



UBUNTUNET CONNECT 2023

Fostering Creative and Innovative Research and Education
Communities



Maximizing Bandwidth Efficiency: App Filtering for Optimal Network Performance

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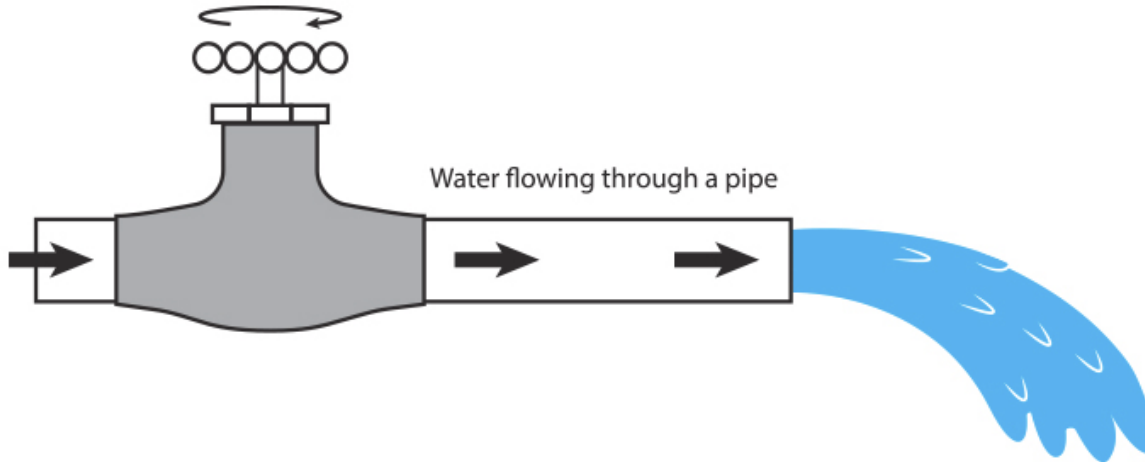
26th October 2023

Outline

- Introduction
- Problem
- Proposed Solution
- Solution Effectiveness
- Conclusion and Future Work

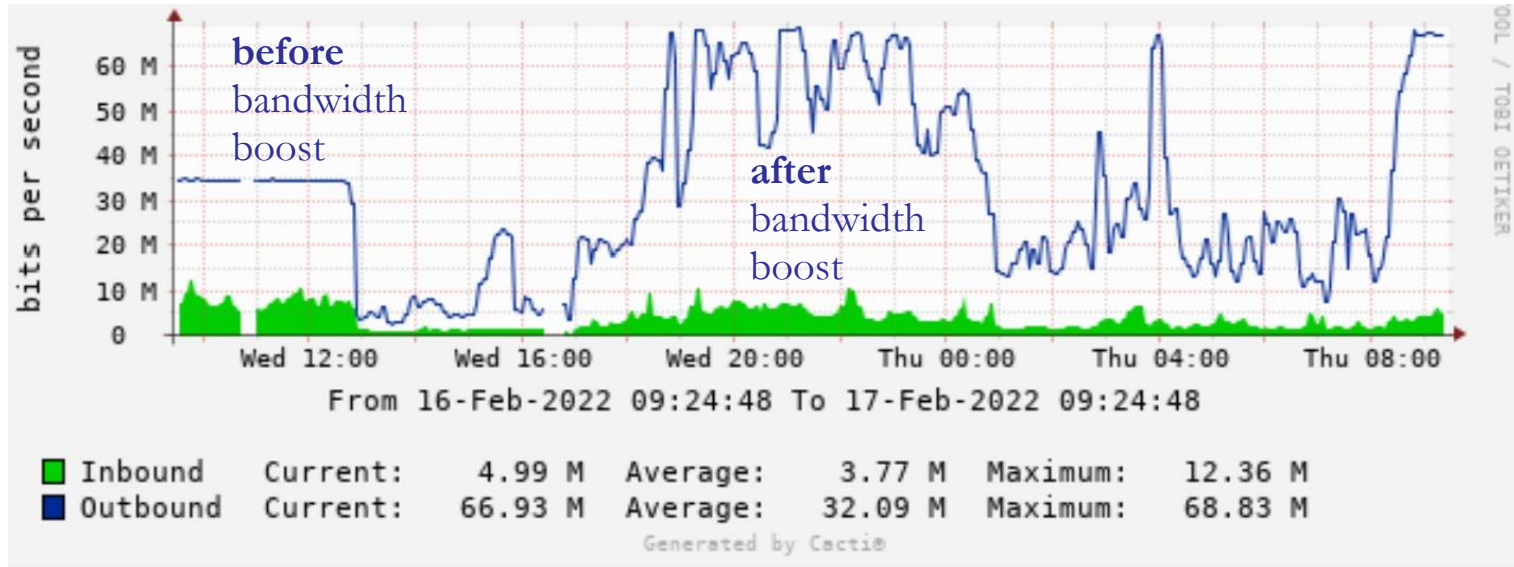
Introduction

What is an Internet Bandwidth subscription?



