Network management as a synthesis problem

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Network management

- High-level policy goals
- Low-level configuration
- Few tools to translate will into action

“You should design how you want traffic to flow under normal operation and under fault scenarios and then design metric standard with satisfies those requirements. I prefer to do this with pen and paper add coffee if so inclined.”

http://networkengineering.stackexchange.com/questions/2765/using-latency-to-calculate-ospf-metrics
Optimize traffic flow

- Classical operational research problem
- Elegant, fast
- Not well adapted for Internet technology
- Doesn’t play well with others
  - How do I selectively overrule the TE engine?
  - Can I incorporate my own metrics?
  - How can I stop it causing huge traffic shifts?
Embed logical constraints

- Many operator goals can be expressed in terms of *path preferences*
  - Even very “dynamic” assertions, like “the protocol must converge”
- Integer/Boolean formulae can be embedded for the numeric solver
- Constrained optimization is fast and reliable
Engine speed

Solver time in seconds

Number of constraints
Next steps

- Conditional policy
  - “If this link goes down, then I want ...”
  - Calls for reactive synthesis with LTL (?)

- Adapt for true interactive use

- Explore relationships between different goals and constraints