Storage over Ethernet : key to the new always-on Internet infrastructure for service providers and enterprise alike

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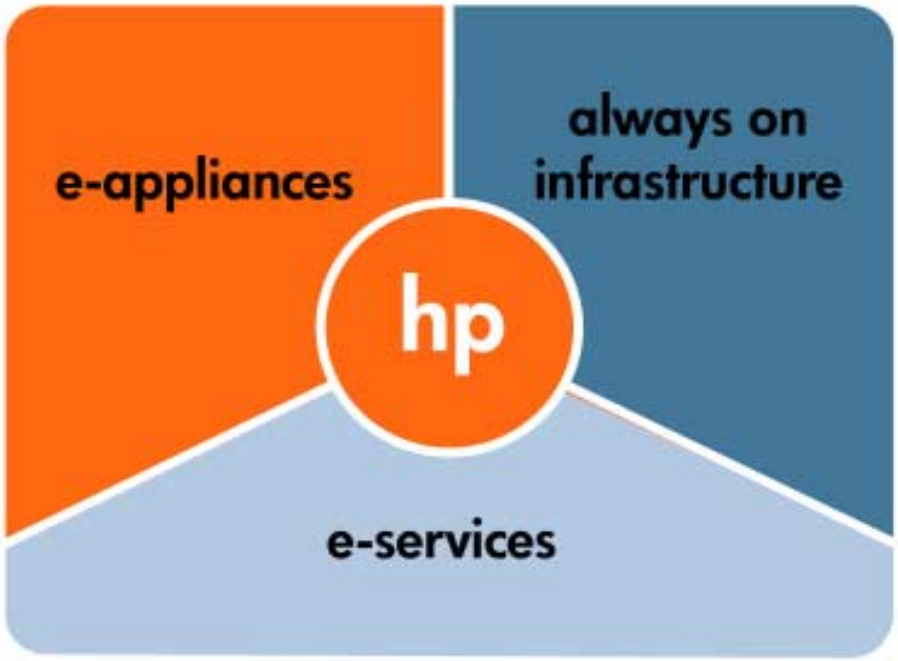
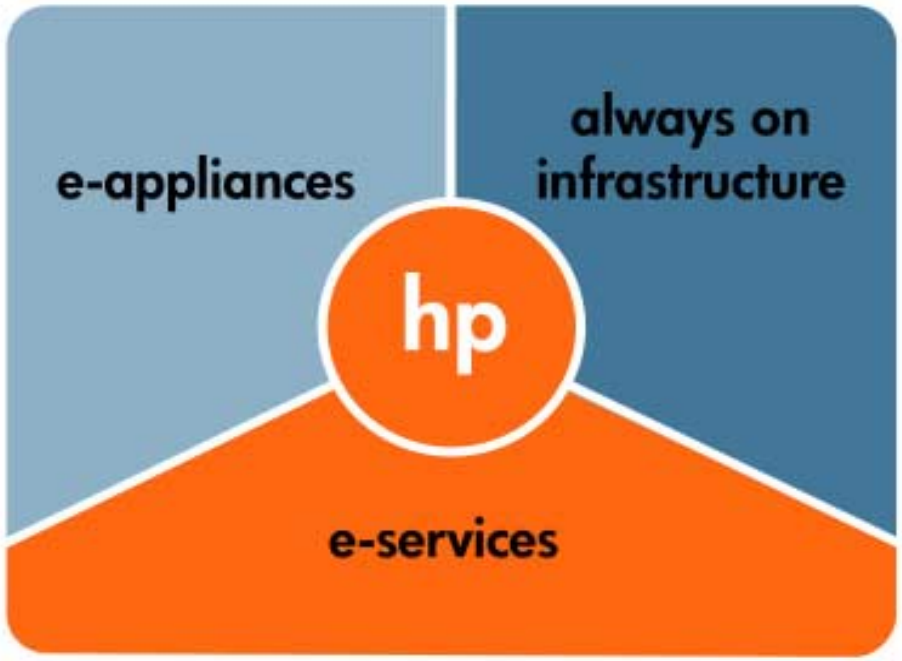


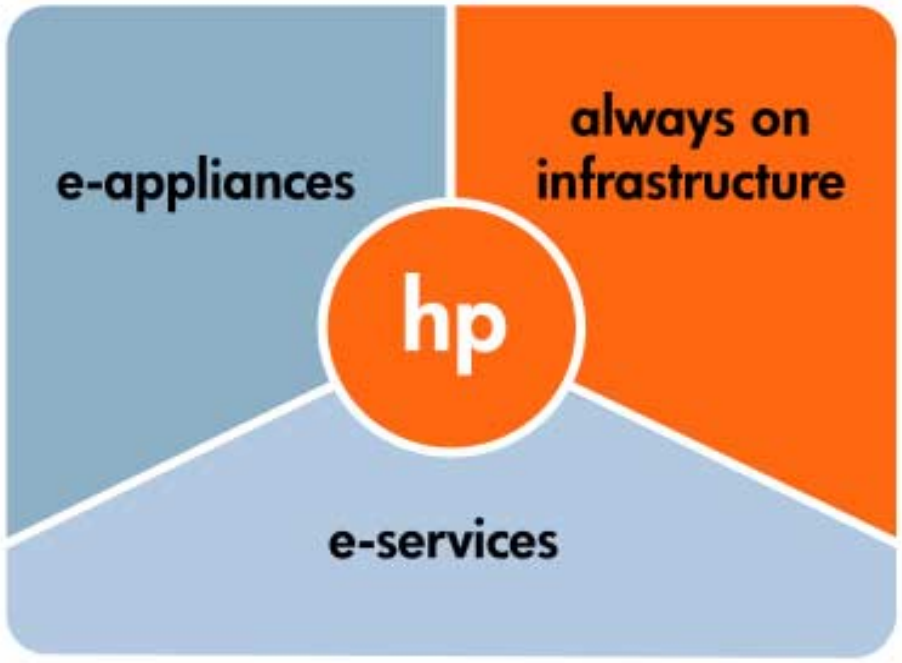
e-appliances

- today they are PCs, PDAs, cellular phones and pagers
- tomorrow they are anything and everything that can hold a small and increasingly much smaller microchip



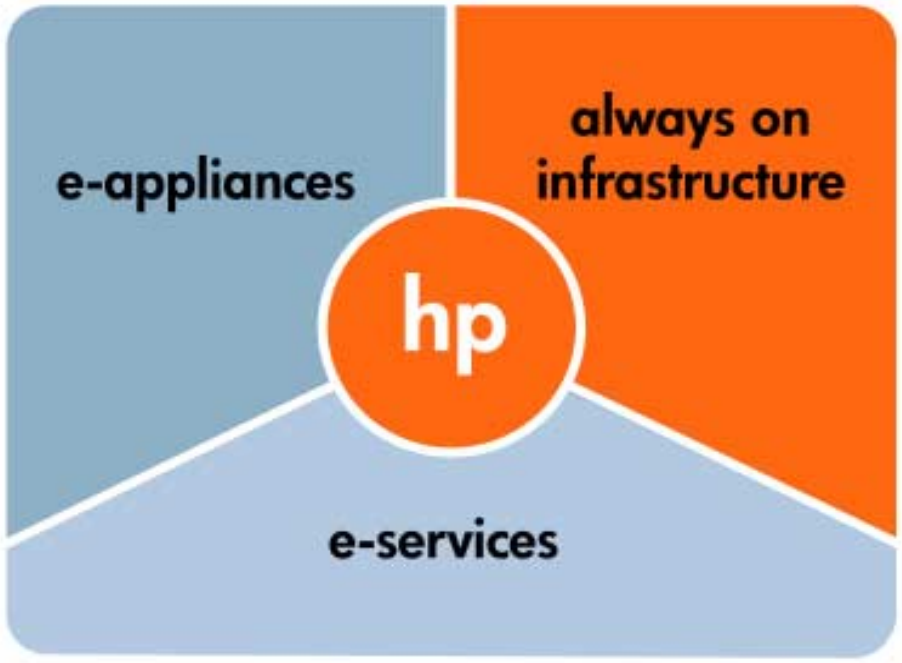
e-services

- any asset that can be turned into a service for delivery over the net to drive profit, create revenue or generate efficiency



always on infrastructure

- necessary to support millions and millions of transactions and appliances
- ushering in the new age internet data center

