Scaling IXPs

Scalable Infrastructure Workshop

Objectives

- To explain scaling options within the IXP
- To introduce the Internet Routing Registry at the IXP

IXP Scaling Techniques

- Route Collector
- Route Server
- Internet Routing Registry

Introduction to Route Collectors

Route Collector Background

- What is a Route Collector?
- Features of a Route Collector
- Purpose of a Route Collector
- IXP Design with a Route Collector

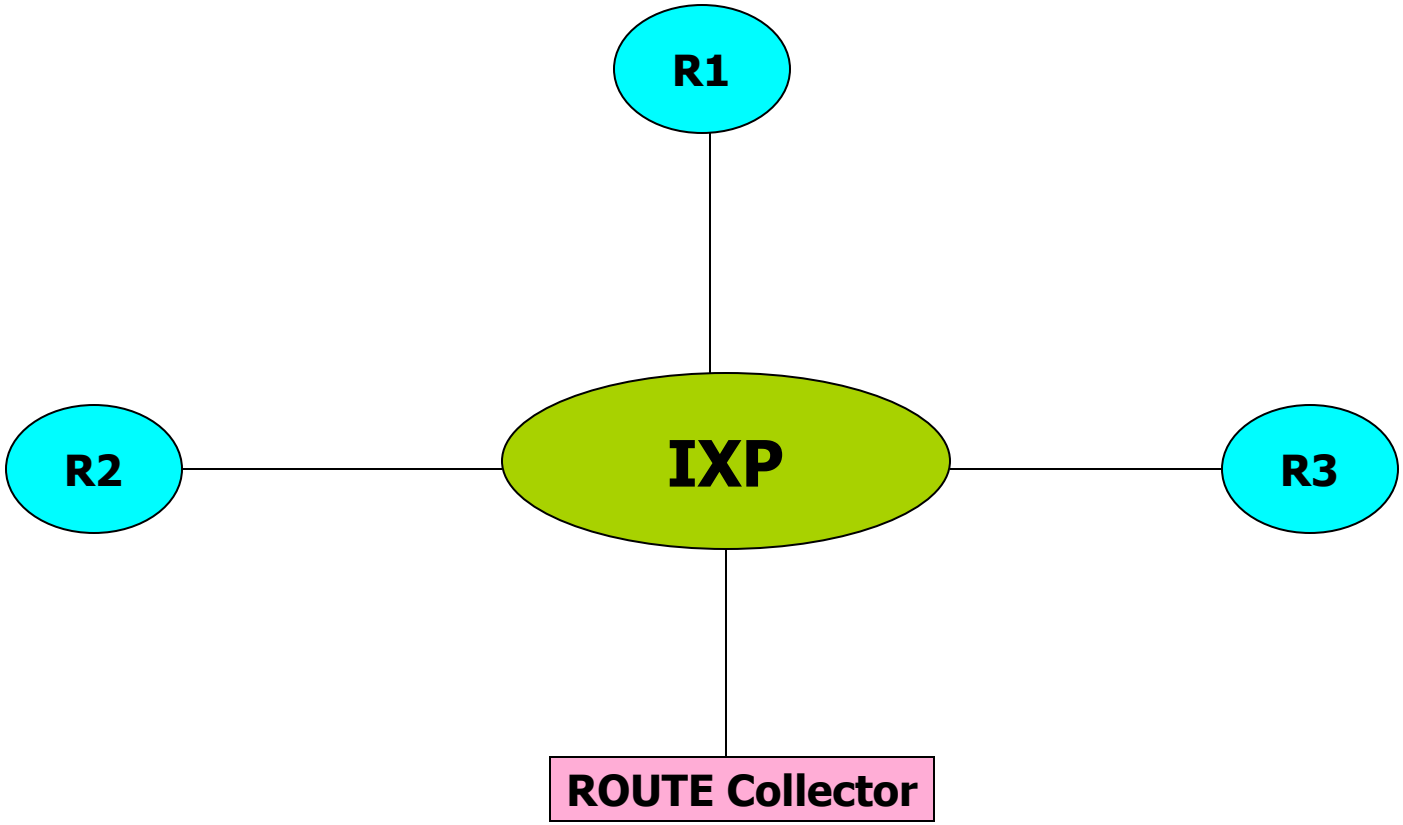
What is a Route Collector?

