

The imagination driving Australia's ICT future.



Lessons Learned from Building Large-Scale Testbeds

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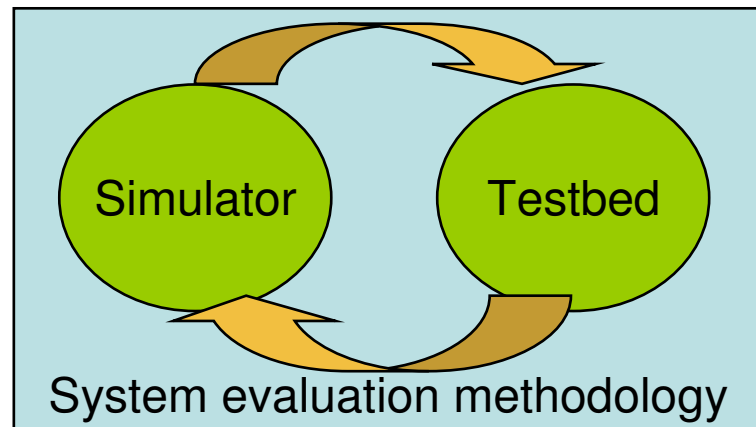
Introduction

- Testbed Pragmatics
 - How to predict performance of 'this new thing' in a very specific real-world setting?
- Testbed Mechanics
 - A cost model
 - A framework
 - to build an eco system of testbeds
 - To support the experimental evaluation life-cycle

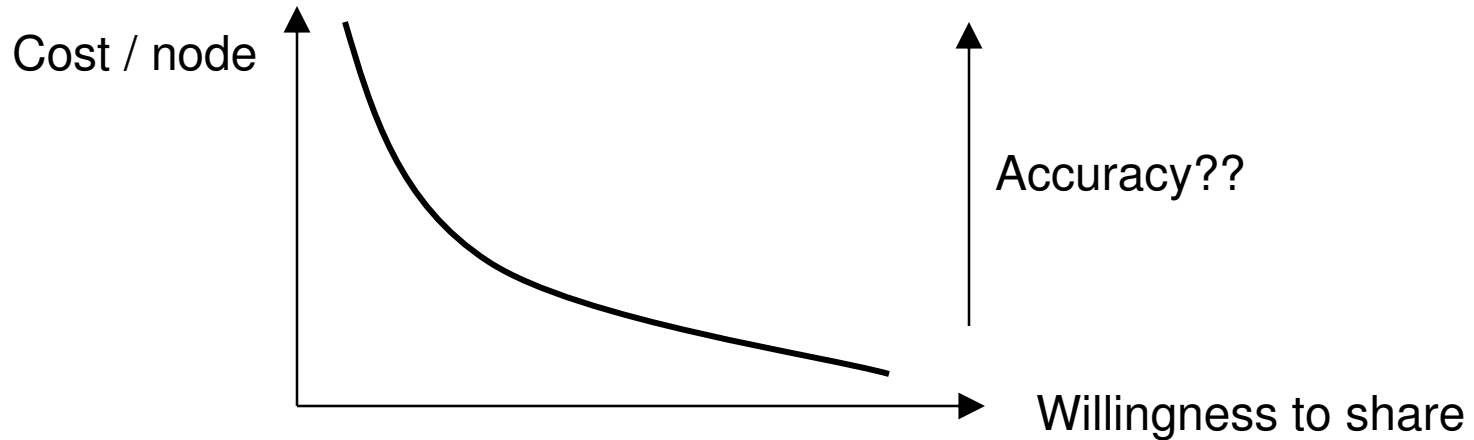
Is X a viable technology to solve Y in location Z?

Can mesh + diversity routing provide the control backbone for an adaptive ITS system over 3000 traffic lights in Sydney?

- Simulation
 - Scale, but simplified world model
- Testbed
 - Has real world model (maybe), but small numbers
- Challenge: Methodology
 - How to combine theory, simulation, testbeds, measurements to predict performance for a large scale deployment.



