

IT Basics and Trouble Shooting for Clinical Medical Physicist

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Rationale:

Typical help requests

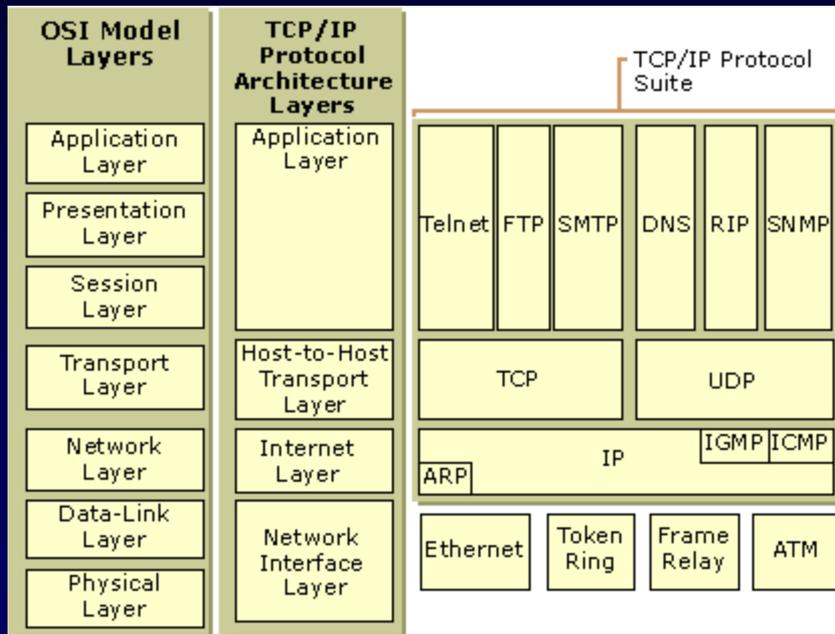
1. I loss network connection, how can I solve the problem?
2. I setup a dicom networking node, how to do or why not working?
3. I can not find any text book on RO IT, do you have some cheat sheet to share?

Outline:

1. Review networking basics
2. Trouble shooting example
3. Typical network topogram

Network Layers

- Network Layers
 - ◆ Primarily TCP/IP in RO



Hardware/Software

DICOM, web, remote access

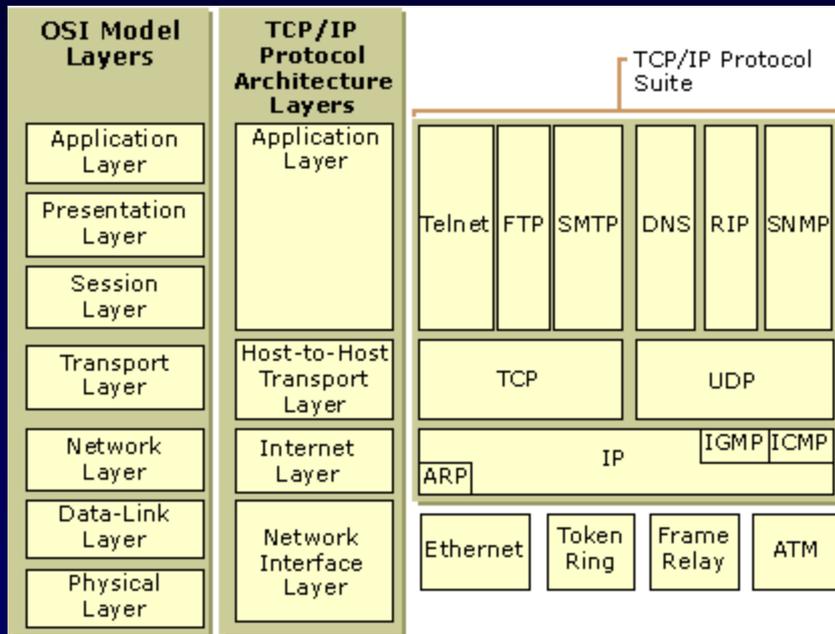
Connection, firewall

IP address, router, layer 3 switch

Cable, Connector, Network Interface Card, Hub, layer 2 switch

Network address

■ Network address layer



Network address

Hostname: varidb

Port: 445 (network share)

