

# Scaling IXPs



Scalable Infrastructure  
Workshop  
AfNOG 2009

# Objectives

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

# IXP Scaling Techniques

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- Route Collector
- Route Server
- Internet Routing Registry

# Introduction to Route Collectors



# Route Collector Background

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- 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?

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

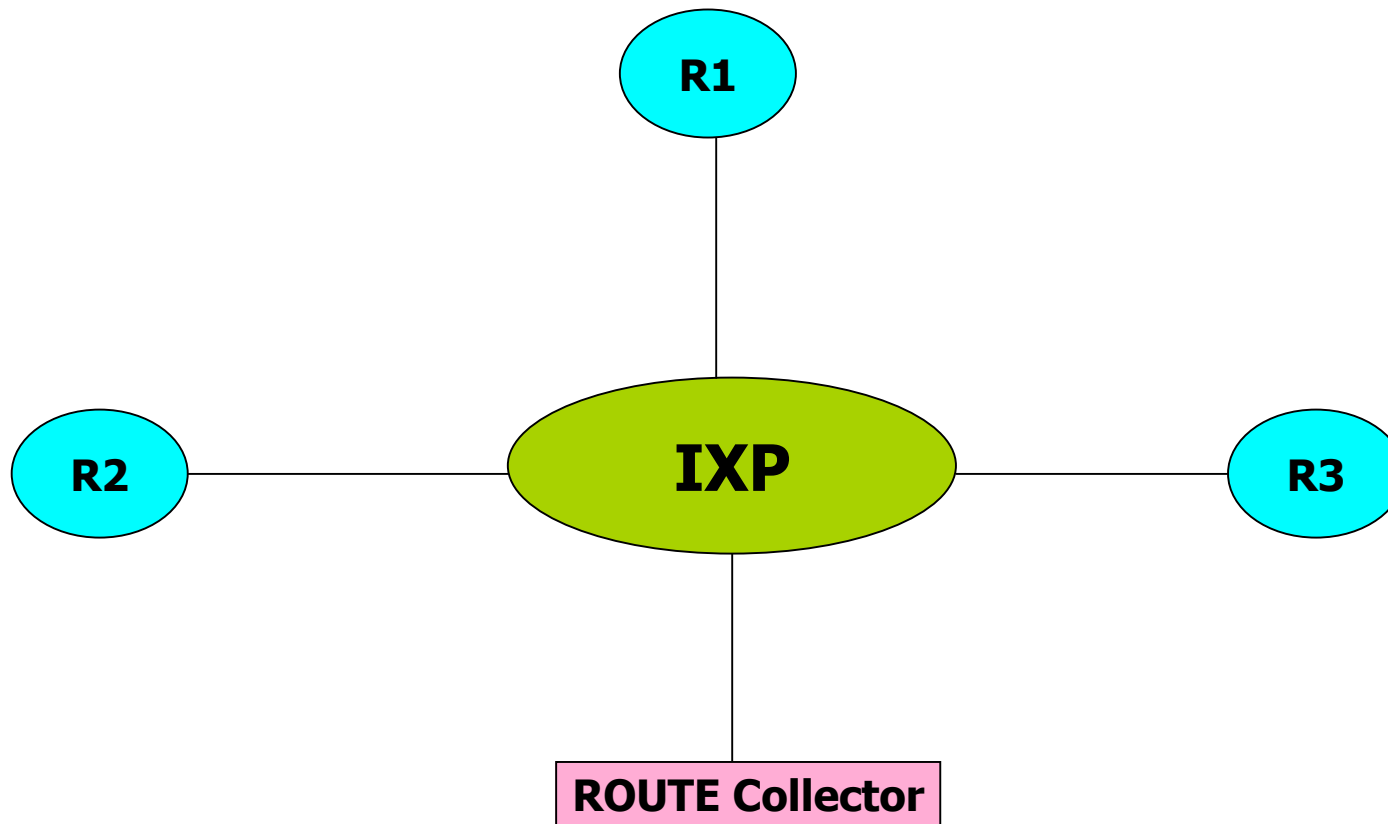
# Purpose of a Route Collector

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- 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](http://www.traceroute.org)

# Route Collector at an IXP

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# Route Collector Requirements

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- 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

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- 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

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- 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?

