+ BGPlay

the **real-time** Internet routing observatory

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Unveiling the Internet structure with BGP data

Data collected by BGP route collectors has been unvaluable to reveal the Internet inter-domain characteristics ...

... however, data collected so far has been shown to be largely incomplete
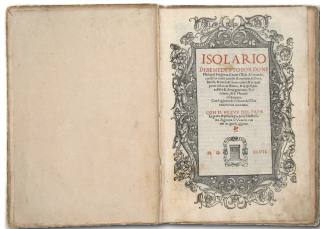
In May 2014 it was possible to discover the **full** connectivity of 15.90% of the ASes offering transit services

Motivation: most AS administrators may not see any direct outcome in sharing their routing data

Isolario project

Objective: push more ASes to join

The more the ASes, the more the completeness of public BGP data

Isolario - The Book of Islands

"where we discuss about all islands of the world, with their ancient and modern names, histories, tales and way of living..."

Benedetto Bordone
(Italian cartographer)

Approach: Do-ut-des

- Participants open a BGP session with Isolario providing the BGP full routing table and its evolution over time
- In change, Isolario offers **real-time** and **historic** analysis applications based on the aggregation of every routing information collected

Data we plan to provide to research community

MRT data (same format as RIPE RIS, Route Views, $\cdots$)

1. RIB feeder snapshots every 2 hours
2. UPDATE collections every 5 minutes

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Periodic analyses (daily, weekly, monthly, · · ·)

work in progress

1. AS-level Topologies (Global and Geographic)
2. AS characteristics
3. Feeder contribution
4. Total coverage of RCs

# Enhanced BGP Route Collector

Incoming flows are duplicated as soon as they arrive and feed both the Route Collecting Software (RCS) and service modules
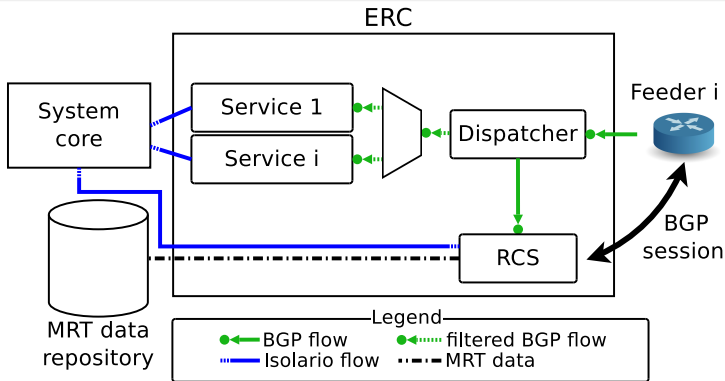
As usual, RCs only collect routing information and **not** user traffic

Enhanced BGP Route Collector

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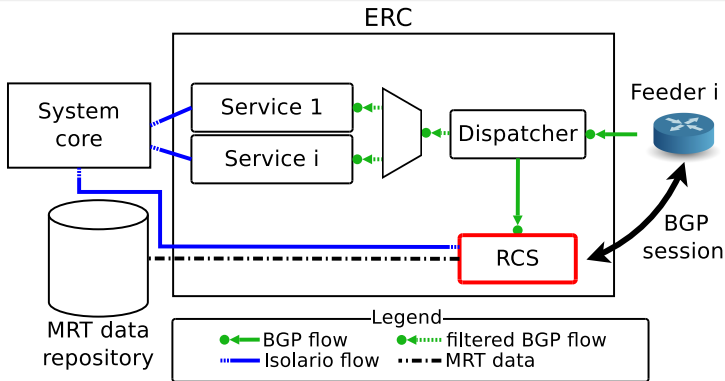
As usual, RCs only collect routing information and **<u>not</u>** user traffic

