Università di Roma La Sapienza

Dipartimento di Informatica

SAP e il Mainframe
Un binomio di successo

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IBM IT Architect - SAP Technical Sales Support

Roma, 24 maggio 2010

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Agenda

L’azienda SAP

Le applicazioni SAP

Le architetture SAP

SAP e il Mainframe IBM

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SAP AG

- **Sebbene il prodotto principale (R/3 o ECC o ERP) venga comunemente chiamato SAP…**

  SAP è un'Azienda e non un Prodotto

- **Ma cosa significa l'acronimo SAP ?**

Significa:

Systeme

Anwendungen

Produkte

in der Datenverarbeitung

In Italiano:

Sistemi, Applicazioni and Prodotti in Data Processing

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SAP's Mission Statement

SAP will…

… define and establish undisputed leadership in the emerging market for business process platform applications,

… accelerate business innovation powered by IT for firms and industries worldwide,

… and thus contribute to economic development on a grand scale

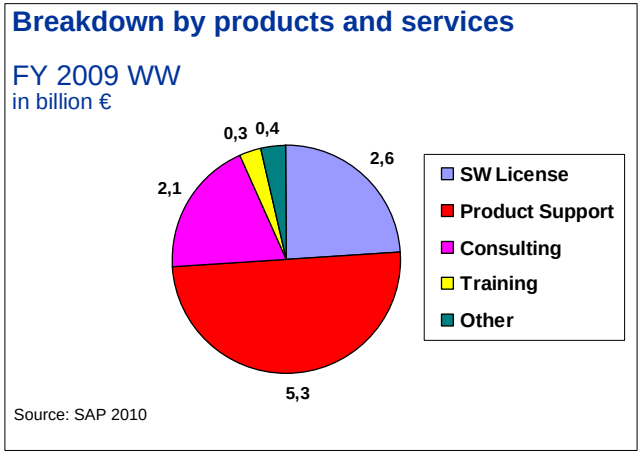
SAP is committed to…

… making every customer a best-run business

Overview of SAP AG company

SAP AG in 2009 revenues: €10.67 billion

- More than 97.000 customers in 120 countries
- Providing 28 specific industry solutions
- About 48.000 employees in > 50 countries
- 25 million users around the world

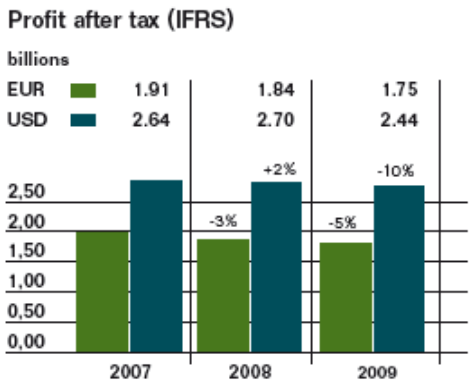


Sampling of SAP's 97,000 customers

Adobe Systems	Kellogg's
American Express	McDonald's
Apple	Nestle
BMW	Nike
BP	Nokia
Canon	PepsiCo.
Chevron	Procter & Gamble
Chrysler	Samsung
Coca-Cola	Siemens
Colgate-Palmolive	Sony
Dept of Defense	Starbucks Coffee
Disney	Target
Ford	The Body Shop
GE	Unilever
General Motors	U.S. Postal Service
Hershey Foods	Verizon
Home Depot	Wal-Mart

Financial Highlights (IFRS) – FY 2009

Total revenue	€10.67 bn
Software and software-related service revenue	€8.20 bn
Operating profit	€2.59 bn
Profit after tax	€1.75 bn
Operating margin	24.3%
Free cash flow	€2.81 bn



http://www.sap.com/about/company/index.epx

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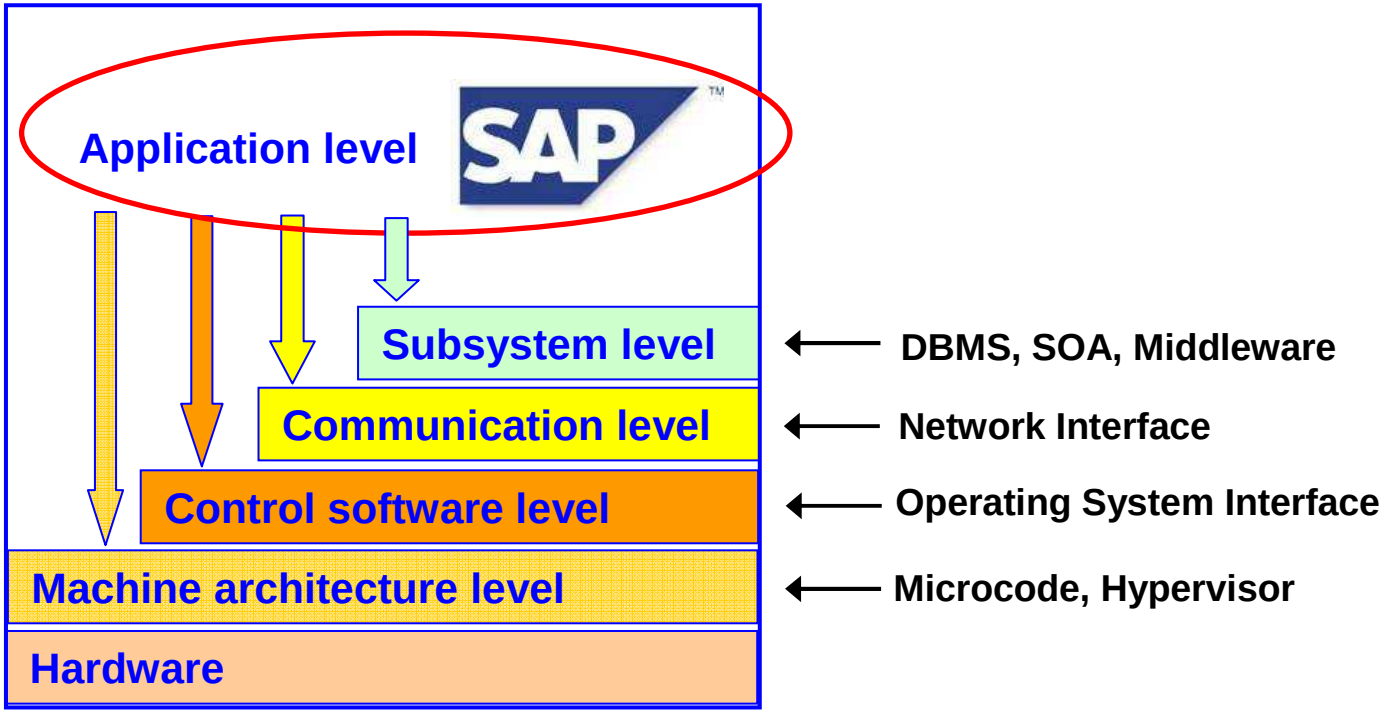
Componenti di sistema

Dove si colloca l'applicativo SAP



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L'offerta SAP

http://service.sap.com/pam

SAP Application Components
- ANALYTICAL BANKING EXTENSION
- SAP AUTO-ID INFRASTRUCTURE
- SAP CM SOA
- SAP CPROJECT SUITE
- SAP CRM
- SAP E-COMMERCE FOR SAP R/3
- SAP E-RECRUITING
- SAP E-SOURCING / CLM
- SAP EH&S
- SAP ENTERPRISE LEARNING
- SAP ERP
- SAP ERP ES
- SAP EVENT MANAGEMENT
- SAP EXTENDED WAREHOUSE MGM
- SAP FSCM
- SAP BILLING CONSOLIDATION
- SAP LEARNING SOLUTION
- SAP MULTI-RESOURCE SCHEDULI
- SAP MRS OPTIMIZER
- SAP R/3
- SAP R/3 ENTERPRISE
- SAP RECORDS MANAGEMENT
- SAP SCM
- SAP SCM 5.0 ADD-ON TM
- SAP SCM ES
- SAP SEM
- SAP SNC
- SAP SRM (WITH SAP EBP)
- SAP SRM ES
- SAP TALENT ORG CHART
- SAP TALENT VIEWING
- SAP TALENT VISUALIZATION
- SAP TRANSPORTATION MANAGEMENT
- SAP TUTOR

SAP Industry-Specific Components
- BANKING SERVICES FROM SAP
- CONNECTION PACKAGE FOR C
- RECYCLING ADMINISTRATION
- REGULATORY REPORTING BY I
- SAP ALLEGIANCE
- SAP APPAREL AND FOOTWEAR
- SAP AUDIT WATCH
- SAP BANK ANALYZER
- SAP BANKING
- SAP BEVERAGE
- SAP BUSINESS PACKAGE FOR
- SAP BUSINESS PACKAGE FOR
- SAP CABLE SOLUTION
- SAP CAMPUS MANAGEMENT
- SAP CFM
- SAP COMP APP FOR RMA
- SAP COMP APP PROJECT LOG
- SAP MILITARY DATA EXCHANG
- SAP DEMAND MANAGEMENT
- SAP CYT MANAGEMENT
- SAP DEALER BUSINESS MANA
- SAP DEPOSITS MANAGEMENT
- SAP DISCRETE INDUSTRIES
- SAP DI - WEB INTERFACE
- SAP ENTERPRISE POS
- SAP F&R
- SAP FI-CA
- SAP FRAUD WATCH
- SAP FUNDS MANAGEMENT
- SAP GCP
- SAP HCM FOR U.S. FEDERAL
- SAP HR PUBLIC SECTOR
- SAP IDEX AT
- SAP IDEX DE
- SAP INSURANCE FS-CD
- SAP INSURANCE FS-CM
- SAP INSURANCE FS-CS
- SAP INSURANCE FS-PM
- SAP INSURANCE FS-RI

- SAP IS-M
- SAP IS-M/AMC
- SAP IS-M/NAE
- SAP IS-T
- SAP IS-U/CCS
- SAP IS-U/FERC
- SAP IS-U/IDEX
- SAP IS-U/UCES
- SAP JVA EBILLING
- SAP MILL PRODUCTS
- SAP MINING - IS-MINE
- SAP NPO PAYROLL PROCESS
- SAP OGSD
- SAP OIL&GAS - IS-OIL
- SAP OIL&GAS - JVA
- SAP OIL&GAS - OLM
- SAP OIL&GAS - PRA
- SAP OIL&GAS - PSA
- SAP OIL&GAS - TSW
- SAP PATIENT MANAGEMENT
- SAP PH-ELR
- SAP POS
- SAP POS SERVICES
- SAP PRICE & MARGIN MANA
- SAP PRICE OPT. FOR BANKI
- SAP PUBLIC SECTOR PSCD
- SAP RETURNS AUTHORIZAT
- SAP RETAIL
- SAP SOCIAL CARE MANAGE
- SAP STOCK BALANCING MANAGEMENT
- SAP STORED VALUE PROGR
- SAP SYNDICATIONS MANAG
- SAP TRADE INDUSTRY DEMA MGMT
- SAP TRANSACTIONWARE E
- SAP TRANSACTIONWARE G
- SAP TRANSNET
- SAP VERSORGUNGSADMINIS
- SAP WASTE AND RECYCLING
- SAP W&R APPS BY PROLOG
- SAP WORKFORCE MANAGEM
- SRM PPS

