

# TOWARDS A TAXONOMY OF WEB SERVICE COMPOSITION APPROACHES

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# AGENDA

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# Motivation

## Service-oriented architecture (SOA)

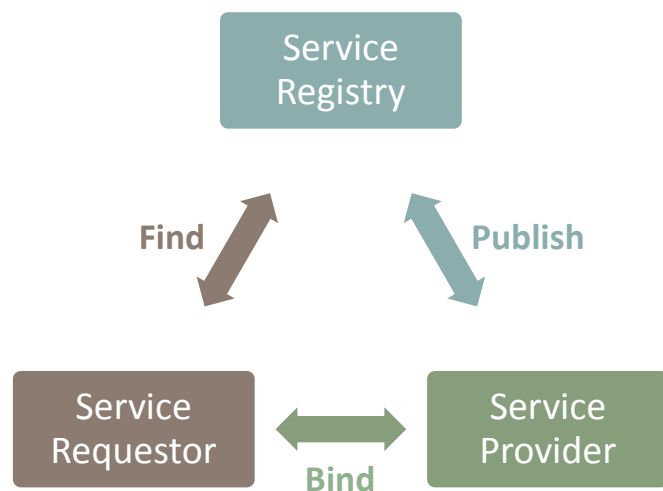
**OASIS:** SOA is as a paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains

- ❑ Increased maintainability and scalability
- ❑ Less development efforts
- ❑ Decreased cost of development

## Challenges of web service composition

- ❑ Need of complex functionality satisfying specific business goal
- ❑ Need of service composition middleware in terms of abstractions and infrastructure
- ❑ Lack of support in conventional middleware for description of web services functionality, interfaces and protocols

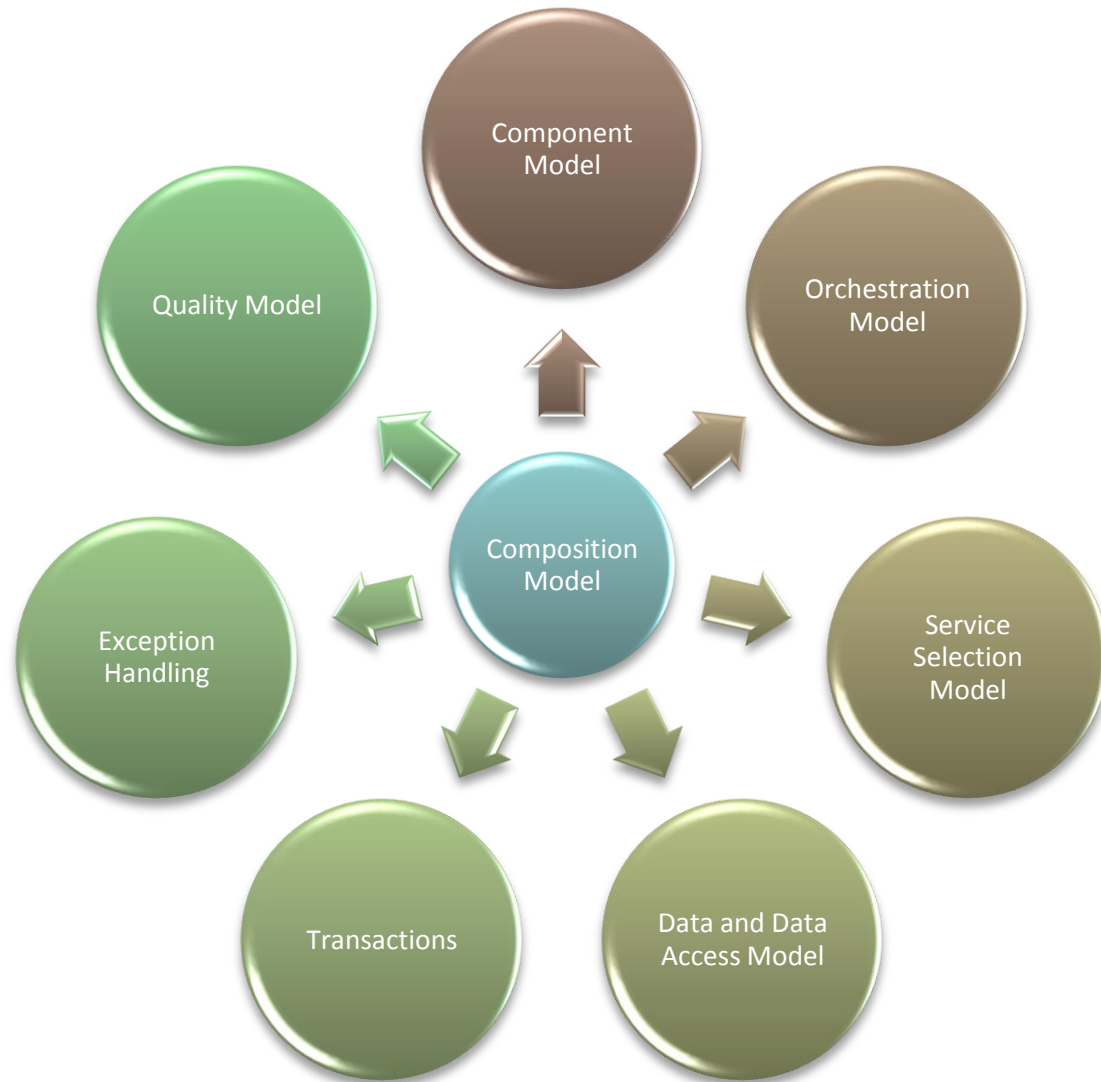
## Web services as a model for SOA implementation



