NetworkCare
The knowledge behind the network

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Greater Chicago Chapter

GREATER CHICAGO CHAPTER

Thursday, 9-21-00

Management of Converging Networks

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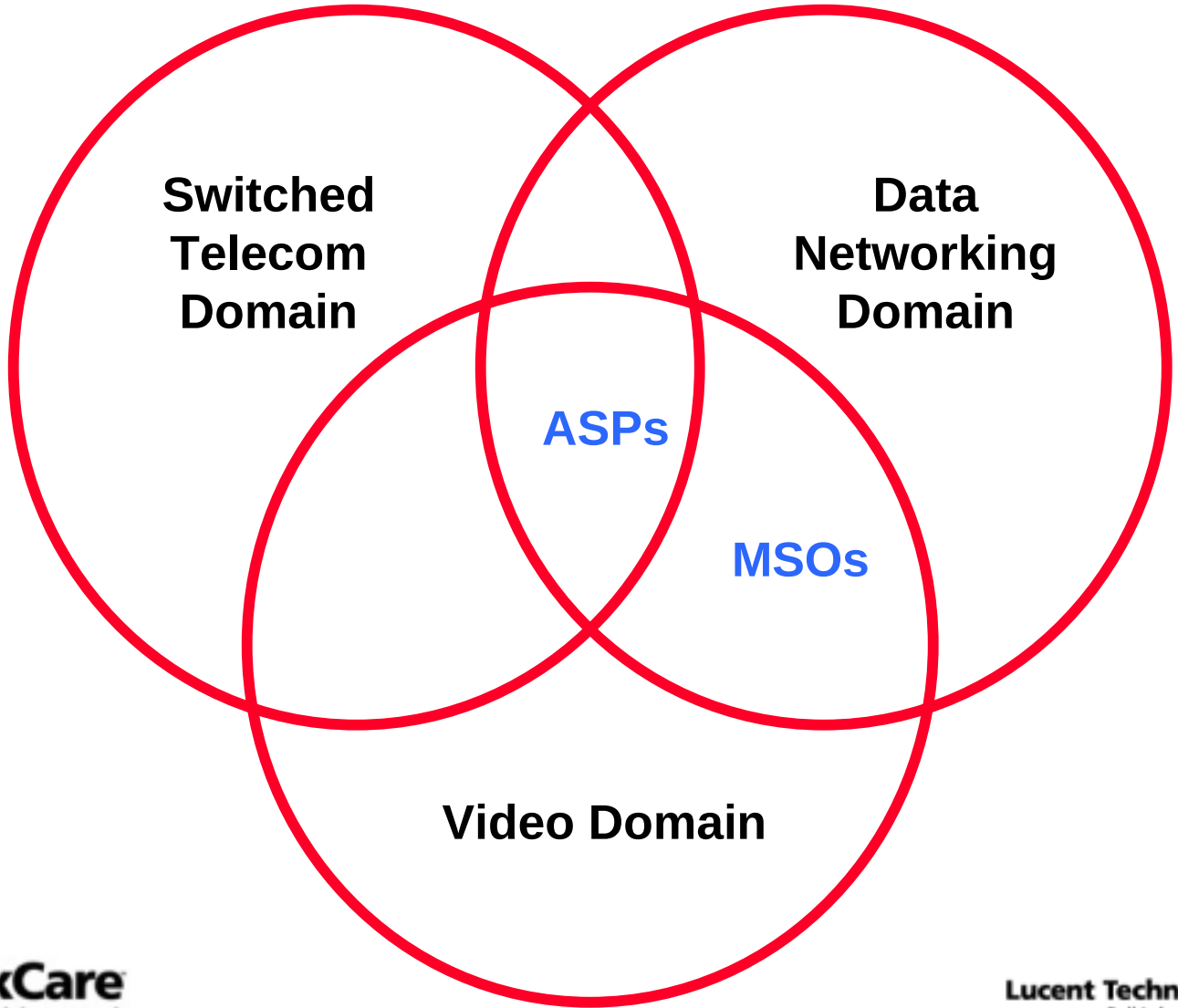
Lucent Technologies

Agenda

- ☆ ***Converging Networks***
- ☆ ***Why Network Management?***
- ☆ ***What Is Network Management?***
- ☆ ***Network Management for CATV***

Converging Networks



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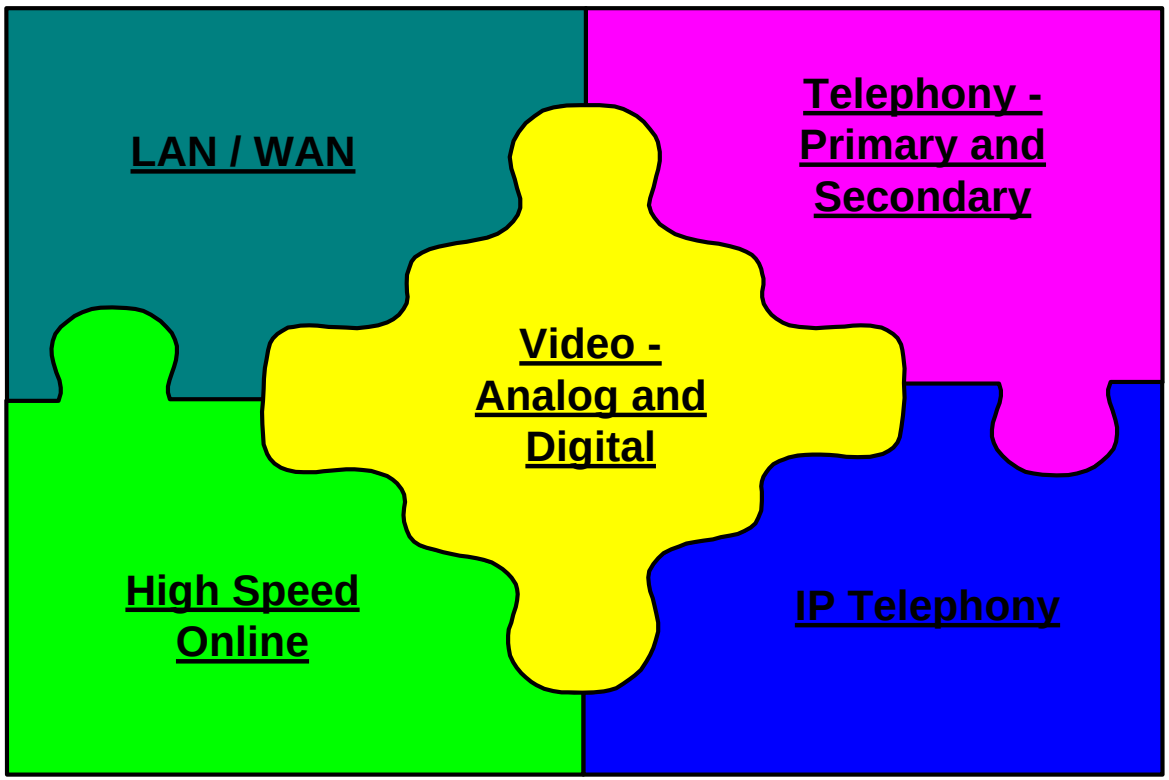
Converging Networks



