



# **System z Enables Solutions For A Smarter Planet**

The Rule Of Three

# Quiz

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- What is the Rule of Three?
  - a) A form of government in the Soviet Union
  - b) Two's company, three's a crowd
  - c) The Three Stooges in charge
  - d) A rule to help you recognize when a smarter planet solution will cost less to deploy on the mainframe

# The True TCO Of The Mainframe

Every smarter planet solution you talked about today cost less to deploy on System z. Is that for real?



**Service Oriented Finance CEO**

Yes and we can give you a rule of thumb to help recognize when a smarter planet solution will cost less on System z.



**IBM**

# TCO Top Down Methodology

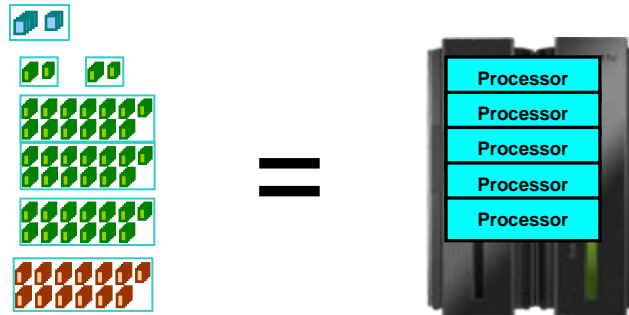
First we need a method to compare costs.



**IBM**

# TCO Top Down Methodology

## 1. Establish Equivalent Configurations

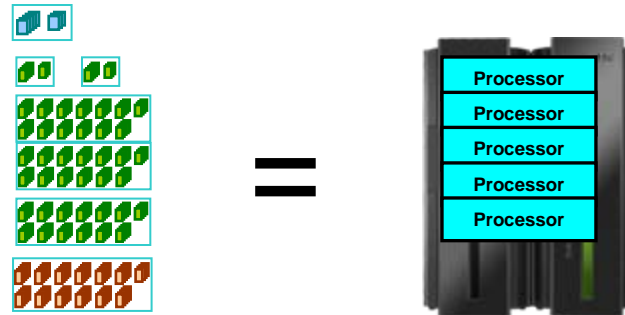


## 2. Price out Total Cost of Acquisitions

## 3. Add cost of labor and environmentalals

# TCO Top Down Methodology

## 1. Establish Equivalent Configurations



## 2. Price out Total Cost of Acquisitions

## 3. Add cost of labor and environmentals

# Banking Benchmark Comparison

## Asian Bank

- ▶ IBM System z9 and DB2
- ▶ TCS BaNCS
- ▶ 15,353 Transactions/second
- ▶ 50 Million Accounts
- ▶ IBM benchmark for customer

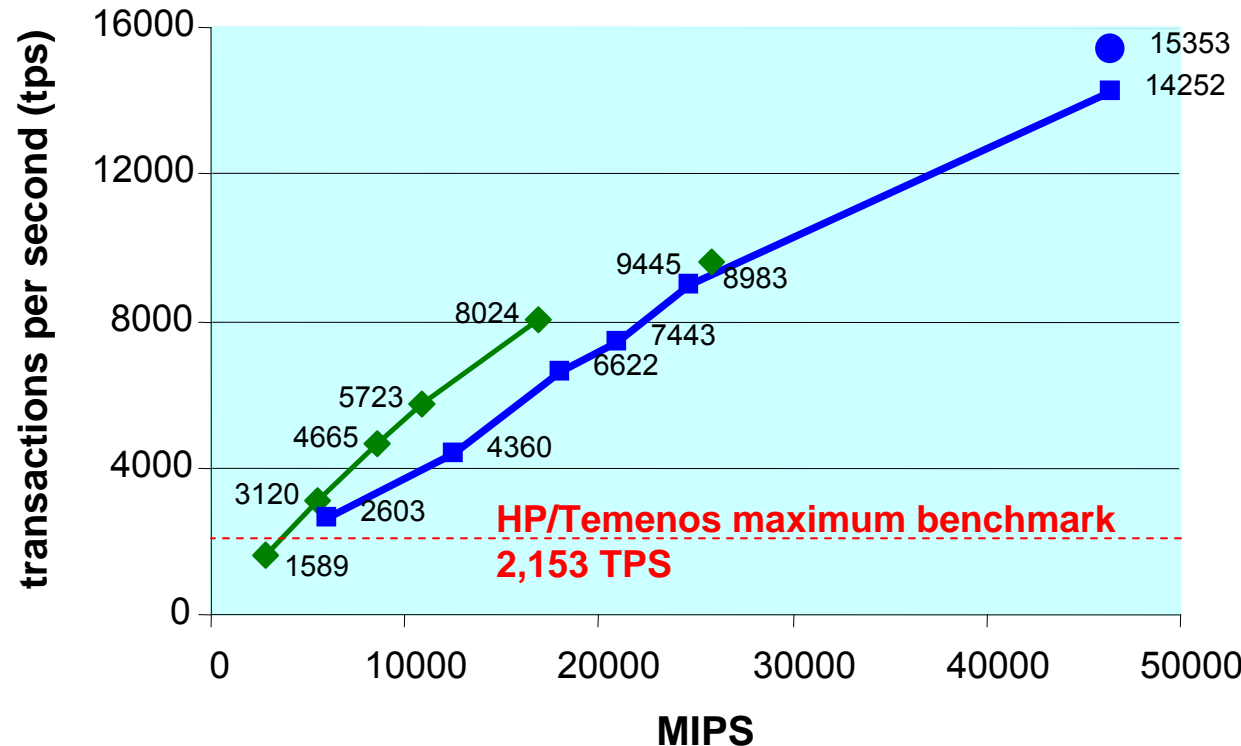
## Bank of China \*\*

- ▶ IBM System z9 and DB2
- ▶ TCS BaNCS
- ▶ 9,445\*\*\* Transactions/second
- ▶ 380 Million Accounts
- ▶ IBM benchmark for customer

## HP/Temenos \*

- ▶ HP Itanium
- ▶ Temenos T24
- ▶ 2,153 Transactions/second
- ▶ 13 Million Accounts
- ▶ Largest banking benchmark performance claimed by HP

## System z and BaNCS Online Banking Benchmarks



\* SOURCE: TEMENOS BENCHMARKS; <http://h71028.www7.hp.com/enterprise/downloads/TemenosBenchmark.pdf>

\*\* SOURCE: <http://www.enterprisenetworksandservers.com/monthly/art.php?2976> Source: InfoSizing FNS BaNCS Scalability on IBM System z – Report Date: September 20, 2006

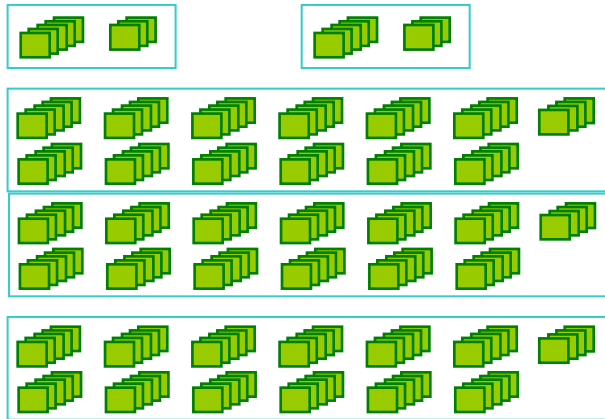
\*\*\* Standard benchmark configuration reached 8024 tps, a modified prototype reached 9445 tps

