

OPENSIGNAL

TUTELA

Crowdsourced Mobile Experience Data



Sobre la Empresa

Fundada en 2011, como una empresa de insights de la experiencia móvil, Tutela recopila datos anónimos de rendimiento y uso de millones de dispositivos en todo el mundo para ayudar a las empresas móviles a analizar y mejorar la experiencia del cliente móvil.

Tutela está comprometida con la inversión continua en nuestro conjunto de datos y panel de usuario. Ofrecemos estos datos a CRC Colombia y otras organizaciones en forma de insights, inteligencia comercial y datos crudos a través de nuestros informes y herramientas líderes en la industria. Nuestro ya grande y creciente panel de usuarios permite a CRC Colombia obtener conocimientos incrementales y valor comercial asociado más allá de lo que nunca antes había sido posible.

La misión de Tutela es mejorar la experiencia móvil de los usuarios proporcionando a la industria móvil información para permitir la mejora de la red y la experiencia. Logramos esto recopilando y procesando cantidades significativas de datos de uso y calidad móvil y entregándolos en un formato útil e intuitivo para permitir las decisiones comerciales. Invertir en las soluciones de Tutela permite a las organizaciones obtener acceso inmediato a conocimientos móviles completos que permiten una toma de decisiones comerciales más rápida.

Usando los productos de datos de Tutela, las organizaciones pueden:

- Comprenda la experiencia del usuario final en todo el país en una ciudad y granularidad a nivel de calle.
- Comparar competidores y pares. Comprender el rendimiento de la red competitiva. Aproveche esta información para tomar decisiones de inversión.
- Reduzca los costos de las pruebas de red de campo, al tiempo que reduce significativamente el tiempo de información de semanas a segundos.

Tutela es una sociedad de responsabilidad limitada con sede en Victoria, Canadá y oficinas en Boston, MA.

Historial

Fuimos la primera organización del mundo en lograr la escala masiva de colaboración abierta (superando los 100 millones de usuarios) utilizando un enfoque basado en SDK y ofrece la escala líder de la industria para datos de experiencia móvil de colaboración abierta mundial con más de 300 millones de usuarios en todo el mundo y más de 50 mil millones de mediciones recopiladas cada día. .

Nuestra experiencia en la recopilación y el procesamiento de grandes conjuntos de datos nos ha colocado en una posición única para ayudar a las organizaciones a procesar y obtener valor de los datos.

Nuestros clientes abarcan 4 continentes e incluyen algunas de las marcas móviles líderes en el mundo, como Nokia, Telefónica, O2, Movistar, Telecom Italia, Bell, Telus y más. Los datos de Tutela también han sido utilizados por reguladores de todo el mundo, instituciones académicas, analistas de la industria y bancos de inversión.

Nosotros producimos periódicamente informes de mercado que se ofrecen de forma gratuita a la industria. Estos informes han sido utilizados regularmente por los medios de comunicación para informar sobre el rendimiento y la calidad de la red de los operadores móviles en todo el mundo.

Opensignal tiene amplios compromisos regulatorios y de promoción a nivel mundial

¿Por qué Opensignal trabaja con reguladores y responsables políticos?

- Proporcionar análisis independientes para respaldar los enfoques regulatorios basados en evidencia y la política de conectividad.
- Evolucionar la discusión regulatoria desde el cumplimiento de QoS estático hasta enfoques de calidad de experiencia de extremo a extremo.

Independiente y estandarizado a nivel mundial

- Metodología robusta: la independencia, la integridad de los datos y los estándares de privacidad más estrictos son fundamentales para nuestro trabajo.
- Las comparaciones regionales e internacionales son posibles gracias a una metodología estandarizada a nivel mundial.



Statistics
Canada



Department for
Digital, Culture
Media & Sport



Body of European Regulators
for Electronic Communications
BEREC
OFFICE



هيئة الاتصالات وتقنية المعلومات
Communications & Information
Technology Commission



NTRA
National Telecom Regulatory Authority
الهيئة الوطنية لتنظيم الاتصالات



2021 asociaciones

DADOS DA OPENSIGNAL

Relatório de acompanhamento do setor de telecomunicações

Telefonia Móvel
1º semestre de 2021

Nesta seção serão apresentados dados retirados do Relatório de Experiência em Redes Móveis, de julho de 2021 publicado pela Opensignal[®]. Bem como informações por Unidade da Federação obtidas como resultado do Acordo de Cooperação Técnica entre a empresa e a Anatel. A Opensignal coleta dados a partir dos dispositivos de seus usuários e os utiliza para calcular métricas de experiência de rede móvel.

As figuras desta seção apresentam o intervalo de confiança de cada métrica associada¹.

Os dados aqui mostrados se referem ao período de noventa dias, entre 01/03/2021 e 29/05/2021.

Segue breve descrição de cada métrica:

Experiência de vídeo

Quantifica a qualidade de vídeo em redes móveis percebida pelos usuários em aplicações reais de *streaming* de vídeo. O cálculo de experiência de vídeo mede diretamente *streaming* de vídeo em terminais de usuário, utilizando uma abordagem baseada na UIT que leva em conta a qualidade da imagem, tempo de carregamento e taxa de travamento, em redes 3G e 4G. A métrica de experiência de vídeo é calculada em escala de 0 a 100, sendo:

75 - 100	65 - 75	55 - 65	40 - 55	0 - 40
Excelente	Muito bom	Bom	Regular	Ruim

4G for Meaningful Connectivity Indonesia

We have meaningful connectivity when we can use the internet every day using an appropriate device with enough data and a fast connection. The Alliance for Affordable Internet (A4AI) published these targets in 2020 to help policymakers set targets for higher quality and more affordable internet access.

This brief focuses on a fast connection — one of the four pillars to measure meaningful connectivity — and the availability of 4G across Indonesia. It uses data collected from Opensignal to test the amount of time users have a 4G signal that they're able to use on their phone.

This kind of connectivity — at 4G, rather than 3G or earlier technologies — offers higher speeds and greater potential for users to work, play, and communicate online. As governments set visions for their post-Covid recovery with the digital economy as a driver for innovation and economic growth, the meaningful connectivity targets ensure this growth is inclusive and has the foundations to grow to scale.

4G AVAILABILITY IN INDONESIA
% time, January-March 2021

MAP LEGEND: 4G 3G 2G

MOBILE INTERNET DOWNLOAD SPEED EXPERIENCE (IN MBPS)

	Overall	3G	4G
11.8 (10.025)	4.36 (10.025)	13.0 (10.025)	

1) Numbers values represent confidence intervals. Test only confidence intervals and experience. © Opensignal Limited

This report is an A4AI brief, with data provided by Opensignal. Learn more about their work at www.a4ai.org/press-releases. Data, safety, and terms are on www.a4ai.org/terms. Opensignal. All text is written by A4AI and released on a CC BY-NC-SA license.

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4G for Meaningful Connectivity Bangladesh

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4G AVAILABILITY IN BANGLADESH
% time, January-March 2021

MAP LEGEND: 4G 3G 2G

MOBILE INTERNET DOWNLOAD SPEED EXPERIENCE (IN MBPS)

	Overall	3G	4G
7.9 (10.025)	5.0 (10.025)	9.1 (10.025)	

1) Numbers values represent confidence intervals. Test only confidence intervals and experience. © Opensignal Limited

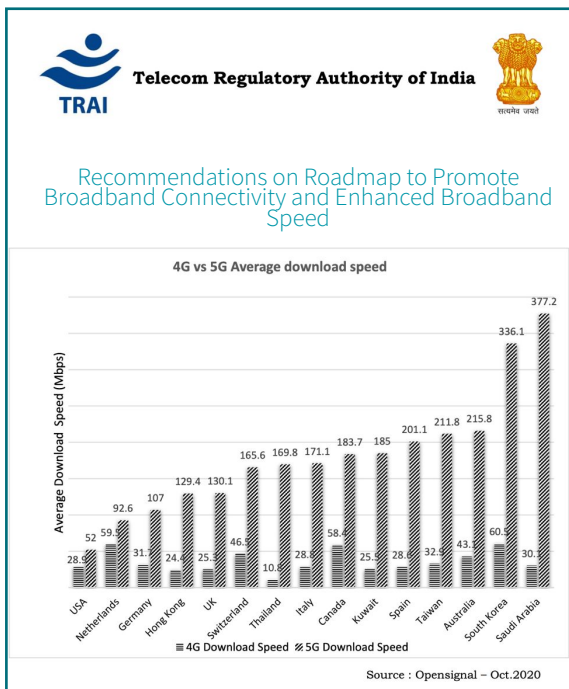
This report is an A4AI brief, with data provided by Opensignal. Learn more about their work at www.a4ai.org/press-releases. Data, safety, and terms are on www.a4ai.org/terms. Opensignal. All text is written by A4AI and released on a CC BY-NC-SA license.

