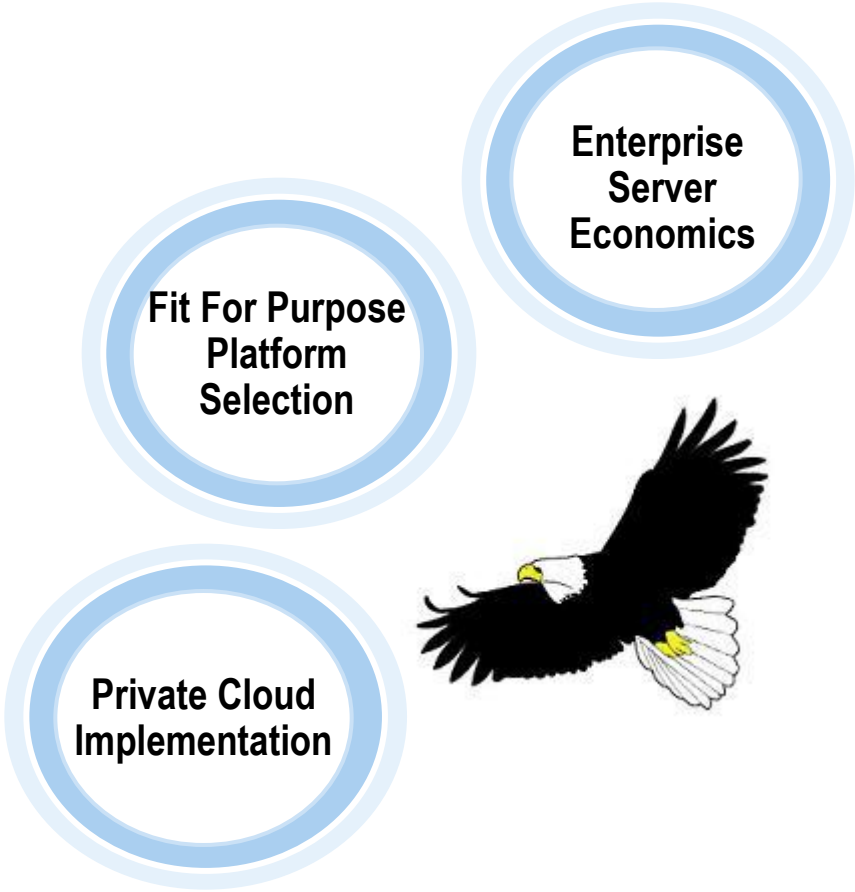
The New zEnterprise – A Cost-Busting Platform

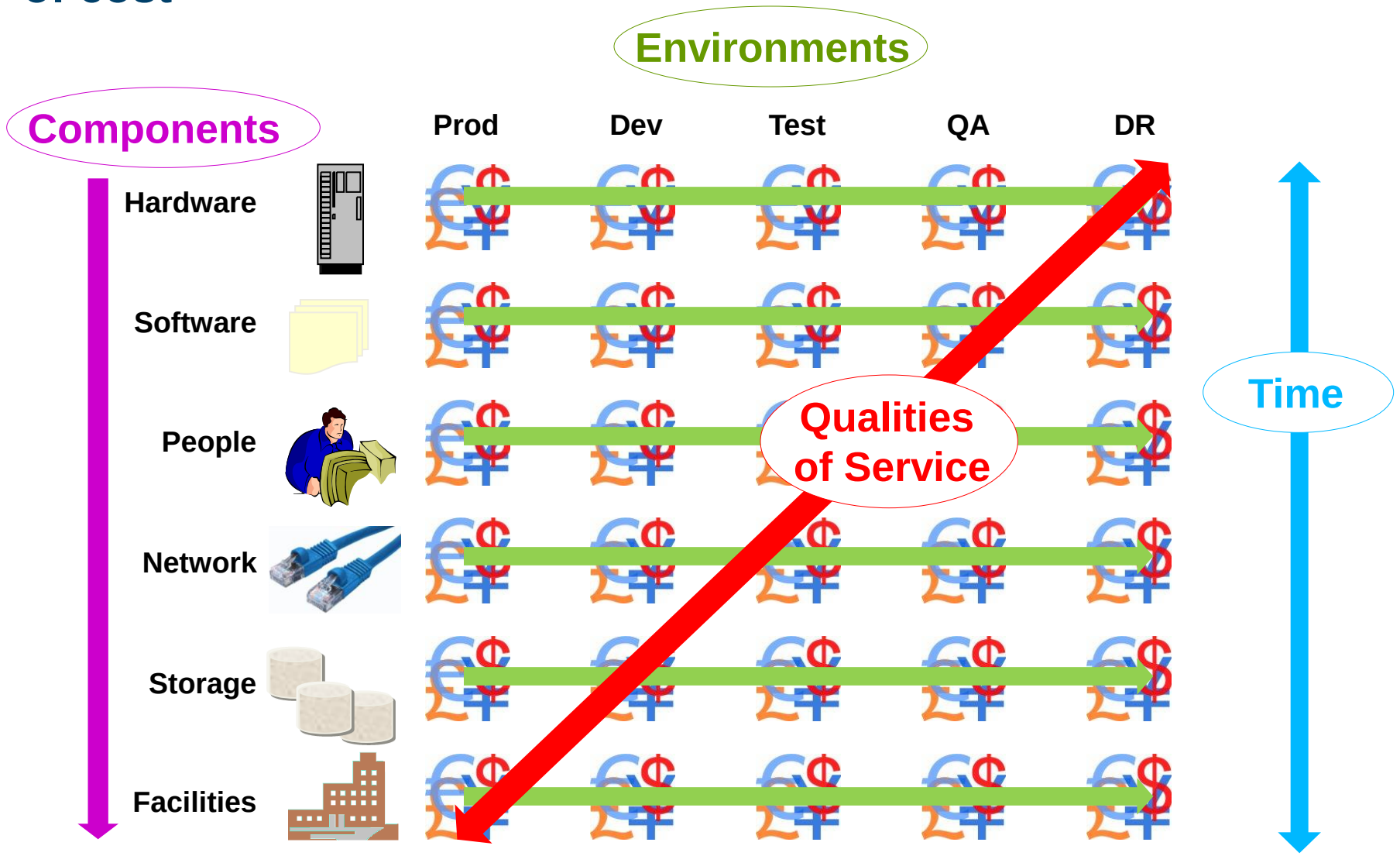
TCO Lessons Learned, Part 2: Discovering Total Costs

The IBM Eagle team helps customers understand mainframe costs and value

- **Worldwide** team of senior technical IT staff
- **Free of Charge** Total Cost of Ownership (TCO) studies
  - Help customers evaluate the lowest cost option among alternative approaches
  - Includes a one day on-site visit and is **specifically tailored to a customer's enterprise**
- Studies cover POWER, PureSystems and Storage accounts in addition to System z
  - For both IBM customer and Business Partner customer accounts
- Over 300 customer studies since formation in 2007
- Contact: eagletco@us.ibm.com



Understanding TCO means understanding multiple dimensions of cost



Some mainframe clients are tempted to move workloads off the mainframe, allegedly to save money

z900
and
z/OS v1

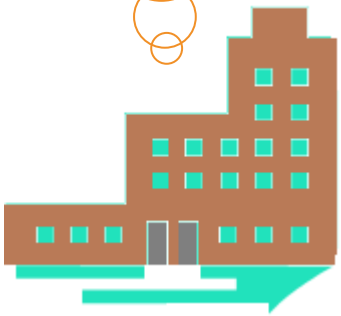
… our hardware and software are old…

"…we're only running 87 MIPS…"

… our mainframe is pretty small…

$$$$

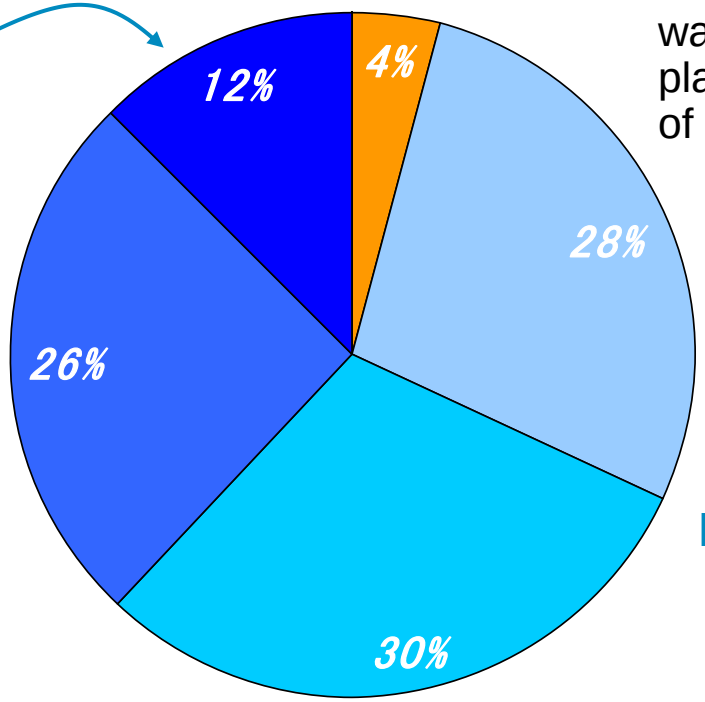
… accounting is telling me the mainframe is expensive…



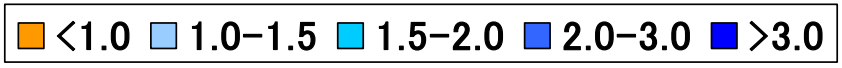
But Eagle team data shows that in 96% of mainframe rehosting cases, clients ultimately end up spending *more* for an offload

In only 4% of Eagle TCO studies was the cost of the distributed platform cheaper than the cost of the System z platform

In 38% of cases, the distributed platform was 2 or more times the cost of the System z platform



Cost ratio – Distributed to System z



Sampling of 97 Eagle team TCO studies from 2007 - 2011

Status of an on-going offload project

We did a big offload*!
Big savings!
ROI in 2 years!

