

CCN

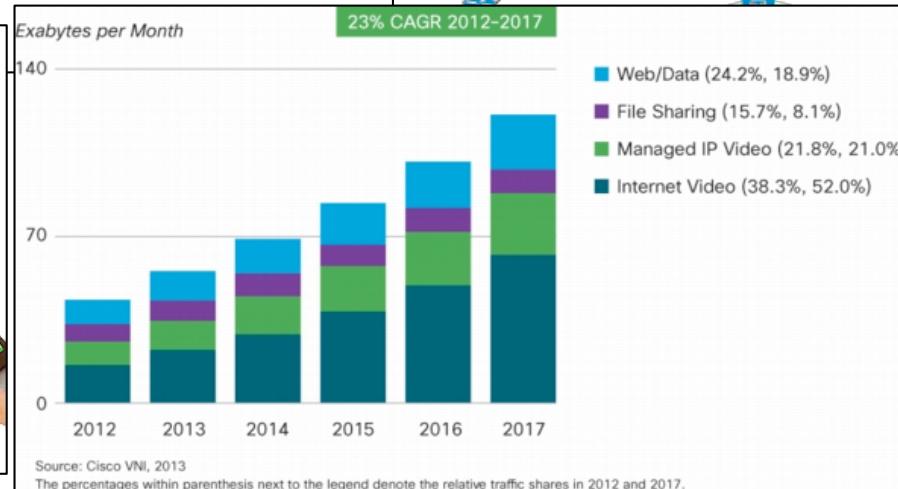
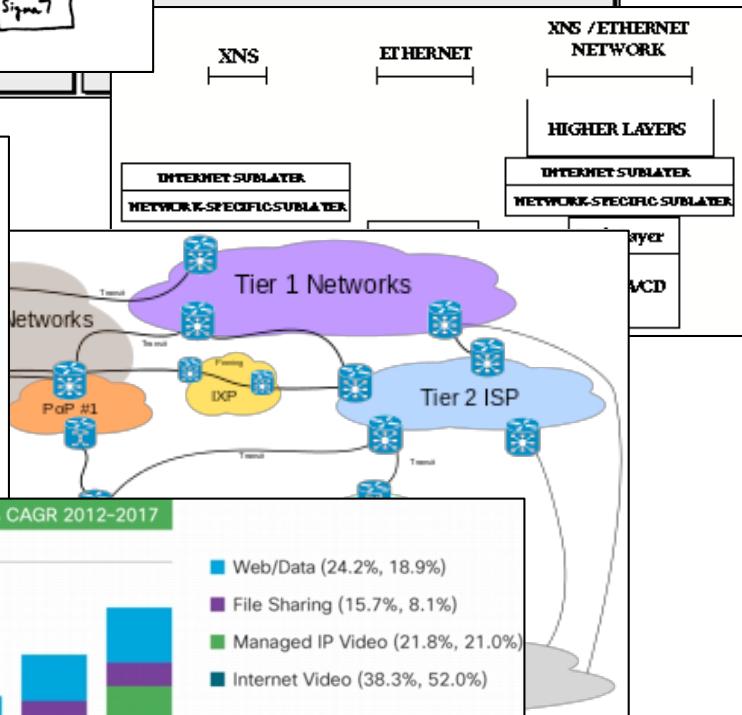
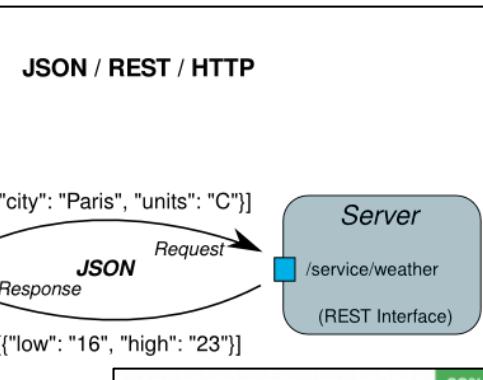
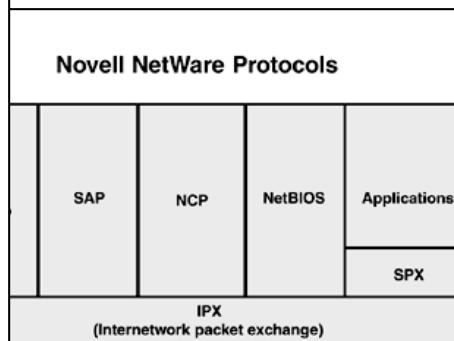
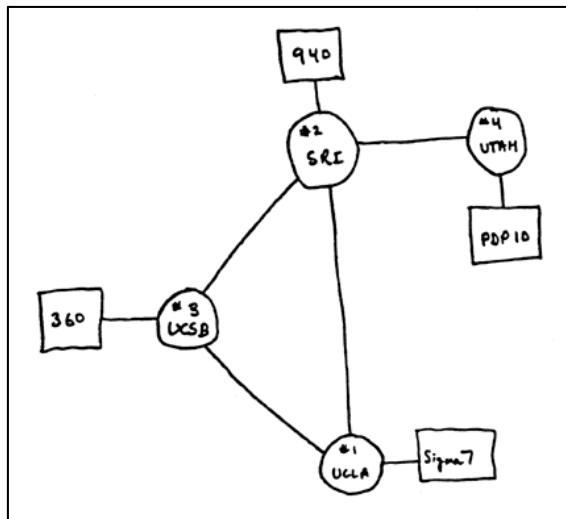
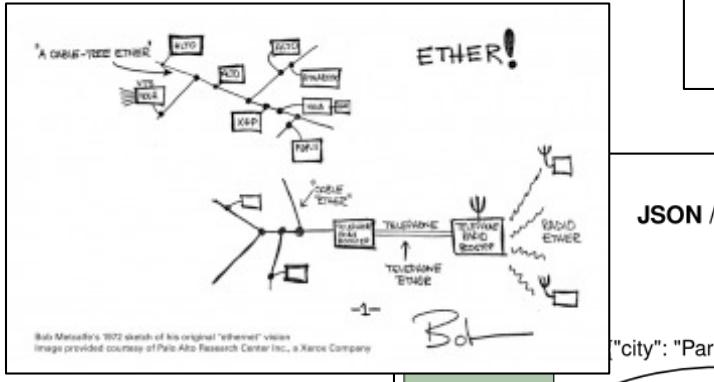
CCNx 1.0 Motivations & Overview

