

Network-Political Resiliency

A Classification of Internet Resiliency by Country

Chloe Reynolds

Saghar Iranzadeh Tamaddon

Spring 2011

Why this project?

The New York Times

Middle East

Iran Disrupts Internet Service Ahead of Protests

By NAZILA FATHI
Published: February 10, 2010

In an effort to disrupt communications and head off huge opposition demonstrations planned for Thursday, the Iranian authorities on Wednesday drastically slowed Internet service in [Iran](#) and shut down [text messaging](#) services, and an official said that Gmail, the [Google](#) e-mail service, would be blocked.

BBC

News Sport Weather Travel Future

NEWS TECHNOLOGY

Egypt severs internet connection amid growing unrest

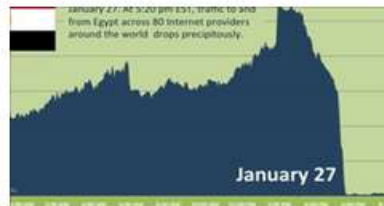
Internet connections across Egypt have been cut, as authorities geared up for a day of mass protest.

Net analysis firms and web watchers have reported that the vast majority of the country's internet has become unreachable.

The unprecedented crack down has left millions of Egyptians without internet access.

There has been unprecedented protest in the country over the past few days - much of it co-ordinated via the web.

According to internet monitoring firm Renesys, shortly before 2300 GMT on 27 January virtually all routes to Egyptian networks were simultaneously withdrawn from the internet's global routing table.



The drop in net traffic in Egypt was dramatic

CNN Tech

INTERNET ACCESS

Libya faces internet blackouts amid protests

February 22, 2011 | By John D. Sutter, CNN

Share | Twitter | Email

Recommended

138 recommendations. Sign Up to see what your friends recommend.

Libya is the latest North African country to experience internet trouble as democratic protests continue to sweep the region.

The massive Saharan country, long controlled by the dictator Moammar Gadhafi, has suffered "rolling blackouts" of its internet connections during the regime's ongoing violent crackdown on protestors, according to the internet traffic monitor Renesys.

The cause of these internet service cuts, however, remains uncertain. Possibilities include a government crackdown, an internet traffic overload or simple power outages, said Jim Cowie, Renesys' co-founder.



Protestors in Egypt show their support for an ongoing anti-government demonstration in neighboring Libya.

THE WALL STREET JOURNAL | TECHNOLOGY

Syria's Internet Blockage Brings Risk of Backfire

By CHRISTOPHER RHOADS

A A

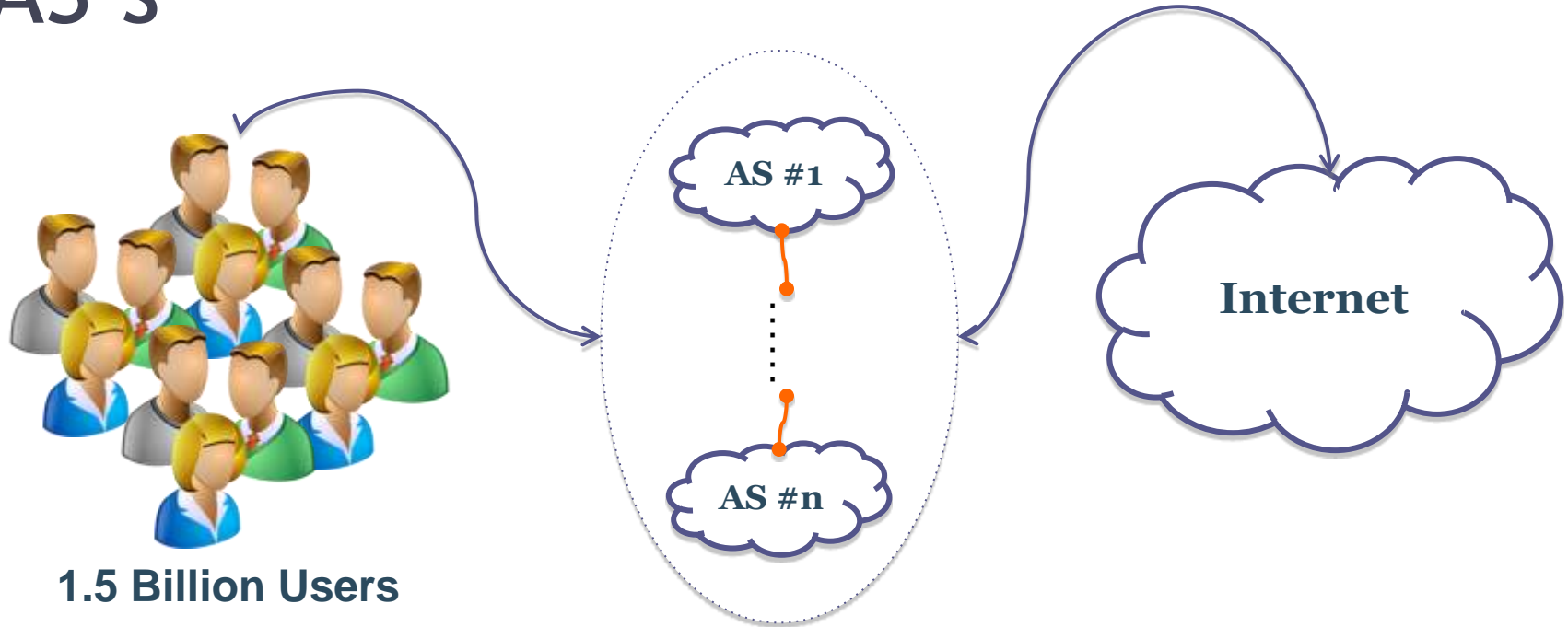
Syria shut down most of its Internet and mobile data connections early Friday, adopting a strategy used by other governments in the Middle East during critical points of the uprisings.

