December 2017

MANRS

Mutually Agreed Norms for Routing Security

Internet Society

Andrei Robachevsky
robachevsky@isoc.org

The Problem

A Routing Security Primer

Routing Basics

~60,000 networks (Autonomous Systems) across the Internet

Routers use Border Gateway Protocol (BGP) to exchange "reachability information" - networks they know how to reach

Routers build a "routing table" and pick the best route when sending a packet, typically based on the shortest path

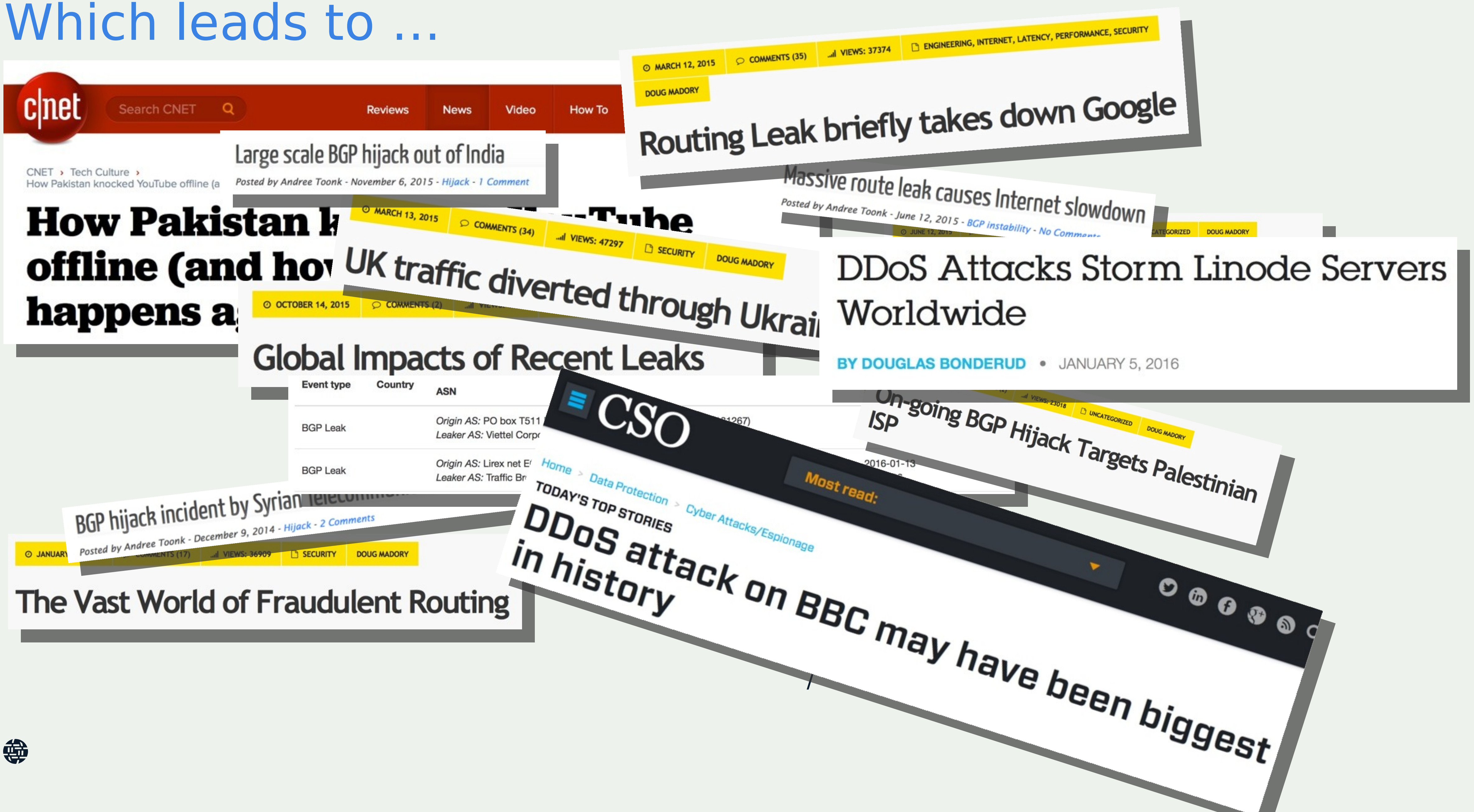
Routers use unique Autonomous System Numbers (ASNs) to identify themselves to all other routers

The Problem

Border Gateway Protocol (BGP) is based entirely on trust

- No built-in validation of the legitimacy of updates
- The chain of trust spans continents
- Lack of reliable resource data

Which leads to ...



