



RIPE NCC
RIPE NETWORK COORDINATION CENTRE

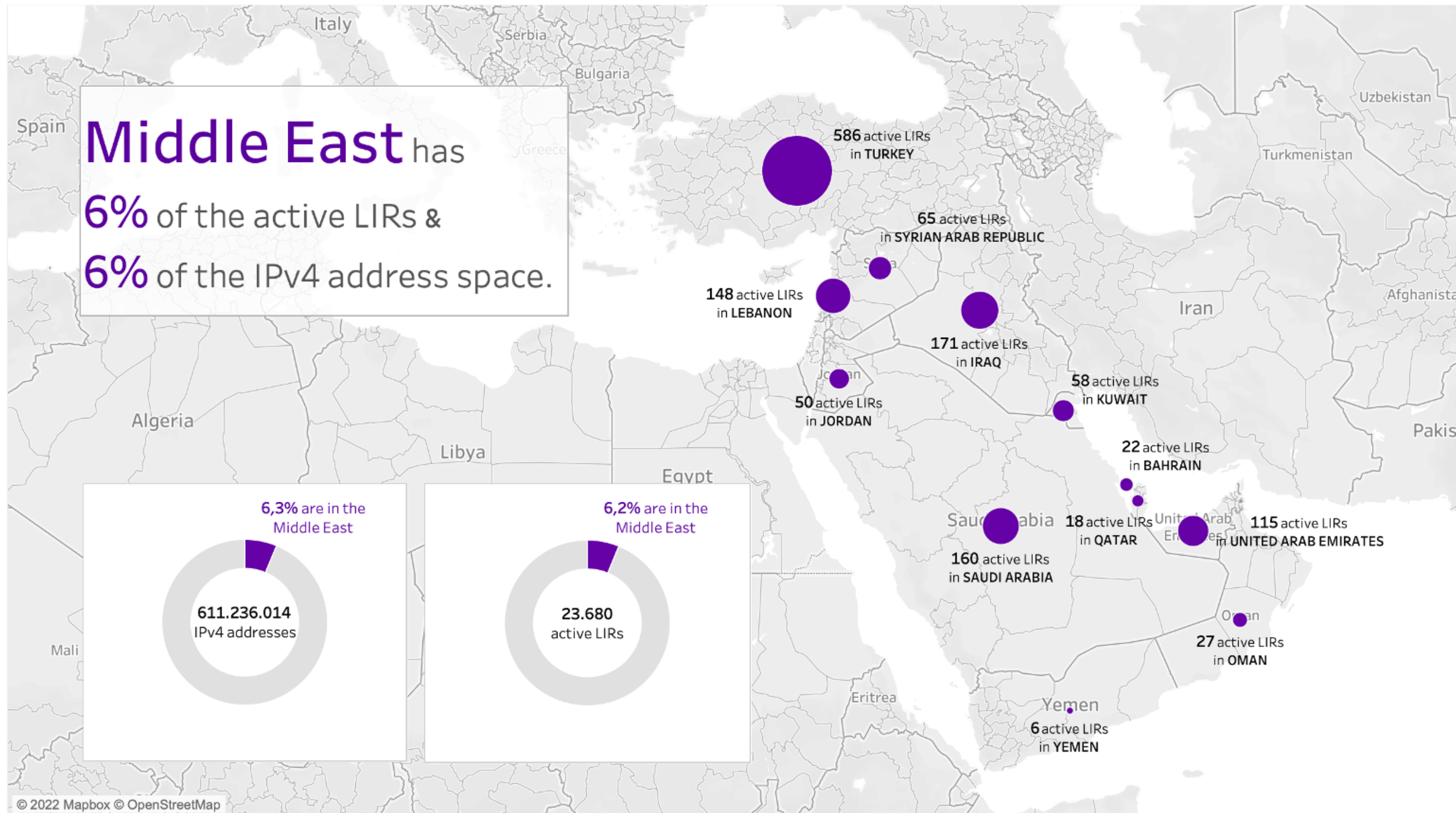
MENOG 22

Routing Security

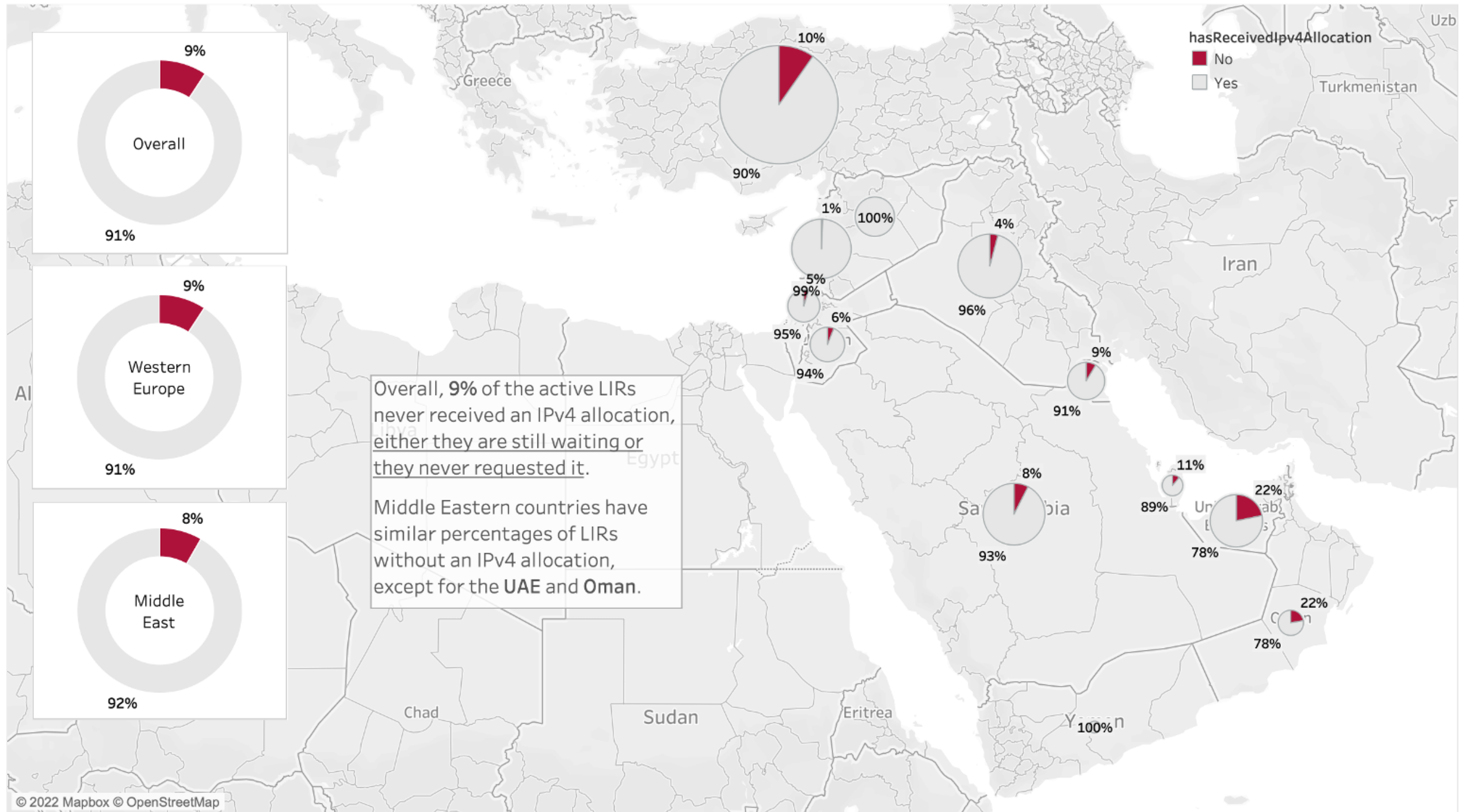


Statistics PoV

LIRs in MENOG Region



IPv4 in MENOG Region



IPv4 in MENOG Region

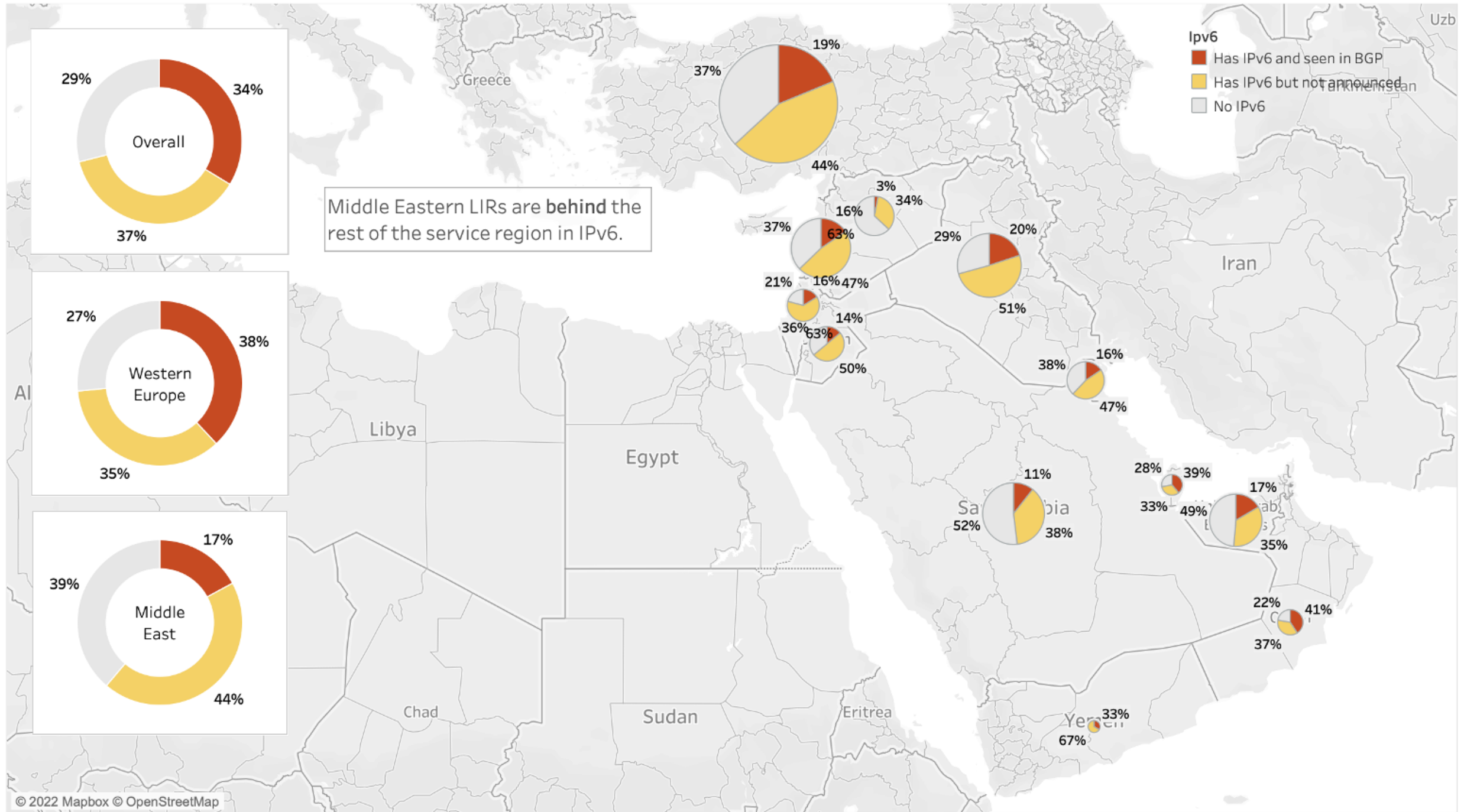


Country Name	Reg Id	Legal Name	Year of Acti..	
UNITED ARAB EMIRATES	ae.dpworld-fze	D P World FZE	2010	12 y.o.
	ae.dfm	Dubai Financial Market (DFM) PJSC	2011	11 y.o.
	ae.centroid	Centroid Solutions DMCC	2020	2 y.o.
	ae.digital	DIGITAL 14 LLC	2020	2 y.o.
	ae.adarame	Adara Middle East FZE	2021	1 y.o.
	ae.oryxlabs	Oryxlabs Technologies - Sole Proprietorship L.L.C.	2021	1 y.o.
	ae.horizon	Horizon Technology-Fzco	2022	1 y.o.
	ae.cloudhost3	Rajesh Sajnani trading as CLOUD HOST TECHNOLOGY	2022	1 y.o.
	ae.bamboozle2	Bamboozle Web Services MEA FZ-LLC	2022	1 y.o.
	ae.pinelabsuae	PINE LABS PAYMENT SERVICES PROVIDER L.L.C	2022	0 y.o.
	ae.mebridge	ME BRIDGE TELECOM FZCO	2022	0 y.o.
	ae.ip	Seven Digital Network Services LLC	2022	0 y.o.
	ae.stormwall	StormWall FZE LLC	2022	0 y.o.
	ae.datatech	DATATECH LABS MIDDLE EAST DMCC	2022	0 y.o.
	ae.cloudhost4	Rajesh Sajnani trading as CLOUD HOST TECHNOLOGY	2022	0 y.o.
	ae.skytell	SKYTELL FZ LLC	2022	0 y.o.
	ae.adports	ABU DHABI PORTS COMPANY PJSC	2022	0 y.o.
	ae.rcstechnologies	RCS Technologies FZE LLC	2022	0 y.o.
	ae.lir	LIR Limited	2022	0 y.o.
	ae.universalsatcom	UNIVERSAL SATELLITE COMMUNICATION DMCC	2022	0 y.o.
	ae.basra	Basra Energy Company Limited	2022	0 y.o.
	ae.iqweb-llc	IQWeb FZ-LLC	2022	0 y.o.
	ae.digitalcity	Digital City FZE	2022	0 y.o.
	ae.airoserver	Mahdiar Rafiee	2022	0 y.o.
	ae.arvancloud	ARVANCLOUD GLOBAL TECHNOLOGIES L.L.C	2022	0 y.o.
	OMAN	om.bankmuscat	Bank Muscat SAOG	2020
om.nbosaog		National Bank of Oman SAOG	2020	2 y.o.
om.ahlibank1		Ahli Bank SAOG	2020	2 y.o.
om.alizzbank		Alizz Islamic Bank SAOC	2021	2 y.o.
om.ufcoman		United Finance Company SAOG	2021	1 y.o.
om.banknizwa		Bank Nizwa SAOG (PJSC)	2022	1 y.o.

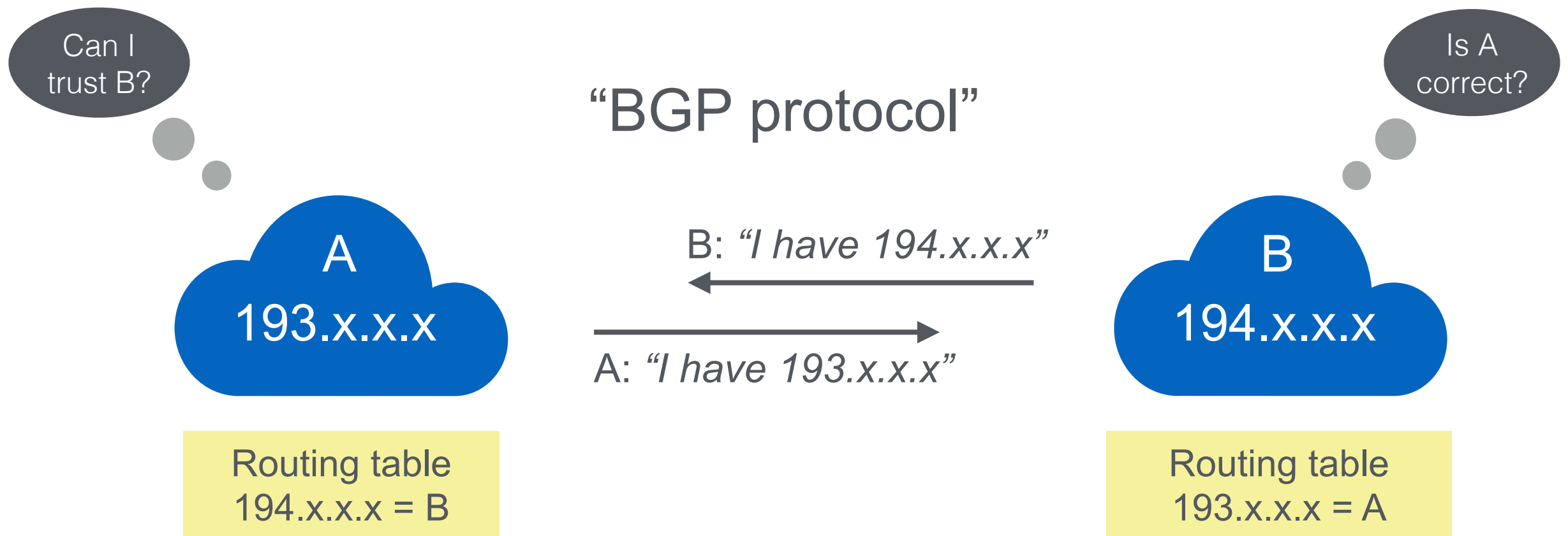
LIRs that never received an IPv4 allocation from the UAE and Oman are only a few years old.

DP World and DFM have been around for over a decade but they **have PI assignments!**

IPv6 in MENOG Region



Routing on the Internet



Accidents Happen



- Fat Fingers
 - 2 and 3 are really close on our keyboards.....
- Policy Violations (leaks)
 - Oops, we did not want this to go on the public Internet
 - Infamous incident with Pakistan Telecom and YouTube

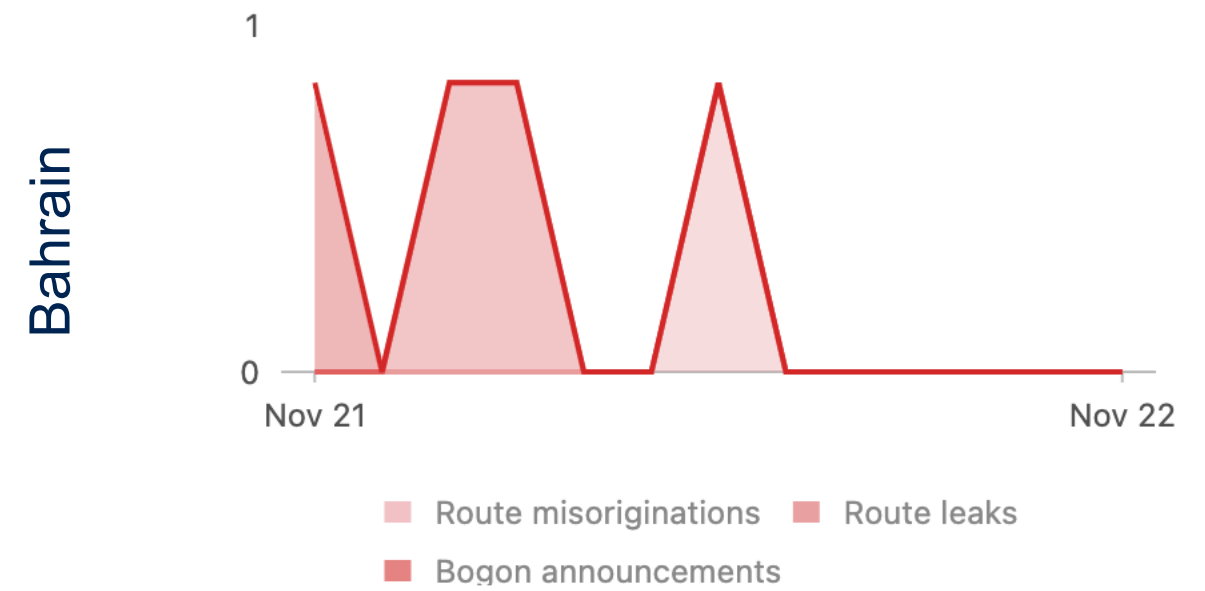
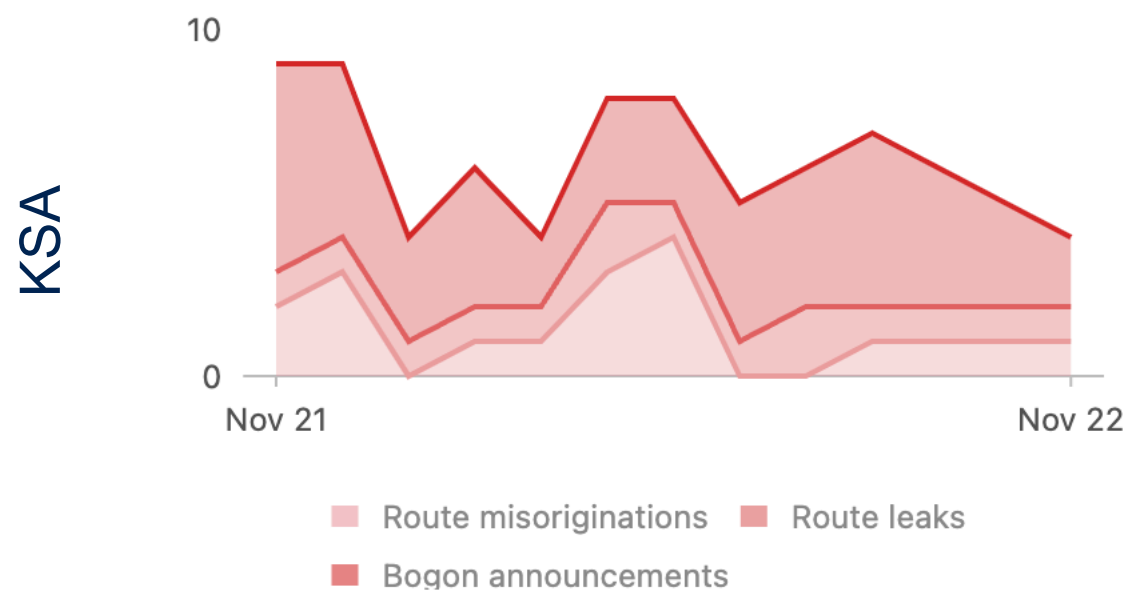
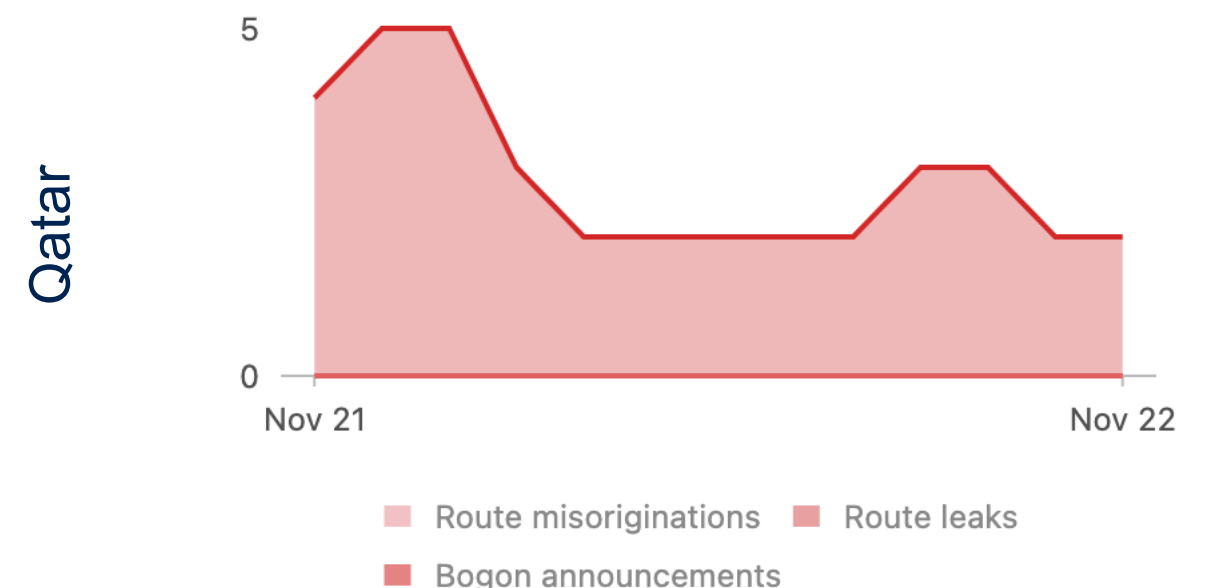
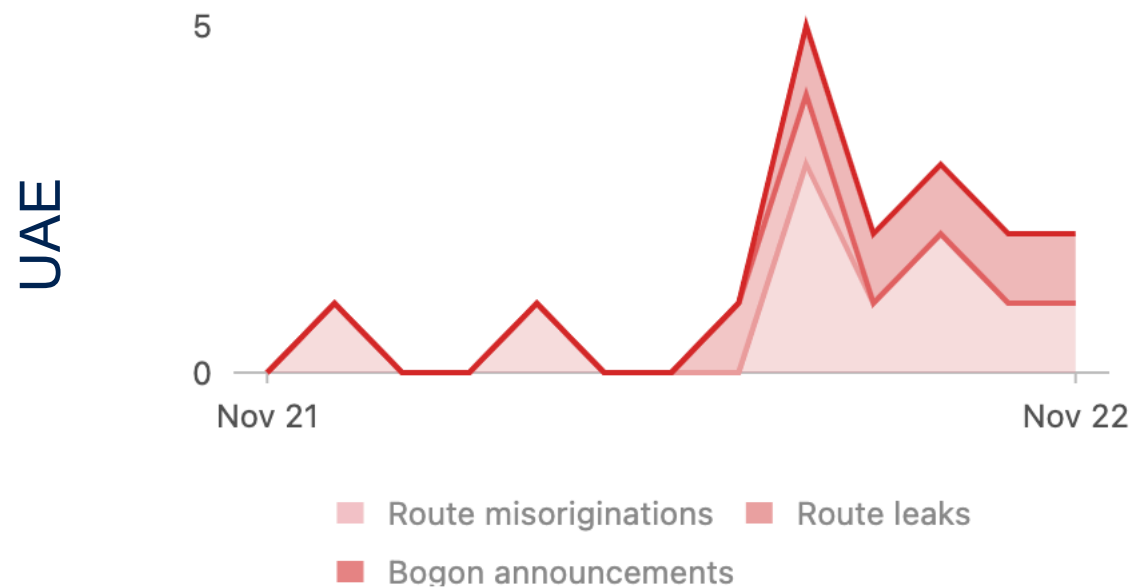
Incidents Are Common