Simple Cost Model



- $\text{Cost}_{\text{experiment}} = N_{\text{nodes}} * C_{\text{node}} * T$
- $\text{Cost}_{\text{investigation}} = \sum \text{Cost}_{\text{exp}}(n, c, t)$

=> Need for an eco system of testbeds

Cost of Building Testbeds

- Hardware
 - Pre mass production technology
 - SDR platforms may take off pressure
 - Modifications
- Installation
 - Often forgotten/ignored
 - Many non-technical issues
- Management software
 - SSH into 100's of nodes is not a solution
 - Complex especially when:
 - User friendly
 - Using cheap, unreliable hardware

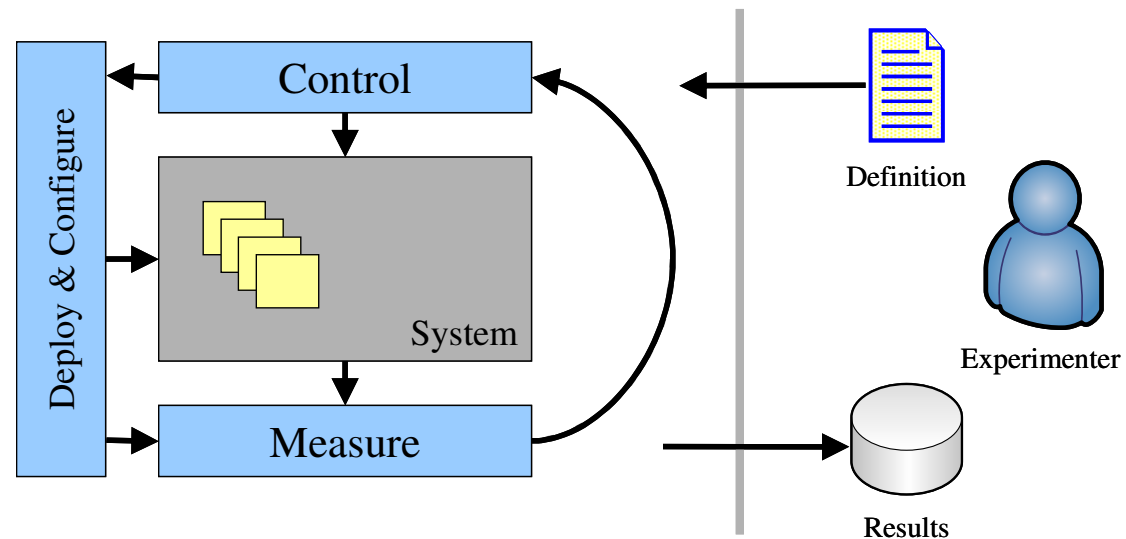


Solution: Order a Testbed

- Soon from a web side near you
 - Pick a motherboard
 - Pick your wireless cards
 - Add a management card
 - Enter budget
 - => N nodes + management server + switches
- OMF: Orbit Management Framework
 - Provides access to testbed infrastructure through web services
 - Manages crucial resources
 - Provides tools to control the experiment life cycle
 - Easy customization
 - => Result of multi-million \$ engineering effort

Supporting the Experimental Evaluation Life-Cycle

- Our experimental culture and rigor is POOR
 - Need repeatability
 - Need more rigor in analysis
- Support Evaluation Life-Cycle
 - Reach out to other disciplines (who are not interested in using the testbed)



Summary

- Challenge
 - Need scientific methodology to combine theory, simulation, and testbeds to predict performance of specific, real deployment
- Testbeds
 - Understand cost trade-offs
 - Understand business model
 - There is no 'one size fits all' testbed
 - There can be ONE management framework which fits most
- OMF (Orbit Management Framework)
 - Manages testbed resources
 - Supports experiment life-cycle
 - Available to the community*
 - Battle proven

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Testbeds: How to share?

resources vs. duration vs. accuracy

- # resources
 - The more the better
 - Not necessarily all the time
- Duration of experiment
 - Depends on type of experiment
 - Usually a reflection of uncertainty of 'usage model'
- Accuracy of results
 - Virtualization is touted as THE answer
 - When does slicing distort the result?