METIS | MANAGEMENT CONSULTING

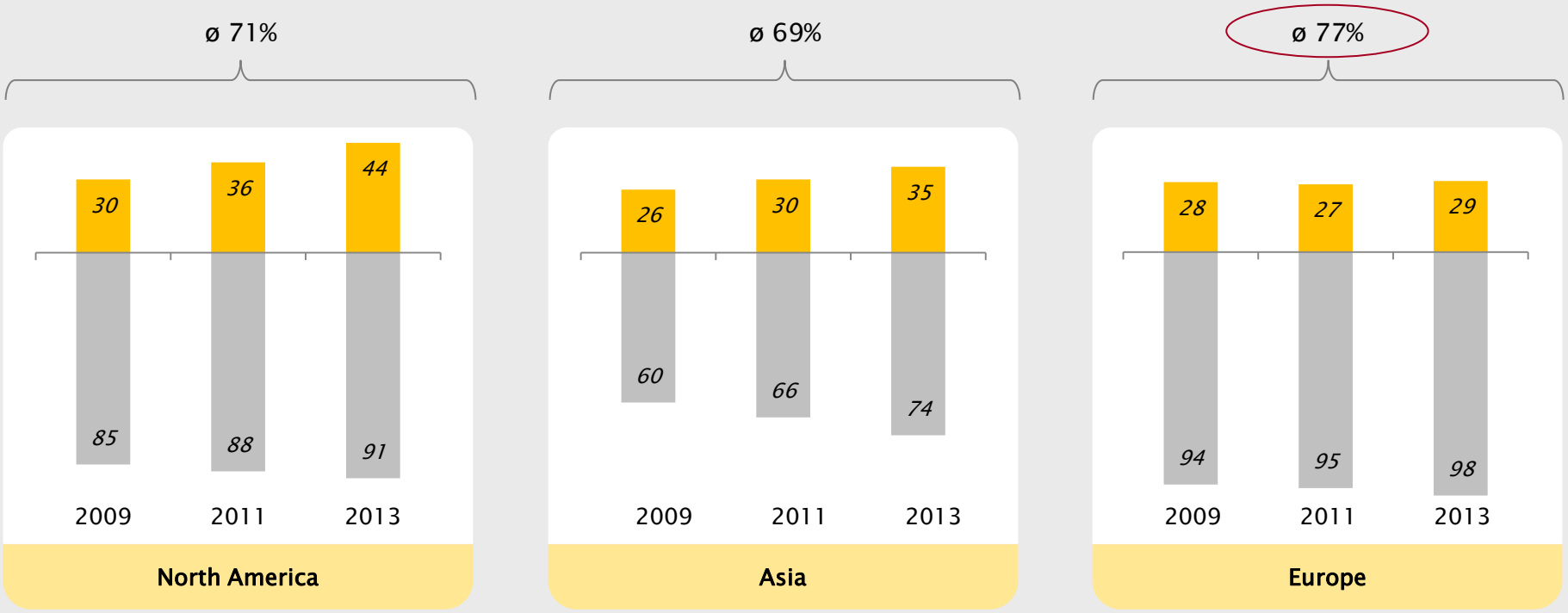
Re-Hosting Mainframe Applications

Munich, July 2012

In comparison to North America and Asia, European financial service industry's maintenance share of total IT budget is the highest

IT Expenditure in Financial Services

Maintenance share of total IT budget in percentage:[1)]



