Innovating Maritime Digital Connectivity

A selection of background information that came publicly available since end 2020 about advancements in wireless communication systems that will possibly enhance the maritime situational awareness and digitization on the North Sea

december 2021 | www.cfns.nl | cfns@rws.nl

–https://www.sdxcentral.com/articles/press-release/tideworks-nokia-seals-lte-5g-private-wireless-deal-at-port-of-seattle/2021/01/ On January 8, 2021, Nokia announced it will build a high-performance, industrial-grade **LTE/5G private wireless network at the Port of Seattle**. The platform will offer reliable high-bandwidth, low-latency private networking, local edge computing capabilities, voice and video services and a catalog of applications.

– http://www.circleid.com/posts/20210112-trump-parting-ntia-5g-debacle/ An opinion article by a communication insider about the lack of **participation by the US government** under the Trump administration **in the global 5G specifications organizations**.

– https://www.techzine.eu/news/infrastructure/54483/red-hat-and-intel-work-together-to-capture-the-emerging-5g-market/ Intel and RedHat (owned by IBM) announce collaboration in the 5G market. It will provide a blueprint for the **v-RAN** architecture and employ RedHat's **OpenShift** Container Platform, based on **Kubernetes**.

– https://www.msn.com/en-us/money/companies/american-tower-buys-telefonica-masts-for-9-4-billion/ar-BB1cHZti & https://www.telefonica.com/en/web/press-office/-/telefonica-sells-telxius-tower-division-to-american-towers-corporation-at-record-multiples-for-7-7-billion-euros After Vodafone and Deutsche Telekom / T-Mobile, also **Telefonica sells it towers**. This trend is not only about money, but about **edge computing, neutral hosts and (RAN) disaggregation**.

- https://www.fiercetelecom.com/telecom/google-cloud-nokia-forge-alliance-to-accelerate-cloud-native-5g-core-cloud-and-edge **Google Cloud and Nokia** announced they have teamed up to jointly **build cloud-native 5G core solutions** for service providers and their enterprise customers.

- https://www.fiercetelecom.com/telecom/chua-edge-computing-2021-when-elephants-dance The hyperscaler cloud battle will extend into the enterprise on-premises edge. **AWS** Outpost, **Azure** Private Edge Zones, and **Google** will push against platforms from HPE, IBM and Lenovo coupled with software from VMware, Red Hat, and a host of startups. – "***When the elephants dance, the chickens must be careful***."

– https://venturebeat.com/2021/02/23/google-goes-for-market-share-in-5g-cloud/ A similar analysis by VentureBeat about **the position of Google compared to the other hyperscalers** and why it is partnering with Intel and others now to gain a "fast start". *"Google plans to work with Intel on three aspects of co-marketing CSP solutions: providing next-generation infrastructure and hardware systems for VRAN and ORAN solutions; creating a lab environment where CSPs can develop their solutions, and enabling easier deployments to the edge. **The edge is an area that will see massive growth over the next few years** as both CSPs and third-party developers offer additional paid apps to mobile users. Indeed, edge has the potential to generate revenues even greater than the VRAN/ORAN segment of the market."*

– https://www.sdxcentral.com/articles/news/europes-telecom-giants-vow-open-ran-support/2021/01/ **Europe's four largest mobile network operators** are linking up to **support the deployment of open RAN** (Radio Access Network) technology across the continent. Deutsche Telekom, Orange, Telefónica, and Vodafone describe **Open RAN as "the technology of choice** for future mobile networks to the benefit of consumer and enterprise customers across Europe.",

– https://www.sdxcentral.com/articles/news/where-are-you-open-source-ran/2020/12/ The largest RAN vendors, which aren't exactly champions of open source, including Huawei, Ericsson, Nokia, Samsung Networks, ZTE, Fujitsu, and NEC control about 99% of the RAN market. Beware that **OPEN RAN does not equal Open Source RAN.**

– https://www.sdxcentral.com/articles/news/vmware-embraces-intel-for-vran-integration/2020/08/ VMware and Intel collaborate in the **Open RAN market**.

– CEPT-ECC Strategic Plan 2020-2025 **New business models and applications will emerge** based on the latest advances in network technologies. For example, smaller cell sizes for 5G will require many new antennas and masts to be deployed which means that appropriate backhaul infrastructure will be required and **neutral host network infrastructure models may emerge**.

– https://innovationorigins.com/zeus-is-also-the-worlds-first-hydrogen-powered-ship/

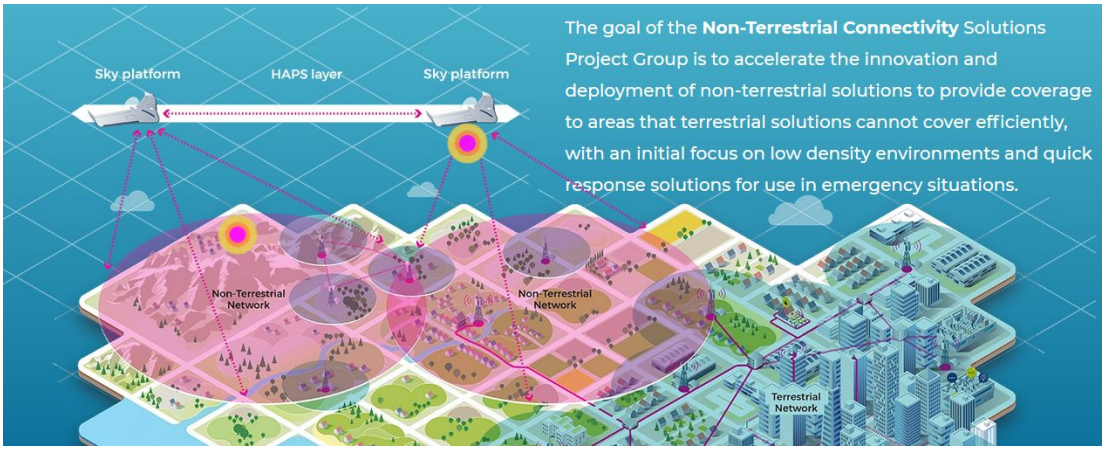
"Zero Emission Ultimate Ship"

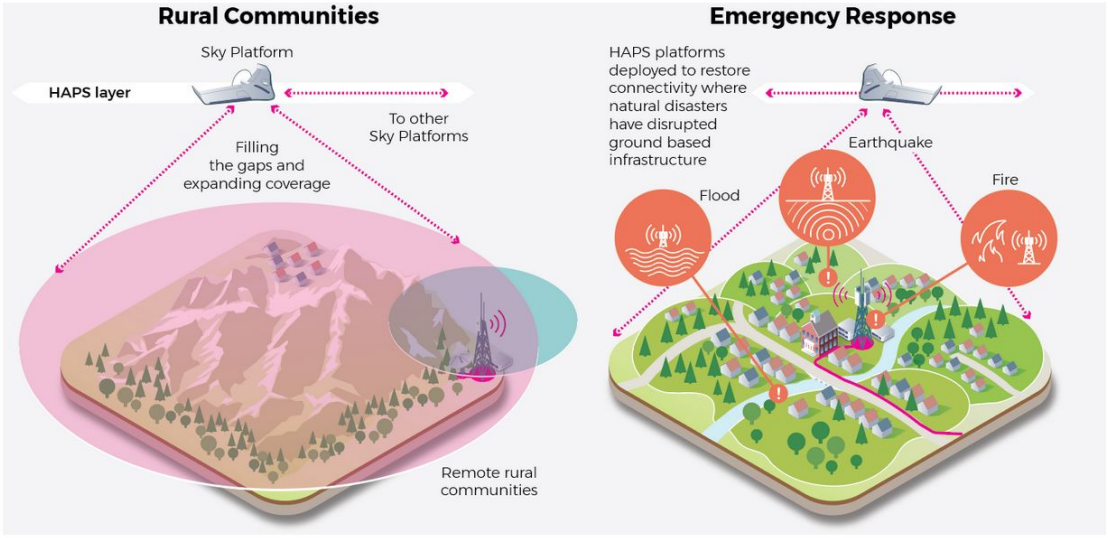
– https://www.sdxcentral.com/articles/news/aws-verizon-launch-5g-partnership-at-reinvent/2019/12/ In a surprise move at the end of **AWS** CEO Andy Jassy's three-hour keynote, **Verizon** CEO Hans Vestberg joined Jassy on stage to announce a **partnership**.

– https://www.sdxcentral.com/articles/press-release/nokia-and-mobily-pilot-worlds-first-4g-and-5g-fixed-wireless-access-network-slicing/2021/01/ First-ever **network slicing trial on a live commercial network** showcases fixed wireless access (FWA) slicing use case for the first time.

– https://www.sdxcentral.com/articles/news/ericsson-casts-network-slicing-for-5g-operators/2021/01/ Ericsson released software that enables **5G RAN Slicing**. *"Ericsson 5G RAN Slicing dynamically optimizes radio resources to deliver significantly more **spectrum-efficient** radio access network slicing,"* This technology has already some early adopters and it's expected to be widely adopted by 5G operators once other technical resources are established and expertise is gained to push network slicing services out to customers in their respective markets.

– https://telecominfraproject.com/ntcs/ about **TIP and Non Terrestrial Network integration**.





– https://www.satellitetoday.com/imagery-and-sensing/2021/01/28/hawkeye-360-prepares-to-expand-rf-tracking-capabilities-with-second-cluster/ *"Customers who are in the international domain — **the Five Eye countries,** allies in Asia Pacific and Europe and in the Middle East — desperately need **access to high quality RF data**, but have never before had their own organic access. They now can use this to protect their borders, to protect their interests, and to understand adversary implications of actions,"*

– https://www.sdxcentral.com/articles/news/onf-drops-sd-ran-v1-0-for-open-ran-expansion/2021/01/ The **Open Network Foundation (ONF)** today released SD-RAN v1.0, a **cloud-native open RAN project**.

– https://www.tmcnet.com/voip/news/articles/447850-speeding-up-access-broadband-services-rural-communities-5g.htm Ribbon is a high capacity and low latency system featuring **advanced Layer 2 Ethernet aggregation capabilities along with a next-generation Dense Wavelength Division Multiplexing (DWDM)** network to deliver faster data speeds.

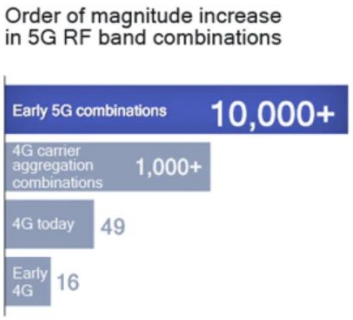
– https://www.technology.org/2021/01/26/laser-light-can-reveal-condition-of-ship-paint/ **SHIP-COAT** (Sub-Surface, High-Resolution, Inspection of Paints and Coatings Using Non-Destructive Laser Tomography); **Laser light can reveal condition of ship paint**. Next step is to **equip drones with this technology?**

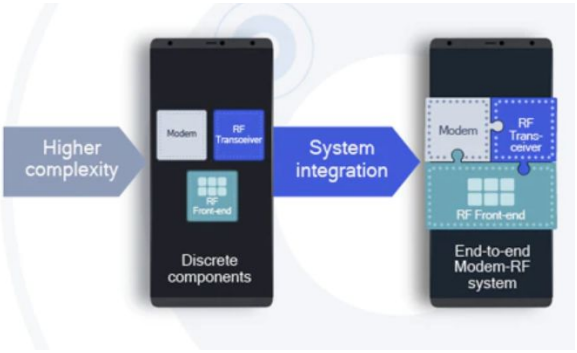
– ghttps://www.euractiv.com/section/5g/news/portugal-blames-covid-19-for-5g-delays-promises-progress/ Portugal, along with Cyprus, Lithuania and Malta is part of the group of **EU countries where 5G has not yet been implemented**.

– https://www.sdxcentral.com/articles/news/o2-touts-open-ran-trial-success/2021/02/ **UK-based** operator O2 touted the **successful** completion of an **O-RAN trial** with its network vendors NEC, Altiostar, GigaTera Communications, and Supermicro.

– https://www.euractiv.com/section/5g/news/eu-charts-cybersecurity-certification-scheme-for-5g/ An **EU-wide cybersecurity certification scheme for 5G** networks will be rolled out across the bloc in a bid to patch technical vulnerabilities in next-generation mobile communications

– https://www.mwrf.com/technologies/systems/article/21154431/qualcomm-6-reasons-to-move-to-a-complete-modemtoantenna-solution-in-the-era-of-5g

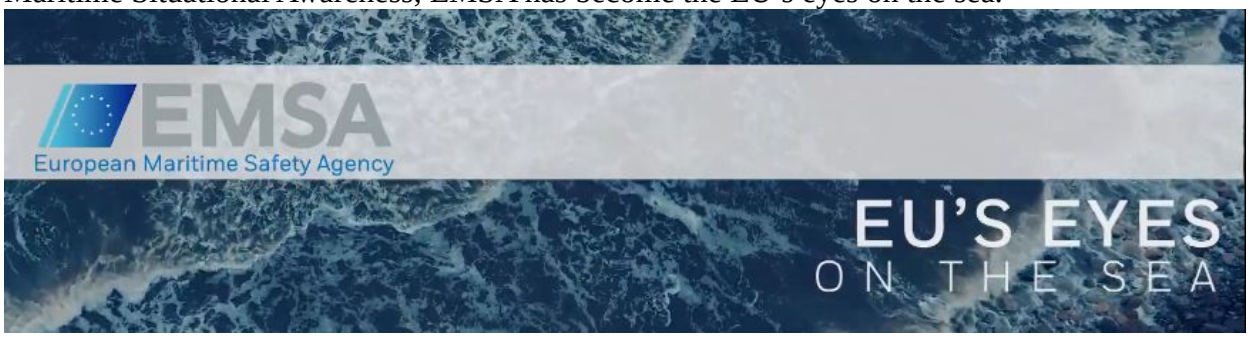




– https://www2.deloitte.com/nl/nl/pages/technology-media-and-telecommunications/articles/5g-consumers.html 5G: **Unloved, Unwanted or Unknown? – Why 5G is widely misunderstood by consumers**.