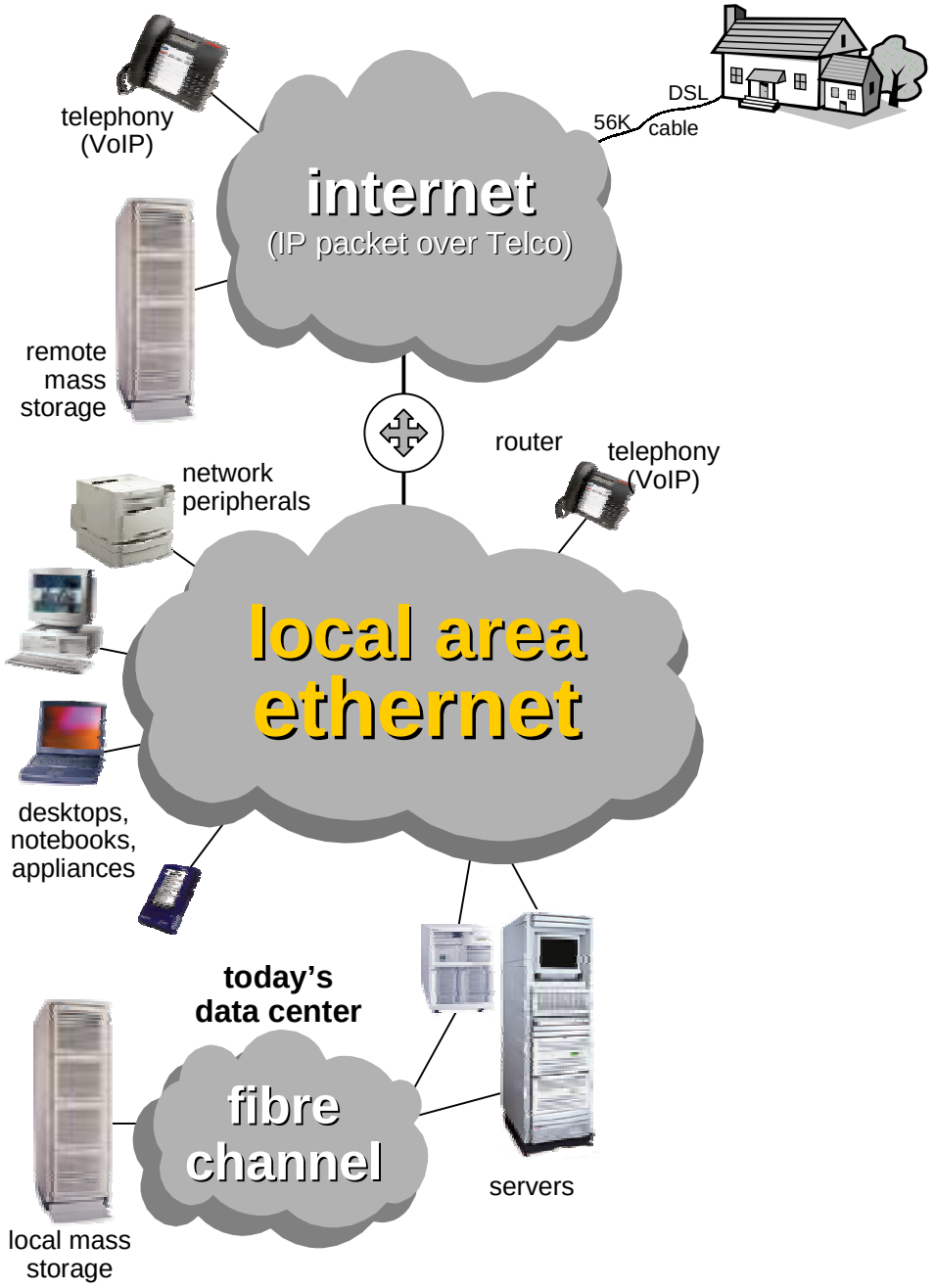


always on infrastructure

- the evolution of the network: the e^2 vision
- storage joins the e^2 vision
- enabling the new age always on infrastructure with e^2

e²
ethernet everywhere

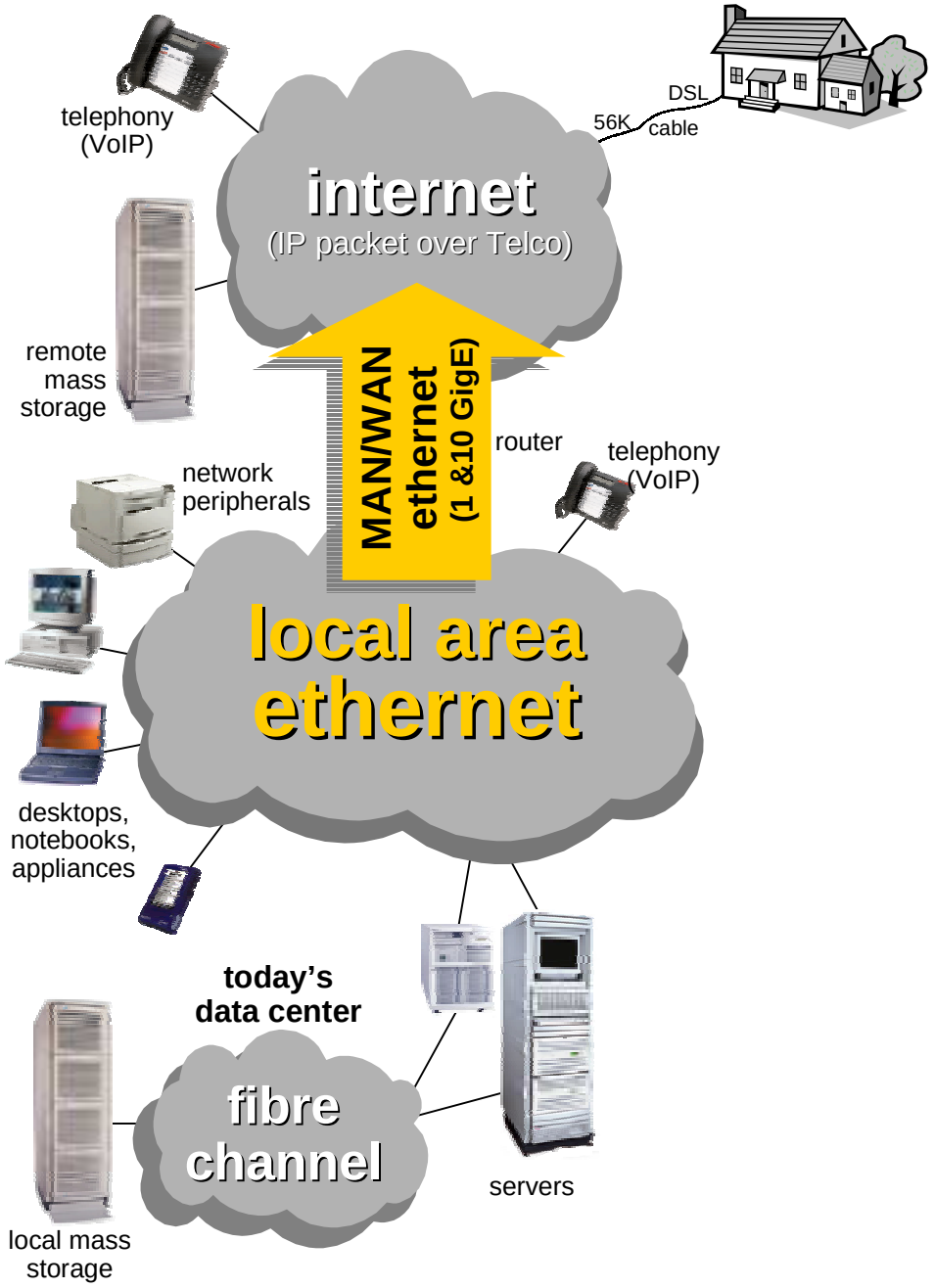
- *1990's:* the dominant LAN
- *late 1990's:* switched LAN
  - no protocol related distance limits
  - 10/100/1000Mbps + 10 Gig in 2002
- *today:*
  virtually all traffic begins and/or ends as an Ethernet frame with an IP header
- *today:* ethernet LANs connect to WANs with routers
- *today:* key innovations enable the impossible:
  eliminate the WAN and build a global LAN …

