Capgemini

POINT OF VIEW

SMART LOGISTICS

ADVANCED CONNECTIVITY ALLEVIATES LOGISTICS' CHALLENGES

Over the years, supply chains have become increasingly complex and global. Logistics companies face various challenges related to operational costs optimization, international competitiveness, and carbon footprints.

The COVID-19 pandemic has revealed the weaknesses in global supply chains and has accelerated key trends: the soar of online shopping, in particular, drives key requirements (reduced time-to-market and new fast delivery standards).

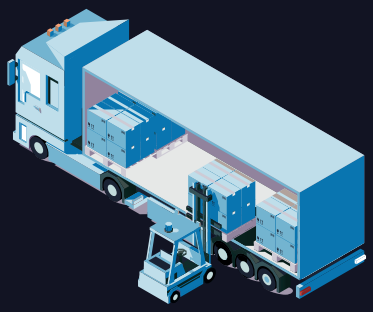
This produces a strong incentive for logistics companies to accelerate their digital transformation towards 'smart' logistics: increase automation, monitor & control logistics processes & assets in real time, enhance flexibility… Along this digital journey, exponential volumes of data from multiple sensors and equipment will have to be collected and processed, bringing connectivity to centre stage.

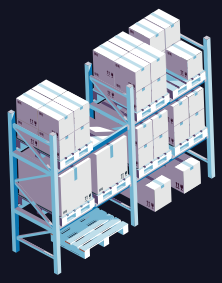
Advanced connectivity solutions are needed to address growing requirements in terms of performance (speed, latency, devices/sensors density, reliability), security and coverage: from seamless indoor/outdoor coverage in the logistics warehouse to connectivity service continuity across the supply chain.

Major pain points have been identified today in the logistics activities:

Putaway process

No continuous and real-time communications from the trucks to the warehouse.
No possibility to prepare and benefit from specific - manual or automated - reception actions.



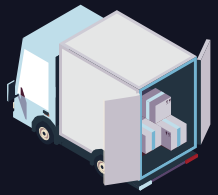


Storing / Warehousing / Intralogistics

No real time 360 vision in intralogistics activities
No automated organization management to reduce delays (order preparation, packages storage, …) and related costs.

Last mile

Insufficient digital order management and route optimization in last mile delivery
No real time supervision of financial and environmental costs/savings



5G IS A TRANSFORMATIVE CONNECTIVITY ENABLER FOR SMART LOGISTICS

5G, the latest mobile communication generation, is being widely rolled-out and, will benefit from progressive performance & functional enhancements based on International Standards in the coming years.

As with 4G, 5G offers the possibility for Enterprises to create and manage their own private network, to use public 5G network offered by Connectivity Service Provider or to go for any in-between deployment model.

5G offers key benefits: higher speed and capacity (uplink/downlink) for bandwidth consuming applications like video streaming, ability to support massive network of sensors, low latency to allow for real time data processing and automation, reliability, as well as higher control over network quality of service.

These characteristics are well adapted to the smart logistics requirements to develop ever faster, more reliable and safety conscious processes.

For instance, 5G can support efficiency improvements in warehouses on various levels:

> Massification of low latency connections between operators and robotic elements.
>
> More efficient use of AIV, robots etc. within the warehouse.
>
> Error avoidance in warehouse operations thanks to highly reliable and continuous data sharing.
>
> Real time geolocation & tracking of assets, equipment, goods.
>
> 5G-native Multi-access Edge Computing enables local (i.e. confidential) data analysis.
>
> Real time data visualization in a digital twin to maximize geolocation & tracking outputs while optimizing put away/expediting processes.

Even more broadly, 5G technology provides three major improvements for logistics actors:

> Professional risks reduction and optimization of workers' environment: 5G performances allow AIVs & robots remote control and advanced automation thus avoiding operators to conduct risky processes.
>
> Indoor/outdoor seamless handover: thanks to better signal robustness & handover capabilities, 5G outperforms other technologies like WiFi in providing reliable and continuous indoor/outdoor connectivity.
>
> Environmental impact decrease through end-to-end process optimization: 5G enables to have reliable and near real time information on all supply-chain related assets' (trucks, AIV, drones, goods, …) movement, thus limiting environmental impact associated with extended lead times.

