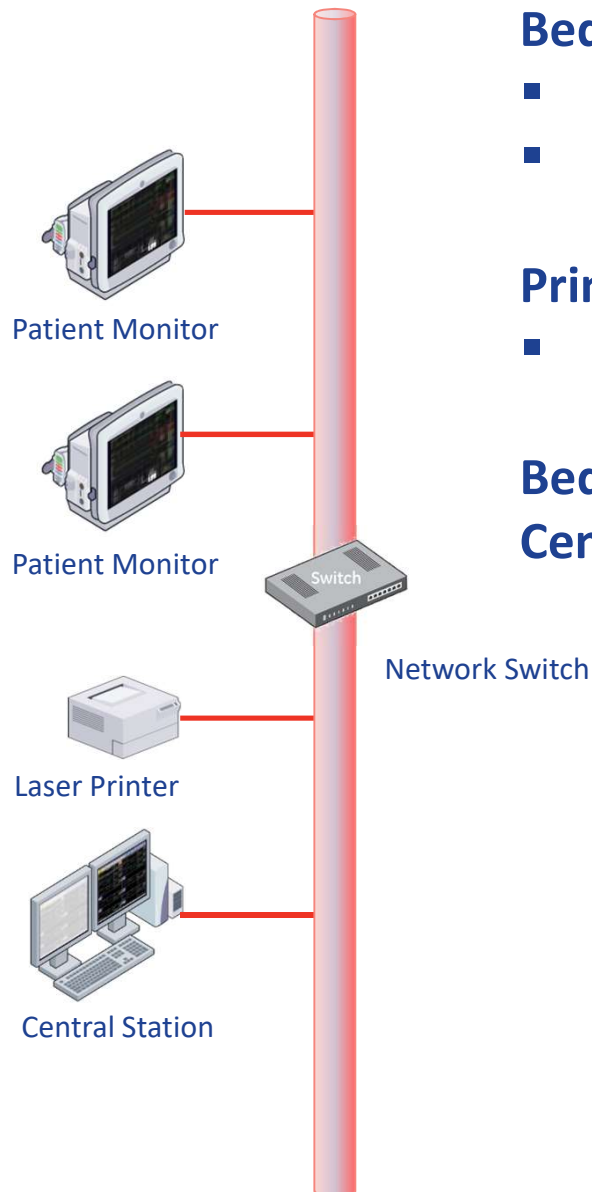
Client Server Network with Network Switch



Client Server Network

A patient monitoring network in which one centralized, powerful computer (called the server, typically a central station) is a hub to which many less powerful patient monitors (called clients) are connected. The clients run programs and access data that are stored on the server.

Client Server Network with Network Switch



Bed to Bed Viewing:

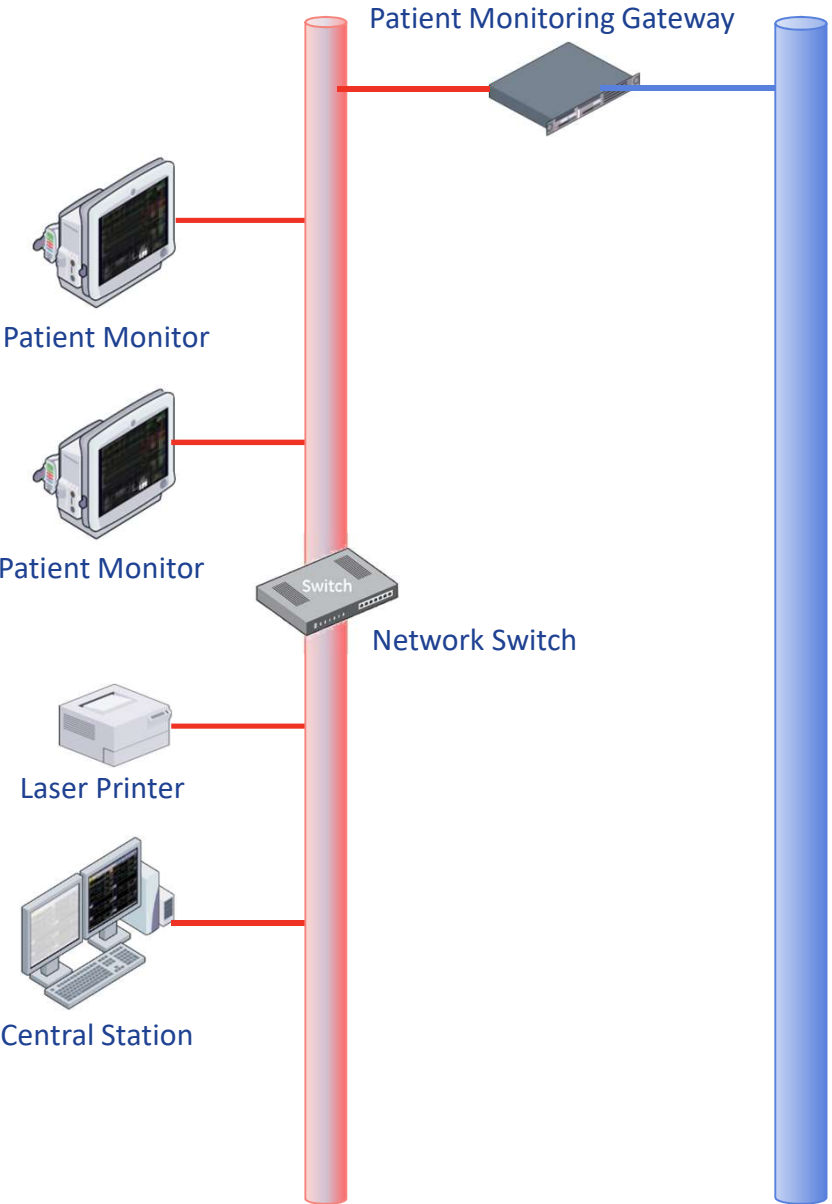
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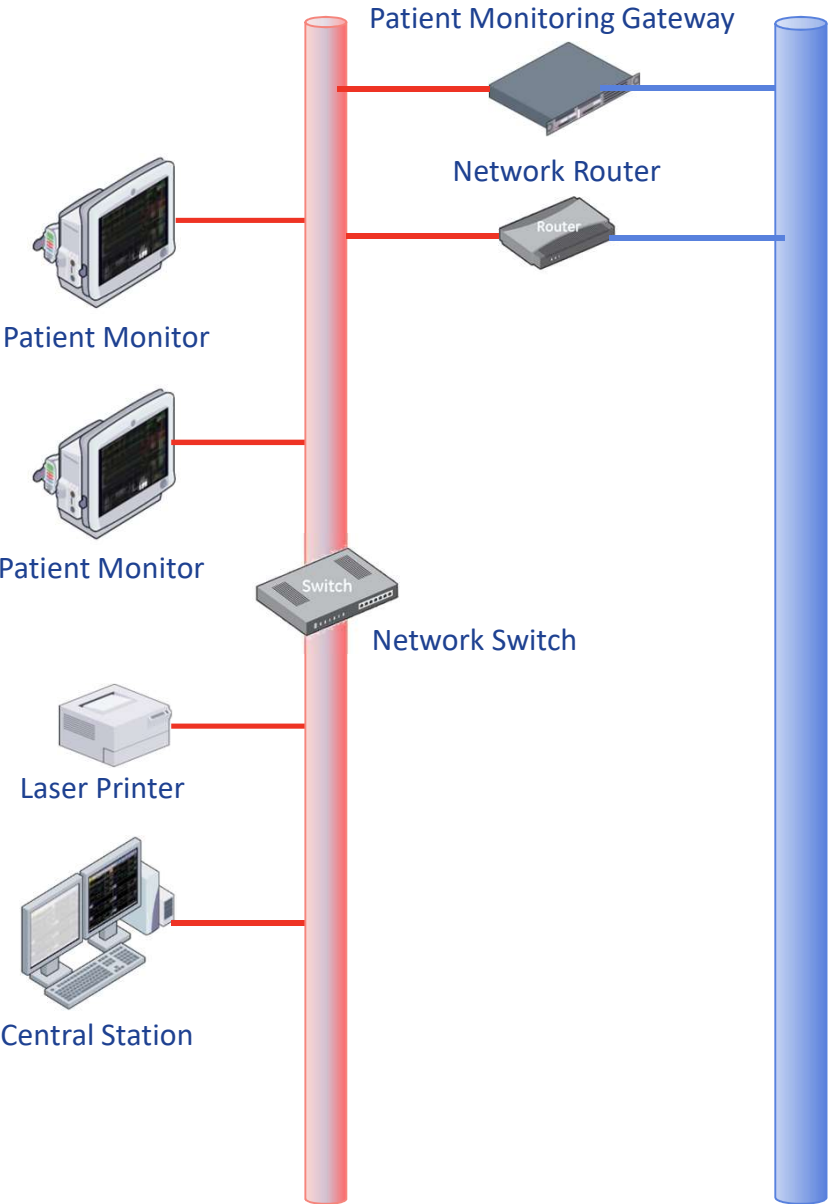
Bed to Bed Viewing and Printing require the presence of a Central Station.

