



Services Foundation

Msc in Management - Services Science

Giovanna Di Marzo Serugendo

Giovanna.Dimarzo@unige.ch, room B 235, 022 379 00 72

University of Geneva

<http://cui.unige.ch/~dimarzo>



Lecture 3 / 4 / 5

Technologies for Services

- Interaction Modes (Publish /Subscribe)
- (SOA) / Mashups / Clouds
- Services Composition



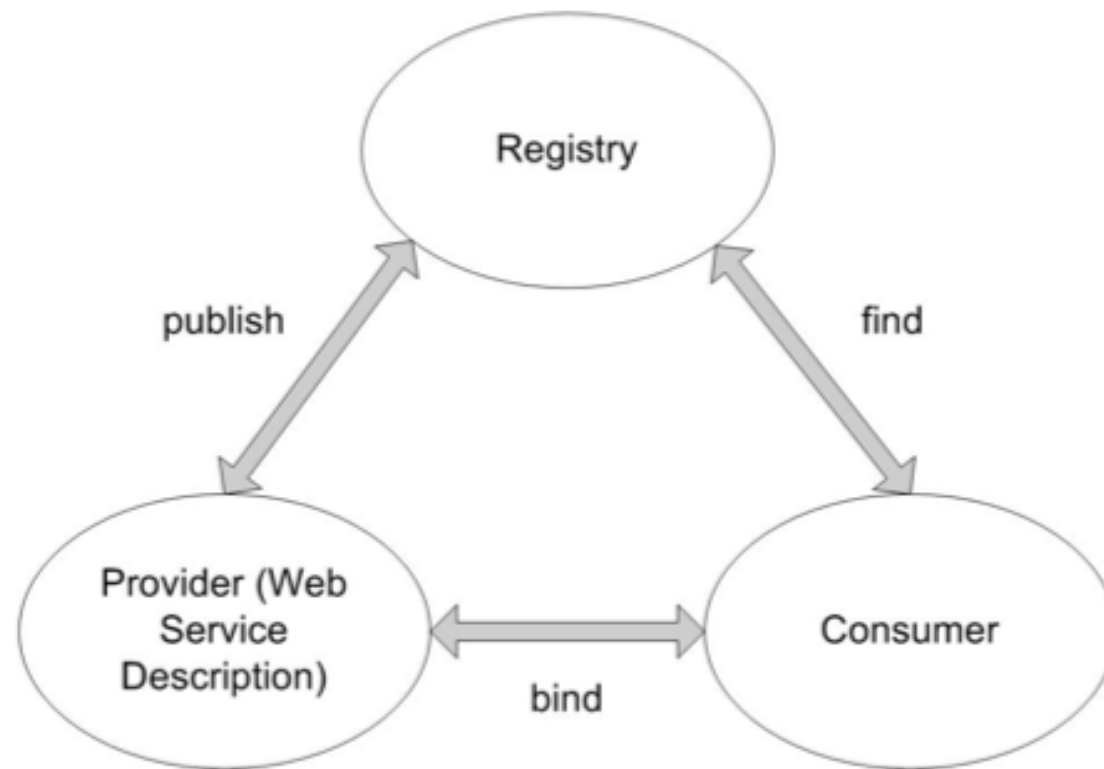
Lecture 5: Summary

Services Composition

- Static Services Composition
 - Orchestration
 - Choreography
- Dynamic Services Composition
 - Semantics
- Languages



