

SILO

Scalable Internet with Local Addressing
& Orthogonal Routing

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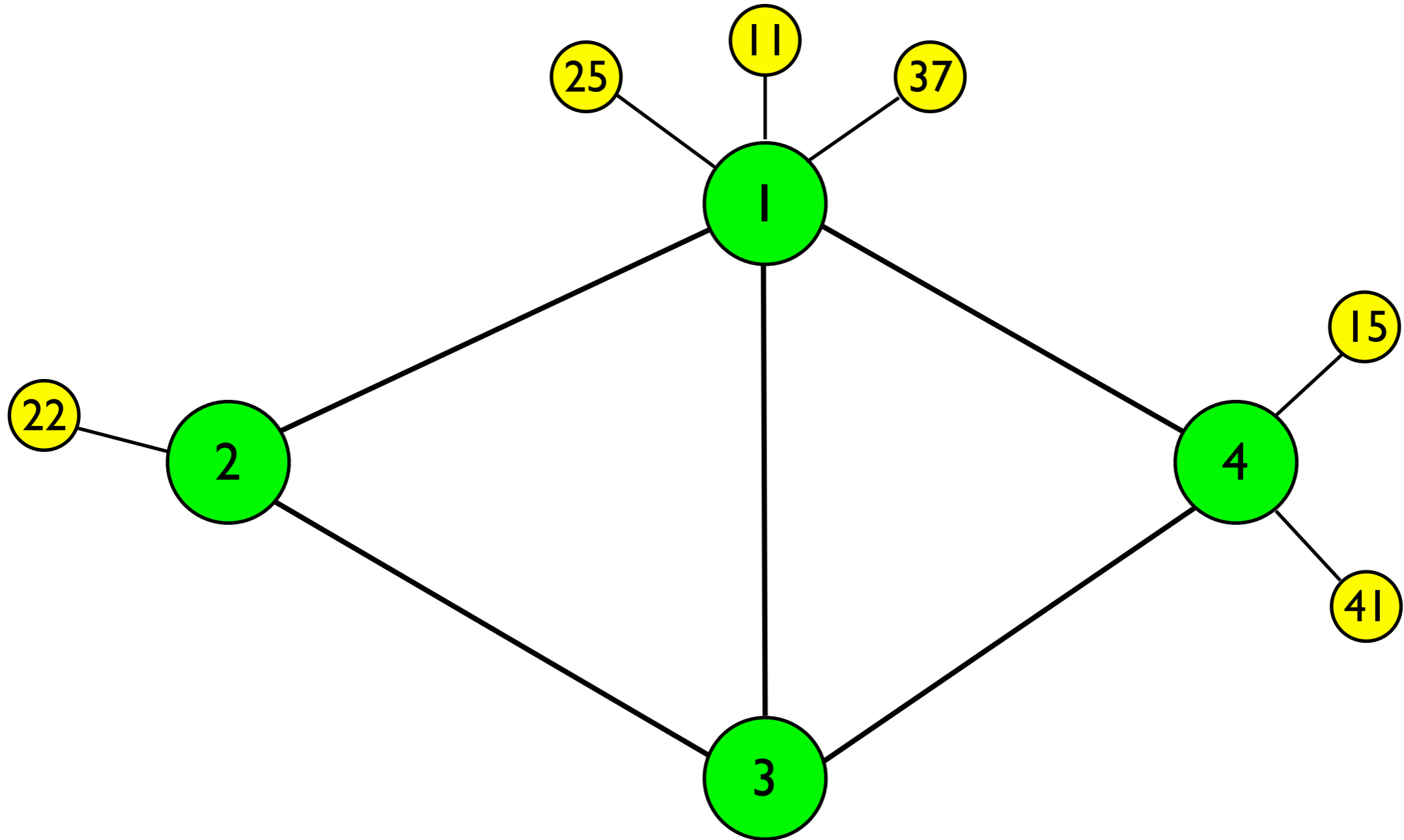
Key Words

- Scalable
 - recursive; inwards & outwards
- Local
 - to a given autonomous site
- Orthogonal
 - interior opaque to exterior

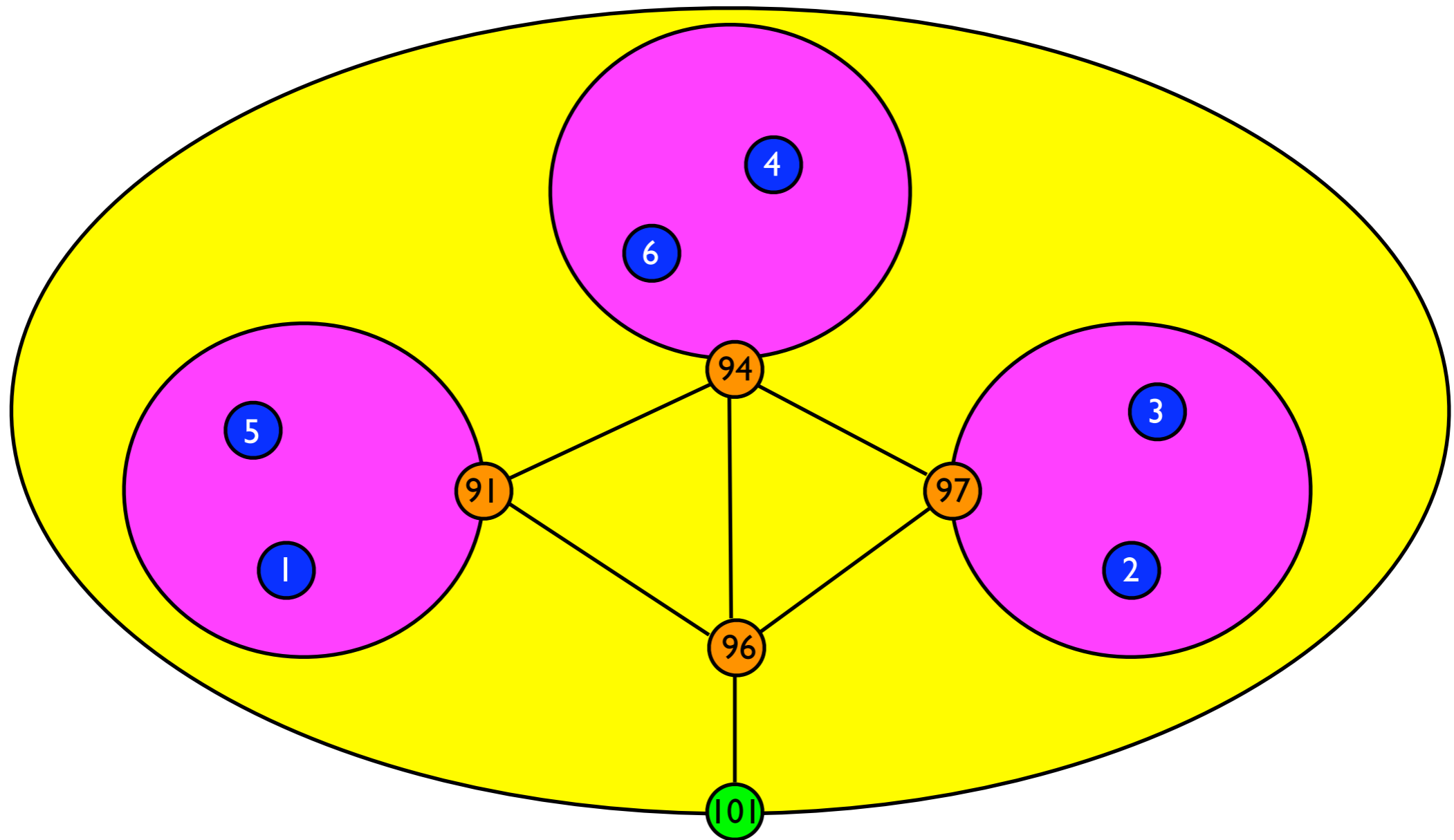
Architecture

- Internet: a network of autonomous sites
- Site: a collection of nodes
- Site named by a global site address
- Node named by a local node address
- Exterior routing on site addresses
- Interior routing on node addresses