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Measurement data from Opensignal, which independently captures real user experience, also suggests there may be issues with 4G availability in some towns. Mobile coverage predictions can vary from the 4G service people actually experience due to local factors such as trees and buildings or the degree of congestion on the network. Similarly, predicting indoor or in car coverage is subject to variations as signal loss can vary depending on the materials that signals must travel through. Ofcom recognises these issues with modelling in its mobile coverage reports that are based on predictions provided by the mobile operators. Nevertheless, there are questions about how substantial the variations are and whether there is room for further optimisation of mobile coverage to improve the user experience in certain places.

Recommendation 7: Ofcom and the government should consider real world user experience data, alongside prediction models, to improve the understanding of how people experience mobile connectivity in different places and identify any significant patterns that need to be addressed. As part of this, consideration should be given to whether Ofcom's existing reporting on user experience can be extended to provide a more granular view of localised mobile user experience.



ITU Publications

International Telecommunication Union
Development Sector

Connect2Recover: A methodology for identifying connectivity gaps and strengthening resilience in the new normal



Canada's 5G Future

January 6, 2022 / Leave a Comment

Facebook Twitter Pinterest LinkedIn Email Print

On December 17, the Government of Canada opened its consultation on the 3800 MHz spectrum band. The day before, Ceri Howes, Head of Regulatory for Opensignal published an article that I think merits highlighting, in light of the government's stated object for the consultation "to ensure Canadians have access to high-quality wireless services."

In the header for "Canada's 5G future – the story so far", Opensignal indicates the article "discusses some key considerations for Canada's 5G future and highlights how policymakers and regulators can better make use of independent, globally-standardized data that reflects the actual experience of the consumers they serve."

The article shows that Canada's wireless carriers have consistently invested in new technologies, increasing spectrum efficiency and capacity, leading to Canada currently having some of the fastest 4G networks in the world, "despite Canada's relatively low population density and the high capex and opex costs involved in deploying networks in rural and remote parts of a large country."

However, the article observes that Canada is "unfortunately slipping behind" when it comes to 5G, and Opensignal suggests that spectrum policy is a factor.

4.5.1 Network performance during the pandemic year of 2020

Further, as highlighted recently by Opensignal based on their analysis of global traffic data, flexibility will be required of MNOs. According to Opensignal, "As lockdowns ease, operators will look at how to manage capacity more dynamically, for example between downtown areas and residential suburbs, and be more nimble to future changes in the pattern of mobile usage. We will see greater thought on where to build mobile base stations."⁶⁹

In February 2021, Opensignal undertook an analysis for the ITU of global mobile network experience data during the COVID-19 pandemic for the entire calendar year 2020. The findings are summarized in **Figures 18 and 19**.

A world map with a dark gray background. Red dots and lines are scattered across the landmasses, representing data points. The density of these points is highest in North America, Europe, and East Asia, and lower in South America, Africa, and Australia. The text is overlaid on the map.

Massive Global Dataset

Installed on >300 million devices
>1 Trillion Measurements per month

High statistical accuracy in all populated locations

Solution Overview

OpenSignal/Tutela Available Solutions

1. Direct Data Access

- Online, cloud-based access
- Network quality data for **all of Colombia**
- Includes 18 months worth of historical data

2. Data Analysis Tool

- Tutela Explorer
- 500 million records of capacity
- Includes approx. 5 month worth of historical data

3. Value-added Features

- Indoor/Outdoor Identification
- SiteMapper - shows the locations of competitor LTE sites and tracks changes
- Video Performance Data - YouTube and Tutela's CND testing results
- Coverage Analytics - Detect coverage holes and assess coverage quality

1. Raw Data (Datos Crudos)

Tutela will provide CRC Colombia with direct access to raw network quality data from Colombia

CRC Colombia can directly connect, query and download Tutela's database in real-time.

Data can be accessed via Tutela's online portal: insights.tutela.com

Data can be queried and exported (downloaded)

CRC Colombia can also directly connect Tutela's data through 3rd party BI tools (e.g. PowerBI, Tableau, etc)

Over 190 KPIs including device, connection and quality metrics - Full [KPI list](#) available.

The screenshot shows the Google BigQuery web interface. On the left, there's a sidebar with 'COMPOSE QUERY', 'Query History', and 'Job History'. Below that, a list of datasets is shown, including 'reportdataexternal-telefonica' and 'Public Datasets'. The main area displays a SQL query in the 'New Query' editor:

```
1 SELECT
2 *
3 FROM
4 [reportdataexternal-telefonica:Standard_US.Mexico_MexicoCity]
5 LIMIT
6 100
```

Below the query editor, there are buttons for 'RUN QUERY', 'Save Query', 'Save View', 'Format Query', and 'Show Options'. A status bar indicates 'Query complete (8.0s elapsed, 23.0 GB processed)'. The results are displayed in a table with columns: Row, ConnectionType, ConnectionTechnology, ServiceProvider, ConnectionStart, ConnectionEnd, and CID. The table shows 11 rows of data.

Row	ConnectionType	ConnectionTechnology	ServiceProvider	ConnectionStart	ConnectionEnd	CID
1	MOBILE	UMTS	TELCEL	2017-03-11 16:25:31 UTC	2017-03-11 16:27:04 UTC	135040477
2	MOBILE	EDGE	TELCEL	2017-03-11 16:27:04 UTC	2017-03-11 16:28:05 UTC	20617
3	MOBILE	EDGE	TELCEL	2017-03-11 16:39:20 UTC	2017-03-11 16:40:51 UTC	20617
4	MOBILE	UMTS	TELCEL	2017-03-12 08:20:37 UTC	2017-03-12 08:55:35 UTC	135049457
5	MOBILE	EDGE	TELCEL	2017-03-12 09:42:53 UTC	2017-03-12 09:43:47 UTC	null
6	MOBILE	EDGE	TELCEL	2017-03-12 09:42:08 UTC	2017-03-12 09:42:47 UTC	36317
7	MOBILE	EDGE	TELCEL	2017-03-12 09:31:09 UTC	2017-03-12 09:42:02 UTC	57960
8	MOBILE	EDGE	TELCEL	2017-03-12 08:55:40 UTC	2017-03-12 09:31:00 UTC	null
9	MOBILE	EDGE	TELCEL	2017-03-12 07:26:41 UTC	2017-03-12 07:38:14 UTC	36317
10	MOBILE	UMTS	TELCEL	2017-03-12 09:46:40 UTC	2017-03-12 09:57:21 UTC	135029457
11	MOBILE	EDGE	TELCEL	2017-03-12 10:01:31 UTC	2017-03-12 10:01:44 UTC	47960

Tutela's data is hosted in the Cloud by Google BigQuery and can be queried and exported at any time using SQL

2. Tutela Explorer

Tutela will provide access to **Tutela Explorer**: a GPU powered web-based tool for data analysis and visualisation.

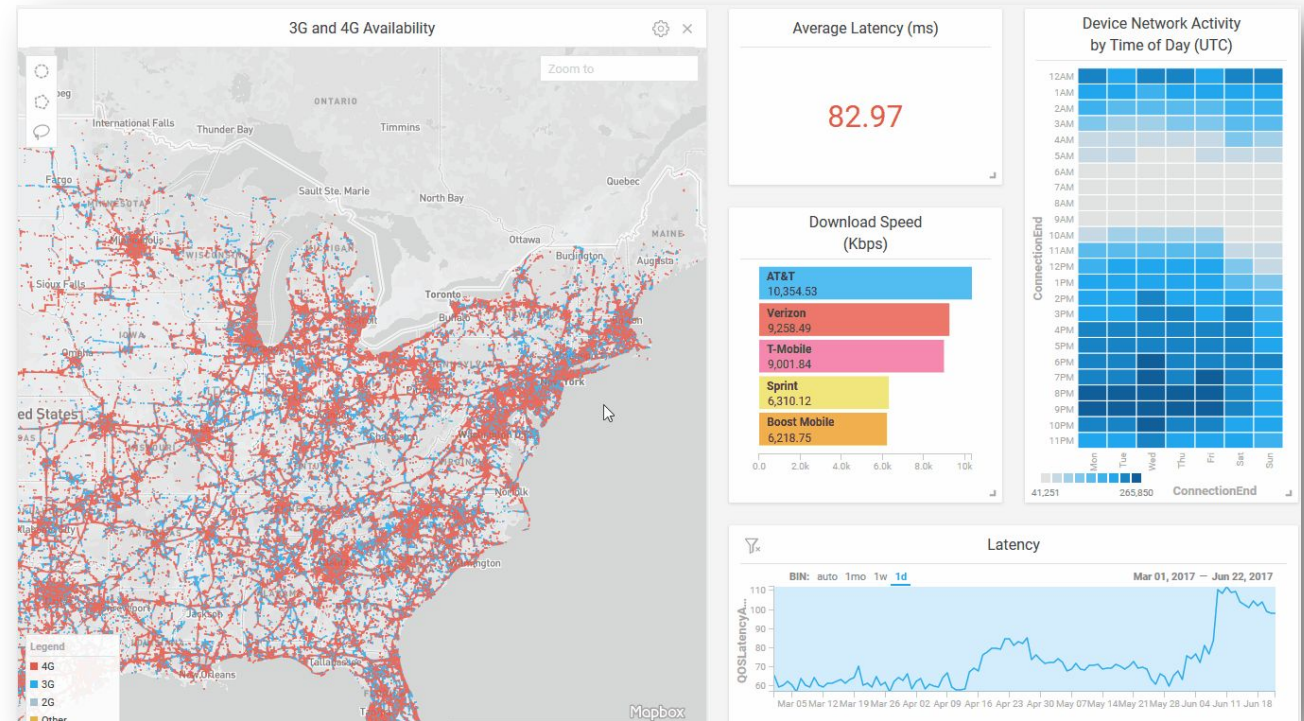
Tutela Explorer is a powerful big data visualisation tool

Tutela's massive dataset can be rendered and analysed in real-time to answer questions faster than any other tool

Tutela Explorer uses **GPU acceleration** to achieve extreme performance and flexibility.

