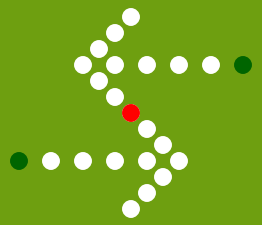


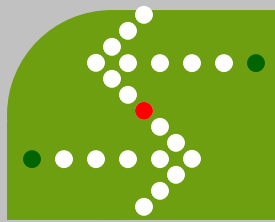
# Improvement of Consistency among AS Policies on IRR Database

Masasi Eto, Youki Kadobayashi, Suguru Yamaguchi

Graduate School of Information Science

Nara Institute of Science and Technology (NAIST)

Japan



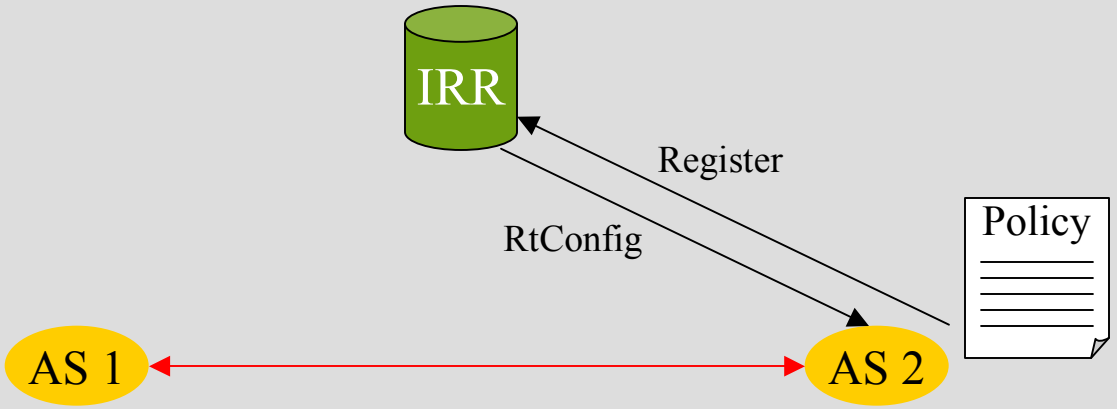
# BGP is crucial to reliability of the Internet

- Autonomous System (AS)
- Border Gateway Protocol (BGP)
- faults in BGP disrupt large regions of the Internet

  e.g.
  - AS7007 (April, 1997)
  - AS3561 (April, 2001)

# Internet Routing Registry (IRR)

- Global Internet resource database storing routing policy
  e.g. Route Object, Aut-num Object, Maintainer Object, etc..
- Routing policies are written in "Routing Policy Specification Language (RPSL)"
- generate router configuration with "RtConfig"