But the attempt to gain an advantage over the opposition groups by unplugging or partially blocking the Internet, which has played a key role in the protests, could backfire. In some cases, most notably in Egypt, the move appeared to prompt more angry protesters into the streets.

The blockage began to take effect over a half hour early Friday in Syria, according to Renesys Corp., an Internet research firm in Manchester, N.H. A Syrian government-backed website confirmed Internet service had been shut down.

Blocking access to the Internet has risks both for the economy and for the regime, giving the appearance of desperation, Internet experts say.

AS's



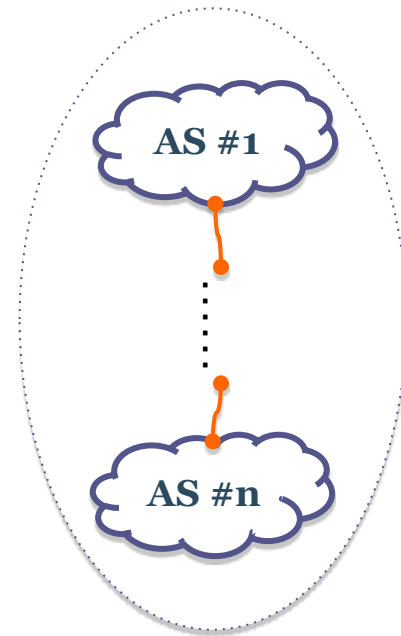
1.5 Billion Users

30,000 Autonomous Systems

ASs are generally ISPs but can also be large companies, universities, and other such organizations who act as independent entities on the Internet. They assign individual IP addresses and route traffic from individual IP addresses out to and in from the wider Internet.

AS's

- Controlling the traffic (filtering, surveilling, blocking, etc) of those 1.5 billion users only requires controlling those 30,000 ASs. But the vast majority of those ASs are small organizations that rely on one or more larger ASs for access to the wider Internet, so the vast majority of traffic flows through this much smaller slice of less than a thousand large ASs.



Real n is far smaller than 30,000

What is a “Point of Control”?

- For a given country, list its ASs in order of which are busiest until you reach the number of ASs needed to control 90% of IPs in a country
- Any AS included in that list is a Point of Control

Examples

- 90% of China's population - 190 million IP addresses - ultimately connect to the wider Internet through one of only 4 Points of Control, while in Russia 90% of the country's approximately 20 million IP addresses connect through one of 36 Points of Control.”



