Inferring Country-Level Transit Influence of Autonomous Systems

Alexander Gamero-Garrido

Esteban Carisimo, Shuai Hao, Bradley Huffaker,
kc claffy, Amogh Dhamdhere, Alex C. Snoeren and Alberto Dainotti

Center for Applied Internet Data Analysis

The Register
Biting the hand that feeds IT

NTRE   SOFTWARE   **SECURITY**   DEVOPS   BUSINESS   PERSONAL TECH   SCIENCE

Security

DDoS attack boots Kyrgyzstan from net

Russian bears blamed

By Dan Goodin 28 Jan 2009 at 19:57   6 💬   SHARE ▼
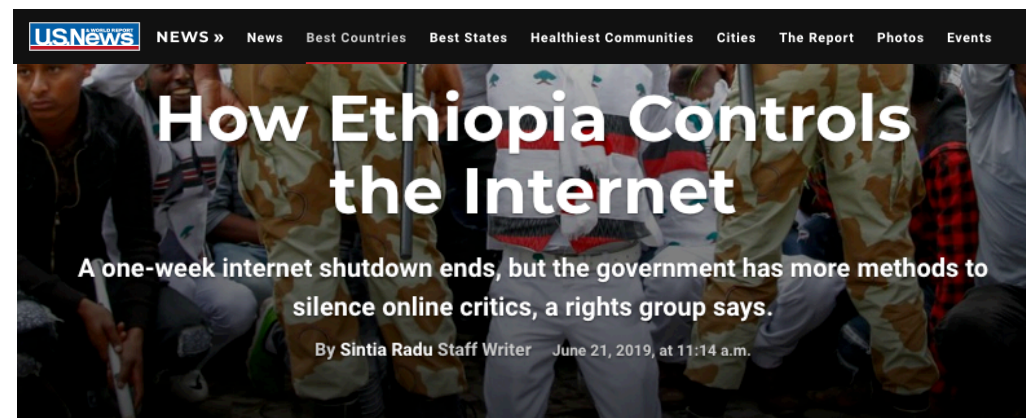
Kyrgyzstan Under DDoS Attack From Russia

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.

