

Netheads and Bellheads: What is the issue?

The Political Economy of Networks

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The Political Economy of Networks

- The bellheads versus netheads debate is part of a broader discussion about freedom and innovation, and the relationship of property arrangements to these two issues.
- The broader discussion would also include topics of intellectual property and spectrum allocation, which cannot be dealt with here.
- This paper focuses on what common carriage means in an era where the Internet model competes with older forms of communication.



The Broader Discussion

- The broader discussion is about the appropriate roles of private property, a commons, and government regulation in securing the advantages of the Internet.
- The technological miracle is radically diminishing the costs of certain factors of production (computation; bits/second).
- In this context, should there be monopolies? Legal privileges? If private property is good, would more of it be better?



20th Century Policy

- The pre-Internet era saw the emergence of highly concentrated ownership in telephones, movies, music & broadcasting. In the case of telephones, elaborate pricing regulation has constrained (somewhat) their market power.
- Advances in technology have undermined the scarcities which have made these media owners so powerful. They see this and wish to throttle the possibilities of competition from new technologies. (Napster, CLEC's etc)



The classic issues of political economy

- The argument is about what needs to be free and what is best owned. *Free* as in free to use a language or a park. *Free* as in common.
- In the face of great uncertainty regarding appropriate business models and ownership arrangements, we should not be expanding monopolies and strengthening legal privileges, yet this is what we are doing.
 - Auctioning spectrum
 - Longer and stronger IP
 - Removal of cross-ownership regulation



The context of debate

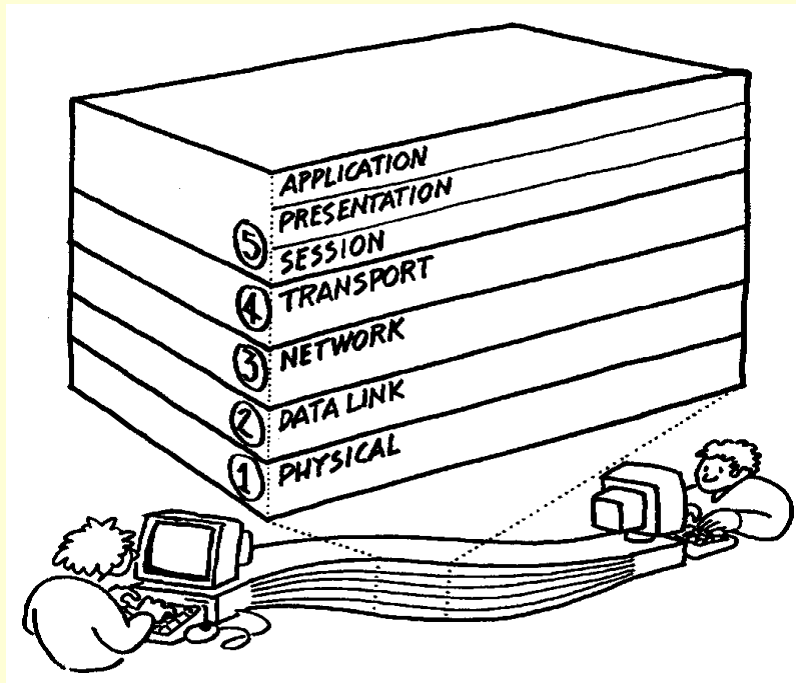
- The end-to-end architecture of the Internet enables a type of highly important collaborative and distributed intellectual production to take place.
- Compare the Internet to the English language. No one owns the language, it is a commons. It gives power to the end user. The e2e philosophy does the same. Innovation takes place without the permission of the incumbents – the Internet’s heresy.




The Internet as a commons

- The Internet functions as a commons, linking privately held resources on a basis of voluntary action. The protocols that make the current Internet work (TCP/IP) are an esperanto for computers.
- The layered model (physical, logical, and content) dissociates the economies of physical apparatus from the economies of content. The owner of the physical layer can't define what services (applications) are.

Physical, code and content layers



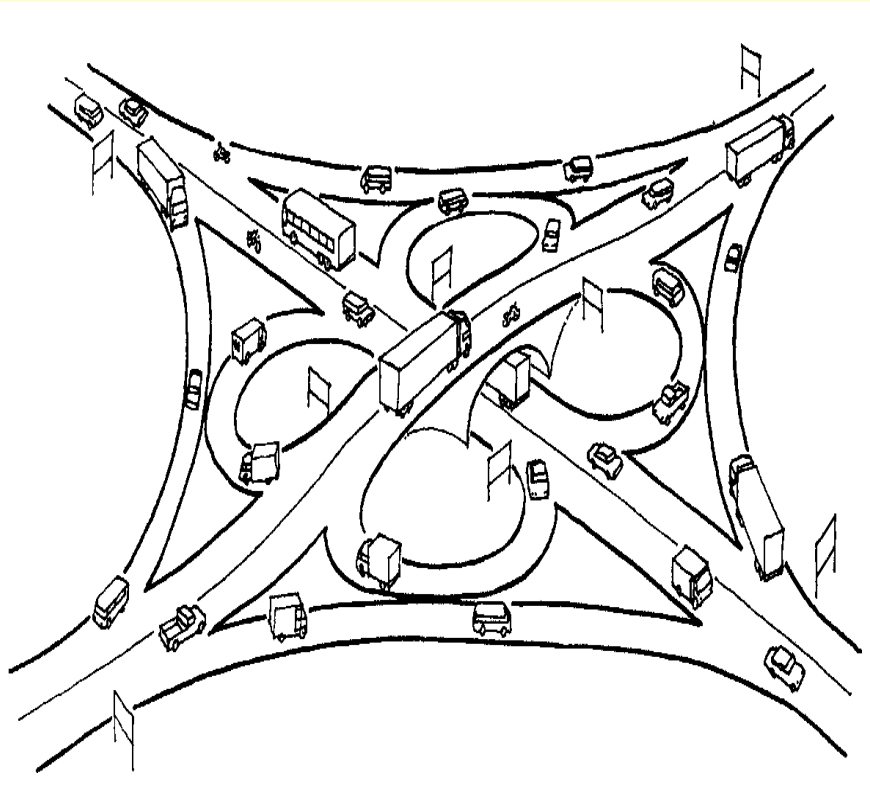
- The layers are *physical* (1), *code* (2,3,4), and *content* (5).
- Generically, the 3-layered model could apply to any means of communication




