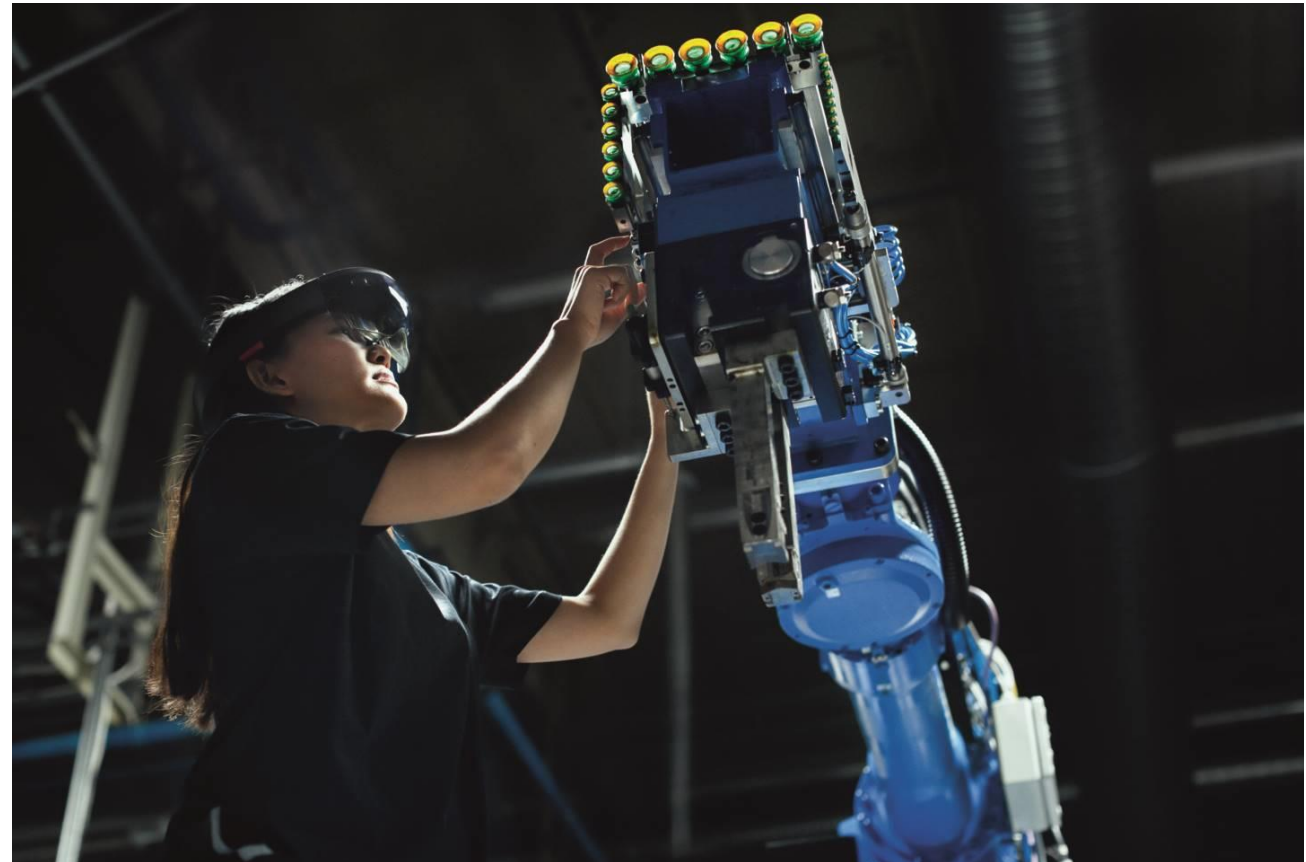


# 5G on Licensed Spectrum for Local Industries



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# 5G and Licensed Spectrum for local industries – Why important?

Industrial use cases with requirements on extremely reliable service, short and predictable latency, and with mobility

- Licensed spectrum
  - For interference control
- 5G
  - For Mobility, local and wide area
  - For URLLC (Ultra-reliable low-latency communication)

Industries are often within geographically limited areas (manufacturing, mining, ports etc.)