c|net Search CNET Reviews News Video How To

CNET › Tech Culture › How Pakistan knocked YouTube offline (a

How Pakistan k… …Tube offline (and hov… happens a…

Large scale BGP hijack out of India

Posted by Andree Toonk - November 6, 2015 - Hijack - 1 Comment

MARCH 12, 2015 | COMMENTS (35) | VIEWS: 37374 | ENGINEERING, INTERNET, LATENCY, PERFORMANCE, SECURITY | DOUG MADORY

Routing Leak briefly takes down Google

Massive route leak causes Internet slowdown

Posted by Andree Toonk - June 12, 2015 - BGP instability - No Comments

MARCH 13, 2015 | COMMENTS (34) | VIEWS: 47297 | SECURITY | DOUG MADORY

UK traffic diverted through Ukrai…

OCTOBER 14, 2015 | COMMENTS (2)

Global Impacts of Recent Leaks

Event type	Country	ASN
BGP Leak		*Origin AS:* PO box T511 … *Leaker AS:* Viettel Corp…
BGP Leak		*Origin AS:* Lirex net E… *Leaker AS:* Traffic Br…

DDoS Attacks Storm Linode Servers Worldwide

BY DOUGLAS BONDERUD • JANUARY 5, 2016

VIEWS: 23018 | UNCATEGORIZED | DOUG MADORY

On-going BGP Hijack Targets Palestinian ISP

2016-01-13

BGP hijack incident by Syrian Telecom…

Posted by Andree Toonk - December 9, 2014 - Hijack - 2 Comments

JANUARY … | COMMENTS (17) | VIEWS: 36909 | SECURITY | DOUG MADORY

The Vast World of Fraudulent Routing

CSO

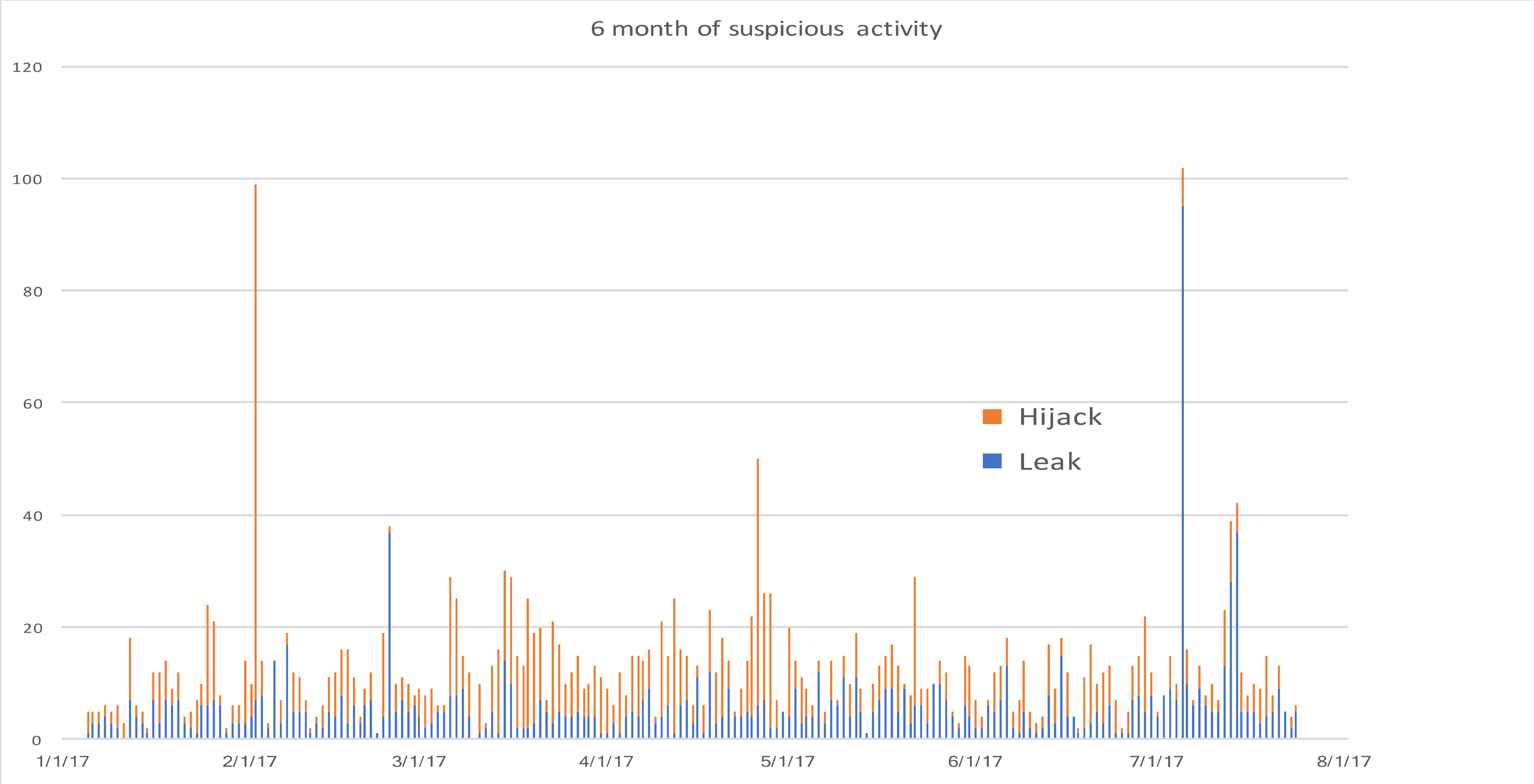
Home > Data Protection > Cyber Attacks/Espionage

Most read:

TODAY'S TOP STORIES

DDoS attack on BBC may have been biggest in history

No Day Without an Incident



http://bgpstream.com/

What’s Happening?

