



Session 5: Operational strategies for QoS measurement

OSS-based solutions: a cost effective way to measure QoS countrywide

José Ruy - Product Manager at  jose.ruy@bwtech.com

Who is speaking ?

- José Ruy - Brazilian, from Belo Horizonte, Minas Gerais
- Electrical Engineer, specialized in Telecommunications and Computer Science by UFMG, with MBA in project management by FGV
- In the telecom industry for over 11 years
- Product Manager of an OSS-Based solution software
- This software won as the best one in its category in well know events of the industry in LATAM (2016), MENA (2017) and Africa (2017)





Network Overview

Network – Operation

Night



Day

It's $24 \times 7 \times 366$ – **yes, the leap year too!**

Network – Coverage

- Countrywide



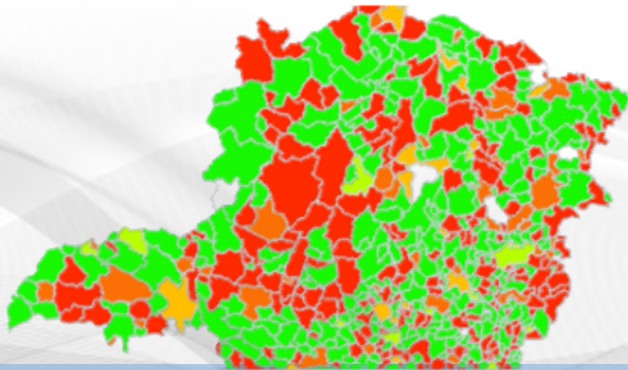
Brazil 207.7 million people

- Per State



Minas Gerais 20.87 million people

