GlobalPing Alternative using NDN

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Mibura Inc.

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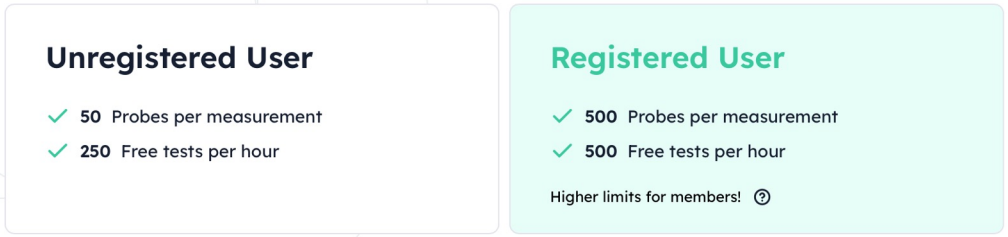

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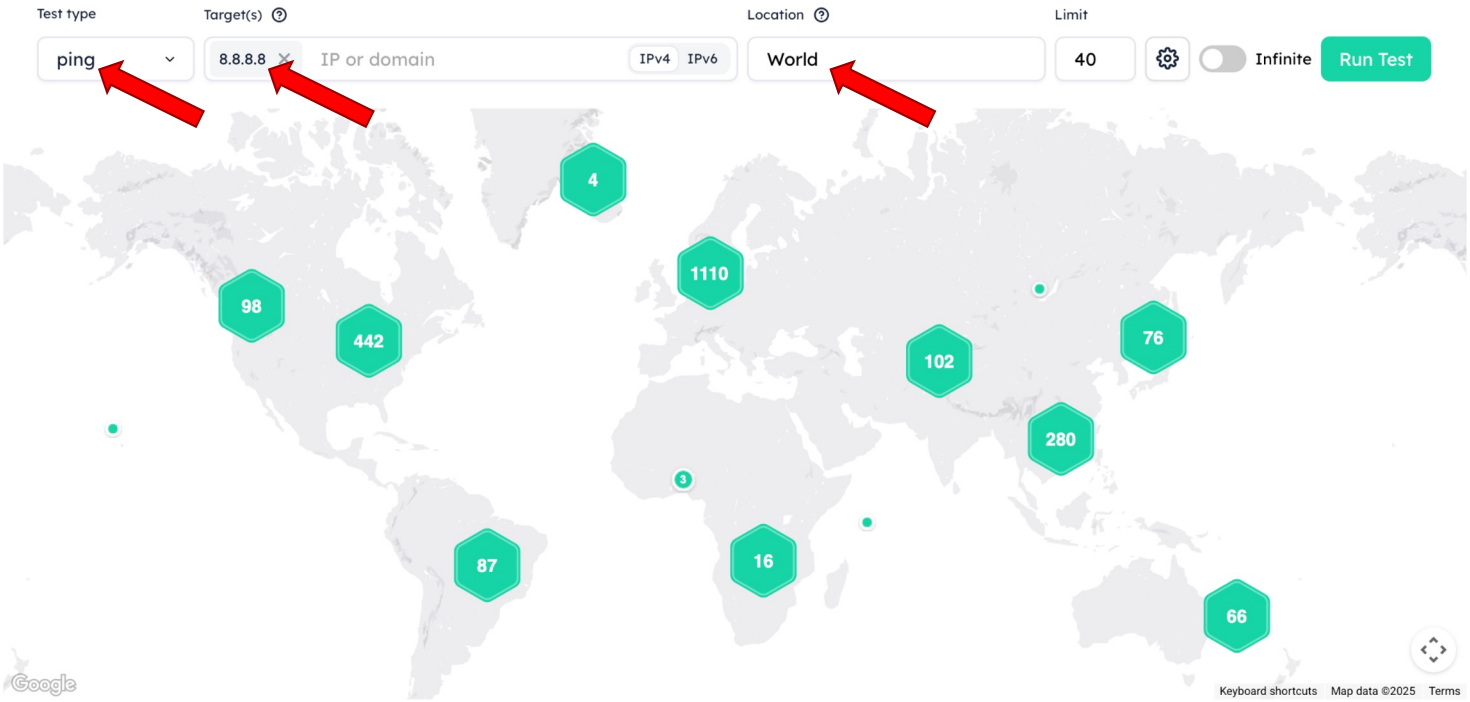

GlobalPing Cont.

We use GlobalPing for

- Monitor our infrastructure (birds eye view)
- Use ping and traceroute on failing nodes
  - Identify if network problem or equipment failure

```
--- 45.130.142.254 ping statistics ---
20 packets transmitted, 0 received, 100% packet loss, time 9734ms

> Helsinki, FI, EU, Hetzner Online GmbH (AS24940)
PING 45.130.142.254 (45.130.142.254) 56(84) bytes of data.
64 bytes from 45.130.142.254: icmp_seq=1 ttl=234 time=240 ms
64 bytes from 45.130.142.254: icmp_seq=2 ttl=234 time=240 ms
64 bytes from 45.130.142.254: icmp_seq=3 ttl=234 time=240 ms
```

```
--- 45.130.142.254 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 239.506/239.664/239.933/0.190 ms

> Ashburn (VA), US, NA, Amazon.com, Inc. (AS14618) (aws-us-east-1)
PING 45.130.142.254 (45.130.142.254) 56(84) bytes of data.
64 bytes from 45.130.142.254: icmp_seq=1 ttl=232 time=145 ms
64 bytes from 45.130.142.254: icmp_seq=2 ttl=232 time=145 ms
64 bytes from 45.130.142.254: icmp_seq=3 ttl=232 time=145 ms
```

So why replace GlobalPing?

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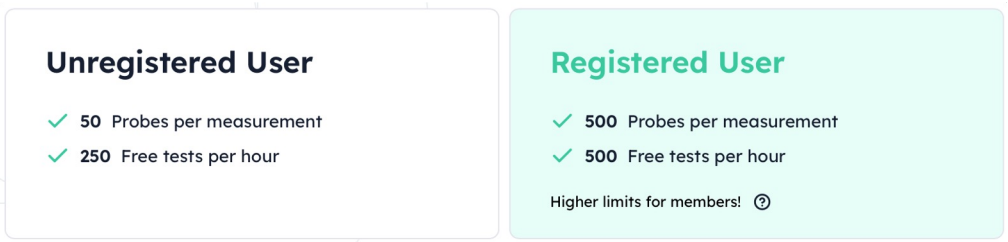
Answer: Rate Limiting!



