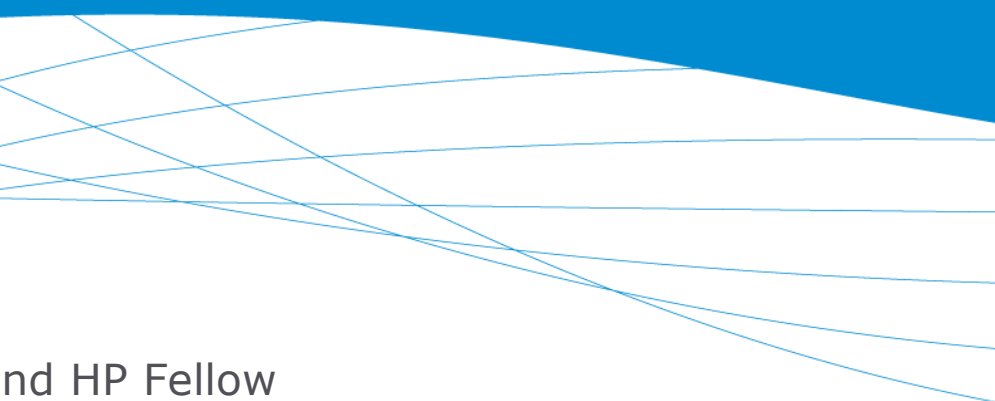


The logo graphic for ProCurve, consisting of a series of blue lines and dots that fan out from the top right towards the center of the slide.

ProCurve

Computing and Next Generation Switching

A graphic consisting of several thin blue lines that cross each other in a complex, web-like pattern, representing a network or data flow.

and HP Fellow
Las Vegas

and Networks

Networking Assumptions

Networking Requirements

Ethernet Switching Technologies

Role of Ethernet in the GRID

up

Grids made of?



ols



Res

Services

Networks made of?

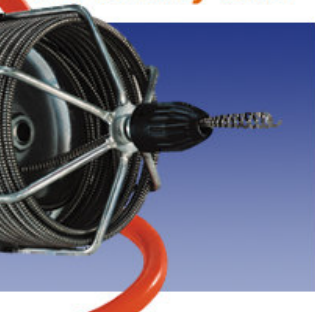


from England – “Routers”)

