Disaster Connectivity Map Webinar

Update to Global ETC partners

Wednesday, 2 February 2022

etc EMERGENCY TELECOMMUNICATIONS CLUSTER

ITU GSMA

Proof of concept:

DCM concept launched at ITU Global Forum on Emergency Telecommunications (GET-19, Mauritius) in 2019 to develop a map service that can provide information on the type, level and quality of connectivity that is available following a disaster.

Problem:

How to show on a map something that is not there; how to detect complete or partial decreases in the level and quality of connectivity in disaster situations compared to normal times.

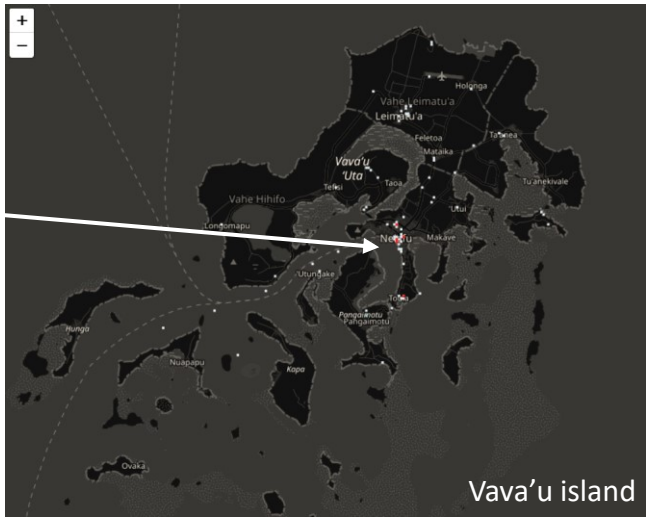
Solution:

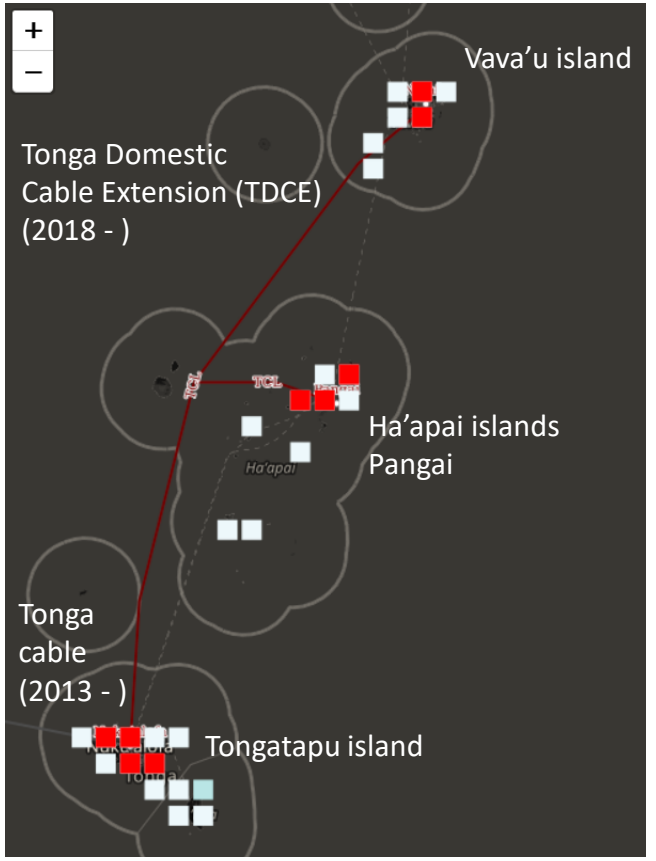
- Collect real-time connectivity measurements from probes, sensors, geolocated IP addresses, and other data sources.
- Process and display this data as historic baseline and near real-time connectivity performance map.
- Highlight differentials in connectivity performance between baseline and real-time map.

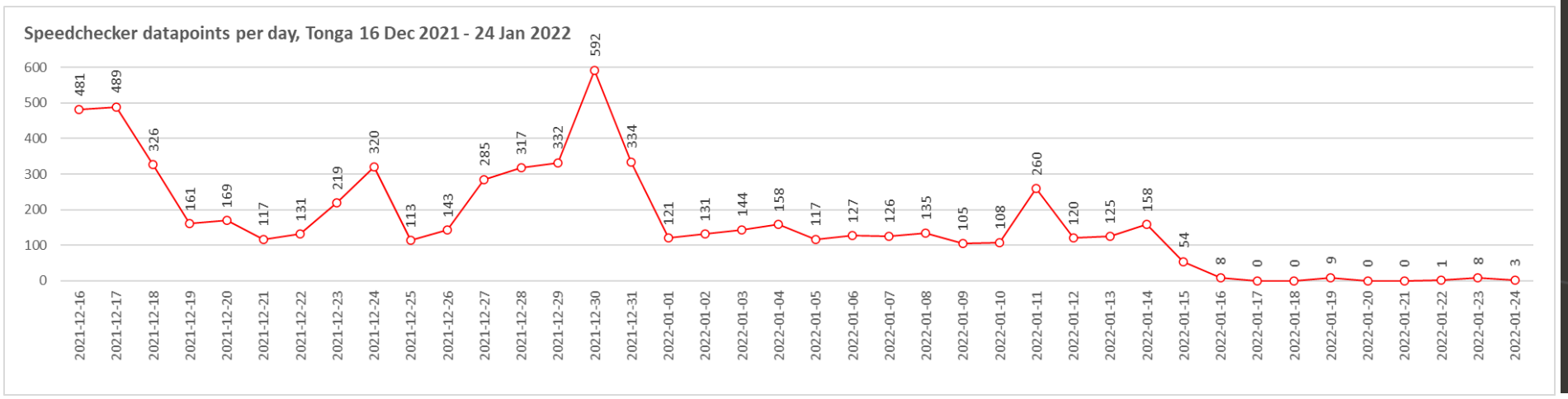
South Ridge tower, Telecom Fiji. Radio Communication Experience, Telecom Fiji Ltd. Mesake Tuinabua, Manager Network Operations, Telecom Fiji. September 2016

Contents


Time
Switch between DCM activations: filter by country and time
Tonga, 16 Dec 2021 - 20 Jan 2022
2022-01-13T23:00:00.000Z
1fps
User defined time variables:
To override these bookmarked settings, select a new start time and end time using the controls below then click the Apply new start and end time button.
Select start date and time (local time) 2021-12-16 00:00
Select end date and time (local time) 2022-01-18 00:00
Apply new time interval
1 Day
Apply new start and end time
Reset
Selected SpeedChecker connectivity performance data since January 2013. Each measurement record contains upload speed (Mbps), download speed (Mbps), latency (Ms), latitude, longitude and a datetime field.
Press play (pause) to run as an animation for each day. Press forward or backward to view all results forward or backward by one hour at a time. Adjust the second slider to increase the speed of the animation from 1 frame per second (fps) to 10
White squares: 6600 baseline
Speedchecker datapoints in last 30 days
Red squares: 158 Speedchecker datapoints received that day
Tongatapu island
Leaflet | Data © OpenStreetMap contributors, SpeedChecker, SpeedChecker


Vava'u island


Vava'u island
Tonga Domestic Cable Extension (TDCE) (2018 -)
Ha'apai islands
Pangai
Tonga cable (2013 -)
Tongatapu island


Speedchecker datapoints per day, Tonga 16 Dec 2021 - 24 Jan 2022
600
500
400
300
200
100
0
481 489 326 161 169 117 131 219 320 113 143 285 317 332 592 334 121 131 144 158 117 127 126 135 105 108 260 120 125 158 54 8 0 0 9 0 0 1 8 3
2021-12-16 2021-12-17 2021-12-18 2021-12-19 2021-12-20 2021-12-21 2021-12-22 2021-12-23 2021-12-24 2021-12-25 2021-12-26 2021-12-27 2021-12-28 2021-12-29 2021-12-30 2021-12-31 2022-01-01 2022-01-02 2022-01-03 2022-01-04 2022-01-05 2022-01-06 2022-01-07 2022-01-08 2022-01-09 2022-01-10 2022-01-11 2022-01-12 2022-01-13 2022-01-14 2022-01-15 2022-01-16 2022-01-17 2022-01-18 2022-01-19 2022-01-20 2022-01-21 2022-01-22 2022-01-23 2022-01-24

Prototype

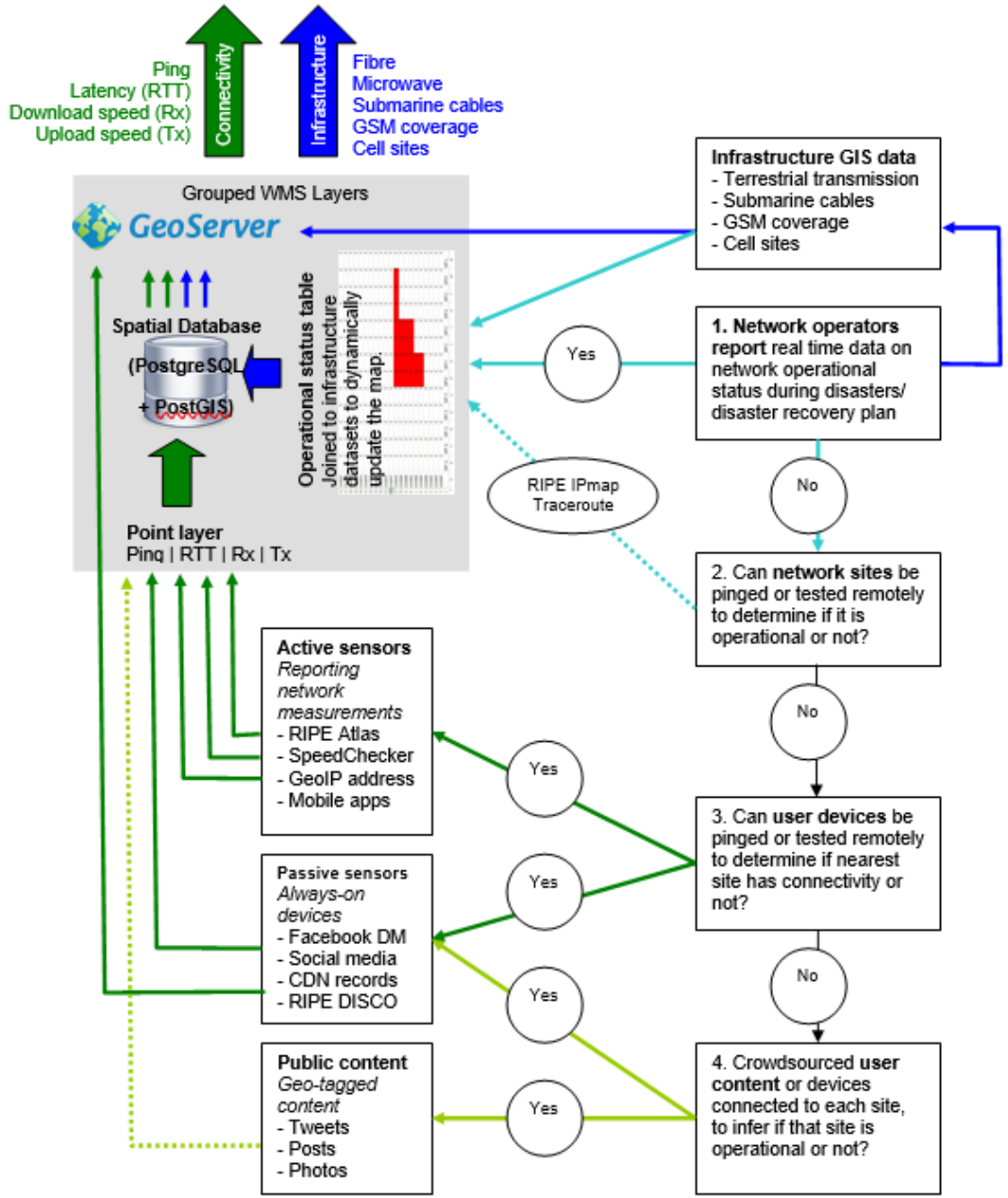
- Geoserver + WPS (Web Processing Service) extension
- PostgreSQL + PostGIS extension
- Web Map Service (WMS) output

