INTERACT – Interactive Manual Assembly Operations for the Human-Centered Workplaces of the Future

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Summary:

This deliverable serves as the INTERACT integrated platform user and administration manual. The electronic version of this document exist in the following URL:

http://150.140.148.224:8888/eap/ (Click on the "Electronic Handbook" link)

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EXECUTIVE SUMMARY

The main purpose of this document is to provide a user and administrative reference manual for the usage, installation and configuration of INTERACT integrated platform. It also provides a tutorial section for the two pilot cases a guidelines section for collaborative usage.

The Electronic (HTML) version of the Handbook is available also through the public version of INTERACT EAP and Apps here http://150.140.148.224:8888/eap/.

1. INTRODUCTION

This document is divided into a section which is addressed to administrators/ICT experts and provides information for installation and configuration while the rest sections are for the end users and provides a manual for working with the INTERACT platform. Specifically this document is structure as bellow:

- *INTERACT Platform Deployment:* Instructions for the software and hardware installation and configuration
- *Description of INTERACT EAP and Apps:* A user manual is provided for each app as well as the EAP (Enterprise Application Platform) platform.
- *Workflow/Guidelines:* Usage instructions for collaborative usage
- *Tutorials:* Tutorials dedicated to the Automotive and White Goods industries.

2. INTERACT PLATFORM DEPLOYMENT

INTERACT integrated platform is released as a virtual machine. This machine can support Optical Sensing system (Microsoft Kinect 2), Wireless Sensors (Data Glove) and Tool Sensors (Makita Bluetooth screwdriver). Below are the steps that need to be performed for configuration and usage of the platform with its full potentials.

2.1. Hardware and software requirements

The virtual machine is tested with “VMWare Player” version 6 and above but can run on any VM player. The “host” computer must be able to provide to the VM at least 16 GB of memory but depending on the use case can reach up to 32 GB or more. In case that the VM would need more memory then specific configuration is needed to split the VM into multiple instances.

The number of processors provided to the VM can be as low as 2 processors but it performance will suffer, again the correct approach would be to adjust this number on a specific use case.

2.2. Software Deployment and Configuration

The VM comes as a bundle of various components. These components reside inside the VM but can be distributed to different locations as long as it is configured the component but also the depended components. Each component has its own configuration files. In the next subsections a quick tour will be provided to these configuration files.

2.2.1. Aggregated Datastore

The following configuration shows where the Cassandra instance is running. Cassandra is the persistence layer of the Aggregated Datastore.

```
cassandra.contactpoints=127.0.0.1

cassandra.port=9042

cassandra.keyspace=interact
```

2.2.2. Basic Analysis & Ergonomics Analysis

These applications are divided by a front end and a backend component. For the front end component the configuration needed is the location of the datastore:

```
aggregated.datastore.location.scheme = http

aggregated.datastore.location.host = localhost

aggregated.datastore.location.port = 8888

aggregated.datastore.location.context = /aggregated-datastore
```

The backend components along with collision avoidance module and Knowledge Base are bundled together in to a set of services delivered by a single implementation (2.2.12 Knowledge Base, Ergonomics Assessment backend, Basic Analysis backend, Collision Avoidance)

2.2.3. EAP

EAP configuration is divided into two sections. The first one is the location of the datastore:

```
aggregated.datastore.location.scheme = http

aggregated.datastore.location.host = localhost

aggregated.datastore.location.port = 8888

aggregated.datastore.location.context = /aggregated-datastore
```

and the other is the configuration of the communication mechanism. EAP communicates via a broker who is wrapped and the needed functionalities are exposed to other component in terms of rest services implementing a publish/subscribe pattern. This means that the components that require to listen to messages need to subscribe to a specific topic by providing the message entry point. The configuration for this start with the keyword subscriber, followed by the topic and the value represents the listener's entry point. The following is part of the EAP configuration in the integrated environment.

```
activeMQ.broker.url = tcp://localhost:61616

subscriber.SAVE_DATA = http://localhost:8080/compass/resources/restv1/interact

subscriber.SAVE_DATA = http://localhost:8080/compassAdaptor/compassAdaptorCommunication

subscriber.SAVE_DATA = http://localhost:8888/projectEditor/projectEditorCommunication

subscriber.DATA_SAVED = http://localhost:8888/workflow-engine/workflowCommunication

subscriber.Basic\ Analysis = http://localhost:8888/assesment-apps/basicAnalysisCommunication

subscriber.Ergonomics\ Analysis = http://localhost:8888/assesment-apps/ergonomicAssesmentCommunication

subscriber.KnowledgeBase = http://localhost:8080/compassAdaptor/compassAdaptorCommunication

subscriber.KnowledgeBase = http://localhost:8888/projectEditor/projectEditorCommunication

subscriber.CollisionAvoidance = http://localhost:8888/workflow-engine/workflowCommunication

subscriber.ProjectEditor = http://localhost:8888/projectEditor/projectEditorCommunication

subscriber.CompassAdaptor = http://localhost:8080/compassAdaptor/compassAdaptorCommunication

subscriber.DELETE_DATA = http://localhost:8080/compassAdaptor/compassAdaptorCommunication

subscriber.PROCESS = http://localhost:8888/fivesAdaptor/fivesAdaptorCommunication
```

2.2.4. 3D Scene Simulator

This application is composed by a server and a client component.

The server component is an open source component and configuration instructions can be found at https://github.com/fives-team/FiVES. This component is wrapped by an adaptor application to implement INTERACT needs out of Fives. This component (adaptor) has the following configuration:

Datastore location:

```
aggregated.datastore.location.scheme = http

aggregated.datastore.location.host = localhost

aggregated.datastore.location.port = 8888

aggregated.datastore.location.context = /aggregated-datastore
```

Fives server location:

```
fives.location.scheme = http

fives.location.host = localhost

fives.location.port = 8081

fives.location.context = /BVH

fives.createAnimationEntity.json = {"targetAvatarURI":"resources/models/male/male.xml"\, "avatarID":"0"}
```

Configuration for exporting the 3D Scene from 3d Scene Editor and import it to 3D Scene Simulator:

```
compass.host.address = localhost

fives.host.address = localhost

compass.to.fives.export.cmdCommand = cmd /c python
"c:\\interact\\compass_fives_export\\export_compass_scenario_to_fives.py"
```

The client part has the following configuration which is actually the location of the Fives server:

```
"port": 34837,

"host": "localhost"
```

2.2.5. Project Editor

The project Editor app has two backend components, the CNL breakdown component for transforming the CNL language to elementary actions and the sensor management platform for managing the recording of a motion (along with the Motion Recognition which is fed with the result of the recording). Thus there are the following configuration sections:

CNL Breakdown location:

```
cnl.breakdown.location.scheme = http
cnl.breakdown.location.host = localhost
cnl.breakdown.location.port = 8088
cnl.breakdown.location.context = /breakdownList
```

Sensor Network Management Platform location:

```
snmp.location.scheme = http
snmp.location.host = 192.168.0.220
snmp.location.port = 5566
snmp.location.context = /session
```

Motion Recognition Algorith location:

```
mra.location.scheme = http
mra.location.host = localhost
mra.location.port = 9089
mra.location.context = /entry-point/invokeCmd
```

Knowledge Base location for initializing (required by Cnl Breakdown service)

```
knowledge.base.message.subject = KnowledgeBase
knowledge.base.location.scheme = http
knowledge.base.location.host = localhost
knowledge.base.location.port = 80
knowledge.base.location.context = /imk.BackendServices/KnowledgeBase
```

And finally the location of the datastore and the location of EAP for sending messages:

```
aggregated.datastore.location.scheme = http
aggregated.datastore.location.host = localhost
aggregated.datastore.location.port = 8888
aggregated.datastore.location.context = /aggregated-datastore
eap.location.scheme = http
eap.location.host = localhost
eap.location.port = 8888
eap.location.context = /eap
```

2.2.6. Workflow Engine

This component is a workflow orchestrator which uses the Cammunda BPMN engine. This component requires the datastore location and the process identifier to execute.

```
aggregated.datastore.location.scheme = http
aggregated.datastore.location.host = localhost
aggregated.datastore.location.port = 8888
aggregated.datastore.location.context = /aggregated-datastore
workflow.motion.synthesis.identifier = motionSynthesisProfiled
```

2.2.7. 3D Scene Editor

This application due to its capabilities requires a dedicated application server which hosts apart from the app itself other necessary modules. There are:

- Atlas worker: A module responsible for importing Collada files inside the app's internal storage
- Atlas server: A module responsible for serving geometry data
- COMPASS: Is the actual application
- COMPASS adaptor: A module which wraps COMPASS and enrich it with capabilities required for the INTERACT project (as done also with Fives)

Each of these subsystems has its own configuration:

2.2.8. Atlas Worker

Configuration instructions can be found at https://github.com/dfki-asr/atlas-worker

2.2.9. Atlas Server

Configuration instructions can be found at https://github.com/dfki-asr/atlas-server

2.2.10. COMPASS

Configuration instructions can be found at https://github.com/dfki-asr/compass

2.2.11. COMPASS adaptor

Compass adaptor requires the location of the datastore, the COMPASS location, the Knowledge Base location (for updating the changes performed in the 3D Scene), the CNL Breakdown service location (for updating the elementary action which are derived from the 3D scene and the CNL tasklist) and finally the EAP location communication purposes.

```
aggregated.datastore.location.scheme = http
aggregated.datastore.location.host = localhost
aggregated.datastore.location.port = 8888
aggregated.datastore.location.context = /aggregated-datastore
compass.initialization.url = http://localhost:8080/compass/indexINTERACT.xhtml
compass.scenenodes.rest.url = http://localhost:8080/compass/resources/restv1/scenenodes/
compass.scenenodecomponents.rest.url = http://localhost:8080/compass/resources/restv1/scenenodecomponents/
compass.location.scheme = http
compass.location.host = localhost
compass.location.port = 8080
compass.location.context = /compass/resources/restv1
compass.location.rest.communication.context = /compass/resources/restv1/interact
knowledge.base.location.scheme = http
knowledge.base.location.host = localhost
knowledge.base.location.port = 80
knowledge.base.location.context = /imk.BackendServices/KnowledgeBase
cnl.breakdown.location.scheme = http
cnl.breakdown.location.host = localhost
cnl.breakdown.location.port = 8088
cnl.breakdown.location.context = /breakdownList
eap.location.scheme = http
eap.location.host = localhost
eap.location.port = 8888
eap.location.context = /eap
```

2.2.12. Knowledge Base, Ergonomics Assessment backend, Basic Analysis backend, Collision Avoidance

These services are divided into the interfaces (Web Services) which are deployed on Microsoft IIS Server and the implementations (Backend Services)

For the Web Services the following configuration exists:

KB_ScaleData_mm	*Scaling value, default is 10 mm.*
KB_ScaleXML3D_mm	*Scaling for XML3D content, default is 10 mm.*
MG_OutputFile	*Relative path to the BVH output file. (compatibility)*
MG_PathToScript	*Relative path to the corresponding Python script. (compatibility)*
PTH_ToCNLUI	*Relative path to CNL start script.*
PTH_ToPython	*Relative path to the Python installation folder.*
SRV_Address	*Address to use (has to exist on the processing machine) IP address or hostname.*
SRV_PortForCNL	*Listening port for CNL communication.*
SRV_WebPortForCA	*Listening port for collision avoidance communication. (compatibility)*
SRV_WebPortForKB	*Listening port for knowledge base initialization.*

For the Backend services configuration:

addressRepository	Web address of data repository service.
addressServiceBus	Web address of EAP service bus.
addressWindowsBackendService	WebSocket address of Windows background service for CNL <-> KnowlegdeBase communication.
addressAssetServer	Web address of asset server.
localMeshCache	The folder name for the mesh cache.
loggingEnabled	If you want to log some data, set loggingEnabled to true. Logging is only implemented for entry points in the implementation. Ensure that you have set the loggingPath value properly. We recommend to disable logging as soon as possible.
loggingPath	Path for log files. Ensure write access for the web server user account
loggingAllowDebug	Allow additional debugging. Extends the output of entry point logging.
threadStartTimeout	A timeout value in milliseconds for the starting time of threads. The threads have to start within this time span. Do not use too small values. If the timeout is reached processing of the current task will be stopped.
dataInputDomainObjects	URL path for domain objects.
dataInputDomainMotion	URL path for motion data.
dataInputDomainTasks	URL path for constraint data.
dataInputDomainProject	URL path for project data.
dataOutputDomainCollisionAvoidance	URL path for storing collision avoidance data.
dataOutputDomainBasicAnalysis	URL path for storing basic analysis data.
dataOutputDomainErgonomicsAnalysis	URL path for storing ergonomic analysis data.
statusMsgDomainKnowledgeBase	URL path for KB initialization status.
statusMsgDomainCollisionAvoidance	URL path for CA processing status.
statusMsgDomainBasicAnalysis	URL path for basic analysis processing status.
statusMsgDomainErgonomicsAnalysis	URL path for ergonomic analysis processing status.
useExternalDomainNames	The default value is “true”, and ensures the use of the domain names and urls defined in this config (e.g.: dataInputDomainObjects….).

2.2.13. CNL Breakdown service

The CNL Breakdown service mainly communicates with the Knowledge Base. The configuration file of this module is:

```
# preferred hand of avatar
avatar.pref.hand=right
# strategy to apply when preferred hand is already holding an object and
# the non-preferred hand is empty; possible values:
# - transfer: transfer the object from the preferred hand to the non-preferred hand
# - non-preferred_hand: use the non-preferred hand instead
# - put_down: put the object in the preferred hand down
preferred.hand.strategy=transfer
# REST server port
server.port=8088
# host name and port of the IMK Knowledge Base socket server
kb.host.name=localhost
kb.port=10027
# flag to activate demo mode;
# when in demo mode, dummy object mapping and context are used instead of
# the ones provided by IMK Knowledge Base
demo.mode=false
# flag to activate KB reset after processing a task or list of tasks
reset.after.task=true
```

2.2.14. Constraint Manager

This module has as configuration the port that it should listen and the location of the datastore.

```
serverPort = 9088
aggregated.datastore.location.scheme = http
aggregated.datastore.location.host = localhost
aggregated.datastore.location.port = 8888
aggregated.datastore.location.context = /aggregated-datastore
```

2.2.15. Motion Recognition

As with Constraint Manager the Motion Recognition has as configuration the port that it should listen for incoming calls and the datastore location

```
serverPort = 9089
aggregated.datastore.location.scheme = http
aggregated.datastore.location.host = localhost
aggregated.datastore.location.port = 8888
aggregated.datastore.location.context = /aggregated-datastore
```

2.2.16. Motion Graph

This module even if it provided mainly as a standalone service it has a lot to be configured / tweaked but mainly flags that affect the algorithm performance or quality. The main configuration properties are:

Location of the Motion Database:

```
"model_data": "c:\\interact\\mg++\\Motion DB\\mp\\motion_primitives_quaternion_PCA95 m30-integration-2.2" ,
```

Port to listen for incoming calls:

```
"port": 8880,
```

2.3. Hardware (Sensors and relevant software) Deployment and Configuration

2.3.1. Optical Sensing System

The optical sensing system consists of one or multiple Kinect v2 cameras attached to common PCs, connected together via (preferably GBit) Ethernet. In the following sections, requirements and basic setup are described.

2.3.1.1. Optical Sensing Hardware

To deploy a Multi-Kinect sensor system, it is necessary to provide following hardware **per camera node**:

- A suitable Windows PC (Win 8 or greater) with the Microsoft Kinect SDK 2.0 installed. The PC needs to have an Ethernet port as well as USB 3.0 for connecting the camera. The recommended minimum specifications are an Intel i3 CPU and 4GB of RAM.
- A Kinect v2 (Kinect for Xbox One) camera
- The Kinect for Xbox One PC adapter to be able connect the camera to a regular USB 3.0 port

The total number of cameras / camera nodes is depending on the actual tracking situation. Restrictions are to be expected in terms of camera range (max.: 4.5 m) and camera FOV (70° x 60°). For a basic capture setup without occluding objects in the scene, we recommend a circular setup of 6 cameras with a diameter of no more than 4.5 meters, with the cameras mounted on tripods at about 1.30m height.

No separate hardware is required for the central fusion node / studio software, as it is running in the integrated sensor VM under normal operation conditions.

2.3.1.2. Optical Sensing Software

The optical sensor system software consists of two components:

- The FusionKit Kinect 2 Sensor Server: This component is deployed on each sensor PC and provides data from the attached Kinect camera to the fusion system via REST and WCF data channels. It relies on the Kinect for Windows SDK (v.2.0).
- The FusionKit Studio software: This is the central component running in the sensor VM. It connects to the available sensors in the optical sensor network, performs the registration of the sensors and world coordinates and provides fused movement data from the sensors to the SMP and in turn to the motion recognition via a JSON-based REST interface.

2.3.1.3. Sensor Node Setup walkthrough

- Make sure the PC meets the requirements stated above (hardware, Windows version)
- Download and install the Microsoft Kinect SDK 2.0 (via https://www.microsoft.com/en-us/download/details.aspx?id=44561)
- Connect the Kinect camera via the PC adapter to the PC

- Make sure the Ethernet connection of the PC is configured and running correctly (e.g. by issueing a ping to the sensor VM or other networked subsystems). Note down the assigned IP address.
- Disable the Windows firewall, as the sensor server software is using incoming connections on various ports.
- Install the Sensor Server Software via the provided setup.exe
- After the installation has finished successfully, start the sensor server. If everything works correctly, you should be able to see the tracked image of the Kinect as well as a 12-digit numeric sensor ID at the top of the GUI.
- To test the network connectivity of the software, you can try to access the IP address of the respective sensor node via a Browser from another machine on port 8082. You should see a message from the software when issueing a GET request (e.g. to http://10.0.0.10:8082).

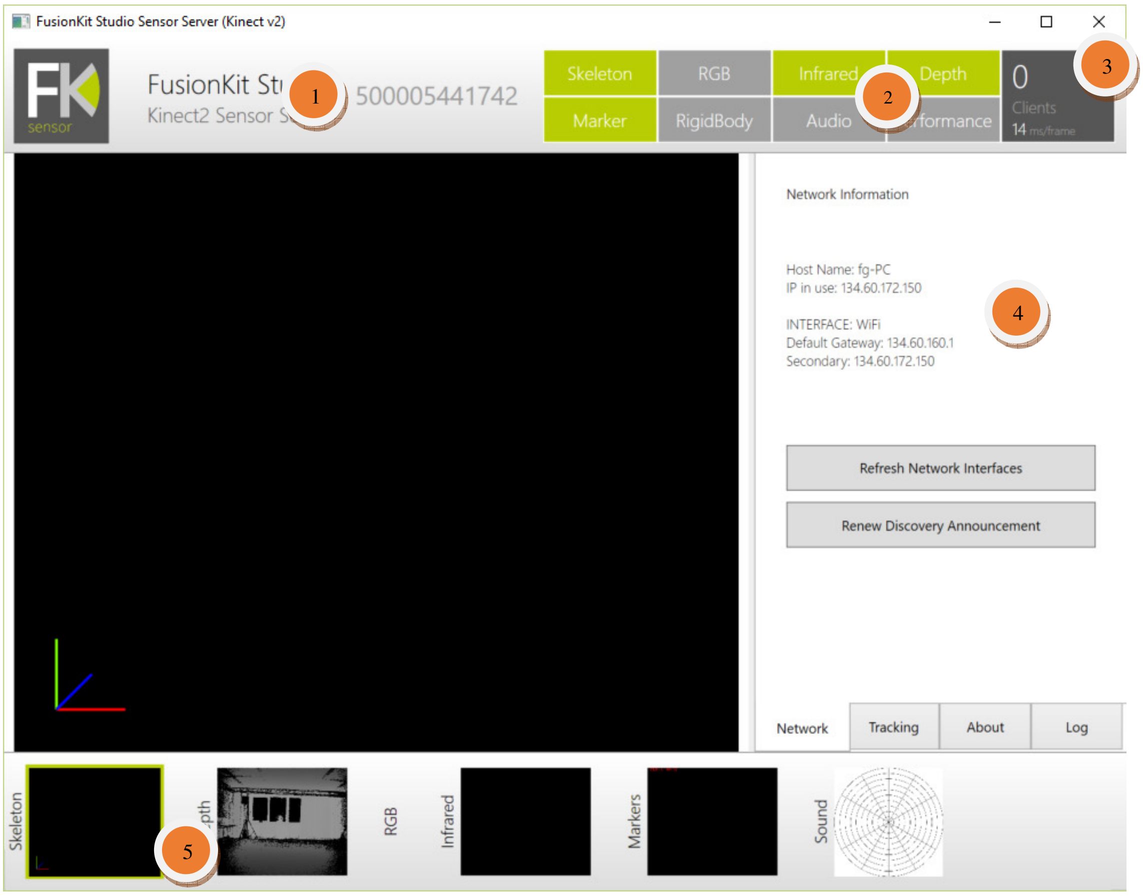
2.3.1.4. Fusion Service Setup walkthrough

- The fusion binaries do not need to be installed, it should be sufficient to copy them to an appropriate place in the sensor VM
- The sensor VM itself needs to have working network connectivity to the network, which can also be tested by issueing a GET request to the machine's IP address and port 8083 (e.g. to http://10.0.0.1:8083) after starting up the studio software.
- Note: It might also be necessary to disable the firewall on the sensor VM or at least to allow incoming connections for port 8083 – for fully working discovery etc. it is however recommended to have the firewall completely disabled.

2.3.1.5. Basic usage of the sensor server

The sensor server is ready to use when installed. In the following screenshot, some explanations of the main UI elements are given.

2.3.1.5.1. Main SensorServer UI



Network Information

Host Name: fg-PC
IP in use: 134.60.172.150

INTERFACE: WiFi
Default Gateway: 134.60.160.1
Secondary: 134.60.172.150

Figure 1 Main SensorServer UI

1. The top bar shows the ID of the sensor hardware which is currently connected. This ID is used throughout the system to uniquely identify the sensor across the system.
2. The different data channels can be switched off and on with this buttons. Highlighted buttons indicate that the data channel is currently enabled. For normal tracking operation (skeleton tracking), it is sufficient to enable only “Skeleton” and “Depth” channels. If marker tracking is being used additionally, “Marker” and “Infrared” also have to be enabled.
   The button “Performance” disables all preview and rendering on the sensor server, lowering the load and decreasing overall delay. It is recommended to turn the performance mode on during regular operation, and only turn it of e.g. for camera adjustment.
3. The status box shows the time currently used to process a single frame and the number of clients currently connected. As the camera delivers data at 30 fps, the time should never exceed 33 ms, otherwise frames will be lost. The time can be kept at a low value by only enabling the necessary channels and enabling performance mode.
4. The network control panel shows information about the current network configuration if available. The buttons allow to refresh this information as well to do an instant re-announcement for the discovery (which is otherwise done periodically in the background). Via the tabs below, other panels can be selected for tracking options and additional information about the server software (including debug logs).
5. The channel thumbnails show a preview for the current input of the different channels. By selecting one of the channels, the respective channel preview is showed in the large preview window above.

2.3.1.5.2. Main SensorServer UI – Tracking Options

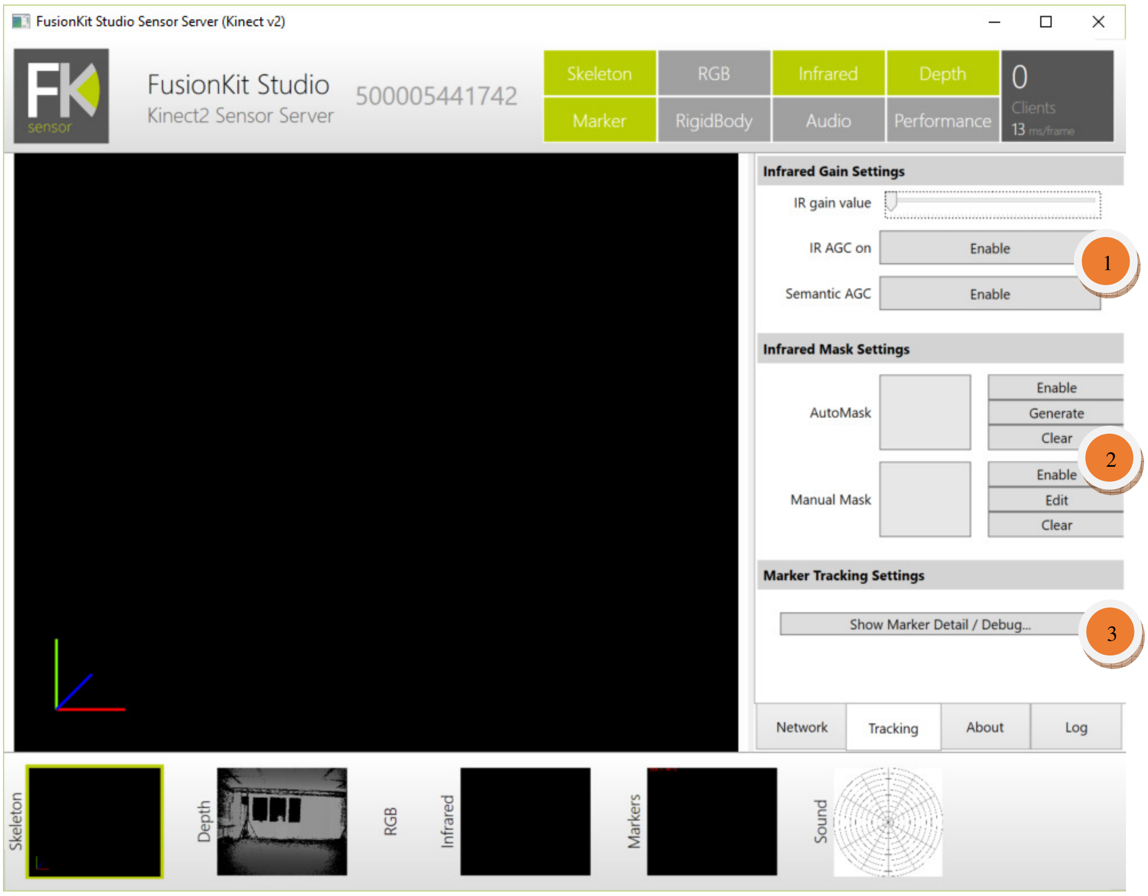


Figure 2 Tracking Options

1. The infrared gain section alters the way infrared data is captured from the sensor by applying a static gain for better recognition of markers. The setting can either be modified manually by using the slider, or different automatic gain control modes (AGC) can be enabled to continuously optimize the gain towards the current tracking situation.
2. The masking section provides a possibility to exclude parts of the infrared image from the marker processing. This can be done either by creating a mask automatically (from overexposured parts of the image) or manually by drawing mask areas. Both masks can be used in a combined way, too.
3. The marker tracking settings / details allow to get a detailed output of the marker tracking system and the markers currently tracked. Please note: This feature can significantly increasy frame times, use with caution and only for debug purposes.

2.3.1.6. Basic usage of the Studio Component

The “FusionKit Studio” software wraps the central fusion algorithms and subsystems for skeleton and marker tracking in a easy-to-use graphical user interface. Within INTERACT, there are three workflows of particular interest which can be carried out with the help of the Studio software, which are described in the following.

2.3.1.6.1. Optical system setup and calibration

Before being able to use the system, some setup tasks have to be done to be able to get valid data from the optical capture system:

1. **Adding cameras:** Upon system startup, the camera list in the left part of the UI is empty. You can either wait until the integrated discovery finds the various cameras on the network, or add them manually using the button below the list and the IP addresses of the sensor nodes. Camera sets can be saved and loaded via the menu, to be able to use sensor setups without the overhead of adding / discovering sensors.
2. **Activating cameras:** Tick the checkbox of all sensors in the list that you want to use for calibration and capturing.
3. **Optional: Selecting a different main sensor** – depending on the tracking situation, it might be necessary to select a different main sensors than the one assigned automatically. You can do this by right-clicking on the sensor in the list and choosing "Assign as Main Sensor".
4. **Registering the cameras:** Start the registration wizard via the menu or the "Fusion" tab on the right side. You will see an overlay saying "Waiting for T-Pose". Now enter the capture space and do a T-Pose. Take care that no other persons are seen by the cameras at that time, as the calibration mode is only able to deal with a single person at the moment.

   After the system has recognized a T-Pose, it starts to collect data to perform the registration. After a short time, the cameras should move to their respective positions in the 3D view. Move around the whole capture volume, facing all the cameras over time to speed up this process. When the cameras are positioned correctly, again do a T-Pose to stop the registration process. The system is now ready to provide fused data.
5. **Optional: Saving the registration** – the registration data of the current sensor set can also be saved to a file and loaded for later use without having to re-do the calibration and registration process. Please note that this only works if the cameras have not been moved between the sessions.

2.3.1.6.2. Using marker tracking for world coordinate system synchronization

For the INTERACT system, it is necessary to establish a common coordinate system between sensor system, real world and digital scene. For this, a marker-based reference object is used, which is placed in the capture area (and also in the digital scene, see SNMA/EAP handbook). To enable marker tracking for the scene and thus also tracking of the reference objects, please follow these steps:

1. Activate marker tracking on one or more sensor nodes.
2. Make sure the three markers of the reference object are the only ones to be seen in the marker view
3. The reference object should be tracked and visible in the 3d view (RigidBody)
4. Now you can run scene sync from the SNMA

2.3.1.6.3. Running captures

Captures are controlled via the SMP and SNMA applications in the EAP. In the Fusion Studio UI, it is possible to observe the realtime data of the tracked users during the capture and to rate the quality of the current tracking to decide if the data is usable and suitable for motion recognition later on.

2.3.2. Wireless Sensor Network

The Wireless Sensor Network consists of the following components:

- Wireless Sensor Base Station which includes a ZigBee Router module that connects to the computer running the Sensor Base Station SW module through a USB connection
- Several Wireless Sensor Nodes which can act as standalone IMU sensors or Data Glove interface and/or IMU sensors when they are apart if the Interact Data Glove

2.3.2.1. ZigBee Router module installation

The ZigBee router module can be connected with the computer running the Sensor Base Station SW module through a USB connection. Upon connection a virtual serial will be created, which must be inserted in the WSBS configuration file as presented in sec 3.3.2.4.

2.3.2.2. Wireless Sensor Node operation

The WSN provides the following functionality:

- Interface with the various sensors and acquire sensor data. The sensor samples according to a parameterized sampling rate all the onboard or attached sensors (analog and/or digital) and stores them temporarily. The WSN transmits the data to the WSBS.
- Interface with the Wireless Sensor Base Station in order to transmit sensor data and receive sensor management commands. The WSN is able to accept a series of commands through the Management software and always reports back to the connected WSBS, which then forwards the data to other INTERACT modules for further analysis.

The HW layout of the WSN can be seen in the following figure.

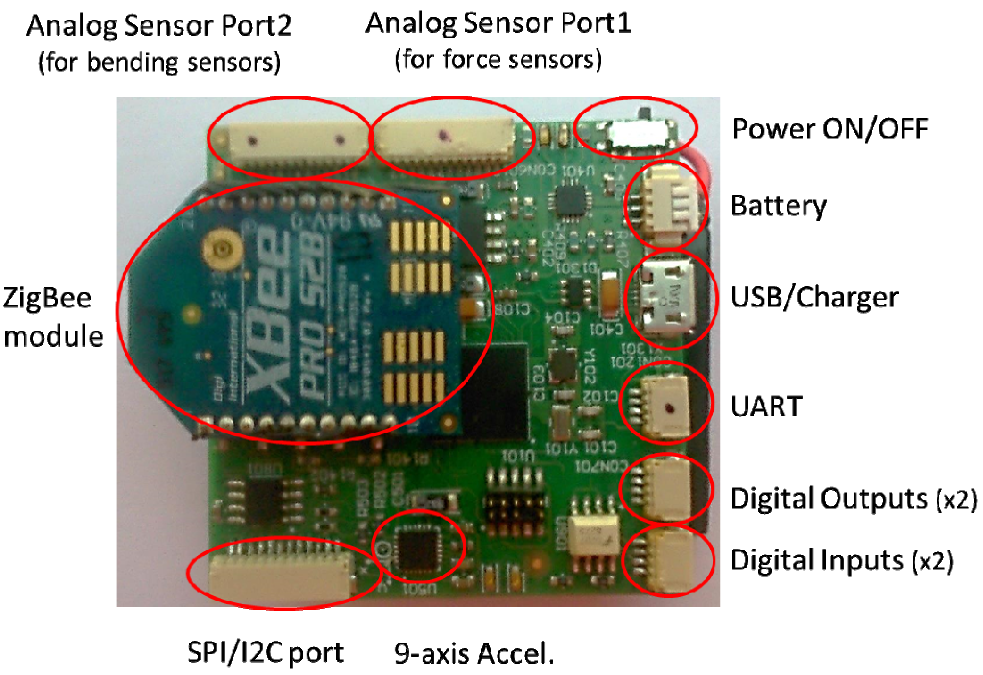


Figure 3 WSN board layout

For checking the operational state of the WSN a set of LEDs is provided according to the following figure

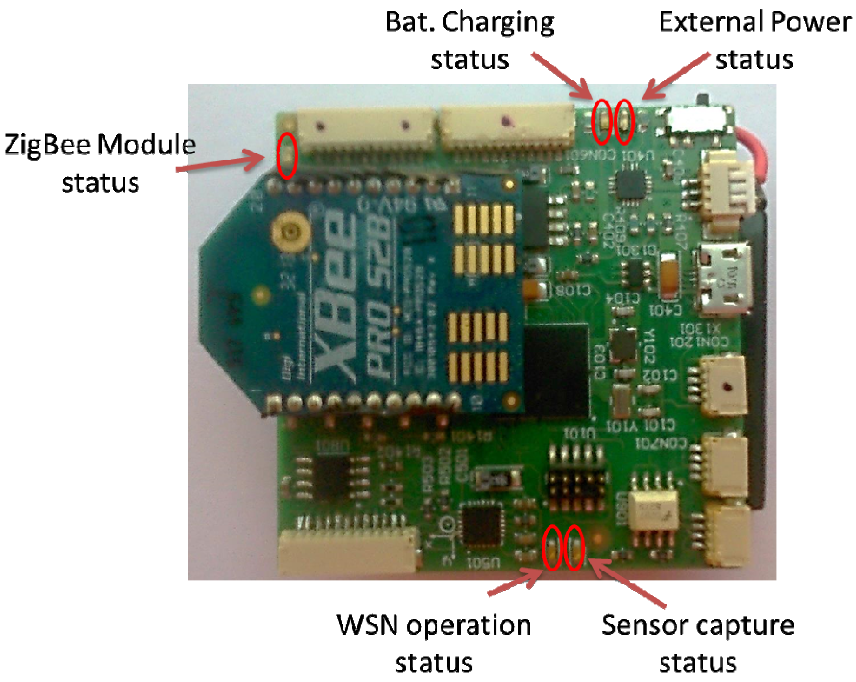


Figure 4 WSN operational status LEDs

In order to proceed with capturing procedure the following steps apply. The same steps apply to both IMU and Data glove operation of the WSN.

1. Powering on of the WSN by the user through the POWER ON/OFF switch.

After powering up the WSN the ZigBee module operation follows the following table in respect to the ZigBee Module status LED

STATUS	LED	LED status
Module is not working	ZigBee Module status	OFF
Module tries to join a PAN	ZigBee Module status	ON
Module joined a PAN	ZigBee Module status	BLINKING

Table 2.1: ZigBee operational Status

2. Connection of the WSN with the WSBS through the ZigBee network.

   It is an automated procedure that applies after the PAN join procedure of step 1. Its status can be seen from the WSN operation status and Sensor capture status LEDs according to table 3.2.

3. Capturing procedure therough the SNMA of the INTERACT platform.

   The capturing procedure can be started and stopped through the SNMA application. Its status can be seen from the WSN operation status and Sensor capture status LEDs according to table 3.2.

STATUS	LED	LED status
WSN tries to connect with WSBS	WSN operation status	BLINKING (0.5 sec ON/OFF)
	Sensor capture status	ON
WSN connected with WSBS and in “Stand By” made for capturing process	WSN operation status	BLINKING (0.1 sec ON/OFF)
	Sensor capture status	ON or OFF permanently
WSN is in capturing process	WSN operation status	FAST BLINKING
	Sensor capture status	BLINKING (0.5 sec ON/OFF)

Table 2.2: WSN operational ststus

The WSN is battery operated and can be charged with the use of a USB charger with microUSB connector.

After connecting the charger on the USB/Charger port, charging status is according to the following table.

STATUS	LED	LED status
No charger present	Bat. Charging status	OFF
	External Power status	OFF
Battery charging	Bat. Charging status	ON
	External Power status	ON
Battery fully charged	Bat. Charging status	OFF
	External Power status	ON

Table 2.3: WSN charging status

The WSN provides also a serial connection which is used for connection with the WSBS in order to make the time synchronization with the WSBS, as presented in sec 2.6. In order to make the connection the following steps must be followed:

1. Connect the supplied USB-Serial cable with the computer running the WSBS SW module. Make sure that the serial port created is set in the configuration xml file as presented in sec 3.3.2.4.
2. Connect the supplied Serial cable with the WSN using the connector shown in the below figure

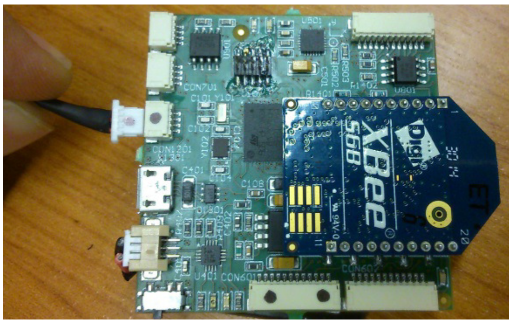


Figure 5 Serial connection of the WSN

2.3.2.3. Data Glove installation

For Data Glove operation no special procedure from the WSN procedures presented above.

During Data glove usage the following precautions should be taken:

- **General handling**
  - Do not hold the glove from the cables

    - Do not bend the glove fingers in opposite direction from finger movement
    - Do not crease the glove
    - Do not let the WSN wristband hanging from the wires that connect it with the glove
- **During glove wearing procedure:**
    - Wear the glove before attaching the WSN wrist band
    - During hand insertion in the glove make gently moves. If you feel that the hand movement is obstructed pull hand back and try again
    - Adjust the WSN wrist band on wrist taking so that the hand movement is not obstructed
- **During taking off the glove**
    - First remove the WSN wrist band. Do not let it hanging from the wires
    - Pull the glove fingers gently from their sides and not from back or front where sensors are located

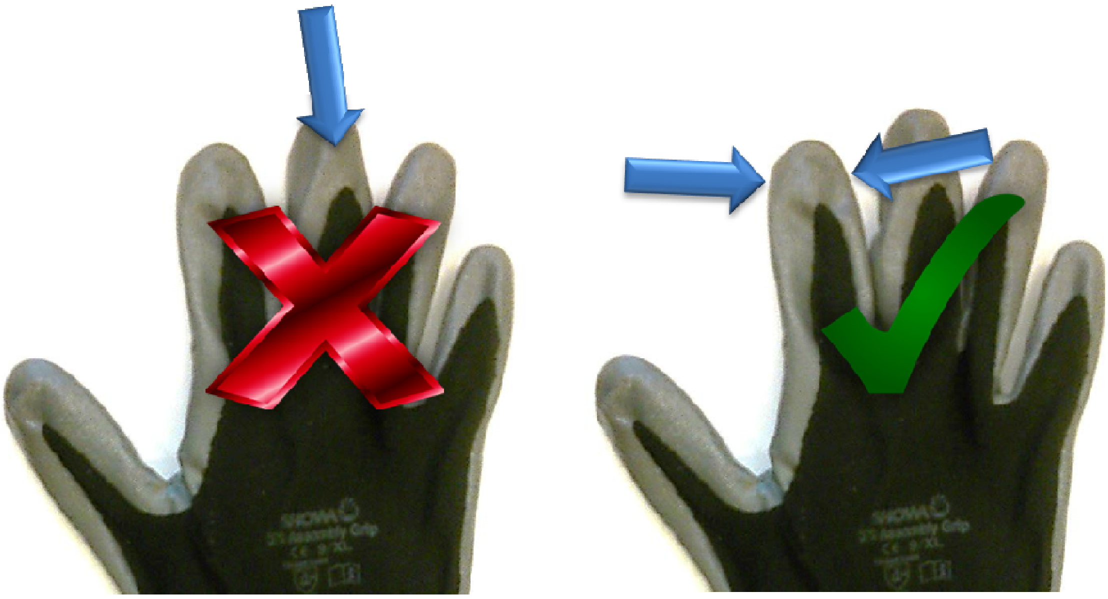


Figure 6 Data glove removal procedure

2.3.2.4. WSBS Software module operation and configuration

The following figure depicts the overall deployment landscape of the Wireless Base Station Software.

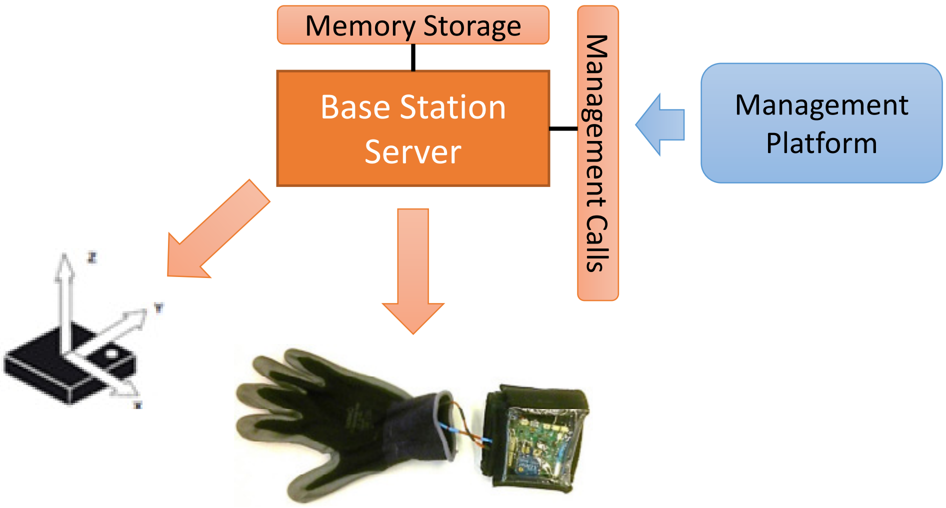


Figure 7 Base Station Software landscape

The landscape centers around the Base Station Server (in orange colour). It is the software component that interacts with the Data Glove and IMU sensors. It receives control requests from the Management Platform to configure the sensors and manage monitoring sessions. Connection with the sensors is based on a comprehensive Zigbee-based interaction protocol and data is based in volatile memory structures. Recorded data is then returned to the Management Platform for further analysis and aggregation with other INTERACT modules. Another operation supported by the Base Station Server is the direct time synchronization of the sensors' hardware clocks from an NTP Server using a Serial Port cable.

Below is shown a sample configuration of the Base Station Server in XML format:

```xml
<?xml version="1.0" encoding="utf-8" ?>
<Parameters>
  <Port>8080</Port>
  <ConnectionType>Zigbee</ConnectionType>
  <ZigbeeConfig>
    <COMPort>COM8</COMPort>
    <BaudRate>115200</BaudRate>
  </ZigbeeConfig>
  <SyncTimeConfig>
    <COMPortSync>COM3</COMPortSync>
    <BaudRateSync>19200</BaudRateSync>
    <NtpHost>213.216.102.102</NtpHost>
    <NtpPort>123</NtpPort>
    <SetSystemTime>false</SetSystemTime>
  </SyncTimeConfig>
</Parameters>
```

The main parameter of the Data Glove Server is the *Port* that defines the connection port for the external HTTP invocation from the Management Platform.

The Zigbee is configured through its *ComPort* name and *BaudRate*.

Last the time synchronization configuration contains information on the *ComPort* name and its *BaudRate* as well as the NTP *host* and *port* values. Normally the NTP Server is co-hosted at the Management Platform computer. Last, parameter *SetSystemTime* defines whether the hosting system time should also be aligned.

The following UML-like activity diagram depicts the necessary user actions for the setup of the Base Station environment in order to make it ready for external Management Platform control.

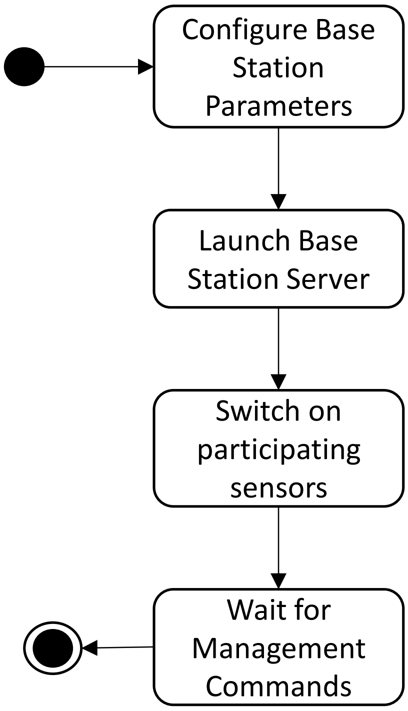

Configure Base Station Parameters
Launch Base Station Server
Switch on participating sensors
Wait for Management Commands

Figure 8 Steps for the setup of the Wireless Base Station

2.3.3. Tool Sensors Network

2.3.3.1. Short description

Tool Sensors Network is one of the sensor systems in INTERACT Platform. Its main task is to manage, control and enable data acquisition from sensors that were classified as “tool” sensors. It is closely integrated to Sensor Management Platform (will be described later).

Research of pilot cases indicated that there is a need for one type of tool sensor – wireless screwdriver. Specific tool was chosen to fulfill pilot case's and future requirements – Makita BFL201R cordless angle screwdriver (described later).

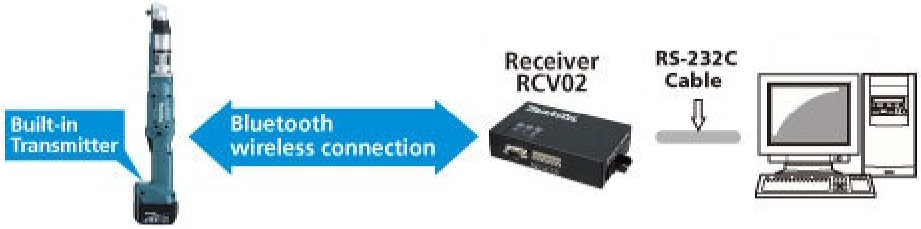
Tool Sensors Network consists of central sensors management system (Tool Sensors Manager) and tools with dedicated hardware and software.

2.3.3.2. Hardware – Makita BFL201R

Makita's Wireless Fastening Data Capture System enables to transmit various fastening data from the tool to PC via RCV02 receiver. System operates between one tool, one receiver and interfaces through a PC.