High quality access networks, delivering performance 24/7

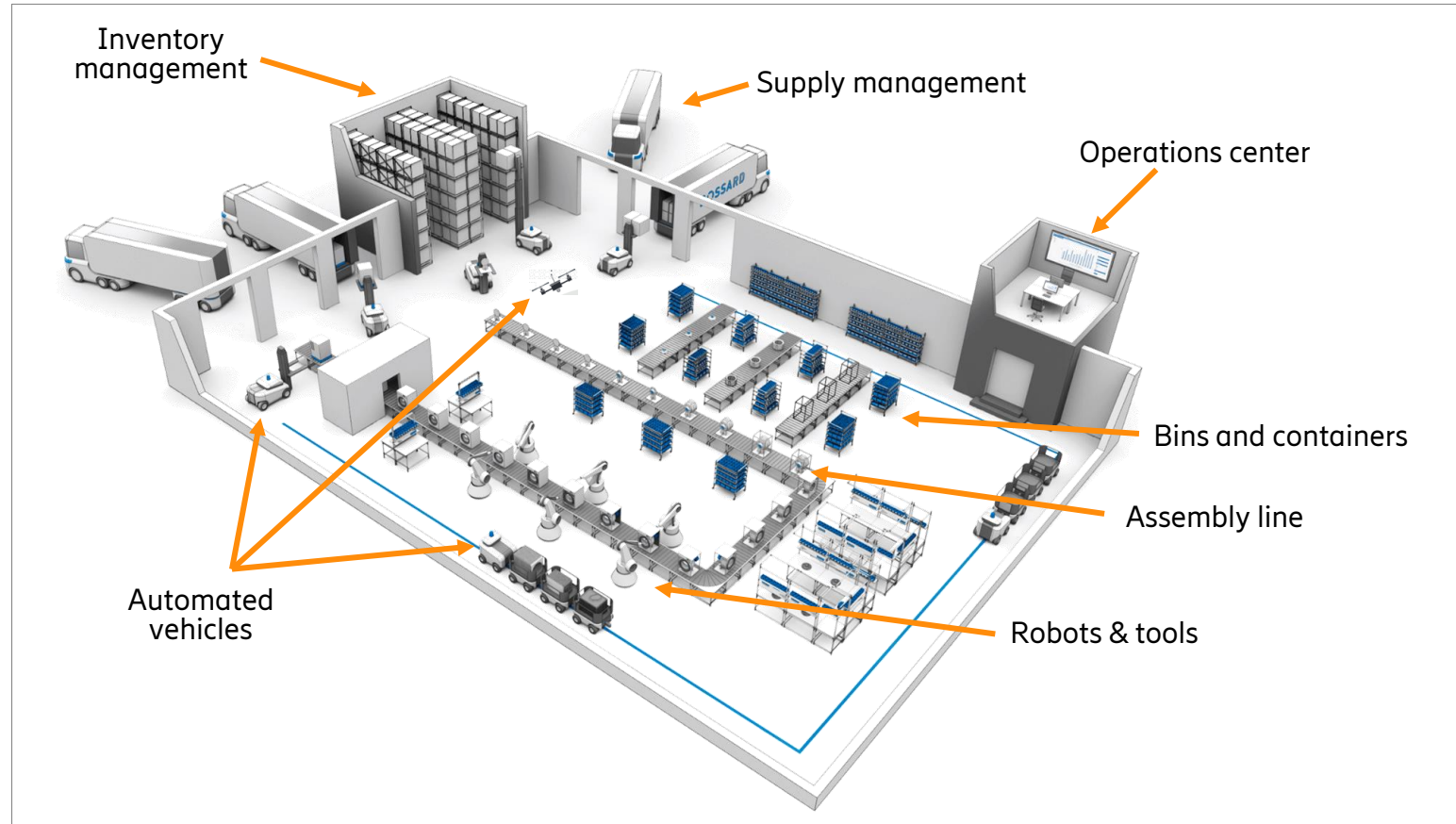
**5G - the Backbone of Industry 4.0**



# Different needs of connectivity for an industry






- Thousands of simple sensors in an energy-efficient way  
**NB-IoT & Cat-M**
- Low-latency, super-reliable (local) cloud-based steering of robotic arms  
**5G NR URRLC**
- Voice services, access to internet, video surveillance  
**eMBB over LTE / 5G**
- **Local and Wide area connectivity** for supply and produced goods



# Industries will leverage multiple spectrum ranges for different characteristics and accesses



	Key Characteristics	Leverge multiple spectrum ranges for optimal performance, diverse use cases and capacity	
mmWave bands (TDD)	<ul style="list-style-type: none"><li>Extremely high capacity</li><li>Limited coverage</li></ul>		<ul style="list-style-type: none"><li>5G NR URLLC</li></ul>
Sub-6GHz TDD bands	<ul style="list-style-type: none"><li>Good coverage and high capacity</li><li>Stringent TDD co-existence requirements</li></ul>		<ul style="list-style-type: none"><li>5G NR URLLC</li><li>LTE</li></ul>
FDD bands	<ul style="list-style-type: none"><li>Widest coverage</li><li>All radio access technologies supported</li><li>Limited capacity in low FDD bands</li></ul>		<ul style="list-style-type: none"><li>5G NR URLLC</li><li>LTE</li><li>NB-IoT &amp; Cat-M</li></ul>

# Options for local industries to operate on licensed spectrum supporting long-term investments



1. Sign a Service Level Agreement (SLA) with MNO owning licensed spectrum
  - The MNO provides local services to the industry with their network implementations including local deployments where needed
  - Responsibility & operational agreements between MNO and industry
  - All spectrum ranges could be available
2. Lease Spectrum locally from an MNO
  - Mandatory leasing proposed in some countries, allowing long term lease essential
3. Regulators may set aside some spectrum for very local licenses
  - Needs to be designed for industries and be very local, e.g. real-estate based and harmonized with global frequency bands for device eco system availability
  - Interference protection between local industry and wide area MNO use of spectrum
  - Avoid spectrum hoarding and un-used spectrum
  - Typically one or two range(s) in midband and mmW band, will not cater for all use cases