# Compare The Processors Needed To Achieve 2,200 Transactions Per Second

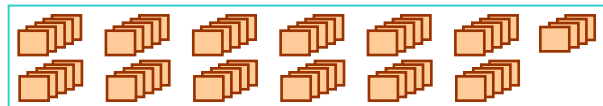
Online Injector: 1x HP RX7620



Temenos T24 Servers:  
2x HP RX7620  
3x HP 9000 Superdome

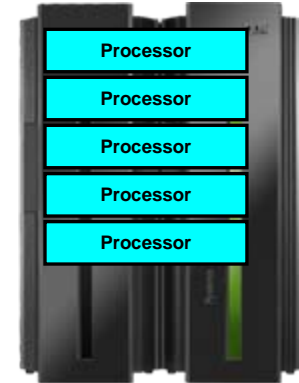


Oracle 10g: 1x HP 9000 Superdome



HP Integrity rx7620 - (10U) 1.5GHz 6MB (8ch/8co)  
HP 9000 Superdomes - 32W 1GHz 32MB (32ch/64co)

TCS BaNCS and DB2  
1x z10 2097-705



5 processors  
(3,906 MIPS)



280 processors  
(457,762 RPEs)

\$26.0M  
TCO(3yr)

\$18.9M  
TCO(3yr)

117 Performance  
Units per MIP

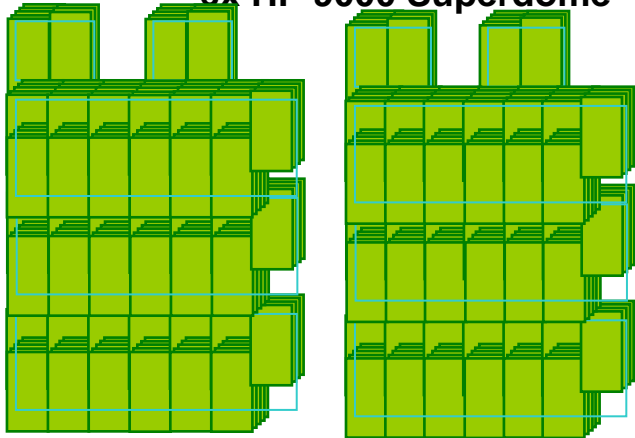


# Compare The Processors Needed To Achieve 2,200 Transactions Per Second (with Dev/QA)

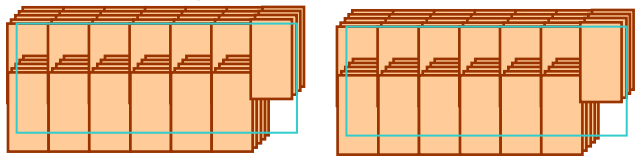
Online Injector: 2x HP RX7620



Temenos T24 Servers:  
4x HP RX7620  
6x HP 9000 Superdome



Oracle 10g: 2x HP 9000 Superdome



HP Integrity rx7620 - (10U) 1.5GHz 6MB (8ch/8co)

HP 9000 Superdomes - 32W 1GHz 32MB (32ch/64co)

**7 processors**

*(4,906 MIPS)*



**560 processors**

*(915,524 Performance Units)*

\$59.2M  
TCO (3yr)

TCS BaNCS and DB2  
1x z10 2097-707



\$22.7M  
TCO (3yr)

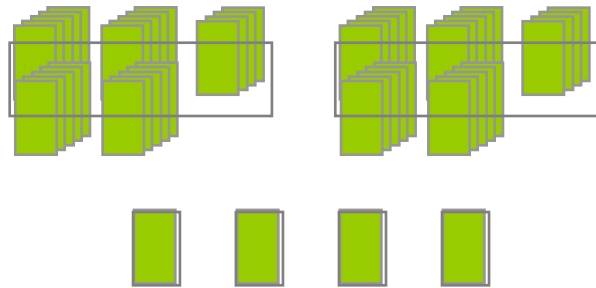
**187 Performance  
Units per MIP**

NOTE: Double Distributed Servers, add 1000 MIPS to System z for Dev/QA

# Another Customer Case: European Financial Services Offload

- 2x 24-way Production / Dev / Test / Education  
Application, DB, Security, Print and Monitoring
- 4x 1-way Admin / Provisioning / Batch Scheduling

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



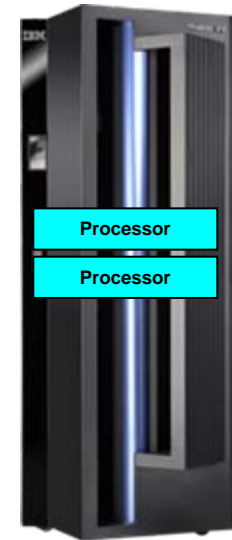
\$17.9M TCO(4yr)

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



**52 Unix processors  
(222,292 Performance  
Units)**

**2 processors  
(332 MIPS)**



\$4.9M TCO(4yr)

**670 Performance  
Units per MIP**  
Disaster recovery not included

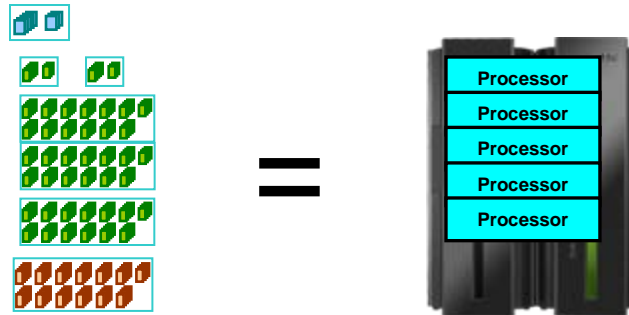
# Lesson Learned

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- It usually takes far more processor cores to deploy on a distributed platform
  - ▶ Cases: 1 mainframe processor = 26 to 80 HP cores
- Select a reasonable number within the observed range to establish equivalence

# TCO Top Down Methodology

## 1. Establish Equivalent Configurations



## 2. Price out Total Cost of Acquisitions

## 3. Add cost of labor and environmentalals

# Facts To Consider When Pricing Out The Cost On The Mainframe

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- Incremental costs get cheaper as system grows
- Specialty processors
- Disaster recovery
- Sub capacity pricing vs co-location
- New workload pricing
- DB2 compression advantage
- Utilization rates
- Virtualization core and storage ratio
- Technology refresh
- . . .

