# The Socio-Economic Impact of the Internet Shutdown in Sudan

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# Executive Summary

This report explores the socio-economic impact of the June to July 2019 Internet shutdown in Sudan. The first section of the report highlights findings from a network measurement analysis, while the second examines the socio-economic impact of the Internet shutdown. For this study, network measurement is defined as the process of measuring the amount and type of traffic on a particular network. The study uses three primary network measurement tools in its analysis: IODA, Google Transparency, and OONI. IODA and Google Transparency reports identified Internet outages that occurred amid the Sudanese revolution[1], while OONI network measurement data determined the blocking of social media and other specific sites or applications. These tools showed when the Internet shutdown occurred, and thus provided evidence of the shutdown. The data was collected via key informant interviews, surveys, social networks analysis, and NGO reports. This report is in partnership with Internews' OPTIMA training fellowship on network measurement tools.

**Probed ISPs:** MTN SD (AS36972), Zain SDN (AS36998), Sudatel (AS15706) and Canar telecommunication "Kanartel" (AS33788).

# Introduction

This report defines an Internet shutdown as an intentional disruption of Internet-based communications that renders them inaccessible or effectively unavailable for a specific population, location, or mode of access, often to exert control over the flow of information.[2] In many countries, including Sudan, Internet shutdowns are largely driven by political and national security concerns. It is important to note that the United Nations considers cutting off Internet access - regardless of the justification provided, including on the grounds of violating intellectual property rights law - to be disproportionate and thus a violation of Article 19, Paragraph 3, of the International Covenant on Civil and Political Rights. The United Nations also calls upon all States to ensure that Internet access is always maintained, including during times of political unrest.[3]

Internet access across Sudan is on the rise and the number of mobile connections increased by 456,000 (+1.4%) between January 2020 and January 2021, reaching 76.0% of the total population by January 2021.[4] In February 2020, social media penetration in Sudan stood at 3.0% of the population or 1.30 million users.[5]

# Key Findings

       1. Effects of the Internet shutdown
           a. Decrease in medication availability

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[1] The Sudanese revolution
[2] Internet Shutdowns definition
[3] Report of the Special Rapporteur on the promotion and protection of the right to freedom of opinion and expression 2011.
[4] Digital 2021: Sudan
[5] Digital 2020: Sudan

      b. Job loss

      c. Loss of scholarship opportunities for students

      d. Operational shutdowns for many startup businesses

      e. Decreased growth rate for many major companies

2. Total economic loss due to the shutdown approached more than $1 billion

3. Economic loss for individuals and companies exceeded $750 million.

## Internet Freedom in Sudan

Sudan scores low on Freedom House's "Freedom on the Net 2020" report S at just 30 on a scale of 0 (least free) to 100 (most free).[6] Sudan has a history of Internet censorship and surveillance. In 2011, Sudan's National Intelligence and Security Service established a "Cyber Jihadist Unit," a special unit that uses an imported remote-control system (RCS) and sophisticated computer spyware to manipulate information to spy on government opponents, journalists, human rights activists, and youth groups. In 2014, it was found that the Cyber Jihadist Unit had been using advanced equipment imported from Italy to filter web content, censor Internet communications, and spy on political opposition and journalists.[6]

## Internet Shutdown History in Sudan

Sudan has a troubling history with network interference and has implemented full scale Internet shutdowns, Internet throttling[7] and censorship.[8] Over the past decade, the Sudanese people have experienced three country-wide Internet shutdowns. The first was in 2013[9] amid fuel protests, the second was in 2019[10] after the massacre of Khartoum,[11] and the third occurred in 2020[12] during national exams.

Amid the December 2018 revolution to oust Sudan's longtime dictator, Omar al-Bashir, the Sudanese government blocked access to social media sites such as Facebook, Twitter, WhatsApp, and Instagram.[13] To circumvent the ban, citizens were able to use Virtual Private Networks (VPNs) to access social media, which allowed for the organization of protests and provided access to information about the revolution. On February 26, 2019, after two months, the government unblocked social media sites; however, digital rights activists and human rights defenders called on citizens to continue using VPNs for privacy purposes.

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[6] Freedom house 2020 report

[7] Internet intelligence tweet

[8] Surveillance in Sudan

[9] https://www.indexoncensorship.org/2013/09/amidst-Internet-blackout-whats-government-sudan-hiding/

[10] https://www.washingtonpost.com/politics/2019/06/13/end-mass-protests-sudan-has-cut-off-Internet-access-nationwide-heres-why/

[11] Massacre of Khartoum

[12] Internet shutdown due to exams

[13] https://www.reuters.com/article/us-sudan-protests-Internet-idUSKCN1OW0Z7

A study conducted by Netblocks illustrates the extent to which social media sites were blocked in Sudan during the Internet shutdown (sorted by ISP and social media platform).[14] The study found that Zain-SDN, Sudan's first mobile telecom operator, had the most extensive blocking scheme, covering all key social media platforms.



NetBlocks.org Internet Measurements: Sudan, morning of 21 December 2018

*NetBlocks.org Internet Measurements: Sudan, morning of 21 December 2018*
**Note:** This data was collected on December 21, 2018. Measurements could have changed in the time since.

After the massacre of Khartoum, the Transition Military Council ordered telecom companies in Sudan to turn off mobile data to prevent activists and media agencies from sharing the human rights violation with the world.[15]

On the morning of September 16, 2020, Zain-SDN subscribers received an SMS message announcing that there would be an Internet blackout between 8:00 AM and 11:00 AM local time. The SMS announcement told subscribers that the blackout was meant to avoid cheating during

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[14] Netblocks study
[15] https://en.wikipedia.org/wiki/Transitional_Military_Council_(2019)

the high school exams, which are taken between September 16 and September 24.[16] The Sudanese government justified the shutdown by stating that the potential for students to cheat on the national exam was a national security concern.

## Methodology

This study analyzes OONI measurements data collected from OONI Probe users in Sudan to investigate the blockage of social media platforms during the Sudanese revolution. OONI Probe is a free and open-source tool created by the Open Observatory of Network Interference (OONI) that is used to measure various forms of Internet censorship and network interference across the world.[17] Interviews, focus groups, and surveys were used in conjunction with IODA and OONI network data to understand the economic and social impacts of Internet shutdowns. Six interviews were conducted with telecommunications companies and digital payment companies to investigate the impact that the Internet disruption had on their business.

Due to the limited number of OONI users in Sudan, this study relied on three data samples collected using the OONI explorer to prove that the Internet blocking and unblocking had taken place. The first sample timeframe is from December 15 to December 18, 2018, the second sample's timeframe is from December 19, 2018, to December 22, 2018, and the third sample's timeframe is from February 22 to February 28, 2019. The social media platforms that were tested included WhatsApp, Facebook, and Facebook Messenger. While Twitter was one of the platforms blocked, OONI Probe can only test for WhatsApp, Facebook Messenger, Signal, and Telegram applications.

The OONI Probe can test the connectivity of any website, but not any application as applications have their own endpoint which would require customization.

The OONI Probe's data quantity and availability depends on users' number of tests. Due to the small number of users in Sudan, these findings have limitations. For example, if WhatsApp was blocked on January 1, 2021, and the OONI WhatsApp test was not used, no data would appear for WhatsApp on the OONI platform on that day.

To verify the longest Internet shutdown in Sudan's history between June 3 and July 9, 2019, this study used data collected by the Google Transparency report,[18] Internet Outage Detection and Analysis data (IODA),[19] and other NGO reports.

While OONI can test application and website blockages, it cannot test total Internet disruption. However, IODA and Google traffic data can show the Internet connectivity traffic. As such, this

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[16]https://smex.org/noexamshutdown-4-mena-countries-shut-down-the-Internet-so-far-to-fight-cheating/#:~:text=ZAIN%20Sudan%20explained%20that%20the,continue%20until%20September%2024%2C%202020 20

[17]OONI

[18]Google transparency report

[19]IODA

study uses OONI to verify the social media blockage, with IODA and the Google Transparency report to verify the Internet blackout.