Switches

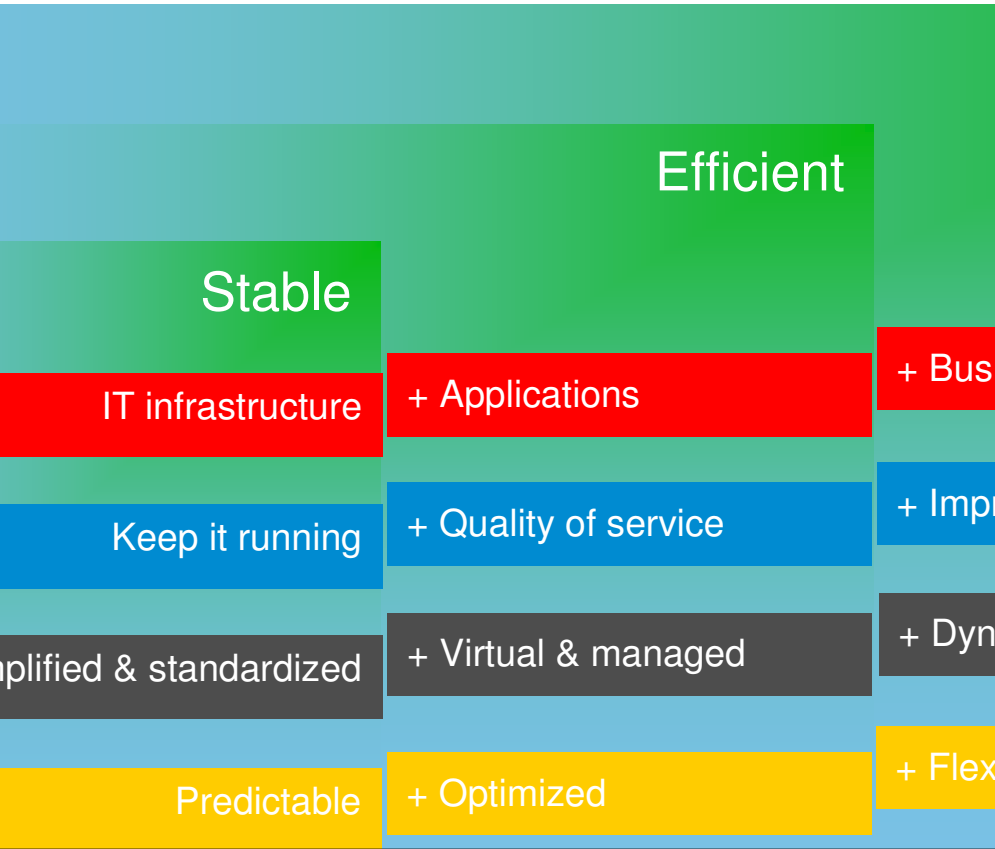


*For sinks, showers
and laundry tubs*



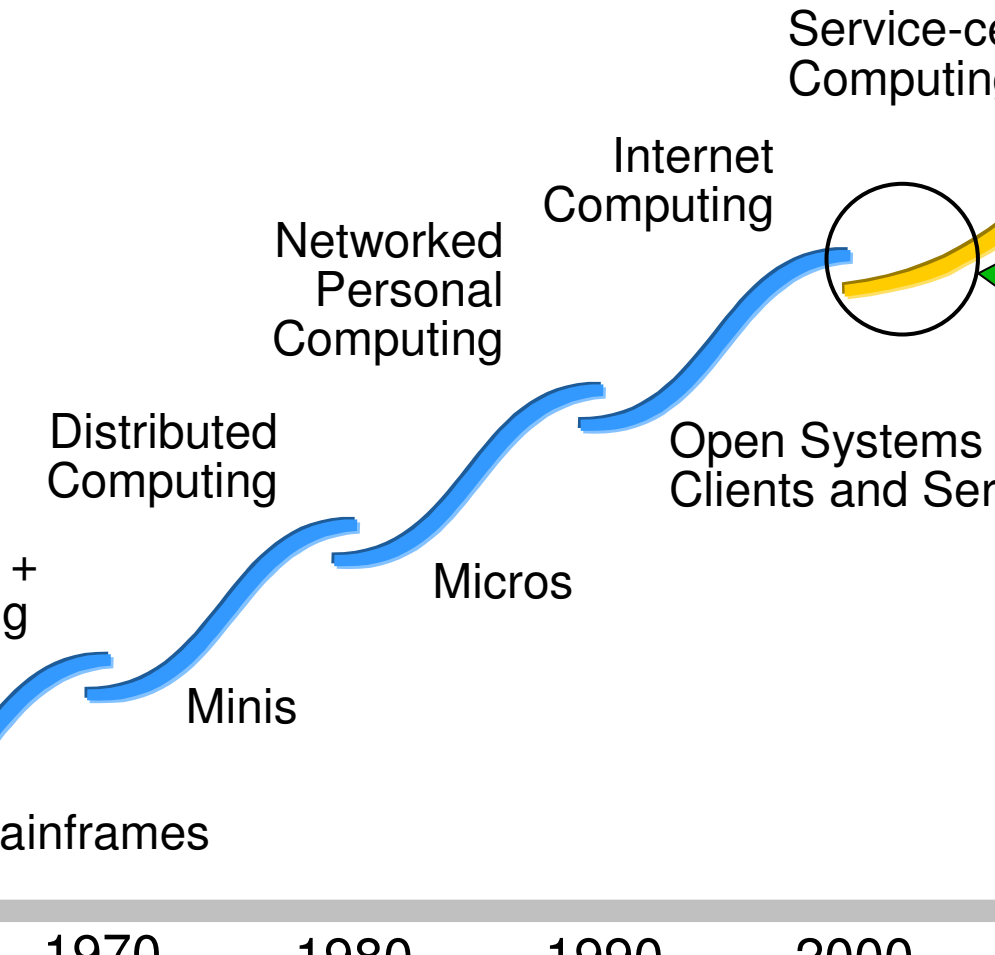
IT

Adaptive Edge N

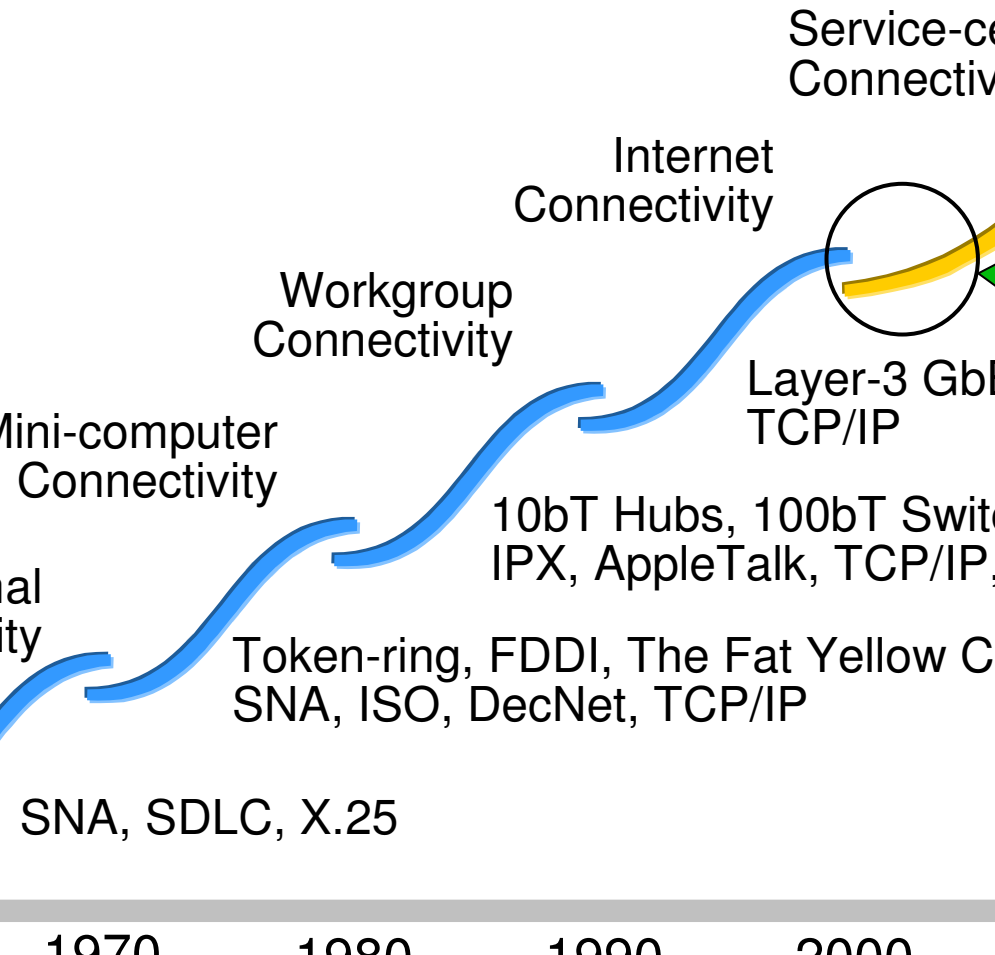


CIO focus areas

of computing



of networking

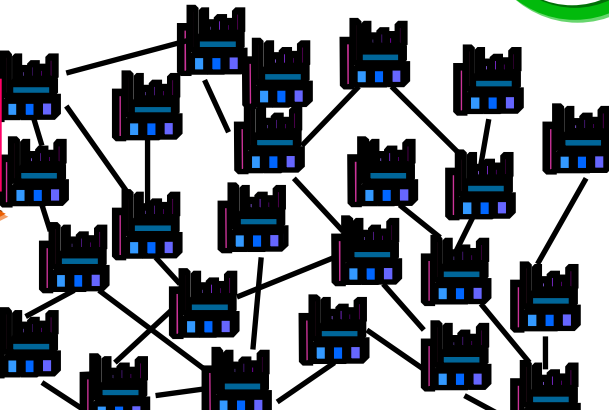
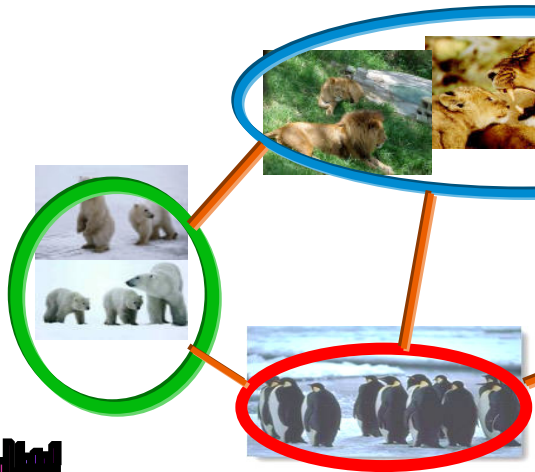


ns



Cluster: A collection of typically homogeneous I organized in a single ma domain... a single system

ent, secure,
source sharing
more sites, usually
terogeneous
ster of clusters



Utility: Deliver as needed bas

dition from 100,000 feet

ddleware technology to enable
, distributed, asynchronous, loosely-c
sed IT environment

itself, neither a product nor a co

s a service-oriented architecture
uilt, not bought."

employed, not downloaded."

of Grid (true Grid)

most anything in IT as a "Grid service"
and computer cycles
and storage space

t, etc.

ds on a network service to deliver "Grid se
ces can then be

llows for secure sharing and collaboration
n members of a virtual organization
ership domains
agement domains

Assumptions

From the user's point of view, the network

is free of bandwidth

limitations for transactions

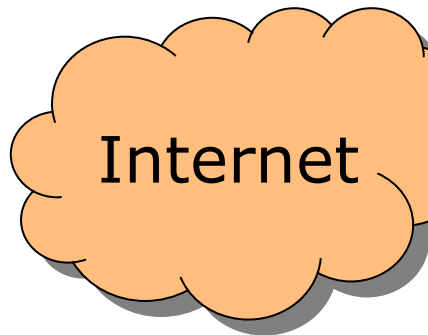
transport

is secure and privacy

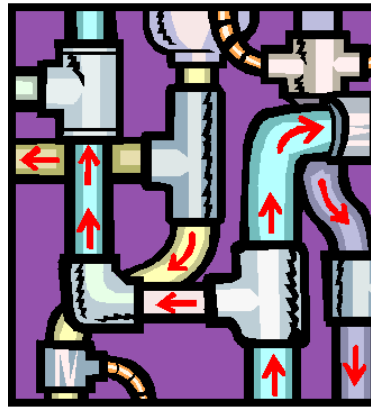
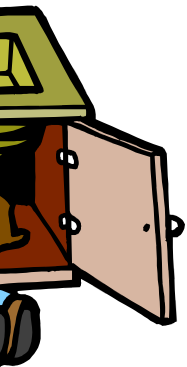
is provided end-to-end connectivity addressed with

virtually no cost... Its FREE

Perspectives

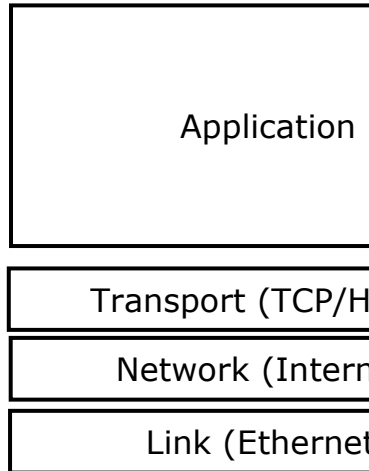
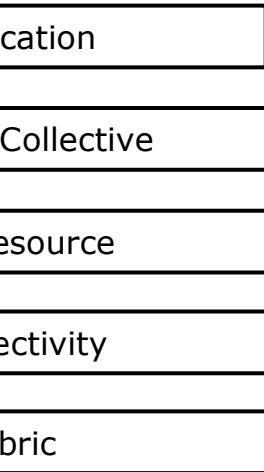


