zEnterprise – An Ideal Basis For Smarter Computing

The Reality Of Rehosting

Competitors Tell Stories

Your competitor says I can save money by moving workloads off z196

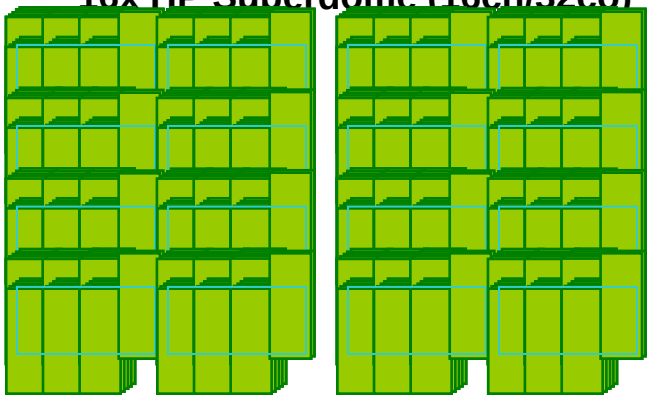
CIO

Our competitor's claims are often false….We've shown several cases where z196 was the lowest cost platform for core business workloads

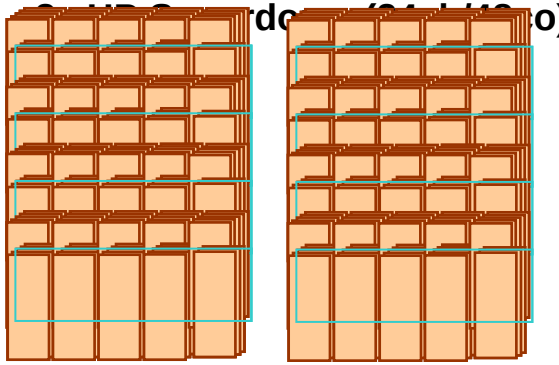
IBM

Core Proliferation For A Large Workload

BaNCS Application Servers:
16x HP Superdome (16ch/32co)



BaNCS Database Servers:



49 processors
(41 GPs + 8 zIIPs)
(39,112 MIPS)

896 processors
(3,668,600 PerfUnits)

18x more cores

TCS BaNCS
1x z196-741
with 8 zIIPs

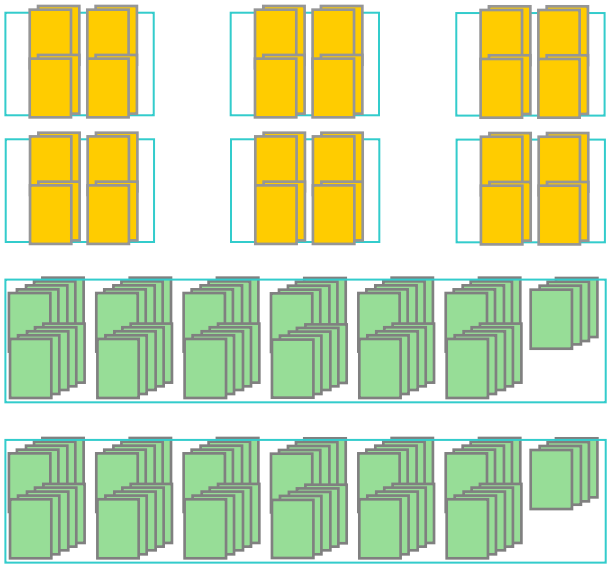
Total (5yr TCA) **$180M**

Total (5yr TCA) **$110M**

NOTE: To cover DEV/QA capacity, add 100% servers for distributed servers, add 25% MIPS (8,000) to System z

Core Proliferation For A Mid-sized Offload Project

6x 8-way Production / Dev
2x 64-way Production / Dev
Application/MQ/DB2/Dev partitions



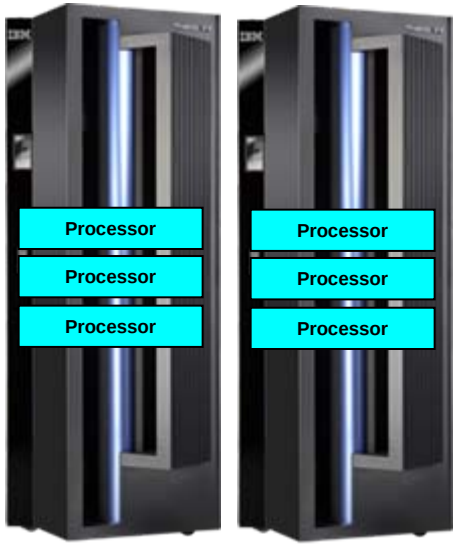
$25.4M TCO (5yr)

6 processors
(1,660 MIPS)

176 processors

(800,072 Performance units)

2x z900 3-way Production / Dev / QA / Test



$17.9M TCO (5yr)

482 Performance Units per MIPS

Is There A Cross-Over Point?

Is a 500 MIPS workload small enough to offload from System z?

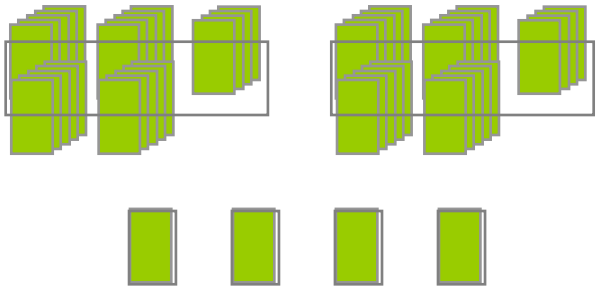
CIO

It depends on the ***nature*** of the workload, rather than the ***size***!