- Usually a router or Unix box running BGP
- Gathers routing information from service provider routers at an IXP
- Does not forward packets

Purpose of a Route Collector

- To provide a public view of the Routing Information available at the IXP
  - Useful existing members to check functionality of BGP filters
  - Useful for prospective members to check value of joining the IXP
  - Useful for the Internet Operations community for troubleshooting purposes
    - E.g. www.traceroute.org

Route Collector at an IXP



Route Collector Requirements

- Router or Unix system running BGP
- Peers eBGP with every IXP member
  - Accepts everything; Gives nothing
  - Uses a private ASN
  - Connects to IXP Transit LAN
- "Back end" connection
  - Second Ethernet globally routed
  - Connection to IXP Website for public access

Route Collector Implementation

- Most IXPs now implement some form of Route Collector
- Benefits already mentioned
- Great public relations tool
- Unsophisticated requirements
  - Just runs BGP

Introduction to Route Servers

Route Collector plus more

Route Server Background

- What is a Route Server?
- Features of a Route Server
- Advantages of using a Route Server
- Exchange Point Design with a Route Server

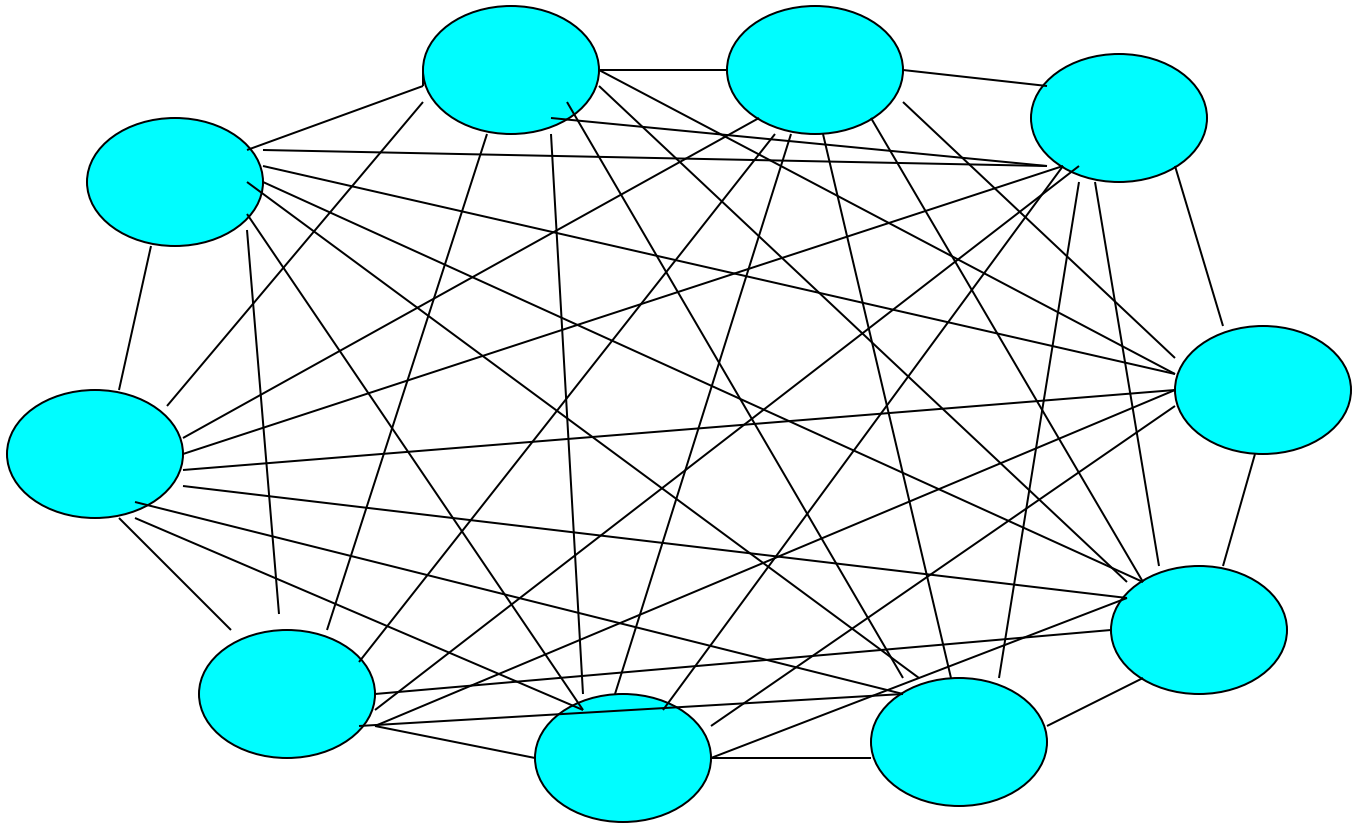
What is a Route Server?

