NetSE Council

~~GSC~~ Update

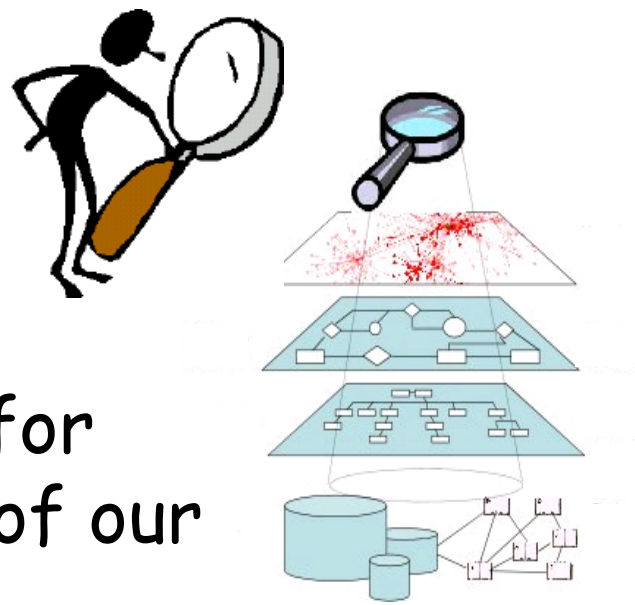
GENI Engineering Conference

4 March 2008

Ellen Zegura

Challenge to the Community

Fundamental Question: Is there a science for understanding the complexity of our networks such that we can engineer them to have predictable behavior?



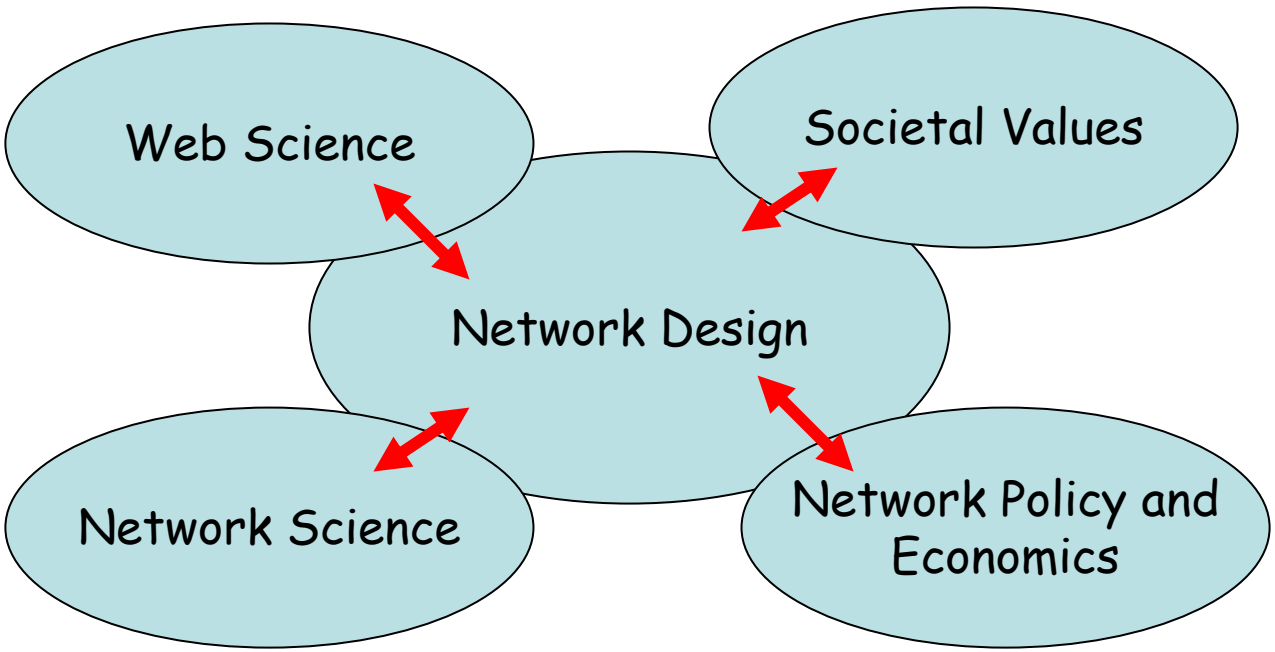
Call to Arms: To develop a compelling research agenda for the science and engineering of our evolving, complex networks.