– http://www.circleid.com/posts/20210207-consumer-technology-vs-5g/ Opinion: **5G represents a threat to the level playing field and innovation of the Internet**. "*We are moving from intelligence in the network to intelligent devices. As I see it, 5G seems more like the past of networking rather than the future.*"

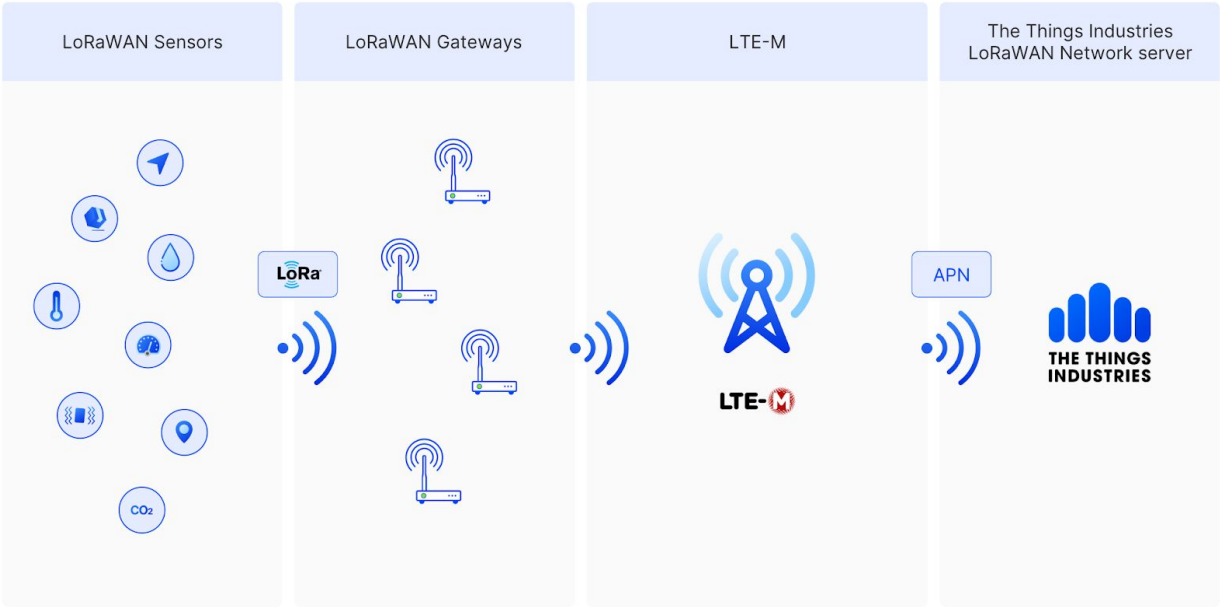
– https://youtu.be/snBCjYFHtH0 With data from 15 satellites, **EMSA** provides **Earth Observation Services** like Clean Sea Net **and** Copernicus **Maritime Surveillance** that enhance Maritime Situational Awareness, EMSA has become the EU's eyes on the sea.



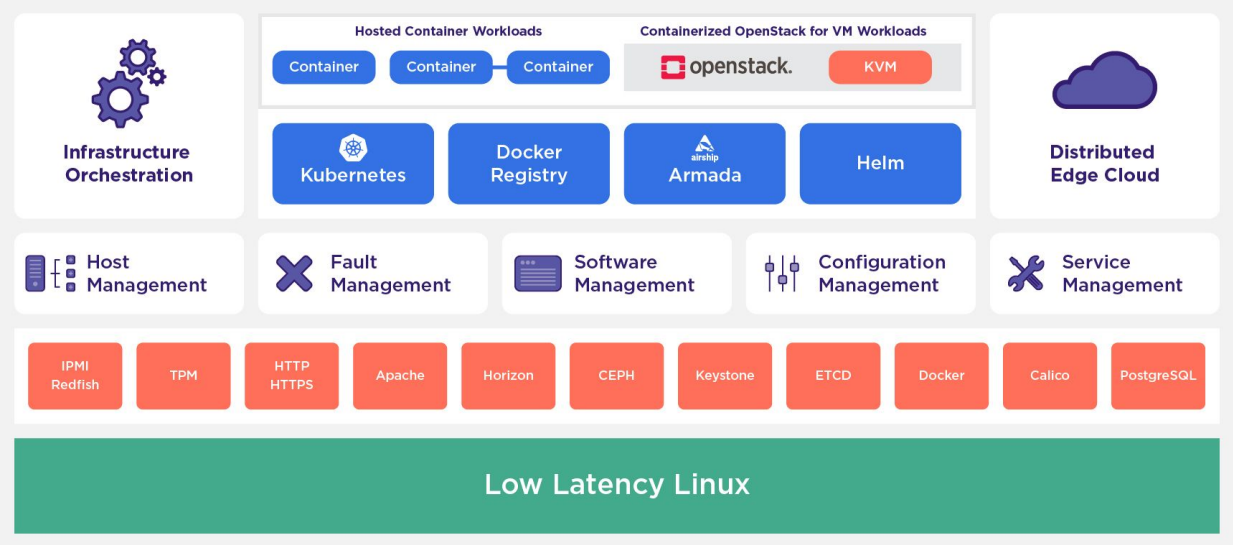
– https://ingenuity.siemens.com/2020/12/secure-remote-access-via-public-5g-network/ *"No matter where the journey goes – it is only a matter of time until 5G will establish itself in the industry. **The flexibility of 5G** with its different implementation approaches – private and/or public – makes this standard the most versatile mobile communications solution for the industry. Solutions previously not feasible are now within reach, and **applications no one dared to think about may be realized in the near future**."*

– https://innovationorigins.com/**denmark-is-building-the-worlds-largest-wind-energy-island**/

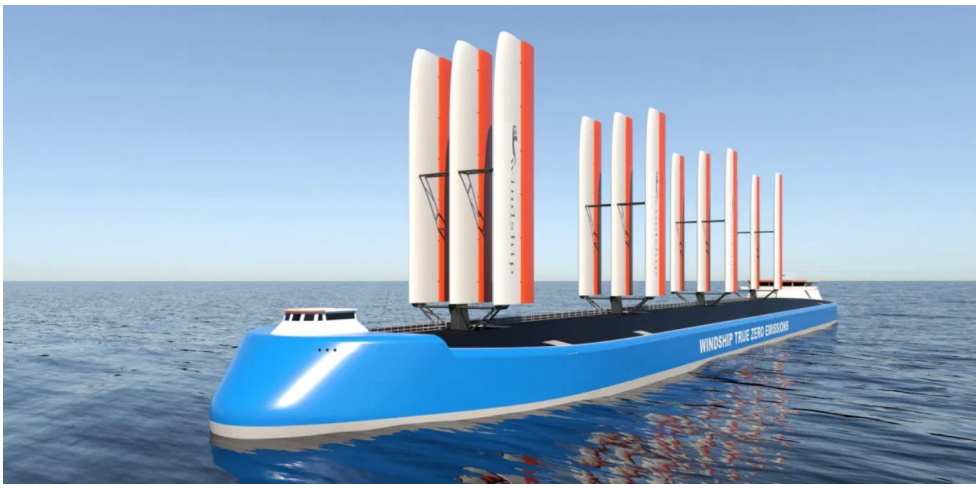
– https://www.thethingsindustries.com/news/things-industries-partner-deutsche-telekom-iot-combine-power-**lorawan-and-lte-m**/ read about a pre-configured **LoRaWAN gateway** from Mikrotik, **connected over a LTE-M backhaul to TTI**'s device and data platform.



– https://www.starlingx.io/ **StarlingX** provides **a container-based infrastructure for edge implementations.**



- https://vpoglobal.com/2021/02/08/windship-technology-unveils-zero-emission-tesla-of-the-seas/ **The Tesla of the Seas!** As we all know, Tesla's need to be "always connected".



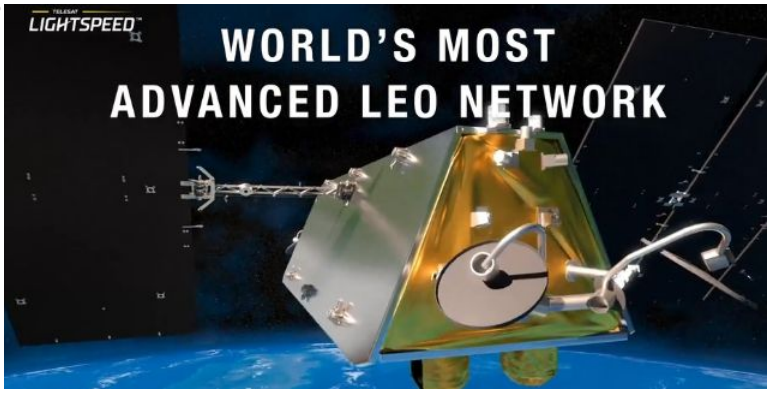
– https://www.strategyanalytics.com/access-services/enterprise/IoT/reports/report-detail/iot-cellular-connections-by-air-interface-by-region **The growth in 5G modules for IoT** will start slowly, with many applications requiring only low power data rates and affordable modules. Strategy Analytics has revised its 5G connections forecast downwards in the short term to 2025. **5G will increase to 40% of all connections by 2030**.

– https://telecominfraproject.com/telecom-infra-project-inaugurates-new-community-lab-in-indonesia/ "this **collaboration between the government, the telecommunications, industry and universities**, through the **TIP Community Lab** at Telkom University (**Indonesia**), will help accelerate digitalization equity and improve connectivity".

– https://edition.cnn.com/2021/02/23/americas/space-solar-energy-pentagon-science-scn-intl/index.html **Energy on demand everywhere**, by sending electricity from space?

– https://www.rivieramm.com/news-content-hub/billionaires-compete-to-deliver-leo-constellations-63734 Developments in **LEO satellite constellations will enable** faster communications with **higher bandwidth and lower latency for maritime applications**. OneWeb, Starlink and Project Kuiper to provide maritime connectivity. When, where and how?

– http://interactive.satellitetoday.com/via/march-2021/id-bet-on-telesat-dan-goldberg-all-in-on-lightspeed-leo-play/ Another **LEO** venture is also on it's way, the **Lightspeed** constellation: an innovative global network composed of 298 state-of-the-art Low Earth Orbit (LEO) satellites, seamlessly integrated with on-ground data networks. Read the interview with **Telesat** CEO Dan Goldberg and about the role of **Thales** and how they secured funding from the Canadian government. And also: *"it's two or three or four, that's the kind of the number you're talking about for big, high-throughput broadband LEO constellations. It's a big market, but it's only so big. You've got issues around spectrum and how many constellations can have access to enough spectrum to provide the kind of broadband connectivity that the market needs."*



– https://enterpriseiotinsights.com/20210225/channels/news/europe-release-review-public-private-5g-funding The **European Commission** has published a major review of **funding for 5G-based and 5G-related industrial transformation, including €10 billion of new public-private partnership (PPP) funding.** After we went from triple ("golden triangle") to quadruple helix, we now have to take **Environment as fifth helix**, surrounding the other helices, as drivers for knowledge production and innovation. The **Quintuple Helix Concept** looks like this:

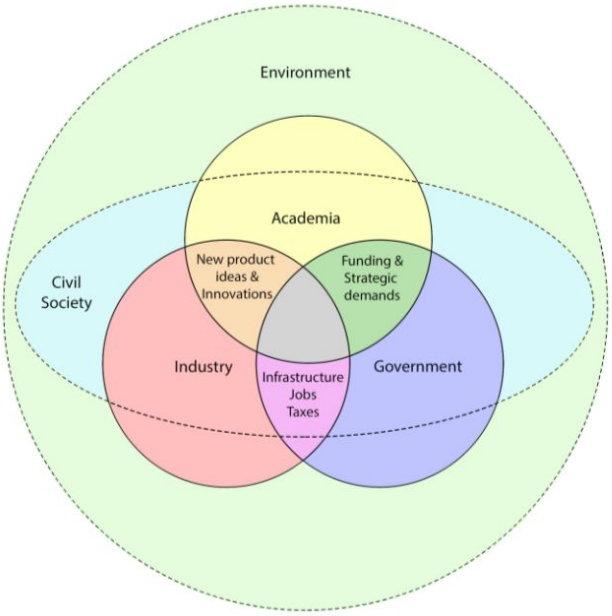


Figure 4: The five Helices of the Quintuple Helix concept. It is based on the triple and quadruple helix models and adds as fifth helix the natural environment. The quintuple helix views the natural environments of society and the economy as drivers for knowledge production and innovation. (figure adapted and extended from Kimatu, 2016)[11].

– https://www.telecompaper.com/news/eib-study-calls-for-more-european-public-investment-in-5g-innovation--1373446 The European Investment Bank (EIB) is the latest to call on European countries to **accelerate investment in 5G**.