Source: Celent (2011), METIS Analysis

[1)]Absolute numbers in bn USD

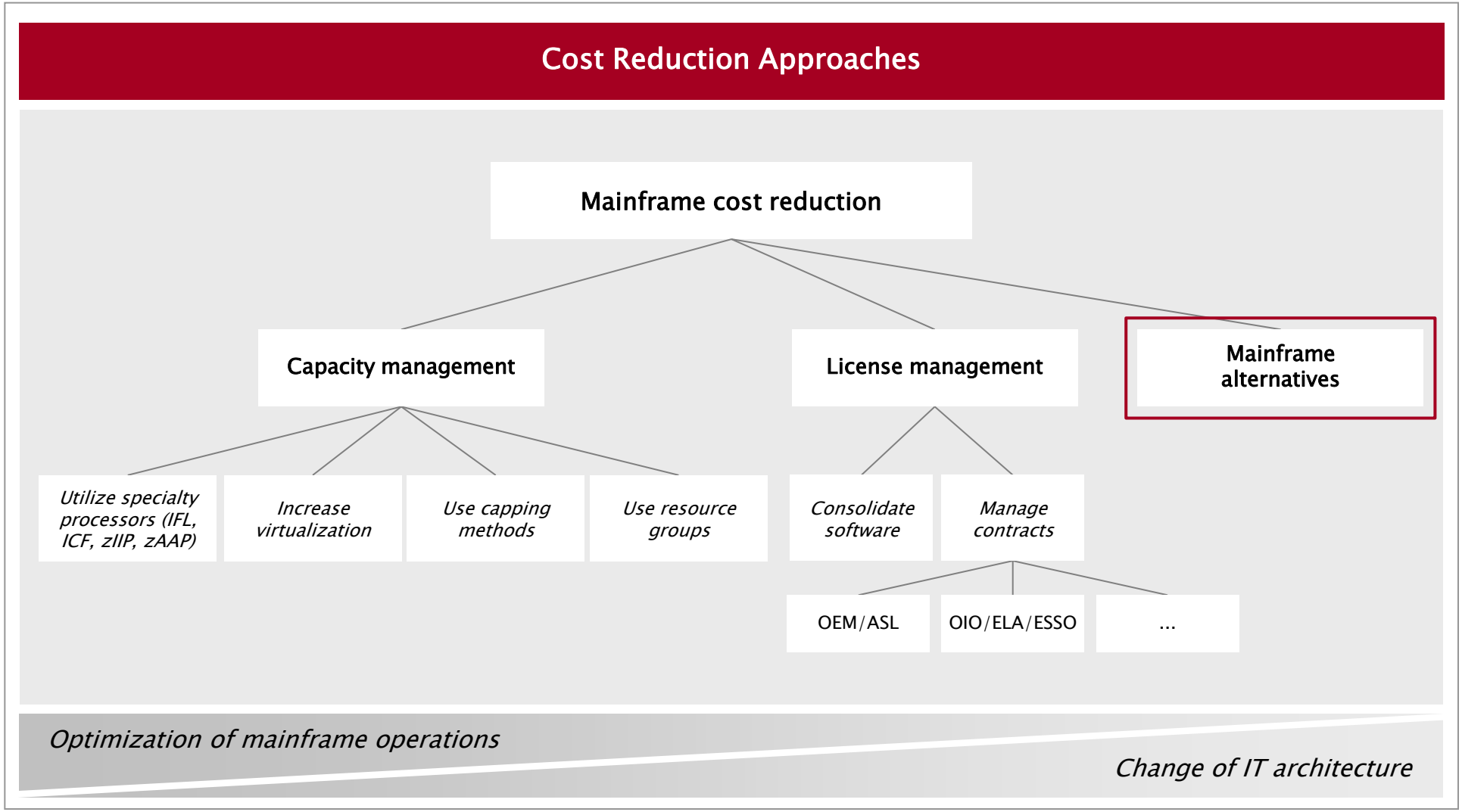
Most financial service companies have already utilized traditional IT cost reduction levers

Cost Reduction Levers

Optimization levers		Time to realize: Quick wins	Time to realize: Short/medium term	Time to realize: Long term
Technology and architecture	**Lever 1:** Architecture complexity & utilization	▪ Life cycle/investment cycle optimization ▪ Decommissioning of duplicate/ unused applications ▪ Volume adjustments (hard- & software	▪ Standardization ▪ Virtualization (servers & desktops) ▪ Consolidation of storage, WAN ▪ Load optimization (server, storage, space)	▪ Front-to-back complexity reduction ▪ Application utilities ▪ Architecture optimization
Services, processes, and organization	**Lever 2:** Service level appropriateness	▪ Tiered service levels ▪ Service level adjustment	▪ Service differentiation	
	Lever 3: IT process effectiveness	▪ Billing optimization ▪ Optimization of the project portfolio	▪ Output adjustment ▪ Process optimization	▪ IT supply-portfolio optimization ▪ Optimization demand management/governance ▪ Industry utilities
	Lever 4: Procurement optimization	▪ Re-negotiation of procurement contracts ▪ Software license & asset management	▪ Strategic procurement	
	Lever 5: Sourcing & location		▪ Out-tasking	▪ Site optimization & consolidation ▪ Outsourcing, Near shoring/off-shoring ▪ Spin-offs, legal organization redesign
Resources	**Lever 6:** IT organization effectiveness	▪ Reduction of external resources	▪ Wage adjustment ▪ Co-sourcing	▪ Joint ventures ▪ Shared services
	Lever 7: Staff productivity & utilization	▪ Resource optimization	▪ Industrialized capacity management	
	Savings potential (% of annual budget)	5%	10% – 15%	20% – 30%
	Investment need (% of annual budget)	0% – 2% (self-funding)	5% – 30% (limited investment)	50% – 150% (structural changes)