Incoming BGP flows are used as **real-time streams**
for services dedicated to participants
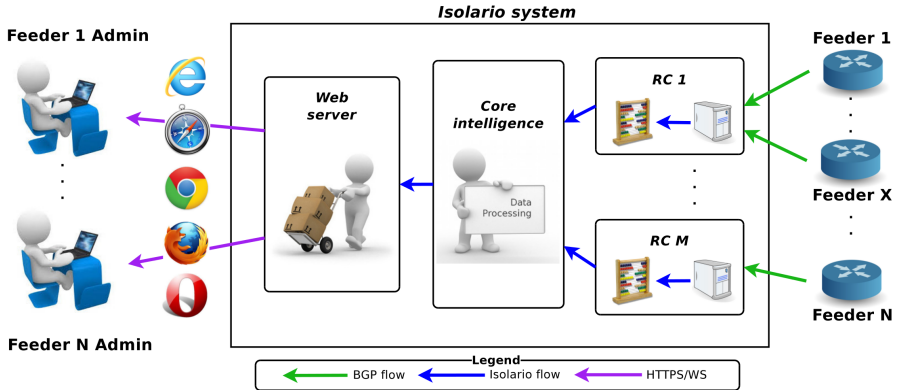
Results are provided to users via WebSockets

Isolario free services for feeders

Every feeder has **free** access to a set of services tailored to monitor and analyse BGP data coming into Isolario system

Real-time services
- BGP flow viewer
- Routing table viewer
- Route flap detector
- Website reachability
- Subnet reachability

Historic services
work in progress
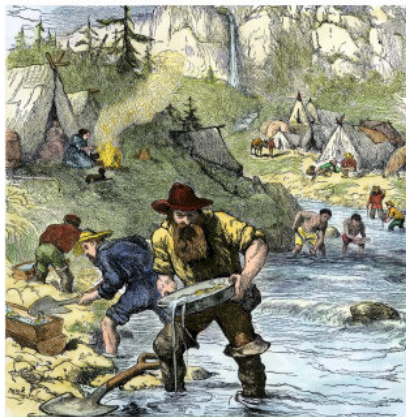- Routing table viewer
- Subnet reachability

Diagnostic services
- Alerting system
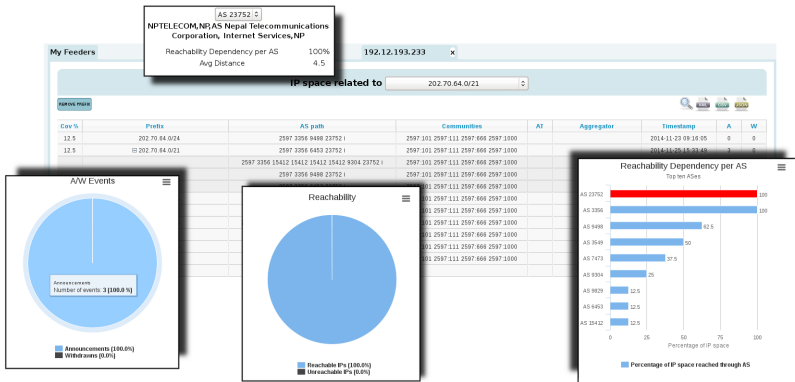- Daily report *work in progress*

Real-time services

Real-time services allow to monitor BGP
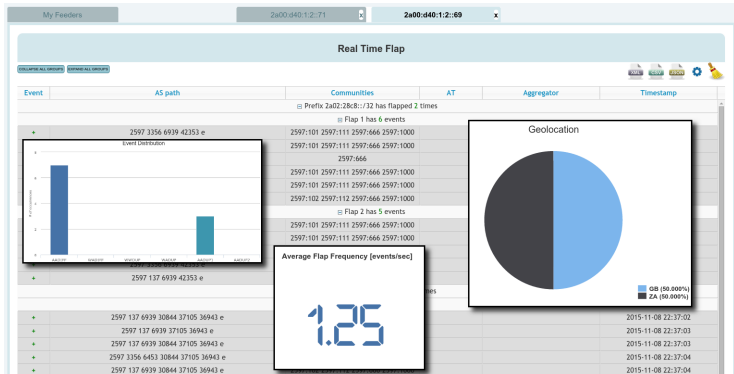data flowing into Isolario system

