OMNITELE

experience

Predictive Analytics for QoS/QoE measurements

August 20th 2019

agenda

- What is Omnitele
- Predictive analytics for quality measurement data
- Market use cases:
  1. Drive-test benchmark
  2. Crowdsourced measurements
- Value to operator
- How is it done

Omnitele

Network Transformation Consultancy
and Professional Services

Based in Finland

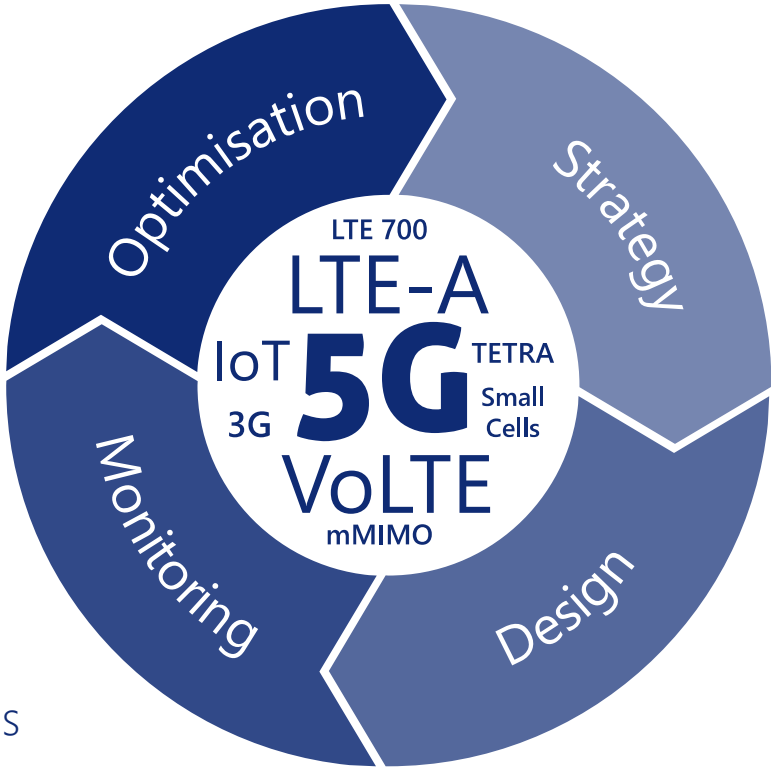
35+ experienced consultants

30 years of history

1000+ projects in 80+ countries

Independent from vendors & operators

Consultancy services & customised solutions



Omnitele Services Portfolio

Strategy

for optimal impact

Technology options with best fit to your transformation objectives

Strategy selection with optimal impact on your network

Investment plan & timing with maximised ROI

Design

to secure the targets

Secured performance and interoperability of the legacy and the new technologies

Future proof dimensioning ensuring the quality & business targets with minimum cost

Detailed optimisation to secure seamless service launch

Monitoring

the target realisation

Prediction and monitoring of quality & customer value realisation in the network

Benchmark to competition & internal operators

Identifying the root causes behind performance gaps, including operational, design, technology and spectrum

Optimisation

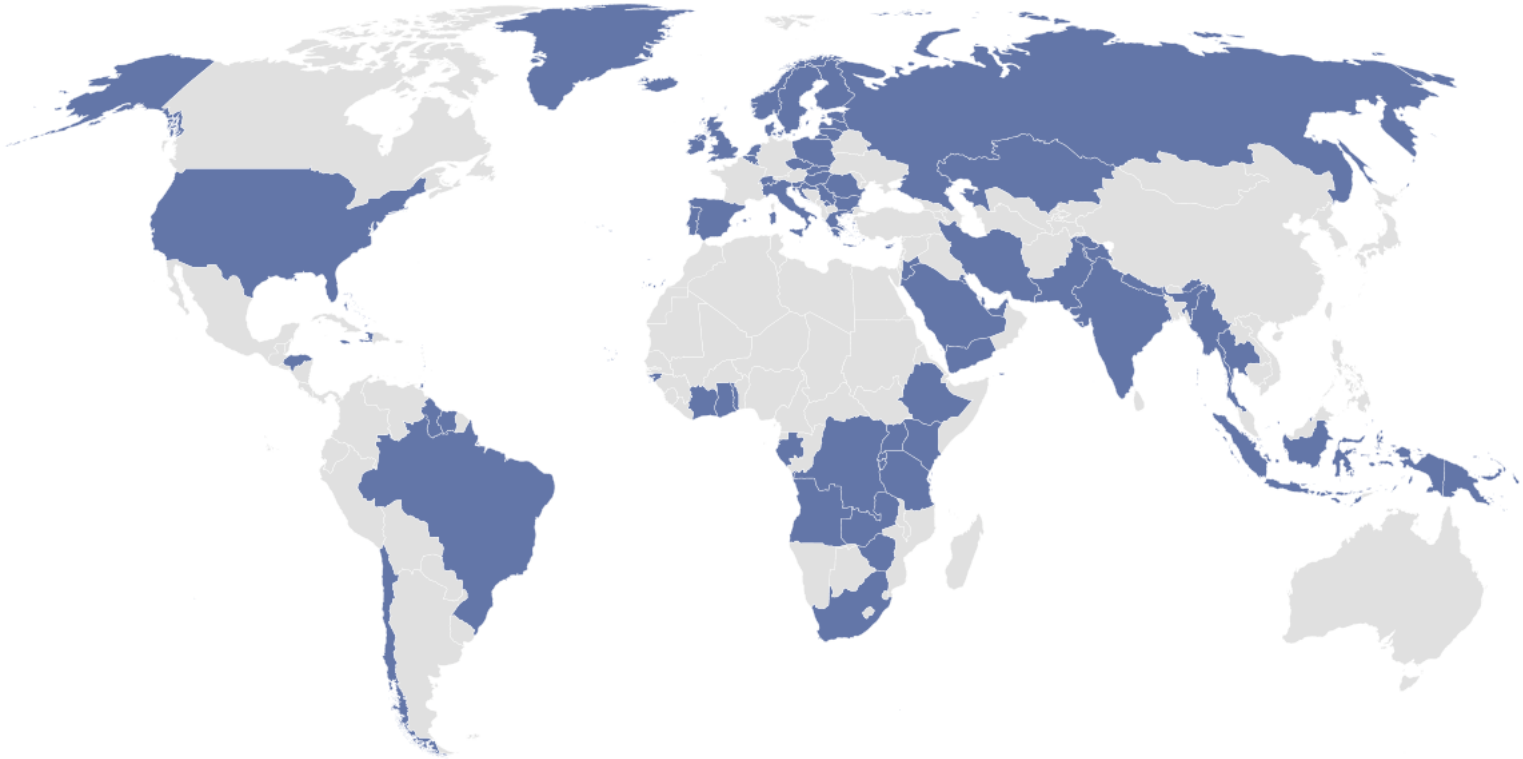
of network value

Maximised performance from the deployed network assets

Optimised expansions with maximised ROI, avoiding under & over investments

Evaluation of technology life cycle and timing of the next technology transformation

Omnitele Projects Footprint



OMNITELE PREDICTIVE ANALYTICS

OUR VISION

Any measurement data can be developed for higher value than their original use

Notable value can be gained for both strategic & operational network managment

Field-tests

Crowdsrouced

OSS/PM

From quality monitoring to..