CNN World   • LIVE TV ☰
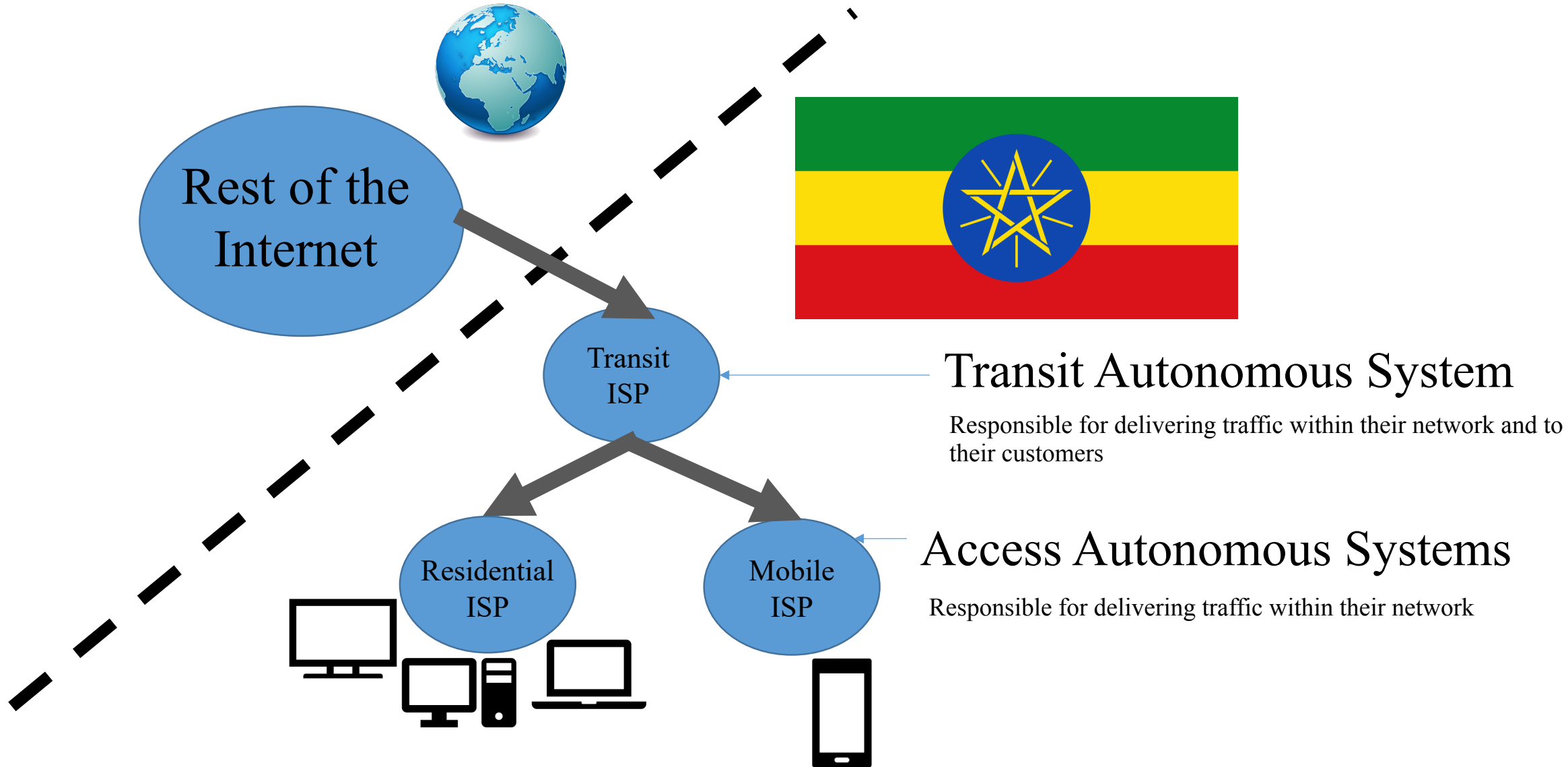
Ethiopia has been offline, and nobody really knows why

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

U.S.News   NEWS »   News   Best Countries   Best States   Healthiest Communities   Cities   The Report   Photos   Events

How Ethiopia Controls the Internet

A one-week internet shutdown ends, but the government has more methods to silence online critics, a rights group says.

