

# System z 对于中国金融客户的价值

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客天下 · 智高远

## The Top 3 Most Concerns to meet a Critical Business Needs


**Continuous  
Business  
Operations**

**System z HIGH  
AVAILABILITY  
RELIABILITY**



**Flexibility and  
Speed to  
Respond**

**EXTREME  
VIRTUALIZATION  
REAL TIME  
ANALYTICS**



**High Business  
Growth**

**System z  
HIGH  
SCALABILITY**



# IBM Family of Platforms



## **System z (Close to ZERO downtime)**

? Most reliable, mission-critical data transaction servers on earth



## **System p (Performance)**

? Most powerful, technologically advanced UNIX servers



## **System i (Integrated)**

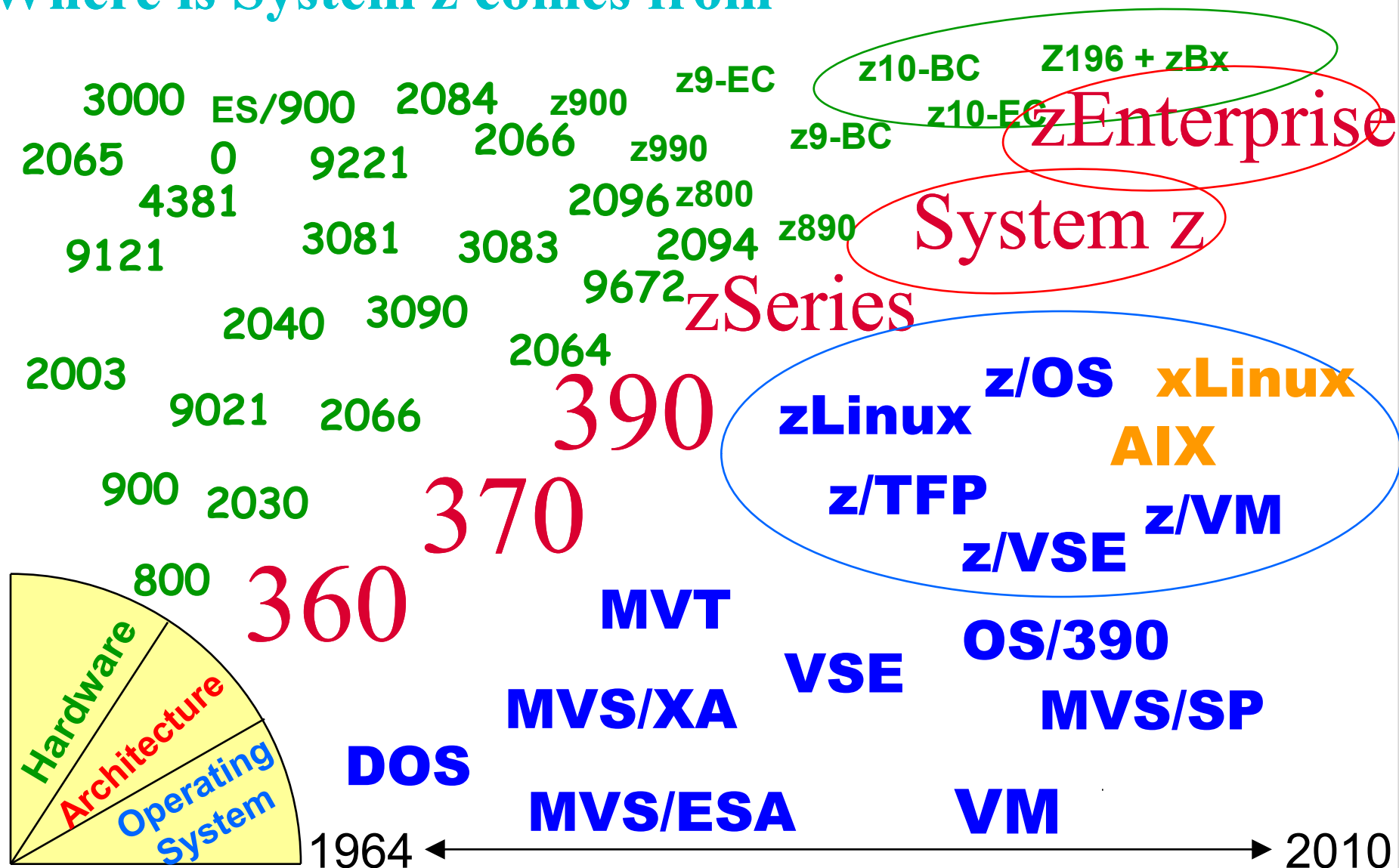
? High-performance integrated business servers for mid-market companies



## **System x (x-Architecture)**

? Affordable, Linux-ready, Intel-based servers with mainframe-inspired reliability technologies

# Where is System z comes from



# What is the System z (Mainframe) ?

## *Definition:*

*A computer system designed to continuously run very large, mixed workloads at high levels of utilization meeting user defined service level objectives.*

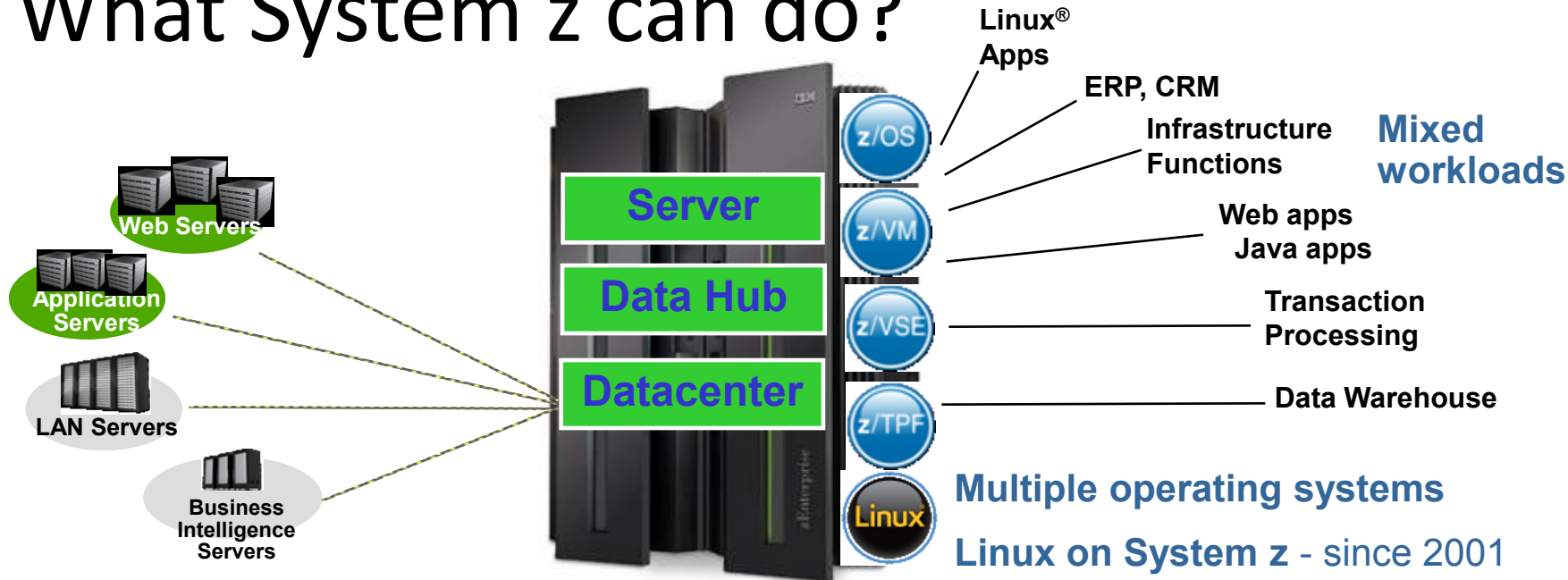
## *Capabilities:*

The System z is structured for highest level of

(RAS)

- ✓ Reliability
- ✓ Availability
- ✓ Serviceability

# What System z can do?



**Most scalable**  
Scale up and out  
Highest throughput for high I/O transactions



**Extreme virtualization**  
Up to 100% utilization



**Unmatched security**



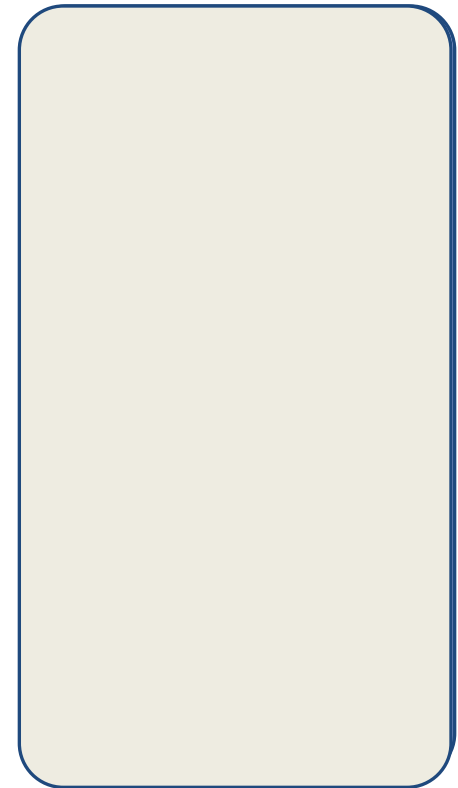
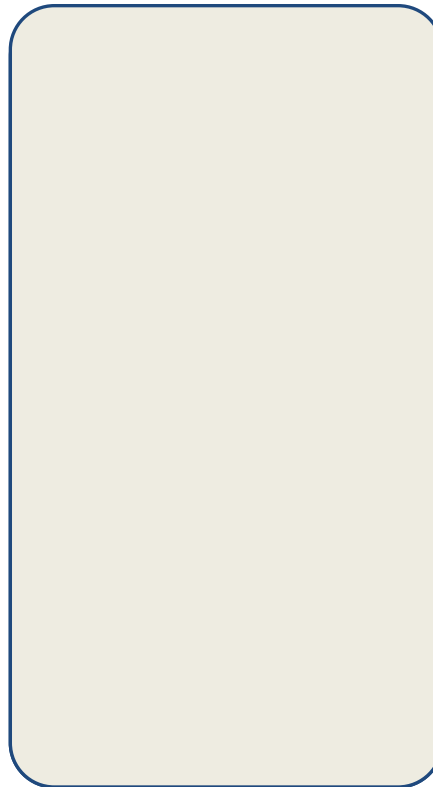
**Unparalleled reliability, highest availability\***



**Leader in green technologies**

## The Top 3 Most Concerns to meet a Critical Business Needs

**Continuous  
Business  
Operations**



What are the most important Measurement for IT operation:

“Outages get measured!”

- Set up Service Level Agreements (SLA)
  - Measure system ‘up time’ and response time
    - i.e. 98% of the time, and end user will encounter 2 second response time or better, system will be available 23.5/7
    - If a system is down to 50 users for 30 min., that is 25 user hours
- Availability Targets
  - No hardware failures
    - No ‘single point of failure’
    - Redundant equipment, dual components, dual paths
    - Uninterruptible Power Supply systems
    - More extensive concurrent hardware changes
  - Reduce batch windows
    - More automated processes (jobs, monitors, restarts)
    - Products evolved to require fewer system and subsystem restarts
    -
  - **NO** unscheduled outages, **Restarting the system**





# 'Availability' becomes the most important aspect in Bai



## High Availability

Fault-tolerant, failure-resistant infrastructure supporting availability of application processing

- *Protection of critical business and data*

## Continuous Operations

Non-disruptive backups and system maintenance coupled with continuous availability of applications

- *Recovery is predictable and reliable*

## Disaster Recovery

Protection against unplanned outages such as disasters through reliable, predictable recovery

- *Operations continue after a disaster*

There are two fundamental Chip design strategies in the market today  
determines the functionality of the operation

***RISC – Reduced  
Instruction Set  
Computing***

Dedicated / Commodity



***CISC – Complex  
Instruction Set  
Computing***

Shared / Optimized



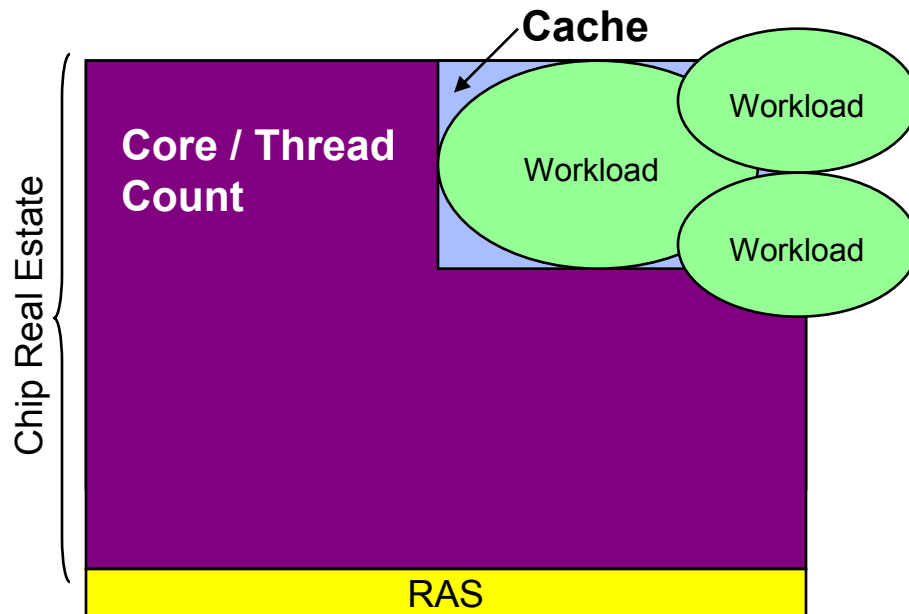
**Distributed (Replicated)**



**System z (Consolidated)**

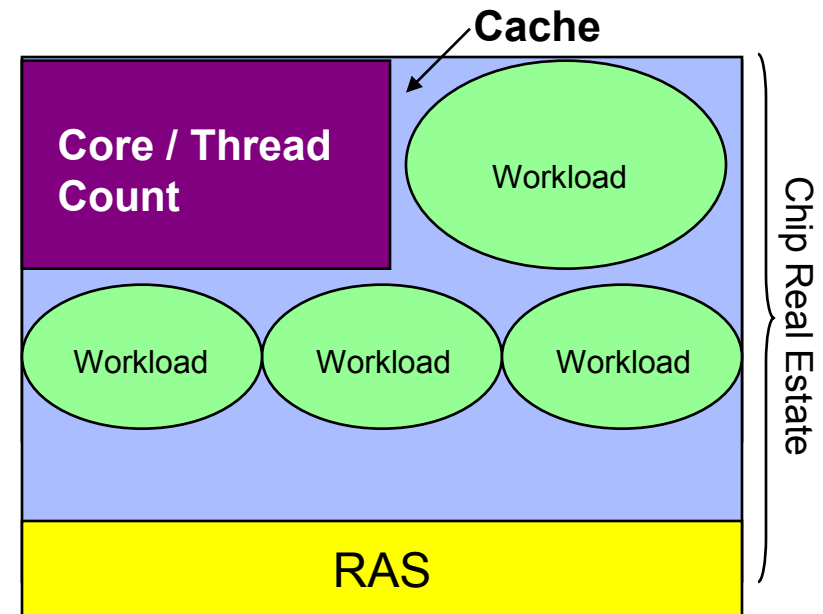
# Chip Design Affects Virtualization Capabilities