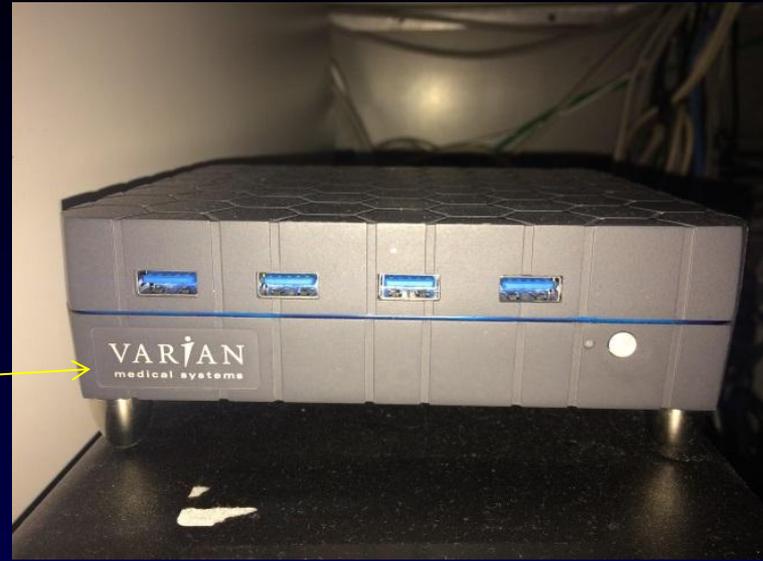
IP: 172.19.106.195

MAC address: 2C-44-FD-14-51-63

Network Hardware

- Network hardware layer

Remote Access
Application Layer



Firewall/gateway
Transport/Internet layer

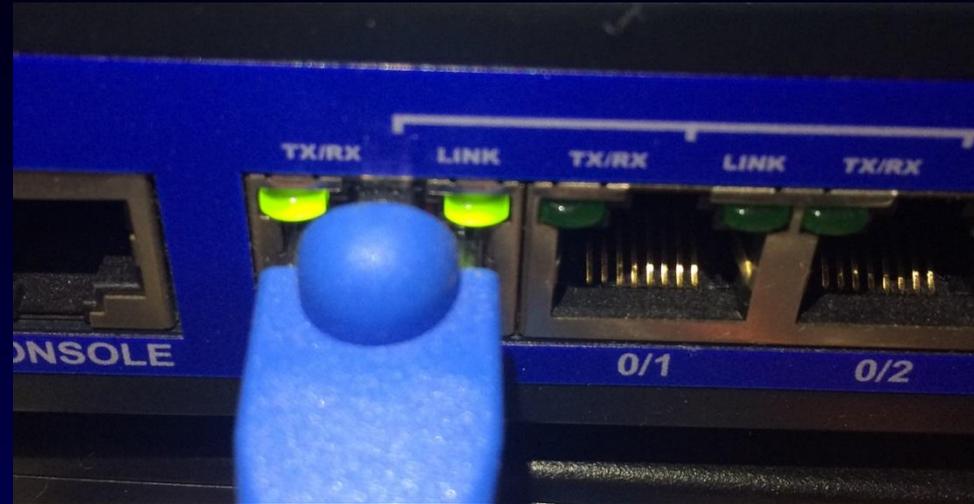


Switch
Interface layer

Cable
Interface layer

Interface Layer - Ethernet

- Ethernet cabling
 - ◆ RJ-45 connector
 - ◆ Check led status
 - Link status
 - Rx/Tx activity
 - ◆ Twist pair cable
 - ◆ **Straight through patch cable**
 - ◆ computer to switch
 - ◆ Commonly used
 - ◆ cross-over cable
 - ◆ computer to computer
 - ◆ switch to switch sometimes



Straight Through Cable

Crossover Cable

Interface Layer - Ethernet

■ Speed

◆ 10/100Base-T	Cat5 (Category 5)	10/100 Mbps 328 feet
◆ 1000Base-T	Cat5E (Cat 5 Enhanced)	1 Gbps 328 feet
	Cat6 (Category 6)	10 Gbps 164 feet
◆ 10GBase-T	Cat6A (Category 6)	10 Gbps 328 feet

■ Duplexing

◆ full-duplex

- ◆ transmit and receive with different wire pairs and simultaneously
- ◆ doubles the throughput

◆ half-duplex

- ◆ transmit and receive with same wire pair

■ Auto-negotiation

- ◆ link speed
- ◆ link duplexing

■ Auto-sense

- ◆ link speed

Internet layer - Special IP Address

- Loop back IP address

127.0.0.1 (127.0.0.1 - 127.255.255.255)

- Private IP address

Class	Start	End
A	10.0.0.0	10.255.255.255
B	172.16.0.0	172.31.255.255
C	192.168.0.0	192.168.255.255

- Automatic Private IP address

When the DHCP process fails, Windows automatically allocates an IP address from private range **169.254.0.1** to **169.254.255.254**.

Transport layer - Default Port

- a port is an endpoint to a logical connection and the way a client program specifies a specific server program on a computer.
 - ◆ 21: File Transfer Protocol (FTP)
 - ◆ 22: Secure Shell (SSH)
 - ◆ 23: Telnet remote login service
 - ◆ 25: Simple Mail Transfer Protocol (SMTP)
 - ◆ 53: Domain Name System (DNS) service
 - ◆ 80: Hypertext Transfer Protocol (HTTP) used in the WWW
 - ◆ 104: DICOM
 - ◆ 110: Post Office Protocol (POP3)
 - ◆ 119: Network News Transfer Protocol (NNTP)
 - ◆ 123: Network Time Protocol (NTP)
 - ◆ 143: Internet Message Access Protocol (IMAP)
 - ◆ 161: Simple Network Management Protocol (SNMP)
 - ◆ 194: Internet Relay Chat (IRC)
 - ◆ 443: HTTP Secure (HTTPS)
 - ◆ 445: SMB/CIFS
 - 3389: Microsoft RDP

Application layer

- DHCP stands for Dynamic Host Configuration Protocol.
 - ◆ This protocol/service is used to automatically configure a network workstation with its IP address data if the computer is set to obtain an IP address automatically. It can also be used to send other important network information to a computer on connection to the network (addresses of DNS and WINS servers).

- ipconfig (win)
- ifconfig (linux)
- IP
- Subnetmask
- Default gateway
- DNS

```

C:\WINDOWS\system32\cmd.exe

C:\Temp>ipconfig /all

Windows IP Configuration

Host Name . . . . . : BHKROCD110
Primary Dns Suffix . . . . . : bayhealth.org
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No
DNS Suffix Search List. . . . . : bayhealth.org

Ethernet adapter Local Area Connection:

Connection-specific DNS Suffix . : bayhealth.org
Description . . . . . : Intel(R) Ethernet Connection I217-LM
Physical Address. . . . . : 2C-44-FD-14-51-63
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
Link-local IPv6 Address . . . . . : fe80::8ddb:9ba3:b224:97f7%11(Preferred)
IPv4 Address. . . . . : 172.19.12.111(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Lease Obtained. . . . . : Thursday, April 05, 2018 2:19:13 PM
Lease Expires . . . . . : Friday, April 13, 2018 2:19:13 PM
Default Gateway . . . . . : 172.19.12.1
DHCP Server . . . . . : 172.19.106.79
DHCPv6 IAID . . . . . : 237782269
DHCPv6 Client DUID. . . . . : 00-01-00-01-1A-B1-68-2D-2C-44-FD-14-51-63

DNS Servers . . . . . : 172.16.1.18
                       172.16.1.19
NetBIOS over Tcpip. . . . . : Enabled
    
```