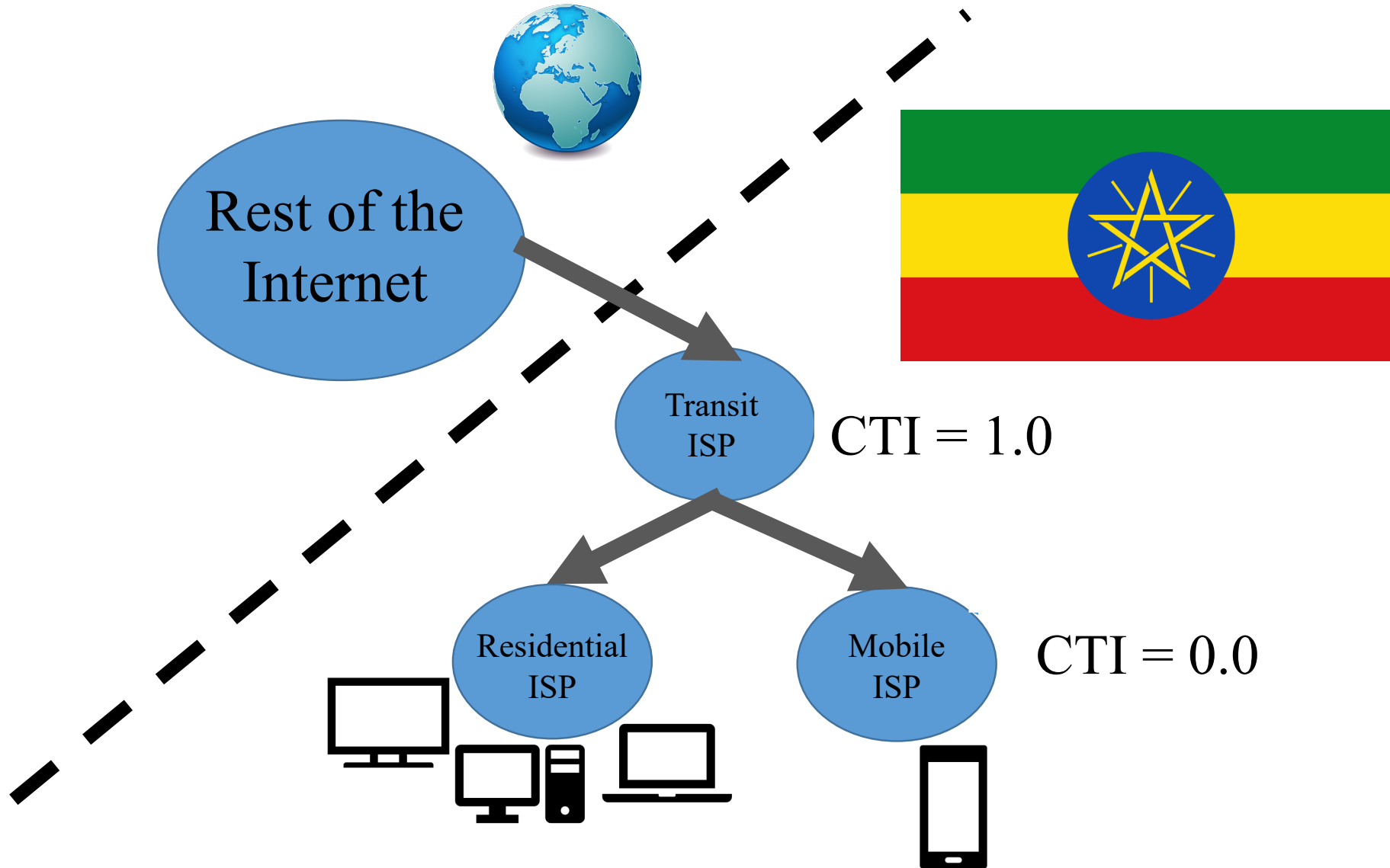By Sintia Radu Staff Writer   June 21, 2019, at 11:14 a.m.

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.
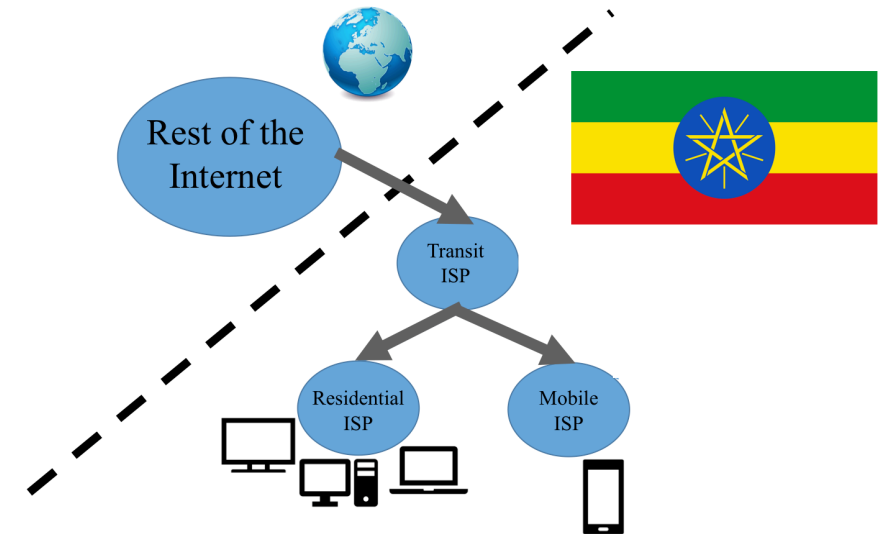
2