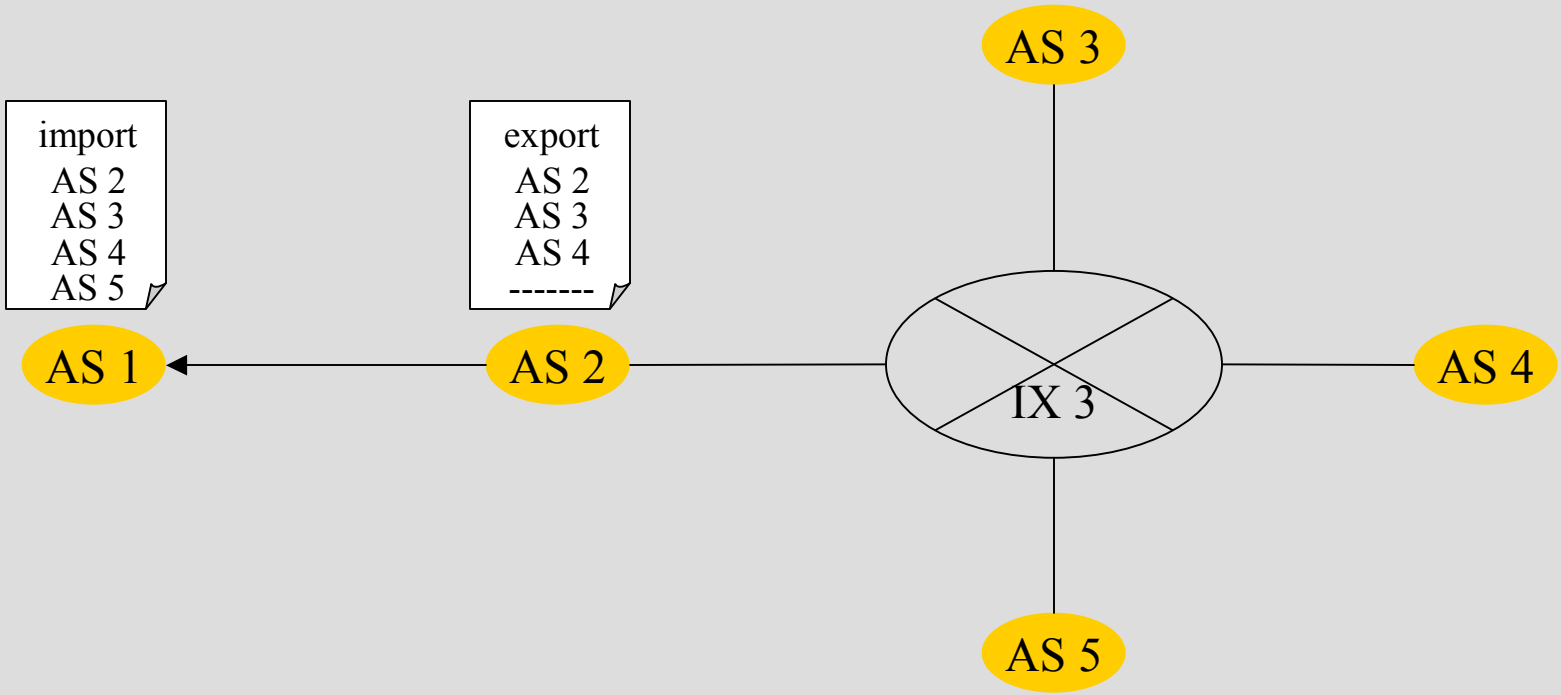


# Problem of IRR

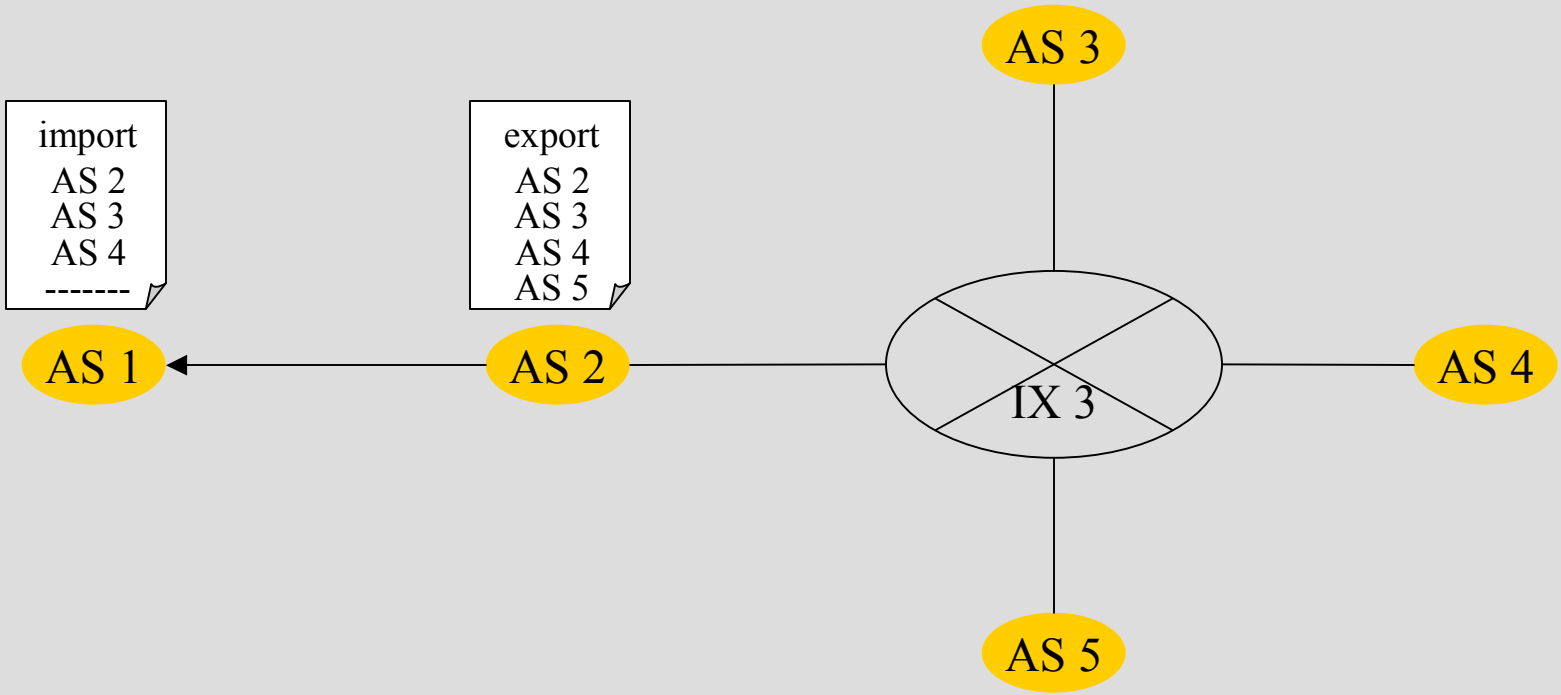
- Usage IRR isn't spreading due to lack of consistency.
- inconsistency we defined is
  - inconsistency between the peering contract and its RPSL description given to IRR (mistakes on interpretations)
- as a result
  - When we generate the router configurations from IRR database, the connectivity between peering ASes will be lost.