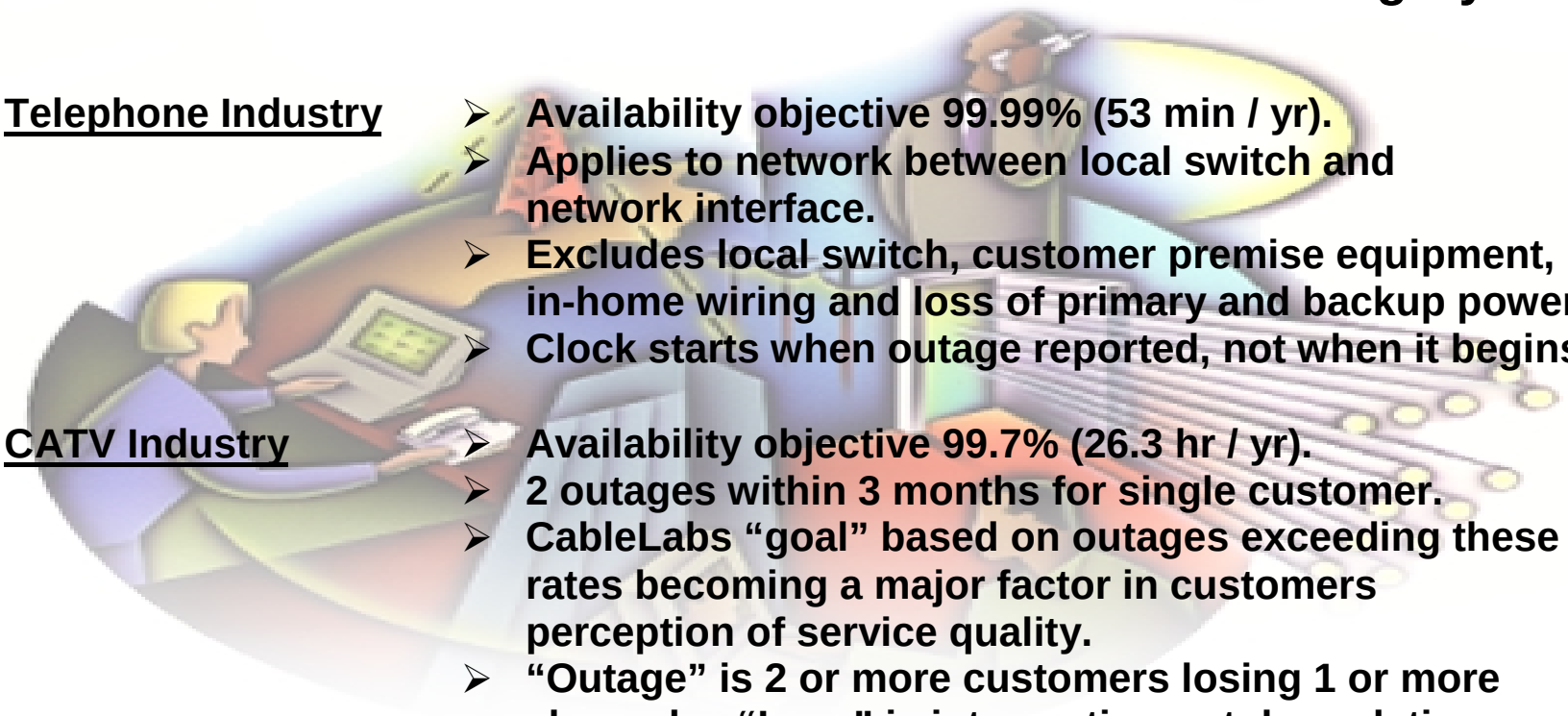
Why Network Management?

New Service Demands on HFC Networks :

- ***Transmission quality***
- ***Effective bandwidth***
- ***Service reliability*** **(the probability that a system will survive without interruption for a defined period)**
- ***Outage Rate*** **(the average rate at which service interruptions occur)**
- ***Availability*** **(the percentage of time that service is available)**

Why Network Management?