IBM

Core Proliferation For A Small Offload Project

2x 16-way Production / Dev / Test / Education
App, DB, Security, Print and Monitoring
4x 1-way Admin / Provisioning / Batch Scheduling

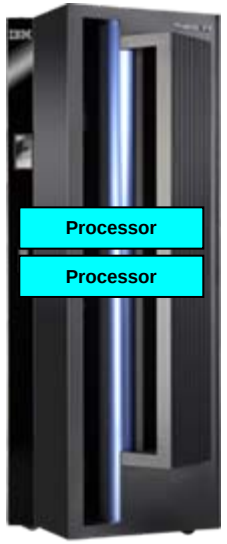


0.88 processors
(332 MIPS)

36 Unix processors
(222,292 Performance Units)

$17.9M TCO (4yr)

z890 2-way Production / Dev / Test / Education
App, DB, Security, Print, Admin & Monitoring



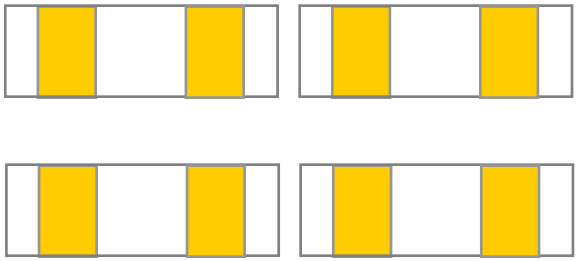
$4.9M TCO (4yr)

Plus:
2x HP SAN Servers (existing)
Many (existing) Windows servers

670 Performance Units per MIPS
No Disaster Recovery

Core Proliferation For A Smaller Offload Project

4x p550 (1ch/2co)
Application and DB



1x z890
(production + test)

0.24 processors
(88 MIPS)

8 Unix processors
(43,884 Performance Units)

$8.1M TCO (5yr)

$4.7M TCO (5yr)

499 Performance Units per MIPS

Migration duration 3 years

What Is System z Optimized For?

- Transaction processing and master data base
  - Linear scalability with Parallel Sysplex and streamlined middleware
- High I/O bandwidth workloads like batch
  - Dedicated I/O processing plus DS8000 and Easy Tier
- Making full use of processing resources
  - Intelligent prioritization of multiple workloads to service objectives, reduced TCO
- Efficient system management tools
  - Hard to replace equivalent function in distributed environments
- Ultra-high availability
  - Multi-layered strategy for reliability and serviceability
- Business critical workloads
  - Centralized data mirroring and systematic disaster recovery
- Easy growth in processing capacity
  - Elastic scaling through Capacity On Demand
- Strong security to protect data
  - Centralized, universal Resource Access Control Facility (RACF)

Moving Transaction Processing Off System z Rarely Reduces Cost

Typical Eagle TCO Study For A Financial Services Customer

4 HP Proliant DL 980 G7 servers

Production

Development

256 cores total

Hardware	$1.6M
Software	$80.6M
Labor (additional)	$8.3M
Power and cooling	$0.04M
Space	$0.08M
Disaster Recovery	$4.2M
Migration Labor	$24M
Parallel Mainframe costs	$31.5M
Total (5yr TCO)	**$150M**

System z z/OS Sysplex

2,800 MIPS

Hardware	$1.4M
Software	$49.7M
Labor	Baseline
Power and cooling	$0.03M
Space	$0.08M
Disaster recovery	$1.3M
Total (5yr TCO)	**$52M**

65% less

Some Typical Eagle Studies Under 3,000 MIPS – Most Stayed On System z

Customer	z (MIPS)	distributed (PUs)	5-Year TCO z	5-Year TCO distributed	5-Year TCO z/dist %
Average	**1,166**	**218,472**	**9,050,451**	**16,325,492**	
SA Government Agency	475	241,291	19,773,442	25,261,624	78.27%
German Financial	1,200	263,177	3,939,889	4,701,033	83.81%
NA Financial Servieces	2,526	308,144	3,456,611	5,939,476	58.20%
US utility company	456	163744	6,157,295	13,380,866	46.02%
European Insurance	904	171,062	13,019,980	15,877,484	82.00%
US Manufacturor	900	453,168	11,277,266	16,019,269	70.40%
Asian Bank	1,416	136,013	2,342,300	7,237,681	32.36%
US Retailer	1,700	215,124	3,543,154	8,951,851	39.58%
US County Government	88	43,884	4,717,394	8,108,668	58.18%
US Retailer	1,500	184,732	9,254,186	20,861,515	44.36%
AP bank	1,336	168,113	17,300,000	27,200,000	63.60%
AP bank	300	24,162	5,200,000	11,500,000	45.22%
US Manufacture	1,917	261,040	4,758,313	7,350,216	64.74%
US Food Services	1,600	424,952	21,966,475	56,167,206	39.11%

Typical Decision Factors: Cost and Risk

Re-hosting Dynamics

- Competitors team up to promise substantial cost savings by offloading
  - Oracle, HP, Micro Focus, Clerity, TmaxSoft, Microsoft…
  - Projections of cost savings and benefits are unproven
  - Benefits of successful projects often glorified

- Clients likely to be approached for re-hosting
  - Outdated hardware and software (less cost-effective)
  - Smaller footprints
  - Poor understanding of mainframe cost and value
    - Inaccurate charge backs
    - High mainframe costs due to high cost ISV software
    - Failure to exploit price concessions (e.g., specialty engines)

What Happens When You Try To Move A Best-Fit Workload On System z To Another Platform?

1. Core Proliferation
   - Long-term costs go up
2. Missing Function and Processes
   - Long-term costs go up
3. Sub-optimized Performance
   - Long-term costs go up
4. Risks – Failure, Delay, Degraded Qualities Of Service
   - Business case does not close

Bottom line – you spend MORE, not less

1. Why Core Proliferation Happens

- De-consolidation of applications to dedicated servers
  - Dedicated servers for functional roles - application, database, security, batch, systems management
  - Separate servers for production, development, quality assurance test
  - Low utilization due to provisioning for the peak on each server and pre-provisioning for growth
- Disaster Recovery
  - 100% coverage doubles the number of cores required
- Processing comparisons
  - Mainframe has dedicated processors for I/O operations, distributed does not
  - Language expansion (CICS/COBOL path lengths are highly optimized)
  - Converting IMS hierarchical database to relational results in a 3x expansion
  - Zero network on mainframe reduces computation (and latency)

2. Missing Function

- No distributed alternatives to handle large transactional workloads against a single-image database
  - Oracle RAC has a “glass ceiling” on scalability
- Systematic error and disaster recovery is not well-supported in distributed environments
  - HyperSwap, scripted failover, system automation may be missing
  - No discounts for dark standby processors
- Storage capabilities of DFSMS and DS8000 may be missing
  - Shared virtualized storage across a sysplex environment
  - Hierarchical Storage Management, Hyper Swap disk mirroring, Easy Tier SSD optimization

