INFOCOM MOBILE CONNECTED World

MWC – Always Connected!
14.07.2020

FASMETRICS Brief Intro

We are an **award-winning high-tech SME,** specialized in producing innovative radio communication technology as well as offering advanced managed services **for the Global mobile telecommunications industry.**

We have successfully developed **proprietary technology to address the RAN market**. Our current product portfolio consists of 4 product lines (F-CAT, Obelisk, 3skelion, & SONAR) targeting the mobile industry globally.

Quick Facts

Founded:
2005

Headquarters:
Athens, Greece

Incorporation:
Société Anonym (S.A.)

Registered in Greece:
Reg. No. 051174344000

Management System:
ISO9001:2018 (TUV)

Key Partners

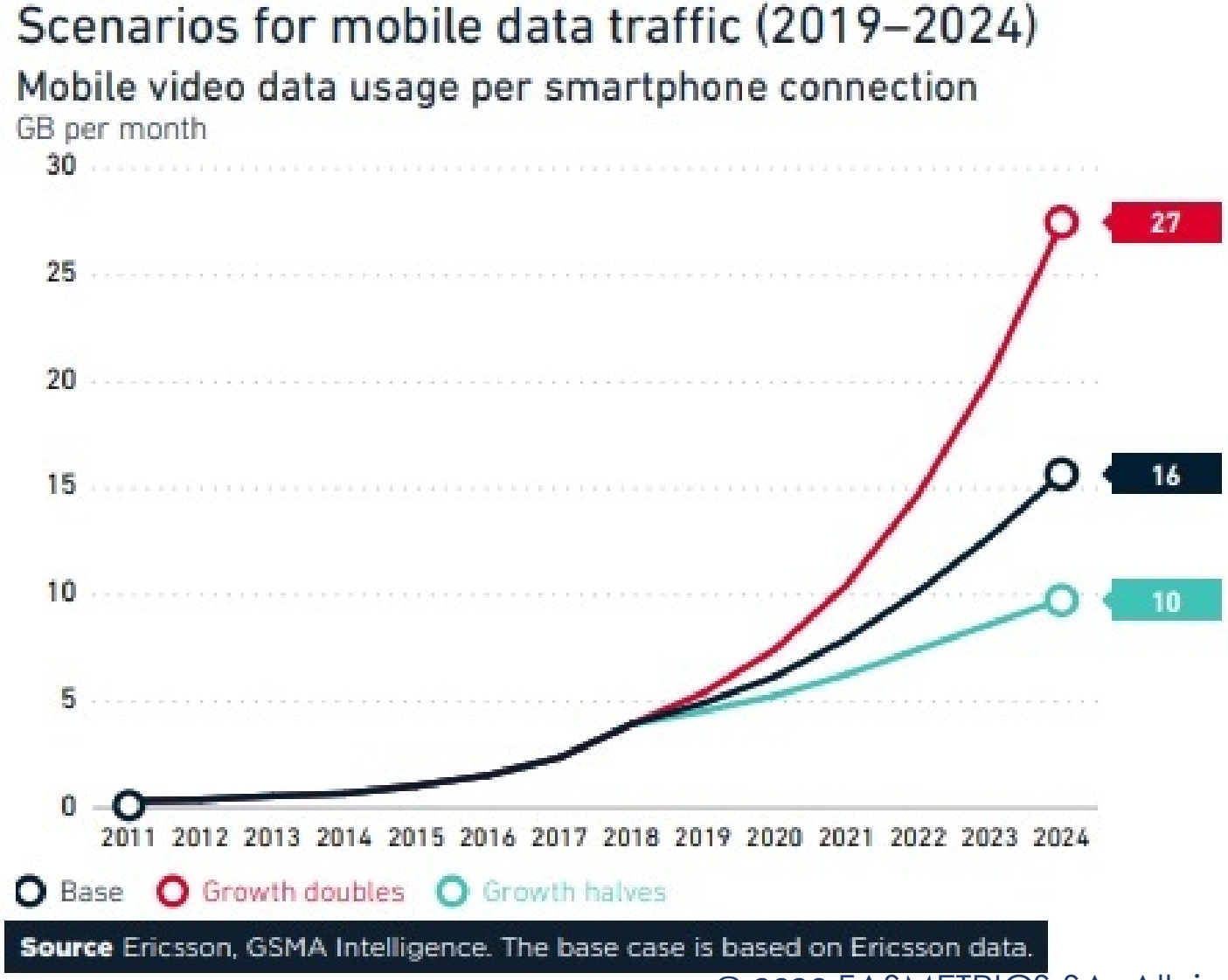
Intellectual Property

US Granted
US9252479, US9287609, US9728849, US9893410, US10098013, US10490890, US20140218249,US20150013261 A1, US20150144758A1, US20170093033A1

WIPO
WO2011042226, WO2012080375,WO2013011002,WO2013098281,WO2013171291, WO2015197324, WO2016087431A1,WO2019110697

Notable Awards

The need: Mobile Traffic

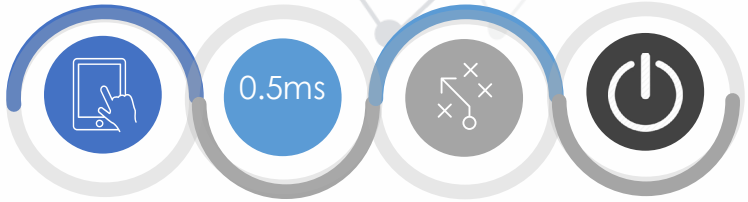


Source Ericsson, GSMA Intelligence. The base case is based on Ericsson data.

- *Video has been the biggest driver of mobile data traffic growth in the smartphone era. This trend is expected to continue in the coming years as **higher definition video streams on mobile devices**.*
- *Based on Ericsson's mobile data projections and GSMA Intelligence's modelling for video usage on smartphones, mobile networks could **carry four to eight times more data by 2025 than at the start of 2019**.*
- *This presents clear capacity risks, particularly at peak hours. Additional 5G spectrum and refarming LTE holdings will need to complement network densification and multiple offload outlets (Wi-Fi and fixed) to cope.*

Our 5G Perspective

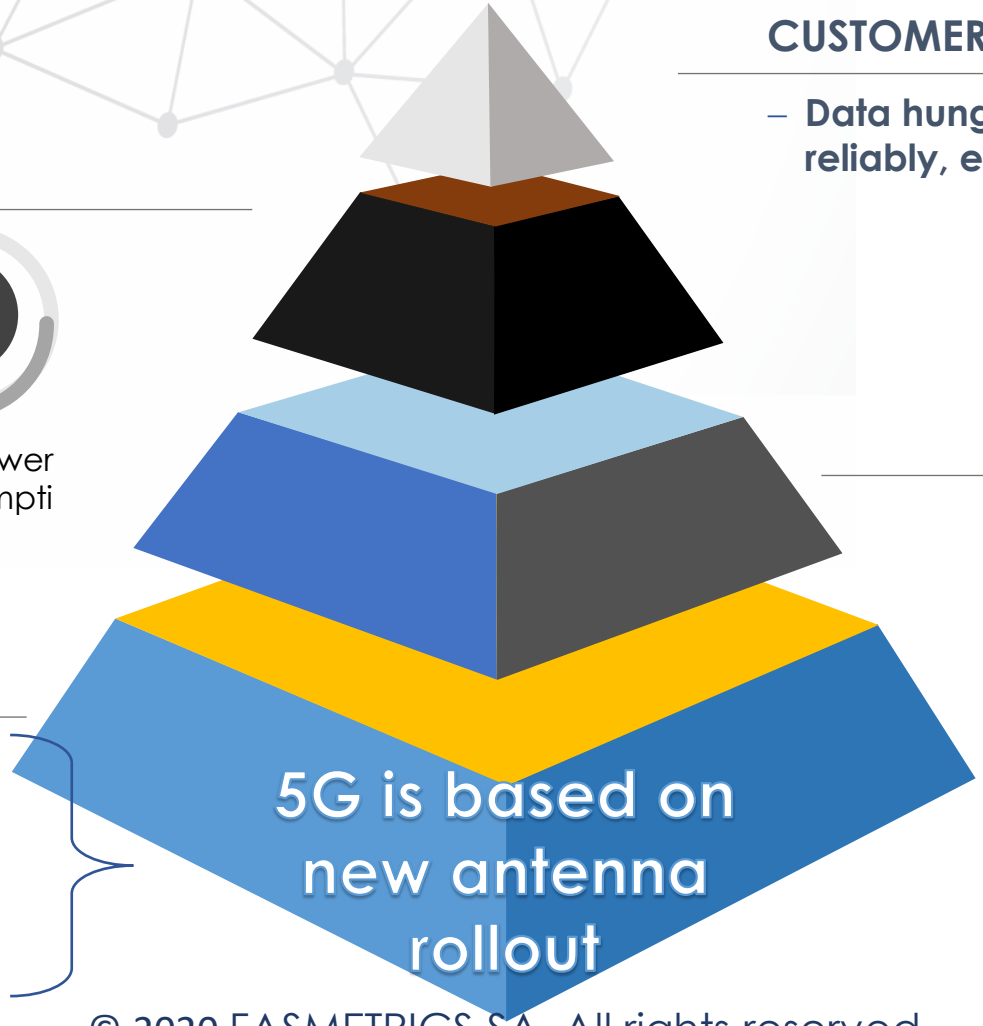
TECHNICAL REQUIREMENTS – 5G



Higher Data Capacity | Low Latency | Multiple concurrent connections | Low Power Consumption

RAN NETWORK REQUIREMENTS

- **New antennas** (suitable for new spectrum)
- **New 5G site** (small cells) **rollout**
- **Existing sites update to 5G ➔ antennas swap to 5G**



