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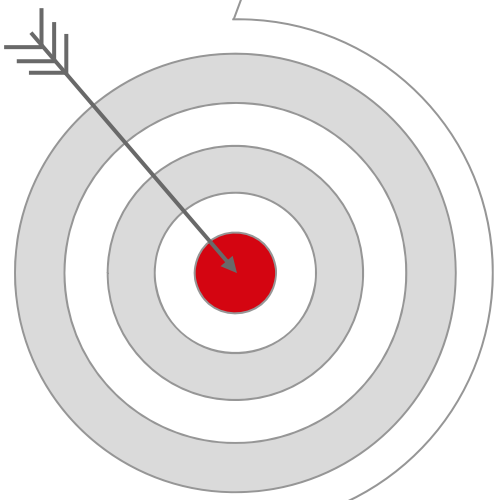
Architecture and Integration

Integration Technologies

Fachbereich 2 Informatik und Ingenieurwissenschaften

Learning Objectives: Integration Technologies



Describe different middleware technologies for integration

Install and configure selected middleware

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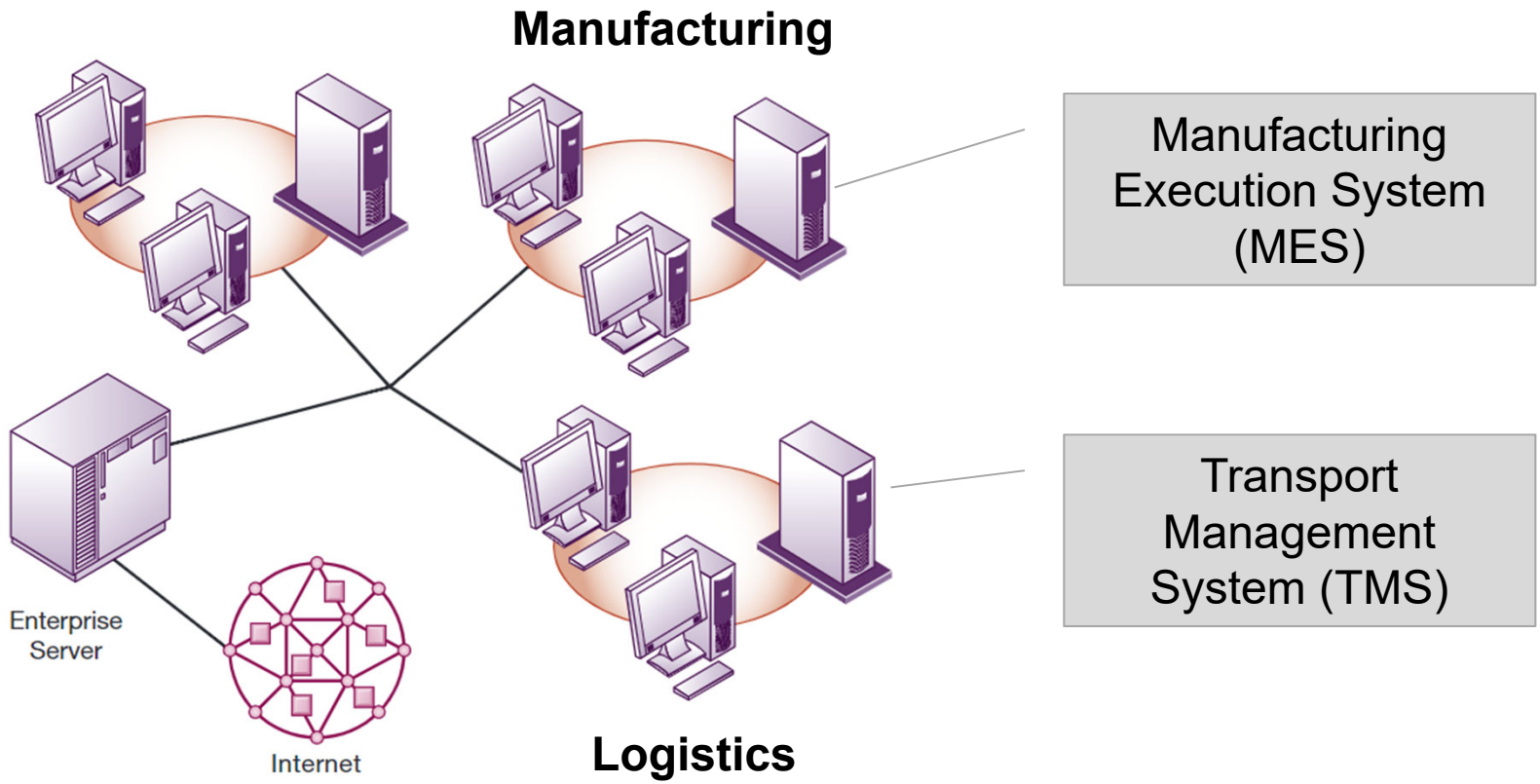
Particify

Which kind of technology do we need for integrating software applications?

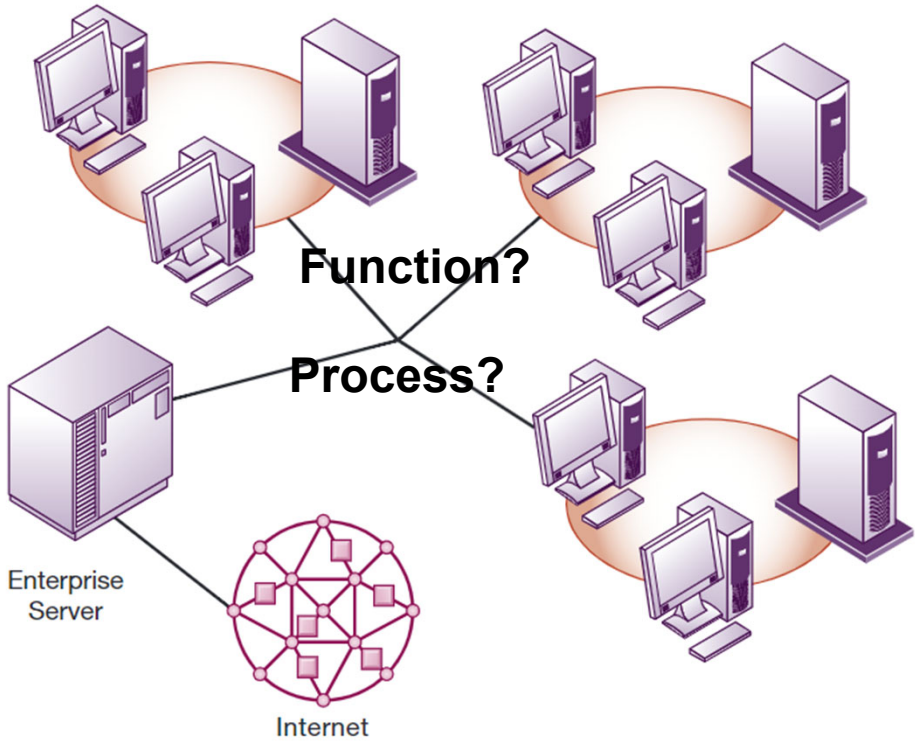
Integration: Computer Network

Computer networks are required for connecting computers. Example:



Integration: Beyond Computer Networks

Basic technology like operating system (OS) or computer networks is not sufficient for function- or process-based integration.



Integration: Benefit

Applications are no isolated islands but need to collaborate in order to support business processes.

