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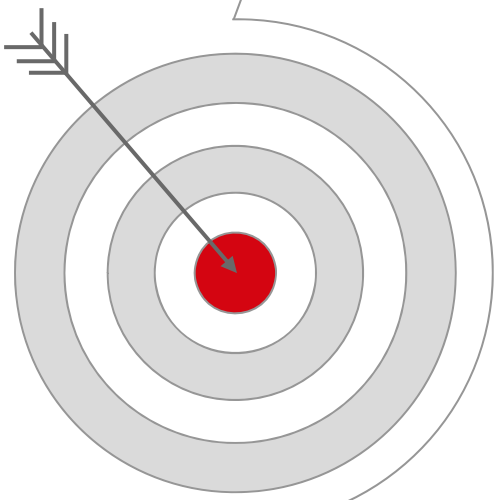
Architecture and Integration

Integration

Fachbereich 2 Informatik und Ingenieurwissenschaften

Learning Objectives: Integration



Explain integration paradigms based on

- Data
- Function
- Process

Describe integration with respect to number of partners:

- Point-to-Point
- Multiple partners

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Particify

We have two systems: A customer relationship management system (CRM) and an order management system (OMS). Customer data is only stored in the CRM system. Customer data is also needed for executing order? How can we get customer data into the OMS?

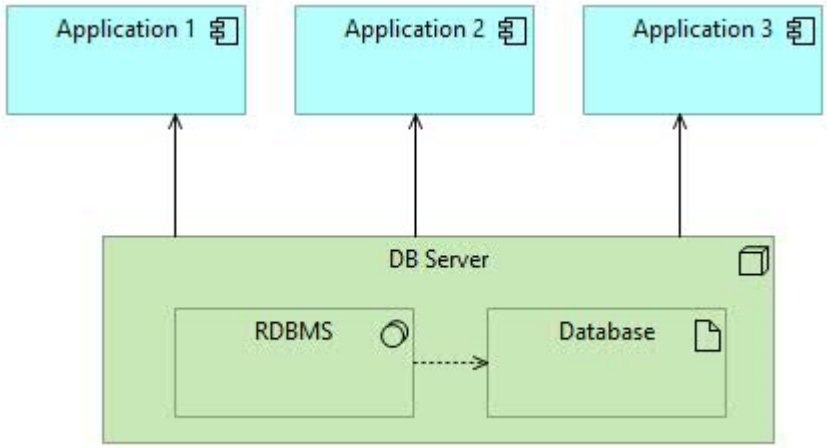
Integration Based on Data

Motivation	Prerequisites	Solution
• Several applications in an organization use the same data • Data should not be entered manually into each system • Example: Customer data required for marketing, sales and shipping	• Common data format – Types and attributes – Representation • Communication channel for data exchange	• Common database • Automatic data exchange

Integration Based on Data: Solutions

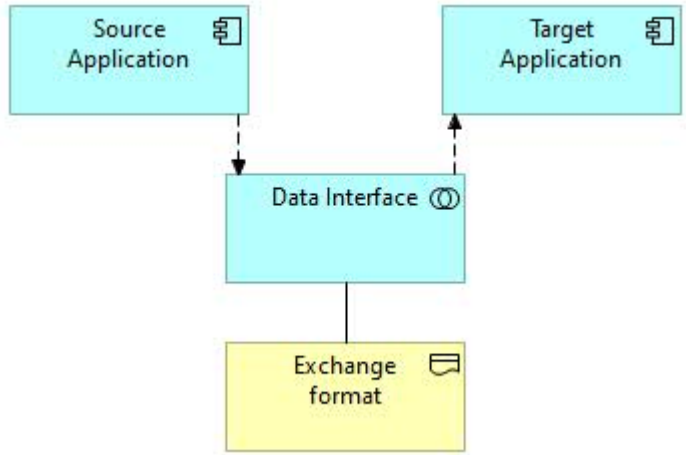
Integration with shared database

- Data is stored in single database
- Format determined by database schema
- Individual applications can read
- Only one application should create data



(Automated) Data exchange

- Data is stored in each applications
- Data exchanged through interface (individual software component)
- Exchange format required



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We are in DHL: There is one system that can create shipping labels (the ones attached onto the parcels). We now want to introduce a web shop system that can also create shipping labels. Do we need to implement the same functionality twice? Which possibilities are you aware of?

