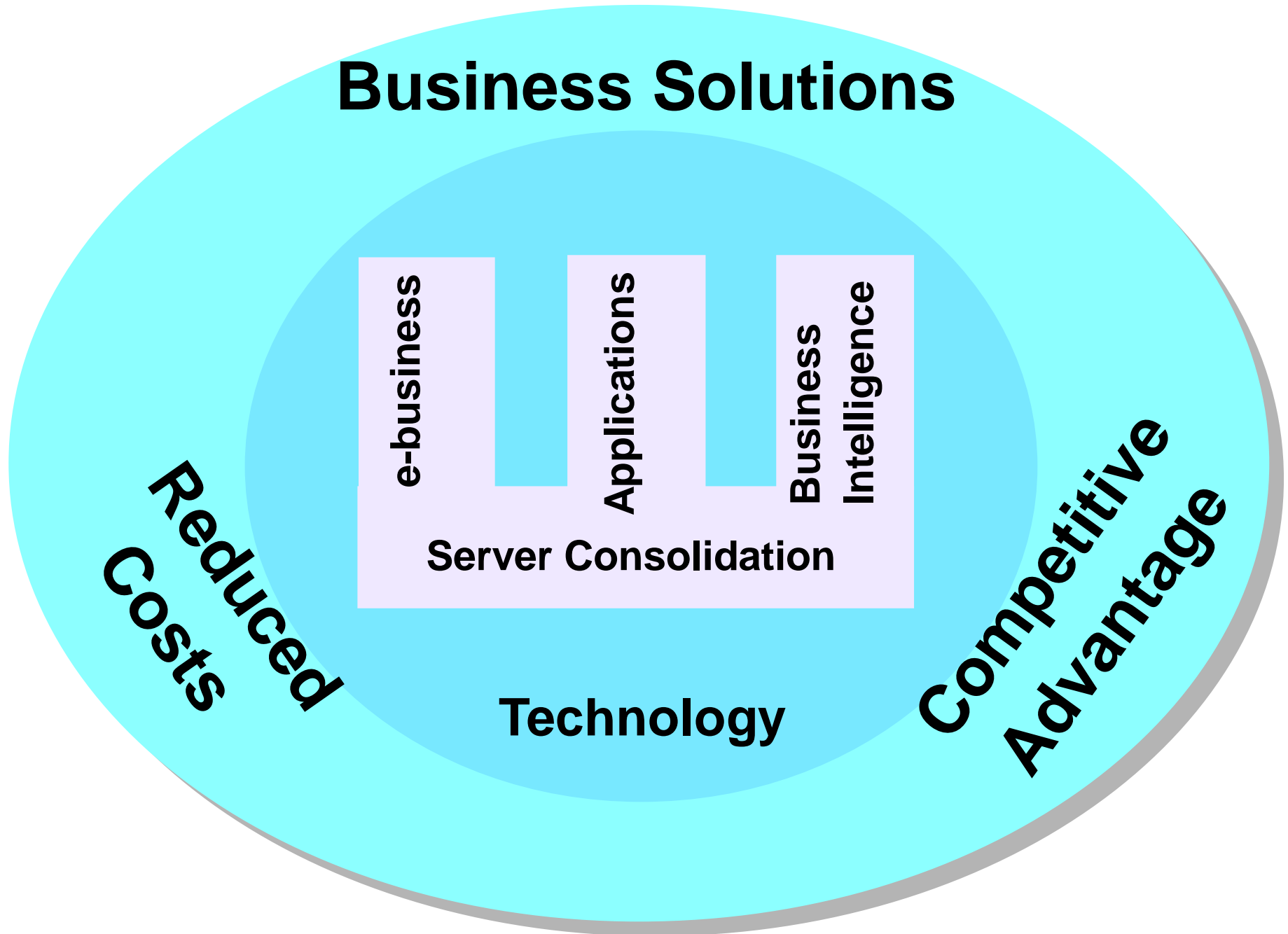# Server Consolidation and Your Business

Alan Glickenhouse
S/390 New Technology Center
Poughkeepsie, NY
calls390@us.ibm.com

AGENDA

- What is Server Consolidation?

- Why Consolidate Servers?

- Technology Comparison: Why S/390 Technology allows for Server Integration

- Creating a Server Consolidation Business Case
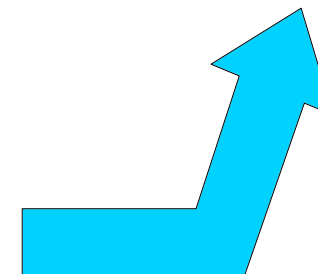
- Summary

S/390 Strategic Initiatives

Business Solutions

e-business

Applications

Business Intelligence

Server Consolidation

Technology

Reduced Costs

Competitive Advantage

What is Server Consolidation?
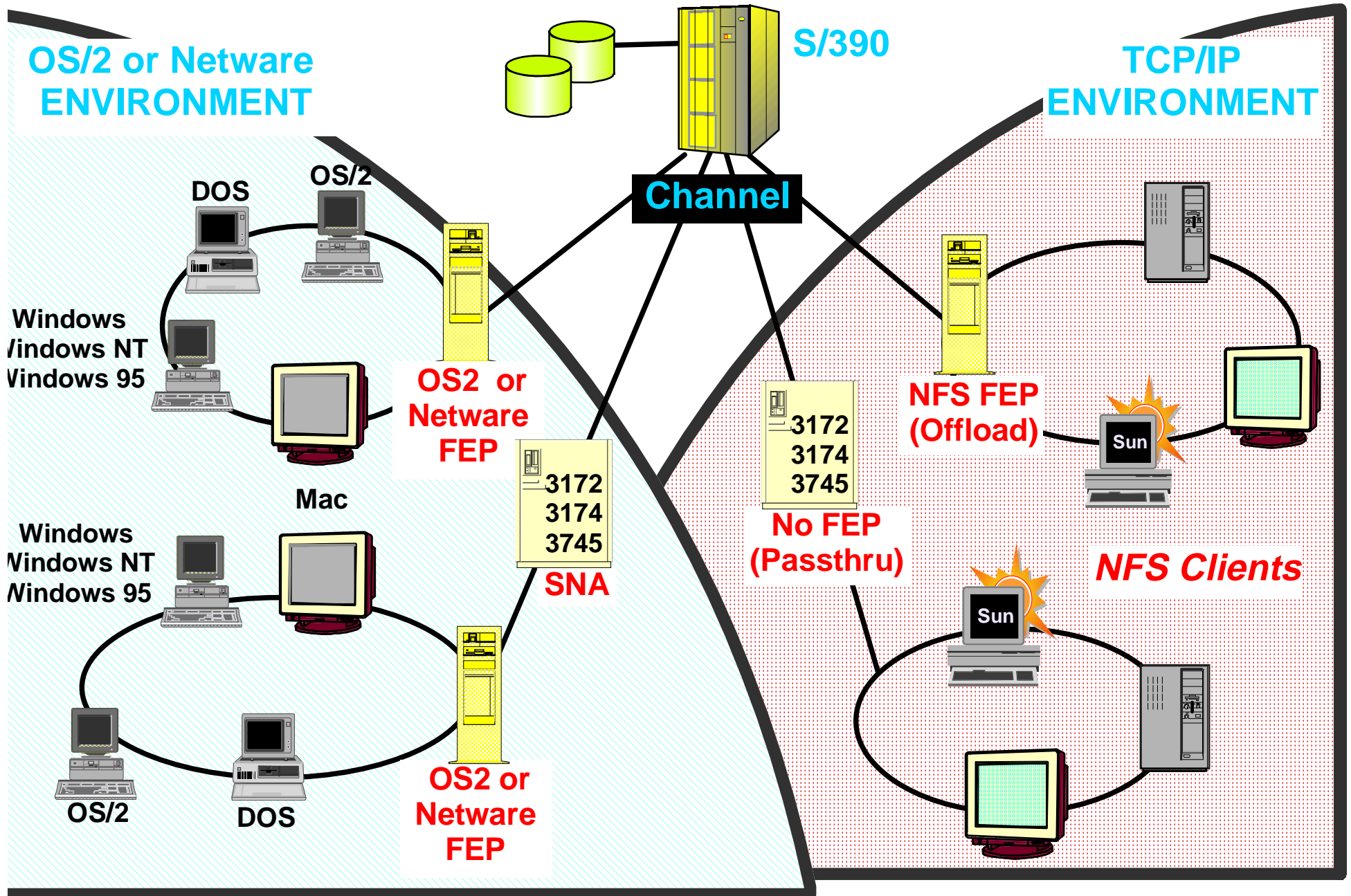
Server Consolidation Definitions

	Location Consolidation (Co-location)	Logical Consolidation (Sys. Mgt.)	Physical Consolidation (Re-centralization)	Combination Consolidation (Rationalization)
	- Co-locating servers in a common location - increased security - reduced operations support compared to physically distributed servers - application of uniform systems management pratices	- Common, consolidated management of distributed servers - use of distributed systems management and nerwork management tools - higher availability, reduced operations costs	- Reducing the total number of servers - replacing smaller servers with larger servers of the same type - fewer points of failure, reduced operations and communications costs, increased security	- re-engineering of applications and databases - simplifying a multi-platform environment - more efficient use of hardware, fewer software assets, reduced complexity
Payback	LO			HI
omplexity	LO			HI

Source: Definitions from Gartner Group, supported by trade press publications.