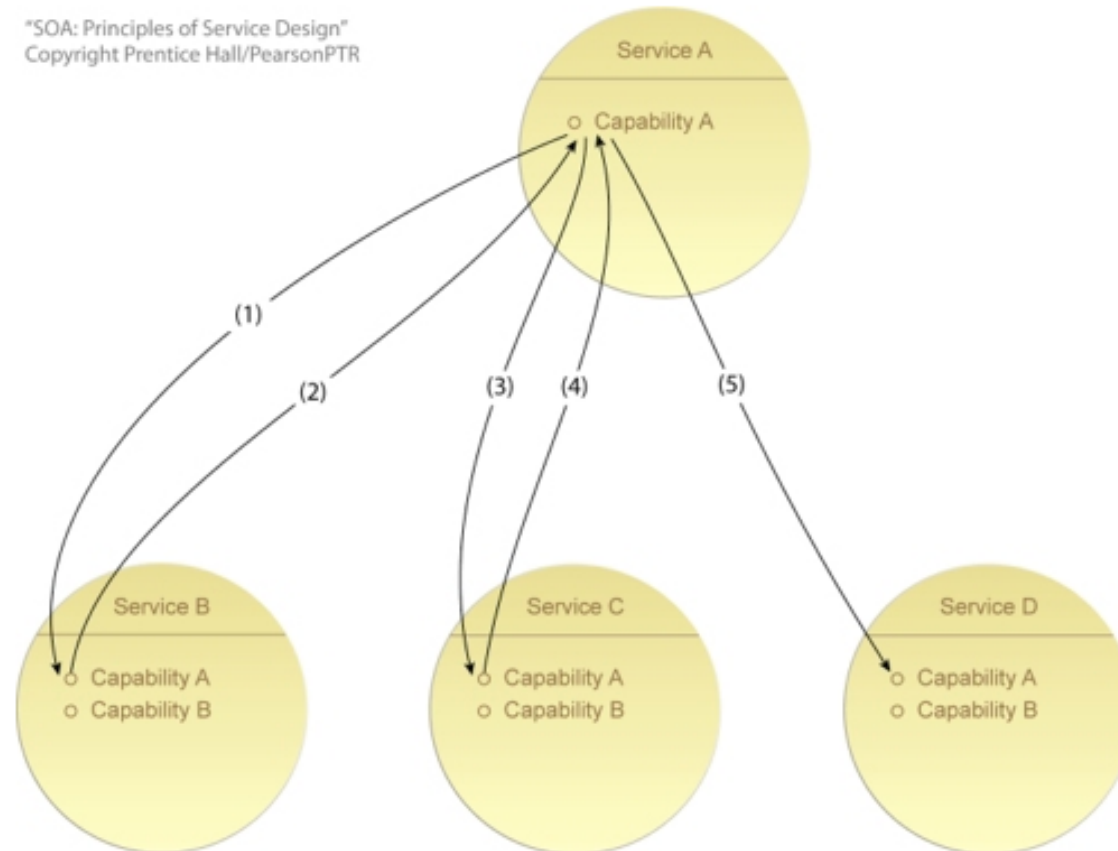
Service-orientation





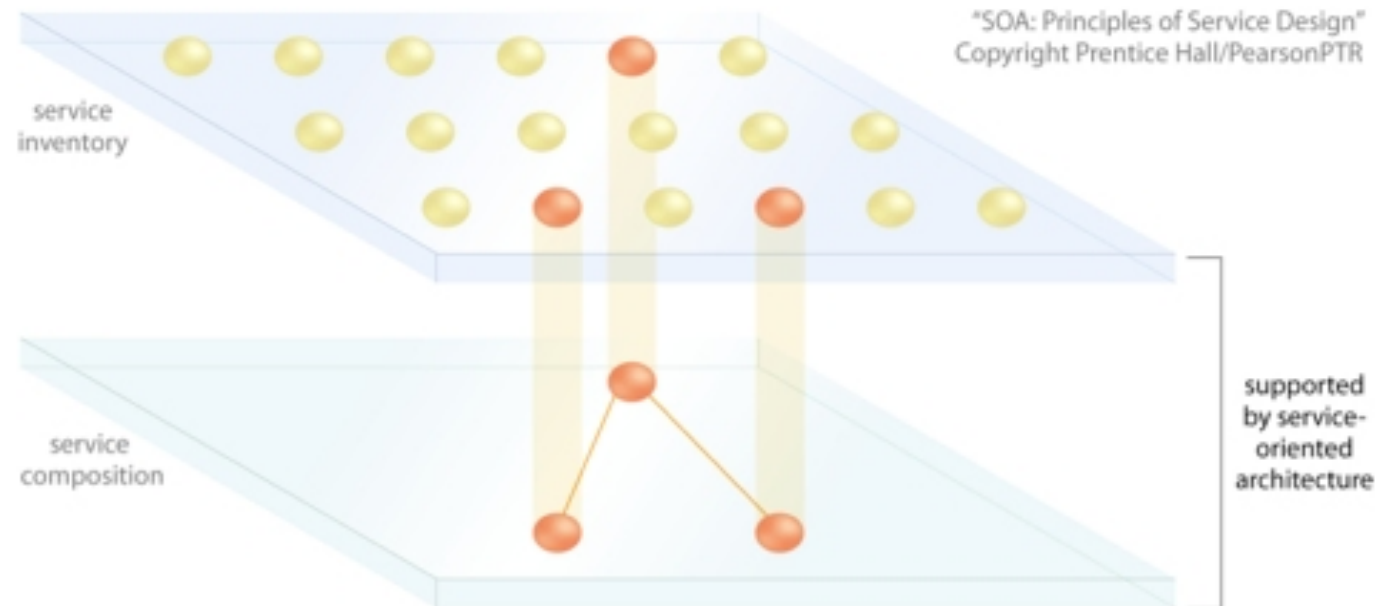
Service-orientation

"SOA: Principles of Service Design"
Copyright Prentice Hall/PearsonPTR



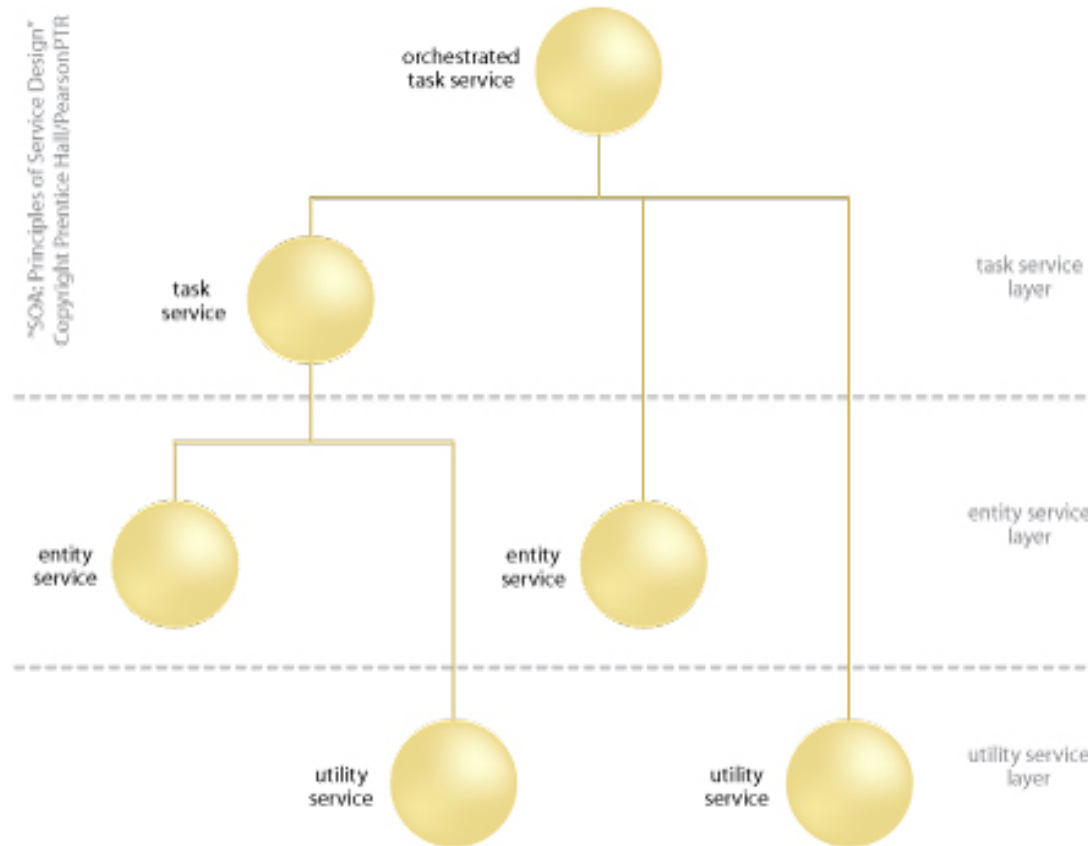


Service-orientation





Service-orientation





