

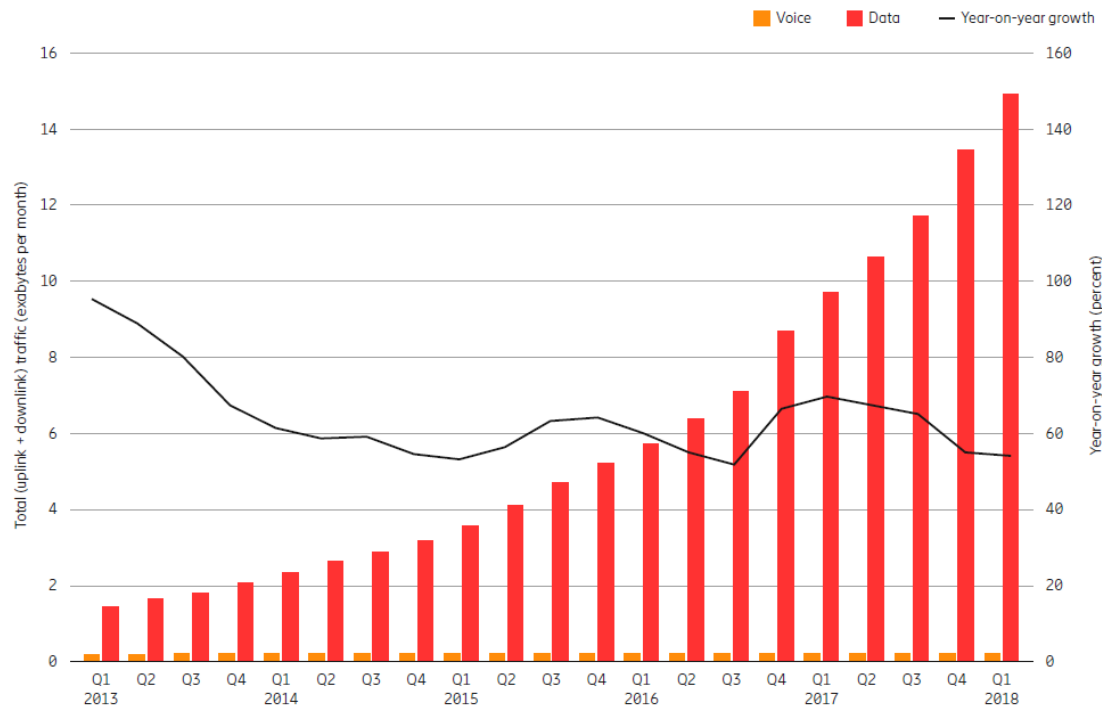
*“Investing on high speed radio access networks (RANs):
The challenges that need to be faced in order to get high
returns on investment”.*



How to unlock your network performance and increase revenues

RANs: ...from Mobile Telephony to Mobile Internet...

According to Ericsson*, the 6-year CAGR for mobile data is expected to be 39%, most to be serviced by LTE technology...



*Source : Ericsson Mobility Report 2018

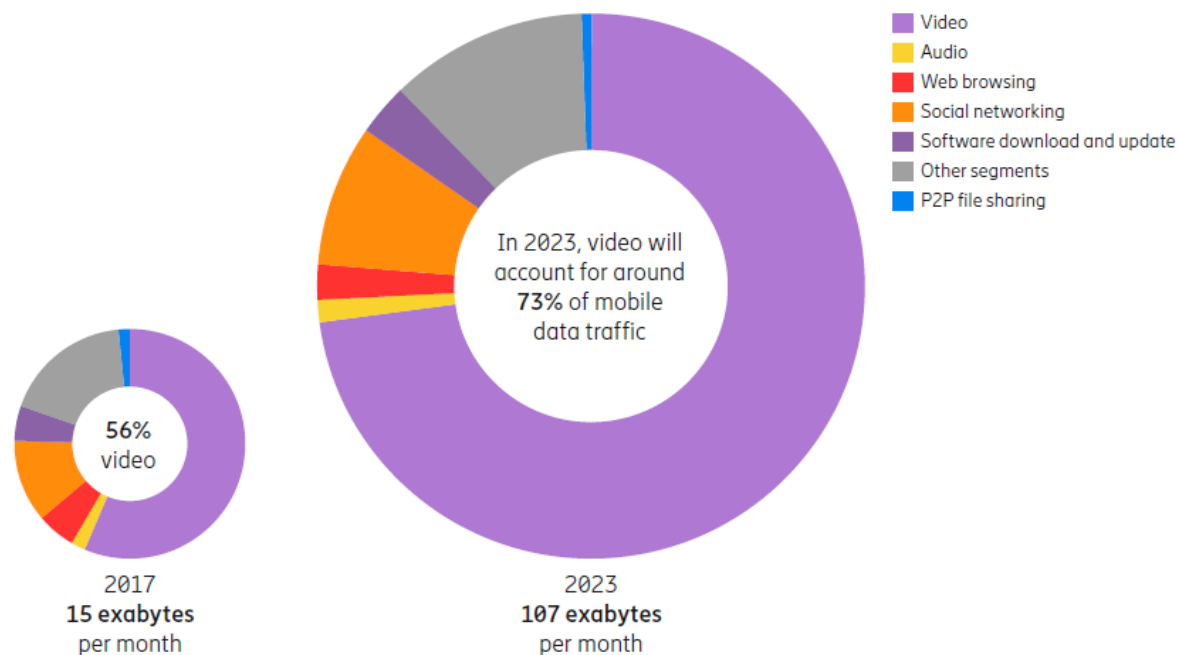
	2017	2023	CAGR
Worldwide mobile subscriptions	7.8bn	8.9bn	2%
Worldwide smartphone subscriptions	4.3bn	7.2bn	9%
Worldwide mobile broadband subscriptions	5.3bn	8.3bn	8%
Worldwide LTE subscriptions	2.7bn	5.5bn	12%
Worldwide monthly data traffic per active smartphone	3.4GB	17GB	31%
Worldwide total monthly mobile data traffic	15EB	107EB	39%