Server Integration

OS/390 LAN Data Consolidation

S/390

Channel

OS/2 or Netware ENVIRONMENT

TCP/IP ENVIRONMENT

DOS

OS/2

Windows
Windows NT
Windows 95

OS2 or Netware FEP

Mac

Windows
Windows NT
Windows 95

3172
3174
3745

SNA

OS/2

DOS

OS2 or Netware FEP

3172
3174
3745

No FEP (Passthru)

NFS FEP (Offload)

Sun

NFS Clients

Sun

OS/390 Application Consolidation

Sockets connectivity

SNA

TCP/IP

AnyNet/2 Gateway

TCP/IP

UNIX 95 Branded

UNIX Applications
and
S/390 applications

SNA

TCP/IP

3270 Emulator (ASCII appearance)

hierarchical files

S/390 datasets

databases

UNIX Workstation

rlogin

Interactive access

UNIX Full Screen Applications

channel, LAN

ASCII

telnet, rlogin

scaleable growth
continuous
availability
easier to manage
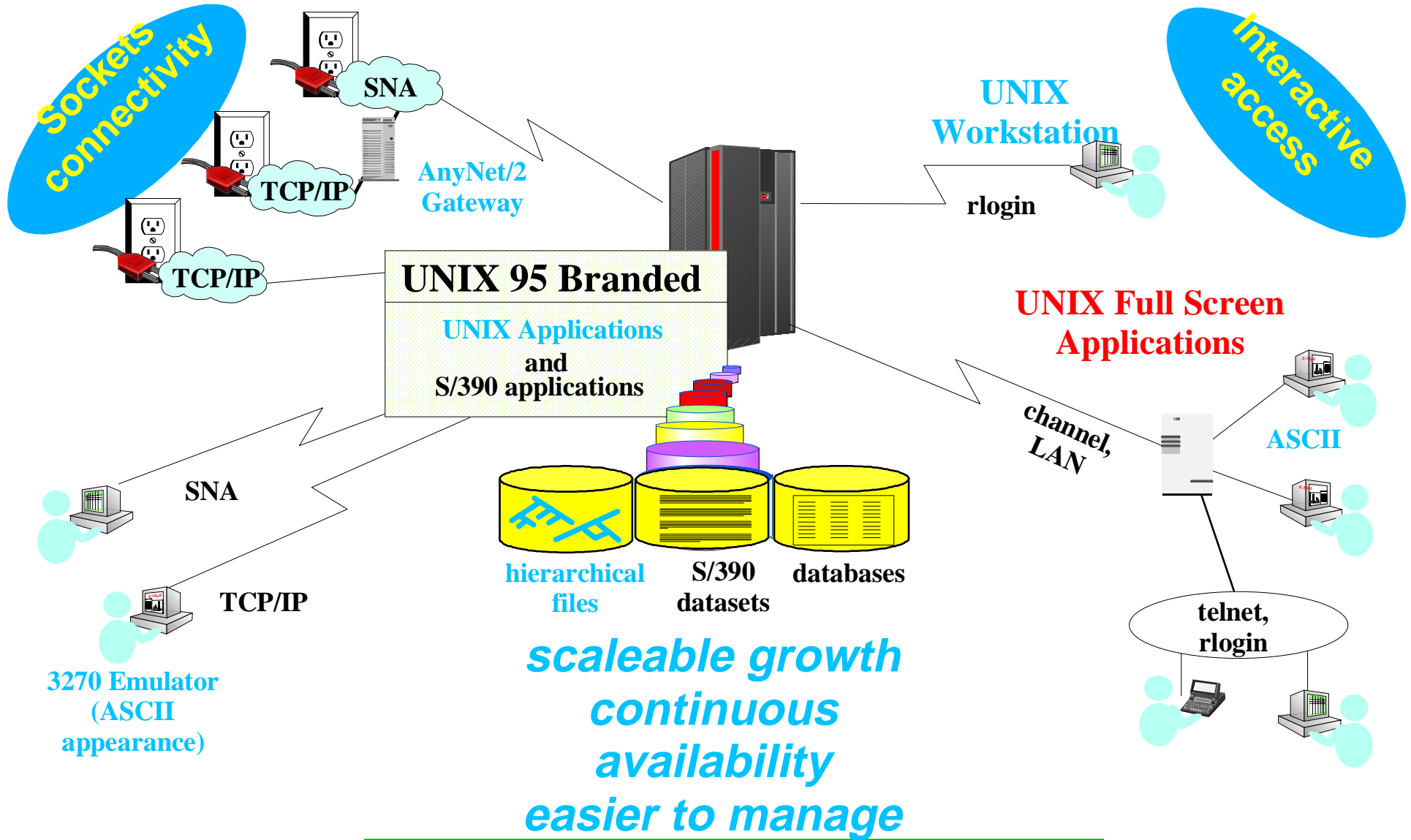
**UNIX Server Consolidation**

Why Consolidate Servers?

Which Solution is Better?

◆ **Small business or independent department**
◆ **Small workgroup support**
◆ **Local branches with low bandwidth connection to enterprise servers**
◆ **Only need a single application supported**
◆ **Autonomous decisions for local IT infrastructure**

?

◆ **Enterprise support**
◆ **Total lower cost solutions**
◆ **Easier to manage**
◆ **More reliable system**
◆ **Mixed workload environment**
◆ **Centralized decisions for IT infrastructure**
◆ **Single view of large databases**
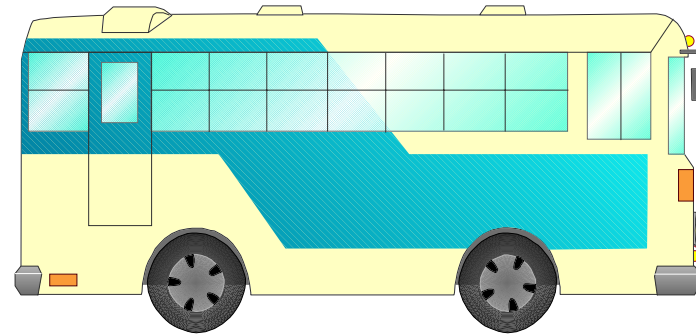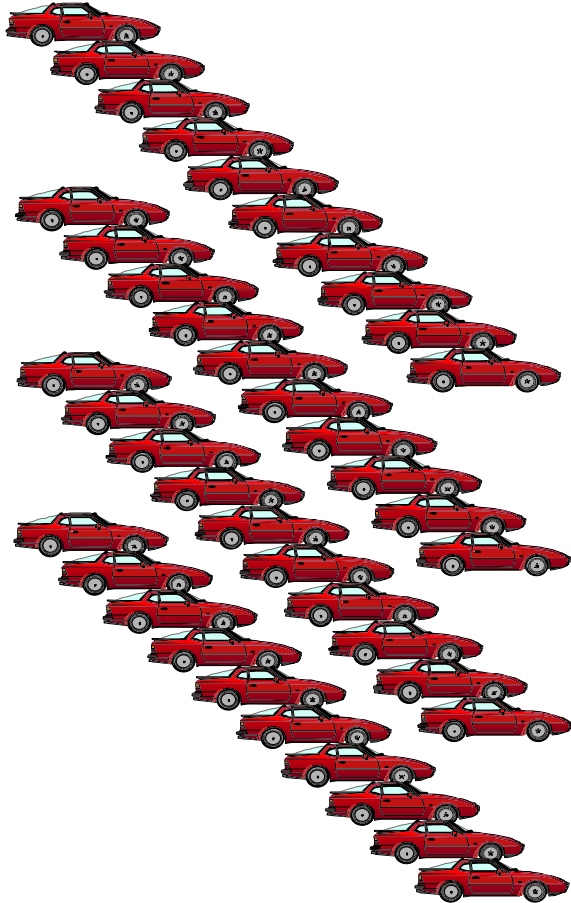◆ **High volume transaction processing**
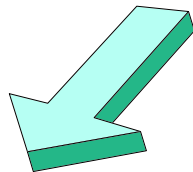
Decentralized Support
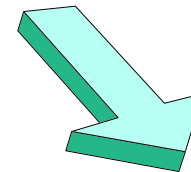
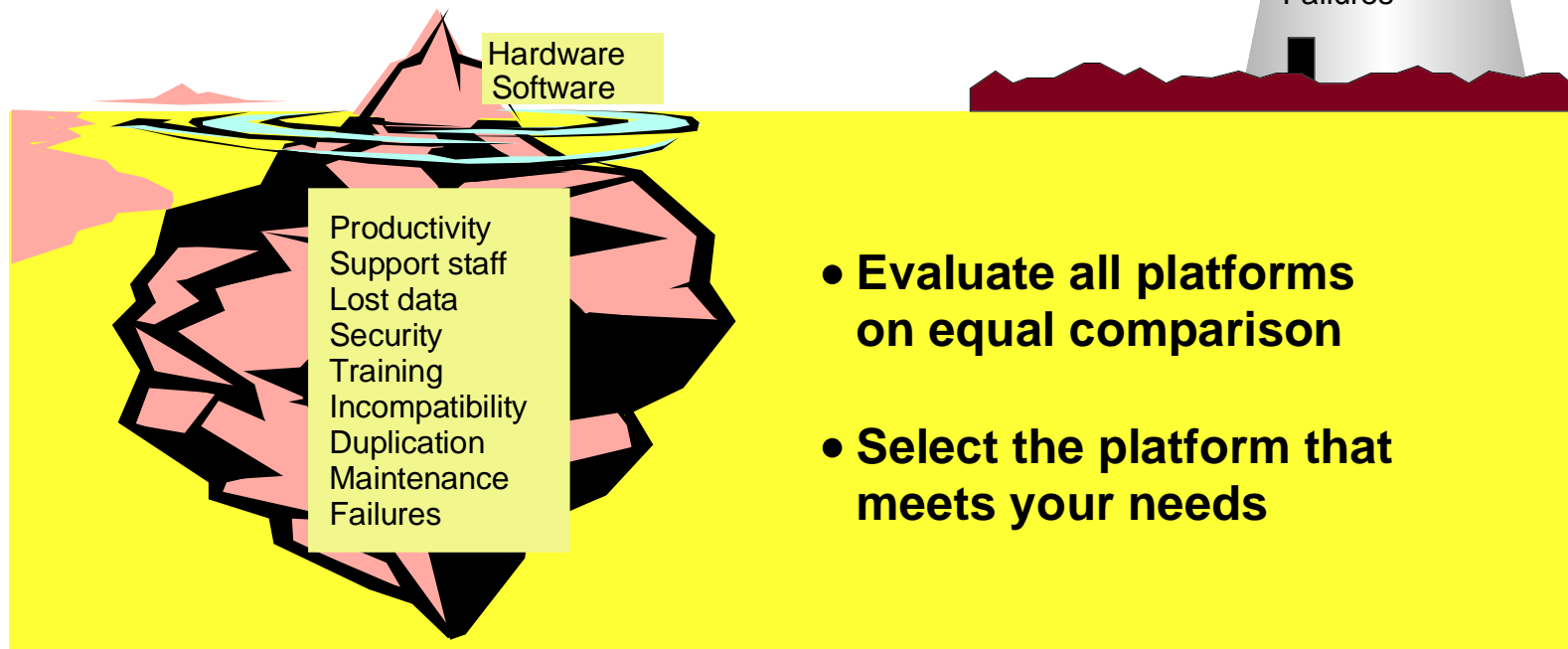**Centralized Support**