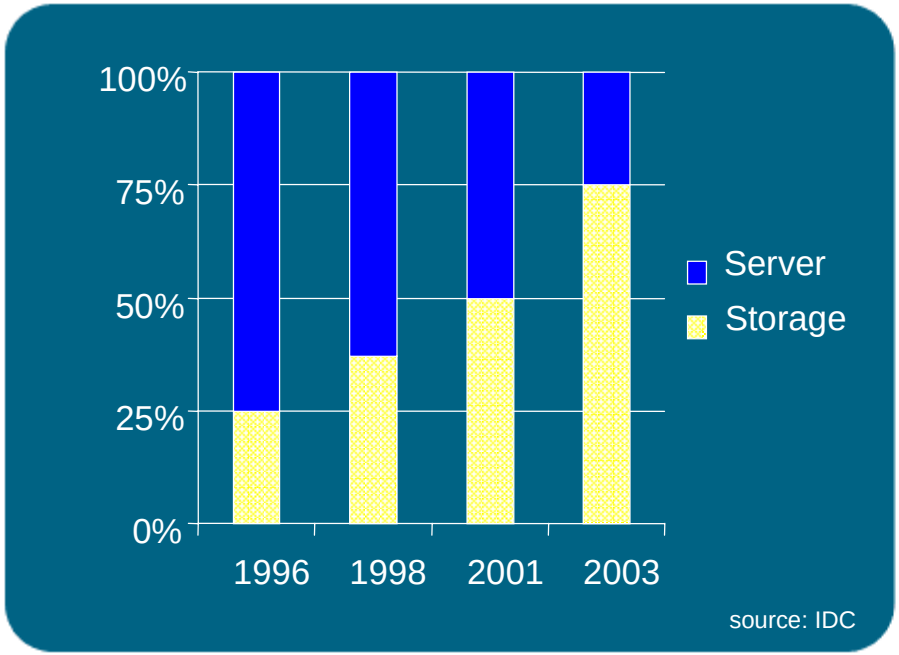


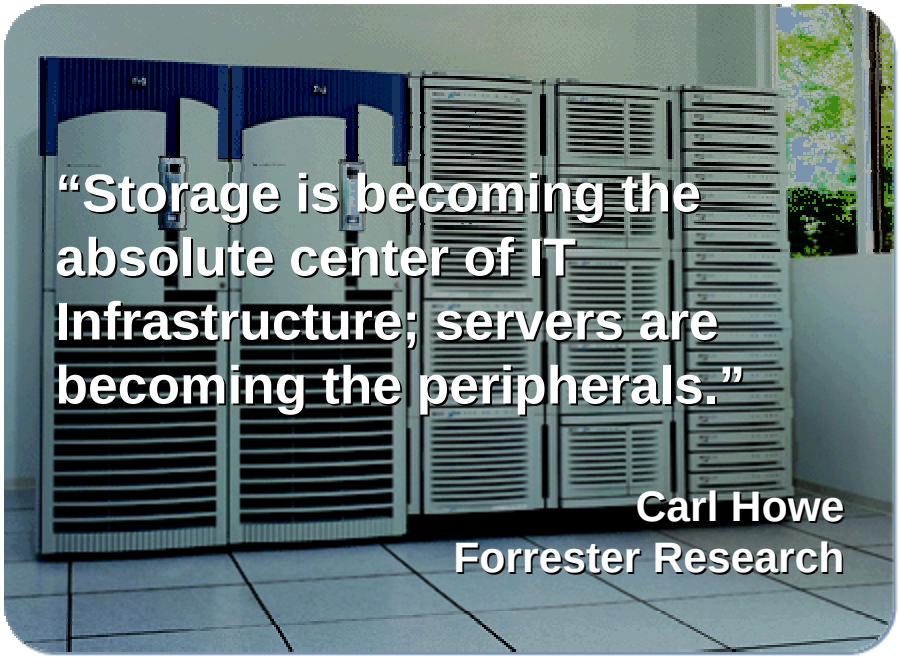
e^2
ethernet everywhere

gigabit ethernet **is already being deployed in MAN's by new service providers such as Yipes and Telseon**

the price is about $1000 per 100 Mbps of bandwidth per month -- about *200 times the price/performance* of conventional T1/E1 lines !!







relative storage spending increasing

- storage/server split growing to 75/25 by 2003
- storage growing from 4% to 17% of overall IT spending by 2003

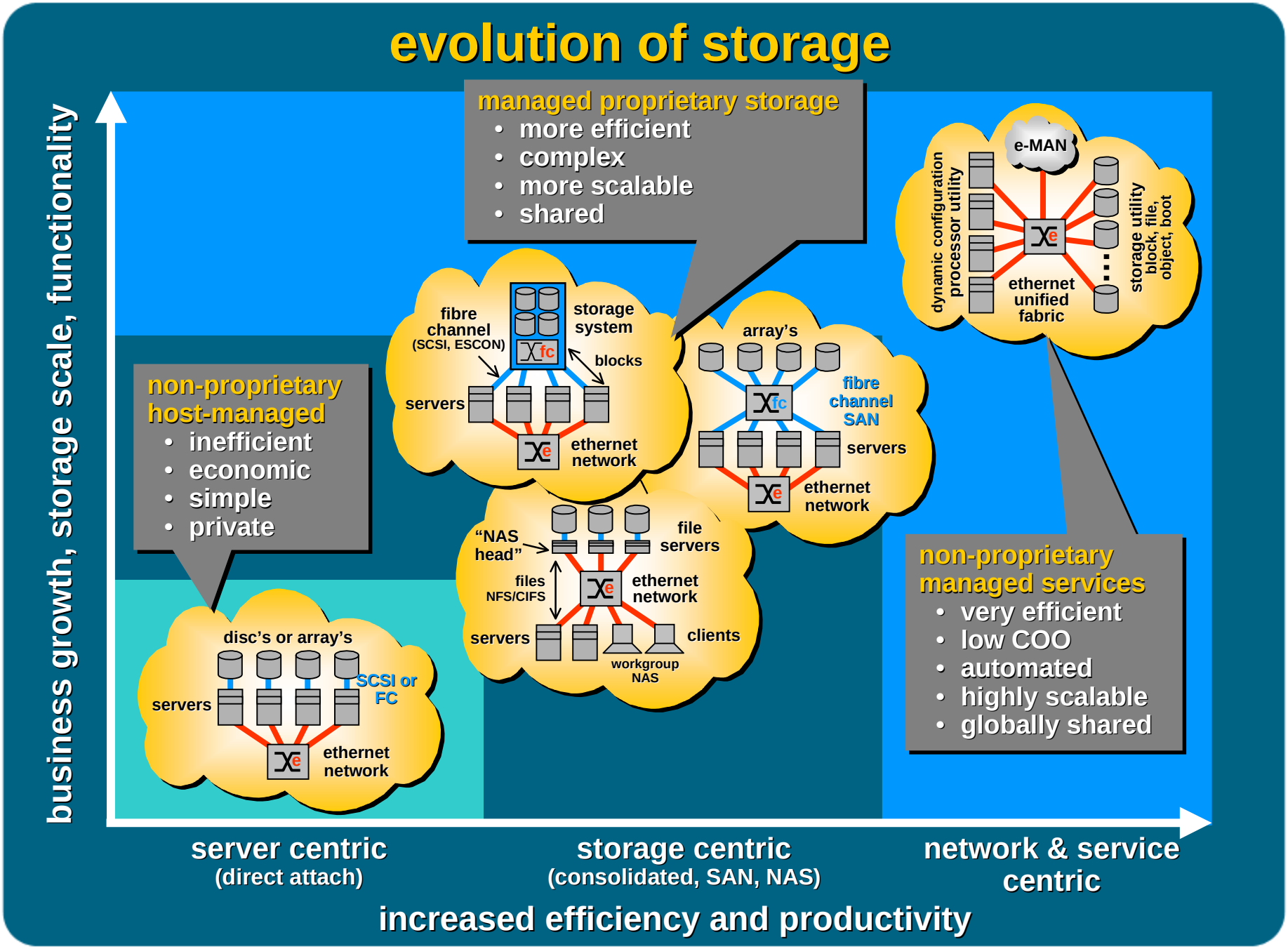
fortune 1000 storage

- added 15 terabytes in 1999
- increasing to 150 terabytes in 2003

ASP and SSP

- massive storage requirements
- doubling every 3 to 4 months

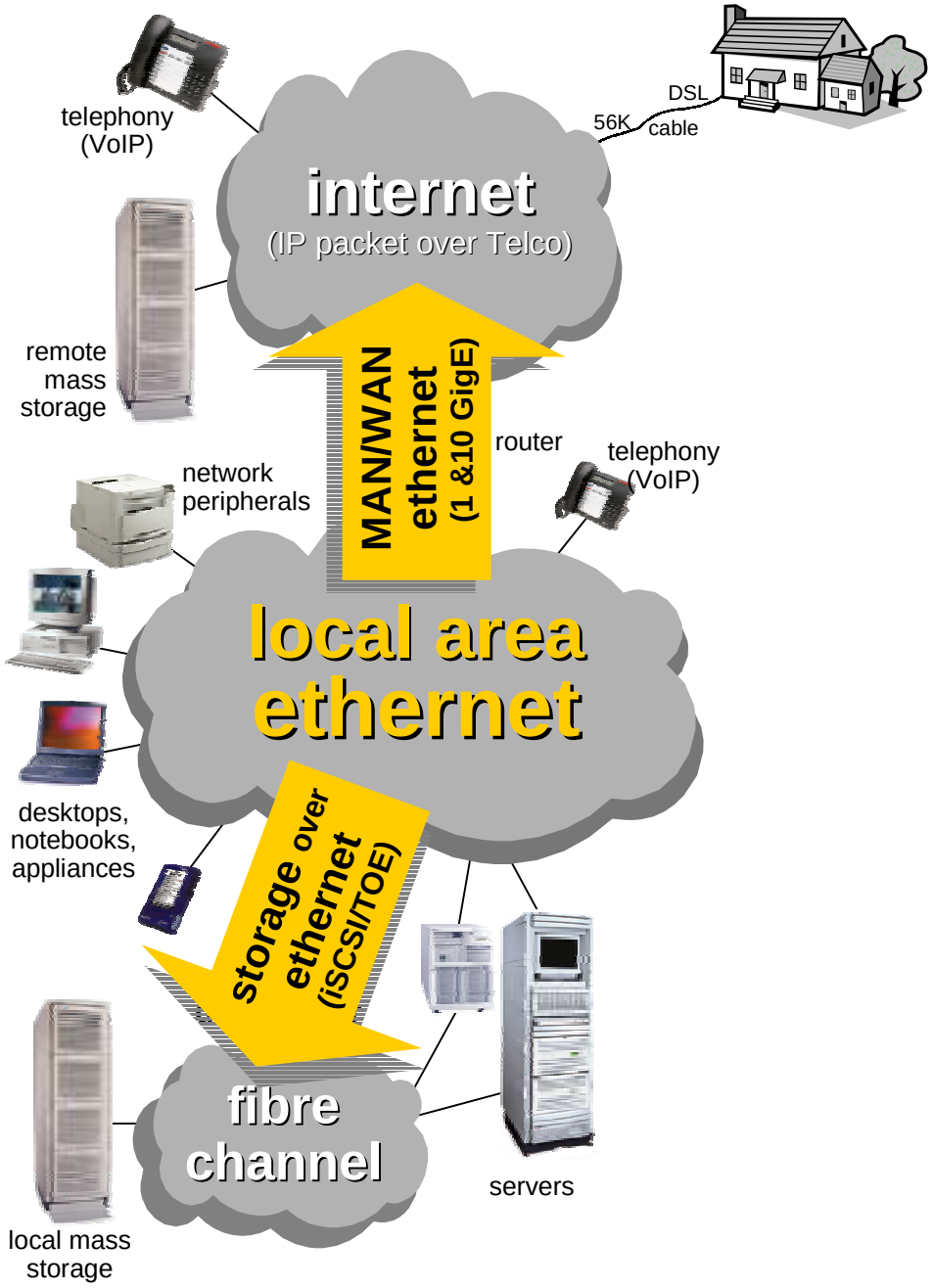
evolution of storage



e² ethernet everywhere

the IETF is already well along in creating a new standard called iSCSI that will catapult ethernet forward as a networking technology for all types of storage