European financial company

*actually a *projection* for a project not yet started (financial customer)

The reality…

…a couple of years later

- No decrease in mainframe MIPS…
  …but addition of 10s of Intel multi-core servers…
- Project only 2/3 done, but $34M spent already…
- Operational FTEs increased by 4 so far…
- Project 18 months behind schedule…
- DB2 migration proving difficult…
- Executive sponsor no longer employed…

In general, rehosting projects tend to be longer than anticipated and more expensive

1 year

Project length

2-3 years*

Project length

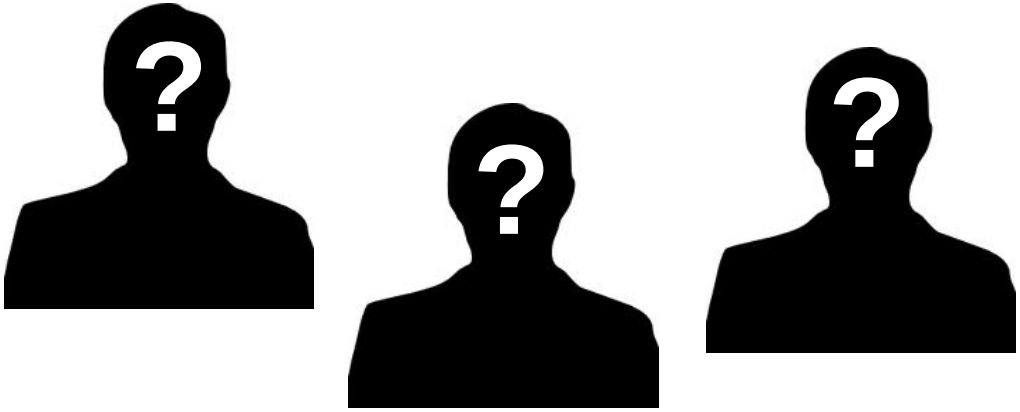
Even if results includes annual savings, TCO is typically quite poor

Examples:

	European government entity	*US county government entity*
Project time frame overrun	1 year	1 year and 8 months
Final total migration costs	$19.6M	$6M
Payback period	>29 years	>20 years

* On average, real customer migrations that completed took 2x the original projected period

We often get asked about “failed” rehosting attempts…



But nobody likes to admit “failure”!

- Infer failures
  - Search for announcements of mainframe rehosting claims…
  - Follow up to determine what was achieved…
  - Is IBM still receiving mainframe revenue from the customers?

- Based on Eagle Team experience, we know a couple of representative real examples…
- The cost of a failed rehosting project can be quite expensive…

In 2005, Canadian insurance company partnered with Micro Focus on a rehosting project…

Lombard Canada Ltd. wanted to replace their old mainframe

- 200 MIPS
- CICS, COBOL, VSAM, DB2

*"We estimate this project will save us in excess of $1 million a year…" **

VP of IT
Lombard Canada Ltd.

BUT one year after starting, the project was abandoned

- System integrator and Micro Focus did not have the skills
- Millions of dollars spent with no results
- VP lost his position

Today, Lombard continues as a System z customer, moving to z114…

*Source: http://www.finextra.com/news/Announcement.aspx?pressreleaseid=4858

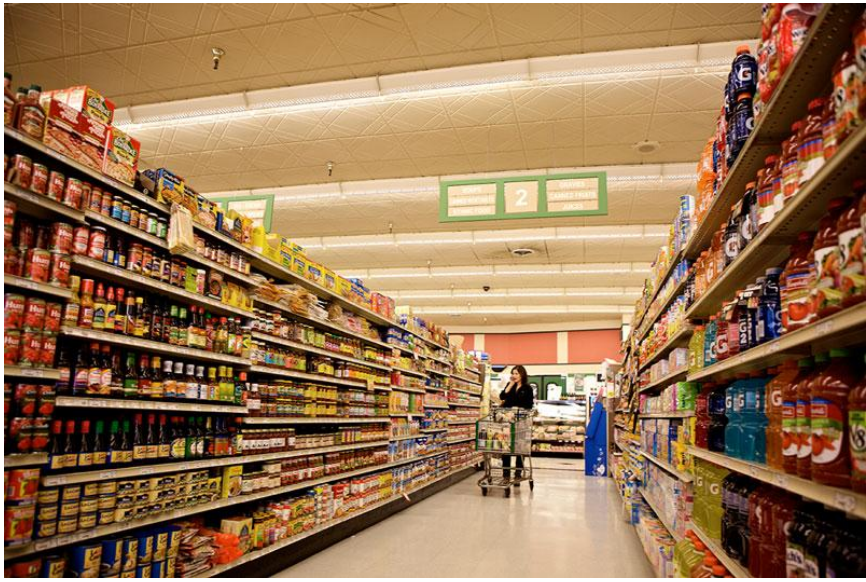
Asian bank project demonstrates another more recent example of failed rehosting

- 60 MIPS CICS/COBOL application plus additional 30 MIPS of Batch processing
  - 2.8M lines of COBOL code
  - 123K LOC in Assembler
  - 44K LOC of JCL
- IMS DB remained on System z
- **Two years later:**
  - Project abandoned after failing to complete development
  - $5.7M spent but unable to estimate eventual deployment costs
  - Team of 10 was disbanded and left the business – no one could describe the problems encountered
  - Management responsible was fired

Ongoing rehosting project at US Retail company provides another example of the risks involved

Customer's stated objective:

- Offload 3,500 MIPS with Micro Focus…
- $10M budget…
- 1 year schedule…



- **18 months later:**
  - $60M spent, but only 350 MIPS offloaded
  - Increased staff to cover over-run
  - Required additional hardware over initial prediction
  - Implemented manual steps to replace mainframe automation
  - Extended the dual-running period of the rehost…
  - Executive sponsor no longer employed…

Eagle team had advised against this offload…

Recent US government agency rehosting project also had to be abandoned

- 360 MIPS of CICS/COBOL for payroll and HR
  - 4M lines of COBOL code
  - Estimated 270K LOC needed to be changed
- Additional 30 MIPS of batch
- IMS DB to stay on System z
- Agency estimated a 5 year contract worth $80M to perform this offload

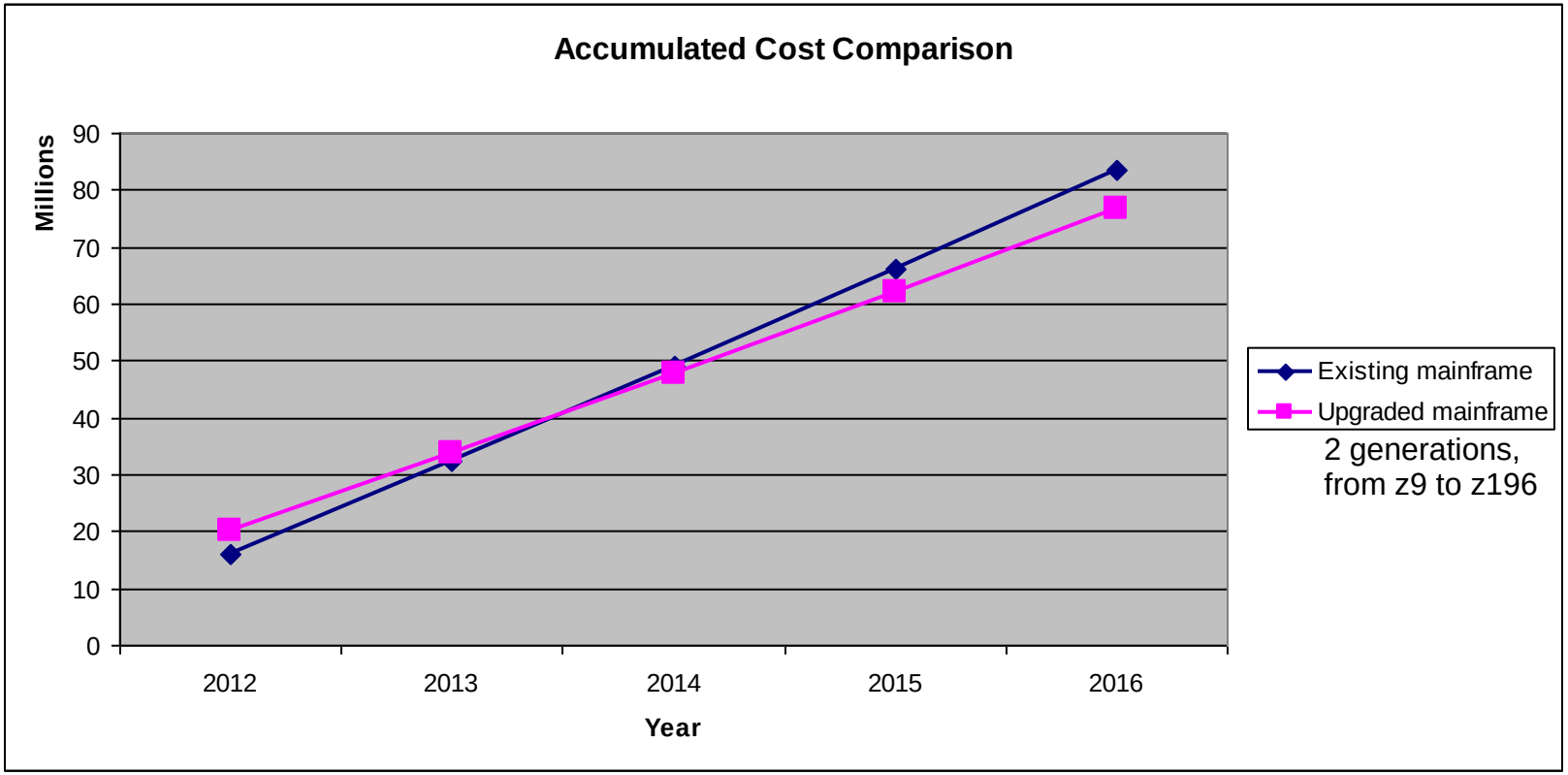
- **Project abandoned** and manager responsible for the decision left