Computer Science Laboratory
Networking & Distributed Systems

March 2014

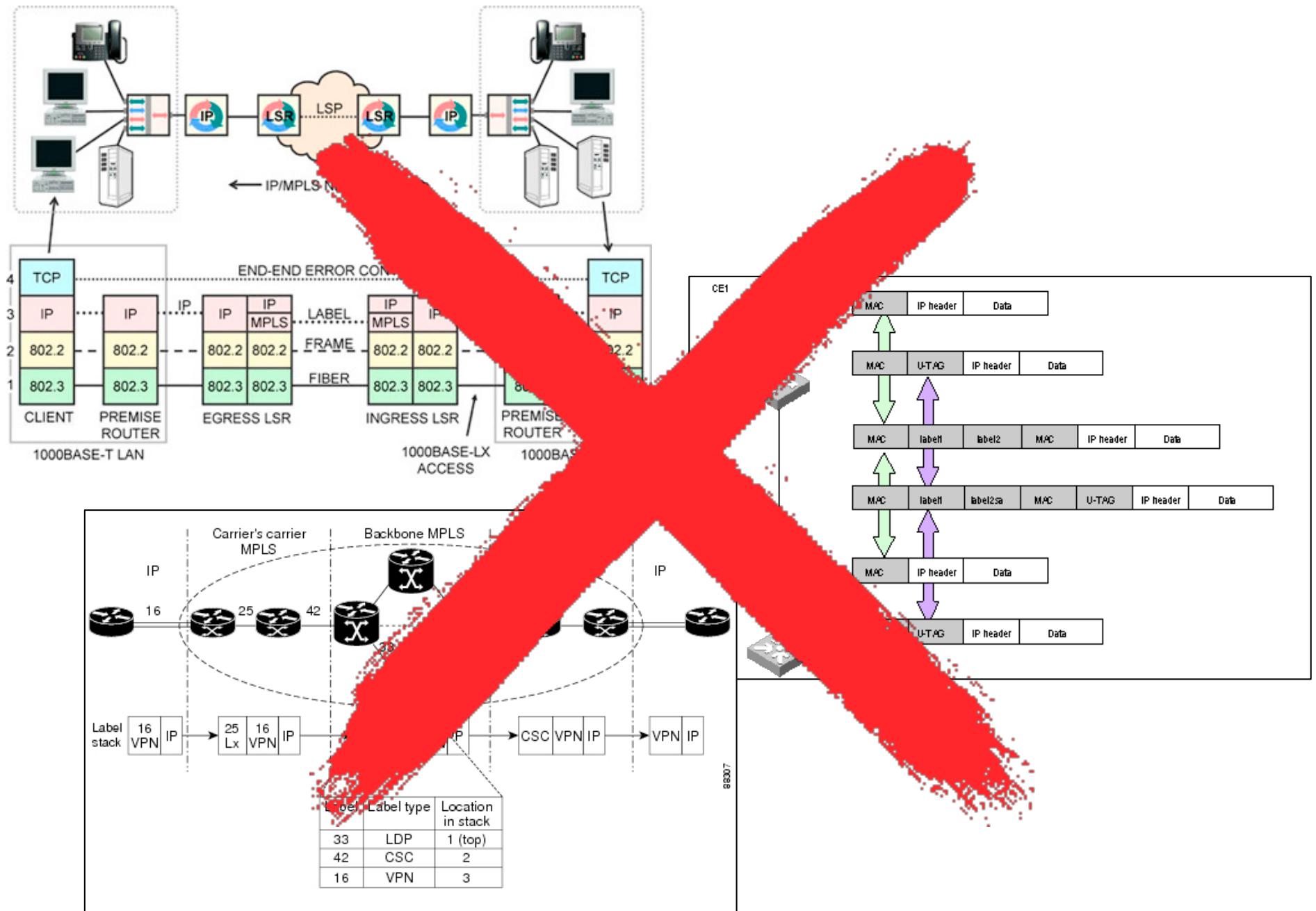
CCN - Motivation

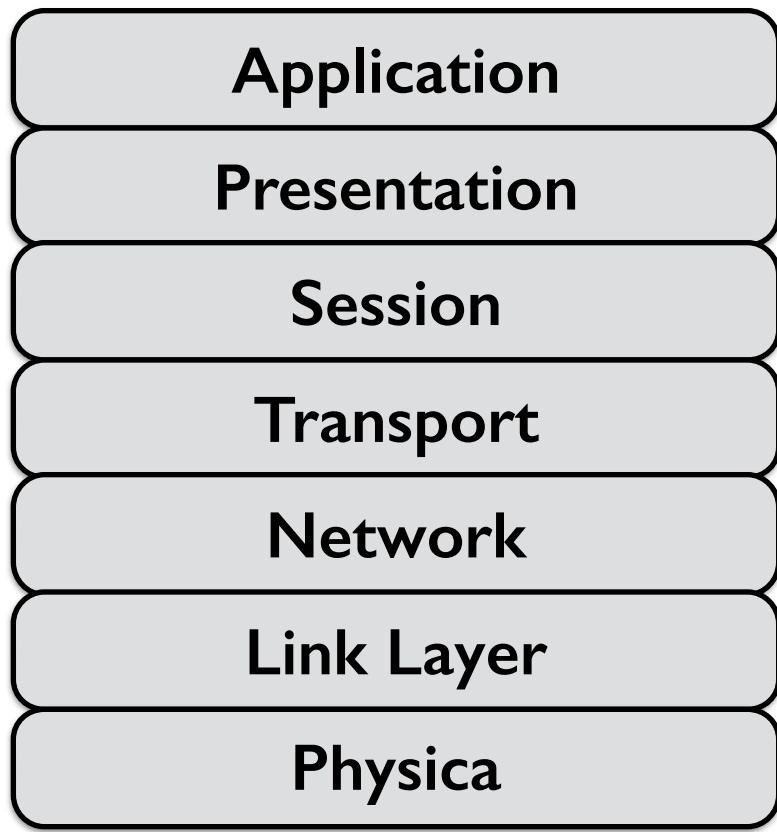
Then evolved to distributing content



We no longer
connect (virtual) wires

We move content





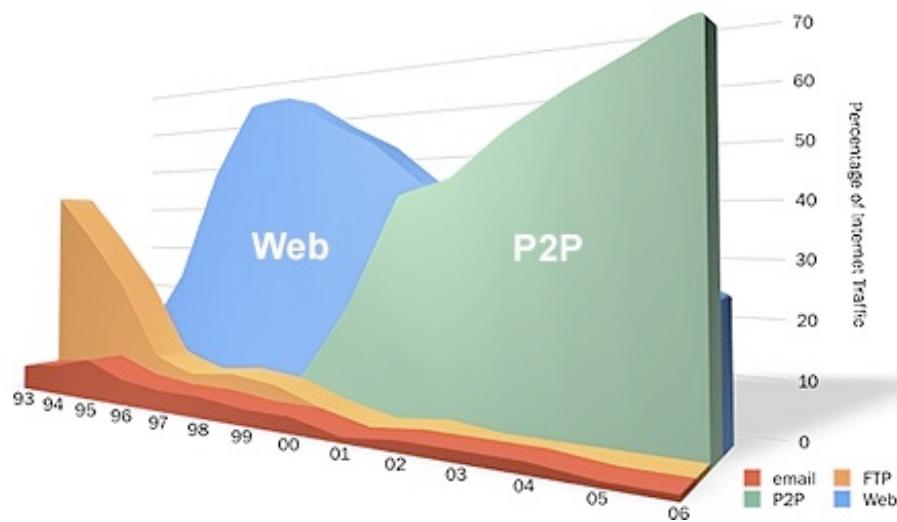
Please send me the invoice
Por favor, envíenme la factura
Vă rugăm să trimiteți-mi factura
Lähetä minulle laskun
الرجاء ارسال لي الفاتورة
Խնդրում եմ ուղարկել
ինձ պարագագիր