- All the features of a Route Collector
- But also:
  - Announces routes to participating IXP members according to their routing policy definitions
- Implemented using the same specification as for a Route Collector

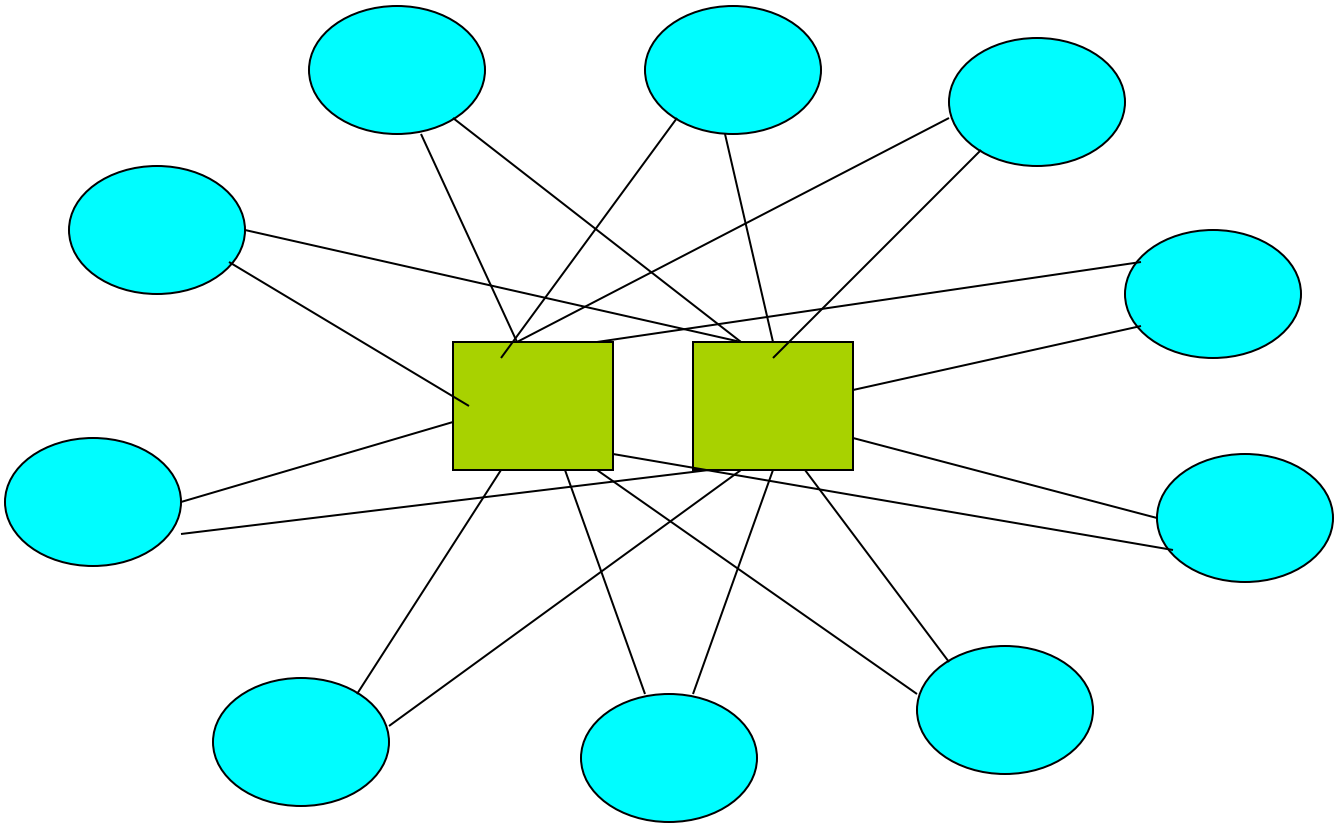
Features of a Route Server

- Helps scale routing
- Simplifies Routing Processes on ISP Routers
- Insertion of RS Autonomous System Number in the Routing Path