Rising to the Challenge

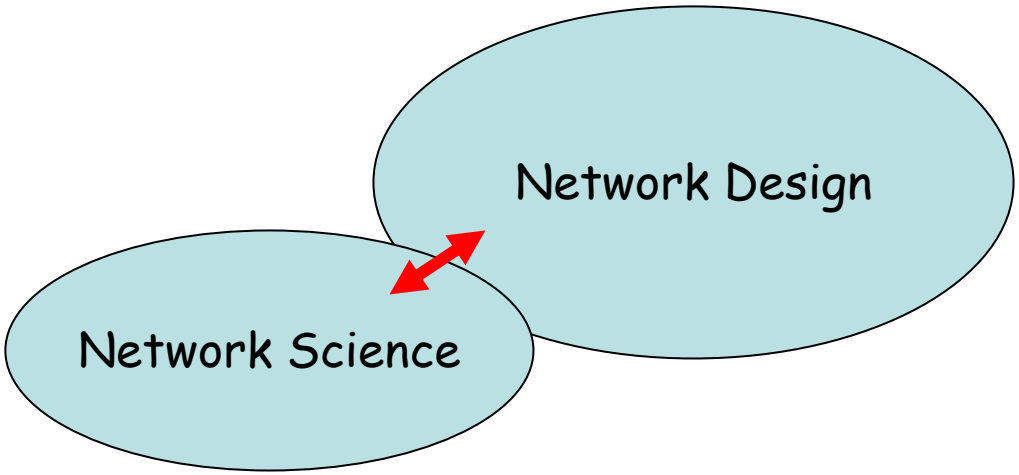
1. Understand and organize intellectual space (high level scope, structure)
   - strawman in a few slides
2. Bring together researchers to discuss and articulate parts of agenda
   - workshops late Spring, …
3. Synthesize discussions into coherent vision with recommendations
4. [But what about GENI?]

NetSE Intellectual Space

Goal: Networks with predictable behavior (better networks)



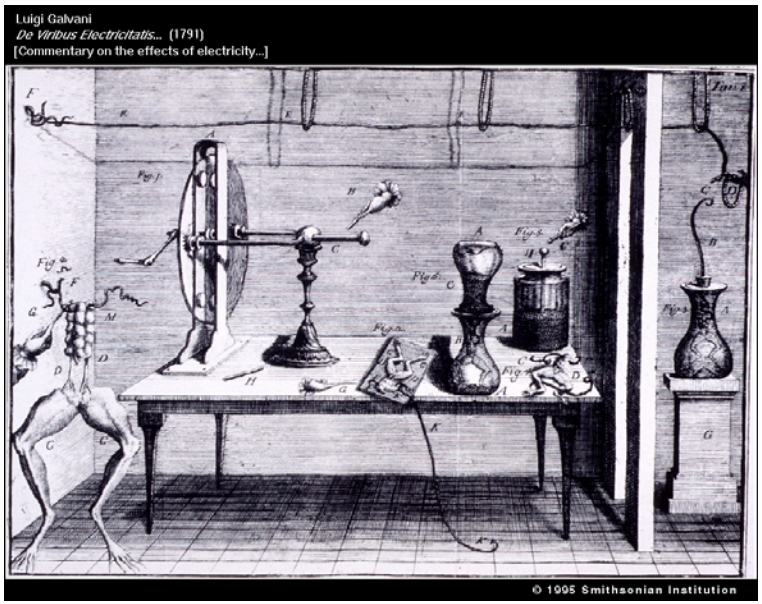
Articulating Agenda I



- Workshop on Science of Network Design
- Co-chairs:
  - John Doyle, CalTech
  - John Wroclawski, ISI

Food for Thought
(courtesy John Wroclawski)