Unified Field Theory

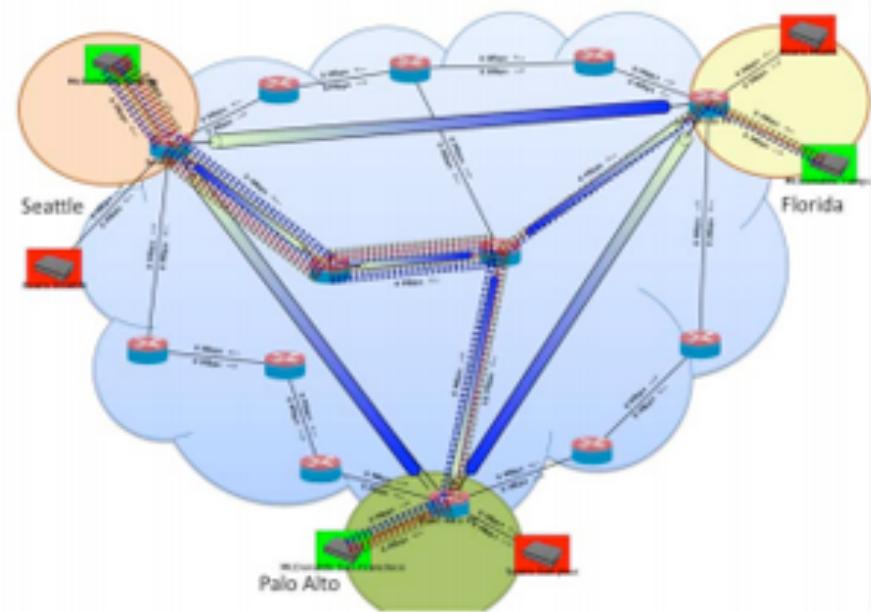
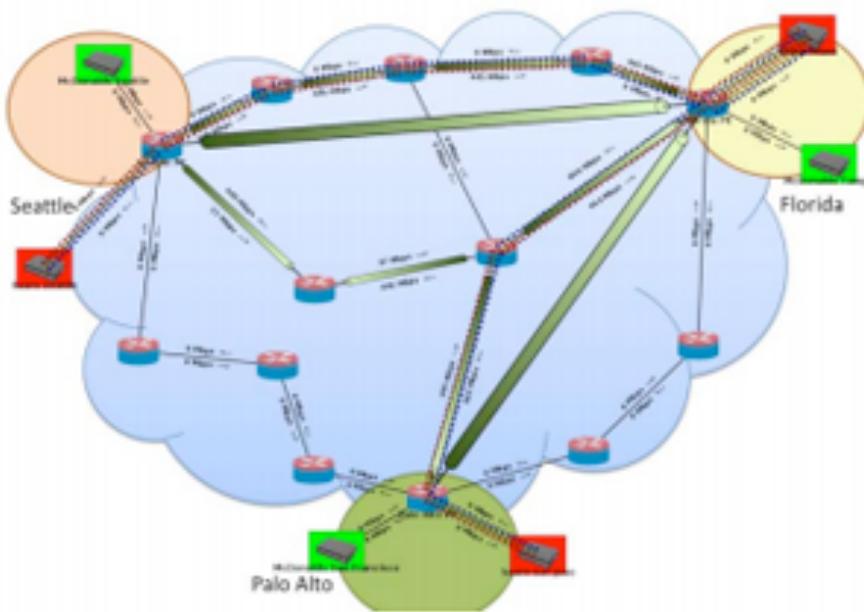
$$\begin{aligned} S_{\text{eff}}^{(D)}(g_{\mu\nu}, A_\mu, \dots) & \quad \text{2-dimensional Lagrangian} \\ & = \sum_{\Sigma_\gamma} e^{-\phi\chi(\Sigma_\gamma)} \int_{M(\Sigma_\gamma)} \int d\psi dX \dots e^{\int d^2z \mathcal{L}_{2d}(\psi, X, \dots, g_{\mu\nu}, A_\mu, \dots)} \\ & = \int d^Dx \sqrt{g} e^{-2\phi} \underbrace{[R + \text{Tr} F_{\mu\nu} F^{\mu\nu} + \dots]}_{\text{general relativity, gauge theory, etc.}} + \mathcal{O}(m_{\text{planck}}^{-1}) \\ & \qquad \qquad \qquad \uparrow \\ & \qquad \qquad \qquad \text{small string corrections} \\ & \Sigma_0 + \Sigma_1 + \Sigma_2 + \Sigma_3 + \dots \end{aligned}$$

Unified Network Addressing

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

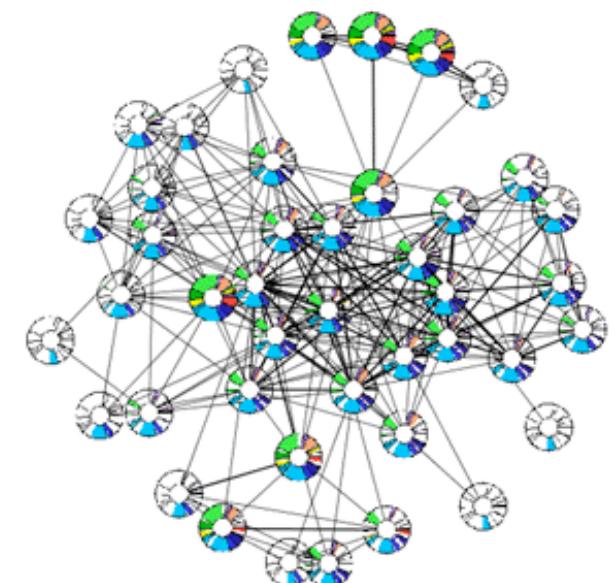
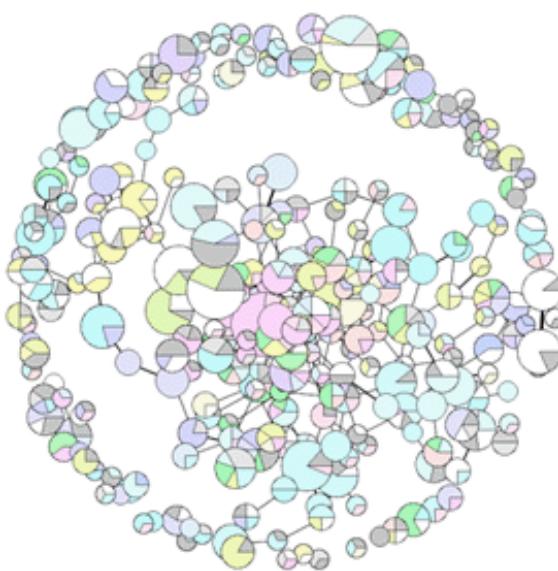
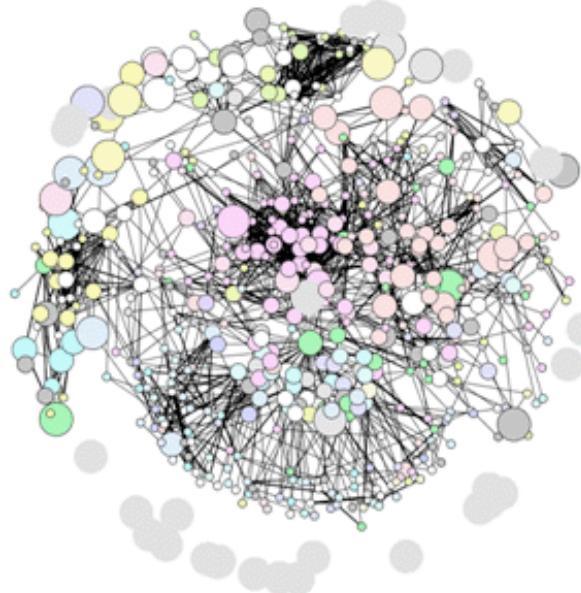