Application layer

■ DNS

- ◆ DNS stands for Domain Name System.
- ◆ DNS is used to resolve (translate) Internet host names to their IP address equivalents.
- ◆ “host” file can be used locally
- ◆ nslookup (win/linux)
- ◆ dig (linux)

■ WINS

- ◆ WINS stands for Windows Internet Naming Service
- ◆ WINS is Microsoft's network name resolution software that converts NetBIOS names to IP addresses. Windows machines are assigned NetBIOS names, which are converted into IP addresses for use on a network using TCP/IP.
- ◆ “lmhost” file can be used locally
- ◆ not required after win2k, NetBIOS over TCP/IP is used

Application layer

- Web
 - ◆ Varian Platform/Service Portal
 - ◆ <https://variweb:55051/Portal/>
- FTP
 - ◆ Transfer plan from Pinnacle to Radcalc
 - ◆ Supervisor download image via tftp from OBI
 - ◆ Built-in ftp client
 - ◆ FileZilla is used personally for historical reason
- Telnet/SSH
 - ◆ Pinnacle remote access
 - ◆ MLC controller VxWorks communication
 - ◆ PuTTY/Tera Term

Application layer

- SMB/CIFS (network share)

- ◆ Truebeam I: is mounted at \\varifs\va_transfer
- ◆ RPM Z: is mounted at \\172.19.12.31\adv4dexport
- ◆ Samba (linux)
- ◆ net use (win)
- ◆ net share (win)

```
Administrator: C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2010 Microsoft Corporation. All rights reserved.

Users\therapist>net use
connections will be remembered.

Status      Local      Remote
-----
Z:          \\172.19.12.31\adv4dexport
The command completed successfully.
```

```
C:\>net share

Share name      Resource
-----
ADMIN$          C:\Windows
VA_DATA$        D:\Varian\Data
C$              C:\
D$              D:\
DCF$            D:\UMSOS\DCF
RSDAgentLogs$  C:\Program Files (x86)\Varian\KeystoneServer\Agent\Shared
IPC$            C:\Windows\system32\pipe\ipc$
KeystonePackages$ D:\Keystone\KeystonePackageImport
print$         C:\Windows\system32\spool\drivers
Argus           D:\Argus
HDR             D:\HDR
RPM             D:\RPM
va_transfer     D:\Varian\Transfer
Varian Software D:\Varian Software
The command completed successfully.
```

Network Shares

- Truebeam I: drive
 - ◆ \\varifs\va_transfer
- Truebeam TrajectoryLog
 - ◆ \\varifs\va_transfer\TDS\H191154\TrajectoryLog
- Truebeam MPC
 - ◆ \\varifs\va_transfer\TDS\H191154\MPC
- HDR GammaMed
 - ◆ \\varifs\HDR
- Argus
 - ◆ \\varifs\Argus
- Special Shares (**hidden administrative share**)
 - ◆ **Eclipse Dicom import directory**
 - ◆ \\varifs\va_data\$\dicom (**clean up periodically**)
 - ◆ Eclipse directory for d: drive
 - ◆ \\varifs\d\$
 - ◆ Eclipse directory for file data
 - ◆ \\varisfs\va_data\$\FileData
 - ◆ Distributed Calculation Framework data
 - ◆ \\varifs\dcf\$\client

Network Shares

- Mosaiq CBCT image storage
 - ◆ \\MOSAIQ_DATA\DB\BDS
 - ◆ \\MOSAIQAPP\BDS (grow fast, free space monitored by IT)
- Mosaiq default escan directory
 - ◆ \\MOSAIQAPP\MOSAIQ_APP\escan
- Mosaiq RTP import directory
 - ◆ \\MOSAIQAPP\MOSAIQ_APP\RTP
- Mosaiq Photo and Diagrams import directory
 - ◆ \\MOSAIQAPP\MOSAIQ_APP\PNDDIR\
- Image Import Area
 - ◆ \\MOSAIQAPP\MOSAIQ_APP\imgstage\stagedcm
- Non Image Import Area
 - ◆ \\MOSAIQAPP\MOSAIQ_APP\nonimage

Network Share Common Errors

- “You don't have permission to access the file or folder you're trying to access”
 - ◆ Share permissions
 - ◆ NTFS permissions
 - ◆ Security software Firewall/Antivirus
 - ◆ Server/client version compatibility



- Network share slow down after a period of time
 - ◆ Increase resource like CPU/memory/bandwidth (**minimum specification from vendor typically not enough for good performance**)
 - ◆ Reboot periodically

Domain

- Domain is a logical group of network objects (computers, users, devices) that share the same active directory database.
 - ◆ Start from Eclipse/Aria v15, user integrated with active directory.
 - ◆ Password expire every 6 month
 - ◆ RO loss the password reset privilege

- Login
 - ◆ Domain user: domain_name\user_name
 - ◆ Local user: computer_name\user_name; or .\username

Security

- DHCP
 - ◆ Only allow registered MAC address
 - ◆ Bind specific ip address with registered MAC address
- Firewall on local system level, like Linux IPTable or Windows Firewall, it can limit the access by IP, port
 - ◆ Block ICMP/ping traffic, which make ping not work
 - ◆ Default block all ports to prevent port scanning
- Firewall on hospital level
 - ◆ Block clinical computer access to internet (shopping, social, media)
 - ◆ Limit internet access only to vendor, gov or intranet
- User group to assign right/permission
 - ◆ To find which group the use belong to
 - ◆ net user UserID /domain
- Antivirus
 - ◆ No real-time virus scanning
 - ◆ Or add exceptions like DB, log, backup, image
 - ◆ Or just do not install at all

