The critical role of antennas for gigabit connectivity

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Let's make this
Europe's Digital Decade!

Digital Agenda for Europe 2020-2030

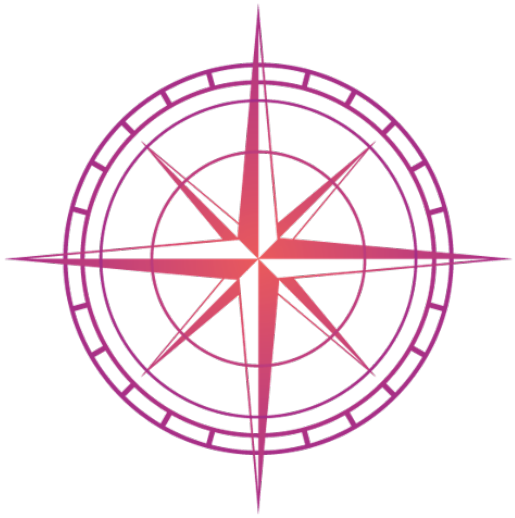
fasmetrics

Skills

20 million employed **ICT specialists**, more graduates + gender balance
80% of adults can **use tech** for everyday tasks

Government

Key Public Services - 100% online
Everyone can **access health records online**
Everyone can use **eID**



Infrastructure

Gigabit connectivity for everyone, **high-speed mobile coverage** (at least 5G) everywhere
EU produces 20% of world's **semiconductors**
10 000 **cloud edge nodes** = fast data access
EU **quantum computing** by 2025

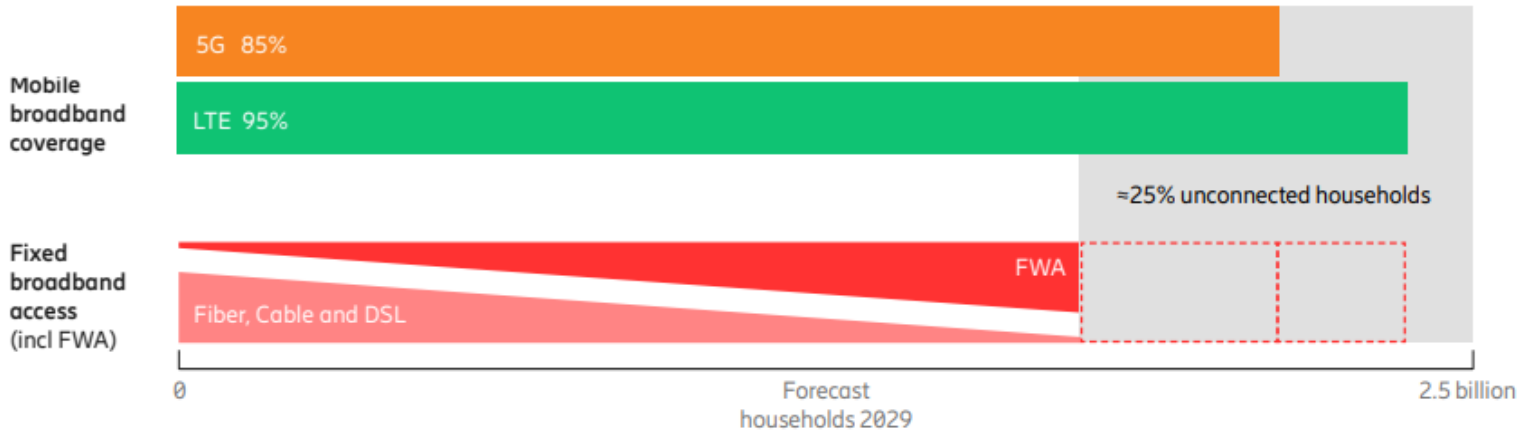
Business

75% of companies using **Cloud, AI or Big Data**
Double the number of **unicorn startups**
90% of **SMEs taking up tech**