Different industries use different measures of service integrity:



Telephone Industry

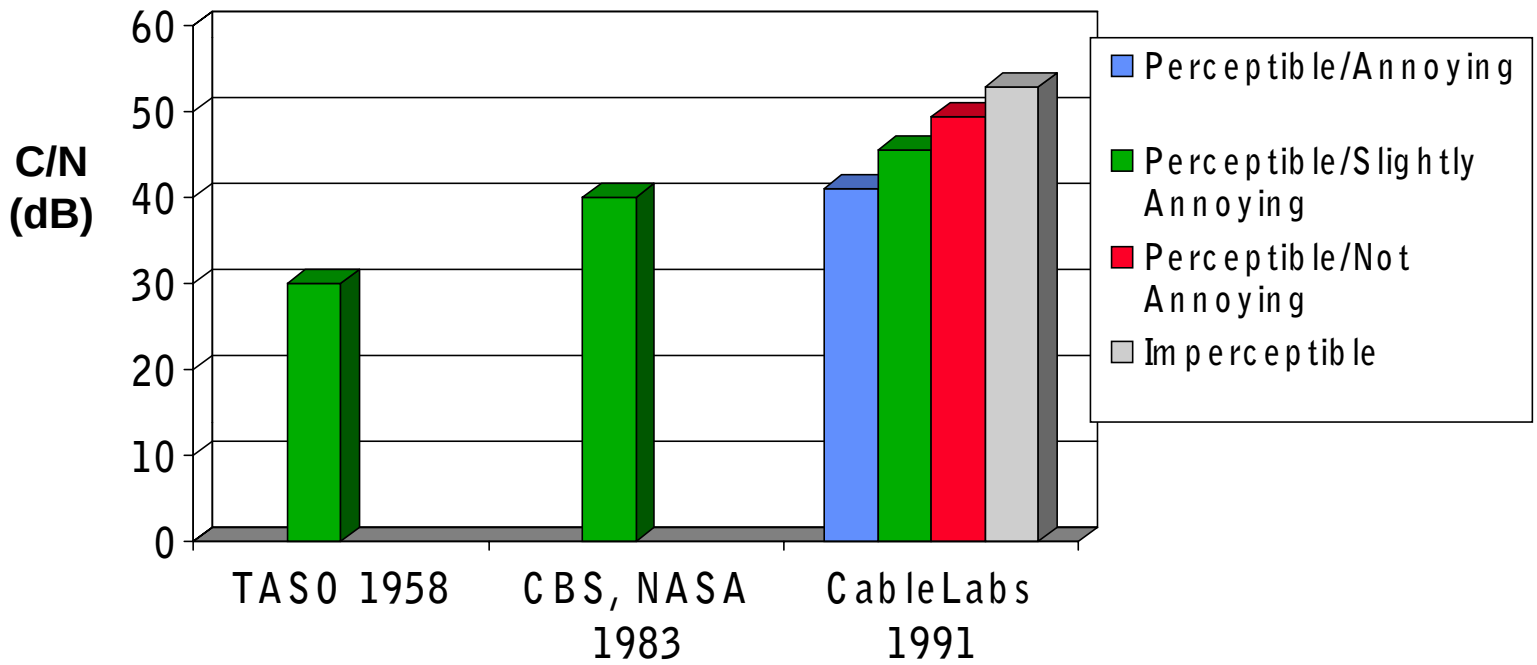
- Availability objective 99.99% (53 min / yr).
- Applies to network between local switch and network interface.
- Excludes local switch, customer premise equipment, in-home wiring and loss of primary and backup power.
- Clock starts when outage reported, not when it begins.

CATV Industry

- Availability objective 99.7% (26.3 hr / yr).
- 2 outages within 3 months for single customer.
- CableLabs "goal" based on outages exceeding these rates becoming a major factor in customers perception of service quality.
- "Outage" is 2 or more customers losing 1 or more channels. "Loss" is interruption not degradation.
- Includes power outages!

Why Network Management?

Customer Expectations are continually increasing



Why Network Management?

Causes of CATV Service Interruptions

Signal Quality

Commercial Power Problems

Equipment Failures

Interfering Signals

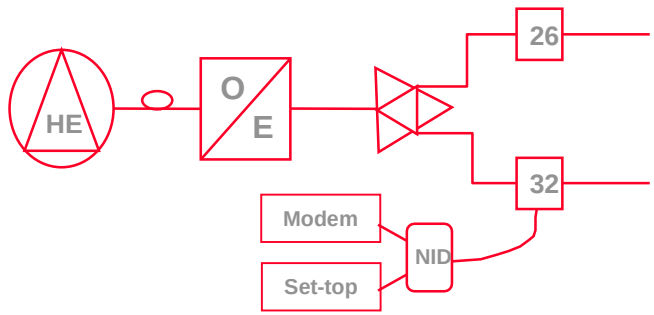
Network Capacity

Customer Misuse

Why Network Management?

Causes of Service Interruptions … Equipment Failures*

⇒ Power Supplies	3%
⇒ Amplifiers	.15% to 10%
⇒ Optical Transmitters	2.3%
⇒ Optical Receivers	.7% to 1.7%
⇒ Passive Devices	.07% to 1%
⇒ Coaxial Connectors	.01% to .25%
⇒ Fiber Optic Cable	.3% to 3%
⇒ Coaxial Cable	.23% to 3%
⇒ Customer Premises	7%
⇒ Network Interfaces	5.4%
⇒ Headend Equipment	5% to 30%



* Regional differences such as lightning strikes and underground construction laws have major effect on outages.
Sources: Network Reliability Council, Werner & Gatseos, Merk and Strode, Hamilton-Piercy and Balsdon, Bellcore.

