

CCN

CCNx 1.0 Motivations & Overview

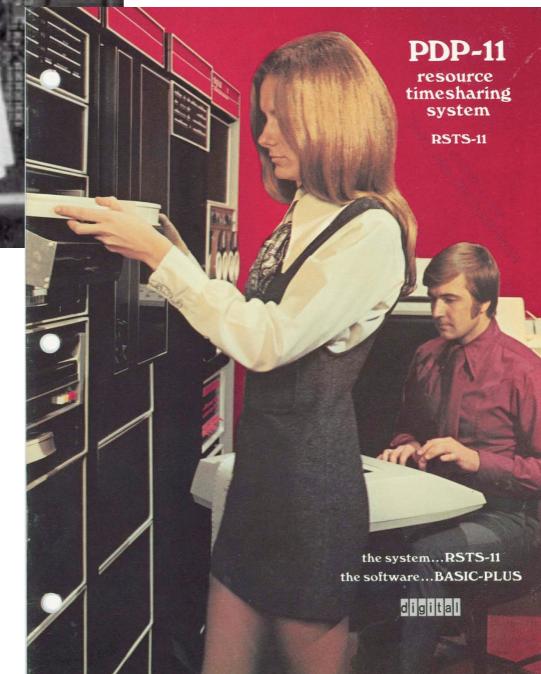
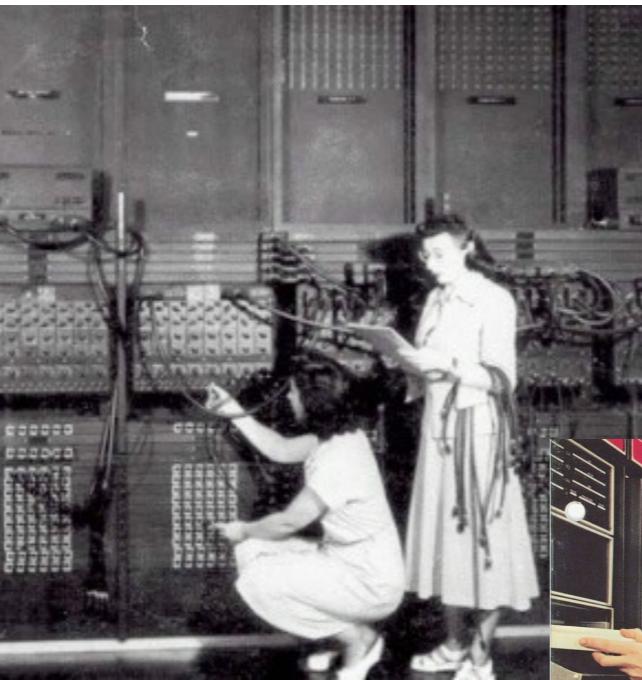
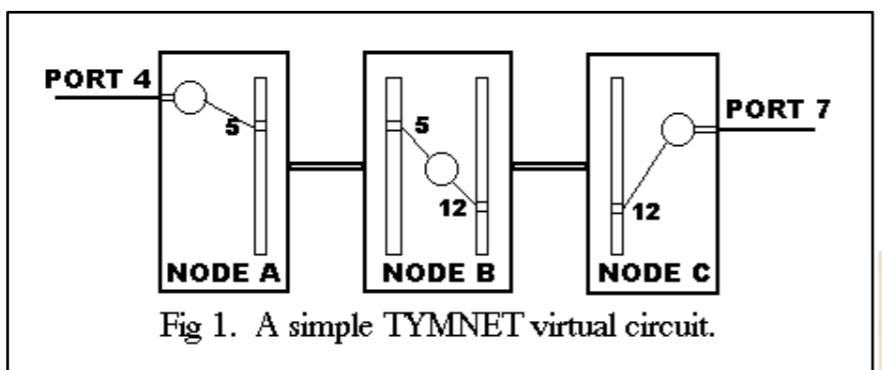
Computer Science Laboratory

Networking & Distributed Systems

March 2014

CCN - Motivation

Computer networks started as wires or virtual wires



We've lowered the cost of the world.

No, the low CompuServe \$5.00 per hour charge hasn't changed, but the world of information we offer is growing steadily.



Of CompuServe's 29 large computer systems, 16 are housed here in our Dallas, Texas Computer Center.

writers and more. We are continually adding new features to the information service, so check our "What's New" section regularly to see what other information is available.

TRS-80™ Color Computer and Videotex*

The CompuServe Information Service is sold in Radio Shack® stores and, in addition to all the major brands of computers and terminals, can be used with the new TRS-80 Color Computer and Videotex terminal. Our special software formats the information in easy-to-read pages. Go forward, backward, anywhere in the CompuServe Information Service databases—even directly to a page of information.

Big System Reliability

When we say we're reliable, we mean it. In fact CompuServe computers were up and running for a 99.5 percent reliability factor last year. We've also built in many "invisible" features like data error detection and retransmission—all those technical enhancements which add up to the CompuServe Information Service being ready to use when you're ready to use it.

More Computer Power

The number of CompuServe customers keeps growing—now more than 8,000 strong. The more customers we have, the more computer power and access lines we dedicate to our Information Service. Our 22 mainframe computer systems provide sufficient power and capacity to serve thousands more.

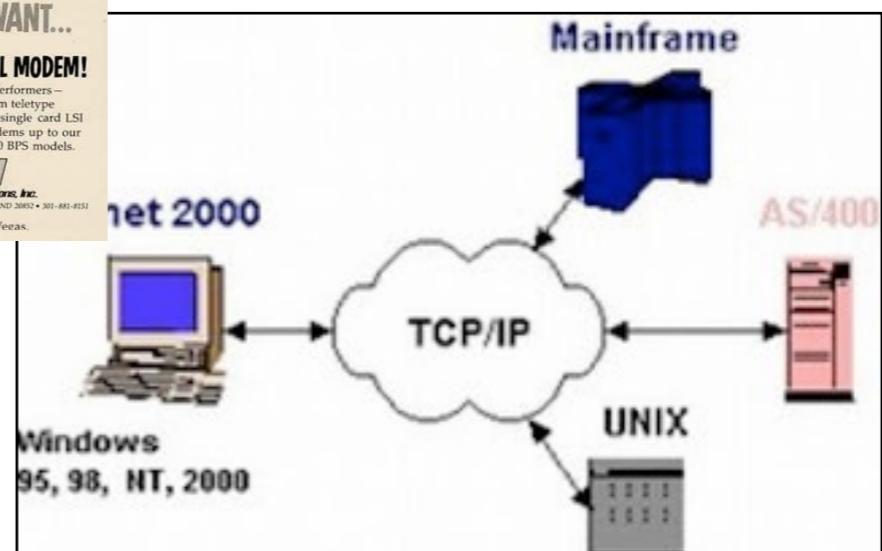
More News

In addition to the Associated Press, we've added more news. Read The New York Times and all the news that's fit to print, including Broadway show and movie reviews, stories from Pulitzer Prize-winning