Lessons learned can be grouped into three broad categories

- Always compare to an optimum System z environment
- Look for not-so-obvious distributed platform costs to avoid
- Consider additional platform differences that affect cost

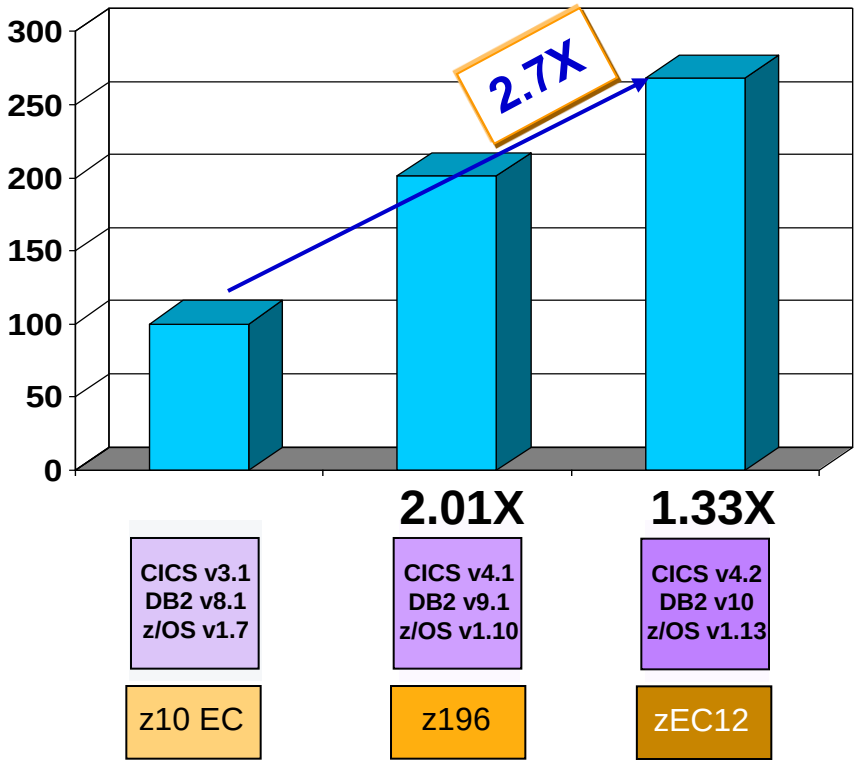
All examples discussed are from actual Eagle Team customer studies

Keeping current with respect to hardware saves money



- Typical customer (European bank) hardware refresh scenario
  - 2M investment pays back >1M savings every year – most cases positive in a 3 year period
  - Savings from technology dividends and specialty processor offload
- Comparing latest technology servers to old mainframes is unfair but often done

Continuous hardware and software performance improvements means MLC costs reduced and hardware capacity freed



Customer examples:

(1) Large MEA bank

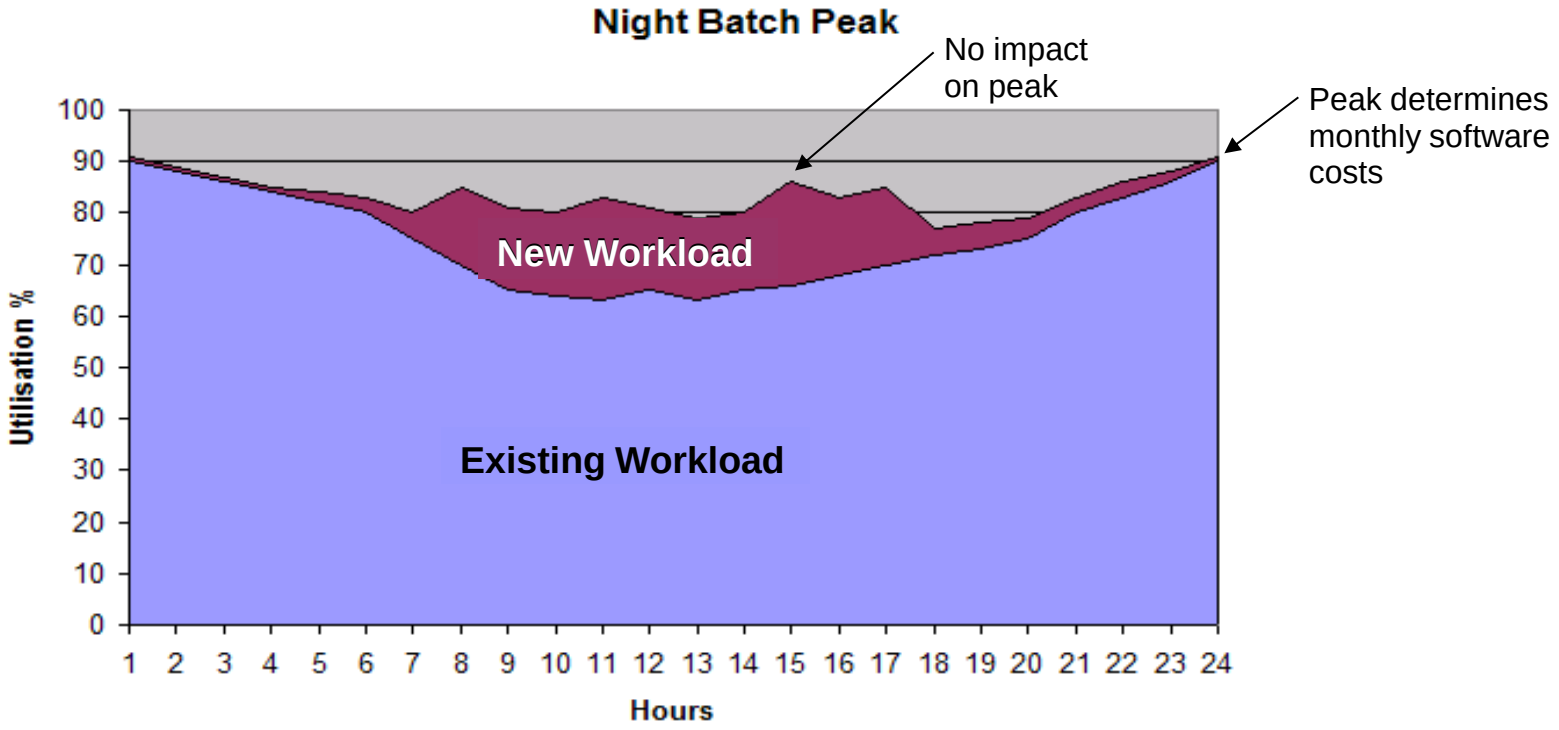
- Delayed upgrade from z/OS 1.6 because of cost concerns
- When finally did upgrade to z/OS 1.8
  - Reduced each LPAR's MIPS by 5%
  - Monthly software cost savings paid for the upgrade almost immediately

(2) BMW Autos

- Upgraded to DB2 10
- Realized 38% pathlength reduction for their heavy insert workload
  - Other DB2 10 users saw 5-10% CPU reduction for traditional workloads

IBM internal core banking workload. Results may vary.

Take advantage of sub-capacity pricing to create free workloads



- Standard “overnight batch peak” profile – drives monthly software costs
- Hardware and software are free for new workloads using the same middleware (e.g. DB2, CICS, IMS, WAS, etc.)
- Ensure you exploit any free workload opportunities, and conversely, avoid offloading free applications!