There are two communication methods used:

1. RS232C serial communication between the PC and the receiver
2. Bluetooth ver 1.2 wireless communication between the receiver and the tool



Configuration

If one is using adapter RS232 – USB there is a need of drivers for it. Usually they will be successfully download automatically via internet. If one do not have internet connection – then the drivers must be provided regarding the brand of adapter that needs to be used.

No other configuration is required.

Setup

1. Plug Makita Receiver to power source and turn it on (red LED should be activated).
2. Plug Makita Receiver to your computer through RS232 or USB.
3. Wait till proper driver is installed.
4. Connect battery to Makita Screwdriver.
5. Push screwing button once to turn on the screwdriver (green LED on receiver should be activated).
6. TSN tries to find connected tools every minute – tool could be used only if it establish connection with TSN. It could last in the worst case about 2 minutes.

2.3.3.3. Software – Tool Sensors Manager

Tool Sensors Manager (TSM) is a back-end component of Tool Sensor Network.

Time synchronization

In order to provide common time of all sensors networks, system provides the way for synchronize it between machine on which Tool Sensors Manager works (client) and NTP Time Server.

Setup requires the proper setup of NTP client on the same machine that Tool Sensor Manager is installed.

- Install and configuration of NTP client
    - Download and install NTP (www.ntp.org).
        - For Windows: https://www.meinbergglobal.com/english/sw/ntp.htm
    - In configuration file *ntp.conf* define local machine as server by adding:

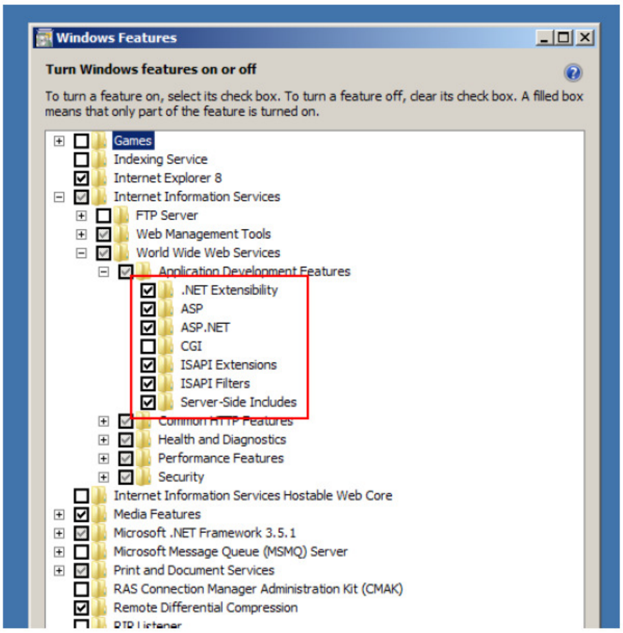
```
restrict default kod nomodify notrap nopeer noquery
restrict -6 default kod nomodify notrap nopeer noquery
restrict 127.0.0.1
restrict -6 ::1
# Timeserver(s)
server <NTP server IP> iburst
```

- Restart NTP (it usually takes about 1 minute to synchronize between ntpd and local clock but for the full stabilization at least 8 hours is needed).
- Change firewall settings if necessary.
- Check upstream synchronization (with local clock):

```
ntpq -pn
```

Installation and configuration

- Pre installation requirements
  - Windows 7 or Windows Server 2012
  - IIS 7 or higher
  - TSN program files
  - Proper NTP setup (described previously)
- ISS installation
  - http://www.iis.net/learn/install/installing-iis-7/installing-iis-on-windows-vista-and-windows-7
  - IMPORTANT! Make sure that you check all .NET 4.0 Framework related components:



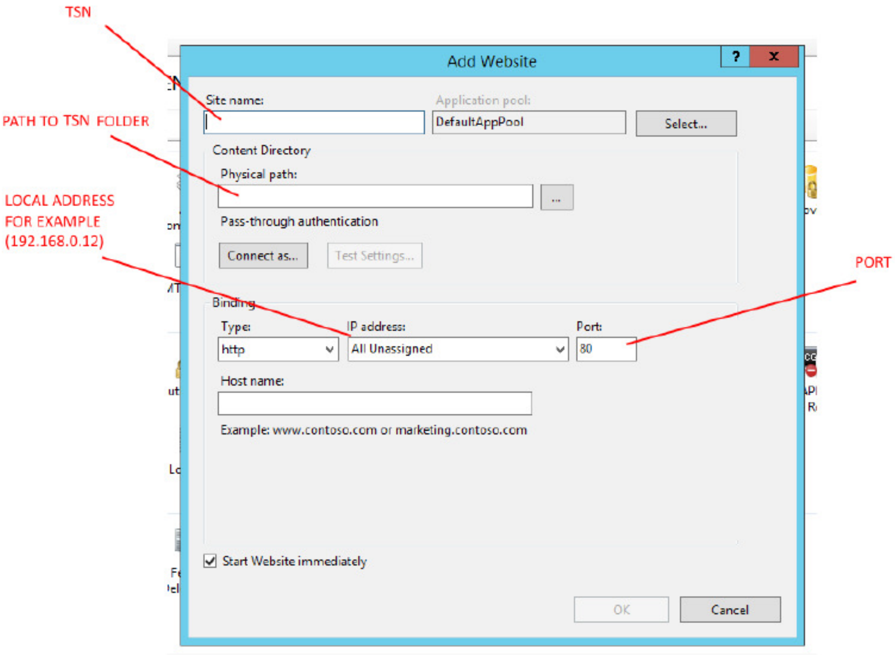
Windows Features

Turn Windows features on or off

To turn a feature on, select its check box. To turn a feature off, clear its check box. A filled box means that only part of the feature is turned on.

- □ Games
- □ Indexing Service
- ☑ Internet Explorer 8
- ☑ Internet Information Services
  - □ FTP Server
  - ☑ Web Management Tools
  - ☑ World Wide Web Services
    - ☑ Application Development Features
      - ☑ .NET Extensibility
      - ☑ ASP
      - ☑ ASP.NET
      - □ CGI
      - ☑ ISAPI Extensions
      - ☑ ISAPI Filters
      - ☑ Server-Side Includes
    - ☑ Common HTTP Features
    - ☑ Health and Diagnostics
    - ☑ Performance Features
    - ☑ Security
- □ Internet Information Services Hostable Web Core
- ☑ Media Features
- ☑ Microsoft .NET Framework 3.5.1
- □ Microsoft Message Queue (MSMQ) Server
- ☑ Print and Document Services
- □ RAS Connection Manager Administration Kit (CMAK)
- ☑ Remote Differential Compression
- □ RIP Listener

- Installation TSN
  - Create folder and unpack TSN program files.
  - Open Internet Information Service (ISS) Manager.
  - Right-click on Sites and choose Add Website...
  - Fill all required fields (remember port number):



Site name:

Application pool: DefaultAppPool

Content Directory

Physical path:

Pass-through authentication

Binding

Type: http

IP address: All Unassigned

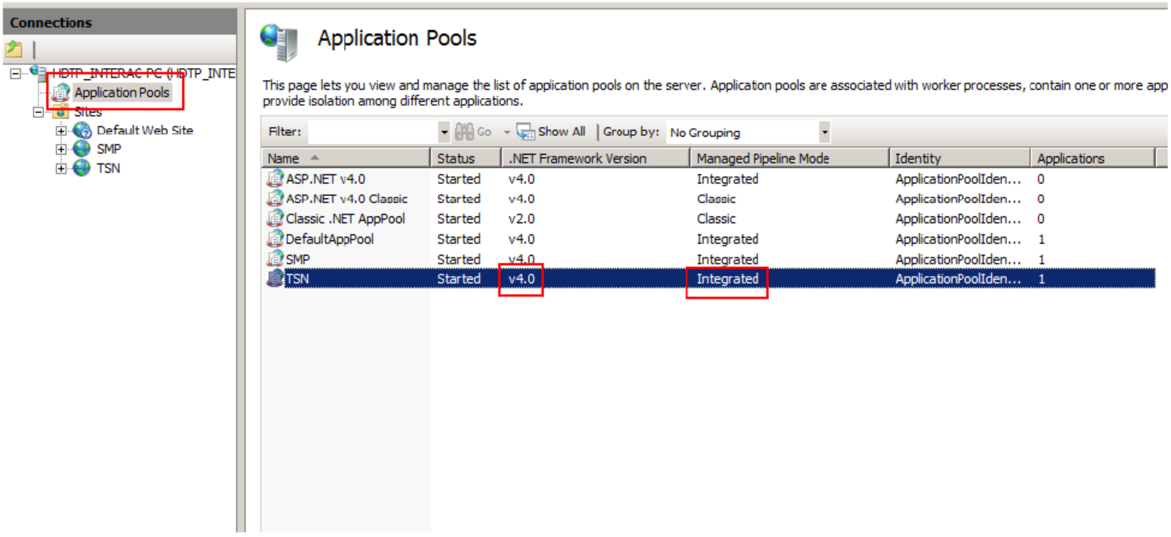
Port: 80

Host name:

Example: www.contoso.com or marketing.contoso.com

☑ Start Website immediately

- ○ Check in Application Pools configuration:
  - ▪ NET Framework version --- v4.0
  - ▪ Managed Pipeline Mode --- Integrated



Application Pools

This page lets you view and manage the list of application pools on the server. Applicaton pools are associated with worker processes, contain one or more app provide isolation among different applications.

Filter:

Group by: No Grouping

Name	Status	.NET Framework Version	Managed Pipeline Mode	Identity	Applications
ASP.NET v4.0	Started	v4.0	Integrated	ApplicationPoolIden...	0
ASP.NET v4.0 Classic	Started	v4.0	Classic	ApplicationPoolIden...	0
Classic .NET AppPool	Started	v2.0	Classic	ApplicationPoolIden...	0
DefaultAppPool	Started	v4.0	Integrated	ApplicationPoolIden...	1
SMP	Started	v4.0	Integrated	ApplicationPoolIden...	1
TSN	Started	v4.0	Integrated	ApplicationPoolIden...	1

2.3.4. Sensor Management Platform

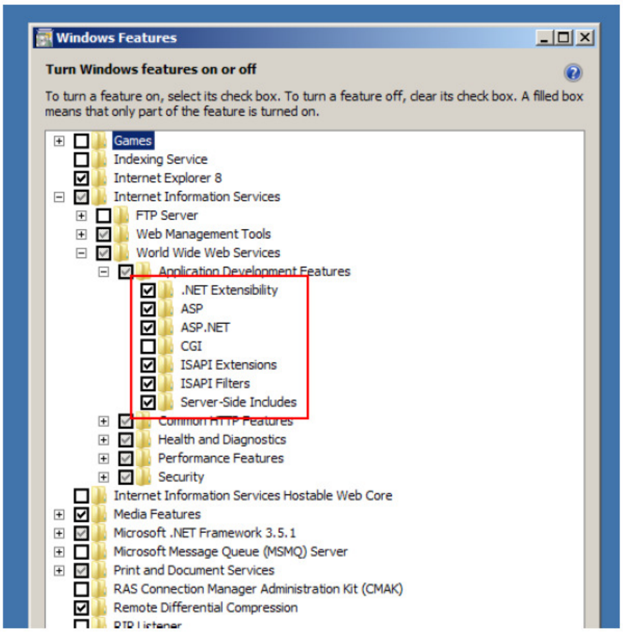
2.3.4.1. Short description

Sensor Management Platform (SMP) is administration component if integrated INTERACT sensor system. Main responsibilities of the application is to handle all sensors networks (Optical, Wireless and Tool) regarding sensors data providing, communication with sensors and changing sensors parameters.

2.3.4.2. Software

Installation and configuration

- Pre installation requirements
  - Windows 7 or Windows Server 2012
  - IIS 7 or higher
  - TSN program files
  - Proper NTP setup (described previously)
- ISS installation
  - http://www.iis.net/learn/install/installing-iis-7/installing-iis-on-windows-vista-and-windows-7
  - IMPORTANT! Make sure that you check all .NET 4.0 Framework related components:

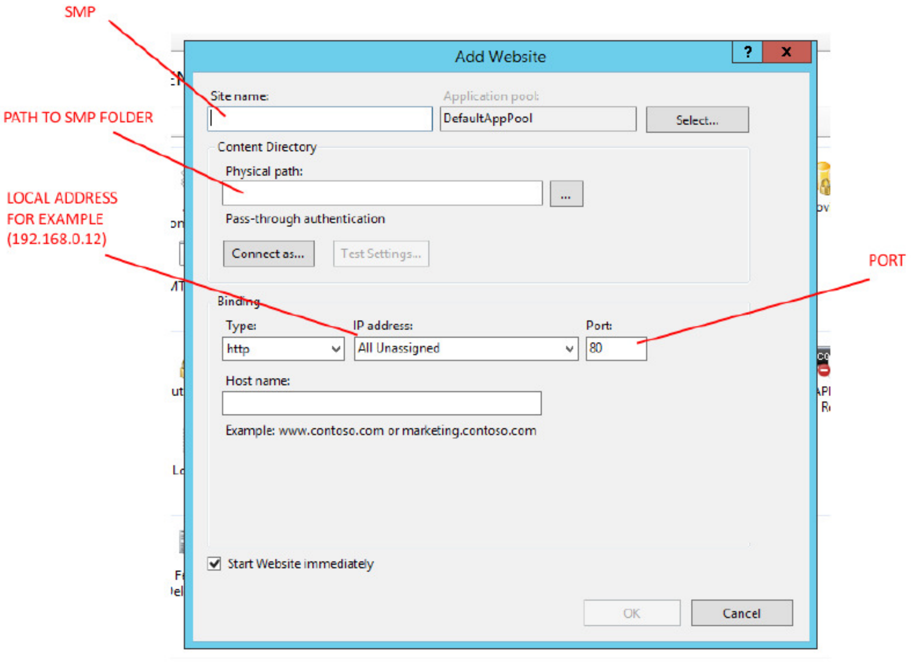


Turn Windows features on or off

To turn a feature on, select its check box. To turn a feature off, clear its check box. A filled box means that only part of the feature is turned on.

- ☐ Games
- ☐ Indexing Service
- ☑ Internet Explorer 8
- ☑ Internet Information Services
  - ☐ FTP Server
  - ☑ Web Management Tools
  - ☑ World Wide Web Services
    - ☑ Application Development Features
      - ☑ .NET Extensibility
      - ☑ ASP
      - ☑ ASP.NET
      - ☐ CGI
      - ☑ ISAPI Extensions
      - ☑ ISAPI Filters
      - ☑ Server-Side Includes
    - ☑ Common HTTP Features
    - ☑ Health and Diagnostics
    - ☑ Performance Features
    - ☑ Security
- ☐ Internet Information Services Hostable Web Core
- ☑ Media Features
- ☑ Microsoft .NET Framework 3.5.1
- ☐ Microsoft Message Queue (MSMQ) Server
- ☑ Print and Document Services
- ☐ RAS Connection Manager Administration Kit (CMAK)
- ☑ Remote Differential Compression
- ☐ RIP Listener

- Installation SMP
  - Create folder and unpack SMP program files.
  - Open Internet Information Service (ISS) Manager.
  - Right-click on Sites and choose Add Website...
  - Fill all required fields (remember port number):



Add Website

Site name:

Application pool: DefaultAppPool

Select...

Content Directory

Physical path:

Pass-through authentication

Connect as... Test Settings...

Binding

Type: http

IP address: All Unassigned

Port: 80

Host name:

Example: www.contoso.com or marketing.contoso.com

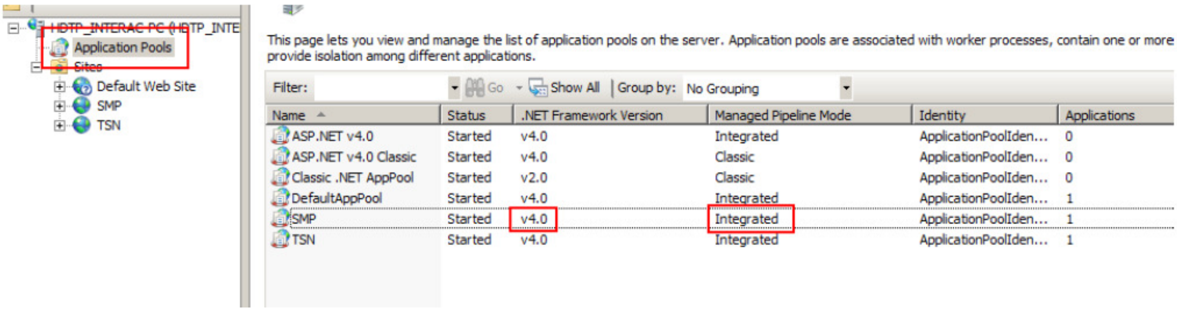
☑ Start Website immediately

OK Cancel

- Change program configuration:
  - Edit Web.config file in SMP folder.
  - In appSettings section fill:
    - addresses of all sensor networks
    - if you want to use specific sensor network

```
<add key="WirelessSensorNetworkAddress" value="http://xx.xxx.xx.xx:8080/InteractAppService/rest"/>
<add key="UseWirelessSensorNetwork" value="1"/>
```

- Check in Application Pools configuration:
  - NET Framework version --- v4.0
  - Managed Pipeline Mode --- Integrated



This page lets you view and manage the list of application pools on the server. Application pools are associated with worker processes, contain one or more provide isolation among different applications.

Name	Status	.NET Framework Version	Managed Pipeline Mode	Identity	Applications
ASP.NET v4.0	Started	v4.0	Integrated	ApplicationPoolIden...	0
ASP.NET v4.0 Classic	Started	v4.0	Classic	ApplicationPoolIden...	0
Classic .NET AppPool	Started	v2.0	Classic	ApplicationPoolIden...	0
DefaultAppPool	Started	v4.0	Integrated	ApplicationPoolIden...	1
SMP	Started	v4.0	Integrated	ApplicationPoolIden...	1
TSN	Started	v4.0	Integrated	ApplicationPoolIden...	1

2.3.5. NTP Server setup

- Download and install NTP (www.ntp.org).
    - For Windows: https://www.meinbergglobal.com/english/sw/ntp.htm
- In configuration file *ntp.conf* define local machine as server by adding:

```
restrict default kod nomodify notrap
restrict -6 default kod nomodify notrap

# Timeserver(s)- in this case – local clock
server 127.127.1.0 # local clock

# Timeserver(s) priority
fudge 127.127.1.0 stratum 0 # disciplined by radio clock
```

- Restart NTP (it usually takes about 1 minute to synchronize between ntpd and local clock but for the full stabilization at least 8 hours is needed).
- Change firewall settings if necessary - it must be possible to connect to port 123, both UDP and TCP, from the outside / all boxes who uses timeserver.
- Check upstream synchronization (with local clock):

```
ntpq -pn
```

3. DESCRIPTION OF INTERACT EAP AND APPS

3.1. Enterprise Application Platform

3.1.1. Application short description

The Enterprise Application Platform (EAP) is a lightweight web based applications and backend services store. As such we divide the functionality of such a system to:

- User/Role management & authorization. An API and user interface for user & role management bundled with an embedded implementation
- App Store. An API for registering apps for later installation and a user interface for installing and using the Apps within a user's workspace in the platform.
- A communication mechanism. An API for inter-apps communication which provides the basis for collaborative sessions and data exchange.
- A service registry. An API for registering new services (API) supporting the extendibility of the EAP system.

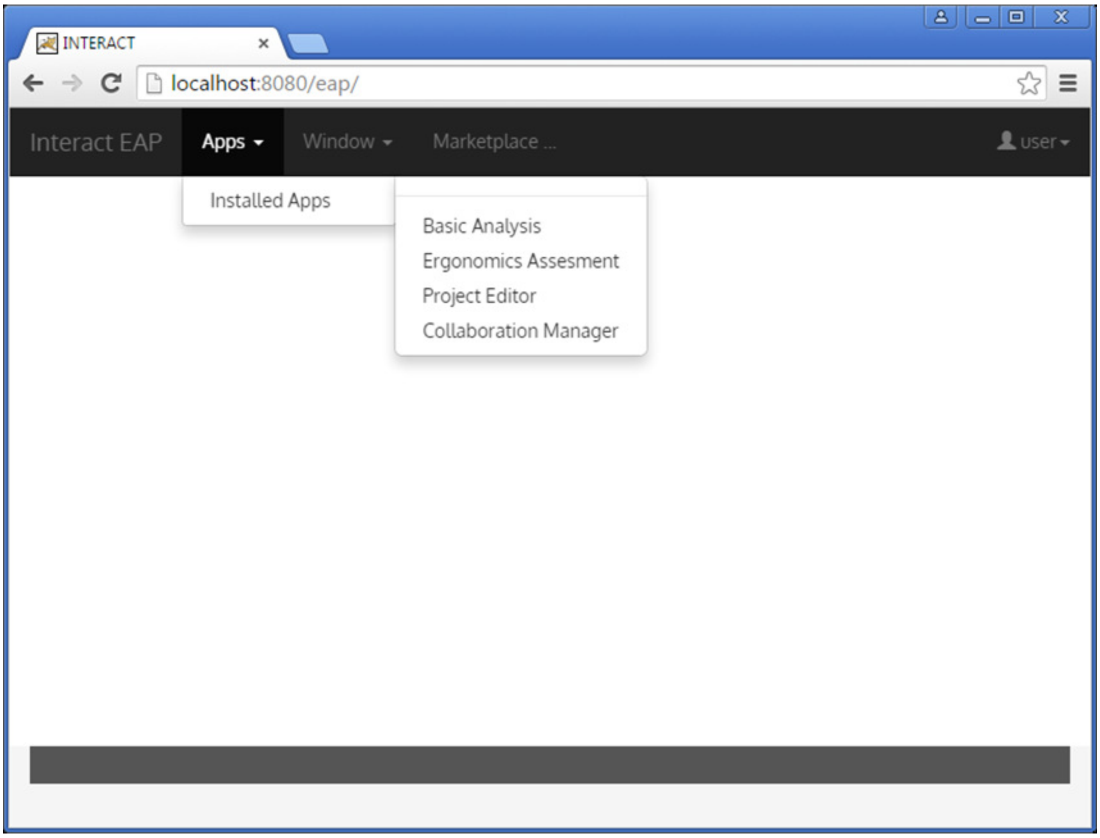


Figure 9: EAP main page

3.1.2. Key application features

In D1.3.1 there was a listing of features foreseen for EAP. These features are presented in the following table with one more additional column to describe how EAP supported/implemented these features.

Need	EAP Feature	Support/Implementation
Authentication and Authorization management	Provide a “Single Sign On” for all applications and users.	Implemented. Details can be found in D5.2.1
Application hosting	Application Store paradigm. Browse, download and use available apps.	Implemented. Details can be found in D5.2.1
Unified Data Access	An API for CRUD (Create Read Update Delete) operation on data sets is provided through EAP backend.	Supported through the service registry. Data Access Services are implemented under WP4 T4.2 and documented in D4.2.1.
Message/Data exchange between applications	An API for inter-application communication is provided through EAP backend.	Implemented. Details can be found in D5.2.1
Motion synthesis	Provide services (API) that will generate: • motion constraints from “project” variant (3D scene and CNL or 3D scene and sensor dataset) • motions based on specific constraints	Implemented. The development of a service orchestrator as EAP’s add-on module and integration has been implemented.

3.1.3. User interaction

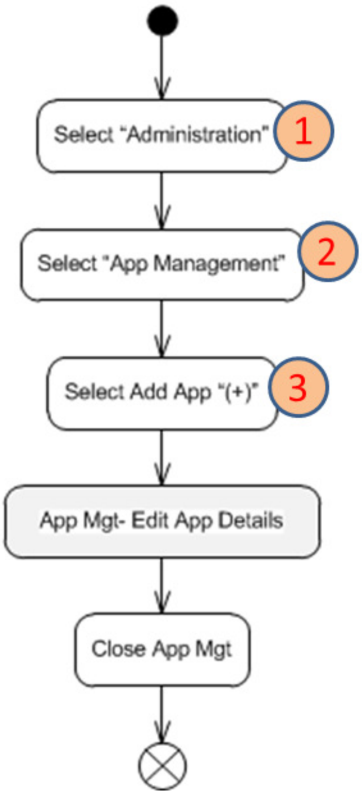
EAP supports two main types of users:

- The EAP administrator.
- The EAP – typical- user.

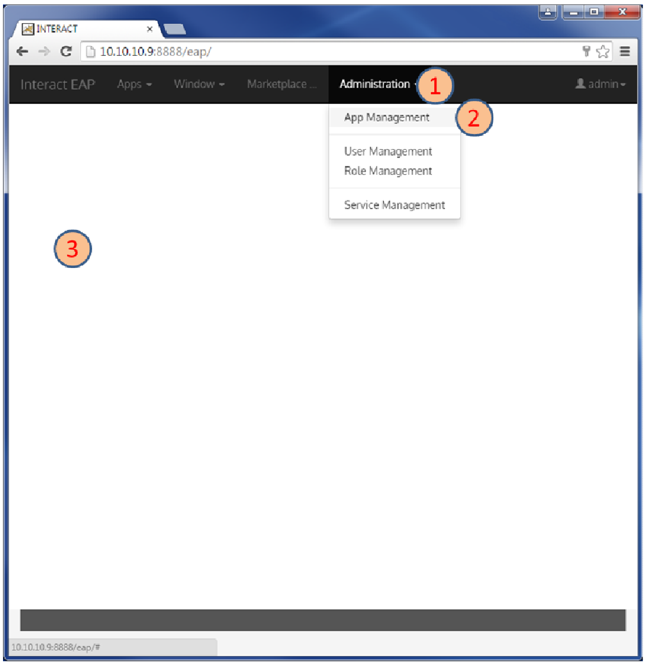
In the next paragraphs key user activities and workflows of the user with the EAP platform are depicted.

EAP Admin – Application Management

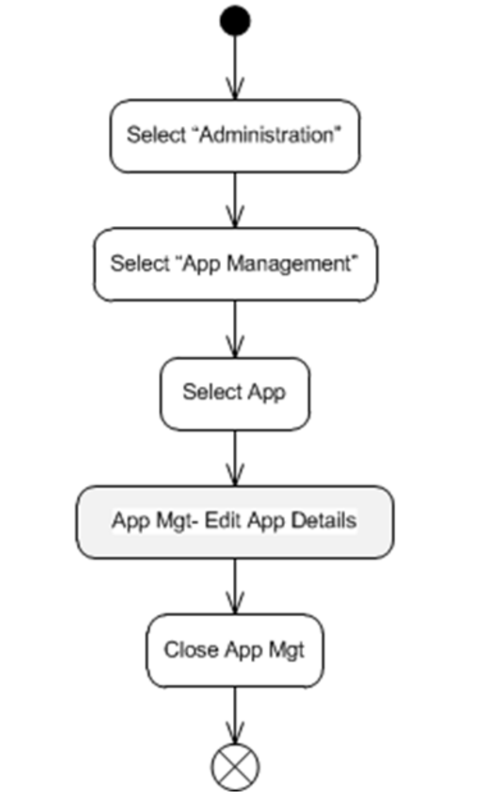
act - Application Mgt – Add App



4 View "App Mgt - Edit App details" in EAP Admin Section



act - Application Mgt – Edit App



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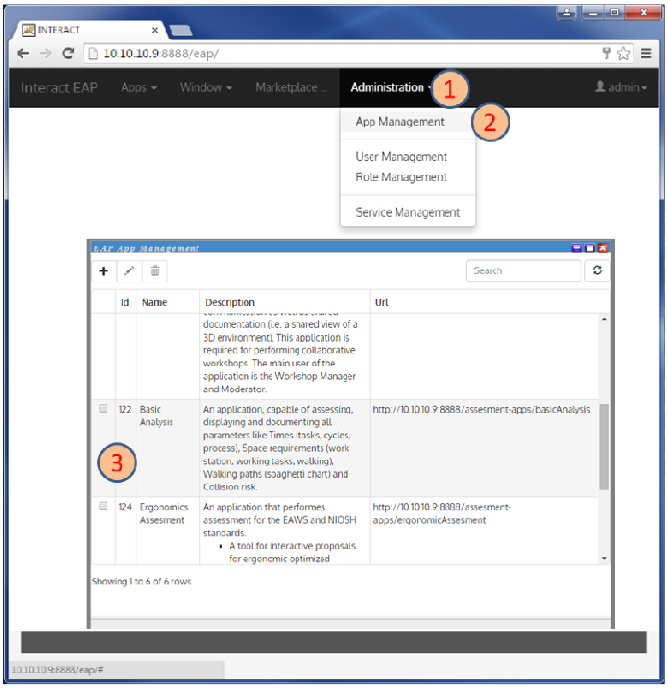
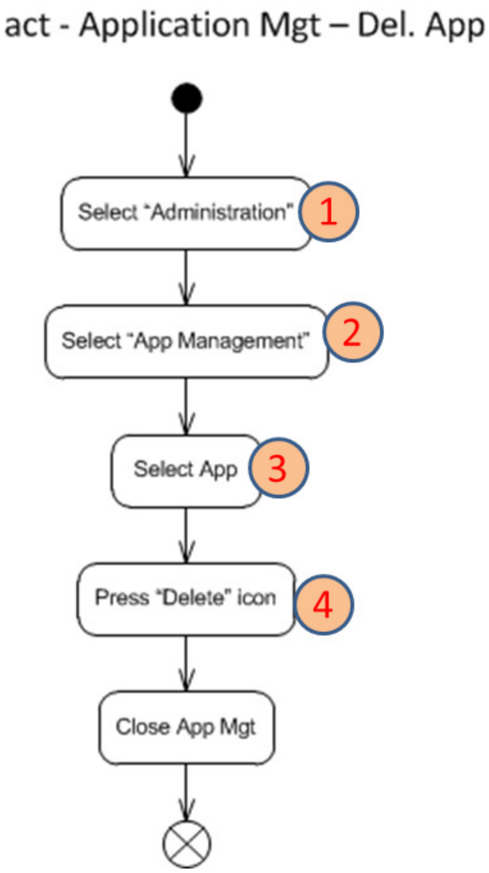
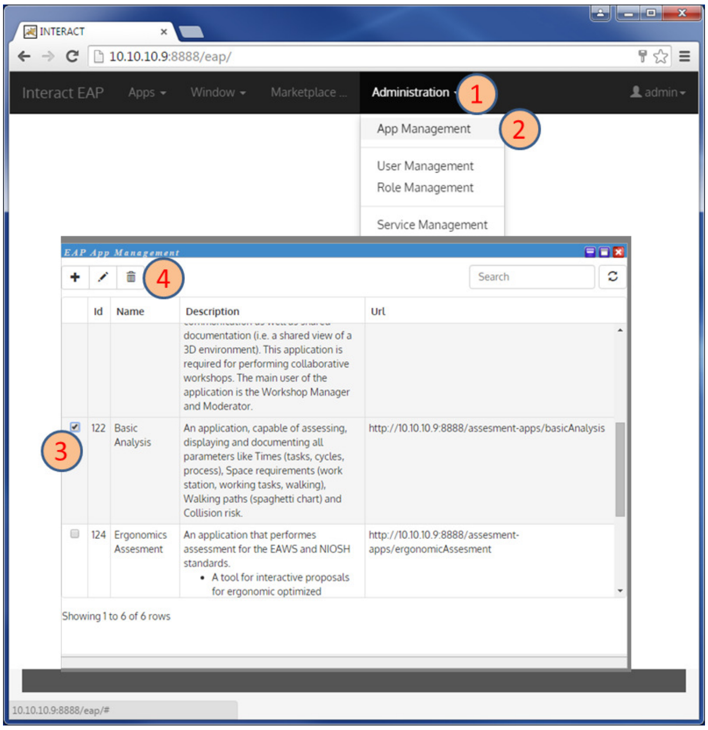


	Id	Name	Description	Url
			documentation (i.e. a shared view of a 3D environment). This application is required for performing collaborative workshops. The main user of the application is the Workshop Manager and Moderator.	
□	122	Basic Analysis	An application, capable of assessing, displaying and documenting all parameters like Times (tasks, cycles, process), Space requirements (work station, working tasks, walking), Walking paths (spaghetti chart) and Collision risk.	http://10.10.10.9:8888/assesment-apps/basicAnalysis
□	124	Ergonomics Assesment	An application that performes assessment for the EAWS and NIOSH standards. • A tool for interactive proposals for ergonomic optimized	http://10.10.10.9:8888/assesment-apps/ergonomicAssesment

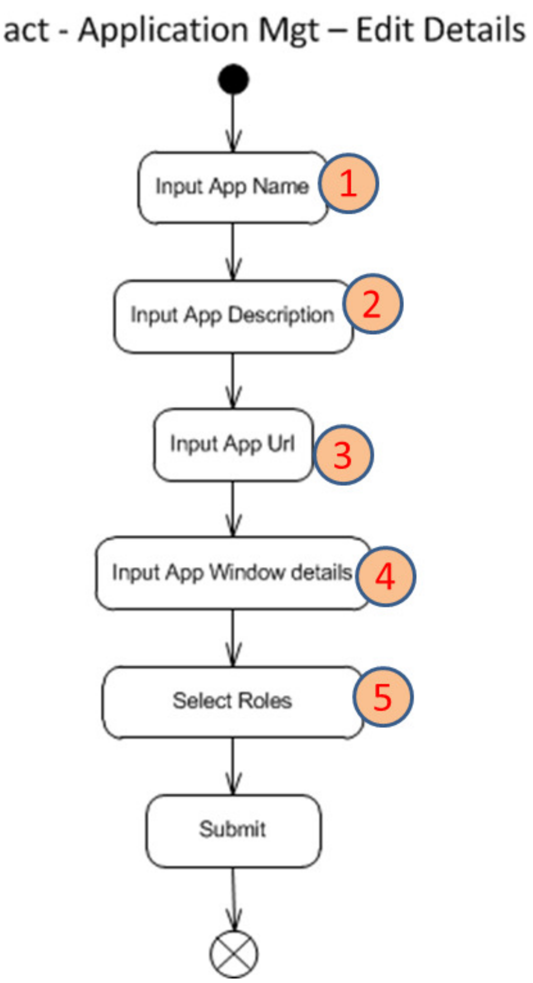
Showing 1 to 6 of 6 rows

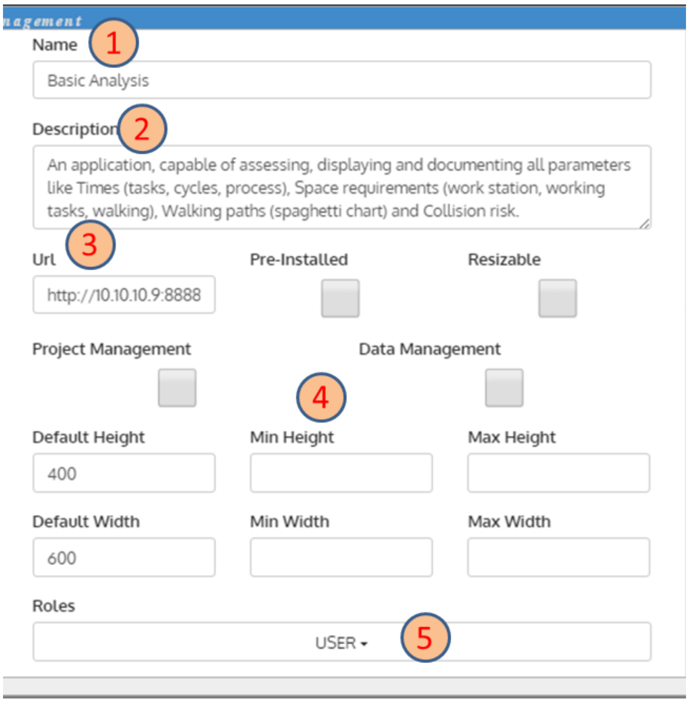




	Id	Name	Description	Url
			documentation (i.e. a shared view of a 3D environment). This application is required for performing collaborative workshops. The main user of the application is the Workshop Manager and Moderator.	
☑	122	Basic Analysis	An application, capable of assessing, displaying and documenting all parameters like Times (tasks, cycles, process), Space requirements (work station, working tasks, walking), Walking paths (spaghetti chart) and Collision risk.	http://10.10.10.9:8888/assesment-apps/basicAnalysis
□	124	Ergonomics Assesment	An application that performes assessment for the EAWS and NIOSH standards. • A tool for interactive proposals for ergonomic optimized	http://10.10.10.9:8888/assesment-apps/ergonomicAssesment

Showing 1 to 6 of 6 rows





Name

Basic Analysis

Description

An application, capable of assessing, displaying and documenting all parameters like Times (tasks, cycles, process), Space requirements (work station, working tasks, walking), Walking paths (spaghetti chart) and Collision risk.

Url

http://10.10.10.9:8888

Pre-Installed □

Resizable □

Project Management □

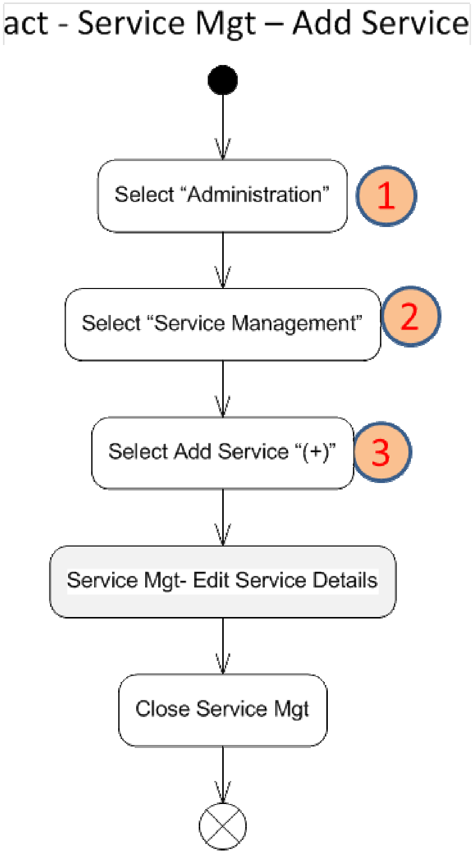
Data Management □

Default Height	Min Height	Max Height
400		
Default Width	Min Width	Max Width
600		

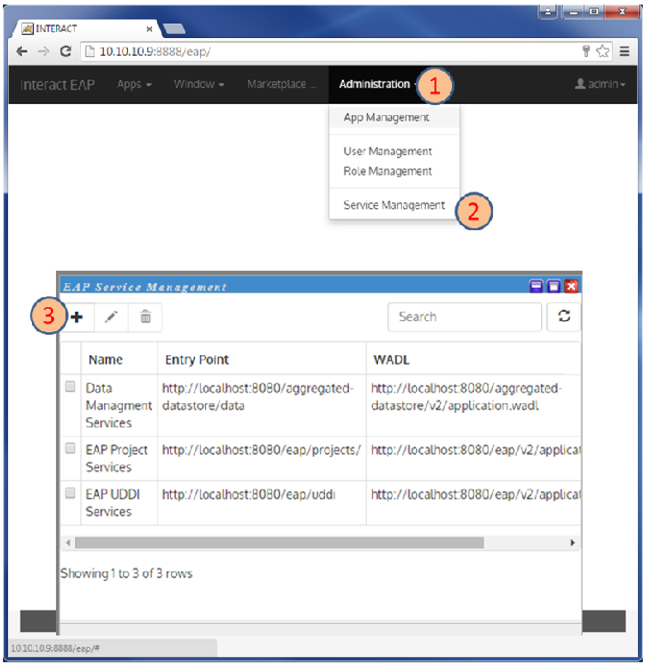
Roles

USER ▾

EAP Admin – Service Management

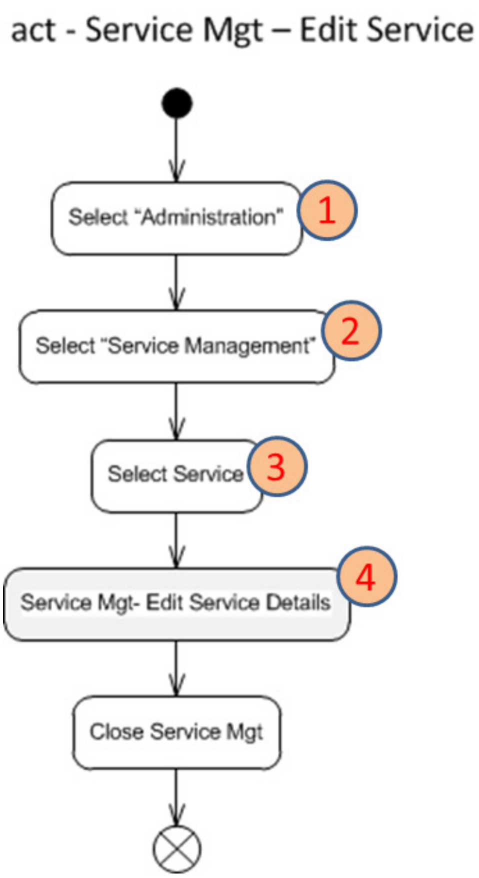

act - Service Mgt – Add Service
Select “Administration”
1
Select “Service Management”
2
Select Add Service “(+)”
3
Service Mgt- Edit Service Details
Close Service Mgt

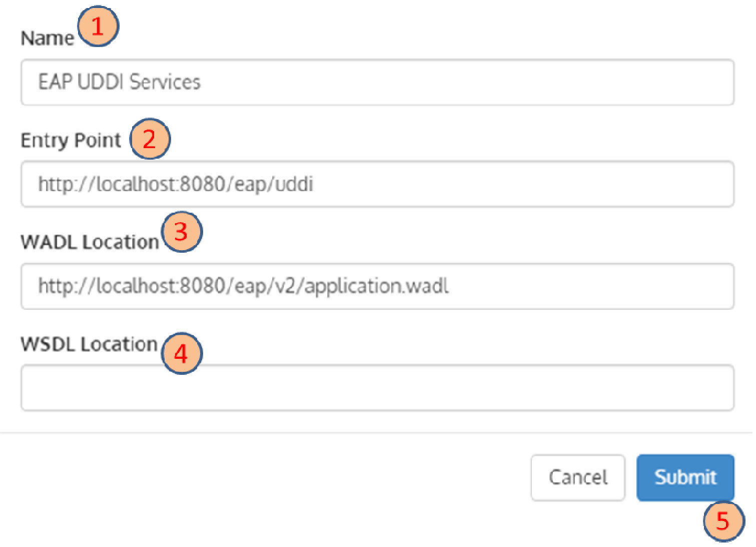
4 View “Service Mgt - Edit Service details” in EAP Admin Section



	Name	Entry Point	WADL
□	Data Managment Services	http://localhost:8080/aggregated-datastore/data	http://localhost:8080/aggregated-datastore/v2/application.wadl
□	EAP Project Services	http://localhost:8080/eap/projects/	http://localhost:8080/eap/v2/applica
□	EAP UDDI Services	http://localhost:8080/eap/uddi	http://localhost:8080/eap/v2/applica

Showing 1 to 3 of 3 rows


act - Service Mgt – Edit Service
Select "Administration"
1
Select "Service Management"
2
Select Service
3
Service Mgt- Edit Service Details
4
Close Service Mgt



Name 1
EAP UDDI Services

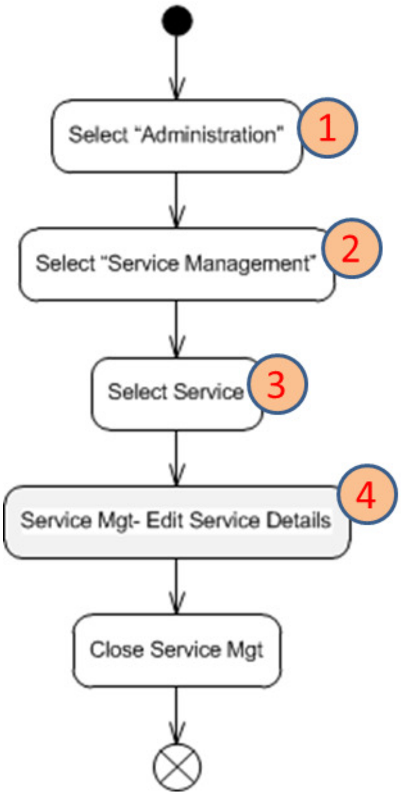
Entry Point 2
http://localhost:8080/eap/uddi

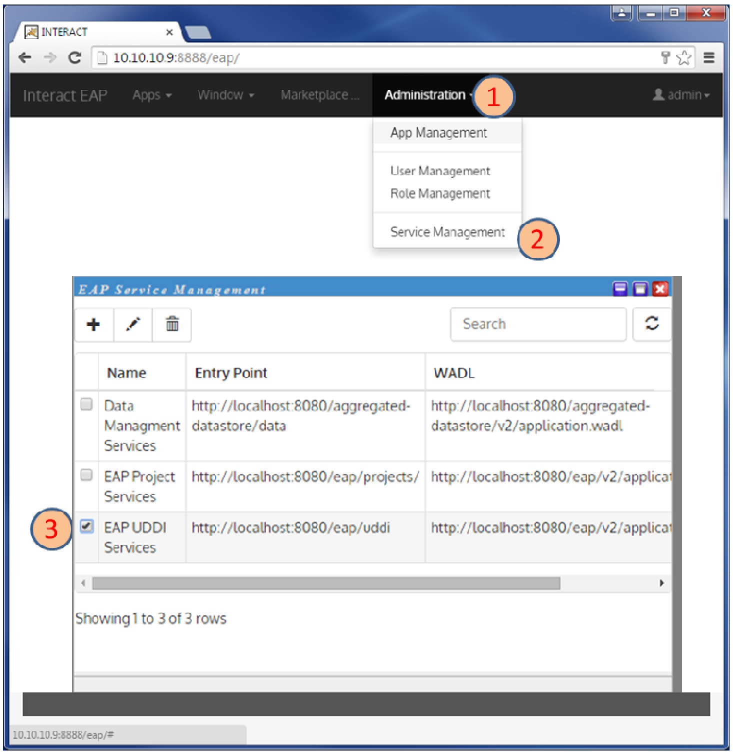
WADL Location 3
http://localhost:8080/eap/v2/application.wadl

WSDL Location 4

act - Service Mgt – Edit Service

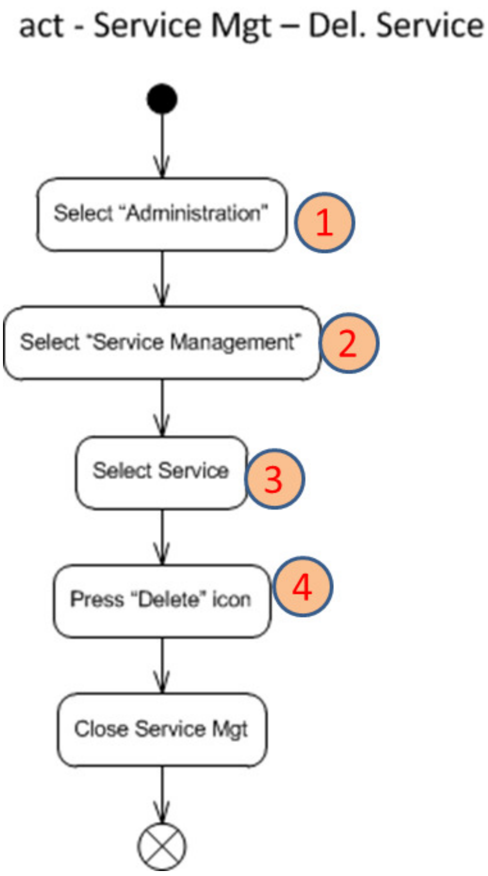
4 View "Service Mgt - Edit Service details" in EAP Admin Section