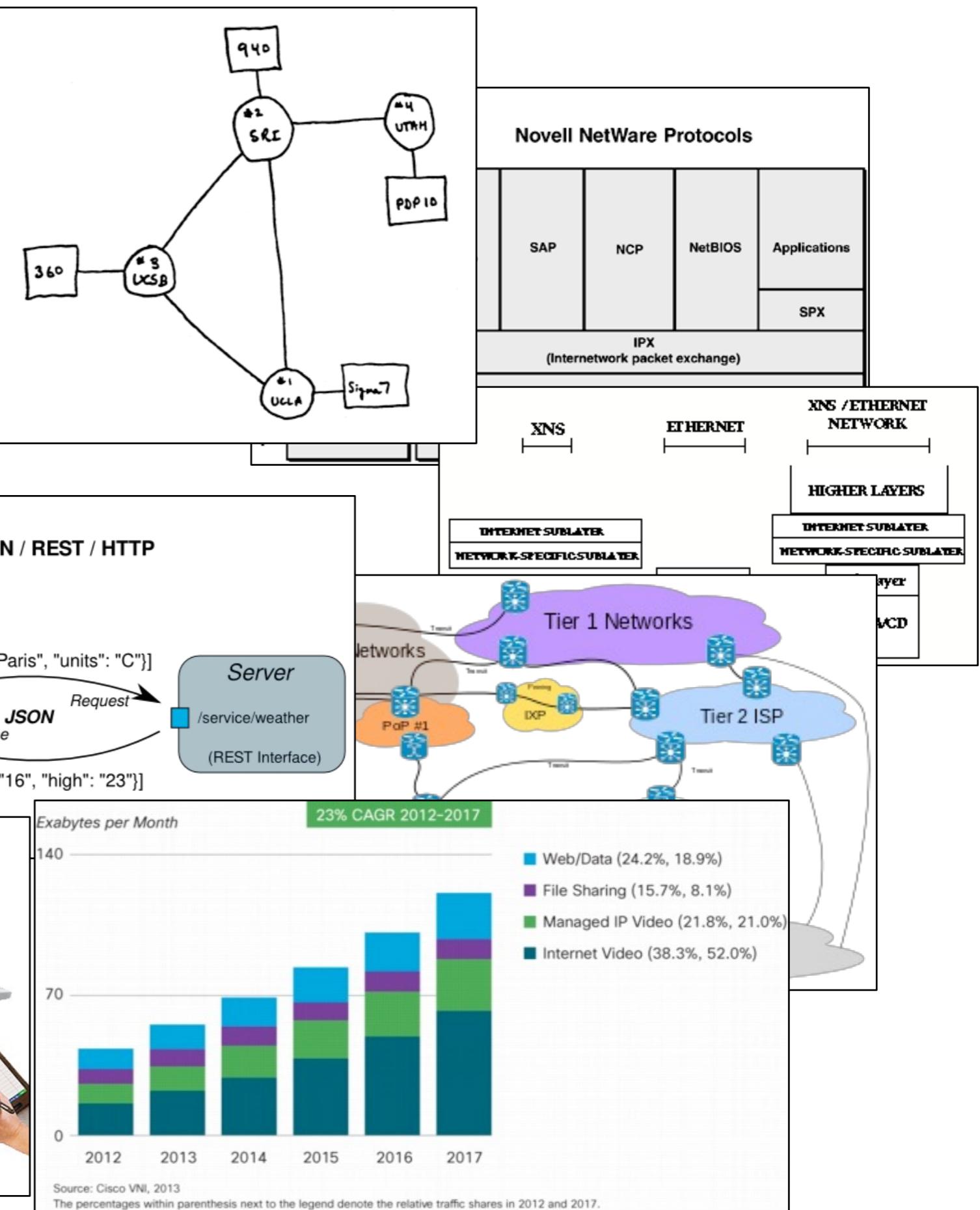
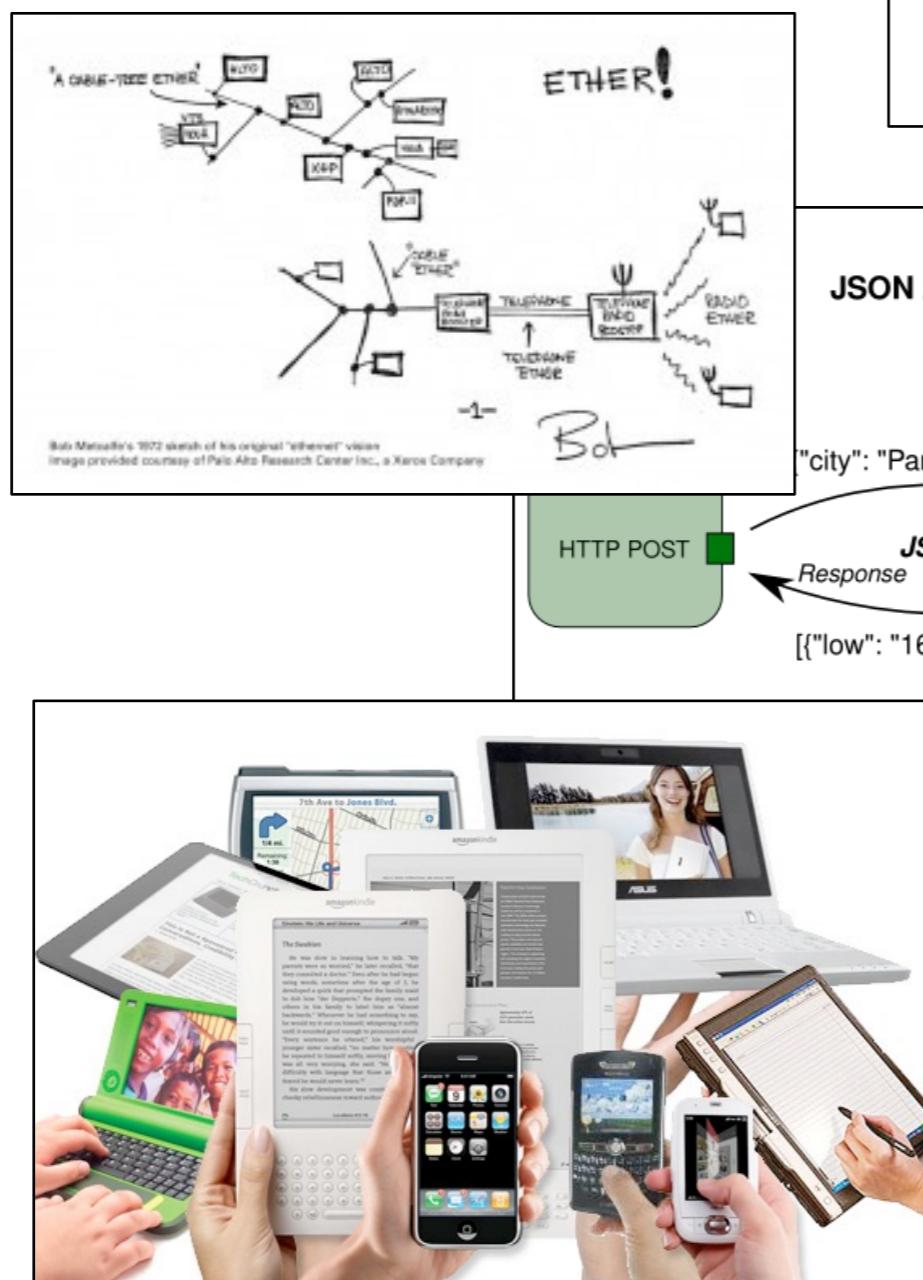


CompuServe

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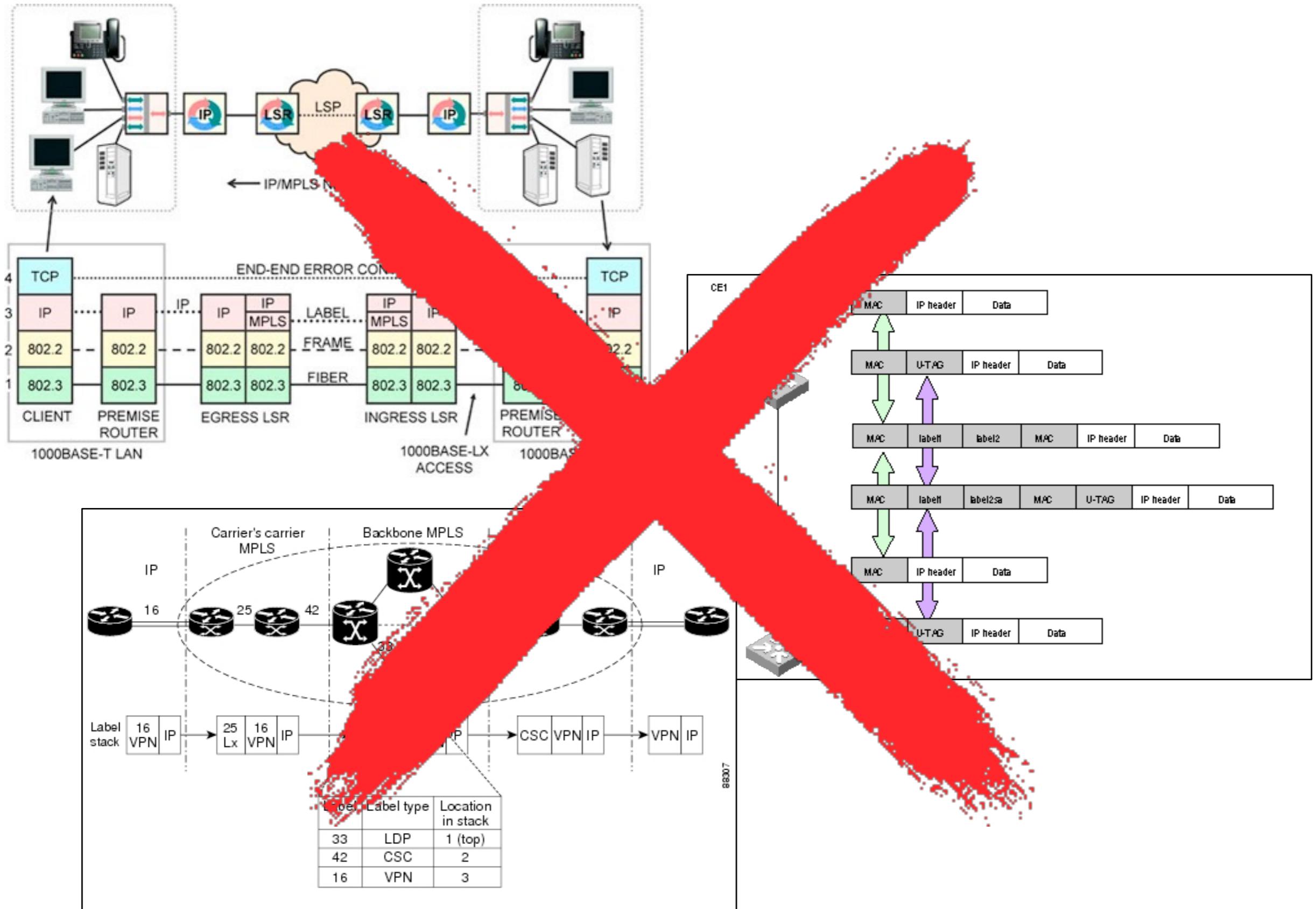


