

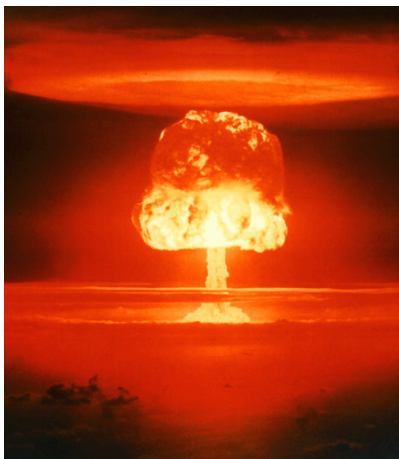
Not your father's Internet, and that hurts

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CENIC - 15 March 2006

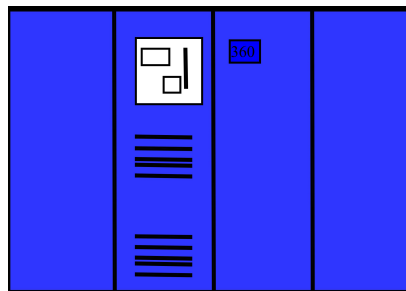
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The Original Reason(s)



or



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What to Do?

use self-describing packets

0/ connect existing networks

design for

1/ survivability

2/ to support multiple types of communications

3/ over a variety of network types

4/ with distributed management

5/ cost effectiveness

6/ low cost attachment

7/ accounting for use of resources

Dest Addr	Src Addr	payload
-----------	----------	---------

!security

!QoS

!efficiency

use internetwork address

The Design Philosophy of the DARPA Internet Protocols - Dave Clark
(nms.lcs.mit.edu/6829-papers/darpa-internet.pdf)

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Architectural Principle

e2e

let the ends do it

(or control it)

let the user decide

(a.k.a., The Stupid Network)

End-to-End Arguments in System Design - Saltzer, Reed & Clark
(<http://web.mit.edu/Saltzer/www/publications/endoend/endoend.txt>)
The Rise of the Stupid Network - David Isenberg (<http://www.isen.com/stupid.html>)

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But!

1. no QoS!

2. no business model!

3. where is security?

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1. QoS

fixation of traditional networking people
but can you sell better QoS at a higher price?
(specifically, multiple levels per customer)
without resorting to extortion?

EBay to buy Skype in \$2.6 billion deal

USA Today 9/12/2005

"It fails to fail often enough so it looks like it works."

Mike O'Dell

"The Internet is not reliably crappy enough to drive the business model."

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IAD = IQ test

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1a. QoS Extortion

ISP tells Google to pay up if they want to get good service to their customers

not just a theoretical concept

Edward E. Whitacre - CEO AT&T

*'Google, Vonage & Skype are using **my** network for **free**'*

William L. Smith - CTO Bell South

'we should be able to charge Yahoo to let their web page load faster than Google'

but if the net is normally quite good ...

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2. Business Model

application service can be provided by 3rd parties - not just by carriers

carriers do not understand concept

"I still don't understand why it is a "users" choice where the "services" are executed - I would have thought that this would be [the] networks choice"

ITU-T SG mailing list 16 Apr 2000

and ISP does not profit from applications using network - i.e., Internet service is a commodity

"We do not know how to route money"

Dave Clark

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3. Internet Security

“e2e” means security is an end system responsibility

end systems & infrastructure are under relentless attack

Internet does not protect end system

e.g., makes sure the worm is delivered promptly

MTBI (mean time before infection) 15min

for a new broadband-connected machine

should ISP be required to “help”?

