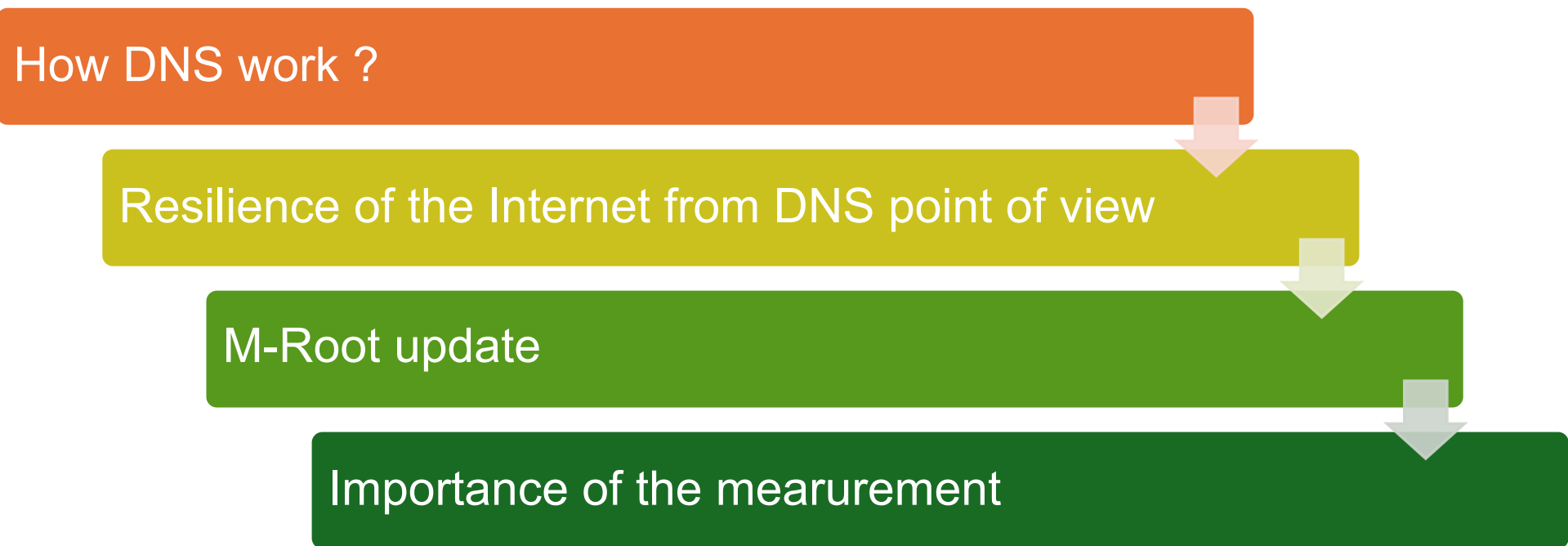


Root server in the Pacific region

**M-Root deployment Manager
Kazuhiro Kitamura**

Today's Topic

How DNS work ?



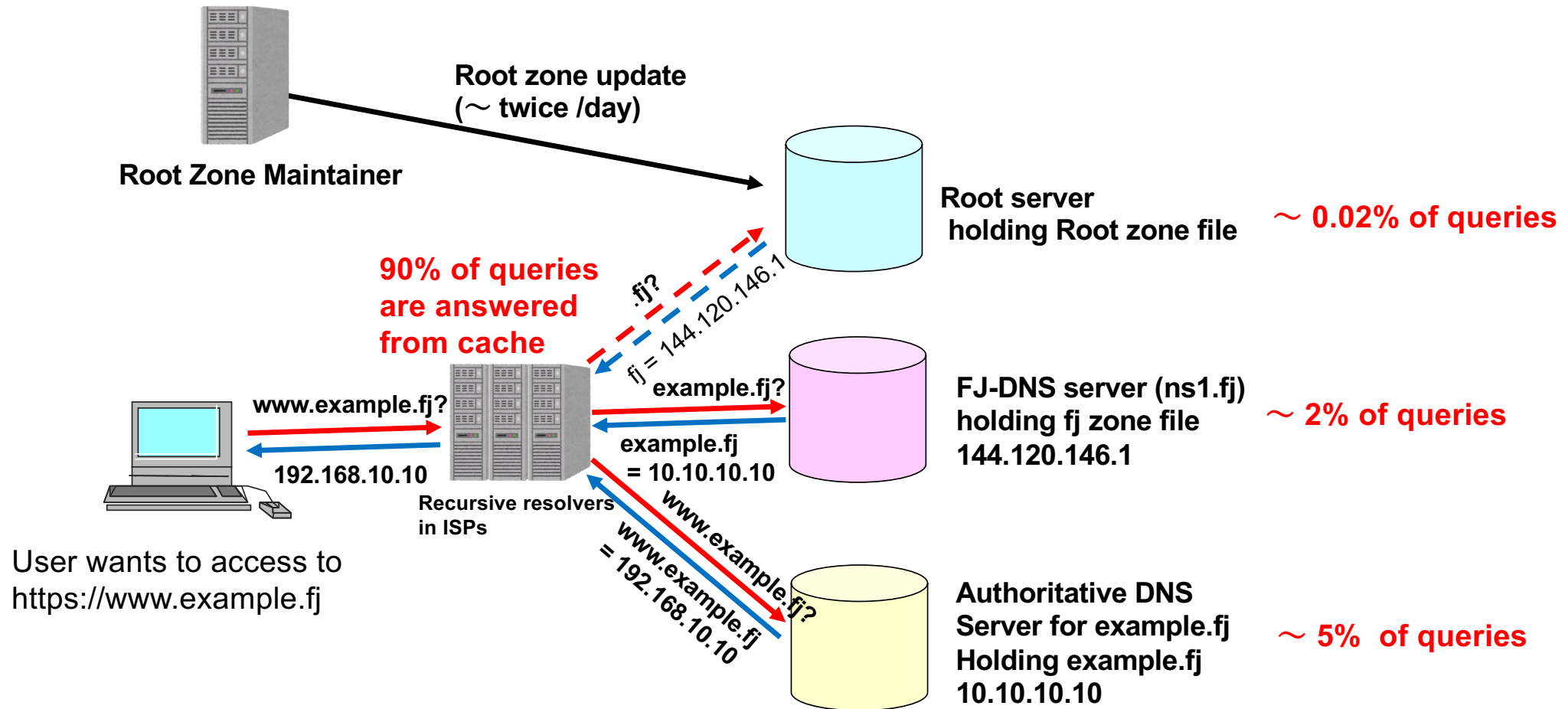
```
graph TD; A[How DNS work ?] --> B[Resilience of the Internet from DNS point of view]; B --> C[M-Root update]; C --> D[Importance of the measurement]
```