- Per City



Belo Horizonte 2.5 million people

Network - Performance



Not constant

The Network is CCnC

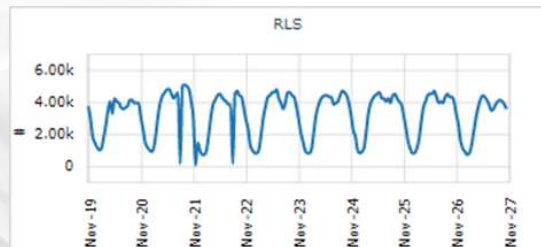
- Continuous



- Countrywide



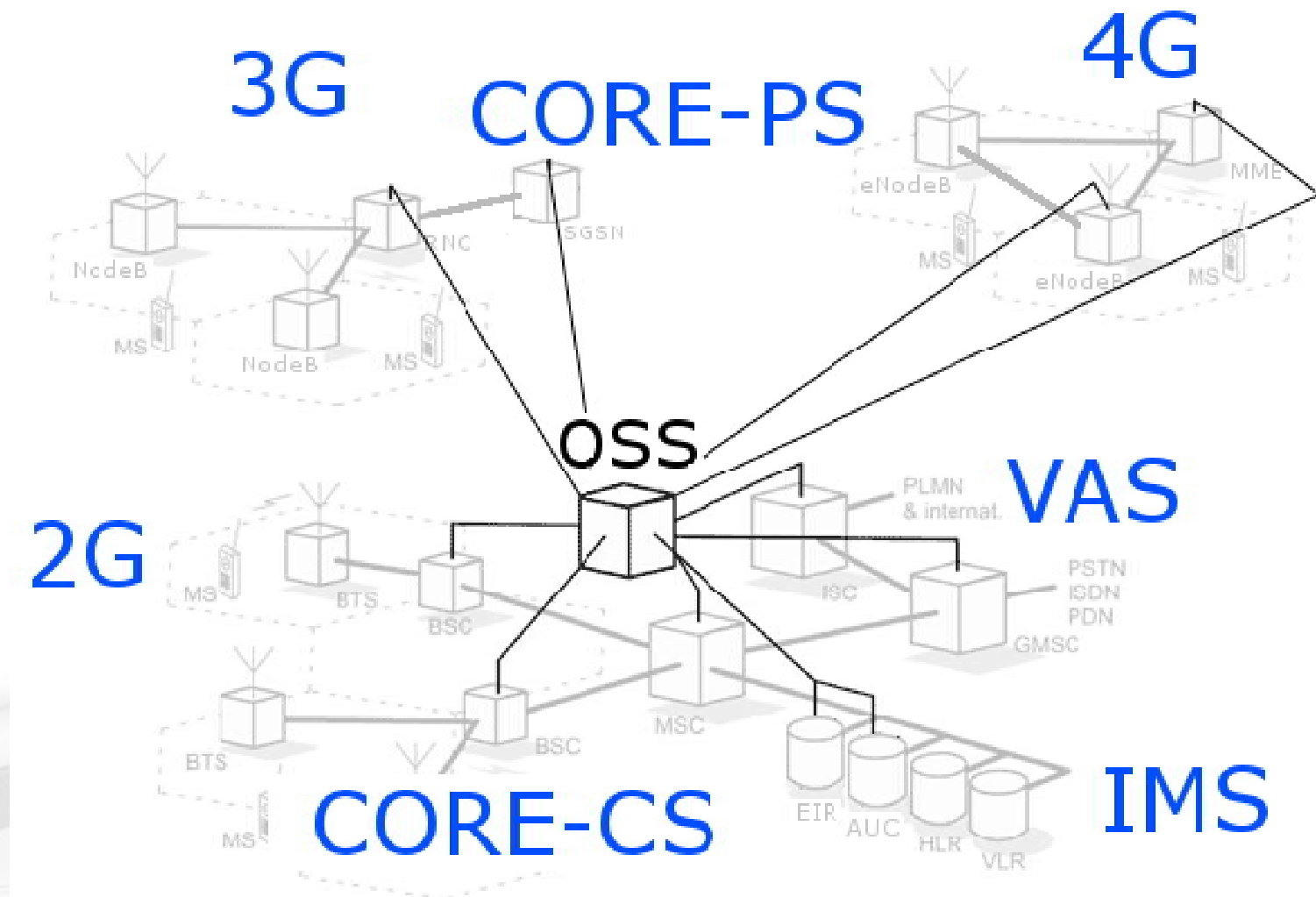
- not Constant



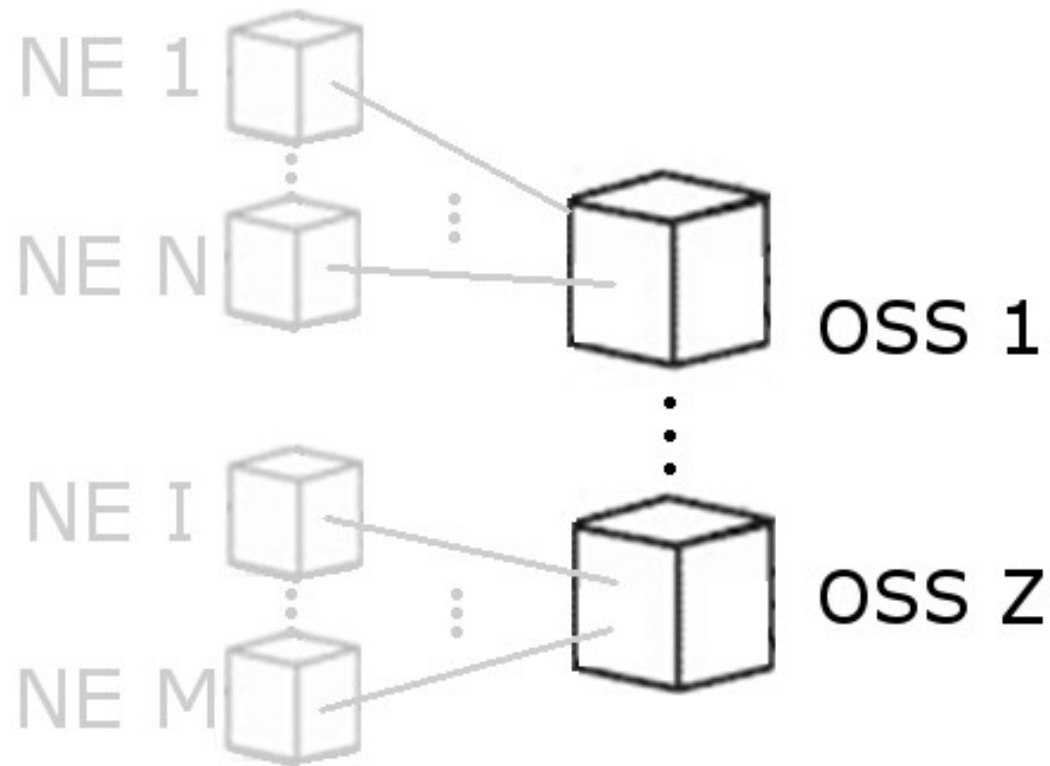


OSS Stats

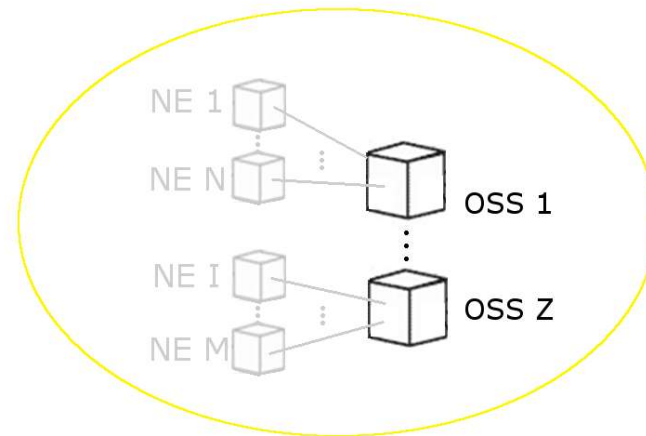
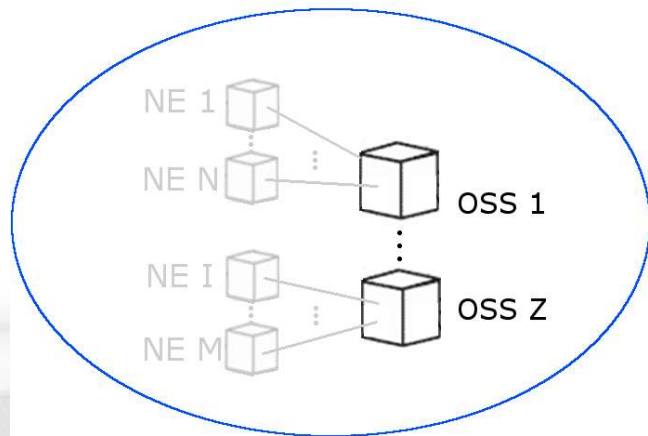
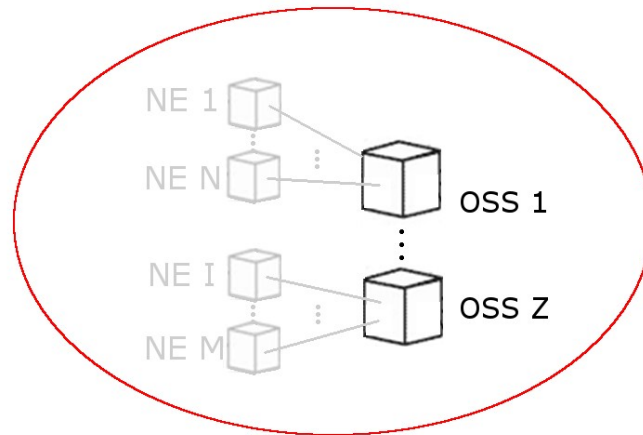
OSS – Operation Support System