Dynamic Adaptation





**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

/parc/ccnx/presentations/slides10/v=2/c=0

globally
routable
name segments

application
dependent
name segments

protocol
dependent
name segments

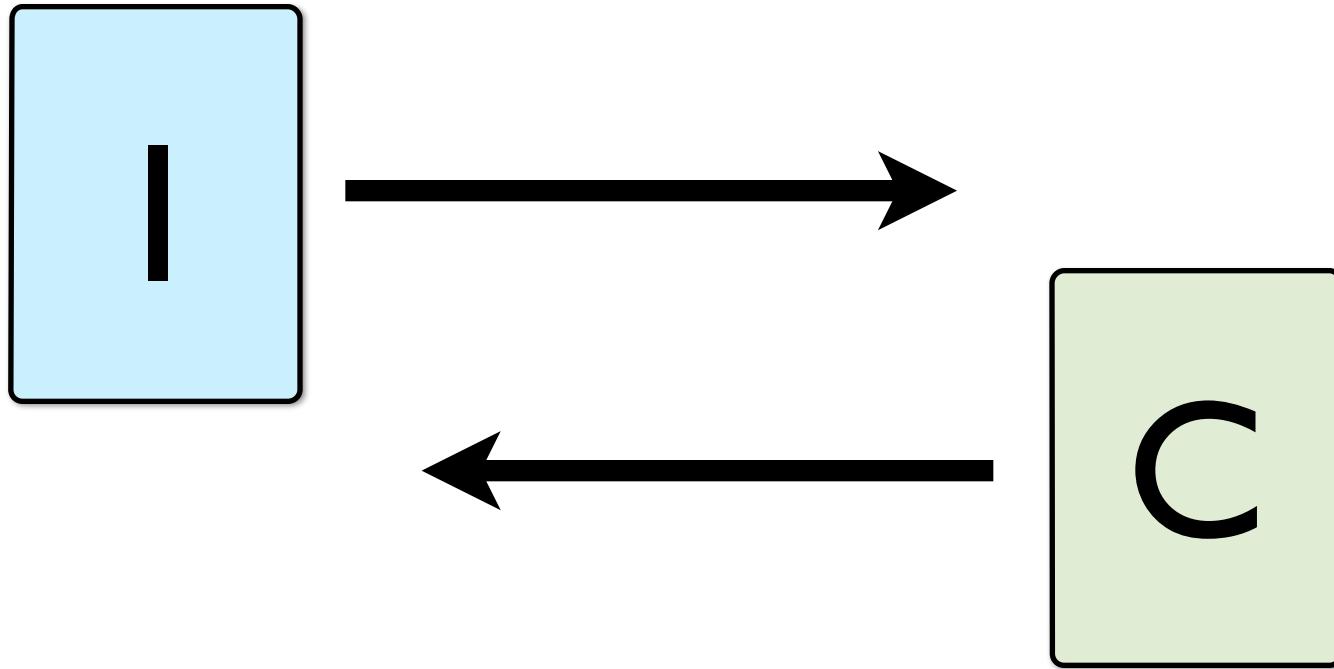
Success is a Journey, Not the Destination





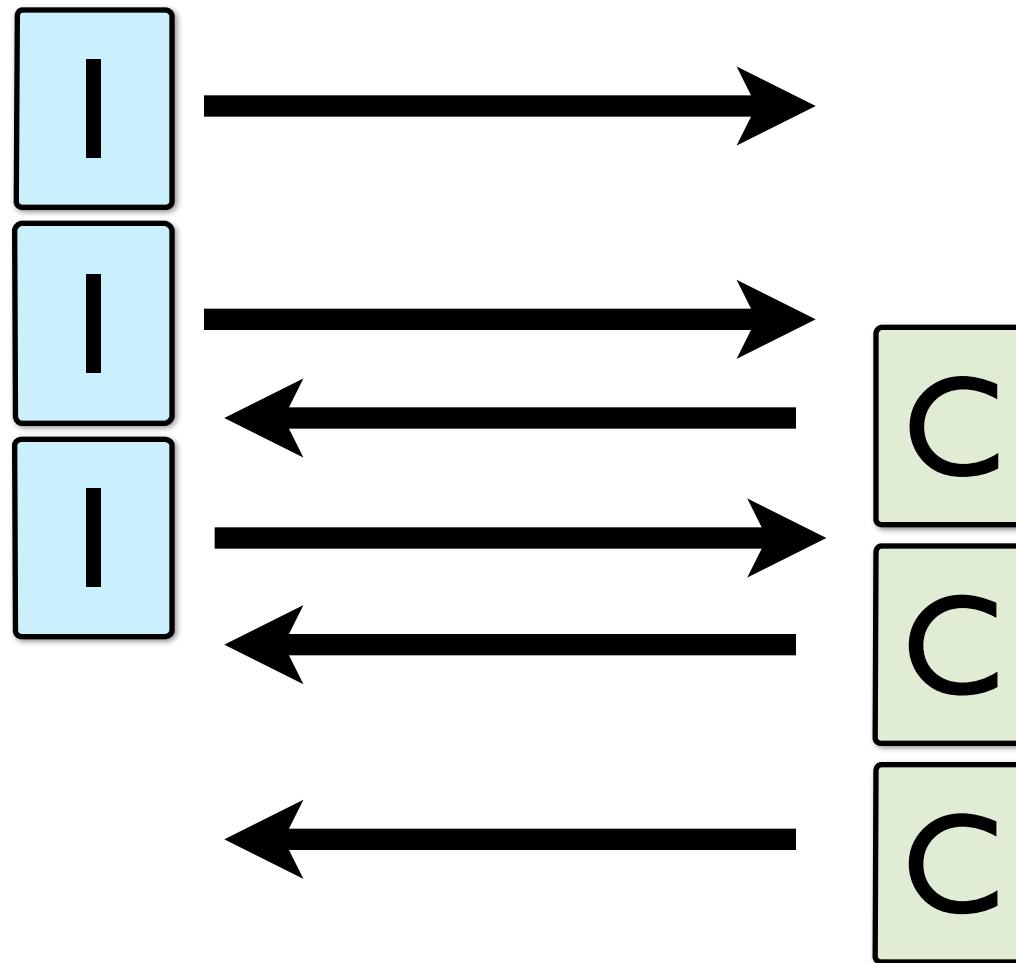
Data no longer tied to hosts
Provenance part of data
Secure the data, not the pipe