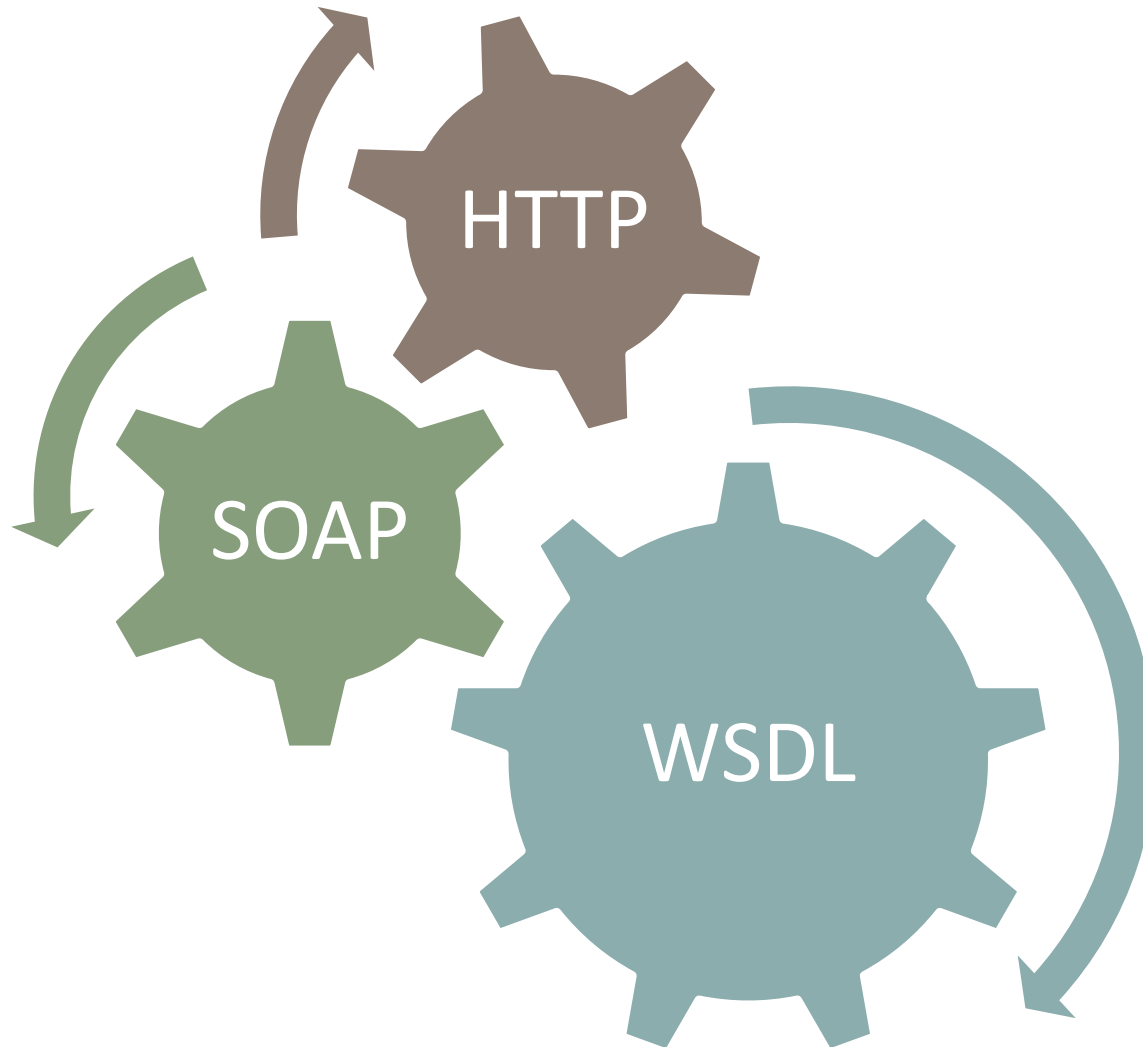
## Elements of web service composition middleware