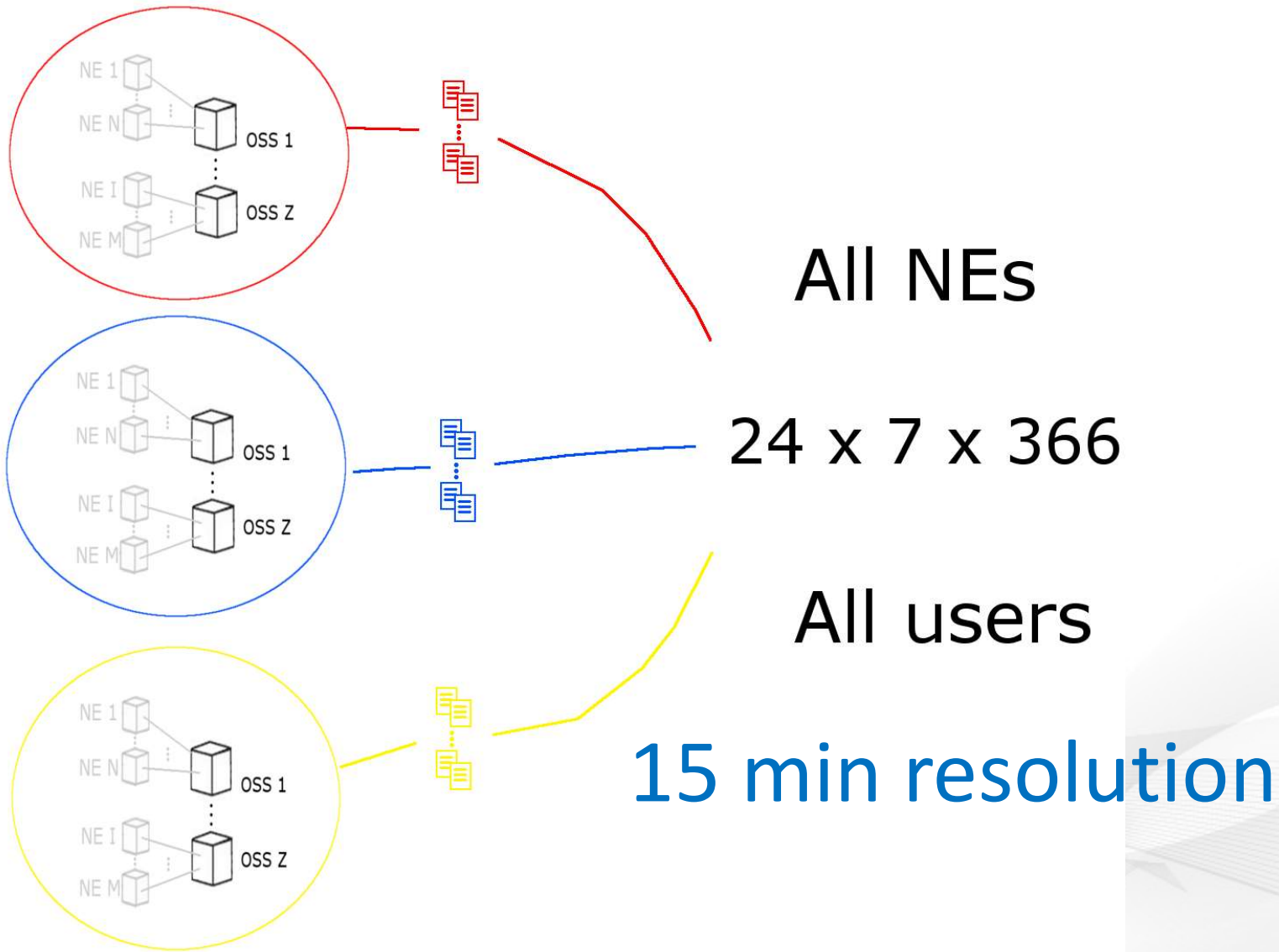
OSS – Can be more than one




OSS – Per vendor



OSS – Data Reporting



OSS – Characteristics

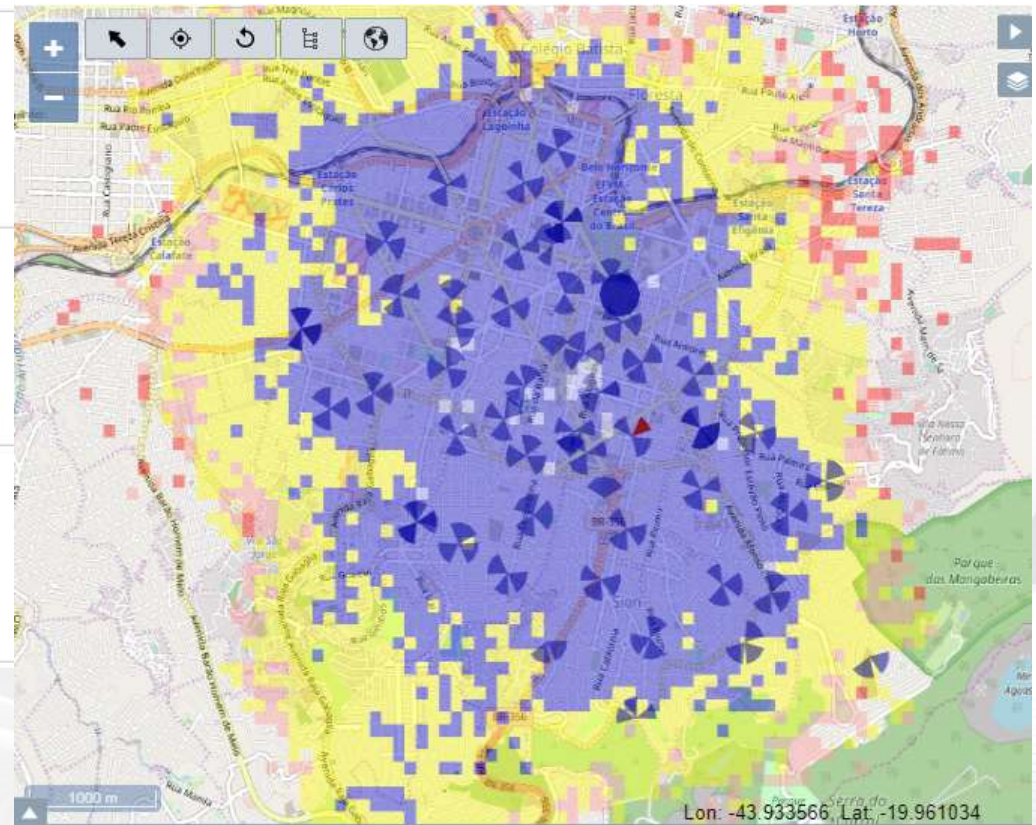
- Comparability: history data and other networks
 - Trustable and complete: all users, all data, all the time (CCnC)
 - Service level from network side
 - Service level from user side (statistically)
- 

OSS – Data Usage Examples

Network level KPIs



Data throughput geolocated






Drive Test

Drive test (DT)

- One car, with a driver and an engineer
- One laptop, some phones, a GPS
- Driving through a city at some day
- May connect to a few different cells



DT – Characteristics

- One UE in a particular moment in time
 - No comparability: too specific to reproduce
 - Not representative statistically
 - Service level from user side (one user)
 - Outdoor data only
- 



OSS Stats vs Drive Test

Data amount

OSS Data

200 million people

All cells of the network (300.000)

24 x 7 x 366

True reflection of the network

CCnC

Drive test

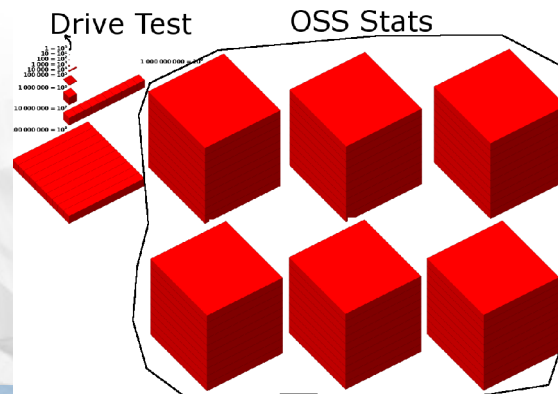
1 UE

Few cells in the route

1 instant in time (10 ms)

