The Business Grid: Providing Transactional Business Processes via Grid Services

The First International Conference on Service Oriented Computing
Session: Business Processes and Transactions
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Objectives

We will discuss Web Services as interoperable integration paradigm, the potential of providing business processes as Web Services, what requirements and restrictions have to be considered regarding transactions and business processes

Further, we will outline a new middleware based on the concept of the Service Oriented Architecture providing business processes as opaque services – the Business Grid

Agenda

- Web Services – a new distributed computing architecture

- Transactions and business processes in the world of Web Services

- Service Arrangements and the Transactional Handshake

- The Business Grid architecture

- Providing business processes with Business Grids

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What are Web Services?

A Web Service is a "virtual component" that hides middleware idiosyncrasies like the underlying component model, invocation protocol etc. as far as possible.
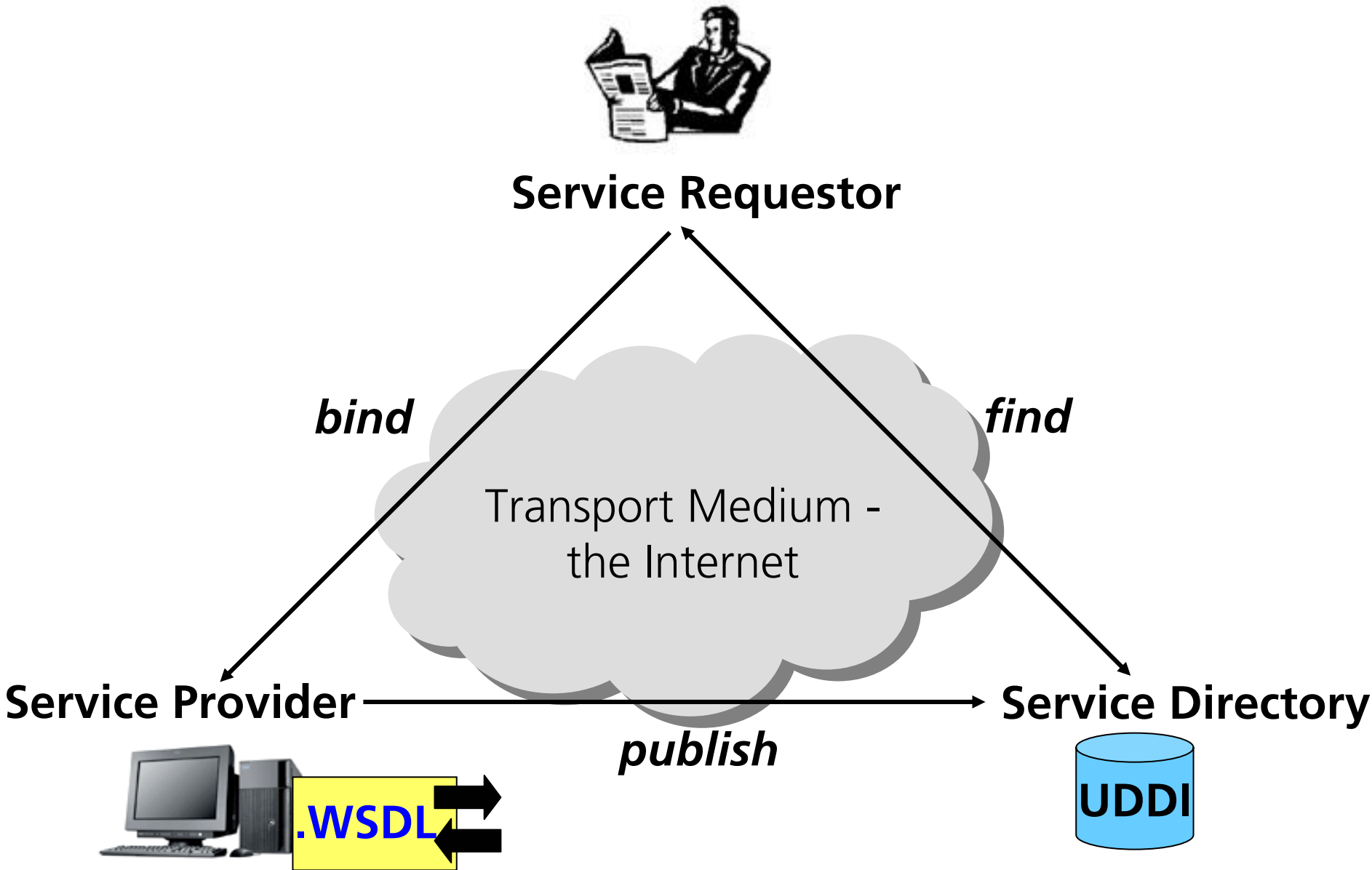
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The functionality provided by Web Services is described using the **Web Services Description Language** (**WSDL**)

For interoperability, we need a globally available invocation mechanism – **SOAP**.

Advantages: using of existing technology – HTTP and XML – no special SOAP API, no special SOAP ORB

The Service Oriented Architecture and Web Services

# Code reuse at the Web Services-level

How can we leverage what already exists?