Country-Level Transit Influence (CTI)

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

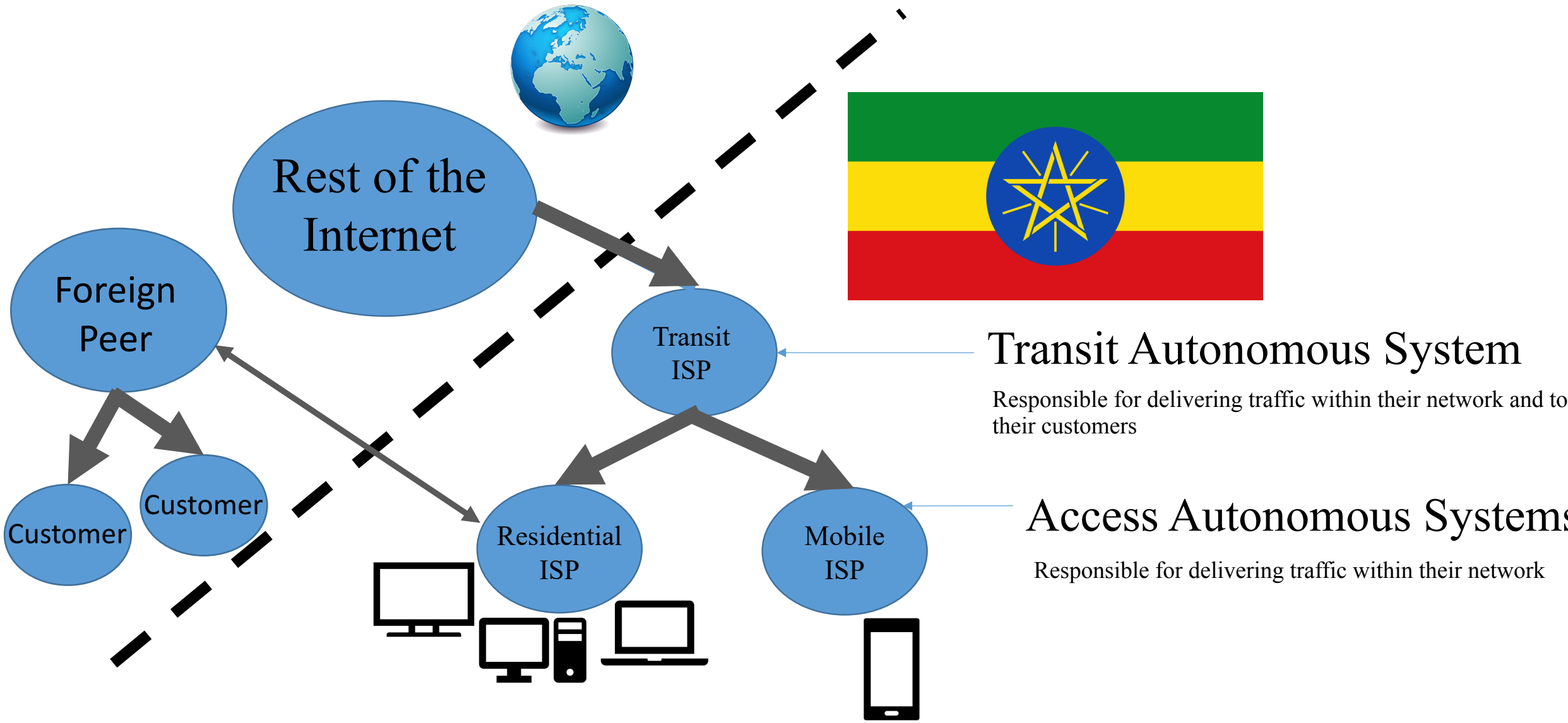Responsible for delivering traffic within their network

Country-Level Transit Influence (CTI) ~ [0,1]