Web-based. Delivered as-a-Service from Tutela. Ready to use immediately.

<https://www.tutela.com/explorer>



3. Value-added Features



Indoor Outdoor Traffic Advanced ML algorithm

Machine learning algorithm used to estimate indoor/outdoor measurements with >90% accuracy.

Tutela will upgrade CRC Colombia database with an indoor/outdoor field to make it simple to filter and analyse traffic between these types.



Coverage Analytics Coverage Holes Detection

Identifies network coverage and detects holes on all networks. Find areas of "confirmed no-coverage" for any operator. Group by clusters to find largest problem areas.

[watch demo](#)



SiteMapper Smart Infrastructure Tracking

Tutela SiteMapper provides the estimated locations of cell sites for any operator globally to within 110 meters (median), updated monthly.

- Get notifications when new site locations (in a monthly or quarterly report)
- LTE band information per site
- Identification of sites with highest data volume



Video Experience Data Embedded in SDK

Tutela executes video tests in the background of mobile devices (within the Tutela SDK) playing videos at a random time of the day for each user from YouTube and Tutela's CDN platforms.

Collecting 17 KPIs related to video performance by operator, location, and time of day.

Pricing

Products	Product Configuration	Annual Price (USD)
Raw Data (Datos Crudos)	Colombia network QoS data All operators, including WiFi <i>18 months of historical data</i>	\$ 300,000
Tutela Explorer	500 million rows of capacity. Unlimited users and dashboards. <i>Approximately 5 months of historical data</i>	\$ 250,000
Bundle Discount		\$400,000

- 1-year subscription
- We would be happy to discuss the scope and price of the products and understand further the CRC Colombia requirements.

General Terms and Assumptions

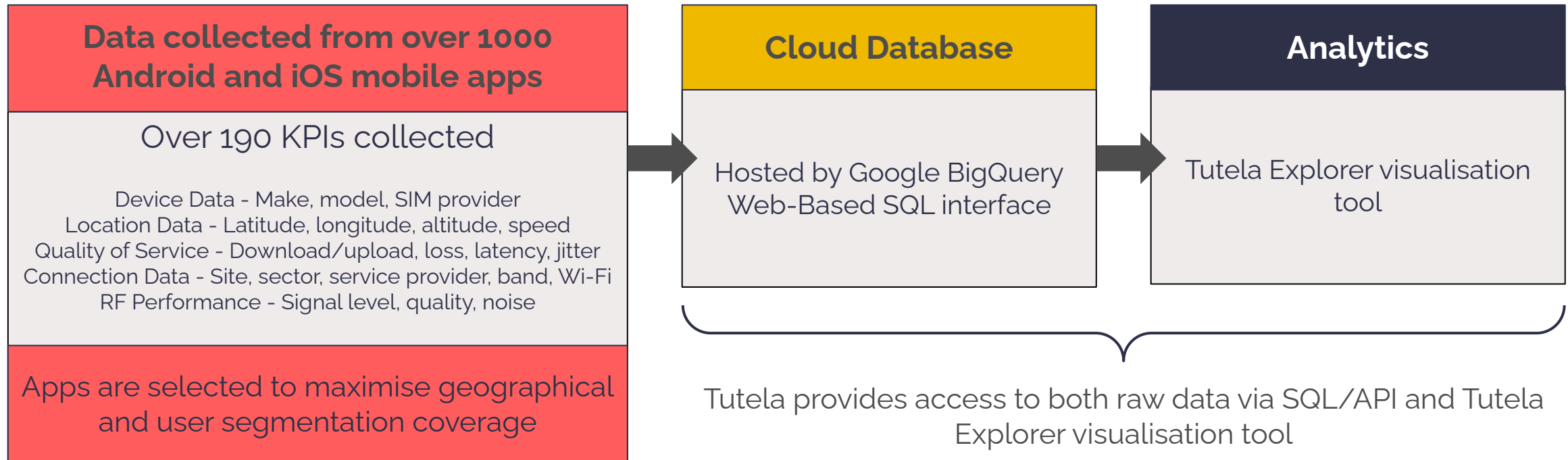
- Data for internal use only
- OpenSignal/Tutela's standard contract ([MSA](#)) will be used.
- Delivery terms: within 2 weeks after PO and signed contract is received
- Payment term will be 30 days
- Initial term is 12 months and cannot be terminated by convenience
- All pricing exclude withholding taxes
- The prices are in USD



Our Methodology and Use Cases

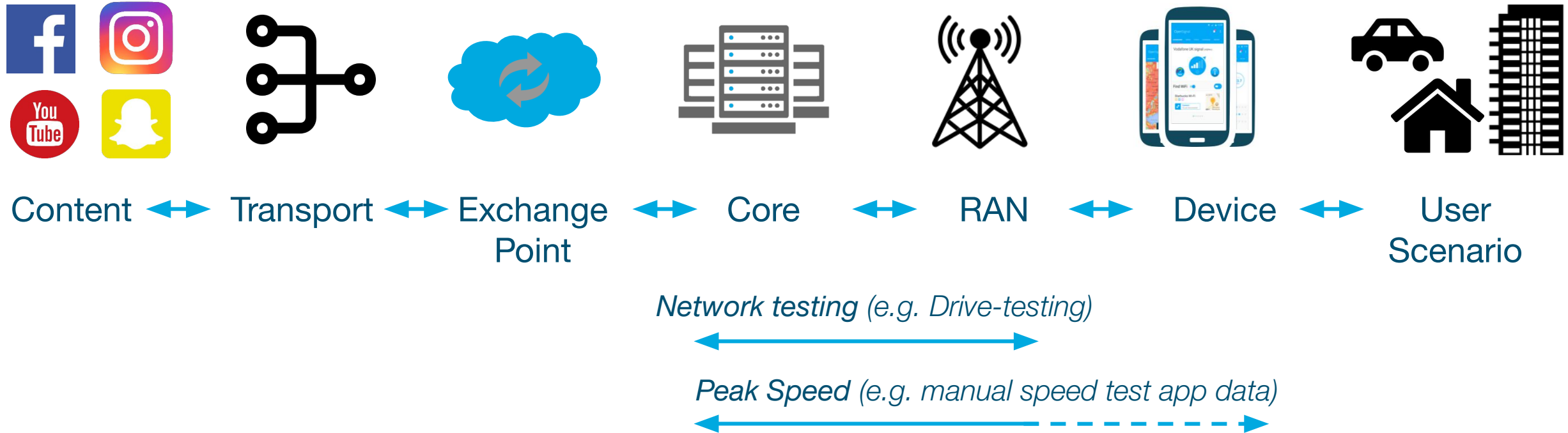
Tutela Data

Installed on millions of devices globally capturing billions of measurements per month



All data is anonymous and fully compliant with GDPR, CCPA and COPPA

Measuring End-to-End Experience

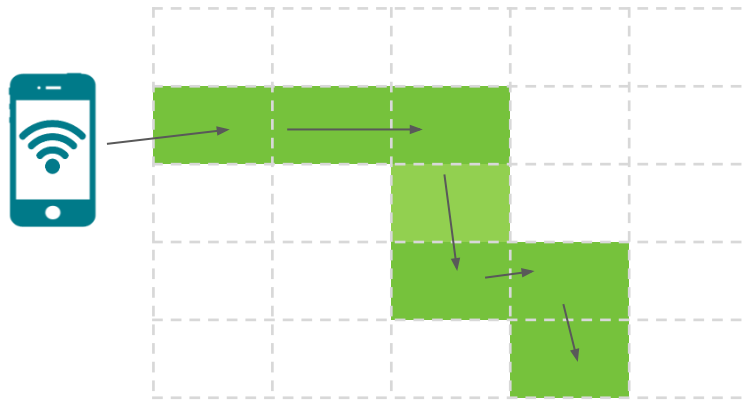


Only Opensignal measures the full end-to-end User Experience



Opensignal Real-World Data Collection

No more simulations; Millions of real-world measurements from consumer devices.



