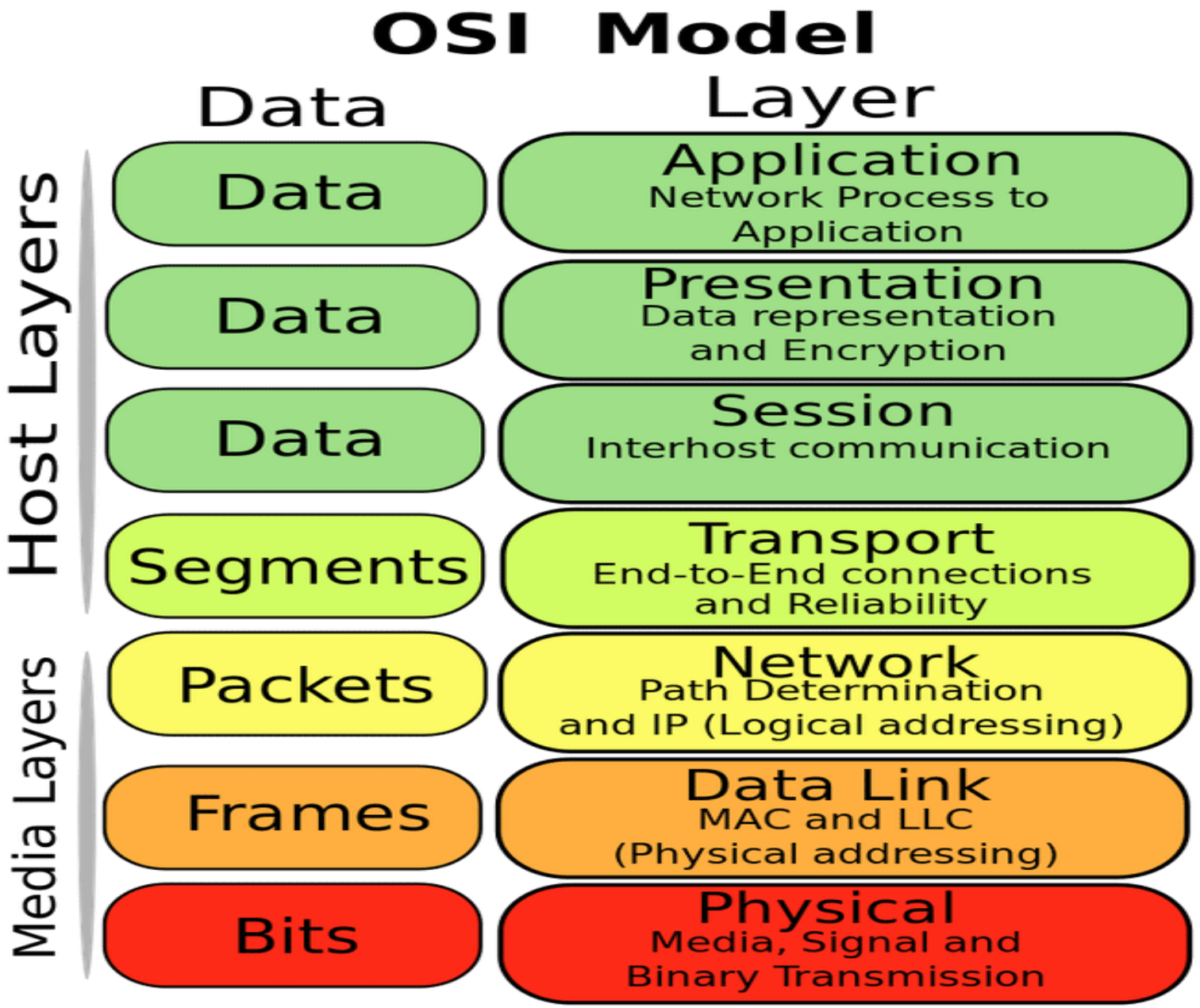
System Administration
Session - 2

P. Prasanna

CDAC, Chennai

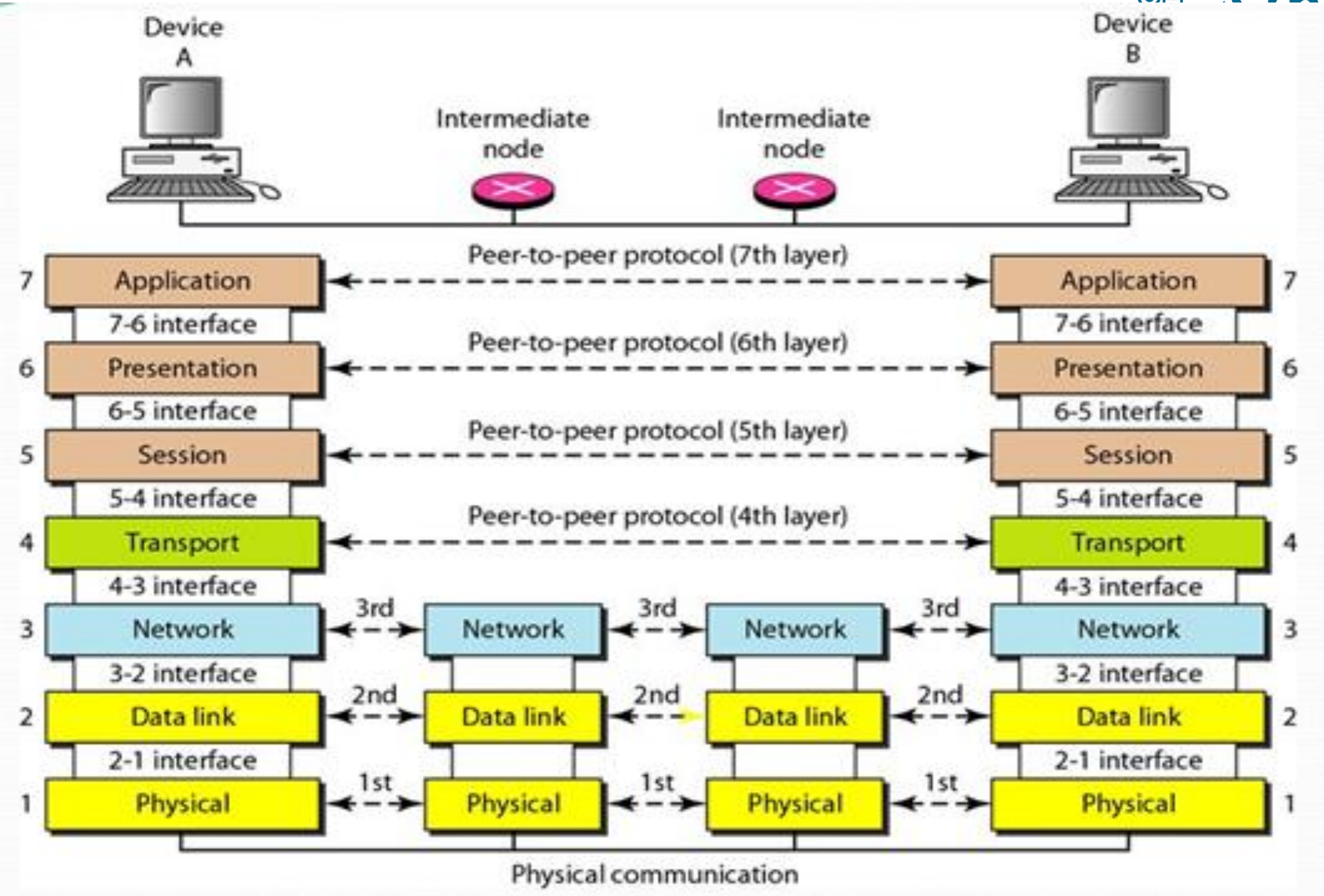
Data Centre Operations

- Network Concepts
  - OSI Layer
  - Address, Subnet and Gateway
  - Network Classes
  - VLAN, Forwarding and Routing
  - Switch, Router and Firewall
  - Services DHCP, DNS, SSH, Telnet, FTP, HTTP and HTTPS
- Storage Concepts
  - RAID level
  - SAN and NAS
  - Fiber Switch, Addressing, Zoning
  - WWN
- Backup
- Disaster Recovery
- High Availability