## Replicated Server Chip Design



- Mixed workloads stress cache usage, requiring more context switches
- Working sets may be too large to fit in cache
- Full processor speed is not realized due to cache misses

## Consolidated Server Chip Design



- System z cache is able to contain more working sets
- zEnterprise 5.2 GHz Processor speed is optimized by increased cache efficiency
- Shared caches enable efficient dispatching of mixed-workload tasks while maintaining high processor utilization
- Comprehensive Remote Access Service (RAS) design supports putting more workload "eggs" in a single processor "basket"

Note: System representations are not to scale, proportions may vary based on generation of chip and model

# *Distributed advantage over Online Analytical Processing (OLAP)*

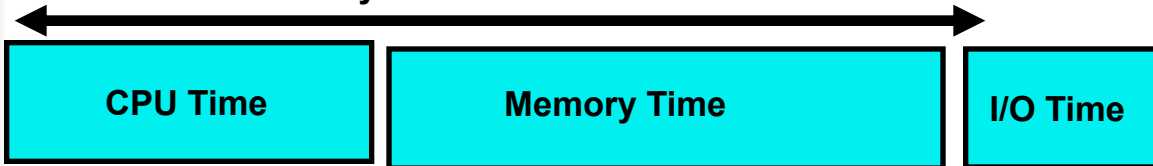
*Workloads that do not require "balanced" computing, and rely solely on processor power*

CPU Busy



**System z**

CPU Busy

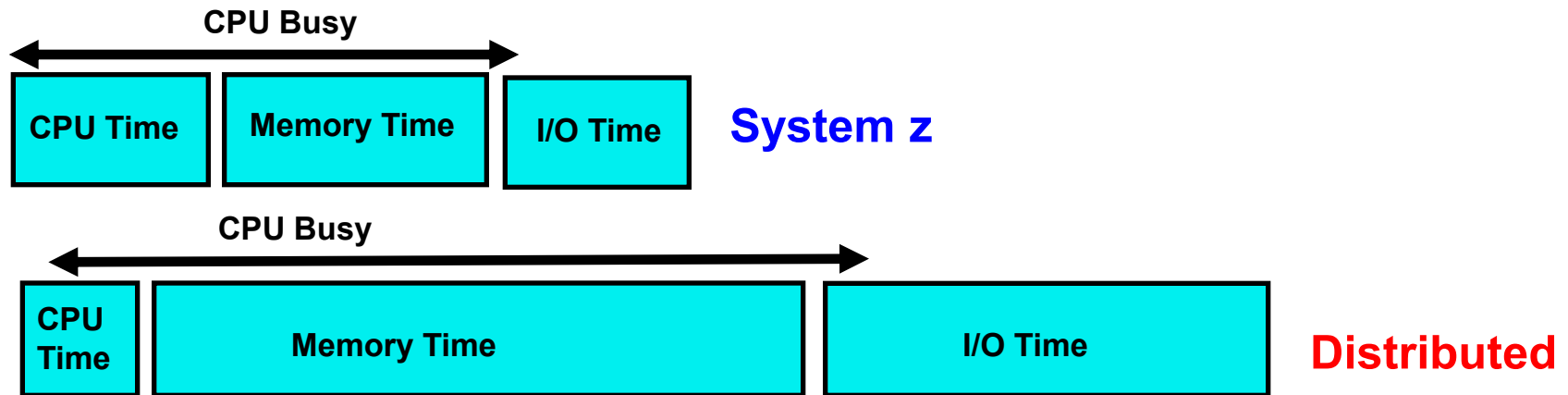


**Distributed**

*Run better on Processor intensive workloads*

- **SPECint**
- **Deep Computing**
- **Graphic Rendering**

## *System z advantage over Online Transaction Processing (OLTP)*



***Run better on Data intensive workloads***

- ***Large databases***
- ***Transaction processing***
- ***Object-oriented code***
- ***Context switching potentially***

## Understanding the Workload Characterization to choose the right platform

10. **CPU Intensive** – e.g. numerically intensive, etc.

9. **Protocol Serving** – e.g. static HTTP, firewall, etc.

8. **Skewless OLTP** – e.g. simple and predictable transaction processing

7. **Java Heavy** – e.g. cpu intensive java applications

6. **Java Light** – e.g. data intensive java applications

5. **Database** – e.g. Oracle DBMS or dynamic HTTP server

4. **Mixed High** – e.g. multiple, cpu-intense simple applications

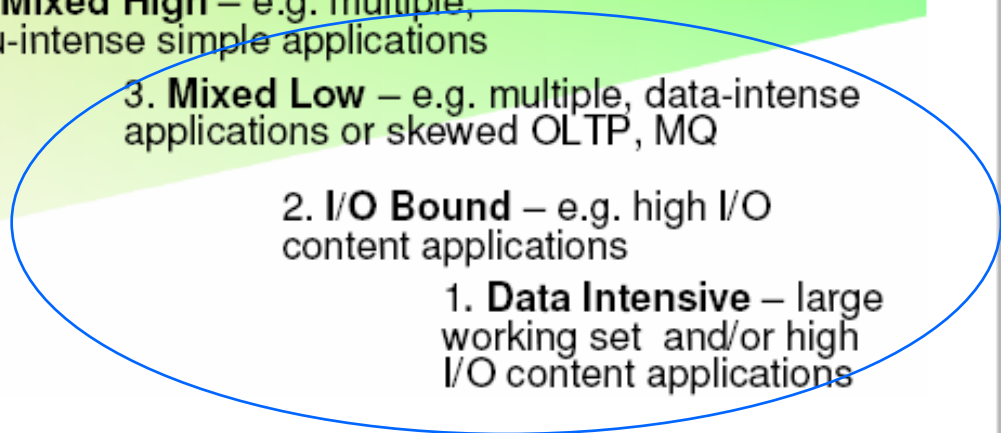
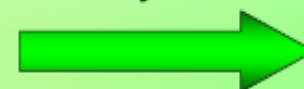
3. **Mixed Low** – e.g. multiple, data-intense applications or skewed OLTP, MQ

2. **I/O Bound** – e.g. high I/O content applications

1. **Data Intensive** – large working set and/or high I/O content applications

Superb Candidates  
for System z

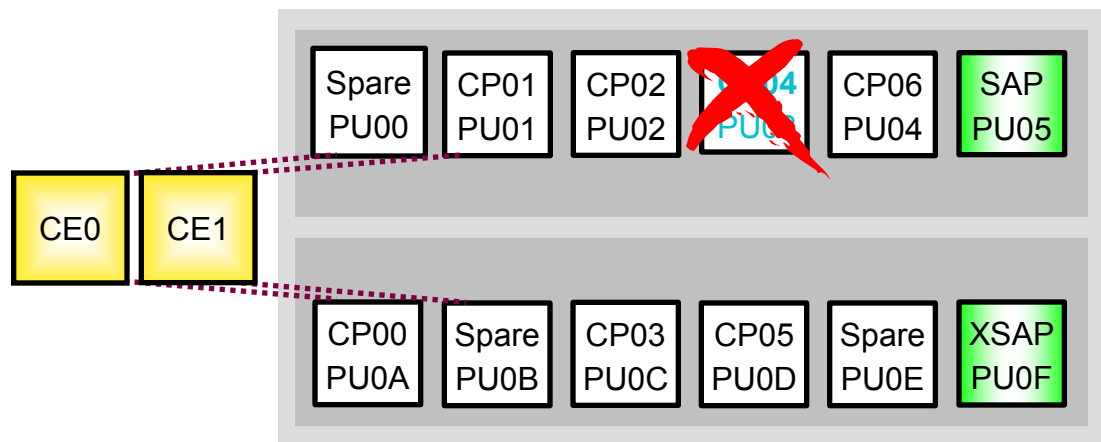
More Challenging  
for System z



# System z CPU has the highest Reliability

## 透明的PU处理器备份

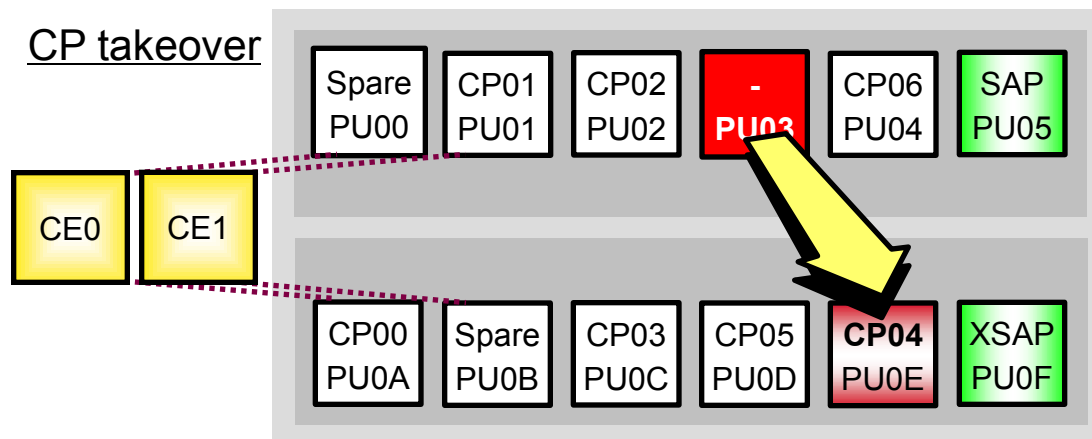
### CP failure








### CP Spring Flow

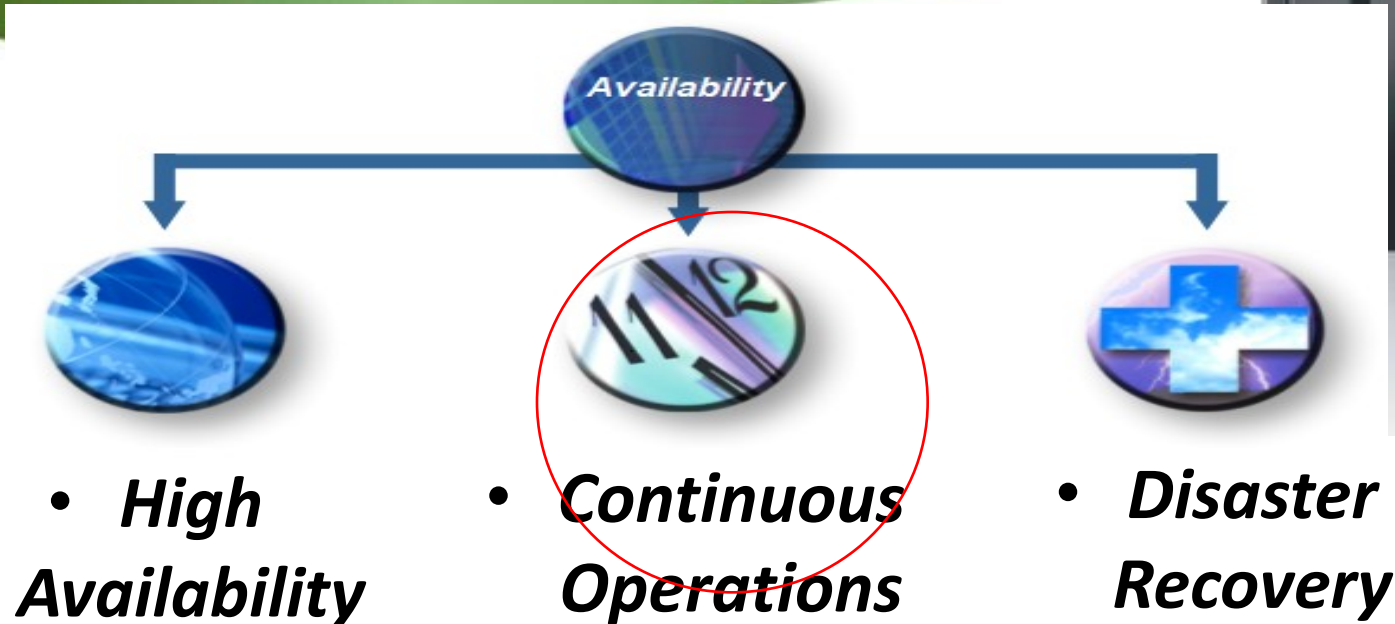
- PU03 (CP04) fails
- Error Detection
- Spare PU0E assigned as CP04
- Error Recovery: restart application on PU0E

### CP takeover



-  CEx Cropto Element
-  CPyy PUnn Assigned CP
-  SAP PUnn Assigned (X)SAP
-  Spare PUnn Spare PU
-  - PUnn Failed PU