Our Solution with NDN

Overview

- Use existing nodes for:
  - Sending requests
  - Gathering telemetry data
  - Collecting measurements
  - Forwarding/Routing

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- There are two roles for each of the nodes
  - Monitoring Node
  - Measuring Nodes

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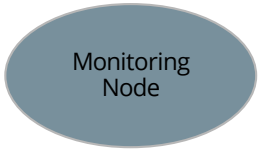
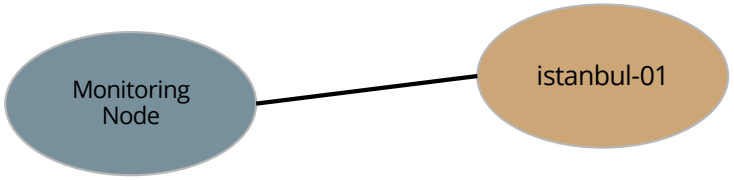
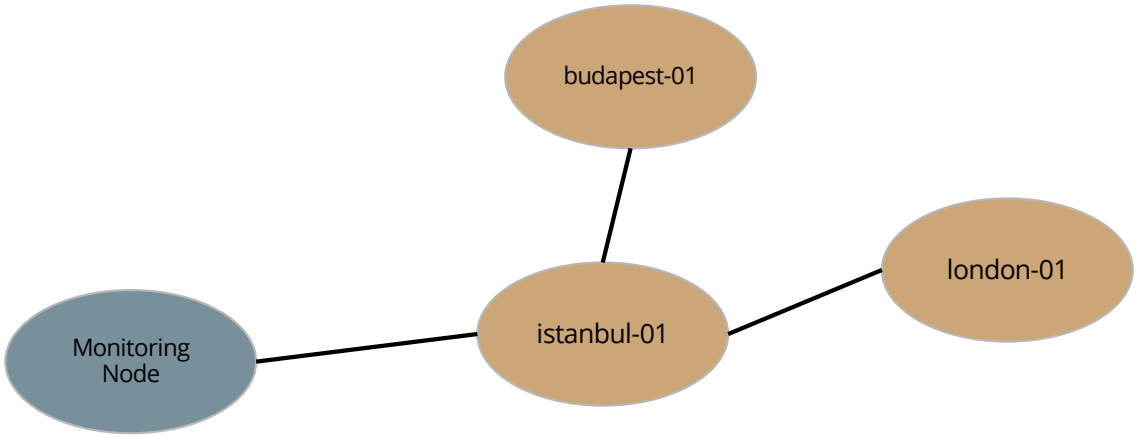
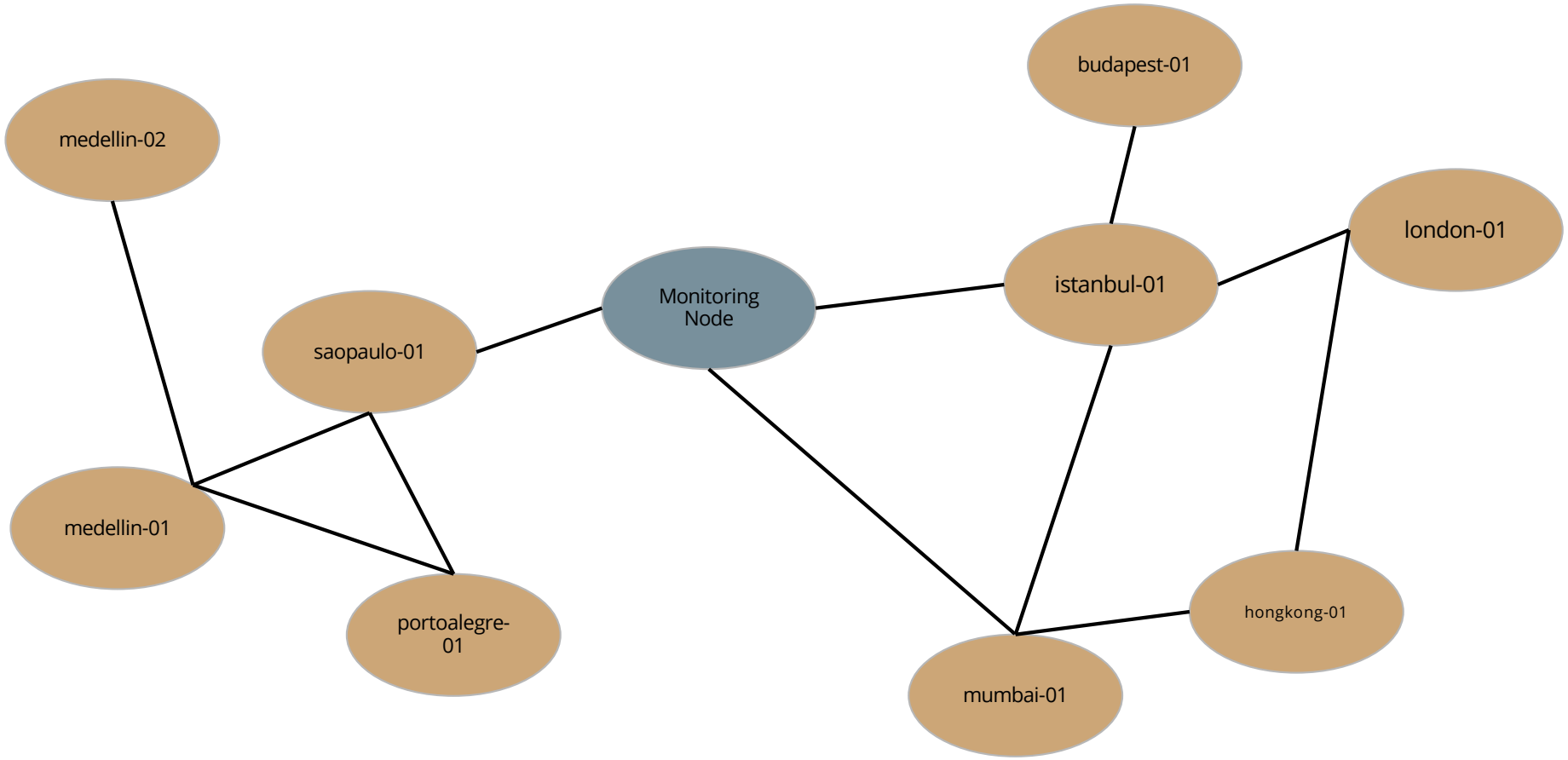
- One *Monitoring Node*, multiple *Measuring Nodes*
- Using Golang NDNd library


