Inferring Country-Level Transit Influence of Autonomous Systems

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Security

DDoS attack boots Kyrgyzstan from net

Russian bears blamed

By Dan Goodin 28 Jan 2009 at 19:57

Kyrgyzstan Under DDoS Attack From Russia

TUESDAY, JANUARY 27, 2009
BY: COUNTER THREAT UNIT RESEARCH TEAM

The two primary Kyrgyzstan ISPs (www.domain.kg, www.ns.kg) have been under a massive, sustained DDoS attack … Few alternatives for Internet access exist in Kyrgyzstan. … [the attacks] essentially knocked most of the small, Central Asian republic offline.

Ethiopia has been offline, and nobody really knows why

By Samuel Getachew, CNN
Updated 4:32 PM ET, Mon June 17, 2019

Government control is facilitated by how internet connectivity works in Ethiopia. The country is landlocked and connects to the internet via satellite, a fiber-optic cable that passes through Sudan and connects to the international gateway, and another cable that connects through Djibouti to an international undersea cable.
Country-Level Transit Influence (CTI)

- **Rest of the Internet**
- **Transit ISP**
  - **Transit Autonomous System**
    - Responsible for delivering traffic within their network and to their customers
  - **Access Autonomous Systems**
    - Residential ISP
    - Mobile ISP
    - Responsible for delivering traffic within their network
Country-Level Transit Influence (CTI) ~ [0,1]

CTI = 1.0

CTI = 0.0
Building this model – Data inputs

1. Every prefix announced to route-views2 and the AS that originates them
2. Netacuity’s geolocated country for each IP address in each routed prefix
3. Prefix-level delegation files published by RIRs (collected by RIPE)
4. CAIDA’s inferred AS-Relationships
5. AS-Rank’s collection of all observed paths towards each prefix from RouteViews and RIPE
Source of Complexity: Peering Links

Foreign Peer

Customer

Customer

Rest of the Internet

Transit ISP

Residential ISP

Mobile ISP

Transit Autonomous System
 Responsible for delivering traffic within their network and to their customers

Access Autonomous Systems
 Responsible for delivering traffic within their network
Finding **non-international-peering** countries:
is it possible to build a set of ASes originating >50% country’s addresses where these four conditions are *simultaneously false*

<table>
<thead>
<tr>
<th>Data</th>
<th>Condition</th>
</tr>
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<tbody>
<tr>
<td>RV Prefix2AS</td>
<td>BGP</td>
</tr>
<tr>
<td>Netacuity Geoloc</td>
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Condition

- **BGP**
- **IXP/PNI**
- **Netacuity Geoloc**
- **RIR Delegation**

Legend:

- CAIDA IXP: Hurr. Electric, PCH, PeeringDB
- PNI from PeeringDB
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CAIDA IXP: Hurr. Electric, PCH, PeeringDB
PNI from PeeringDB
Finding **non-international-peering** countries:
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### Condition

- BGP
- IXP/PNI
- IXP/PNI
- [In progress]

### Data

- **RV Prefix2AS**
- **Netacuity Geoloc**
- **AS-Relationships**

**Data Sources**

- CAIDA IXP: Hurr. Electric, PCH, PeeringDB
- PNI from PeeringDB
- RIR Delegation
- RIPE Atlas Public Traceroutes

**Tools**

- Traceroute + BdrmapIT
- RIPE Atlas Probe
Non-international-peering Countries Candidates Based on Passive Measurements Only
Ethiopia’s Country-Level Transit Influence, Jan. 2020
Pop. 105 million

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<tr>
<th>Top Transit AS</th>
<th>Country of Operation</th>
<th>Owner</th>
<th>CTI</th>
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<tr>
<td>30990-DJIBOUTI TELECOM S.A.</td>
<td>Djibouti</td>
<td>Djibouti</td>
<td>0.58</td>
</tr>
<tr>
<td>3356-Level 3 Communications Inc.</td>
<td>Multinational (US)</td>
<td>Private</td>
<td>0.22</td>
</tr>
<tr>
<td>33788-Kanar Telecommunication</td>
<td>Sudan</td>
<td>UAE</td>
<td>0.21</td>
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<tr>
<td>15706-Sudatel Telecom Group</td>
<td>Sudan</td>
<td>Sudan</td>
<td>0.13</td>
</tr>
<tr>
<td>174-Cogent Communications</td>
<td>Multinational (US)</td>
<td>Private</td>
<td>0.12</td>
</tr>
<tr>
<td>33771-Safaricom Limited</td>
<td>Kenya</td>
<td>Kenya</td>
<td>0.06</td>
</tr>
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- Our metric’s ranking of Ethiopia’s most influential transit ASes reflects physical properties (i.e., landlocked, no access to undersea cables), and also concentration of ecosystem.
- Ethio Telecom, the state monopoly which originates 97% of addresses in the country, probably allows the government to control population’s connectivity.
- This extreme concentration may also expose the country to foreign influence, as several of the dominant transit providers are owned by a foreign government.

https://afterfiber.nsrc.org/