Let's look at How System z can provide Highest Level of Continuous Operations that no other platform can be matched





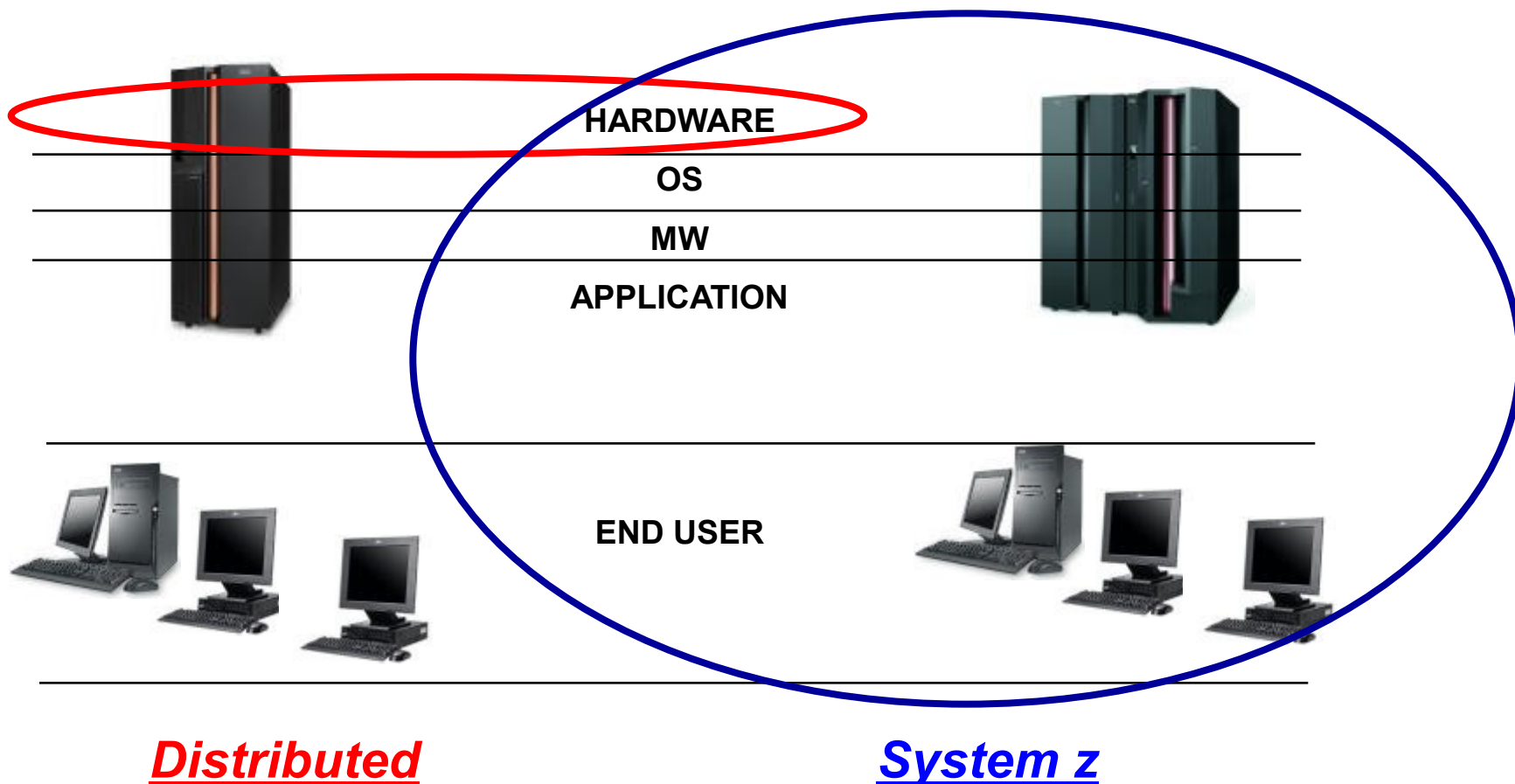
## Understanding the different definition on levels of AVAILABILITY

**Distributed** unplanned outages

(99.999% Hardware Availability)

**System z** unplanned outages

(99.999% System & Application Availability)



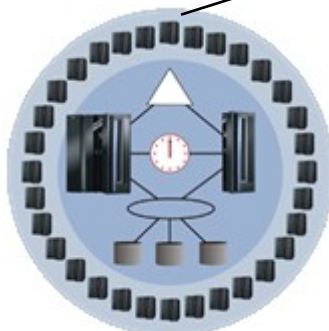
# System z Continuous Availability

Single System z

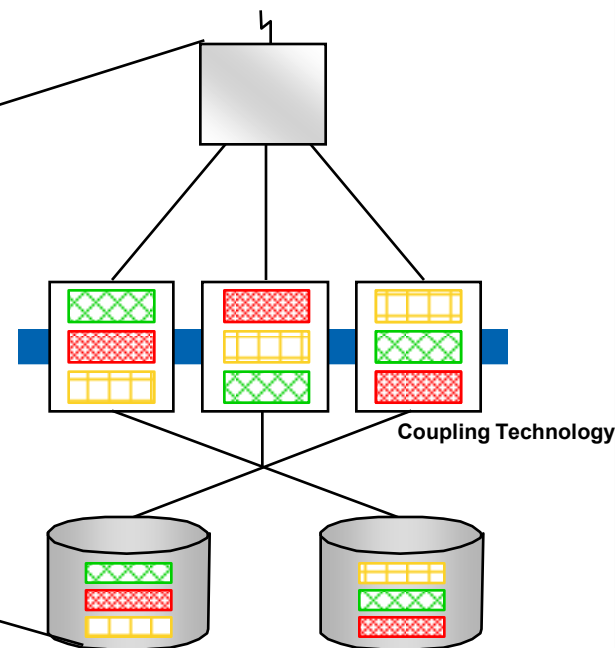


- 内置高冗余性
- 灵活容量配置
- 灵活扩展
- 热插拔 I/O

Multiple System z



- 避免计划内/计划外的软硬件停机时间
- 灵活性，具备不停机扩展的能力
  - Capacity beyond largest CEC
  - Scales better than SMPs
- 动态 Workload/Resource 管理



Let's look at How **System z** can provide  
Highest Level of Data backup and  
Disaster Recovery solution

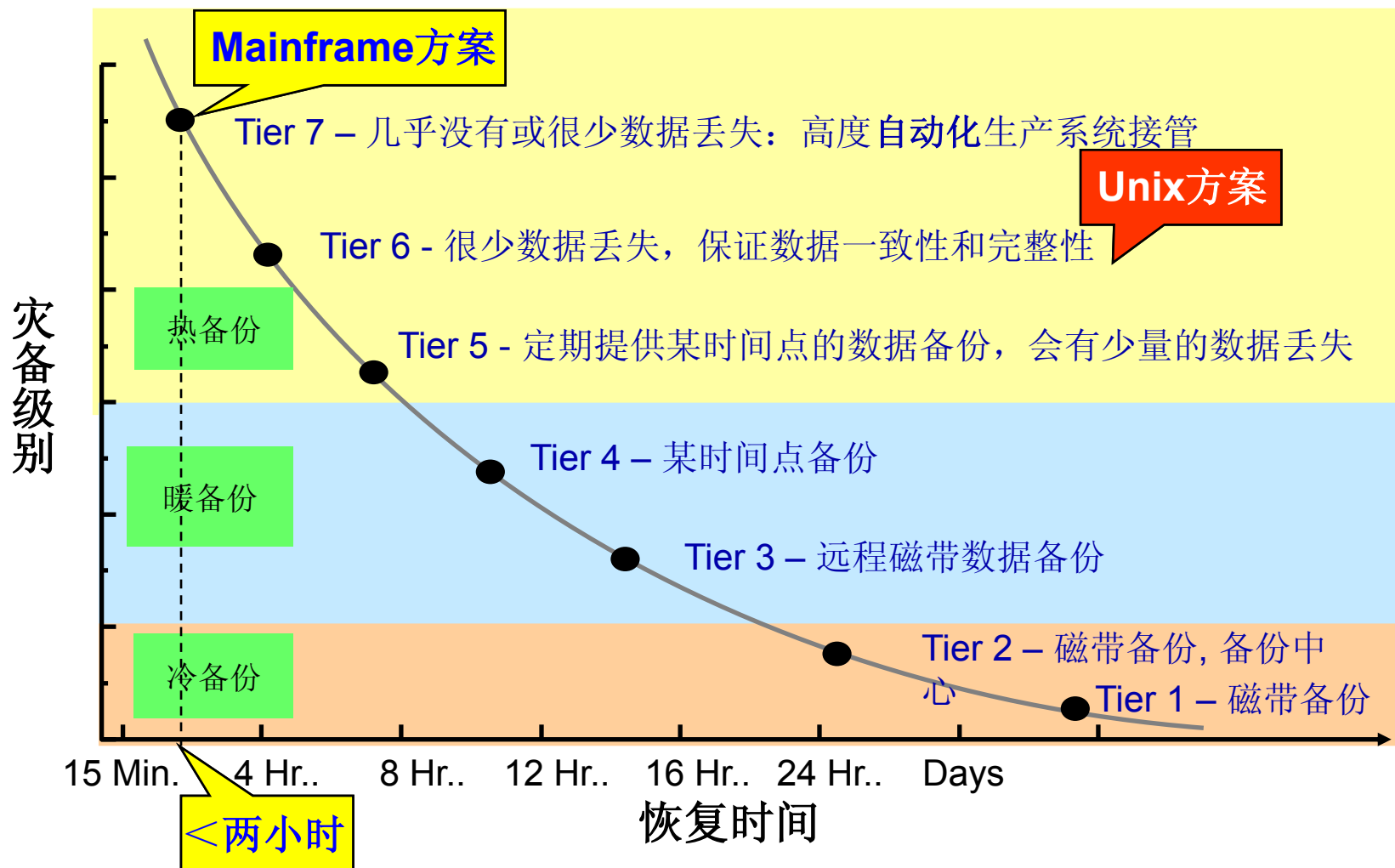


## What is the Disaster Recovery requirements

- 中国人民银行/银监会关于灾备恢复的业务目标的指示：
  - 数据大集中的银行必需建设灾备中心
  - 银行生产系统故障停业超过两小时，需要向人民银行/银监会汇报
- 银行业领导通常的灾备目标指示：
  - 大集中的生产系统发生一般故障导致的停机需要一小时内恢复生产
  - 生产系统发生重大事故时，需要**两个小时内**恢复生产

It is important to determine the Disaster Recovery Objective and Scope

SHARE用户协会为灾备解决方案的成本和将带来的效益做了以下定义：

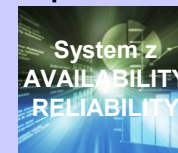


# Manage Risk with System z Resiliency

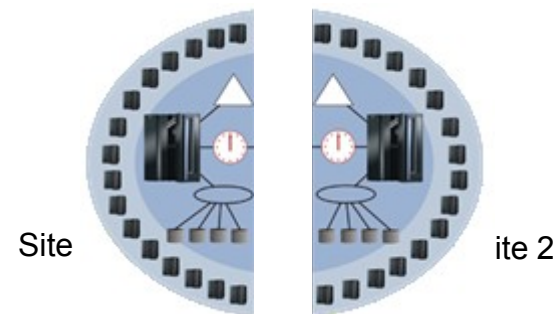
*Availability built in across the system*

Designed to deliver continuous availability at the application level

Continuous  
business  
operations



## Multiple Data Centers

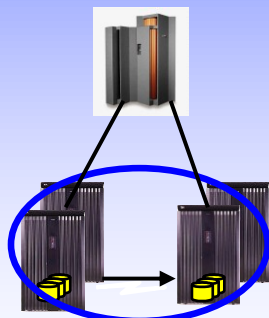


- 避免站点故障或维护停机
- 同步或异步的数据备份
  - Eliminates Tape/Disk SPOF
  - No/Some Data Loss
- 对应用来说是透明的

# Data Backup / Disaster Recovery solution on System z

## Continuous Availability of Data within a Data Center

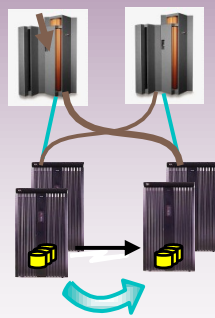
**Single Data Center**  
Applications remain active  
Continuous access to data in the event of a storage subsystem failure