Monitoring
Node

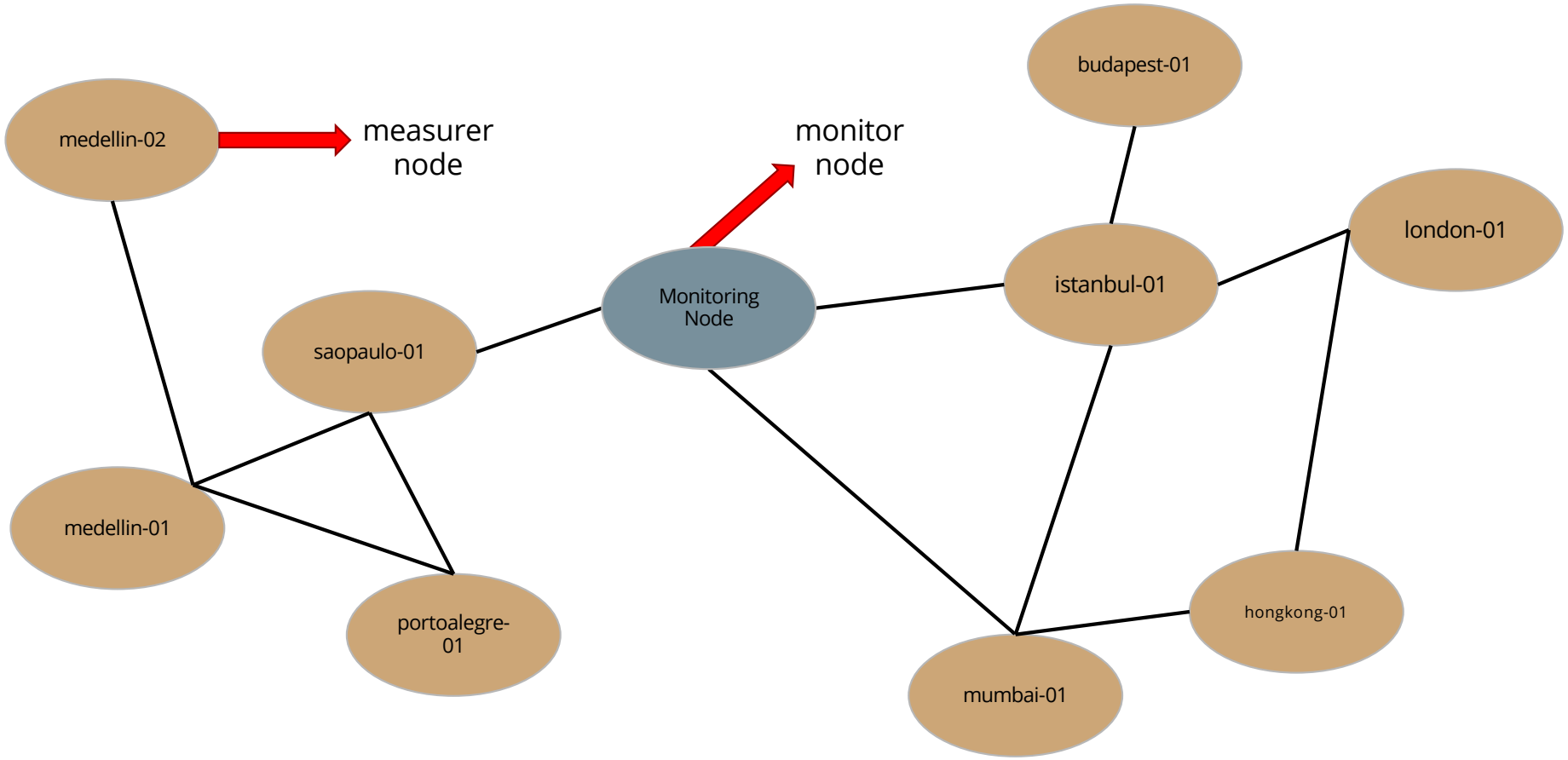

Monitoring
Node
istanbul-01


budapest-01
Monitoring Node
istanbul-01
london-01


budapest-01
medellin-02
london-01
istanbul-01
Monitoring Node
saopaulo-01
medellin-01
portoalegre-01
hongkong-01
mumbai-01

Note: This is a testbed!