guys view the network in the clo

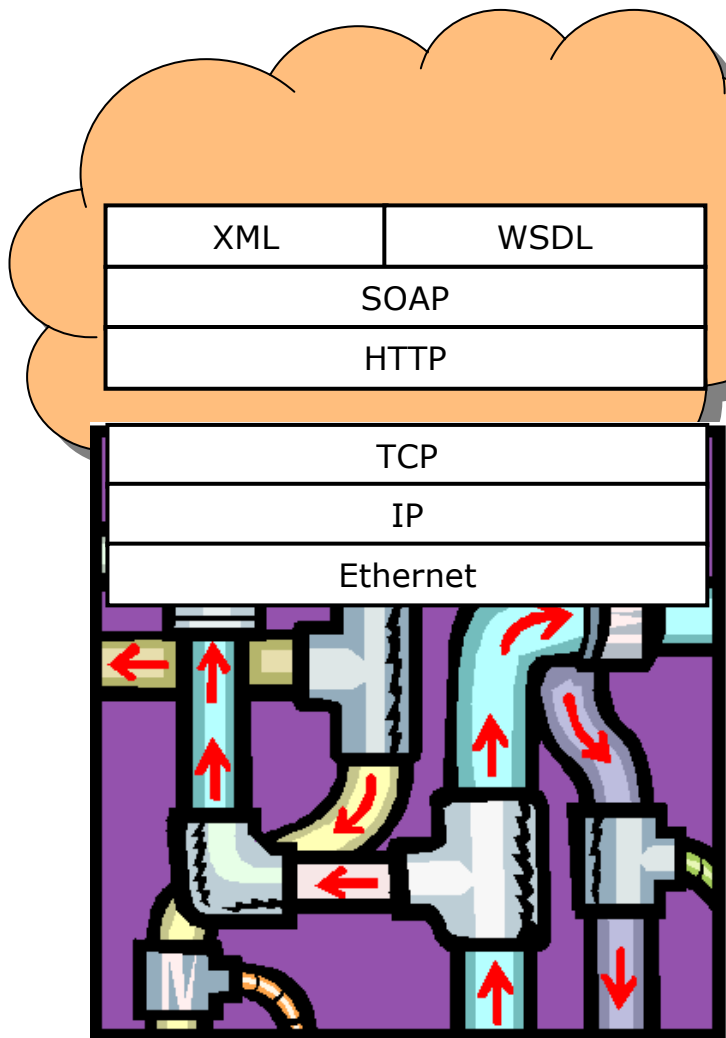
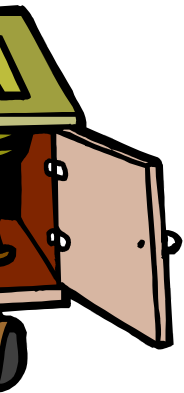


guys view the network as plum

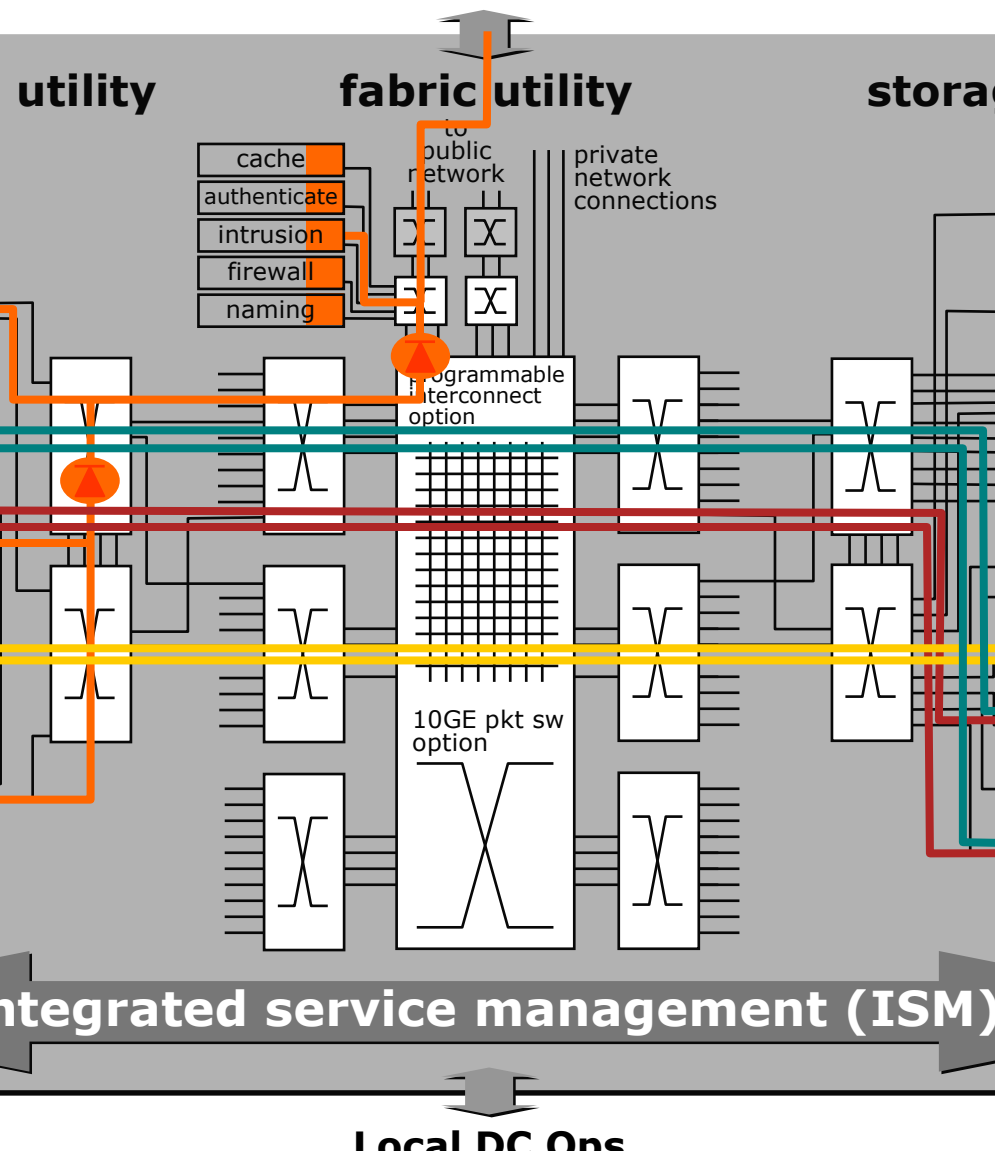
Stack Views



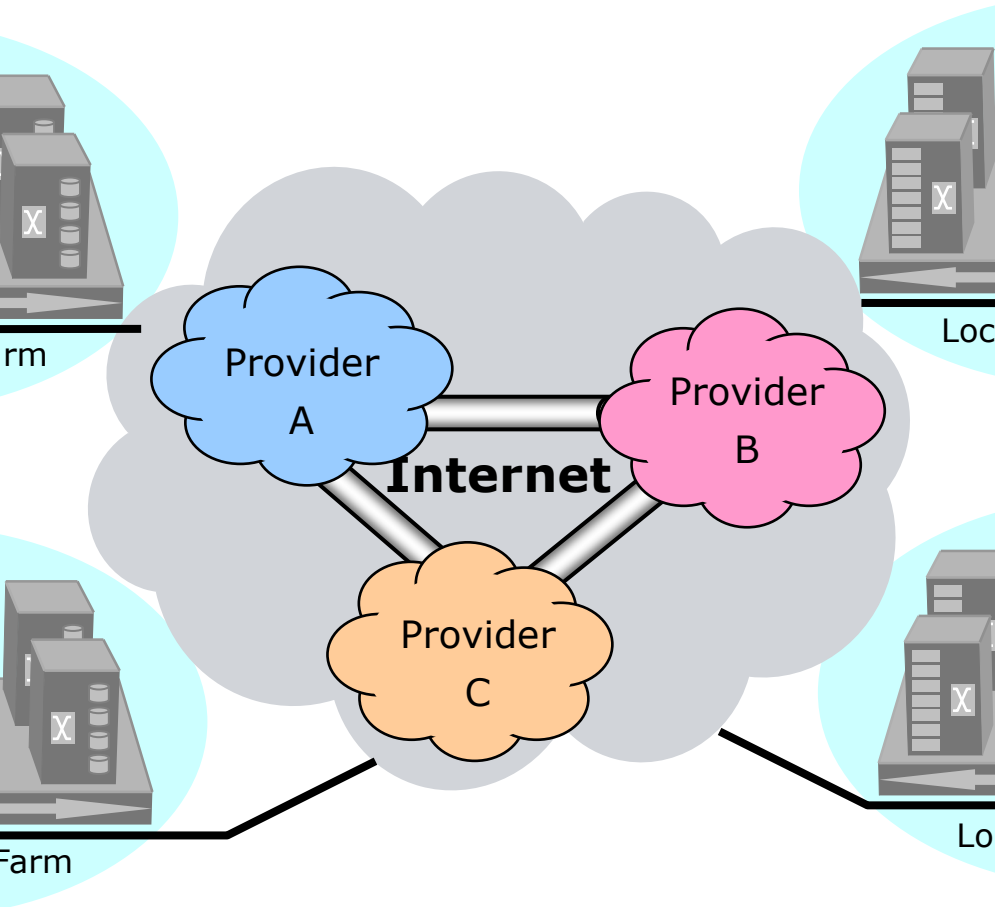
Work Protocol Stack



g the Local Data Center



Work Picture



the Network as a Service

be built on top of a pervasive N

ork Service allows for secure sh
oration of other Grid services b
of a virtual organization

ork Service itself is a virtual
on

e ownership domains

e management domains

hically separate

Elements of the Network

and scalable Grids will depend upon a service.