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
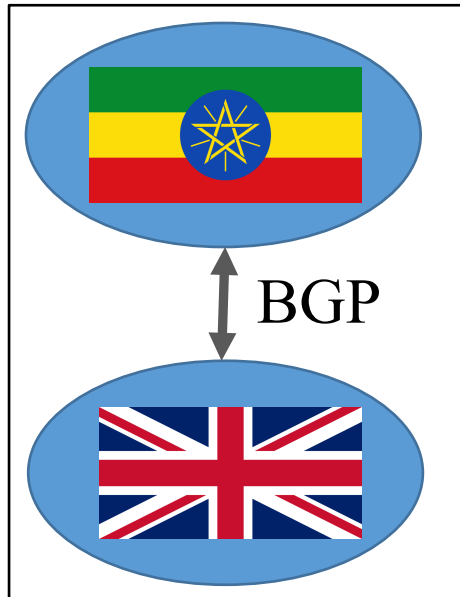
Country-Level Transit Influence (CTI)

Source of Complexity: Peering Links

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***
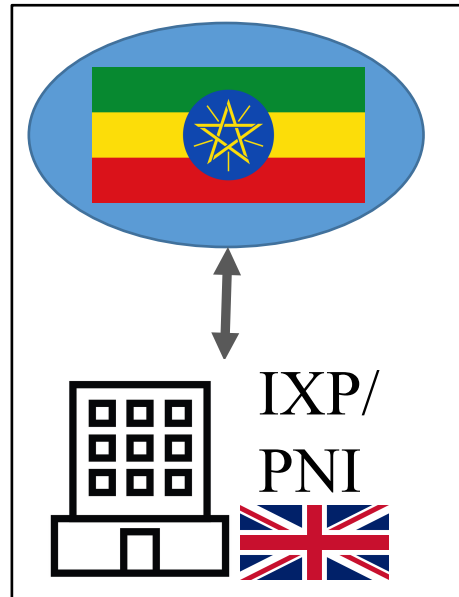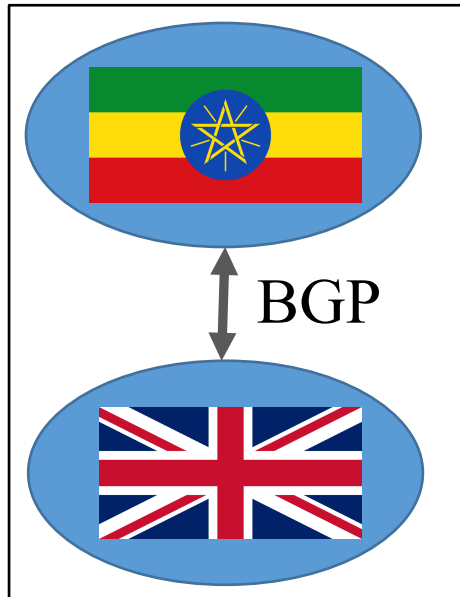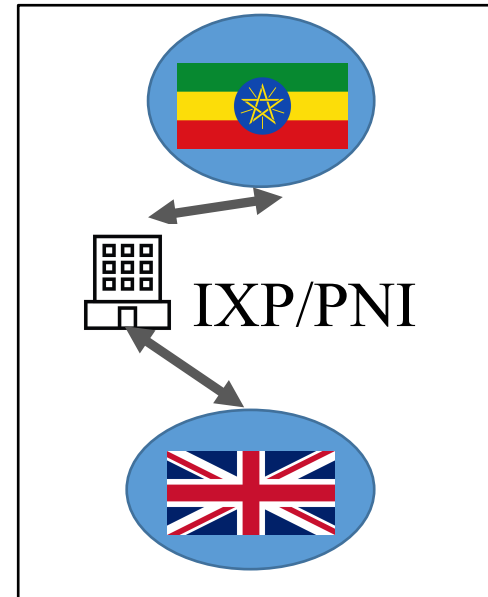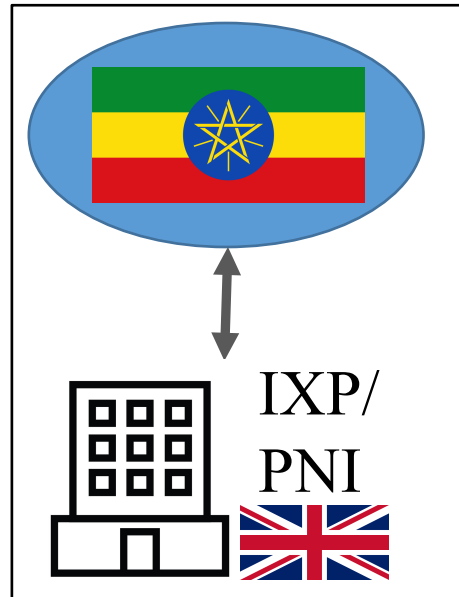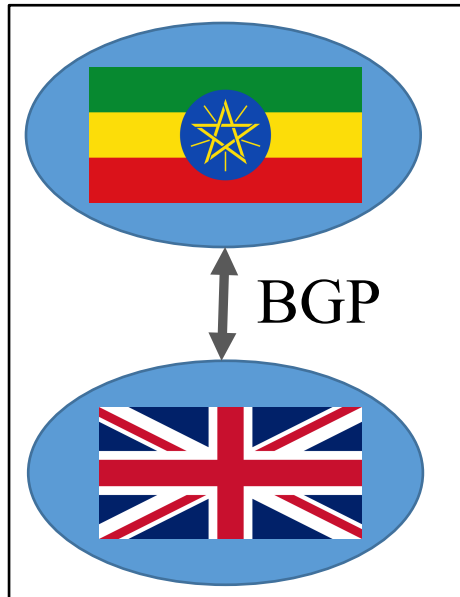
Condition

