Business Beyond Boundaries

From Landscape Visions to SAP NetWeaver Business Intelligence Accelerator

Andrew Ross
SAP NetWeaver EIM TREX
University of Trier
June 16, 2008

THE BEST-RUN BUSINESSES RUN SAP™

From Landscape Visions to SAP

© SAP 2008 / Page 2

Signposts to the Future of Enterprise Software

1984

➔ SAP goes international – SAP R/2

1994

➔ Global ERP market leader – SAP R/3

1999

➔ SAP goes beyond ERP – SAP Business Suite

2007

➔ Enterprise SOA established – Enterprise SOA by evolution + Enterprise SOA by design

SAP 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

SAP Strategy

- **Expanding our portfolio for small and midsize enterprises**
  Powerful and affordable solutions for the unique needs of every business

- **Empowering business users**
  Improving performance management with trusted data and built-in analytics

- **Enhancing our offerings for large enterprises**
  Delivering innovation without disruption, maximizing the value of current investments and aligning IT with strategy

- **Establishing a new IT architecture for business**
  Business process platform solutions leveraging enterprise SOA for improved adaptability, reliability, and overall TCO

SAP Today

SAP AG in 2007 revenues: €10.25 billion

- More than 47,800 companies run SAP software
- Providing more than 25 industry solutions
- 51,274 SAP employees (March 2008)

12 million users in 120+ countries team with us to ...

- Integrate their business processes
- Extend their competitive capabilities
- Get a better return on investment at a lower total cost of ownership

Unique partner ecosystem

- More than 1.1 million community members (SDN and BPX)
- More than 2,000 partner solutions certified for SAP NetWeaver
- 15 Industry Value Networks

Product Portfolio for Small and Midsize Enterprises Completed

SAP Business One

Single Business Application

- 18,690 customers (+38%)

SAP Business ByDesign

Complete and Adaptable

- 150 customer engagements
- Brand new product
- New business model (SaaS)

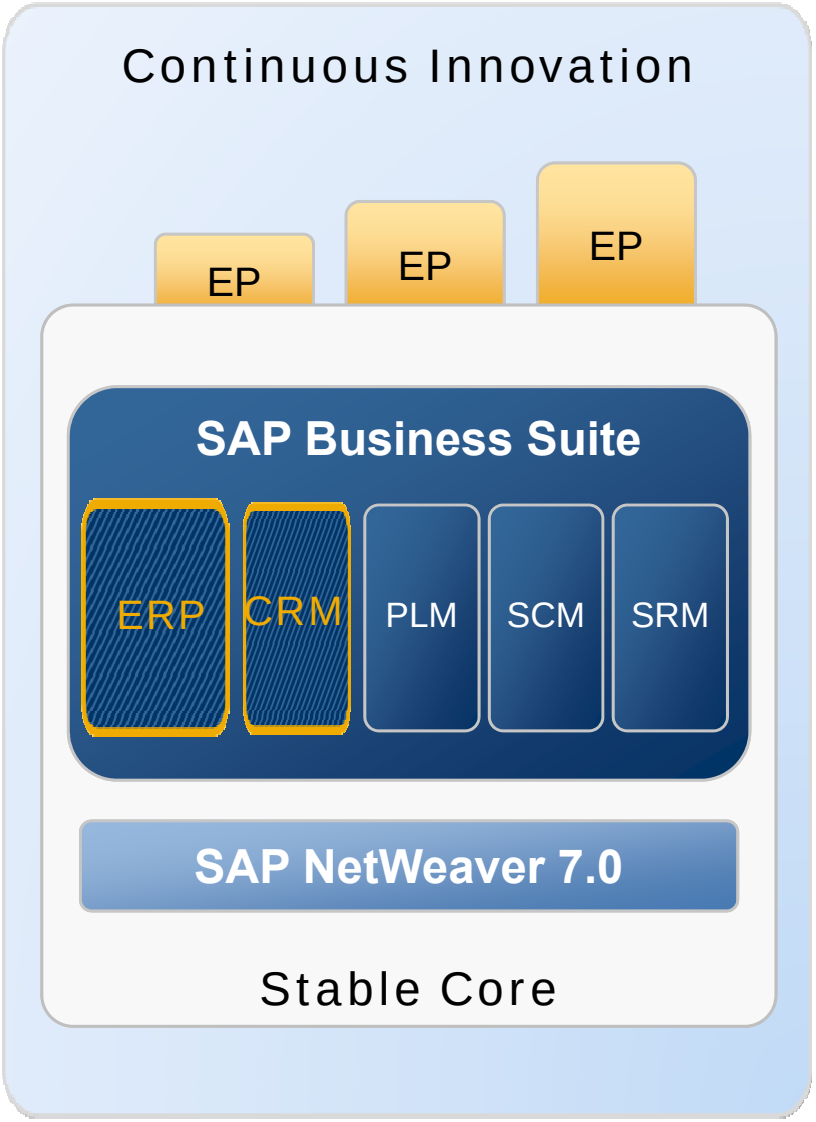
SAP Business All-in-One

Configurable and Extensible

- 11,700 customers (+18%)
- New release based on business process platform, including CRM

Product Offering for Large Customers Expanded

- 5,100+ productive SAP ERP 6.0 customers (adding 500+ per month)
- Three successfully shipped enhancement packages (EP) prove SAP's unique technology of non-disruptive software delivery
- Rapid growth in focus industries
  Financial services: +23%,
  Consumer industries: +27%*
- SAP CRM 2007 successfully shipped



> **"Any SAP customers intending to implement or upgrade any time in the next 12 to 18 months should look no further than [SAP] CRM 2007."****
>
> AMR Research

* Year-on-year software revenue growth
** "SAP CRM 2007: Worth the Wait?", Dec.13, 2007

Enterprise SOA is Delivered
Mass Adoption is Under Way

Product portfolio transformed

- SAP Business Suite on business process platform
- SAP Business All-in-One on business process platform

Composition

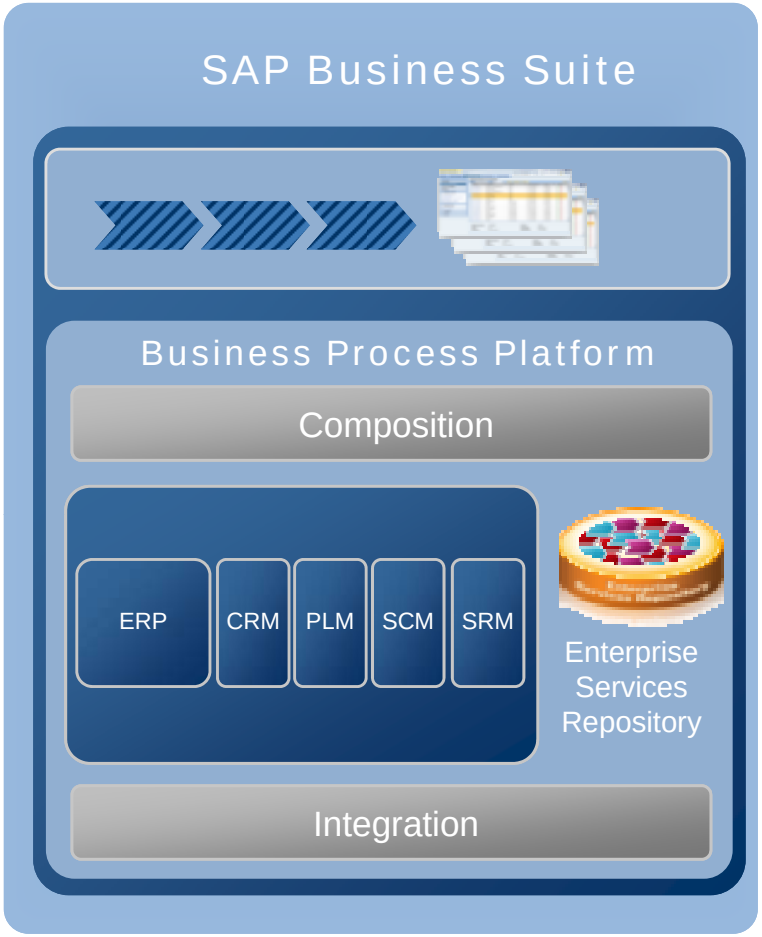
- SAP Netweaver Composition Environment available

Enterprise SOA

- Road map completed
- 150+ reference accounts
- 2,000+ enterprise services available

Momentum in SAP NetWeaver

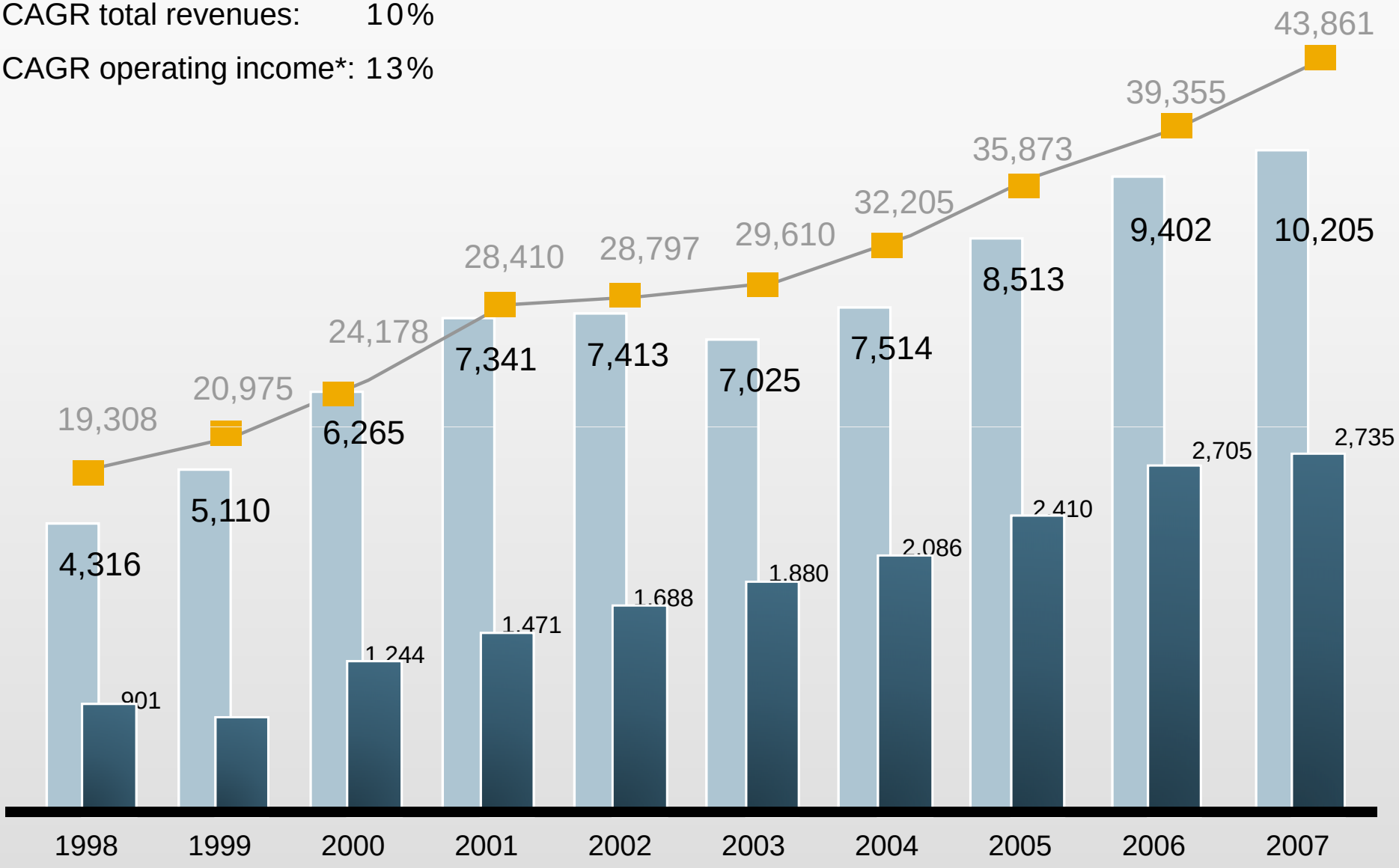
- 29,000+ productive systems (+1,000 per month)
- Overall software revenue of ~ €1bn
- Standalone software revenue grew ~100% to ~ €330m



SAP Performance in the Last 10 Years

CAGR total revenues: 10%

CAGR operating income*: 13%



© SAP 2008 / Page 10

From Landscape Visions to SAP NetWeaver

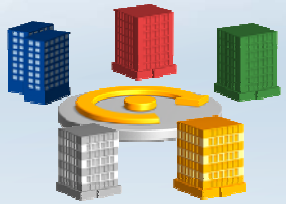
© SAP 2008 / Page 11

Business Trends Impacting Business Strategy

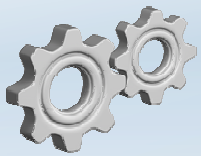
Gartner IDC Analyze the Future

Globalization

Industry Consolidation



New Process Models



> **Customers are demanding more Ready-to-Use application software."**
>
> IDC (205238)

> **Companies who pursue integrated compliance will get the most business value."**
>
> Gartner (G00138712)

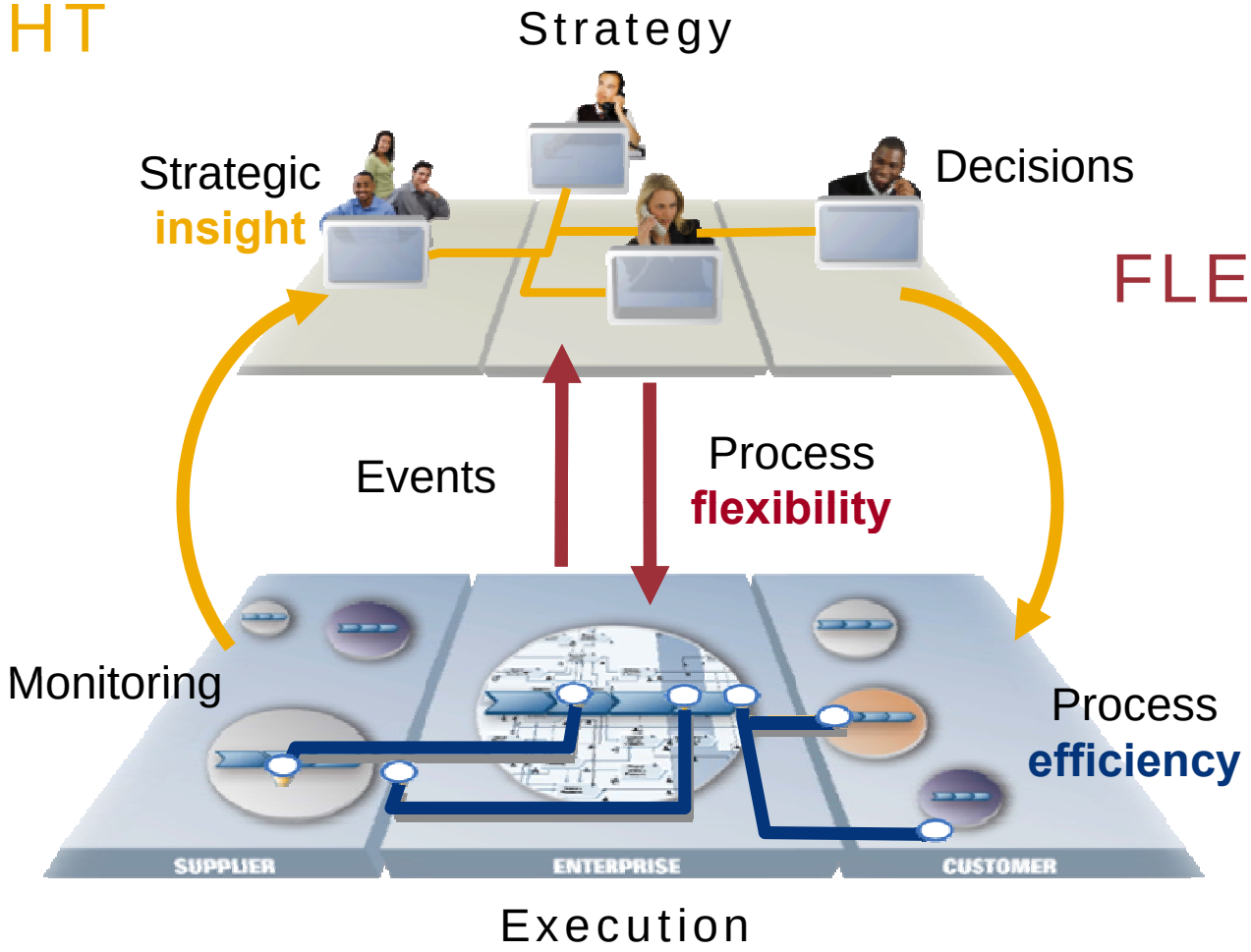
> **Business Analytics is top two IT priorities, after security."**
>
> IDC (204426)

> **Major trend through 2010 will be the integration of business applications with personal productivity applications."**
>
> Gartner (G00138205)

> **Business process agility is becoming a standard requirement for IT and business."**
>
> Gartner (G00138195)

Wanted: Strategic Agility

INSIGHT



FLEXIBILITY

Execution

EFFICIENCY

Business Networks Are Relevant For Everyone

- You lack critical mass to enter a market alone

➔ Complement an incumbent's offer

- Competition is pressuring margins

➔ Divest non-core processes

- Customer problem requires diverse disciplines to solve

➔ Orchestrate as trusted advisor

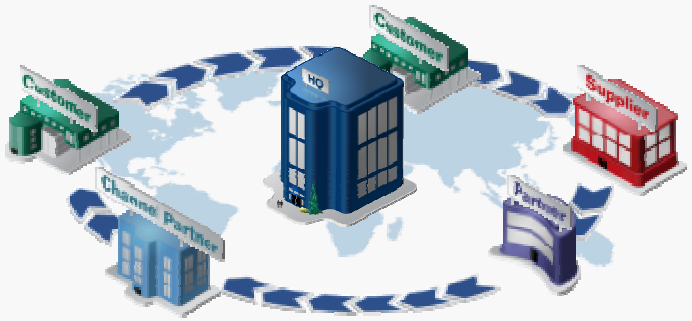
- Market rewards rapid introduction of new products

➔ Drive changes through brand power

Different Business Models Drive Different Types of Networks

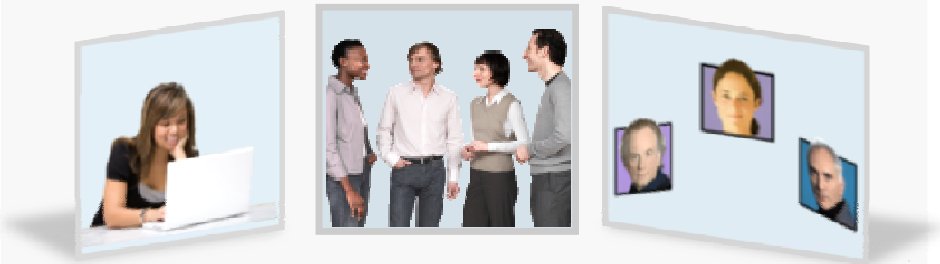
Volume Operations
"Scale-up profitably"
Automated, routine processes

Coordinated Network
Efficiency, speed
Connect systems, share processes



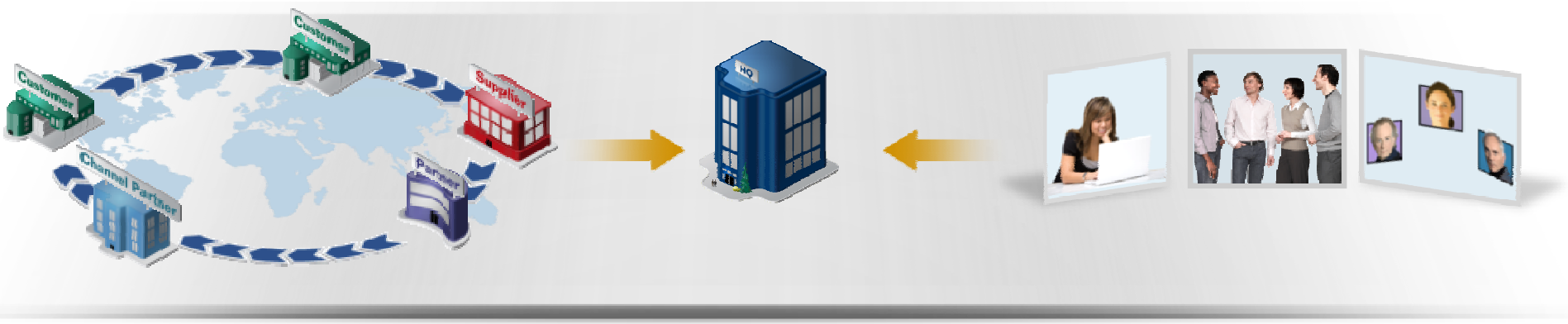
Complex Systems
"Innovate quickly"
People-centric, ad-hoc processes