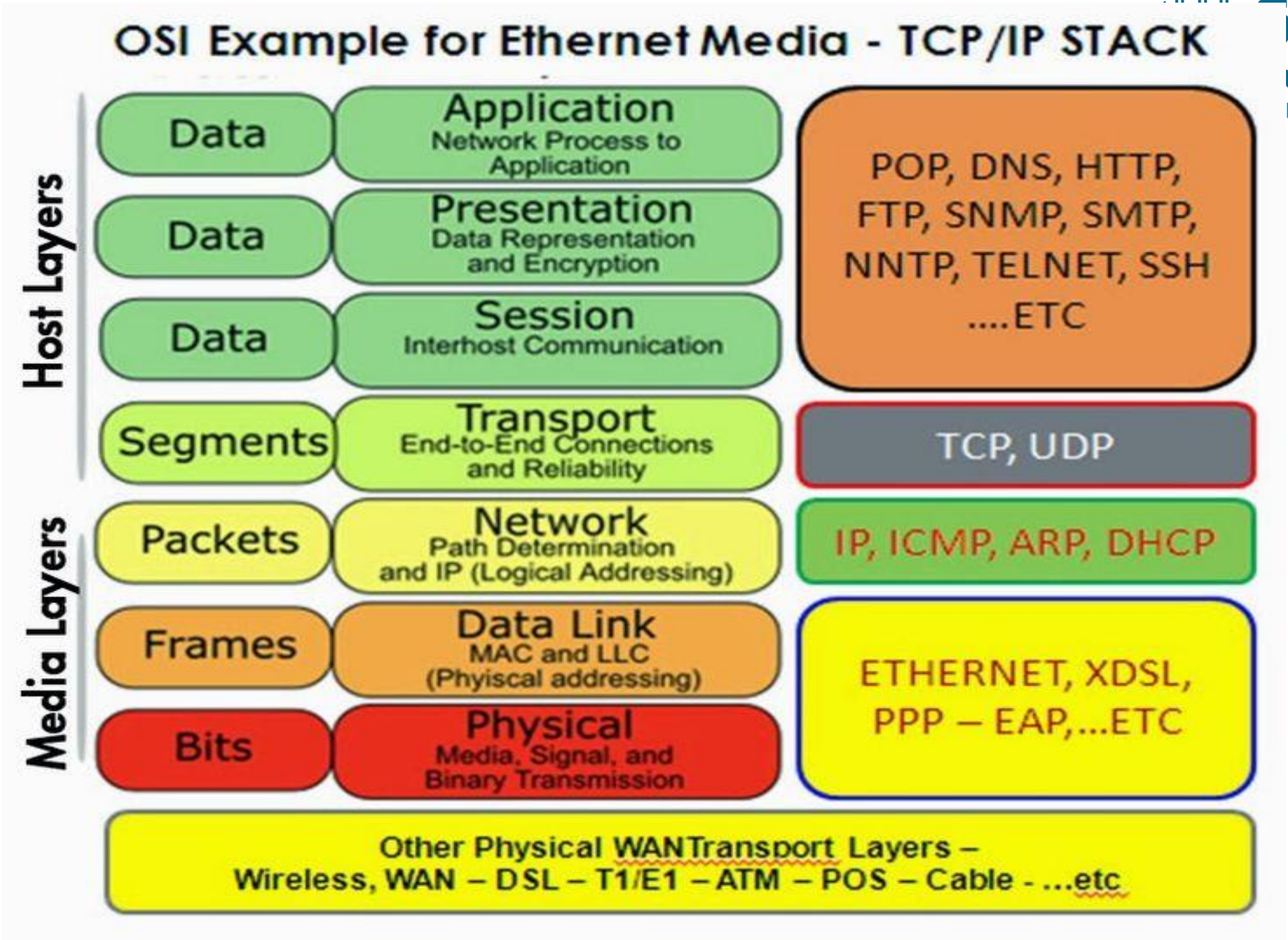

OSI Model
Data
Layer
Host Layers
Media Layers
Data
Application
Network Process to Application
Data
Presentation
Data representation and Encryption
Data
Session
Interhost communication
Segments
Transport
End-to-End connections and Reliability
Packets
Network
Path Determination and IP (Logical addressing)
Frames
Data Link
MAC and LLC (Physical addressing)
Bits
Physical
Media, Signal and Binary Transmission