Save money by replacing ISV software with IBM software

A medium-sized European financial company…

Average Profile (BEFORE)		
Weighted MIPS		8,800
Cost Per MIPS per Year		Profile
IBM Software	1,000.00	24.72%
		0.00%
ISV Software	1,540.00	38.07%
TOTAL SW	2,540.00	

Actuals (AFTER)		
Weighted MIPS		8,900
Cost Per MIPS per Year		Profile
IBM OTC	376.09	13.66%
IBM MLC	1,023.77	37.20%
ISV Software	136.09	4.94%
TOTAL SW	1,535.95	

IBM software costs increased slightly…

… but ISV software costs decreased dramatically!

Result:
***$1,000** per MIPS*
per year savings!

Replacing ISV software with IBM software is also more cost-effective than offloading

A major global bank considered two options…

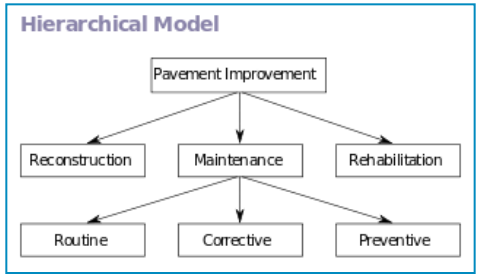
	Mainframe Offload	*Move to IBM Tooling*
Investment cost -> time period	$54M -> 2 years	$3M -> 1 year
Predicted annual cost savings	$13M (from year 3)	$6M (from year 2)
5 Year TCO, breakeven time	$140M, year 7	$101M, year 2
Assessed level of risk	Very high	Very low

The choice was obvious!

Large project, expensive, high risk, distant payback

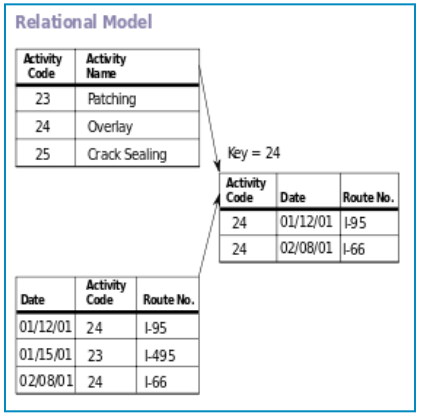
Small project, cheaper, lower risk, instant payback

Changing databases can have dramatic capacity impacts



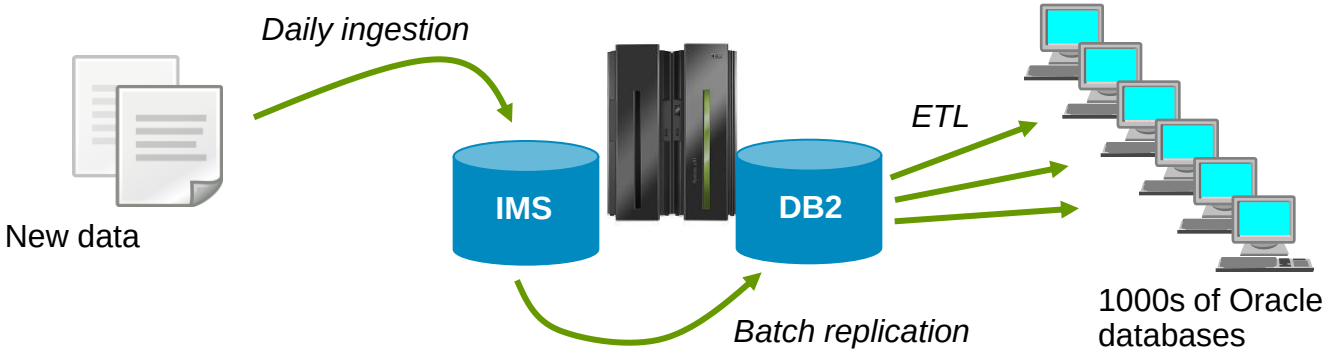
IMS is the most widely used hierarchical data store

Converting from IMS to DB2 can result in 2-3x more MIPS used and degraded response time



SQL databases, including DB2

A European financial company is attempting a conversion while continuing to run the business…



In 4 years, only 30% converted and €500M spent so far

Source: Wikipedia

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All examples discussed are from actual Eagle Team customer studies

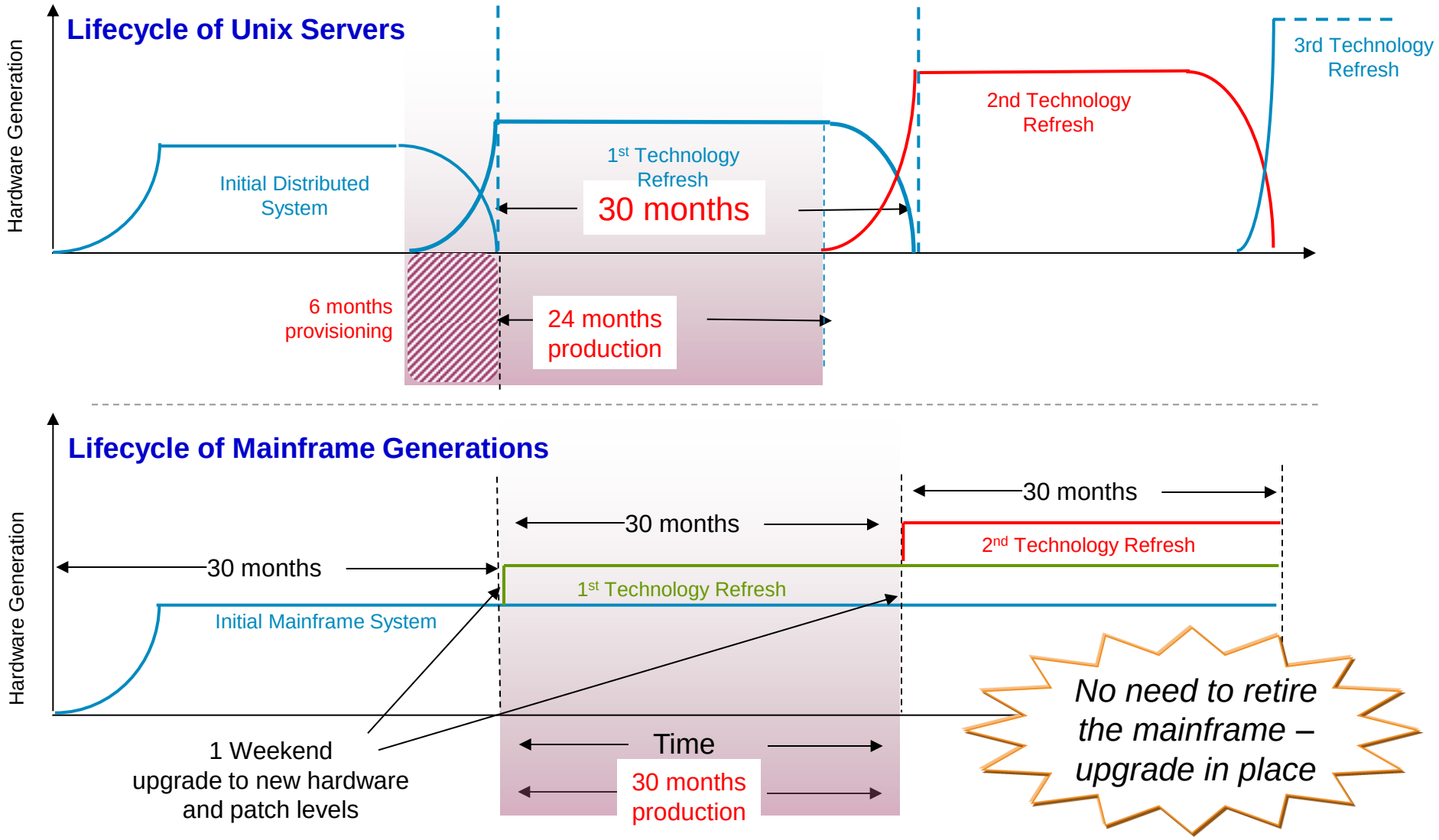
Distributed servers are typically replaced every 3-5 years

- Hardware refreshed in 2-7 year intervals, with average 3-5 years
- New, complete servers purchased each time
  - Typically additional growth capacity added (e.g., CPU, memory, I/O, etc.)