– https://www.sdxcentral.com/articles/news/verizon-att-t-mobile-confront-lasting-damage-from-mid-band-auction/2021/02/ **In the USA**, Verizon, AT&T and T-Mobile are on the hook for nearly 96% of all spending in **the C-band** (spectrum from 3.7 GHz-3.98 GHz) **auction** that ended at a record high of $81.17 billion. **Enterprise adoption of 5G** is now an imperative for all three of the country's nationwide carriers.

Dish Network, an aspiring greenfield **open radio access network (RAN) operator** that has yet to activate 5G service in a single market, spent a surprisingly low amount of just $2.5 million in the auction. The satellite-TV company, prior to the C-band auction, has cumulatively invested or financed at least $26 billion in wireless-related assets (mostly spectrum) since 2008. Regional carrier U.S. Cellular walked away from the auction with spectrum licenses costing a total of almost $1.3 billion.

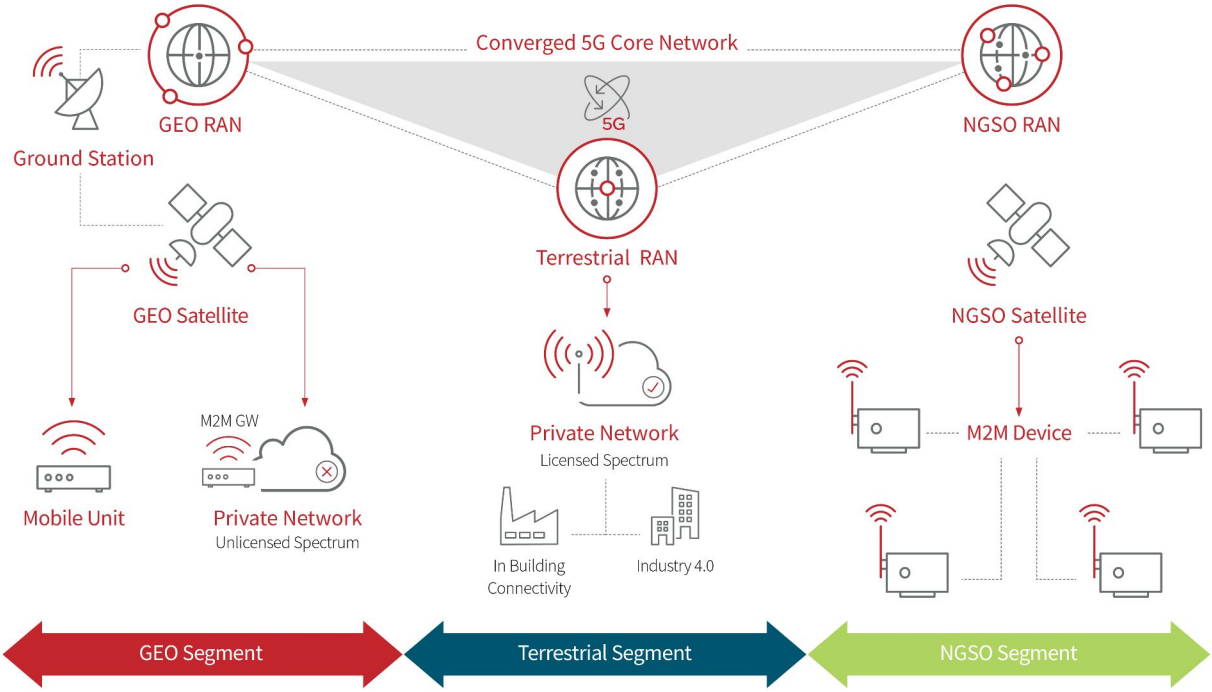
- https://thedigitalship.com/news/electronics-navigation/item/7137-**port-of-antwerp**-deploys-autonomous-drones The **fully autonomous drone** will be testing various use cases in the field of inspection and control. This is part of the short-term ambition to support the port authority in its core tasks by means of a network of autonomous drones. The objective is to test the various applications in a realistic and complex environment (Seveso companies, **wind turbines**, high voltage, etc.) so that they can support the Harbour Safety & Security (HSS) department in the future. Several tests with other autonomous systems will follow over the course of 2021, in preparation of an operational network of **autonomous drones ready to be deployed in 2022**.

– https://www.strategyanalytics.com/strategy-analytics/blogs/service-providers/networks-and-service-platforms/networks-service-platforms/2021/02/22/will-the-6ghz-band-become-the-new-golden-band-for-mobile-broadband Opinon about **the value of the 6 GHz mid-band spectru**m and what to do with it: *"Looking toward **WRC-23**, we believe allocating 6GHz band for mobile broadband service not only will benefit the global mobile industry but will promote the development of human right and connected society. It is the time to re-evaluate the value of this spectrum band. 6GHz band is expected to play a key role in the human and social development in the next decade and **become the new 'Golden Band' for mobile broadband**."* Note **that the FCC in the United States has made 1,200 MHz of the 6 GHz band available to manufacturers for WiFi connections** (14 additional 80 MHz channels or 7 additional 160 MHz channels), offering very large channels and speeds of various Gbps, although in exchange for having a slightly shorter range.

– https://www.sdxcentral.com/articles/news/ericsson-nips-huawei-nokia-in-gartners-5g-vendor-ranking/2021/02/ Read all conclusions of **Gartner's latest magic quadrant for 5G network infrastructure** and communications service providers.

Additon from the Gartner Magic Quadrant publication about Ericsson: ***With respect to Open RAN and vRAN, Ericsson** follows these promoters and **is in a defensive position** in which it is forced to accept multivendor integration."*

– https://echostarmobile.com/en/innovation/5g-standardization.aspx " **EchoStar Mobile** continues to build on this success in 3GPP to ensure inclusion of Band 65 in the 5G NR ("NR65") and LTE NB-IoT operating bands, as well as **to ensure that NTN (non-terrestrial networks) are part of the upcoming 5G 3GPP release 17** due to be commercially available in 2021. This will open the door for EchoStar Mobile to **fully implement Band 65 NR* and LTE NB-IoT air-interface** and deploy a converged S band satellite and terrestrial end to end network, enabling a much wider range of 5G services."
* *n65 band = 2100 MHz FDD spectrum band*



– https://www.nationaldefensemagazine.org/articles/2021/3/22/5g-can-drive-the-automation-of-military-networks "With its support for both wireless and wired access, **5G has the potential to provide a ubiquitous access layer for defense operations**." Read the blog by Jeff Verrant, director of defense and national security at Nokia North America.

– https://www.telecompaper.com/news/eu-outlines-plans-for-digital-decade-with-new-connectivity-targets--1375259 "The Commission presented in February 2020 its initial view on digital development and has since updated the policy based on the impact of the coronavirus pandemic. This takes account of **requirements for EU states to spend at least 20 percent of funds from the EU's recovery fund on digital priorities**" Reports will be based on an enhanced Digital Economy and Society Index (DESI) and show each state's progress on the targets, using a traffic light system.

European Commission

– https://www.6gworld.com/spring-2021-6g-symposium-agenda/
We are at the dawn of commercial 5G. What was promised as a new start for industries and enterprises of all kinds has not met that promise; not least because **the most important people, the end users, weren't involved early enough**. By **2030** and the dawn of commercial **6G** the world's climate aspirations, population, economy and work will have changed. If we are to deliver a smart, connected world that can meet the many demands on it, **we need to** start with all the stakeholders in the room and **grow a complete set of viable solutions and business cases, not just a technology**.

– https://ec.europa.eu/info/sites/info/files/research_and_innovation/funding/documents/ec_rtd_he-partnership-climate-neutral-sustainable-productive-blue-economy.pdf
European Partnership for a Climate Neutral, Sustainable and Productive Blue Economy: *"Europe is a maritime continent. At 22 million km², the Exclusive Economic Zone (EEZ) of the European Union (including EU overseas territories) is the largest in the world; twice as large as that of the USA. In 2018, the EU Blue Economy directly employed close to 5 million people, generating more than €750 billion of turnover."*

"**Seas and oceans do not stop at political borders and neither do the challenges they face**."

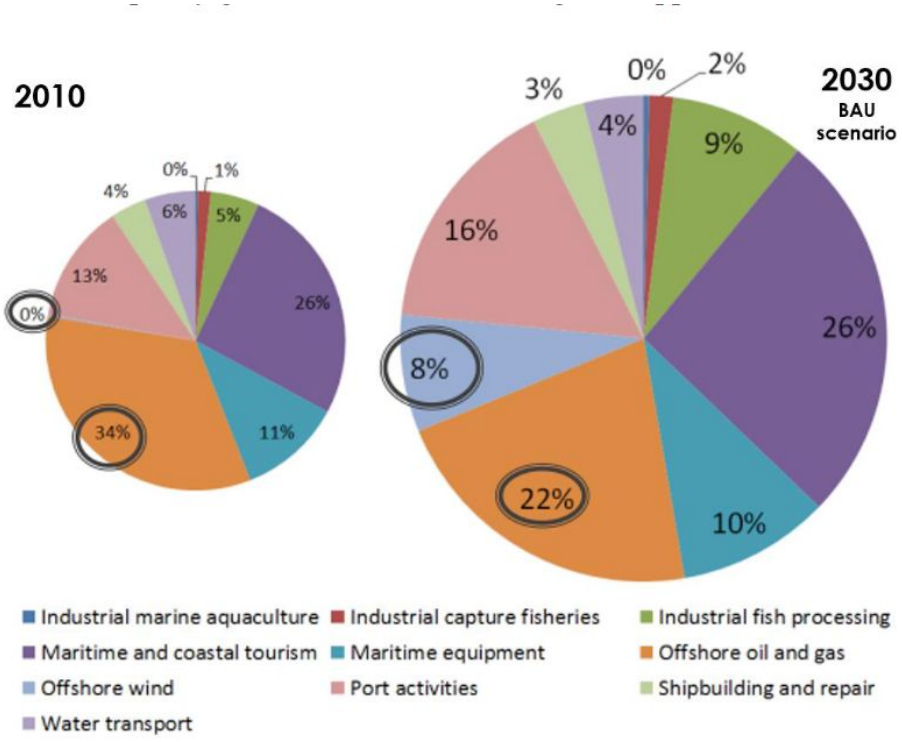
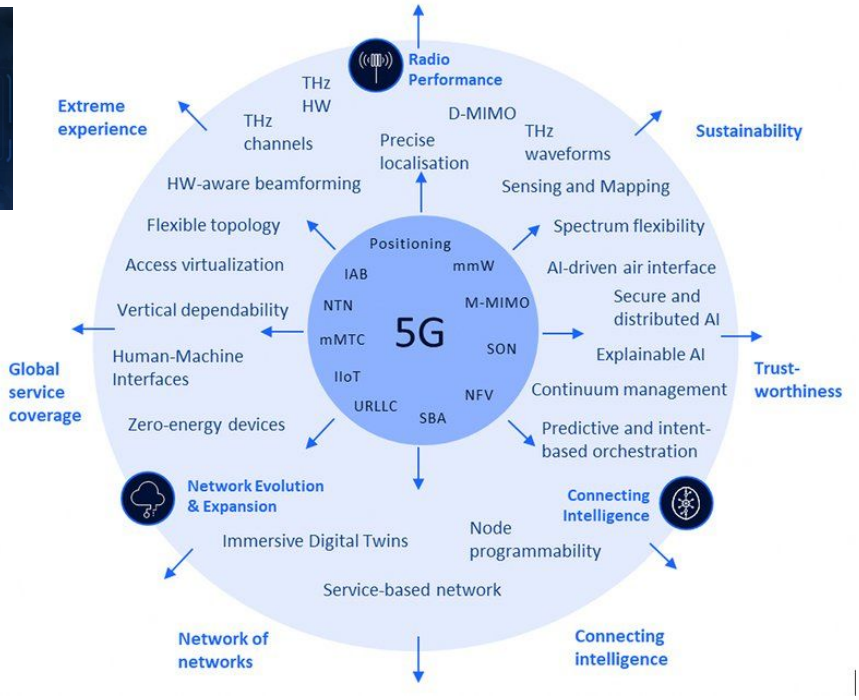


Figure 1: Size and composition of the global ocean economy in 2030 relative to 2010. Projections under a business as usual (BAU) scenario foresee a doubling of value addition and a shift in importance between sectors (OECD, 2016).

– https://eur-lex.europa.eu/legal-content/nl/TXT/?uri=CELEX%3A52021DC0118
Meet the **"2030 Digital Compass: the European way for the Digital Decade"**. Not much about the Maritime Edge: *"The target is to materialise the vision set out in the data strategy that is to have **80% of data processing done at the edge by 2025**. Many of the future data services and 5G applications, such as Connected Automated Driving, smart farming, **intelligent management of energy grids**, smart manufacturing require a latency of a few milliseconds. To achieve such a latency in return requires an edge node in every 100km. 8-10,000 edge nodes correspond to this deployment of a mesh with a node every 100km. This density of edge nodes will conversely stimulate the demand from European user industry for **novel and innovative digital services based on local data processing**, and allow these users to be more in control of their data.*

EU's objective for 2030: "Top-notch trustworthy and secure Digital Infrastructures"		
Dimension	**2030 EU target vs baseline**	**Source**
Connectivity	**All European households** will be covered by **a Gigabit network**, with **all populated areas** covered by **5G**[4] Baseline: - Gigabit Coverage (2020 baseline[5]: 59%) - 5G coverage in populated areas[6] (2021 baseline: 14%)	DESI Study on Broadband coverage in Europe by Omdia
Semiconductors	The production of cutting-edge and sustainable semiconductors in Europe including processors is **at least 20% of world production** in value[7] (2020 baseline: 10%)	Data source to be confirmed in the digital policy programme
Edge/cloud	**10,000 climate neutral highly secure edge nodes** are deployed in the EU, distributed in a way that will guarantee access to data services with low latency (few milliseconds) wherever businesses are located[8] (2020 baseline: 0)	Annual study on edge deployment under CEF2 (as of 2022)
Quantum computing	**By 2025**, Europe will have **its first computer with quantum** acceleration paving the way for Europe to be at the cutting edge of quantum capabilities by 2030. (2020 baseline: 0)	Data source to be confirmed in the digital policy programme

– https://www.6gworld.com/exclusives/6g-gains-momentum-with-initiatives-launched-across-the-world/ Read about various 6G initiatives like the Next G Alliance, Hexa-X, New-6G and RISE-6G and how **performance and convergence will be expanded in 6G, compared to 5G**.