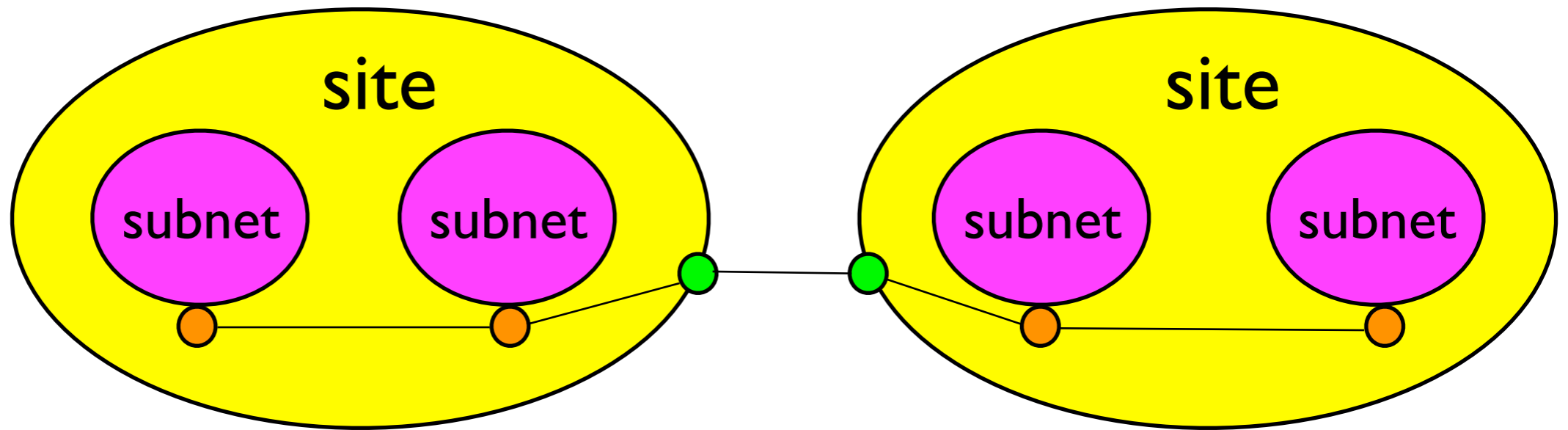
Global Internet = {sites}



site = {nodes} = {subnets}



Scope



mac addr \longleftrightarrow subnet

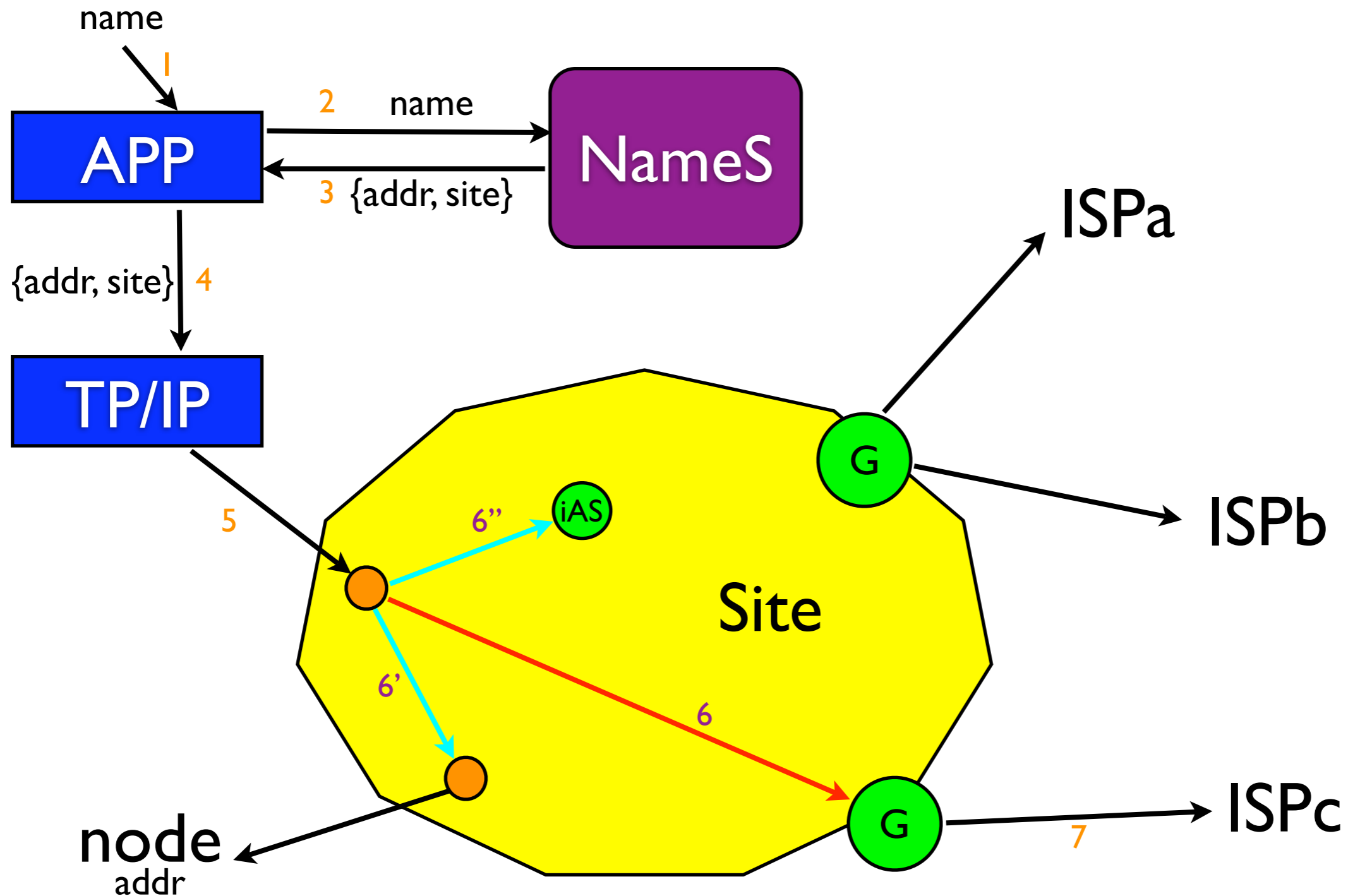
node addr \longleftrightarrow site

site addr \longleftrightarrow global

node name \longleftrightarrow global