Collaborative Network
Insight, relationship
Connect people, share information



Strategic Agility & Business Network Transformation

> In today's challenging environment we must go beyond our comfort zone and build the strategic agility to manage both types of networks in parallel."
>
> Geoffrey Moore



SUPPLY

- Every day matters
- Cost pressure
- ➔ Tightly managed supplier base

Stay agile

Transform networks

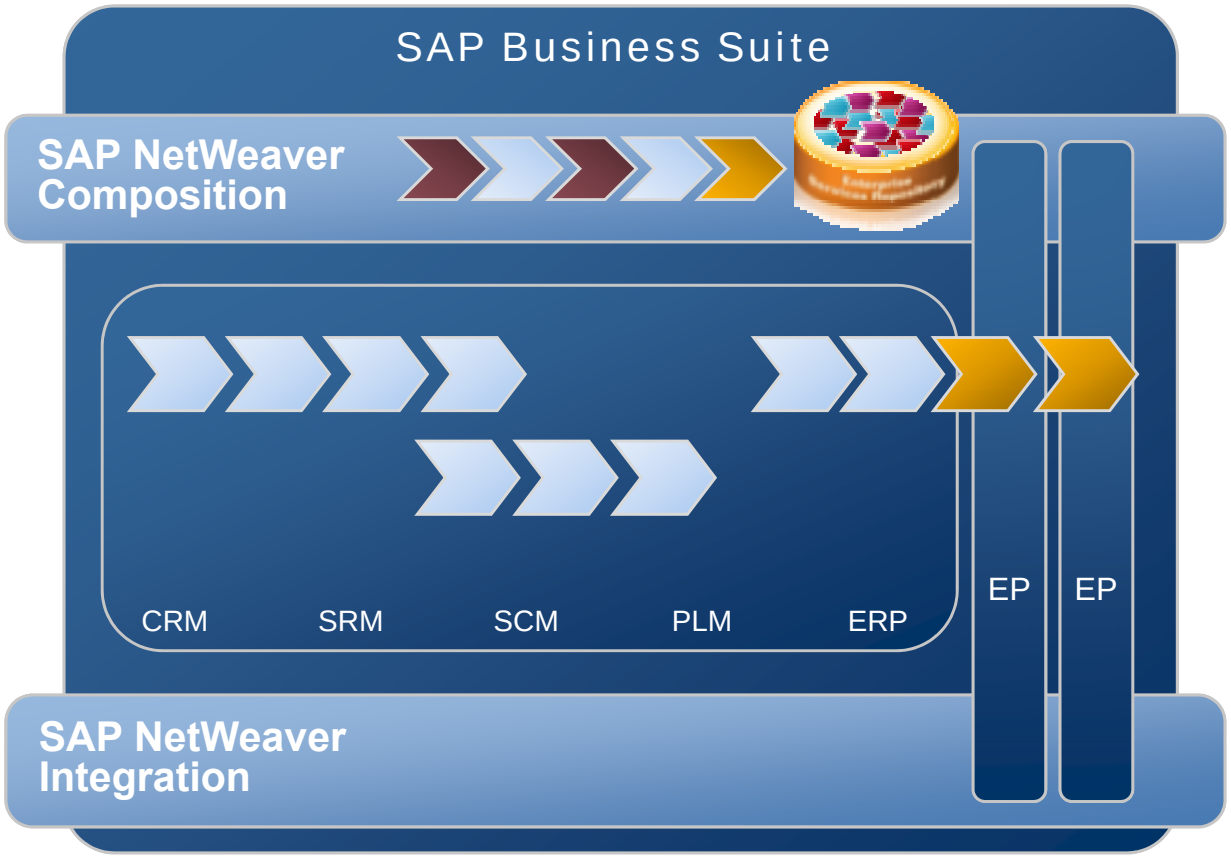
Make profits

DEMAND

- High speed
- ➔ More promotions
- ➔ Co-design with customers

SOA is the Ticket to Strategic Agility

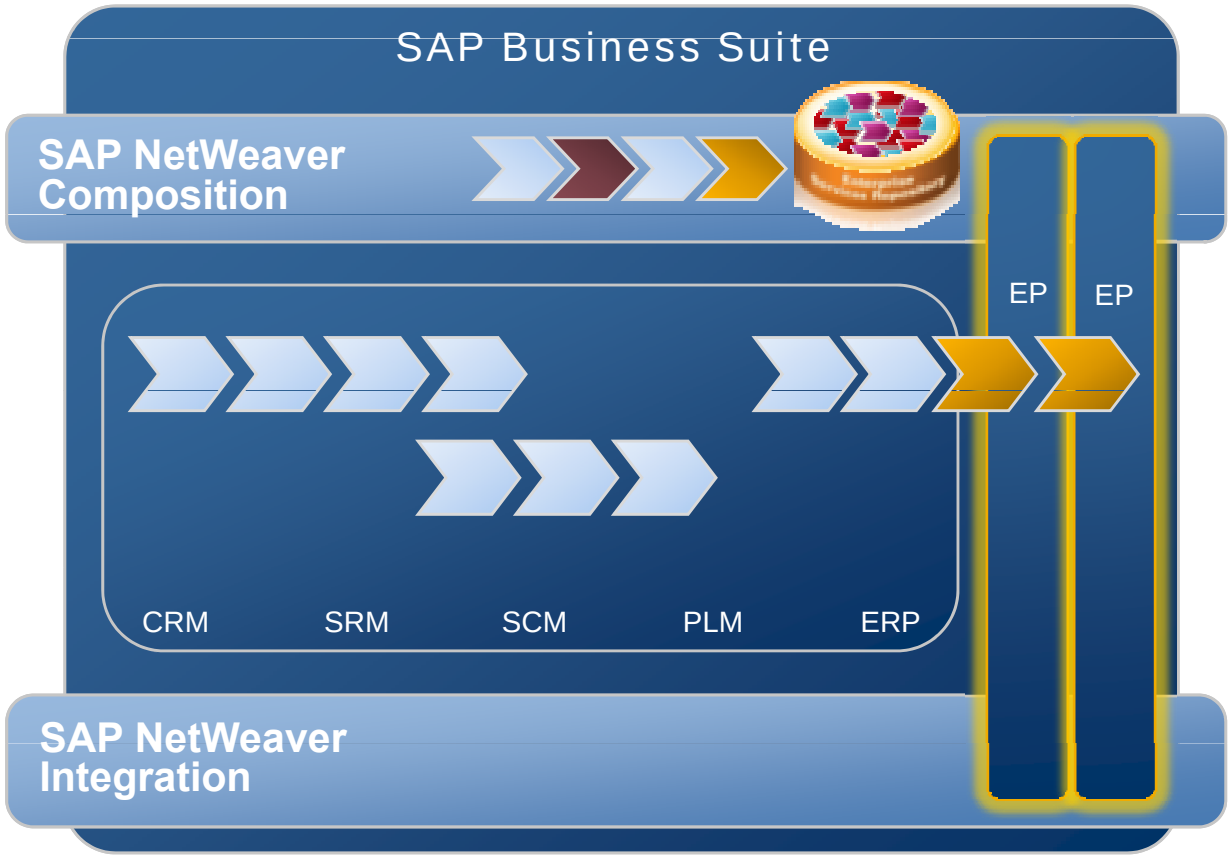
SAP Business Suite: cross-industry and service-enabled



- Best practices for 24 industries
- All applications on SAP NetWeaver
- 2,800+ ready-to-run services
- 10,000+ SAP ERP 6.0 customers
- Vibrant partner ecosystem
- SAP NetWeaver CE
- SAP CRM 2007

Easier to Consume, Continuous Innovation

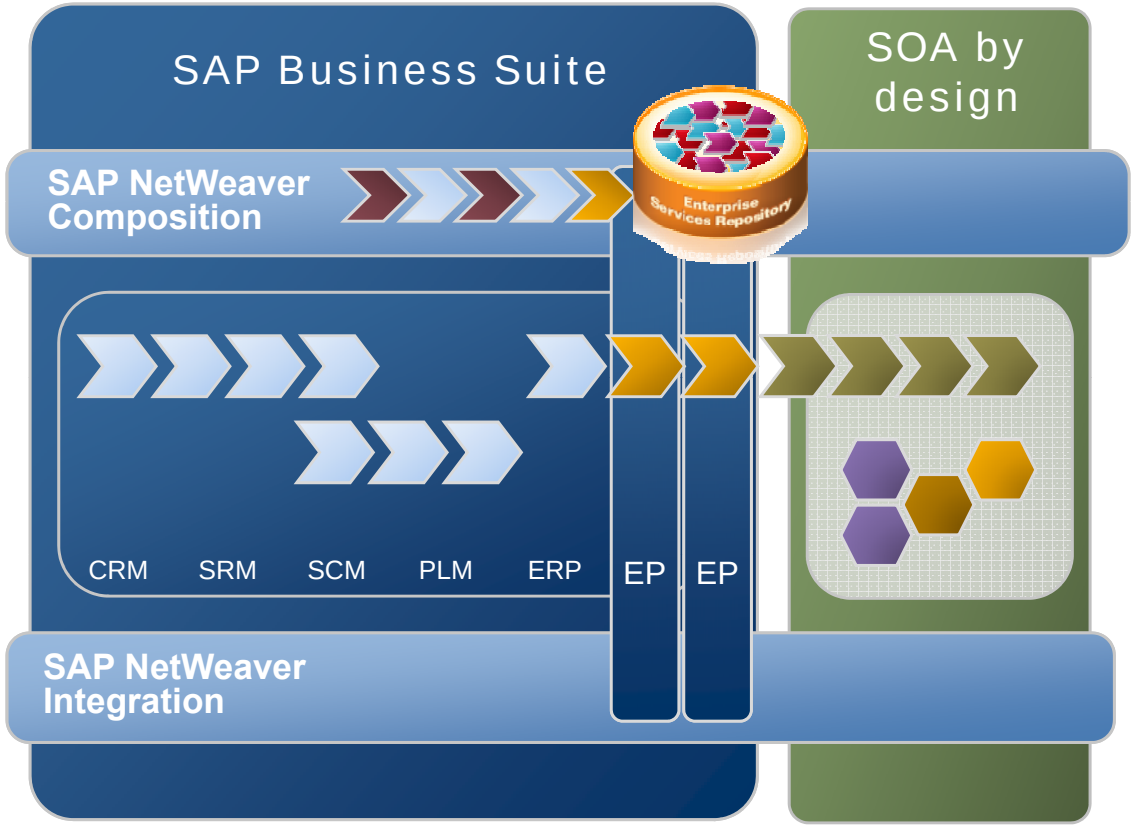
Enhancement Packages - Optionally installed and activated



- More end-to-end industry processes
- Harmonized user interface
- Embedded analytics
- Embedded search
- Continued SOA enablement

Innovation Without Upgrading or Disruption

Accelerated innovation via side-by-side deployments



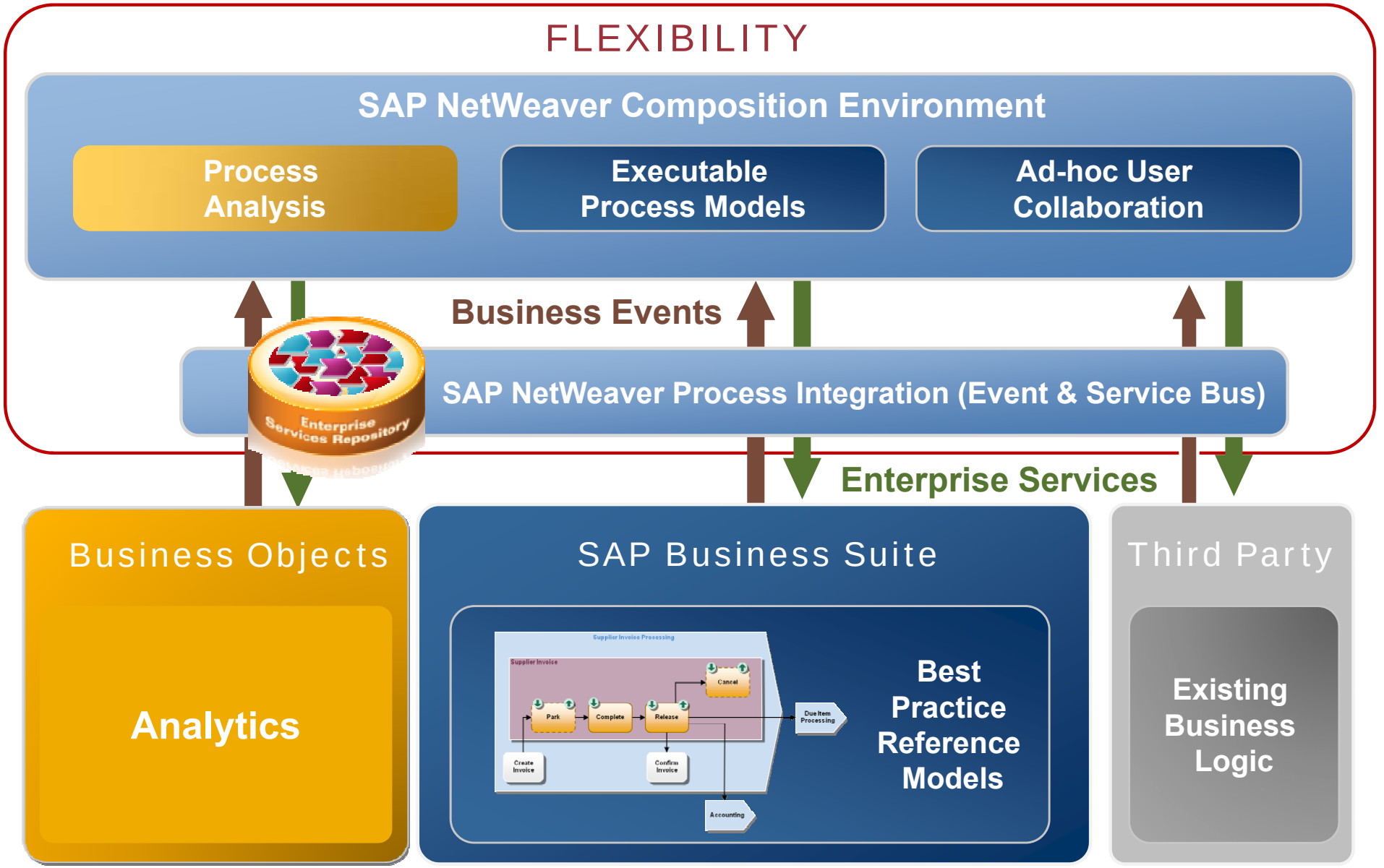
SAP NetWeaver 7.1

- Composition Environment
- Process Integration
- Master Data Management
- Mobile
- Adaptive Computing Controller

Process extensions (planned)

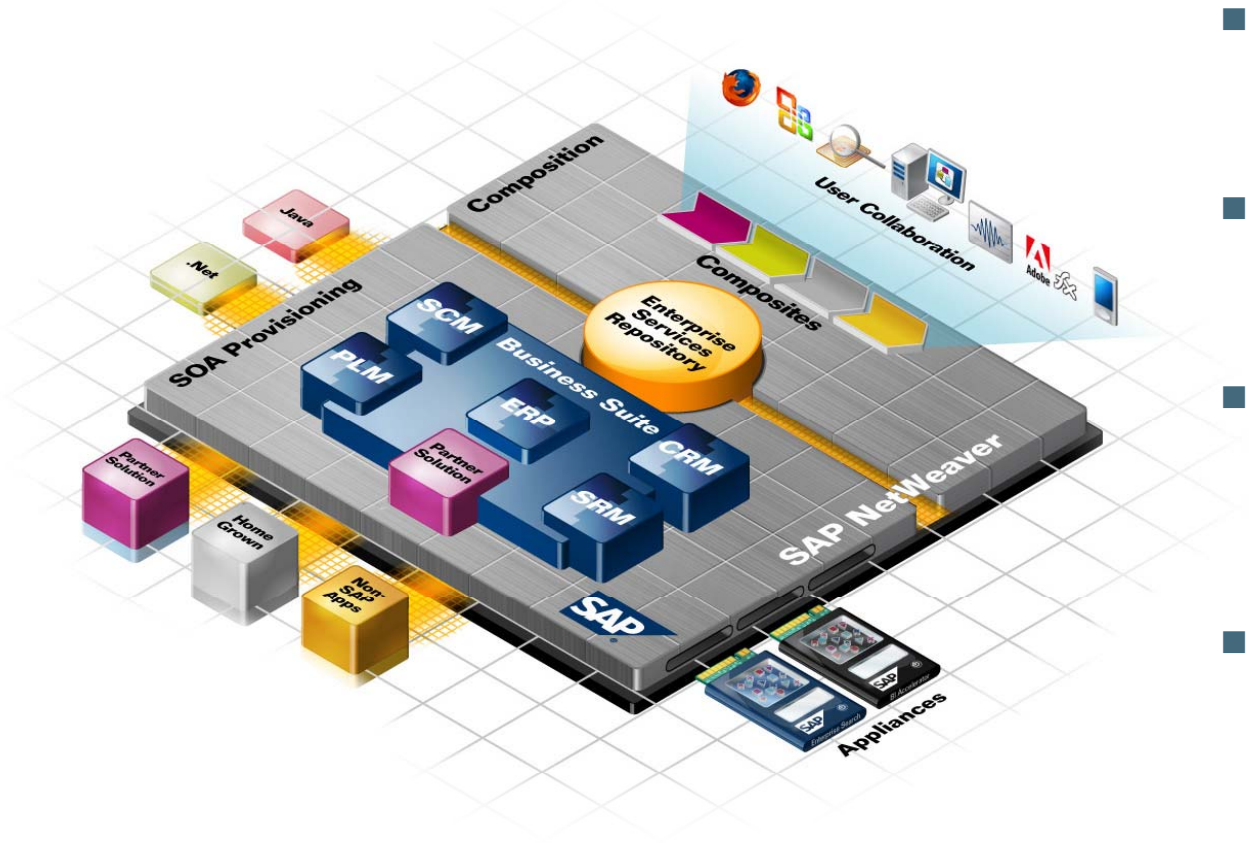
- Collaborative supplier mgmt
- Collaborative product design
- Collaborative corporation