Export of Physiological Monitoring Data to EMR



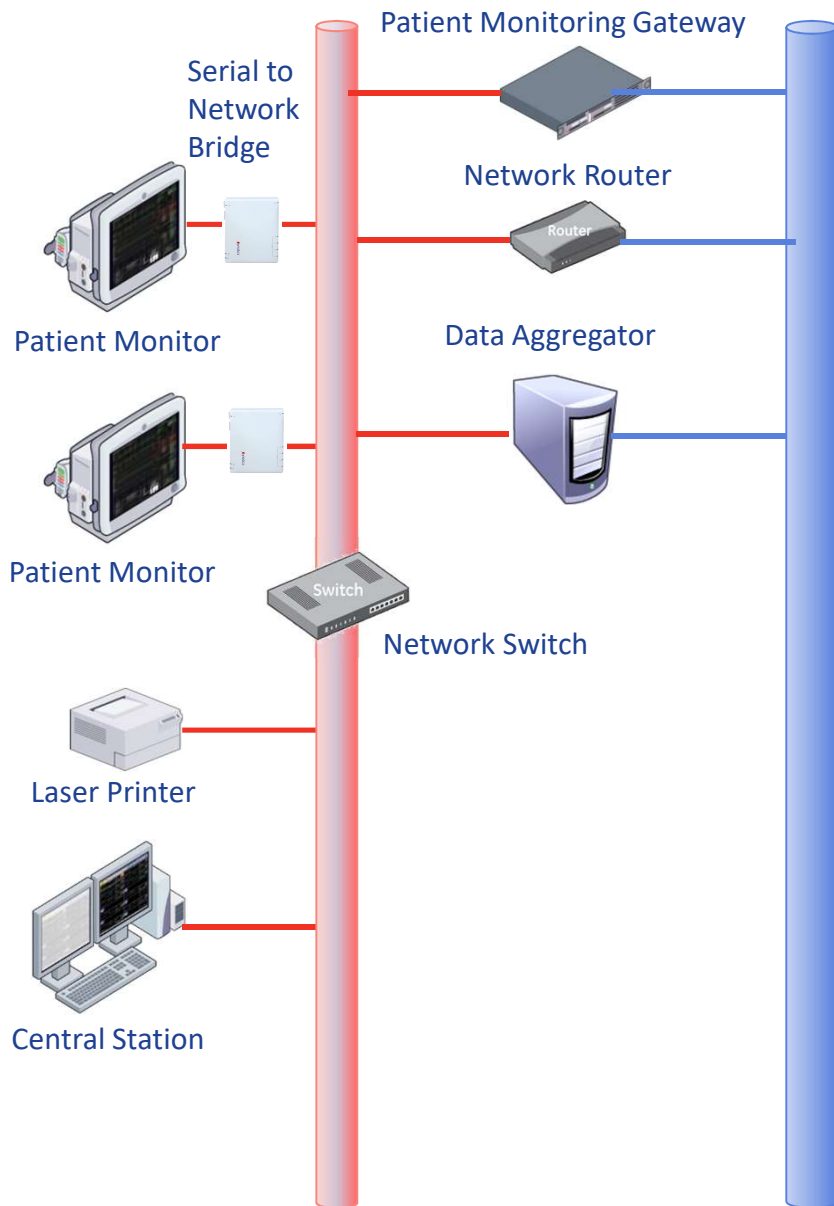
1. Patient Monitoring Gateway

Export of Physiological Monitoring Data to EMR



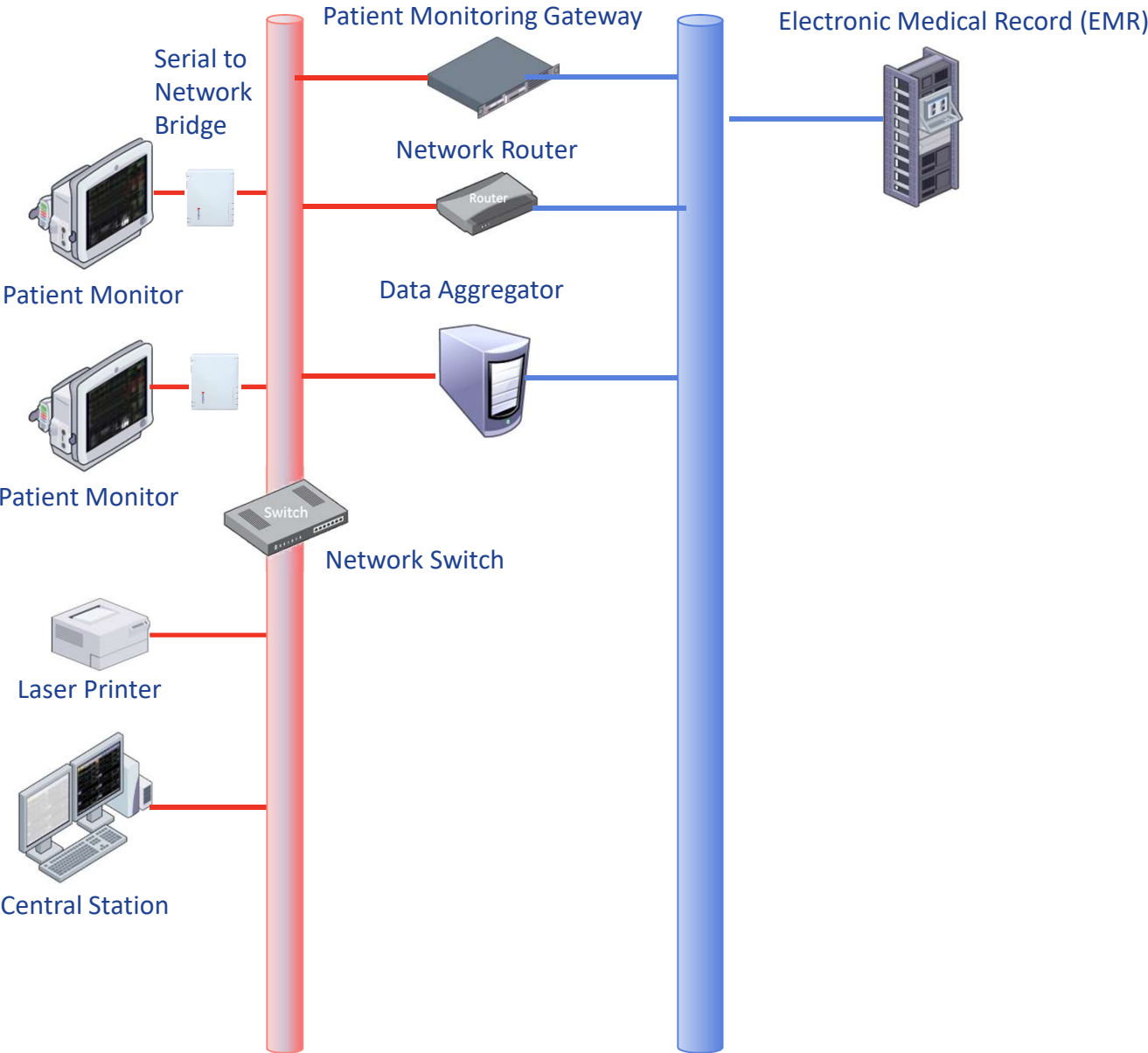
- 1. Patient Monitoring Gateway
- 2. Central Station

