Measuring Internet resilience

Stéphane Bortzmeyer

AFNIC

bortzmeyer@nic.fr
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Internet resilience

The ability to work even under strain (failure, dDoS...)
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The ability to work even under strain (failure, dDoS...)  
A very necessary property, now that the Internet is used for a lot of important things (love letters, banking, process control, e-government, sending ICANN applications for a new gTLD...)
The report

http://www.ssi.gouv.fr/NOT-YET-PUBLISHED-BUT-SOON

« Résilience de l’Internet français 2011 : état des lieux »

or

“Resilience of the French Internet 2011: an assessment”

Actual measurements

The report focuses on data, not theoretical analysis or feelings. 55 pages. Publically available but no actual name given (no domain name, no AS number).
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The authors

1 ANSSI (Agence Nationale de la Sécurité des Systèmes d’Information, the national cyber-security agency, under the Prime Minister http://www.ssi.gouv.fr/),

2 AFNIC (Association Française pour le Nommage Internet en Coopération, the .fr registry http://www.afnic.fr/)
[BGP] The indicators

- Consistency between Internet Routing Registries and the reality
- Level of connectivity
BGP] The method

1. Four big French operators selected,
2. BGP announcements from a RIS route collector during the year,
3. Routing registry data from RIPE-NCC,
4. Analysis by a home-made program.
[BGP] The method

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The method

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Two views:

- BGP announcements compared with registry data ("Is there a route object for this announcement?")
- and registry data compared with announcements ("Is this route object present in the BGProuting table?")
Consistency between the announcements and the registry varies from “perfect” (100 % match) to “better than nothing” (as low as 33 % match for route objects vs. BGP and 13 % for BGP vs. route objects).

Five transit operators provide most of international connectivity of the Big Four.

BGP severe inconsistencies are common (average 10 % for one operator) but typically mistakes, not deliberate hijackings. Nevertheless, we can guess that deploying RPKI will be hard. Operators have trouble managing their address space.
[DNS] The indicators

- Number and diversity (AS, country) of name servers per zone
- Source Port Randomization of resolvers
- Usage of IPv6, DNSSEC, SPF, in the zones
The method

1. Active query of domains under .fr with DNSwitness
   http://www.dnswitness.net/
2. Find out IP addresses, AS numbers, countries for the name servers,
3. Check if signed with DNSSEC, if IPv6 announced,
[DNS] The results

1. Not enough name servers per zone: 2.2 in average (recordman at 8, the maximum allowed by AFNIC),
2. Insufficient variety of AS per zone: 1.2 in average (recordman at 7), 80 % of the zones have only one AS, ← Biggest weakness
3. Concentration: one AS has 36 % of the name servers,
4. Big majority of name servers inside France,
5. Still 10 % of resolvers without SPR, four years after Kaminsky,
6. Very little DNSSEC (∼100 signed zones) or IPv6 (40 % of zones with at least one IPv6 name server but less than 1 % with an IPv6 Web server, 2 % of incoming requests over IPv6).
Future work

- RPKI deployment
- Testing quality of DNS configuration (Zonecheck)
- More BGP collectors

Prospective:

- Analysis through distributed DNS resolvers (Varuna project)
Similar work

- IIS.se does a comprehensive DNS analysis
  http://www.iis.se/docs/
  Healthcheck2011-Reachability.pdf

- Kim Davies analyzes the resilience of TLDs, for instance
  “AS diversity” http://svsf40.icann.org/meetings/
  siliconvalley2011/
Merci !