Sharing data

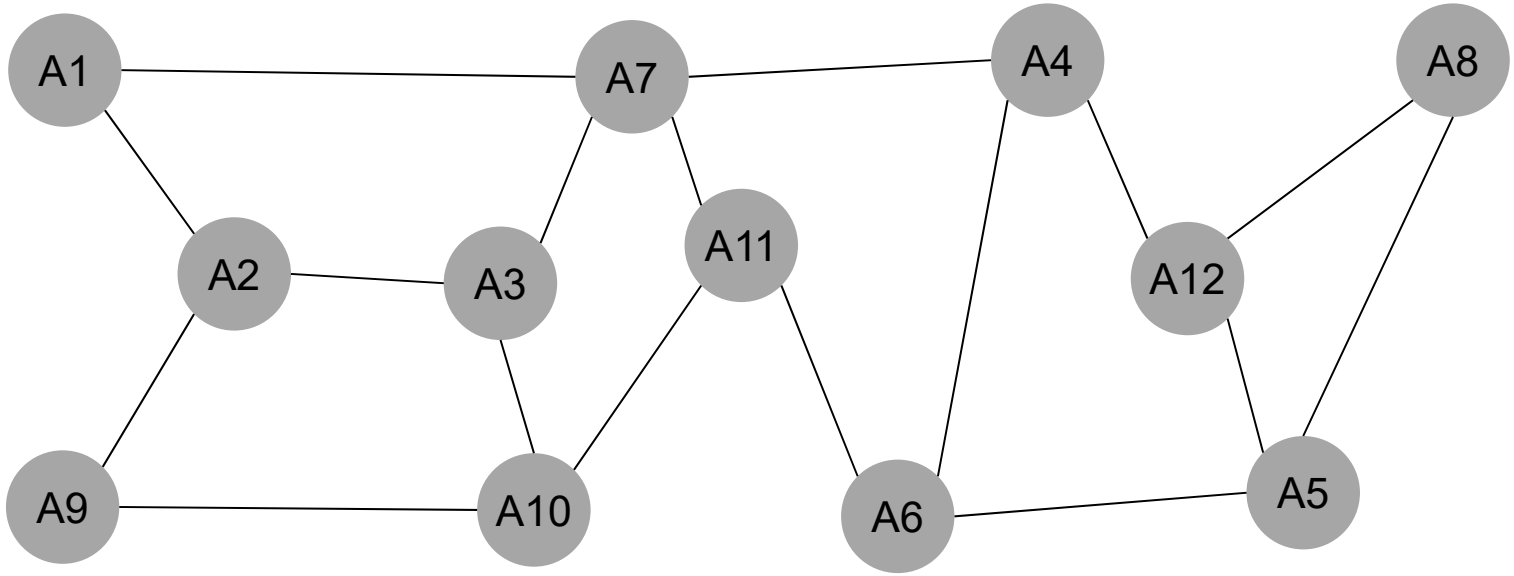
- Common database
  - Standardised data model
  - Consistency managed by Database Management System (DBMS)
  - Concurrency control
- Data ex- and import
  - Easy to implement
  - Different data models
  - No overall consistency

Re-using functionality

- Benefits
  - No redundant implementation
  - Changes only once
  - Functional specialisation
- Requirements
  - Common data model
  - Application Programming Interface (API)
  - Integration infrastructure

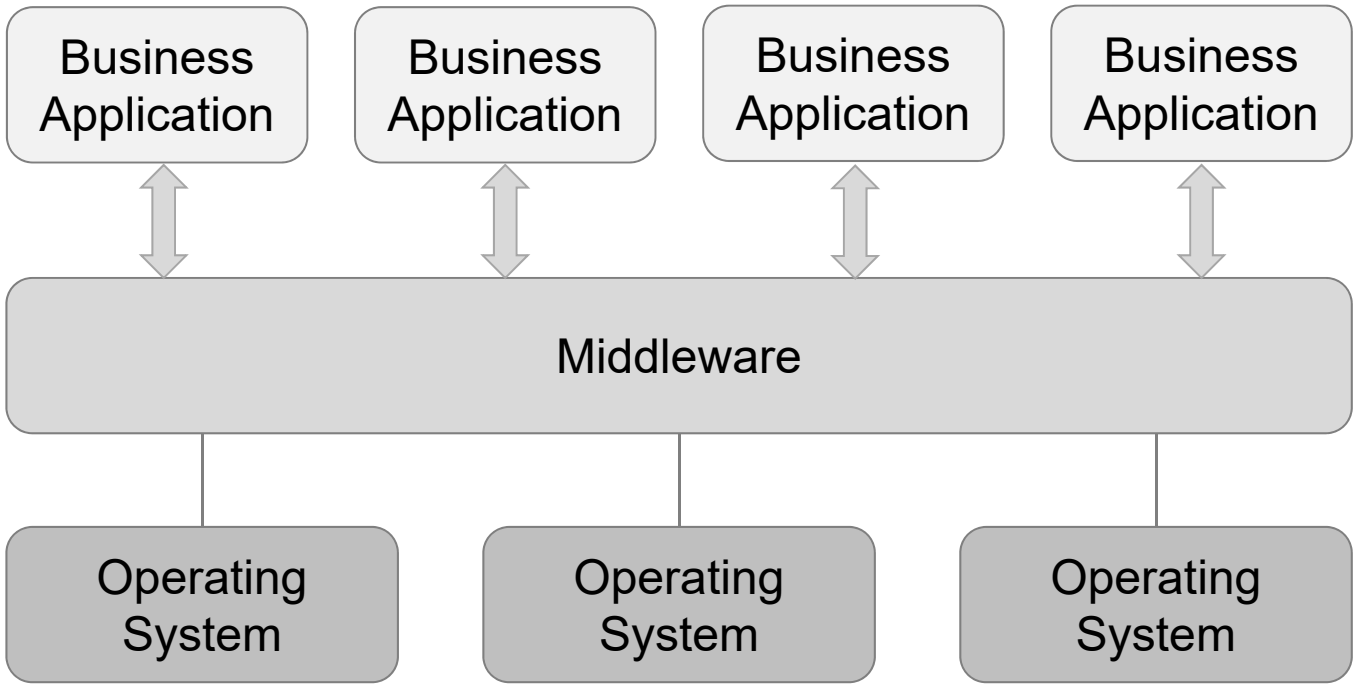
Integration: Challenge

- IS architectures tend to grow large (e.g. several hundreds of applications)
- IS architectures tend to get complex (plethora of interactions between applications)