Number of Components

- A car is less costly and easier to manage than a bus
- But what if I need to take 40 children to school?
- A bus is much less costly and easier to manage than 40 cars

True Total Cost of Computing

- Most distributed system costs are not visible

- Data Center costs are fully visible

Hardware
Software
Support staff
Maintenance
Failures

Hardware
Software

Productivity
Support staff
Lost data
Security
Training
Incompatibility
Duplication
Maintenance
Failures

- **Evaluate all platforms on equal comparison**

- **Select the platform that meets your needs**

Peer to Peer Support

End Users Performing some or all:
- Backups
  - Slow & Unreliable Results
- Security Administration
- Software Installation
- Disk Management
- Network Monitoring
- Problem Analysis
  - Detection & Correction
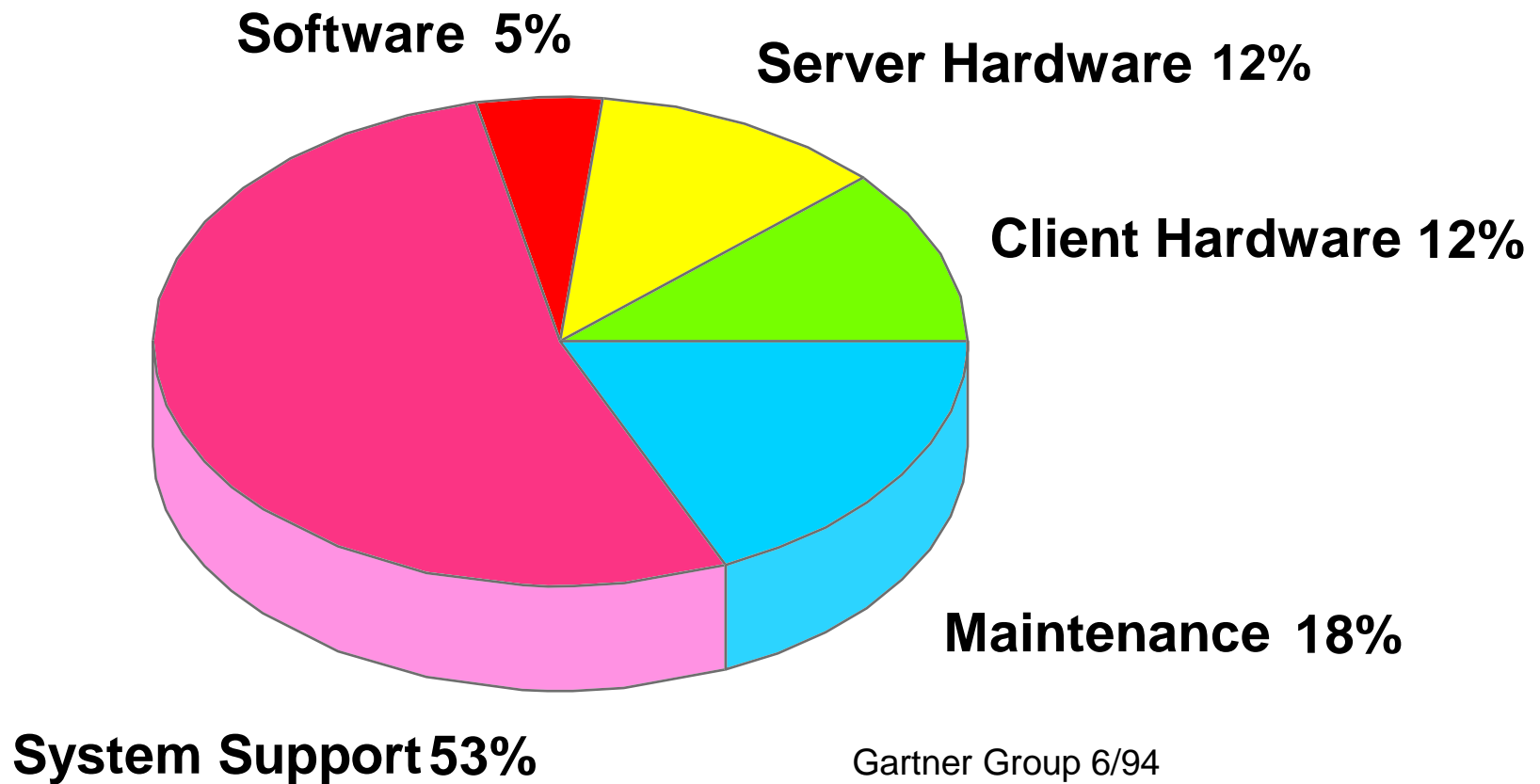 - Send an Expert to Every Location

Nolan, Norton Study
- Major hidden cost is users helping users
- Leads to customer disatisfaction
- Users are untrained in systems
- Creates errors and problems
- Inefficiencies
- Waste average of $6,000 per user per year

Nolan, Norton & CO.
Managing End-User Computing, 1994.

System Management Is Costly

Distribution of Operational Costs in Client/Server

Software 5%

Server Hardware 12%

Client Hardware 12%

Maintenance 18%

System Support 53%

Gartner Group 6/94

Death of the Mainframe?

– **S/390 MIPS shipments increased 65% in 1996 -** *Datamation April 1997*

$ / user / year

Number of Users	Mainframes	Unix Servers
50 to 99	$5183	$7947
100 to 249	$4779	$6036
250 to 499	$3855	$5641
500 to 999	$2883	$5100
1000+	$1225	$4170

Source: *International Technology Group*

– Since the introduction of CMOS, S/390 hardware prices have dropped 35% per year - *International Data Corp.*

Annual Cost per User

	Type Of Environment	Annual Cost per User
Gartner Group	Workgoup configuration Divisional configuration 5,000 user configuration *Enterprise Server costs*	$10,162 $13,270 $9,272 *$5,324*
International Data Corp.	LAN Decentralized configuration LAN Distributed configuration UNIX Servers Decentralized UNIX Servers Distributed	$8,040 $6,624 $10,176 $6,144
International Technology Group	User spending *Mainframe: User spending*	$6,445 *$2,282*
KPMG Management Consulting	Peer Support and Help Desk	$10,000+
Meta Group	PC/LANs	$8,084
Nolan, Norton and Company	Peer Support Specialist support	$6,000 - $15,000 $2,000 - $6,500
Price Waterhouse	PC/LANs	$9,000+

Networking Computing Drives I/T Consolidation

DRIVERS

I/T Architectural Intentions

	'90	Today
No Shift	21%	23%
Decentralization	51%	18%
Centralization	28%	59%

Source: McKinsey

- **Continuous Operations**
- **Consistent Performance**
- **Management Complexity**
- **Security**
- **Cost of Computing**
- **Economies of Scale**
- **Network Technology**

Consolidation Indicators

92% of N.A. Corporations Now Have Hybrid or Centralized IS Models (Computerworld)

80% of Multinational Corporations are Recentralizing IS (The Research Board)