Introduction

Bandwidth Efficiency: Utilising subscribed bandwidth in a non-wasteful way.



Introduction

- **Bandwidth Efficiency:** Utilising subscribed bandwidth in a non-wasteful way.

- **What would waste bandwidth? It depends:**
 - Personal / Organisational goals: Social media platforms
 - Entertainment: Advertisements
 - Careless network administration: (volumetric) Denial of Service attacks
 - ...e.t.c...

Problem #1: Unsolicited Content



Problem #2: Explicit Content



Govt to block pornography sites

Thursday, July 06, 2023

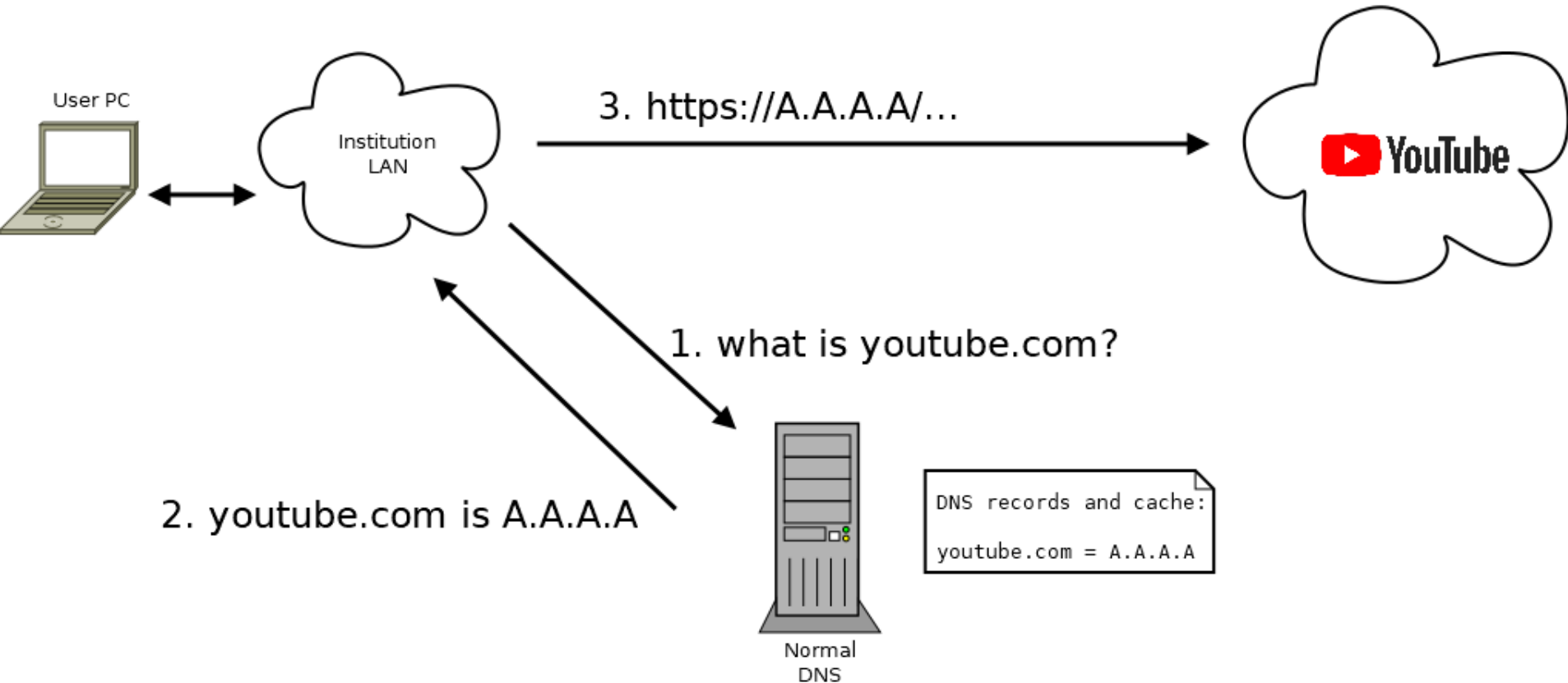


NBS Television ✓
@nbstv

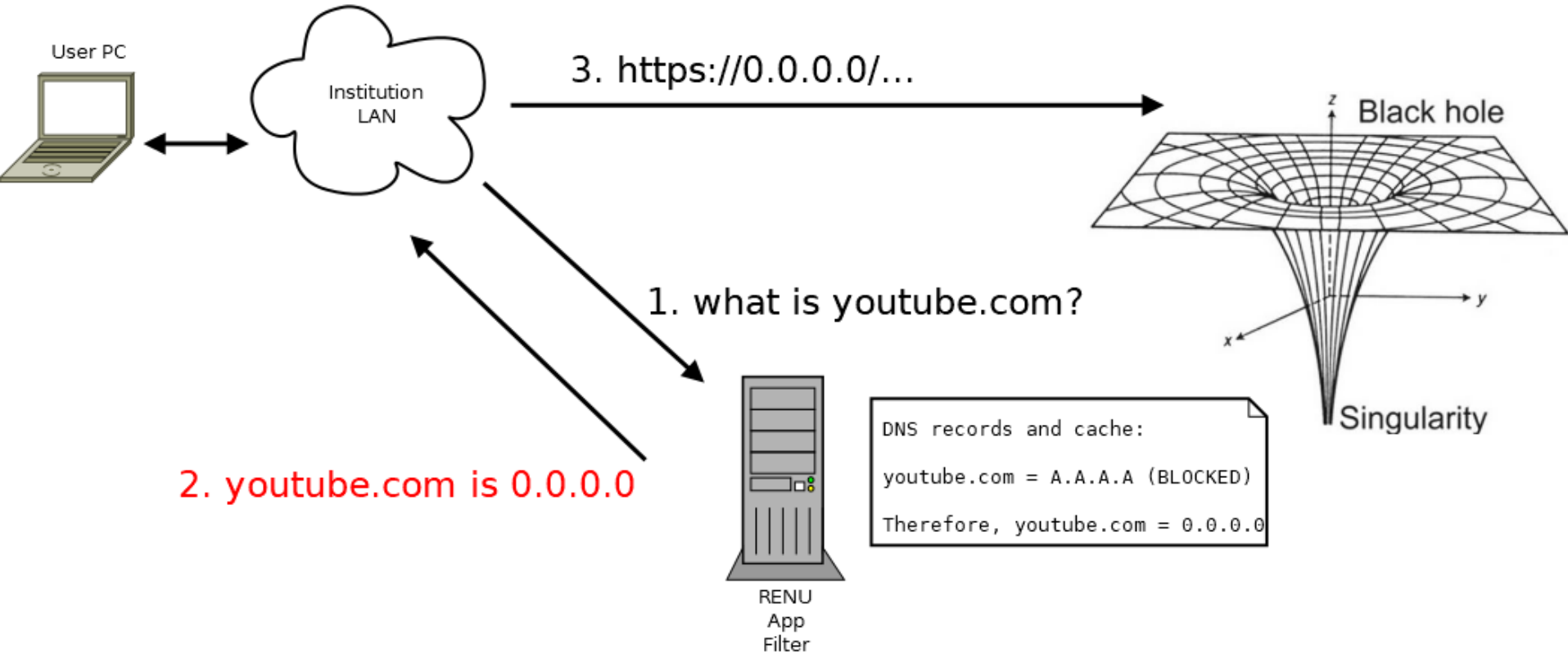


Pornography Control Committee has stepped up efforts to block pornographic content in the country; the committee is working with the Uganda Communications Commission and National Information Technology Authority Uganda (NITA) to block pornographic websites
[#NBSUpdates](#) [#NBSLiveAt9](#)