- Web Service-technology is about *how* to access an application; it is *not* an implementation technology

- From strict RPC-stubs to messaging

- Web Services therefore enable a composable distributed architecture

- From tightly coupled applications to loosely coupled services

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Web Service aggregation

Web Services are intended for integration and can be

- used to compose more complex services
- aggregated into process flows
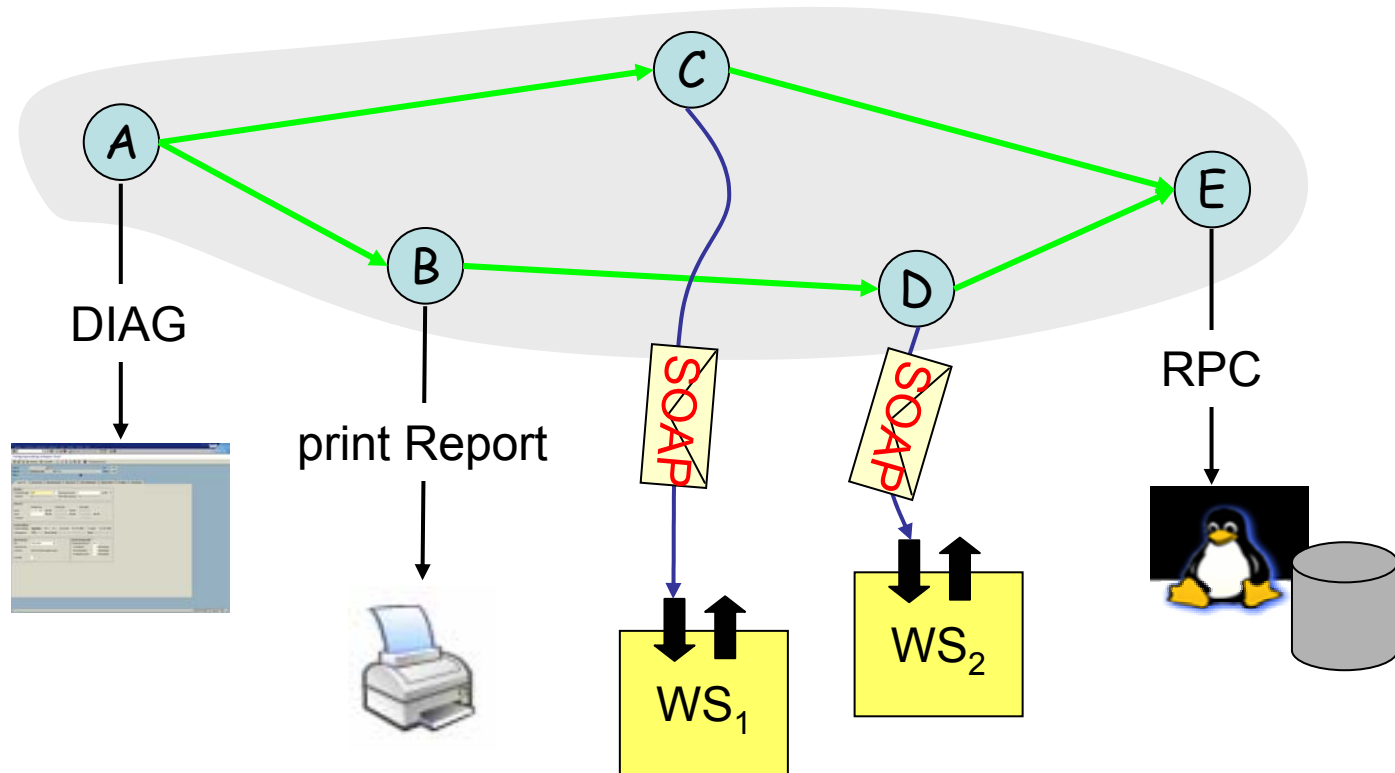
Distributed transactions in the Web Services world

IBM, Microsoft and BEA introduced a specification describing an extensible framework for providing protocols that coordinate the actions of distributed transactions: **Web Services Coordination** (**WS-C**)

Another specification, **Web Services Transaction** (**WS-Tx**), describes coordination types that are used within the coordination framework, up to now Atomic Transaction (AT) and Business Activity (BA)

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Process-Support in the Web Services world