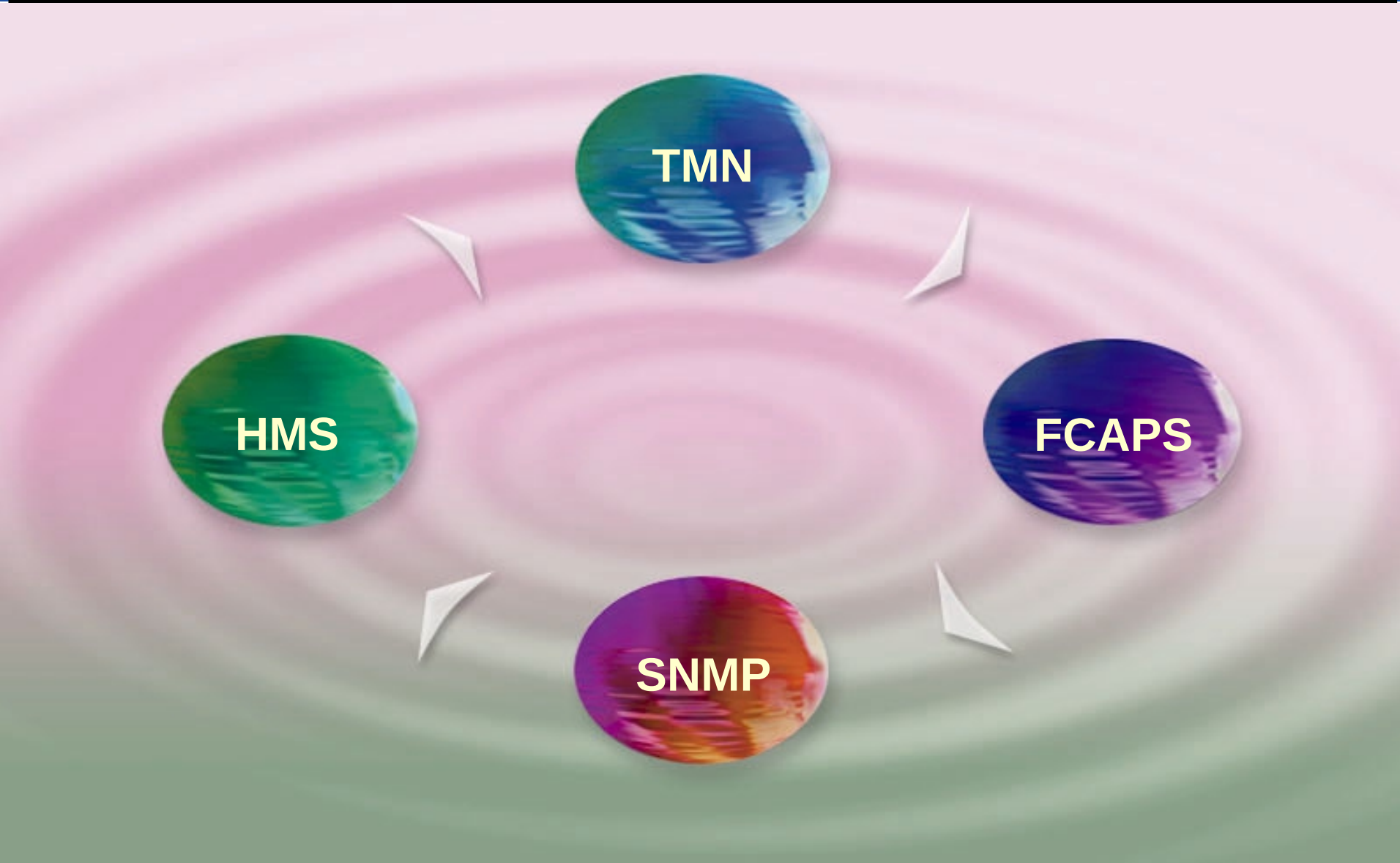
Why Network Management?

Weapons against Service Interruptions ... Equipment Failures

- **Start with high quality, reliable equipment.**
- **Network Architecture minimizing number of HP affected by single point of failure.**
- **Redundant hardware / spares.**
- **Fiber Optic transport … self healing rings.**
- **Monitoring equipment to isolate failure, decreasing repair time.**

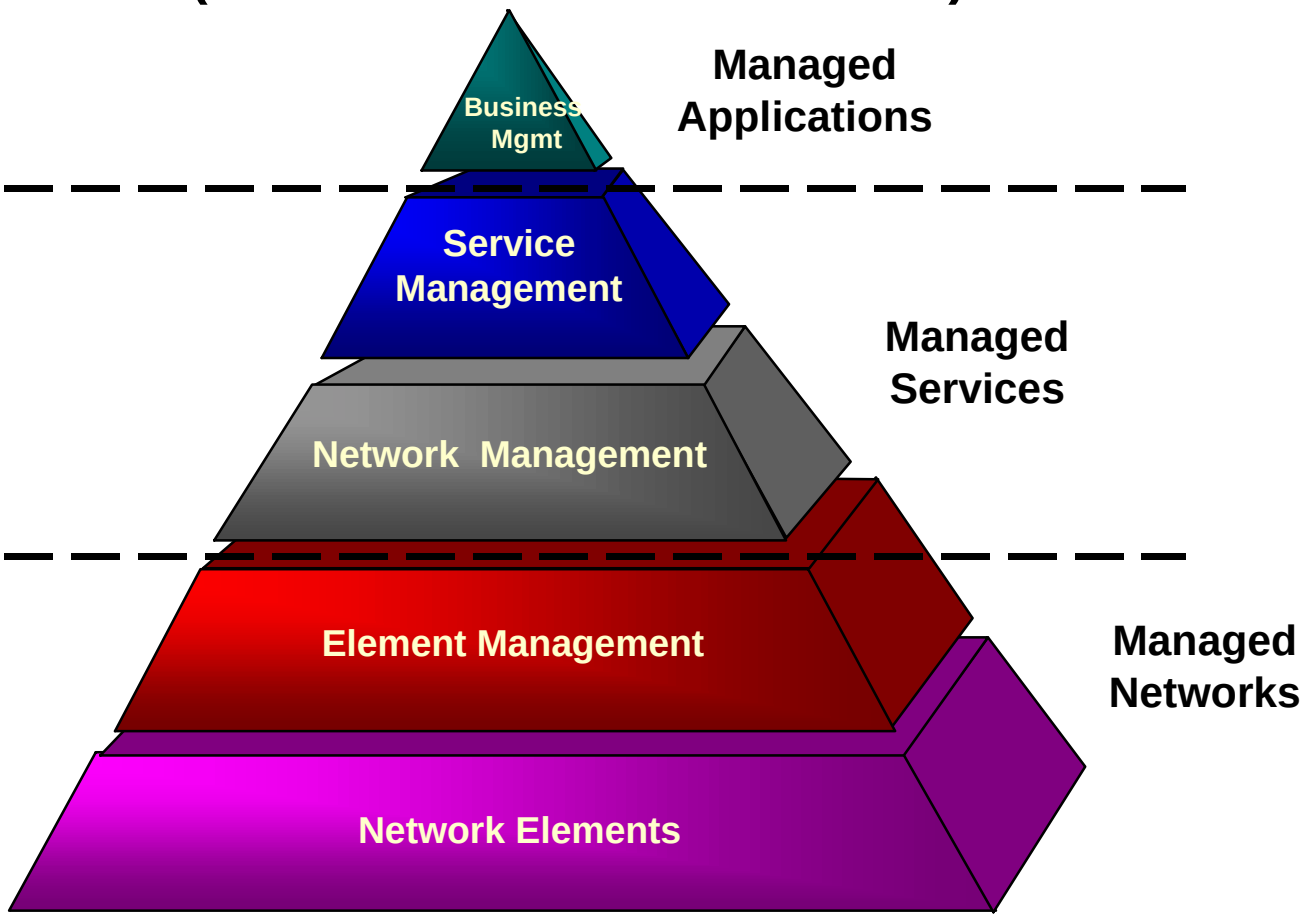
Network Management!