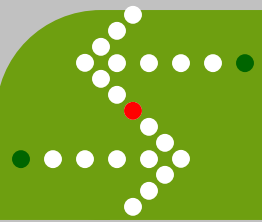
→ to find out the inconsistency systematically, we check
  - Inconsistency in routing information imported from other peers
  - Inconsistency in routing information exported to its own peers

# Inconsistency in routing information import



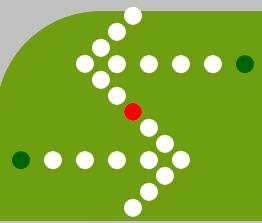
# Inconsistency in routing information export





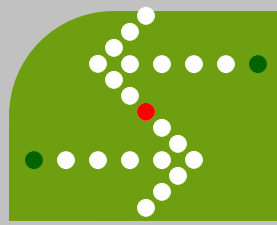
# Our Approach

- We have examined how many inconsistencies exist on whole IRR databases in the world.
- We propose a system to prevent increase of inconsistency.
  - Policy Check Server
- We evaluate this system.



# Policy Check Server

- DBGenerator
  - constructs a common database called “Unified IRR Database” which includes whole IRR databases in the world.
- Database Checker
  - inspects how many inconsistencies exist on Unified IRR database.
- Policy Checker
  - inspects whether the policy which the operator of AS is about to register is consistent with the policies of peering Ases.

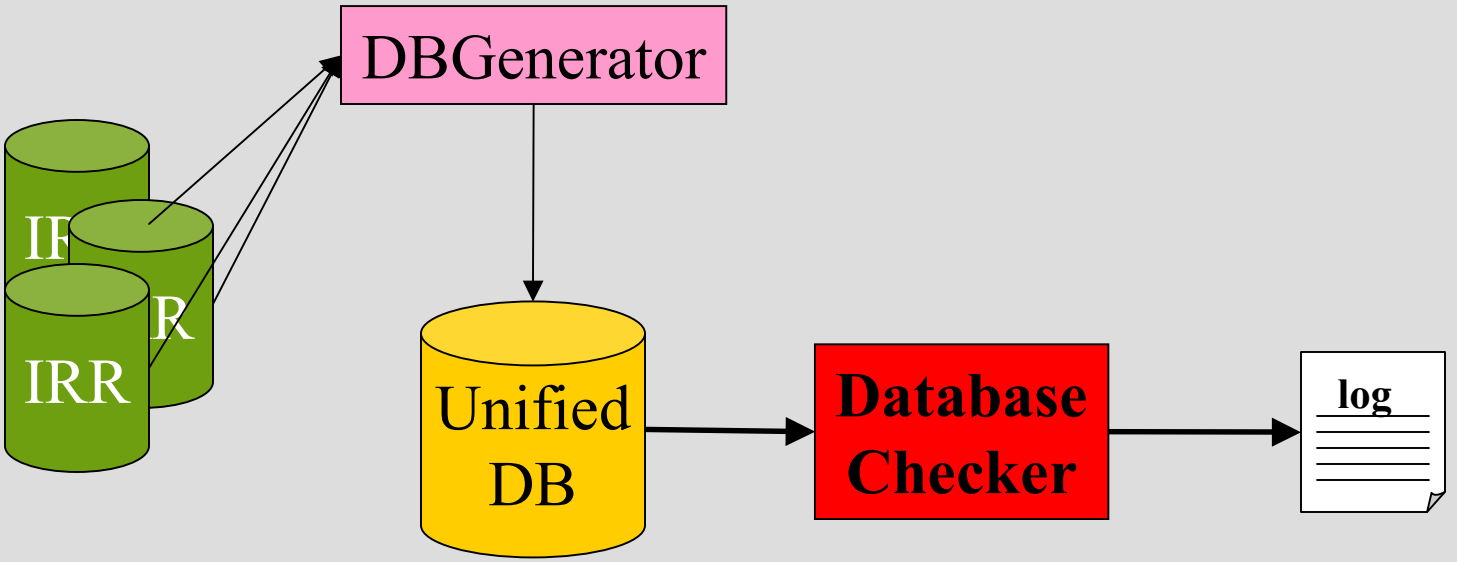


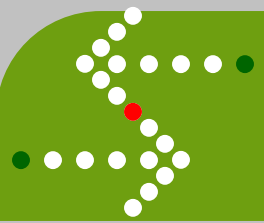
# Implementation – Environment

| | |
|---|---|
| OS | Vine Linux 2.5 |
| DBMS | PostgreSQL 7.2 |
| Programming Language | Java |
| IDE | J2SDK 1.4.1 |
| WWW Server | Apache 1.3.24 |
| Web Application Server | Tomcat 4.1.18 |

# Database Checker

- Database Checker investigates consistency of AS policies in the Unified IRR database.
- Then output the results as a log file.

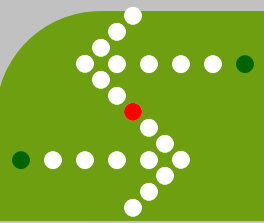




# Algorithm of inspection (1)

1. Specify peering AS

```
extract import, export sentences from input AS object ;
if (the peering AS (or AS-SET) exists on database) {
   create  Autnum object as a peering AS ;
} else {
   inconsistency ;
}
```