SAP Industry Solutions per...
- **Aerospace & Defense**
- **Automotive**
- **Banking**
- **Chemicals**
- **Consumer Products**
- **Engineering, Construction & Operations**
- **Financial Service Provider**
- **Healthcare**
- **Higher Education & Research**
- **High Tech**
- **Industrial Machinery & Components**
- **Insurance**
- **Media**
- **Mill Products**
- **Mining**
- **Oil & Gas**
- **Pharmaceuticals**
- **Professional Services**
- **Public Sector**
- **Retail**
- **Service Providers**
- **Telecommunications**
- **Utilities**

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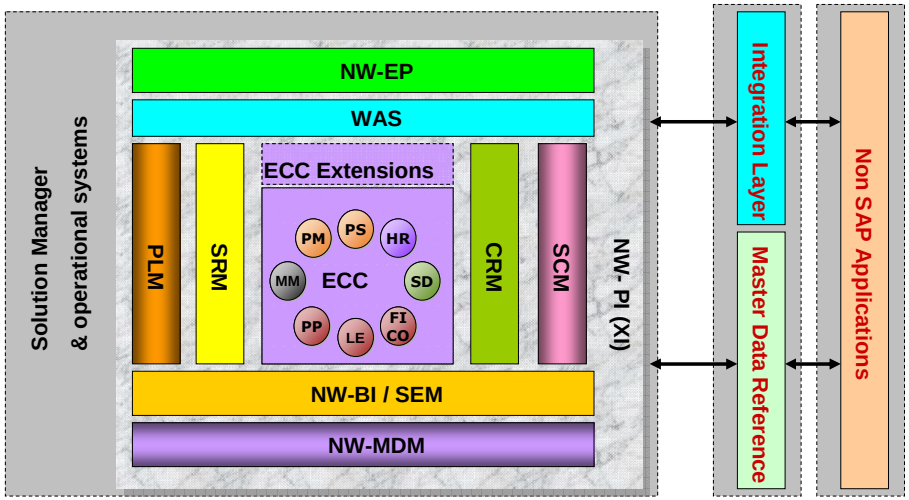
Prodotti di base SAP



SAP Business Suite

ECC (R3)	Enterprise Central Components (moduli finanziari, vendite, acquisti...)
CRM	Customer Relationship Management
SCM	Supply Chain Management (gestione della produzione)
SRM	Supplier Relationship Management (e-procurement)
PLM	Product Lifecycle Management (strategie commerciali dei prodotti)

SAP NetWeaver

BW (BI)	Business Intelligence (Data Warehouse, OLAP, what-if, reporting ...)
EP	Portale
PI	Process Integration (interfacce dati, SOA)

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Cos'è un ERP (Enterprise Resource Planning)

- Termine coniato da Gartner nel 1990
- E' un'insieme di applicazioni (moduli) integrate e transazionali (real-time) che:
  - supportano la pianificazione e il controllo di tutte le risorse dell'impresa per es.: Finanziarie, Umane, Produzione, Vendite, Materiali, Qualità
  - integrano il ciclo operativo e il ciclo amministrativo dando supporto alla catena del valore dell'impresa
- Le applicazioni condividono un'unica base di dati, ad evitare duplicazioni e ridondanze (unicità dell'informazione)
- L'aggiornamento della base dati sincronizza tutti i processi operativi
- Tutti i moduli hanno la stessa interfaccia utente

Il vantaggio fondamentale di un ERP è fornire una piattaforma unica e integrata che permetta un governo integrato dell'impresa

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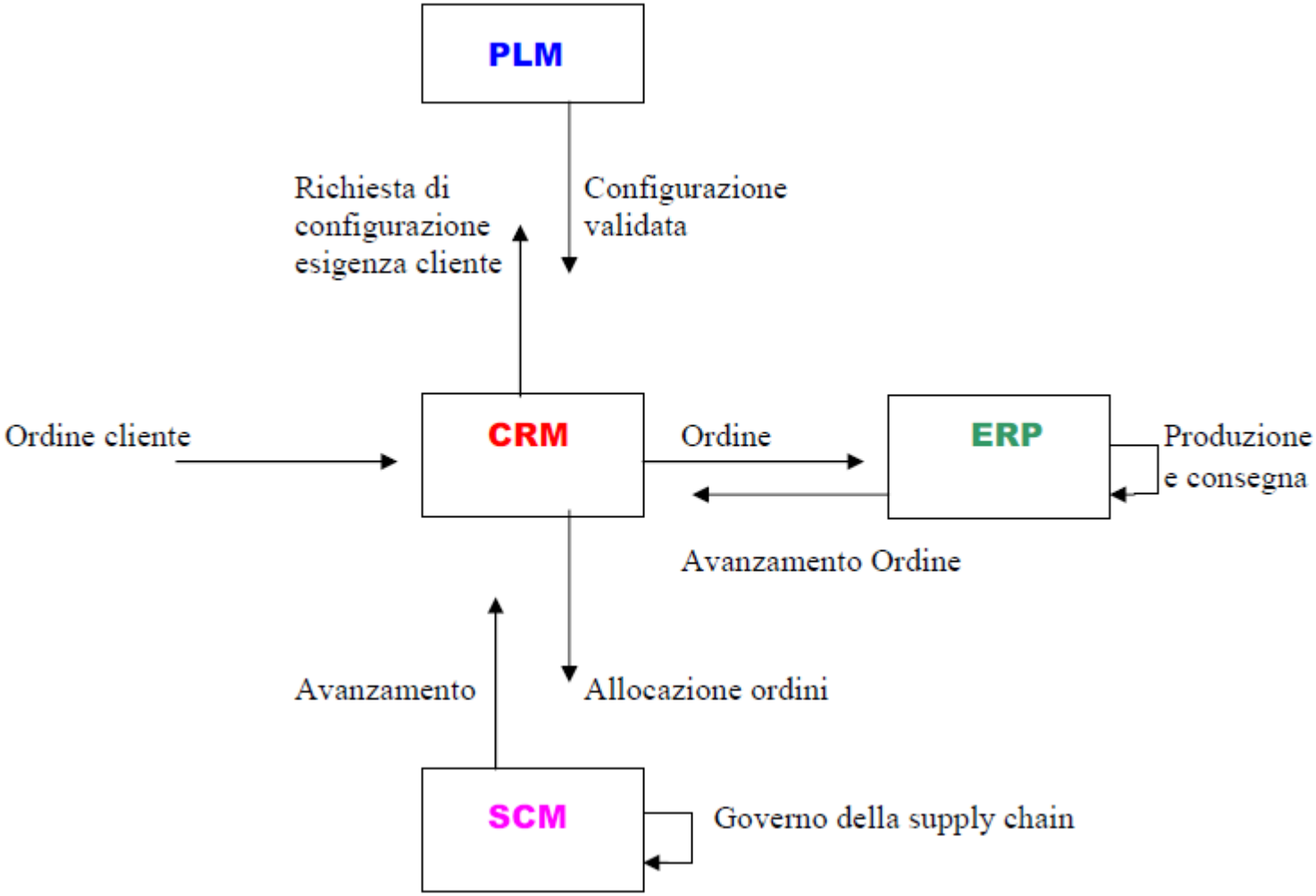
Esempio di legame tra un sistema ERP e le sue estensioni (azienda manufatturiera)



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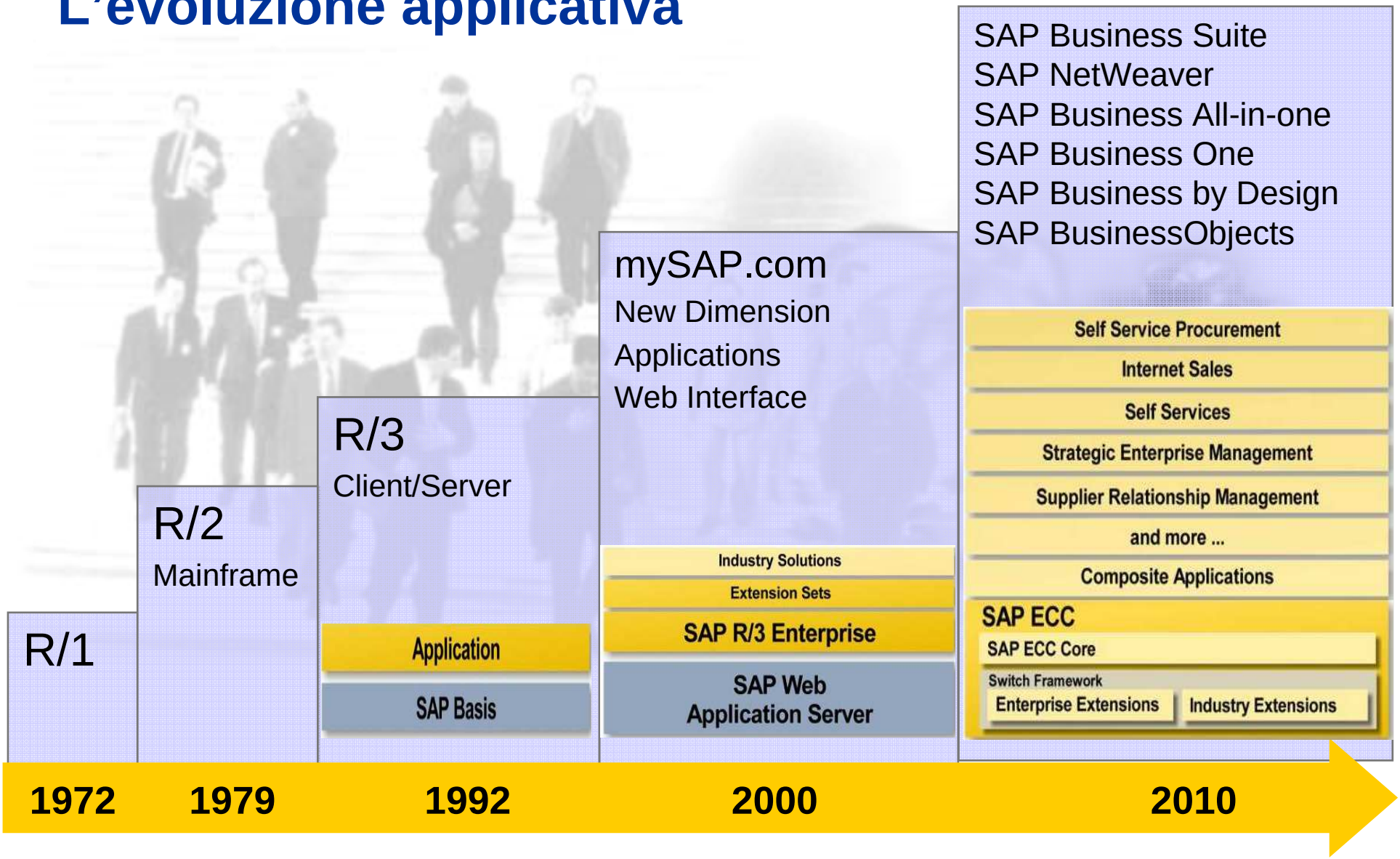
L'evoluzione applicativa