Opensignal measures coverage:

- during every-day usage
- in the places consumers go
- from the devices they use

Opensignal measures coverage *the way consumers experience it.*



Indoor/Outdoor/
Everywhere people go



24/7 testing



Impact of device model
factored in



Always up-to date data



Not limited to
testing on roads



Experience not
simulation

Passive RF Collection Methodology



- Opensignal and 3rd party partners, metrics passively collected every 15 seconds
- With the screen turned on:
 - Determine the network layer being used (2G, 3G, 4G, 5G, WiFi)
 - Sample RF measurements (RSRP, RSRQ, RSSNR, eARFNC, CellID)
 - Sample location (lat, long, accuracy, method used)
 - Sample network info (SIM card, Registered network name)
 - Sample Device Info (Manufacturer, Model, OS)
- Wait 15 seconds
- Repeat

One device with 8 hours of daily screen generates 2000 measurement points per day

Use-Cases

Benchmarking

- Any network, any time, anywhere
- Road and rail infrastructure
- Trending

Competitive Intelligence

- Competitor roll-out tracking
- Competitive strengths and weaknesses
- Cell site locations
- Coverage Comparison

Network Optimisation

- Worst cells
- 3G in 4G detection
- Indoor performance
- Hot spot detection
- Congestion detection
- Overshooting cells
- Coverage holes

Strategic Network Planning

- Better/worse assessment
- 5G priority locations
- Spectrum assessment
- 3G Sunsetting

Application Experience

- Consistent Quality
- Subscriber Experience Index
- Video Quality
- Device Analysis

Roaming

- Inbound/outbound
- Hotspots
- Domestic roaming analysis

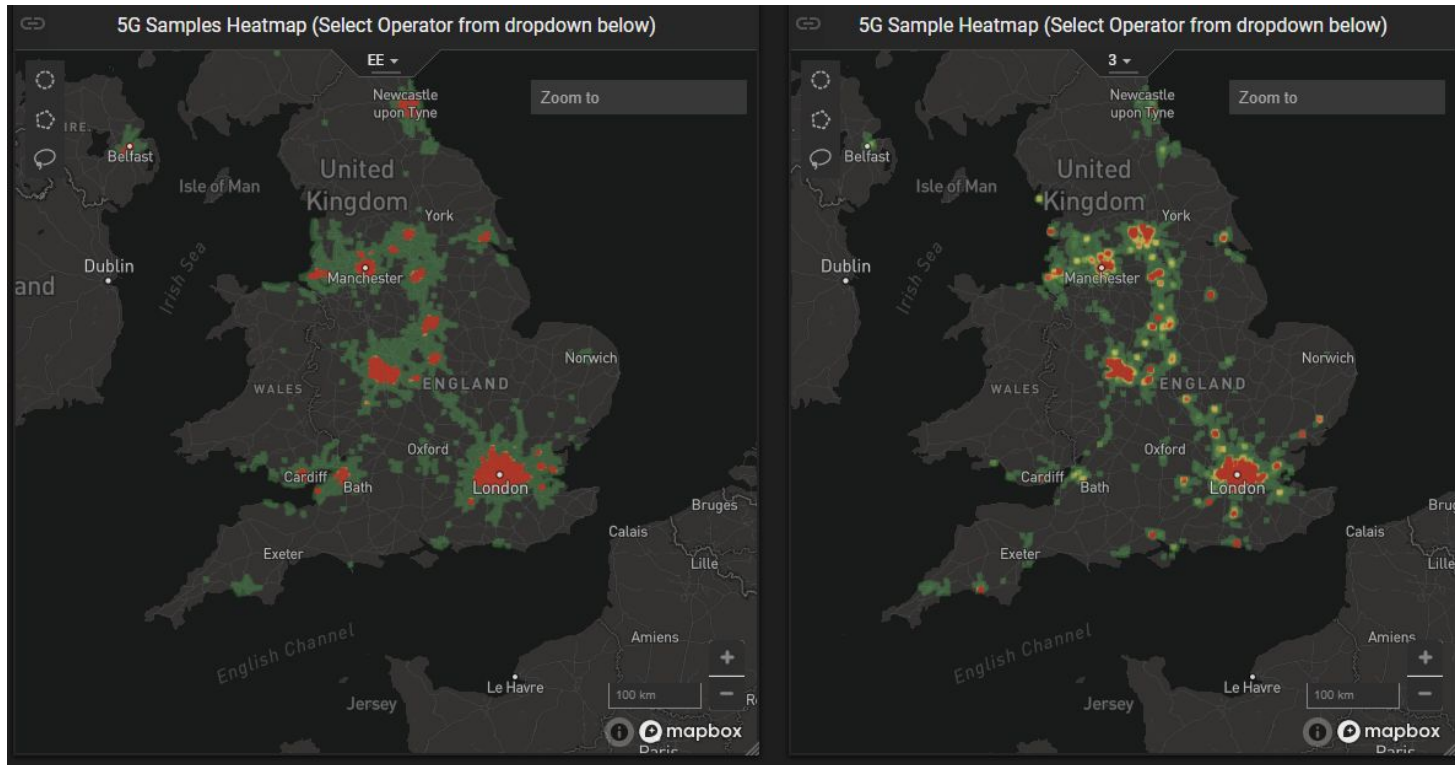
High resolution analysis with statistical confidence



5G Rollout Intelligence



Strategic Planning: 5G Rollout Intelligence



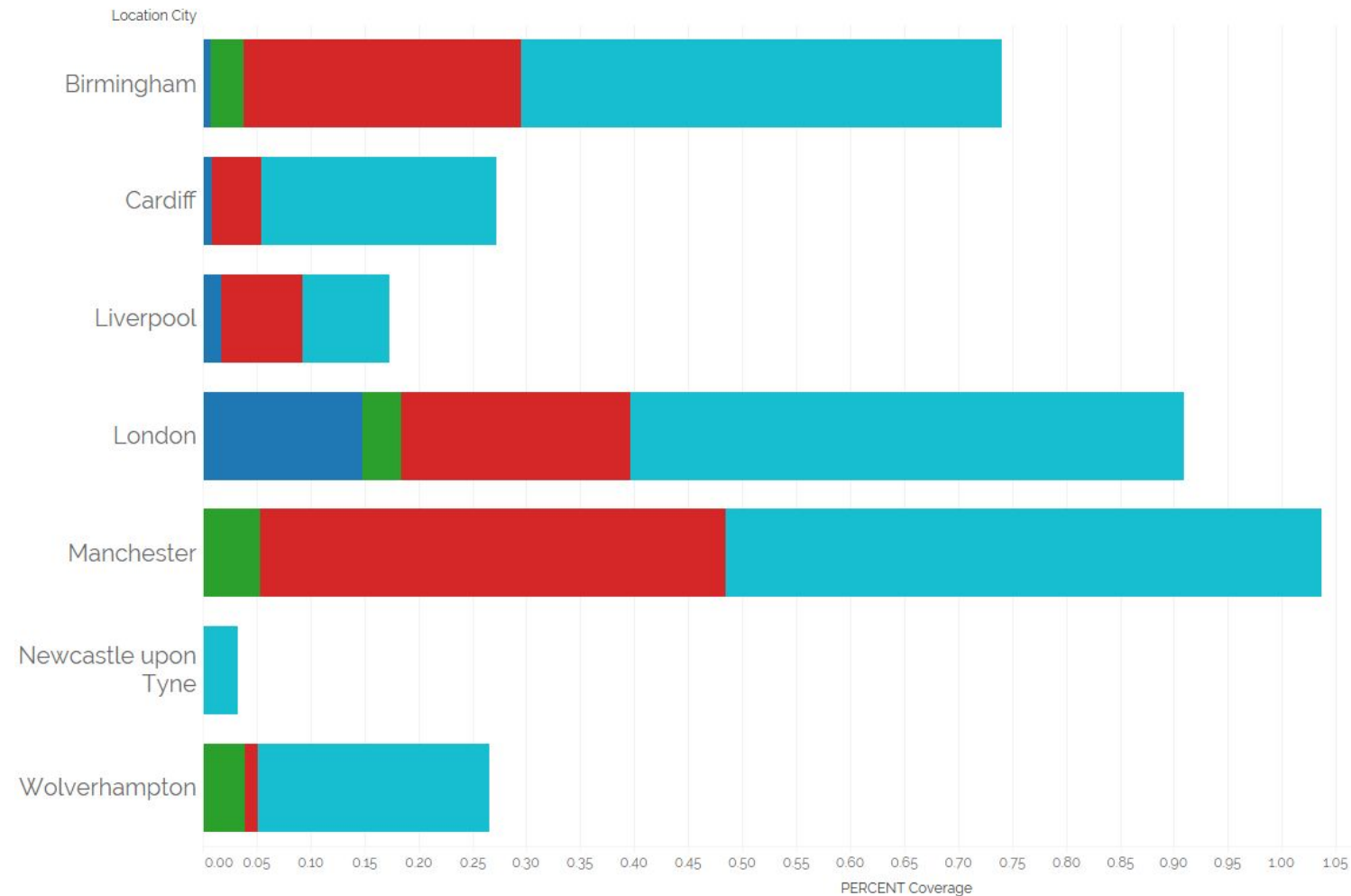
Monitor competitor 5G roll-out:

- Coverage by area and population
- 5G site locations
- 5G performance
- Devices used

Track over time - understand when and where competitors are deploying 5G

Operator Infrastructure Tracking

% of City Covered by 5G (4) - April 2020

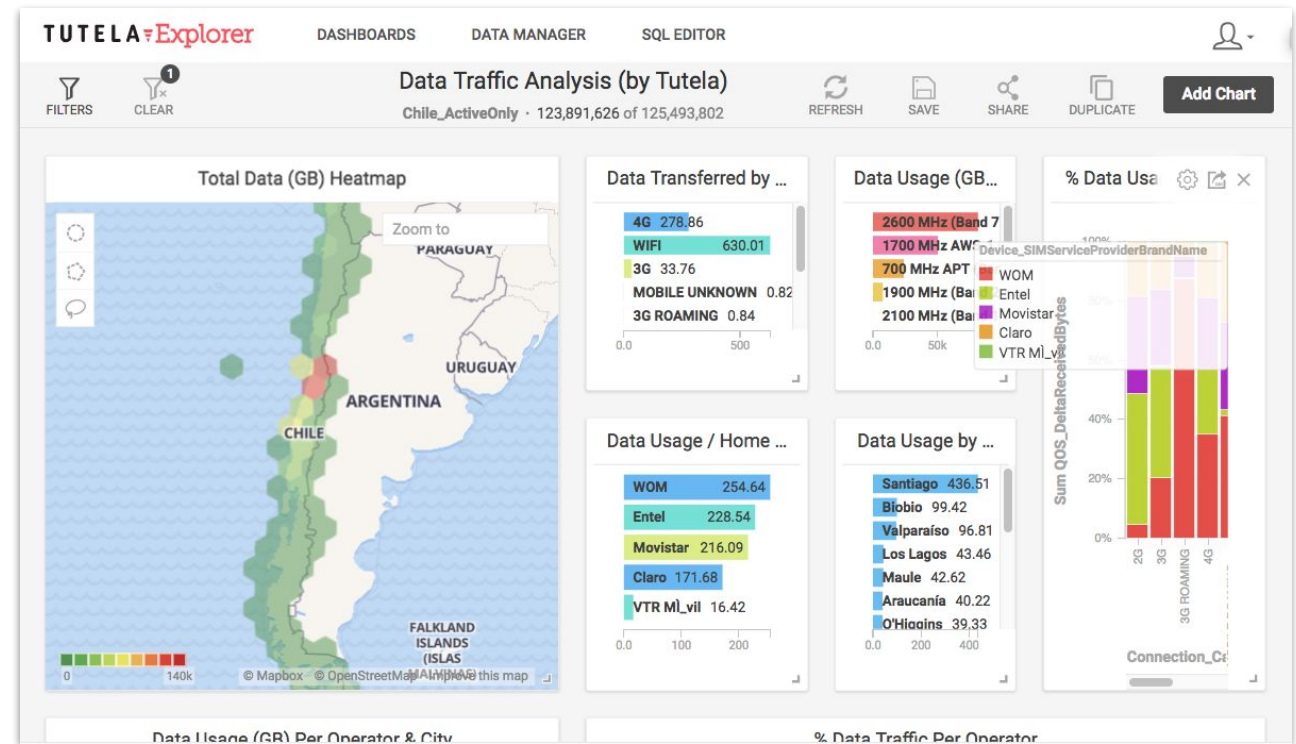


Understand coverage, band usage and technology rollout for all of your competitors

Example shown is 5G roll-out per city over time

Details Data Usage and Traffic Analysis

- Opportunity identification for 5G rollout
- High-level data usage statistics based on end users
- Trends of data usage statistics over time
- Opportunity identification for offboarding congested networks



