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## Revisions

This document is a part of I-Demo demonstration suite version 1.0. It was written for I-X version 4.0 and it has been revised for versions 4.1, 4.2 and 4.5. The simple scenario of this demo is in place (up to section 0), but the further issues that can be demonstrated with this application are still to be established and written up (sections 0 and 0 to be written).

## 1 Introduction

I-Demo-Cooperation is a part of the I-Demo suite of demonstrators which is intended to illustrate the different aspects of configuring and using I-X technologies. I-Demo-Cooperation illustrates how to use I-X process panels to support two agents who are working together on a common task. In more detail, I-Demo-Cooperation shows how to perform the following tasks using I-X technologies:

- pass activities between agents,
- use knowledge about agents to pass activities between agents (e.g. via functions of escalate, delegate),
- update another agent's state,
- send messages between agents.

See I-Demo-Basic for more basic aspects of I-X process panels, and the I-X User Guide for more detail on how to use I-X applications and process panels. The IM-PACs Methods document also provides details on how to build the I-Demo-Cooperation application.

### 1.1 The Scenario

An I-X process panel may be seen as an independent agent who carries out tasks within an organisation while communicating and collaborating with other agents. Therefore, this example application is also provided in such a setting. This example application is a system that aims to support a supervisor and an operator to work together to move objects using different forms of transportation. It is the operator's task to move the object (and reporting back to the supervisor), but the supervisor's authority is required for the use of certain types of transportation.

## 2 Running the Example Application

The walk-through is described below in two phases. First, the two panels for the agents are started and initialised to reflect the knowledge they have about the state of the world and the expertise they have for dealing with activities. Second, the application scenario is shown, performing actions in the different process panels.

## 2.1 Starting I-X Process Panels

We assume that you are running under Windows and that the I-X software is installed in a directory that we refer to as <ix-base>. If you have installed the I-X software in a directory "D:\ix-4.0\I-X", we would call this the I-X base directory and refer to it as <ix-base>. The I-Demo applications can be found in the "apps" folder in the base directory. I-Demo Cooperation can be found in <ix-base>/apps/idemo-coop/. To start up the application, the two process panels that represent the two agents in the example scenario need to be started individually. The first panel to be started is the Supervisor panel, as this panel is configured to also run I-X's native name server which, in this scenario, is used to enable the panels to communicate with each other. So the first step under Windows is to run the windows-specific script in idemo-basic/scripts/win/operator.bat.

```
run <ix-base>/ apps/idemo-coop/scripts/win/supervisor.bat (double-click on the file)
```

Starting up under Unix/Linux will be documented in the next (extended) version of this document.

Running this script brings up three windows. First, there is a system console, labelled "Supervisor Command Console". In it, messages will appear concerning the status of the application. This window is mostly for debugging I-X and can be ignored (minimize it). The second window is an I-X Process Panel, labelled "Supervisor Panel", which is the interface for the Supervisor agent in which incoming requests are shown and from which they can be dealt with. This window is your interface to the application when you are taking the role of the supervisor. The third and final window that appears as a result of running the first script above is the name server window, and is labelled "I-X Name-Server at localhost...". This window shows information about which agents are currently online and on which machine they are running. You can check that the Supervisor agent is registered there, but otherwise this window is of little importance at this point. Minimise it to keep your screen manageable.

With the name server running, we can now start the second agent.

```
run <ix-base>/apps/idemo-coop/scripts/win/operator.bat (again, double-click on the file)
```

This will result in two windows appearing: a second console window (Operator Command Console) which we can ignore and minimize, and a second I-X process panel (Operator Panel). The Operator panel is your interface when you are taking the role of the operator. Currently, the difference in the appearance between the Supervisor and Operator process panels is that the title of each window gives the name of the agent it belongs to, and they also have different background colours so that they are easier to tell apart. As each process panel plays a different role in the application, they will have different capabilities and processes to be carried out which will become clear later on as we go through the demo. You may notice that with each panel a new line appears in the name server window indicating that the panel has registered with the name server and is now available for communication.