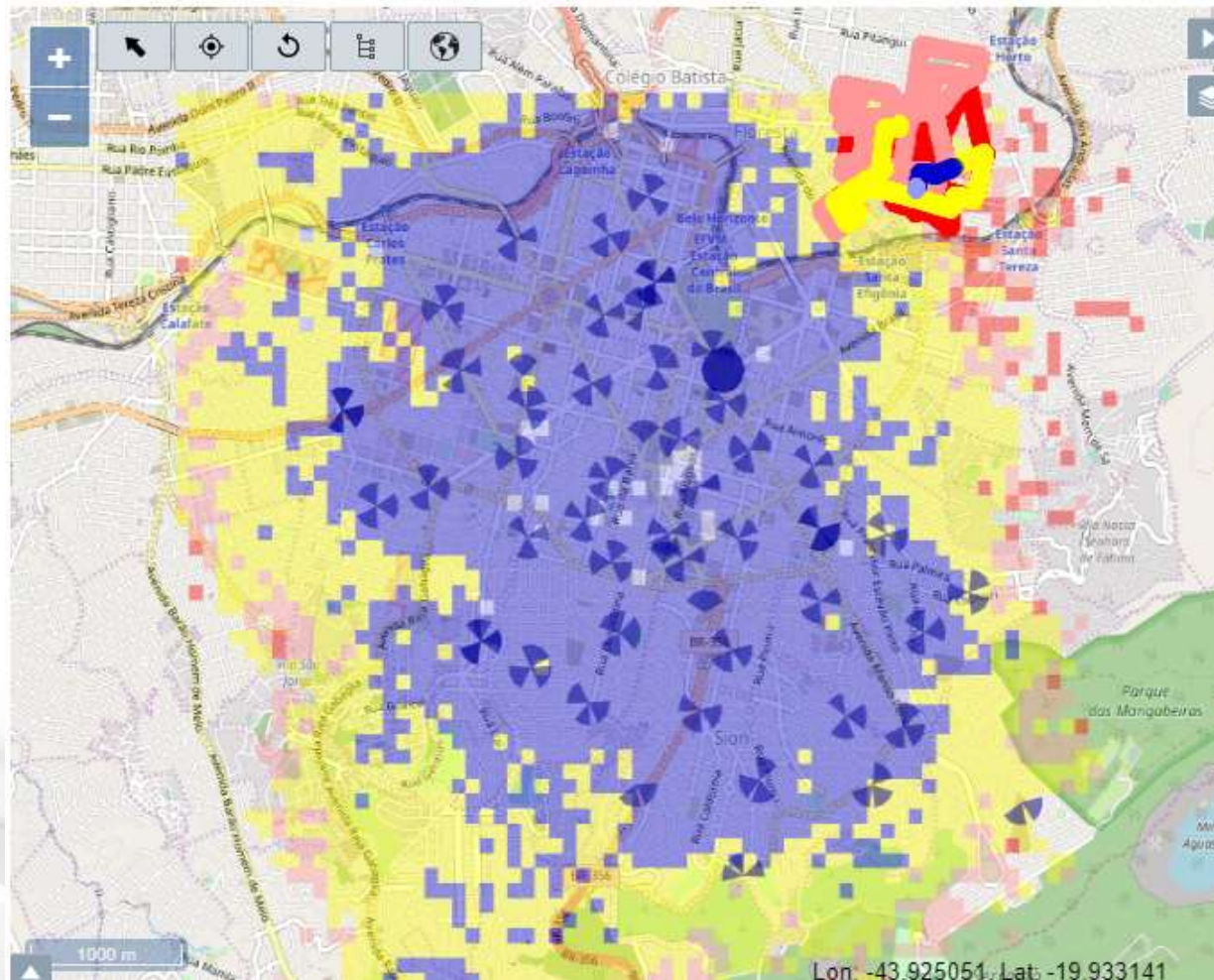
A small snapshot

Not CCnC



Data Usage

Throughput in a city: OSS Data vs drive test (up right)