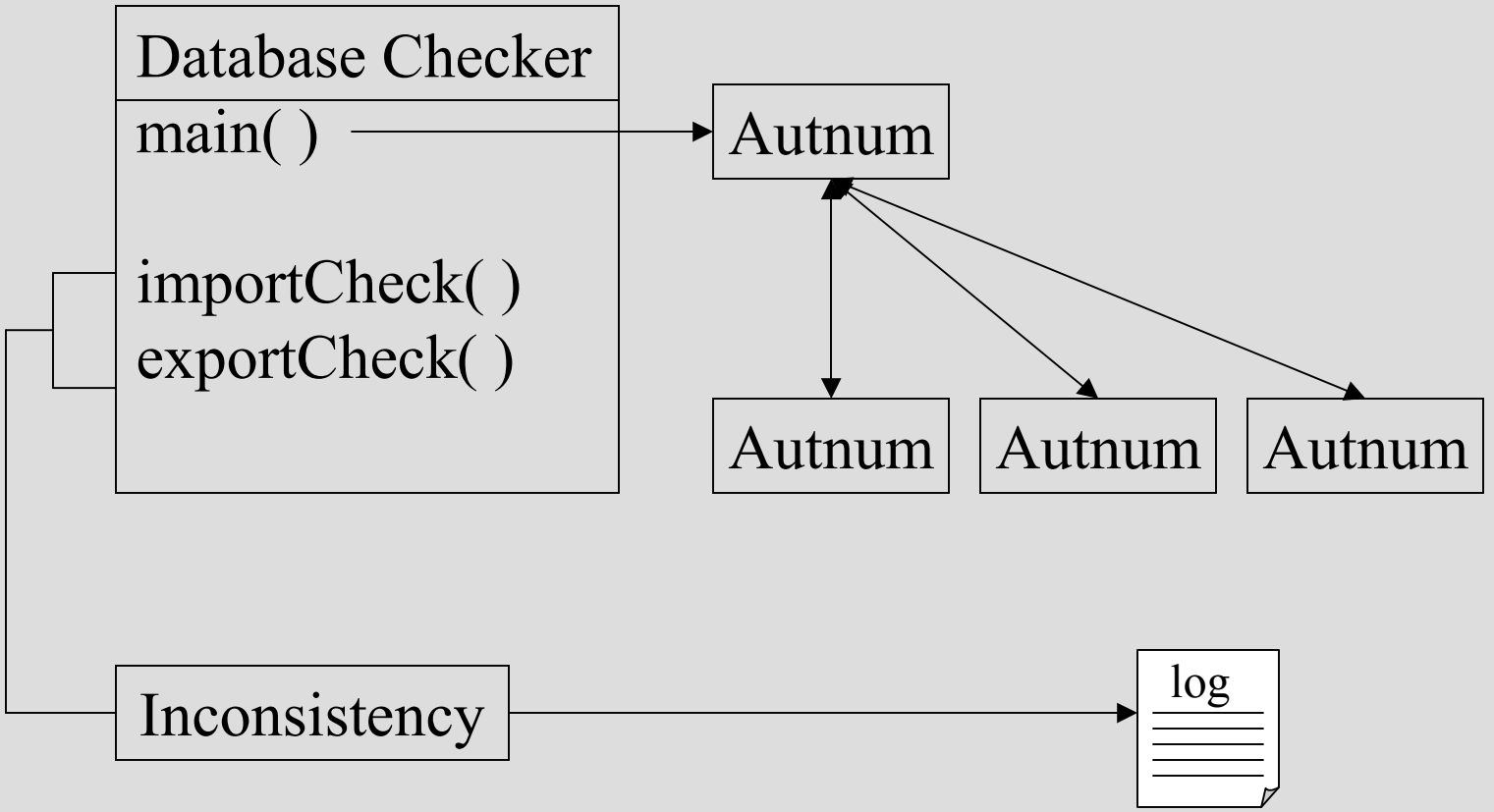
# Algorithm of inspection (2)