Resilience of the Internet from DNS point of view

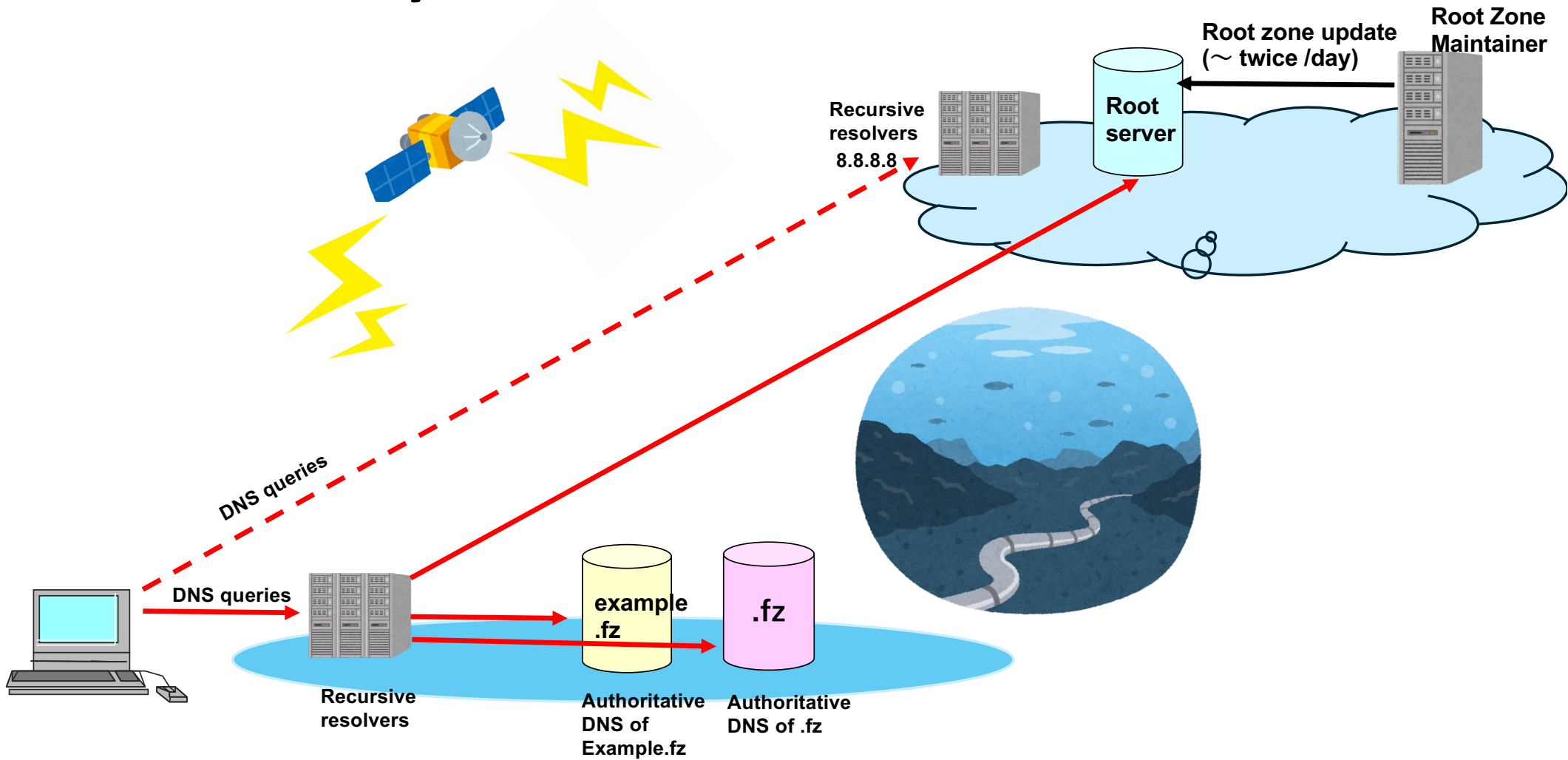
M-Root update

Importance of the measurement

