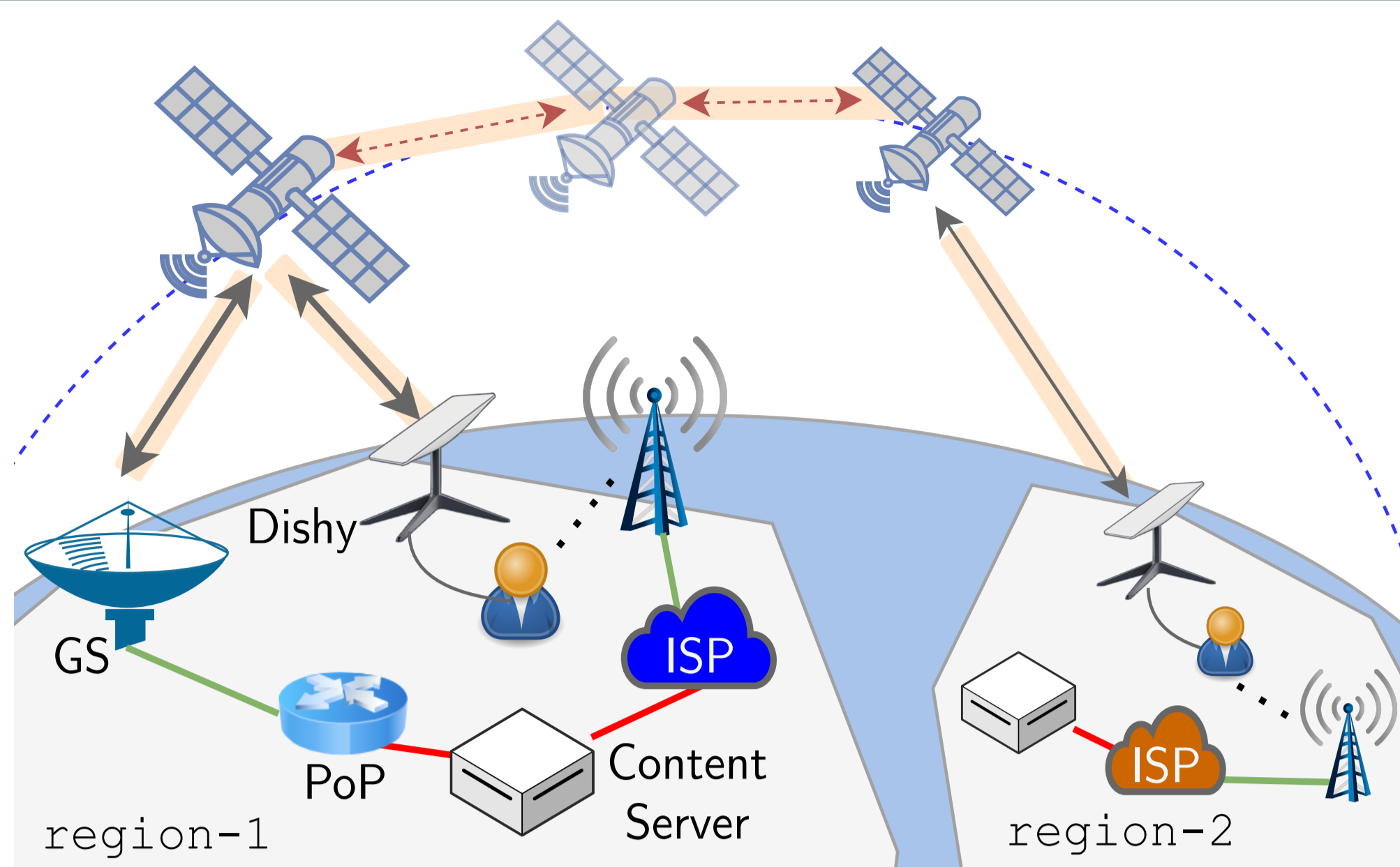