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Internet Architecture

no regulated architecture or basic design

no regulated interconnection requirements

(in US) no registration/control of ISPs (so far)

thus

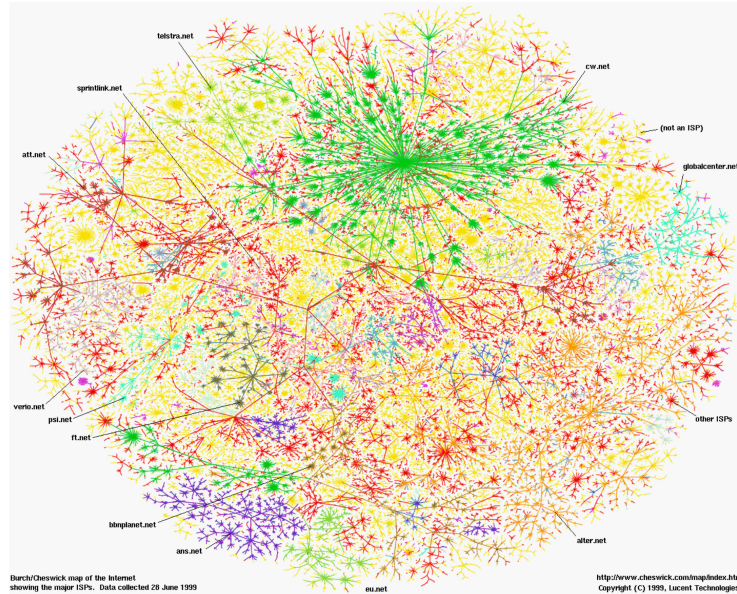
no consistent Internet architecture

(may be better from a security standpoint)

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Internet “Architecture”



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(<http://www.cheswick.com/map/gallery/index.html>) Copyright 2006 Scott Bradner

Thus:



(Internet & IP networks)

by definition (for traditional networking folk)

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What Did It Give Us

e2e Internet, and open computer operating systems, are *generative*

i.e., enable innovation by others

impact society by moving or eliminating control points

e.g., information that can “confuse citizens”

The Internet is a **parent revolution**

“The invention of the printing press is the greatest event in history. It is the mother of revolution.”

Victor Hugo

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Why e2e is (was) Important

customer freedom to access content

psychology important - not clear economically vital

allows widespread innovation activity

dramatic (and chaotic) innovation using Internet

“What achieved success was the very chaos that the Internet is. The strength of the Internet is that chaos.”

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non-transparent net restricts ability to innovate

must get permission of firewall owner or NAT vendor
else must hide in HTTP

CDA testimony - Bradner - (<http://www.sobco.com/papers/index.htm>)

The Future and its Enemies - Postrel - (<http://www.dynamist.com/tfaie/>)

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e2e

convinced that the e2e principle is important?

Google, Vonage, eBay, Skype and thousands of
other companies are

telcos are but in a reverse way
and regulators are not sure

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Current Alternative

Intelligent Network (IN)

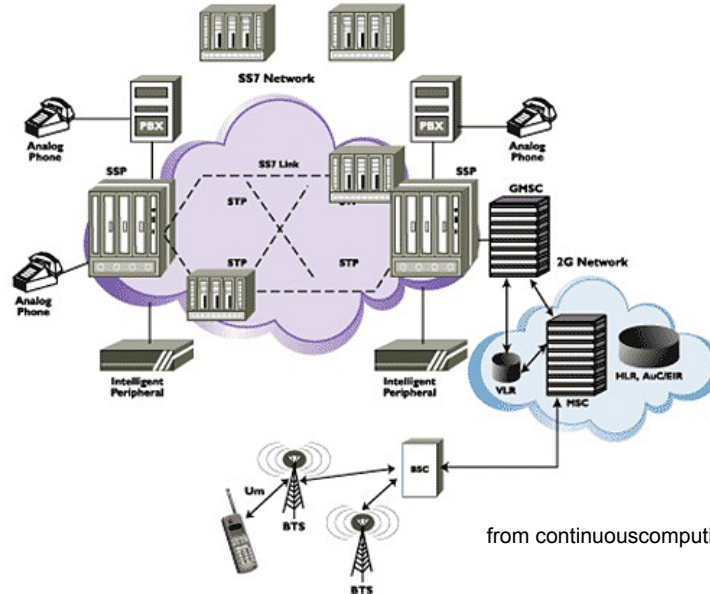
let the carrier do it
(or control it)
i.e., carrier decides

(quiz: what does a fast busy mean?)