DCM Infrastructure: Network infrastructure & coverage map layer

- Fibre & microwave transmission networks
- Submarine cables
- GSM coverage
- Cell sites

DCM Connectivity: Connectivity performance map layer

- Ping, reachability (yes/no)
- Latency, round trip time (Ms)
- Upload speed (Kbps)
- Download speed (Kbps)



Activations (28 countries)

Pilot countries - baseline campaigns

- Fiji 8 May 2020
- Dominica 8 May 2020
- Philippines 8 May 2020

Activations

- Fiji 16 – 21 Dec 2020
- St Vincent & The Grenadines 15 – 23 Apr 2021
- Barbados 15 – 23 Apr 2021
- St Lucia 15 – 23 Apr 2021

Baseline campaigns

- Antigua & Barbuda 16 – 21 June 2021
- Grenada 16 – 21 June 2021
- Kiribati 16 – 21 June 2021
- Micronesia 16 – 21 June 2021
- Marshall Islands 16 – 21 June 2021
- Nauru 16 – 21 June 2021
- St Kitts & Nevis 16 – 21 June 2021
- Tonga 16 – 21 June 2021
- Dominican Rep 1 – 2 July 2021

Baseline campaigns

- Jamaica 1 – 2 July 2021
- Haiti 1 – 2 July 2021
- Dominican Rep 1 – 2 July 2021
- Jamaica 1 – 2 July 2021
- Bahamas 5 – 6 July 2021
- Samoa 5 – 6 July 2021
- Solomon Islands 5 – 6 July 2021
- Trinidad & Tobago 5 – 6 July 2021
- Guadeloupe 5 – 6 July 2021

Activations

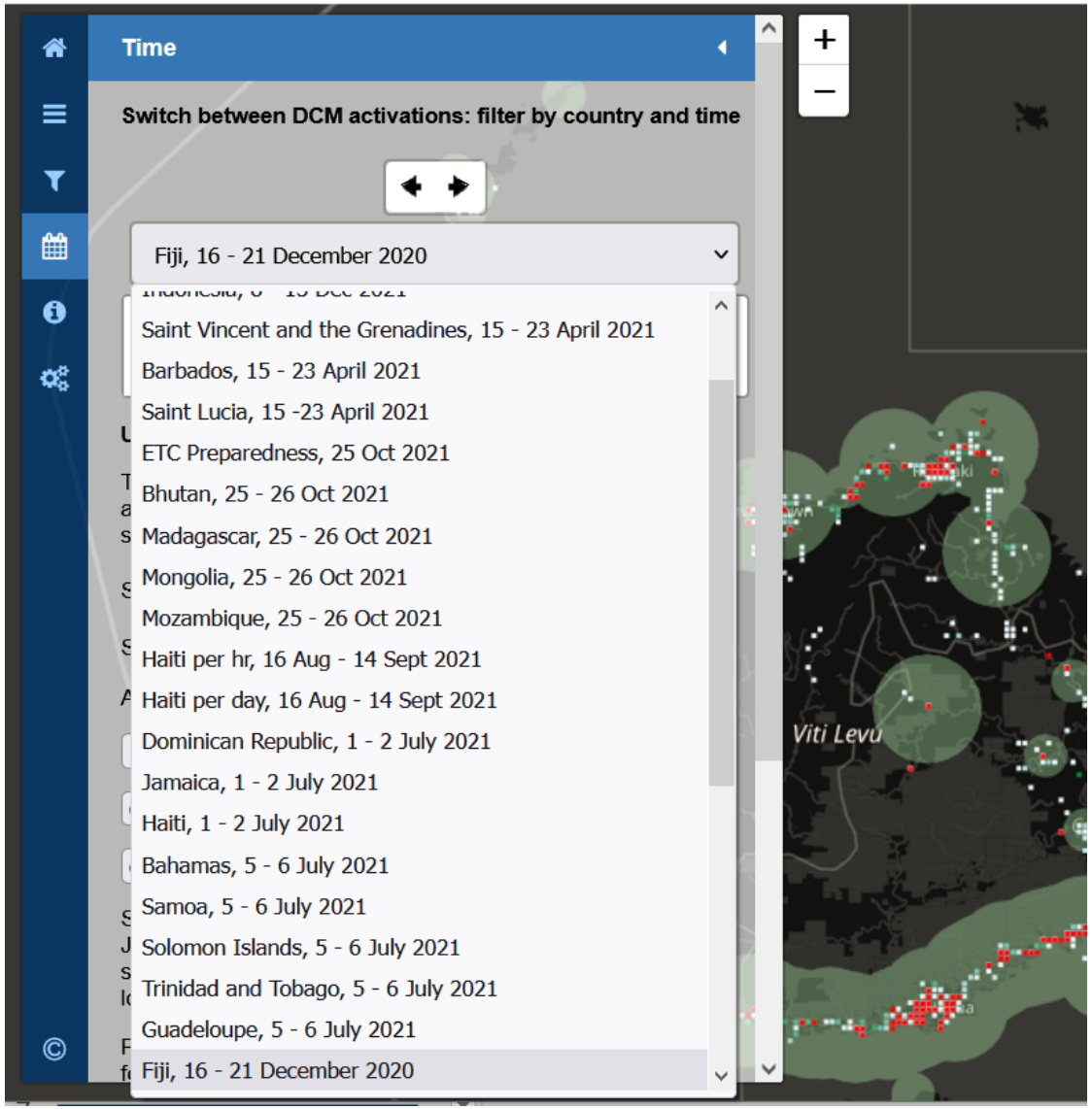
- Haiti 16 Aug – 14 Sept 2021

Baseline campaigns

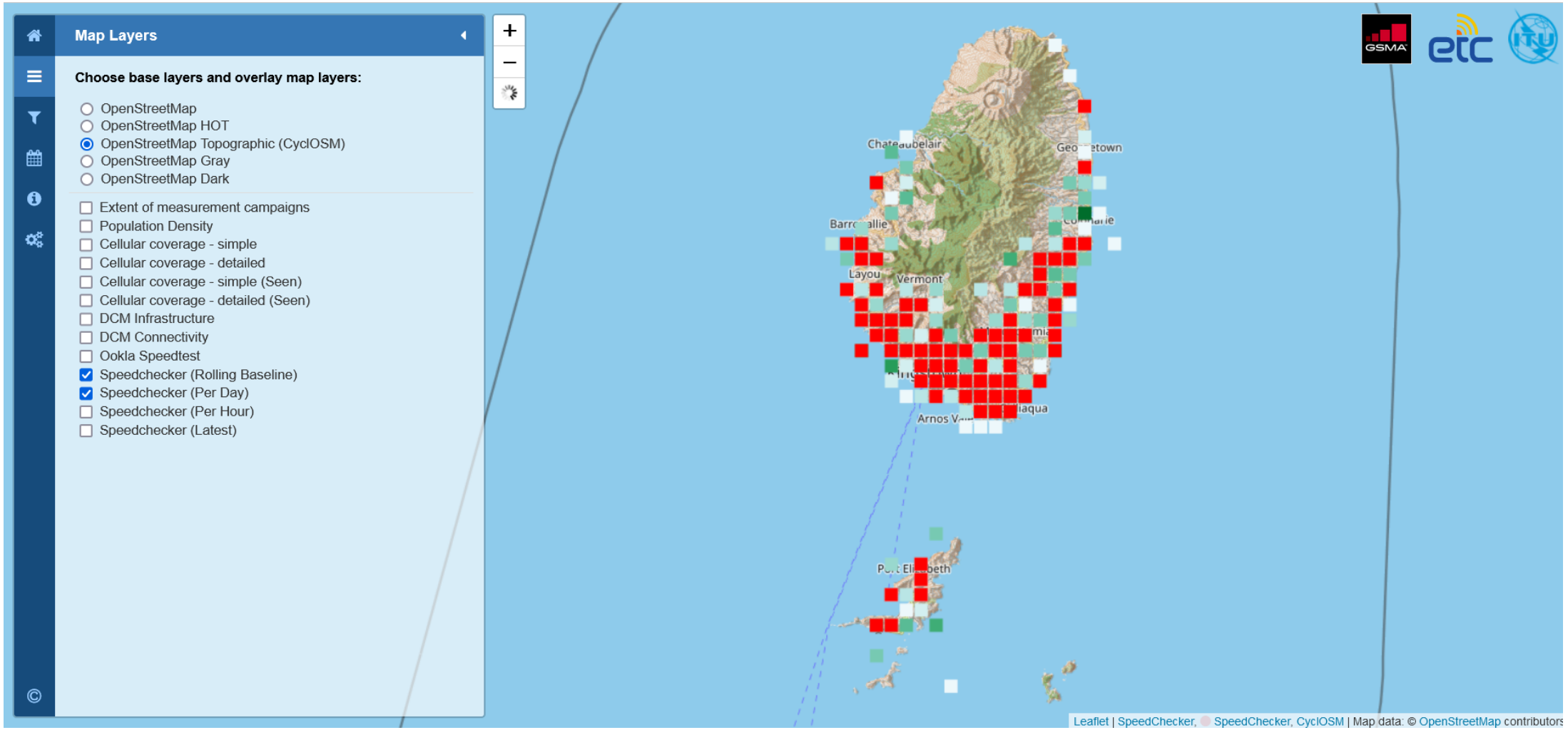
- Bhutan 25 – 26 Oct 2021
- Madagascar 25 – 26 Oct 2021
- Mongolia 25 – 26 Oct 2021
- Mozambique 25 – 26 Oct 2021
- Brunei 2 – 14 Dec 2021