Export of Physiological Monitoring Data to EMR

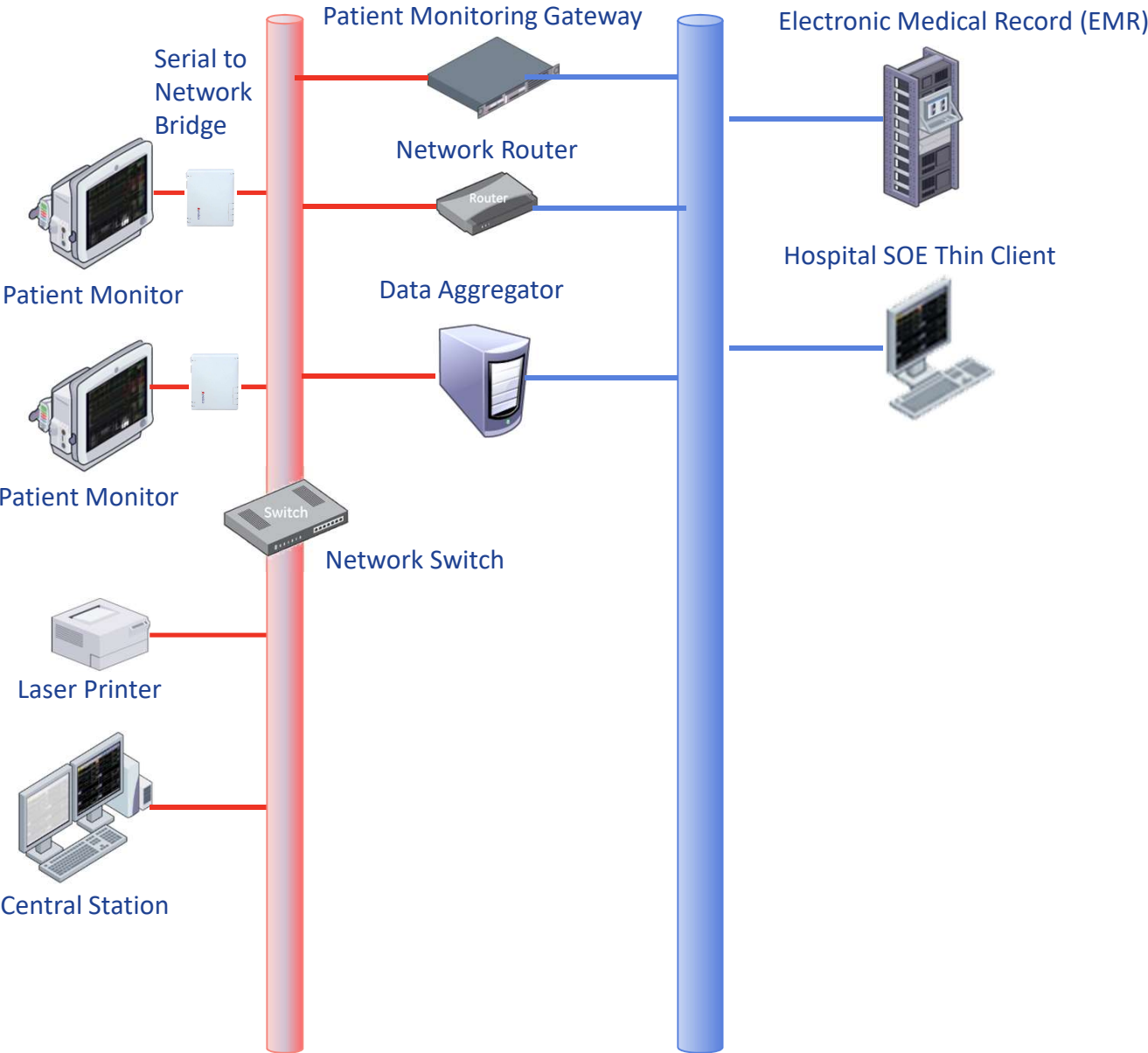


1. Patient Monitoring Gateway
2. Central Station
3. Serial to Network Bridge and Data Aggregator

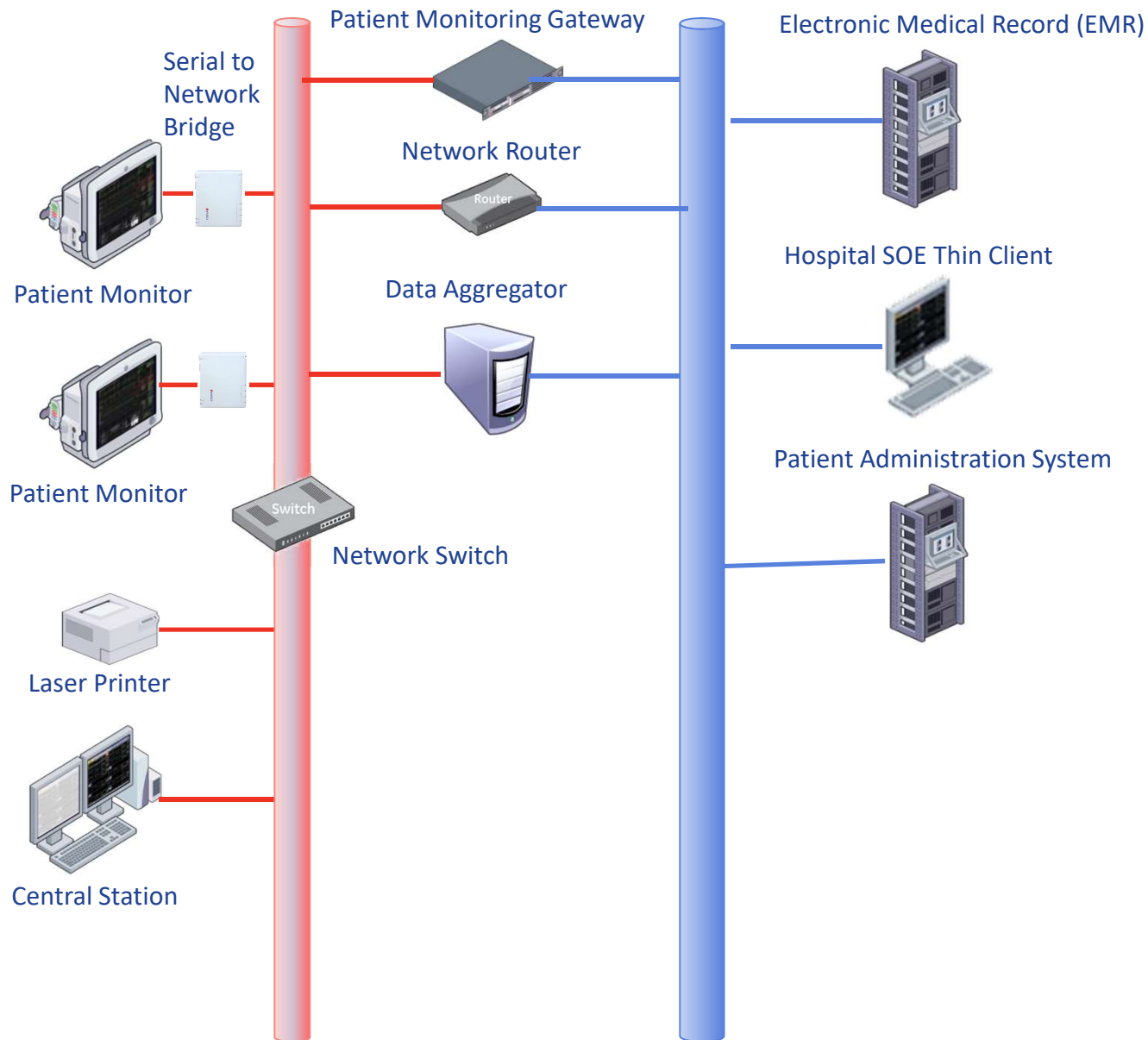