Network service needs mechanisms for:

Security

Quality

Performance Monitoring and Diagnostics

Configuration

Enforcement

Multiple approaches to meet these requirements

with a strong history of success

Modern Ethernet Switching are addressing

5

302 Standards of Interest

	Description	Re
	Link Layer Discovery Protocol	Dis
	MAC Security	Se
	Connectivity Fault Management	Di
	Provider Bridging Backbone Provider Bridging	Pro
	Congestion Management	Se Gu

y- IEEE 802.1AB

Media Access Control Connectivity Dis

ified standard (March 2005) for link layer

e Link Layer Discovery Protocol (LLDP)

means of advertising pertinent informatio

for use by other standards organizations

detecting configuration inconsistencies

s based replacement for vendor proprietary

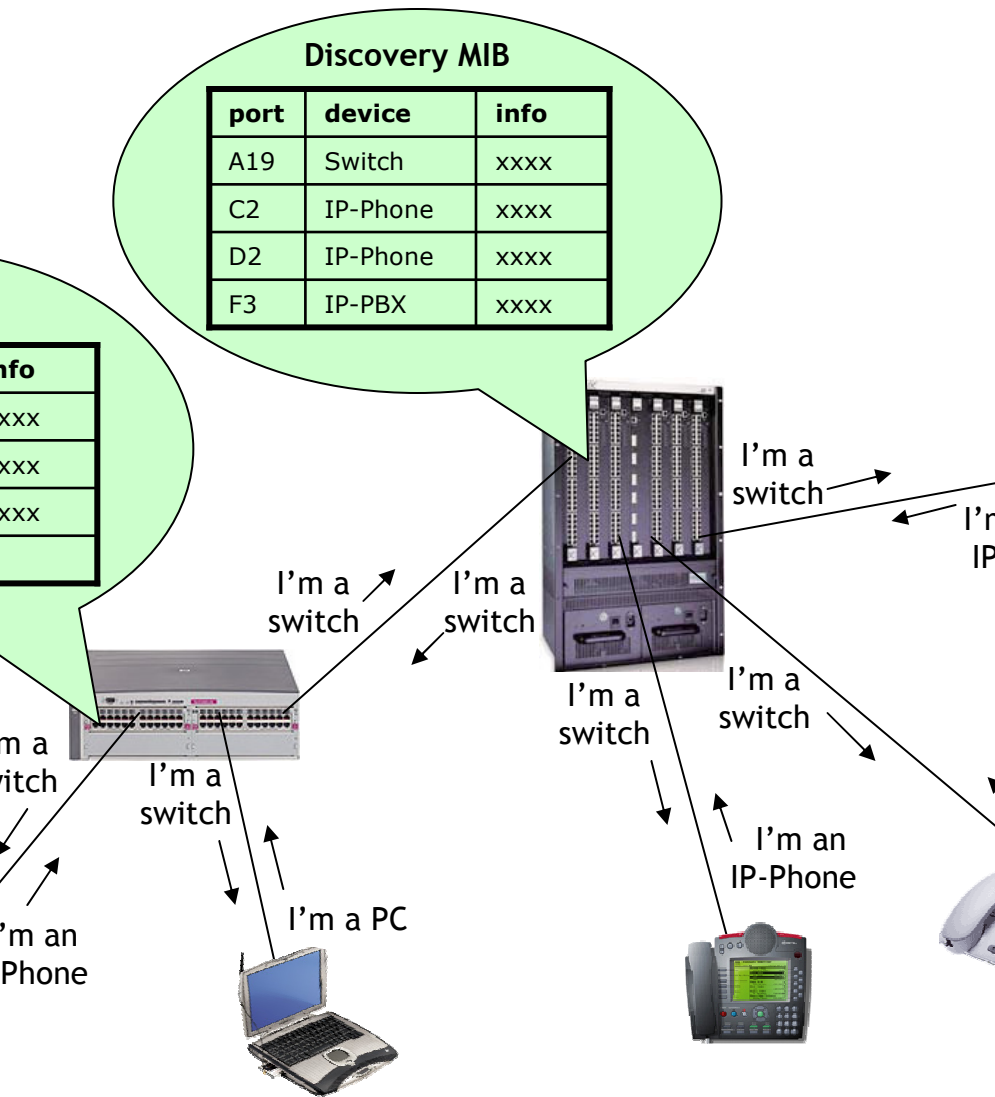
T...

end multicast discovery scheme

tion protocol

t for large message exchange

802.1AB (LLDP) Work?



- IEEE 802.1AE/af

Control (MAC) Security and
Key Agreement

ards under development for MAC independent
encryption above the MAC layer
key agreement protocol to distribute session
r solution supporting shared media and po

T...

ent for 802.1X and EAP

ent for 802.11i and WLAN security mode
only solution

encryption (e.g. IPSec, SSL)

E/af Applications

Working

er to Provider

er to Subscriber

itch Connections

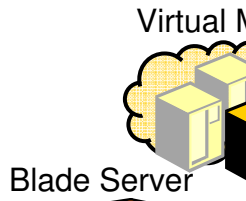
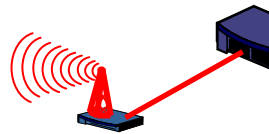
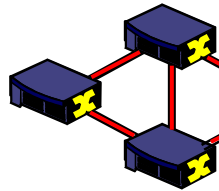
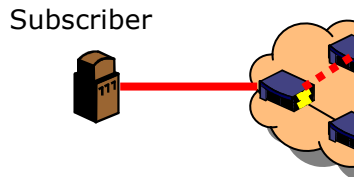
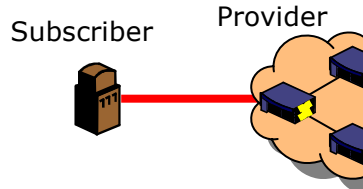
tch links

protection (e.g. spanning tree)

