Drilling Through The Stack

Burkhard Neidecker-Lutz

Technical Director, SAP Research

SAP AG

Talk Outline

Where I come from

Layered stacks

Violating layers for fun and profit

The mother of all stacks: Future Internet

SAP Business Suite

- 12+ million users
- 121,000 installations
- 75,000 customers
- 140 countries
- 26 industry-specific business solutions
- 1 Software stack

The kinds of problems we handle

Business Intelligence
> Analytics over > ~50 TB data in memory with BIA

Human Capital Management
Payroll calculations for 500,000 employees in 3 hours

Consumer Products
1.4 million sales order line items per day

Portal
300,000 users

Supply Chain Management
4.5M characteristic combinations & 512 GB - 1TB memory in live cache

Banking
40 million customers – up to 8 million transactions an hour

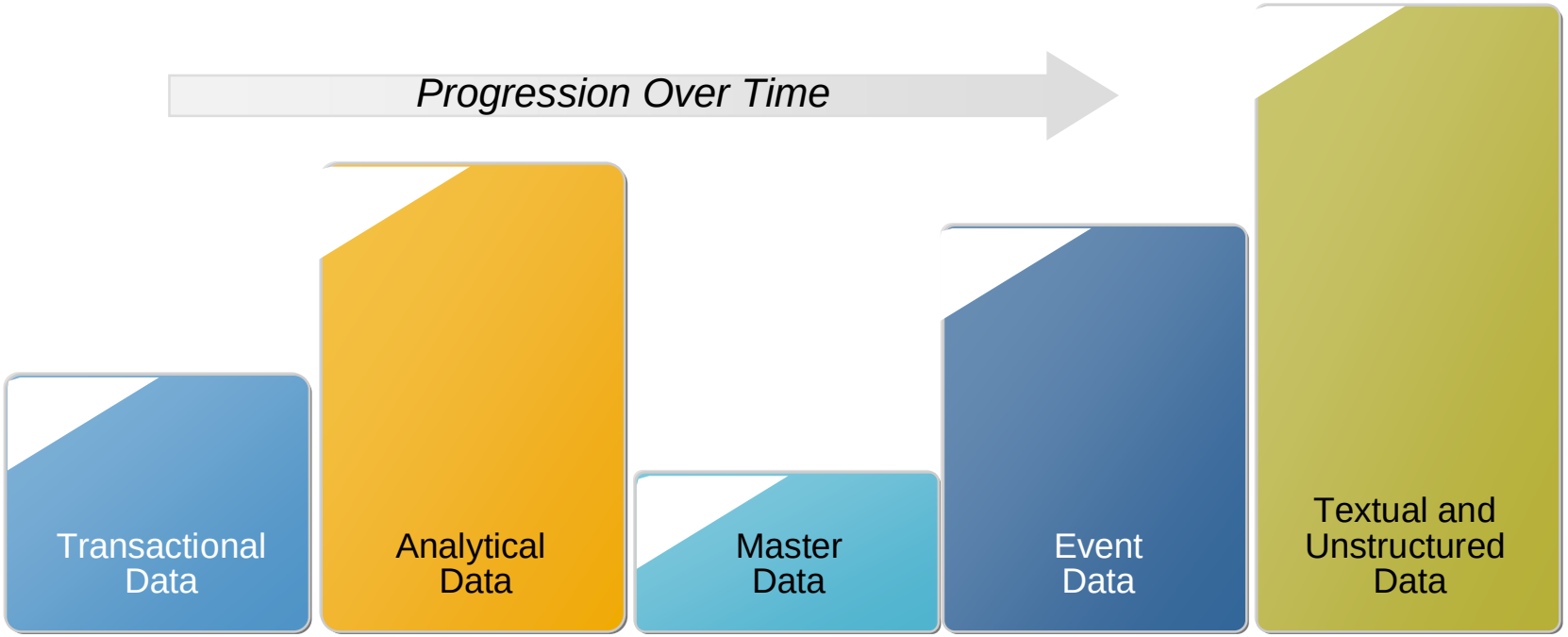
Utilities
25 million business partners – 85 million service and sales orders per year

Enterprise Resource Planning
A customer with 5 users on a laptop

Engineering & Construction
5,000 concurrent active users

Lots of data...One size doesn't fit all

Different types of data impose different requirements & different optimizations



- Order ~ 100G
- Write > read
- Many changes
- Accurate
- Consistent
- Performance

- Order > Tb
- Read only
- Slow changes
- Many queries
- Flexibility
- Performance

- Order ~ 1G
- Mostly read
- Mid change
- Many queries
- Distributed

- Order < Tb
- Many writes
- Few queries
- Distributed
- Filtering
- Correlation

- Order > Tb
- Mostly read
- Slow change
- Many queries
- Unstructured
- Contextual

