WP2

Korian Edeline, Benoit Donnet (ULG)
MAMI Plenary, Sevilla, February 2017

measurement and architecture for a middleboxed internet

measurement | architecture | experimentation

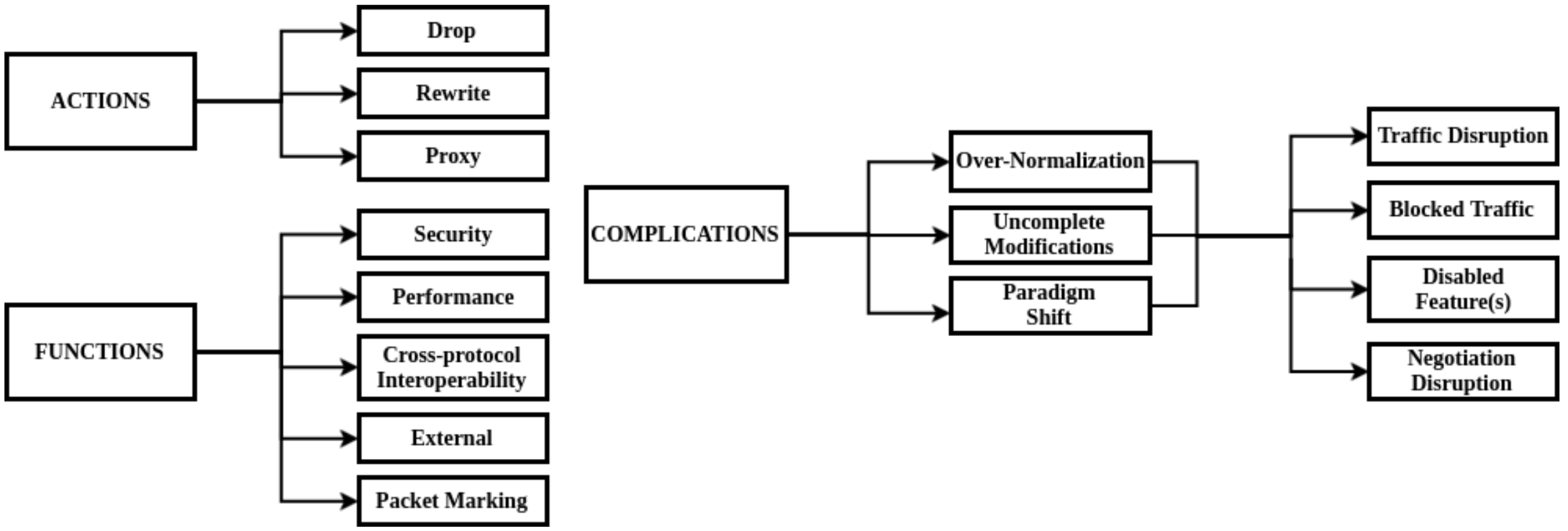
This project has received funding from the European Union's Horizon 2020 research and innovation programme
under grant agreement No 688421.The opinions expressed and arguments employed reflect only the authors'
view. The European Commission is not responsible for any use that may be made of that informa-
tion.

Classification

- What happens to the packet(s) ?
- What is the purpose of such action ?
- Does it involve an error/deliberate restrictive choice ?
- How ***could*** this affect the connection ?

Classification

- Policy Taxonomy



COMPLICATIONS

- Traffic Disruption
- Blocked Traffic
- Disabled Feature(s)
- Negotiation Disruption
- Over-Normalization
- Uncomplete Modifications
- Paradigm Shift

FUNCTIONS

- Security
- Performance
- Cross-protocol Interoperability
- External
- Packet Marking

ACTIONS

- Drop
- Rewrite
- Proxy

	ACTIONS			FUNCTIONS					COMPLICATIONS							
	Proxy	Rewrite	Drop	Packet Marking	External	Cross-protocol Interoperability	Performance	Security	Paradigm Shift	Uncomplete Modifications	Over-Normalization	Negotiation Disruption	Disabled Feature(s)	Blocked Traffic	Traffic Disruption	
Strip unknown TCP option		X					X	X			X		X			

	ACTIONS			FUNCTIONS					COMPLICATIONS							
	Proxy	Rewrite	Drop	Packet Marking	External	Cross-protocol Interoperability	Performance	Security	Paradigm Shift	Uncomplete Modifications	Over-Normalization	Negotiation Disruption	Disabled Feature(s)	Blocked Traffic	Traffic Disruption
Strip unknown TCP option		X					X	X			X		X		
TCP ISN shuffling		X						X		X					X