Conclusion

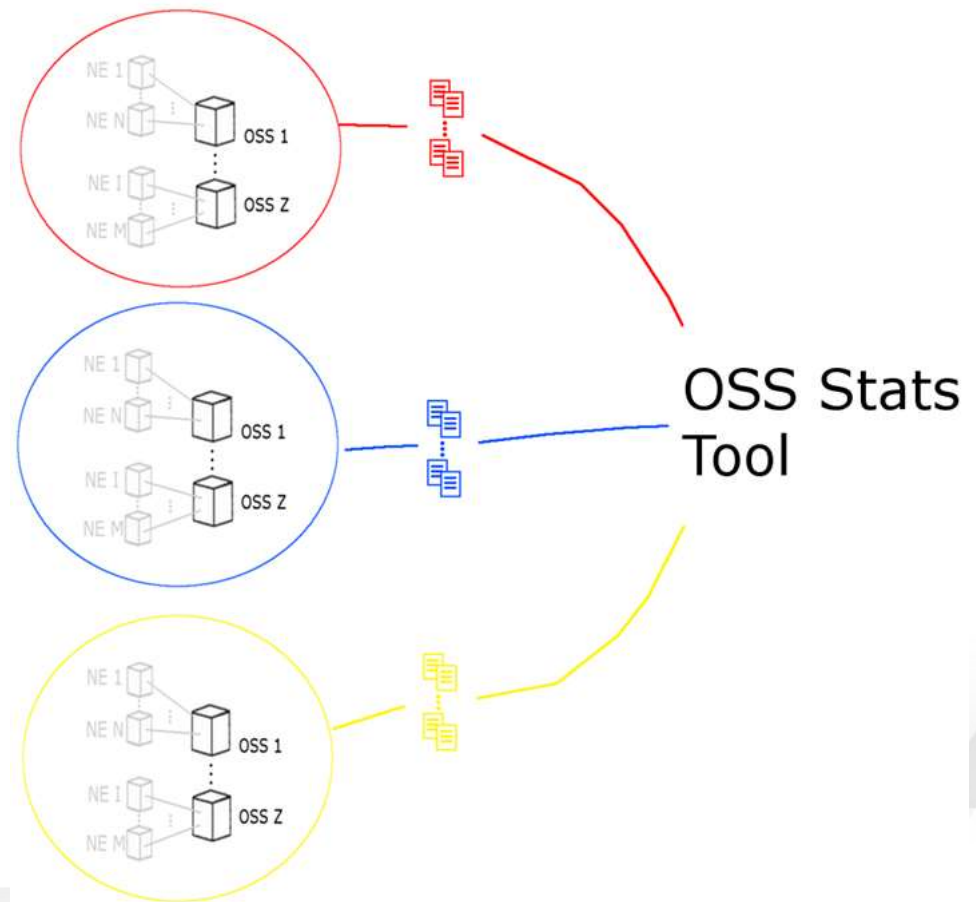
- OSS Stats allows to compare operators continuously, with no big effort
- It's all data, all UEs, no distinction, 100%
- Comparison on different levels (country, state, city, etc.)
- Cost-effective if compared to drive test



OSS Stats Tools

Introduction

- Vendors usually have their own tool: but works for their equipment only
- Data can be loaded manually by engineers or automatically
- Allows to monitor and optimize the Network, improving its quality



Requirements for Regulators

- Support all vendors from the operators (multi-vendor)
- Support all technologies in the country (2G, 3G, 4G)
- Support vendors version changes
- Allow monitoring and comparison of operators in different levels (country, state, city, etc.)
- Allow creation of KPIs
- Cost effective