OSI model

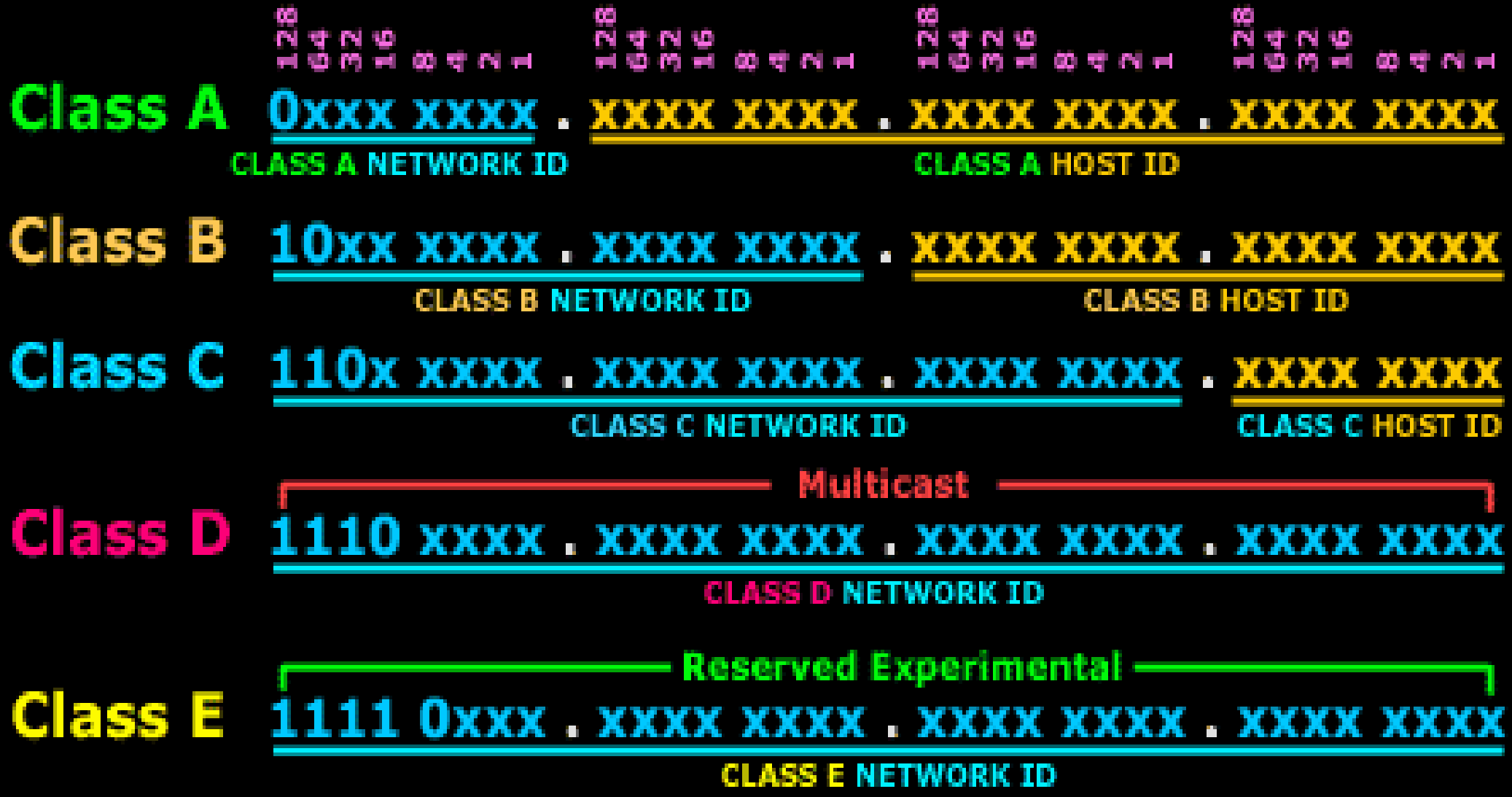
Layer	Name	Example protocols
7	Application Layer	HTTP, FTP, DNS, SNMP, Telnet
6	Presentation Layer	SSL, TLS
5	Session Layer	NetBIOS, PPTP
4	Transport Layer	TCP, UDP
3	Network Layer	IP, ARP, ICMP, IPSec
2	Data Link Layer	PPP, ATM, Ethernet
1	Physical Layer	Ethernet, USB, Bluetooth, IEEE802.11


Device A
Device B
Intermediate node
Intermediate node
Peer-to-peer protocol (7th layer)
Peer-to-peer protocol (6th layer)
Peer-to-peer protocol (5th layer)
Peer-to-peer protocol (4th layer)
7
Application
7-6 interface
6
Presentation
6-5 interface
5
Session
5-4 interface
4
Transport
4-3 interface
3
Network
3-2 interface
2
Data link
2-1 interface
1
Physical
3rd
2nd
1st
Physical communication