we call it SoE or Storage over Ethernet



transporting storage

- dark fiber
  - point-to-point Fibre Channel
- DWDM
  - point-to-point Fibre Channel
- FCIP and iFCP
  - connect existing Fibre Channel SANs over distance
  - both encapsulate FCP in TCP/IP
- iSCSI
  - a new approach to networked storage leveraging ubiquitous Ethernet and TCP/IP
  - natively interconnect hosts and storage devices across a TCP/IP interconnect

connecting storage to networks today

block level I/O				file level I/O	
SCSI via FCP and Fibre Channel	FC over IP (FCIP)	Internet FC Protocol (iFCP)	SCSI over TCP/IP (iSCSI)	Network Attached Storage (NFS, CIFS)	Direct Access File System (DAFS)
hosts connect to storage via Fibre Channel (SAN)	interconnect FC SANs with an IP network	IP fabric: hosts & storage attached to FC/Ethernet GW	hosts directly access storage via Ethernet & TCP/IP	uses a filer	uses VI and writes files directly to host memory
HP, IBM, EMC, Compaq	vendors like CNT, Gadzoox, SAN Valley will likely migrate	Nishan	HP, IBM, Cisco, others	NetApps, Auspex, EMC, SUN, HP, IBM	NetApps, Intel

positioning iSCSI

a new way of transporting storage

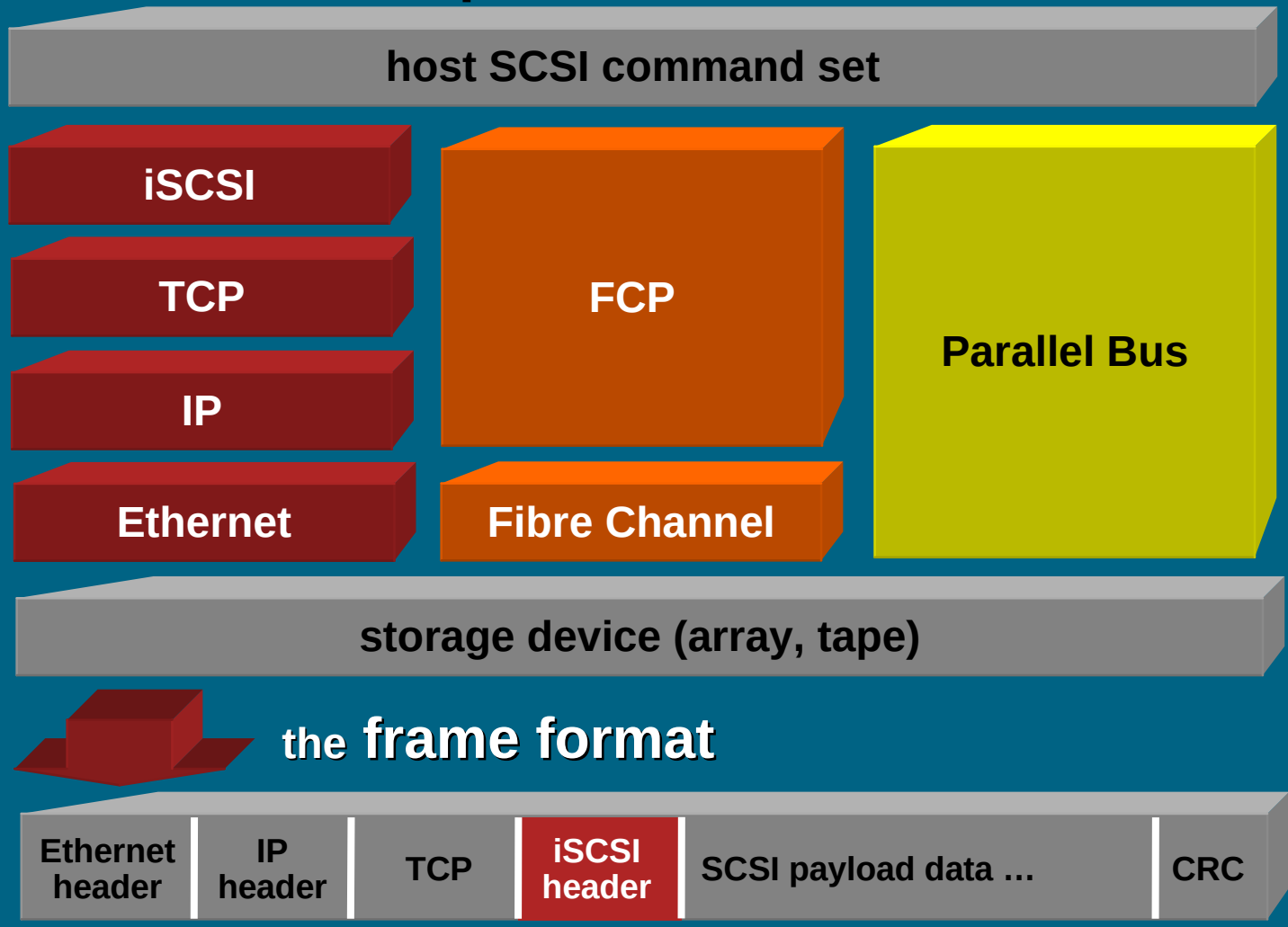
- LAN (Ethernet) and WAN (TCP/IP) compatible
- a SAN without a second network technology

expanding the market for SANs

- new customers that are primarily direct attach today
- ready for SANs but not a second network
- want to extend storage to the WAN and Internet

iSCSI protocol

a transport protocol alternative for SCSI that operates over TCP/IP



SNIA IP Storage Forum Members

mission: **market and promote standards-based block storage networking solutions using IP networks**

Adaptec
ADIC
Agilent Technologies
Alacritech
Aristos Logic
Brocade
Cereva Networks
Cisco
Compaq
Connex
Crossroads
EMC
Emulex
Entrada Networks
Eurologic
FalconStor
Gadzoox Networks
Hewlett-Packard
Hitachi Data Systems
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Lucent Technologies
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NEC
Nishan Systems Pirus Networks
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QLogic
Quantum|ATL
Rhapsody Networks
SAN Valley Systems
Spectra Logic
StoneFly Networks
StoreAge
Storage Tek
Sun Microsystems
Tokyo Electron Ltd
Troika Networks
Vixel

Customer Value Proposition

open

- leverages massive industry investment in Ethernet/TCP/IP
- heterogeneous OS support
- application agnostic environment
- IETF iSCSI standard

manageable

- proven and mature “existing” management infrastructure leverage
- seamless monitoring and billing of storage
- minimizes the footprint (single consolidated ‘network’ to manage)

scalable

- unlimited scalability of storage capacity and performance
- enables convergence of NAS and SAN
- seamless remote storage via Ethernet/Optical/IP MAN/WAN

available

- economical redundancy and availability
- enables highly available serverless, automatic backup/restore
- leverages existing Ethernet high availability technologies

