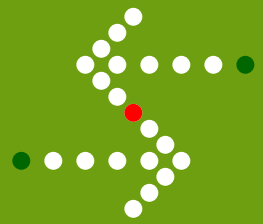

Improving reliability of IRR database

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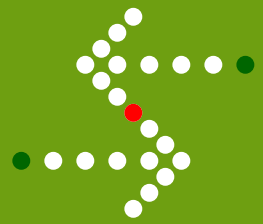
JPNIC IRR Planning Team

Research Activity of JPIRR

- Nagahashi
  - Prefix Validation using IRR Database
- Eto
  - Improvement of consistency among AS policies on IRR database
- Our goal is
  - Improving reliability of IRR database
  - ➢ More widespread use of IRR



Prefix Validation using IRR Database

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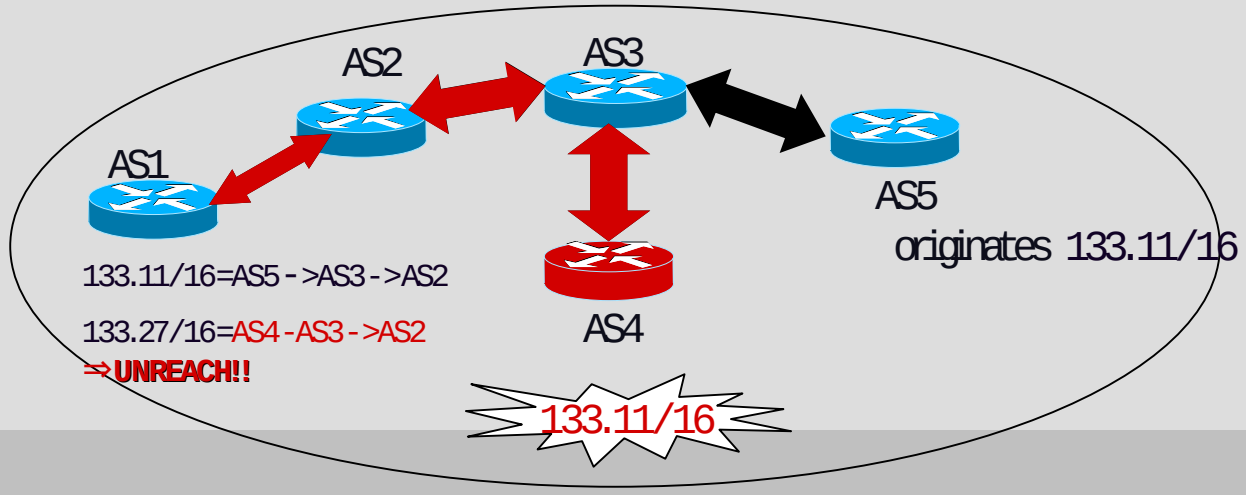
Background

- One of severe problems in Inter-domain routing;
  - Hijacking prefix (black hole)
- Why happen?
  - One AS propagates invalid origin prefix



Counter major Approach

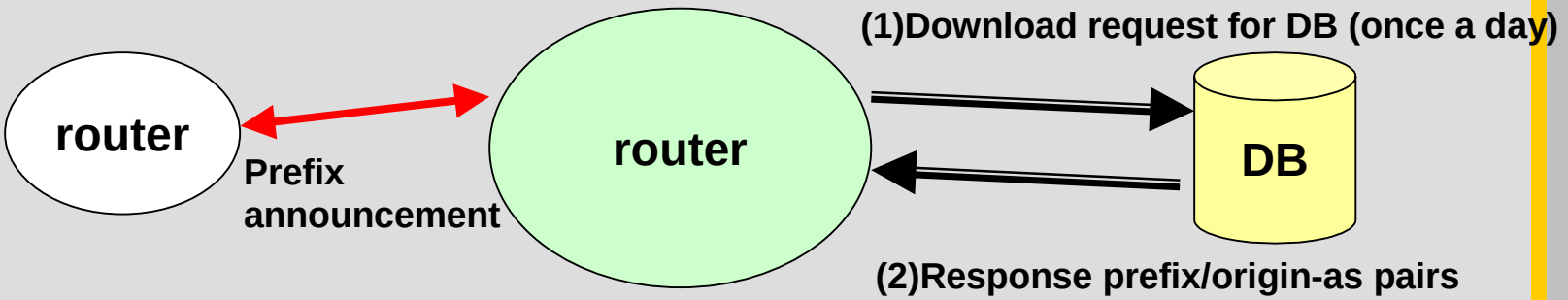
- Authenticate prefix in BGP update
  - BGP Routers exchange Certificate
  - Candidates: s-BGP, soBGP