Middleware: General Idea

- Middleware usually runs on different operating systems

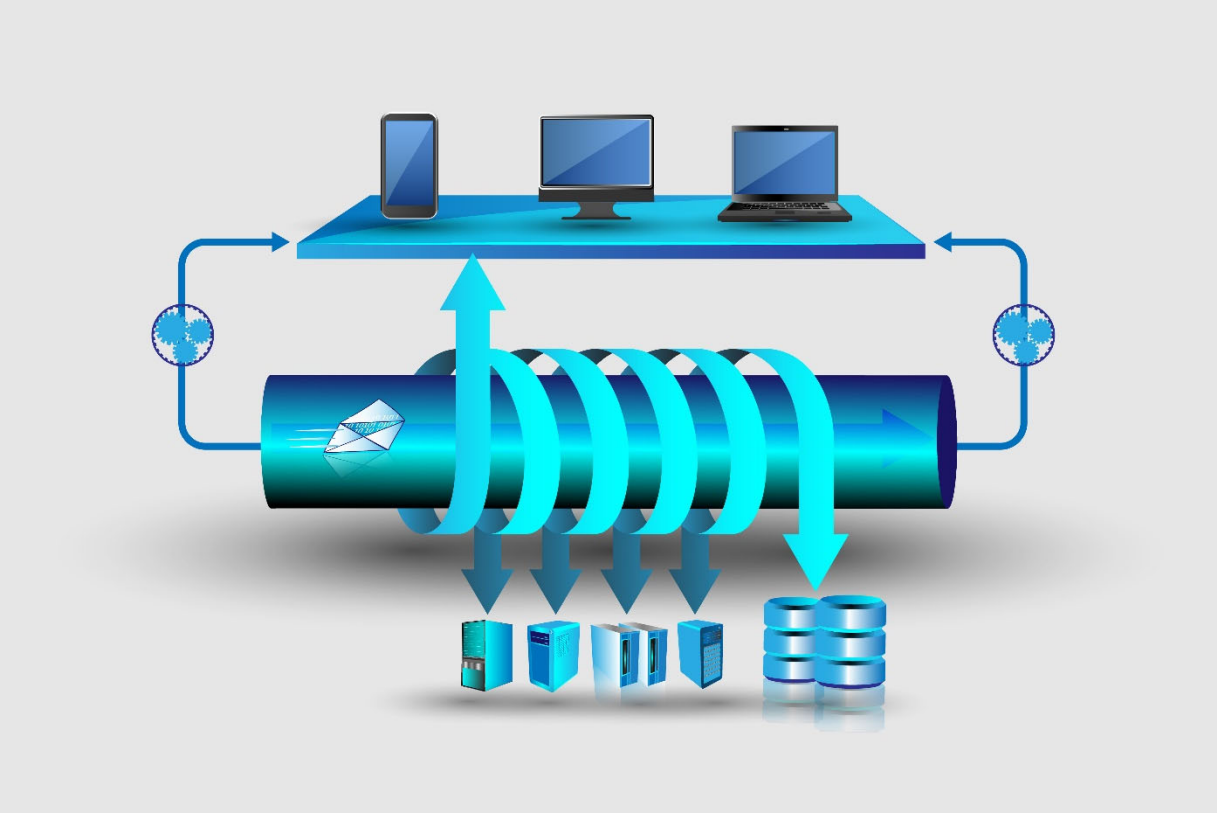


Middleware: Integration

Middleware: The term (*Integration*) *Middleware* refers to a software application which can be used for integrating business software applications. It is located between the operating system and the business applications (hence, *middle*ware).

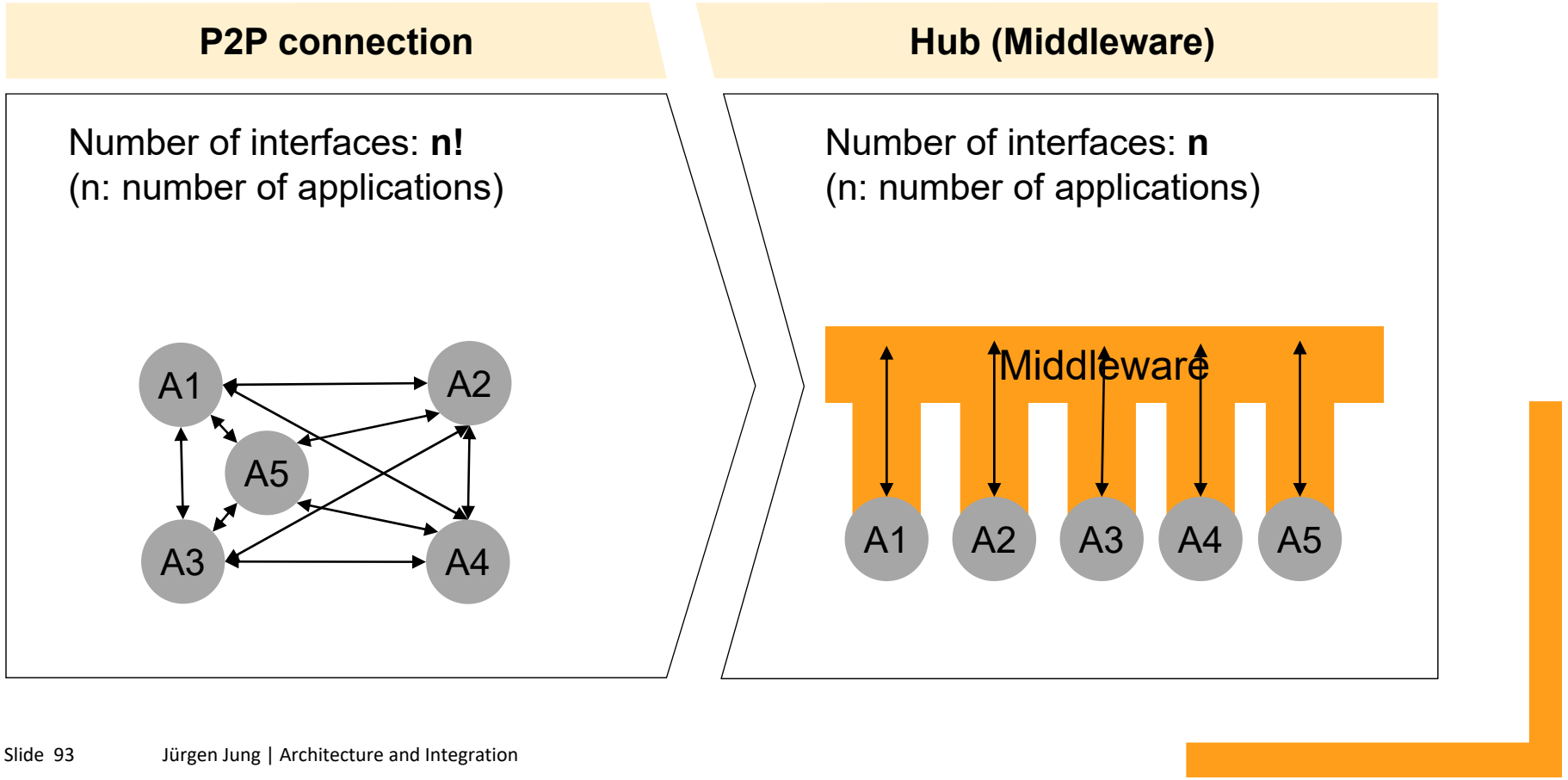
Middleware: General Idea

- Middleware decouples software applications from underlying system software



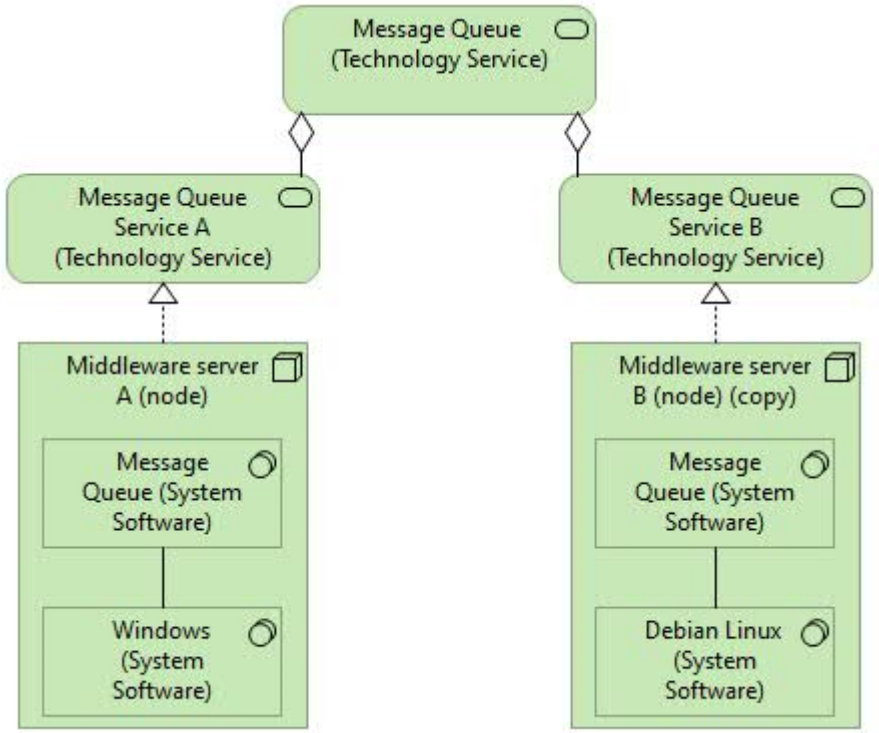
Middleware: Benefit

- Middleware reduces the number of dependencies



Middleware: Example Message Queue

- One middleware service can consist of software installed on several machines



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Middleware: Example Technologies