..Design optimisation & Opex saving
..Strategy optimisation & Capex saving

Operational targets

Quantifies the reasons behind operator quality gaps

Predicts the achievable improvement from focused actions

Prioritises the actions to secure quality leadership

…results in 30-60% Opex saving in network optimisation

Strategic targets

Quantifies the relevance of **different technology strategies**

Predicts **impact of LTE expansions & 5G rollout**

Prioritises RAN **investments for maximised return**

...results in 20-40% Capex saving in meeting the quality targets

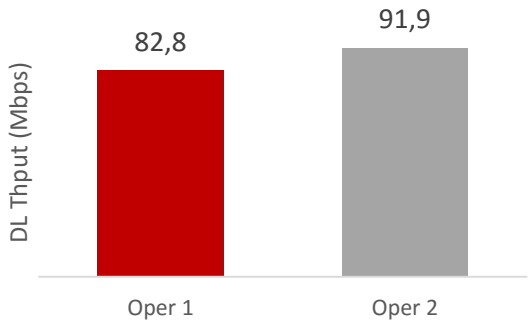
OPERATOR USE-CASE 1:

PREDICTIVE ANALYTICS FOR DRIVE-TEST BENCHMARK

Starting point

- The operator has the goal to be quality leader in the market
- They have recently invested to additional LTE spectrum & 3-CC
- The operator was expecting the leading position in network benchmark
- Omnitele was hired to verify the status with drive-test benchmark, focusing on available downlink data-speed & key applications
- Omnitele methodology included predictive analytics to quantify root-causes & optimal action plan for the follow-up optimisation

Why are we behind the competition?



Potential reasons..

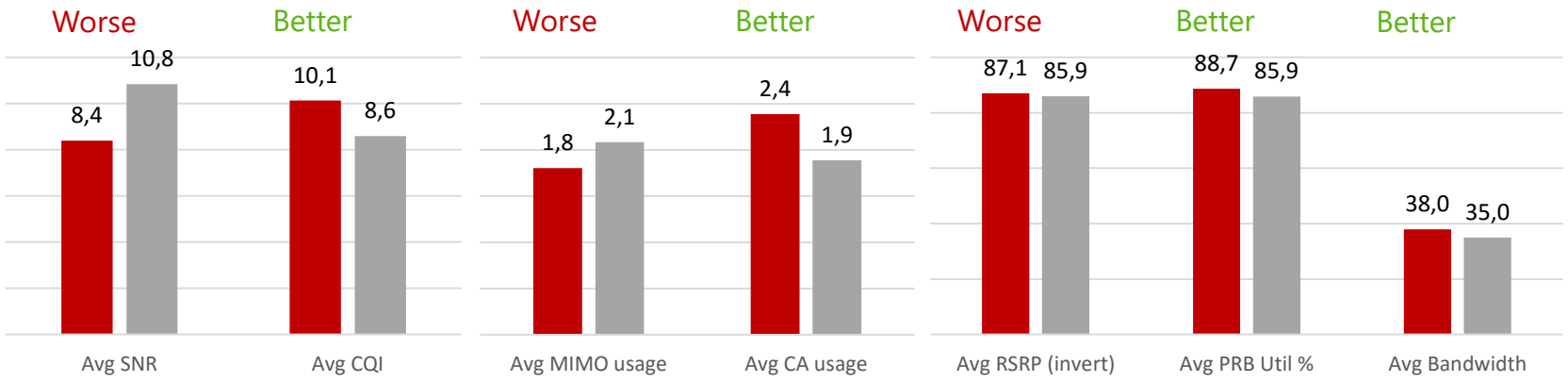
Network strategy
...Spectrum
...Capacity
...Features

Network planning
...Coverage
...Cell dominance
...Traffic steering

KPIs give an indication ..maybe

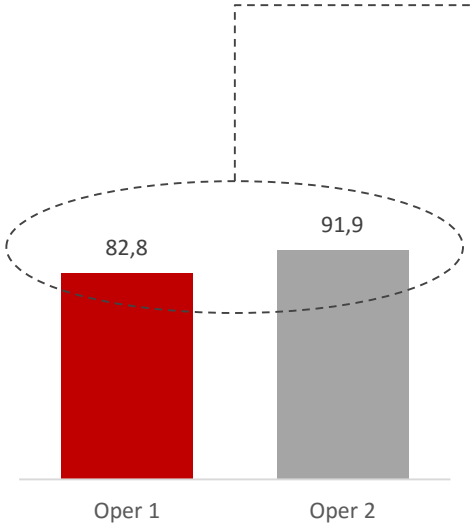
Despite clearly lower throughput, many of the KPIs are better for Oper-1

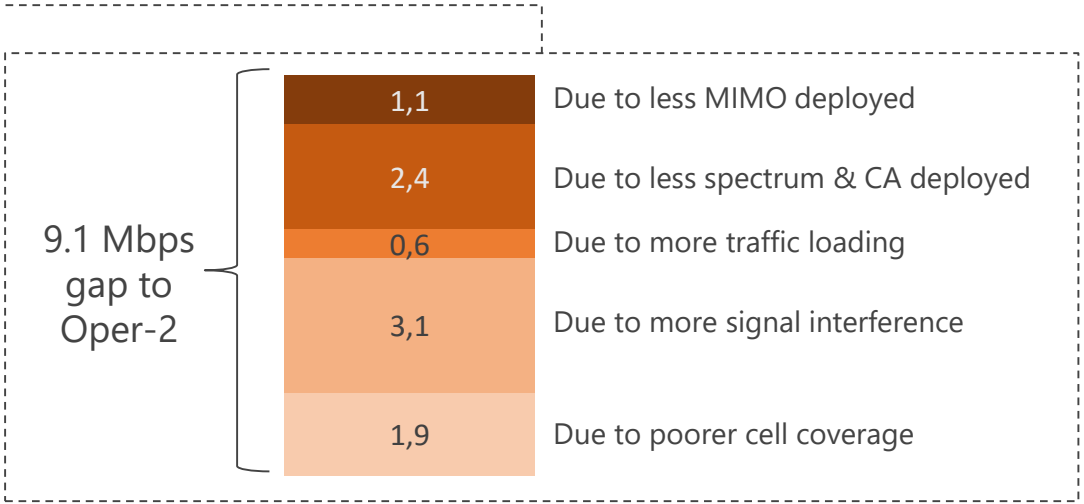
Looking at the KPIs, it is not clear where the gap comes from