68% of Multinational Corporations are Recentralizing Finance Systems (The Conference Board)
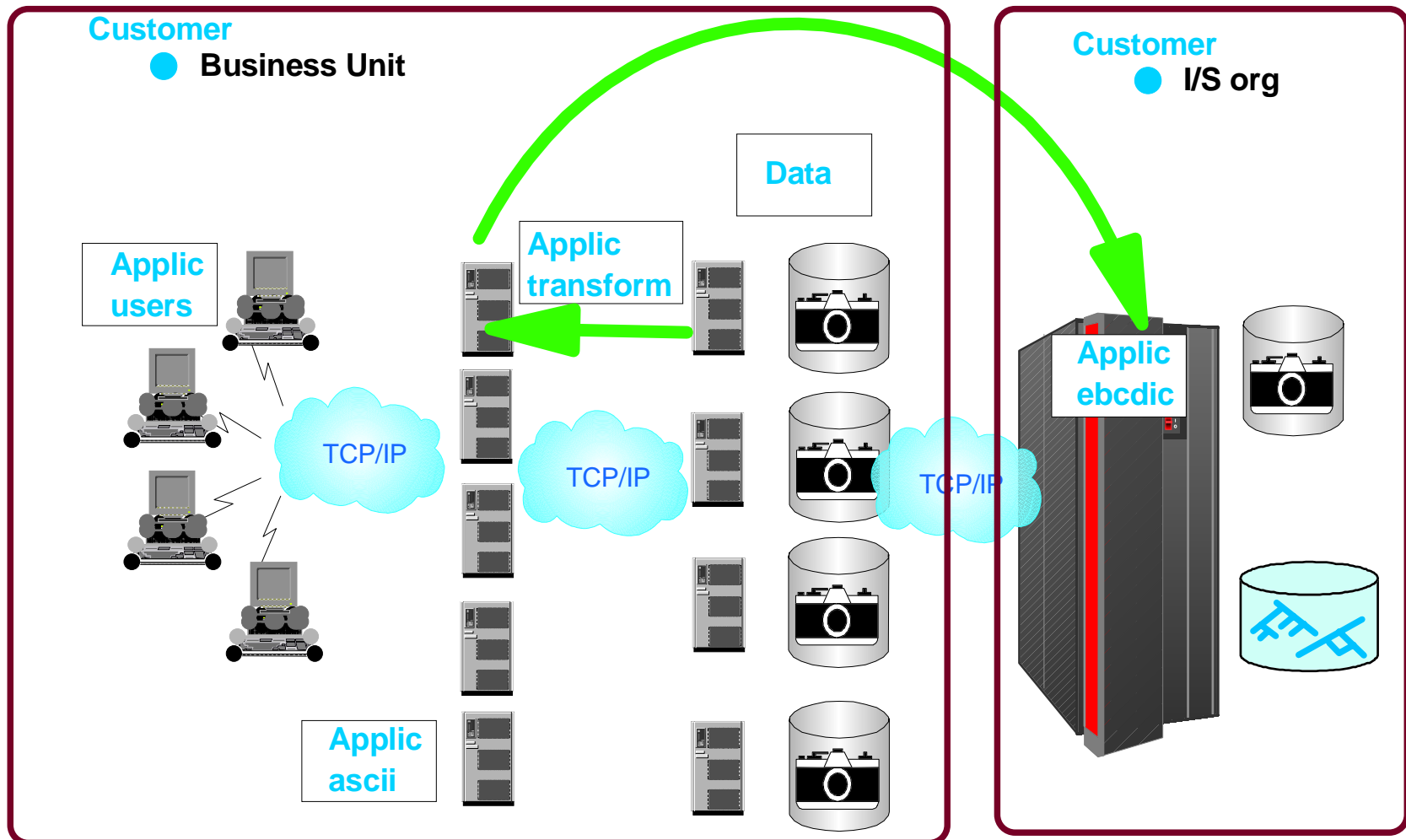
72% of N.A. Corporations are Consolidating / Recentralizing PC/LAN Infrastructures (Computer Economics)

Inhibitors to Consolidation: Responsibility protection

- *S/390 and I/S must understand business unit requirements to ensure consolidation objectives can be met*
- *Working together, optimal solution achievable*

Customer
- CFO - CIO

Customer
- Business Unit

Customer
- I/S org

Data

Applic transform

Applic users

Applic ebcdic

TCP/IP

TCP/IP

TCP/IP

Applic ascii

Technology Comparison:

Why S/390 Can perform Server Integration

Server Consolidation - Key Considerations

► Scalability
- ► Performance
- ► Database
- ► Clients Supported
- ► Transactions

► Availability
- ► Serviceability
- ► Reliability

► Data Management
- ► Database
- ► Storage
- ► Backup and Recovery

► Systems Management
- ► Workload Management
- ► System Management
- ► Network Management

► Security
- ► System
- ► Network
- ► Internet

► Flexibility
- ► Departmental Servers
- ► Clients
- ► Environments

Traditional UNIX Design

- **Fast restart of system after failure**
- **Easy access to comprehensive program development environments and tools**
- **Restricted ability to comprehend data once access is granted**
- **Easy modification of operating system**
- **Workload management does not differentiate types of processing**

UNIX developed in universities and research establishments on small servers

S/390 Design

- **Continue to operate after a failure if at all possible**
- **Prevent unauthorized access**
- **Control the level of authority once access is granted**
- **Do not allow modifications of the operating system**
- **Efficient use of all resources**
- **Workload management of different concurrent types of processing**
  - **Online, batch, query, data mining, Web serving**

S/390 runs the large majority of commercial and government business

Traditional UNIX and S/390 Approaches

Appl A	Appl B	Appl C
UNIX	UNIX	UNIX

| Appl A	Appl B	Appl C	Other Applns
OS/390			
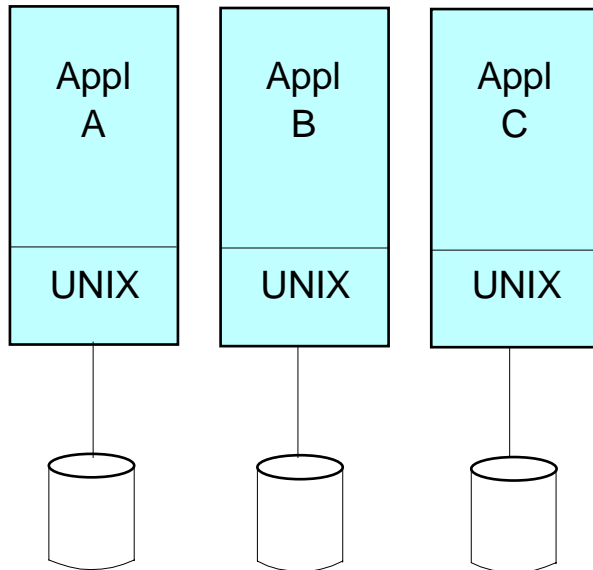
- **Single application per server**
- **Separate/partitioned data bases**
- **Complex system management**
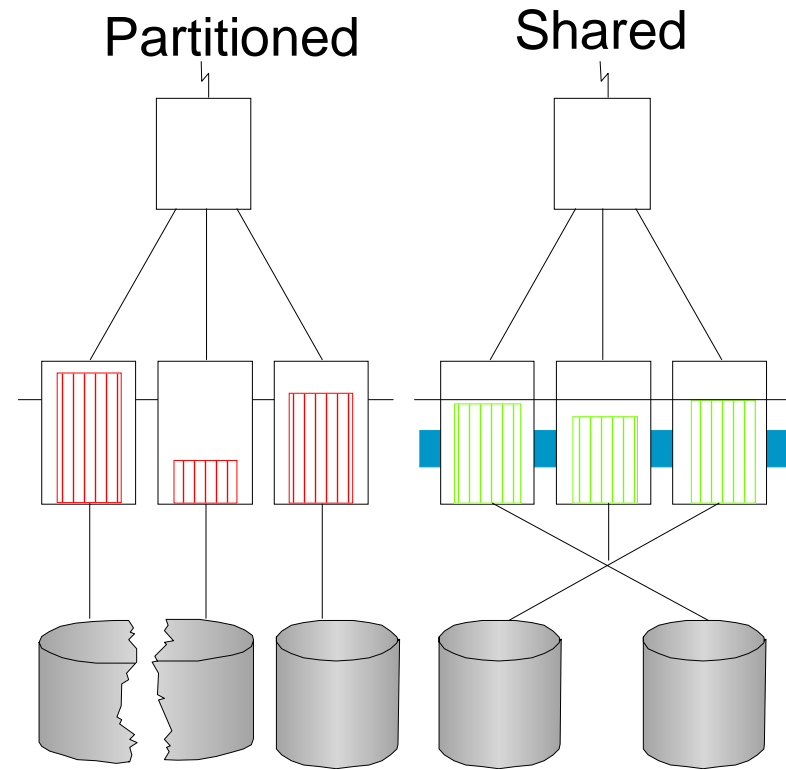- **Complex to integrate applications**
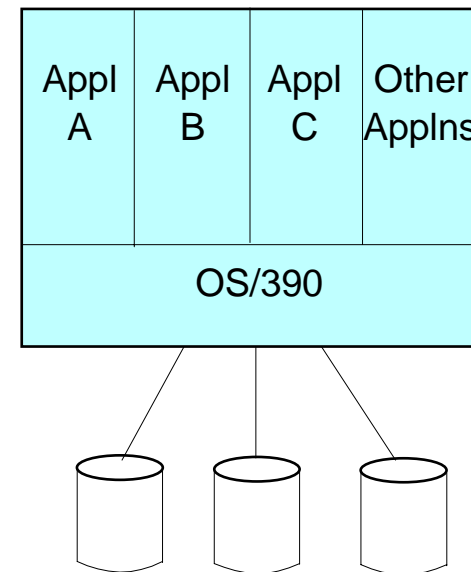
- **Workload managed according to business priorities**
- **Multiple applications per server**
- **Data bases, shared with integrity**
- **Less complex system management**
- **Interoperability and integration between applications**

Workload Management - Cluster

Tuned Benchmark

Partitioned   Shared

Real Workload
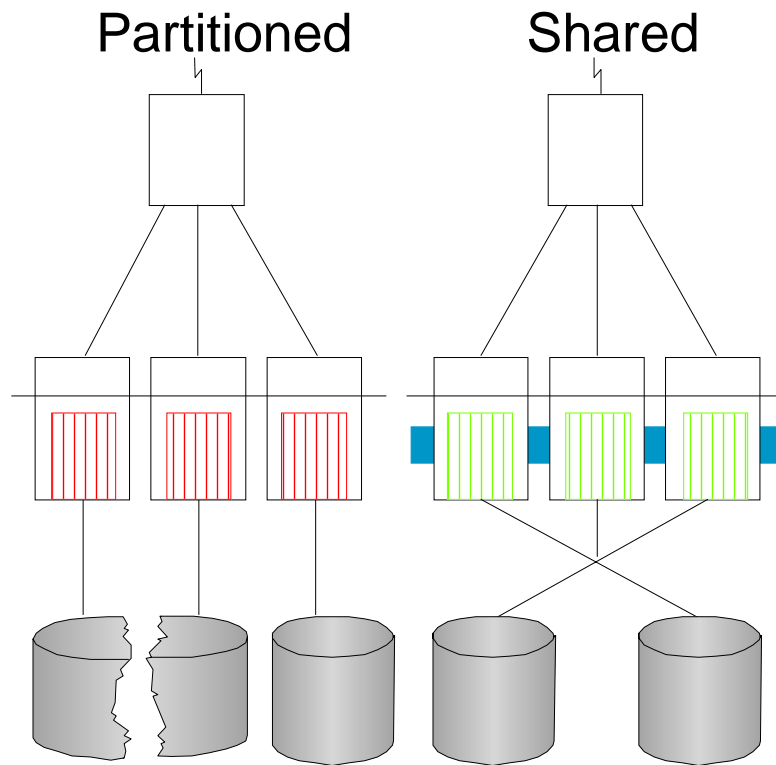
Partitioned   Shared

Coupling Technology

Scalability

Electronic Commerce Benchmark: Platform Configuration

Number of Users	S/390 Systems	MPP Servers	SMP Servers (12-way)
1,000	1 x 2	2 x 15	4
5,000	1 x 10	2 x 81	20
10,000	2 x 10	2 x 158	40
25,000	5 x 10	3 x 256	100
50,000	10 x 10	6 x 256	200
100,000	21 x 10	12 x 256	400
150,000	32 x 10	18 x 256	600