Convergence of Models, Services & Events



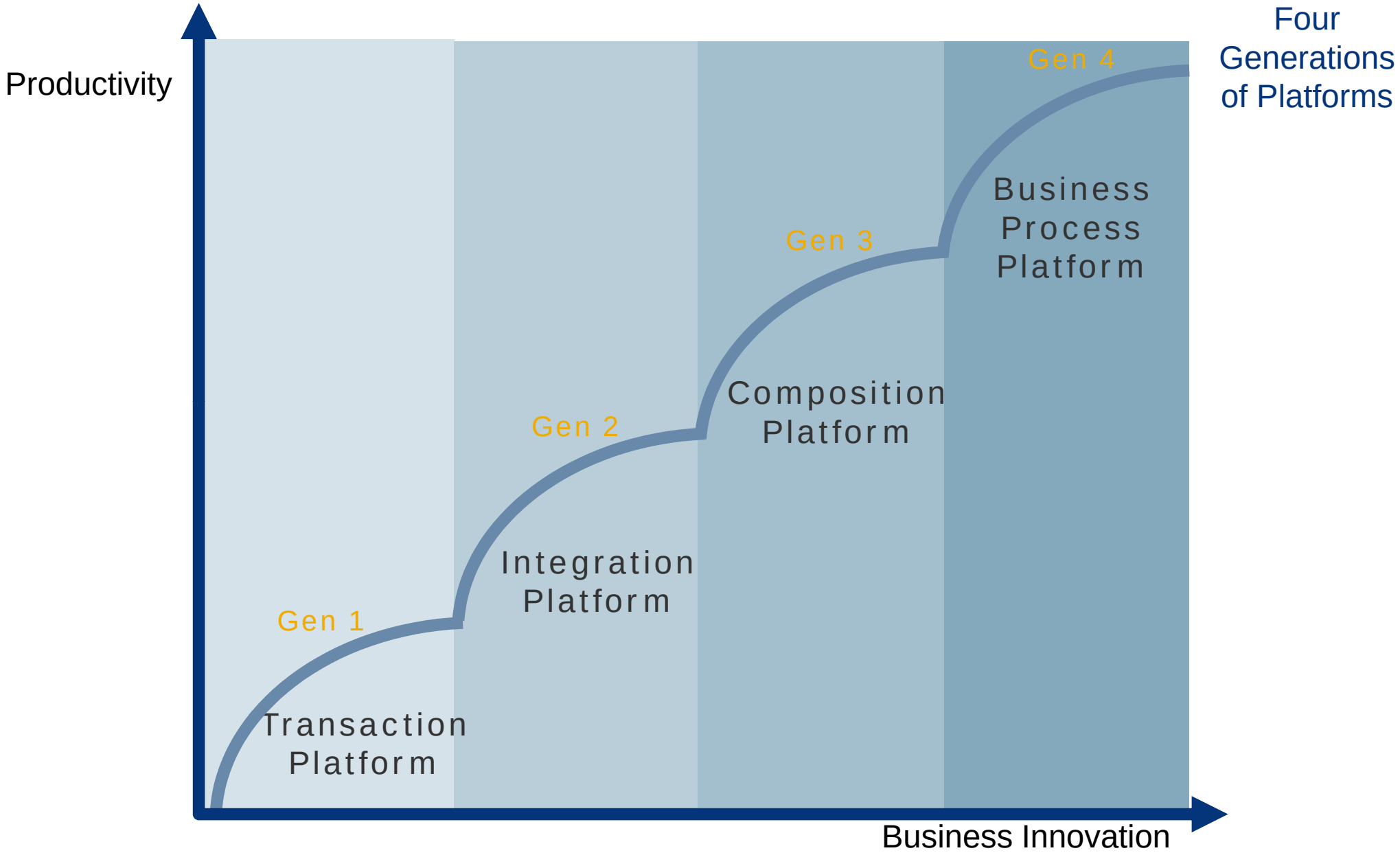
Introducing SAP NetWeaver

SAP NetWeaver enables rapid but controlled business process change

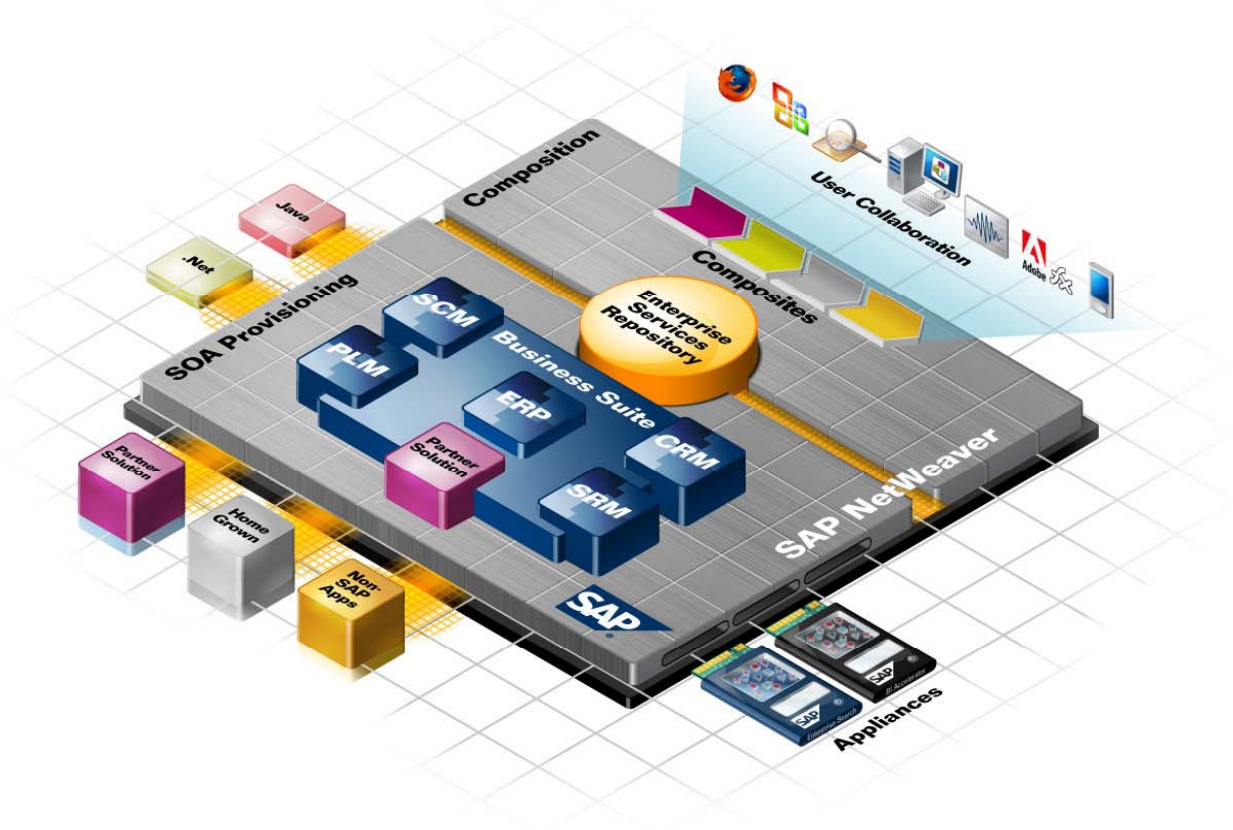


- Technology platform incorporating business functionality – exposed as ready-to-use enterprise services
- Pre-integrated applistructure platform, leverages existing investments, minimizes costs
- Provides an integrated platform of composition technologies for orchestrating business processes and composing applications on top
- Quickly adapt packaged industry xApps™ to the needs of your business users

SAP NetWeaver is an Evolutionary Platform



SAP NetWeaver Powers SAP Applications



Examples: SAP ERP, SAP CRM, xApps, Duet, Partner Solutions, custom solutions and much more

In simple terms:

Every SAP application runs on SAP NetWeaver technology

POWERED BY SAP NetWeaver™

Application*

SAP NetWeaver

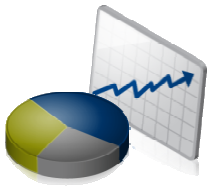
*Third-party and ISV solutions can also be certified as “powered by”

From Landscape Visions to SAP NetWeaver Business Intelligence

SAP NetWeaver Empowers Business Users

Business Client
Simplified user experience

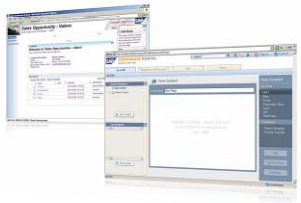
Enterprise Search
Faster responses and action



Analytics
Action oriented and personalized information

Portal and Self-Services
Intuitive productivity

Duet
Integrated access from MS-Office



Workspaces & Networking
Groups and individuals build work communities

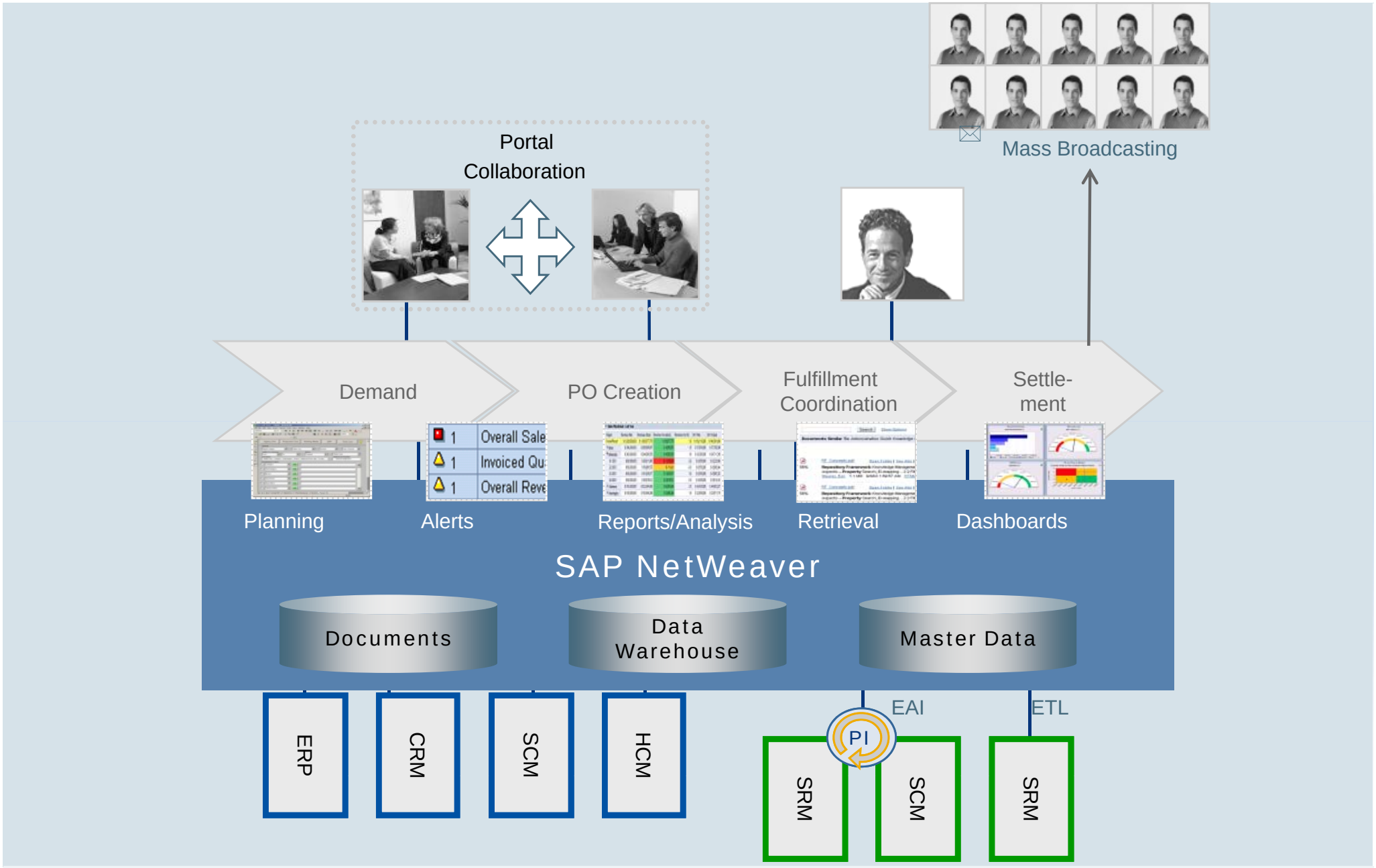
Widgets & RSS
push business events to the end users

Wikis & Blogs
Users contributing to the business

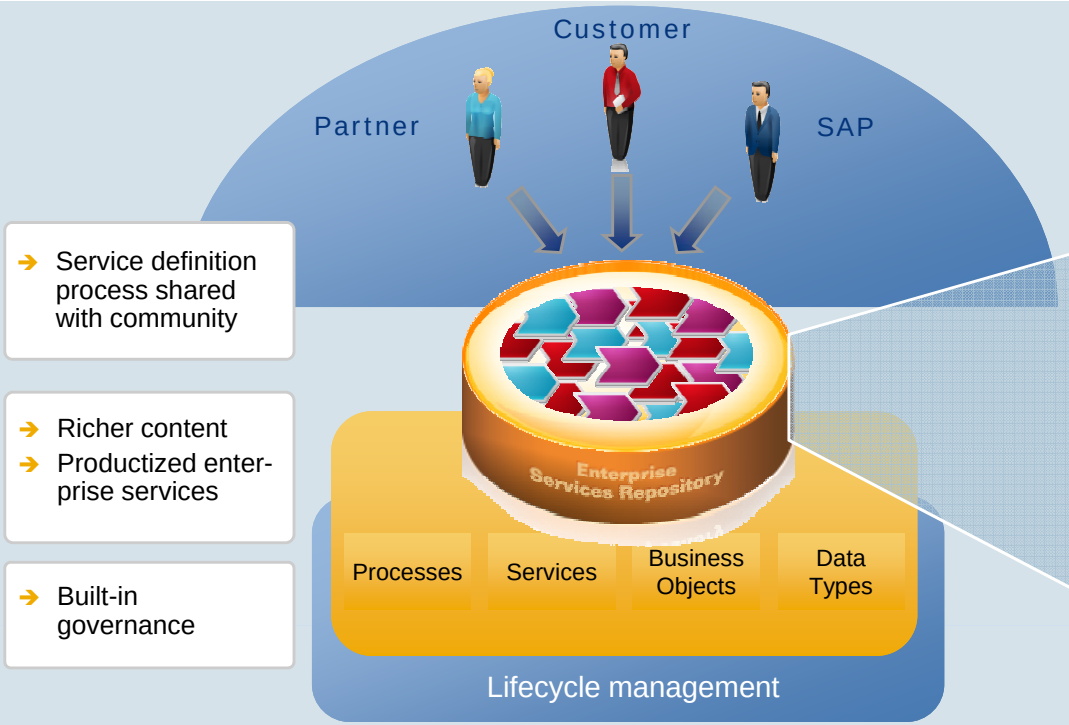
Adobe Forms
Easy form based processing

Mobile & Voice
available everywhere

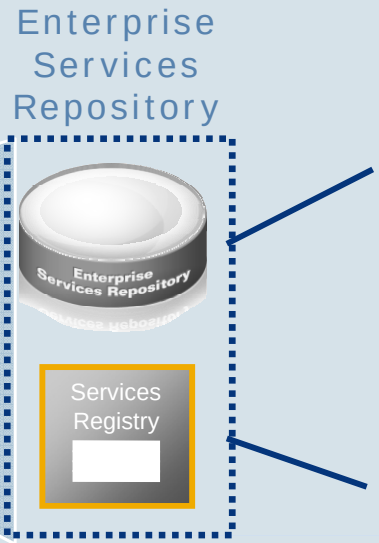
Business Information Management Powered by SAP NetWeaver



Enterprise Services Repository



- Service definition process shared with community
- Richer content
- Productized enterprise services
- Built-in governance



ES Repository

- Definition of processes and services
- Service metadata
- Central modeling and design environment

Services Registry

- Yellow pages of services
- Deployment endpoints
- Services management
- Ease of consumption: browse, discover, and use services

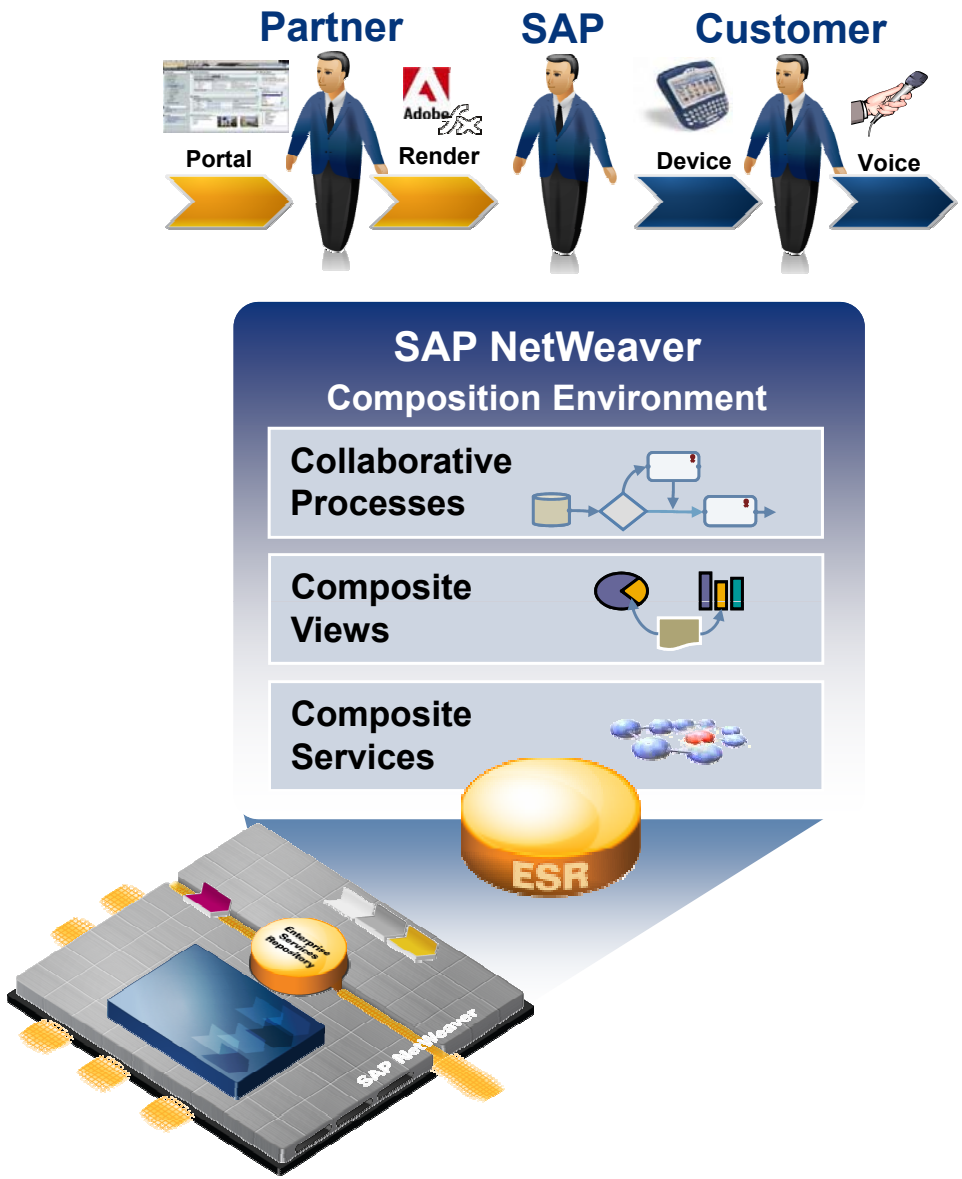
- Enabling SOA design governance
- Providing service metadata
- Enabling A2A and B2B processes
- Developing composite applications

The Enterprise Services Repository and Registry is delivered with:
- SAP NetWeaver Process Integration 7.1
- SAP NetWeaver Composition Environment 7.1

The Enterprise Services Repository is the central repository for enterprise services and service interfaces and their metadata.