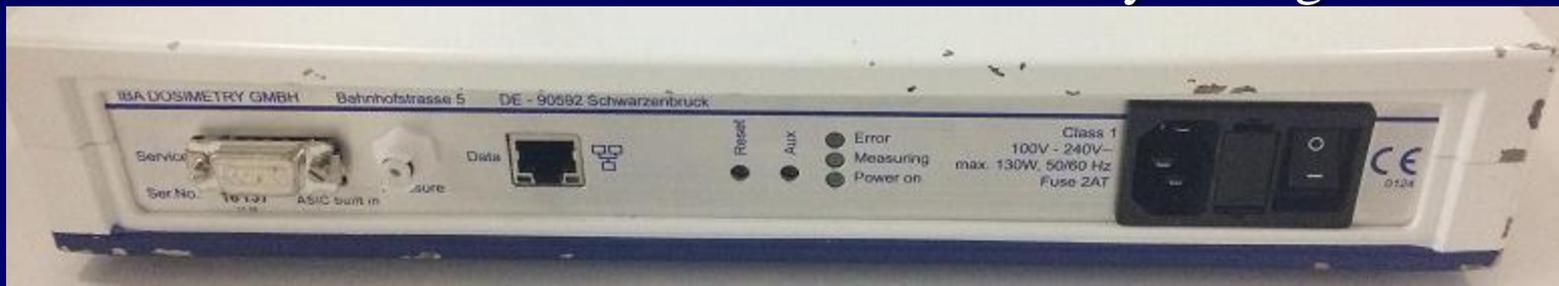
Outline:

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iba BluePhantom

- IT took iba laptop for upgrade from winXp to win7,
- upgrade failed, a new laptop was given with win7,
- After installed OmniPro software and went through licensing

- Network cable
 - ◆ Ethernet cable from laptop to CCU
 - ◆ Straight through patch cable, even direct connect
- Ethernet Setup
 - ◆ DHCP ip 169.254.1.1, for no DHCP server in CCU
 - ◆ Find ip address from manual or config record
 - ◆ Then setup ip to same ip range as CCU (192.168.249.249 default), 192.168.13.40/255.255.0.0 (default gateway is not needed)
 - ◆ CCU ip address changed and no record found
 - ◆ use package sniffer like Wireshark to find CCU ip
 - ◆ Or Press the AUX button to return to factory settings.



iba BluePhantom

■ Firewall

- ◆ Windows Firewall block traffic for iba programs
- ◆ XXSetup.exe to test connectivity
- ◆ Add the XXSetup.exe and OmniProAccept7.exe to the list of applications that are allowed access to the network.