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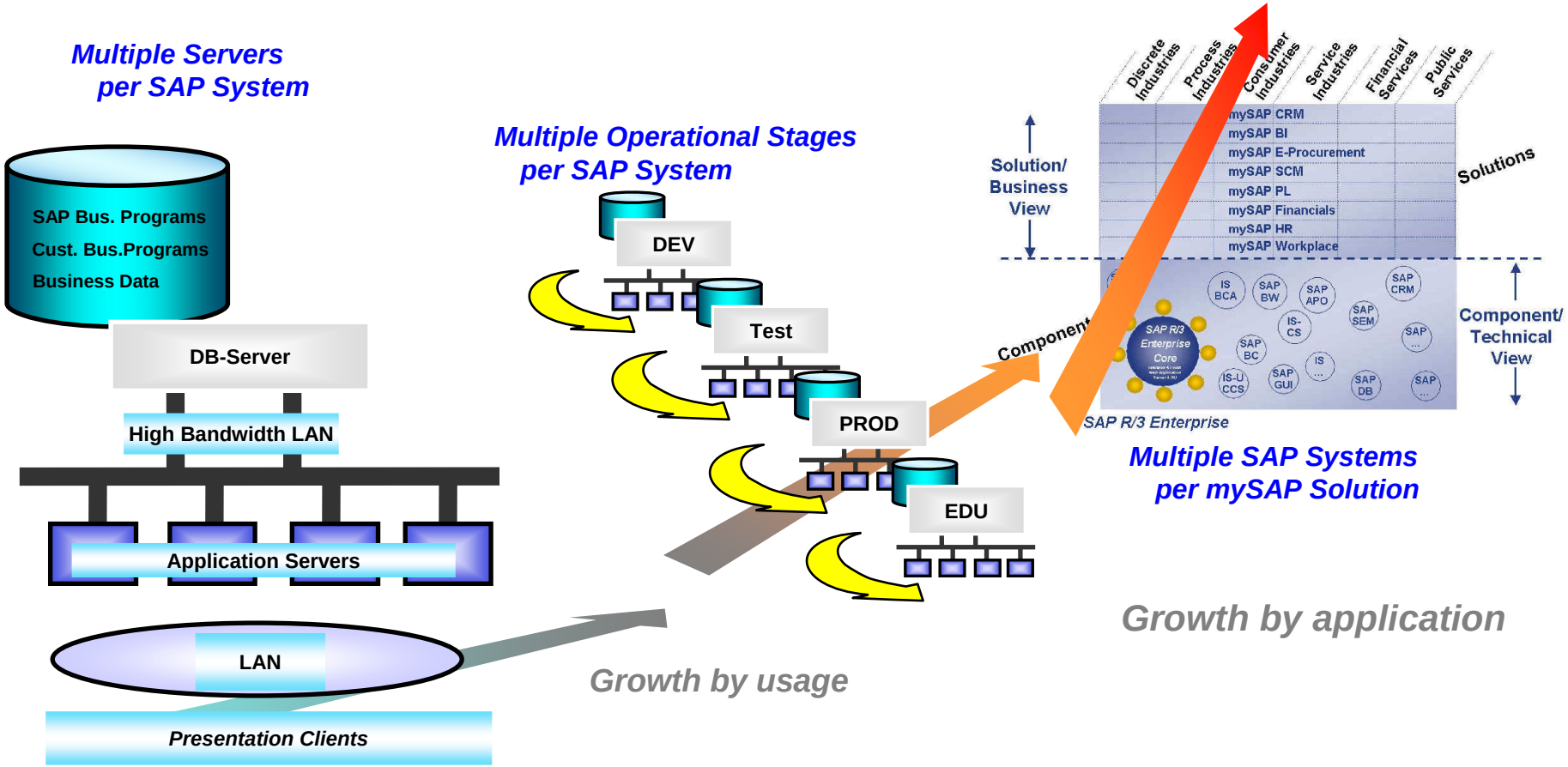
Evoluzione di un sistema ERP SAP



single SAP system

SAP landscape

SAP business solution

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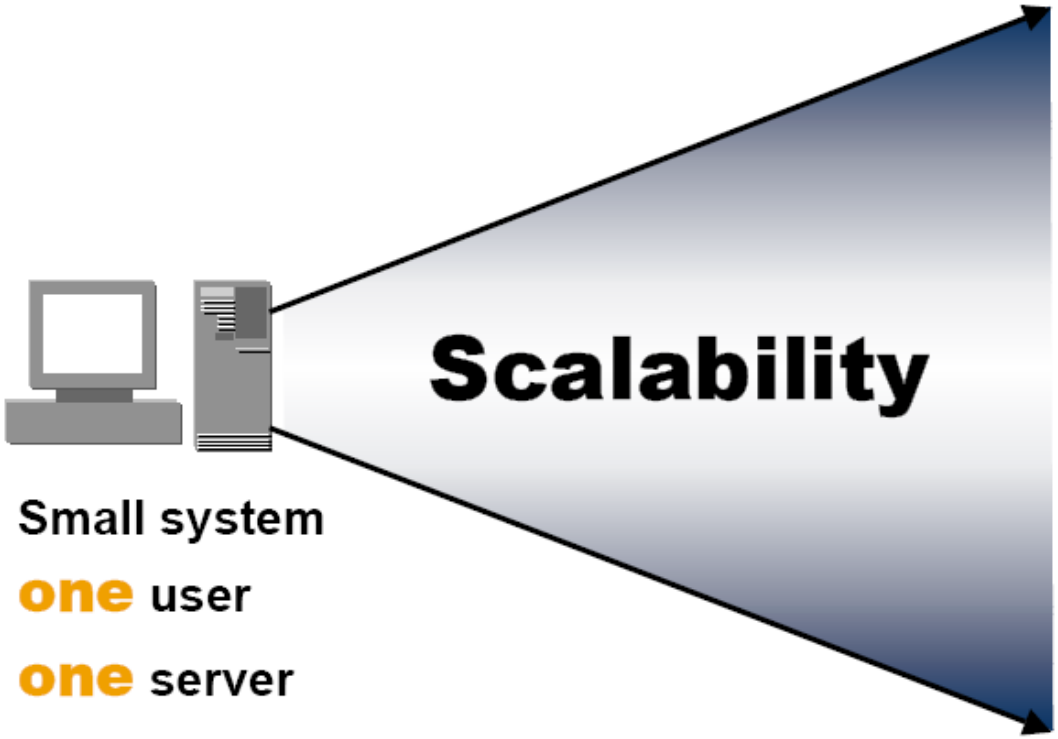
Crescita e Scalabilità



- **Thousands** of users
- Terabytes of data
- High throughput
- Large objects
- 7*24h operation
- High concurrency
- Connected users worldwide
- **Many** servers

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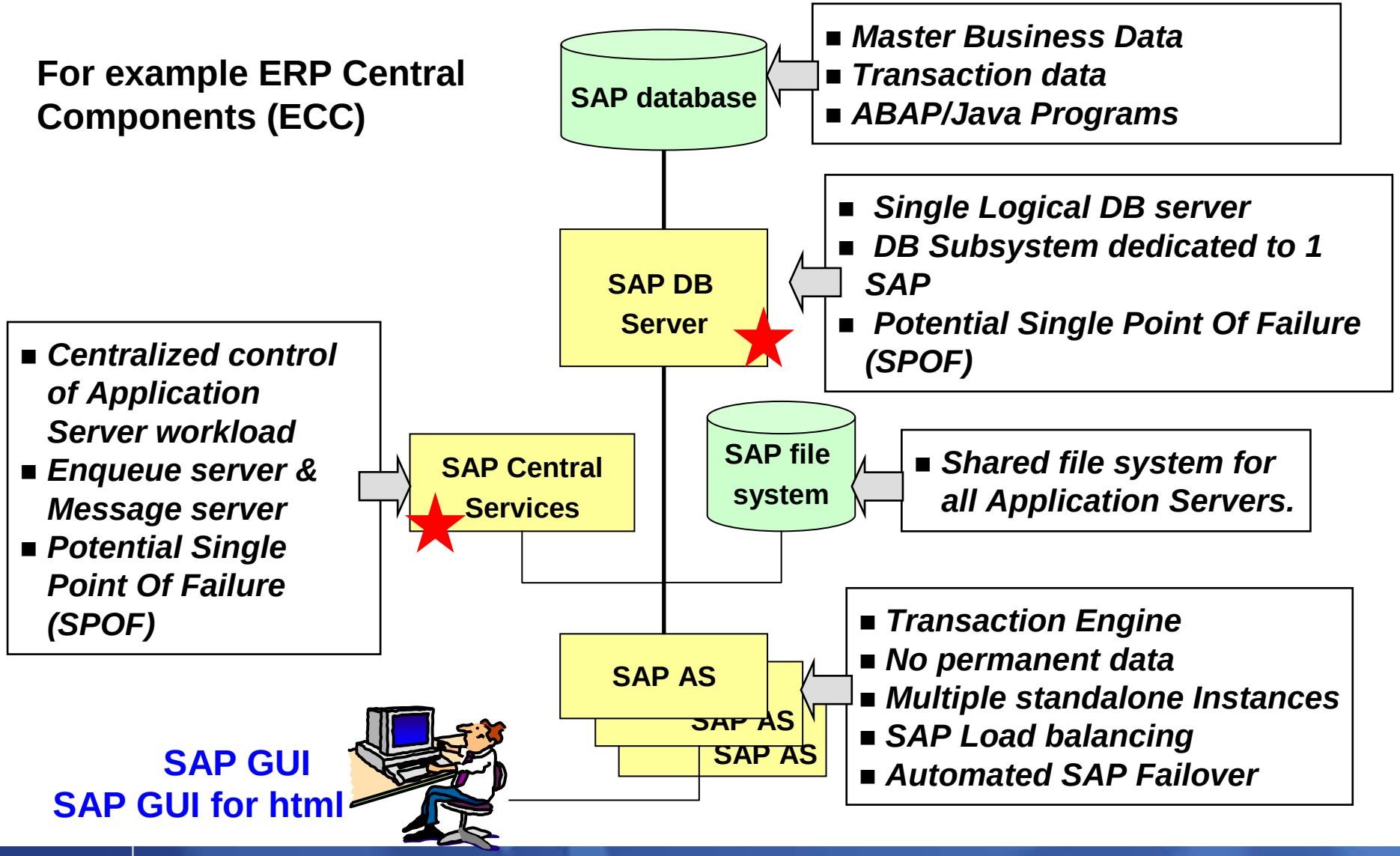
SAP Building Blocks Overview

For example ERP Central Components (ECC)