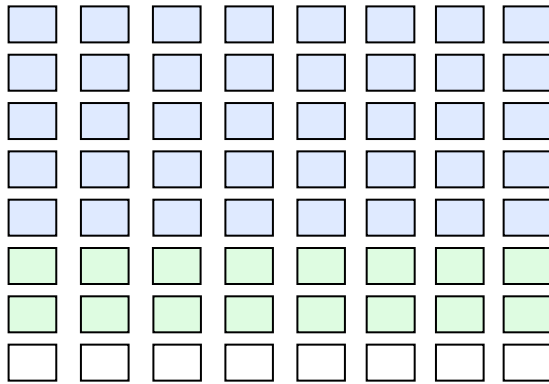
# A Short Primer On Key Mainframe Concepts

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- Incremental workloads
- Specialty processors
- Disaster recovery

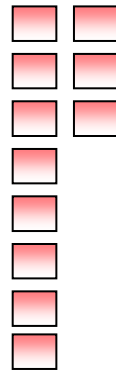
# The System z10 Frame Contains Many Processors

64 way SMP



Application Execution

PLUS: 11 Dedicated System Assist Processors

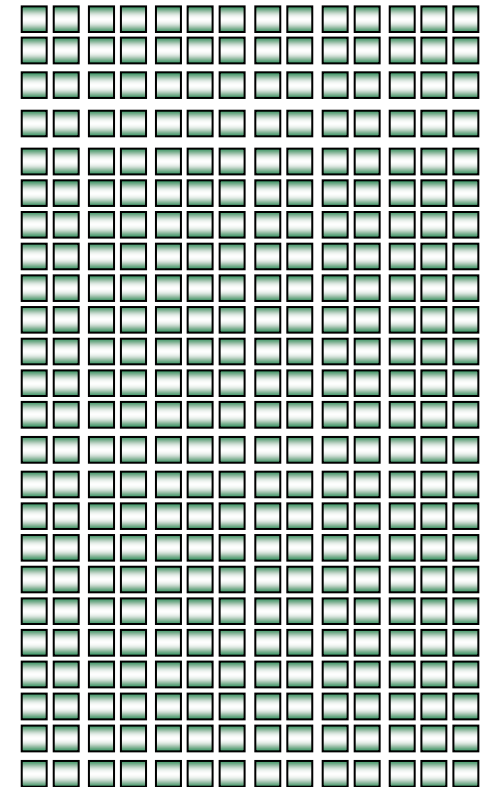


I/O Scheduling

PLUS: 2 Spare Processors



PLUS:  
Max 336 FICON I/O Driver Channels  
Or Max 1024 ESCON Driver Channels

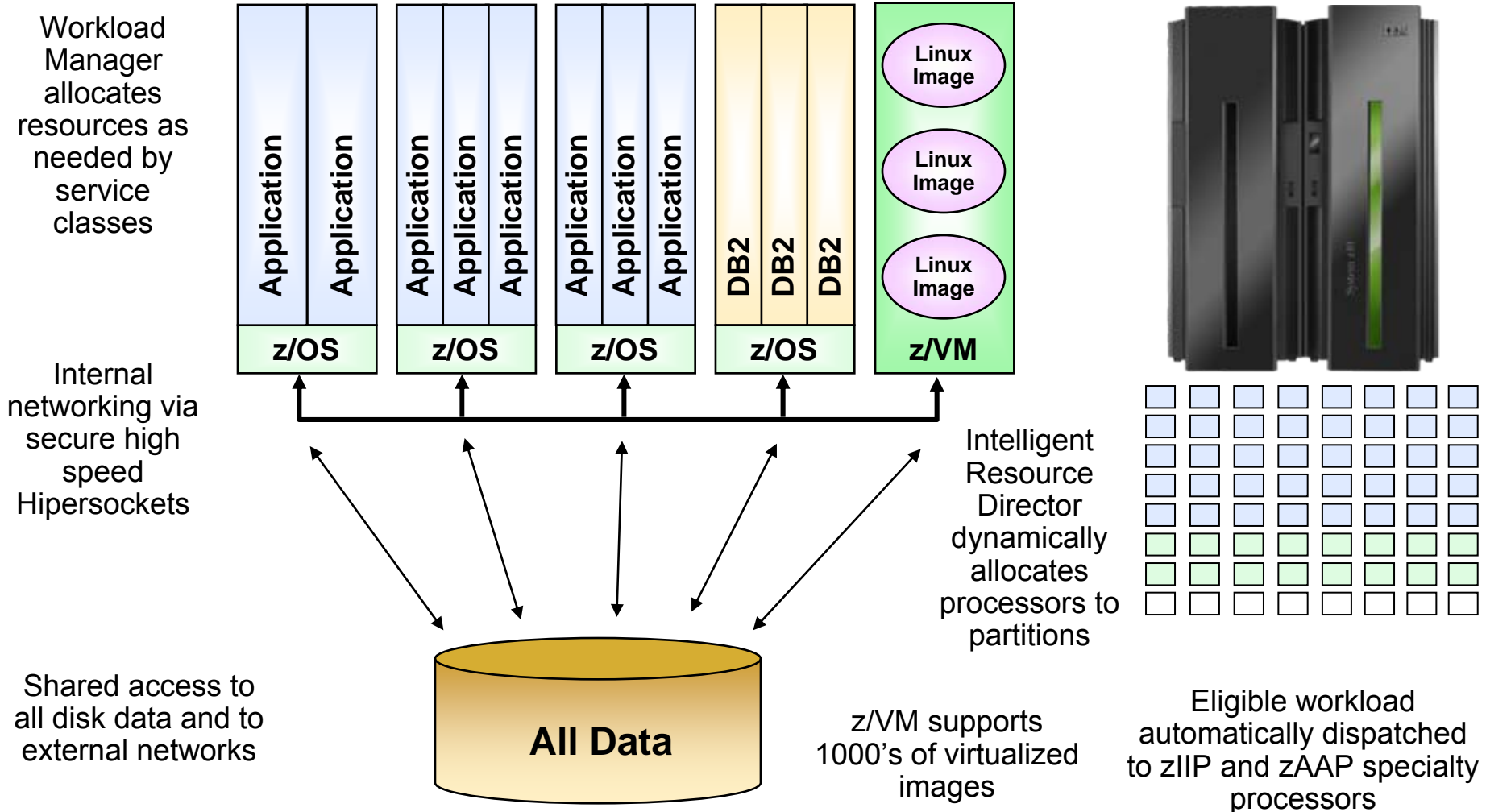


Dedicated I/O Operations

- **Decimal Floating Point Accelerator**
  - ▶ Implemented in hardware - one per core
- **CP Assist for Cryptographic Function (CPACF)**
  - ▶ Two cores share a CPACF