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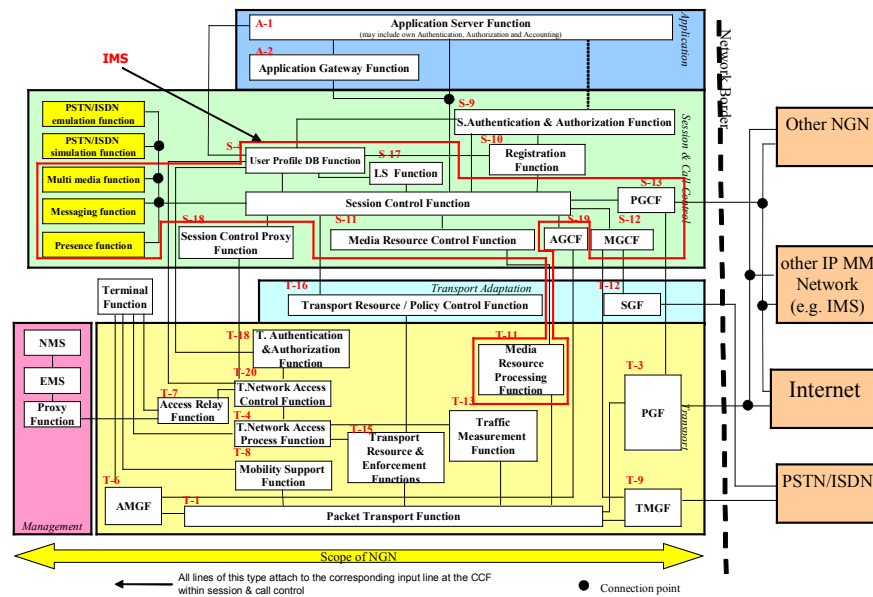
Current Alternative: IN



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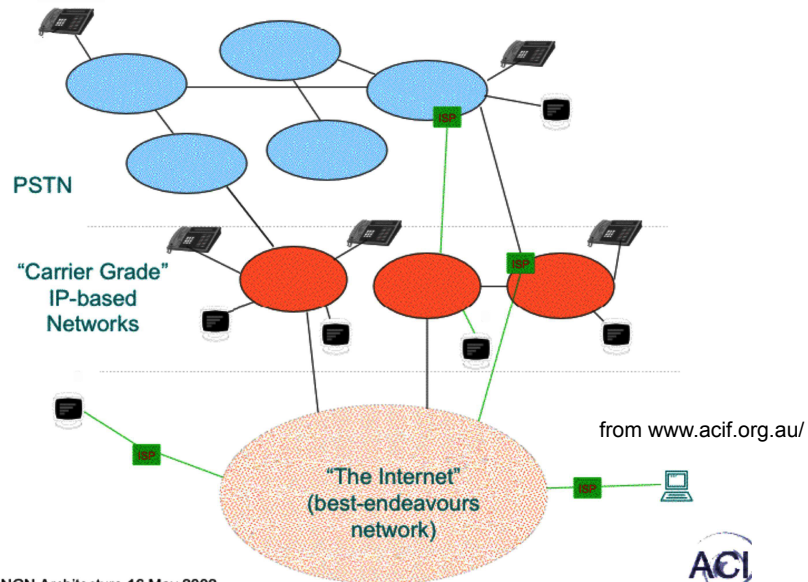
Future Alternative: ITU-T NGN?



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ITU-T NGN Overview



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NGN Architecture 16 May 2002

ACI
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No E2E

alternatives assume carrier involvement in application use of the network

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Regulations

current list of effective US government
regulations on the Internet

~~traditional fraud/business regulations~~

~~CANSPAM~~

~~CDA~~

DNS squatting

~~anti-porn~~

...

note regulators have good rear-view mirrors but
often also have myopia

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Regulatory Approaches

openists

net must be open to enable *innovation commons*

require *network neutrality*

e.g., power grid does not favor toasters

to let people at edge/end innovate

e2e

dumb pipe must be available

deregulationists

if network is property then companies will innovate

note: “property” specifically includes right to exclude

network owner needs incentive to invest

IN

forced *smart pipe* OK

The Broadband Debate: A User's Guide - Tim Wu (<http://ssrn.com/abstract=557330>)

