Future Internet: Where Are We Going?

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FI: Who said that?

- New Arch ('00); MIT, ISI, etc.

- NSF Planning Workshops (Jan-Sep'05)

  - Distruptive, Optical, Security, Mobile, Distributed

- FIND Workshop (Dec'05)

  - Security, Wireless, Optical, Facility, Architecture

- GENI Townhall Meetings (Mar-Jul'06)

Buzzwords we remember

- What if we'd design it again from scrach today?

- Not constrained by the current Internet

- Not an evolution, but a revolution/innovation

- Clean-slate

- FI is on inventing a new Internet architecture

 - not on individual network technolgies

Some Archs & Hypes

- DTN, ICN, LIS(LISP, ILNP), RINA, XIA, ..

- kr: mofi, diana, nara, ..

- SDN/OF, NFV, IoT, ...

- ...

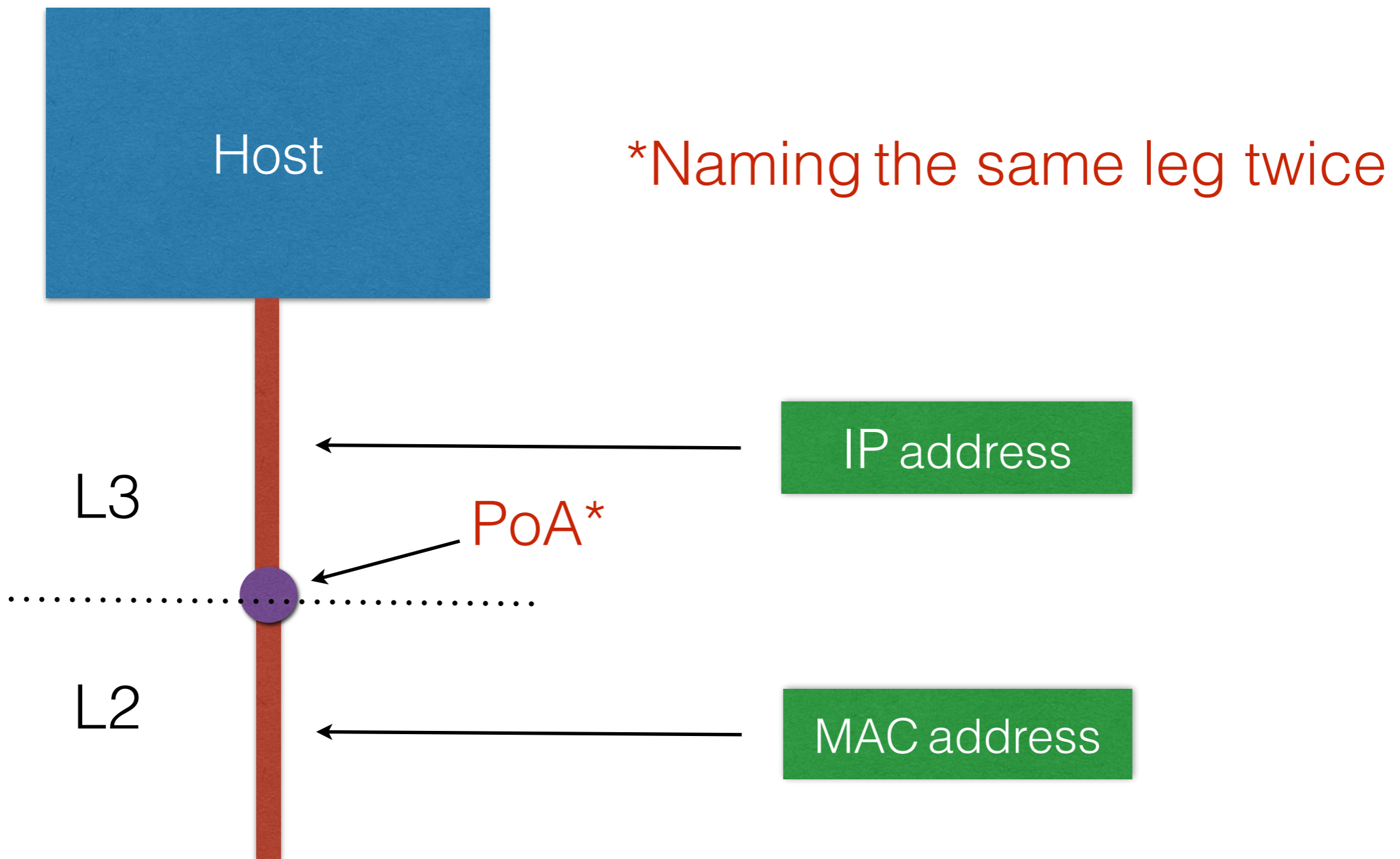# Do we know any better about network architecture by now?

Architecture starts with Naming and Addressing

- Shach['78]

  - name(what), address(where), route(how)

- Saltzer['78 & rfc1498]