subnet addr \longleftrightarrow site

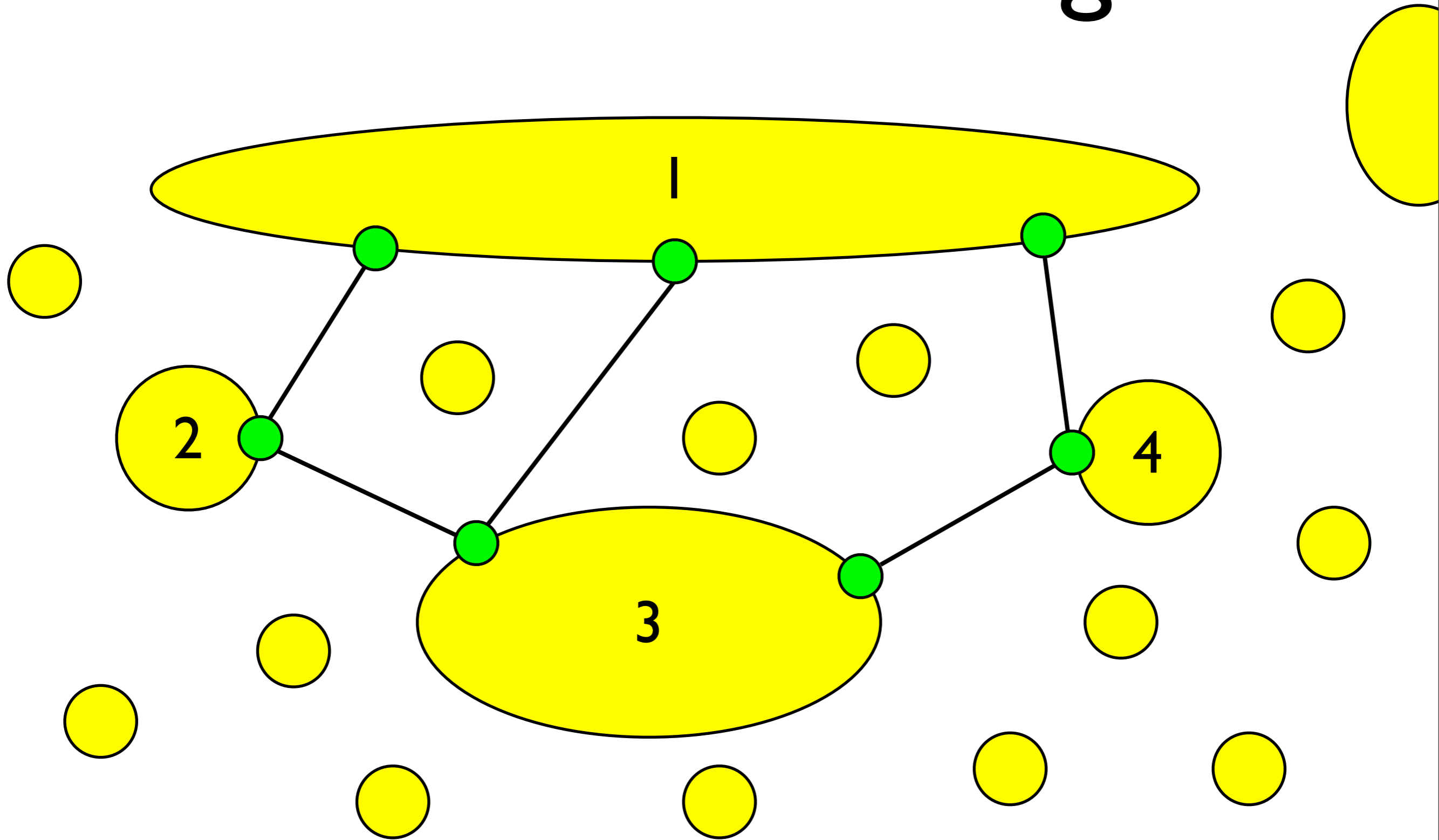
Operational Overview



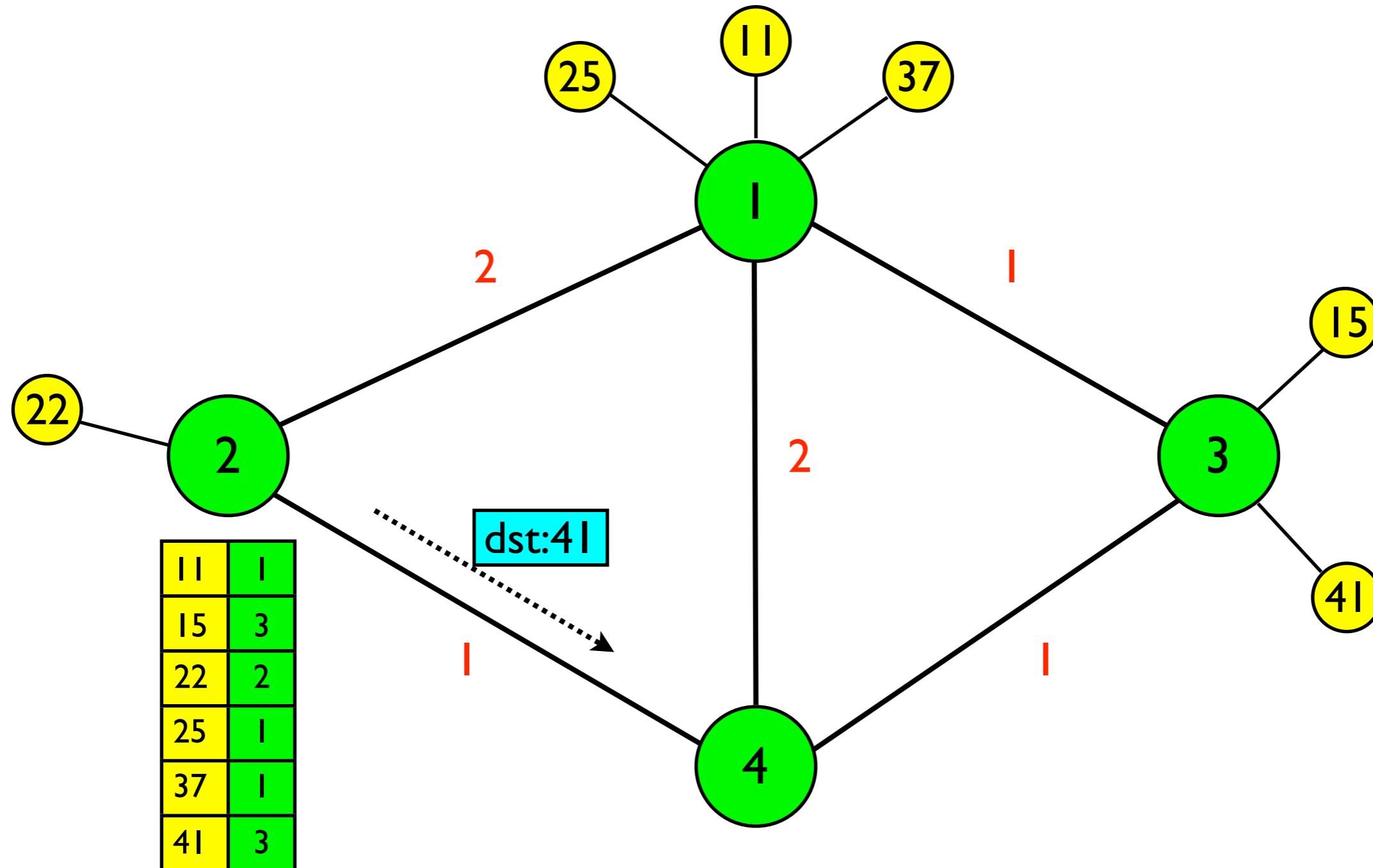
Routing

- Interior & Exterior routings orthogonal
 - Interior routing on node address
 - Exterior routing on site address
- Sites equivalent to network nodes
- Any routing protocols possible