# These Are Used To Run Several Workloads Concurrently

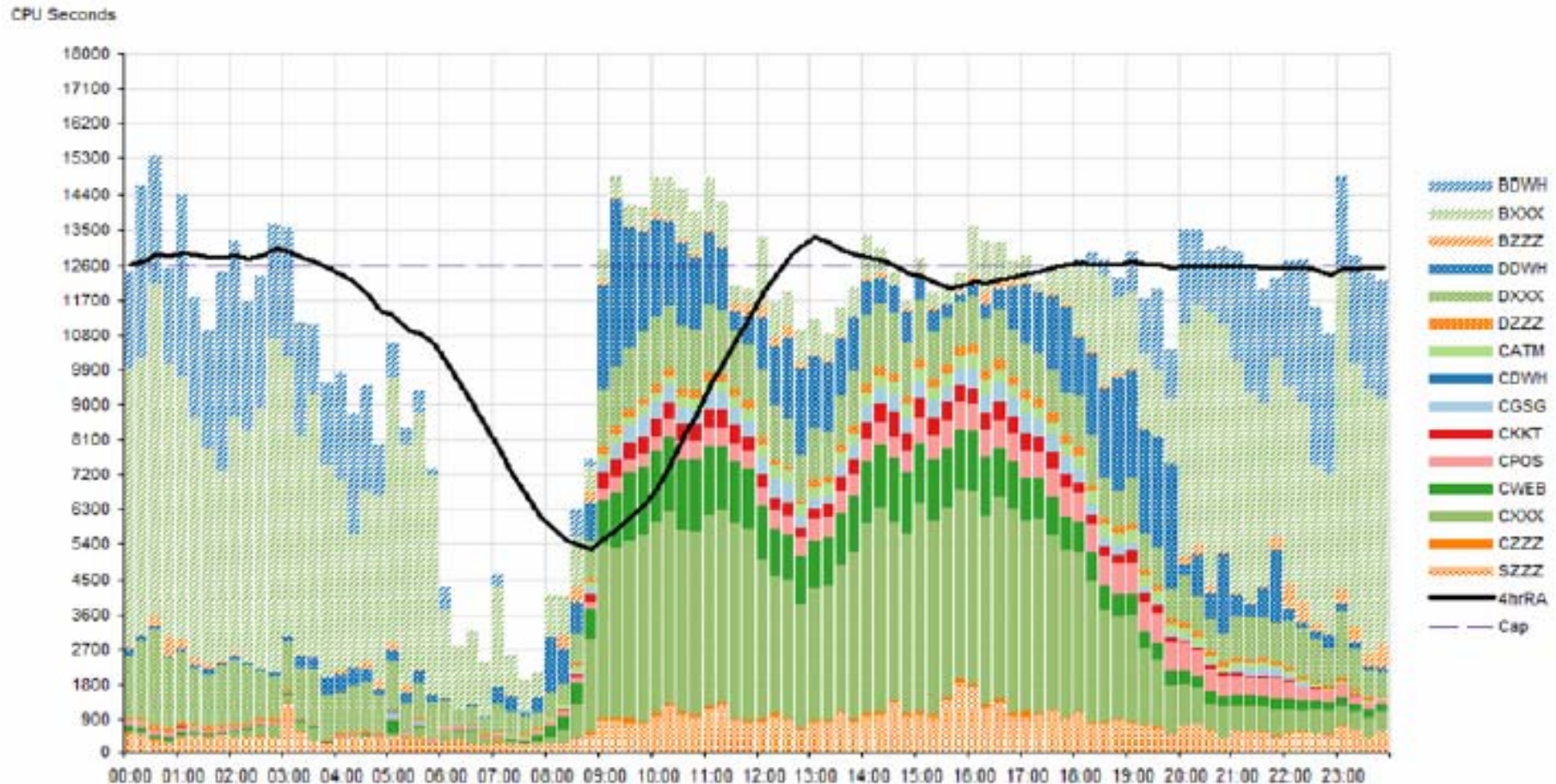
## Logical Partitions Share Processors, Common Cache Structures, and I/O





# This Is What It Looks Like In Operation

New workloads are incremental to the existing workloads



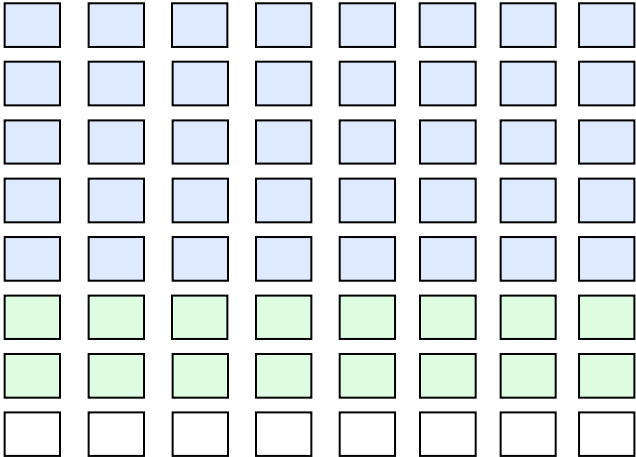
# “Specialty Engines” Reduce Cost For New Workloads

- Special assist processors for System z
  - ▶ For Java workloads (**zAAP**)
  - ▶ For selected DB2 workloads (**zIIP**)
  - ▶ For Linux workloads (**IFL**)
- Attractive pricing
  - ▶ \$125K for a 920 MIP processor (90% discount)
  - ▶ No charge for IBM software running on zAAP/zIIP
  - ▶ IBM software running on IFL costs 120 PVU's
  - ▶ Free upgrade to next generation!
- Requirements
  - ▶ Max number of zAAP =< number of general purpose processors
  - ▶ Max number of zIIP =< number of general purpose processors
  - ▶ No limit on the number of IFL's



# Disaster Recovery – Fast Failover For Less

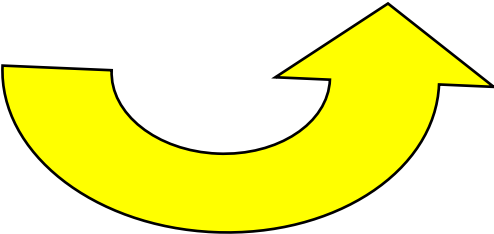
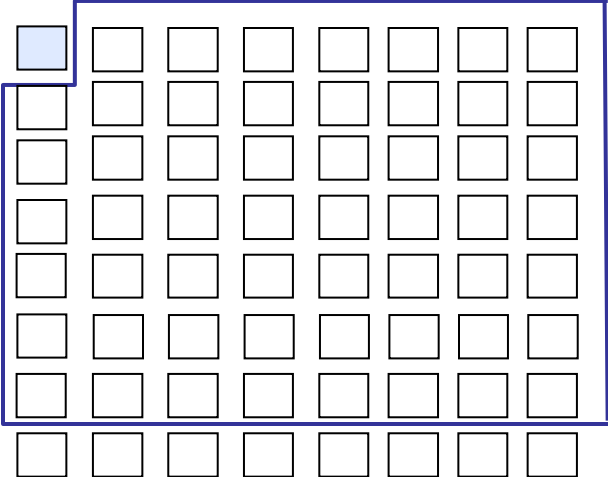
**Primary Site**  
64 way SMP



*Capacity back up  
on demand*  
Pay regular price  
for one active  
processor

*All other dormant  
processors  
discounted 98%  
(\$7K per year for  
general purpose,  
\$2K per year for  
specialty engines*

**Alternative Site**  
64 way SMP



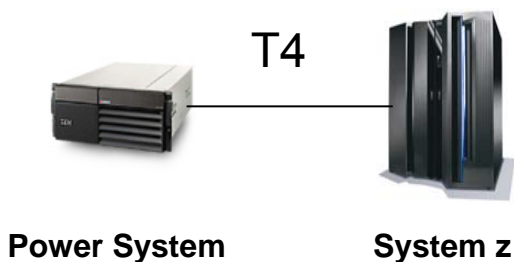
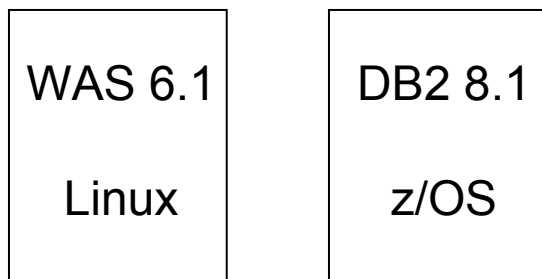
*Pay regular price for  
frame*