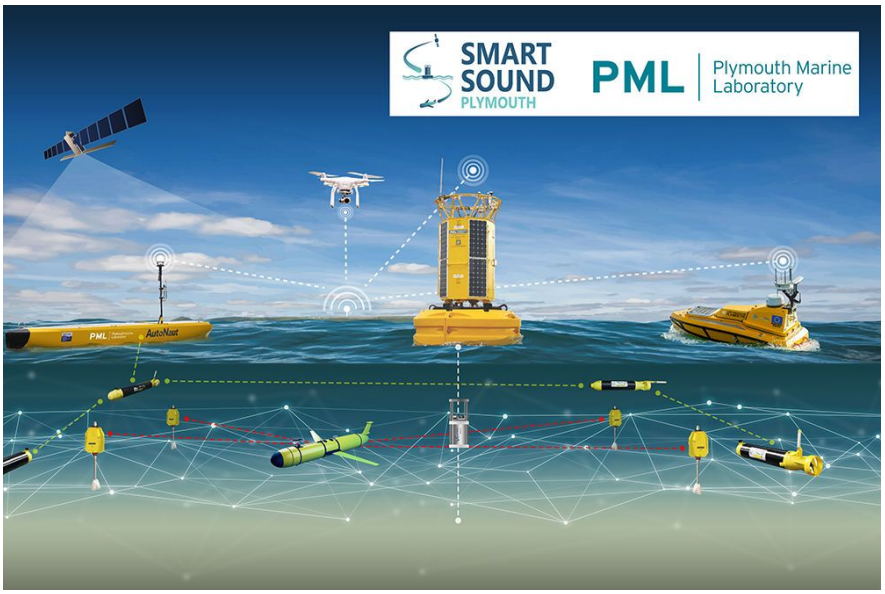
- https://450alliance.org/450connect-receives-the-450-mhz-license-rights-for-the-next-20-years/ The 450Connect consortium, Alliander, E,ON and regional and local utilities that supply around 90% of the criticial (energy related) infrastructure services, has been awarded the license for the usage of the **450 MHz frequencies for the next 20 years.** The 450 MHz allocation will be used to establish a Germany-wide, **highly resilient and secure LTE radio network** for applications of **energy and water utilities and other critical infrastructures.**

– https://450alliance.org/nokia-to-upgrade-the-danish-lte450-network-of-cibicom/ **Cibicom** is a supplier and owner of a nationwide broadcasting network for distribution of television and radio, as well as a nationwide LoRaWAN IoT-network infrastructure and **a 450 Mhz based 4G/LTE network in Denmark**. Building on the company's **450mHz license** acquisition in June, the project together with Nokia will not only allow Cibicom to improve its offering to utility companies but also ensures that the service provider is in a strong position to adapt to changing customer requirements and offer **new opportunities and application support around 5G 3.5Ghz**.

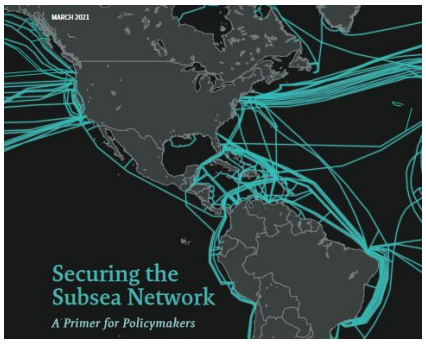
– https://www.etno.eu/library/reports/96-connectivity-and-beyond.html A study performed by the Boston Consulting Group (BCG) shows that a **€150 billion investment is still needed to achieve a full 5G deployment in Europe**. Read the full report.

– https://www.cio.com/article/3614069/saudi-arabia-frees-spectrum-for-emerging-wi-fi-5g-applications.html **Saudi Arabia has designated the entire the 6GHz radio band for unlicensed use** to support emerging Wi-Fi 6, Wi-Fi 7 and 5G technology, including applications in areas such as **robotics, virtual reality (VR), telemedicine and IoT.**

– https://www.offshore-energy.biz/plymouths-autonomous-marine-tech-fleet-set-for-launch/ Read all about a **new smart buoy, innovative sensors and a futuristic fleet of ocean robots**. A flotilla of new generation subs is also integrated together using **acoustic underwater communications**.



– https://www.euractiv.com/section/energy/news/eu-urged-to-keep-low-carbon-fuels-out-of-renewable-energy-mix/ Environmental NGO's, supported by 88 MEPs, tried to **exclude low-carbon fossil fuels**, such as hydrogen made from natural gas steam reforming from the **Renewable Energy Directive**. The missive was signed on March 31 2021 by a group of 116 lawmakers.



– https://www.csis.org/events/securing-subsea-network The United States' position as the world's leading hub in subsea networks can no longer be taken for granted. More of the world is coming online, and China is emerging rapidly as a leading **subsea cable** provider and owner. In June, this paper was followed by a commentary on the CSIS website:

Invisible and Vital: Undersea Cables and Transatlantic Security

It is stating among other observations: "*Submarine cables are also critical for transatlantic security as governments rely heavily on this infrastructure for their own communications. This reliance on subsea cables to project and sustain power will increase in the future as the* ***military applications of 5G*** *are many in terms of intelligence, command and control, or unmanned and autonomous vehicles.*"

- https://www.sdxcentral.com/articles/news/att-scoops-3-flavors-of-coming-soon-private-5g/2021/04/ **AT&T**, like all other MNOs. Is looking forward to sell and deploy **private 5G networks** to enterprises. "***Truly Private 5G Requires Network Slicing***", and: "*Considerations include* ***design, spectrum, and who's going to actually run it***"

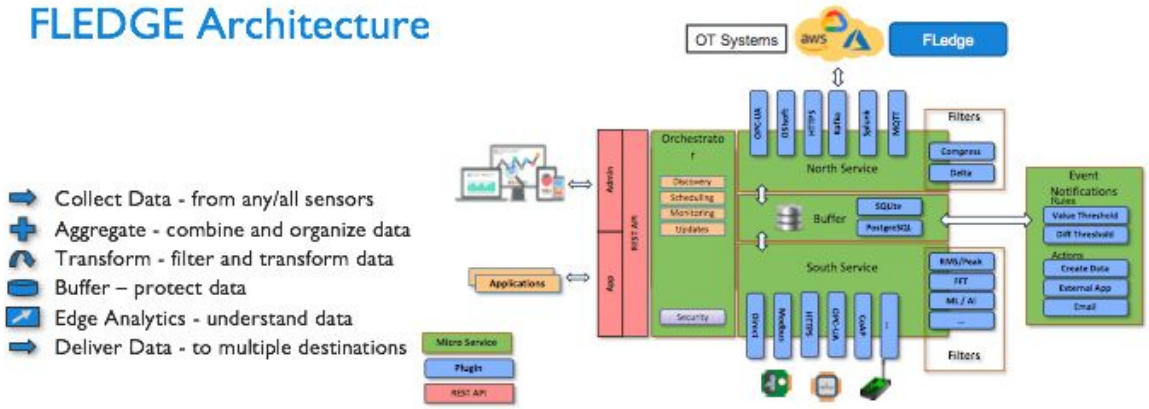
- https://www.zdnet.com/article/microsoft-gets-two-phase-immersion-cooling-running-in-an-azure-data-center/ **Microsoft** says it's the first major cloud provider to test and implement two-phase **liquid immersion cooling in** its **data centers**. This project is related to Microsofts undersea data center experience with **Project Natick**, that demonstrated the **improved reliability of datacenter equipment, when humidity and oxygen are removed** from their environment.

- https://www.lfedge.org/2021/02/25/akraino-release-4-enables-kubernetes-across-multiple-edges-integrates-across-o-ran-magma-and-more/

"With R4, Akraino blueprints enable additional use cases, deployments, and PoCs with support for ***new levels of flexibility that scale Public Cloud Edge, Cloud Native Edge, 5G, Industrial IoT, Telco, and Enterprise Edge Cloud services*** *quickly, by delivering community-vetted and tested edge cloud blueprints to deploy edge services. In addition, new use cases and new and existing blueprints provide an edge stack for Industrial Edge, Public Cloud Edge Interface, Federated ML, KubeEdge, Private LTE/5G, SmartDevice Edge, Connected Vehicle, AR/VR, AI at the Edge, Android Cloud Native, SmartNICs, Telco Core and Open-RAN, NFV, IOT, SD-WAN, SDN, MEC, and more."*

- https://www.lfedge.org/projects/fledge/

Have a look at **the Linux Foundation architecture for Edge Computing (FLEDGE)**:



- https://www.lfedge.org/projects/openhorizon/ this project, formely named "Blue Horizon", was contributed to LFEDGE in 2020. **Open Horizon** simplifies the job of getting the right applications and machine learning onto the right compute devices, and keeps those applications running and updated. It also enables the **autonomous management of** more than 10,000 **edge devices** simultaneously. *Just what we need at sea!*

- https://www.sdxcentral.com/articles/press-release/verizon-signs-european-private-5g-deal-with-associated-british-ports/2021/04/ In partnership with Nokia, **Verizon Business** will provide **one of the** United Kingdom's **(UK's) busiest ports** with a secure, low-latency private network connection. ***"Verizon's private 5G is the foundation for a completely dedicated edge compute infrastructure"***.

- https://www.sdxcentral.com/articles/news/dishs-5g-chief-extols-virtues-of-visibility-in-open-ran-security/2021/04/ **Dish**, that is rolling out a green-field **open RAN** network in the USA, prefer **"to work in the light" when it comes to security**: "Openness allows you to have visibility and it allows you to put your defense and your security where you see the threats might be coming".

- https://thedigitalship.com/news/electronics-navigation/item/7259-singapore-launches-first-drone-technology-test-bed "The launch of the **Maritime Drone Estate** marks an important milestone in advancing Singapore's journey towards the use of **emerging technologies in the maritime sector**.", declares Mr Chee Hong Tat, senior minister of state for foreign affairs and transport of the Maritime and Port Authority of **Singapore** (MPA).

- https://smartmaritimenetwork.com/2021/04/13/satcom-global-agrees-remote-video-support-partnership-with-ansur/ **Satellite-optimised remote visual support services to ships at sea** are delivered by **AnsuR's ASIGN system**. UAV-ASIGN also connects a pilot flying a UAV to remote viewers, bringing real-time high definition UAV photo and video to decision makers, also when flying in locations with **potentially limited bandwidth**. Other use cases include **Disaster / Emergency Management, Security & Defense Operations, Remote Inspection and Maritime.**

- https://decrypt.co/69176/helium-crypto-network-5g-mobile-coverage Google-backed startup FreedomFi launches Helium5G, **a distributed 5G network that will be powered by crypto-mining nodes**. It already runs a **decentralized, blockchain-powered network** that allows users to earn cryptocurrency by running their own nodes, which power **connectivity for Internet of Things (IoT) devices** such as sensors and trackers. But now the Google-backed startup is aiming much larger: 5G mobile phone coverage. *"With FreedomFi, we're excited to enable **Helium 5G**, lowering the national 5G deployment cost exponentially."* The FreedomFi Gateway is the first omni-protocol miner for the Helium network. It will mine HNT for providing LoRa coverage, but is also expandable with certified CBRS small cells (and later Wi-Fi access points) to earn HNT cryptocurrency by **offloading cellular data for carriers** like DISH Wireless and GigSky.

- https://www.sdxcentral.com/articles/news/can-anyone-catch-aws-in-the-telco-cloud-race/2021/05/ Amazon Web Services has made strides in the telco cloud arena with **Wavelength,** the 5G Edge Computing Infrastructure based on AWS Outpost. Together with Local Zones, this may provide virtualized RAN functions. The positioning of Google Cloud and Microsoft's Azure are also discussed in the article.

- https://telecoms.com/opinion/its-time-to-fully-involve-open-ran-community-in-3gpp/ John Baker of **Mavenir believes that Open RAN delivers substantial benefits**. However, the O-RAN specifications have not yet been adopted within 3GPP standards. He also refers to the **Ministerial Declaration of the G7 of April 28**, 2021 with 4 Annexes, that is considered a step in the right direction.