Activations

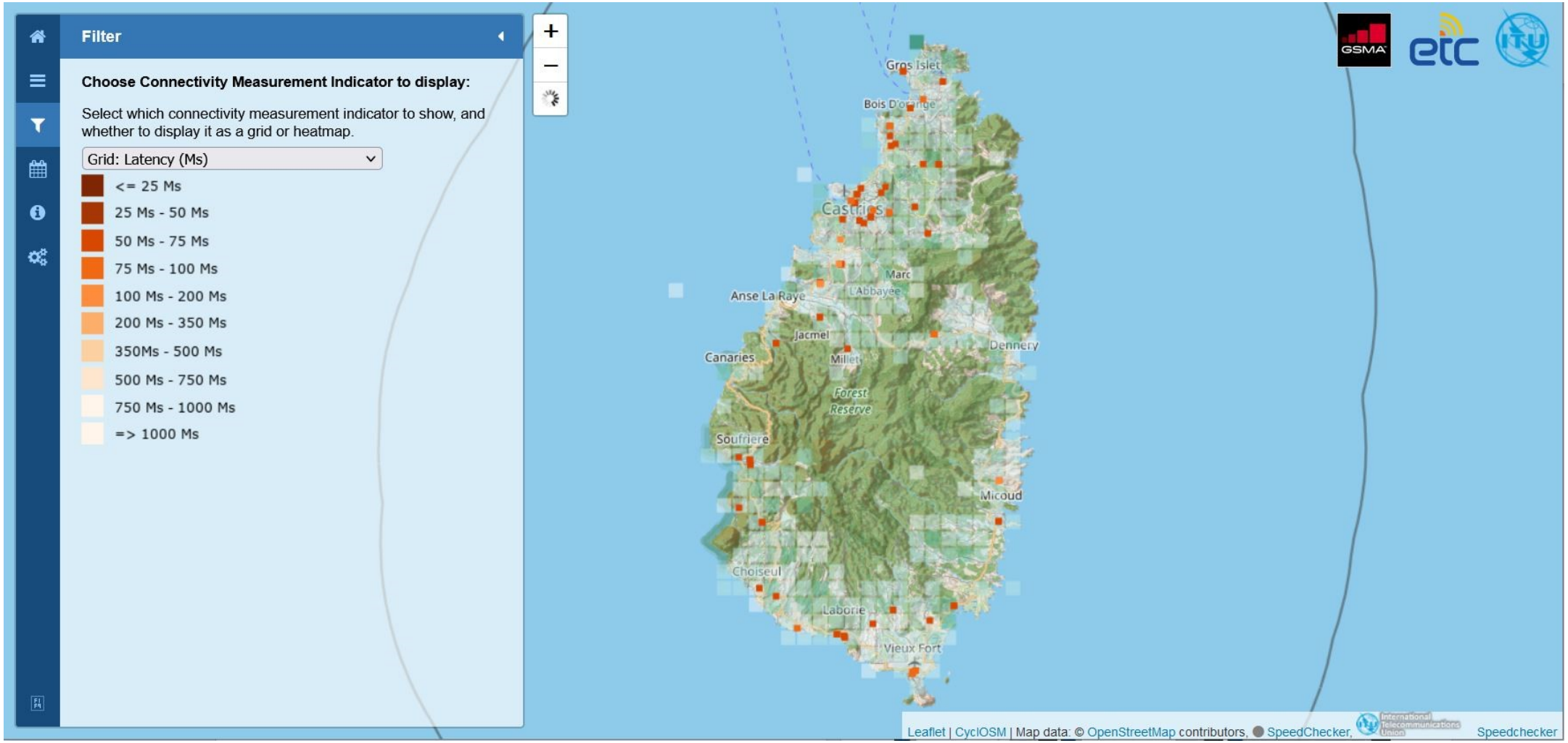
- Indonesia 8 – 13 Dec 2021
- Philippines 21 Dec 2021 ...
- Tonga 15 Jan 2022...



