ISP Route Filtering: Responsibilities & Technical Challenges

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Panel Objectives

- Discussion:
  - what's changed related to inter-domain route filtering over the past 15 years
  - how we can improve inter-domain prefix filtering
  - what operators should be doing, what responsibilities do you have today
- Focus is on validating prefix announcements, NOT transport connection protection

15+ Years, What's Changed?

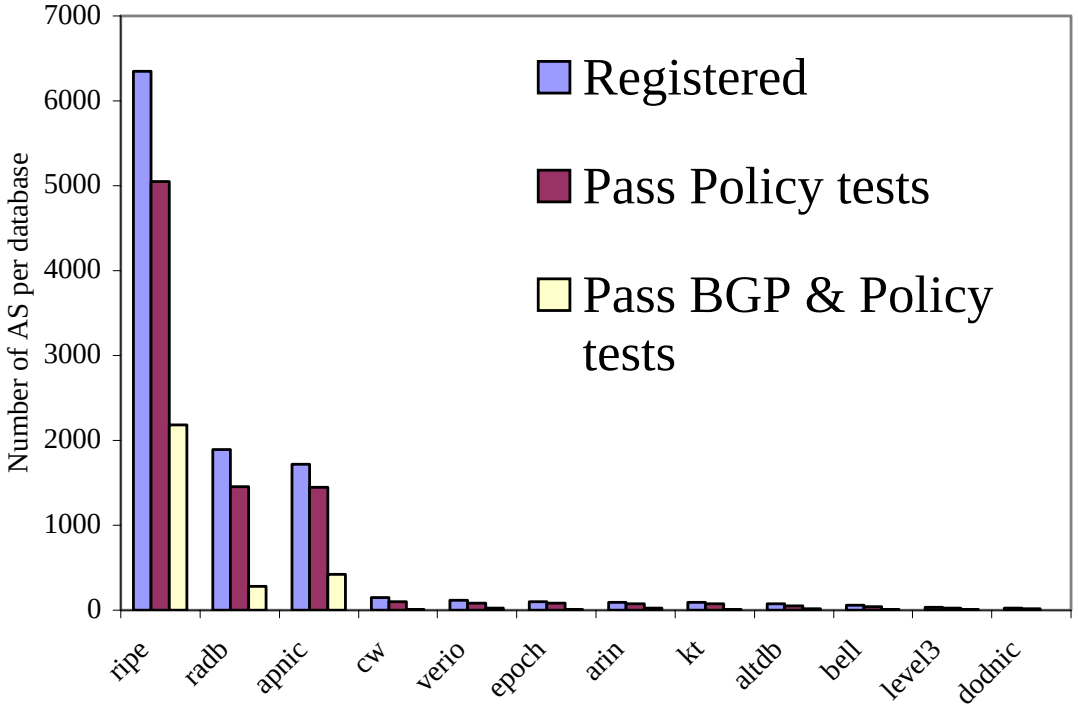
- More stale IRR data
- Less (%) employment of inter-provider filtering
- Still no verifiable source for who owns what, who's authorized to originated what
- An order of magnitude more *meat computers* with BGP router enable access
- Much greater reliance on Internet availability

- Summary: Security of routing system has deteriorated, not improved

The IRRs

- IRRs decentralized - ~55 IRRs currently
  - Operated by RIRs, operators, other, none authoritative
- Perception: data is largely unusable, insecure, stale - Do people ever actually delete IRR objects?
- Customer issues - don’t understand or want to use IRRs, ISPs proxy
- Insecure IRR update models (++RIPE)
- Tools to configure based on IRR data, internal database - ISPs should have these functions fully automated
- Inter-IRR communications, which are trustworthy, how is this enumerated in deployed policy
- Timing issues, race conditions
- Full route policy enumeration
- Special case policies (e.g., more-specifics with blackhole communities)
- Use of IRRs cost money$$

