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<b>Project Title</b>	IRCSET / CSET1 Project: <b>Engineering Autonomic Systems with ASSL</b>

## Objectives

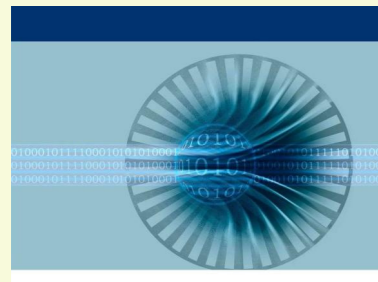
- ❑ Provide the IT community with a powerful framework for autonomic system development.
- ❑ Develop with ASSL autonomic systems and evaluate their self-managing features under simulated conditions.
- ❑ Enhance ASSL with mechanisms for software verification.

## Research Challenges

- ❑ Develop and validate *autonomic computing systems*.
- ❑ Prototype NASA missions capable of self-management.
- ❑ Develop a model-checking mechanism for ASSL.
- ❑ Self-regulation and complexity hiding.

## Publications, Impact & Joint Work

- ❑ Over 40 publications; citations 175; H-Index: 9.



- ❑ NASA; ASCENS, FP7 project; Concordia University, Canada; University of St. Andrews, UK; University of Potsdam, Germany.

Emil Vassev. **ASSL: Autonomic System Specification Language - A Framework for Specification and Code Generation of Autonomic Systems**. LAP Lambert Academic Publishing, Germany, November 2009.

## ASSL (Autonomic System Specification Language)

AS	AS service-level objectives	
	AS self-management policies	
	AS architecture	
	AS actions	
	AS events	
	AS metrics	
ASIP	AS messages	
	AS channels	
	AS functions	
AE	AE service-level objectives	
	AE self-management policies	
	AE friends	
	AEIP	AE messages
		AE channels
		AE functions
		AE managed elements
	AE recovery protocols	
	AE behavior models	
	AE outcomes	
	AE actions	
AE events		
AE metrics		

```

ASSL_MANAGEMENT {
  SELF_HEALING {
    FLUENT inLosingSpacecraft {
      INITIATED_BY { EVENTS.spaceCraftLost }
      TERMINATED_BY { EVENTS.earthNotified }
    }
  }
  MAPPING {
    CONDITIONS { inLosingSpacecraft }
    DO_ACTIONS { ACTIONS.notifyEarth }
  }
} // ASSL_MANAGEMENT
    
```

- ❑ A framework for formal specification, verification and code generation of autonomic systems (ASs):

- special formal notation defined via formalization of tiers;
- toolset that allows specifications to be edited, validated, and Java code generated.

- ❑ Considers ASs as composed of autonomic elements (AEs) communicating over interaction protocols.

## Prototyping NASA Space Missions with ASSL

Develop experimental models for NASA missions with ASSL:

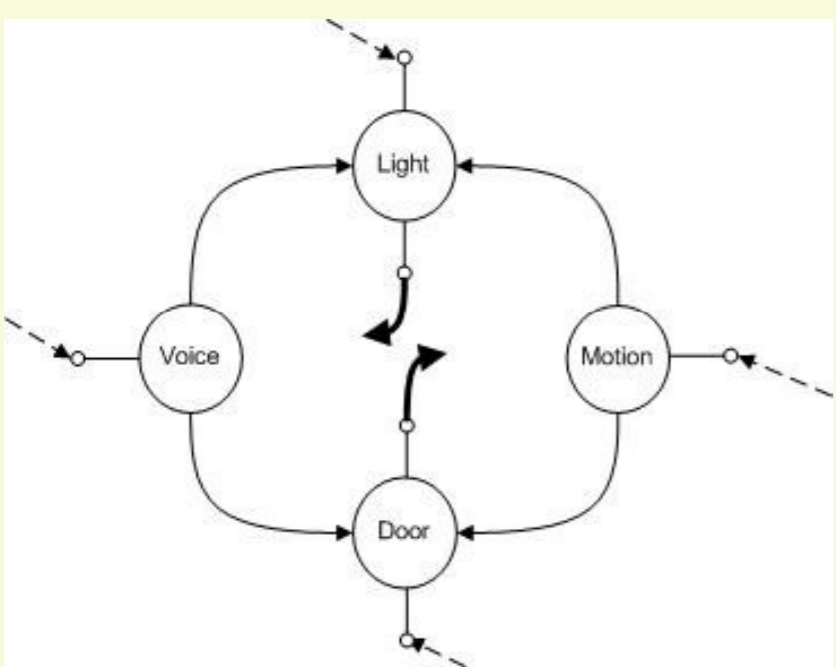
- ❑ NASA ANTS – *self-healing, self-scheduling, and self-configuring*;
- ❑ NASA Voyager – autonomic image-processing behaviour.