Countries Omitted

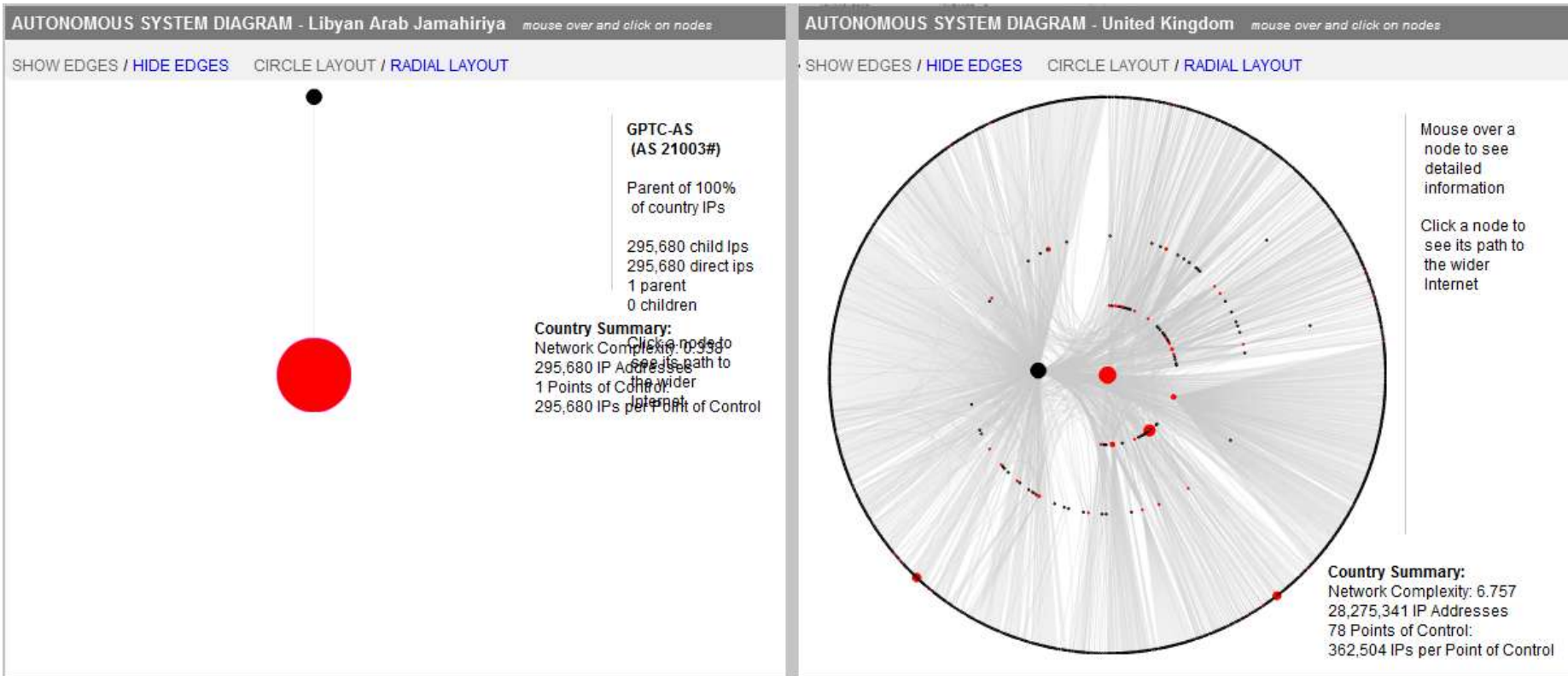
- Many small countries (with observed ASs less than 25,000 IP addresses) are omitted
- The United States is omitted (1.2 billion IP addresses inflates the number of Internet users).

Let's Look At Your Country

- Audience Participation!