What predictive analytics tells

Quantifies the impact of strategic & operational differences

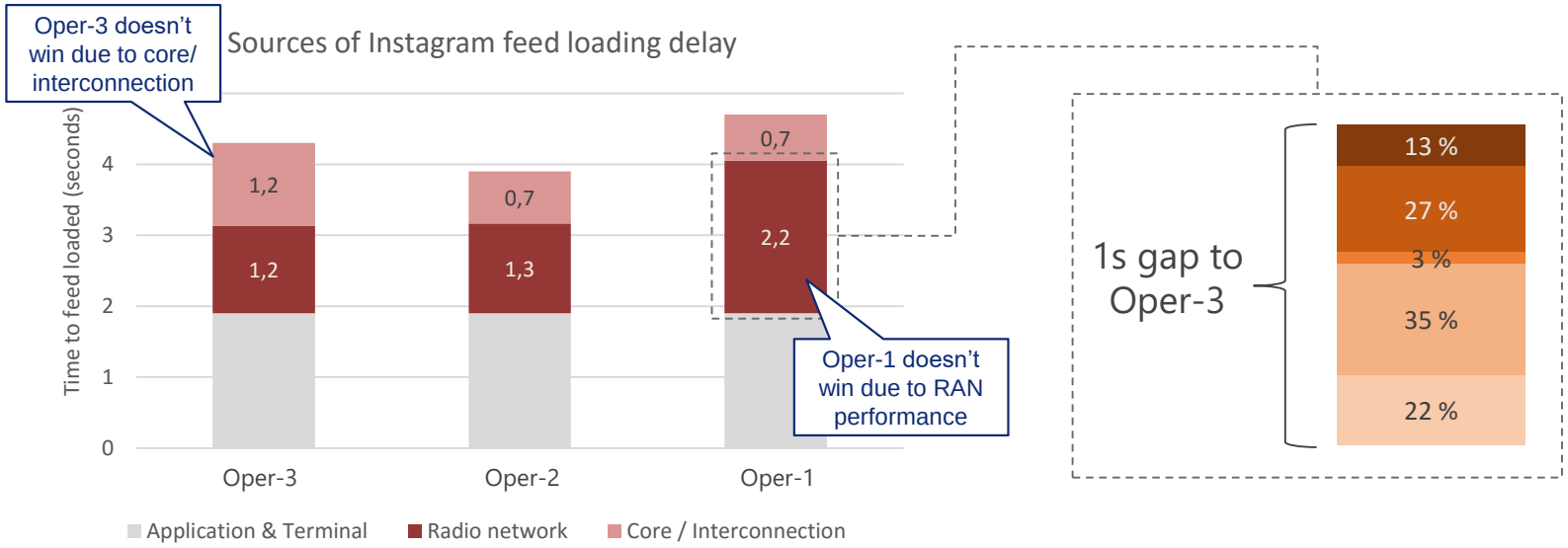




Despite Oper-1 has higher spectrum & CA utilisation on average, those are still major contributors to the lower overall Thput

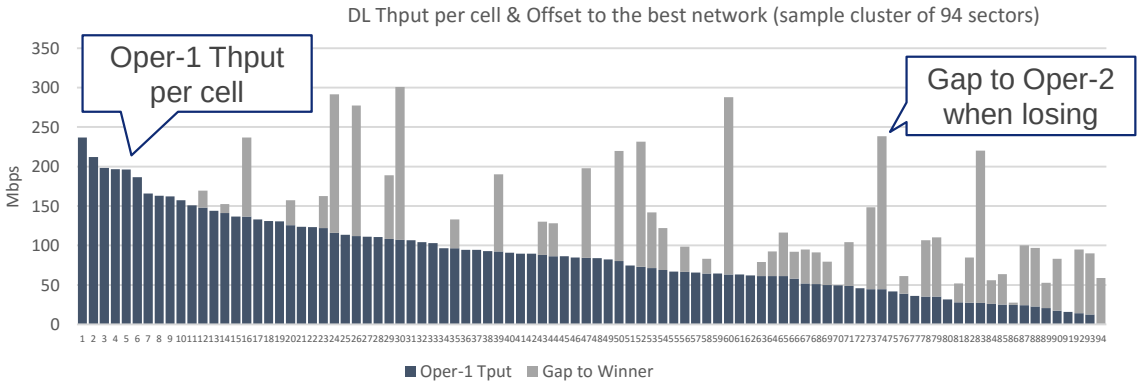
What predictive analytics tells

Quantifies sources of application experience KQIs

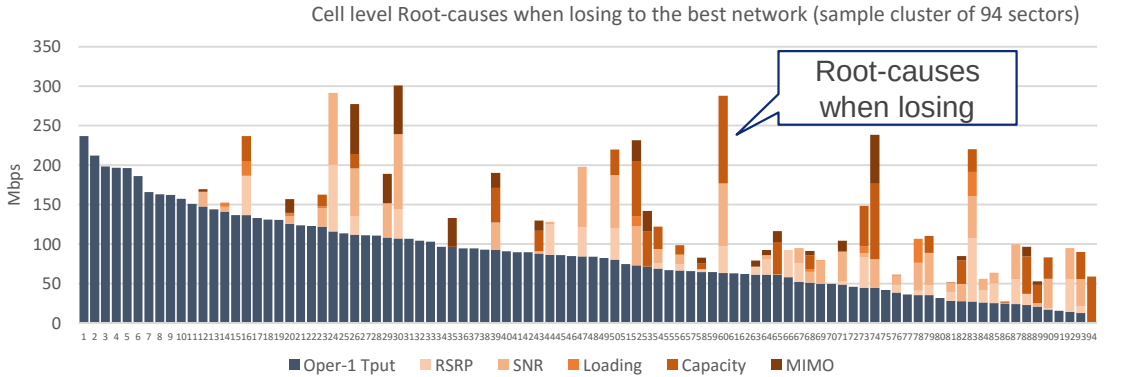


Cell level root-causes for quality gaps

Splitting measurements to cell & sectors enables detailed root-cause analysis



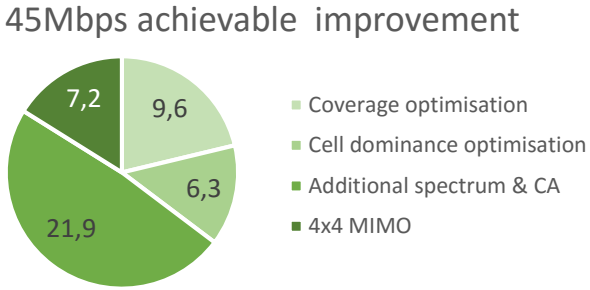
Prediction models quantify how much individual KPI-gaps contribute to the throughput in the cell