Electricity: 1800…



Electricity: Today…

$$\oint \vec{E} \cdot d\vec{A} = \frac{q}{\varepsilon_0}$$

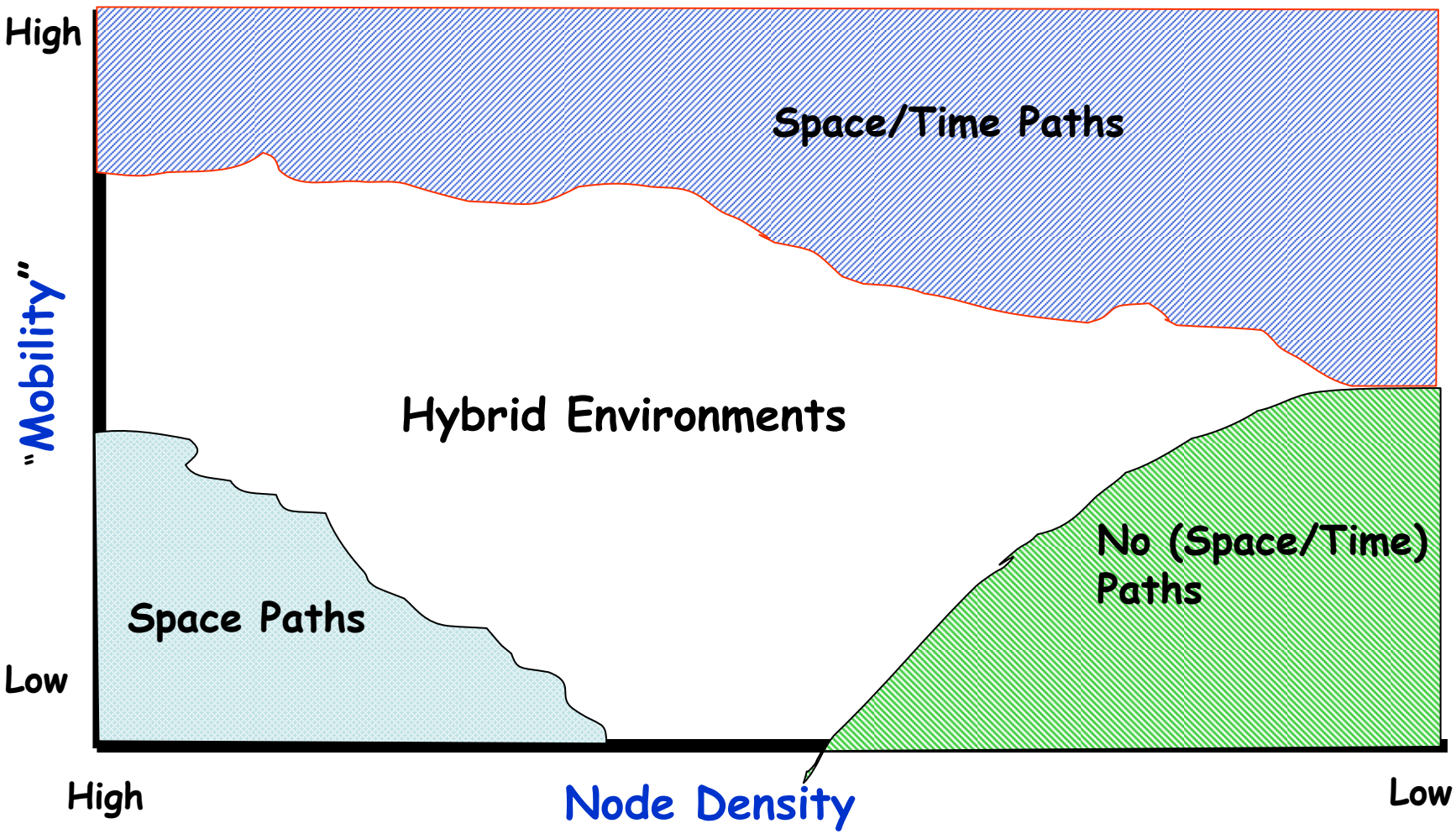
$$\oint \vec{B} \cdot d\vec{A} = 0$$

$$\oint \vec{E} \cdot d\vec{s} = -\frac{d\Phi_B}{dt}$$