- Upgrade normally consists of purchase of additional (new) MIPS capacity
- Existing MIPS, memory, I/O facilities, specialty processors, etc. often carried over to new hardware

5 year TCO studies make sure to include 1 hardware refresh

Distributed server refresh leads to periods of reduced productivity along with extra costs



Disaster Recovery on System z costs much less than on distributed servers

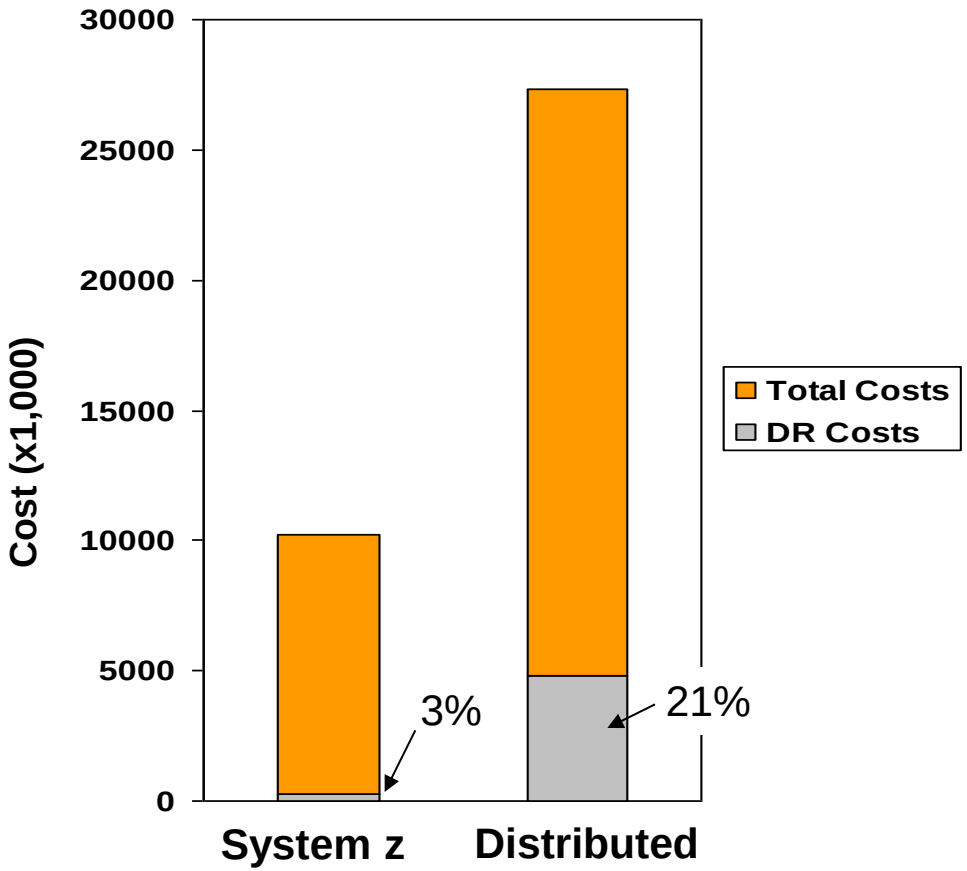
A large European insurance company with mixed distributed and System z environment:

Disaster Recovery Cost as a percentage of Total Direct Costs:

System z – **3%**

Distributed – **21%**

Two mission-critical workloads on distributed servers had DR cost > 40% of total costs



Disaster Recovery *testing* is also more expensive on distributed platforms

A major US hotel chain calculated how much it was spending for DR testing of its 200 distributed servers…

	Person-hours	*Elapsed days*	*Labor Cost*
Infrastructure Test (3 times)	1,144	7	$89,539
Full Test (4 times, inc. Infra Test)	2,880	13	$225,416
Annual Total – Distributed	14,952*	73	$1,170,281
Estimated Total – Mainframe	2,051*	10	$160,000

Customer estimates for Recovery Time Objective (RTO):

48-60 hrs Distributed

20 mins. Mainframe

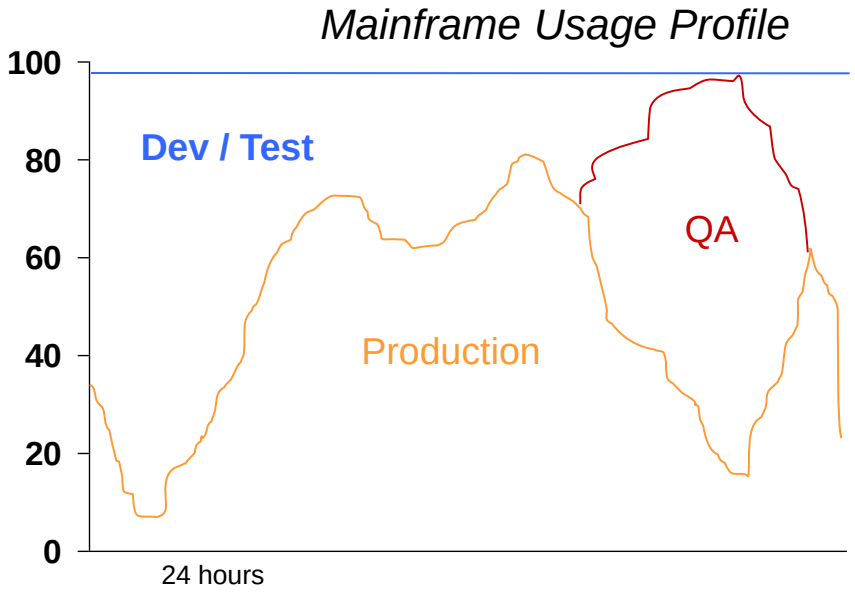
Mainframe both simplifies and improves DR testing!

* Does not include DR planning and post-test debriefing

Non-production environments require fewer resources on the mainframe

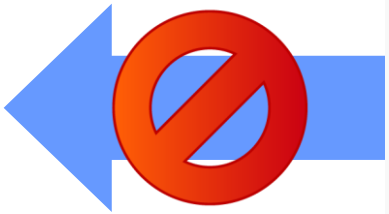
- Development and Test Capacity
  - Mainframe – Prod +20%
  - Distributed – a range, often Prod +200%

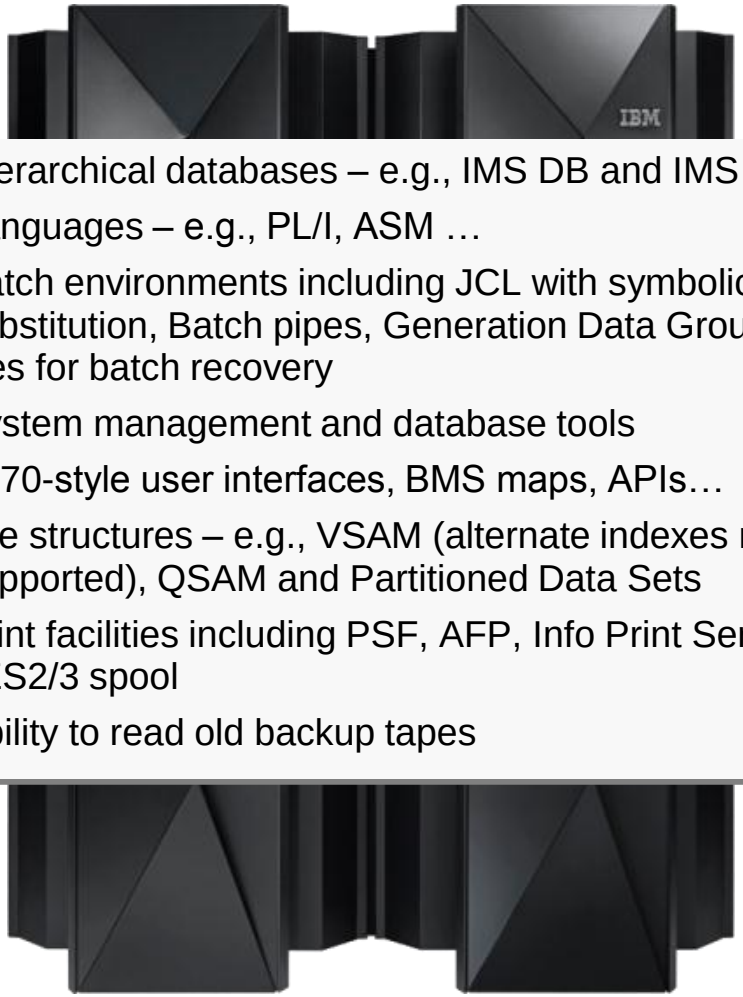
Production *QA* *Dev/Test*



Replacement technologies are not always available for many mainframe functions

Rehosted platform

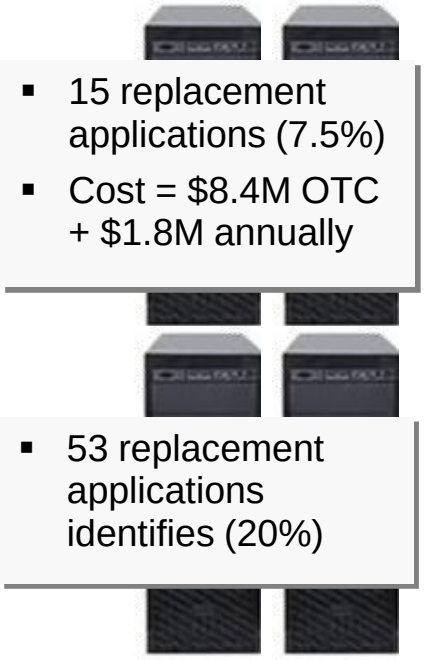




- Hierarchical databases – e.g., IMS DB and IMS DC
- Languages – e.g., PL/I, ASM …
- Batch environments including JCL with symbolic substitution, Batch pipes, Generation Data Group files for batch recovery
- System management and database tools
- 3270-style user interfaces, BMS maps, APIs…
- File structures – e.g., VSAM (alternate indexes not supported), QSAM and Partitioned Data Sets
- Print facilities including PSF, AFP, Info Print Server, JES2/3 spool
- Ability to read old backup tapes