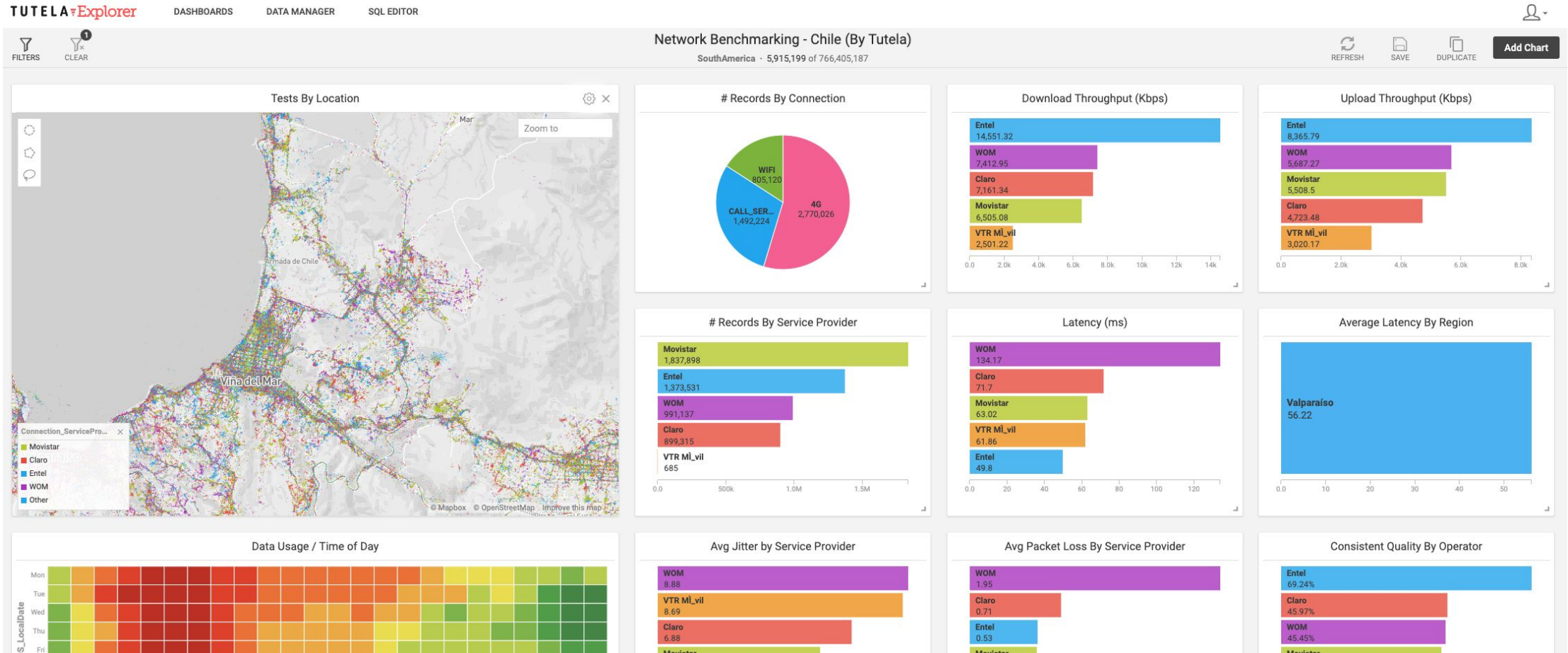
Benchmarking



Compare performance - anytime, anywhere

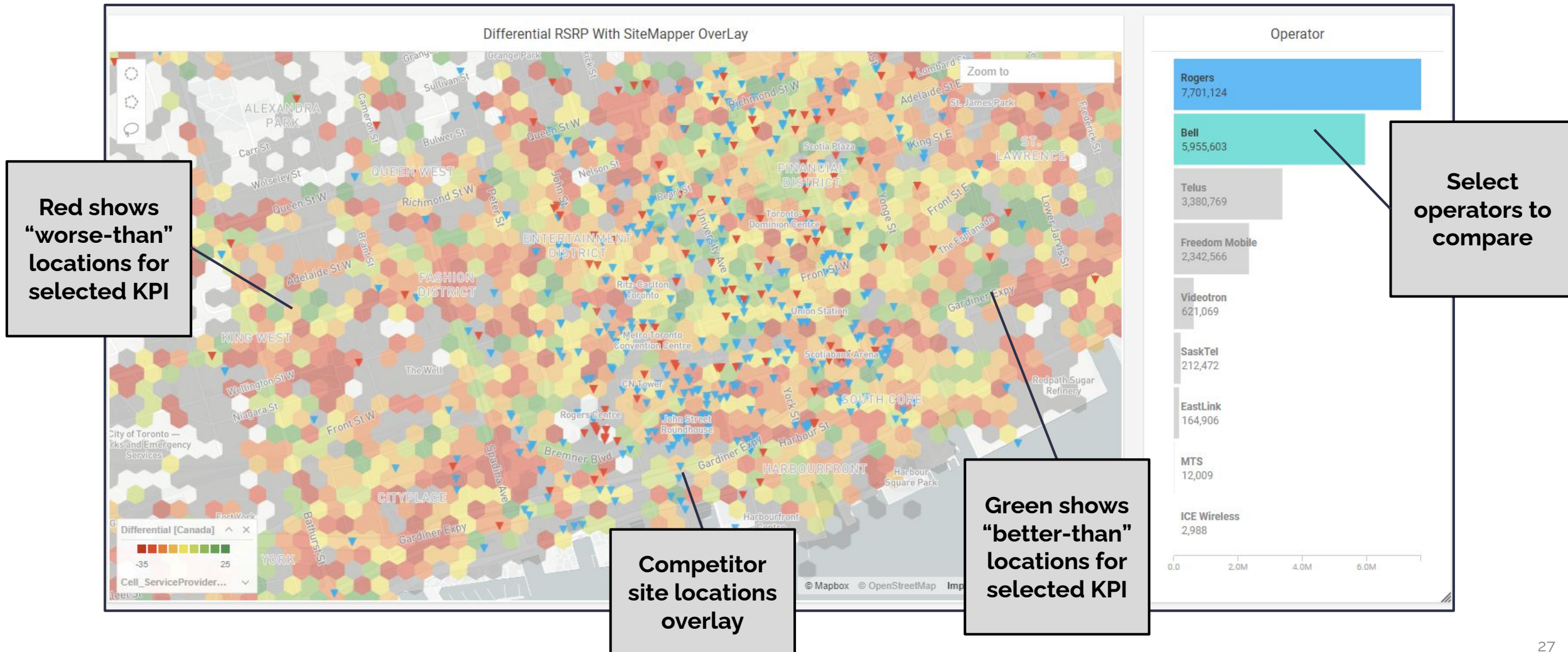
Network Performance Benchmarking

Understand how each network operator compares across important active test KPIs including Download, Upload, Jitter, Latency and Packet Loss.



Find better-than / worse-than locations

Create differential maps to spot location where competitors are performing better or worse

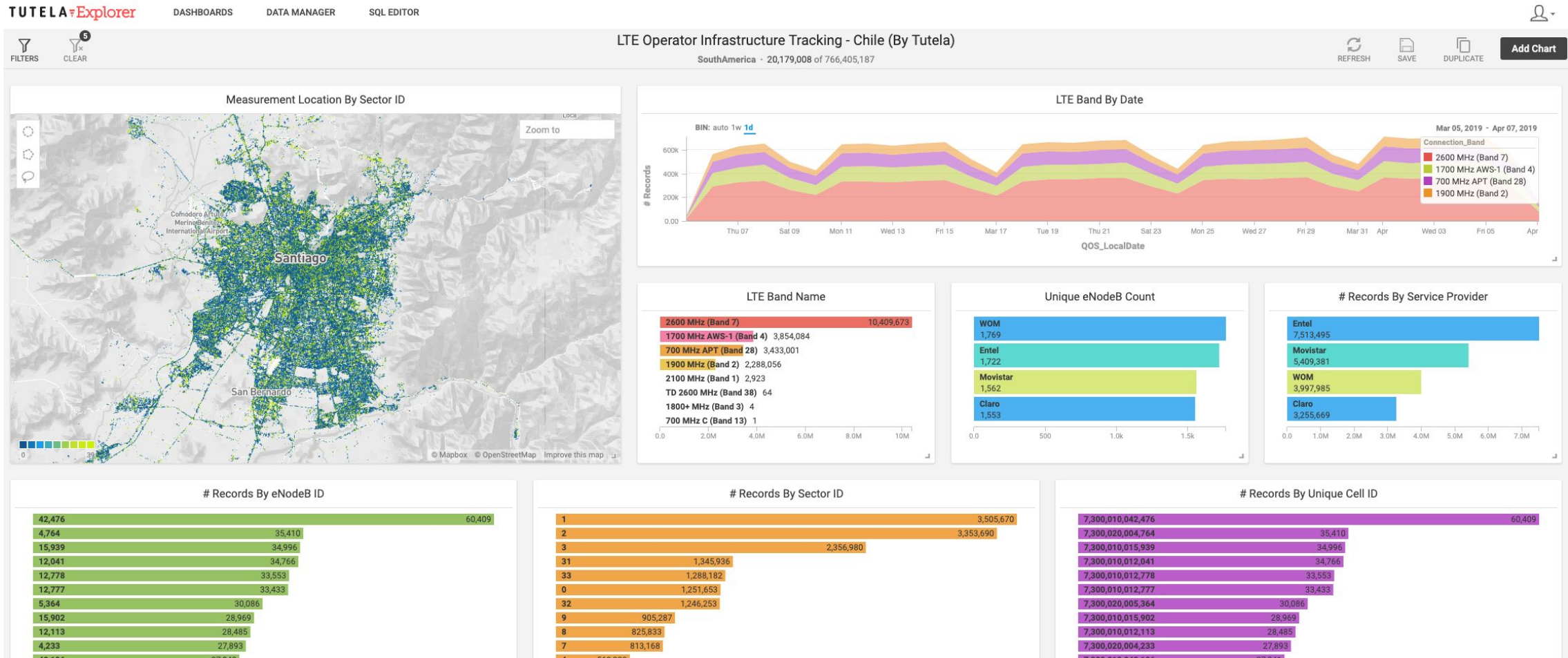


Track spectrum / infrastructure
rollout



LTE Operator Infrastructure Tracking

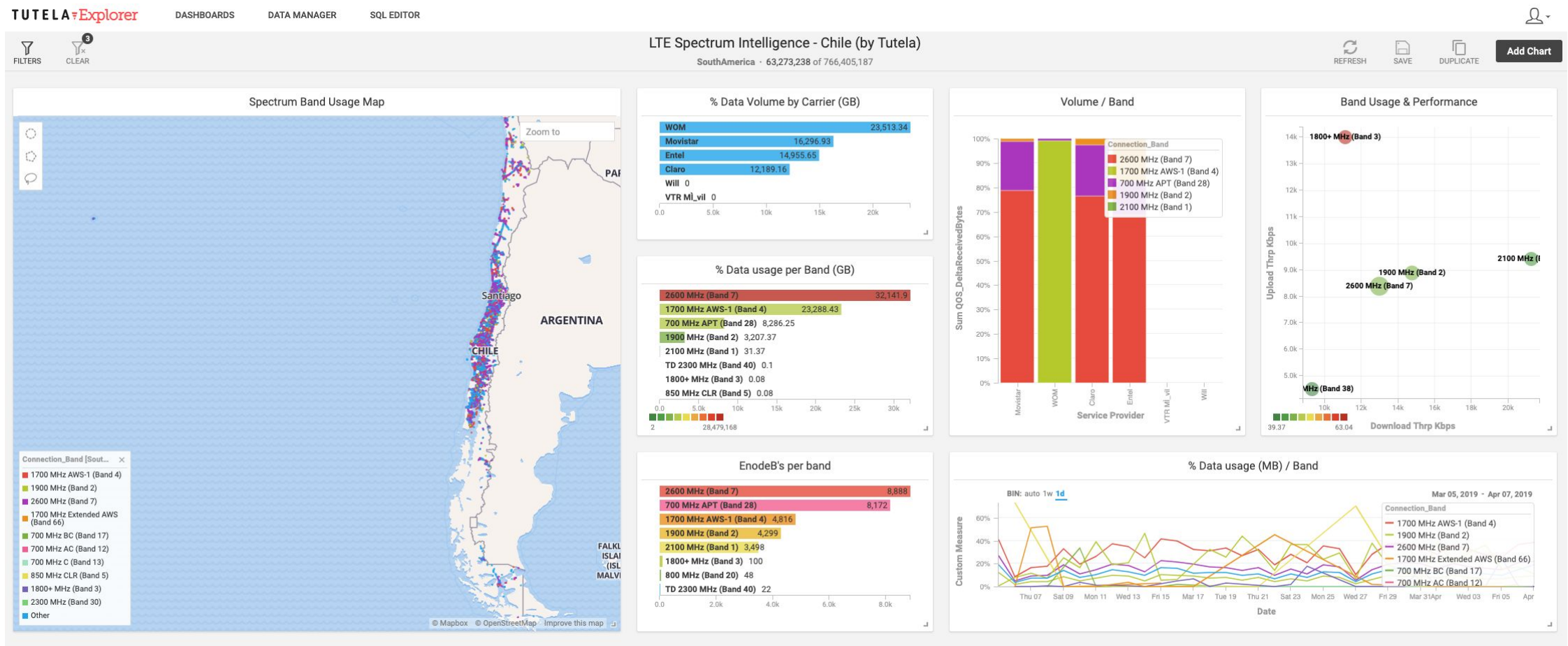
Understand LTE coverage, Band usage, and site locations for your network and for competitors.



LTE Spectrum Intelligence

Understand coverage and performance of each spectrum band for each operator.

Visualize where operators are using different frequencies and on how many cell sites, including where operators are rolling-out newly acquired frequency bands.