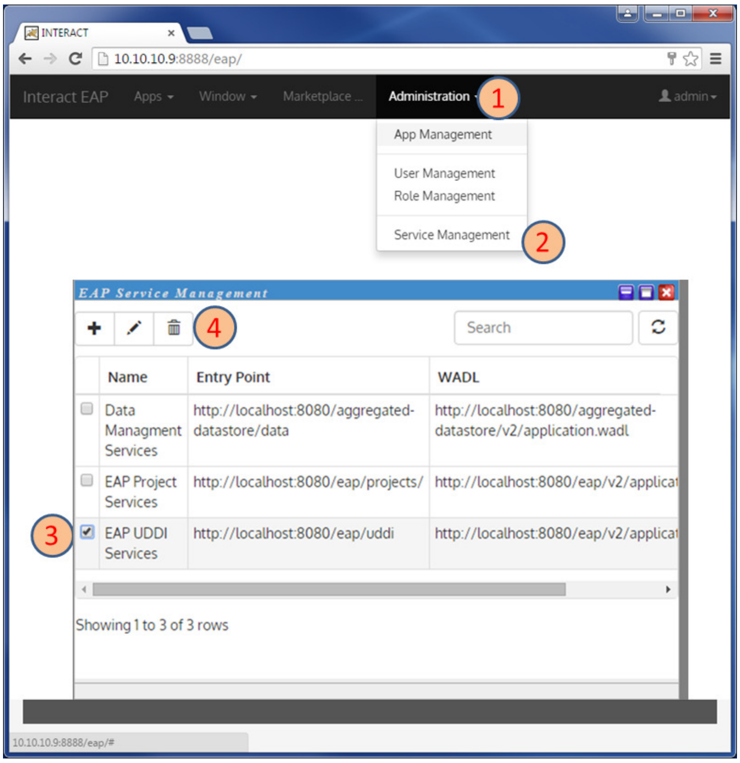

Select "Administration"
1
Select "Service Management"
2
Select Service
3
Service Mgt- Edit Service Details
4
Close Service Mgt



	Name	Entry Point	WADL
□	Data Managment Services	http://localhost:8080/aggregated-datastore/data	http://localhost:8080/aggregated-datastore/v2/application.wadl
□	EAP Project Services	http://localhost:8080/eap/projects/	http://localhost:8080/eap/v2/applicat
☑	EAP UDDI Services	http://localhost:8080/eap/uddi	http://localhost:8080/eap/v2/applicat

Showing 1 to 3 of 3 rows



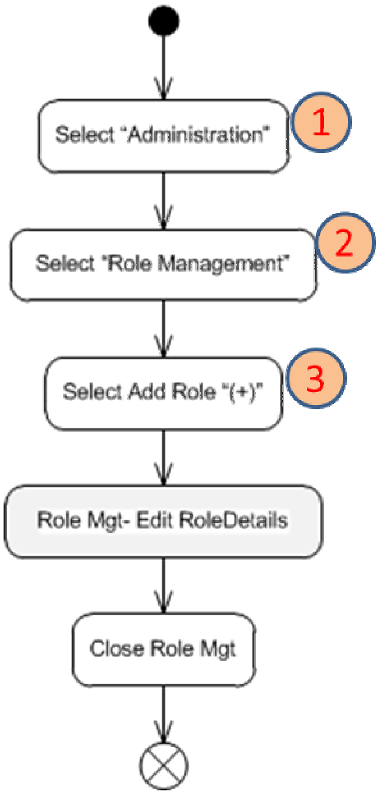


	Name	Entry Point	WADL
□	Data Managment Services	http://localhost:8080/aggregated-datastore/data	http://localhost:8080/aggregated-datastore/v2/application.wadl
□	EAP Project Services	http://localhost:8080/eap/projects/	http://localhost:8080/eap/v2/applicat
☑	EAP UDDI Services	http://localhost:8080/eap/uddi	http://localhost:8080/eap/v2/applicat

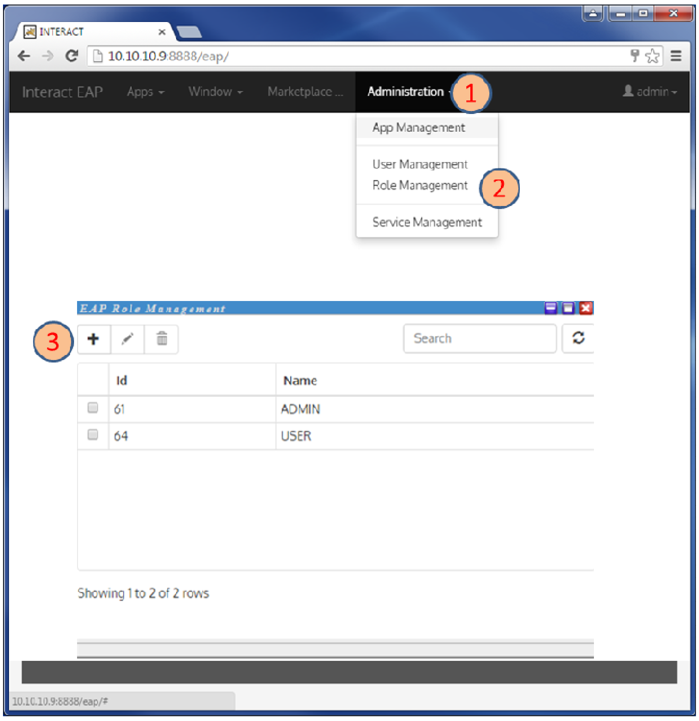
Showing 1 to 3 of 3 rows

EAP Admin – Role management

act - Role Mgt – Add Role



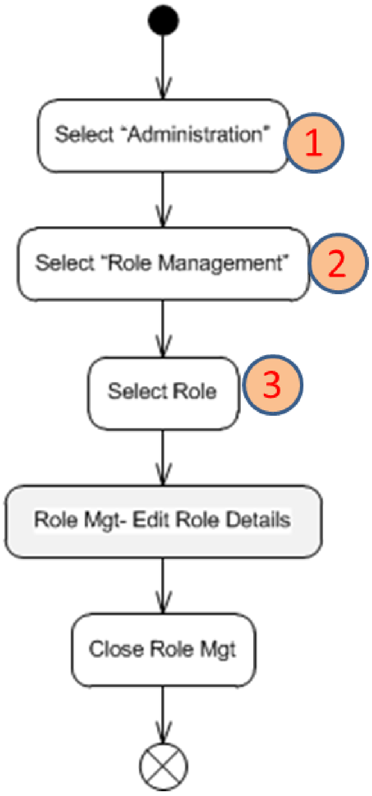
4 View "Role Mgt - Edit Role details" in EAP Admin Section



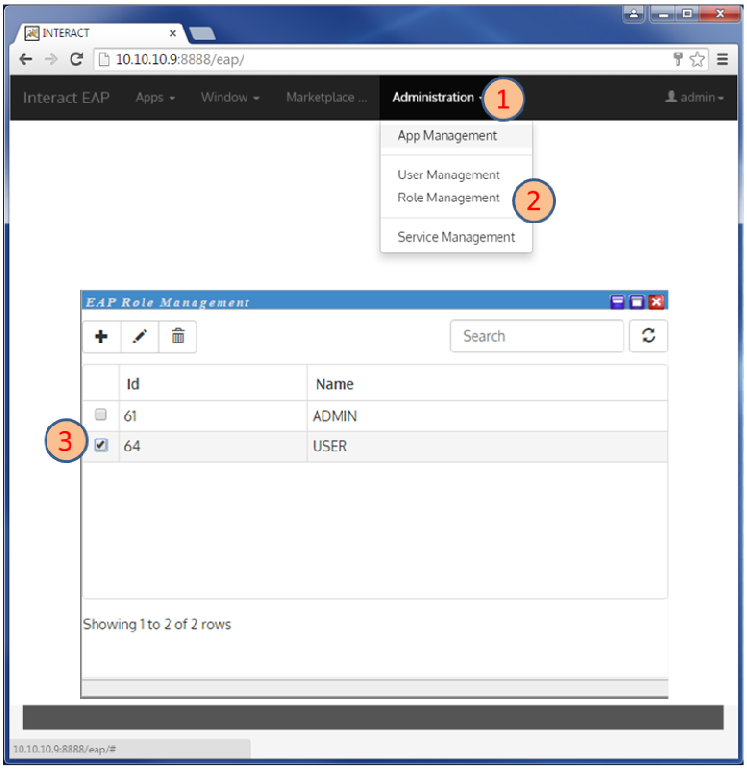
Id	Name
61	ADMIN
64	USER

Showing 1 to 2 of 2 rows

act – Role Mgt – Edit Role

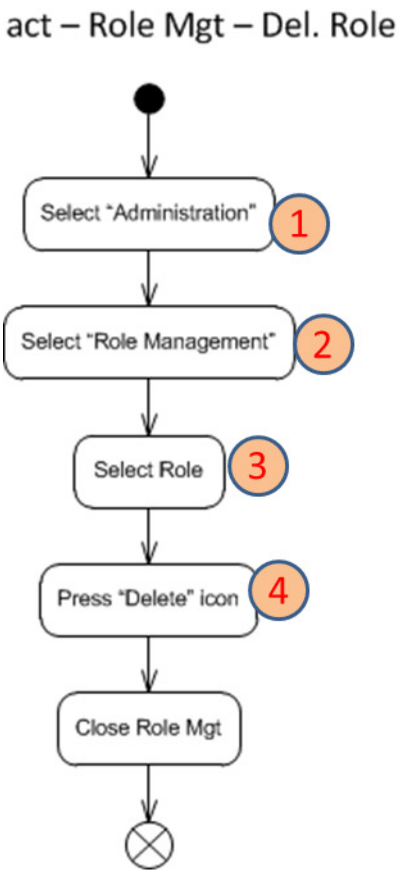


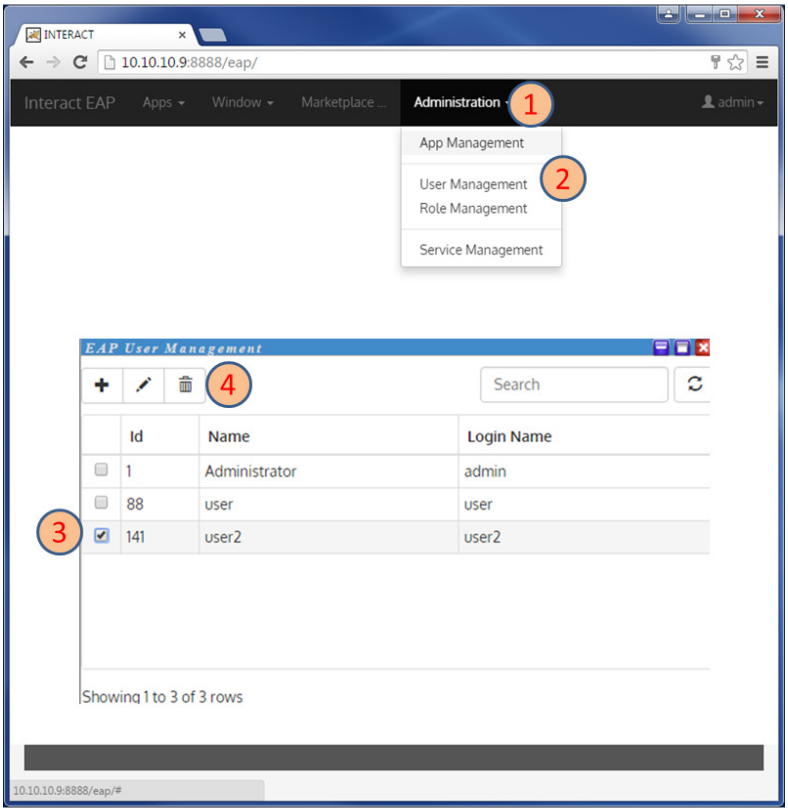
4 View "Service Mgt - Edit Service details" in EAP Admin Section



	Id	Name
□	61	ADMIN
☑	64	USER

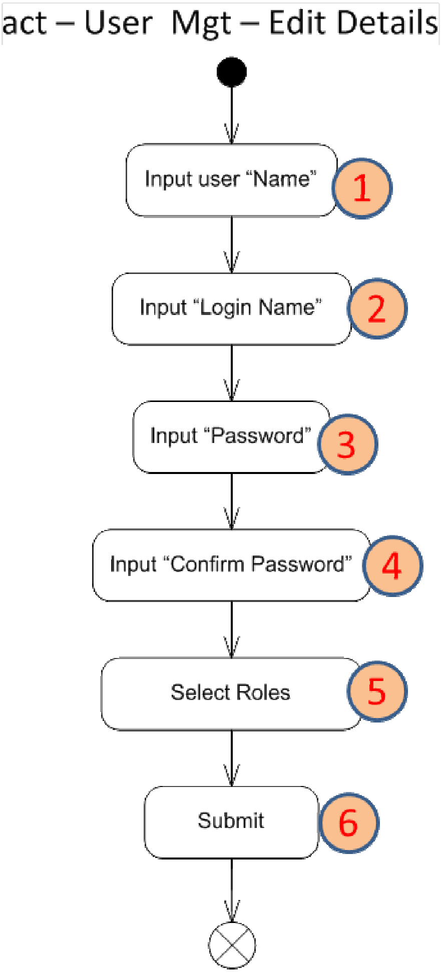
Showing 1 to 2 of 2 rows

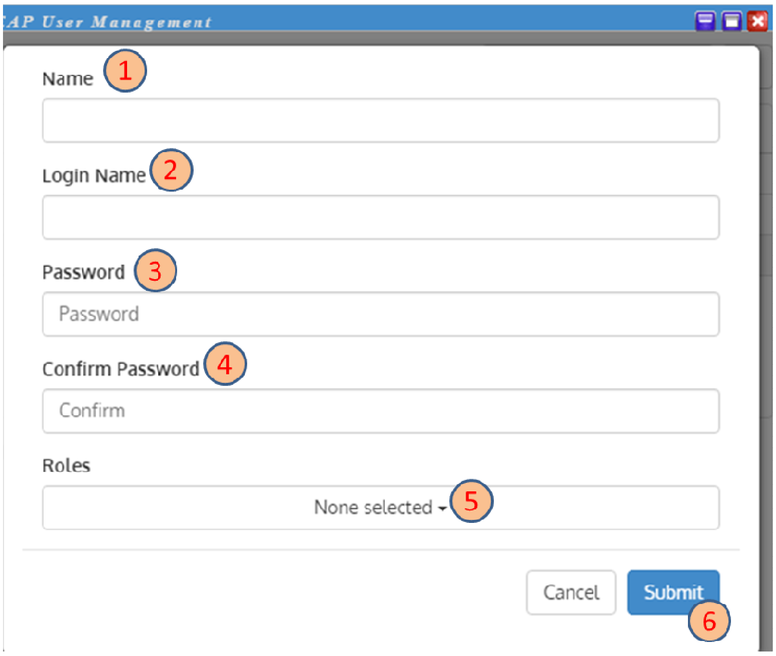




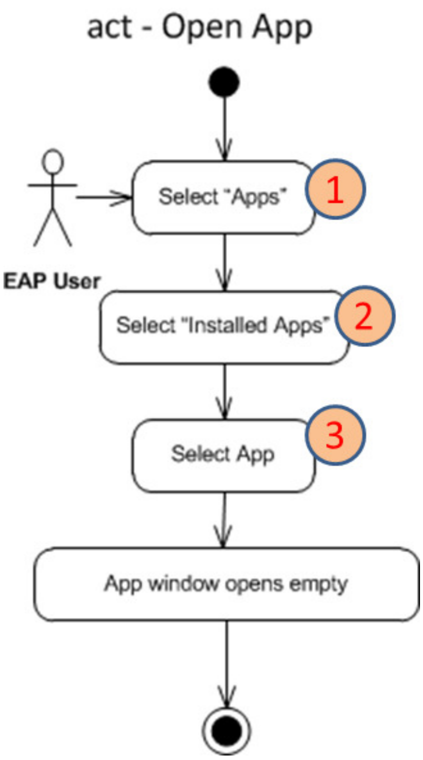
	Id	Name	Login Name
□	1	Administrator	admin
□	88	user	user
☑	141	user2	user2

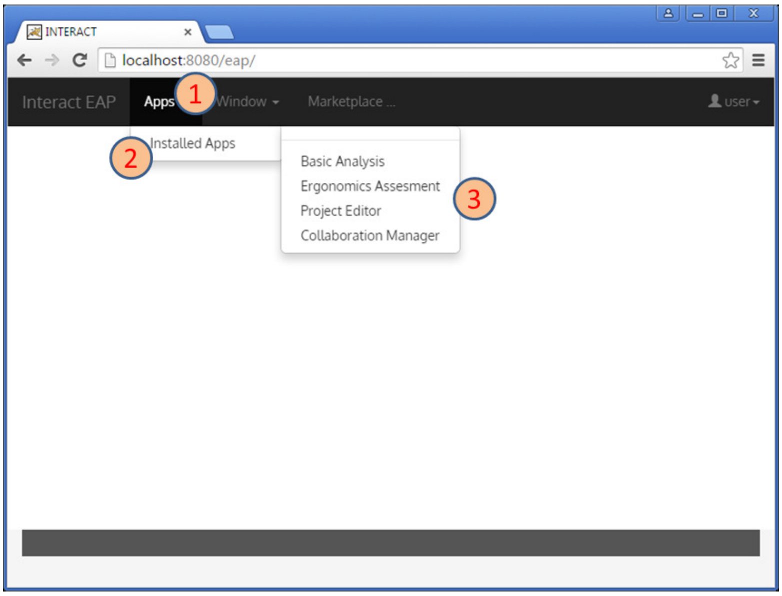
Showing 1 to 3 of 3 rows

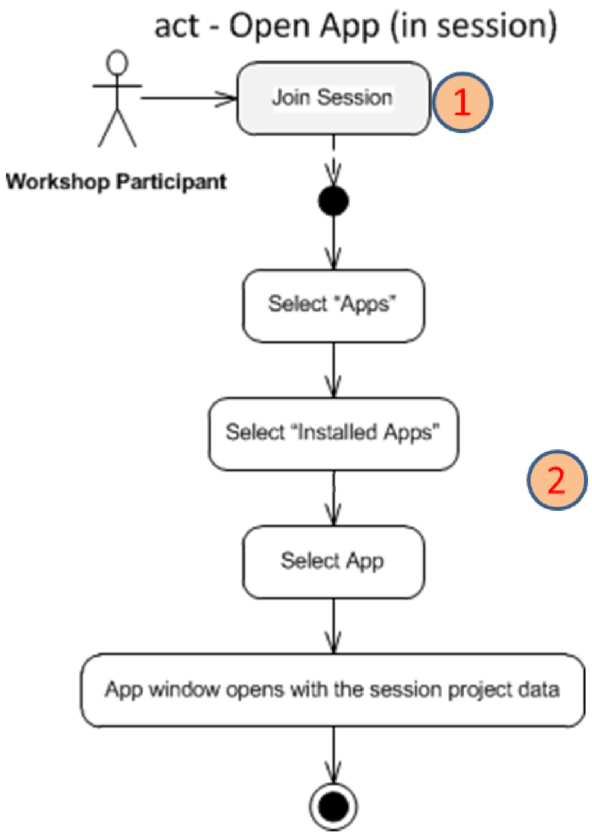

act – User Mgt – Edit Details
Input user "Name"
1
Input "Login Name"
2
Input "Password"
3
Input "Confirm Password"
4
Select Roles
5
Submit
6


AP User Management
Name
1
Login Name
2
Password
3
Password
Confirm Password
4
Confirm
Roles
None selected
5
Cancel
Submit
6

EAP User

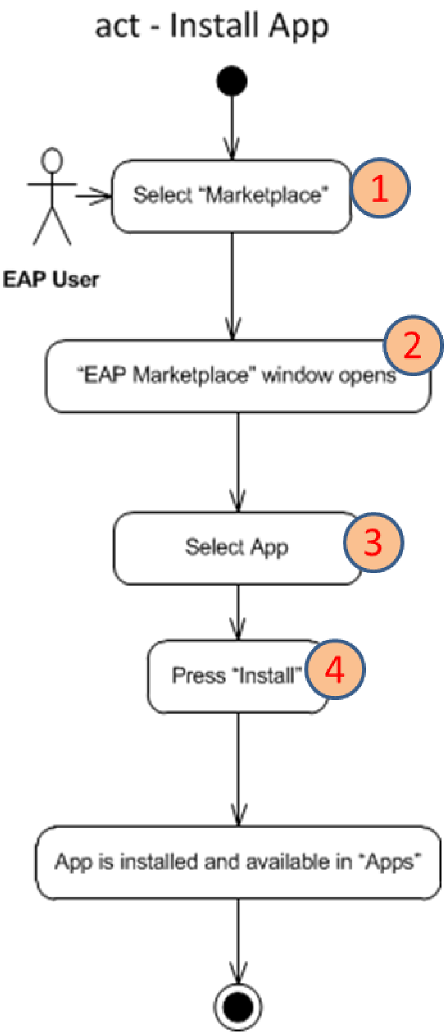

act - Open App
EAP User
Select "Apps"
1
Select "Installed Apps"
2
Select App
3
App window opens empty

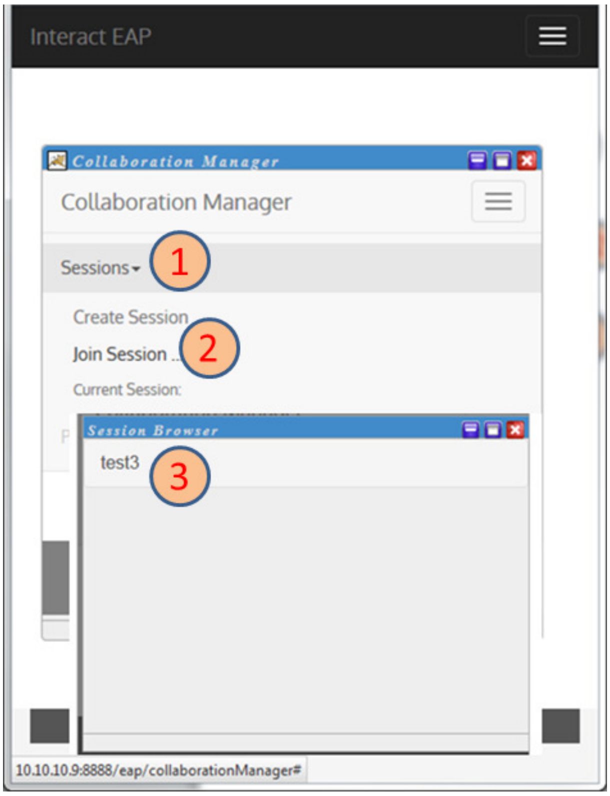

INTERACT
localhost:8080/eap/
Interact EAP
Apps
1
Window
Marketplace ...
user
Installed Apps
2
Basic Analysis
Ergonomics Assesment
Project Editor
Collaboration Manager
3

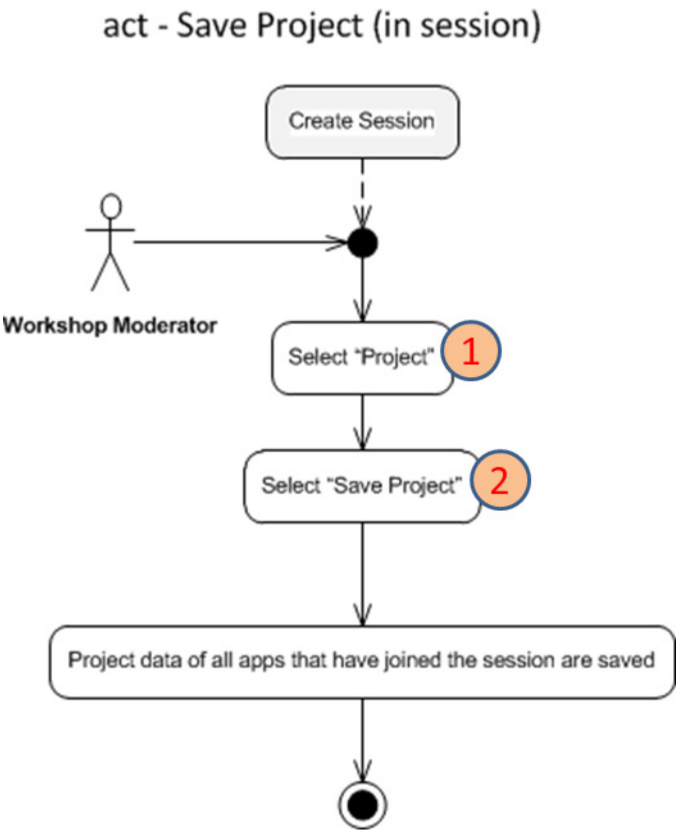


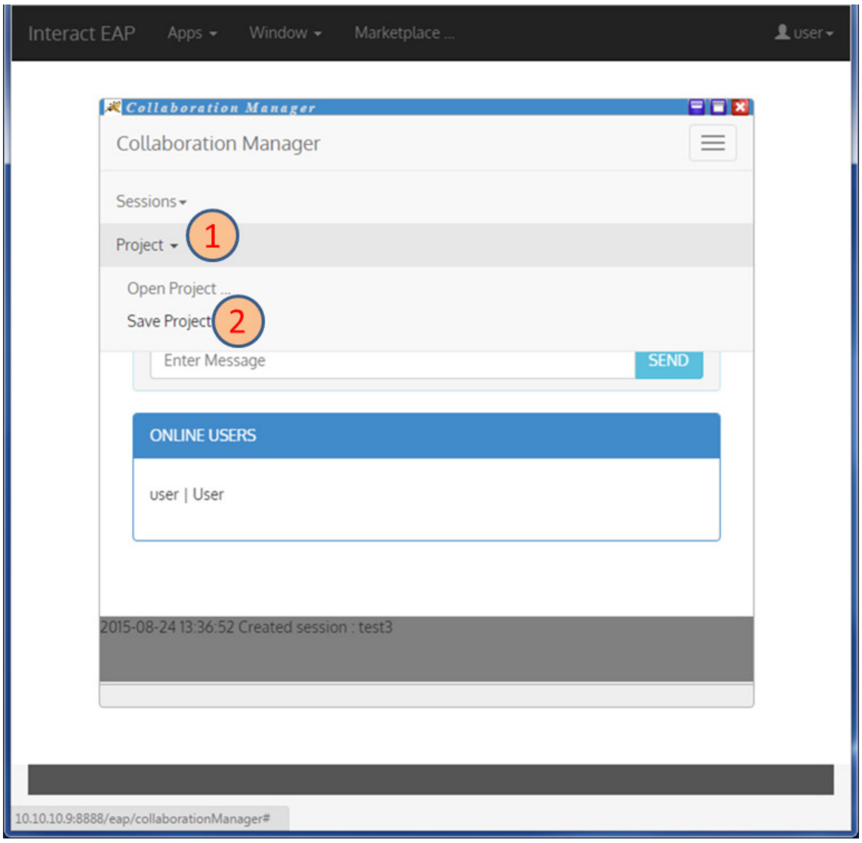
1 View "Join Session" diagram in Collaboration Manager Section

2 View "Open App" diagram in EAP User Section


act - Install App
EAP User
Select "Marketplace"
1
"EAP Marketplace" window opens
2
Select App
3
Press "Install"
4
App is installed and available in "Apps"


Interact EAP
Collaboration Manager
Collaboration Manager
Sessions
1
Create Session
Join Session ...
2
Current Session:
Session Browser
test3
3
10.10.10.9:8888/eap/collaborationManager#


act - Save Project (in session)
Create Session
Workshop Moderator
Select "Project"
1
Select "Save Project"
2
Project data of all apps that have joined the session are saved



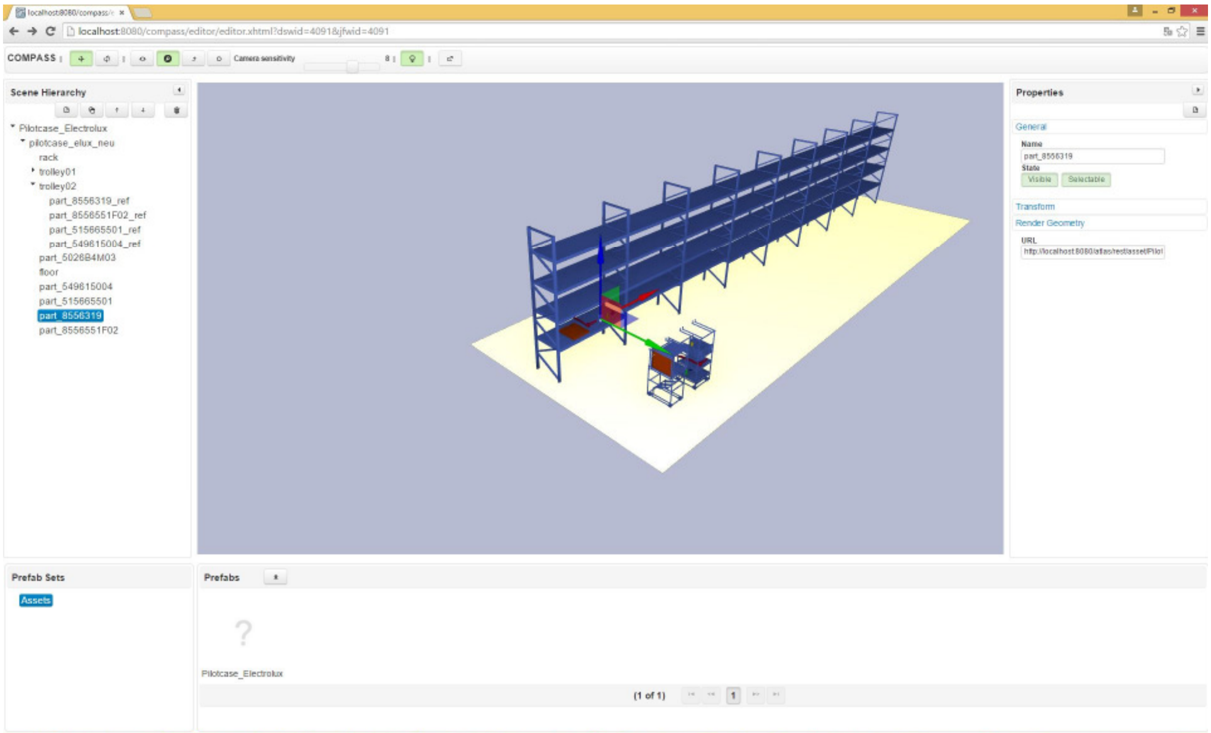
2015-08-24 13:36:52 Created session : test3

10.10.10.9:8888/eap/collaborationManager#

3.2. 3D Scene Editor

3.2.1. Application short description

The 3D scene editor is implemented as a web application using XML3D. It follows the standard CAD editor paradigm to enable construction and manipulation of scenes from existing 3D assets. The editor provides widgets to modify the position and orientation of scene graph nodes. Additionally the scene graph can be manipulated by adding or removing nodes which allows the combination of assets from multiple sources. Figure 10 shows a screenshot of the application.



localhost:8080/compass/editor/editor.xhtml?dswid=4091&jfwid=4091

Name: part_8556319

State: Visible Selectable

URL: http://localhost:8080/atlas/rest/asset/Pilot

Figure 10: 3D Scene editor with loaded scene. The translation widget is activated for a selected scene graph node.

The application is based on the pre-existing technology COMPASS[1] developed by the DFKI. COMPASS is a framework for collaborative Web applications that handles the logic for the scene manipulation on server side in a Java enterprise application server application and stores the scene graphs in a database. For the geometry the COMPASS makes use of an independent asset storage ATLAS[2]. This asset storage provides an import service for existing assets in the interchange format COLLADA.

The implementation as a Web application makes the editor platform independent. Additionally, the implementation of the logic in the backend enables collaboration in multiple views in the same scene. For use in other applications such as the 3D simulation, the scene graph and the asset database can be accessed using a REST-Interface. The 3D Editor uses an entity component model for the scene graph, which allows extension of the scene graph with additional metadata for future applications.

[1] https://github.com/dfki-asr/compass

[2] https://github.com/dfki-asr/atlas

3.2.2. Key application features

D1.3.1 listed in Section 4.1.2 required features for 3D Viewer. Features concerning the 3D editor are presented in the following table with an additional column to describe how these features are supported/implemented. Features concerning the 3D scene simulator are listed in Section 3.3.2.

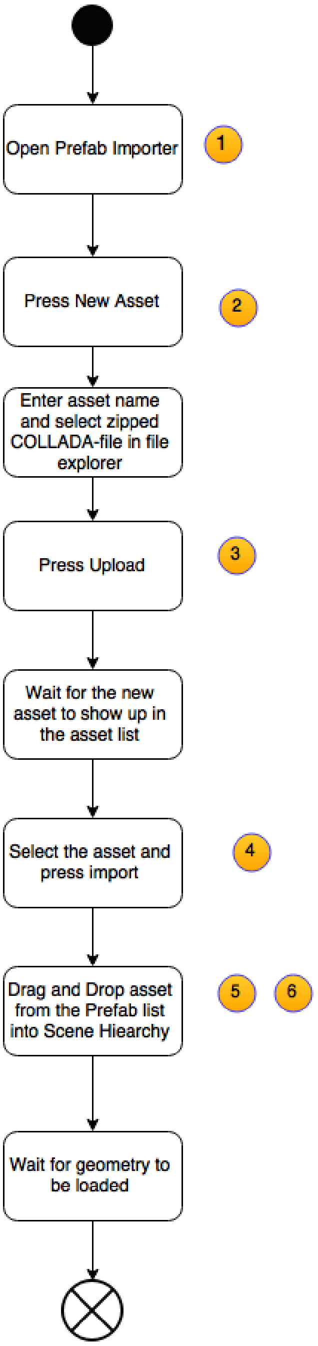
Need	**Feature**	**Support/Implementation**
Sophisticated rendering	Accurate, efficient	Supported by XML3D
Navigation (zoom, scroll, camera positioning)	User should be able to navigate intuitively though the scene	Supported in COMPASS
Interaction (delete, add)	User should be able to add and delete object in the scene dynamically	Supported in COMPASS
Standards	Able to deal with established standards	COLLADA import is supported in ATLAS
Collaboration	Synchronized presentation of models across multiple clients	Supported in COMPASS

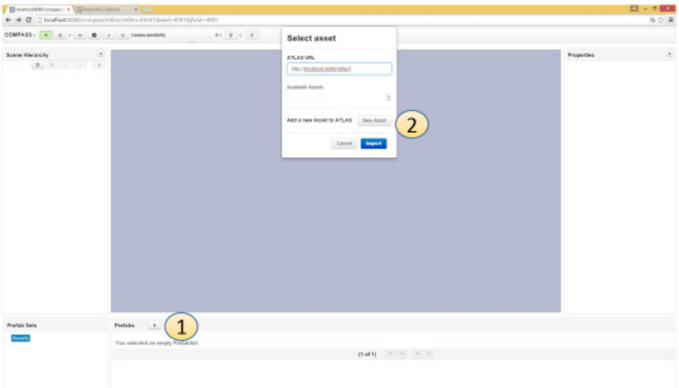
3.2.3. User interaction

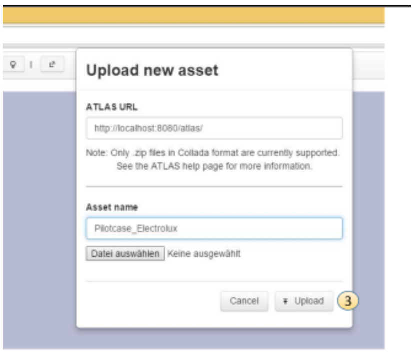
The application is based on the pre-existing technology COMPASS developed by the DFKI. In the following paragraphs only the new user interface that have been implemented to fulfil INTERACT requirements are presented. These interfaces support two activities:

- Asset import
- Metadata definition

Asset import


Open Prefab Importer
1
Press New Asset
2
Enter asset name and select zipped COLLADA-file in file explorer
Press Upload
3
Wait for the new asset to show up in the asset list
Select the asset and press import
4
Drag and Drop asset from the Prefab list into Scene Hiearchy
5
6
Wait for geometry to be loaded




Upload new asset

ATLAS URL

http://localhost:8080/atlas/

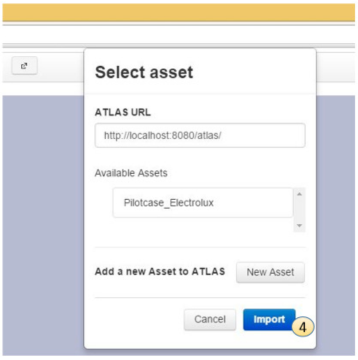
Note: Only .zip files in Collada format are currently supported. See the ATLAS help page for more information.

Asset name

Pilotcase_Electrolux

Datei auswählen Keine ausgewählt

Cancel Upload 3


Select asset

ATLAS URL

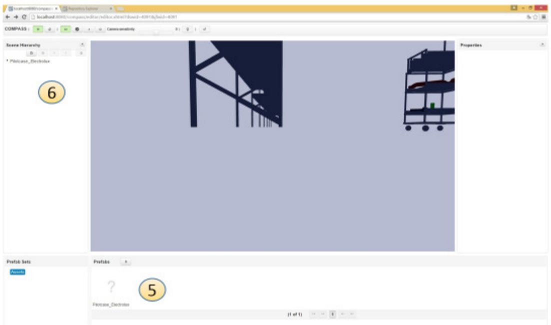
http://localhost:8080/atlas/

Available Assets

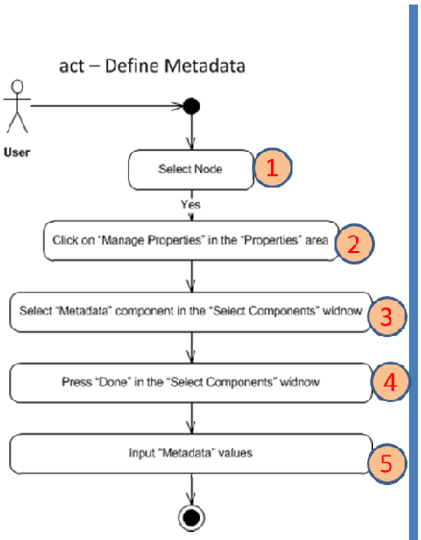
Pilotcase_Electrolux

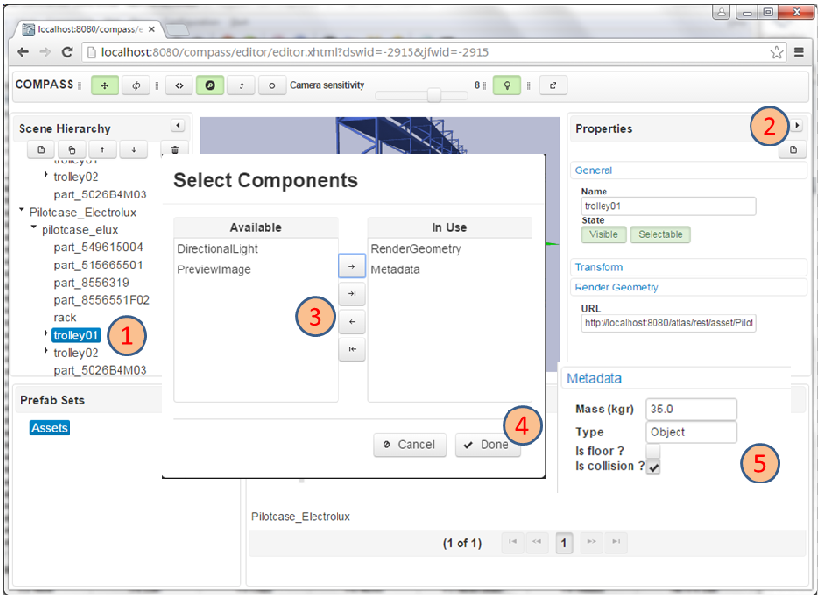
Add a new Asset to ATLAS New Asset

Cancel Import 4



Define Metadata


act – Define Metadata
User
Select Node
1
Yes
Click on "Manage Properties" in the "Properties" area
2
Select "Metadata" component in the "Select Components" widnow
3
Press "Done" in the "Select Components" widnow
4
Input "Metadata" values
5



Name: trolley01

State: Visible Selectable

URL: http://localhost:8080/atlas/rest/asset/Pilot

Mass (kgr): 35.0

Type: Object

Is floor ? □

Is collision ? ✓

3.3. 3D Scene Simulator

3.3.1. Application short description

The 3D scene simulator is a Web application based on XML3D that displays the final output of the simulation pipeline in the 3D scene for user validation. Figure 11 shows a screenshot of the 3D scene simulator replaying a simulation of a worker in the scene.

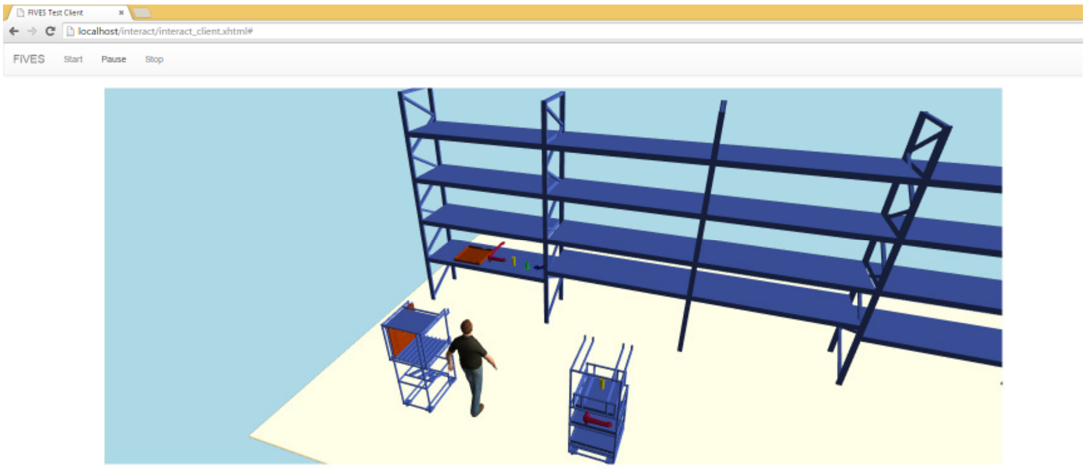


Figure 11: Screenshot of the 3D scene simulator with start, pause and stop buttons.

The simulator makes use of the pre-existing FiVES[3] middleware for efficient scene synchronization for real-time applications developed at the DFKI. The synchronization is implemented via Remote Procedure Calls based on WebSockets. The state of the simulation is stored in a central server. Web clients connected to the server can make changes to the state that are then synchronized across clients.

The simulation server provides an interface for the import of scenes from the 3D scene editor and an interface for the import of animations for digital human models in the BVH-format. The 3D Web application can playback BVH animations for the digital human models in the 3D scene and handles events for scene manipulation associated with keyframes of the animation, e.g. picking and placing objects. The simulation is displayed synchronously across multiple distributed web clients. User controls are restricted to replaying the simulation. For the validation of the simulation it provides a simple visualization of the constraints derived from the user Controlled Natural Language input. The simulation server also supports multiple animated digital human models for future extensions of the simulation pipeline.

3.3.2. Key application features

D1.3.1 Section 4.1.2 lists features required for 3D Viewer. Features concerning the simulator are presented in the following table with an additional column to describe how the simulator supports/implements these features. Features concerning scene editor are listed in section 3.2.2.

Need	Feature	Support/Implementation
Sophisticated rendering	Accurate, efficient	Supported by XML3D

[3] https://github.com/fives-team/FiVES

Navigation (zoom, scroll, camera positioning)	User should be able to navigate intuitively though the scene	Supported by XML3D
Animation	It must be possible to animate the scene, e.g. human model and assembly parts	Supported by XML3D
Collaboration	Synchronized presentation of models across multiple clients	Supported by FiVES
Mobile access	Run on different devices: smart phones, phablets4, tablets, PCs etc.	Display on mobile devices is possible in XML3D. Mobile interaction has not been implemented in the client.

3.3.3. User interaction

User interaction is rather simple and is restricted to start, pause and stop buttons to replay the pre-generated simulation. Additionally, the visualization of the constraints can be toggled. The content of the simulation is controlled from outside of the 3D simulation view.

[4] http://en.wikipedia.org/wiki/Phablet, A phablet is a class of mobile device designed to combine or straddle the functions of a smartphone and tablet.

3.4. Collaboration Manager

3.4.1. Application short description

The Collaboration Manager App provides the necessary functionality that enables collaborative workshops among several users. An EAP user, the workshop Moderator, may create a “Session” and other EAP users, workshop participants may “Join” the session using the Collaboration Manager app. Following all users, that have joined the session, share a common workspace and their apps utilize the data available on this common workspace without any other explicit intervention by the user. Moreover the Collaboration Manager App provides basic communication functionality – chat- among the workshop participants.

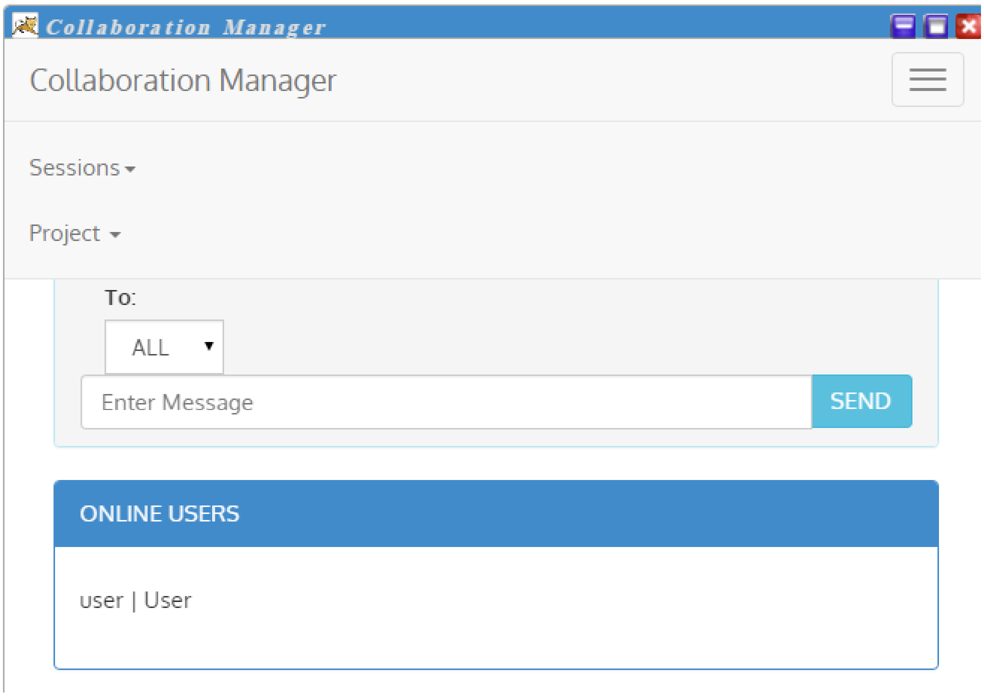


Figure 12: Collaboration manager main page

3.4.2. Key application features

In D1.3.1 there was a listing of features foreseen for Collaboration Manager app. These features are presented in the following table with one more additional column to describe how Collaboration Manager supported/implemented these features.