It is true... Mobile Network Operators are turning into Mobile-ISPs

The mobile data demand is presently driven by the OTTs, while new content providers will push this demand way further...

As for all ISP's, connection speeds is the "secret" to customer satisfaction!!!

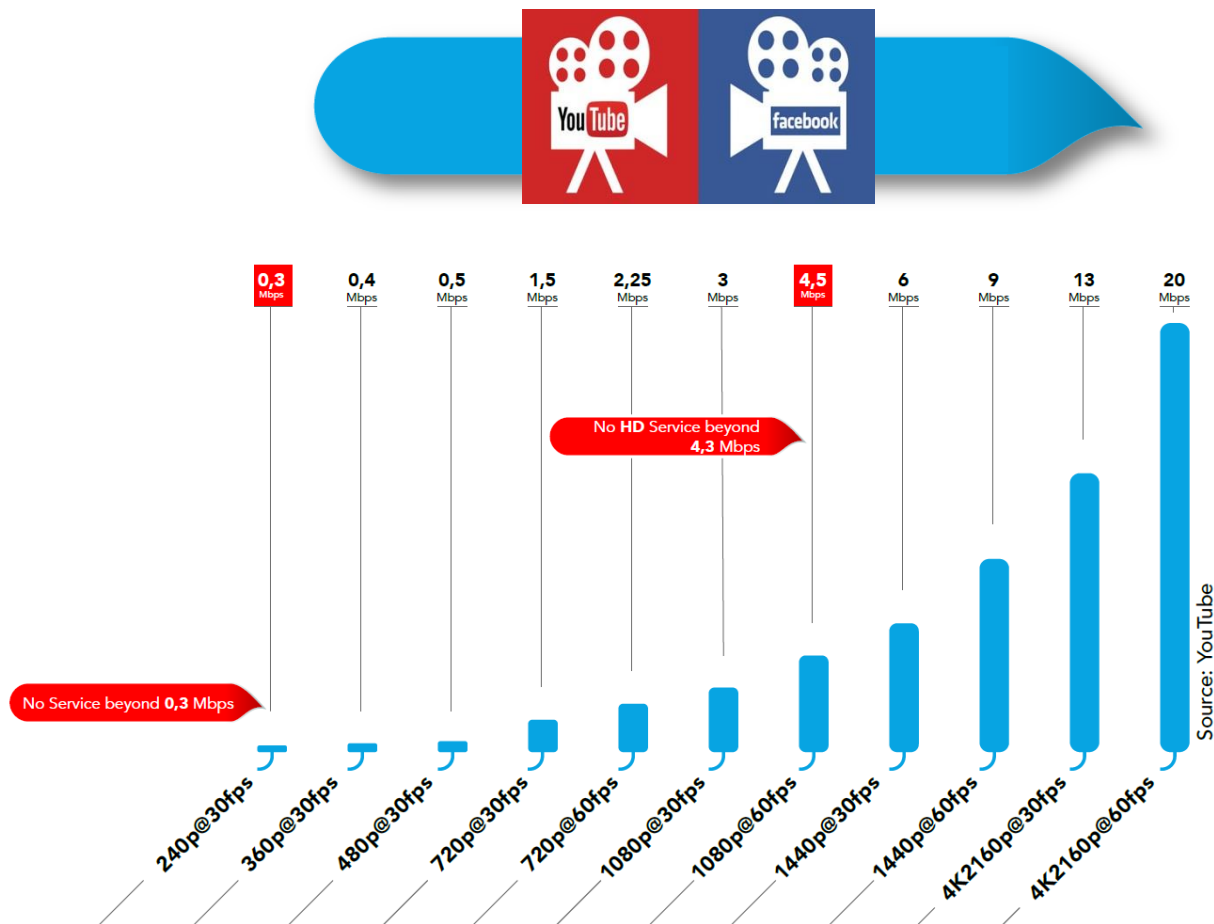
Mobile data traffic by application category per month (percent)