IP prefix hijack

- AS announces prefix it doesn’t originate and wins the ‘best route’ selection
  - AS announces more specific prefix than what may be announced by originating AS
  - AS announces it can route traffic through shorter route, whether it exists or not
- Packets end up being forwarded to wrong part of Internet
- Denial-of-Service (DoS), traffic interception, or impersonating network or service

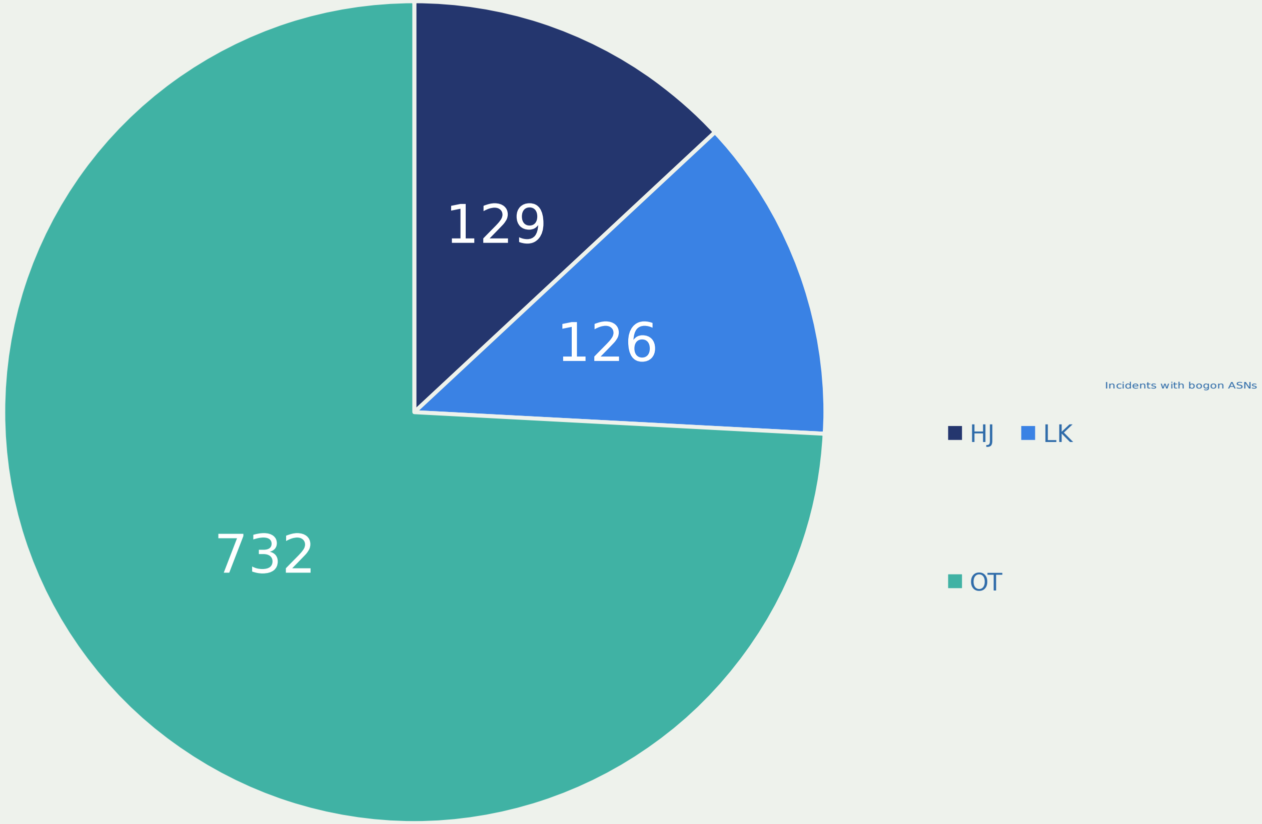
Route leaks

- Violation of valley-free routing (e.g. re-announcing transit provider routes to another provider)
- Usually due to misconfigurations, but can be used for traffic inspection and reconnaissance
- Can be equally devastating

IP address spoofing

- Creation of IP packets with false source address
- The root cause of reflection DDoS attacks

Three months in Brazil



Are There Solutions?

Tools - Yes!

- Prefix and AS-PATH filtering, RPKI, IRR, …
- BGPSEC under development at the IETF
- Whois, Routing Registries and Peering databases

But…

- Lack of deployment
- Lack of reliable data

A Tragedy of the Commons

From a routing perspective, securing your own network does not necessarily make it more secure. Network security is in someone else’s hands.

- The more hands – the better the security

Is there a clear, visible, and industry-supported line between good and bad?

- A cultural norm?