  - service, node, PoA, route

Saltz, hence LIS

Fallacy of PoA

Host

*Naming the same leg twice

IP address

L3

PoA*

L2

MAC address
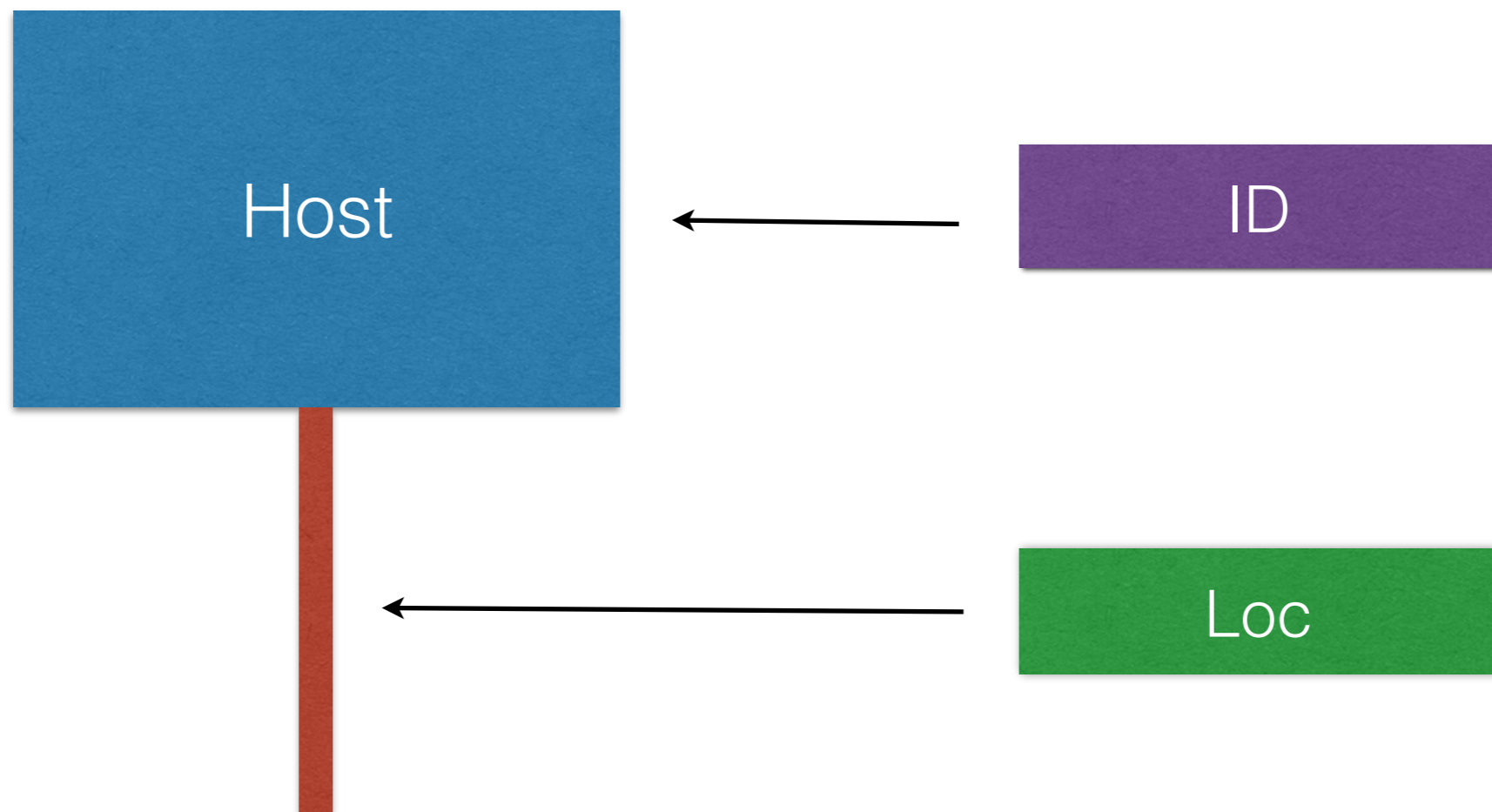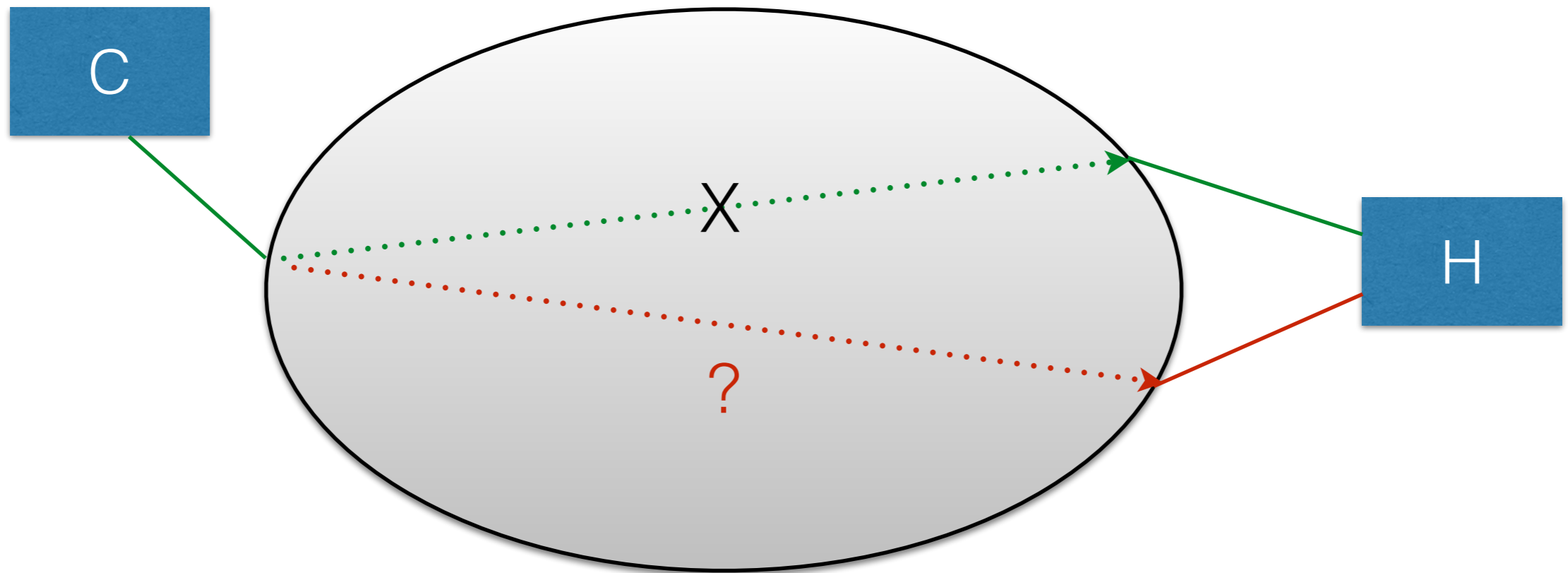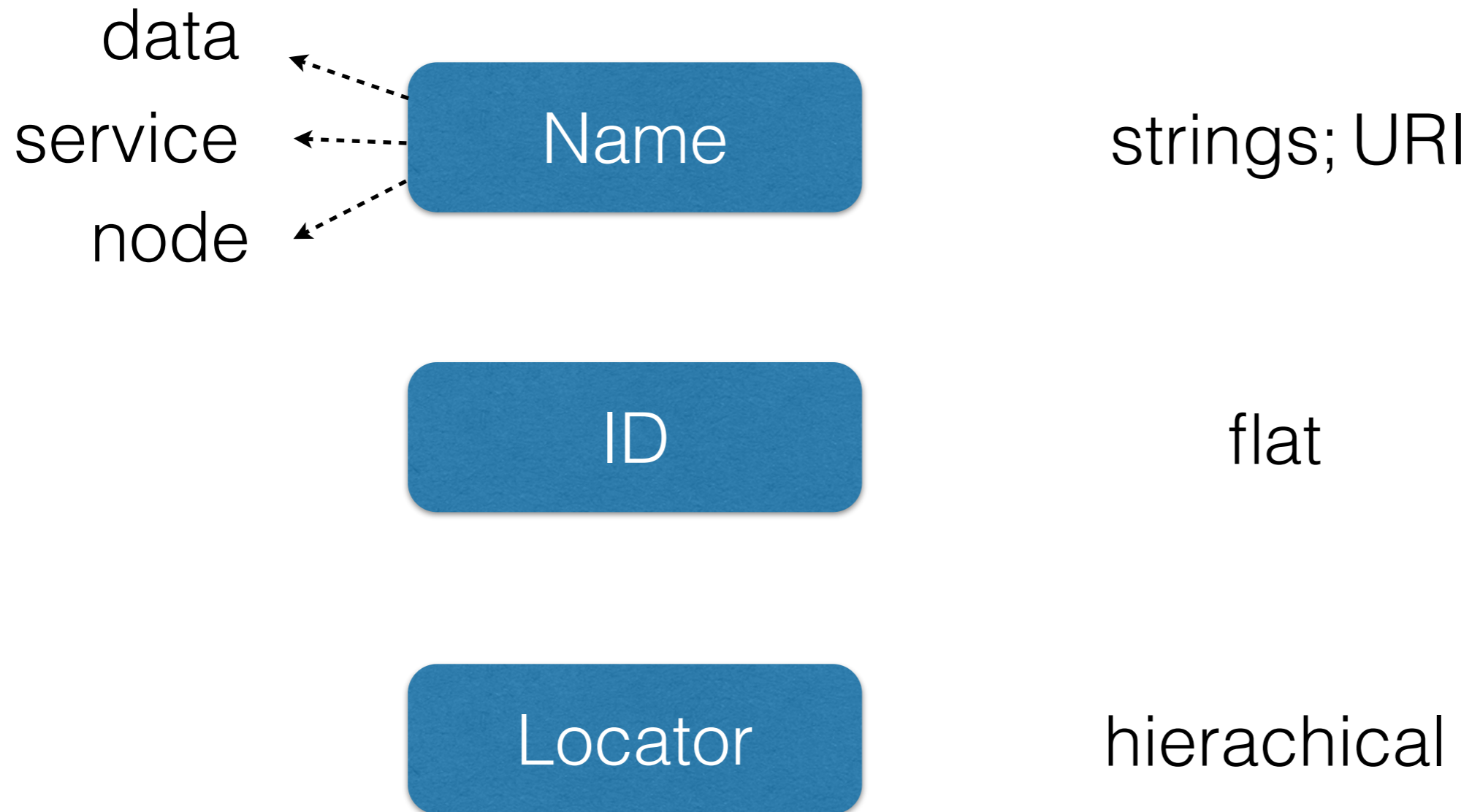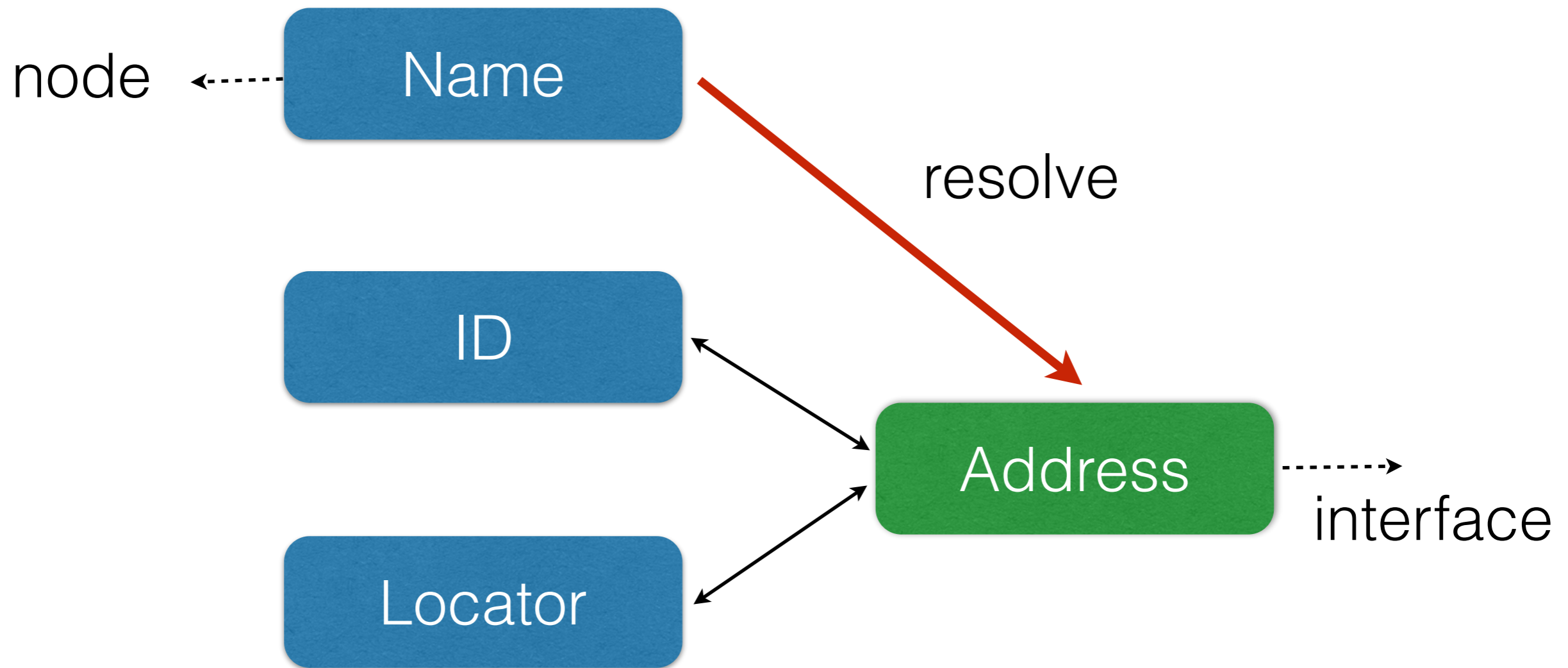
Fallacy of PoA

