MICRO FOCUS | CORBA An OMG Standard

Discover the Future of CORBA

Micro Focus® | CORBA® Add-on for Cloud, Containers & Virtual Environments 1.0.0

Installation and Configuration Guide

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Preface

This Guide describes the Micro Focus® | CORBA® Add-on for Cloud, Containers & Virtual Environments. It describes how to install and set up the product.

In this Guide

This manual contains the following chapters:

- Introduction describes some of the concepts of the CORBA Add-on for Cloud, Containers & Virtual Environments.
- CORBA in the Cloud or in Virtual Environments describes how the CORBA Add-on for Cloud, Containers & Virtual Environments operates in Cloud environments and in Virtual Environments and gives installation instructions.
- CORBA in Containers describes how the CORBA Add-on for Cloud, Containers & Virtual Environments operates in the Docker container and gives installation instructions.
- Silent Installation gives information on using the silent installer.
- Installing the SPS Client gives instructions for installing the SPS Client, which is a command line interface to the Security Policy Server (SPS) included in the I-DBC.
- Docker Toolbox and IP Addresses describes how to use the IP address of your Windows system with the Docker Toolbox.
- Common Docker Images describes the Docker images required for CORBA-based applications.
- The Orbix 3 Docker Image describes the Orbix 3 Docker image.
- The Orbix 6 Docker Image describes the Orbix 6 Docker image.
- Creating Orbix 6 Deployment Descriptors how to create deployment descriptors for Orbix 6-based applications.
- The VisiBroker Docker Image describes the VisiBroker Docker image.
- The VisiBroker Smart Agent Relay describes the Smart Agent Relay (osarelay) which enables you to use the Smart Agent (osagent) in containerized environments.
- Updating SPS Configuration Items describes how to configure the SPS to allow your applications to run correctly.

Contacting Micro Focus

Our Web site gives up-to-date details of contact numbers and addresses.

Further Information and Product Support

Additional technical information or advice is available from several sources.

The product support pages contain a considerable amount of additional information, such as:

- The WebSync service, where you can download fixes and documentation updates.

- The Knowledge Base, a large collection of product tips and workarounds.
- Examples and Utilities, including demos and additional product documentation.

To connect, enter http://www.microfocus.com in your browser to go to the Micro Focus home page.

Note:

Some information may be available only to customers who have maintenance agreements.

If you obtained this product directly from Micro Focus, contact us as described on the Micro Focus Web site, http://www.microfocus.com. If you obtained the product from another source, such as an authorized distributor, contact them for help first. If they are unable to help, contact us.

Information We Need

However you contact us, please try to include the information below, if you have it. The more information you can give, the better Micro Focus SupportLine can help you. But if you don't know all the answers, or you think some are irrelevant to your problem, please give whatever information you have.

- The name and version number of all products that you think might be causing a problem.
- Your computer make and model.
- Your operating system version number and details of any networking software you are using.
- The amount of memory in your computer.
- The relevant page reference or section in the documentation.
- Your serial number. To find out these numbers, look in the subject line and body of your Electronic Product Delivery Notice email that you received from Micro Focus.

Contact Information

Our Web site gives up-to-date details of contact numbers and addresses.

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If you are a Micro Focus SupportLine customer, please see your SupportLine Handbook for contact information. You can download it from our Web site or order it in printed form from your sales representative. Support from Micro Focus may be available only to customers who have maintenance agreements.

Introduction

This chapter introduces the Micro Focus® | CORBA® Add-on for Cloud, Containers & Virtual Environments (the CORBA Add-on for Cloud, Containers & Virtual Environments).

What is the CORBA Add-on for Cloud, Containers & Virtual Environments

The CORBA Add-on for Cloud, Containers & Virtual Environments enables you to extend your CORBA applications to operate with Micro Focus CORBA products (VisiBroker, Orbix 3 and Orbix 6) in the Cloud, in virtual environments, and in container-based platforms such as Docker.

It solves the main problem of network isolation and enables you to expose your enclosed and unreachable CORBA service to the internet or to other services outside of containers.

This product solves issues arising from two main deployment scenarios:

- The use of CORBA in the Cloud or in Virtual Environments,
- The use of CORBA in Containers.

Components

The CORBA Add-on for Cloud, Containers & Virtual Environments contains the following components:

- **Micro Focus IIOP Domain Boundary Controller (I-DBC):** Allows CORBA-based clients and servers to communicate easily across a network boundary where Network Address Translation (NAT) is occurring. A NAT layer can map private internal container addresses to public external host addresses. Connecting CORBA clients to services running either side of a NAT requires use of a proxy server, such as I-DBC, to manage the address translation within the CORBA object references.This is often challenging for CORBA-based applications. The I-DBC is described in the ***Micro Focus IIOP Domain Boundary Controller (I-DBC) v.4.0.0 Deployment Guide***.
- **Administration Console for I-DBC:** A graphical interface for administering the I-DBC. Using the Administration Console is described in the ***Micro Focus IIOP Domain Boundary Controller (I-DBC) v.4.0.0 Administrator's Guide***.
- **Support for the following CORBA ORBs**:
  - Orbix 3
  - Orbix 6
  - VisiBroker
- **CORBA product HotFixes:** To enable the CORBA products to work correctly with I-DBC, some HotFixes are required.

Prerequisites

Each component has its own requirements.

- **Installer:** The installer requires JDK 1.7 (or later) to be installed. The installer is available for both Windows and Linux operating systems.
- **I-DBC**: in order to run I-DBC, you will need a valid license file.

  Note: You must have the license available when you perform the installation; you cannot specify a license code subsequently.
- **Administration Console**: the machine on which the administration console is installed must have JDK 1.8 (or more recent) installed.
- **VisiBroker 8.5.6 (or later)**: during installation, you will need to provide the 64-bit VisiBroker 8.5 installer file and a suitable license file. You will also need to provide the installer files for all HotFixes required.
- **Orbix 6.3.11 (or later)**: during installation, you will need to provide the 64-bit Orbix 6.3 installer and a suitable license file.
- **Orbix 3.3.15 (or later)**: during installation, you will need to provide the 64-bit Orbix 3.3 installer, the 64-bit Orbix 3.3 SSL installer and Java and C++ authentication codes. Orbix 3.3 can be installed without the authentication codes being specified, but in this case the codes must be added to the Orbix 3.3 installation before the ORB can be used.
- An **installation directory**. The installer has an install directory for Cloud, Virtual Environment and Container installations, but not for ORB upgrades. The default directories are:

  On Windows systems:

  `<System Program Files>\Micro Focus\corba_addon_cloud_container`

  On Linux systems:

  `/opt/microfocus/corba_addon_cloud_container`

Uninstalling

An `uninstall` file is included in the installation for Cloud, Virtual Environment and Container installations, but not for ORB upgrades. Running this file guides you through removing the product HotFixes.

CORBA in the Cloud or in Virtual Environments

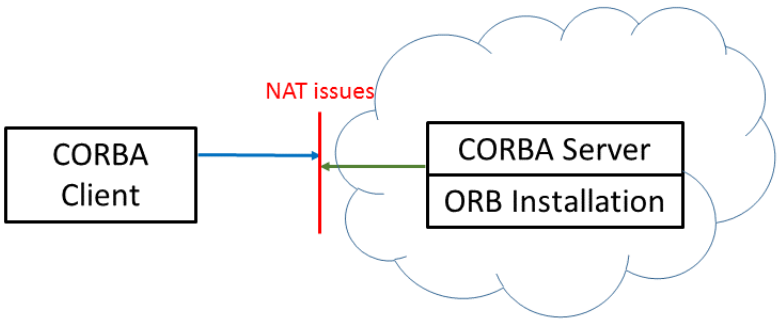
This chapter describes how the CORBA Add-on for Cloud, Containers & Virtual Environments can be used to extend CORBA functionality into the Cloud and in virtual environments.

Introduction

The CORBA Add-on for Cloud, Containers & Virtual Environments adds support for:

- The following Cloud environments:
  - Amazon AWS
  - Microsoft Azure
  - Google Cloud
- The following Virtual Environments:
  - VMWare vSphere
  - VMWare vCloud

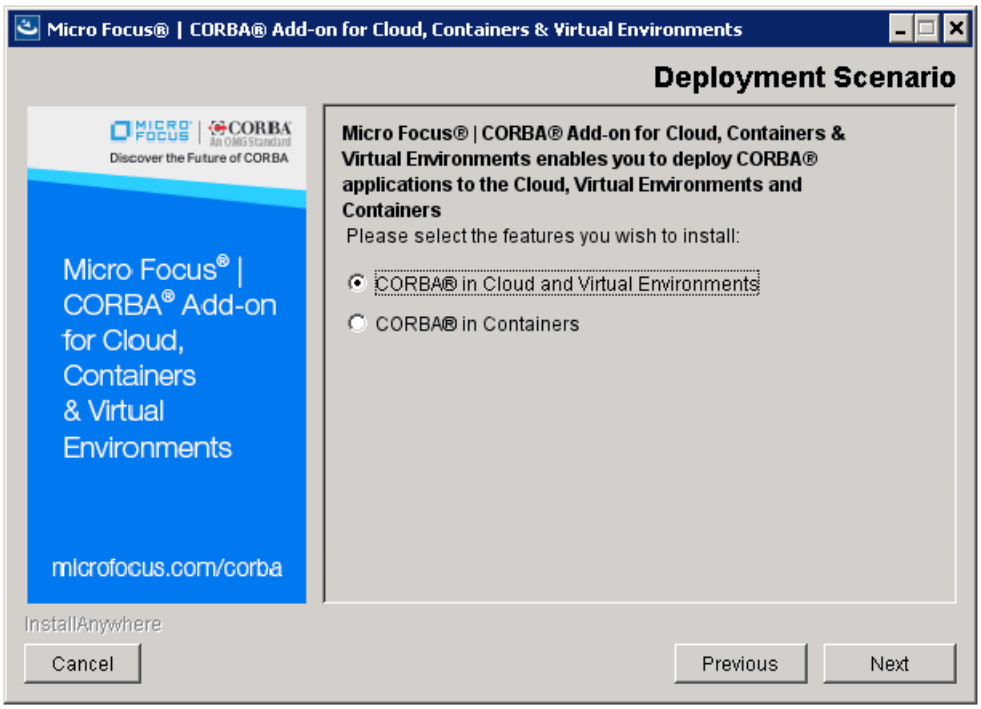
In these circumstances, the CORBA server is hidden inside an isolated network hosted on either the Virtual Environment or the Cloud provider infrastructure, and is therefore unreachable from external CORBA clients, as indicated in the following diagram.



The CORBA Add-on for Cloud, Containers & Virtual Environments product provides a solution to the issues that can arise when trying to connect to CORBA server applications in a cloud or virtual environment with Network Address Translation (NAT) or any other network bridging issues and the challenge when trying to connect to CORBA clients that are running outside of this environment.

Installation in the Cloud or in Virtual Environments

In order to deploy the CORBA Add-on for Cloud, Containers & Virtual Environments in a Cloud or Virtual Environment, run the installer and select the **CORBA in Cloud and Virtual Environments** option at the **Deployment Scenario** window.



Installation Footprints

The CORBA Add-on for Cloud, Containers & Virtual Environments product provides the following components for CORBA in Cloud and Virtual Environments deployments:

- **Micro Focus IIOP Domain Boundary Controller (I-DBC):** Allows CORBA-based clients and servers to easily communicate across a network boundary where network isolation is occurring. Requires a Linux host.
- **Administration Console for I-DBC**: A graphical interface for administering I-DBC. Using the Administration Console is described in the ***Micro Focus IIOP Domain Boundary Controller (I-DBC) v.4.0.0 Administrator's Guide***.
- The capability to upgrade an existing CORBA ORB installation with features and capabilities to communicate across a network boundary with the help of I-DBC.
- The I-DBC install packages and scripts to be used on the Linux host.
- Administration Console install package to be extracted and installed on the host.

Installation footprint on Linux

Installing the product for a Cloud environment or a virtual environment, on a Linux system, installs the following files (assuming you are installing on the Domain Boundary Controller (I-DBC) machine):

`idbc/`	Directory containing the full I-DBC installation
`adminconsole/`	Directory containing the extracted Administration Console GUI to administer an I-DBC installation
`doc/license_agreement.txt`	
`doc/notices.txt`	
`resources/mf_idbc_install.sh`	I-DBC installer script
`resources/mf_idbc_services.sh`	I-DBC service installer script to be run after I-DBC installation
`resources/microfocus_CLI-4.0.0.tar.gz`	I-DBC installer package used by `mf_idbc_install.sh`
`resources/microfocus_IDBC-4.0.0.tar.gz`	I-DBC installer package used by `mf_idbc_install.sh`
`resources/microfocus_SPS-4.0.0.tar.gz`	I-DBC installer package used by `mf_idbc_install.sh`
`resources/microfocus_AdminConsole.tar.gz`	AdminConsole package for manual extraction
`uninstall/`	

Installation footprint on Windows

Installing the product for a Cloud environment or a virtual environment, on a Windows system, installs the following files (assuming you are installing on the Domain Boundary Controller (I-DBC) machine):

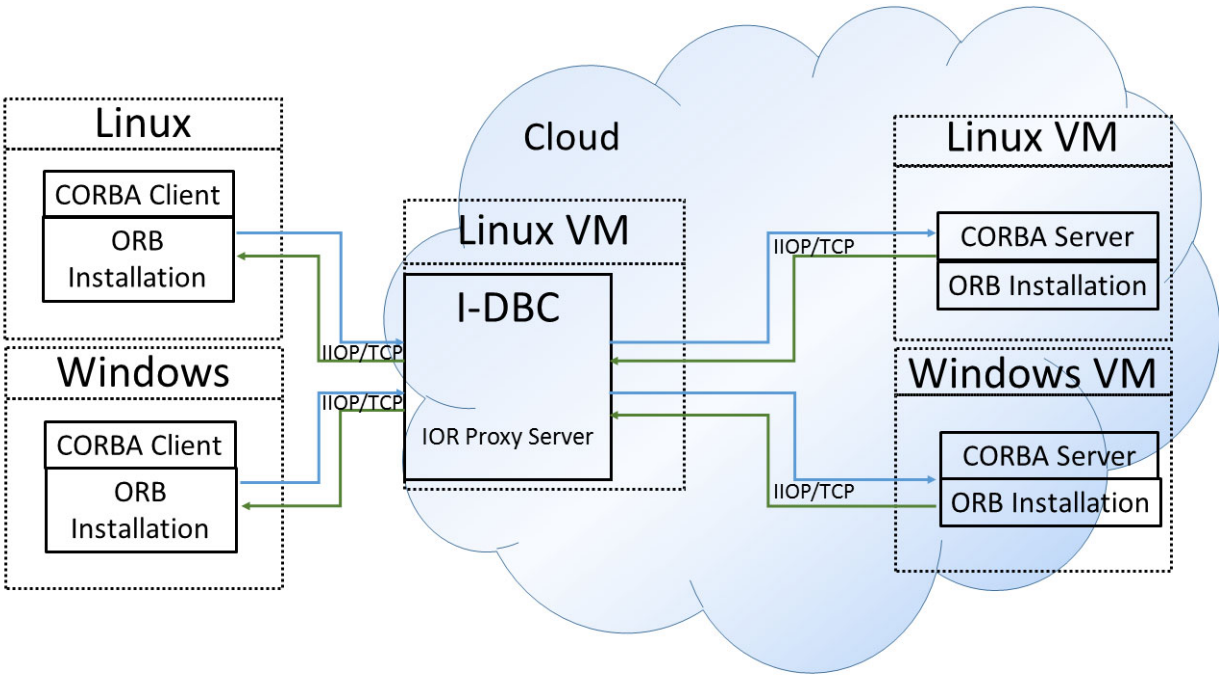
`adminconsole\`	Directory containing the extracted Administration Console GUI to administer an I-DBC installation on a Linux host
`doc\license_agreement.txt`	
`doc\notices.txt`	
`resources\mf_idbc_install.sh`	I-DBC installer script to be installed on a Linux host
`resources\mf_idbc_services.sh`	I-DBC service installer script to be run after I-DBC installation
`resources\microfocus_CLI-4.0.0.tar.gz`	I-DBC installer package used by `mf_idbc_install.sh`
`resources\microfocus_IDBC-4.0.0.tar.gz`	I-DBC installer package used by `mf_idbc_install.sh`
`resources\microfocus_SPS-4.0.0.tar.gz`	I-DBC installer package used by `mf_idbc_install.sh`
`resources\microfocus_AdminConsole.tar.gz`	AdminConsole package for manual extraction
`uninstall\`	

Deployment Scenario for Cloud and Virtual Environment

This section describes the virtual machines that make up a typical Cloud or Virtual Environment deployment:

- **CORBA client machine**: the CORBA client application runs on this machine. This machine is usually located outside the Cloud or Virtual Environment.
- **CORBA server machine**: the CORBA server application runs on this machine. This machine is located within the Cloud or Virtual Environment and it is not directly reachable from the outside.
- **Domain Boundary Controller machine**: this machine acts as the CORBA gateway between the outer CORBA Client machines and the inner CORBA server machines.
- **Optional development machine**: this machine hosts the CORBA development environment and the CORBA Add-on for Cloud, Containers & Virtual Environments components. This can be a generic development machine or it can be dedicated to running the Administration Console component to administer the I-DBC component on the Domain Boundary Controller machine.

For a further overview and full information on the capabilities of the I-DBC and Administration Console components, see the ***Micro Focus IIOP Domain Boundary Controller (I-DBC) v.4.0.0 Deployment Guide*** and the ***Micro Focus IIOP Domain Boundary Controller (I-DBC) v.4.0.0 Administrator's Guide***.



Installation Prerequisites

To deploy the CORBA Add-on for Cloud, Containers & Virtual Environments, you need the following components:

- The CORBA Add-on for Cloud, Containers & Virtual Environments Linux installer, for the installation of I-DBC.
- Optionally the CORBA Add-on for Cloud, Containers & Virtual Environments Windows installer for manual I-DBC deployment and for the Administration Console.
- A Linux VM designated as the boundary controller machine to host I-DBC.
- A license for I-DBC, if you are installing on the Domain Boundary Controller machine.
- An ORB installation. You will need to install an ORB, upgrade and existing installation to work with a Cloud deployment scenario. The current supported ORB installations are:
  - VisiBroker 8.5.6 or higher
  - Orbix 6.3.11 or higher
  - Orbix 3.3.15 or higher
- The CORBA Add-on for Cloud, Containers & Virtual Environments ORB HotFixes for your existing ORB client and server installation machines (to be downloaded from Micro Focus Supportline). The CORBA Add-on for Cloud, Containers & Virtual Environments ORB HotFixes must match the platforms (operating system, compiler version, and bitness) that your ORB installations are deployed on.

Installation Steps

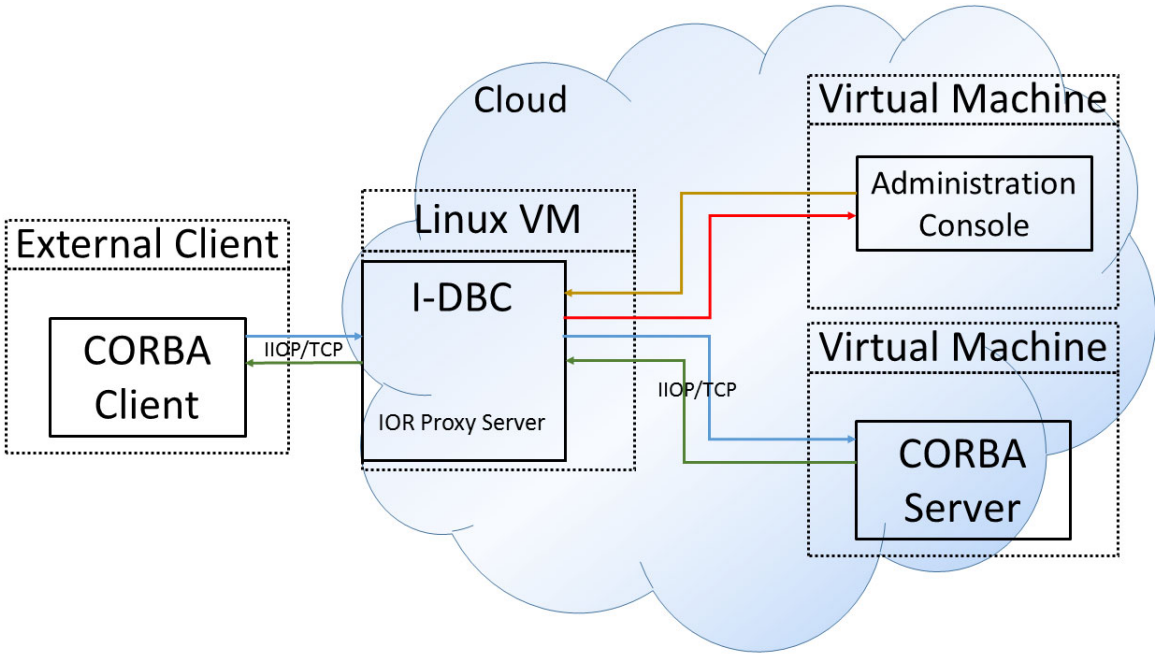
To install the CORBA Add-on for Cloud, Containers & Virtual Environments in a VCloud or virtual environment, follow these steps:

1. On the I-DBC Linux host machine, run the CORBA Add-on for Cloud, Containers & Virtual Environments installer selecting the **CORBA in Cloud and Virtual Environments** deployment scenario, and choosing the option to install on a **Domain Boundary Controller host**.
2. On the CORBA server machine, run the CORBA Add-on for Cloud, Containers & Virtual Environments installer selecting the **CORBA in Cloud and Virtual Environments** deployment scenario, and choosing the **Upgrade an existing ORB installation on this host** option.
3. On the CORBA client machine, run the CORBA Add-on for Cloud, Containers & Virtual Environments installer selecting the **CORBA in Cloud and Virtual Environments** deployment scenario, and choosing the **Upgrade an existing ORB installation** option.

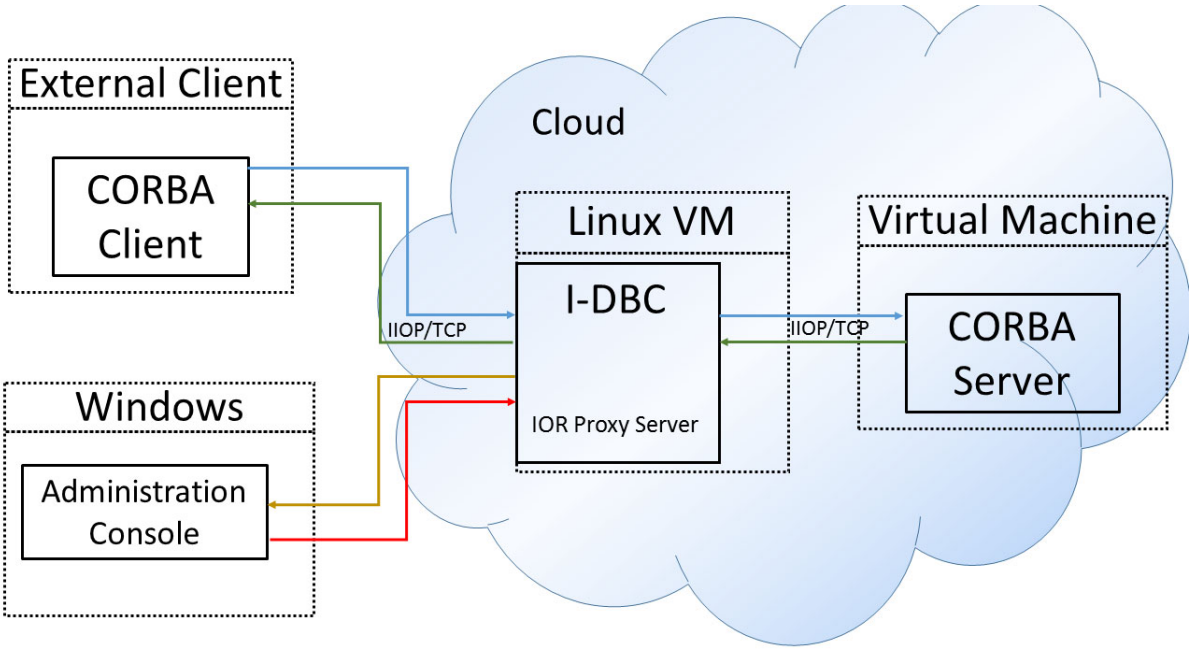
Once the installation is complete and I-DBC is properly configured, the connectivity challenges can be overcome.

CORBA for Cloud and Virtual Environments: Installed Components Overview

After you have installed the CORBA Add-on for Cloud, Containers & Virtual Environments on the appropriate machines, the overall deployment looks like the following illustration.



Suppose the example above chose to install the Administration Console on a Windows system, the result would look like:



To install the CORBA Add-on for Cloud, Containers & Virtual Environments to the Domain Boundary Controller host, run the installer as follows:

1 Download the installer into a temporary directory (for example, `\temp` on Windows, or `/tmp` on UNIX).

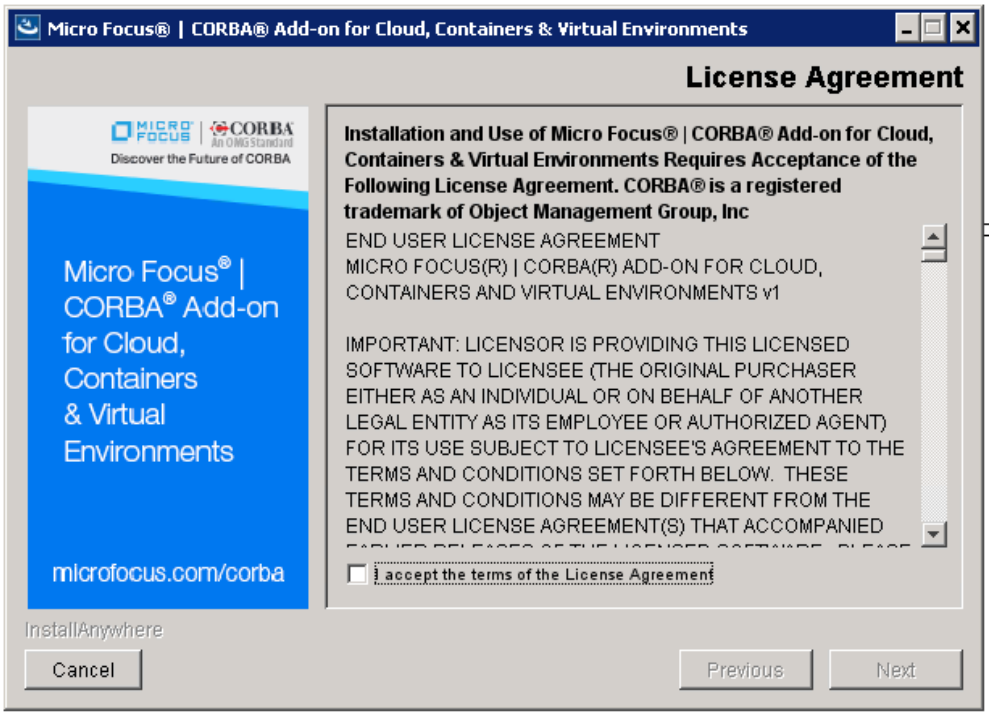
2 Run the installer to launch InstallAnywhere.