*Site Failover  
With GDPS*

# On-line Banking Benchmark Demonstrates Performance Advantages Of Co-Location

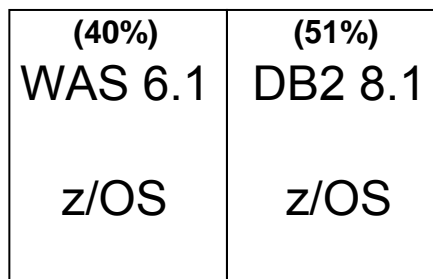
## Separate Machines

150 tps



## Separate LPARs

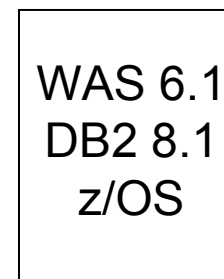
160 tps



**\$5.6M (3 years)**

## Same LPAR

243 tps



**\$6.5M (+15%)**  
**52% more throughput**

# Facts To Consider When Pricing Cost On A Distributed System

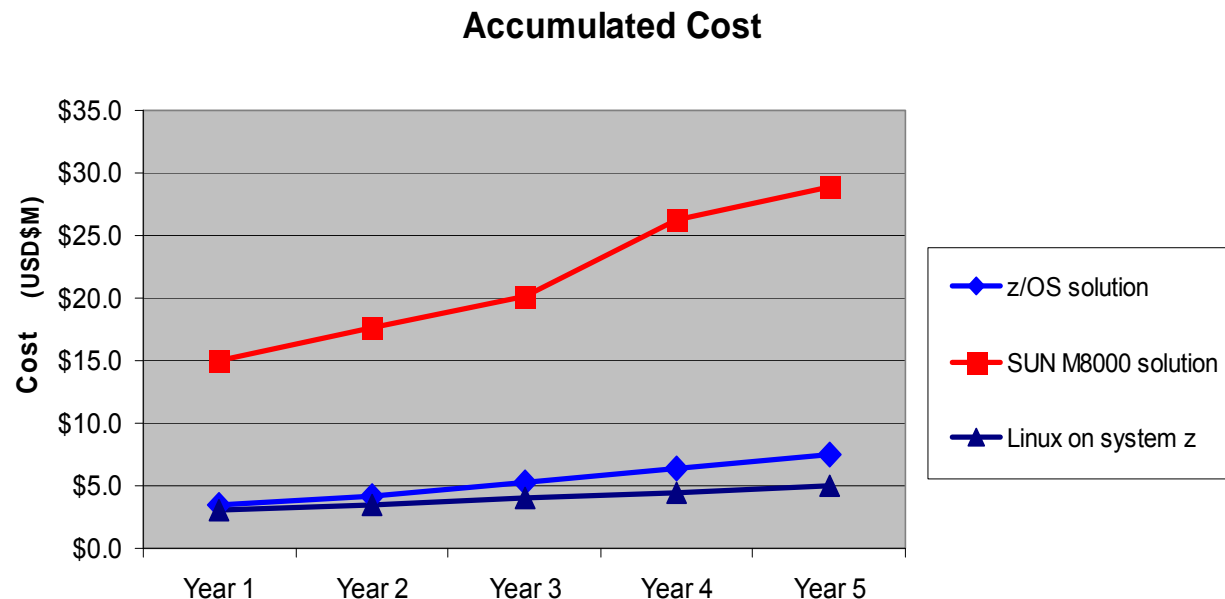
- Make sure you have estimated core proliferation
- Make sure you have estimated storage proliferation
- Separate production, development, quality assurance servers, fail-over
- Disaster recovery site
- Infrastructure servers – systems management, networking, security/directory, workload distribution, firewalls, data staging...
- Distributed hardware needs to be repurchased
- Migration cost, and loss of agility during the process
  - ▶ Dual environments during migration
- Provision for peaks and growth
- Language expansion (CICS/COBOL path lengths are highly optimized)
- Oracle RAC scaling inefficiencies compared to DB2
- Ensure batch can run on one system. If not, then what?
- . . .

# US Bank Study Shows WebSphere Process Server On Sun Costs 5.8X More Than System z

- Currently 3 distributed Sun servers running WebSphere workload
- Compare running same workload on IBM System z10 using zLinux or z/OS
- Scope
  1. Cost – HW, SW, Labor, Power, and Floor Space, but NOT labor
  2. Discipline – Production, QA, Development/Test, and DR
  3. Five Year TCO including HW acquisition in 1<sup>st</sup> and 4<sup>th</sup> year
  4. 3033 MIPS of workload on z/OS
  5. 3791 MIPS of workload on Linux for System z

**Distributed TCO is \$21,214,907 (3.8X) more expensive than z/OS over 5 years**

**Distributed TCO is \$23,802,441 (5.8X) more expensive than Linux for System z over 5 years**



# Deploy WAS Application on Mainframe z/OS vs. HP Servers

*Existing Mainframe*



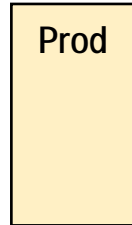
Existing zIU:  
2 GP 1,720 MIPS  
DB2 and utilities  
With 20TB storage

*Existing Disaster Recovery Site*



Existing:  
1 GP processor for hot  
disaster switch-over  
1 "dark" DR processor  
With 20TB storage

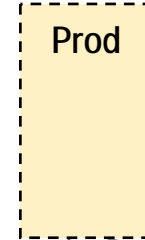
*Add 3 LPARs for New Web Application w 1.28 TB storage*



1,624 MIPS  
additional  
workload

Incremental:  
1 zAAP 920 MIPS WAS (85%)  
1 GP 541 MIPS DB2  
163 MIPS WAS (15%)  
2 GB memory

