**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 analyze 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 **behavioral 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 behavior specified in these requirements.
- Using **formal model checking** techniques the compositions models can be verified and validated for correctness and consistency.

**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)

**Finite State Process (FSP)**

- Each specification and implementation is translated into 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 into **Labelled Transition Systems (LTSs)** using the LTSA tool – which is built into WS-Engineer.

**Related Publications**

- H. Foster, S. Uchitel, J. Magee, J. Kramer, **Model-Based Verification of Web Service Compositions**, ASE 2003, Montreal, Canada.