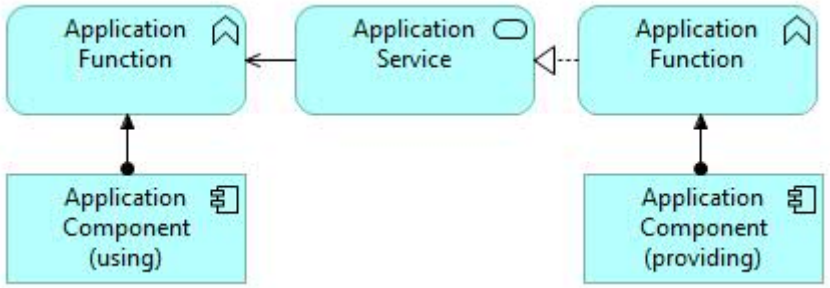
Integration Based on Functions

Motivation	Prerequisites	Solution
• Functionality implemented by an application can be re-used by others • Example: Parcel tracking used by web portal, customer service, operations	• Common data format – Types and attributes – Representation • Communication channel for service invocation	• Software service – Provided at endpoint – Having dedicated name – Data in- and output

Integration Based on Functions: Solution

Application service

- An application (providing) implements a function
- Function is offered as an application service
- A function implemented by another application (using) is served by the service



Example technologies

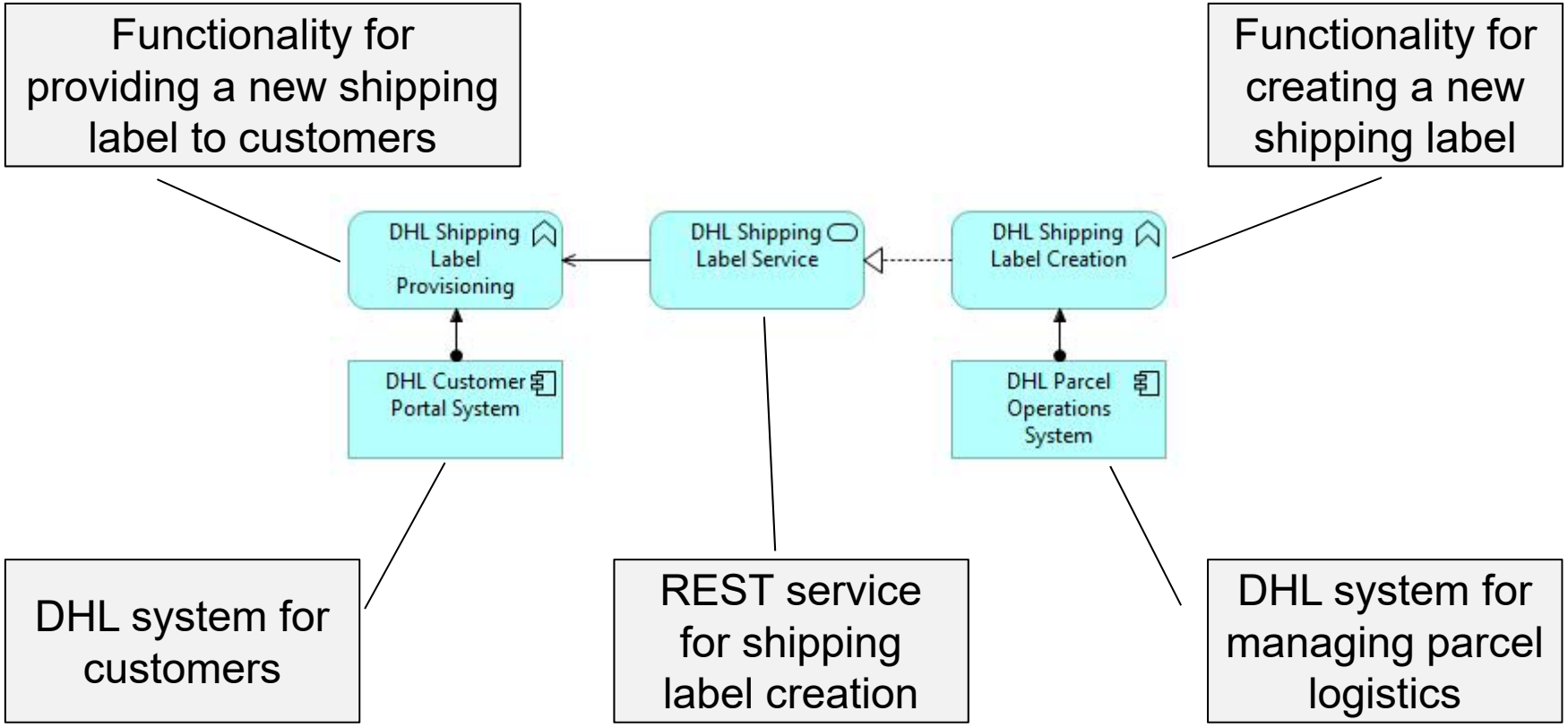
Programming languages

- Remote Method Invocation (RMI)
  - Java
- Remote Procedure Call (RPC)
  - Go, Python
- Remote Function Call: SAP