Sudan's Minister of Telecommunications and Digital Transformation was interviewed for this study and asked about his vision to enhance Sudan's digital freedom score. Additionally, business owners whose businesses rely on the Internet were also interviewed. Surveys were conducted to collect data from 231 random samples to include diverse perspectives.

# Findings

The following data measure whether an Internet disruption occurred between June 3 and July 9, 2019, and a social media blockage between December 19, 2018, to February 26, 2019.

## Social Media Blockage

To verify the social media blockage during the period mentioned above, OONI was used to identify the blocked social media platforms. Each sample refers to a specific timeframe in which OONI data was collected during the period of Internet shutdown.

**Key Findings**
- First sample
  - The data from the OONI explorer show that WhatsApp and Facebook were accessible both from Zain and Sudatel during the first timeframe. MTN and Canar do not appear to have any data, indicating that no tests were conducted by OONI Probe users from these networks during the time in question.
- Second sample
  - The second sample shows that WhatsApp was blocked by all ISPs while Facebook Messenger remained accessible.
- Third sample
  - The third sample shows that WhatsApp was accessible after February 25, 2019, in all ISPs except Canar. Moreover, Facebook Messenger was accessible after February 25, 2019, in all ISPs except Canar.

To see the detailed results of network measurement tests during the period before the revolution, see Appendix A.

## Internet Outage "Shutdown"

On June 3, 2019, mobile data was turned off in Sudan. To shut down the Internet, authorities disabled the "Access Point Name," or APN, in the mobile data network. This technique causes the data sign on users' phone screens to disappear. As a result, the only Internet access point in Sudan during the shutdown was through the fixed line Internet via optical fiber and wireless leased line through Canar and via optical fiber and ADSL connection "fixed phone line" through Sudatel. Sudan has four main ISPs,[20] three have GSM mobility license, Zain, MTN and Sudatel,

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[20] ISPs in Sudan

while Canar has a fixed line license. This proves that this Internet shutdown only affected mobile data. From the perspective of the Sudanese government, the decision to restrict mobile data and not fixed line internet access may be seen as a tactical move, as companies holding fixed-line Internet licenses would still be able to operate while the majority of internet users in the country (using mobile data) would be blocked.

The Internet disruption was visible on public Internet traffic monitors such as Google traffic data,[21] Internet Outage Detection and Analysis (IODA),[22]and Oracle Internet Intelligence Map. For this report, IODA and Google traffic data were used to verify the Internet outage.

**Google Traffic Data**
Google traffic data provides near real-time information about traffic to and from products and services around the world. Each chart shows historic traffic patterns for a given geographic region and product.

This study divides measurements to two levels. First, network outages were measured at the state level, and then at the ISP level.

**Internet Outage Detection and Analysis (IODA)**
The Internet Outage Detection and Analysis (IODA) is a project by the Center for Applied Internet Data Analysis (CAIDA)[23] that measures Internet outages. IODA monitors the Internet in near-real-time to identify macroscopic Internet outages affecting the edge of the network, i.e., significantly impacting a network operator (AS) or a large fraction of a country. The IODA system processes and analyzes measurements from three main sources, Global Internet routing (BGP),[24] Internet Background Radiation,[25] and Active probing. Access to IODA's measurements is available for free on their Dashboard, enabling users to explore Internet disruptions sorted by country, region, and AS level.

**Internet Outage on the State-level**
This section provides a clear analysis using Google traffic data and IODA to show the drop in Internet usage when the shutdown began on June 3, 2019, continuing for 37 days until the Internet was restored on July 9, 2019.

**Findings**
- *Google traffic data*
    - Google report shows that there was a reduction in web search requests from Sudan to Google servers, providing evidence of an Internet outage.
- *IODA*

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[21] Google traffic data
[22]  IODA
[23] CAIDA
[24] BGP
[25] https://en.wikipedia.org/wiki/Internet_background_noise

o Due to the ability to access the Internet through a fixed line during the shutdown, IODA data for Sudan in these samples does not show that there was total Internet disruption. The shutdown in Sudan was only for mobile data.
  ▪ Continuous connectivity provided by Canar and Sudatel, IODA data shows there was not a big drop in the signals coming from Sudan as a whole.
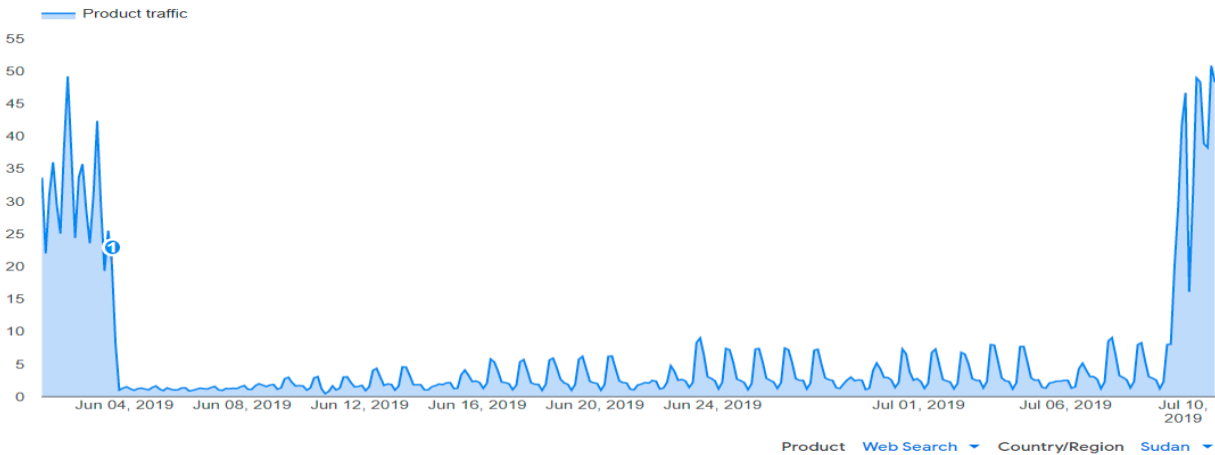


The above chart provides information about the traffic to and from Google's web search server from Sudan between June 1, 2019, and July 10, 2019.[26] The findings indicate that there was a clear drop in Sudan's web search requests to Google servers on June 3, 2019, continuing for 37 days until July 9, 2019, when the Internet was restored and the rate of web searches via Google rebounded.

**Internet Outage on ISP level (AS level)**
**Findings**
- Zain and MTN experienced a total blackout because they only provide Internet service through mobile data which was off.
- Sudatel and Canar had continuous Internet traffic with fewer users because they provide Internet service through a fixed line.
To see the network measurement outputs behind these findings, see appendix C.


## Economic Impact

In their 2018 report, the Sudanese Telecommunication and Post Regulatory Authority (TPRA)[27] confirmed that the telecommunication industry constitutes 14% of the Sudanese economy. This study seeks to find the economic impact of the 37-day Internet shutdown, both inside and outside of Sudan.

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[26] Google traffic data on Sudan in the test period
[27] TPRA

**International Reports**

- Top10VPN.com:[28]
    - Top10VPN.com publishes annual reports on the Global Cost of Internet Shutdowns around the world. They determine the duration of the restrictions and use the COST tool[29] to calculate economic impact using indicators from the World Bank, ITU, Eurostat, and the US Census. In their 2019, report Top10VPN.com provided the following information about the financial impact of the Internet shutdown in Sudan:
        - The duration of the Internet blackout was 864 hours.
        - The duration of the Internet social media shutdowns were 696 hours.
        - According to their findings, Sudan lost $1,866.3 million dollars.
- Internet Society:[30]
    - In their report entitled "Internet Shutdowns, an Internet Society Public Policy Briefing," the Internet Society Organization estimated that the month-long Internet shutdown in June 2019 in Sudan cost the country over $1 billion dollars, or nearly one percent of the country's GDP. The Internet society elicited this value through the methodology of the 2016 Deloitte study, which states:

        *"The impacts of a temporary shutdown of the Internet grow larger as a country develops and as a more mature online ecosystem emerges. It is estimated that for highly Internet connected country [Internet penetration >79%], the per day impact of a temporary shutdown of the Internet and all of its services would be an average of $23.6 million per 10 million population. With lower levels of Internet access, the average estimated GDP impacts amount of $6.6 million and $0.6 million per 10 million population for medium [Internet penetration 49-79%] and low [Internet penetration <49%] Internet connectivity economies, respectively."*

- *Aljazeera*:[31]
    - *Aljazeera* said that during the 37-day period, the losses of companies and individuals with Internet connections exceeded $750 million dollars.