	ACTIONS			FUNCTIONS					COMPLICATIONS							
	Proxy	Rewrite	Drop	Packet Marking	External	Cross-protocol Interoperability	Performance	Security	Paradigm Shift	Uncomplete Modifications	Over-Normalization	Negotiation Disruption	Disabled Feature(s)	Blocked Traffic	Traffic Disruption
Strip unknown TCP option		X					X	X			X		X		
TCP ISN shuffling		X						X		X					X
Drops MPTCP			X				X	X			X			X	

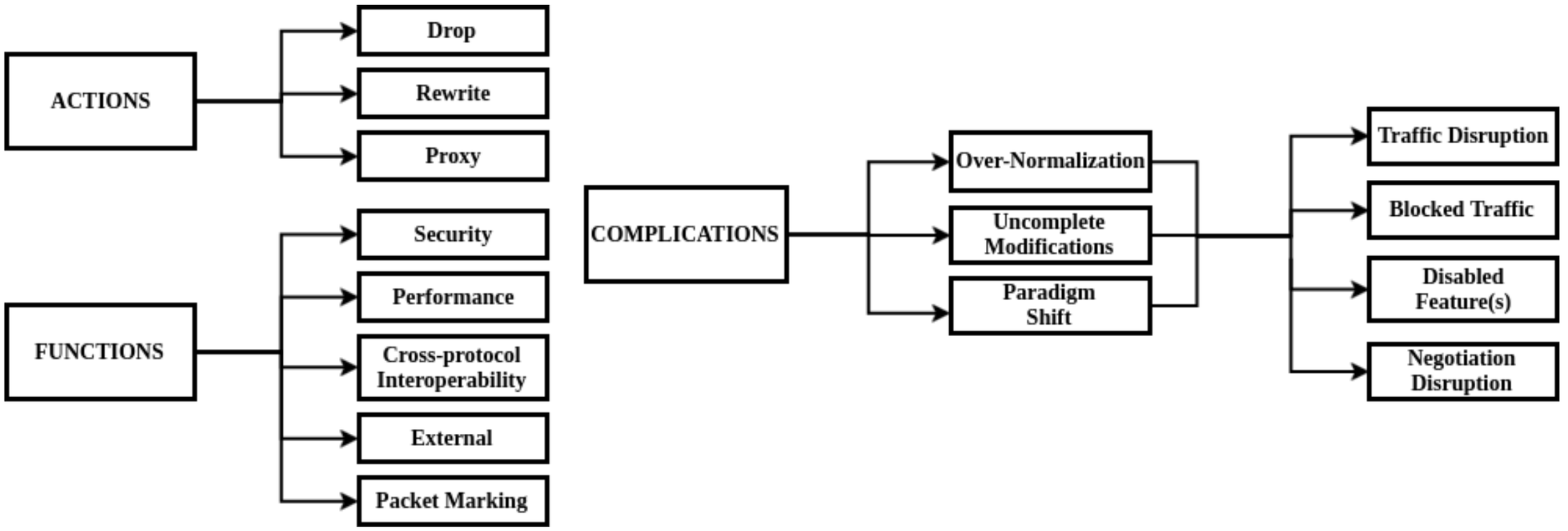
	ACTIONS			FUNCTIONS					COMPLICATIONS							
	Proxy	Rewrite	Drop	Packet Marking	External	Cross-protocol Interoperability	Performance	Security	Paradigm Shift	Uncomplete Modifications	Over-Normalization	Negotiation Disruption	Disabled Feature(s)	Blocked Traffic	Traffic Disruption
Strip unknown TCP option		X					X	X			X		X		
TCP ISN shuffling		X						X		X					X
Drops MPTCP			X				X	X			X			X	
SNAT		X			X			X		X				X	X

	ACTIONS			FUNCTIONS					COMPLICATIONS							
	Proxy	Rewrite	Drop	Packet Marking	External	Cross-protocol Interoperability	Performance	Security	Paradigm Shift	Uncomplete Modifications	Over-Normalization	Negotiation Disruption	Disabled Feature(s)	Blocked Traffic	Traffic Disruption
Strip unknown TCP option		X					X	X			X		X		
TCP ISN shuffling		X						X		X					X
Drops MPTCP			X				X	X			X			X	
SNAT		X			X			X		X				X	X
8-bits DSCP (ToS)		X		X									X		X