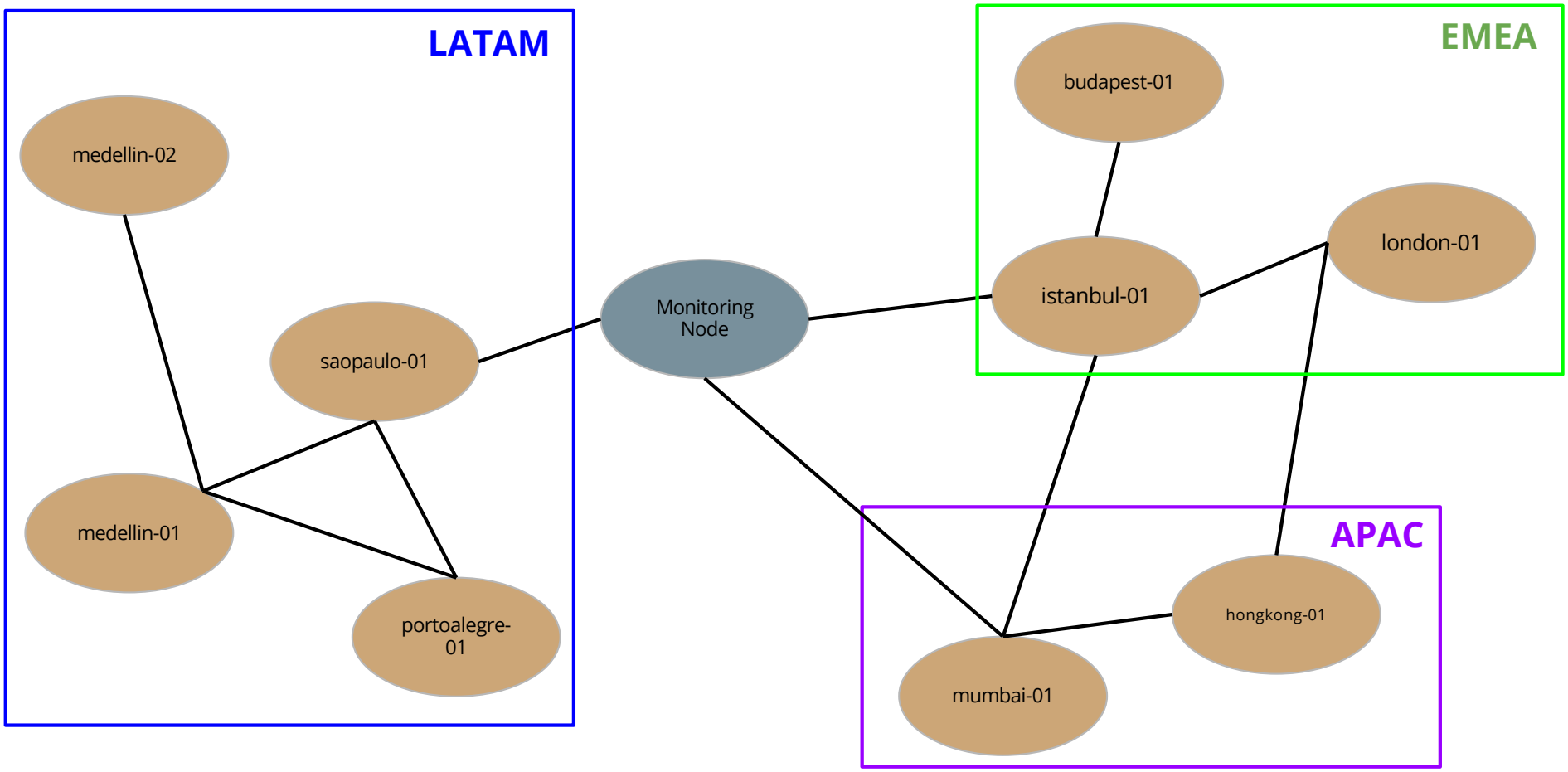
Naming Convention


medellin-02
measurer node
monitor node
budapest-01
london-01
Monitoring Node
istanbul-01
saopaulo-01
medellin-01
portoalegre-01
hongkong-01
mumbai-01

Naming Convention

Names reflect

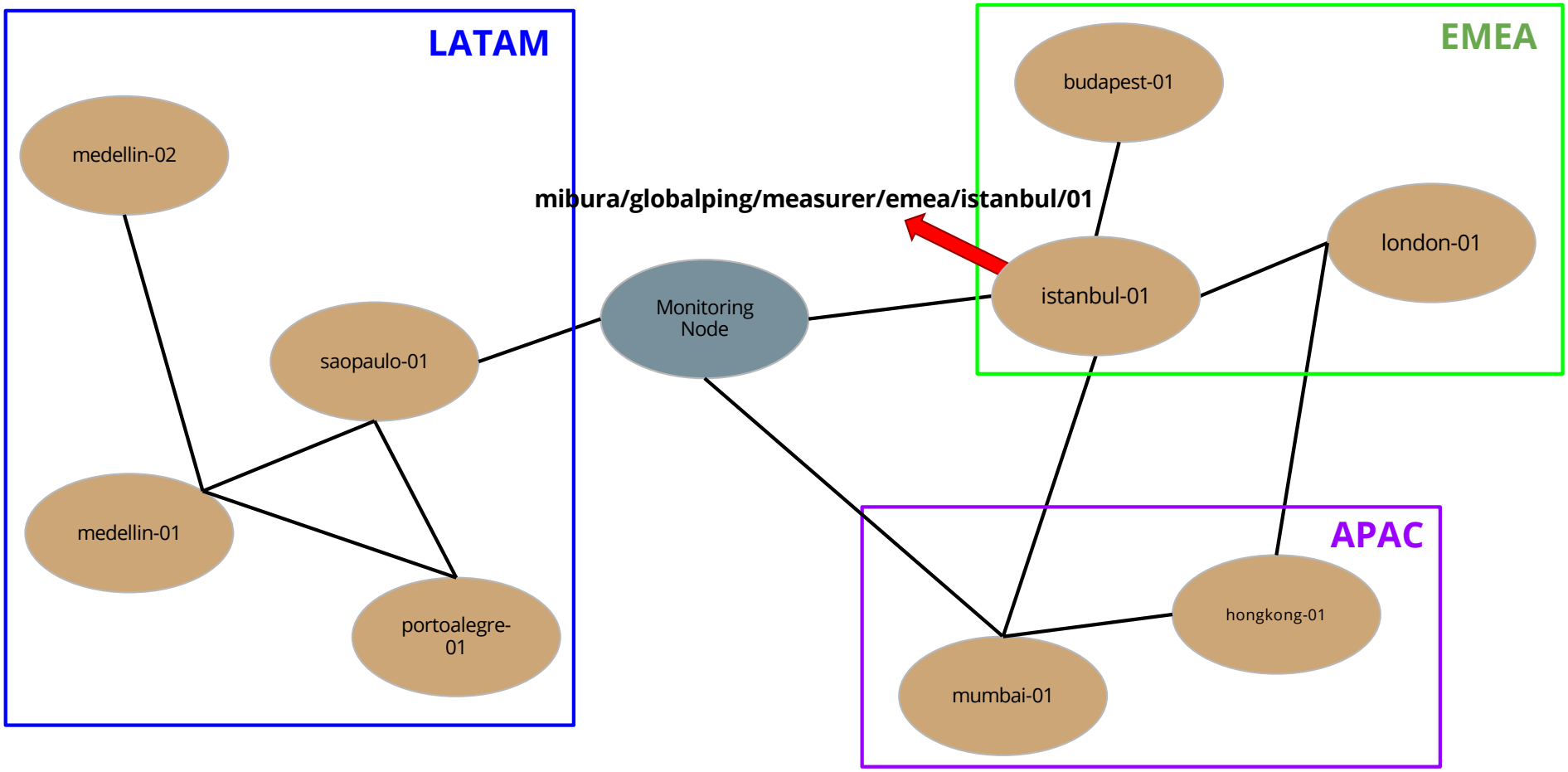
- The role of the server
  - mibura/globalping/**monitor**
  - mibura/globalping/**measurer**


LATAM
medellin-02
saopaulo-01
medellin-01
portoalegre-01
Monitoring Node
EMEA
budapest-01
istanbul-01
london-01
APAC
hongkong-01
mumbai-01

Naming Convention

Names reflect

- The role of the server
  - mibura/globalping/monitor
  - mibura/globalping/measurer
- The characteristics of the topology
  - mibura/globalping/measurer/*<region>*/*<city>*/*<server_id>*