State Farm Insurance Company  
Axiom

## Continuous Availability / Disaster Recovery within a Metropolitan Region

**Two Data Centers**  
Systems remain active  
Multi-site workloads can withstand site and/or storage failures

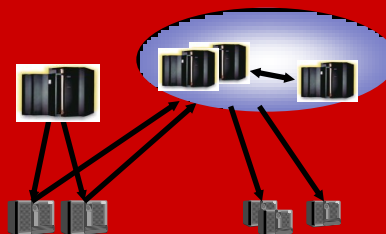


HSBC  
TD Bank  
Royal Bank of Scotland

## Disaster Recovery at Extended Distance

**Two Data Centers**  
Rapid Systems  
Disaster Recovery with "seconds" of Data

Disaster recovery for out of region interruptions

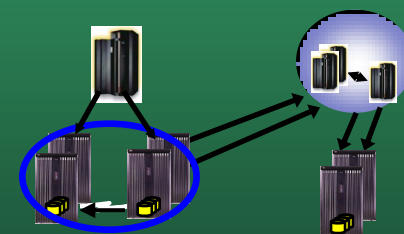


Pershing / A BONY Co.  
Principal Financial Group  
Capital One

## Continuous Availability Regionally and Disaster Recovery Extended Distance

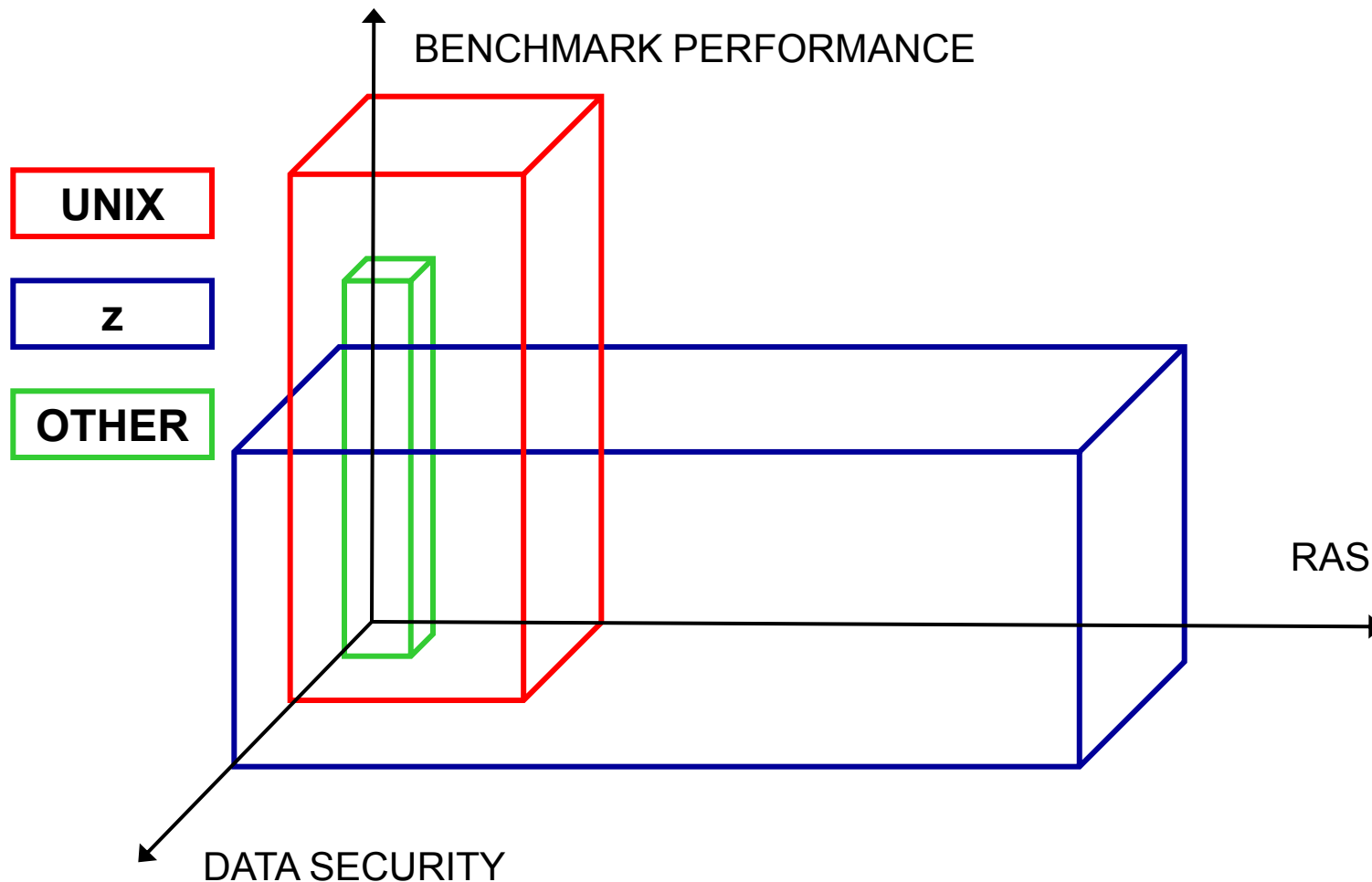
**Three Data Centers**  
High availability for site disasters

Disaster recovery for regional disasters



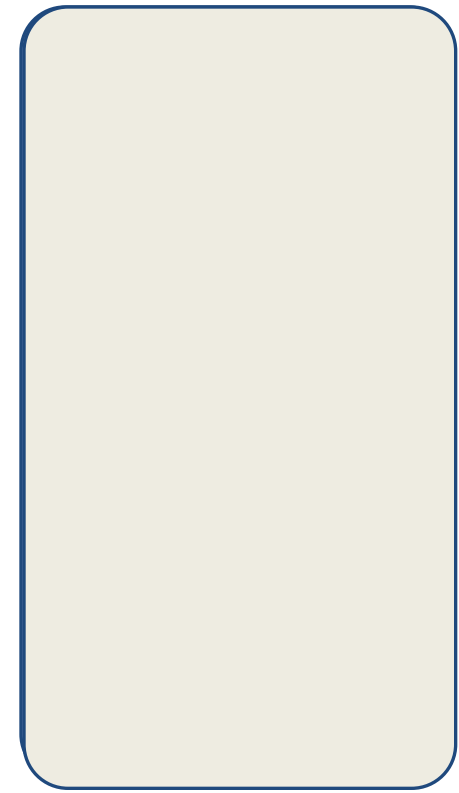
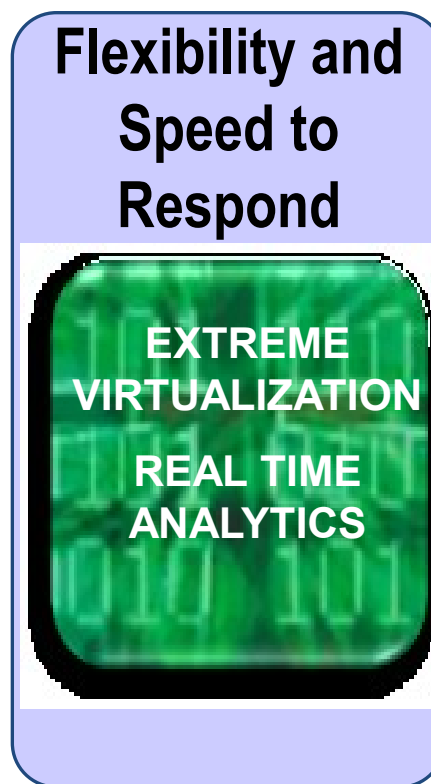
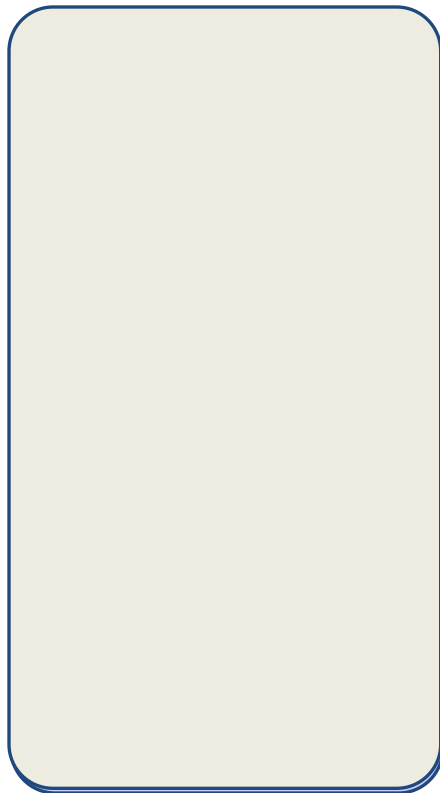
ICBC  
CCB  
ABC

# Positioning of *System z* and UNIX

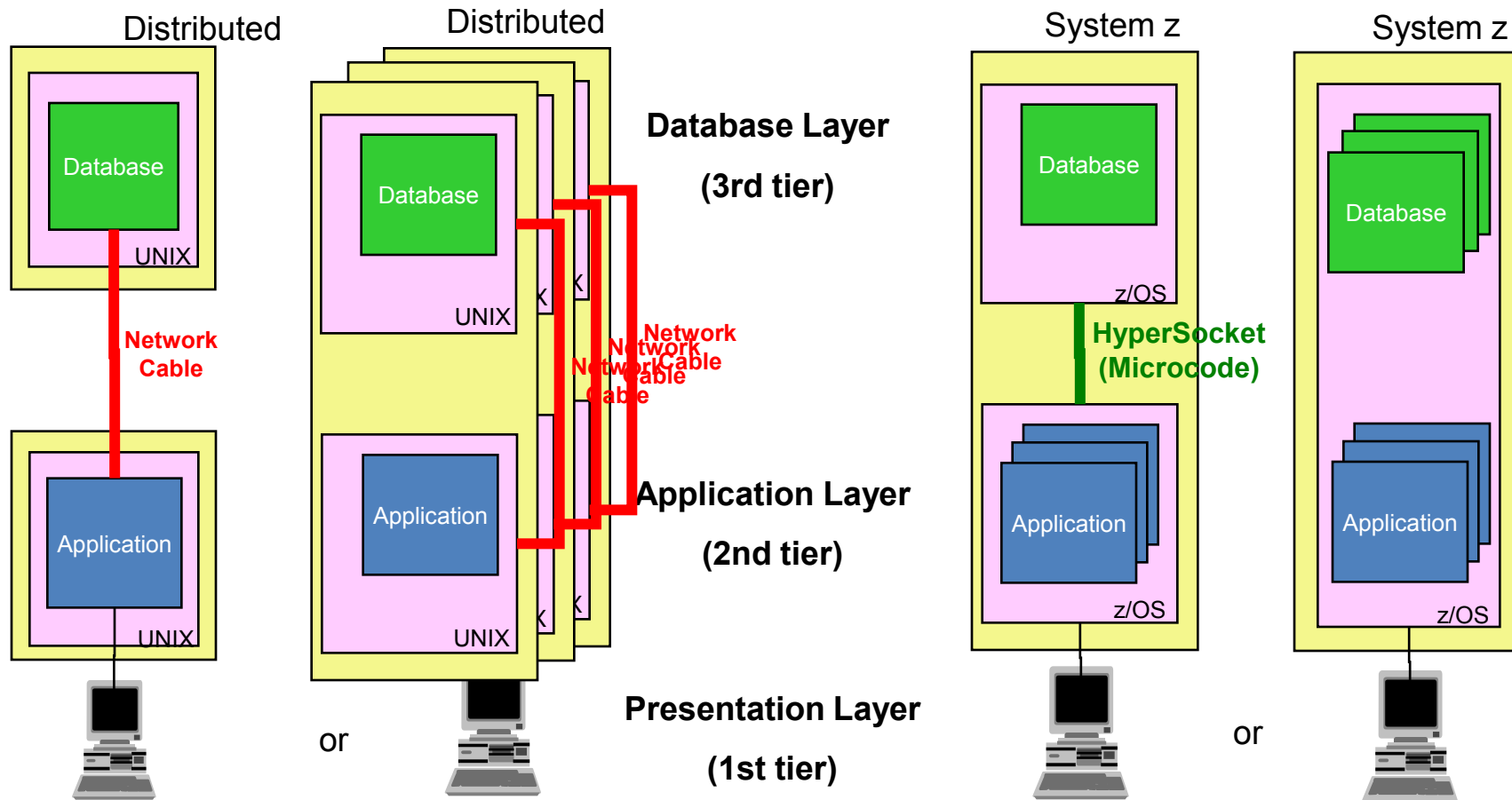




## The Top 3 Most Concerns to meet a Critical Business Needs



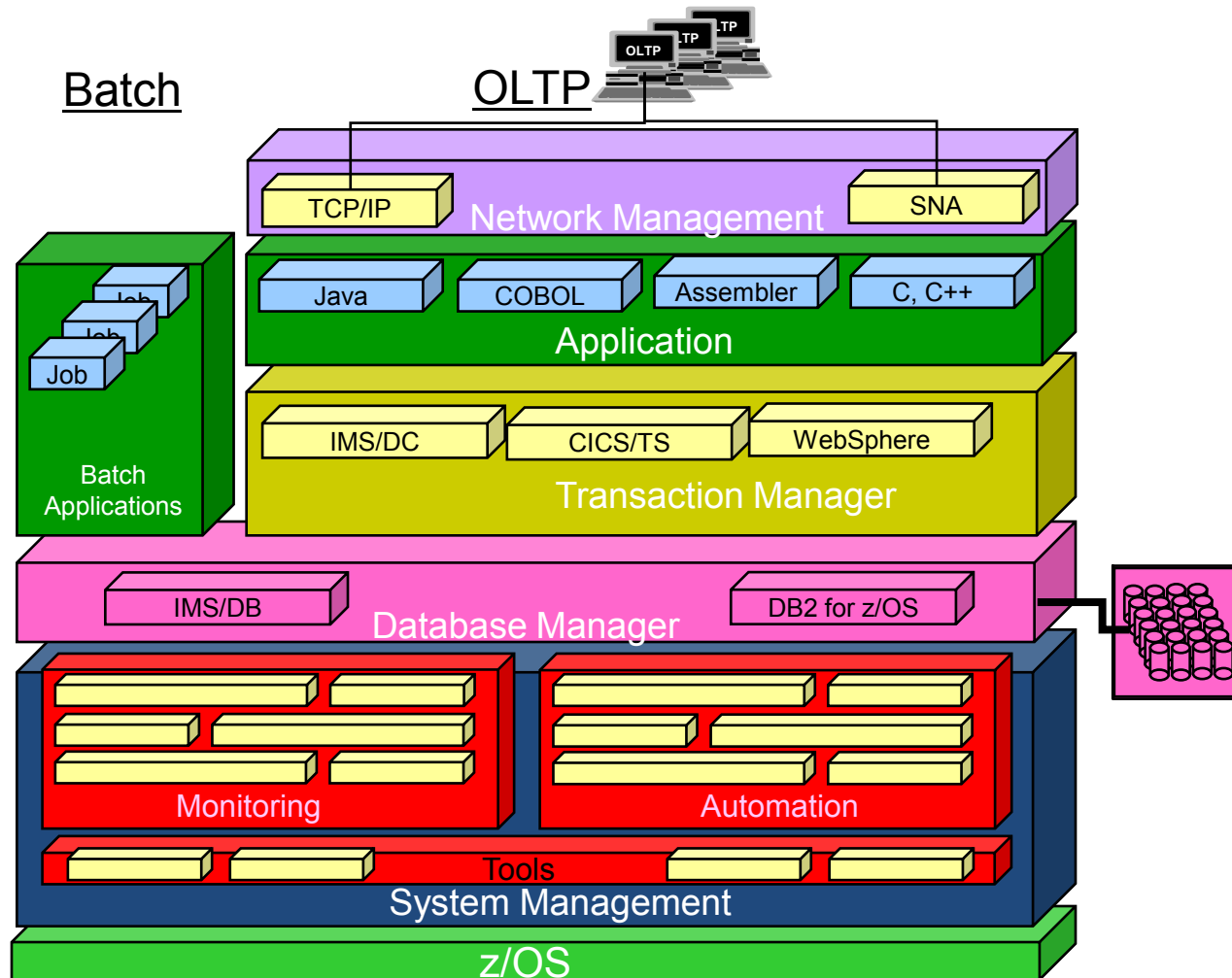
# What is the advantage of 2-tier over 3-tier Architecture