https://digital-strategy.ec.europa.eu/en/policies/europes-digital-decade

Closing the gigabit digital divide with 4G/5G mobile broadband

ericsson.com

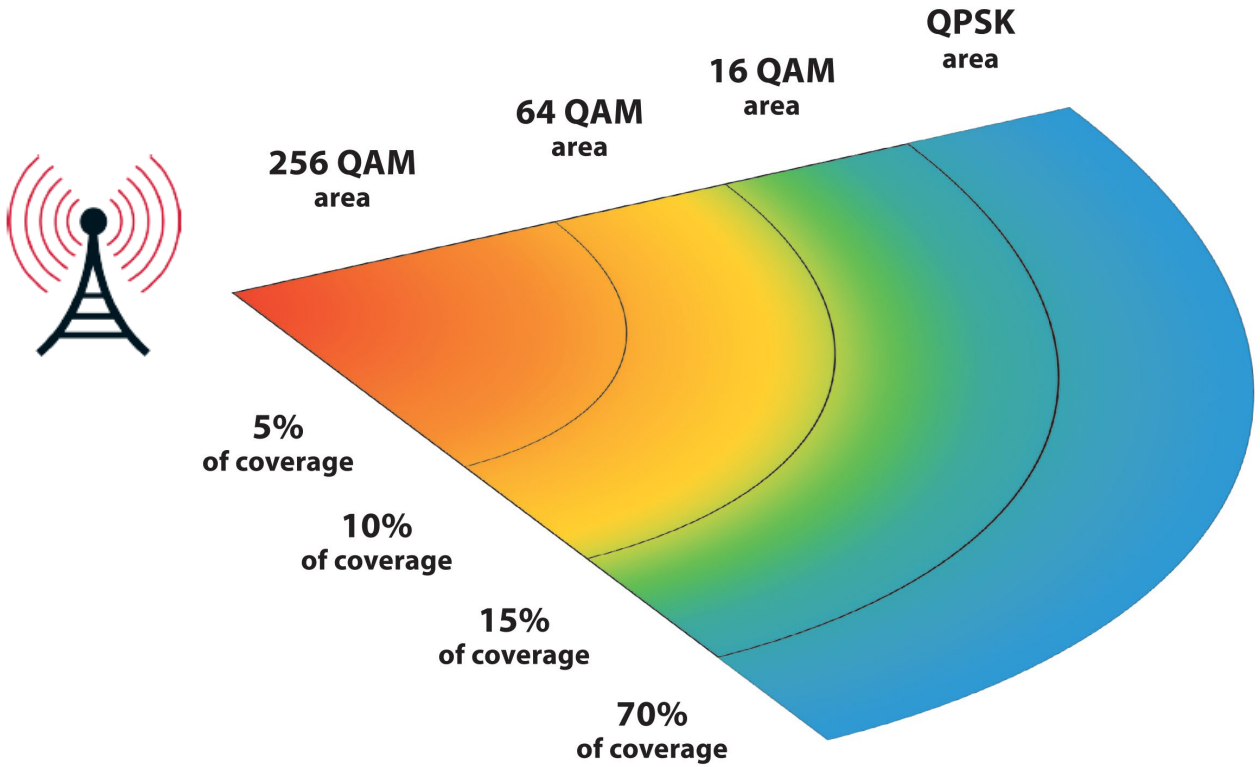


"LTE is forecast to reach over 95 percent of population and household coverage, while 5G is expected to cover around 85 percent of the world's population by 2029 (Ericsson, 2023)".

"The forecast of over 330 million FWA connections by the end of 2029 represents over one billion individuals having access to broadband over a wireless connection (18%). Based on ITU data, we estimate that around 25 percent of households will still be unconnected in 2029".

https://www.ericsson.com/4ade15/assets/local/reports-papers/further-insights/doc/fwa_insights_3_closing_extracted.pdf

But is 4G/5G adequate for gigabit connectivity?



Yes, supposing radio conditions capable of supporting high order modulation schemes.

Please note that connectivity performance degrades down to 3G/2G technology levels (assuming the same spectrum) for low order modulations (QPSK).

Total BW (MHz)	MIMO Layers	MCS Index	Max DL (Mbps)
100	SISO	QPSK	125
		16QAM	250
		64QAM	375
		256QAM	490
	2x2	QPSK	250
		16QAM	500
		64QAM	750
		256QAM	980
	4x4	QPSK	500
		16QAM	1000
		64QAM	1500
		256QAM	1960

Note:
1. For 100% channel (BW) utilization
2. For 50MHz BW only 256 QAM on 4x4 MIMO can deliver gigabit connectivity

https://www.cellmapper.net/4G-speed

What is needed for 4G/5G to support the gigabit connectivity?