*And Add Disaster Recovery w 1.28 TB storage*



3 year  
cost of  
acquisition  
\$3.13M

Capacity Backup:  
1 GP  
1 zAAP

*Or Add HP Integrity Superdome 9140 Server w 1.67 TB storage*



201,977\*  
Performance Units

*And Add 1 server for Disaster Recovery, Development & QA w 1.67 TB storage*



201,977\*  
Performance Units

3 year  
cost of  
acquisition  
\$8.53M

\*Production Performance Units required = 1,624 x 122 = 198,128

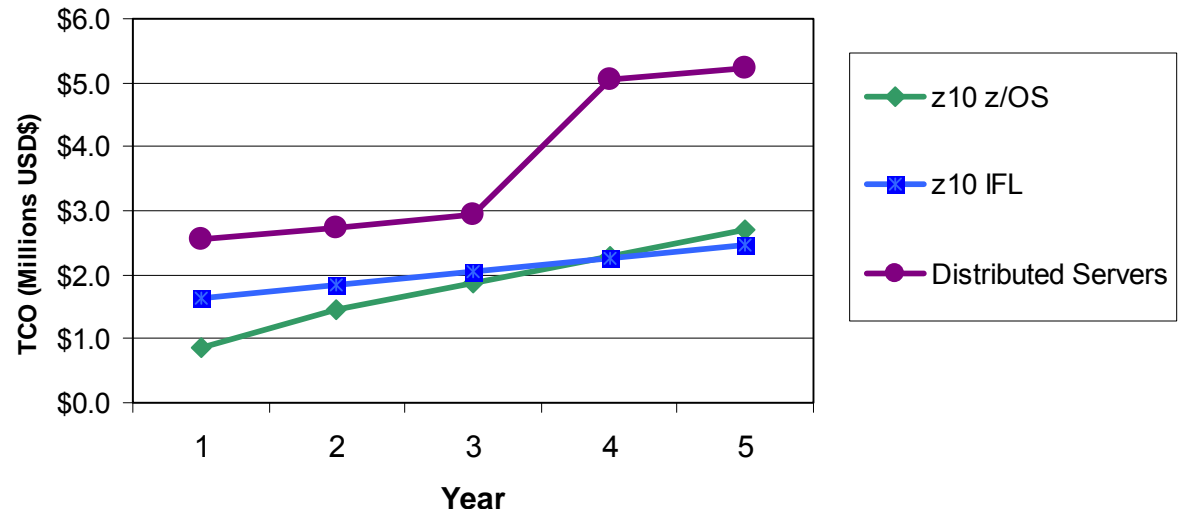
# L.A. Bank Study Shows WebSphere Message Broker On Distributed Costs 2.1X More Than z

- Compare running same workload on IBM System z10 using zLinux or z/OS
- Scope
  1. Cost – HW, SW, Power, and Floor Space
  2. Discipline – Production, QA, Development/Test, and DR
  3. Five Year TCO including HW acquisition in 1<sup>st</sup> and 4<sup>th</sup> year
  4. +120 MIPS & 2 zAAPs of workload on z/OS
  5. 1 IFL for WMB production workload, 4 IFLs for dev/test etc. on Linux for system z
  6. 1 server for WMB production workload, 2 servers for dev/test etc. on distributed

**Distributed TCO is \$2,527,463 (1.9X) more expensive than z/OS over 5 years**

**Distributed TCO is \$2,757,439 (2.1X) more expensive than Linux for system z over 5 years**

**Accumulated Cost**

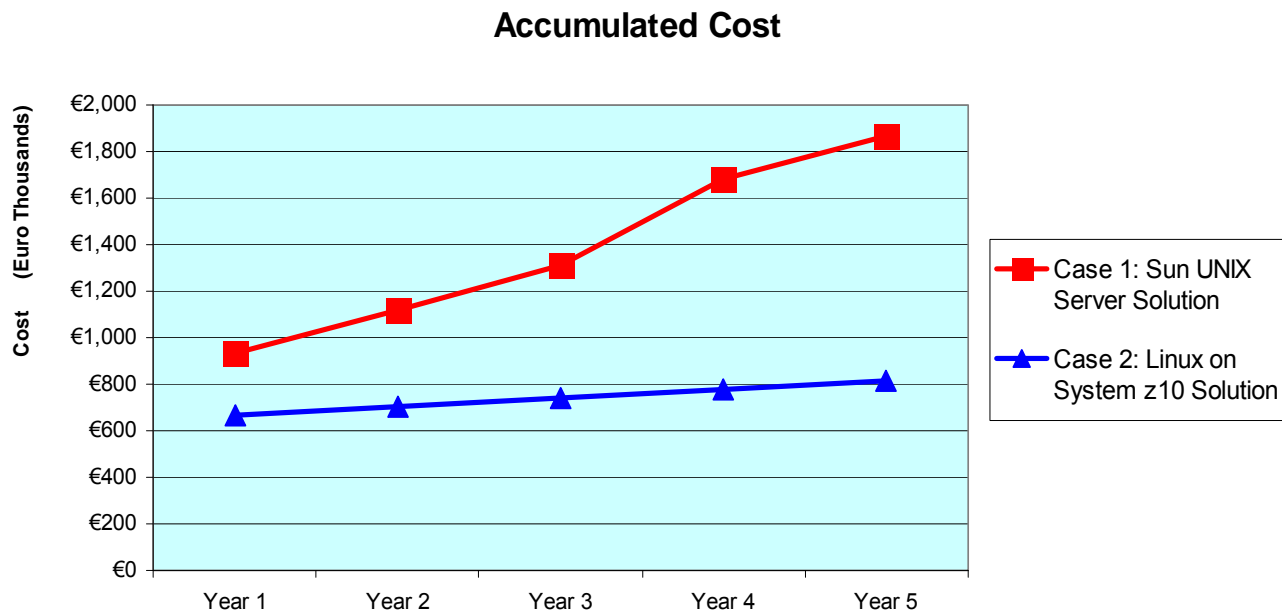




# European Bank Study Shows WAS On Sun Costs 2.3X More Than zLinux

- Currently 9 distributed Sun servers running WebSphere workload
- Compare running the same workload on IBM System z10 with multiple IFLs
- Scope
  1. Cost – HW, SW, Power and Cooling, and Floor Space
  2. Discipline – Development, Test, Production, DR (on Dev/Test machines)
  3. Five Year TCO with HW acquisition in 1<sup>st</sup> and 4<sup>th</sup> year
  4. Migration labor costs are included for Linux on System z
  5. A projected annual capacity growth of 0%

**Distributed TCO is  
€1,054,019 (2.3X)  
more expensive than  
z10 over 5 years**



# Case Studies Demonstrate Consistent TCO Advantage

Scenarios	Cost of Distributed vs. z	Distributed Cost Ratio	Cores vs. Paid z Processors	Core Ratio
<b>Deploy New Applications on Mainframe</b>				
- Database Server	\$6.4M vs \$5.0M	1.3x	60 vs 4	15 : 1
- WebSphere Application	\$7.4M vs \$3.0M	2.4x	132 vs 4	33 : 1
- Data Warehouse	\$8.4M vs \$4.7M	1.8x	120 vs 6	20 : 1
- Data Warehouse w Analytics	\$13.4M vs \$8.4M	1.6x	160 vs 8	20 : 1
- Communications Backbone	\$5.5M vs \$4.2M	1.3x	64 vs 4	16 : 1
- SOA Solution	\$17.2M vs \$3.5M	4.9x	132 vs 4	33 : 1
- SOA Solution vs Sun	\$34.2M vs \$3.5M	9.8x	252 vs 4	63 : 1
- Spatial Database Server	\$6.9M vs \$5.0M	1.4x	120 vs 6	20 : 1
- Major Retailer	\$8.3M vs \$7.0M	1.2x	22 vs 5	4.4 : 1

2.9x

25 : 1

## Rule of Three:

The cost of deploying a new application will usually be less on a mainframe if:

1. It is an incremental workload on an existing mainframe
2. It can make use of a specialty processor
3. Disaster recovery is required

# System z TCO Checklist – Incremental

## New Workload

- Have you considered only the incremental cost if using an existing mainframe?
- Have you used LPARs and sub-capacity pricing to limit incremental cost?
- Have you used zIIPs and zAAPs for new workload?
- Are you co-locating your database and transaction monitor?
- Have you upgraded to the latest hardware to get improved price/performance of specialty engines?
- Have you extended your existing applications to get decreased costs/transaction?
- Do you have an ELA or OIO contract with IBM?
- Is your IBM seller aware of the latest pricing plays?
- Are you aware of the various Capacity on Demand capabilities, and are you using them?