© SAP 2008 / Page 27

Business-Driven Enterprise SOA



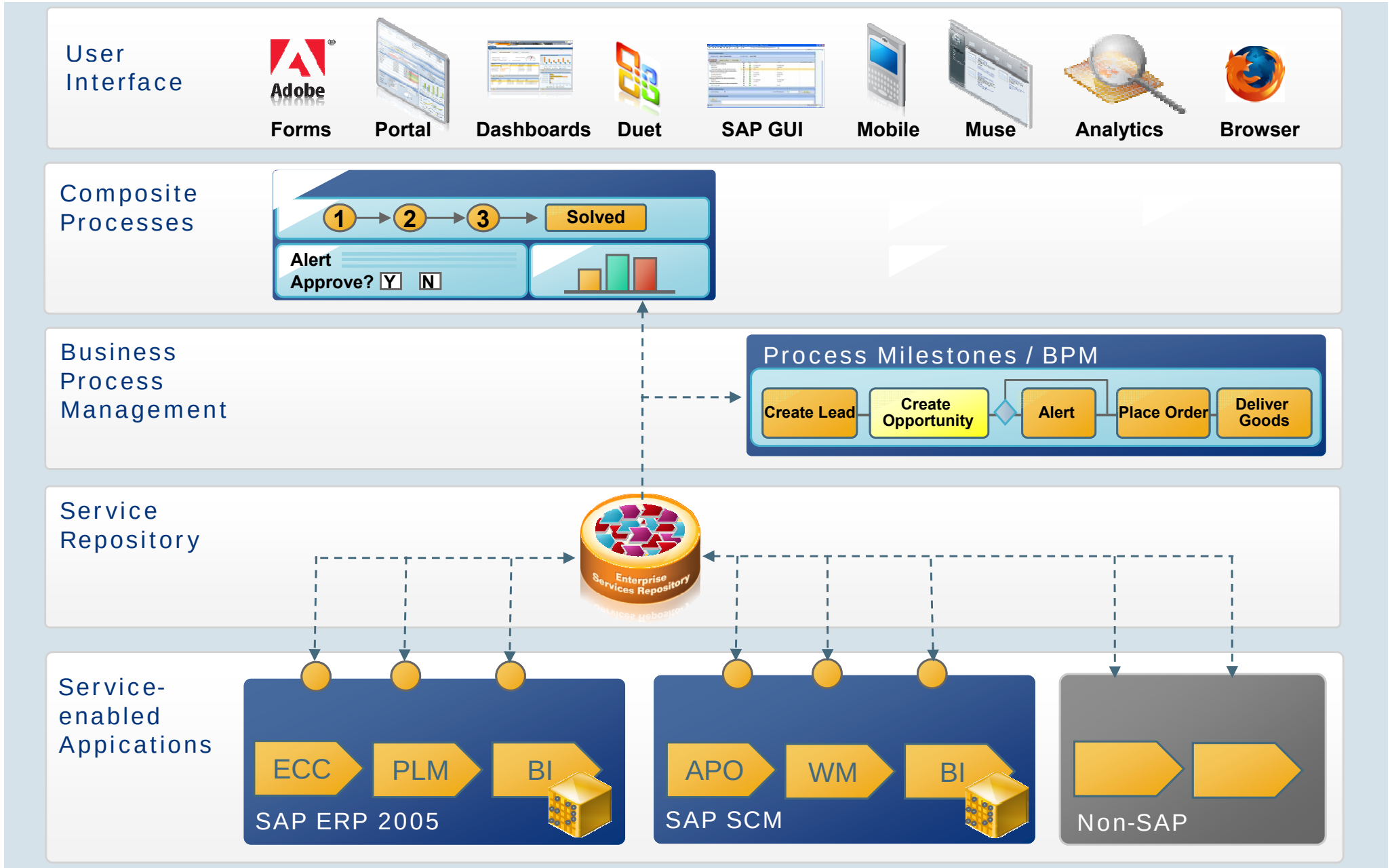
Composing "edge" applications

- Java EE 5 based platform for building and running applications based on Enterprise SOA principles and industry standards
- Model-driven development for processes, views, and business logic
- Integrated UDDI Services Registry

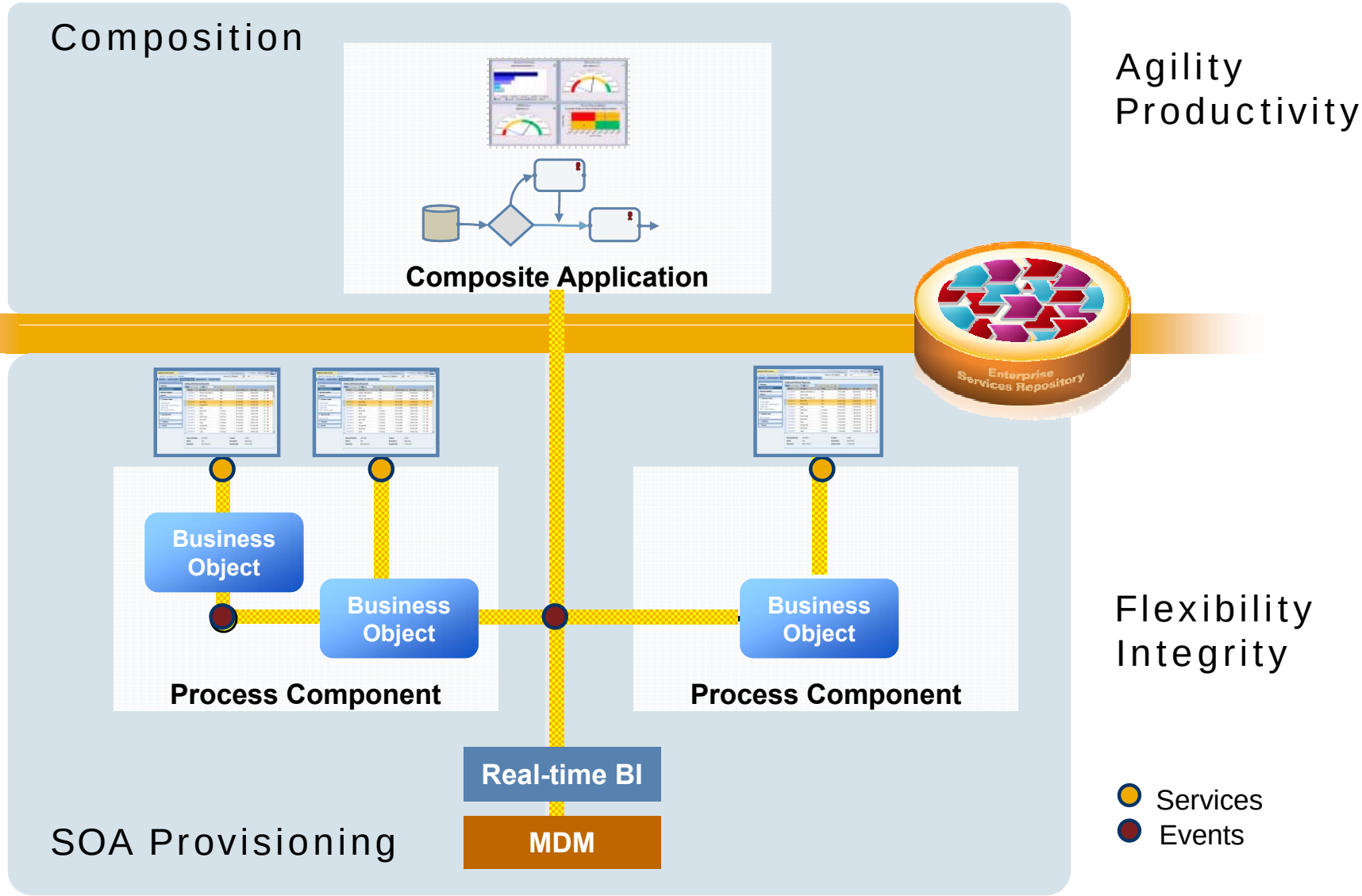
Simplicity and Efficiency

- Fast download & installation in one hour
- Designed for lean consumption, holistic software lifecycle management and model-driven development
- Out-of-the box access to rich business semantics through Enterprise Services Repository (ESR) and Enterprise Services Workplace

SAP NetWeaver Delivers A Flexible Architecture For Innovation



Toward Business Applications with Real-Time Business Intelligence



From Landscape Visions to SAP NetWeaver Business Intelligence Accelerator

SAP NetWeaver BI Accelerator Opportunity

THE TRENDS

Increased adoption of analytics

- **Data explosion, growing 50% p.a.**
- **Frequent need for change**
- **More users / usage of analytics**
- **Users create queries unaware of the BI technology**

THE CHALLENGES

Traditional BI platforms are bottlenecks

- **Unpredictable response times**
- **Inability to meet demand for change**
- **Expenses for manual tuning and specialty hardware**

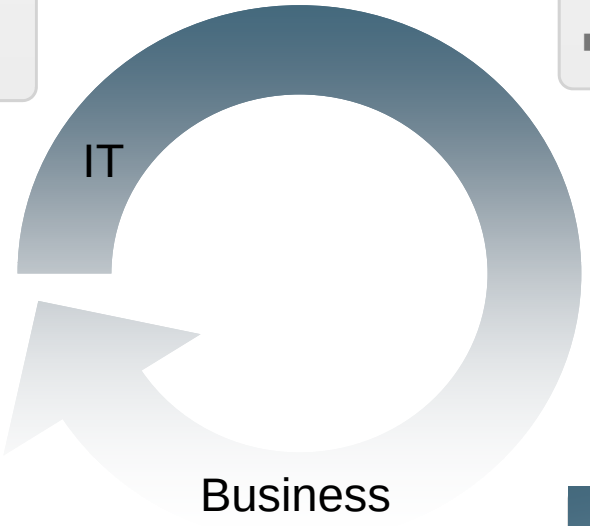
SAP NetWeaver BI Accelerator Value Proposition

Cost of Operation

- **Save time to build and maintain aggregates**
- **Save disk space**
- **Take load off BI hardware**
- **Consolidate BI landscape**

Performance / Scalability

- **Ready for high data volumes (retail, utilities, banking …)**
- **Challenging response time SLAs**
- **Ad hoc reporting with stable response times**
- **Scalable blade server platform**



Time for Development

- **Less focus on performance aspects**
- **Faster development of new models and queries**

New Business Scenarios

- **Get more detailed insight into your business**

Data Latency

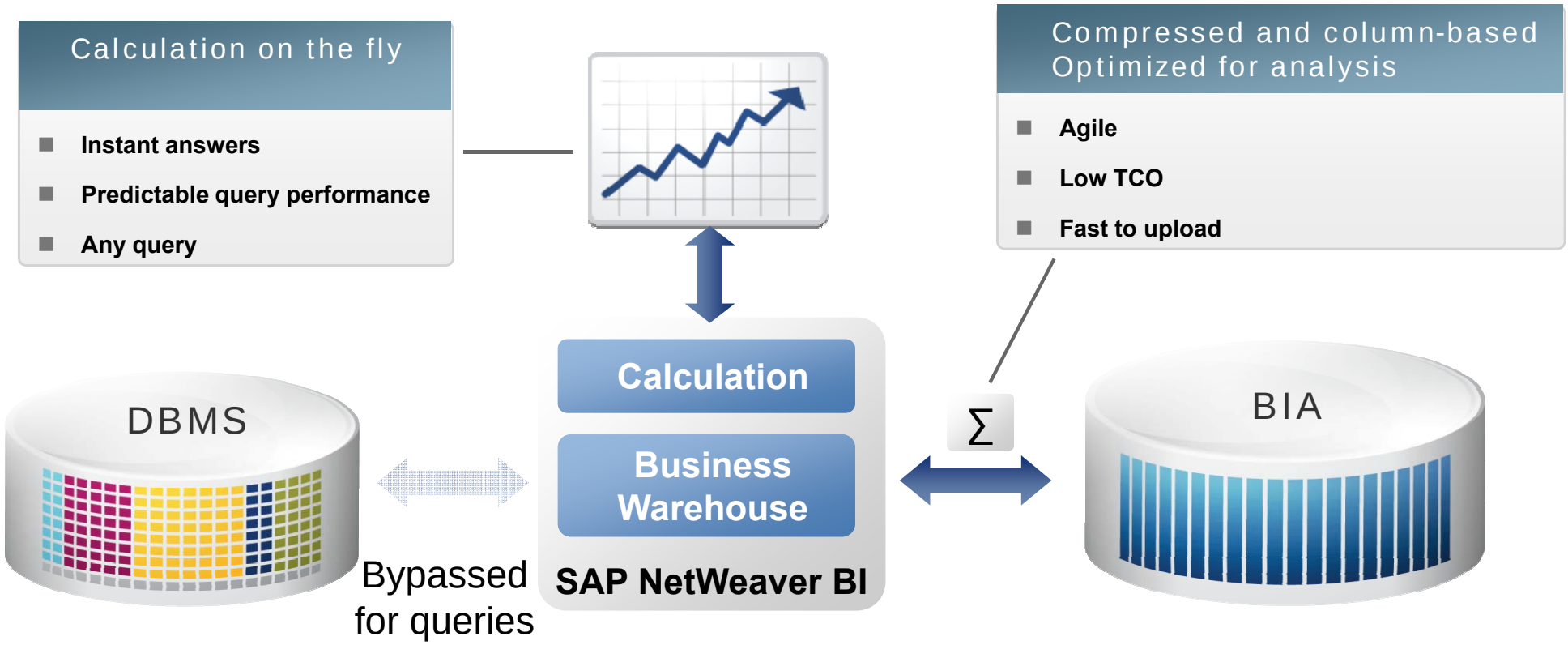
- **Much shorter times for roll-ups and change runs**
- **Opportunity for more frequent data alignments**
- **Compression not always needed**

SAP NetWeaver BI Accelerator Vision

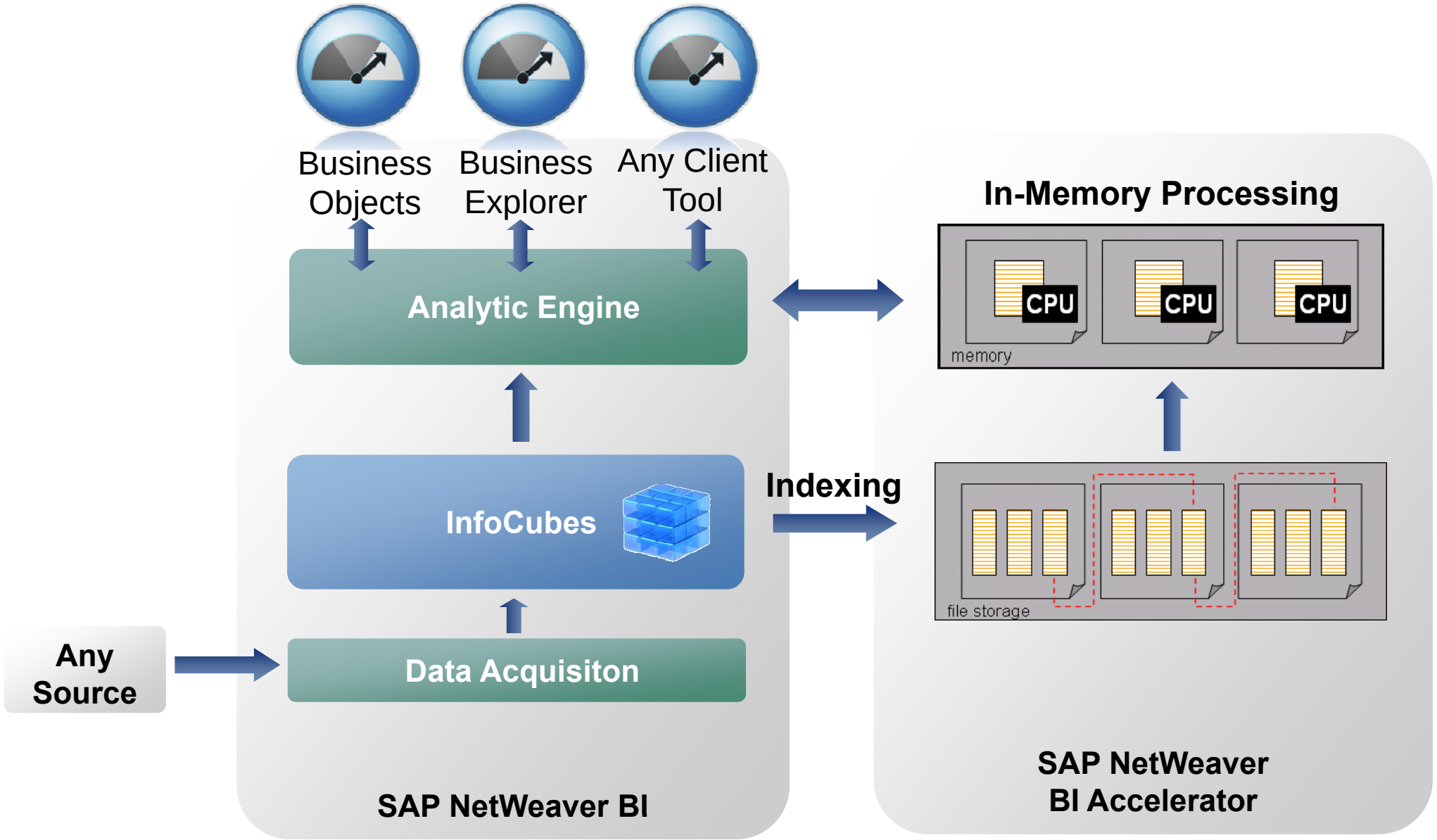
SAP NetWeaver BI Accelerator for high performance BI

A new transparent approach to boost BI query performance

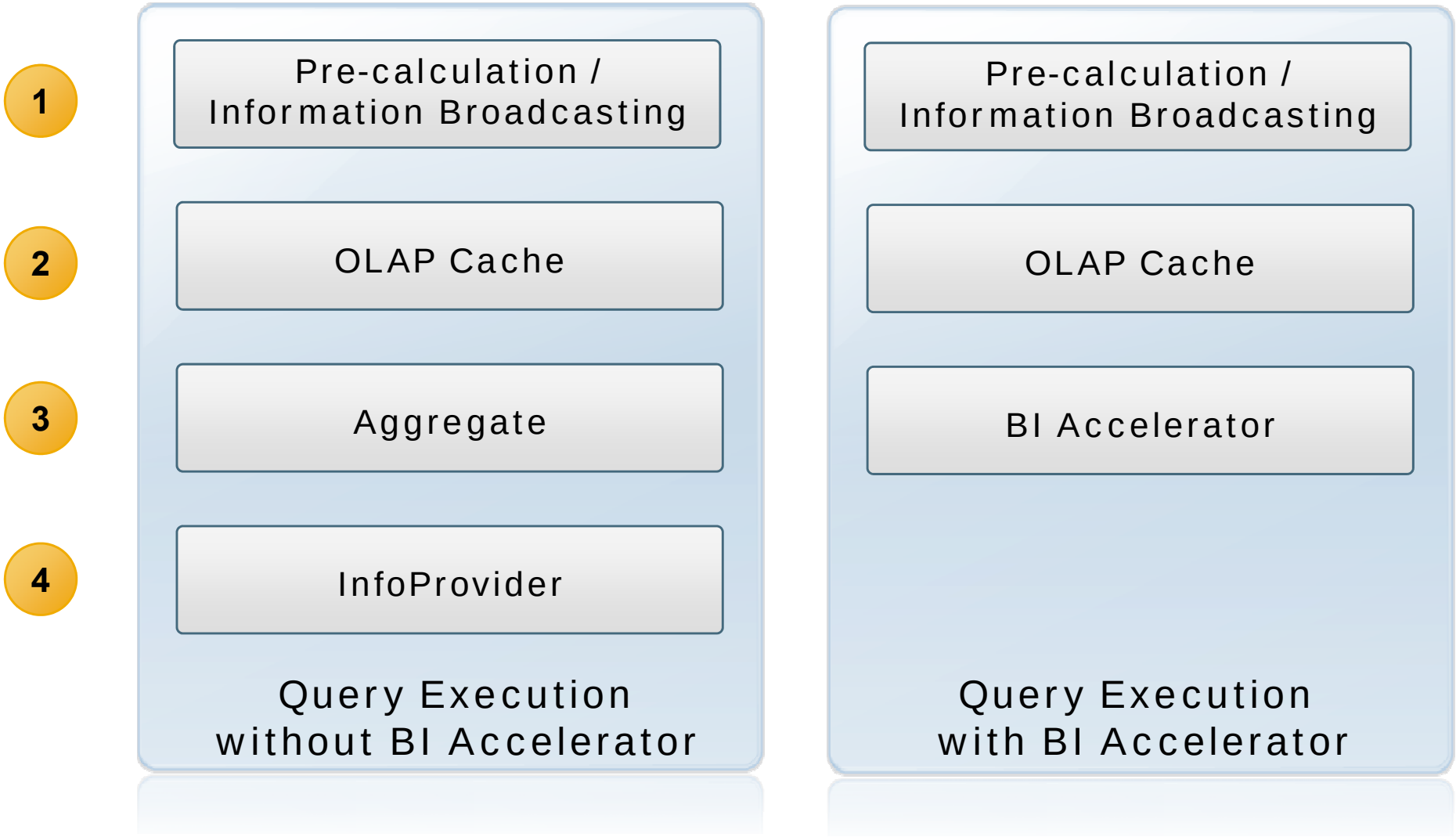
- Performance speedup factor between 10 and 100
- Without changing the BI user experience (transparent to users)
- Boost performance for Business Objects client



SAP NetWeaver BI Accelerator Architecture



SAP NetWeaver BI Accelerator
Query Execution



The SAP NetWeaver BI system checks the listed repositories (in the order shown) to obtain the query result set

SAP NetWeaver BI Accelerator
A New Experience

Orders of magnitude better

A New Experience For Information Workers

- 10x faster queries
- 10x less expensive to acquire
- 20x less expensive to operate
- Ready for high data volume
- Consistently fast response times
- Empowers users with flexibility

SAP NW BI Accelerator

	1990	2006	Improvement
CPU	0.05 MIPS/$	7.15 MIPS/$	143x
Memory	0.02 MB/$	5 MB/$	250x
Addressable Memory	2^{16}	2^{64}	2^{48}x
Network Speed	100 Mbs	10 Gbs	100 x
Disk Transfer Speed	5 MBPS	130 MBPS	25x