**Domestic Data**

To understand the financial impact of the Internet disruption in Sudan, this study draws on interviews with companies and business owners.

- Syber Pay:[32]

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[28] Global Cost of Internet Shutdown
[29] COST tool
[30] Internet Society report
[31] Aljazeera article
[32] Syber Pay

- o Syber Pay is one of the biggest online payment companies in Sudan and allows for its customers to pay for goods, services, and even donations using their ATM & cash cards. Mohamed Alsayed, the Marketing senior manager in Syber Pay, was interviewed for this study, and asked about how the Internet shutdown affected the company's business operation. Mohamed said the following:
- o "The Internet shutdown impact really came negative to our company operations. The company's revenue decreased by 60% and the profit decreased by 66%. In comparison with the previous period, the growth rate was 7%, but during the shutdown period it has decreased to **-45%**. The company has many projects with charities, and it was stopped due to the Internet shutdown. There was no big change in operation cost that happened because of the Internet disruption. The company didn't fire any of its employees because of an Internet shutdown."
- Zain Sudan:[33]
  - o Zain is the largest ISP in Sudan and is a member of Zain group, a telecom group that works in the Middle East. Zain holds 55% of the Sudanese telecom market share.
  - o The Business Excellence director of Zain, Mohamed Shareif provided the following:
    - The direct loss of Zain during the shutdown period was $4.36 million dollars which equals 26% of the company's monthly revenue. As a result, the government lost $1.79 million from TAXs and other deductions.
    - The growth percentage became Zero percent while it was between 3 to 4 % monthly.

**Other Indirect Losses**
- Operation cost including the cost of Internet from the Internet provider inside and outside Sudan.
- The legal cost for any fines that can be imposed to the company by the judge as a compensation for service disruption.
- Getting a bad reputation in the market.

Through the surveys conducted for this study, it was found that many people lost business opportunities, scholarships, and missed job opportunities due to the Internet disruption.

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[33] Zain Sudan

## Number of people whose lost financially
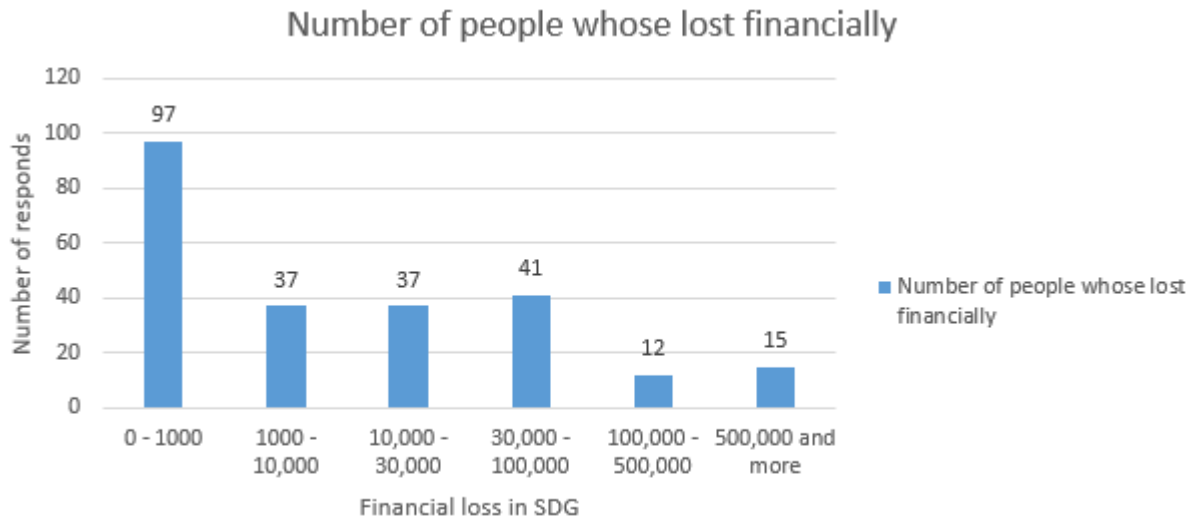


**Note**: In the period of the Internet shutdown, $1 USD equals 45.4 SDG "Sudanese Pound."

## Social Impact

To understand the impact of the Internet shutdown on Sudanese Society, surveys were distributed and interviews with citizens were conducted to evaluate potential social costs. As a result of the Internet shutdown, these respondents report that they lost communication with their relatives, friends, and business contacts. This study shows the impact that the Internet disruption had on Sudanese society from different perspectives through interviews and data collected from social media.

### Health

Sudan is facing shortage in medicine availability[34] which has led people to use social media platforms to locate necessary medicines. Respondents for this research report that the Internet disruption exacerbated the difficulties many Sudanese have in obtaining life-saving medicines.

Randa Alsayigh, a supply chain officer for a private medication company in Sudan mentioned that the Internet shutdown affected the drug's availability as many of the drug companies couldn't communicate with their suppliers outside Sudan. Even inside Sudan, the companies had problems communicating with the governmental Medical Supplies Fund to exchange invoices and correspondence in order to provide the fund with the needed medications.
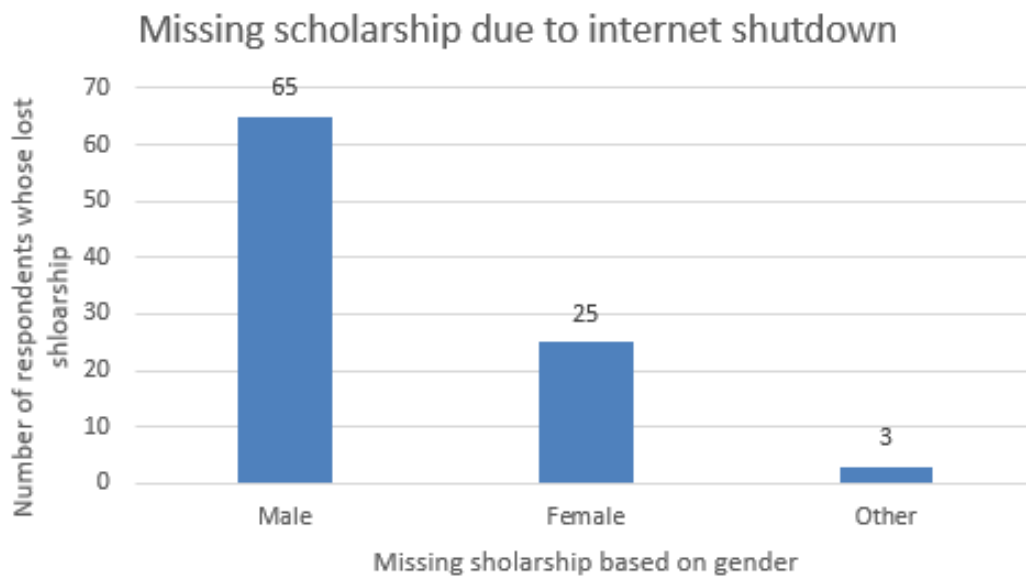
### Education

The internet shutdown had far reaching impact on the education sector and on Sudanese citizens seeking to expand their knowledge and skills through higher education and study abroad opportunities.

