SCIENCE*SPRING*DAY

DEPARTAMENTO DE INFORMÁTICA

Structured Dynamic Systems

Computer Systems

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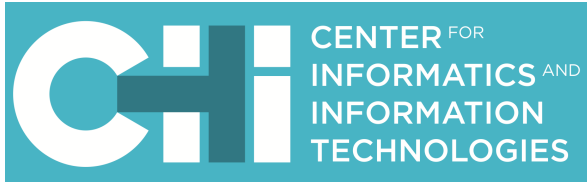
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Objectives

Runtime adaption is a pressing need for distributed/parallel systems across many areas, e.g. to accommodate systems' changes (e.g. new resources), real-time data, or novel user requirements. Examples range from large scale scientific simulations (e.g. weather forecast) requiring the inclusion of fresh sensing data, to urban traffic intelligent transport support systems (ITSS) providing users with real-time reduced time/cost travelling plans.

Due the inherent complexity of such dynamic systems, the objective is to supply structured/well-defined automatic adaptation capabilities helping providing those systems with autonomic properties (e.g. self-configuration, self-healing).

Methodology

The former inclusion of pattern templates/operators in a component/service based workflow system allowed a structured application specification (via pattern composition) and its structured ("per-pattern"), automatic, execution/dynamic adaptation[1]. Patterns may represent expert/proven knowledge or recurrent events.

The specification of structured/pattern-based dynamic interaction models on (web) service access allows a QoS based automatic adaptation triggered by context modifications, e.g. switching from a Publish/Subscriber to a Streaming model dependent on precipitation sensing data [2].

A session abstraction contextualizes and reuses (rule-based) service/data access and aggregation via dynamic interaction models [3].

Expected Results

To provide applications in the area of dynamic data driven applications and systems with contex-based dynamic interaction models capabilities, in order to support automatic runtime QoS adaptability.

To use structured/pattern-based automatic dynamic reconfiguration mechanisms in traffic operations elements, like route guidance systems or managed lanes, in the context of the Autonomic Road Transport Systems (ARTS) project.
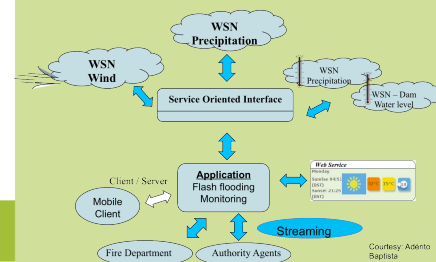
To capitalize on the international experience within ARTS on autonomic properties and systems applied to the ITSS domain.

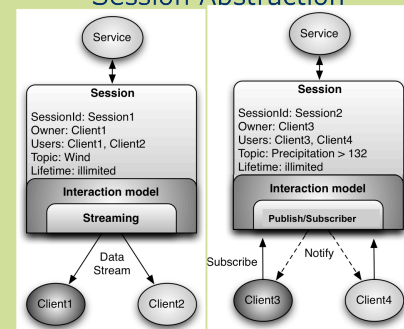### Galaxy Formation Example
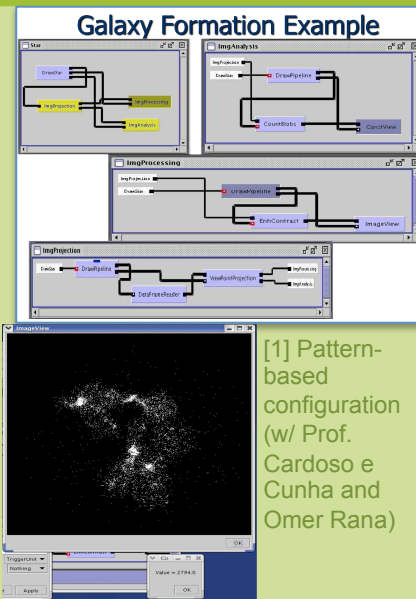
[1] Pattern-based configuration (w/ Prof. Cardoso e Cunha and Omer Rana)

Example – Flash Flooding Events

[2] Dynamic interaction models (w/ Prof. Hervé Paulino)

Session Abstraction

[3] Session abstraction (w/ Prof. Hervé Paulino)