What Is Network Management?



What Is Network Management?

TMN - Telecommunications Management Network
(ITU Recommendation M.3010)



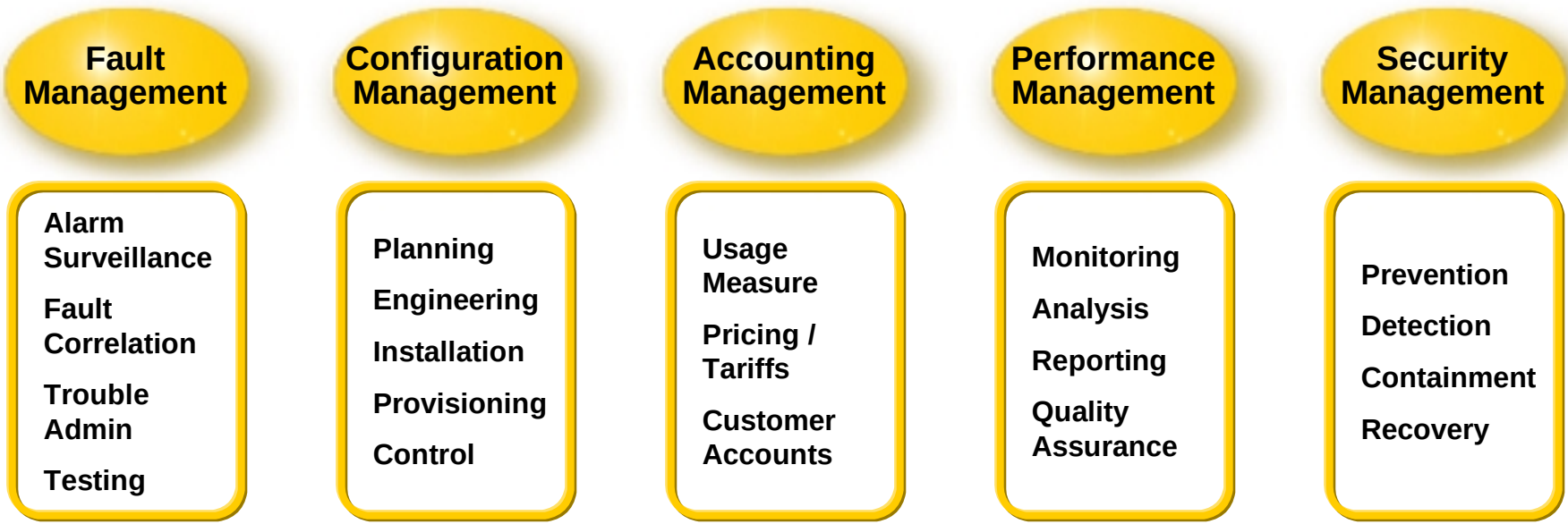
What Is Network Management?

FCAPS - 5 major functional areas defined by ISO, worldwide standard.

- **F** Fault Management
- **C** Configuration Management
- **A** Accounting Management
- **P** Performance Management
- **S** Security Management

What Is Network Management?

FCAPS Model



What Is Network Management?

SNMP - Simple Network Management Protocol
ITU RFC 1155 / 1157 / 1448

SNMP Model of a managed network consists of four components:

- ***Management Station*** **- manager controls number of nodes on a network, each equipped with a management agent.**
- ***Management Agent*** **- communications intelligence.**
- ***Management Information Base (MIB)*** **- collection of information or objects about the node where agent resides. Messages from manager to agent results in reading or configuring an object in the MIB.**
- ***Network management protocol*** **- manager and agent communicate through a network management protocol, enabling the manager to access objects in the agent's MIBs. In TCP/IP networks, SNMP is an application level protocol using UDP as its underlying transport.)**

What Is Network Management?

SNMP - Three basic sets of messages

Retrieves the value of an object from an agent MIB (sent by manager).

Configures the value of an object in an agent MIB (sent by manager).

Enables the agent to alert a manger of an event (sent by agent).

The data message containing the SNMP operation is called the Protocol Data Unit (PDU).