LATAM
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APAC
medellin-02
budapest-01
mibura/globalping/measurer/emea/istanbul/01
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Monitoring Node
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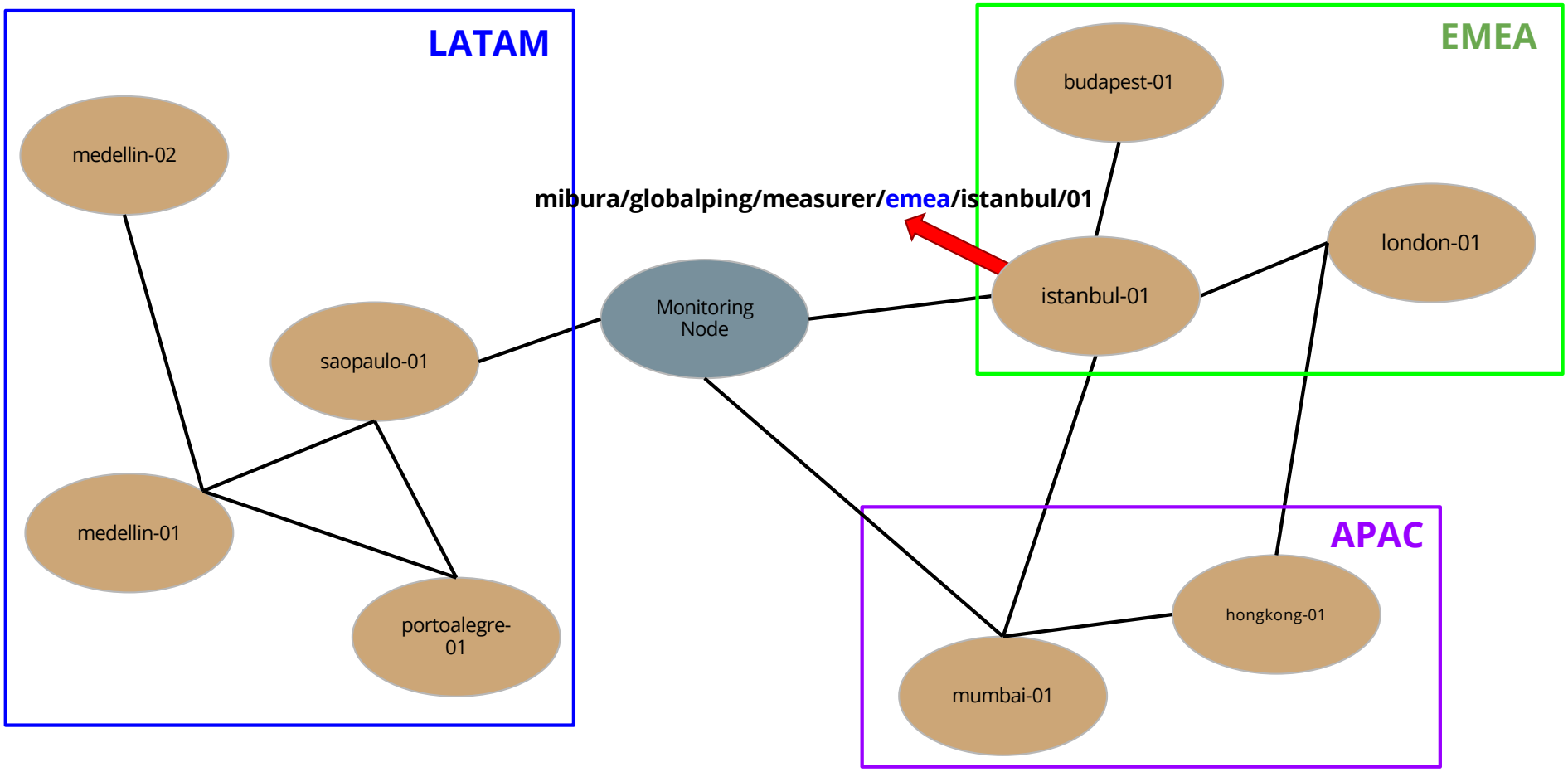
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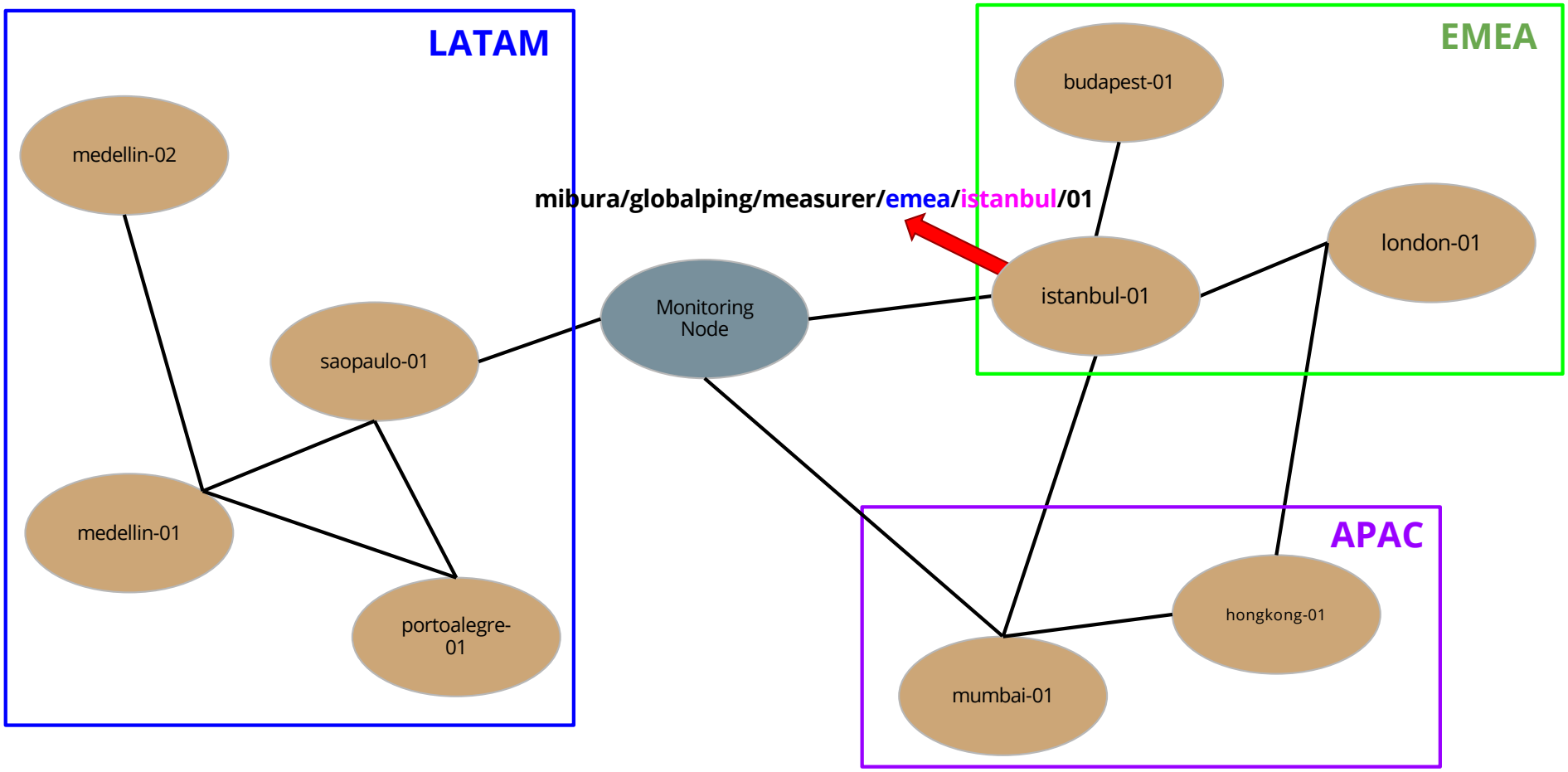
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mibura/globalping/measurer/emea/istanbul/01
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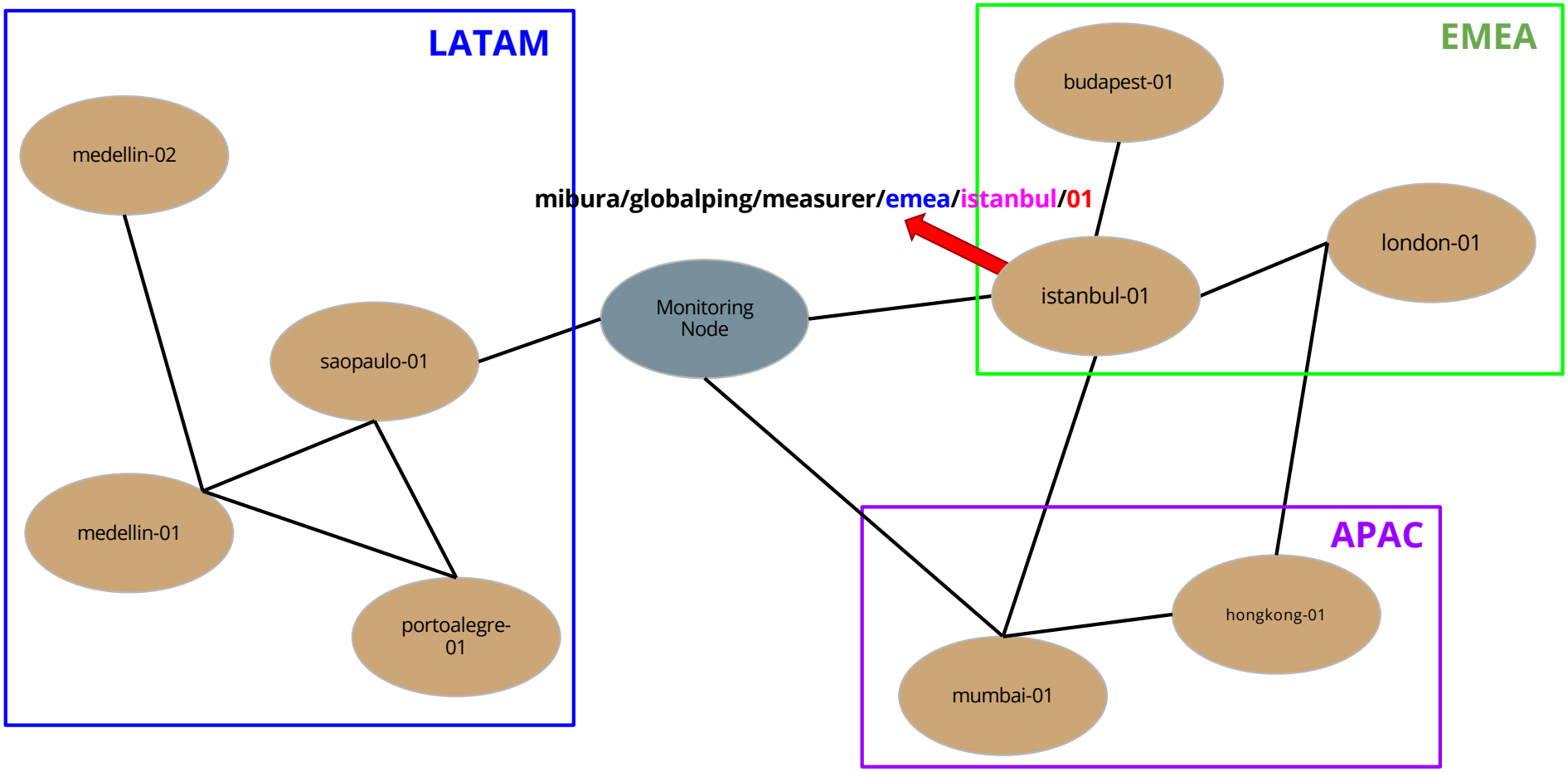
LATAM
medellin-02
saopaulo-01
medellin-01
portoalegre-01
Monitoring Node
mibura/globalping/measurer/emea/istanbul/01
EMEA
budapest-01
istanbul-01
london-01
APAC
hongkong-01
mumbai-01

