MIRAI components with Universal Robots

The MIRAI UX1 kit includes key components that are required to set up the MIRAI robot control subsystem for a Universal Robot arm. The following components are included in the kit:

Figure 1-a. MIRAI robot controller incl. power supply and L-mount

Figure 1-b. Ximea xiQ USB3

Figure 1-c. Fujinon lens

Figure 1-d. camera fixtures

Scope of delivery:

- 1x MIRAI UX1 robot controller (Figure 1a)
- 1x L-mount for MIRAI UX1
- 1x universal AC power supply, DC19V/120W
- 1x AC power cord for EU and US region
- 2x wireless antennas
- 1x Ximea xiQ USB3 camera (Figure 1b)
- 1x USB3 cable
- 1x Fujinon lens 1 (Figure 1c)
- 1x Fujinon lens 2
- 2x Camera fixtures for the robot arm (Figure 1d)
- 4x M-6 mounting screws (included with the camera)
- 4x CBSTSR6-16 screws to mount the fixtures
- 1x USB pendrive with MIRAI Training App, MIRAI URCaps plugin and the user documentation

Furthermore, the following system components are recommended for a minimum MIRAI controlled robot setup:

- Universal Robot arm and control system (UR3, UR5, UR10, UR3e, UR5e, UR10e, UR16e): **minimum software versions required for UR e-Series: 5.3.0 (please do not use versions 5.5.x and 5.6.x), and for UR CB3 series: 3.9.0**
- OnRobot HEX-E v2 or QC force/torque sensor (ideally the respective UR kit from OnRobot)
- ATI FT sensors supported models
- All ATI sensors that support Network Force/Torque (NET F/T) system (tested with ATI-9105-Net-Gamma)
- ATI Axia80-M20 with adapters
- Ethernet Gigabit switch (1GB per port, full duplex) - Android based 10” tablet running Android 6 or higher
- An external lighting solution for cameras is recommended to ensure constant lighting conditions during recordings. We recommend Effilux ring light for your setup.

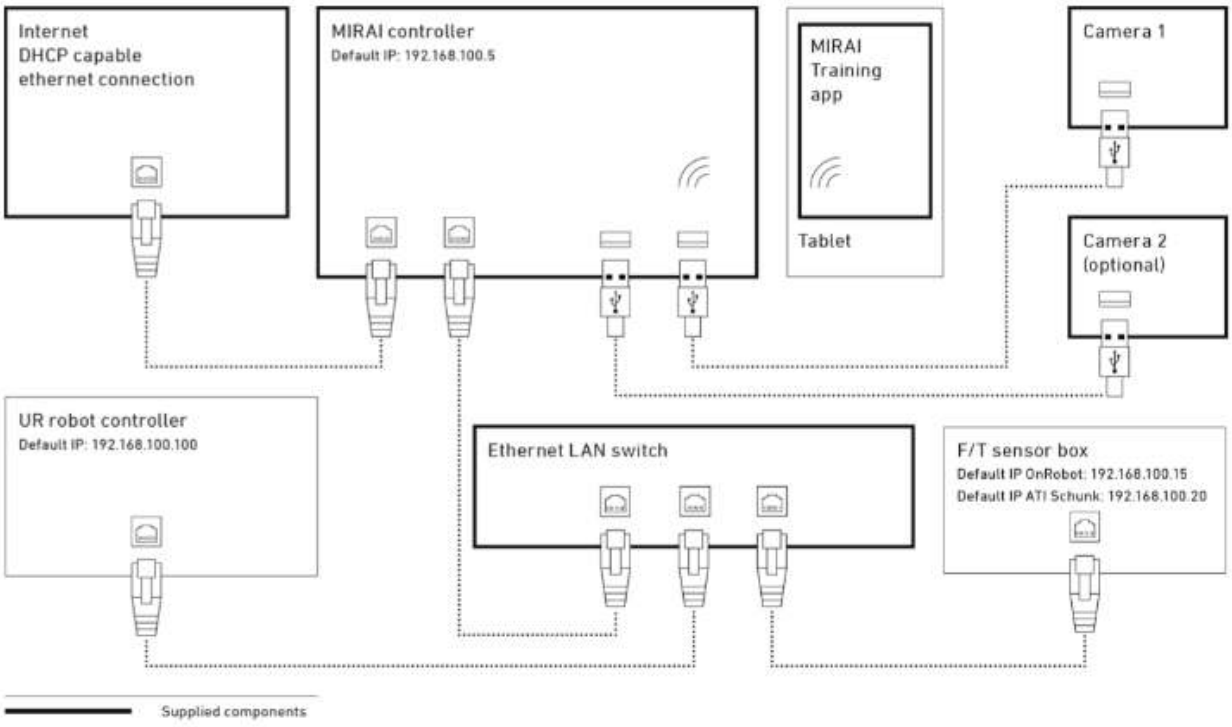

Figure 2: Schematic view of a MIRAI controlled robot setup

The schematic view of a MIRAI controlled robot setup shows the various components that a MIRAI based solution includes. It also indicates all the components and peripherals supported by the MIRAI controller, and how these are connected through various available interfaces.

The MIRAI solution comprises of the following elements:

- MIRAI robot controller creates sensor-based, real-time robot movements based on trained ‘skills’.
- ’MIRAI Training App’ is the primary user interface for the MIRAI controller to record training episodes and manage MIRAI skills. It is a mobile app for Android based tablet devices.
- The Micropsi cloud training service calculates MIRAI skills based on the recorded and uploaded training episodes.
- The MIRAI URCaps plugin enables the user to access the MIRAI skills and integrate these in UR PolyScope robot program flows.

The MIRAI controller (Figure 2) is the edge compute and control unit for:

- recording and storing training episodes the user performs;
- receiving and storing trained skills from the Micropsi Industries training cloud; and
- generating and driving robot movements by executing trained skills in real time, based on vision and other sensory input.

- Place the MIRAI controller in proximity to the UR robot arm or the UR robot control cabinet; since it must be connected to the USB cameras and the robot controller. When placing the controller ensure that there is enough intake of air (room temperature) through the ventilation slits. After the setup is complete, we recommend physically fixing the controller to protect it from falling and movement. The enclosed L-mount fixture allows mounting the controller to a surface.
- Connect the MIRAI ethernet interface for robot control, the ethernet interface from the UR control cabinet, and the ethernet interface of the ‘Compute Box’ of the OnRobot F/T sensor to a Gbit ethernet switch using UTP cables, creating a local area network (LAN) for the robot control environment.
- Plug the remaining end of the USB cable that is connected to the camera into one of the free USB3 ports of the MIRAI controller. Several USB3 type A ports can be found at the rear or the front of the controller.
- Connect the remaining free Ethernet WAN port to a network with WAN/internet access. Since the IP address of this port is expected to be set through a DHCP, ensure the connected network provides a DHCP service.
- Mount the enclosed Wi-Fi antennas to the antenna connectors.
- Connect the MIRAI controller to power using the enclosed universal AC power supply (240V, 120W)

- Once you turn on the MIRAI controller, wait for the second ‘beep’, which indicates that the system is up and running. This can take between 2 and 4 minutes, depending on the setup.
- A Connexion 3D space mouse can be connected to one of the remaining USB ports if available or specifically required for a setup.
- The HDMI ports are not supported; therefore, do not connect a video output device to these.