Service-orientation



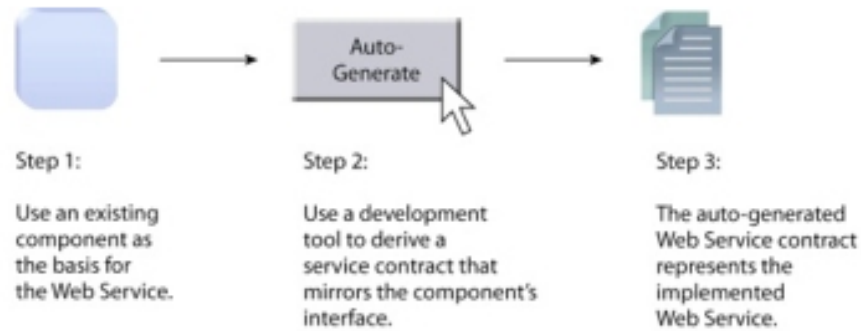
traditional projects
SOA projects



"SOA: Principles of Service Design"
Copyright Prentice Hall/PearsonPTR

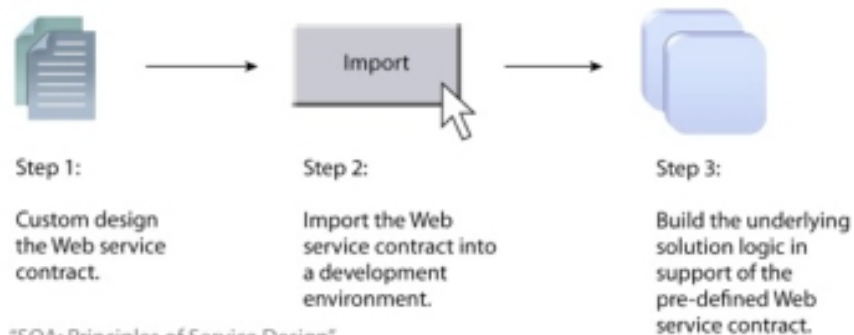


Service-orientation



traditional Web service development process