2. inspection of import sentence

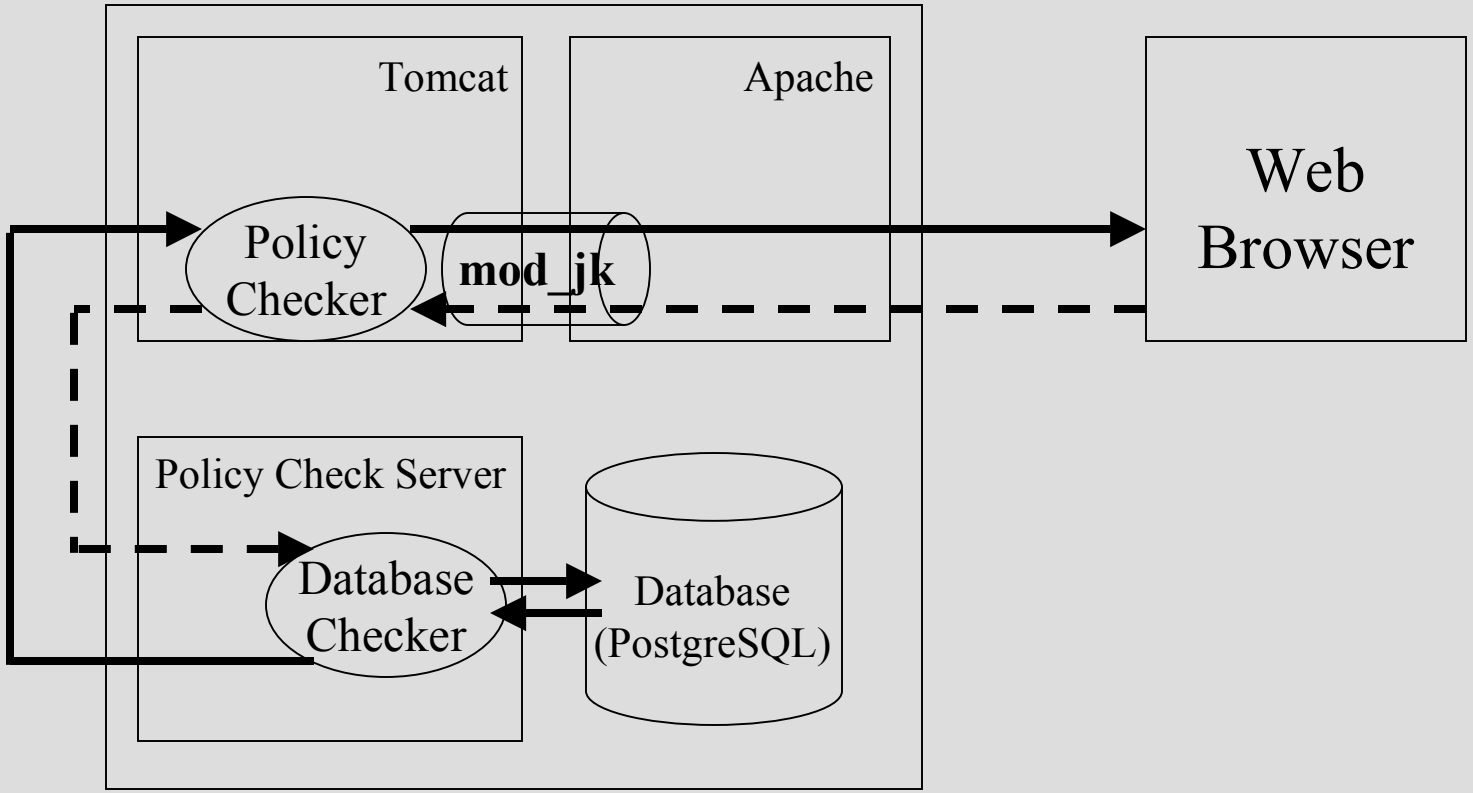
```
for (number of import sentence, repeat following processes) {
    for (number of export sentence, repeat following processes) {
        If (the export sentence specify input AS as a peer) {
            if (the sentence doesn't export required routes) {
                inconsistency ;
            }
        } else {
            inconsistency ;
        }
    }
}
```