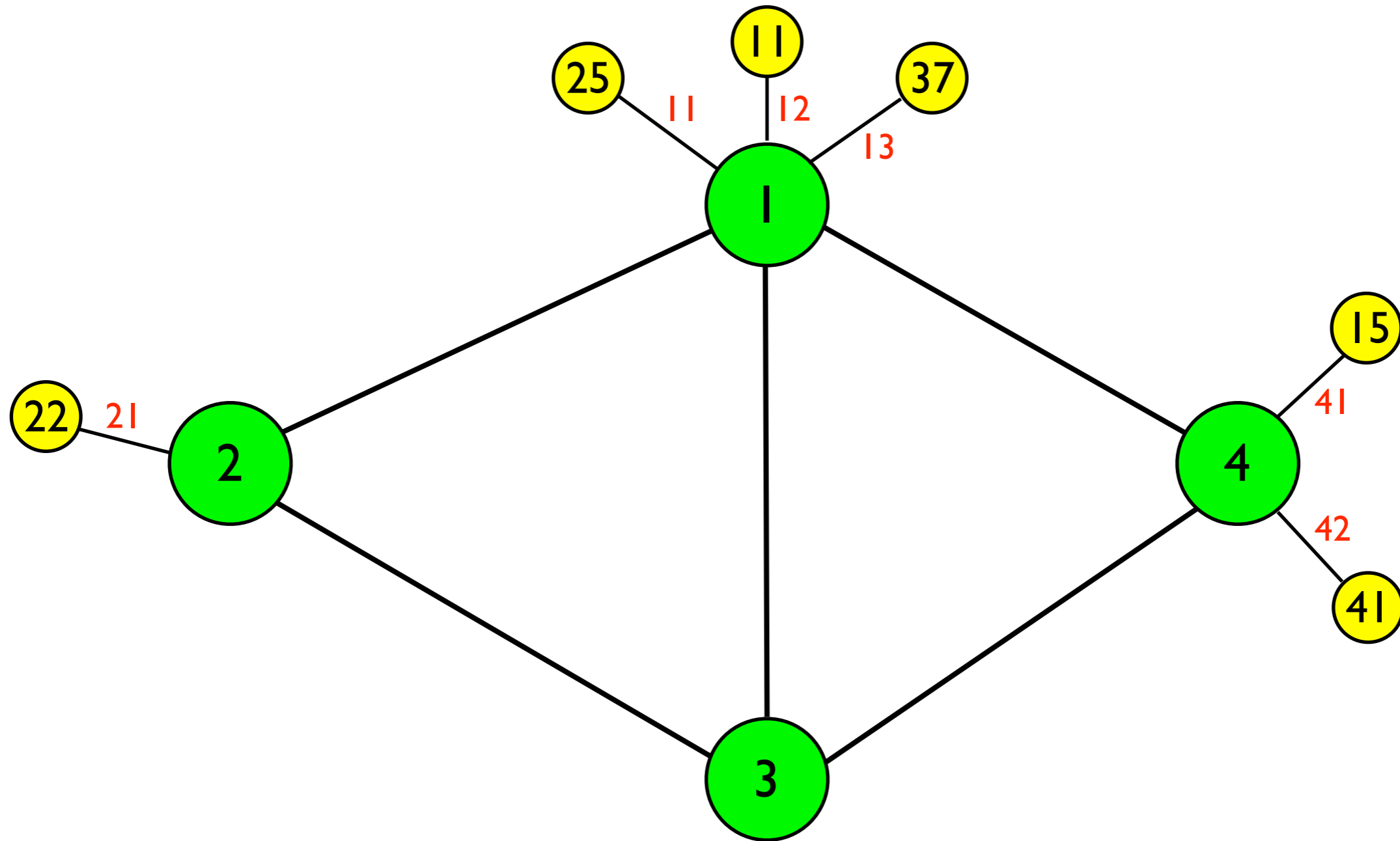
Exterior Routing



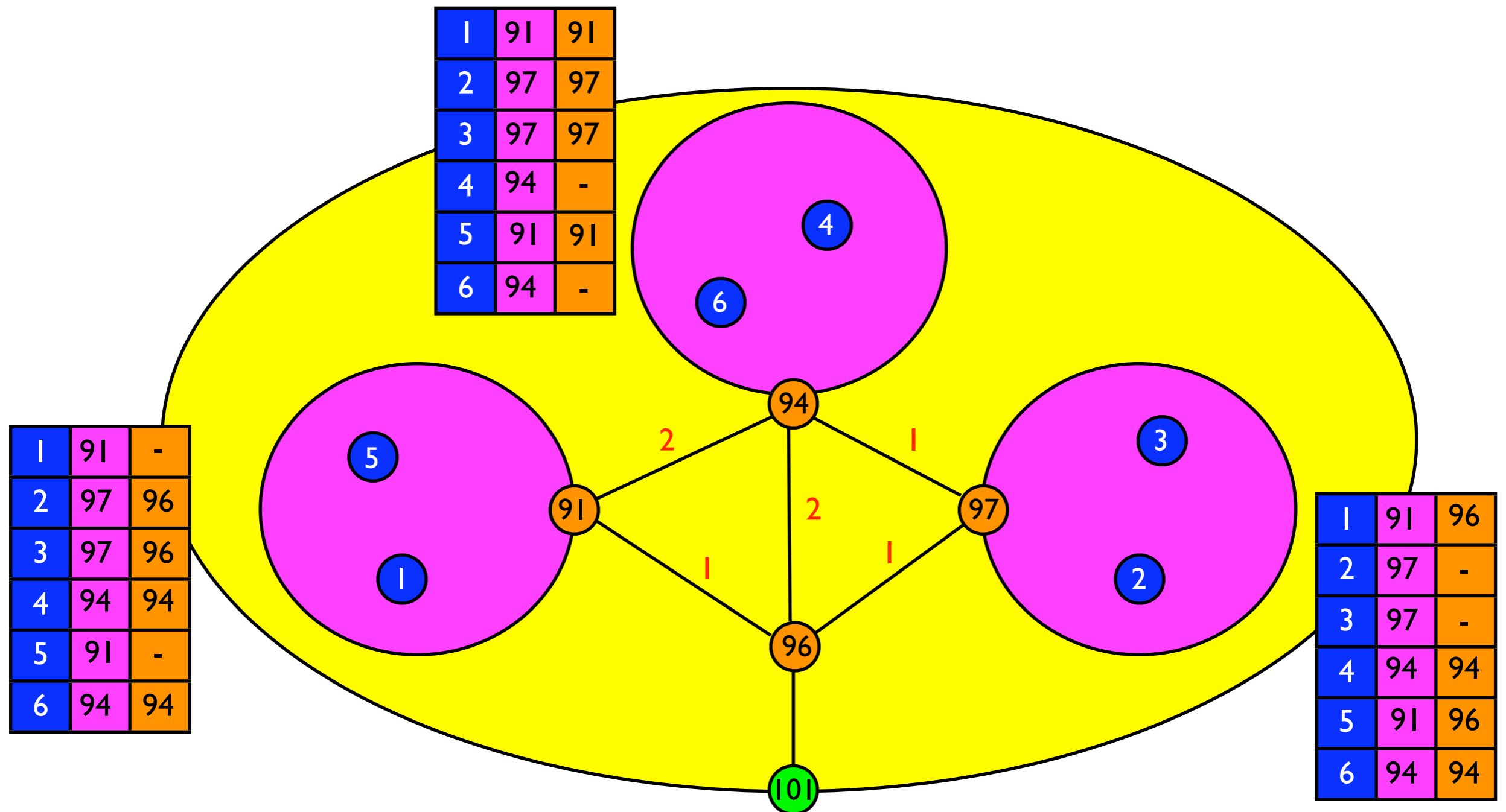
Flat Exterior Routing



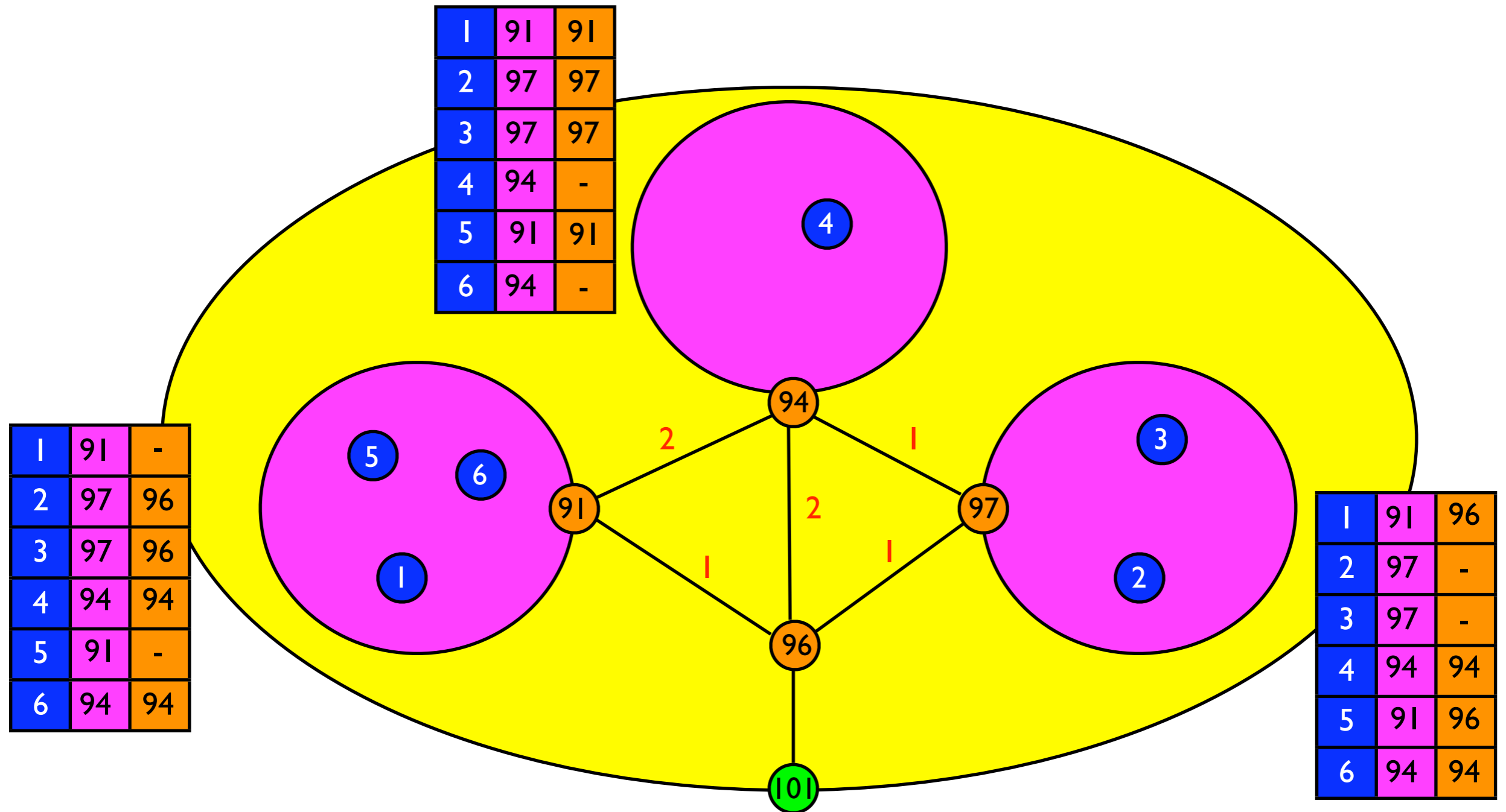
Virtual Exterior Routing



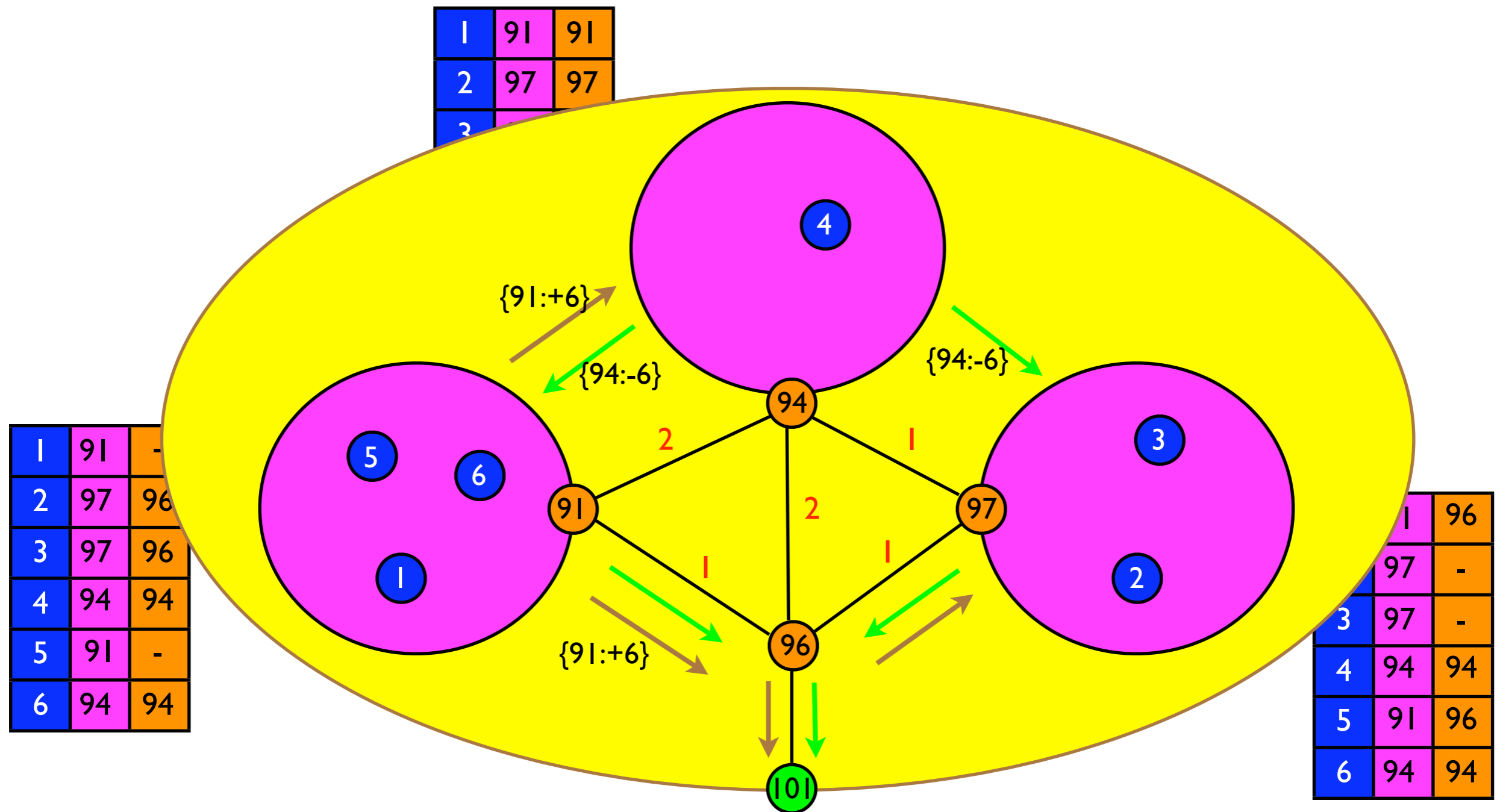
Flat Interior Routing



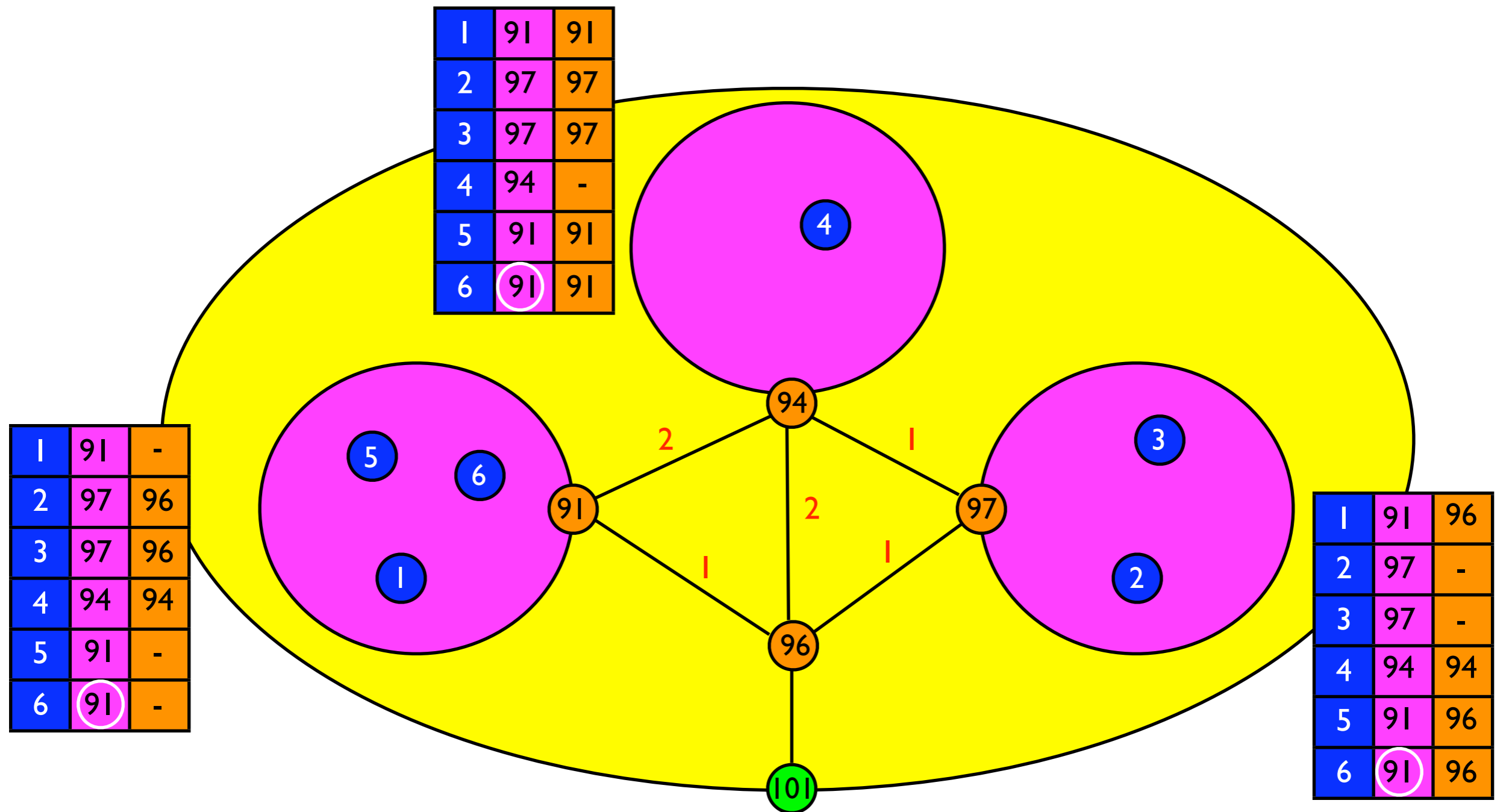
Flat Interior Routing



Flat Interior Routing



Flat Interior Routing

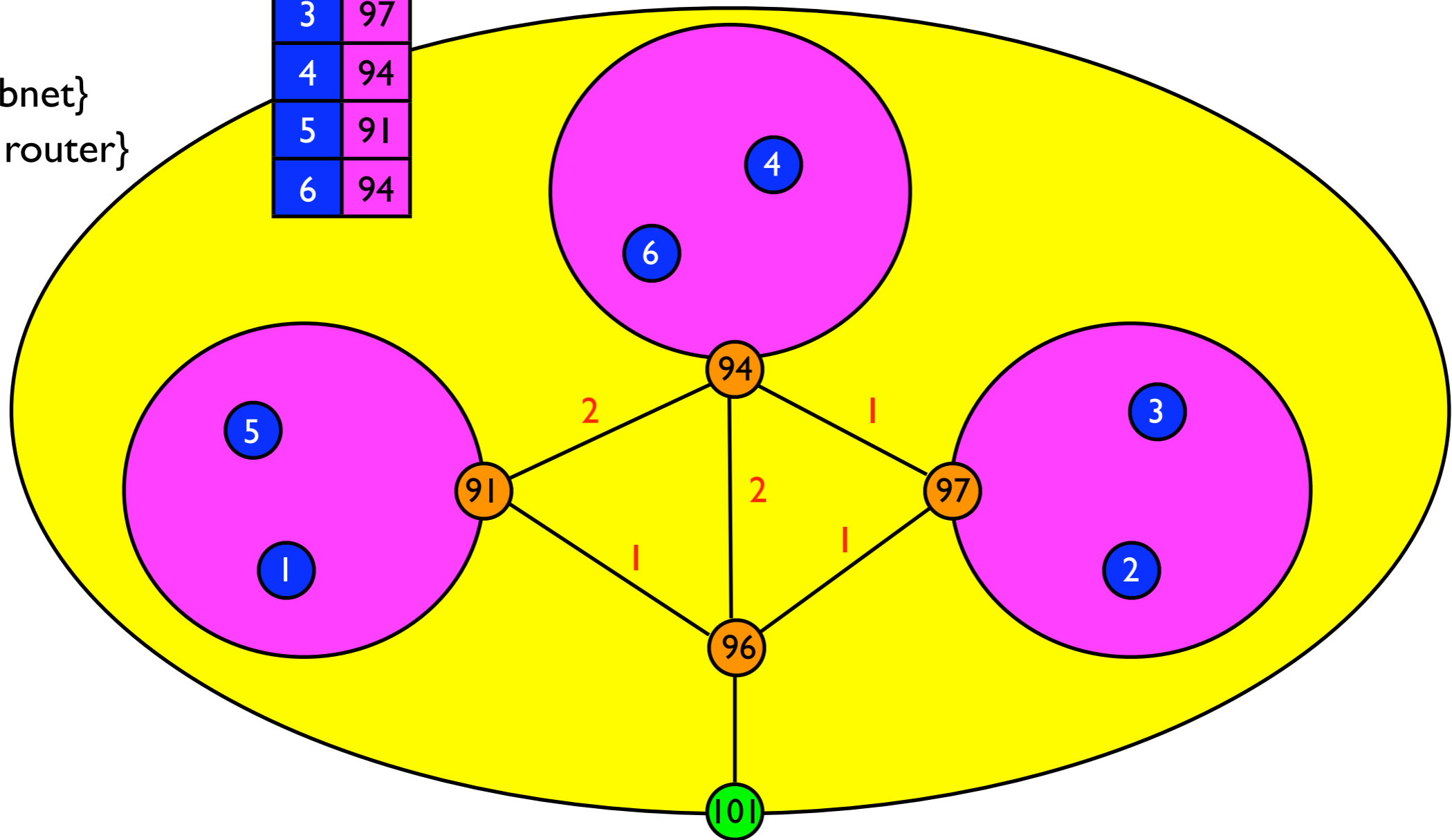


Mapped Interior Routing

mapper