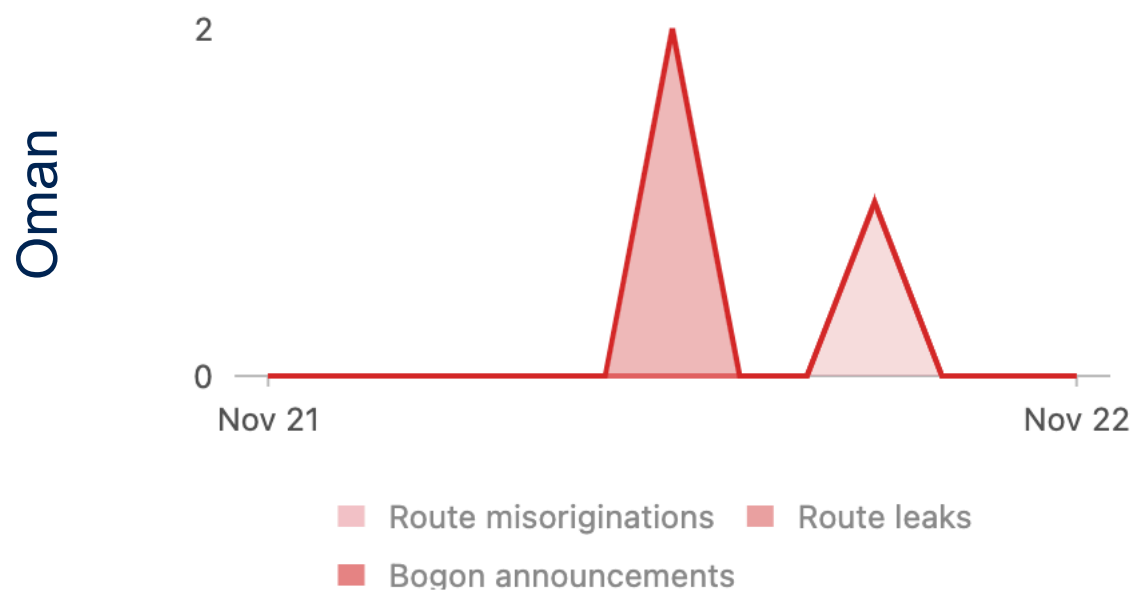
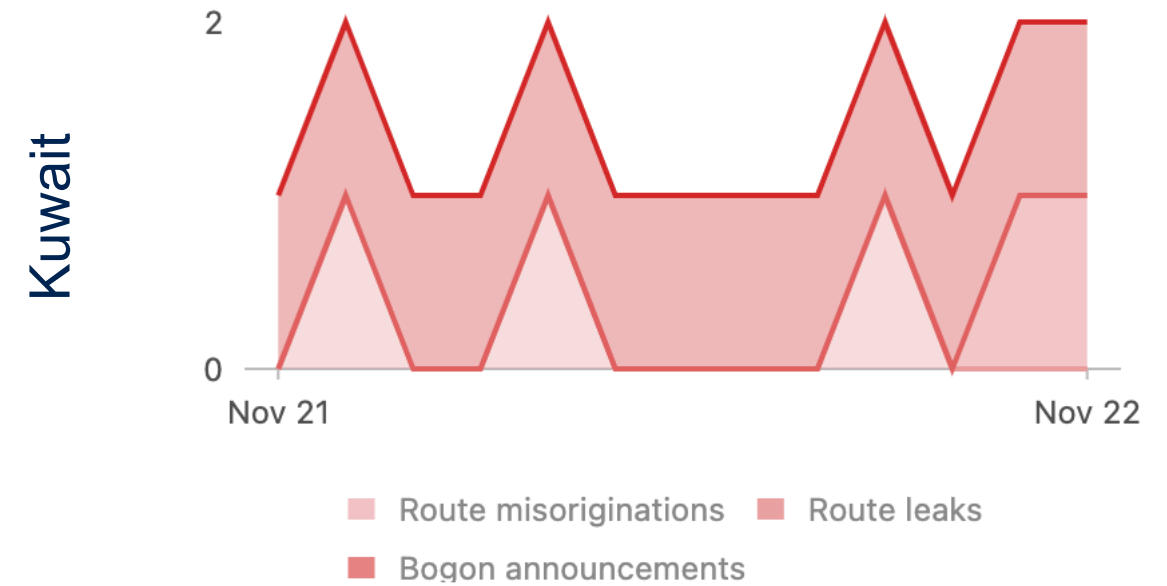
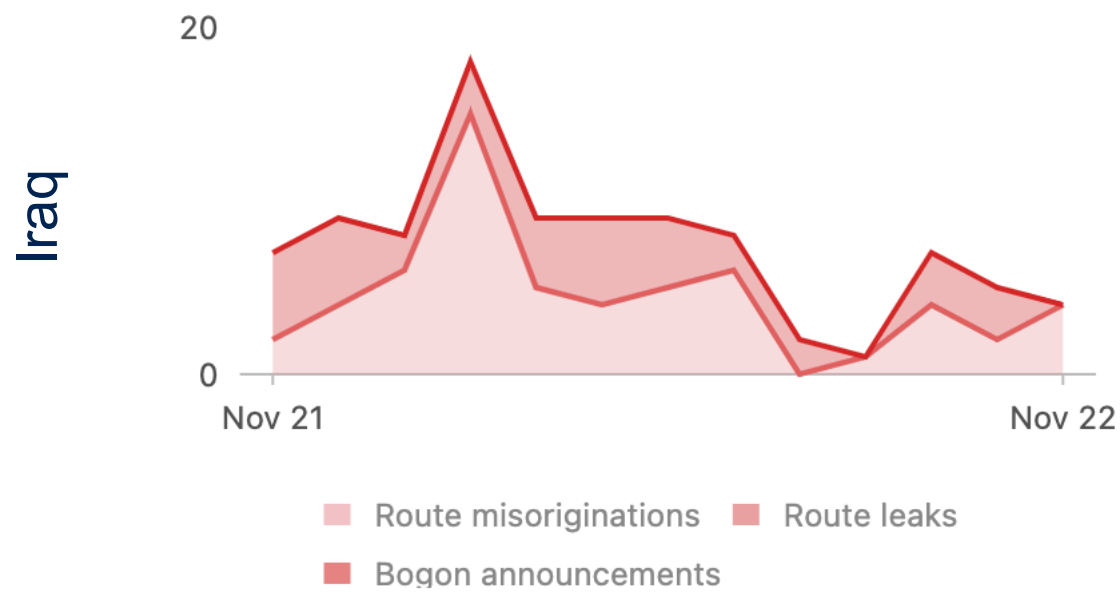
- 2021 Routing Incidents Review
 - 775 possible Hijacks (2255 in 2020)
 - 830 possible Route Leaks (1260 in 2020)
 - 9868 Bogon announcements (9059 in 2020)

Source: MANRS & <https://bgpstream.com>

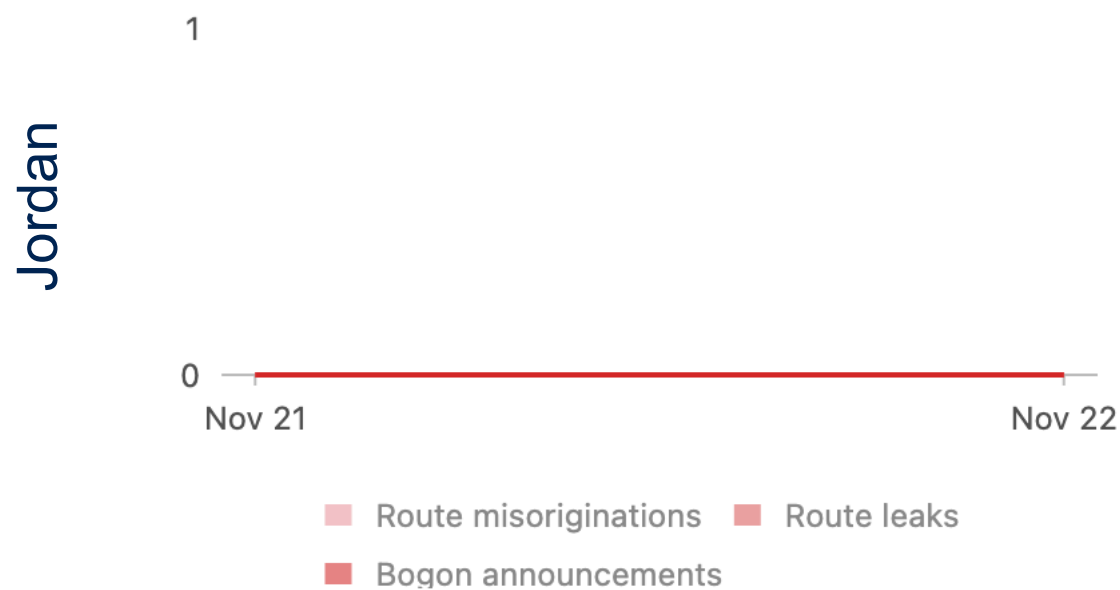
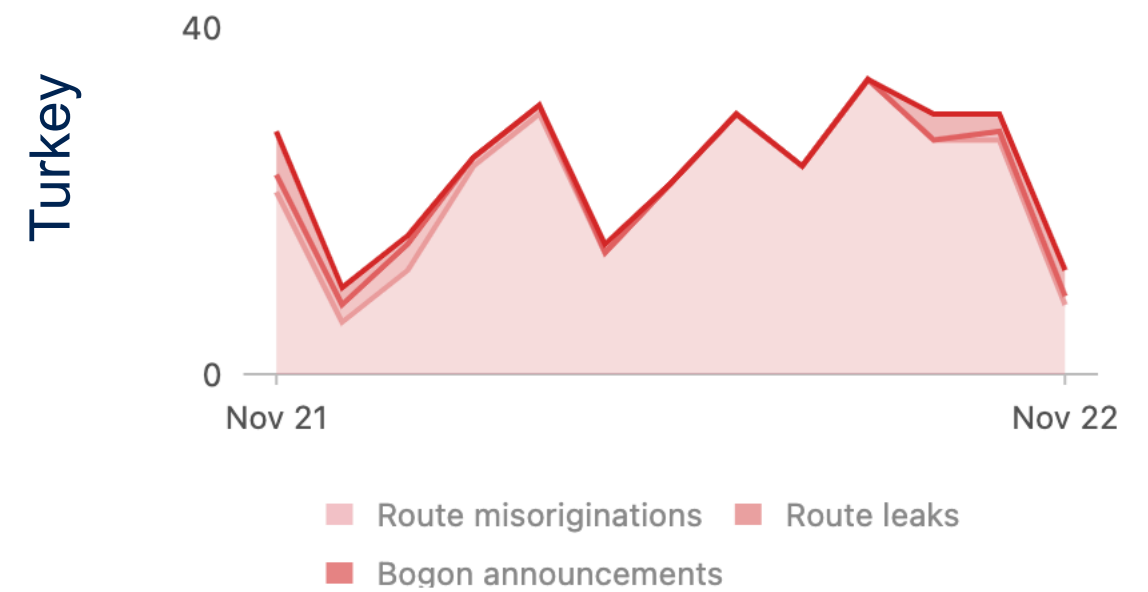
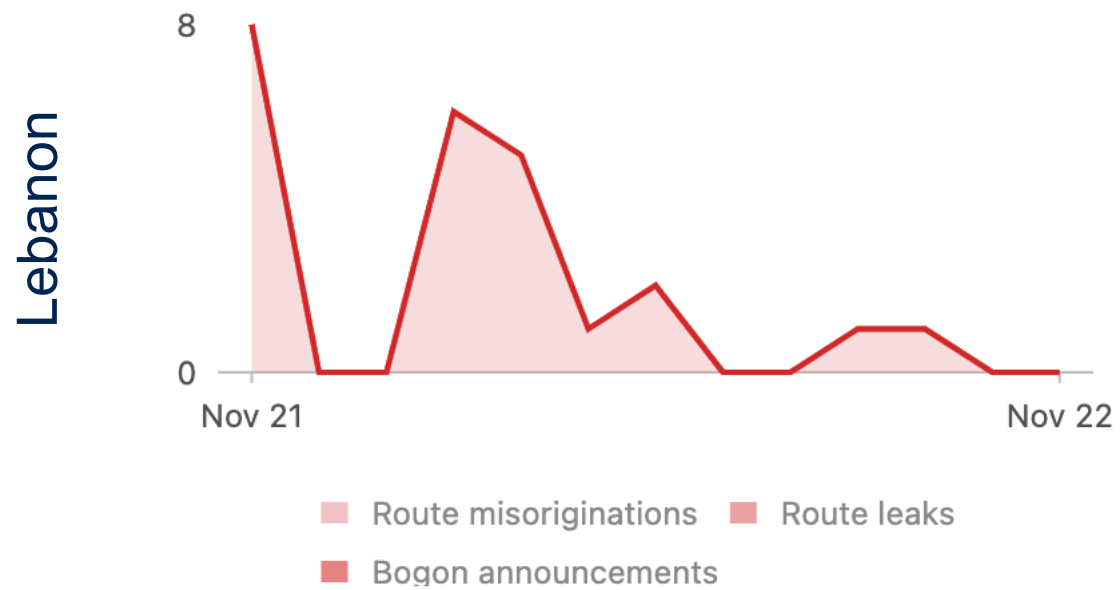
Effects on global routing