Proposed Solution: DNS



Proposed Solution: DNS sinkholing



Solution Effectiveness: Deployment and Usage



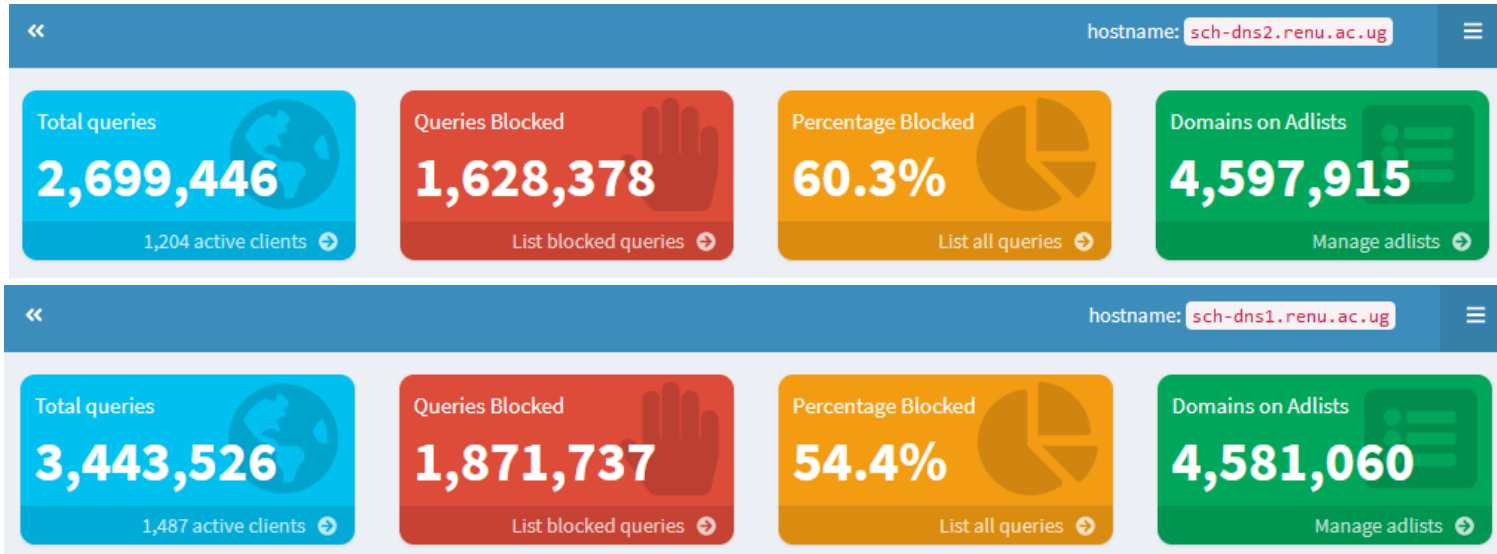
Pi-Hole

Service Uptake:

- Shared platform: 3 research institutions
- Dedicated platforms: 4 universities

Service Usage:

- Secondary Schools: 172



Solution Effectiveness: Deployment and Usage



Service Usage:

- Metro eduroam
27,000+ users (Q3 2023)