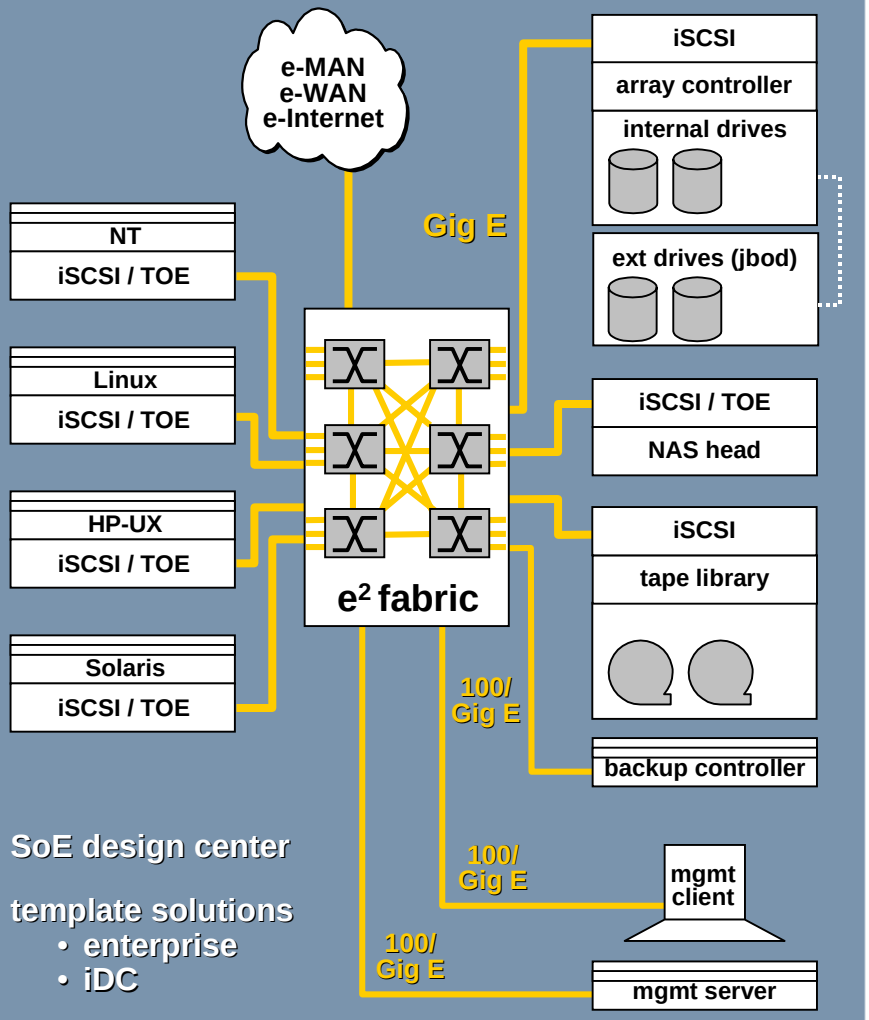
SoE makes storage simple

- ***storage*** **that's plug-and-play the** ***ethernet*** **way …** ***easy***
- ***storage*** **that's linked with one intelligent** ***ethernet*** **fabric …** ***expandable***
- ***storage*** **that extends and grows with** ***ethernet*** **…** ***everywhere***

e-storage

easy, expandable, everywhere, ethernet

SoE solution framework



customers speak

"It's easy for me to upgrade my existing Ethernet to support storage. I know how to do that and I know it will work. I just don't want another network."

Sony America
IT Manager

"We have three major data centers and using Fibre Channel SANs and gateways to TCP/IP is just too complex. We've been slow to adopt FC because it hasn't worked well. We think the company that can provide native IP storage in the next 12 to 18 months will have a tremendous advantage."

Bill Telford
Proctor and Gamble
Director of Worldwide IT Systems

analysts speak

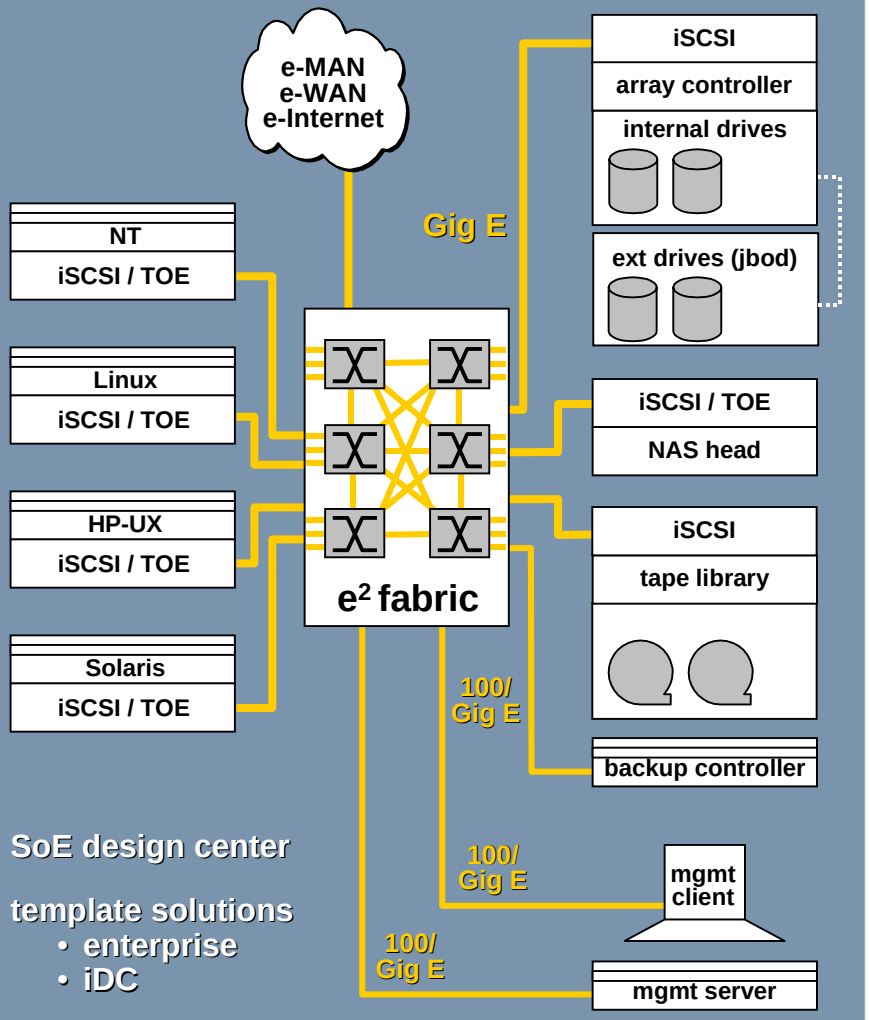
“Storage is the killer app for Networking”

Steve DuPlessie
Senior Analyst
Enterprise Storage Group

storage: networking's killer app

- high bandwidth requirements (10 gigE)
- scalability is key in with rapidly expanding storage requirements
- quality of service with low latency
- high availability / transparency
- load balancing / adaptive provisioning

SoE solution framework



analysts speak

"Storage is the killer app for Networking"

Steve DuPlessie
Senior Analyst
Enterprise Storage Group

"Do we really need a second local area network (LAN) technology and infrastructure simply to support server-to-storage device data traffic? We believe (IP storage) will supplant Fibre-Channel (FC)-based SANs as the primary conduit for enterprise data traffic in the next five years."

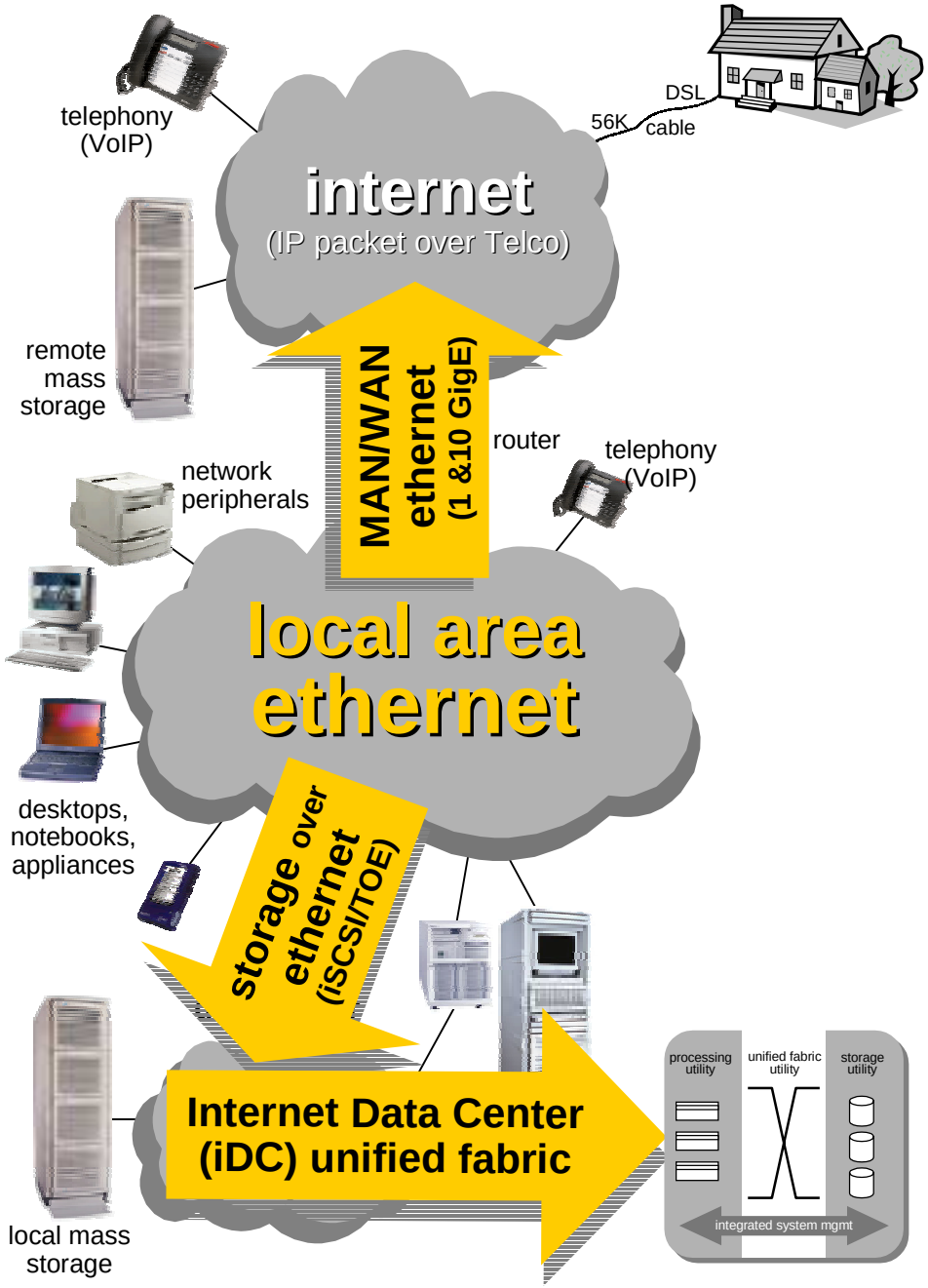
Stan Schatt
Colin Rankine
Giga

"While the benefits of network storage remain unmistakable, the cost and complexity of fibre channel have left many exploring the viability of less costly and easier to manage native IP-based SAN solutions."