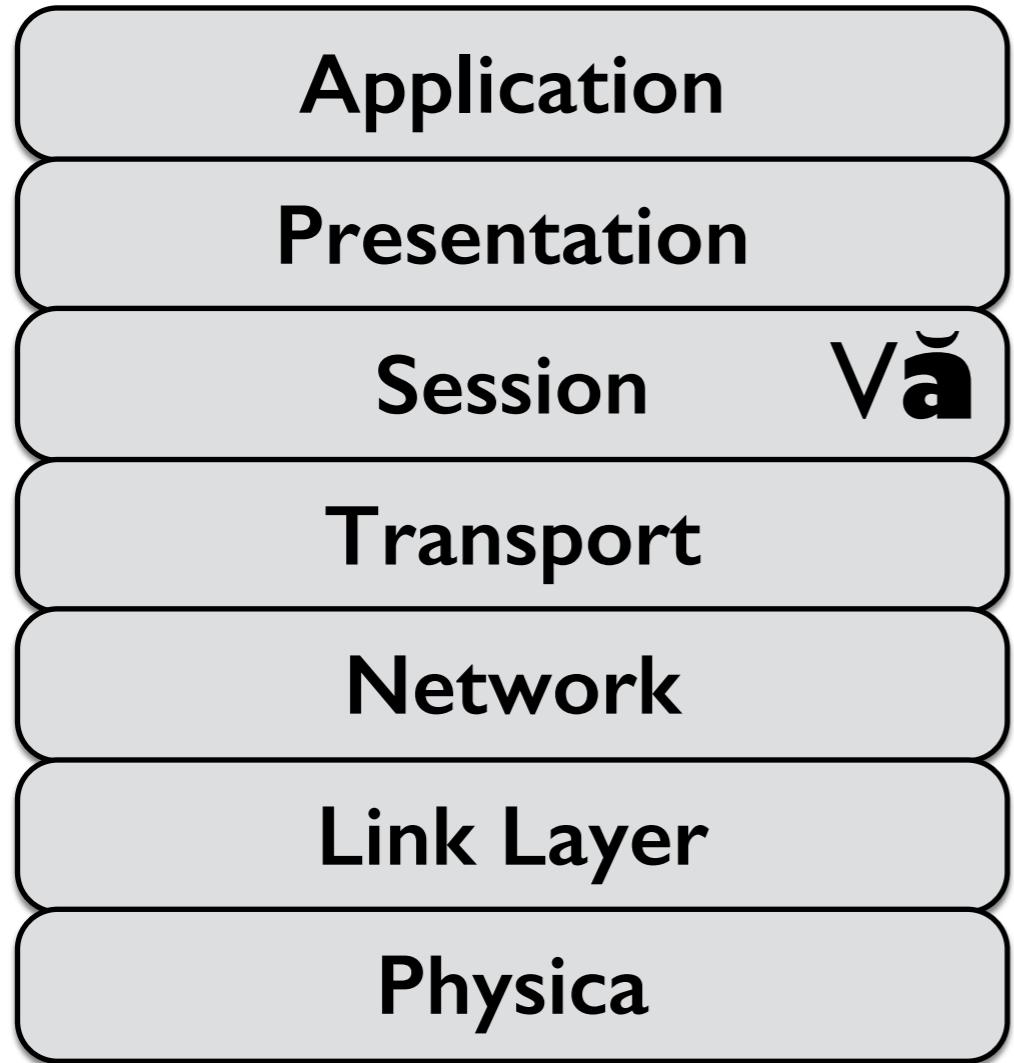
Then evolved to
distributing
content



We no longer
connect (virtual) wires

We move content





Please send me the invoice

Por favor, envíenme la factura

Vă rugăm să trimiteți-mi factură

Lähetä minulle laskun

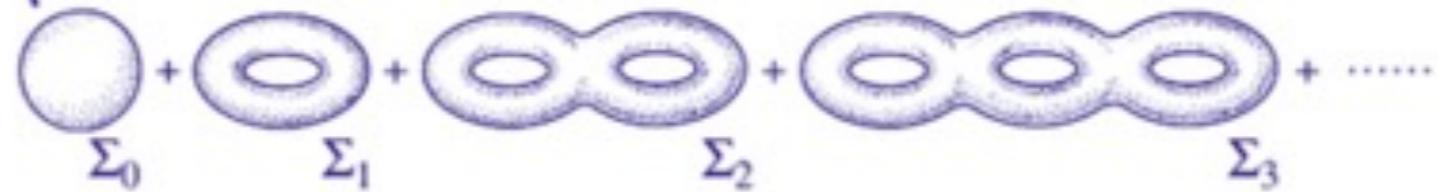
الرجاء ارسال لي الفاتورة

Խնդրում եմ ուղարկել
իսկ ապասեքազիր

Unified Field Theory

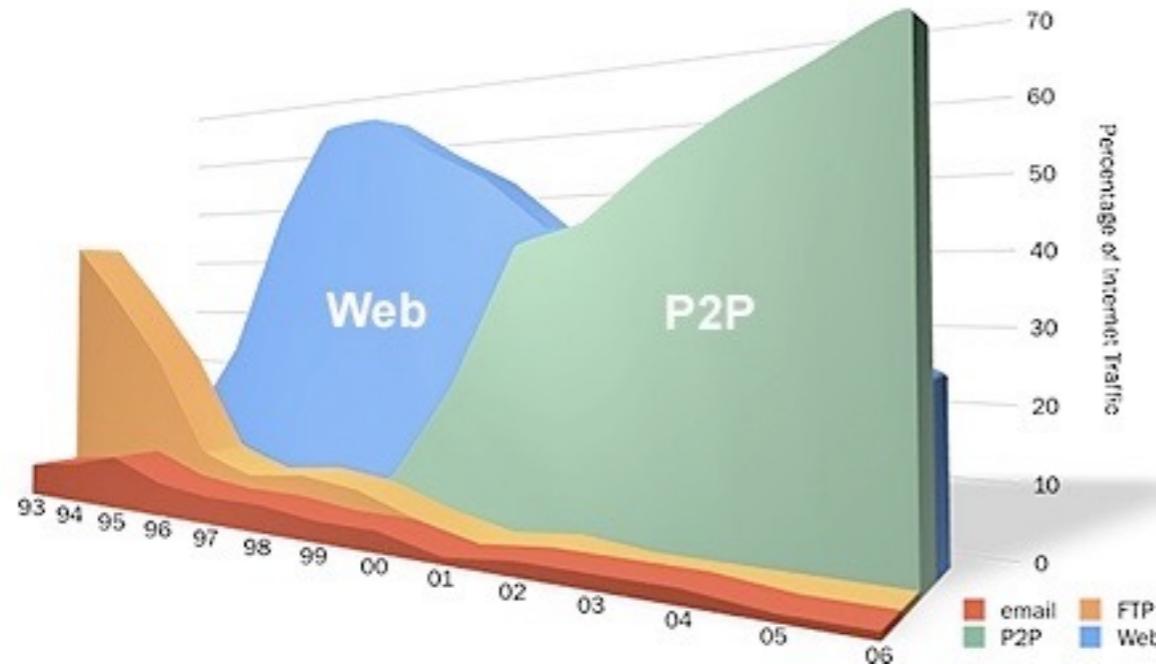
$$\begin{aligned} S_{\text{eff}}^{(D)}(g_{\mu\nu}, A_\mu, \dots) &= \sum_{\Sigma_\gamma} e^{-\phi\chi(\Sigma_\gamma)} \int_{M(\Sigma_\gamma)} \int d\psi dX \dots e^{\int d^2z \mathcal{L}_{2d}(\psi, X, \dots, g_{\mu\nu}, A_\mu, \dots)} \\ &= \int d^Dx \sqrt{g} e^{-2\phi} \underbrace{[R + \text{Tr} F_{\mu\nu} F^{\mu\nu} + \dots]}_{\text{general relativity, gauge theory, etc.}} + \mathcal{O}(m_{\text{planck}}^{-1}) \\ &\quad + \dots \end{aligned}$$

2-dimensional Lagrangian
↓
↑ small string corrections

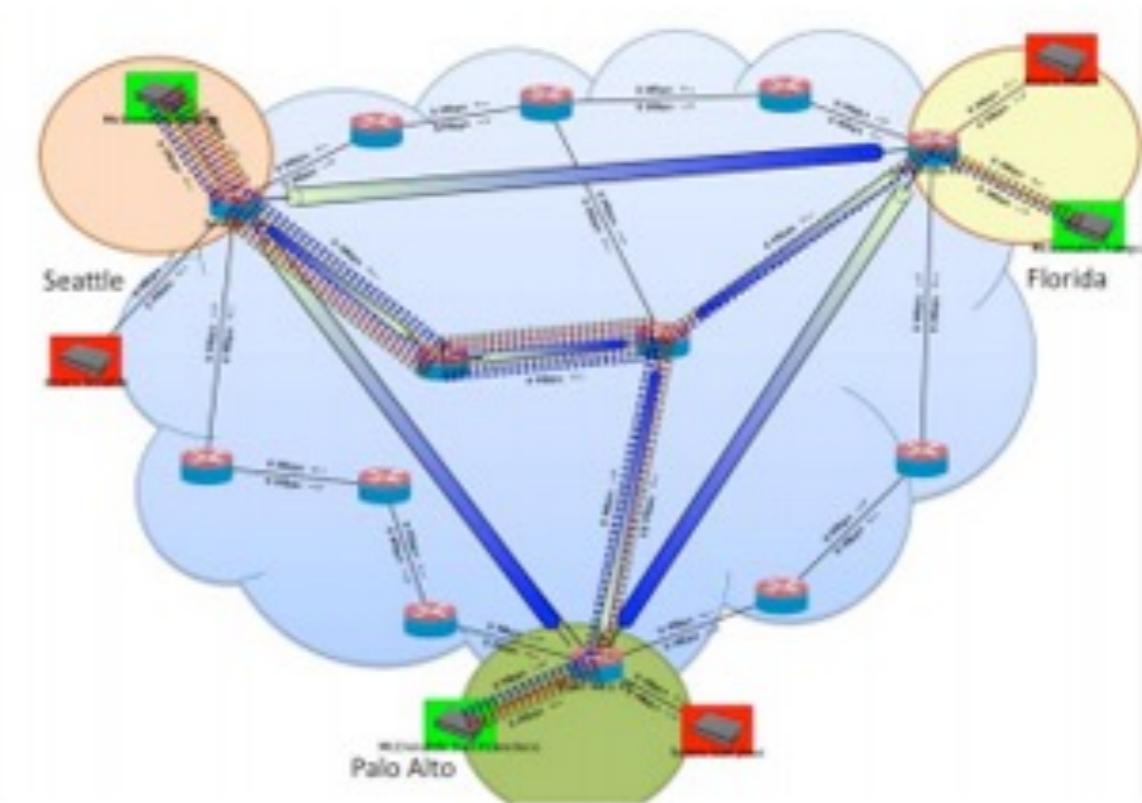
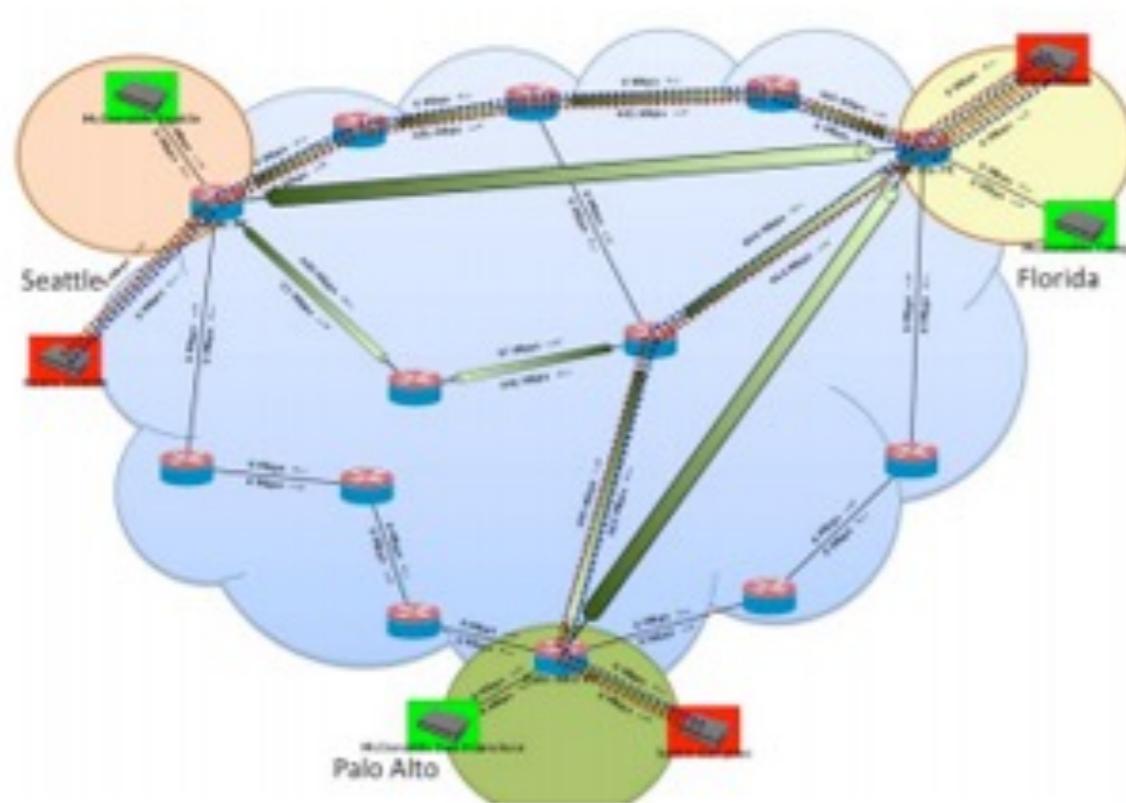