Data	• Shared file storage • Database Management System (DBMS) • Message Queue (MQ)
Function	• Application server (web server) • Service-oriented Architecture (SOA) • Enterprise Service Bus (ESB)
Process	• Workflow Management System (WfMS) • Process Automation • Robotic Process Automation

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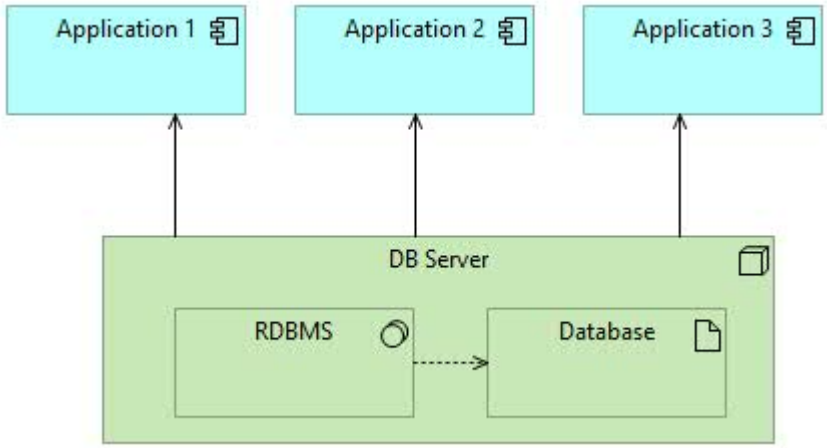
Particify

Which kind of middleware can be used for data-oriented integration?

Integration: Technologies for Data

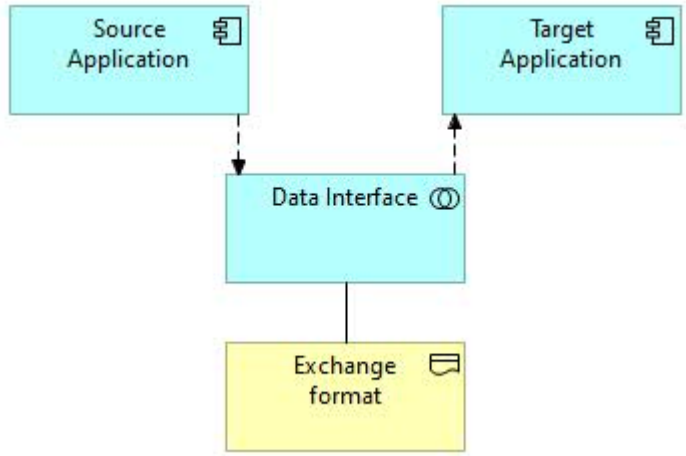
Shared database

- Centralised approach
- DB server provided in the network
- Applications access data remotely



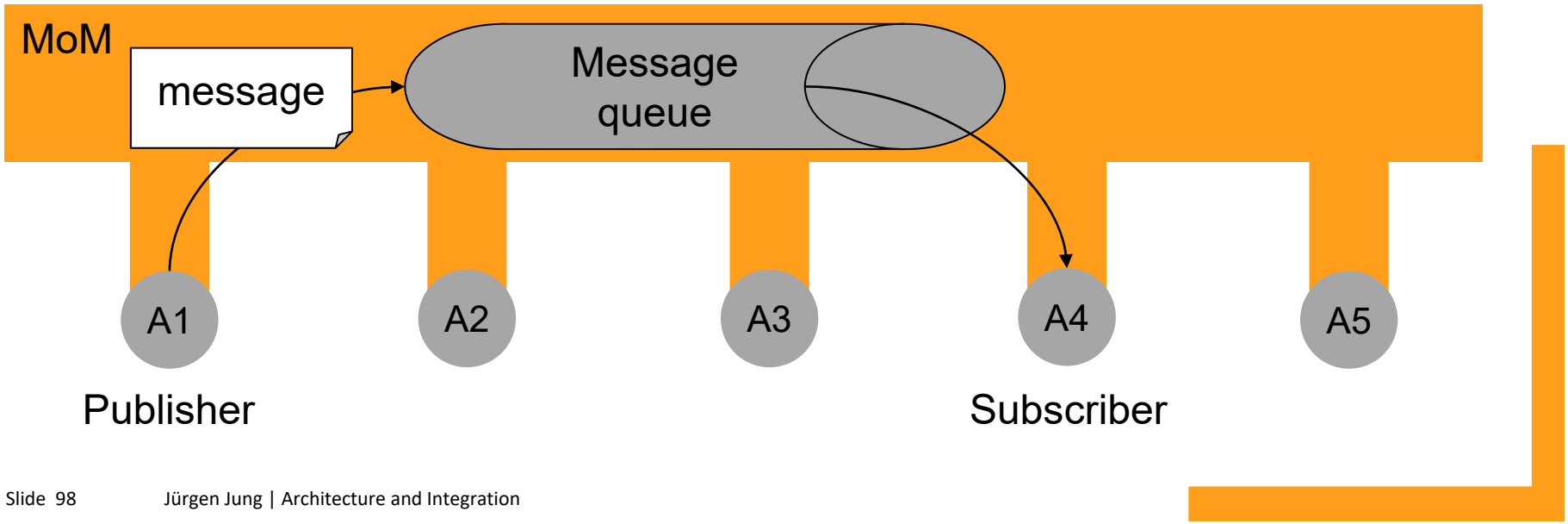
Data exchange

- Decentral approach
- Data is stored as file
- Files distributed to other applications



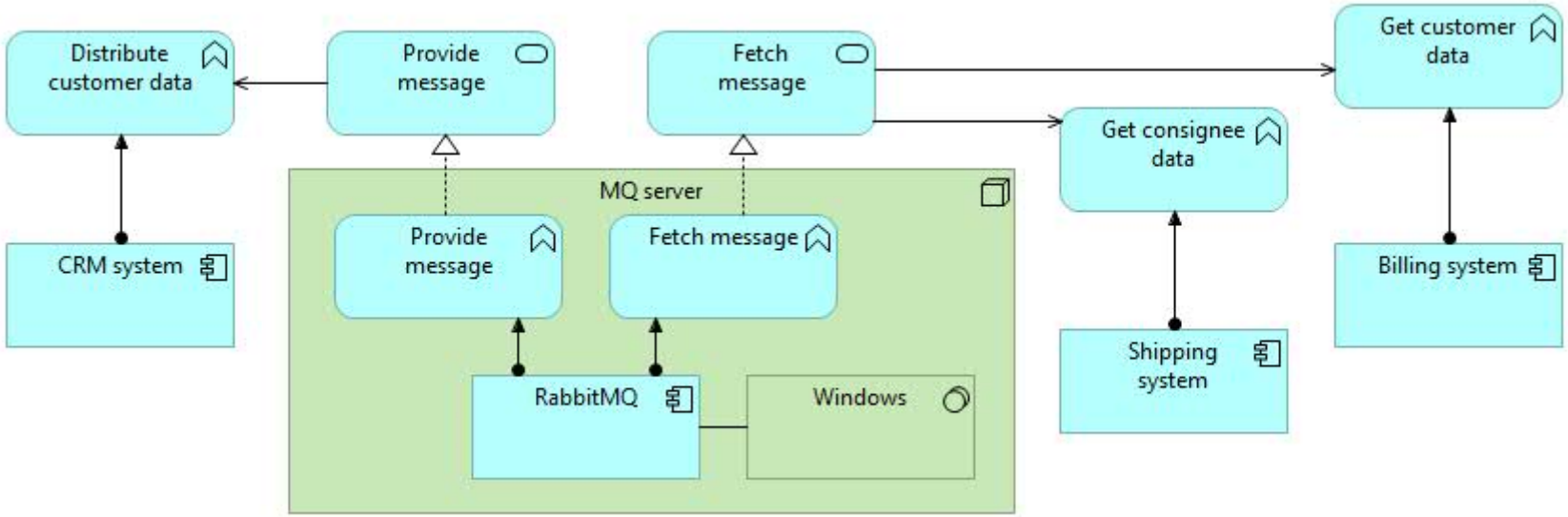
Integration: Message-oriented Middleware