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- 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

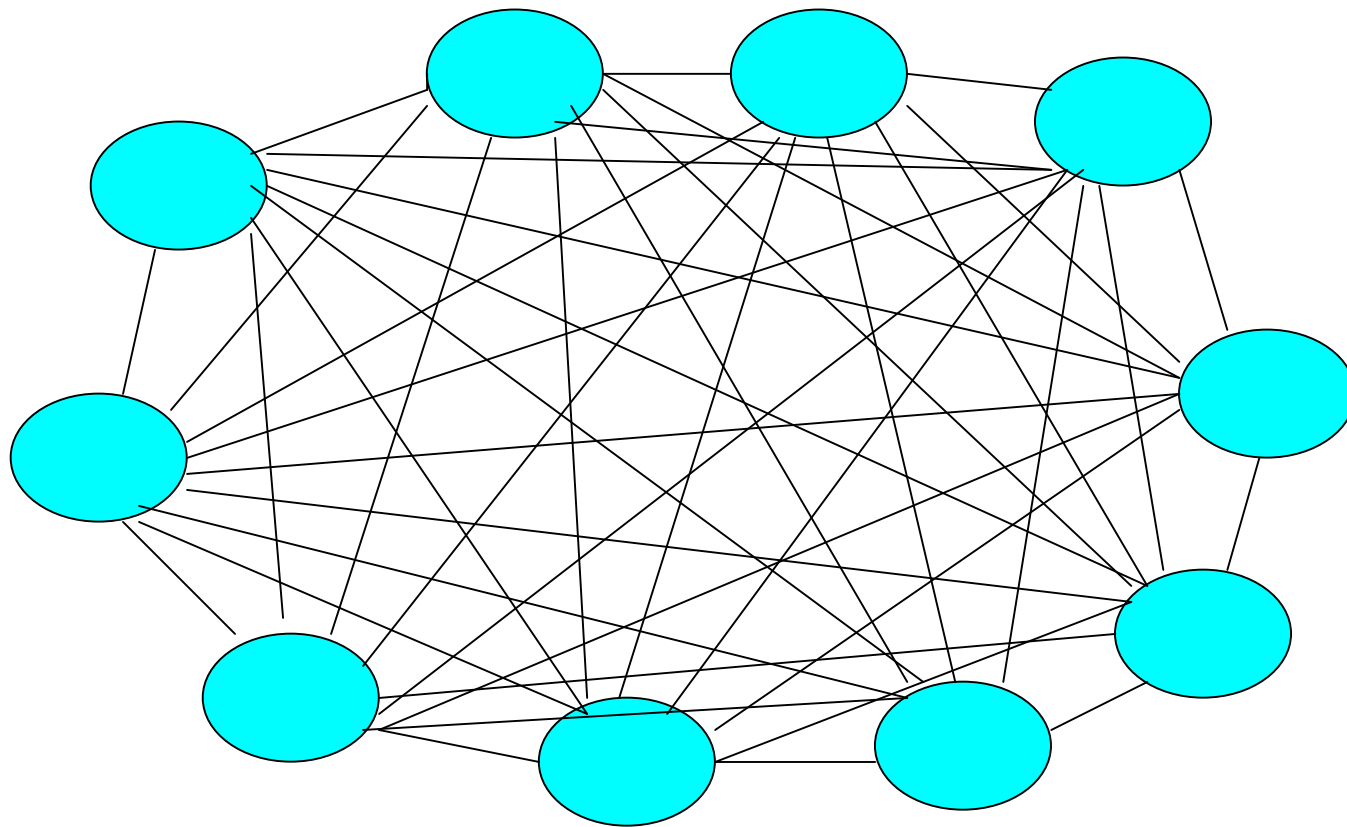
# Features of a Route Server

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- ❑ 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)