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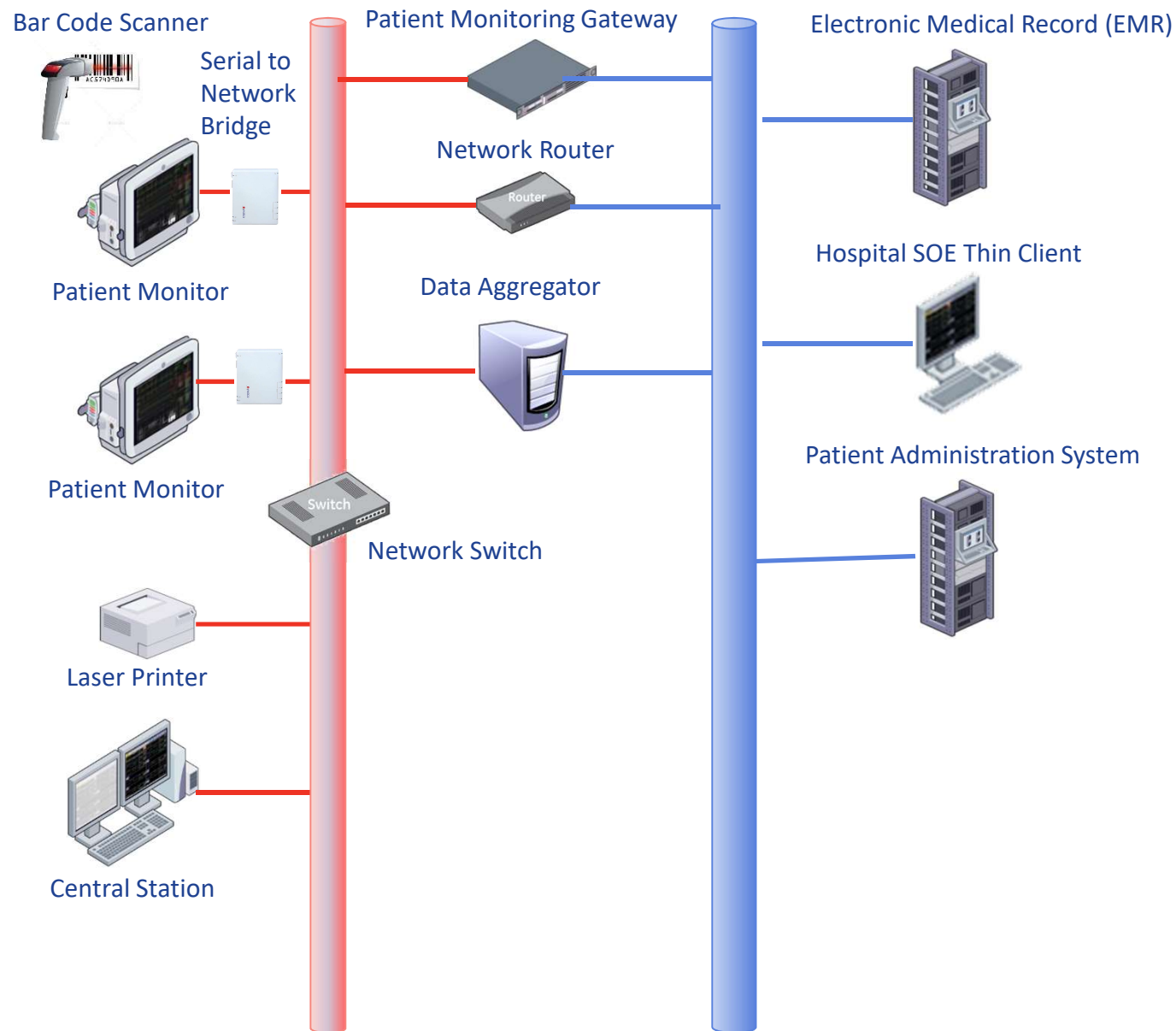
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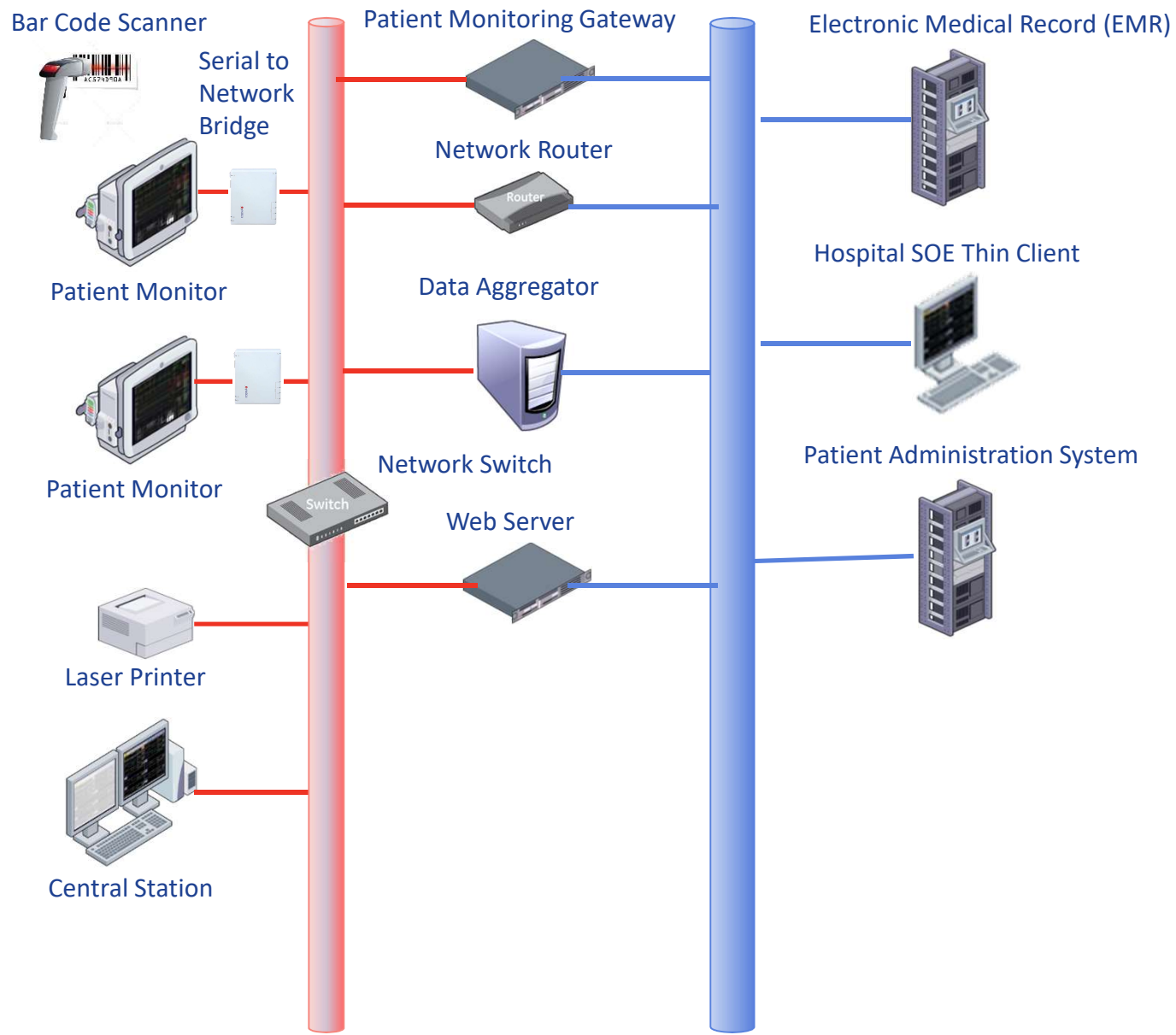
Import of ADT Data to Physiological Monitoring Systems