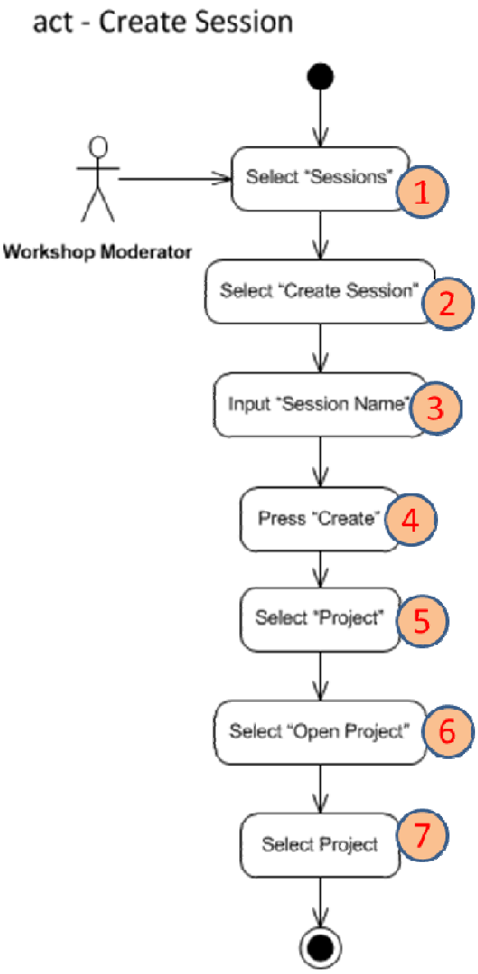
Need	Features	Support/implementation
Creation of a digital workplace.	Open sessions and browse opened sessions for joining in.	A user, moderator, Creates a Session for a project. All users that Join the Session have immediate and concurrent access to the same digital workspace.
Communication between participants of the digital workshop.	Synchronous (voice) and asynchronous (text messages) communication.	Basic chat functionality has been implemented. Voice communication functionality will not be provided.

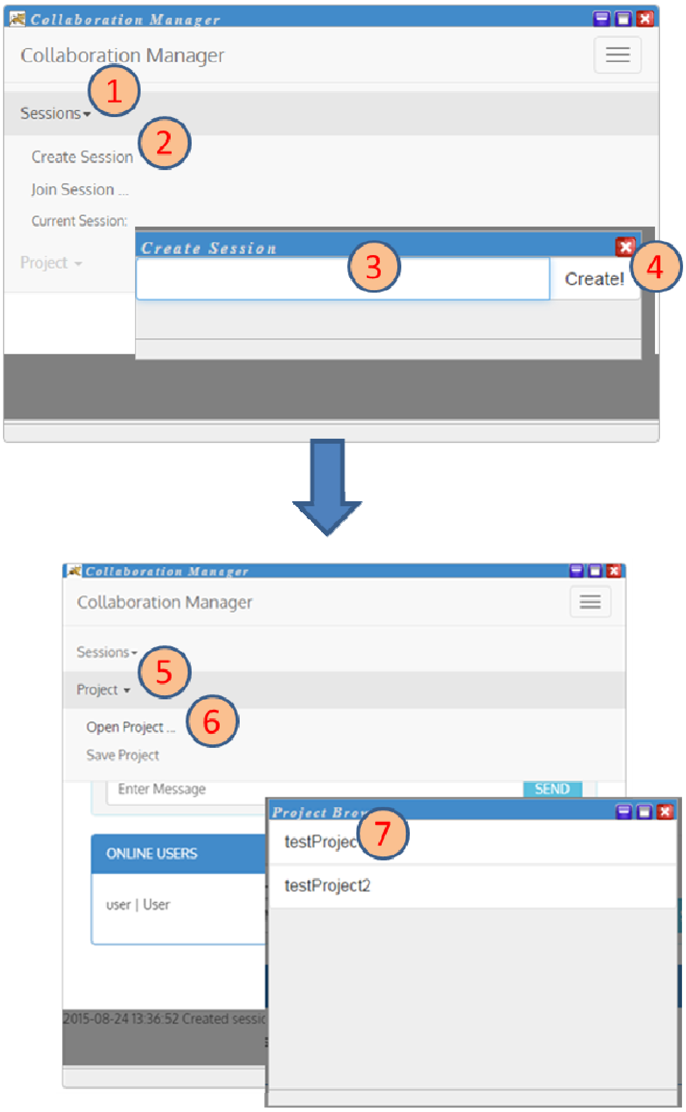
Show different variants of the same 3D model (i.e. a process variant or a different assembly sequence). Note: Variants are to be created from a separate application.	Project variant management. Select a Project (3D model aligned with a process) and a project's variant (a "tagged" instance of the model)	

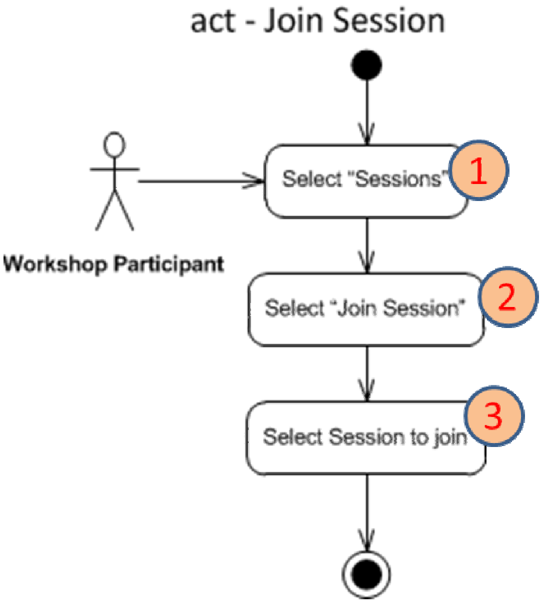
3.4.3. User interaction

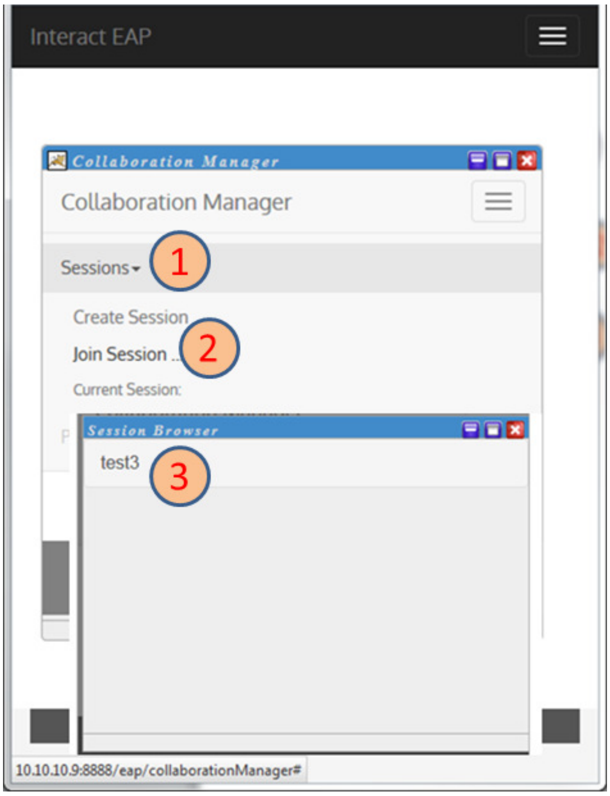
The key functions provided by the collaboration manager are:

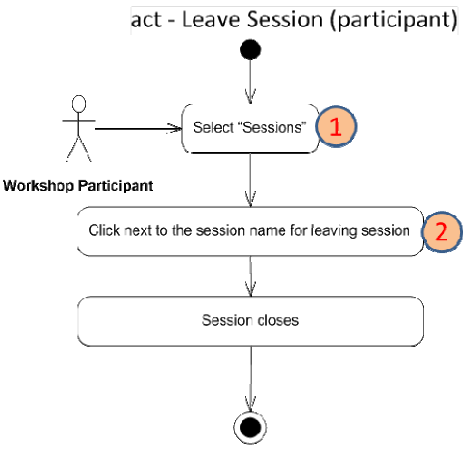
- Create a session (moderator)
- Join a session (participant)
- Logout/leave from a session (when the moderator logs out the session is deleted and all participants are automatically logged out)
- Communication –chat- among participants that have joined the session

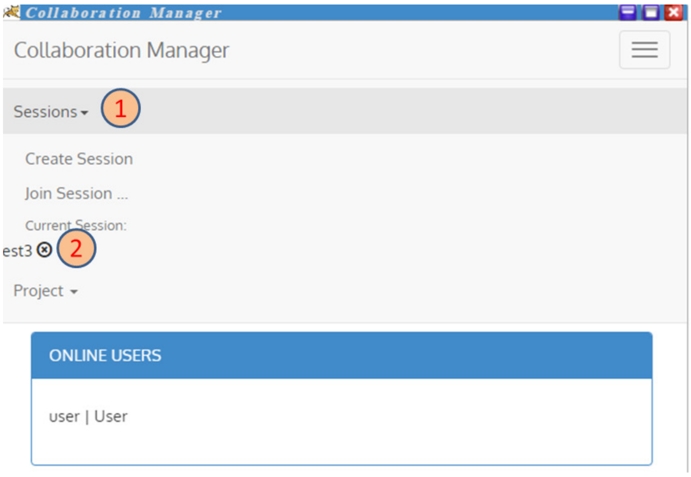

act - Create Session
Workshop Moderator
Select "Sessions" 1
Select "Create Session" 2
Input "Session Name" 3
Press "Create" 4
Select "Project" 5
Select "Open Project" 6
Select Project 7

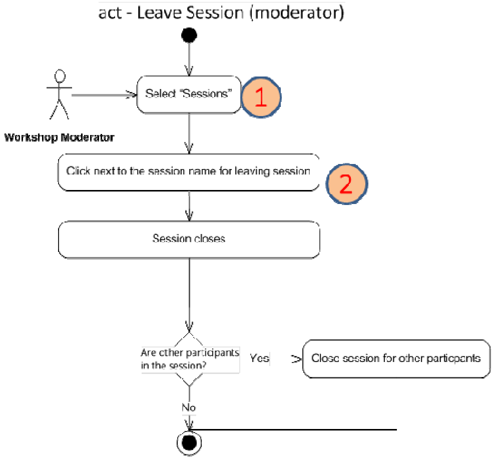

Collaboration Manager
Collaboration Manager
1
Sessions
2
Create Session
Join Session ...
Current Session:
Project
Create Session
3
Create!
4
Collaboration Manager
Collaboration Manager
Sessions
5
Project
Open Project ...
6
Save Project
Enter Message
SEND
Project Brow
7
testProjec
testProject2
ONLINE USERS
user | User
2015-08-24 13:36:52 Created sessio

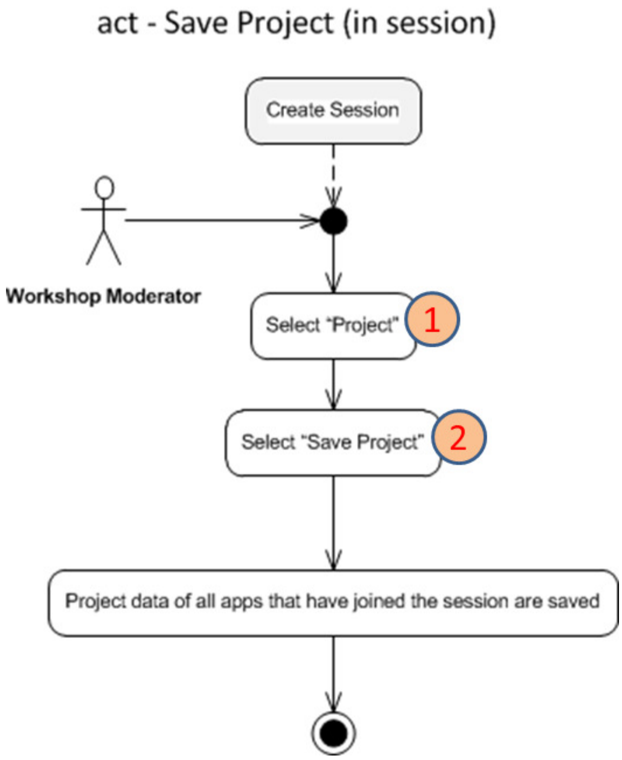

act - Join Session
Workshop Participant
Select "Sessions"
1
Select "Join Session"
2
Select Session to join
3

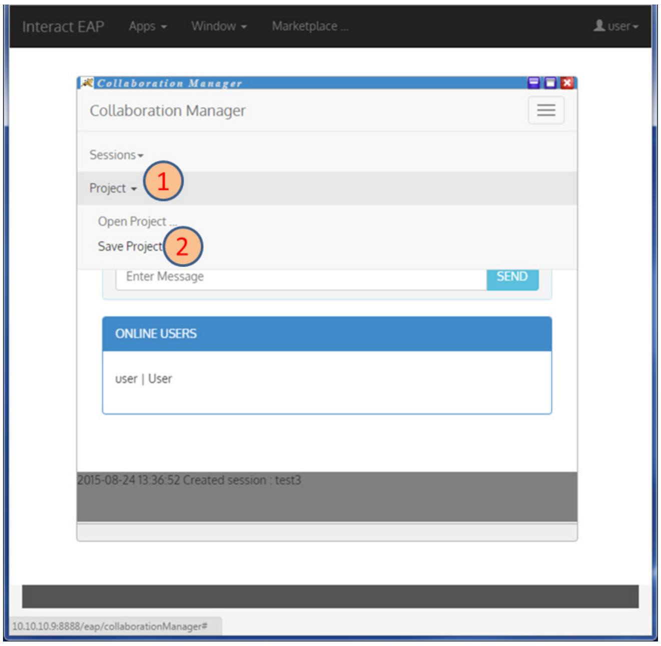

Interact EAP
Collaboration Manager
Collaboration Manager
Sessions
1
Create Session
Join Session ...
2
Current Session:
Session Browser
test3
3
10.10.10.9:8888/eap/collaborationManager#


act - Leave Session (participant)
Workshop Participant
Select "Sessions"
1
Click next to the session name for leaving session
2
Session closes


Collaboration Manager
Collaboration Manager
Sessions
1
Create Session
Join Session ...
Current Session:
est3
2
Project
ONLINE USERS
user | User


act - Leave Session (moderator)
Workshop Moderator
Select "Sessions"
1
Click next to the session name for leaving session
2
Session closes
Are other participants in the session?
Yes
Close session for other participants
No


act - Save Project (in session)
Create Session
Workshop Moderator
Select "Project"
1
Select "Save Project"
2
Project data of all apps that have joined the session are saved



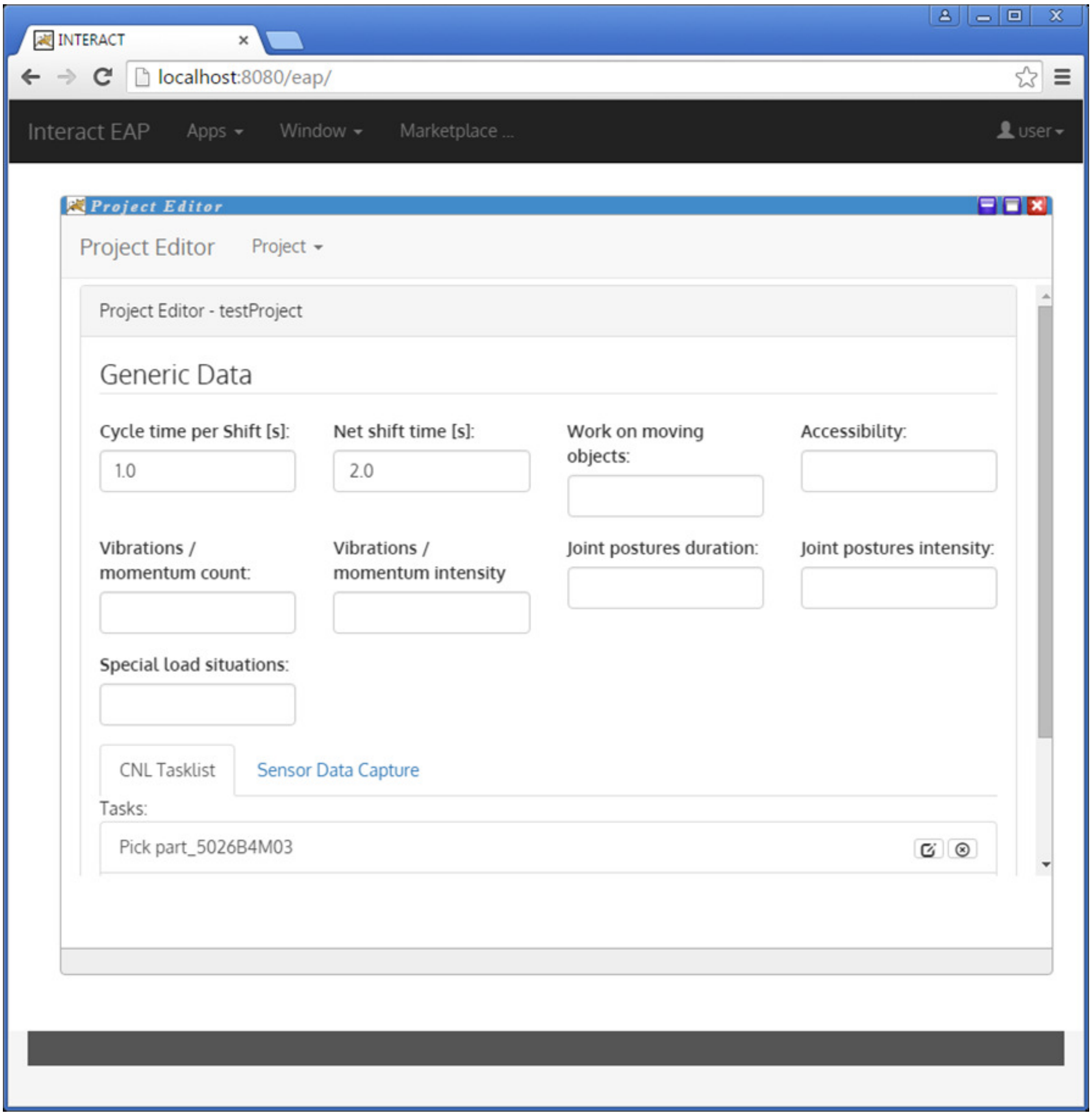
user | User

2015-08-24 13:36:52 Created session : test3

3.5. Project Editor

3.5.1. Application short description

The Project Editor app provides the necessary functionality to create and edit basic project data as well as CNL data. The project editor app, is practically the first app to be used when a process design and validation project starts.



Project Editor - testProject

Generic Data

Cycle time per Shift [s]: 1.0

Net shift time [s]: 2.0

Work on moving objects:

Accessibility:

Vibrations / momentum count:

Vibrations / momentum intensity

Joint postures duration:

Joint postures intensity:

Special load situations:

Tasks:

Pick part_5026B4M03

Figure 13: Project Editor main page.

3.5.2. Key application features

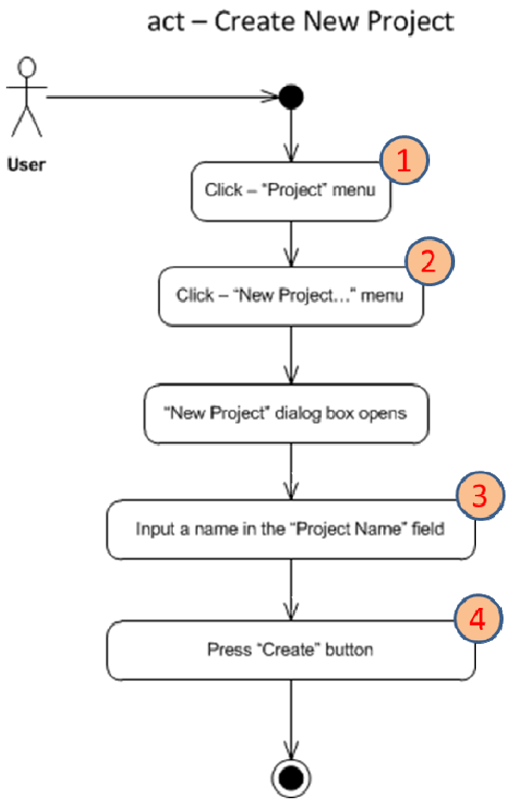
In D1.3.1 there was a listing of features foreseen for Project Editor app. These features are presented in the following table with one more additional column to describe how Project Editor App supported/implemented these features. It should be noted that since M06 the requirements for the project Editor app have been changed especially due to the implementation approach for 3D scene editor and 3D Simulation apps.

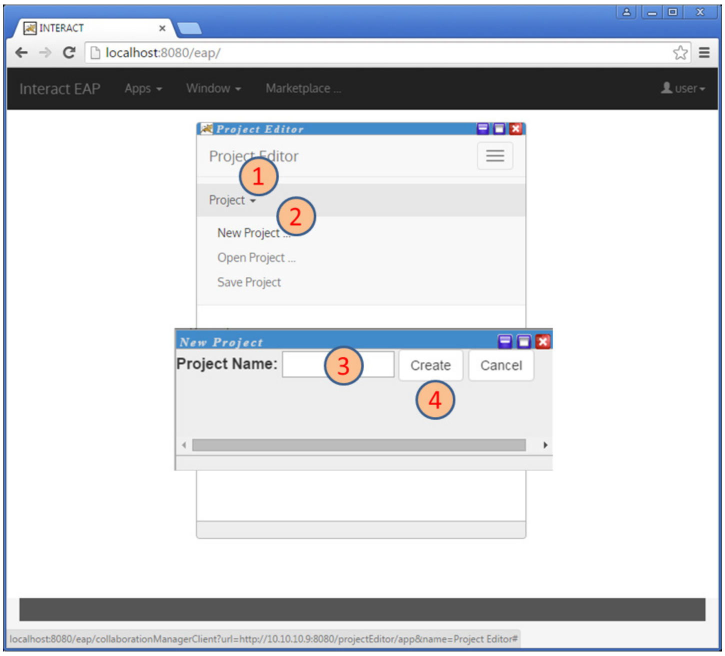
Need	Features	Support/implementation
Project management system.	Support of CRUD (Create, Read, Update, Delete) operations on projects.	These features are fully functional in M24 version.
Easy manipulation of a 3D scene.	Data Model editors • 3D Scene editor (Product / Resource) • Interaction using CNL • Process/Work Task editor (Natural language support) • Model editing from sensor captured data	• The 3D scene Editor is a separate app whole the 3D scene Editor app may load and save 3D scene data created by the Project Editor app. • The Project editor supports CNL tasks editing • The Project editor supports CNL task list editing • The Project editor supports interface for sensor data capture.
3D Motion Scene construction	3D scene construction from the data models (Product, Resources, CNL, captured data)	This functionality is part of the 3D Scene Editor and 3D Scene Simulation apps
Management of variants	Project variant management (basic version control functionalities)	

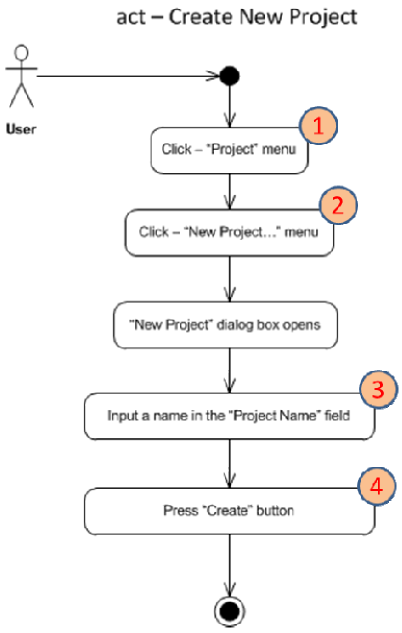
3.5.3. User interaction

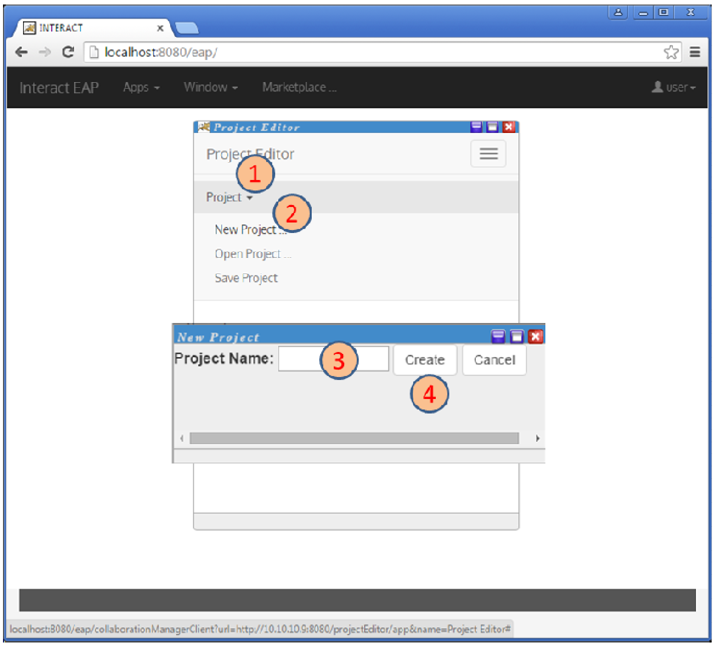
The project editor provides the following key functions to the user:

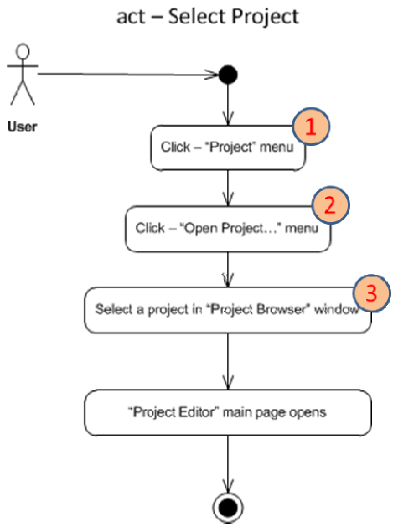
- Create, open delete a project in EAP.
- Edit/view generic project data
- Create/view/edit/delete CNL task-list.
- Create/view/edit/delete CNL tasks.
- Execute sensor data capture.

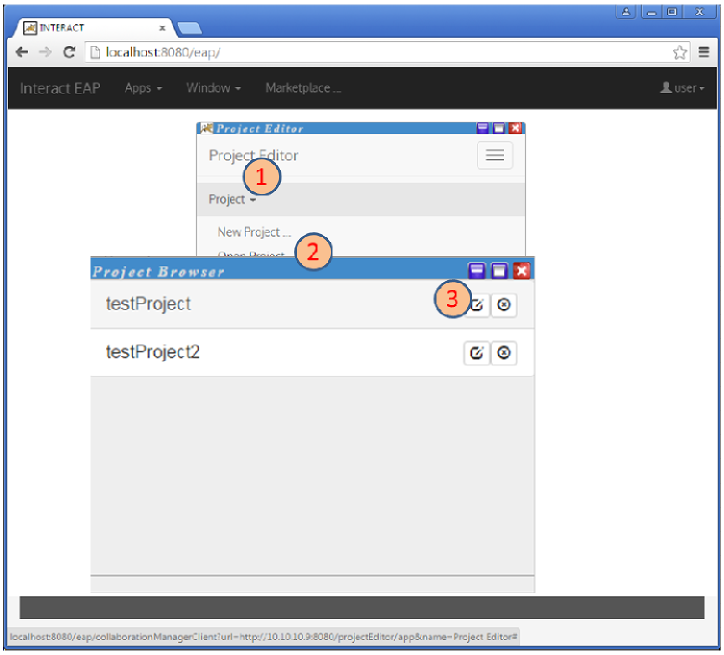

act – Create New Project
User
Click – "Project" menu
1
Click – "New Project…" menu
2
"New Project" dialog box opens
Input a name in the "Project Name" field
3
Press "Create" button
4


INTERACT
localhost:8080/eap/
Interact EAP
Apps
Window
Marketplace ...
user
Project Editor
Project Editor
1
Project
2
New Project ...
Open Project ...
Save Project
New Project
Project Name:
3
Create
Cancel
4
localhost:8080/eap/collaborationManagerClient?url=http://10.10.10.9:8080/projectEditor/app&name=Project Editor#

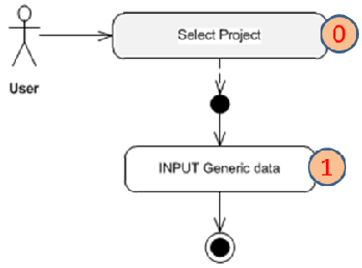

act – Create New Project
User
Click – "Project" menu
1
Click – "New Project…" menu
2
"New Project" dialog box opens
Input a name in the "Project Name" field
3
Press "Create" button
4


INTERACT
localhost:8080/eap/
Interact EAP
Apps
Window
Marketplace ...
user
Project Editor
Project Editor
1
Project
2
New Project ...
Open Project ...
Save Project
New Project
Project Name:
3
Create
Cancel
4
localhost:8080/eap/collaborationManagerClient?url=http://10.10.10.9:8080/projectEditor/app&name=Project Editor#

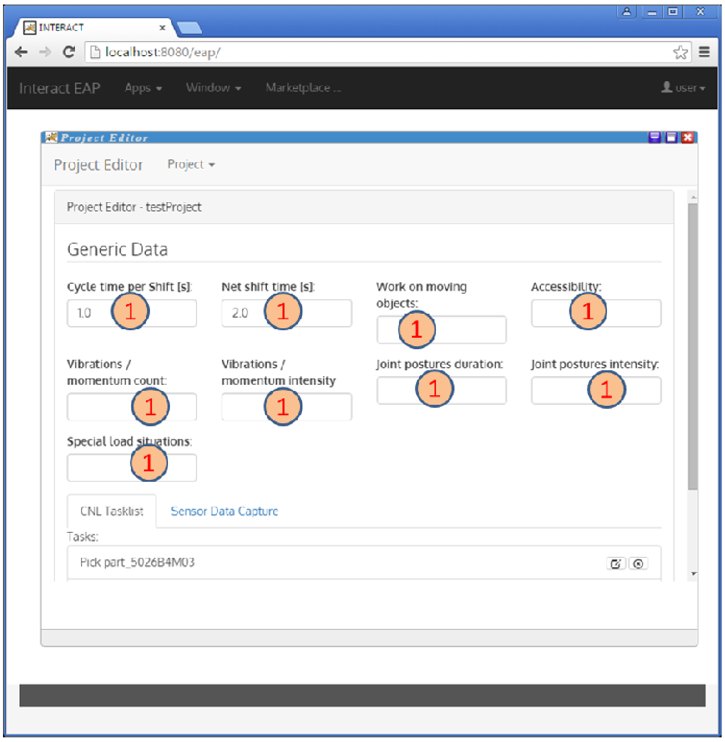

act – Select Project
User
1
Click – "Project" menu
2
Click – "Open Project…" menu
3
Select a project in "Project Browser" window
"Project Editor" main page opens


INTERACT
localhost:8080/eap/
Interact EAP
Apps
Window
Marketplace ...
user
Project Editor
Project Editor
1
Project
New Project ...
2
Project Browser
testProject
3
testProject2
localhost:8080/eap/collaborationManagerClient?url=http://10.10.10.9:8080/projectEditor/app&name=Project Editor#

act – Input Project Generic Data



0 Check “Select Project” diagram in Project Editor Section



Project Editor - testProject

Generic Data

Cycle time per Shift [s]: 1.0

Net shift time [s]: 2.0

Work on moving objects:

Accessibility:

Vibrations / momentum count:

Vibrations / momentum intensity

Joint postures duration:

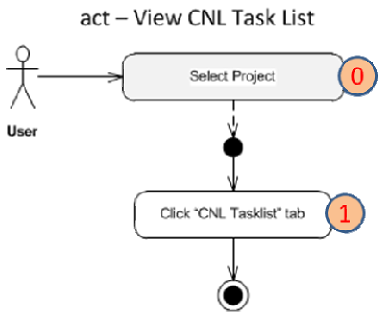
Joint postures intensity:

Special load situations:

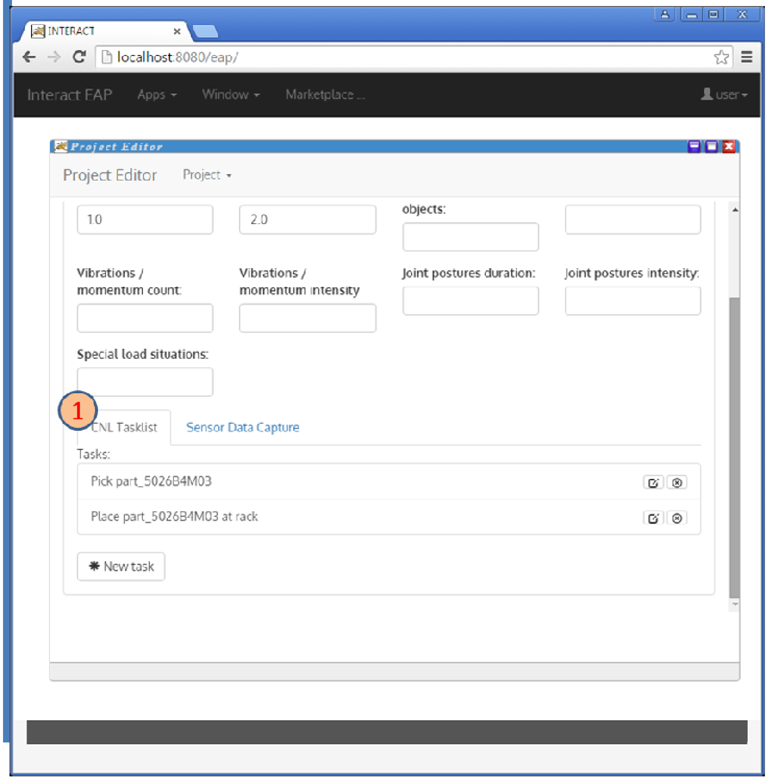
CNL Tasklist | Sensor Data Capture

Tasks:

Pick part_5026B4M03



0 Check "Select Project" diagram in Project Editor Section



10

2.0

objects:

Vibrations / momentum count:

Vibrations / momentum intensity

Joint postures duration:

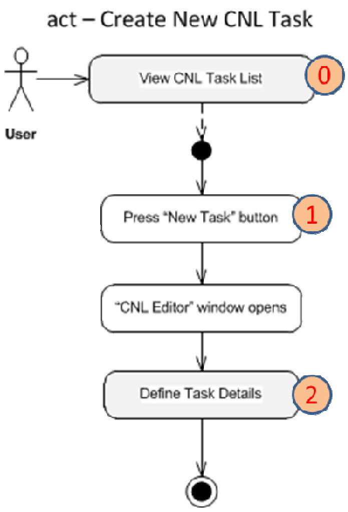
Joint postures intensity:

Special load situations:

Tasks:

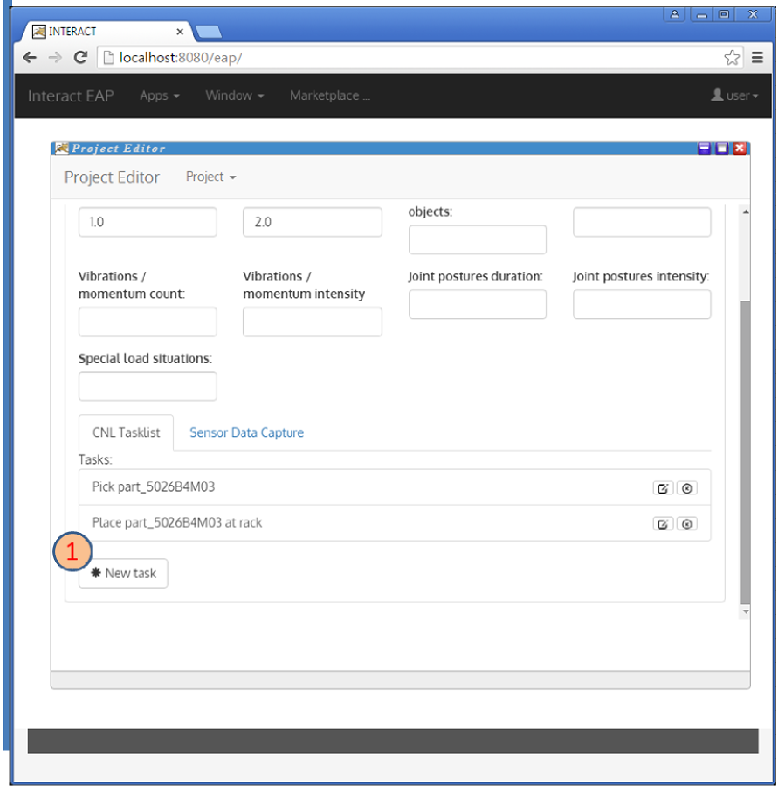
Pick part_5026B4M03

Place part_5026B4M03 at rack



0 Check "View CNL Task List" diagram in Project Editor Section

2 Check "Define Task Details" diagram in Project Editor Section



1.0

2.0

objects:

Vibrations / momentum count:

Vibrations / momentum intensity

Joint postures duration:

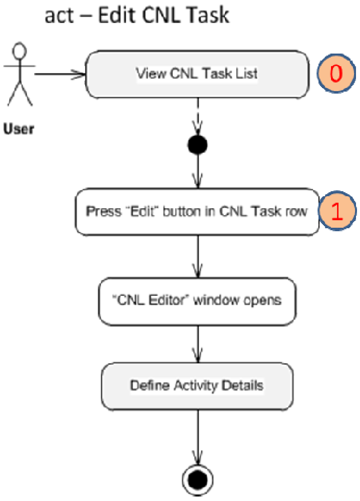
Joint postures intensity:

Special load situations:

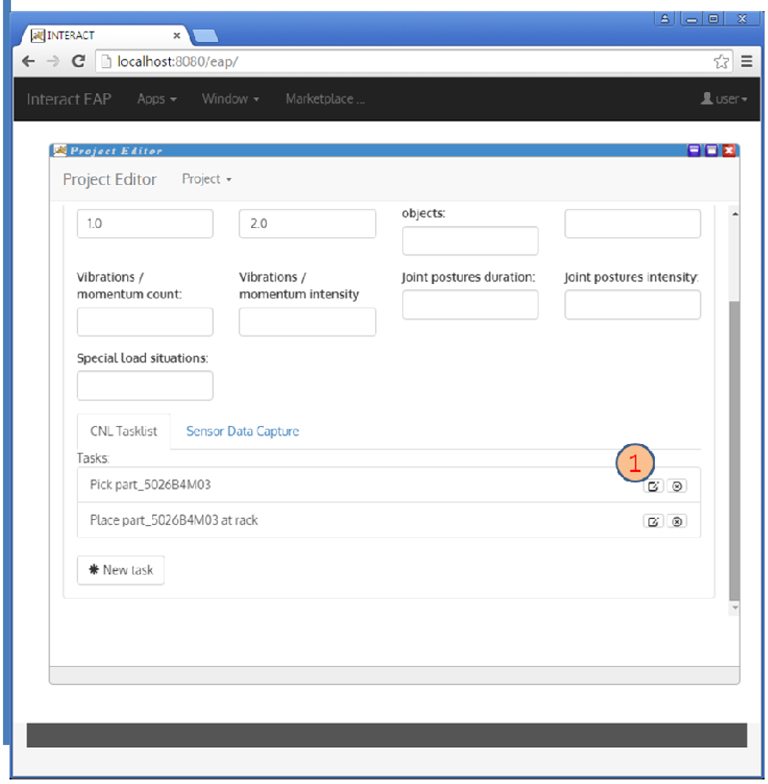
Tasks:

Pick part_5026B4M03

Place part_5026B4M03 at rack



0 Check "View CNL Task List" diagram in Project Editor Section



1.0

2.0

objects:

Vibrations / momentum count:

Vibrations / momentum intensity

Joint postures duration:

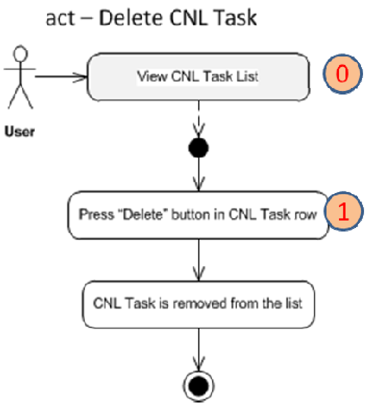
Joint postures intensity:

Special load situations:

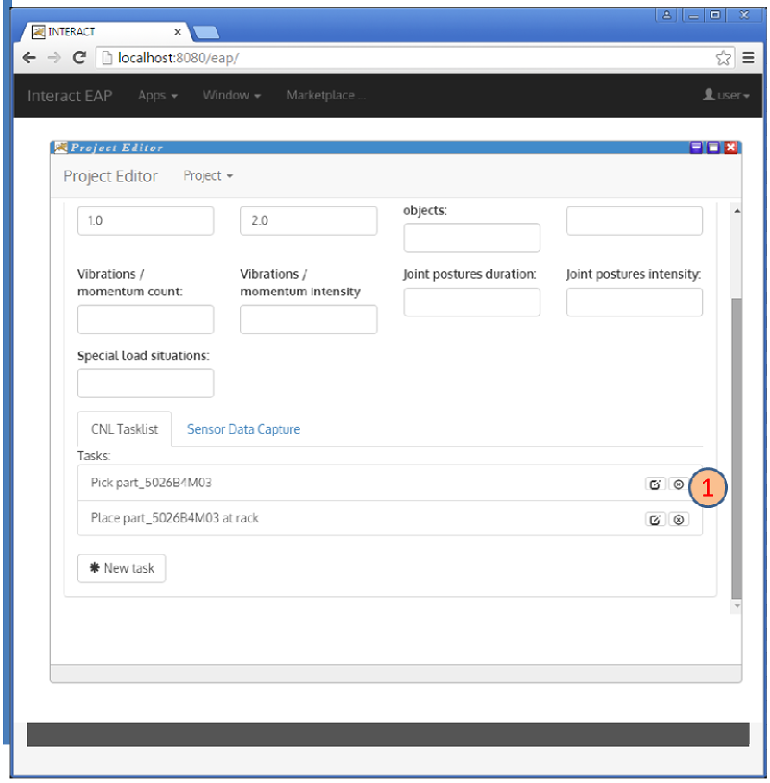
Tasks:

Pick part_5026B4M03

Place part_5026B4M03 at rack


act – Delete CNL Task
User
View CNL Task List
0
Press "Delete" button in CNL Task row
1
CNL Task is removed from the list

0 Check "View CNL Task List" diagram in Project Editor Section



1.0

2.0

objects:

Vibrations / momentum count:

Vibrations / momentum intensity

Joint postures duration:

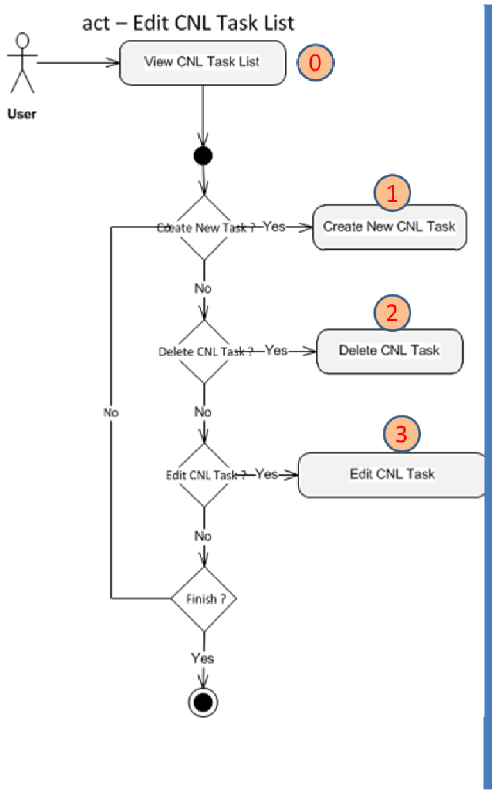
Joint postures intensity:

Special load situations:

Tasks:

Pick part_5026B4M03

Place part_5026B4M03 at rack

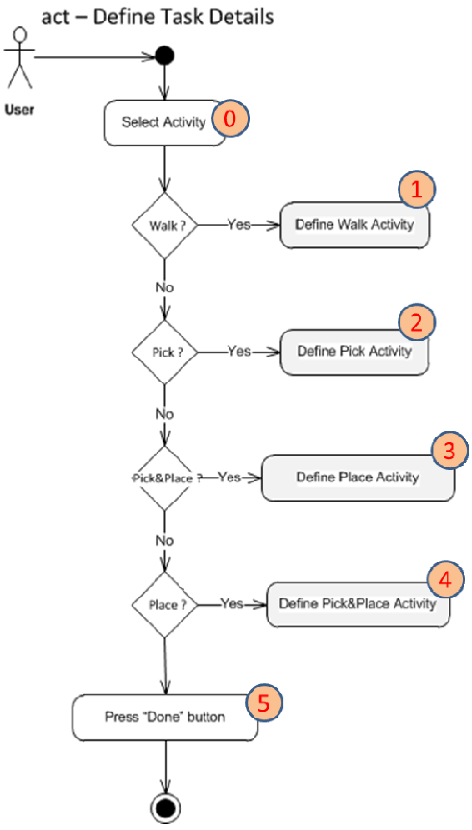


0 Check “View CNL Task List” diagram in Project Editor Section

1 Check “Create New CNL Task” diagram in Project Editor Section

2 Check “Delete CNL Task” diagram in Project Editor Section

3 Check “Edit CNL Task” diagram in Project Editor Section

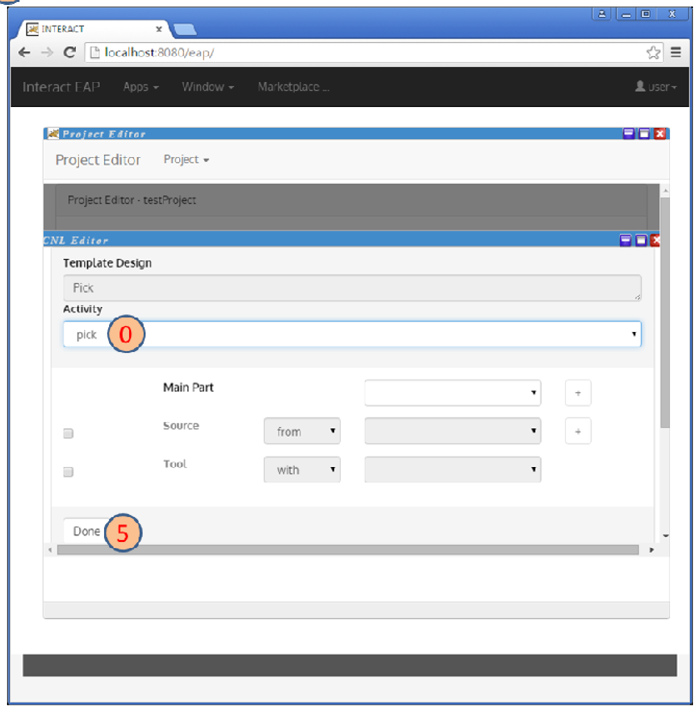


1 Check "Define Walk Activity" diagram in Project Editor Section

2 Check "Define Pick Activity" diagram in Project Editor Section

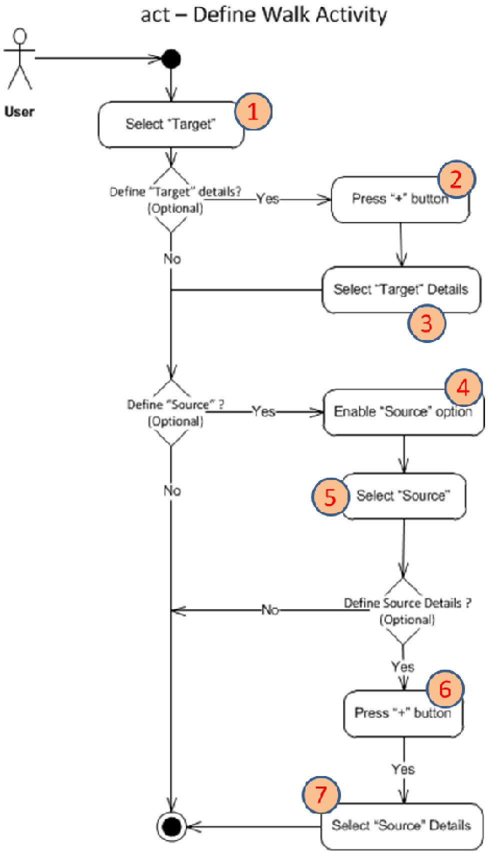
1 Check "Define Place Activity" diagram in Project Editor Section

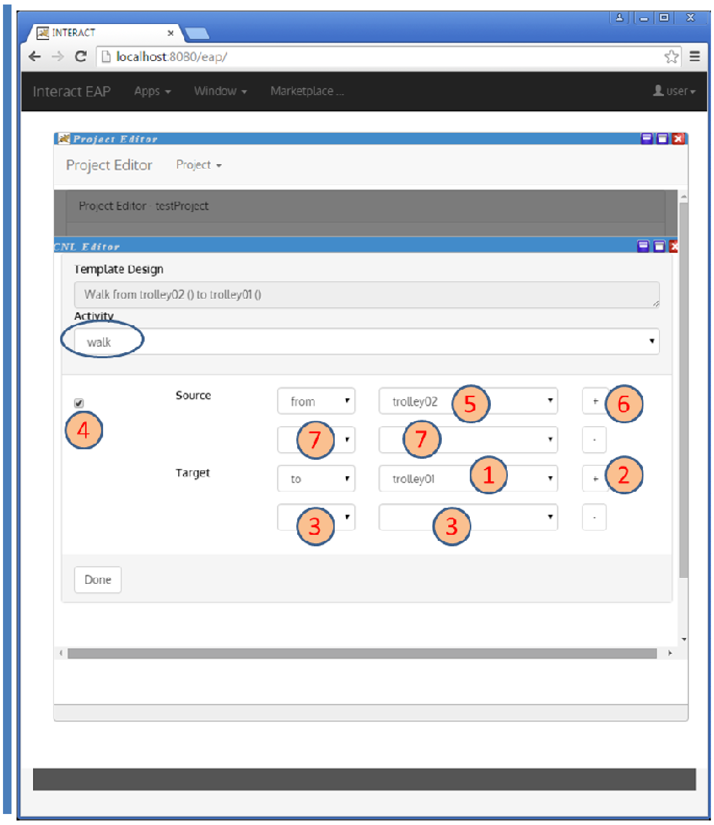
2 Check "Define Pick&Place Activity" diagram in Project Editor Section



Template Design: Pick

Activity: pick





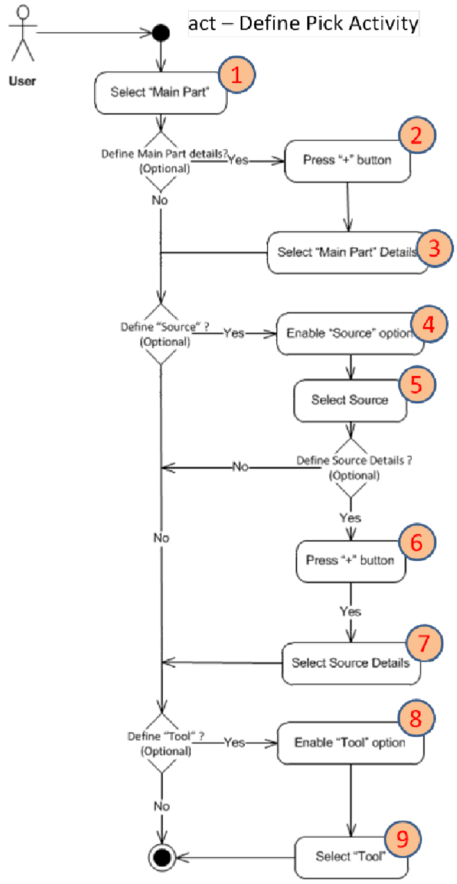
Template Design

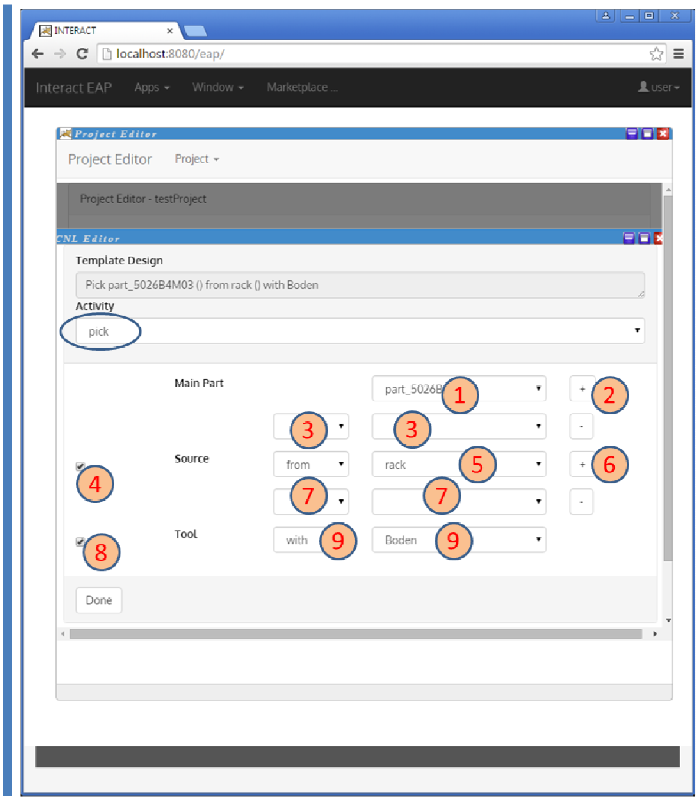
Walk from trolley02 () to trolley01 ()

Activity: walk

☑ Source: from trolley02 +

Target: to trolley01 +


act – Define Pick Activity
User
Select "Main Part"
1
Define Main Part details? (Optional)
Yes
No
Press "+" button
2
Select "Main Part" Details
3
Define "Source" ? (Optional)
Yes
Enable "Source" option
4
Select Source
5
Define Source Details ? (Optional)
No
Yes
No
Press "+" button
6
Yes
Select Source Details
7
Define "Tool" ? (Optional)
Yes
Enable "Tool" option
8
No
Select "Tool"
9



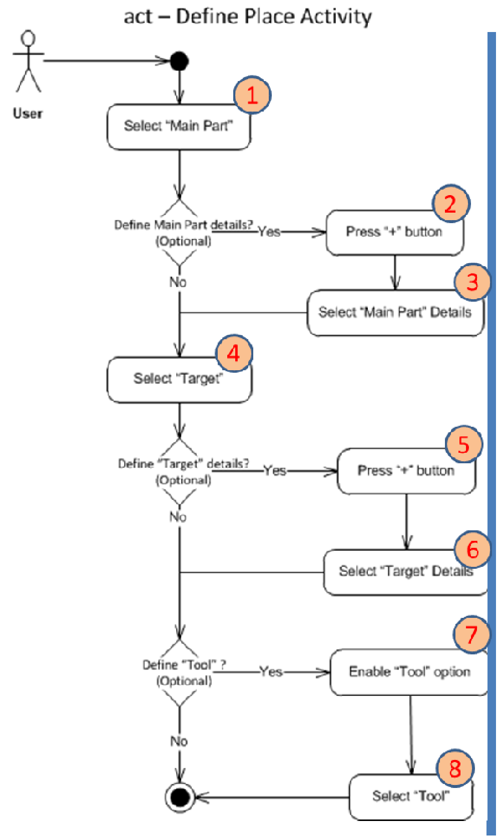
Template Design: Pick part_5026B4M03 () from rack () with Boden

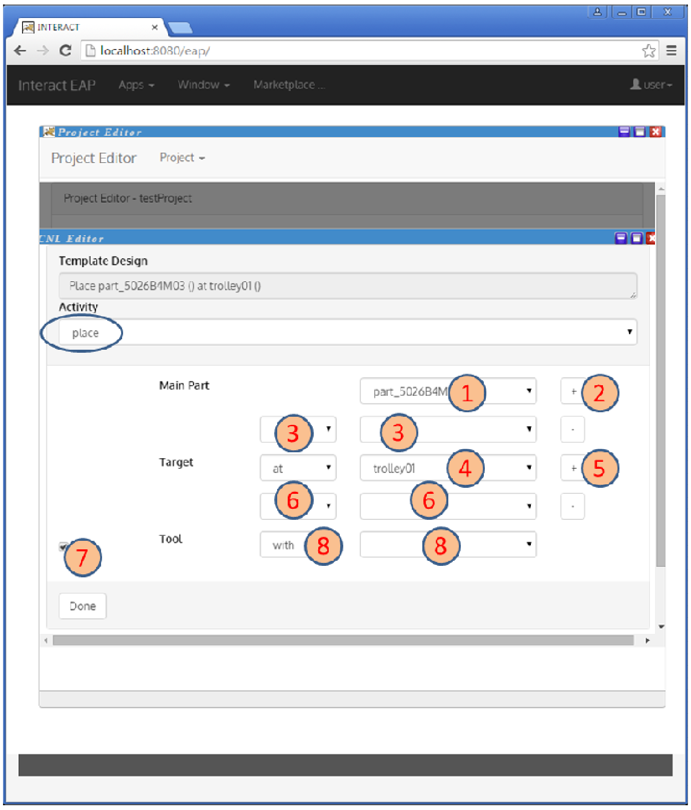
Activity: pick

Main Part: part_5026B

Source: from rack

Tool: with Boden





Template Design

Place part_5026B4M03 () at trolley01 ()

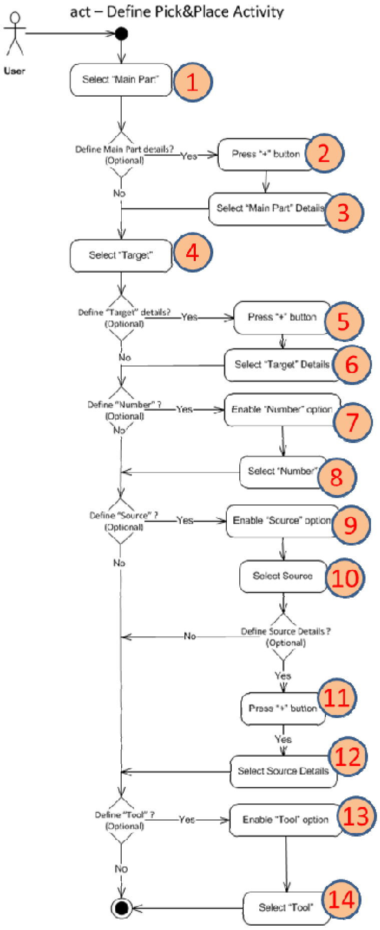
Activity

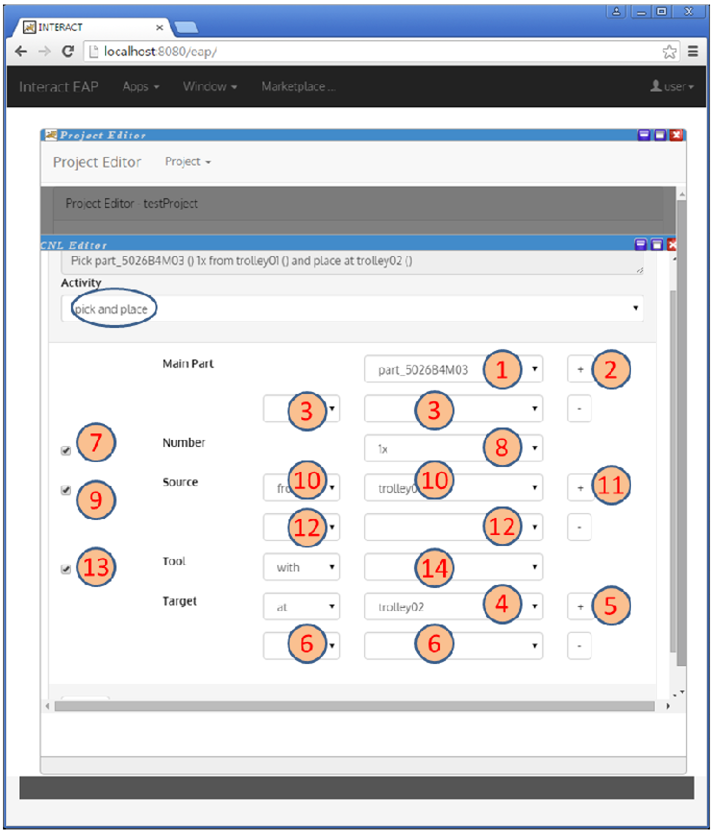
place

Main Part: part_5026B4M +

Target: at trolley01 +

Tool: with

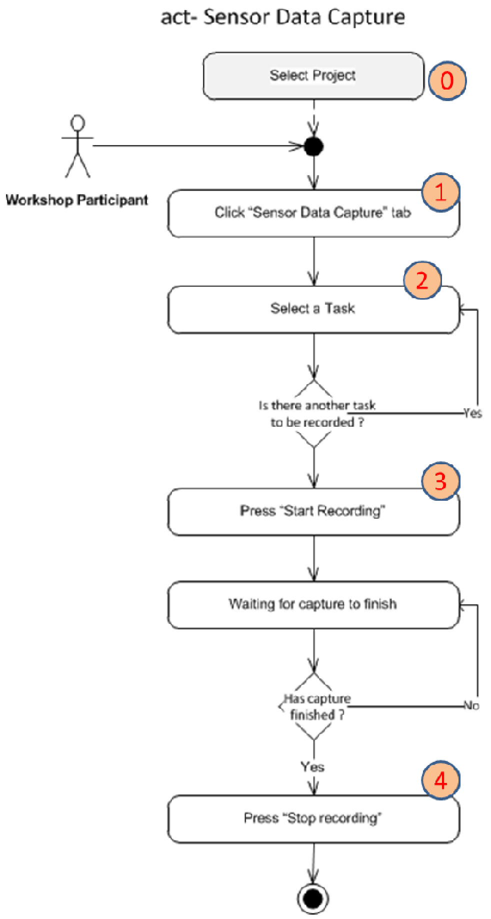




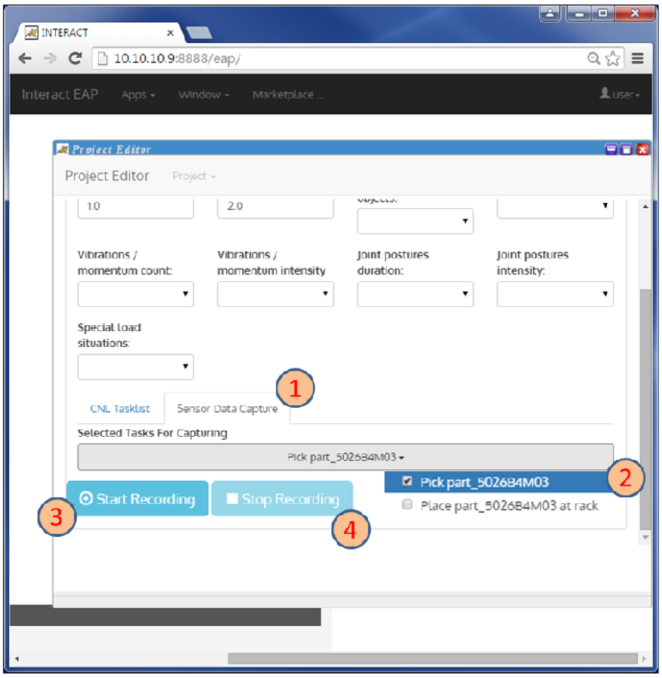
Pick part_5026B4M03 () 1x from trolley01 () and place at trolley02 ()

Activity: pick and place

Main Part		part_5026B4M03
☑ Number		1x
☑ Source	fro	trolley0
☑ Tool	with	
Target	at	trolley02



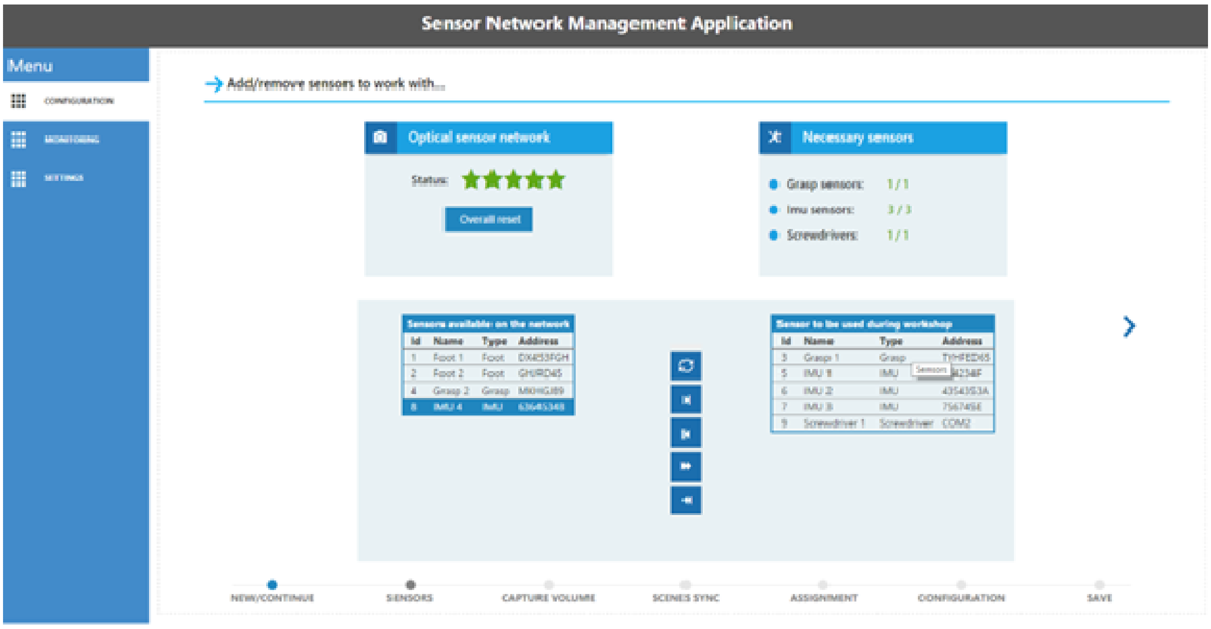
0 Check "Select Project" diagram in Project Editor Section



3.6. Sensor Network Management Application (SNMA)

3.6.1. Application short description

Sensor Network Management Application (SNMA) is one of the front-end applications of INTERACT platform. Main responsibilities of the application are to provide to end-user a GUI which allows preparing data capturing session along with sensors and scene management, configuration and monitoring. SNMAs communication with Aggregated DataStore, Sensor Management Platform (SMP) and other platform's applications is enabled through a HTTP REST interface.



- Grasp sensors: 1 / 1
- Imu sensors: 3 / 3
- Screwdrivers: 1 / 1

Sensors available on the network

Id	Name	Type	Address
1	Foot 1	Foot	DX453FGH
2	Foot 2	Foot	GH/RD45
4	Grasp 2	Grasp	MKHGJ89
8	IMU 4	IMU	636453[illegible]

Sensor to be used during workshop

Id	Name	Type	Address
3	Grasp 1	Grasp	TYHFED65
5	IMU 1	IMU	[illegible]J254F
6	IMU 2	IMU	43543S3A
7	IMU 3	IMU	756745E
9	Screwdriver 1	Screwdriver	COM2

Figure 14: Sensor Network lManagement Application overview

3.6.2. Key application features

In D1.3.1 there was a listing of features foreseen for application. These features are presented in the following table with one more additional column to describe how application is supporting/implementing these features.

Need	Features	Support/Implementation
Deployment speed	Intuitive, coherent and concise user interface, providing relevant default or previously saved configuration if possible	Implemented. Application based on a software wizard which consists of well-defined steps that makes application intuitive and consumer-oriented. Application is providing default configurations, choosing automatically sensors to take part in capturing session and providing possibility of continue or editing previously saved configurations.
Unification	Access to different sensors configuration from one standardized user interface	Implemented. User do not need any expert knowledge to finish configuration successfully.
Visualization	Simple visualization of configured parameters and status of sensors	Implemented.

	(devices)	Application enables raw data monitoring of sensors. It is also checking sensors availability on the network.
Mobile access	Run on different devices: smart phones, phablets, tablets, PCs etc.	Supported. Application implemented in use of javascript so only thing that is required is a web browser.
Privacy	Sensor data captured from real working environment should be protected with regards to privacy (e.g. consider deleting them after been processed and used for motion generation purposes)	Supported. Application has only access to raw monitoring data which is not stored within application in any way.

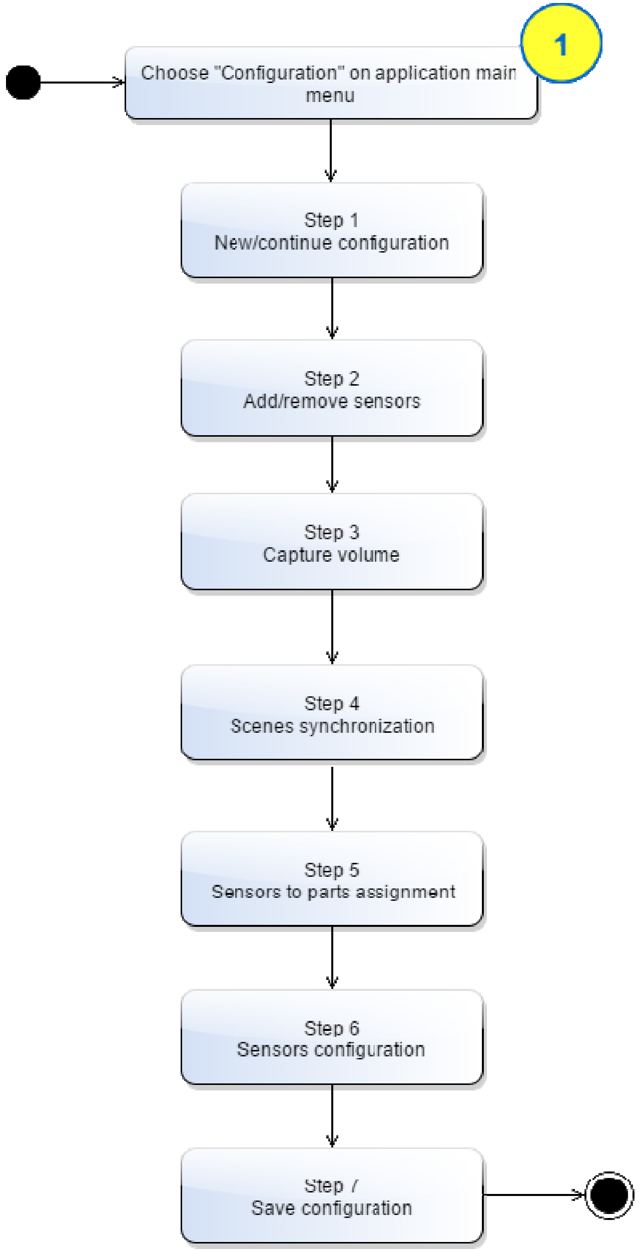
3.6.3. User interaction

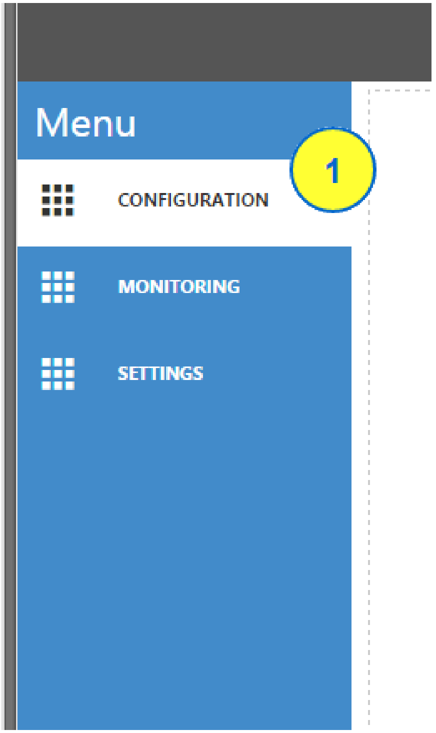
Application is prepared to be used by non-expert users.

In the next paragraphs key user activities and workflows of the user with the EAP platform are depicted.

.

Sensors configuration wizard Overall

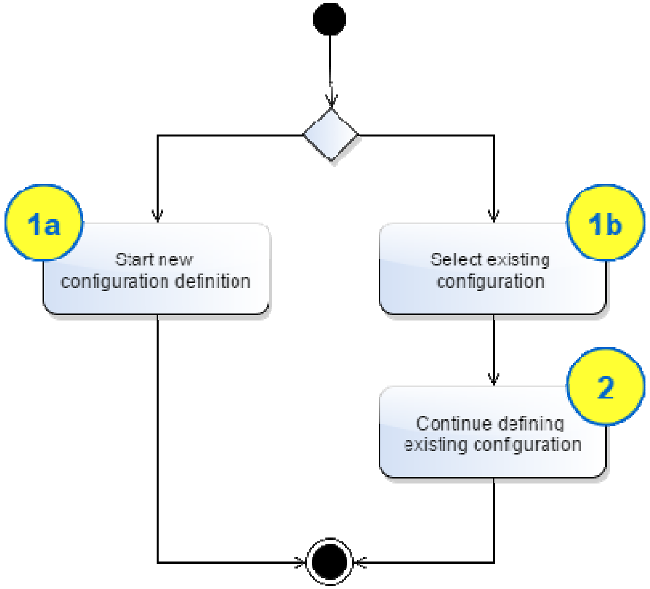


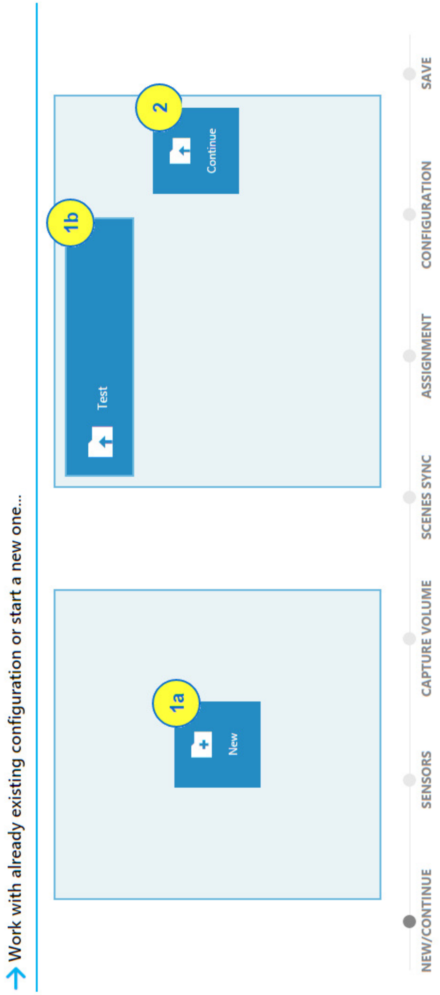


Sensors configuration is based on a software wizard (setup assistant). User will be dealing with a sequence of pages that lead him/her through a series of well-defined steps. Big advantage of this approach is the fact that tasks that are complex, infrequently performed, or unfamiliar may be easier to perform using a wizard. Another big advantage is the need for completion of the entire wizard so there will be no problems with incomplete setups. Wizards are the commonplace in most of consumer-oriented commercial systems.

Later in this document, each of the steps will be described in detail.

Sensors configuration wizard
Step 1
New/continue configuration


1a
Start new configuration definition
1b
Select existing configuration
2
Continue defining existing configuration



Loading:

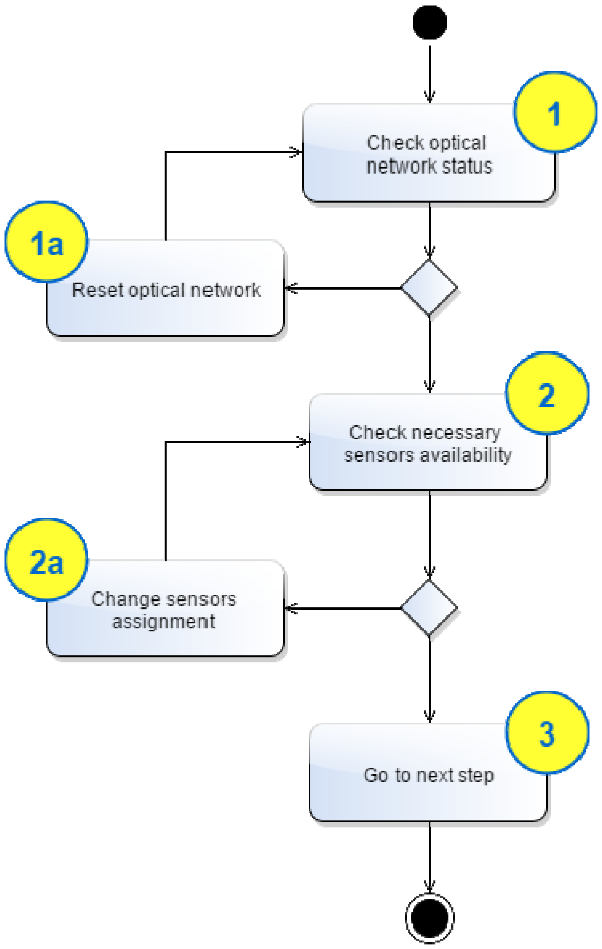
<u>1) Previously saved project sensors configurations (from EAP)</u>

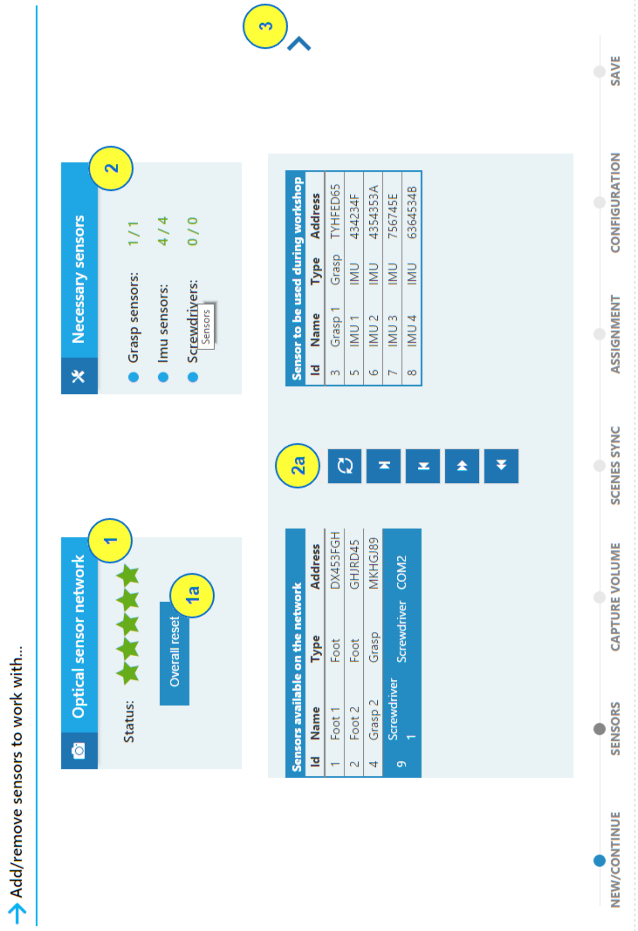
1. GET /data/get/domain-group-value/{domain}/{groupId}
   1.1. {domain}=SNMA_CONFIGURATION
   1.2. {groupId}= testProject2

Before next step:

1) Load new configuration schema or load previously saved configuration as current.

Sensors configuration wizard
Step 2
Add/remove sensors


1
Check optical network status
1a
Reset optical network
2
Check necessary sensors availability
2a
Change sensors assignment
3
Go to next step



Optical sensor network

Status: ★★★★★

Necessary sensors

- Grasp sensors: 1 / 1
- Imu sensors: 4 / 4
- Screwdrivers: 0 / 0

Sensors available on the network

Id	Name	Type	Address
1	Foot 1	Foot	DX453FGH
2	Foot 2	Foot	GHJRD45
4	Grasp 2	Grasp	MKHGJ89
9	Screwdriver 1	Screwdriver	COM2

Sensor to be used during workshop

Id	Name	Type	Address
3	Grasp 1	Grasp	TYHFED65
5	IMU 1	IMU	434234F
6	IMU 2	IMU	4354353A
7	IMU 3	IMU	756745E
8	IMU 4	IMU	63645348

Loading:

1) CNL task list (from EAP)

- GET /data/get/domain-group-value/{domain}/{groupId}
- {domain}=CNL_TASKLIST_OBJECTS
- {groupId}= project id

3. Optical network status (from SMP)

- GET /sensor/status/optical

4. Sensors avaliable in network (from SMP)

- GET /sensor/discover

Functionalities:

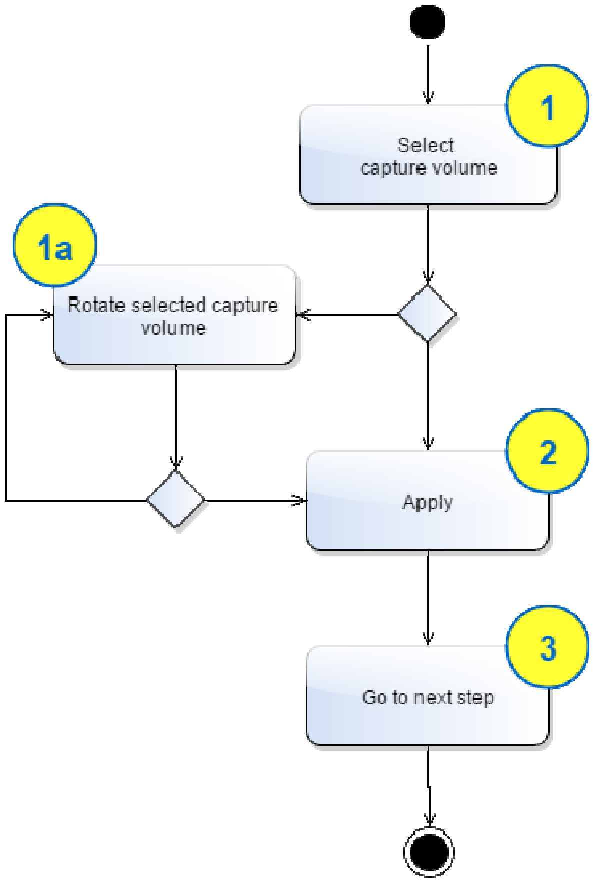
1) Reset optical sensors network (SMP)

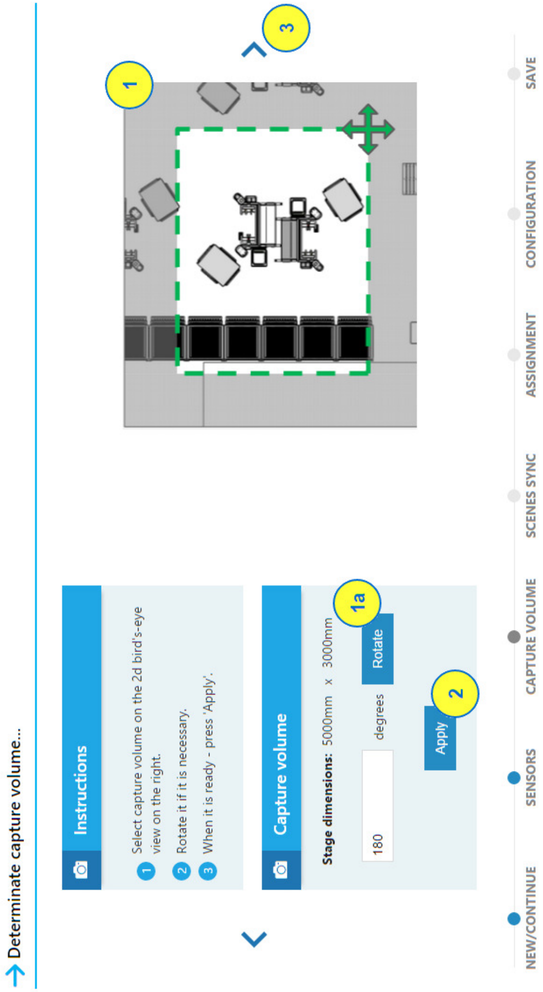
- GET /sensor/reset/optical

Before next step:

1) Save used sensors to project's sensors configuration

Step 3
Capture volume





Determinate capture volume...

Instructions

1. Select capture volume on the 2d bird's-eye view on the right.
2. Rotate it if it is necessary.
3. When it is ready - press 'Apply'.

Capture volume

Stage dimensions: 5000mm x 3000mm

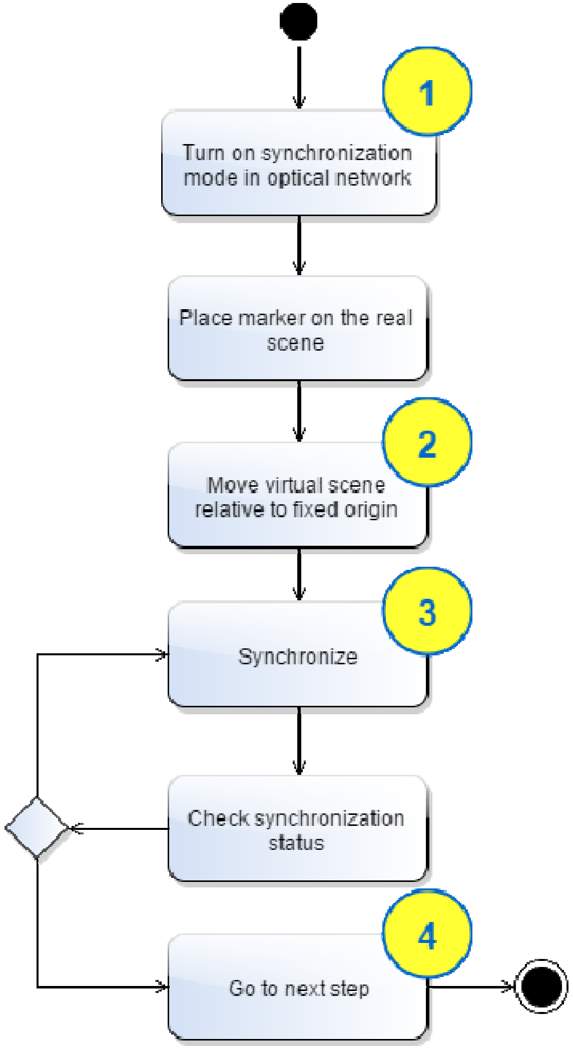
180 degrees

Functionality not ready yet.

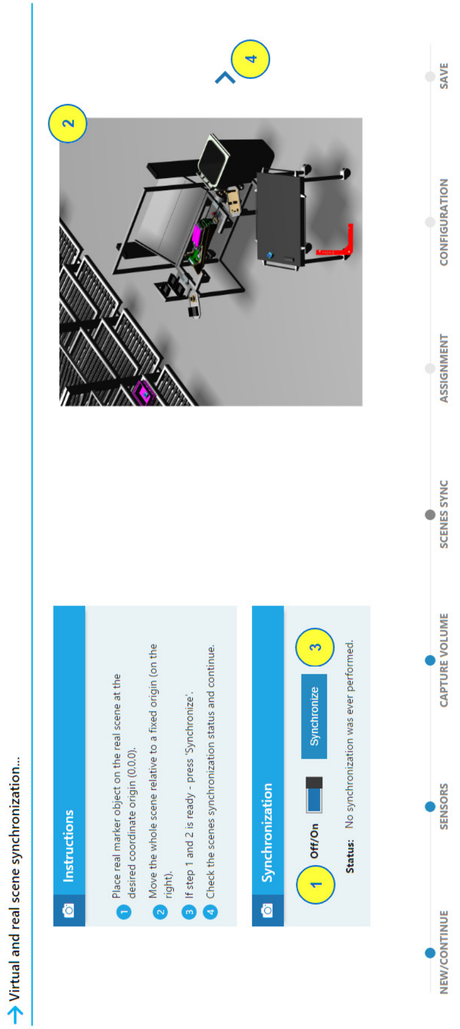
There should be a possibility to get 2d *bird's eye view of the scene.*

Before next step capture volume data *should be saved as part of project's sensors configuration.*

Sensors configuration wizard


1
Turn on synchronization mode in optical network
Place marker on the real scene
2
Move virtual scene relative to fixed origin
3
Synchronize
Check synchronization status
4
Go to next step

Sensors configuration wizard
Step 4
Scenes synchronization



Virtual and real scene synchronization...

Instructions

1. Place real marker object on the real scene at the desired coordinate origin (0,0,0).
2. Move the whole scene relative to a fixed origin (on the right).
3. If step 1 and 2 is ready - press 'Synchronize'.
4. Check the scenes synchronization status and continue.

Synchronization

Off/On

Synchronize

Status: No synchronization was ever performed.

Loading:

1) Invoke 3d scene application

Functionalities:

1) Get coordinates of virtual marker (EAP)

- GET /compass/resources/restv1/interact/toplevelscenenode?groupId={GROUPID}&scenenodeName={OBJECT_NAME}
  - {GROUPID} = project id
  - {OBJECT_NAME} = CoordinatesSynchObject

2) Enable real tracking mode (SMP)

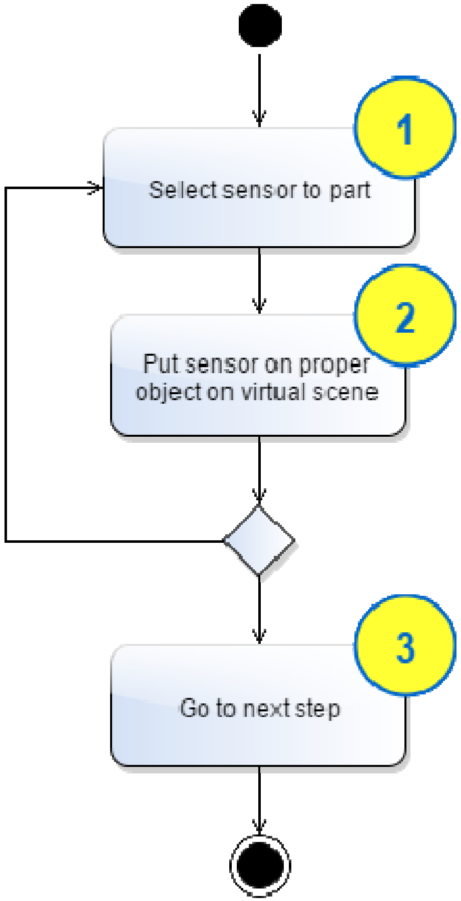
- GET /platform/syncmarkermode/start

3) Get coordinates of real marker (SMP)

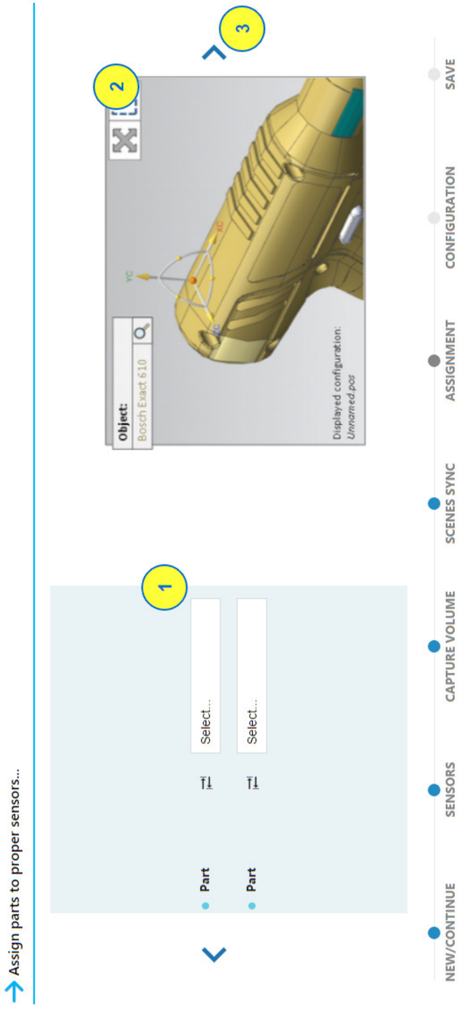
- GET /platform/syncmarkercoords

Before next step:

1) Scenes coordinates offset is saved as part of project's sensors configuration.