- Problem
  1. Heavy protocol:
     - To verify certificate per one prefix
     - BGP holds over 120,000 prefixes…
  2. Take long time to deploy

Motivation

- To check a correct prefix by lightweight and simple
  - What to "check" ?
    - To identify invalid origin prefix
    - To use certificate is too heavy (same as sBGP, soBGP)
  - How to verify?
    - Using IRR Database

Approach



(3)Comparison with (1) and (2)

Example:
#show invalid route

Network	origin	origin in DB
199.31.20.0/24	2400	568

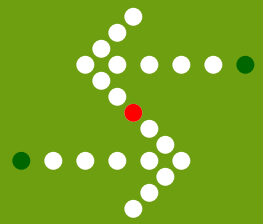
- Using IRR as Database

simple protocol

- Download
  - Router requests Download to DB
  - Frequency is once a day
- Response
  - DB responses to router
  - Response prefix/origin-as pairs which stores in DB

Problems to be solved

- Future Work
  - Router Overhead
    - To hold 120,000 prefix/origin-as pairs is overhead?
  - Utilization of IRR
    - All entries are registered in IRR database?
  - Duration of update
    - Is Once a day too long ?



Consistency Check among AS policies

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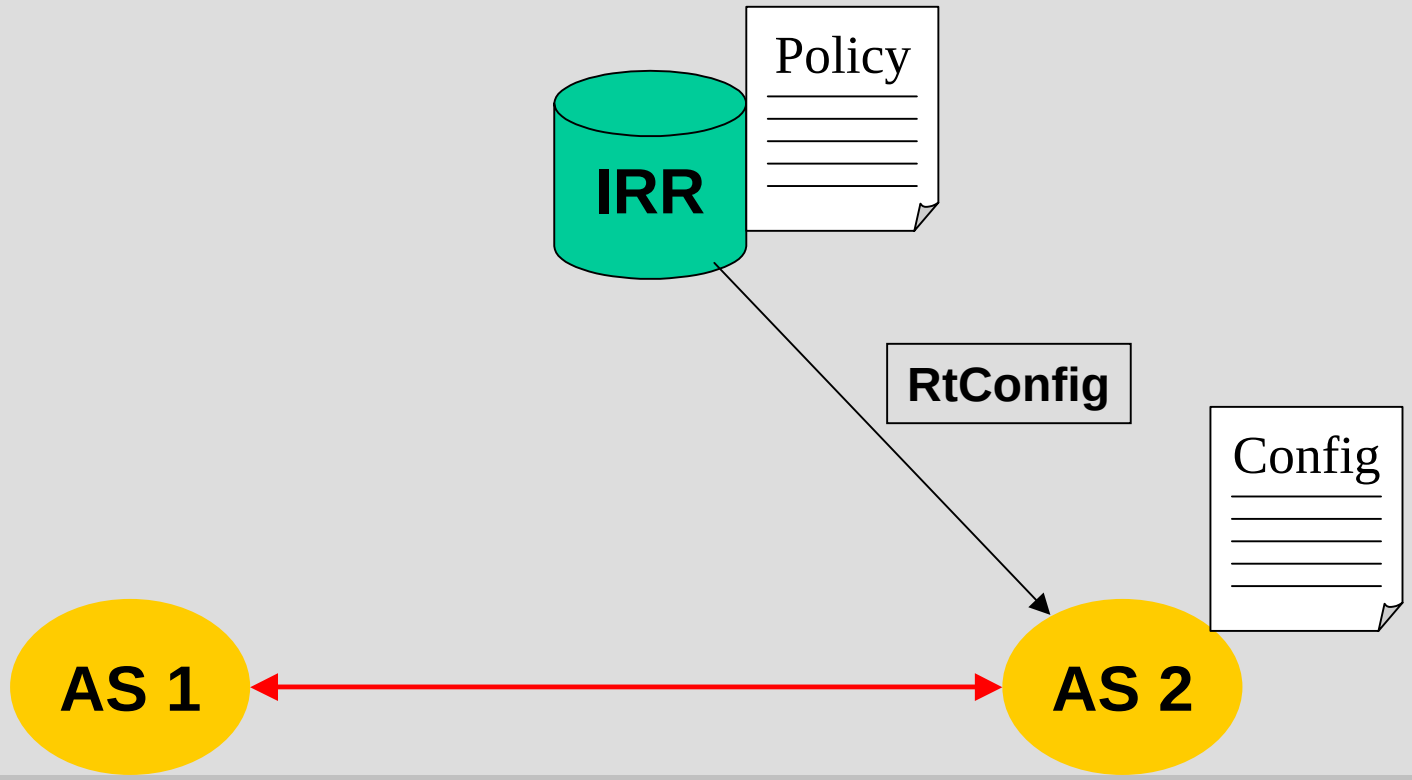
auto-configuration with IRR