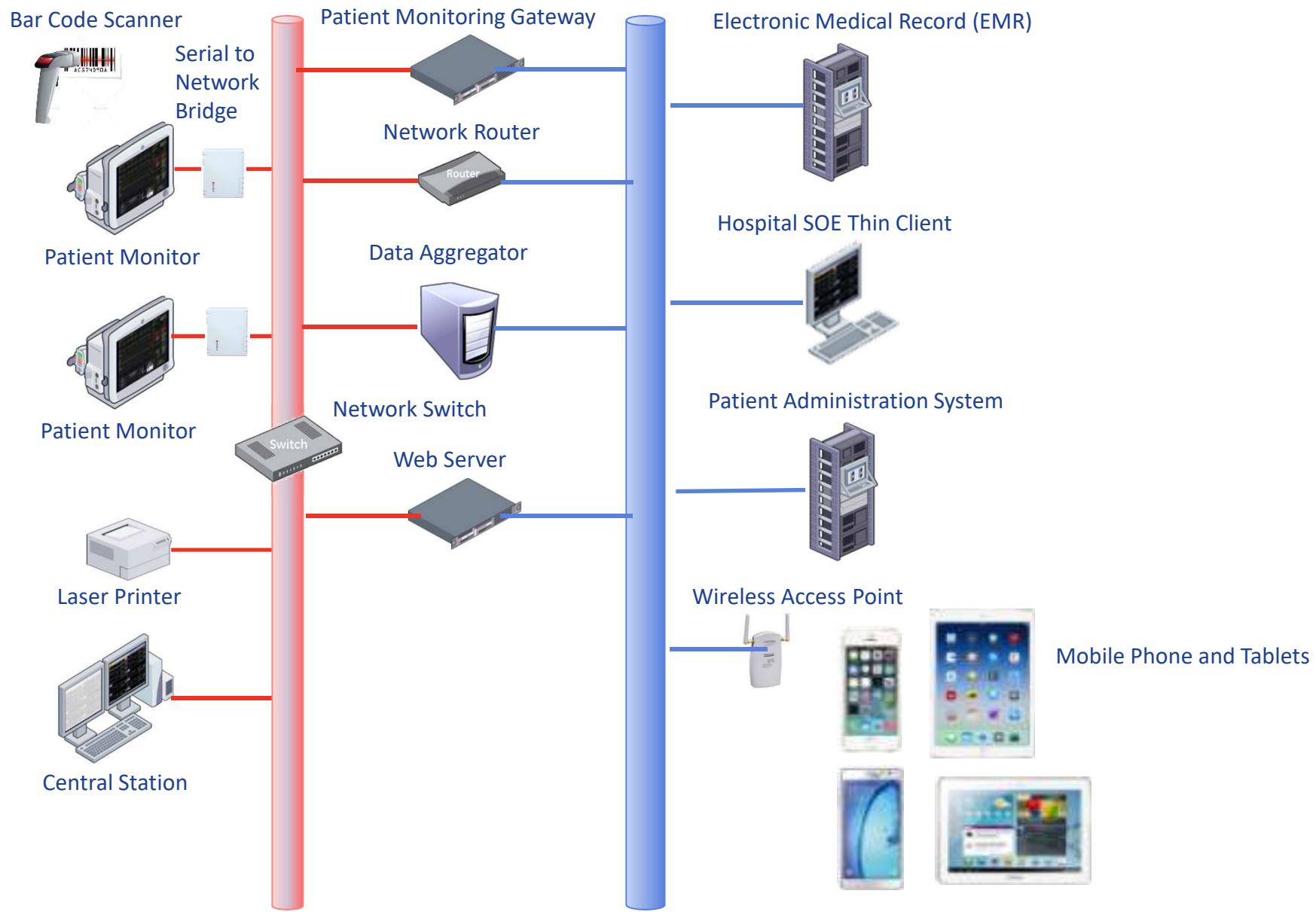
Import of ADT Data to Physiological Monitoring Systems