service-oriented Web service development process



"SOA: Principles of Service Design"
Copyright Prentice Hall/PearsonPTR



Service-orientation



Service Composition

Service-orientation design paradigm

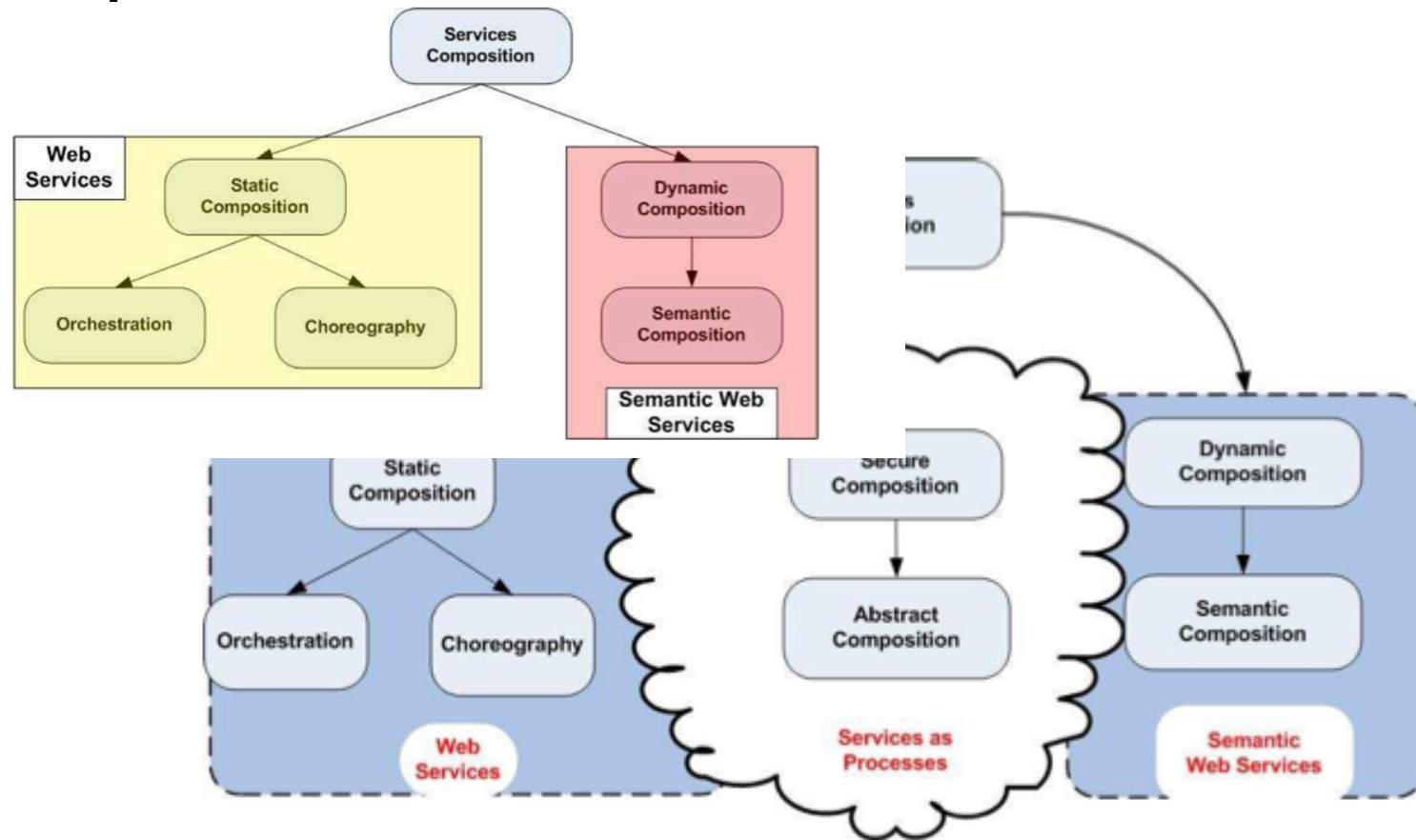