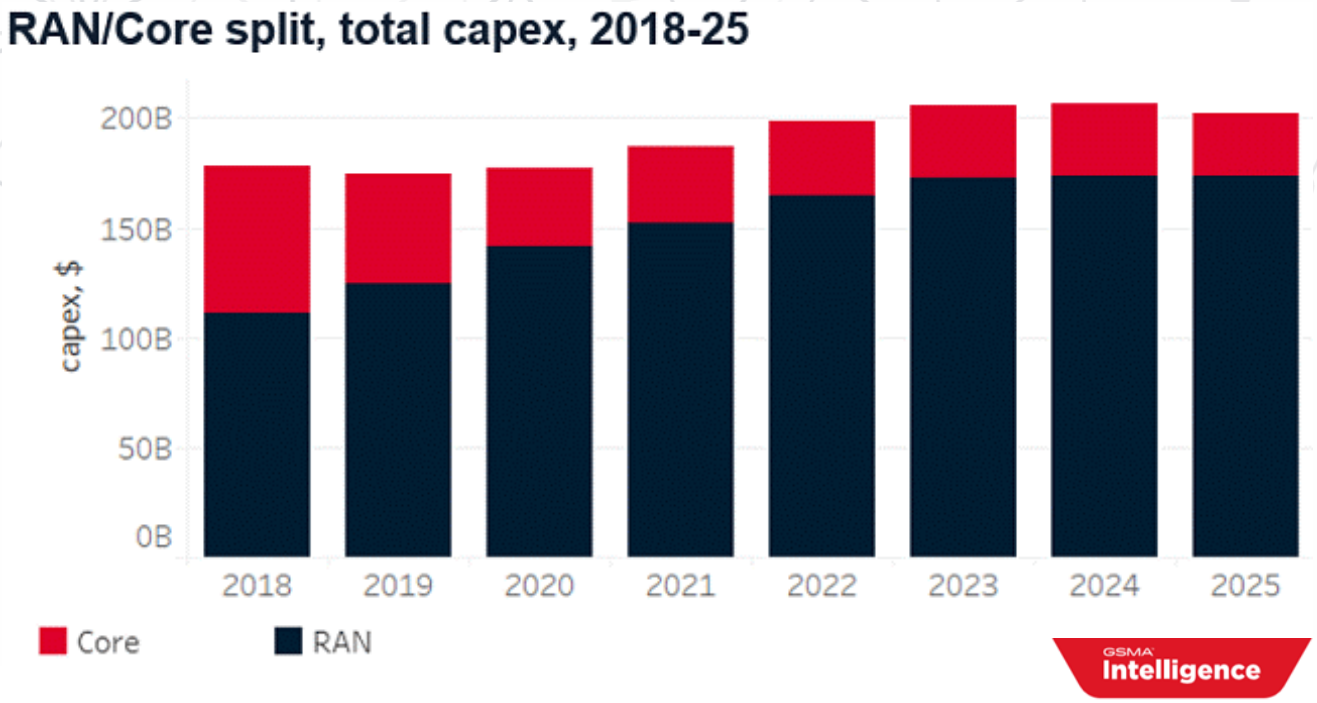
CUSTOMERS' NEED

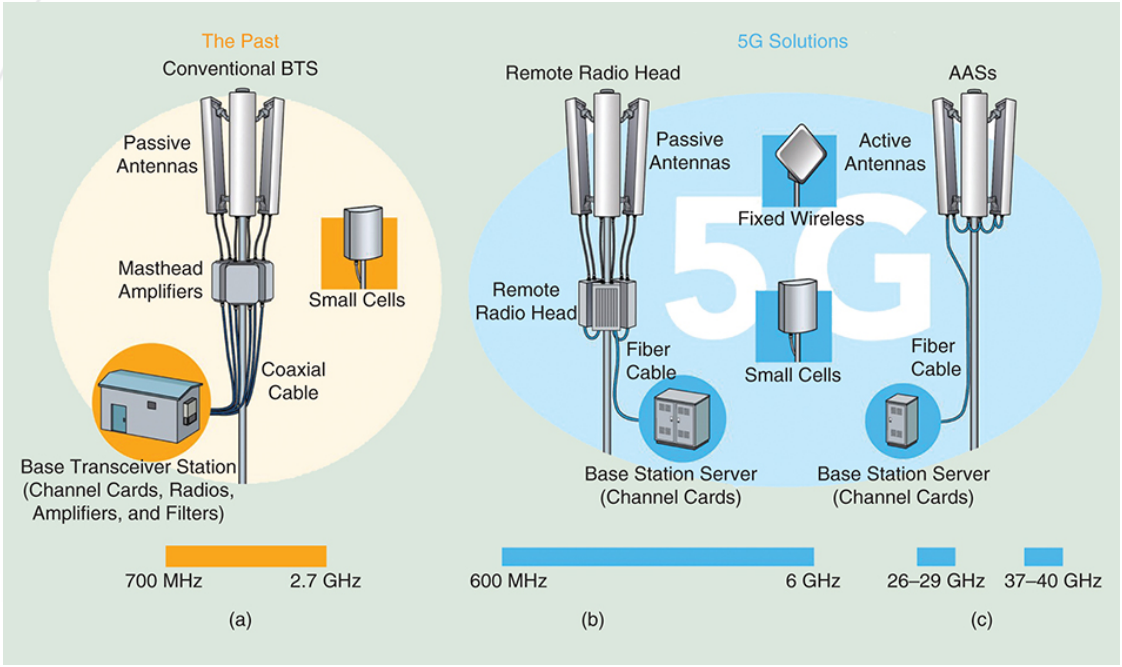
- **Data hunger & quick data transfer reliably, everywhere, always on**

MOBILE NETWORK NEEDS

- **RAN**
  - **Additional Spectrum** (700MHz, 3.5Ghz, mm Wave)
  - **Site Densification**
  - **Improved Spectrum Efficiency**
- **Core**
  - New 3GPP standards

RAN gets 5G investments lion's share





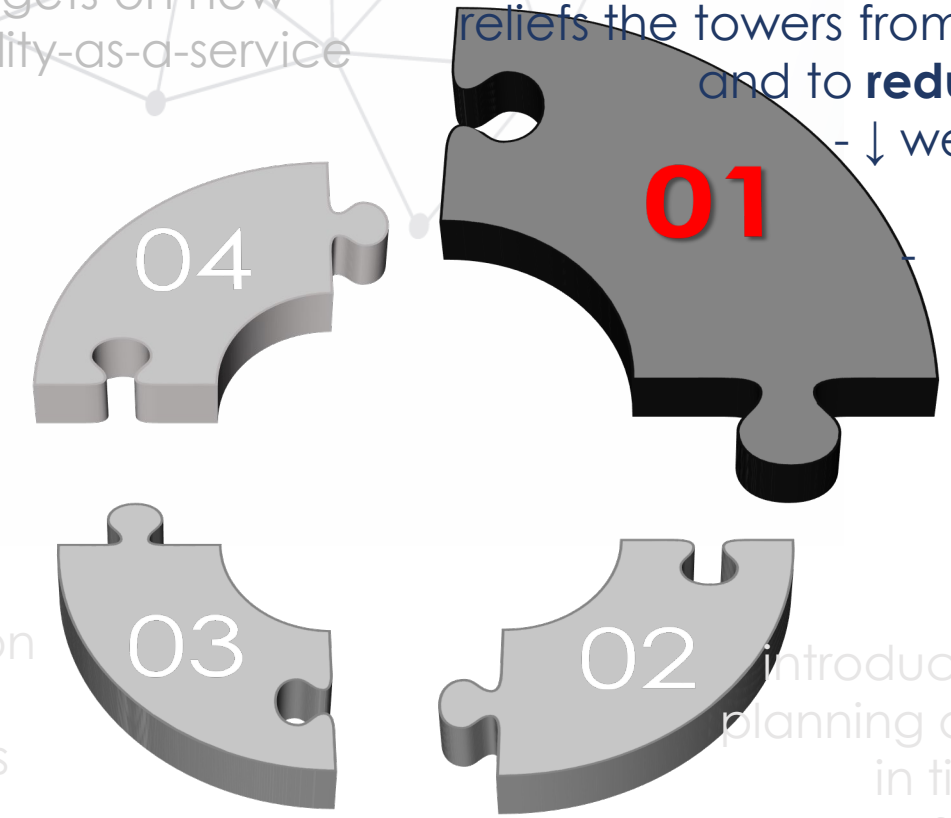
"Always connected" finally means **intensive radio site rollout**, with **additional, new and bigger antennas** and radio equipment in general **on tower tops**.

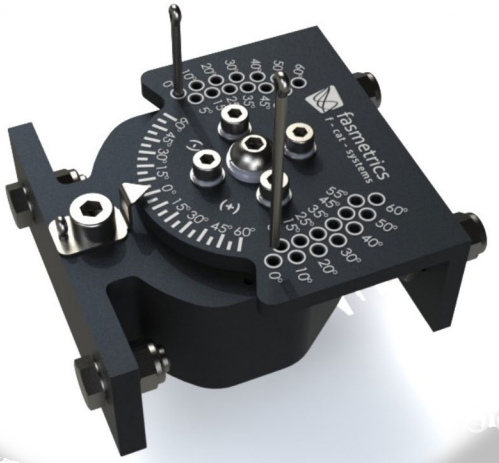
Our Products for 5G Challenge…

A. F-CAT

It aims at replacing the legacy antenna supports and reliefs the towers from excessive weight and wind load, and to **reduce** mobile **sites TCO by >20%,** by:

- ↓ weight on tower top by **>50Kgr/cell**
- ↓ installation time by 50%
- ↓ logistics complexity/cost by 80%





D. 3skelion

A product that evolutionary targets on new revenue streams from 5G mobility-as-a-service

C. Obelisk

An innovative, modular, pre-fabricated "site-in-a-box" solution that reduces site TCO.