- ❑ Composition model and language
- ❑ Development environment
- ❑ Run-time environment

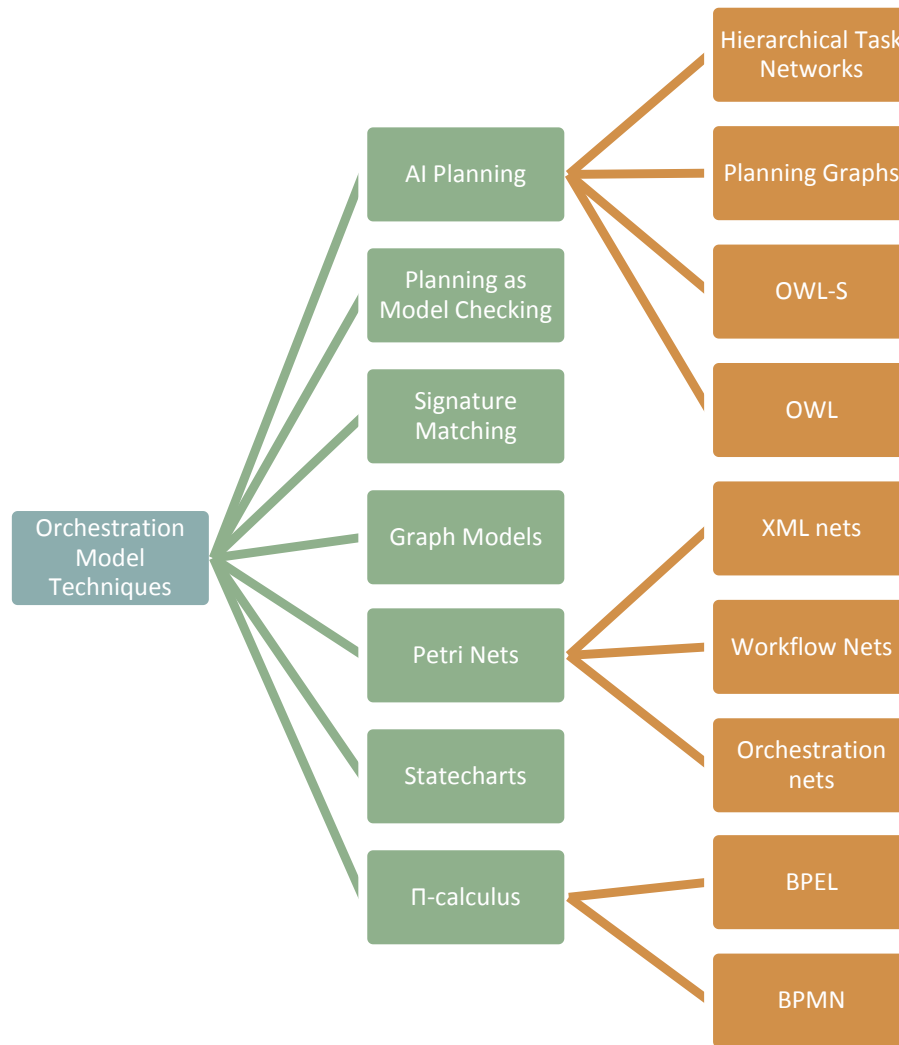
# Composition model



# Component Model



# Orchestration Model



# TRANSACTIONS

June 6-9, 2011

2nd Workshop on Software Services: Cloud Computing and  
Applications based on Software Services, Timisoara

# Data and Data Access Model

- Possible solutions for data transfer
  - Blackboard approach
  - Explicit data flow approach
- Sample solutions
  - Using data type definitions from XML schema to solve the problem with message passing
  - Checking similarity of an output and input parameter of web service activities according to preliminary defined rules using OWL

# Exception Handling

## □ Possible solutions

- Using conditional branch that checks the result from invocation of an activity for failures or timeout
- Association of exception handling logic to an activity or group of activities
- Using rule based languages