- On Windows, `mf_ccve_corba_addon_1.0_win_x64.exe`
- On UNIX, `mf_ccve_corba_addon_1.0_lnx_x64.bin`

Installing with the GUI

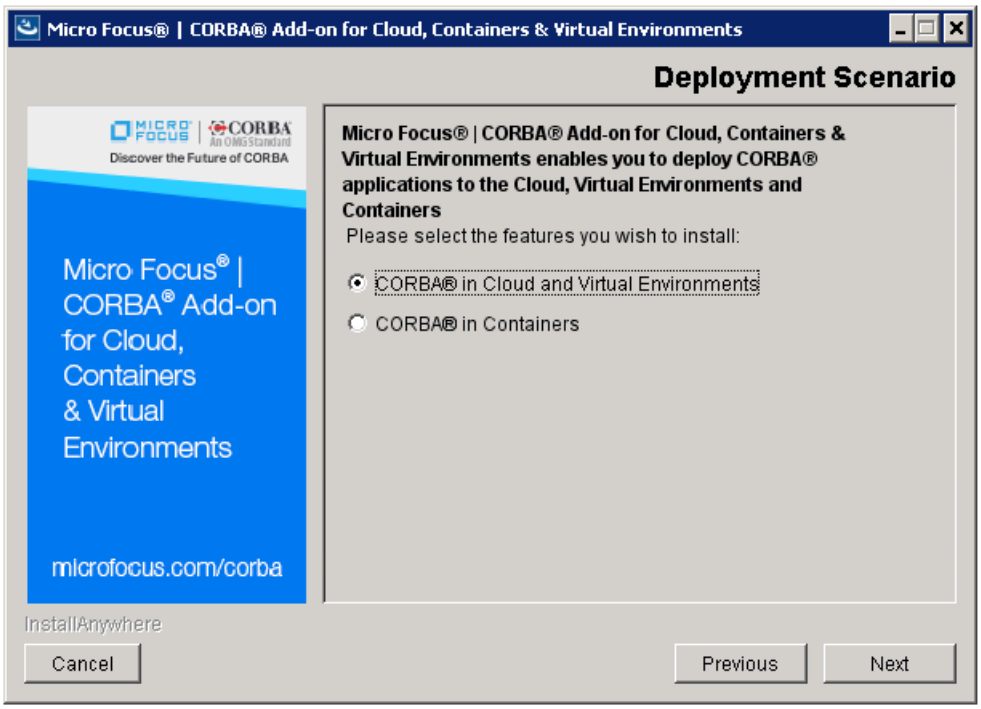
To install via the GUI, run the installer as described above. The installer will run through the following screens.

1 The **License Agreement** screen displays.

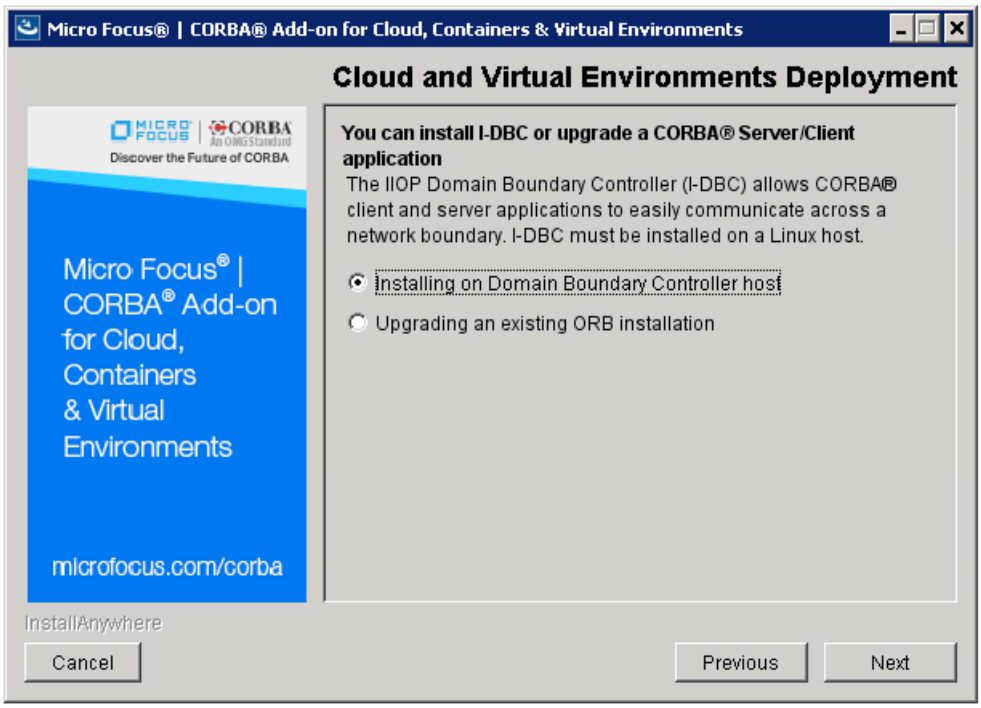


Read and agree the terms of the license agreement. Check **I accept the terms of the License Agreement** and click **Next**. If you do not accept the license, you cannot proceed further.

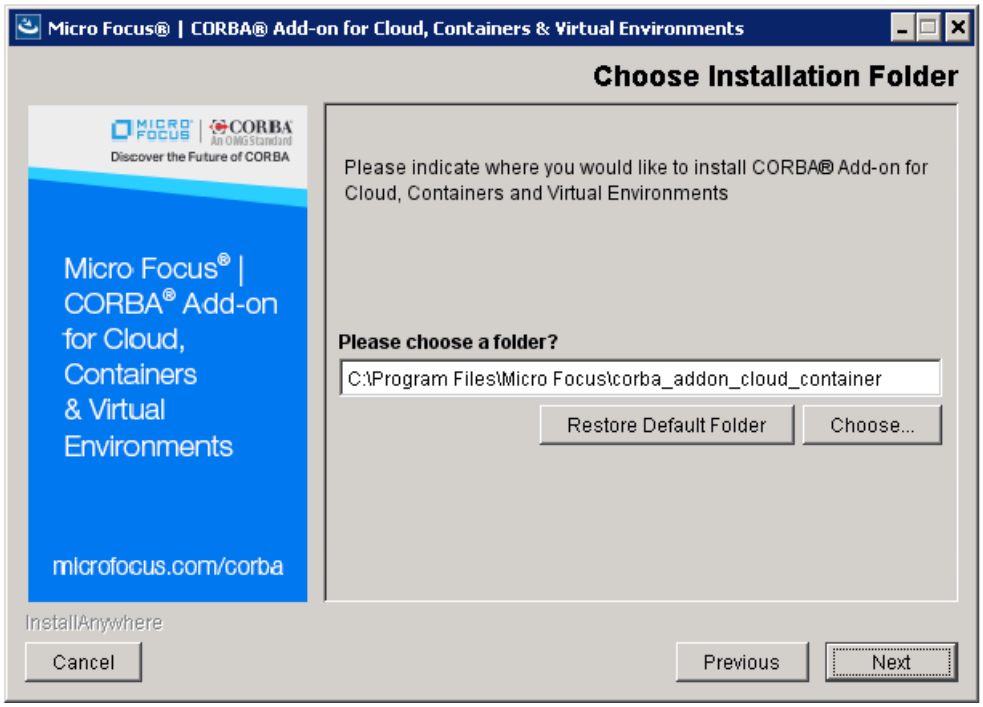
2 The **Deployment Scenario** window displays. Select **CORBA in Cloud and Virtual Environments** and click **Next**.



3 The **Cloud and Virtual Environments** window displays. Select **Installing on Domain Boundary Controller host**.

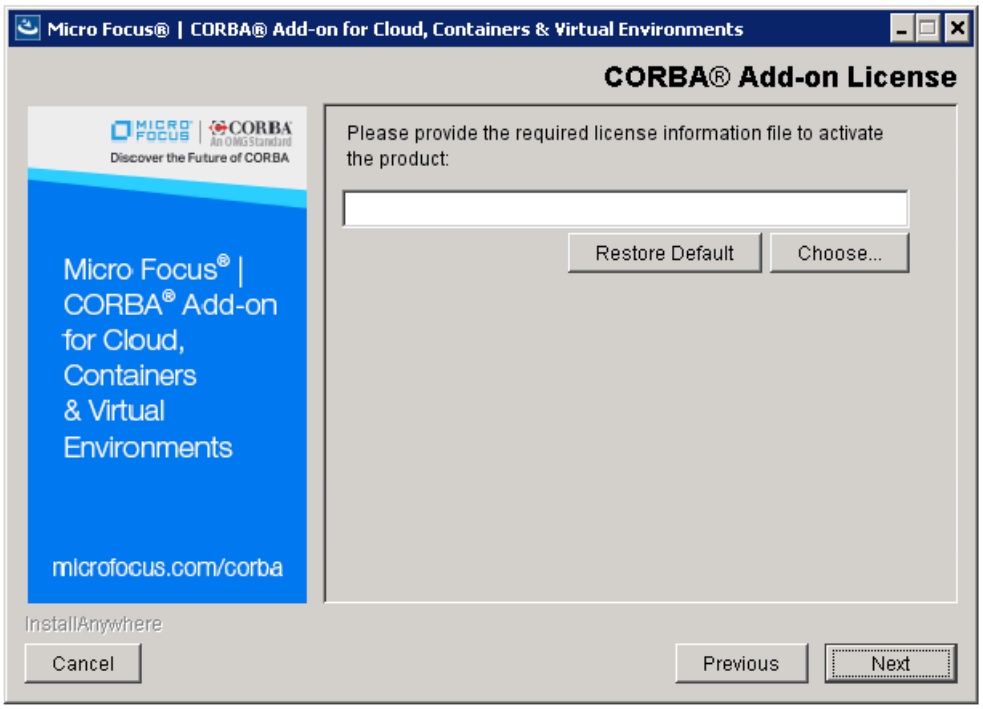


4 The **Choose Installation Folder** screen displays.



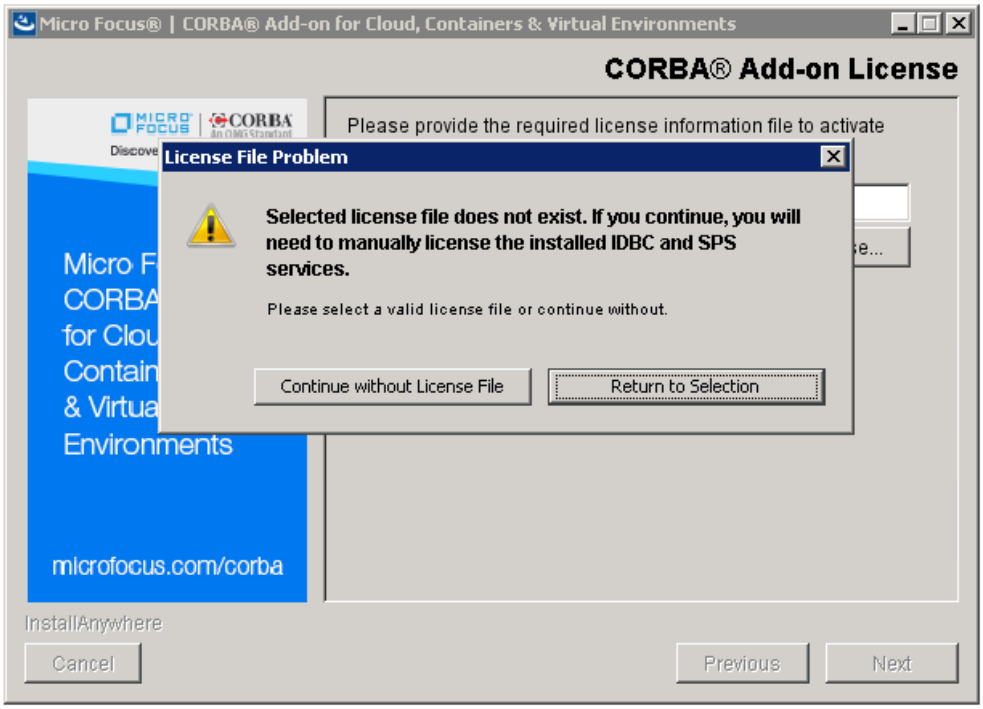
Specify your desired installation directory either by typing the folder name into the text box or by clicking **Choose** to browse for it. Click **Next** to proceed.

5 The **CORBA® Add-on License** screen displays.



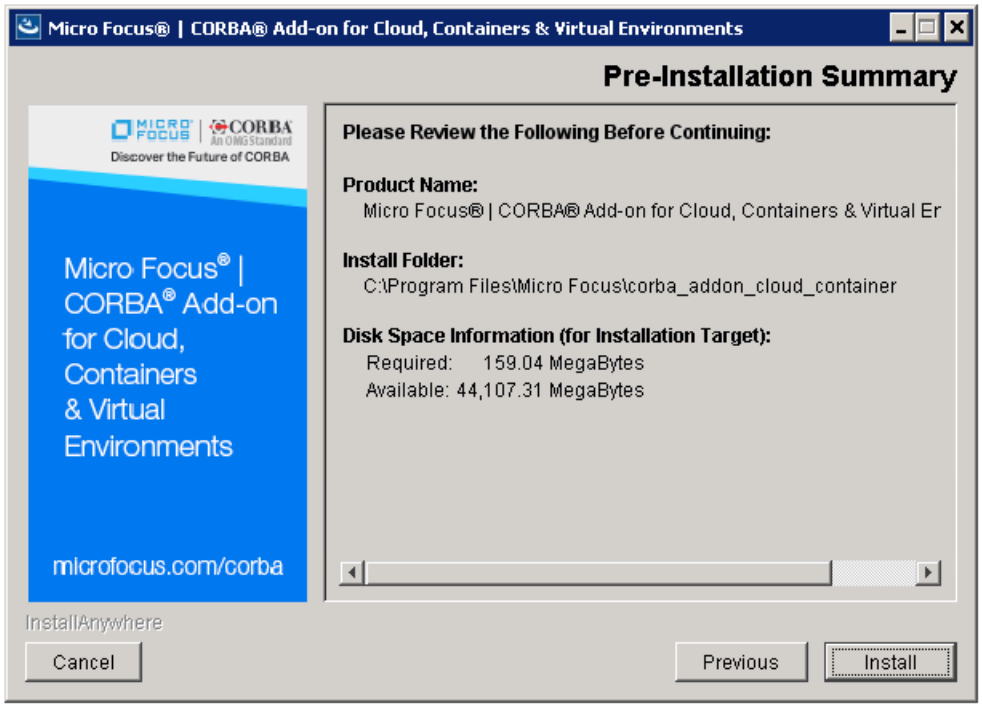
Specify your CORBA® Add-on `license.slip` file by typing the filename into the textbox or clicking **Choose** to browse for it. Click **Next** to continue.

6 If the `license.slip` file you specify does not exist or cannot be found, the following screen is displayed.



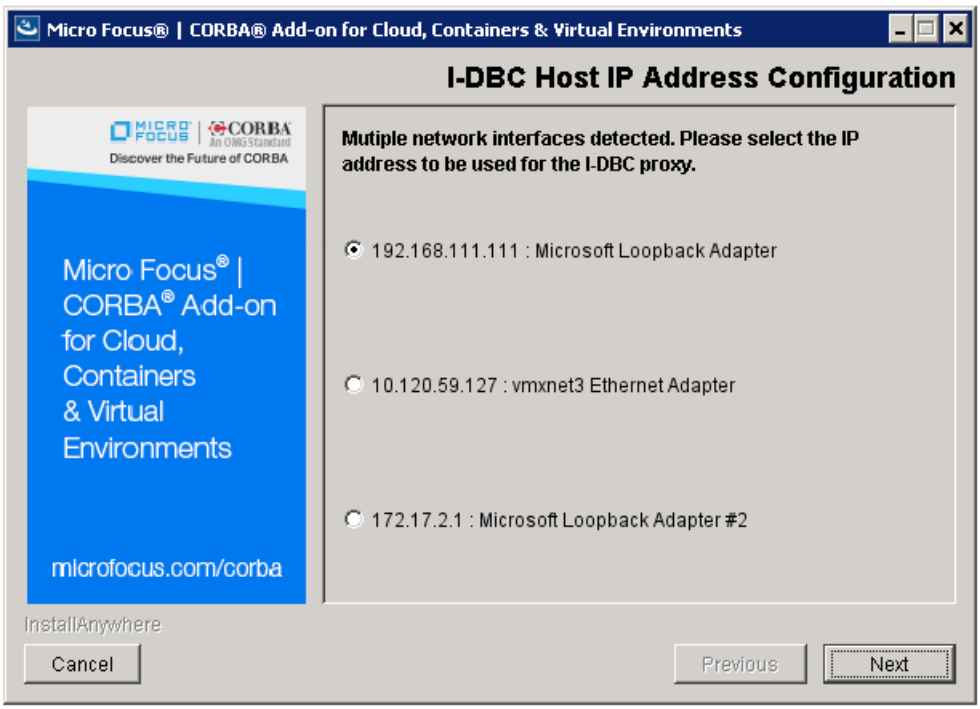
If you do not have a `license.slip` file, then you can click the **Continue without License File** button to continue with installing I-DBC. However you will need to manually license the installed I-DBC and SPS services before you can use it. To do this, once you have obtained a `license.slip` file, you need to place it into the license directory for I-DBC.

7 The **Pre-Installation Summary** screen displays.



This screen is shown once all the required installation parameters have been specified. Click **Previous** to move back through earlier screens if any changes need to be made. Click **Install** to proceed with the installation.

8 If more than one network interface is detected, you will see the following screen.



Select the correct IP address for the I-DBC that you wish to configure.

Silent installer properties

As an alternative to the GUI installation, you can use the silent installer as described in "Installing with the Silent Installer".

The silent installation properties that you need to specify in this case are:

USER_INSTALL_DIR=<*install location*>

INSTALLER_UI=SILENT

INSTALL_CLOUD=1

INSTALL_IDBC=1

CCVE_LICENSE=<*license.slip location*>

UPGRADE_ORB=0

INSTALL_CONTAINER=0

INSTALL_DOCKER=0

If the I-DBC host has multiple network interfaces, use the following properties to configure which IP address will be used with the I-DBC and SPS services.

CONFIG_IDBC_HOST=<*Network Interface IP*>

CONFIG_SPS_HOST=<*Network Interface IP*>

CORBA for Cloud and Virtual Environments: Upgrading an existing ORB installation

In order to upgrade an existing VisiBroker, Orbix 3 or Orbix 6 installation to operate with the CORBA Add-on for Cloud, Containers & Virtual Environments, run the installer as follows:

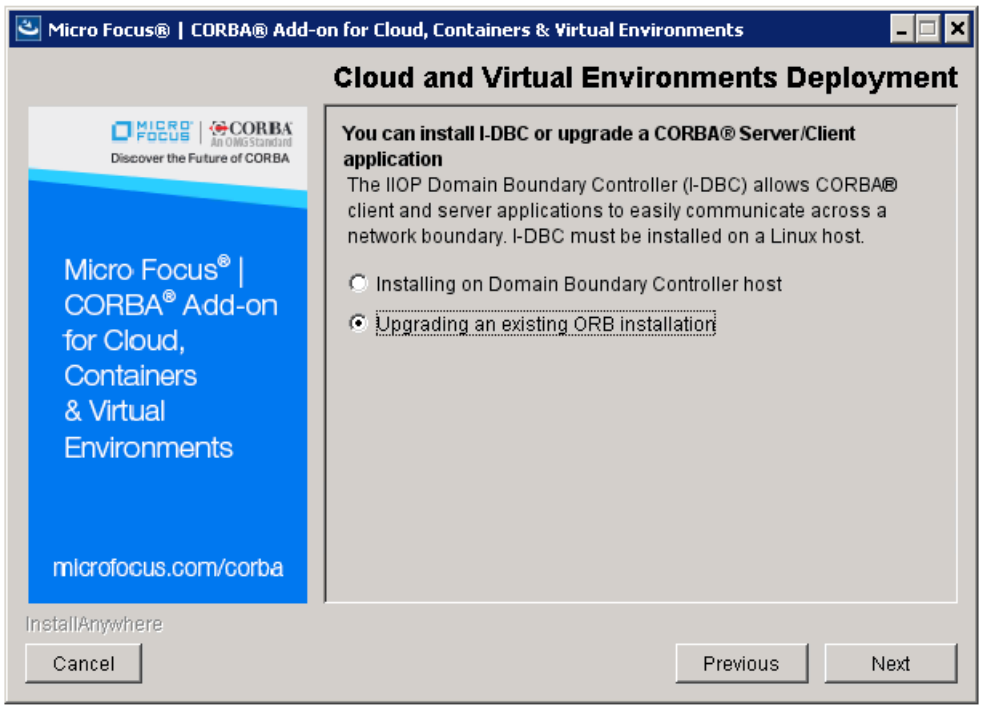
1. Download the installer into a temporary directory (for example, `\temp` on Windows, or `/tmp` on UNIX).
2. Run the installer to launch InstallAnywhere.
   - On Windows, `mf_ccve_corba_addon_1.0_win_x64.exe`
   - On UNIX, `mf_ccve_corba_addon_1.0_lnx_x64.bin`

Installing with the GUI

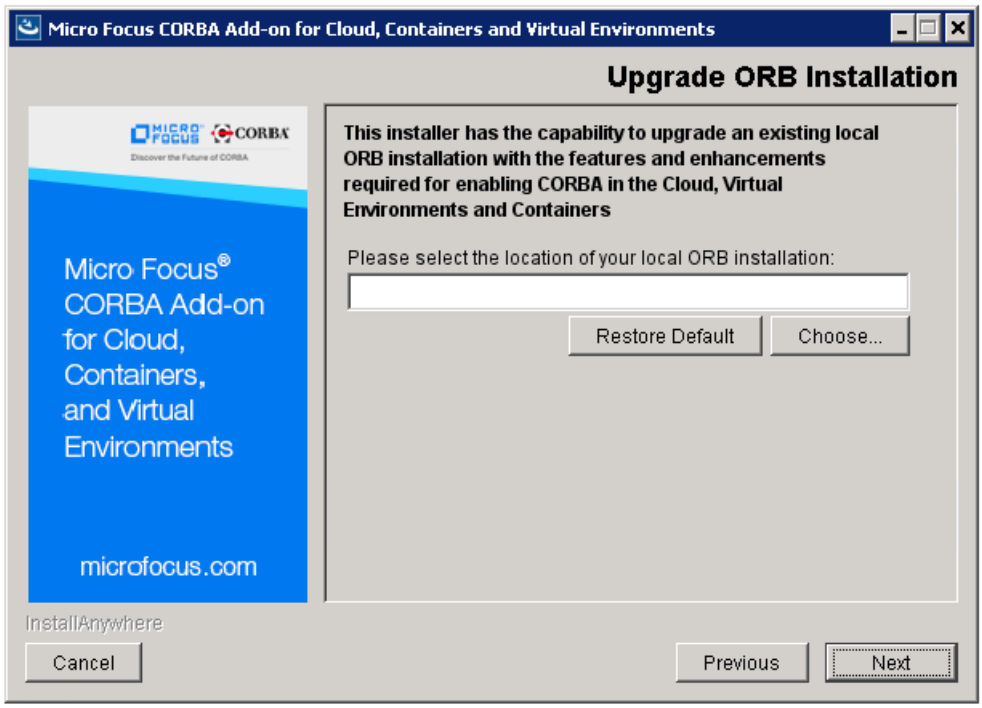
To install via the GUI, run the installer as described above. The installer will run through the following screens.

1. The **License Agreement** screen displays, as described in the previous procedure.
2. The **Deployment Scenario** window displays. As in the previous procedure, select **CORBA in Cloud and Virtual Environments** and click **Next**.

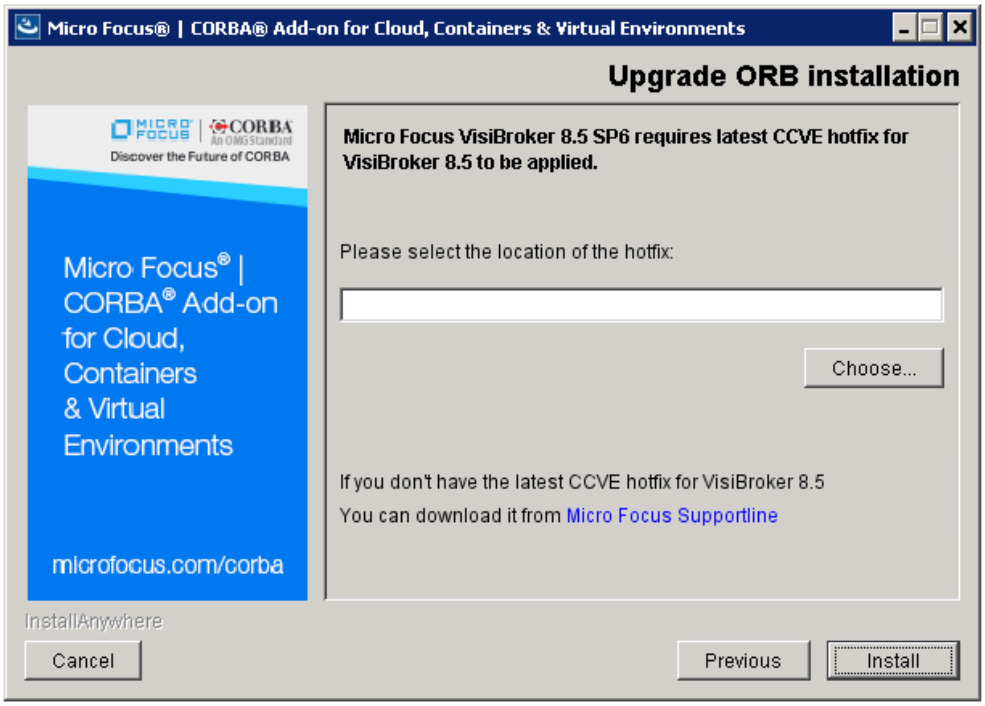
3 The **Cloud and Virtual Environments** window displays. This time, select **Upgrading an existing ORB installation**.



4 The **Upgrade ORB Installation** window displays. Select the location of a valid ORB to upgrade and click **Next**.



5 At the next screen, specify the location of the HotFix to apply in order to upgrade your ORB.



If you have not yet downloaded the necessary HotFix, click the **Micro Focus Supportline** link shown on the screen, and download from there to your local machine. You can now select the HotFix and proceed with the installation.