1	91
2	97
3	97
4	94
5	91
6	94

{addr, subnet}
= {addr, router}

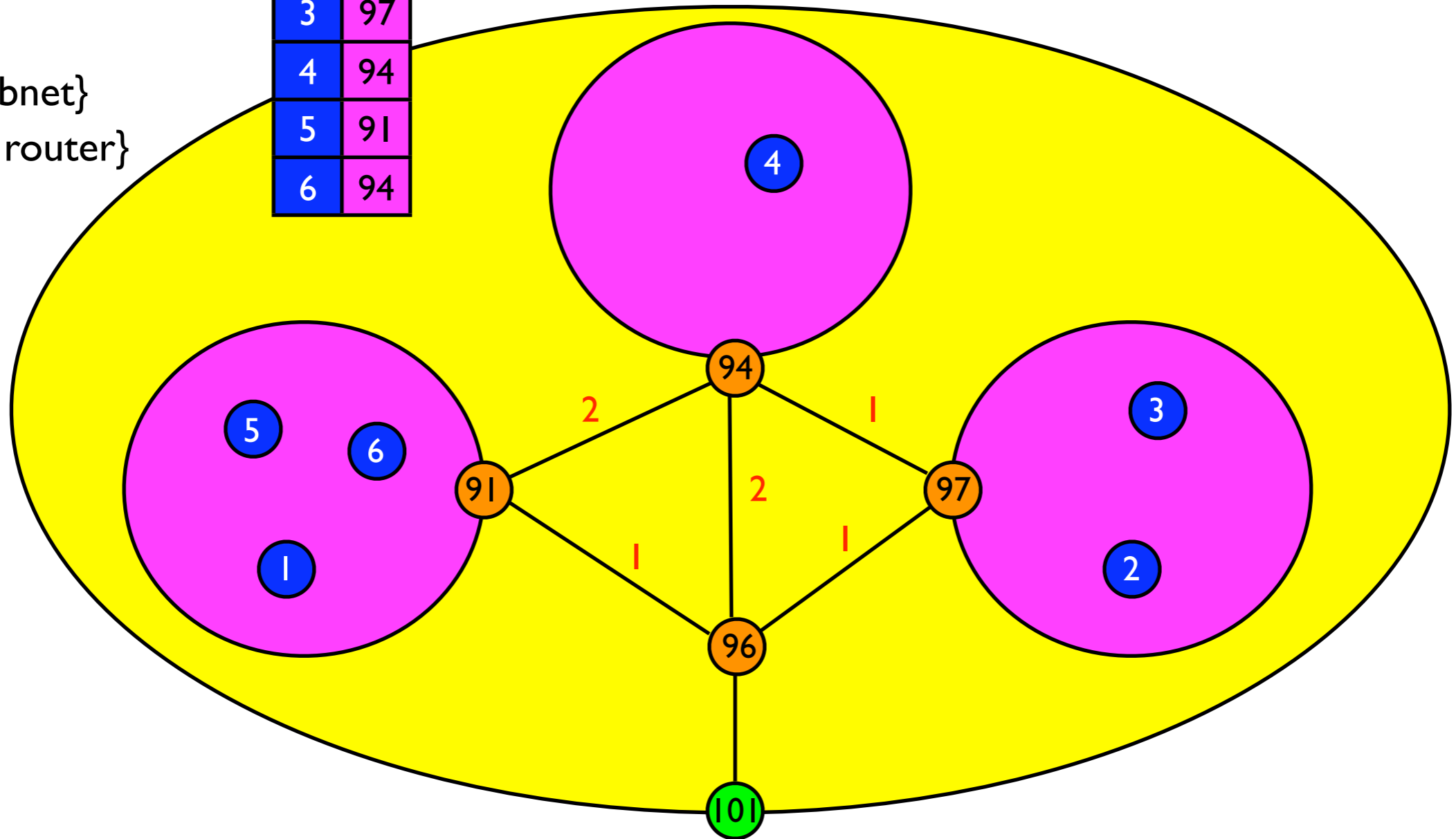


Mapped Interior Routing

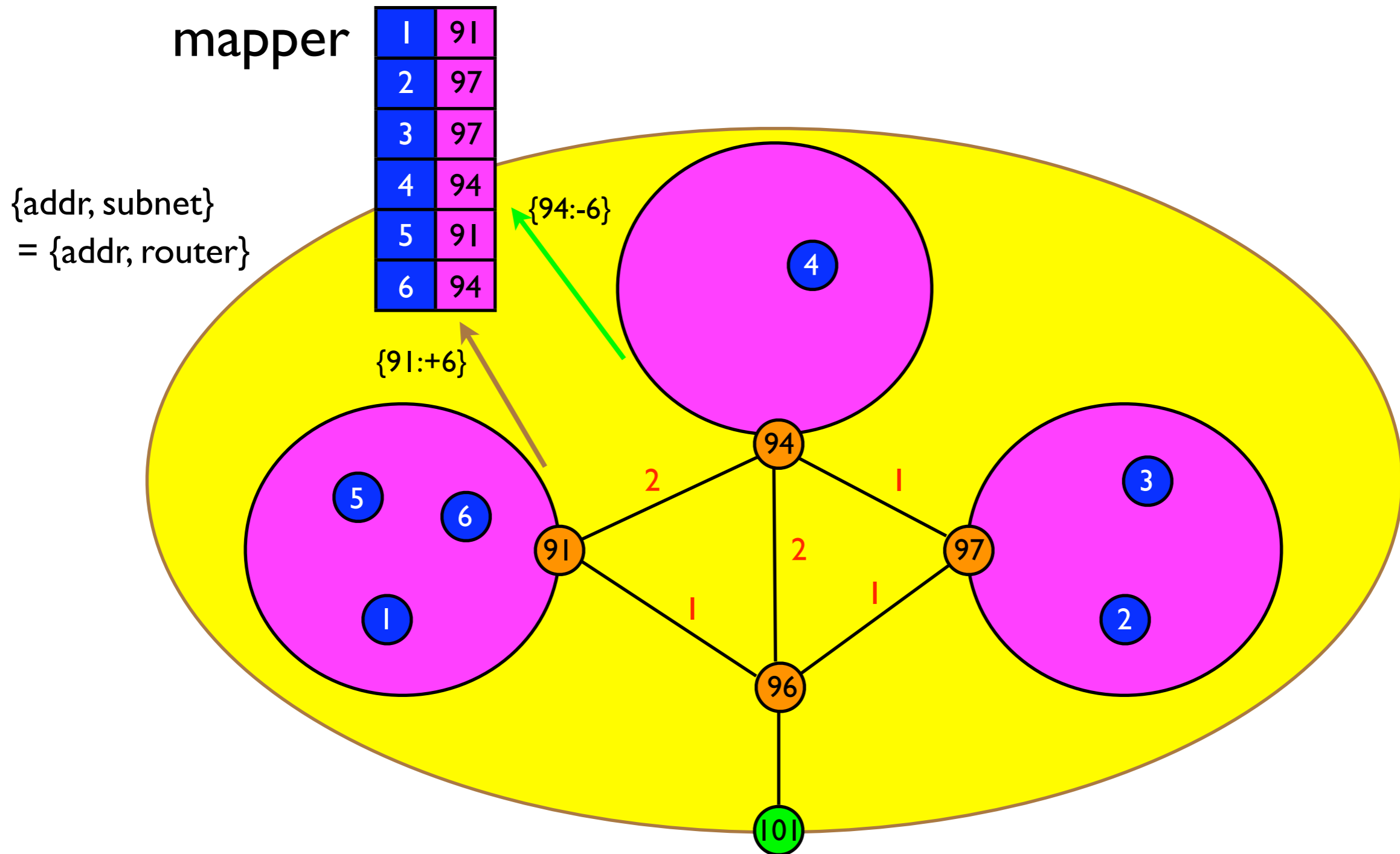
mapper

1	91
2	97
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4	94
5	91
6	94

{addr, subnet}
= {addr, router}



Mapped Interior Routing

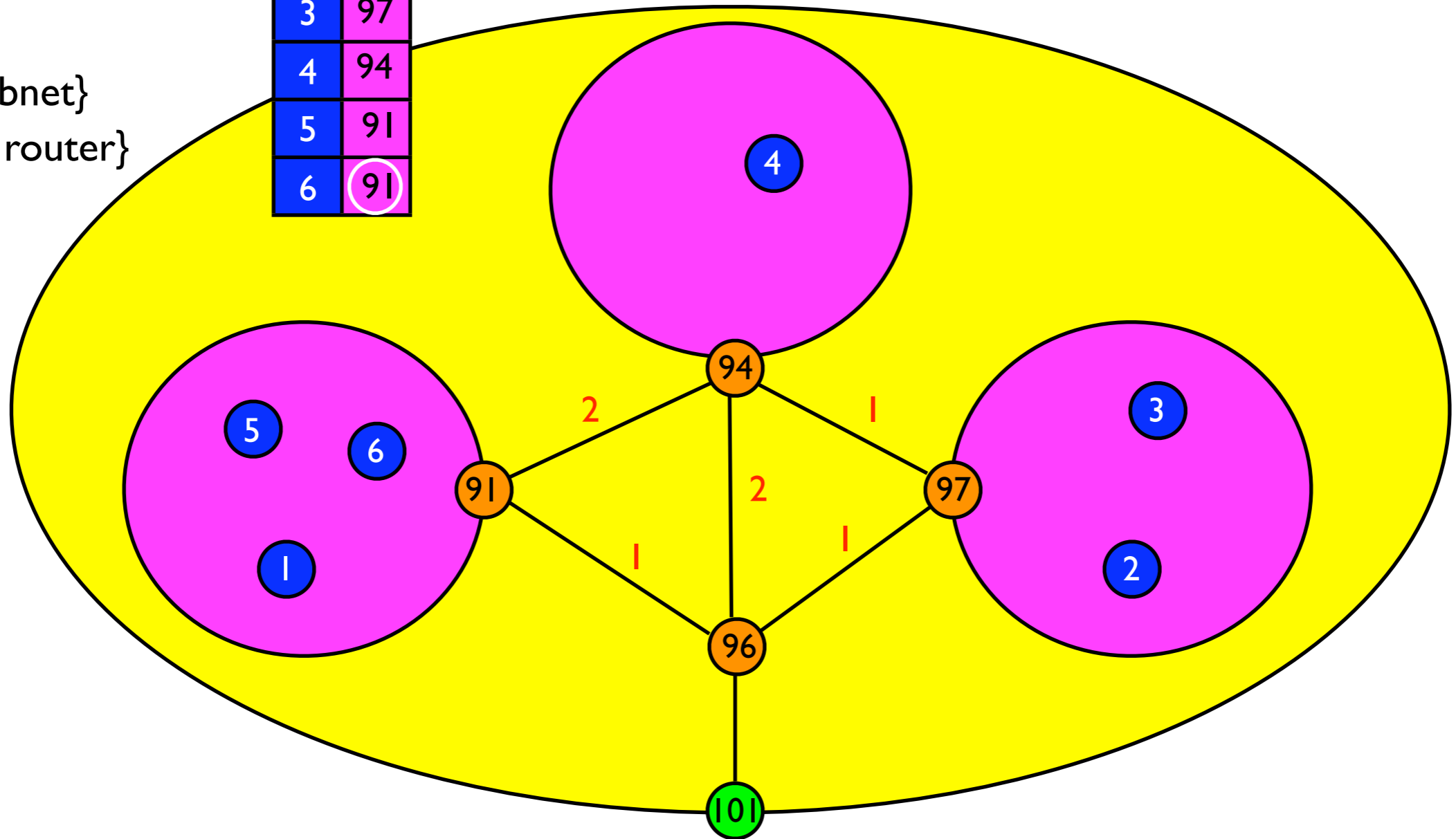


Mapped Interior Routing

mapper

1	91
2	97
3	97
4	94
5	91
6	91

{addr, subnet}