- ↓CAPEX by 50% for rooftop sites
- ↓OPEX by 50%
- Combined with SONAR ↑ performance by 30%

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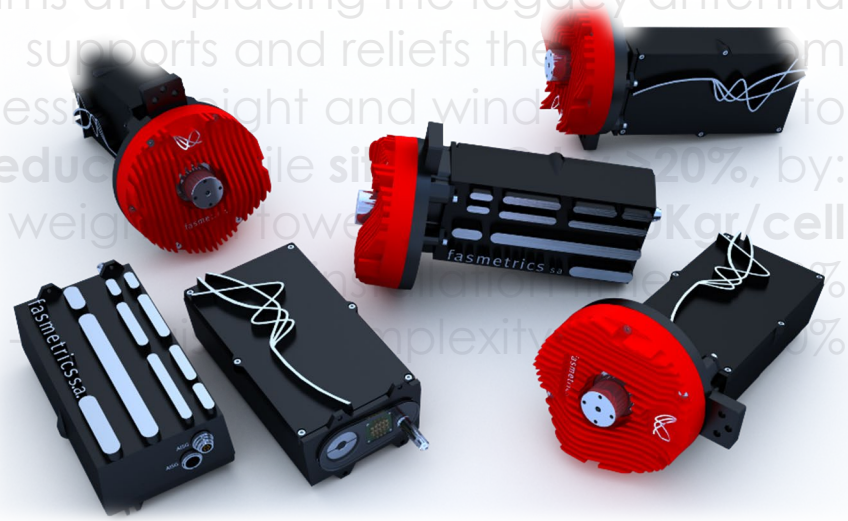

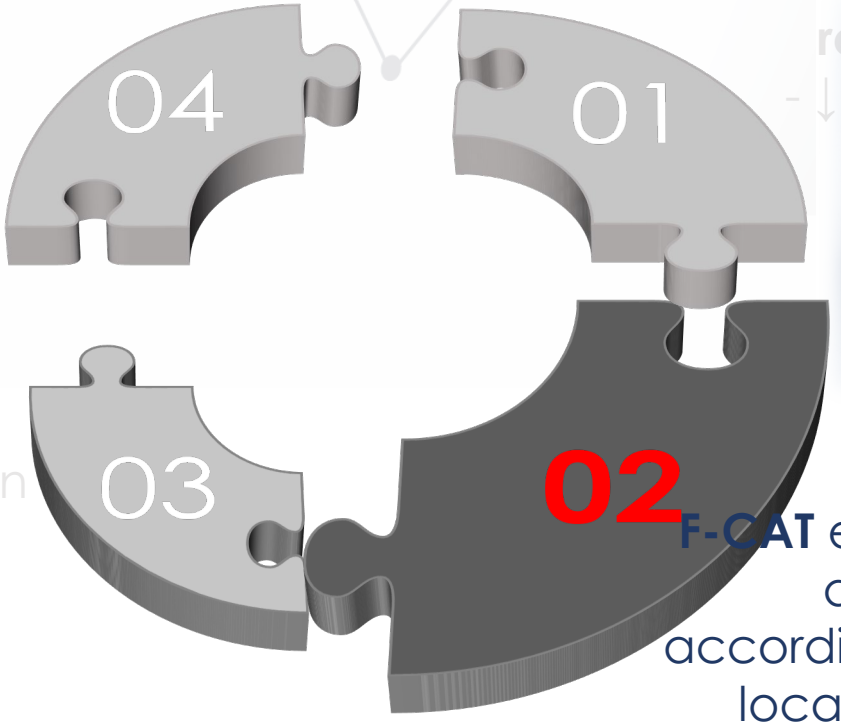

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B. SONAR

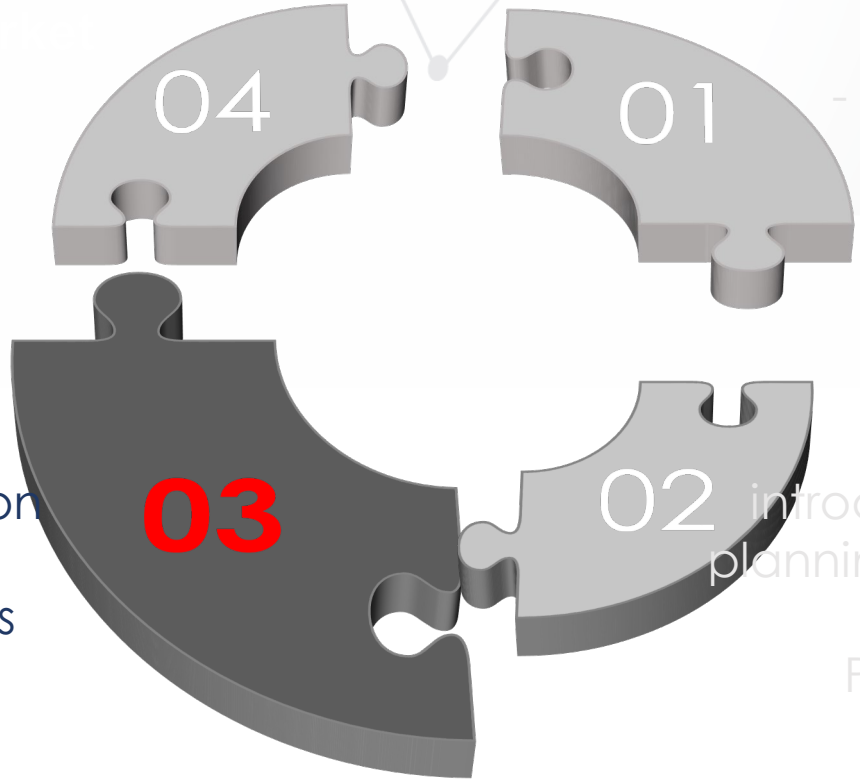
F-CAT evolution… SONAR aims at introducing a fully dynamic radio network planning according to usage patterns both in time and location. It increases site Performance (i.e. Revenue), by >30%, though:
- Optimizing radio resource by >30%
- Increasing traffic & capacity by >30%

Our Products for 5G Challenge…

C. Obelisk

An innovative, modular, pre-fabricated "site-in-a-box" solution that reduces site TCO.

- ↓CAPEX by 40% for rooftop sites
- ↓OPEX by 30%
- Combined with SONAR ↑ performance by 30%



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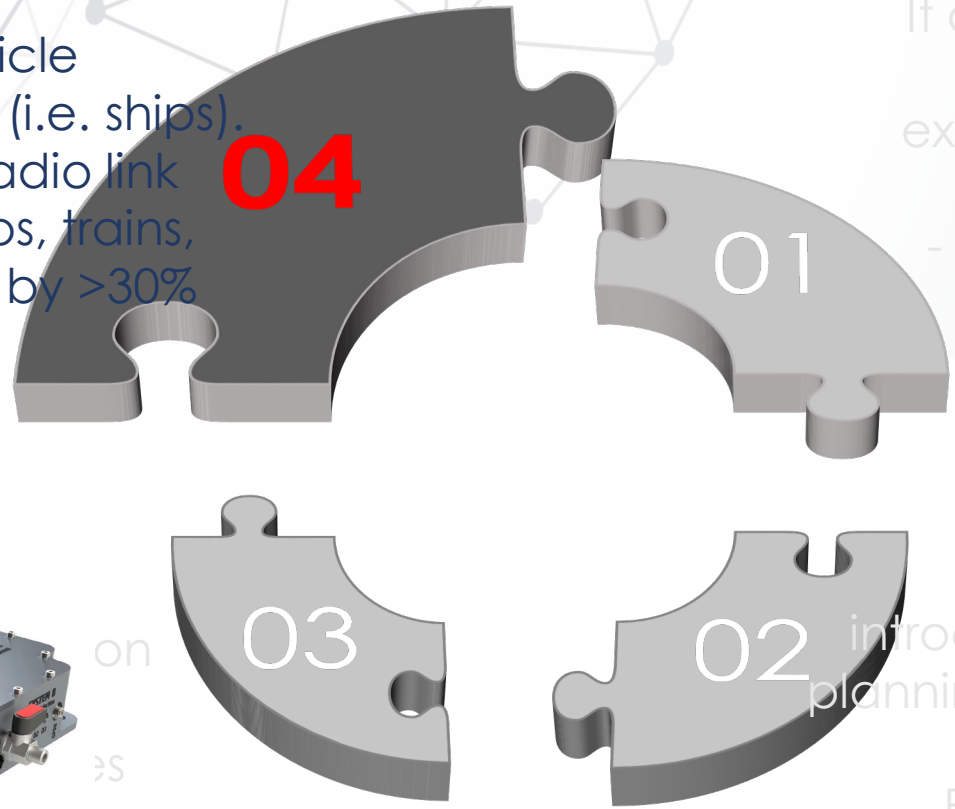
Our Products for 5G Challenge…

D. 3skelion

It aims at improving coverage, capacity & quality of communication on in-vehicle broadband repeater sites (i.e. ships). It optimizes backhauling radio link for sites-on-the-go (i.e. ships, trains, cars), improving capacity by >30%



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F-CAT: The Challenge

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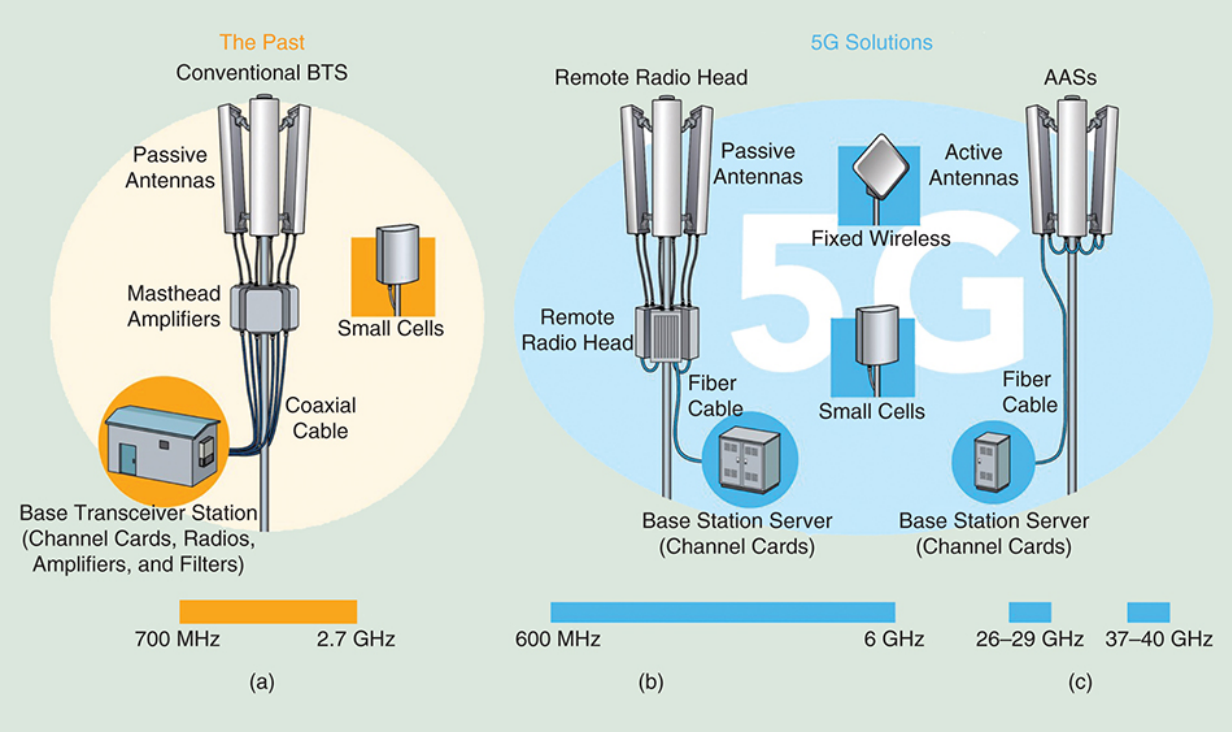
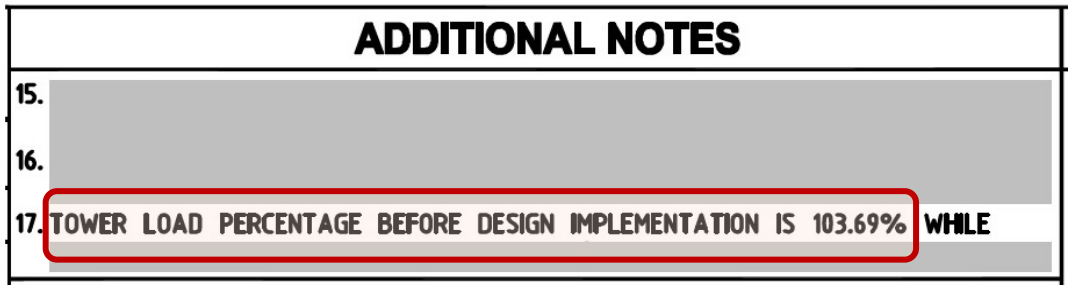
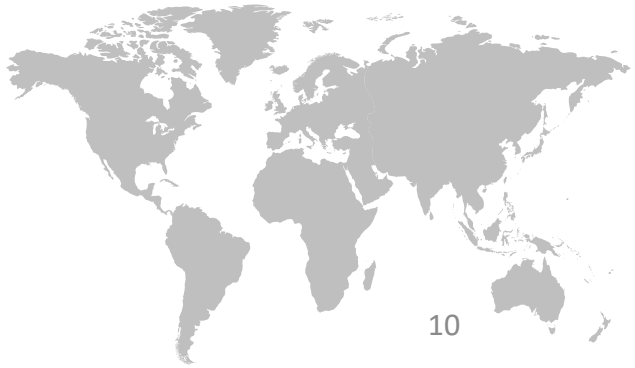
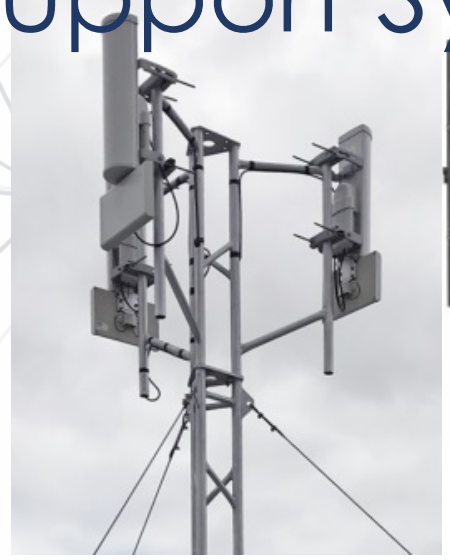