Silent installer properties

As an alternative to the GUI installation, you can use the silent installer as described in "Installing with the Silent Installer".

The silent installation properties that you need to specify in this case are:

INSTALLER_UI=SILENT

INSTALL_CLOUD=1

INSTALL_IDBC=0

INSTALL_CONTAINER=0

INSTALL_DOCKER=0

UPGRADE_ORB=1

ORB_INSTALLATION=<*orb install location*>

CCVE_ADDON_HOTFIX=<*hotfix files location*>

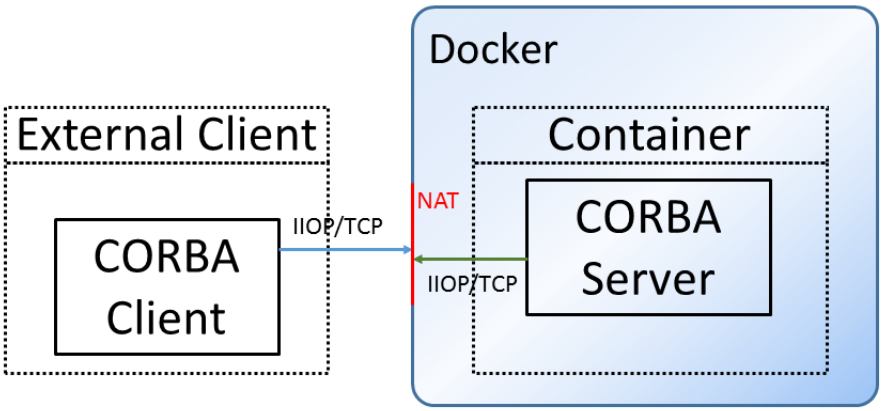
CORBA in Containers

This chapter describes how the CORBA Add-on for Cloud, Containers & Virtual Environments can be used to extend CORBA functionality into the Docker container.

Introduction

The Docker containers can be hosted on either Linux or Windows systems.

In these circumstances, the CORBA server is isolated within a Docker container and is therefore by default unreachable from external CORBA clients.



The CORBA Add-on for Cloud, Containers & Virtual Environments provides a solution to the issues arising when trying to connect CORBA clients running outside of containers to CORBA servers running within containers.

The Docker container will run one of the following operating systems:

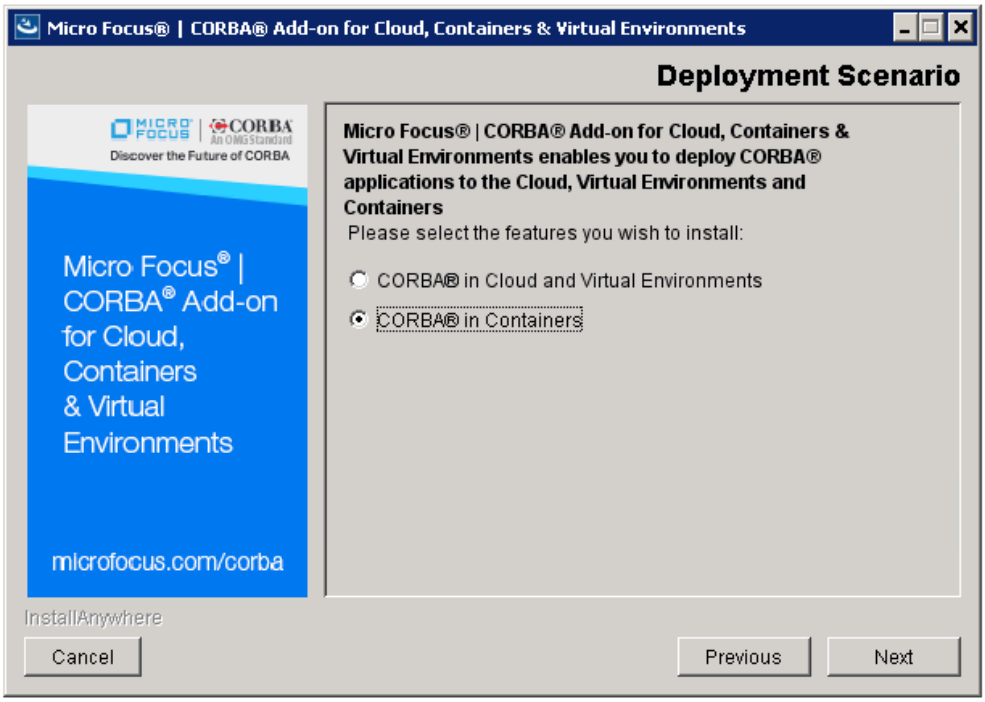
- CentOS
- Ubuntu

The Docker container can be hosted on a system running one of the following operating systems:

- Linux
- Windows 7
- Windows 10

Installation in Containers

In order to deploy the CORBA Add-on for Cloud, Containers & Virtual Environments in a container, run the installer and select the **CORBA in Containers** option at the **Deployment Scenario** window.



Installation Footprint

The CORBA Add-on for Cloud, Containers & Virtual Environments product provides the following components for the CORBA in Containers deployment.

- **Dockerfiles** to enable you to build Docker image layers, from the base operating system layer image all the way to the CORBA application samples layer.
- **Administration Console for I-DBC**: A graphical interface for administering I-DBC. Using the Administration Console is described in the ***Micro Focus IIOP Domain Boundary Controller (I-DBC) v.4.0.0 Administrator's Guide***.
- The capability to upgrade an existing CORBA ORB installation with features and capabilities to communicate with a CORBA application deployed within a container.
- The I-DBC install packages and scripts to be used within a container.
- Administration Console install package to be extracted and installed on the host.

The footprint of the CORBA Add-on for Cloud, Containers & Virtual Environments when installed in a container differs from the Cloud installation, as it installs the Docker folder. This folder contains dockerized

samples, and scripts demonstrating how to dockerize ORB applications. Installing the product installs the following files:

`adminconsole/`	The extracted Administration Console GUI to administer a I-DBC installation running within a container.
`doc/license_agreement.txt`	
`doc/notices.txt`	
`docker/`	Directory containing all Docker-related assets. See "CORBA for Containers: Installed Components Overview" for the contents of the directory.
`docker/common/centos_layer`	An operating system image for a CentOS base layer used by the `idbc_layer`.
`docker/common/ubuntu_layer`	An operating system image for an ubuntu base layer used by the `idbc_layer`.
`docker/common/idbc_layer_layer`	An I-DBC image built on top of the operating system image. I-DBC overcomes the NAT issues. Used by the `orb_base_layer`.
`docker/<orbix3,orbix6,visibroker>/orb_base_layer`	A CORBA product image built on top of the I-DBC image. The CORBA product can be one of Orbix 6, Orbix3, or VisiBroker. Used by the `application_layer`.
`docker/<orbix3,orbix6,visibroker>/application_layer/`	An application image built on top of the CORBA product image. Several demonstration examples are provided to illustrate how to build your own CORBA-based application inside a Docker container.
`resources/`	The resources sub-directory contains all the components necessary and used within and outside a container. That can be used when creating your own containerized CORBA application.
`resources/mf_idbc_install.sh`	
`resources/mf_idbc_services.sh`	
`resources/microfocus_CLI-4.0.0.tar.gz`	
`resources/microfocus_IDBC-4.0.0.tar.gz`	
`resources/microfocus_SPS-4.0.0.tar.gz`	
`resources/microfocus_AdminConsole.tar.gz`	
`uninstall/`	

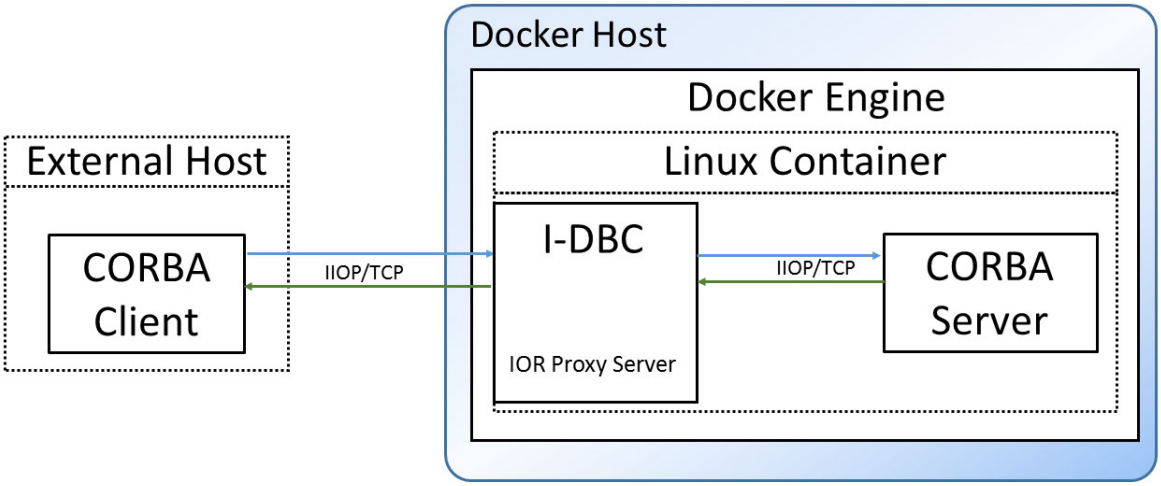
Deployment Scenario for CORBA for Containers

This section describes the infrastructure that makes up a typical Docker deployment:

- **CORBA client machine**: the CORBA client application runs on this machine.
- **CORBA server machine**: the CORBA server application runs within a Docker container hosted in the Docker engine running on this machine. This CORBA server application is isolated by Docker and is not directly reachable to the outside. The I-DBC component deployed within each Docker container makes the CORBA server application available to the outside.

- **Development machine**: this machine hosts the CORBA development environment and the Docker development environment. This machine is used to build Docker container images that can then be deployed to the CORBA server machine.

For a further overview and full information on the capabilities of the I-DBC and Administration Console components, see the ***Micro Focus IIOP Domain Boundary Controller (I-DBC) v.4.0.0 Deployment Guide*** and the ***Micro Focus IIOP Domain Boundary Controller (I-DBC) v.4.0.0 Administrator's Guide***, and the chapter "Common Docker Images".



Installation Prerequisites

To deploy the CORBA Add-on for Cloud, Containers & Virtual Environments, you need the following components:

- The CORBA Add-on for Cloud, Containers & Virtual Environments Linux installer.
- Optionally the CORBA Add-on for Cloud, Containers & Virtual Environments Windows installer.
- A license for the CORBA Add-on for Cloud, Containers & Virtual Environments.
- A Docker development environment.
- An ORB installation. You will need to install an ORB, or upgrade an existing installation to work with a Cloud deployment scenario. The current supported ORB installations are:
  - VisiBroker 8.5.6 or higher for Linux 64-bit installer, or VisiBroker 8.5 for Linux 64-bit GA installer plus VisiBroker 8.5 service pack 6.
  - Orbix 6.3.11 or higher for Linux installer
  - Orbix 3.3.15 or higher for Linux 64-bit installer (both Orbix and OrbixSSL installers required).
- The CORBA Add-on for Cloud, Containers & Virtual Environments ORB HotFixes for Linux 64-bit for the ORB runtime deployed within Docker containers (to be downloaded from Micro Focus Supportline).
- The CORBA Add-on for Cloud, Containers & Virtual Environments ORB HotFixes for the existing ORB client machines (to be downloaded from

Micro Focus Supportline). The ORB HotFixes must match the platforms (operating system, compiler, bitness) that your ORB installations are deployed on.

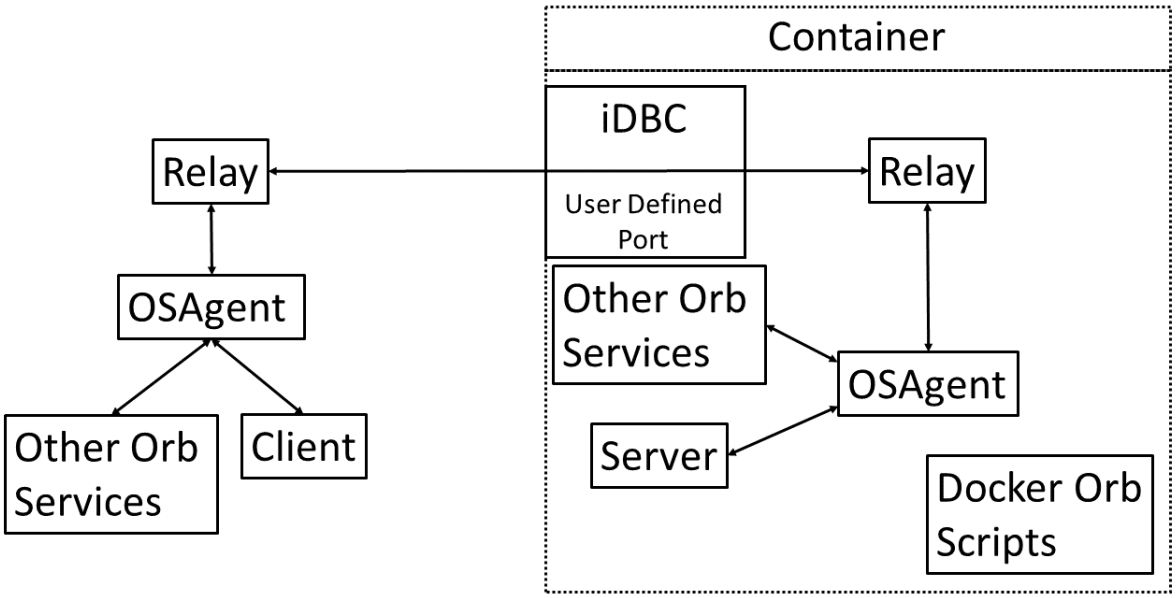
CORBA for Containers: Installed Components Overview

The CORBA Add-on for Cloud, Containers & Virtual Environments for Containers needs to be installed on the Docker development machine and also on the CORBA client machines. See "CORBA for Containers: Installed Components Overview" for a description of the process.

After you have installed the CORBA Add-on for Cloud, Containers & Virtual Environments, the following components will have been installed in the `docker/` directory (see "Installation Footprint"):

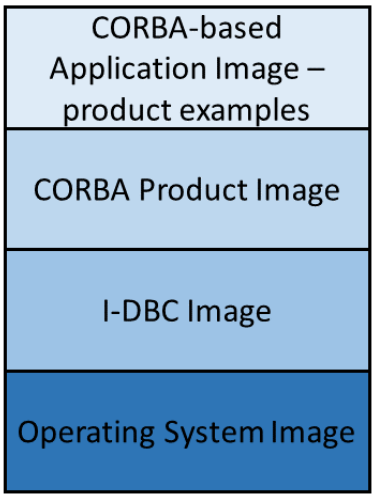
- Dockerfiles to enable you to build Docker images:
  - An operating system image base layer - the operating system base layer is either CentOS or Ubuntu by default.
  - An I-DBC image layer built on top of the operating system image. I-DBC enables connectivity between the Docker isolated network within the container and the outside.
  - An ORB product image layer built on top of the I-DBC image layer. By default, the ORB product can be either:
    - Orbix 3
    - Orbix 6
    - VisiBroker
  - An application image layer built on top of the ORB product image. Several demonstration examples are provided to illustrate how to build your own CORBA server application inside a Docker container.
- Scripts to support configuration and running of I-DBC, the ORB, and CORBA server applications inside a Docker container.
- Enhancements and fixes to ORB products to allow them to work with I-DBC inside a Docker container, such as the VisiBroker OSAgent relay component.
- The I-DBC and SPS components to enable cross-containers connectivity. These allow CORBA based clients and servers to easily communicate across a network boundary where Network Address Translation (NAT) is occurring.
- The Administration Console for I-DBC. This is a graphical interface for administering I-DBC.

Docker application image layers built with these tools can be deployed and run on any Docker host machine. CORBA server applications run inside these containers can now be transparently accessed from CORBA clients.



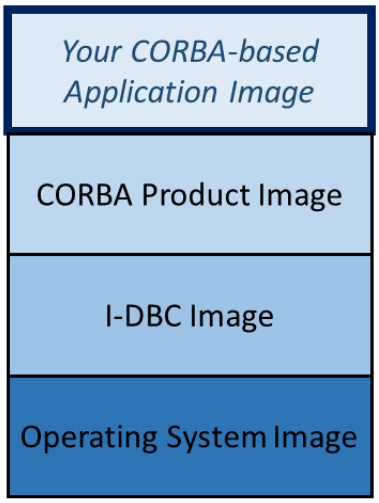
The Docker product examples provide several README files that explain how to build Docker images. Follow through the examples to gain an understanding of how to build the Docker images and run Docker containers using those images.

The final Docker image is composed of multiple Docker images:



Once you get a basic understanding of how to build Docker images that can run CORBA product examples, you can follow the examples as a guide to building a Docker image that runs your particular CORBA-based application.

You replace the "product examples" image with an image that runs your CORBA-based application.



Installation

The CORBA Add-on for Cloud, Containers & Virtual Environments for Containers needs to be installed on the Docker development machine and also on the CORBA client machines.

1. On the Docker development machine, run the installer selecting the **CORBA in Containers** deployment scenario.
2. On the CORBA client machines, run the installer selecting the **CORBA in Containers** deployment scenario to upgrade an existing ORB installation.

Installing on the Docker Development machine

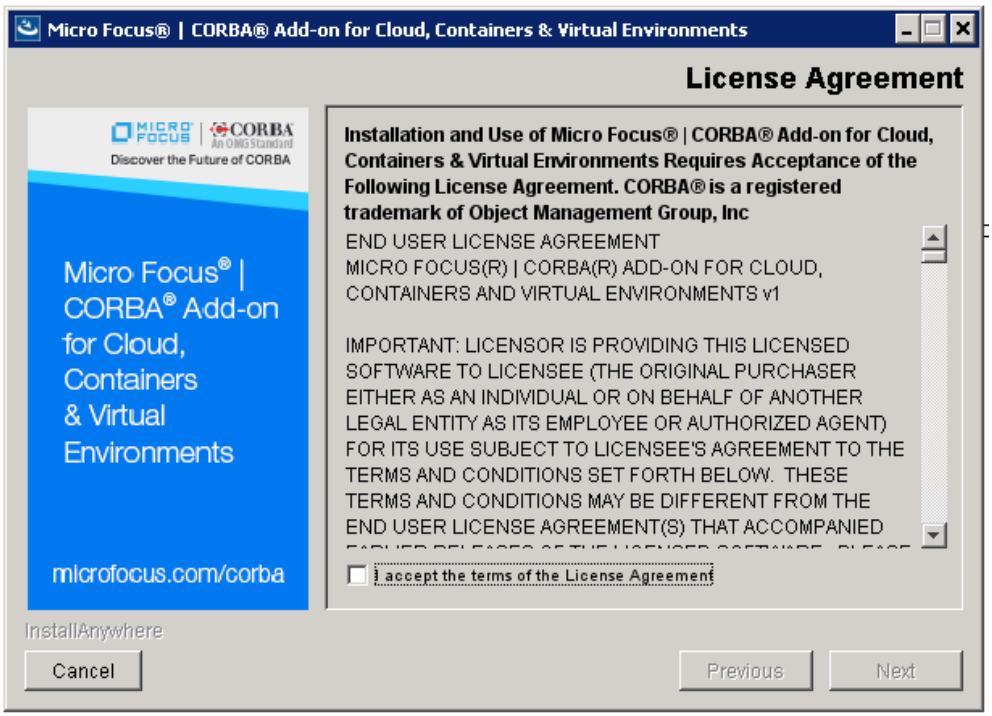
To install the CORBA Add-on for Cloud, Containers & Virtual Environments to the Docker development machine, run the installer as follows:

1. Download the installer into a temporary directory (for example, `\temp` on Windows, or `/tmp` on UNIX).
2. Run the installer to launch InstallAnywhere.
   - On Windows, `mf_ccve_corba_addon_1.0_win_x64.exe`
   - On UNIX, `mf_ccve_corba_addon_1.0_lnx_x64.bin`

Installing with the GUI

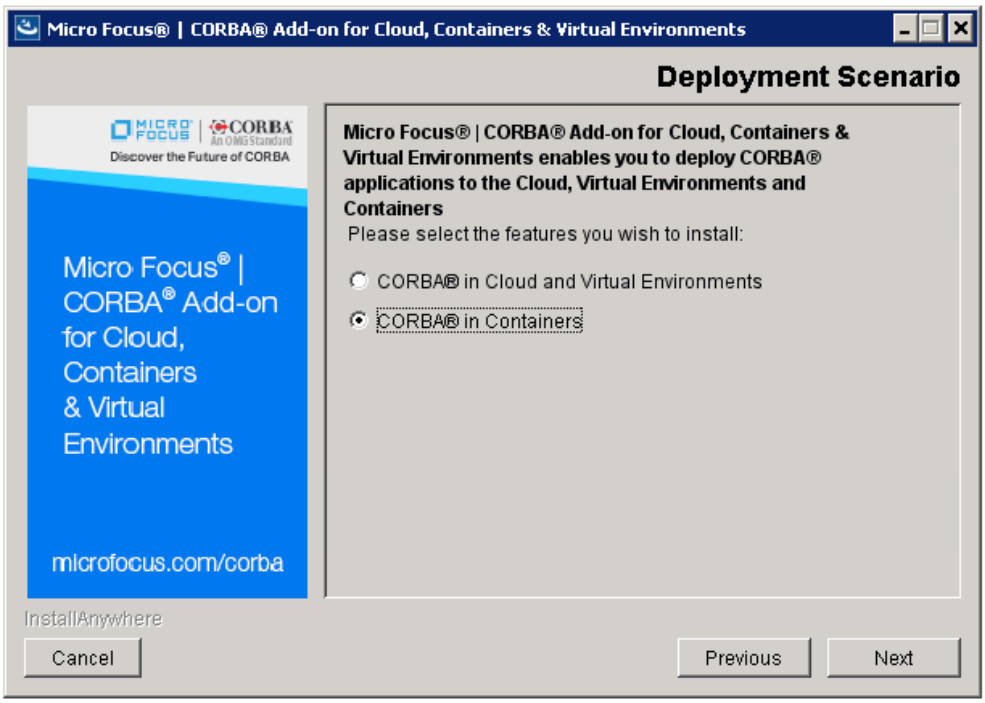
To install via the GUI, run the installer as described above. The installer will run through the following screens.

1 The **License Agreement** screen displays.

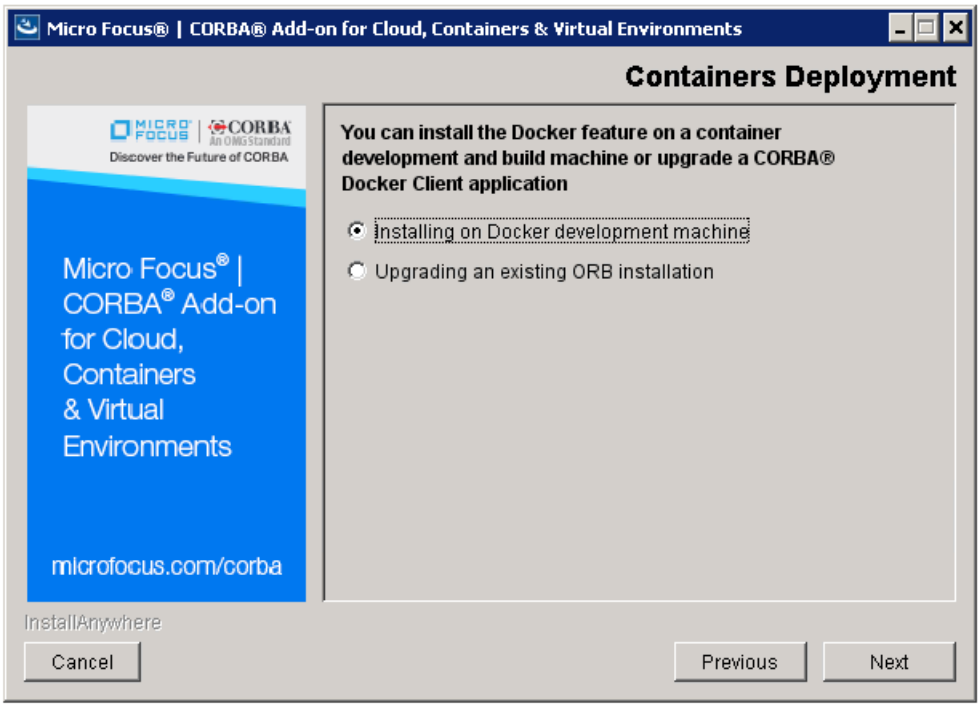


Read and agree the terms of the license agreement. Check **I accept the terms of the License Agreement** and click **Next**. If you do not accept the license, you cannot proceed further.

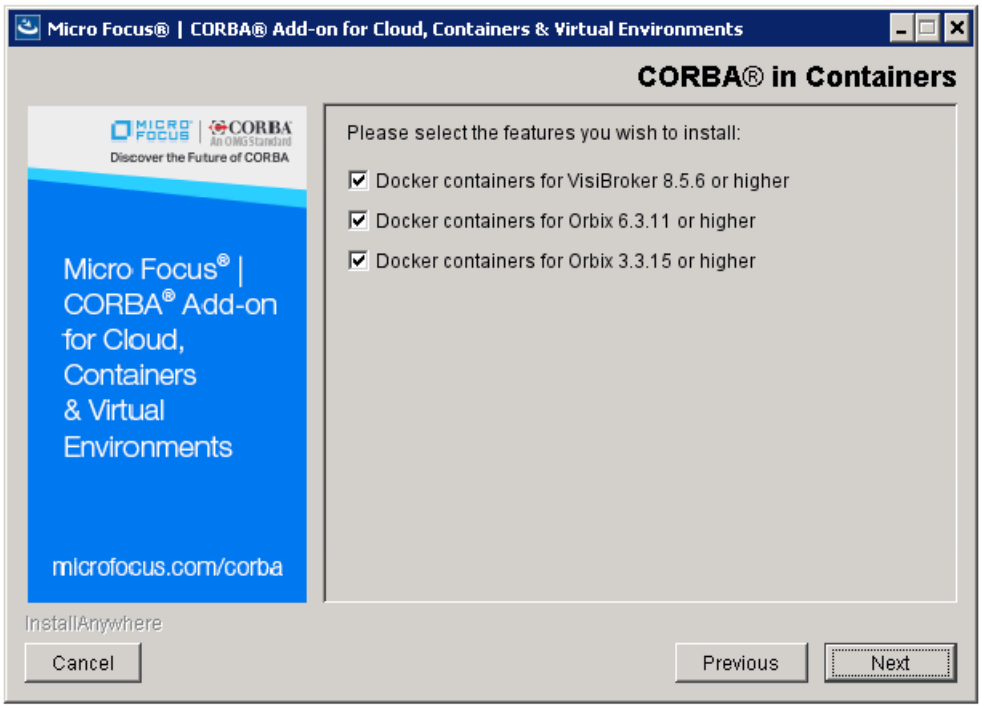
2 The **Deployment Scenario** window displays. Select **CORBA® in Containers** and click **Next**.