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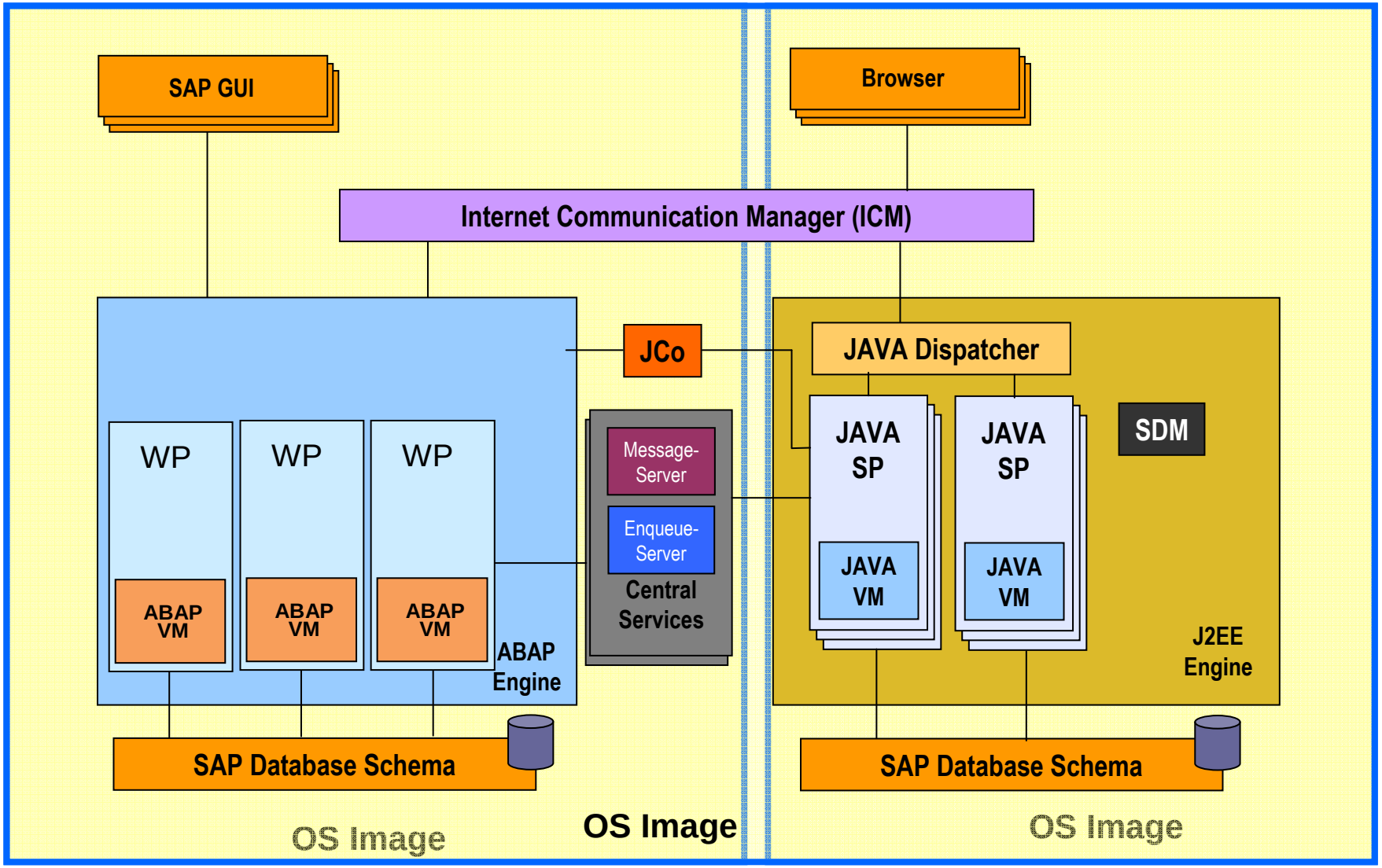
SAP NetWeaver 7.0 Application Server Architecture



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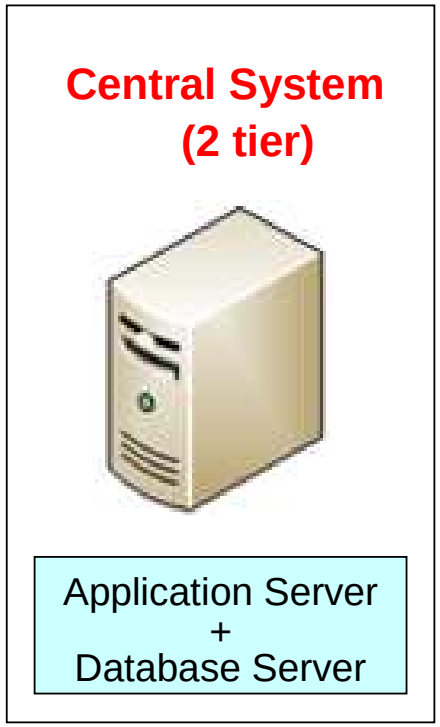
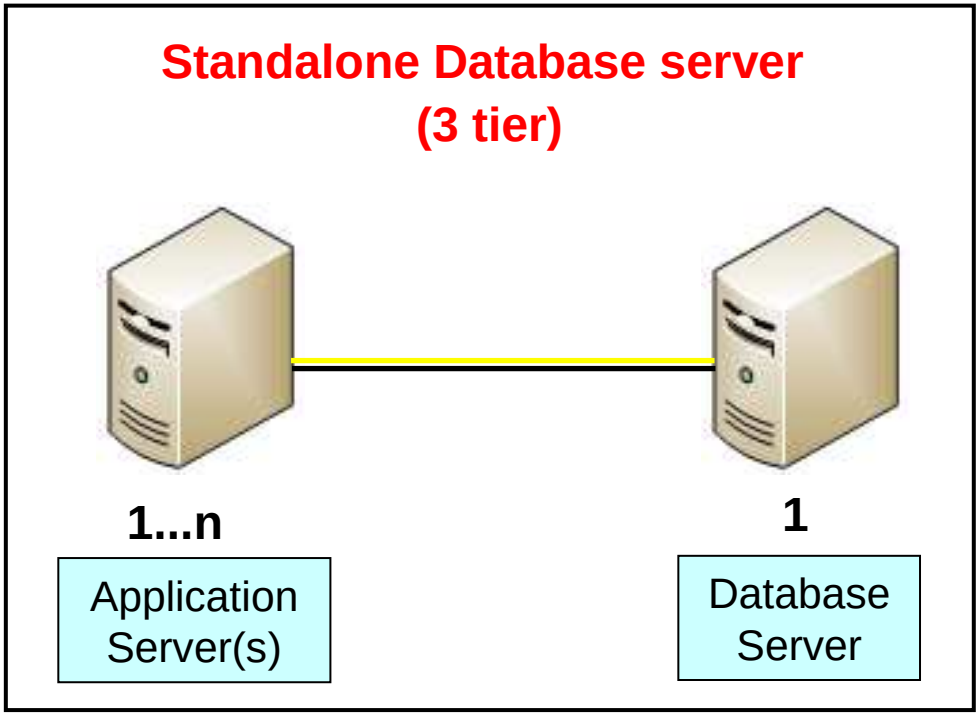
Architettura SAP: 2 o 3 livelli





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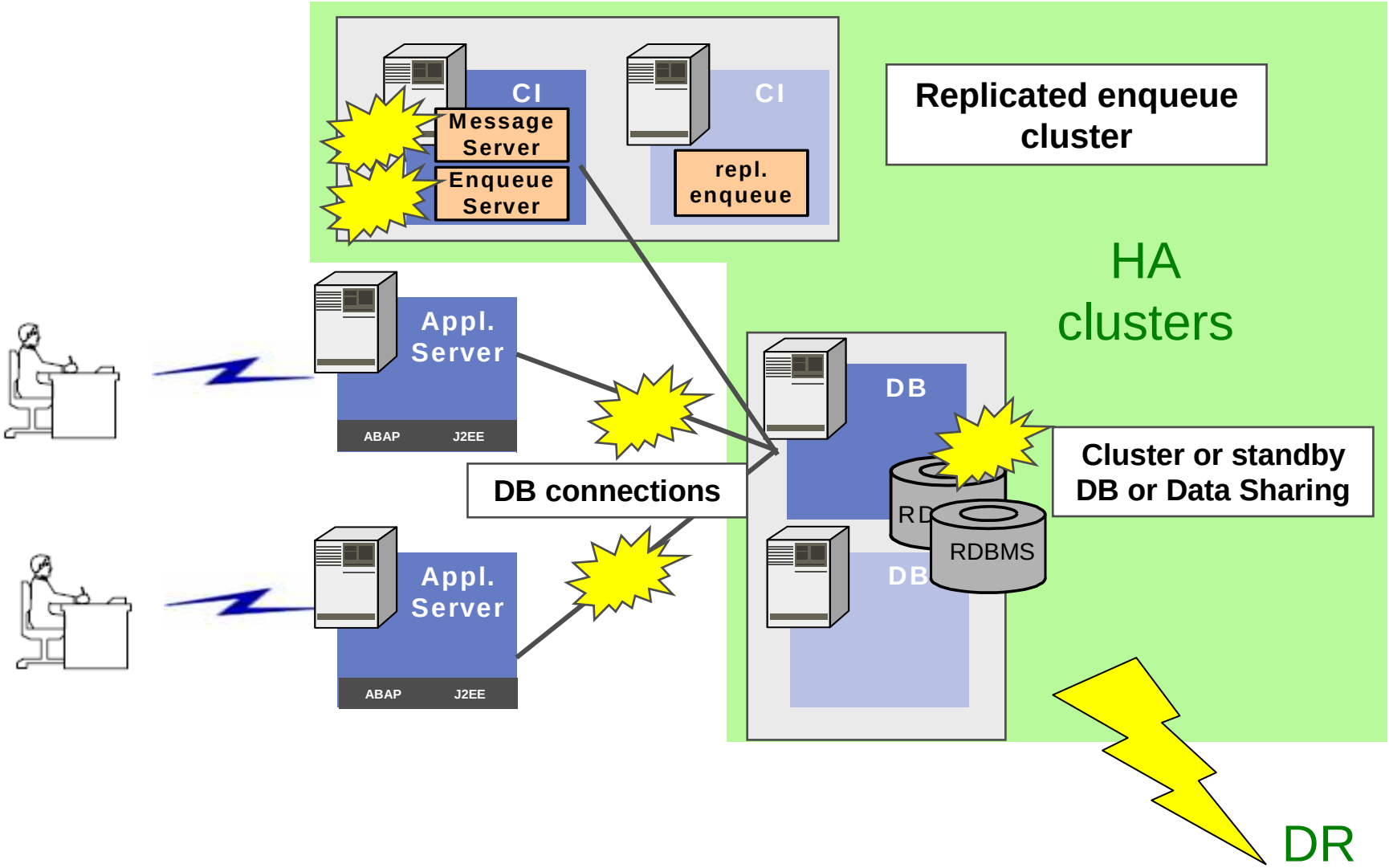
Single Points Of Failure



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Requisiti non funzionali

Un'infrastruttura che ospita applicazioni core business / mission critical come quasi sempre è SAP deve anche rispondere a precisi requisiti non funzionali quali, ad esempio:

- Sicurezza (protezione fisica, logica, accessi…)
- Alta Affidabilità, Disaster Recovery, Business Continuity
- Back-up & Recovery
- SLA - Performance
- Scalabilità

I requisiti non funzionali hanno impatto sul dimensionamento

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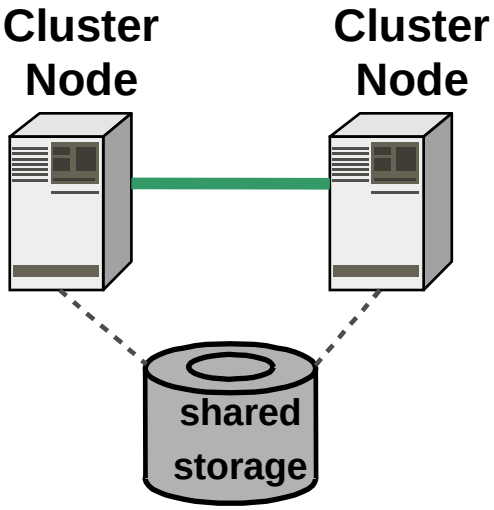
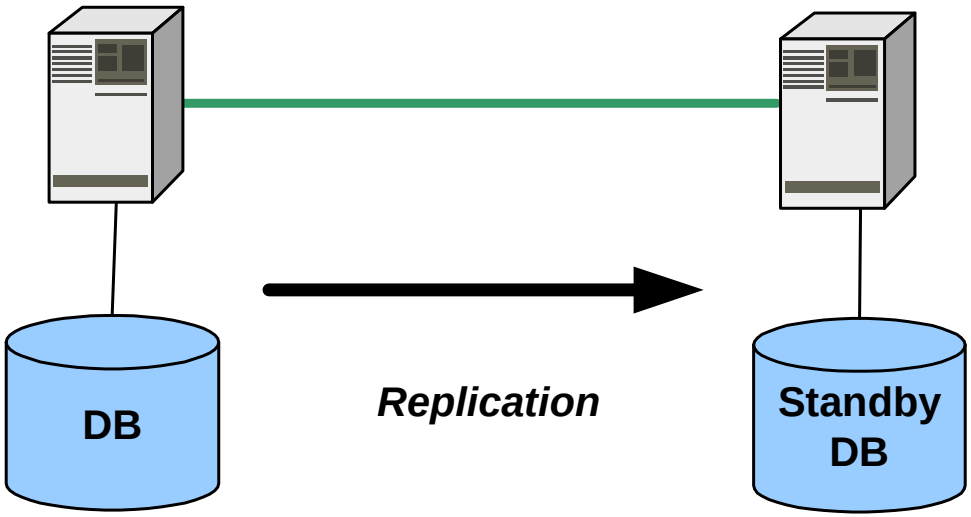
HA & DR

One logical SAP Database

Single DB instance | **Two DB instances**





Clustering alternatives: shared nothing vs shared everything

Replication alternatives: database level vs storage level

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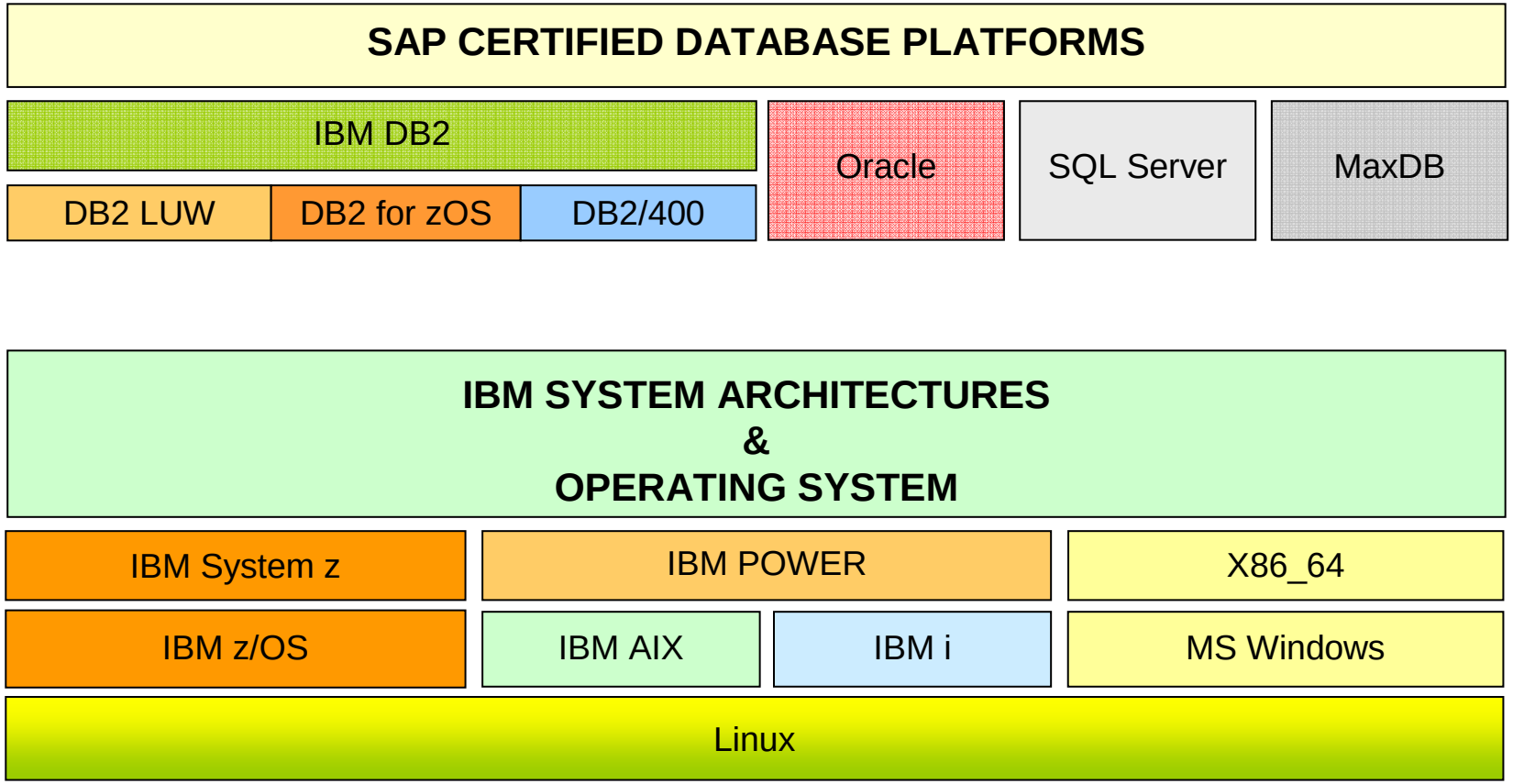
Piattaforme tecnologiche per SAP



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IBM Systems Family for SAP Business Suite

Servers for every type of business - for small, medium and large enterprises

- **IBM BladeCenter**
  - ✓ Highly manageable, modular infrastructure
  - ✓ Performance density

- **AIX on IBM Power**
  - ✓ The ***performance*** platform
  - ✓ > 18000 SAP installations
  - ✓ ~ 9000 customers

- **IBM i on IBM Power**
  - ✓ The ***integrated*** platform
  - ✓ > 3200 SAP installations
  - ✓ ~ 1600 customers

- **IBM System z**
  - ✓ The ***mission critical*** platform
  - ✓ ~ 1200 SAP installations
  - ✓ ~ 400 customers

- **IBM System x**
  - ✓ The ***flexible*** platform
  - ✓ > 14000 SAP installations
  - ✓ ~ 7000 customers

Status: February 2010

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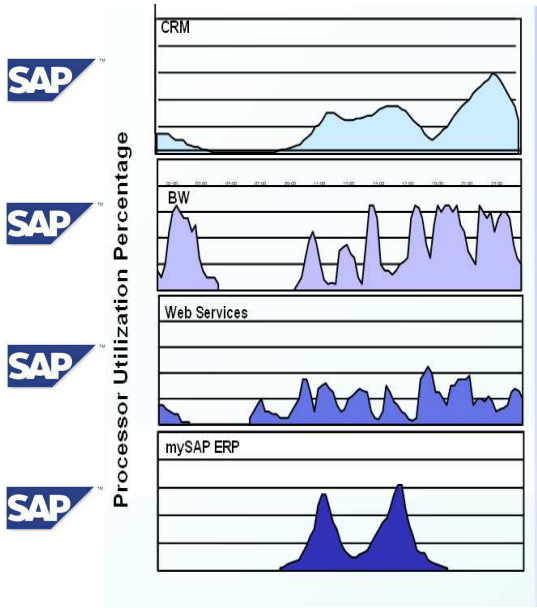
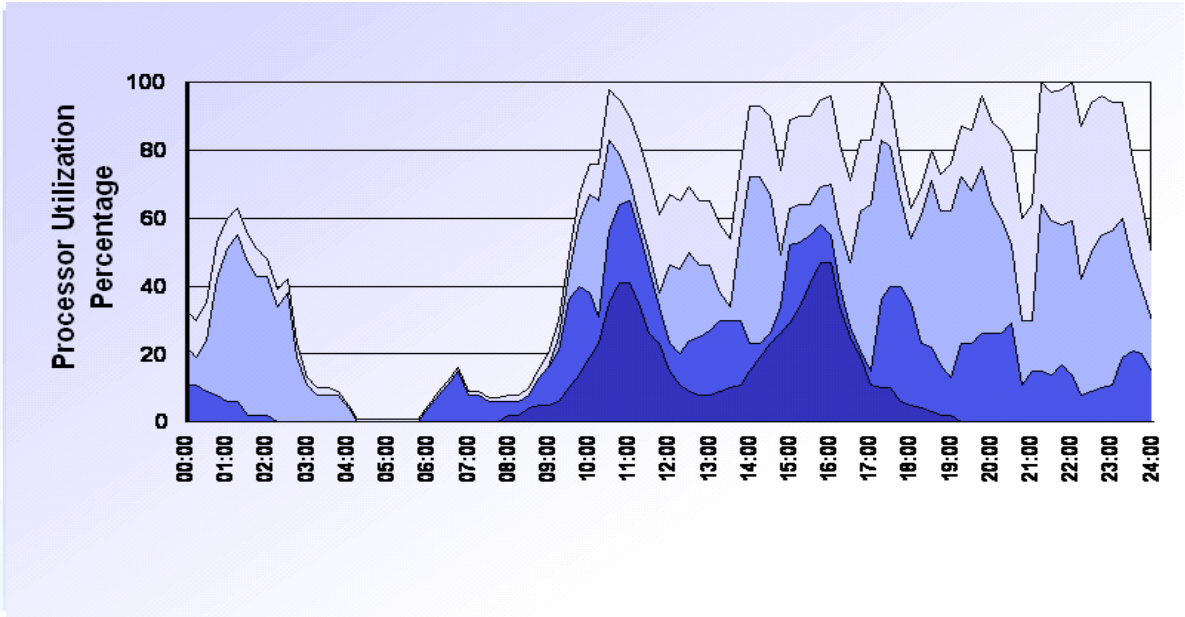
Virtualizzazione