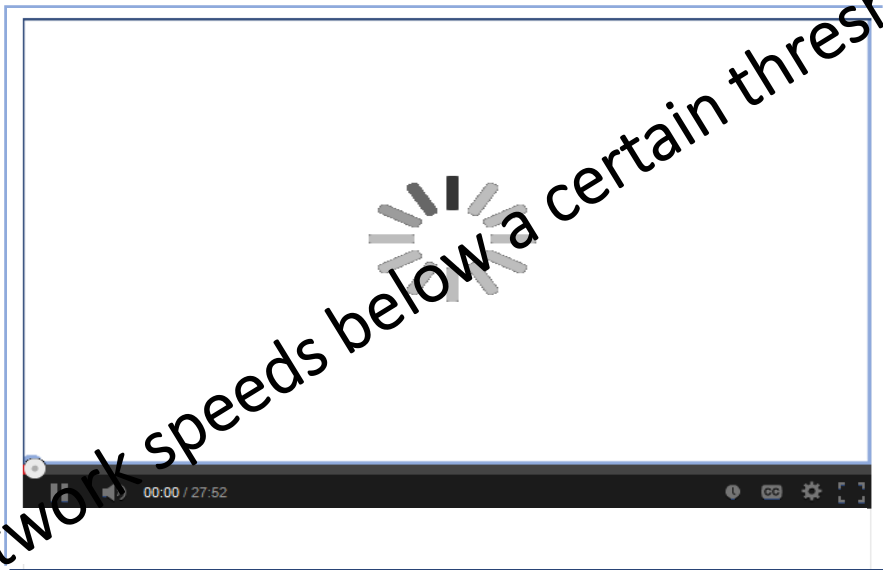
*Source : Ericsson Mobility Report 2018

Application coverage should be the target for any Mobile ISP...

Streaming and HD video require network speeds that are above a certain threshold in order to be successfully performed...



Network speeds below a certain threshold

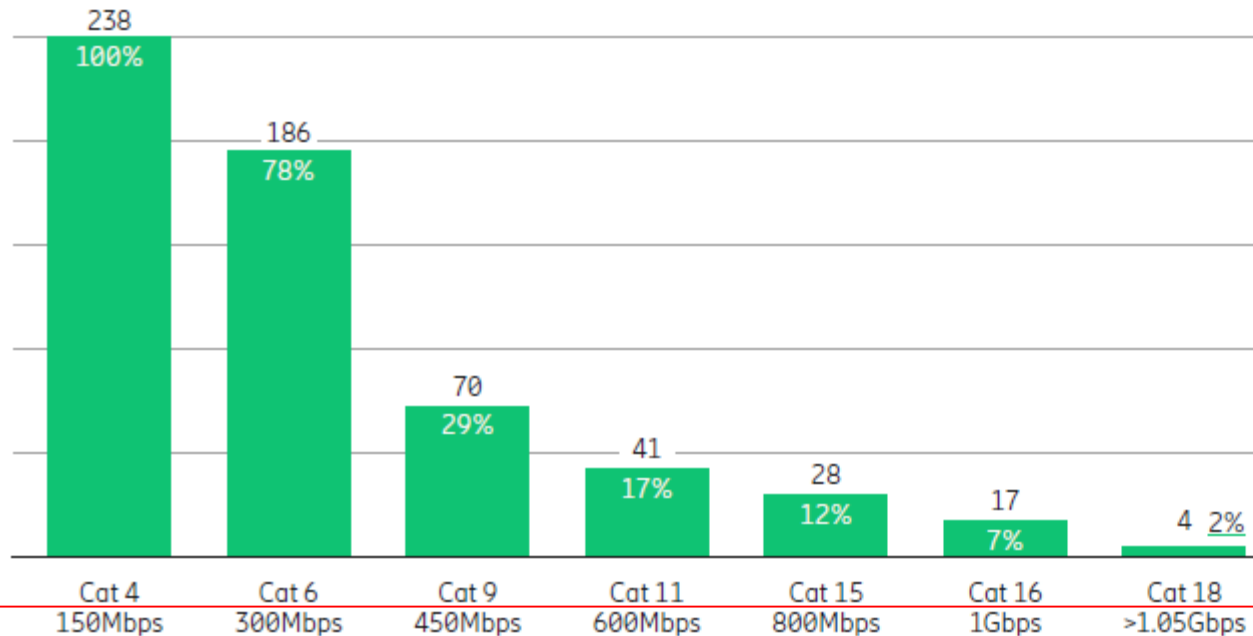


*Source : Ericsson Mobility Report 2018

LTE & LTE-A technology supports high speed connectivity...

It is true, LTE technology supports high speed connectivity, but you also need to account it's highly sensitive radio interface...