Credit Suisse First Boston

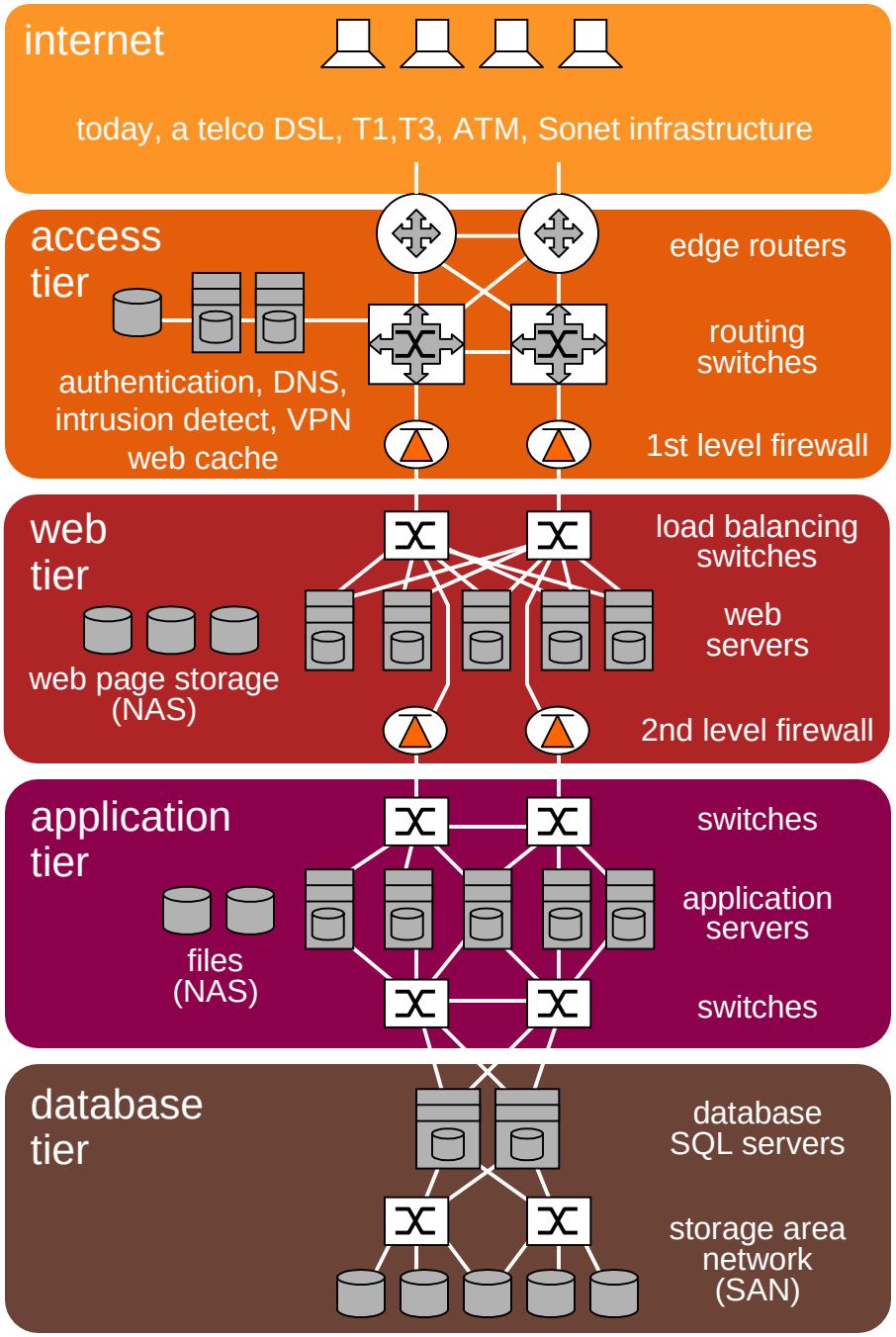
e² ethernet everywhere

SoE will enable a unified switching fabric that will combine processing pools and storage pools with a single network technology -- *ethernet*

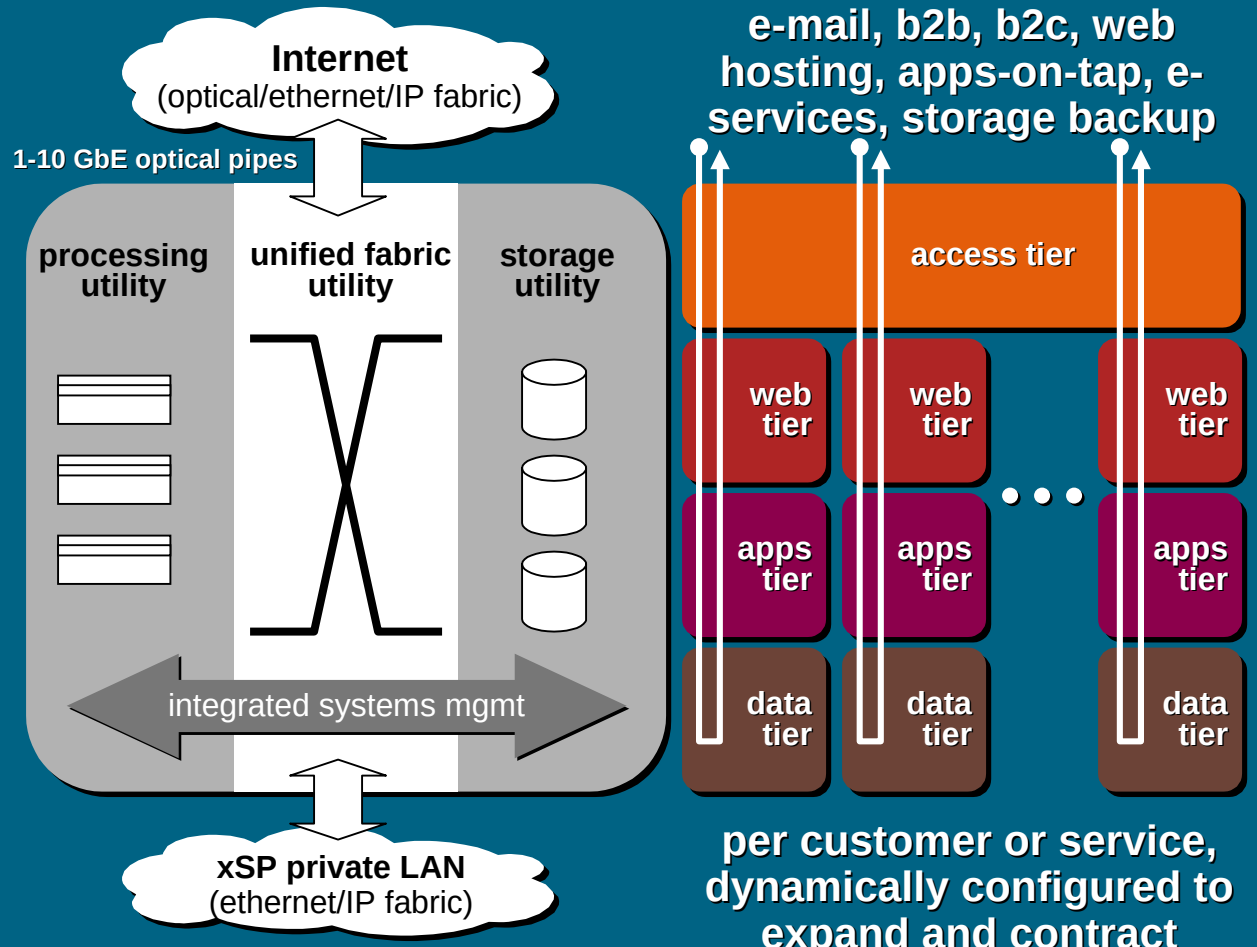


today's internet data center

- four tiers
- customize bottom 3
- implement many times
  - per customer
  - per service
- *unmet needs*
  - *rapid deployment*
  - *rapid reconfiguration*
  - *rapid adjustment to load*
  - *always-on*