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[34] Shortage of Medicine in Sudan

Mishal Ameeri was studying for his degree in Internal medicine at University of Edinburgh. As a doctor working with the Hadreen initiative, he was conducting research on the health impact of the Sudanese revolution and studying remotely from Cairo, Egypt. When Mishal travelled to Sudan on the morning of July 5, 2019, he found the internet was out of service. He was forced to inform his university that he would need to pause his studies indefinitely due to the lack of internet access in Sudan.

In addition, the survey data shows that there are many students and scholarship seekers who lost scholarship opportunities because they could not access the internet to complete their submission applications or communicate with their targeted education institutions. The survey results show that ninety-three respondents report losing scholarship opportunities due to the internet shutdown. The below chart shows how the Internet shutdown impacted the education progress in Sudan with respect to scholarship opportunities based on gender.



*The above chart shows how the Internet shutdown impacted the education progress in Sudan with respect to scholarship opportunities based on gender.*

Motaz Abugsaisa,[35] an Economist in the Central bank of Sudan, explained the communication difficulties he faced during the Internet shutdown period. Motaz was accepted to study for a master's degree in public administration at Columbia University in New York City. In order to obtain a visa to travel to the United States, Motaz had to complete the registration process online. However, due to the Internet shutdown, he was unable to complete all the necessary requirements. In many cases, this would have resulted in the loss of his scholarship opportunity.

Fortunately for Motaz, a friend of his had graduated from the same university while in Saudi Arabia. After placing an expensive international call to his friend in which Motaz was able to

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[35] Motaz Abugsaisa

explain his predicament, his friend wrote to the academic coordinator at the university. The academic coordinator granted Motaz an excuse and expressed his regret for the situation in Sudan. As a direct result of the Internet disruption, Motaz was three weeks late to his degree program which caused him to fall behind.

**Media and Journalism**

Hussam Haider, a well-known Journalist in Sudan, said: "During the period of the Internet being cut off by order of the Military Council, my work as a reporter was greatly affected in terms of covering and sending news, and there was great suffering in finding an Internet service. At the time, we were looking for companies or institutions that have a terrestrial Internet service, for example, and that required roaming in most parts of the capital to find coverage. Also, I lost contact with the TV channel I was working in, lost an employment opportunity, because the Internet was interrupted, and I lost my job, consequently, due to poor communication and the ability to perform well."

Sudanese Bloggers Network[36] stopped its operations to share the human rights violations and defend the media freedoms due to the Internet shutdown.

The timing of the Internet shutdown in June 2019 limited the spread of information about the massacre of Khartoum online, including evidence of abuses perpetrated by security forces, especially the Rapid Support Forces (RSF)[37] which killed 127 protestors, injured hundreds more, and sexually assaulted dozens.[38]
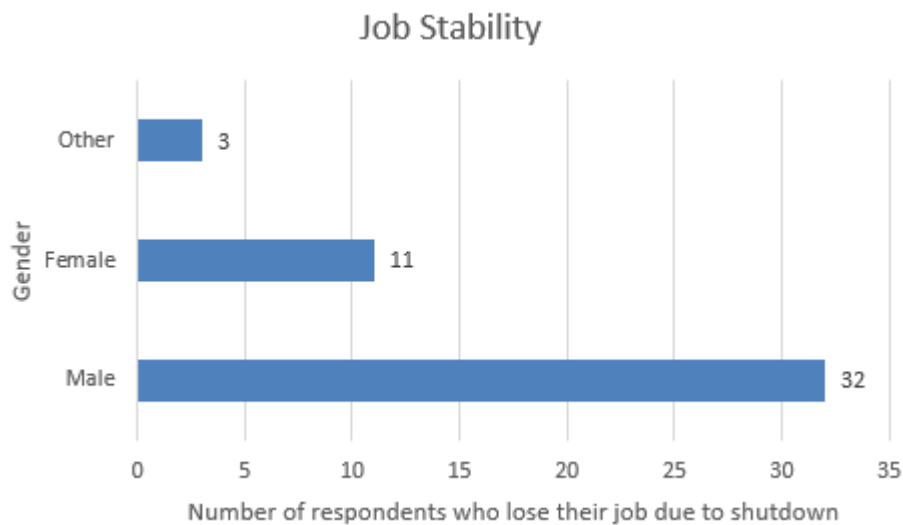


*The above chart shows the impact of the Internet shutdown on job stability by gender.*

[36] Sudanese bloggers network
[37] Rapid Support Forces
[38] https://www.theguardian.com/world/2019/jun/11/sudan-troops-protesters-attack-sit-in-rape-khartoum-doctors-report

**Startup Businesses**

With the internet shutdown lasting for thirty-seven days, many businesses that rely on digital services and transnational linkages suffered significant losses. Waleed Ahmed, a blogger who tried to establish his own business in Sudan, said that due to the Internet shutdown he had to shut down his business for 37 days and ultimately lost all of his customers during this time.

Mohalab Hamdan, the founder of <u>The S</u> digital marketing company said that the internet shutdown had a negative impact on their startup company. As an organization working on digital services for international clients their contracts are issued on annual basis and they take their payment on a monthly basis. Without internet for more than a month, their work was basically stopped and lost all of their expected monthly earnings. . The revenue of the company was between three to ten thousand Saudi Arabian Riyal (SAR) "almost 800 to 2666 USD" and the company lost this revenue for the period of the internet shutdown.

 In addition to that, the company faced penalty clauses in their contracts that affect the company's assets.  "We lost many employees for not being able to pay them. After internet recovery, we faced another loss due to the high rate of inflation," Mohalab said. After the internet shutdown ended, the company was forced to move its office location from a unique and prime location due to the high cost of rent, and the company even sold some of its furniture to cover some of these losses. According to Hamden "It's been like establishing a new business", as they struggled to regain their clients after suffering reputational damages during the shutdown and risks facing another shutdown.

## Government Opinion on Internet Shutdowns

Since August 2019, Sudan has been ruled by a transitional government that came as a result of a revolution called to sustain freedom, peace, and justice. When the government took power, citizens were optimistic that the precedents of the previous regime would not be repeated, but the government quickly showed a willingness to continue to cut off the Internet. To understand the government's plan to prevent the possibility of an Internet shutdown, this report draws on an interview conducted with the Minister of telecommunication and digital transformation Eng. Hashim Hasabelrasoul.[39] The minister explained that the government has created a committee to revise old ICT legislations and policies including those related to the Internet shutdown. Indeed, Hasabelrasoul said that the Internet will not be shut off without a legal decision related to national security.

"National security" is a vague term that poses many questions and concerns.  The government must provide a clear definition so that it is not used as a justification for cutting off the Internet, among other digital violations. The minister mentioned that this is being worked on to avoid such privacy or Human rights violation. He also mentioned that they are working to establish a new authority to monitor the security forces with the hopes that this helps avoid any potential abuse of ICTs.

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[39] [Minister of Telecommunication](#)

In terms of the ministry's vision to develop the ICT field, the minister said that telecom coverage only covers 48% of the population. Now, their priority is to deliver telecom service to isolated citizens to let them work, learn and communicate through the Internet.

## Conclusion

In Sudan, the continued cutting of the Internet creates material and moral losses that affect society. The government is working on legal reforms that limit Internet shutdowns and provide Internet service to areas that have so far been isolated from advanced communication.

Civil society in Sudan is working to advocate against Internet shutdowns and the laws that provide justification for the government's violation of privacy and digital rights.

## Recommendations

**For Civil Society and its Donors**

- NGOs should press the government to guarantee the right to access information. For this, they should consider the Internet as a tool to access information.
- Urge the government to be transparent with telecom companies by letting them publish connectivity data like other international ISPs.
- Provide training for people and human rights defenders on network measurement tools. There is not enough data in the telecom sector, so there's a real need to collect more data.
- Train human rights defenders on how to document human rights violations during network disruptions.
- Investor stakeholders should press the government by showing the losses that they faced during any Internet shutdown period and legally threaten the government.
- Develop tools and methodologies to better and more consistently determine the economic impact of shutdowns. Current methodologies lead to divergent estimates, and accurate numbers could lead to government behavior change. Through this research, authors tried to assess the losses of the banking sector during the shutdown, but we couldn't get any information from this sector.