Core

nnctions

associations per port



cs – IEEE 802.1ag

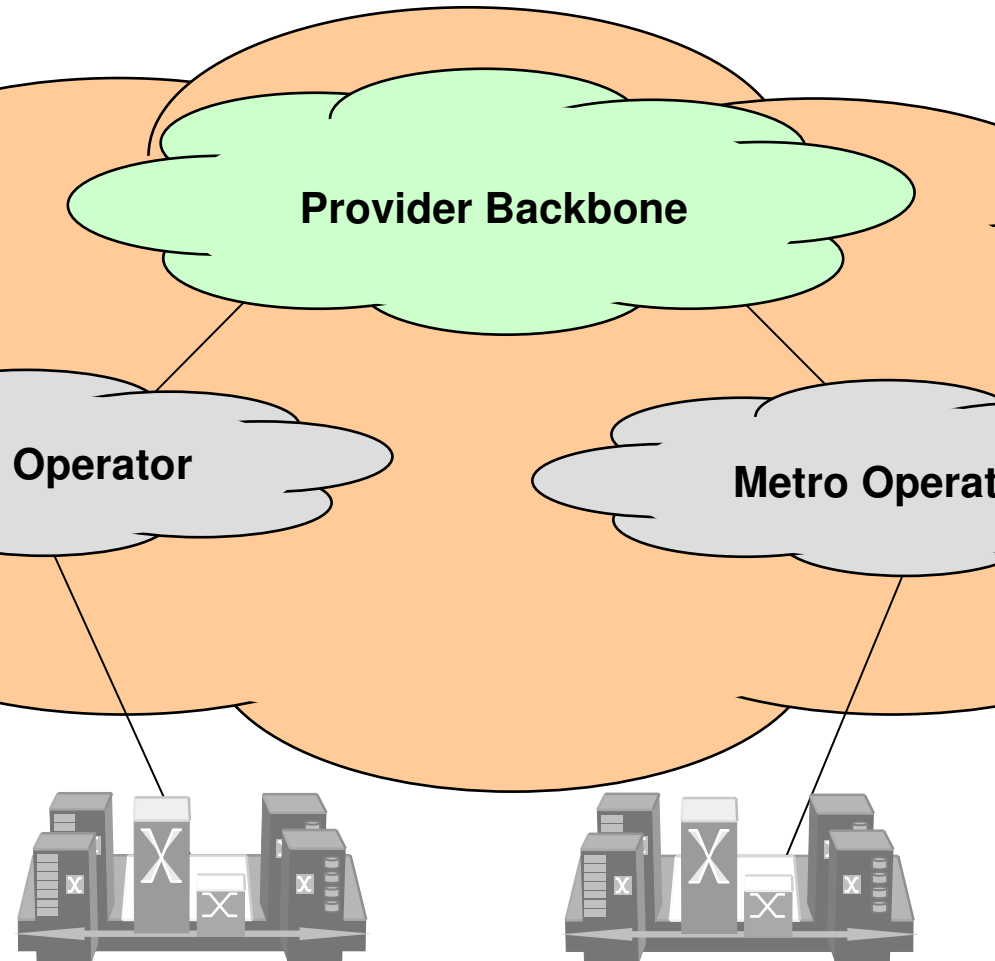
Fault Management

under development for transport fault management
Maintenance End Points and Intermediary Points
protocols, procedures and objects for path verification
following Layer-2 message exchanges
Connectivity Check Message
Connectivity Confirmation Message (e.g. Layer-2 traceroute)
Connectivity Loss Message (e.g. Layer-2 ping)
Connectivity Loss Indication Signal
software implementation, however new hardware

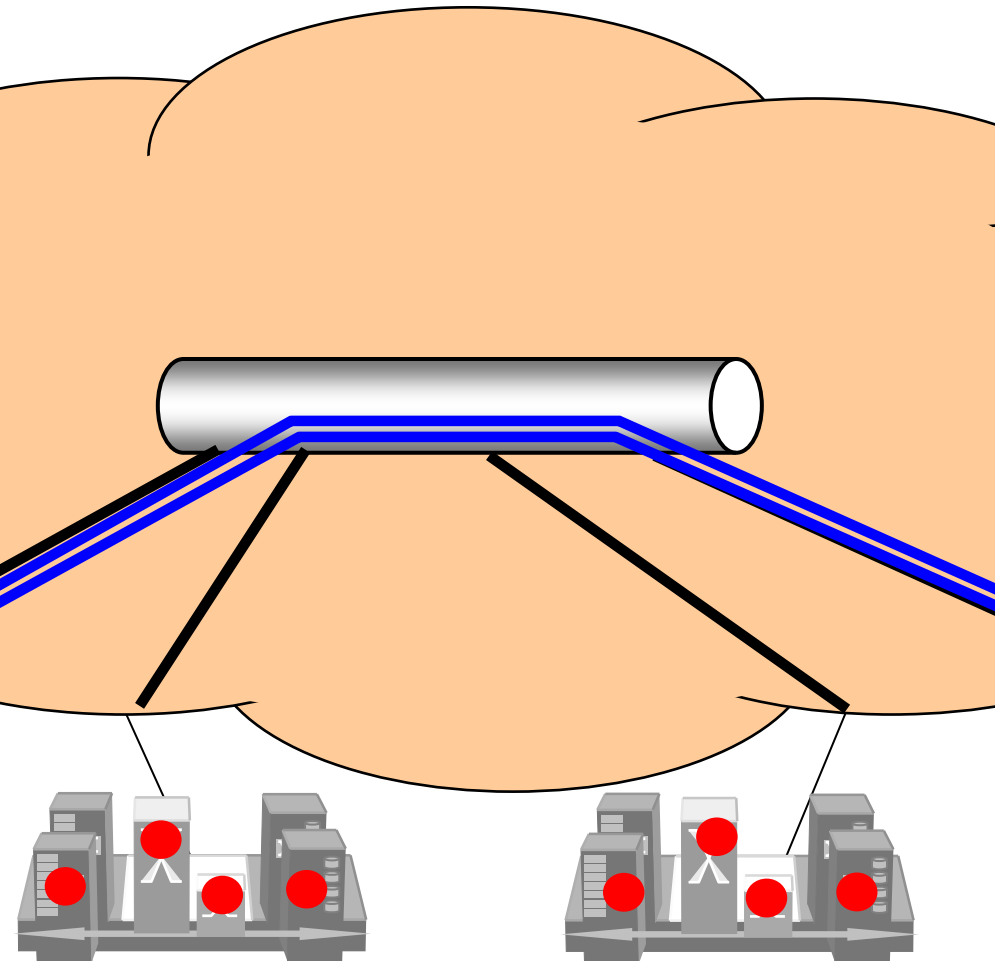
T...

transport Layer 3 diagnostics (e.g. ping, IP Traceroute)
protection for provider bridged networks
means for hardware latency and jitter measurement