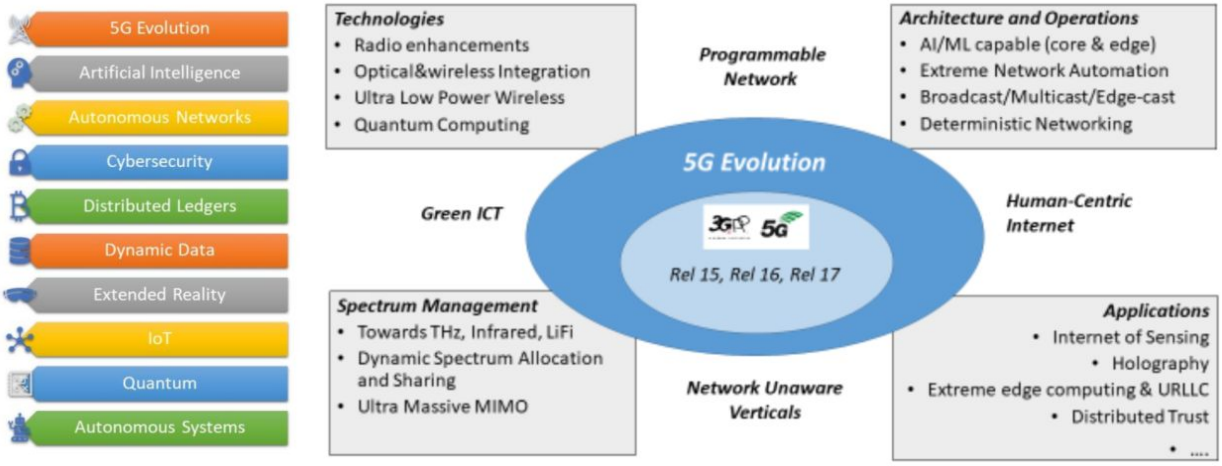
- https://www.cncf.io/case-studies/ericsson/ How **Ericsson is leveraging cloud native to enable 5G transformation:**
"5G will enable new business models and use cases that we have not seen before. Businesses, people, and society at large will benefit from 5G innovation. We see cloud native technologies playing a vital role in the evolution of 5G networks and helping to meet the needs of operators and their customers—the end users.". Also have a look at the projects that form the **Cloud Native Landscape**!

- https://www.iotevolutionworld.com/iot/articles/448735-how-two-companies-partnered-turn-up-70-smart.htm The Low Power Wide Area Network (**LPWAN**) market size on track to be valued $80 billion by 2027, according to a recent research report by Global Market Insights. In **India**, more than 100 smart cities are planned, which opens the door for **LoRaWAN** technology.

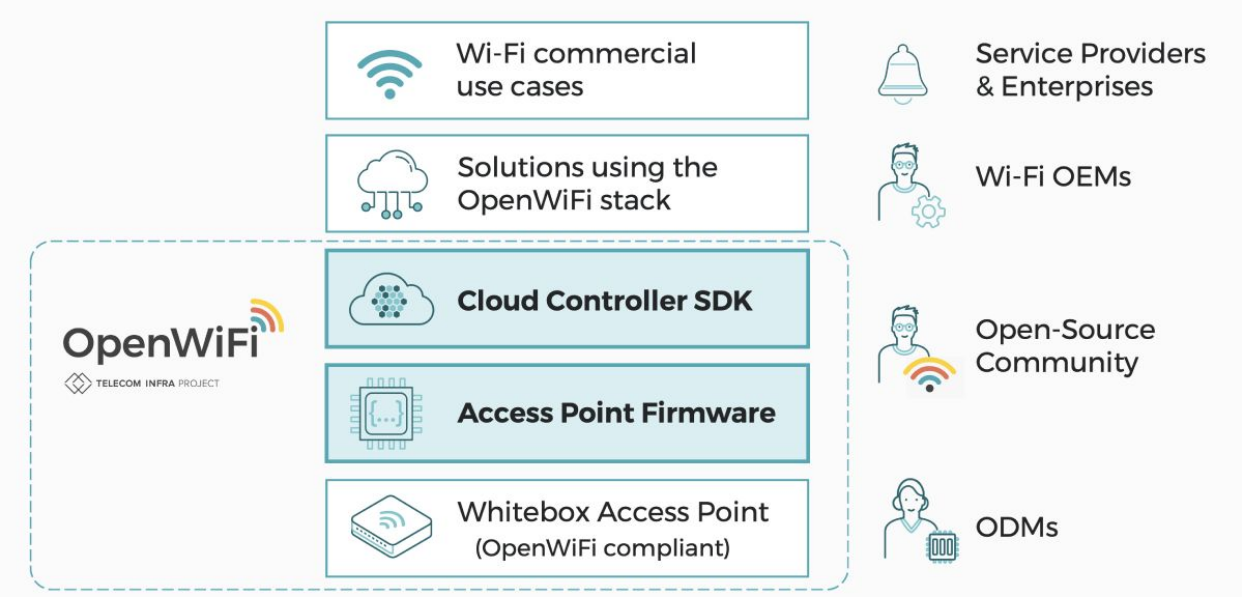
- https://www.rrmediagroup.com/Features/FeaturesDetails/FID/1055 A Verizon exec highlights **the advantages of C-Band spectrum for the Public Sector**. Two examples are given: Increased diagnostic capabilities in ambulances and a PoC (Proof-of-Concept) for a "fusion center", that establishes a private 5G and multi-access edge computing (MEC) environment that brings in a different streams of video data from thousands of cameras around an area.

- https://www.vodafone.com/news/press-release/vodafone-google-cloud-industry-first-global-data-platform On 3 May 2021, a Press Release from **Vodafone** announced a six year strategic **partnership with Google Cloud**. Also Vodafone will host its SAP environment and all big data and business intelligence workloads on Google Cloud. Vodafone and Google Cloud will also explore opportunities to provide **consultancy services**, offered either jointly or independently, to other multi-national organizations and businesses.

- https://www.etsi.org/images/files/ETSIWhitePapers/etsi_wp45_ETSI_technology_radar.pdf In the **ETSI Technology Radar** (April 2021) the European digital standardization organization (SDO) is looking at the **upcoming technology trends**, to be sure *"to be at the heart of Digital"* by addressing the ICT needs for future services and applications. For the first trend, **5G evolution**, a non-exhaustive set of **key drivers** are recognized:



- https://telecominfraproject.com/openwifi-unveiling/ May 12, 2021, the Telecom Infra Project announced Release 1.0 of **OpenWiFi, a community-developed, fully disaggregated Wi-Fi system**, including Access Point (AP) hardware, an open-source AP network operating system (NOS) and an SDK to build Cloud native Wi-Fi Controller software for Service Providers and Enterprises.



In Europe, Deutsche Telekom, also co-chair of the Wi-Fi Solution Group, have kicked off trials at their labs in Berlin with plans for field trials in Darmstadt, Germany.

- https://www.satellitetoday.com/opinion/2021/05/27/are-haps-a-viable-way-to-provide-telecom-infrastructure-to-underserved-regions/ Roughly half of the world's population is still offline. **Are HAPs a Viable Way to Provide Telecom Infrastructure to Underserved Regions?** Google shut-down Project Loon, but other initiatives, i.e. by Avealto and Thales Alenia are still considered viable possibilities to efficiently bring low-cost and high-quality telecom and data services to the underserved and unserved regions of the world and **close the digital divide.** ***Also @sea?***

- https://www.techrepublic.com/article/3-native-american-tribes-use-nokia-tech-to-bring-4g-and-5g-to-remote-towns-in-four-states/ The Standing Rock Sioux Tribe in North and South Dakota and the Cheyenne and Arapaho Tribes in Oklahoma are building out networks to provide 4.9G/LTE and **5G private wireless access.** The **2.5Ghz band** of spectrum offered by the Tribal EBS program can be found in most mobile phones, telephone switching equipment and add-on devices in the market today. Access to more than **100MHz** of that spectrum is well suited for 4G, and also can provide a viable transition into 5G in the future.

- https://www.ericsson.com/en/blog/2020/12/5g-positioning--what-you-need-to-know Learn all about the **enhancements in positioning that 5G brings us** in 3GPP Release 16. Since 4G LTE, mobile networks have supported observed time difference of arrival (OTDOA), uplink time difference of arrival (UL-TDOA) and positioning methods based on power measurements. In 5G, the list of supported methods is extended to include round trip time (RTT) and angle-based positioning. To enable **more accurate positioning measurements than LTE**, new reference signals were added to the NR specifications. These signals are the positioning reference signal (**NR PRS**) in the downlink and the sounding reference signal (**SRS**) for positioning in the uplink. The inclusion of new positioning methods and enhancements of existing positioning methods enables **high accuracy positioning** for several use cases in 5G.

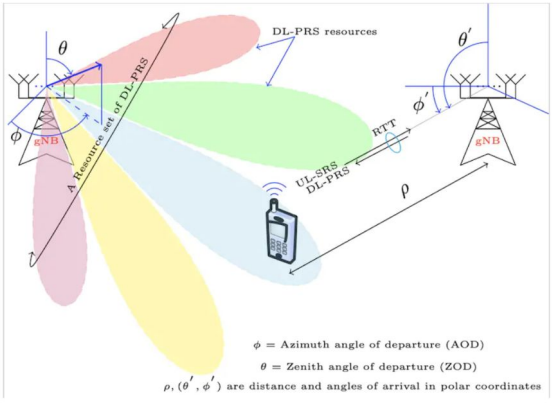


Illustration depicting beamforming, multi-antenna aspects in 5G positioning

- https://www.topsectorenergie.nl/nieuws/publication-continued-success-dutch-offshore-wind-innovation-needs-attention-more-innovation The report "Offshore renewable energy: threats and opportunities in the post-2030 Netherlands" investigates lock-in in relation to the diffusion of specific offshore renewable technologies in specific markets and **whether the Dutch offshore wind industry can adapt to potential disruptions** in the future. The report recommends accelerating the diffusion of disruptive innovations, invigorating the **entire innovation eco-system for offshore renewable energy**.

ENERGY INNOVATION NL
Powering a sustainable future

- https://www.sdxcentral.com/articles/news/vodafone-claims-5g-open-ran-ric-milestone/2021/06/ With a **AI-based RAN intelligent controller (RIC)** that supported open RAN components from multiple vendors, Vodafone claims to have **doubled the capacity of a commercial low-band 5G cell site** and validates the role that this new platform plays in defining open RAN as the future of (mobile) networking.

vodafone

- https://www.digitaltveurope.com/2021/05/21/liberty-global-heads-for-the-edge-with-digital-colony-jv/ Liberty Global and Digital Colony believe that movement of data traffic to the edge of the network will mean that edge connectivity will be increasingly relevant and created **a new European edge data center business. AtlasEdge** will deliver services via a network of facilities located close to the edge of the network to serve growing demand from cloud providers, streaming services and enterprises for facilities through which they can distribute low-latency applications and services such as 5G, gaming, IOT and edge compute.

LIBERTY GLOBAL

- https://www.gaia-x.eu/news/gaia-x-association-elects-its-first-board-directors Philips and TNO representatives were selected out of 64 candidates for the 24 members if the first Board of Directors of Gaia-X. They are complemented by two independent Board members. The initiative that started in september 2020 with 22 founding members, has now attracted 248 other participating companies, in June 2021.

gaia-x

- https://youtu.be/R1xcqF9teRs **‘there can be no green deal without blue economy!’** The **EU’s**

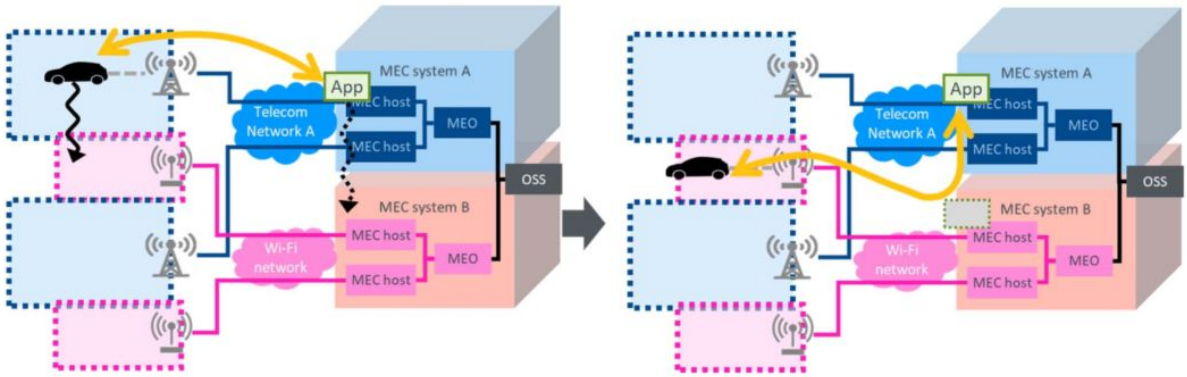
Integrated Maritime Policy aims to adopt a more coherent European approach to maritime issues in order to contribute to the creation of sustainable growth and jobs from sea-related activities. The marine economy is typically associated with traditional activities such as fishing or transport, but we are witnessing **the emergence of an increasing number of innovative sectors** including marine renewable energy, which is **on track to produce up to 35% of the EU's electricity by 2050**. But tensions and potentially conflicting activities (transport, fisheries, energy production or leisure) are present in EU and international waters. These challenges require joint efforts through **enhanced international cooperation**. (*Full session with keynote, statements, discussion & Q&A:* https://youtu.be/9fie-o3E_ts)

-https://offshorewind.rvo.nl/file/download/55040934/Presentation+held+during+webinar+Offshore+Wind+Energy+2040%2C+June+3rd+2021 In a webinar on 3 June 2021, **a New Offshore Wind Approach 2040 for the Netherlands** was presented. *Some highlights:*

- **Offshore wind is to grow** towards 38-72 GW in 2050, roll-out speed needs to increase
- Roadmap 2040: a **27 GW add-on to Roadmap 2030** to meet 49 TWh!
- **Combining offshore wind and hydrogen** has major potential, before 2030 with onshore electrolysis, post 2030 also offshore
- Offshore wind projects will become **more internationally connected**. These hybrid projects pose new challenges
- **Focus on the role of public organizations** (**EZK, RVO, RWS, TenneT**)"

– https://www.dlink.com/en/products/dwm-3010-5g-nr-m2m-gateway **D-Link** presents a **5G NR (New Radio) M2M-gateway** for industrial environments that also supports Band n28 (700 MHz band).