Sensors configuration wizard Step 5 Sensors to parts assignment



Loading:

1) Invoke 3d scene application
2) CNL Tasklist (step 2)
3) Online sensors (step 2)

Functionalities:

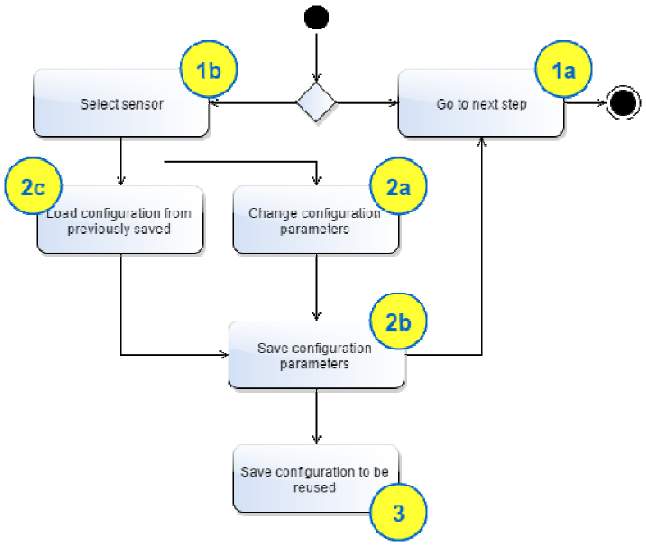
1) Get coordinates of virtual sensor attached to part (EAP)

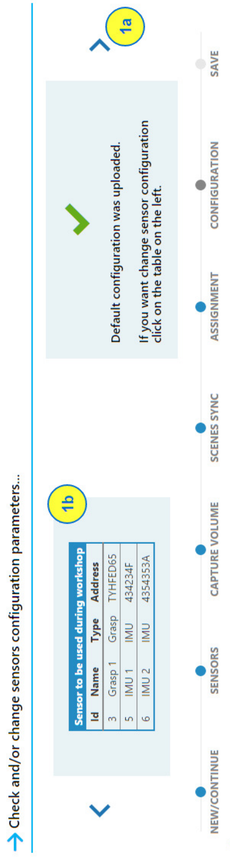
- *not established yet*

Before next step:

1) Sensors and parts assignment saved as part of project's sensors configuration.

Sensors configuration wizard
Step 6
Sensors configuration

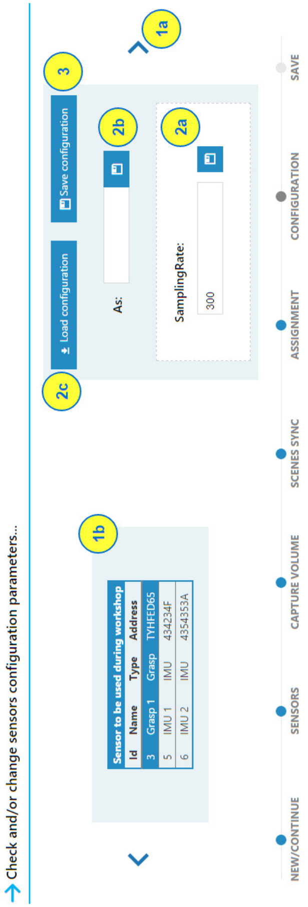

Select sensor
1b
Go to next step
1a
2c
Load configuration from previously saved
Change configuration parameters
2a
Save configuration parameters
2b
Save configuration to be reused
3


Check and/or change sensors configuration parameters...

Default configuration was uploaded.

If you want change sensor configuration click on the table on the left.

Sensor to be used during workshop			
Id	Name	Type	Address
3	Grasp 1	Grasp	TYHFED65
5	IMU 1	IMU	434234F
6	IMU 2	IMU	4354353A


Check and/or change sensors configuration parameters...

Sensor to be used during workshop			
Id	Name	Type	Address
3	Grasp 1	Grasp	TYHFED65
5	IMU 1	IMU	434234F
6	IMU 2	IMU	4354353A

SamplingRate: 300

As:

Loading:
1) Online sensors (step 2)
2) Load default sensor's configuration (functionality 2)

Functionalities:
1) Save sensor's configuration to be reused (EAP)

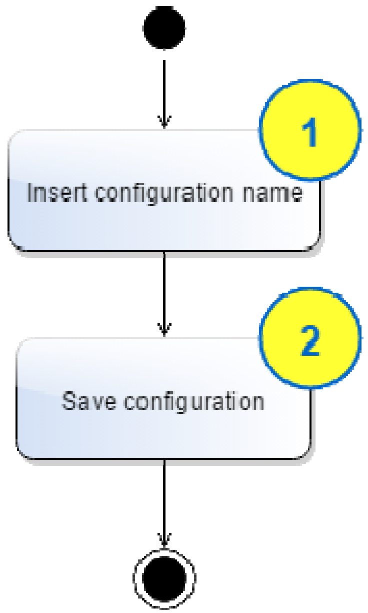
- POST /data/insert-update/{domain}/{groupId}
  - {domain} = CONFIGURATION_LIBRARY_ITEM
  - {groupId}: {library name}

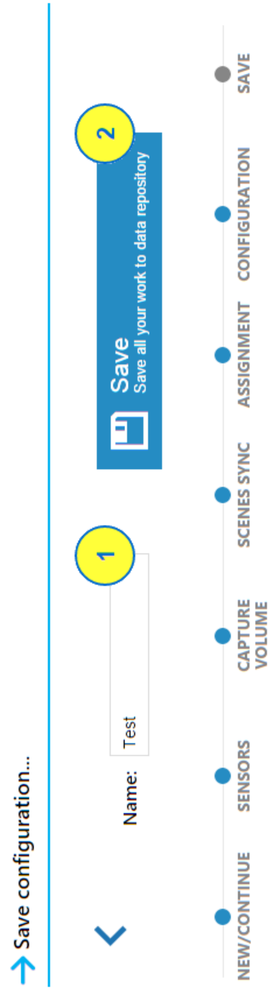
2) Load previously saved sensor's configuration (EAP)

- GET /data/get/domain/{domain}
  - {domain} = CONFIGURATION_LIBRARY_ITEM

Before next step:
1) Sensors configurations saved as part of project's sensors configuration.

Sensors configuration wizard
Step 7
Save configuration





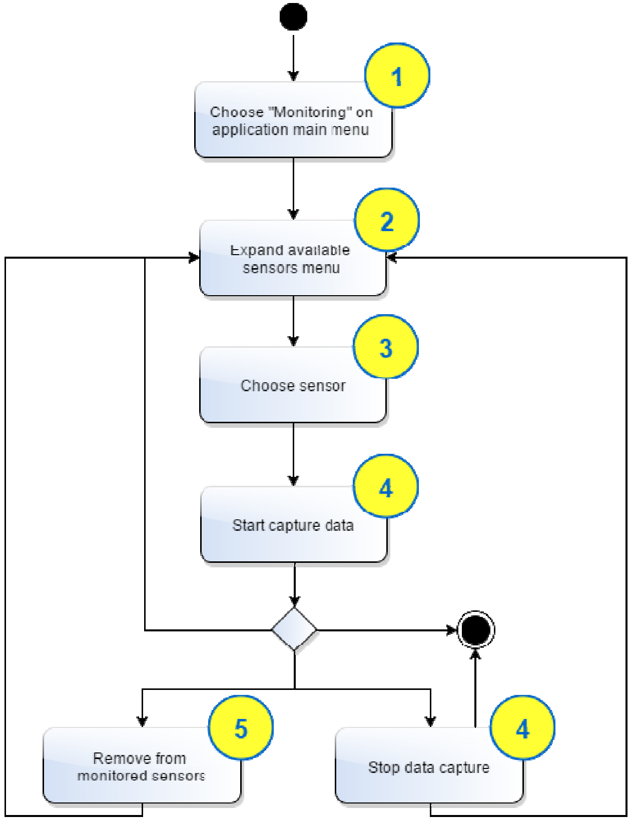
Name: Test

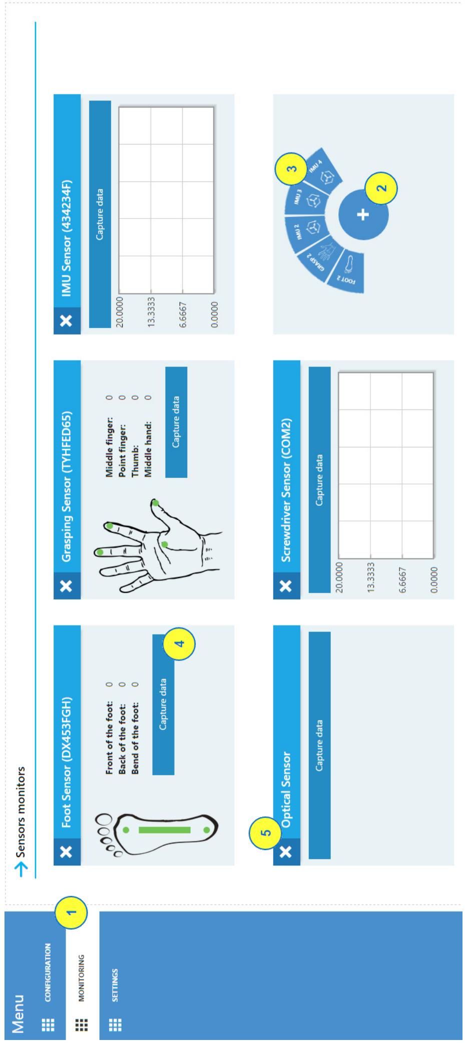
Functionalities:

1) Save project's configuration to Data Storage

- POST /data/insert-update/{domain}/{groupId}
  - {domain} = SNMA_CONFIGURATION
  - {groupId} = { projectId }
- BODY = {project's sensors configuration}

Sensors raw data monitoring


1
Choose "Monitoring" on application main menu
2
Expand available sensors menu
3
Choose sensor
4
Start capture data
5
Remove from monitored sensors
4
Stop data capture



Loading:

<u>1) Sensors avaliable in network (from SMP)</u>

- GET /sensor/discover

Functionalities:

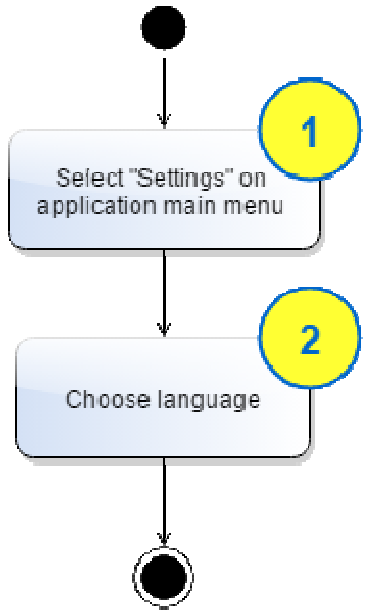
2) <u>Start raw data capture</u>

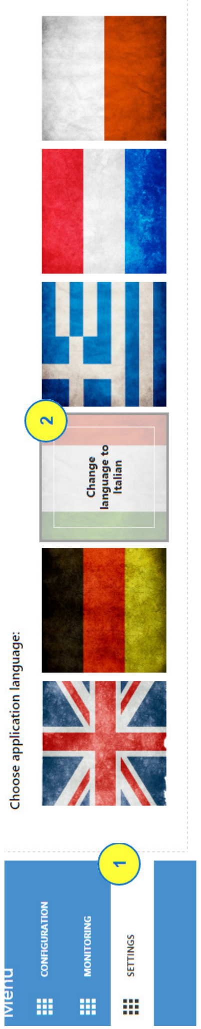
- GET /sensor/data/{address}/{type}
  - {address} = sensor address (example: 0013A20040B87B12)
  - {type} = sensor type (1 – optical, 2 – grasp, 3 – foot, 4 – imu, 5 - screwdriver)

3) <u>Stop raw data capture</u>

- GET /sensor/stopdata/{address}/{type}
  - {address} = sensor address
  - {type} = sensor type

Change language



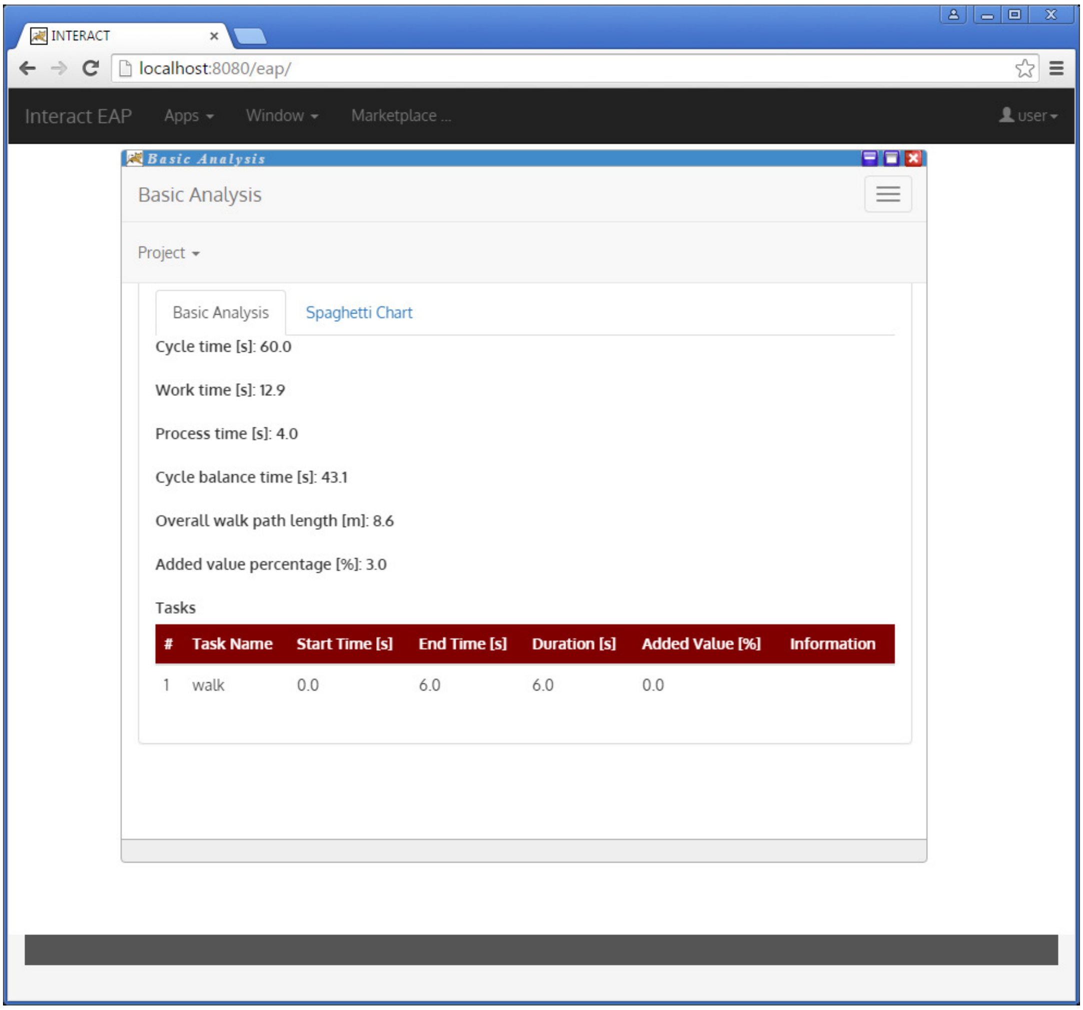


User can change application language accoring to his/her needs during work with it.

3.7. Basic Analysis

3.7.1. Application short description

The Basic Analysis application can be used for evaluating the performance, time and space and optimization, all features regarding these issues are combined in this application.



Cycle time [s]: 60.0

Work time [s]: 12.9

Process time [s]: 4.0

Cycle balance time [s]: 43.1

Overall walk path length [m]: 8.6

Added value percentage [%]: 3.0

Tasks

#	Task Name	Start Time [s]	End Time [s]	Duration [s]	Added Value [%]	Information
1	walk	0.0	6.0	6.0	0.0	

Figure 15: basic Analysis main page

3.7.2. Key application features

In D1.3.1 there was a listing of features foreseen for Basic Analysis app. These features are presented in the following table with one more additional column to describe how Basic Analysis supported/implemented these features.

Need	Priority	Features	Support/implementation
Performance measures of 1. Cycle time 2. Time of adding value 3. Process times (tool usage, etc.) 4. Time adding value	10	5. Evaluation 6. Visualization 7. Documentation	• Evaluation and visualization of cycle time is included in M24 prototype. • Documentation is planned for M30.

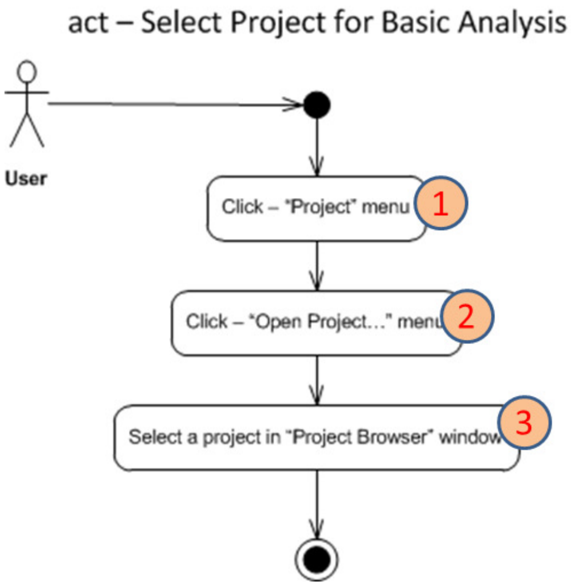
			• Process times evaluation, visualization and documentation are under discussion. Not included in M24 prototype. • Time adding value functionality is not included in M24 prototype. Electrolux & Daimler to provide list of elementary actions/motion primitives to be considered as adding value. Planned for M30.
3D Space requirement of 8. Working space 9. Work place 10. Material supply areas 11. Walking paths	6	12. Evaluation 13. Visualization including spaghetti chart 14. Documentation	15. Spaghetti chart first version is included in M24 prototype. 16. Working space requirements are cancelled by Daimler. 17. Material supplier areas requirement is considered for cancellation. Daimler/Electrolux to decide
Collision risk	3	18. Detection 19. Visualization 20. Documentation	Will not be available for M30.

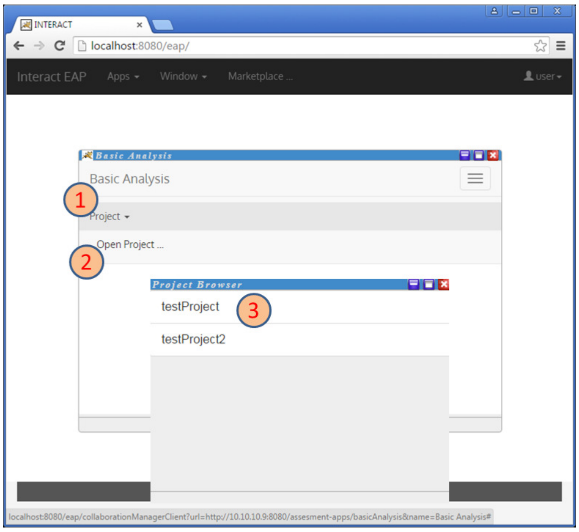
3.7.3. User interaction

Basic Analysis app support two main groups of analysis measures

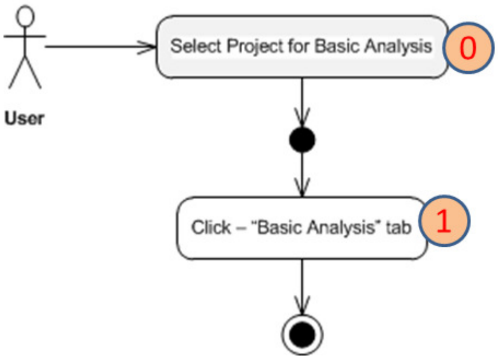
- Basic Analysis
- Spaghetti Diagram

The application requires NO USER INPUT. The user interacts with the app only for navigating in the app.

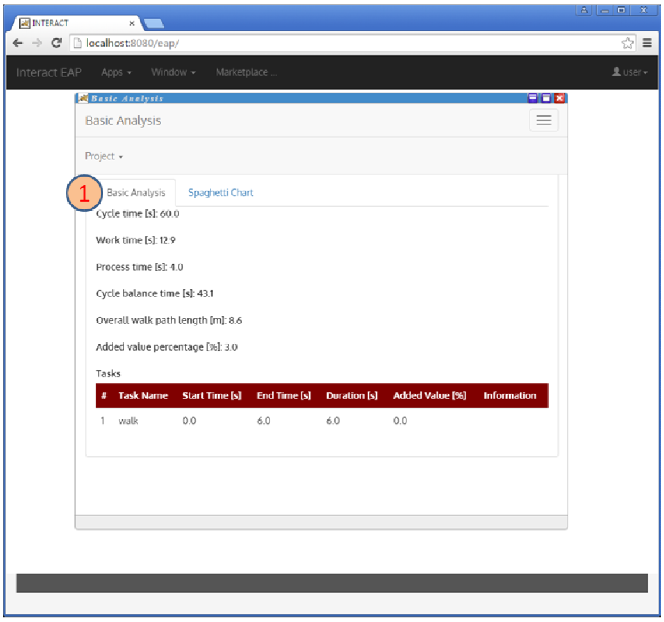

act – Select Project for Basic Analysis
User
Click – "Project" menu
1
Click – "Open Project…" menu
2
Select a project in "Project Browser" window
3


INTERACT
localhost:8080/eap/
Interact EAP
Apps
Window
Marketplace ...
user
Basic Analysis
Basic Analysis
1
Project
2
Open Project ...
Project Browser
testProject
3
testProject2
localhost:8080/eap/collaborationManagerClient?url=http://10.10.10.9:8080/assesment-apps/basicAnalysis&name=Basic Analysis#

act – View Basic Analysis Results


User
Select Project for Basic Analysis
0
Click – "Basic Analysis" tab
1

0 Check Select Project diagram in Basic Analysis Section



Cycle time [s]: 60.0

Work time [s]: 12.9

Process time [s]: 4.0

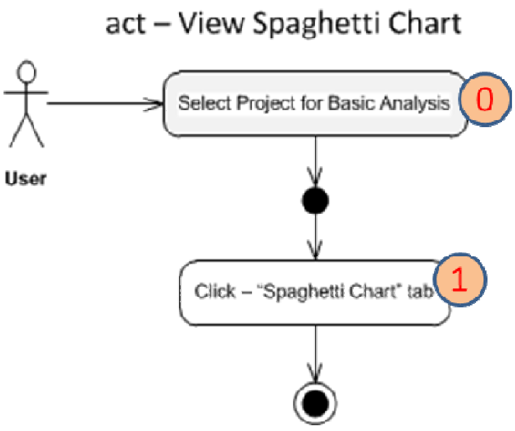
Cycle balance time [s]: 43.1

Overall walk path length [m]: 8.6

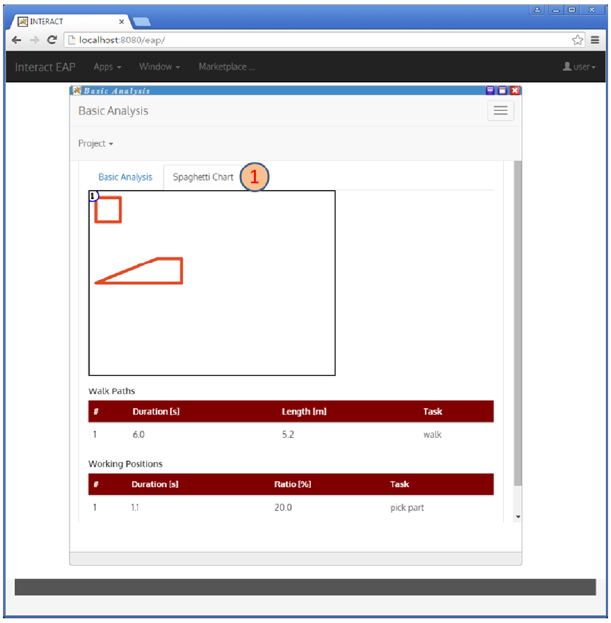
Added value percentage [%]: 3.0

Tasks

#	Task Name	Start Time [s]	End Time [s]	Duration [s]	Added Value [%]	Information
1	walk	0.0	6.0	6.0	0.0	


act – View Spaghetti Chart
User
Select Project for Basic Analysis
0
Click – "Spaghetti Chart" tab
1

0 Check Select Project diagram in Basic Analysis Section



Walk Paths

#	Duration [s]	Length [m]	Task
1	6.0	5.2	walk

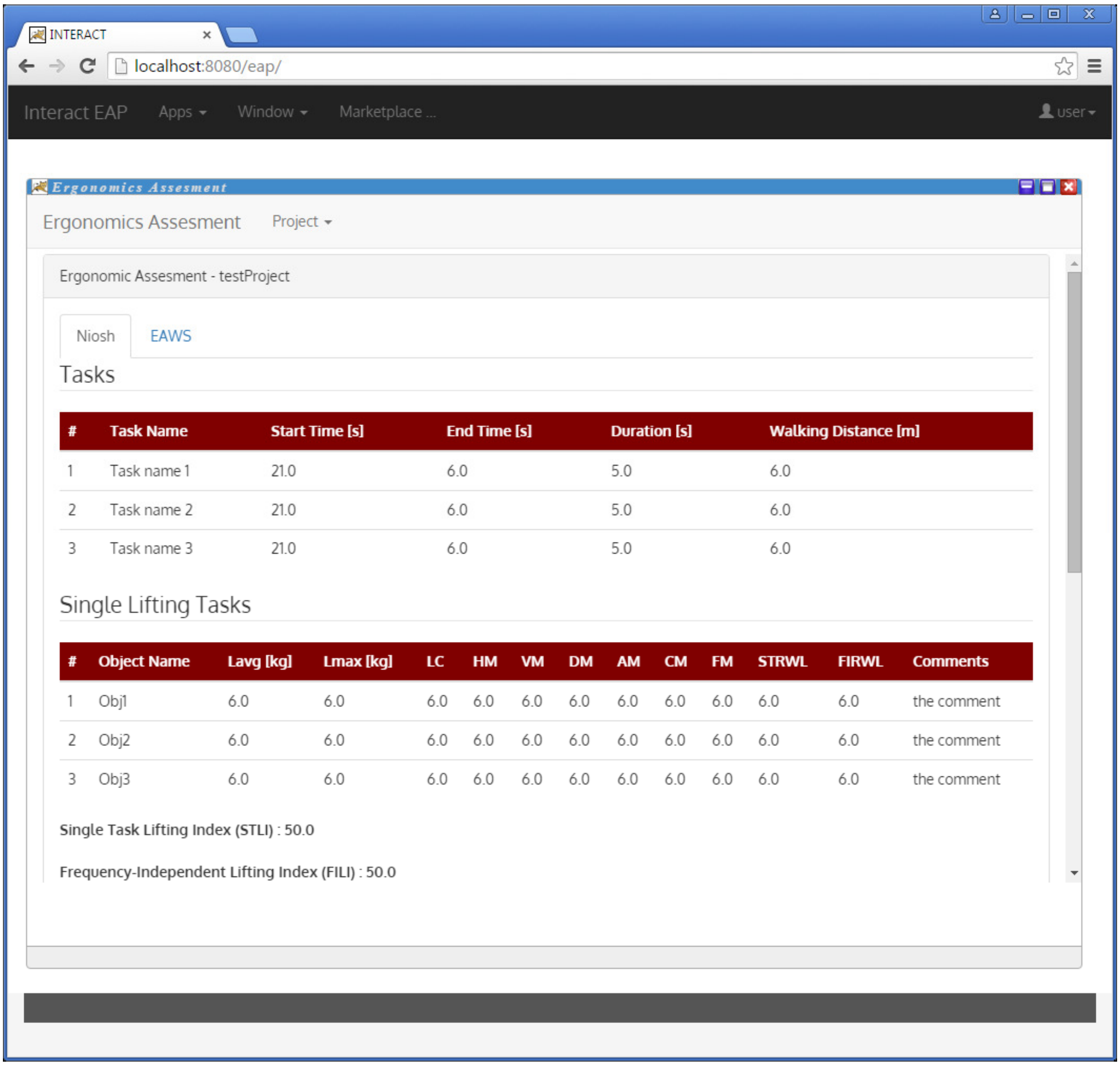
Working Positions

#	Duration [s]	Ratio [%]	Task
1	1.1	20.0	pick part

3.8. Ergonomics Assessment

3.8.1. Application short description

Ergonomic assessment is a key feature of digital human models. Next to the correct evaluation of simulated processes, ergonomics can be an important parameter for the optimization of the simulation-process itself. The status quo of ergonomic assessment and optimization is an iterative process through which the user of DHM software has to find the best ergonomic solutions himself. The main functionality of the Ergonomic Assessment application is the assessment of simulations within the scope of standards like EAWS and NIOSH.



Ergonomic Assesment - testProject

Tasks

#	Task Name	Start Time [s]	End Time [s]	Duration [s]	Walking Distance [m]
1	Task name 1	21.0	6.0	5.0	6.0
2	Task name 2	21.0	6.0	5.0	6.0
3	Task name 3	21.0	6.0	5.0	6.0

Single Lifting Tasks

#	Object Name	Lavg [kg]	Lmax [kg]	LC	HM	VM	DM	AM	CM	FM	STRWL	FIRWL	Comments
1	Obj1	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	the comment
2	Obj2	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	the comment
3	Obj3	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	the comment

Single Task Lifting Index (STLI) : 50.0

Frequency-Independent Lifting Index (FILI) : 50.0

Figure 16: Ergonomics Analysis main page

3.8.2. Key application features

In D1.3.1 there was a listing of features foreseen for Ergonomics Assessment app. These features are presented in the following table with one more additional column to describe how Ergonomics Assessment supported/implemented these features.

Need	Priority	Features	Support/implementation
Ergonomic assessment of existing simulations	10	EAWS, NIOSH standard	Finished and available in M24 prototype.
Visualization of ergonomic risks	10	real-time coloring of	Will not be available for

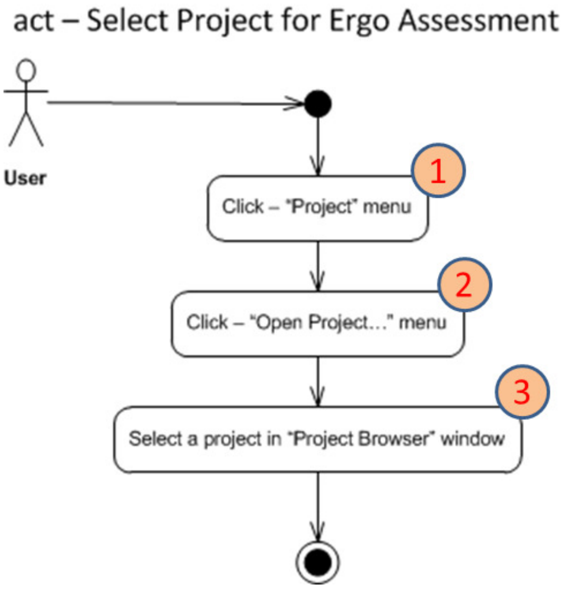
		affected body parts	M30.
Creation of ergonomic landscapes	8	analyses and visualization of ergonomic assessment of multiple work stations	Cancelled.
Identification of ‘point-booster’	4	Analyzing tool for ergonomic assessment results	Will not be available for M30.
Evaluation of non-human related working conditions	2	Assessment tool for different industry standards or/and guidelines	Cancelled.
Constraint generation for sampling motions	10	Motions which severely affect ergonomic ratings should be identified, so that the motion generation tries to avoid them whenever possible	Cancelled.

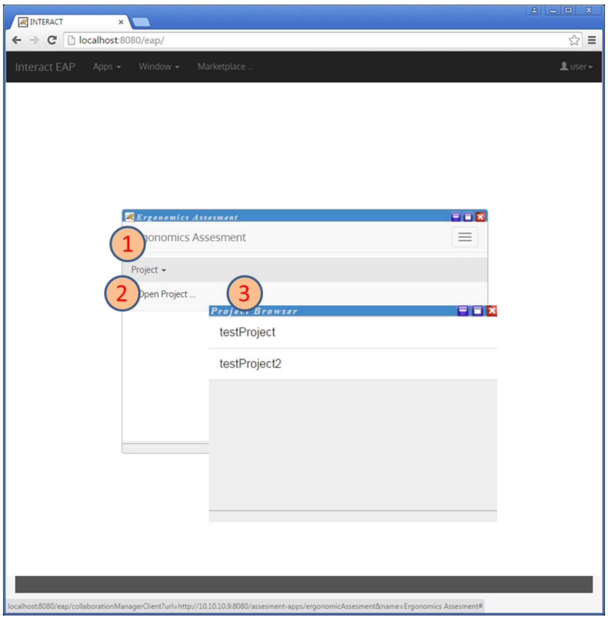
3.8.3. User interaction

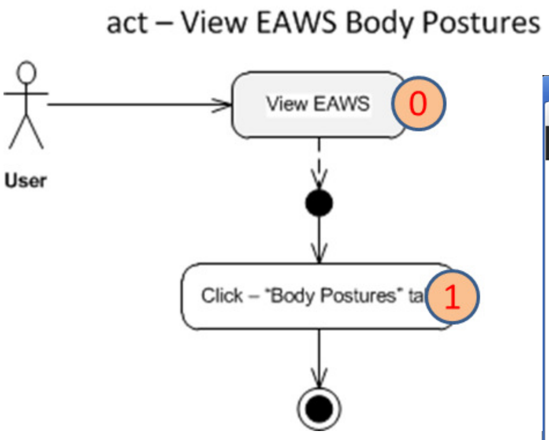
The Ergonomics Assessment app support two main functions

- NIOSH lifting index analysis
- EAWS analysis

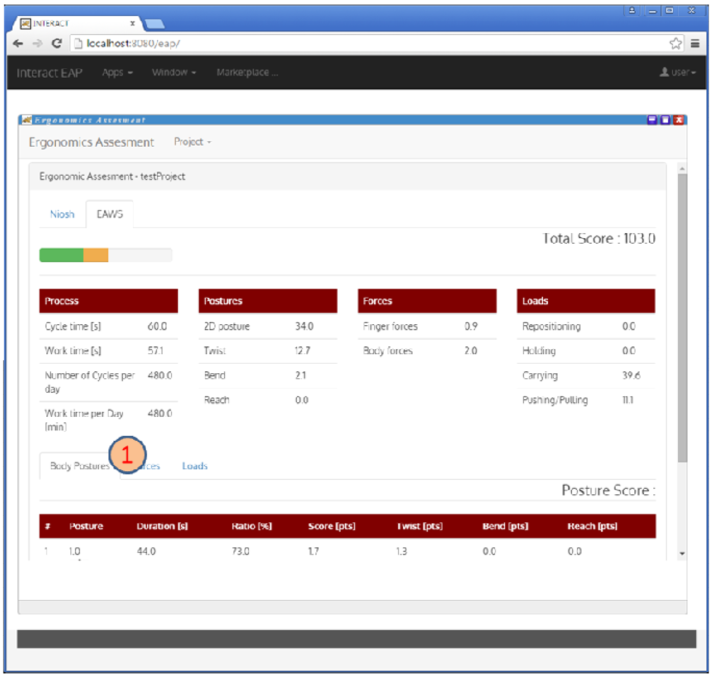
The application requires NO USER INPUT although for the analysis specific user input provided to “Project Editor” app is taken into consideration. The user interacts with the app only for navigating in the app.


act – Select Project for Ergo Assessment
User
Click – "Project" menu
1
Click – "Open Project…" menu
2
Select a project in "Project Browser" window
3


INTERACT
localhost:8080/eap/
Interact EAP
Apps
Window
Marketplace ...
user
Ergonomics Assesment
1
onomics Assesment
Project
2
Open Project ...
3
Project Browser
testProject
testProject2
localhost:8080/eap/collaborationManagerClient?url=http://10.10.10.9:8080/assesment-apps/ergonomicAssesment&name=Ergonomics Assesment#



0 Check View EAWS diagram



Ergonomics Assesment

Ergonomic Assesment - testProject

Total Score : 103.0

Process	
Cycle time [s]	60.0
Work time [s]	57.1
Number of Cycles per day	480.0
Work time per Day [min]	480.0

Postures	
2D posture	34.0
Twist	12.7
Bend	2.1
Reach	0.0

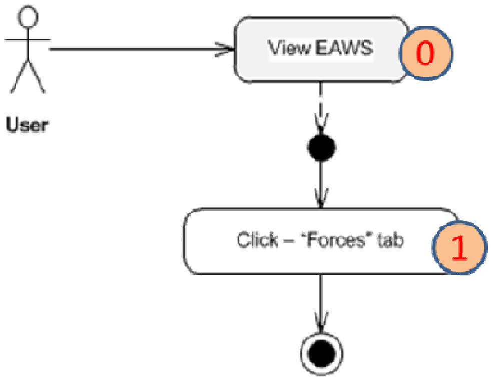
Forces	
Finger forces	0.9
Body forces	2.0

Loads	
Repositioning	0.0
Holding	0.0
Carrying	39.6
Pushing/Pulling	11.1

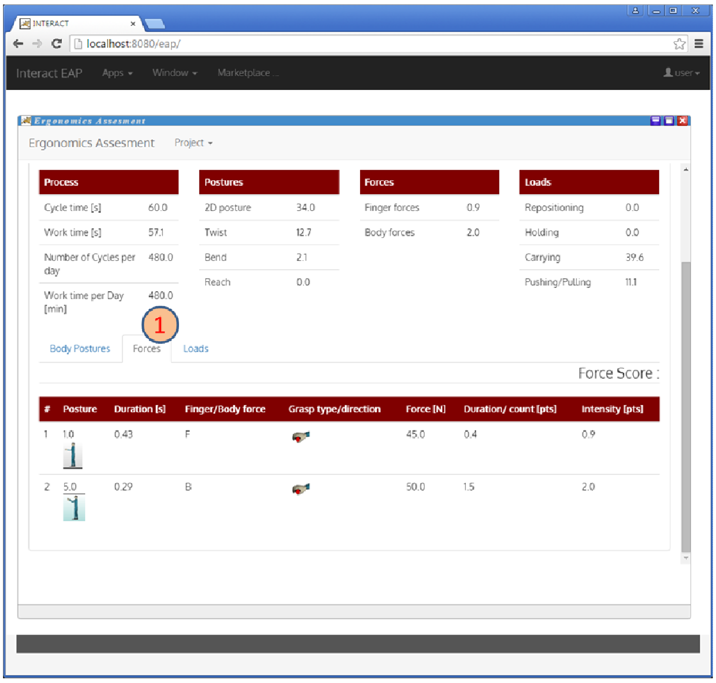
Posture Score :

#	Posture	Duration [s]	Ratio [%]	Score [pts]	Twist [pts]	Bend [pts]	Reach [pts]
1	1.0	44.0	73.0	1.7	1.3	0.0	0.0

act – View EAWS Forces



0 Check View EAWS diagram



Ergonomics Assesment

Process	
Cycle time [s]	60.0
Work time [s]	57.1
Number of Cycles per day	480.0
Work time per Day [min]	480.0

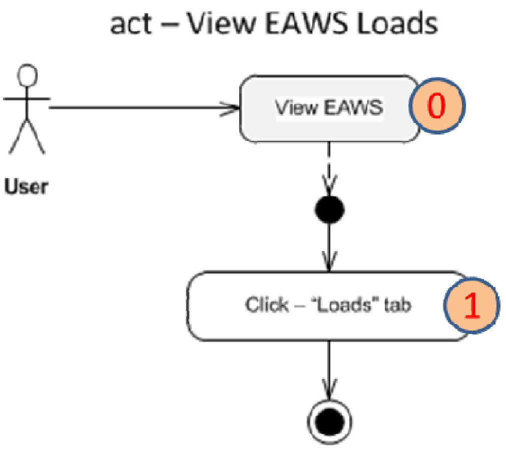
Postures	
2D posture	34.0
Twist	12.7
Bend	2.1
Reach	0.0

Forces	
Finger forces	0.9
Body forces	2.0

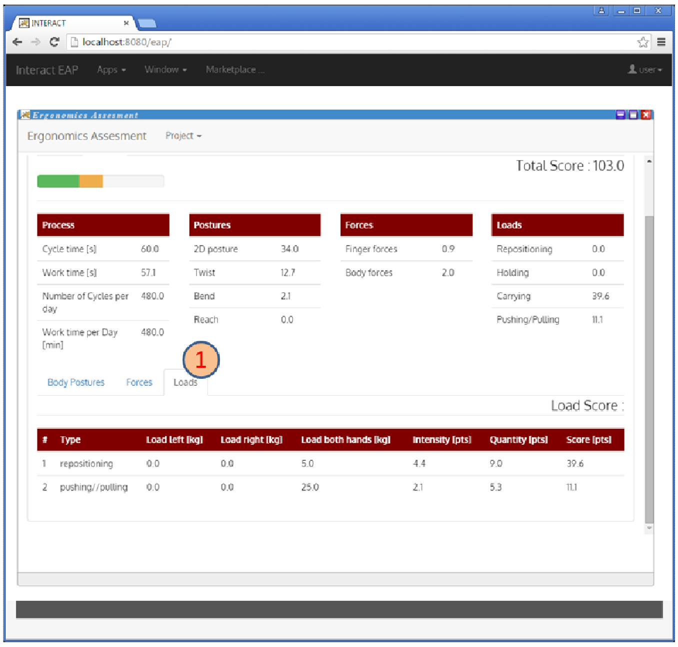
Loads	
Repositioning	0.0
Holding	0.0
Carrying	39.6
Pushing/Pulling	11.1

Force Score :

#	Posture	Duration [s]	Finger/Body force	Grasp type/direction	Force [N]	Duration/ count [pts]	Intensity [pts]
1	1.0	0.43	F		45.0	0.4	0.9
2	5.0	0.29	B		50.0	1.5	2.0



0 Check View EAWS diagram



Total Score : 103.0

Process	
Cycle time [s]	60.0
Work time [s]	57.1
Number of Cycles per day	480.0
Work time per Day [min]	480.0

Postures	
2D posture	34.0
Twist	12.7
Bend	2.1
Reach	0.0

Forces	
Finger forces	0.9
Body forces	2.0

Loads	
Repositioning	0.0
Holding	0.0
Carrying	39.6
Pushing/Pulling	11.1

Load Score :

#	Type	Load left [kg]	Load right [kg]	Load both hands [kg]	Intensity [pts]	Quantity [pts]	Score [pts]
1	repositioning	0.0	0.0	5.0	4.4	9.0	39.6
2	pushing//pulling	0.0	0.0	25.0	2.1	5.3	11.1

4. WORKFLOW/GUIDELINES

4.1. Workshop workflows/guidelines

In this chapter the workflow for performing a workshop is depicted. More specifically the INTERACT users' interaction with the INTERACT system apps are depicted using a workflow. The workshop is supported by INTERACT modules in two phases:

a) Workshop preparation

b) Workshop execution

4.1.1. Workshop preparation guidelines

Figure 17 describes the steps required to prepare the execution of a collaborative workshop using INTERACT system.

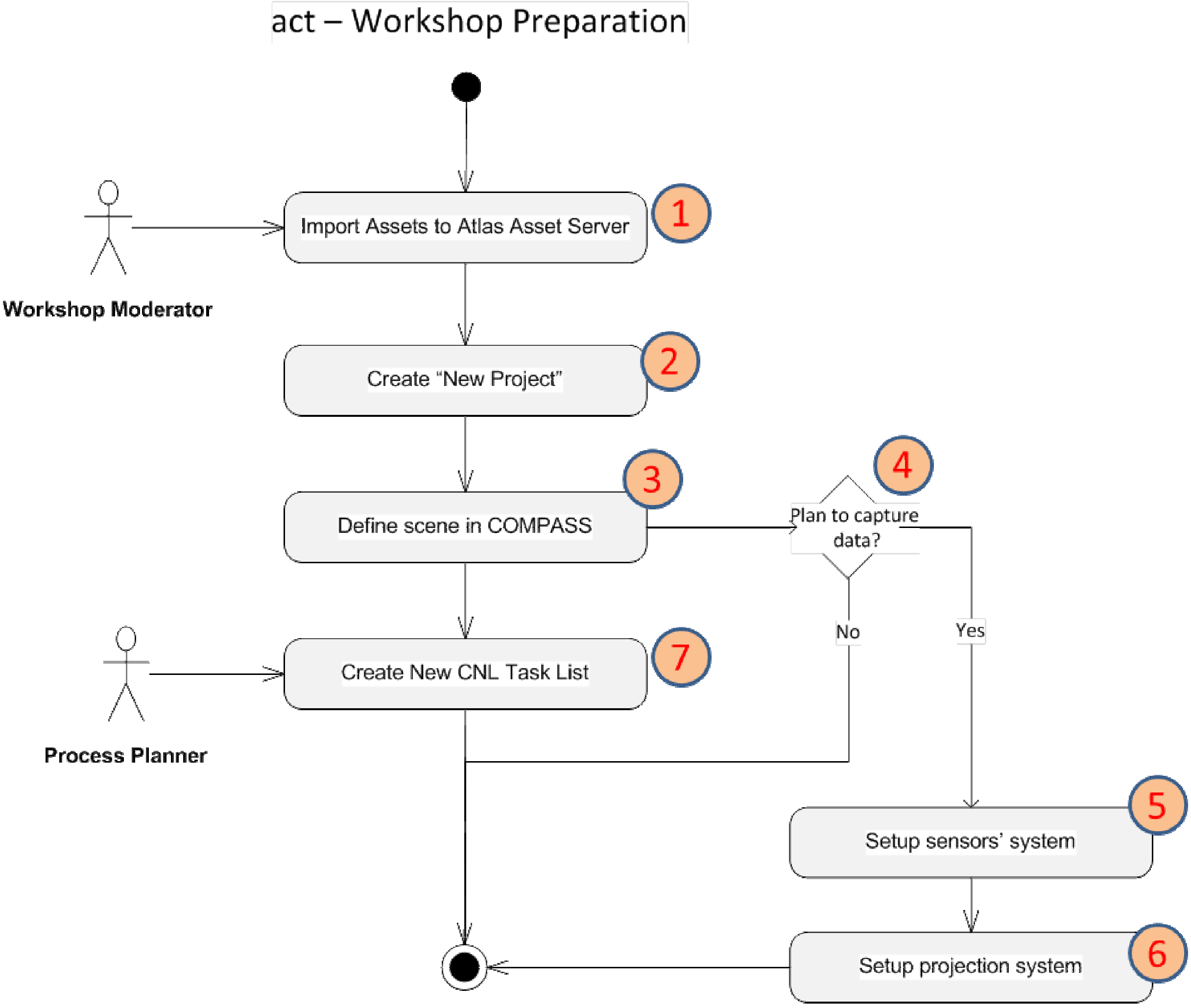


Figure 17: Workshop preparation workflow

4.1.2. Workshop execution guidelines

The figure below describes the steps to execute a collaborative workshop using INTERACT system. Some key points in the workflow are:

- In Step 3 the participants may work in parallel making changes to the project data.