Source: Oliver Wyman, METIS Analysis

Mainframe costs are traditionally controlled by capacity or license management while mainframe alternatives constitute a more fundamental approach



Source: METIS Analysis

Mainframe environments can be altered by various approaches, which may be also combined with each other

Mainframe Alternatives	
1. Retire	▪ Applications become obsolete, critical data is still accessible to allow future use
2. Replace	▪ Replacement of individual mainframe application through standard software
3. Re-Platform	▪ Replacement of mainframe standard software through open system software
4. Re-Host	▪ Migration of the application to an open system platform by re-using the application code
5. Reengineer	▪ Redesign and develop the functionality using a modern architectural framework

Availability of appropriate software products is the basis for migrating code to an open system platform

Exemplary

Software Mapping

Function	Mainframe		Open System	
	Vendor	Product	Vendor	Product
Application Development	▪ CA Technologies	▪ AllFusion Modeling Suite	▪ MicroFocus	▪ Server Express
Programming Language	▪ IBM ▪ IBM	▪ COBOL ▪ PL/I	▪ MicroFocus ▪ MicroFocus	▪ COBOL ▪ Open PL/I
Data Services	▪ IBM ▪ CA Technologies	▪ VSAM ▪ IDMS/DC	▪ IBM ▪ Clerity Solutions, Inc	▪ C-ISAM ▪ UniKix TPE
Database	▪ IBM ▪ IBM ▪ CA Technologies	▪ IMS/DB ▪ DB2 ▪ IDMS/DB	▪ Oracle ▪ IBM ▪ Microsoft	▪ Oracle Database ▪ UDB ▪ SQL-Server
Transaction Services	▪ IBM ▪ IBM	▪ IMS/TM ▪ CICS	▪ Oracle ▪ Clerity Solutions, Inc	▪ Tuxedo ▪ UniKix TPE
Batch	▪ IBM ▪ IBM	▪ JCL ▪ REXX	▪ Clerity Solutions, Inc ▪ The Workstation Group	▪ UniKix BPE JCL Translator ▪ Uni-REXX
Scheduler	▪ CA Technologies ▪ IBM ▪ BMC	▪ CA-7 ▪ Tivoli Workload Scheduler ▪ Control-M	▪ ORSYP ▪ Clerity Solutions, Inc	▪ Dollar Universe ▪ UniKix BPE
Report Generator	▪ CA Technologies ▪ IBM	▪ Easytrieve Plus ▪ IBM RMF	▪ Mergilent	▪ Easytrieve to COBOL
Security	▪ IBM ▪ CA Technologies	▪ RACF ▪ ACF2	▪ Clerity Solutions, Inc	▪ UniKixSecure

Source: METIS Analysis

Massively increased performance requirements led NYSE Euronext in 2007 to thoroughly review the mainframe environment of its shared data center

Challenges

- 400% rise in transaction volume over the past 2 years
- Regulatory challenges and algorithmic trading
- Mainframe costs are increasingly unattractive in comparison to open systems

Application

- Managed service of NYSE for multiple market participants
- Post trade services, trade monitoring, reconciliation, regulatory compliance
- Self developed COBOL applications
- Size of total application >10m LoC[1)]
- Data handling >3.5 TB[2)] per month

