Infrastructure Matters

CFP

April 2016 Workshop

Infrastructure

- The basic physical and organizational structures and facilities (e.g., buildings, roads, and power supplies) needed for the operation of a society or enterprise.
  - From Google
- Stuff that you just assume is there and working so you don't have to think about it.

Exciting?

- Infrastructure does not normally try to be exciting.
  - Exciting when it advances so something new can happen.
    - Into the developing world.
    - New and exciting service opportunities.
  - "Exciting" when it breaks.
    - "You don't miss you water 'till the well runs dry".
- Internet is younger and more dynamic than (say) roads or pipes.

CFP

- It's the <u>Communications</u> Futures Program.
  - We care about all aspects of communication:
    - What gets communicated.
    - How that happens.
- What:
  - From VoIP music to IP video (and beyond…)
- How:
  - The maturation of the Internet is turning its basic facilities into infrastructure.
  - People just assume it is there and will work on demand.

The distinctive Internet

- Internet (or technology based on the Internet protocols) is becoming the converged infrastructure for communications.
- What is distinctive?
  - It is build by the private sector.
- Raises two central questions:
  - What is the incentive of the private sector to invest?
  - Will the private sector build the infrastructure society wants?
    - And if not, then what?

In contrast…

- My town just voted $16+M to upgrade one of our water treatment plants.
    - After years of deliberation and planning.
- We are replacing the inflow pipe from the pond.
    - It was put in about 100 years ago.
- (New England runs local government by town meeting.)

Incentive to invest

- A long-standing concern of CFP
  - The "Broadband Incentive Problem", 2005

- But go back to 1995:
  - "If we [the telephone industry] do not come to your party, you don't have a party. And we don't like your party very much. The only way you will get broadband to the home is if the FCC makes us install it".
    - A telco executive to me.
    - He thought broadband was ISDN.
    - It never occurred to him that the cable industry might be a viable competitor. He was perhaps living in the past.

Carrots and sticks

- Hard to make the private sector invest.
  - Current approach: pile obligations onto mergers.
    - AT&T/DirecTV: 12.5 M new FTTP installs.
    - What will happen to Time Warner/Charter?
- Incentive of private sector is to make money.
  - How do you make money on infrastructure?
    - If monopolist: make too much. -> Regulation.
    - If competitive: may not make enough.
  - Alternative is public sector investment.

Commodity?

- Infrastructure often has the character of a commodity.
  - Not much product differentiation in water…
  - A "substantially fungible marketable item."
- If infrastructure is characterized by:
  - High up-front or sunk cost.
  - Commodity character.
  - Competitive pressure on pricing.
  - Result may be a dismal outcome.
- Perhaps there could be more product differentiation in broadband infrastructure.
  - How think about this question?

The right infrastructure?

- Is the Internet:
    - Whatever the private sector brings us?
    - Something that society should have a voice in defining?
- Do "we" know what we want?
    - Is "we" society? The government? The complementors?

Some aspirations

- Available to all users, everywhere.
- Low cost, but with constantly expanding capacity.
- Open to all complementors and content.
- Trustworthy, secure, resilient.
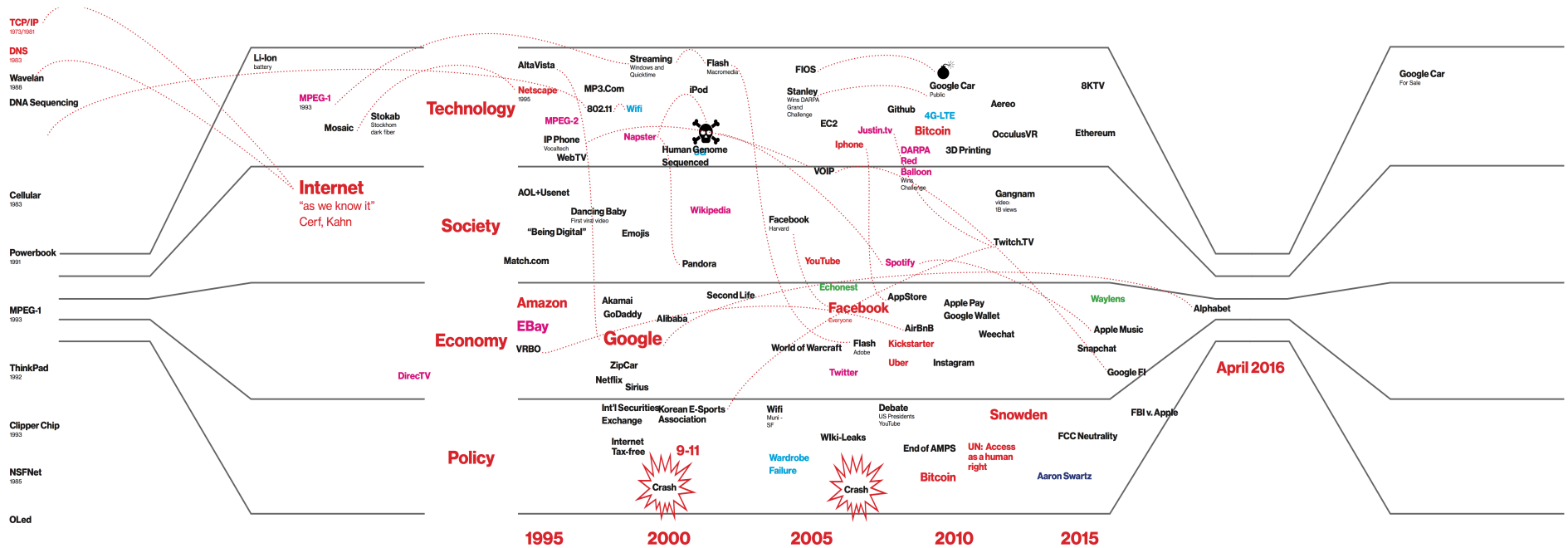- Respectful of local values but a platform for a global world.

Some questions

- Which of these relate to the infrastructure aspect of the Internet?
- Which of these need to be "the same everywhere"; define its platform character?
- Assuming you accept a goal, how can the infrastructure be nudged in the right direction?

The next steps

- After "infrastructure" comes "critical infrastructure".
  - Implies more attention from government.
  - Is Facebook now infrastructure? Is it "critical"?
- Setting directions.
  - Should anyone be setting a direction?
- What could go wrong?
  - The pessimistic question.
- What are the opportunities for innovation at all of these layers?
  - The optimistic question.
  - What are the barriers?
- Understanding the barriers to the future is part of the central mission of the CFP.

A communications timeline

Where do you fit in this picture?