Motivation: reuse services, services are made of composed services, themselves made of services

A business process is automated by combining multiple services

Choreography is a type of service composition

Orchestration is a type of service composition

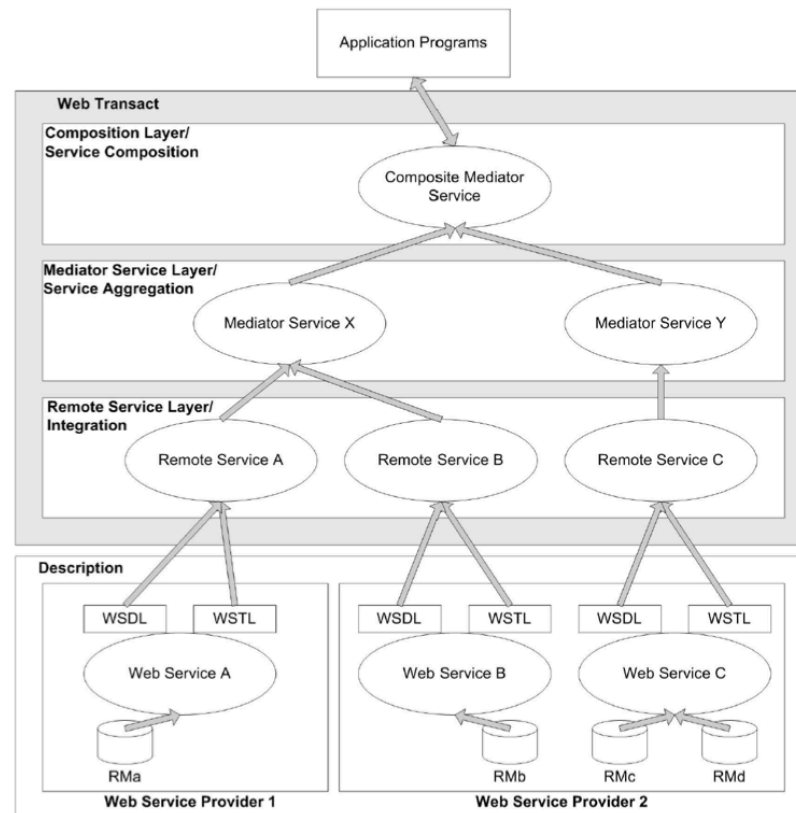
Service Composition



[terBeek]