	ACTIONS			FUNCTIONS					COMPLICATIONS							
	Proxy	Rewrite	Drop	Packet Marking	External	Cross-protocol Interoperability	Performance	Security	Paradigm Shift	Uncomplete Modifications	Over-Normalization	Negotiation Disruption	Disabled Feature(s)	Blocked Traffic	Traffic Disruption
Strip unknown TCP option		X					X	X			X		X		
TCP ISN shuffling		X						X		X					X
Drops MPTCP			X				X	X			X			X	
SNAT		X			X			X		X				X	X
8-bits DSCP (ToS)		X		X					?	?	?		X		X

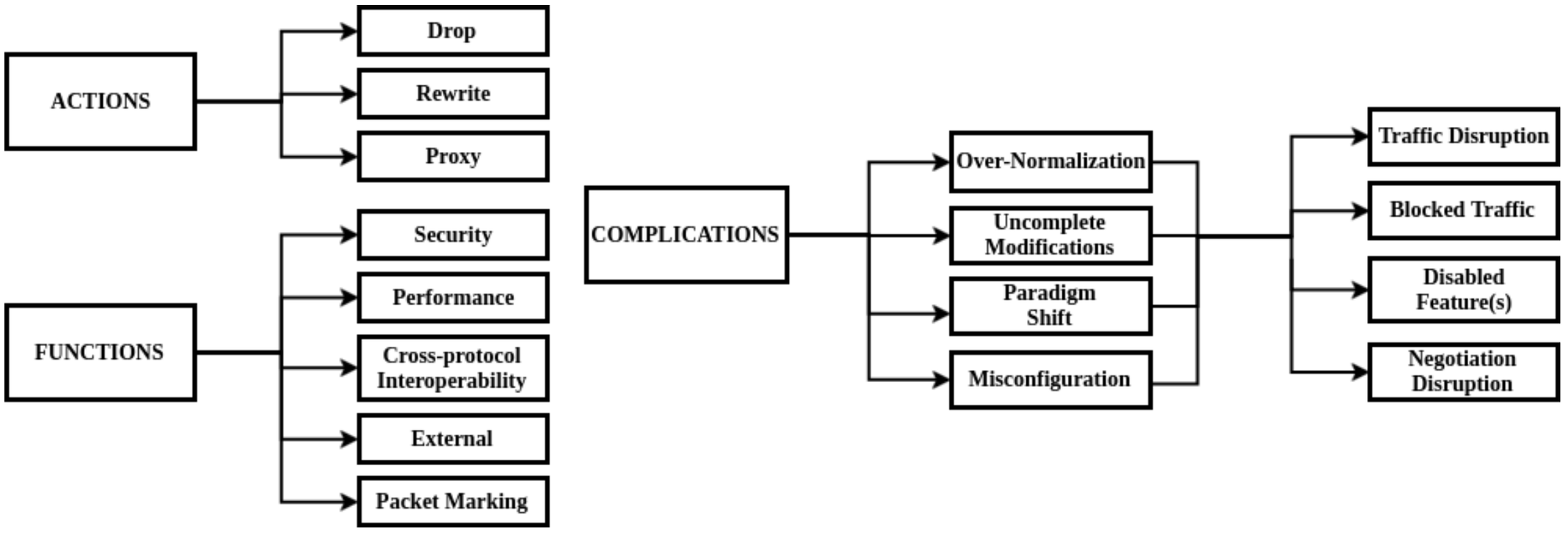
Classification

- Policy Taxonomy



Classification

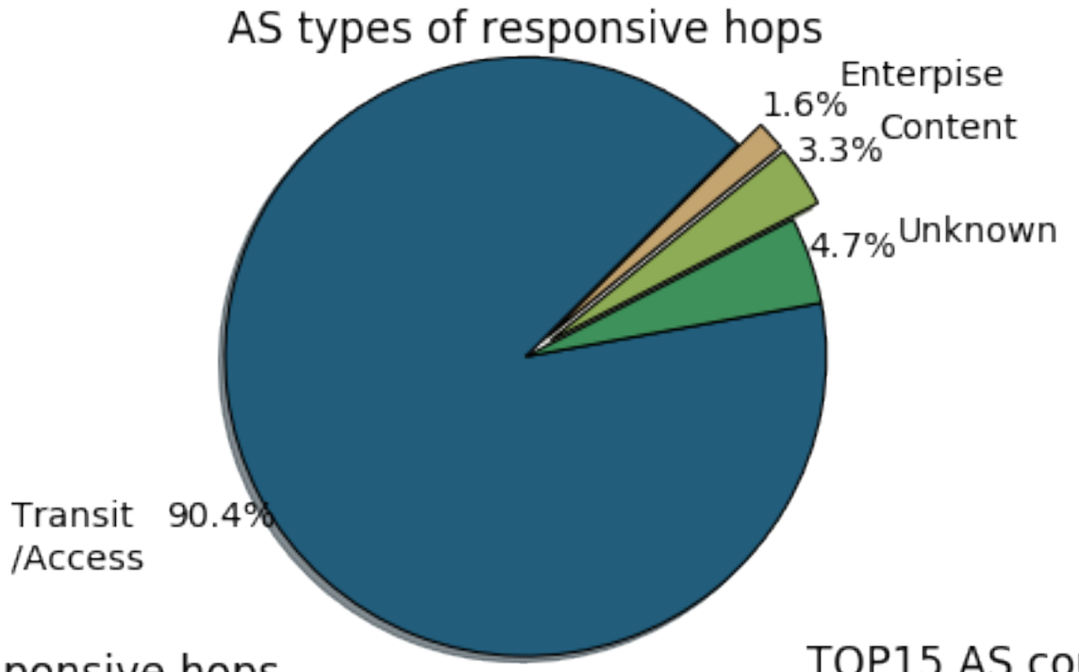
- Updated Taxonomy

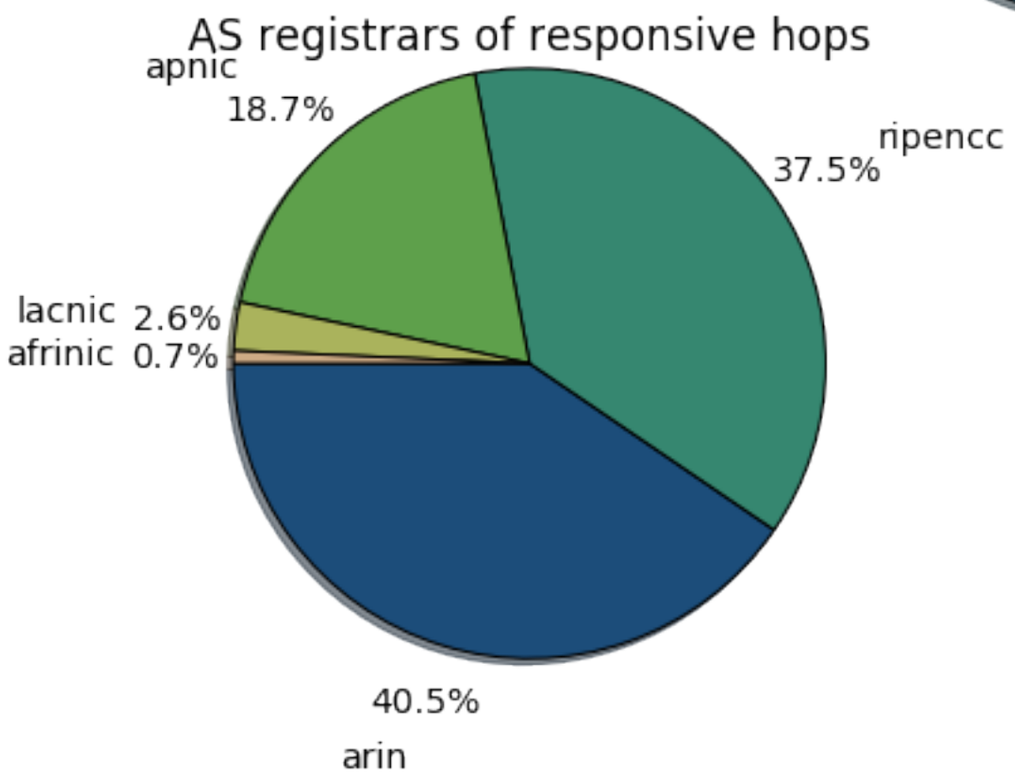


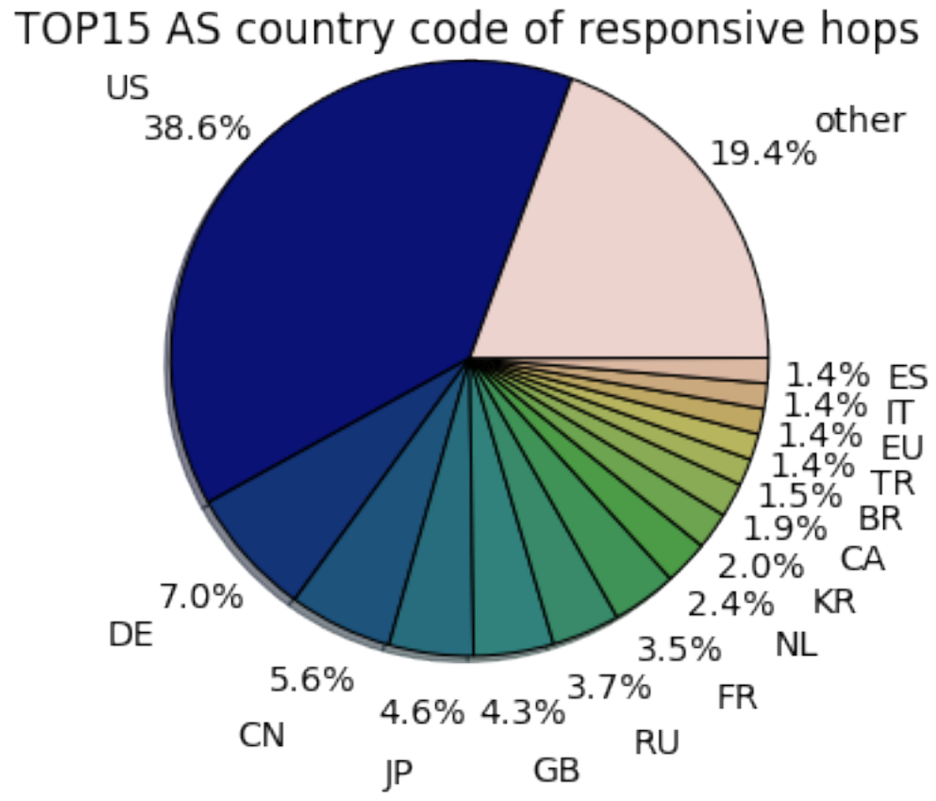
Dataset

- 14 Campaigns, one every ~5 day over 70 days.
- From 89 nodes to 594,241 destinations
- 948,457 responsive intermediate hops overall (59,861 HTTP(S)-only)
- 2,978 ASs crossed

ASs


AS types of responsive hops
Enterprise
1.6%
Content
3.3%
4.7%
Unknown
Transit
/Access
90.4%


AS registrars of responsive hops
apnic
18.7%
ripencc
37.5%
lacnic
2.6%
afrinic
0.7%
40.5%
arin