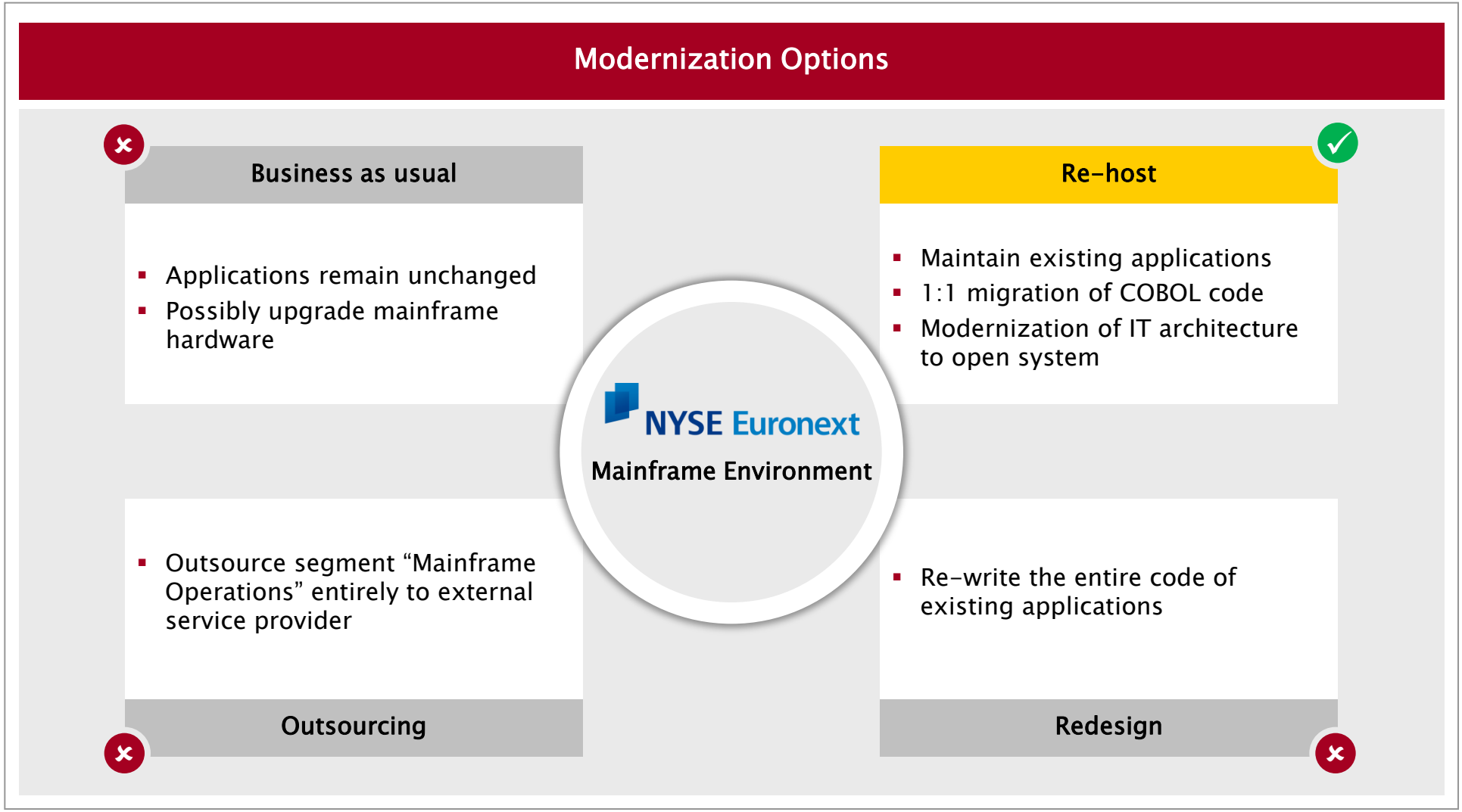
System Platform

- IBM parallel sysplex mainframe complex (2 sites with 5 LPARs)[3)]
- Computing power of 1.660 MIPS
- Server with independent, own power supply
- Data replication in real time

Source: NYSE (2008), METIS Analysis

[1)]LoC = Lines of Code; [2)]TB = Terabyte; [3)]LPAR = Logical Partition

NYSE selected re-hosting as the best modernization option available in light of investment, return and project risk