MANRS

A vital part of the security solution

MANRS was founded with the ambitious goal of improving the security and reliability of the global Internet routing system, based on collaboration among participants and shared responsibility for Internet infrastructure.

Mutually Agreed Norms for Routing Security

MANRS defines four concrete actions that network operators should implement

- Technology-neutral baseline for global adoption
- A *minimum* set of requirements

MANRS builds a visible community of security-minded operators

- Promotes culture of collaborative responsibility

MANRS Actions

Filtering – Prevent propagation of incorrect routing information

- *Ensure the correctness of your own announcements and announcements from your customers to adjacent networks with prefix and AS-path granularity*

Anti-spoofing – Prevent traffic with spoofed source IP addresses

- *Enable source address validation for at least single-homed stub customer networks, their own end-users, and infrastructure*

Coordination – Facilitate global operational communication and coordination between network operators

- *Maintain globally accessible up-to-date contact information*

Global Validation – Facilitate validation of routing information on a global scale

- *Publish your data, so others can validate*

A Note on MANRS' Limitations

MANRS is an *absolute minimum* an operator should consider, with *low risk* and *cost-effective* Actions

The more operators implement MANRS, the fewer routing incidents we will see, and the smaller will be their scope

MANRS is not a one-stop solution to all of the internet's routing woes, but it is an important step toward a globally robust and secure routing infrastructure

Why join?

So, what is the business case for MANRS?

(and routing security)

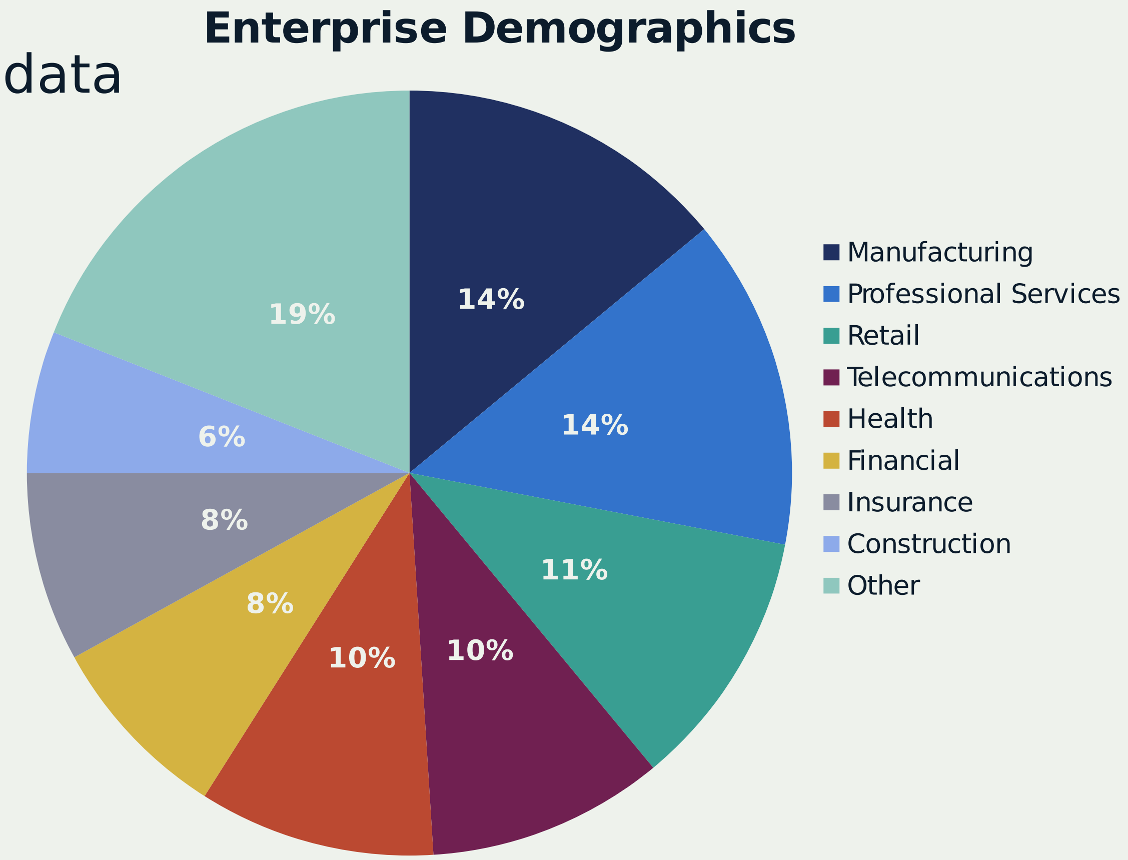
Engaged 451 Research to better understand the attitudes and perceptions of Internet service providers and the broader enterprise community around the project

Comprehensive Research Study

Questionnaire-based study
– Assessment against existing 451 Research data
– Common perception elements

Service providers
– Initial targeting interviews
  - Global demographic
– 25 telephone interviews

Enterprise Internet teams
– 250 web questionnaires
– 1,000 employee minimum
– Primarily North America



