# Malina Software Corp. – Principal Research Initiatives

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**Malina Software Crop.**

# Primary Research Initiatives

- **Commissariat a l'Energie Atomique (CEA) – FRANCE**
  - Laboratoire LIST-LISE
  - Methods and Standards for Modeling and Analysis of Real-Time and Embedded Systems

- **Simula Research Laboratory – NORWAY**
  - CERTUS Centre
  - Methods for model-based specification of complex integrated control systems

- **Network for Engineering of Complex Software-Intensive Systems for Automotive Systems (NECSIS) – CANADA**
  - Model-based methods and technologies for the development of automotive systems

- **University of Sydney – AUSTRALIA**
  - Model-based engineering for business process modeling
  - Fault-tolerance for high-performance computing

# Simula Research

- **Research institute created by the Norwegian Ministry of Education and Research**

- **Objectives:**

  - Basic and long-term research in networks, distributed systems, scientific computing, and software engineering

  - Promote the application of research in public and private sectors

  - Educate students at master's, doctoral, and post-doctoral levels

- **Various research domains**

  - Software estimation, cardiac modeling, biomedical computing, computational geoscience, networks, media

  - Certus centre: software V&V

# CERTUS

- **Purpose:**
  - Develop new and improved methods and tools for modeling, certifying, and testing of critical software systems

- **Supported by:**
  - The Research Council of Norway and its Centre for Research-Based Innovation

- **Established in September 2011**
  - 8-year mandate (2011-2019)
  - ~10 MNOK/year (~US$ 1.75M/year)
  - 7 permanent scientists, 7 PhD students, 4 adjunct researchers

- **Initiated by Prof. Lionel Briand (U. of Luxembourg) and led by Dr. Arnaud Gotlieb**

# CERTUS Industry Partners

- **All research projects are industry driven:**
  - CISCO Systems Norway
  - ESITO
  - FMC Technologies
  - KONGSBERG Maritime
  - TOLL customs and excises

# CERTUS Technical Strategy

- **Use of model-based engineering (MBE) methods, tools, and standards**

- **Current focus on**

  - Certification and verification of real-time and embedded software

  - Modeling, configuring, and testing of complex product families

  - Automated testing of data-intensive software systems

- **OMG industry standards used:**

  - Unified Modeling Language (UML)

  - Modeling and Analysis of Real-time and Embedded Systems (MARTE) – a UML profile

  - Systems Modeling Language (SysML)

# NECSIS

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- **An industry-academia collaborative research project to develop new model-based methods and technologies for automotive software development**

- **Funded by Automotive Partnership Canada**

- **Duration: 2010-2016**

- **Budget: C$15.5M over 5 years (~C$3M/yr)**

- **Industrial participants:**
  - GM Canada, IBM Canada, Malina Software Corp.

- **Academic participants:**
  - U. of Victoria, U. of British Columbia, U. of Waterloo, McMaster U., U. of Toronto, Queen's U., McGill U., CRIM-Montreal

# NECSIS Structure

- **Theme 1: Capturing and Sharing Knowledge**

  - Domain-specific abstractions and notations

  - Cognitive support for developers

  - Distributed collaborative development

  - Model visualization

- **Theme 2: Reasoning Analysis and Transformation**

  - Model management

  - Automated (formal) model analysis

  - Model testing and simulation

  - Model transformations

- **Theme 3: Uncertainty, Adaptibility, and Variability**

  - Feature-oriented modeling

  - Flexible architectures

  - Software product-line engineering

- **Theme 4: Process and Practice**

  - Relationships between models

  - Cross-cutting concerns (e.g., safety))