More Missing Function

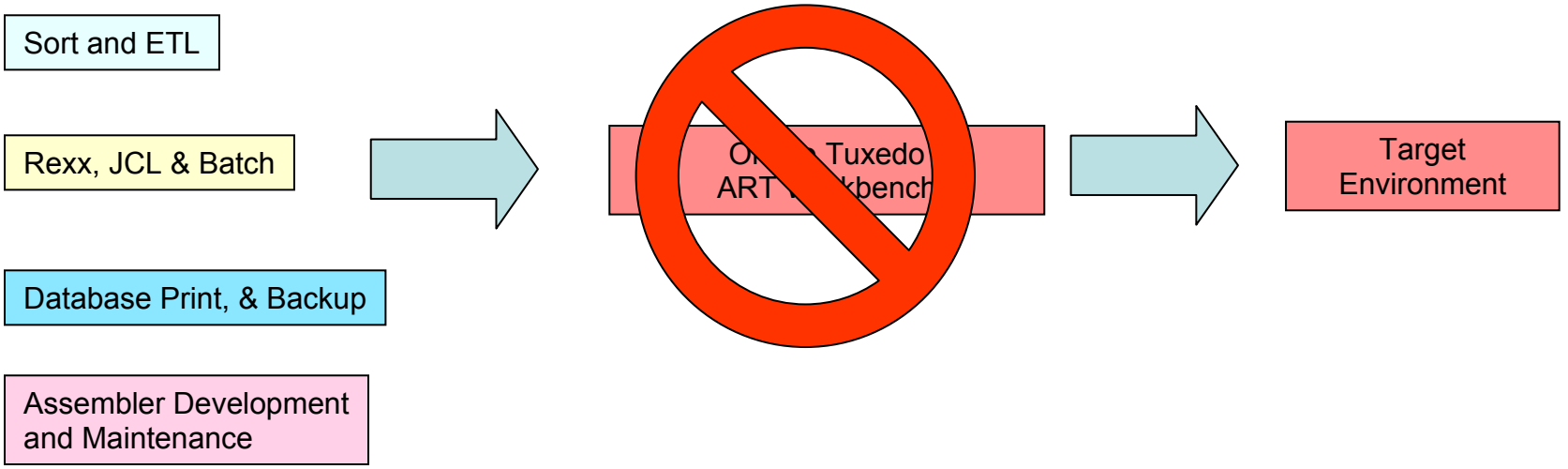
- Replacement technologies aren't always available
  - Hierarchical data base
    - IMS DB and IMS DC
  - Languages
    - PL/I, ASM …
  - Batch environments
    - JCL with symbolic substitution, batch pipes, Generation Data Group files for batch recovery
    - Scheduling capability
  - System management and database tools
  - 3270-style user interfaces, BMS maps, APIs…
  - File structures
    - VSAM, QSAM and Partitioned Data Sets
  - Print
    - PSF, AFP, Info Print Server, JES2/3 spool

Missing Systems Management Function

- Case Study (US retailer):
  - 200 system management products used on the mainframe
  - Only 15 of them had distributed replacements (7.5% coverage)
  - Cost of those 15 products was $8.4M OTC plus $1.8M annual
  - Distributed system management pricing is generally based on the number of cores to be managed
- Case Study (another US retailer):
  - 261 system management products used on the mainframe
  - Initial analysis showed only 53 had distributed equivalents (20% coverage)
- Additional hidden costs:
  - Finding a replacement product
  - Re-writing the applications to not need it
  - Write code to perform the function from scratch
  - Adding operations labor to manually do the function
  - Adding hardware and software to run the additional code in the re-write
  - Adding hardware and software to run code written from scratch

All Functional Elements Must Be Considered

- Rehosting proposal to a major Bank
  - Tools to migrate CICS and BATCH, but no tools for major z/OS utilities