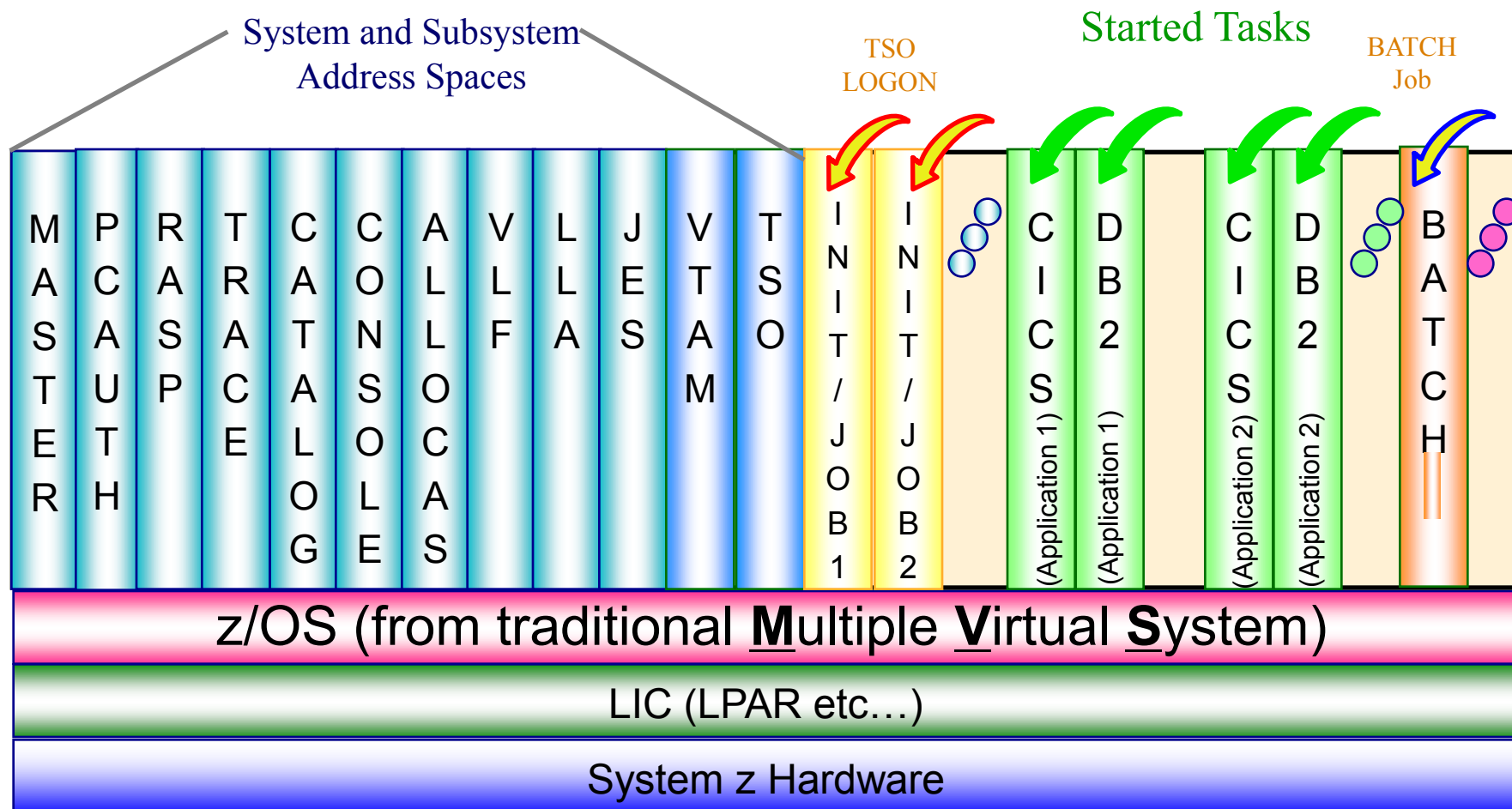
**3-tier Distributed**

**3-tier & 2-tier System z**

# System z System Software Architecture



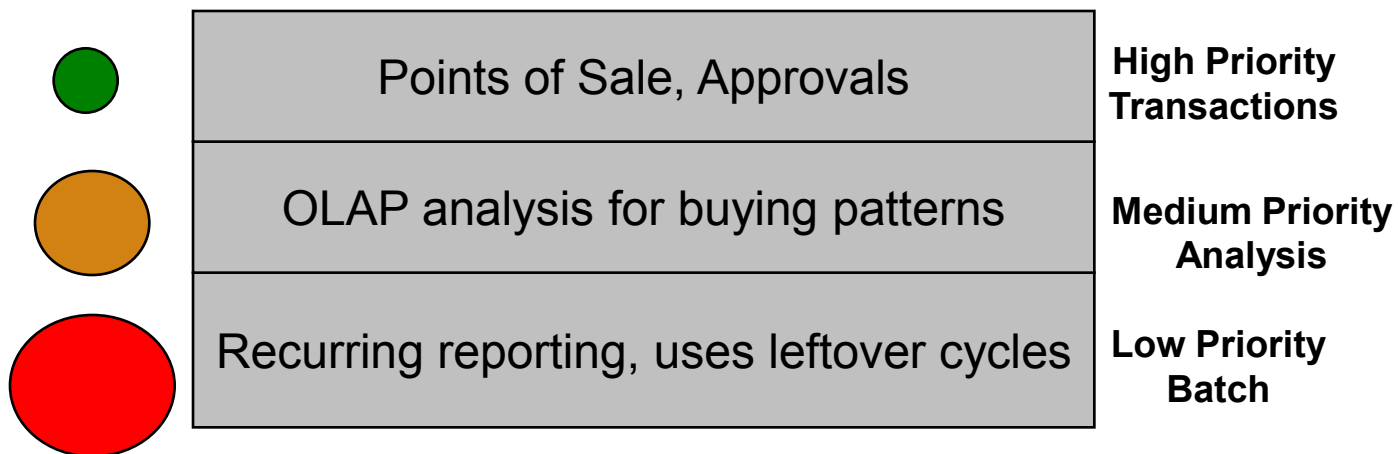
# System z runs everything within a single operating System z/OS



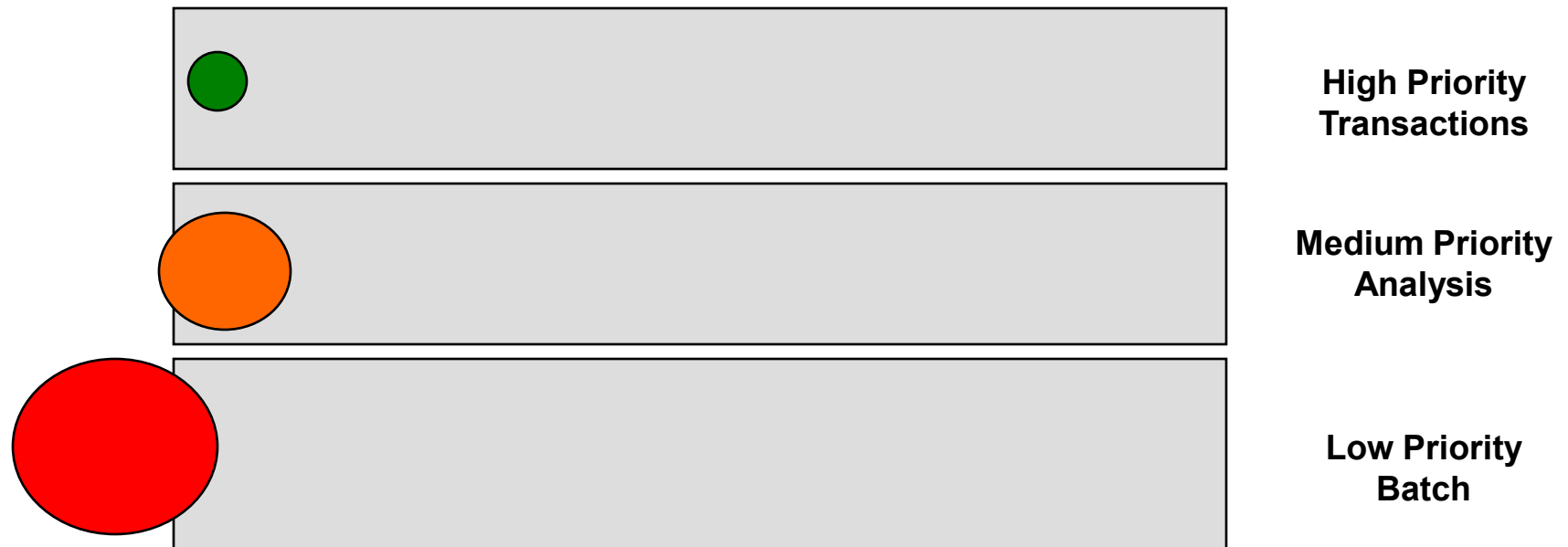
# z/OS – Qualities of Service

## ❑ Workload Management and Resource Optimization

- Ability to intelligently manage workloads, dynamically reallocate system resources between applications quickly and efficiently
- Can handle unexpected workload spikes, helping to improve your system's efficiency and availability to meet business priorities
- The Workload Manager (WLM) component of z/OS is designed to manage the processing of mixed diverse workloads according to your business goals, including response time goals.
- WLM allows you to monitor and adapt the system to help you match resources to meet business goals.

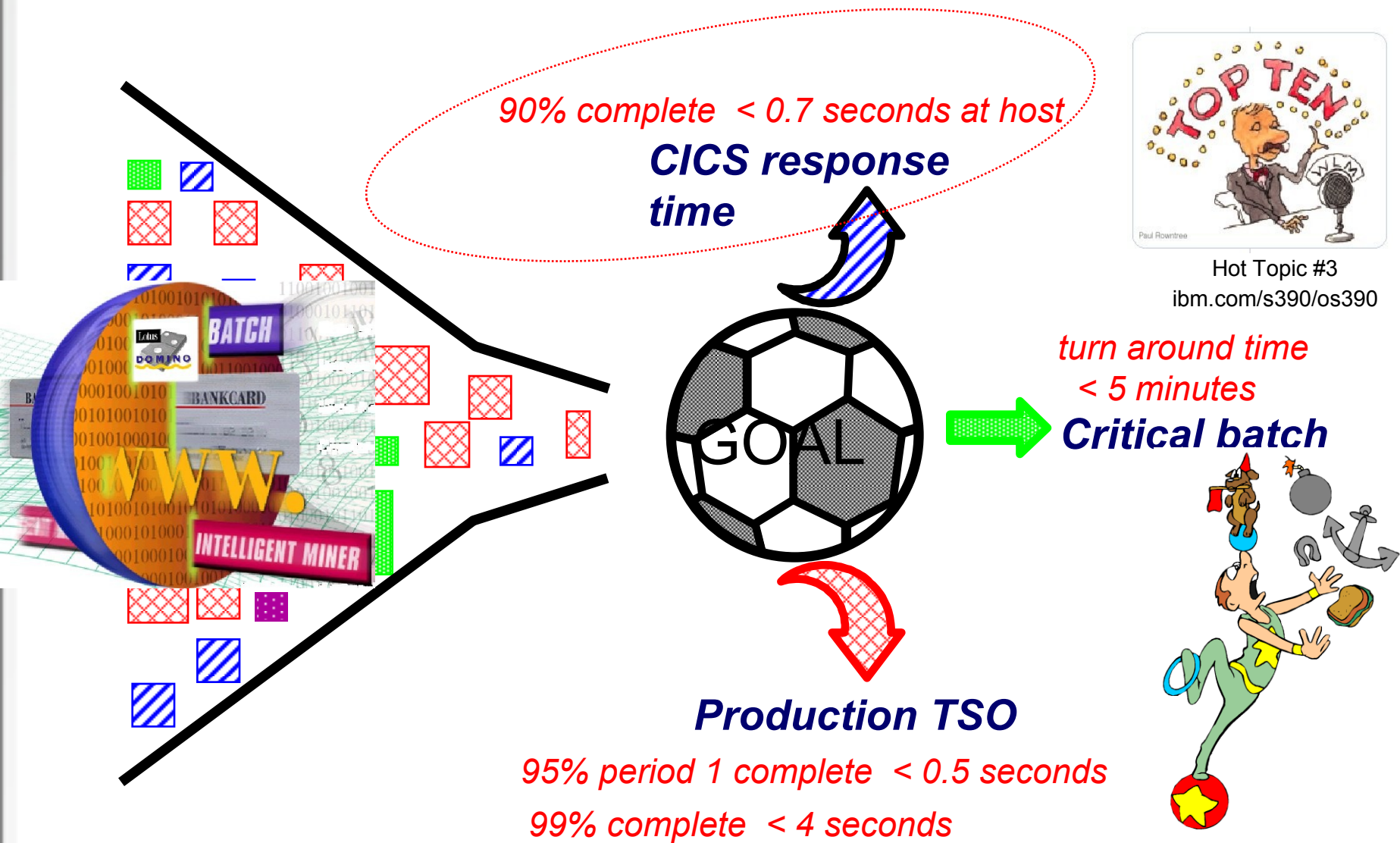


# How **Distributed** platform manage Multiple Workloads



Workloads can affect one another. A long running lower priority workload might affect higher priority workloads.