The **Business Process Execution Language for Web Services** (**BPEL4WS**) is an aggregation model for Web Services, whereas the resulting business process in turn can be considered as a composite service, i.e. a Web Service
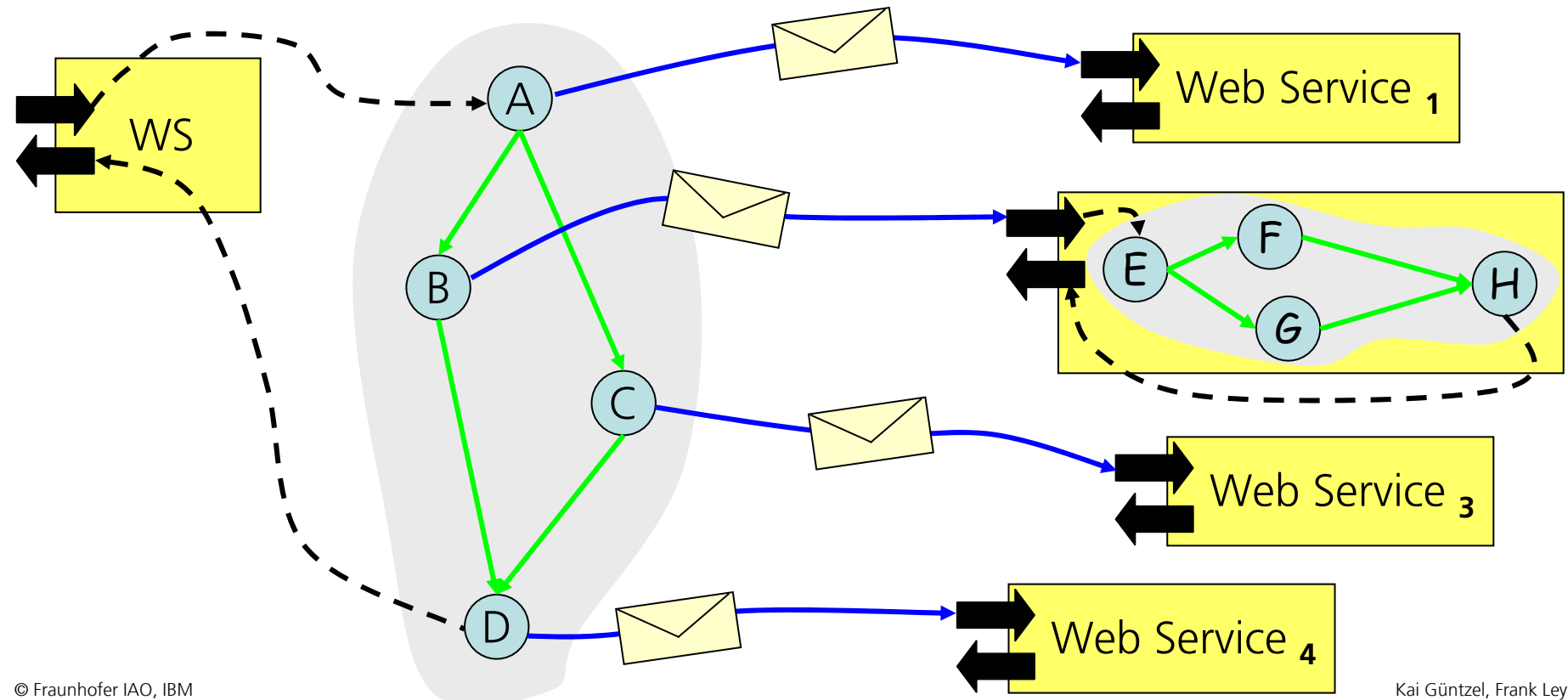
Business Processes in the world of Web Services

- BPEL4WS introduces a mechanism to define how individual or composite activities within a process are to be compensated in cases where exceptions occur or a partner requests reversal
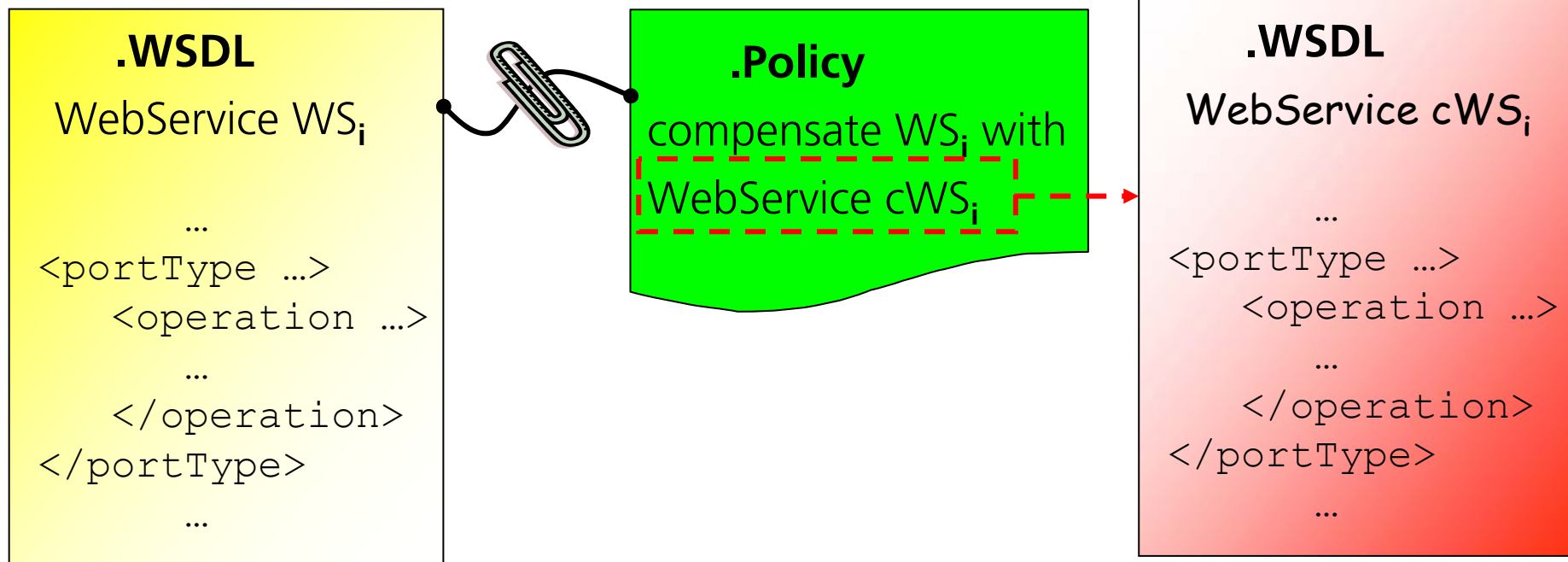
➔ Therefore, the aggregated Web Services have to provide in advance some information about their characteristics