Service Composition





Service Composition

Design considerations to encourage service reuse

- Different from “service providing a functionality” or different from “controller”
- Service contract
- Stateless
- Loose coupling
- Service autonomy



Service Composition

Principles

- Service contract
- Stateless
- Loose coupling
- Service autonomy



Service Choreography

Service choreography is a form of service composition in which the interaction protocol between several partner services is defined from a global perspective. The intuition underlying the notion of service choreography can be summarised as follows:

“Dancers dance following a global scenario without a single point of control”

That is, at run-time each participant in a service choreography executes its part of it (i.e. its *role*) according to the behavior of the other participants. A choreography's role specifies the expected messaging behavior of the participants that will play it in terms of the sequencing and timing of the messages that they can consume and produce



Service Choreography

Service choreographies are not executed: they are *enacted*.

A service choreography is enacted when its participants execute their roles^[5]. That is, unlike

Service orchestration, service choreographies are not run by some engine on the service infrastructure, but they “happen” when their roles are executed. This is because the logic of the service choreography is specified from a global point of view, and thus it is not realized by one single service like in service orchestration.



Service Choreography

Roles

Skeletons

Realisable

Examples



Services Choreography Languages

Web Services

Web Service Choreography Description Language (WS-CDL) is a XML-based specification from the W3C for modelling choreographies using constructs inspired by Pi calculus

Web Service Choreography Interface (WSCI) is an XML-based specification that was put forward to the W3C by Intalio, Sun Microsystems, BEA Systems and SAP AG, and that served as input to the Web Service Choreography Description Language (WS-CDL)



Principles

Service choreographies specify message-based interactions among participants from a global perspective. In the same way as [programming languages](#) can be grouped into [programming paradigms](#), service choreography languages can be grouped in ``styles^[19]:

Interaction Modelling: the logic of the choreography is specified as a workflow in which the activities represent the message exchanges between the participants ^[20] (for example [Web Service Choreography Description Language \(WS-CDL\)](#) and Let's Dance^[8])

Interconnected Interfaces Modelling: the logic of the choreography is split across its participants through the roles they play (i.e. their expected messaging behavior). The roles are connected using message flows, channels, or equivalent constructs^[21] (this is for example the case of BPEL4Chor^[9])



Choreography vs Orchestration

Service choreography

- the logic of the message-based interactions among the participants are specified from a global perspective.
- Language: WS-CDL
- Cf web site below to see how it works

Service orchestration

- logic is specified from the local point of view of one single participant, called the *orchestrator*
- language [BPEL](#): the specification of the service orchestration (e.g. the [BPEL](#) process file) can be deployed on the service infrastructure (for example a [BPEL](#) execution engine like [Apache ODE](#)). The deployment of the service orchestration specification creates the composed service.
- Cf ws-bpel.pdf



Service Orchestration

More explanation



Choreography vs Orchestration

Orchestration: Executable Process

Web Service Orchestration relates to the execution of specific business processes. WS-BPEL is a language for defining processes that can be executed on an orchestration engine.

Choreography: Multi-party Collaboration

Web Service Choreography relates to describing externally observable interactions between web services. WS-CDL is a language for describing multi-party contracts and is somewhat like an extension of WSDL: WSDL describes web services interfaces, WS-CDL describes collaborations between web services.



Choreography vs Orchestration

From service choreography to orchestrations and back

- The roles of a service choreography can be extracted as service orchestrations through a process called *projection* [\[4\]](#). Through projection it is possible to realize *skeletons*, i.e. incomplete service orchestrations that can be used as baselines to realize the web services that participate to the service choreography.
- On the other hand, already existing service orchestrations may be composed in service choreographies.



Dynamic Service Composition

Cf paper survey



Summary

Orchestration

- ..

Composition

- ..



Recommended Reading

http://en.wikipedia.org/wiki/Service_choreography