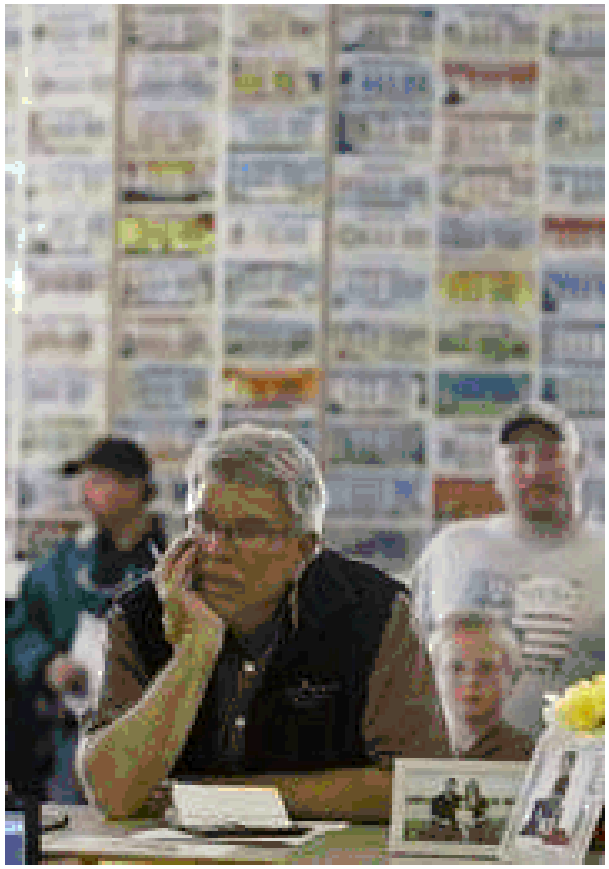


- Better understanding of z/OS and Mainframe Architecture needed

Source: https://forums.oracle.com/forums/thread.jspa?threadID=2296851&tstart=0

3. Sub-Optimized Performance

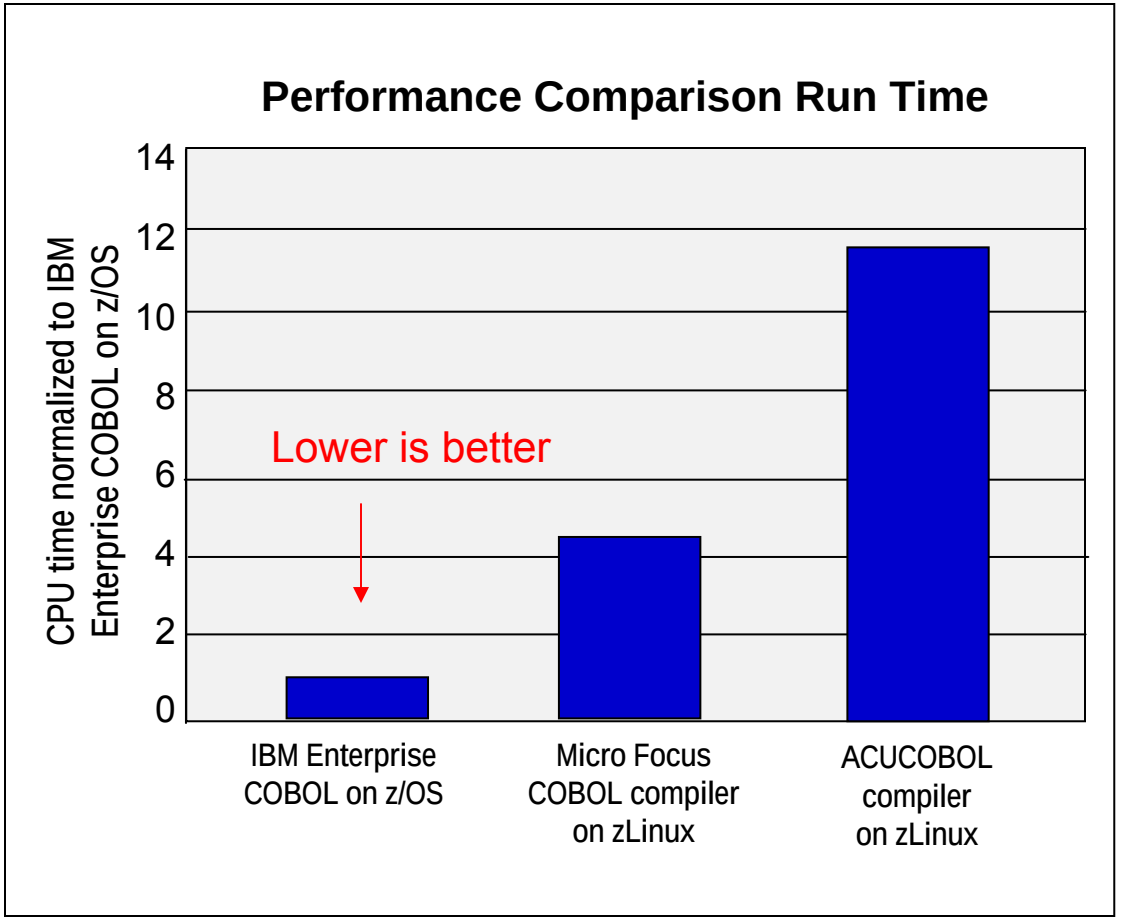
- Offload project to move State of Montana Department of Motor Vehicles license registration system (MERLIN) from CICS to Microsoft
- Performed by Microsoft and Bearing Point
- CICS solid sub-second response times
- Microsoft 30 second response times
- Cost of project $28.3M, 3 years late



"Transferring titles is taking two to three hours instead 15 minutes," Anderson said. One employee told him she had never heard so many "four-letter words" from customers.

COBOL Recompiled With Micro Focus Had Inferior Performance

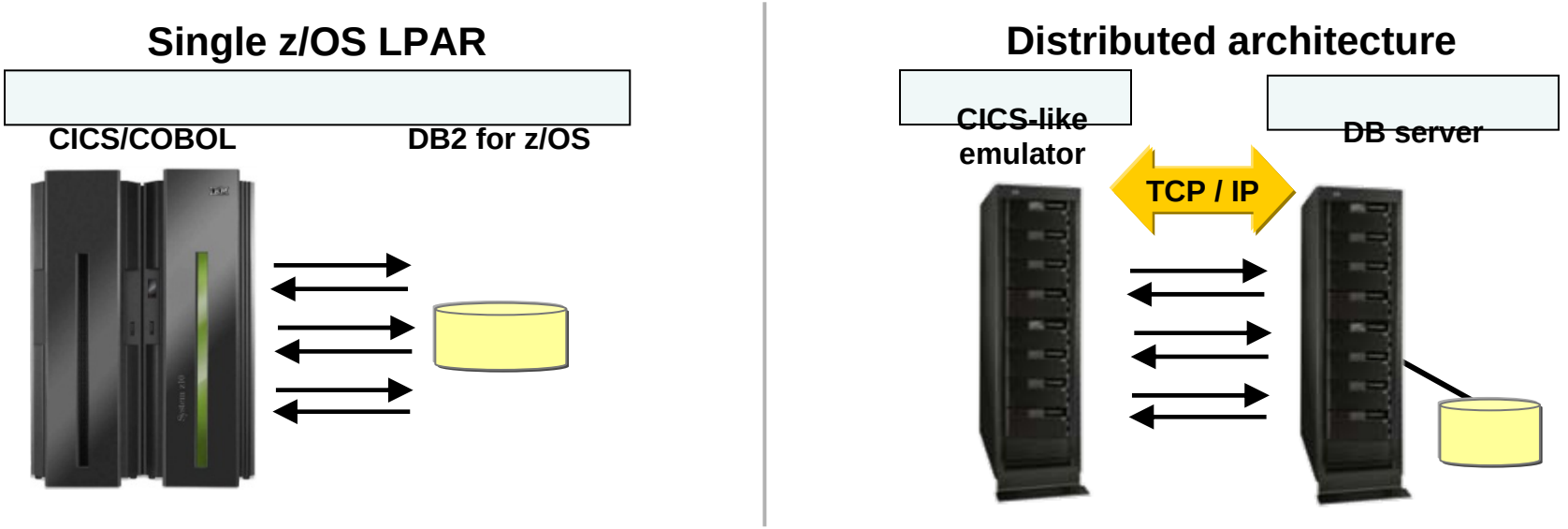
- Offloads require a different COBOL compiler
- IBM Enterprise COBOL on z/OS performed best in customer benchmarks
- Micro Focus COBOL is a COBOL interpreter, so code is over 4.5 times less efficient
- ACUCOBOL, a compiler acquired by Micro Focus, was 12 times less efficient
- Micro Focus functional differences required additional debugging