Remote Clinical Access



Remote Clinical Access



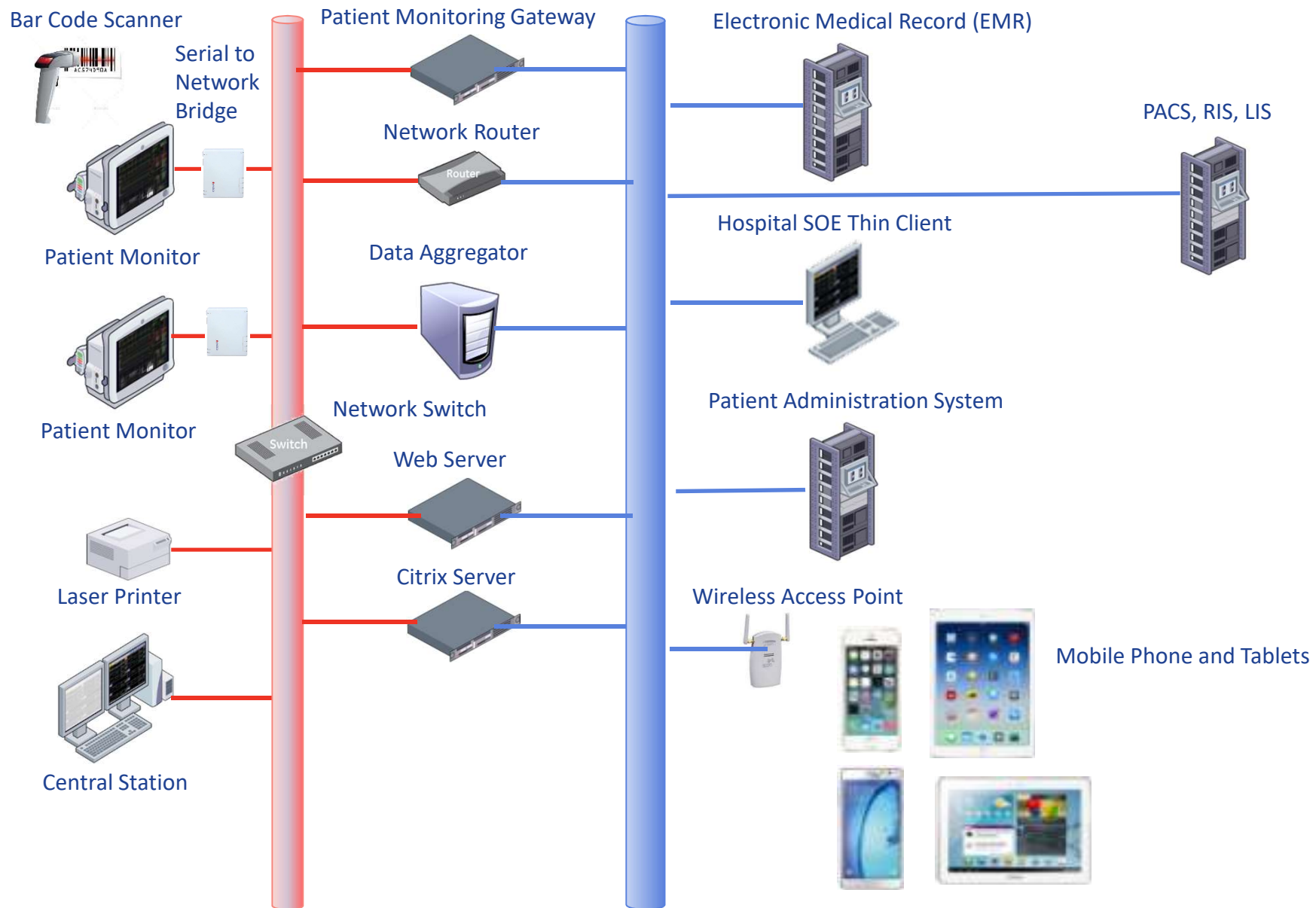
Access to Clinical Information at the Bedside

Virtual Desktop Infrastructure (VDI)

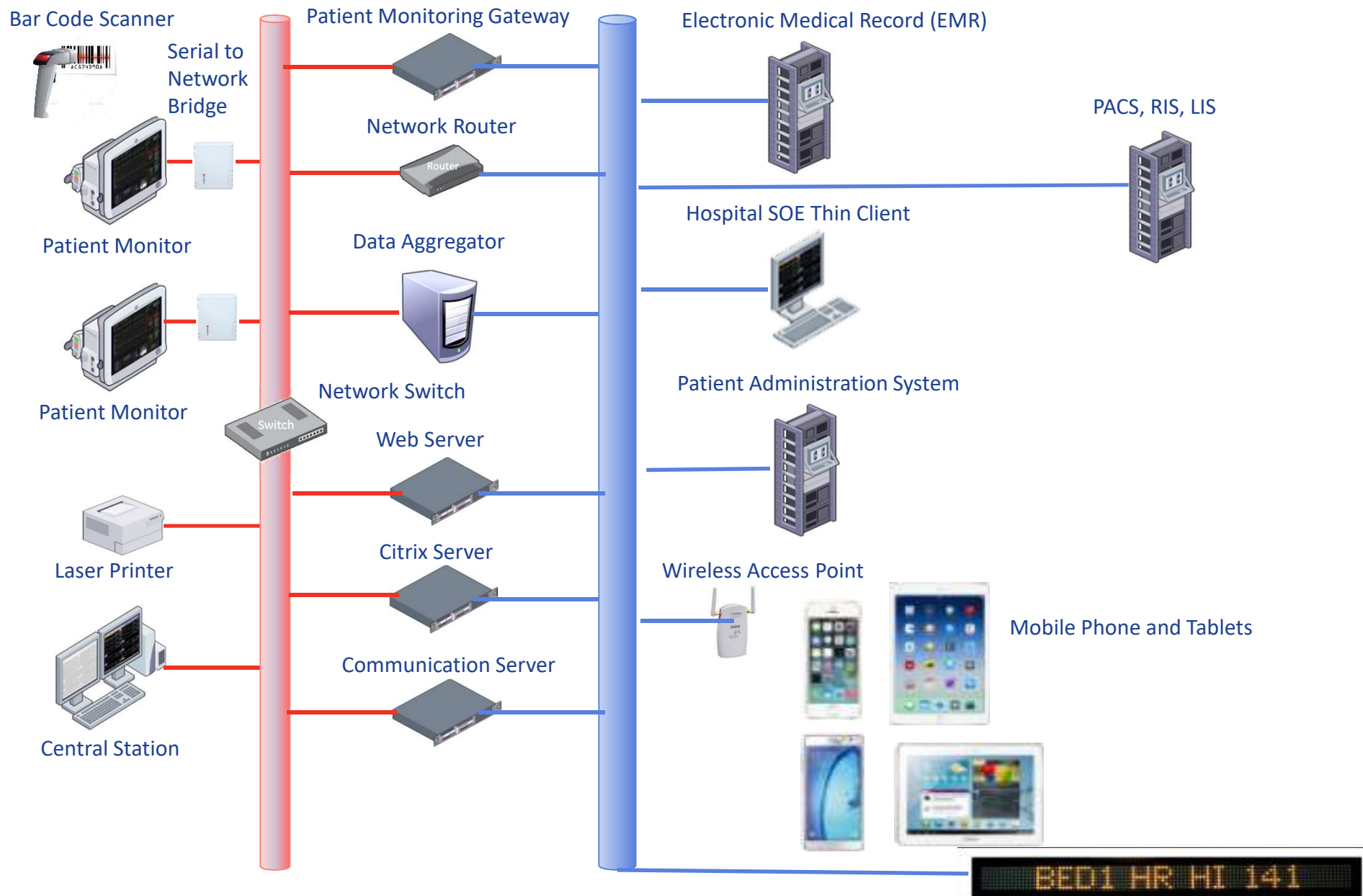
Virtual Desktop Infrastructure, or VDI, refers to the process of running a user desktop inside a virtual machine that lives on a server in the datacenter.

Typically, accessing clinical information at the bedside will require that the hospital have a virtual desktop infrastructure (e.g., Citrix, Microsoft Remote Desktop Services).

