

Towards a Framework of Technologies to Support Reconfiguration

Carl Gamble
Newcastle University



Outline

- Introduction
- Reconfiguration Framework
 - Need
 - Alternatives
 - Selection
- Summary

The Project

SSEI

- 3 year project
- York, BAE, Newcastle....
- Multiple themes and tasks

Task 7

- Dependability explicit computing;
- prototype reconfiguration environment.
- Context : Network Enabled Capability

Types of Reconfiguration

Topological

- implementing voting mechanisms

Behavioural

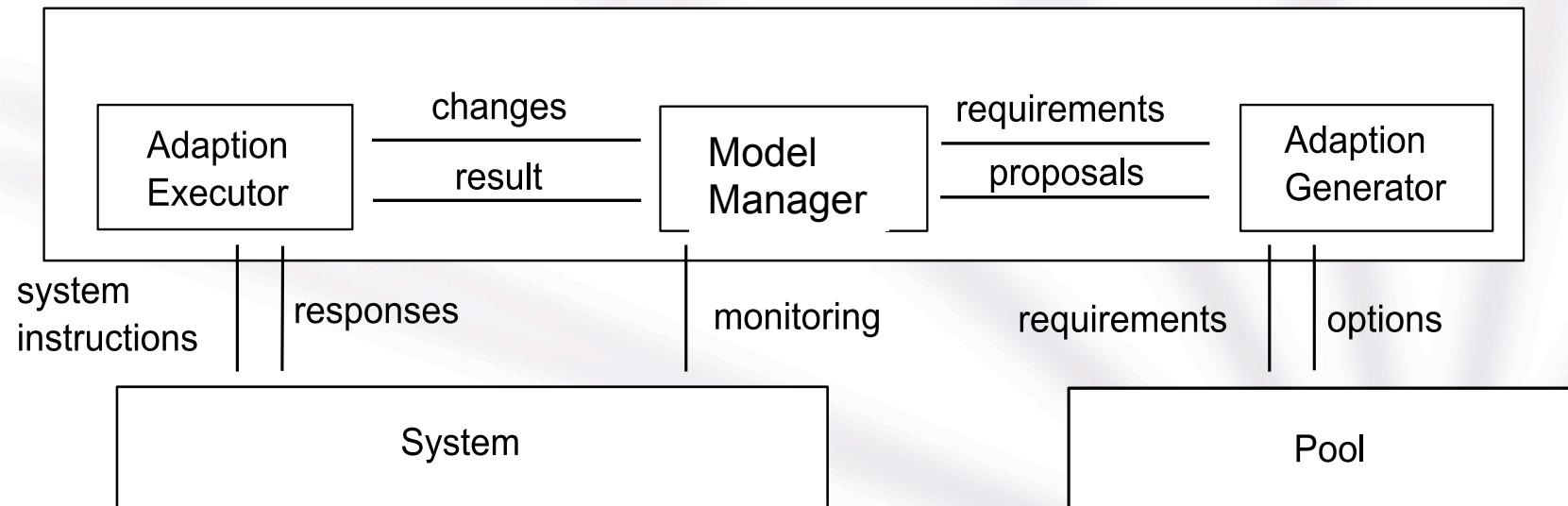
- changing packet size

Modular

- altering mappings of process to processor

Reconfiguration Framework

- Need
- Alternatives
- Selection



Need for Reconfiguration

Needs recognised using :

- Theoretical system performance
- required system performance
- current system performance

Policies required to make the decision.

Sources of Metadata

- Dependability Benchmarking
 - Workload and Faultload
 - Mapping errors to failure modes
- Robustness Testing
 - Tests interface
 - Similar results to the above
- Field Data
 - User fault logs
 - System error logs
- Runtime
 - What and how to measure?

Reconfiguration Policies

Policies

- Declarative rules governing choices in system behaviour
- Obligation policies : condition -> action pairs

Teleo-Reactive

- Ordered list of conditions : best -> worst
- Actions : move system toward a better condition

