Improving reliability of IRR database

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JPNIC IRR Planning Team

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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

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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

AS2 AS3
AS1
AS5
originates 133.11/16
133.11/16=AS5->AS3->AS2
133.27/16=AS4-AS3->AS2
=UNREACH!!
AS4
133.11/16

Counter major Approach

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

- Problem
  - Take long time solution
  - Heavy protocol:
    - To verify certificate per one prefix
    - BGP holds over 120,000 prefixes…

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

(1)Download request for DB (once a day)

router **router** **DB**

Prefix announcement

(2)Response prefix/origin-as pairs

(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

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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

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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 ?

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Slide 1

Consistency Check among AS policies

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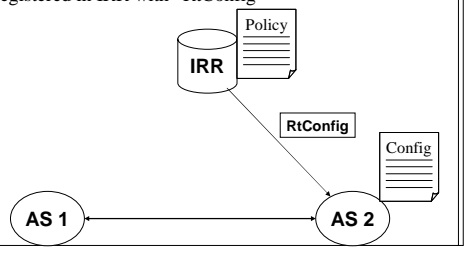2003/8/15   10

Slide 2

auto-configuration with IRR

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

Policy

IRR

RtConfig

Config

AS 1 ←→ **AS 2**

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Slide 3

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**

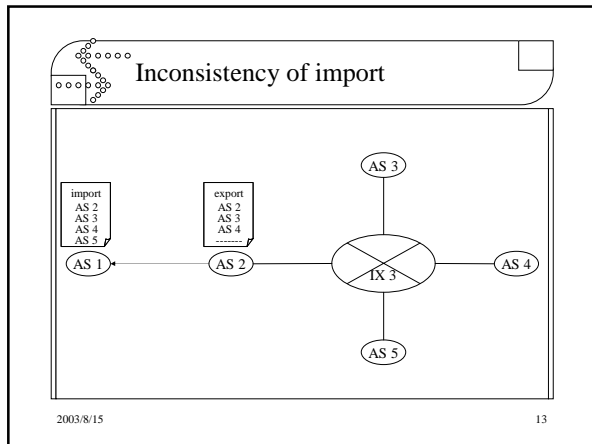2003/8/15   12

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Inconsistency of import

import
AS 2
AS 3
AS 4
AS 5

export
AS 2
AS 3
AS 4

AS 3

AS 1 ← AS 2 — IX 3 — AS 4

AS 5

Inconsistency of export

import
AS 2
AS 3
AS 4
----

export
AS 2
AS 3
AS 4
AS 5

AS 3

AS 1 ← AS 2 — IX 3 — AS 4

AS 5
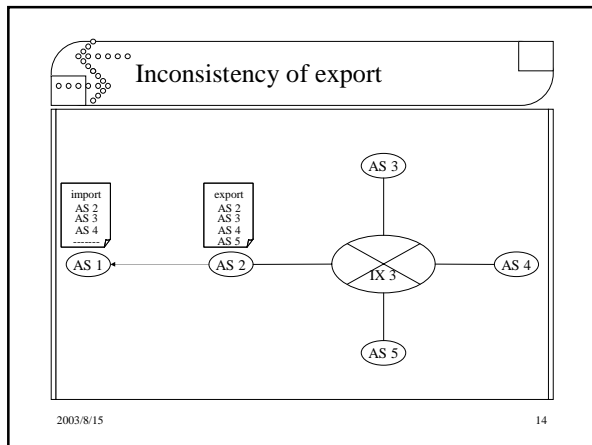
Classification of Inconsistencies

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.

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Example - query

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Example - result

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Analysis of Inspection Result

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

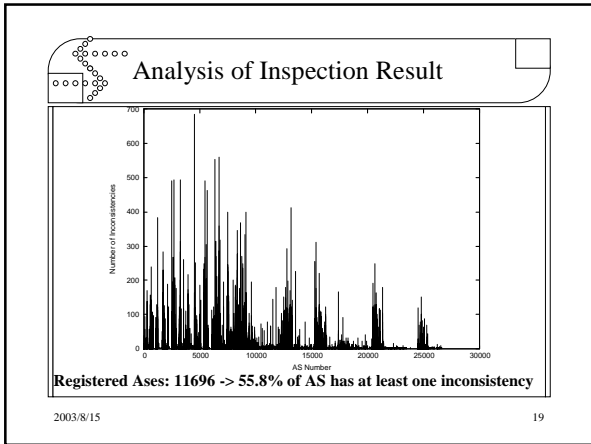2003/8/15   19

Detail of Inconsistencies

Classification	Number	Rate
Peer AS-SET doesn't exist on IRR database	482	0.2 %
Peer AS doesn't exist on IRR database	7,971	4.0 %
Peer AS doesn't exist export any routes to the AS	36,333	18.6 %
Peer AS doesn't import any routes from the AS	34,710	17.8 %
Peer AS doesn't export route which the AS imports	11,436	5.8 %
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

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Future Work

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

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