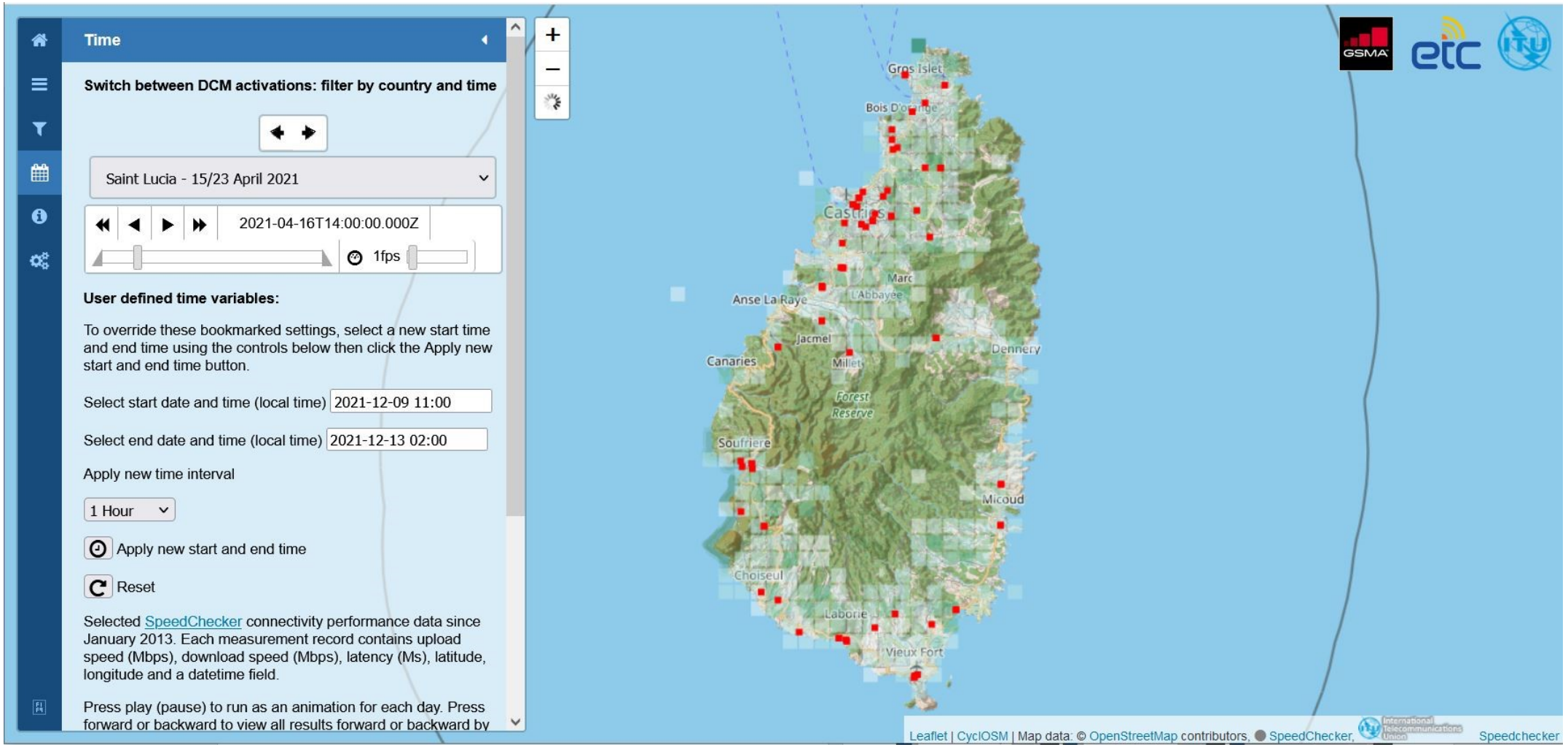
DCM user guide: map layers



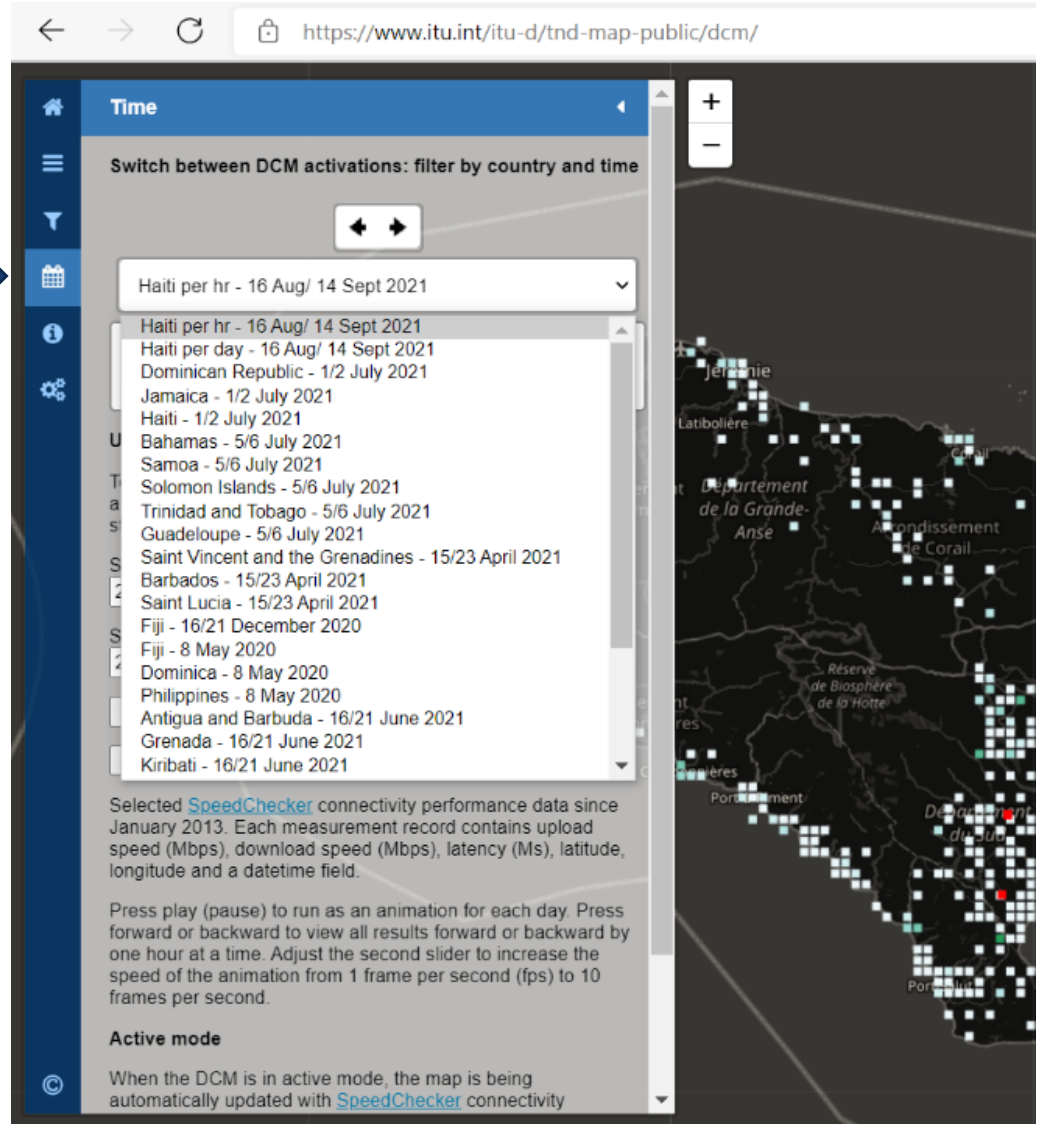
DCM user guide: select measurement

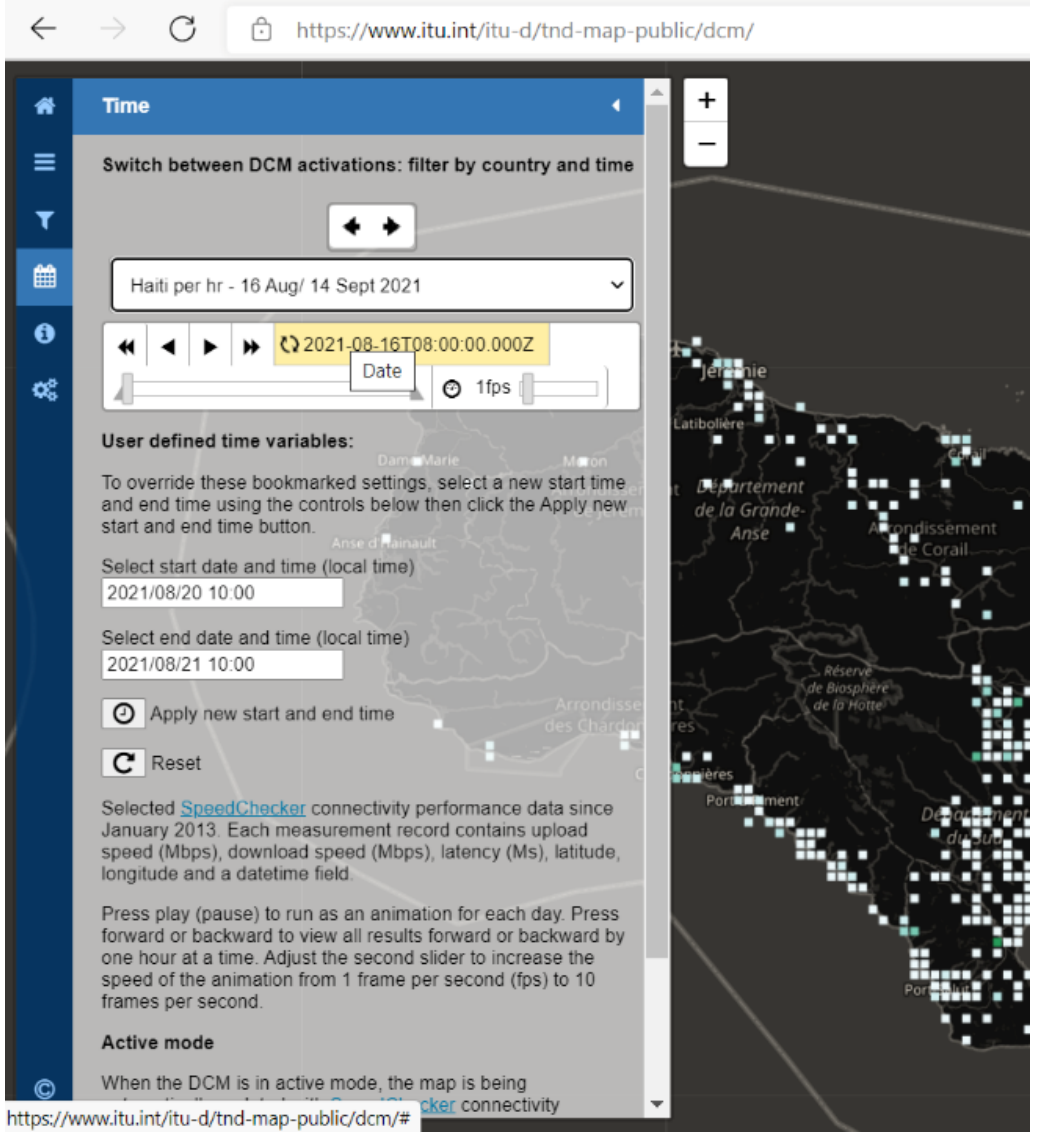


DCM user guide: time



DCM user guide: time





DCM user guide: desktop GIS

Accessing DCM via desktop GIS software

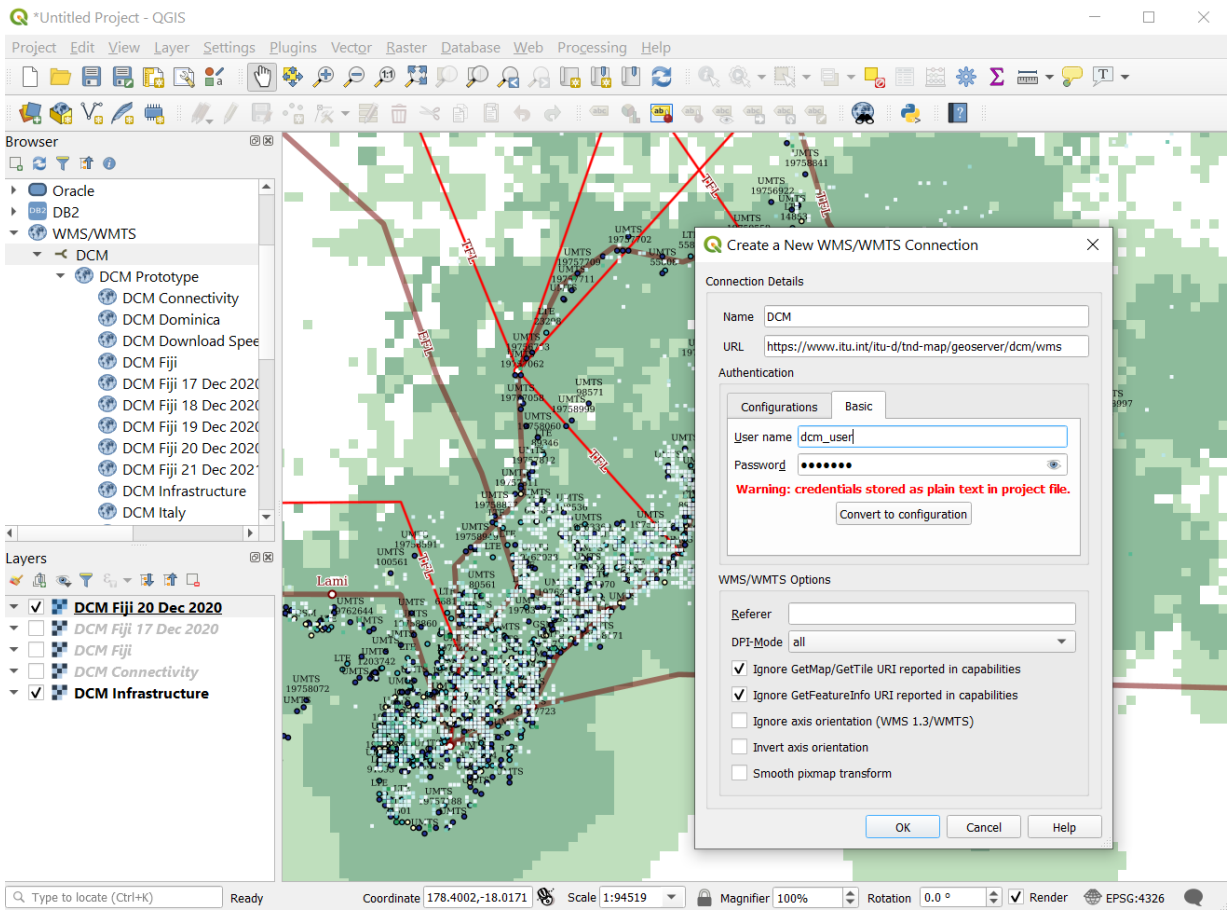
DCM WMS layers can be accessed in your desktop GIS software. To create a new connection to a WMS server, enter the URL below and connect. This will provide access to all WMS layers that are published through the DCM Geoserver platform, which can then be added to your desktop GIS project.

https://www.itu.int/itu-d/tnd-map-data/geoserver/dcm/wms/

Follow these links for guidance on adding WMS layers:

- ESRI ArcGIS: https://desktop.arcgis.com/en/arcmap/10.3/map/web-maps-and-services/adding-wms-services.htm

- QGIS: https://docs.qgis.org/3.10/en/docs/training_manual/online_resources/wms.html



DCM user guide: Javascript web maps

Adding DCM to your web map application

DCM WMS layers can be added into your javascript web map applications, for example:

- **ESRI Javascript API**
  https://developers.arcgis.com/javascript/latest/sample-code/layers-wms/index.html

- **Leaflet**
  https://leafletjs.com/examples/wms/wms.html

- **Mapbox**
  https://docs.mapbox.com/mapbox-gl-js/example/wms/

- **OpenLayers**
  https://openlayers.org/en/latest/examples/wms-tiled-wrap-180.html

```
var layer = new WMSLayer({
  url: "https://ows.terrestris.de/osm/service",
  sublayers: [
    {
      name: "OSM-WMS"
    }
  ]
});
```

```
var wmsLayer = L.tileLayer.wms('http://ows.mundialis.de/services/service?', {
    layers: 'TOPO-OSM-WMS'
}).addTo(map);
```

```
map.on('load', function() {
    map.addSource('wms-test-source', {
        'type': 'raster',
        'tiles': [
            'https://img.nj.gov/imagerywms/Natural2015?bbox={bbox-epsg-3857}&format=image/png&
              service=WMS&version=1.1.1&request=GetMap&srs=EPSG:3857&transparent=true&width=256&
              height=256&layers=Natural2015'
        ],
        'tileSize': 256
    });
    map.addLayer(
        {
            'id': 'wms-tes
```

```
var layers = [
  new TileLayer({
    source: new OSM()
  }),
  new TileLayer({
    source: new TileWMS({
      url: 'https://ahocevar.com/geoserver/ne/wms',
      params: {'LAYERS': 'ne:ne_10m_admin_0_countries', 'TI
```