the network structure

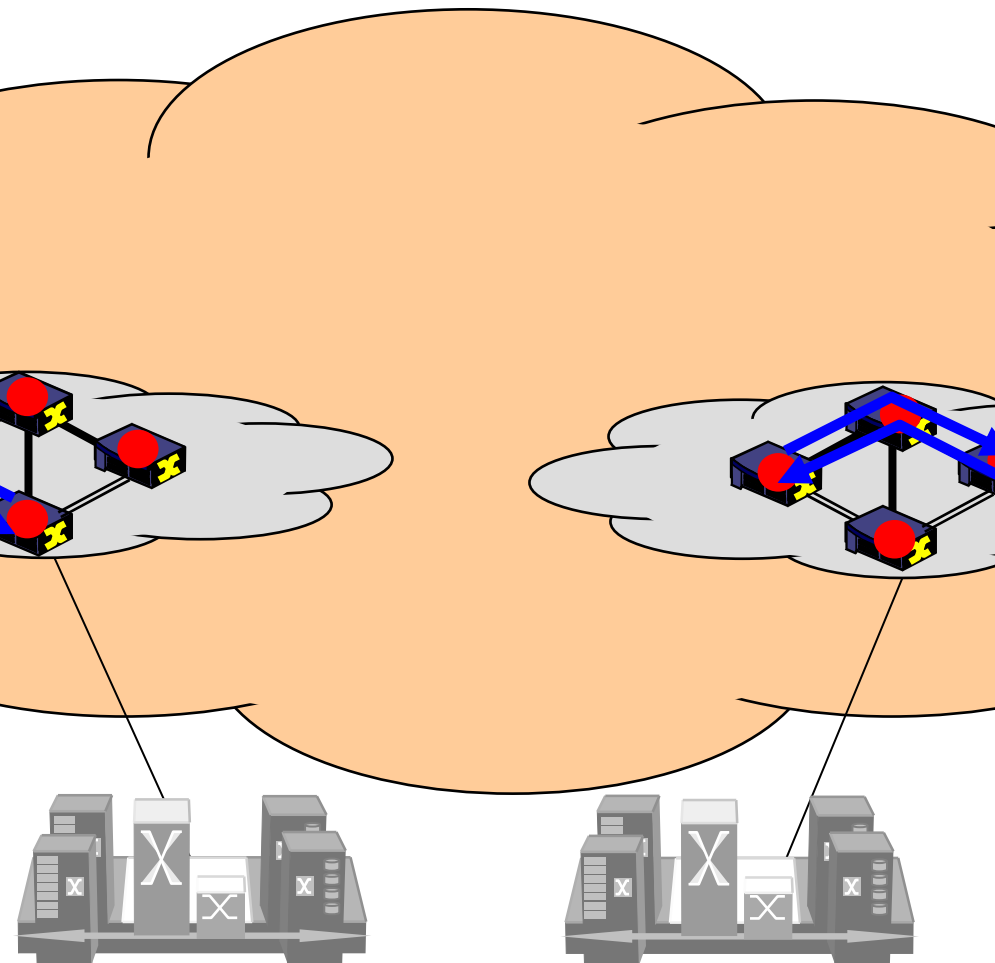


the network view



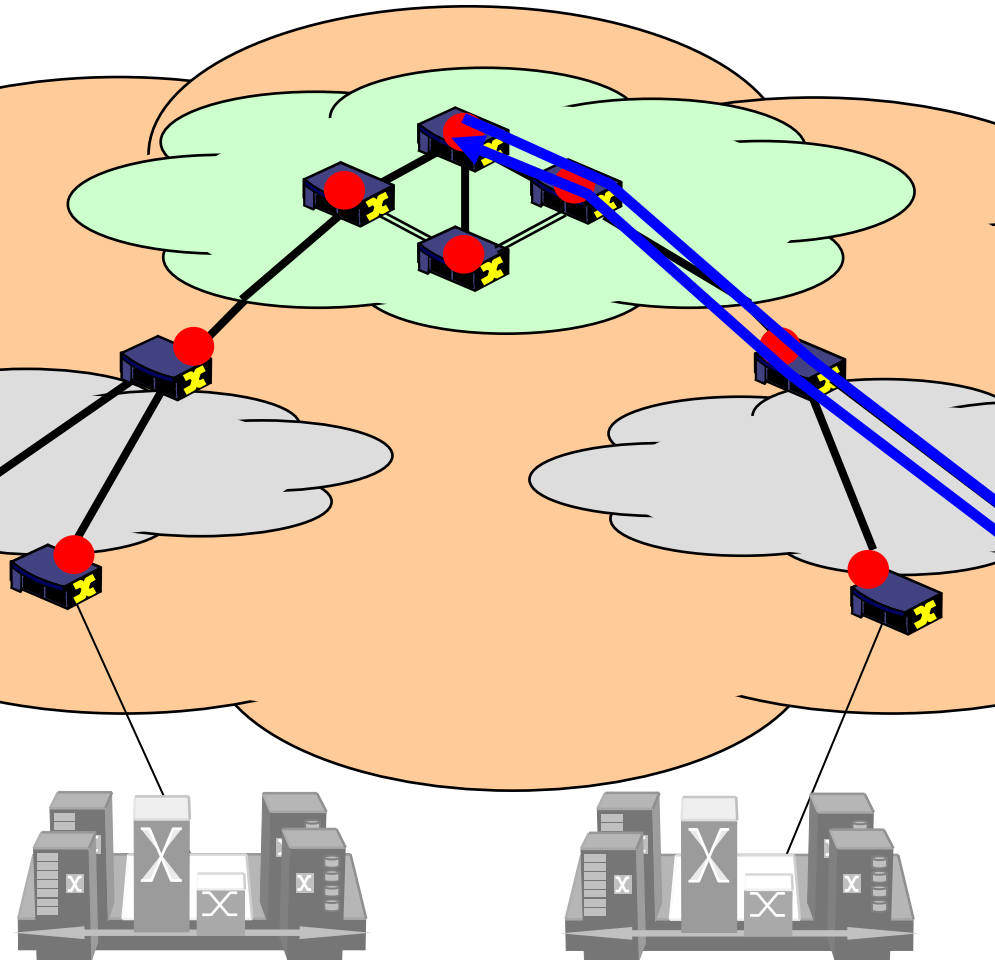
Maintenance End Points

the network operator view



Maintenance End Points

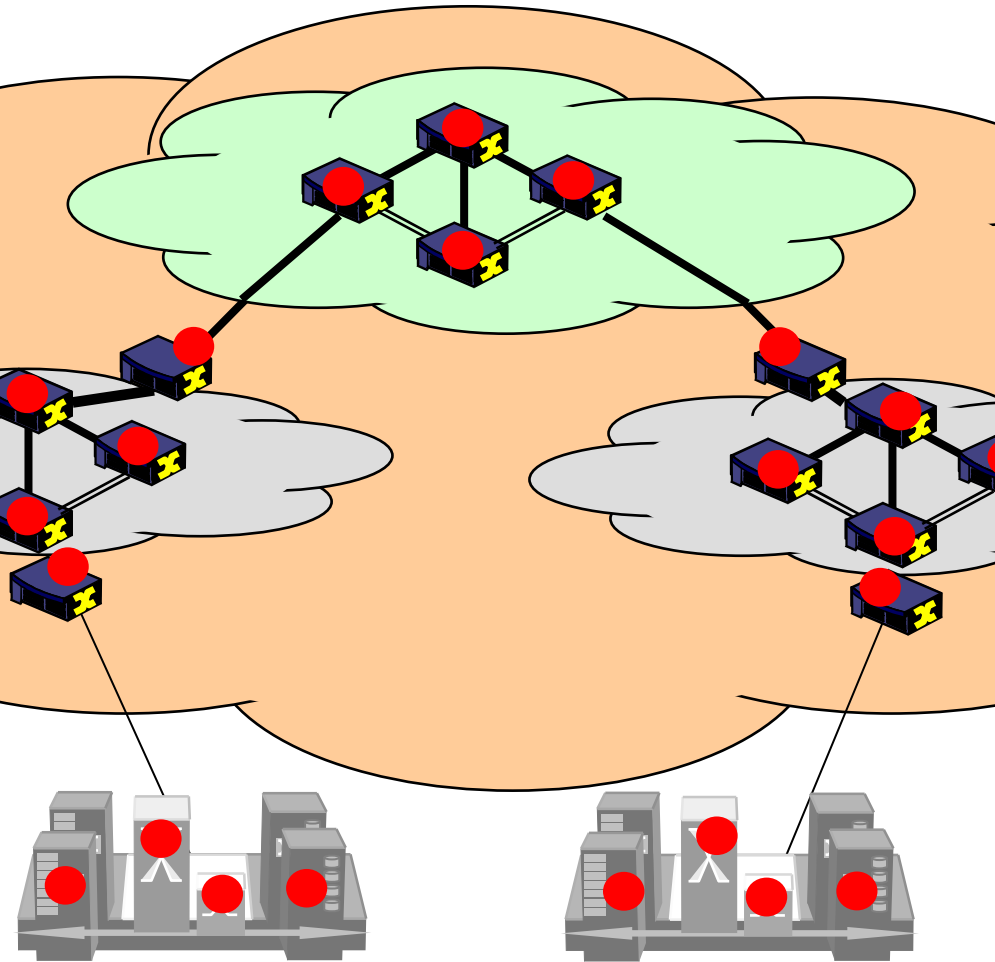
the network new



Maintenance End Points

the network

ew



Maintenance End Points

g – IEEE 802.1ad and IEEE

es and Provider Backbone Bridges

ards that update 802.1Q (VLANs) for servi
vice provider bridge architecture and forw
v frame tagging formats:

VLAN tag (i.e. an additional VLAN tag)

Instance tag (i.e. a MAC encapsulation ta
management for provisioning Ethernet servic