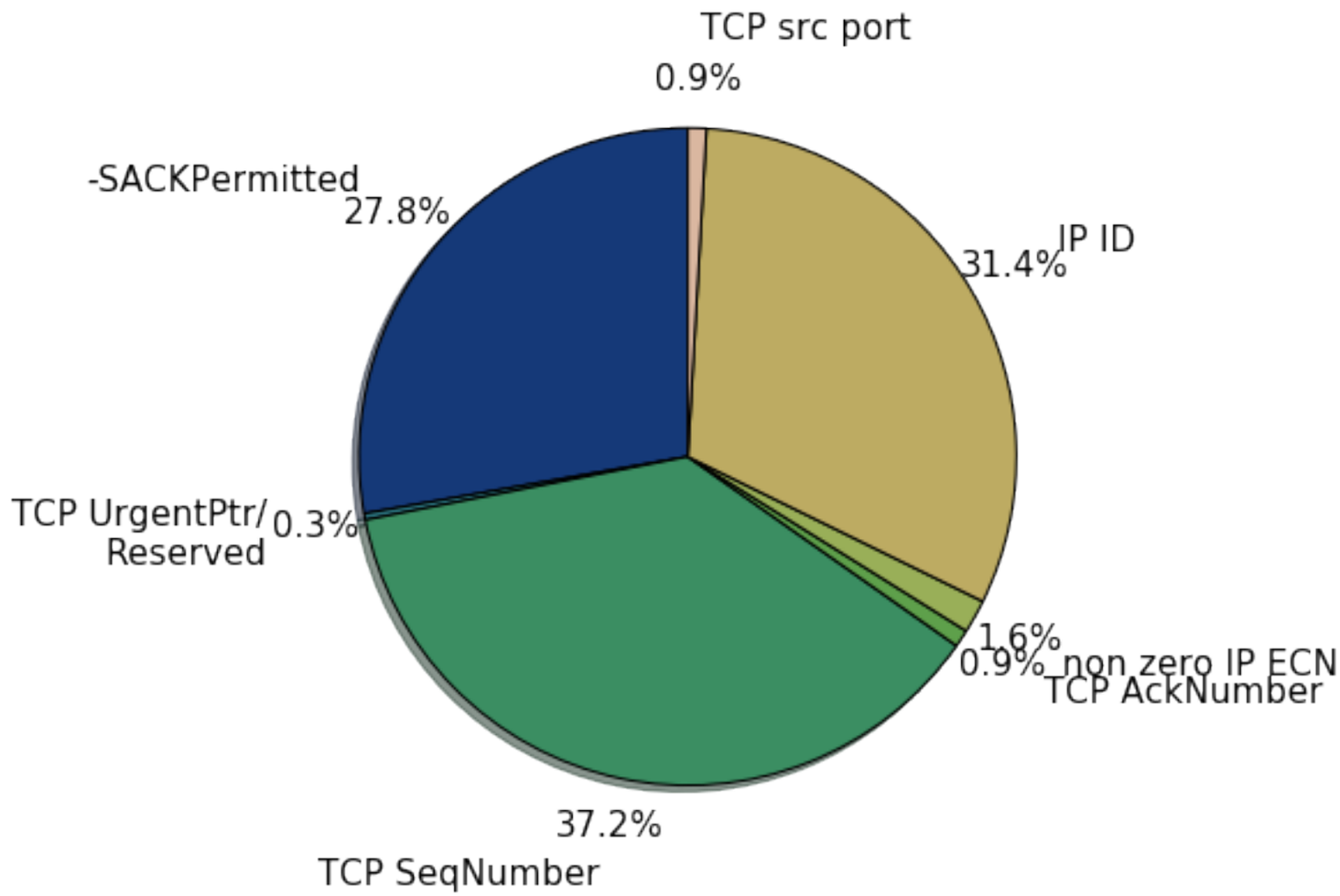

TOP15 AS country code of responsive hops
US
38.6%
other
19.4%
1.4% ES
1.4% IT
1.4% EU
1.4% TR
1.5% BR
1.9% CA
2.0% KR
2.4% NL
3.5% FR
3.7% RU
4.3% GB
4.6% JP
5.6% CN
7.0% DE

Findings summary

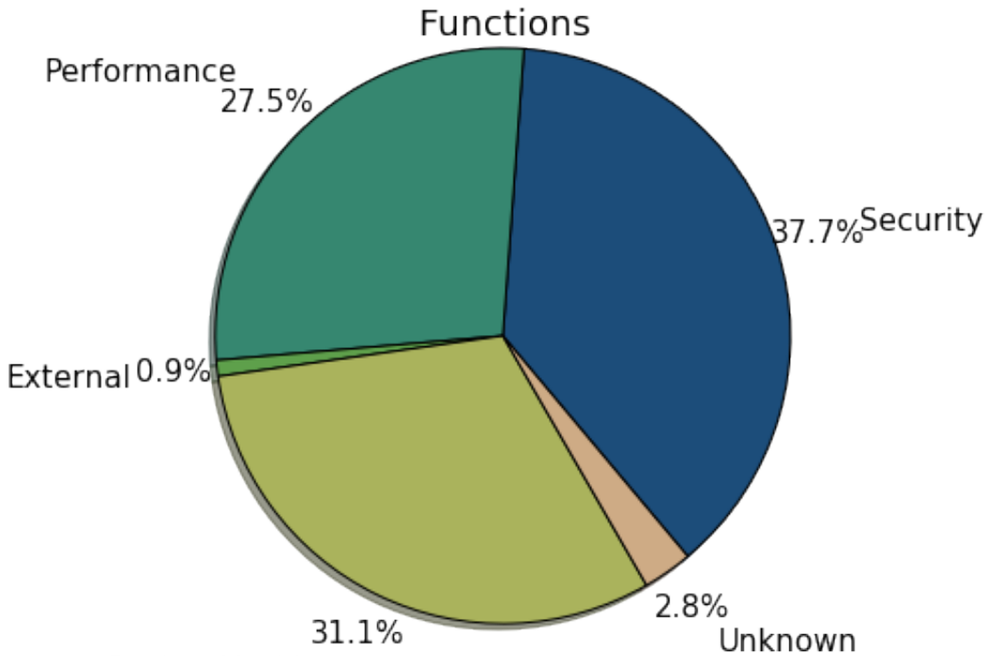
Modifications/Opt.stripping by intermediate hops (not incl. MSS/DSCP/TTL, HTTP(s) ports only):