Core Protocol



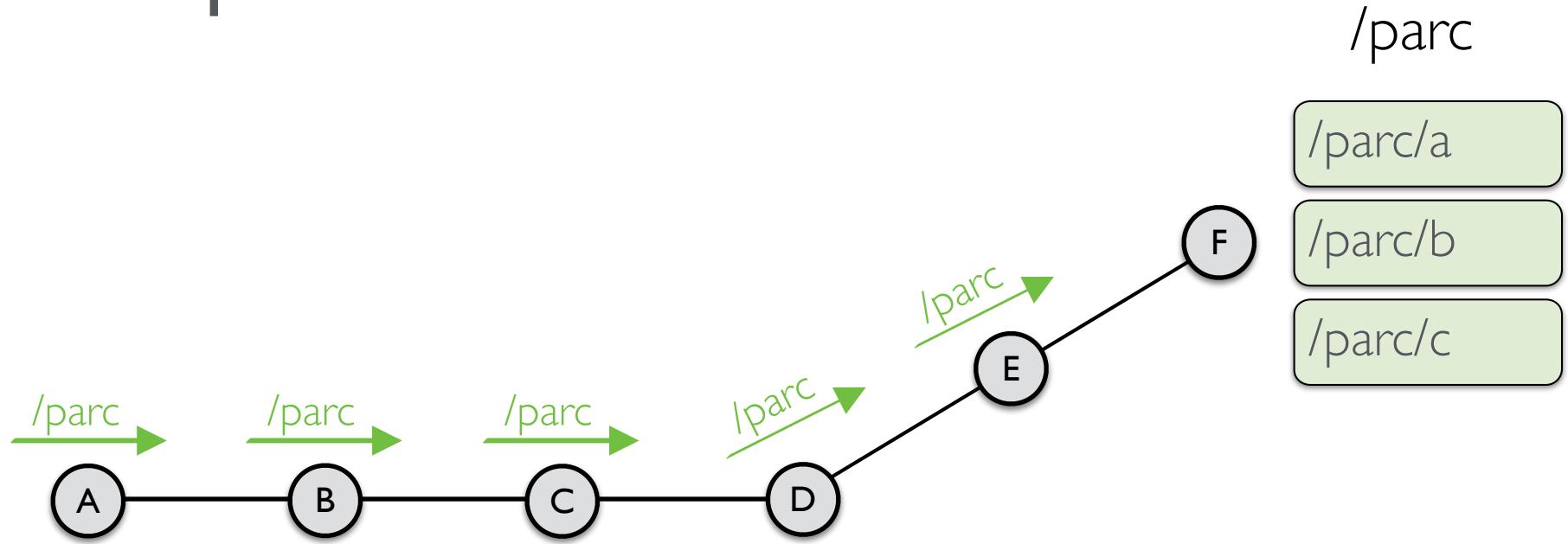
One interest packet gets one content packet

Congestion Aware Protocols



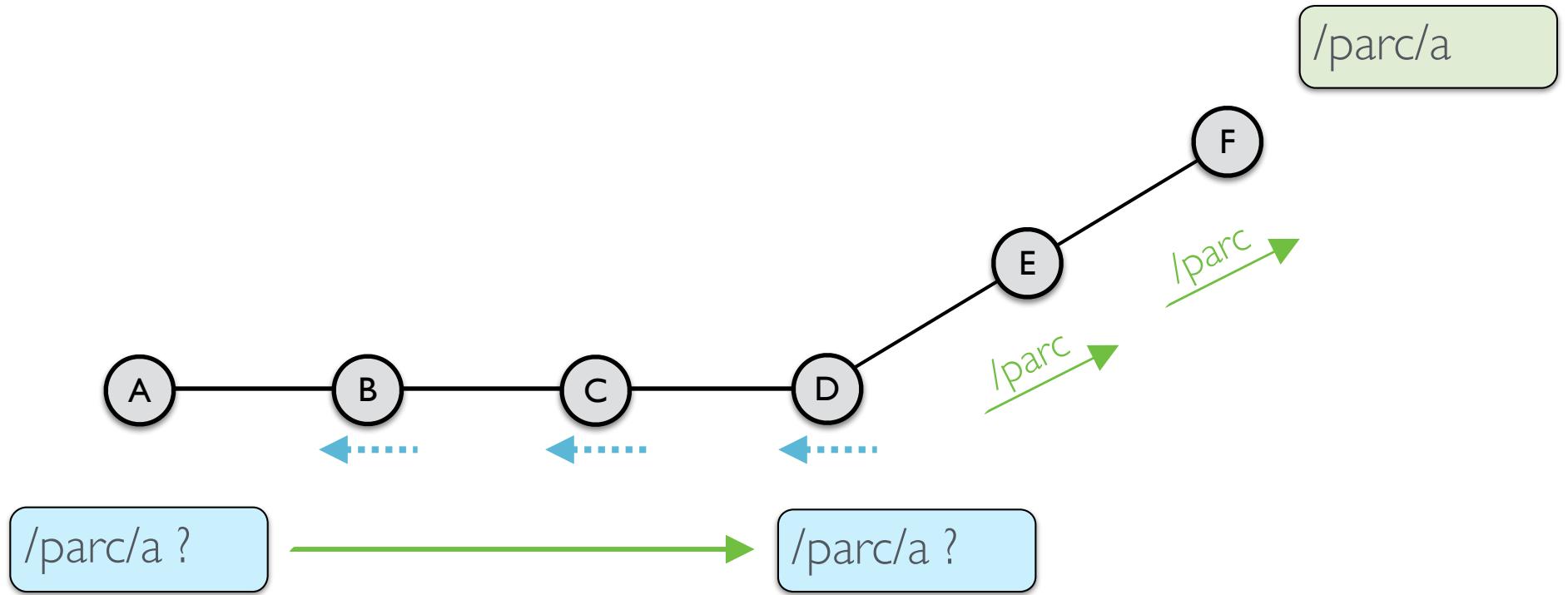
Transport protocols can do parallel requests

Routes point to authoritative sources



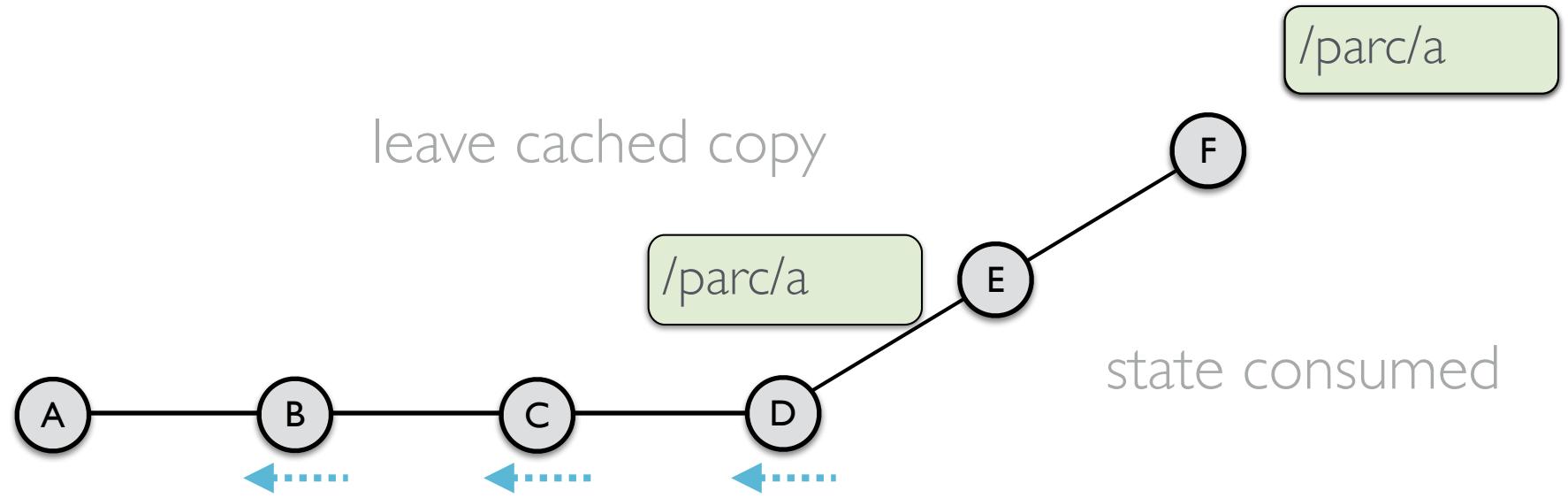
Routes are set up pointing to F for prefix /parc