Source: *Strategies for Scalability Management Brief* International Technology Group, 1997

Response Time and Utilization

- In traditional UNIX, as processor utilization increases response time increases and becomes more variable
- With OS/390, utilization at which online response time became unacceptable:

Year	Maximum processor utilization for online workloads
1960s	60%
1970s	65%
1980s	75%
1990s	90% +

- Improvements with data in memory, system dispatcher, and workload management
- UNIX servers typical utilization is 50-70% now

Value of Availability

Industry	Avg Cost/hour downtime (US $)
Package Shipping	$30K
Cellular Services	$45K
Telephone Ticket Sales	$70K
Airline Reservations	$85K
Catalog Services	$85K
Home Shopping	$120K
Pay per View	$150K
800 number services	$200K
Credit Card	$2600K
Brokerage	$6500K

Levels of Availability

Class of 9s	Outage	COST Estimate (3 yr life)*	Examples**
99.999 %	5 min/year	$9000	
99.99 %	53 min/year	$99000	S390 Parallel Sysplex ■
99.9 %	8.8 hrs/year	$950,000	S390 Single System ■
99.8 %	17.5 hrs/year	$1,900,000	AS/400 Cluster ■
99.6 %	35 hrs/year	$3,800,000	Unix Clusters ■
99 %	88 hrs/year	$9,504,000	NT Clusters ■

* Merit Project study indicates avg cost of $36000/Hour (Information Week 9/21/98)

**Gartner 100 percent Application Availability study (12/97)

Availability Factor?
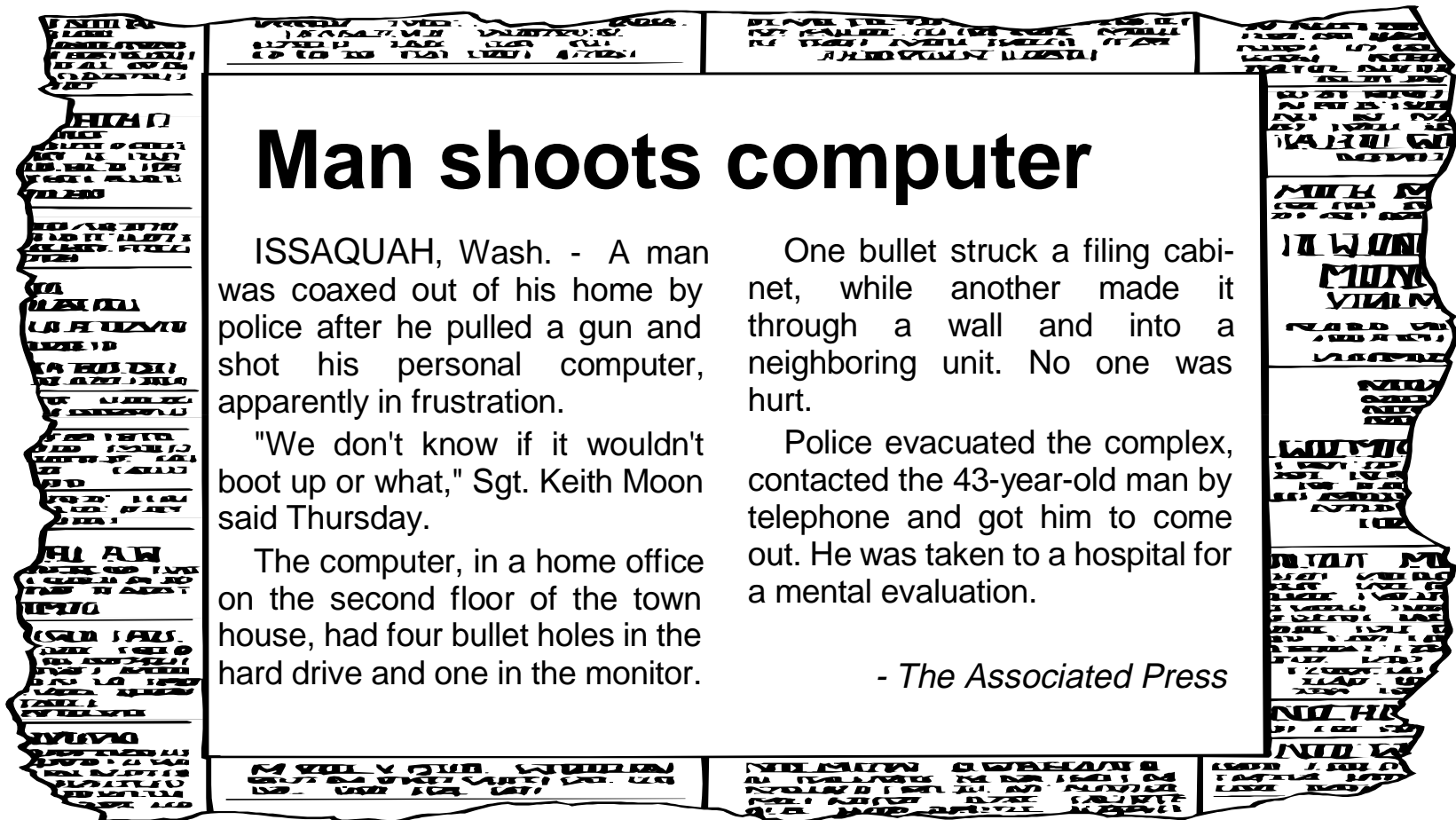
Man shoots computer

ISSAQUAH, Wash. - A man was coaxed out of his home by police after he pulled a gun and shot his personal computer, apparently in frustration.

"We don't know if it wouldn't boot up or what," Sgt. Keith Moon said Thursday.

The computer, in a home office on the second floor of the town house, had four bullet holes in the hard drive and one in the monitor.

One bullet struck a filing cabinet, while another made it through a wall and into a neighboring unit. No one was hurt.

Police evacuated the complex, contacted the 43-year-old man by telephone and got him to come out. He was taken to a hospital for a mental evaluation.

- The Associated Press

Flexibility

- **Low risk**
  - ► **There is lots of experience of running mission-critical applications on S/390 with**
    - – **Availability**
    - – **Security**
    - – **Performance**
    - – **Recoverability**

- **Flexibility in deploying new applications**
  - ► **Data can all be on one platform**
    - – **No data movement issues**
  - ► **New applications can interface to current applications**
  - ► **Large batch processes can be run**

- **Flexible growth**
  - ► **Very large capacity there if you need it**
  - ► **LPAR to segment, vary, and control capacity**

- **Continuous availability with Parallel Sysplex**

System Integrity and Security

- **System integrity**
  - ► OS/390 system integrity warranty since MVS/370 in 1974
    - – Has affected how OS/390 has been written ever since
  - ► Facilities in OS/390:
    - – Storage protection keys
    - – Subsystem storage protection
    - – Clearing storage
    - – Parity bit checking
    - – Storage locks for multiple systems updating data
    - – Transaction and data base managers
- **Security**
  - ► SAF interface and RACF
  - ► LPAR
  - ► Auditability, even of superuser
  - ► 9672 Generation 3 Cryptographic Coprocessor Feature
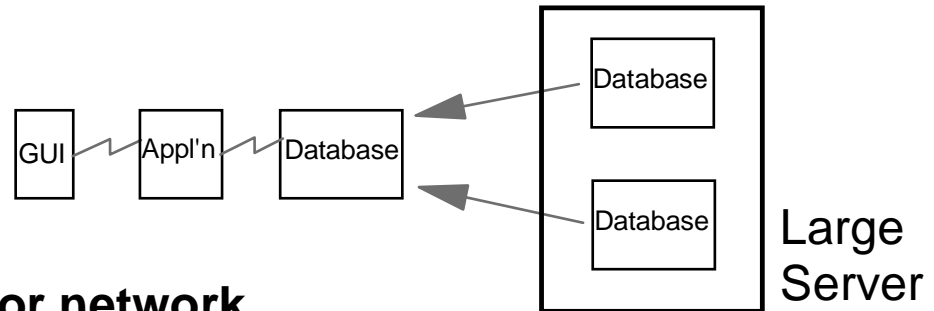 - ► Physical security - easier within a data center

Data Management

- **Move data for**
  - ▸ **Backup**
  - ▸ **Data extract**
  - ▸ **Distributed data**

- **Distributed solution**
  - ▸ **Move data across I/O channel or network**
  - ▸ **Best data rate 2 - 3 MB/sec**
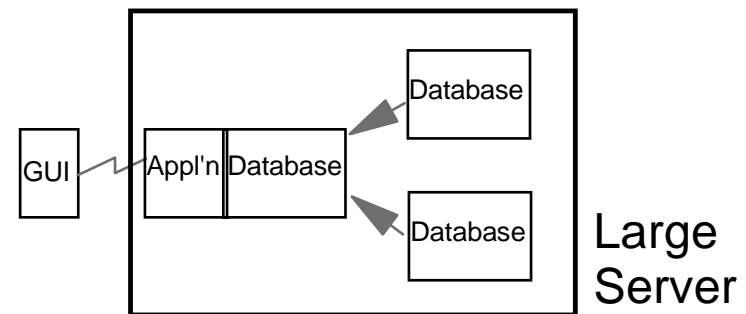 - ▸ **Needs sophisticated tools to manage**