## Consolidation

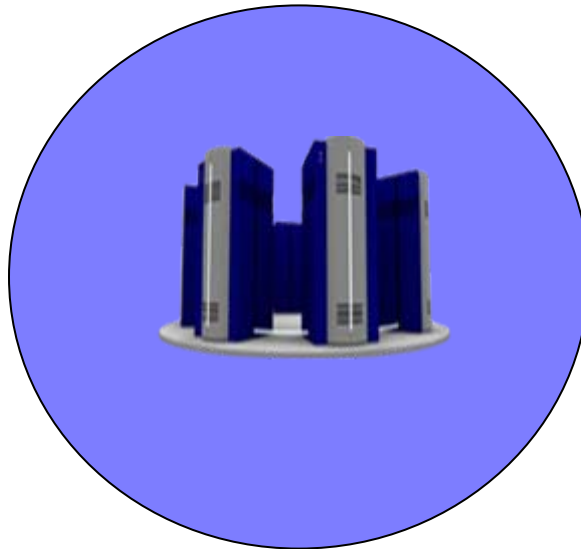
- Do you understand the savings in software licensing?
- Have you considered System z's ability to over-commit memory by 3x?
- Have you examined the savings in
  - network complexity
  - storage required
  - power and cooling
  - labor productivity ?
- Have you considered how to avoid server hardware refresh?
- Are you using sub-capacity pricing where appropriate?
- Have you consolidated as much workload as possible on your System z?
- Have you engaged with the zCPO TCO Studies team?**

# Remember The Rule Of Three

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- The cost of deploying a new application will usually be less on a mainframe if:
  - 1. It is an incremental workload on an existing mainframe**
  - 2. It can make use of a specialty processor**
  - 3. Disaster recovery is required**

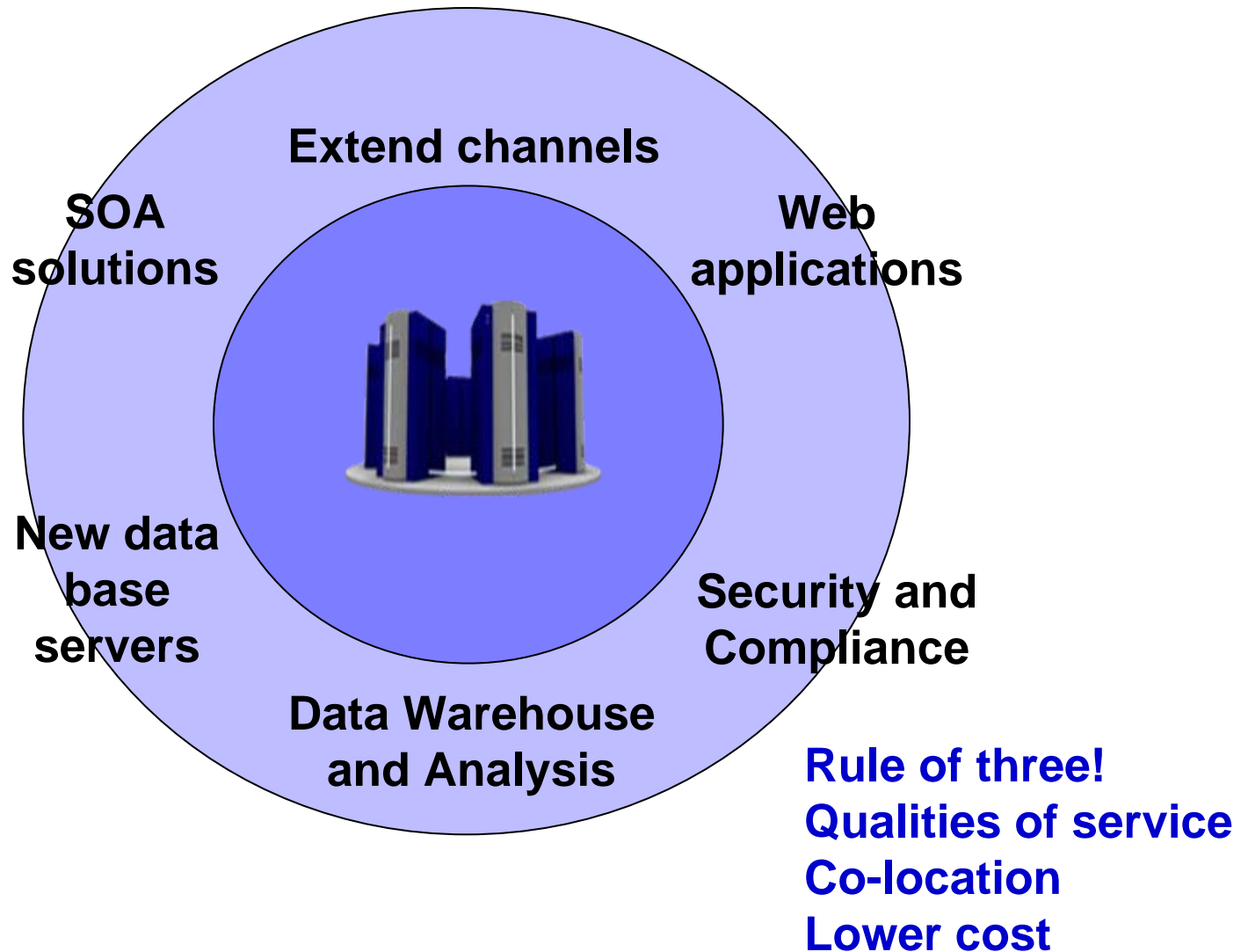
# Some Large Core Processing Workloads Can Only Run Efficiently On The Mainframe