What Do I Mean By Stacks

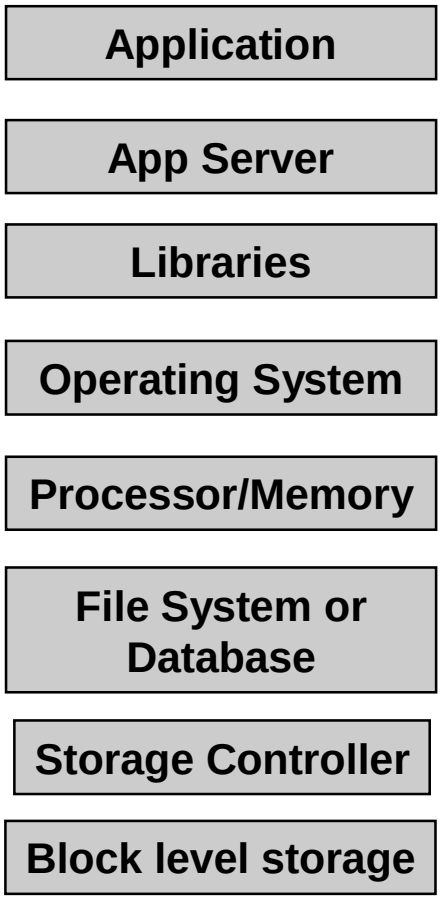
Where I come from

Layered stacks

Violating layers for fun and profit

The mother of all stacks: Future Internet

Example: Single machine stack



Why Layers

Good engineering practice

Hides complexity

Allows interchangeability

Allows for virtualization

Why break layers

Some concerns span layers

- Non-functional properties

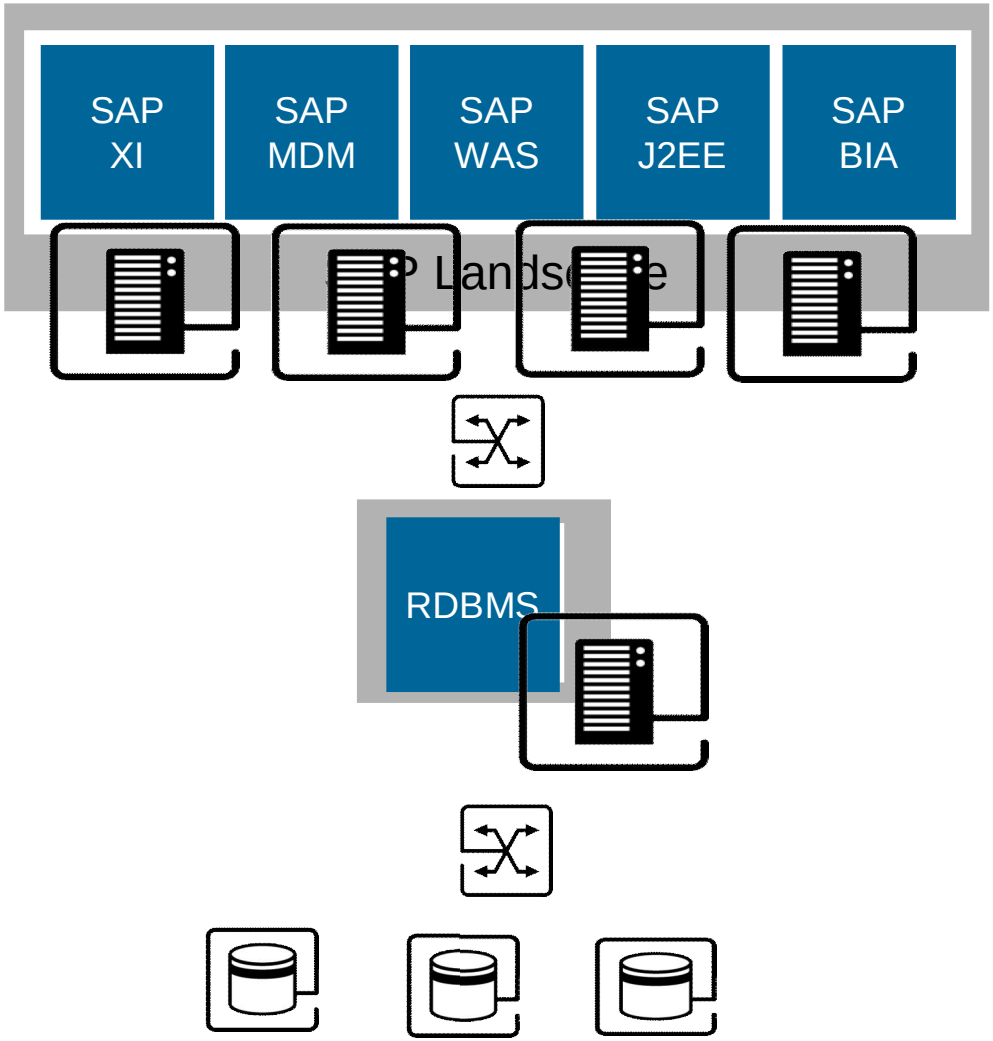
Layer contracts can become obsolete over time