Naming Convention Advantages

Utilizing this naming convention, we can order:

- all nodes in a ***region*** to ping → mibura/globalping/measurer/*<region>*
- all nodes in a ***city*** to ping → mibura/globalping/measurer/*<region>*/*<city>*
- one server to ping → mibura/globalping/measurer/*<region>*/*<city>*/*<server_id>*

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- Previously, have to check a database, mapping IP to location

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- one server to ping → mibura/globalping/measurer/*<region>*/*<city>*/*<server_id>*

- Previously, have to check a database, mapping IP to location

	IP	Region	Location
0	192.0.2.1	California	San Francisco
1	203.0.113.42	Texas	Dallas
2	198.51.100.77	Ontario	Toronto
3	8.8.8.8	New York	New York City
4	185.199.110.153	Bavaria	Munich

Takeaway: Naming conventions are a unique advantage of NDN

Sync Groups

We use two sync groups

- Collecting → mibura/globalping/monitor
- Requesting → mibura/globalping/measurer

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- Collecting → mibura/globalping/monitor
- Requesting → mibura/globalping/measurer

- Why two sync groups?
  - SVS Pub/Sub not available in NDNd yet
  - Implementation “hack”
    - Monitoring Node → Pub in requesting group, Sub in collecting group
    - Measuring Nodes → Pub in collecting group, Sub in requesting group

Future Work

- Implement trust schema
  - Only the monitoring node can publish requests
  - Only measuring nodes can publish measurements