- Uses Policy registered in IRR (optional)

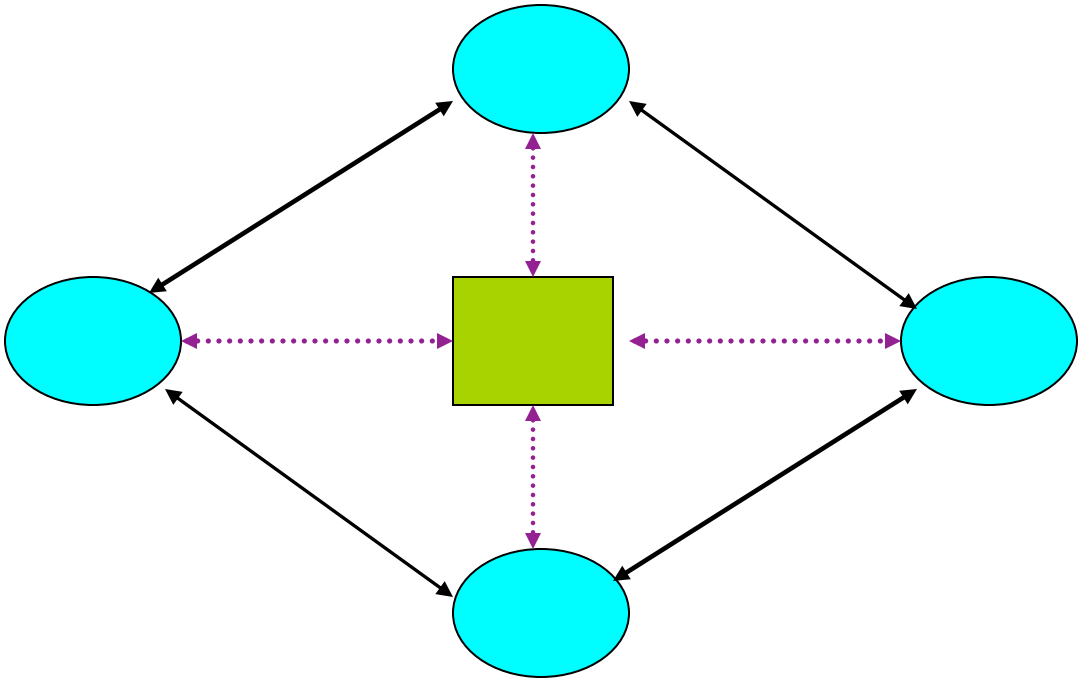
Diagram of N-squared Mesh



With the Route Servers



RS based Exchange Point Routing Flow



TRAFFIC FLOW

ROUTING INFORMATION FLOW

Advantages of Using a Route Server

- Helps scale Routing
- Separation of Routing and Forwarding
- Simplify Routing Configuration Management on ISPs routers
- Can help prevent the spread of bogus routing information!