OSI Example for Ethernet Media - TCP/IP STACK

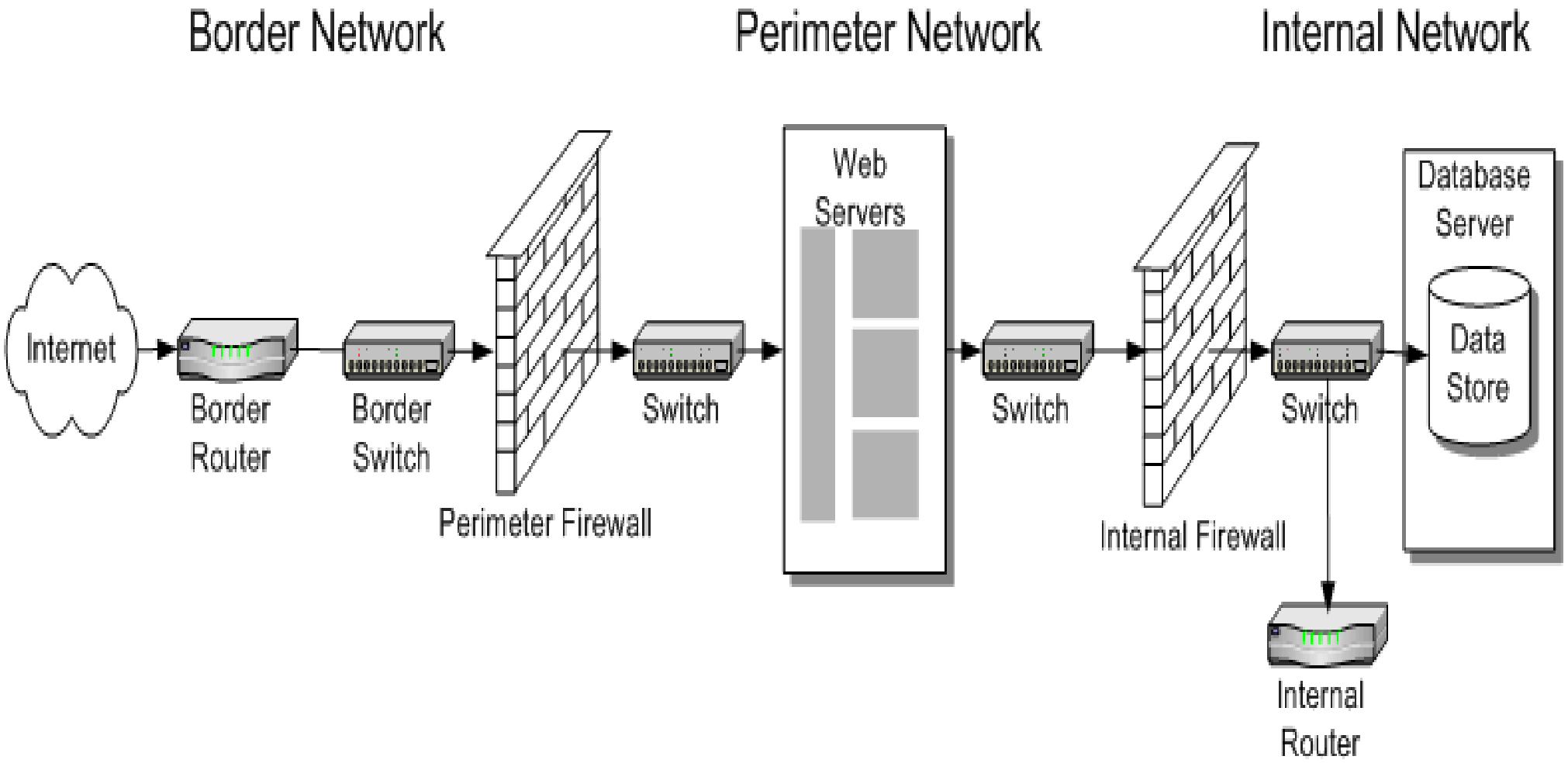


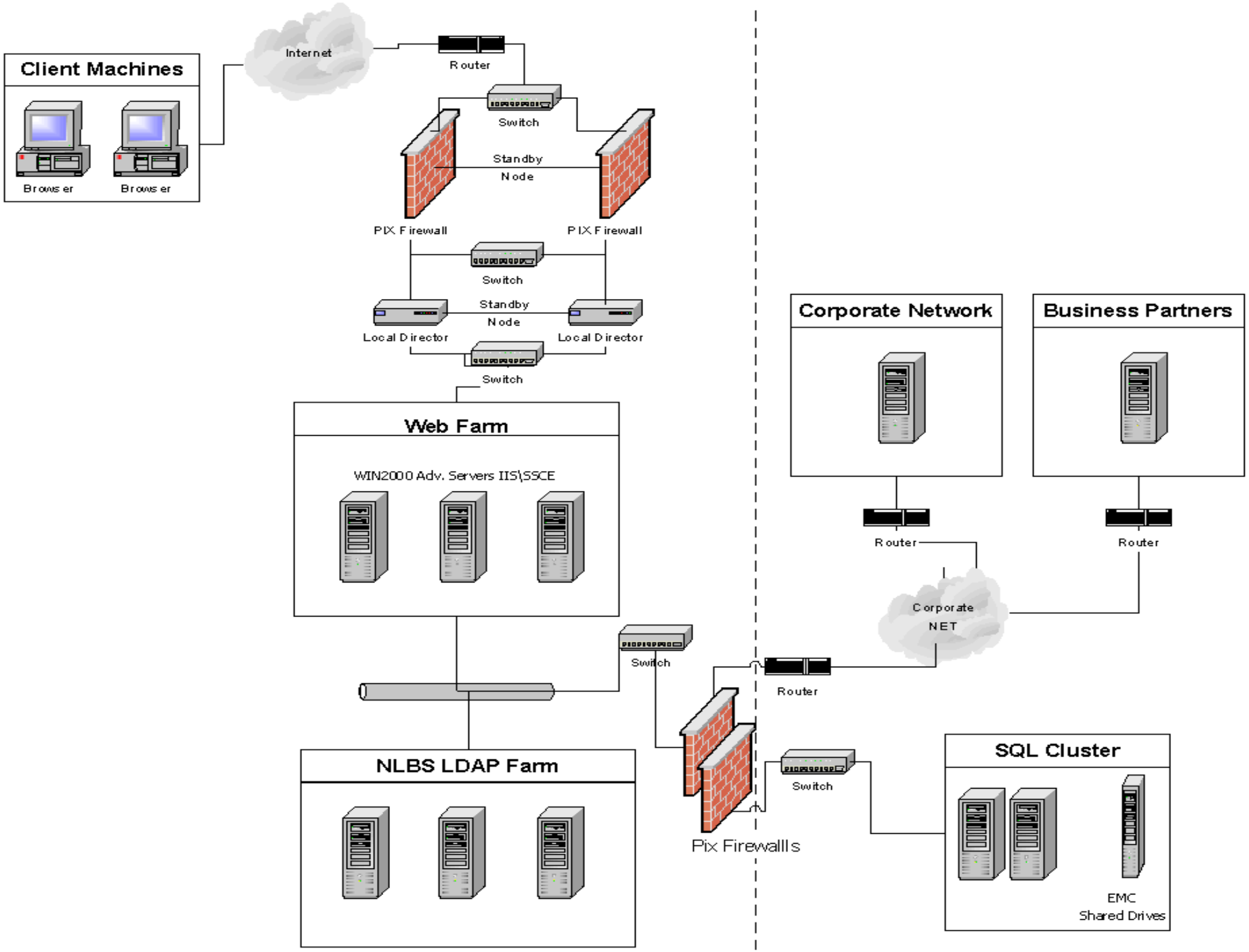
Identifying Network and Host ID

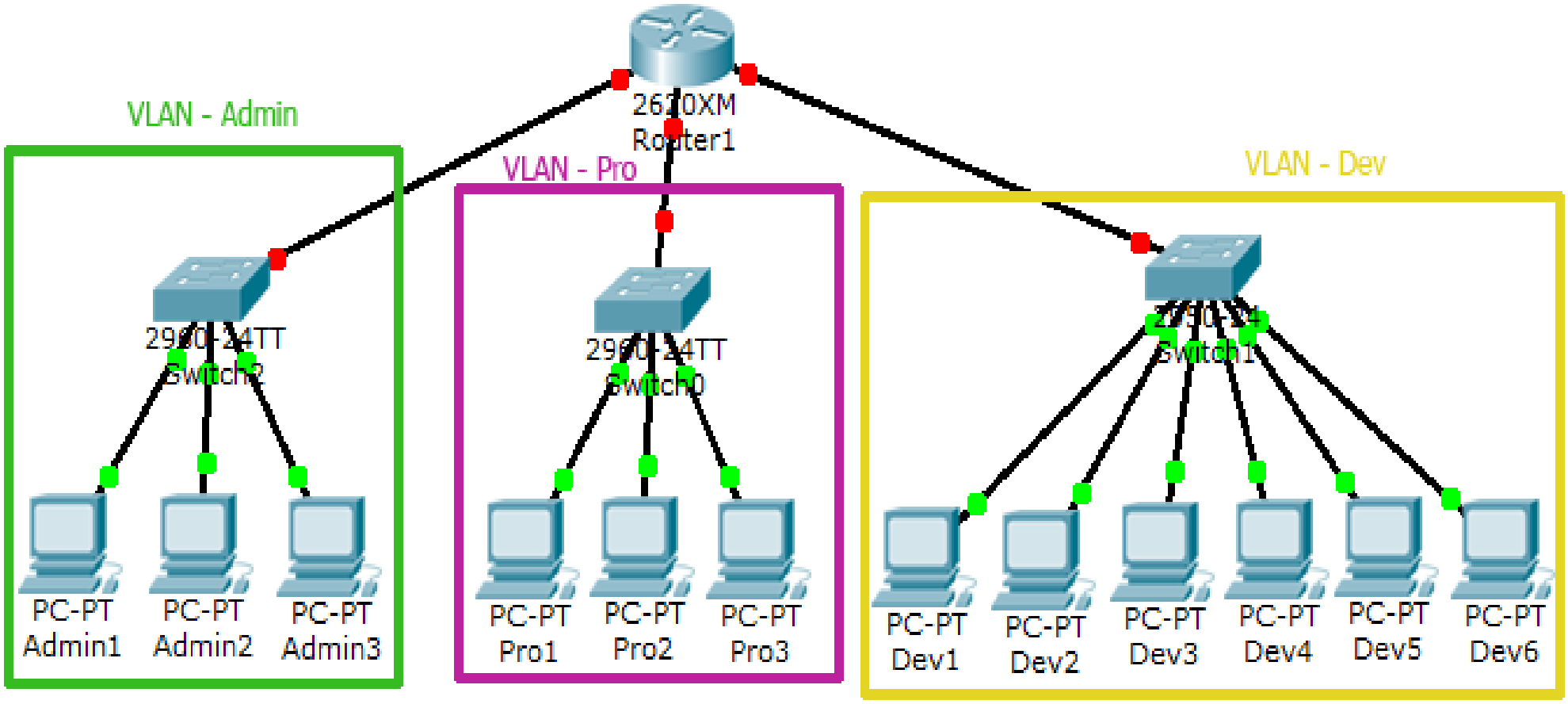


Here you see each Class's Network and Host ID portion. Notice that there are only few Class A networks (Network ID), but many Host ID's, where as a Class C has alot more Networks and fewer Host ID's.