- Generate router configuration from routing policy registered in IRR with “RtConfig”

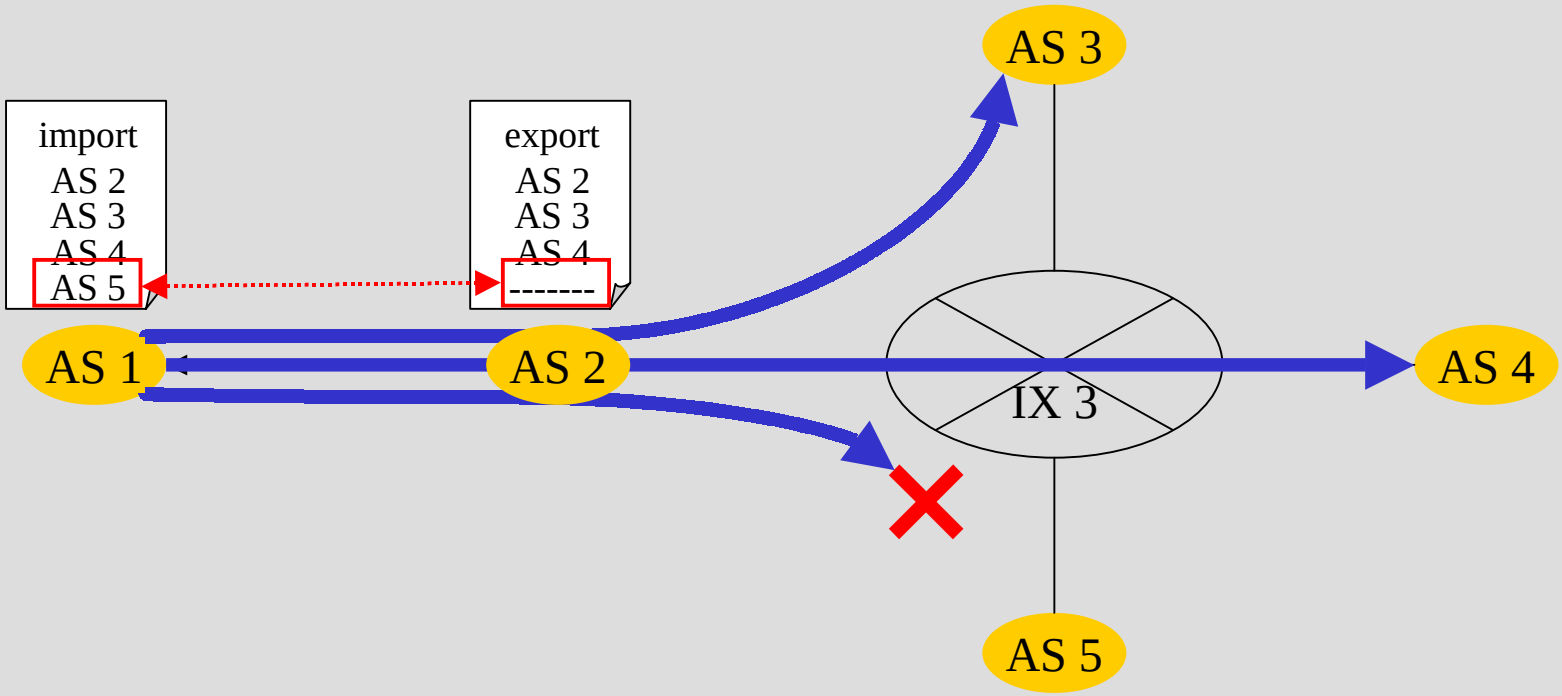


Consistency among AS policies

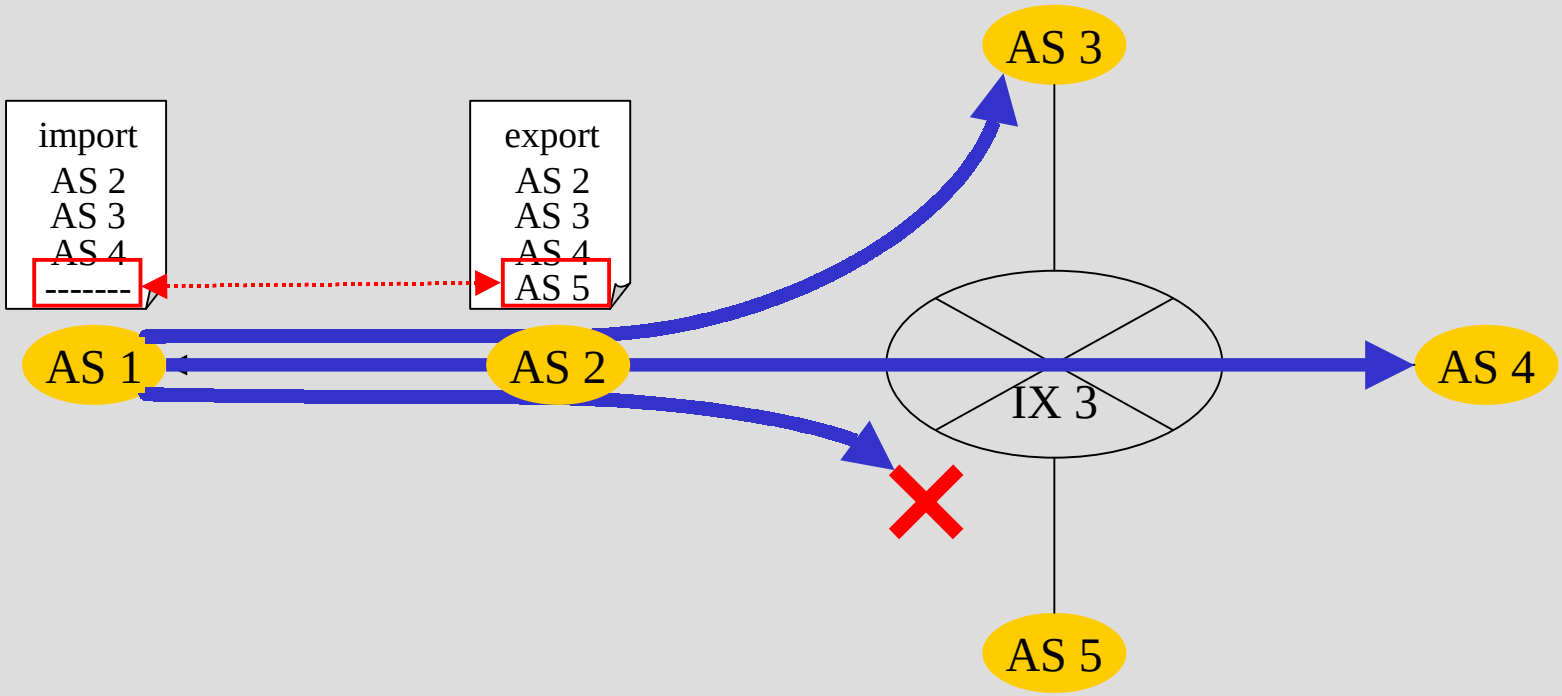
- Inconsistencies
  - Inconsistency of import in routing information
  - Inconsistency of export in routing information
- As a result
  - When we generate the router configurations from IRR database, the connectivity between peering ASes will be lost.
- IRR inspects only policy's syntax.