  - Data and semantic integration
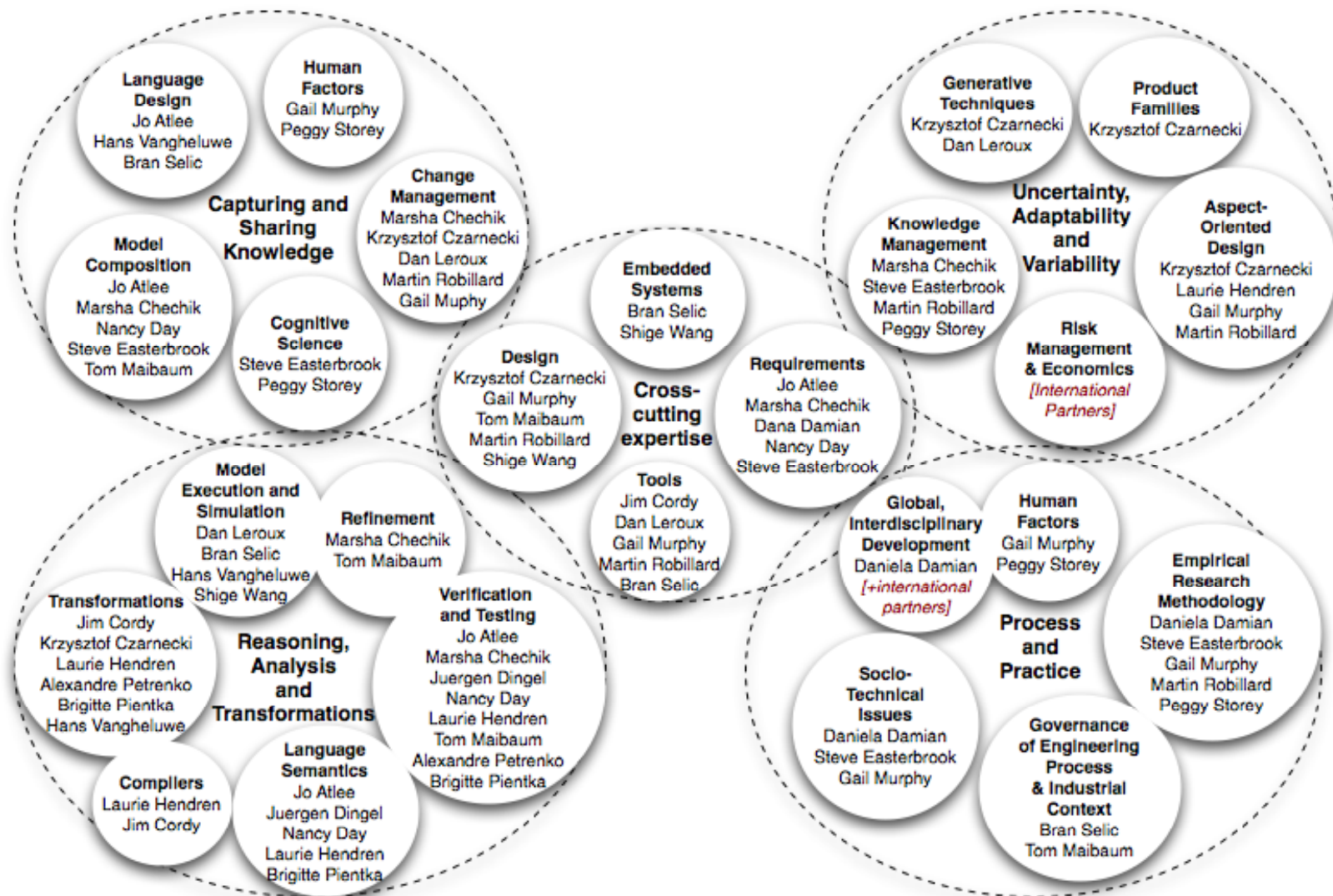
# Projects and Themes

**Projects**

feature perspective

cross-cutting properties

domain-specific abstractions

flexible architectures

software product lining

model management

model testing and debugging

Integrated simulation

human/model interactions

distributed collaboration

## Theme 1 - Cognition/Collaboration

(domain-specific) modelling notations

cognitive support for developer

distributed collaboration

model visualization

## Theme 2 - Automation

model composition / integration

automated analysis

testing and simulation

model transformations

## Theme 3 - Adaptability

feature-oriented modelling

flexible architectures (e.g, AUTOSAR)

software product lining

## Theme 4 - Pragmatics

relationships between models

cross-cutting concerns

data and semantic integration

# Interrelated Projects