- **Centralized solution**
  - ▸ **Move data within data center**
  - ▸ **12 MB/sec** *per channel*
  - ▸ **Simple tools needed**

- **Issues to consider**
  - ▸ **Timeliness of data**
  - ▸ **Backing up the extracted data**
  - ▸ **Managing multiple data base managers**
  - ▸ **Performance**
  - ▸ **Availability**

GUI — Appl'n — Database

Database

Database

Large Server

GUI — Appl'n Database

Database

Database

Large Server

Validation of Conclusions

- **Consultant reports**
- **User study of S/390 and traditional UNIX servers for a specific application**
- **UNIX vendor cost saving claims**
  - ► **Typically centralized UNIX against old-style S/390**
- **UNIX vendor direction**
  - ► **Centralized UNIX**
  - ► **"Mainframe" class servers**
  - ► **Major thrust to add system management functions**
- **User experience**
  - ► **Spending more on distributed UNIX and LAN servers than on S/390 Enterprise servers**

# Creating a Business Case

Costs and Benefits

Hardware

Cost Triangle

Software — People
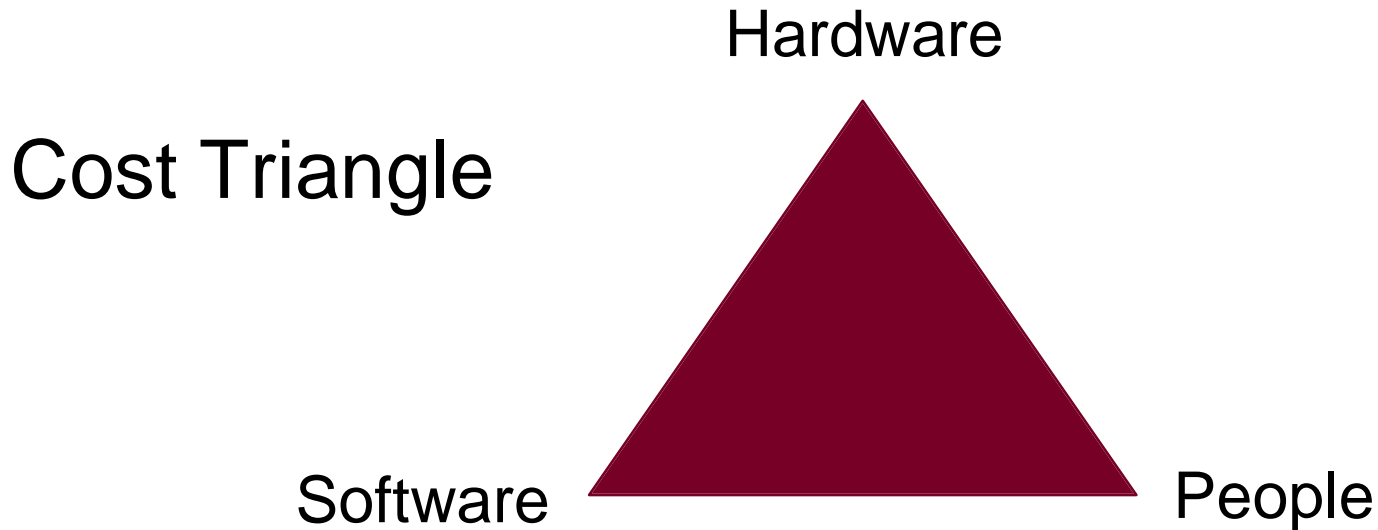
- **You can make different tradeoffs**
- **Different platforms make different tradeoffs**
- **Add in _ALL_ costs**
- **Attempt to quantify business benefits for availability:**
  - ► **How much does it cost if your LAN or UNIX server is down?**
  - ► **How long does it take to recover?**
- **Business value of different platforms may be different**

Server and Application Inventory

Gather Characteristics

- In House Name
- Workload type (e.g. OLTP)
- Software Dependencies
- Location
- Hardware used
- Network Connections
- Server to Server Communication
- Original Source of Data
- High Availability Req'd
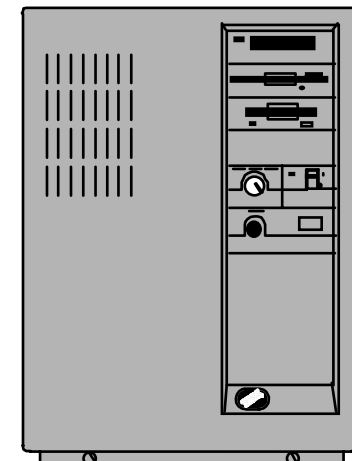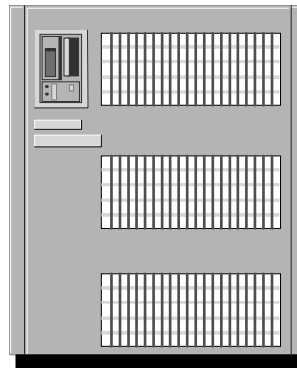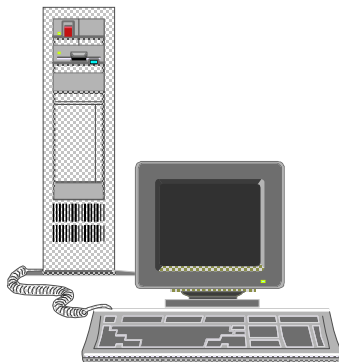
Collect Performance Attributes

- # of Users
- Disk space required (GB)
- Memory required
- # of Tx/day
- CPU Utilization
  (Avg, & Peak)
- Backup Resource(s)

The Life of A Project

Development   Production   Migration

- Identify ongoing costs versus one time costs

- Multiply ongoing costs over the projected time frame

Hardware Cost Comparison

- **CPU**
  - Not a fixed ratio Vendor A Model X = S/390 Model Y
  - Varies with workload type and other factors
  - UNIX
    - utilization %
    - duplicate hardware backup for high availability
  - S/390
    - Parallel Sysplex and LPAR for high availability
    - Contact IBM and provide info for comparable system estimate

- **Disk**
  - UNIX duplicate disk/data:
    - Backup
    - Multiple Application access
    - Multiple access paths for performance

- **Tape Backup Systems**

- **Network Bandwidth**
  - Channel Connectivity
  - Reduced data flows

Additional Cost Comparisons

- **Software**
  - Consult Licensing
  - E.g. Price * Number of payments * Number of Systems or Enterprise license or User based license or ...

- **Support** (ongoing costs)
  - Administrators / Operators
  - System Management
  - Maintenance
  - Security
  - Backups
  - Training / user support

- **Development/Conversion** (one time costs)
  - Tools
  - Project personnel
  - Test and Test Environment
  - Procedure Changes

Estimating Added Value

- **Eliminated Efforts**
  - Single copy of shared data vs. Data replication and synchronization
  - Business Units reduced performance of I/T tasks (Server Admin)

- **Growth**
  - Hardware - scalability or duplication?
  - Software - another copy? change management?
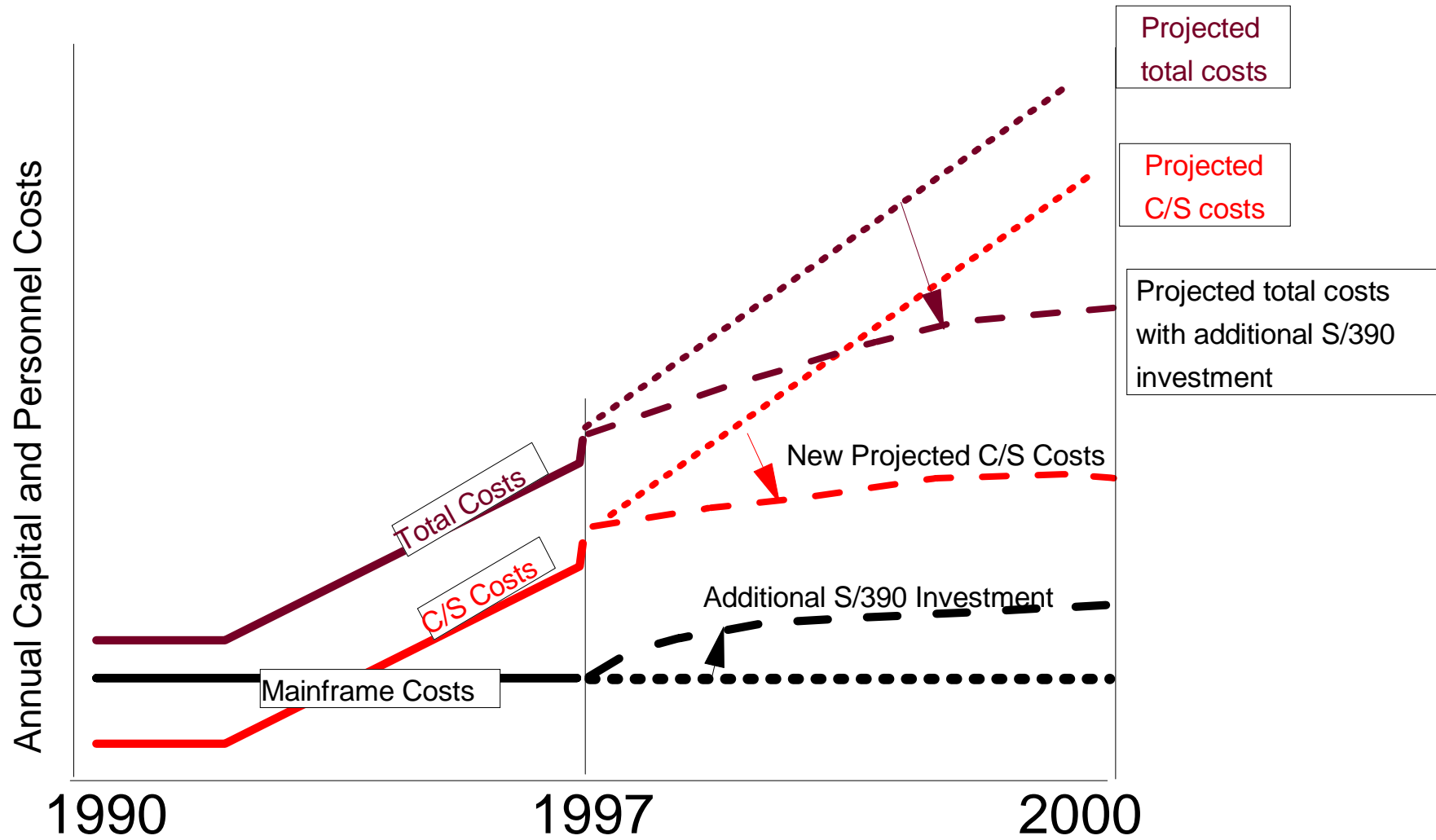 - Personnel - Numbers of servers/Administrator?