3. inspection of export sentence: same as import sentence

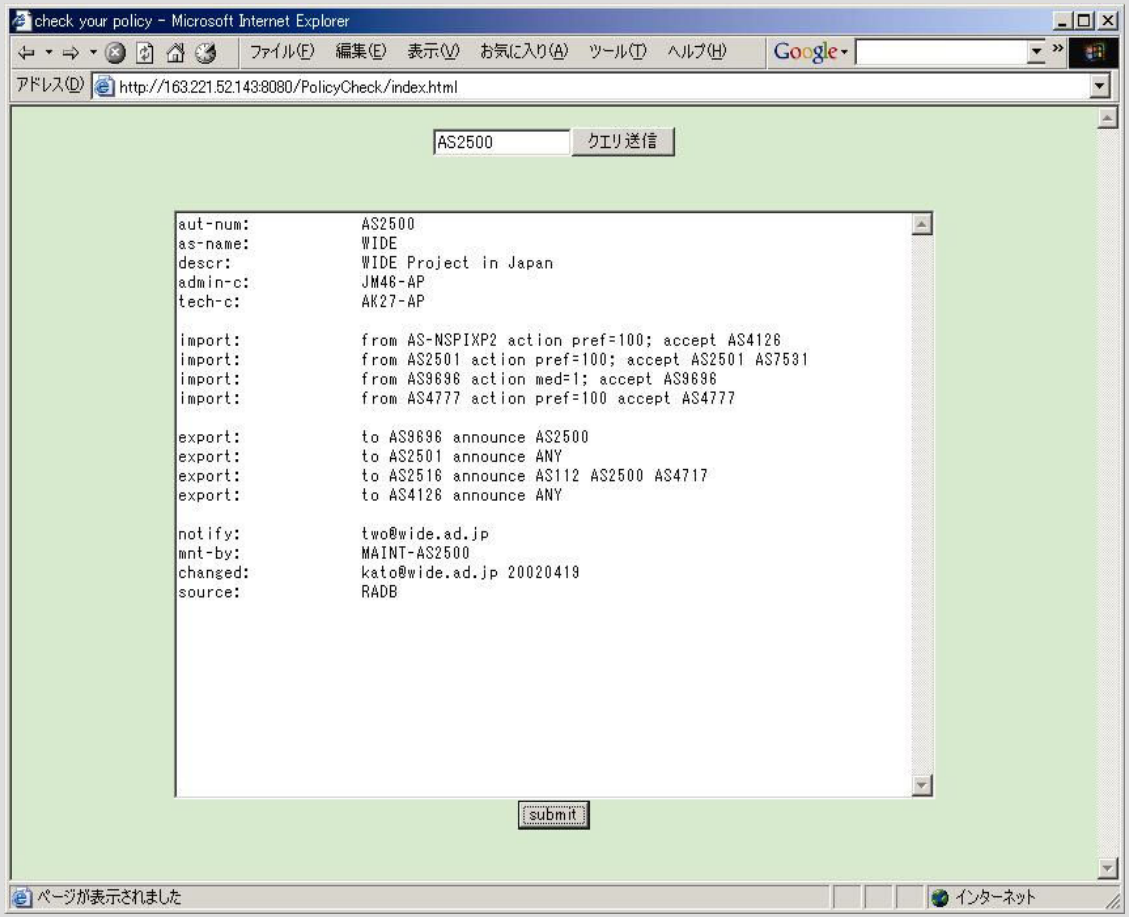
# Class Object Diagram



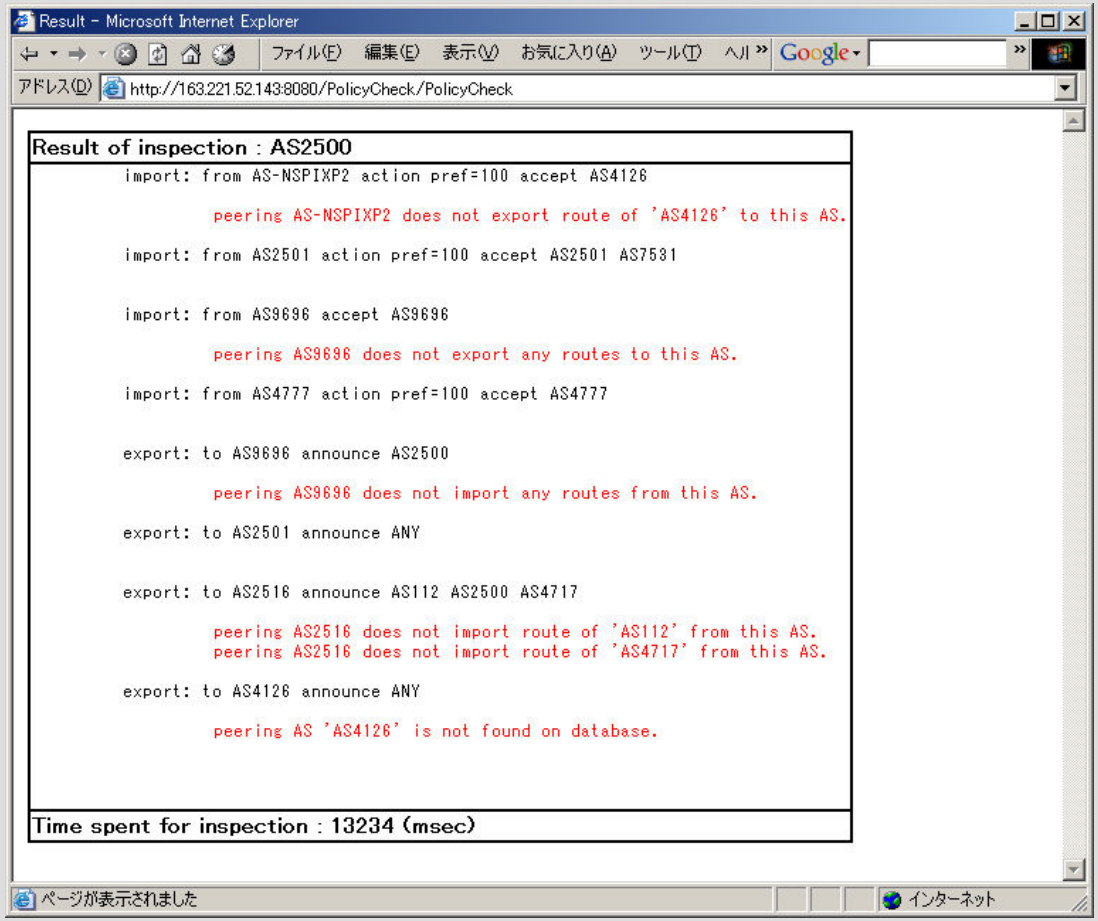
# Policy Checker



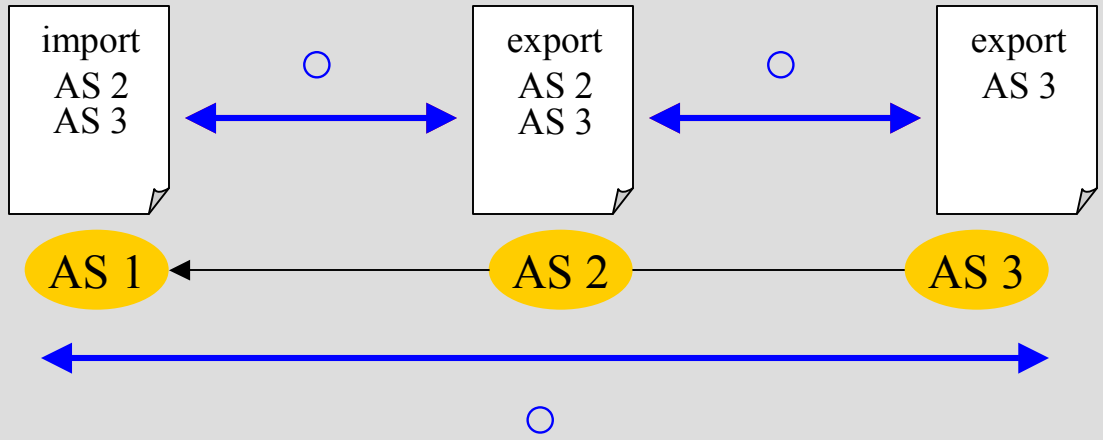