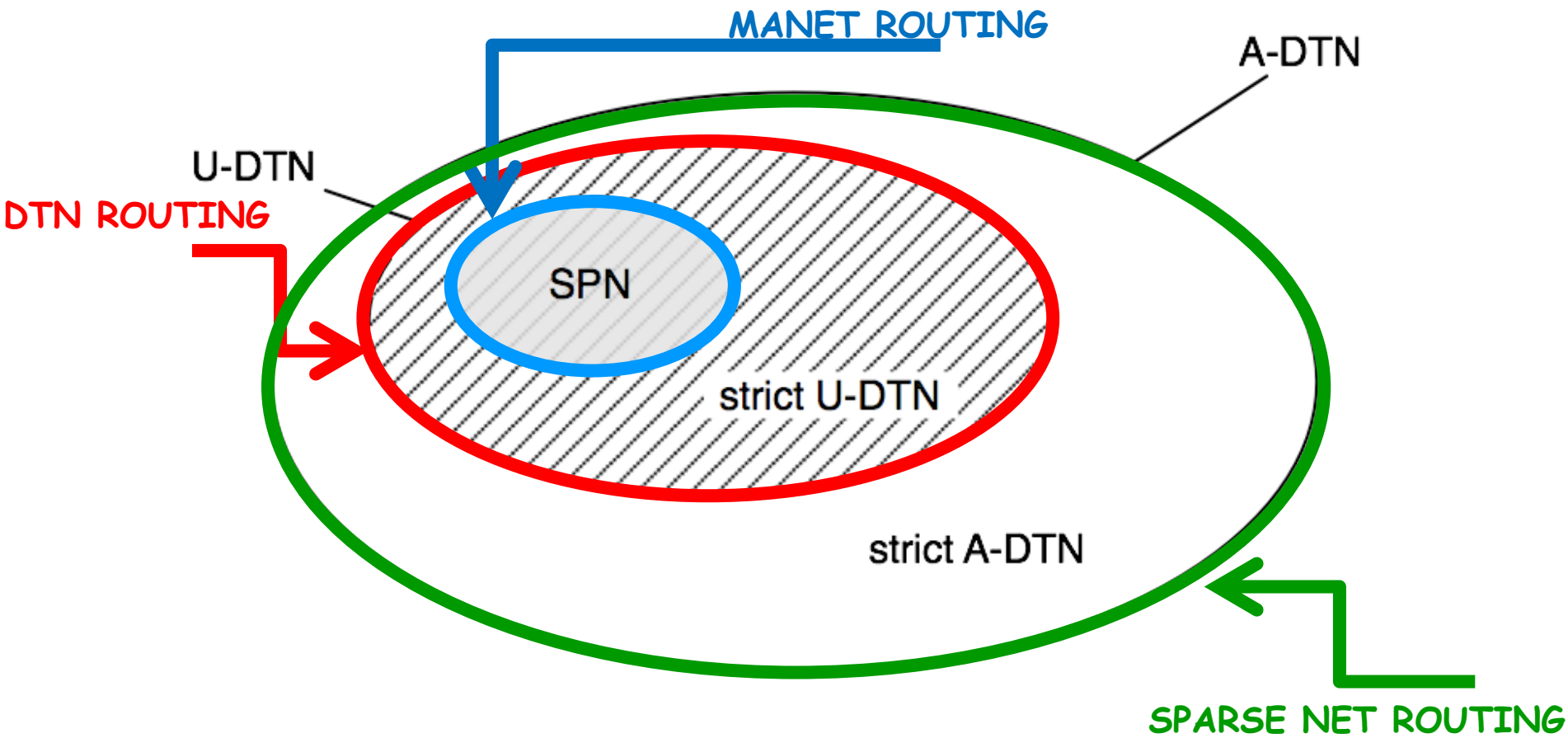
$$\oint \vec{B} \cdot d\vec{s} = \mu_0 i + \frac{1}{c^2}\frac{\partial}{\partial t}\int \vec{E} \cdot d\vec{A}$$

What are the analogies…
… for Network Architecture and Design?