813,632,593
Queries

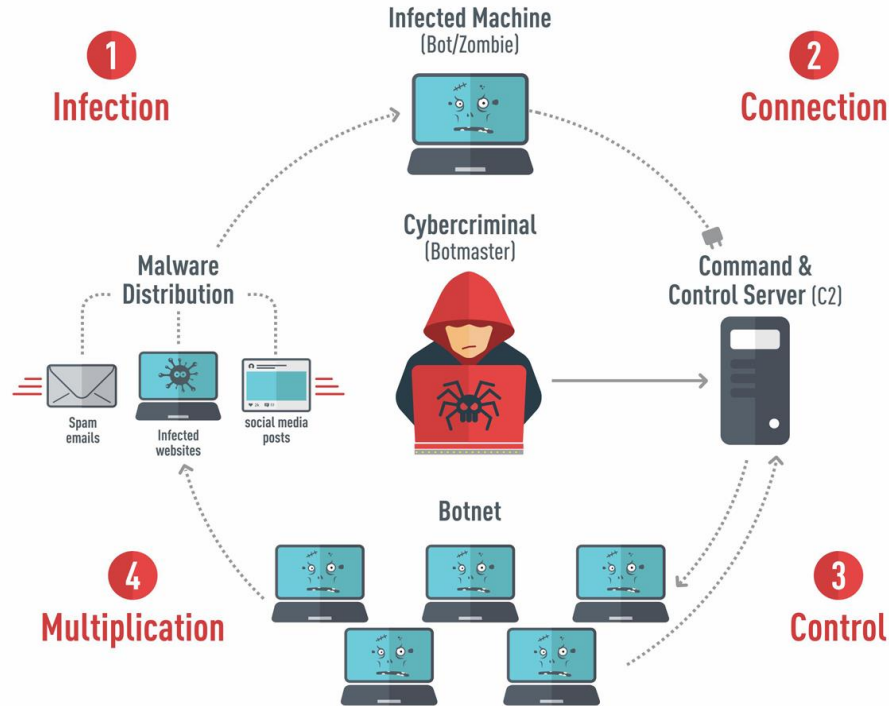
216,632
Queried Domains

2,661
Blocked Queries

148
Blocked Domains

Added Advantage: Botnet mitigation

How a Botnet works



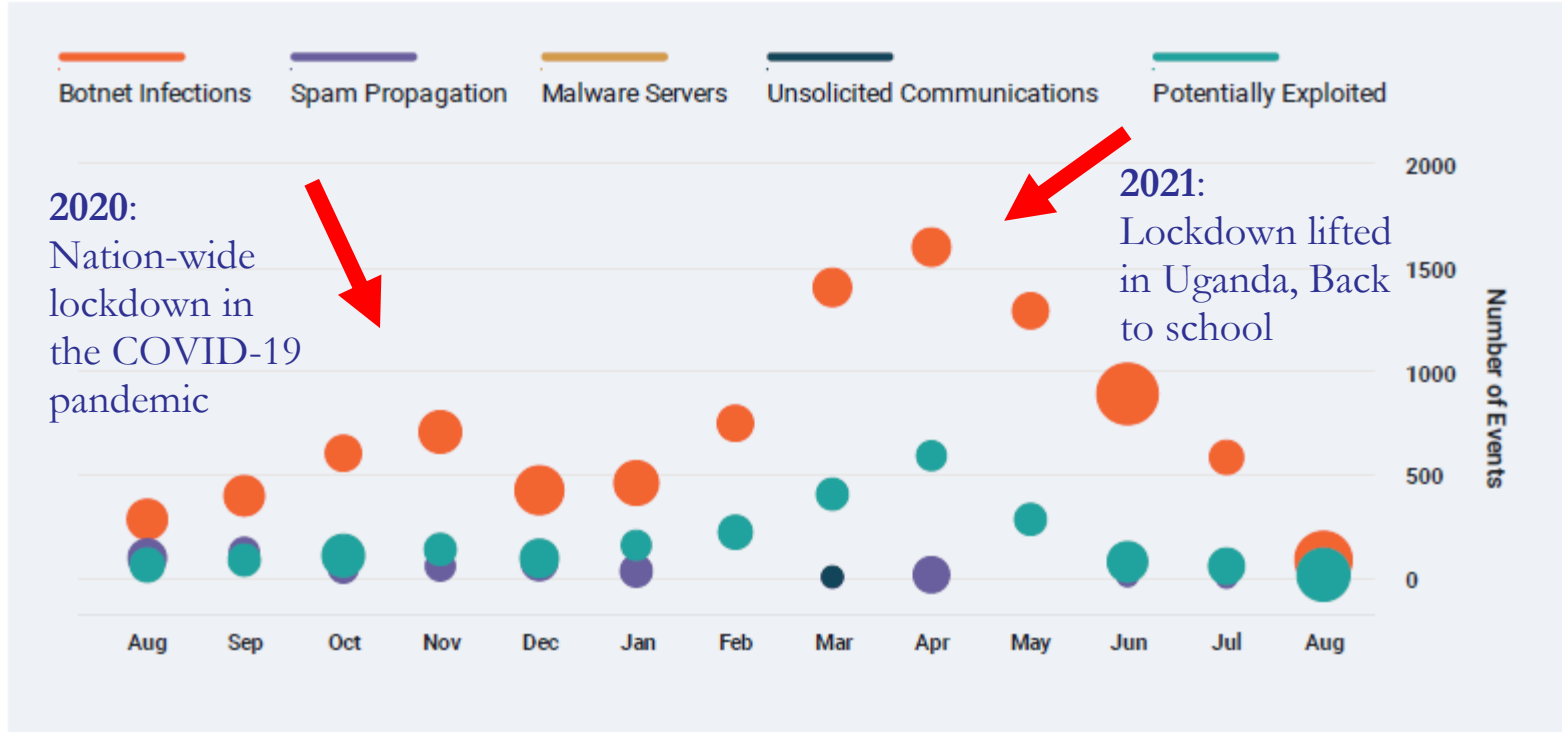
EMSISOFT

Solution Effectiveness: Global Ranking



2020/2021