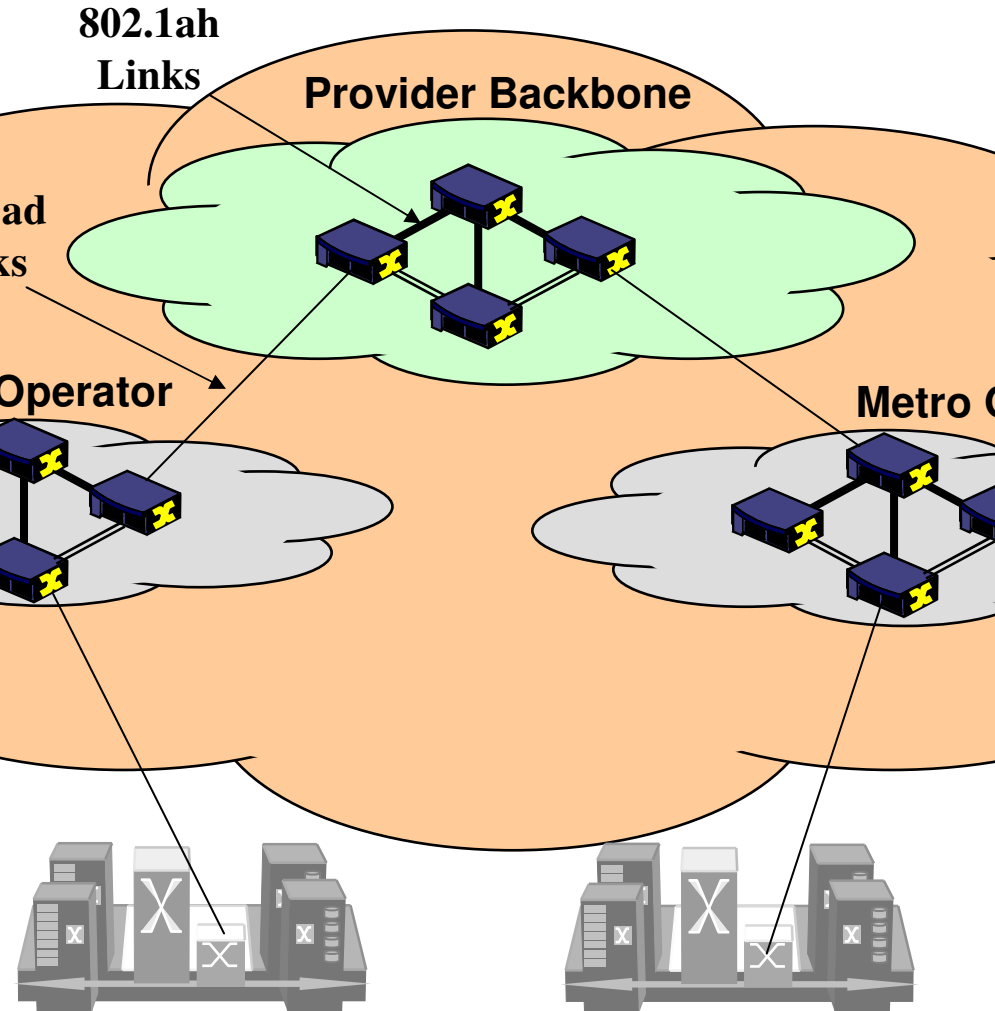
...