	Class A	Class B	Class C
First octet range	1 – 126	128 – 191	192 – 223
Valid network numbers	1.0.0.0 – 126.0.0.0	128.0.0.0 – 191.255.0.0	192.0.0.0 – 223.255.255.0
Total networks	$2^7 - 2 = 126$	$2^{14} = 16{,}384$	$2^{21} = 2{,}097{,}152$
Hosts per network	$2^{24} - 2$	$2^{16} - 2$	$2^8 - 2$
Octets (bits) in network part	1 (8)	2 (16)	3 (24)
Octets (bits) in host part	3 (24)	2 (16)	1 (8)
Default mask	255.0.0.0	255.255.0.0	255.255.255.0


Border Network
Perimeter Network
Internal Network
Internet
Border Router
Border Switch
Perimeter Firewall
Switch
Web Servers
Switch
Internal Firewall
Switch
Database Server
Data Store
Internal Router


Client Machines
Browser
Browser
Internet
Router
Switch
Standby
Node
PIX Firewall
PIX Firewall
Switch
Standby
Node
Local Director
Local Director
Switch
Web Farm
WIN2000 Adv. Servers IIS\SSCE
NLBS LDAP Farm
Switch
Pix Firewalls
Router
Corporate
NET
Corporate Network
Business Partners
Router
Router
Switch
SQL Cluster
EMC
Shared Drives


VLAN - Admin
2610XM
Router1
VLAN - Pro
VLAN - Dev
2960-24TT
Switch2
2960-24TT
Switch0
2960-24
Switch1
PC-PT
Admin1
PC-PT
Admin2
PC-PT
Admin3
PC-PT
Pro1
PC-PT
Pro2
PC-PT
Pro3
PC-PT
Dev1
PC-PT
Dev2
PC-PT
Dev3
PC-PT
Dev4
PC-PT
Dev5
PC-PT
Dev6

Distributed Computing Vs GRID

- Grid is an evolution of distributed computing
  - **Dynamic**
  - **Geographically independent**
  - **Built around standards**
  - **Internet backbone**

- Distributed computing is an “older term”
  - **Typically built around proprietary software and network**
  - **Tightly couples systems/organization**

Introduction to Grid Architecture

A grid architecture identifies fundamental system components, specifies the purpose and function of these components, and indicate how these components interact.

Introduction to Grid Architecture

Grid's protocols allow **VO** users and resources to negotiate, establish, manage and exploit sharing relationships.

- Interoperability a fundamental concern
- The protocols are critical to interoperability
- Services are important
- We need to consider APIs and SDKs

VO: Virtual Organization

Grid architecture requirements

- The components are
  - numerous
  - owned and managed by different, potentially mutually distrustful organisations and individuals
  - may be potentially faulty
  - have different security requirements and policies
  - heterogeneous
  - connected by heterogeneous, multilevel networks
  - have different resource management policies
  - are likely to be geographically separated