- Asynchronous message exchange between applications
  - Publisher sends data (i.e. message) when it is available
  - Subscriber reads messages whenever it is ready
  - Publisher does not need to wait until subscriber is ready



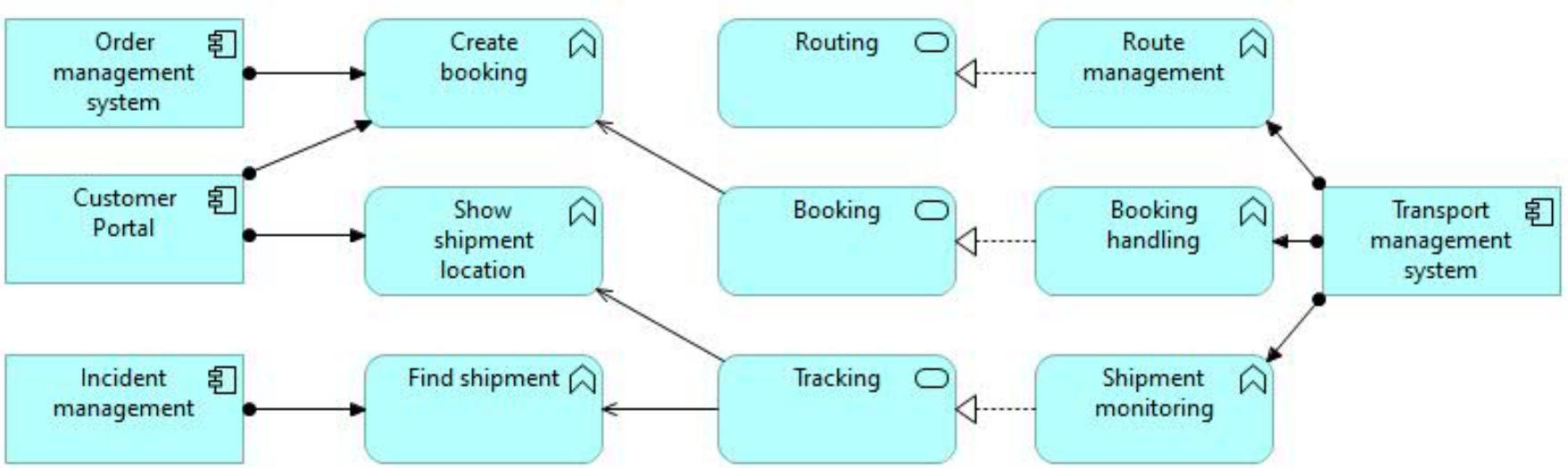
Integration: Message Queue

- Reliable message delivery
  - Messages are stored until fetched by consumer
  - Messages are persisted so that they do not get lost



Integration: Services

- Services provide functionality implemented by one application
- Services can be invoked by other applications
- Example: Webservices



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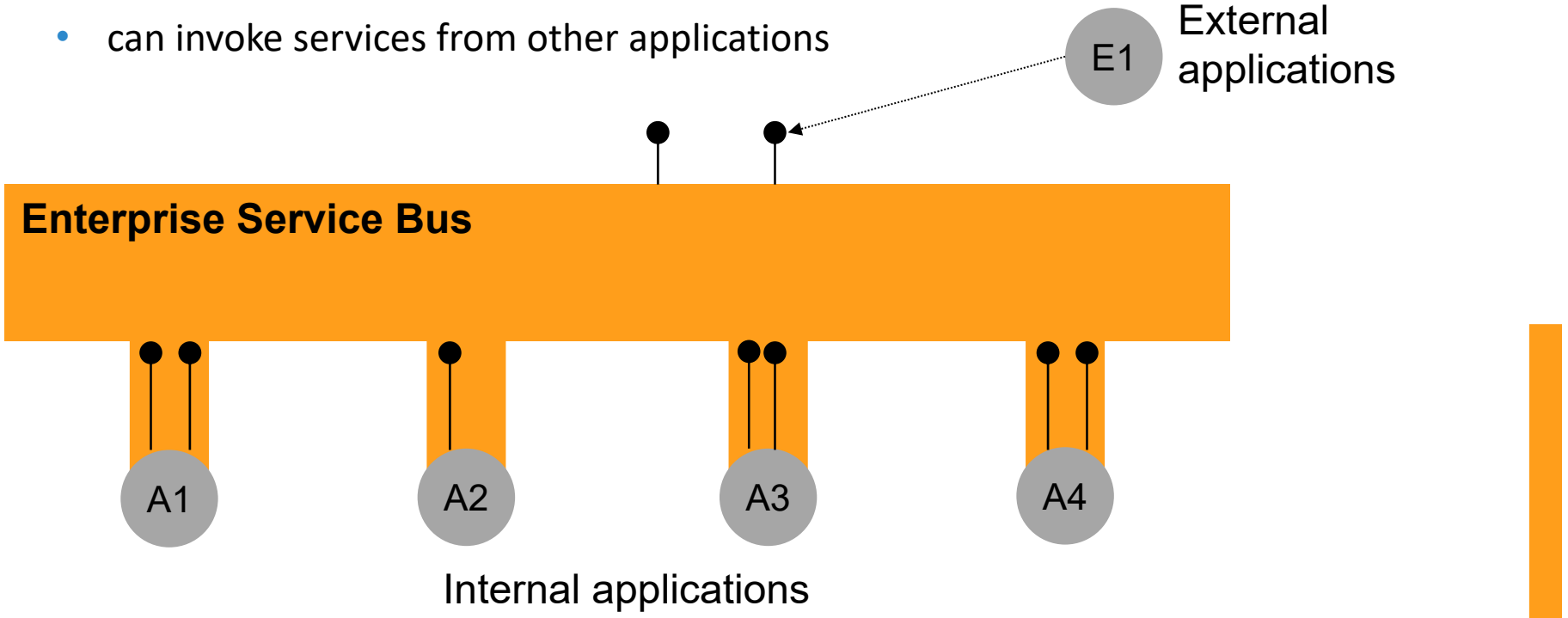
Role play