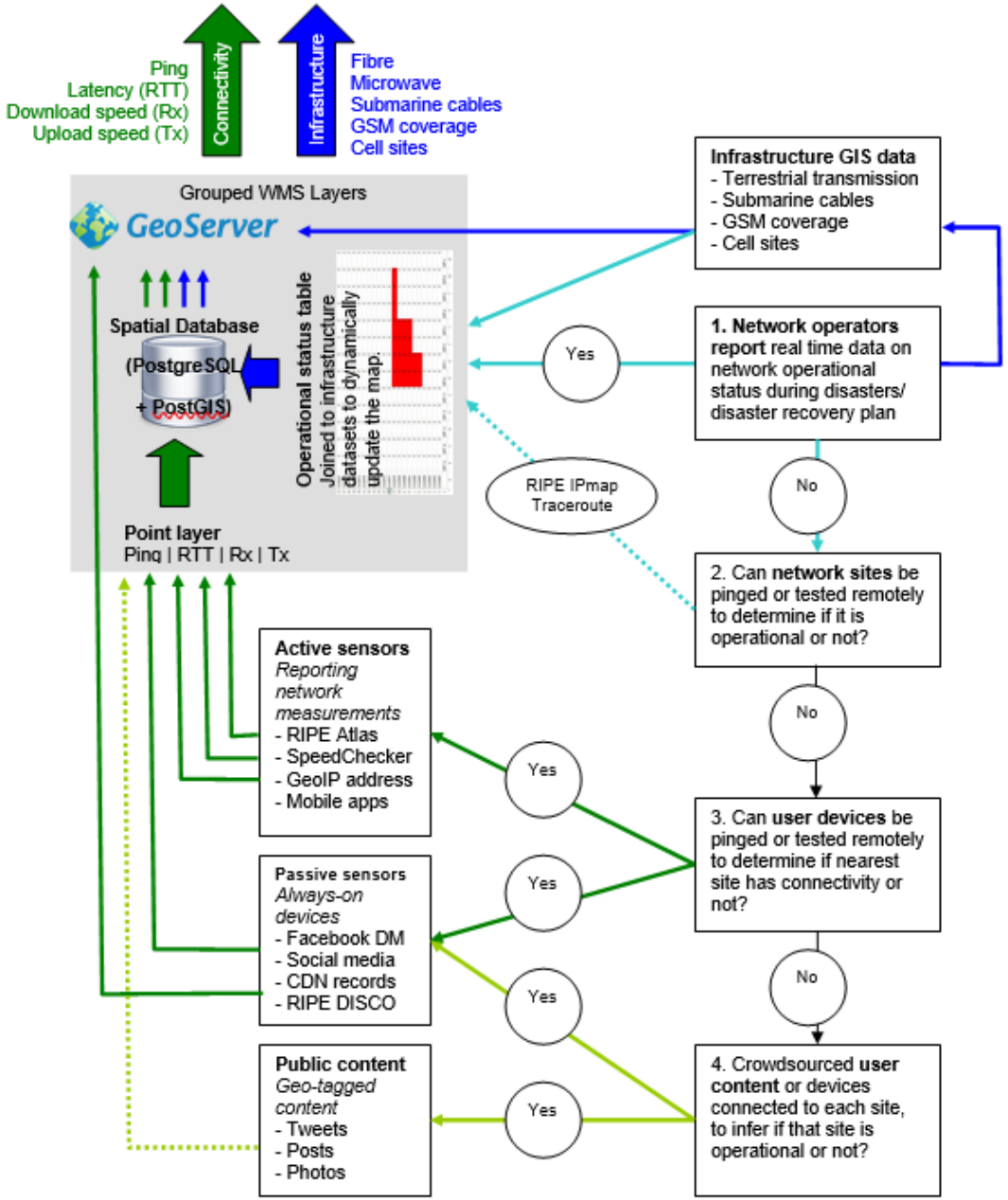
Features: existing data sources

DCM Infrastructure: Network infrastructure & coverage map layer

- ITU Transmission Map
- TeleGeography Submarine Cable Map
- GSM coverage – OpencellID
- Cell sites - OpencellID

DCM Connectivity: Connectivity performance map layer

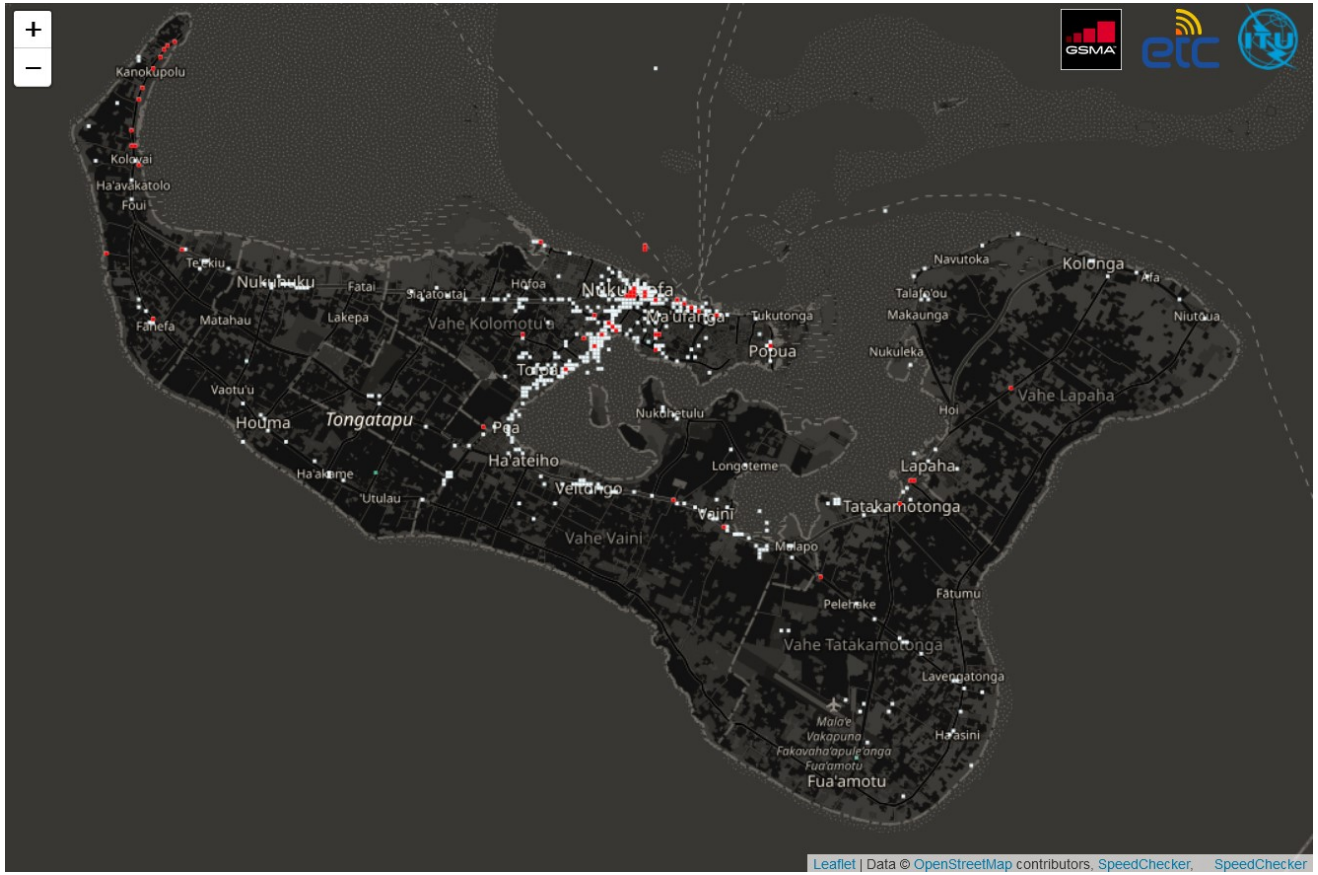
- SpeedChecker, targeted on-demand measurement campaigns
- Ookla for Good, Global Fixed and Mobile Network Performance Maps

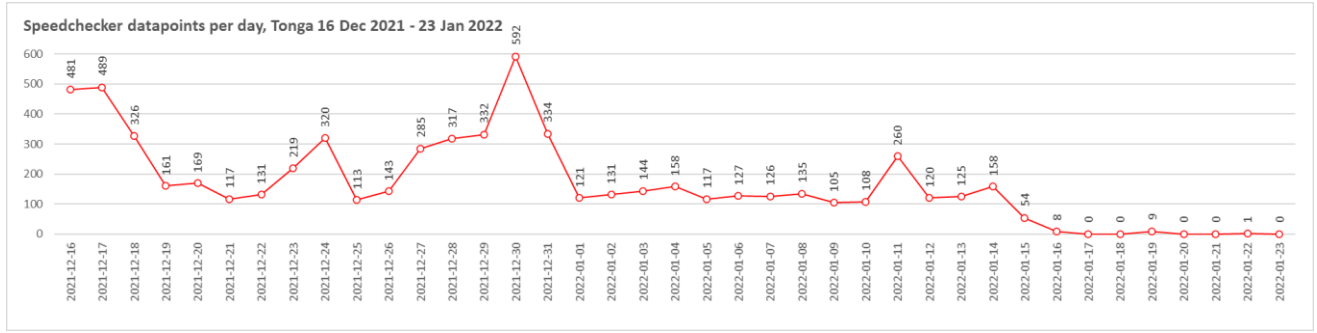


New features: new data sources

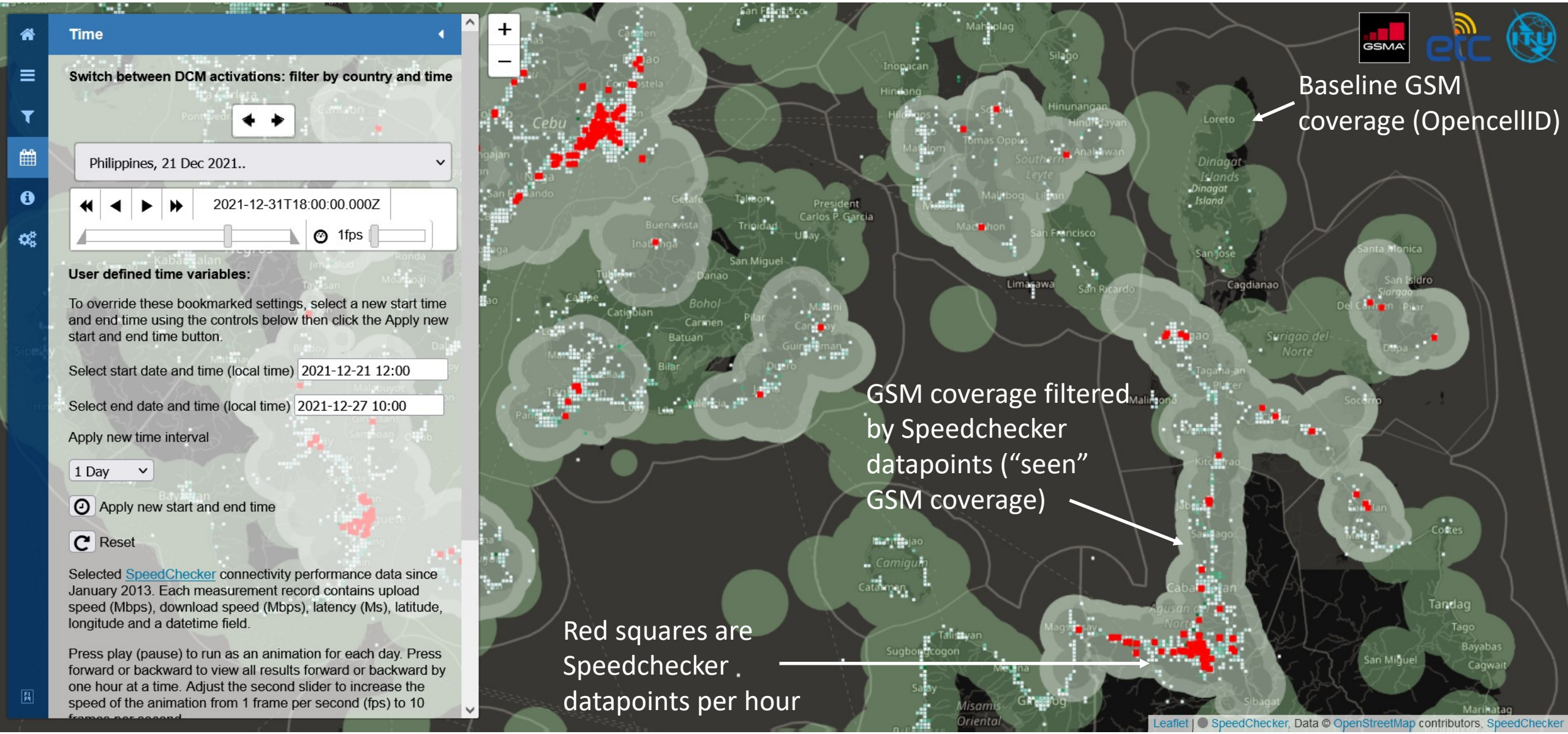
New crowdsourced SpeedChecker data

- In December a new source of crowdsourced data provided by Speedchecker was trialled. The data was collected through third-party apps which collect data passively, as there is no active throughput test.
- This means a binary yes/no can be shown indicating the presence/absence of connectivity, but there is no upload speed, download speed or latency measurements.
- The new data sourced has a 30-day historic record, which can provide a strong baseline to compare the pattern of connectivity before and after a disaster event.
- The new data was updated once a day and sometimes there were delays. The data feed was delayed slightly, so the timestamp of the measurement was correct but not all results were transferred immediately.
- For the time being this new data is added to the map manually on a daily basis, but we are currently working on the automation of this process.