3 The **Containers Deployment** screen is displayed. Select **Installing on Docker development machine** and click **Next**.



4 The **CORBA® in Containers** screen displays.

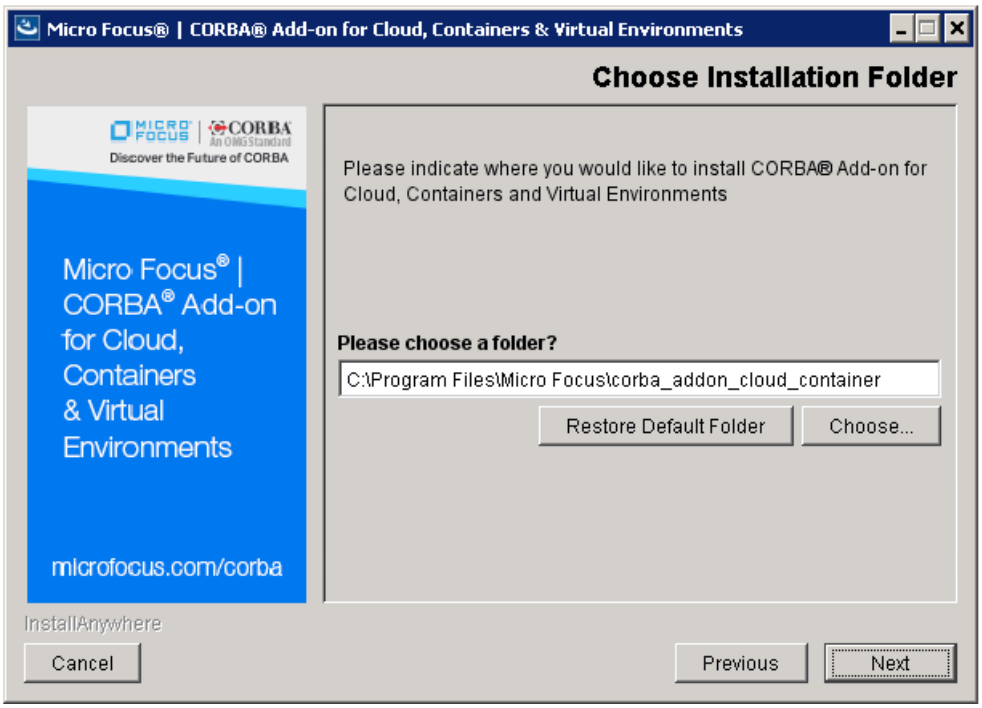


Here you can tick all, some, or none of the options presented. Select the option for the ORB or ORBs you wish to use.

Note:

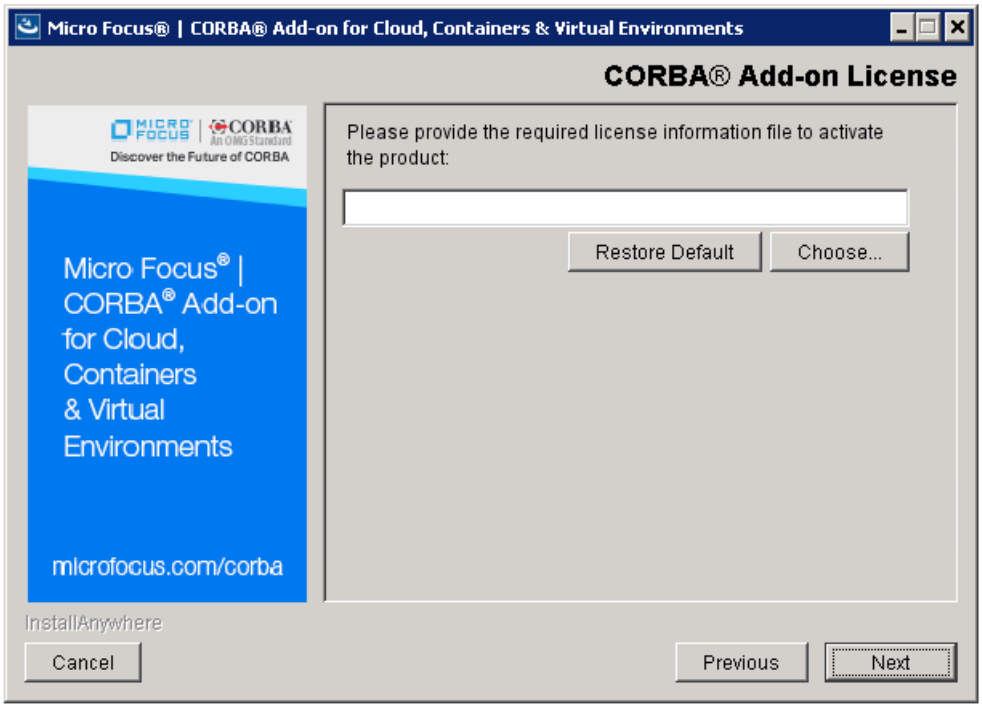
If you select no options, Docker common layers (OS layer and I-DBC layer) are installed, giving you a starting point to develop an ORB layer that could be built on Orbacus, JacORB or TAO or any other ORB runtime.

5 The **Choose Installation Folder** screen displays.



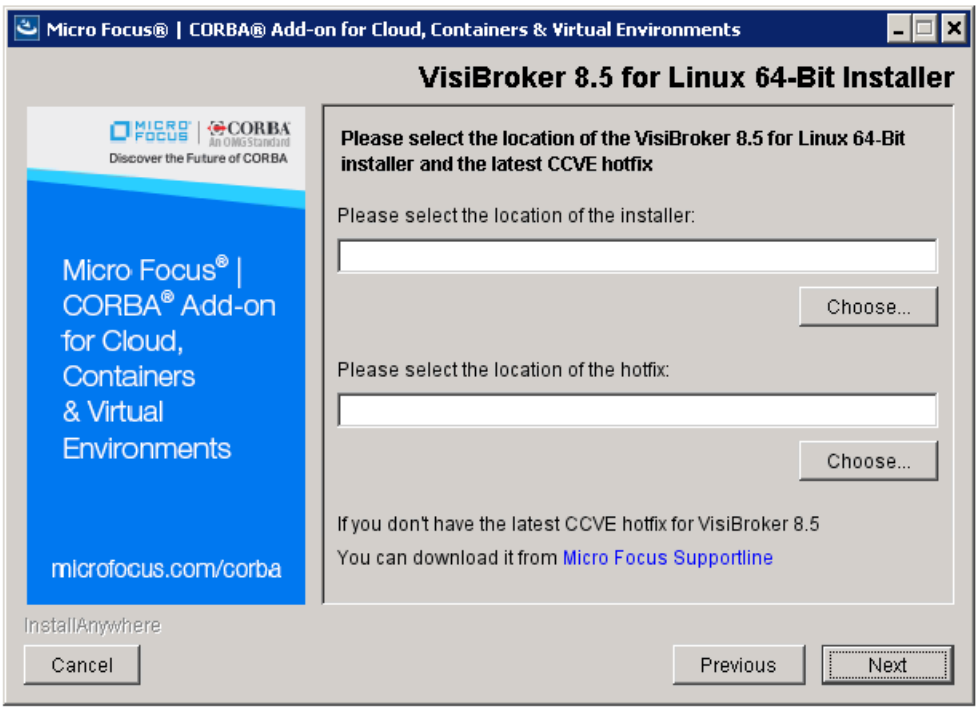
Specify your desired installation directory either by typing into the text field or by clicking **Choose** to browse for it. Click **Next** to proceed.

6 The **CORBA® Add-on License** screen displays.



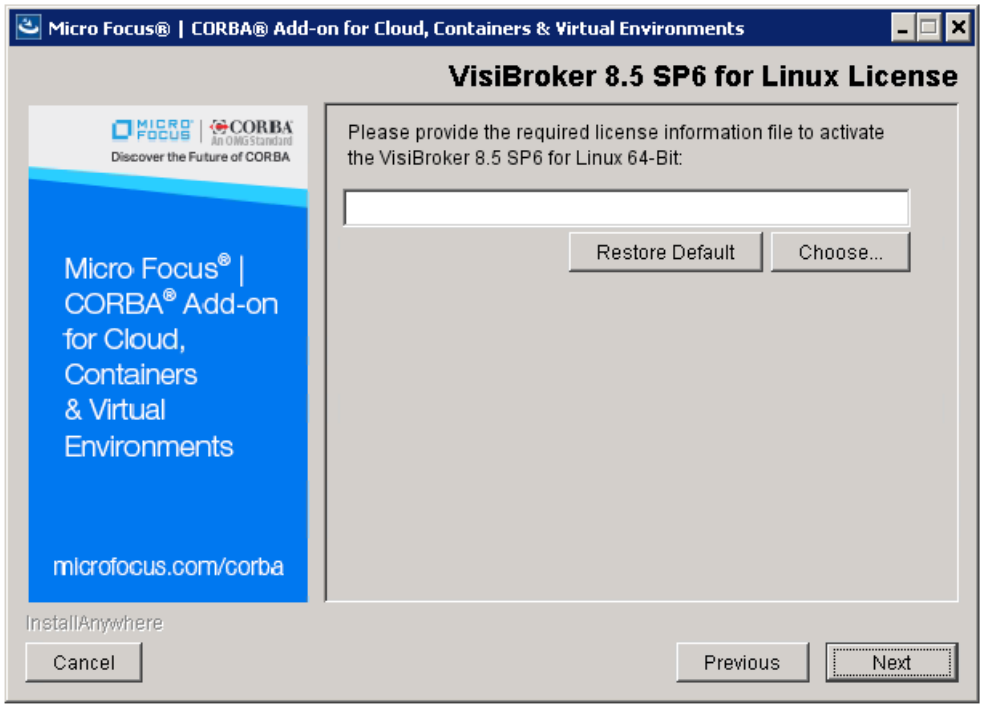
Specify your CORBA® Add-on license file by typing the filename into the textbox or clicking **Choose** to browse for it. Click **Next** to continue.

7 If you selected VisiBroker in step 4, the **VisiBroker Installer** screen displays.



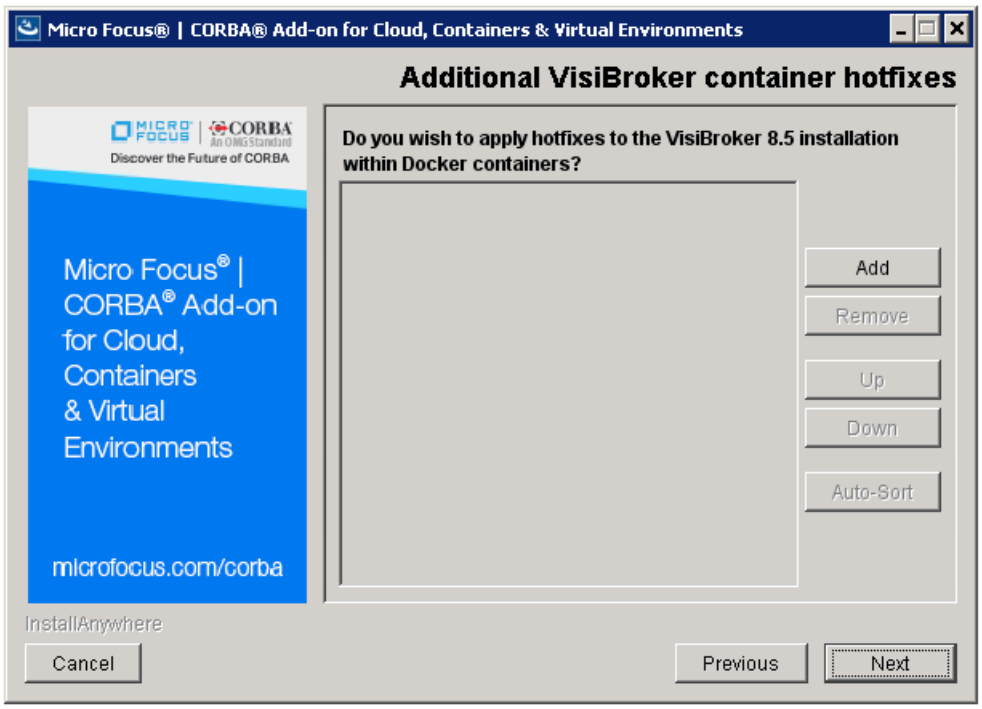
Select the location of the VisiBroker installer and the location of the HotFix to apply in order to upgrade the VisiBroker ORB. If you have not yet downloaded the necessary HotFix, click the **Micro Focus Supportline** link provided on the screen, and download from there to your local machine. You can now select the hotfix and proceed with the installation. Click **Next**.

8 The **VisiBroker License** screen displays.



Enter the location of your VisiBroker license file. You can type the filename directly into the textbox, or browse for it by clicking **Choose**. Click **Next** to continue.

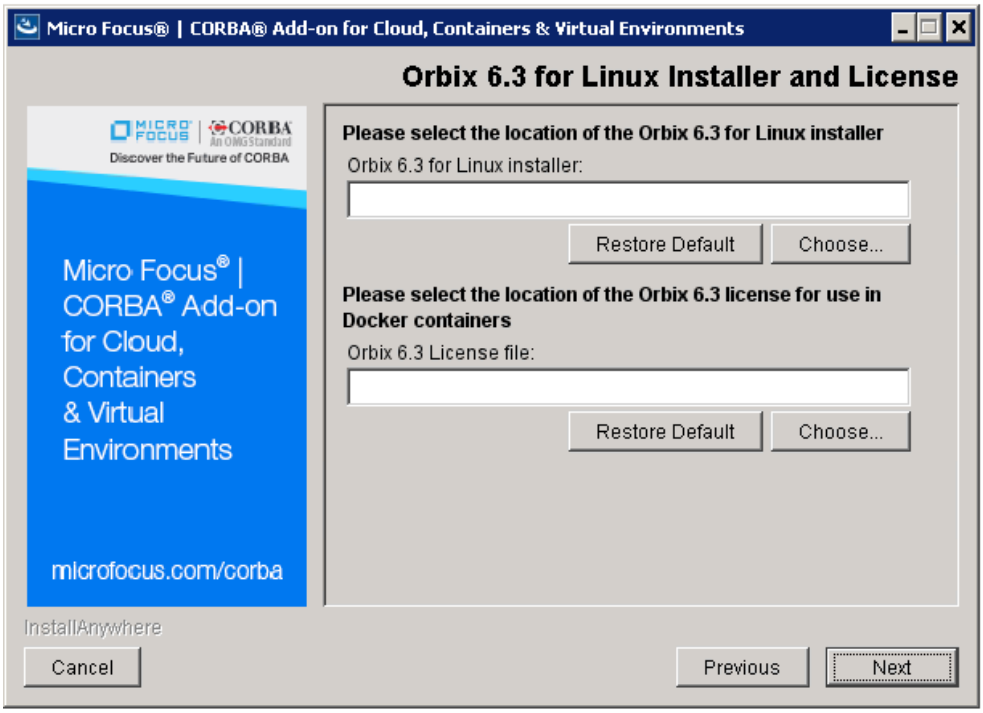
9 The **Additional VisiBroker container HotFixes** screen displays.



If you have HotFixes that need to be applied to the VisiBroker installation within Docker containers, you can specify them here. Select the HotFix and click **Add** if there are any more to apply. The HotFixes will be applied

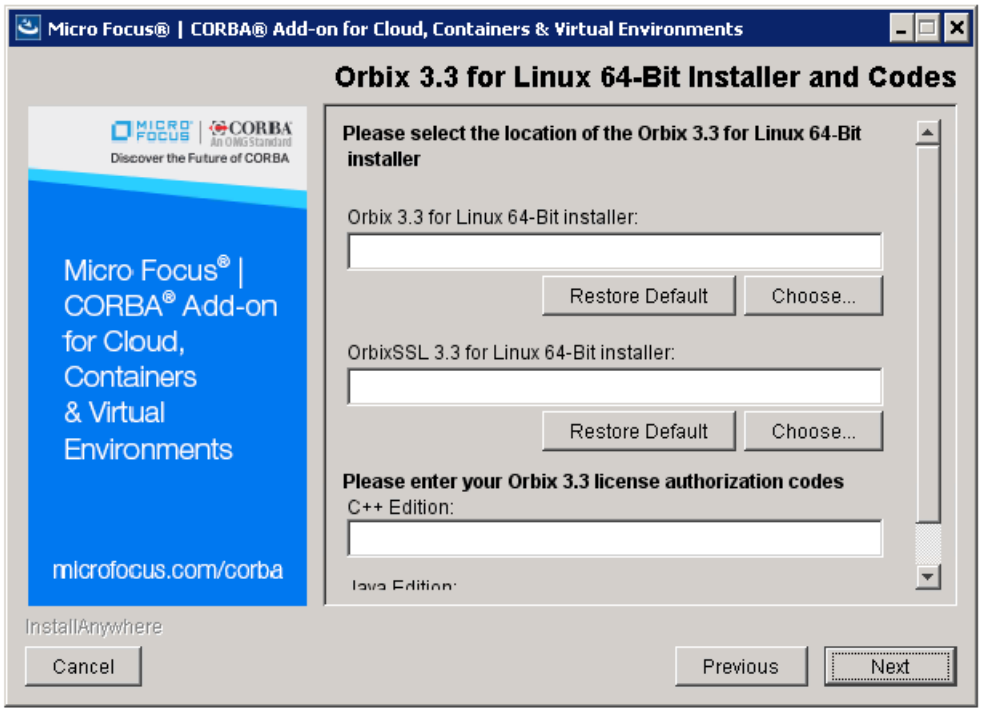
in the order they are listed in the text box (top to bottom). Use the **Up** and **Down** buttons to adjust the sequence. To specify HotFix(es), click the **Add** button. When you have listed all of them in the correct order, click **Next**.

10 If you selected Orbix 6 in step 4, the **Orbix 6.3 Installer and License** screen displays.



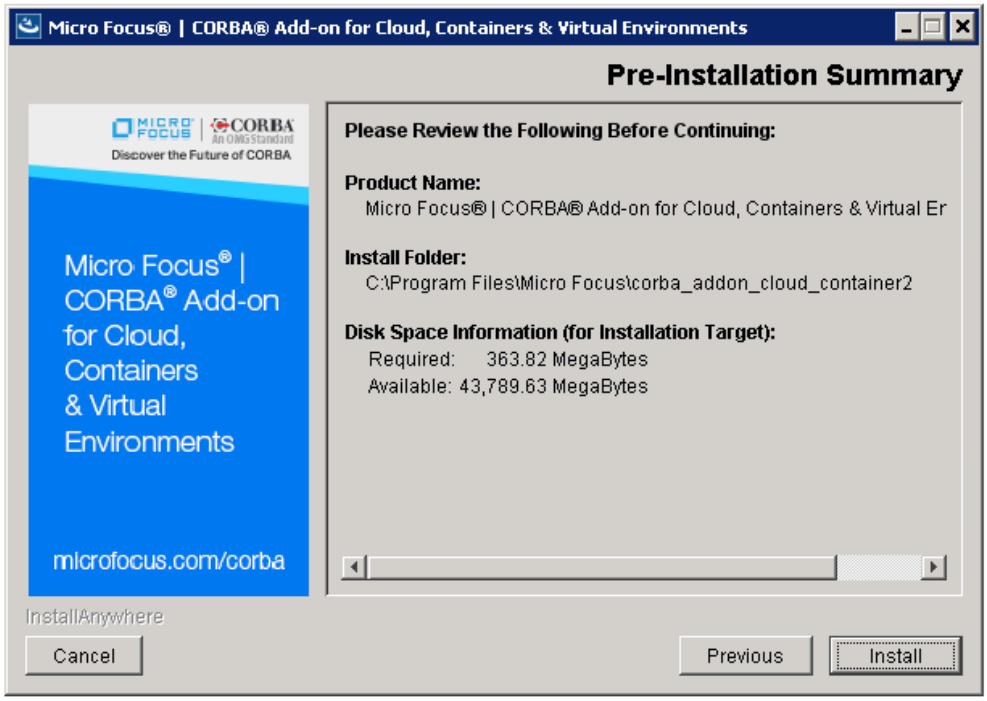
Enter the locations both of the Linux 64-bit installer and of the license file in this screen. You can type the filenames directly into the textboxes, or browse for them by clicking **Choose**. Once both files have been specified, click **Next** to continue.

11 If you selected Orbix 3 in step 4, the **Orbix 3.3 Installer and Codes** screen displays.



Enter the locations both of the Orbix 3.3 and the OrbixSSL 3.3 Linux 64-bit installers and of the C++ and Java license codes in this screen. You can type the filenames directly into the textboxes, or browse for them by clicking **Choose**. Once both files have been specified, click **Next** to continue.

12 The **Pre-Installation Summary** screen displays.



This screen is shown once all the required installation parameters have been specified. Click **Previous** to move back through earlier panels if any changes need to be made. Click **Install** to proceed with the installation.

Silent installer properties

As an alternative to the GUI installation, you can use the silent installer as described in "Installing with the Silent Installer".

The silent installation properties that you need to specify in this case are:

USER_INSTALL_DIR=<*install location*>

INSTALLER_UI=SILENT

INSTALL_CLOUD=0

INSTALL_IDBC=0

UPGRADE_ORB=0

INSTALL_CONTAINER=1

INSTALL_DOCKER=1

CCVE_LICENSE=<*license.slip location*>

INSTALL_VB_DOCKER=1

VISI_INSTALLER=<*VB 8.5.6 Linux 64 Bit installer location*>

VISI_LICENSE=<license.slip location>

VISI_CCVE_ADDON_HOTFIX=<*ccve hotfix for VB 8.5.6 Linux 64 Bit location*>

VISI_HOTFIX_LIST=<*Comma seperated customer hotfix files location list*>

INSTALL_O6_DOCKER=1

ORBIX6_INSTALLER=<*Orbix 6.3.11 Linux installer location*>

ORBIX6_LICENSE=<*license.slip location*>

INSTALL_O3_DOCKER=1

ORBIX3_INSTALLER=<*Orbix 3.3.15 Linux 64 Bit installer location*>

ORBIXSSL3_INSTALLER=<*OrbixSSL 3.3.15 Linux 64 Bit installer location*>

ORBIX3_CXX_KEY=<*product code*>

ORBIX3_JAVA_KEY=<*product code*>

Upgrading the client side ORB installation

To upgrade the client side ORB installation, run the installer as follows:

1. Download the installer into a temporary directory (for example, `\temp` on Windows, or `/tmp` on UNIX).
2. Run the installer to launch InstallAnywhere.
   - On Windows, `mf_ccve_corba_addon_1.0_win_x64.exe`
   - On UNIX, `mf_ccve_corba_addon_1.0_lnx_x64.bin`

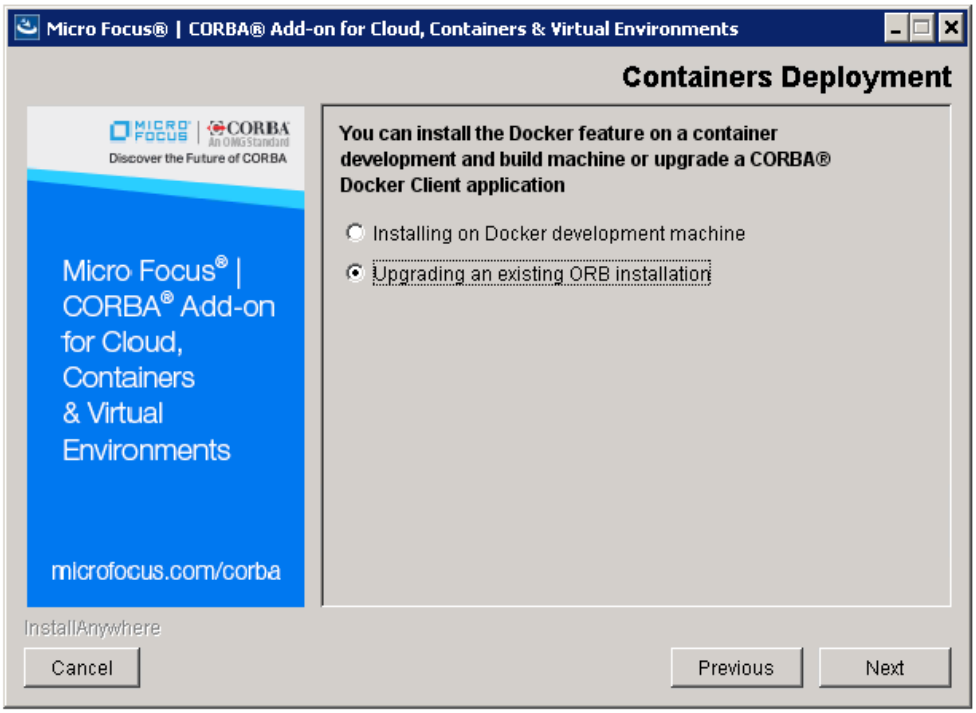
Installing with the GUI

To install via the GUI, run the installer as described above. The installer will run through the following screens.

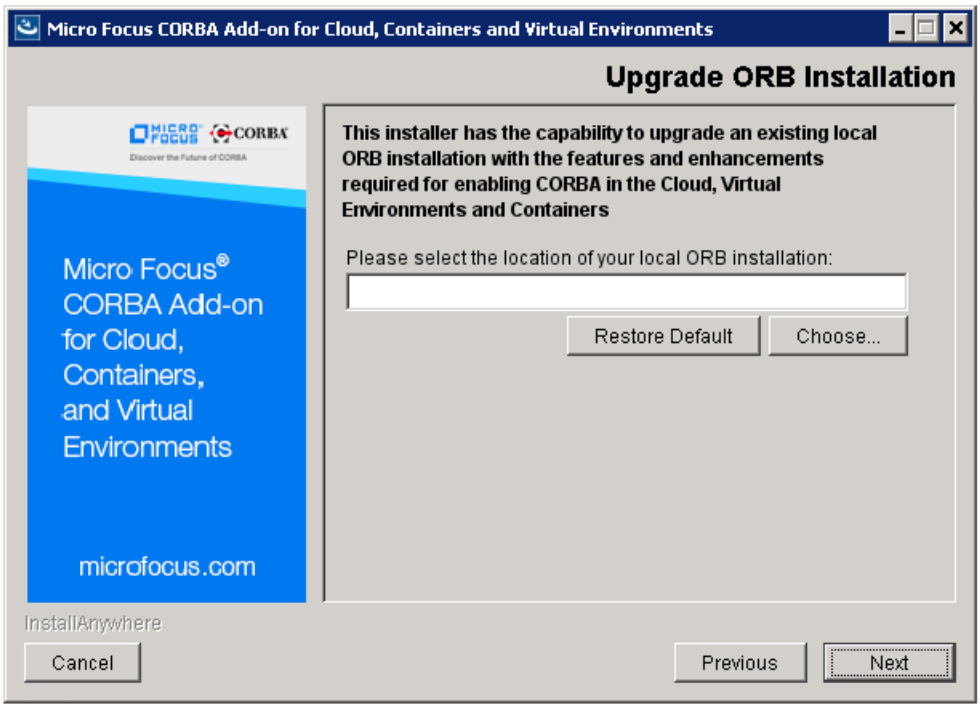
1. The **License Agreement** screen displays, as described in the previous procedure.