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FCC Principles

4 “principles” (5 August 2005)

consumers are entitled to access the lawful Internet content of their choice

consumers are entitled to run applications and use services of their choice, subject to the needs of law enforcement

consumers are entitled to connect their choice of legal devices that do not harm the network

consumers are entitled to competition among network providers, application and service providers, and content providers

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(http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-05-151A1.pdf)

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FCC Principles, Annotated

4 “principles” (5 August 2005)

*consumers are entitled to access the **lawful** Internet content of their choice*

*consumers are entitled to run applications and use services of their choice, **subject to the needs of law enforcement***

*consumers are entitled to connect their choice of **legal** devices that **do not harm the network***

consumers are entitled to competition among network providers, application and service providers, and content providers

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FCC: CALEA

Internet & interconnected VoIP providers subject to CALEA (wiretapping) law

VoIP provider "***must necessarily*** use a router or other server" thus is facilities-based

logic in FCC Order & principles logically leads to a requirement that the FBI pre-approve applications

something they requested

may apply to private networks

FCC asked for comment on application to higher ed

(http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-05-153A1.pdf)

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Network Neutrality

Senate Commerce Committee hearing 2/7/06

Vint Cerf et al vs. TIA et al

Cerf

described e2e concept & power of Internet

asked Senators to not let carriers destroy it

Walter McCormick, Jr. for US Telecom Industry Association

would never "*block, impair, or degrade content, applications or services.*"

but do not make any rules to stop us from doing so

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Net Neutrality, contd.

Vint' s reason

carriers could make it so carrier permission (or payment) is required for new applications
block new app development - destroy generative effect

TIA' s reason

'carriers will not deploy new facilities if they are not guaranteed a return on their investment' (!!!)

(note: did not say what they would actually do -
McCormick disavowed AT&T etc CEO statements)

(<http://commerce.senate.gov/hearings/witnesslist.cfm?id=1705>)

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Net Neutrality, contd.

but note that the business issue is a **very** real one

commodity can be a hard business model
and infrastructure can be very expensive

muni networks may have a real place

so might regulated monopolies

that is what got us the phone net (& Internet) of today

common carriage enabled the Internet

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Internet Governance

World Summit on the Information Society - WSIS

discussing “Internet Governance”

started by ITU looking for a role in the future

e.g., who should control DNS root? (<http://www.itu.int/wsis>)

currently ICANN with US DoC oversight

intergovernmental body

NGOs may watch but ...



big push to move to UN (or the like)

assumptions of other authorities might follow

e.g., protect citizens from confusing information

fought to a standstill - maintain status quo

plus Internet Governance Forum (IGF)

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ITU post WSIS

- ITU Secretary-General Yoshio Utsumi

“the Internet need not be one net controlled by one centre”

domestic networks are *“more efficient and economical”* (because much traffic is local)

“telephone networks are made up of regional, domestic networks united together in agreement with ITU framework. A similar situation may start with the Internet” - if so the ITU will be called upon to fix things (within 5 years)

- end-to-end? what is that?

(http://www.theregister.co.uk/2005/11/21/utsumi_rejection/)

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Non Transparent Net

transparency of end2end network mostly gone

enterprise edge issues

NATs, firewalls, proxies, content caches, TCP reshapers

core issues

deregulationists want to let carriers block/impact traffic

in the name of incentives to deploy

governmental issues

e.g., China blocking access to “bad” sites

would not want to “confuse the citizens”

PA law blocking access to “child porn” sites

1.6 M sites were blocked to “block” 400 “child porn” sites

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Trust-Free Net

must mistrust IP address

e.g., NAT, firewall

must mistrust privacy

e.g., wiretapping, hacking

must mistrust identity of source

e.g., spoof

must mistrust identity of destination

e.g., proxy, phish

must mistrust own computer

e.g., root kit, trusted computing

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Security in a Trust-Free Net

must be e2e

as noted in original e2e paper

cannot include network devices/systems in trust envelope and still be sure of security

thus e2e identification & encryption are key

e2e encryption is a problem for law enforcement

Clipper II on the way?