  → **Need to inspect policy's semantics**

Inconsistency of import



Inconsistency of export



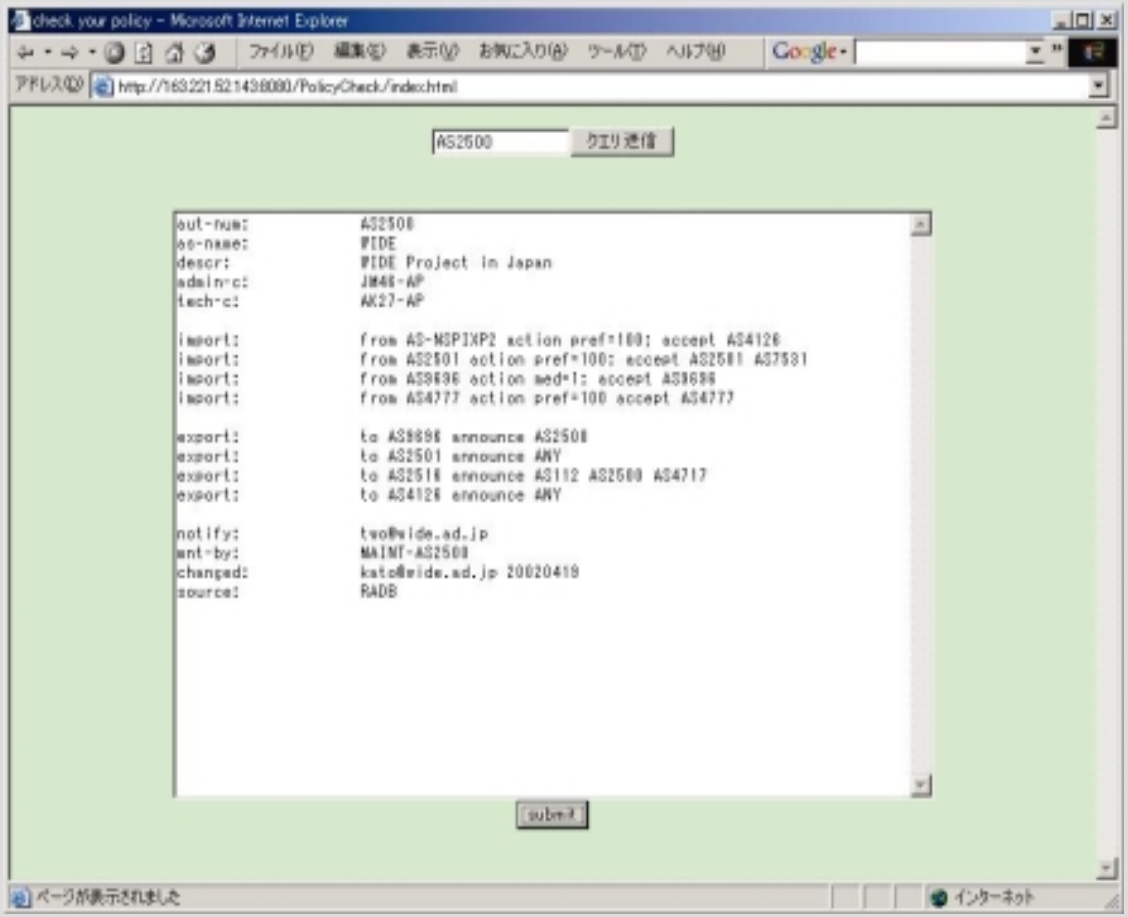
Classification of Inconsistencies

Inconsistencies of import	Peer AS-SET doesn't exist on IRR database
	Peer AS doesn't exist on IRR database
	Peer AS doesn't export any route to the AS
	Peer AS doesn't export route which the AS imports
Inconsistencies of export	Peer AS-SET doesn't exist on IRR database
	Peer AS doesn't exist on IRR database
	Peer AS doesn't import any route from the AS
	Peer AS doesn't import route which the AS exports