– https://www.etsi.org/newsroom/press-releases/1954-etsi-releases-a-report-to-enable-mec-deployment-in-a-multi-operator-s-environment The **ETSI MEC Industry Specification Group** (ETSI ISG MEC) has released a study (ETSI GR MEC 0035) to enable inter-MEC system deployment and MEC-Cloud system coordination. Federation of Multi-access Mobile Compute (MEC) services and applications, illustrated by mobility V2X and Augemented Reality (AR) use cases, also show **hybrid multiconnectivity solutions with Wi-Fi and 5G** combined:



- https://youtu.be/crnPWql-0oo **what is MEC?** Watch this funny **2 minutes video from ETSI**!

ETSI World Class Standards

https://5g-ppp.eu/wp-content/uploads/2021/06/WhitePaper-6G-Europe.pdf **The 5G Infrastructure Association (5GIA)** presented an **European Vision for the 6G Network Ecosystem**. In this paper one can find a lot of exciting predictions, i.e. about the migration from legacy and existing proprietary radio protocols (e.g. the current DVB-based satellite data and broadcast protocols) towards 3GPP that will take around 5-10 years. As to the 5G NR NTN (**Non Terrestrial Networks**, such as LEO, MEO, GEO, and overall air-/spaceborne communication networks) roadmap, it is expected that first products and technologies availability will be closely aligned to the finalization of 3GPP Rel. 17 (planned for March 22) with the necessary completion of development and validation phases in roughly 12-18 months. As such **it is reasonable to assume that first 5G NR NTN systems may be operational around end of 2023.** Also, the evolution from edge to fog computing is envisioned: "*methods are needed for the collection of distributed data for AI/ML and caching for timely utilisation at the edge and in the core. Finally, this kind of development would also mean that* ***edge computing as an independent concept would fade away***."

The envisioned main differences between 5G and 6G network architecture can be summarized in the following table:

	5G	6G
TYPE OF SERVICE	Point to point QoS transport	Point-to-multipoint transport, including configurable logical network overlay topologies with managed quality properties and net-app awareness, with compute services, sync services, AI services
TYPE OF RESOURCES	Communication	Communication + compute + sensing
ARCHITECTURE SCOPE	RAN+CN	Terminal + RAN + CN
CLOUD-NATIVE	Only CP in 5GC	E2E and cross-plane (User plane / Control plane / Management plane)
MICROSERVICES	No	Yes, E2E, all planes
RESOURCE AWARENESS	Only air interface	Yes, all employed resources, including compute, transport, wireless
TRUSTWORTHINESS	Trustworthy nodes	Trustworthy adaptive services/ network of networks
AI/ML INTEGRATION	Over-the-top	Natively integrated
ADMISSION CONTROL	Access control	Execution control
DEVICE/NODE DISAGGREGATION	CU/DU, IAB	Fully flexible

The envisioned ***timeline for 6G by ITU-R****:*

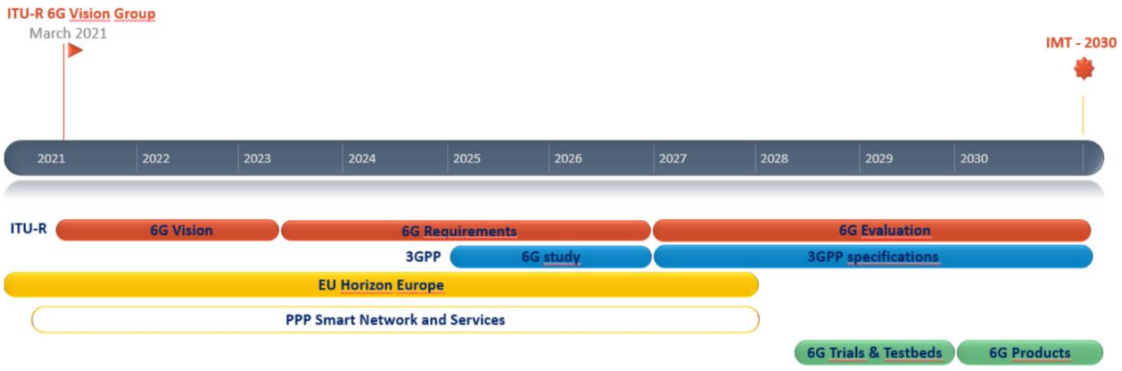


Figure 6.1: Overall roadmap for 6G development.

– https://thedigitalship.com/news/maritime-satellite-communications/item/7381-bharti-injects-additional-500m-into-oneweb Another **major investment in OneWeb** is expected to be completed in the second half of 2021, subject to regulatory approvals. On completion of the Call Option and with Eutelsat's $550m investment, Bharti will hold 38.6 per cent. The UK Government, Eutelsat and Softbank will each own 19.3 per cent.

– https://www.rivieramm.com/news-content-hub/a-decade-of-e-navigation-standards-overhauled-66410 Introducing the S-100 standard for universal navigational data represents **the largest change in e-navigation since IMO's ECDIS** carriage requirements came into effect. S-100 provides the framework to transform static information currently held in physical nautical publications into interoperable digital layers for use in ECDIS, to improve the mariner's situational awareness and enhance voyage planning and monitoring. Also significantly enhanced in the revised standard is the presentation of information derived from **AIS application specific messages (ASM),** such as those that provide meteorological and hydrographical information and standards for aids to navigation (**AtoNs**). Read the full report of the Comité International Radio-Maritime here.

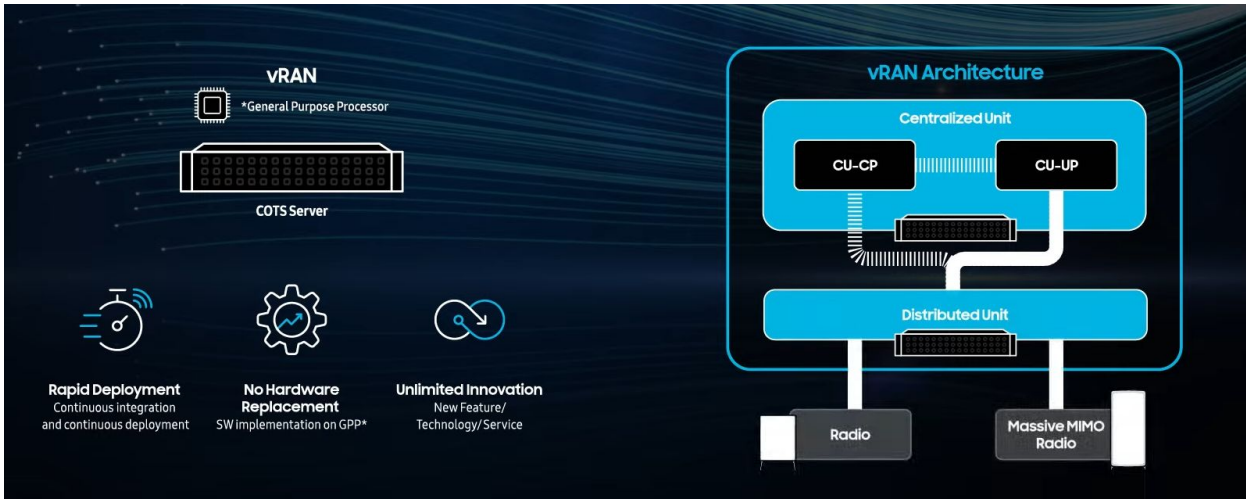
– https://www.fiercetelecom.com/telecom/facebook-google-continue-to-lead-latest-undersea-cable-boom The **new Echo and Bifrost undersea cables** - the first of which also includes Google as an investor will increase trans-Pacific Ocean capacity by 70%. Nowadays, the main driver in the latest undersea build-out cycle is the world wide storage and distribution of content, **a market led by Facebook, Google, Amazon and Microsoft**.

– https://www.rrmediagroup.com/Features/FeaturesDetails/FID/1066 **3GPP** Declares **Release 17 Stage 2 Architecture Standards Frozen.** The R17 **stage 3 (protocol) freeze date remains on schedule for March 2022.** In R17 further MIMO and security enhancements are foreseen, as well as the Ka band as candidate band for satellite based NR in bands above 10 GHz. Also **multicast broadcast en Mission Critical (MCX)** were further developed in R17.

– https://www.sdxcentral.com/articles/news/verizon-5g-sails-samsungs-vran-massive-mimo/2021/07/ Samsung's 64T/64R massive MIMO radios were paired with Samsung's software stack and run in coordination with **Verizon**'s virtualized core during a trial. **Samsung** claims to be the first company in the telecom industry to support interoperability between **vRAN and massive MIMO radios.**

– https://thedigitalship.com/news/maritime-satellite-communications/item/7433-inmarsat-plans-100m-investment-in-orchestra-communications-network

– https://youtu.be/- GMCCIC1q80 **Samsung's vRAN** ensures flexibility, scalability and reliability for Telco-grade performance



– https://safety4sea.com/emsa-to-receive-long-range-general-maritime-surveillance-drones/ **EMSA** is going to use **Nordic Unmanned fixed-wing drones**. Full utilization of the framework contract is expected to happen from Q3 2022.

– https://www.sdxcentral.com/articles/news/nokia-exec-forges-5g-strategies-in-vran-open-ran/2021/07/ **Nokia Pushes vRAN Advancements**. Beware, that Open RAN and vRAN are not the same: Virtualized RAN (vRAN) involves the separation of hardware and software, and the use of cloud compute, cloud orchestration, and elasticity.

– https://telecominfraproject.com/tip-pucp-peru-partnership-to-create-the-first-tip-community-lab-in-the-andes/ **TIP Community Labs** are a vehicle for testing telecommunications network solutions that helps the industry to accelerate the adoption and deployment of open, disaggregated network technologies. **PUCP** is a leading university in the region, being ranked 395th in the world, 13th in Latin America and 1st in Peru, according to the QS World University Ranking 2022. It hosts the latest TIP C-Lab to help shaping the adoption of TIP´s solutions in the region.

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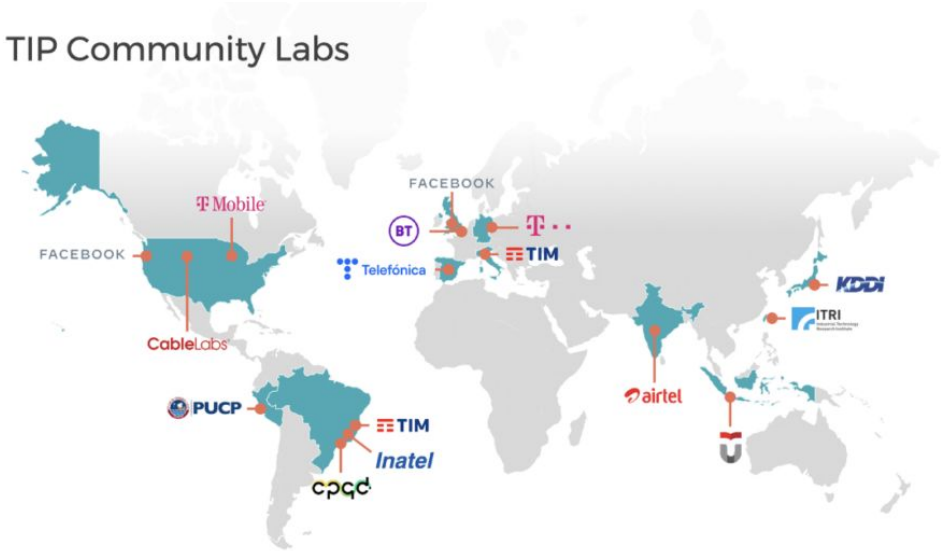


http://interactive.satellitetoday.com/via/august-2021/facebook-connectivity-exec-charts-a-path-for-collaboration-with-satellite/ Read all about **Facebook's strategy to partner with the satellite industry**. While Amazon and SpaceX are taking part in the current LEO space race, Facebook is focused on partnerships with geostationary (GEO) operators. The company is not looking to own satellites.