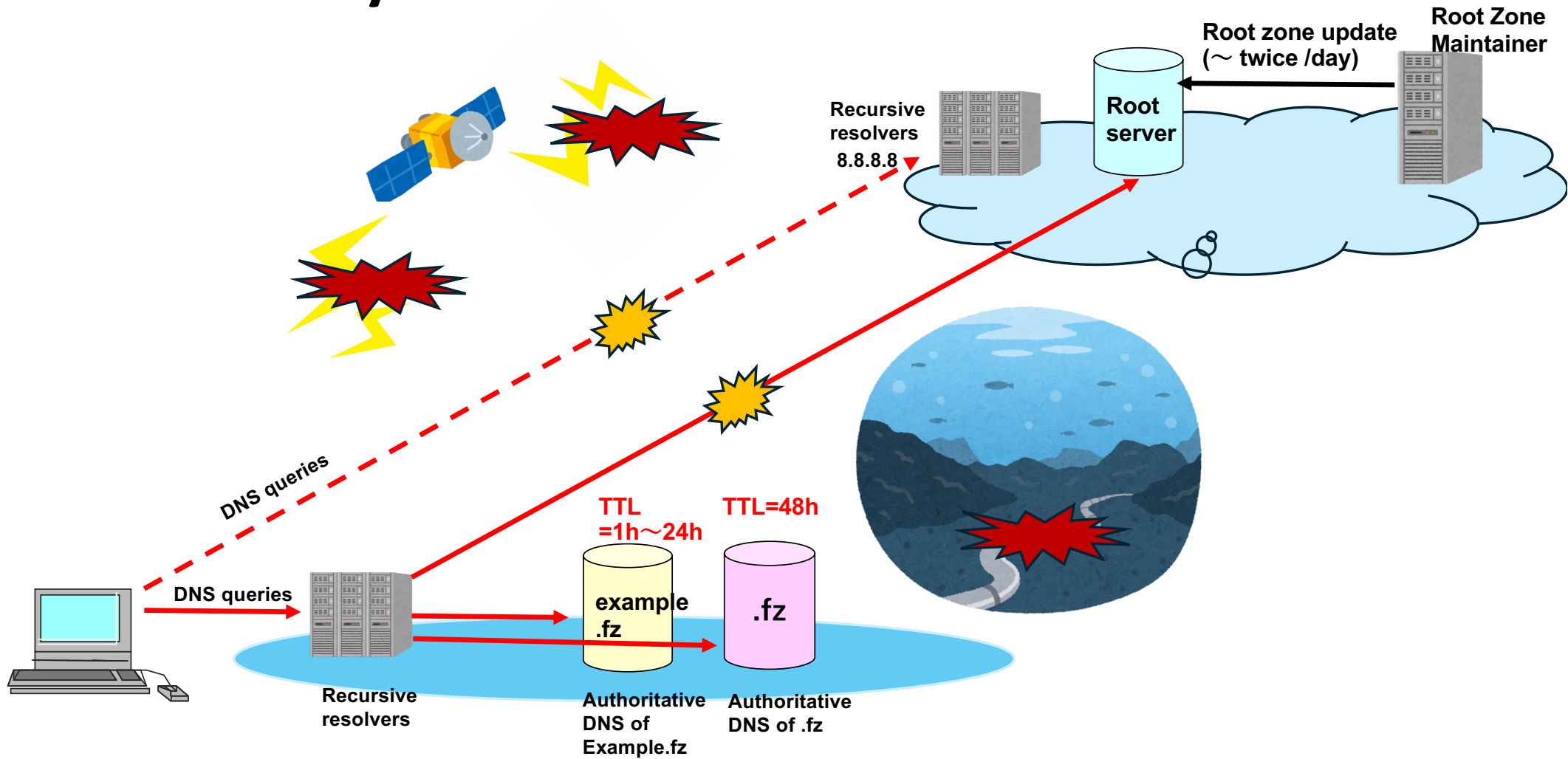
How DNS works



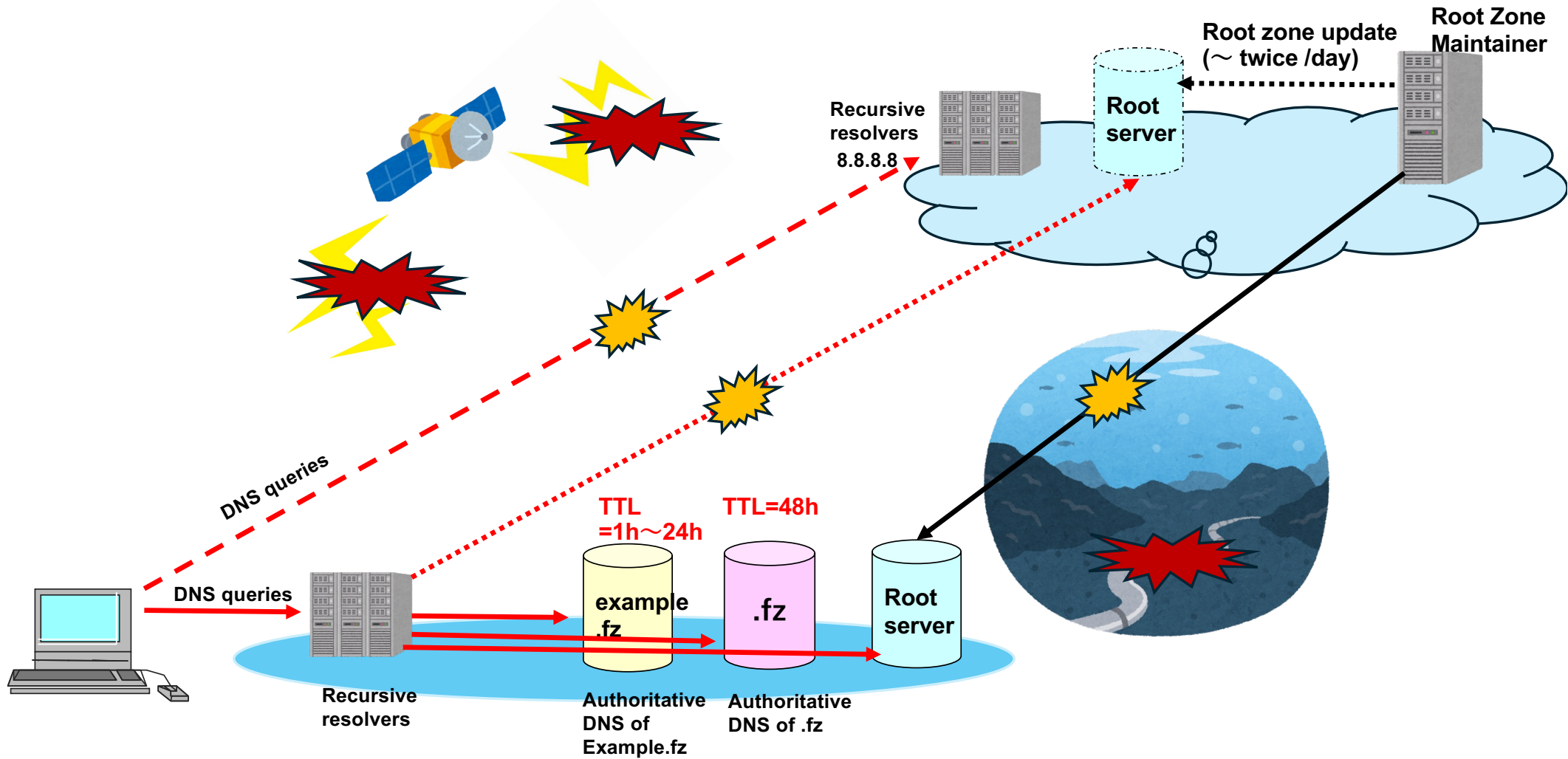
Island country case



Island country isolated case



Island country isolated case with root server



Why more anycast instances are needed?