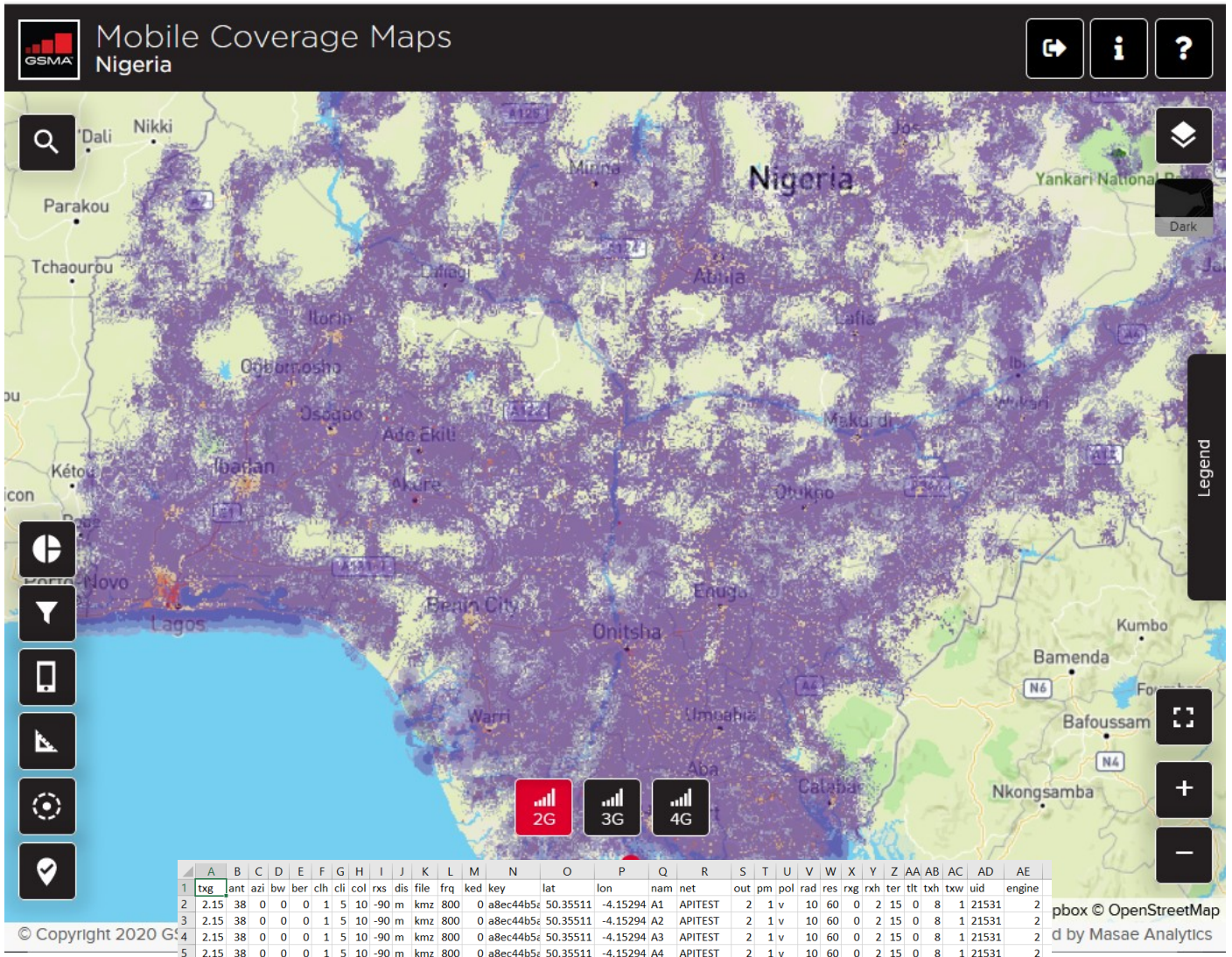




New features: cell tower filtering



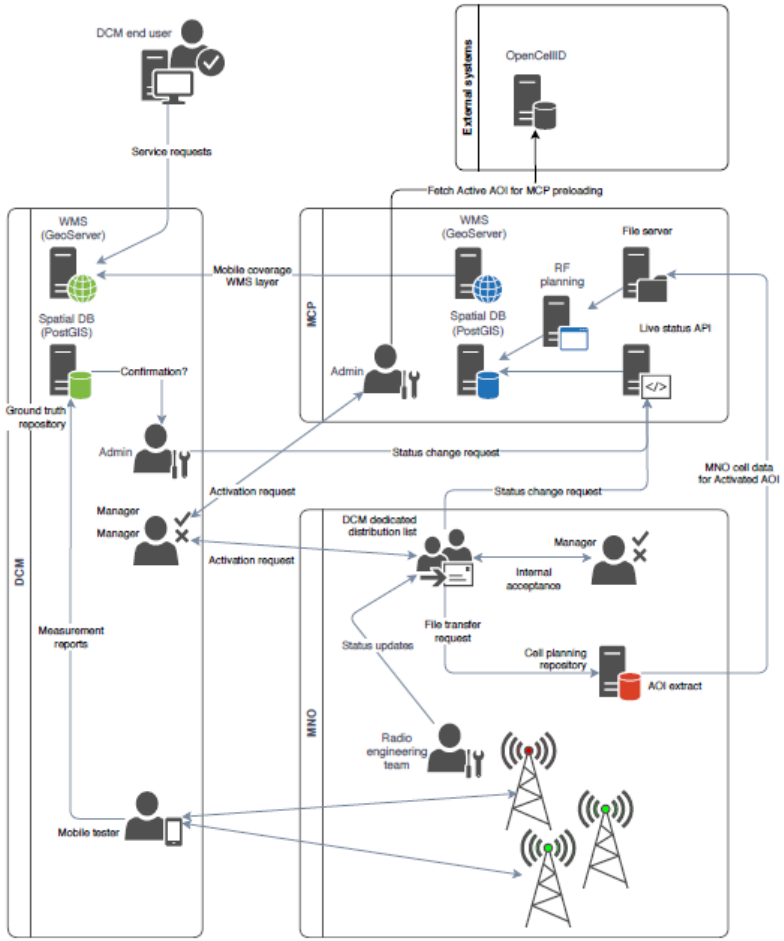
New features: high resolution mobile coverage



	txg	ant	azi	bw	ber	cln	cli	col	rxs	dis	file	frq	ked	key	lat	lon	nam	net	out	pm	pol	rad	res	rxg	rxh	ter	tlt	txh	txw	uid	engine
2	2.15	38	0	0	0	1	5	10	-90	m	kmz	800	0	a8ec44b5a	50.35511	-4.15294	A1	APITEST	2	1	v	10	60	0	2	15	0	8	1	21531	2
3	2.15	38	0	0	0	1	5	10	-90	m	kmz	800	0	a8ec44b5a	50.35511	-4.15294	A2	APITEST	2	1	v	10	60	0	2	15	0	8	1	21531	2
4	2.15	38	0	0	0	1	5	10	-90	m	kmz	800	0	a8ec44b5a	50.35511	-4.15294	A3	APITEST	2	1	v	10	60	0	2	15	0	8	1	21531	2
5	2.15	38	0	0	0	1	5	10	-90	m	kmz	800	0	a8ec44b5a	50.35511	-4.15294	A4	APITEST	2	1	v	10	60	0	2	15	0	8	1	21531	2
6	2.15	38	0	0	0	1	5	10	-90	m	kmz	800	0	a8ec44b5a	50.35511	-4.15294	A5	APITEST	2	1	v	10	60	0	2	15	0	8	1	21531	2
7	2.15	38	0	0	0	1	5	10	-90	m	kmz	800	0	a8ec44b5a	50.35511	-4.15294	A6	APITEST	2	1	v	10	60	0	2	15	0	8	1	21531	2
8	2.15	38	0	0	0	1	5	10	-90	m	kmz	800	0	a8ec44b5a	50.35511	-4.15294	A7	APITEST	2	1	v	10	60	0	2	15	0	8	1	21531	2
9	2.15	38	0	0	0	1	5	10	-90	m	kmz	800	0	a8ec44b5a	50.35511	-4.15294	A8	APITEST	2	1	v	10	60	0	2	15	0	8	1	21531	2
10	2.15	38	0	0	0	1	5	10	-90	m	kmz	800	0	a8ec44b5a	50.35511	-4.15294	A9	APITEST	2	1	v	10	60	0	2	15	0	8	1	21531	2
11	2.15	38	0	0	0	1	5	10	-90	m	kmz	800	0	a8ec44b5a	50.35511	-4.15294	A10	APITEST	2	1	v	10	60	0	2	15	0	8	1	21531	2
12	2.15	38	0	0	0	1	5	10	-90	m	kmz	800	0	a8ec44b5a	50.35511	-4.15294	A11	APITEST	2	1	v	10	60	0	2	15	0	8	1	21531	2
13	2.15	38	0	0	0	1	5	10	-90	m	kmz	800	0	a8ec44b5a	50.35511	-4.15294	A12	APITEST	2	1	v	10	60	0	2	15	0	8	1	21531	2