Effects on global routing



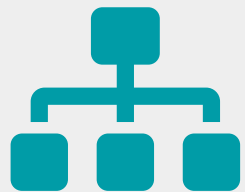
Effects on global routing



Resource Public Key Infrastructure



Ties IP addresses and ASNs to public keys



Follows the RIR hierarchy



Authorised statements from resource holders

- “ASN X is authorised to announce my Prefix Y”
- Signed, holder of Y

Two elements of RPKI



Signing



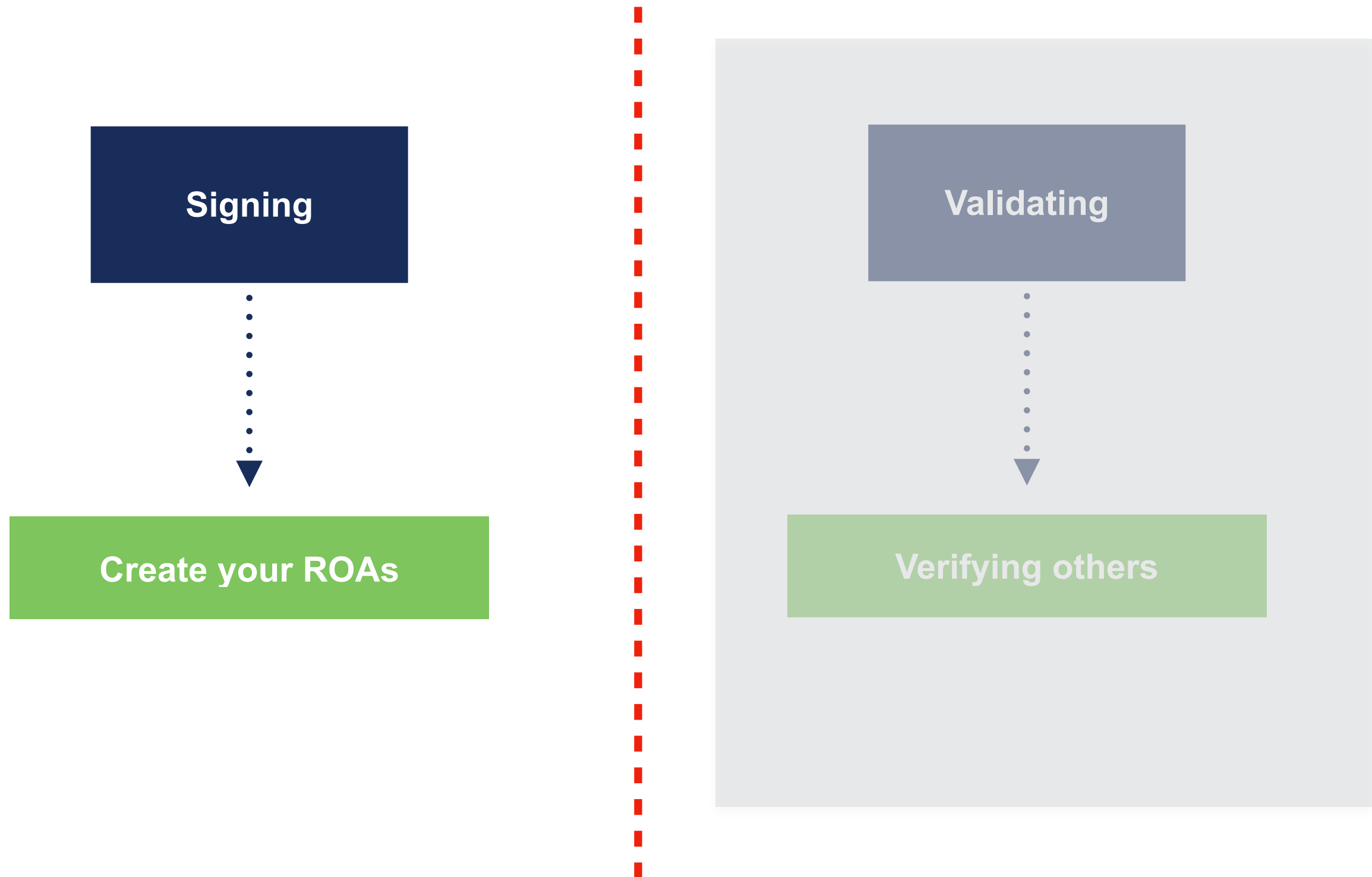
Create your ROAs

Validating

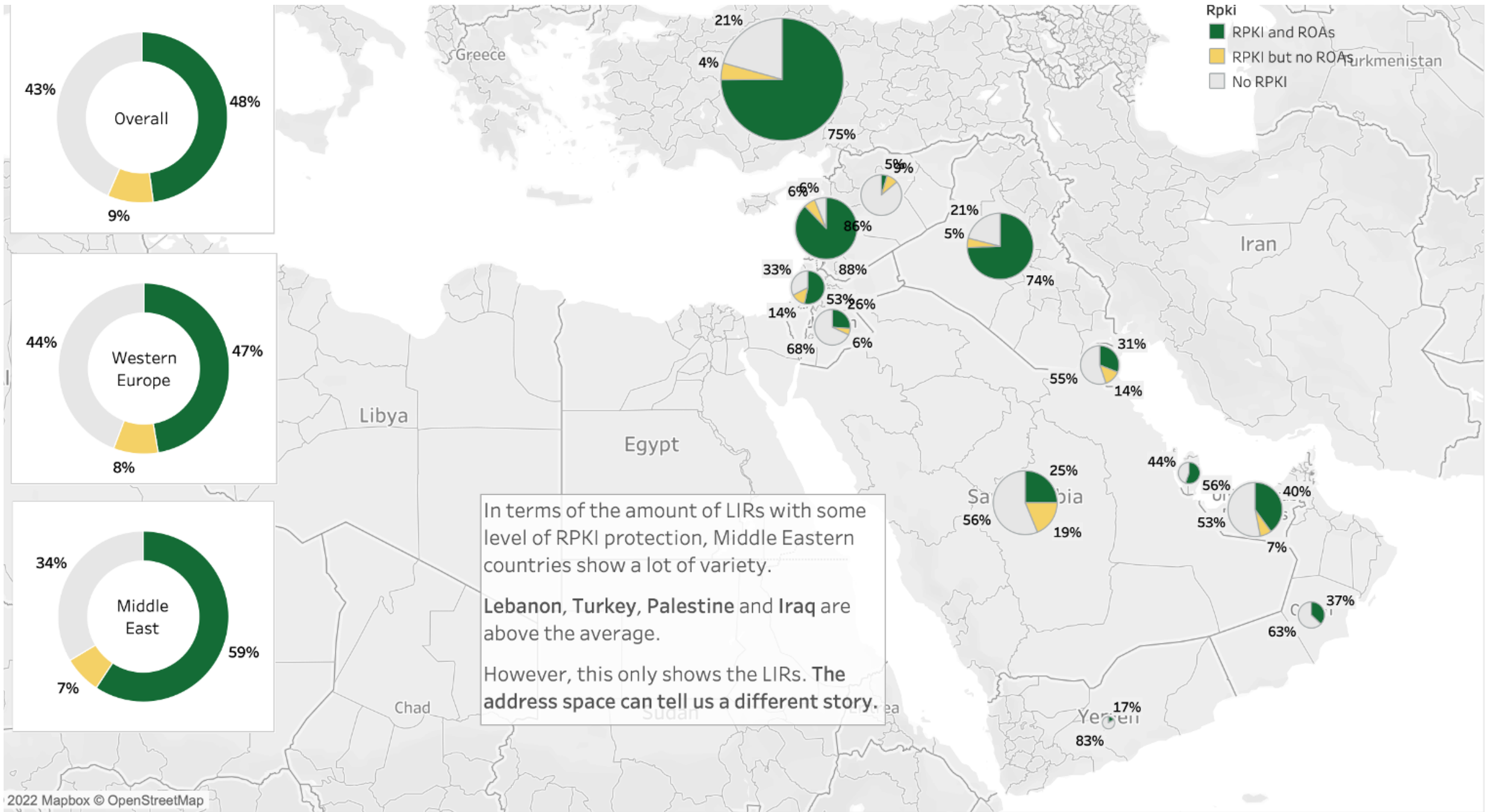


Verifying others

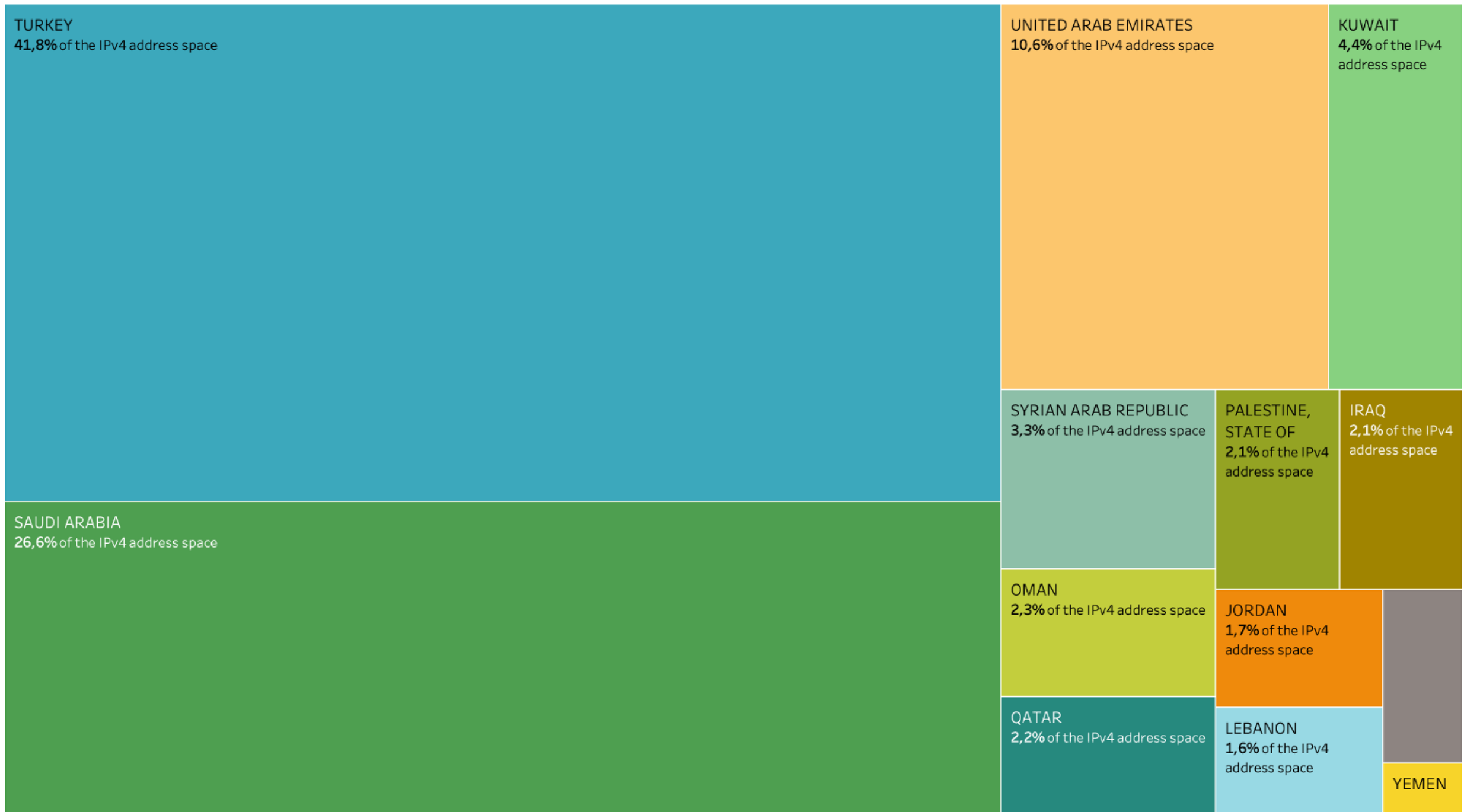
Two elements of RPKI - Signing



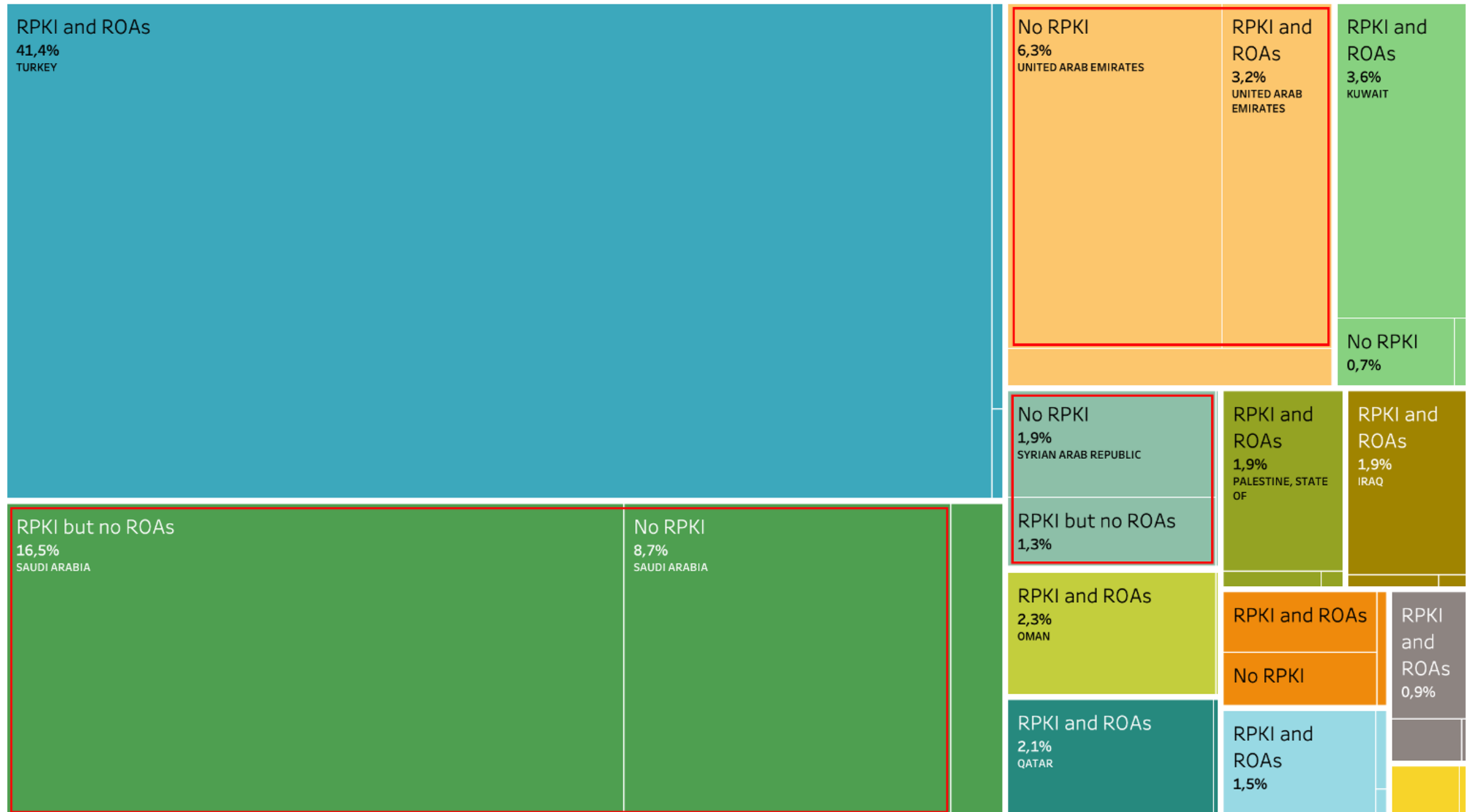
RPKI in MENOG Region



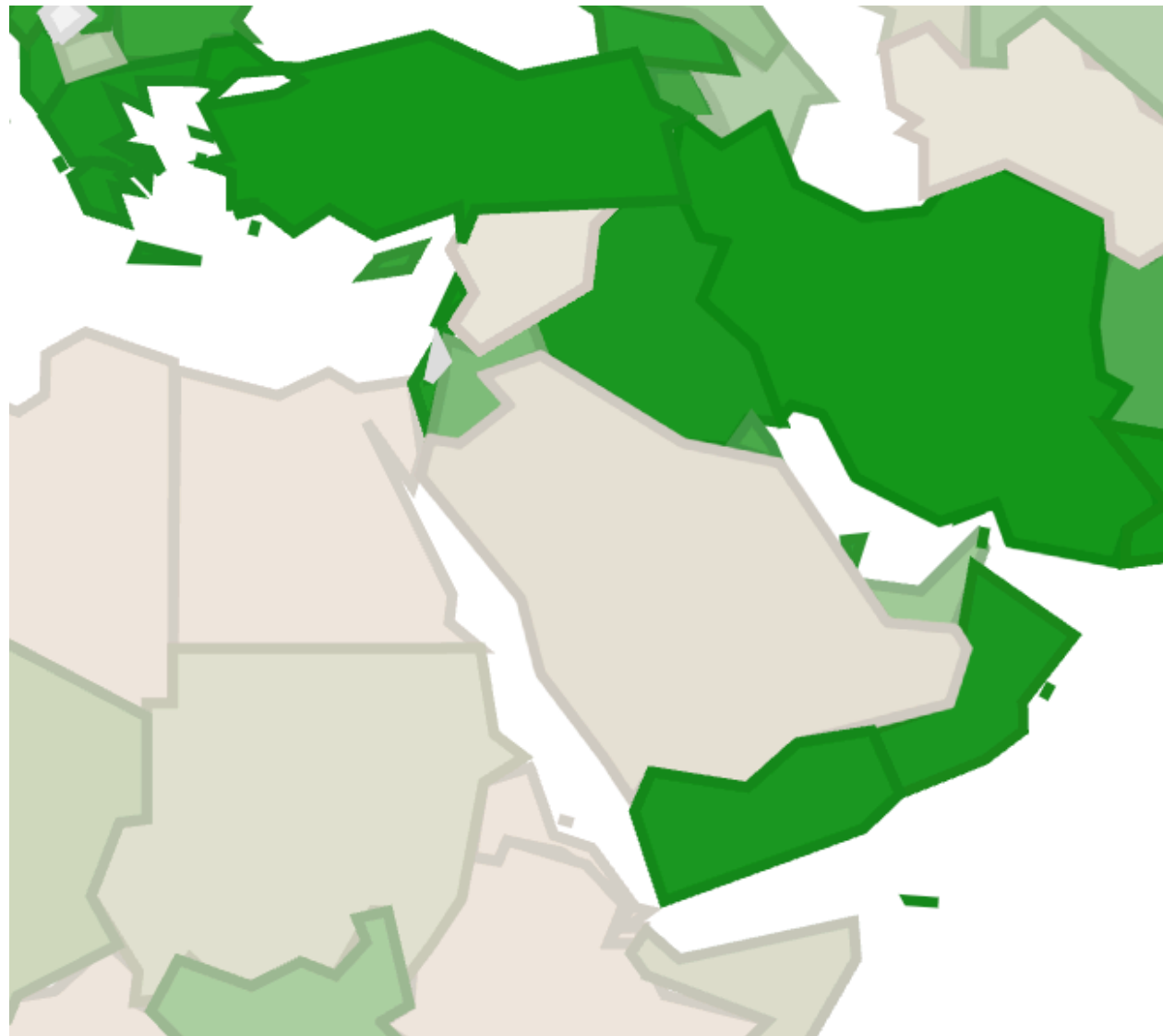
Address Space in MENOG Region



Address Space w/o RPKI



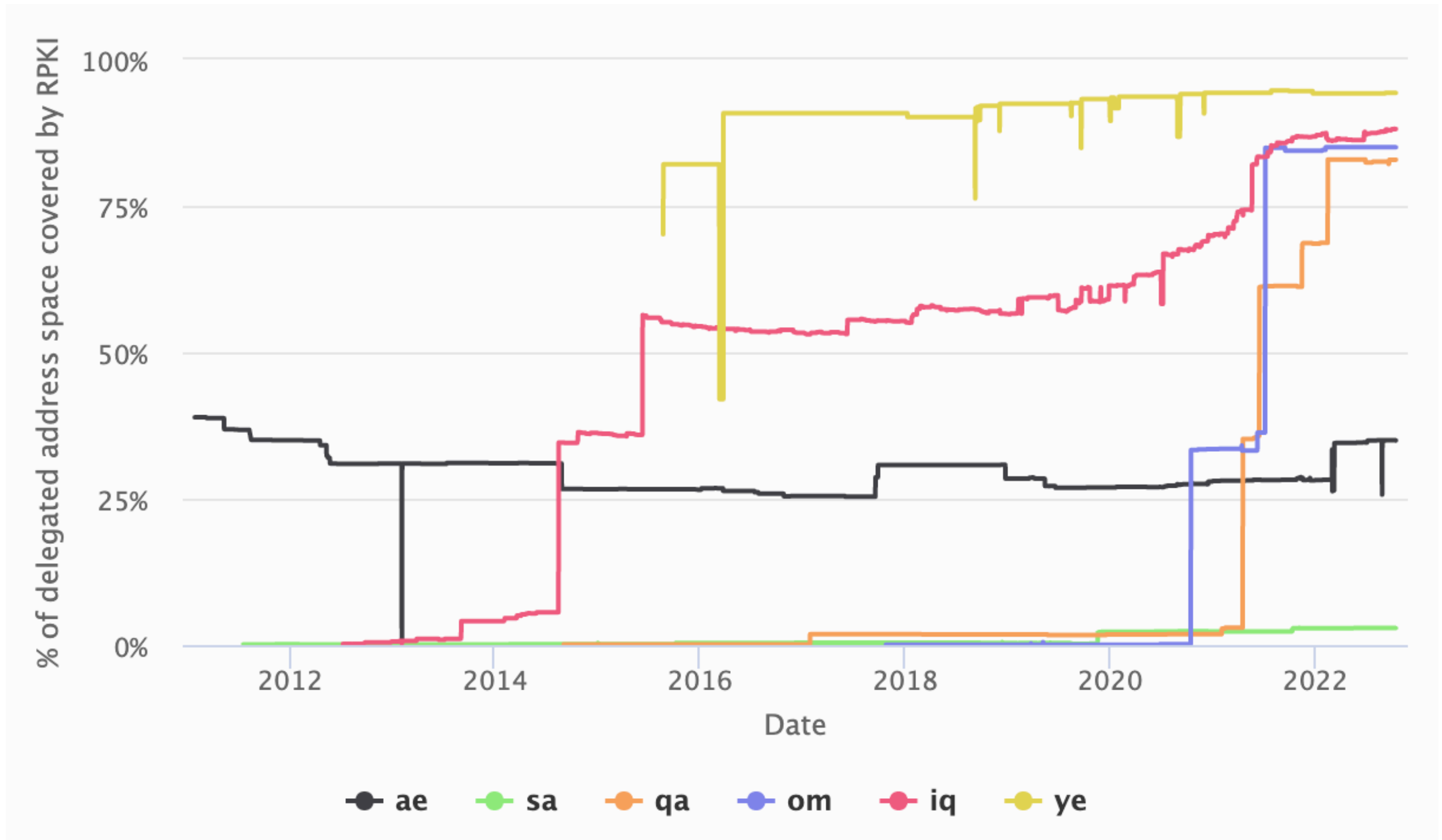
% IPv4 space covered by ROAs



Source: [RIPE NCC](#)

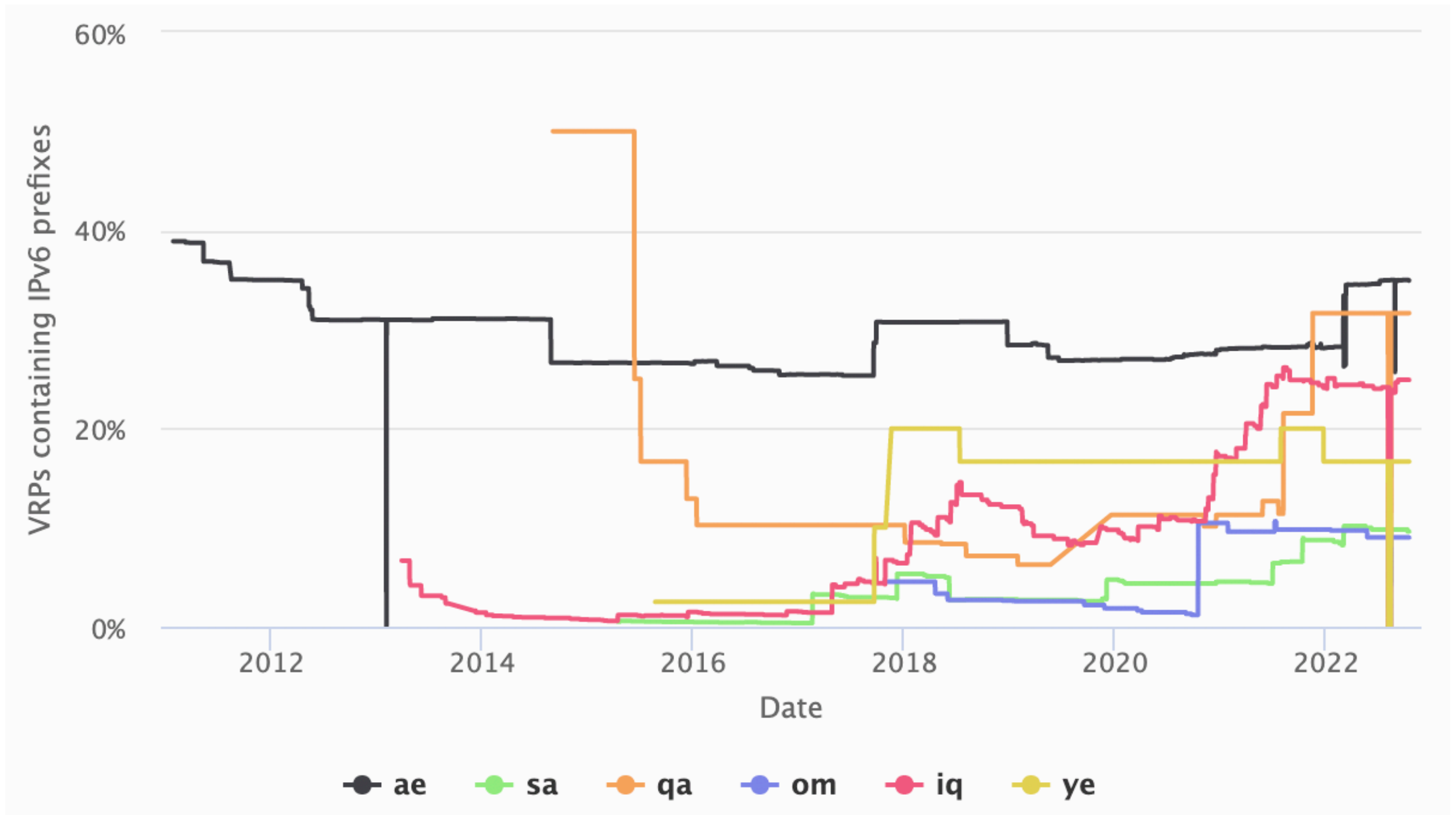
Country	%
Turkey	97.65
Lebanon	97.28
Yemen	95.66
Iraq	94.86
Oman	94.02
Qatar	83.82
Kuwait	73.9
Bahrain	71.78
Jordan	50.17
Palestine	50.08
UAE	35
KSA	3.13
Syria	0.87

Historical View of RPKI Adoption (v4)



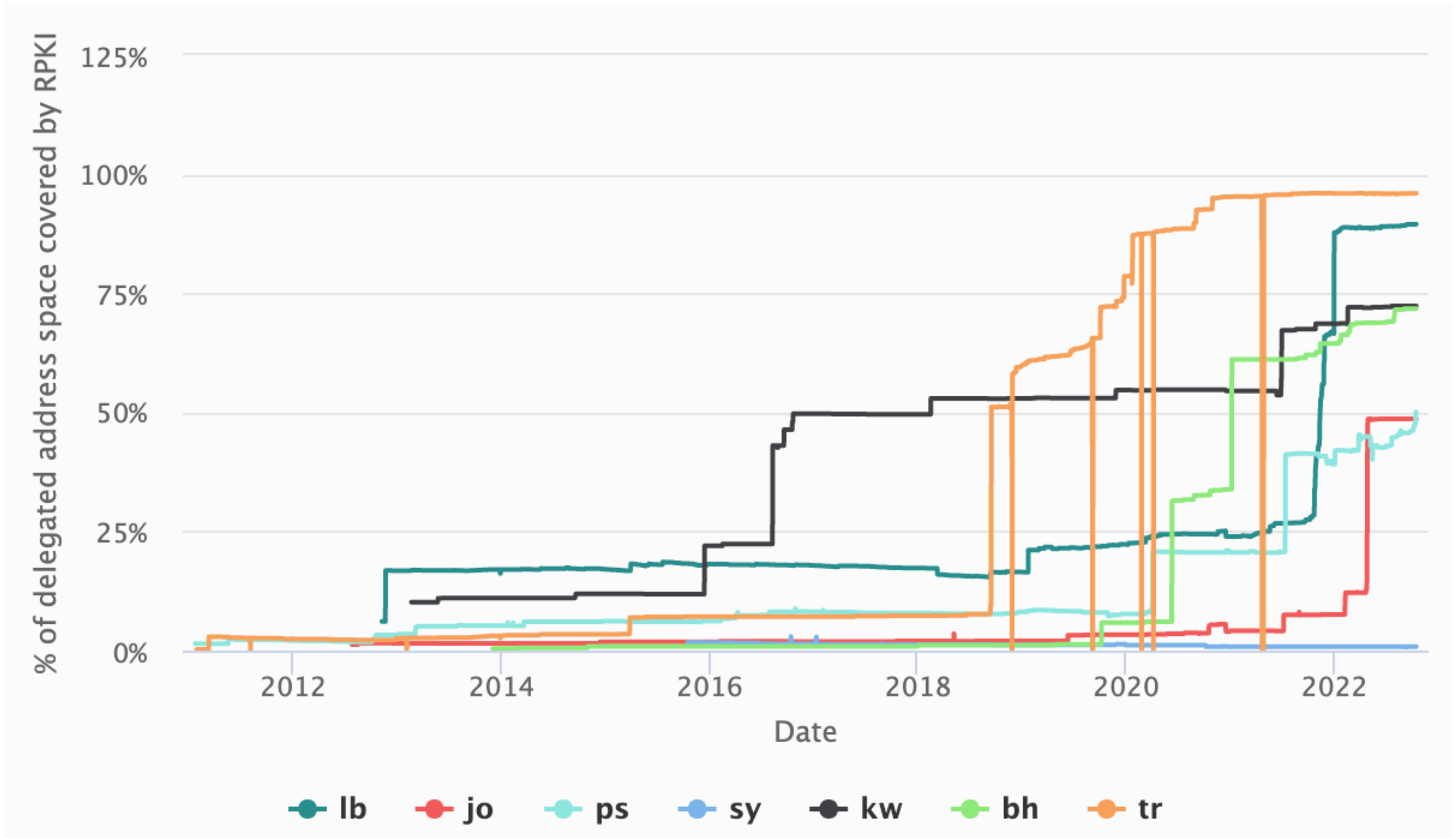
Source: <https://stat.ripe.net/>

Historical View of RPKI Adoption (v6)



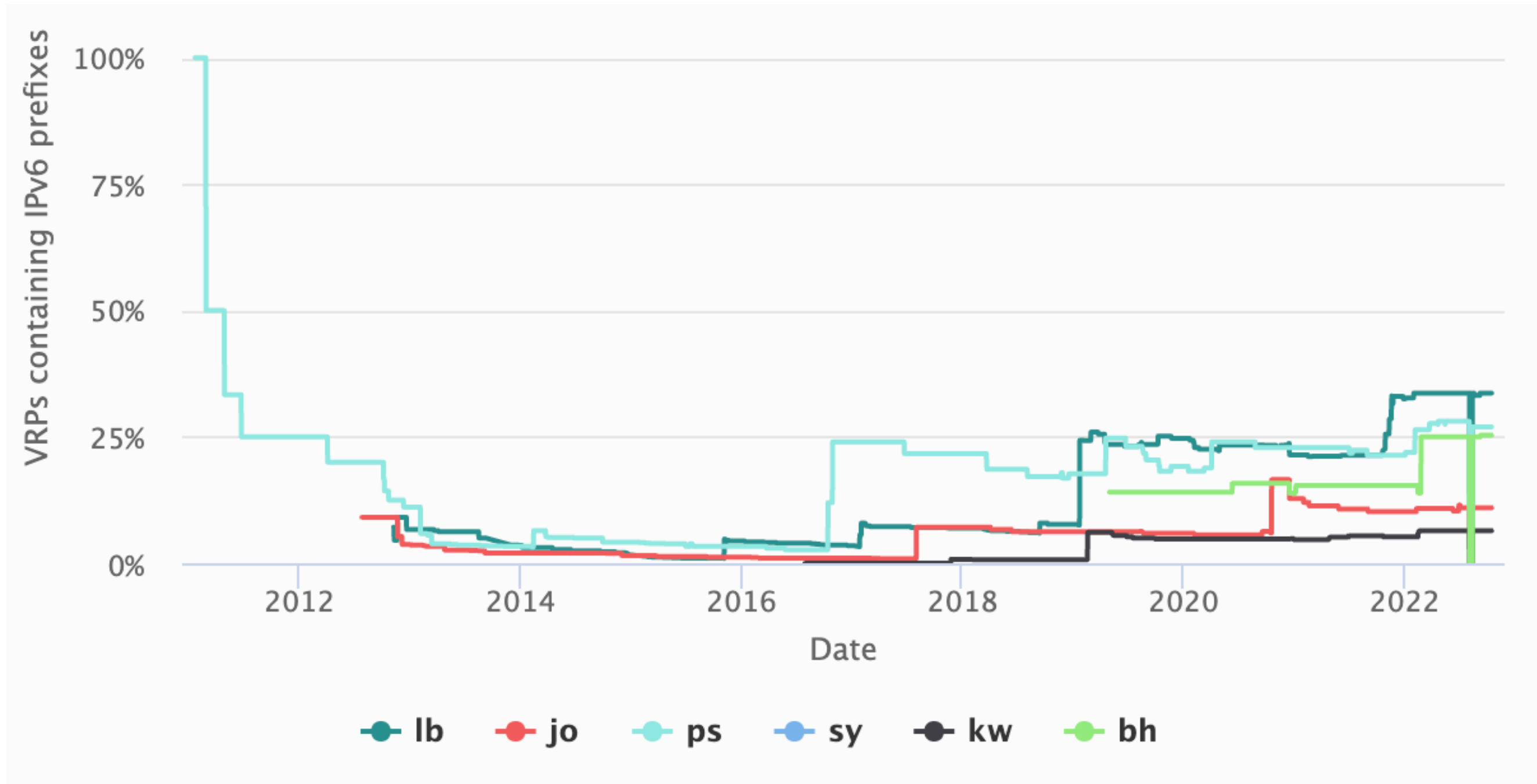
Source: <https://stat.ripe.net/>

Historical View of RPKI Adoption (v4)



Source: <https://stat.ripe.net/>

Historical View of RPKI Adoption (v6)