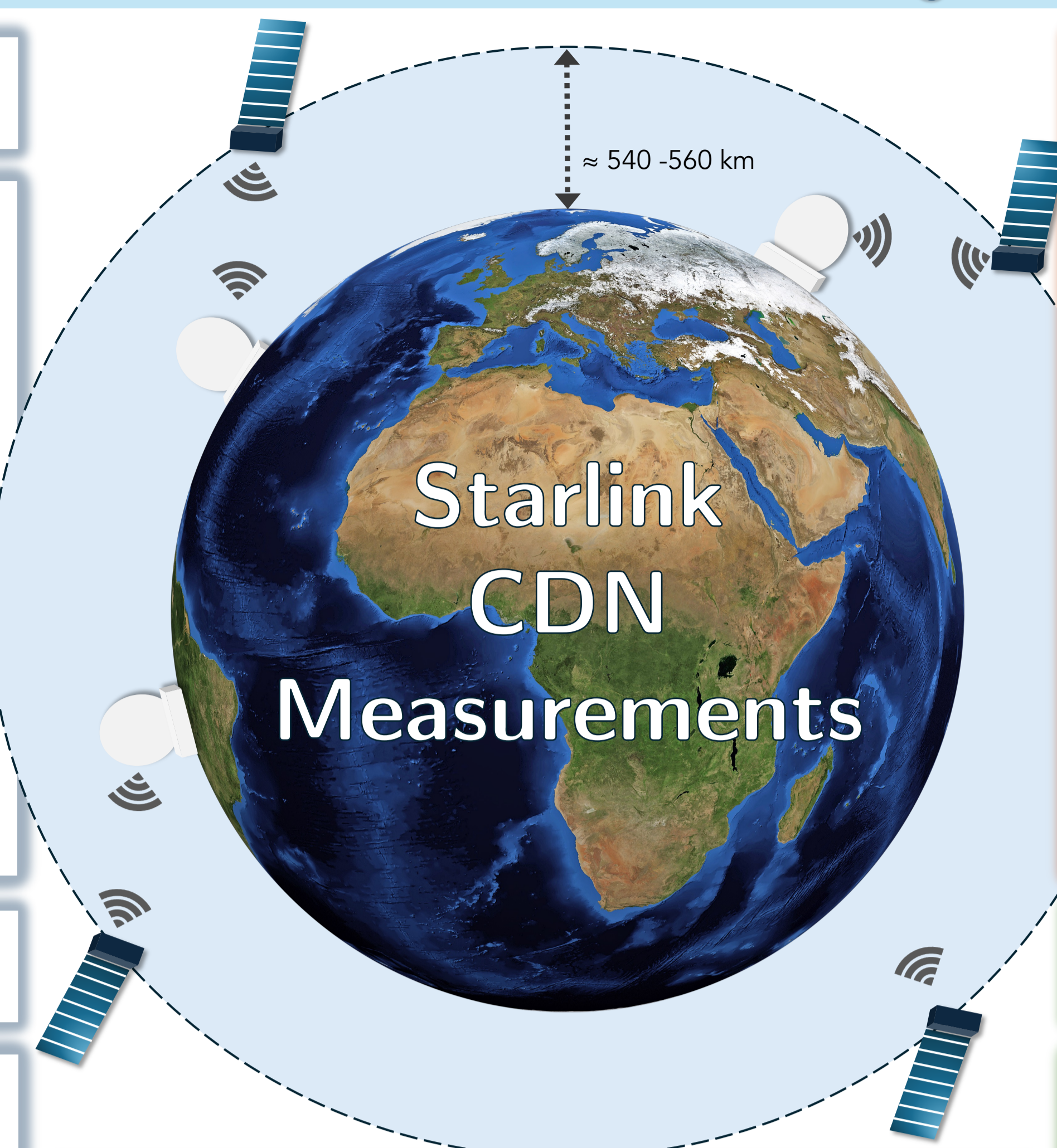