Data

| RV Prefix2AS | Netacuity Geoloc | AS-Relationships |

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*

CAIDA IXP: Hurr. Electric, PCH, PeeringDB
PNI from PeeringDB
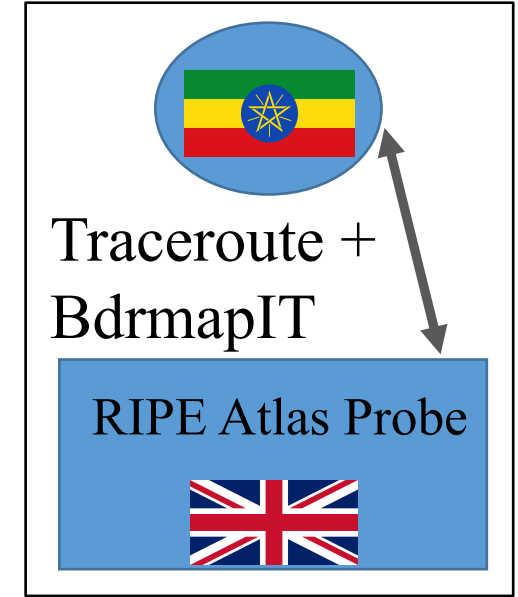
RV Prefix2AS   Netacuity Geoloc   AS-Relationships