– https://asia.nikkei.com/Spotlight/5G-networks/Rakuten-to-export-low-cost-5G-tech-to-German-telecom **Rakuten Group** has agreed to export its **low-cost virtual 5G tele-communications** technology to **German wireless carrier 1&1**, the Japanese tech announced, in a deal believed to be worth more than $2 billion. About its **OpenRAN based 5G network**, 1&1 declares: *"Our successful participation in the 5G frequency auction has laid the foundations for a high-performance mobile network. We are now building on this to create Germany's most modern 5G network – fully virtualized and with state-of-the-art OpenRAN technology."*

– https://www.federatedwireless.com/federated-wireless-oversees-successful-12-million-5g-private-network-pilot-using-shared-spectrum-for-united-states-department-of-defense/ A **demonstration of a 5G testbed of the US Marine Corps** Base in Anbany showcased the capabilities of the $12 million prototype Smart Warehouse Technology (based on a Private 5G Network) by reaching high-speed downloads of 1.5 Gbps and sub 15 msec latency using **380 MHz of spectrum** in the 3.5 GHz and 37 GHz millimeter wave (mm Wave) shared DoD bands. Federated Wireless provided the automated sharing framework for the 3.5 GHz Citizens Broadband Radio Service (**CBRS**) spectrum band. *"the U.S lead innovation of shared spectrum and 5G can provide a leap ahead experience for the DoD and for U.S. businesses"*

– https://www.satellitetoday.com/business/2021/08/12/korean-company-hanwha-invests-300m-into-oneweb/ Korean Company **Hanwha Invests $300M into OneWeb**

– https://orbitalmarine.com/o2-power-generation/ (2 MW tidal turbine)

–https://sam.gov/api/prod/opps/v3/opportunities/resources/files/0e2bbaa2797f4cde8d8e92e95e0248f3/download **Firstnet** issues Request for Information for **Next Generation Off-Network Communications**

– https://www.politico.eu/article/nokia-pauses-5g-open-ran-work-due-to-fear-of-us-penalties/

– https://www.itbusinessedge.com/data-center/developments-edge-ai/ **Edge computing** is witnessing a significant interest with new use cases, especially after the introduction of 5G. **The 2021 State of the Edge** report by the **Linux Foundation** predicts that the global market capitalization of edge computing infrastructure would be worth more than $800 billion by 2028. At the same time, enterprises are also heavily investing in artificial intelligence (AI).

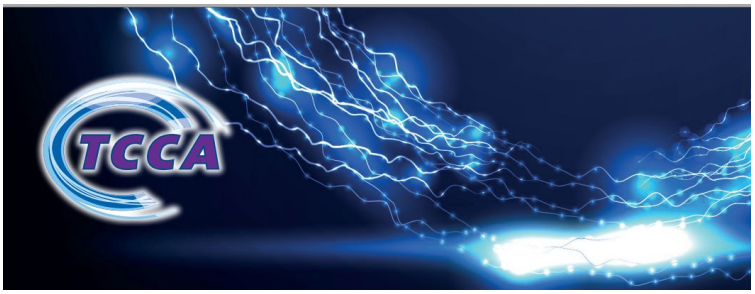
– https://www.offshore-energy.biz/eu-wide-partnership-to-deliver-world-first-bankable-hybrid-marine-energy-parks/ Read about the recently launched €45 million marine energy-project EU-SCORES (**European Scalable Energy Sources**)

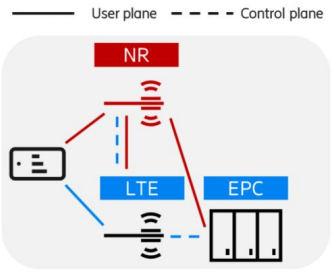
– https://www.intelliantech.com/news/newsroom/oneweb-announces-leo-flat-panel-device-for-terrestrial-broadband-service/ The **Intellian flatpanel antenna for OneWeb** measures 50x43x10 cm and weighs 10 kg.

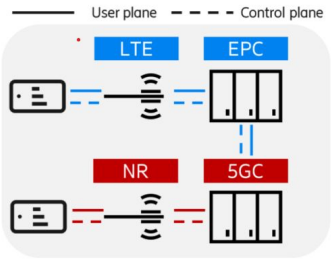
-https://thedigitalship.com/news/maritime-satellite-communications/item/7567-oneweb-confirms-successful-launch-of-36-satellites OneWeb is now over the halfway point toward **delivering global service by 2022** and is seeing growing demand from telecommunications providers, ISPs, and governments worldwide to offer its low-latency, high-speed connectivity services.

– https://www.sdxcentral.com/articles/news/nokia-wins-u-s-cellular-5g-standalone-core-contract/2021/09/ **US Cellular**, a mobile operator with 5 million customers claims that **Nokia's 5G SA core** will help it deliver higher speeds, lower latencies, and new applications at a faster pace.

– https://tcca.info/documents/What-role-will-5G-play-for-critical-communications-users.pdf/ Read all about how **mission critical functions of 4G LTE will evolve to 5G.**

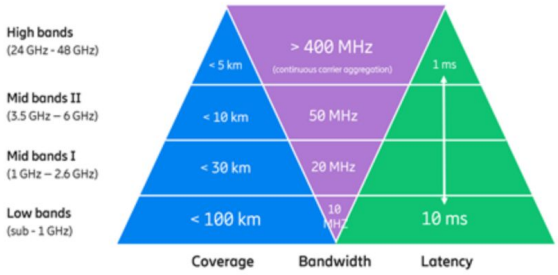






The timetable of the Connectivity Fieldlab North Sea, aiming to enable PPDR and other mission critical applications of mobile networks to maritime operations, still aligns with the predictions of the TCCA in this paper: *"This together with other factors mentioned throughout **this paper forecasts that PPDR 5G SA systems, with a comprehensive suite of mission-critical functionality, are likely to surface circa 2025.**"* The following, yet to develop MCX-functionalities are reconized:

1. porting of all MCX services to 5G NR;
2. 5G Multicast & Broadcast;
3. Device-to-device communications using Sidelink.



Once again, the TCCA also affirms that **for misson critical networks spectrum is needed** in all categories: low, mid and high bands.

– https://spectrum.ieee.org/an-alternative-to-gps Read about a clever idea to use much the more **resilient broadband signals of Low Earth Orbit satellites** to mitigate the vulnarabilities and **enhance** the resolution of **GPS** (Galileo, GLONASS , etc.) **positioning services**.

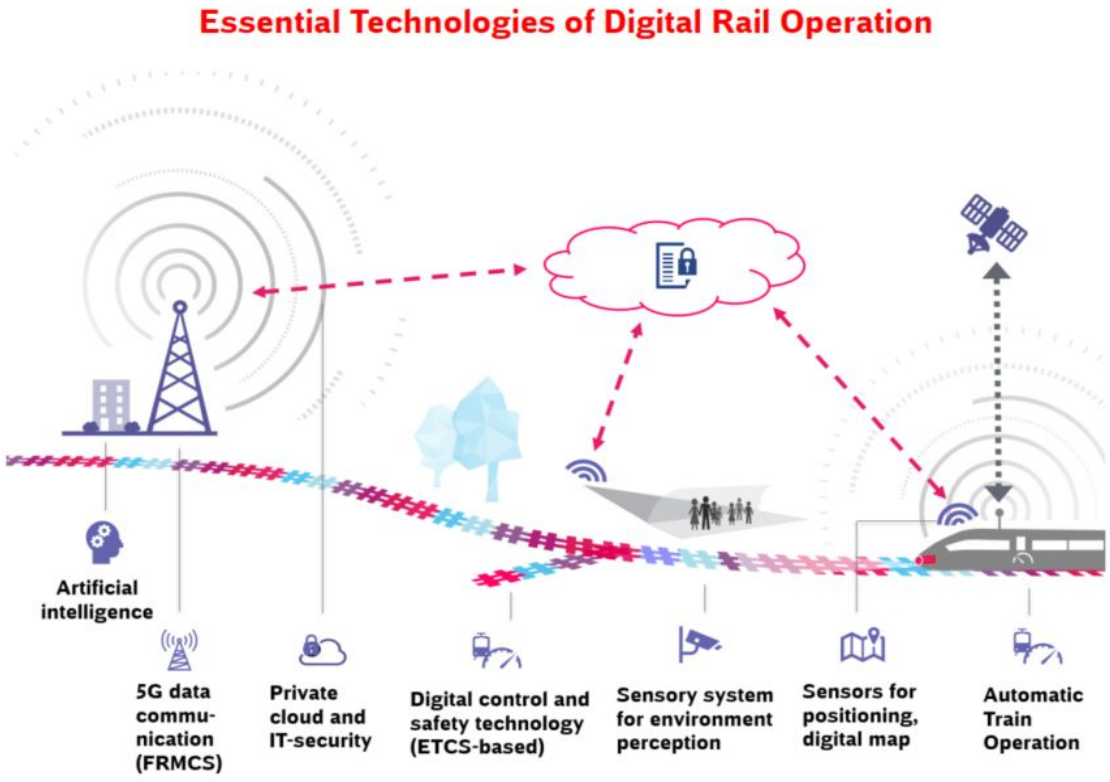
–https://www.computerworld.com/article/3635589/cutting-edge-healthcare-how-edge-computing-will-transform-medicine.html
"You need **edge computing** anytime you're generating a lot of data and need **real-time analysis** of it."

– **Nokia** revealed its **MX Industrial Edge Server**, which is managed by the Nokia Digital Automation Cloud **to support 5G standalone private networks.**

– https://www.youtube.com/watch?v=M8V2CFin0Sw In 24 minutes, the founder of **Silverpeak** explains how they went from traditional SD-WAN meaning "software defined" to make it 'self driving". David Hughes tells you a lot about **multiconnectivity WAN, SASE, edge based security, digital transformation**, etc.

– https://rspg-spectrum.eu/wp-content/uploads/2021/06/RSPG21-022final_RSPG_Opinion_Spectrum_Sharing.pdf Read the final Opinion Paper on **Spectrum Sharing** by the EU Spectrum Sharing Policy Group, including examples and call to the Member States to innvestigate the possibities. Al lot of recommendations are feasible PoCs to be conducted in a connectivity fieldlab, such as: *"Member States are encouraged to support the development of initial "proof of concept" systems in bands where advanced spectrum sharing systems, such as cognitive radio systems and other ICT or database assisted systems have been developed at least at the experimental level"*. And: *"Where it seems sensible and possible and there is demand, Member States are encouraged to issue temporary "test&trial" / "innovation&trial" licences (sandboxes), including in a multi-country context, where appropriate in order to foster innovation. Those licenses should give users, including non-traditional operators, the possibility to get access to spectrum."*, to give a few examples. An additional questionnaire to RSPG on cross-border coordination and synchorization issues in the 3.4 – 3.8 GHz band can be found here.

– https://5g-mobix.com/assets/files/5-EC_5GWS_CEF2_Kemeter.pdf Dr. Kartsen Kemeter, CTO Communications Technology of the **Deutsche Bahn**, presented the German Railway **perspective on FRMCS for 5G corridors along railways**. The migration from 2G to 5G (6G?) for mobile networks supporting Rail Operations is foreseen to take place between 2027 – 2035. Another highlight: "Sharing is key: **Infrastructure competition between mobile operators not feasible**"



– https://www.gov.uk/government/publications/national-space-strategy/national-space-strategy On 27 September 2021 the **UK National space strategy** was published. According to the foreword by Prime Minister Boris Johnson, it is *"putting the UK firmly in the front rank of the global space industry"*. Also: *"The European Space Agency **(ESA) will remain a close multilateral partnership for the UK** for civil science, exploration, climate monitoring, and technical collaboration."*

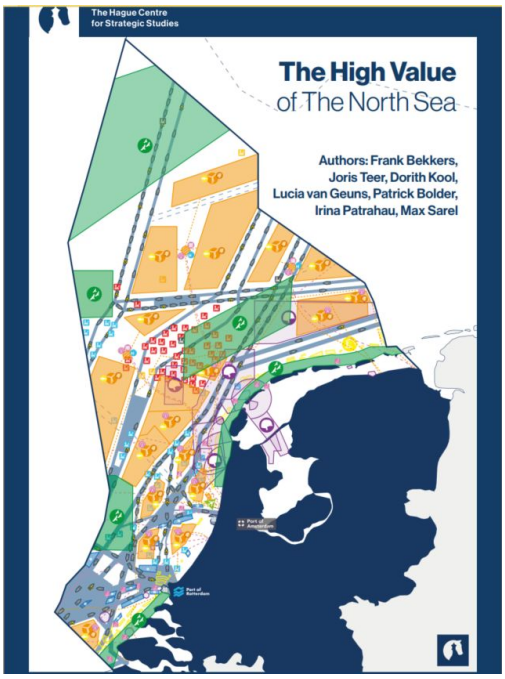
– https://www.euractiv.com/section/5g/news/slovak-government-will-not-yet-invest-in-satellite-internet/ While EU countries like Germany are investing in **satellite internet connections to provide connectivity in hard-to-reach places**, Slovakia has decided not to do so, at least for the moment.

– https://www.euclidia.eu/ With non-EU tech giants entering the GAIA-X ecosystem, European IT SMEs have set up an alternative alliance, the **European Cloud Industrial Alliance (EUCLIDA)**.

*The continent also has a number of successful and highly advanced SMEs within the cloud space, which represents a new breed of cloud suppliers, born in **an edge-native era where software is at the centre of the business, and open source and collaboration is part of the DNA**.*
Yet in last decades the centre of gravity for innovation has moved to the West and the East. Some of the fastest growing companies in the cloud sector have over the past decades come from the US and Asia. Much of this context is shared with the telecom industry and was inspired by the European Association of Next Generation Innovators (EANGTI).”

EUCLIDIA	GAIA-X
CEOs of European companies that create original cloud technology, mostly SMEs	Mostly managers of large European companies or reseach organisations that use or run cloud through strategic partnerships with AWS, Azure or Google
European based companies with European based shareholders that create original cloud technology	Mostly cloud users and cloud providers from any country
Accelerate the adoption of cloud technology created in Europe	Develop compliance policies for cloud providers

Nextcloud, offering and building out an Open Source based alternative cloud solution and more or less a founding member of GAIA-X, has also become one of the initiative taking members of EUCLIDA.