What We Learned from the Study

Security is Vital to Enterprises

- MANRS knowledge is low, but the desire for security is high
- Enterprises are willing to require MANRS compliance of their service providers

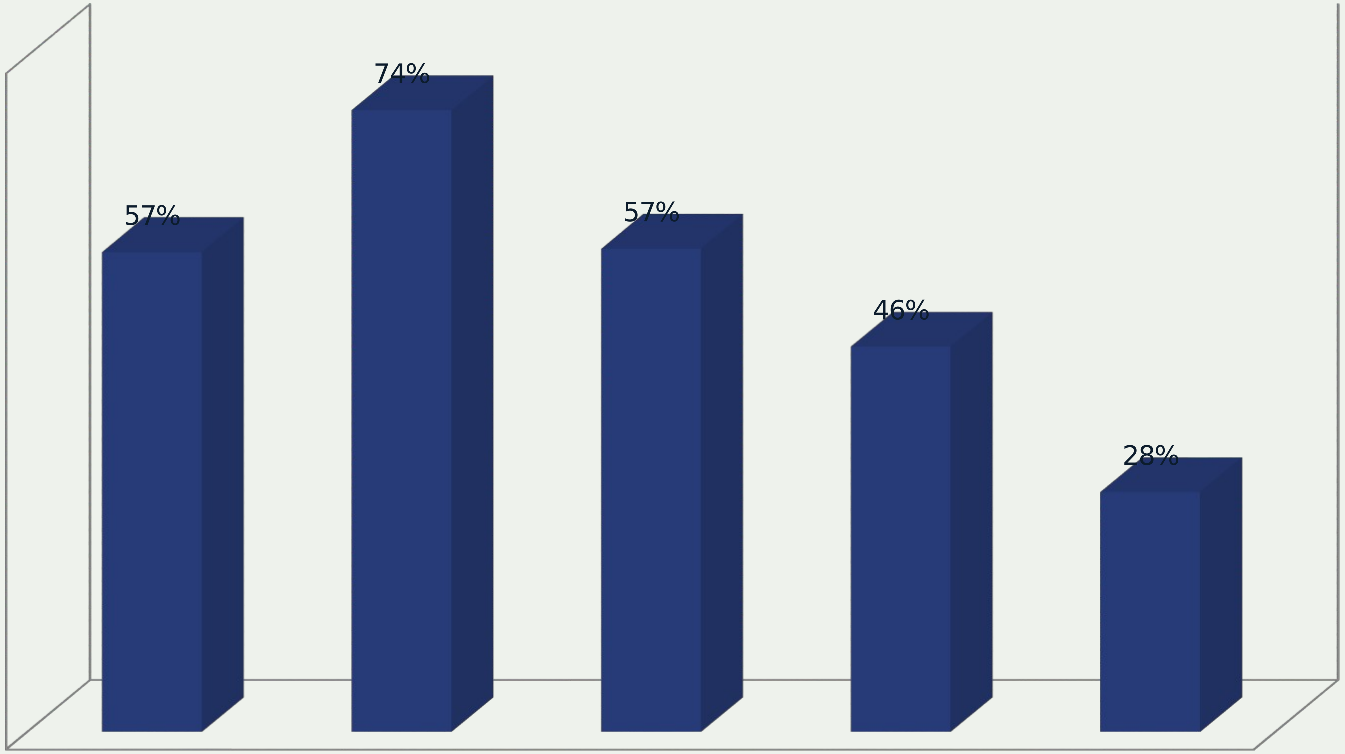
MANRS Adds Value for Service Providers

- Security can help service providers differentiate from their competitors; Identifiable value in a vague market
- Service providers may be able to add additional revenue streams based on information security feeds and other add-on services

Enterprise Security Concerns

- Widely varying concerns across a range of issues, with traffic hijacking leading the list
- Security focus is aligned with types of issues MANRS is looking to address
- Confidence that MANRS can help long-term routing security