SAP NetWeaver BI Accelerator Appliance

Rapid Deployment

- Installed ready to run
- Software pre-Installed by hardware vendor
- Minimal configuration steps from BI frontend
- Simple purchase and licensing
- Limited variations based on standard components
- Quick time to market

Performance & Integration

- Optimized hardware/software efficiency
- Hardware and configuration optimized for high performance and high availability
- Assured quality of functionality
- Reduced integration effort with hardware and software

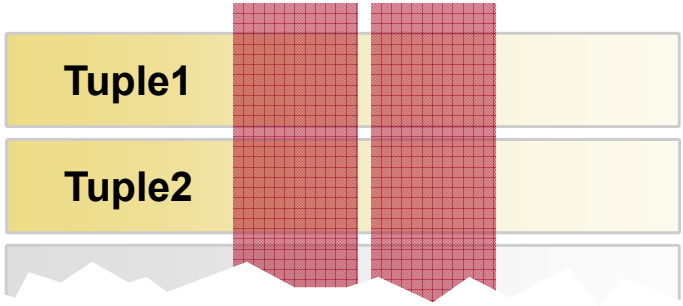
Reduced Costs of Operation

- Minimized maintenance
- Centralized monitoring through CCMS
- Easy scalability through blade server architecture
- Affordable commodity hardware
- Reduced license costs for 3rd party components
- Minimized upgrade risk
- Optimized HW/SW support offers

SAP NetWeaver BI Accelerator
Vertical Decomposition

Classical DB

stores tables by row



To find all instances of an attribute value:

- Go to the first row
- Check the attribute value
- Go to the next row
- Check the attribute value
- Repeat for each row in the table

If you don't have a predefined index ready you can wait a long time …

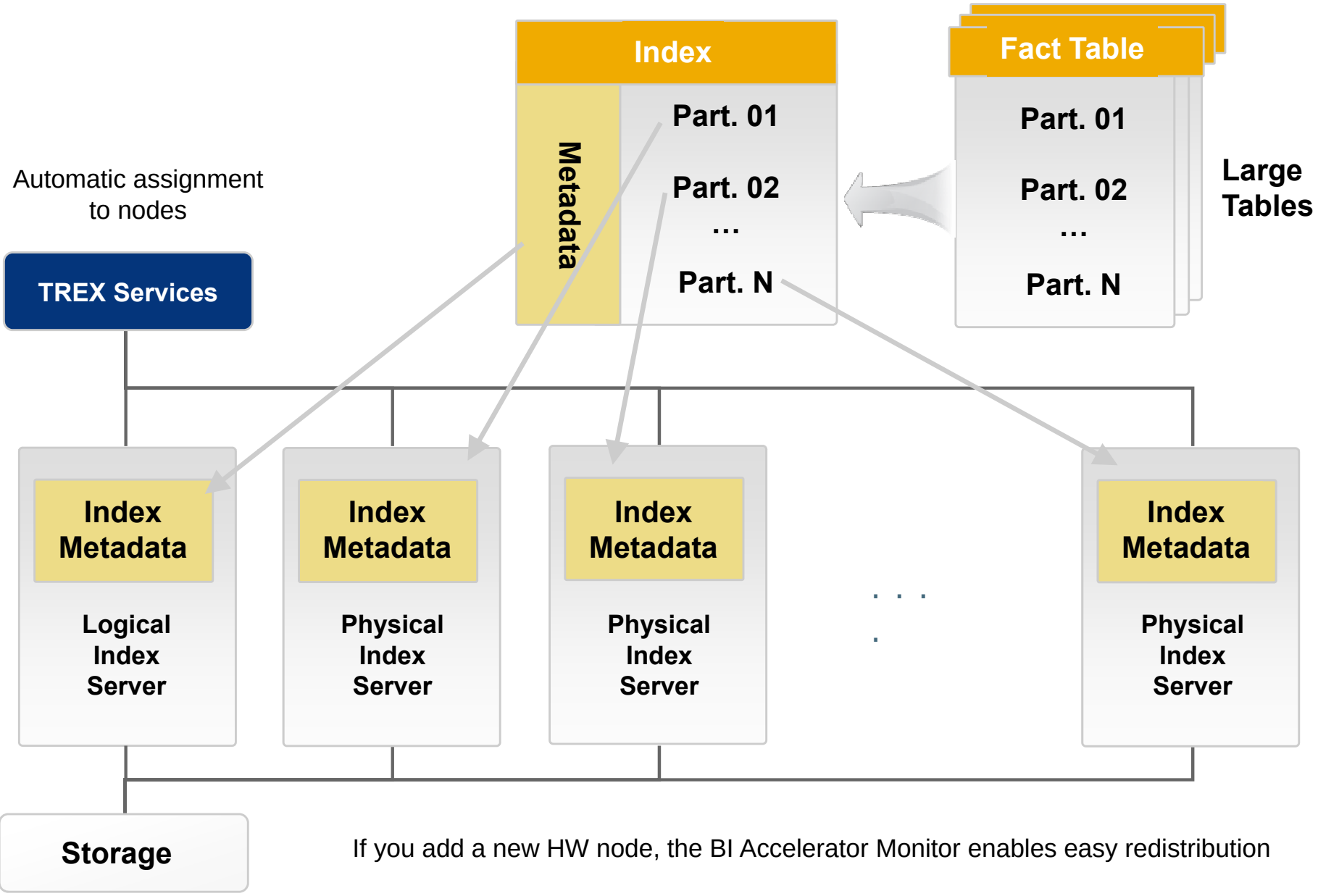
BI Accelerator

stores tables by column

To find all instances of an attribute value:

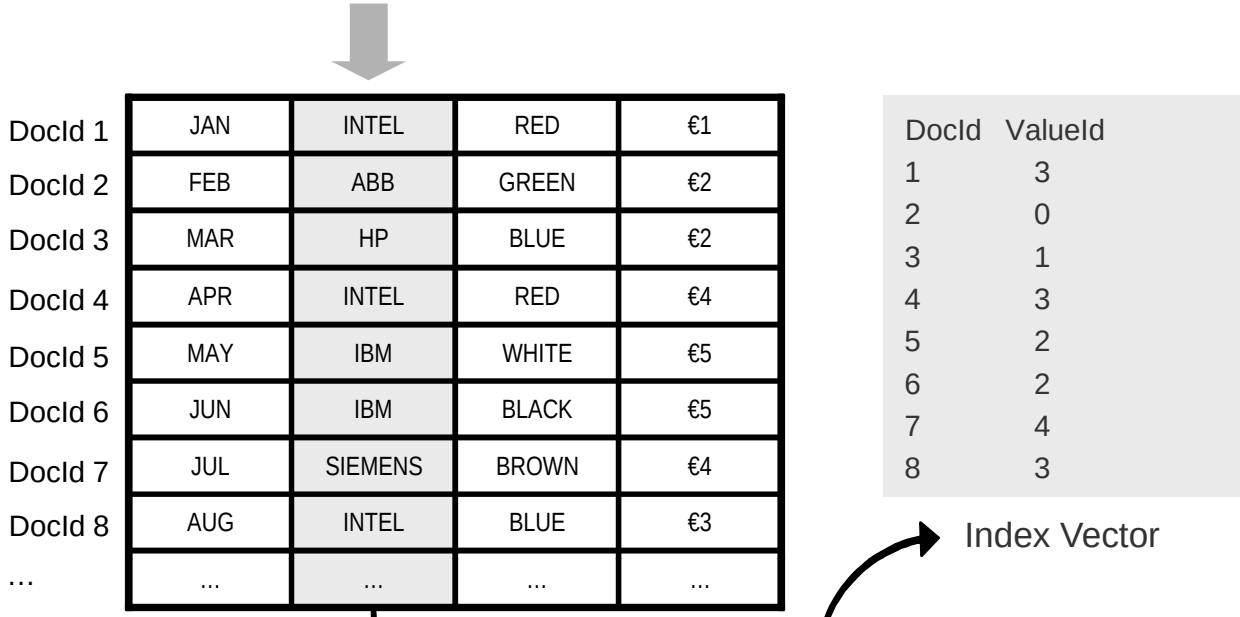
- Go to the attribute column
- Read its row values

SAP NetWeaver BI Accelerator
Horizontal Partitioning



If you add a new HW node, the BI Accelerator Monitor enables easy redistribution

SAP NetWeaver BI Accelerator
Dictionary Compression



DocId 1	JAN	INTEL	RED	€1
DocId 2	FEB	ABB	GREEN	€2
DocId 3	MAR	HP	BLUE	€2
DocId 4	APR	INTEL	RED	€4
DocId 5	MAY	IBM	WHITE	€5
DocId 6	JUN	IBM	BLACK	€5
DocId 7	JUL	SIEMENS	BROWN	€4
DocId 8	AUG	INTEL	BLUE	€3
…	…	…	…	…

DocId	ValueId
1	3
2	0
3	1
4	3
5	2
6	2
7	4
8	3

Index Vector

Dictionary

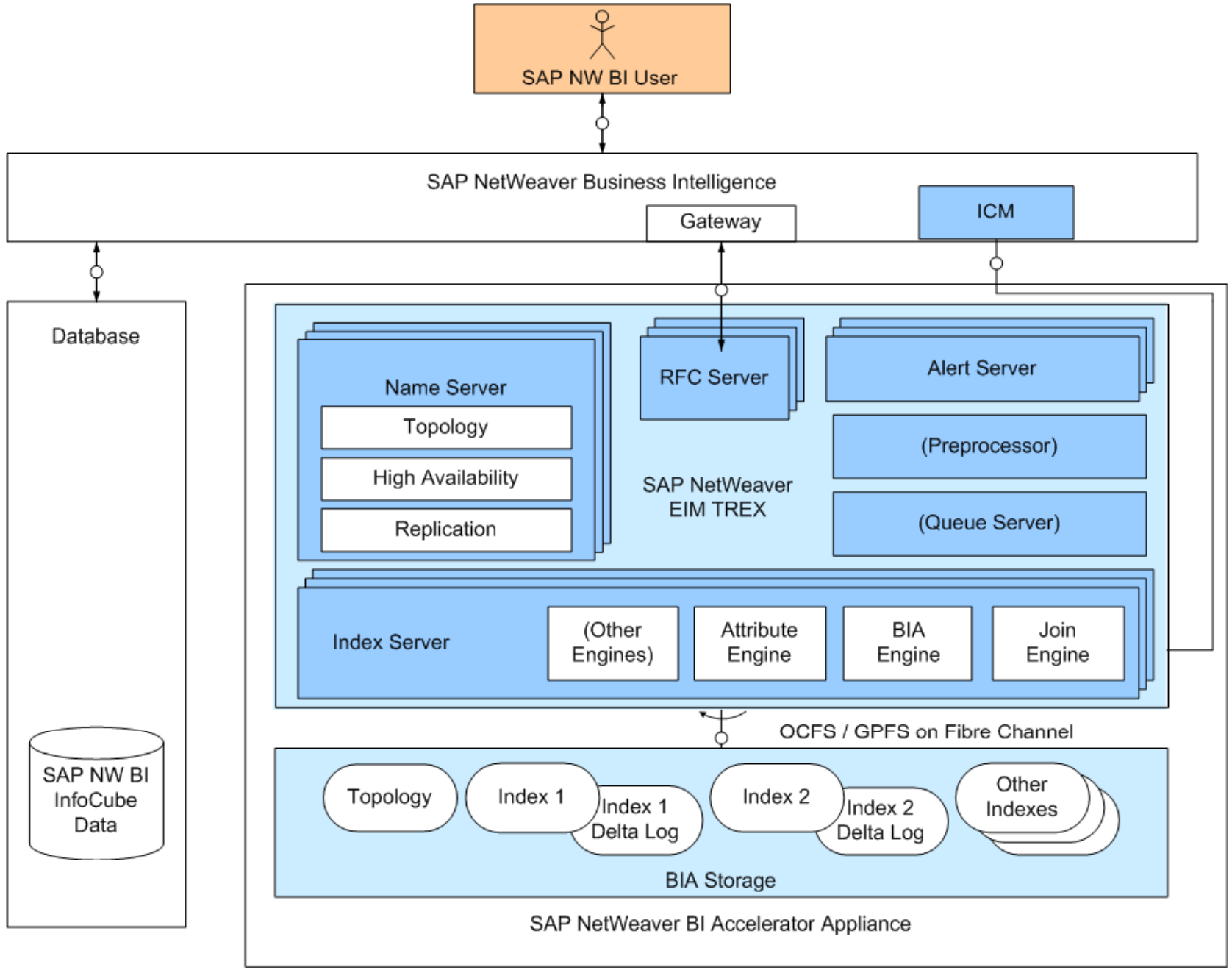
ValueId	Value
0	ABB
1	HP
2	IBM
3	INTEL
4	SIEMENS

Inverted Index

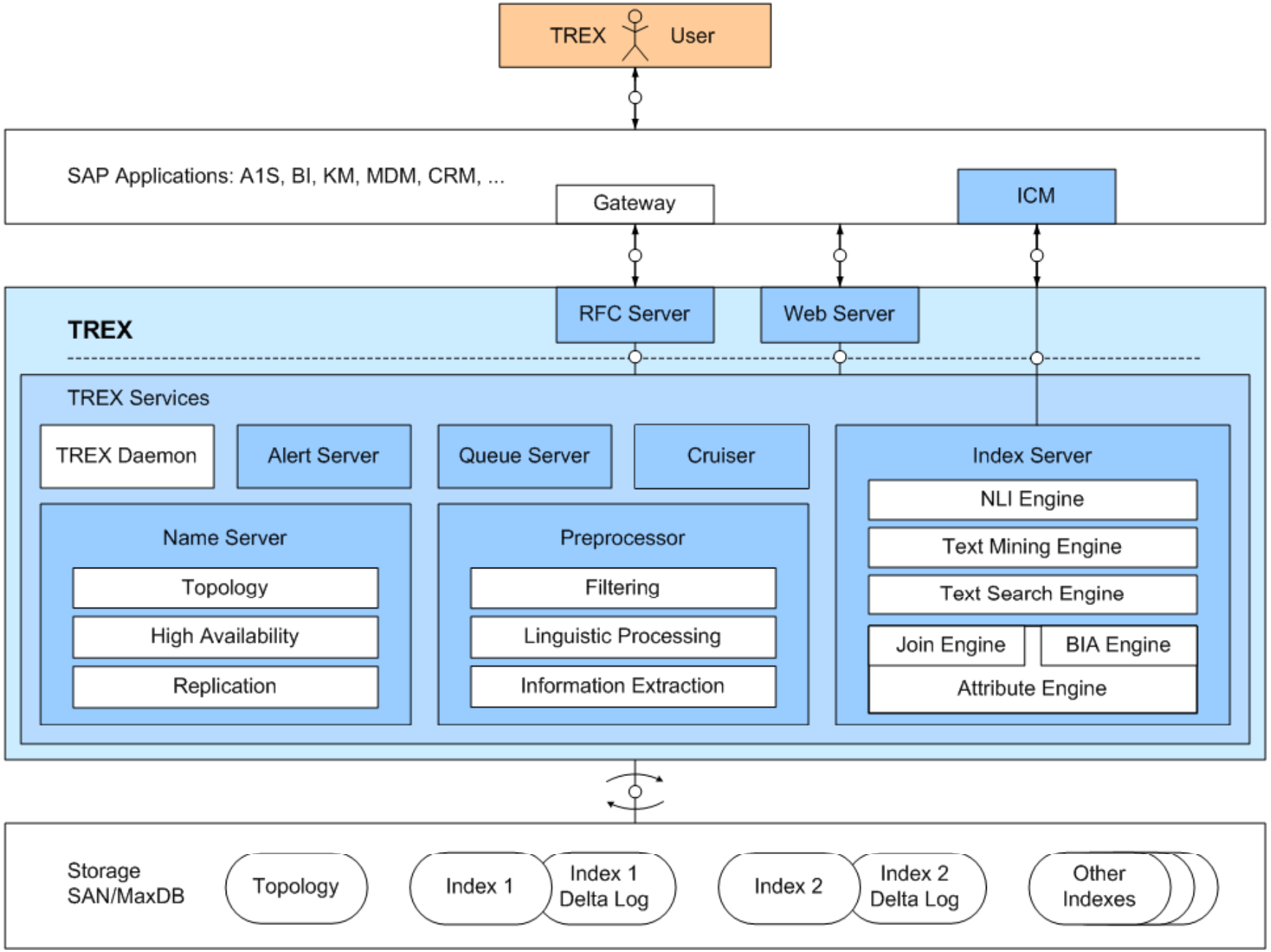
ValueId	DocIdList
0	2
1	3
2	5,6
3	1,4,8
4	7

1. Take a column
2. Map its values to integers in a dictionary
3. Write the index vector with integers
4. Invert the index vector for fast lookup

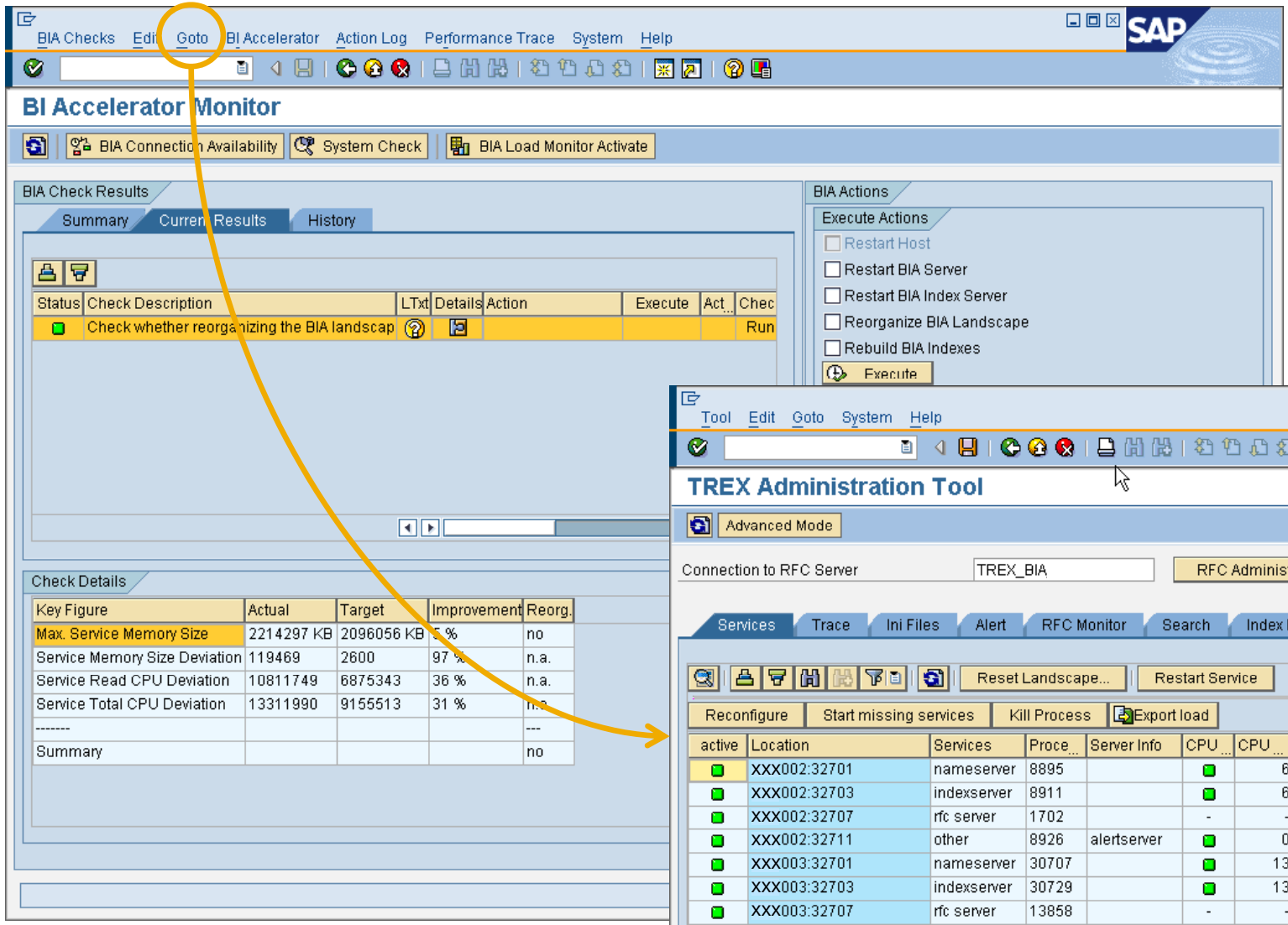
SAP NetWeaver BI Accelerator Technical Architecture