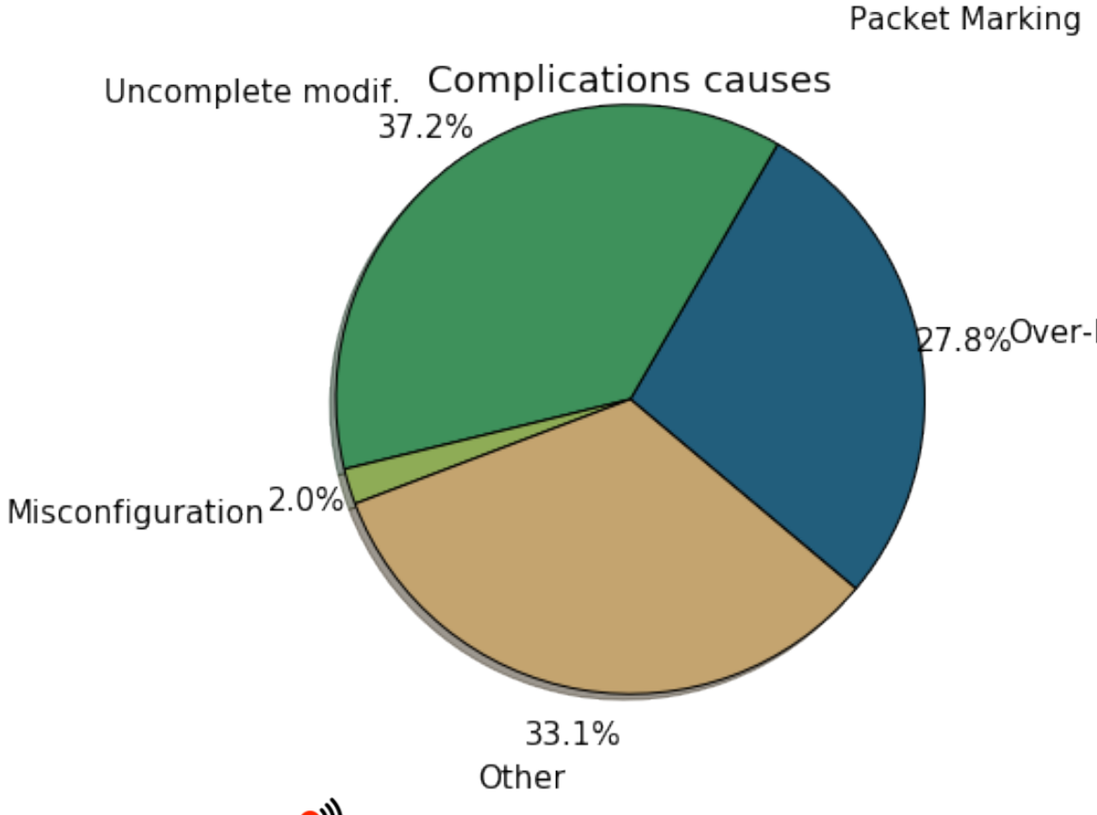
- TCP SACKPermitted stripped: 13,991 paths
- TCP SeqNumber shuffled: 18,718 paths
- TCP src port rewritten: 457 paths
- TCP AckNumber rewritten: 431 paths
- IP ECN set to non zero: 828 paths
- TCP Reserved rewritten: 78 paths
- TCP UrgentPtr rewritten: 79 paths
- IP ID modified rewritten: 15,796 paths