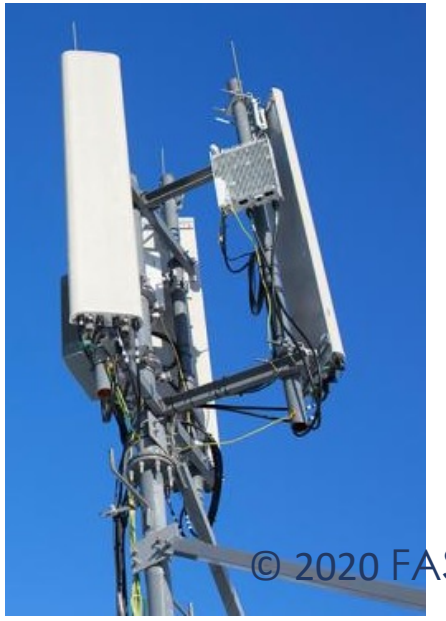
The challenge:
Existing sites are to a broad extend statically and space limited. This makes their upgrade (i.e supporting additional new (and bulkier) antennas) a big challenge!
Even if it is feasible, they need to be statically enforced. This costs a lot!

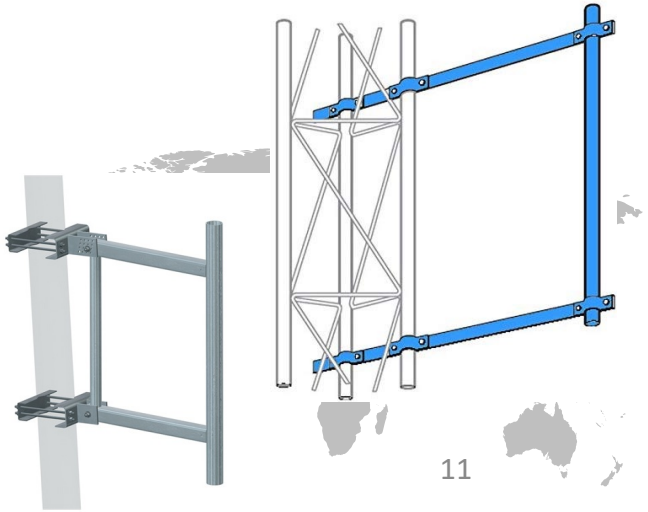




Challenge Root Cause: Legacy Antenna Support Systems



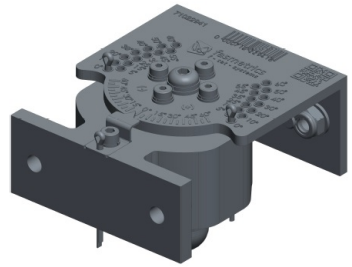


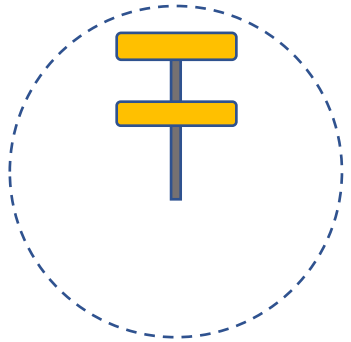


- **Bulky & heavy steel structures** that heavily affect tower static & dynamic performance
- **Non-standardized, inhomogeneous** material that affects traceability, and logistics, whereas it increases load variability on the tower
- Various OD **mounting poles are inherent part of** any state-of-the-art mediation, for supporting the antenna azimuth adjustment

F-CAT: Key Benefits vs Legacy

- ***Modular design*** *and a broad product family to cover all kinds of installations and the vast majority of tower and antenna/radio equipment types*
- *Tangible* ***overall supply chain process cost optimization*** *(less weight and volume, fully traceable material)*
- *Tremendous reduction* ***(80%)*** *of tower-top weight & volume, hence dynamic wind-load (per antenna).* ***None or less tower static reinforcement needed!***
- ***Less space is needed, which is critical especially for rooftop covered sites***
- *Tangible simplification of antenna installation steps with 50% decrease of working time on tower-top (antenna azimuth alignment is performed exclusively* ***on the ground****)* ⇒ ***50% less site down-time and total installation time***
- *Significantly reduced health & safety risk for riggers on tower-top*
- *Increased environmental footprint due to less galvanized steel used on site*
- *High accuracy level in antenna alignment*



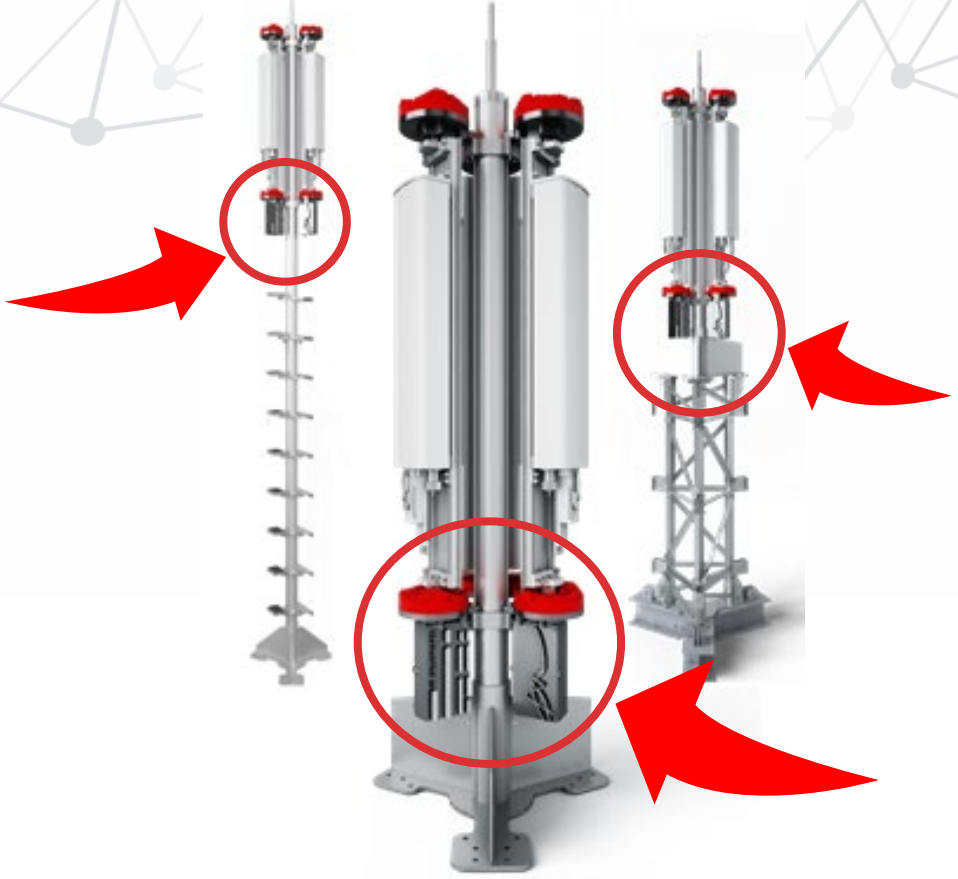


F-CAT *innovation reduces site TCO by more than* ***20%***

SONAR: The Challenge I

SON-AR *stands for* ***S****elf* ***O****rganizing* ***N****etwork* ***- A****ntenna* ***R****obotics*

Antenna azimuth automation & remote-control system for traffic based active cell coverage



Fixed Azimuths? Not any more… SONAR It applies on any antenna… legacy or new.