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*

CAIDA IXP: Hurr. Electric, PCH, PeeringDB
PNI from PeeringDB

Condition		
BGP	IXP/PNI	IXP/PNI

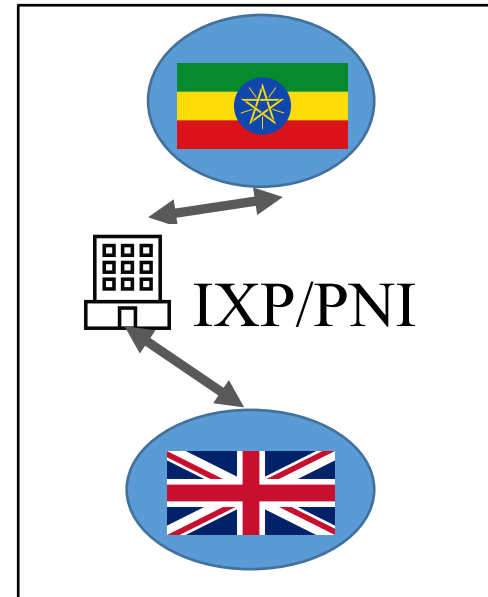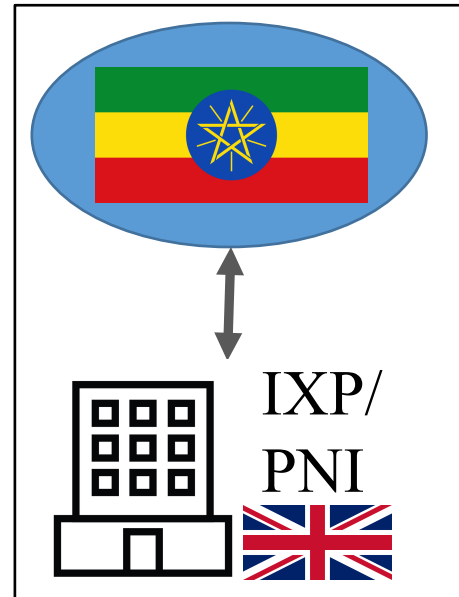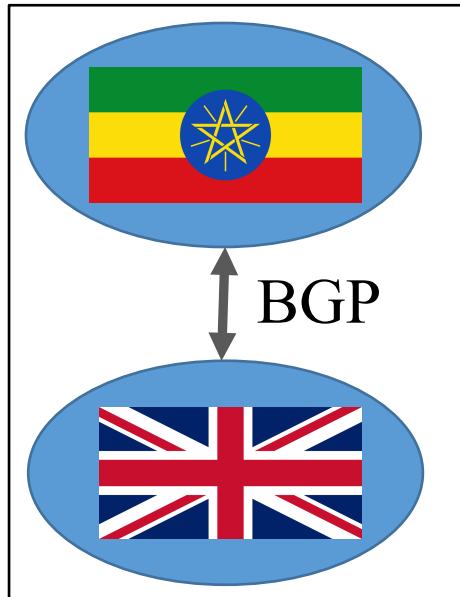| Data		
RV Prefix2AS	Netacuity Geoloc	AS-Relationships