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Service arrangements with the Policy Framework

- The **Web Services Policy Framework** (**WS-Policy**) provides a general purpose model and corresponding syntax to describe and communicate the policies of a Web Service

- The policy information is expressed through an XML-based structure called a *policy expression*

- These policy information can be either associated with specific instances of WSDL services or referenced from WSDL definitions

- ➔ Thus, the Service Provider can expose the conditions under which he provides the Web Service

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An example

- To compensate a Web Service we define a compensating Web Service undoing the effects caused by the original service

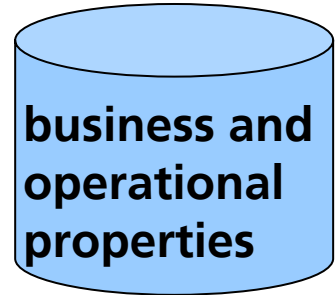- We propagate the information and relationship about WS_i and cWS_i in an attached policy-file

.WSDL
WebService WS_i

```
...
<portType ...>
    <operation ...>
    ...
    </operation>
</portType>
    ...
```

.Policy
compensate WS_i with
WebService cWS_i

.WSDL
WebService cWS_i

```
    ...
<portType ...>
    <operation ...>
    ...
    </operation>
</portType>
    ...
```

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The Transactional Handshake – Contracting Phase
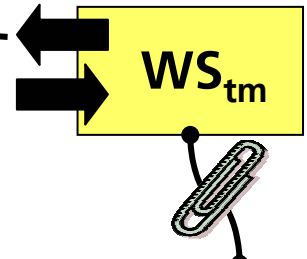
I'm searching for a Web Service for transferring money