What can be free? What needs to be owned?

- The specter threatening our media is disruptive innovation. The method used to suppress it in the telecom/cable world is to allow the private property rights of the ownership of the physical medium to translate into a power over the content (applications and services), and the code layer.
- What was an inevitable feature of a pre-Internet era is no longer necessary. Yet policy decisions reinforce the artificial scarcities.

E2E- the highway analogy



The owner of the roadbed does not determine the nature of the traffic, beyond general rules. The owner of the vehicle determines what he will drive, and where he will go.



The end-to-end principle

- The e2e principle was embedded in the design of the TCP/IP protocols.
- The radical innovation of IP was to have the least possible specification of result deriving from the architecture of the Internet. The code layer permits this.
- This meant innovation without permission, such as the Web and email.



Compare legacy to IP networks

Internet

- Underspecified
- Peer-to-peer
- End-to-end
- Open
- Services are defined by anyone with an idea.
- Applications split from transport – hence the *protocol stack*

Legacy networks

- Completely specified
- Master-slave
- Service control points
- Proprietary
- Services are defined by owners of the system.
- Services are vertically integrated with transport




Innovation fostered by regulation of monopolies

- Much more is at stake than some trivial difference of fashion or of generation. Most of what makes life different today (email, the web) proceeded from the innovation commons created by the Internet.
- That in turn depended on government decisions
 - to make telephone carriers *common carriers*;
 - to keep the phone industry out of computers;
 - To maintain low prices for unlimited local calling
- Public policy is vital to maintaining the innovation commons, or destroying it.



The innovation commons - Grids

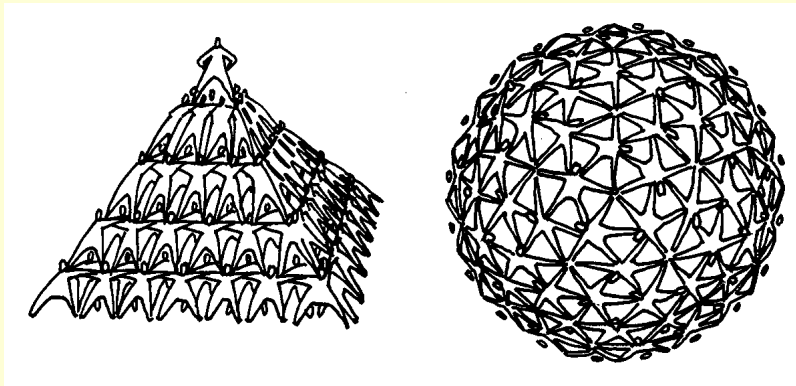
- Peer production common enterprises, or grids, are neither firms, nor markets. They have neither the hierarchy of the firm, nor the payments associated with markets. They are voluntary collaborations.
- The declining price of physical capital, and of communications, raises the relative importance of human capital. Peer production taps human capital with exquisite precision.



The Netheads versus Bellheads argument

- The core of the argument is about control over outcomes. The unconscious belief of courts and parliaments in our time is, if private property is good, then more of it is better.
 - If the Internet is a language for computers, does it make sense to allow the private appropriation of “and©”, “but©” and “the”©?
- The equivalent in carrier policy is to allow the owner of the physical network to define and control the applications which run across the physical media.

Different network design = Different social outcomes



- The political argument about end-to-end architecture engages a broader discussion about what kind of society we will have.



Implications for carrier policy

- The e2e principle is not necessarily achieved by unbundling, or facilities-based competition.
- It requires that wavelengths be sold at prices appropriate to wavelengths, rather than bundled as services.
- If telcos and cable are not going to do this, then new ways must be found to use existing fiber and spectrum.
- Municipal and state/provincial deployment of public utility fiber may provide a way.



What is the relevant form of competition?

- The paper argues that in an Internet era, the relevant form of competition is not in facilities, though the provision of competitive facilities should always be encouraged.
- Competitive facilities are not as supremely important when applications can be separated from the physical media of delivery.
- The relevant form of competition is in allowing all the possibilities of the Internet to reach customers. The end-to-end principle.



Is this “extremely unrealistic”?

- The issue is which of the two models will prevail: legacy or Internet?
- Part of the answer lies in which model *should* prevail, and the culture seems particularly incapable of raising the question at this time.
- The triumph of markets over state planning in the 20th century has blinded us to the utility of common rules, and rights of way, which enhance the usefulness of private property and create the conditions in which markets work for our common benefit.

Further reading



- At www.tmdenton.com you will find a number of links to the works of Professors Lawrence Lessig, Yochai Benkler, and James Boyle, to whom I am indebted and whose writings I recommend.
- Communities are starting to build broadband networks; see CivicNet in Chicago
http://www.computerworld.com/storyba/0,4125,NAV47_STO67133,00.html