Access to Clinical Information at the Bedside

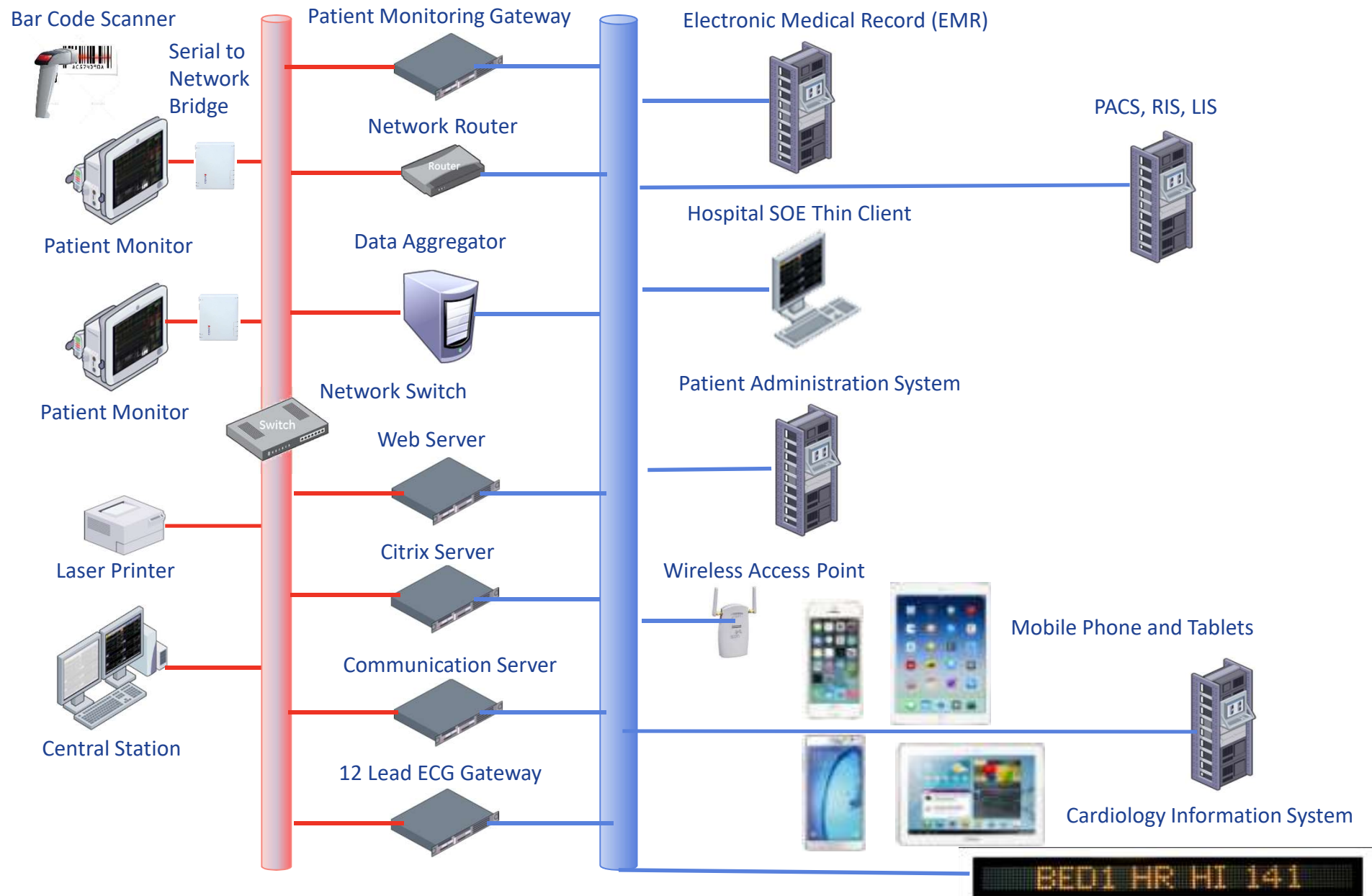


Ancillary Alarm Communication



BED1 HR HI 141

12 Lead ECGs to Cardiology Information System

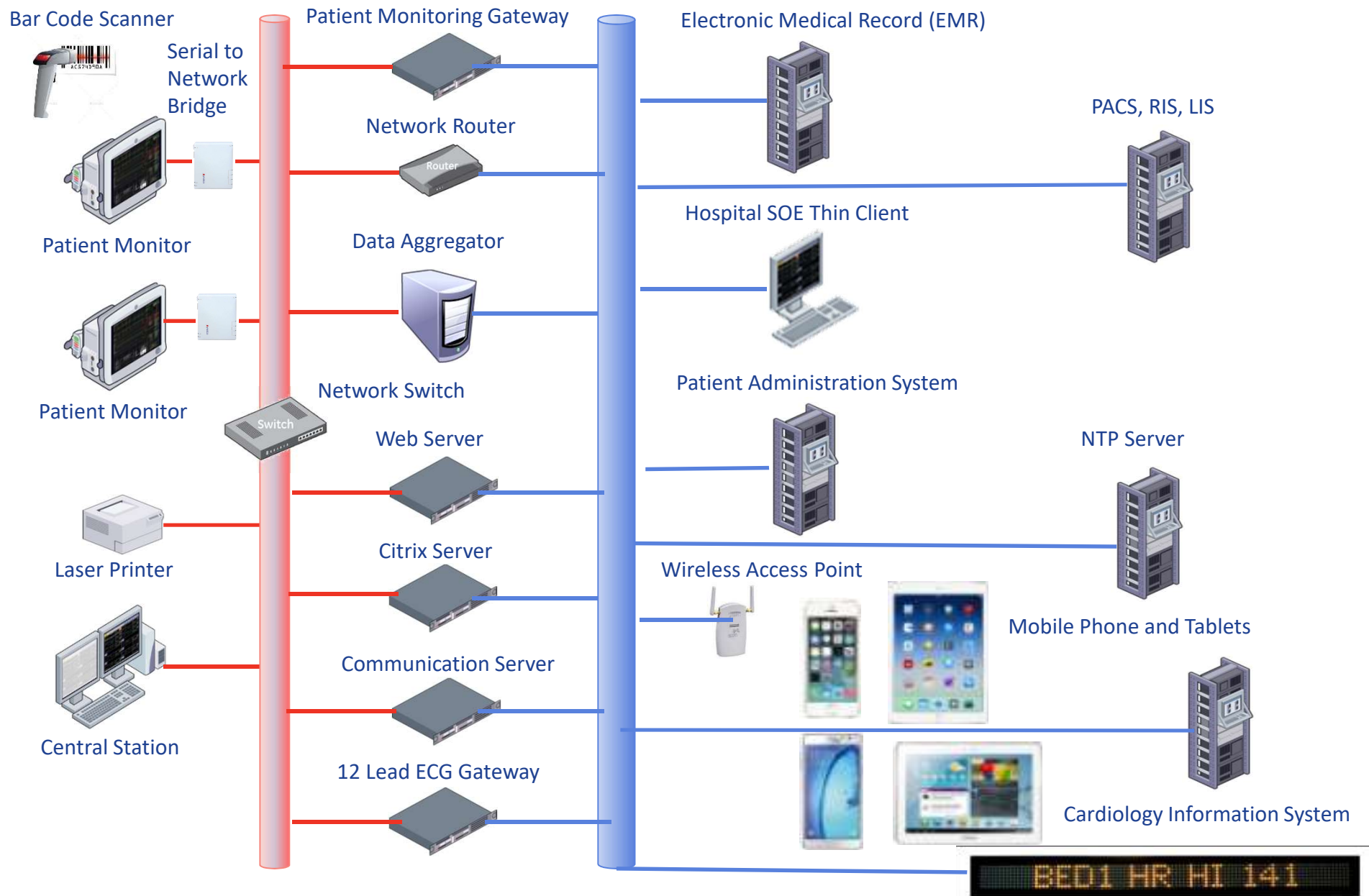


Time Management (NTP)

Network Time Protocol (NTP)

A networking protocol for clock synchronization between computer systems over packet-switched, variable-latency data networks.