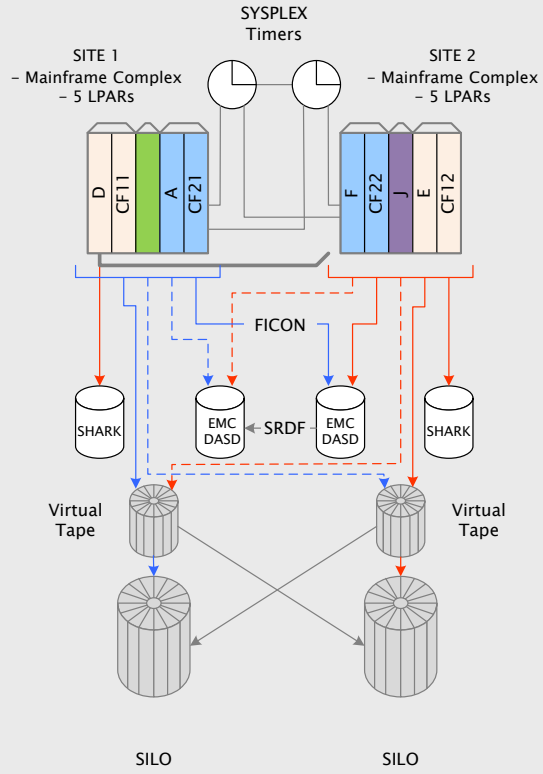


Source: NYSE (2008), METIS Analysis

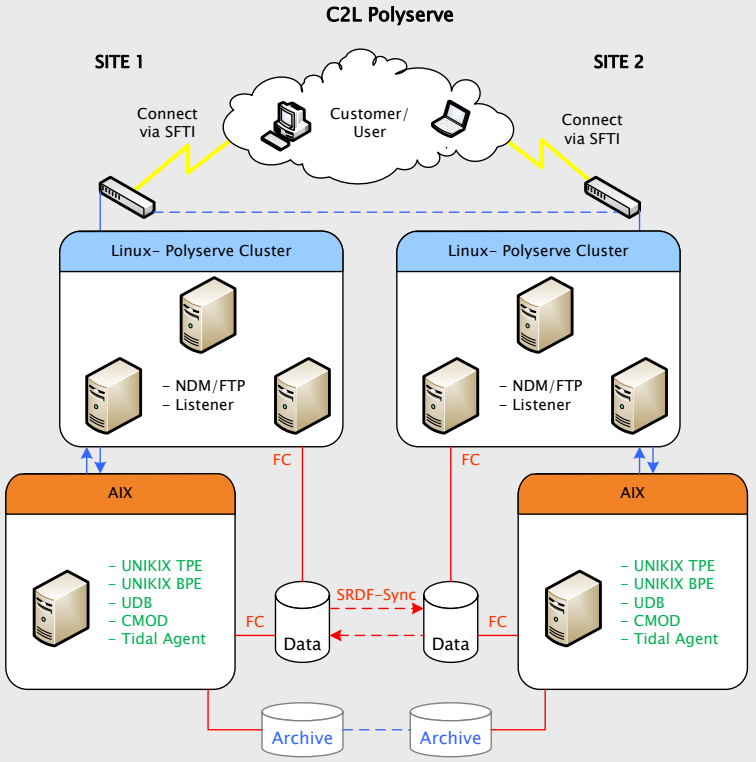
Using open system clustering, the new IT architecture shows similar availability figures as the replaced mainframe environment

Old and New System Architecture

Mainframe Sysplex Complex



Open System Platform



Source: NYSE (2008), METIS Analysis

NYSE Euronext's expectations on mainframe modernization were successfully fulfilled in all defined categories when going live in 2008

Project Results

Replacement of mainframe with stable open system	Robust/accustomed applications maintained	Improved performance for less costs	Reduced time efforts
▪ IBM system p 595 server (online- and batch-processing) as replacement for the mainframe ▪ PolyServe cluster of HP DL585 servers installed with Linux used as frontend	▪ No change in business logic of applications ▪ Of >10m LoC more than 98% remained unchanged and were transferred automa-tically ▪ CICS- and batch-transactions, utilities, and reporting were transferred smoothly	▪ Cost per transaction significantly reduced (>50%) ▪ Batch window reduced by 25% ▪ Low adaption and (re-) training costs for employees	▪ Planning requirement: 3 months ▪ Implementation: 14 months

Source: NYSE (2008), METIS Analysis

Basis for the successful porting was the availability of appropriate mainframe software 'clones' on the open system platform

Software Architecture		
Function	**Old Software Architecture**	**New Software Architecture**
Application Development	▪ Syncsort ▪ ISPF	▪ Syncsort ▪ Uni-SPF
Programming Language	▪ COBOL ▪ Assembler	▪ COBOL ▪ C
Data Services	▪ GDG ▪ VSAM ▪ IAM	▪ GDG ▪ VSAM ▪ IAM
Database	▪ DB2	▪ UDB
Transaction Services	▪ CICS	▪ UniKix TPE
Batch	▪ JCL ▪ JES	▪ ksh ▪ UniKix BPE
Scheduler	▪ OPC	▪ Tidal Agent
File Transfer	▪ NDM ▪ FTP	▪ NDM ▪ FTP
Security	▪ RACF	▪ UniKixSecure
OS	▪ z/OS	▪ SUSE Linux ▪ AIX
Bridging	▪ MQ	▪ MQ

Source: NYSE (2008), METIS Analysis