



# Software Engineering

new challenges, some solutions

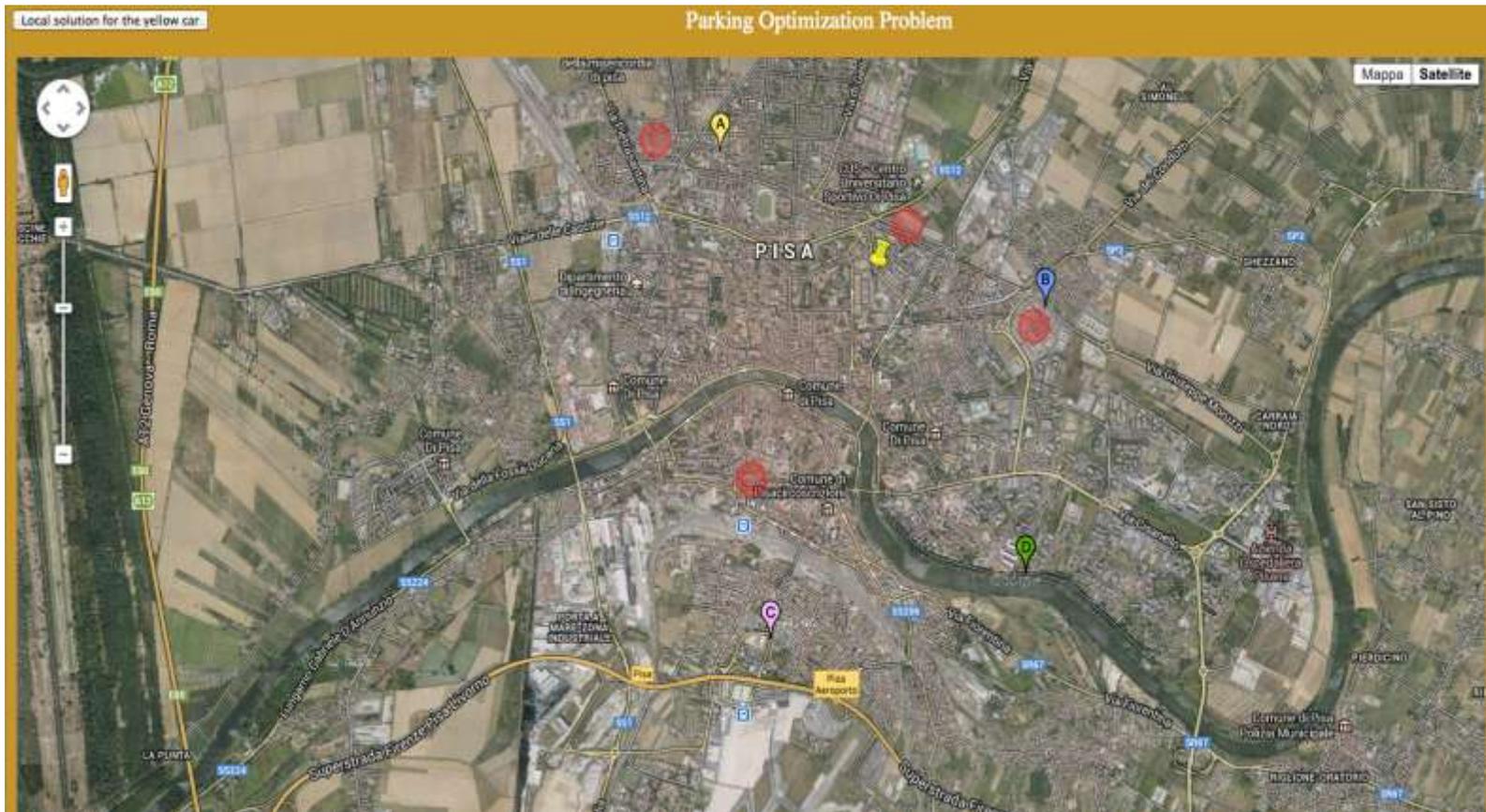
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# Software for E-Mobility

- ASCENS European project about programming self-aware, self-adaptive and self-expressive autonomic systems.
- Collaboration with Volkswagen about intelligent interaction between electric vehicles and services



Local: optimal parking slot

Global: optimal parking allocation



# New Challenges for Sw Engineering

## Classical waterfall model of SE

- top-down development methodology
- clear distinction between design time and run time
- purely procedural semantics