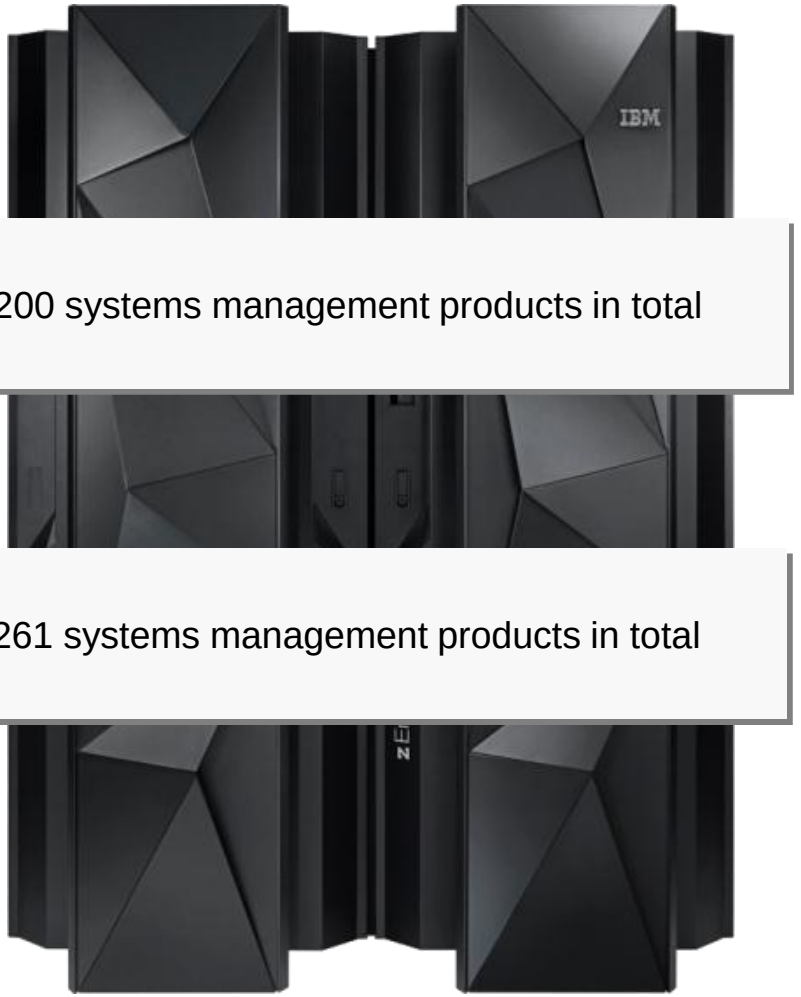
Eagle studies for two US retailers highlight missing systems management functionality

Rehosted platform



- 15 replacement applications (7.5%)
- Cost = $8.4M OTC + $1.8M annually

- 53 replacement applications identifies (20%)



- 200 systems management products in total

- 261 systems management products in total

- Options?
  - Re-write applications to avoid usage
  - Write new code to perform the function
  - Add staff to manually perform the function

Lessons learned can be grouped into three broad categories

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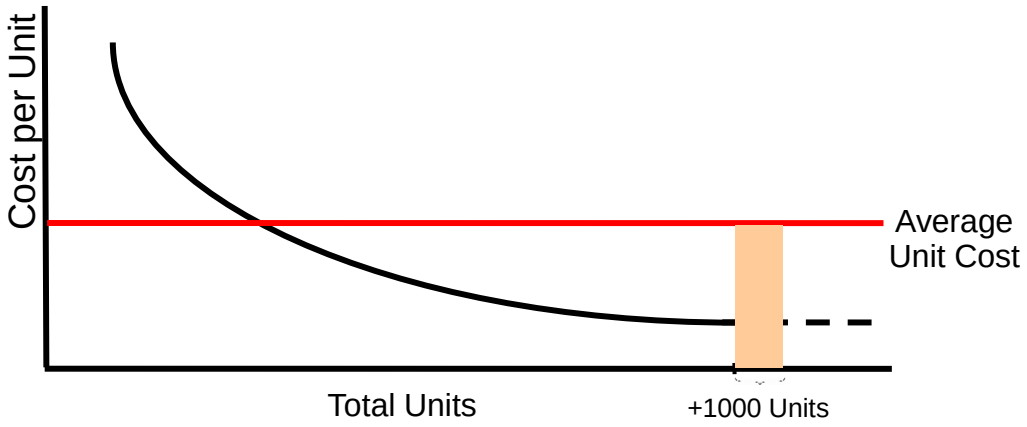
All examples discussed are from actual Eagle Team customer studies

Mainframes with Capacity on Demand can respond to unforeseen business events

- Transportation company experienced a natural disaster
  - Required them to re-run a whole weeks worth of business while continuing to operate normally
  - Able to turn on double capacity immediately to achieve this

- Customer decided to run a Super Bowl advertisement with very short notice
  - Informed IT department to expect a massive capacity spike
  - Temporarily turned on additional capacity
  - Stress tested their systems prior to the event despite short notice

The cost of adding incremental workloads to System z is less than linear



- Mainframes are priced to deliver substantial economies of scale as they grow
- Doubling of capacity results in as little as a 30% cost growth for software on z/OS
- Average cost is significantly more than incremental cost

Example: European bank compared costs of growing WAS applications on distributed and on mainframe

Incremental cost of adding one large WAS application to platform (5 yr. TCO):

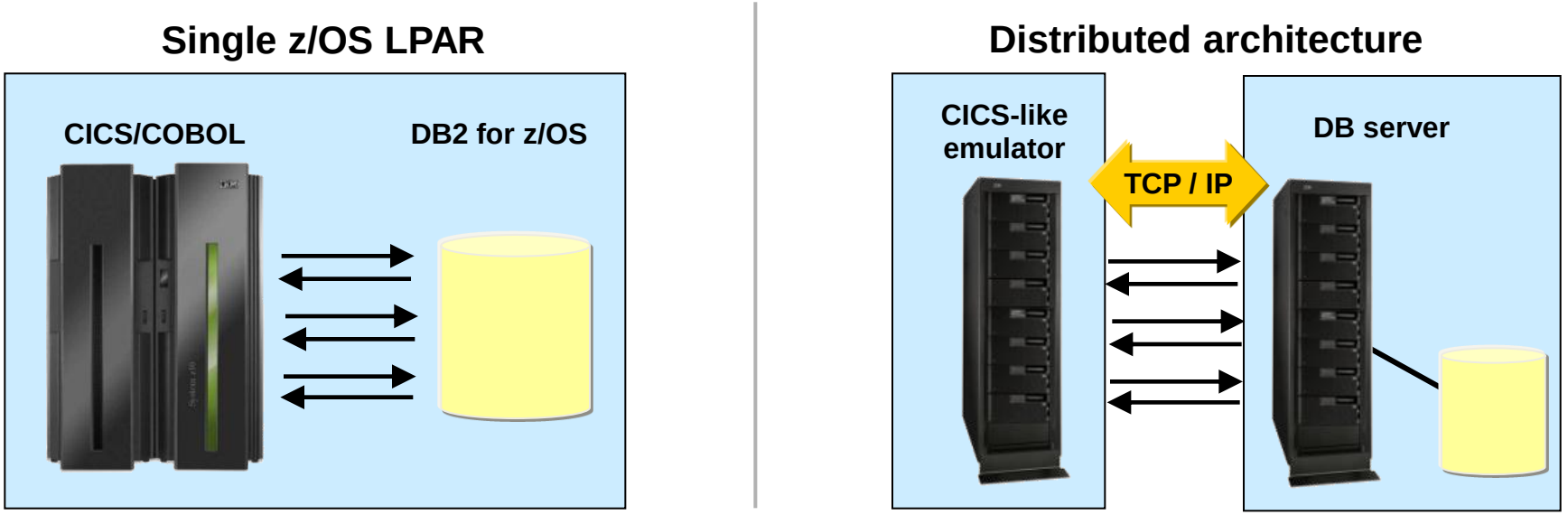
€1.56M
(378K OTC, 192K Y1, 249K Y2-5)
Distributed