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***

Condition

BGP

IXP/PNI

IXP/PNI

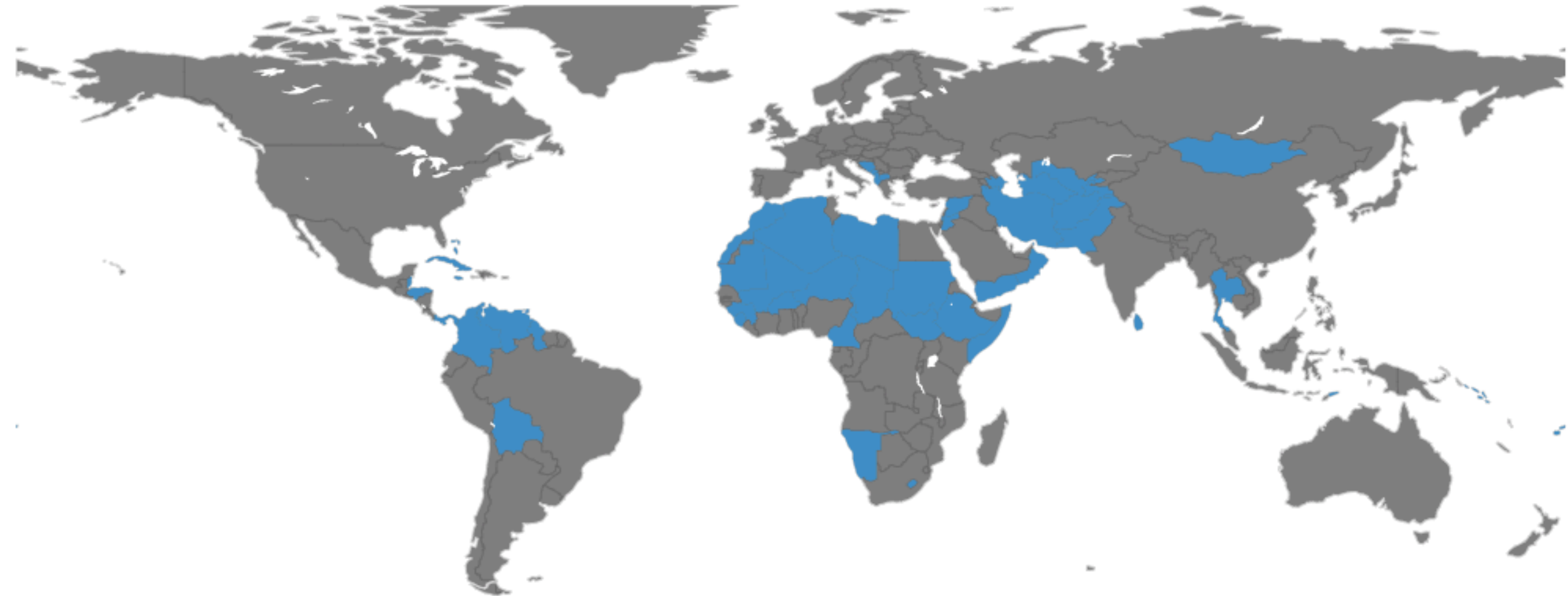Traceroute + BdrmapIT

RIPE Atlas Probe

CAIDA IXP: Hurr. Electric, PCH, PeeringDB
PNI from PeeringDB

RIR Delegation
RIPE Atlas Public Traceroutes

Data

RV Prefix2AS

Netacuity Geoloc

AS-Relationships

Non-international-peering Countries
Candidates Based on Passive Measurements Only

Ethiopia's Country-Level Transit Influence, Jan. 2020
Pop. 105 million

Top Transit AS	Country of Operation	Owner	CTI
30990-DJIBOUTI TELECOM S.A.	Djibouti	Djibouti	0.58
3356-Level 3 Communications Inc.	Multinational (US)	Private	0.22
33788-Kanar Telecommunication	Sudan	UAE	0.21
15706-Sudatel Telecom Group	Sudan	Sudan	0.13
174-Cogent Communications	Multinational (US)	Private	0.12
33771-Safaricom Limited	Kenya	Kenya	0.06

https://afterfiber.nsrc.org/
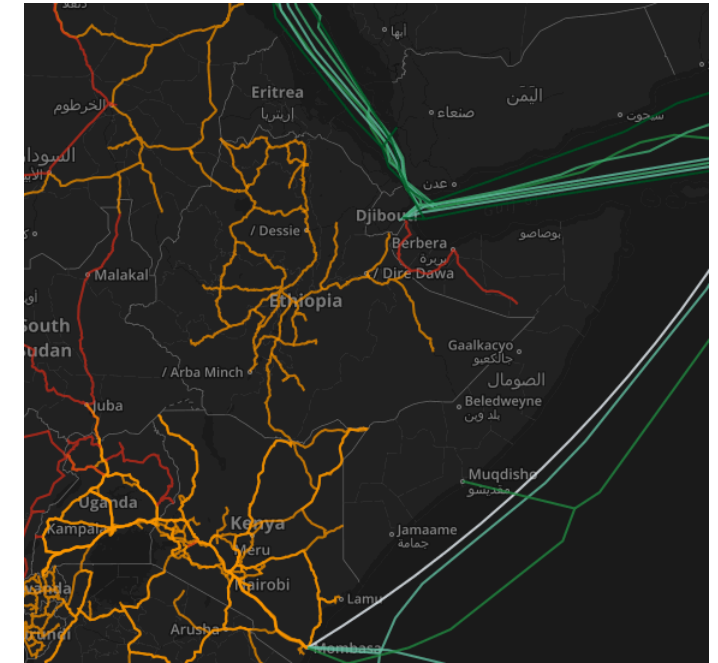
- Our metric's ranking of Ethiopia's most influential transit ASes reflects physical properties (i.e., landlocked, no access to undersea cables), and also concentration of ecosystem.

- 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.