# Example – query



# Example – result



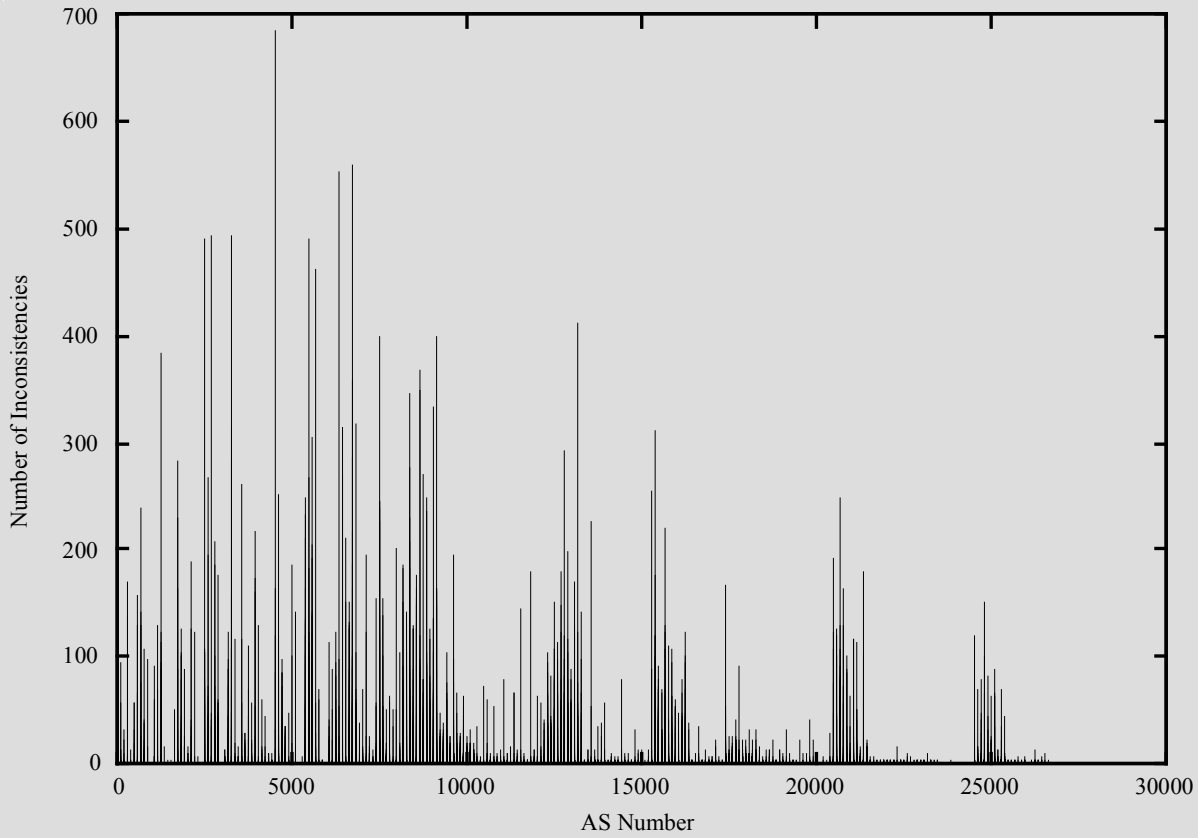
# Consistency Chain




- By correcting the inconsistencies between peering ASes, it is possible to exchange route information between ASes that are not directly peering.