Name?

- Human readable characters?

- URI: string of characters used to identify a name of a resource

- Non-hierarchical flat names: ID?
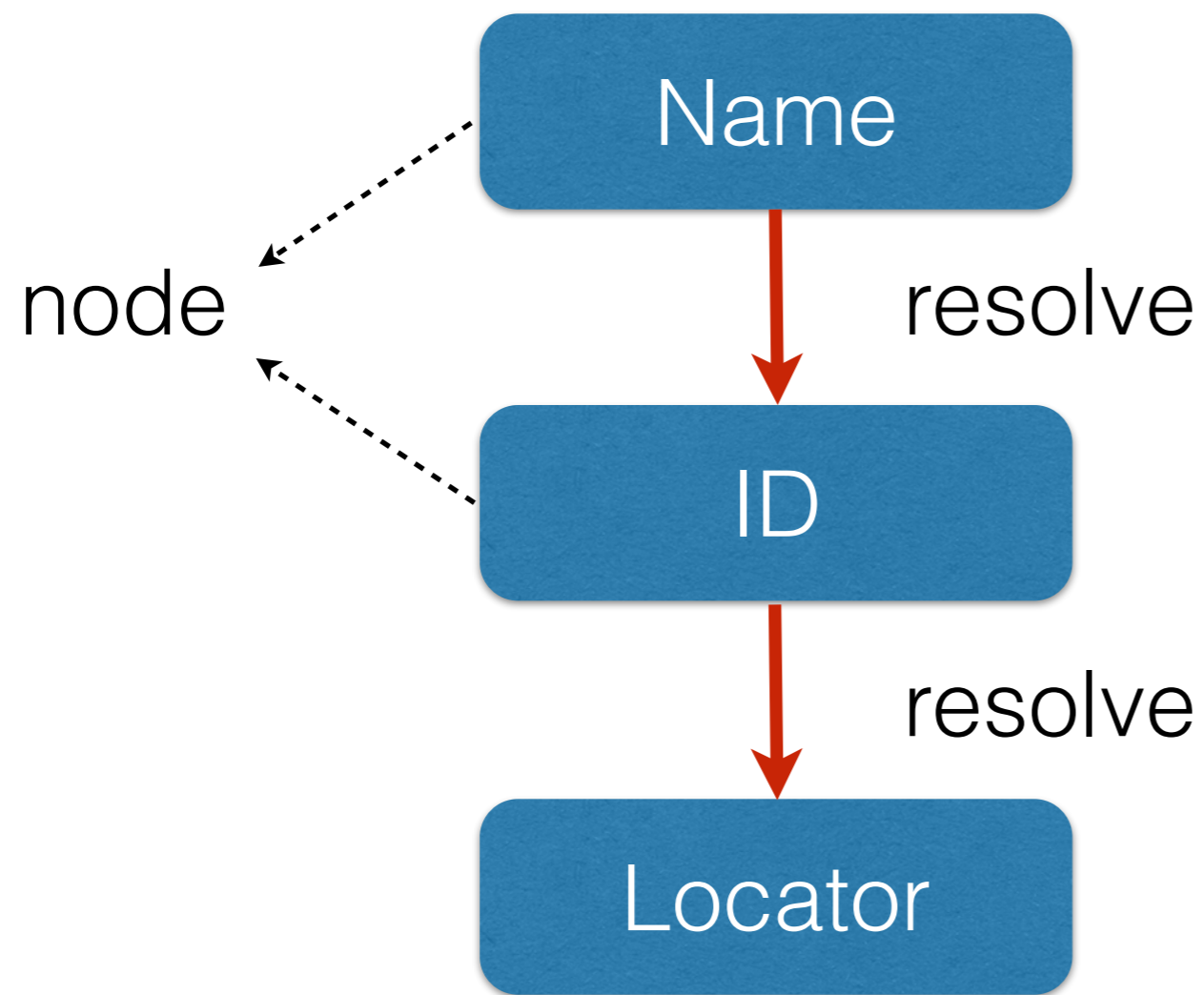
- 'ID names an object.'