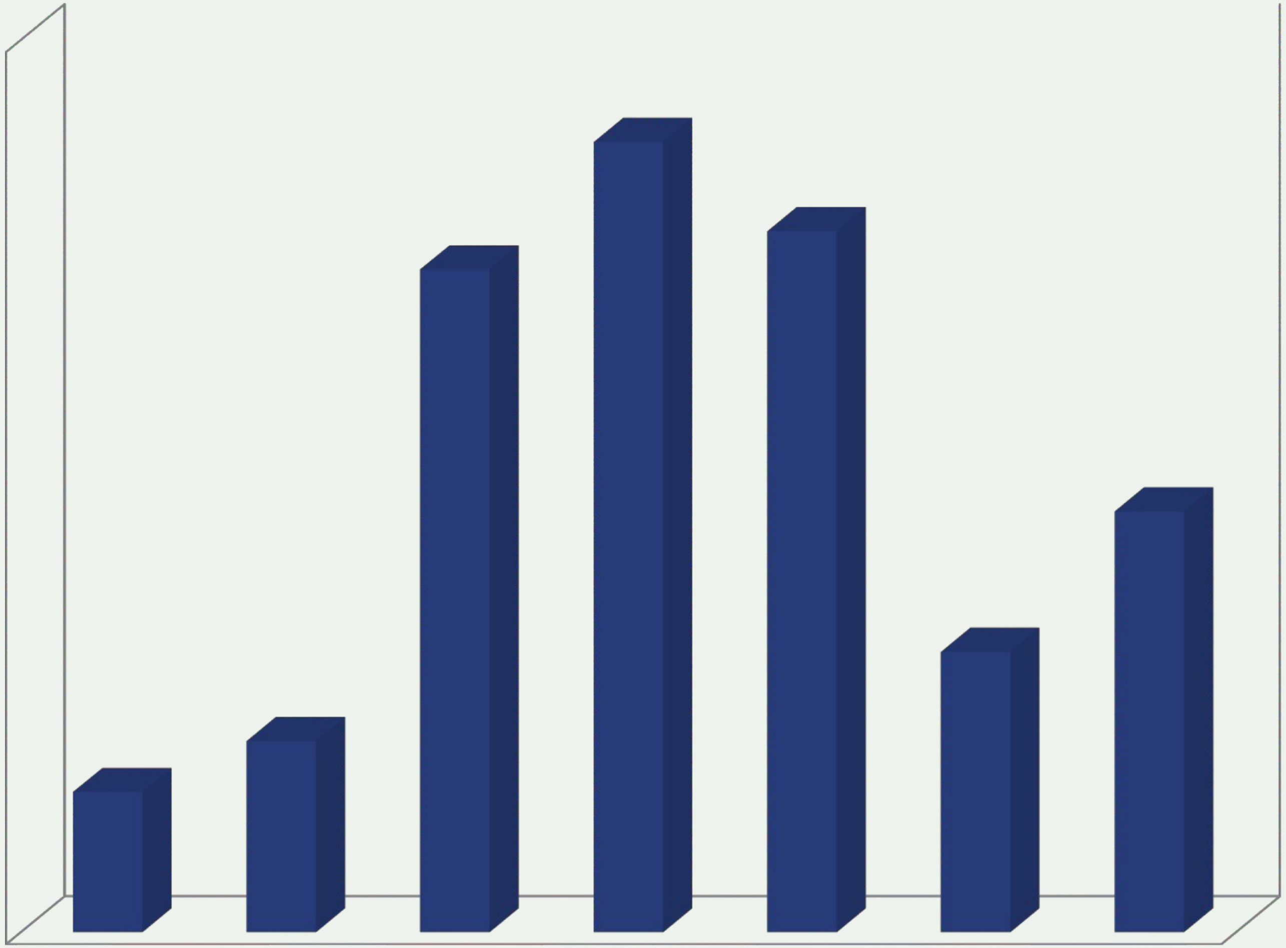
Internet Security Concerns



Enterprises are Willing to Pay for MANRS

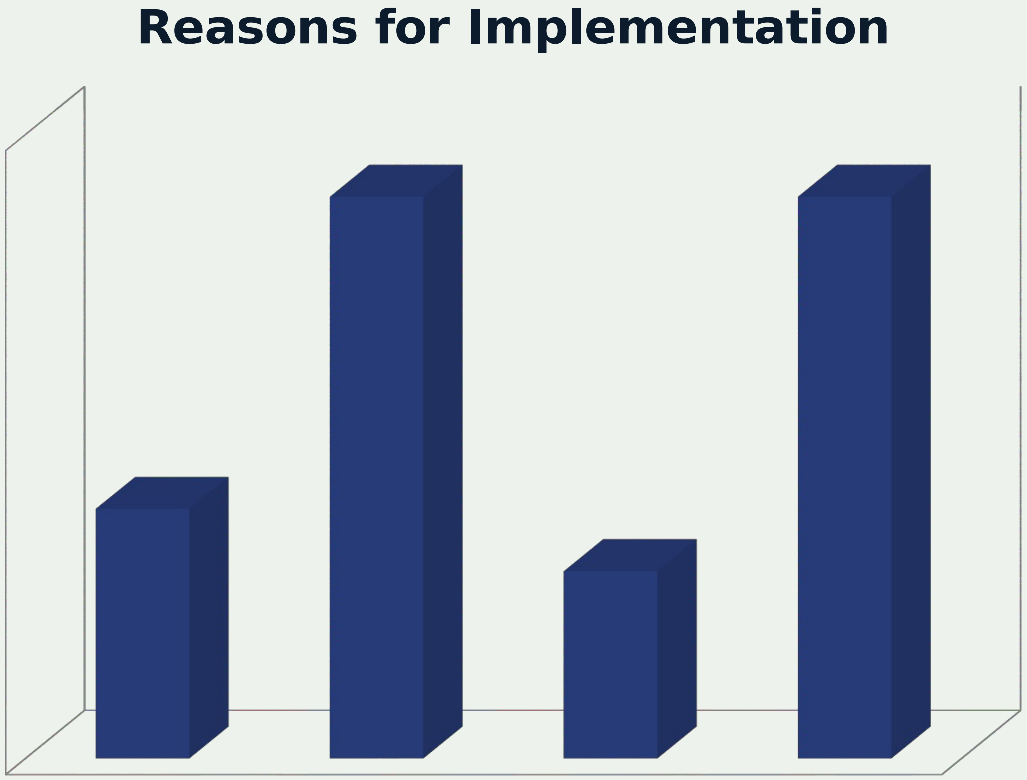
Significant value on security posture

- Median premium of 15%
- 13% would only choose MANRS- compliant providers



Q: Would you pay a premium for MANRS compliant services?