ESB

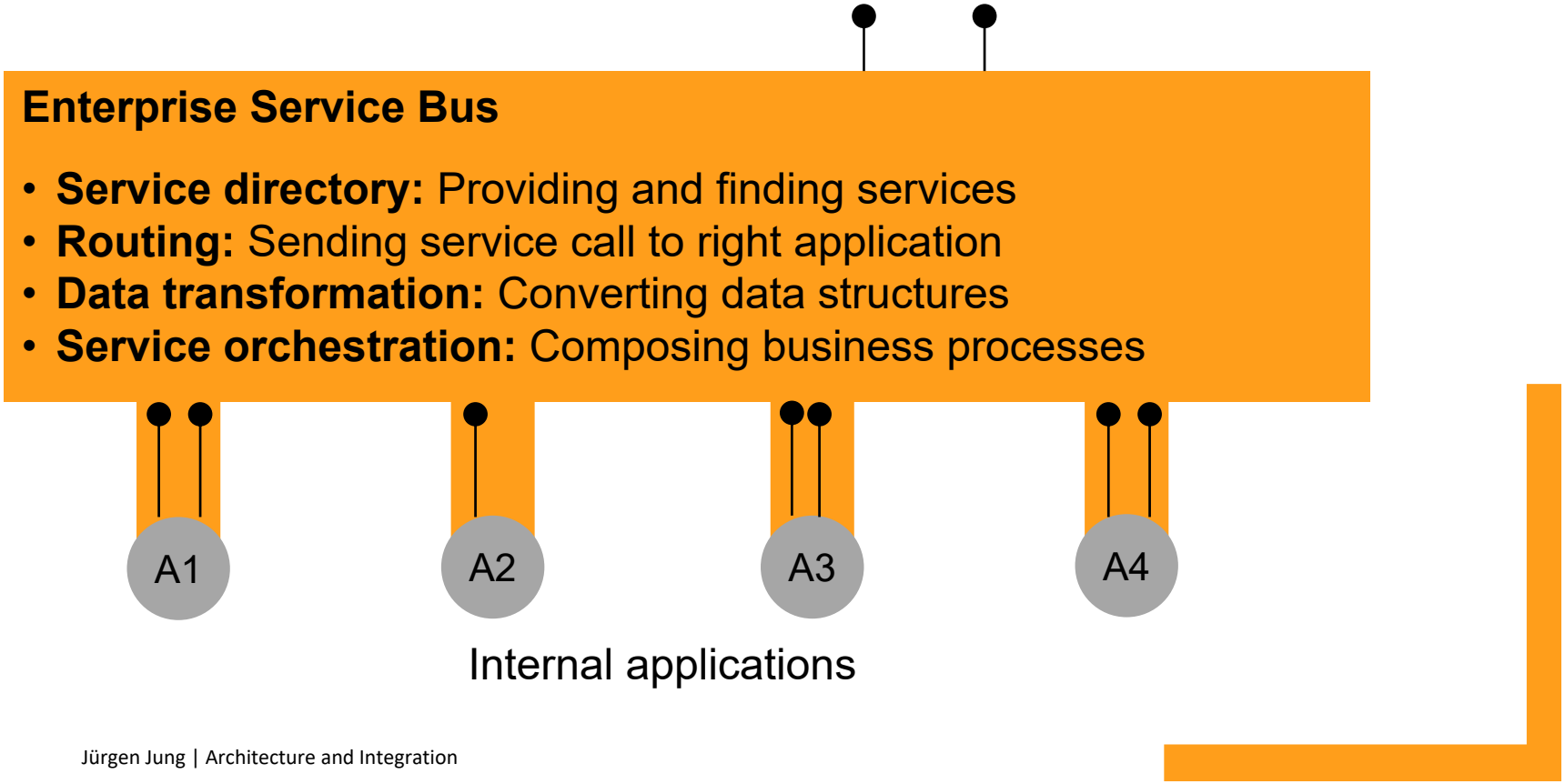
Integration: Enterprise Service Bus

- Enterprise Service Bus (ESB) manages services in a standardised way
- Applications …
  - provide software services for re-use
  - can invoke services from other applications



Integration: Enterprise Service Bus

- ESB provides functionality for managing services



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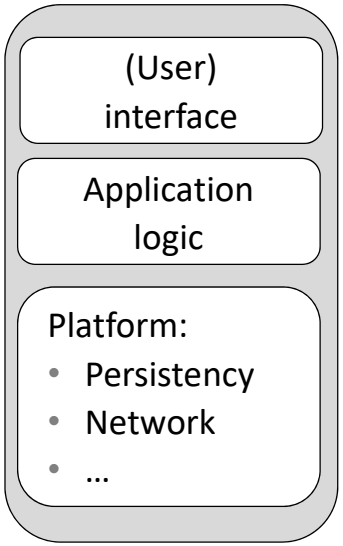
Particify

Which of the following middleware technologies are you aware of?

Integration: Microservices

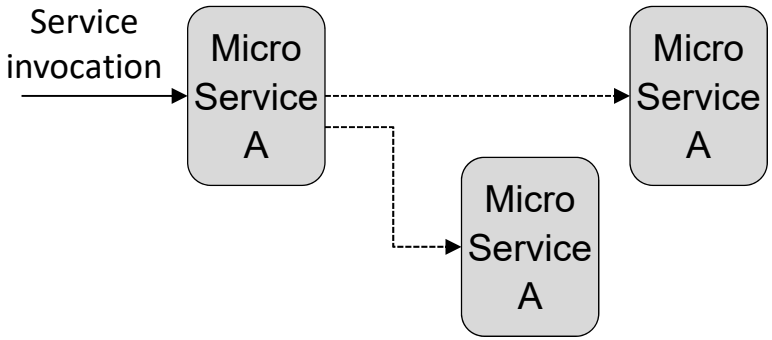
Microservices are self-contained functional units that are developed and deployed by single autonomous team (agile & DevOps).

Microservice



Properties of Microservices

- Self-contained (functionality and technology)
- Encapsulation (of implementation)
- Technological independency
- Service composition