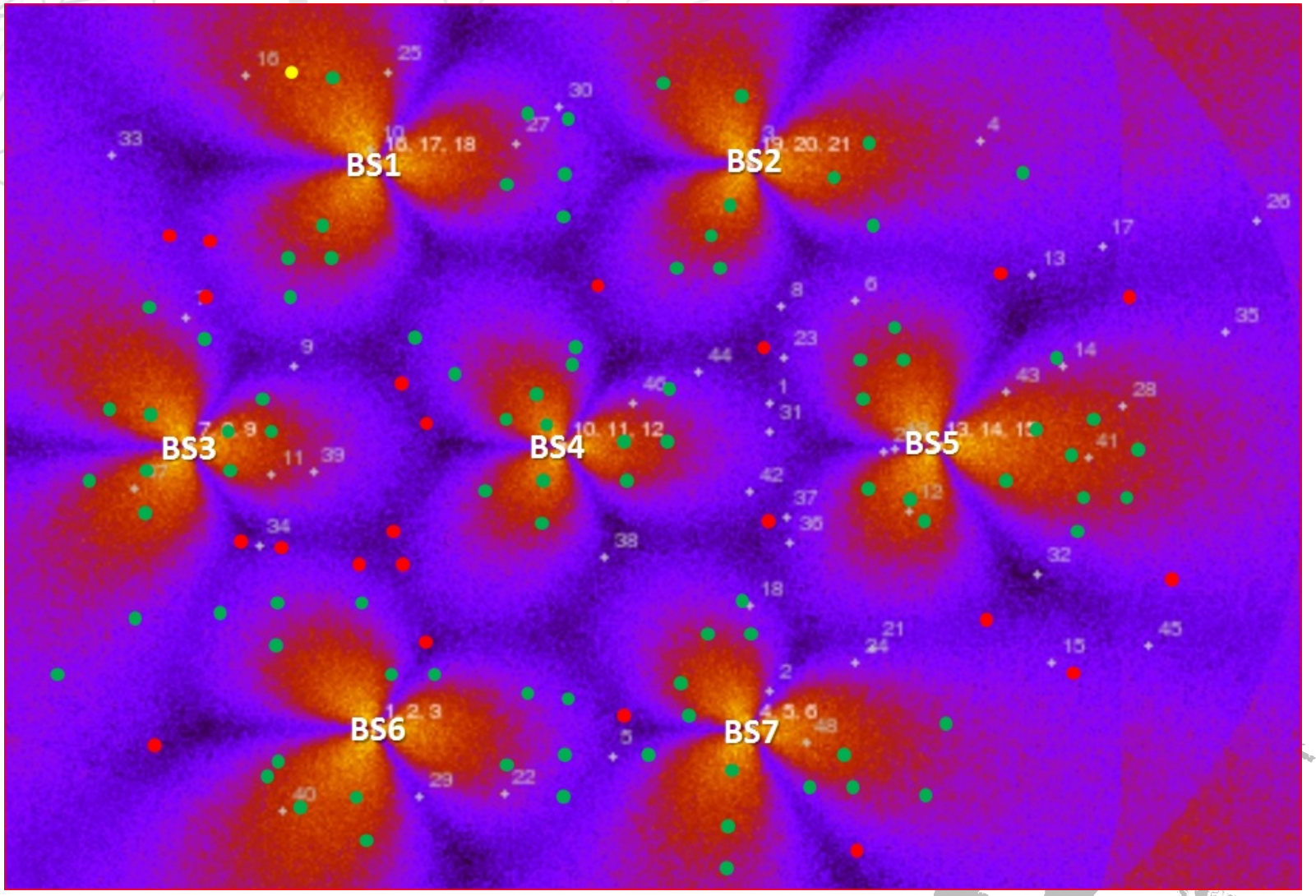
SONAR: The Challenge II

The Challenge II:
Since radio network sites are still being planned for geographical coverage (as from the 2G/3G era), MNOs will continue to lose revenues!

Users are served at different service level (or some not at all!).
Optimizing the radio network means:

- ❑ Drop Calls are minimized
- ❑ Access Failures are minimized
- ❑ Throughput is increased

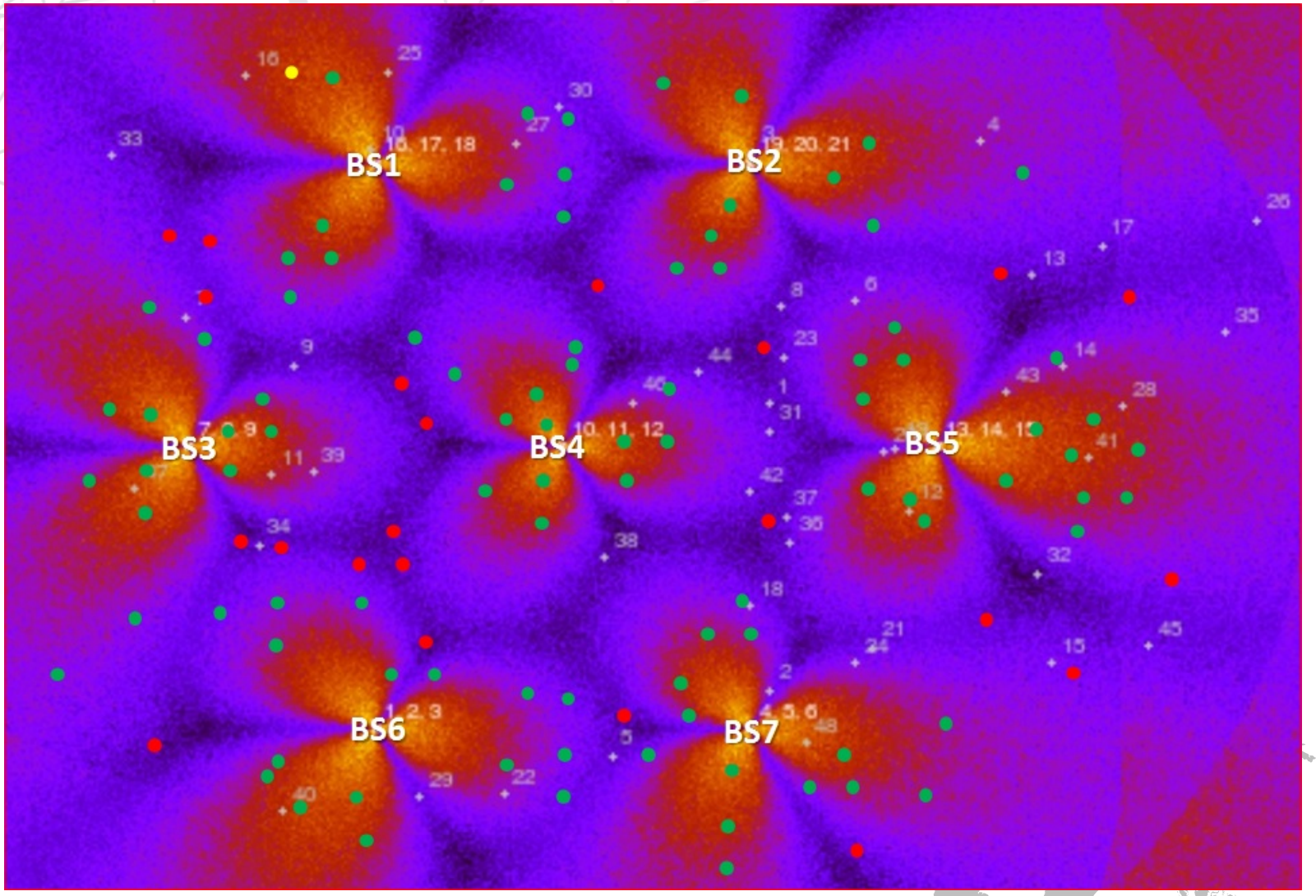
and leads to better user experience and customer loyalty, increased revenue, and higher RoI for the MNO.



SONAR: The Solution

The solution to this problem can be either through the increase of network resources (more spectrum, more sites)
or
through better utilization of existing resources(Increase spectrum efficiency, reduce radio interference, boost signal coverage).

SONAR: The Solution
SONAR makes the **red** dot **green** by boosting the intelligence of the existing network flexible and smart, and improving the High Usage Area coverage



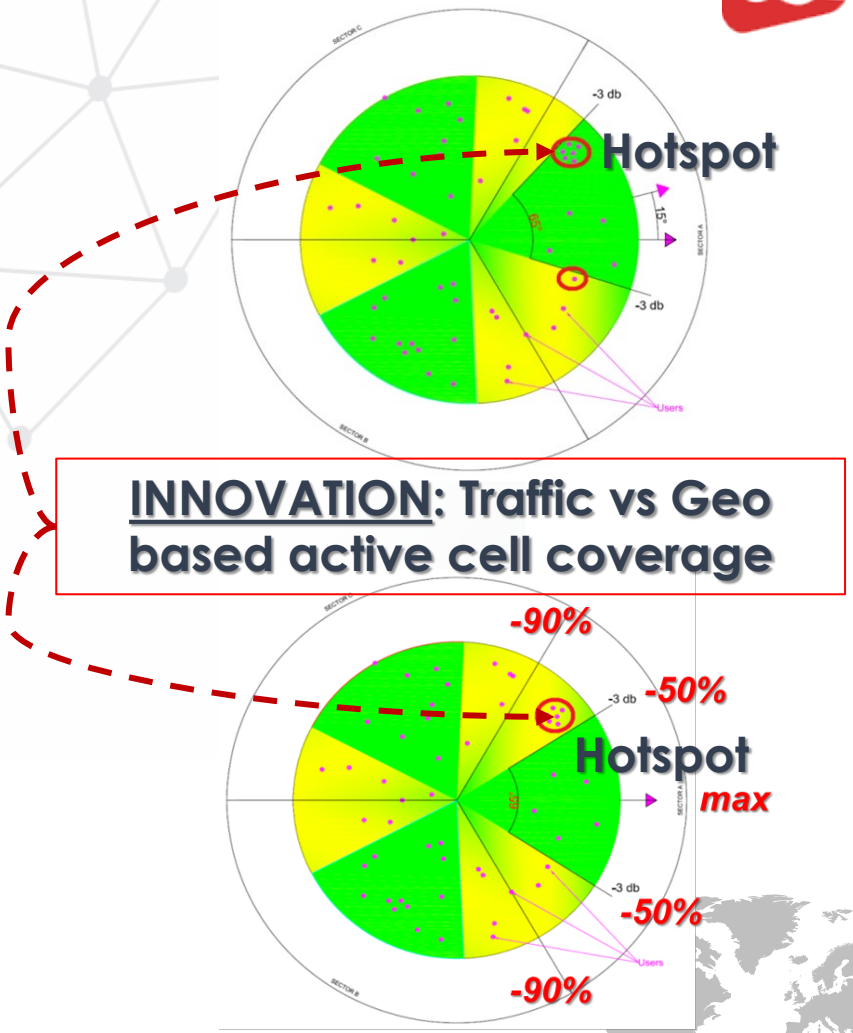
SONAR: How it works

Optimization of traffic capacity for 4G/5G mobile networks can become a reality through novel radio planning methodologies….Try **traffic-based vs geographical-based** planning

SONAR uses an intelligent antenna azimuth steering device that automatically scans the h-plane within ±15° the cell's initial coverage footprint, evaluating clockwise and counterclockwise the "cell-edge" performance in order to identify the best antenna azimuth heading for which the High Usage Areas (HUAs) in a pre-defined time frame are better served from the network.