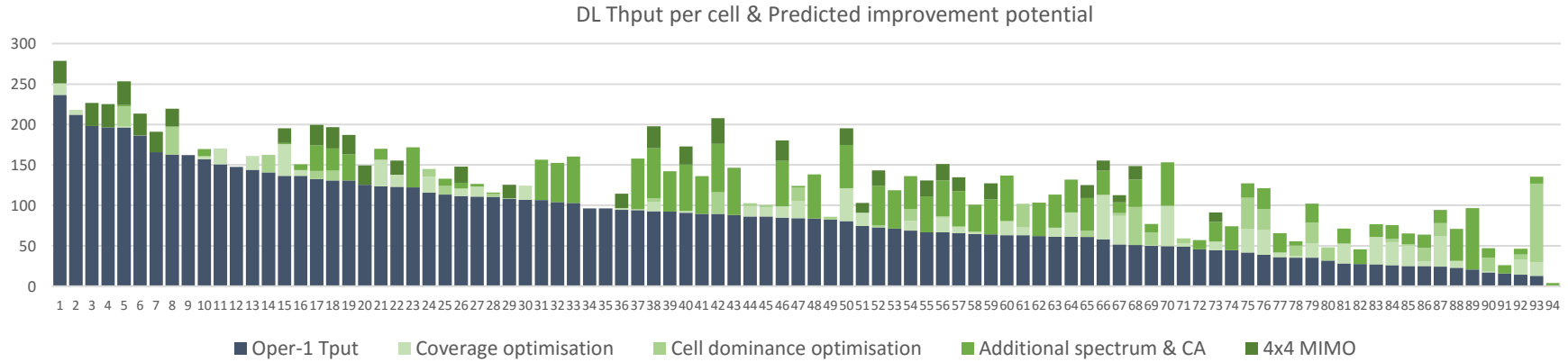


Improvement from optimisation

Total ~45Mbps improvement potential quantified from different optimisation actions

Not feasible to execute all actions at once, but the quantified potential is the key to effective & efficient optimisation



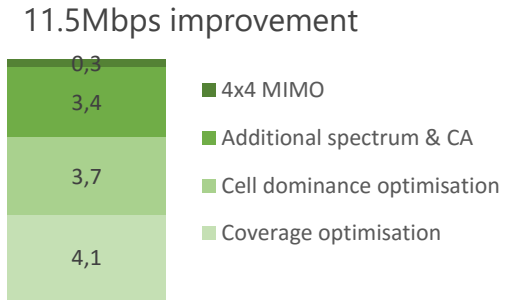


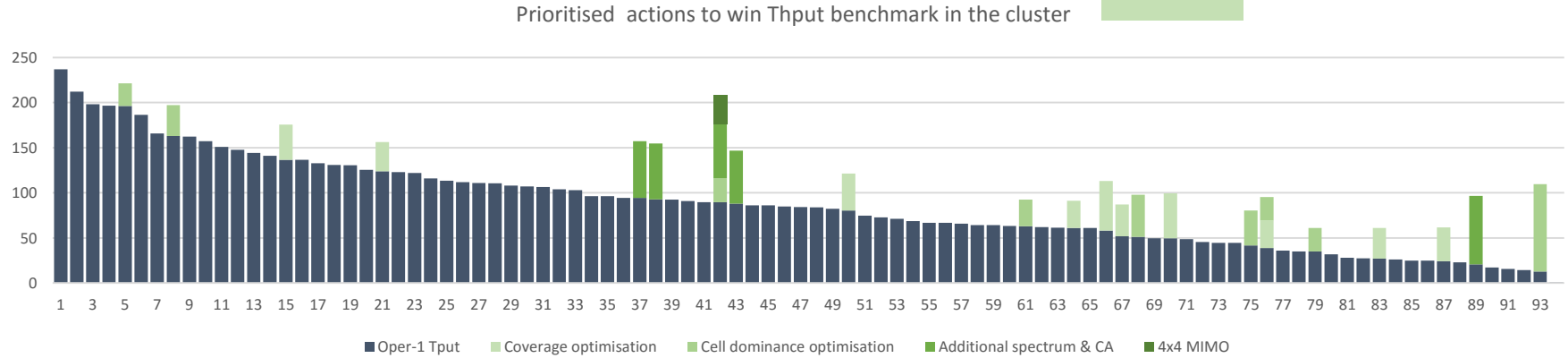
Prioritised actions to win the benchmark

Actions needed to win benchmark in a sample cluster

25 focused optimisation actions are expected to turn Operator-1 into benchmark winner in the sample cluster

Actions are prioritised by the expected Thput improvement & the cost-efficiency of different actions (Opex & Capex)

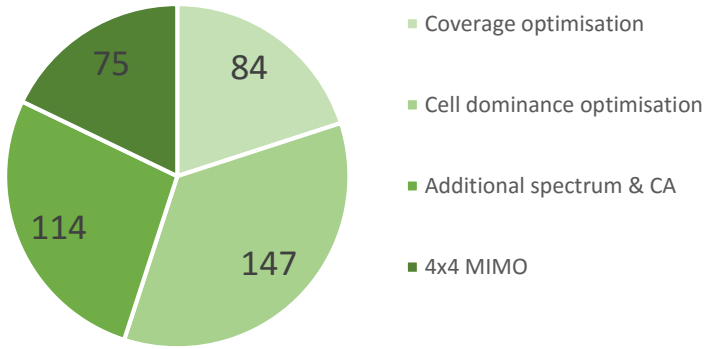




Project outcome

- Total 420 optimisation & expansion actions network wide
- +11Mbps DL throughput improvement targeted in network level
- Each planner has prioritised list of actions to execution
- Optimisation campaign schedule cut from 5 months to 3 months
- Optimisation budget cut by 45%

Network wide optimisation plan
(# of sectors with different actions)



COMPARISON TO
DIRECT KPI ANALYSIS (Traditional method)

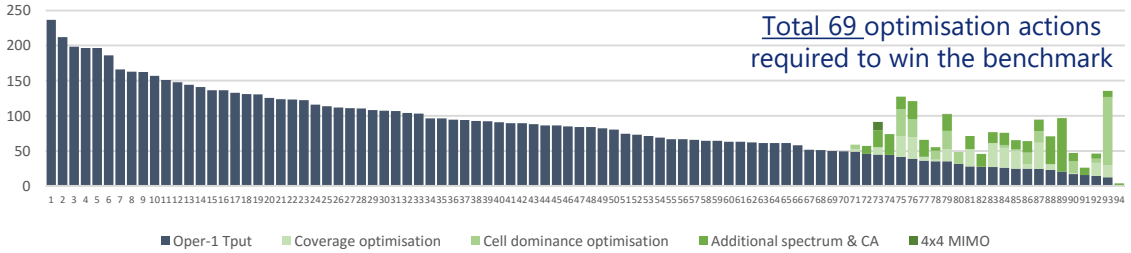
40-60% less Opex in optimisation

To win the benchmark

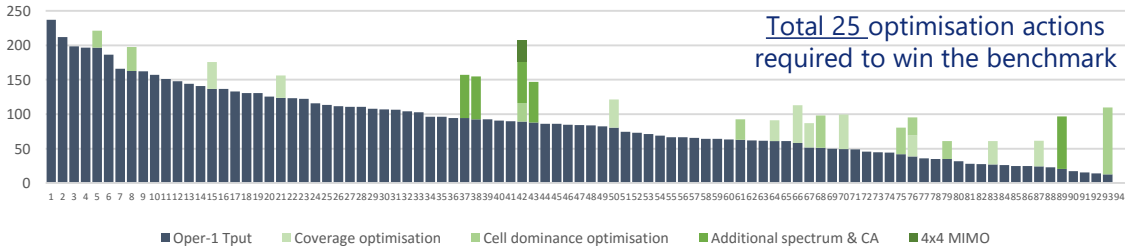
Traditional optimisation focuses on cells with the lowest KPIs