Interests leave state



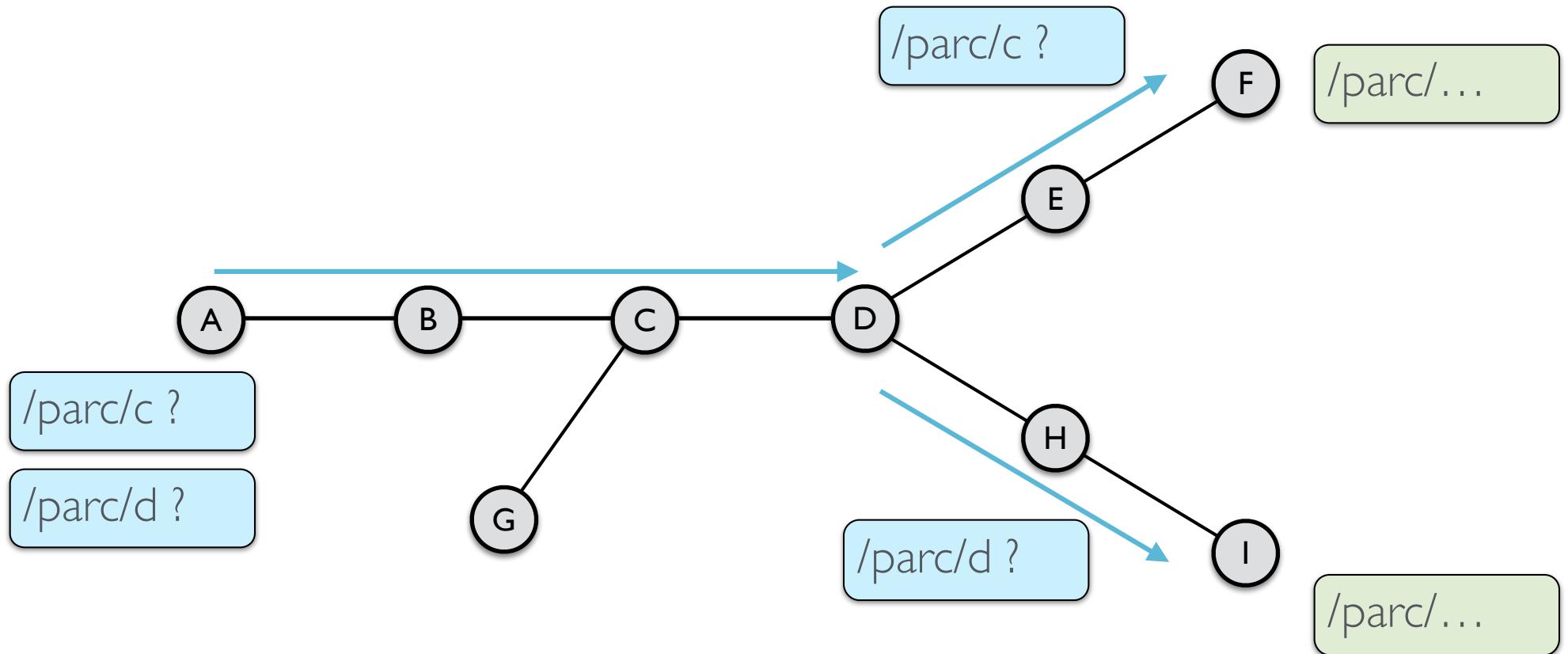
Interest leaves reverse path state in the network