2 The **Deployment Scenario** window displays. As in the previous procedure, select the **CORBA in Containers** option and click **Next**.

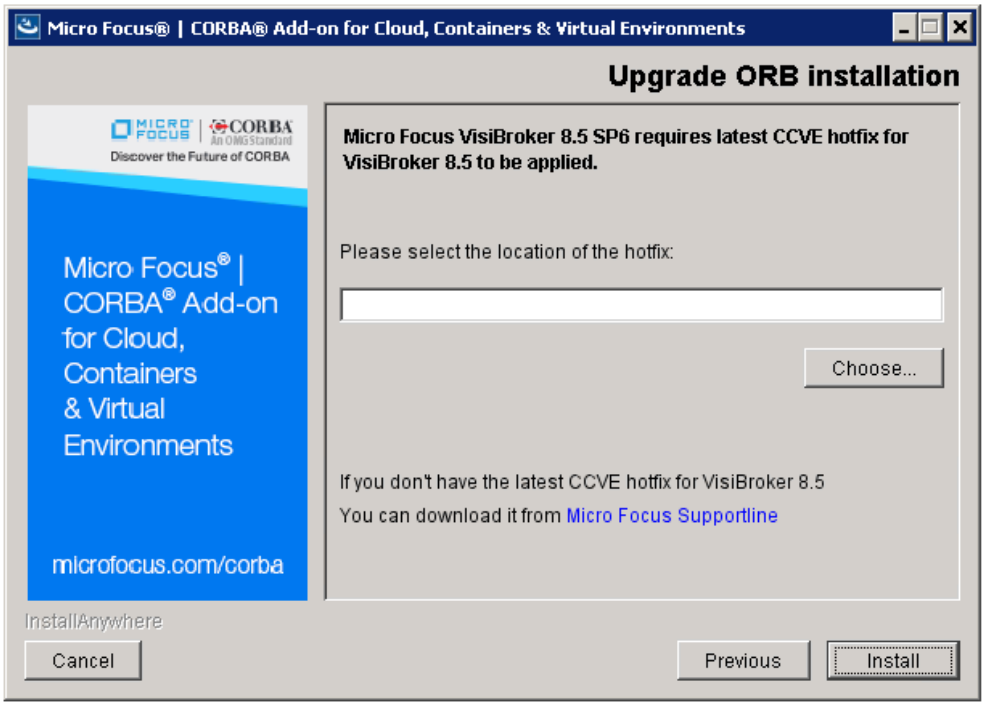
3 The **Containers Deployment** screen is displayed. Select the **Upgrading an existing ORB Installation** option and click **Next**.



4 The **Upgrade ORB Installation** window displays. Select the location of a valid ORB to upgrade and press **Next**.



5 At the next screen, specify the location of the HotFix to apply in order to upgrade your ORB.



If you have not yet downloaded the necessary HotFix, click the **Micro Focus Supportline** link provided on the screen, and download from there to your local machine. You can now select the HotFix and proceed with the installation.

Silent installer properties

As an alternative to the GUI installation, you can use the silent installer as described in "Installing with the Silent Installer".

The silent installation properties that you need to specify in this case are:

INSTALLER_UI=SILENT

INSTALL_CLOUD=0

INSTALL_IDBC=0

INSTALL_CONTAINER=1

INSTALL_DOCKER=0

UPGRADE_ORB=1

ORB_INSTALLATION=<*orb install location*>

CCVE_ADDON_HOTFIX=<*hotfix files location*>

Silent Installation

This chapter describes the silent installer. For further installation information, see CORBA in the Cloud or in Virtual Environments and CORBA in Containers.

The silent installer is available for both Windows and Linux operating systems.

Installing with the Silent Installer

As an alternative to the GUI described in *CORBA in the Cloud or in Virtual Environments* and *CORBA in Containers*, the installation can be performed in silent mode. A silent installation runs without user interaction, and is typically used to automate installation across multiple machines. Instead of specifying the installation parameters via the interface, the parameters are stored in an installer properties file. The properties and values required will vary greatly depending on what sort of installation you are carrying out. See the *CORBA in the Cloud or in Virtual Environments* and *CORBA in Containers* chapters for details of those properties.

Sample installer properties file

To perform a silent installation, you must prepare an installer properties file that contains the required information. Each line consists of a property name and a property value, separated by an equals sign. A line can be commented out (or a descriptive comment added) by placing a hash mark (#) at the start of the line. A sample file is below:

```
USER_INSTALL_DIR=<install location>
INSTALLER_UI=SILENT
INSTALL_CLOUD=0
INSTALL_IDBC=0
#CONFIG_IDBC_HOST=<Network Interface IP>
#CONFIG_SPS_HOST=<Network Interface IP>
UPGRADE_ORB=0
#ORB_INSTALLATION=<orb install location>
#CCVE_ADDON_HOTFIX=<hotfix files location>
INSTALL_CONTAINER=1
INSTALL_DOCKER=1
CCVE_LICENSE=<license.slip location>
INSTALL_VB_DOCKER=1
VISI_INSTALLER=<VB 8.5.6 Linux 64 Bit installer location>
VISI_LICENSE=<license.slip location>
VISI_CCVE_ADDON_HOTFIX=<ccve hotfix for VB 8.5.6 Linux 64 Bit
location>
VISI_HOTFIX_LIST=<Comma seperated customer hotfix files location
list>
INSTALL_O6_DOCKER=1
ORBIX6_INSTALLER=<Orbix 6.3.11 Linux installer location>
ORBIX6_LICENSE=<license.slip location>
INSTALL_O3_DOCKER=1
ORBIX3_INSTALLER=<Orbix 3.3.15 Linux 64 Bit installer location>
ORBIXSSL3_INSTALLER=<OrbixSSL 3.3.15 Linux 64 Bit installer
location>
ORBIX3_CXX_KEY=<product code>
ORBIX3_JAVA_KEY=<product code>
```

The meaning of each property is described below. In the chapters *CORBA in the Cloud or in Virtual Environments* and *CORBA in Containers*, the descriptions of each installation scenario set out which properties require which values.

Note that for Windows directory paths, the backslash directory separator must be escaped and specified by using `$` and `/`. This is required by InstallAnywhere. For example:

```
USER_INSTALL_DIR=C:$/$MainDirectory$/$SubDirectory$/$CCVE
```

Property name	Description
USER_INSTALL_DIR	Specifies the target directory for the installation.
INSTALLER_UI	Specifies the type of installation. For a silent installation, this must have the value `silent`.
INSTALL_CLOUD	Specifies whether the Cloud and Virtual Environments installer scenario will be used (1) or not (0).
INSTALL_CONTAINER	Specifies whether the Container installer scenario will be used (1) or not (0).
INSTALL_IDBC	Specifies whether IDBC/SPS/CLI servcies will be installed (1) or not (0). Used only with `INSTALL_CLOUD=1`.
CONFIG_IDBC_HOST	Specifies the IP address to use for the I-DBC service, if there is more than one possible on the I-DBC host. Used only with `INSTALL_IDBC=1` on Linux platforms.
CONFIG_SPS_HOST	Specifies the IP address to use for the SPS service, if there is more than one possible on the I-DBC host. Used only with `INSTALL_IDBC=1` on Linux platforms.
CCVE_LICENSE	Specifies the location of the CCVE license file. Used with `INSTALL_IDBC=1` on Linux platforms or `INSTALL_DOCKER=1`.
UPGRADE_ORB	Specifies whether an existing Orbix6, Orbix3 or VisiBroker 8.5 installation will be upgraded (1) or not (0). Only to be used with `INSTALL_IDBC=0` and `INSTALL_DOCKER=0`.
ORB_INSTALLATION	Specifies the location of the existing CORBA product to be upgraded. Used only with `UPGRADE_ORB=1`.
CCVE_ADDON_HOTFIX	Specifies the location of the product-specific CCVE hotfix available from Micro Focus Support. Used only with `UPGRADE_ORB=1`.
INSTALL_DOCKER	Specifies whether Docker examples will be installed (1) or not (0). Used only with `INSTALL_CONTAINER=1`.
INSTALL_VB_DOCKER	Specifies whether the Docker examples for VisiBroker will be installed (1) or not (0).
VISI_INSTALLER	Specifies the location of the VisiBroker installer binary. Used only with `INSTALL_VB_DOCKER=1`.
VISI_LICENSE	Specifies the location of the VisiBroker license file. Used only with `INSTALL_VB_DOCKER=1`.
VISI_CCVE_ADDON_HOTFIX	Specifies the location of the CCVE Linux hotfix for VisiBroker avaible from Micro Focus Support. Used only with `INSTALL_VB_DOCKER=1`.
VISI_HOTFIX_LIST	Specifies the list of VisiBroker hotfix files, separated by commas. Used only with `INSTALL_VB_DOCKER=1`.
INSTALL_O6_DOCKER	Specifies whether the Docker examples for Orbix 6 will be installed (1) or not (0).
ORBIX6_INSTALLER	Specifies the location of the Orbix 6 installer binary. Used only with `INSTALL_O6_DOCKER=1`.
ORBIX6_LICENSE	Specifies the location of the Orbix 6 license file. Used only with `INSTALL_O6_DOCKER=1`.
INSTALL_O3_DOCKER=1	Specifies whether the Docker examples for Orbix 3 will be installed (1) or not (0).

Property name	Description
ORBIX3_INSTALLER	Specifies the location of the Orbix 3 installer binary. Used only with `INSTALL_O3_DOCKER=1`.
ORBIXSSL3_INSTALLER	Specifies the location of the Orbix 3 SSL installer binary. Used only with `INSTALL_O3_DOCKER=1`.
ORBIX3_CXX_KEY	Specifies the C++ authentication key for Orbix 3. Used only with `INSTALL_O3_DOCKER=1`.
ORBIX3_JAVA_KEY	Specifies the Java authentication key for Orbix 3. Used only with `INSTALL_O3_DOCKER=1`.

Performing a silent installation

To perform a silent installation, specify silent mode by using the `-i` switch on the command line.

- **Windows:** `mf_ccve_corba_addon_1.0_win_x64.exe -i silent`
- **Linux:** `mf_ccve_corba_addon_1.0_lnx_x64.bin -i silent`

If the installer properties file is named `installer.properties` and is in the current directory, it will be automatically picked up. To specify a file with a different filename or in a different location, use the `-f` command line switch.

- **Windows:**
```
mf_ccve_corba_addon_1.0_win_x64.exe -i silent
-f c:\corba\installer_win.properties
```
- **Linux:**
```
mf_ccve_corba_addon_1.0_lnx_x64.bin -i silent
-f /home/users/corba/installer_linux.properties
```

Installing the SPS Client

The SPS Client is a command line interface to the Security Policy Server (SPS). The SPS Client can be used to configure the SPS or to obtain state information about the SPS.

Installing the SPS Client

Note that the SPS Client can only be installed on Linux systems.

All files are placed in the directory `/opt/microfocus/cli`.

Install the package by typing:

```
rpm -ivh /cdrom/linux/resources/Microfocus_CLI-4.0.0-<x>i386.rpm
```

If you want to install into a different directory use the `--prefix` option (not possible using RPM 4.0, for example RedHat 8.0):

```
rpm -ivh --prefix /different_directory ...
```

For more information about the installed package, such as the date of installation, the version number, etc., use the command:

```
rpm -q -i Microfocus_CLI
```

Installation Overview

The SPS Client installation directory contains the following:

Directory	Description
env.sh	Source this script to set the appropriate shell environment (bash and sh) for DBC commands.
env.csh	Source this script to set the appropriate shell environment (csh and tcsh) for DBC commands.
bin/	Contains the binaries.
bin/cliconfig.sh	Shell script to configure the SPS Client.
bin/collectperfdata.sh	Shell script for collecting performance data (see also "Performance Monitoring" in the ***I-DBC Deployment Guide***).
bin/dbcstat	Tool to find out the status of the DBC.
bin/deploydominoior.sh	Shell script to deploy a domino IOR.
bin/der2pem.sh	Shell script to convert key and certificate files from DER to PEM encoding.
bin/generateior	Shell script to generate an IOR.
bin/listconnections.sh	A helper script to view all connections on a single DBC.
bin/openssl	Tool to create keys and certificates
bin/printcert.sh	Tool for checking the validity of certificates.
bin/printior	Tool for printing an IOR in a readable way.
bin/proxifyior.sh	Tool to proxify an IOR.
bin/showciphers.sh	Script to display a list of cipher suite presets offered by the DBC.

Table 1 Contents of the SPS Client installation directory

Directory	Description
bin/spsclient	The SPS Client executable.
bin/spscli.sh	Script to start the SPS Client.
bin/xtradyne.sh	Collection of common settings. This is sourced by all other scripts.
lib/	Dynamic libraries for the SPS Client.
adm/	Contains configuration information and keys.

Table 1 Contents of the SPS Client installation directory

After Installation

Configuring the SPS Client

Use the script `<installdir>/bin/cliconfig.sh` to configure the SPS Client, that is, to give the script the host and port of the Security Policy Server. The script can be given the following arguments:

```
./cliconfig.sh [-h][-b] [-i <address>] [-p <port>]
 [-s yes|no] [-n <cluster>]
```

`-h` prints a help message

`-b` batch mode, do not ask for confirmation

`-i <address>` This is the IP address of SPS to contact. The default address is 127.0.0.1

`-p <port>` This is the port of SPS to contact. The default port is 15000.

`-s yes|no` If you choose "yes" IIOP/SSL will be used to contact the SPS. If you choose "no" plain IIOP will be used to contact the SPS. The default is yes.

`-n <cluster>` name of the DBC cluster. The default name is `iDBCProxyCluster1`.

If your SPS is for example running on a host with the IP address 192.168.47.11 with the default management port 15000, type:

```
./cliconfig.sh -i 192.168.47.11
```

Installing Keys and Certificates

If SSL is used on the management connection, you need to install the proper keys and certificates for the SPS Client installation:

1. Copy the file `<installdir>/sps/adm/AdminConsoleKeys.tar` from the SPS host to the directory `<installdir>/cli/adm` on the host where the SPS Client will be running.
2. On the SPS Client host change to directory `<installdir>/cli/adm` and unpack the tar file:
   ```
   tar xvfp AdminConsoleKeys.tar
   ```
3. Create symbolic links as follows:
   ```
   ln -sf AdminConsoleKey.der SPSClientKey.der
   ln -sf AdminConsoleCert.der SPSClientCert.der
   ```
4. Make sure that key files are owned by user `corba`:
   ```
   chown corba *.der
   ```

Docker Toolbox and IP Addresses

Introduction

Docker for Windows systems can be one of:

- Docker Desktop for Windows
- Docker Toolbox

If your Windows system does not meet the requirements for Docker Desktop for Windows, then you can use the Docker Toolbox.

A component of the Docker Toolbox is the Docker Quickstart terminal. When running this terminal, a message similar to the following may appear on the screen:

```
docker is configured to use the default machine with
IP 192.168.99.100
```

IP address **192.168.99.100** is most likely not the IP address of your Windows system. It is an IP address used by the Oracle VM VirtualBox, which is another component of the Docker Toolbox.

When running a Docker container, the IP address of the Windows system hosting the container is passed as an environment variable:

```
--env MF_HOST_IP=192.168.99.100
```

Using the IP address displayed in the Docker Quickstart terminal (192.168.99.100) can pose challenges when running an application inside a Docker container. I-DBC inside the container will use IP address 192.168.99.100 when it proxifies an IOR.

For clients running outside the Docker container that use the proxified IOR to make invocations on the server running inside the Docker container:

- The invocation will succeed if you run the client on the *same* Windows system that is hosting the Docker container.
- The invocation will most likely fail if you run the client on a *different* system from the one hosting the Docker container. IP address 192.168.99.100 is probably not a known IP address to your network.

Using the IP Address of the Windows System

Rather than passing IP address 192.168.99.100 as an environment variable into the Docker container, we recommend that you use the IP address of the Windows system itself.

Pass the IP address of your Windows system as an environment variable when starting the Docker container, using the command:

```
--env MF_HOST_IP=<ip_addr>
```

For example:

```
--env MF_HOST_IP=10.16.16.120
```

I-DBC will then proxify IORs using the IP address passed, in this example 10.16.16.120. Client invocations using this IOR will still fail, however.

In order to be able to use the IP address of the Windows system, you can configure *port forwarding* can be configured in the Oracle VM VirtualBox.

Configure Oracle VM VirtualBox Port Forwarding

Before configuring port forwarding, compile a list of all the published ports used when running Docker containers.

The CORBA Add-on for Cloud, Containers & Virtual Environments samples publish the following ports when running Docker containers:

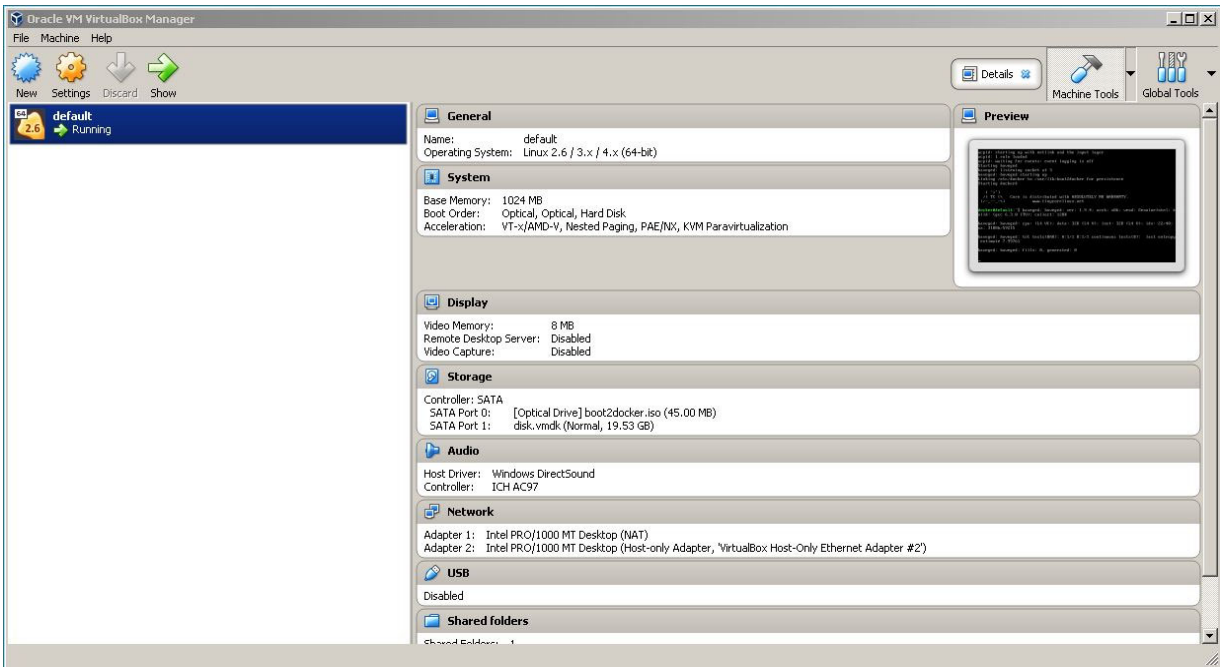
Port	Description
3000	Insecure port
3001	Insecure port
3002	Insecure port
8885	Secure port

Your application may use ports in addition to or instead of these ports. Be sure to note all of them.

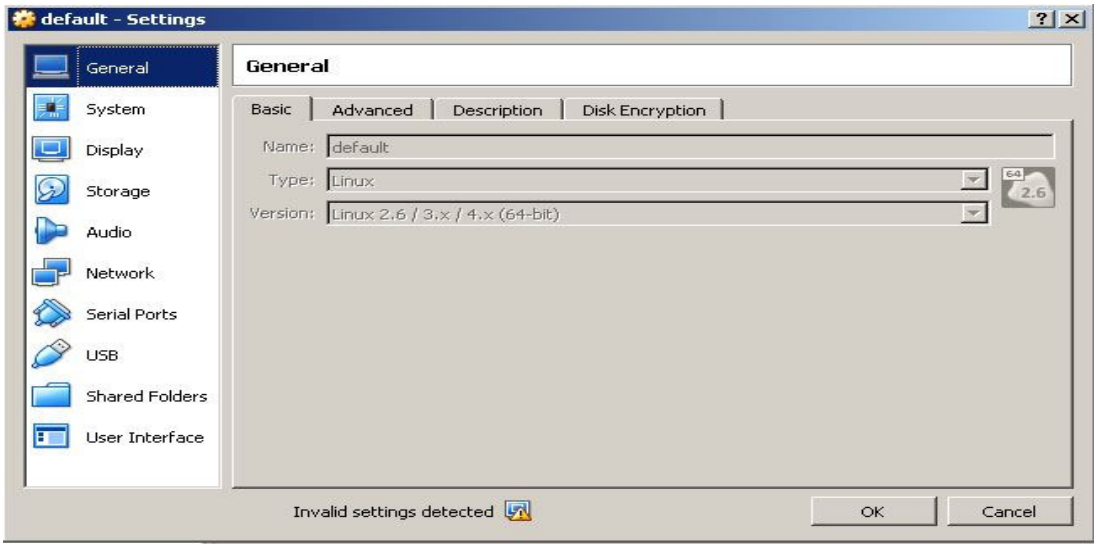
Once a list of all the ports that require forwarding is made, configure the Oracle VM VirtualBox.

Double-click **Oracle VM VirtualBox** on your Windows system desktop

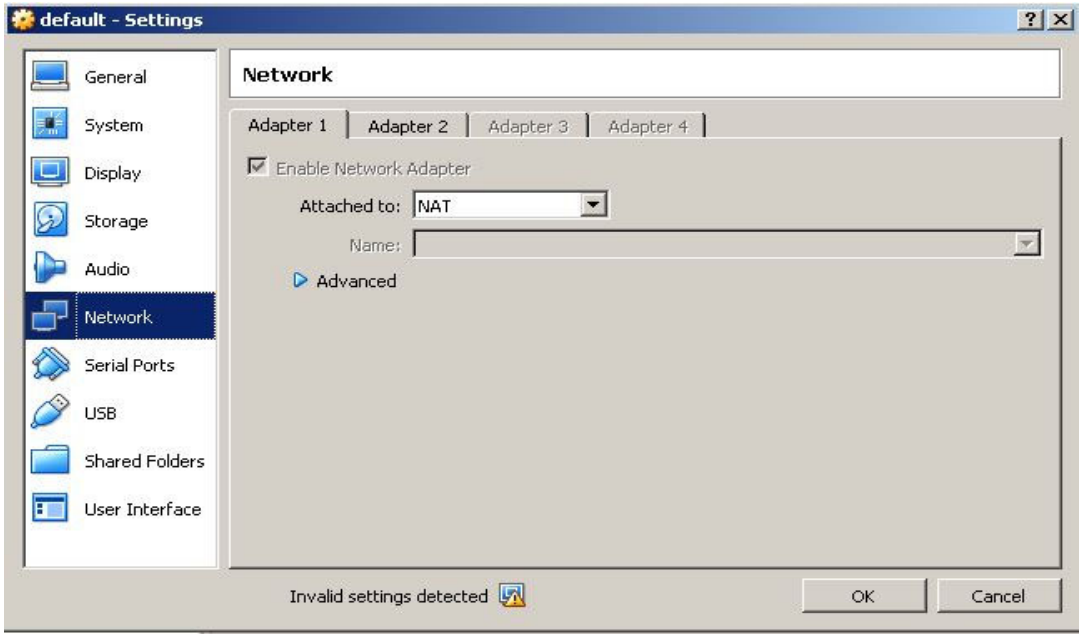
Clicking this displays the Oracle VM VirtualBox Manager window.



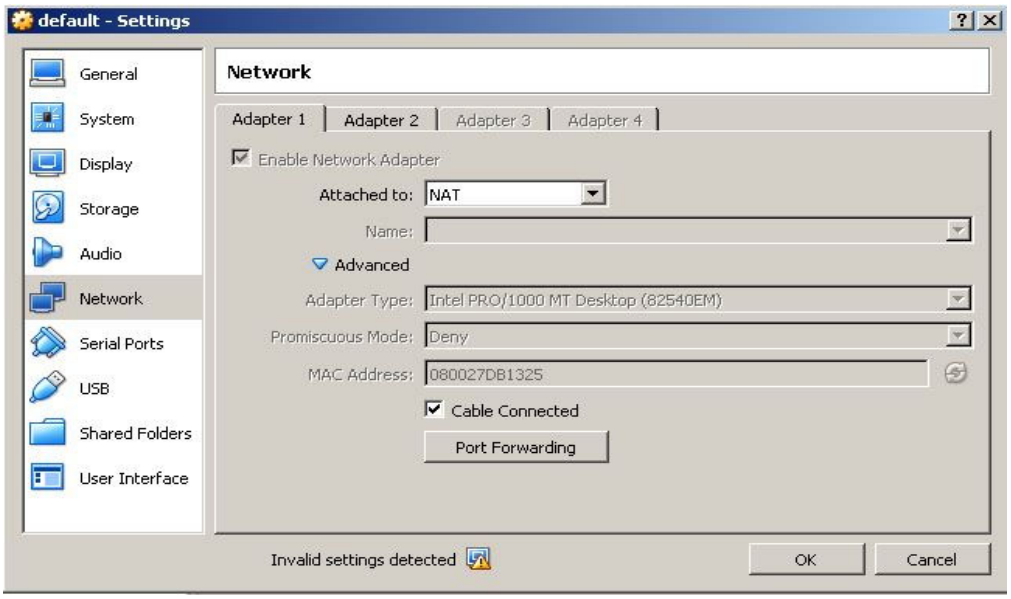
Click **Settings**. The **default-Settings** window displays.



Click **Network**.