Time Management (NTP)



Active Directory (LDAP)

Lightweight Directory Access Protocol (LDAP)

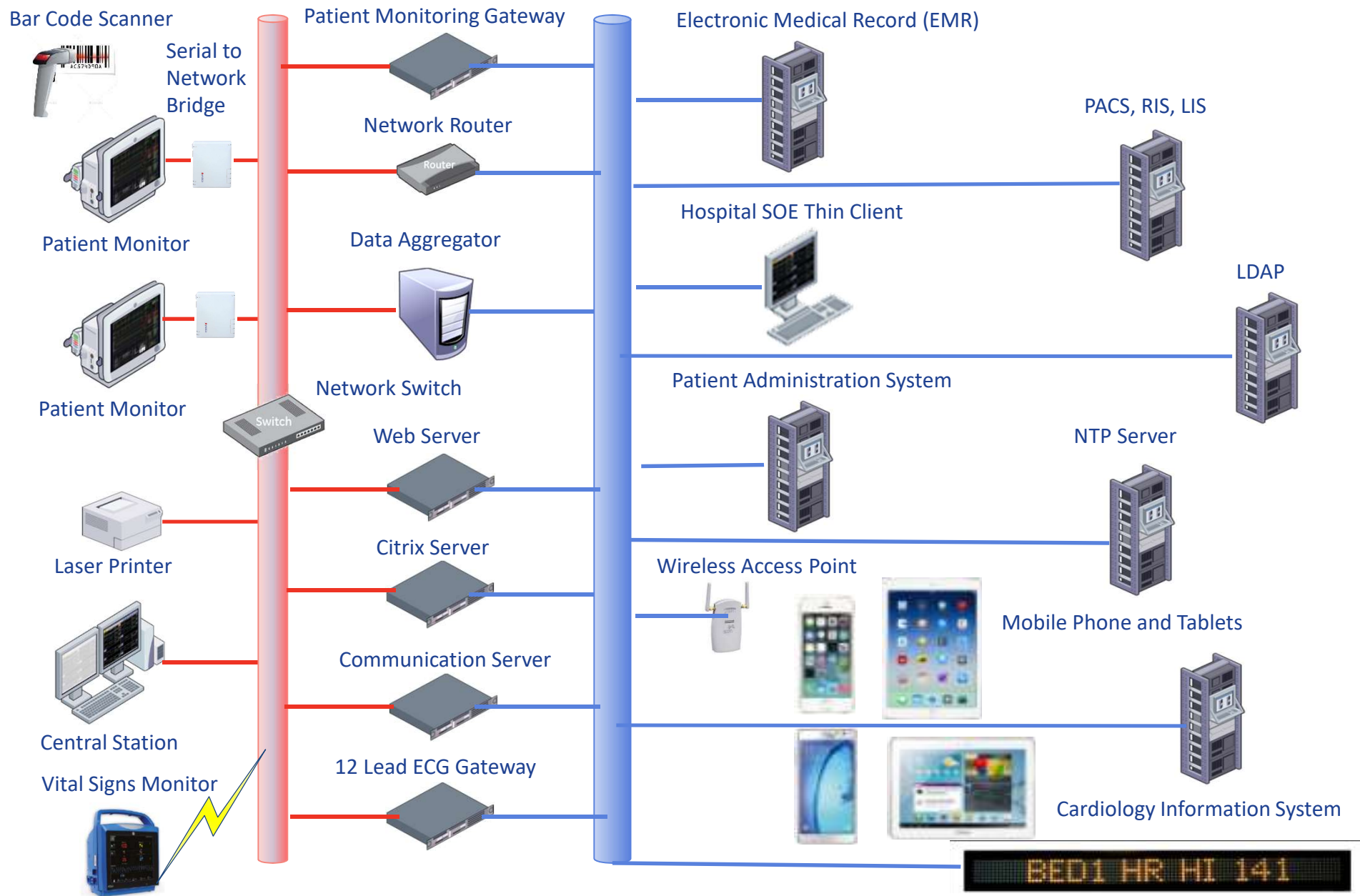
An open, vendor-neutral, industry standard application protocol for accessing and maintaining distributed directory information services over an Internet Protocol (IP).

Commonly used to provide a central place to store usernames and passwords.

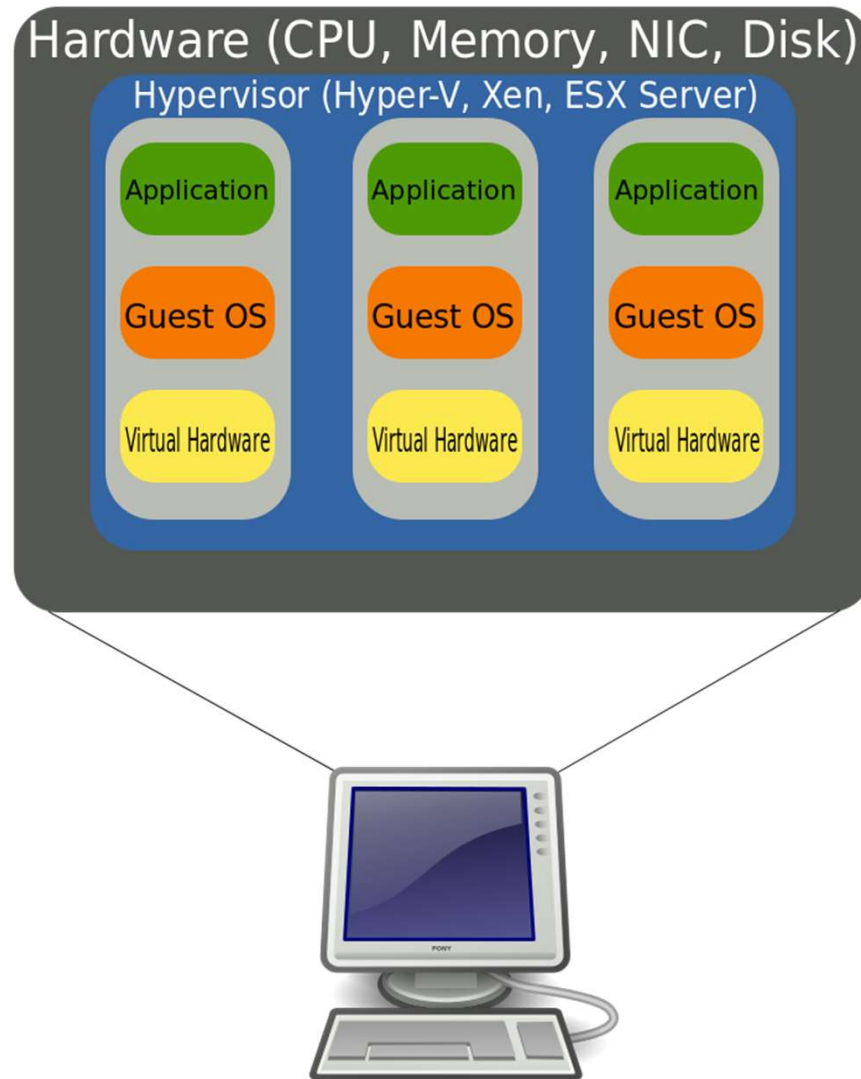
Microsoft's Active Directory (AD) is a directory service that for Windows domain networks. It is underpinned by LDAP.

It authenticates and authorizes all users and computers in a Windows domain type network—assigning and enforcing security policies for all computers and installing or updating software.

Active Directory (LDAP)



Virtual Machines



Source: [https://en.wikipedia.org/wiki/Virtual_machine#/media/File:Hardware_Virtualization_\(copy\).svg](https://en.wikipedia.org/wiki/Virtual_machine#/media/File:Hardware_Virtualization_(copy).svg)

Recap

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Thank you!

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