I can offer you the Web Service WS_{tm}
Please confirm my
Policy requirements:
- WS_{tm} is a BusinessActivity
- WS_{tm} has to be compensated
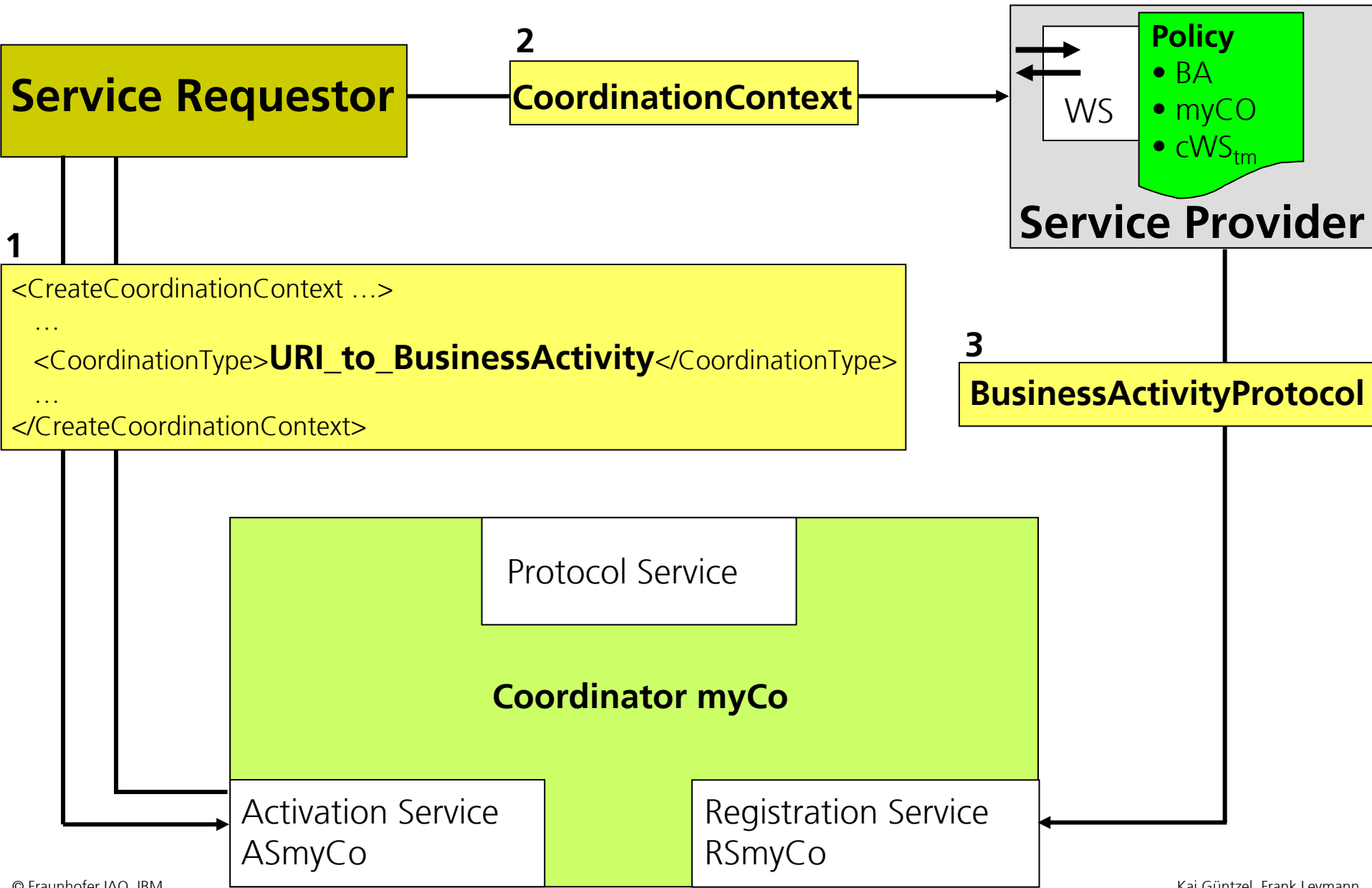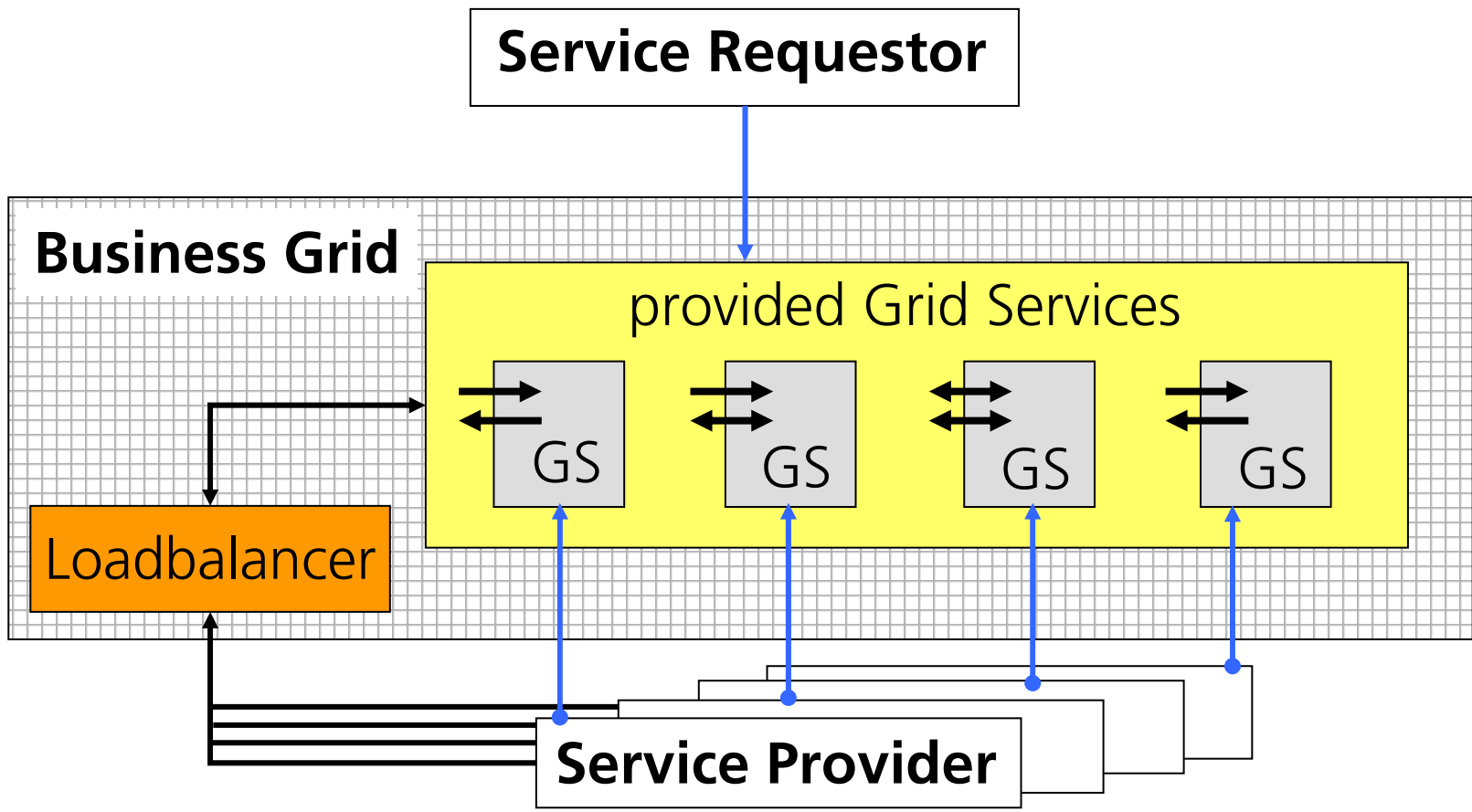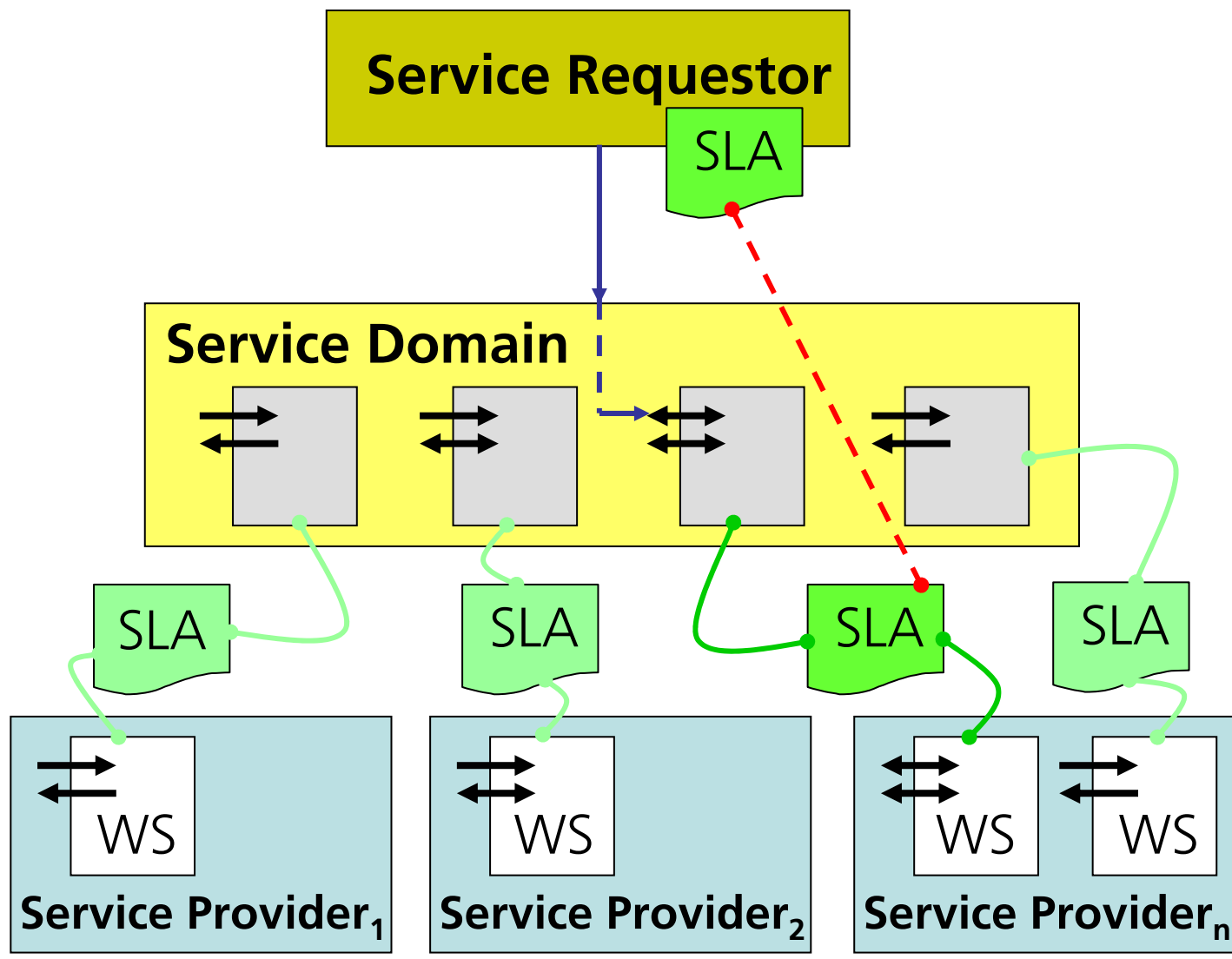- myCo is my preferred Coordinator

