TE-NGMN

Making better decisions

A tool for techno-economic analysis
in next generation mobile networks

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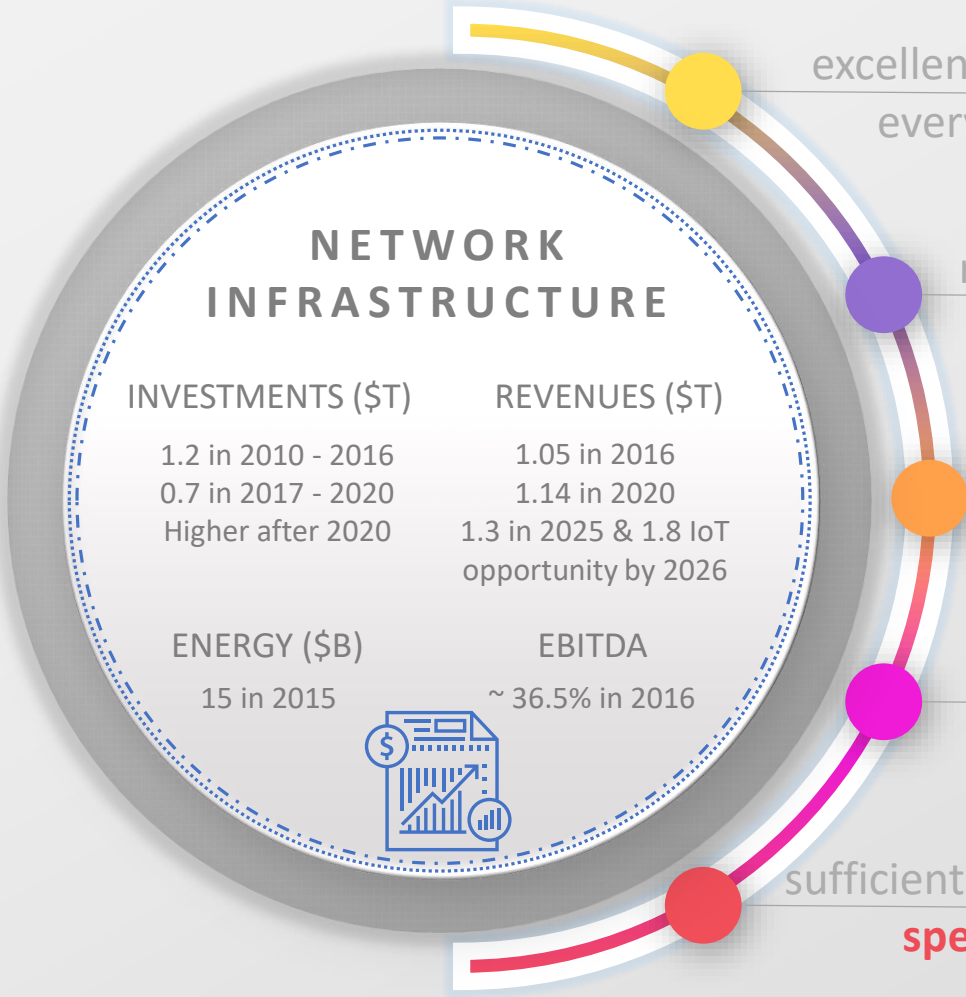
Mobile facts and trends



excellent **coverage** everywhere

Availability

4G*:
50% → 70% of the developing pop.
93% → 95% of the developed pop.

5G:
34% by 2025

* 2016 → 2020

massive and critical **connectivity**

Connections

total*: 7.9bn → 9.7bn
4G*: 23% → 41%
5G: 1.1bn by 2025

IoT**:
total 6.6bn → 30bn
cellular 0.43bn → 6bn

* 2016 → 2020, excl. M2M

** 2016 → 2026

massive **capacity**

Mobile data traffic

8.5 EB per month in 2016
40 EB per month in 2020

environmental sustainability

Greenhouse gas emissions

70 $MtCO_2e$ (0.14 % of global) in 2015
160 $MtCO_2e$ (0.3% of global) in 2020

sufficient harmonised **spectrum**

Spectrum amount

available: 360-630 MHz & identified: ~ 1 GHz
additional needed by 2020: 0.4 - 1 GHz

References:

GSMA - The Mobile Economy 2017
GSMA - The guide to the IoT
GSMA - The 5G era
GSMA - Mobile Energy Efficiency
GeSI - Smarter2020
Ericsson - Spectrum requirements for 2020 and beyond