Disadvantages of Using a Route Server

- ISPs can lose direct policy control
  - Peer with all ISPs, want to or not
- Completely dependent on 3rd party for configuration and troubleshooting
- Insertion of RS Autonomous System Number in the Routing Path
  - If router is used
- IXPs tend to offer Route Servers as an optional extra

Peering with the Route Servers

- Any ISP attached to an IXP can peer with the Route Servers
- ISP must register their policy in the Internet Routing Registry
  - Most IXPs who provide the RS facility also provide a local IRR for policy registration
- Must use BGP

Things to think about...

- Would using a route server benefit you?
  - Can be helpful when BGP knowledge is limited
  - Avoids having to maintain a large number of eBGP peers
  - But can you afford to lose policy control?

  - Maybe bilateral peering with some peers
  - And Route Server for remaining peers
  - ?

Introduction to the IRR

The Internet Routing Registry

What is the Routing Registry

- Contact names, email addresses and telephone numbers for an AS
- Routing policy for an AS (what other ASes does it connect to, which routes do they exchange)
- Information about routes (most important is which AS originates the route)
- Several other types of information

What is the Routing Registry?

- Distributed database collectively known as Internet Routing Registry (IRR)
  - APNIC, RIPE, ARIN, RADB, etc
  - http://www.irr.net/docs/list.html
- Providers register routing policy
- Used for planning, debugging and generating backbone router configs

What is the Routing Registry?

- Can be used by anyone worldwide
  - debugging
  - configuring
  - engineering routing
  - addressing

What happens if I don't use the IRR

- Routing Horror Stories
  - AS7007
  - announcing bogus routes
- Inconsistent policy at network borders
  - Peers and upstreams need physical notification of policy changes
  - Mistakes easily made

So, I need to use the database because…..

- Filters generated off the IRR protect against inaccurate routing information
- Makes troubleshooting and debugging easier
- Keep track of policy
- Security
- Filter! Filter! Filter!!

Why Bother using the IRR?

- View of global routing policy in a single cooperatively maintained database
- To improve integrity of Internet's routing
- Generate router configs
  - protect against inaccurate routing info distribution
  - verification of Internet routing

- Several providers require that you register your policy (or they won't peer with you)

Describing Policy

- Use the policy languages to describe your relationship with other Peers
  - routes importing
  - routes exporting
  - specific policies
    - interfaces, MEDs, communities
- register routes
  - with origin AS

Querying the Database

- whois -h whois.ripe.net AS702
- whois -h whois.ripe.net AS1849-MAINT
- whois -h whois.ripe.net 158.43.0.0