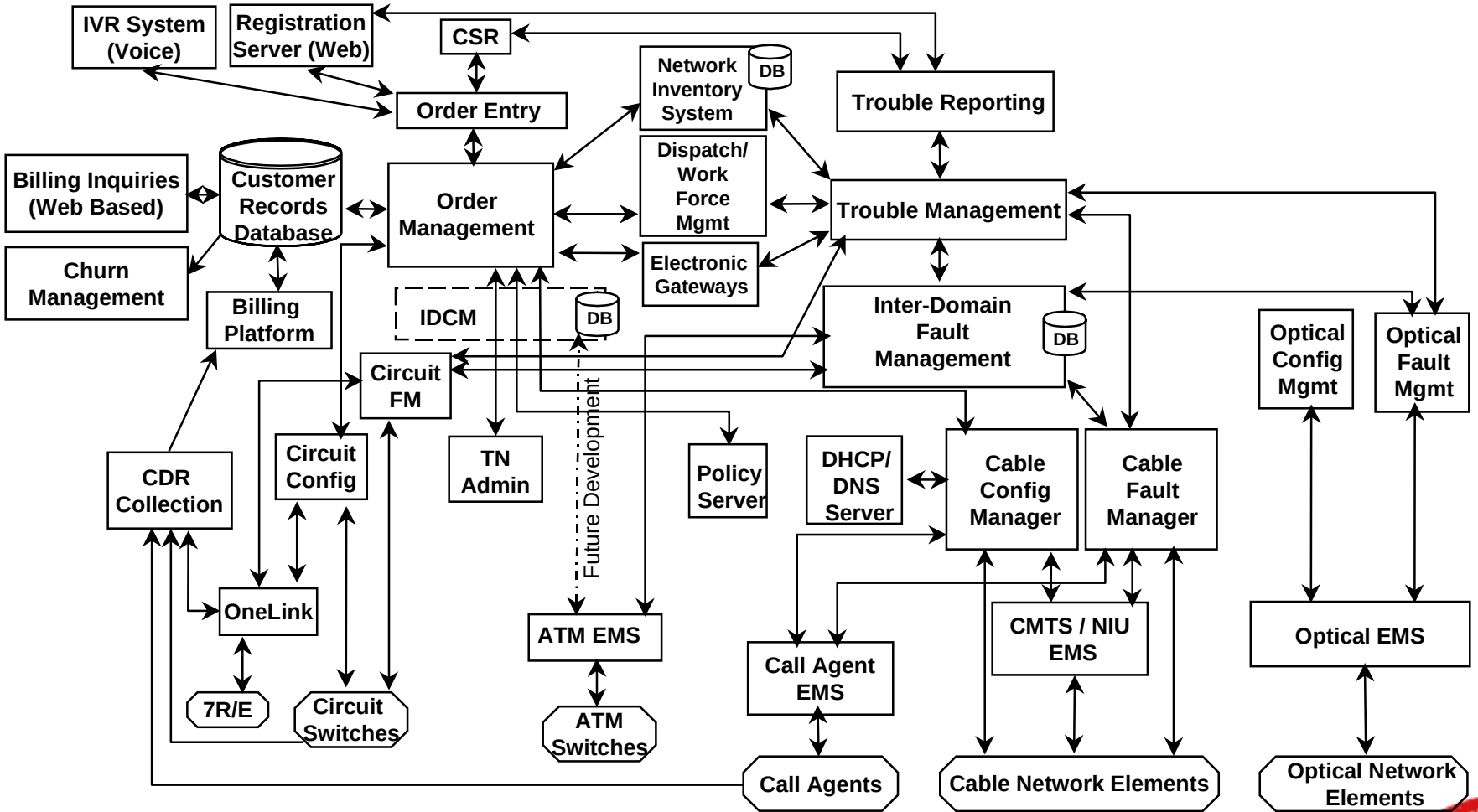
What Is Network Management?