Service Provider

business and operational properties

WS_{tm}

Service Requestor

.Policy

< WS_{tm} is a BusinessActivity>
< compensate WS_{tm} with cWS_{tm}>
< Coordinator is myCo >

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The Transactional Handshake – Binding Phase

Service Requestor

2

CoordinationContext

WS

Policy
- BA
- myCO
- cWS$_{tm}$

Service Provider

1

```
<CreateCoordinationContext …>
    …
    <CoordinationType>URI_to_BusinessActivity</CoordinationType>
    …
</CreateCoordinationContext>
```

3

BusinessActivityProtocol

Protocol Service

Coordinator myCo

Activation Service
ASmyCo

Registration Service
RSmyCo

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The Business Grid architecture

Service Domains

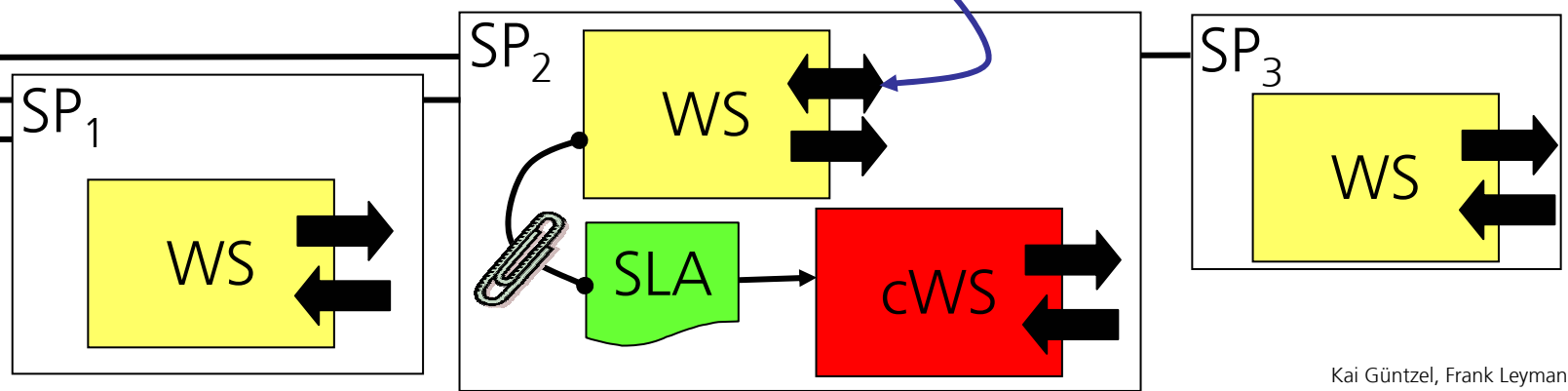# Providing business processes with a Business Grid

Service Requestor

A → C → D
A → B → D

BPEL process

Business Grid

Service Domain

GS GS GS

Loadbalancer

Process #1
...
Act. B@SP$_2$
...

Service Provider

SP$_1$
WS

SP$_2$
WS
SLA → cWS

SP$_3$
WS

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Opaque compensation of a business process

Service Requestor

A → C → D (BPEL process)
A → B → D

compensate

Business Grid

Service Domain

GS   GS   GS
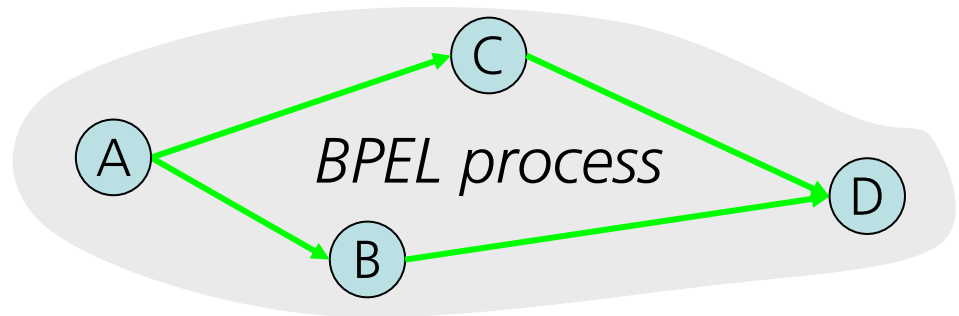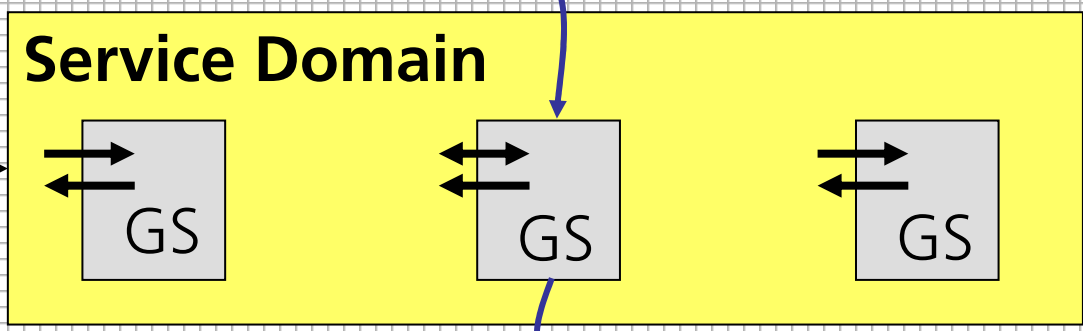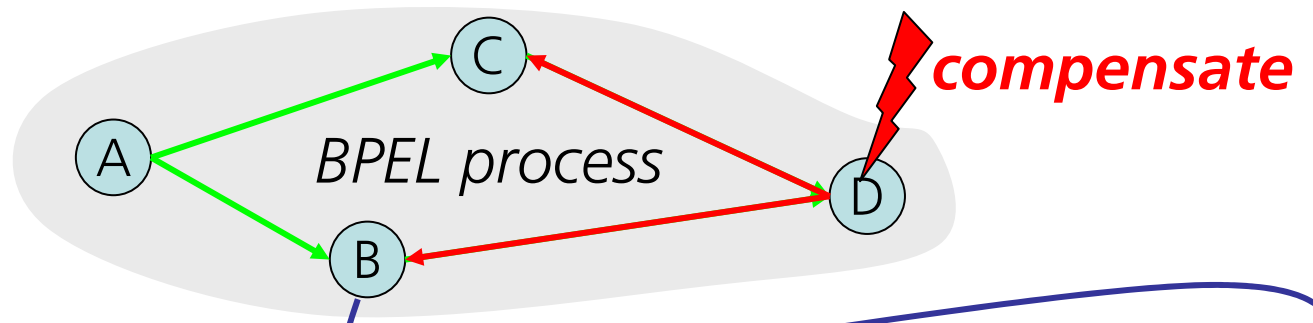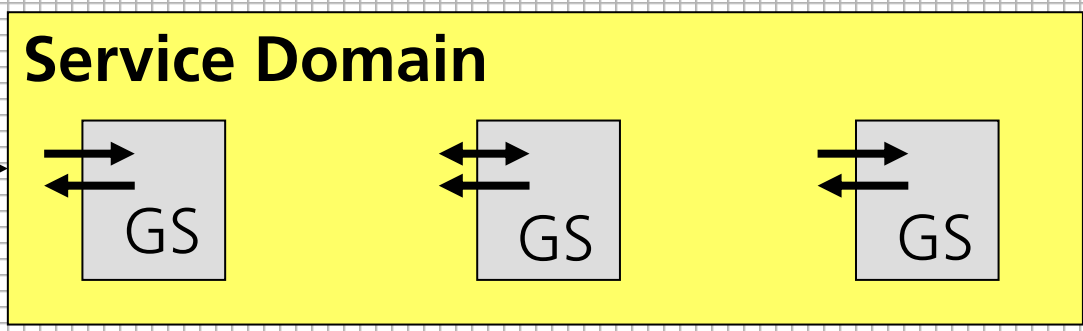
Process #1