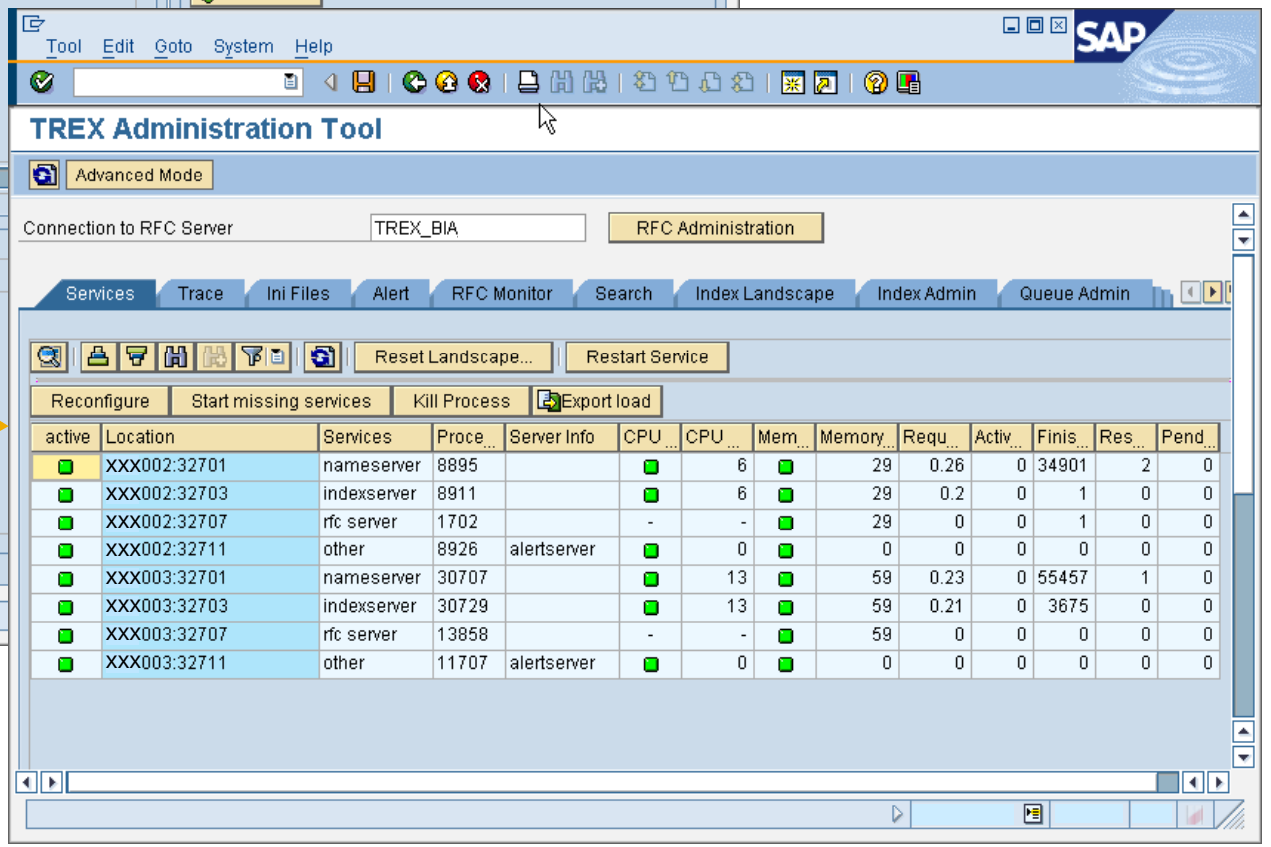
SAP NetWeaver BI Accelerator
TREX Architecture



SAP NetWeaver BI Accelerator Monitor and the TREX Administration Tool



SAP NetWeaver BI Transaction RSDDBIAMON

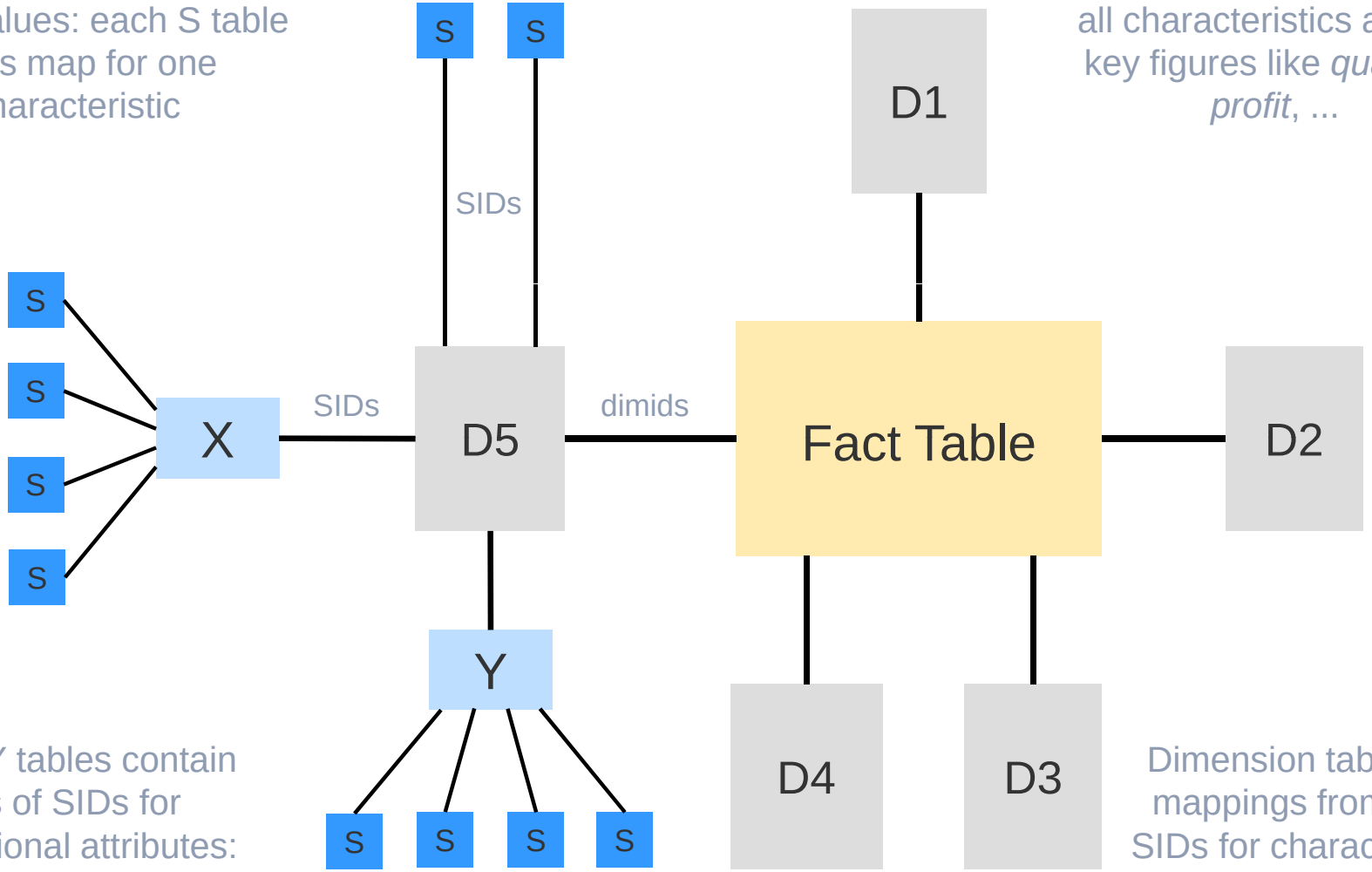


SAP NetWeaver BI Transaction TREXADMIN

SAP NetWeaver BI InfoCube Star Schema

S tables contain mappings from surrogate IDs (SIDs) to key values: each S table gives map for one characteristic

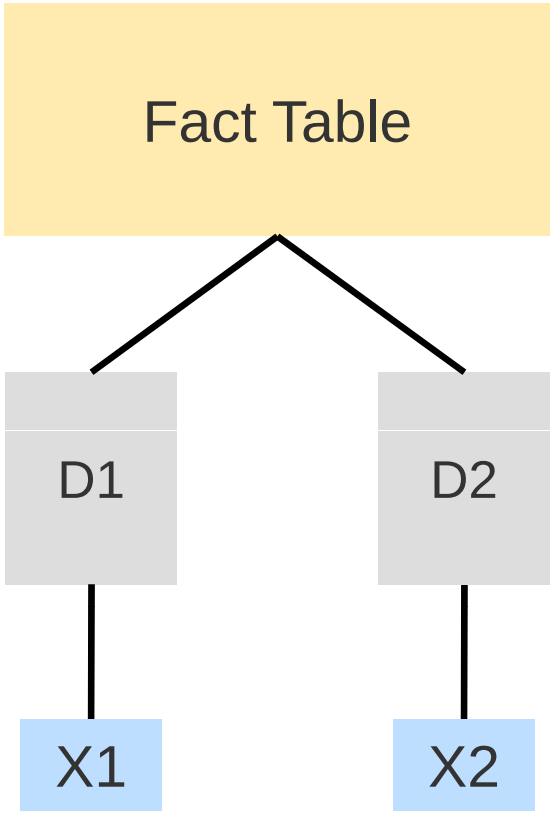
Fact table contains dimension IDs (dimids) for all characteristics and for key figures like *quantity*, *profit*, ...



X and Y tables contain sets of SIDs for navigational attributes: X time-independent, Y time-dependent

Dimension tables contain mappings from dimids to SIDs for characteristics like *customer*, *sold to*, ...

SAP NetWeaver BI Accelerator
Indexing 1



The above part of a star schema is represented in the BI Accelerator like this

BIA Index

Indexes

Name	Type
F	...
D1	...
D2	...
X1	...
X2	...

Join Paths

...
...

Join Conditions

Name	tab1	field1	tab2	field2
...	...	...	...	...
...	...	...	...	...
...	...	...	...	...
...	...	...	...	...

Key Figures

...
...

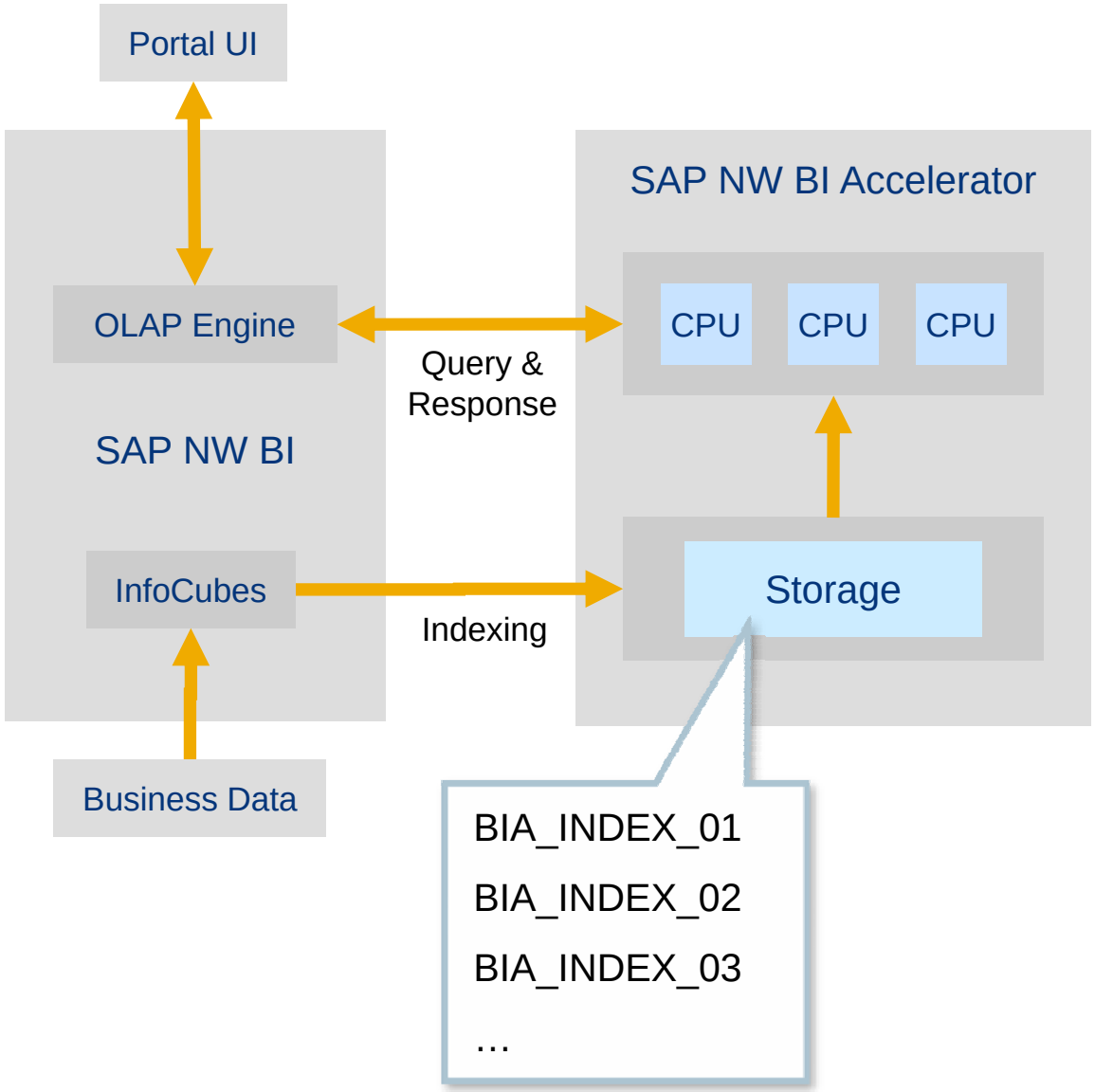
View Attributes

Name	Table	Field	Join Path	View	Type
...	...	...	...	...	...
...	...	...	...	...	...
...	...	...	...	...	...
...	...	...	...	...	...

SAP NetWeaver BI Accelerator
Indexing 2

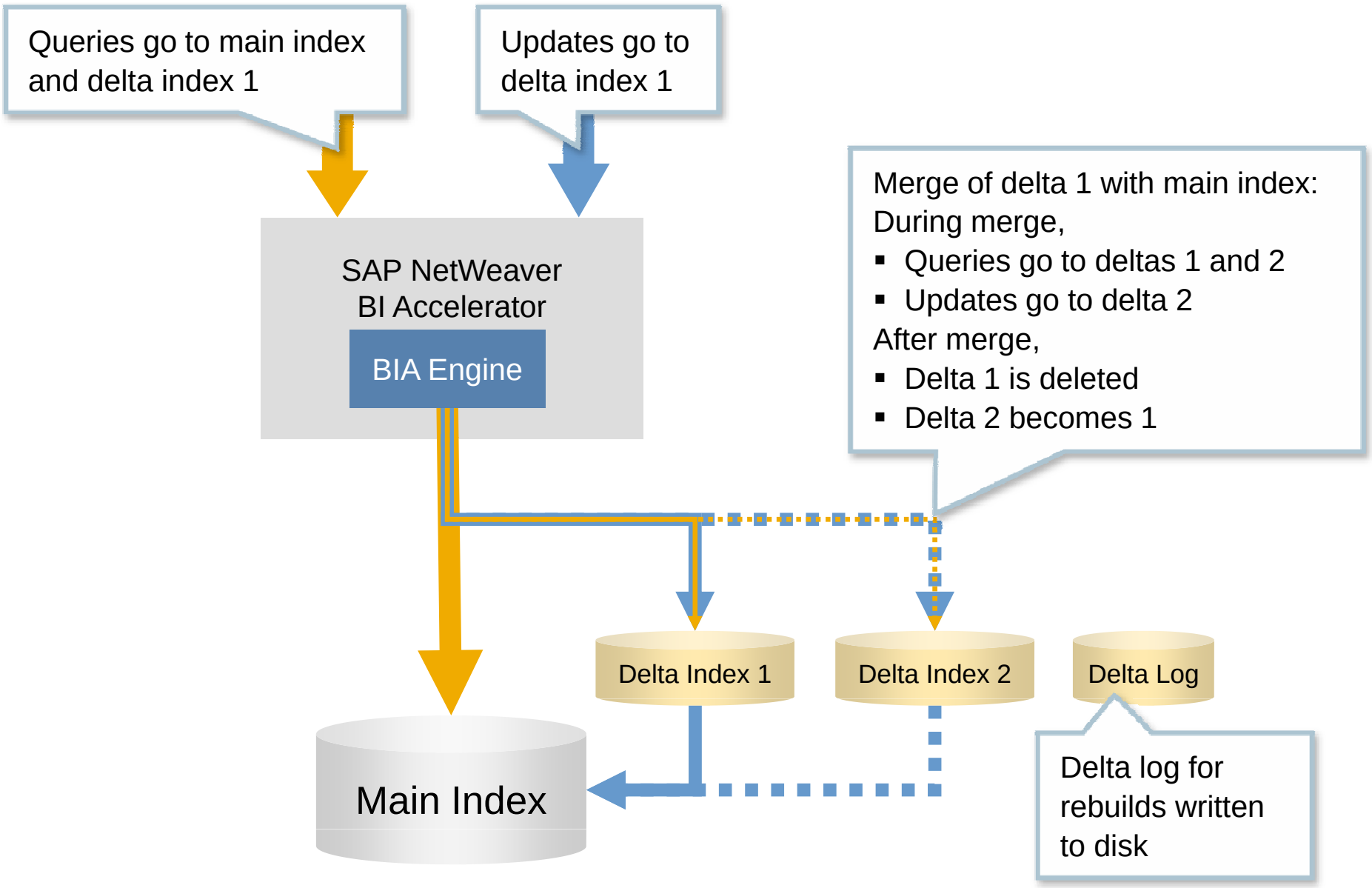
A BIA Index

- Contains lists of
  - Index names
  - Join conditions
  - Join paths
  - View attributes
  - Key figures
- Stores metadata
- Enables engine to execute queries
- Corresponds to a BI InfoCube
  - But highly compressed to minimize main memory footprint



© SAP 2008 / Page 47

SAP NetWeaver BI Accelerator
Fast Index Updates in Memory

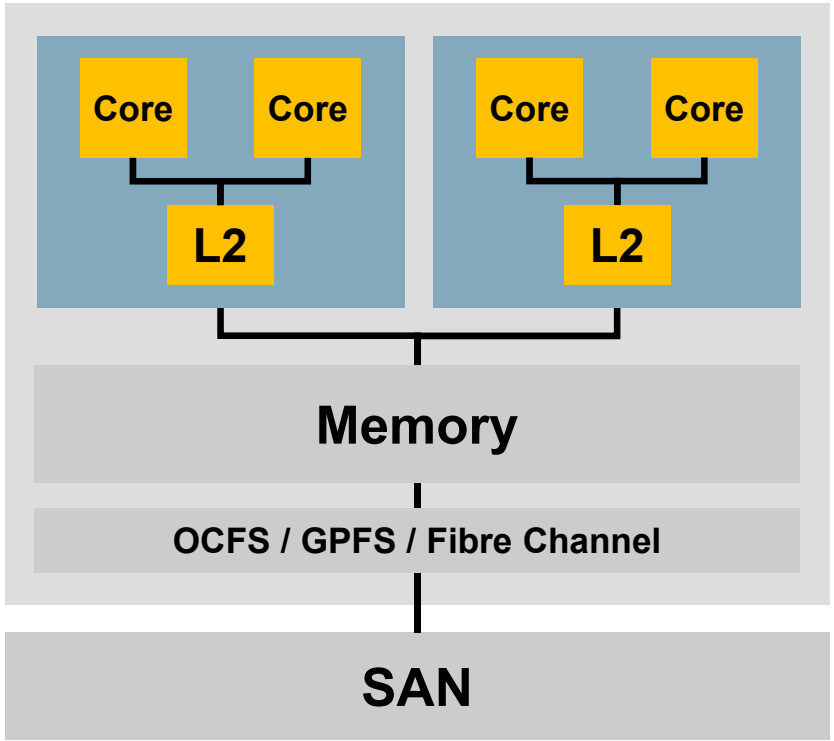


SAP NetWeaver BI Accelerator
CPU Architecture

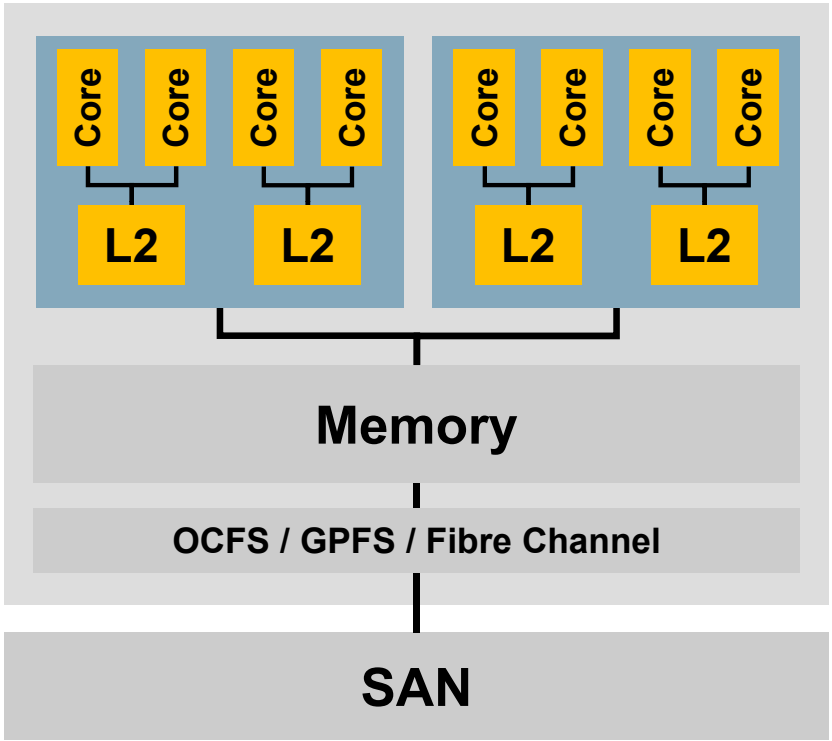
BIA Roadmap: From Dual-Core to Quad-Core CPUs