Society of Cable Telecommunications Engineers

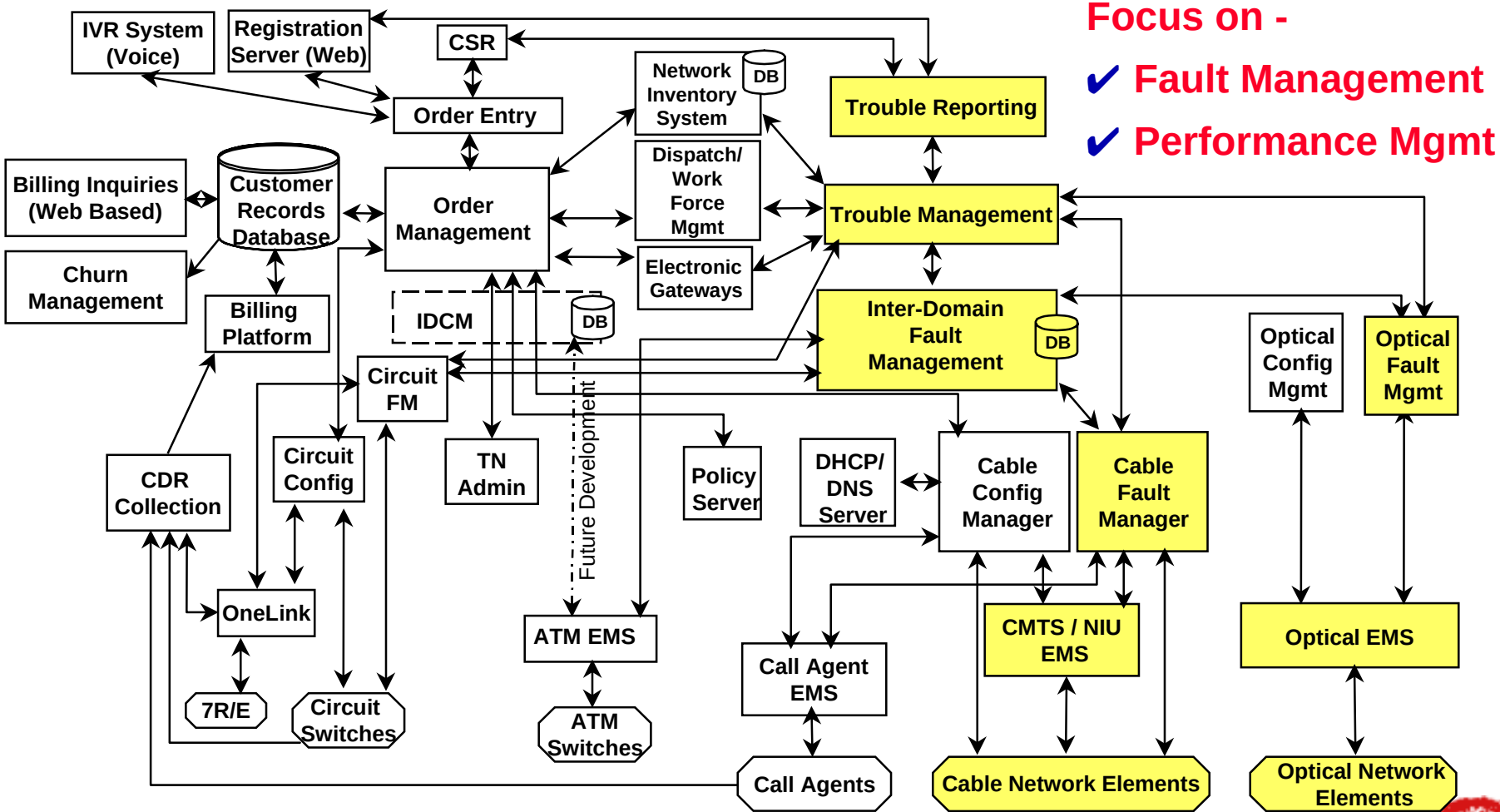
HMS - Hybrid Management Subcommittee

- **SCTE Standards Department subcommittee (1 of 7).**
- **Official standards body for ANSI in North America.**
- **Developing Network Management Interface standards for the CATV industry in North America.**
- **Chairman is Esteban Sandino (AT&T Broadband).**
- **All work is SNMP based.**
- **PHY layer - MAC layer - MIBs - Traps - Alarm handling.**
- **Participants are vendors and CATV operators.**

Network Management For CATV



Network Management For CATV



Focus on -

- ✔ **Fault Management**
- ✔ **Performance Mgmt**

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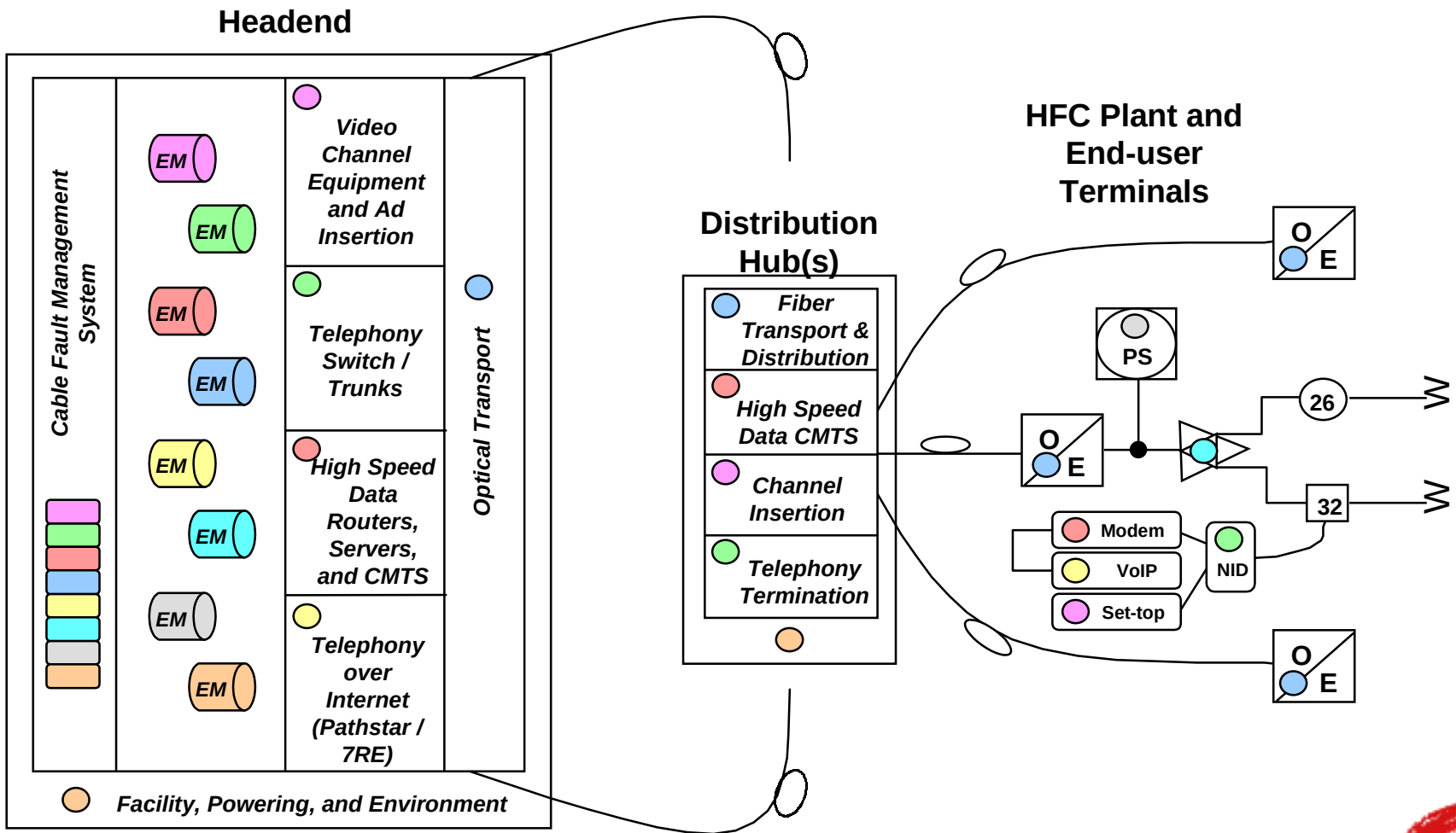
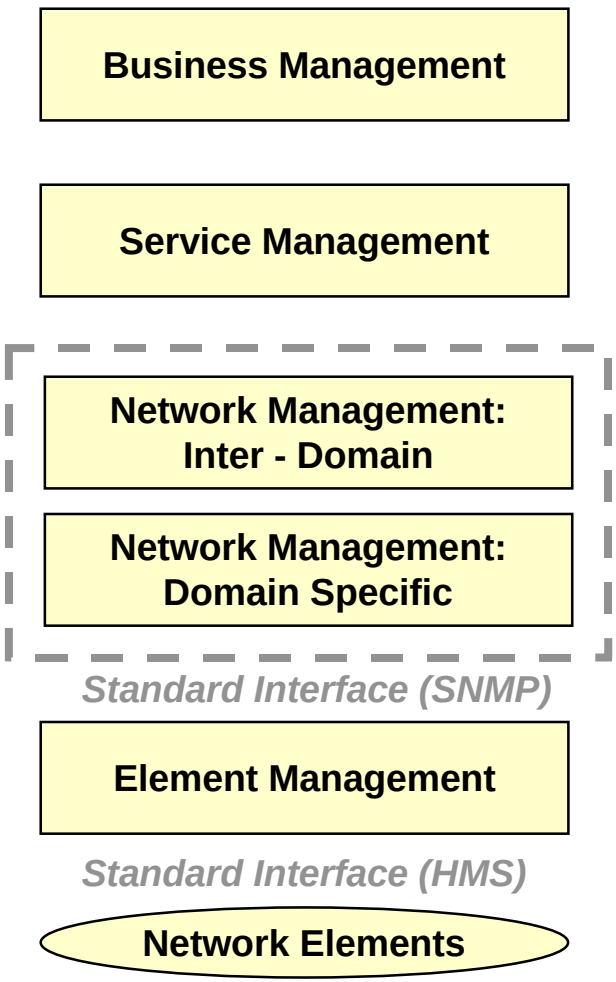
Network Management For CATV