solution. Requires new hardware

tion for public service providers

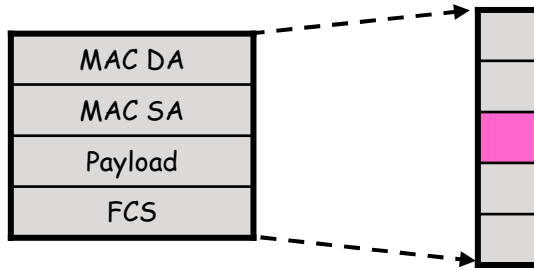
et more than 4K VLANs

the network structure

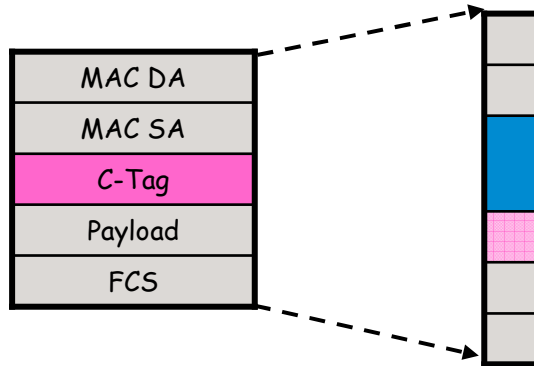


ing with Service Tags

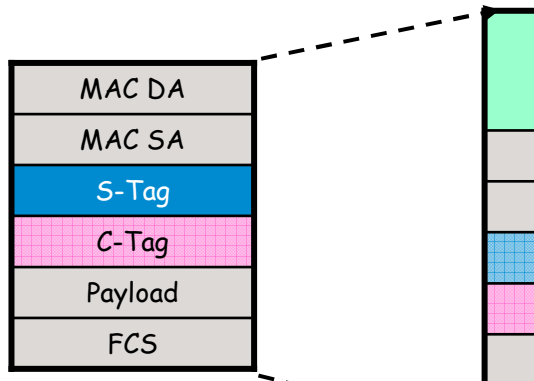
s traffic
a resource



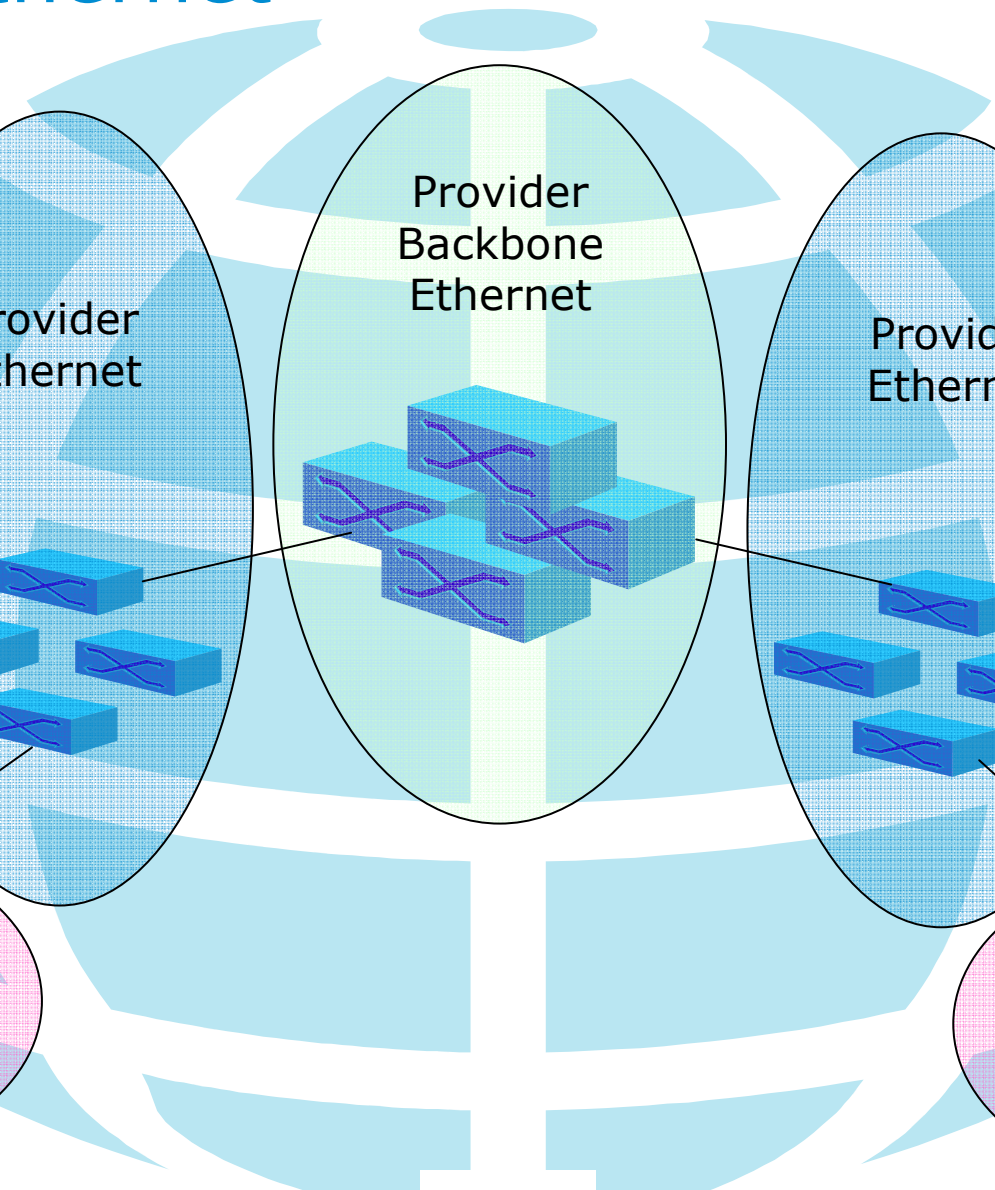
oup
a provider



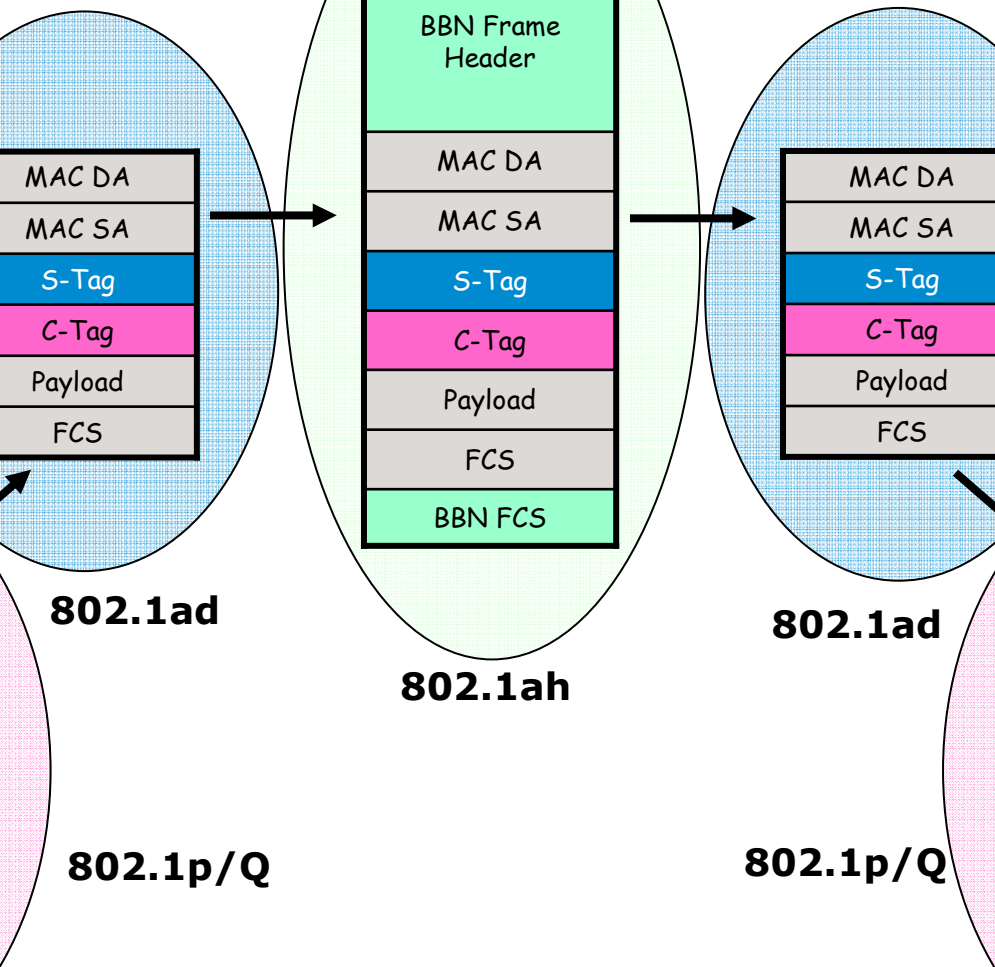
vice
backbone
ce



Ethernet



Packet



Requirements for Congestion Management

new task force investigating how to rate limit congestion on the LAN.

enabling low-latency, low-jitter, low-loss wide server backplanes, clustering and storage-compact switch architecture and QoS capabilities

Lots of proposals, some controversial, some

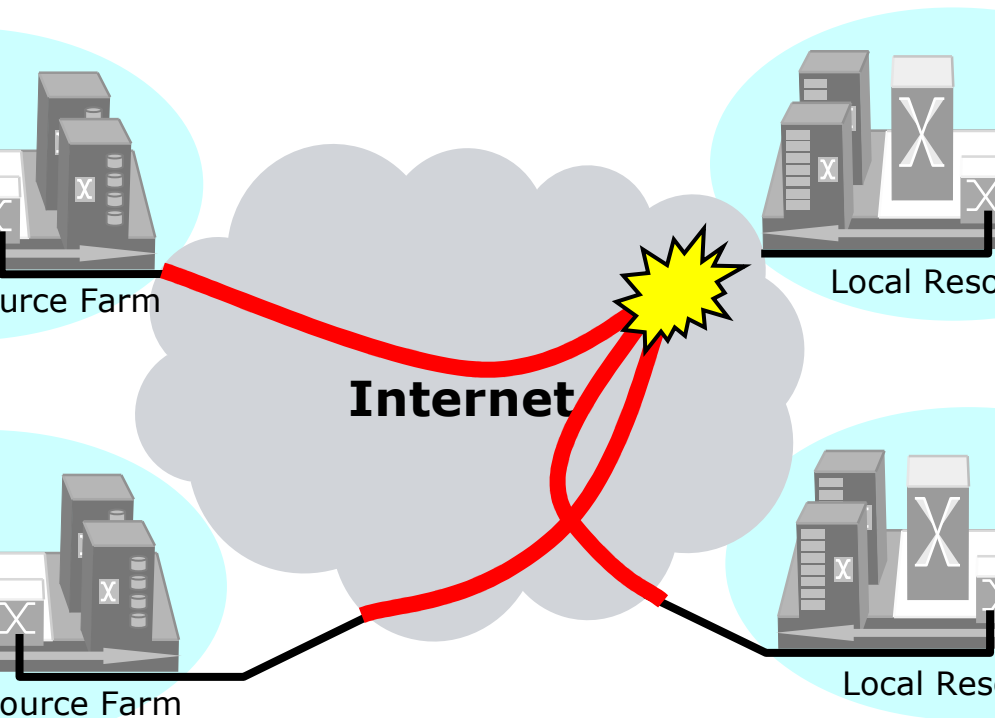
...

... for large complex topologies.

... congestion management

... support for IETF DiffServ or ECN functionality

and Congestion



-End Congestion Management Handled by IP and TCP

any years of research and study (IntServ, DiffServ)

CP/IP improvements (SACK, ECN)

ons necessarily focus on Internet scale

e Level Guarantees across the public Internet are hard

Network Management

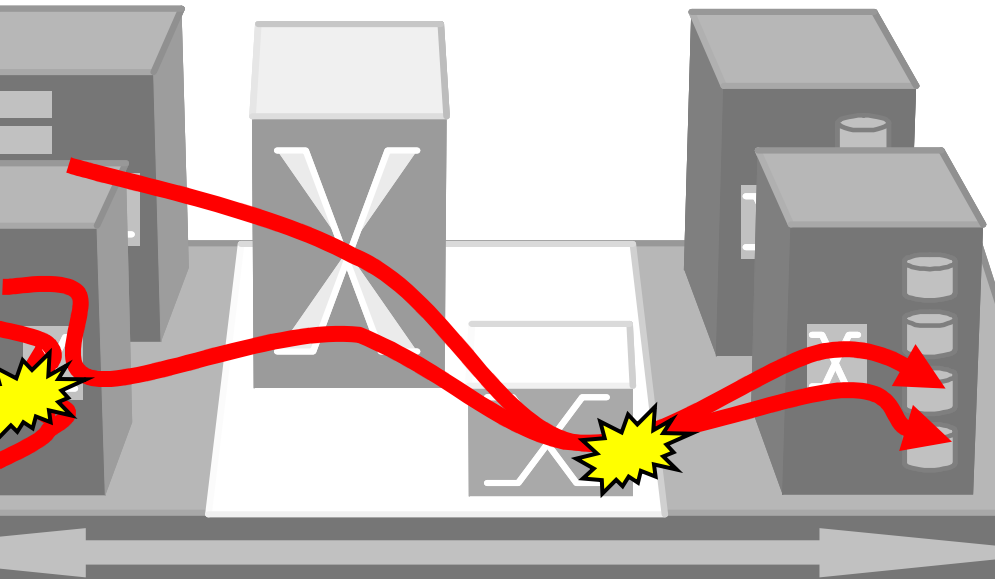
focused on congestion within the Data Center

needed?

Management scope improves effectiveness of provisioning
s (i.e. congestion avoidance by design)

er scale improves effectiveness of signaling protocols
stion avoidance by resource reservation)

Standardized controls for rate limiting and switch b
needed.



Internet's Role in Grid

The Grid renders everything IT as a service. Service is a key enabler. It can be:

802.1AB Link Layer Discovery Protocol

802.1ad, IEEE 802.1ah Provider Bridging

802.1ag Connectivity Fault Management

802.1AE/802.1af MAC Security

802.3ar Congestion Management Enhancements

Utility computing are high-level virtual
that require real hooks in the plumbing
scalable way...

Internet Switching technology is focused
a network service.

Internet service will enable ubiquitous
computing.

Thank You

