Where to Start Documentation

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## → 1) 5G-ERA Purpose

The 5G-ERA purpose is to provide an intent-based networking paradigm QoE to support enhanced robot autonomy in real-world applications. It enables cloud-native resource provision over autonomous robots, and standardized APIs by integrating ROS and OSM. It should also showcase the QoE on experimental facilities for vertical applications. For more information, please visit [5g-era.eu](https://5g-era.eu/).

## → 2) What is 5G-ERA Middleware?

5G-ERA Middleware enables cloud-native resource provision over autonomous robots. 5G-ERA supports multiple ROS (Robot Operating System)distributions. It is the objective of 5G-ERA (5th Generation Enhanced Robot Autonomy) which is the link between vertical applications managed by ROS and 5G infrastructure managed by OSM. It realizes the 5G-ERA intent-based network using cloud-native design. The latest version of the 5G-ERA Middleware is available at the GitHub repository under this [link](https://github.com/5G-ERA/middleware). The Middleware is in active development so the specification and available functionality will grow. This is the instruction for the pre-release version for D4.1 and D4.2 system integration and internal testing.

## → 3) Who is 5G-ERA for (USERS)?

5G-ERA’s main target users are Robotic engineers, especially those who want to migrate or use cloud native robotics systems based on the ROS framework.

## → 4) How to use it (Installations, Deployment, and Testing)

This is a basic idea of what is expected to download the software, the utilizations, the primary users, installation, and deployment of the Middleware

### → 4.1 ) Middleware Initial Configuration

Working procedure on how to configure the environment for running the 5G-ERA Middleware. Testing environment is furthermore for those who want to contribute into the middleware code as an open source

### → Hardware Requirements

The testing environment is based on the **Microk8s**, the minimal Kubernetes installation. It assumes the use of the **Ubuntu 20.04** operating system. For other Linux distributions or other operating systems, the instructions may vary, so check the official guides for installing the respective software.

Recommended hardware:

| Processor | 8 logical cores or above |
| --- | --- |
| RAM | 16GB or above |
| Storage space | 100 GB free space |

The further steps;

The first step is to install Docker Engine. The Docker engine is used for the verification of the credentials and pulling the containers from the private AWS registry that Middleware uses. To install the Docker Engine, refer to [Docker's official website](https://docs.docker.com/engine/install/ubuntu/) on how to install it on the Ubuntu distro. For easier access to the Docker CLI execute the [post-installation steps](https://docs.docker.com/engine/install/linux-postinstall/). Next is the AWS CLI Installation, for this, please follow the [official guide](https://docs.aws.amazon.com/cli/latest/userguide/getting-started-install.html) on the installation process.

For detailed information, on installation, deployment, and testing please visit [Middleware testing guide](https://github.com/5G-ERA/middleware/blob/main/docs/0_Where_To_Start/5G-ERA%20Middleware%20Testing%20Enviroment%20Guide%20(1).pdf)

### →4.2 Network and cloud topology provision:

### Lorem ipsum

### →4.3 Robot provision - (how to provision my robot to the 5gera system):

### Lorem ipsum

### →4.4 How to ask for a plan to deploy some cloud resources:

Planning :

### →4.5 How to ask for a Replan to deploy some cloud resources:

Replanning : Task planner asks resource planner for resources to complete the replanning of task, assuming Robot knows the task\_id to be completed and the pre-selected policy.

Steps

### → Youtube Link

5G-ERA Partners have done workshops for a better understanding of the work we are doing for example, middleware installation and deployment, BED Workshop ROS Simulation, Reference Netapp workshops. For more detailed understanding, please visit our youtube channel [5g-era/youtube](https://www.youtube.com/@5g-era460). It has all the workshop demonstrations and installations step-by-step.

## → ROS Compatibility

5G-ERA Middleware is allowing robots from different vertical sectors to use 5G-Based digital skills to enhance their autonomy. The Middleware is the link between vertical applications managed by ROS and 5G infrastructure managed by OSM. The middleware was designed to accommodate a disputed model architecture in which each node in the network: an edge-cloud machine in the topology, has a copy of the middleware running as a KNF function. All the actors of the system are interconnected with a Redis cluster representing the centralized knowledge base which also allows the system to coordinate and act together. Each middleware can orchestrate the deployment of different netApps under the running infrastructure. The planning of best placement is selected by using the data that the middleware entities running in the network publish to the central API. This information includes the status of the machine, CPU usage, and storage availability. This allows for real-life data transport and decision-making.

## → Contact

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## → Use cases

1. Public protection and disaster relief (PPDR)

2. 5G enhanced semi-autonomous transport

3. 5G enhanced healthcare robots

4. 5G remote assistance for manufacturing process