Network Management For CATV



Inter-Domain Management Separates Services from Networks

Inter - Domain Management:

- **High-speed Data**
- **Switched Access**
- **Video Entertainment**
- **Transport**
- **Control Systems**

Multi-Vendor Support

Support New Network Elements

Network Management For CATV

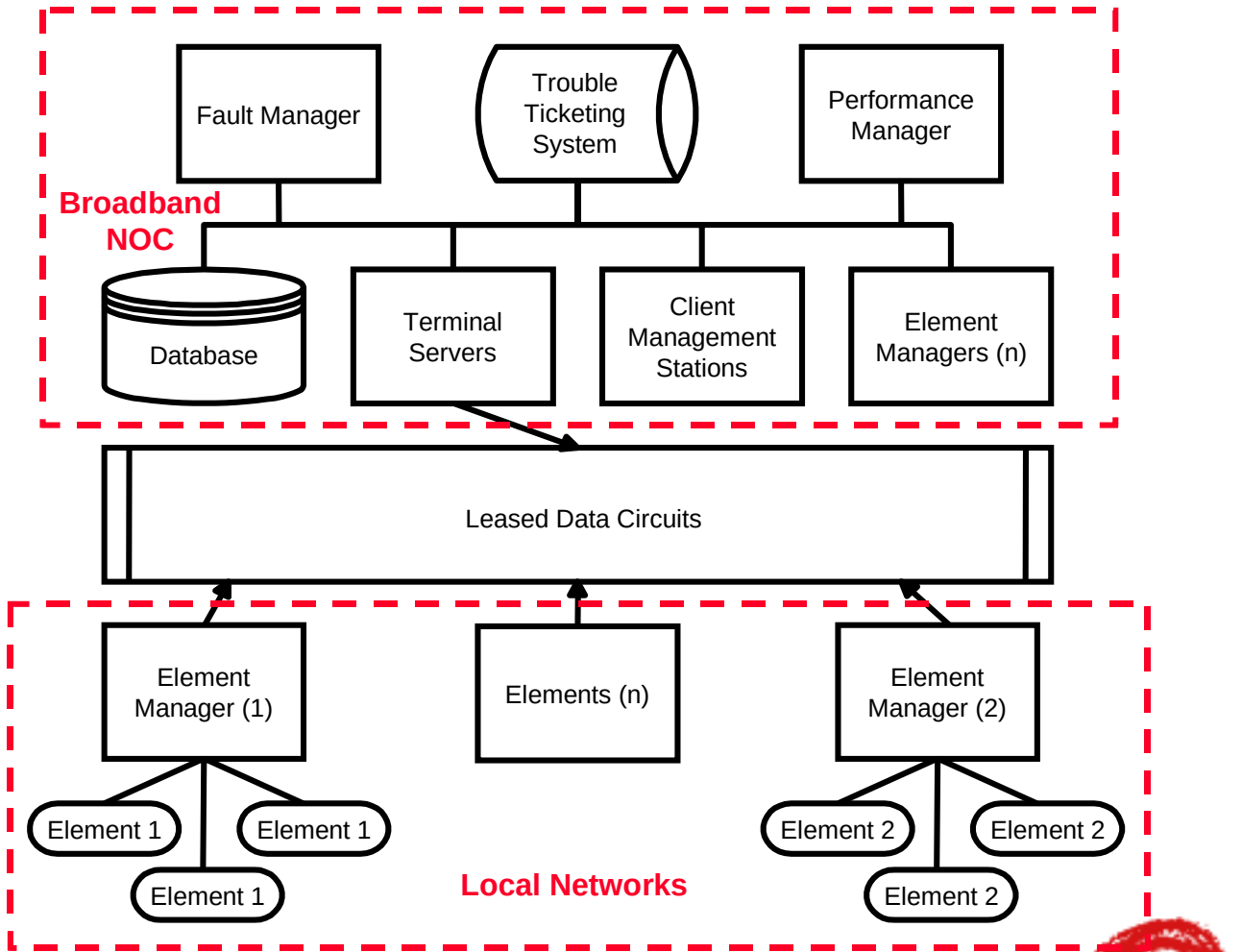
Difficulties for CATV companies to initiate Inter-Domain Management …

- *New technologies and platforms.*
- *High capital cost for equipment and hardened facility.*
- *Technical staff with unique skill sets, difficult to find, and expensive to hire.*

Network Management For CATV

Network Manager Layer:

- **Fault Manager**
- **Performance Manager**



Element Manager Layer

Element Layer

Network Management For CATV

Let's bring this all together -

✔ **Deploy Fault Management and Performance Management (initially).**

✔ **Interface existing Element Managers and new IDFM.**

✔ **Consider deployment costs … Remote Network Management Services?**

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Thank You!