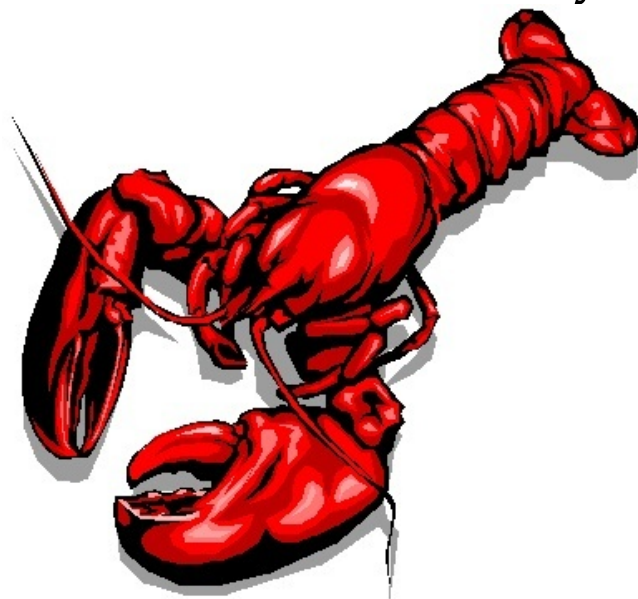
firewalls do not provide real security

unless the firewall is in the end system

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Crustacean Security



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Dad's Net

your father's net was end-to-end
your father's ISPs understood they were in the
bit transport business
your father's net was ignored by the carriers,
regulators and governments
your father's ISPs were in the ISP business
your father's ISPs did not all try to sell for less
than it cost them to provide service
your father's net was not the underpinning of all
telecommunications

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Your Net

- your net is sometimes e2e
- in your net it's everything over IP
- your net is becoming the underpinning of all telecommunications
- your net confuses citizens
- governments (and regulators) are paying attention to your net
- telephone companies bring you your net
(and they are in the business of controlling regulators)

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Bottom Line

your net is too important to be left to those that
know what they are doing

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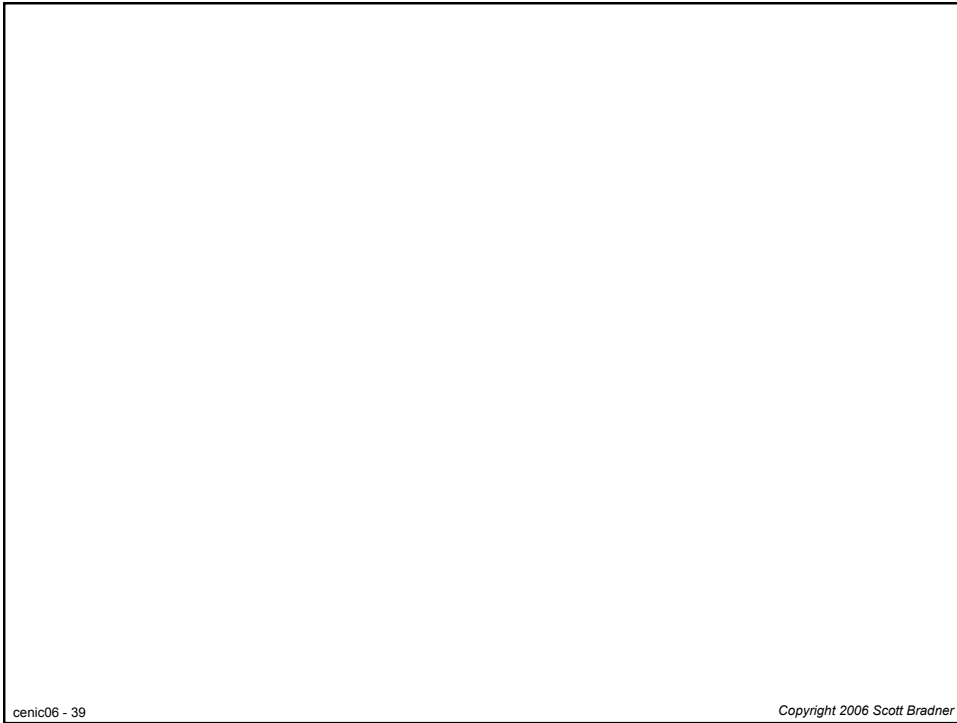
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good luck

maybe your grand kids will still have an Internet
(and maybe not)

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