- The results presented by using the functionalities available in Step 4 and 5 are based on the data saved by the latest “Save Project” action.
- Many users may in parallel visualize the results (step 4).
- Many users may in parallel visualize the simulation (step 5) during the workshop.
- The Workshop Moderator may save as times as he/she wishes the project data. As by M24 there is no project versioning or scenario management.

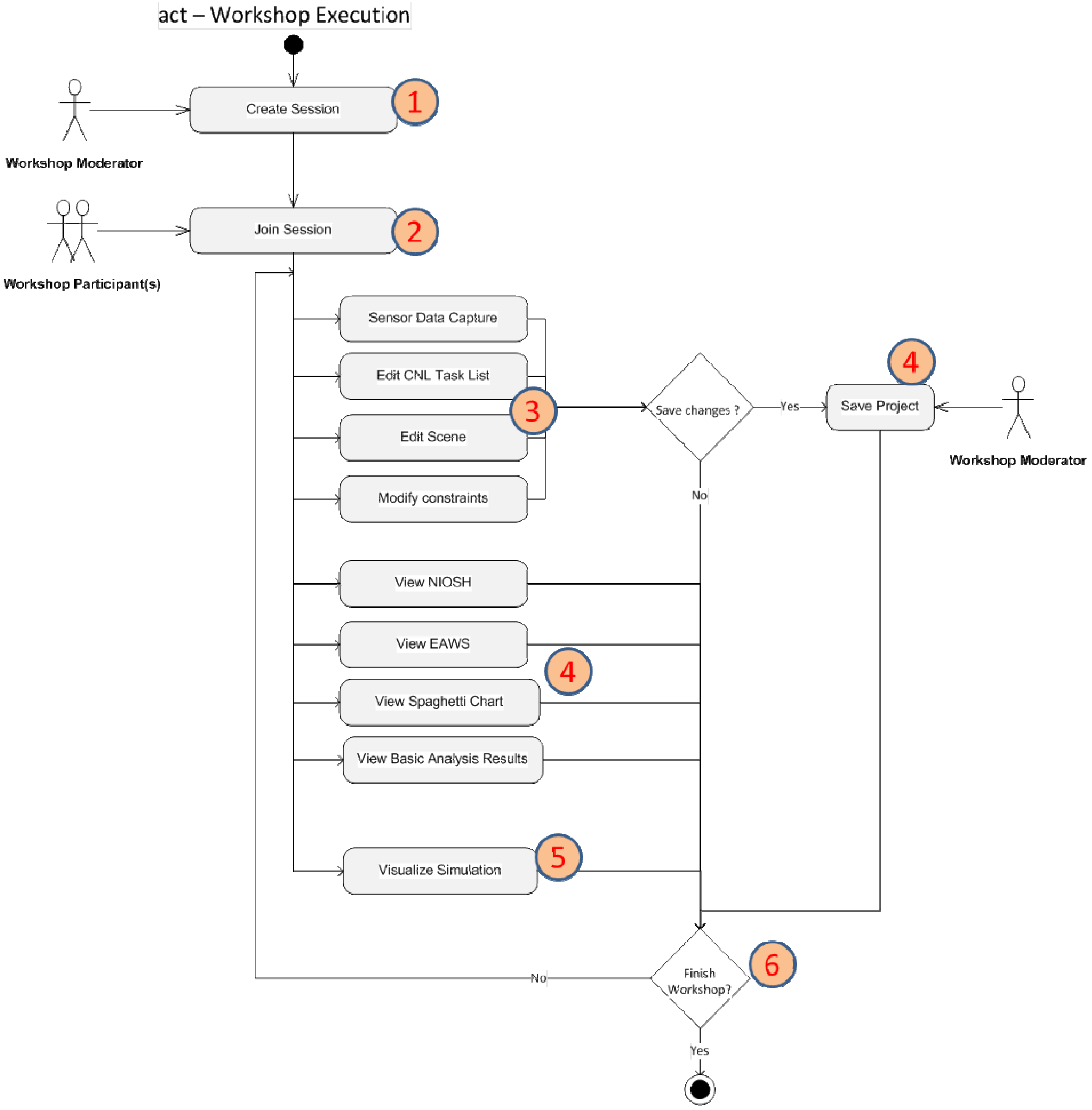


Figure 18: Workshop execution workflow

5. TUTORIALS

In this section the steps for creating a new project from scratch until the simulation stage are presented in detail.

5.1. White Goods Tutorial

In case of the Electrolux scene, the steps for creating a new project are the following:

1. Open the INTERACT EAP.
2. From the INTERACT EAP menu click Apps → Installed Apps → Project Editor.

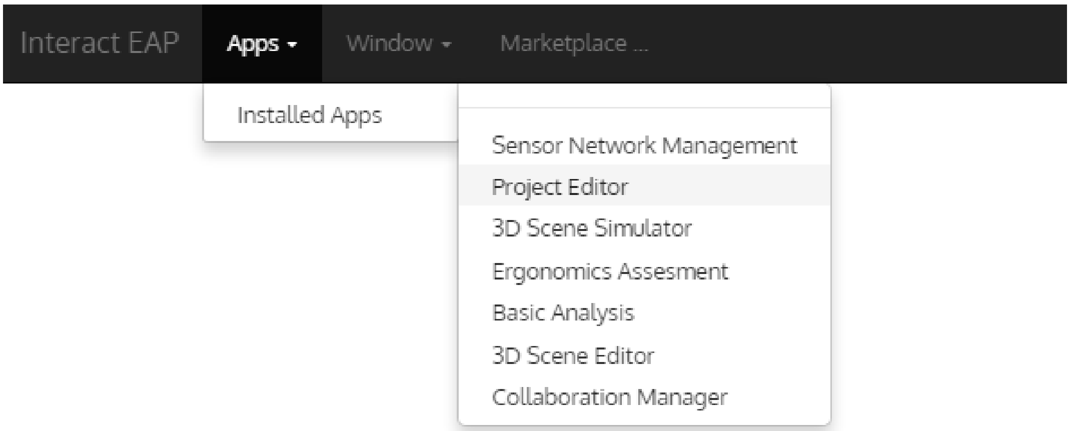


Figure 19: INTERACT EAP Applications

3. The Project Editor window will appear. Click on the button on the right corner of Project Editor window, then click on “Project” dropdown menu and select “New Project…”.

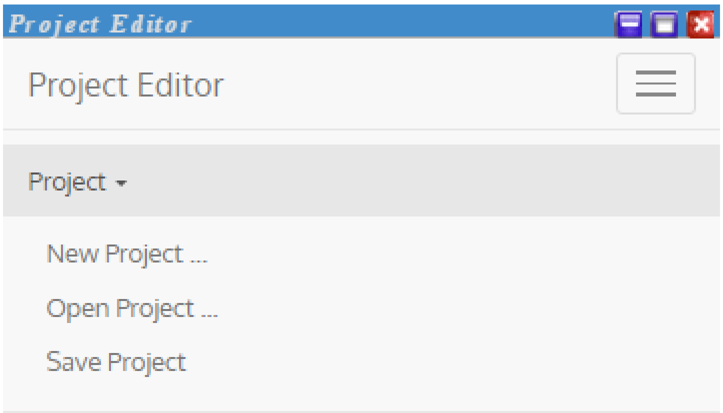


Figure 20: Project Editor menu

4. After selecting “New Project…”, a new window named “New Project” will appear. In “Project Name” field type the name of the new project and then press “Create” button.

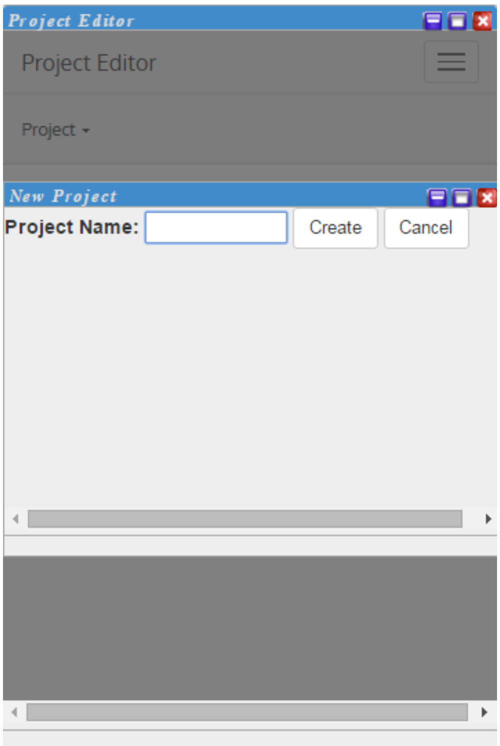
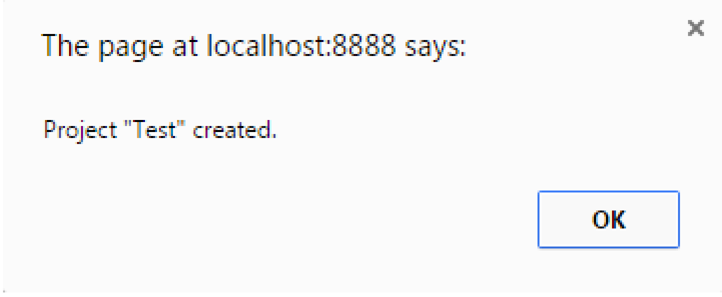


Figure 21: New Project window

If the project has been successfully saved, then the following popup window will appear on screen:



The page at localhost:8888 says:

Project "Test" created.

Figure 22: Success in saving new project

5. Press “OK” button.
6. Close Project Editor window.
7. From the INTERACT EAP menu click Apps → Installed Apps → 3D Scene Editor. The 3D Scene Editor window will appear.

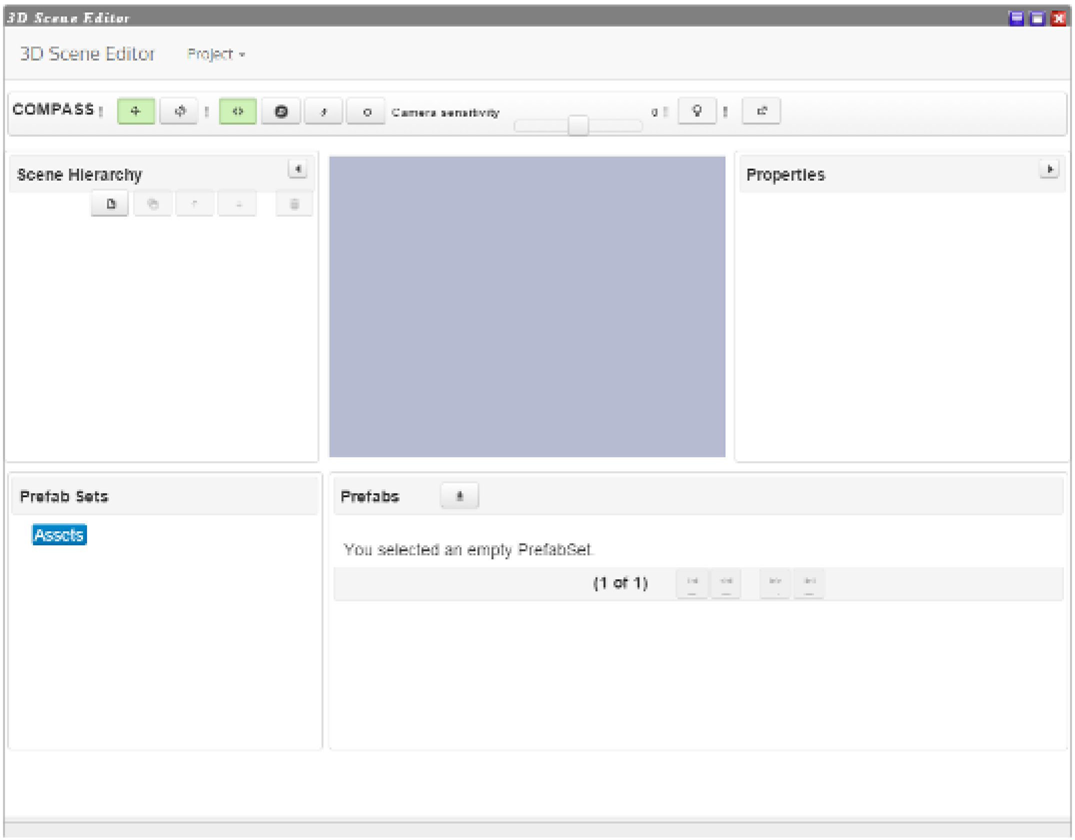


Figure 23: 3D Scene Editor

8. In order to import the Electrolux asset to the project, click on the arrow button of Prefabs tab. A list containing the available assets will be displayed. From the “Available Assets” list, select the asset named “PilotcaseElux2” and click on “Import” button.
9. The asset will be imported and displayed in Prefabs tab.

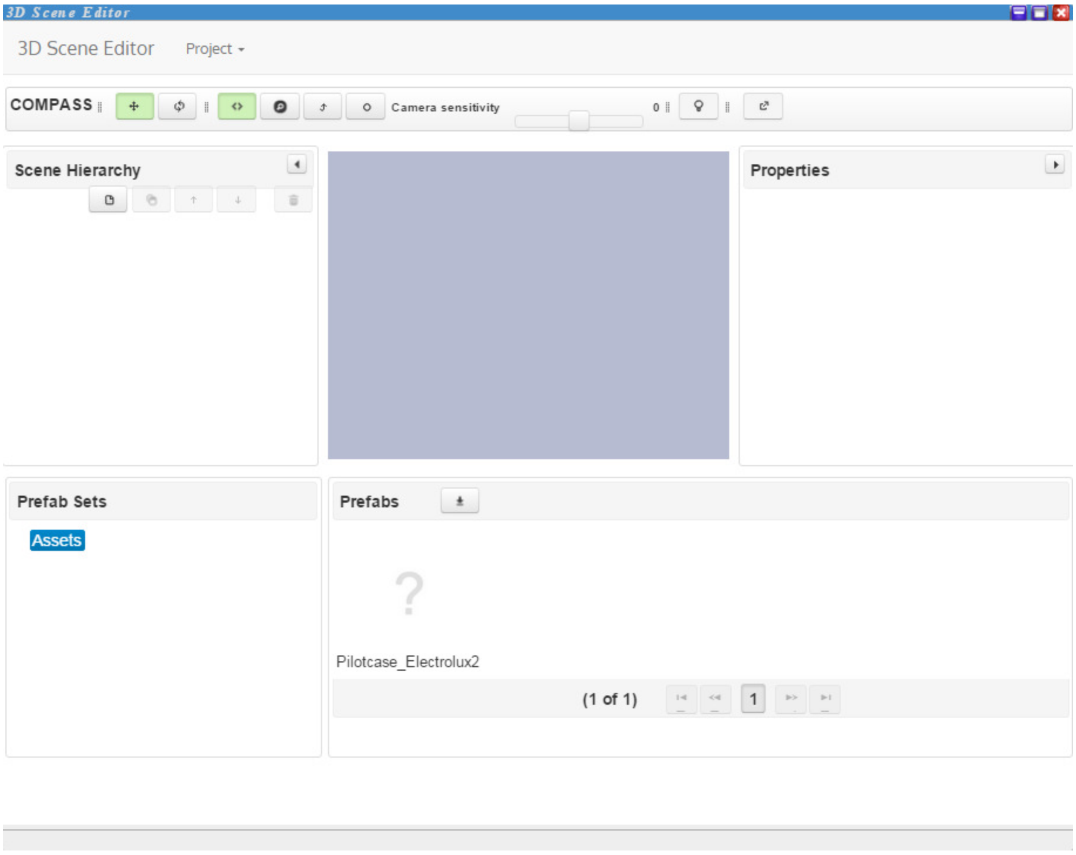


Figure 24: Asset in Prefabs tab

10. Click on “Pilotcase_Electrolux2” asset from Prefabs tab and drag and drop it into Scene Hierarchy tab.

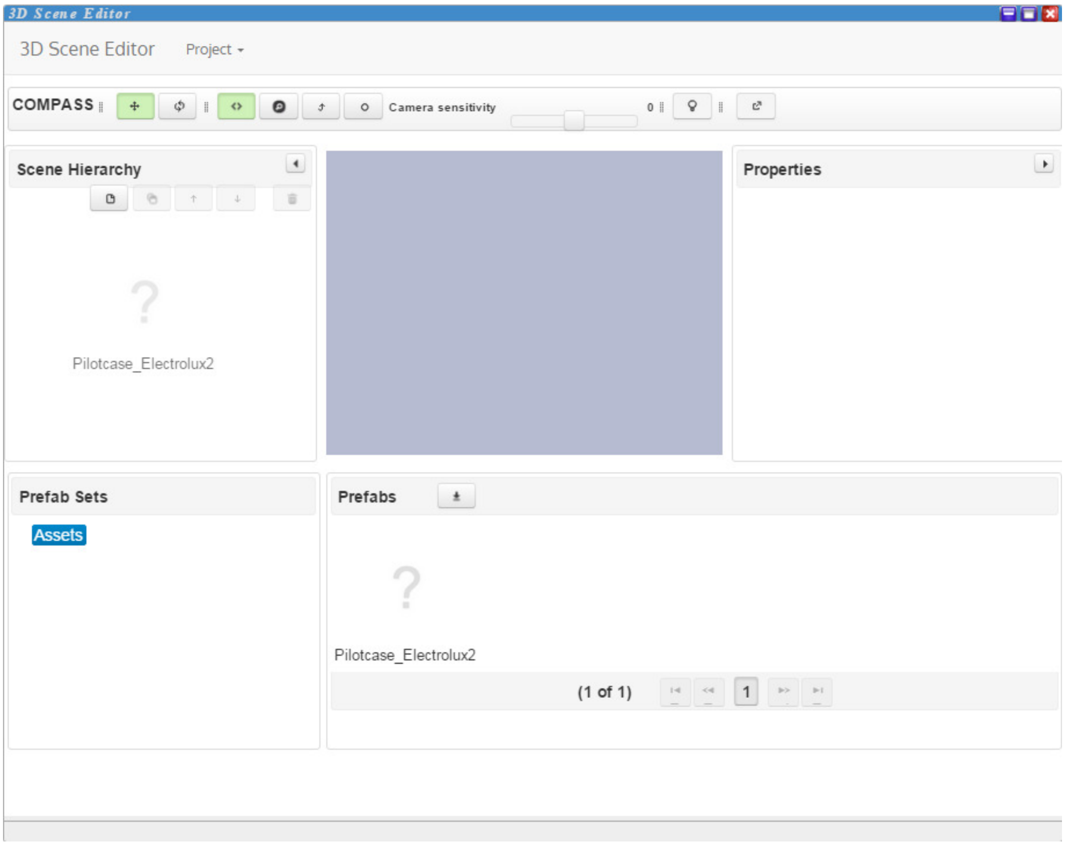
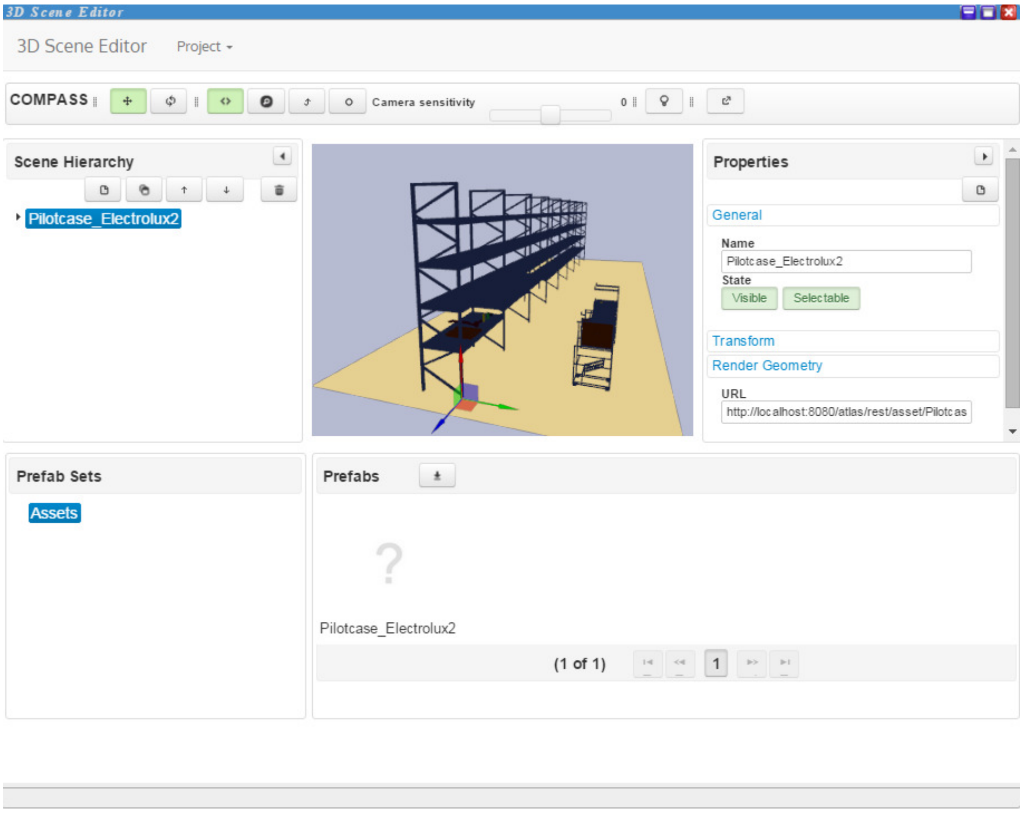


Figure 25: Drag and drop asset

11. Wait for the Electrolux scene to load and to appear on screen.



Name: Pilotcase_Electrolux2

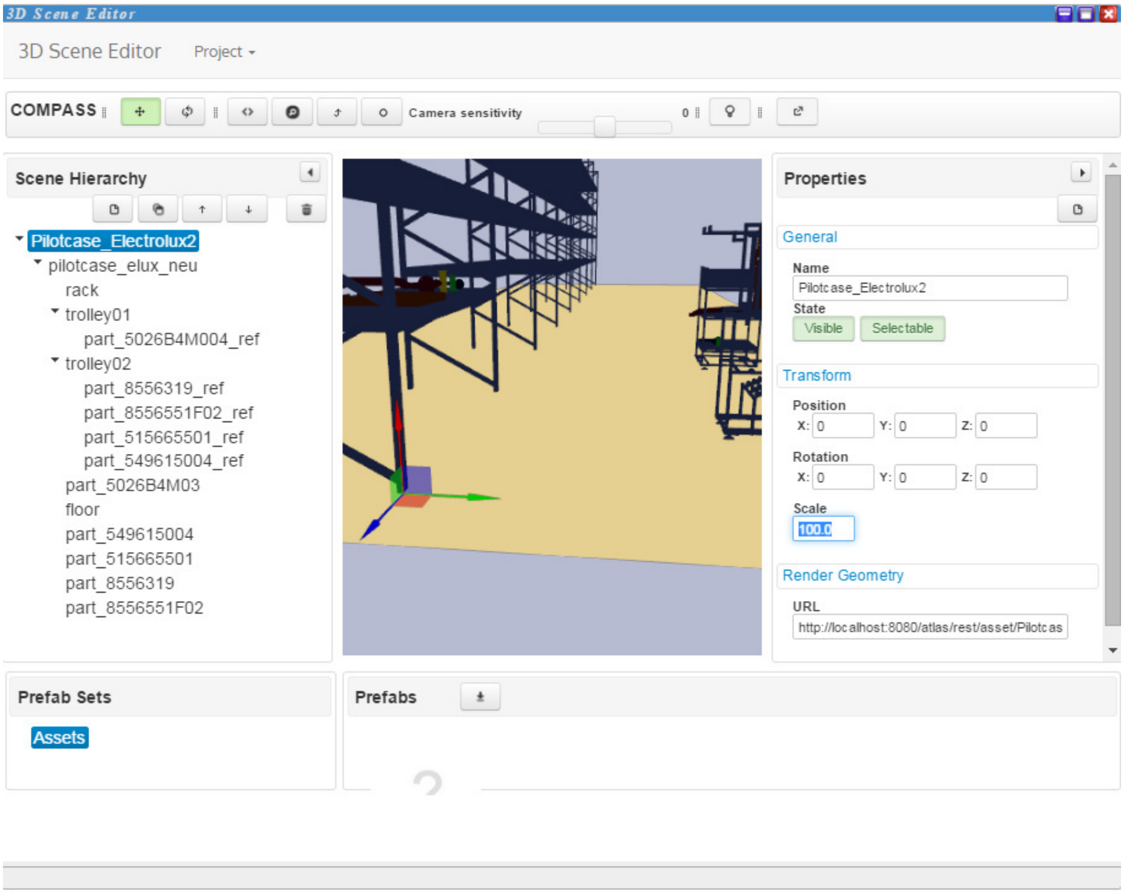
State: Visible, Selectable

URL: http://localhost:8080/atlas/rest/asset/Pilotcas

Figure 26: Electrolux scene in 3D Scene Editor

All the available objects in scene can be seen by clicking on the arrow button next to "Pilotcase_Electrolux2" object in Scene Hierarchy tab.

12. From Scene Hierarchy tab, select the root node named "Pilotcase_Electrolux2" and then in Properties tab, located on the right side of the 3D Scene Editor window, click on "Transform" and apply a scaling of 100 to this node.



Scene Hierarchy:

- Pilotcase_Electrolux2
  - pilotcase_elux_neu
    - rack
    - trolley01
      - part_5026B4M004_ref
    - trolley02
      - part_8556319_ref
      - part_8556551F02_ref
      - part_515665501_ref
      - part_549615004_ref
    - part_5026B4M03
    - floor
    - part_549615004
    - part_515665501
    - part_8556319
    - part_8556551F02

Properties:

General

Name: Pilotcase_Electrolux2

State: Visible Selectable

Transform

Position X: 0 Y: 0 Z: 0

Rotation X: 0 Y: 0 Z: 0

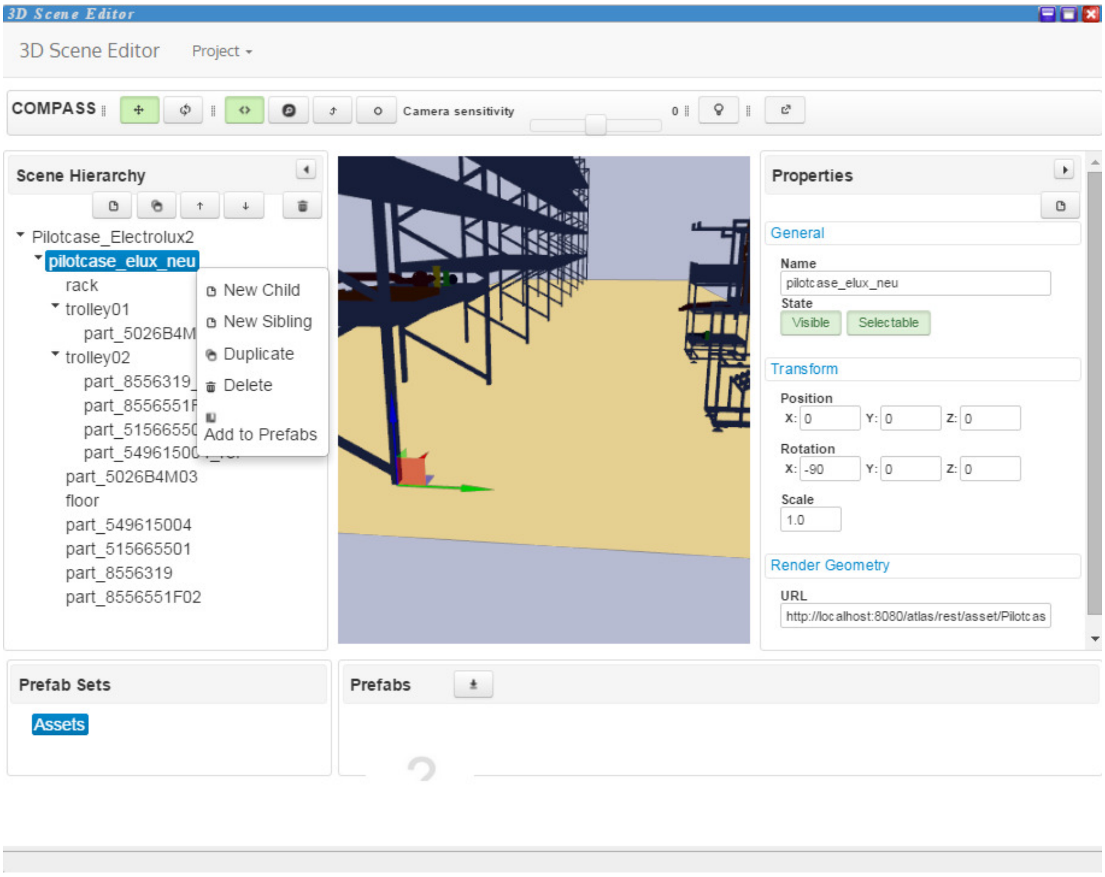
Scale: 100.0

Render Geometry

URL: http://localhost:8080/atlas/rest/asset/Pilotcas

Figure 27: Scale root node to 100

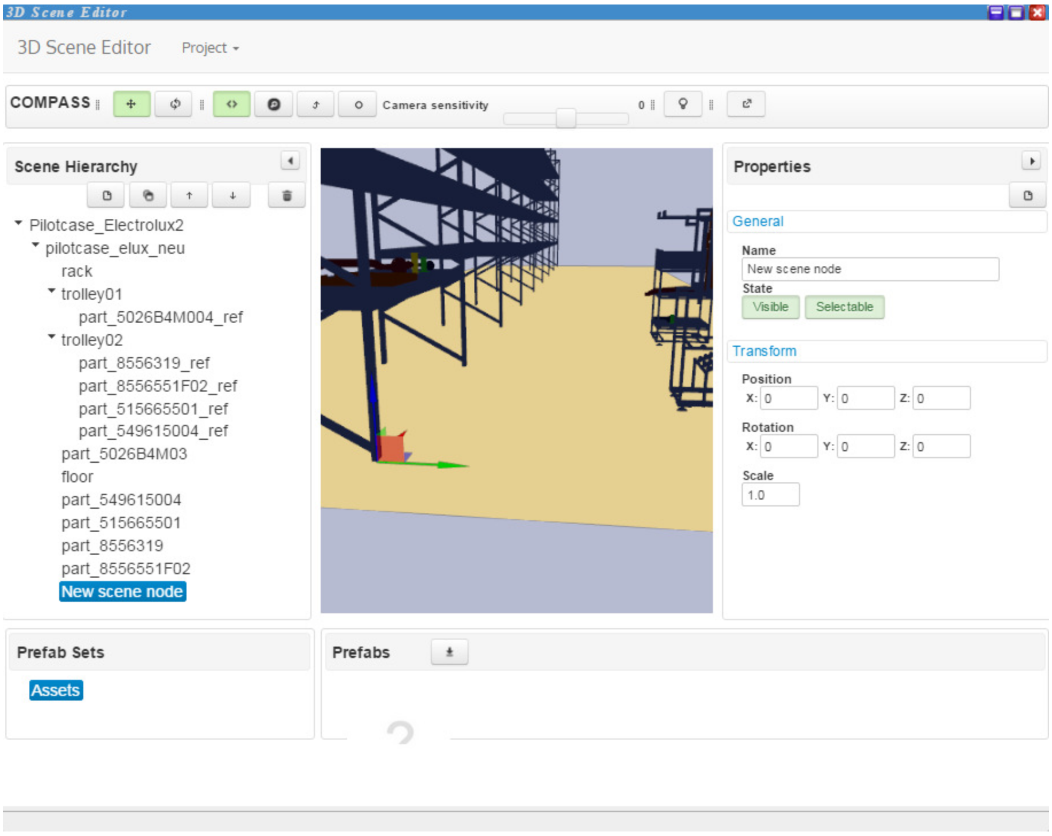
13. From Scene Hierarchy tab, select "pilotcase_elux_neu" object, right click on it and select "New Child" option.



Name: pilotcase_elux_neu
State: Visible Selectable
Position X: 0 Y: 0 Z: 0
Rotation X: -90 Y: 0 Z: 0
Scale 1.0
URL http://localhost:8080/atlas/rest/asset/Pilotcas

Figure 28: Add child to node

A new node will be created and displayed in Scene Hierarchy tab, inside "pilotcase_elux_neu" object.



- Pilotcase_Electrolux2
  - pilotcase_elux_neu
    - rack
    - trolley01
      - part_5026B4M004_ref
    - trolley02
      - part_8556319_ref
      - part_8556551F02_ref
      - part_515665501_ref
      - part_549615004_ref
    - part_5026B4M03
    - floor
    - part_549615004
    - part_515665501
    - part_8556319
    - part_8556551F02
    - New scene node

General

Name: New scene node

State: Visible Selectable

Transform

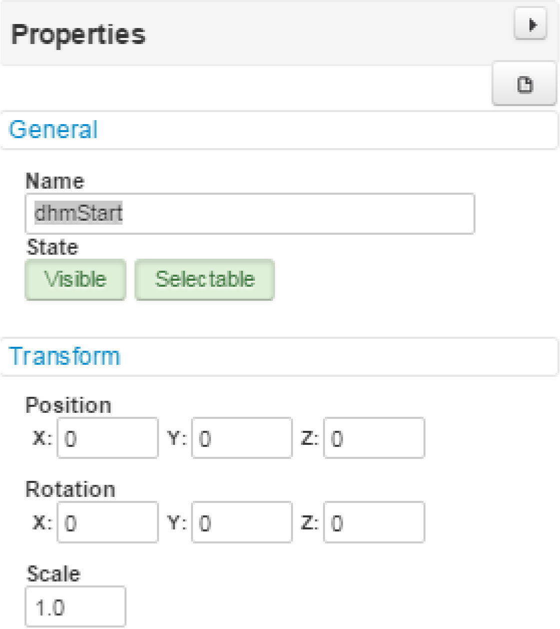
Position X: 0 Y: 0 Z: 0

Rotation X: 0 Y: 0 Z: 0

Scale 1.0

Figure 29: New node in Scene Hierarchy

14. Select the created node named “New scene node” and from Properties tab, change the node’s name to “dhmStart”. This node is imported in the scene in order to define the mannequin’s start position in the final simulation.



General

Name: dhmStart

State: Visible Selectable

Transform

Position X: 0 Y: 0 Z: 0

Rotation X: 0 Y: 0 Z: 0

Scale 1.0

Figure 30: “dhmStart” node

15. Click on “Pilotcase_Electrolux2” object in Scene Hierarchy tab and then click on new node button located in the same tab. A new node will be created.

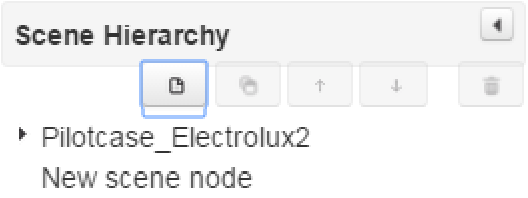
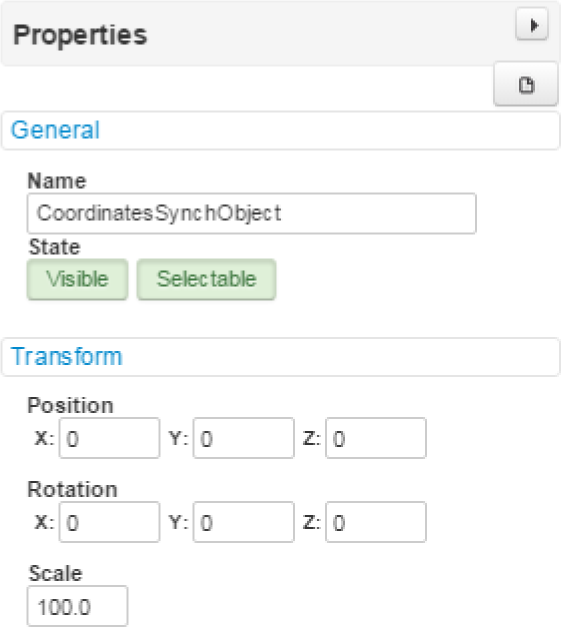


Figure 31: New node

16. Select the newly created node and from Properties tab, name it “CoordinatesSynchObject” and scale it to 100. This node is the reference for synchronization of the 3D Scene with the real world coordinate system and it should be placed on the top level of the “scene hierarchy”.



Name
CoordinatesSynchObject
State
Visible Selectable

Position
X: 0 Y: 0 Z: 0

Rotation
X: 0 Y: 0 Z: 0

Scale
100.0

Figure 32: “CoordinatesSynchObject” properties

17. After creating and modifying the two nodes mentioned in steps 13 to 16, select “Project” and “Save Project” from the 3D Scene Editor menu.

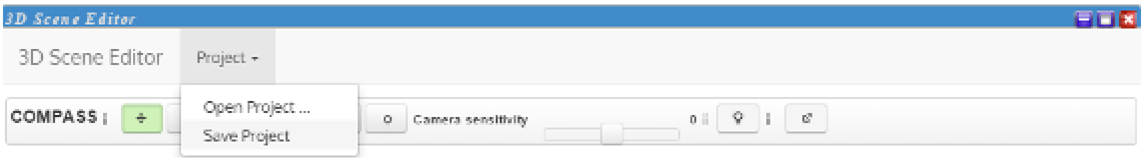
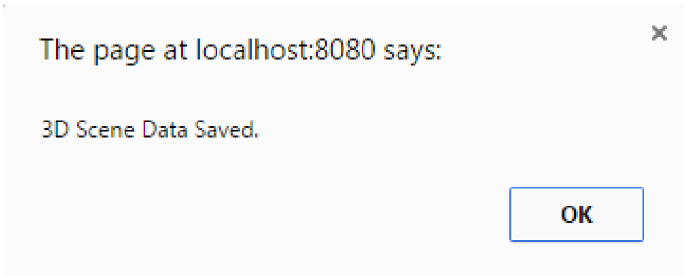


Figure 33: 3D Scene Editor menu

If the 3D scene data has been successfully saved, then the following popup window will appear on screen:



The page at localhost:8080 says:

3D Scene Data Saved.

Figure 34: Success in saving 3D scene data

18. Press “OK” button.

19. Close 3D Scene Editor window.

20. From the INTERACT EAP menu click Apps → Installed Apps → Project Editor. The Project Editor window will appear. Click on the button on the right corner of Project Editor window, then click on “Project” dropdown menu and select “Open Project …”.

21. From the Project Editor window open the newly created project. The following window will appear:

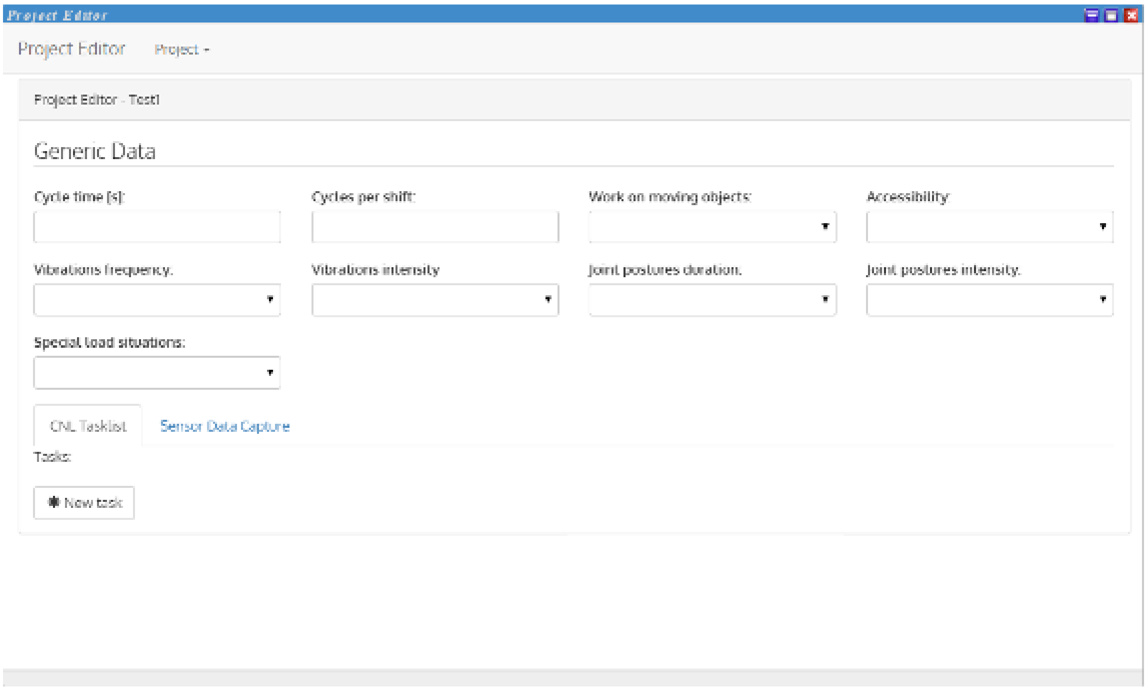
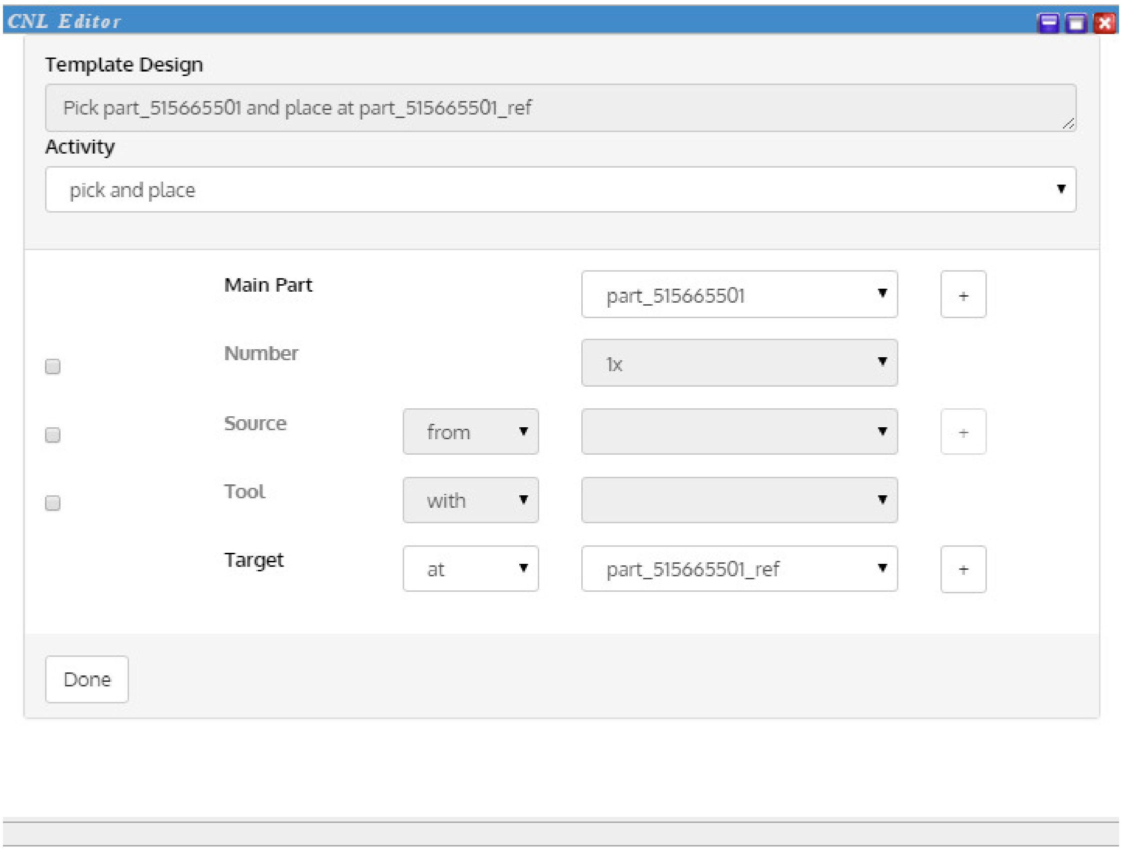


Figure 35: Edit project’s parameters

22. Fill in the Generic Data fields according to the projects requirements.

23. In order to create a task for the project, click on “New task” button on the bottom of the window.

24. The CNL Editor window will appear on screen. From the dropdown menu of “Activity” field choose the task that will be performed. Also select the parts that will be involved in the activity, and in case of ‘pick and place’ actions, select also the target of the ‘place’ action.