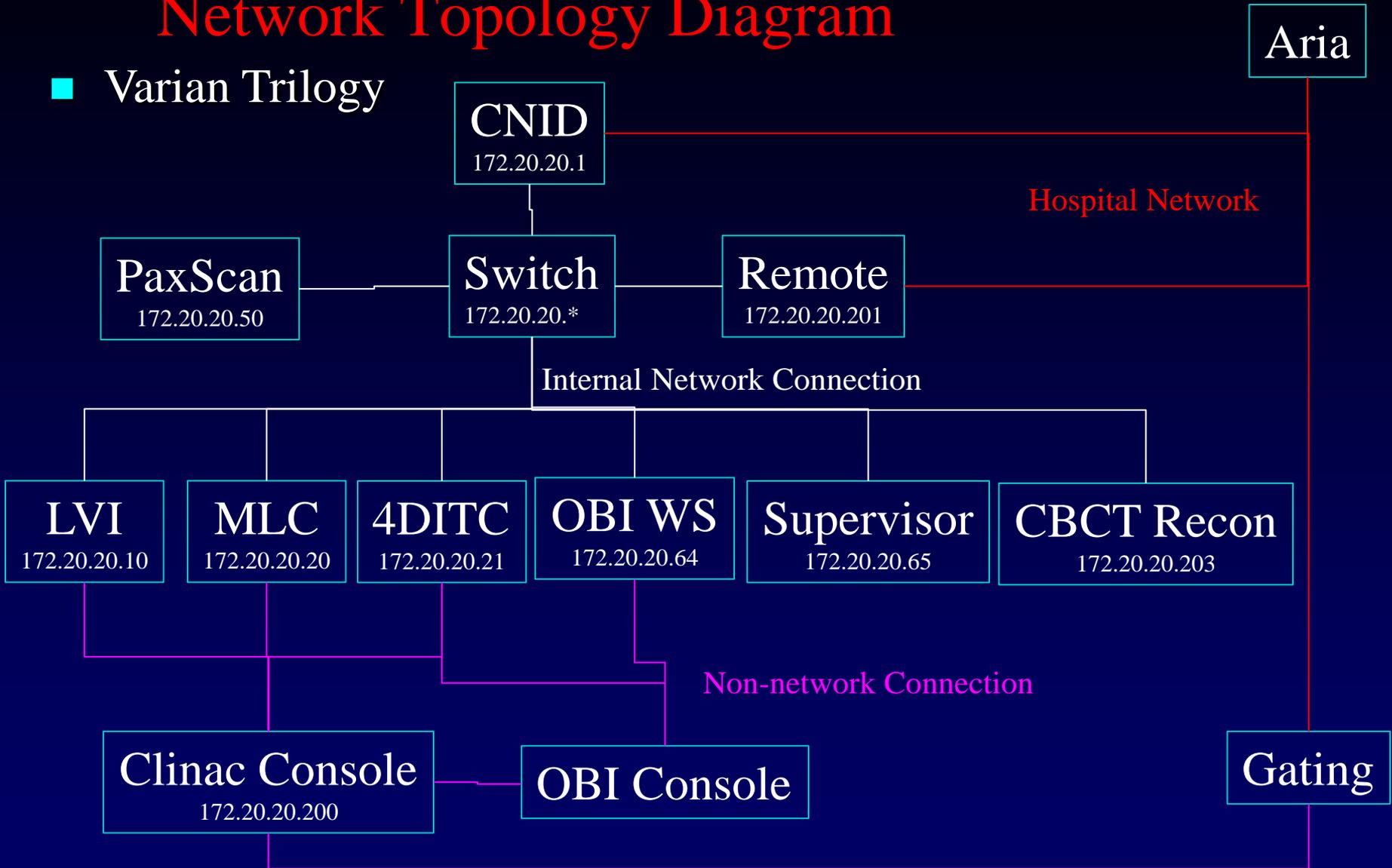
Group	Profile	Enabled	Action	Override	Program	
Networking - Echo Request (ICM...	Private, Public	Yes	Block	No	Any	
Networking - Echo Request (ICM...	Domain	Yes	Allow	No	Any	
Networking - Echo Request (ICM...	Domain	Yes	Allow	No	Any	
Networking - Redirect (ICMPv4-In)	Private, Public	Yes	Block	No	Any	
Networking - Redirect (ICMPv4-In)	Domain	Yes	Block	No	Any	
Networking - Redirect (ICMPv6-In)	Private, Public	Yes	Block	No	Any	
Networking - Redirect (ICMPv6-In)	Private, Public	Yes	Block	No	Any	
Networking - Router Solicitation (...)	Domain	Yes	Block	No	Any	
Networking - Timestamp Request...	Private, Public	Yes	Block	No	Any	
Networking - Timestamp Request...	Private, Public	Yes	Block	No	Any	
Remote Desktop	Remote Desktop	Private, Public	Yes	Block	No	Any
SMB over TCP	File and Printer Shar	Private, Public	Yes	Block	No	Any
OmniPro-Accept 7.5	All	Yes	Allow	No	C:\Program Files (x86)\IBADosimetry\OmniPro-A...	
OmniPro-Accept 7.5	All	Yes	Allow	No	C:\Program Files (x86)\IBADosimetry\OmniPro-A...	
XXSetup	All	Yes	Allow	No	C:\Program Files (x86)\IBADosimetry\OmniPro-A...	