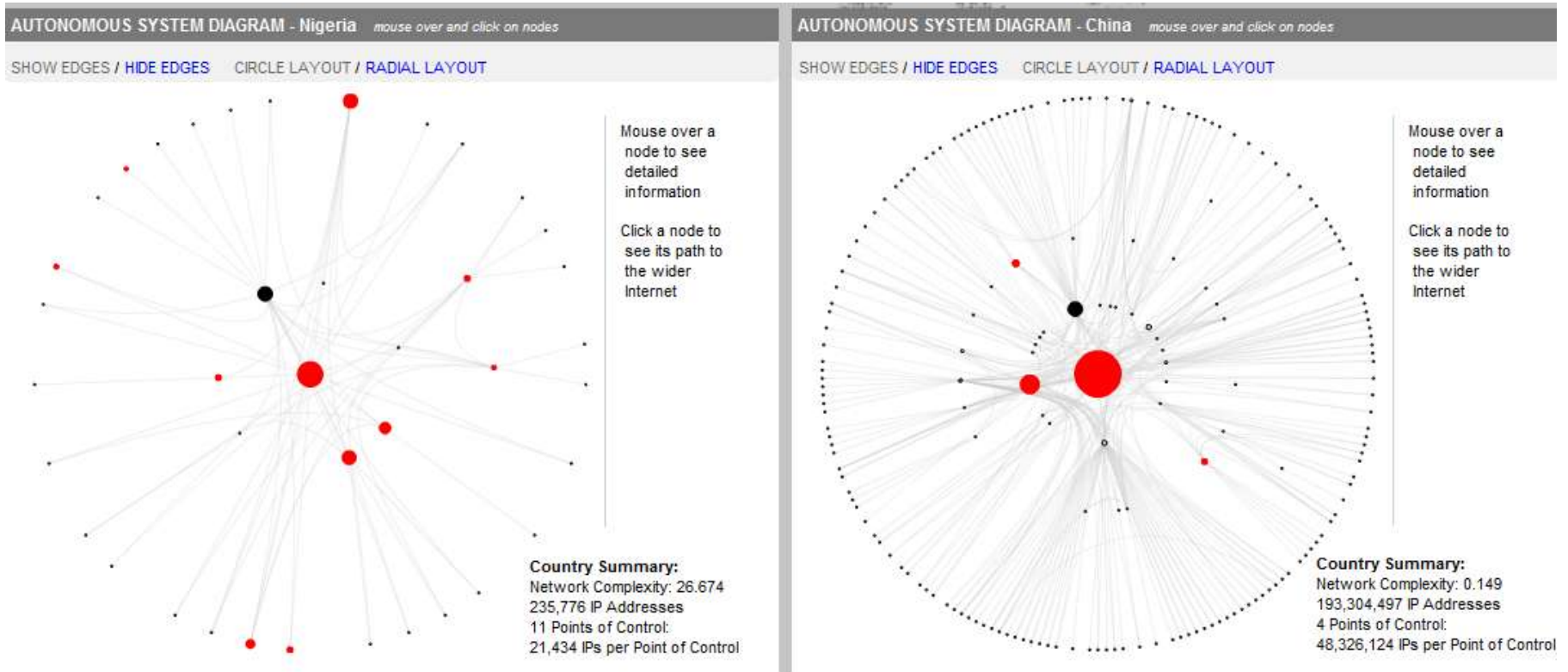
Points of Control: Libya vs. UK

- Fewest (Libya, 1) vs. most (UK, 78) Points of Control