Routing table viewer

Allows to analyse in real-time the routes that a feeder is currently announcing to Isolario to reach a portion of the IP space
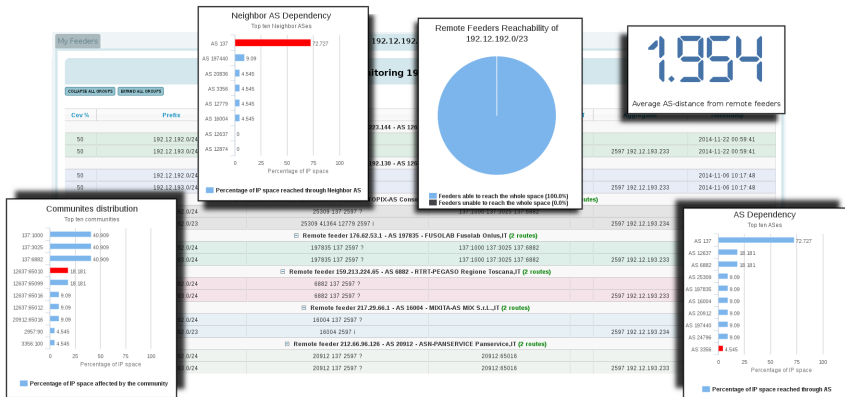
Flap detector

Allows to detect and analyse in real-time the routes that are experiencing flap events
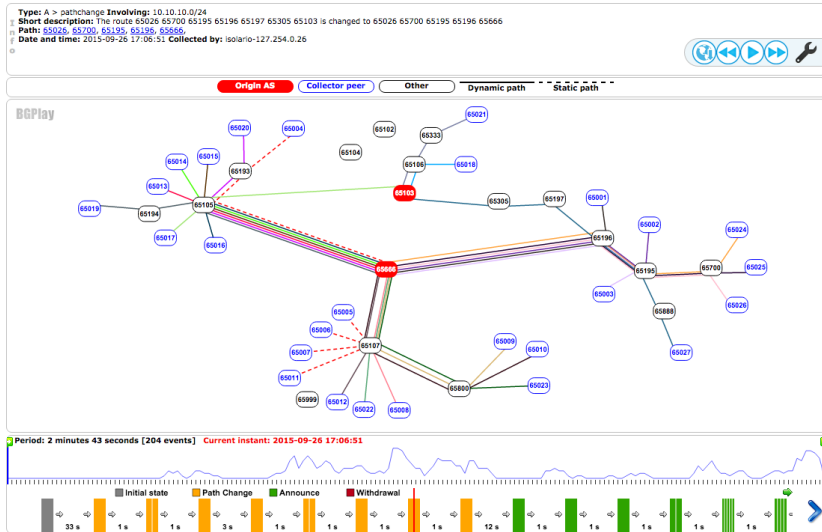
Subnet reachability

Allows to analyse in real-time the routes that every Isolario feeder is announcing to Isolario to reach a portion of the IP space

The more the feeders, the more the usefulness of the application!

Isolario real-time visualisation with BGPlay

- BGPlay is an **open**-**source** tool for the visualisation of BGP routing
- Thanks to the close collaboration with Massimo Candela (RIPE NCC) we integrated in Isolario the recently released BGPlay **real**-**time version** (**http://bgplay.massimocandela.com**)

BGPlay is currently integrated in SR

BGPlay real-time

BGPlay real-time: **http://bgplay.massimocandela.com**

13

Diagnostic services

Diagnostic services exploit incoming BGP flows and/or historic data to report anomalies of the inter-domain routing status

Alerting system

Alerting service

- **BGP attributes:** BGP UPDATEs matching attributes of interest
- **Flap events:** a prefix UPDATE rate is larger than a threshold
- **Hijack attempts:** BGP UPDATEs hijacking a feeder subnet
- **Prefix reachability:** (un)reachability of prefixes of interest

Daily report

Summary about the feeder inter-domain routing status as perceived by the Isolario system

Routing statistics
- #Announce, #Withdrawn
- Most (un)stable prefixes

Reachability statistics
- Inbound reachability

BGP attributes statistics
- AS path anomalies

One-time configuration: no need to be connected to the system

Daily report: Summary of statistics

1 General statistics

Analysis start date: *Thursday 21 May 2015 at 00:00:00*
Analysis end date: *Thursday 21 May 2015 at 23:59:59*

Number of non overlapping IPv4 space covered[1]: *2739704260 (98.581001 %)*
The remaining 1.418999 % is covered by a default route

Packets received: *227490*
Feeder status at end date: *up*
Downs experienced since start date: *0*