CQI	MCS	Code rate × 1024	Spectral efficiency	SNR (dB)	
				Perfect channel estimation	Practical channel estimation
1	QPSK	78	0.1523	-11.2	-6.3
2	QPSK	120	0.2344	-6.9	-5.8
3	QPSK	193	0.377	-2.2	-1.4
4	16QAM	308	0.6016	2.7	3.9
5	16QAM	449	0.877	4.3	5.3
6	16QAM	602	1.1758	6.9	8.1
7	64QAM	378	1.4766	8.5	9.8
8	64QAM	490	1.9141	10.6	11.7
9	64QAM	616	2.4063	12.4	13.6
10	64QAM	466	2.7305	14.4	15.8
11	64QAM	567	3.3223	17.5	18.8
12	256QAM	666	3.9023	18.1	21.4
13	256QAM	772	4.5234	20.2	23.6
14	256QAM	873	5.1152	22.8	28.2
15	256QAM	948	5.5547	24.9	32

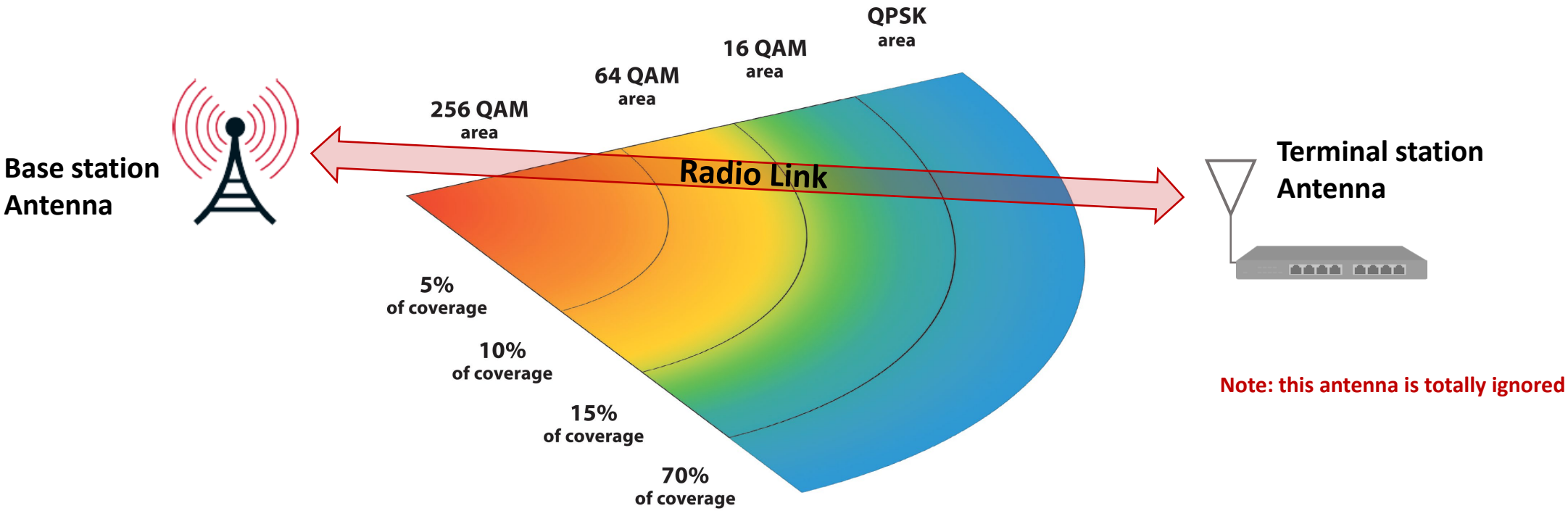
Low order MCS 0,9dB (avg SINR).

High order MCS 20,9dB (avg SINR).

The transition from low order MCS to high order MCS (>64 QAM) requires +20dB in SINR on avg.

How can we go from low order to high order MCS?

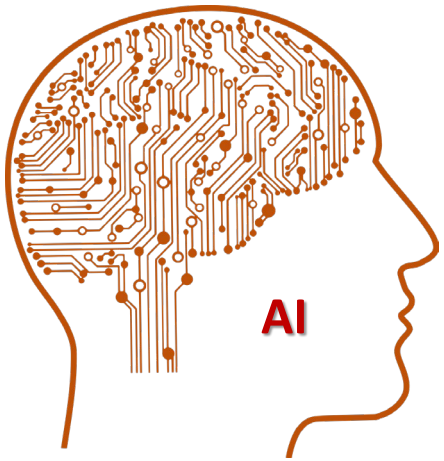
Radio link performance is a two parts story between the base station and terminal station antennas.
To improve MCS the radio link must be improved.
Assuming properly planned RAN, signal strength determines MCS.