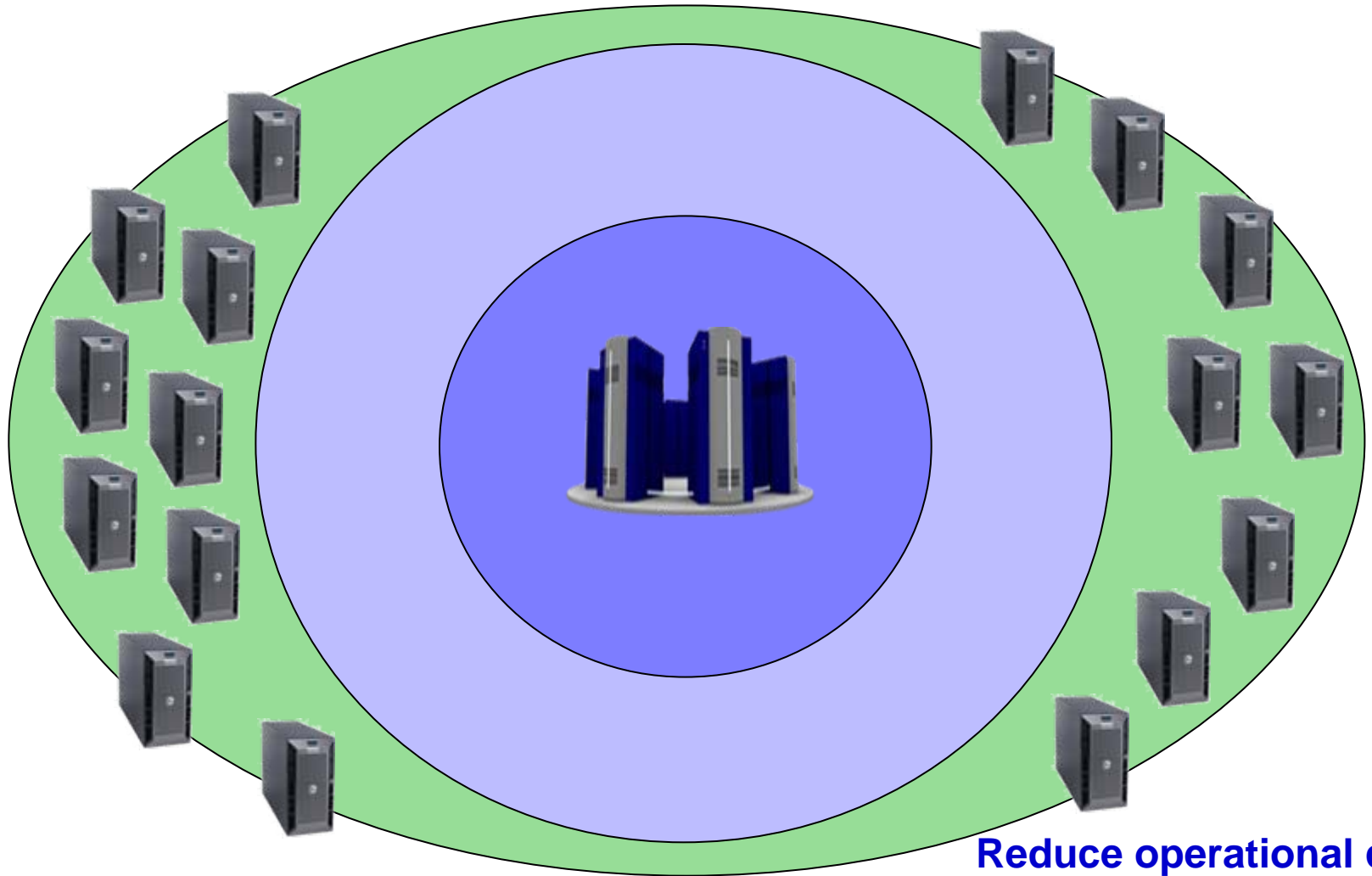
**Banks  
Financial Services  
Reservations  
Transaction Accounts  
Batch Workloads...**

**No effective alternative on distributed**

# An Existing Mainframe Can Be Incrementally Extended To Run New Workloads At A Lower Cost Than Distributed

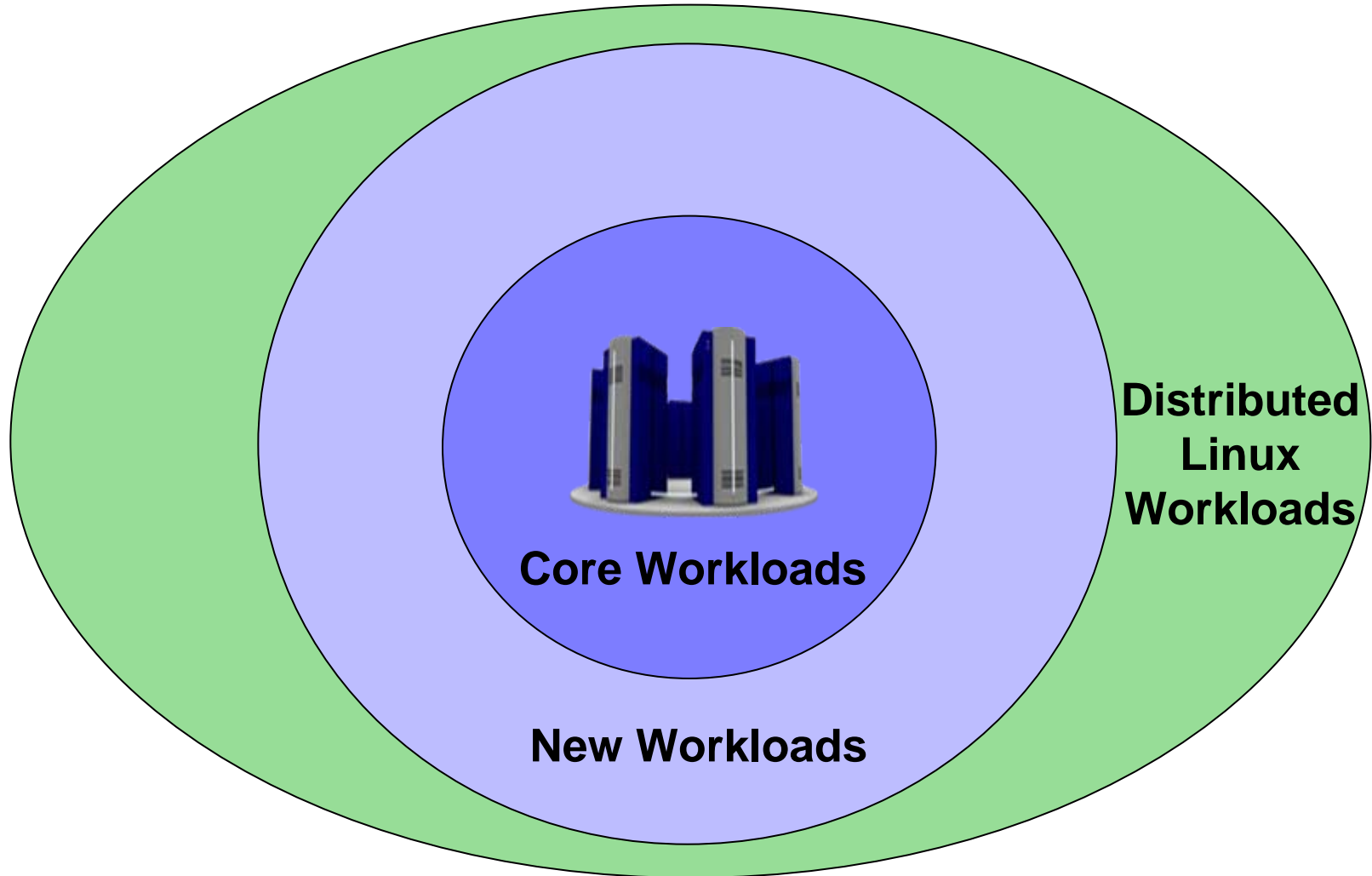


# Distributed Linux Workloads Can Be Consolidated To Cut Costs



**Reduce operational costs**  
**Faster provisioning**  
**Environmentals**

# A Fully Leveraged System $z = \text{Lowest Cost Per Unit Of Work}$





# What's Next? Enhanced Virtualization

- Virtualization was pioneered and perfected on IBM mainframes
- System z continues to set the gold standard in virtualization
- All other servers lag in virtualization capabilities
- zFuture will deliver integrated virtualization to a heterogeneous system configuration!