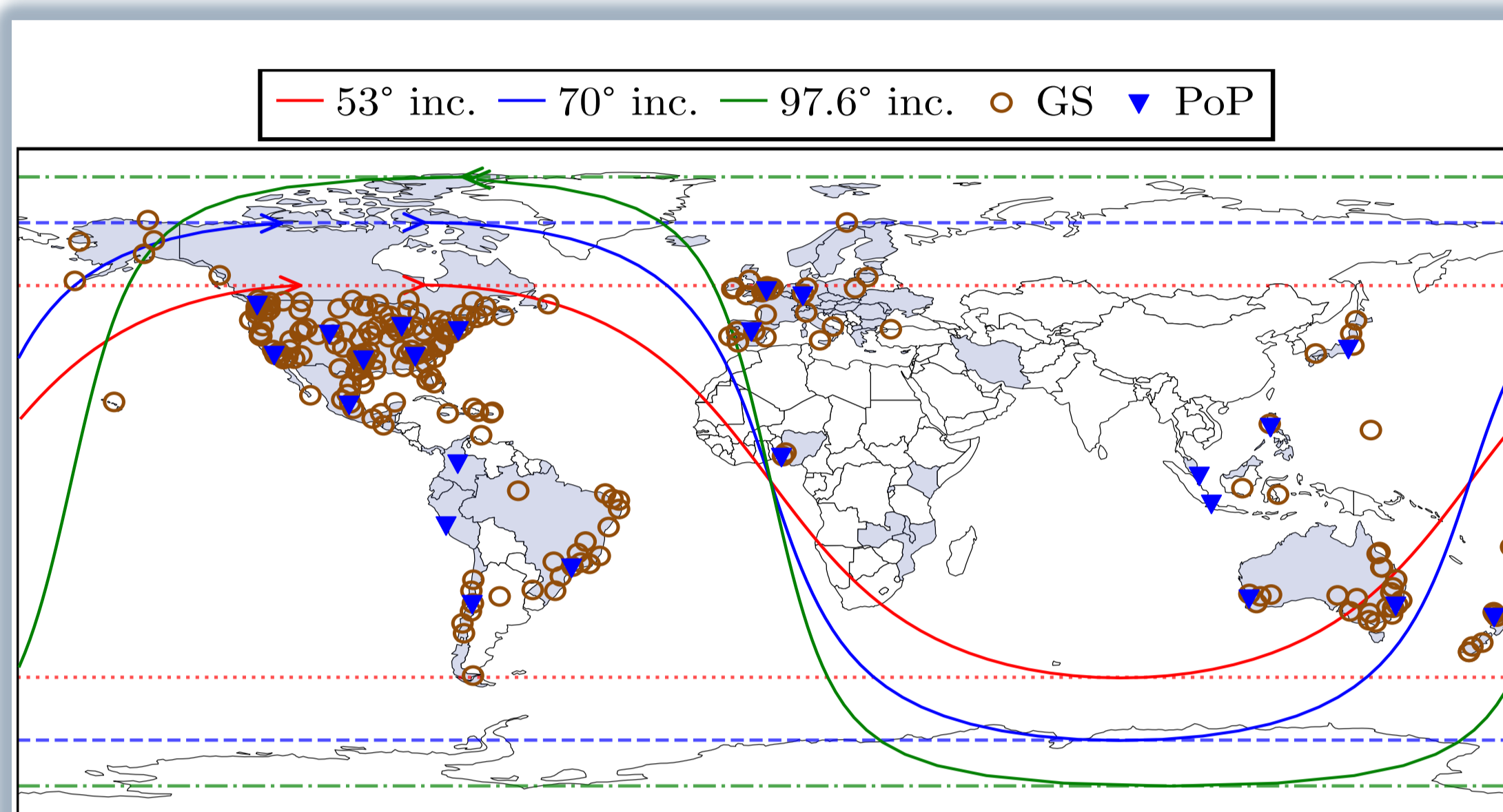