Problem

REVENUE — COST = PROFIT

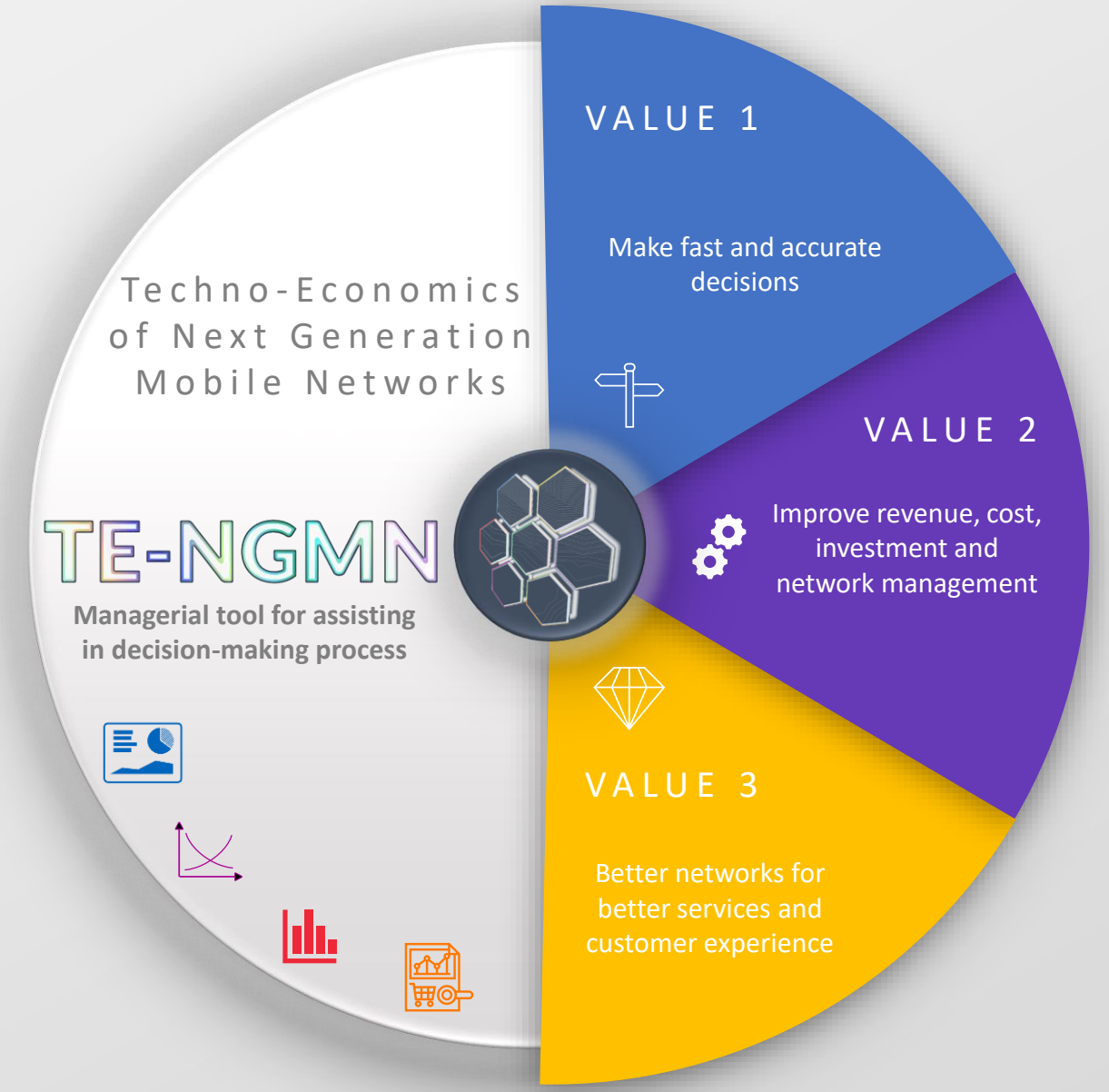
Difficult to predict and generate new sources

Difficult to calculate and control operating and investment costs

High pressure on keeping positive profit margin

Considering regulation, competition and partnerships

Our solution



Features

- Importing infrastructure (greenfield deployment or existing network from files)
- Creating future scenario and cell traffic growth progression
- Network changes over any data traffic growth

- Unit cost curves (short- and long-run)
- Fully allocated cost and bottom-up marginal cost
- Asset value (access, transport, core, spectrum)
- Operating cost (with a focus on energy)

- Demand estimation and forecast
- Data traffic growth scenarios
- Price per traffic unit and revenue over any data traffic growth
- Profitability (income statement)

- Investment cost and disposal value over any data traffic growth
- Cash flows (not available yet)

- Multilayer and multi-technology networks
- Analysis at network and cell level
- Use cases: cellular, unlicensed band, IoT (not available yet)
- Network visualization and graphical representation