Internal customer study

Some Applications Originally Designed With Co-located Data

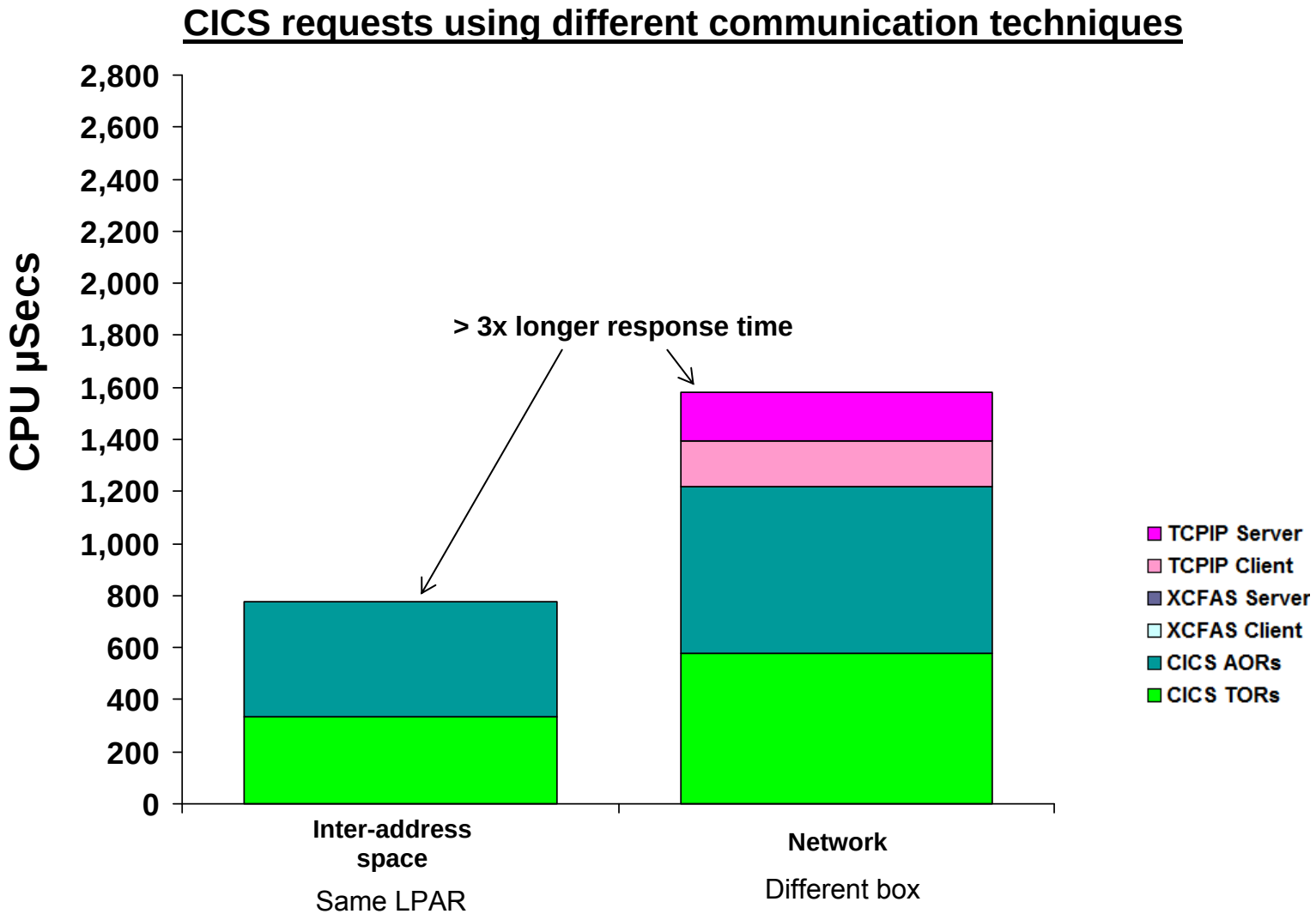
- A large insurance company rehosted a portion of an application as a Proof Of Concept
  - *"When folks wrote screen-based transactions many years ago, they wrote it at a business function viewpoint…"* = very 'chatty' (and no separation of presentation, business logic, data logic)
  - SQL suboptimized for networking (comms performance wasn't originally an issue)
- Various tuning/tweaking done for several months, but ultimately the POC was stopped
- TCP/IP stack consumes considerable CPU overhead/resource AND introduces security considerations (firewalls …) and latency (network delay)