Integration: Process in Company

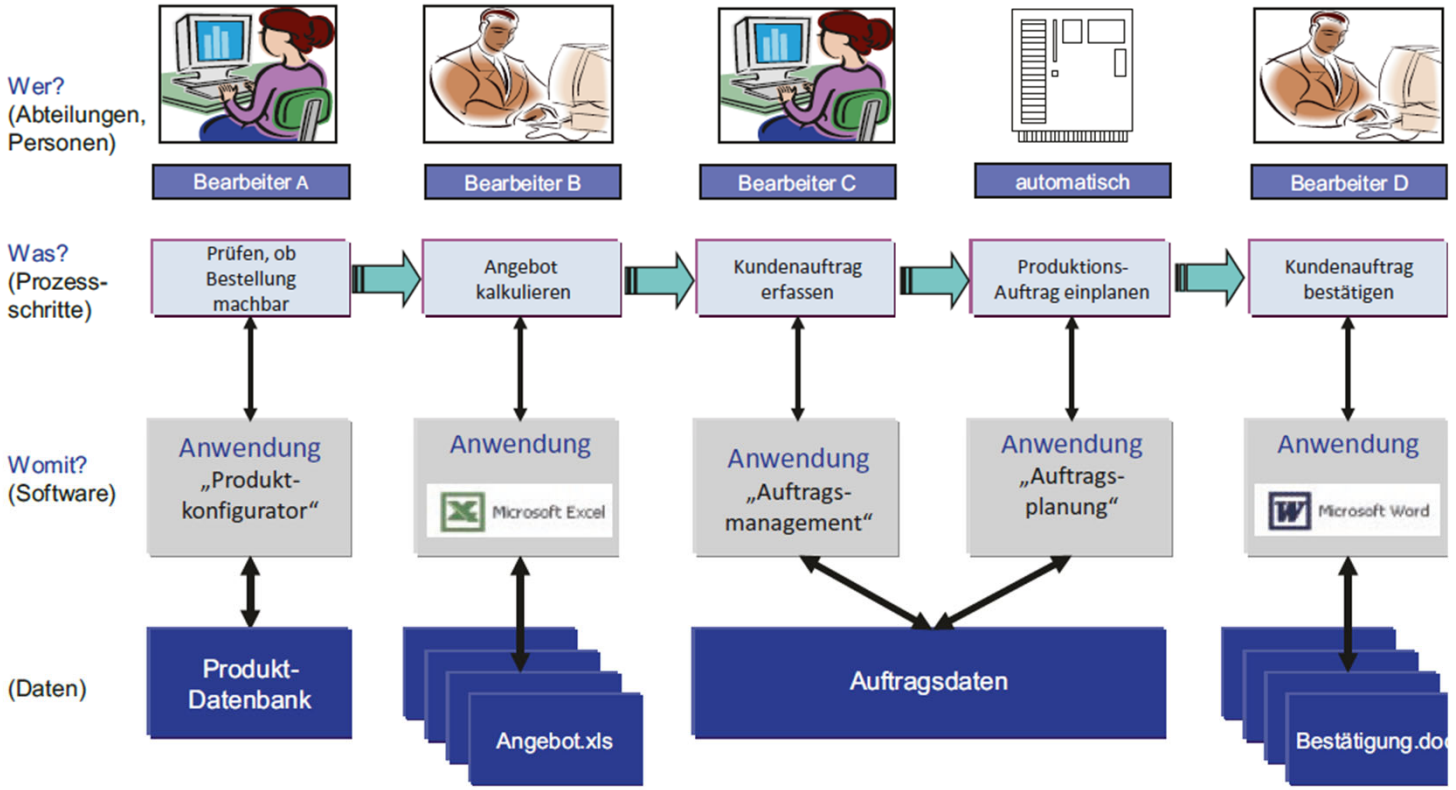
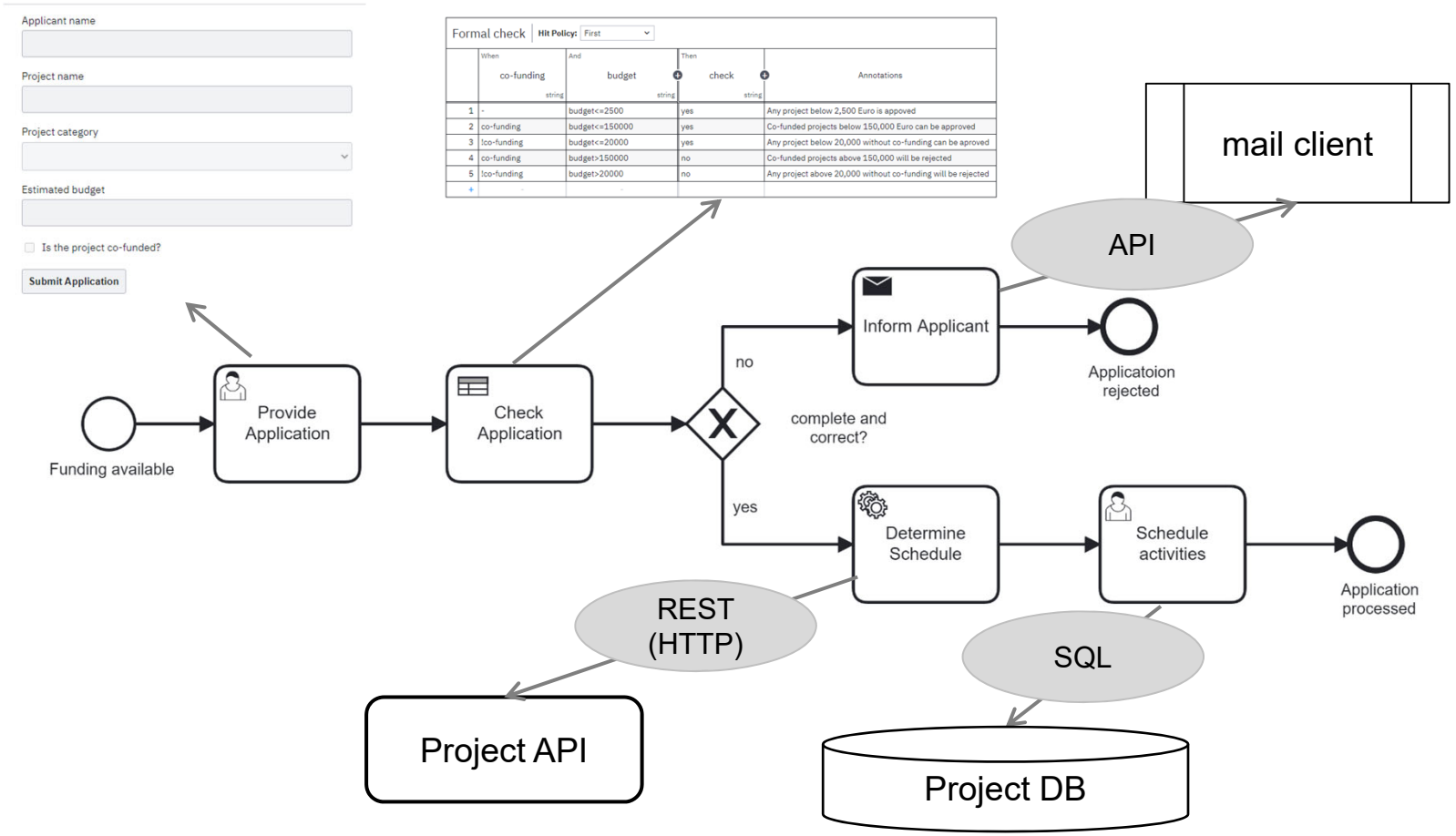


Abb. 1.2 Arbeitsteiligkeit von Prozessen – Schematische Darstellung

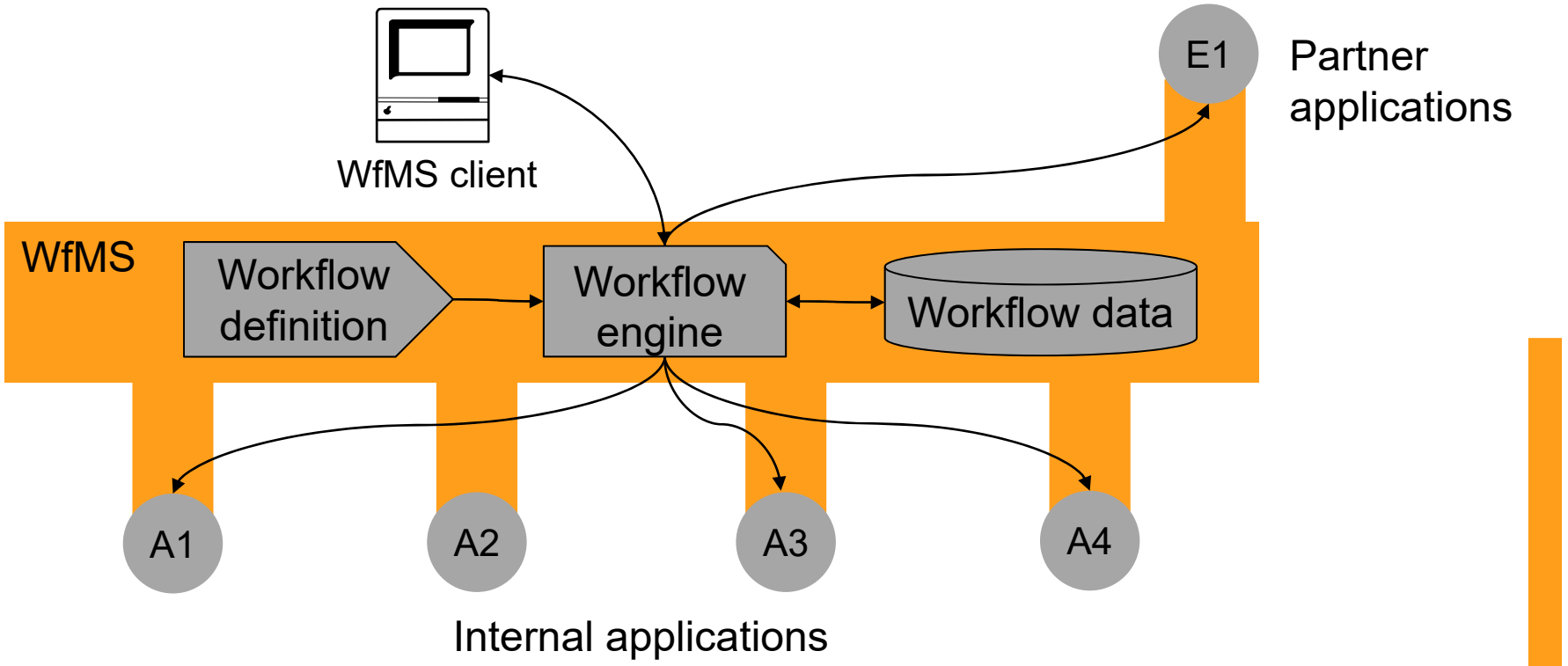
Source: Gadatsch “Grundkurs Geschäftsprozessmanagement”, Springer