- 'Locator names an interface.'
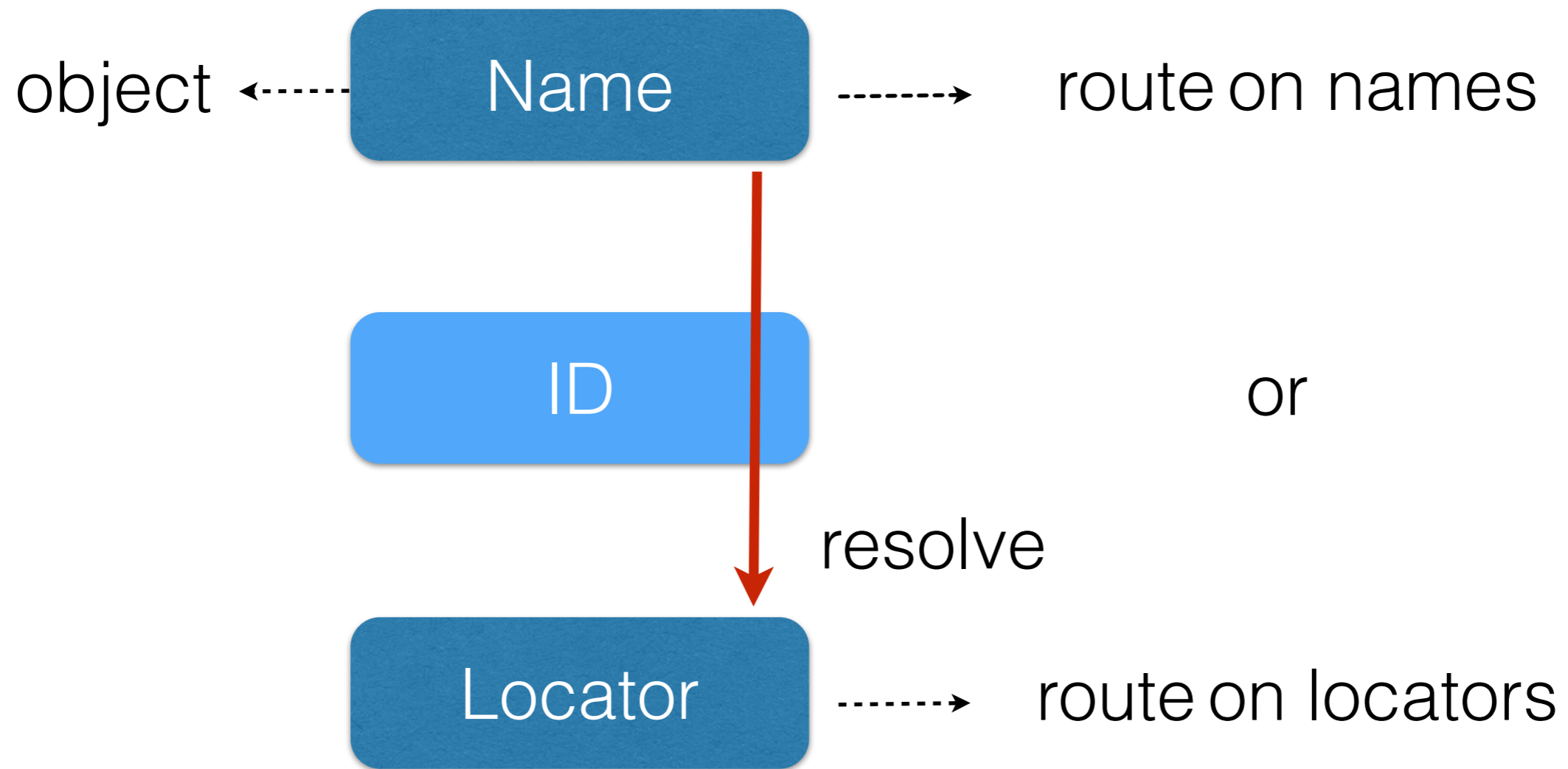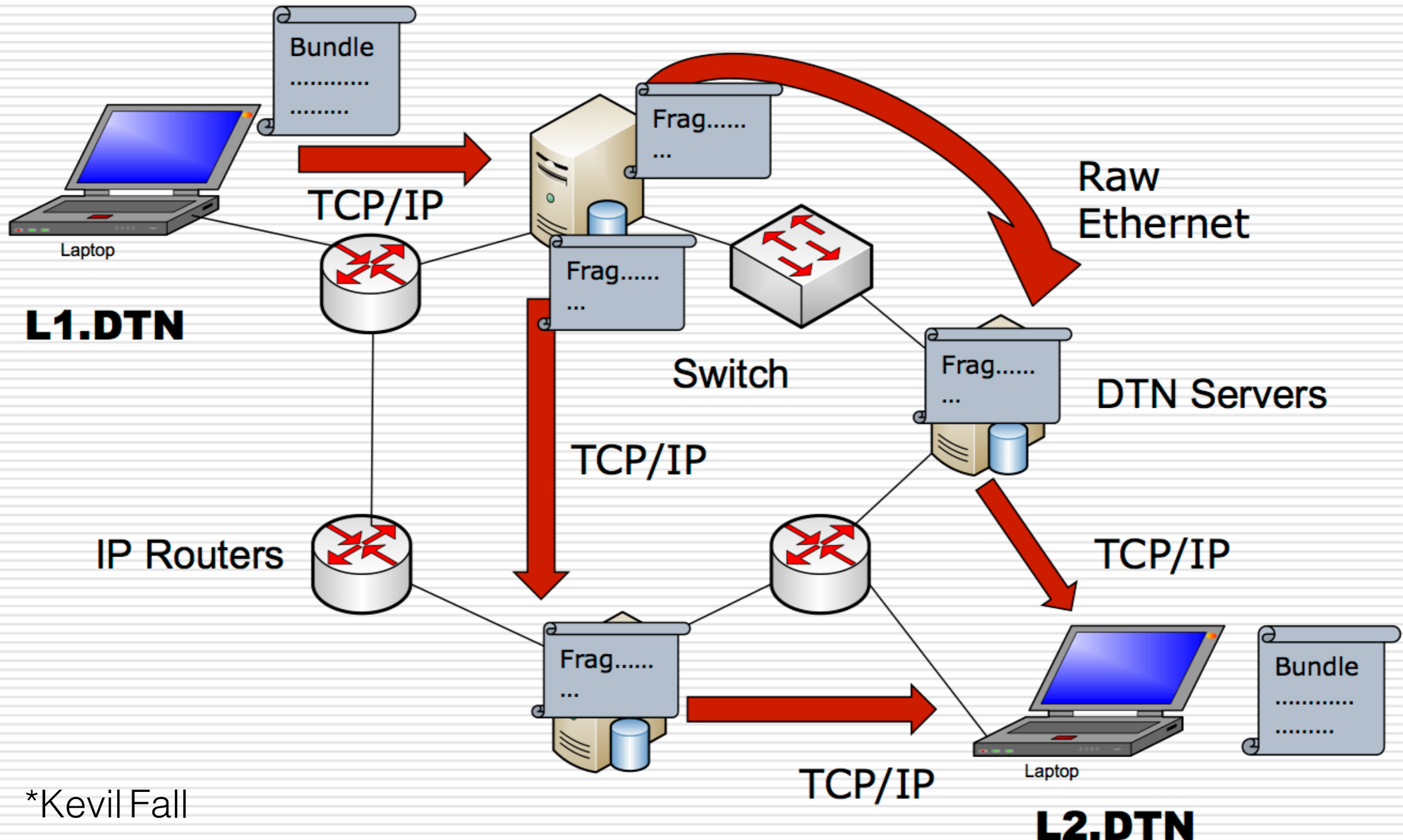
Name, Address, ID, Locator