**For the Sudanese Government**

- The government must keep Internet connectivity and any other form of communication up and running to prevent financial losses.
- Legal reforms should be made to guarantee digital rights and criminalize shutting down the Internet for any reason.
  - Enact a law that guarantees privacy and data integrity:
    - The current legal framework for ICTs that addresses digital rights issues is the cybercrimes law of 2020 (which was based on the unsuccessful cybercrimes law of 2018). The law has many shortcomings as it gives the government the authority to violate privacy under the permission of the

judiciary or prosecutorial or other "designated authority." [40]   It also criminalizes network shutdown if a citizen is responsible but does not mention if the government cuts off network access.

**For the Sudanese Telecommunication and Internet Companies**
- The telecom companies should press on the government legally by filing lawsuits against the government to compensate for previous financial losses from Internet cuts.
- Also, the telecom companies should work together towards amending the telecommunication operation license to make the companies independent as much as possible which will give the ISPs the power to ignore any shutdown order in future.

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[40] Cybercrimes law shortcomings

# Appendices

**Appendix A: Test Results – Social Media Blocking During Revolution**

**First Sample: Blockage of social media platforms before the revolution**
**WhatsApp**
- MTN SD (AS36972):[41]
  - No results found
- Zain SDN (AS36998):[42]



- Sudatel (AS15706):[43]



- Canar (AS33788):[44]
  - No results found

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[41] First sample of MTN SDN (AS36972) for WhatsApp
[42] First sample of Zain SD (AS36998) for WhatsApp
[43] First sample of Sudatel (AS15706) for WhatsApp
[44] First sample of Canar (AS33788) for WhatsApp

**Facebook Messenger**
- MTN SD (AS36972):[45]
    - No results found
- Zain SDN (AS36998):[46]



- Sudatel (AS15706):[47]
    - Accessible, "The previous snapshots were to show how the test result appears"
- Canar (AS33788):[48]
    - No results found

Second Sample: Blockage of Social media platforms amid the revolution

| ISP (ASxxxxx) | WhatsApp accessibility | Reference | FB Messenger Accessibility | Reference |
|---|---|---|---|---|
| MTN (AS36972) | Inaccessible most of tests<br><br>Accessible at 20:24 UTC 21 Dec 2018 | https://explorer.ooni.org/search?until=2018-12-22&since=2018-12-19&probe_cc=SD&probe_asn=AS36972&test_name=whatsapp | Accessible on 21 Dec 2018 | https://explorer.ooni.org/search?until=2018-12-22&since=2018-12-19&probe_cc=SD&probe_asn=AS36972&test_name=facebook_messenger |
| Zain (AS36998) | Inaccessible | https://explorer.ooni.org/search?until=2018-12-22&since=2018-12-19&probe_cc=SD&probe_asn=AS36998&test_name=whatsapp | Accessible<br>Inaccessible at 08:45 UTC 21 Dec 2018 | https://explorer.ooni.org/search?until=2018-12-22&since=2018-12-19&probe_cc=SD&probe_asn=AS36998&test_name=facebook_messenger |

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[45] First sample of MTN SD (AS36972) for Facebook messenger
[46] First sample of Zain SD (AS36998) for Facebook messenger
[47] First sample of Sudatel (AS15706) for Facebook messenger
[48] First sample of Canar (AS33788) for Facebook messenger

| Sudatel (AS15706) | Inaccessible | https://explorer.ooni.org/search?until=2018-12-22&since=2018-12-19&probe_cc=SD&probe_asn=AS15706&test_name=whatsapp | Accessible on 20-21 Dec 2018 | https://explorer.ooni.org/search?until=2018-12-22&since=2018-12-19&probe_cc=SD&probe_asn=AS15706&test_name=facebook_messenger |
| --- | --- | --- | --- | --- |
| Canar (AS33788) | Inaccessible | https://explorer.ooni.org/search?until=2018-12-22&since=2018-12-19&probe_cc=SD&probe_asn=AS33788&test_name=whatsapp | Accessible on 21 Dec 2018 | https://explorer.ooni.org/search?until=2018-12-22&since=2018-12-19&probe_cc=SD&probe_asn=AS33788&test_name=facebook_messenger |

**Third Sample: Blockage of Social media platforms amid the revolution when the government unblock the social media accessibility**

| ISP (ASxxxxx) | WhatsApp accessibility | Reference | FB Messenger Accessibility | Reference |
| --- | --- | --- | --- | --- |
| MTN (AS36972) | Accessible 26-2-2019 / Inaccessible 22-2-2019 16:43 UTC | https://explorer.ooni.org/search?until=2019-02-28&since=2019-02-22&probe_cc=SD&probe_asn=AS36972&test_name=whatsapp | Results from days of 22 and 26-2-2019. Accessible on both. | https://explorer.ooni.org/search?until=2019-02-28&since=2019-02-22&probe_cc=SD&probe_asn=AS36972&test_name=facebook_messenger |
| Zain (AS36998) | (One result)Accessible 26-2-2019 | https://explorer.ooni.org/search?until=2019-02-28&since=2019-02-22&probe_cc=SD&probe_asn=AS36998&test_name=whatsapp | (One result)Accessible 26-2-2019 | https://explorer.ooni.org/search?until=2019-02-28&since=2019-02-22&probe_cc=SD&probe_asn=AS36998&test_name=facebook_messenger |
| Sudatel (AS15706) | Accessible on 26 and 27-2-2019 / Inaccessible on 25-2-2019 | https://explorer.ooni.org/search?until=2019-02-28&since=2019-02-22&probe_cc=SD&probe_asn=AS15706&test_name=whatsapp | Two results-accessible on 26 and 27-2-2019 | https://explorer.ooni.org/search?until=2019-02-28&since=2019-02-22&probe_cc=SD&probe_asn=AS15706&test_name=facebook_messenger |

| Canar (AS33788) | (One result) Inaccessible on 27-2-2019 | https://explorer.ooni.org/search?until=2019-02-28&since=2019-02-22&probe_cc=SD&probe_asn=AS33788&test_name=whatsapp | (One result) Inaccessible on 27-2-2019 | https://explorer.ooni.org/search?until=2019-02-28&since=2019-02-22&probe_cc=SD&probe_asn=AS33788&test_name=facebook_messenger |
|---|---|---|---|---|

**Appendix B: Online Traffic Data**

## Google traffic data

The below chart provides information about the traffic to and from Google's web search server from Sudan between June 1, 2019, and July 10, 2019.[49]
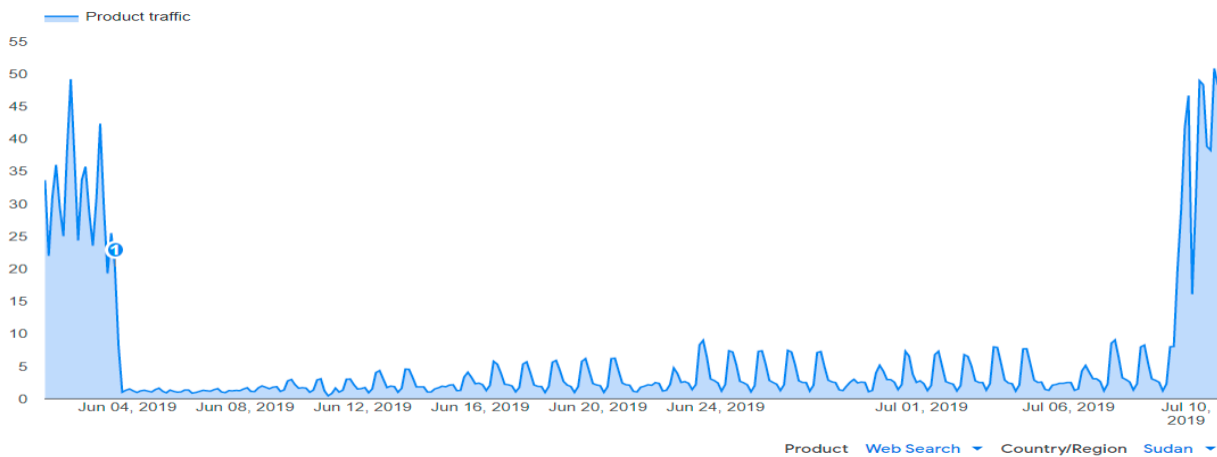