Percentage and number of LTE-Advanced networks supporting Cat 4, Cat 6, Cat 9, Cat 11, Cat 15, Cat 16 and Cat 18 devices

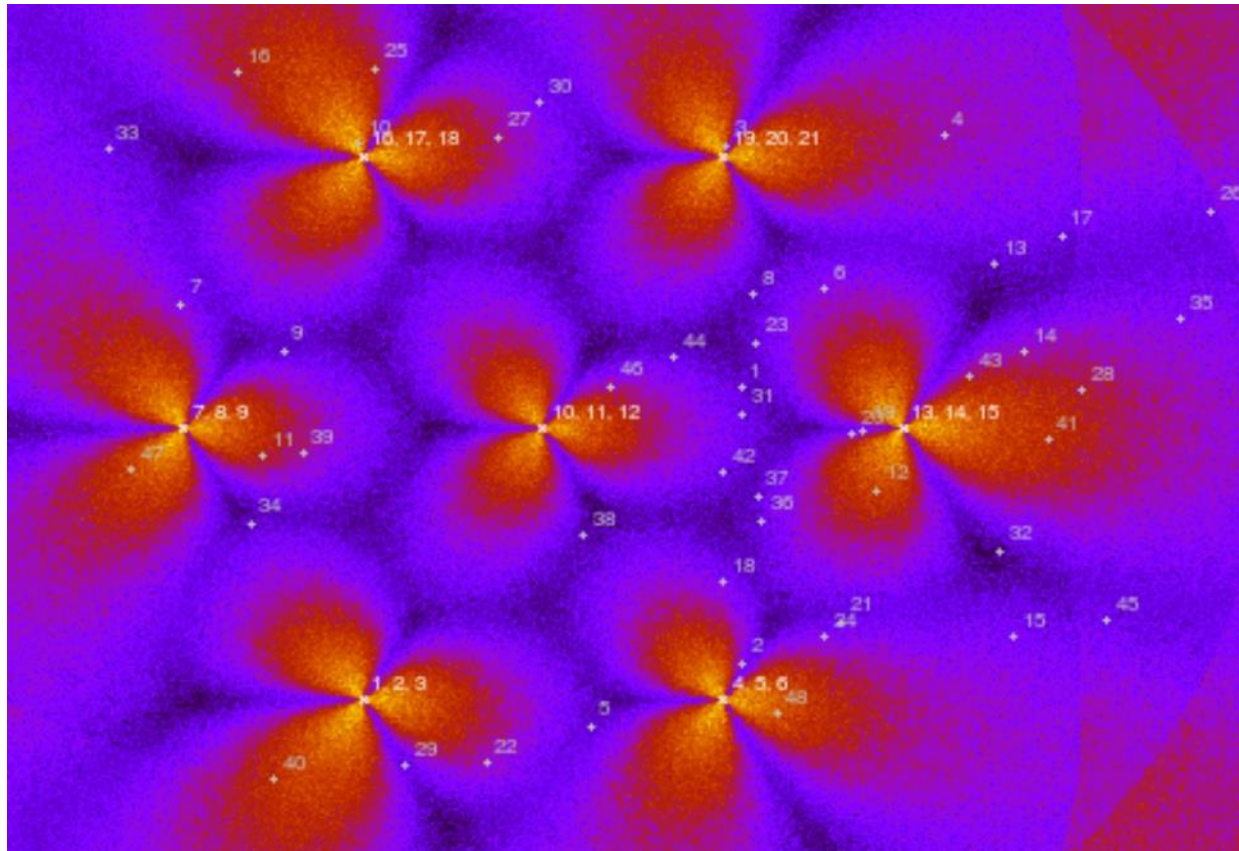


A total of 21 gigabit networks have been commercially launched.

Source: Ericsson and GSA (April 2018)

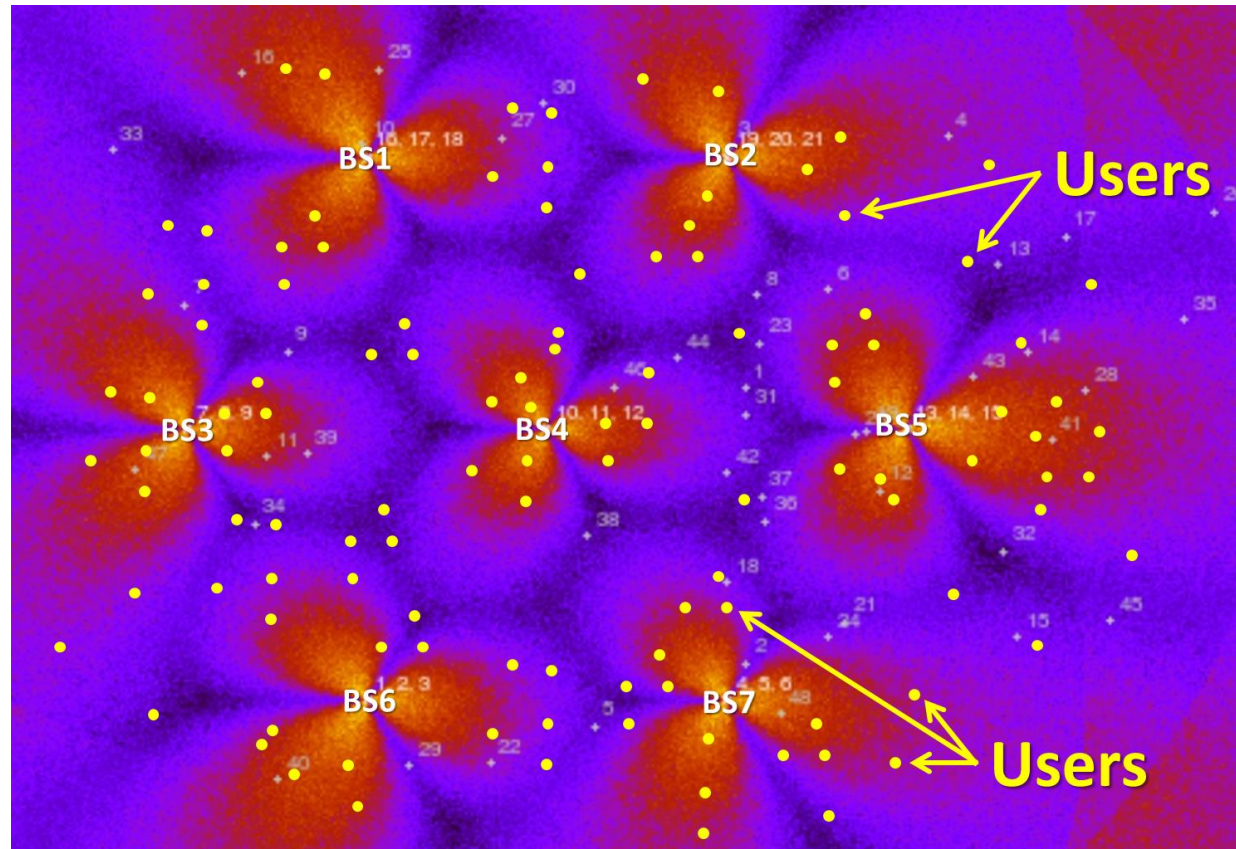
Let's see why theory does not meet practise...