Source: <https://stat.ripe.net/>

LIRs w/o RPKI or ROA - KSA



LIRs w/o RPKI or ROA - UAE

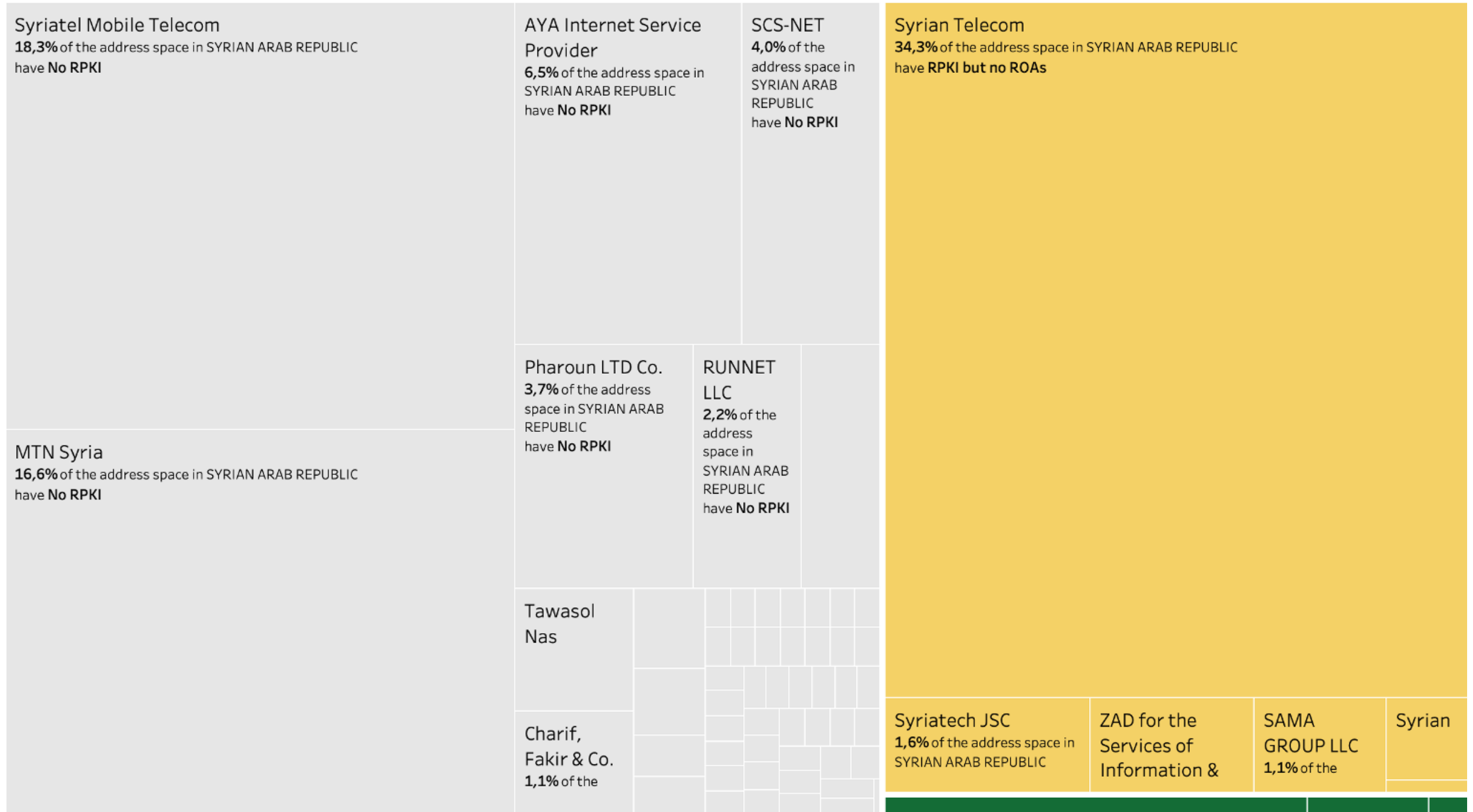


Emirates Telecommunications Corporation
58,0% of the address space in UNITED ARAB EMIRATES
have No RPKI

Emirates Integrated Telecommunications Company PJSC
28,0% of the address space in UNITED ARAB EMIRATES
have RPKI and ROAs

Cyber Assets FZCO
9,3% of the address space in UNITED ARAB EMIRATES
have RPKI but no ROAs

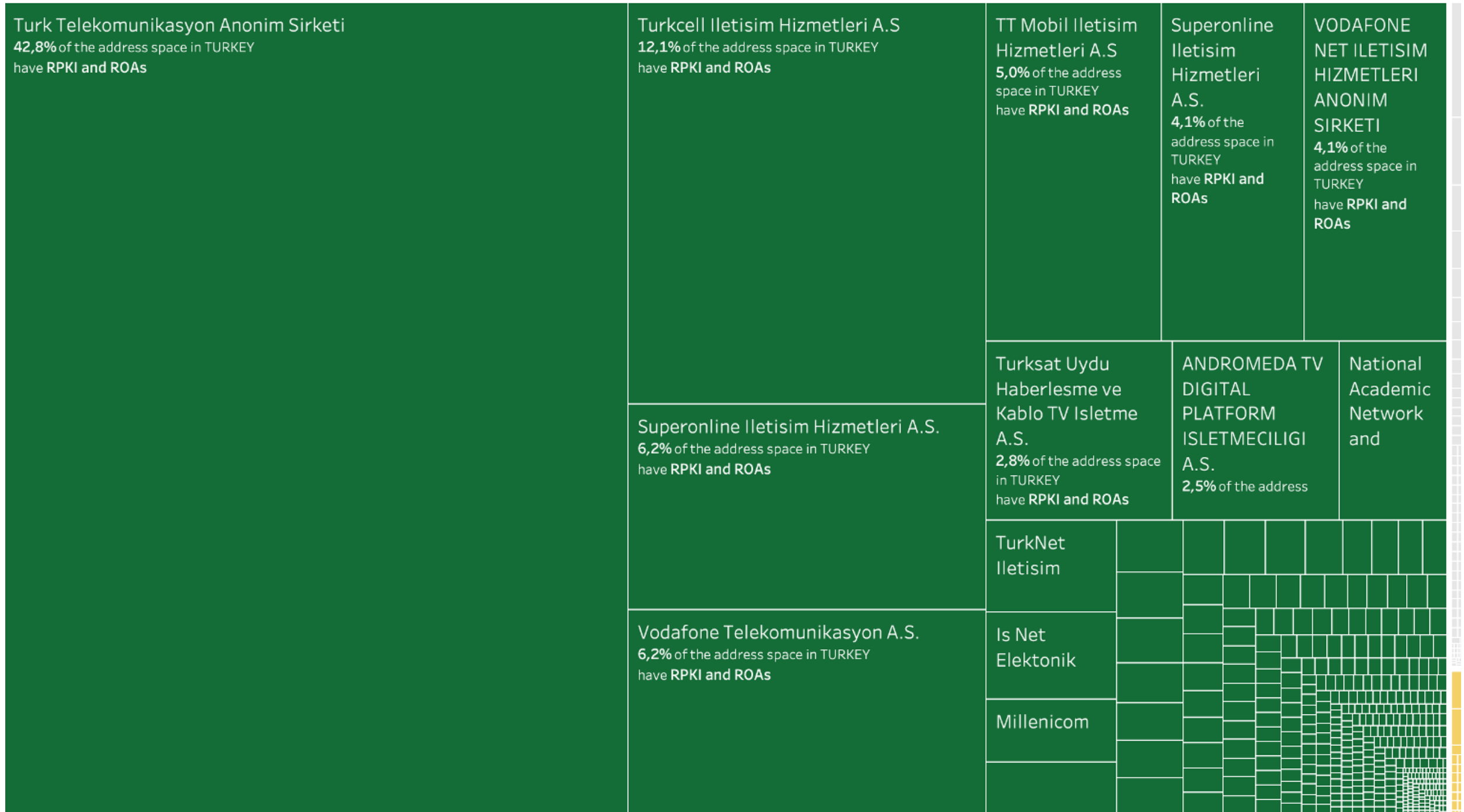
LIRs w/o RPKI or ROA - Syria



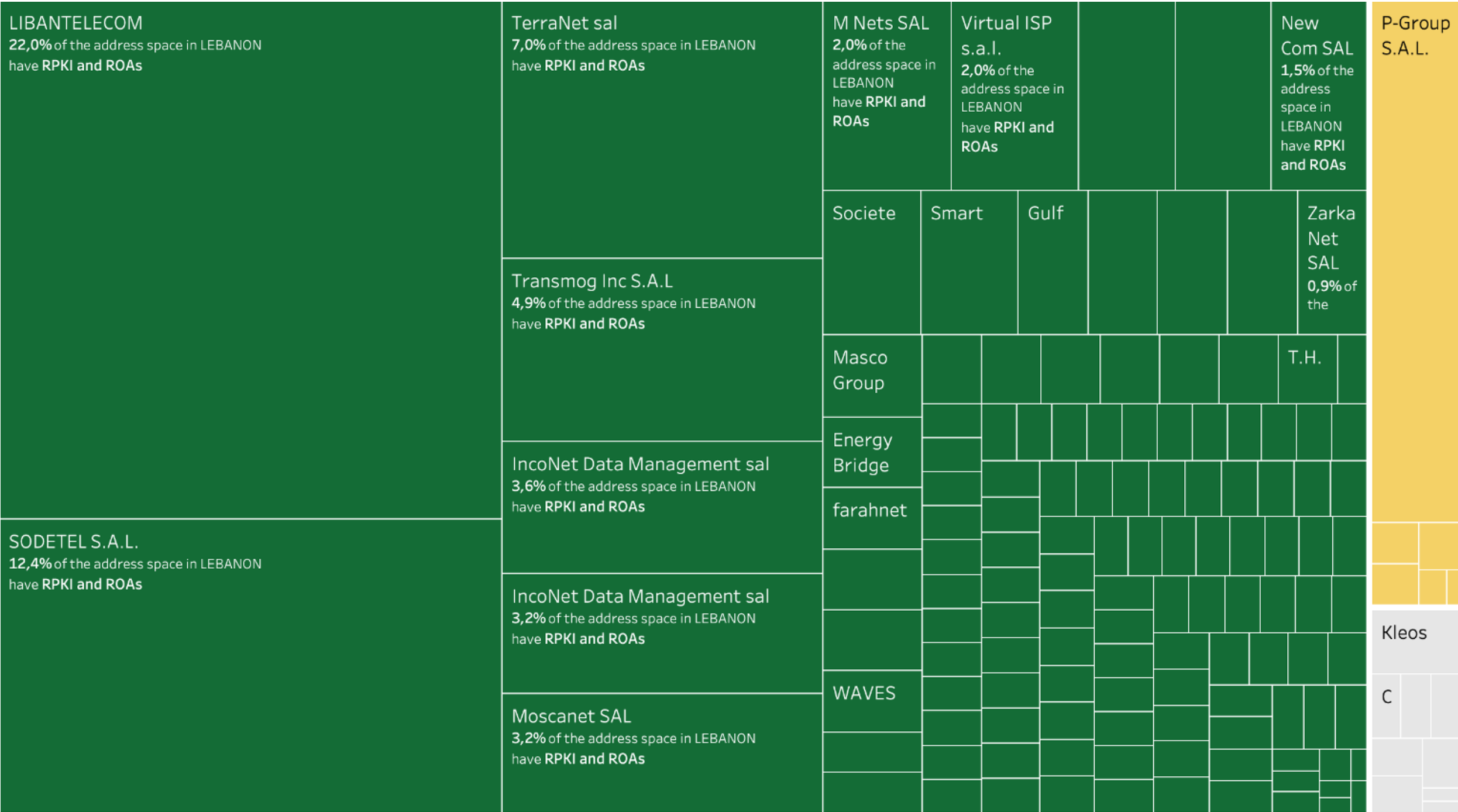
LIRs w/o RPKI or ROA - Bahrain



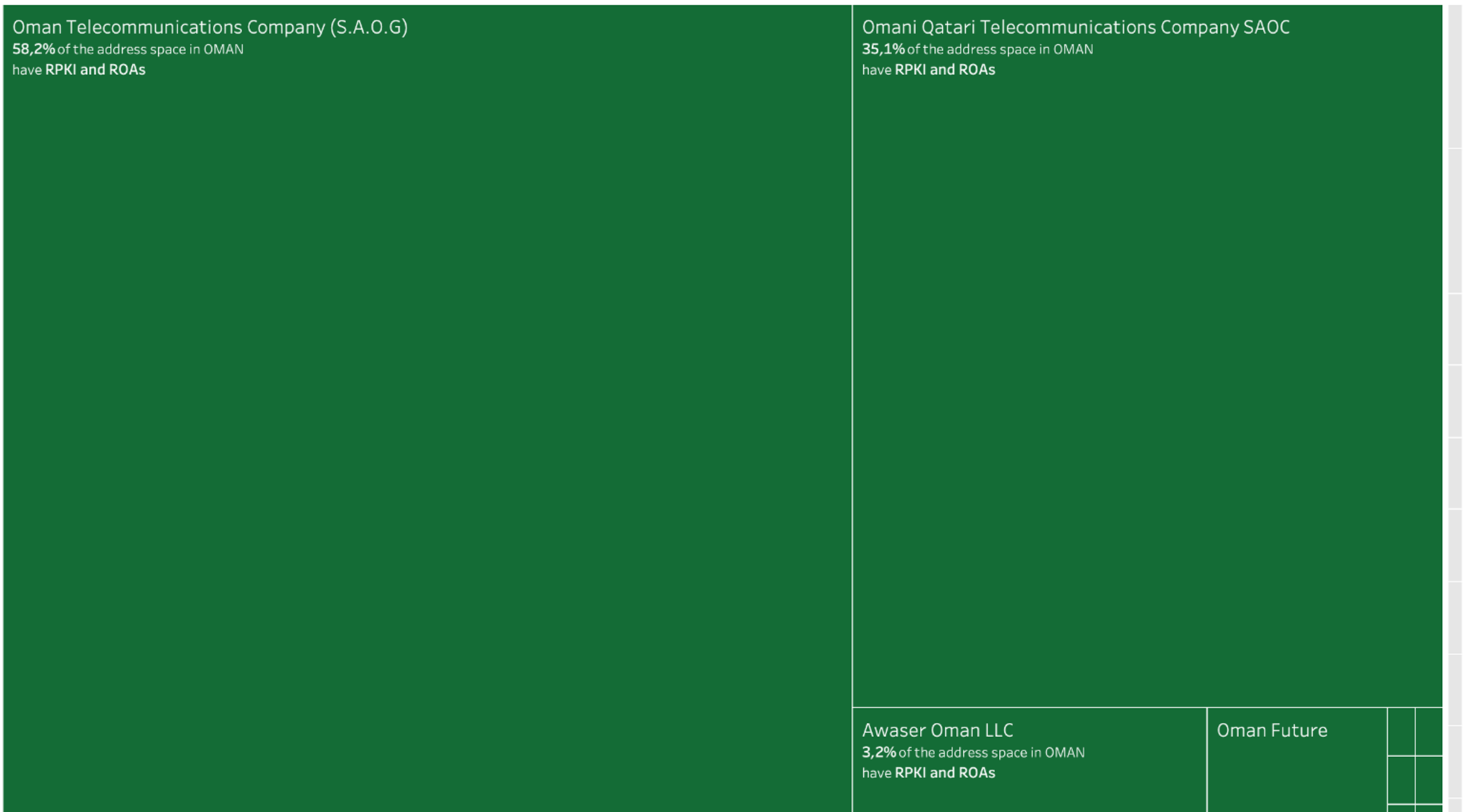
LIRs w/o RPKI or ROA - Turkey



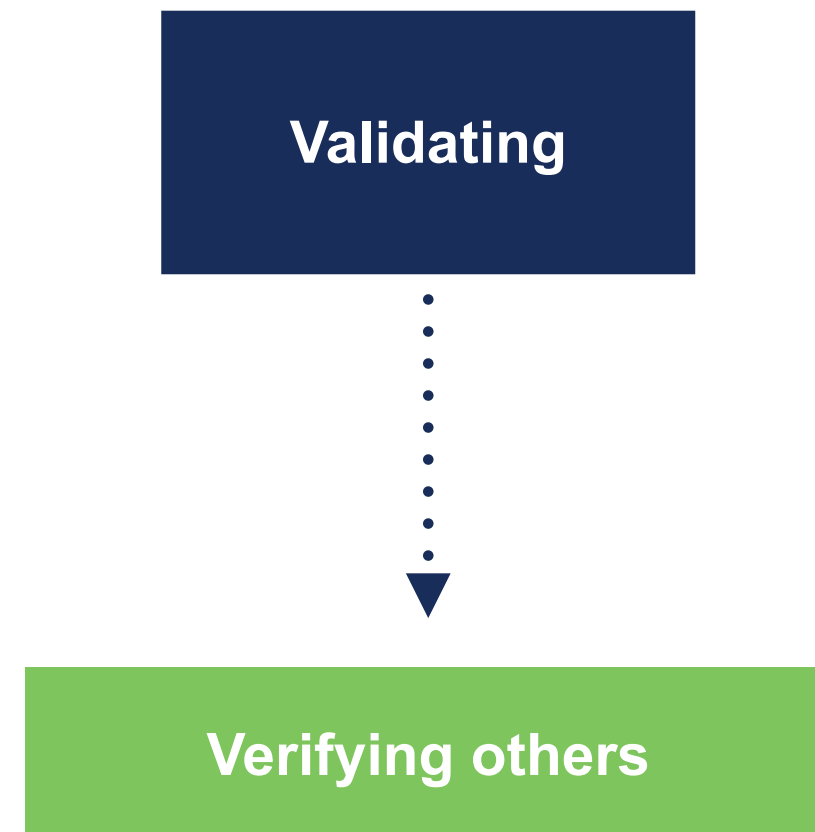
LIRs w/o RPKI or ROA - Lebanon



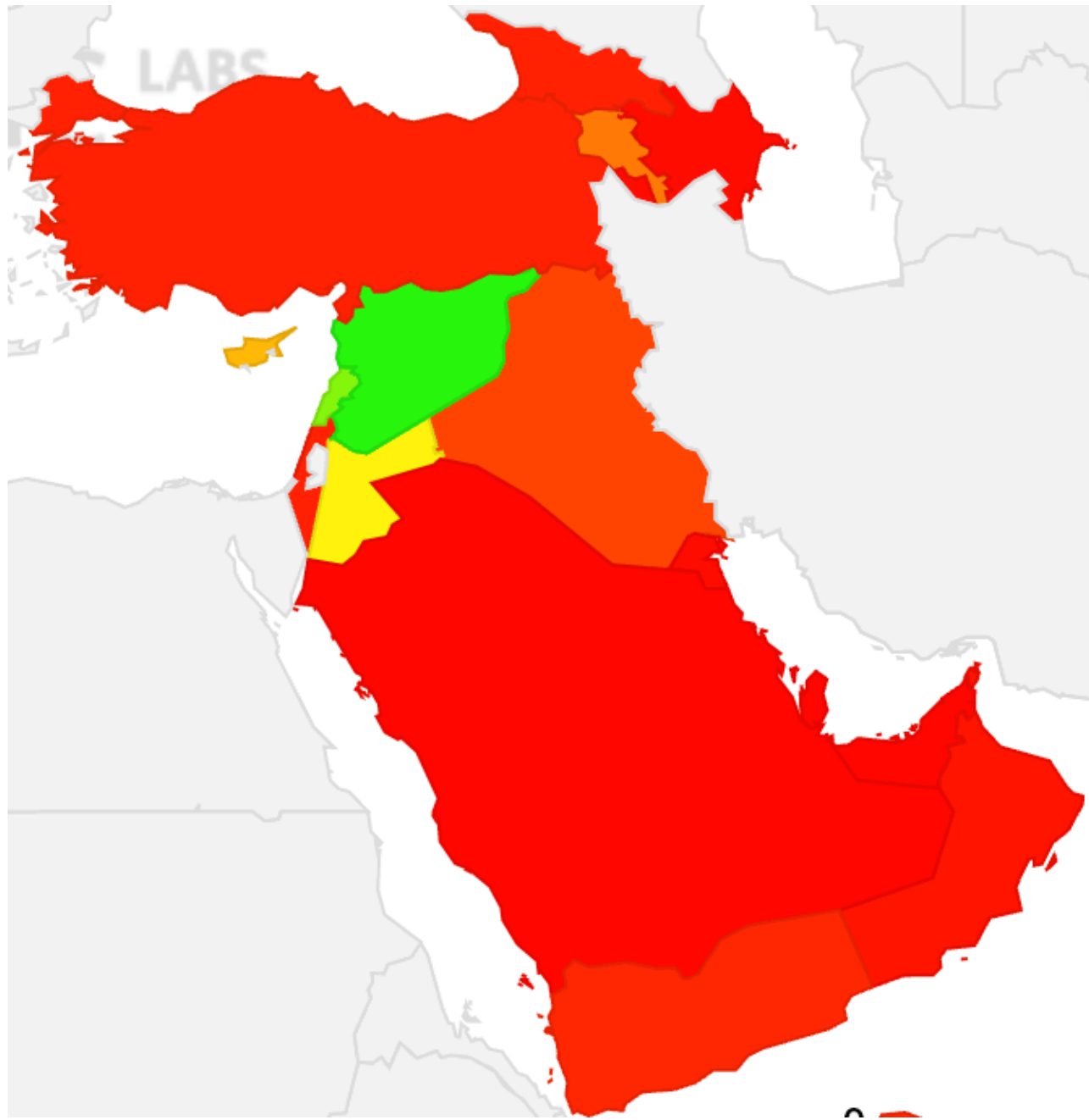
LIRs w/o RPKI or ROA - Oman



Two elements of RPKI - Validating



% Use of RPKI Validation (ROV)



Source: [APNIC](#)

Country	%
Syria	86.28
Lebanon	67.37
Jordan	42.95
Iraq	12.40
Yemen	7.26
Turkey	6.80
Palestine	6.19
Oman	3.56
Kuwait	2.19
KSA	1.82
UAE	1.18
Qatar	1.17
Bahrain	0.74



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Open Discussion

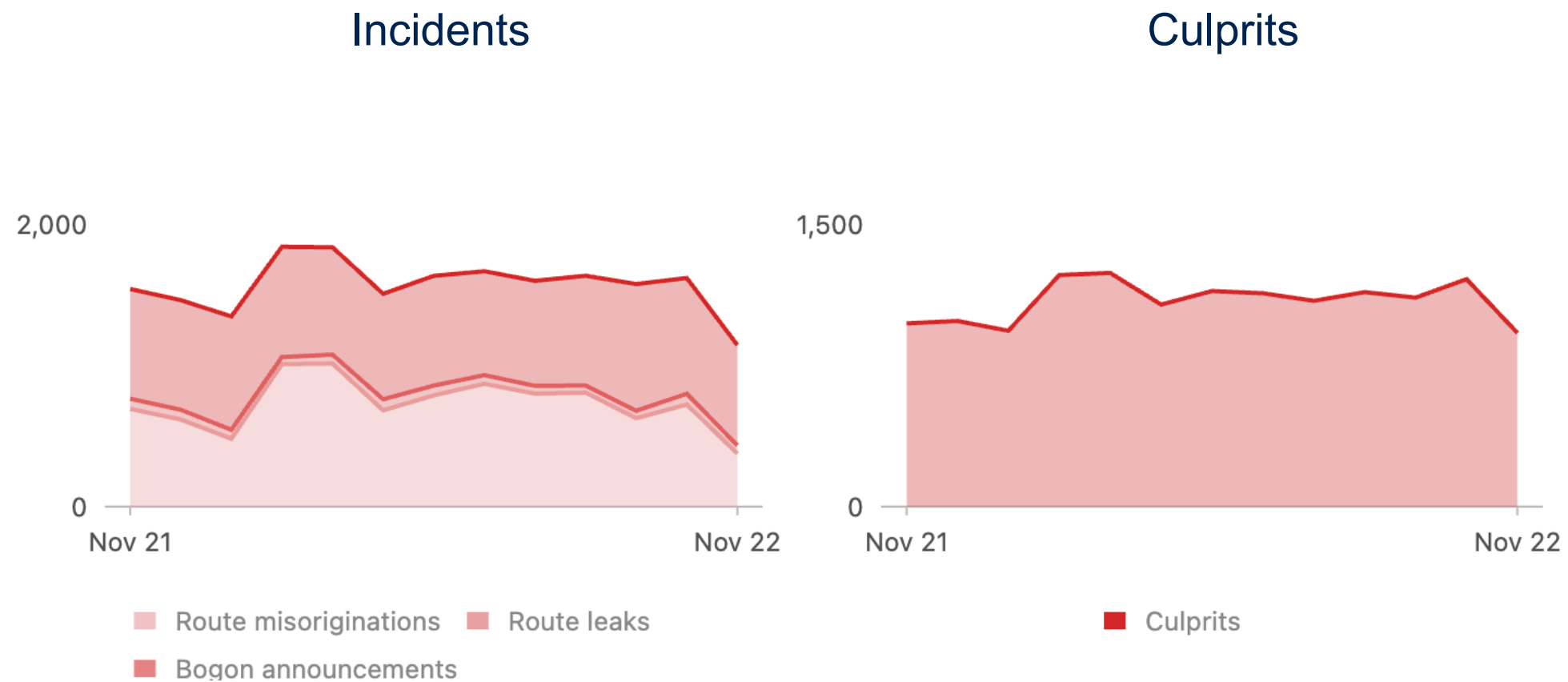


RIPE NCC

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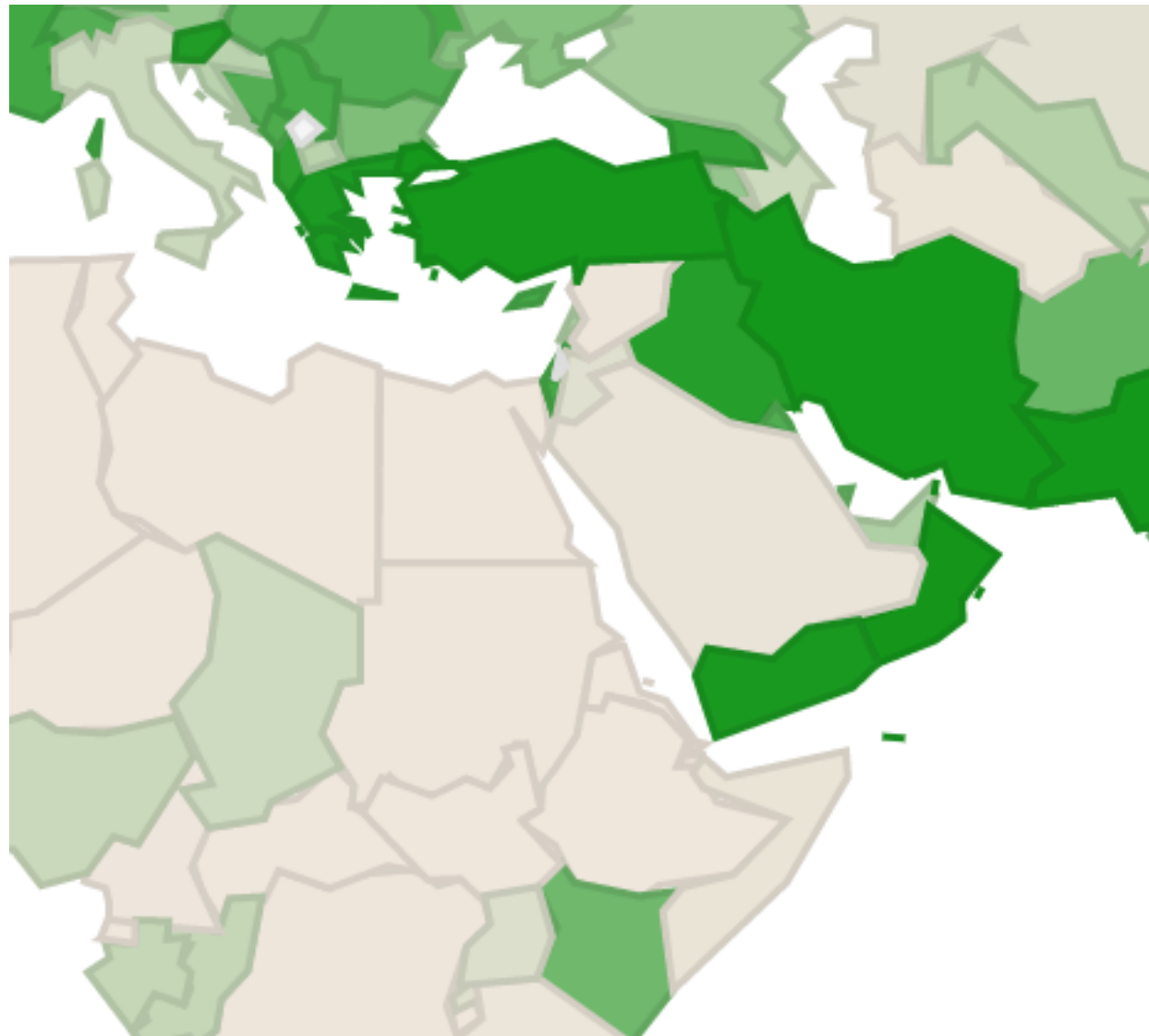
Annex