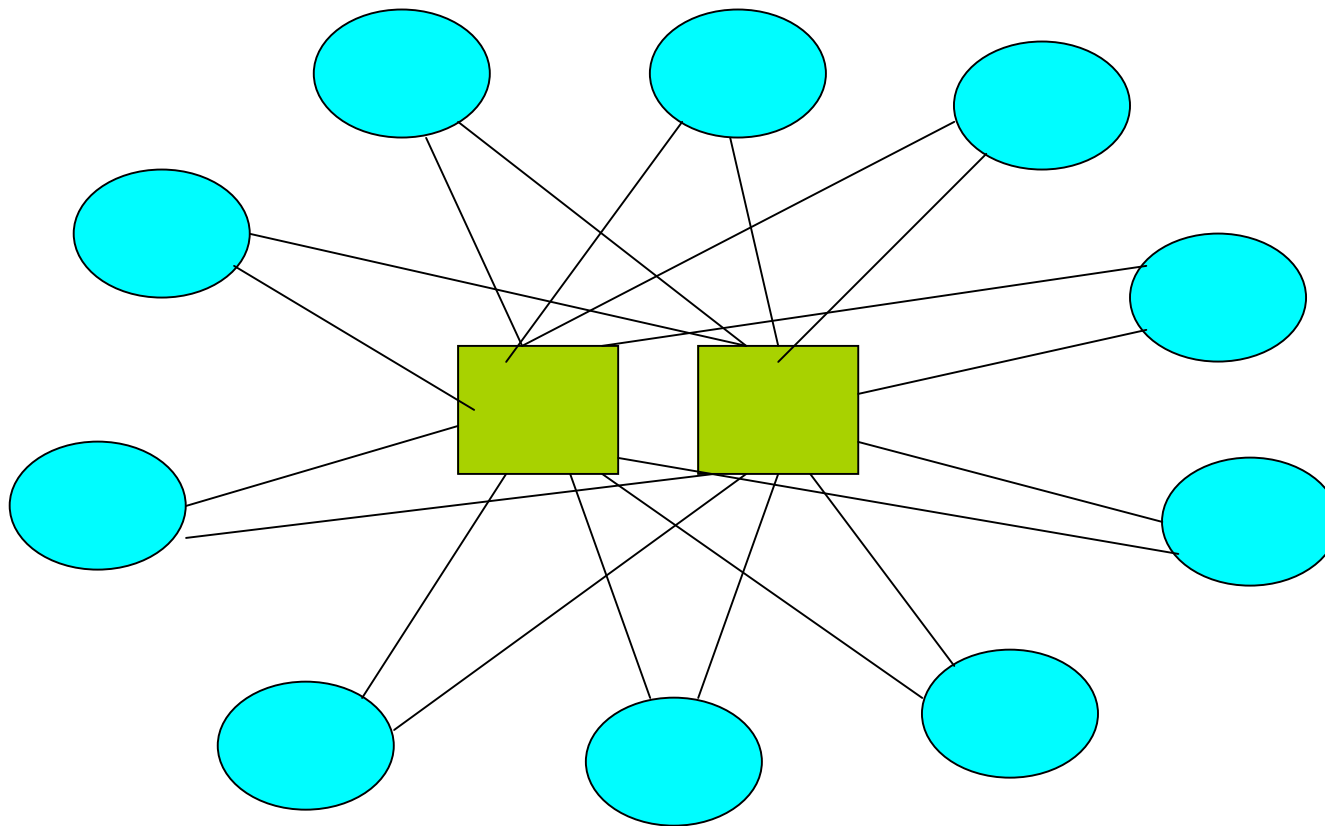
# Diagram of N-squared Mesh

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# With the Route Servers

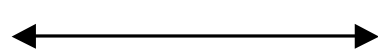
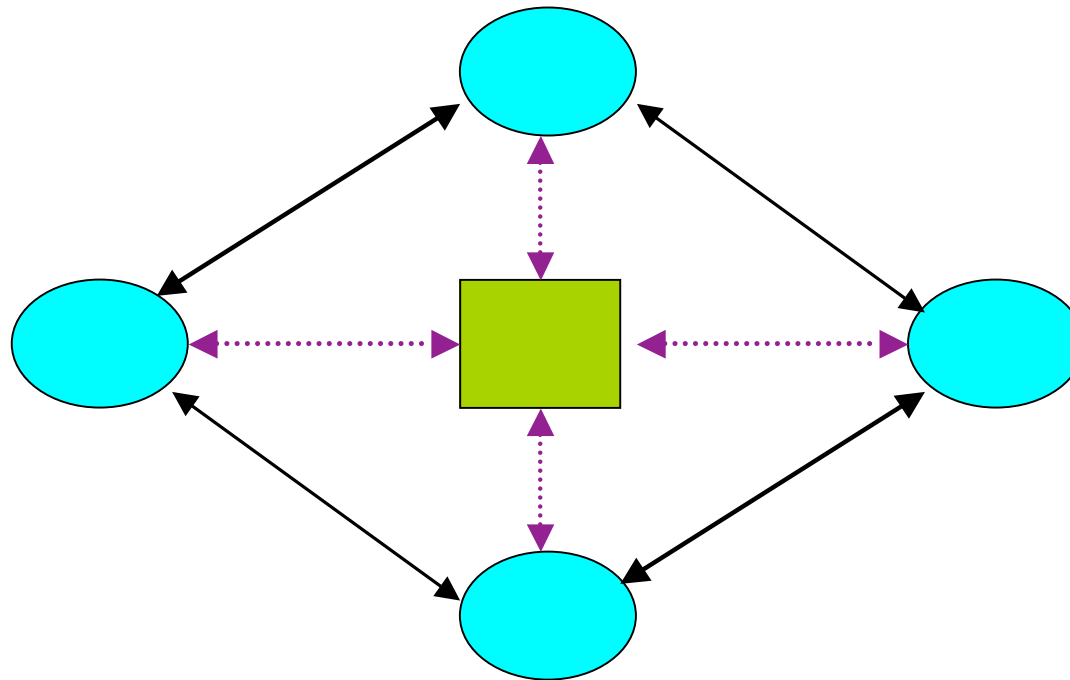
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# RS based Exchange Point Routing Flow

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**TRAFFIC FLOW**



**ROUTING INFORMATION FLOW**

# Advantages of Using a Route Server

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- ❑ 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

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- ❑ ISPs can lose direct policy control
  - Peer with all ISPs, want to or not
- ❑ Completely dependent on 3<sup>rd</sup> 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

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- 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...