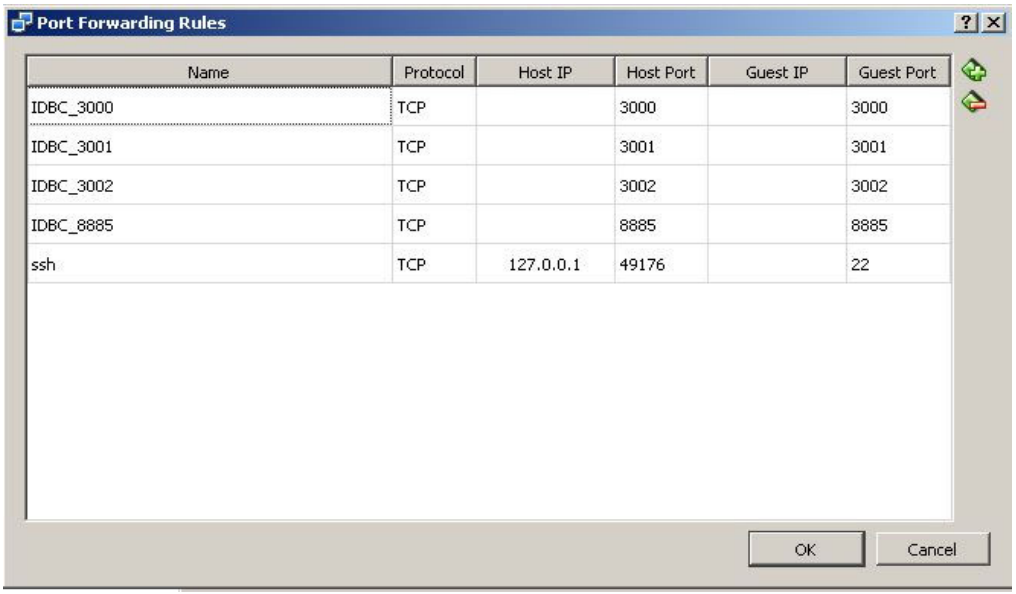


On the **Adapter1** tab, click **Advanced**.



Click **Port Forwarding**.

Use the **+** icon on the right-hand side of the **Port Forwarding Rules** window to add rows and build up a table similar to the one below, based on the list of ports that require port forwarding.



The **Name** column should provide a descriptive name of the port being forwarded.

If you wish to give the Administration Console access to the I-DBC Security Policy Server (SPS) running inside a Docker container on port 15000, add an entry as follows:

Name	**Protocol**	**Host IP**	**Host Port**	**Guest IP**	**Guest Port**
…	…	…	…	…	…
IDBC_15000	TCP		15000		15000

Once all possible ports that Docker containers might publish are configured into the Port Forwarding rules, the IP address of the Windows system (rather than the IP address of the Oracle VM VirtualBox) can be passed as the MF_HOST_IP environment variable when running Docker containers.

Common Docker Images

In Object Oriented Programming, a class is the "blueprint" used to create an instance of an object. Similarly in Docker, a Docker image is the blueprint used to create an instance of a Docker container.

Classes can also inherit from other classes, providing a "building block" approach to creating classes. Similarly, Docker allows images to be created from other images using the same "building block" approach.

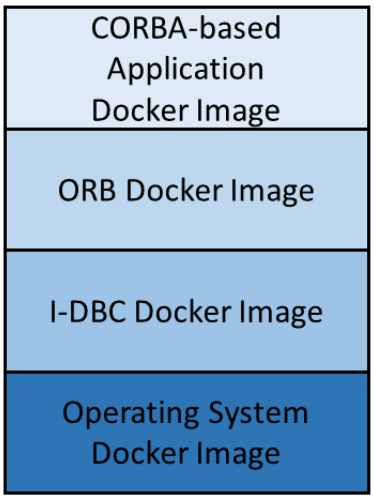
The next few chapters describe the fundamental Docker images required for using CORBA-based applications in a Docker environment. This chapter focuses on the *operating system Docker image* and the *I-DBC Docker image*.

This chapter assumes that the CORBA Add-on for Cloud, Containers & Virtual Environments product is installed at `<installdir>`. See *CORBA in Containers* for instructions on installing the CORBA Add-on for Cloud, Containers & Virtual Environments.

The paths and commands given here assume installation on a Linux machine. If you are using a Windows machine, adjust the paths and commands to suit Windows.

The Docker Images

Docker images are built upon each other as follows:



The foundation image is the operating system Docker image. Currently two operating systems are supported:

- CentOS
- Ubuntu

The I-DBC Docker image is built on top of the operating system Docker image. I-DBC is an application that facilitates crossing network boundaries for CORBA-based applications.

The ORB Docker image is built on top of the I-DBC Docker image. The ORB Docker image contains one of the following CORBA products:

- Orbix 3
- Orbix 6

- VisiBroker

The CORBA-based application Docker image is built on top of the ORB Docker image. It contains the CORBA based application that you wish to run inside a Docker container.

Dockerfiles

Docker images are defined by Dockerfiles. Dockerfiles consist of a set of instructions. Some common instructions are:

- **FROM**: Specifies the Docker image that this particular Dockerfile is based on.
- **RUN**: Execute a command as part of the Docker image creation.
- **COPY**: Copy a file into the Docker image.
- **ENV**: Define an environment variable.

The `docker build` command is used to create a Docker image from a Dockerfile.

The Operating System Docker Image

The operating system Docker image is the foundation upon which all other Docker images are built.

It is good practice is to make this image as lightweight as possible by creating the smallest image possible that is still capable of running your CORBA based application.

Currently two operating systems are supported:

- CentOS
- Ubuntu

The Dockerfile for CentOS

The Dockerfile for the CentOS Docker image can be found at *<installdir>*`/docker/common/centos_layer/Dockerfile`.

It looks as follows:

```
## Our image is based on the official CentOS Docker image
FROM centos

## We also install some essential tools as well as OpenJDK
RUN yum install -y iproute initscripts
RUN yum install -y net-tools
RUN yum install -y java-1.8.0-openjdk java-1.8.0-openjdk-devel
RUN yum group install -y "Development Tools"

ENV JAVA_HOME /usr/lib/jvm/java
```

The Dockerfile is based on the CentOS Docker image, as indicated in the `FROM` command. This is a 64-bit version of the operating system. Multiple `RUN` commands install tools needed to run I-DBC and a CORBA ORB. One of the tools installed is an OpenJDK 8, and an environment variable is set to indicate its location.

Building the CentOS Operating System Docker Image

In a window that supports Docker commands, use the following to build the CentOS operating system Docker image. You will need access to the internet for this command to work correctly:

```
cd <installdir>/docker/common/centos_layer
docker build -t base-os-layer .
```

Note:

The '.' character is an essential part of the "docker `build`" command.

This Docker image is given the name `base-os-layer`. The I-DBC Docker image will build on top of this image.

The Dockerfile for Ubuntu

If you prefer, you can use Ubuntu instead of CentOS in the operating system Docker image. The Dockerfile for the Ubuntu Docker image can be found at `<installdir>/docker/common/ubuntu_layer/Dockerfile`.

It looks as follows:

```
## This image is based on the ubuntu Docker image
FROM ubuntu
ENV DEBIAN_FRONTEND=noninteractive

## We also install some essential tools as well as OpenJDK
RUN apt-get update
RUN apt-get install -y openjdk-8-jdk
RUN apt-get install -y iproute2 net-tools iputils-ping
RUN apt-get install -y gcc mono-mcs
RUN ln -s /usr/bin/make /usr/bin/gmake
RUN ln -s /usr/lib/jvm/java-1.8.0-openjdk-amd64 /usr/lib/jvm/java

ENV JAVA_HOME /usr/lib/jvm/java-1.8.0-openjdk-amd64
```

The Dockerfile is based on the Ubuntu Docker image, as indicated in the `FROM` command. This is a 64-bit version of the operating system. Multiple `RUN` commands install tools needed to run I-DBC and a CORBA ORB. One of the tools installed is an OpenJDK 8, and an environment variable is set to indicate its location.

Building the Ubuntu Operating System Docker Image

In a window that supports Docker commands, use the following to build the Ubuntu operating system Docker image. You will need access to the internet for this command to work correctly:

```
cd <installdir>/docker/common/ubuntu_layer
docker build -t base-os-layer .
```

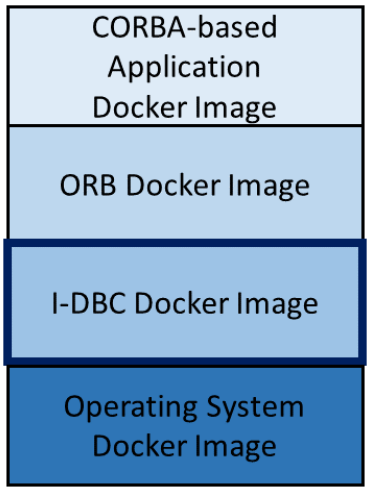
Note:

The '.' character is an essential part of the "docker build" command.

This Docker image is given the name `base-os-layer`. The I-DBC Docker image will build on top of this image.

The I-DBC Docker Image

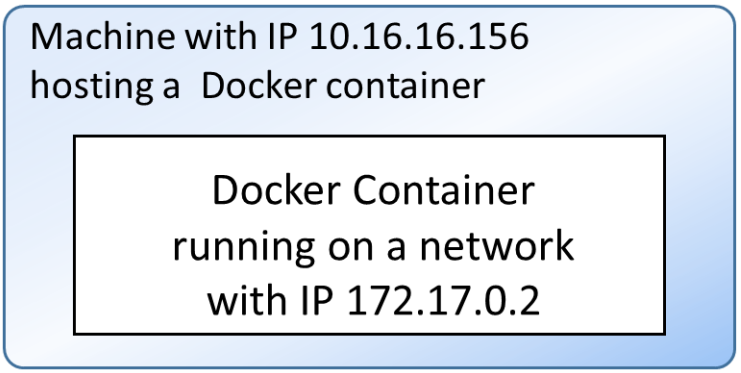
The I-DBC Docker image is built upon the operating system Docker image built according to the instructions above, with the image name `base-os_layer`.



See the ***I-DBC Administrator's Guide*** for detailed information on I-DBC.

Running CORBA-based applications inside a Docker container poses challenges where the network running inside a Docker container is often distinct from, and unknown to, the general network outside the Docker container.

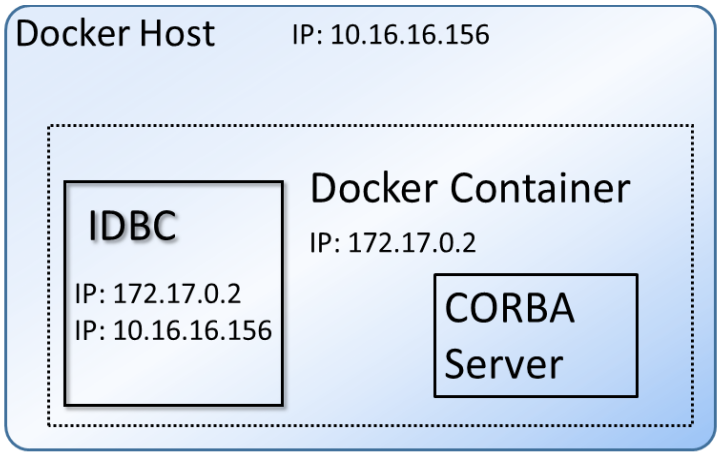
The following diagram illustrates the point, using some example IP addresses.



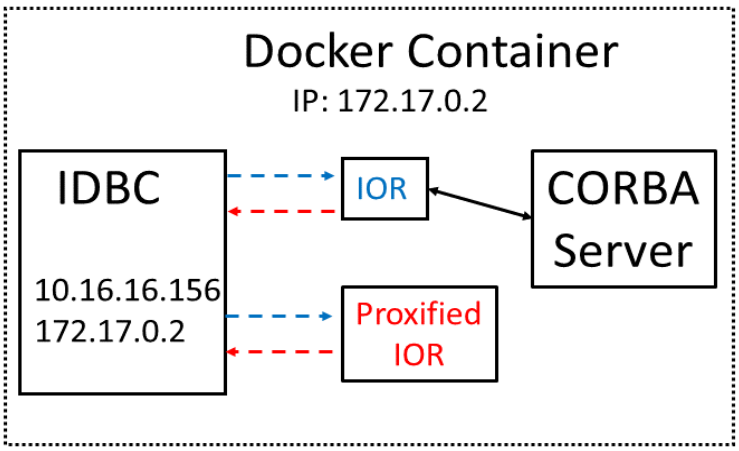
A CORBA-based application running inside the Docker container in the diagram above will publish IORs with an IP address of 172.17.0.2. A client application running outside the Docker container will likely be unable to use an IOR with an IP address of 172.17.0.2.

I-DBC can help with this issue. I-DBC will run inside the container along with the CORBA based application. I-DBC is aware of both the network hosting the Docker container (the machine with IP address 10.16.16.156)

and the network inside the Docker container (the container with IP address 172.17.0.2).



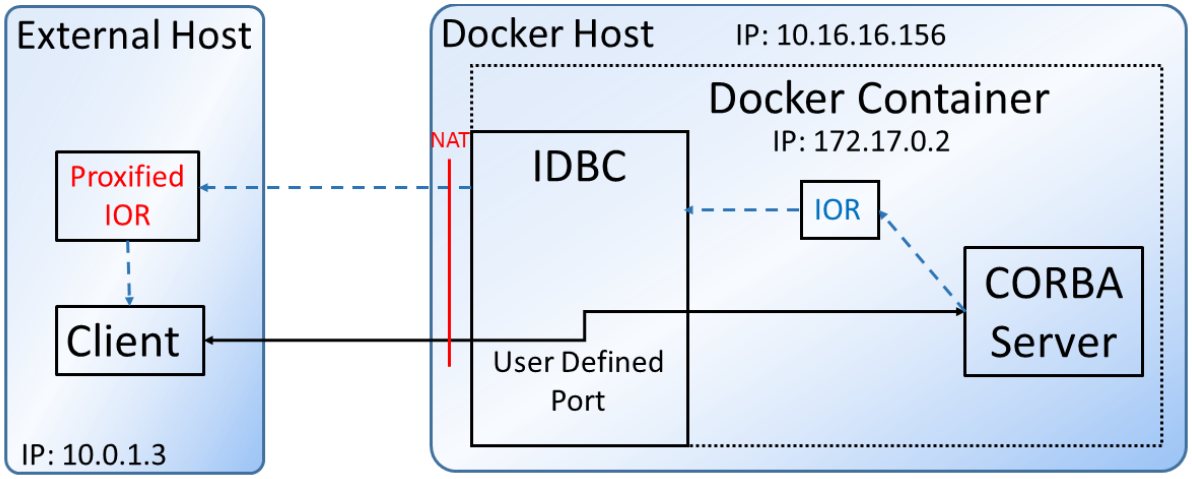
When the application publishes an IOR, I-DBC can be used to "proxify" the IOR. This means that I-DBC transforms the original IOR into a new IOR, replacing information such as the hostname (IP address 172.17.0.2 in the diagram above) and port with a hostname (IP 10.16.16.156 in the diagram above) and port of the machine hosting the Docker container.



The proxified IOR can be used successfully by clients as the IP address in the proxified IOR is a "known" address on the network.

I-DBC:

- Receives client invocations,
- Passes them along to the CORBA-based application running inside the container,
- Receive any replies from the application,
- Passes them back to the client.



The Dockerfile for I-DBC

The Dockerfile for the I-DBC Docker image can be found at:
<installdir>/docker/common/idbc_layer/Dockerfile

It looks as follows:

```
## Docker image is based on the previous platform image
FROM base-os-layer:latest

## Pre-Installation User Setup
RUN groupadd --gid 1024 corbagroup
RUN useradd -ms /bin/bash -g corbagroup corba

ENV DBC_USER corba
ENV PRODUCT_HOME /home/corba/microfocus/idbc

RUN mkdir -p $PRODUCT_HOME
RUN chown -R corba:corbagroup /home/corba
USER corba

ENV PRODUCT_USER corba
ENV COUNTRY uk
ENV COMPANY microfocus
COPY entrypoint_common.sh /home/corba/entrypoint_common.sh

## Install the SPS and run its setup scripts
COPY microfocus_SPS-4.0.0.tar.gz $PRODUCT_HOME/microfocus_SPS-4.0.0.tar.gz
COPY microfocus_CLI-4.0.0.tar.gz $PRODUCT_HOME/microfocus_CLI-4.0.0.tar.gz
COPY microfocus_IDBC-4.0.0.tar.gz $PRODUCT_HOME/microfocus_IDBC-4.0.0.tar.gz
COPY mf_idbc_install.sh $PRODUCT_HOME/mf_idbc_install.sh
COPY idbc_license.slip $PRODUCT_HOME/license.slip
WORKDIR $PRODUCT_HOME/
RUN /bin/bash $PRODUCT_HOME/mf_idbc_install.sh install
RUN /bin/bash $PRODUCT_HOME/mf_idbc_install.sh configure
#
## Install IDBC and get the contents of ProxyKeys from the SPS

ENV IDBC_PRODUCT_DIR $PRODUCT_HOME
```

The Dockerfile is based on the `base-os-layer:latest` Docker image, as indicated by the FROM command. This was the operating system Docker image created in "The Operating System Docker Image".

There are several important things to note.

User ID

The `RUN` command is used to create a group and user ID as follows:

- Group: `corbagroup`
- User ID: `corba`

The `ENV` command sets the `DCB_USER` variable to "corba", and the `PRODUCT_HOME` variable to the I-DBC installation directory.

The `RUN` command is used to create the I-DBC installation directory, and to recursively change ownership of user **corba**'s home directory to user **corba**.

The `USER` command sets the user to **corba**.

All further Docker commands, and all applications run inside Docker containers, will now be run as user **corba**, assuming that no Dockerfiles built upon the Dockerfile for I-DBC specify a different user with the `USER` command.

I-DBC Environment Variables

The `ENV` command sets these variables:

- `PRODUCT_USER` to **corba**, indicating that I-DBC is to run as user **corba**.
- `COUNTRY` to **UK**, which will be used when generating certificates.
- `COMPANY` to **microfocus**, which will be used when generating certificates.

Common Entrypoint Helper Script

The `COPY` command is used to copy the file `entrypoint_common.sh` to the directory `/home/corba/entrypoint_common.sh`.

This file contains helper functions to do things such as:

- Set configuration items for I-DBC
- Start I-IDBC
- Check the running status of I-DBC
- Proxify an IOR
- Start a CORBA server application

These functions are used in the various examples found in:

```
<installdir>/docker/orbix3/application_layer
<installdir>/docker/orbix6/application_layer
<installdir>/docker/visibroker/application_layer
```

The entrypoint scripts for the various examples illustrate how to make use of these functions.

When creating your own CORBA based application running inside of a Docker container, you can:

- Use the functions in `entrypoint_common.sh` as illustrated in the various example entrypoint scripts, if they satisfy the requirements of your application.
- Add or update functions in `entrypoint_common.sh` to suit the requirements of your application.

- Provide your own mechanism to do the equivalent of what `entrypoint_common.sh` does.

Install I-DBC

The COPY command is used to copy the I-DBC installation files. The installer files are:

- `microfocus_SPS-4.0.0.tar.gz`: Installs a 64-bit version of the Security Policy Server
- `microfocus_CLI_4.0.0.tar.gz`: Installs a 64-bit version of the Security Policy Server client
- `microfocus_IDBC-4.0.0.tar.gz`: Installs a 64-bit version of the I-DBC proxy
- `mf_idbc_install.sh`: Install and configuration script
- `idbc_license.slip`: A license needed to run I-DBC

The `RUN` command is used to run the `mf_idbc_install.sh` script to install and configure I-DBC.

The `ENV` command sets the `DCB_USER` variable to "corba", and the `PRODUCT_HOME` variable to the I-DBC installation directory.

Building the I-DBC Docker Image

In a window that supports Docker commands, use the following to build the I-DBC Docker image:

```
cd <installdir>/docker/common/idbc_layer
docker build -t idbc-layer .
```

Note:

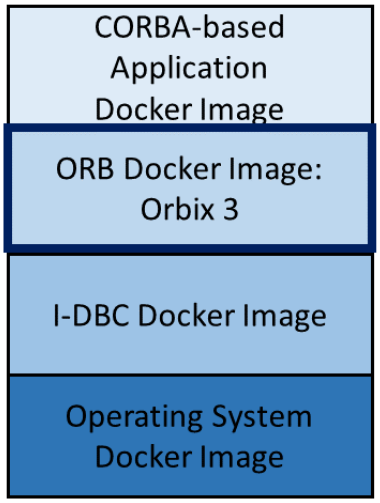
The '.' character is an essential part of the `docker build` command.

This Docker image is given the name `idbc-layer`. The various ORB Docker images will build on top of this image.

The Orbix 3 Docker Image

This chapter describes the Orbix 3 ORB Docker image.

The Orbix 3 Docker Image



The Orbix 3 Docker image is built upon the I-DBC Docker image, which is in turn built upon the operating system Docker image.

This chapter assumes that the CORBA Add-on for Cloud, Containers & Virtual Environments product is installed at *<installdir>*.

Paths and commands given in this chapter assume installation on a Linux machine. If using a Windows machine, adjust the paths and commands to suit Windows.

The Dockerfile for Orbix 3

The Dockerfile for the Orbix 3 Docker image can be found at *<installdir>*/docker/orbix3/orb_base_layer/Dockerfile.

It looks as follows:

```
FROM idbc-layer

## Pre-Installation User Setup
USER corba
run mkdir -p /home/corba/microfocus/orbix/orbix33
ENV CORBA_PRODUCT_DIR /home/corba/microfocus/orbix/orbix33

## Copy the Orbix 3 installer files
COPY microfocus_orbix3_lnx.bin ${CORBA_PRODUCT_DIR}/
microfocus_orbix3_lnx.bin
COPY microfocus_orbix3_ssl_lnx.bin ${CORBA_PRODUCT_DIR}/
microfocus_orbix3_ssl_lnx.bin
COPY installer.properties ${CORBA_PRODUCT_DIR}/
installer.properties

## Install Orbix 3
RUN ${CORBA_PRODUCT_DIR}/microfocus_orbix3_lnx.bin -f
${CORBA_PRODUCT_DIR}/installer.properties
RUN ${CORBA_PRODUCT_DIR}/microfocus_orbix3_ssl_lnx.bin -f
${CORBA_PRODUCT_DIR}/installer.properties
```

```
## Add the entrypoint_helper script
COPY entrypoint_helper_o3.sh /home/corba/

## Create location for proxified IOR's to go
RUN mkdir -p /home/corba/proxified_iors

## Ready to work
WORKDIR ${CORBA_PRODUCT_DIR}
```

The Dockerfile is based on the `idbc-layer` Docker image, as indicated by the `FROM` instruction. This image was the I-DBC Docker image created in the steps outlined in the "Common Docker Images" chapter.

User ID

Note that the `USER` instruction indicates that all further Docker commands, and all applications that are run inside Docker containers created from this image, will now be run as user **corba** (unless any Dockerfiles built upon the Dockerfile for Orbix 3 specify a different user with the `USER` instruction).

Installing Orbix 3

The Dockerfile creates the directory path `/home/corba/microfcous/orbix/orbix33`, which is where Orbix 3 will be installed.

The following files are copied:

- `microfocus_orbix3_lnx.bin`: The Orbix 3 installer for Linux
- `microfocus_orbix3_ssl_lnx.bin`: The Orbix 3 SSL installer for Linux
- `installer.properties`: The silent installer file

The `RUN` instruction runs the Orbix 6 installer, referencing the silent installer file.

Orbix 3 Entrypoint Helper Script

The `COPY` instruction is used to copy the file `entrypoint_helper_o3.sh` to the directory `/home/corba`.

The file `entrypoint_helper_o3.sh` includes methods that are found in the separate file `entrypoint_common.sh`, which was installed as part of the I-DBC Docker image.

This file contains helper function `run_securely`, which is used to indicate that Orbix 3 is running in secure mode.

The functions in `entrypoint_helper_o3.sh` and `entrypoint_common.sh` are used in the various demos found in:

`<installdir>/docker/orbix3/application_layer`

The entrypoint scripts for the various demos illustrate how to make use of these functions.

When creating your own CORBA based application running inside a Docker container, you can:

- Use the functions in `entrypoint_helper_o3.sh` and `entrypoint_common.sh` as illustrated in the various example entrypoint scripts, if they satisfy the requirements of your application.
- Add or update functions in `entrypoint_helper_o3.sh` and `entrypoint_common.sh` to suit the requirements of your application.

- Provide your own mechanism to do the equivalent of what `entrypoint_helper_o6.sh` and `entrypoint_common.sh` do.

Proxified IOR Location

The `RUN` instruction makes a directory called `/home/corba/proxified_iors`. When using functions from `entrypoint_helper_o6.sh` and `entrypoint_common.sh` to proxify IORs, they will be written to this directory.

Building the Orbix 3 Docker Image

In a window that supports Docker commands, use the following to build the Orbix 3 Docker image:

```
cd <installdir>/docker/orbix3/orb_base_layer
docker build -t orbix3-idbc-layer .
```

Note:

The '.' character is an essential part of the "`docker build`" command.

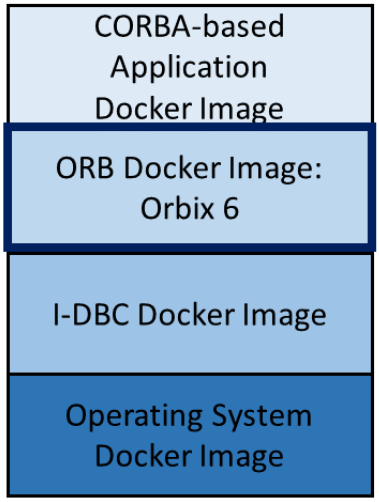
The Docker image is given the name `orbix3-idbc-layer`. All the Orbix 3 demo Docker images in `<installdir>/docker/orbix3/application_layer` are built on top of this image.

As illustrated in the demos, your CORBA-based application would create a Docker image based on the `orbix3-idbc-layer` image as well, following a pattern similar to what is done for each demo.

The Orbix 6 Docker Image

This chapter describes the Orbix 6 ORB Docker image.

The Orbix 6 Docker Image



The Orbix 6 Docker image is built upon the I-DBC Docker image, which is in turn built upon the operating system Docker image.

This chapter assumes that the CORBA Add-on for Cloud, Containers & Virtual Environments product is installed at *<installdir>*.

Paths and commands given in this chapter assume installation on a Linux machine. If using a Windows machine, adjust the paths and commands to suit Windows.

The Dockerfile for Orbix 6

The Dockerfile for the Orbix 6 Docker image can be found at *<installdir>*/docker/orbix6/orb_base_layer/Dockerfile.