Unified Network Addressing

/parc/csl/presentations/CCN Intro.ppt/slides06/v3/c0

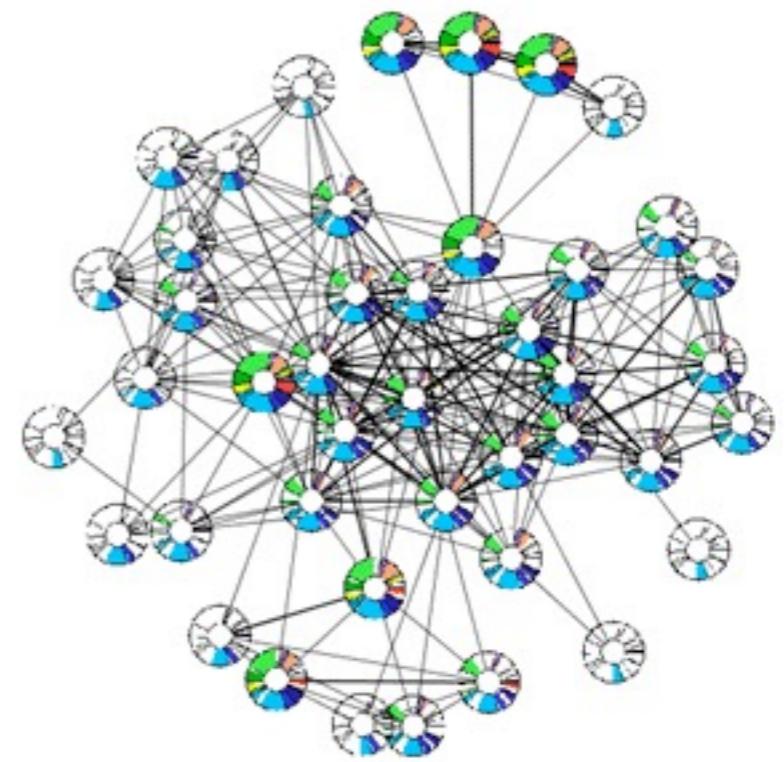
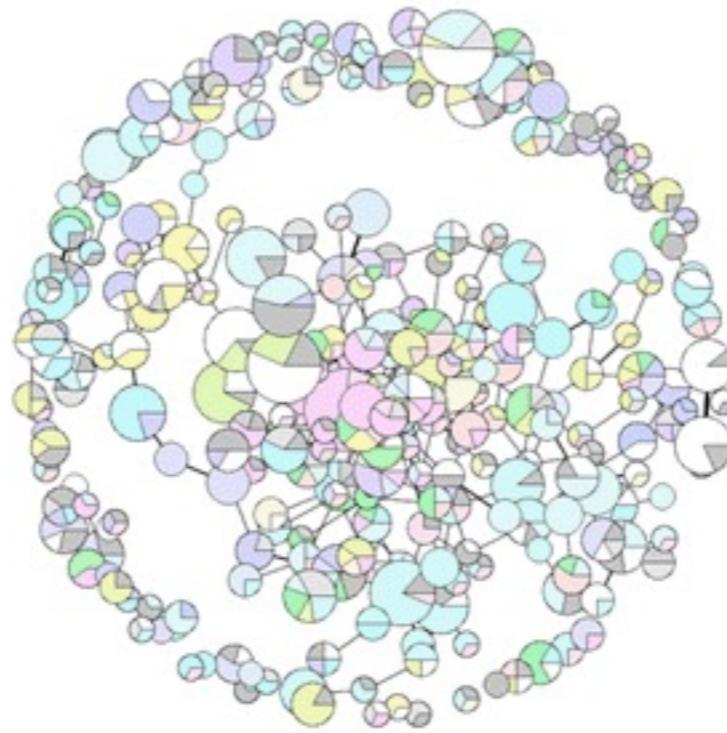
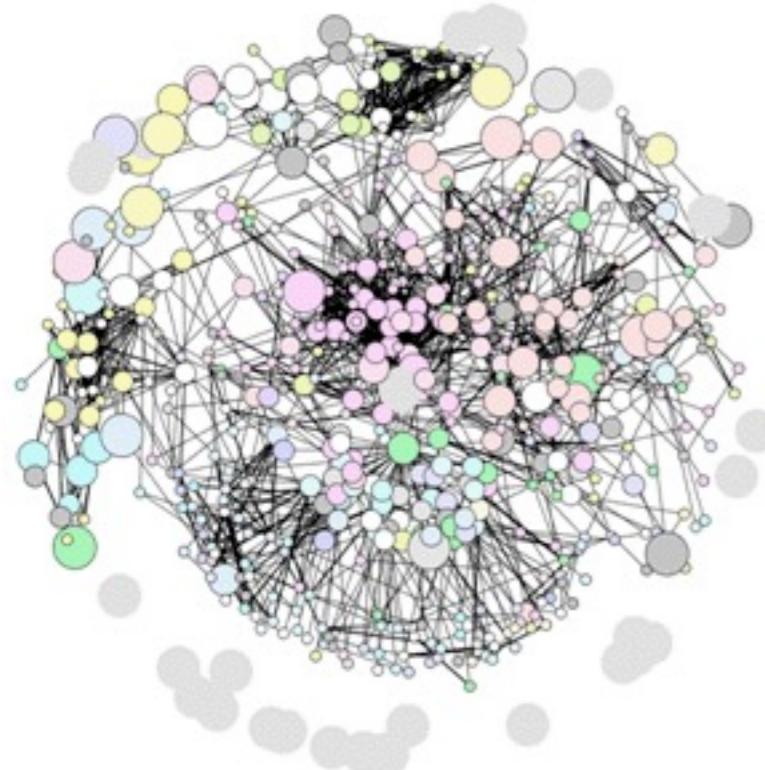


Dynamic Adaptation





Build applications
around their data,
the network
organically adapts.



CCN - Core idea

Application

Service
Frameworks

Transport

Forwarder

“Please send me the invoice”

“Please send me the invoice”

Chunks 0 - 3

“Please send me the invoice”

Chunks 0 - 3

Verify a trusted signature

Fragment to the MTU

Forwarder

Application

Service
Frameworks

Transport

Forwarder

Core Protocol



Core Protocol Everywhere

Layered Name-based Protocols

CCN Names

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globally
routable
name segments

application
dependent
name segments

protocol
dependent
name segments

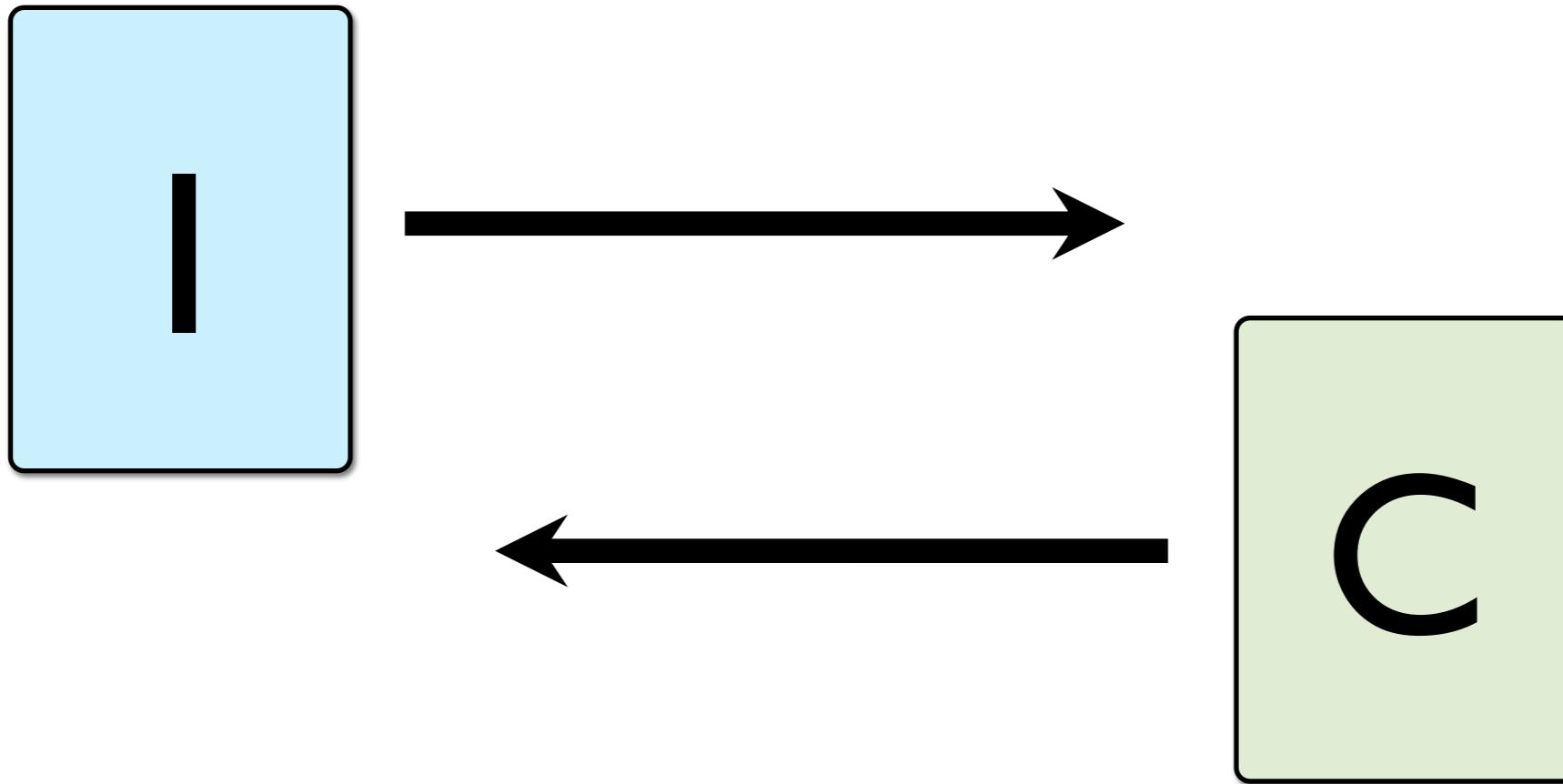
A photograph of a hiker from behind, walking up a steep, snow-covered mountain slope. The hiker is wearing a blue backpack, red shirt, and tan pants, and is using trekking poles. The mountain is rugged with dark rock faces and patches of snow. The sky is clear and blue.