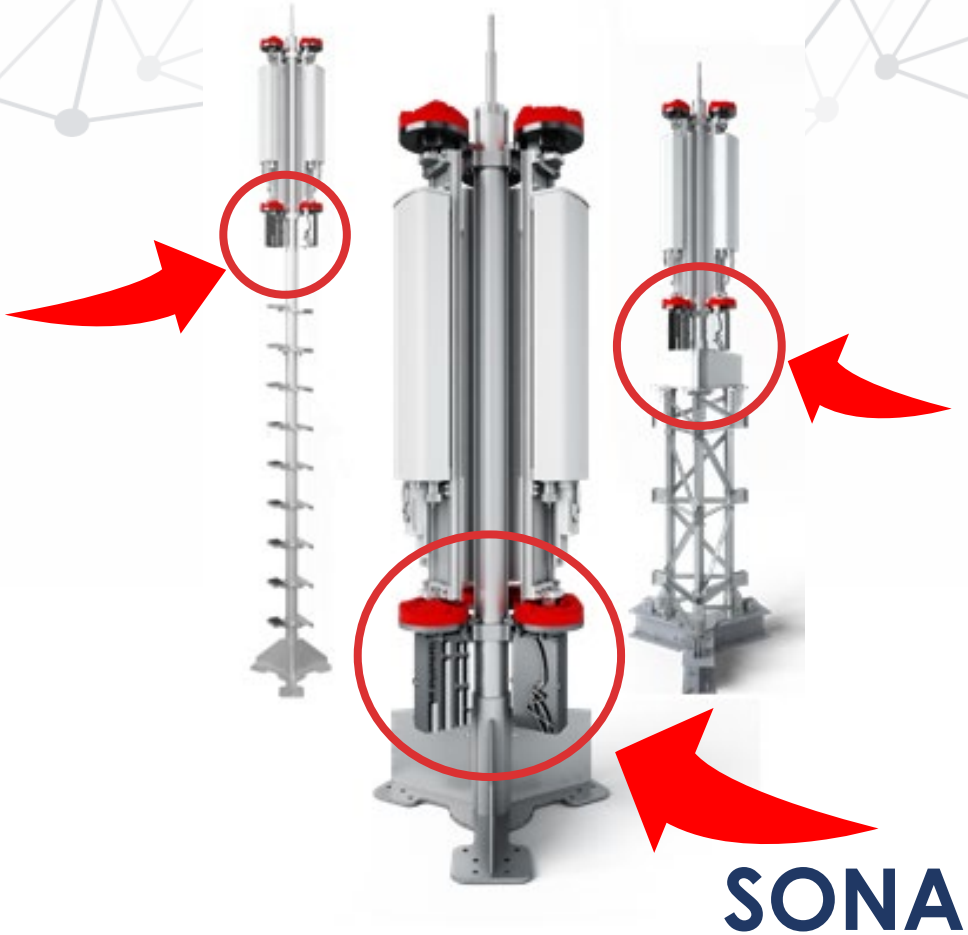
SONAR: Results from a real cluster

DCR -18%
AFR -26%
Voice performance +13%
Data performance +35%

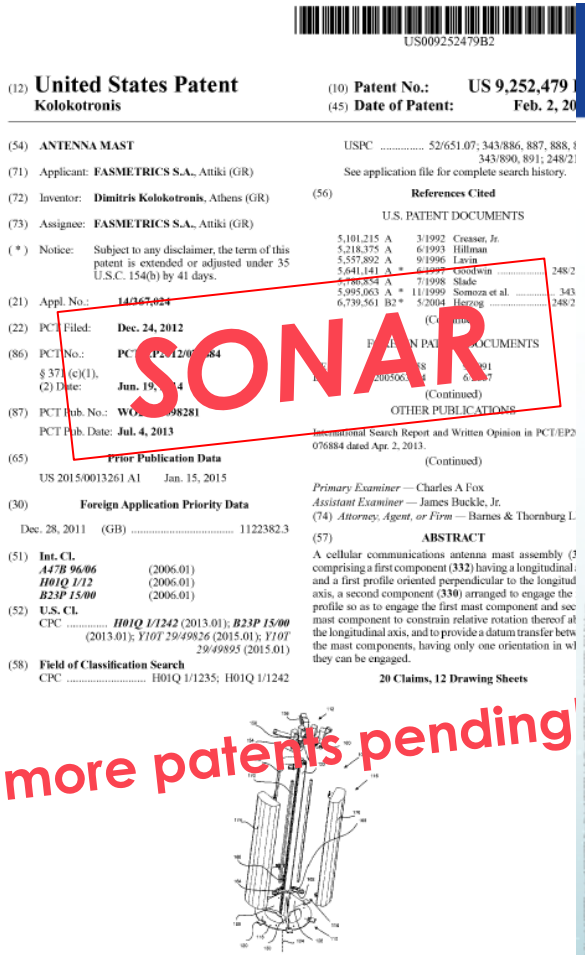


SONAR: F-CAT Evolution

SONAR is the remote F-CAT controller



SONAR



US009252479B2

(12) **United States Patent**
Kolokotronis

(10) **Patent No.: US 9,252,479**
(45) **Date of Patent: Feb. 2, 20**

(54) **ANTENNA MAST**

(71) Applicant: **FASMETRICS S.A.**, Attiki (GR)

(72) Inventor: **Dimitris Kolokotronis**, Athens (GR)

(73) Assignee: **FASMETRICS S.A.**, Attiki (GR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 41 days.

(21) Appl. No.: **14/367,024**

(22) PCT Filed: **Dec. 24, 2012**

(86) PCT No.: **PCT/EP2012/0[illegible]84**
§ 371 (c)(1),
(2) Date: **Jun. 19, [illegible]4**

(87) PCT Pub. No.: **WO[illegible]98281**
PCT Pub. Date: **Jul. 4, 2013**

(65) **Prior Publication Data**
US 2015/0013261 A1 Jan. 15, 2015

(30) **Foreign Application Priority Data**
Dec. 28, 2011 (GB) 1122382.3

(51) **Int. Cl.**
A47B 96/06 (2006.01)
H01Q 1/12 (2006.01)
B23P 15/00 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 1/1242*** (2013.01); ***B23P 15/00*** (2013.01); *Y10T 29/49826* (2015.01); *Y10T 29/49895* (2015.01)

(58) **Field of Classification Search**
CPC H01Q 1/1235; H01Q 1/1242
USPC ..... 52/651.07; 343/886, 887, 888, [illegible] 343/890, 891; 248/2[illegible]
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,101,215 A 3/1992 Creasser, Jr.
5,218,375 A 6/1993 Hillman
5,557,892 A 9/1996 Lavin
5,641,141 A * 6/1997 Goodwin 248/2
5,786,854 A 7/1998 Slade
5,995,063 A * 11/1999 Somoza et al. 343
6,739,561 B2 * 5/2004 Herzog 248/2

(Continued)

FOREIGN PATENT DOCUMENTS

[illegible]200506.[illegible] 6[illegible]

(Continued)

OTHER PUBLICATIONS

International Search Report and Written Opinion in PCT/EP2[illegible]076884 dated Apr. 2, 2013.

(Continued)

Primary Examiner — Charles A Fox
Assistant Examiner — James Buckle, Jr.
(74) *Attorney, Agent, or Firm* — Barnes & Thornburg L[illegible]

(57) **ABSTRACT**

A cellular communications antenna mast assembly ([illegible] comprising a first component (**332**) having a longitudinal [illegible] and a first profile oriented perpendicular to the longitud[illegible] axis, a second component (**330**) arranged to engage the [illegible] profile so as to engage the first mast component and sec[illegible] mast component to constrain relative rotation thereof al[illegible] the longitudinal axis, and to provide a datum transfer betw[illegible] the mast components, having only one orientation in wl[illegible] they can be engaged.

20 Claims, 12 Drawing Sheets

SONAR

more patents pending

SEAL OF EXCELLENCE

European Commission

Certificate delivered by the European Commission, as the institution managing Horizon 2020, the EU Framework Programme for Research and Innovation 2014-2020

The project proposal 685150, SONAR

SONAR - Self Organizing Network Antenna Robotics

Submitted under the Horizon 2020's SME instrument phase 2 call H2020-SMEInst-2014-2015 (H2020-SMEINST-2-2015) of 18 March 2015 in the area of Open Disruptive Innovation Scheme (implemented through the SME instrument) by

Fasmetrics S.A.
Perikleous 17
Athens
Greece

following evaluation by an international panel of independent experts

WAS SUCCESSFUL IN A HIGHLY COMPETITIVE EVALUATION PROCESS* AS AN INNOVATIVE PROJECT PROPOSAL

This proposal is recommended for funding by other sources since Horizon 2020 resources available for this specific Call were already allocated following a competitive ranking.

* This scores passing all stringent Horizon 2020 assessment thresholds for the 3 award criteria (excellence, impact, quality and efficiency of implementation) required to receive funding from the EU budget Horizon 2020.

Corina Crețu,
Commissioner for Regional Policy

Carlos Moedas,
Commissioner for Research, Science and Innovation

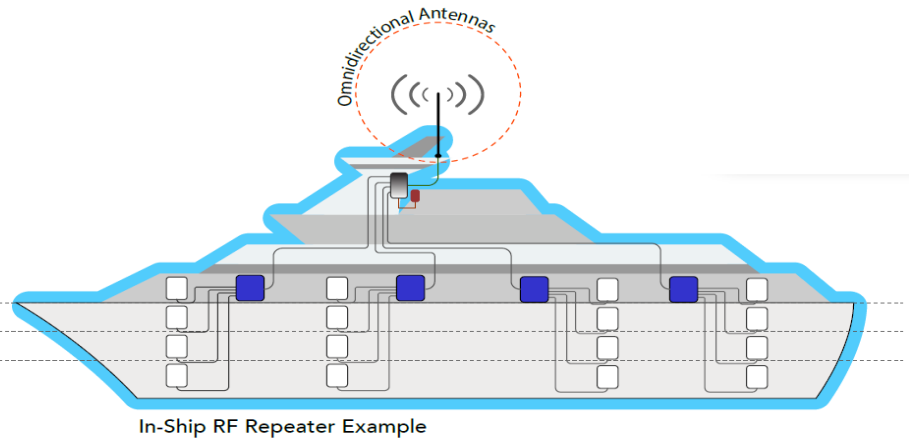
Brussels, 01/02/2016

3Skelion: The Challenge

The Challenge:
Cruise ships are crowded High Value Customer (HVC) hotspots, that starving for data capacity and throughput, typically at cell edge.
Existing coverage solutions that have been perfoming adequately for 2G/3G technologies, have been proved limited for 4G/5G to satisfy constantly growing data demand and service level expectations on behalf of the customers.