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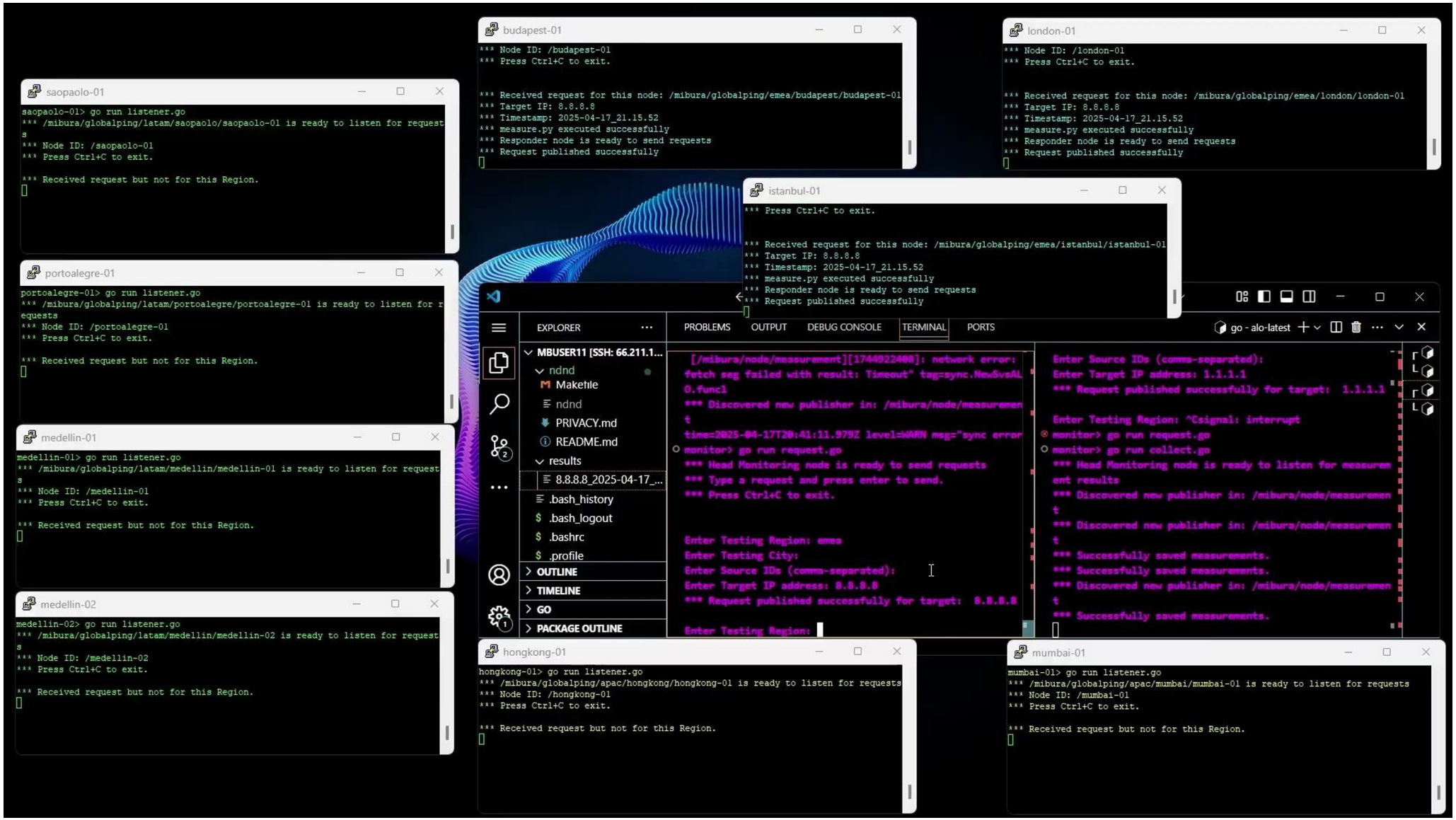
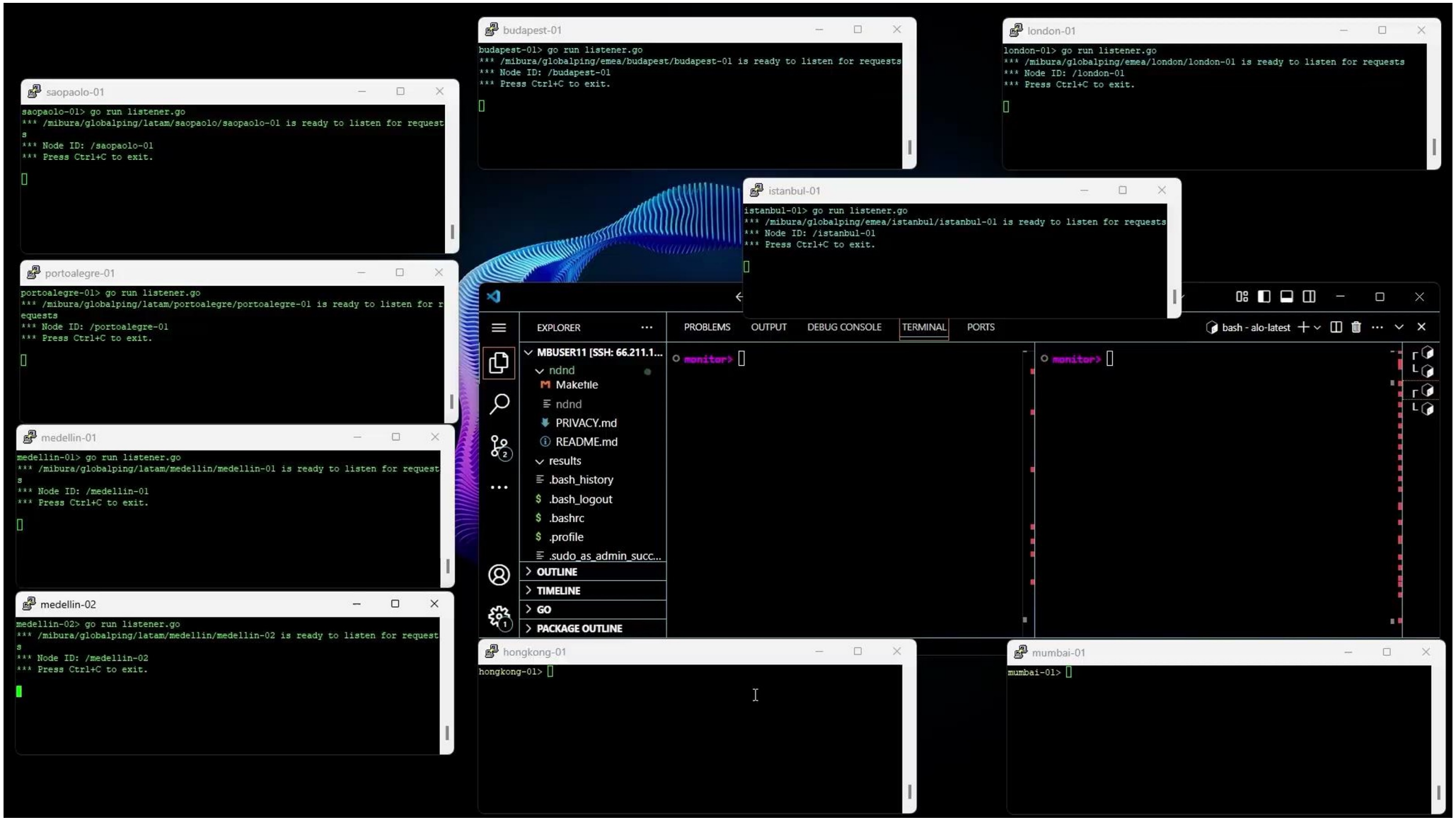
  - Only measuring nodes can publish measurements
- Nodes requiring few hops to reach can be slow in some edge cases
- Deployment to our infrastructure