KPI Definition for QoS

Which KPIs - example

- Coverage – is there a network?
- Accessibility – can I use the network ?
- Drop – is the network stable ?
- Data Throughput – is it fast ?
- Best operator (a combination of the above)
- Map the questions you want to answer with the correct KPIs

KPIs Considerations

- Each vendor has its own way to measure the network, with its own counters
- Formulas between vendors must mean the same thing
- What time aggregation to consider when comparing the operators ?
 - All data
 - Busy Hour
 - From 9PM to 11PM
 - Complex criteria: the average of the 5 hours with highest traffic, within the 2 days in the week with the lowest accessibility

Why all data

- Different operators may have different busy hours in their networks – the comparison must be fair and with the same data
- The purpose is to rank operators in a region, not to optimize the network or meet minimum KPI values

Why busy hour

- More load in the equipment = more prone to problems
- The purpose is to meet minimum KPI values

Why not to use a fixed time

- Because networks are not constant
- Traffic profile changes, the busy hour changes

Why not to use complex time aggregations

- May yield in similar results as daily or busy hour analysis
- May require high computational resources
- Introduce complexity in an already complex environment is not good: may generate misunderstandings, miss calculations and unnecessary errors



Comparing Operators Performance

Comparing by different levels

The image displays four screenshots of the bwtech software interface, illustrating data analysis at different levels: All, Brazil, and MG (Minas Gerais). Each screenshot shows maps, performance metrics, and a table of results.

Top Left Screenshot (All - ACC_RRC): Shows a map of Brazil and performance metrics for the 'All' level.

Metric	3G	4G	Total
Accessibility	98.68%	99.73%	99.73%
PS Drop	0.89%	2.4%	1.19%
CS Drop	1.21%	0%	1.21%
Data Throughput (Mbps)	1.55	20.1	4.14
Coverage	88%	41%	65%

Top Right Screenshot (All - Brazil - ACC_RRC): Shows a map of Brazil with regional data.

Metric	3G	4G	Total
Accessibility	98.68%	99.73%	99.73%
PS Drop	0.89%	2.4%	1.19%
CS Drop	1.21%	0%	1.21%
Data Throughput (Mbps)	1.55	20.1	4.14
Coverage	88%	41%	65%

Bottom Left Screenshot (MG - ACC_RRC): Shows a map of Minas Gerais with detailed regional data.


Metric	3G	4G	Total
Accessibility	98.68%	99.73%	99.73%
PS Drop	0.89%	2.4%	1.19%
CS Drop	1.21%	0%	1.21%
Data Throughput (Mbps)	1.55	20.1	4.14
Coverage	88%	41%	65%

Bottom Right Screenshot (MG - ACC_RRC): Shows a map of Minas Gerais with a detailed table of results for Belo Horizonte.


REGION	BEST_OP	WORST_OP	ALL	3G	4G	Total
Belo Horizonte			100	84.73	84.24	90.94
Belo Oriente			100	96.75	91.75	100
Belo Vale			100	100	93.79	100
Campo Belo			100	91.2	97.29	97.5
Monte Belo			86.44	97.47	100	100

The interface also includes a 'CHARTS' section showing a line graph for 'Belo Horizonte - ACC_RRC - week' and a 'FORMULAS' section.

Comparing by time

- Which operator is the best in the last week, month, year?
 - Is the operator quality improving over time ?
- 
- The bottom of the slide features a decorative graphic consisting of several overlapping, wavy, semi-transparent lines in shades of light blue and white, creating a sense of motion and depth. These lines flow across the width of the slide, with some appearing to rise and fall like waves.

Final Slide

- OSS Stats: a valuable source of data to improve networks
 - IF MNO invests money in network, OSS Stats will reflect this
 - Regulator to work together with MNO to improve network quality
- 
- The bottom of the slide features a decorative graphic consisting of several overlapping, wavy, semi-transparent lines in shades of light blue and white, creating a sense of motion and depth. These lines flow across the width of the slide, with some appearing to rise and fall like waves.



Session 5: Operational strategies for QoS measurement

Thank You!

José Ruy - Product Manager at  jose.ruy@bwtech.com