### Benefits for Space Missions

- ❑ Higher levels of assurance regarding correctness.
- ❑ Compare actual missions with hypothesized alternatives employing autonomic features.
- ❑ Gradually construct models for more realistic missions.

## Home Automation Sensor Networks with ASSL

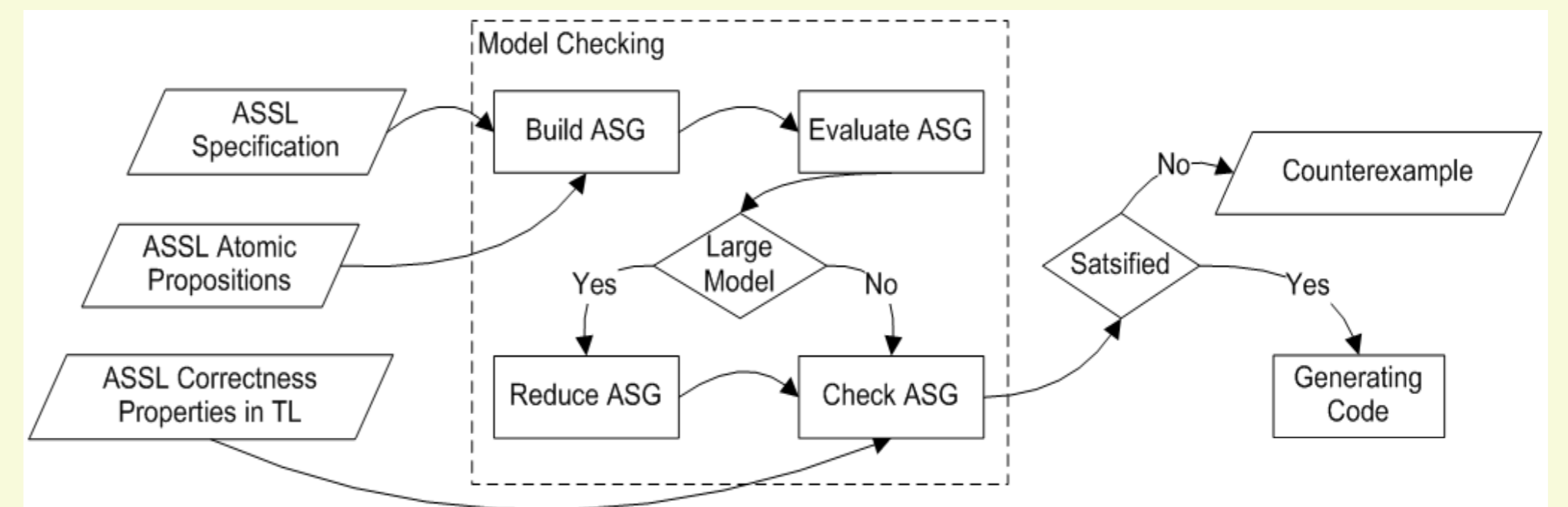


Develop prototype models for wireless sensor networks controlling home environment. Experiments under simulated conditions; smooth transition from a prototype system to a real one.

## Pattern Recognition Systems with ASSL

Develop self-managing autonomic properties for DMARF (Distributed Modular Audio Recognition Framework).

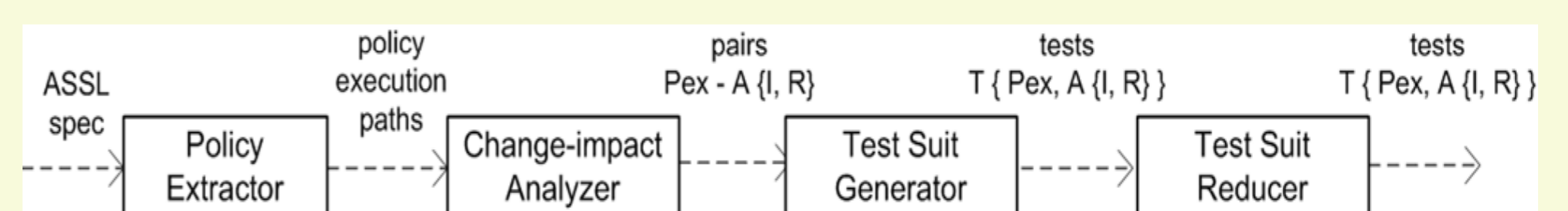
## Model Checking with ASSL



Develop verification techniques for ASSL that handle logical errors:

- ❑ Built-in model checking mechanism for ASSL;
- ❑ Post-implementation model checking with NASA's Java Pathfinder;
- ❑ Map ASSL specifications to graphs supporting reverse model checking;

## Automatic Test Case Generation with ASSL



Test-generator tool based on change-impact analysis:

- ❑ allows for post-implementation software verification;
- ❑ automatically generates high-quality test suites for self-managing policies.