Effects on global routing



Global

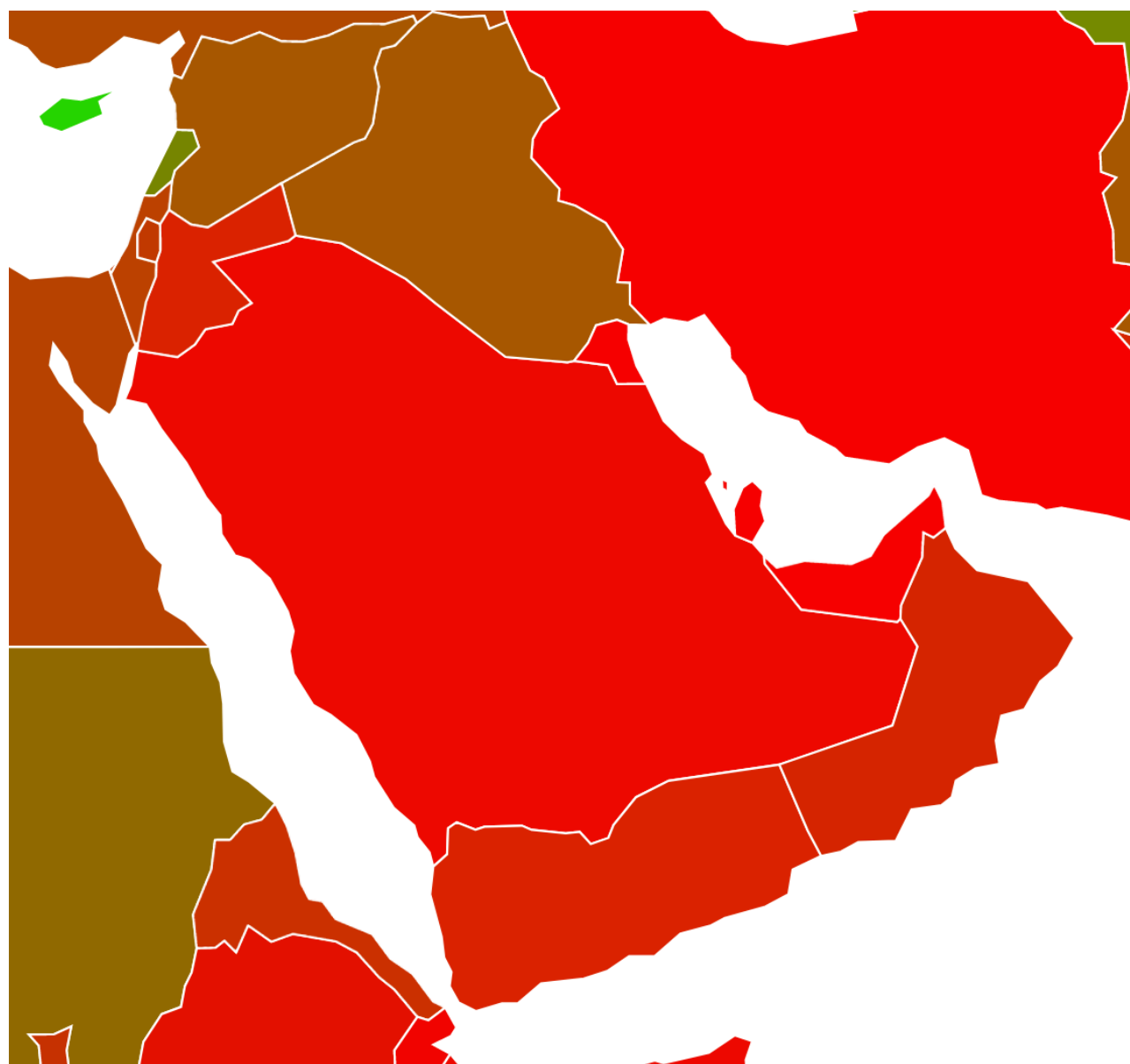
% IPv4 space covered by ROAs (2021)



Source: [RIPE NCC](#)

Country	%
Oman	98.28
Yemen	95.66
Iraq	90.27
Kuwait	70.66
Bahrain	69
Qatar	61.93
Palestine	40.85
Lebanon	28.74
UAE	28.48
Jordan	6.71
KSA	2.51
Syria	0.8

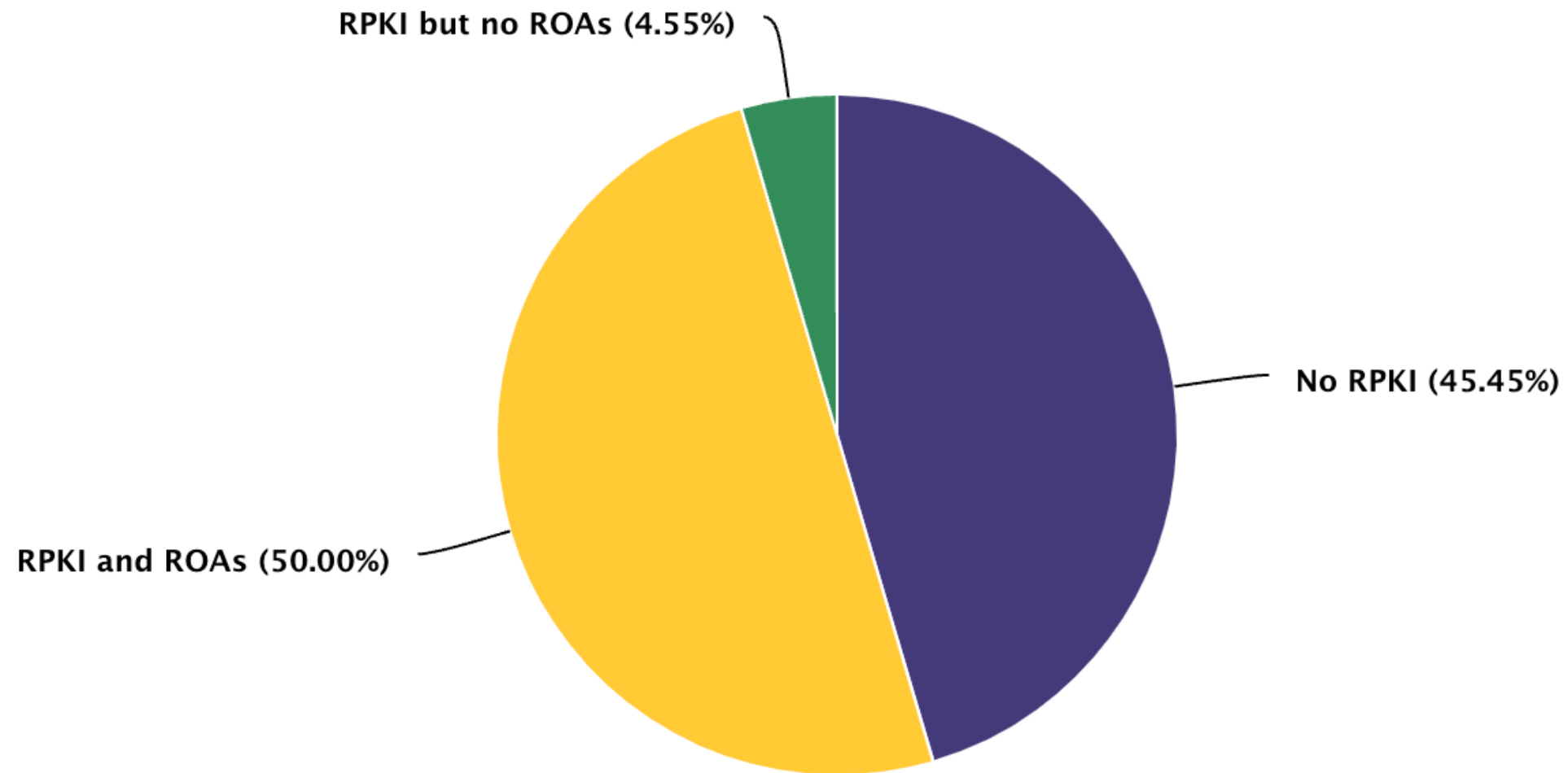
% ROV Filtering (2021)



Source: [APNIC](#)

Country	%
Lebanon	52.11
Syria	34.48
Iraq	33.58
Palestine	23.22
Oman	16.16
Jordan	14.02
Yemen	13.34
KSA	6.89
Bahrain	3.72
UAE	3.55
Kuwait	3.15
Qatar	1.87

