AGV/AMR
MCTE 4362 (ROBOTIC HARDWARE SYSTEM)

MUHAMMAD DANIEL
1911801

Contents

WHAT ?

AGV

- AGV stands for “automated guided vehicle.”
- AGVs are typically guided by a pre-programmed route, which is either physically marked on the floor or navigated using sensors.

AMR

- AMR stands for “autonomous mobile robot.”
- AMRs are autonomous robots that are capable of navigating without the need for pre-programmed paths or fixed infrastructure.

AGV

Automated **G**uided **V**ehicle

AMR

Autonomous **M**obile **R**obot

The TUG is an "autonomous mobile robot" (AMR). As an autonomous robot, it has considerable advantages in flexibility, compatibility and control compared to "automated guided vehicles" (AGV).

AMR	vs.	AGV
Trackless navigation		Requires "tracks"
Can go around obstacles		Obstacles stop it
Can be easily re-mapped		Difficult to re-map
No depots needed		Needs "depots"
Delivers to user location		Does not deliver to user
Travels around people		Travels in dedicated areas
Easy to expand & change		Difficult to expand

WHEN ?

AGV

AGVs have been around since the 1950s.
The credit for their invention goes to Arthur Barrett, whose company Barrett Electronics created the “Guide-O-Matic” driverless vehicle in 1954.
In the 1970s, the “Stop & Drop” AGV came along, which could automatically handle and unload pallets.
From the 1980s onward, much of AGV development has been focused on improving navigational and fuel systems.

AMR

The origins of AMRs can be traced to William Grey Walter.
He developed the first AMR between the late 1940s and early 1950s.
From its conception, it was designed to be used as an assistant in medical research laboratories.
AMRs didn’t successfully enter into commercial use until the early 1990s, with the creation of the “HelpMate” robot.

FUNCTIONS

AGV

- AGVs are commonly used for transport That includes moving raw materials used in production or transferring work-in-progress materials between lines and workstations.
- They are also used for picking and storage activities.
- For example, warehouses may use AGVs to move inbound materials to storage or retrieve storage items needed to replenish stock.

AMR

- AMR transport systems are designed to move, load, retrieve, sort, pick, or even stack cases, totes, or carts.
- An example of how an AMR might function in a warehouse is as follows:
  - Robotic arms, conveyors, or human workers load the AMR with products or materials
  - The AMR then automatically moves to its next destination
  - There, it deposits its load onto chutes, conveyors, shelving, flow racks, or workstations