- Virtualization
- Shift of responsibilities

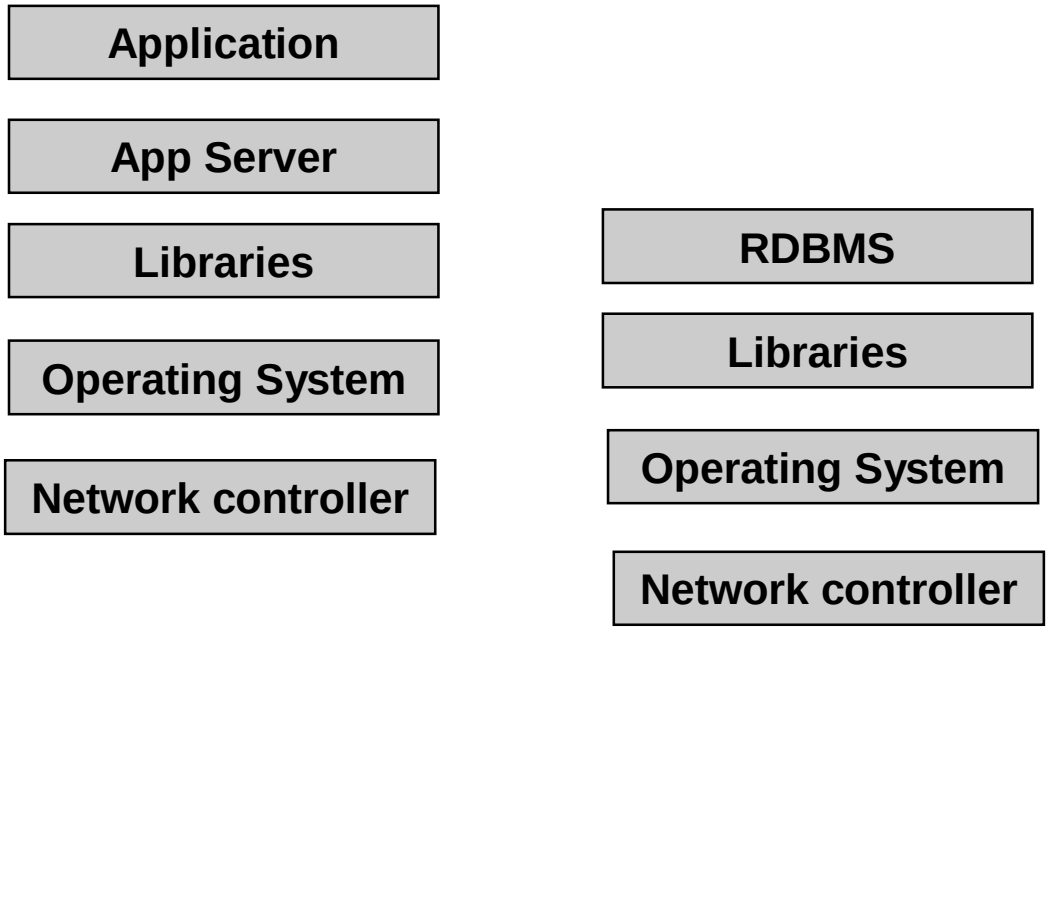
Layering can hide important things

- Error handling
- Optimization opportunities

Digression: SAP Landscape in 30 seconds



„Machine“ Stack, more realistically



Talk Overview

Where I come from

Layered stacks

Violating layers for fun and profit

The mother of all stacks: Future Internet

Playing With The Stack

Application

App Server

Libraries