This can steer the efforts into actions that are not always effective

Optimisation prioritization **by worst KPIs**



Optimisation prioritization **by predictive analytics**

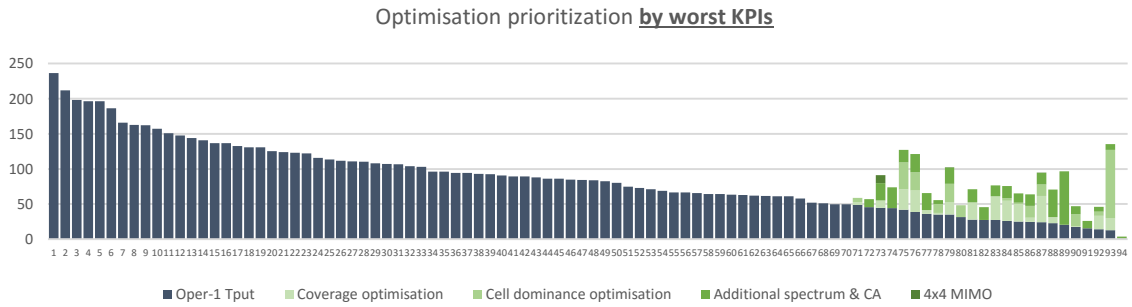


With predictive analytics driven optimisation the achieved Opex saving is in range of 40-60%

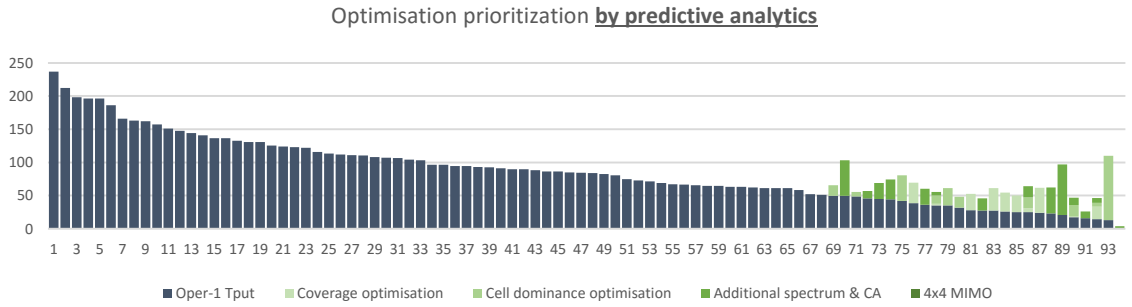
40-60% less Opex in optimisation

To minimise low-throughput sectors

69 optimisation actions
→ 92% of sectors > 50Mbps



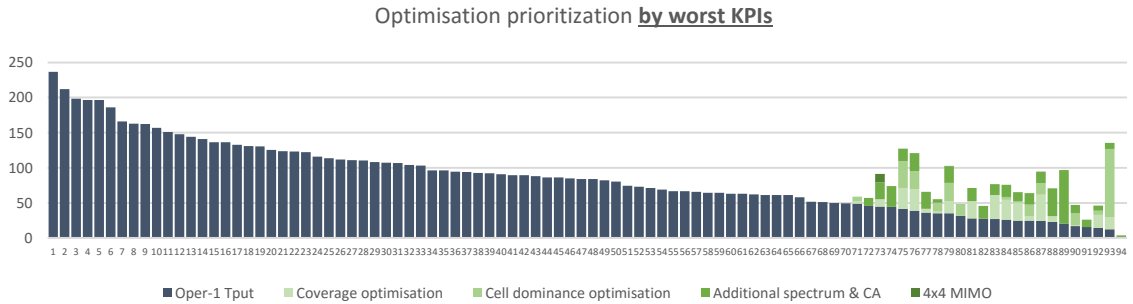
31 optimisation actions
→ 94% of sectors > 50Mbps



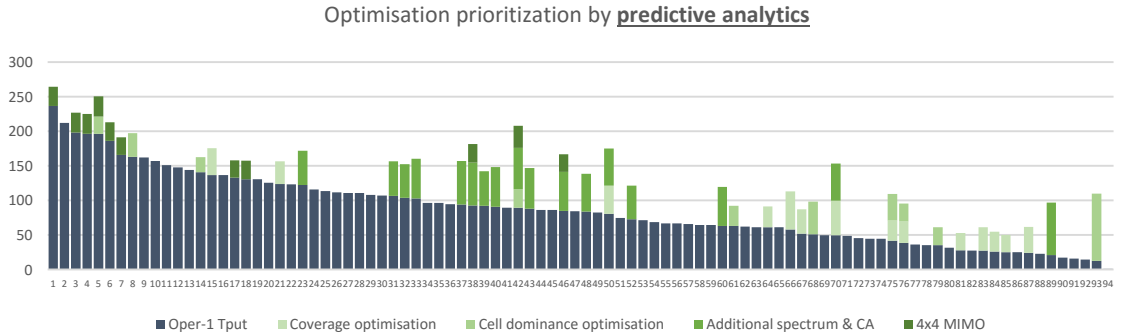
100% more quality improvement

with the same amount of Opex

69 optimisation actions
+11Mbps avg sector Thput



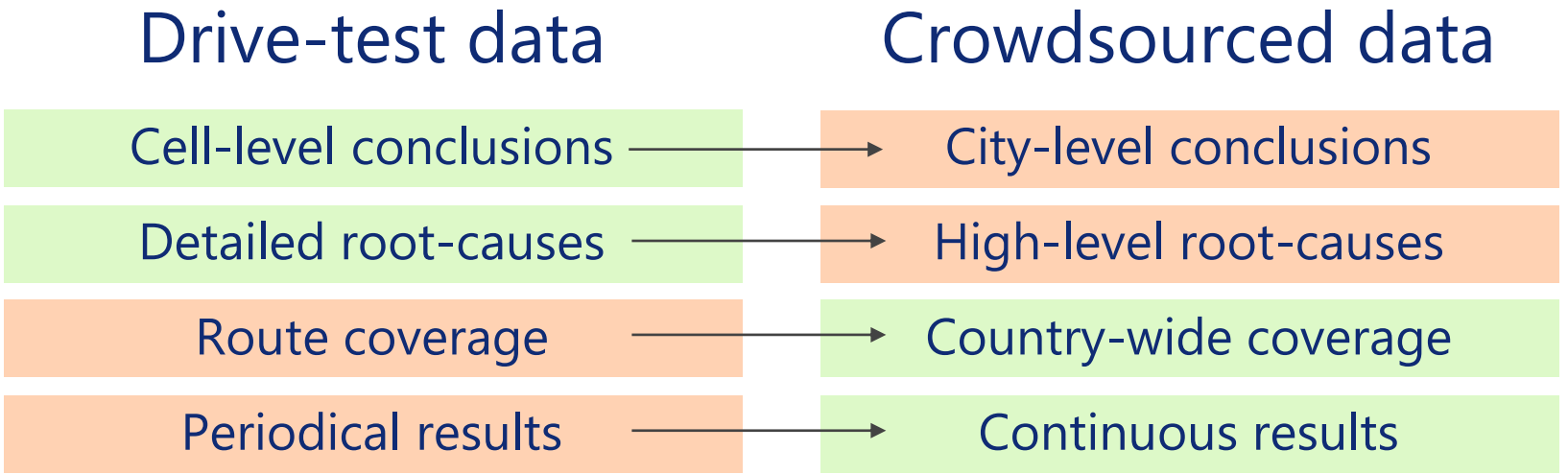
67 optimisation actions
+22Mbps avg sector Thput