All these new 5G-enabled features will be accretive for the logistics sector.

5G ALREADY ENABLES VARIOUS LOGISTICS USE CASES

Smart Logistics actors investing in 5G will increase their ability to leverage their data and create a digital and connected ecosystem in two main domains:

Warehouse process automation

5G's high throughput properties allow the deployment of 360 vision of the warehousing processes, i.e. a digital twin, based on video analytics (indoor and outdoor) to supervise and monitor all activities regarding packages and storage management.

5G-native multi-access edge computing makes it possible to orchestrate IT applications and services between Cloud and Edge e.g. AIV low latency creates faster decision-making capabilities that can be combined with flow management systems.

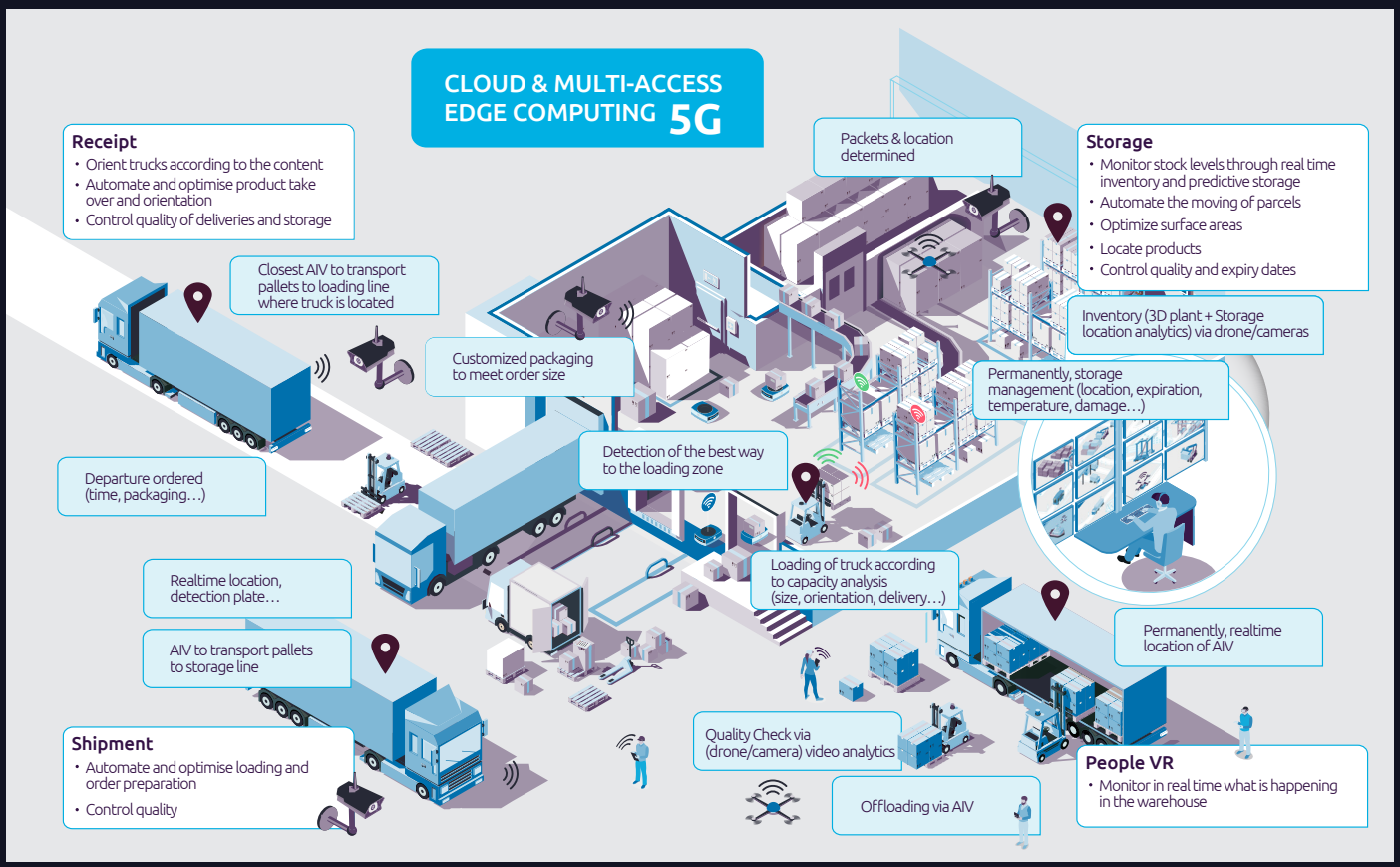
Massified immersive experience and applications