€1.29M
(657K OTC, 42K Y1, 147K Y2-5)
Mainframe

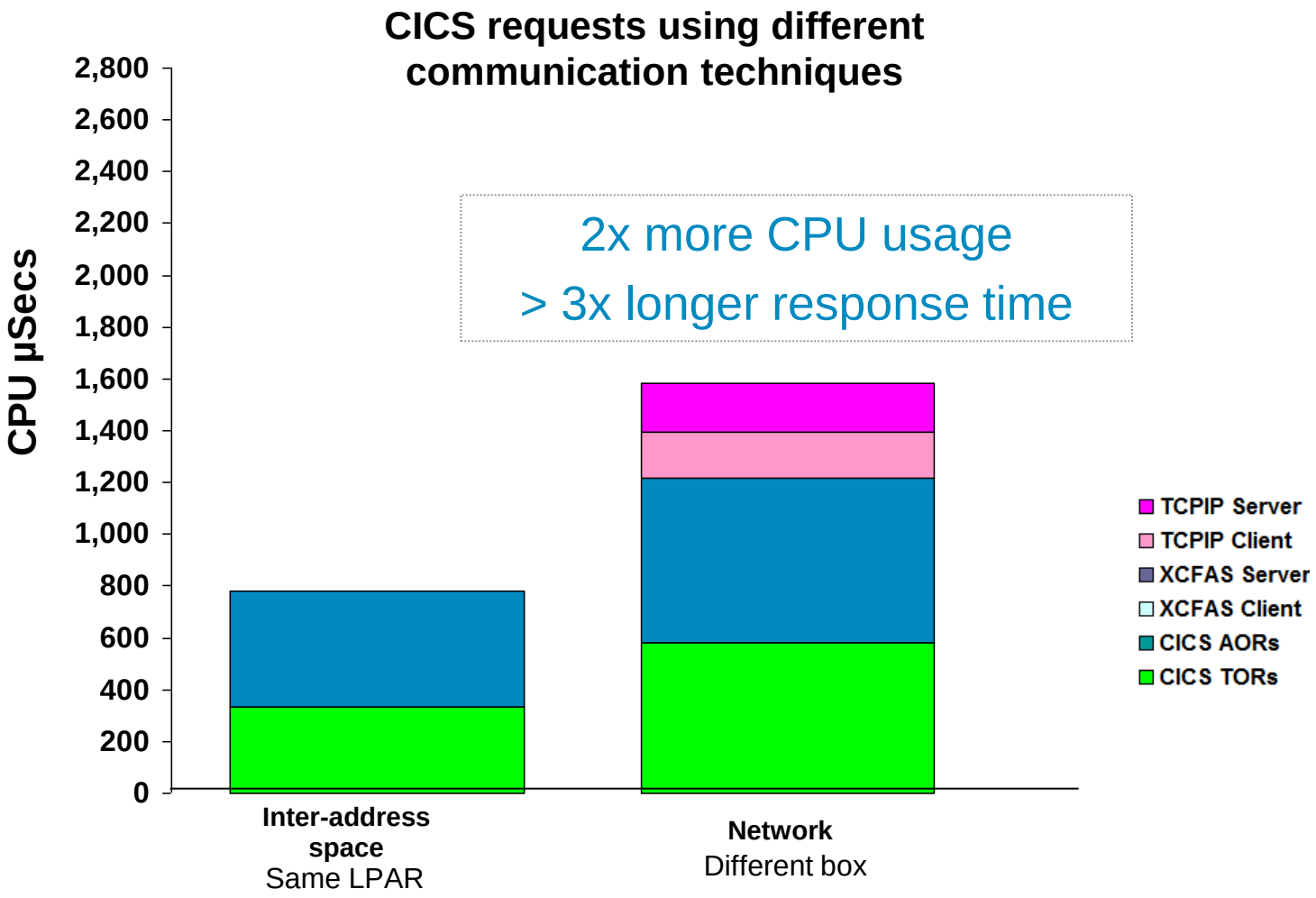
Future deployments will be targeted to the mainframe!

Some applications originally designed with co-located data are not good offload candidates

- Large insurance company rehosted portion of application as POC
  - Found TCP/IP stack consumed considerable CPU resource, and introduced security compromises and network latency
- European bank tried rehosting CICS workload to Linux while maintaining VSAM and DB2 data on System z
  - Induced latency resulted in CICS applications no longer meeting its SLA



Co-locating in the same address space is more efficient



Source: http://hurgsa.ibm.com/projects/t/tp_performance/public_html/OS390CICS/reports/CICS%20TS%20V4.2%20Performance.ppt and email with z/OS Communications Server development team

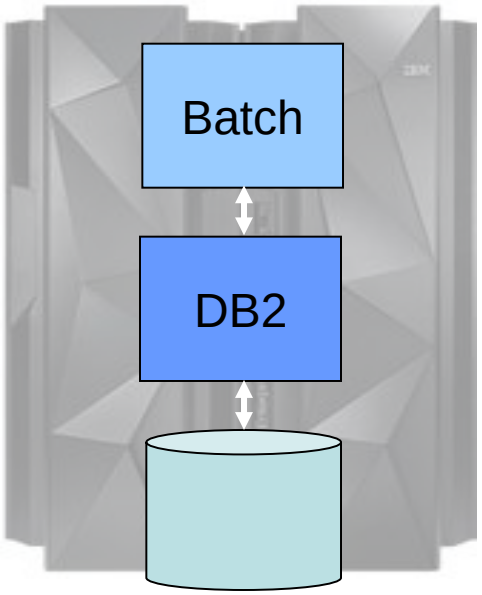
Moving Batch applications off the mainframe can have serious consequences

- Customer was facing large one-time charges for mainframe growth
- Rehosting vendor committed to a quick partial migration to avoid mainframe growth

Before:

1 Mainframe CPU usage units

1 Units of elapsed job time



System z

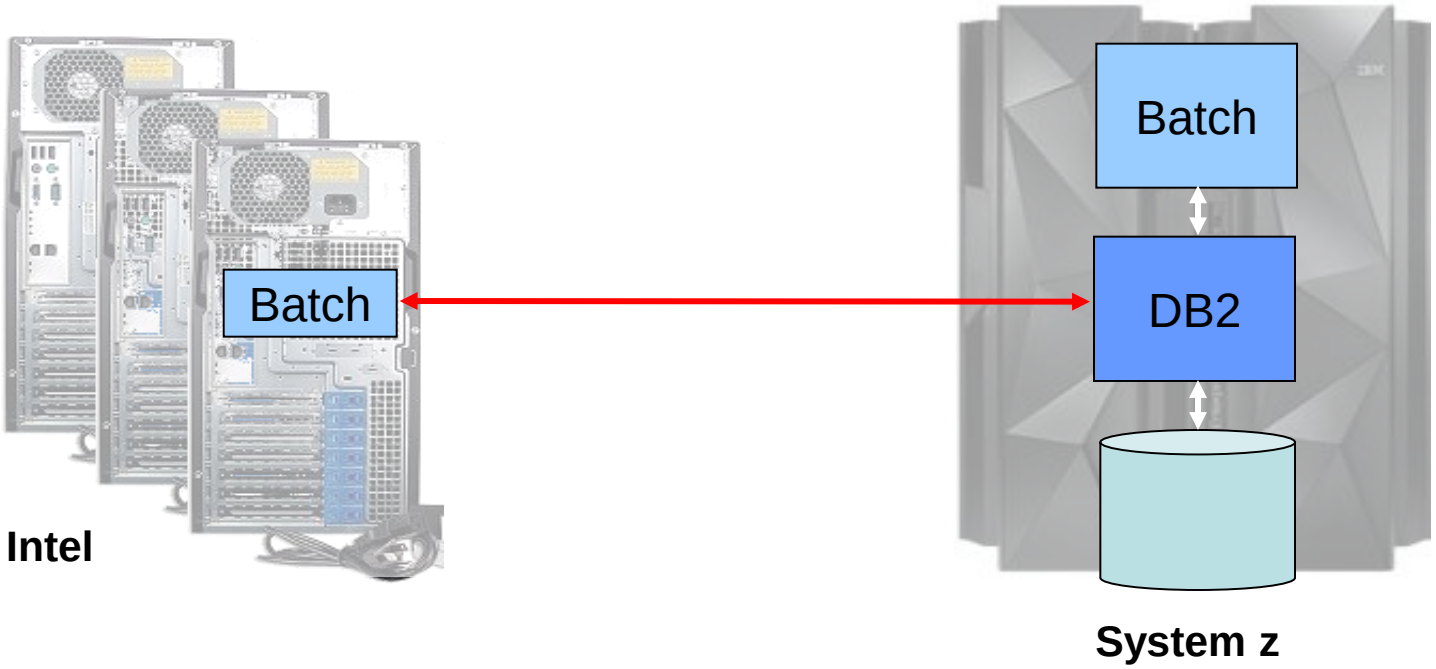
Moving Batch applications off the mainframe can have serious consequences

- Additional DRDA processing doubled mainframe CPU usage even though the application was now running on Intel
- Additional network latency dramatically increased elapsed job time (10-25x)

After:

2 Mainframe CPU usage units

10-25 Units of elapsed job time



Large systems with centralized management deliver better labor productivity

Large US Insurance Company

HP Servers + ISV

Production Servers
HP 9000 Superdome RP4440
HP Integrity RX6600

Dev/Test Servers
HP 9000 Superdome RP5470
HP Integrity RX6600

Claims per year **327,652**

$0.12 per claim

$0.79 per claim

Mainframe support staff has 6.6x better productivity

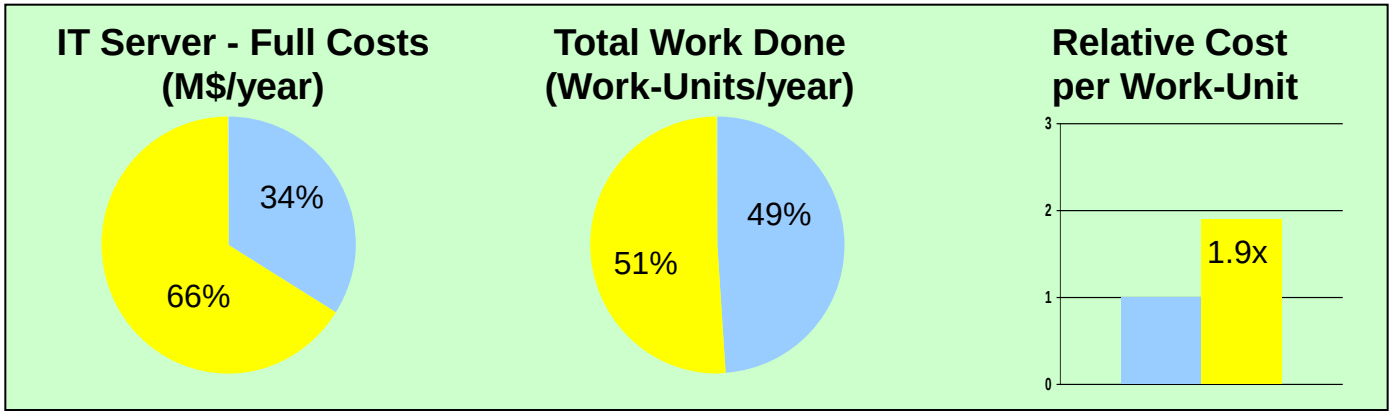
IBM System z CICS/DB2

Total MIPS **11,302**

MIPS used for commercial claims processing prod/dev/test **2,418**

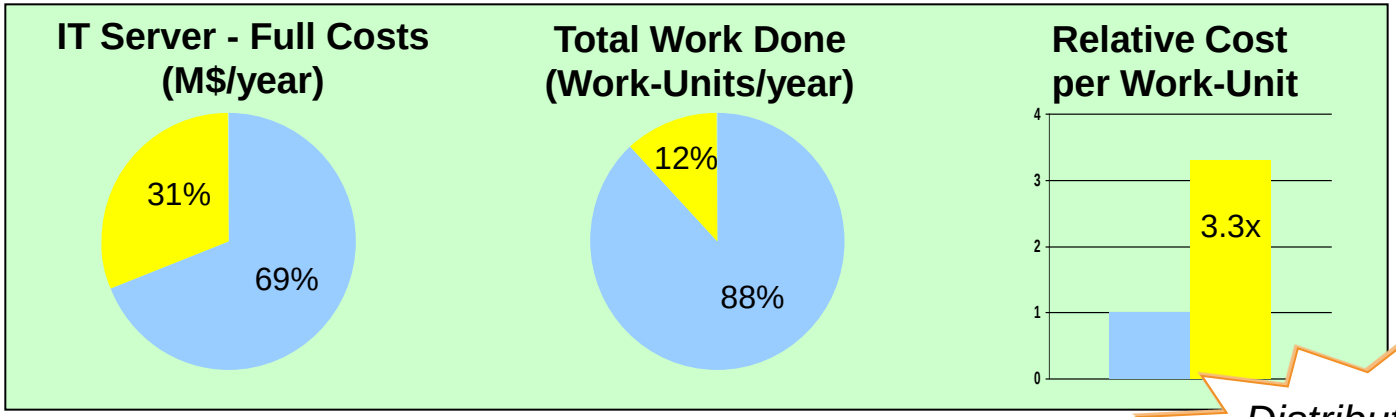
Claims per year **4,056,000**

Cost per unit of work is much lower for the mainframe than for distributed platforms



Case 1:
Very large retail bank – total of service delivery plus application development

Mainly UNIX distributed (>5000 servers)



Mainframe

Distributed

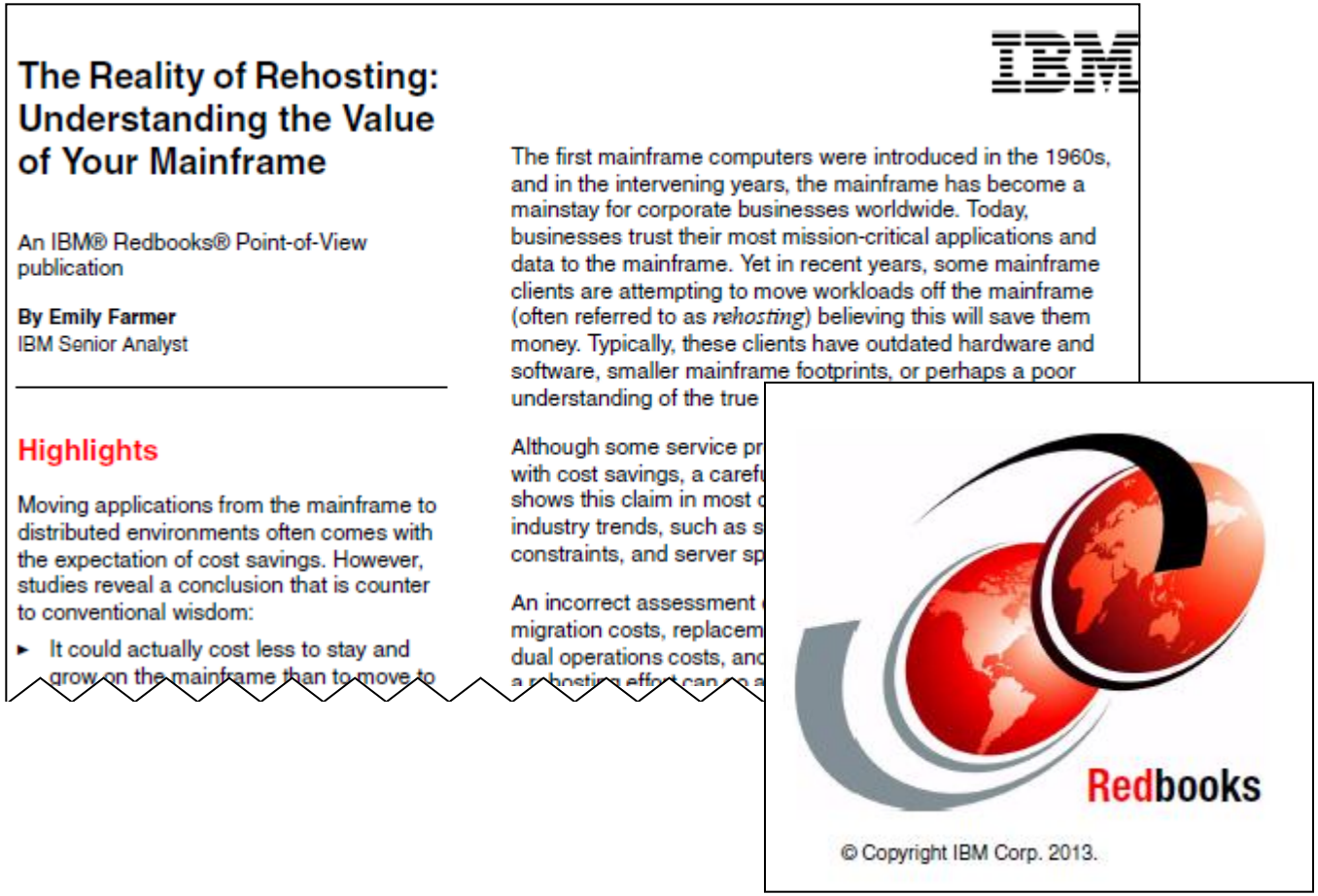
Case :
Medium retail bank service delivery only. Mainly mainframe
2,500 MIPS, 13M txns/day.
Limited distributed servers
Windows + some UNIX
(~350 servers, 12% util'n)

*Distributed cost is **2-3x** more than mainframe!*

Data from 3Q06 Scorpion studies

For more information on TCO and “The Reality of Rehosting”, see…

http://www.redbooks.ibm.com/redpapers/pdfs/redp5032.pdf



The Reality of Rehosting: Understanding the Value of Your Mainframe

An IBM® Redbooks® Point-of-View publication

By Emily Farmer
IBM Senior Analyst

Highlights

Moving applications from the mainframe to distributed environments often comes with the expectation of cost savings. However, studies reveal a conclusion that is counter to conventional wisdom:

- It could actually cost less to stay and grow on the mainframe than to move to

The first mainframe computers were introduced in the 1960s, and in the intervening years, the mainframe has become a mainstay for corporate businesses worldwide. Today, businesses trust their most mission-critical applications and data to the mainframe. Yet in recent years, some mainframe clients are attempting to move workloads off the mainframe (often referred to as *rehosting*) believing this will save them money. Typically, these clients have outdated hardware and software, smaller mainframe footprints, or perhaps a poor understanding of the true

Although some service pr
with cost savings, a carefu
shows this claim in most c
industry trends, such as s
constraints, and server sp

An incorrect assessment
migration costs, replacem
dual operations costs, and

Redbooks

Summary

IBM zEnterprise EC12

IBM zEnterprise BC12

IBM zEnterprise is leading the way!

- Still the best platform for critical data and transaction workloads
- Runs a complete portfolio of business analytics
  - Add the DB2 Analytics Accelerator for the world's fastest analytics
- Advanced by integrated development and test tools from Rational
- With Linux and z/VM, provides a low-cost consolidation and virtualization platform that is ideal for private cloud computing
- Consistently provides lowest Total Cost of Ownership. as evidenced by numerous Eagle team studies