- **Dimensionamento su Picco della Somma vs Somma dei Picchi**
- **Migliore utilizzo dei server, ottimizzazione delle risorse (minori sprechi)**
- **Maggiore potenza utilizzabile rispetto al caso di server separati**
- **Meno core (e più potenti) permettono di risparmiare sulle licenze sw**
- **Consolidamento: decine di partizioni, logicamente isolate, nello stesso server**
- **Minori spese per il Data Center (energia elettrica, condizionamento, spazio…)**

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Agenda

Dalle esigenze di business a SAP

Applicazioni SAP

Architetture SAP

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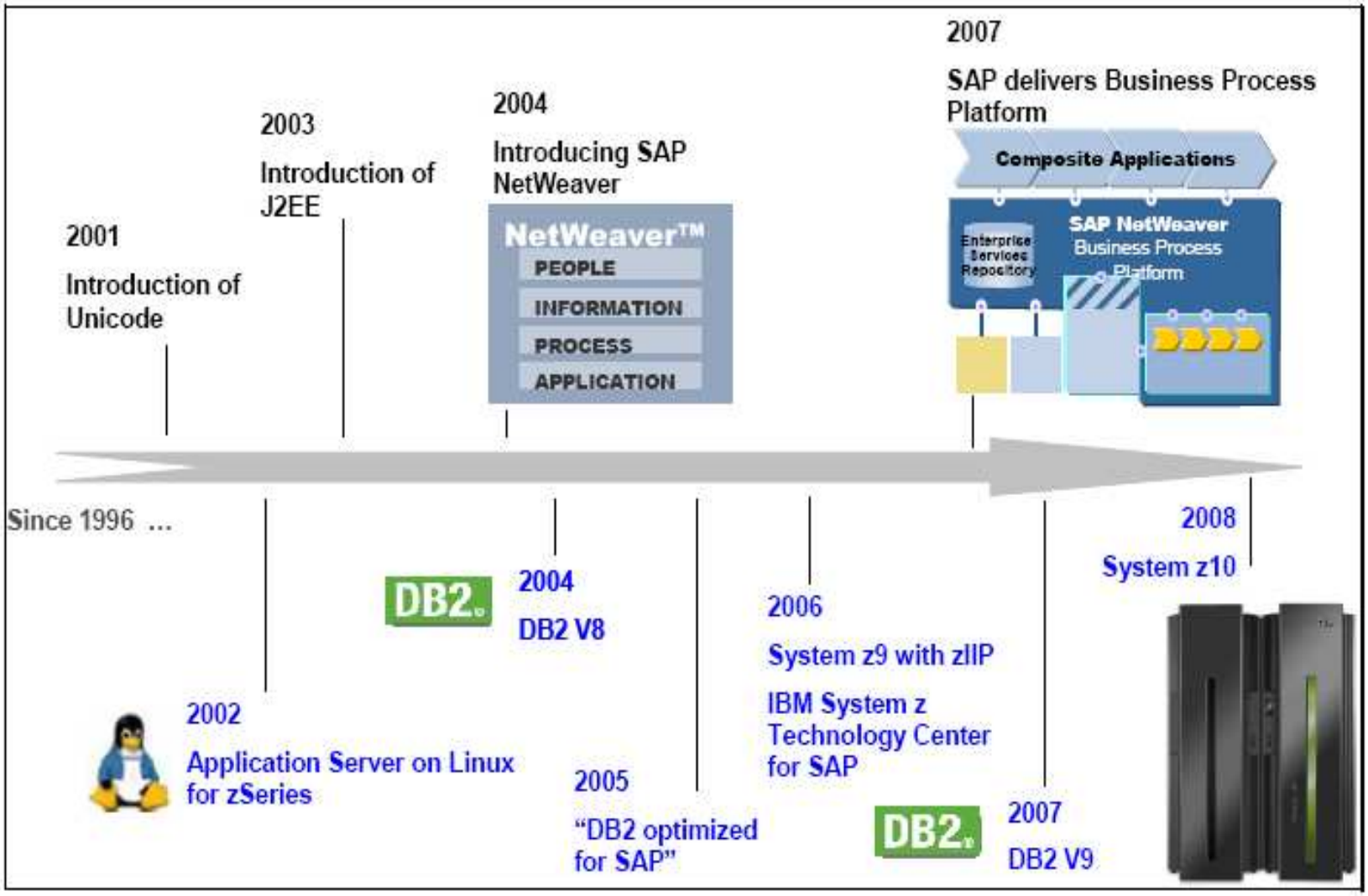
SAP and System z



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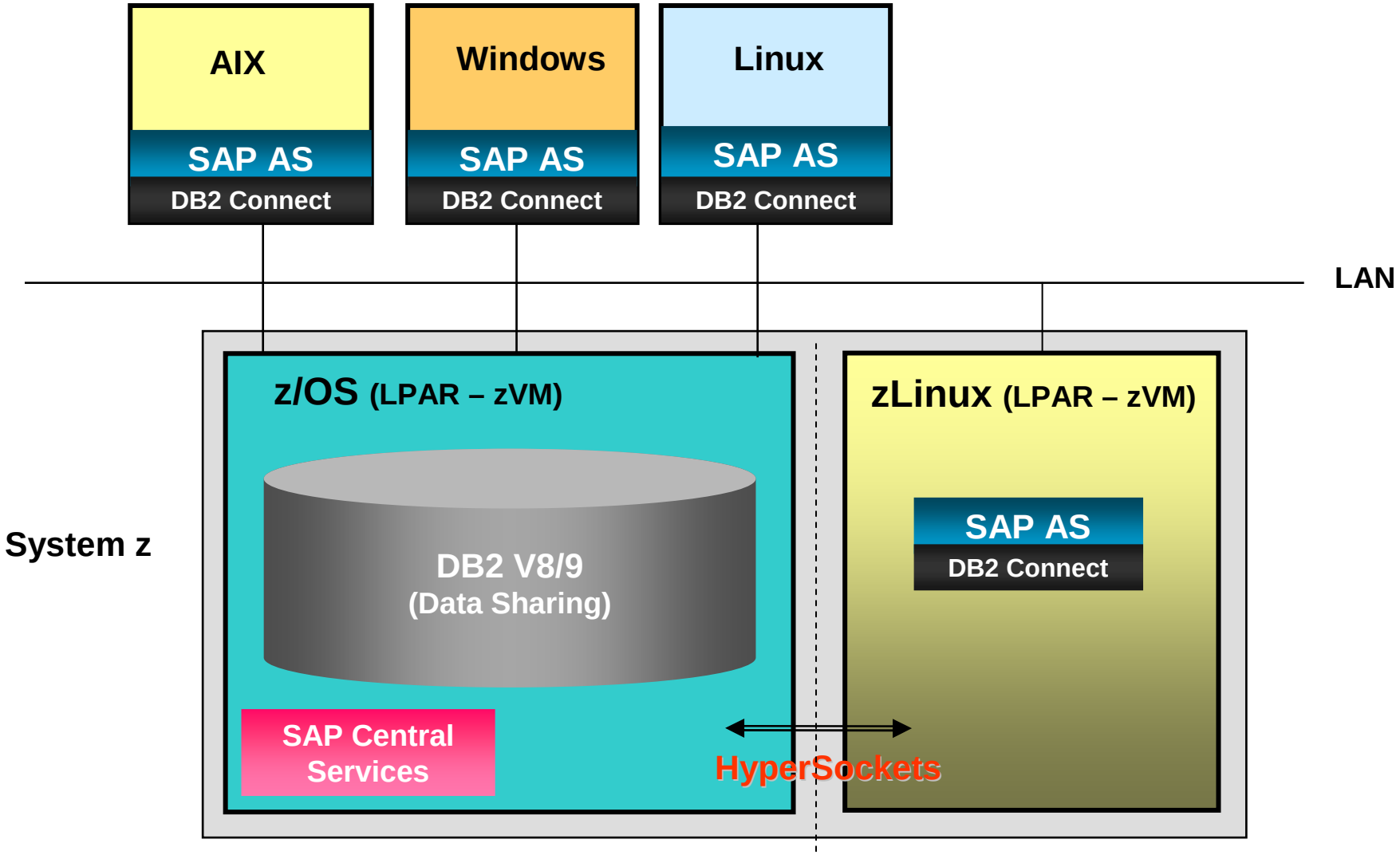
SAP on IBM Mainframe - Architecture



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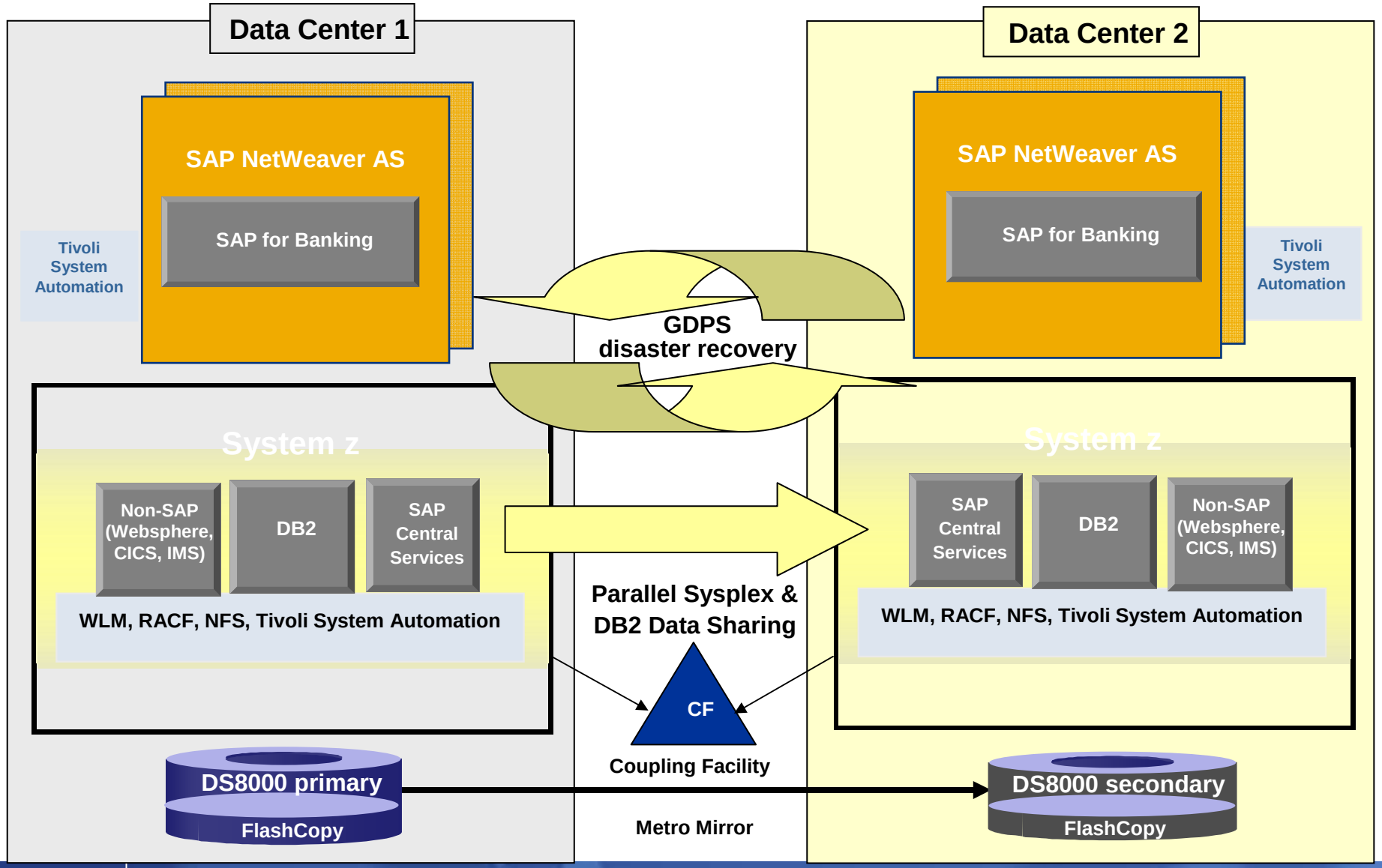
SAP on System z – Reference Architecture



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Perchè SAP su System z DB2 ?

