

Slide 1 – Title

I had a hard time focusing on a single topic for my talk today.

There are just so many things about the future of the net that are intriguing.

There was the idea that with so much of knowledge being stored on very fragile electronic media, that with an accidental or intentional flicker we could lose vast parts of our culture.

And as many of you know I'm up to my ears in the question of internet governance, a matter that I view as part of the accelerating erosion of the concept of territorial-based nation states that came about from the treaty of Westphalia in 1648.

Where does the individual person fit in this? Is the internet a vehicle that will promote democracy or will the individual be subordinated to the caste system that we euphemistically call “stakeholderism”?

And with the rise of Quasi Non-Governmental Organizations (QUANGOs) are we losing sight of the principles of constitutional governments constructed with limited powers and internal tensions and separations of powers to constrain the exercise of authority?

In other words, is our future to be the bright and shining future of the 1936 movie “Things to Come” or the dark future of “Bladerunner”?

But instead I'm going to tell you that the singular internet of today is going to be a short-lived phenomenon.

I'm going to mention a very important, but rather fuzzy concept – the End-to-End principle. I'm not going to try to explain that principle in its full glory, nor could I, it's one of those concepts that one feels rather than explains.

And I'm going to tell you why fragmentation of the net could sometimes be a good thing and sometimes a bad thing, sometimes a very bad thing.

In the end I'm going to suggest to you that unless lawyers and techies work together to find good policies to separate the good from the bad we are at risk of a future internet that will resemble the telephone systems of the 1950's: dull, boring, and static.

Slide 2 - Thesis

- What's the quickest way to look stupid and out of touch?
 - Utter the phrase “The Internets”
- Unfortunately my role here today is to argue that “the internets” is what the future holds in store.

- There is an historic tension between unity and fragmentation:
- Rome unified the known world
- After Rome Europe was burdened by local tolls on commerce.
- One of the driving forces behind the US Constitution was to remove such barriers.
- Why do these barriers grow like kudzu? Because they are profitable.
- The internet is falling prey to the same forces.
- But more is at stake than just tolls – the End-2-End principle, if lost means that internet innovation will be stifled.

Slide 3 – The End-to-End Principle

- The key idea to the internet is that IP packets may freely flow between any two devices that have IP addresses.
- The net is naturally peer-to-peer.
- The intermediary packet transport is merely best effort. Packet loss, damage, delay, or duplication is assumed to be part of the internet facts of life.
- It is also assumed that the packet transport mechanism may have some priority structure to deal with those situations in which the load exceeds capacity.
- Notice that there is an assumption of reasonable fairness until the switching points in the net run out of resources.
- Of course it is also assumed that security may require that certain limits on what devices may communicate or what they may say to one another, but that's a topic in its own right.

Slide 4 - The End-to-End Principle Makes The Internet Special

- The key element of the end-to-end principle is that it allows innovation at the edges. People do not have to ask permission in order to try out new things.
- With the risk of spam, botnets, and people trying to capitalize on their ownership of choke points, we are seeing an increasing risk to the end-to-end principle.
- Much of this has been discussed under the heading of “net neutrality”. But that discussion has not been properly focused and has, rather, been a kind of dance of the seven veils to cover what are really interest groups seeking to expand or protect their territory.

- We need to refocus on protecting those things that make the internet special and allowing those other things to leave the nest and survive and evolve on their own.
- But how do we make that distinction?
- The end-to-end principle is the key – it is the element that distinguishes those things that should be protected.

Slide 5 - Innovation Usually Causes Fragmentation

- The internet is not “forward compatible”.
- In other words, when something new is created those users that do not adopt that new thing will usually be left behind.
- Consider the case of the transition of telephones from rotary dial to touch pad and the addition of the # and * buttons.
- Folks who kept their old phones had a hard time dealing with new services such as voice mail and interactive voice response systems. (Maybe they knew something we didn't?)
- And 34 years ago (when I got my first email account) those of us on the net, not surprisingly, could not send email to those who were not.
- In other words, “fragmentation” is not a pejorative; it is often simply a side effect of what happens as technology advances.

Slide 6 - Forces Driving Fragmentation (1 of 2)

- So what kinds of things push the network to break from a shimmering uniformity into disjoint shards?
- The first two points are relatively self explanatory.
- But “network rot” - what's that?
- In short it is the accumulation of filters on the internet.
- Filters are applied to block spam, block phishers, to block annoying client computers that haven't realized that a server has moved to a new address.
- But those filters are rarely removed.
- As a result we have a kind of toxic waste all over the internet address space that increasingly hinders recycling of addresses, domain names, and other resources.

Slide 7 - Forces Driving Fragmentation (1 of 2)

- I couldn't fit all of the centrifugal forces onto one slide.
- I can't help but mention that the internet has already become burdened by expensive, bloated, self-protective bureaucracies that don't really do what they were constructed to do.
- The domain name tax imposed by ICANN already amounts to nearly half a billion dollars each year in regulatory fees that exceed the costs of providing the service being regulated.
- And with the domain name marketplace locked tighter than a medieval guild entrepreneurs face the question of self-survival or internet fragmentation. The answer is obvious.

Slide 8 - Factors Facilitating Fragmentation

- An important, but subtle shift is occurring about what the internet is.
- It used to be that the net was considered a communications medium.
- Now people are beginning to view it as a platform for applications.
- As an applications platform the concern is whether the application can be made to work, even if that requires ad hoc bridging and the technical equivalent of duct tape.
- The end-to-end principle then becomes merely optional and expedient rather than foundational and valuable.
- Network Address Translators have made us familiar and even comfortable with a fragmented IP address space without exposing us to the the potential difficulties.

Slide 9 - Factors Resisting Fragmentation

- So what's resisting fragmentation?
- Not much.
- And those forces of resistance are likely to fade over time.

Slide 10 - Our Challenge As Lawyers and Policymakers

- As usual our job is going to be to distinguish one shade of gray from another.
- We must learn to comprehend the value of the end-to-end principle so that we can begin to define when it is permissible to encumber or limit end-to-end

communications and when the greater good is served by protection of the principle.

- For example, I'd ask you to consider when it is permissible for a network provider for purposes of elevating its products over those of a competitor to induce packet delay, loss, and engage in other forms of predatory behavior, or to put it the other way around, when can a provider give preference to its own offerings?
- Would this kind of behavior be acceptable if the provider offered comparable preferences to competing traffic for a reasonable price?

Slide 11 – The First Law of the Internet

- Without a hint of humility, I offer you this as a guiding principle.

Slide 12 - Finished