- Strengthen resilience from DDOS attacks on Root Server by limiting the affected areas, and then avoid global-level instability of the root DNS service
- For local communities hosting root servers,
 - Improve accessibility to root server even when they lose the connectivity to outside the country, which enables the name resolution
 - Faster access to root server (but less than 1sec level)

Recent update of M-Root deployment Scheme

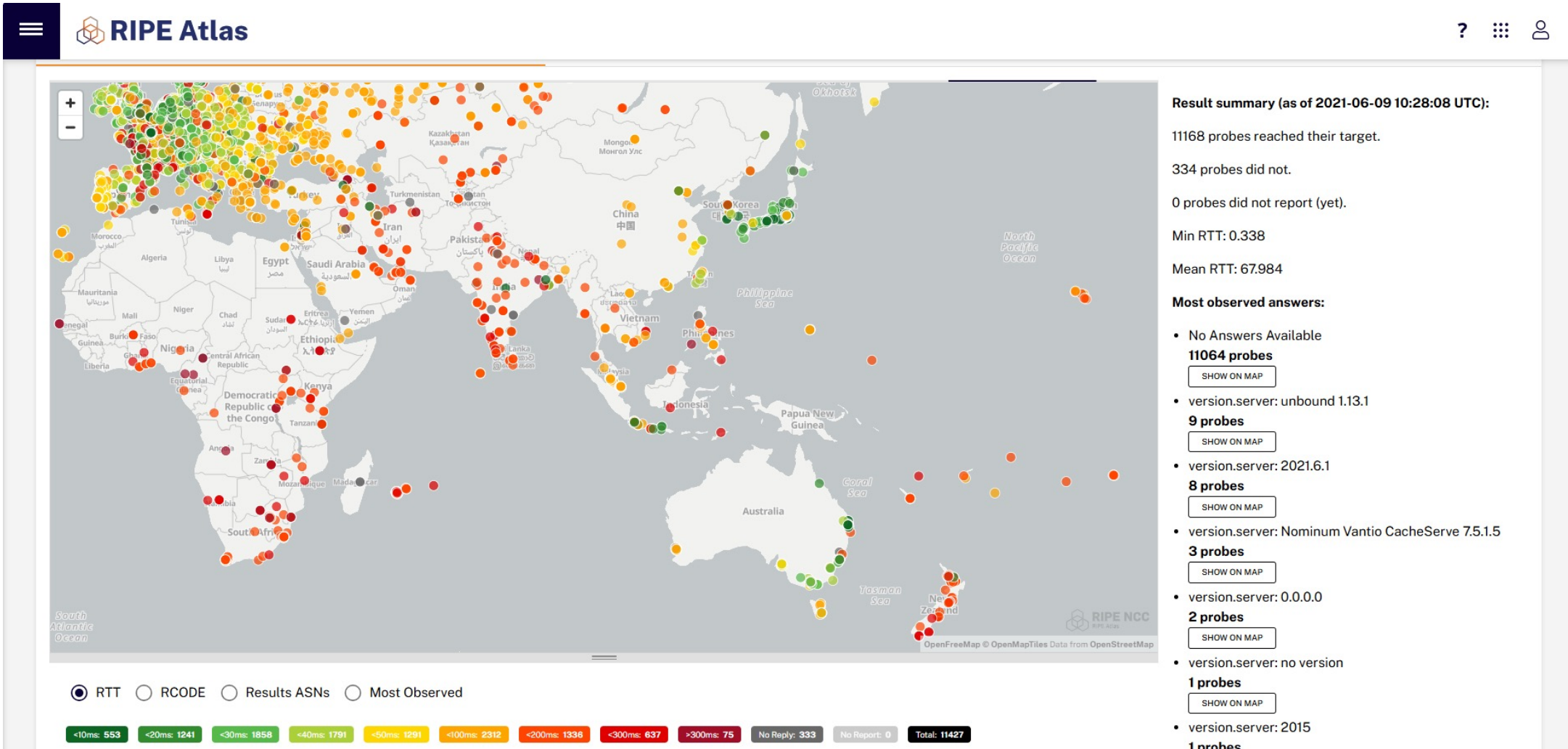
- In 2004, M-Root started anycast services
- In 2020, the MoU among WIDE Project, JPRS, and APNIC concluded for global deployment of M-Root instances with focus on AP region
- Deployment of more anycast instances underway with funding support from APNIC Foundation/APIDT
- Kazuhiro Kitamura <kitamura@jprs.co.jp> is appointed as M-Root Deployment Manager

Update of M-Root deployment in AP region

	City/Country • Economy: connected IX etc	# of locations
2020	Brisbane/ AU : MegalX, QLD-IX	1
2021	Hanoi/ VN : VNNIC	1
2022	GU : MARIIX, Kuala Lumpur/ MY : MylX, Bangkok/ TH : BKNIX, SG : Equinix, SingAREN-SOE	4
2023	Kaohsiung/ TW : TWIX, Jakarta/ ID : IIX, OpenIXP, Ulaanbaatar/ MN : MISPA-IXP, HK : HKIX, Phnom Penh/ KH : CNX	5
2024	Dhaka/ BD : BDIX, Kathmandu/ NP : NPIX, Lahore/ PK : PKIX, Mumbai/ IN : NIXI, Kolkata/ IN : Kolkata IX, Malé/ MV : MVIX Sao Paulo/ BR : nic.br	7(6)
2025 (Equipment delivered)	Jinan/ CN : CNNIC, Vientiane/ LA : NIX, Colombo/ LK : Dialog, Hamilton/ NZ : ALK-IX, WLG-IX, CHC-IX, MegalX Auckland Funafuti/ TV : Tuvalu Telecom, Manila/ PH : Almaty/ KZ , Bucharest/ RO	8(6) (planned)