- **Cost of Failure**
  - Cost per minute per outage ... History of outages?
  - Reliable and automated backups ... Can you do a Restore?
  - Data Integrity

- **Flexibility**
  - Workload management and fully utilized resources
  - LPAR to vary capacity

Cost / Savings Projection

Evolution or Revolution?

- **Revolution**
  - ▶ Make a major change in one step
  - ▶ May be cheapest and fastest, if it works
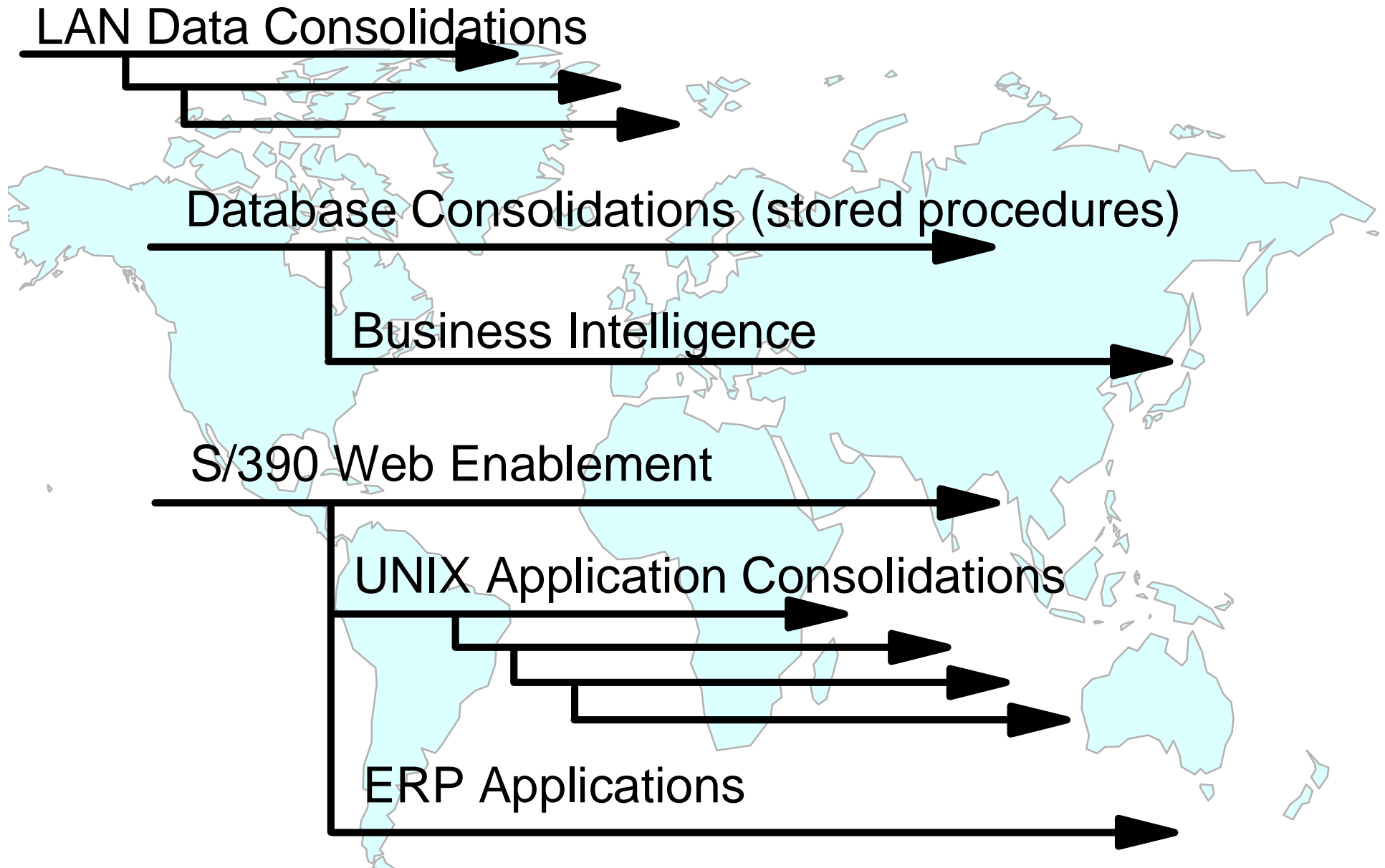 - ▶ Many changes so high risk of failure

- **Evolution**
  - ▶ Take smaller steps
  - ▶ Lower risk
  - ▶ Each step is more manageable

- **Change involves risk**
  - ▶ Manage the risks
  - ▶ Minimize them where they do not materially affect the value

S/390 Server Integration Roadmap

LAN Data Consolidations

Database Consolidations (stored procedures)

Business Intelligence

S/390 Web Enablement

UNIX Application Consolidations

ERP Applications

Summary

LANRES Efficiently Connects LANs to Direct Marketing Company

BEFORE:

Tapes Are Cut and Transported by Courier

AFTER:

LANRES FEP

High Speed Data Transfers Initiated by Print Routines

High Speed Channel

Internet

S/390 with High Speed Printers Used for Printing Direct Marketing Materials

Internet

LANs Isolated from S/390 - Contains Client's Data Used in Marketing Campaigns

PROBLEM:

High cost of manual processing of tapes for transporting data between LANs and S/390.

GOAL:

Automate the process

SOLUTION:

Attach S/390 to LANs by direct channel connection to LANRES Front End Processor (FEP), allowing S/390 programs high speed access to LAN data.

RESULTS:

Eliminate over 200 tapes per week and over 52,000 man-hours per year.
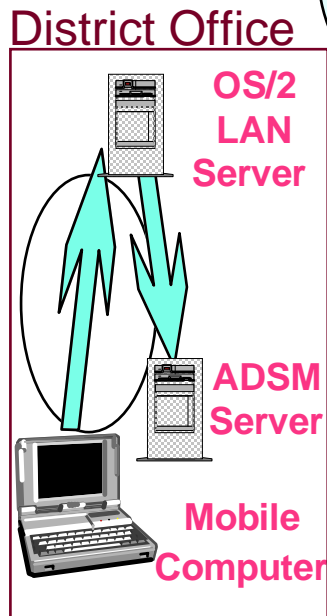
BENEFITS:

A more Efficient Process resulting in Reduced Costs and the potential to use S/390 to back up LAN data.

LAN Server for MVS Saves Business at European Insurance Company

BEFORE:

00 District Offices:

olicy data copied to ocal OS/2 LAN Server nd backed up to local DSM Server.
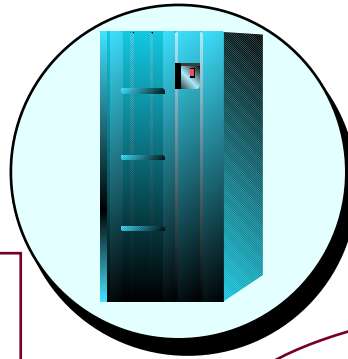
ocal tools used to nalyze local data.

District Office

OS/2 LAN Server

ADSM Server

Mobile Computer

ROBLEM:

JK government requires insurance ompanies to comply to new reporting egulations to continue to sell policies.

OAL:

onsolidate data from 200 District ffices to produce required reports

AFTER:

S/390 at Central Office houses all policy data: Centralized data allows required reports to be easily produced.

D.O.

D.O.

Leased lines connect all 200 District Offices to Central Office

D.O.

D.O.

D.O.

D.O.

D.O.

D.O.

D.O.

D.O.

. . .
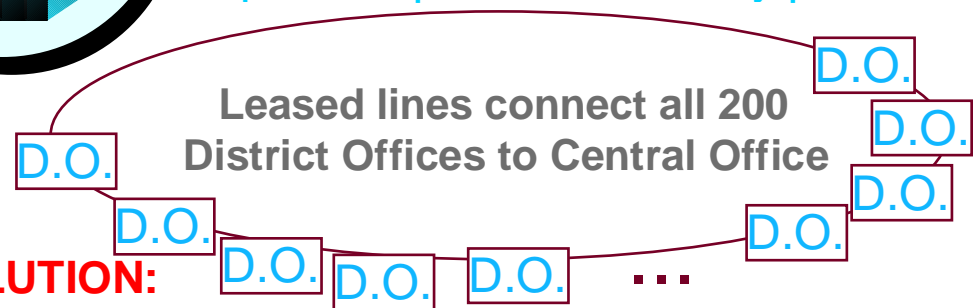
SOLUTION:

LAN Server for MVS allows the data on the OS/2 LAN Servers to be moved to the Central Office but remain accessible from District Offices.