= {addr, router}



Implementation Choices

- IPv4 (or IPv6 address) for node address
- AS# or PI prefixes for site address
- DNS extended for NameS
- OSPF⁺ or IS-IS⁺ for interior routing
- BGP4⁺ for exterior routing

Consequences

- Recursively scalable without bound
- No address depletion, No governance
- No routing table explosion
- Inherent fast host / nw mobility by routers
- Effortless ISP migration and multi-homing
- No Loc/ID Separation

Others

- HIP ;mobility
- Shim6 ;multi-homing
- GSE ;multi-homing
- LISP ;local & PA address
- ILNP ;global ID & Loc
- CCN ;app arch

Conclusions

- Scalable Internet
 - by local addressing & orthogonal routing
 - feasible and deployable
- Further works for proof of concept

Acknowledgements

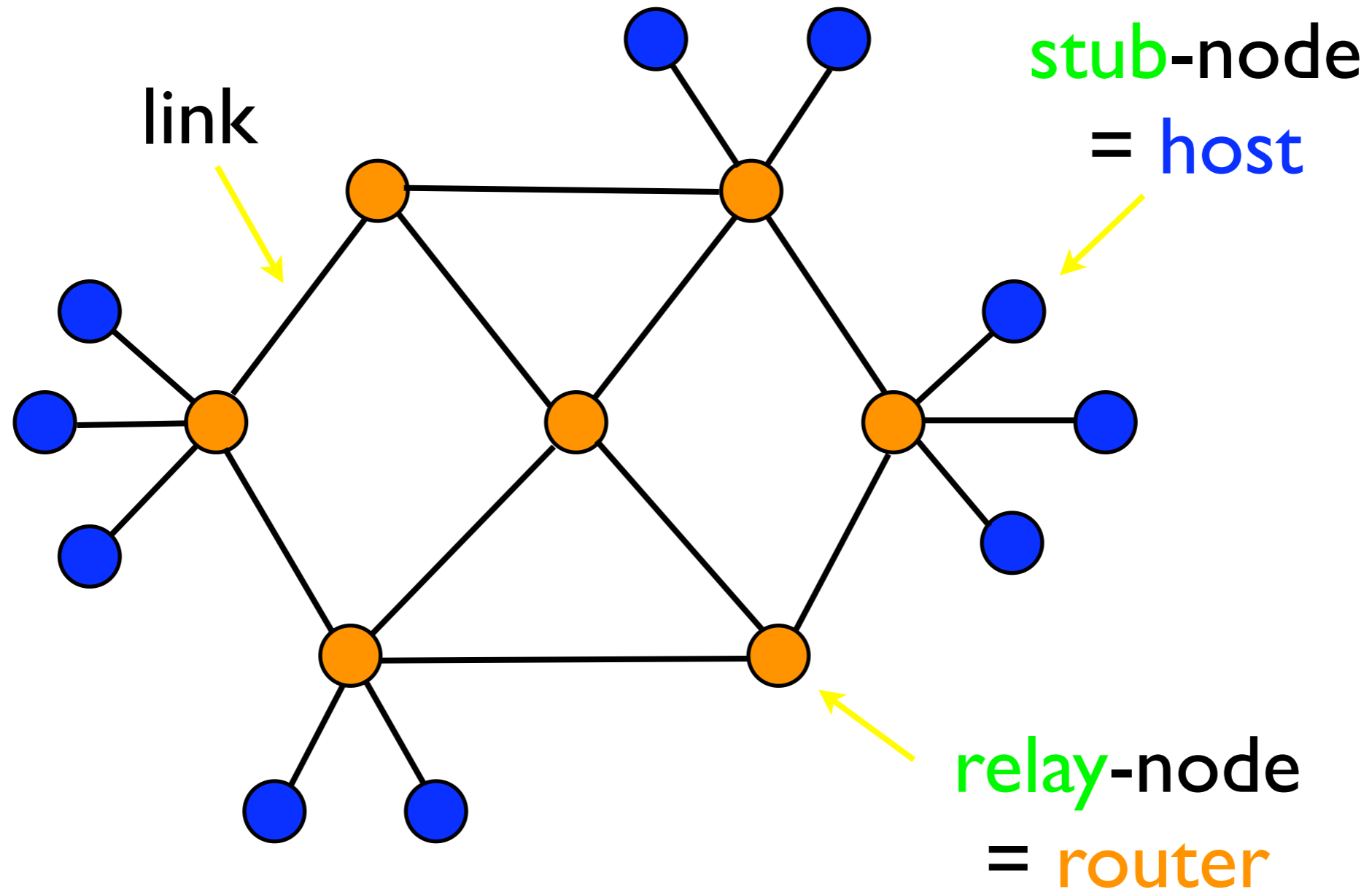
- Work done during a stay at ACCMS, Kyoto University with their support.
- Profound thanks to Prof. Yasuo OKABE.