Content follows reverse path



Content packet follows reverse path and consumes state

Forward on alternating paths

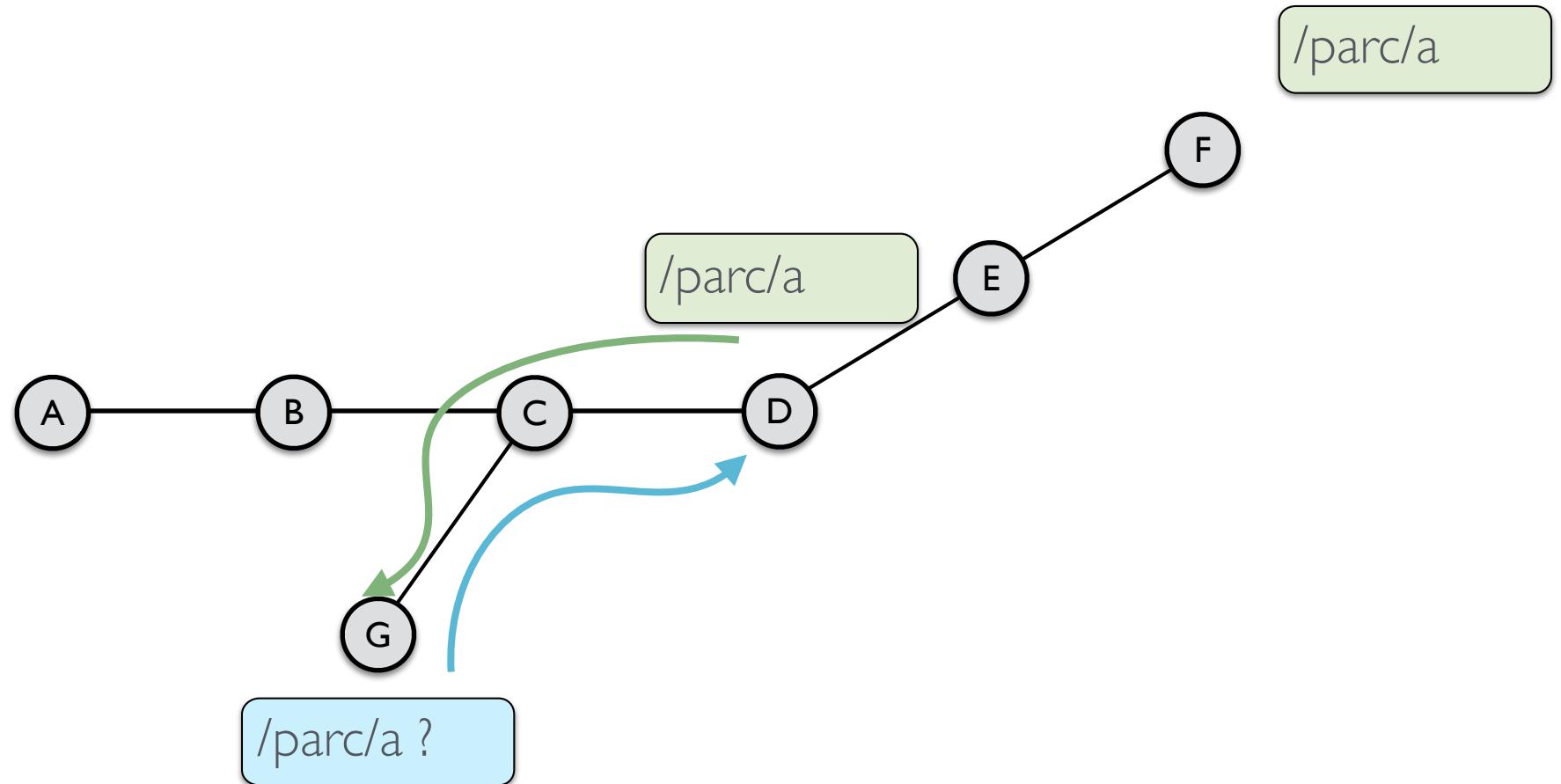


Each interest can go to a different content provider



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

Any node can cache



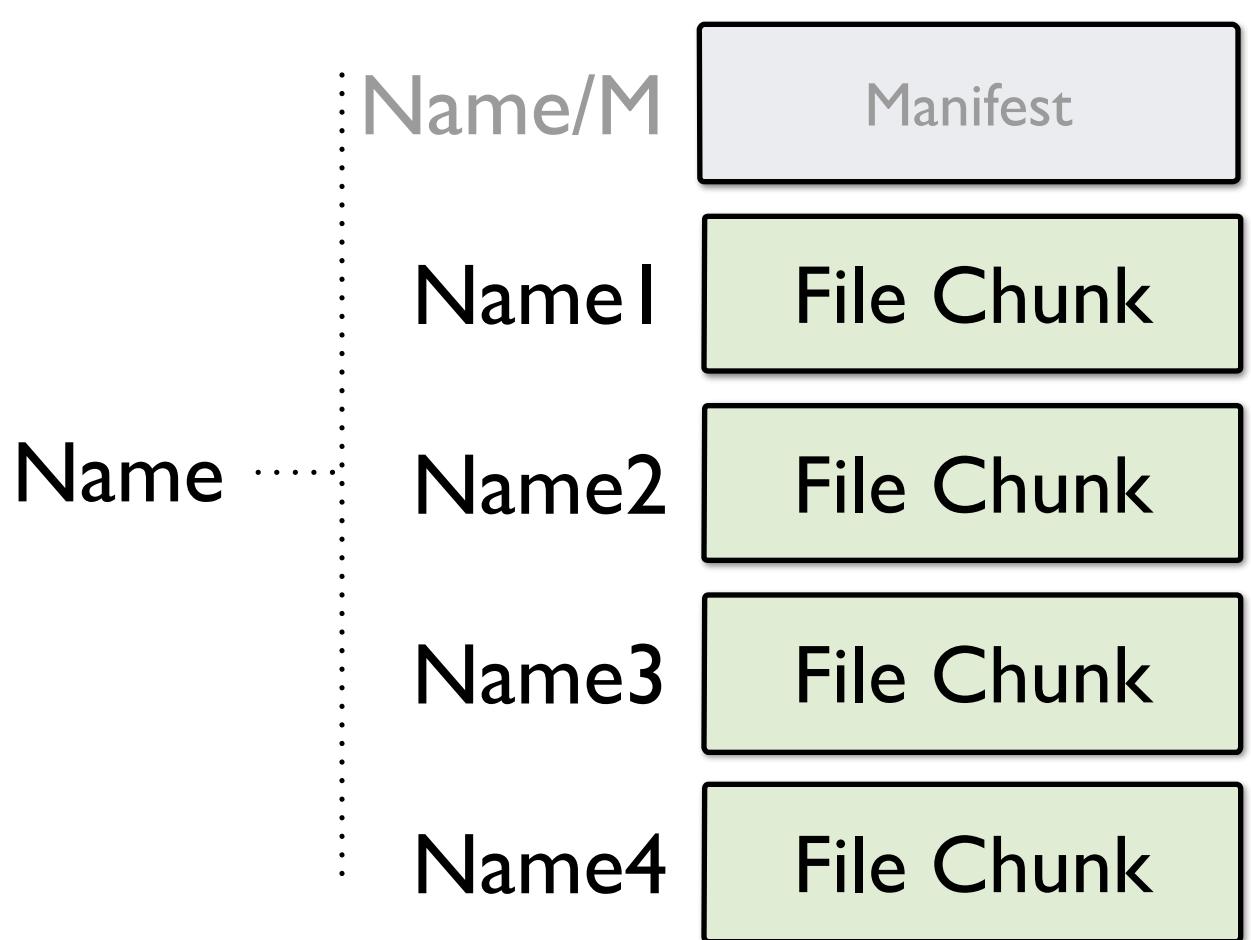
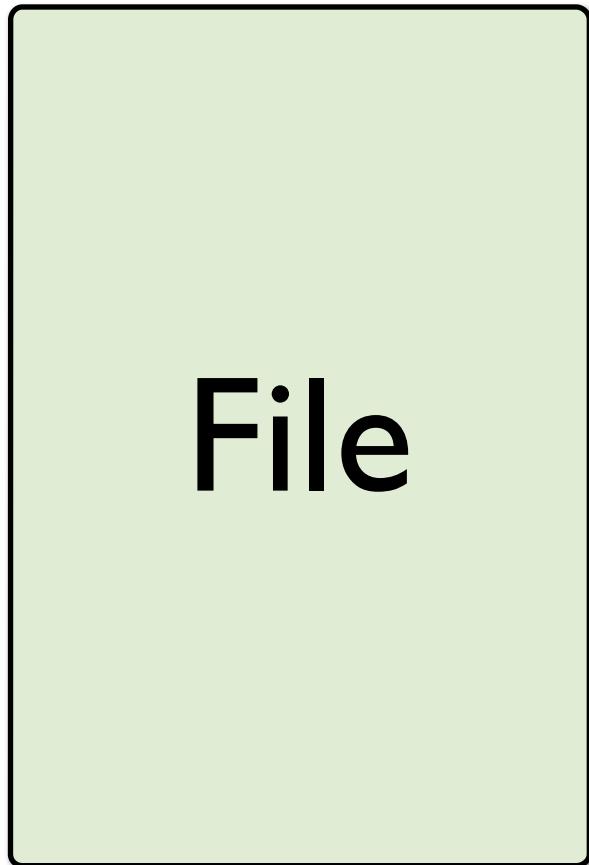
Node G requests same content, gets it from a cache in D
G authenticates content via the content signature, not the sender