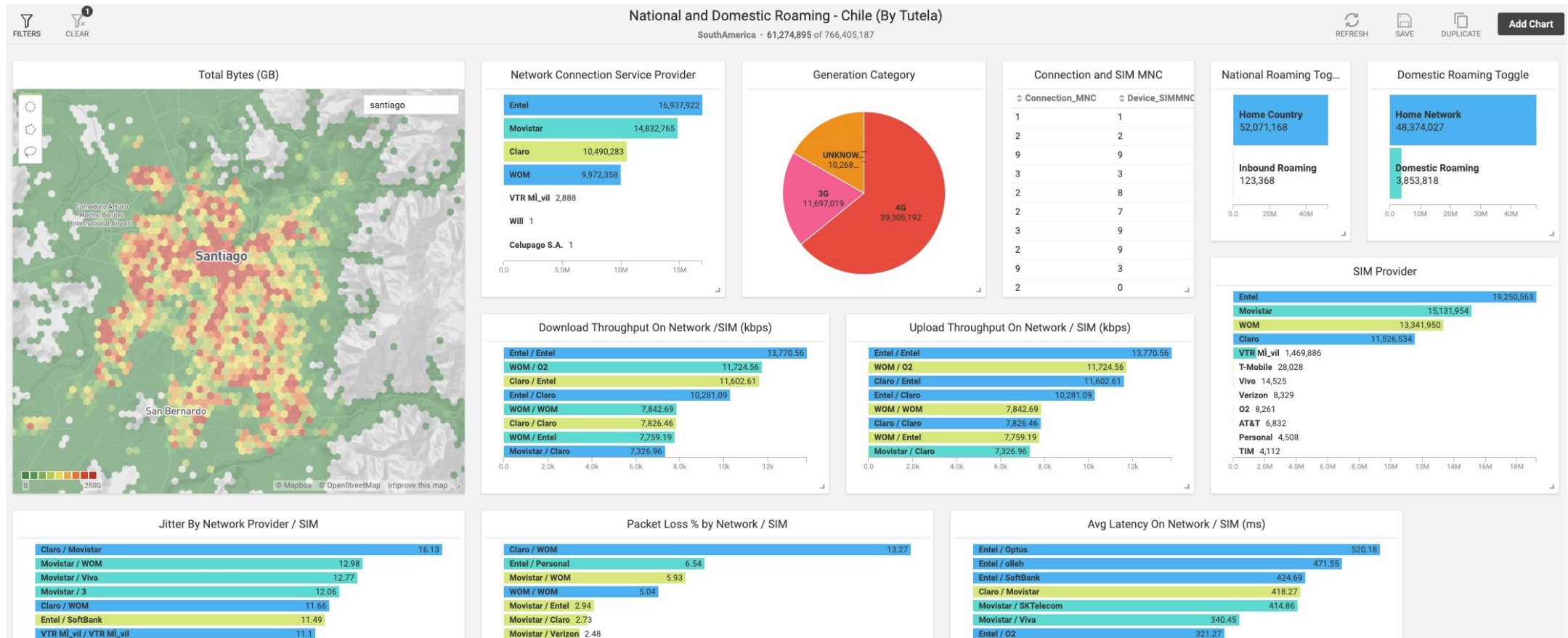
Planning



Compare better/worse assessment - anytime, anywhere

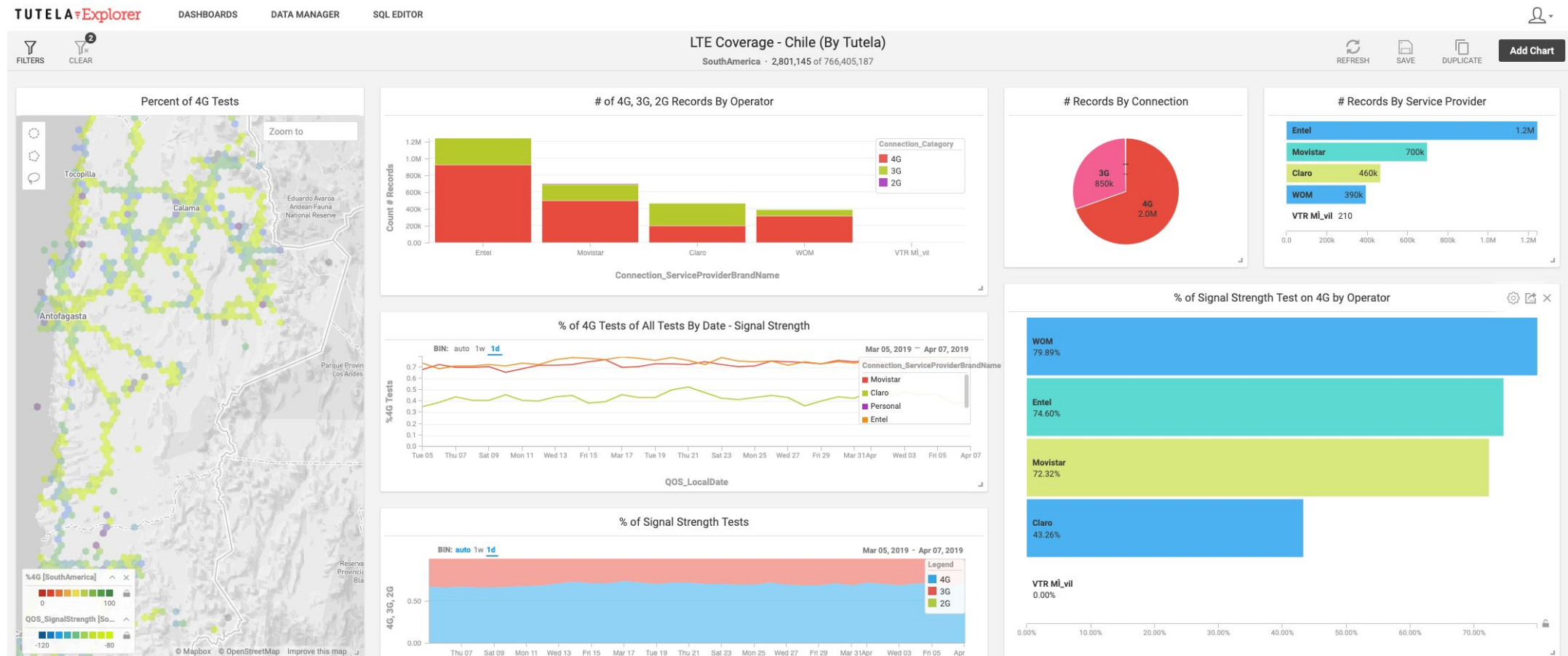
National and Domestic Roaming

Gain insights into users that are roaming onto your network from international and domestic providers and understand where and how much data roaming users are consuming (any network)



LTE Coverage Dashboard

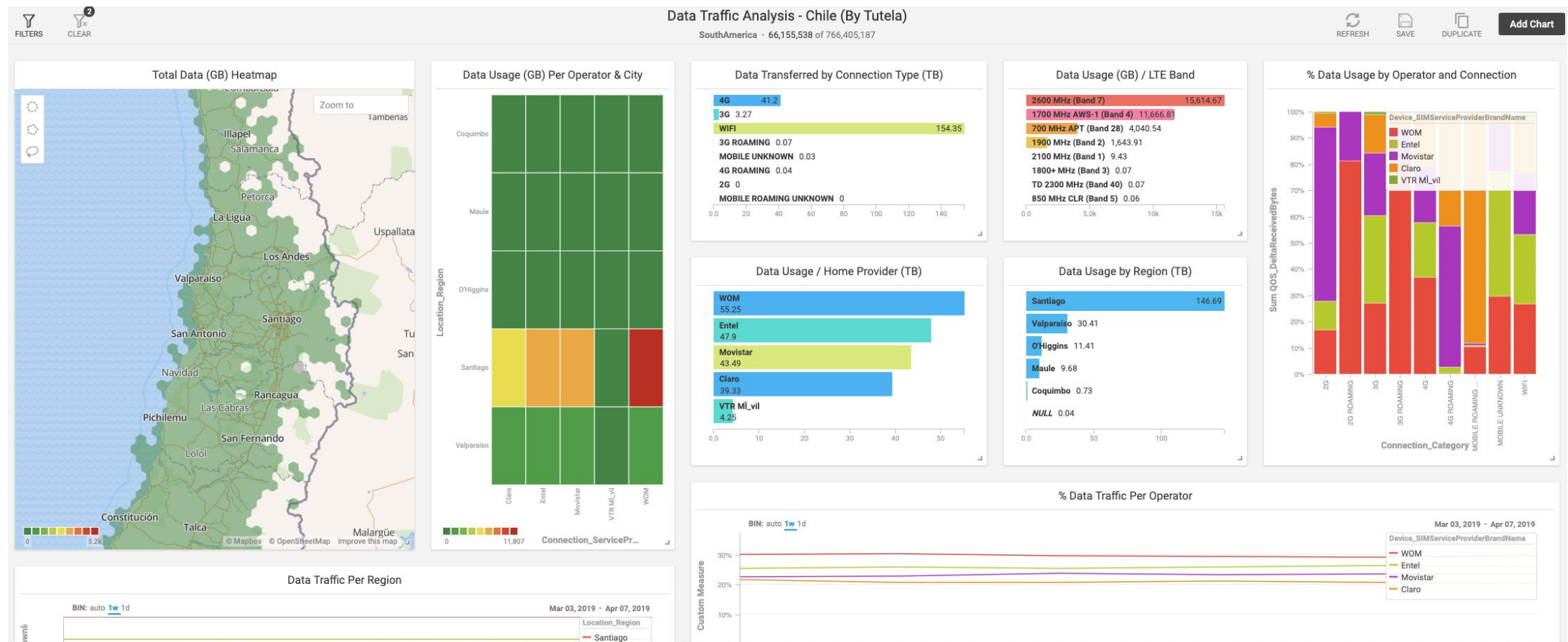
Understand current LTE Coverage compared to older generation technologies on your network and for competitors.