AGV/AMR COMPONENTS

01 CONTROL SYSTEM

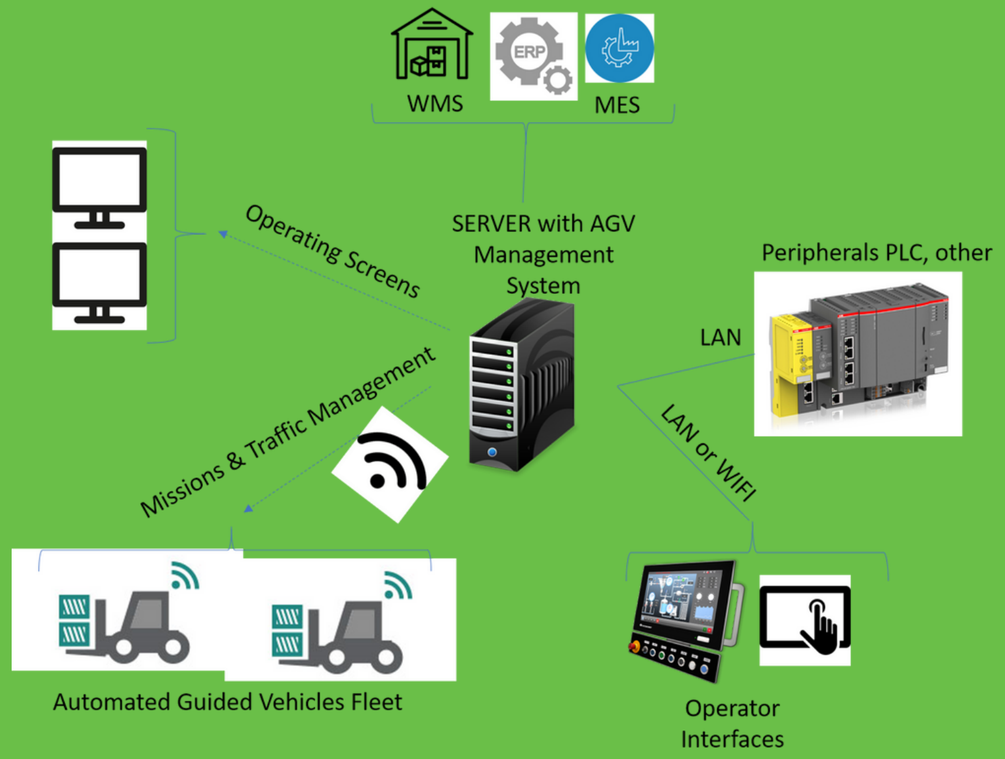
02 SENSORS

03 DRIVE SYSTEM

04 BATTERY

05 COMMUNICATION SYSTEM

06 PAYLOAD HANDLING SYSTEM



CONTROL SYSTEM

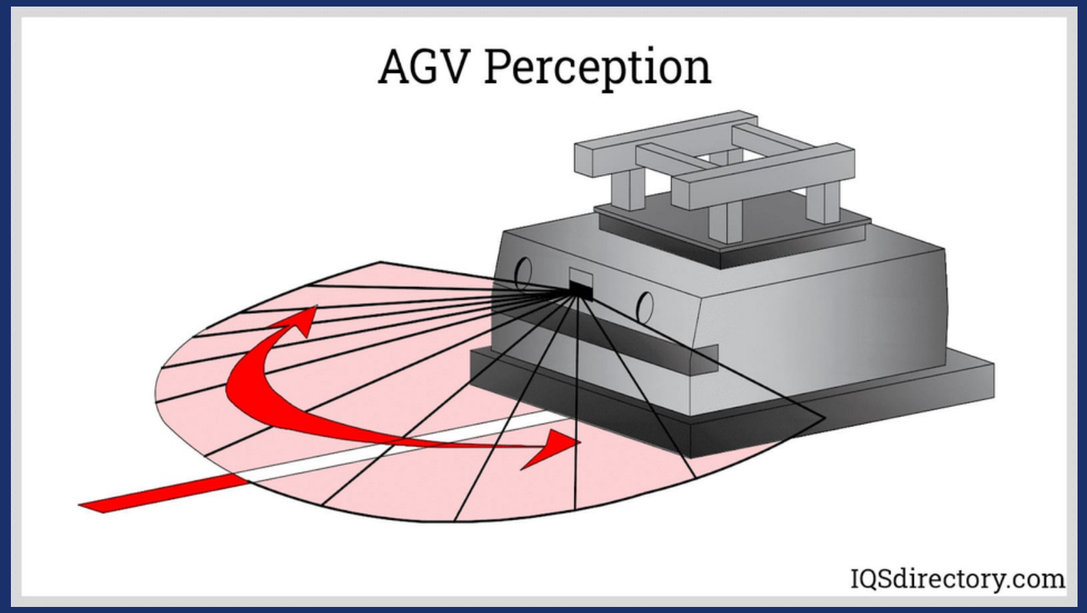
The control system is the brain of the robot, which includes hardware and software components that enable the robot to navigate, plan routes, and execute tasks.