BIT SIGHT
The Standard in SECURITY RATINGS



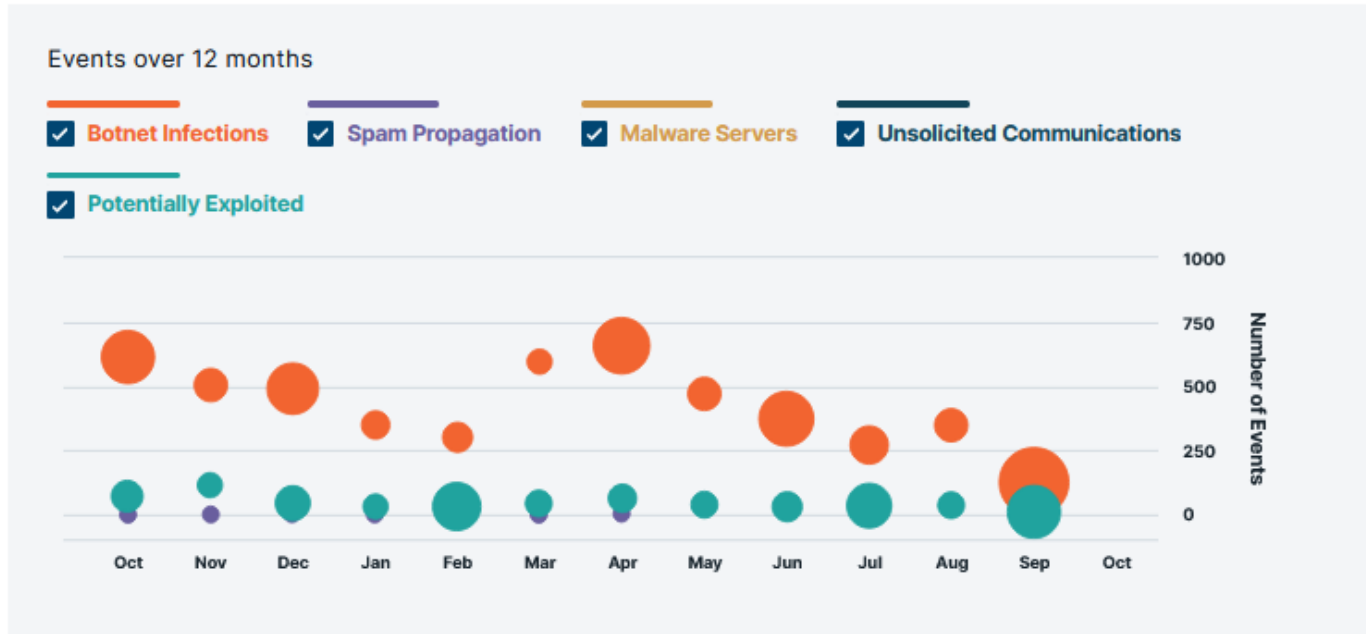
Solution Effectiveness: Global Ranking

2022/2023

BIT SIGHT
The Standard in SECURITY RATINGS



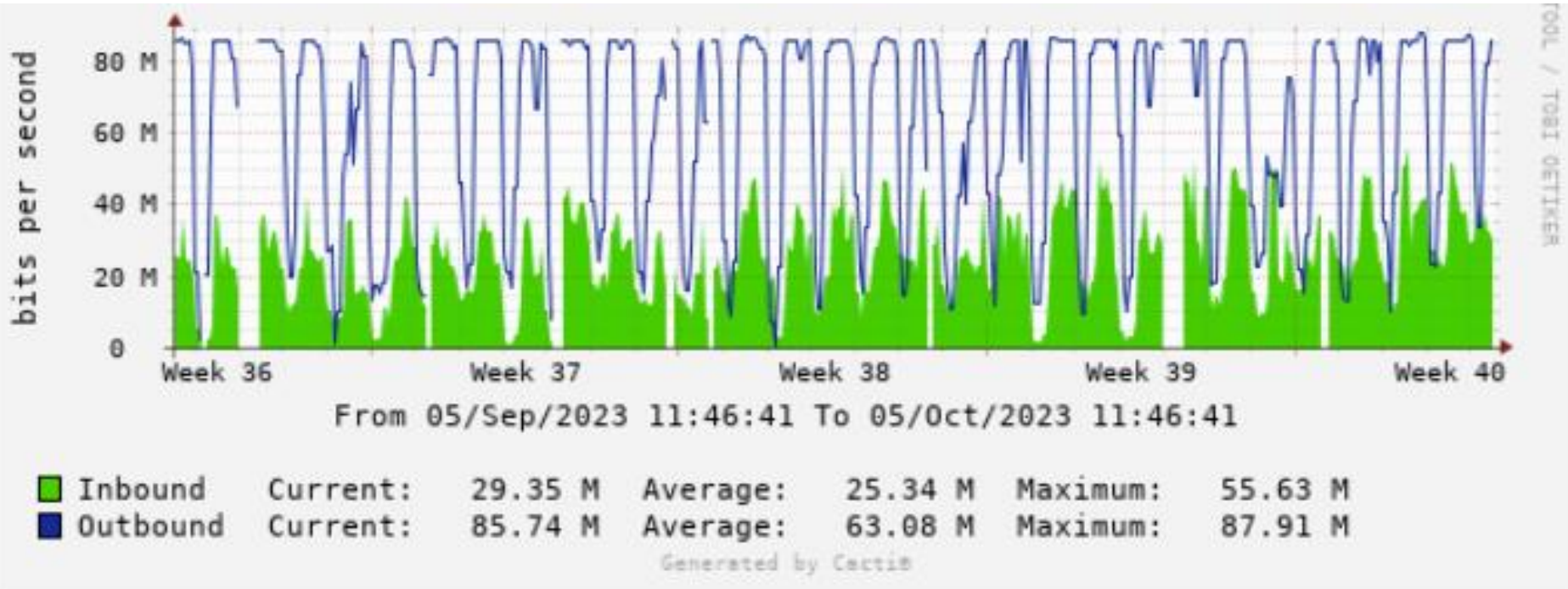
Rating Details for Research and Education Network for Uganda



