A Framework for Network Complexity

draft-irtf-ncrg-complexity-framework-00

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http://irtf.org/ncrg/

History

- First draft:
  draft-behringer-complexity-framework-00
  published Oct 2012
- Moved to RG draft:
  draft-irtf-ncrg-complexity-framework-00
  in Feb 2013
- Changes:
  - Section 2.3: added that a single methodology won't work for all the different network types
  - New section 2.4: Layering considerations
  - 4.1: Adding considerations on metrics from NetComplex paper

Network Complexity

- Questions:
  - What is network complexity?
  - How to measure and compare complexity in:
    - Networks
    - Protocols
  - How to contain, control, reduce complexity
  - Use cases, examples

Objective

Quantifyable

Learning from mistakes

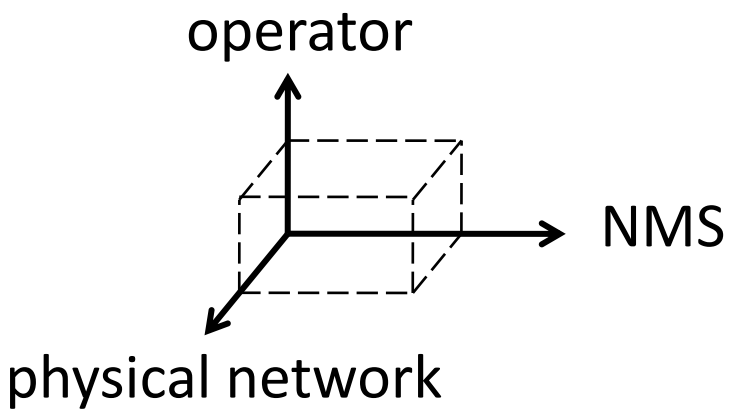
A Framework for Defining Network Complexity

1. Introduction
2. Current Understanding of Network Complexity
   2.1. The Behavior of a Complex Network
   2.2. Robust Yet Fragile
   2.3. The Complexity Cube
3. Towards Defining Network Complexity
   3.1. General Observations
   3.2. The Problem Space
   3.3. Technical Debt
   3.4. Layering Considerations (new section)
4. Possible Directions of Research
   4.1. Definitions and Metrics
   4.2. Comparative Analysis
   4.3. Containment, Control or Reduction of Complexity
   4.4. Use Cases

Current Understanding

Please help expand this section

- Behavior of a Complex Network
  - Self-organization
  - Un-predictability
  - Emergence
  - Non-linearity
  - Fragility
- Robust Yet Fragile (RYF)
- Complexity Cube



Towards Defining Network Complexity

- Many “variables”
  - State in the network
  - Human operators
  - Classes/templates
  - Dependencies and interactions
  - Total cost of ownership (TCO)
  - Benchmark unit cost (BUC)
  - Churn / rate of change
- Technical Debt

Possible Directions of Research

- Definitions and Metrics
- Comparative Analysis
- Containment, control or reduction of complexity
- Use Cases
  - Examples of “catastrophic failure”
  - Complexity analysis of a particular network/protocol
  - Work in related areas, such as total cost of ownership, software complexity, …

Sub-Group to Continue Work on this Document

- Interest expressed by:
  - Luca Caviglione
  - Dave Meyer

  (who else?)
- Next Steps:
  - Form sub-group, meet (webex) and discuss what needs to be done.

Comments?