2 Route statistics

Subnets: *532099*
Unstable subnets: *57727 (10.848 %)*
Stable subnets: *474372 (89.151001 %)*

Number of reserved subnets: *1* – see Sect. 2.4 for further details

Geolocated subnets[2]: *475610 (89.383003 %)*

5 AS statistics

ASes seen: *50241*
Private ASes: *34 (0.067 %)*
Public ASes: *50207 (99.931999 %)*

Public ASes on 16 bits: *42864 (85.316002 %)*
Public ASes on 32 bits: *7343 (14.615 %)*
Number of public ASes at start date: *50089*
Number of public ASes at end date: *50142*
Difference: *+53 ASes (+0.105 %)*

7 My subnet statistics
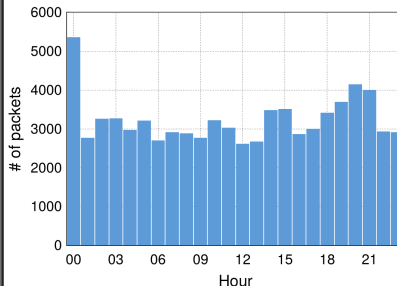
Total number of subnets perceived as proprietary: *1*

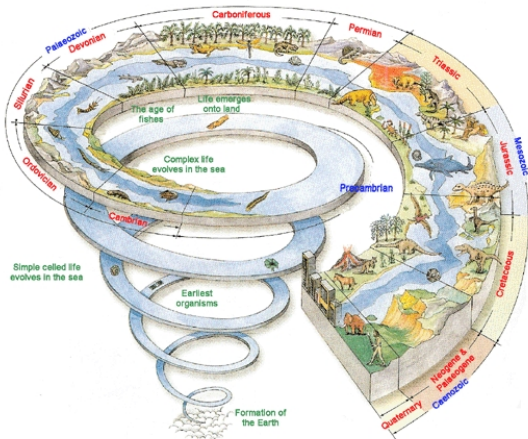| Subnet |
| --- |
| 192.65.131.0/24 |

Number of events related to proprietary subnets: *0*
Number of announcements related to proprietary subnets: *0*
Number of withdrawns related to proprietary subnets: *0*

Figure 1: Amount of packets received per hour

Historic services exploit every BGP data available
(Route Views, RIPE NCC RIS, Isolario) to show historic results

Historic services

Applications

- **Routing table viewer:** Allows to analyse portion(s) of the routing table that each feeder announced to Isolario
- **Subnet reachability:** Allows to analyse the reachability of the IP space portions from every feeder available in the past
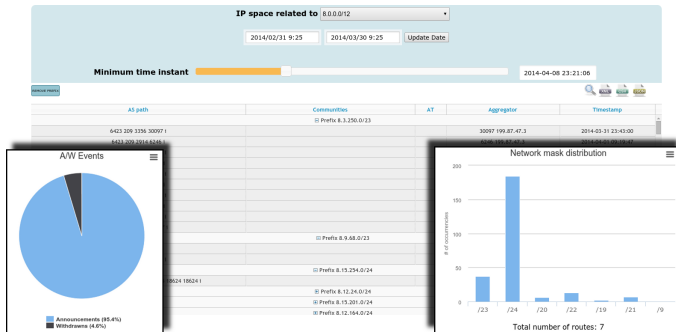
Summary: how to use Isolario?

Real-time services
Something is happening
How is my RIB(s) evolving?
How is my reachability affected?

Historic services
work in progress
Something happened
How was my RIB(s) evolving?
How was my reachability affected?

Alerting System
Something is happening NOW!
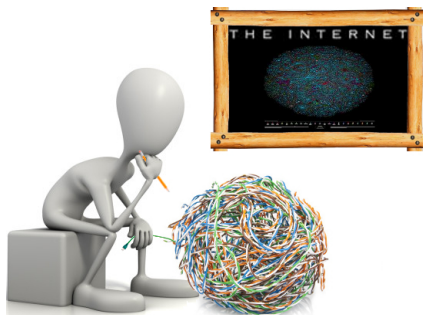Check real-time services!
Do something! (if needed)

Daily report
work in progress
Did something happen yesterday?
Check historic services!
Do something! (if needed)

THE INTERNET

Any question?

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