XXSetup	All	Yes	Allow	No	C:\Program Files (x86)\IBADosimetry\OmniPro-A...	
SMC Service	Domain	Yes	Allow	No	C:\Program Files (x86)\Symantec\Symantec Endp...	
SMC Service	Domain	Yes	Allow	No	C:\Program Files (x86)\Symantec\Symantec Endp...	
SNAC Service	Domain	Yes	Allow	No	C:\Program Files (x86)\Symantec\Symantec Endp...	
SNAC Service	Domain	Yes	Allow	No	C:\Windows\CCM\RemCon\ConfService.exe	
System Center Configuration Ma...	System Center Conf...	Domain	Yes	Allow	C:\Windows\idms\idms.exe	
DameWare Mini Remote Control ...	All	Yes	Allow	No	C:\Windows\idms\idms.exe	
DameWare Mini Remote Control ...	All	Yes	Allow	No	C:\Windows\idms\idms.exe	
DameWare Mini Remote Control ...	All	Yes	Allow	No	C:\Windows\idms\idms.exe	
Windows Communication Found...	Windows Communi...	All	Yes	Allow	C:\Windows\system32\regsvr32.exe	
Sentinel License Manager	All	Yes	Allow	No	C:\Windows\system32\regsvr32.exe	
Sentinel License Manager	All	Yes	Allow	No	C:\Windows\system32\regsvr32.exe	
Sentinel License Manager	All	Yes	Allow	No	C:\Windows\system32\regsvr32.exe	
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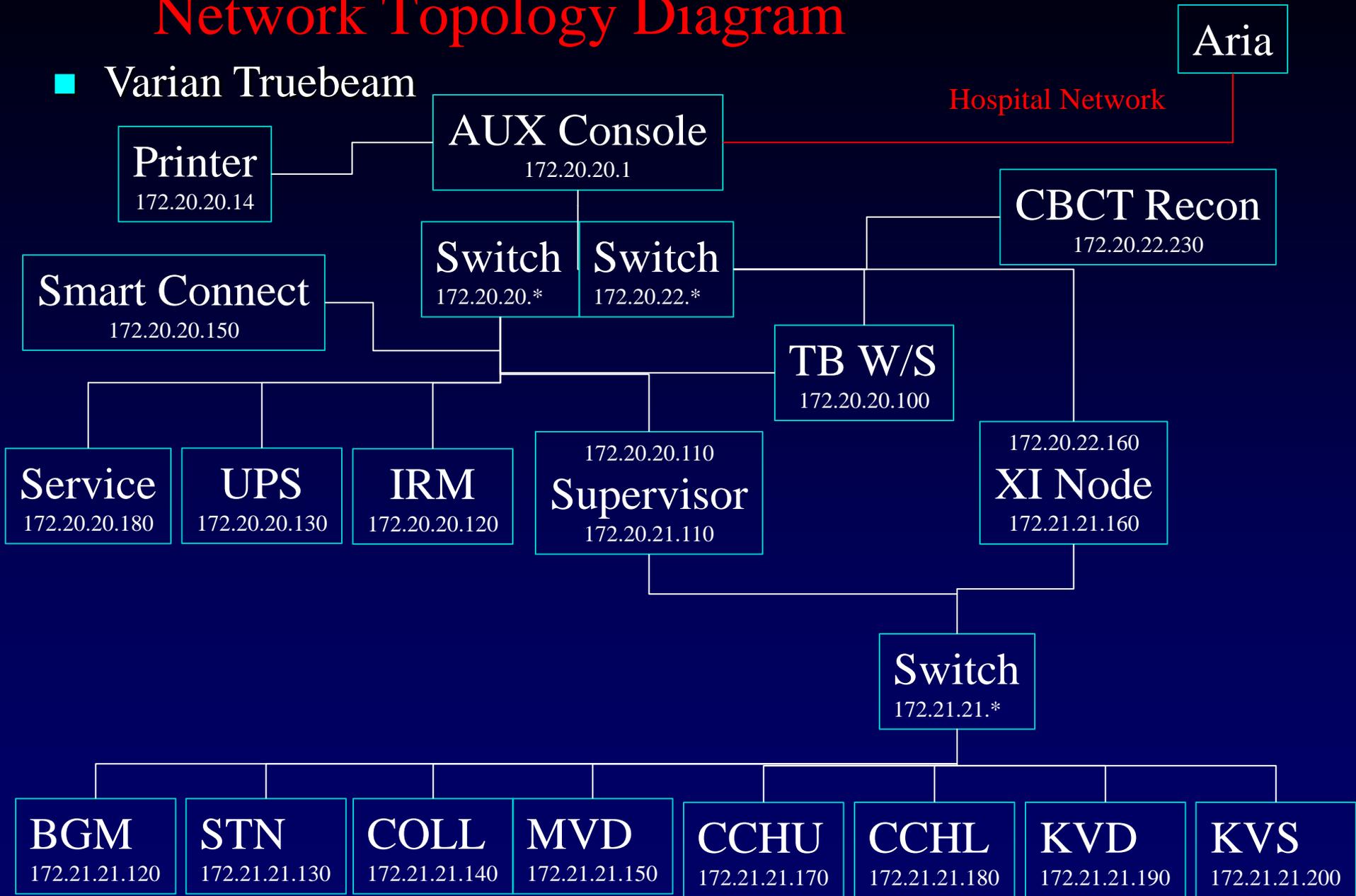
Network Topology Diagram