A Comparison

SERIAL

- Fetch/Store
- Compute

PARALLEL

- Fetch/Store
- Compute/ communicate
- Cooperative game

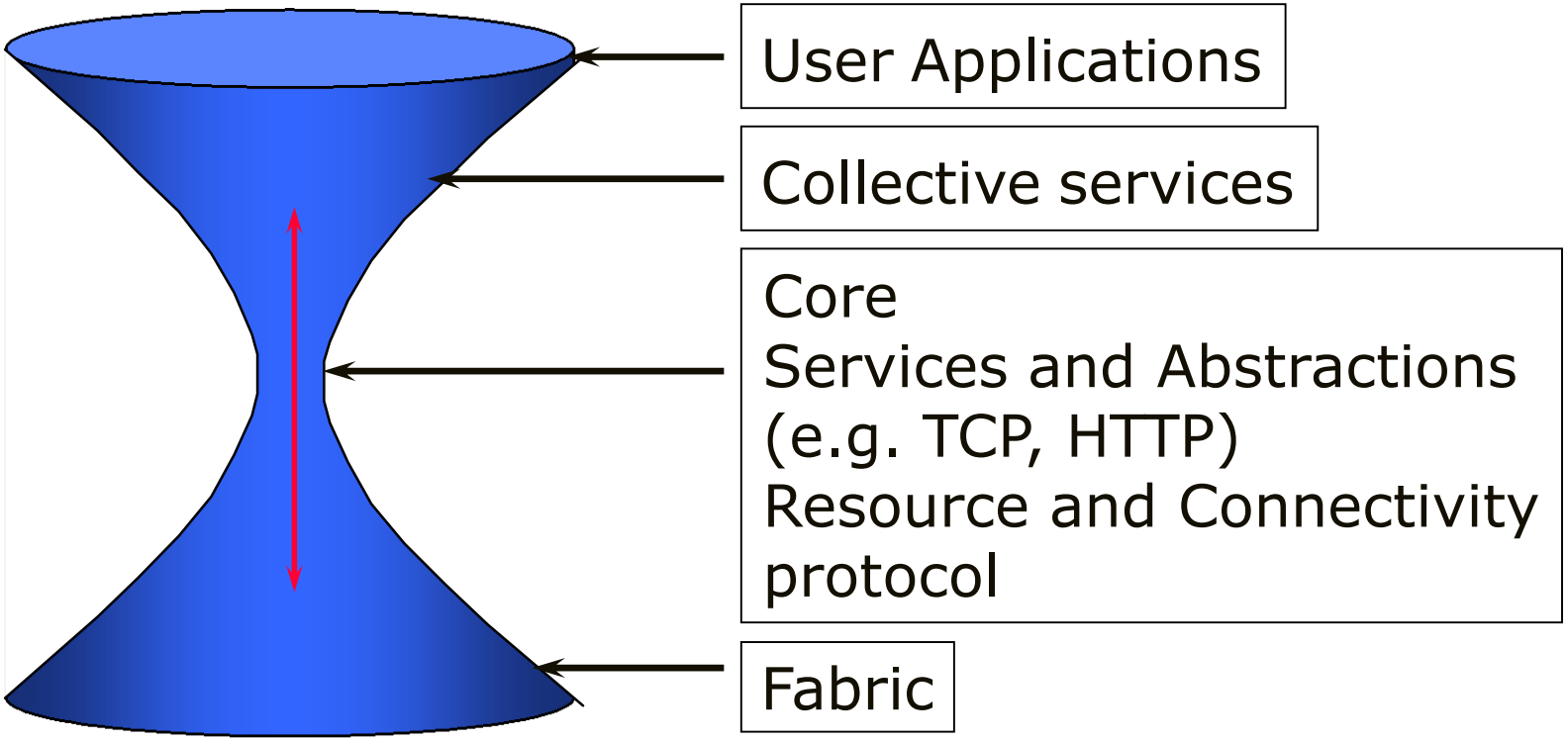
GRID

- Fetch/Store
- Discovery of Resources
- Interaction with remote application
- Authentication / Authorization
- Security
- Compute/Communicate
- Etc

Key Components
The Hourglass Model

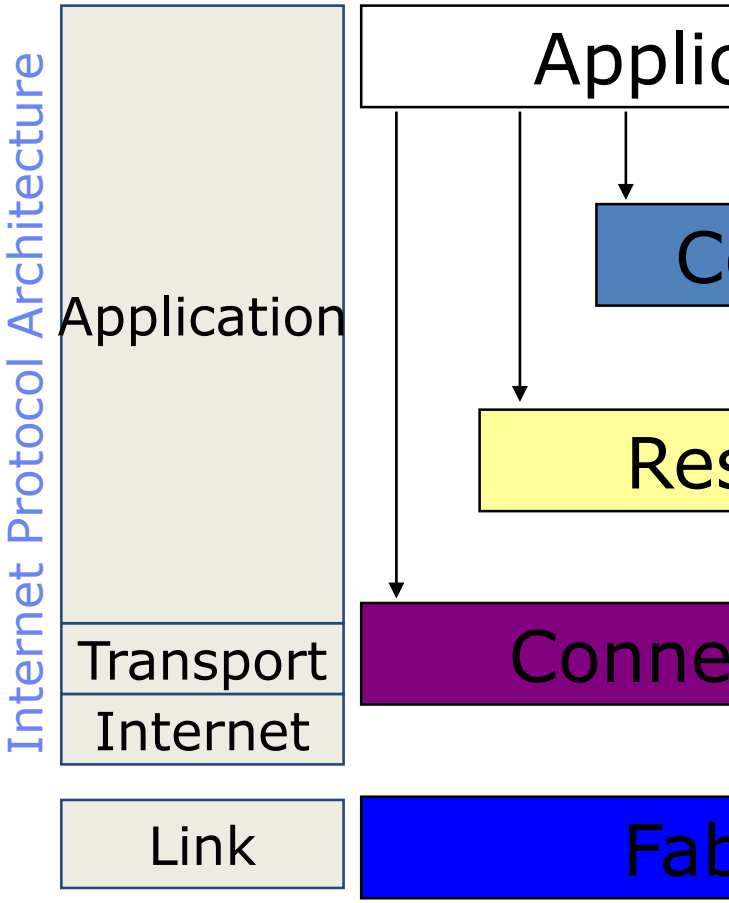
Applications

Diverse global services



Key Components

Layered Grid Architecture
(By Analogy to Internet Architecture)



"Coordinating multiple resources": ubiquitous infrastructure services, app-specific distributed services

"Sharing single resources": negotiating access, controlling use

"Talking to things": communication (Internet protocols) & security

"Controlling things locally": Access to, & control of, resources

HPC Cluster

Essential Services Required

- SSH
- NFS
- User Authentication
- Logging
- Monitoring