IRR & Routing System

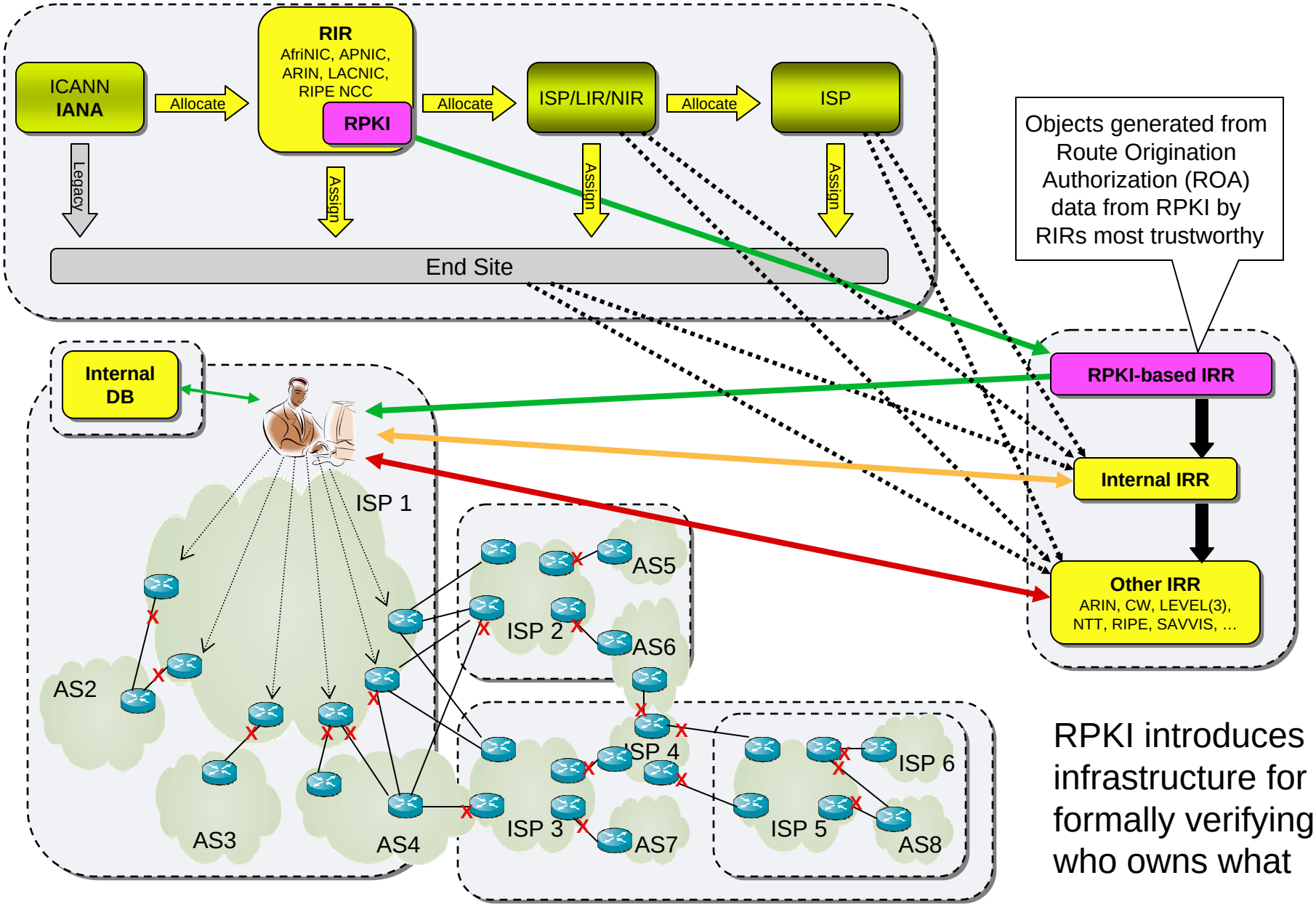


- What's delta from RIR -> IRR -> routing system?
- NEMECIS:
  - "RIPE has best IRR data set"
  - "Data in IRR is useful"
- No 'RIR x Origin AS' association data today

Data Above From NEMECIS:

- www.cs.ucr.edu/~michalis
- www.cs.ucr.edu/~siganos

IP Address Allocation, Assignment, and IRR Conceptual Model



RPKI introduces infrastructure for formally verifying who owns what

Constructing Validated IRR Objects from RPKI

- IRR data generated from RPKI provides trustworthy source, RIRs operate IRRs
- What other IRR objects need more security wrapped around them (e.g., as-set and aut-num)
- Secure IRR update mechanisms
- Do other components in the model need secured?

Routing Protocol Issues

- Timing issues associated with route announcements and new policy application, newer techniques ease old constraints
  - Soft reconfiguration
  - Adj-RIB-In storage & implementation
  - BGP Route Refresh
- Eases much of this burden - no need to bounce route at source, or reset BGP sessions

Router Issues

- Ability to handle per-peer explicit prefix lists (500k or more) - where do things break?
- Policy specification language, e.g.,:
  - Transit explicit /24 prefix
  - Accept /24-32 with community *n*
  - How to express?
- What's processing hit, process prioritization during configuration loads?
- Can policy also be used for datapath (e.g., BCP 38) or must another be defined?
- New policy application (e.g., immediate application versus periodic, etc..) - e.g., Cisco versus Juniper configuration model?
- Where's bottleneck?
- RICHARD: SLIDE FROM SCHOLL?

Other Related Functions

- General filtering stuff today
- Max prefix - what about full possibilities enumeration?
- Prefix length-based filtering (/24 longest generally)
- AS_PATH based
- Customer communities based stuff (e.g., blackholing) - separate session?
- Prevent /8 hijacking? announce two /9s!

Panel/Community Questions

Achieving Incremental Deployment

- With:
  - A tool like NEMECIS that diffs RPKI IRR and internal/third-party IRR data v. routing system state
  - RPKI as formally verifiable source to construct IRR data
  - Tools to manage internal database for router configuration
  - cont…

Achieving Incremental Deployment (cont.)

- What else is gating deployment:
  - Bi-lateral deployment inter-domain prefix-based filtering policies - incremental benefit
  - At least ORDERED preference model where RPKI IRR routes preferred over non-RPKI, then subsequent diminishing preference based on source
  - Would really like to account for no acceptance of more-specifics for RPKI routes, but this might become problematic until full IRR model is employed

Incentive Models

- Tragedy of the commons?
- There’s incremental benefit with each new peer that you filter - Agree or disagree?
- Do you consider this in peering agreements today, or only customer side?

- Every ISP MUST filter customer BGP route announcements, no excuses! Agree or disagree?

IRR Questions

- Is IRR at end of life and only incremental changes and move to direct RPKI model?
- Or build RPKI-seeded IRRs from RIRs and tools to expand their use
- “Is IRR system too complex for most users?
  - Expression language enables extremely complex configurations, perhaps at expense of being able to easily generate prefix lists
  - Software to parse it can barely be compiled, let alone run
  - Thereby slowing adoption rate among ISPs”
- Give up….

Miscellaneous Considerations

- Availability and security of RPKI infrastructure and IRRs
- Who are RPKI Trust Anchors and what impact does that have on technical, political considerations?
- Are we trading autonomy for security with RPKI model?
- Where are ALL the RIRs with implementation of RPKI data to construct validated IRR objects?

Other?