- BIA is ready to run on dual-core or quad-core CPUs
- BIA sizing: up to 16 GB per blade for 2-core, 16 GB or more for 4-core
- BIA appliance can run with mixed 1, 2 or 4 core blades

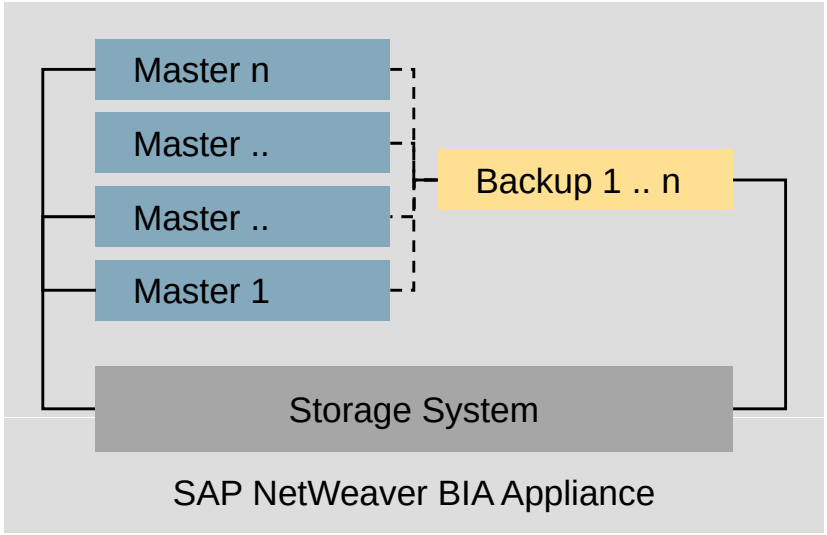
Blade with Dual-Core CPUs



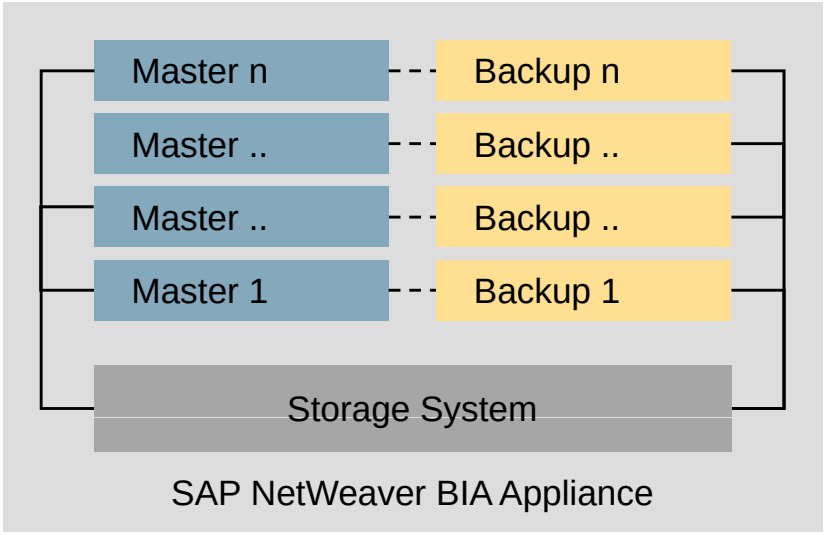
Blade with Quad-Core CPUs



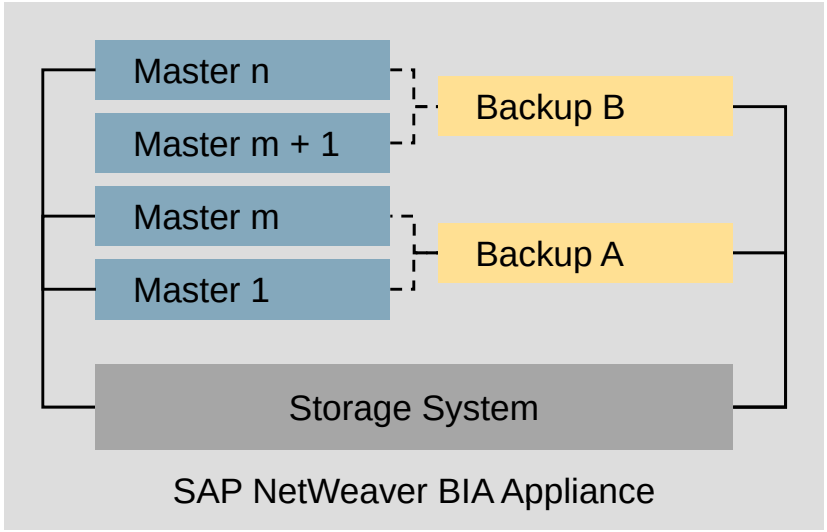
SAP NetWeaver BI Accelerator
Backup Modes



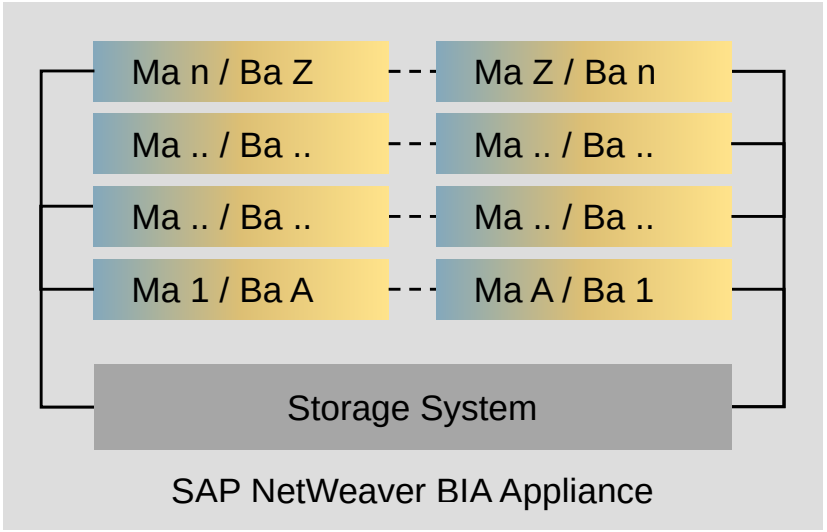
Shared



Dedicated

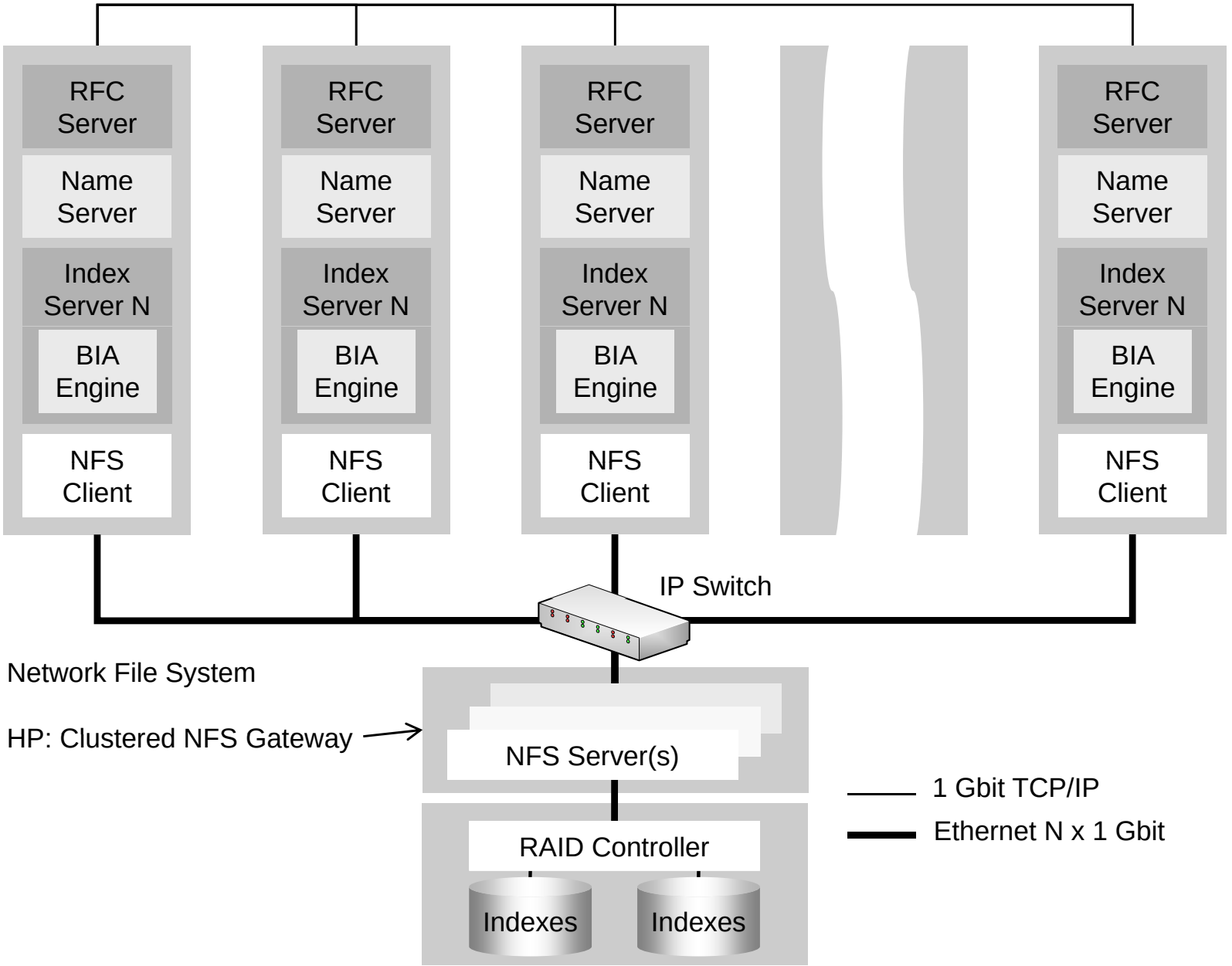


Multiplexed

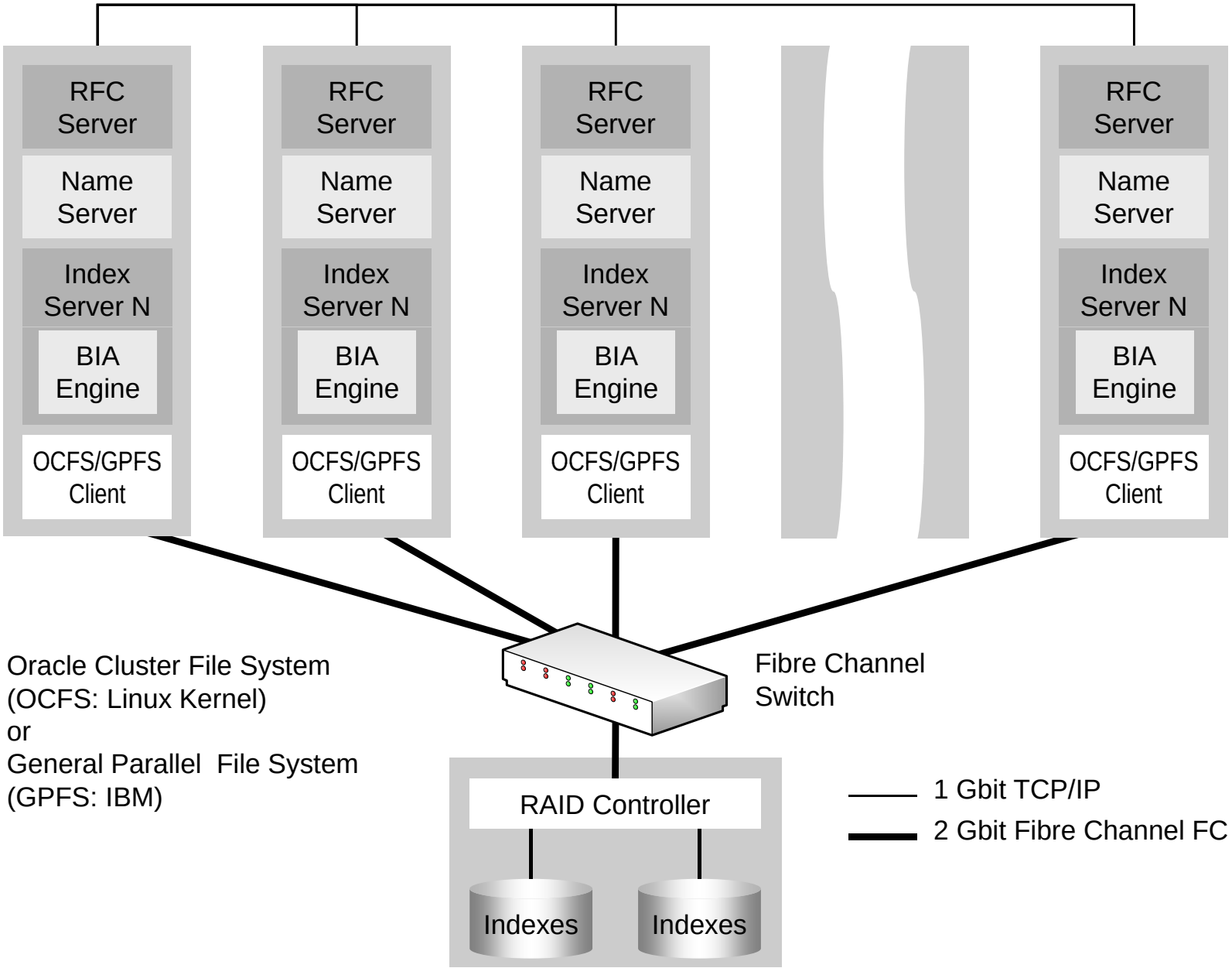


Mutual

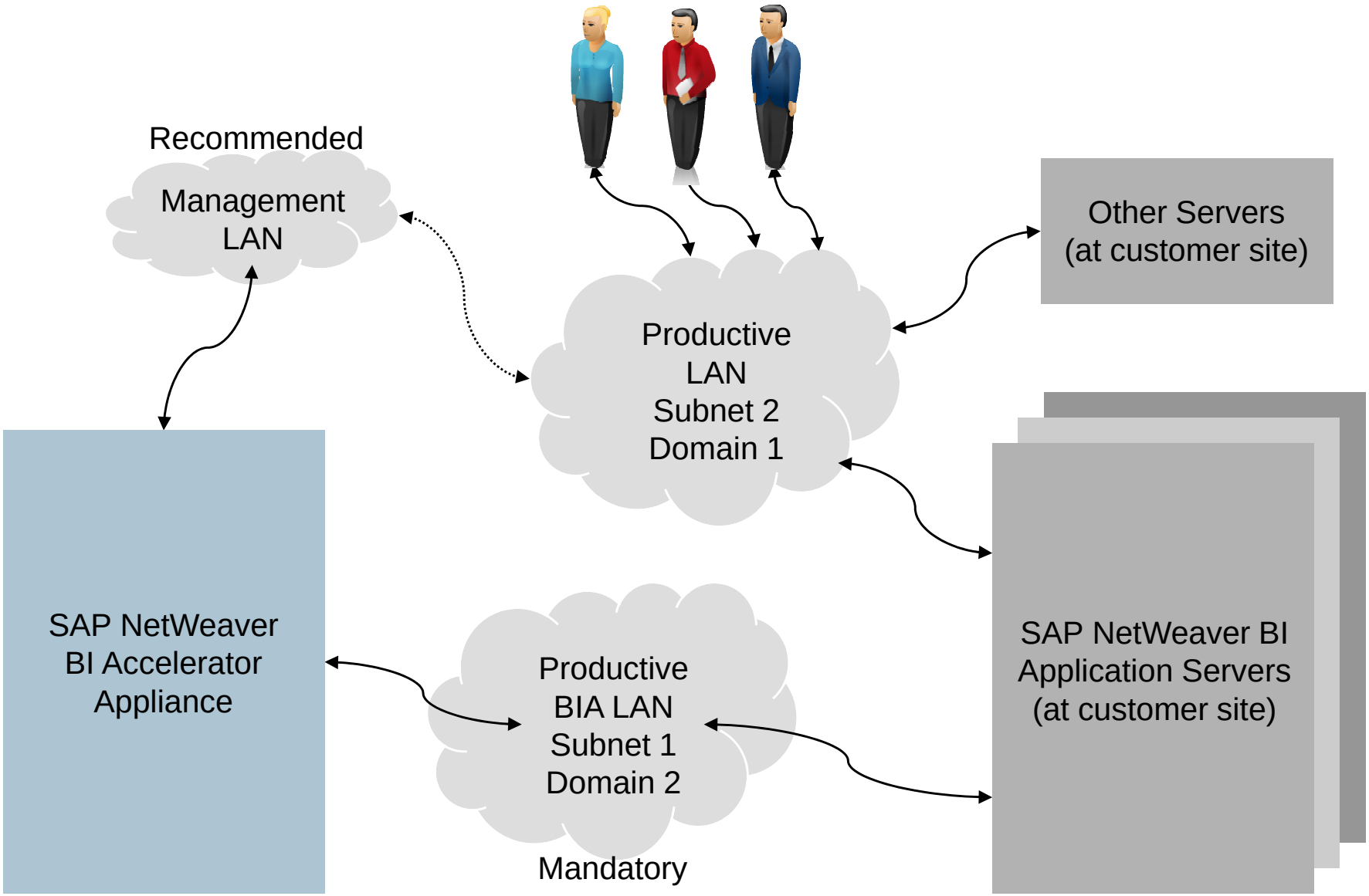
SAP NetWeaver BI Accelerator
Storage Concept 1