Operating System

Network controller

RDBMS

Libraries

Operating System

Network controller

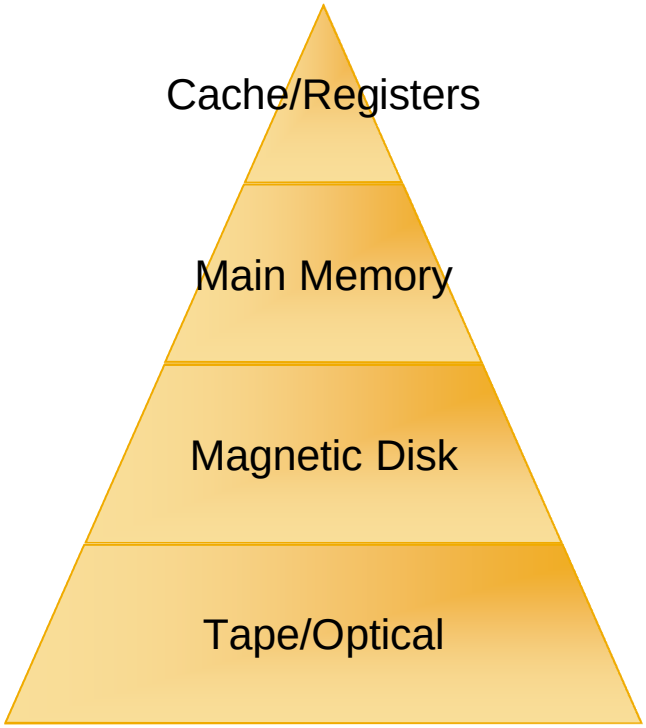
OSD OS

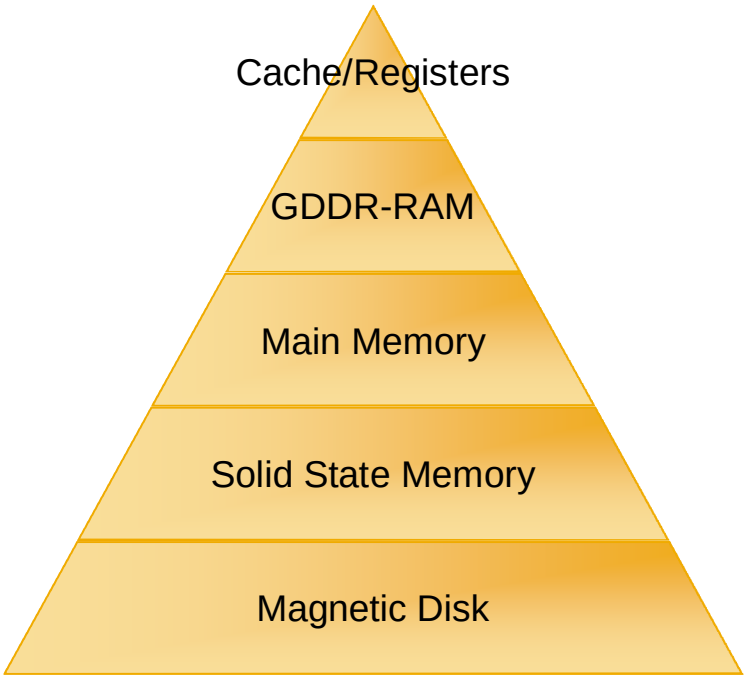
Network controller

Storage Controller

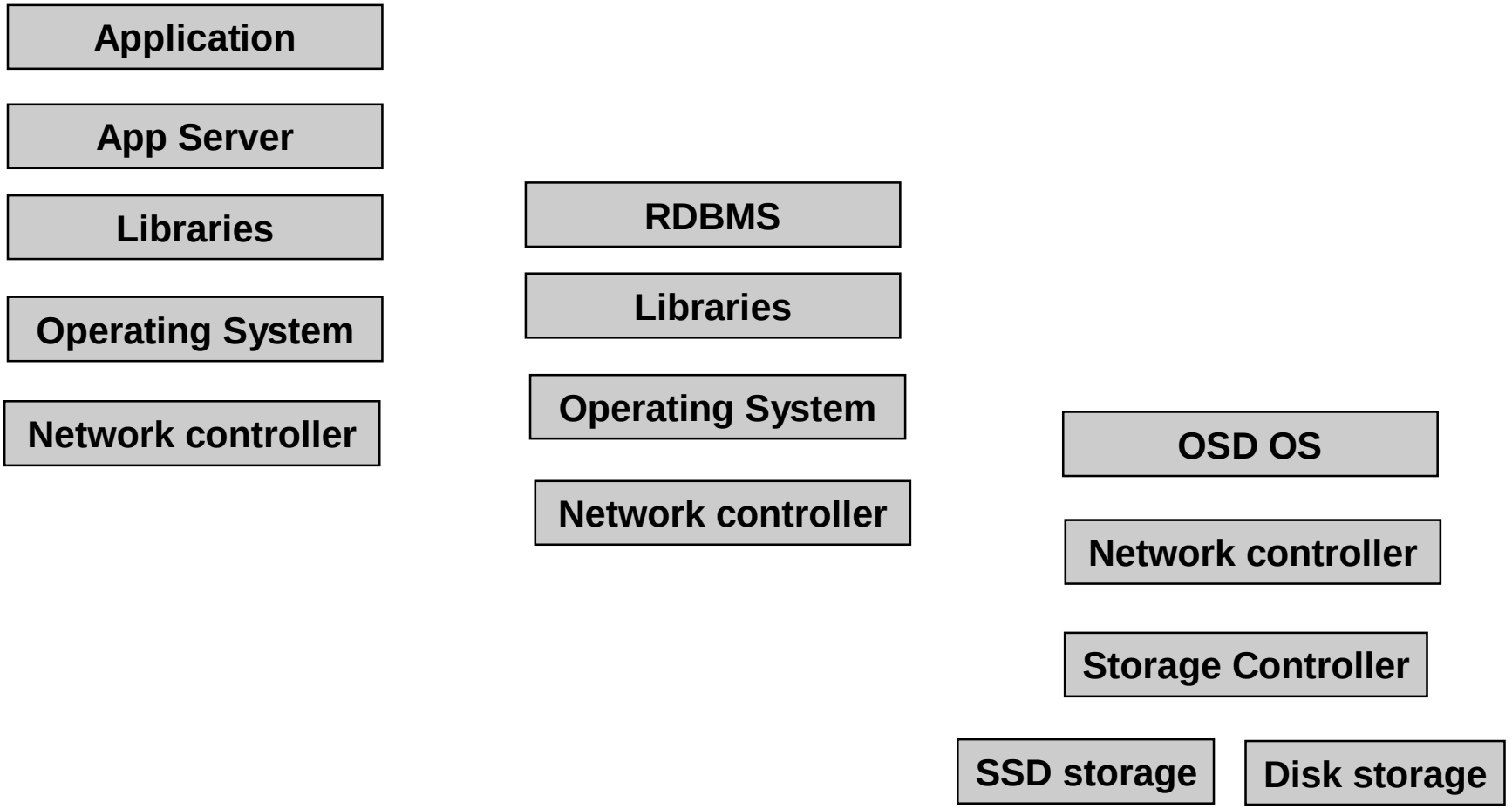
Block level storage

Introducing New Hardware

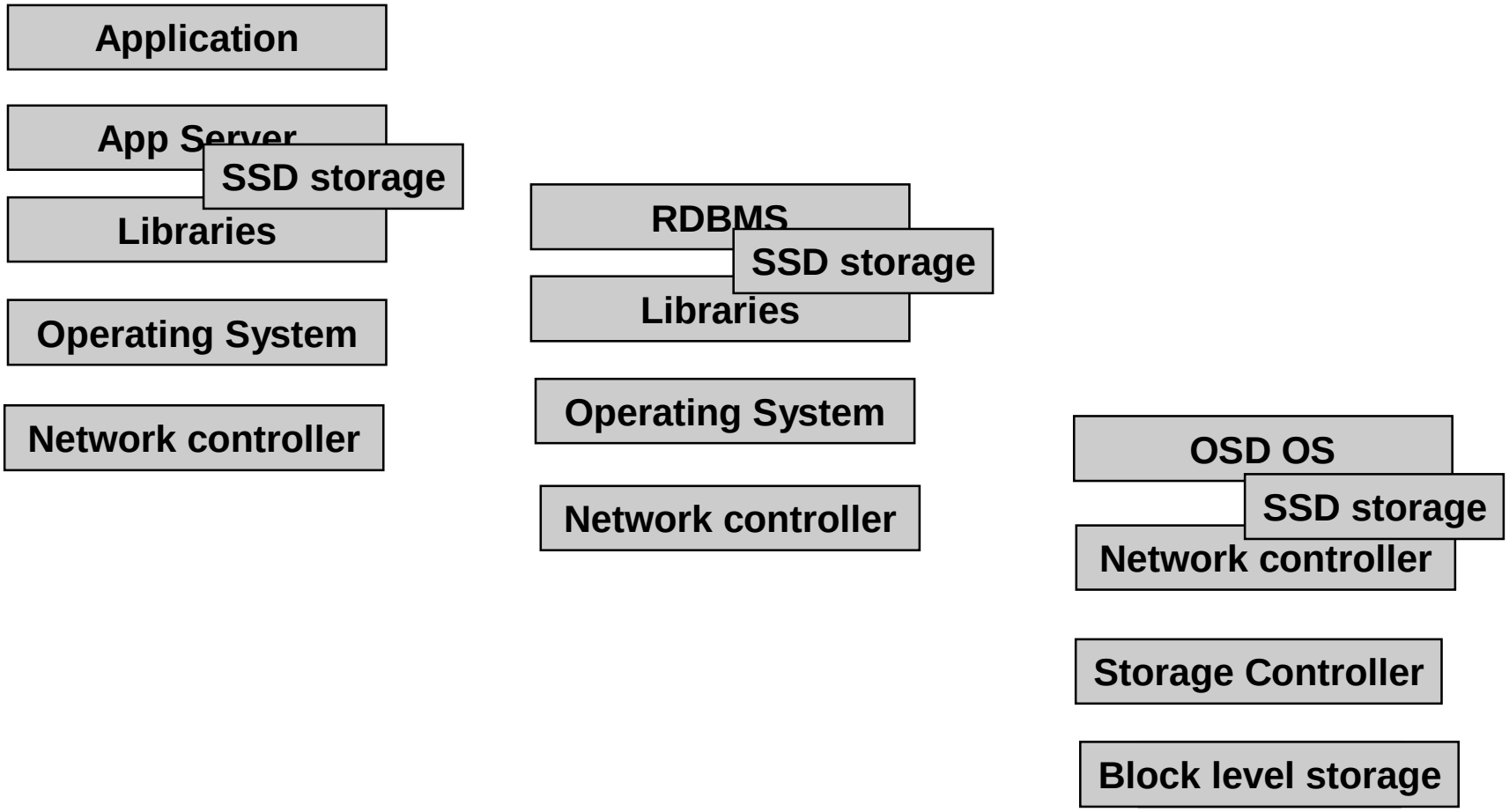




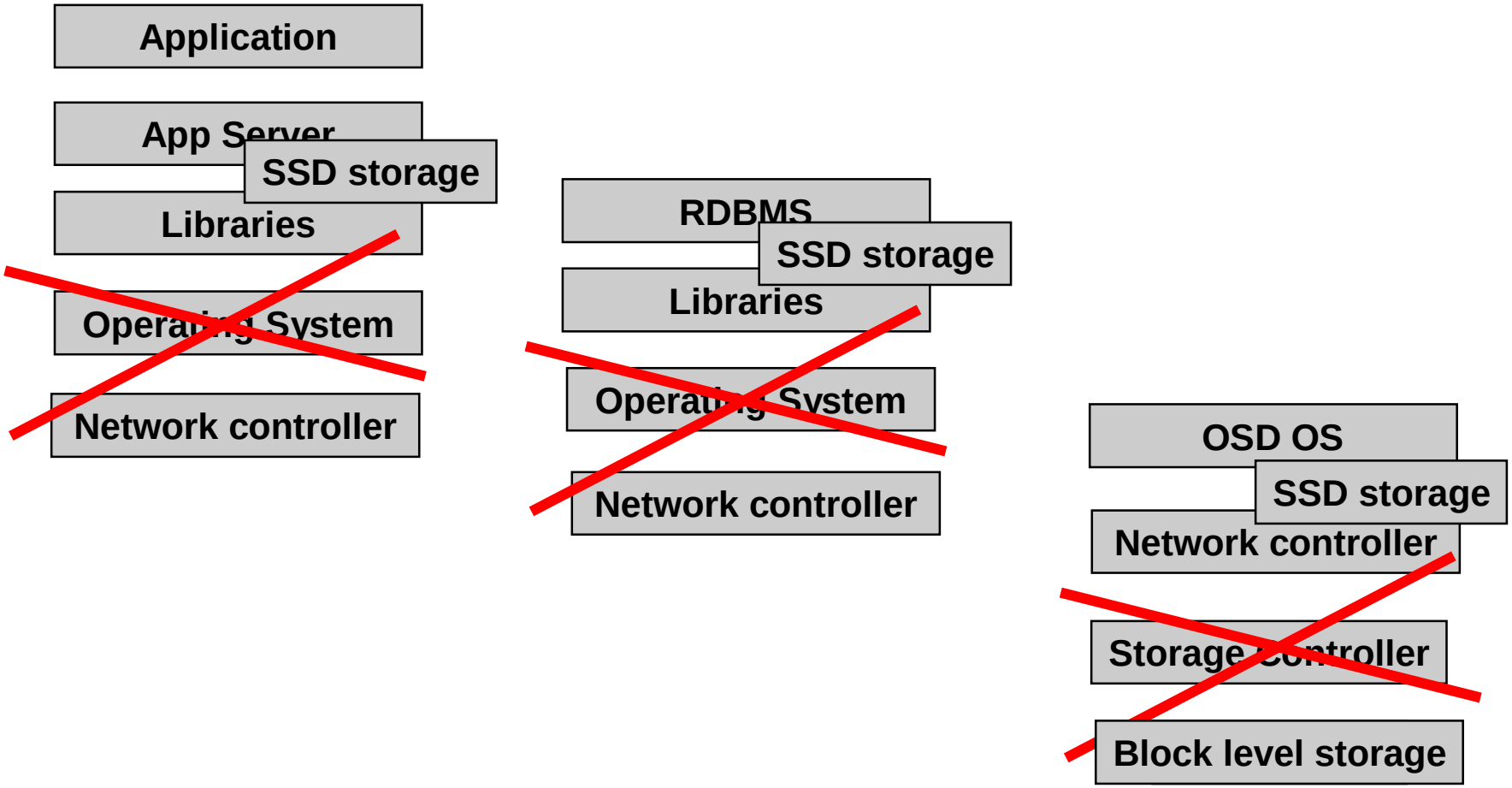
The „common“ but stupid layering