Integration: Process Automation



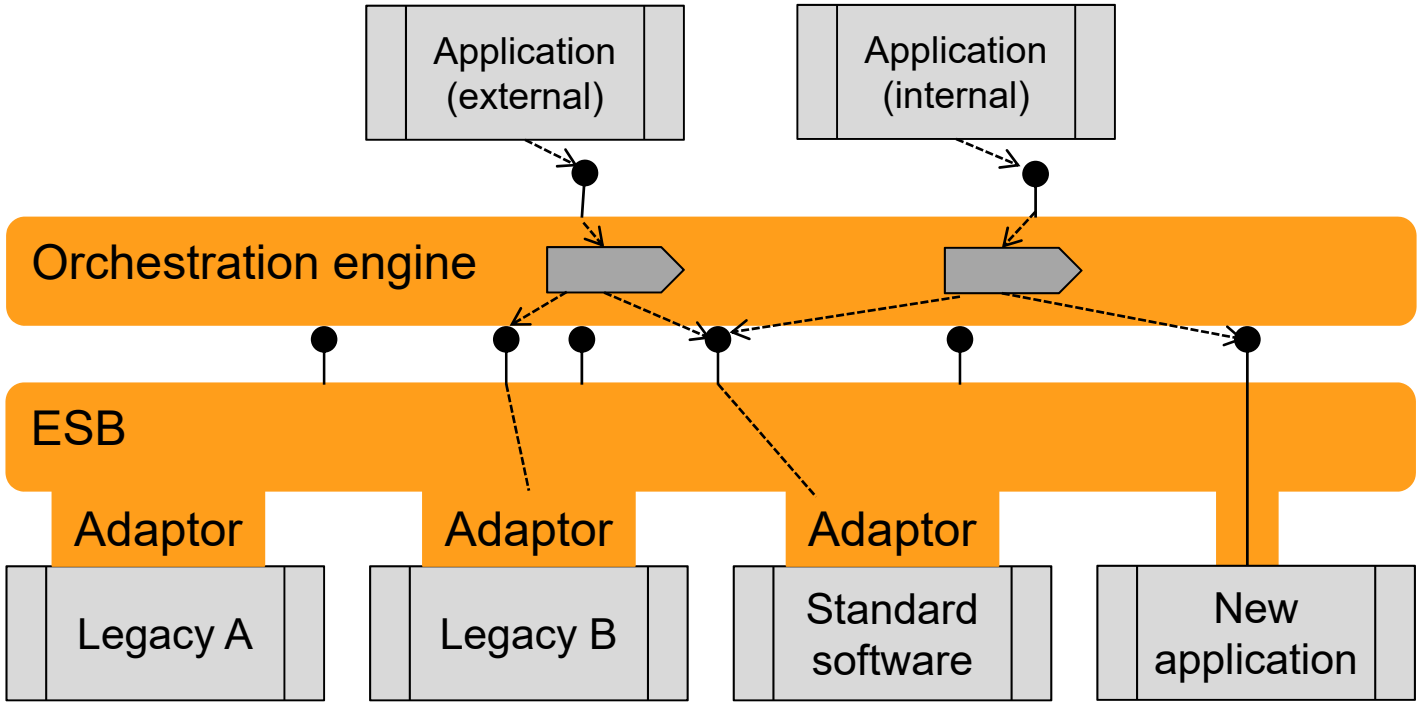
Integration: Workflow Management System

- Workflow Management (WfM) aims at automating administrative processes
- Workflow engine executes process and invokes applications for each activity

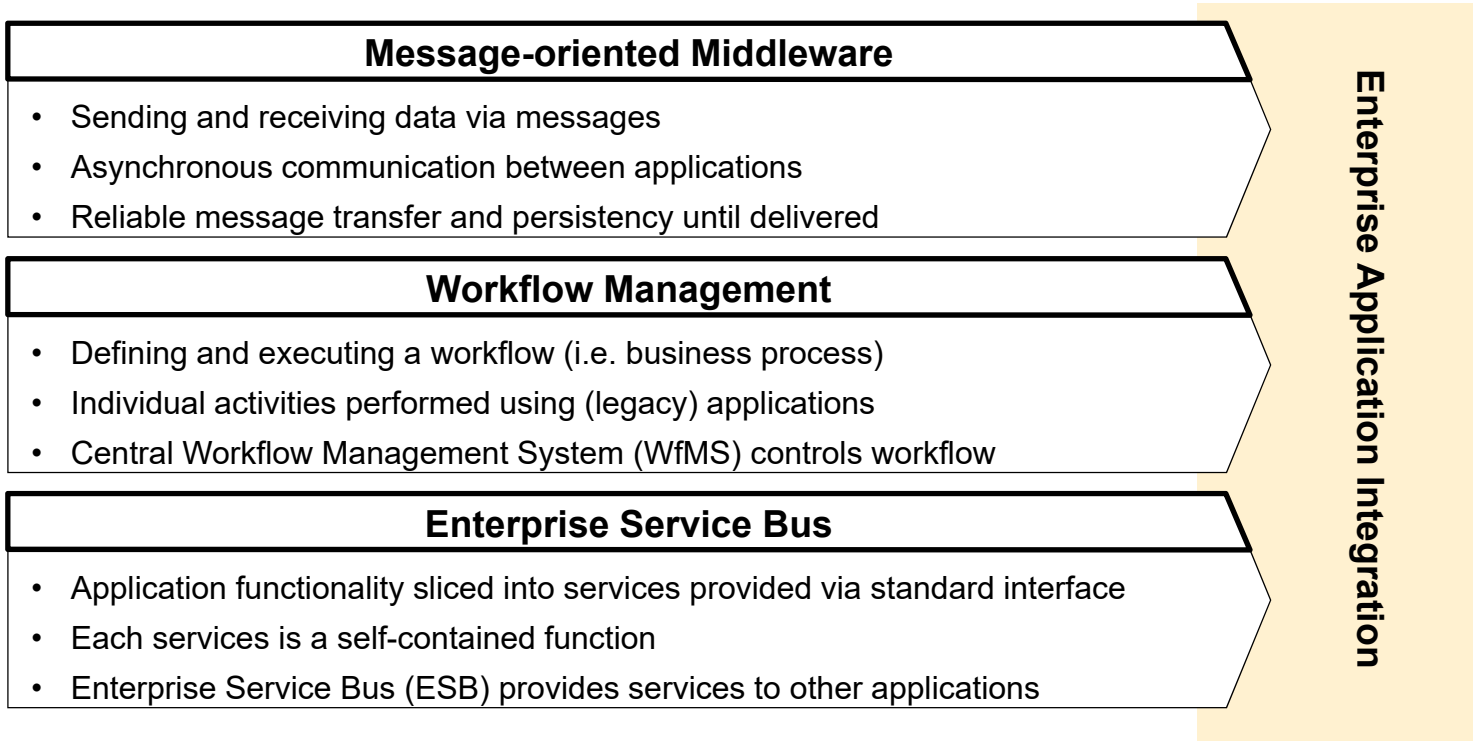


Integration: Service Orchestration

- Orchestration engine executes process like WfMS
- Service invocation instead of direct call to application



Integration technology: Summary



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Exercise: RabbitMQ

1. Install RabbitMQ: https://www.rabbitmq.com/docs/download
2. Choose a programming language: Java, JavaScript, Python, …
3. Perform the tutorials: https://www.rabbitmq.com/tutorials
    1. Hello World
    2. Work Queues
    3. Publish/Subscribe
    4. Routing
    5. Topics
    6. RPC
4. Present your results