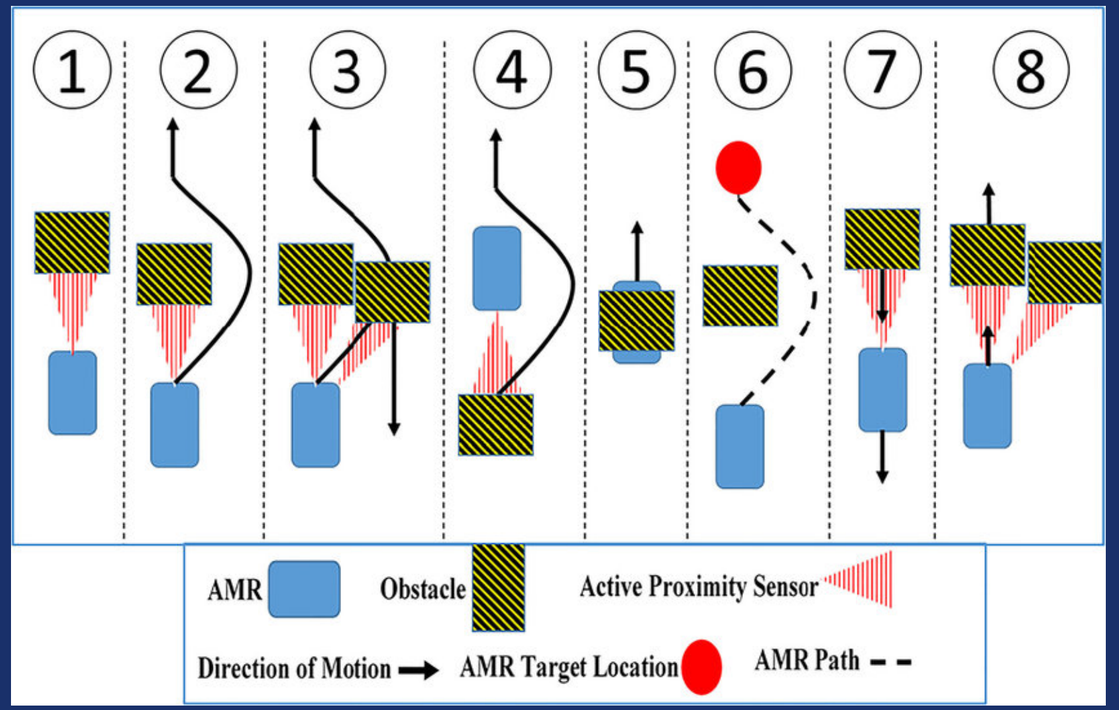
SENSORS

AGVs and AMRs use a variety of sensors, such as laser scanners, cameras, and ultrasonic sensors, to detect obstacles, measure distance, and perceive their surroundings.

DRIVE SYSTEM

The drive system includes motors, wheels, and other mechanical components that enable the robot to move and maneuver.


AGV Perception
IQSdirectory.com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AMR
Obstacle
Active Proximity Sensor
Direction of Motion
AMR Target Location
AMR Path

BATTERY

AGVs and AMRs are typically powered by rechargeable batteries that provide the energy required for the robot to operate.