- **10% of users** abandon video after **4sec** waiting
- **40% of users** abandon video after **10sec** waiting

Legacy Solution



In-Ship RF Repeater Example

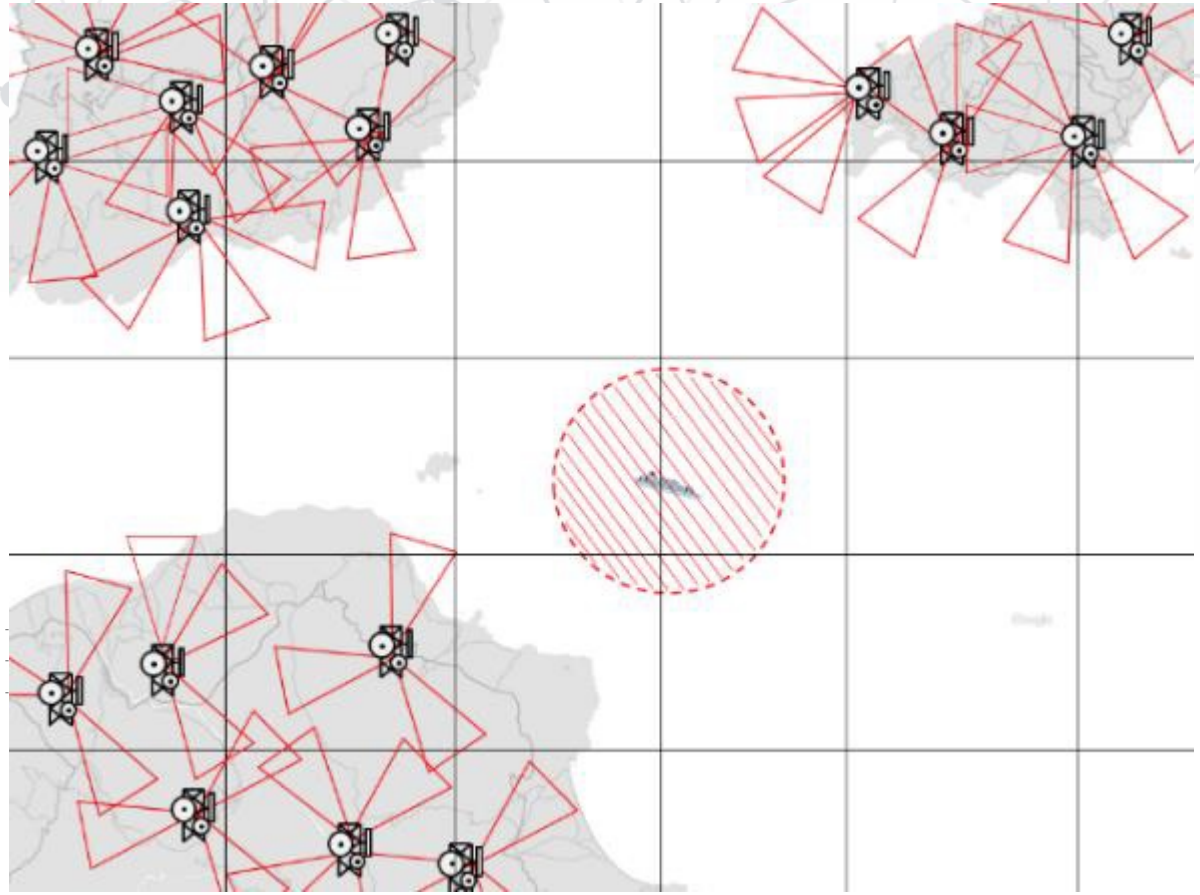
- Even from 2G era, MNOs have appreciated the value of the ships as **heavy usage moving underserviced hotspots**
- Hence, MNOs heavily invest in RF repeaters and indoor DAS to **enhance in-ship radio coverage** and improve hotspot service
- This practice although works quite successfully in 2G where coverage is the main requirement, it has certain data service limitations for the modern broadband technologies (3G→4G→5G)
- To improve the in-ship broadband performance (and hence data service capacity) we just need to "feed" the RF repeater with "better" radio signals (better Rx levels, less noise)
- "Junk" radio (i.e. high noise levels) that omni antenna feeds in the system, is the root cause for data service underperformance (less Data Throughputs/Capacity)