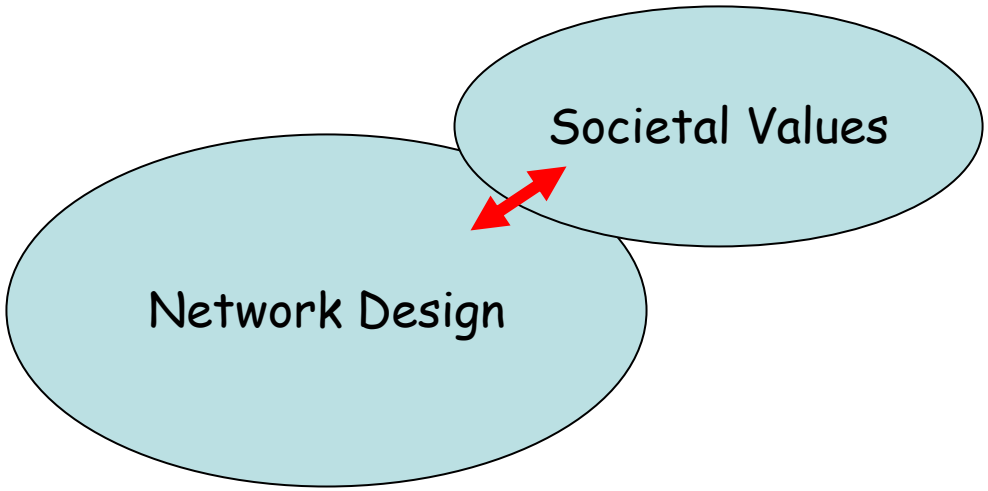
Example: Understanding



Implications for Routing



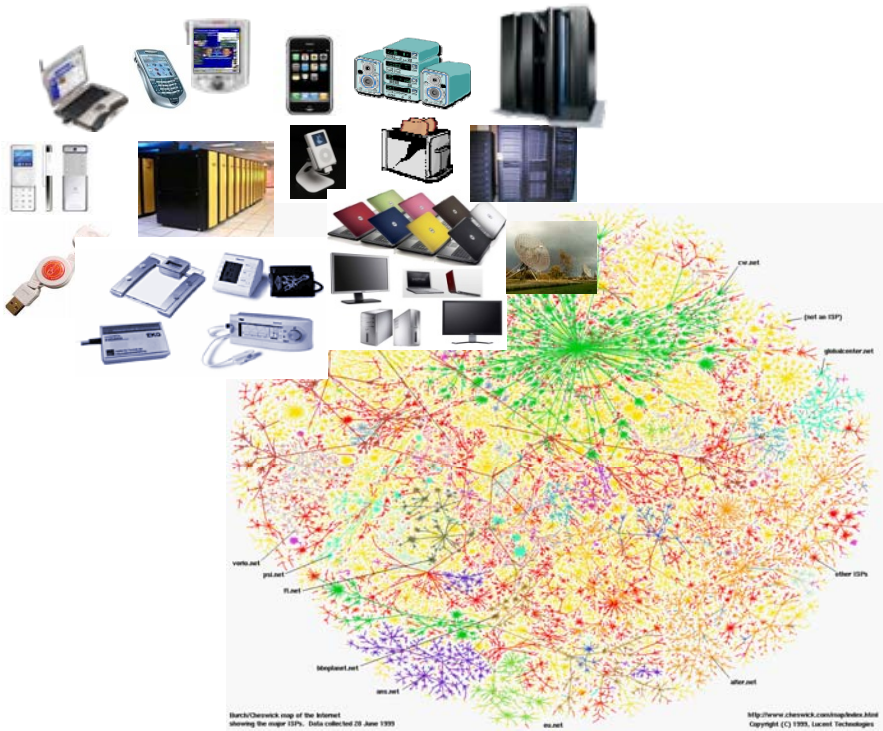
Articulating Agenda II



- Workshop on Network Design and Societal Values
- Co-chairs:
  - Helen Nissenbaum, NYU
  - David Clark, MIT