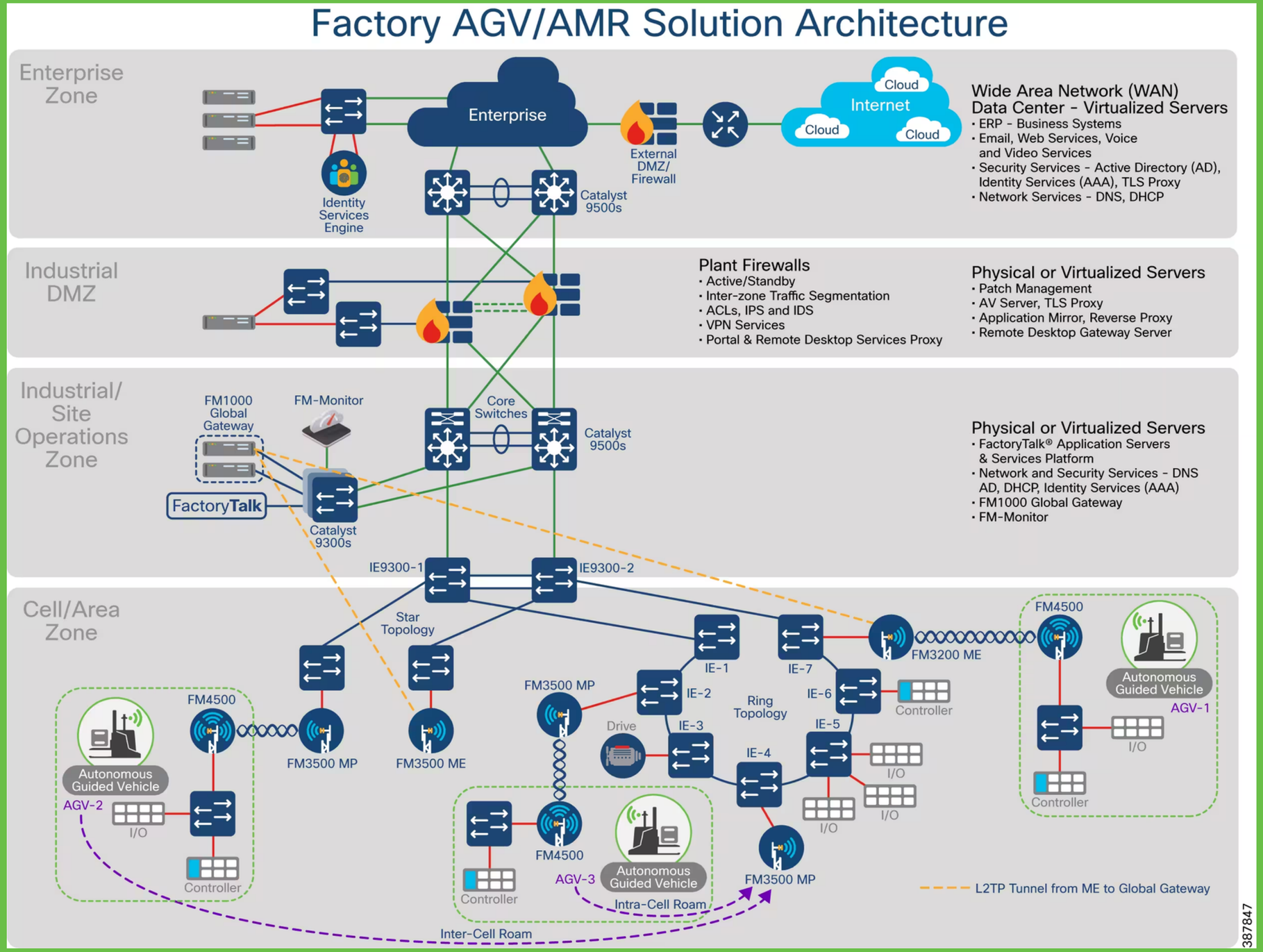
COMMUNICATION SYSTEM

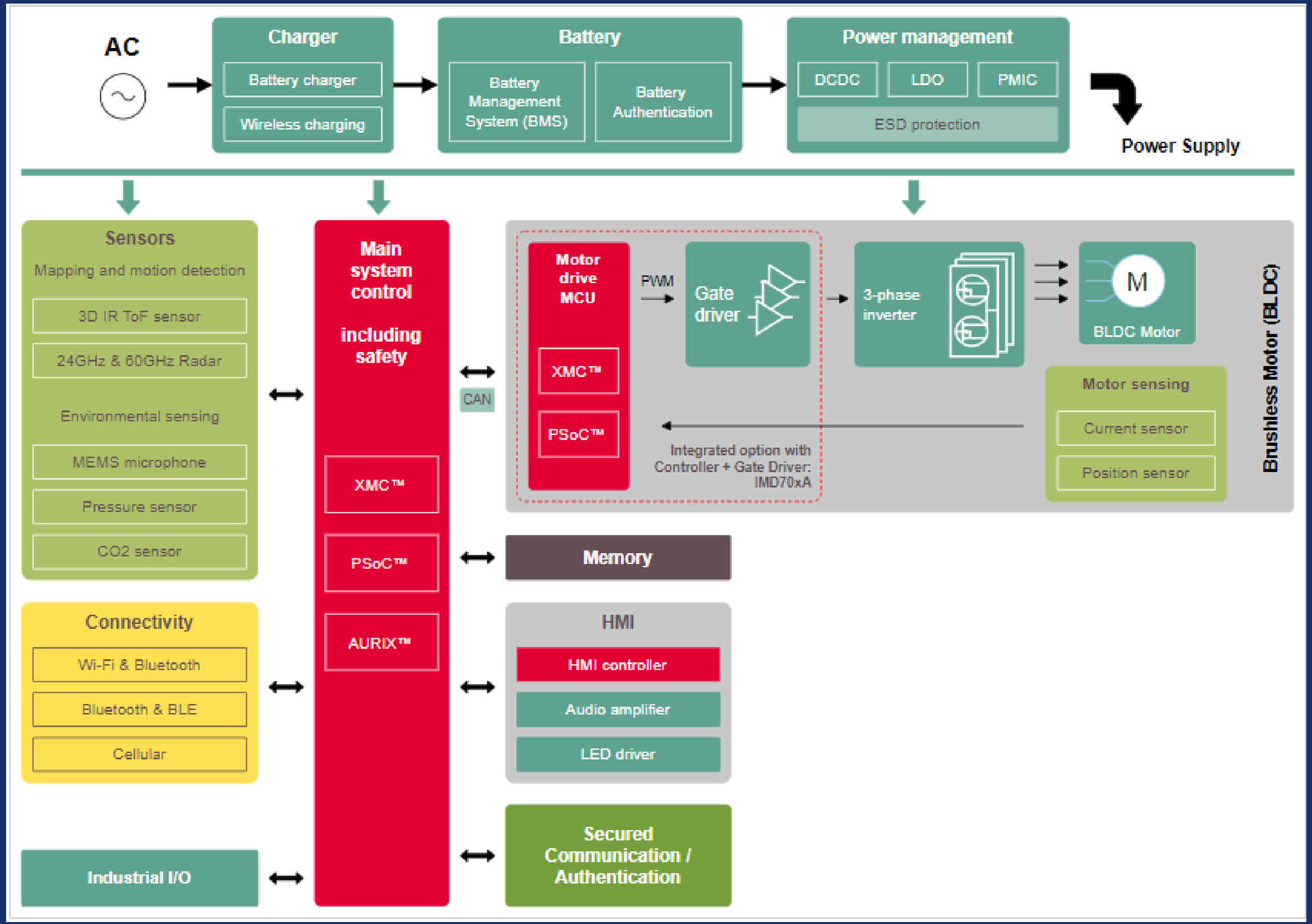
AGVs and AMRs need to communicate with other machines, as well as with humans, to operate effectively. The communication system can include wireless connectivity, such as Wi-Fi or Bluetooth, or other protocols such as Ethernet or CAN.