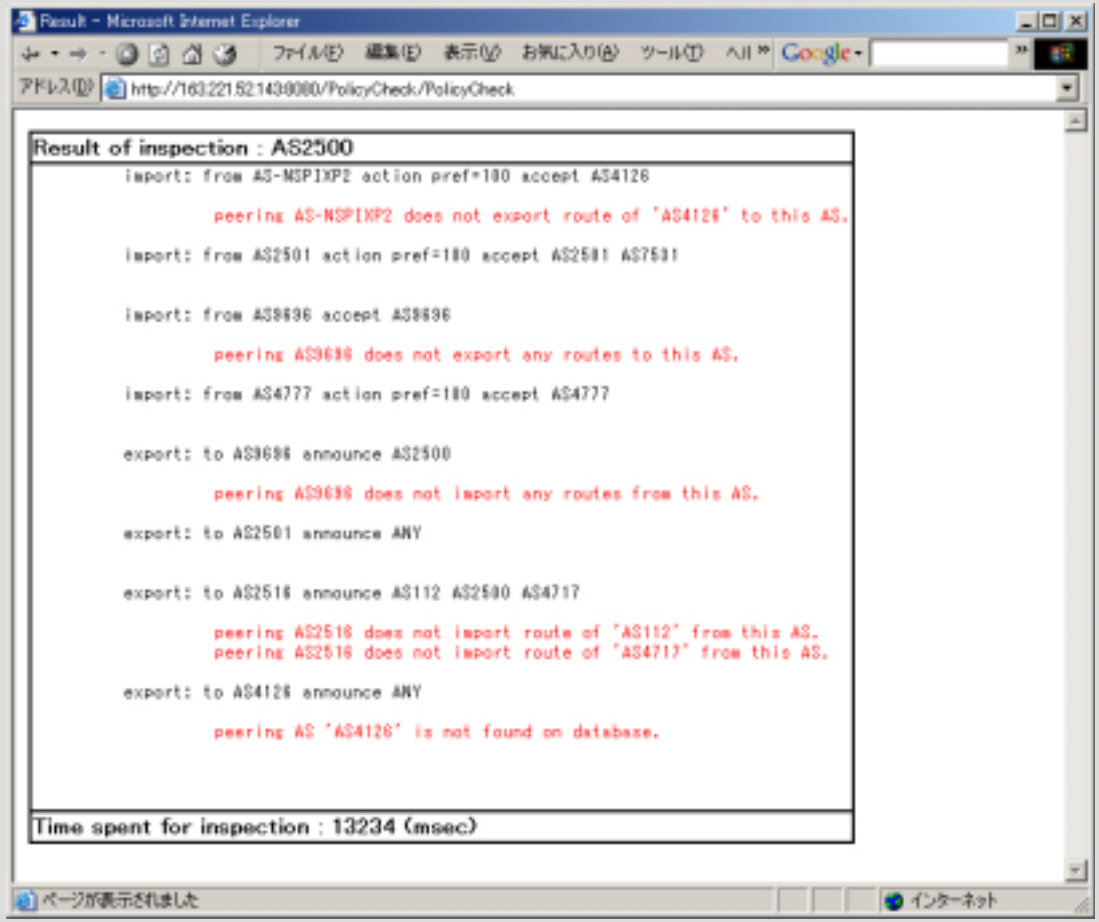
Policy Check Server

- Policy Checker
  - Inspects if the policy is consistent with peer ASes' policies
- Database Checker
  - Inspects how many inconsistencies exist on unified IRR database.