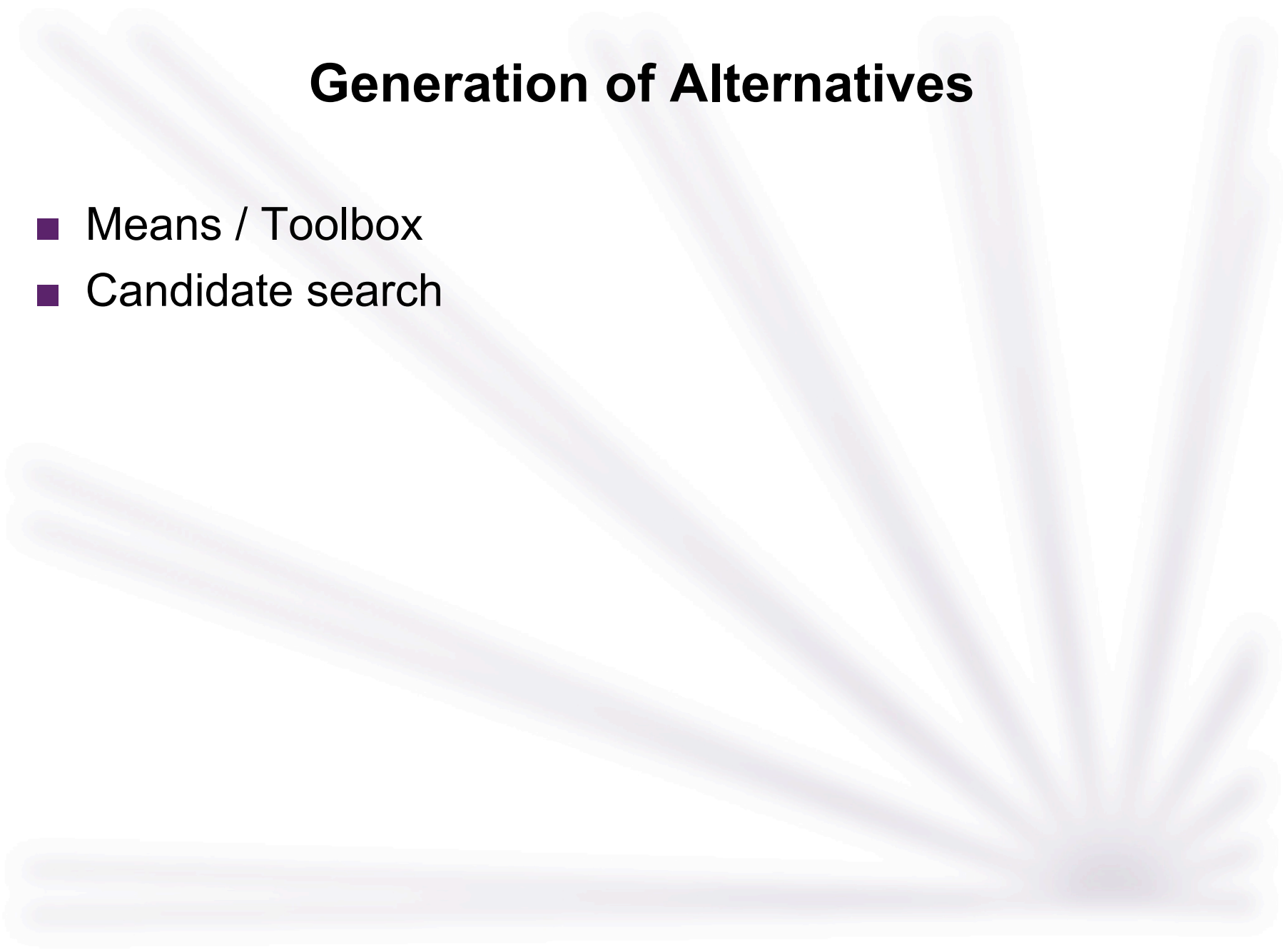
Avail \geq min and cost \leq max -> nil

Avail \geq min and cost $>$ max -> reduce cost

Avail $<$ min -> increase avail

Generation of Alternatives

- Means / Toolbox
- Candidate search



Toolbox



Resilience Mechanisms

- Dynamic Function Allocation
- Voting mechanisms

Blueprints

- Requirements
- Resources
- Constraints

Candidate Search

Search Algorithm

- Simulated annealing

Policy Based

- Direct from Need policy
- Known Solutions

Selection

- Prognostic evaluation
- Single or multi attribute decisions

Prognostic Evaluation

Static Models

- Reliability Block Diagrams, Binary Decision Diagrams
- Issues : independent components

State Based Models

- General Stochastic Petri Nets, Coloured Petri Nets
- Issues : computationally expensive

Multi-Attribute Decisions

Weighted Additive Value Model

- Characteristics treated independently
- Preference in weighting

Enumeration and Scoring

- Goals recorded naturally
- Allows multiple characteristic statements

Lexicographic Criteria Analysis

- First winning option chosen
- Computationally cheap
- Not thorough

Summary

Need

- benchmarking, field measurements, robustness testing

Alternatives

- Resilience mechanisms, arch. Styles, blueprints, search algorithms

Decisions

- Static models, State based models, Multi attribute decisions

Gaps

- Run time metadata
- Trustworthiness of Metadata and sources
- Configuration generation policies

Software Systems Engineering Initiative

www.ssei.org.uk



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