

### Introduction

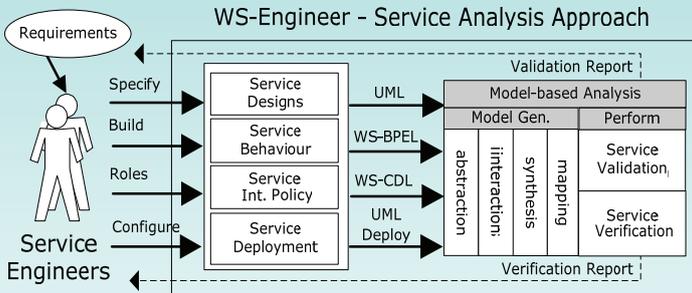
• **LTSA WS-Engineer** provides tool support for a model-based approach to verifying compositions of service architecture, behaviour and deployment configurations. The tool supports **verification of properties** created from design specifications and implementation models to analyse correctness and consistency of service compositions. **LTSA WS-Engineer** supports verification of service compositions with design (in the form of MSCs), interactions (between multiple services), choreography (in the form of WS-CDL) and deployment models (in the form of xADL2 or UML2).

### The Problem

• With a **service-oriented architecture** the focus is on interaction with multiple service partners and specifying the correct behavior can be complex depending on the requirements of the partner services. Complexity arises in assuring service compositions are implemented correctly, in terms of **behavioural obligations, architecture and deployment** configurations, as part of an overall service choreography.

### The Approach

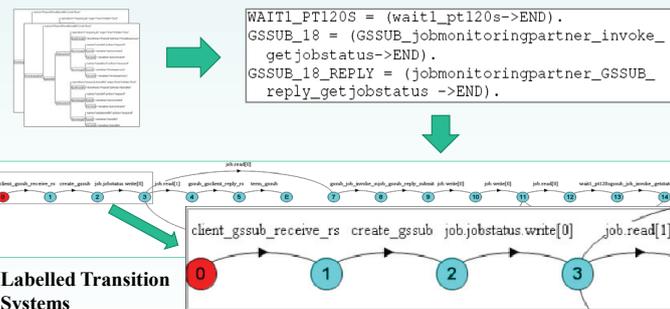
- The **WS-Engineer approach** takes requirement specifications and service composition implementations, and builds formal models of the behaviour specified in these requirements.
- Using **formal model checking** techniques the compositions models can be verified and validated for correctness and consistency.



• Each specification and implementation is translated in to the **Finite State Process (FSP)** notation. FSP is based upon the Concurrent Sequential Process (CSP) algebra and is designed to be easily machine readable. FSPs can be compiled in to **Labelled Transition Systems (LTSs)** using the **LTSA** tool – which is built in to WS-Engineer.

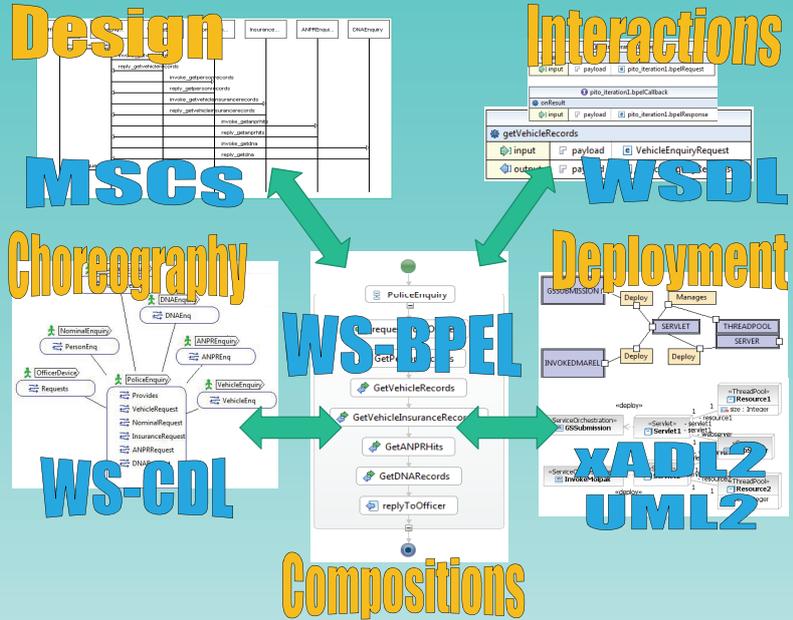
#### Models, Code etc

#### Finite State Process (FSP)



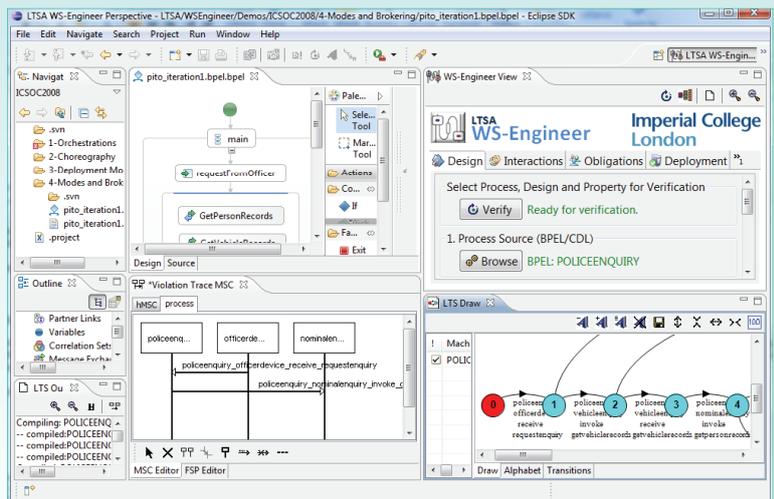
• Comparing these models provides **traces to any violations** in properties over either the design or implementation.

### Verification Features



### The Tool

- Built on the **Eclipse IDE** and integrated in to other software engineering tools e.g. **IBM Rational Software Architect**.
- WS-Engineer includes the **Labelled Transition System Analyser** (built at Imperial College London) for model checking Service Compositions.
- Freeware - available at: [www.ws-engineer.net](http://www.ws-engineer.net)



### Related Publications

- H.Foster, S.Uchitel, J.Magee, J.Kramer, **Model-Based Verification of Web Service Compositions**, ASE 2003, Montreal, Canada
- H.Foster, S.Uchitel, J.Magee, J.Kramer, **Compatibility Verification for Web Service Choreography**, ICWS 2004, San Diego, CA.
- H.Foster, M.Hu, et al, **Using a Rigorous Approach for Engineering Web Service Compositions: A Case Study**, SCC 2005, Orlando, FL.
- H.Foster et al, **Model Checking Service Compositions under Resource Constraints**, ESEC/FSE 2007, Dubrovnik, Croatia.