CNL Editor

Template Design

Pick part_515665501 and place at part_515665501_ref

Activity

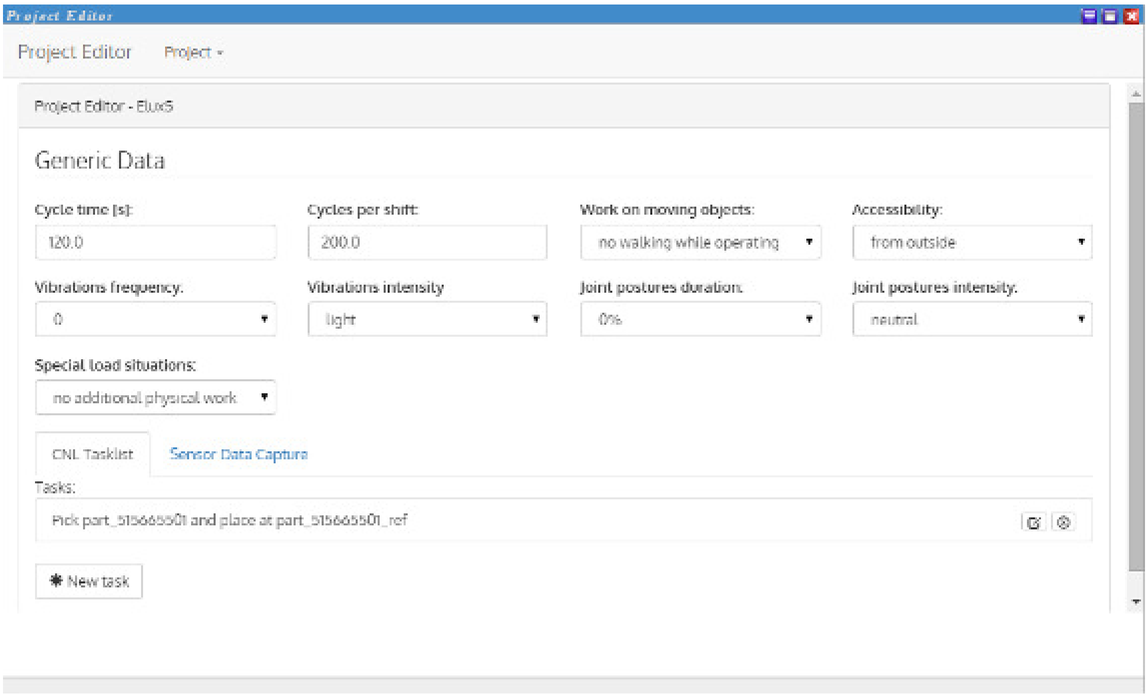
pick and place

	Main Part		part_515665501	+
□	Number		1x	
□	Source	from		+
□	Tool	with		
	Target	at	part_515665501_ref	+

Done

Figure 36: Example of 'pick and place' task

25. Press "Done" button. The created task will appear under "Tasks" label of the CNL Tasklist tab.



Project Editor

Project Editor Project ▾

Project Editor - Elux5

Generic Data

Cycle time [s]: 120.0

Cycles per shift: 200.0

Work on moving objects: no walking while operating

Accessibility: from outside

Vibrations frequency: 0

Vibrations intensity: light

Joint postures duration: 0%

Joint postures intensity: neutral

Special load situations: no additional physical work

CNL Tasklist | Sensor Data Capture

Tasks:

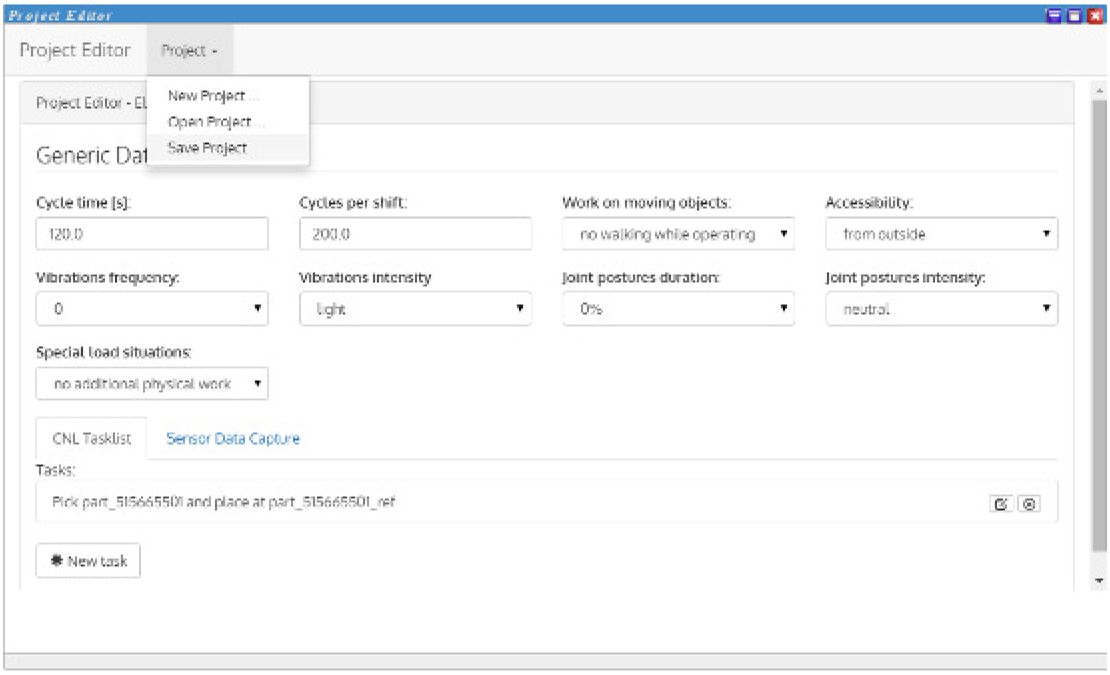
Pick part_515665501 and place at part_515665501_ref

✱ New task

Figure 37: Task added to the project

26. If there are more tasks to be included in the project, repeat steps 19 to 20.

27. When all tasks have been created, from Project Editor menu, select Project → Save Project.



Cycle time [s]: 120.0

Cycles per shift: 200.0

Work on moving objects: no walking while operating

Accessibility: from outside

Vibrations frequency: 0

Vibrations intensity: light

Joint postures duration: 0%

Joint postures intensity: neutral

Special load situations: no additional physical work

Tasks:

Pick part_515665501 and place at part_515665501_ref

Figure 38: Saving Project

28. From the INTERACT EAP menu click Apps → Installed Apps → Basic Analysis.

29. The Basic Analysis window will appear. Click on the button on the right corner of Basic Analysis window, then click on “Project” dropdown menu and select “Open Project …”.

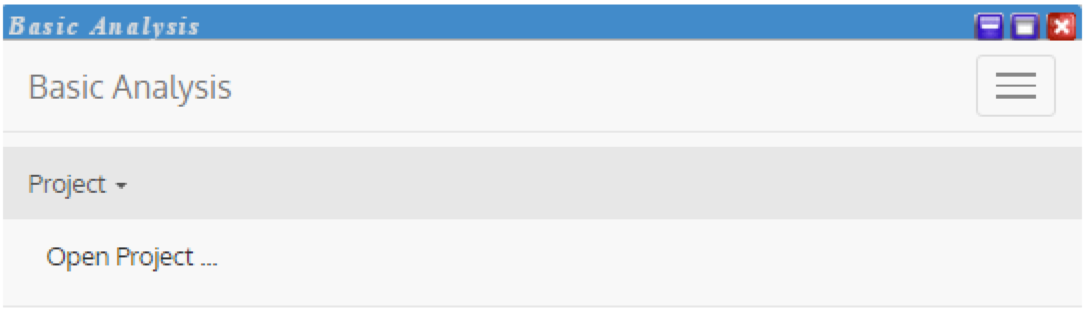
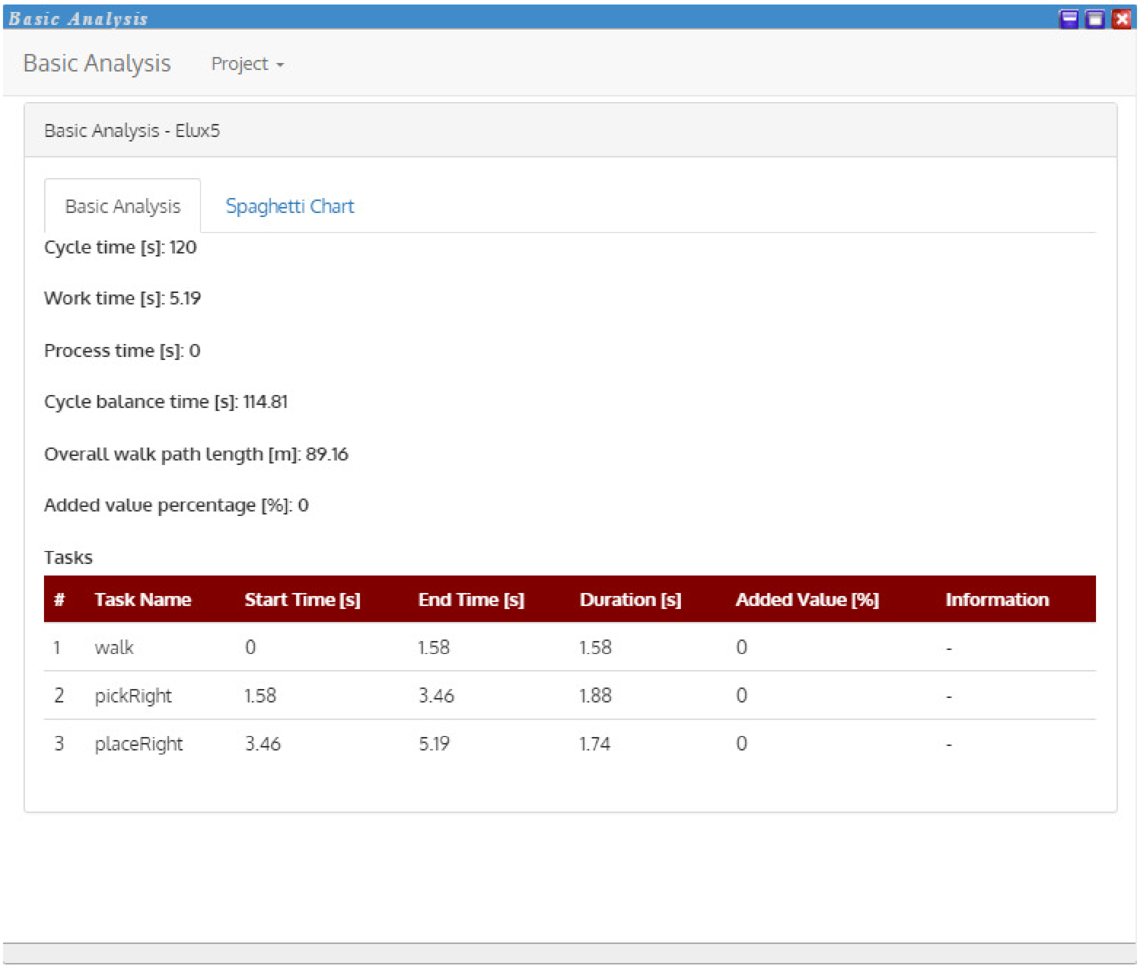


Figure 39: Basic Analysis menu

30. From the Project Editor window that will appear, select to open the created project. The tasks’ basic analysis will be displayed in Basic Analysis window.



Cycle time [s]: 120

Work time [s]: 5.19

Process time [s]: 0

Cycle balance time [s]: 114.81

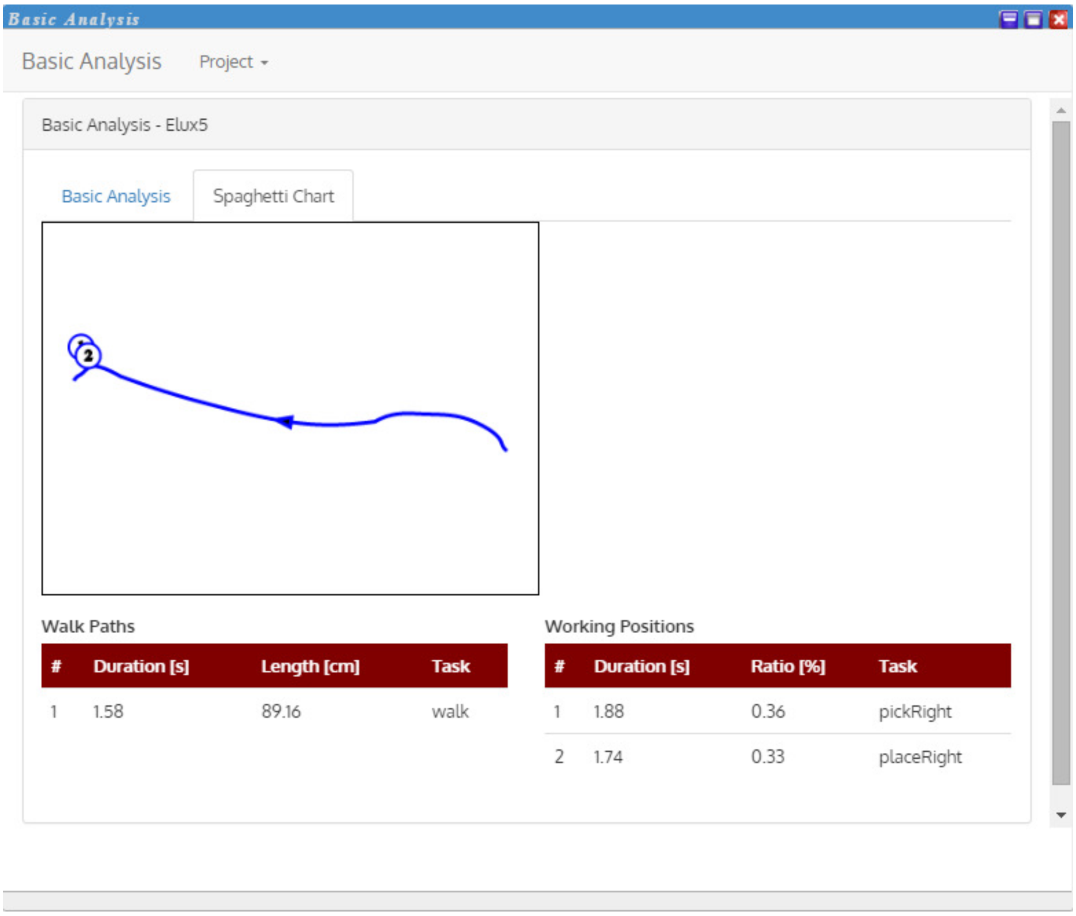
Overall walk path length [m]: 89.16

Added value percentage [%]: 0

Tasks

#	Task Name	Start Time [s]	End Time [s]	Duration [s]	Added Value [%]	Information
1	walk	0	1.58	1.58	0	-
2	pickRight	1.58	3.46	1.88	0	-
3	placeRight	3.46	5.19	1.74	0	-

Figure 40: Basic Analysis tab



Walk Paths

#	Duration [s]	Length [cm]	Task
1	1.58	89.16	walk

Working Positions

#	Duration [s]	Ratio [%]	Task
1	1.88	0.36	pickRight
2	1.74	0.33	placeRight

Figure 41: Spaghetti Chart tab

31. From the INTERACT EAP menu click Apps → Installed Apps → Ergonomics Assessment.

32. The Ergonomics Assessment window will appear. Click on the button on the right corner of Ergonomics Assessment window, then click on “Project” dropdown menu and select “Open Project …”.

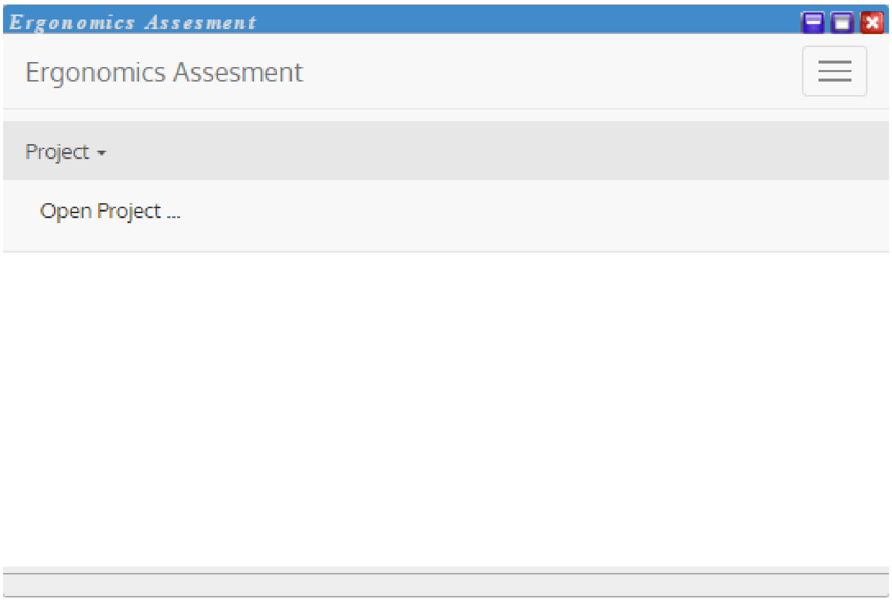
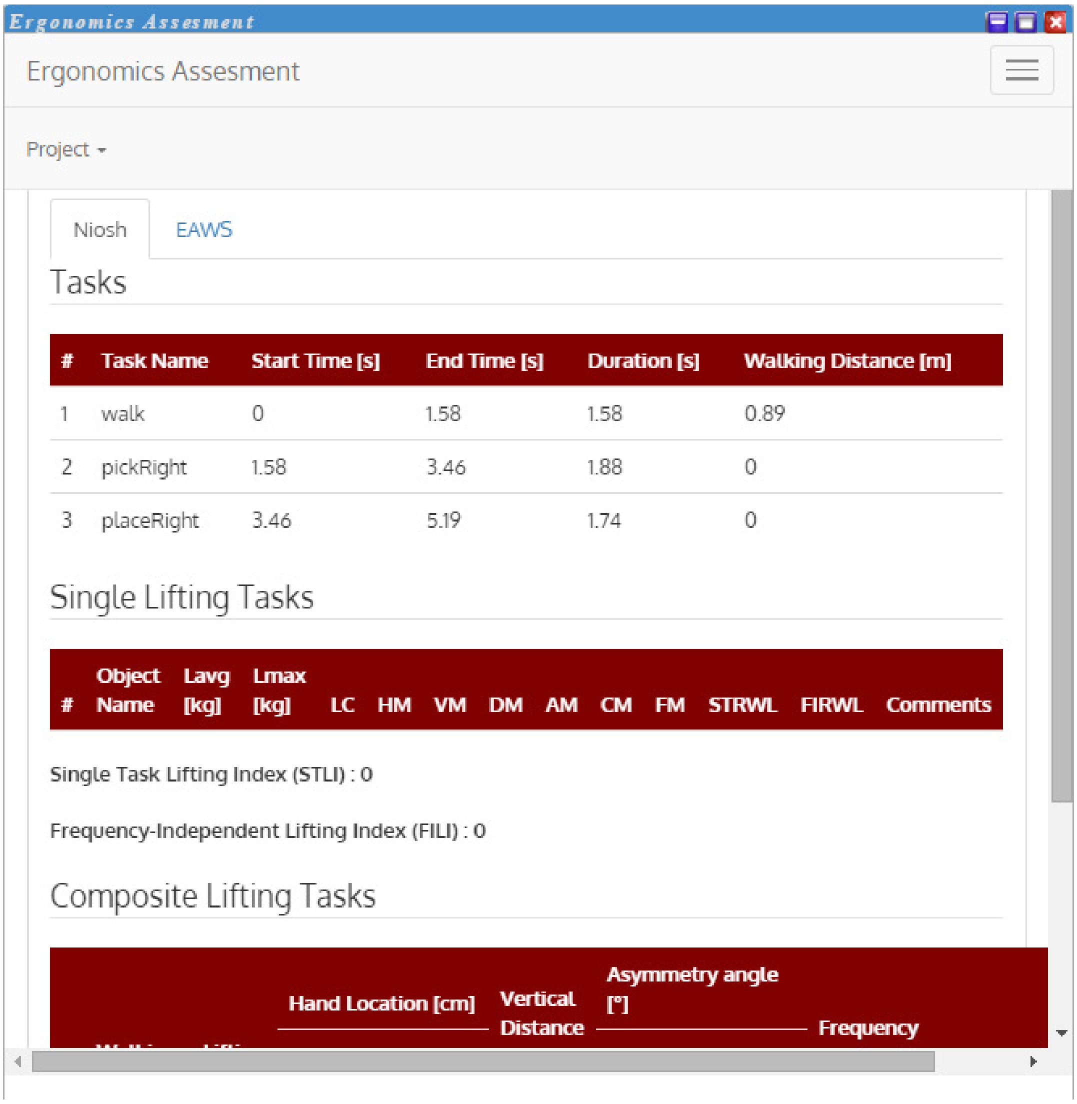


Figure 42: Ergonomics Assessment menu

33. From the Project Editor window that will appear, select to open the created project. Information about the tasks ergonomic assessment will be displayed in Ergonomics Assessment window.



Tasks

#	Task Name	Start Time [s]	End Time [s]	Duration [s]	Walking Distance [m]
1	walk	0	1.58	1.58	0.89
2	pickRight	1.58	3.46	1.88	0
3	placeRight	3.46	5.19	1.74	0

Single Lifting Tasks

#	Object Name	Lavg [kg]	Lmax [kg]	LC	HM	VM	DM	AM	CM	FM	STRWL	FIRWL	Comments

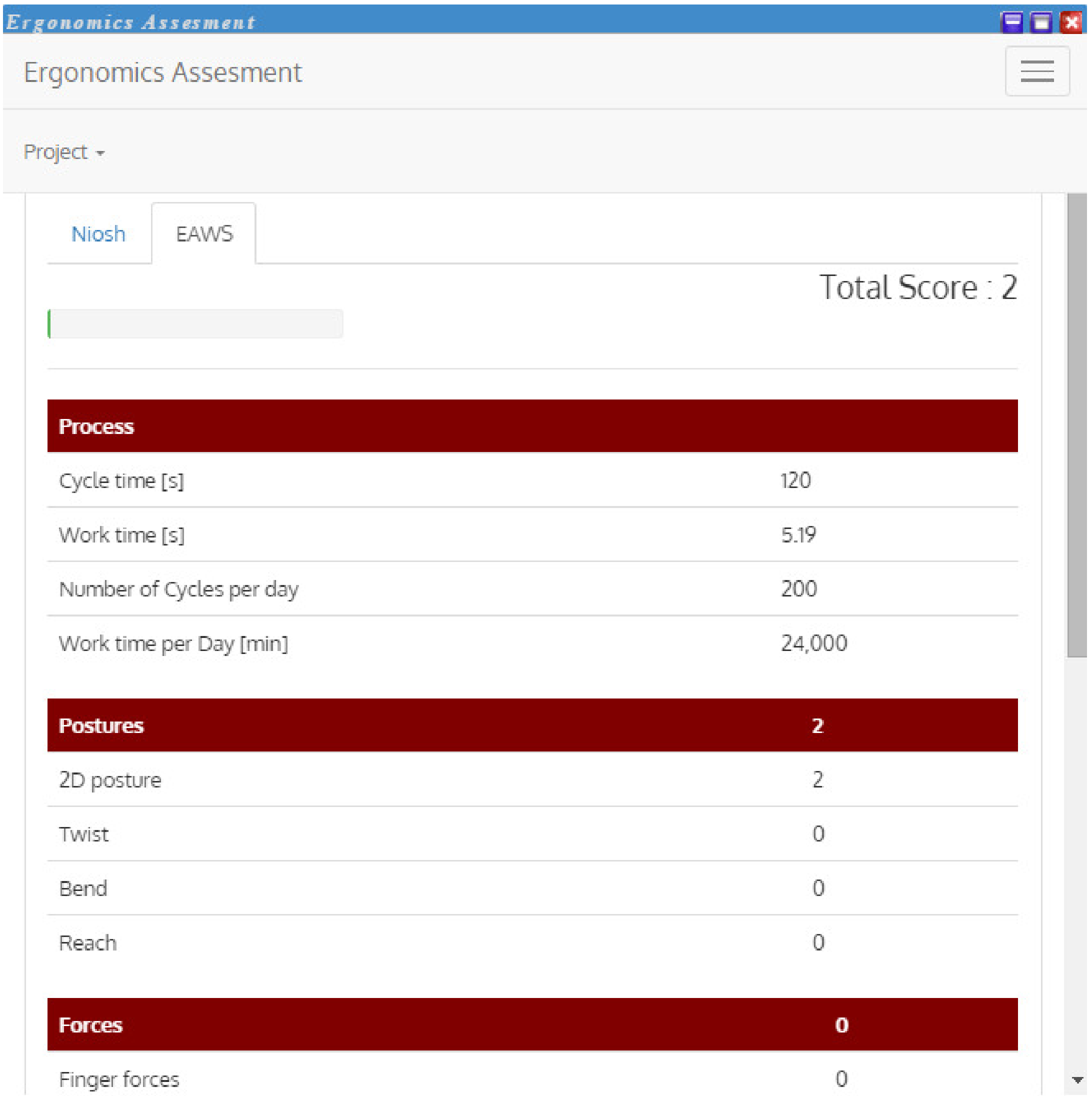
Single Task Lifting Index (STLI) : 0

Frequency-Independent Lifting Index (FILI) : 0

Composite Lifting Tasks

Hand Location [cm]	Vertical Distance	Asymmetry angle [°]	Frequency

Figure 43: Ergonomics Assessment Niosh tab



Total Score : 2

Process	
Cycle time [s]	120
Work time [s]	5.19
Number of Cycles per day	200
Work time per Day [min]	24,000

Postures	2
2D posture	2
Twist	0
Bend	0
Reach	0

Forces	0
Finger forces	0

Figure 44: Ergonomics Assessment EAWS tab

34. From the INTERACT EAP menu click Apps → Installed Apps → 3D Scene Simulator.

35. From the 3D Scene Simulator menu select Project → Open Project…, and from the Project Browser window that will appear, select the created project.

36. Wait for the scene to load and then press “Start” button in order to view the simulation.

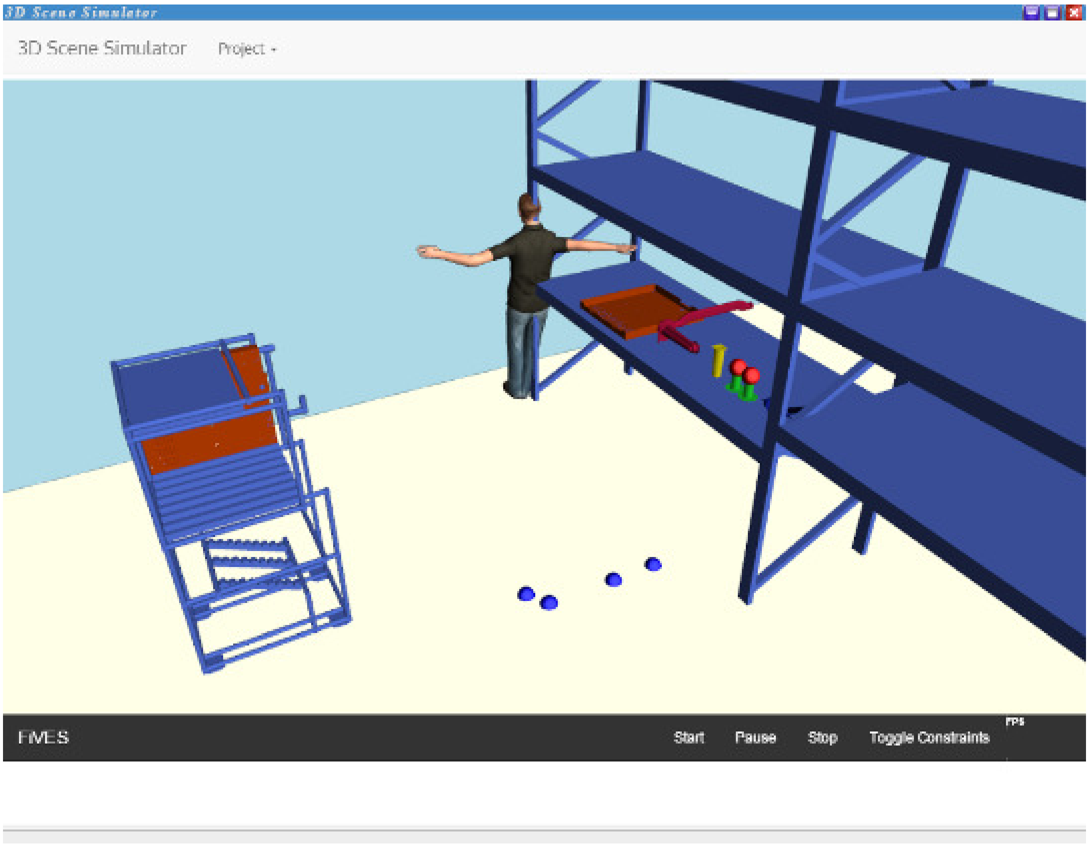


Figure 45: Simulation window

5.2. Automotive Tutorial

In case of the Daimler scene, the steps for creating a new project are the following:

1. In order to import the Daimler asset to the project, click on the arrow button of Prefabs tab. A list containing the available assets will be displayed. From the “Available Assets” list, select the asset named “Pilotcase_Daimler” and click on “Import” button.
2. The asset will be imported and displayed in Prefabs tab.

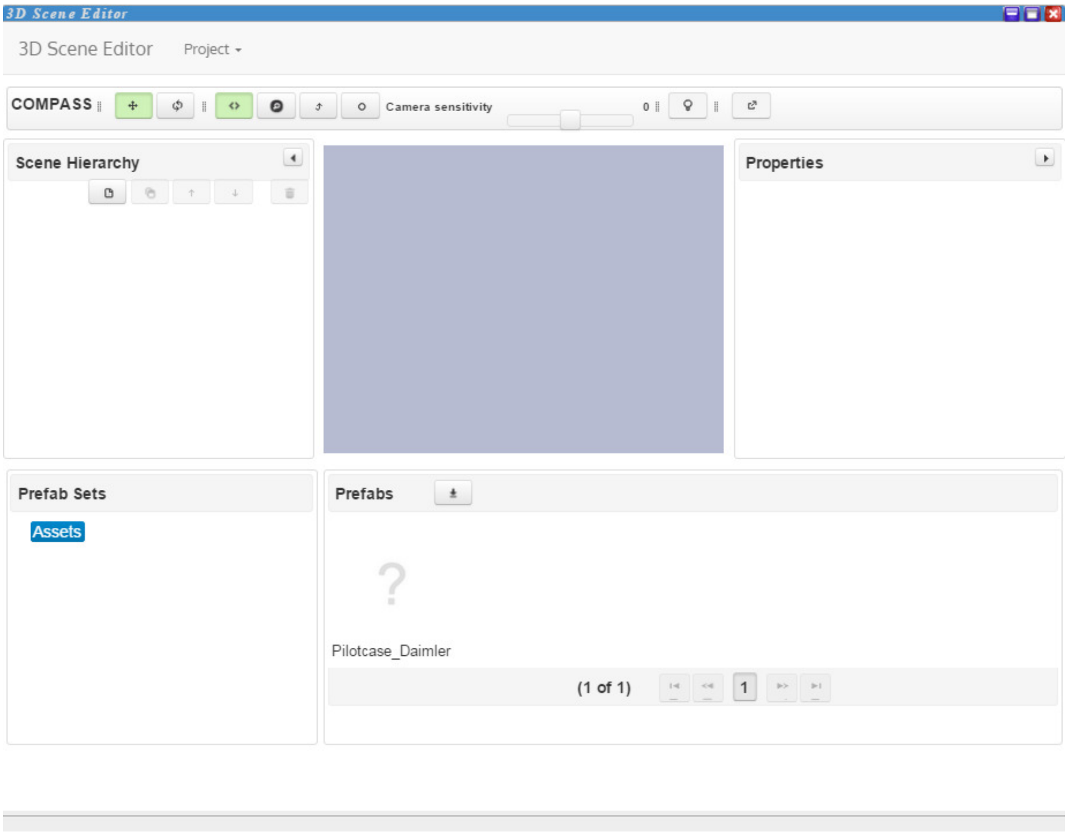


Figure 46: Asset in Prefabs tab

3. Click on "Pilotcase_Daimler" asset from Prefabs tab and drag and drop it into Scene Hierarchy tab.

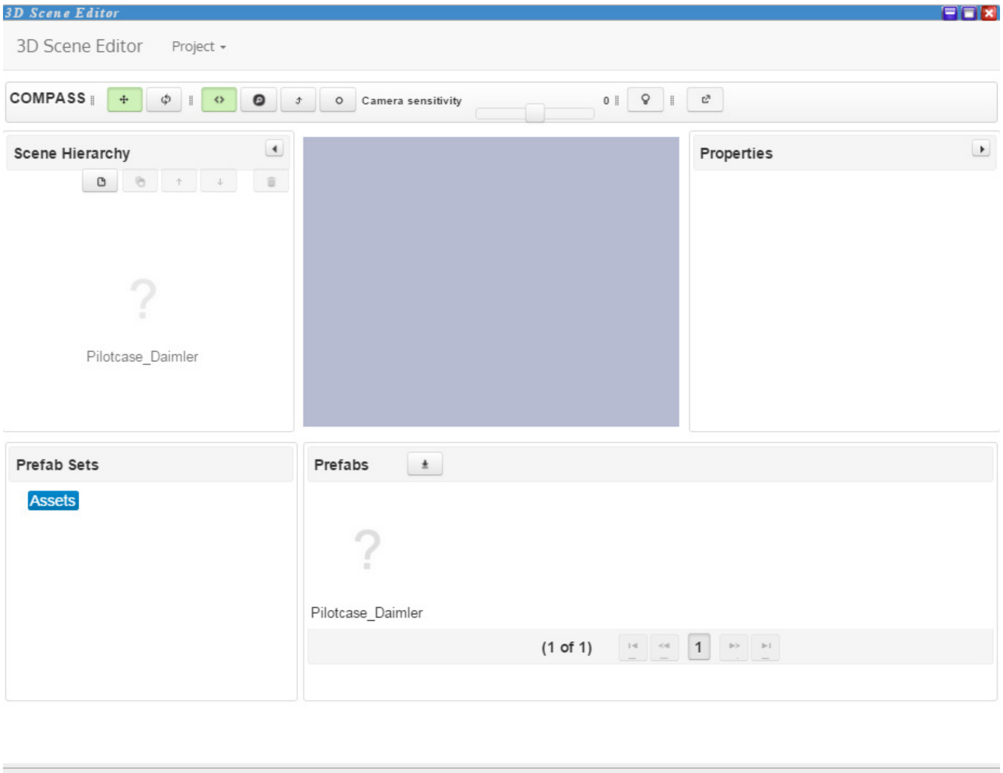
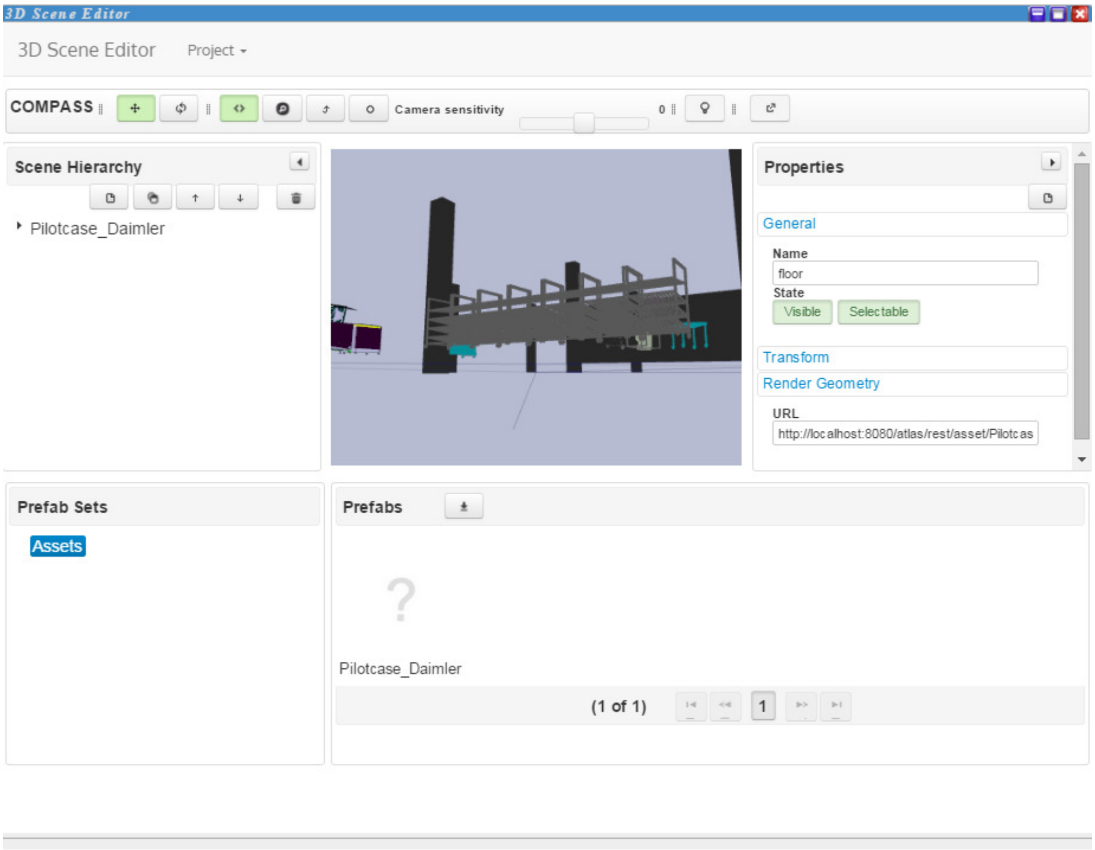


Figure 47: Drag and drop asset

4. Wait for the Daimler scene to load and to appear on screen.



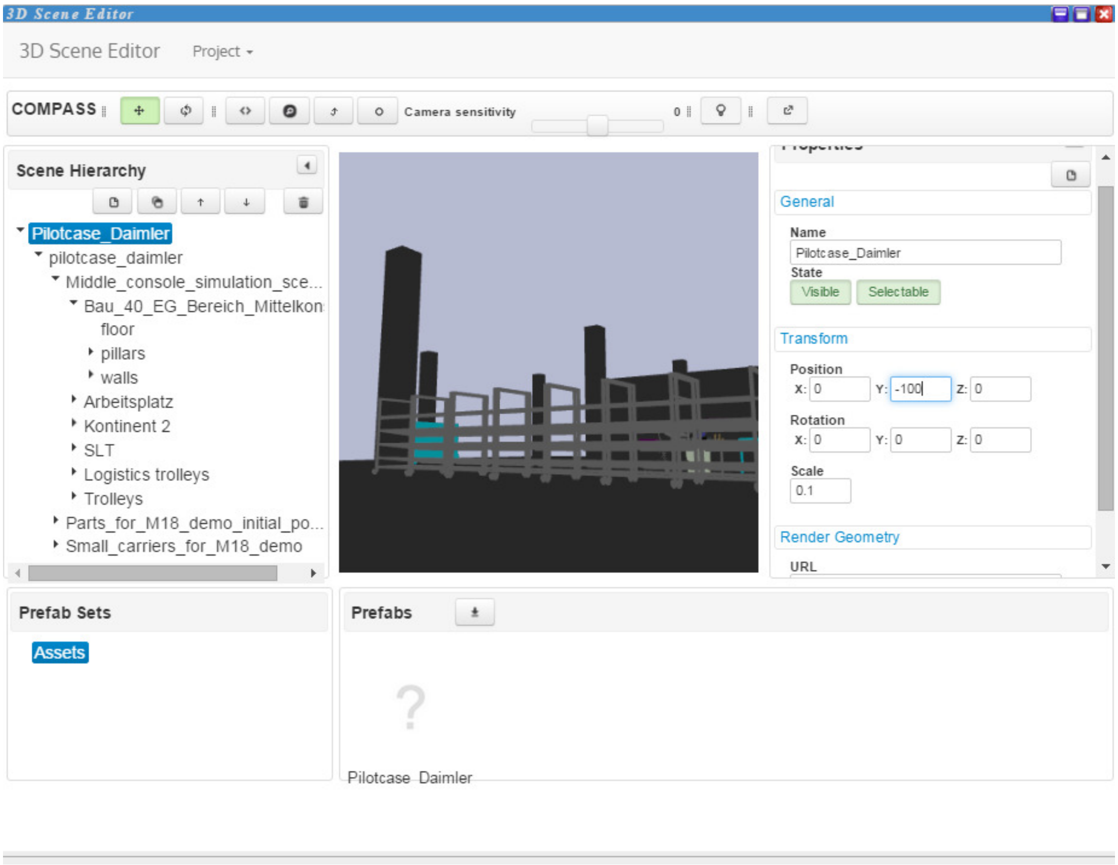
Name: floor

URL: http://localhost:8080/atlas/rest/asset/Pilotcas

Figure 48: Daimler scene in 3D Scene Editor

All the available objects in scene can be seen by clicking on the arrow button next to “Pilotcase_Daimler” object in Scene Hierarchy tab.

5. From Scene Hierarchy tab, select the root node named “Pilotcase_Daimler” and then in Properties tab, located on the right side of the 3D Scene Editor window, click on “Transform” and apply a scaling of 0.1 and a translation of -100 on the Y axis of this node.



Scene Hierarchy:

- Pilotcase_Daimler
  - pilotcase_daimler
    - Middle_console_simulation_sce...
      - Bau_40_EG_Bereich_Mittelkon
        - floor
        - pillars
        - walls
      - Arbeitsplatz
      - Kontinent 2
      - SLT
      - Logistics trolleys
      - Trolleys
    - Parts_for_M18_demo_initial_po...
    - Small_carriers_for_M18_demo

Name: Pilotcase_Daimler

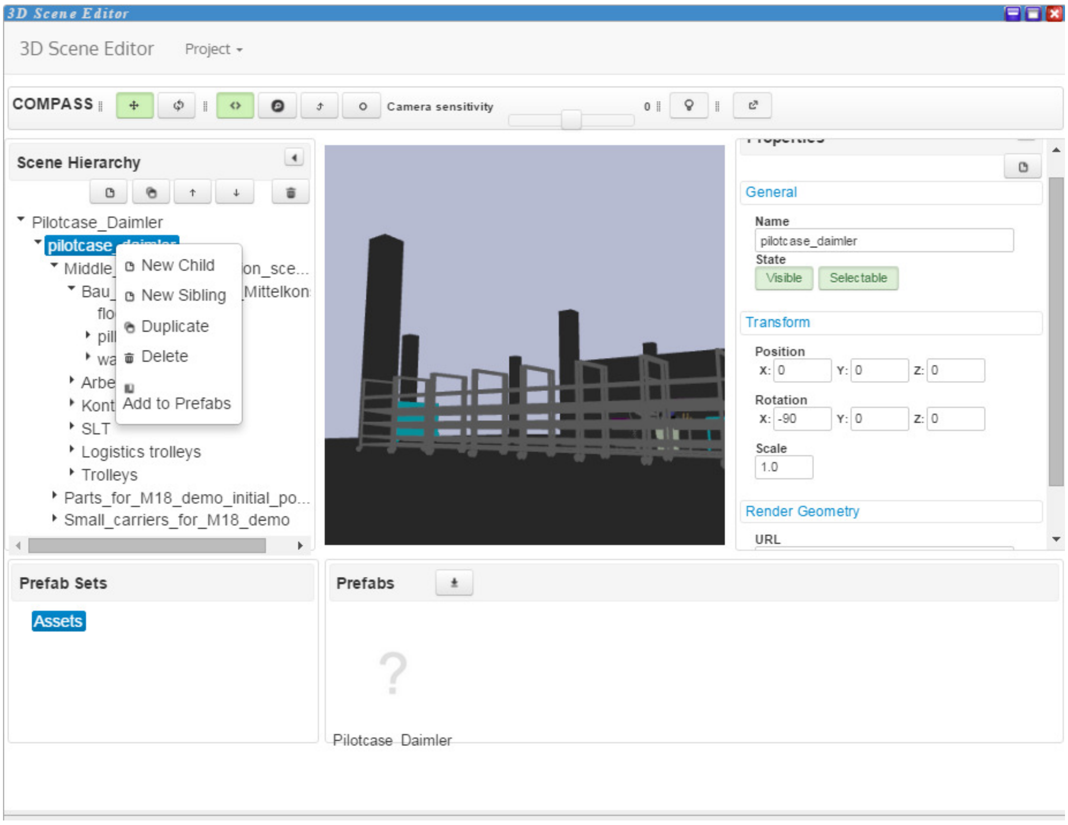
Position X: 0 Y: -100 Z: 0

Rotation X: 0 Y: 0 Z: 0

Scale: 0.1

Figure 49: Scale and Y position of root node

6. From Scene Hierarchy tab, select “pilotcase_daimler” object, right click on it and select “New Child” option.



Name: pilotcase_daimler

State: Visible Selectable

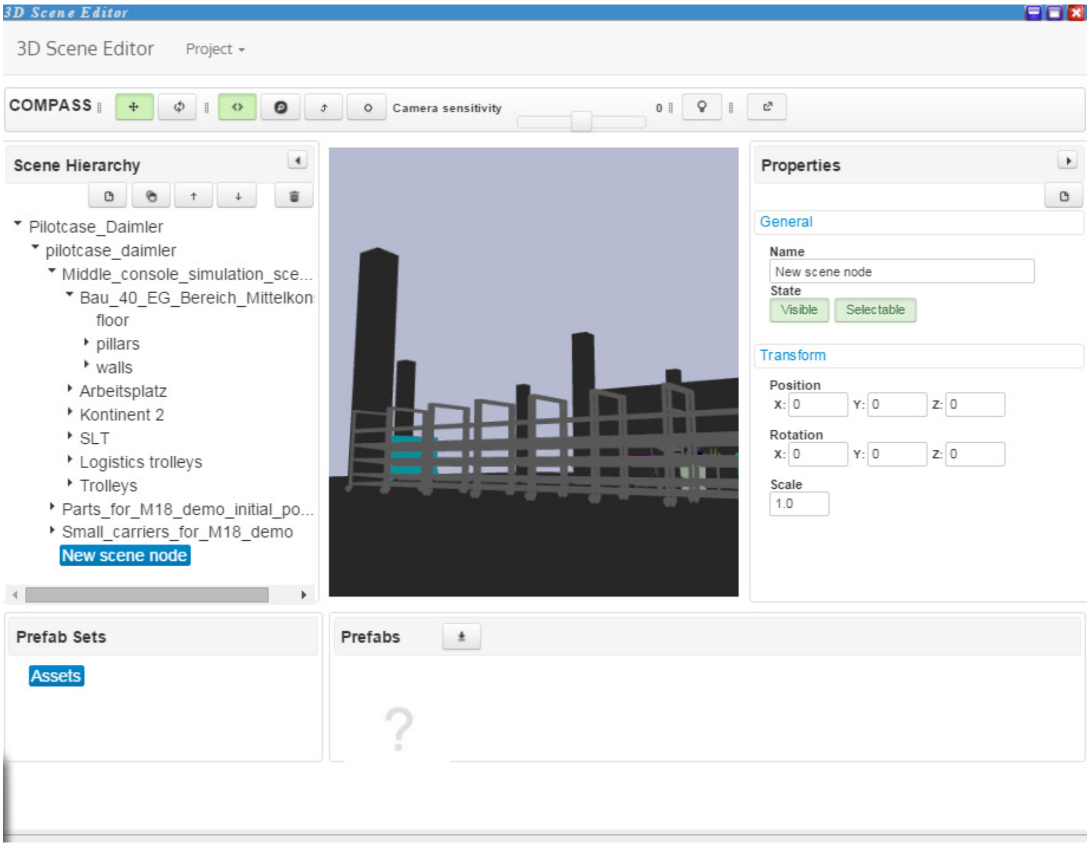
Position X: 0 Y: 0 Z: 0

Rotation X: -90 Y: 0 Z: 0

Scale 1.0

Figure 50: Add child to node

A new node will be created and displayed in Scene Hierarchy tab, inside “pilotcase_daimler” object.



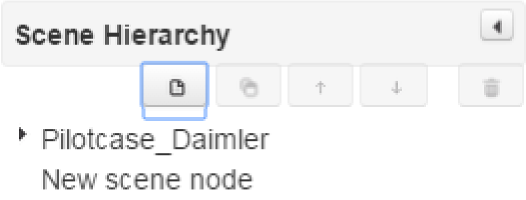
Pilotcase_Daimler
pilotcase_daimler
Middle_console_simulation_sce...
Bau_40_EG_Bereich_Mittelkon
floor
pillars
walls
Arbeitsplatz
Kontinent 2
SLT
Logistics trolleys
Trolleys
Parts_for_M18_demo_initial_po...
Small_carriers_for_M18_demo
New scene node

General
Name: New scene node
State: Visible Selectable

Transform
Position X: 0 Y: 0 Z: 0
Rotation X: 0 Y: 0 Z: 0
Scale: 1.0

Figure 51: New node in Scene Hierarchy

7. Click on “Pilotcase_Daimler” object in Scene Hierarchy tab and then click on new node button located in the same tab. A new node will be created.



Pilotcase_Daimler
New scene node

Figure 52: New node

8. *… The tutorial from here is the same as the White Goods Tutorial from step 16 until step 36*