Language-independent

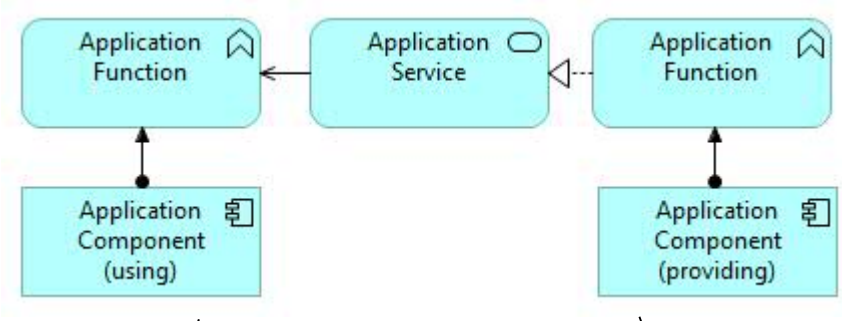
- Webservices (REST)
  - HTTP
- Service-oriented Architecture (SOA)

Integration Based on Functions: Example



Integration: Realisation as Function

- Integration usually requires changing a software system (i.e. programming)
- Changes are conducted within a software development project



Program code for
- Invoking the remote service (Application Service)
- Processing the result

Program code for
- Functionality (Application Function)
- Service interface (Application Service)

Integration – Definition

Integration: The term *Integration* in the context of Information Systems refers to the combination of several applications so that they can share data and use common functionality. Integration is driven by business processes creating business value.

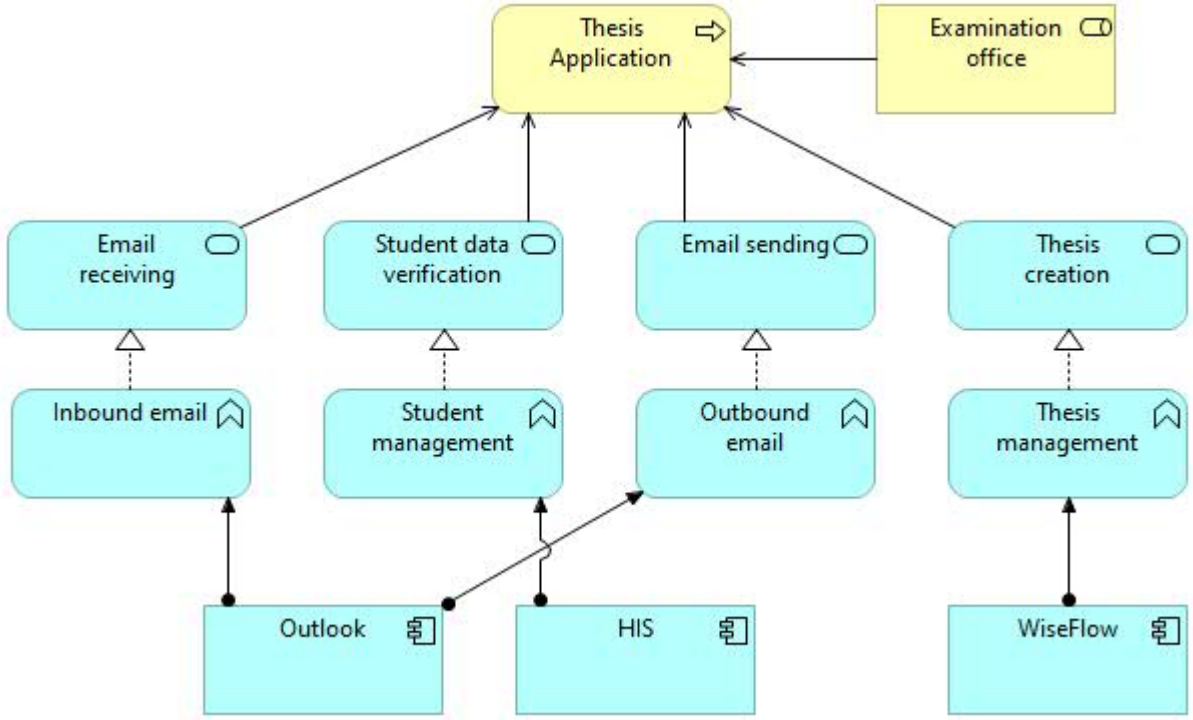
Integration Based on Processes

Motivation	Prerequisites	Solution

• Processes define workflow
• Different software applications are required for workflow
• Example: Order management
	• Common data format
	  – Types and attributes
	  – Representation
	• Communication channel for service invocation
	• Processes well-defined
		• Process automation
		  – Process engine executes process
		  – Uses existing software systems (services)