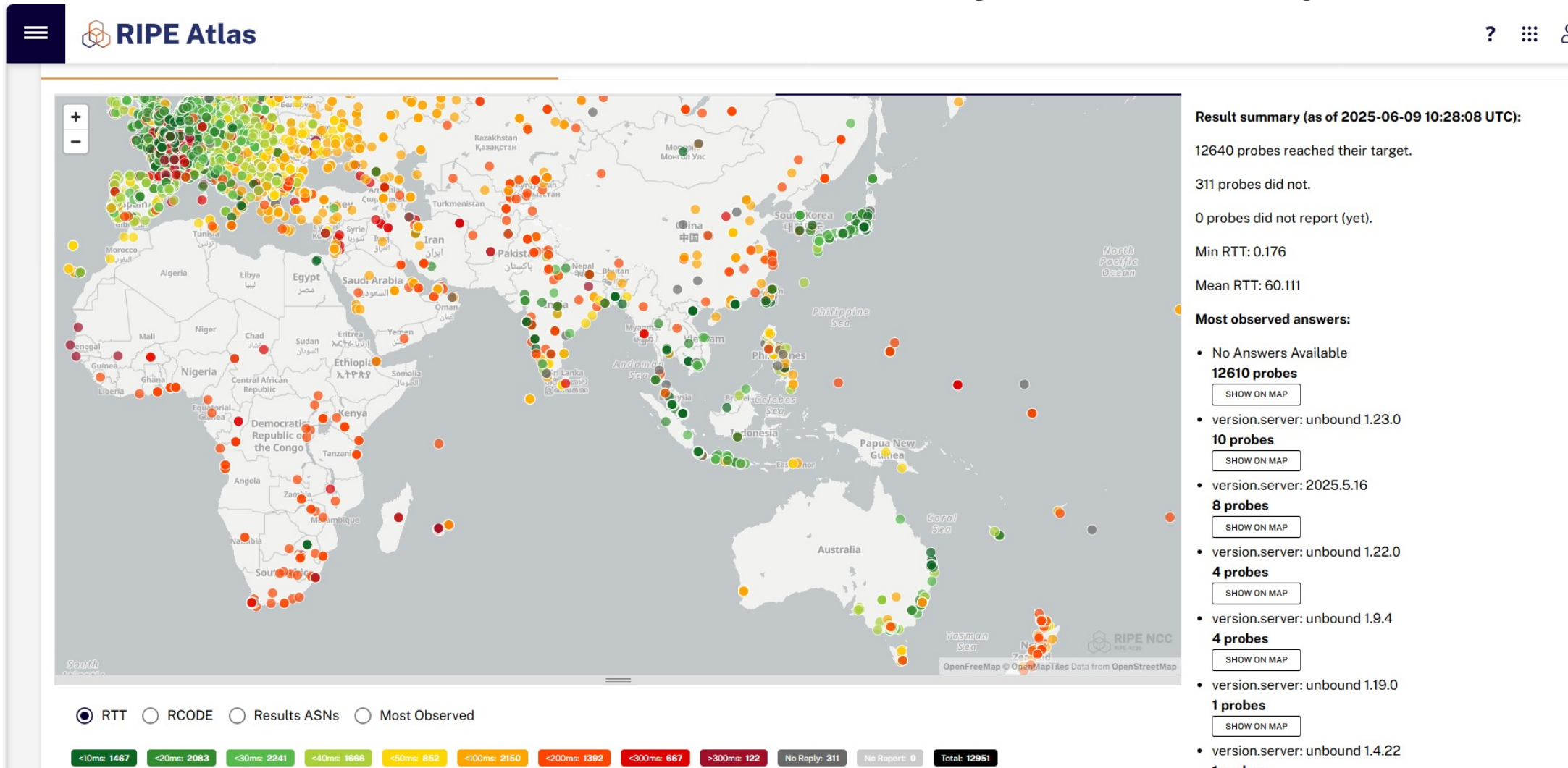
(※) 30 countries/economies in Asia, 26 in Oceania of APNIC service region