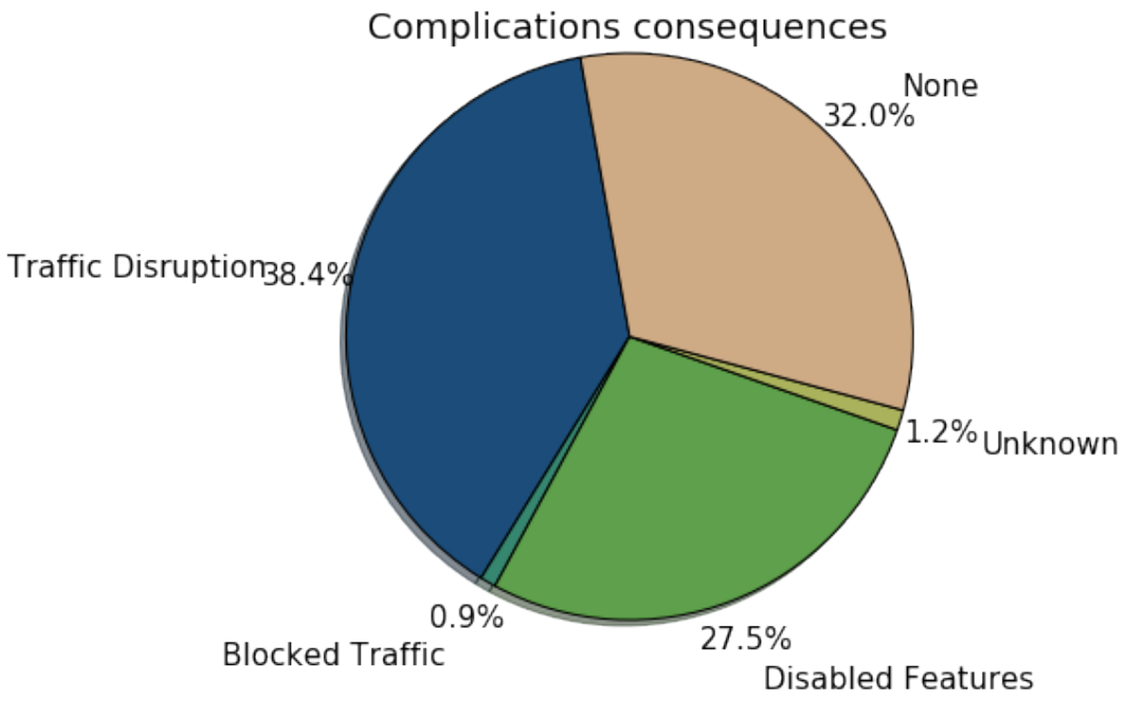
Findings summary



Back to Classification







Limitations/Challenges

- Tracebox-based (reversed ICMP quotation, after last answering hops, out of scope)
- Solution: Extend it with other tools finding
- Analyze each impairment separately
- Inline with the PTO conditions

Next Steps

- Include other aspects to taxonomy
- Temporal (dynamic, always up ?)

Next Steps

- Include other aspects to taxonomy
- Temporal (dynamic, always up ?)

- Include path conditions to classification

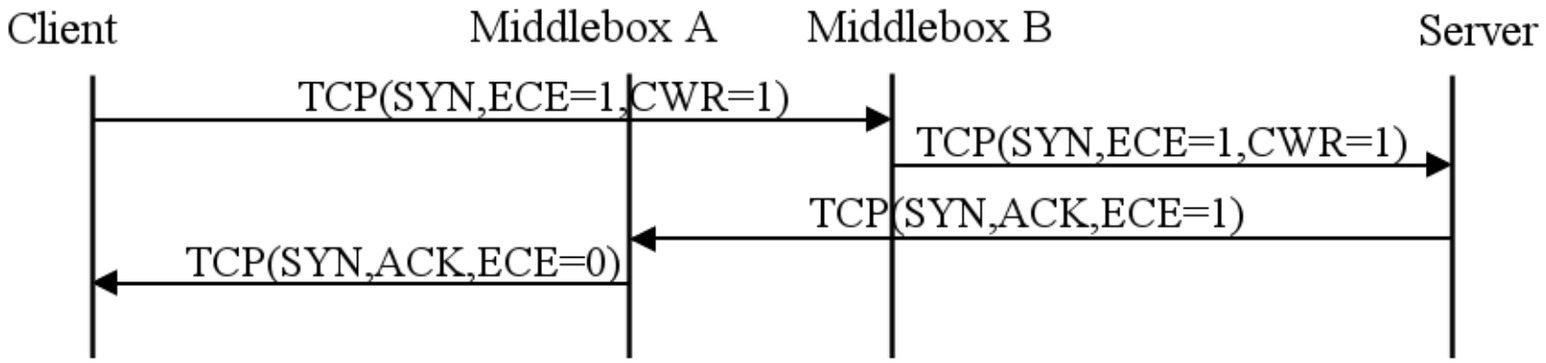
- Someone wants to help?

Next Steps

- Include other aspects to taxonomy
- Temporal (dynamic, always up ?)

- Include path conditions to classification
- Someone wants to help?

- Implement conditions in the simulator
- Someone wants to help?

Comments ?

Classification: Paradigm shift