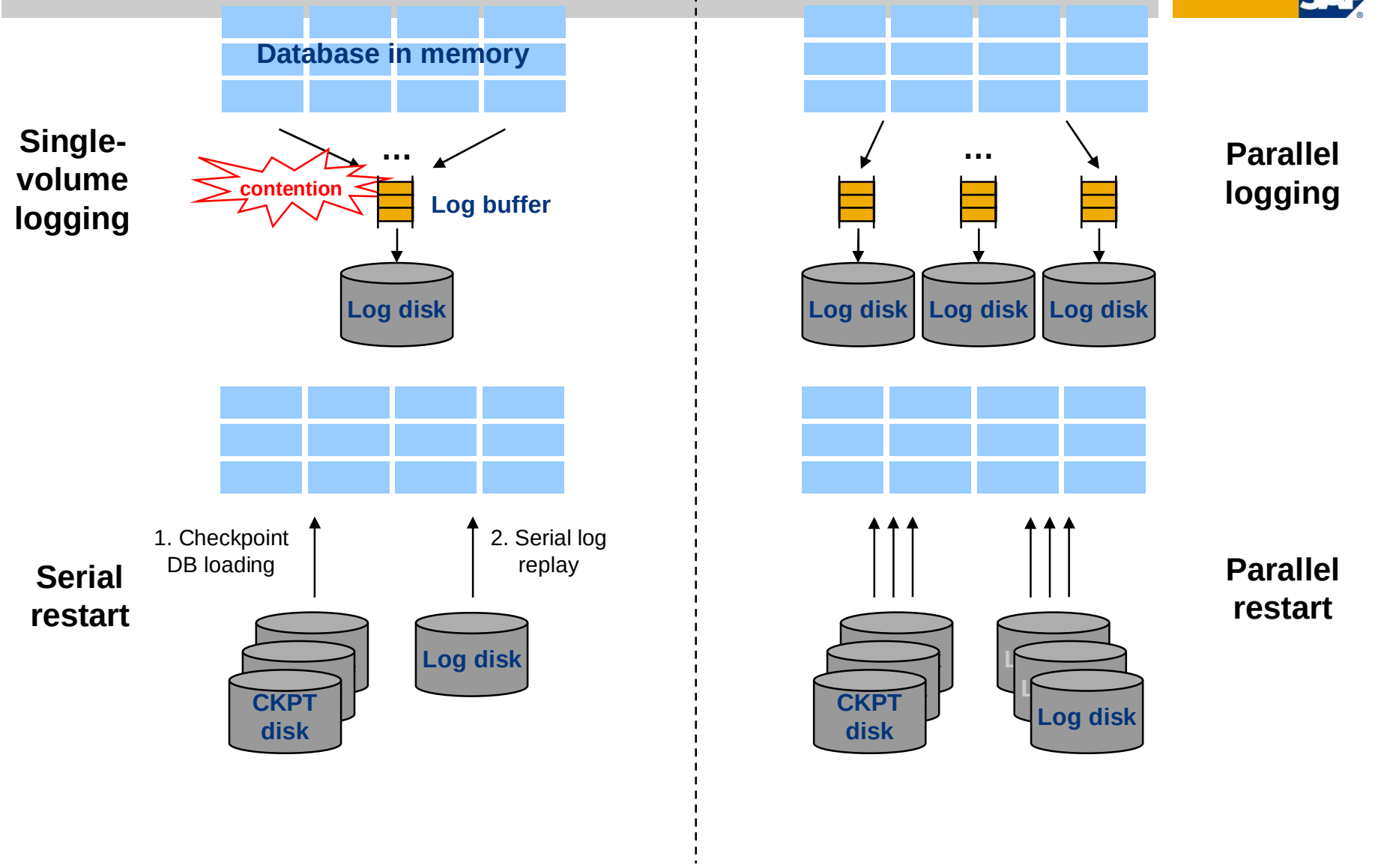
The „interesting“ shift of layers



Eliminating layers



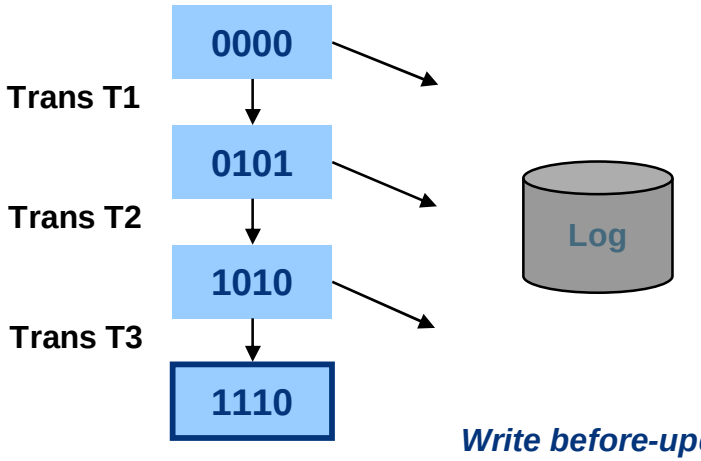
Transactions and Parallelism



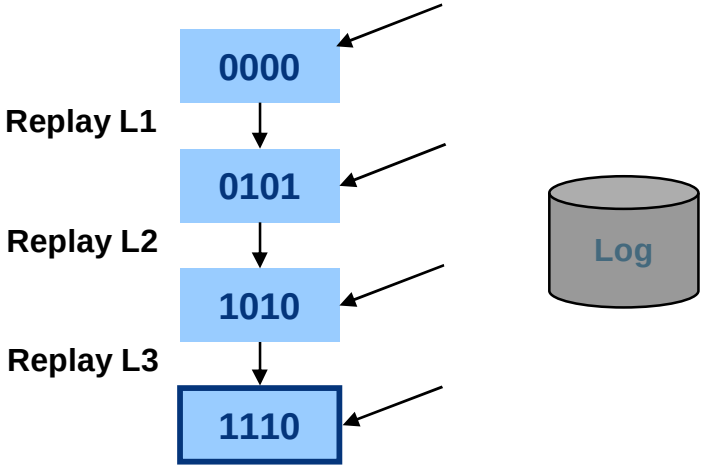
Textbook Transactions

Image of a record

Transactional log generation



Write before-update image and after-update image ordered into log

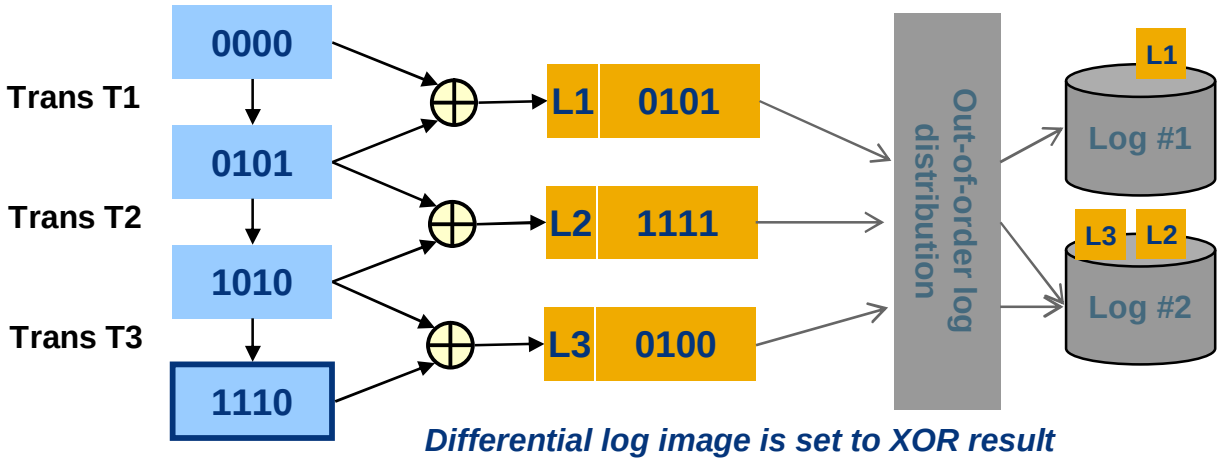


Recovery by log replay

Eliminate Ordering Constraint