RTT measurements in June 2021 by RIPE Atlas probes



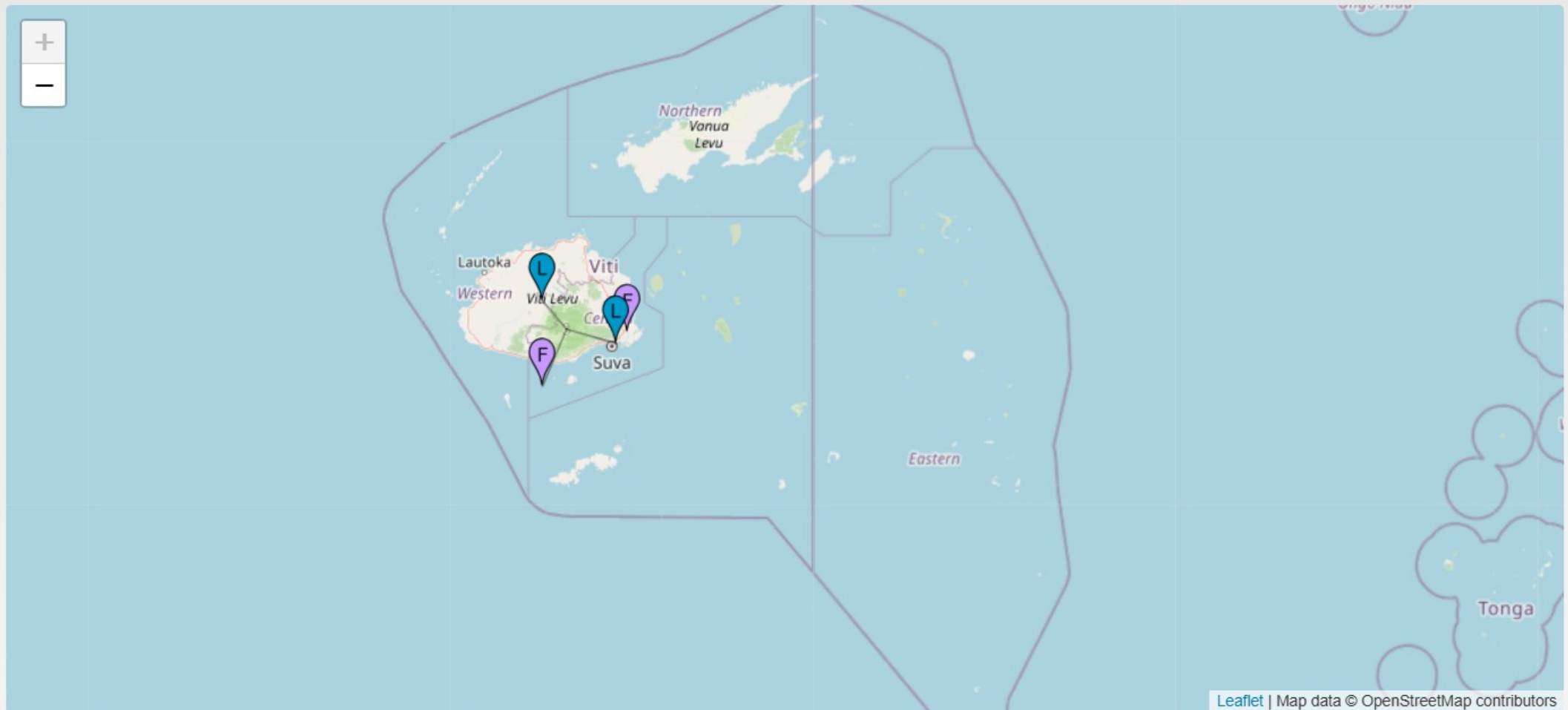
<https://atlas.ripe.net/measurements/10506/>