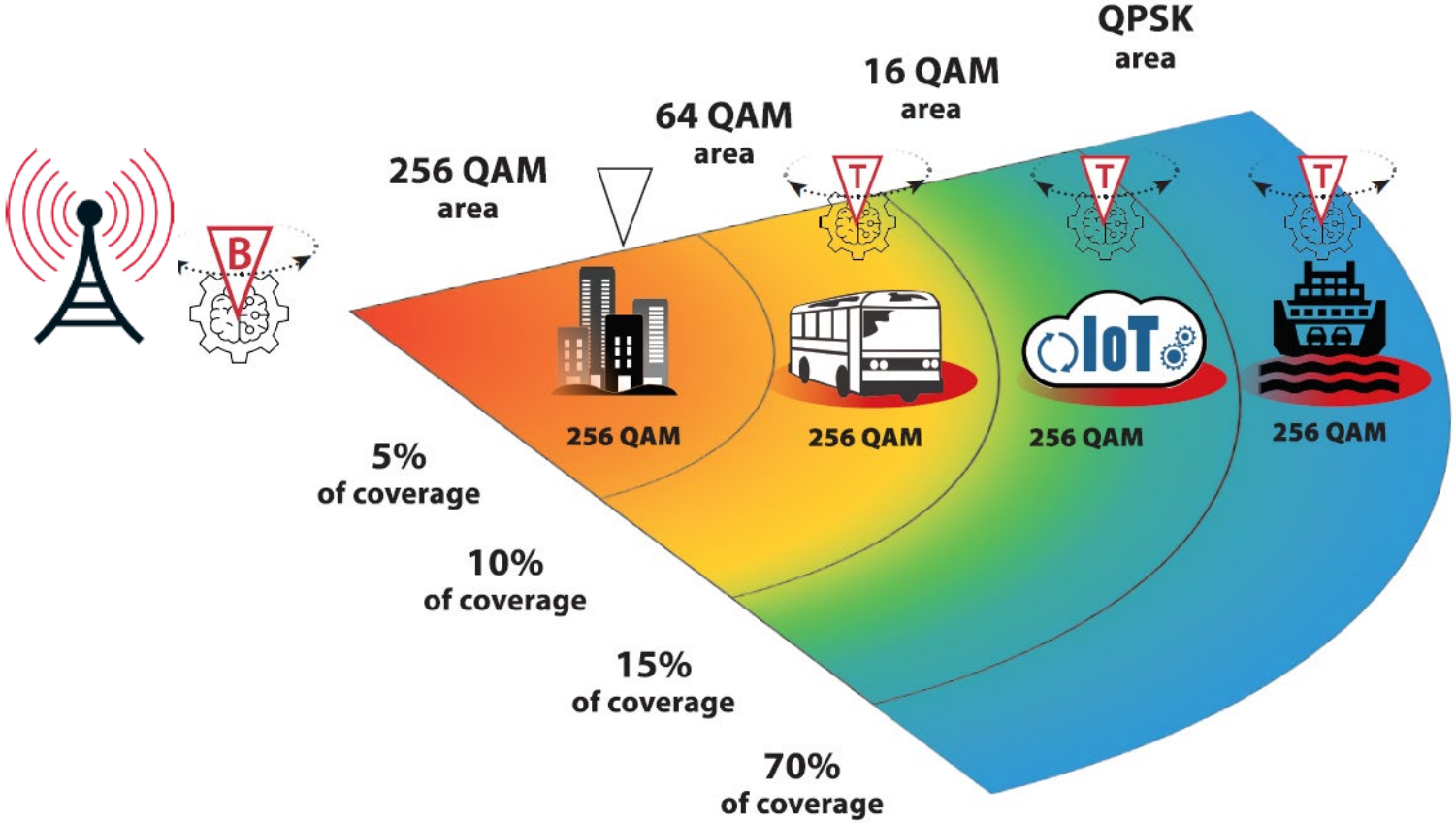
Antenna is the key element…

FASMETRICS heavily invests on antenna engineering…

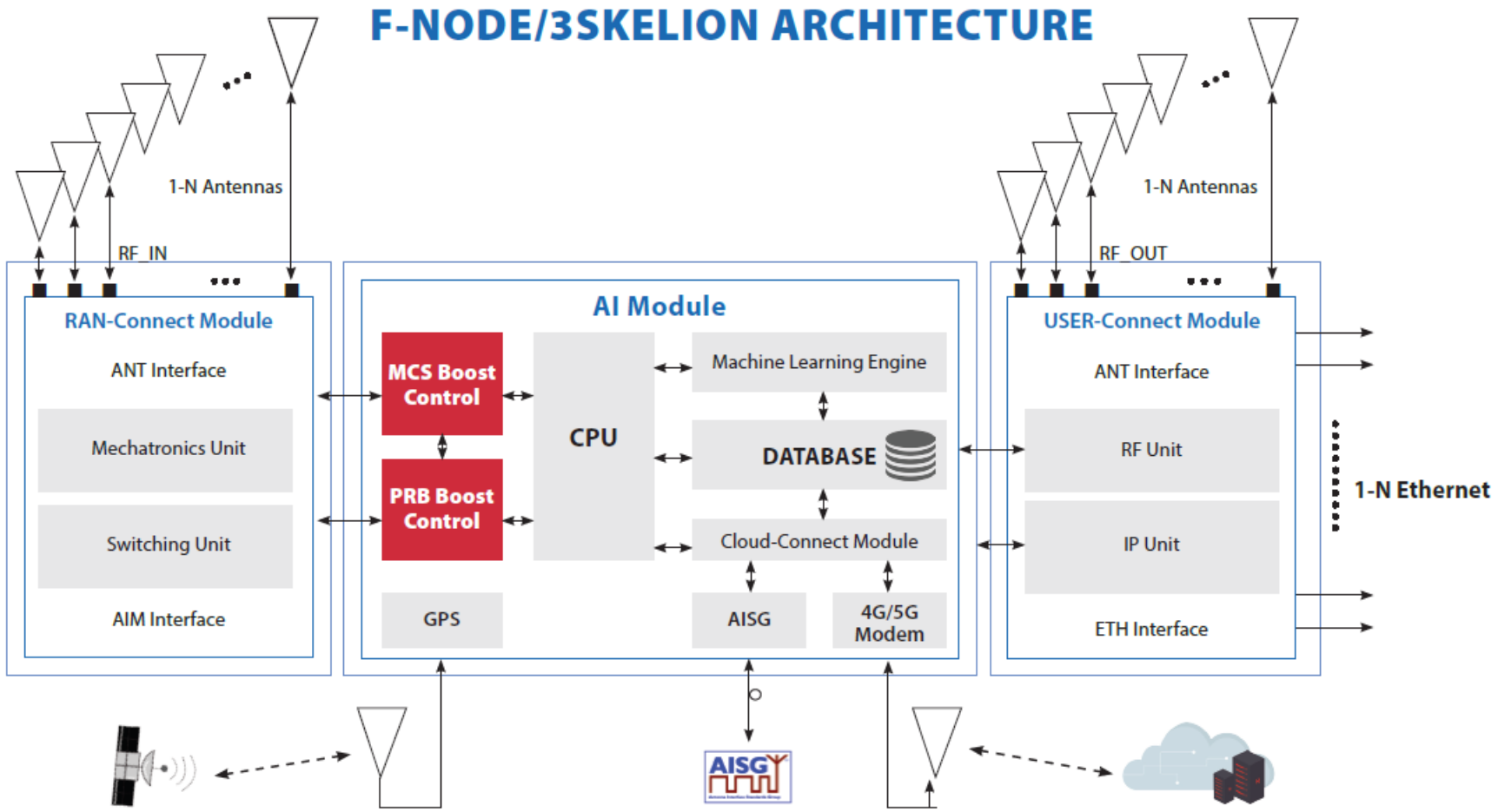
F-NODE/3SKELION: Sophisticated antennas to address the poor radio link area, that offers low MCS/low channel capacity



What if we could boost radio link by 20dB?



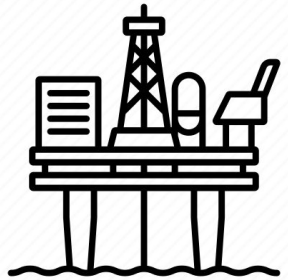
F-NODE/3SKELION Architecture



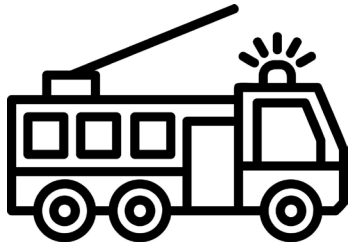
Use cases with immediate need…

Maritime

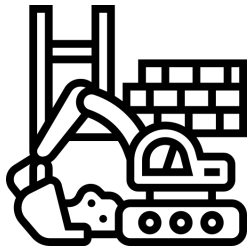
Transportation



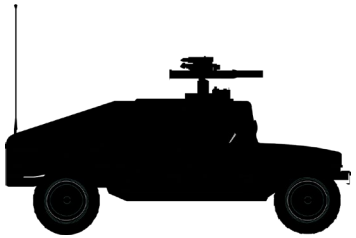
Energy



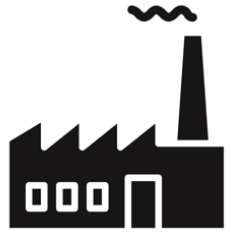
Safety



Construction



Tactical 4G/5G



Remote/Rural


fasmetrics
Building a fully connected world is not easy!
We are here to help ...
It’s more than just antennas.
It’s connectivity engineering.