RESULTS:

Reports are produced from centralized data, while District Office tools continue to analyze D.O. data.
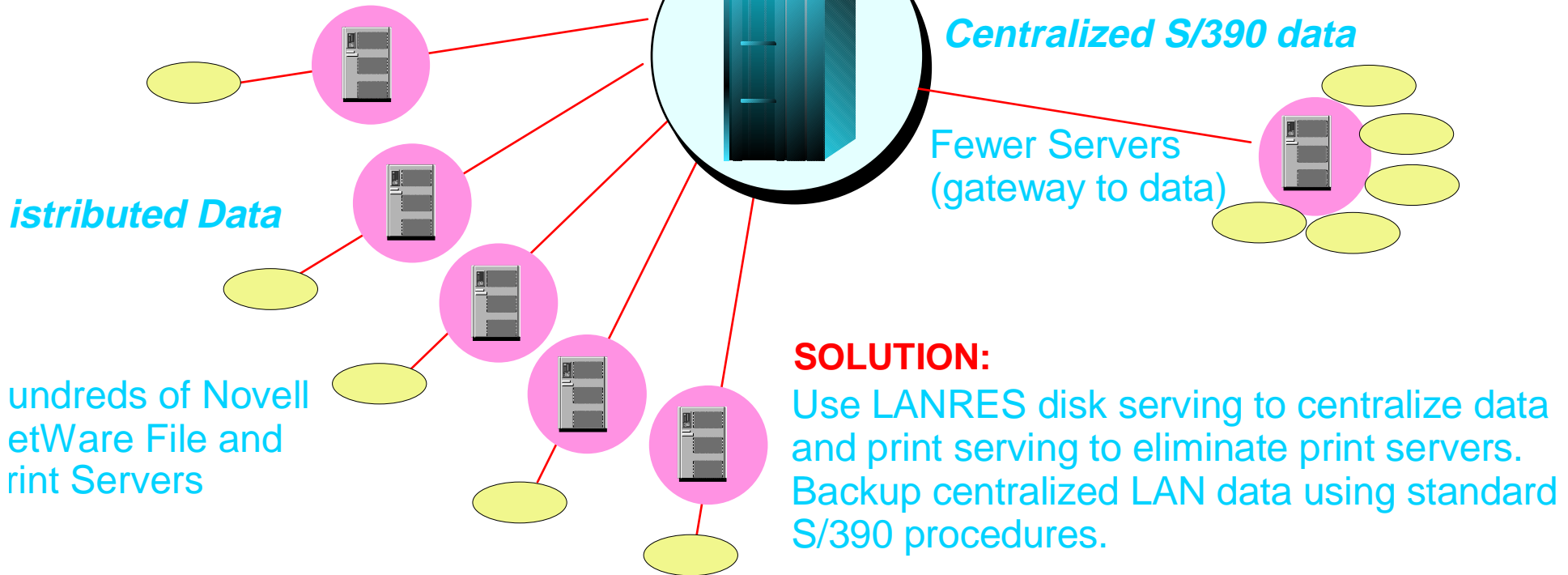
BENEFITS:

Swift implementation allowed the customer to Continue to Sell policies, as well as Save Time and Money by backing up data with ADSM at the Central Office.

OS/390 LANRES Consolidates Servers at Large National Bank

BEFORE:

S/390

AFTER:

Centralized S/390 data

istributed Data

Fewer Servers (gateway to data)

undreds of Novell
etWare File and
rint Servers

SOLUTION:
Use LANRES disk serving to centralize data
and print serving to eliminate print servers.
Backup centralized LAN data using standard
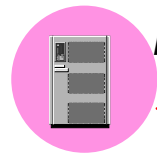S/390 procedures.

RESULTS:

Eliminate over 100 servers.

ROBLEM:

ligh cost of managing distributed data.

BENEFITS:

**Reduced Total Cost of Ownership due to
substantial savings from managing
centralized data.**

OAL:

entralize data to reduce costs.

S/390 Oracle DB & Unix Services County Government in Florida

BEFORE:

S/390 Server :
HR program (CICS/IDMS application)
Post-processing

Data transfers

NT Server :
REXX DB loader utility, Oracle DB, and report generator

PROBLEM:
Inadequate performance.
Concern that NT server won't easily scale with increased load.

GOAL:
Centralize data AND processing to streamline the process.
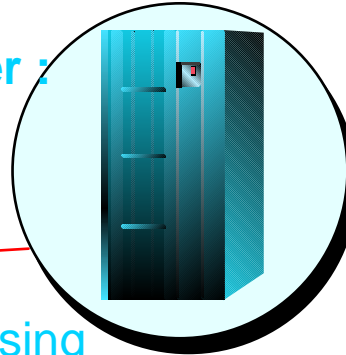
AFTER:

S/390 Oracle DB centralizes data. Utility and report generator ported to S/390.

SOLUTION:
Replace Oracle on NT w/ Oracle on S/390.
Recompile utility for MVS REXX.
Use vendor port of report generator with OS/390 Unix Services.

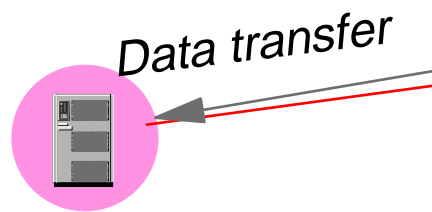**RESULTS:**
Data transfers and NT Server are eliminated.

BENEFITS:
Decreased Costs and
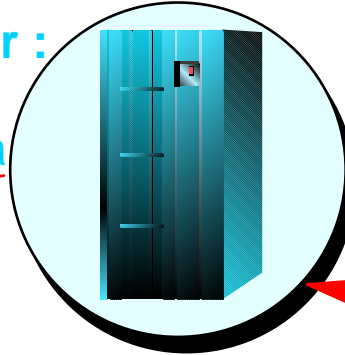**Increased Performance and Scalability.**

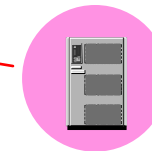# S/390 Unix Port Boosts Productivity at European Weather Forecaster

BEFORE:

S/390 Server : Terabytes of weather data

Data transfer

AFTER:

Data processing is accomplished on the S/390 w/o data transfer.

LOGIN to Unix Services to use MARS

Unix Workstations:
Weather forecasting program
MARS = Meteorological
Archive And Retrieval System)

SOLUTION:

The customer ported MARS to OS/390 Unix Services.

PROBLEM:

Inadequate performance due to long data transfer times.

RESULTS:

Data transfers are eliminated.

GOAL:

Move processing to the data WITHOUT requiring users to learn new tools.

BENEFITS:

Increased Productivity for forecasters using familiar tool w/o requiring additional skills.

OS/390 Unix & Web Server Improve University Communications

BEFORE:

S/390 w/ Alumni Data Base

AFTER:

Combine data and web serving on OS/390.

Local & Remote Users

Non-S/390 Web Server

Nightly Bulk Transfer of Data

Local & Remote Users
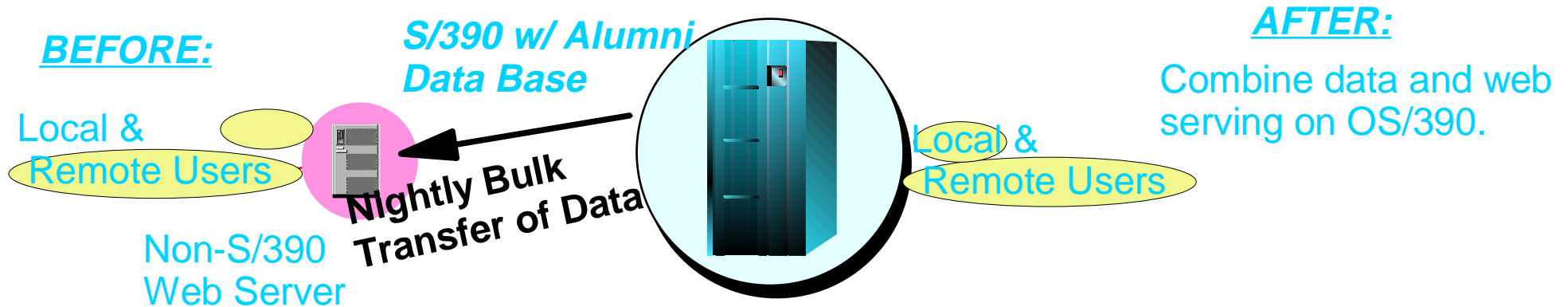
PROBLEM:

Inefficient distributed web serving process.

GOAL:

Combine data and web serving for efficient processing.

SOLUTION:

Use OS/390 Internet Connection Secure Server (ICSS) and an Adabase web gateway created with the help of Motrice Kern Systems. The C++ web gateway utilizes OS/390 Unix Services to allow ICSS direct access of the database.

RESULTS:

Eliminate Non-S/390 Web Server and nightly data transfer.

BENEFITS:

Efficient & Secure Web Serving of Alumni Communications to local and remote users.

Conclusions

- **Avoid a technology focus**

- **Take a business view**

- **Understand the business requirements**
  - ► Not just short term cost and implementation speed
  - ► Consider long term cost and benefit
  - ► Flexibility
  - ► Data access and protection
  - ► Performance
  - ► Availability
  - ► Management cost and effort

- **You generally have a choice of solutions and servers**

- **Select a platform based on your business needs**

Additional Information

http://www.s390.ibm.com/unix - OpenEdition home page
http://www.gartner.com - Gartner Group
http://www.itgcorp.com - International Technology Group
http://www.nnc.kpmg.nl - Nolan, Norton, and Co.
http://www.idcresearch.com/idc.htm - International Data Corp.
http://www.metagroup.com - Meta Group
http://www.mckinsey.com - McKinsey Corp.
http://www.computerworld.com - Computerworld
http://www.researchboard.com - The Research Board
http://www.computereconomics.com - Computer Economics
http://www.datamation.com - Datamation