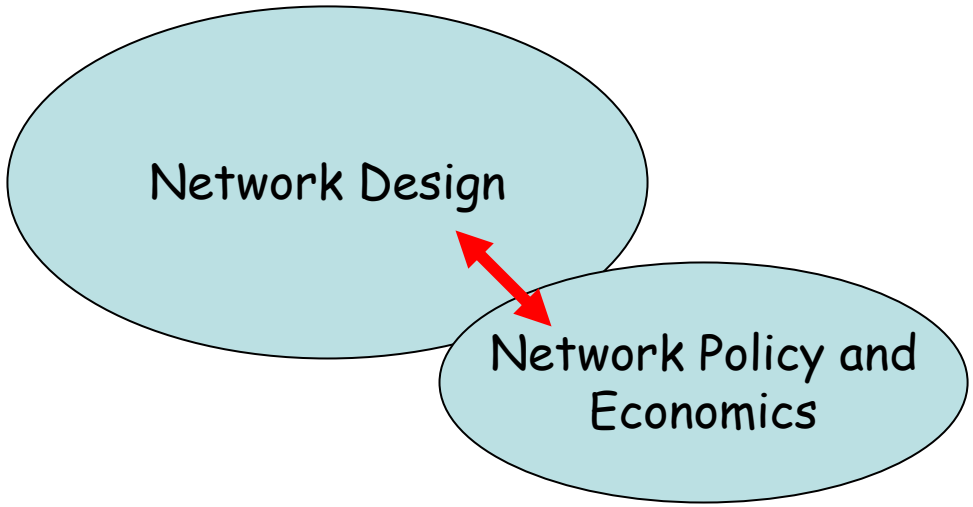
Food for Thought

- (Where) does the current Internet embed assumptions of plenty?



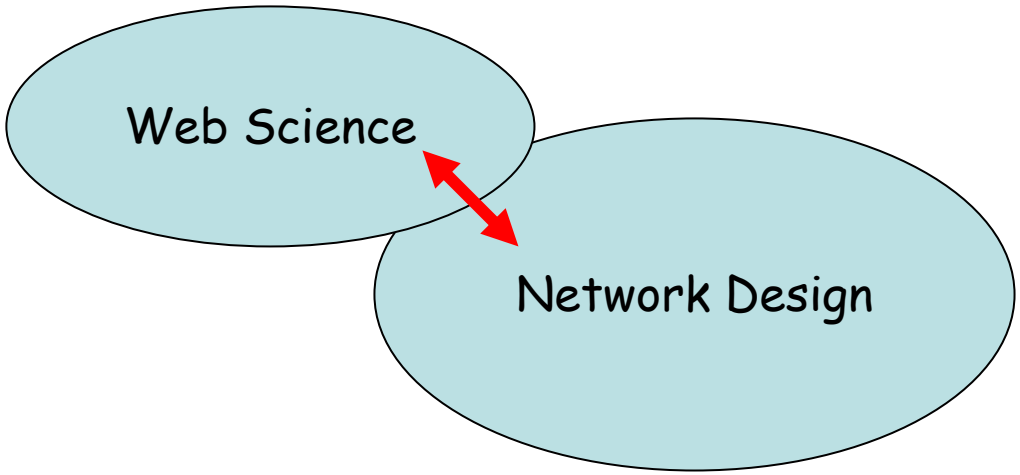
Does TCP work here? (Hint: no!)

Articulating Agenda III



- Workshop in network economics,…
- Discussions with Mike Kearns, UPenn,…
- Food for thought: See Shane Greenstein talk yesterday!

Articulating Agenda IV

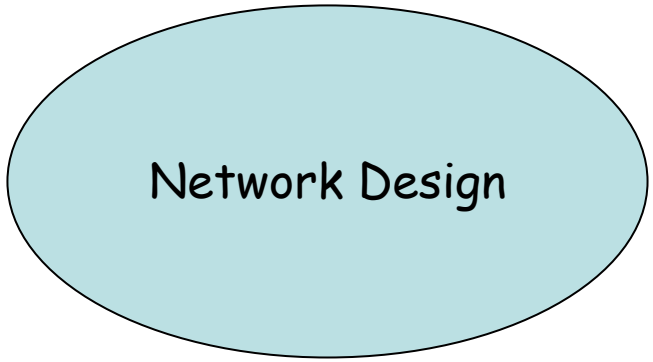


- Workshop in web science,…
- Co-chairs:
  - Jim Hendler, RPI
  - TBD

Food for Thought
(courtesy of Jim Hendler)

- Network adaptivity is not just to what is happening in network
  - But what is happening in the real world
    - political, economic, social
      - Example: slashdot effect
  - These can change any level of network dynamics

Back to the Beginning



- Good progress under GENI auspices, with emphasis on architecture
- See Dave Clark Research Plan
- What more? You tell me…

Synthesizing Discussion: NetSE Council

Mission (work in progress): The primary mission of the Network Science and Engineering (NetSE) Council is to articulate a compelling research agenda for Network Science and Engineering, including inter-related theoretical, experimental and societal aspects.