Benefits

Accuracy

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- Manage regional heterogeneous networks at the cell level
- Know the operating and investment costs for any traffic growth
- Know the future unit price and revenue for any traffic growth

Performance assurance

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- Network: Ensure adequate network capacity and coverage
- Investment: Generate positive rate of return
- Business: Achieve high profit margin

Cost savings

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- Control the cost structure of infrastructure
- Monitor operating costs
- Cut unnecessary costs (with a focus in energy consumption)

Sufficient Investments

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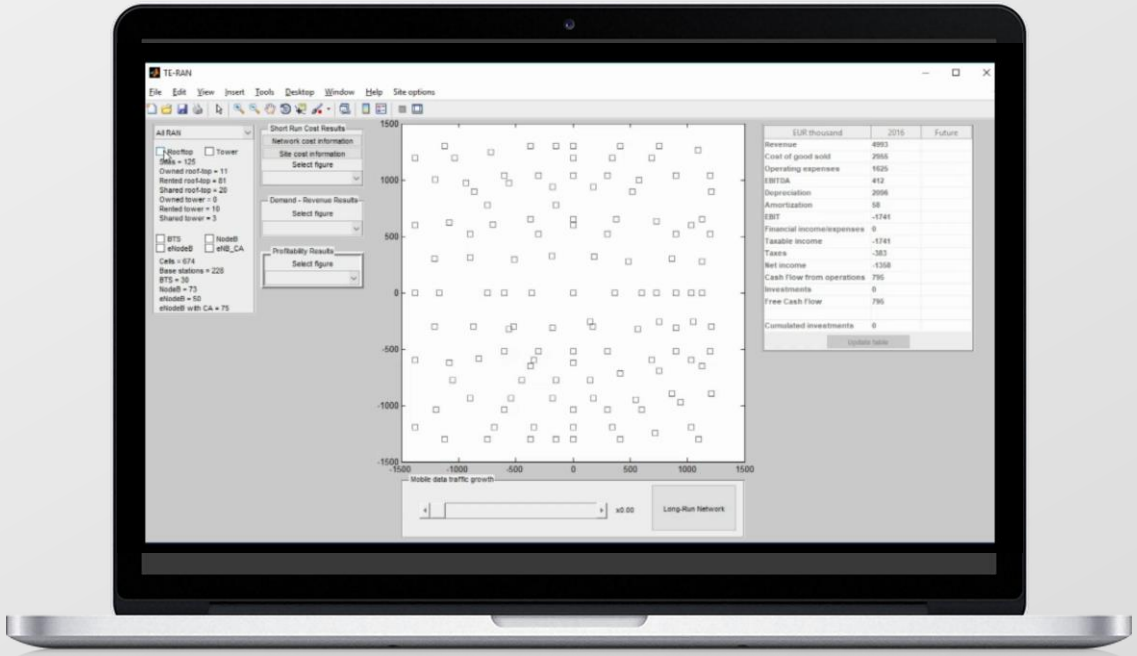
- Optimize investment plans
- Identify where and when to invest, based on the traffic growth and coverage targets
- Choose the most preferable investment

Demo



Use case:

MOBILE NETWORK EVOLUTION

Gigabit LTE

References:

cover background picture - apod.nasa.gov
slide design ideas - Creative Venus
icons - thenounproject.com
video editor - GoPlay
song - Pink Floyd, Breathe

Extra slides

Machine learning examples

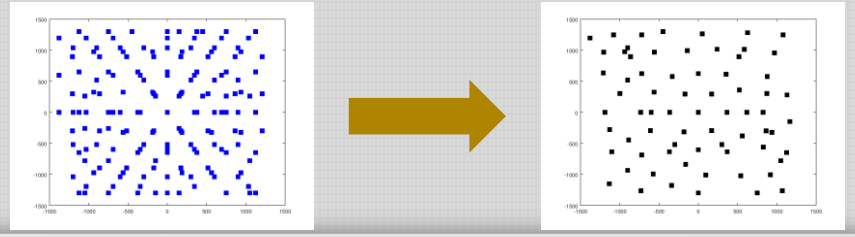
Methods

Create value by using machine learning algorithms

Clustering

Initial network dimensioning:

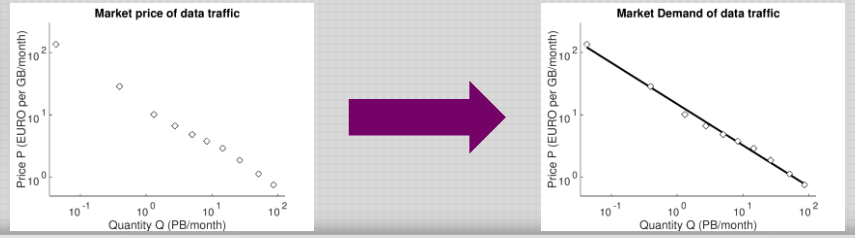
Group the base stations with different technologies into multi-technology sites