- **Continuous Availability**
  - Affidabilità del 99.999%
  - Minimali fermi di sistema dovuti a operazioni di manutenzione
  - Continuous availability per sistemi SAP (Central Services)
- **Prestazioni e Scalabilità**
  - Verticale e orizzontale
  - Migliore throughput per attività DB oriented
  - Sysplex con Coupling Facility
  - I/O Bandwidth, data in memory
- **Gestibilità di grandi database**
  - Supporto di database molto grandi (TB) grazie a compressione hw
  - Backup e Reorg online
  - Storage technology (flash copy, snapshot)
- **Sicurezza**
  - Designed to deliver system integrity and highest level of security (EAL5)
- **Protezione investimento**
  - LPAR multiple (fino a 60)
  - Automazione end to end
  - DR ready
  - Goal-driven workload management

✸ **Consolidamento di DB server e Application Server in un unico box**

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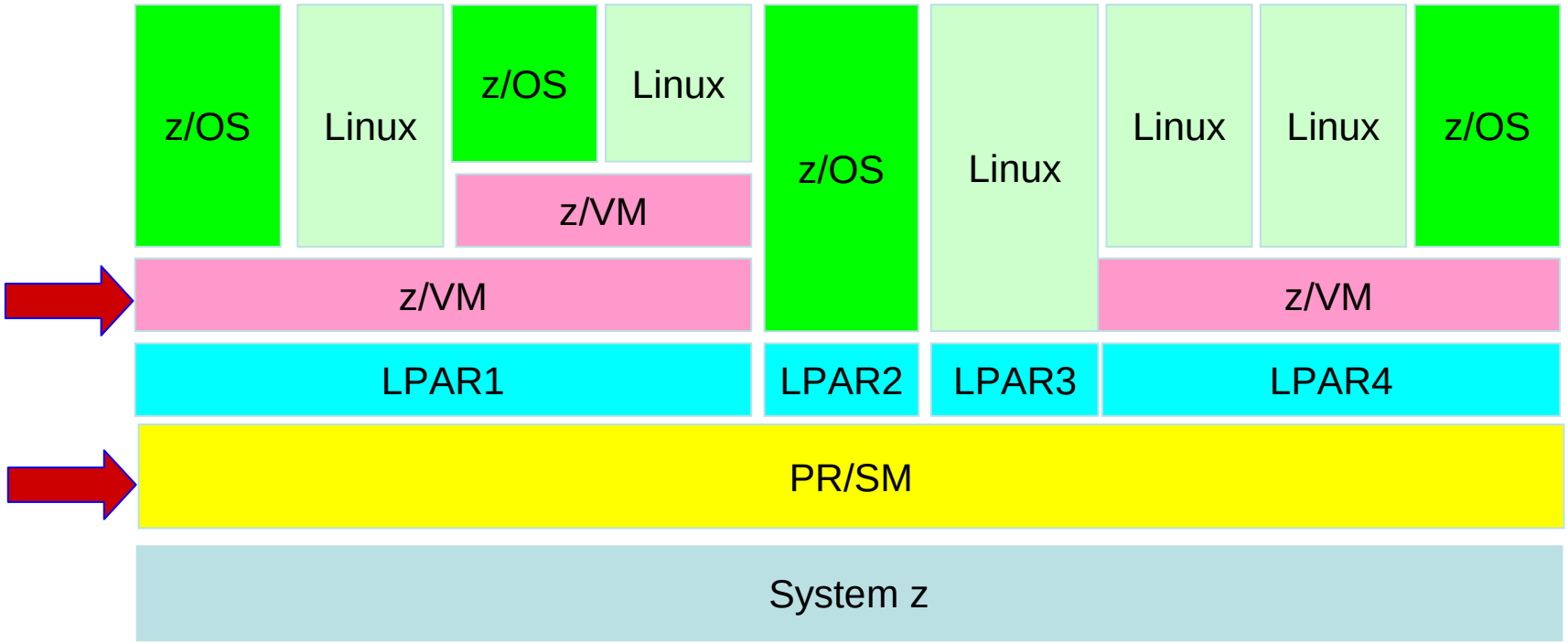
Livelli Multipli di Virtualizzazione HW + SW



PR/SM	**Completa Condivisione di TUTTE le risorse** **Supporta Diversi Sistemi Operativi** **Partizioni Logiche con differenti 'time of day'** **Allocazione Dinamica delle Risorse** **Eventuali Risorse Dedicate** **Capping** **Intelligent Resource Director**

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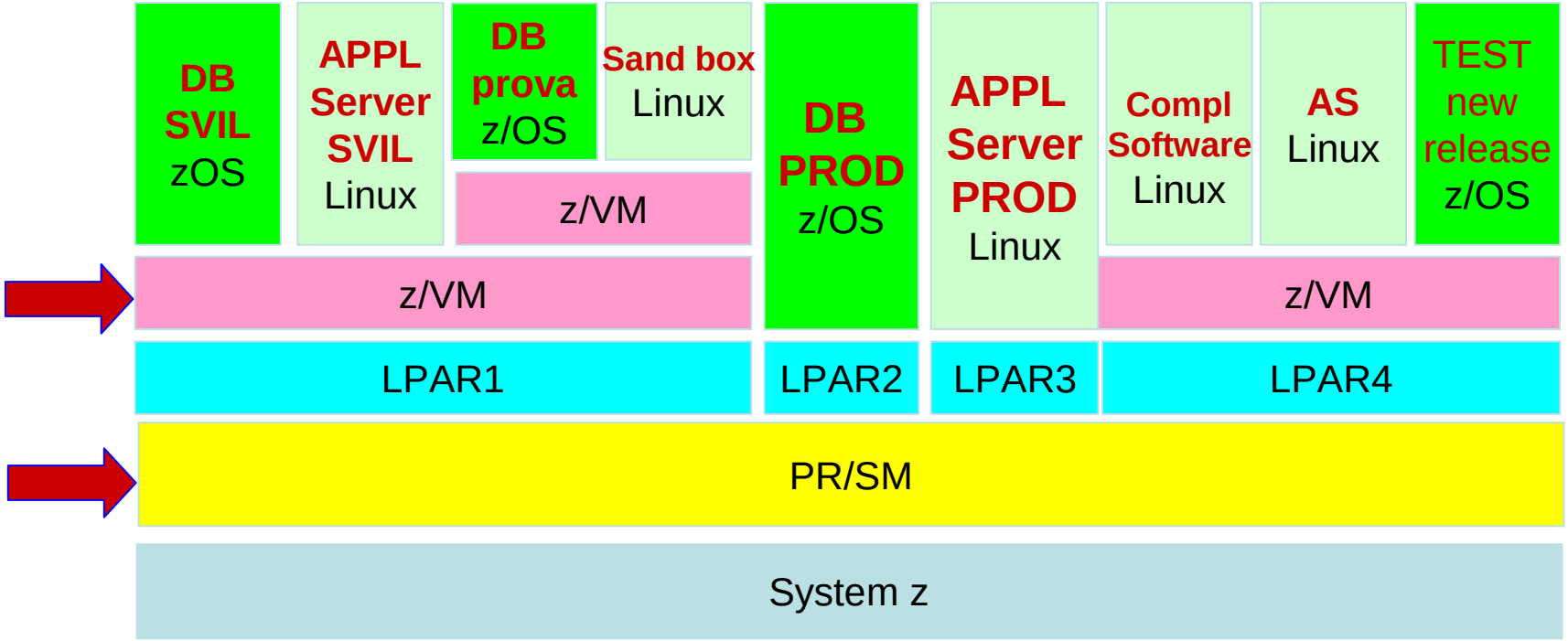
Virtualizzazione applicata a SAP



Flessibilità operativa
Condivisione risorse
Solidità

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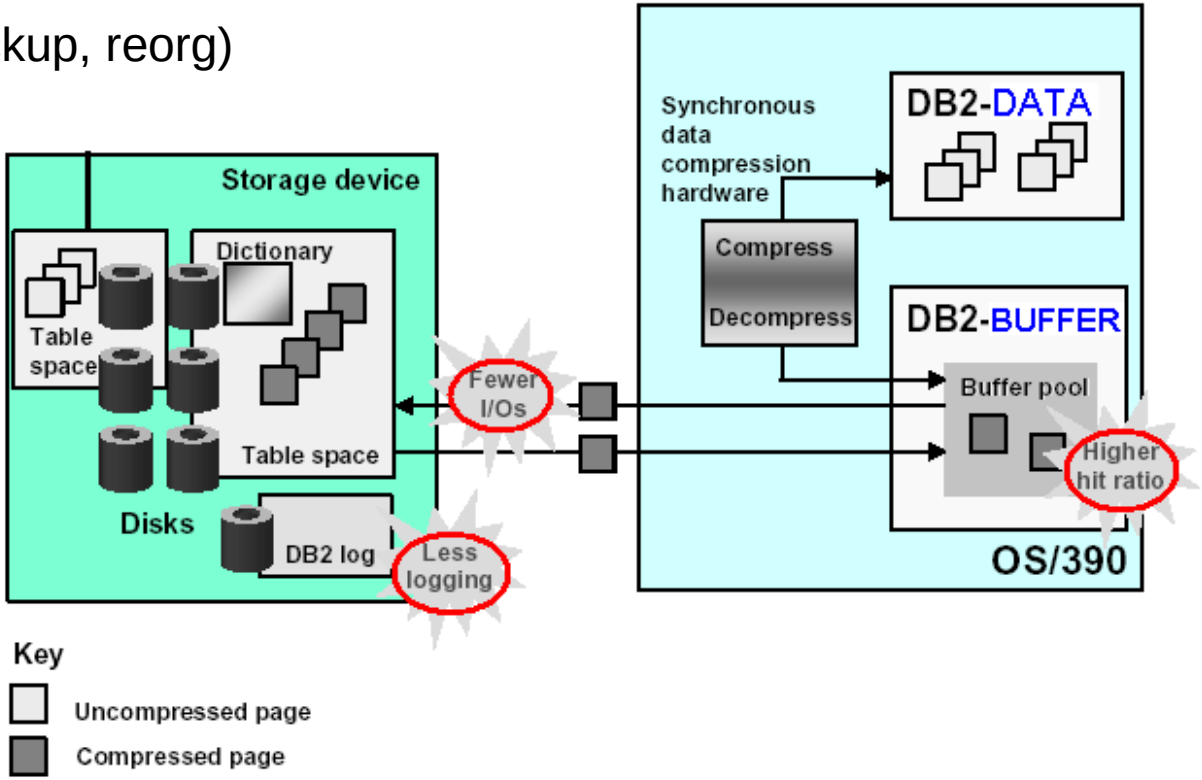
Compressione dei dati