3Skelion: The Solution

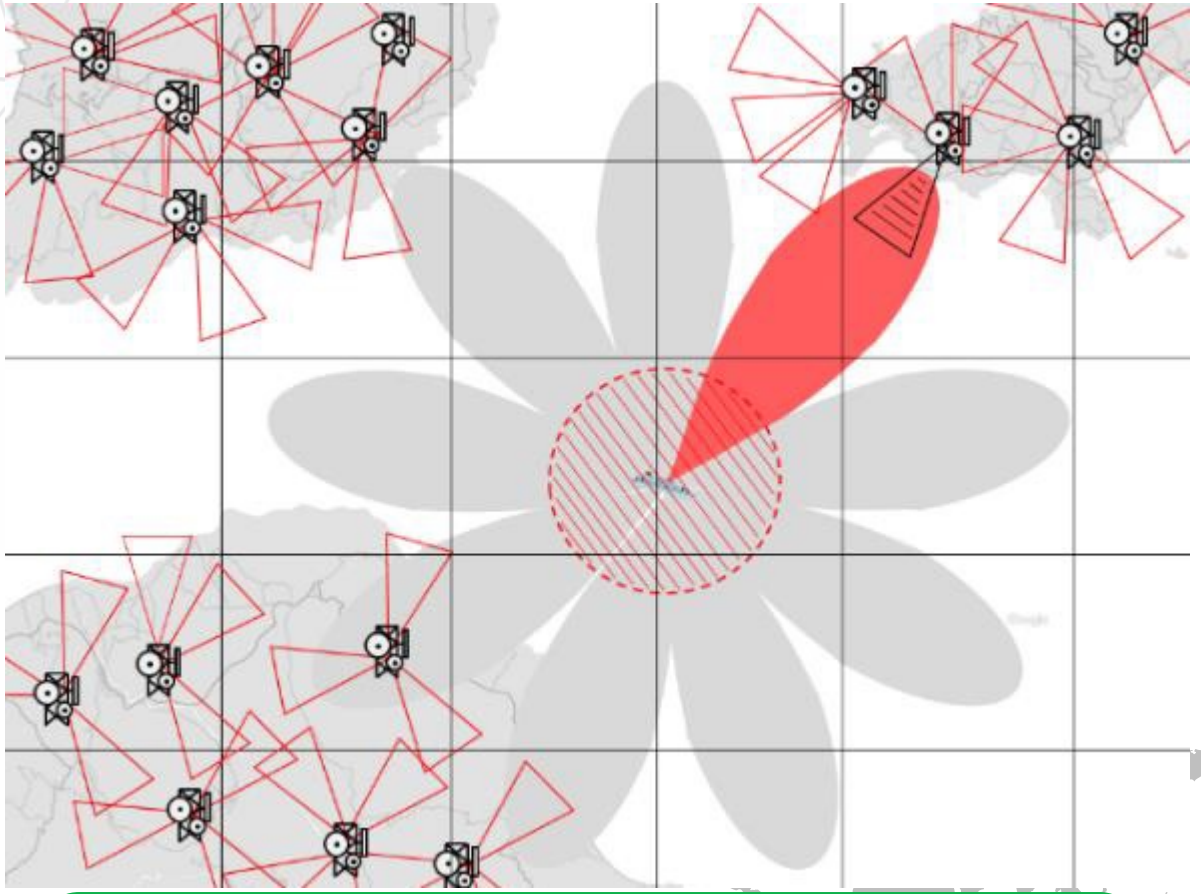
Before/Omni Antenna

After/Directional Antennas

3Skelion: How it works

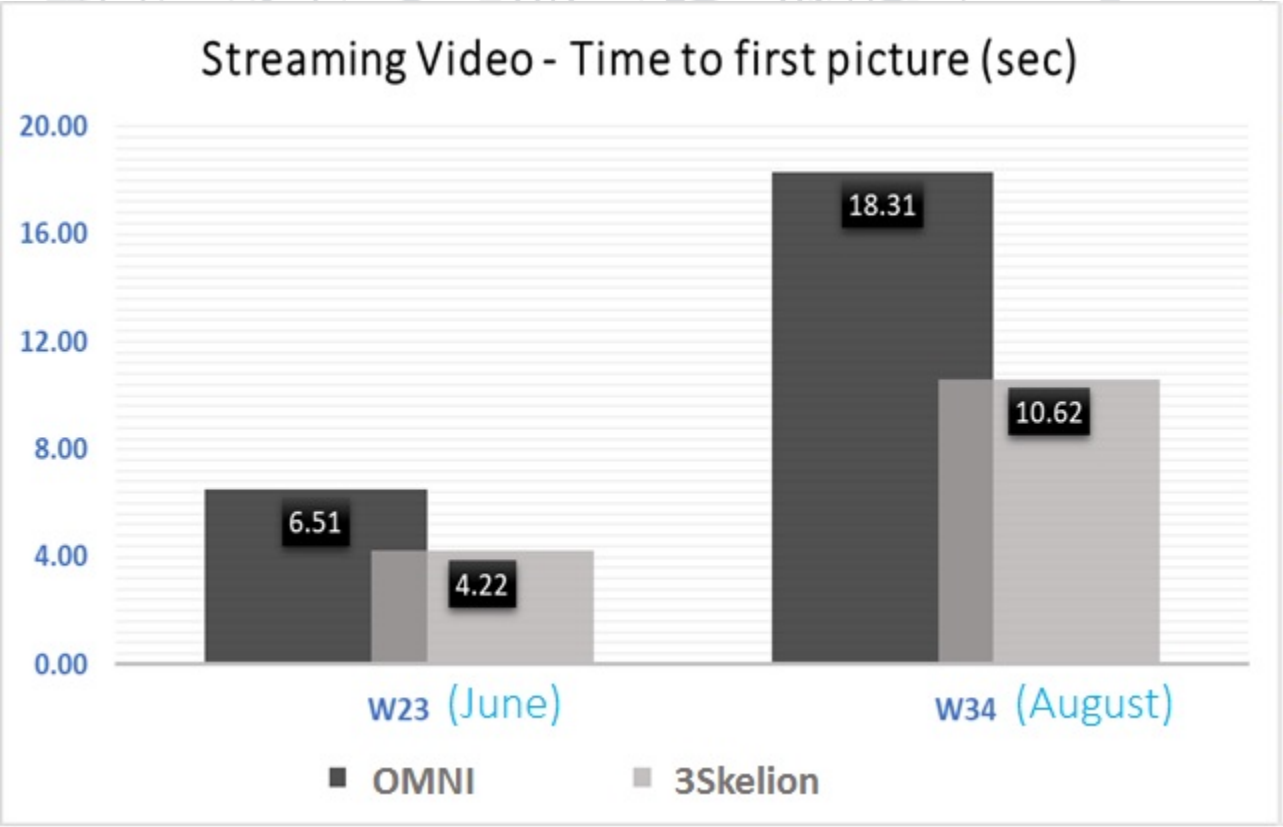


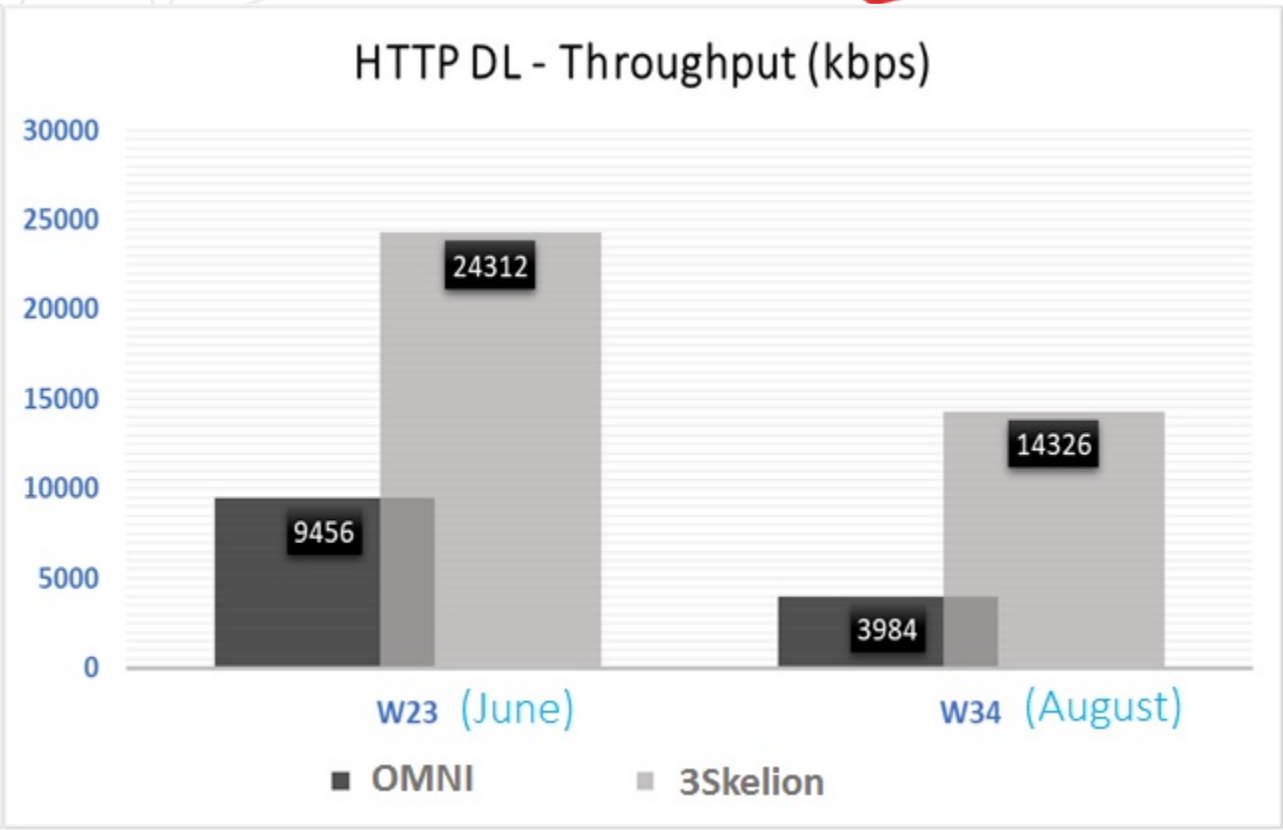
Before/Omni Antenna



After/Directional Antennas

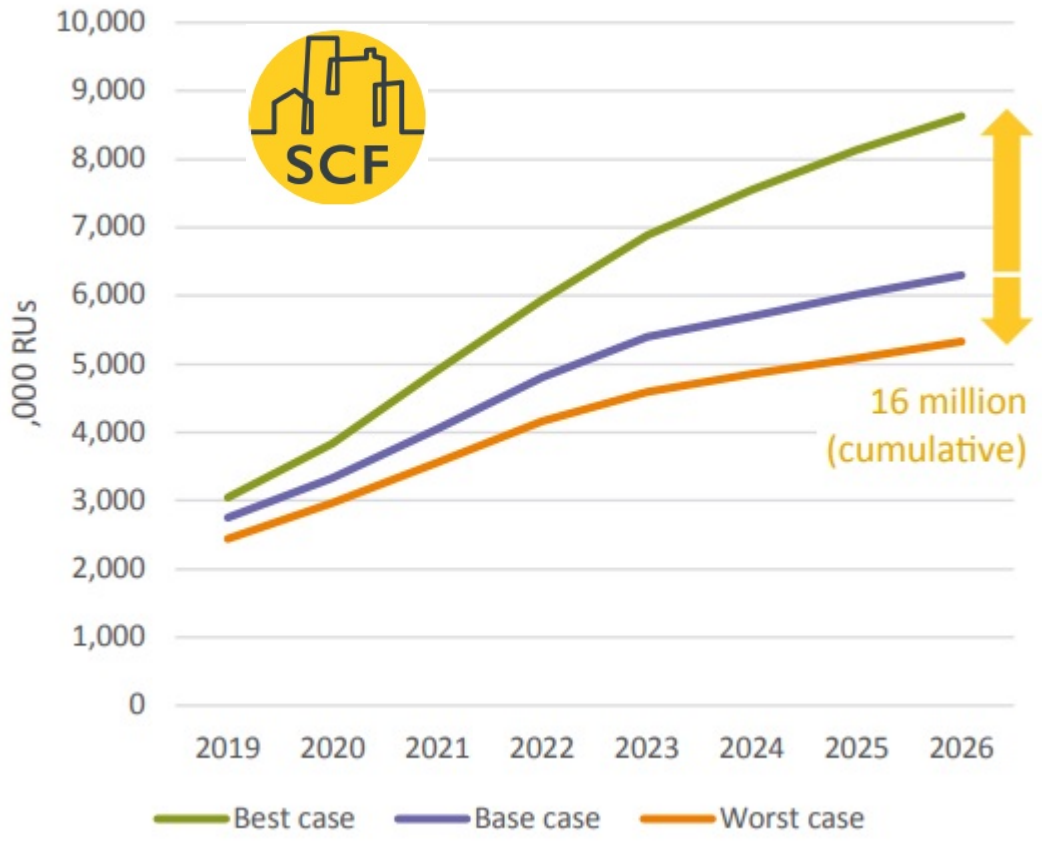
3Skelion: Key Benefits vs Legacy



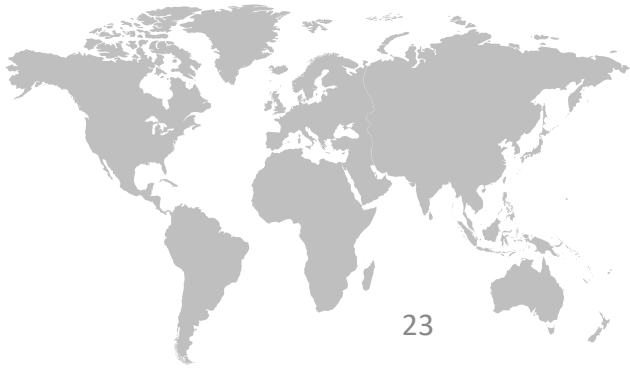


- Avg. "Time to first Picture" (TTFP) with omni is ~18sec (in August) vs ~6sec (in June)
- Avg. "Time to first Picture" (TTFP) with **3skelion** technology is ~10sec (in August) vs ~4sec (in June)
- Avg. DL throughput with omni is ~4Mbps (in August) vs ~ 9Mbps (in June)
- Avg. DL throughput with **3skelion** technology is ~14Mbps (in August) vs ~ 24Mbps (in June)

OBELISK: The Challenge

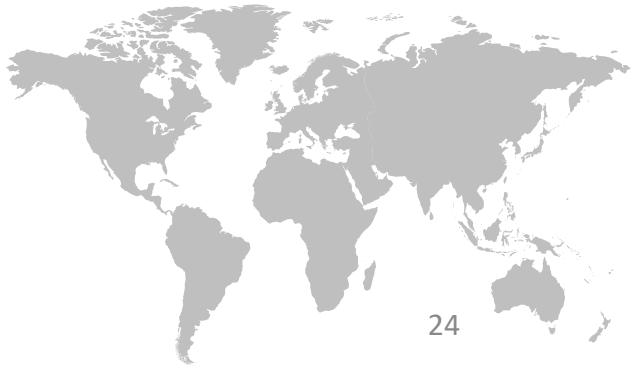


The Challenge:
According to a worst case scenario, more than 30million small cells will have cumulatively been installed around the globe till 2026 (Source Small Cell Forum, July 2020).



Legacy Solution

- Non standardized, manufacturer-based proprietary solutions
- Increased Capex
- Increased Opex



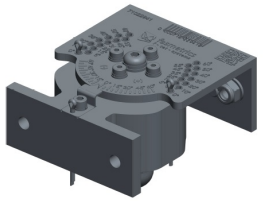
Obelisk: The Solution

OBELISK introduces the site-in-a-box concept, being a modular & easy to install site, which offers significant cost optimization to rooftop sites rollout (**Site TCO is reduced by >30%).**
It is fully compatible with **FCAT** and **SONAR**.

U-Tower Base

U-Tower Segment

1m height module used to assemble rooftop towers up to 15m



On which radio Equipment (antennas) are mounted with F-CAT

Which performance may be further improved through SONAR

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