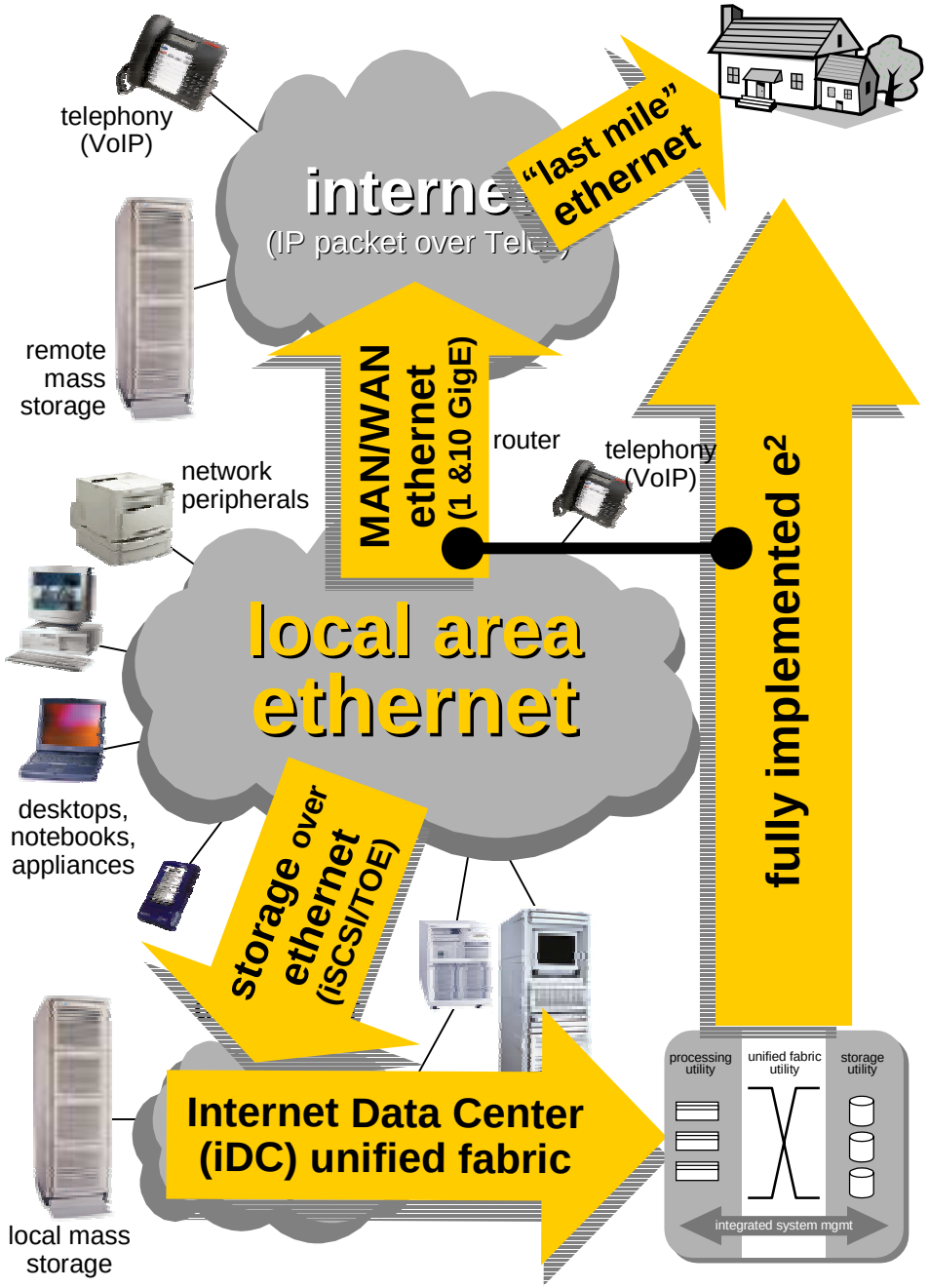


new age internet data center - iDC



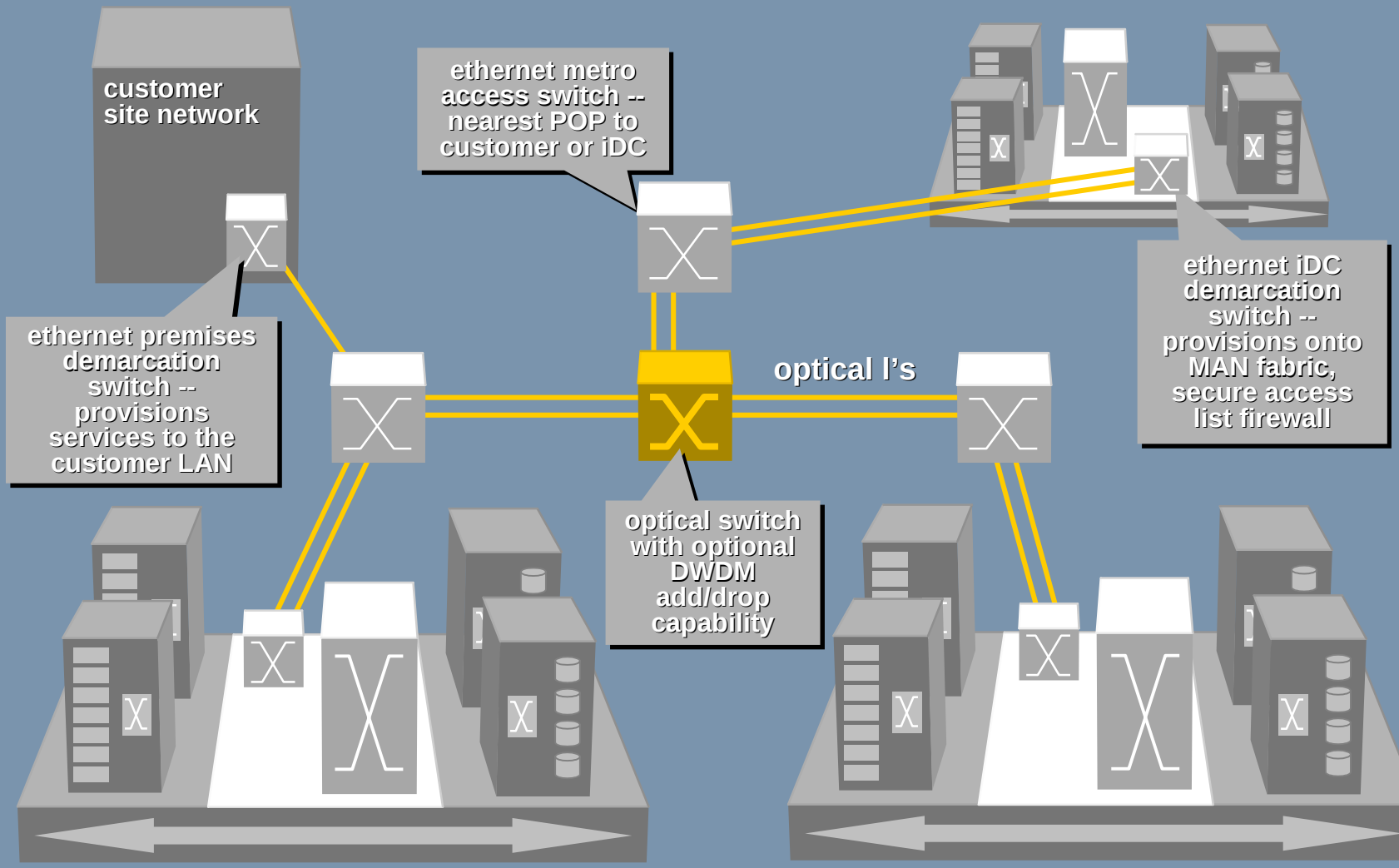
e² ethernet everywhere

the new internet data centers or iDCs will take advantage of the new "e-MANs" and "e-WANs" to deliver high performance services to business …



optical iDC

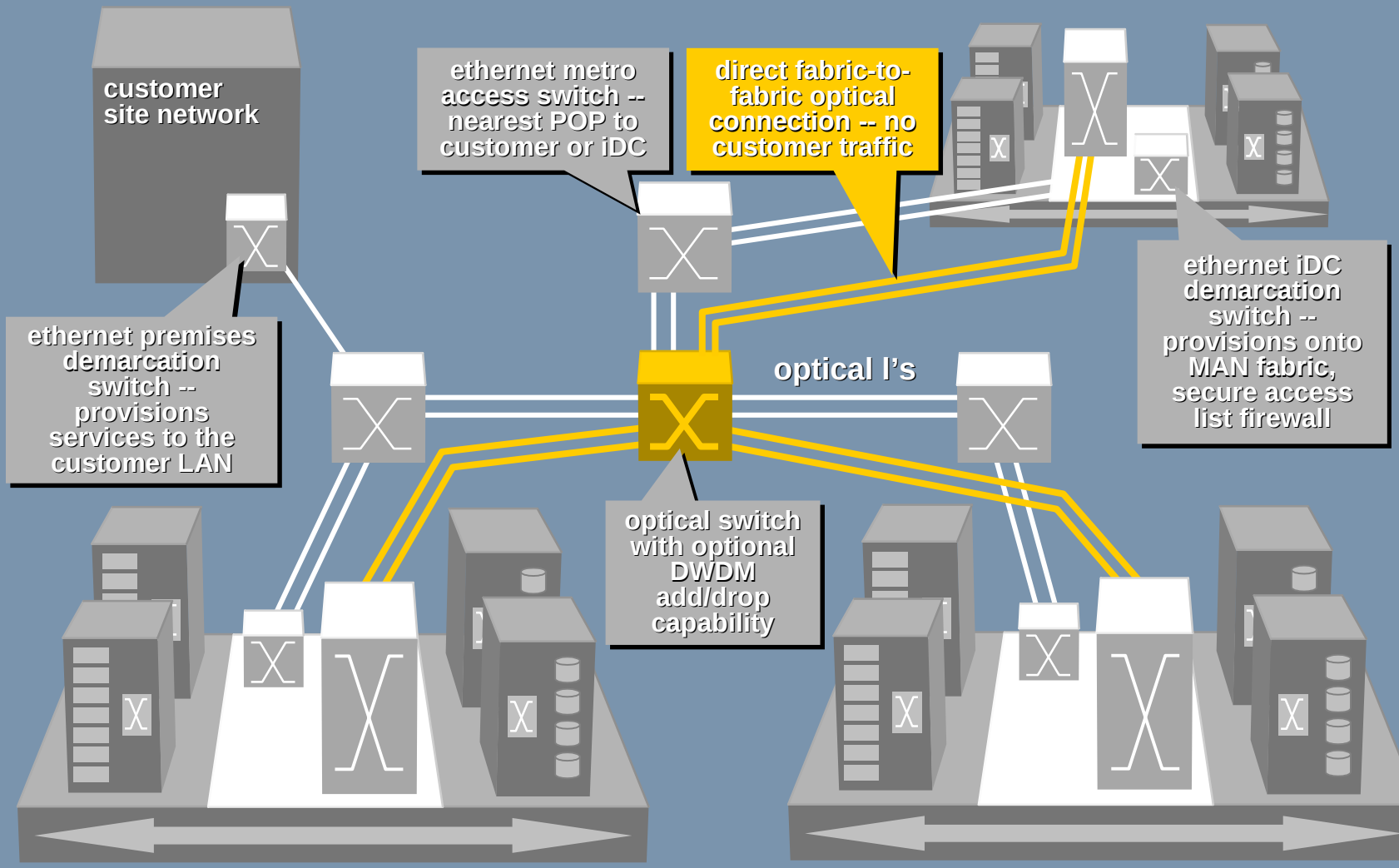
public optical ethernet MAN (e-MAN) fabric-to-fabric