Unfortunately, due to the imperfect antenna radiation patterns and the physical RF attenuation over distance, you get...



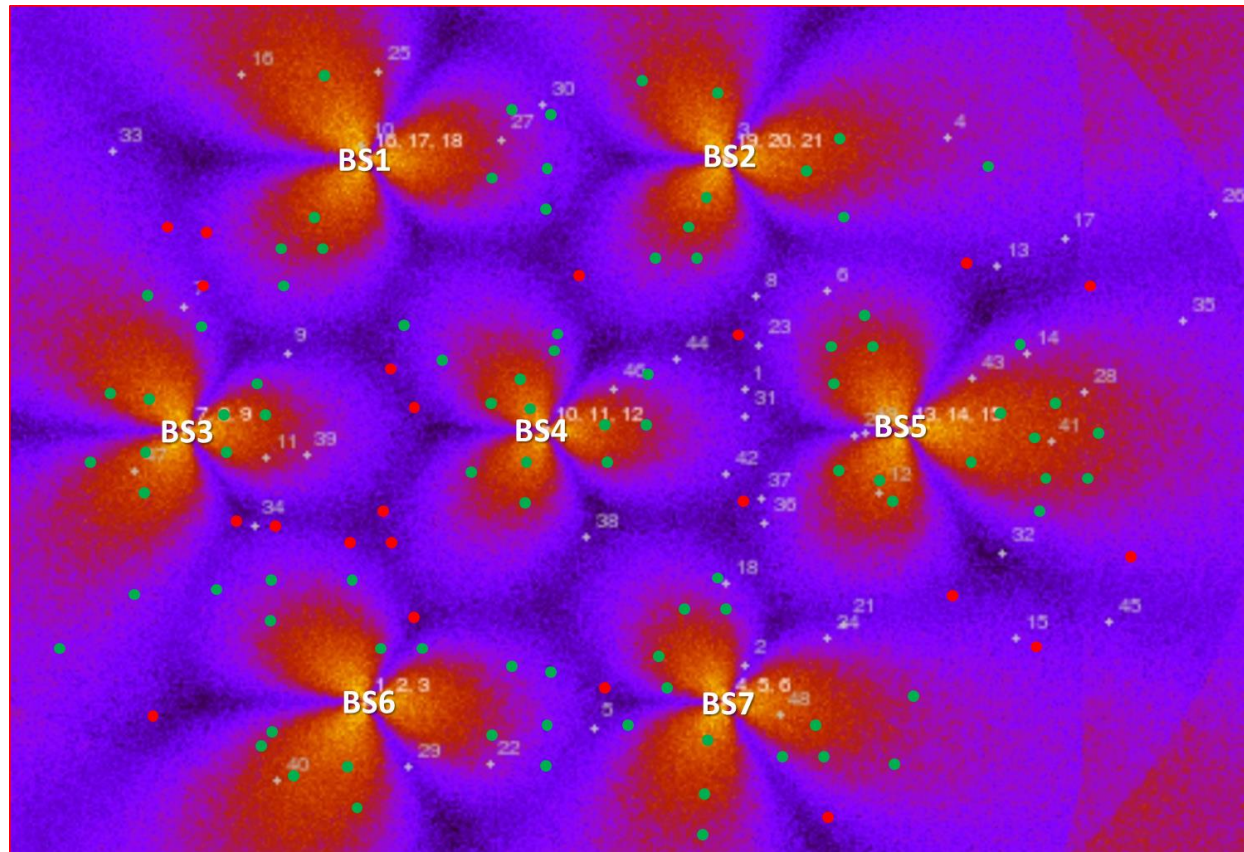
The LTE radio base stations that offer coverage...