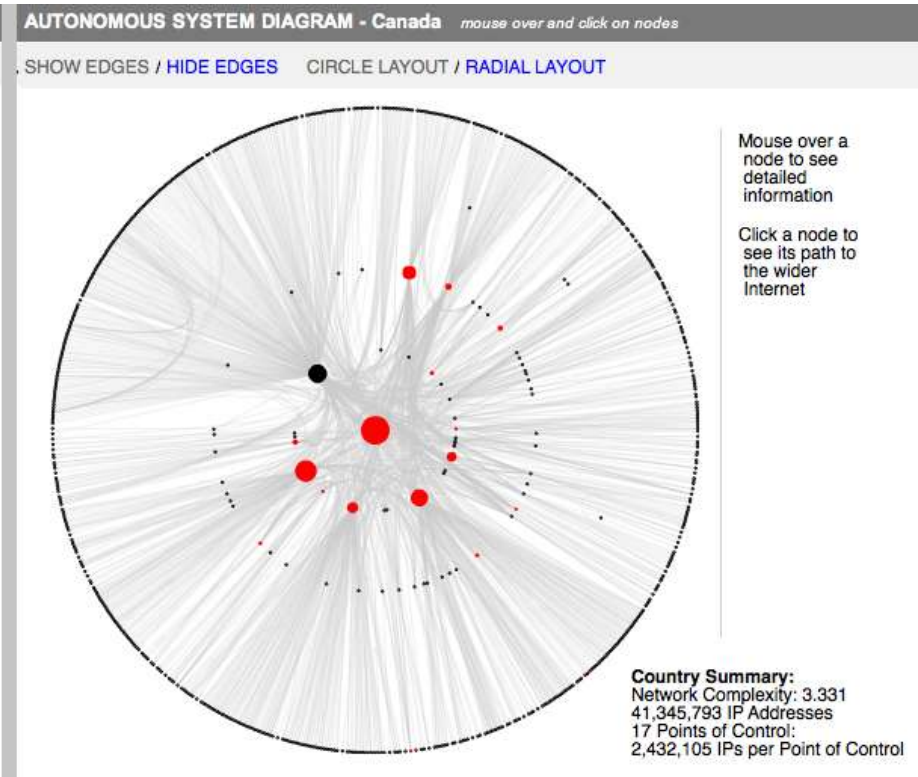
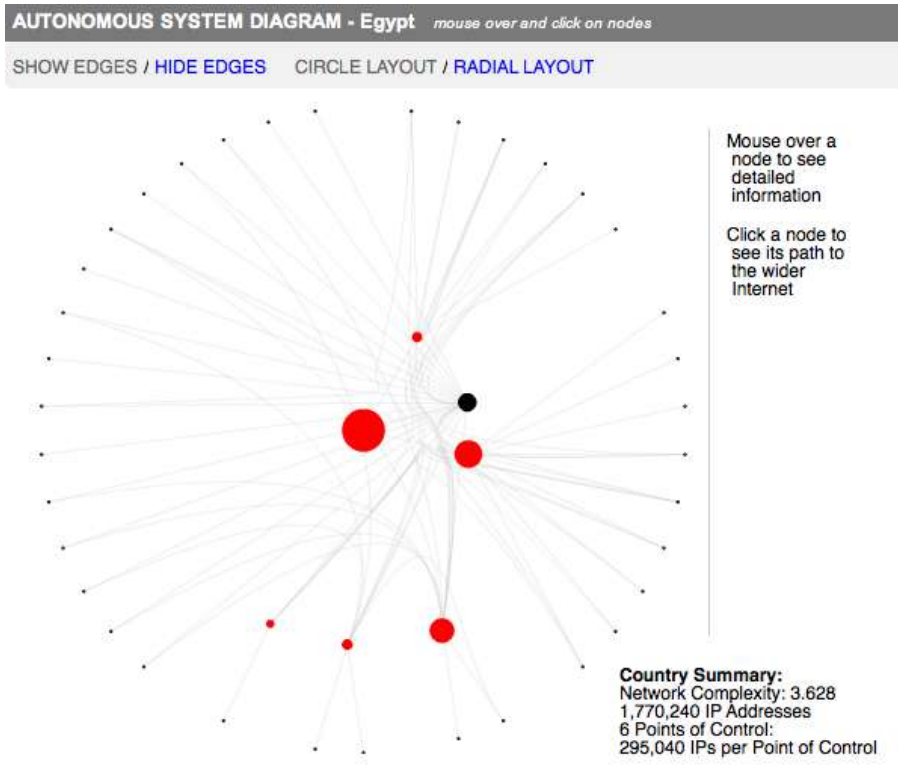
Points of Control: Nigeria vs. China