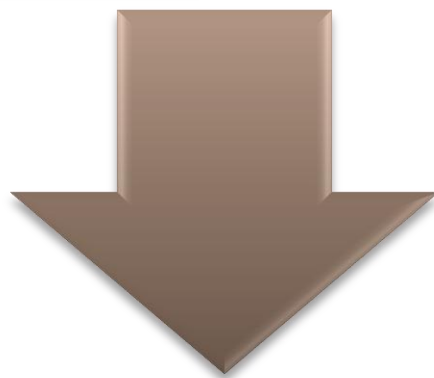
## □ Sample solutions

- Computation Tree Logic
- Global planning approach

# Service Selection Model



Dynamic  
Binding



Static  
Binding

# Quality Model

- Some approaches rely on additional standards like SLA and OWL-S in order to enrich the composition model with QoS and semantic data.

| Ref. | All QoS properties | Response time | Throughput | Execution price | Reliability | Availability | Reputation |
|------|--------------------|---------------|------------|-----------------|-------------|--------------|------------|
| [2]  | √                  |               |            |                 |             |              |            |
| [3]* |                    | √             |            |                 |             |              |            |
| [8]  | √                  |               |            |                 |             |              |            |
| [9]  | √                  |               |            |                 |             |              |            |
| [10] |                    | √             | √          |                 |             |              |            |
| [11] |                    | √             |            | √               |             |              |            |
| [12] | √                  |               |            |                 |             |              |            |
| [14] | √                  |               |            |                 |             |              |            |
| [15] |                    | √             |            | √               | √           | √            | √          |
| [17] | √                  |               |            |                 |             |              |            |

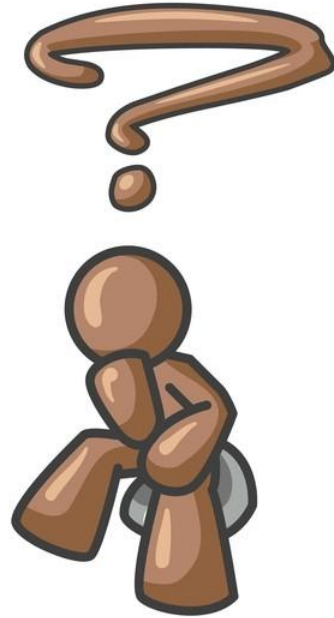
\* The QoS properties are not defined. A sample dealing with Response time is presented.

# Comparison results

| Ref. | OM       | CM              | QM | T | DDAM | EH | SSM | TS |
|------|----------|-----------------|----|---|------|----|-----|----|
| [2]  | BPMN     | WSDL            | ●  | ○ | ◎    | ●  | ●   | ●  |
| [3]  | BPEL     | WSDL            | ◎  | ○ | ○    | ○  | ●   | ●  |
| [4]  | PG       | WSDL            | ○  | ○ | ○    | ○  | ○   | ●  |
| [5]  | PMC      | WSDL            | ○  | ○ | ○    | ●  | ●   | ●  |
| [6]  | AIP      | OWL-S, OWL      | ○  | ○ | ○    | ○  | ○   | ●  |
| [7]  | OWL-S    | SWRL            | ○  | ○ | ●    | ○  | ○   | ●  |
| [8]  | WS-BPEL  | WSDL, SLA       | ●  | ○ | ◎    | ○  | ○   | ○  |
| [9]  | GM       | WSDL, UDDI      | ●  | ◎ | ○    | ◎  | ○   | ●  |
| [10] | GM       | WSDL, WSLA, OWL | ◎  | ○ | ○    | ○  | ○   | ●  |
| [11] | S        | OWL-S or SAWSDL | ◎  | ○ | ●    | ○  | ○   | ●  |
| [12] | HTN      | OWL-S           | ●  | ○ | ○    | ○  | ●   | ●  |
| [13] | PMC      | WSDL            | ○  | ○ | ●    | ●  | ●   | ●  |
| [14] | AIP      | WSDL            | ●  | ○ | ○    | ○  | ●   | ●  |
| [15] | S        | WSDL, SLA       | ◎  | ○ | ○    | ●  | ●   | ●  |
| [16] | SM       | WSDL, UDDI      | ○  | ○ | ○    | ○  | ○   | ●  |
| [17] | XML Nets | OWL-QoS         | ●  | ○ | ●    | ○  | ●   | ○  |
| [18] | HTN      | OWL-S           | ○  | ○ | ○    | ○  | ○   | ●  |
| [19] | OWL      | WSDL            | ○  | ○ | ●    | ○  | ○   | ●  |

Legend: ● Consider ◎ Partially consider ○ Do not consider

# CONCLUSION



THANK YOU FOR YOUR ATTENTION!

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