Success is a Journey,
Not the Destination



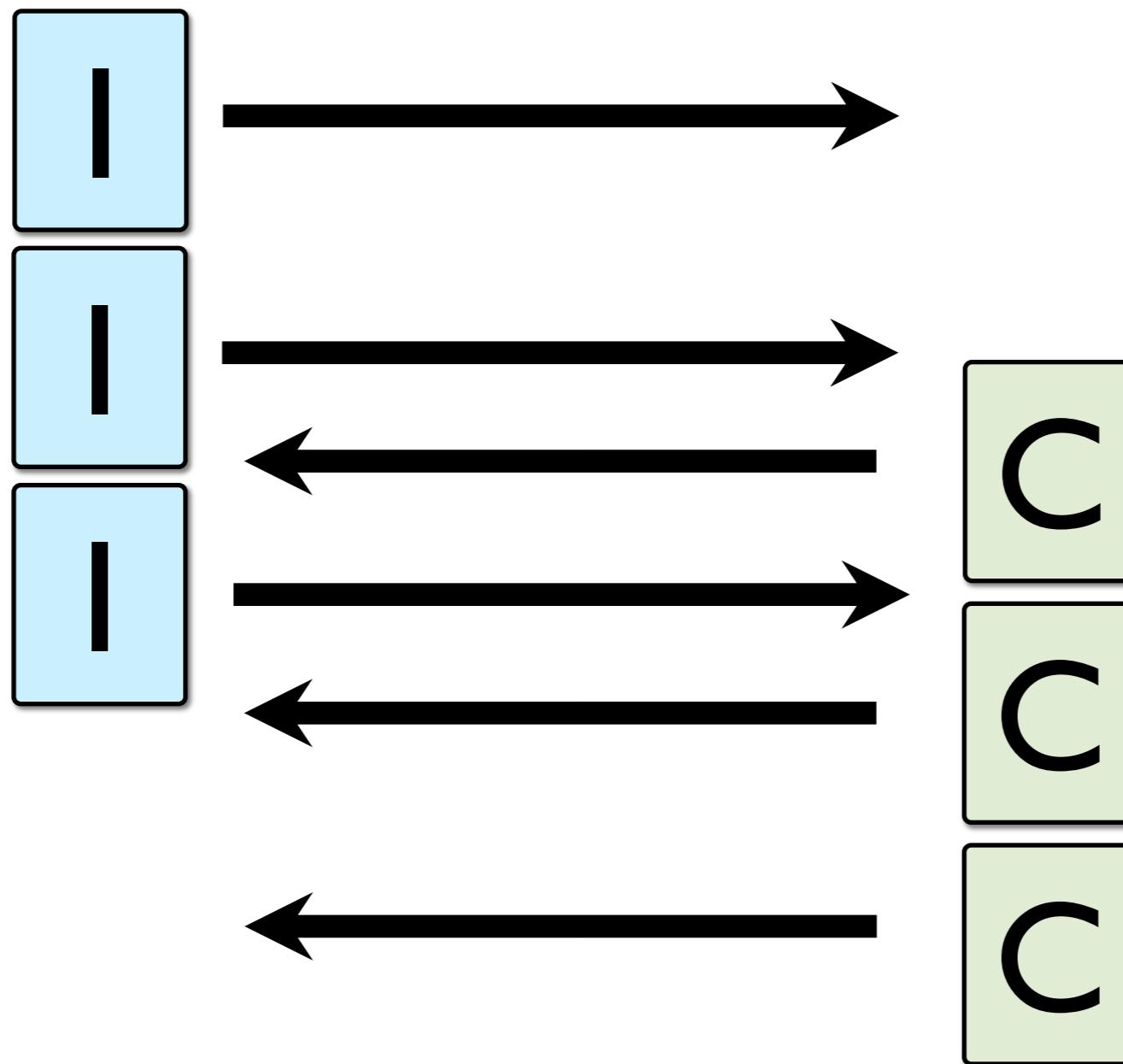
Data no longer tied to hosts
Provenance part of data
Secure the data, not the pipe

Core Protocol



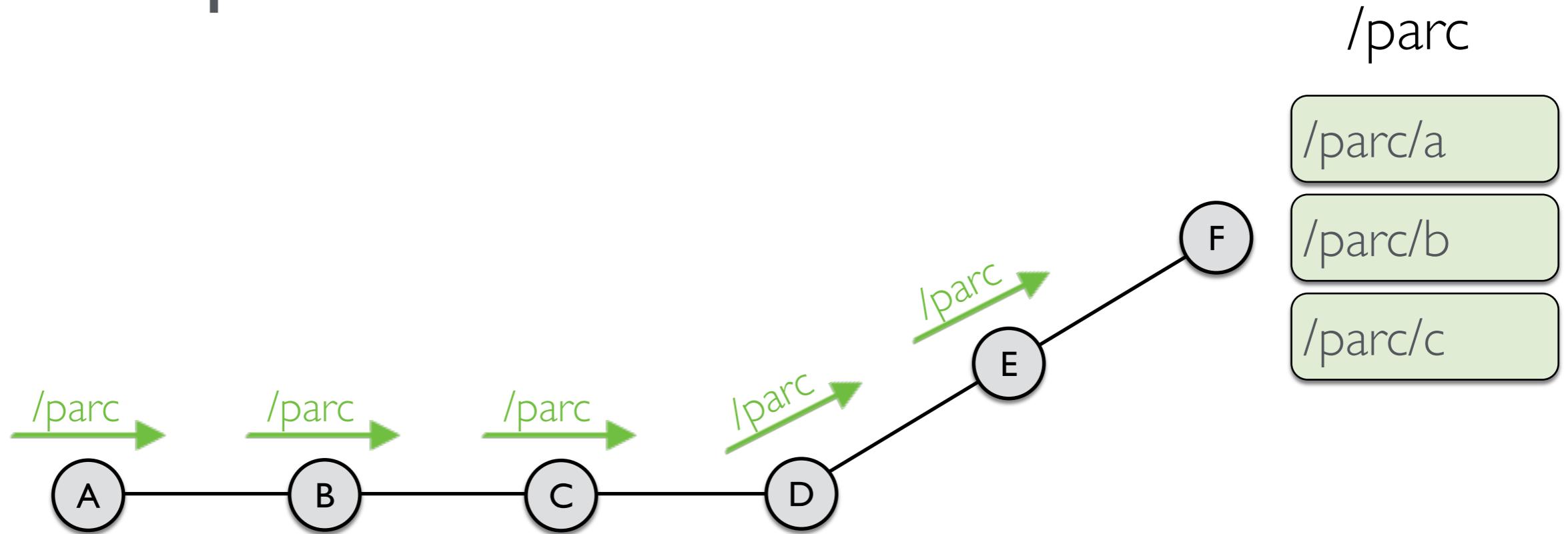
One interest packet gets one content packet

Congestion Aware Protocols



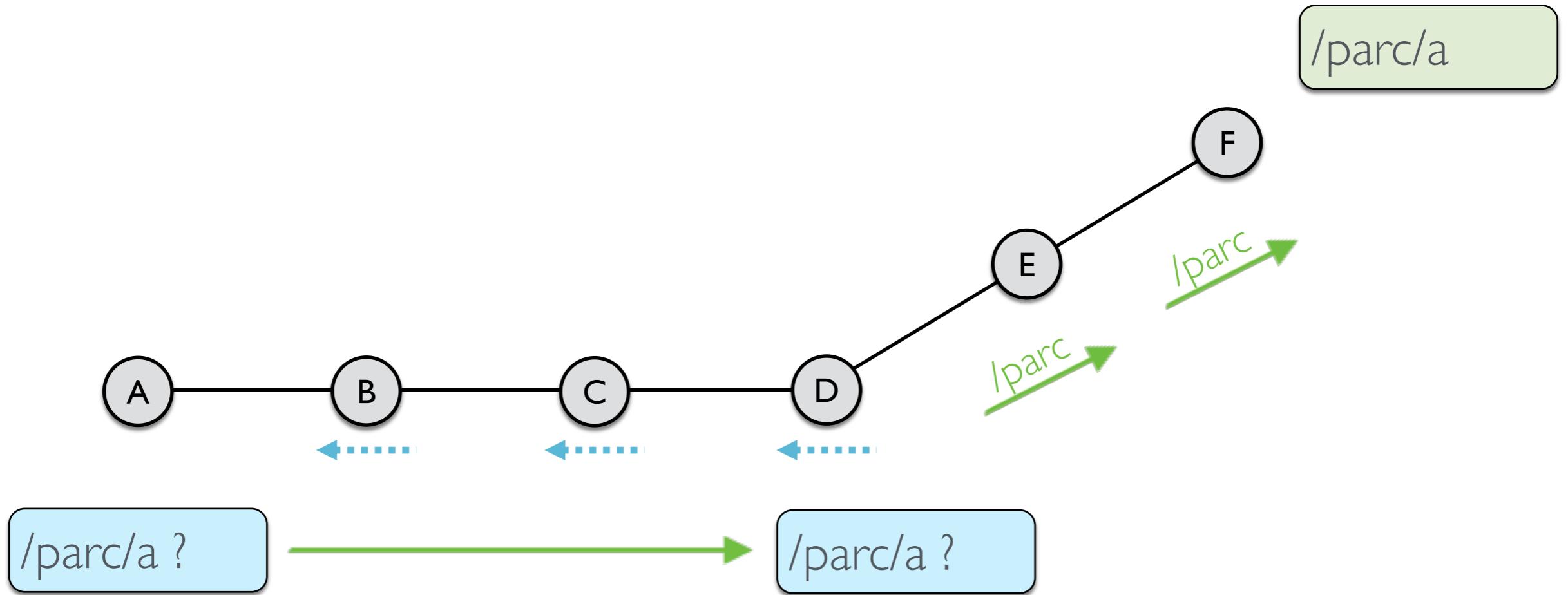
Transport protocols can do parallel requests