## z/OS use Workload Manager (WLM) to support your defended SLA

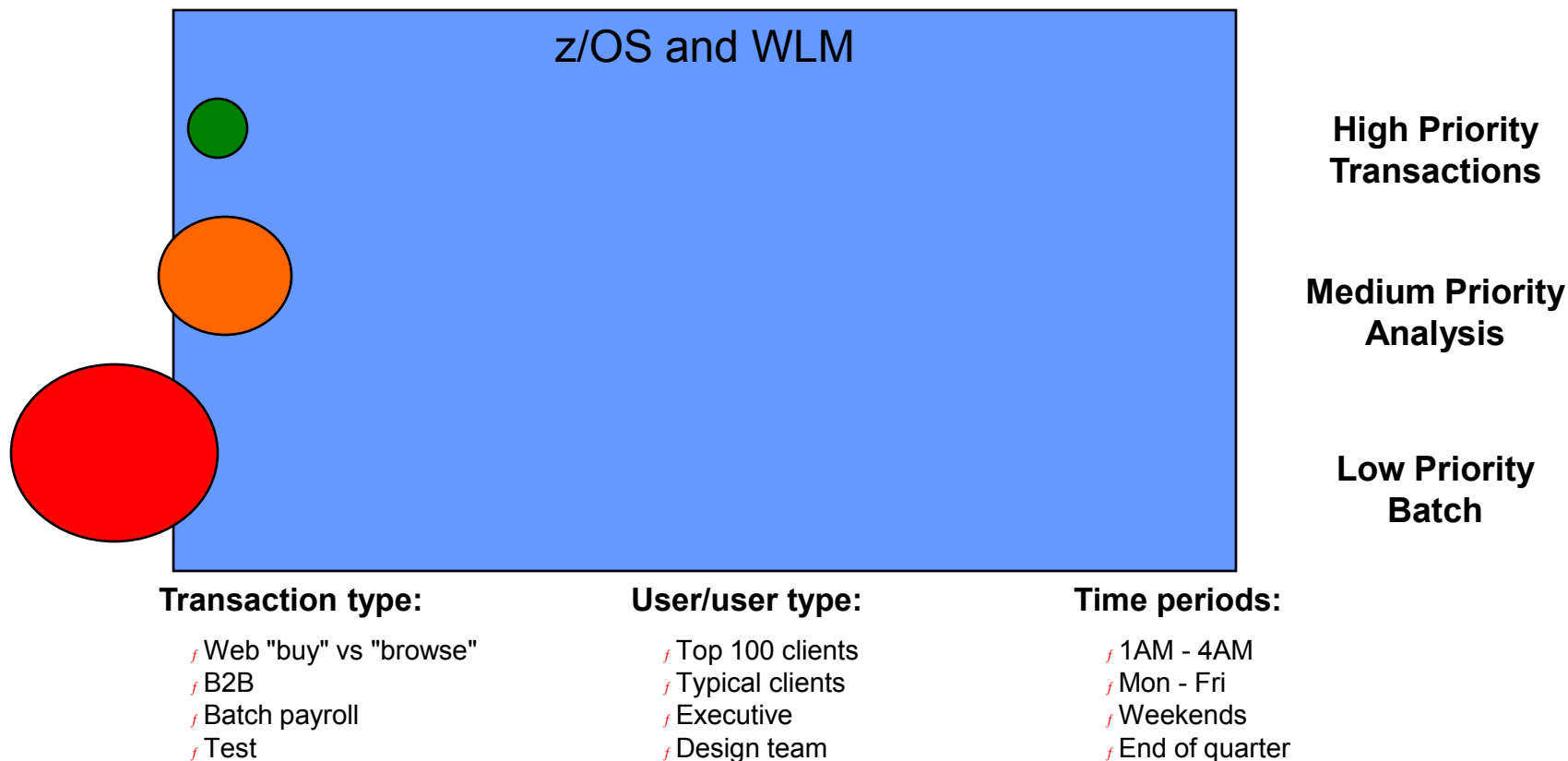


# **z/OS** Workload Manager can Differentiate and Prioritize your work based on your Business Policy

*Resources are automatically allocated, adjusted and reallocated to meet objectives*

*WLM will manage LPARs, CPUs, channels, I/O subsystems and DASD, TCP/IP connections, servers, etc.*

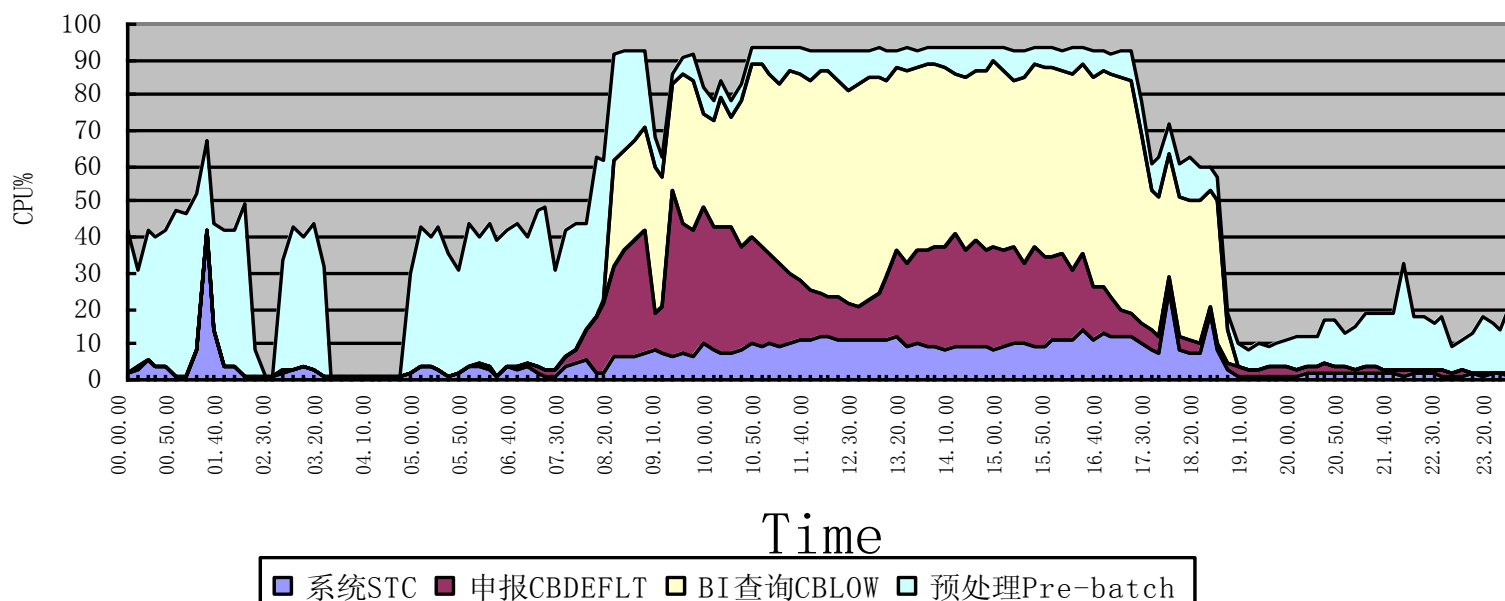
*Enables 100% utilization of capacity*



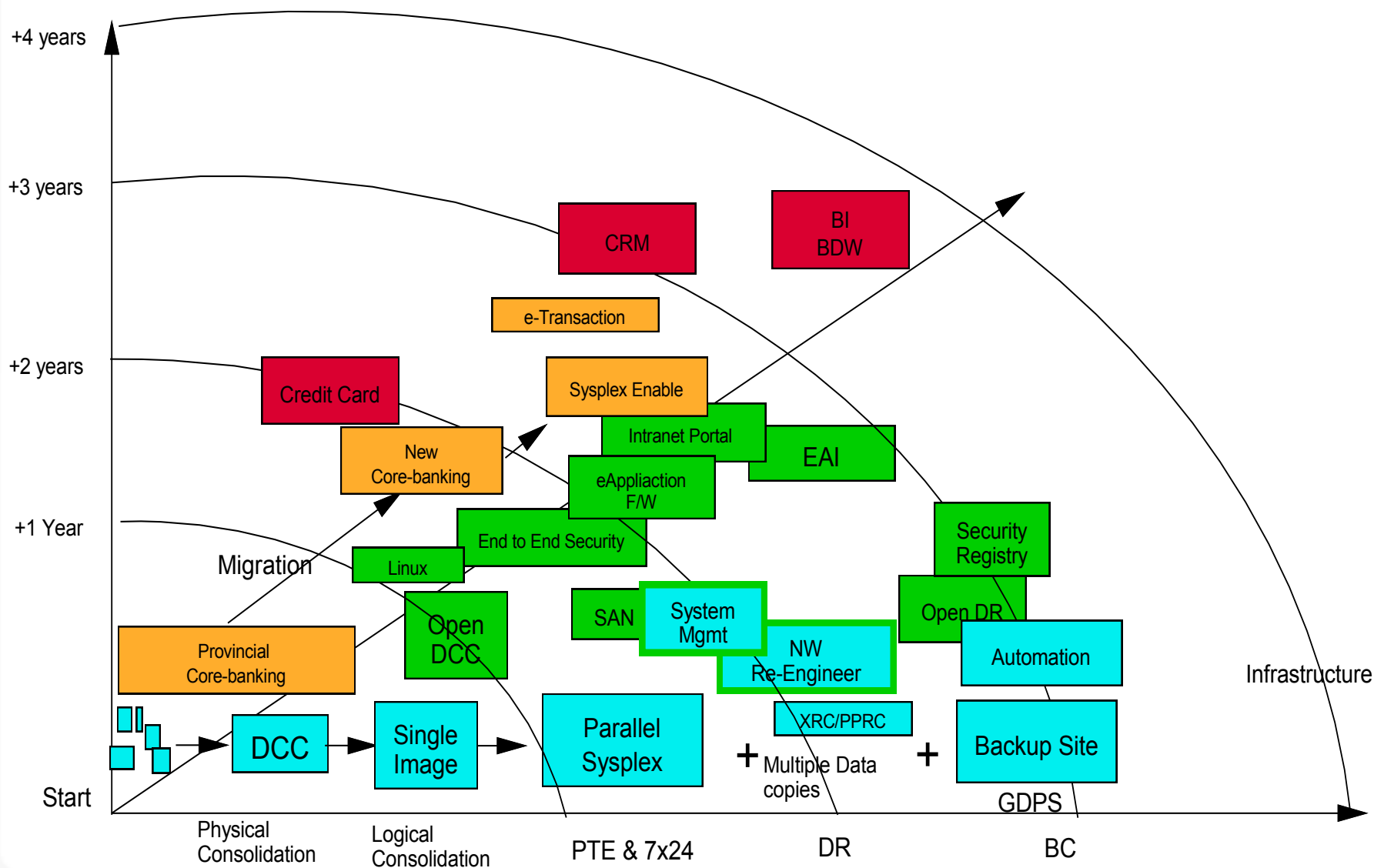


## Typical mixed workload daily distribution for System z customer

2009年08月10日系统CPU分类使用情况



# 面向未来需求的技术导向图



# Realize business advantage

*Make better decisions with insight, rather than hindsight*

## IBM Smart Analytics Optimizer (SAO)

## IBM Smart Analytics System 9600



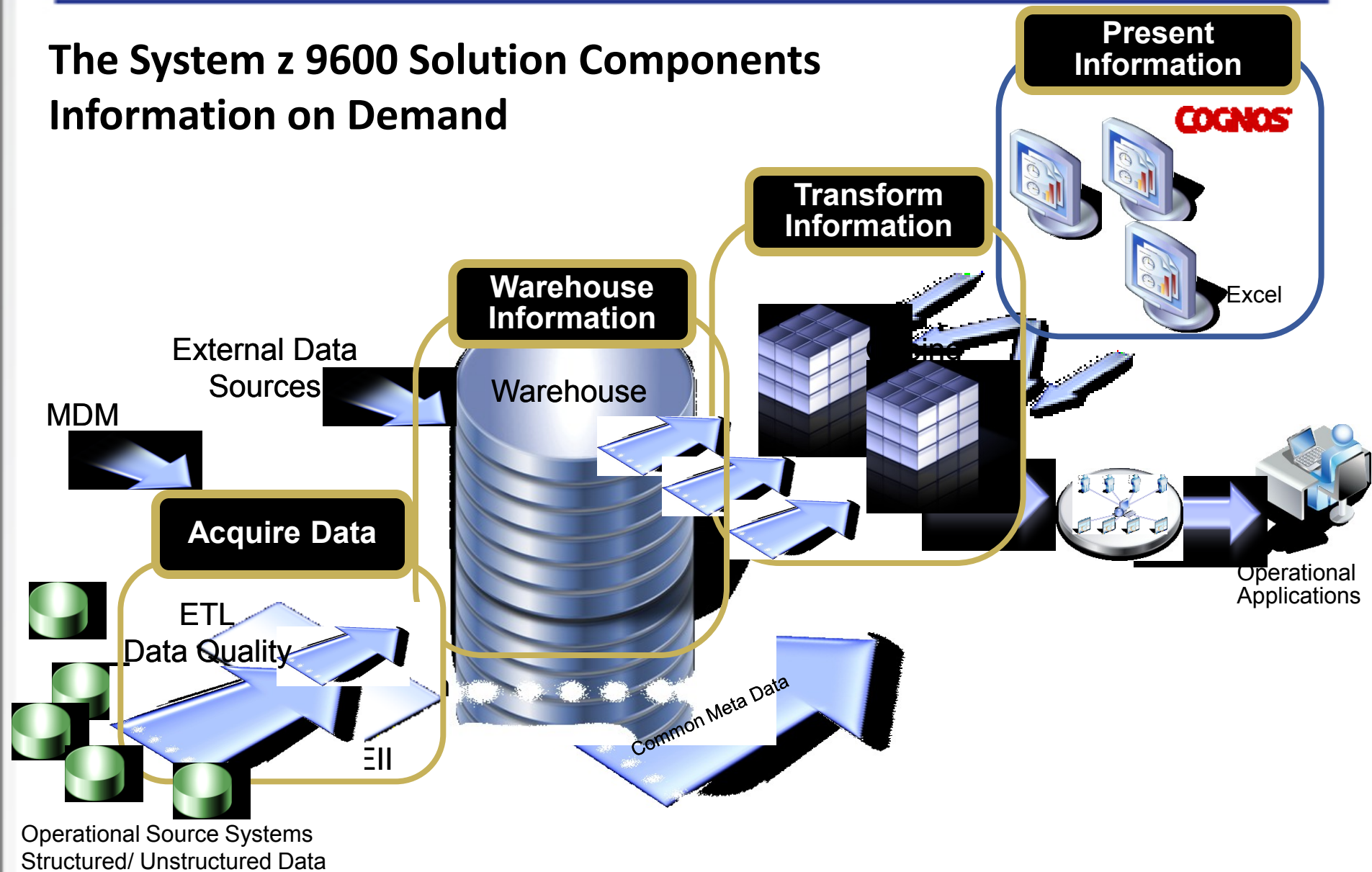
A centrally managed and integrated near-real-time analytics infrastructure, that delivers:

- ✓ Up to 5x – 80x improvement in query performance for many complex queries
- ✓ Simplified and automated to lower costs compared to traditional ETL

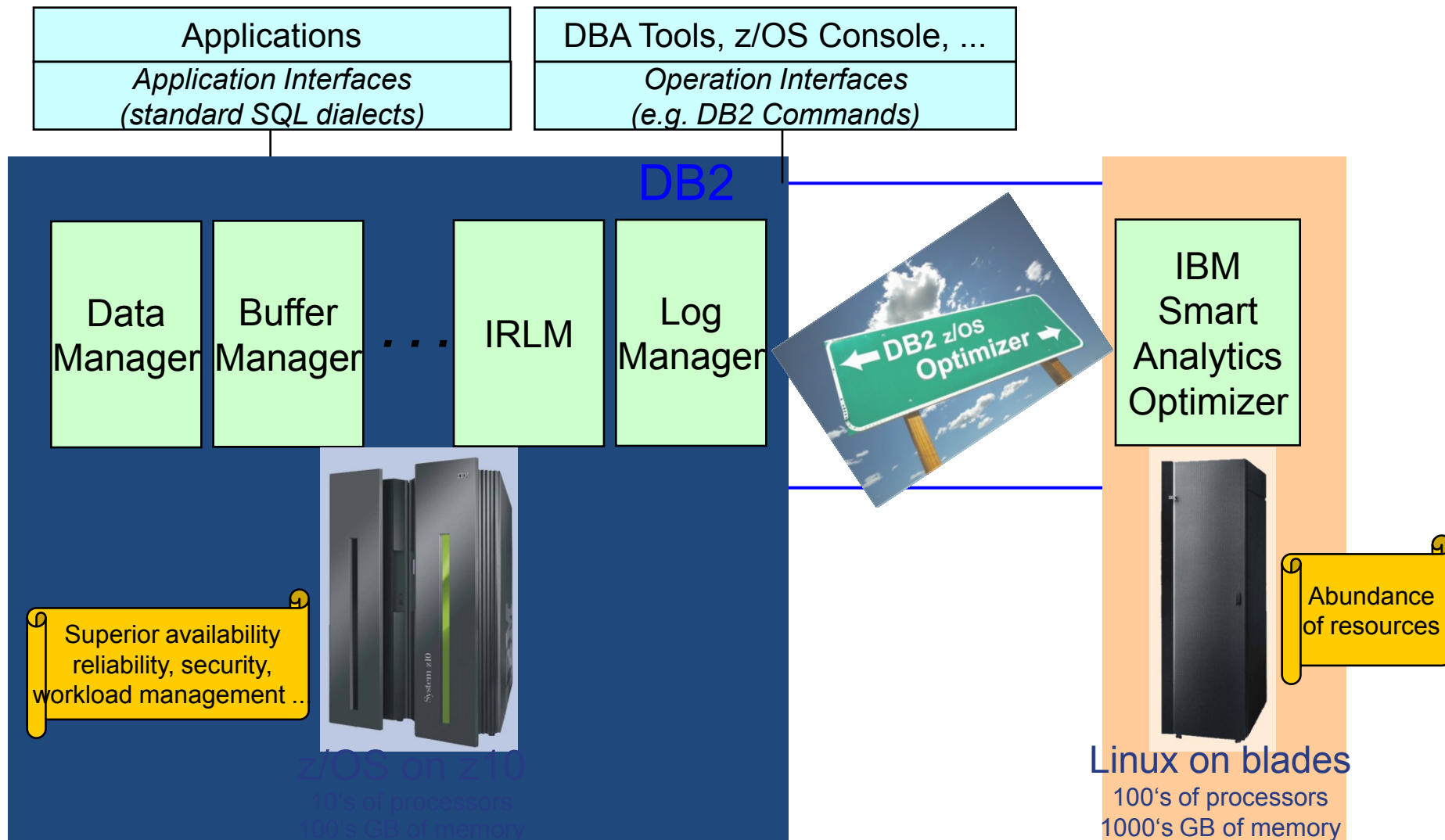
***“A European banking client saw an 80-fold improvement in query performance with ISAO”***

***PLUS: new levels of performance with DB2 for z/OS 10 Beta***

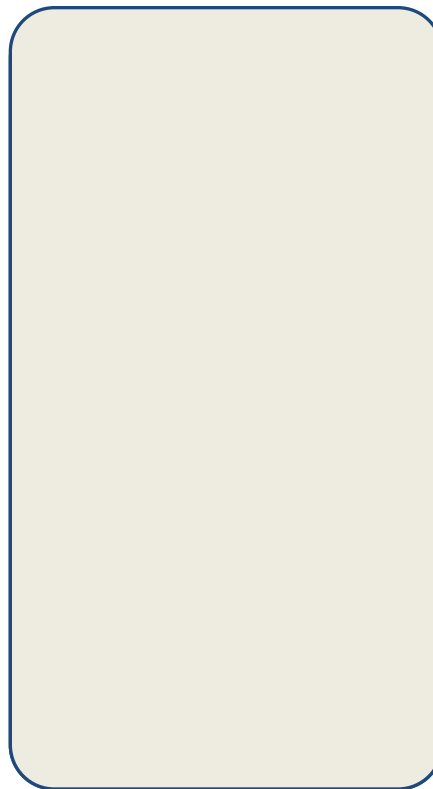
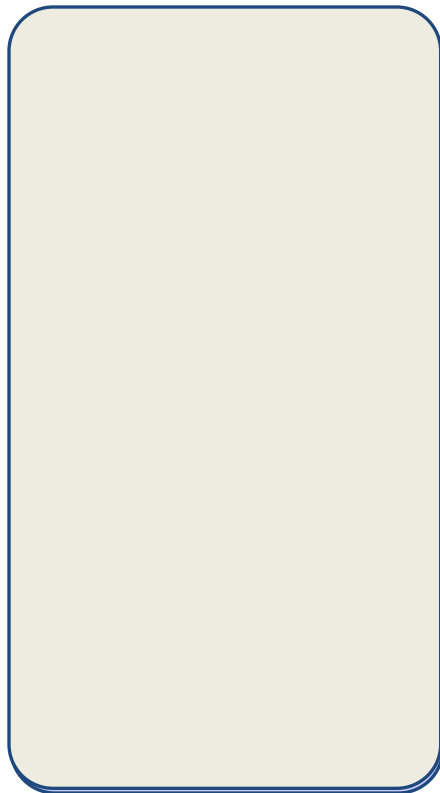
## The System z 9600 Solution Components Information on Demand



# IBM Smart Analytics Optimizer - a Virtual DB2 Component

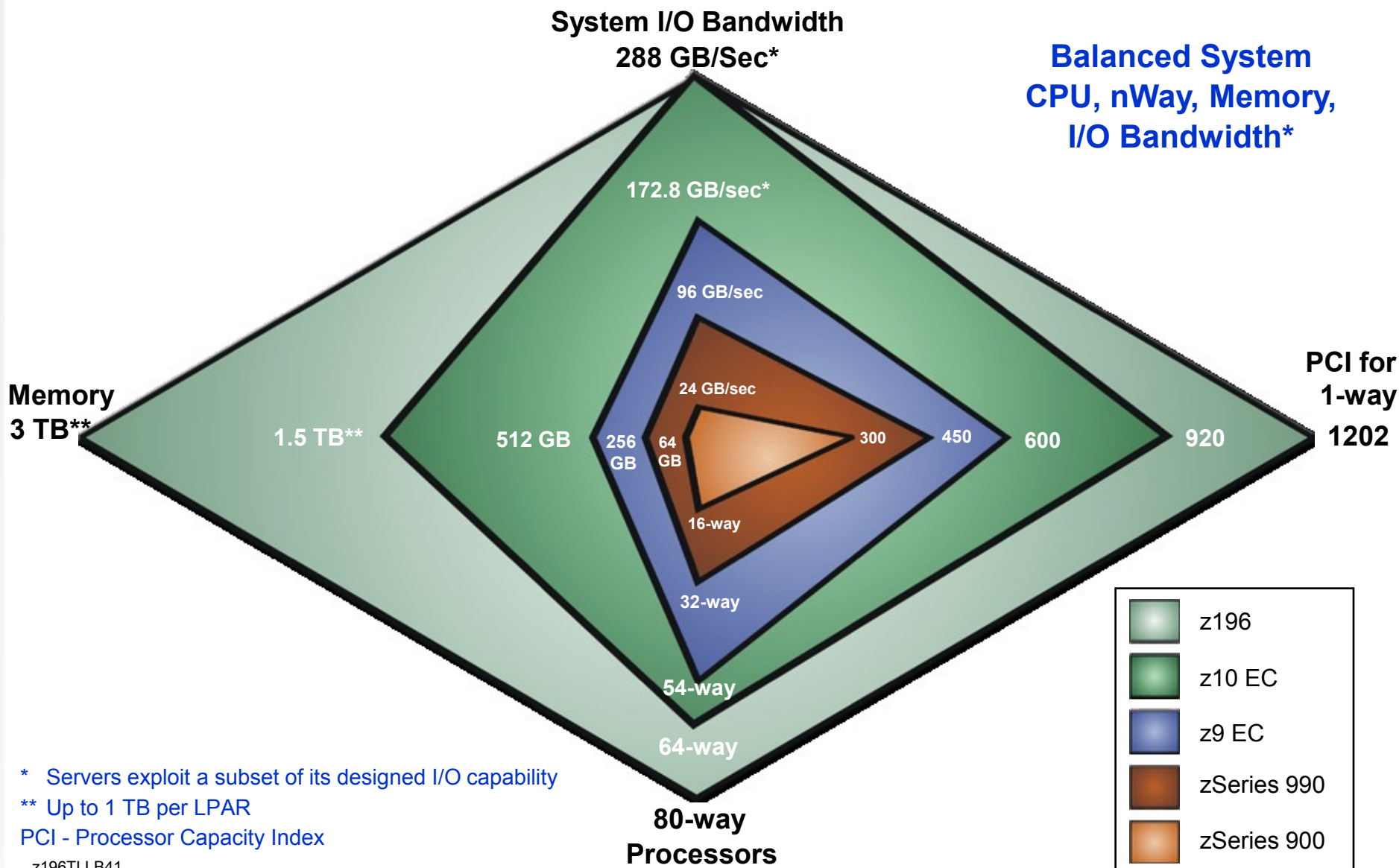


# The Top 3 Most Concerns to meet a Critical Business Needs



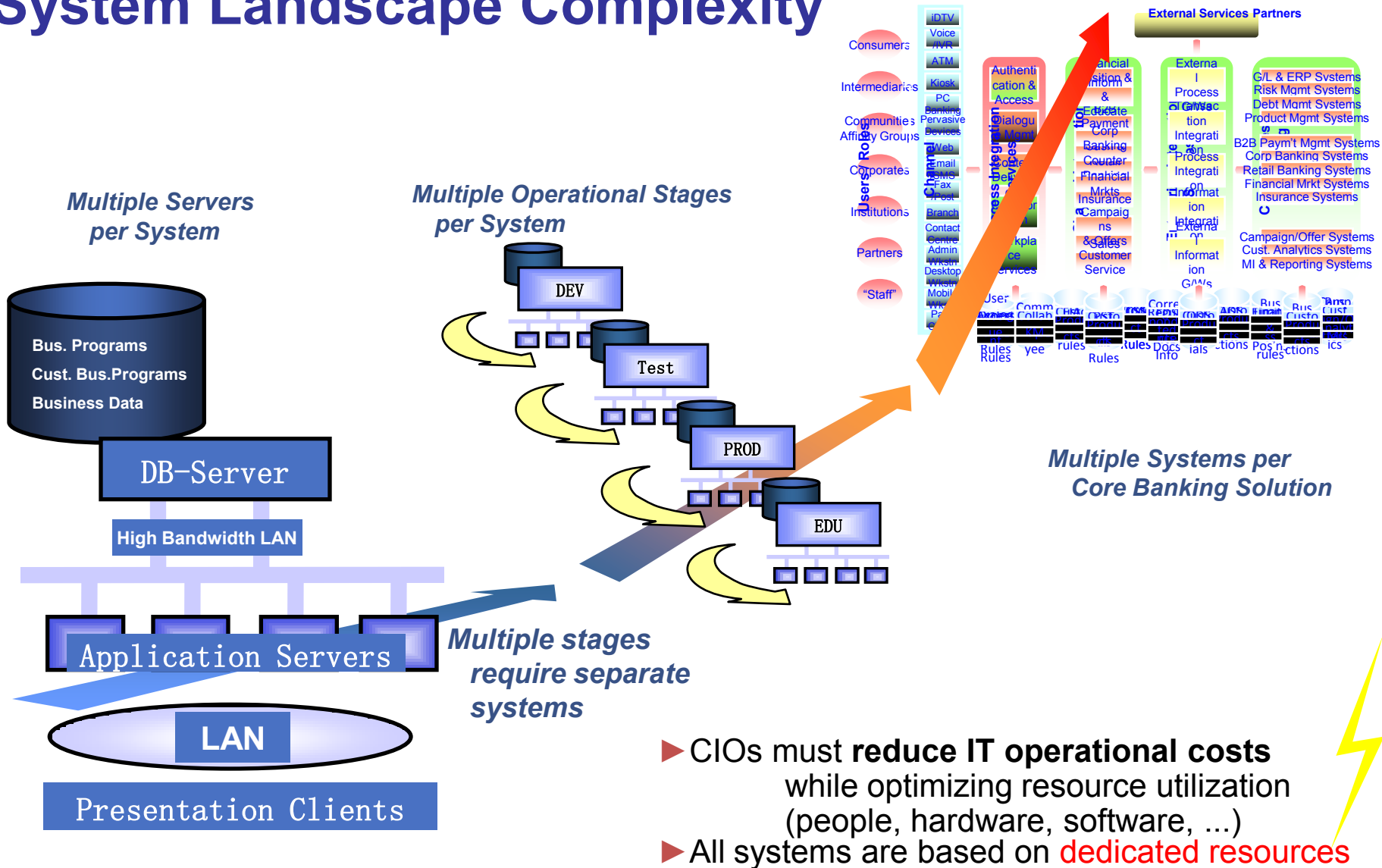
# CPU speed is NOT the only things for Processing