5G's properties are also enabling immersive operations through the usage of Augmented/ Virtual Reality technologies:

- Remote control of the warehouse activities in immersive applications to help the workers executing their tasks quicker and in a more reliable way, taking advantage of the 360° vision of the warehousing activities (remote command/control, augmented workers, etc.).
- Real time remote solicitation of needed knowledges, skills, and expertise towards augmented-worker enablement (remote assistance, AI-guided tasks with AR).

As 5G is being rolled out, Logistics companies can benefit from key enhancements brought by 5G:

- Private networks, to keep a total control of the Quality of Service associated with each of their use cases).
- "Network Slicing" to enabling Logistics actors to tailor their 5G network properties (low latency, high throughput…) according to their use cases' requirements (local & dynamic slices orchestration).



5G SMART LOGISTIC DEMONSTRATOR AT CAPGEMINI

Capgemini has launched a global network of 5G Labs, dedicated to the development of use cases and applications leveraging 5G and Edge Computing. Together with Hardis, a leader in warehouse management systems, Capgemini has developed a Smart Logistics demonstrator in its 5G Labs in Paris and Mumbai.

The demonstrator leverages key 5G assets & capabilities (5G SA R16 Private Network, multi-access edge computing) to test the benefits of 5G for Autonomous Intralogistics Vehicles in warehousing activities:

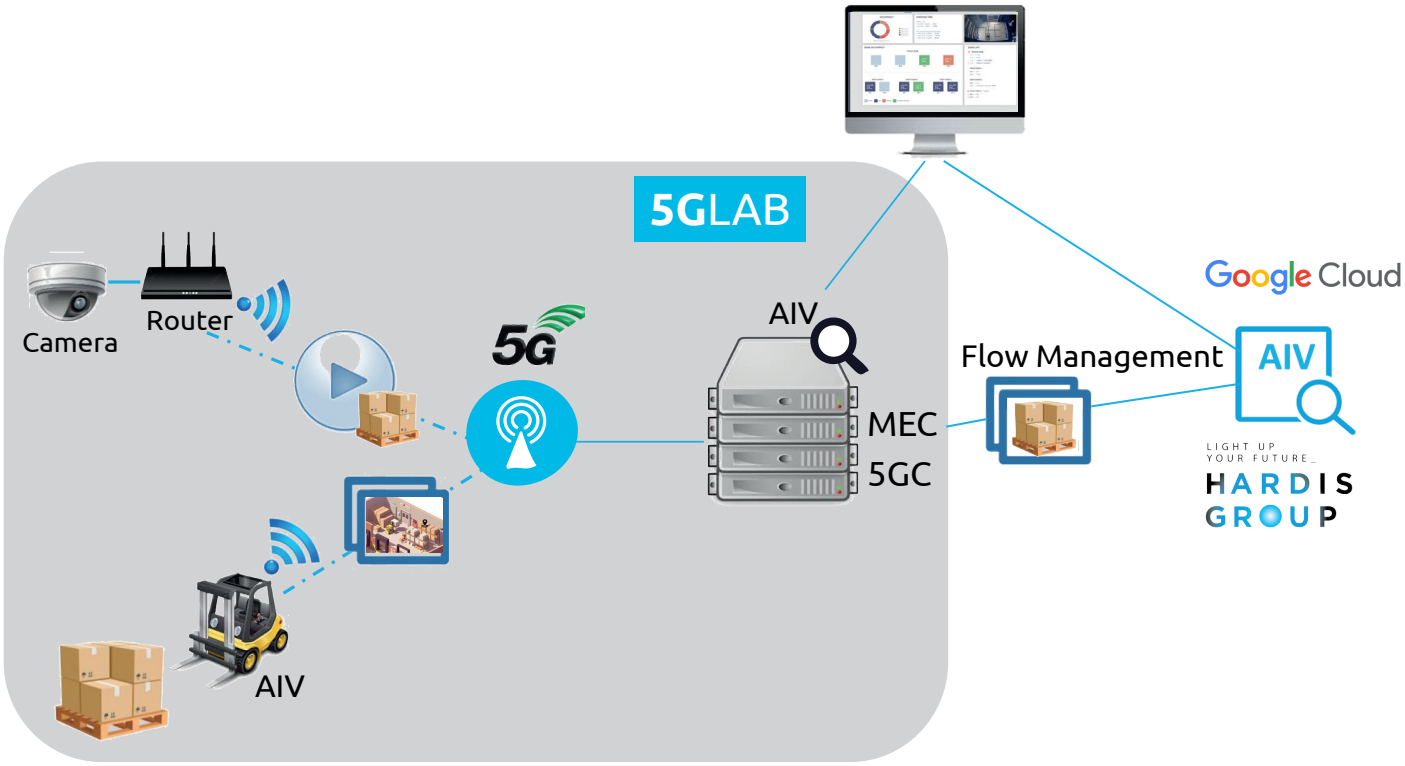
- Logistics applications and services orchestration between Cloud and Edge computing to allow AIV low latency decision-making (mission assignment at Cloud Level, real-time vehicle guidance at Edge level).
- High throughput video flows for surveillance and Computer Vision analytics.
- Slicing for guaranteed Quality of Service.