Routes point to authoritative sources



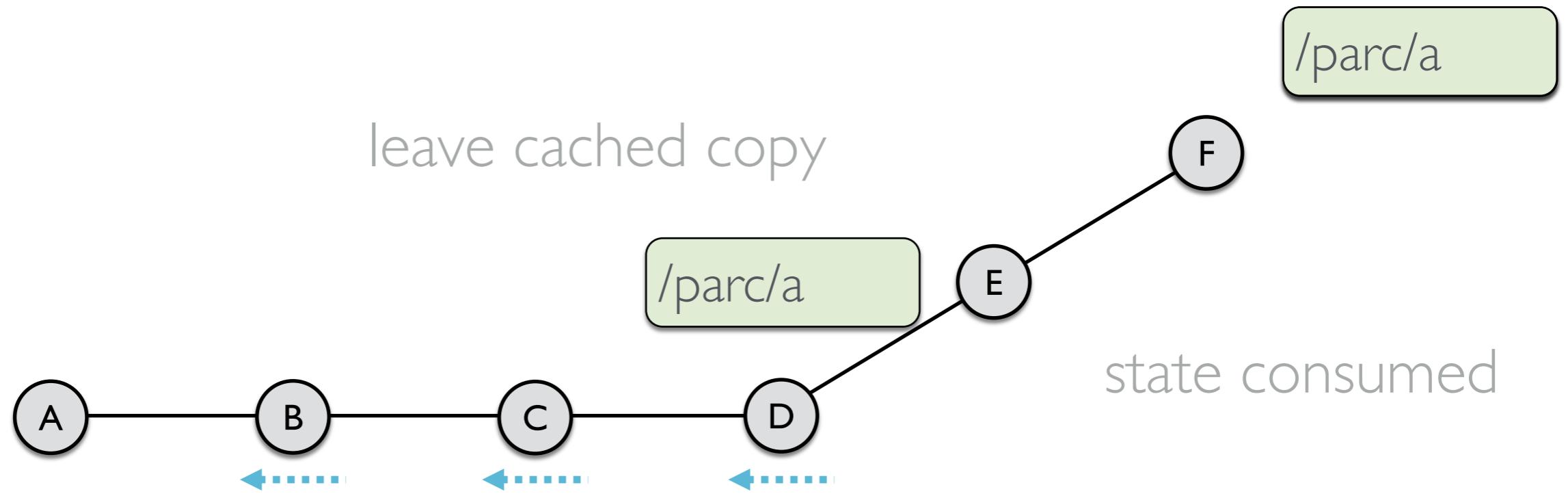
Routes are set up pointing to F for prefix /parc

Interests leave state



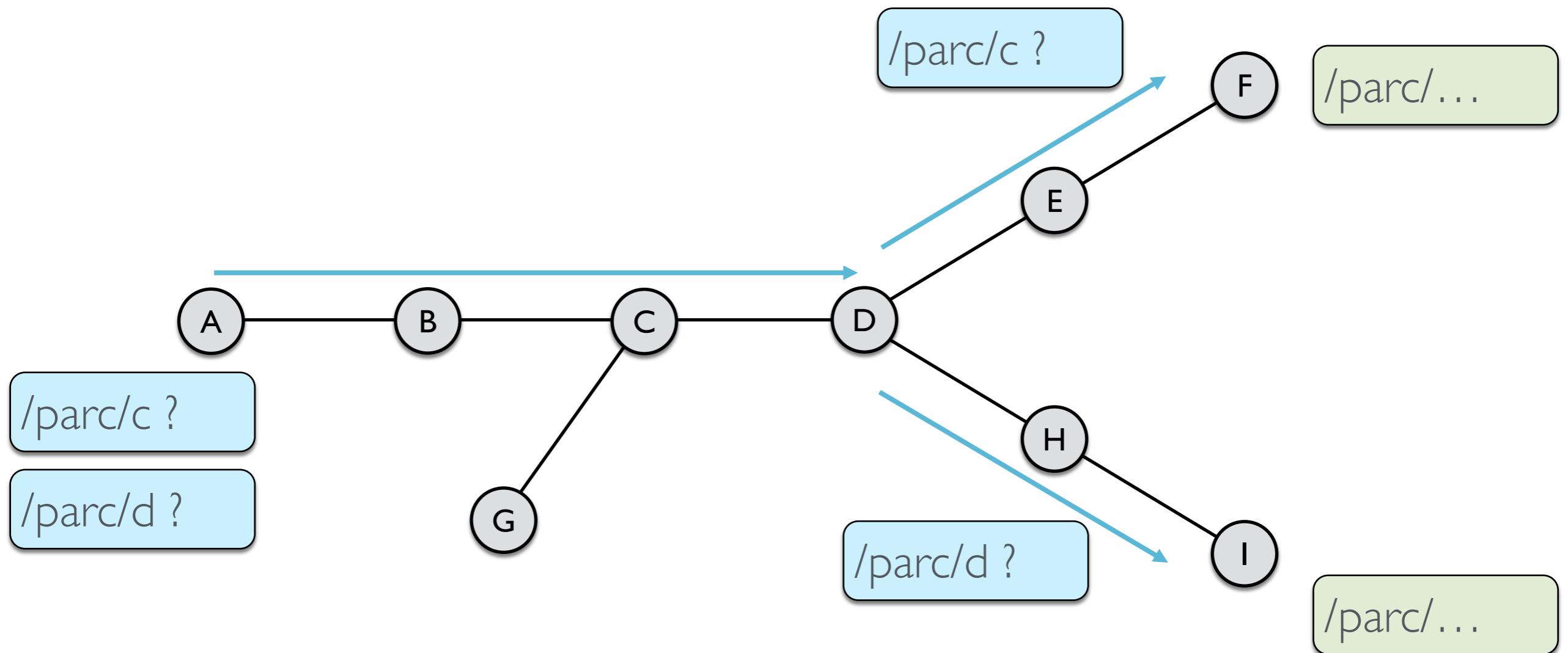
Interest leaves reverse path state in the network

Content follows reverse path



Content packet follows reverse path and consumes state

Forward on alternating paths

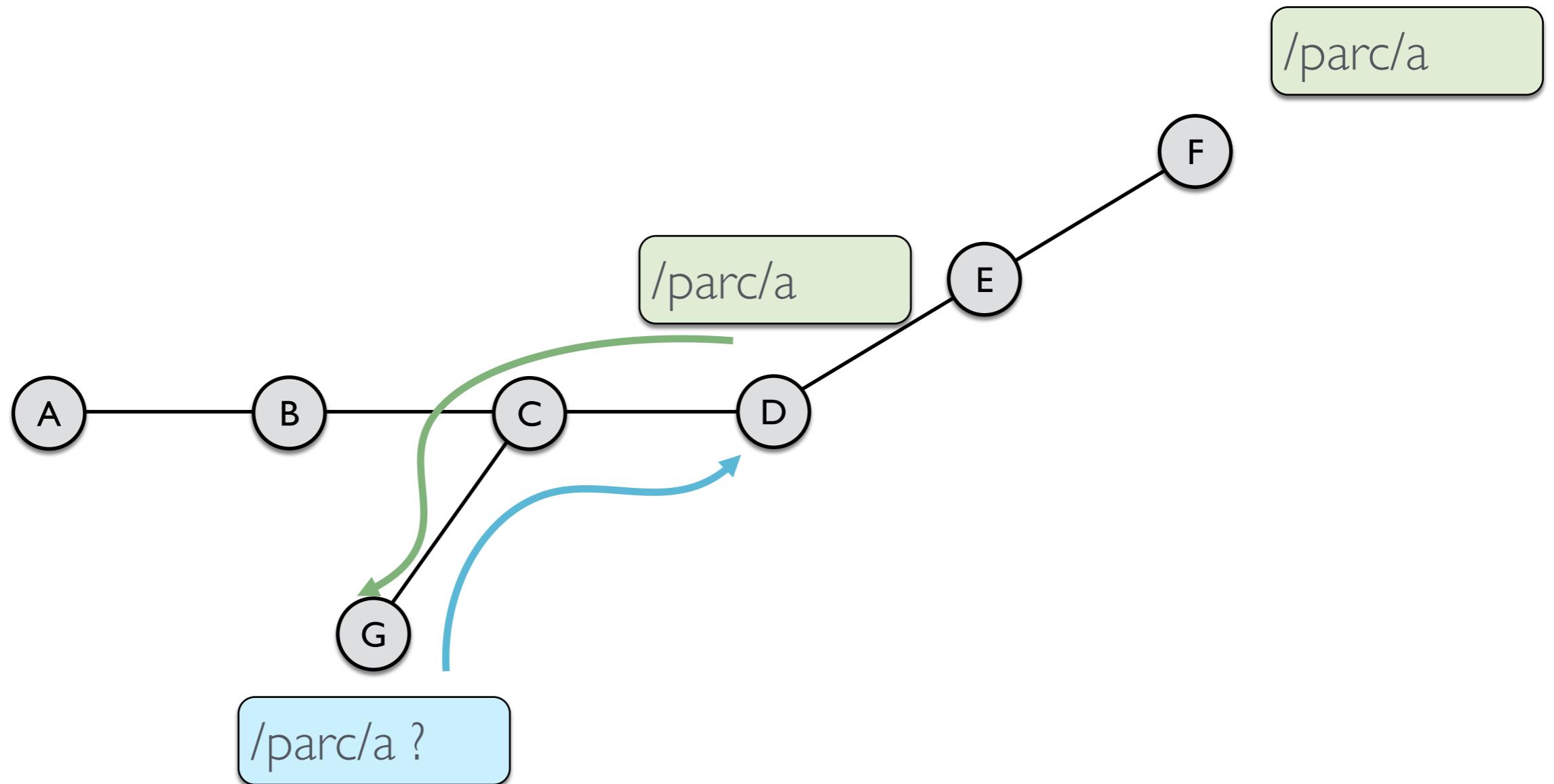


Each interest can go to a different content provider



Intrinsic multi-path
Works around hotspots
Works around failures
Load balances
Mobility