PAYLOAD HANDLING SYSTEM

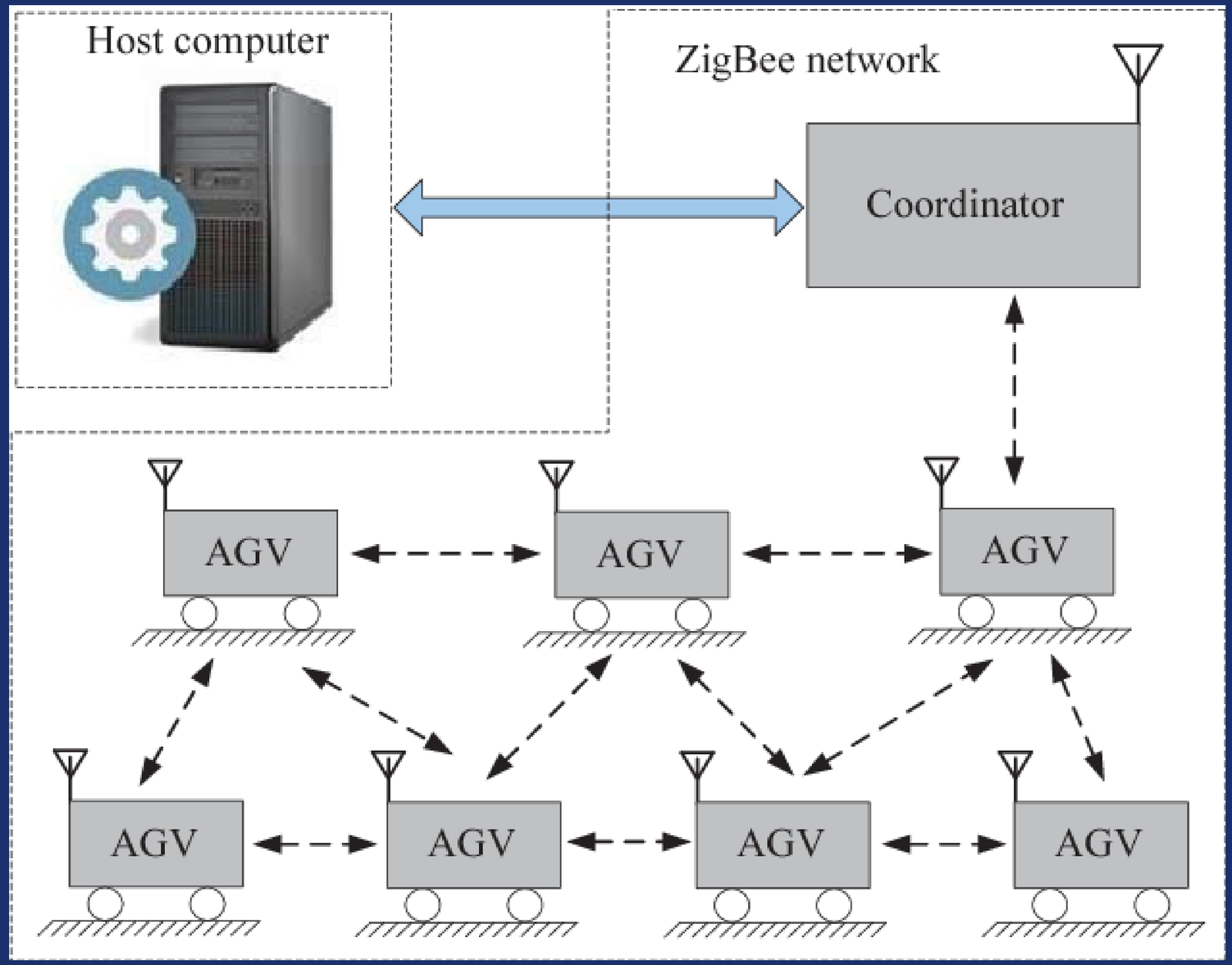
The payload handling system includes components that enable the robot to interact with the load it is carrying, such as grippers or conveyor belts.

Factory AGV/AMR Solution Architecture




AC
Charger
Battery charger
Wireless charging
Battery
Battery Management System (BMS)
Battery Authentication
Power management
DCDC
LDO
PMIC
ESD protection
Power Supply
Sensors
Mapping and motion detection
3D IR ToF sensor
24GHz & 60GHz Radar
Environmental sensing
MEMS microphone
Pressure sensor
CO2 sensor
Main system control
including safety
XMC™
PSoC™
AURIX™
CAN
Motor drive MCU
XMC™
PSoC™
PWM
Gate driver
3-phase inverter
M
BLDC Motor
Motor sensing
Current sensor
Position sensor
Integrated option with Controller + Gate Driver: IMD70xA
Brushless Motor (BLDC)
Memory
Connectivity
Wi-Fi & Bluetooth
Bluetooth & BLE
Cellular
HMI
HMI controller
Audio amplifier
LED driver
Industrial I/O
Secured Communication / Authentication

communication system



AGV	AI level	AMR
Manual Control /Tape/Track/QR Code	Low — High **Flexible Field**	Use SLAM to create Map. No extra efforts
Human manually removes obstacles	Low — High **Autonomous**	Dynamically detect and avoid obstacles
Cannot interact with Human	Low — High **Human-Robot Collaboration**	Sensors combine Camera detection and DDS QoS to realize Real-Time collaboration
Centralized System only	Medium — High **Fleet Management**	ROS2 Decentralized System (SWARM) enables Smart Devices to communicate with each other in Real Time