Image of a record

Differential log generation

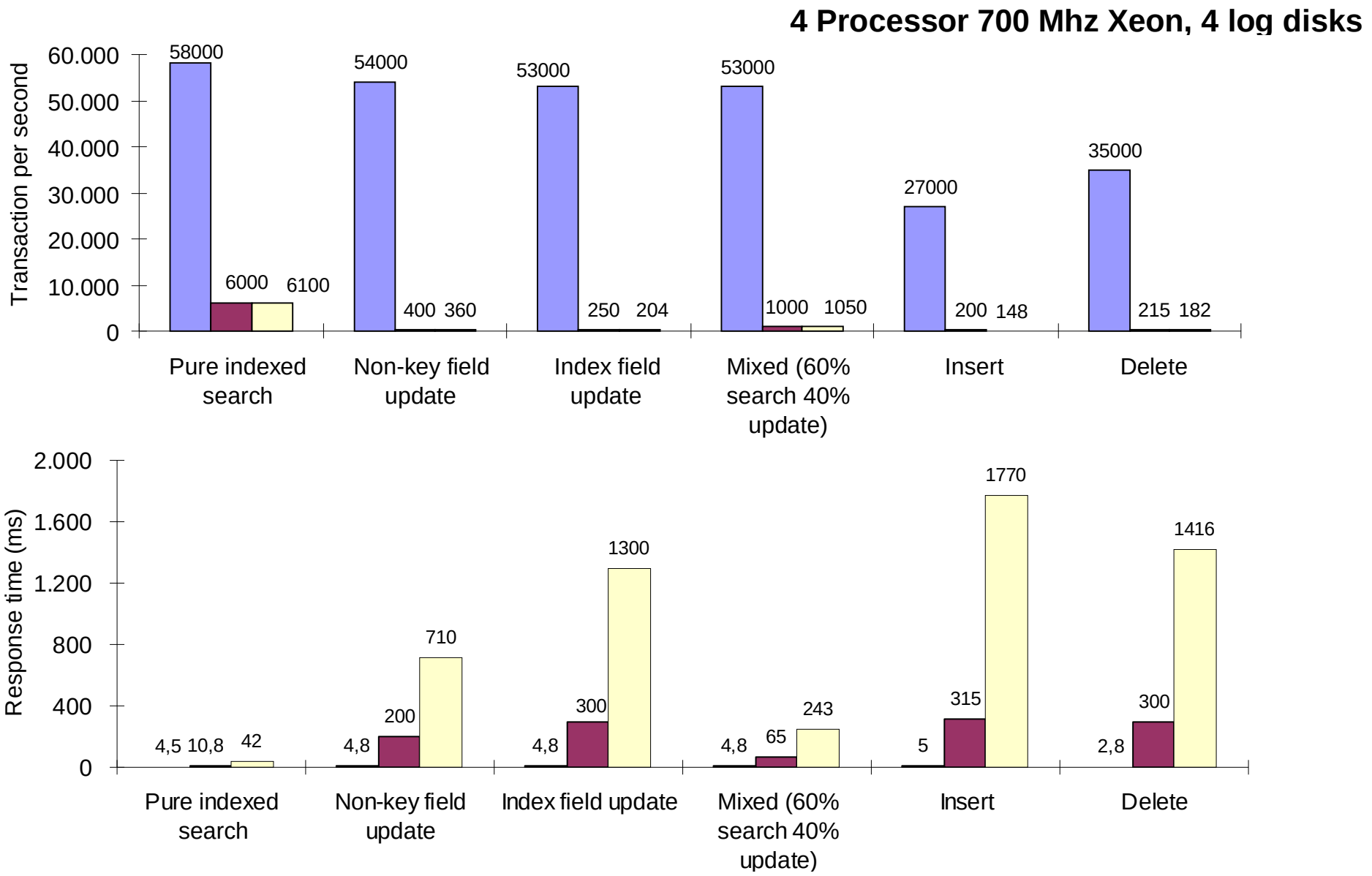


Differential log image is set to XOR result between before-update image and after-update image

Out-of-order log replay

Regardless of the log replay order, the same consistent record image is recovered

Results: new DBMS vs traditional DBMS



Talk Overview

Where I come from

Layered stacks

Violating layers for fun and profit

The mother of all stacks: Future Internet

Future Internet: Service Webs

FutureCar.com

SmartBuilding.com

Entrepreneur.com

eGovBroker

MediaMart.com

Custom-car design

Car Connector

Smart business start-up

Debt-wealth offsetting

NewsTopia

eGovConnect

secureBanking

TelcoConnect

Automobiles

Public Sector

Banking

Media

Teleco

SOA

Service Delivery Platform

Service Channel

Service Broker

Service Aggregator

Service Gateway

Service Provider

Business Model g. Marketplace)

CRM

Order management

Payments

Business partner mgmt

SCM

Analytics

Warehouse management

Service deployment & registration

Service composition & mediation

SLA & contract management

Service presentation management

Search/ discovery

Authentication & authorization

Systems monitoring & management

Business Process Platform

Chasing nonfunctional properties through the stacks