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- 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

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- ❑ 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?

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- 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?

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

# What happens if I don't use the IRR

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- 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.....

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- ❑ 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?

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- 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

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- 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

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- ❑ `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

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- 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

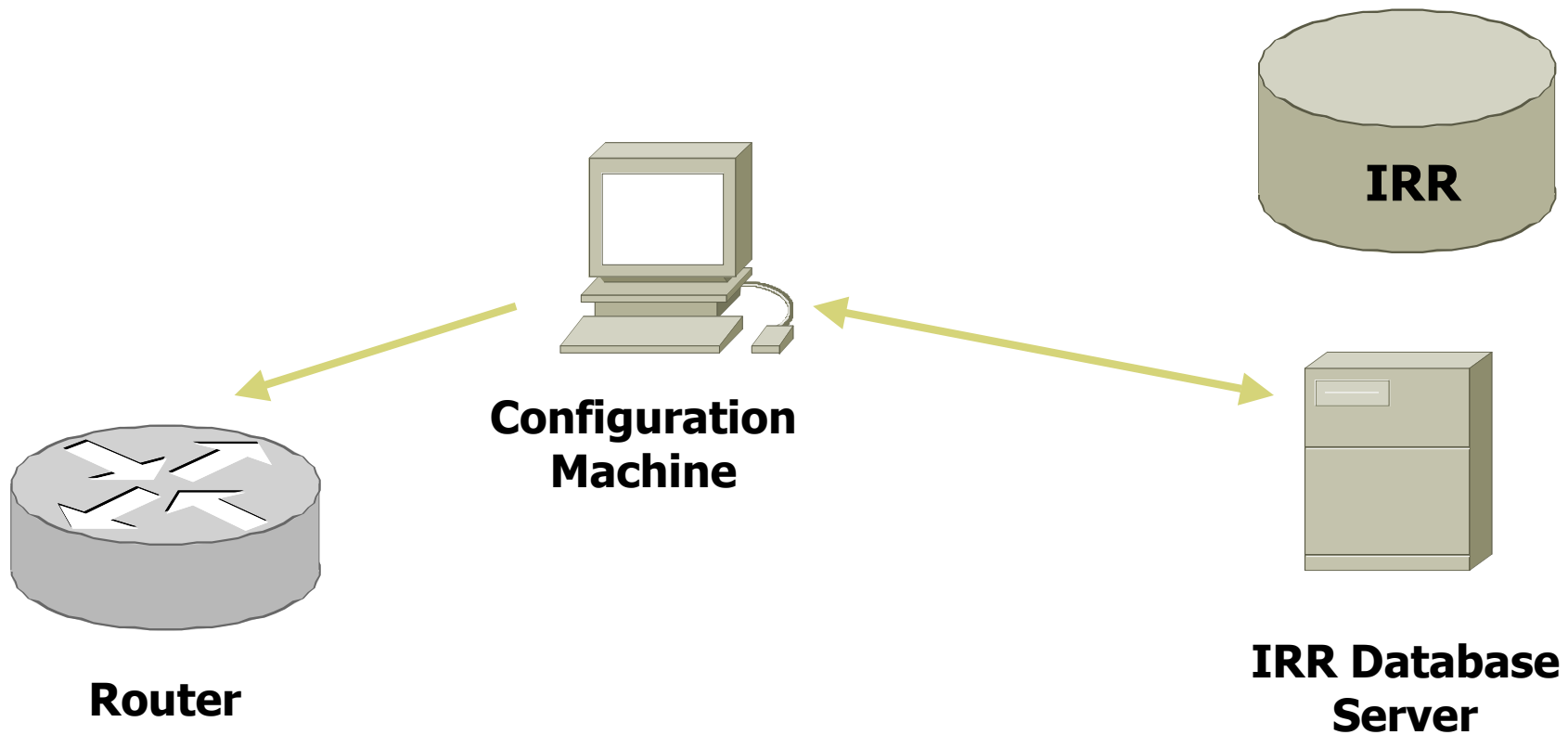
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- Currently configs by hand
  - Slow and inaccurate
- Configuring routers using the IRR
  - Tools are available!!!
  - IRRToolSet maintained by ISC
    - route and Aspath filters.
    - Import and export
- Filtering is a good thing...



# Router Configuration

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# How do I use the IRR to generate configurations

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- ❑ 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?

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- 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
  - Ask AfriNIC to set one up?

# Things to think about...

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