■ Varian Trilogy



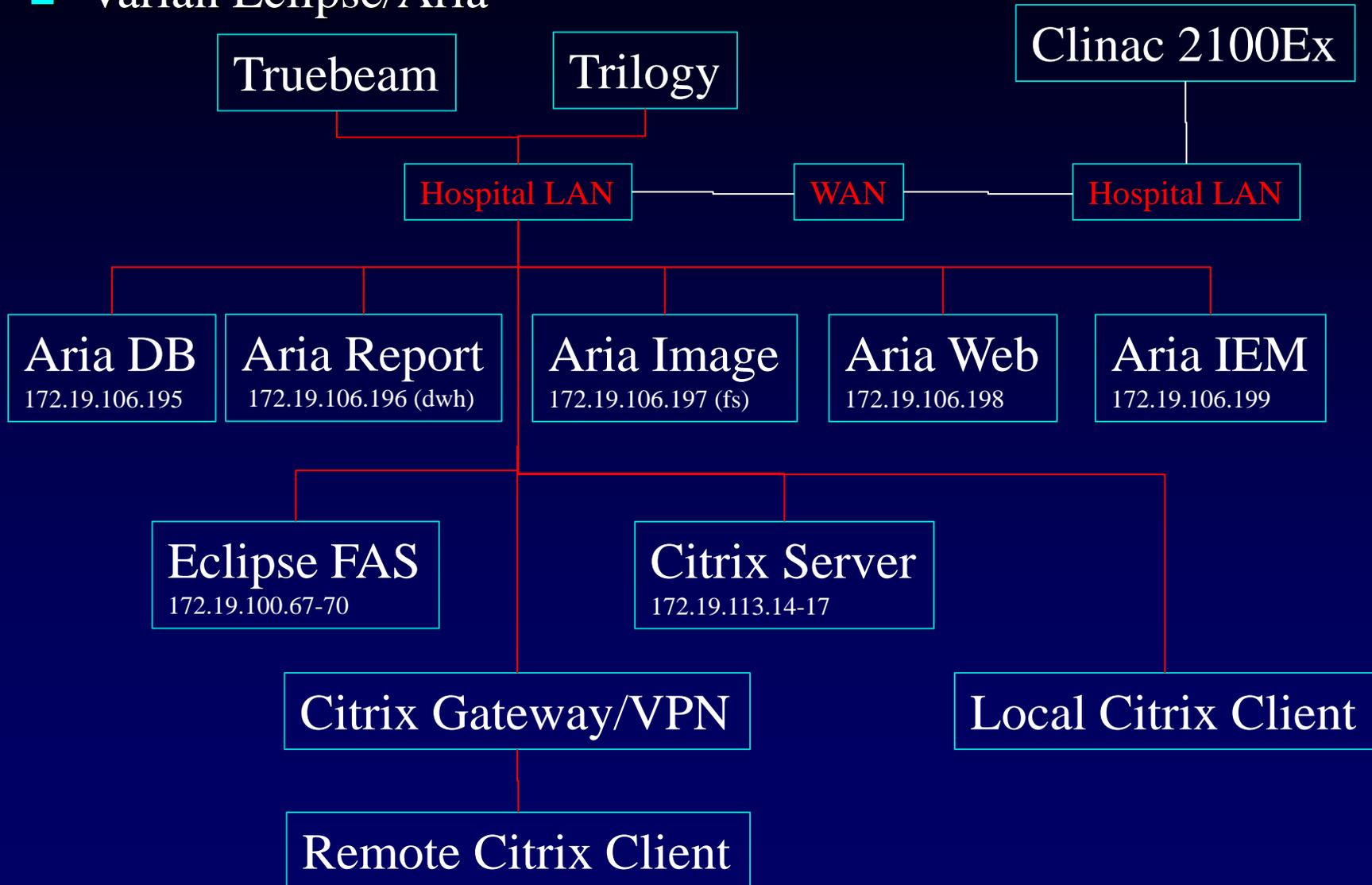
Network Topology Diagram

■ Varian Truebeam



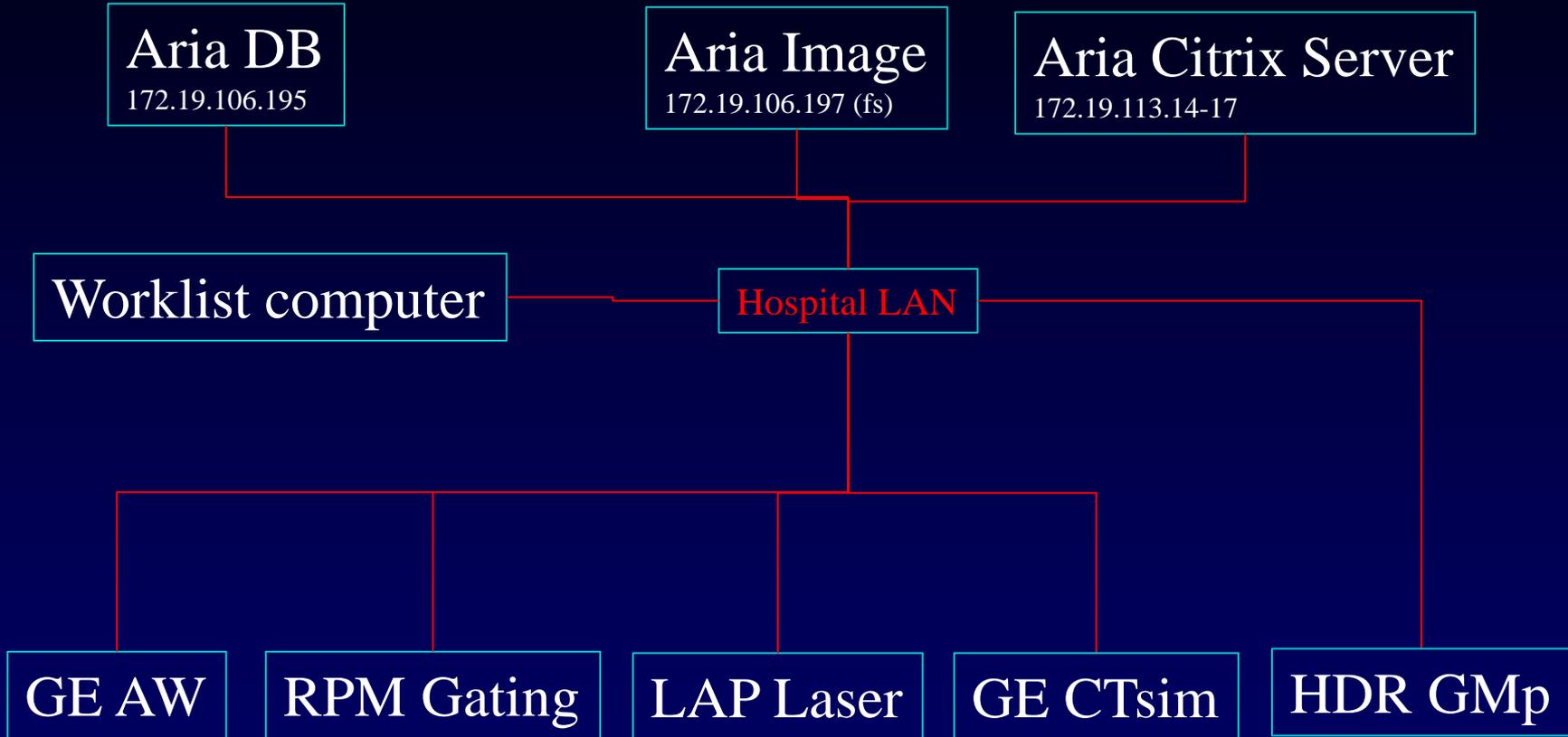
Network Topology Diagram

■ Varian Eclipse/Aria



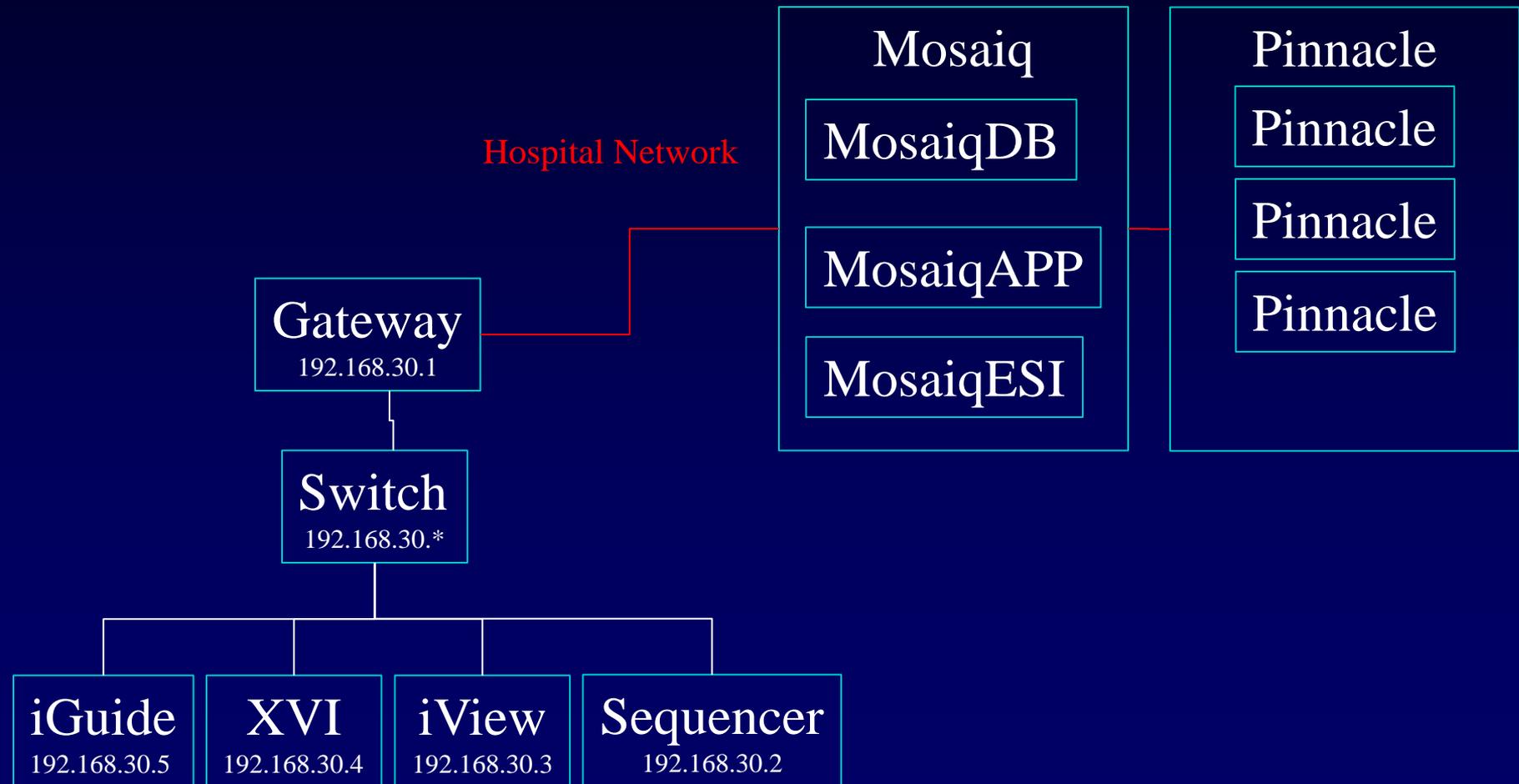
Network Topology Diagram