Service Provider Motivations are Misaligned with Enterprise Perceptions



- Most providers would implement MANRS to be more secure or for regulatory compliance
- Some would implement to be a ’good citizen’ or to increase efficiency
- *No one mentioned customer demand as a reason*

Q: Which aspect of MANRS would provide the greatest reason for implementing for your organization?

Why ENTERPRISES Should Require MANRS

- To improve your organizational security posture
  - Facilitate risk management for the supply chain.
  - Require MANRS compliance in RFPs, tender, and purchasing processes
  - Can be an additional factor for auditors to consider in assessments (e.g. ISO 27001:2013)

- MANRS addresses the problems that enterprises care about
  - Traffic hijacking and detour
  - Malicious traffic
  - Prompt resolution of routing security incidents

- MANRS provides a foundation for security value-added services
  - E.g. Incident Information sharing/information feeds

Why SERVICE PROVIDERS Should Join MANRS

- To add competitive value and differentiate in a "flat", price driven market
  - Growing demand from enterprise customers for managed security services (info feeds)
  - To signal security proficiency and commitment to your customers

- To "lock-in" - from a connectivity provider to a security partner
  - Information feeds and other add-on services may increase revenue and reduce customer churn
  - Enterprises indicate willingness to pay more for secure services

- To help solve global network problems
  - Lead by example and improve routing security for everyone
  - Being part of the MANRS community can strengthen enterprise security credentials

Why to join MANRS?

- Improve your security posture and reduce number and impact of routing incidents

- Join the community of security minded ioperators

  Can you stand up publicly and say:

  ✓ I care about routing security
  ✓ I am prepared to spend resources on it
  ✓ I am prepared to be held accountable by the community