Integration Based on Processes: Example

- Before writing their final thesis, students need to send an application
- The examination office executes the process by using different applications



Integration Based on Processes: Overview

- Process defines workflow execution (e.g. via BPMN diagram)
- Process automation tool executes process as defined
  - Triggering activities of different actors
  - Invoking several software applications
  - Coordinates data exchange between actors and applications
  - Combination of manual and automated activities possible
- Various systems available on the market, e.g.
  - Camunda BPM (open source & commercial)
  - SAP Business Workflow (commercial)
  - jBPM (open source)

Integration: Summary

Type of integration	Data-oriented	Function-based	Process-based
Central concepts	• Data	• Function • Service	• Process • Event
Prerequisites	• Data format	• Function • Data format	• Process • Function • Data format
Examples	• Database • File exchange	• RMI • REST	• Workflow Management

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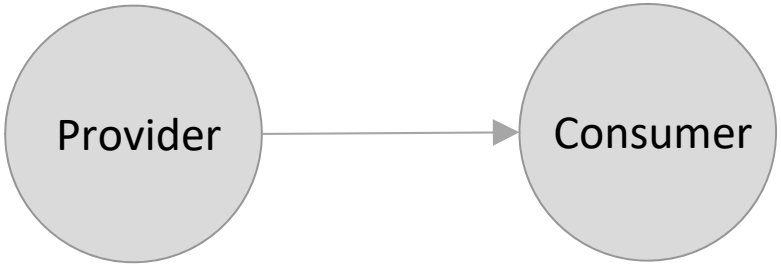
Particify

How many systems can be integrated?

Partners: Point-to-Point (P2P) unidirectional



- Two systems involved
  - Provider: source for information
  - Consumer: drain for information

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P2P unidirectional: Examples

Hardware

- MP3 player ⇨ headphones (music)
- Keyboard / mouse ⇨ computer (input)
- Computer ⇨ display (screen)

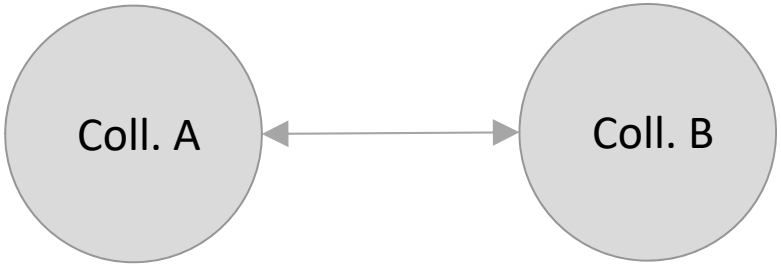
Software

- Address book ⇨ email client (contact)
- http server ⇨ http client (web page)

Other

- Voyager spacecraft ⇨ base station (pictures)

Partners: P2P bidirectional



- Two collaborators (Coll. A and Coll. B) involved
- Both exchange information

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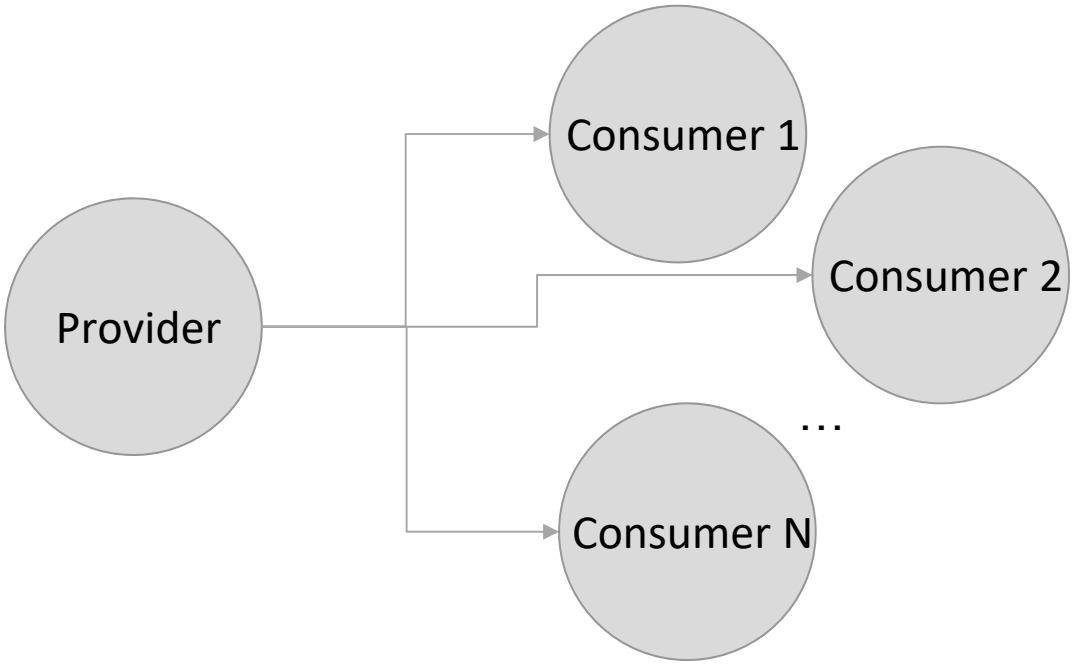
Particify