## Innovative application domains

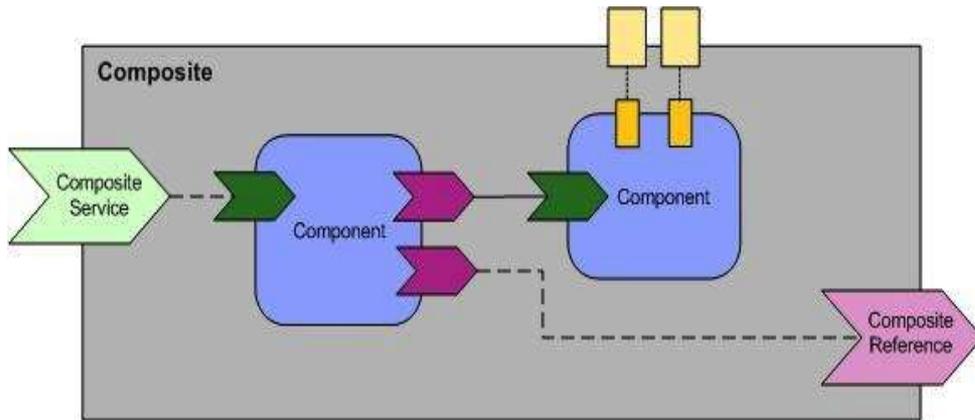
- service oriented architectures: inherently distributed, asynchronous, session-based systems
- adaptive workflows
- autonomic systems: adapting to unpredictable changes while hiding intrinsic complexity

## Key features

- open endness
- forever yours: eternal systems
- procedural vs. declarative knowledge: new procedural behavior derived from general knowledge when needed

New theories and new methodologies for innovative applications

# Service Oriented Architectures



## Some challenges

- Session management
- QoS contract negotiation
- Long-running transactions
- Inherently distributed, asynchronous

## Enabling methods and techniques

- Negotiate, commit, execute:
  - amalgamate static and dynamic verification
- Effective infinite state verification
- Local and global optimization



# Adaptive Workflows



## Some challenges

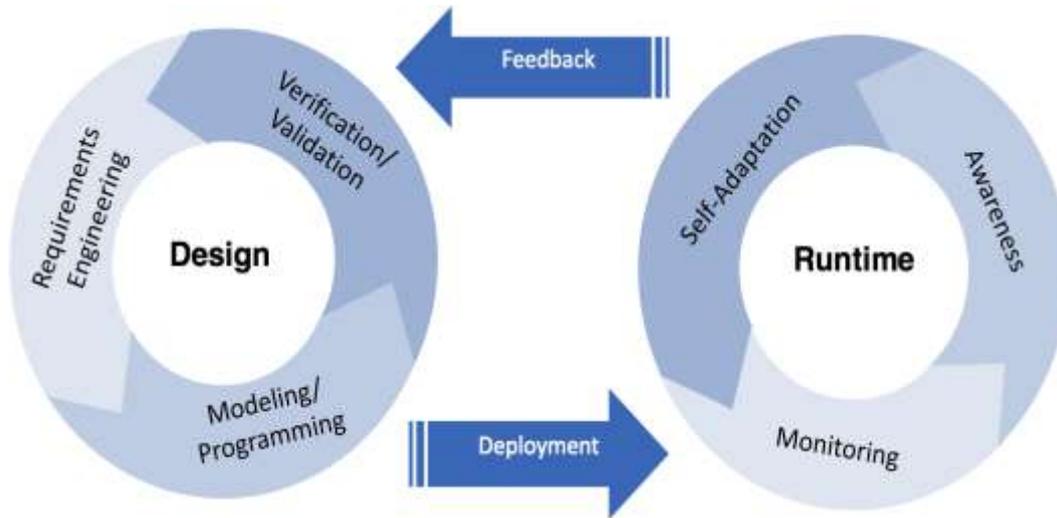
- Coordination policies enforcement
- Replaceability of activities
- Human involvement
- Process mining

## Enabling methods and techniques

- Event-condition-action policy specification
- Java event-based middleware
  - formally designed and verifiable workflows
- On-the-fly consistency verification
- Event logs conformance and performance checking

# Autonomic Systems

## ASCENS Ensemble Development Life Cycle



## Some challenges

- Self-\* behaviours
- Design at Runtime
- Adaptivity
- Non-functional requirements.

## Enabling methods and techniques

- Statistical model checking
- Continuous software life cycle
- Knowledge management for awareness
- Local and global optimization