■ Varian Aria/Worklist



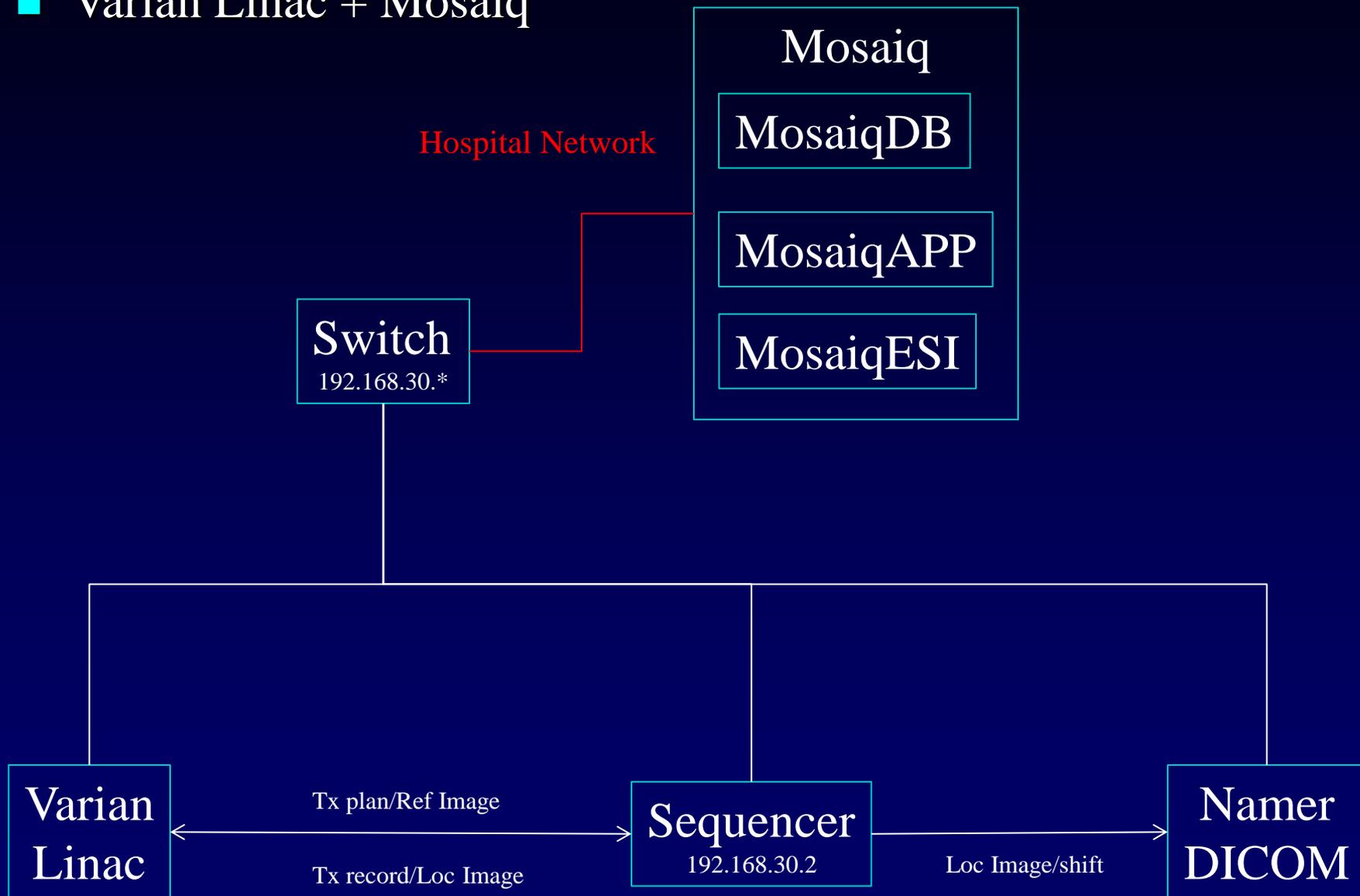
Network Topology Diagram

- Elekta Mosaiq + Pinnacle



Network Topology Diagram

■ Varian Linac + Mosaiq



Acknowledgement

■ Vendor

- ◆ Varian
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