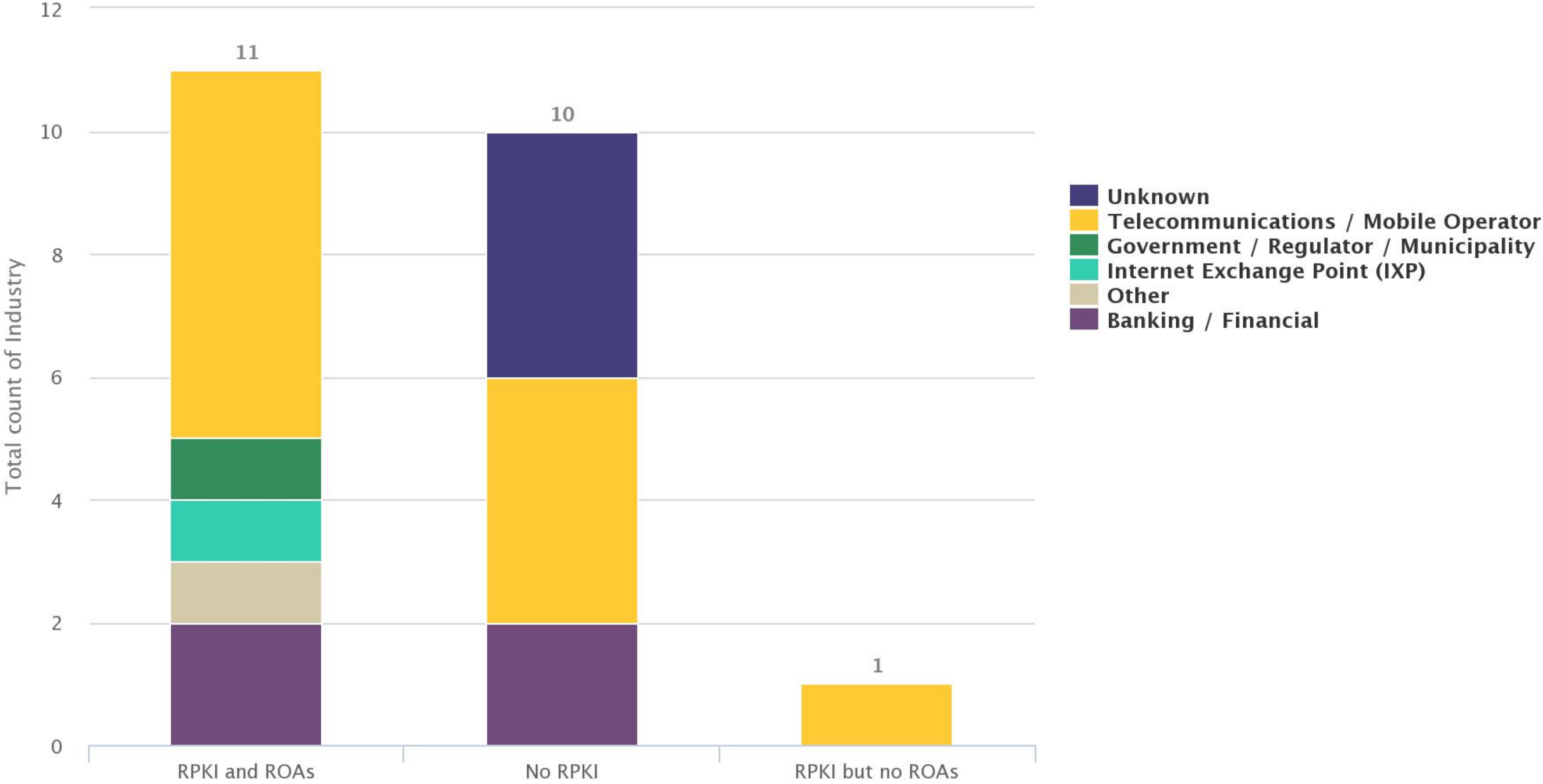
RPKI Adoption - Bahrain



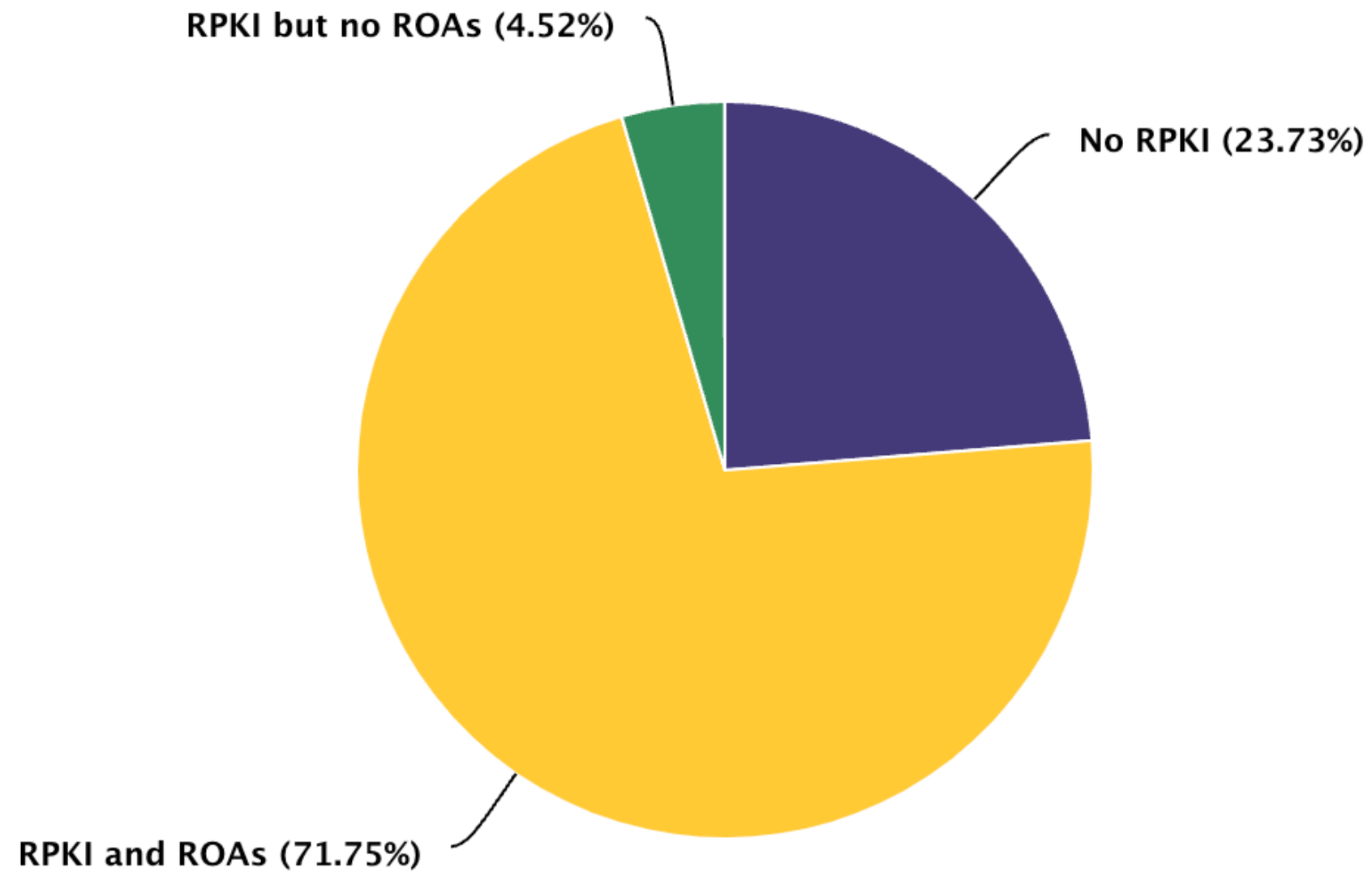
RPKI Adoption - Bahrain



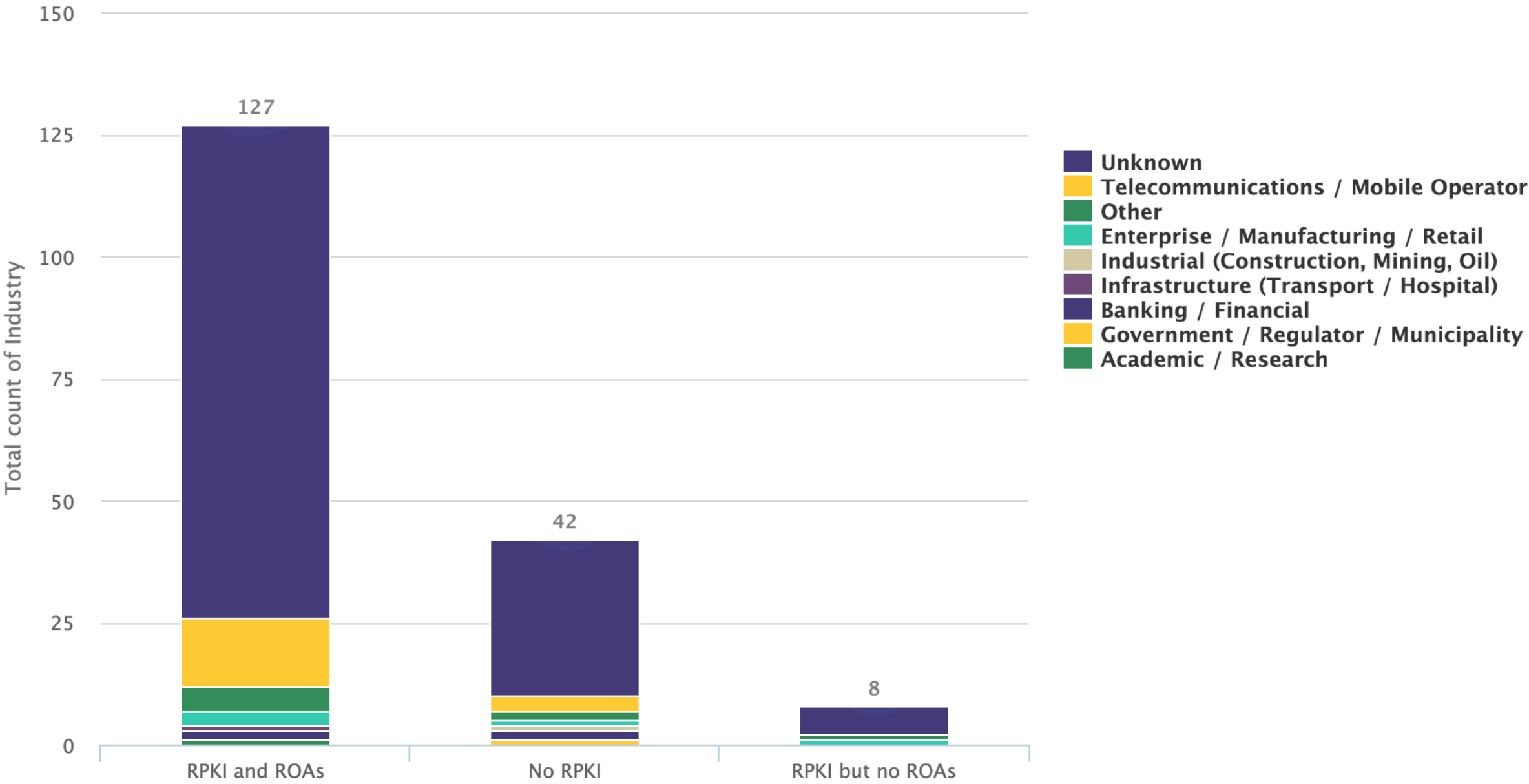
RPKI by Industry



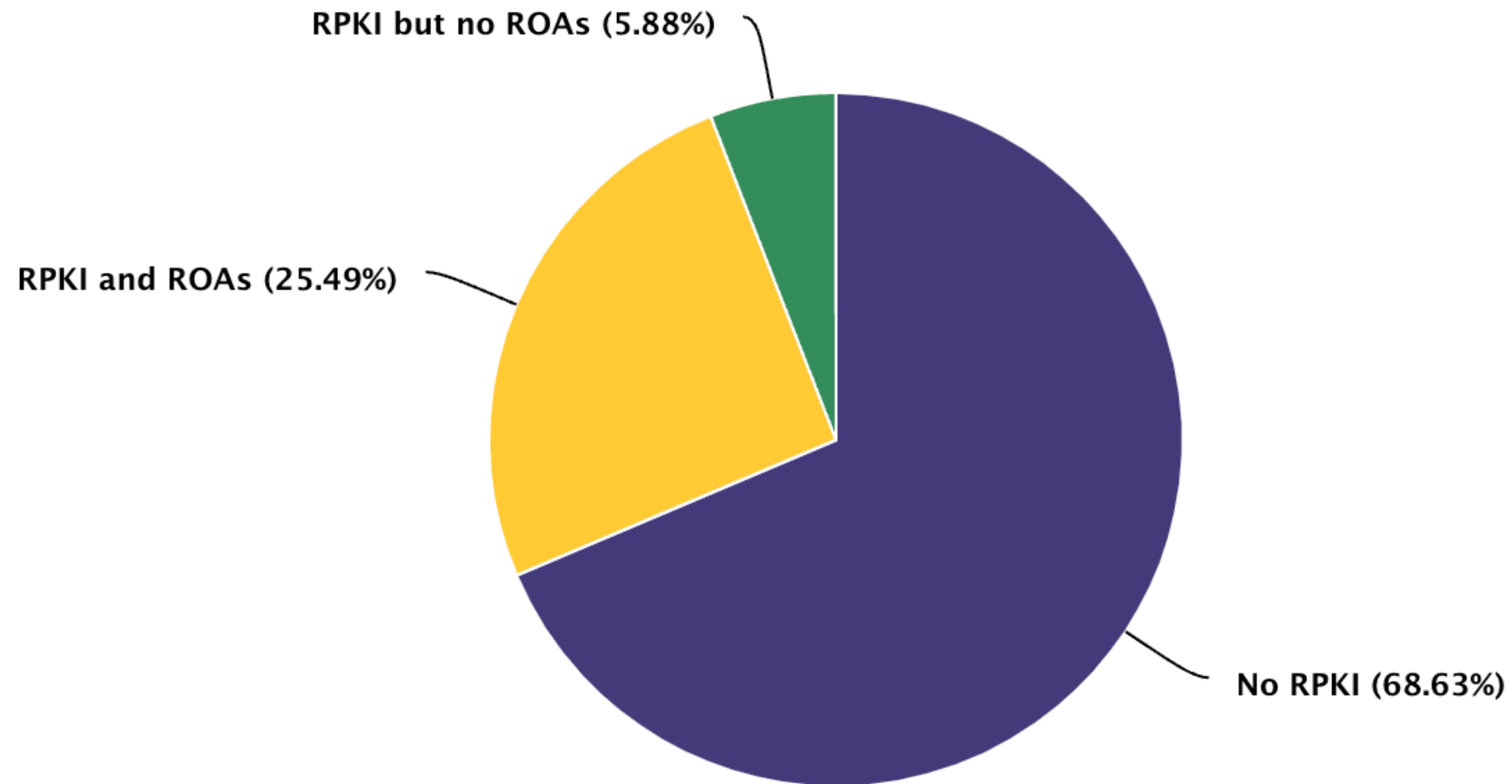
RPKI Adoption - Iraq



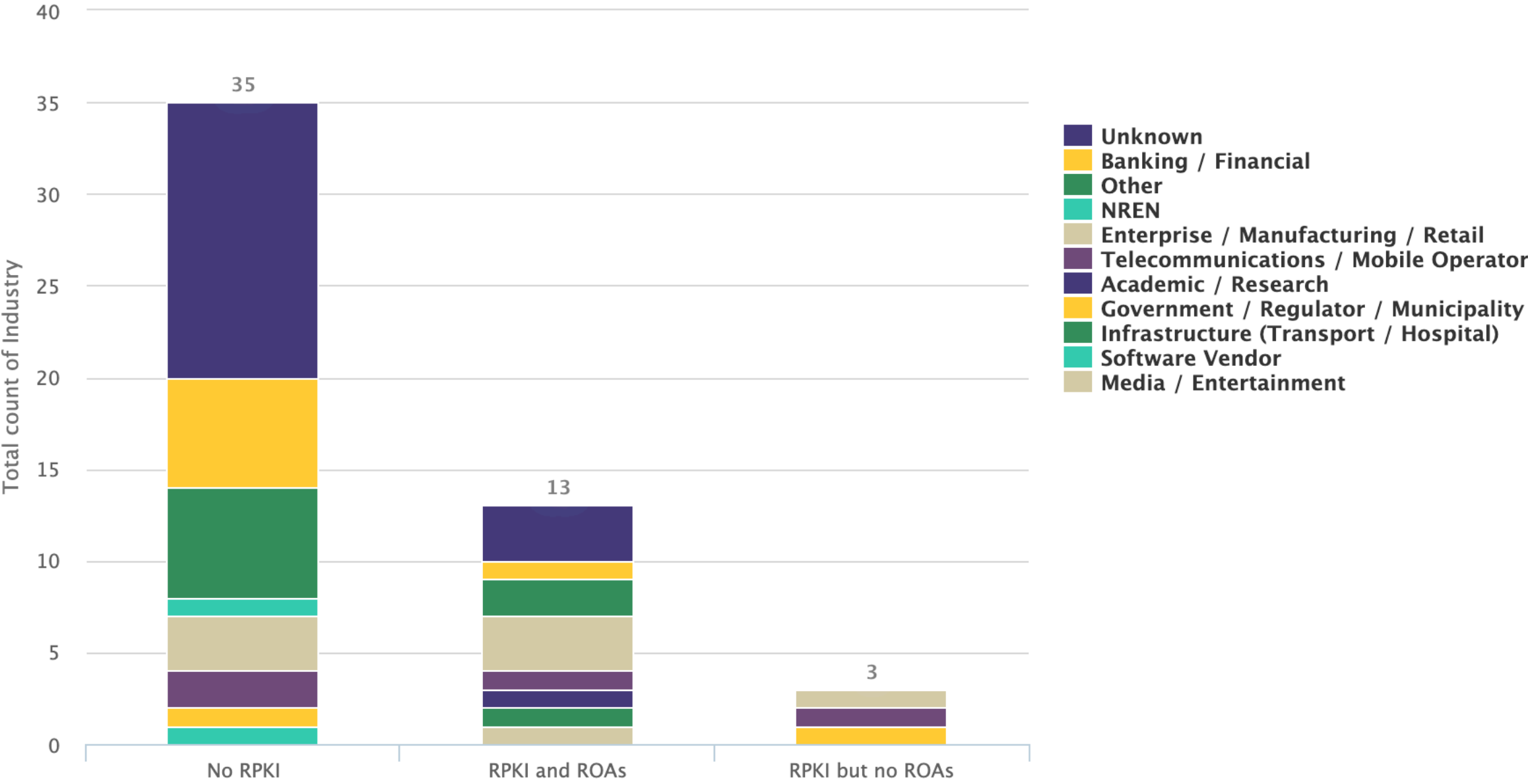
RPKI Adoption - Iraq



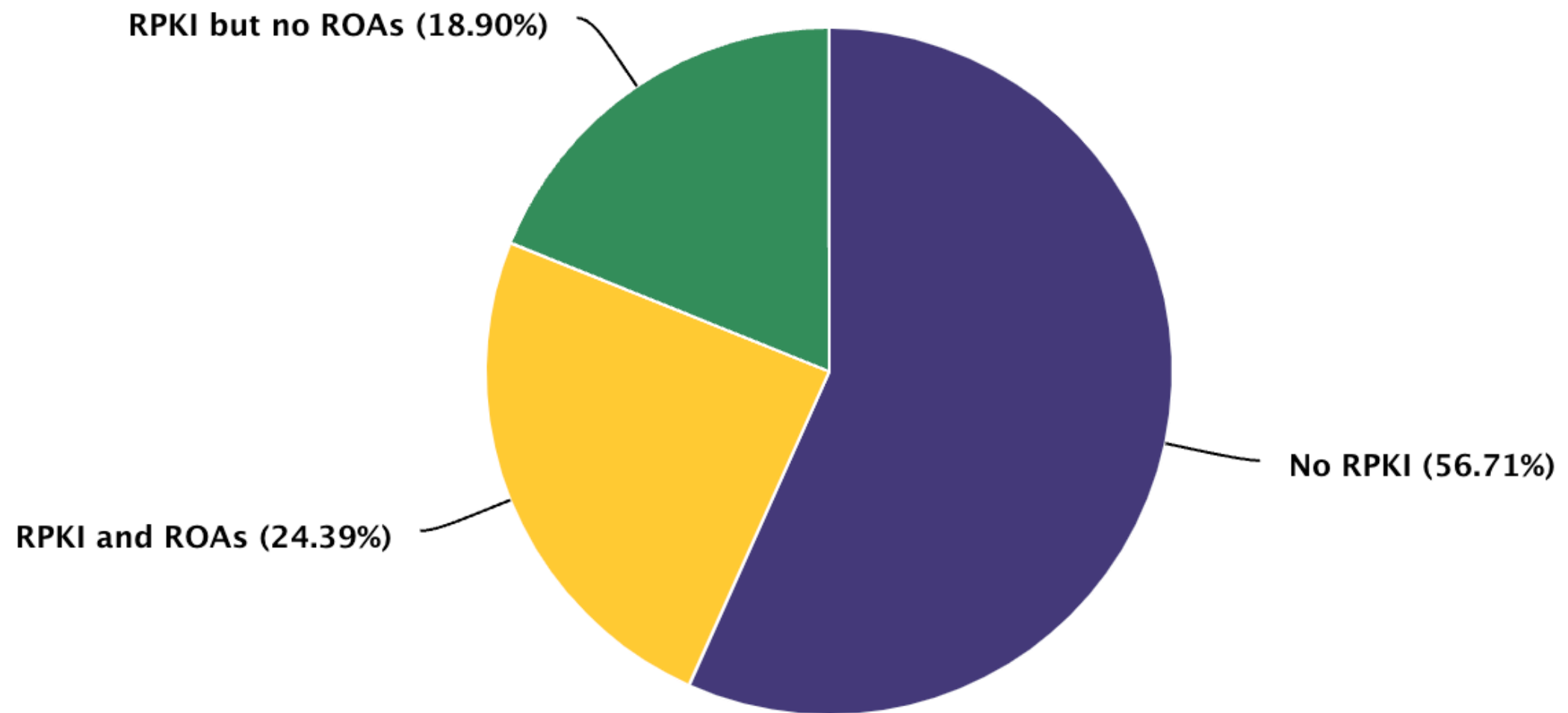
RPKI Adoption - Jordan



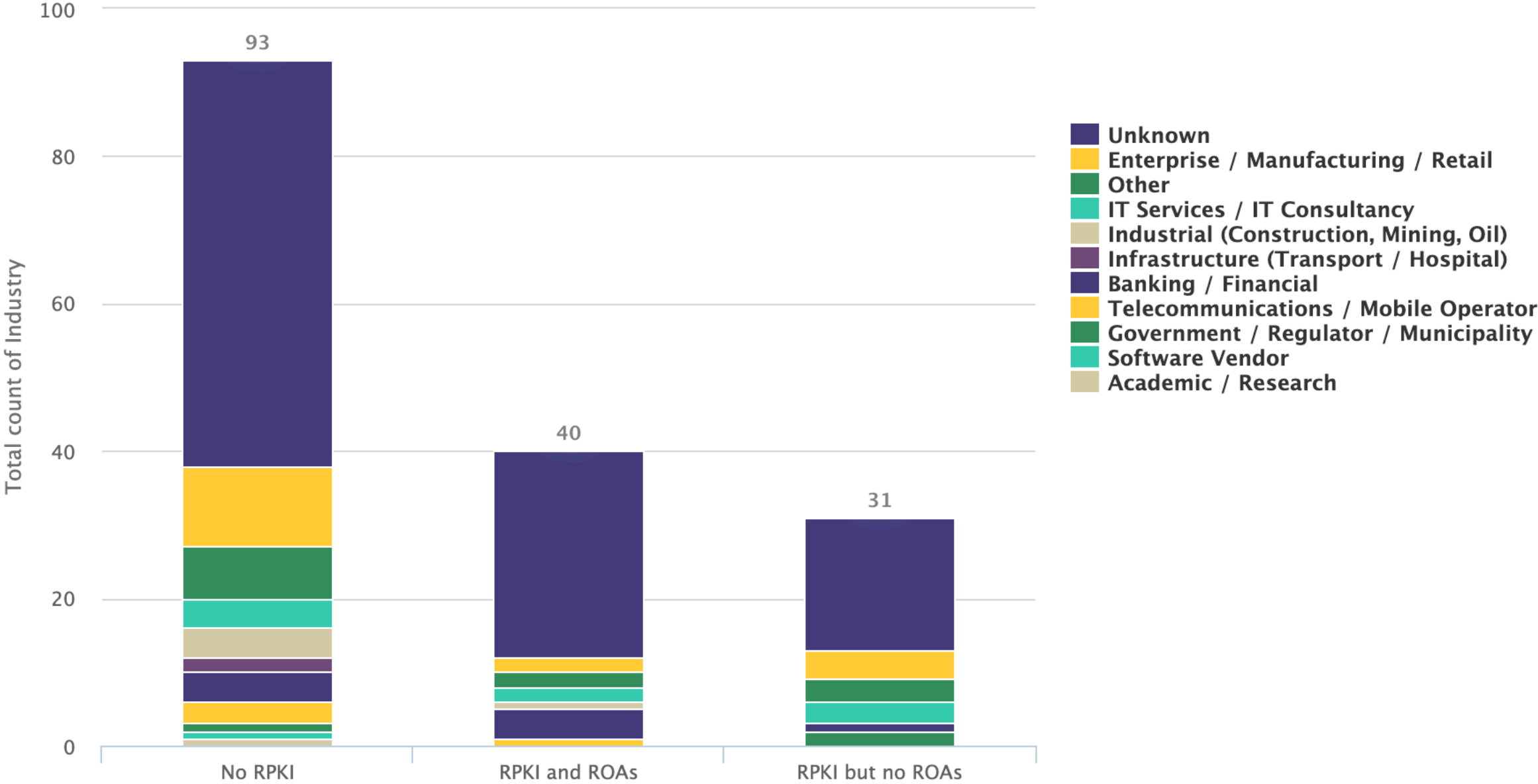
RPKI Adoption - Jordan



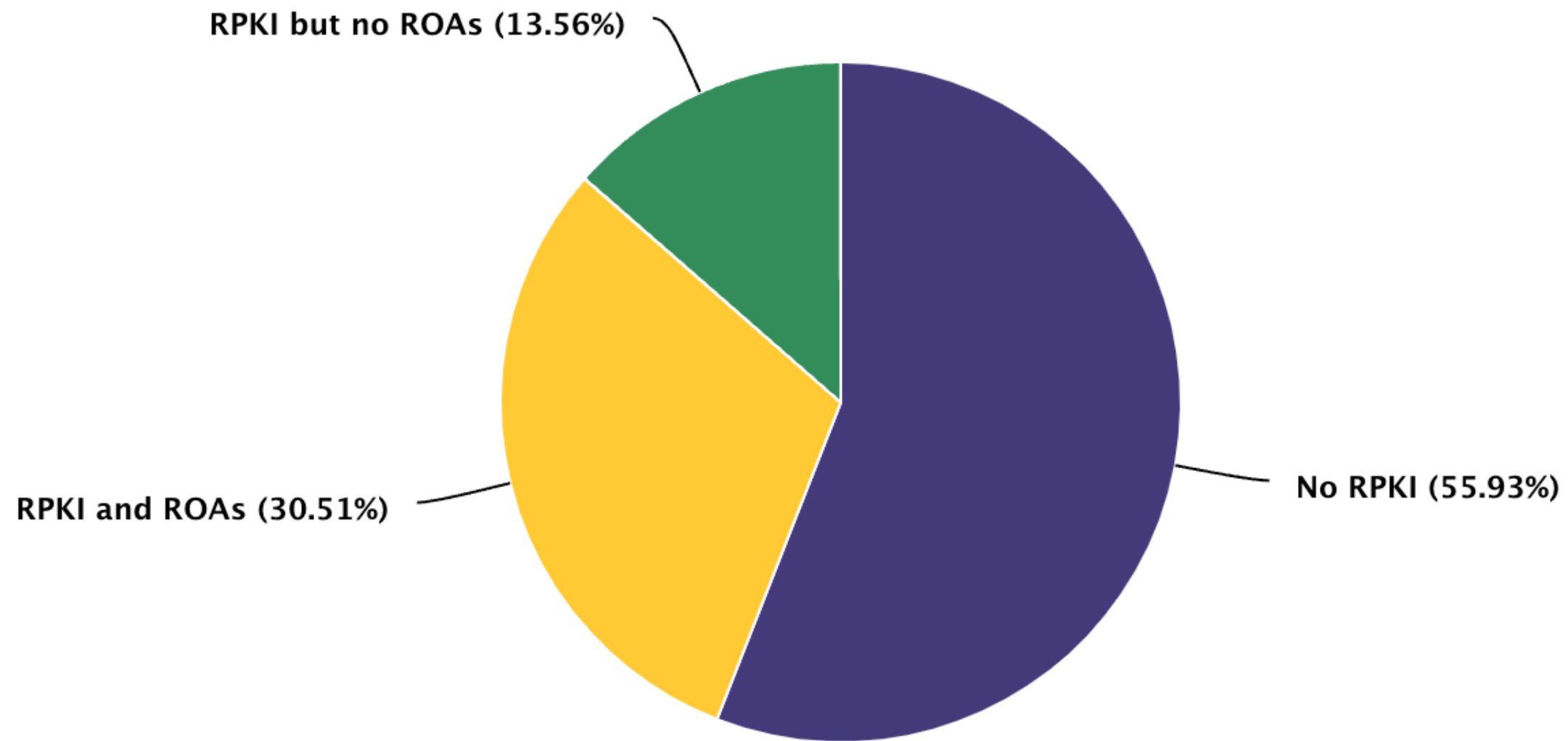
RPKI Adoption - KSA



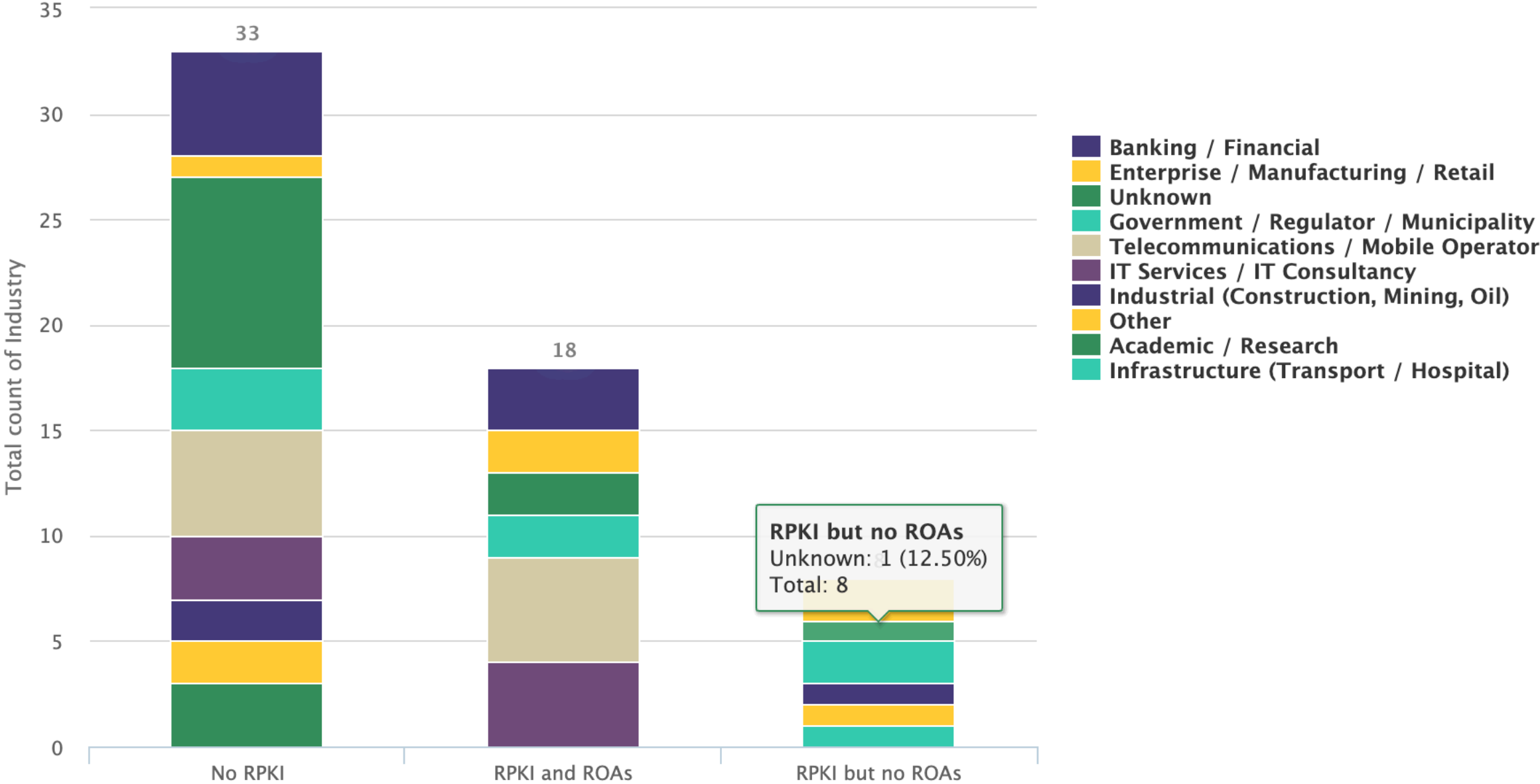
RPKI Adoption - KSA