- China (4) vs. Nigeria (11) Points of Control



Points of Control: Egypt vs. Canada

- Egypt (6) vs. Canada (17) Points of Control

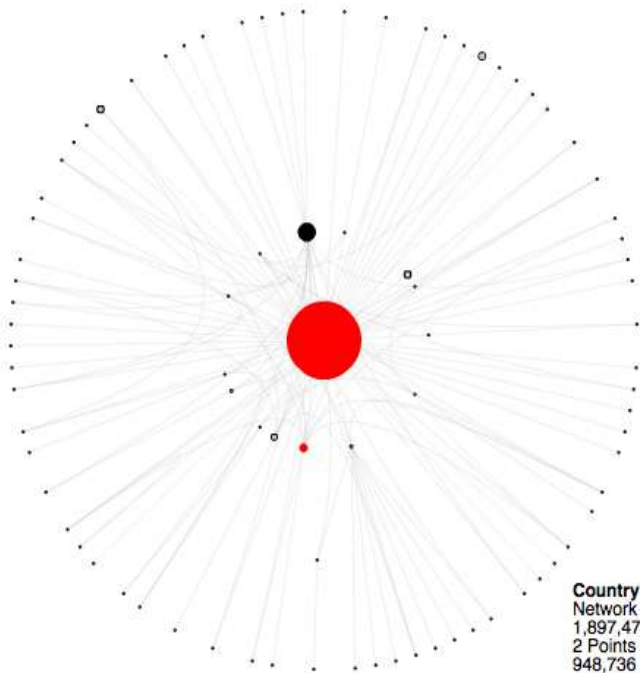


Points of Control: Iran vs. Switzerland

- Iran (2) vs. Switzerland (28) Points of Control

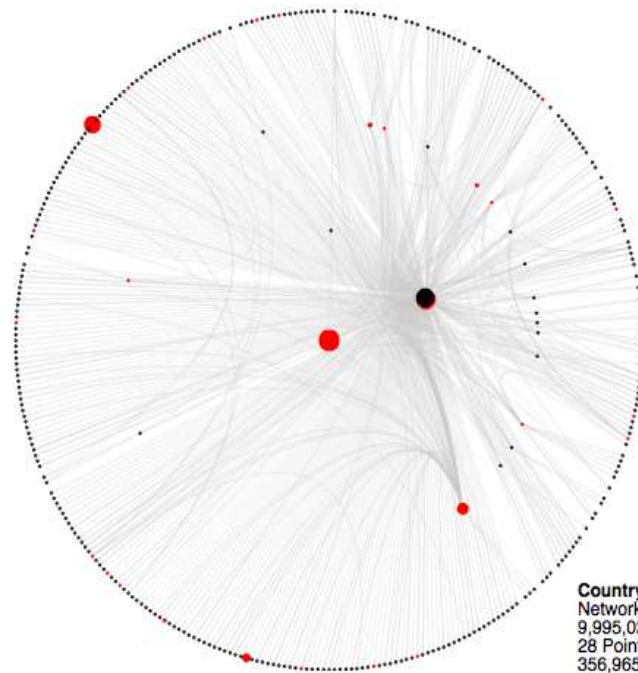
AUTONOMOUS SYSTEM DIAGRAM - Iran, Islamic Republic of *mouse over and click on nodes*

SHOW EDGES / HIDE EDGES CIRCLE LAYOUT / RADIAL LAYOUT



AUTONOMOUS SYSTEM DIAGRAM - Switzerland *mouse over and click on nodes*

SHOW EDGES / HIDE EDGES CIRCLE LAYOUT / RADIAL LAYOUT



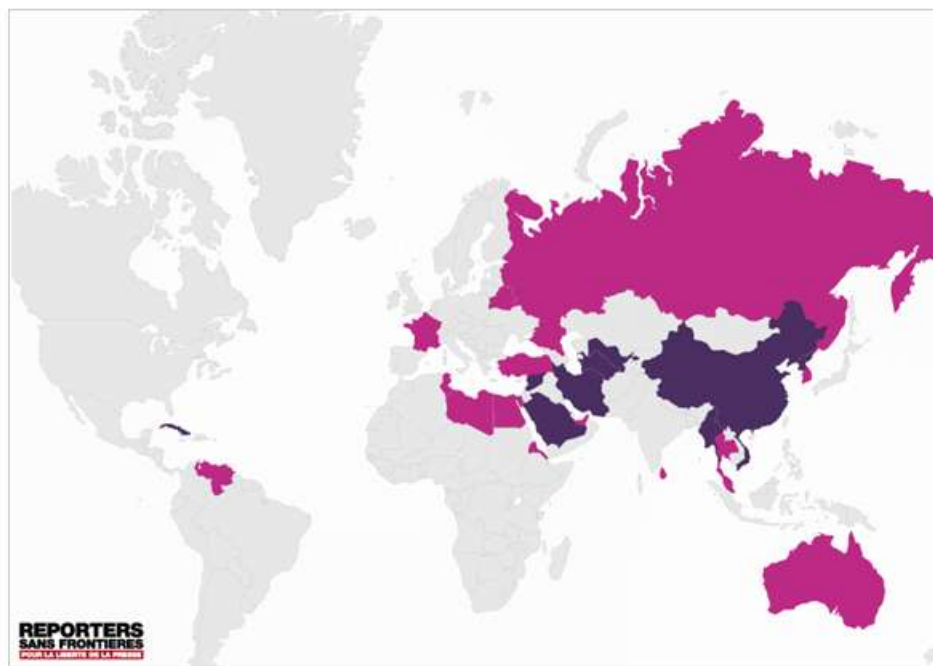
Next

- Points of Control indicate the network infrastructure of the internet
- Now we turn to political measures