Content Fetching in Starlink



Starlink Infrastructure



Problem

Starlink users might be connected to PoPs in a completely different country or continent. We might observe issues like higher latencies, content relevance when fetching content from CDNs

Analysis

Main Takeaways

- For Starlink users, content fetching latency is heavily dependent on the assigned PoP location, affecting regions far away from a PoP
- Fetching locally popular content over Starlink might observe higher latencies

Open Questions

- Is fetching globally popular content over Starlink from regions with less developed IT infrastructure faster?
- Do CDN user localisation mechanisms, e.g. DNS-based redirection, Anycast further affect CDN server selection algorithms?
- Will putting CDN servers on LEO satellites help improve CDN performance? → check HotNets'24 Publication

Active Measurements



Chromium-based plugin for web browsing measurements



5K+ measurements from 8 and 15 countries from Starlink and Terrestrial Network users respectively

- HTTP measurements**
- CDN server location
 - HTTP Response time
 - First Contentful Paint

Passive Measurements

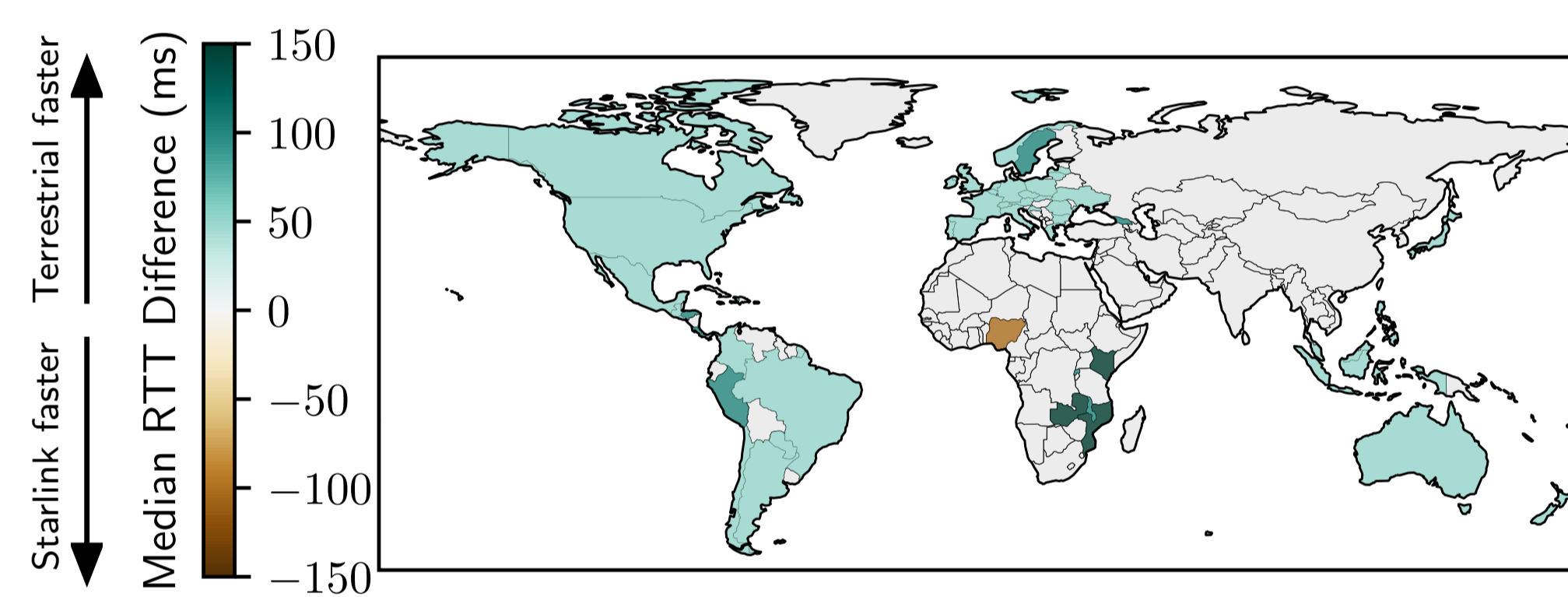


Aggregated Internet Measurements (AIM)

22K+ measurements from 55 countries from Starlink and Terrestrial Network users

- Cloudflare speed test**
- CDN Server Location
 - Idle latency
 - Latency under load