Both panels have been set up to contain initial information about the world state (as you can see in the State part of the panels) and to contain expert knowledge of how to perform activities. The supervisor also has an initial item on its activity list ("move medical-box1 60 70"). This is the agent's initial plan.

## 2.2 Using the Application

In the Supervisor panel the initial plan consists of an activity to move a medical box to a given pair of coordinates. This activity's "Action" field is orange, indicating that the action can be taken now. In addition to the basic actions described in I-Demo Basic, we now also have options related to the other agents that are part of the application. The option "Delegate ..." under the Supervisor's action menu for the "move ..." activity is such an option, giving the supervisor the means to delegate the activity to a suitable subordinate rather than carrying it out itself.

### A Simple Scenario

Choose this option below to take the action and progress the demonstration.

```
in the Supervisor Panel, select "Delegate to Operator" from the action menu of the "move ..." activity.
```

The activity status will turn green to indicate that – as far as the Supervisor is concerned – this activity has started. This activity is now be transferred and appears as a new activity in the Operator Panel. Here, the activity status is orange to indicate that the operator has not yet started the activity, but it is ready to be carried out.

## I-Demo-Cooperation Demo Script

To deal with the activity, we now change role and work as the Operator agent. Operator has its own process model that represents its expert knowledge and provides details. This knowledge is made available through the activity's action menu (as before, click on the action part of the activity to see the menu).

in the Operator Panel, select "Expand using move-object" from the action menu of the "move ..." activity.

This turns the above activity green (in progress), shows which action is being taken, and adds sub-activities to the activity field, in this case four sub-activities. A small triangle also appears on the left of the "move ..." activity. This can be used to expand and collapse the display of sub-activities.

The first of the sub-activities, "select-transport-at ..." is ready to be performed, indicated again by its orange colour. Choose its "Expand using use-helicopter". This adds a "seek-authority ..." sub-activity for the "select-transport-at ..." activity. This sub-activity reflects the need to seek permission from the supervisor to assign a helicopter. We escalate the activity to the supervisor by choosing the action "Escalate to Supervisor" for that activity. Note that at this point there is nothing else that can be done on the current task from within the Operator process panel.

in the Operator Panel, select "Expand using use-helicopter" from the action menu of the "select-transport-at ..." activity.

in the Operator Panel, select "Escalate to Supervisor" from the action menu of the "seek-authority ..." sub-activity.

We now change role back to the Supervisor agent and expand the "seek-authority ..." activity by using the "Expand using grant-helicopter-authority" action for that activity. Using this expansion has the effect that the activity is considered done (it turns blue) and that the authority is given to the operator. Note that in both panels there are now a transport-assignment state constraint that links the helicopter to the cargo.

We now change role back to the Operator agent and note that the next step, "load ...", can now be performed. Step through all sub-activities in the Operator Panel as they become doable, each time using the "Expand..." action, and note how the world state information changes as the activities are performed (watch objects and vehicles moving positions).

You can end the demo here.

### Continuing the Demonstration

If you want to continue the demonstration, you can work to

- Update another agent's state,
- Manually send messages.

Details on how to do this will be given in a later version of this document.

You can end the demo here.

### Further Options

If you want to continue the demonstration, you can work to add agents using I-Space. Details on how to do this will be given in a later version of this document.

## 2.3 Summary of Demo Steps

run "<ix-base>/ apps/ideo-coop/scripts/win/supervisor.bat" (double-click on the file)

run "<ix-base>/apps/ideo-basic/scripts/win/operator.bat" (again, double-click on the file)

in the Supervisor Panel, select "Delegate to Operator" from the action menu of the "move ..." activity.

in the Operator Panel, select "Expand using move-object" from the action menu of the "move ..." activity.

in the Operator Panel, select "Expand using use-helicopter" from the action menu of the "select-transport-at ..." activity.

in the Operator Panel, select "Escalate to Supervisor" from the action menu of the "seek-authority ..." sub-activity.

...in the Operator Panel, step through the activities as they become doable, choosing the "Expand..." options...