*The above graph shows that there was a clear drop in Sudan's web search requests to Google servers on June 3, 2019, continuing for 37 days until July 9, 2019, when the Internet was restored and the rate of web searches via Google rebounded.*

## Internet Outage Detection and Analysis (IODA)

- **Key findings**
  - Due to the ability to access the Internet through a fixed line during the shutdown, IODA data for Sudan in these samples does not show that there was total Internet disruption. The shutdown in Sudan was only for mobile data.
  - For IODA, two samples were taken to show that the Internet was turned-off and turned-on. This was necessary because IODA does not query data for a period greater than 30 days. The first sample's timeframe is from June 1 to June 10, 2019. The second sample's timeframe is from July 1 to July 10, 2019.

**Appendix C: Test Results – State-level Outage Data**
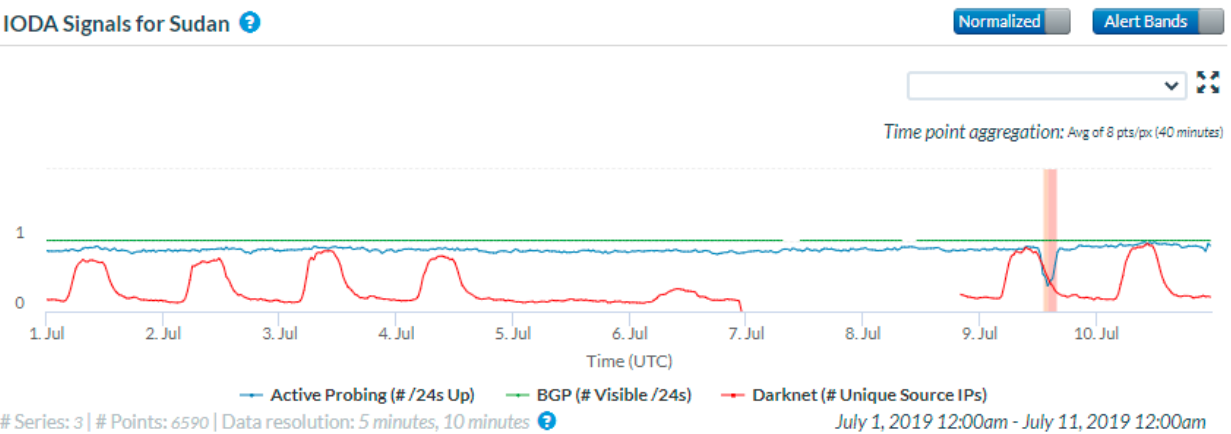**First Sample:[50]**

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[49] Google traffic data on Sudan in the test period
[50] First sample
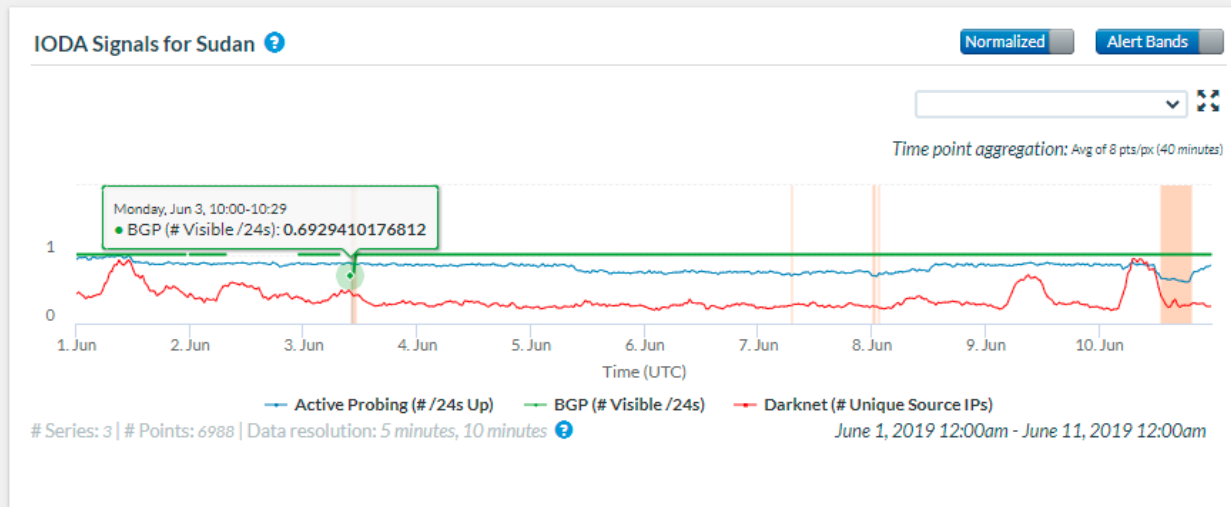
The first sample shows a drop in BGP signal, which is represented in the green signal, on the first day of the outage, June 3, 2019. BGP value decreased from 1 to 0.6. Other signals appeared to be normal.

## Second Sample:[51]



The second sample shows an outage on the day of service restoration, July 9, 2019. The green BGP signal was stable on this sample, but active probing, in blue, (0.47) and darknet, in red, (0.65) signals dropped at 01:10 UTC. On July 6, 2019, between 23:00 and 23:29, the darknet signal faced an outage and connectivity was restored on July 8, 2019 at 20:00.