Global CDN Performance



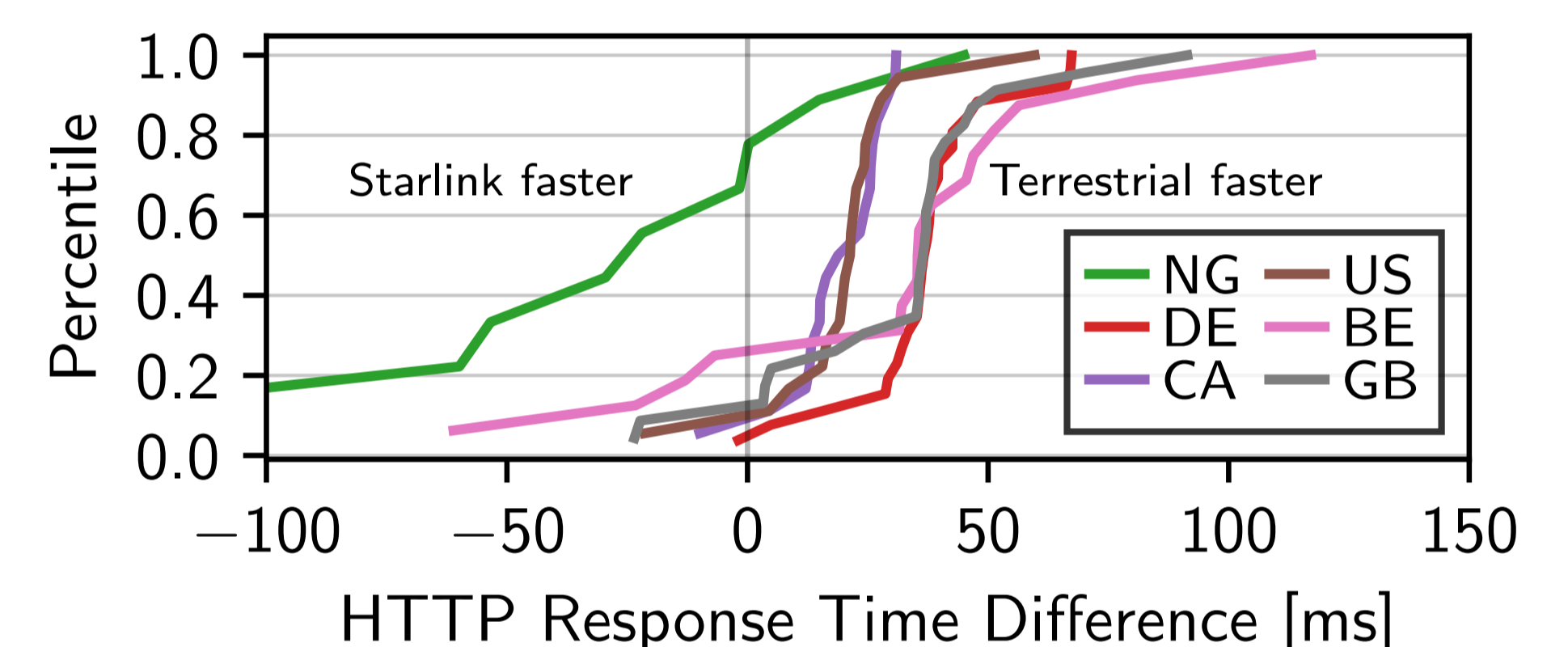
Starlink users observe $\approx 30-50$ ms higher median latency than Terrestrial ISPs to CDNs

Country	Terrestrial ISP		Starlink	
	Distance (km)	minRTT (ms)	Distance (km)	minRTT (ms)
Guatemala	6.9	7	1220.9	44.2
Mozambique	5.0	7.2	8776.5	138.7
Cyprus	34.7	7.45	2595.3	55.35
Swaziland	301.8	12.8	4731.6	122.7
Haiti	6.1	1.5	2063.2	50
Kenya	197.5	16	6310.8	110.9
Zambia	1202.64	44	7545.9	143.5
Rwanda	9.25	5	3762.8	87.5
Lithuania	168.6	12.4	1243.2	40
Spain*	375.3	14.3	13.4	33
Japan*	253	9	57.0	34