the unified fabric extended seamlessly to enterprise customers

optical iDC

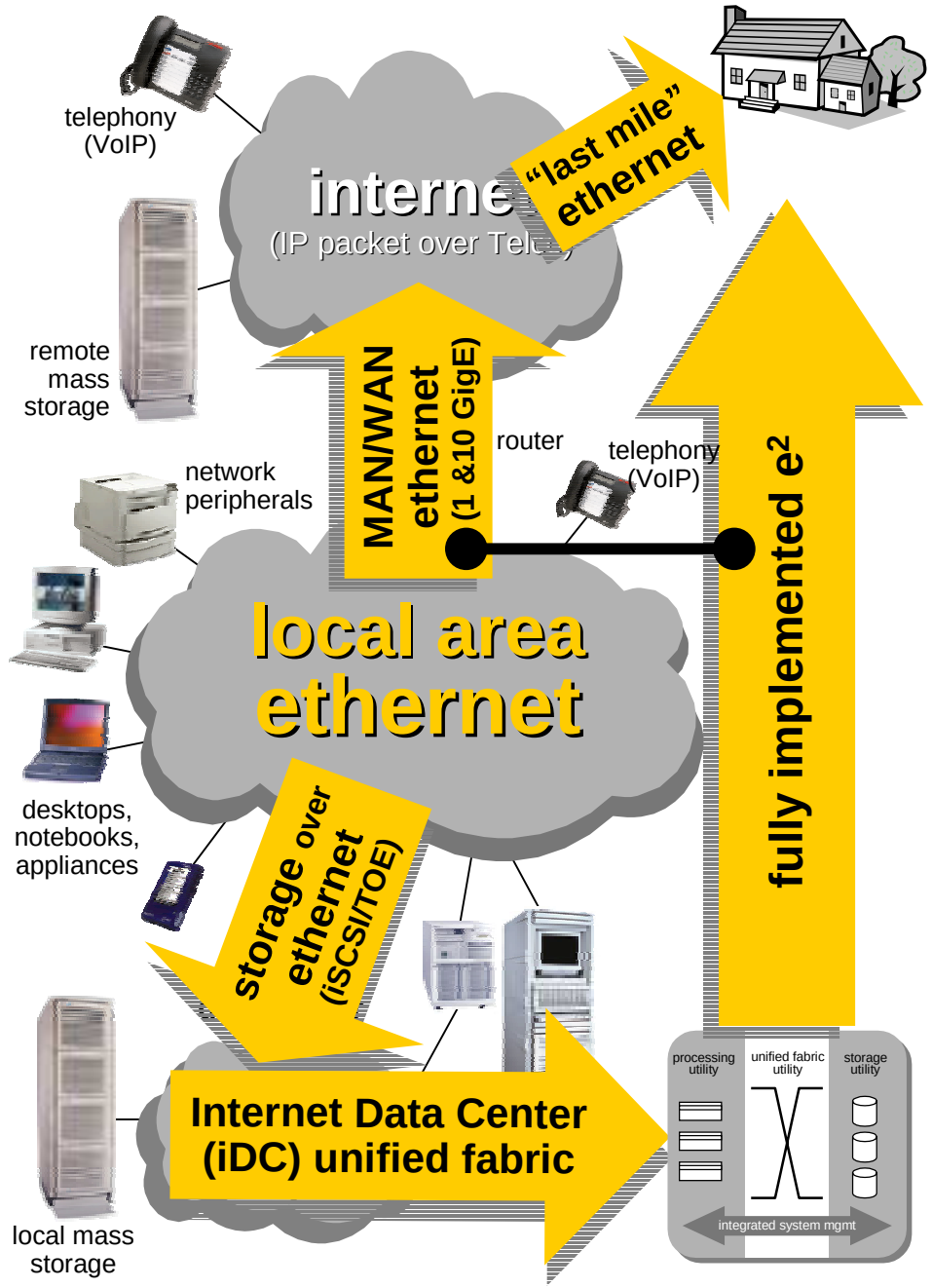
private direct optical ethernet fabric-to-fabric



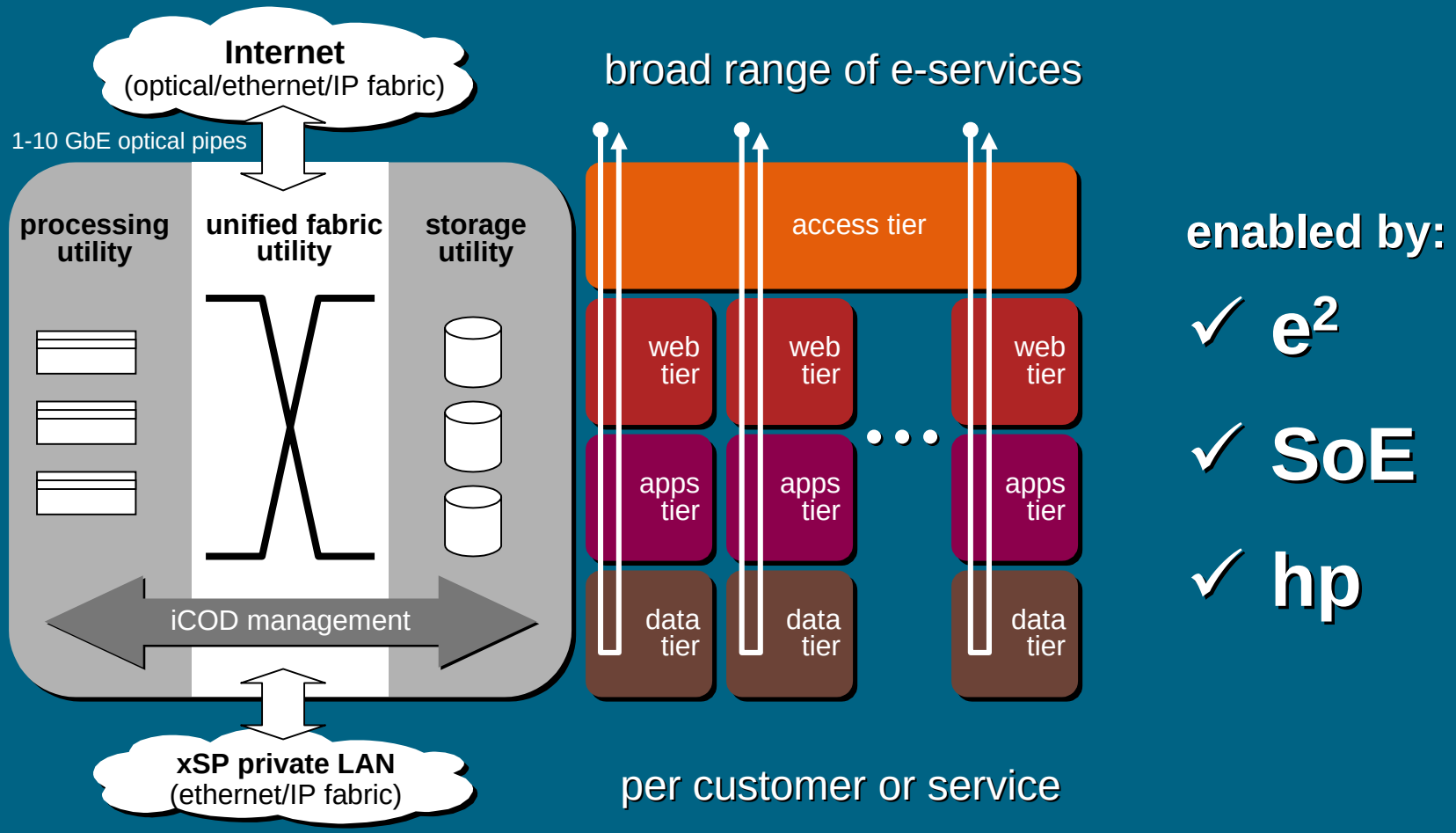
the unified fabric extended seamlessly to multiple data centers

e² ethernet everywhere

converging computing, storage, voice, video and the Internet into a *seamless* interoperable switch fabric *… ethernet*



hp's new age internet data center



enabled by:

- ✓ e²
- ✓ SoE
- ✓ hp

vision
commitment
servers
storage
networks
management
consulting