data

service ← Name   strings; URI

node

ID   flat

Locator   hierachical

Internet

node ◁------ **Name** ----→ resolve

ID ↔ **Address** ------→ interface

Locator ↕

Loc/ID Separation

Name

node

resolve

ID

resolve

Locator

ICN

object ◀┈┈┈ **Name** ┈┈┈▶ route on names

ID   or

resolve

Locator ┈┈┈▶ route on locators

14

DTN: R(d) = {Ni, Pi, Li}

*Kevil Fall

15

Locators

Recursive Addressing

?   node   site   ?

tier -1   tier 0   tier +1   tier +2

⟵ Name ⟶
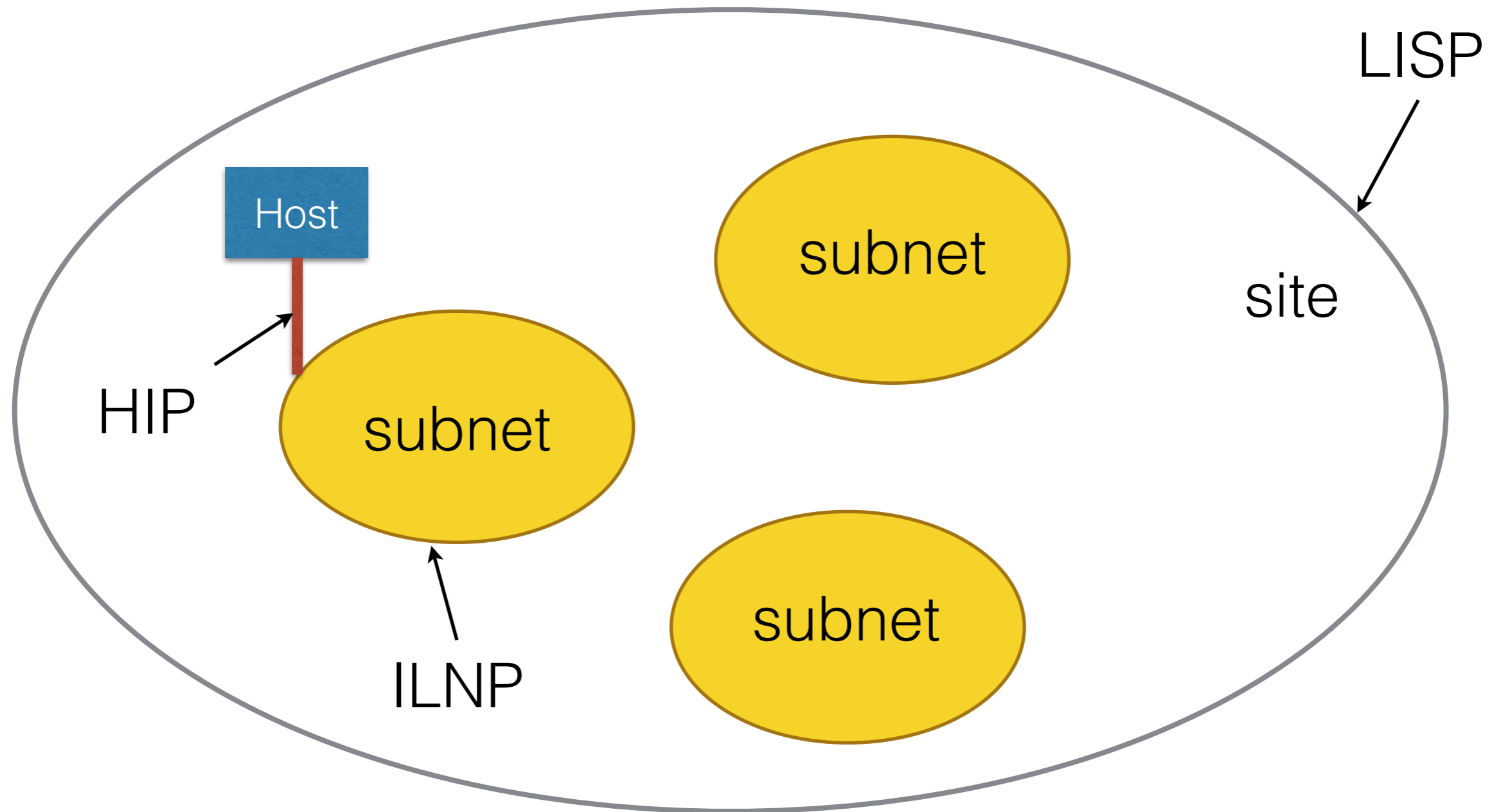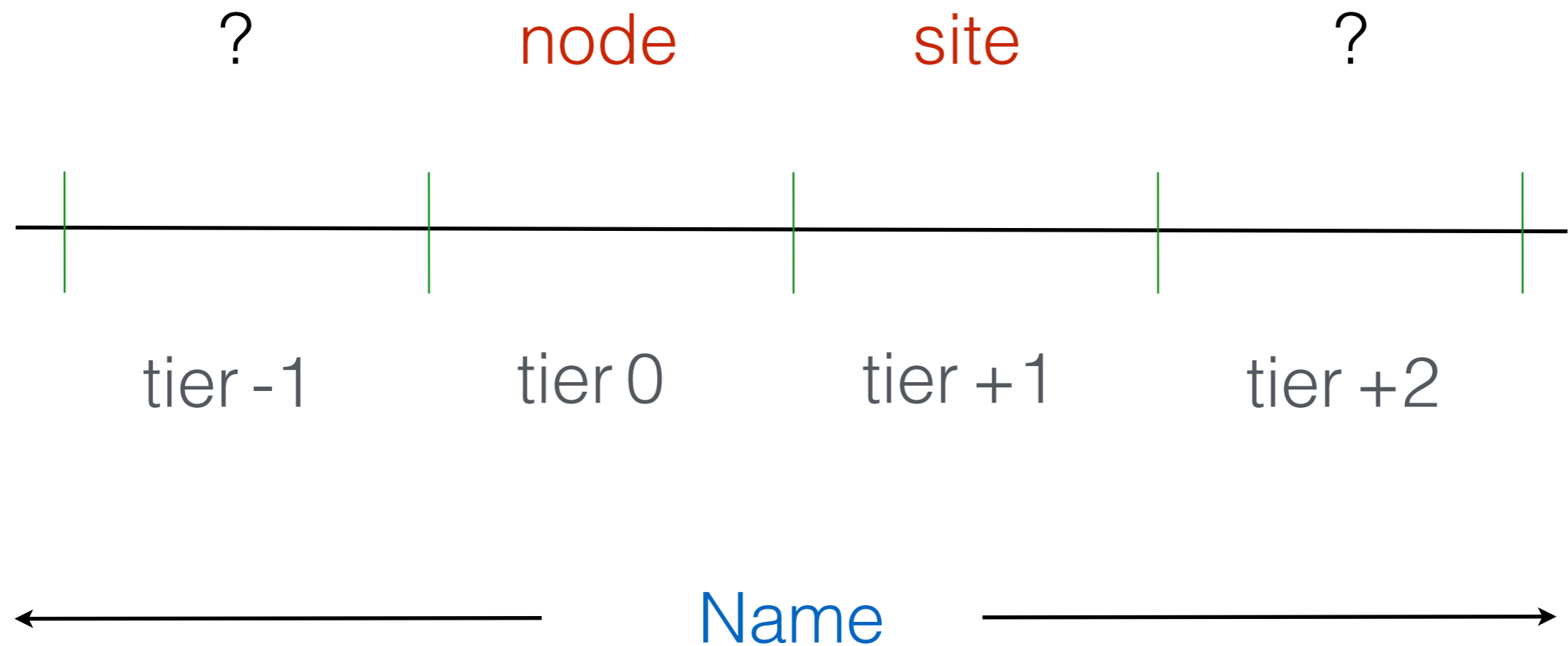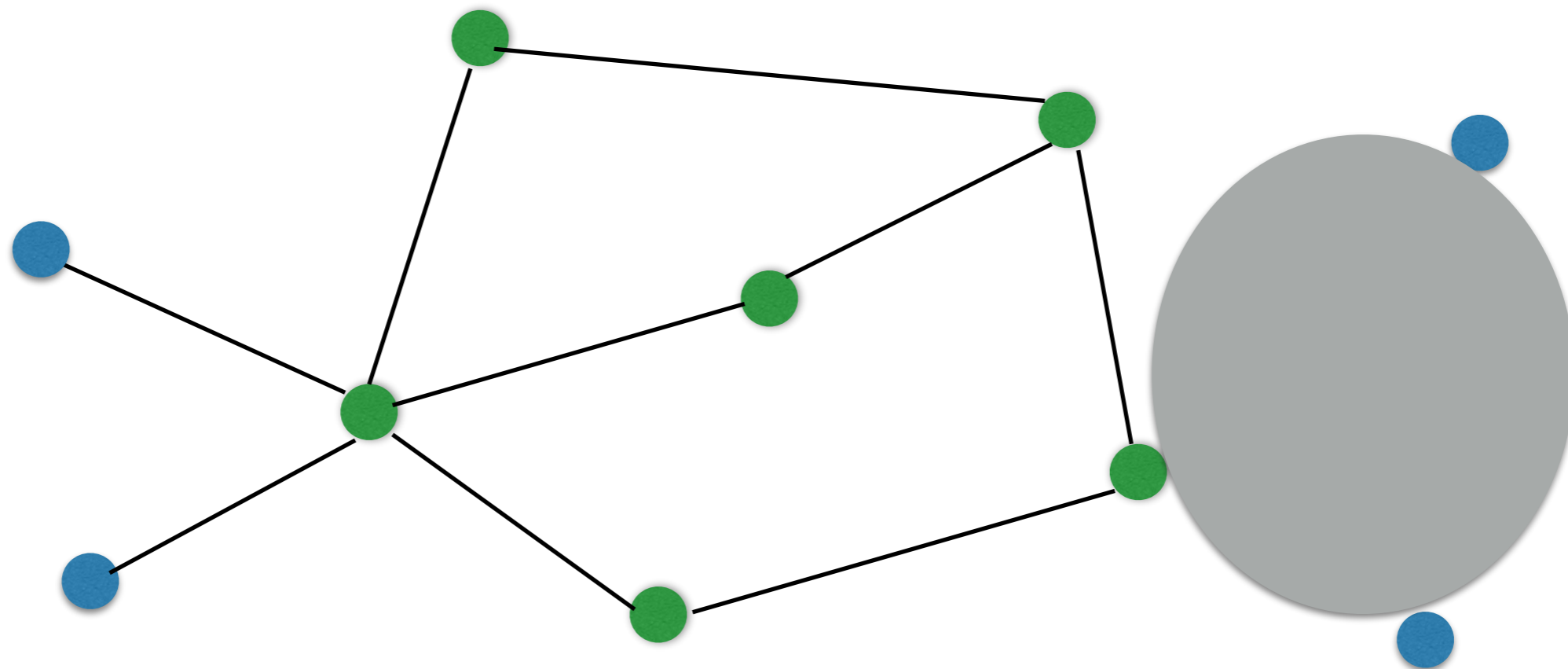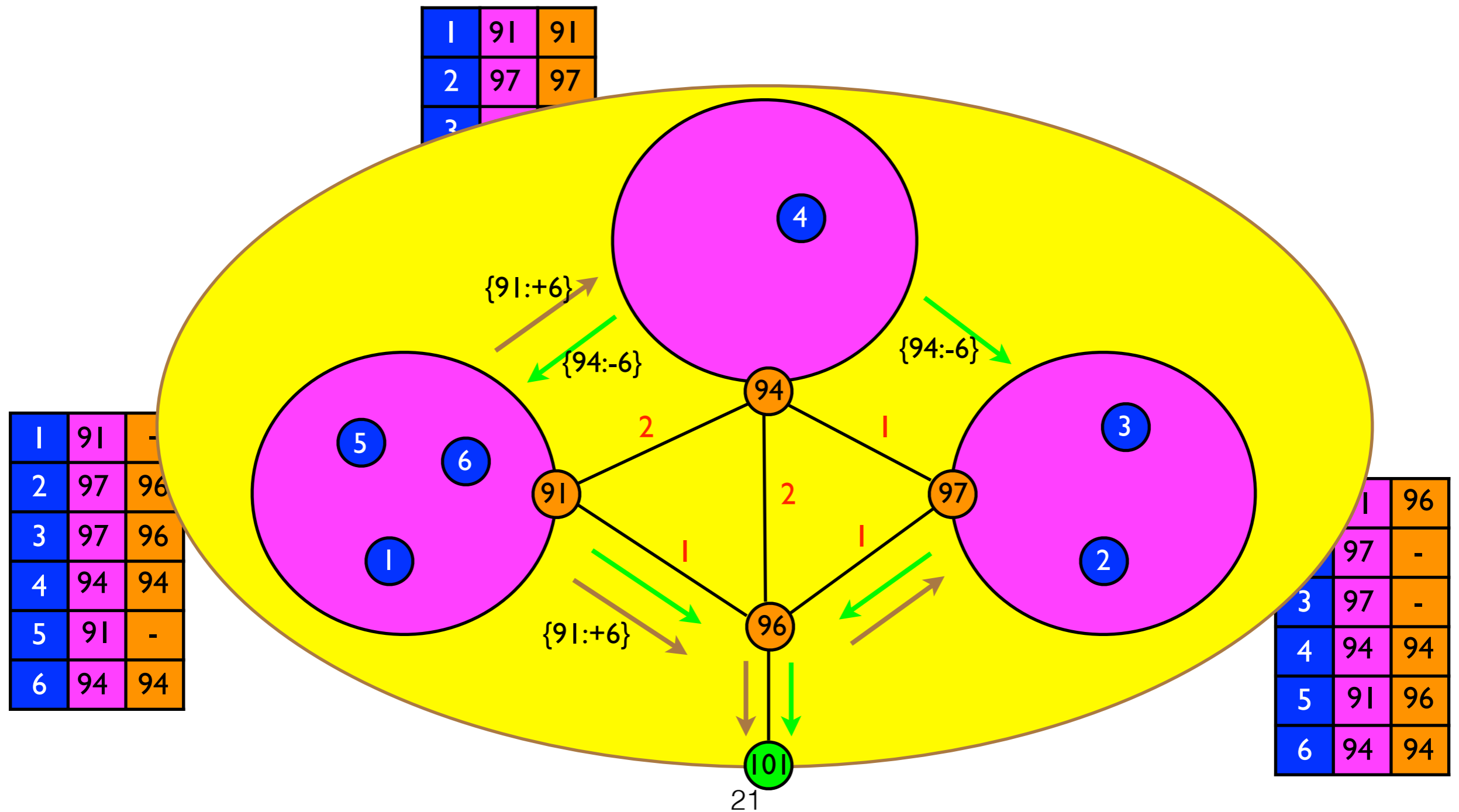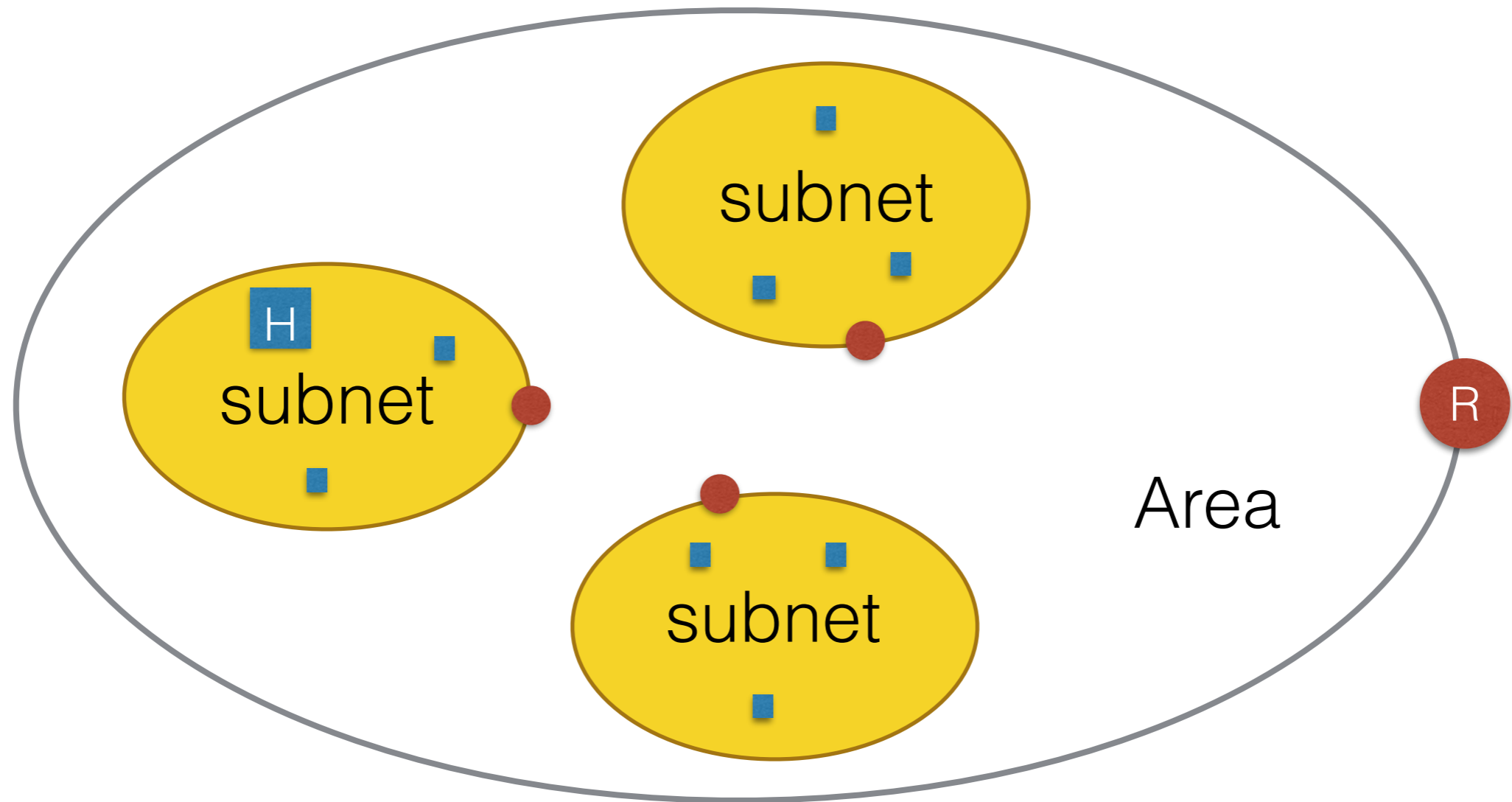
Links First
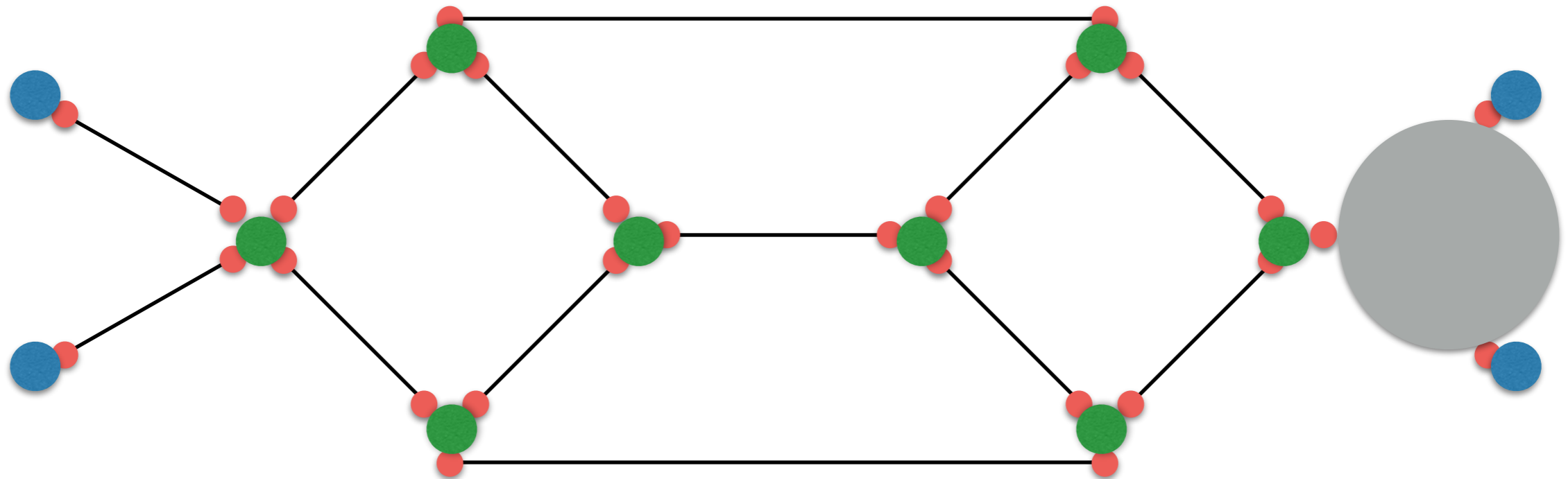
Nodes First