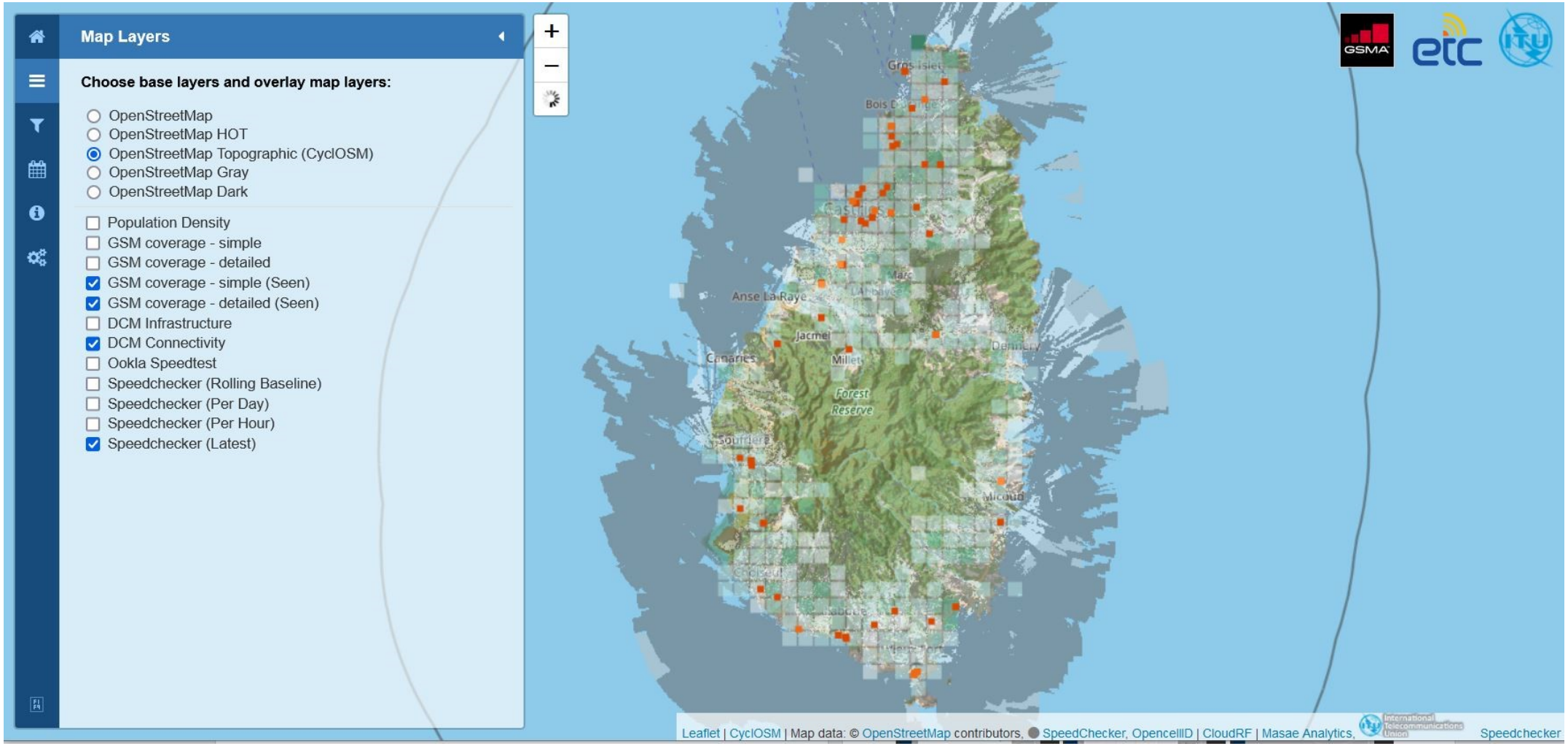
masae ANALYTICS

2. ARCHITECTURE OVERVIEW

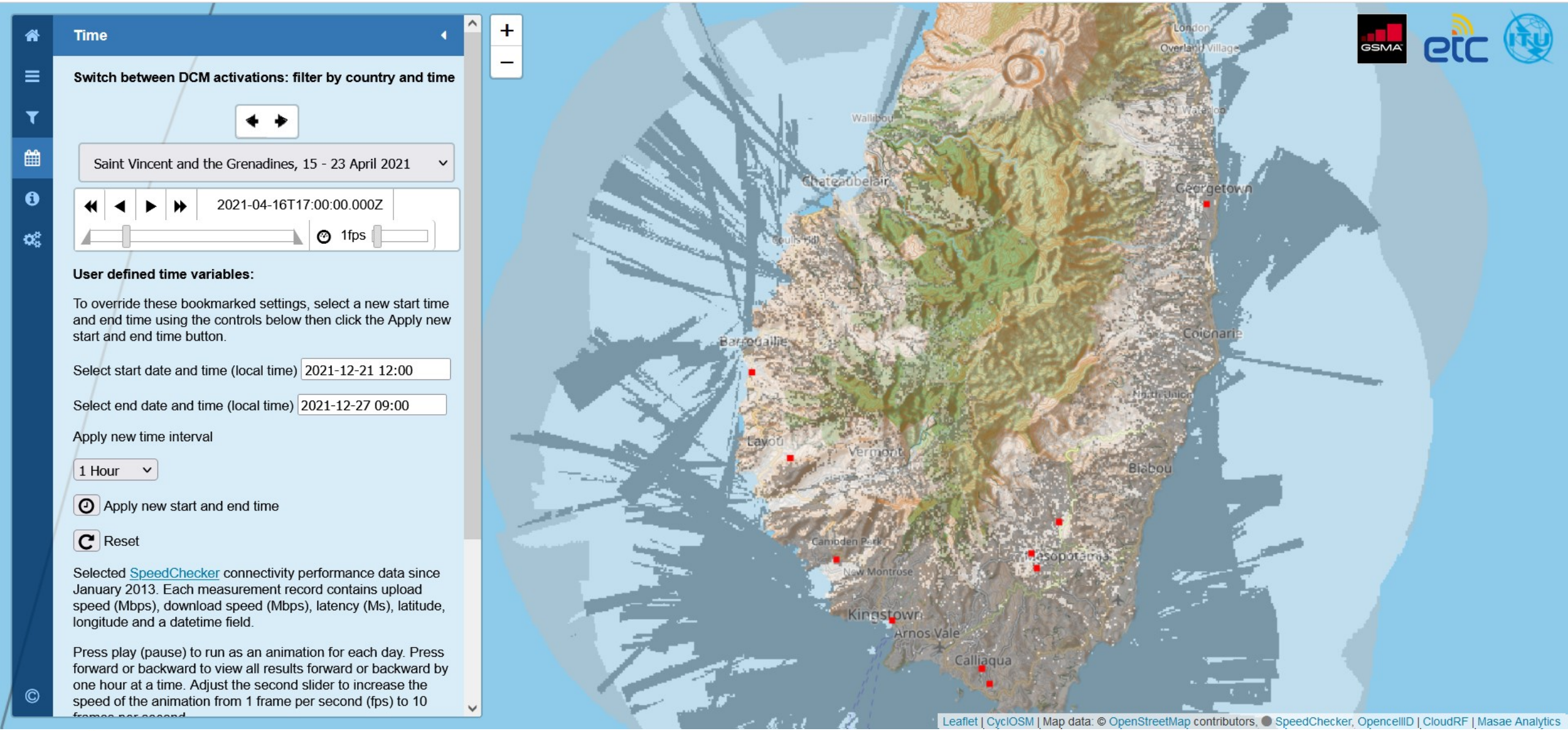


Note: "status change requests" are based on a REST API described in §6.2

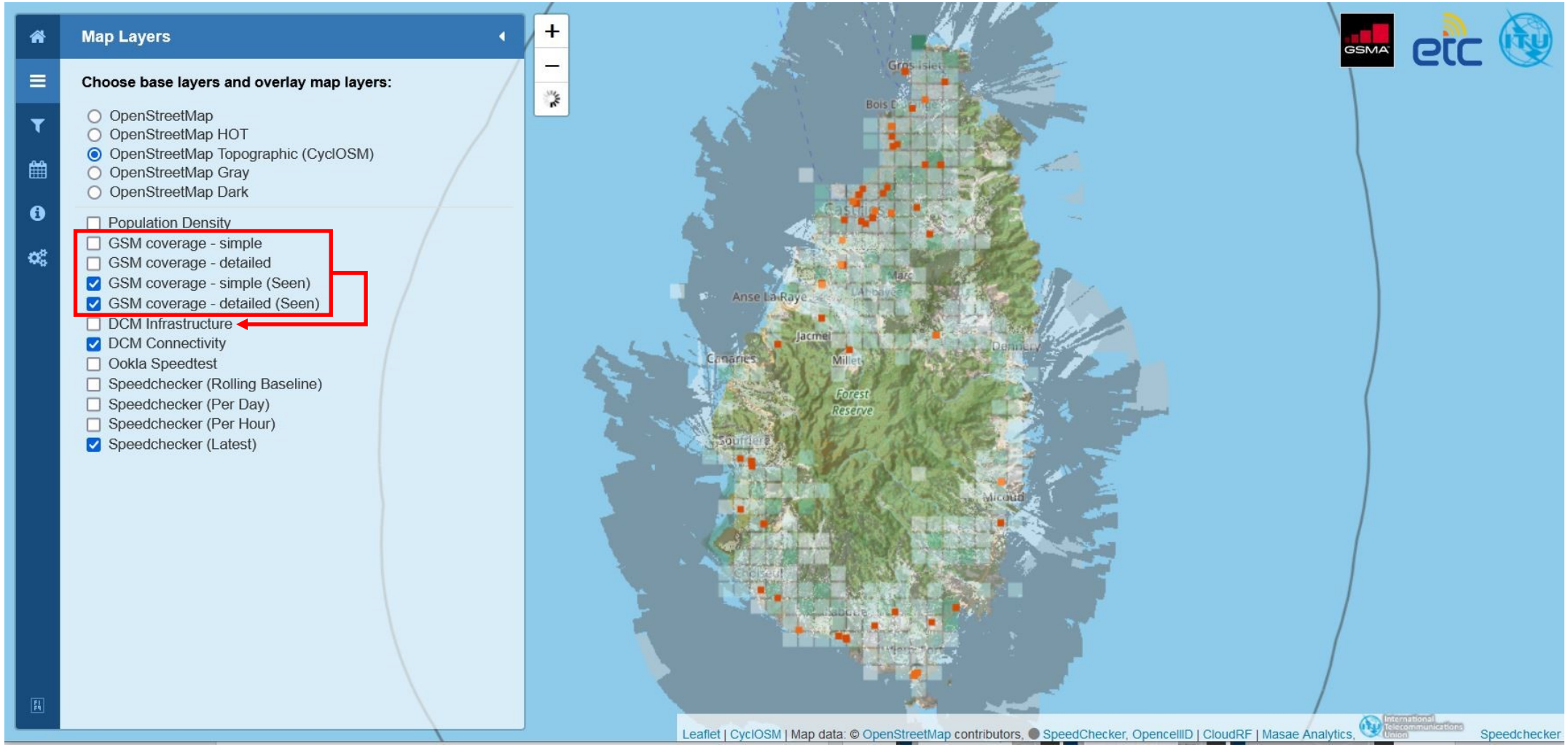
DCM user guide: mobile coverage



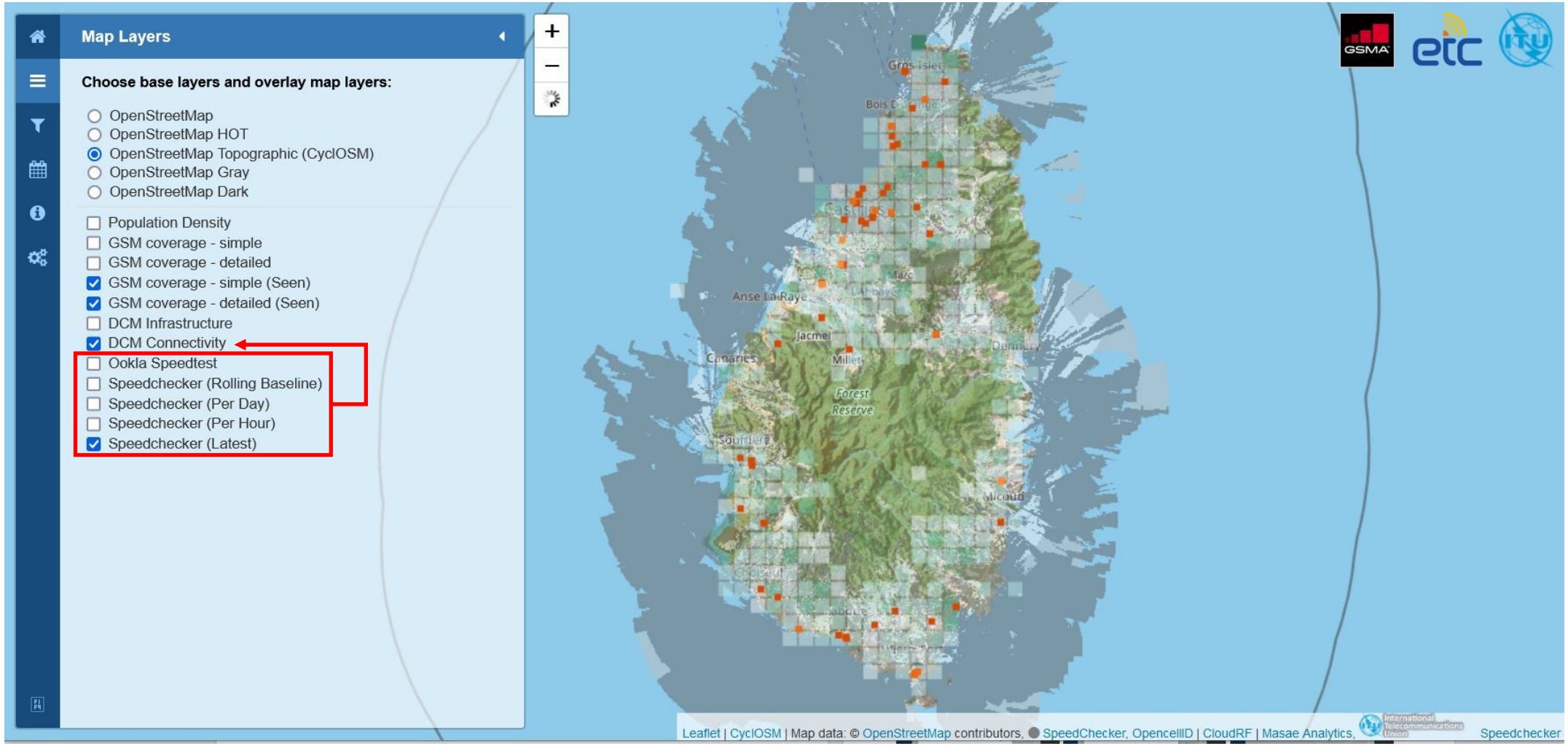
New features: high resolution mobile coverage



DCM work plan - 2022



DCM work plan - 2022



Running costs & funding for DCM

Fixed and variable costs:

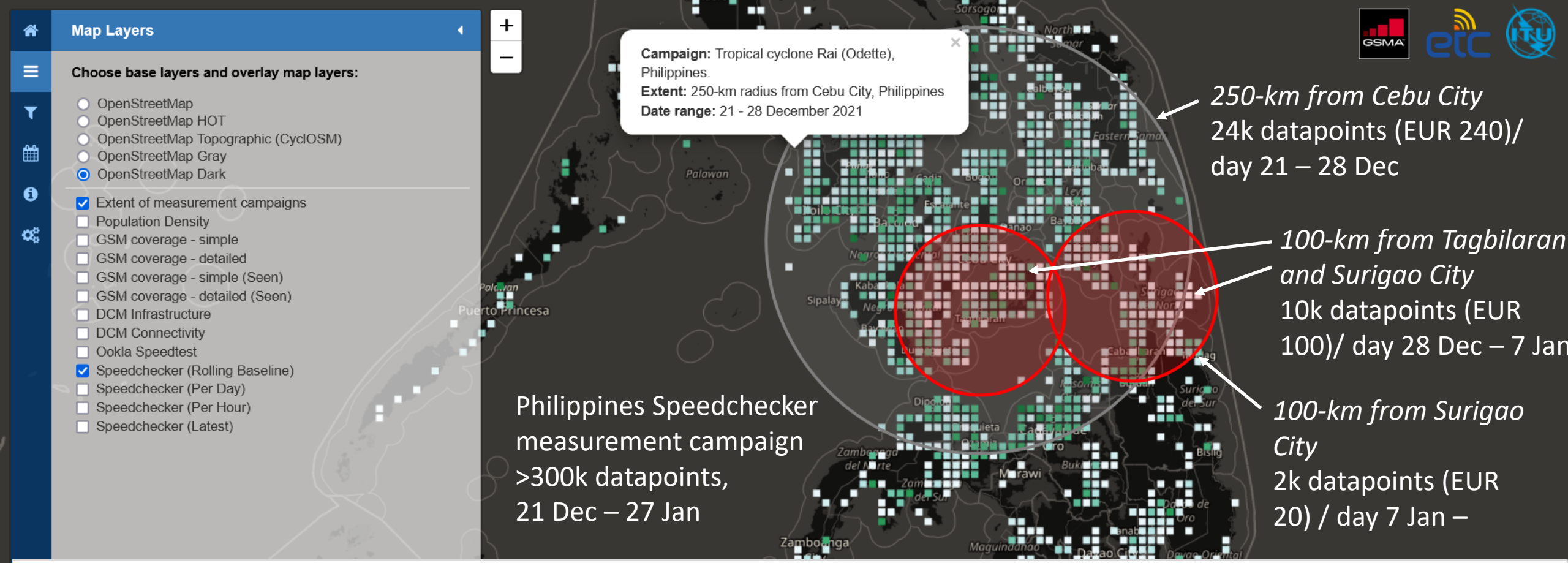
- Fixed: server, personnel
- Variable: running baseline assessments, activation of the DCM in response to disasters

An example:

Philippines: cost appx. USD 3,500 to create DCM maps for affected areas.

Tonga: appx cost: EUR 62 to create DCM maps for affected areas.

Note: we are also discussing with data providers if data can be provided at no cost or at a discount.


Map Layers
Choose base layers and overlay map layers:
OpenStreetMap
OpenStreetMap HOT
OpenStreetMap Topographic (CyclOSM)
OpenStreetMap Gray
OpenStreetMap Dark
Extent of measurement campaigns
Population Density
GSM coverage - simple
GSM coverage - detailed
GSM coverage - simple (Seen)
GSM coverage - detailed (Seen)
DCM Infrastructure
DCM Connectivity
Ookla Speedtest
Speedchecker (Rolling Baseline)
Speedchecker (Per Day)
Speedchecker (Per Hour)
Speedchecker (Latest)
Campaign: Tropical cyclone Rai (Odette), Philippines.
Extent: 250-km radius from Cebu City, Philippines
Date range: 21 - 28 December 2021
250-km from Cebu City
24k datapoints (EUR 240)/ day 21 – 28 Dec
100-km from Tagbilaran and Surigao City