Some transactions are not easily moved

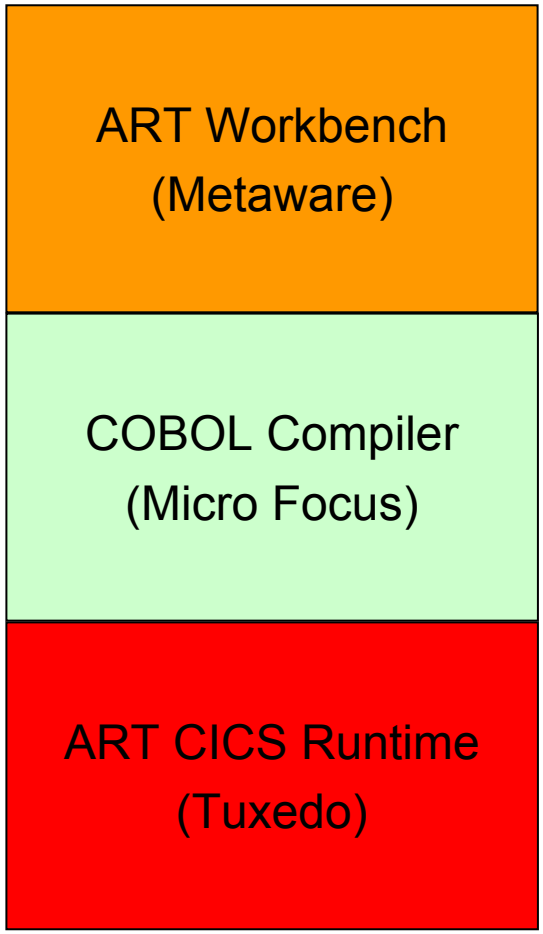
Source: Phil Murphy, Forrester Research

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

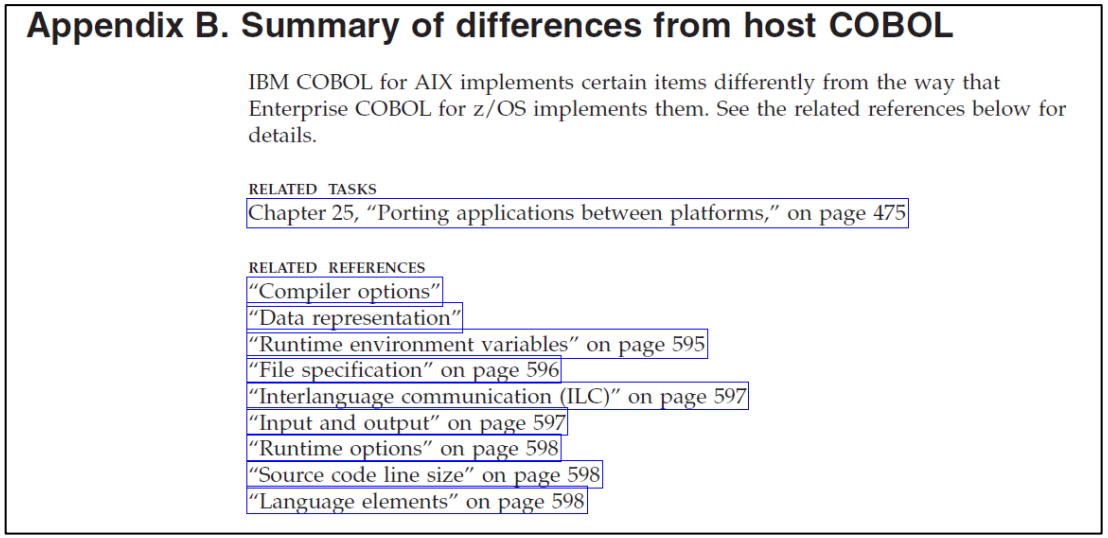
4. Risk Of Migration Failure – Tuxedo ART



- Workbench:
  - Workarounds needed for certain migration tasks
  - Incorrect code generated that leads to compilation problems
- Micro Focus Compiler/Runtime:
  - Poor integration with Tuxedo
  - Very limited scope of debugging when running on Tuxedo
- ART CICS Runtime
  - Service crashes with memory errors
  - Behavior of application not the same after porting

Compiler Differences May Lead To Changed Behavior

- Even the closest COBOL compiler has differences:



Appendix B. Summary of differences from host COBOL

IBM COBOL for AIX implements certain items differently from the way that Enterprise COBOL for z/OS implements them. See the related references below for details.

RELATED TASKS

Chapter 25, "Porting applications between platforms," on page 475

RELATED REFERENCES

"Compiler options"
"Data representation"
"Runtime environment variables" on page 595
"File specification" on page 596
"Interlanguage communication (ILC)" on page 597
"Input and output" on page 597
"Runtime options" on page 598
"Source code line size" on page 598
"Language elements" on page 598

From SC27-3601-00 http://publib.boulder.ibm.com/epubs/pdf/cob4pg00.pdf

Potential collation problems (EBCDIC vs. ASCII) especially with VSAM keys

- What about Micro Focus COBOL?
  - *"Indeed, some of the Micro Focus COBOL compiler options do change the behavior of the executed code."*
    http://download.oracle.com/docs/cd/E18050_01/artwb/docs11gr1/wbref/CobolConverter.html

Risk Of Migration Failure

Lombard Canada Ltd., one of the oldest property and casualty insurance operations in Canada, partnered with Micro Focus to replace old mainframe

- 200 MIPS S/390
- CICS, COBOL, VSAM, DB2

"We estimate this project will save us in excess of $1 million a year, but more importantly, it will enable us to become more competitive in our industry both today and in the future."

VP of IT
Lombard Canada Ltd., 2005

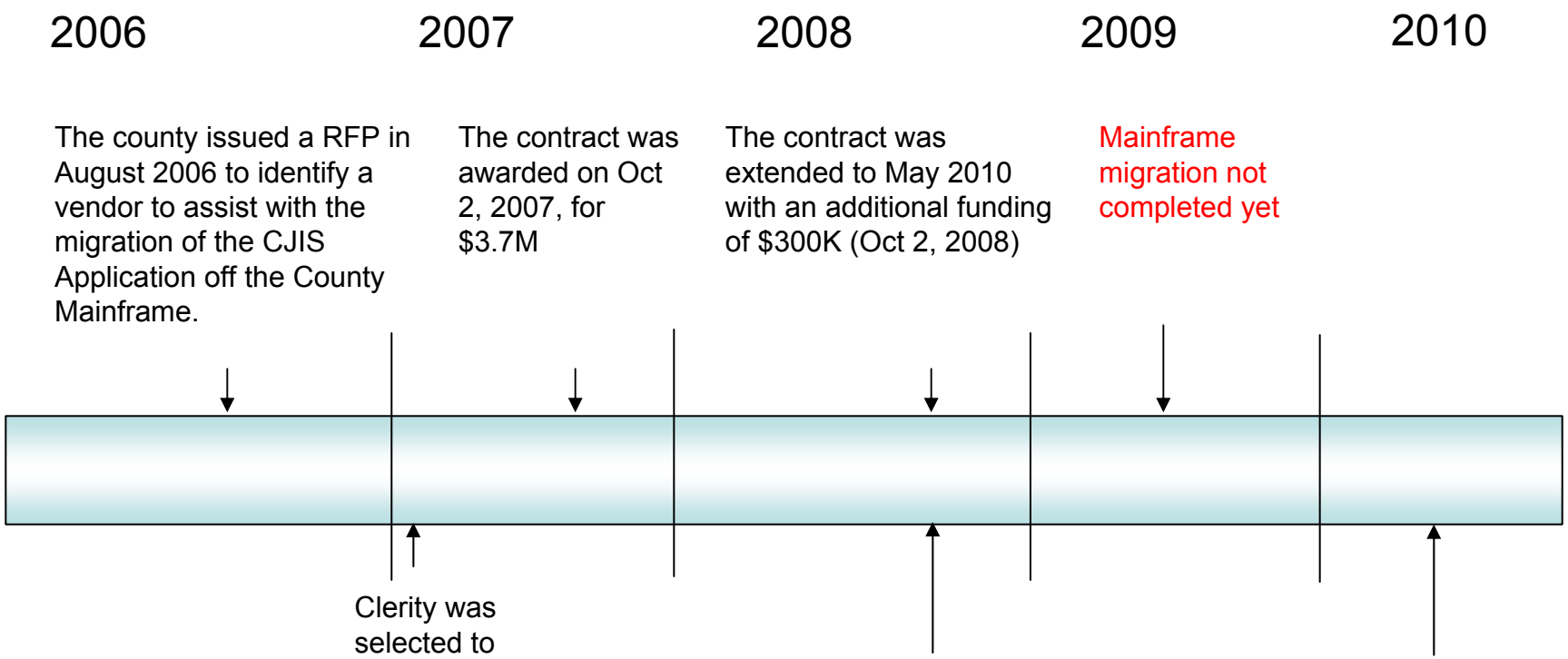
Project abandoned in 2006:

- System Integrator and Micro Focus did not have the skills
- Lombard spent millions on conversion with no results
- VP lost his position
- Installed a new z890 platform and re-architected front end to access CICS
- New VP stated Disaster Recovery capability of System z as a key benefit

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

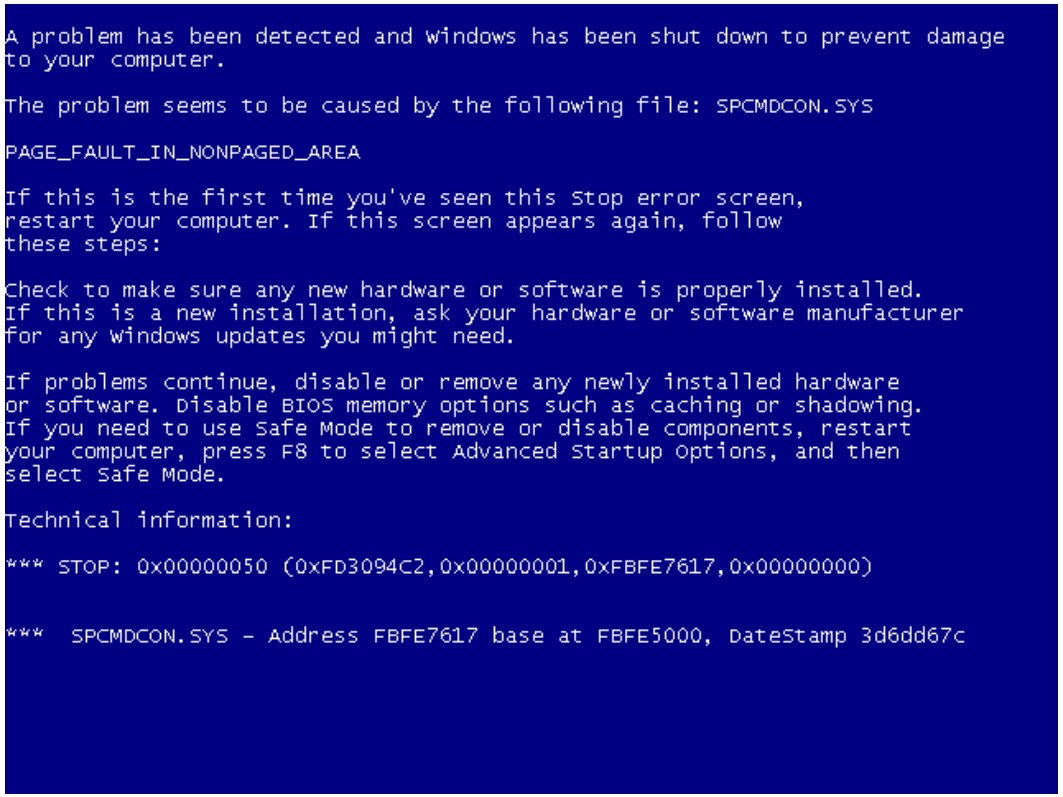
Project Delays Can Be Greater Than Anticipated

US County Government Offload Project Delayed By Complexity



Degraded Qualities – Risk Of Code Stability

- Mature System z software is very stable
- Some distributed software is not



Familiar Microsoft “Blue Screen Of Death”

Degraded Qualities – Patching, Security

DB2 for z/OS Security

- Less than 10 security-related patches in the last 10 years

Oracle's Security Exposures

- Oracle.com – January 2012
  78 security patches, including **2** for the database
- Oracle.com – October 2011
  57 security patches, including **5** for the database
- Oracle.com – July 2011
  78 security patches, including **13** for the database
- Oracle.com – April 2011
  73 security patches, including **6** for the database

In the last year Oracle has issued 286 security patches, 26 for the database

Source: http://www.oracle.com/technetwork/topics/security

Case Study – A Recent Migration Attempt

Let's see what problems come to light in a recent migration attempt using Clerity Unikix and Microfocus Cobol