A snapshot of users (yellow dots) in the geographical coverage area of our example, are serviced by 7 LTE radio base stations...



The LTE radio base stations offer “**different**” coverage...

A snapshot of users (red / green dots) in the geographical coverage area experience bad (red) & good (green) radio conditions...



LTE radio base stations offer “NO” or “BAD” data coverage to some...

Red dot users in the geographical coverage area experience “no” or “bad” internet service from these LTE radio base stations...



*Source : Ericsson

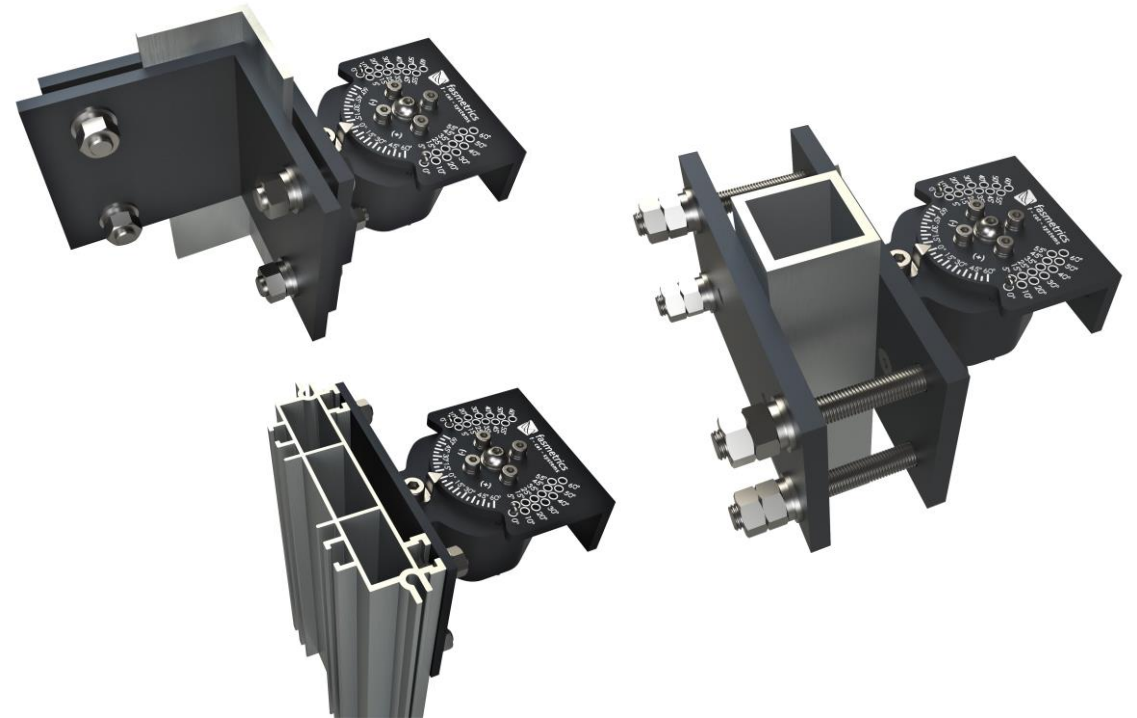
So we have to make the RED dots GREEN... or make GREEN as many as possible

There is only one way to make the GREEN dots as many as possible: optimize the radio conditions (SNR) in the coverage area...

Case Study 1: 3skelion



Case Study 2: Azimuth-SON



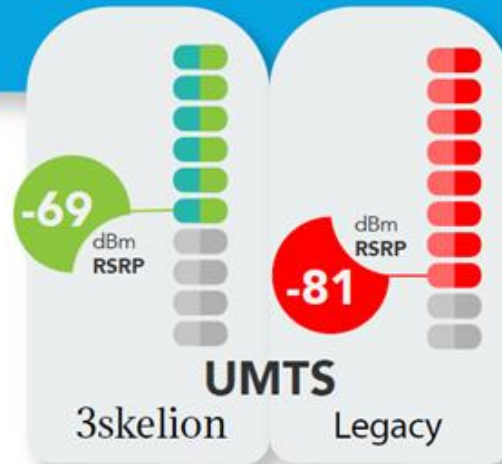
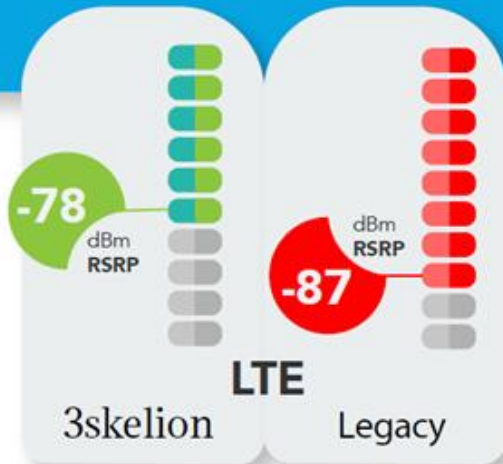
CASE STUDY 1: 3skelion Systems

Feeding the in-ship repeaters with “clean” radio after scanning, detecting & auto selecting the direction of the optimum donor...