IODA was used to check the ISPs performance to verify that Sudan faced an Internet shutdown during the targeted period.
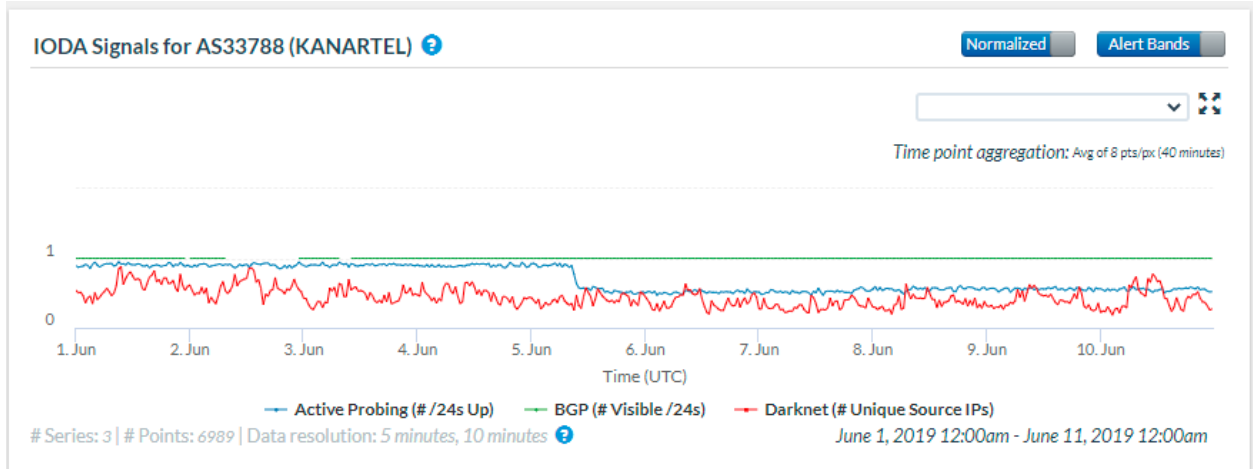
## Appendix D: Test Results – ISP Level Outage Data for Canar, Sudatel, Zain, and MTN
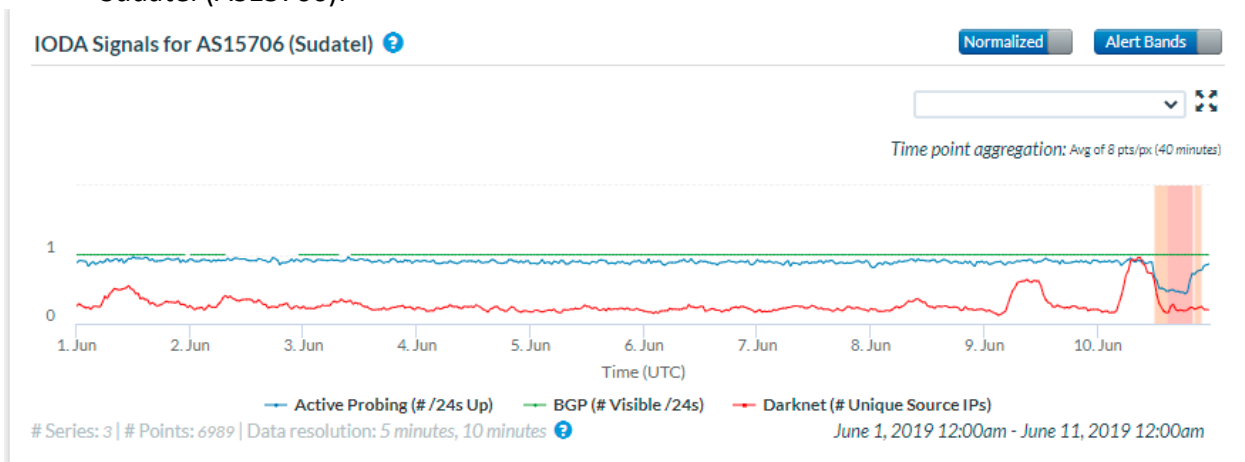
### First Sample:

- Canar (AS33788):[52]

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[51] Second sample
[52] Canar first sample

*The first sample of Canar shows that the BGP and Darknet signals were normal. The active probing signal was normal until June 5, 2019. Some reports suggest that Canar turned off LTE service two days after other operators. The active probing signal can be used to prove these reports.*

- Sudatel (AS15706):[53]



*The first sample of Sudatel shows that all signals are normal. There's a drop in Darknet and active probing on June 10 but it does not seem to be a shutdown. Sudatel provides Internet service through mobile data, Optical fiber, and ADSL via telephone line which could explain the stable signal.*
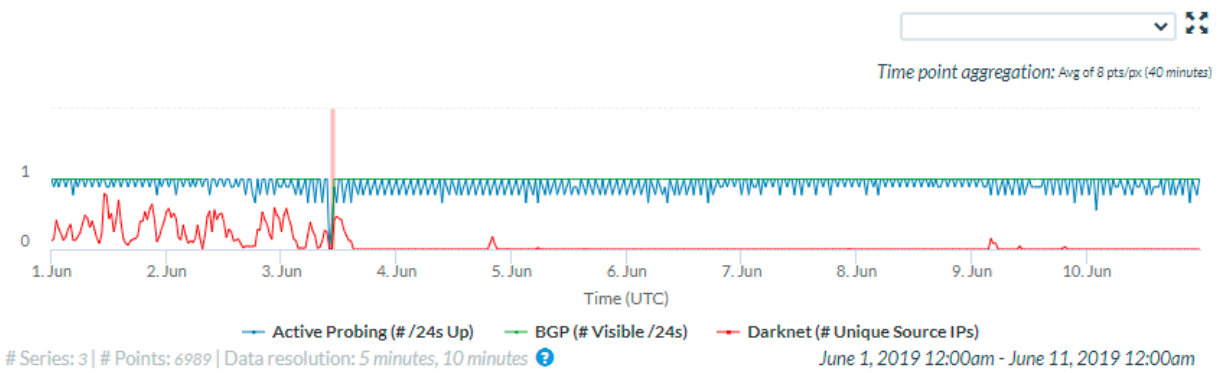
- MTN SD (AS36972):[54]

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[53] Sudatel first sample
[54] First sample of MTN
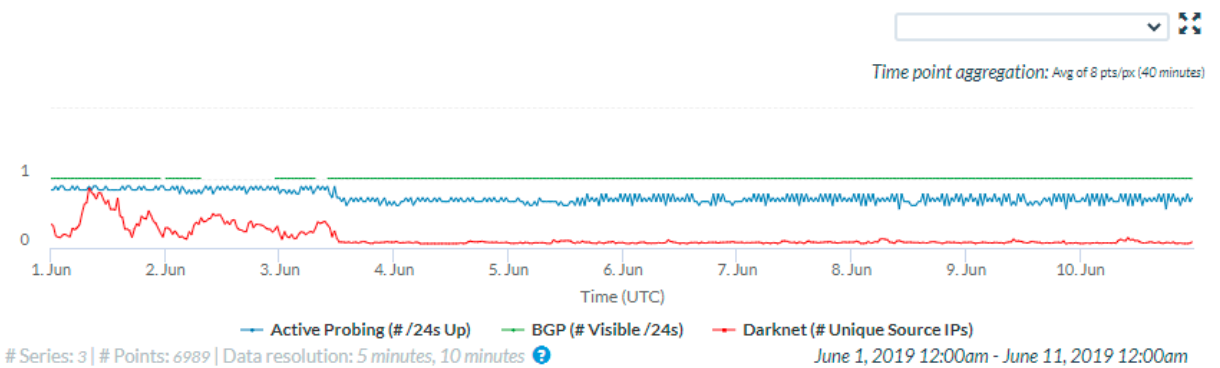
IODA Signals for AS36972 (MTNSD)

The first sample of MTN SD shows that the Darknet signal went down on the first day of the shutdown and continued. This provides evidence of a mobile data shutdown as MTN only provides Internet through mobile data.

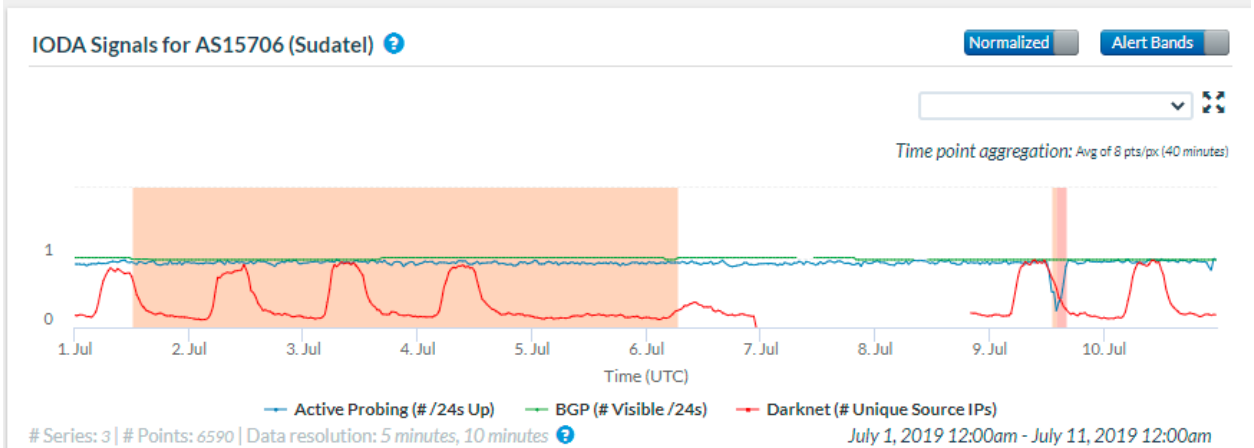- Zain SDN (AS36998):[55]



IODA Signals for AS36998 (SDN-MOBITEL)