Data Traffic Analysis

Analyze the impact of specific events in the network, when high people concentration (by time of day)

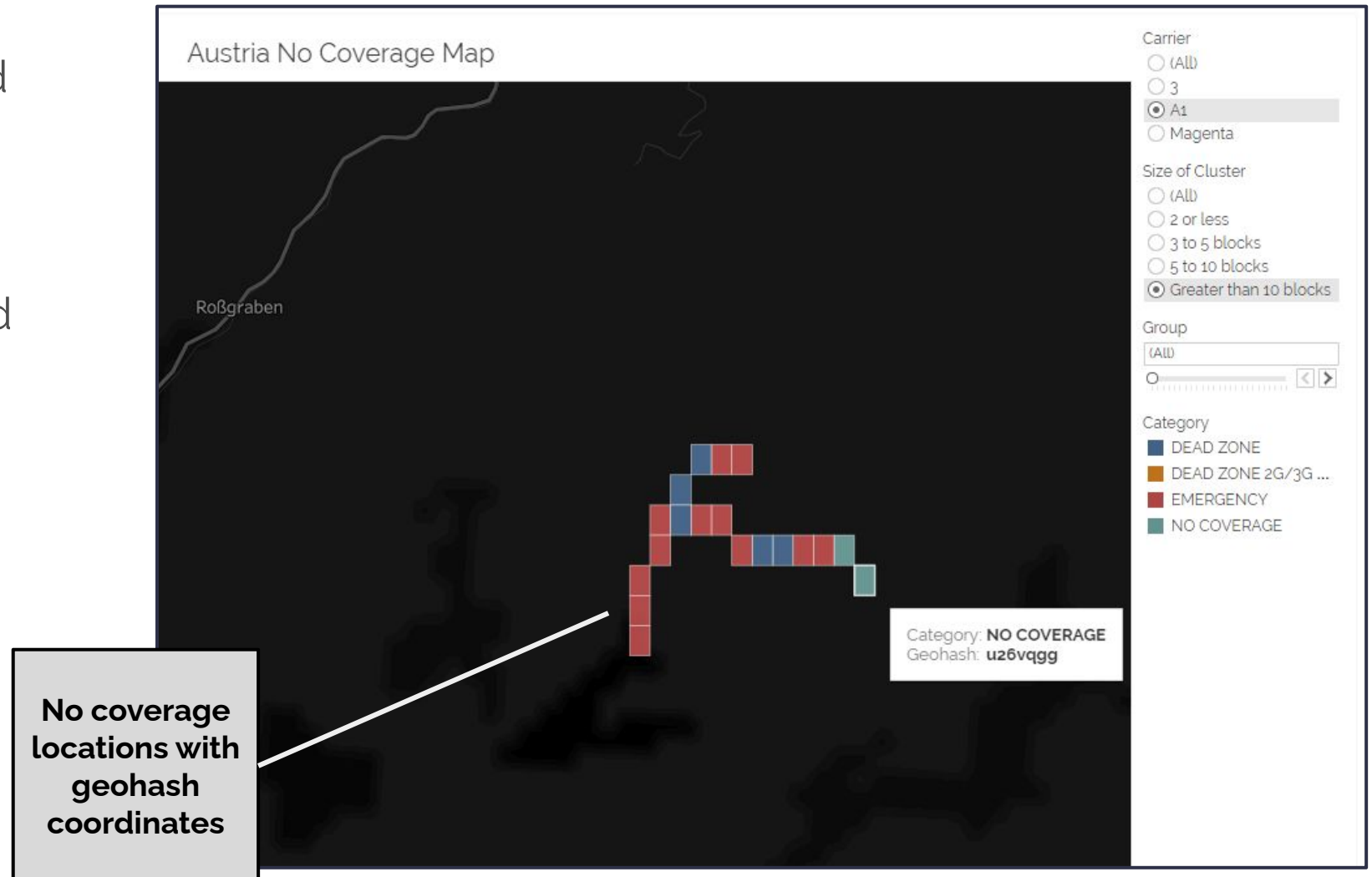
Understand where and how much data users are consuming in different regions



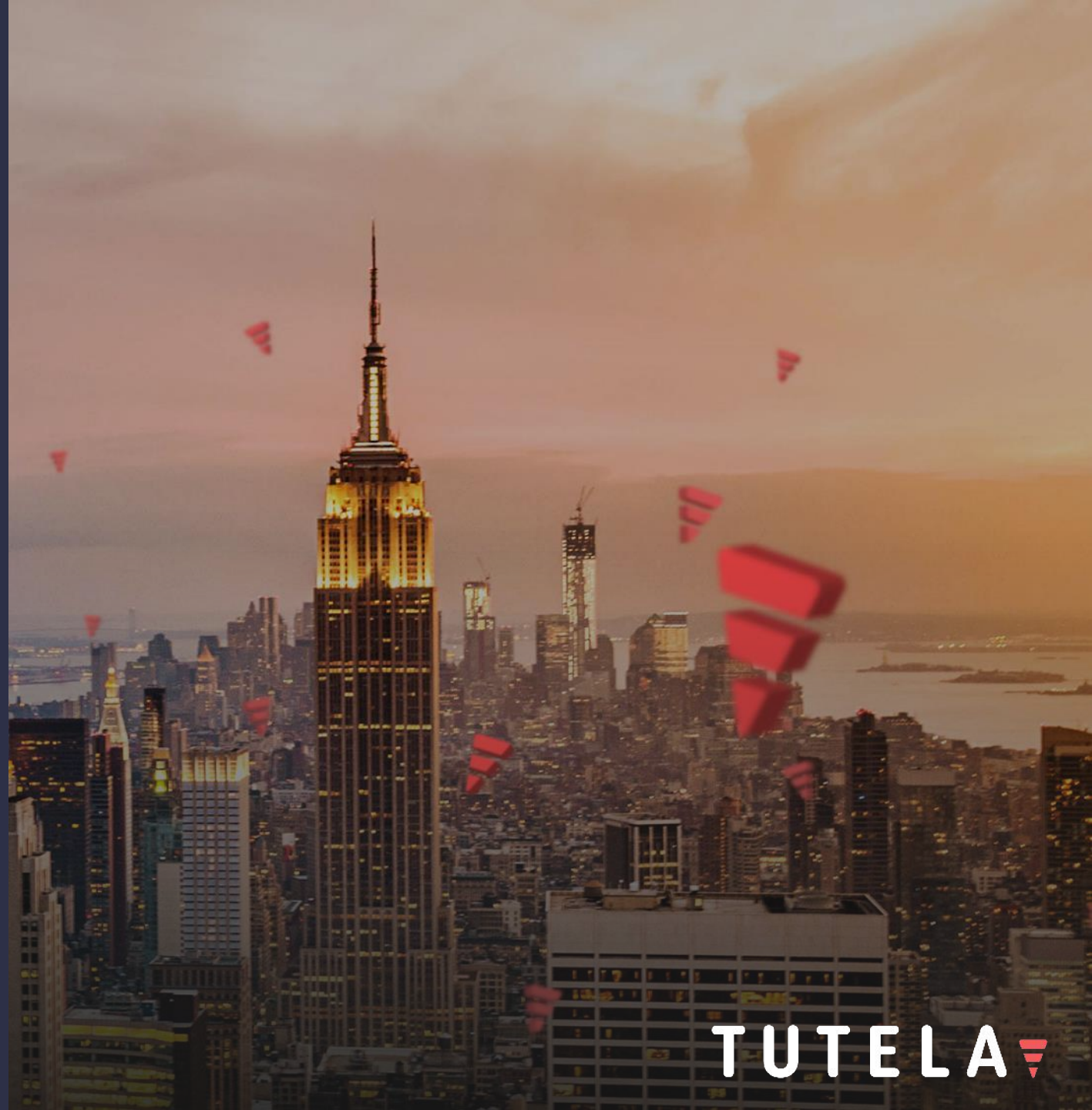
Automatically identify coverage holes

Find areas of “confirmed no-coverage” for any operator

Group by clusters to find largest problem areas



Gracias!



TUTELA 