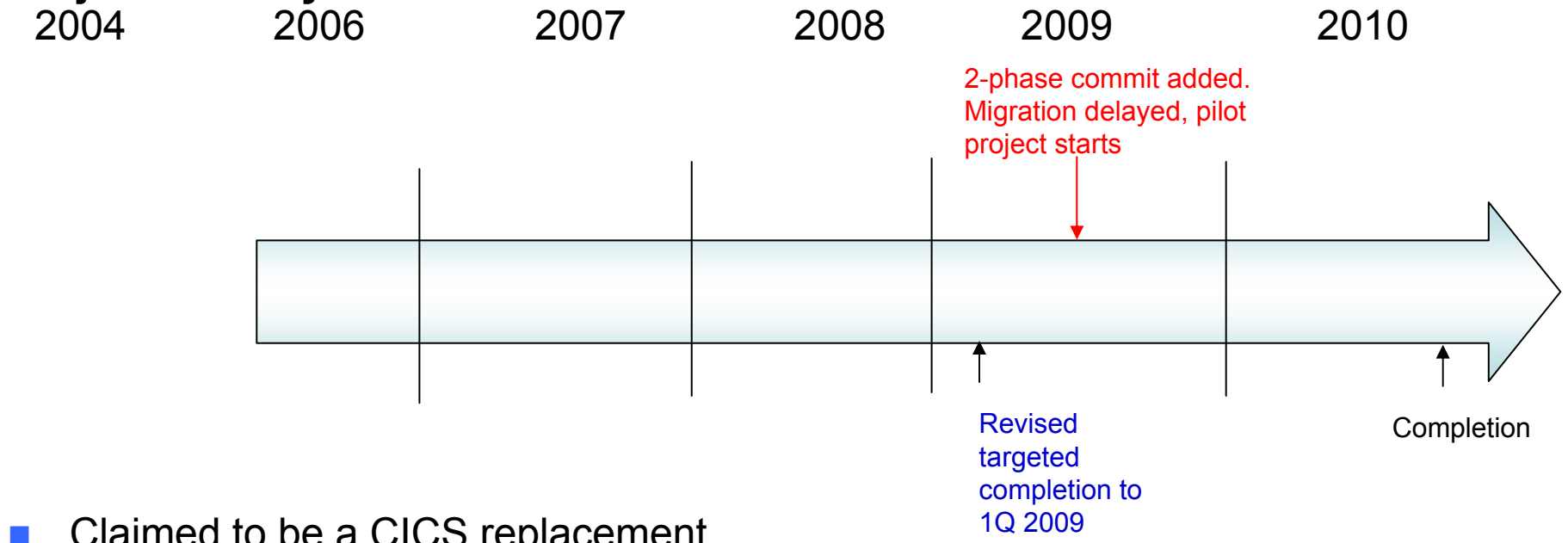
IBM

Customer Feedback Confirms The Following

1. Core proliferation
   - 6X core growth
   - Utilization rate dropped from 100% to 75%
2. Missing Function
   - Micro Focus COBOL integrating/debugging problems
   - 2,500 COBOL lines changed in 50 programs AND all Assembler rewritten
3. Sub-optimized performance
   - Micro Focus COBOL compiler less efficient and required more hardware
4. Risk Of Failure, Delays
   - Qualities of Service (Non Functional Requirements) compromised
   - Very costly extensive testing by professionals to protect against subsequent customer problems
   - First attempt failed using different COBOL compiler
   - This type of migration using UniKix had never been done before

Delays Greater Than Anticipated

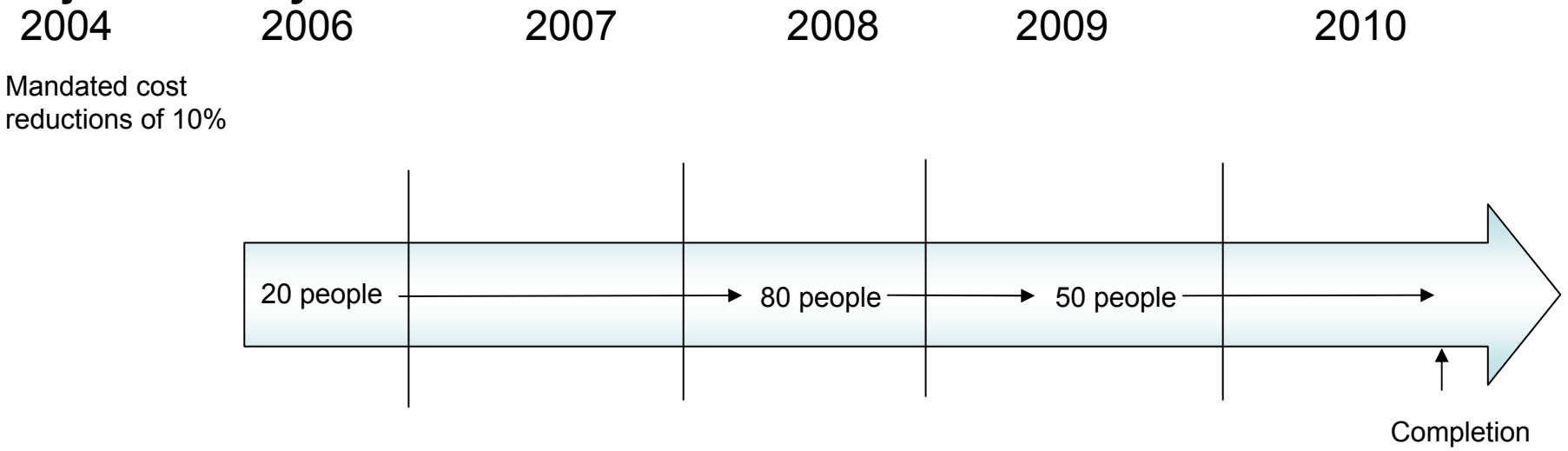
Project History



- Claimed to be a CICS replacement
- Project delay upon discovery of missing 2-phase commit support
- 3+ months to switch compilers (estimated $1M labor)
- Change-management issues

Bottom Line: Actual Costs Increased

Project History



- 170 person years @ $100K/PY **$17M to migrate, $19.6M with hw/sw**
- Best-case estimate savings on operating cost **$0.77M per year**
- Payback > **29 years**
- Better to have invested the money in the financial markets!

Conclusions

- Offloading existing System z workloads rarely saves money, often increases risk, and freezes innovation
- Instead, zEnterprise enables a new strategy for cost reduction
  - Consolidate peripheral workloads using fit for purpose assignments to reduce cost of acquisition
  - Multiple virtualized architectures managed as a single system reduces operational costs
  - Private cloud capabilities
  - No other vendor offers these capabilities