10k datapoints (EUR 100)/ day 28 Dec – 7 Jan
100-km from Surigao City
2k datapoints (EUR 20) / day 7 Jan –
Philippines Speedchecker measurement campaign
>300k datapoints,
21 Dec – 27 Jan
Palawan
Puerto Princesa
Cebu
Tagbilaran
Surigao City
Marawi
Zamboanga
Davao City

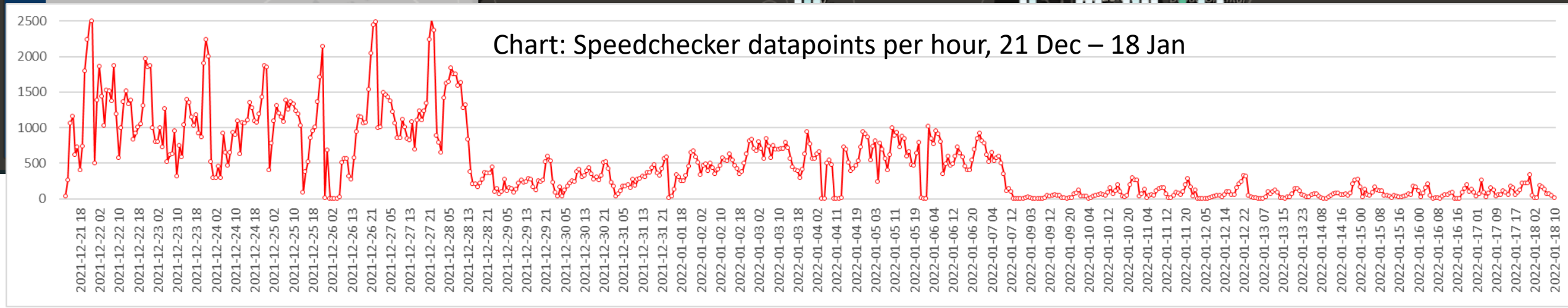


Chart: Speedchecker datapoints per hour, 21 Dec – 18 Jan
2500
2000
1500
1000
500
0
2021-12-21 18
2021-12-22 02
2021-12-22 10
2021-12-22 18
2021-12-23 02
2021-12-23 10
2021-12-23 18
2021-12-24 02
2021-12-24 10
2021-12-24 18
2021-12-25 02
2021-12-25 10
2021-12-25 18
2021-12-26 02
2021-12-26 13
2021-12-26 21
2021-12-27 05
2021-12-27 13
2021-12-27 21
2021-12-28 05
2021-12-28 13
2021-12-28 21
2021-12-29 05
2021-12-29 13
2021-12-29 21
2021-12-30 05
2021-12-30 13
2021-12-30 21
2021-12-31 05
2021-12-31 13
2021-12-31 21
2022-01-01 18
2022-01-02 02
2022-01-02 10
2022-01-02 18
2022-01-03 02
2022-01-03 10
2022-01-03 18
2022-01-04 02
2022-01-04 11
2022-01-04 19
2022-01-05 03
2022-01-05 11
2022-01-05 19
2022-01-06 04
2022-01-06 12
2022-01-06 20
2022-01-07 04
2022-01-07 12
2022-01-09 03
2022-01-09 12
2022-01-09 20
2022-01-10 04
2022-01-10 12
2022-01-10 20
2022-01-11 04
2022-01-11 12
2022-01-11 20
2022-01-12 05
2022-01-12 14
2022-01-12 22
2022-01-13 07
2022-01-13 15
2022-01-13 23
2022-01-14 08
2022-01-14 16
2022-01-15 00
2022-01-15 08
2022-01-15 16
2022-01-16 00
2022-01-16 08
2022-01-16 16
2022-01-17 01
2022-01-17 09
2022-01-17 17
2022-01-18 02
2022-01-18 10

Questions?

Find Disaster Connectivity Map here:

https://www.itu.int/itu-d/tnd-map-public/dcm