The first sample of Zain SDN shows that the Darknet signal went down on the first day of the shutdown and continued. This provides evidence of a mobile data shutdown as Zain only provides Internet through mobile data.
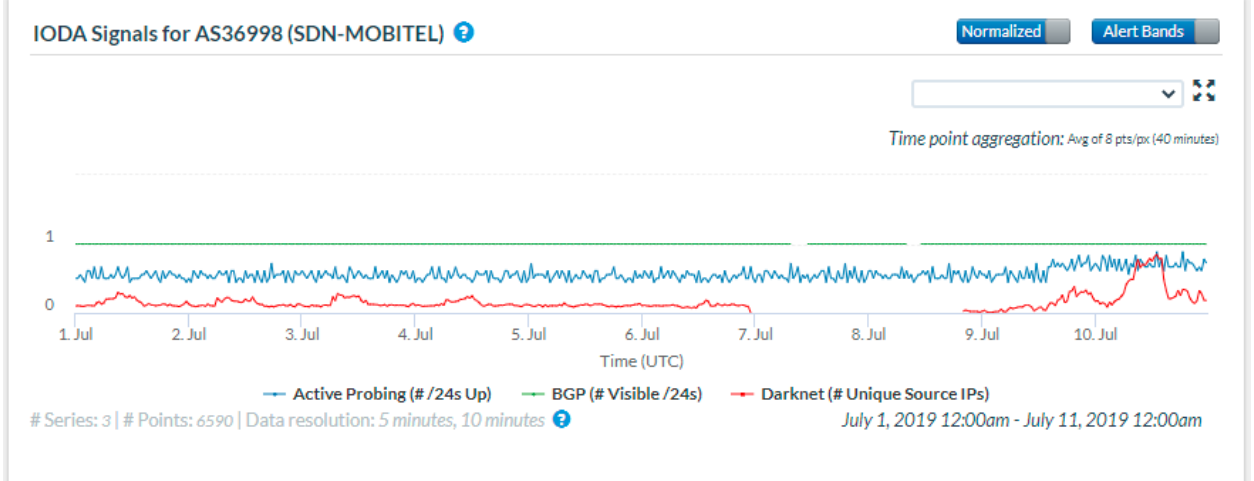
**Second Sample:**
- Sudatel (AS15706):[56]

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[55] First sample of Zain SDN
[56] Second sample of Sudatel

**IODA Signals for AS15706 (Sudatel)** ❓ | Normalized | Alert Bands

Time point aggregation: Avg of 8 pts/px (40 minutes)

— Active Probing (# /24s Up)　— BGP (# Visible /24s)　— Darknet (# Unique Source IPs)

# Series: 3 | # Points: 6590 | Data resolution: 5 minutes, 10 minutes ❓　　July 1, 2019 12:00am - July 11, 2019 12:00am

*The second sample of Sudatel shows that there was an outage between July 1 and July 6. However, three signals are up and responsive, suggesting that a false positive case occurred.*

- Zain SDN (AS36998):[57]



**IODA Signals for AS36998 (SDN-MOBITEL)** ❓ | Normalized | Alert Bands

Time point aggregation: Avg of 8 pts/px (40 minutes)

— Active Probing (# /24s Up)　— BGP (# Visible /24s)　— Darknet (# Unique Source IPs)

# Series: 3 | # Points: 6590 | Data resolution: 5 minutes, 10 minutes ❓　　July 1, 2019 12:00am - July 11, 2019 12:00am
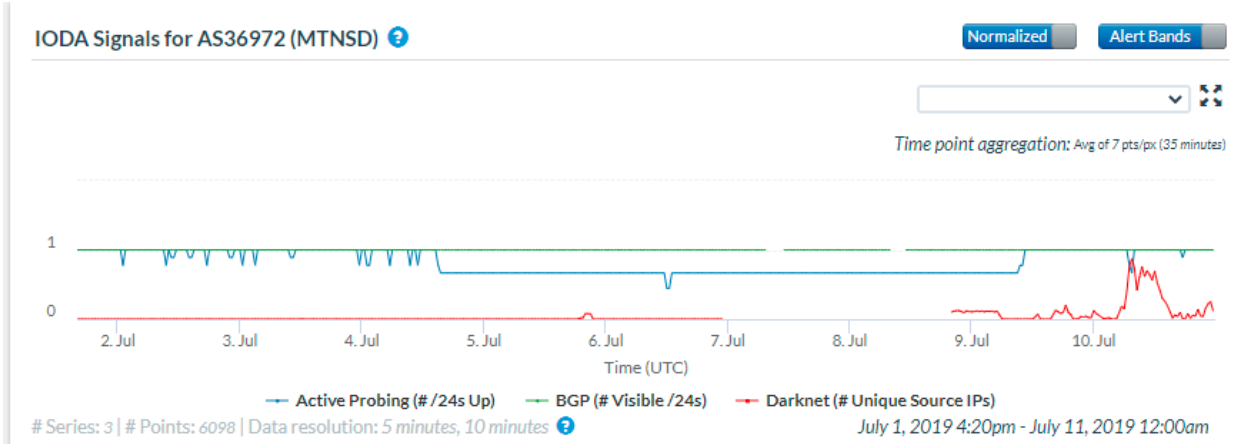
*The second sample of Zain SDN shows that the Darknet signal came up and started to rise on the last day of the shutdown and continued. This is proof of mobile data restoration as Zain only provides Internet through mobile data.*

- MTN SD (AS36972):[58]

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[57] Second sample of Zain
[58] Second sample of MTN

**IODA Signals for AS36972 (MTNSD)**

The second sample of MTN SD shows that the Darknet signal came up and started to rise on the last day of the shutdown and continued. This is proof of mobile data restoration as MTN only provides Internet through mobile data.

- Canar (AS33788):[59]



**IODA Signals for AS33788 (KANARTEL)**
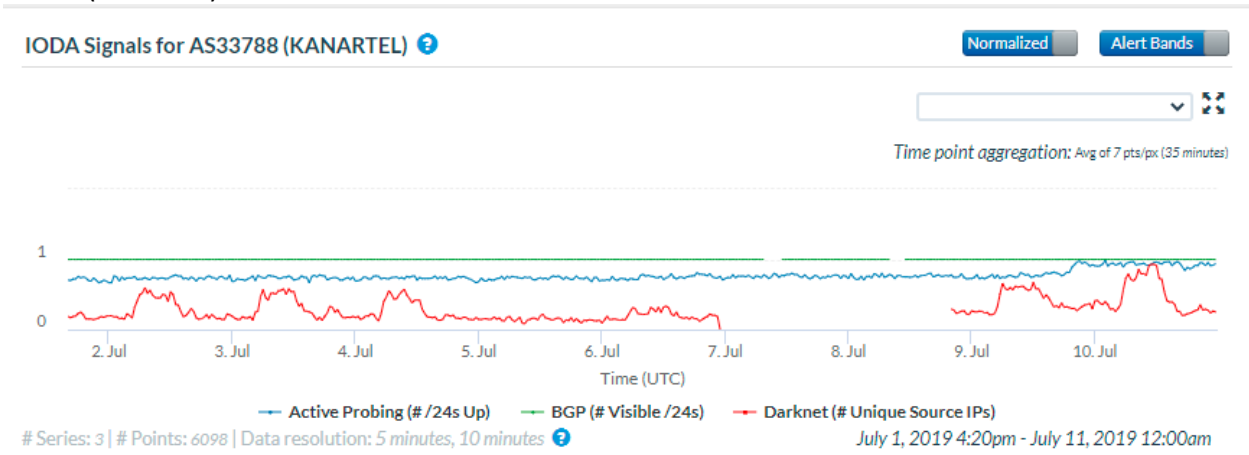
The second sample of Canar shows a rise in darknet and active probing signals on July 9 which shows an increase in Internet consumption due to the restoration of other Canar services that are not through the fixed line like Wimax and LTE.

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[59] Second sample of Canar