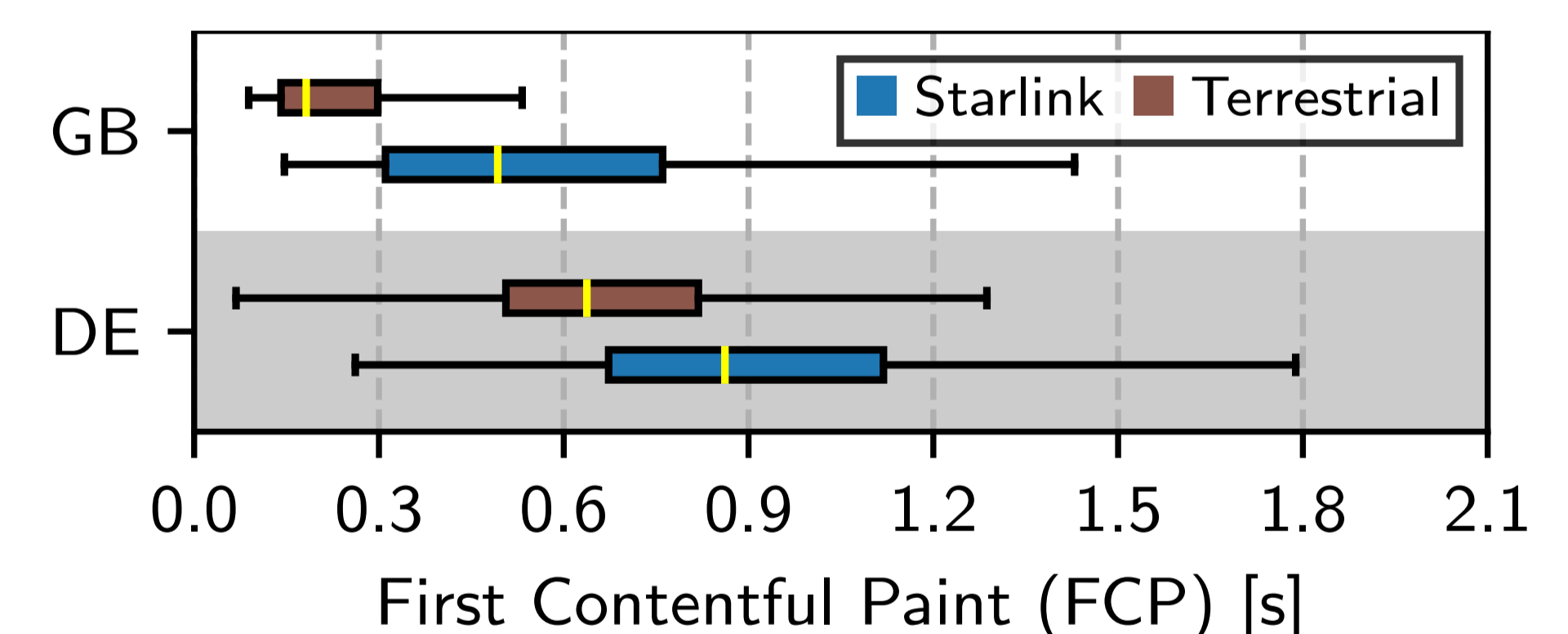
* Countries with a local Starlink PoP

Distance and minimum RTT to the most optimal CDN server for Starlink vs Terrestrial ISP connections