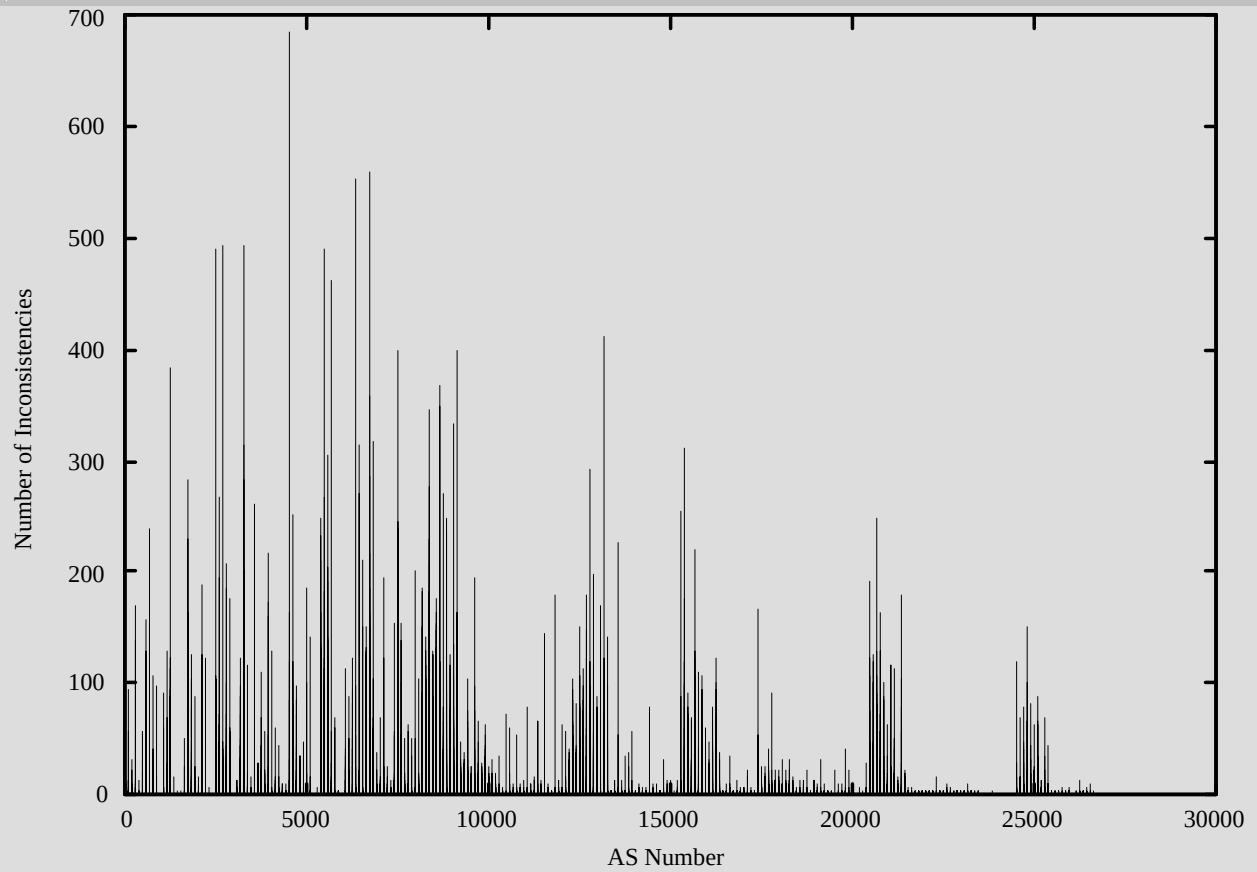
Example - query



Example - result



Analysis of Inspection Result



Registered Ases: 11696 -> 55.8% of AS has at least one inconsistency

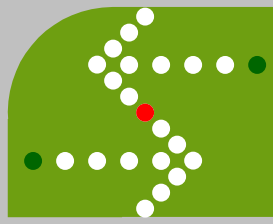
Detail of Inconsistencies

No	Classification	Number	Rate
1	Peer AS-SET doesn't exist on IRR database	482	0.2 %
2	Peer AS doesn't exist on IRR database	7,971	4.0 %
3	Peer AS doesn't export any routes to the AS	36,333	18.6 %
4	Peer AS doesn't import any routes from the AS	34,710	17.8 %
5	Peer AS doesn't export route which the AS imports	11,436	5.8 %
6	Peer AS doesn't import route which the AS exports	17,753	9.1 %
	Total	108,685	55.8 %

- Rate of each inconsistency in all 194,820 import and export sentences

Future Work

- Deploy Policy Checker on JPIRR.
- Implement a function to notify result of investigation to JPIRR users periodically.



Question ?