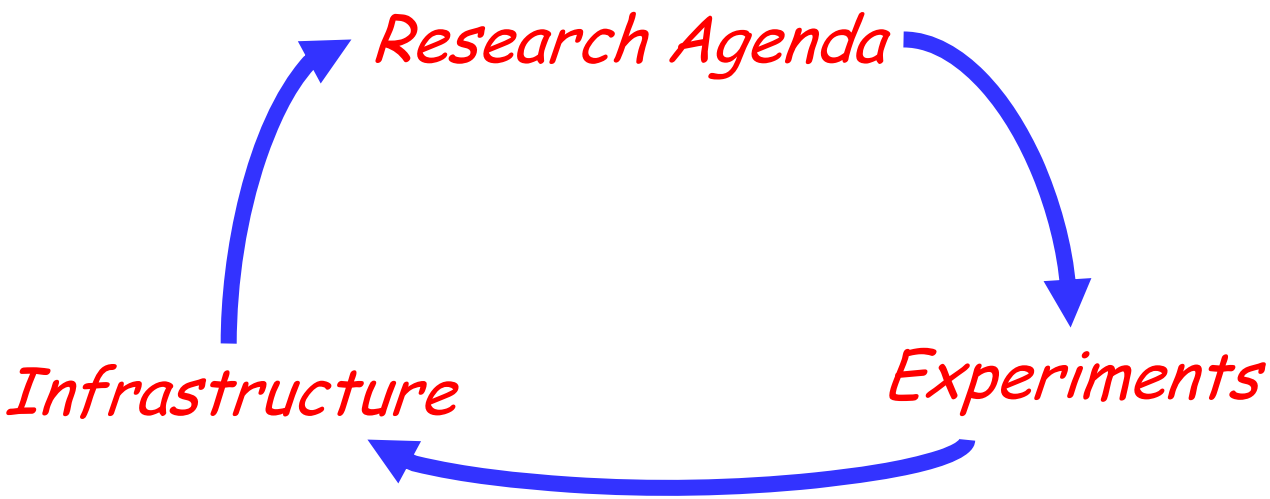
- Ellen Zegura, chair
- Tom Anderson, Washington
- Hari Balakrishnan, MIT
- Joe Berthold, Ciena
- Charlie Catlett, Argonne
- Mike Dahlin, UT Austin
- Chip Elliot – GPO (ex-officio)
- Joan Feigenbaum, Yale
- Stephanie Forrest, UNM
- Roscoe Giles, Boston Univ
- Jim Hendler, RPI
- Michael Kearns, UPenn
- Ed Lazowska, Washington
- Peter Lee, CMU
- Helen Nissenbaum, NYU
- Larry Peterson, Princeton
- Jennifer Rexford, Princeton
- Stefan Savage, UCSD
- Scott Shenker, ICSI/Berkeley
- Alfred Spector, IBM (ret.)

Draft Timeline

- Late Spring 2008 – workshops
- Early Summer 2008 – meeting of writing group
  - initial reports from each workshop
  - discussion of pieces missing or in need of attention
  - discussion of cross-over issues between reports
  - integration discussion
- Summer 2008 – integration
- August 2008
  - post draft for public comment

What about GENI?

Virtuous cycle of agenda setting, demands for experimentation, identification of infrastructure needs, building, learning, building, learning, …



Sometimes one part gets a little ahead…that's ok
Research enterprise is incredibly robust

Challenge to the Community

Question: *Is there a science for understanding the complexity of our networks such that we can engineer them to have predictable behavior?*

Call to Arms: To develop a compelling research agenda for the science and engineering of our evolving, complex networks.

NSF (and the world) is listening. Let's work together to speak with vision and clarity.