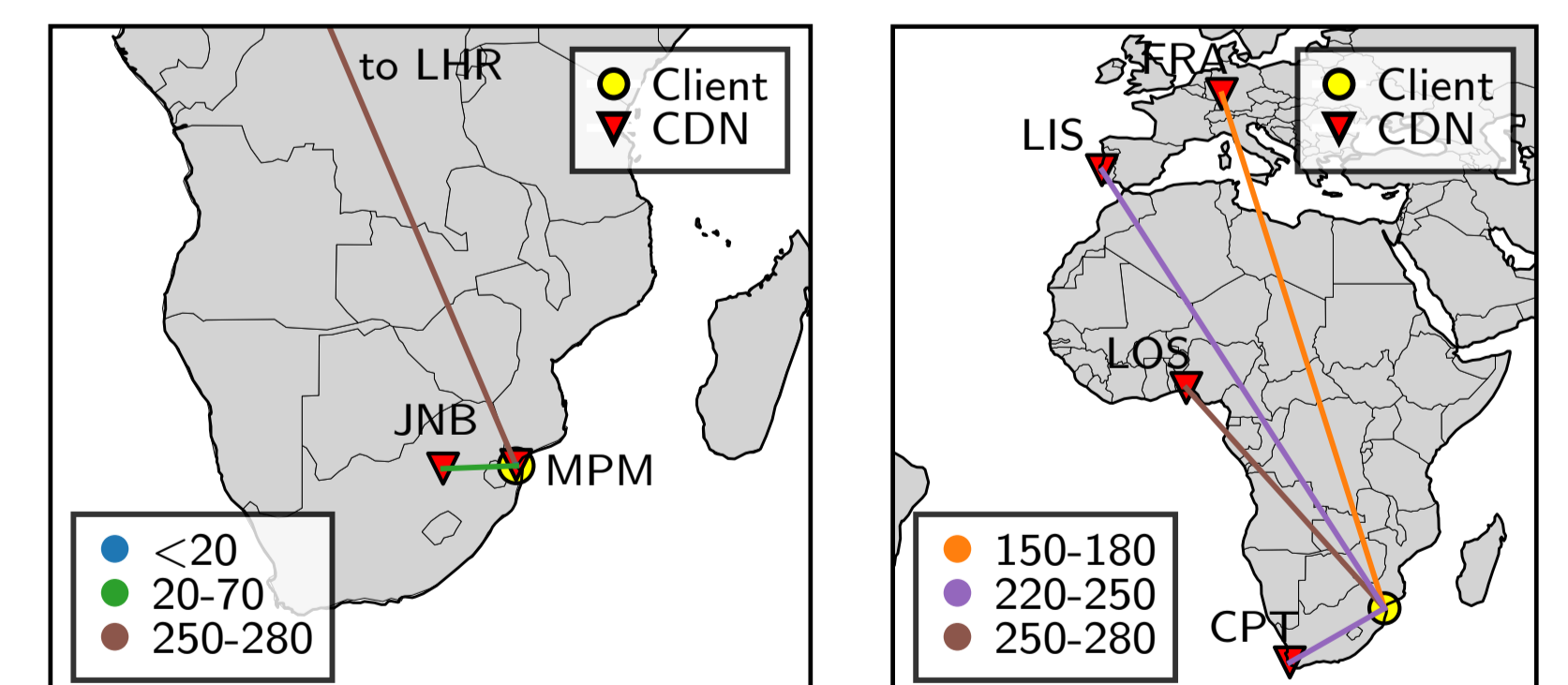
Web Performance



HTTP Response Times are $\approx 20-50$ ms higher for Starlink than Terrestrial ISPs



FCP times are ≈ 200 ms higher for Starlink than Terrestrial ISPs



For Mozambique, Terrestrial ISP user's most frequently selected CDN server is in the same city (MPM), reachable within 20 ms. For Starlink users it is in Frankfurt, ≈ 150 ms.

Associated Publication

It's a bird? It's a plane? It's CDN!: Investigating Content Delivery Networks in the LEO Satellite Networks Era.
Rohan Bose, Saeed Fadaei, Nitinder Mohan, Mohamed Kassem, Nishanth Sastry, and Jörg Ott
In The 23rd ACM Workshop on Hot Topics in Networks (HOTNETS '24)
<https://doi.org/10.1145/3696348.3696879>



Acknowledgements