References

- RFC 1498, On the Naming and Binding of Network Destinations, J. Saltzer, 1993.
- RFC 1955, ENCAPS, B. Hinden, 1996.
- John Day, *Patterns in Network Architecture*, Prentice-Hall, 2008.
- Discussions at IRTF/RRG.

Appendix

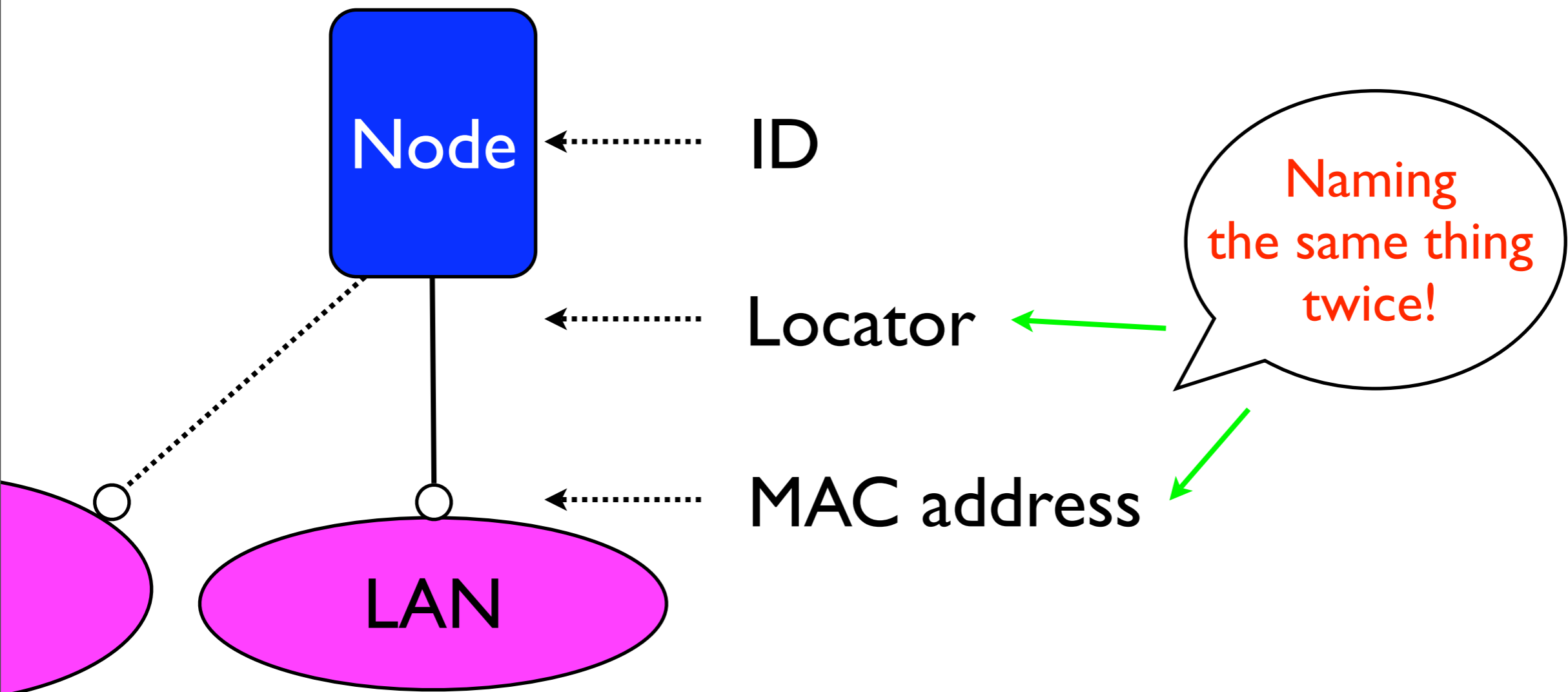
Inter-Net



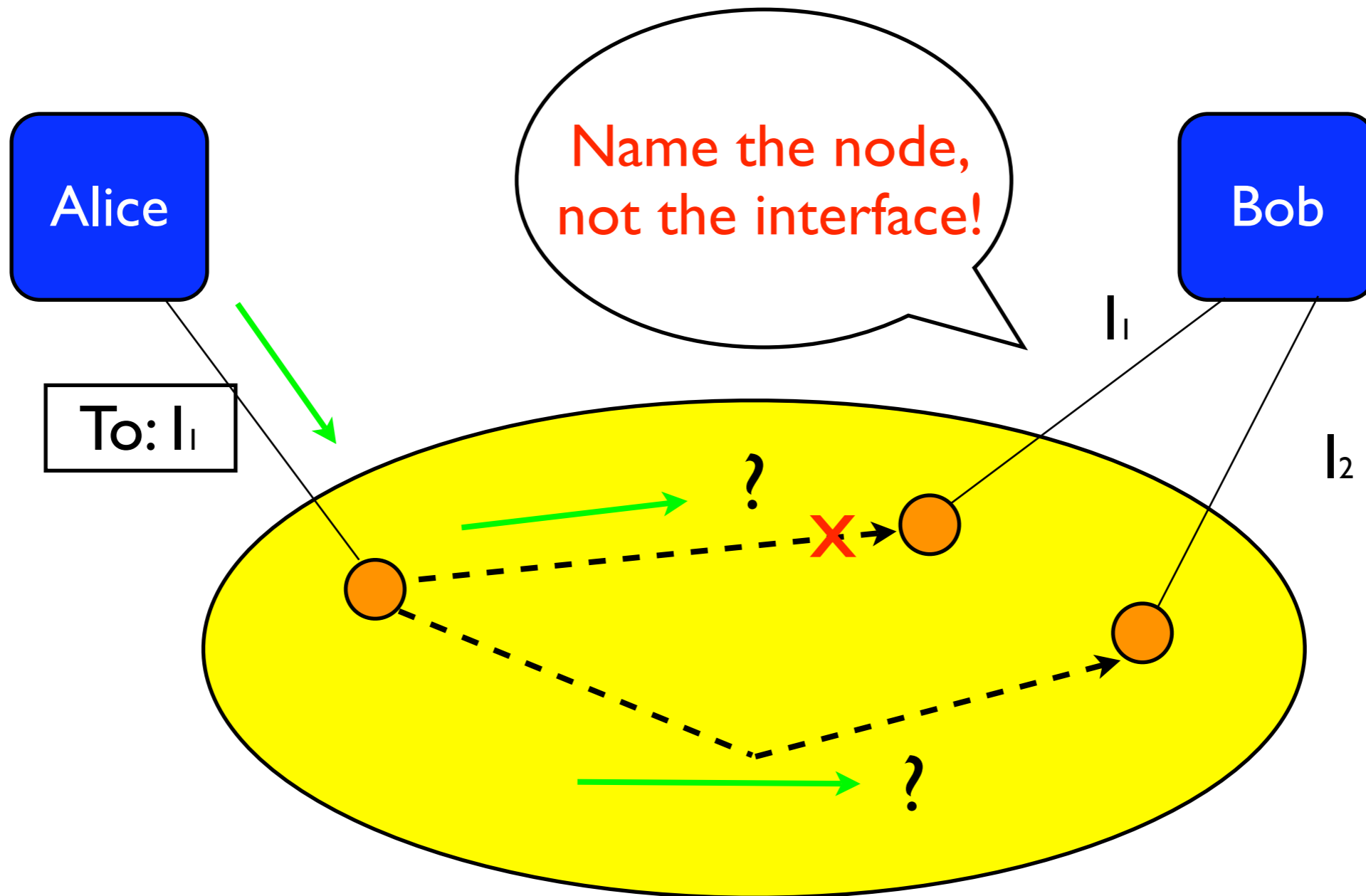
N & A Classics

- Name: identifier of an object (**node**)
- Address: locator of an object
- The two are different and distinct
- Need both to locate/identify an object
- “There’s no identifying an object without locating it, and vice-versa” - Jerry Saltzer

Loc/ID Separation?



Fallacy of IP Address



ID == Address !

- Need only ID
- ID points to a node, not an interface.
- ID should be routable in inter-net.
- So, ID is a node address.
- Address is the right term, not ID!

Address == Name !

iPAD-dy.kr

name

APP

DNS



168.188.68.120

address

name

inter-net

ARP

00:25:00:21:e4:a9

PoA

address

network

Global Name & Local Address

Why bother keeping both global?