...

Act. B@SP$_2$

...

Loadbalancer

Service Provider

SP$_2$

WS

SP$_1$

WS

SLA → cWS

SP$_3$

WS

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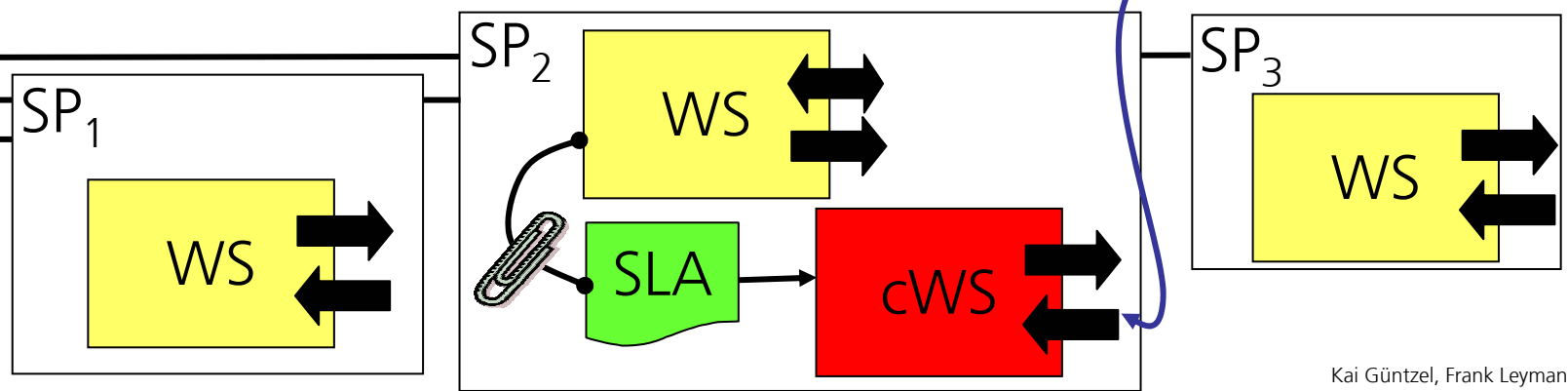
Integration of SAP R/3 in a Business Grid

- SAP R/3 functions, reports or processes (RFC, BAPI, IDOC) can be externalized as Web Services

- These Web Services often have to be explicitly committed by a special Web Service

- This information has to be propagated when providing these Web Services for code reuse, no matter if the Web Service will participate in WS-C or in a BPEL-process

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Conclusion and future work

- The Transactional Handshake facilitates the aggregation and composition of Web Services, especially in business processes

- The Business Grid architecture could be the middleware to outsource business processes as fine-grained services

- Business models have to be sketched

- End-user interaction for outsourced services has to be worked out

Thank you