- Use MANRS as a competitive differentiator

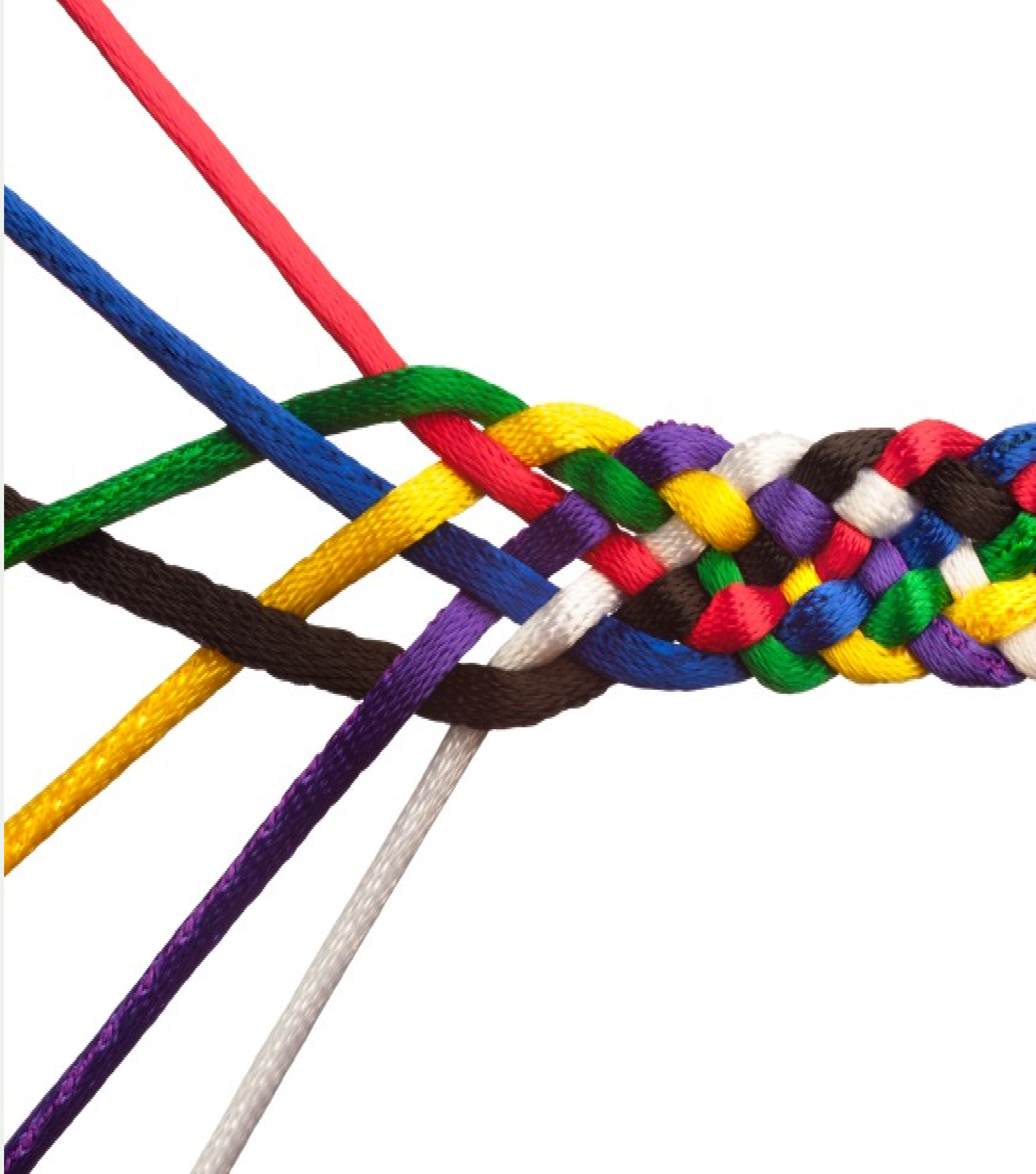
Join Us

Visit https://www.manrs.org

- Fill out the sign up form with as much detail as possible.
- We may ask questions and run tests

Get Involved in the Community

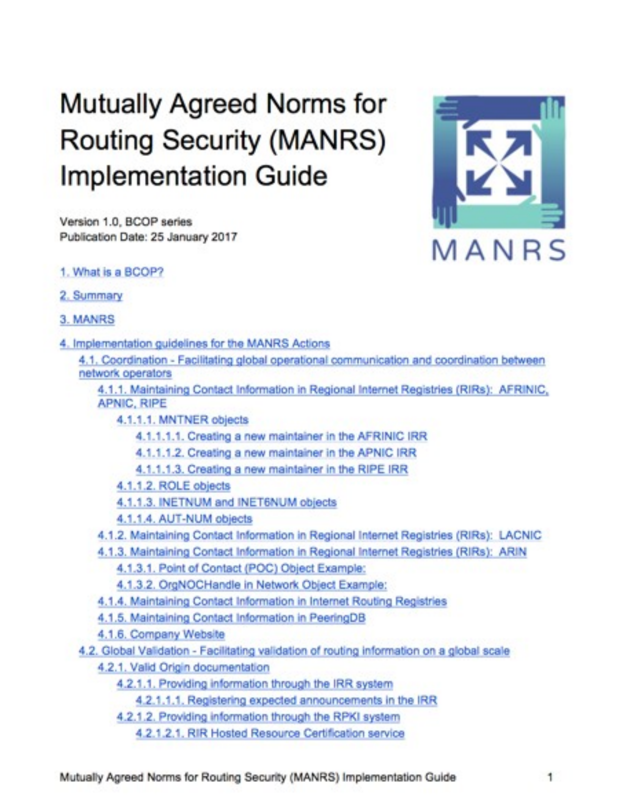
- Members support the initiative and implement the actions in their own networks
- Members maintain and improve the document and promote MANRS objectives



MANRS Implementation Guide

If you’re not ready to join yet, implementation guidance is available to help you.

- Based on Best Current Operational Practices deployed by network operators around the world
- http://www.manrs.org/bcop/



Mutually Agreed Norms for Routing Security (MANRS) Implementation Guide

Version 1.0, BCOP series
Publication Date: 25 January 2017

Mutually Agreed Norms for Routing Security (MANRS) Implementation Guide 1

What’s Next: MANRS Training and Certification

Routing security is hard. How can we make it more accessible? The “simple” MANRS Implementation Guide is a 50-page document that assumes a certain level of expertise.

Online training modules

- Based on the MANRS Implementation Guide
- Walks a student through the tutorial with a test at the end
- Working with and looking for partners that are interested in integrating it in their curricula

A hands-on lab to achieve MANRS certification

- Completing the online modules as a first step in MANRS certification
- Looking for partners

What’s Next: MANRS IXP Partnership Programme

There is synergy between MANRS and IXPs

- IXPs form a community with a common operational objective
- MANRS is a reference point with a global presence – useful for building a “safe neighborhood”

How can IXPs contribute?

- Technical measures: Route Server with validation, alerting on unwanted traffic, providing debugging and monitoring tools
- Social measures: MANRS ambassador role, local audit as part of the on-boarding process
- A development team is working on a set of useful actions

LEARN MORE: https://www.manrs.org

Routing security & MANRS: a poll

Vote link:

http://etc.ch/X86z

Thank you.

Firstname Lastname

Job title
surname@isoc.org

Visit us at
www.internetsociety.org
Follow us
@internetsociety

Galerie Jean-Malbuisson
15,
CH-1204 Geneva,
Switzerland.
+41 22 807 1444

1775 Wiehle Avenue,
Suite 201, Reston, VA
20190-5108 USA.
+1 703 439 2120