Any node can cache



Node G requests same content, gets it from a cache in D
G authenticates content via the content signature, not the sender

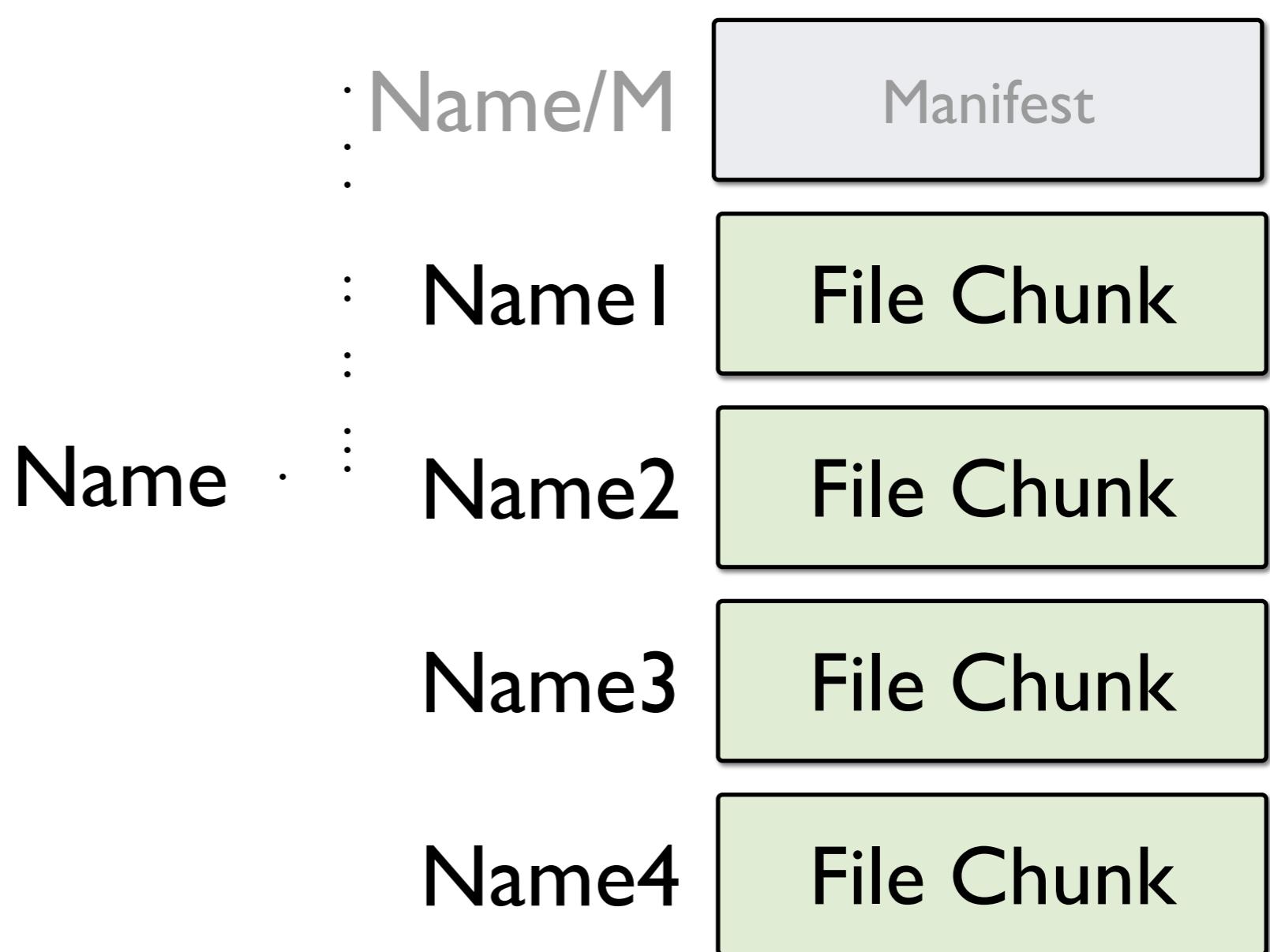
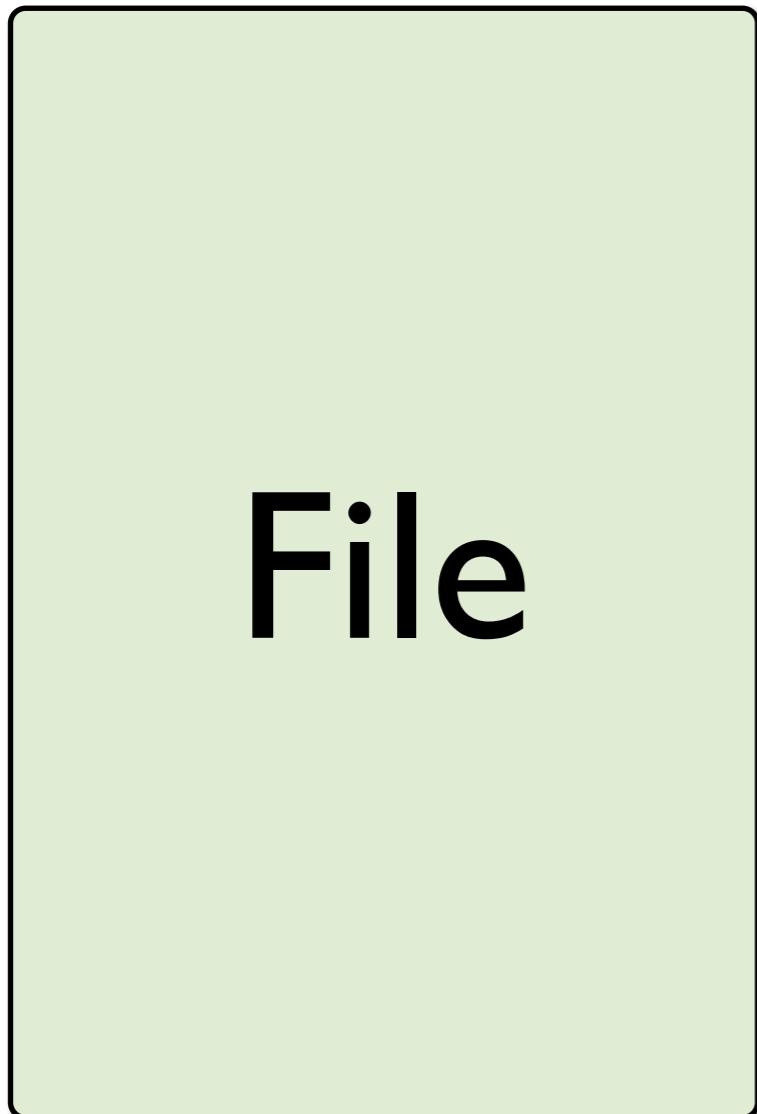


Data lives where its used
Network adapts to usage

/ccnpx/users/mosko/halfdome.jpg/manifest

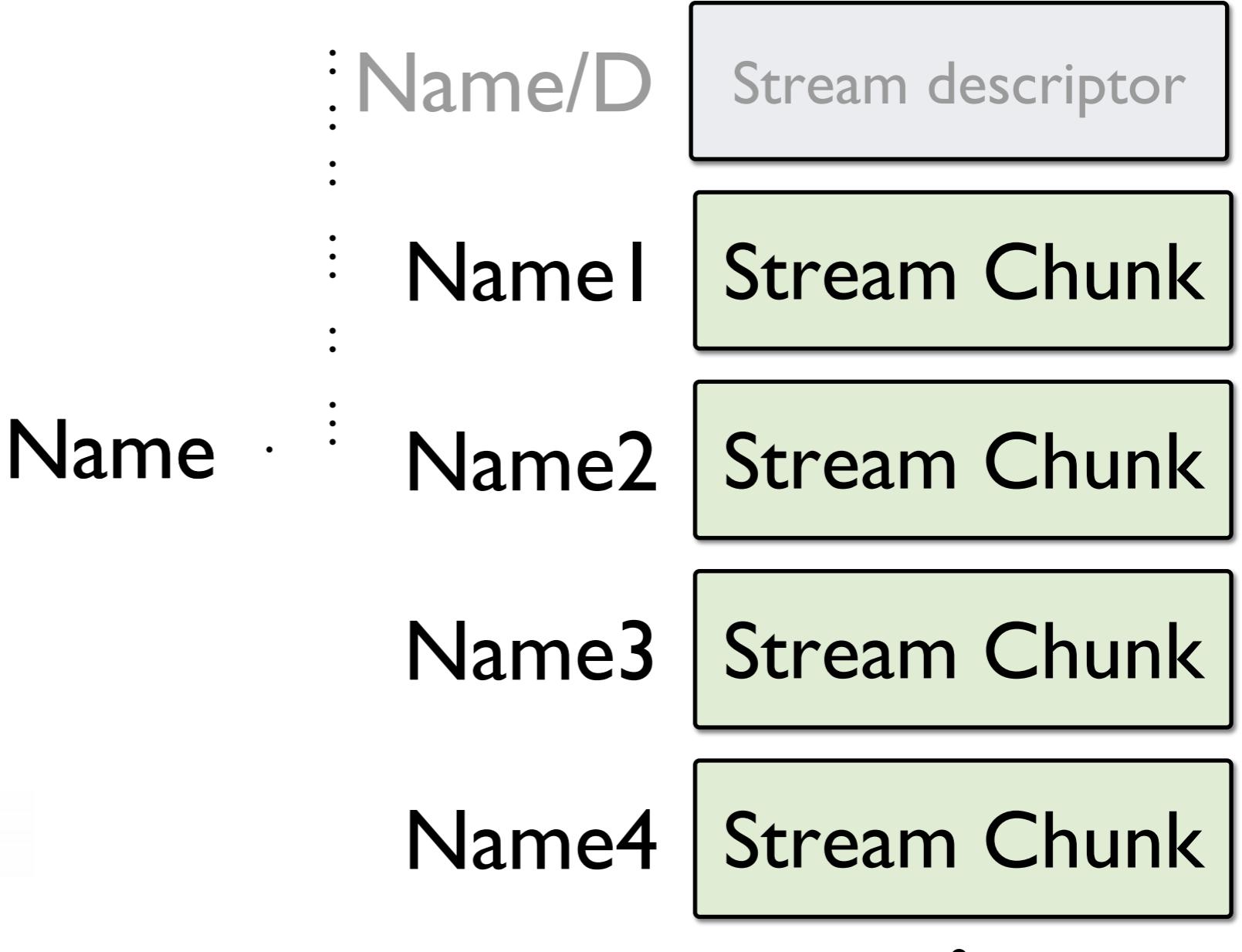
/ccnpx/users/mosko/halfdome.jpg/c0

...