COSMOTE Case Study

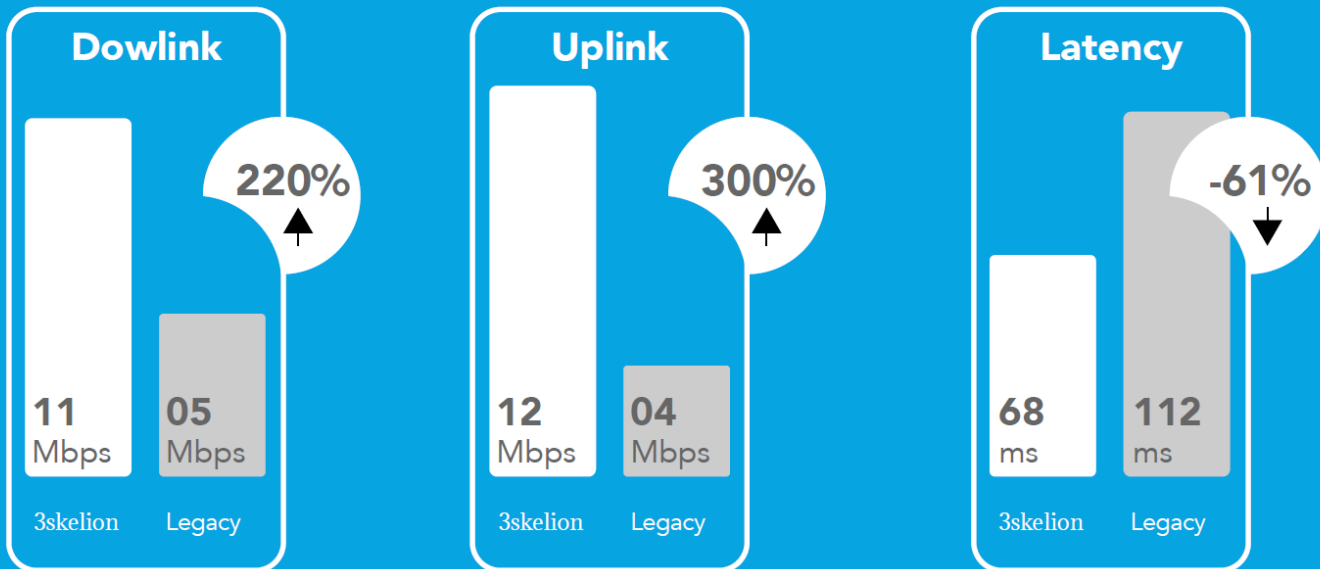
June - December 2016 @ Knossos Palace Ferry



CASE STUDY 1: 3skelion Systems

There was so much “room” on the sea-route, that performed tests, over-doubled the average network speeds...

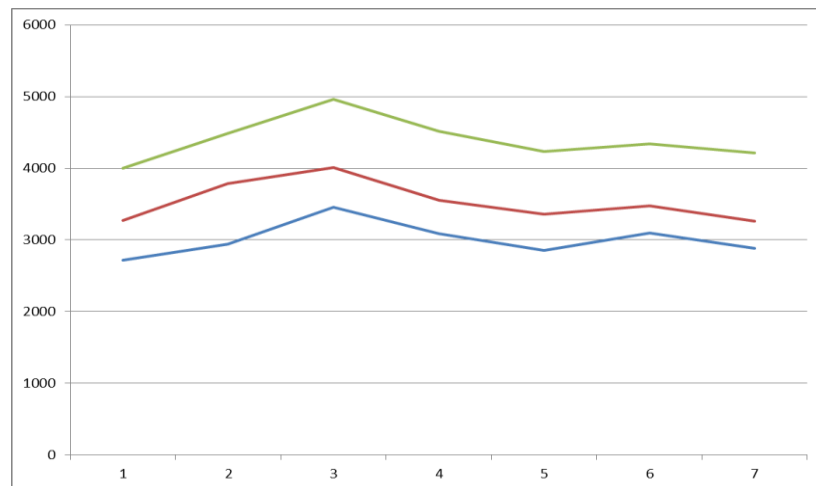
...Where this resulted in optimized network speeds & latency...



CASE STUDY 2: Azimuth-SON

Auto Scanning Azimuth direction in time, selecting according to best Radio conditions, optimizing performance in real time...