Regression

Demand estimation and forecast:

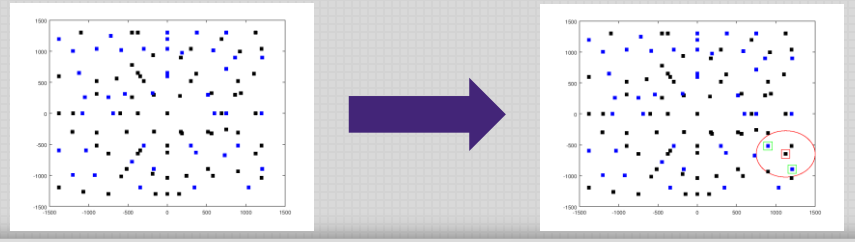
Predict the price and the quantity of mobile data traffic



Classification

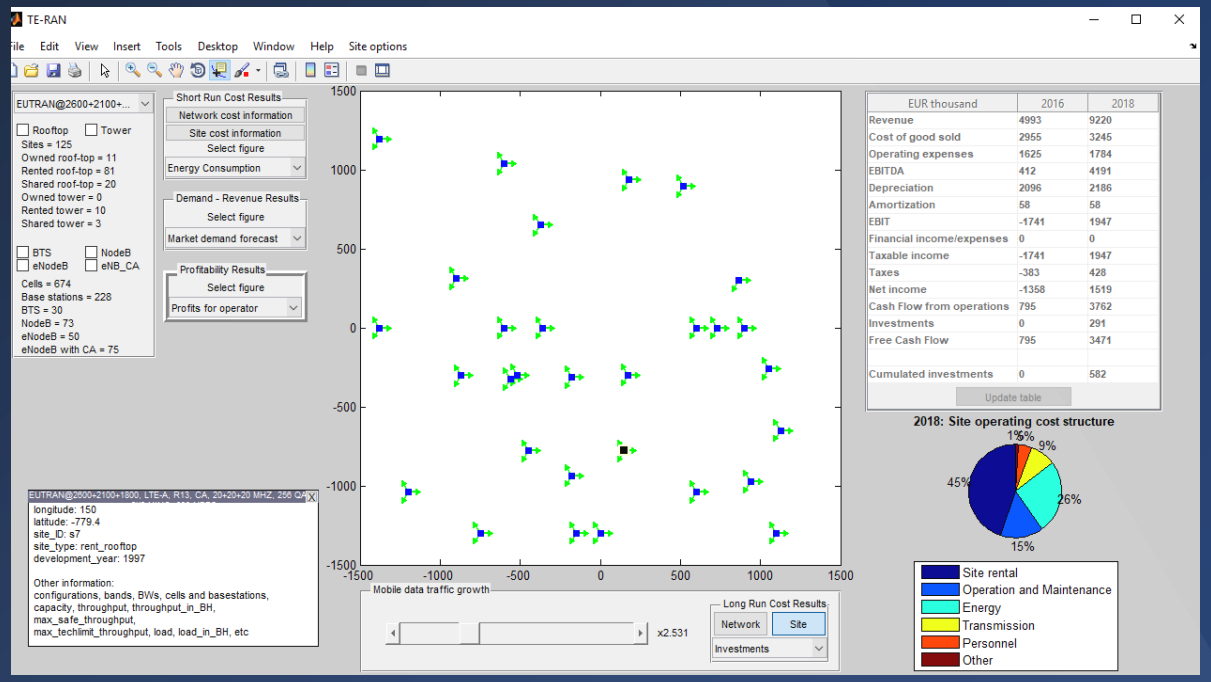
Load balancing after investments:

Identify the base stations which are within the coverage area of an upgraded site



Main outputs

TE-NGMN



Network Information

Sort sites by RAN configuration, site types, technology

Short Run Cost Results

Network cost structure
Site cost structure for selected site
Total operating cost
Unit cost curves
Energy Consumption
Cost per GB and GB per data user

Demand - Revenue Results

Market Demand
Mobile data traffic forecast
Market demand forecast
Annual market revenue
Market marginal analysis (2020)

Profitability

Annual traffic for operator
Profits for operator
Income statement table

Long Run Cost Results

After selecting Mobile data traffic growth:
Cumulated investments
Network cost structure
Site cost structure for selected site
Total operating cost
Unit cost curves
Energy Consumption
Cost per GB and GB per data user