

Tussle in Cyberspace: Defining Tomorrow's Internet

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Introduction

- One important reality that surrounds the Internet today
 - Different stakeholders that are part of the Internet milieu have interests that may be adverse to each other, and these parties each vie to favor their particular interests
- We call this process “The Tussle”

Introduction

- The different players
 - Music lovers vs. the rights holders
 - People who want to talk in private vs. the government that want to tap their conversation
 - ISPs must interconnect but are sometimes fierce competitors
- New **requirements** on the internet's technical architecture
 - Motivate new design **strategies** to accommodate the growing tussle

The natures of engineering and society

- Engineers solve problems
 - Designing mechanisms with **predictable consequences**
- The Internet moves from an engineering curiosity to a mirror of the societies
 - The Internet designed by engineers is by no means predictable today
- The essence of successful societies
 - The dynamic management of evolving and conflicting interests
 - **Controlled tussle**
- This is the way Internet is defined today
- The challenge facing Internet research and engineering
 - Recognize and **leverage** this reality

The Internet landscape

- Many parties that are part of the Internet milieu
 - Users, who want to run applications and interact over the Internet
 - Commercial ISPs, who sell Internet service with the goal of profit
 - Governments, who enforce laws, protect consumers, regulate commerce, and so on
 - Intellectual property rights holders, who want to protect their materials on the Internet
 - Providers of content and higher level services, offered in search of profit or as a public service
- The resulting tussle span a broad scope

The guiding principle

- **Design for variation in outcome**, so that the outcome can be different in different places, and the tussle takes place within the design, not by distorting or violating it
 - Rigid designs will be broken
 - Designs that permit variation will flex under pressure and survive

Specific principle #1

- “Modularize along tussle boundaries”
 - Tussle isolation
- Separate functions that are within a tussle space from functions outside of that space
 - E.g. the design of the DNS
- Less efficient solutions from a technical perspective may do a better job of isolating the collateral damage of tussle
 - E.g. the IP QoS design

Specific principle #2

- “Design for choice”
 - Protocols must permit all the parties to express choice
 - E.g. the design of the mail system
- The form that the choice takes for the different parties may be different
- The complexity of configuring and using a service
 - The emergence of third parties that provide pre-configured choice support software

Further implications

- Choice often requires open interfaces
 - Allows competition among algorithms, vendors
- It matters if the consequence of choice is visible
 - The hidden routing arrangements among ISPs, the visible consequences at the BGP level
- Tussles have different flavors
 - The interests of the players may be adverse, sometimes not
- Tussles evolve over time
- There is no such thing as value-neutral design
- Don't assume that you design the answer
 - You are designing a playing field, not the outcome

Tussle spaces

- Some specific aspects of the Internet in which different players with competing interests come together
- Our goal is to examine the nature of the tussle and to illustrate how our principles can be applied in specific cases

Tussle spaces: Economics

- Providers tussles as they compete and consumers tussle with providers to get the service they want at a low price
- Our principle of **design of choice into mechanism** is the building block of competition

Tussle spaces:

Examples for economics 1/2

- Provider lock-in from IP addressing
 - ISPs want to lock in their customers but customers want to change providers freely
 - Addresses should reflect connectivity, not identity, to modularize tussle
- Value pricing
 - Divide customers into classes based on their willingness to pay, and charge them accordingly
 - What mechanisms get designed, and what standards get approved, are all part of the tussle
 - No value neutral design

Tussle spaces:

Examples for economics 2/2

- Residential broadband access
 - The loss of choice and competition is viewed with great alarm
 - Municipal deployment of fiber as a platform for competitors
 - Supports competition in higher-level services
- Competitive wide area access
 - The Internet system does not let the individual customer select his “long distance provider”
 - An example of designers failing to appreciate a competitive tussle space
 - The Internet should support a mechanism for choice of source routing at the level of providers

Tussle spaces: Trust

- The most profound and irreversible changes in the Internet
 - Many of the users don't trust each other
- The principle of “design for choice”
 - Users should be able to choose with whom they interact and the level of transparency they offer to other users
- The principle of “tussle isolation”
 - All the mechanisms should not be overloaded on to any other mechanism

Tussle spaces: Openness

- The openness to innovation that permits a new application to be deployed
- The openness of access that allows a user to point their Web browser at any content they please
- The openness that allows a user to select the servers and services that best meet their needs
- Motivations concerning open vs. proprietary systems have much to do with economics

Old principles

- The future of the end to end arguments
 - Mechanism should not be placed in the network if it can be placed at the end node
 - Two general dimensions to the arguments
 - *Innovation*
 - *Reliability*
 - Still valid, but need a more complex articulation
- Separation of policy and mechanism
 - No pure separation of policy from mechanism
 - Mechanisms defines the range of policies
 - Discover parts of mechanism that actually are value-neutral

Conclusion

- The introduction of new principles and more complex interpretation of old design principles guides us in defining tomorrow's Internet
- Do not deny the reality of the tussle, but recognize our power to shape it