**Balanced System**  
CPU, nWay, Memory,  
I/O Bandwidth\*



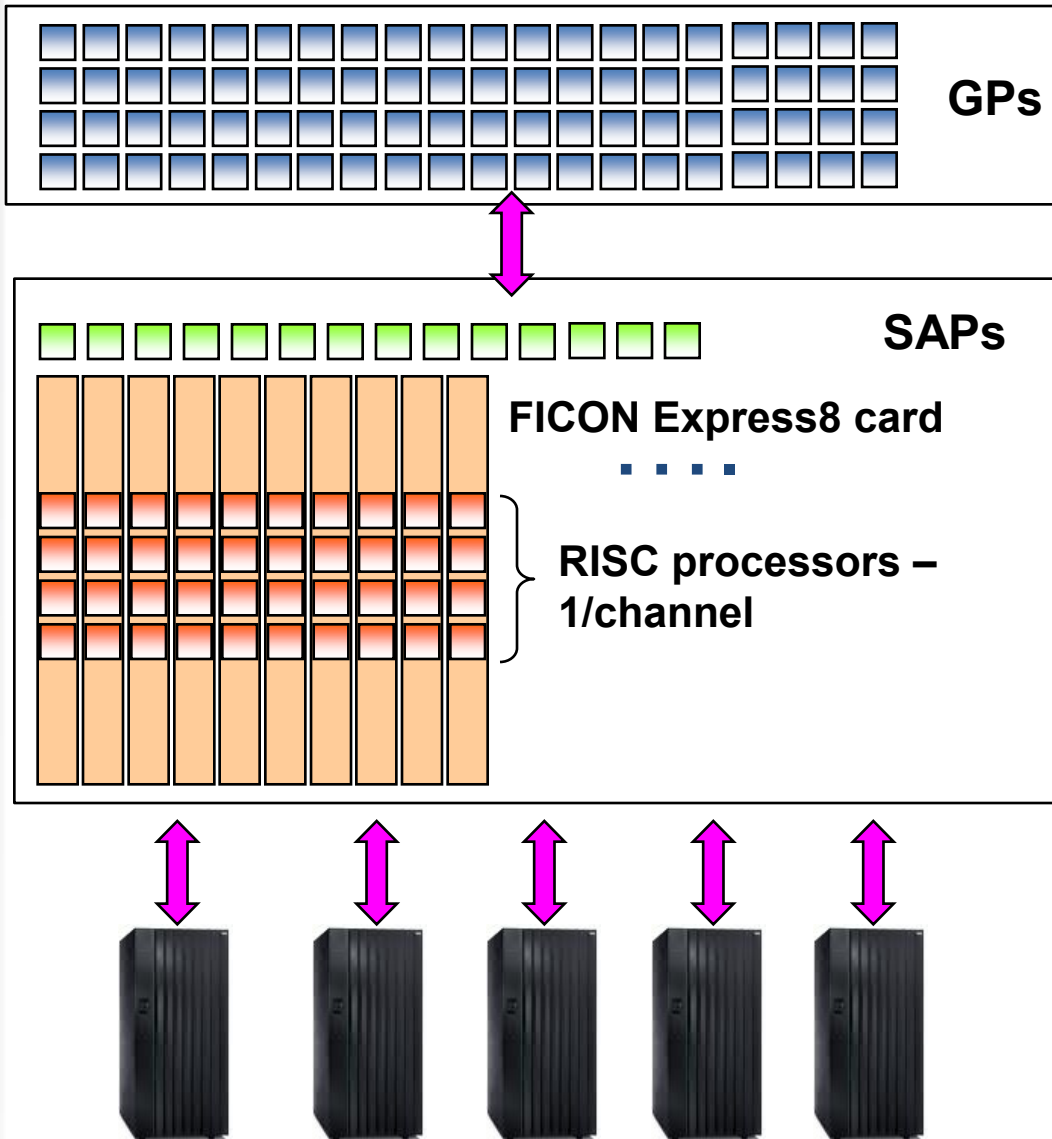


# System Landscape Complexity





# System z - Optimized for High I/O Bandwidth



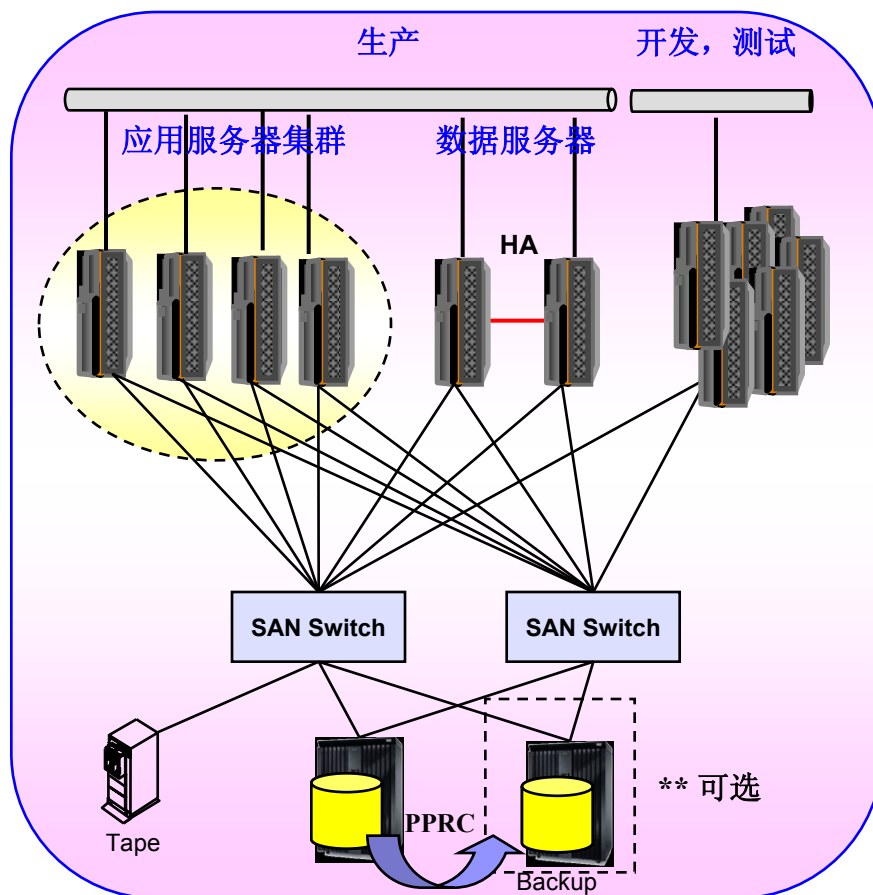
- Up to 80 General Purpose (GP) or Specialty Engine processors
  - Execute business logic
- Up to 14 System Assist Processors (SAP) to manage I/O requests
  - Can sustain up to **1.6M IOPS\***
- Logical Channel Subsystem virtualizes I/O
  - Up to 1024 logical channels
- Up to 84 physical FICON cards for I/O transfers
  - Up to **336 RISC channel I/O processors**
  - High Performance FICON connections
- IBM DS8700 Storage System
  - Up to **420K IOPS capability** with zHPF

\* Testing on pre-GA HW  
Recommend 70% max SAP Utilization – 1.1M IOPS

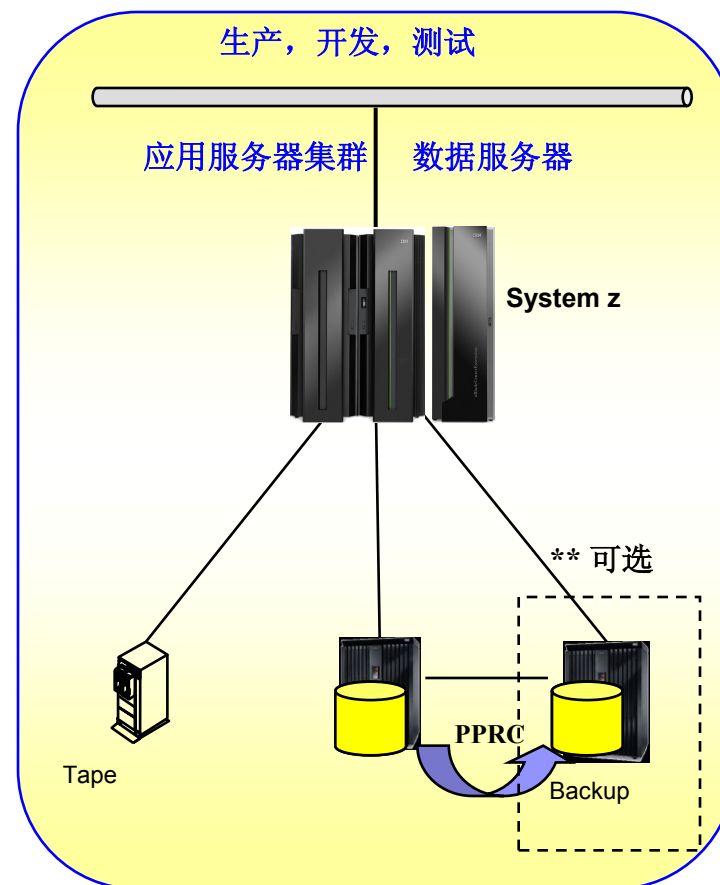
在德国一家银行最近的实践验证，将**UNIX**上的批处理(Batch Job)应用迁移到 **System z**上，性能提高了两到三倍！

	Unix	System z
I/O处理性能	<ul style="list-style-type: none"><li>• I/O处理由中央CPU控制完成</li><li>• 运行批处理作业时，大量同步I/O操作导致CPU利用率低，无法通过增加CPU提高批处理性能</li></ul>	<ul style="list-style-type: none"><li>• 具有专用于I/O处理的CPU (System Assistant Processor)</li><li>• 运行批处理作业时，即使有大量的同步I/O操作，CPU利用率仍可达90%以上</li></ul>
操作系统设计原则	<ul style="list-style-type: none"><li>• Unix最初是为交互式开发环境而设计</li><li>• 将批处理和一般交互式作业都作为进程(process)管理，无区分</li></ul>	<ul style="list-style-type: none"><li>• z/OS最初是为批处理而设计的操作系统</li><li>• 针对批处理(如时序安排scheduling等)方面有独特的设计</li></ul>
系统架构设计	<ul style="list-style-type: none"><li>• 由于UNIX操作系统本身的局限，对大型系统，一般将应用服务器和数据库服务器分开部署；对批处理作业，这种架构会带来处理性能上的瓶颈。</li></ul>	<ul style="list-style-type: none"><li>• 应用和文件、数据库服务都在同一个操作系统内完成，访问效率高</li></ul>

# Infrastructure Simplification on System z



**Distributed**



**System z**

# Why Customers Say System z Delivers

## High business growth

System z  
HIGH  
SCALABILITY

*"We have decided to adopt System z because of its **high scalability, guaranteed high security** and that it ultimately will be **cheaper to manage** only one machine instead of many distributed servers."*

*Armin Gerhardt, Chairman, EFiS Corporation*

## Continuous business operations

System z  
HIGH  
AVAILABILITY  
RELIABILITY

*"We chose System z for its **continuous operation, service quality** made available through IBM's mainframe software solutions, and economic returns for the years ahead. We see System z as a critical success factor for our business objectives and service level requirements for customers."*

*Jeongkyu Lee, Chief Information Officer at PC Card*

## Flexibility and speed to respond

EXTREME  
VIRTUALIZATION  
REAL TIME  
ANALYTICS

*"..System z was the only platform that could handle **unpredictable peaks in demand without any risk of failure.**"*

*Igor Otliga, Data Centre Manager  
Belarusian Railways*

*"We have 3,800 users and 7,000 customers using our SAP systems worldwide, and **downtime costs** us more than \$100,000 an hour. Availability is king for Baldor, and the IBM System z gives us what we need."*

*Mark Shackelford,  
Director of Information Systems, Baldor*

# What does people do on the airplane?



You are not alone.



## What make the airplane the safest transportation on earth

- Similar to 飞行记录仪 (黑盒) on the plain
- System z is very serious on collecting data for diagnosis of problems
  - System activities and status are stored in SMF and hardware
  - The data is available even the system is down



# 谢谢



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