# Summary and Recommendation



- 5G on licensed spectrum important for the development of nations and industries
- Multiple licensed spectrum ranges needed for industries

## Options for industries

- Industries served by MNOs under SLA, on MNO spectrum
- Local / real-estate-based licenses for local services in combination with spectrum for wide area MNO services in some countries
- Mandatory leasing in a few countries

## Recommendation

- Licensing of new frequency bands to 5G to cater for national societal needs
- 5G in all current frequency bands as soon as feasible
- MNOs to support industries with 5G
- Ensure efficient usage of all spectrum resources

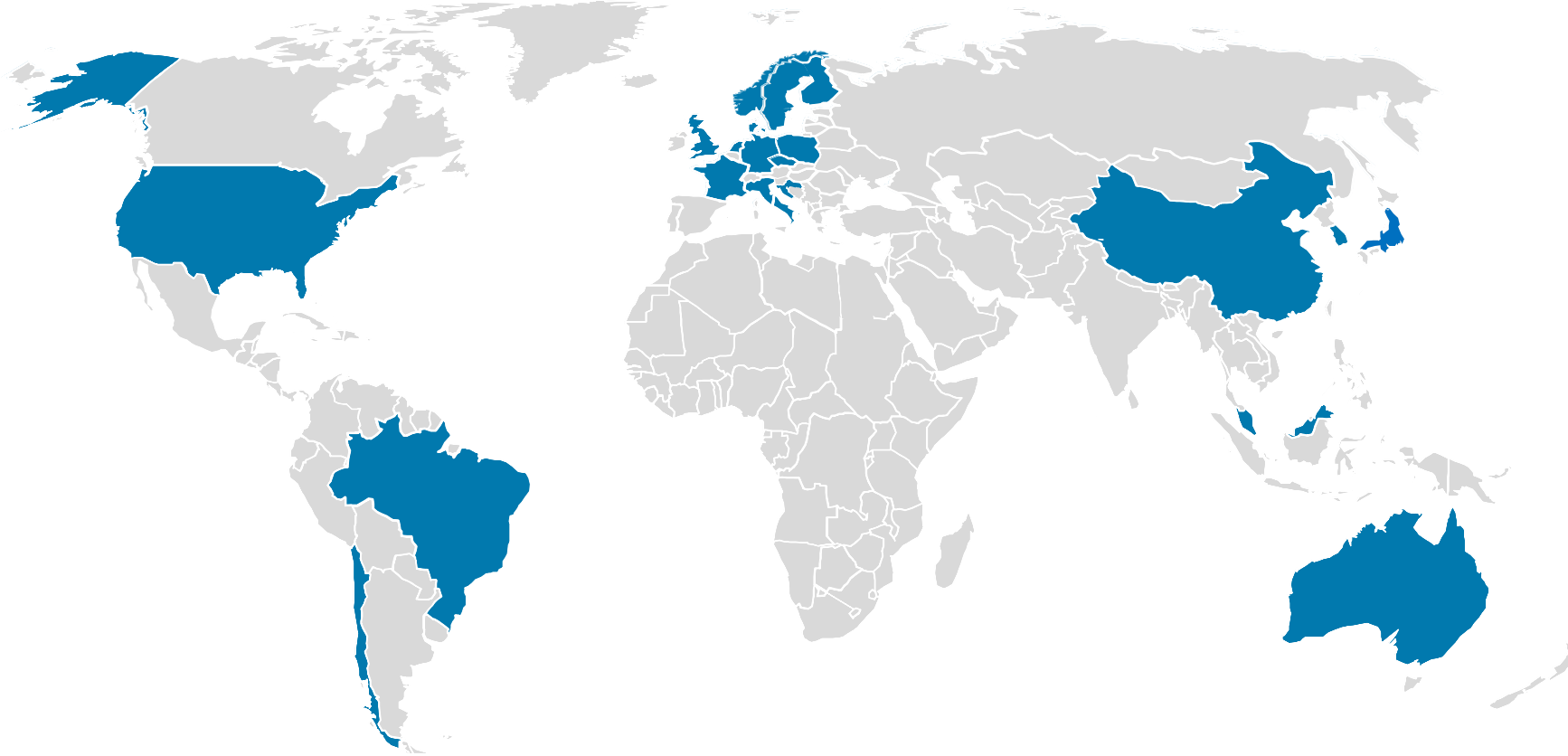




# Discussions on dedicated spectrum and mandatory leasing for industries – Spring 2021



Discussions on dedicated spectrum for Industries are ongoing or dedicated local spectrum is assigned.  
Includes spectrum made available by regulators through mandatory leasing.



## **Mid band**

Chile, China, Croatia, Czech Republic, Denmark, Finland, France, Germany, Japan, Netherlands, Norway, Poland, Sweden, UK, US

## **High band**

Australia, Brazil, Croatia, Finland, Germany, Hong Kong, Italy, Japan, Malaysia, Republic of Korea, Sweden, UK