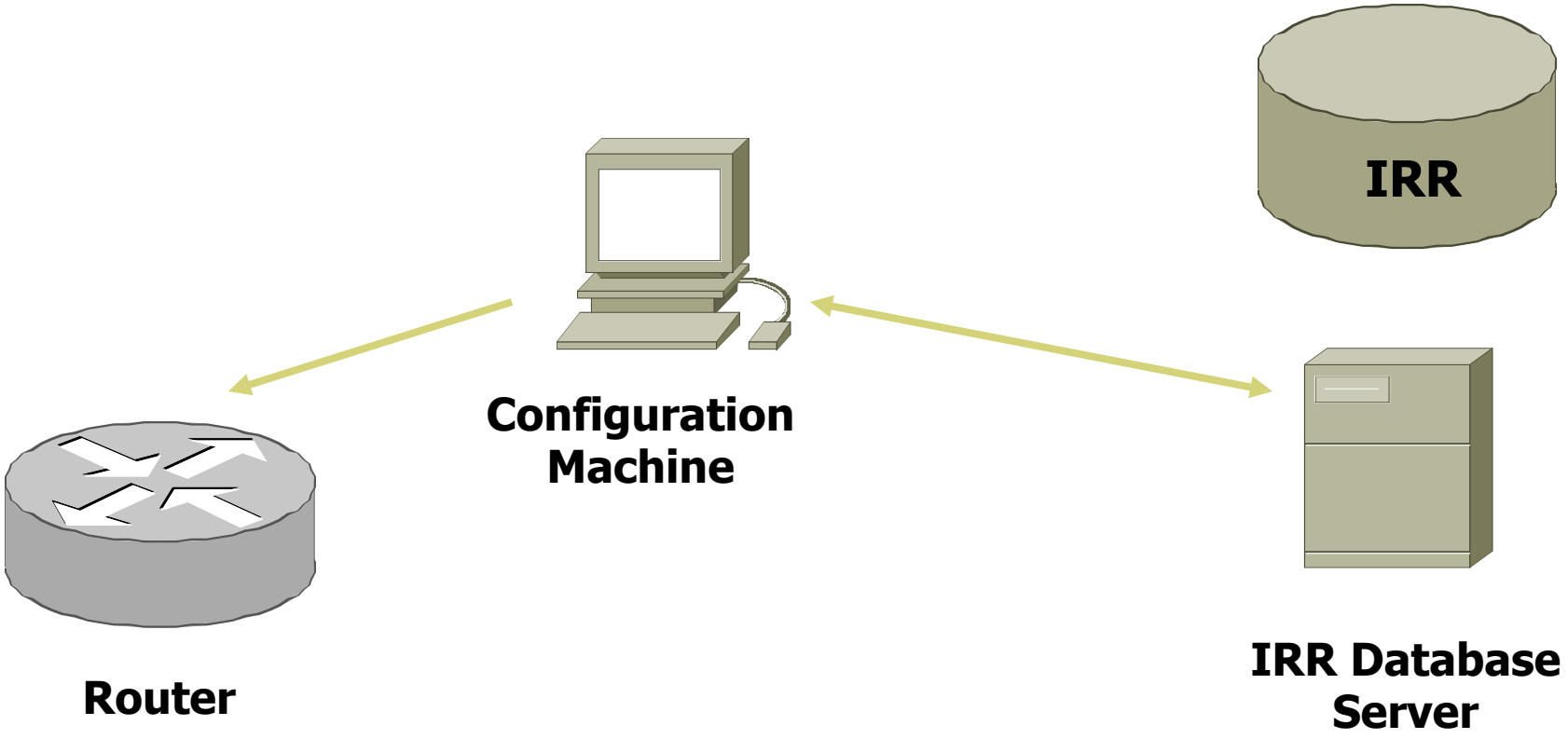
How to Register your IRR policy

- Register one or more maintainers
- Register AS and policy information
- Register Routes
- Describes your import and export policy
  - At the very least, provides contact information

Router Configuration

- Currently configs by hand
  - Slow and inaccurate
- Configuring routers using the IRR
  - Tools are available!!!
  - IRRToolSet maintained by ISC
    - route and Aspath filters.
    - Import and export
- Filtering is a good thing...

Router Configuration



How do I use the IRR to generate configurations

- Tools available to generate config files for most BGP implementations

- IRRToolSet
  - http://www.isc.org/sw/IRRToolSet/
  - Started off as RAToolSet as a project of ISI
  - Moved to RIPE NCC custodianship and became IRRToolSet
    - Enhanced to support RPSL (RFC2622)
  - Now maintained by ISC

How do I participate?

- Set up your own registry
  - Private for your ISP?
  - Community for the region?
  - Download the software (from ISC)
- Use one of the many public IRR systems

Things to think about...

- How would you register your policy?
  - Try to describe it in an aut-num object
- How would registering your policy benefit you? The community?