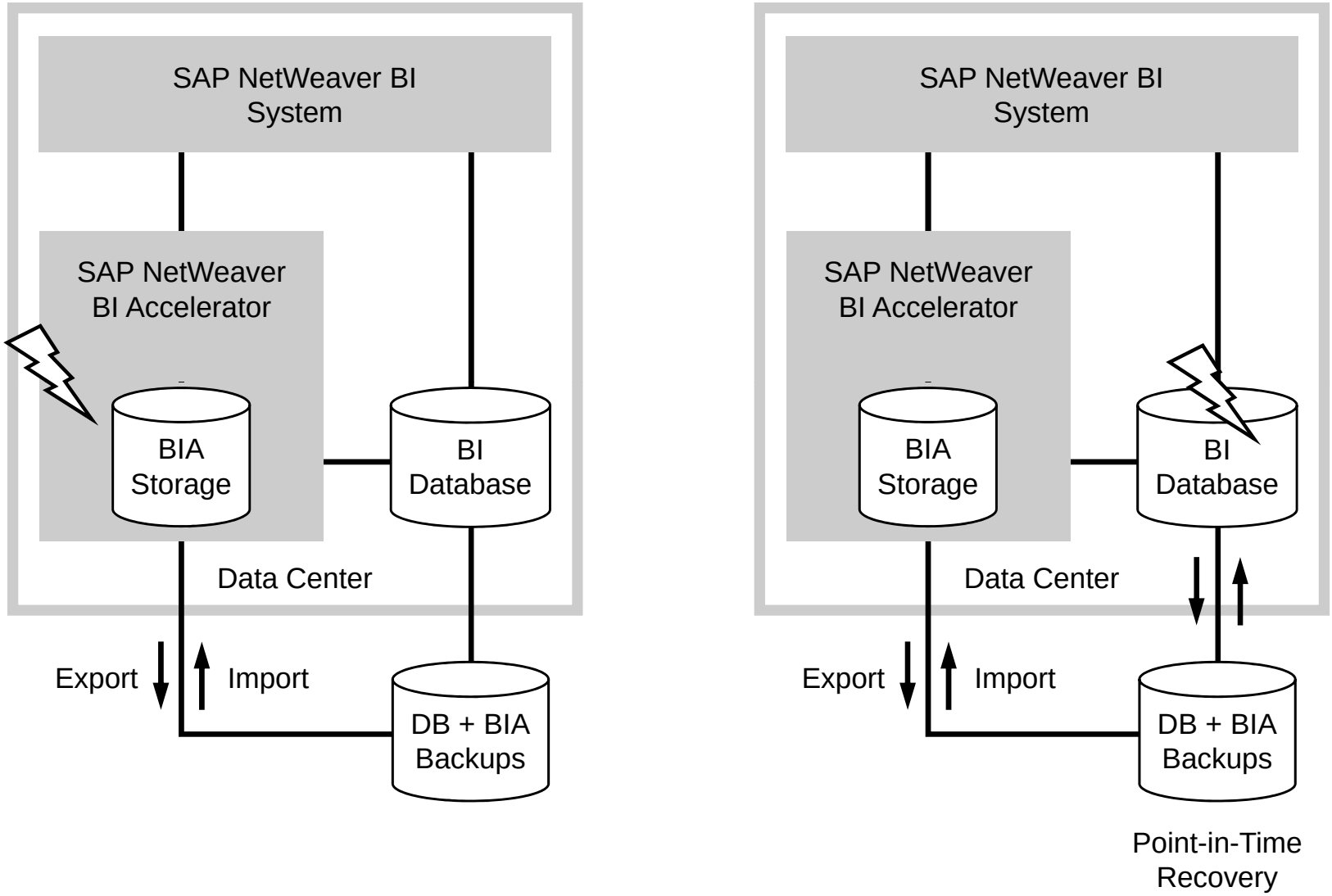
SAP NetWeaver BI Accelerator
Storage Concept 2



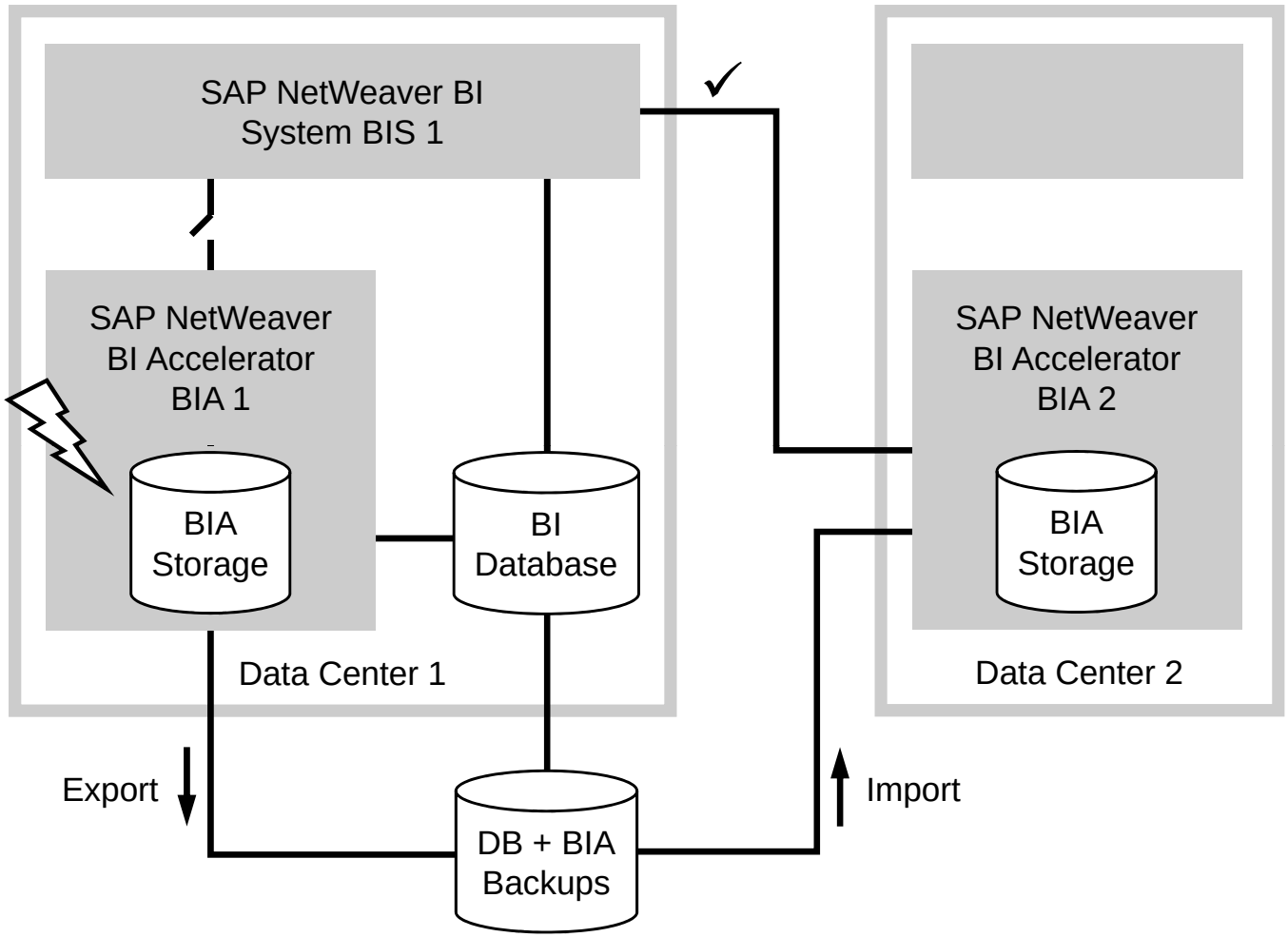
SAP NetWeaver BI Accelerator Network Integration



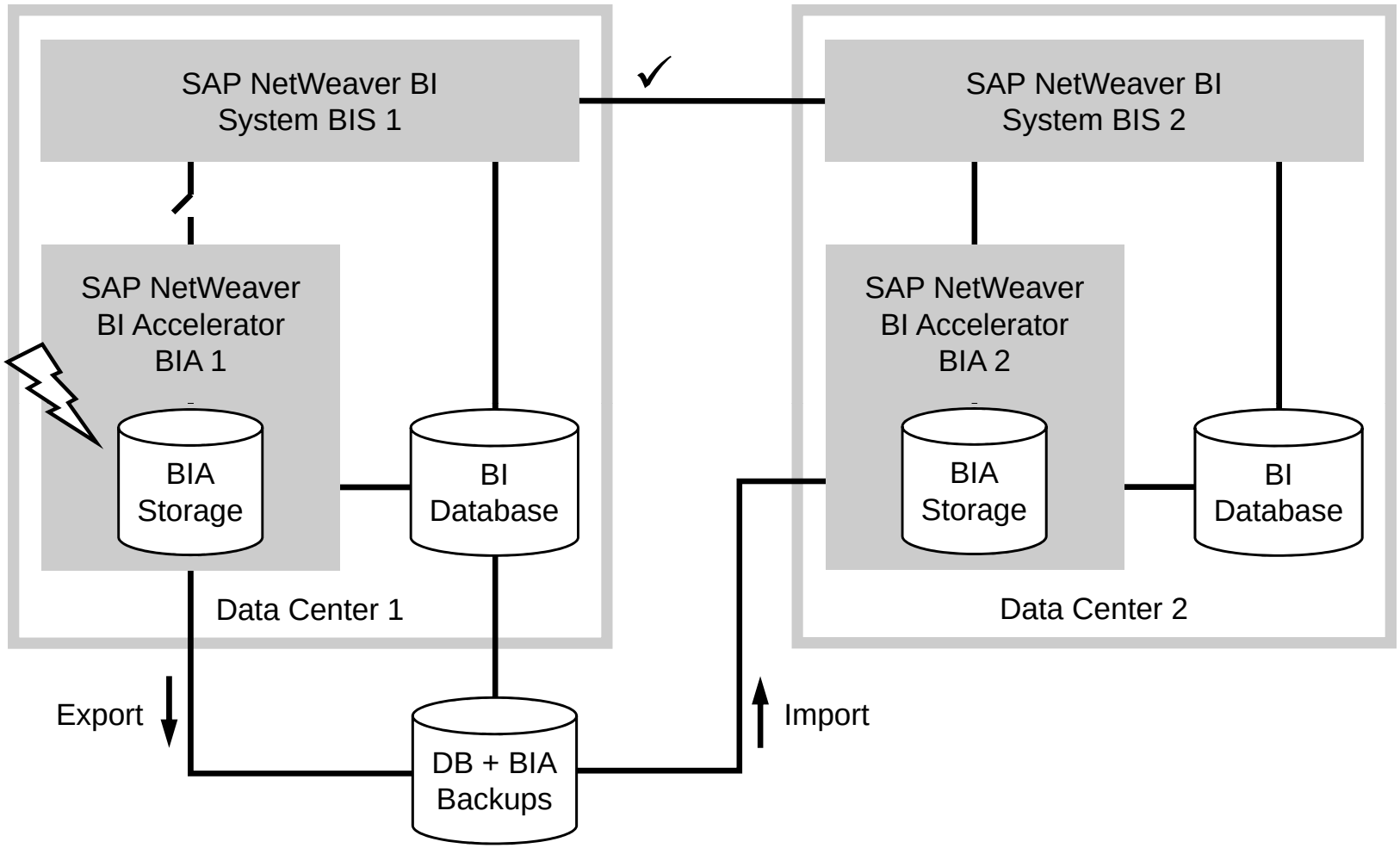
SAP NetWeaver BI Accelerator
Backup and Recovery 1



SAP NetWeaver BI Accelerator
Backup and Recovery 2



SAP NetWeaver BI Accelerator
Backup and Recovery 3



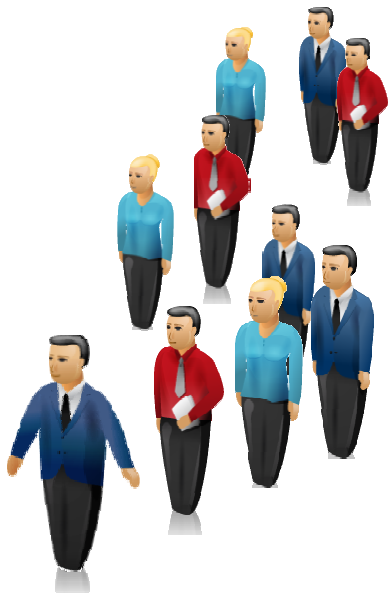
SAP NetWeaver BI Accelerator
High-End Scalability

Jupiter – Executive Summary

- SAP NetWeaver BI Accelerator ready for huge data volumes
- No scalability limits identified (tested up to 140 blades)
- Proven manageability of large-scale SAP NetWeaver BI installations
- Impressive throughput – for both writing and reading BIA indexes
- High reliability

Jupiter Facts

- 25 TB InfoCube data
  - Total of 78 InfoCubes, 30 billion rows
  - Corresponds to overall 50-70 TB data warehouse
- 135 IBM HS21 blades
  - Per blade: 2x dual-core CPUs + 16 GB RAM
  - 17 TB storage
  - Plus 5 backup blades – not needed – no hardware outages

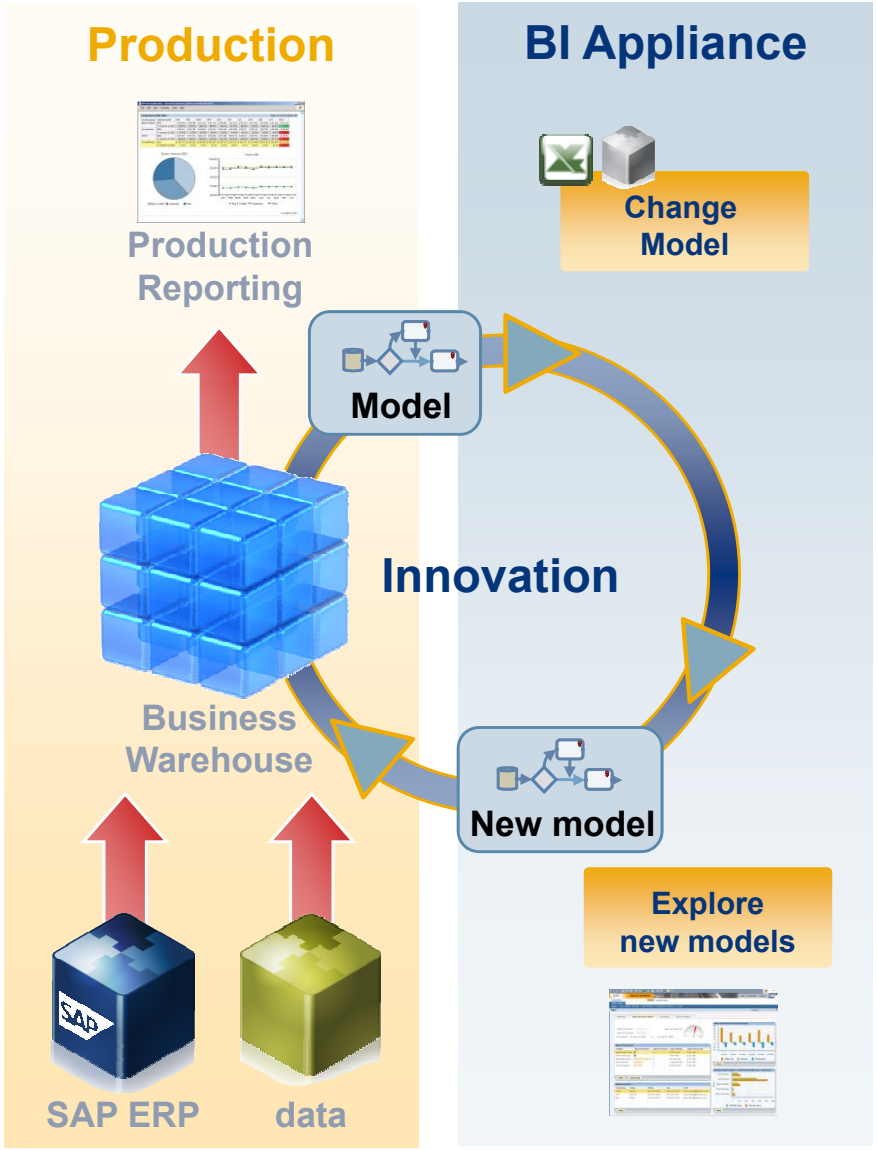


Back to the Future

Agile Business Intelligence –

SAP NetWeaver BI Appliance

- Works with all sources
- Access data models from production
- Simple modeling environment
- Central maintenance and governance
- Local innovation spaces for departments
- Safe, reliable & scalable environment for rapid business insight and innovation
- Propagate new proven models back into production



Business Beyond Boundaries

Copyright 2008 SAP AG
All rights reserved

- No part of this publication may be reproduced or transmitted in any form or for any purpose without the express permission of SAP AG. The information contained herein may be changed without prior notice.
- Some software products marketed by SAP AG and its distributors contain proprietary software components of other software vendors.
- SAP, R/3, mySAP, mySAP.com, xApps, xApp, SAP NetWeaver, Duet, Business ByDesign, ByDesign, PartnerEdge and other SAP products and services mentioned herein as well as their respective logos are trademarks or registered trademarks of SAP AG in Germany and in several other countries all over the world. All other product and service names mentioned and associated logos displayed are the trademarks of their respective companies. Data contained in this document serves informational purposes only. National product specifications may vary.

- The information in this document is proprietary to SAP. This document is a preliminary version and not subject to your license agreement or any other agreement with SAP. This document contains only intended strategies, developments, and functionalities of the SAP® product and is not intended to be binding upon SAP to any particular course of business, product strategy, and/or development. SAP assumes no responsibility for errors or omissions in this document. SAP does not warrant the accuracy or completeness of the information, text, graphics, links, or other items contained within this material. This document is provided without a warranty of any kind, either express or implied, including but not limited to the implied warranties of merchantability, fitness for a particular purpose, or non-infringement.
- SAP shall have no liability for damages of any kind including without limitation direct, special, indirect, or consequential damages that may result from the use of these materials. This limitation shall not apply in cases of intent or gross negligence.
- The statutory liability for personal injury and defective products is not affected. SAP has no control over the information that you may access through the use of hot links contained in these materials and does not endorse your use of third-party Web pages nor provide any warranty whatsoever relating to third-party Web pages

- Weitergabe und Vervielfältigung dieser Publikation oder von Teilen daraus sind, zu welchem Zweck und in welcher Form auch immer, ohne die ausdrückliche schriftliche Genehmigung durch SAP AG nicht gestattet. In dieser Publikation enthaltene Informationen können ohne vorherige Ankündigung geändert werden.
- Einige von der SAP AG und deren Vertriebspartnern vertriebene Softwareprodukte können Softwarekomponenten umfassen, die Eigentum anderer Softwarehersteller sind.
- SAP, R/3, mySAP, mySAP.com, xApps, xApp, SAP NetWeaver, Duet, Business ByDesign, ByDesign, PartnerEdge und andere in diesem Dokument erwähnte SAP-Produkte und Services sowie die dazugehörigen Logos sind Marken oder eingetragene Marken der SAP AG in Deutschland und in mehreren anderen Ländern weltweit. Alle anderen in diesem Dokument erwähnten Namen von Produkten und Services sowie die damit verbundenen Firmenlogos sind Marken der jeweiligen Unternehmen. Die Angaben im Text sind unverbindlich und dienen lediglich zu Informationszwecken. Produkte können länderspezifische Unterschiede aufweisen.

- Die in diesem Dokument enthaltenen Informationen sind Eigentum von SAP. Dieses Dokument ist eine Vorabversion und unterliegt nicht Ihrer Lizenzvereinbarung oder einer anderen Vereinbarung mit SAP. Dieses Dokument enthält nur vorgesehene Strategien, Entwicklungen und Funktionen des SAP®-Produkts und ist für SAP nicht bindend, einen bestimmten Geschäftsweg, eine Produktstrategie bzw. -entwicklung einzuschlagen. SAP übernimmt keine Verantwortung für Fehler oder Auslassungen in diesen Materialien. SAP garantiert nicht die Richtigkeit oder Vollständigkeit der Informationen, Texte, Grafiken, Links oder anderer in diesen Materialien enthaltenen Elemente. Diese Publikation wird ohne jegliche Gewähr, weder ausdrücklich noch stillschweigend, bereitgestellt. Dies gilt u. a., aber nicht ausschließlich, hinsichtlich der Gewährleistung der Marktgängigkeit und der Eignung für einen bestimmten Zweck sowie für die Gewährleistung der Nichtverletzung geltenden Rechts.
- SAP übernimmt keine Haftung für Schäden jeglicher Art, einschließlich und ohne Einschränkung für direkte, spezielle, indirekte oder Folgeschäden im Zusammenhang mit der Verwendung dieser Unterlagen. Diese Einschränkung gilt nicht bei Vorsatz oder grober Fahrlässigkeit.
- Die gesetzliche Haftung bei Personenschäden oder die Produkthaftung bleibt unberührt. Die Informationen, auf die Sie möglicherweise über die in diesem Material enthaltenen Hotlinks zugreifen, unterliegen nicht dem Einfluss von SAP, und SAP unterstützt nicht die Nutzung von Internetseiten Dritter durch Sie und gibt keinerlei Gewährleistungen oder Zusagen über Internetseiten Dritter ab.
- Alle Rechte vorbehalten.