– https://hcss.nl/report/high-value-of-the-north-sea/ The Hague Centre for Strategic Studies (HCSS) published a report that emphasises **the key position of the Netherlands on the North Sea**, among others by the **strategic logistical role** of its seaports. As ‘sea’ becomes more like ‘land’, guaranteeing the security of structures and processes in the North Sea warrants more attention, and could potentially necessitate new approaches. Intensifing the international cooperation, especially with European partners like Frontex and EMSA, are recommended.

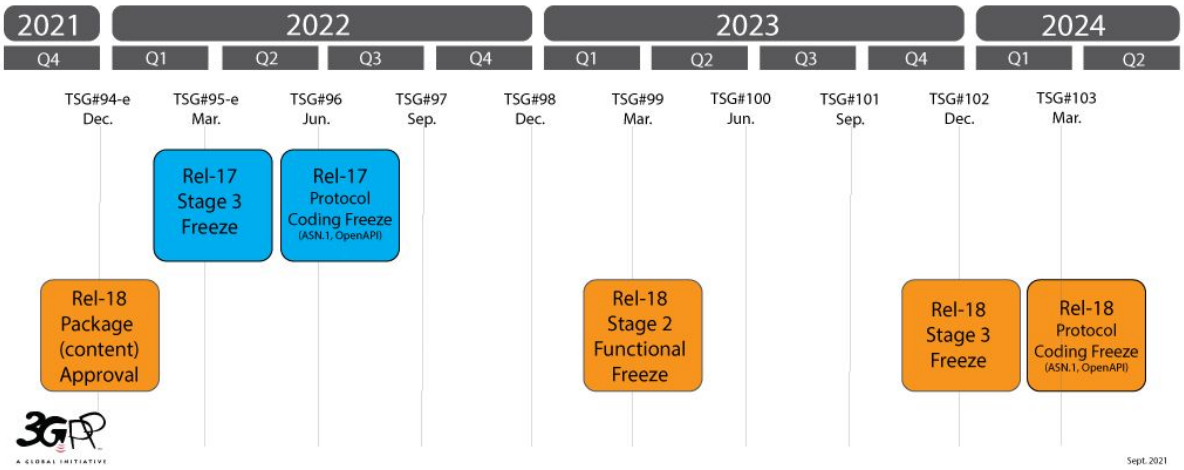
“ Other international initiatives, particularly in the realm of information and analysis sharing, should also be pursued, such as the Common Information Sharing Environment (CISE) of EMSA”

In the final thoughs, we recognize a lot of similar arguments and themes related to connectivity, i.e. in respect to **enhance Maritime Situational Awareness** with real time oversight and insight. Or: ***“Security outside the territorial sea poses a crucial dilemma”*** and a plea to “*Establish a ‘**North Sea Authority’ (NSA)**”*. HCSS was commissioned with this study and reporting by the Netherlands Coastguard (NLCG) and the Dutch Ministry of Defense.

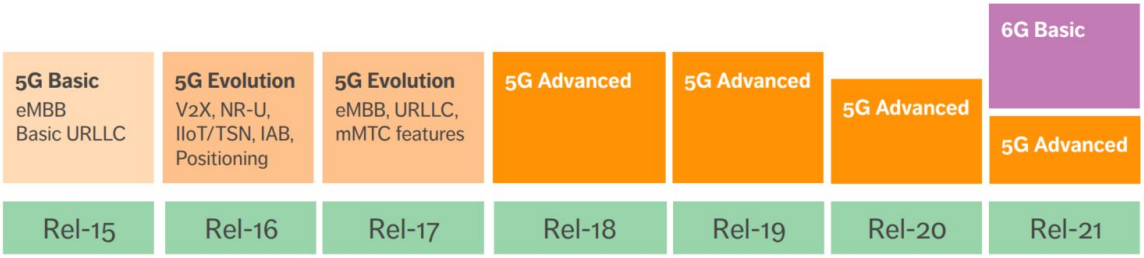
– https://www.offshore-energy.biz/fugro-brings-its-new-usv-generation-to-europe/ **Fugro** has launched its new generation of **uncrewed surface vessels (USVs)** known as Blue Essence in the European market. The planned inspection with USVs was welcomed by the Rotterdam Port Authority: "*We expect the development of digitalisation in the shipping sector will improve the safety and accessibility of the Rotterdam port.*"

– https://www.vodafone.com/news/technology/europe-urged-build-open-ran-ecosystem (download full report: https://www.vodafone.com/sites/default/files/2021-11/building-open-ran-ecosystem-europe.pdf)

– https://www.3gpp.org/news-events/2228-rel-17_f2f The Technical Specification Group (TSG) e-meetings (#93-e) in September have agreed that **the freeze date for the Release-17** set of features will remain the major focus in the working groups until the end of the first quarter of 2022.



- https://www.ericsson.com/4a92c5/assets/local/reports-papers/ericsson-technology-review/docs/2021/an-overview-of-3gpp-releases-17-and-18.pdf So, what does all this Rel-17/18 mean for 5G? Read this comprehensive overview by Ericsson of the most significant enhancements from "Basic 5G" in Release 15, via "5G Evolution" in Rel-15 and 16, **toward 5G Advanced**, starting with Release 18.



Read about the application of AI/ML, the high expectations for **Red**(used)**Cap**(ability) Ues for industrial sensor networks, the integration of Non Terrestrial Network (**NTN**) technology with HAPs and LEOS. Did you already hear abbout Stand-alone Non Public Network (**SNPN**) and their support for **emergency services**? The Multicast and Broadcast service (**MBS**) was mentioned before in this reader, leading to **SFN** (Single Frequency Network) capabilities, as seen in DAB+ broadcast networks today. For those that are dazzled with so much new abbreviations and terminology, a list of terms and abbreviations is included!

– https://www.satellitetoday.com/5g/2021/11/11/lockheed-martin-teams-up-with-keysight-technologies-on-5g-defense-national-security-platform/ **Lockheed Martin and Keysight Technologies collaborate to adapt commercial 5G technology** and meet tactical communications needs in terrestrial and non-terrestrial networks **for defense and national security applications**.

– https://www.techzine.eu/news/infrastructure/68863/kkr-and-cvc-capital-want-to-buy-telecom-italia/ Two Private Equity **(PE) funds are teaming up to buy Telecom Italia**. After the sale of T-Mobile Netherlands, another European MNO is targeted by PE.

- https://www.sdxcentral.com/articles/news/is-open-ran-too-little-too-late-for-5g/2021/11/ Although specifications are still and will likely remain under development for the foreseeable future, many industry heavyweights and observers now view the **shift to open, disaggregated architecture as irreversible.** Unsurprisingly, the world's largest RAN vendor Huawei remains a firm nonbeliever in open or virtualized RAN. **Huawei** expresses doubt **about open and virtualized RAN**. *"From a commercial perspective, is it too late?"* Also: *"often a lot of the reasons why we want to do something is perhaps for political reasons and just haven't been very well thought out."*

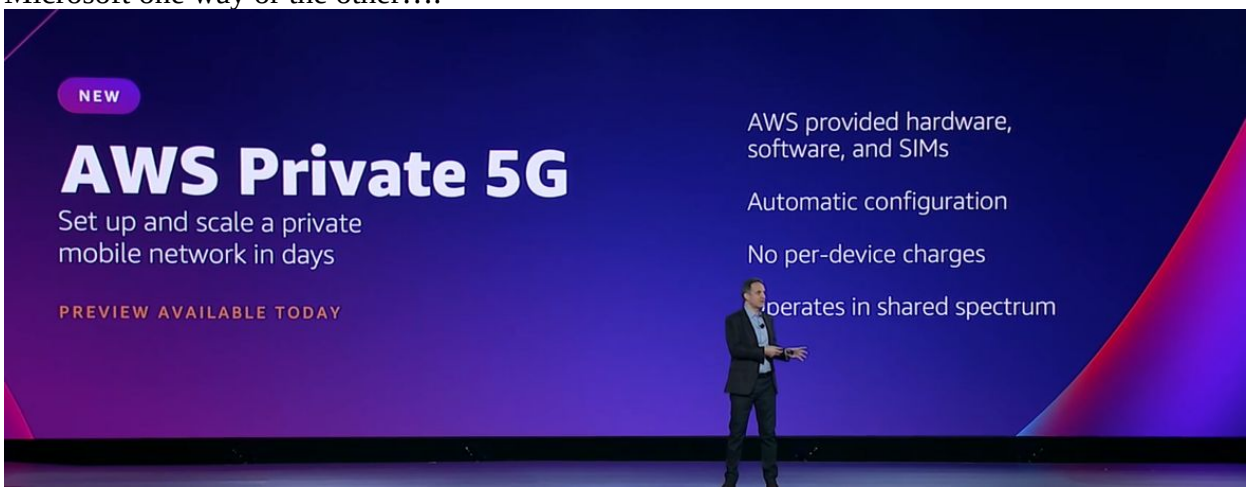
- https://450alliance.org/ruggear-to-develop-a-new-450-mhz-lte-handheld-device-with-bands-31-72-and-87/ RugGear will develop a **new 450MHz LTE handheld device** with band31, band72 and band87 support.

- https://www.msptoday.com/topics/msp-today/articles/450704-ericsson-extends-its-wireless-enterprise-strategy-with-vonage.htm The acquisition of Vonage by Ericsson is considered to confirm the vision in the context of a **converged mobile and cloud telecom market**.

-https://www.mwrf.com/markets/defense/article/21180552/microwaves-rf-dod-fields-5g-network-for-first-responders The Department of Defense's (**DoD**'s) Defense Innovation Unit (DIU) unveiled a year-long prototyping project in California to explore future **military uses for fifth-generation (5G) cellular wireless networks**. Working with private wireless networks, the DIU will use the emerging wireless networks for critical communications between first responders, including the California National Guard. **The 5G networks will provide cost-effectiveness compared to satellite-communications (satcom) networks and performance advantages compared to older two-way radios, with added geolocation capabilities**. In addition, Nokia Innovations, a business unit of Nokia America, will provide the DoD with enough **portable cellular radios to blanket an area under emergency conditions**.

- https://frontex.europa.eu/media-centre/news/news-release/frontex-to-support-member-states-in-the-channel-and-north-sea-region-pZWNYE **Frontex** deployed a plane in France to support with aerial **surveillance of the North Sea,** following the ministerial meeting in Calais on Sunday, 28 November. On December 1, the Danish plane, equipped with modern sensors and radars, landed in Lille.

-https://www.sdxcentral.com/articles/news/aws-muscles-into-private-5g-spoils-carriers-role/2021/11/ **AWS** presents **'Shockingly Easy' Private 5G**: "The service, which is available in preview mode, integrates with small cell radio units, servers, a 5G core, and radio access network (RAN) software — **all delivered and maintained by AWS**." It is offered in de USA only for now, but an obvious trend to become worldwide and to be followed by Google and Microsoft one way or the other….



- https://www.rrmediagroup.com/News/NewsDetails/newsID/21194
- https://450alliance.org/telox-communications-joins-450-mhz-alliance/
RAD & Telox join the 450 MHz Alliance, that now welcomes both a well known IIoT and a mission critical equipment manufacturer in the 450 MHz ecosystem.

RAD Your Network's Edge® TELOX 450 alliance.org

- https://tech.ebu.ch/files/live/sites/tech/files/shared/tech-i/tech-i-050.pdf The latest EBU Tech-i issue is subtitled "Testing what's possible with 5G-based production", but also contains some interesting articles about (future) **5G broadcast**. The first is titled *"Better safe than sorry – how 5G Broadcast can save lives"* and looks back to the flooding that happened in summer 2021 in Germany with over 130 casualties:

EBU OPERATING EUROVISION AND EURORADIO

"A lesson definitively learned from the catastrophe was that the widespread and intensively used smartphones carried in every pocket became useless as the mobile networks went down."

Another article is about the contribution of broadcasters in 3GPP. In release 17 and 18 work items such as "**5G Multicast Broadcast Services (5MBS)**" *(also see the Ericsson "toward 5G Advanced reader" on page 27)* and "**Sidelink (ProSE**)" can only be found back with a reduced scope in Rel. 17, but is now discussed to be (fully?) implemented in Rel. 18.

- https://www.politico.eu/sponsored-content/toward-2022-the-state-of-the-tech-and-telecoms-debate/ Lise Fuhr, the Director General of **ETNO** published a letter in Politico about the broader EU ambitons and the role the telecom operators should play. One of the actual questions is: **"how big is big enough to compete globally?"**

ETNO reemphasizes the crucial role digital transformation will have to reduce the CO2 emissions in other

etno European Telecommunications Network Operators' Association

sectors and also has to accelerate its own adoption of renewables and take action to reduce its own footprint. A plea to find balance in regulation versus business freedom and the broadening scope of technological discussions are mentioned: Tech nerds must realize they are not alone in these matters anymore, and non-experts must takes steps to learn tech basics: ***"with digitalization being the very fabric of human interactions, all must step up and understand how technology works."***

- https://cfns.nl You probably know the website of the Connectivity Fieldlab North Sea. It has not changed much, since it was launched, end 2020. The website was updated with added some nice video's, a new flyer *(- or click on the thumbnail on the bottom of each page of this reader-)* was added. A lot more was added to the Github multiconnectivity repositories of CFNS, since now the third cluster of students are finishing their projects in january 2022. The latest projects were added in English, to reflect the international character of this innovation program, that will be continued in 2022 also.

Another "sleeping beauty" for international collaboration and exchange of ideas and inspiration for better connectivity at the North Sea, is the CFNS LinkedIn page. The new partner-organizations that joined the fieldlab in 2021 will be visible soon and we do also welcome you to visit and join the growing community in 2022!