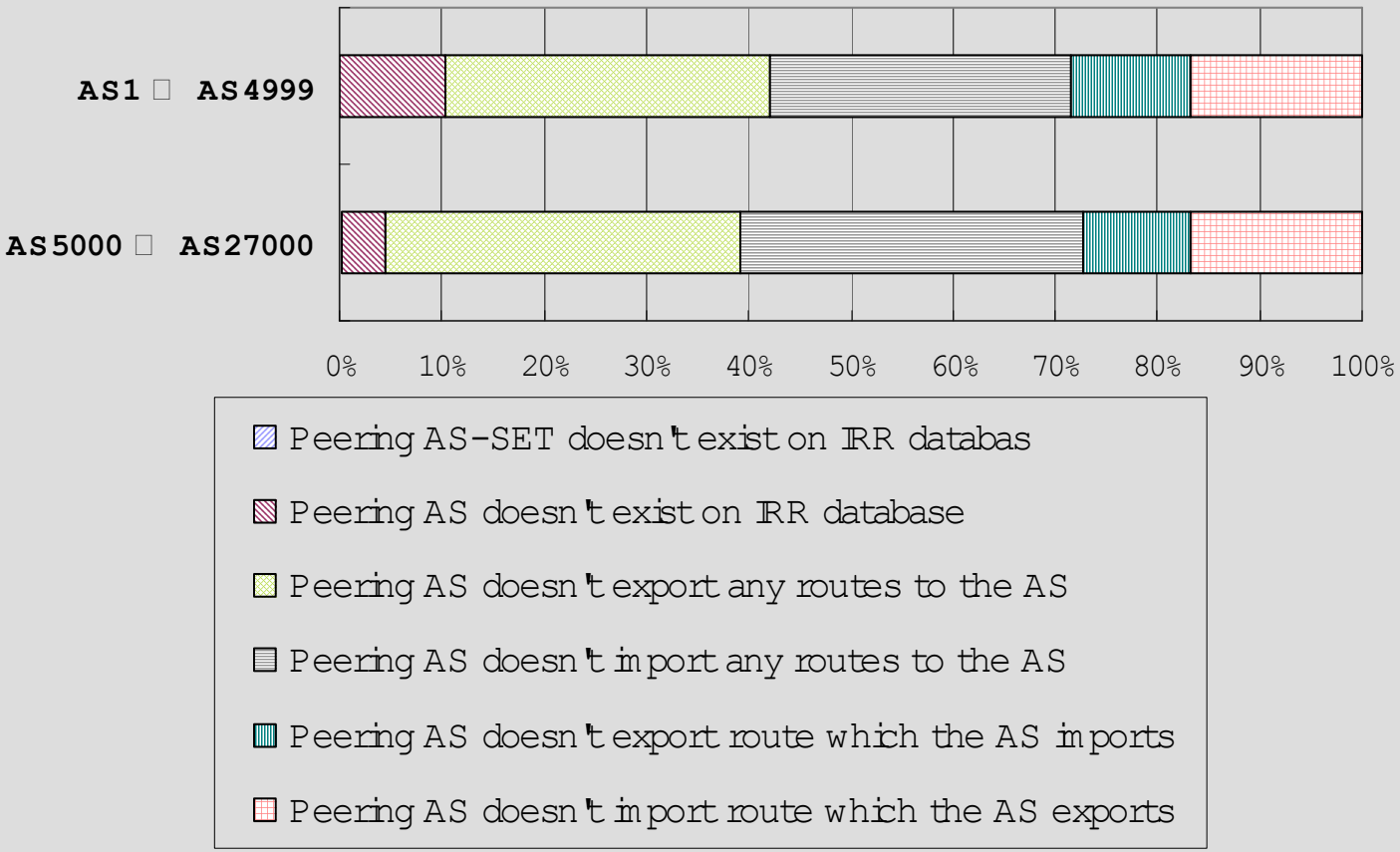
  → improve consistency of the whole IRR databases

# Analysis of inspection result




55.8% of AS has at least one inconsistency

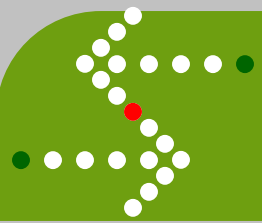
# Specification of the inconsistency



# Detail of inconsistencies

| | Classification | Number | Rate |
|---|---|---|---|
| 1 | Peering AS-SET doesn't exist on IRR database | 482 | 0.2 % |
| 2 | Peering AS doesn't exist on IRR database | 7,971 | 4.0 % |
| 3 | Peering AS doesn't exist export any routes to the AS | 36,333 | 18.6 % |
| 4 | Peering AS doesn't import any routes from the AS | 34,710 | 17.8 % |
| 5 | Peering AS doesn't export route which the AS imports | 11,436 | 5.8 % |
| 6 | Peering AS doesn't import route which the AS exports | 17,753 | 9.1 % |
| | Total | 108,685 | 55.8 % |

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

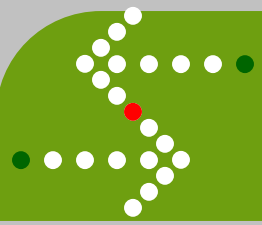


# Operations

- JPNIC IRR (JPIRR)
  - JPNIC IRR planning team
  - Operating IRRd
  - We intend to apply Policy Check Server to JPIRR maintained by JPNIC and provide a service to inspect consistency.

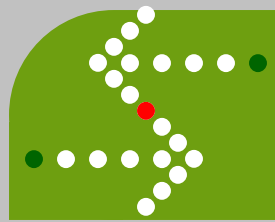
# Conclusion

- Policy Check Server
  - Classification of the inconsistency
  - proposed a system to investigate consistency
  - proposed a system to prevent increasing inconsistency
- Analysis of inspection result
  - 55.8% of AS has at least one inconsistency
- Future work
  - Operation on IRR server



# Question?

- in slow and easy English please ..



# Classification of Inconsistencies

| | |
|---|---|
| Inconsistencies in routing information import | Peering AS-SET doesn't exist on IRR database |
| | Peering AS doesn't exist on IRR database |
| | Peering AS doesn't export any routes to the AS |
| | Peering AS doesn't export route which the AS imports |
| Inconsistencies in routing information export | Peering AS-SET doesn't exist on IRR database |
| | Peering AS doesn't exist on IRR database |
| | Peering AS doesn't import any routes from the AS |
| | Peering AS doesn't import route which the AS exports |