Map of Cyber-Censorship

From: Reporters Without Borders

THE MAP OF CYBER-CENSORSHIP



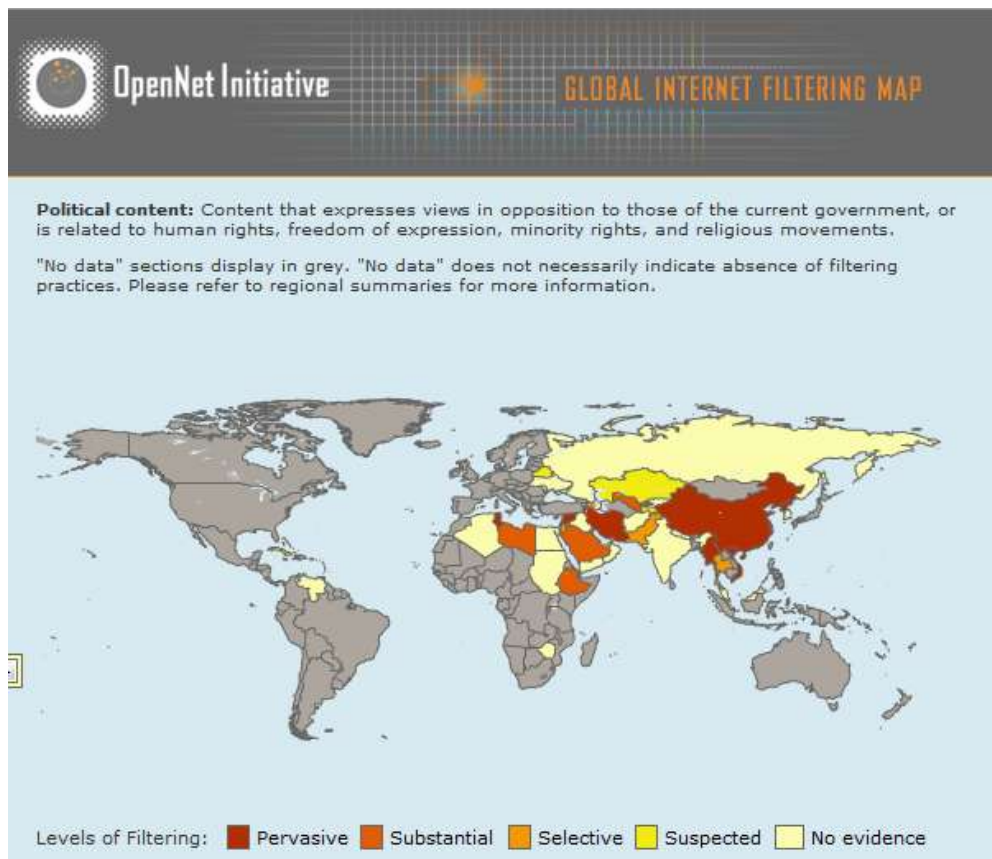
**REPORTERS
SANS FRONTIÈRES**
RUE LA FONTAINE 103 - 1000 BRUXELLES

■ INTERNET ENEMIES

■ COUNTRIES UNDER SURVEILLANCE

Internet Political Filtering

From: OpenNet Initiative's



Method

- We categorized countries based on the overlap of Points of Control and Political behavior (RWB Cyber-Censorship and ONI Filtering)
- Our categorization is call **NPR**, short for **Network-Political Resiliency**
- NPR scores can be “High”, “Moderate”, “Low” or “Very Low”
 - A high NPR score = more resilient to internet shutdowns
 - A low or very low NPR score = less resilient to internet shutdowns

NPR Scores

For selected countries

Source:	<i>OpenNet Initiative (2011)</i>		<i>Reporters Without Borders (2011)</i>	<i>Roberts & Larochelle (2010)</i>	<i>Calculated by authors (Reynolds & Tamaddon, 2011)</i>	
Country	Political [Internet] Filtering Level	Total Internet Filtering Level	Internet Enemies	Points of Control (POC)	POC Redundancy Level	Network-Political Resiliency (NPR)
Canada	0	0	No data	17	Moderate	Moderate
China	4	14	Internet Enemy	4	Very Low	Very Low
Libya	no data	no data	Country under surveillance	1	Very Low	Very Low
Sweden	0	0	no data	44	Moderate	Moderate
Syria	no data	no data	Internet Enemy	2	Very Low	Very Low
UK	0	0	no data	78	High	High

Conclusion

- Your Country – results
- Questions