

## Thesis proposal

Matti Kinnunen 26/3/2005

To: Professor **Ed Crawley**

Topic: **Model analysis of complex systems using Crawley Machine**

### Objective:

To simplify analysis of complex system models

By measuring the complexity of and reducing the size of solution space

Using mathematical techniques derived from computational linguistics

### Background

Many meta-models that describe the space of system architectures may be overwhelmingly complex to be fully enumerated and simulated [2]. Furthermore, given models of several alternative system architectures, it is desirable to define certain algorithmic methods to compare and differentiate properties of generated architectural models. For example, it may be overly complex to simulate and compare the consequences of two alternative air-traffic regulatory policies. Architects need a model analysis and construction instrument that holistically analyzes the properties of system models in terms of execution time, storage space, and uncertainty.

In order to both reduce the execution times and storage space of generated models and to enabling comparing the complexity of alternative system architectures, we need to develop automatic methods for

- Reducing the solution space of modes
- Measuring the complexity of architectures.

An industrial application would help concretely illustrate the benefits of this abstract research project. To test the methods, I intend to apply them to the NGATS [3] (Next generation air traffic system) architecture, especially to network structure of the air traffic systems. The temporal, spatial, and uncertainty factors of the NGATS provides a rich source of examples to demonstrate the needs of a Crawley Machine-based approach.

My background [1] in hands-on system architecting of complex, distributed and wireless systems, mathematics, and logic has prepared me to work on these problems.

### Project Scope

For 24 credits, I will develop methods for reducing the solution space and measuring the complexity. I will implement these methods in the kernel of the Crawley-machine, and also develop the necessary user interfaces. I will also develop reusable software function for measuring the system models. Finally, I will also write the results in an SDM-thesis.

### References:

[1] <http://www.helsinki.fi/~mjkinnun/resume2.html>

[2] A meta-language for systems architecting, MIT, 2005

[3] [http://www.jpdo.aero/site\\_content/NGATS\\_v1\\_1204.pdf](http://www.jpdo.aero/site_content/NGATS_v1_1204.pdf)