It looks as follows:

```
FROM idbc-layer

## Pre-Installation User Setup
USER corba
RUN mkdir -p /home/corba/microfocus/orbix/etc/bin
ENV IT_PRODUCT_DIR /home/corba/microfocus/orbix

## Install Orbix 6
COPY microfocus_orbix6_lnx.bin ${IT_PRODUCT_DIR}/
microfocus_orbix6_lnx.bin
COPY installer.properties ${IT_PRODUCT_DIR}/installer.properties
RUN ${IT_PRODUCT_DIR}/microfocus_orbix6_lnx.bin -i silent -f
${IT_PRODUCT_DIR}/installer.properties

## Copy the Orbix 6 License file into the install etc directory
COPY licenses.txt ${IT_PRODUCT_DIR}/etc/licenses.txt

ENV IT_LICENSE_FILE ${IT_PRODUCT_DIR}/etc/licenses.txt

## Add the entrypoint_helper script
```

```
COPY entrypoint_helper_o6.sh /home/corba/

## Create location for proxified IOR's to go
RUN mkdir /home/corba/proxified_iors

# Allows for Java builds using "itant"
#
ENV IT_DOMAIN_NAME orbix6_domain
COPY build_env.sh /home/corba/

## Ready to work
WORKDIR ${IT_PRODUCT_DIR}
```

The Dockerfile is based on the `idbc-layer` Docker image, as indicated by the `FROM` instruction. This image was the I-DBC Docker image created in the steps outlined in the "Common Docker Images" chapter.

User ID

Note that the `USER` instruction indicates that all further Docker commands, and all applications that are run inside Docker containers created from this image, will now be run as user **corba** (unless any Dockerfiles built upon the Dockerfile for Orbix 6 specify a different user with the `USER` instruction).

Installing Orbix 6

The Dockerfile creates a directory path and sets the IT_PRODUCT_DIR environment variable to `/home/corba/microfcous/orbix`, which is where Orbix 6 will be installed.

The following files are copied:

- `microfocus_orbix6_lnx.bin`: The Orbix 6 installer for Linux
- `installer.properties`: The silent installer file

The `RUN` instruction runs the Orbix 6 installer, referencing the silent installer file.

An Orbix 6 license file is copied, and the IT_LICENSE_FILE environment variable is set to point to its location.

Orbix 6 Entrypoint Helper Script

The `COPY` instruction is used to copy the file `entrypoint_helper_o6.sh` to the directory `/home/corba`.

The file `entrypoint_helper_o6.sh` includes methods that are found in the separate file `entrypoint_common.sh`, which was installed as part of the I-DBC Docker image.

This file contains helper functions to do things such as:

- Get an IOR from an Orbix 6 configuration file
- Proxify an IOR from an Orbix 6 configuration file
- Run an Orbix 6 deployment
- Start Orbix 6 services

These functions are used in the various demos found in:

`<installdir>/docker/orbix6/application_layer`

The entrypoint scripts for the various demos illustrate how to make use of these functions.

When creating your own CORBA based application running inside a Docker container, you can:

- Use the functions in `entrypoint_helper_o6.sh` as illustrated in the various example entrypoint scripts, if they satisfy the requirements of your application.
- Add or update functions in `entrypoint_helper_o6.sh` to suit the requirements of your application.
- Provide your own mechanism to do the equivalent of what `entrypoint_helper_o6.sh` does.

Proxified IOR Location

The `RUN` instruction makes a directory called `/home/corba/proxified_iors`. When using functions from `entrypoint_helper_o6.sh` and `entrypoint_common.sh` to proxify IORs, they will be written to this directory.

Orbix 6 Domain Name

The `ENV` instruction is used to set the IT_DOMAIN_NAME environment variable to the value `orbix6_domain`.

When building and running the Orbix 6 demos in `<installdir>/docker/orbix6/application_layer`, the domain name will be assumed to be **orbix6_domain**.

Build Script

The file `build_env.sh` is copied into the directory `/home/corba`. This script allows for building Orbix 6-based applications before a deployment is performed.

Building the Orbix 6 Docker Image

In a window that supports Docker commands, use the following to build the Orbix 6 Docker image:

```
cd <installdir>/docker/orbix6/orb_base_layer
docker build -t o6-idbc-layer .
```

Note:

The '.' character is an essential part of the "`docker build`" command.

The Docker image is given the name `o6-idbc-layer`. All the Orbix 6 demo Docker images in `-3.2-<x>/docker/orbix6/application_layer` are built on top of this image.

As illustrated in the demos, your CORBA-based application would create a Docker image based on the `o6-idbc-layer` image as well, following a pattern similar to what is done for each demo.

Creating Orbix 6 Deployment Descriptors

This chapter describes how to create deployment descriptors for Orbix 6-based applications.

Introduction

When developing applications based on Orbix 6, one of the development steps is to perform an Orbix 6 deployment. The items generated by the deployment process include:

- A configuration file. It can be file based, or a Configuration Repository (CFR).
- Log files for deployed services.
- Database files for the IMR, and potentially other Orbix 6 services.
- A deployment descriptor.

See the ***Orbix 6 Deployment Guide*** for further information on deployment.

Orbix 6-based applications running inside a Docker container will require deployment. Deployments inside Docker containers will use a deployment descriptor. This chapter explains how to create this deployment descriptor by using the supplied Orbix 6 basic log demo as an example.

This chapter assumes that:

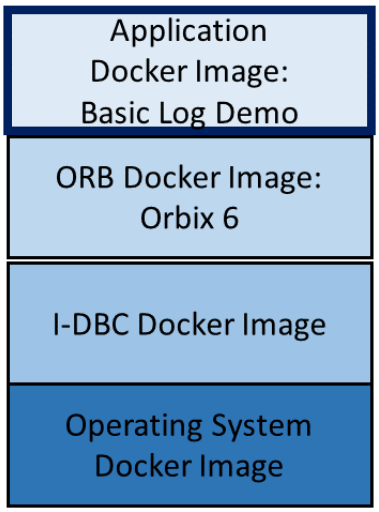
- Orbix 6 is installed outside of Docker at `<orbix6dir>`.
- The CORBA Add-on for Cloud, Containers & Virtual Environments is installed at `<installdir>`.
- Paths and commands given in this chapter assume installation on a Linux machine. If using a Windows machine, adjust the paths and commands to suit Windows.

Note that the basic log demo exists in two places:

- The demo supplied with Orbix 6 at `<orbix6dir>/asp/6.3/demos/corba/enterprise/basic_log`. The client part of the demo is run outside Docker from here.
- The demo supplied with the CORBA Add-on for Cloud, Containers & Virtual Environments at `<installdir>/docker/orbix6/application_layer/basic_log_demo_cxx`. The server part of the demo is run inside Docker from here.

The Basic Log Demo

This demo creates a Docker image built upon the `o6-idbc-layer` Docker image.



The Dockerfile for the demo looks as follows:

```
# Dockerfile for the basic_log demo
#
# Use o6-idbc-layer as the base layer for this image.
# To create the Docker image for this demo run:
#
#  docker build -t orbix6_application:latest .
#
FROM o6-idbc-layer

WORKDIR ${IT_PRODUCT_DIR}
ENV TEST_DIR ${IT_PRODUCT_DIR}/asp/6.3/demos/corba/enterprise/
basic_log/simple/cxx_demo

# Build the basic_log demo inside the image
#
RUN . /home/corba/build_env.sh && cd ${TEST_DIR} && make -e

# Add the deployment descriptor file to the image
#
COPY ${IT_DOMAIN_NAME}_dd.xml ${IT_PRODUCT_DIR}/etc/
${IT_DOMAIN_NAME}_dd.xml

# Add the entrypoint.sh file to the image
#
COPY entrypoint.sh ${TEST_DIR}

# When a Docker container is started using this image, run this
script
#
ENTRYPOINT ${TEST_DIR}/entrypoint.sh
```

When creating a Docker image from this Dockerfile:

- The Orbix 6 basic log xx demo is built.
- Files `orbix6_domain_dd.xml` and `entrypoint.sh` are copied.
- The `ENTRYPOINT` instruction indicates that the `entrypoint.sh` script is to be run when a Docker container is started using this image.

File *<installdir>*/docker/orbix6/application_layer/basic_log_demo_cxx/README_CXX.txt has instructions on how to run this demo.

Deployment inside a Docker Container

The file entrypoint.sh calls the function deploy_orbix6_if_needed, which is part of entrypoint_helper_o6.sh. This function will perform a deployment if no prior deployment is detected.

It runs the Orbix itconfigure tool in command line mode and takes deployment descriptor orbix6_domain_dd.xml as input. The file orbix6_domain_dd.xml looks as follows:

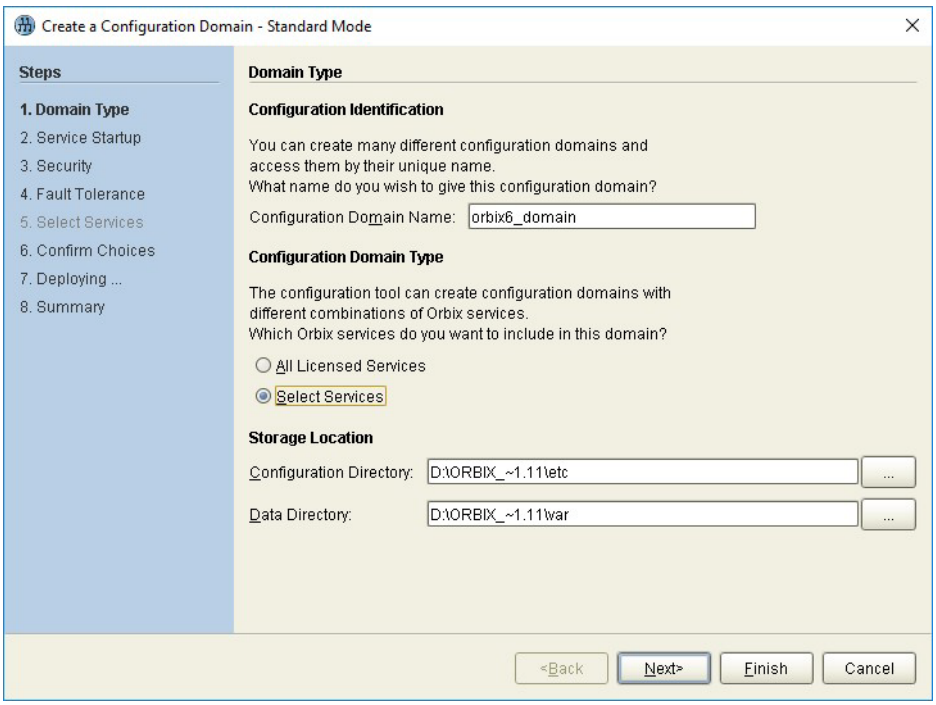
```
<?xml version="1.0" encoding="UTF-8"?>
<dd:descriptor xmlns:dd="http://ns.iona.com/orbix/schema/dd/1.2">
  <!--This deployment descriptor version 1.2.0 has been generated
by Orbix tools-->
  <dd:configuration>
    <dd:domain>orbix6_domain</dd:domain>
    <dd:source>file</dd:source>
    <dd:location_domain>all_services.location</
dd:location_domain>
  </dd:configuration>
  <!--Concrete node information for this deployment-->
  <dd:nodes>
    <dd:node name="node1" ip="1.1.1.1" profile="node1">
      <dd:policies>
        <dd:policy name="prefer_ipv4" value="true" />
      </dd:policies>
    </dd:node>
  </dd:nodes>
  <!--The following profiles will be deployed-->
  <dd:profile id="node1">
    <dd:service name="locator" link="false">
      <dd:activation mode="manual" />
      <dd:run mode="direct_persistent" instrumented="false"
proxified="false" managed="false" authenticated="false"
perflog="false" dynlog="false" />
      <dd:endpoint protocol="iiop" port="3075" />
    </dd:service>
    <dd:service name="node_daemon" link="false">
      <dd:activation mode="manual" />
      <dd:run mode="direct_persistent" instrumented="false"
proxified="false" managed="false" authenticated="false"
perflog="false" dynlog="false" />
      <dd:endpoint protocol="iiop" port="53079" />
    </dd:service>
    <dd:service name="basic_log" link="false">
      <dd:activation mode="manual" />
      <dd:run mode="direct_persistent" instrumented="false"
proxified="false" managed="false" authenticated="false"
perflog="false" dynlog="false" />
      <dd:endpoint protocol="iiop" port="53093" />
    </dd:service>
    <dd:component name="demos">
      <dd:endpoint protocol="iiop" />
    </dd:component>
  </dd:profile>
</dd:descriptor>
```

Creating the Deployment Descriptor

Whether running the basic log demo, or your own Orbix 6 based application inside a Docker container, you will need to create an `orbix6_domain_dd.xml` file to be used when deploying.

Use the Orbix 6 `itconfigure` tool in GUI mode to create the deployment descriptor file. The descriptor file used in the basic log demo was created as follows:

1. Open a window and set the JAVA_HOME environment variable to a JDK that can run the Orbix 6 `itconfgure` tool.
2. Start the `itconfigure` tool.
3. Use standard mode to create a new domain named `orbix6_domain`. It is important to use this name as the deployment functions in `entrypoint_helper_o6.sh` are coded to use a deployment descriptor named `orbix6_domain_dd.xml`. In the **Configuration Domain Type**" section, choose the **Select Services** button.



4. Navigate through the **Service Startup** and **Security** windows. Choose **Insecure Communication**.
5. Navigate through the **Fault Tolerance** window to the **Select Services** window and check the following checkboxes:
   a. Location
   b. Node Daemon
   c. Basic Logging
   d. Demos
6. Navigate to the **Confirmation** and **Deploying** window.
7. Once deployment is complete, the **Summary** window appears. Press **Finish** to end the deployment process. You can close the **Orbix Configuration** window.

The deployment descriptor file is written to *<orbix6dir>*/etc/domains/orbix6_domain/orbix6_domain_dd.xml.

It will look something like:

```
<?xml version="1.0" encoding="UTF-8"?>
<dd:descriptor xmlns:dd="http://ns.iona.com/orbix/schema/dd/1.2">
  <!--This deployment descriptor version 1.2.0 has been generated by Orbix tools-->
  <dd:configuration>
    <dd:domain>orbix6_domain</dd:domain>
    <dd:source>file</dd:source>
    <dd:location_domain>orbix6_domain.location</dd:location_domain>
  </dd:configuration>
  <!--Concrete node information for this deployment-->
  <dd:nodes>
    <dd:node name="MY-SYSTEM" ip="10.16.16.188" profile="MY-SYSTEM">
      <dd:policies>
        <dd:policy name="prefer_ipv4" value="true" />
      </dd:policies>
    </dd:node>
  </dd:nodes>
  <!--The following profiles will be deployed-->
  <dd:profile id="MY-SYSTEM">
    <dd:service name="locator" link="false">
      <dd:activation mode="manual" />
      <dd:run mode="direct_persistent" instrumented="false" proxified="false"
managed="false" authenticated="false" perflog="false" dynlog="false" />
      <dd:endpoint protocol="iiop" port="3075" />
    </dd:service>
    <dd:service name="node_daemon" link="false">
      <dd:activation mode="manual" />
      <dd:run mode="direct_persistent" instrumented="false" proxified="false"
managed="false" authenticated="false" perflog="false" dynlog="false" />
      <dd:endpoint protocol="iiop" port="53079" />
    </dd:service>
    <dd:service name="basic_log" link="false">
      <dd:activation mode="manual" />
      <dd:run mode="direct_persistent" instrumented="false" proxified="false"
managed="false" authenticated="false" perflog="false" dynlog="false" />
      <dd:endpoint protocol="iiop" port="53093" />
    </dd:service>
    <dd:component name="demos">
      <dd:endpoint protocol="iiop" />
    </dd:component>
  </dd:profile>
</dd:descriptor>
```

Modifying the Deployment Descriptor for use with Docker

Two lines in the generated deployment descriptor above are highlighted:

```
<dd:node name="MY-SYSTEM" ip="10.16.16.188" profile="MY-SYSTEM">
…
  <dd:profile id="MY-SYSTEM">
```

These lines have information that reflects the machine where the deployment was run:

- The host name of the machine: **MY-SYSTEM**
- The IP address of the machine: **10.16.16.188**

Since these values will have no meaning when the deployment descriptor is used inside a Docker container where the host name and IP address will almost certainly be different, you can change the two lines in the file to more general values as follows:

```
    <dd:node name="node1" ip="1.1.1.1" profile="node1">
…
    <dd:profile id="node1">
```

When deploying inside a Docker container, the values `node1` and `1.1.1.1` will be replaced with the Docker container's actual host name and IP address.

Creating a Deployment Descriptor for your Orbix 6-based Application

The instructions above illustrate how the deployment descriptor for the basic log demo was created. When considering your particular application, you will need to consider several questions including:

- Whether to run insecurely or securely.
- Whether fault tolerance is required.
- The set of Orbix 6 services your application needs.

Once you have determined these, run the `itconfigure` tool as described above, selecting the security, fault tolerance, and services as required by your application. Be sure to use the name `orbix6_domain` as the domain name if you are using the functions supplied in `entrypoint_helper_o6.sh` to deploy inside Docker.

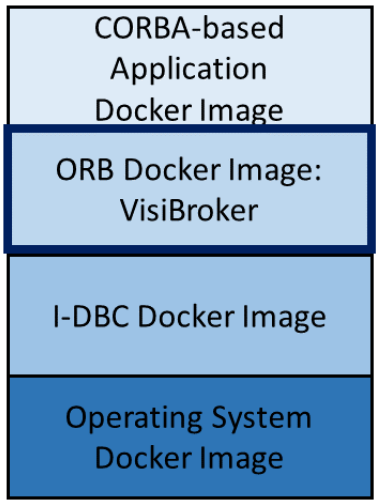
In the Dockerfile for your application, copy o`rbix6_domain_dd.xml` into the Docker container, to `/home/corba/microfocus/orbix/orbix6_domain_dd.xml`.

Use the `deploy_orbix6_if_needed` function from `entrypoint_helper_o6.sh` in the entrypoint script for your application to perform the deployment.

The VisiBroker Docker Image

This chapter describes the VisiBroker ORB Docker image.

The VisiBroker Docker Image



The VisiBroker Docker image is built upon the I-DBC Docker image, which is in turn built upon the operating system Docker image.

This chapter assumes that the CORBA Add-on for Cloud, Containers & Virtual Environments product is installed at *<installdir>*.

Paths and commands given in this chapter assume installation on a Linux machine. If using a Windows machine, adjust the paths and commands to suit Windows.

The Dockerfile for VisiBroker

The Dockerfile for the VisiBroker Docker image can be found at *<installdir>*/docker/visibroker/orb_base_layer/Dockerfile.

It looks as follows:

```
## Based on our idbc layer
FROM idbc-layer

## Pre-Installation User Setup
USER corba
RUN mkdir -p /home/corba/microfocus/Visibroker
ENV VB_INST_DIR /home/corba/microfocus/Visibroker

## Install Visibroker & configure
COPY microfocus_visibroker_lnx.bin /home/corba/
microfocus_visibroker_lnx.bin
COPY silentproperties.txt /home/corba/silentproperties.txt
RUN /home/corba/microfocus_visibroker_lnx.bin -f /home/corba/
silentproperties.txt

## Copy the Visibroker License file into the install directory
COPY license.slip $VB_INST_DIR/license/license.slip
```

```
## Install hotfixes on top of the installation if there are any
COPY hotfixes /home/corba/hotfixes
COPY hotfix_install_helper.sh /home/corba/
hotfix_install_helper.sh
RUN /home/corba/hotfix_install_helper.sh

## Add the entrypoint_helper script
COPY entrypoint_helper_vb.sh /home/corba/

## Create location for proxified IOR's to go
RUN mkdir /home/corba/proxified_iors

## Ready to work
WORKDIR $VB_INST_DIR
```

The Dockerfile is based on the `idbc-layer` Docker image, as indicated by the `FROM` instruction. This image was the I-DBC Docker image created in the steps outlined in the "Common Docker Images" chapter.

User ID

Note that the `USER` instruction indicates that all further Docker commands, and all applications that are run inside Docker containers created from this image, will now be run as user **corba** (unless any Dockerfiles built upon the Dockerfile for VisiBroker specify a different user with the `USER` instruction).

Installing VisiBroker

The Dockerfile creates the directory path `/home/corba/microfocus/Visibroker`, which is where VisiBroker will be installed. The `ENV` instruction sets the environment variable VB_INST_DIR to point to this directory.

The following files are copied:

- `microfocus_visibroker_lnx.bin`: The VisiBroker installer for Linux
- `silentproperties.txt`: The silent installer file

The `RUN` instruction runs the VisiBroker installer, referencing the silent installer file.

The license file `license.slip` is copied to the VisiBroker installation license directory.

Install HotFixes

If any HotFixes are available, they are applied by copying:

- The HotFixes directory
- The `hotfix_installer_helpers.sh` script

The `hotfix_installer_helpers.sh` script will install any HotFixes it finds in the HotFixes directory.

VisiBroker Entrypoint Helper Script

The `COPY` instruction is used to copy the file `entrypoint_helper_vb.sh` to the directory `/home/corba`.

The file `entrypoint_helper_vb.sh` includes methods that are found in the separate file `entrypoint_common.sh`, which was installed as part of the I-DBC Docker image.

This file contains helper functions to do things such as:

- Start a VisiBroker feature
- Start a VisiBroker feature and wait for an IOR to be created
- Deploy a VisiBroker service.

The functions in `entrypoint_helper_vb.sh` and `entrypoint_common.sh` are used in the various examples found in:

`<installdir>/docker/visibroker/application_layer`

The entrypoint scripts for the various examples illustrate how to make use of these functions.

When creating your own CORBA based application running inside a Docker container, you can:

- Use the functions in `entrypoint_helper_vb.sh` and `entrypoint_common.sh` as illustrated in the various example entrypoint scripts, if they satisfy the requirements of your application.
- Add or update functions in `entrypoint_helper_vb.sh` and `entrypoint_common.sh` to suit the requirements of your application.
- Provide your own mechanism to do the equivalent of what `entrypoint_helper_vb.sh` and `entrypoint_common.sh` do.

Proxified IOR Location

The `RUN` instruction makes a directory called `/home/corba/proxified_iors`. When using functions from `entrypoint_common.sh` to proxify IORs, they will be written to this directory.

Building the VisiBroker Docker Image

In a window that supports Docker commands, use the following to build the VisiBroker Docker image:

```
cd <installdir>/docker/visibroker/orb_base_layer
docker build -t vb-idbc-layer .
```

Note:

The '.' character is an essential part of the "`docker build`" command.

The Docker image is given the name `vb-idbc-layer`. All the VisiBroker example Docker images in `<installdir>/docker/visibroker/application_layer` are built on top of this image.

As illustrated in the examples, your CORBA-based application would create a Docker image based on the `vb-idbc-layer` image as well, following a pattern similar to what is done for each example.

The VisiBroker Smart Agent Relay

This chapter describes the VisiBroker Smart Agent Relay.

VisiBroker's Smart Agent (osagent) is a dynamic, distributed directory service. It allows client programs to locate object implementations, enabling the client to connect to those implementations and invoke their behavior. The Smart Agent is proprietary to VisiBroker, and so does not operate with other ORB implementations.

For detailed information on what the Smart Agent is and how to use it, see the VisiBroker (for C++ or Java) ***Developer's Guide*** chapter entitled "Using the Smart Agent".

The Smart Agent in Containerized Environments

The VisiBroker Smart Agent Relay (osarelay) enables you to use Smart Agent in containerized environments.

The VisiBroker Smart Agent uses both UDP and TCP to communicate with VisiBroker clients and server implementations. UDP is primarily used for communications from clients and servers to the Smart Agent, and is preferred to TCP because:

- UDP is very lightweight relative to TCP, minimizing network traffic overhead.
- UDP broadcast is used to enable running Smart Agents to be automatically discovered by clients, servers and other Smart Agents.

Although UDP is the primary transport used by the Smart Agent, TCP is used to support the Location Service functionality (see the VisiBroker (for C++ or Java) ***Developer's Guide*** chapter "Using the Location Service").

However, the use of UDP is a problem in some containerized environments, such as Docker, which do not allow UDP communications across the container boundary. This prevents the Smart Agent from being able to operate in these conditions. The Smart Agent Relay (osarelay) has been developed to provide a solution for this issue.

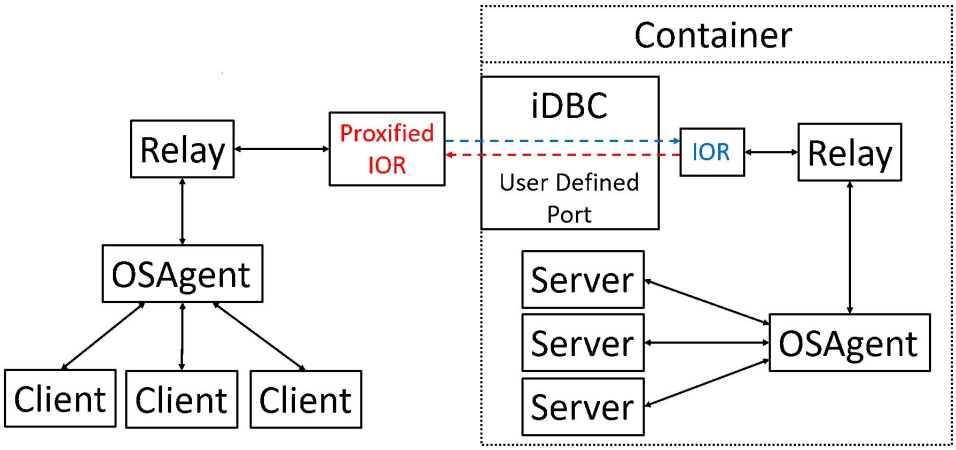
Containers enable application environments to be isolated. Connecting CORBA clients to services running either side of a container boundary NAT layer (see "What is the CORBA Add-on for Cloud, Containers & Virtual Environments") requires the use of a proxy server, such as I-DBC, to manage the address translation within the CORBA object references. The I-DBC is described in the ***Micro Focus IIOP Domain Boundary Controller (I-DBC) v.4.0.0 Deployment Guide.***

The Smart Agent Relay (in concert with I-DBC) enables the Smart Agent to operate across the container boundary. It does this by using CORBA to extend Smart Agent functionality, to send CORBA messages over the domain boundary to another Smart Agent relay. This in turn enables external Smart Agents to talk to internal containerized Smart Agents.