Demo


budapest-01
*** Node ID: /budapest-01
*** Press Ctrl+C to exit.
*** Received request for this node: /mibura/globalping/emea/budapest/budapest-01
*** Target IP: 8.8.8.8
*** Timestamp: 2025-04-17_21.15.52
*** measure.py executed successfully
*** Responder node is ready to send requests
*** Request published successfully
london-01
*** Node ID: /london-01
*** Press Ctrl+C to exit.
*** Received request for this node: /mibura/globalping/emea/london/london-01
*** Target IP: 8.8.8.8
*** Timestamp: 2025-04-17_21.15.52
*** measure.py executed successfully
*** Responder node is ready to send requests
*** Request published successfully
saopaolo-01
saopaolo-01> go run listener.go
*** /mibura/globalping/latam/saopaolo/saopaolo-01 is ready to listen for requests
*** Node ID: /saopaolo-01
*** Press Ctrl+C to exit.
*** Received request but not for this Region.
istanbul-01
*** Press Ctrl+C to exit.
*** Received request for this node: /mibura/globalping/emea/istanbul/istanbul-01
*** Target IP: 8.8.8.8
*** Timestamp: 2025-04-17_21.15.52
*** measure.py executed successfully
*** Responder node is ready to send requests
*** Request published successfully
portoalegre-01
portoalegre-01> go run listener.go
*** /mibura/globalping/latam/portoalegre/portoalegre-01 is ready to listen for requests
*** Node ID: /portoalegre-01
*** Press Ctrl+C to exit.
*** Received request but not for this Region.
EXPLORER
PROBLEMS
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
go - alo-latest
MBUSER11 [SSH: 66.211.1...
ndnd
Makefile
ndnd
PRIVACY.md
README.md
results
8.8.8.8_2025-04-17_...
.bash_history
.bash_logout
.bashrc
.profile
OUTLINE
TIMELINE
GO
PACKAGE OUTLINE
[/mibura/node/measurement][1744922408]: network error: fetch seg failed with result: Timeout" tag=sync.New6vsAL0.func1
*** Discovered new publisher in: /mibura/node/measurement
time=2025-04-17T20:41:11.979Z level=WARN msg="sync error
monitor> go run request.go
*** Head Monitoring node is ready to send requests
*** Type a request and press enter to send.
*** Press Ctrl+C to exit.
Enter Testing Region: emea
Enter Testing City:
Enter Source IDs (comma-separated):
Enter Target IP address: 8.8.8.8
*** Request published successfully for target: 8.8.8.8
Enter Testing Region:
Enter Source IDs (comma-separated):
Enter Target IP address: 1.1.1.1
*** Request published successfully for target: 1.1.1.1
Enter Testing Region: ^Csignal: interrupt
monitor> go run request.go
monitor> go run collect.go
*** Head Monitoring node is ready to listen for measurement results
*** Discovered new publisher in: /mibura/node/measurement
*** Discovered new publisher in: /mibura/node/measurement
*** Successfully saved measurements.
*** Successfully saved measurements.
*** Discovered new publisher in: /mibura/node/measurement
*** Successfully saved measurements.
medellin-01
medellin-01> go run listener.go
*** /mibura/globalping/latam/medellin/medellin-01 is ready to listen for requests
*** Node ID: /medellin-01
*** Press Ctrl+C to exit.
*** Received request but not for this Region.
medellin-02
medellin-02> go run listener.go
*** /mibura/globalping/latam/medellin/medellin-02 is ready to listen for requests
*** Node ID: /medellin-02
*** Press Ctrl+C to exit.
*** Received request but not for this Region.
hongkong-01
hongkong-01> go run listener.go
*** /mibura/globalping/apac/hongkong/hongkong-01 is ready to listen for requests
*** Node ID: /hongkong-01
*** Press Ctrl+C to exit.
*** Received request but not for this Region.
mumbai-01
mumbai-01> go run listener.go
*** /mibura/globalping/apac/mumbai/mumbai-01 is ready to listen for requests
*** Node ID: /mumbai-01
*** Press Ctrl+C to exit.
*** Received request but not for this Region.


budapest-01
budapest-01> go run listener.go
*** /mibura/globalping/emea/budapest/budapest-01 is ready to listen for requests
*** Node ID: /budapest-01
*** Press Ctrl+C to exit.
london-01
london-01> go run listener.go
*** /mibura/globalping/emea/london/london-01 is ready to listen for requests
*** Node ID: /london-01
*** Press Ctrl+C to exit.
saopaolo-01
saopaolo-01> go run listener.go
*** /mibura/globalping/latam/saopaolo/saopaolo-01 is ready to listen for request
s
*** Node ID: /saopaolo-01
*** Press Ctrl+C to exit.
istanbul-01
istanbul-01> go run listener.go
*** /mibura/globalping/emea/istanbul/istanbul-01 is ready to listen for requests
*** Node ID: /istanbul-01
*** Press Ctrl+C to exit.
portoalegre-01
portoalegre-01> go run listener.go
*** /mibura/globalping/latam/portoalegre/portoalegre-01 is ready to listen for r
equests
*** Node ID: /portoalegre-01
*** Press Ctrl+C to exit.
EXPLORER
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OUTPUT
DEBUG CONSOLE
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PORTS
bash - alo-latest
MBUSER11 [SSH: 66.211.1...
ndnd
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.profile
.sudo_as_admin_succ...
OUTLINE
TIMELINE
GO
PACKAGE OUTLINE
monitor>
monitor>
medellin-01
medellin-01> go run listener.go
*** /mibura/globalping/latam/medellin/medellin-01 is ready to listen for request
s
*** Node ID: /medellin-01
*** Press Ctrl+C to exit.
medellin-02
medellin-02> go run listener.go
*** /mibura/globalping/latam/medellin/medellin-02 is ready to listen for request
s
*** Node ID: /medellin-02
*** Press Ctrl+C to exit.
hongkong-01
hongkong-01>
mumbai-01
mumbai-01>

Q&A