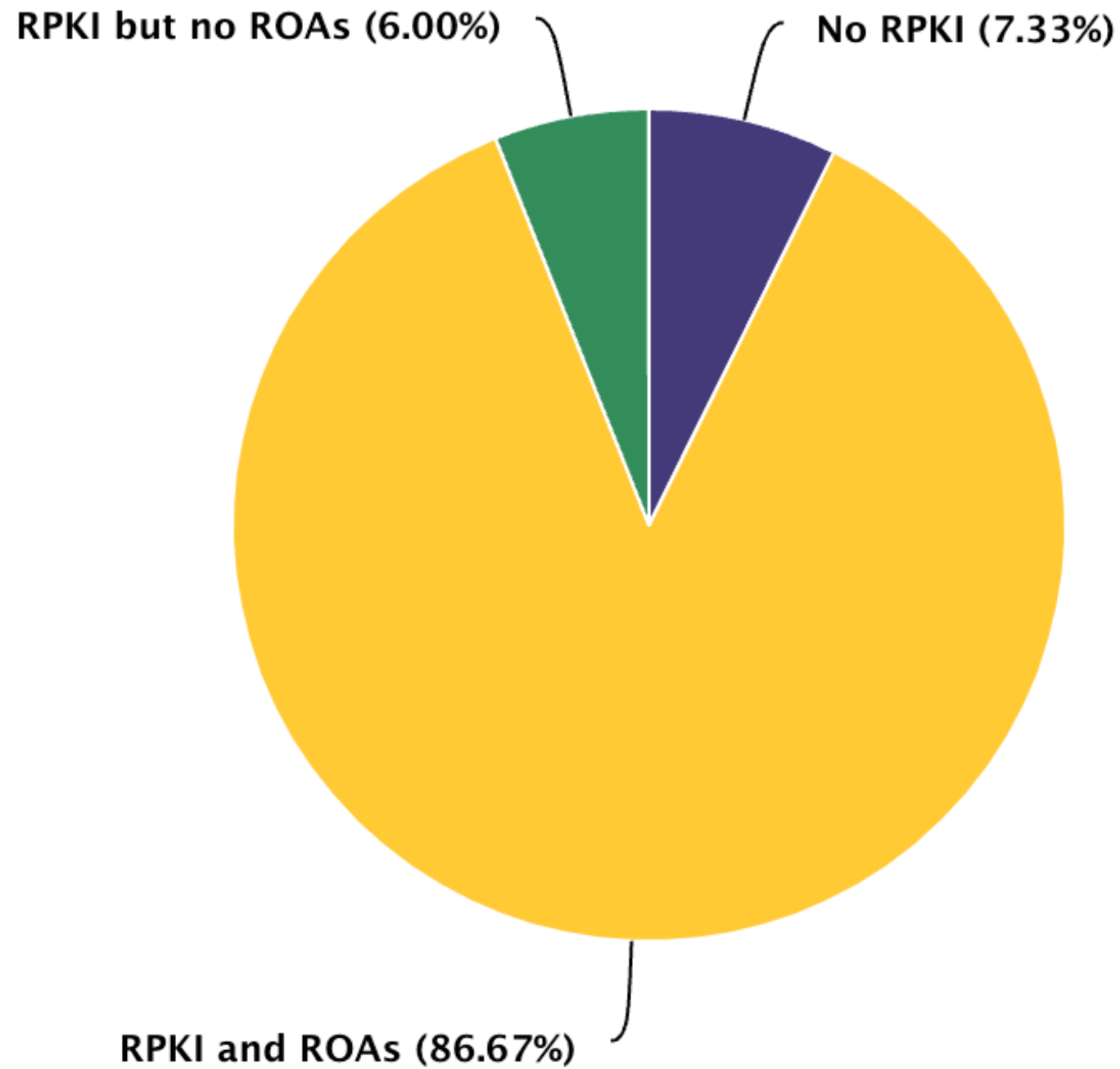
RPKI Adoption - Kuwait



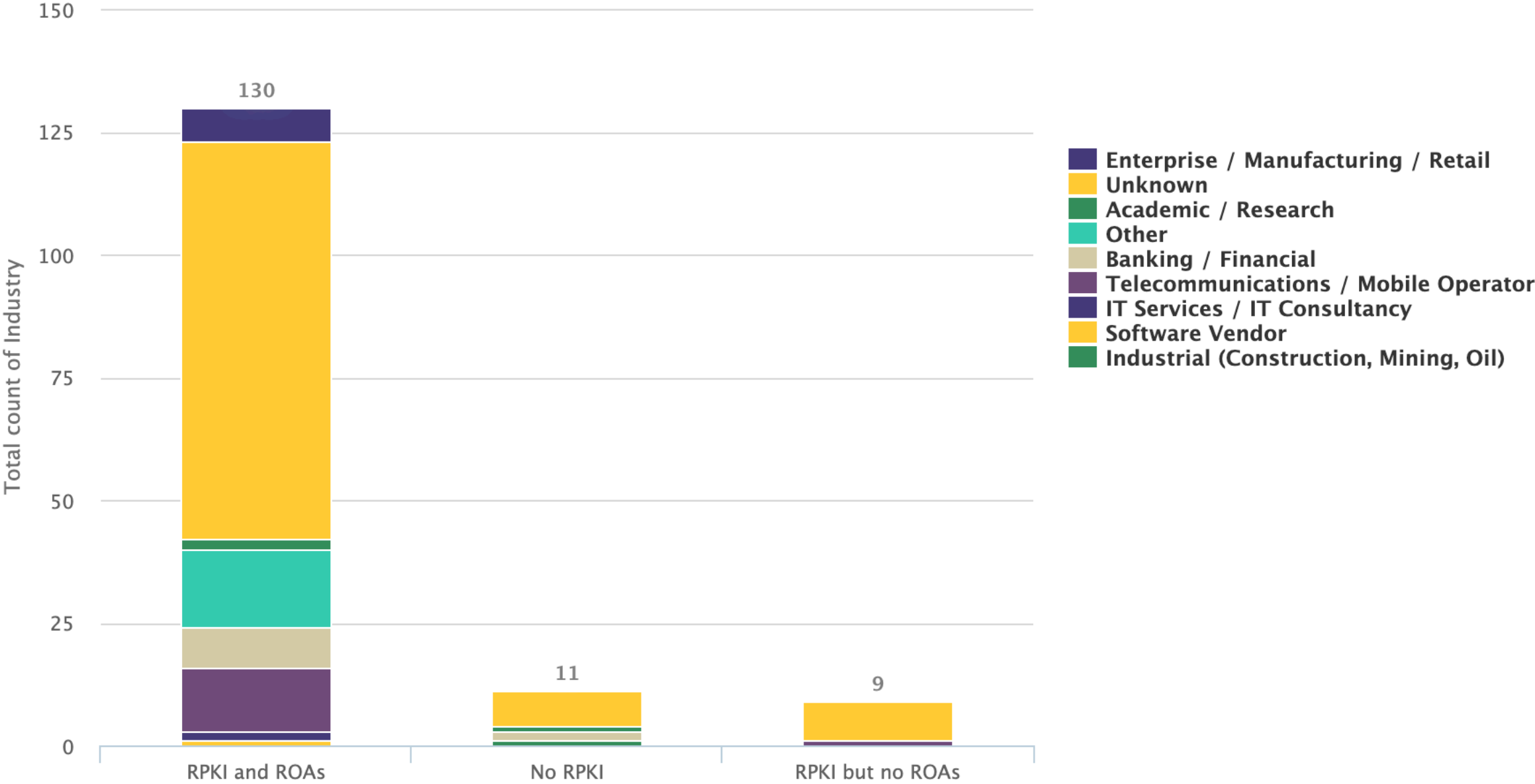
RPKI Adoption - Kuwait



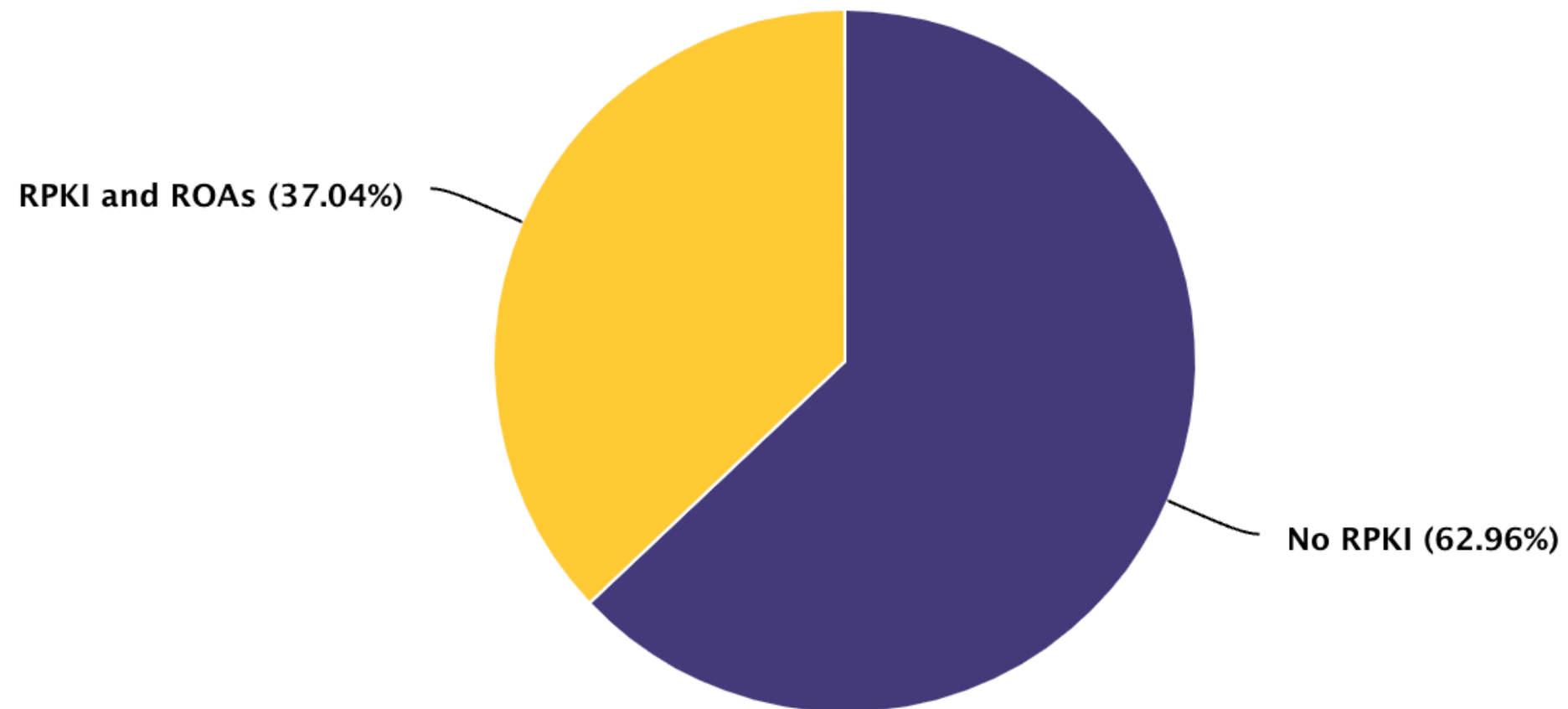
RPKI Adoption - Lebanon



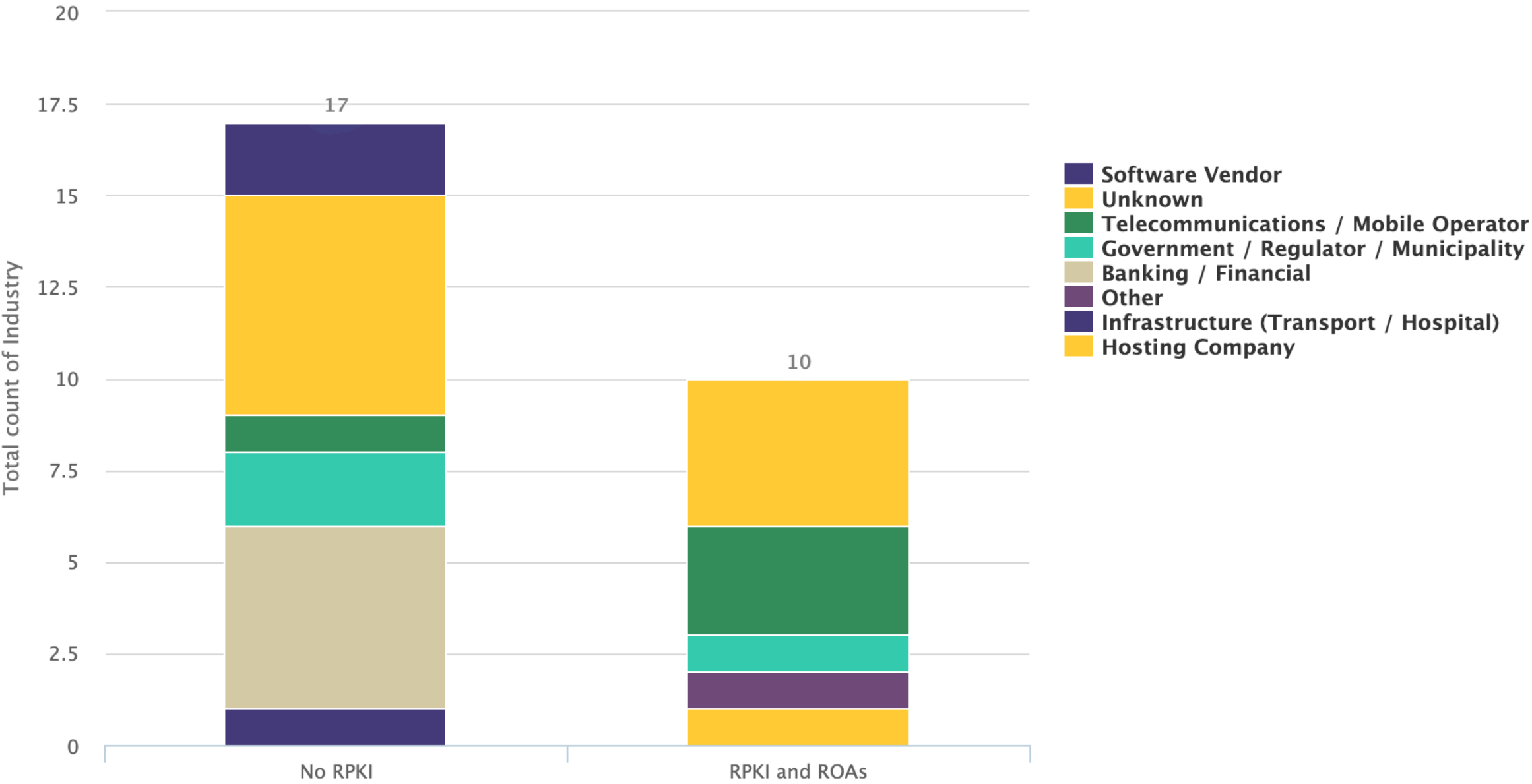
RPKI Adoption - Lebanon



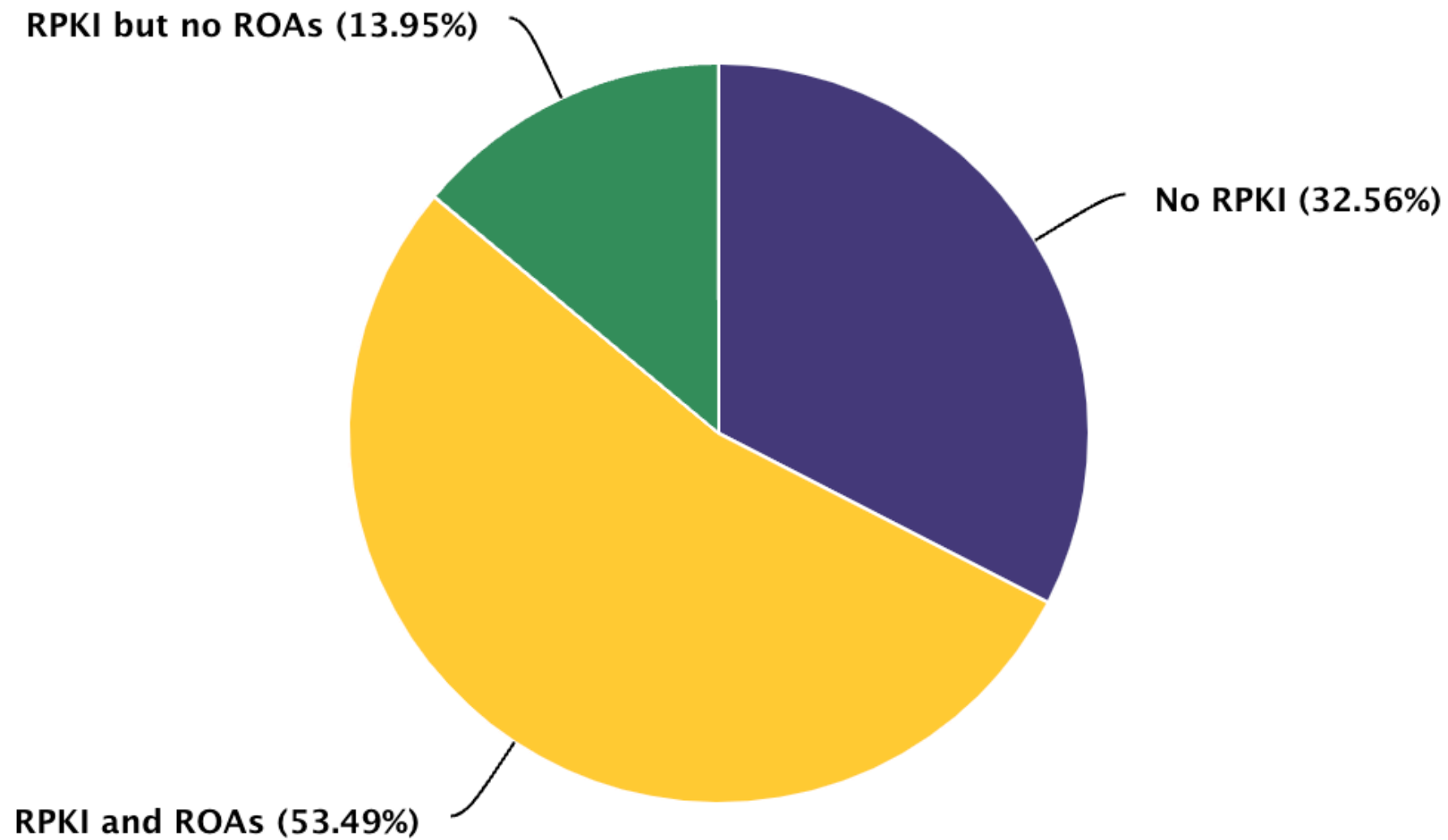
RPKI Adoption - Oman



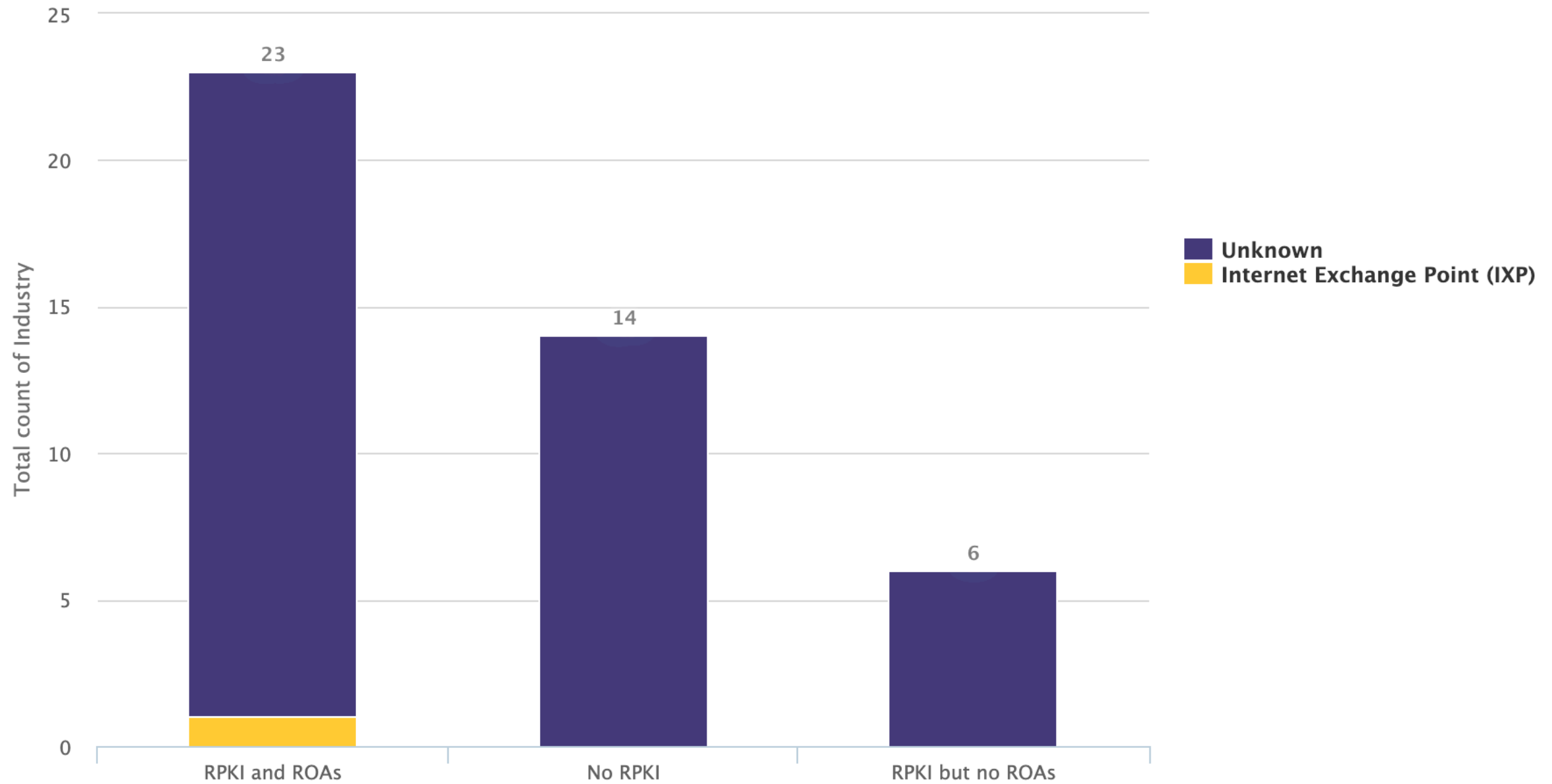
RPKI Adoption - Oman



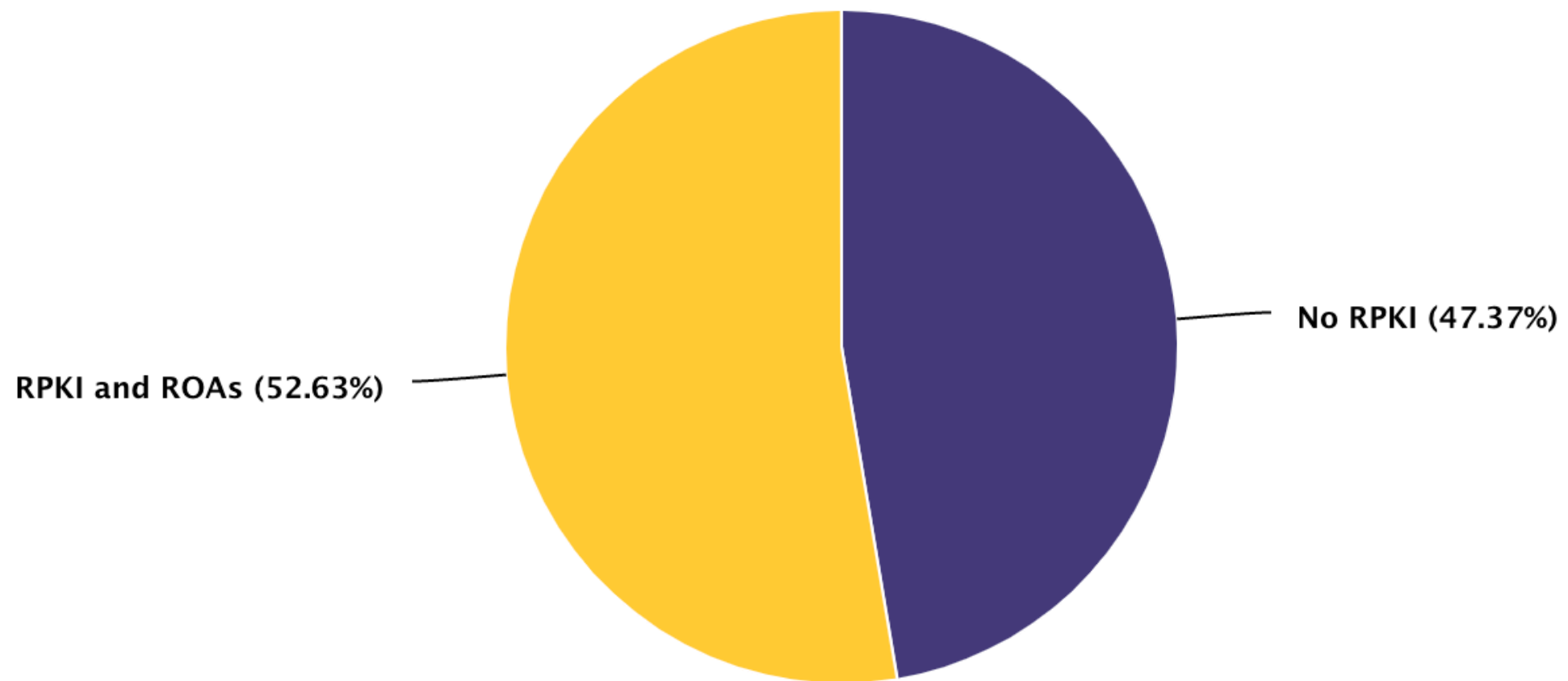
RPKI Adoption - Palestine



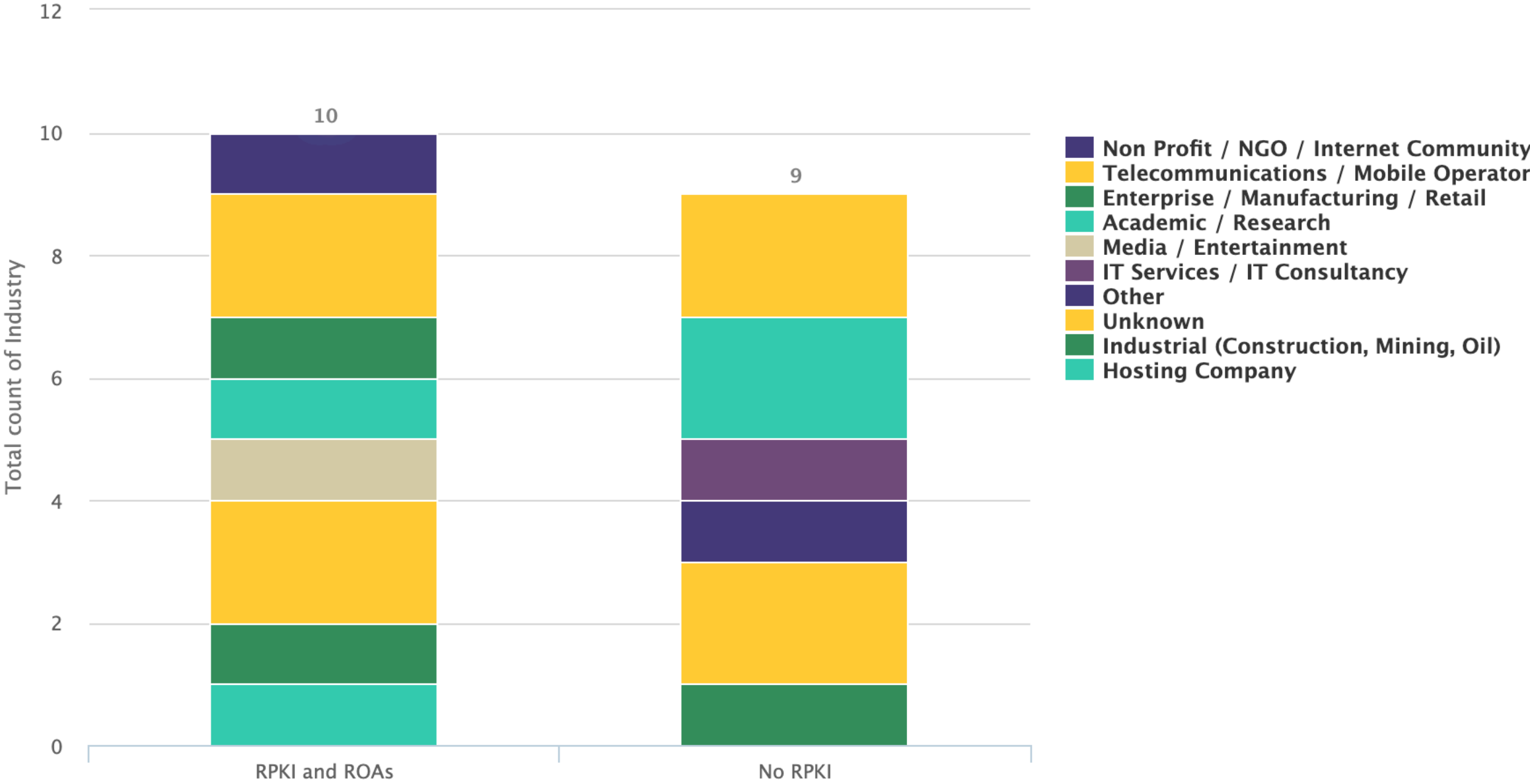
RPKI Adoption - Palestine



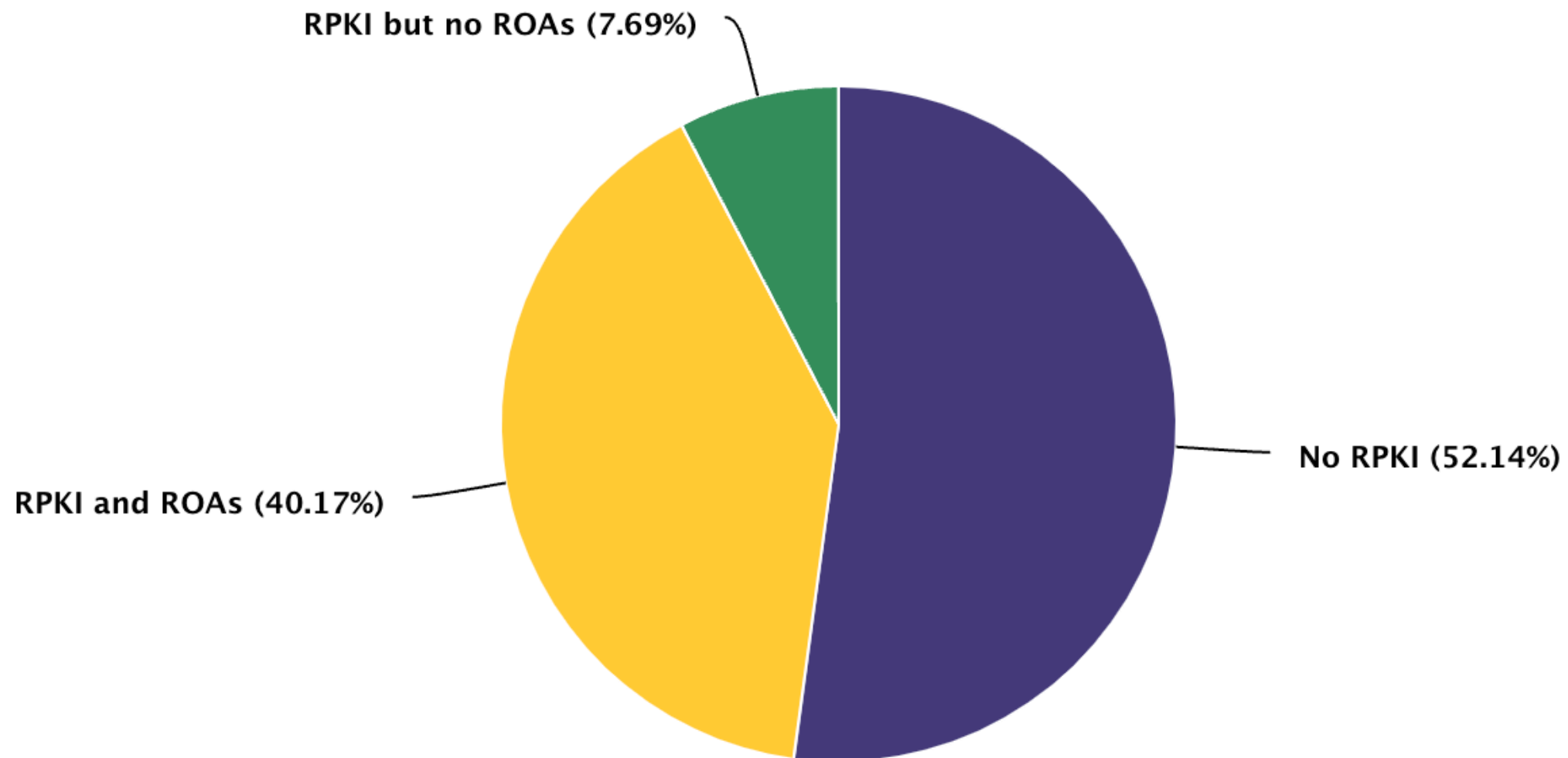
RPKI Adoption - Qatar