Solution Effectiveness: Challenges Faced



Example #1: Bandwidth consumption



Solution Effectiveness: Challenges Faced



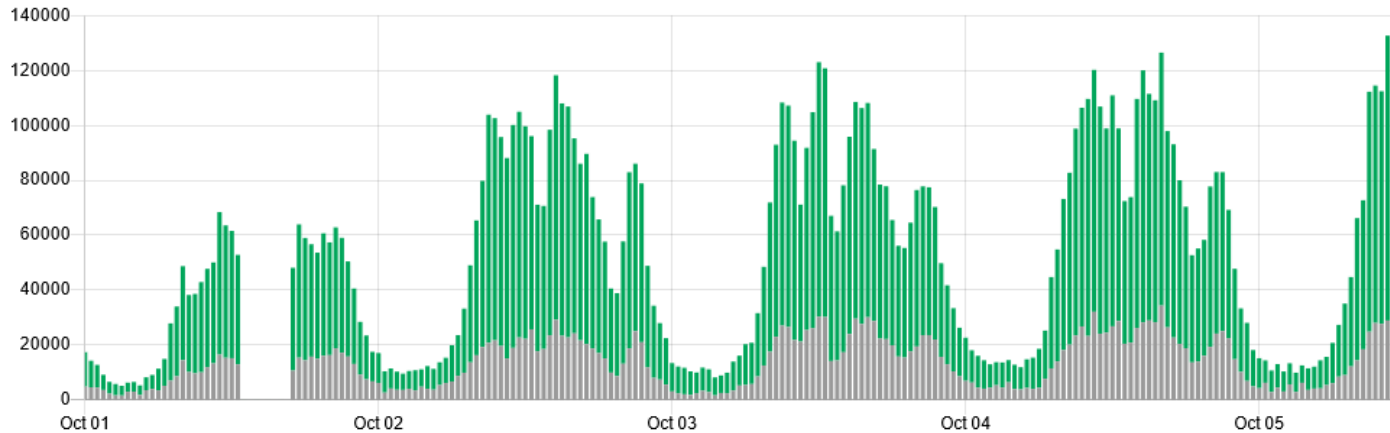
Example #1: Application Filtering usage

Select date and time range



October 1st 2023, 00:00 to October 5th 2023, 11:46

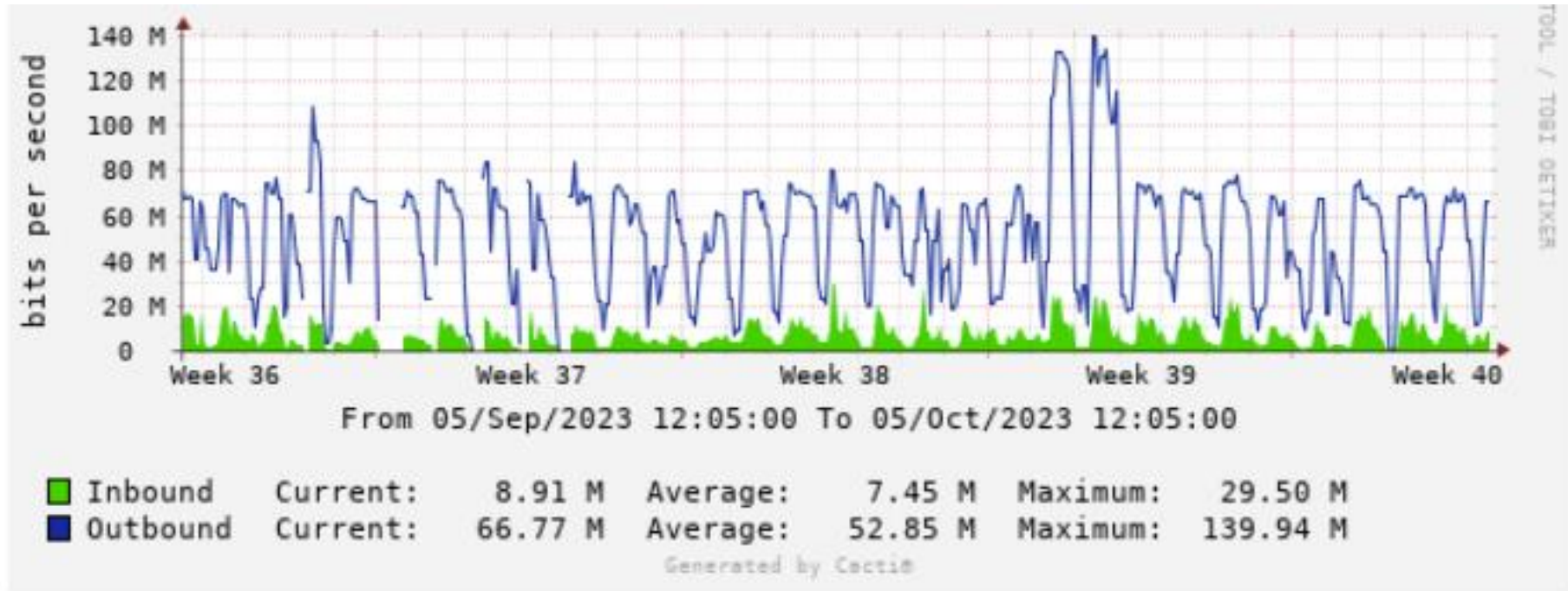
Queries over the selected time period



Solution Effectiveness: Challenges Faced



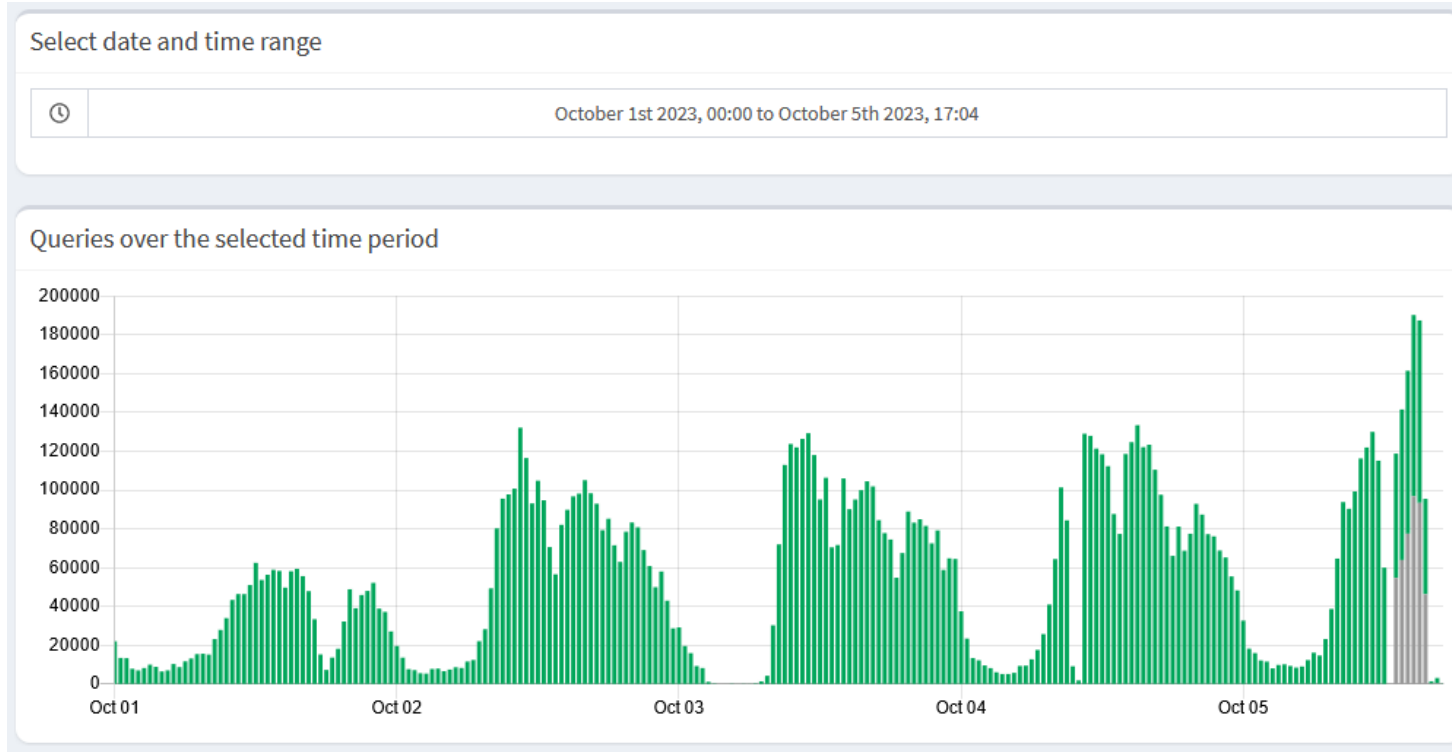
Example #2: Bandwidth consumption



Solution Effectiveness: Challenges Faced



Example #2: Application Filtering usage



Solution Effectiveness: Other challenges



- **Scalability**

- From a home to an NREN

- **Insufficient blocklists (Whack-A-Mole)**

- Against today's dynamic applications
- Against today's threats



SwiftOnSecurity @SwiftOnSecurity · Mar 2

Old and busted: **DNS-over-HTTPS**



New hotness: **DNS-over-QUIC**

- **Circumvention technology**

- VPNs, DNS-over-QUIC, etc...

A screenshot of a tweet from techradar.com. The tweet text reads: "DNS-over-QUIC becomes proposed standard: Wh... Better equipped to meet the challenges of the digital age". Below the text are icons for replies (8), retweets (22), likes (133), and views (33K).

techradar.com
DNS-over-QUIC becomes proposed standard: Wh...
Better equipped to meet the challenges of the digital age

8 22 133 33K

Conclusion and Future Work



- App Filtering with DNS sinkholing solves some things (cybersecurity), but not everything (bandwidth consumption optimisation)
- Institutions need more capacity!
- More sophisticated solutions (AI??)
 - Privacy issues??
 - Scalability & robustness





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Services

- Incident Handling
- Security-related Information Dissemination
- Cybersecurity Auditing
- Filtering Services



THE END

Security is EVERYONE's Responsibility

Thank you