OPERATOR USE-CASE 2:

PREDICTIVE ANALYTICS FOR CROWDSOURCED MEASUREMENTS

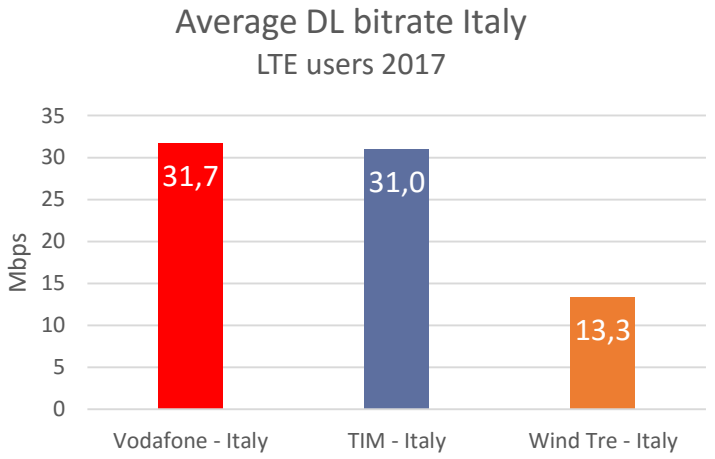
Difference to Drive-test analytics



4GMark crowdsourced data benchmark
Case Italy

DI data speed benchmark shows that Vodafone & TIM are almost in par with the network performance, TIM slightly trailing behind Vodafone

In 2017 Wind & Tre networks & spectrum were still partly separated, which indicates the reason for the big gap against the two other operators



The samples are avg throughputs of individual users from 4GMARK measurement data base. 4GMARK database includes measurements from total 12500 subscribers in Italy

Root-causes for operator gaps

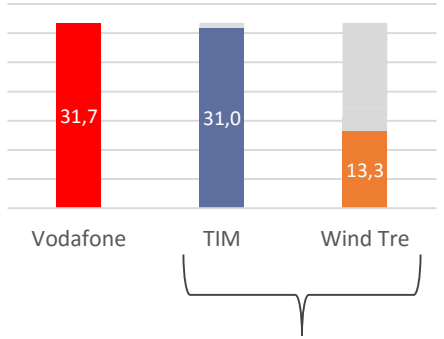
Case Italy

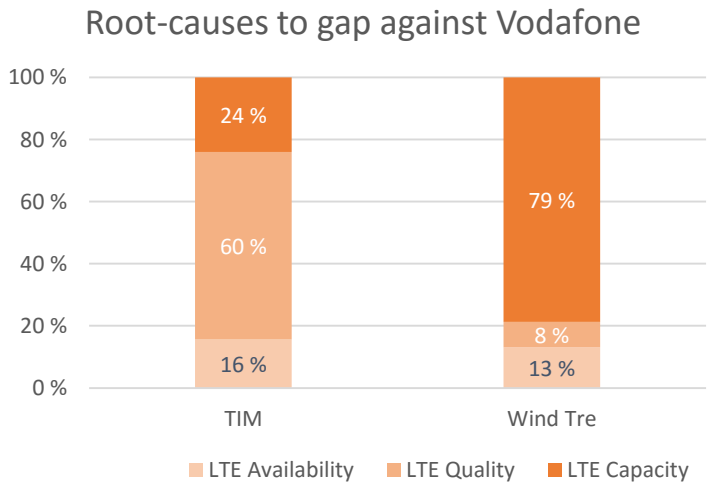
Predictive analytics on the measured network KPIs reveals how much the DL speed gaps are caused by different network limitations

Wind Tre gap to Vodafone is almost fully explained by the LTE capacity, i.e. the narrower band for the high-band LTE

TIM's small gap to Vodafone is mostly explained by the lower LTE signal quality, which is the usually the most common root-cause, when networks are otherwise similarly dimensioned

LTE availability explains only small part of the differences, as the overall coverage is relatively good for all operators, and concentrated in the same areas





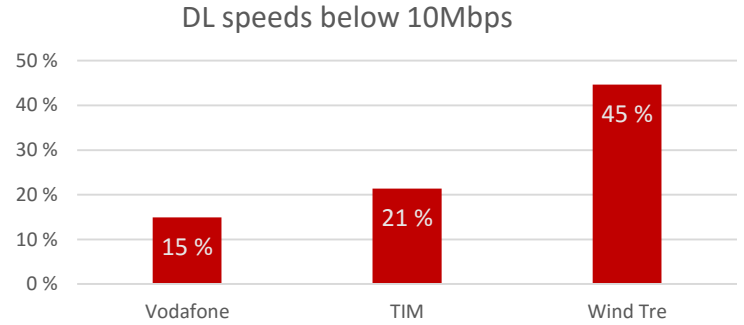
Root-causes for low data speeds

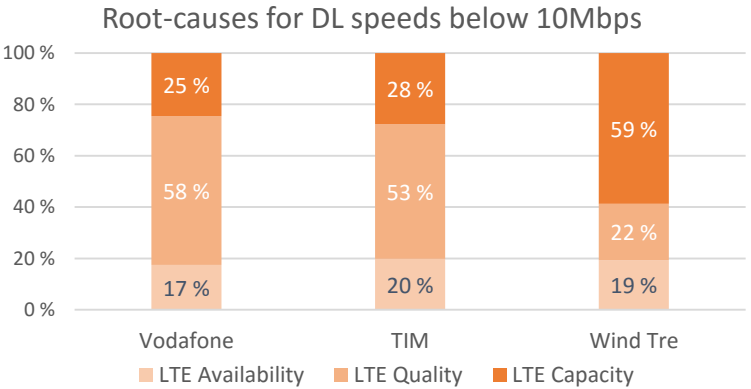
Case Italy

Root-causes can be also quantified for low QoE samples, i.e. “what is causing the DL speeds to be below critical threshold?”

Wind Tre has lot of low DL speeds, they are mostly due to low LTE spectrum capacity.

Both Vodafone & TIM low DL speeds are mostly caused by low signal quality, which the dominant reason in any LTE network that have the “standard” LTE spectrum capacity.

