

# Ultra-Reliable and Low-Latency 5G Systems for Port Automation

**5G** VIIMA™

**5G FOR INDUSTRY**

**NOKIA**

**VTT**



VTT – beyond the obvious

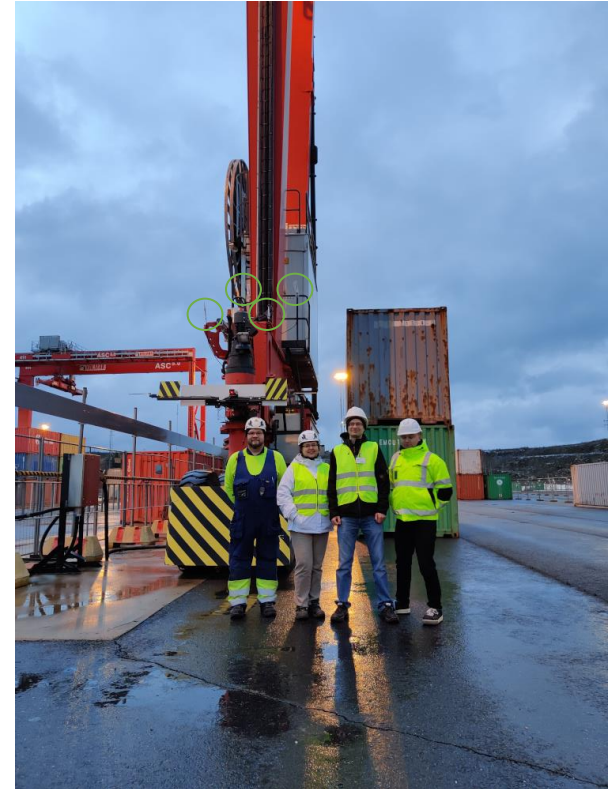
08/09/2021

# Achievements to highlight

Jan 2021: Cargotec Kalmar and Nokia announced strategic cooperation

- provide new solutions for ports and intermodal terminal operators
- joint go-to-market ventures
- integrated solutions development
- research collaboration.

<https://www.cargotec.com/en/nasdaq/press-release-kalmar/2021/kalmar-and-nokia-extend-partnership-in-terminal-automation/>



# Achievements to highlight

- Contribution to tens of patents and 3GPP contributions
- Impact on product development and cooperation
- M. A. Uusitalo, H. Viswanathan, H. Kokkonen-Tarkkanen, A. Grudnitsky, M. Moio, T. Harkonen, P. Yli-Paunu, S. Horsmanheimo and D. Samrdzija, "Ultra-Reliable and Low-Latency 5G Systems for Port Automation", accepted for IEEE Com Mag Aug 2021 issue.
- P. Nouri, H. Alves, M. A. Uusitalo, O. Alcaraz López, M. Latva-aho, "Machine-type wireless communications enablers for beyond 5G: Enabling URLLC via diversity under hard deadlines", Computer Networks, Vol. 174, 2020.
- D. Korpi, P. Yli-Opas, M. R. Jaramillo, and M. A. Uusitalo, "Visual detection based blockage prediction for beyond 5G wireless systems," in Proc. 6G Wireless Summit, Levi, Finland, Mar. 2020.
- J. Kilpi, H. Kokkonen-Tarkkanen and M. A. Uusitalo, "Efficient method to validate high reliability of 5G URLLC", VTC 2021.
- D. Korpi and M. A. Uusitalo, "Reinforcement Learning Based Inter-User Interference Suppression in Full-Duplex Networks", VTC 2021.
- O. Tirkkonen, S. R. Khosravirad, P. Baracca, L. Zhou, U. Parts, D. Korpi and M. A. Uusitalo, "Optimized Survival Mode to Guarantee QoS for Time-critical Services", ICC 2021.
- J. Pihlajasalo, D. Korpi, M. Honkala, J. Huttunen, T. Riihonen, J. Talvitie, A. Brihuegagarcia, M. A. Uusitalo and M. Valkama, "HybridDeepRx: Deep Learning Receiver for High-EVM Signals", IEEE PIMRC 2021

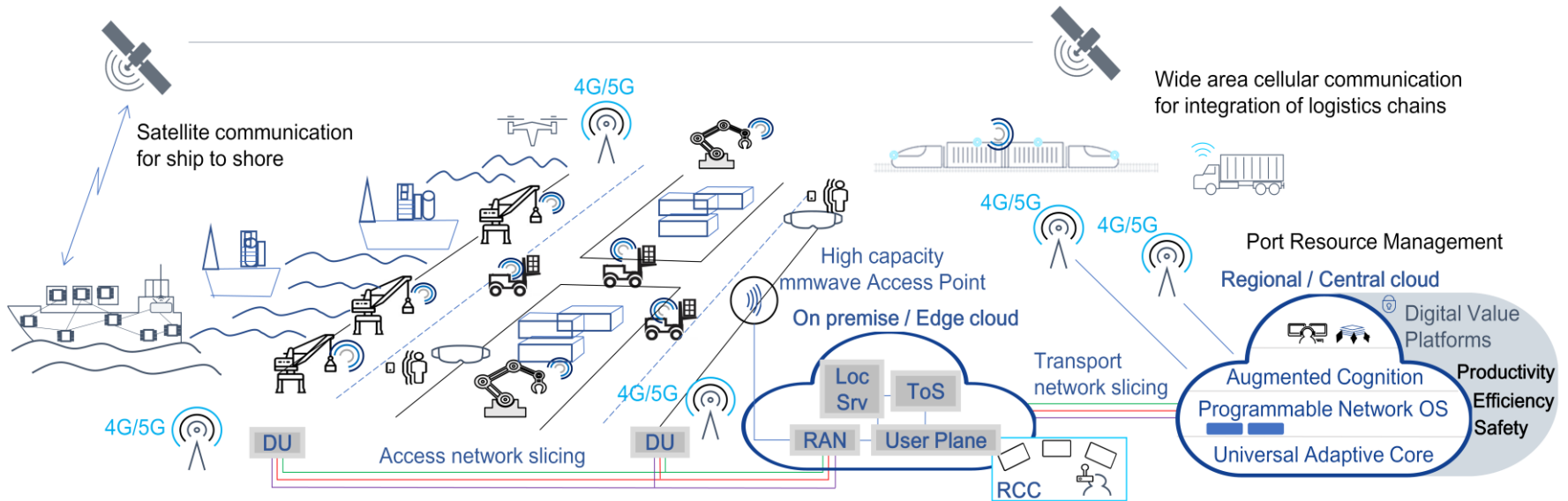
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- TRANSFORMATION IN PORT OPERATIONS
- COMMUNICATION IN PORTS
- TEST SYSTEMS FOR PORT COMMUNICATION



DU – Distributed Unit; RAN – Radio Access Network; Loc Srv – Location Server; ToS – Terminal Operating System; RCC – Remote Control Center



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