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

Name

Name/D

Stream descriptor

Name1

Stream Chunk

Name2

Stream Chunk

Name3

Stream Chunk

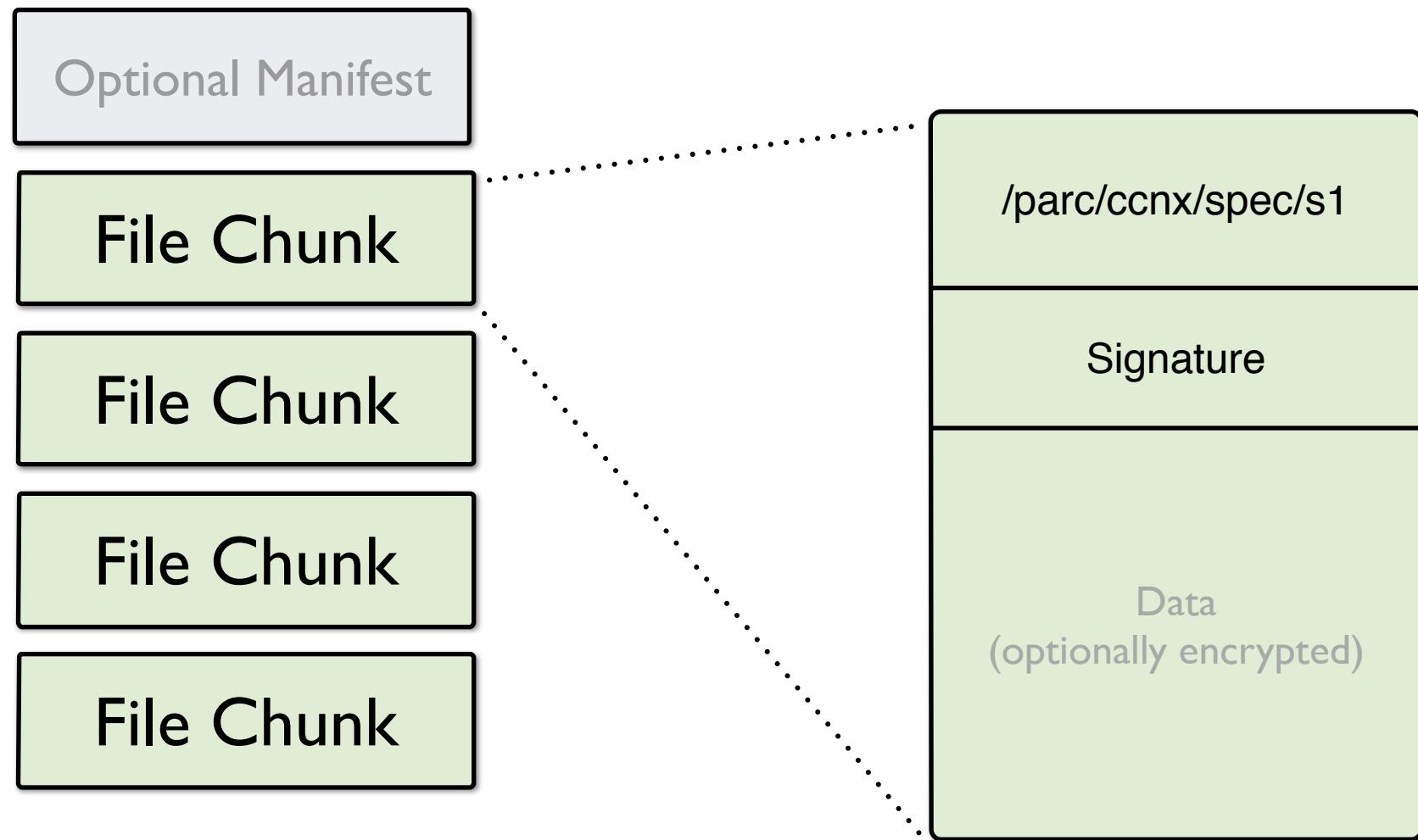
Name4

Stream Chunk

⋮

The stream descriptor is the metadata for the stream.

Secure single chunk



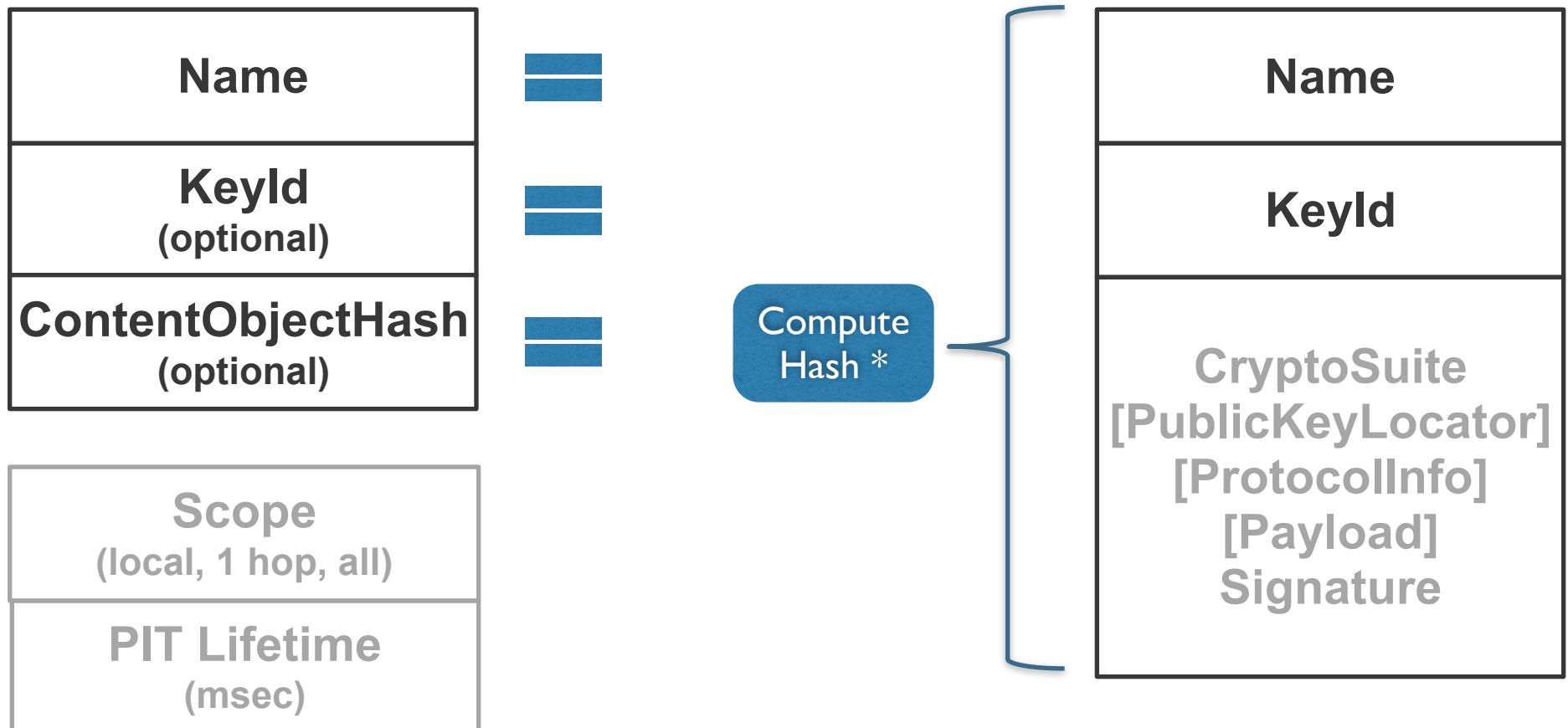
CCN names and signs every chunk



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>