The demonstrator simulates the following logistics process:

- Warehouse video images (drop zones / pickup zones availability) are captured by 4K cameras within the logistic area and are propagated via 5G connectivity towards the MEC.
- They are processed locally and sampled towards the Hardis Flow Management Application hosted on the Google Cloud where a mission assignment is created for the AIVs as soon as one or several pallet(s) are detected.
- Upon detection of new packages, the Flow Management Application exchanges with the AIV Application at the Edge.
- This application controls and manages the AIV to guide it in its assigned mission, benefiting from 5G ultra low latency.
- The packages are transported by the AIV from the pickup zone towards the drop zone based again on the sampled Stream flows of the cameras, avoiding any possible events on the route such as e.g., collision with other AIVs.

About Hardis Group

Hardis Group is a consulting and IT services company, Salesforce integrator, and independent logistics software vendor. Its mission is to accelerate transformation in retail, supply chain, and information systems, with a particular focus on cloud technologies. Its 1,235 employees support the strategic, organizational, and technological transformations of companies throughout Europe, in order to increase their competitive edge, productivity, and attractiveness.



In the next step of the Demonstrator, dynamic network slicing features will be applied. Network KPIs will be continuously analyzed to dynamically create a new slice for the AIV and guarantee the latency performances when SLA required by the AIVs are not fulfilled anymore.

With this Smart Logistics demonstrator, Capgemini intends to tackle the main challenges of experimenting 5G for Supply Chain management, in a use case that reflects a major Automation trend across industrial sectors and Retail. Leveraging business experts and technology specialists, this demonstrator provides a solid proof of value and foundation layers for future deployments at scale.

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About Capgemini

Capgemini is a global leader in partnering with companies to transform and manage their business by harnessing the power of technology. The Group is guided everyday by its purpose of unleashing human energy through technology for an inclusive and sustainable future. It is a responsible and diverse organization of over 325,000 team members in nearly 50 countries. With its strong 55-year heritage and deep industry expertise, Capgemini is trusted by its clients to address the entire breadth of their business needs, from strategy and design to operations, fueled by the fast evolving and innovative world of cloud, data, AI, connectivity, software, digital engineering and platforms. The Group reported in 2021 global revenues of €18 billion.

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