RTT measurements in June 2025 by RIPE Atlas probes



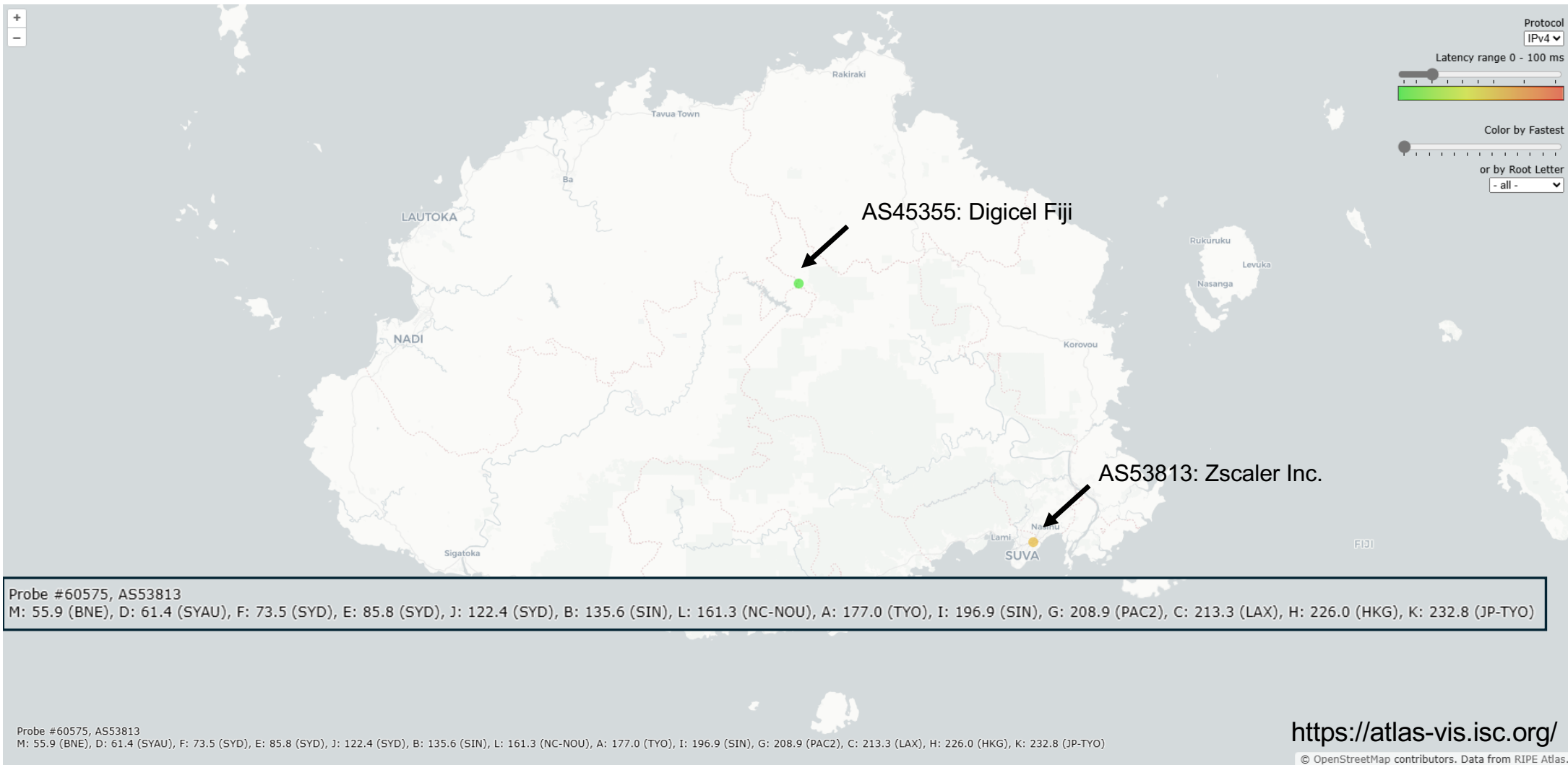
<https://atlas.ripe.net/measurements/10506/>

Root servers in Fiji



As of 2025-06-12T04:44:43Z, the root server system consists of 1954 instances operated by the 12 independent root server operators.

RTT to root servers from Atlas probes in Fiji



Current # of RIPE Atlas probe locations in AP region

Country or Economy/cc	#of probe (connect ed)	# of probe (disconn ected)	Country/cc	#of probe (connect ed)	# of probe (disconn ected)	Country or Economy/cc	#of probe (connect ed)	# of probe (disconn ected)	Country/cc	#of probe (connect ed)	# of probe (disconn ected)
Japan/JP★	254	114	Pakistan/PK★	3	8	Cocos Islands/CC	0	0	Palau/PW	1	0
China/CN★	79	247	Bhutan/BT	1	1	Christmas Island/CX	0	0	Northern Mariana Islands/MP	1	0
Hong Kong/HK★	55	39	British Indian Ocean Territory/IO	0	0	Australia/AU★	253	93	Pitcairn Islands/PN	0	0
Taiwan/TW★	48	26	Singapore/SG★	137	60	New Zealand/NZ★	101	24	Samoa/WS	0	0
South Korea/KR★	28	24	Indonesia/ID★	97	63	Guam/GU★	8	4	French Southern Territories/TF	0	0
Mongolia/MN★	7	8	Philippines/PH	65	49	New Caledonia/NC	6	0	Marshall Islands/MH	0	0
Macau/MO	0	1	Thailand/TH★	41	14	French Polynesia/PF	5	1	American Samoa/AS	0	0
North Korea/KP	0	0	Malaysia/MY★	30	15	Papua New Guinea/PG	3	0	Niue/NU	0	0
India/IN★	151	153	Vietnam/VN★	16	3	Micronesia/FM	3	0	Nauru/NR	0	0
Nepal/NP★	12	5	Timor-Leste/TL	3	0	Fiji/FJ	2	2	Tuvalu/TV★	0	0
Maldives/MV★	7	3	Cambodia/KH★	2	3	Vanuatu/VU	2	1	Norfolk Island/NF	0	0
Afghanistan/AF	7	0	Myanmar/MM	1	1	Kiribati/KI	2	0	Wallis and Futuna/WF	0	0
Bangladesh/BD★	5	8	Brunei/BN	1	1	Cook Islands/CK	1	1	Solomon Islands/SB	0	0
Sri Lanka/LK★	4	3	Laos/LA★	0	2	Tonga/TO	1	1	Tokelau/TK	0	0

Red letter : less than 1 probe per one million population Blue letter : zero probe ★: M-Root deployed or planned

Data as of Jan. 21, 2025