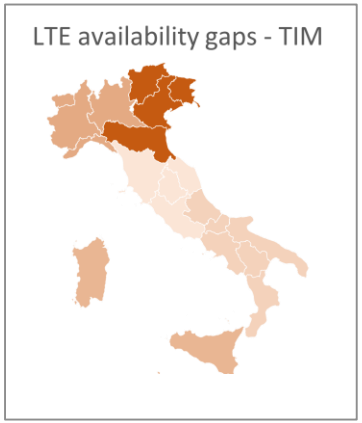


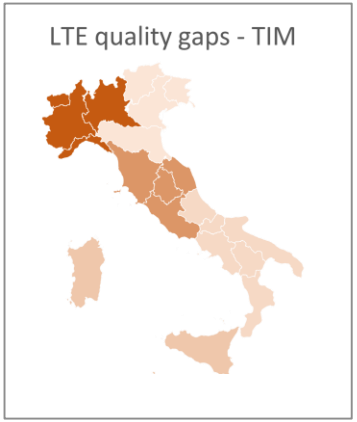


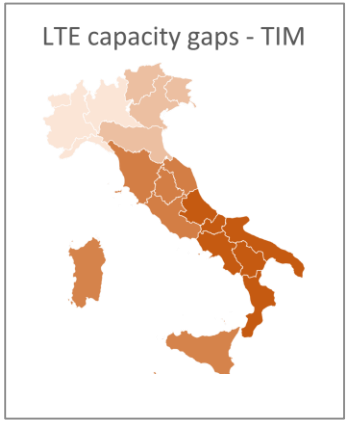
Root-causes for low data speeds
Case Italy

Root-causes can be analysed reliably in cluster, city, or region level

Cluster & region level results can be used to target the right actions to right areas, and to predict the regional improvement from strategic network changes







CUSTOMER VALUE BENCHMARK

FROM QUALITY GAPS TO VALUE GAPS

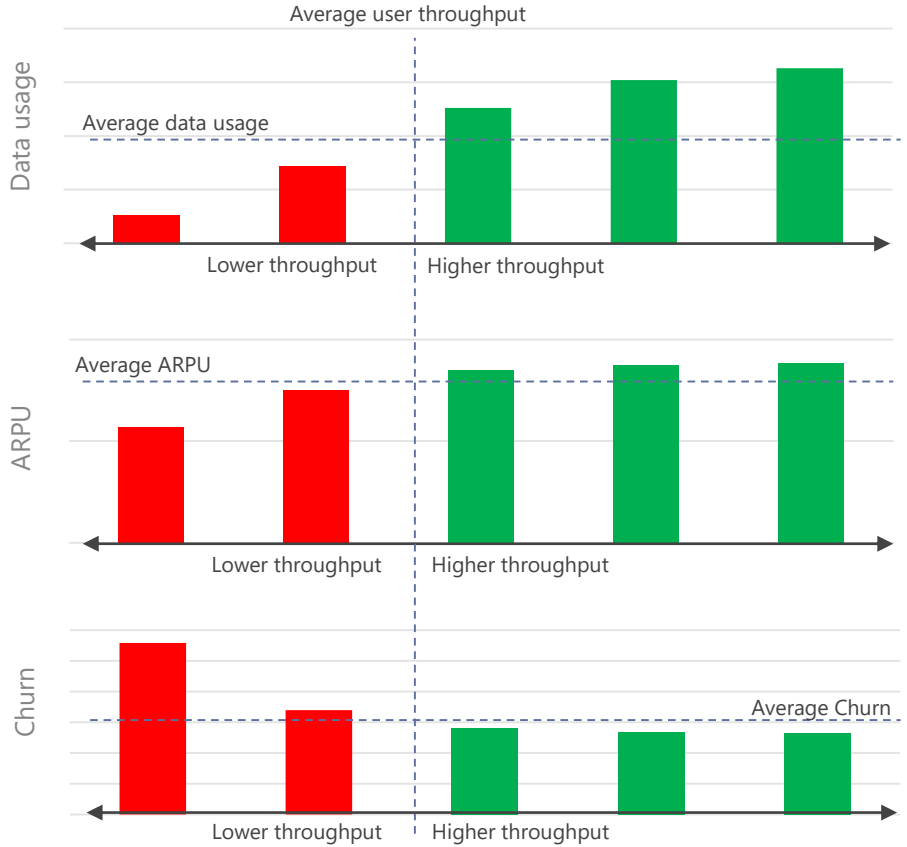
Customer value gap-analysis

Case Italy

In most markets subscribers behave in similar way when the quality deviates from the market average

Market & operator specific prediction models require additional information on

- Used data applications
- Avg data usage & churn
- Data ARPU tariffs & bundles
- Subscription types (Postpaid/prepaid)

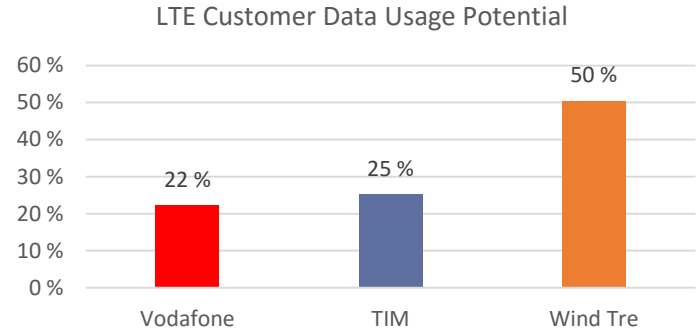


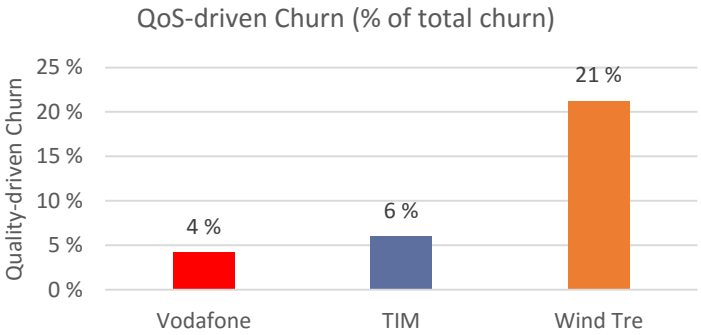
Customer value gap-analysis
Case Italy

After combining the market & operator data with the crowdsoursed data analytics, the impact of operator data quality gaps can be quantified also for customer business KPIs

Data usage potential, i.e. how much more mobile subs would consume data if data speeds were sufficient for all used applications

QoS driven churn, i.e. What proportion of the total mobile customer churn is cause by poor data service experience





5G IMPACT ON THE RESULTS

PREDICTED IMPACT OF 5G ROLLOUT

Impact of 5G deployment on data speeds
Case Spain

As the network footprints have been modelled with the measurement data, also impact of different technology & spectrum expansion can be predicted.