A carico dell'hw, con minimo impatto sui processori (circa 2%)
Riduzione spazio fisico, fondamentale per grandi tabelle (> 100 GB)
Migliora le performance dei canali e dei controller dischi
Ottimizza l'utilizzo della memoria, migliori performance
Diminuisce il logging
Migliora la gestione (backup, reorg)



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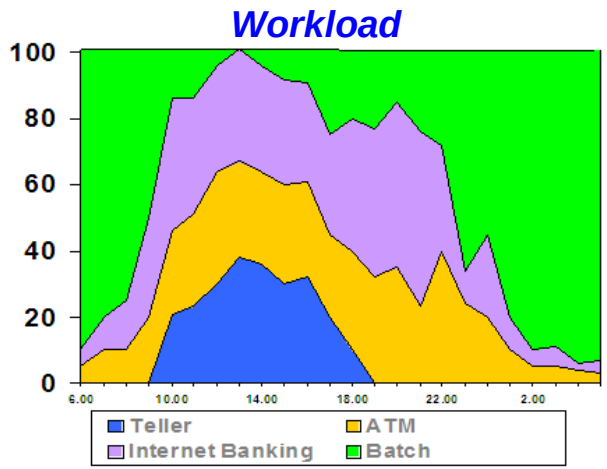
Workload manager - WLM

E' la componente del Sistema Operativo z/OS che controlla l'esecuzione di programmi concorrenti tramite politiche di utilizzo complessivo al fine di raggiungere un obiettivo globale di prestazione (Goal).

Per raggiungere il Goal, il Workload Manager agisce sulle risorse del Sistema (cpu e memoria), modifica le priorità dei progammi in esecuzione, i meccanismi di uso della memoria virtuale, della paginazione e la priorita' nell'uso dei dispositivi di I/O.



Tempo di risposta delle transazioni COSTANTE

- ***Risorse limitate***
- ***Carichi diversi, concorrenti, "on demand"***
- ***Obiettivi di Business ("goals") definiti per carichi individuali***
- ***Lavori di produzione in accordo con gli obiettivi di business & SLAs***
- ***Uso ottimale delle risorse***
- ***Reporting completo per accounting & monitoring***

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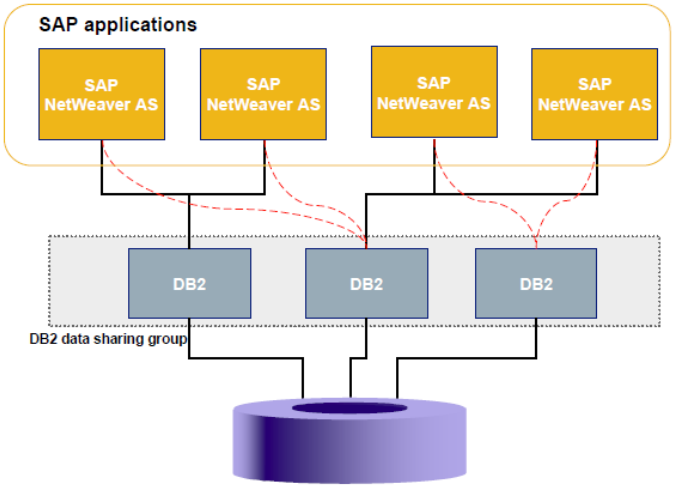
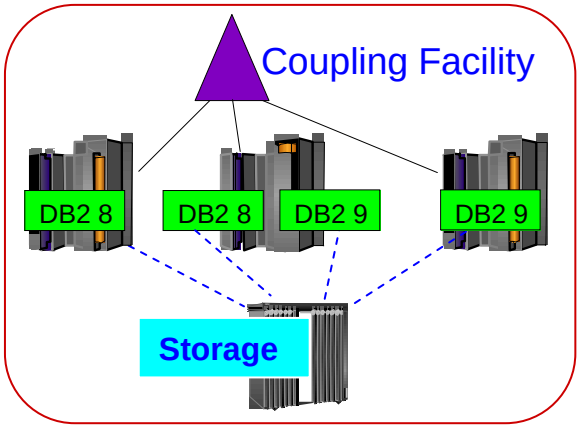
Clustering: Parallel Sysplex



- ✓ **Coupling technology**
  - Infrastruttura HW di elevata performance
    - 15 anni di esperienza nella gestione di grandi volumi ed elevato carico transazionale
- ✓ **HW + Operating systems + DBMS + tools**
  - Sviluppo congiunto
- ✓ **Manutenzione durante la normale operatività**
  - Upgrade del Sistema Operativo e del Database (un sistema per volta)
- ✓ **Molto diffuso**
  - Su tutte le tipologie di azienda
- ✓ **Base per realizzazioni di 'Business continuity'**



- L'uso delle coupling facilities consente performance elevate ed eccellente scalabilità
- Load balancing & Fault tolerance
- I guasti sono 'isolati'
- La gestione della manutenzione può essere svolta senza fermi
- Permette il consolidamento di carichi
- Utilizza un livello di sicurezza elevato (software RACF)

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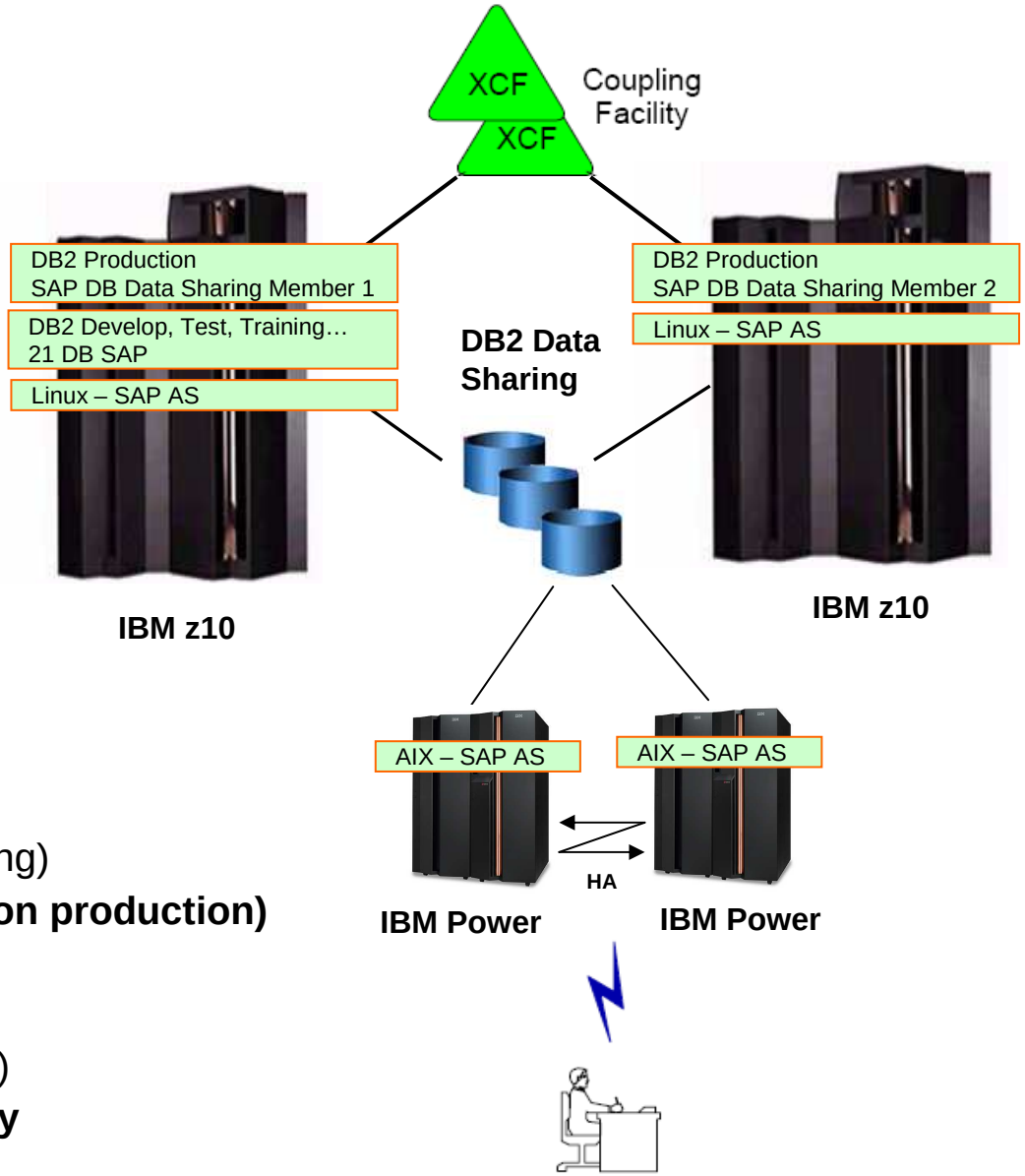
Caso reale zSAP

- SAP DB servers on two IBM System z10 EC
- DB2 for z/OS
- DB2 Data Sharing for production systems
- SAP Application Servers on zLinux and AIX
- Disaster Recovery in a remote site



SAP Applications

- 28 SAP Systems
- ECC 6.0 - BW 7.0

Consolidation

- 35 DBs in 3 LPAR z/OS (7 DB in Data Sharing)
  of which **21 DBs in just one LPAR z/OS (non production)**
- 9 Application Servers in 4 zLinux LPARs
- 37 Appl Servers in 21 AIX LPARs
  15 of which in 4 AIX LPARs (non production)
- **hw not dedicated to SAP applications only**

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Link utili

- **IBM and SAP**
  www.ibm.com/solutions/sap/us/en

- **IBM System z Solution Edition for SAP Applications**
  www.ibm.com/systems/z/solutions/editions/sapapp

- **GDPS overview: GDPS Family. An Introduction to Concepts and Facilities**
  www.redbooks.ibm.com/redpieces/abstracts/sg246374.html?Open

- **SAP Website**
  www.sap.com

- **SAP developer network: SAP on DB2 for z/OS**
  www.sdn.sap.com/irj/sdn/db2
  - SAP Business Suite on IBM System z Reference Architecture
  - Improving I/O Performance Using Solid-State Drive Technology
  - News, Blogs, Backgrounds, Documents

- **SAP Business Suite**
  www.sap.com/solutions/business-suite

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