Could you imagine examples for a bidirectional P2P integration?

Partners: Broadcast



- Broadcast: Provider is distributing information to several consumers
- Publish-Subscribe: Consumers can register for receiving information

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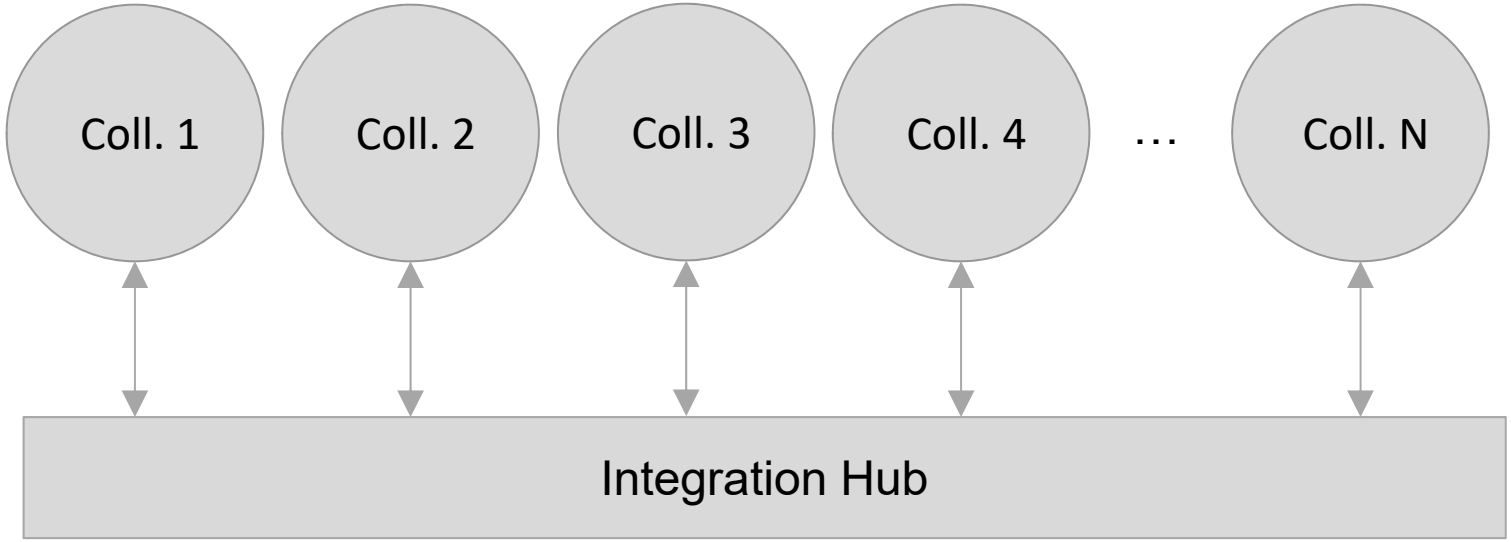
Particify

Could you imagine examples for a broadcast integration?

Partners: Hub



- Several collaborators are connected to a single hub
- A collaborator can communicate with any other

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Particify

Could you imagine examples for a hub integration?

ArchiMate 3rd Step – Model this Scenario

Open the ArchiMate model (view in folder “First Steps”) from the previous session and add a database server. Identify relevant concepts:

- Application component for the database
- Application functions implemented by the database
- Device on which the database is located
- System software for the DBMS