Δ	Day 1	Δ	Day 2	Δ	Day 3	Δ	Day 4	Δ	Day 5	Δ	Day 6	Δ	Day 7
1	15	15	15	15	15	15	15	15	15	15	15	15	15
2	15	15	15	15	15	15	15	15	15	15	15	15	15
3	15	15	15	15	15	15	15	15	15	15	15	15	15
4	15	15	15	15	15	15	15	15	15	15	15	15	15
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9	15	15	15	15	15	15	15	15	15	15	15	15	15
10	15	15	15	15	15	15	15	15	15	15	15	15	15
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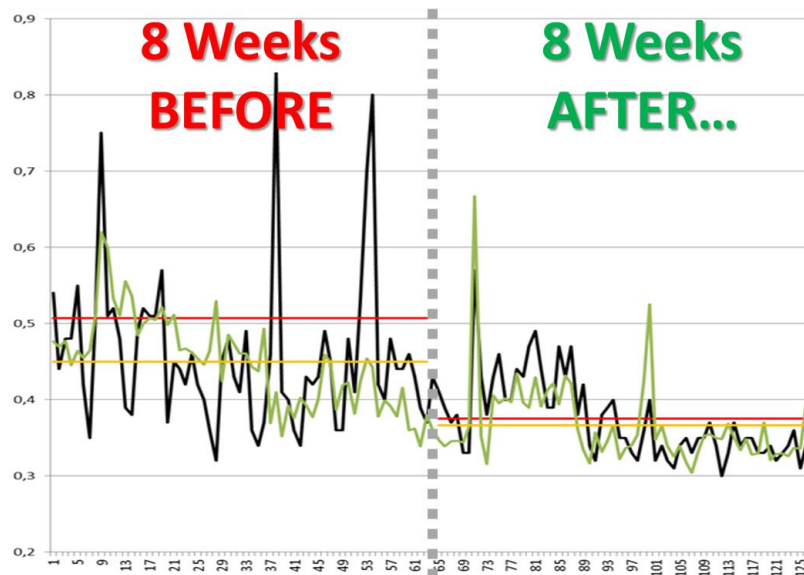
FIXED Azimuths?

Not any more...



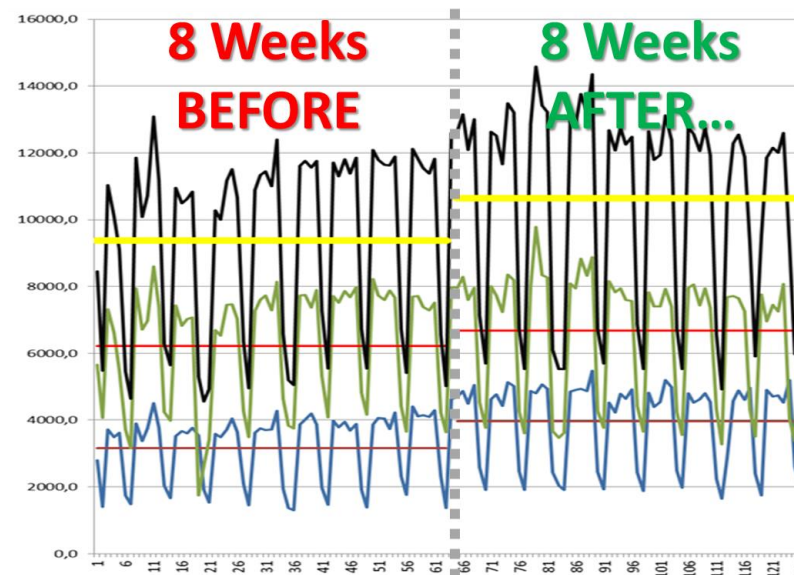
CASE STUDY 2: Azimuth-SON

Optimisation results define the return on Investement...

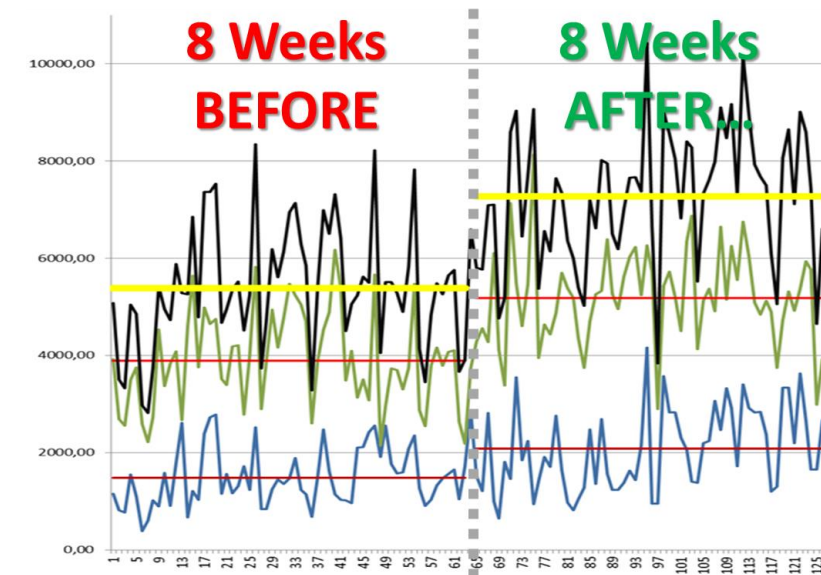


DCR%
-18,45%

AFR%
-26,04%



Voice Performance
+13,48%



Data Performance
+35,01%

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