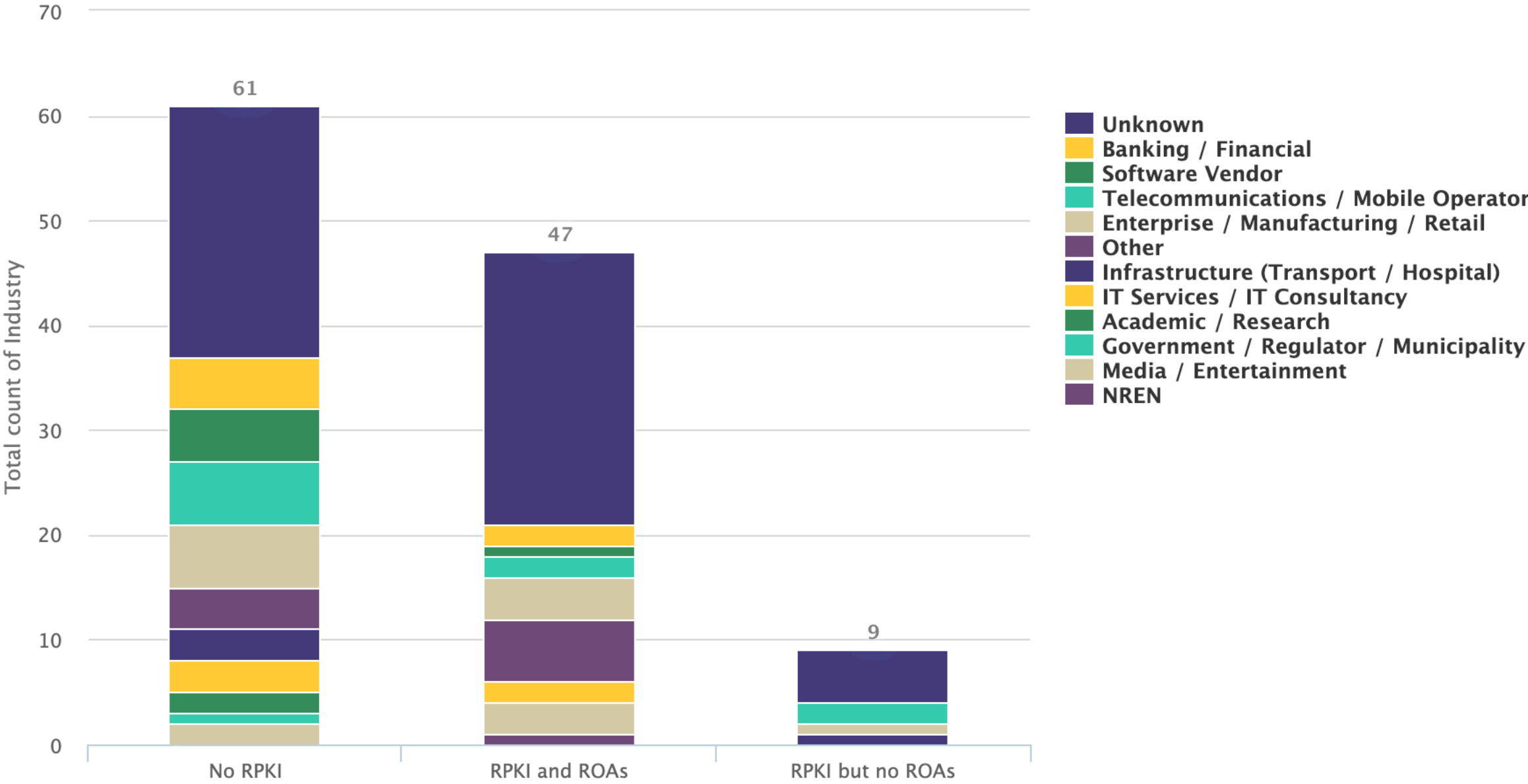
RPKI Adoption - Qatar



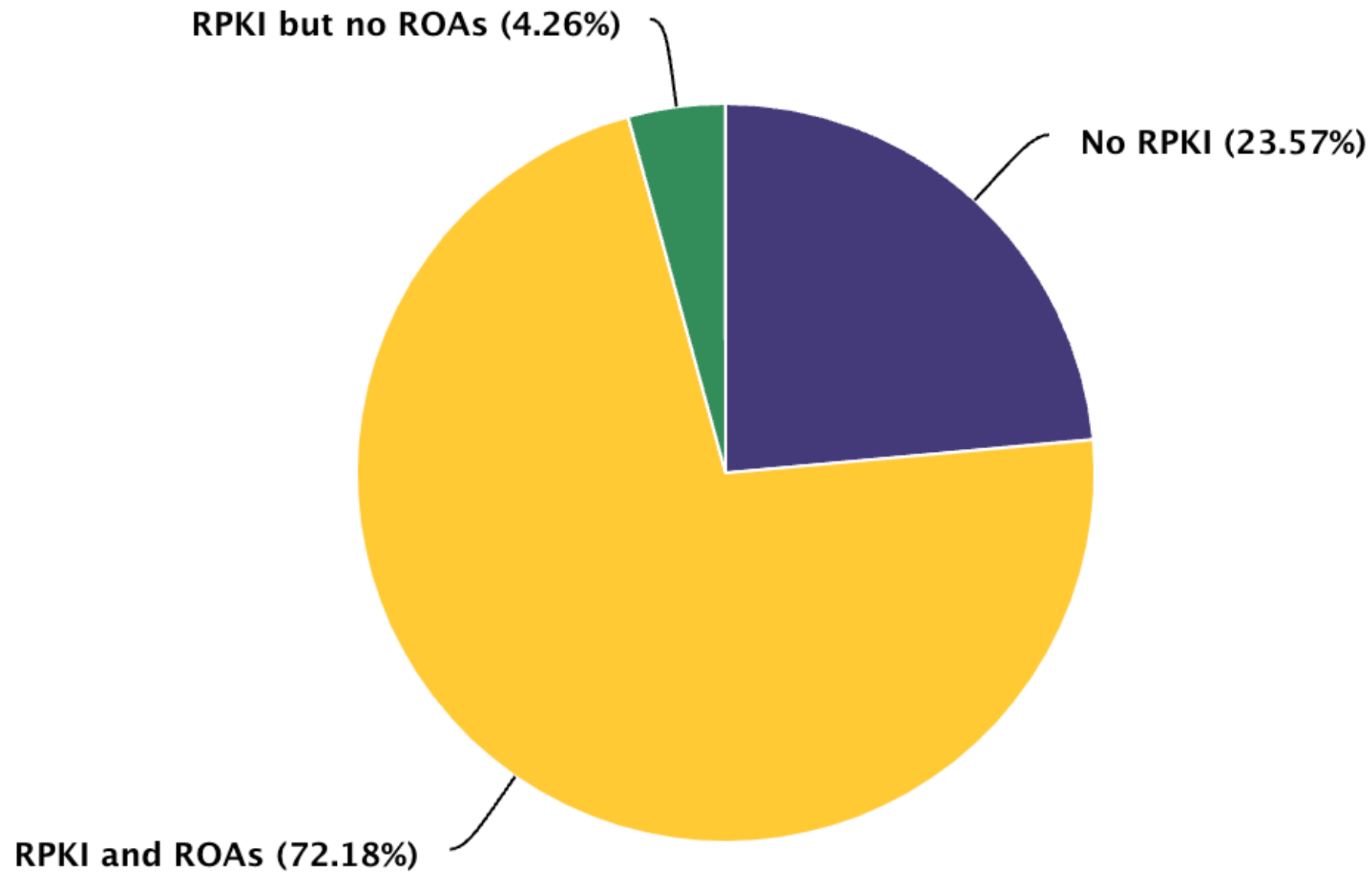
RPKI Adoption - UAE



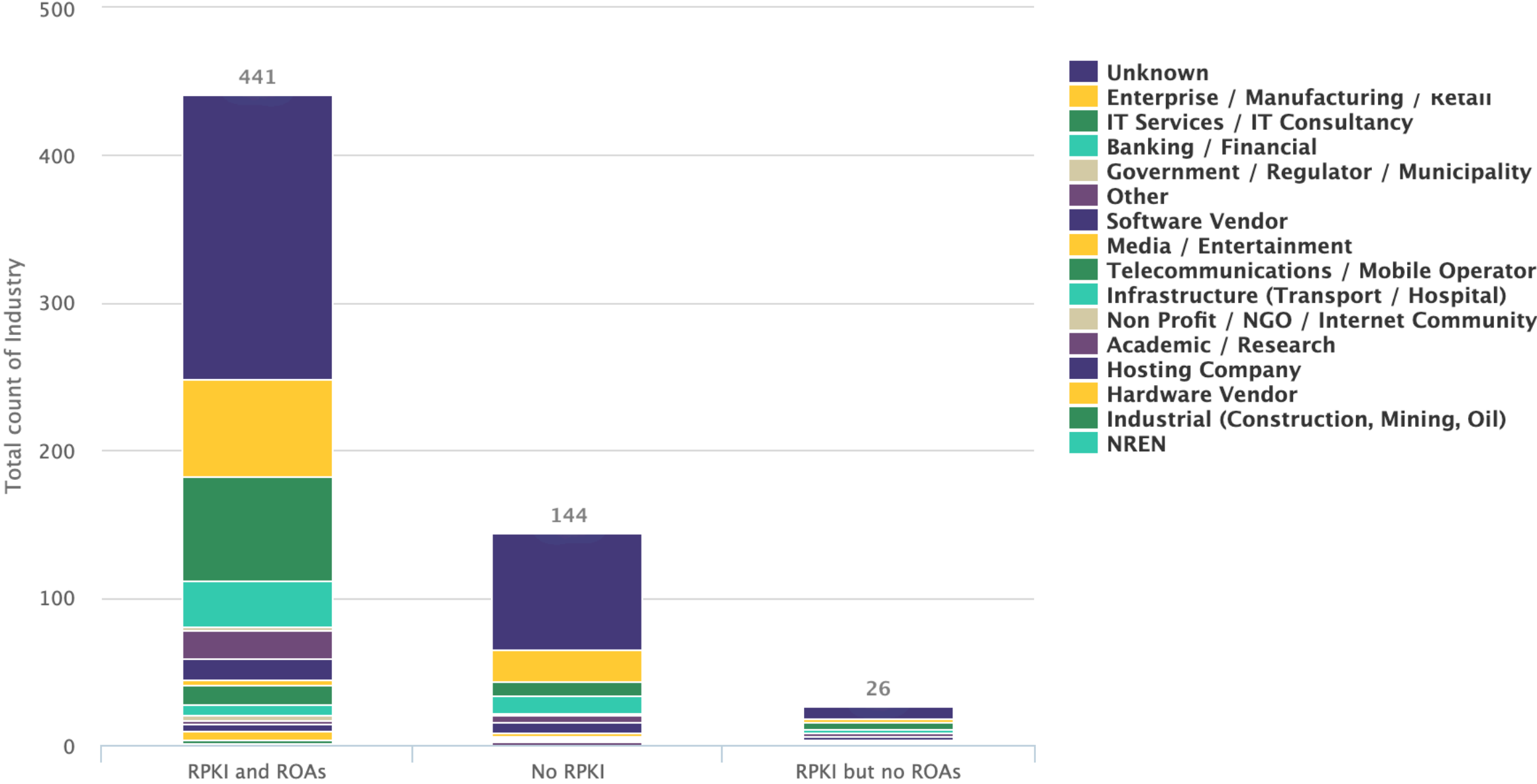
RPKI Adoption - UAE



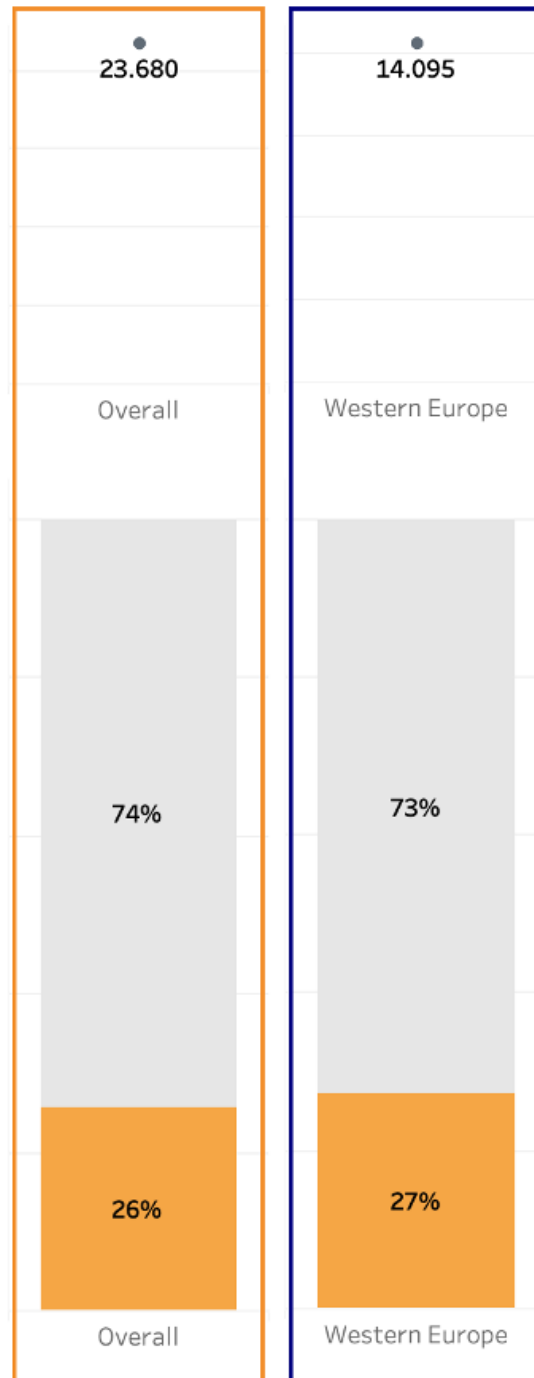
RPKI Adoption - Turkey



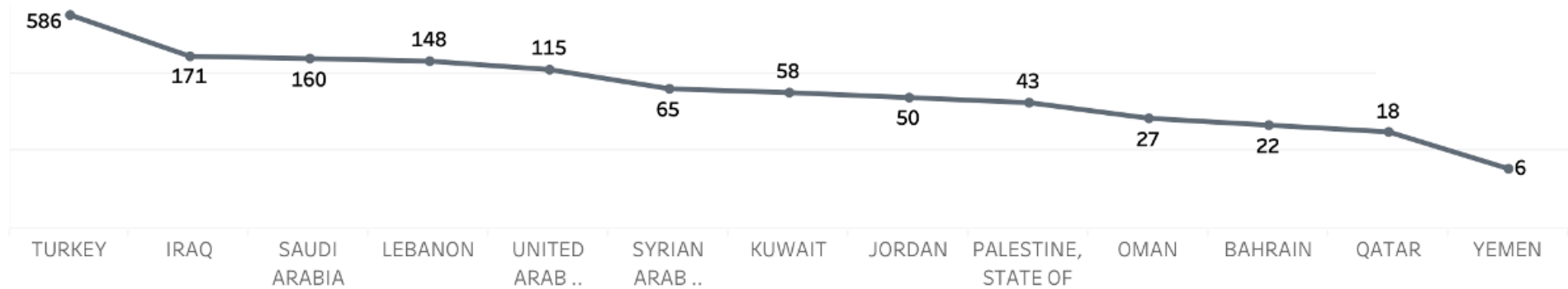
RPKI Adoption - Turkey



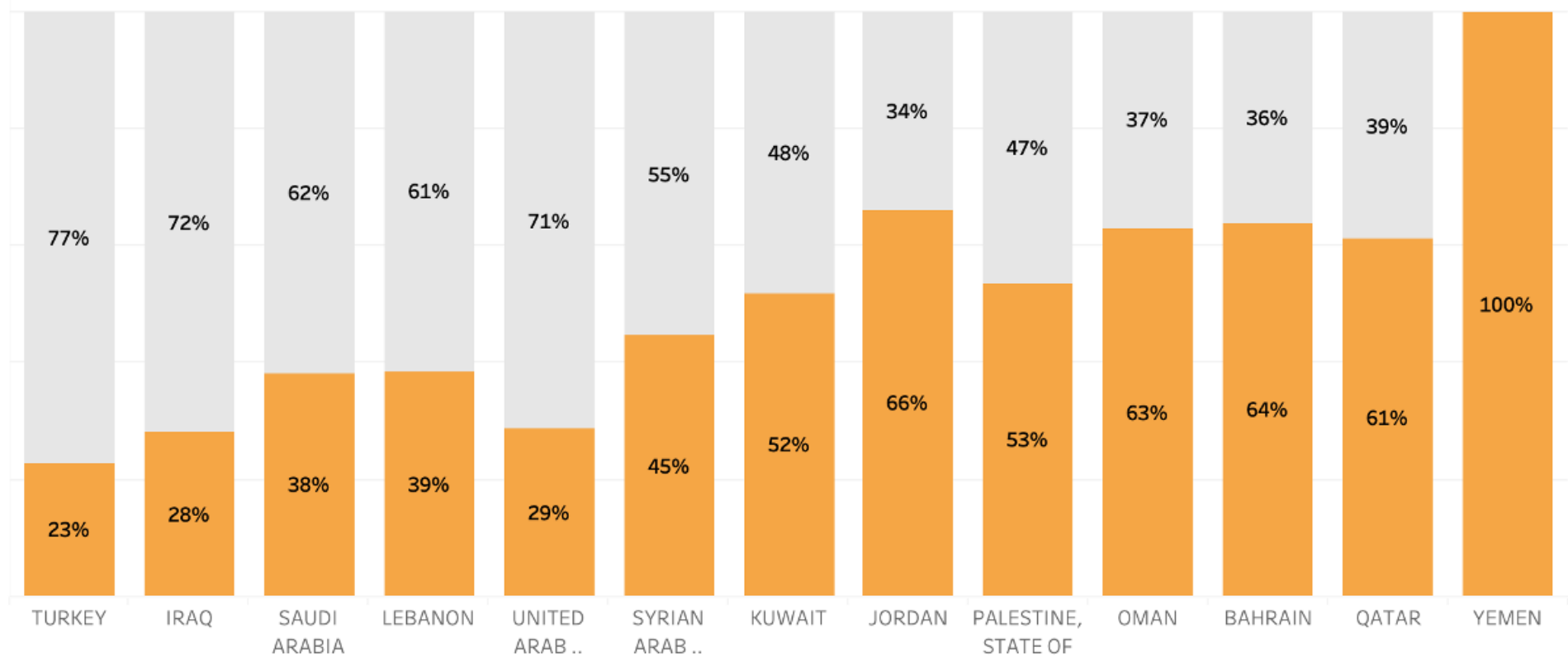
Training - Stats



of active LIRs

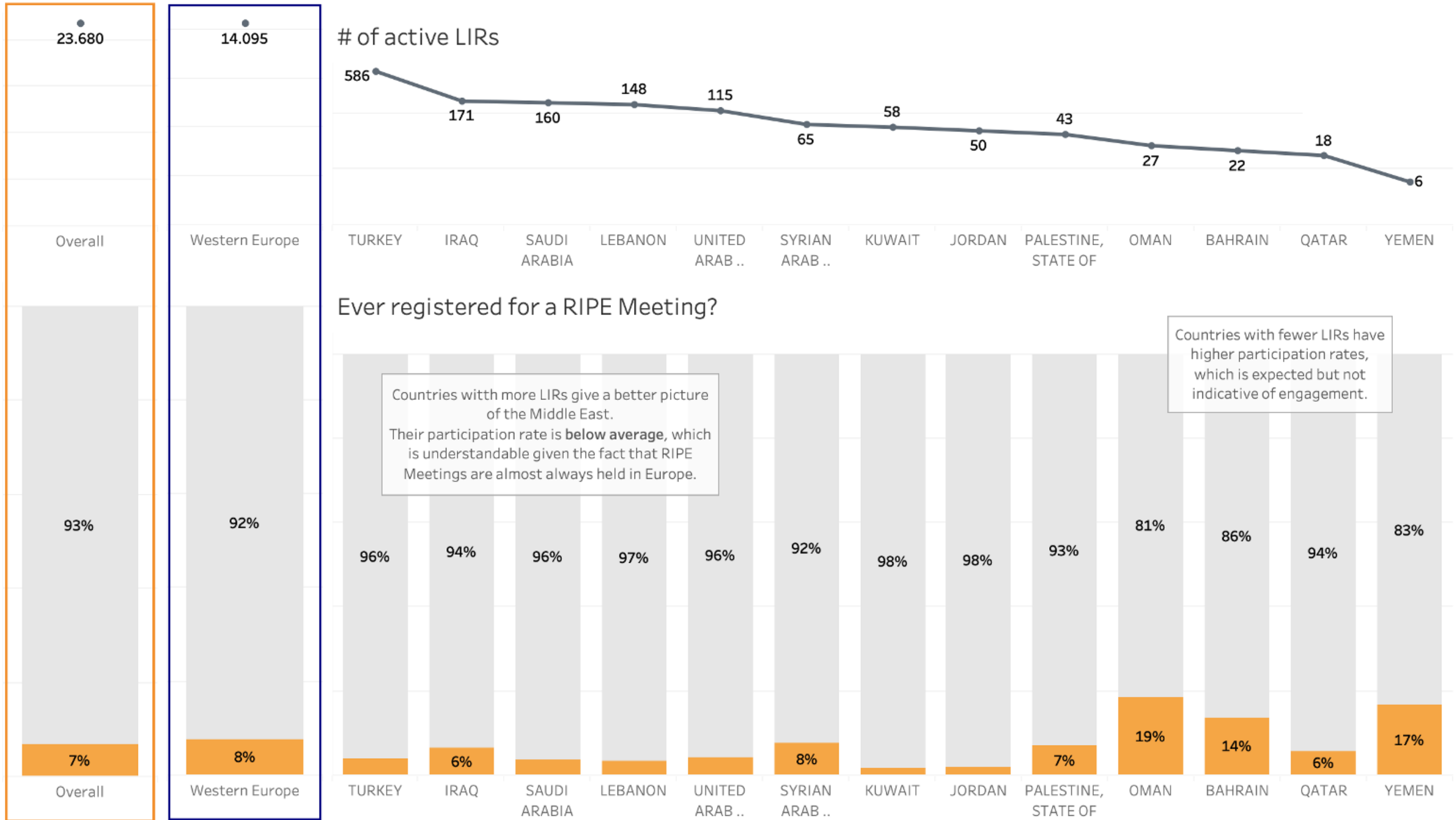


Ever attended a training?



Not surprisingly, the participation rate is higher in countries with fewer LIRs.

RIPE Meeting - Stats



GM - Stats