Assumptions used to predict impact of 5G rollout:

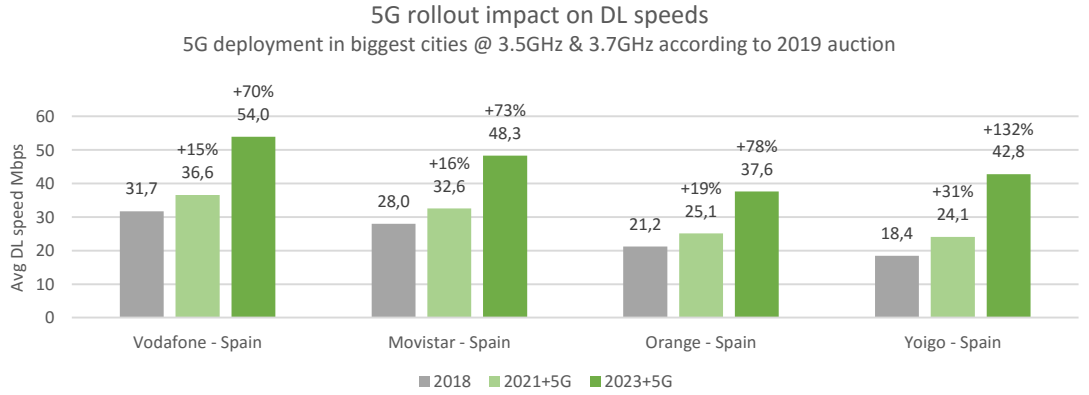
- 5G will cover the biggest cities by 2021-2023
- Mid-band 5G spectrum (3.5GHz & 3.7GHz) is used as overlay on top of LTE
- Whole licensed spectrum will be used, according to status after 2019 auction
- LTE to 5G terminal & data migration:
  - 2021: 5% terminal & 22% data
  - 2023: 26% terminals & 50% data

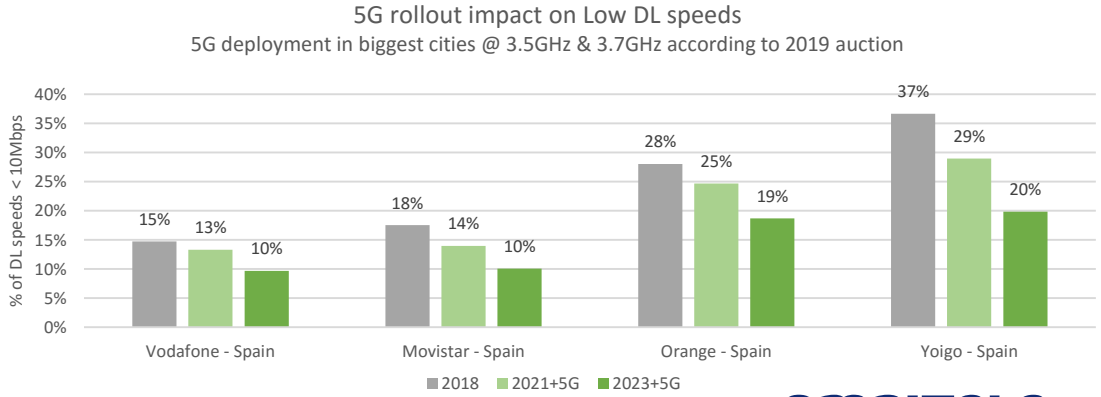
Impact of 5G deployment on data speed results
Case Spain

The leading operators VF & Movistar will not gain significant proportional gain from early 5G-rollout (+15%)

The challenging operators, especially Yoigo, could have opportunity to notably improve its position with an early 5G rollout (+31% in 2021)

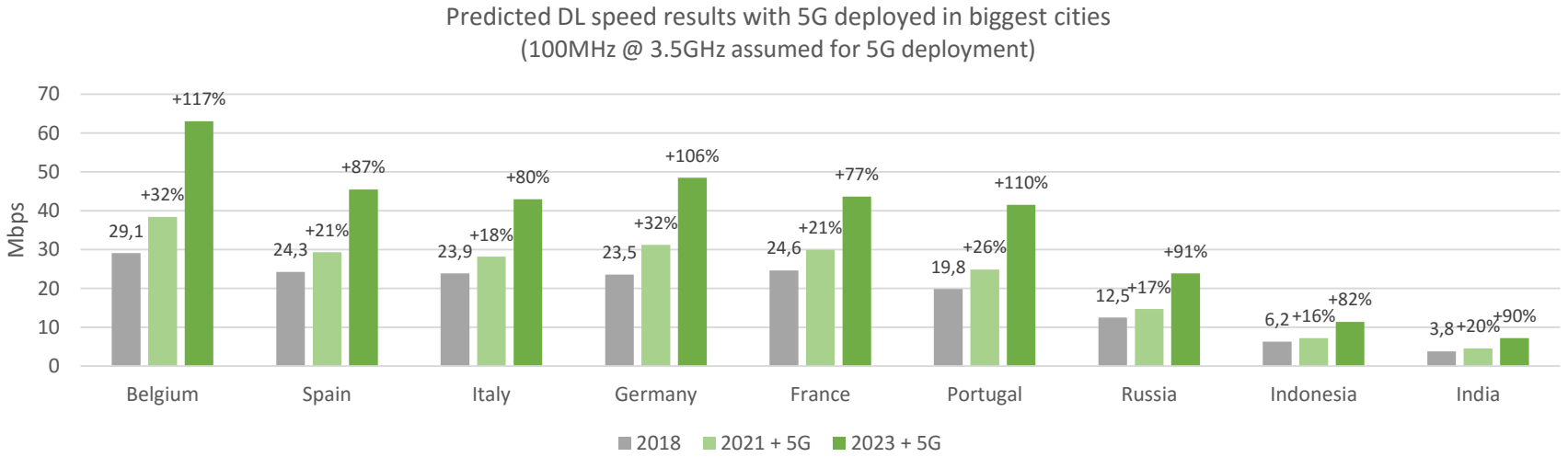
5G migration will notably mitigate poor QoE (also in LTE), and can decrease the proportion of low throughputs by up to 50% by 2023





Impact of 5G deployment on data speeds
Comparison of different markets

- 5G-impact on average speeds stays relatively moderate across all markets
- In European markets 5G impact on avg DL speeds is +20-30% by 2021
- In developing countries the impact will lower (15-20%) due to slower 5G terminal migration
- By 2023 the avg DL speeds would have roughly doubled, also in the developing countries



VALUE TO OPERATOR

Benefit to Optimisation team

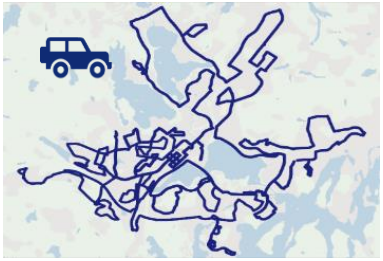
KNOWLEDGE	Know the relevance of alternative network strategies Know what is really behind the gaps against competition
FOCUS	Focus on the truly effective actions to close the gap Avoid actions with low expected quality return
CONTROL	Set quantified targets for the improvements Plan & control work through prioritised action list

Value to Operator

QUALITY	50-100% higher quality improvement with the same Opex
OPEX	30-60% saving in reaching the quality targets
CAPEX	20-40% saving in network expansions
TIME	30-40% faster execution of optimisation campaign

HOW IS IT DONE

Same model for any measurement data



KEYSIGHT TECHNOLOGIES
ascom
SwissQual
ROHDE&SCHWARZ

4Gmark mobile performance test
TUTELA
SPEEDTEST by OOKLA
OPENSIGNAL

1. Data parsing & slicing
2. KPI defintions
3. Prediction model customisation
4. Scenario predictions & results

~2 weeks execution time

Omnitele Experience

300+ Benchmark
projects world wide

Leading methodology for
value adding analysis

Tailored scope, data,
& tooling by operator need

30 YEARS OF EXPERIENCE

1 000+ PROJECTS IN 80 COUNTRIES

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