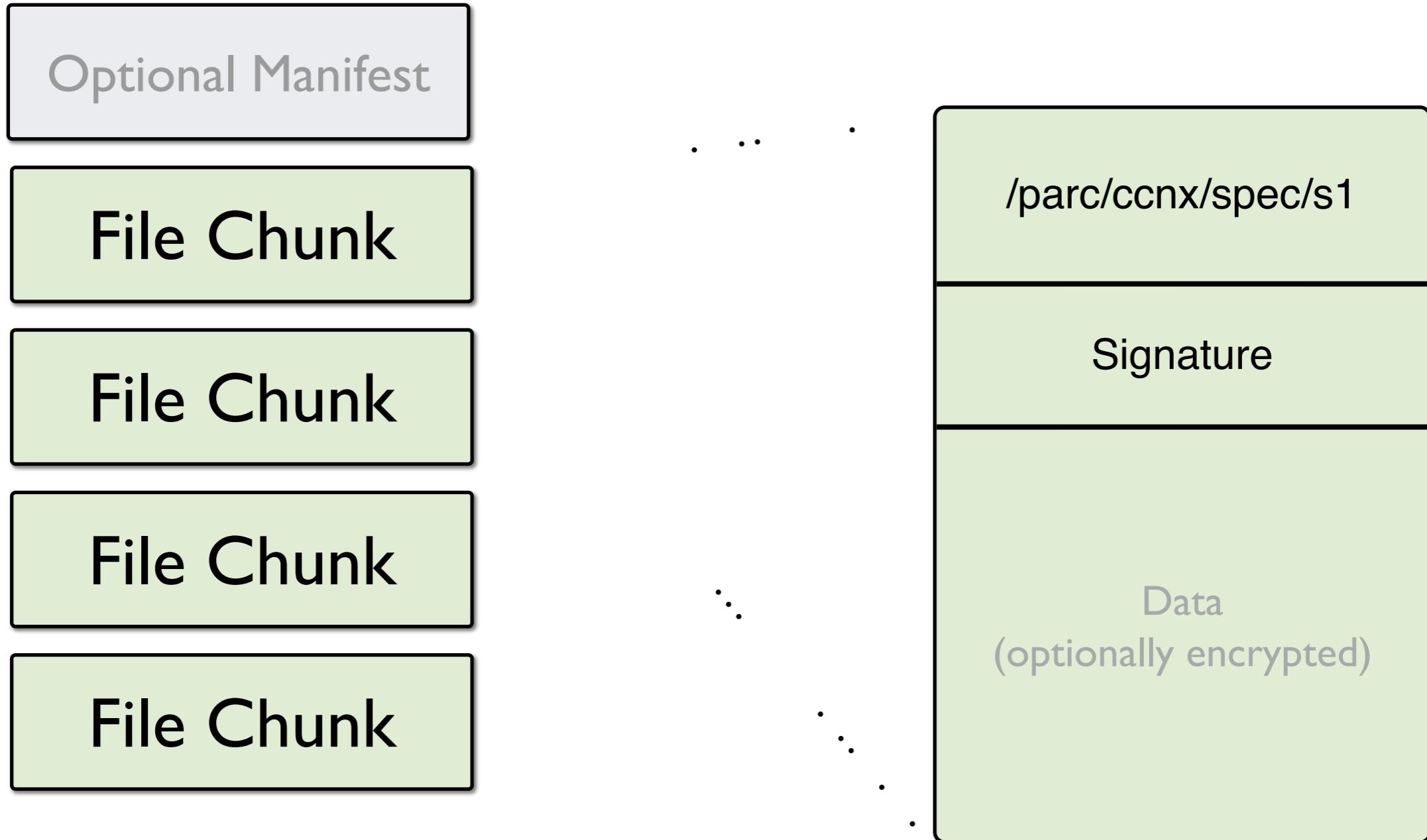
CCN also names the network sized chunks

Stream



The stream descriptor is the metadata for the stream.

Secure single chunk



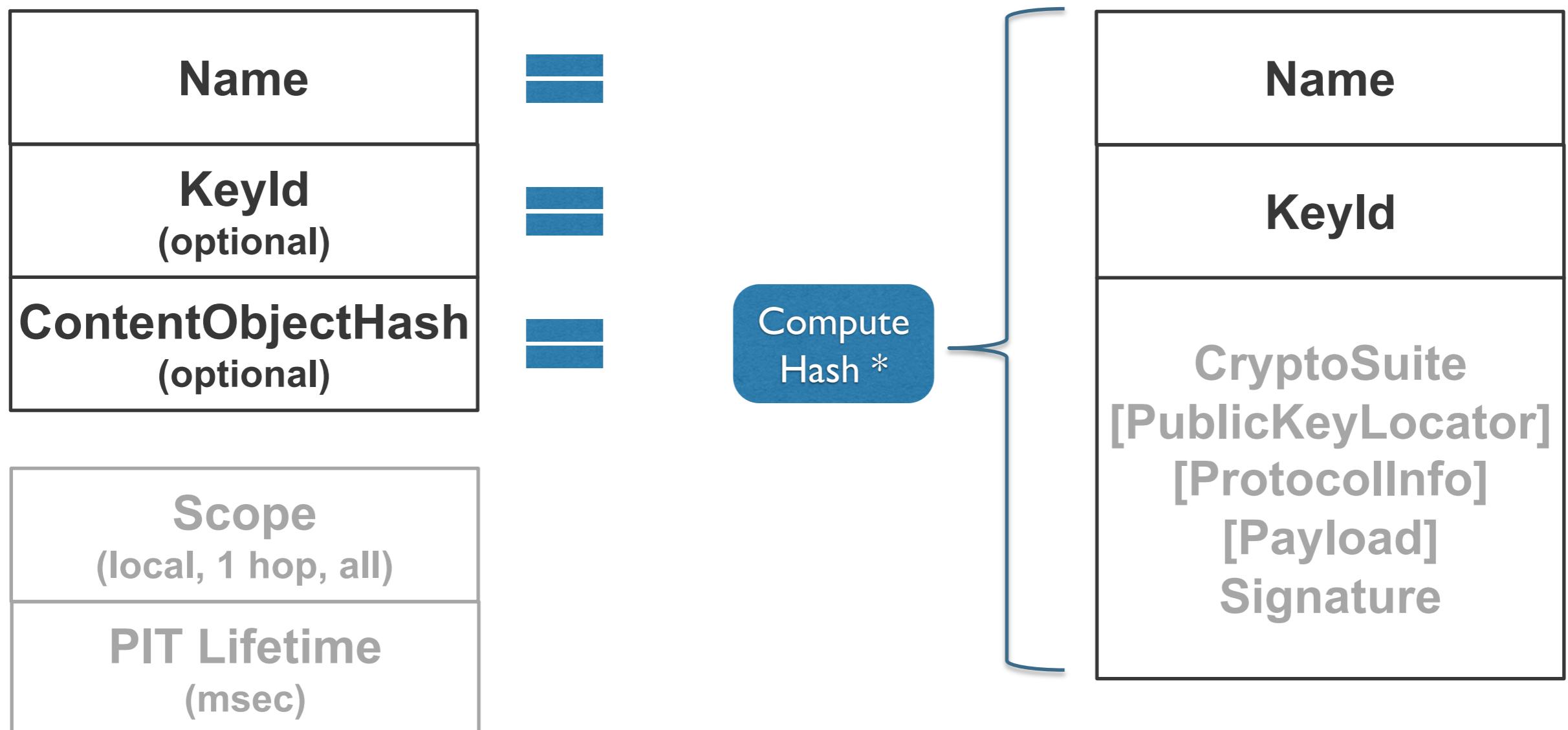
CCN names and signs every chunk



Name Encapsulation
Unites Routing and Transport
Intrinsic Authentication
Unites Data and Trust

CCN - 1.x

Forwarding Primitives





Forwarding on Names

Simple and fast

Secure

Label-Based Names

Discovery

Versioning

Chunking

Sync

Repo

Trust

CCN Core Protocol

Hash Forwarding

Fragmentation

TLV Packet Format

Protocol Specifications

1. CCNx 1.0 Protocol Specification Roadmap
2. CCNx Semantics
3. TLV Packet Format
4. CCNx Messages in TLV Format
5. Labeled Segment URIs
6. Labeled Content Information URIs for CCNx
7. CCNx Content Object Caching
8. CCNx End-to-end Fragmentation
9. CCNx Content Object Segmentation
10. CCNx Publisher Clock Time Versioning
11. CCNx Publisher Serial Versioning
12. CCNx Selector Based Discovery
13. CCNx Hash Forwarding



Well specified Name
protocols
Multiple vendor support
Extensible

CCN - Summary



Data no longer tied to hosts
Provenance part of data
Network adapts to usage
Simple and fast
Secure
Well specified
Multiple vendor support
Extensible

Thank you

<http://www.ccnx.org/>

<http://www.parc.com/ccn>