Mobility

- Intradomain vs Interdomain

- Mobile IP, etc.: interdomain

- No seamless mobility with interface addressing

- Flat addressing for seamless mobility

Mobility with Flat Node Addressing

ISIS
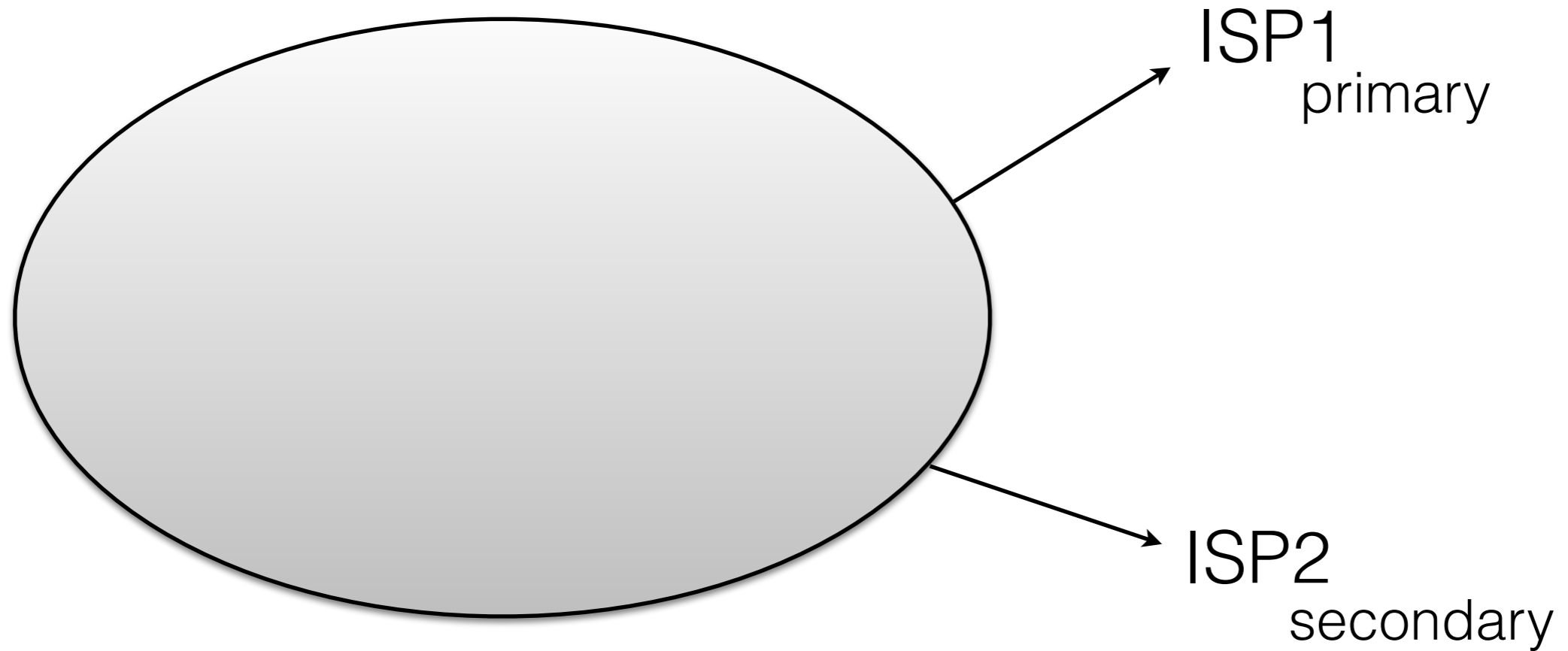

addr	Area	Sys ID

Multi-homing

ISP1
primary

ISP2
secondary

Multi-path

- Who's job is this?

  - Transport or Network?

- MPTCP, SCTP

- Had we Session Layer....

Authentication

- Data

- Domain

- ...

ICN revisited

- Object security

- Decoupling senders and receivers

- Inherent multicast, mobility

- Scalability of name-based routing

SDN

- Centralized routing?

  - like telephone n/w?

- Internet: distributed routing

- at scale?

IoT

- Which fits best?; ICN, Internet, DTN, or else

- Fusion of everything?

Scalability

- Any scalability excuse based on the Moor's Law should fail.

  - Soft-state

  - Route on names

So what?

- Still much ad hoc

- Networking, intrinsically an artifact

  - No chance for science?

- Worth trying paradigm shifts

  - until we know better

Thanks.