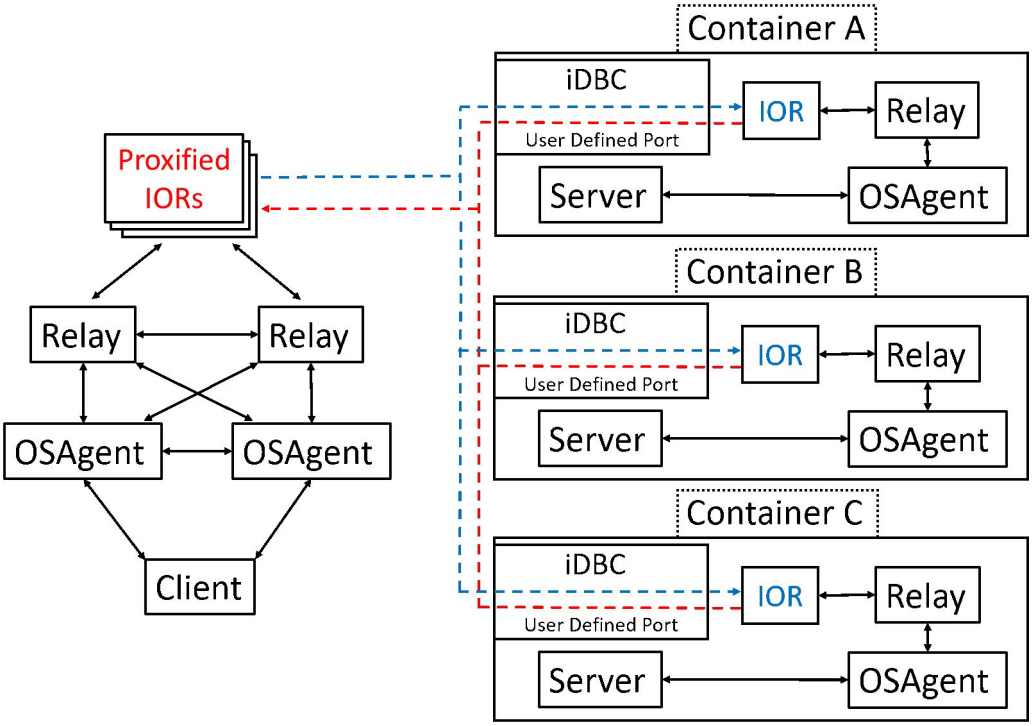
The Smart Agent Relay has been designed to complement Smart Agent in such a way as to be installable non-intrusively along with existing VisiBroker implementations.

Topology of the Smart Agent Relay

The diagram below shows a typical topology of a containerized application that can be invoked upon from outside the container. This example assumes that your services are running inside containers and your clients are executed outside. This is not a hard restriction; it is also perfectly possible to run clients inside containers and run servers outside containers.



A more complex multi-container example is depicted below:



This diagram shows multiple containers, each hosting a server. As before, each server registers with a Smart Agent that is running inside its container. In order to make that service available externally, a Smart Agent Relay is included. This Smart Agent's IOR is proxified by I-DBC and made available to the external Relays. Once the external Relays are able to establish IIOP connections to the internal Relays and vice-versa, any requests from clients and subsequent responses are relayed via the internal

Smart Agent Relay. I-DBC dynamically proxifies object references that are passed as IIOP request or response messages between relays so that these object references can be used by clients effectively to call onto the servers via the i-DBC proxies.

Configuring I-DBC for Use with the Smart Agent Relay Within a Container

To correctly set up interaction between i-DBC and the Smart Agent Relay within a container, there are some options that need to configured correctly. By default, I-DBC handles *incoming* connections and works as a proxy to forward messages. Some settings need to be activated for *outgoing* connections to be passed through the Smart Agent Relay.

First, ensure that you set ports for I-DBC's `privateDomain` correctly:

- `configs.iDBCProxyCluster1.shared.proxy.privateDomain.acceptors.[0].localAddress.port`

  This enables the Smart Agent Relay that exists inside the container to send messages out, via i-DBC. Make sure that whatever value ports you use are published for use with the container.

- `configs.iDBCProxyCluster1.shared.proxy.privateDomain.acceptors.[1].localAddress.port`

  This sets up the `privateDomain`'s second acceptor as well, which is necessary for a secure connection.

Secondly, activate the use of the `publicDomain` connectors:

- `configs.iDBCProxyCluster1.shared.proxy.publicDomain.connectors.[0].useConnector`
- `configs.iDBCProxyCluster1.shared.proxy.publicDomain.connectors.[1].useConnector`

  Both of these must be set to `true` to allow for outgoing connections. As above, the second connector is for secure connections.

Finally, you must change a pair of I-DBC's proxification options for compatibility with the Smart Agent and Smart Agent Relay:

- `configs.iDBCProxyCluster1.shared.proxy.proxificationOptions.useOriginalKey`

  You must set this to `true` so that proxified IORs preserve the correct information passed from the Smart Agent Relay to the Smart Agent.

- `configs.iDBCProxyCluster1.shared.proxy.proxificationOptions.visiOSAgentPerPOA`

  This option must be set to `true` to allow the Smart Agent Relay to pass server references bound using `BindSupportPolicy`. This option is specific for use with the Smart Agent Relay so see the section "I-DBC Proxification using visiOSAgentPerPOA" for more information.

For more information on the above options, and any others you wish to alter, please refer to the ***I-DBC Administrator's Guide***. For an example on how these options are set, see the `basic_bank_agent_with_relay` examples provided with the installation.

I-DBC Proxification using visiOSAgentPerPOA

If you need the Smart Agent Relay to be able to pass server references that are bound to a local Smart Agent using a BindSupportPolicy of `BY_POA`, you must set the I-DBC option `visiOSAgentPerPOA` to `true`.

When binding a Server object reference to a Smart Agent using the `BY_POA` BindSupportPolicy, Smart Agent passes a 'service' IOR (which identifies only the POA and not a specific object) between instances of itself and its clients. VisiBroker clients can use a service IOR as supplied by Smart Agent to generate a full object IOR that may then be used to make an IIOP request back to a specific object.

I-DBC maintains an IOR table which contains a mapping of proxified IORs that it has generated to their original IORs. When binding `BY_POA`, the proxified IOR will be based upon a service IOR. However, the Client generates an IOR (based on the proxified service IOR but with an object identifier included) when making its IIOP request back via I-DBC. Because I-DBC's IOR table does not contain an entry for this generated object IOR, I-DBC responds to the Client with an `OBJECT_NOT_EXIST` message.

Setting the `configs.iDBCProxyCluster1.shared.proxy.proxificationOptions.visiOSAgentPerPOA` option to `true` ensures that when I-DBC cannot initially find an entry in its IOR table for the object IOR provided, it will try again using a service IOR that is based on the supplied object IOR. This enables I-DBC to locate the appropriate entry for the service in its IOR table and thus identify the correct route back to the Server inside the container so that the request can be delivered.

Note that if your Servers only bind to Smart Agent using the BindSupportPolicy `BY_INSTANCE`, full object IORs will be registered with Smart Agent and so the `visiOSAgentPerPOA` option is not required.

Configuring the Smart Agent Relay

You can control the behavior of the Smart Agent Relay (osarelay) using a number of options. These are:

- Command line switches used to control behavior that is in common with the Smart Agent (osagent).
- VisiBroker-style properties used to control osarelay’s contact with Smart Agents.

Command Line Switches

The command line switches allow you to control behavior that is in common with the Smart Agent

To display details of the available command line switches, run:

```
osarelay -?
```

Logging

You can use the following switches to enable logging:

Option	Description
`-v`	Turns verbose mode on, which provides information and diagnostic messages during execution. On UNIX, the verbose output is sent to stdout.
`+l <options>`	Show or enable the logging level: • o - Turn logging on. Log levels: • `f` - Fatal • `e` - Error • `w` - Warning • `i` - Informational • `d` - Debugging • `a` - All

For example, to start the Smart Agent Relay with comprehensive logging set to on, enter:

```
osarelay +l oa -v
```

By default, log messages are directed to `stdout`. Log messages can alternatively be redirected to a file. The log file name will be generated (based off its process ID), but the location and the maximum log file size can be controlled using the following switches:

Option	Description
`-d <`*`pathname`*`>`	Sets the OSARELAY_LOG_DIR log directory location.
`-ls <`*`size`*`>`	Specifies the trimming log size of 1024KB block. Max value is 512, therefore the largest log size is 512MB

Ports

The Smart Agent Relay will partner with the Smart Agents that are listening for traffic on the UDP port defined by the `OSAGENT_PORT` variable, as described in the chapter "Using the Smart Agent" in the VisiBroker (for C++ or Java) ***Developer's Guide***. The UDP port that will be used by Smart Agent Relay for communicating with its partner Smart Agents can be set using the `OSARELAY_PORT` environment property. This can be overridden on the Smart Agent Relay's command line using the `-p` switch described below.

Option	Description
`-p <`*`UDP_port_number`*`>`	Overrides the setting of OSARELAY_PORT (registry setting on Windows systems).

The Smart Agent Relay does not share the same UDP port used by the Smart Agent for listening for discovery requests. If neither `OSARELAY_PORT` nor `-p` is specified then Smart Agent Relay will listen on the port at (`OSAGENT_PORT` + 1).

Properties

Some aspects of Smart Agent Relay are set using properties, which are defined in the VisiBroker style used by OSAgent itself.

Initializing the SmartAgent Relay

Smart Agent Relay finds a partner Smart Agent by either:

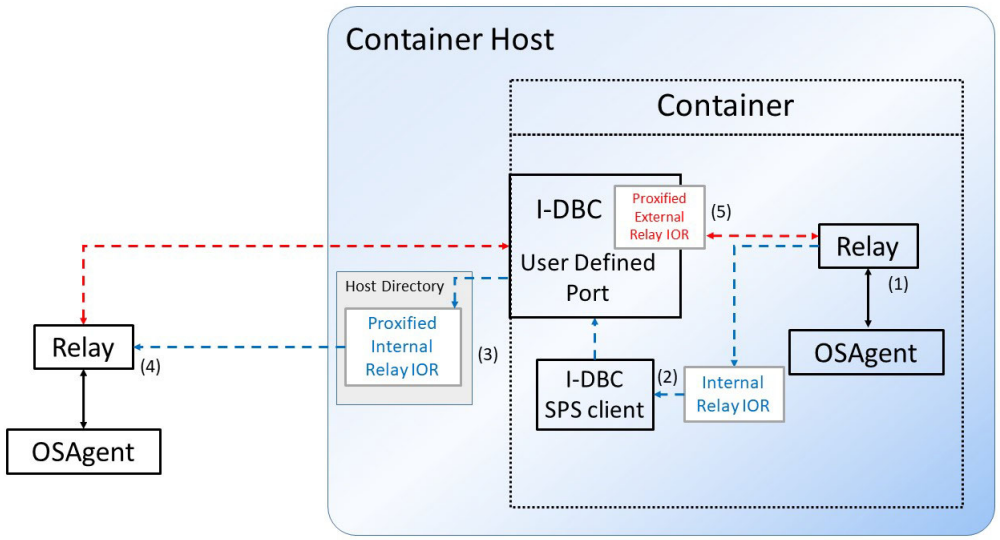
- Sending a direct UDP message to vbroker.agent.addr: OSAGENT_PORT, or
- Sending out a UDP broadcast message on OSAGENT_PORT.

As described in "Ports", Smart Agent Relay uses a distinct port for communicating with Smart Agent. It cannot share OSAGENT_PORT unless it will be hosted separately from Smart Agent. By using a port number that is distinct from OSAGENT_PORT, Smart Agent Relay can reside on the same host as Smart Agent. Since Smart Agent is unaware of Smart Agent Relay's port, Smart Agent Relay must make the initial contact to establish a relationship between the two.

If at start-up the Smart Agent Relay is unable to establish contact with a Smart Agent, it will periodically retry attempts to locate a partner Smart Agent with the frequency defined by the property `vbroker.agent.relay.discoverAgentTimeout` (by default, 2 seconds).

During initialization, Smart Agent Relay will by default share information about other running Smart Agent Relays that it is aware of. However, to get an initial connection established, one Smart Agent Relay must be provided with the IOR for a second Smart Agent Relay.

In the topology depicted below, a Smart Agent Relay (1) that is internal to the Container Host is started first.



During start-up, Smart Agent Relay writes out its own IORs to file:

IOR File	Description
`osarelay.ior`	`Transient IOR for the Smart Agent Relay service.`
`osarelayadmin.ior`	`Persistent IOR for the Smart Agent Relay service.`

These are default filenames which can be overridden using the properties `vbroker.agent.relay.ior` and `vbroker.agent.relay.adminior`.

When the Container is started, its start-up script proxifies the Internal Relay IOR (2) by using the I-DBC SPS Client. An example of such a command is provided below:

```
/usr/xtradyne/sps/bin/spsclient -u admin -p admin -d /usr/
xtradyne/sps/adm -C "ior deployTransient iDBCProxyCluster1
IOR:123...789 {}" > proxifiedInternalRelay.ior
```

The osarelayadmin.ior file of the internal relay after proxification is then copied (3) to an area of the Container Host's filesystem that will be visible to the external relay when it is started.

The external Smart Agent Relay is then started with the internal Relay's proxified IOR supplied on the command line (4) using the property `vbroker.agent.relay.admins`.

An example command line might be:

```
osarelay -Dvbroker.agent.relay.admins=file://
<path_to_volume>/proxifiedInternalRelay.ior
```

During its initialization, the external Relay will make a call to the internal Relay passing its own IOR. Note that I-DBC proxifies this IOR on-the-fly (5). Once this stage is complete, both internal and external Smart Agent Relays are aware of each other.

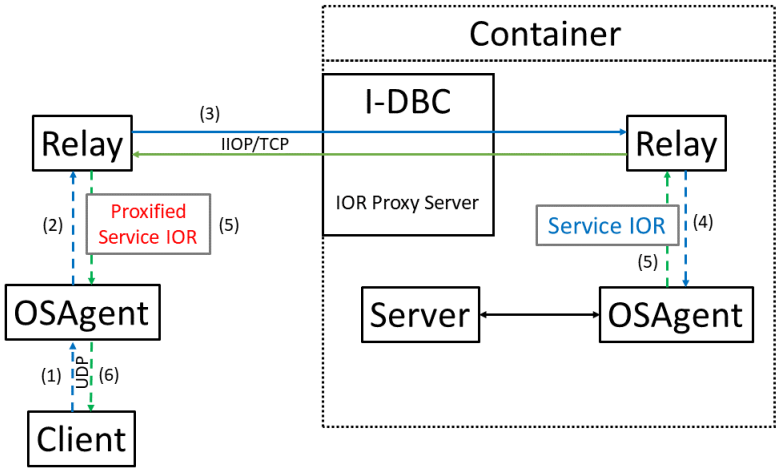
Satisfying Smart Agent Requests

The following sections describe possible outcomes of a Smart Agent request. These are:

- A Successful Request/Response Cycle
- No response from the Internal Smart Agent Relay
- No response from the Internal Smart Agent

Successful Request/Response Cycle

The following diagram illustrates how requests for containerized CORBA services are satisfied using a combination of Smart Agents and Smart Agent Relays.



When a client makes a request for a service (1) on a Smart Agent (OSAgent) which the Smart Agent cannot immediately satisfy, it forwards this request (2) on to any further Smart Agents and Smart Agent Relays that it is aware of. In the arrangement depicted above, the external Relay will package the content of the request into a CORBA one-way request and forward it (3) across the container boundary (via I-DBC) to its peer Relay inside the container. The internal Relay then reconstitutes the Smart Agent request and sends it over UDP to any running internal Smart Agents (4). In this instance, the internal Smart Agent does have a registered entry for the requested service, so it is able to respond to the internal Relay with a Service IOR (5). The internal Relay packages the content of the response, including the Service IOR, into a CORBA one-way request and sends it back across the container boundary. I-DBC recognizes that the payload of the CORBA message contains an IOR and proxifies it on-the-fly, such that the IOR received by the external Relay is already proxified. The external Relay then reconstitutes a Smart Agent response message, including the Proxified Service IOR, and sends it on to the external Smart Agent which is then able to satisfy the original client request (6).

Transient Error Mitigation

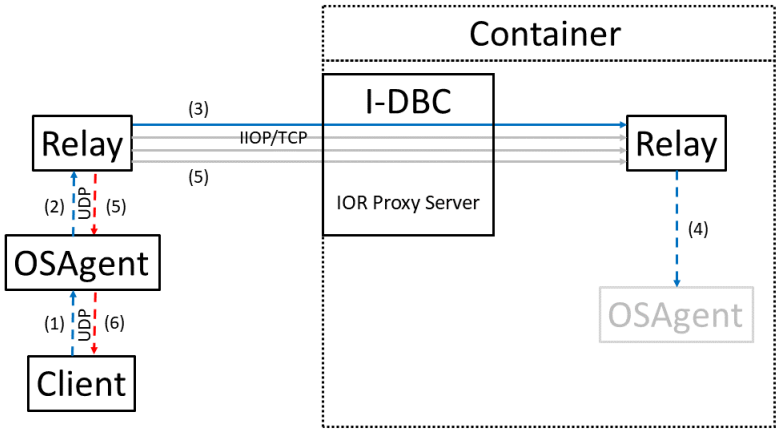
As stated previously (see “The Smart Agent in Containerized Environments”), Smart Agent uses UDP for communication with VisiBroker clients and server implementations. UDP is an “unreliable” transport, in that it does not

guarantee whether data has arrived at its destination, nor, if it has, whether it is intact. The Smart Agent application layer protocol builds in retry behavior and message integrity checking to address these issues. The CORBA communication between Relays is TCP based but in the event of short-duration connection issues it might also suffer message loss.

Smart Agent Relay uses a combination of timeouts and retry schedules to mitigate the risk of a message (whether UDP-based or CORBA one-way) not successfully arriving at its destination. These measures are configurable and are described in the following sections.

No response from the Internal Smart Agent Relay

If the external Smart Agent Relay does not receive a response from the internal Relay within a specific period of time, it will retry the request. This is illustrated below:



The external arrangement of Client, Smart Agent and Smart Agent Relay follows the Successful Request/Response Cycle previously described. However, in the example illustrated above, the requests forwarded on by the internal Relay are not being responded to (perhaps because its partner internal Smart Agent(s) has become unavailable).

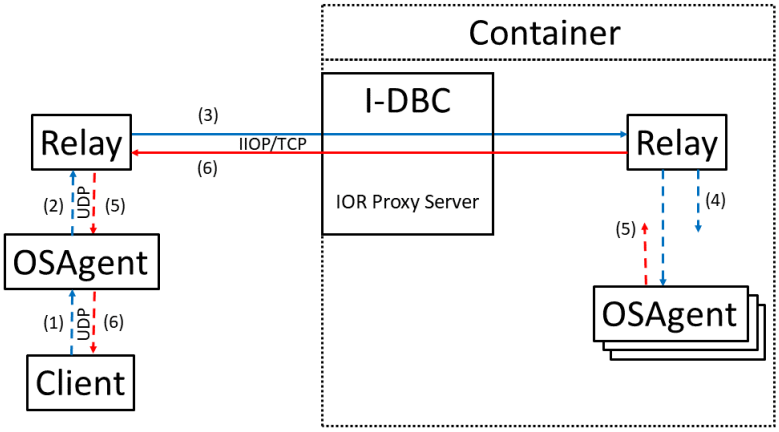
The initial client request (1) is forwarded by Smart Agent (2) on to the external Smart Agent Relay, which re-packages the request into a CORBA one-way request and sends it to the internal Relay (3) In this case, the internal Relay reconstitutes the Smart Agent request and sends it on to an address and port where it believes its partner Smart Agent is listening (4).

Timeout and retry properties

In this scenario no response is forthcoming from that request, and therefore no Relay response is generated by the internal Smart Agent Relay. After a period of time defined by vbroker.agent.relay.relayRequestTimeout, the CORBA request (3) times out and is retried. This occurs as many times as defined by vbroker.agent.relay.maxFullRequestRetries. If no response has been received after the maximum number of timeouts for that request has occurred, a TIMEOUT response will be returned by the external Relay.

No response from the Internal Smart Agent

Transient errors can potentially occur at the link between the internal Smart Agent Relay and its partner internal Smart Agent(s), as shown below:



Such errors could result in either the request failing to arrive at the Smart Agent (4) or the response failing to arrive back at the Relay (5). Smart Agent Relay mitigates against both these circumstances by implementing a timeout for a response to be received.

If the internal Relay does not receive a response from any of its internal Smart Agents within the time defined by vbroker.agent.relay.agentRequestTimeout, it times out and immediately returns a TIMEOUT response to the external Relay. This is then forwarded on to the external Smart Agent which can then respond to the original client request with FAIL.

Property Reference

The properties used by the Smart Agent Relay, together with the corresponding environment variables where there are any, are as follows:

Property	Environment variable	Default	Description
vbroker.agent.relay.admins	*none*	""	Comma-separated list of proxified IORs of peer Smart Agent Relays. Can use either of osarelay.ior or osarelayadmin.ior as the source IORs.
vbroker.agent.relay.discoverAgentTimeout	OSARELAY_DISCOVER_AGENT_TIMEOUT	2000	The period (in milliseconds) between attempts to locate a partner Smart Agent while the Relay is without a partner.
vbroker.agent.relay.relayRequestTimeout	OSARELAY_RELAY_REQUEST_TIMEOUT	3000	The time, in milliseconds, between attempts to retry a failed request.
vbroker.agent.relay.maxFullRequestRetries	OSARELAY_MAX_REQUEST_RETRIES	0	The maximum number of times a failed request is retried before returning a failure response.
vbroker.agent.relay.agentRequestTimeout	OSARELAY_AGENT_REQUEST_TIMEOUT	1000	The time, in milliseconds, between attempts to retry a request.

Property	Environment variable	Default	Description
vbroker.agent.relay.timeoutCheckInterval	OSARELAY_TIMEOUT_INTERVAL	500	The time, in milliseconds, between checks for Smart Agent request timeouts.
vbroker.agent.relay.announceSelf	*none*	true	Whether a relay should automatically register itself as a destination for locate requests from another relay when it becomes aware of that other relay.
vbroker.agent.relay.pushRelays	*none*	true	When a relay becomes aware of another relay if this property is true it will send all current registered destinations to it.
vbroker.agent.relay.pullRelays	*none*	true	When a relay becomes aware of another relay if this property is true it will request all the other relay's known destinations and register them as destinations.
vbroker.agent.relay.unreachableCleanupAfter	*none*	600	The minimum limit, in seconds, on how long a relay destination will be retained after it is first detected to be no longer reachable.
vbroker.agent.relay.adminior	*none*	osarelay admin.ior	The filename to output the Relay service IOR to. This is a persistent lifecyle IOR (that is, the IOR will be the same if the relay is restarted if configured with a fixed IIOP listen port).
vbroker.agent.relay.ior	*none*	osarelay.ior	The filename to output a transient lifecycle IOR for the Relay service (that is, previous file contents will become invalid whenever the service is restarted).
vbroker.agent.relay.port	OSARELAY_PORT	OSAGENT_PORT +1 (14001)	The port number used to connect the Relay to the OSAGENT_PORT domain.
vbroker.agent.relay.addrFile	OSARELAY_ADDR_FILE	OSAGENT_ADDR_FILE (null)	A file that stores the IP address or host name of a host running a Smart Agent.
vbroker.agent.relay.localFile	OSARELAY_LOCAL_FILE	OSAGENT_LOCAL_FILE (null)	Specifies which network to use on Multi-home machines.
vbroker.agent.relay.logDir	OSARELAY_LOG_DIR	VBROKER_ADM	Specifies the directory for the OSARELAY log to reside in.
vbroker.agent.relay.logLevel	*none*	i	Specifies the log level of messages to be written to the log file. Acceptable values are: • Debug(d) • Informational(i) • Error(e) • Warning(w) • Fatal(f) • All(a) Equivalent to the -l switch described under "Logging".

Property	Environment variable	Default	Description
vbroker.agent.relay.logSize	*none*	1	Sets the maximum log file size (in megabytes). Equivalent to the -ls switch described under "Logging". The maximum size is 512.
vbroker.agent.relay.verbose	*none*	false	Turns Smart Agent Relay logging's verbose mode on (true) and off (false). Equivalent to the -v switch described under "Logging".
vbroker.agent.relay.broadcastOff	*none*	false	When this is set to true, Smart Agent Relay will not send out a broadcast to find other agents. You can use this in combination with vbroker.agent.relay. addrFile; if this is set to true, the relay will communicate only with the agents listed in addrFile.
vbroker.agent.relay.ignoreSignal	*none*	*none*	Allows you to specify that certain signals are to be ignored. Possible options are: • Quit(quit) • Hangup(hup) • Interrupt(int) Bourne and Korn shell users are recommended to run the Smart Agent Relay with ignoreSignal=hup. If you wish to ignore more than one of these signals, list the option separately for each one. For example: vbroker.agent.relay.ignoreSignal=hup vbroker.agent.relay.ignoreSignal=int Note that this usage of repeated statements is unique to this option.

In addition to osagent-specific and osarelay-specific options the Smart Agent Relay will accept any (C++) ORB configuration option to modify its behavior as a service. For example, in order to configure a fixed IIOP listen port to 12345 one might pass the argument:

```
-Dvbroker.se.iiop_tp.scm.iiop_tp.listener.port=12345
```

See the ***VisiBroker C++ Programmer's Guide*** for the complete list of ORB options.

Note

These properties can also be added to a properties file, and passed to the relay using the `-OSApropStorage` option. This is the recommended method for most environments.

For example:

```
osarelay -OSApropStorage /path/to/relay_properties.txt
```

The properties in this file should be separated by new lines.

Options passed to the Smart Agent Relay take priority over Environment Variables, and the Environment Variables take priority over options found inside the property file.

Updating SPS Configuration Items

When you are using I-DBC inside Docker, it is essential to configure the Security Policy Server (SPS) properly to allow your application to run correctly. The `entrypoint_common.sh` *script, copied into the Docker container during the creation of the I-DBC Docker image, provides an example of how to configure SPS using commands run in a shell script.*

Introduction

Whether expanding on the functions in `entrypoint_common.sh`, or providing your own mechanism, one challenge is to determine the SPS configuration item names and values that must be set to allow your application to work as expected.

This section will walk through the steps to determine the SPS configuration item name of the server SSL version - `configs.iDBCProxyCluster1.shared.proxy.SSL.SSLServer.crypto.method`.

The approach is to use the Administration Console to make the update. Then use the `diff` command on a "before" and "after" version of the SPS configuration file to determine the server SSL version configuration item name.

Once you understand how to determine the name of this configuration item, the same process can be used to determine the name of other configuration items.

The combination of the SPS configuration item names and their corresponding values allow for I-DBC to be configured using an automated approach (as is done via `entrypoint_common.sh`) rather than non-automated interactive approach (as is done via the Administration Console).

When running outside Docker, paths and commands given in this document assume installation on a Linux machine. If using a Windows machine, adjust the paths and commands to suit Windows.

Prerequisites

Before you make any update, ensure that:

- The Administration Console is installed. See the instructions in the *CORBA in the Cloud or in Virtual Environments* and *CORBA in Containers* chapters. The following procedures assume that the Administration Console is installed in `<installdir>/adminconsole`.
- The CORBA Add-on for Cloud, Containers & Virtual Environments is installed.See the instructions in the *CORBA in the Cloud or in Virtual Environments* and *CORBA in Containers* chapters. The following procedures assume that the CORBA Add-on for Cloud, Containers & Virtual Environments is installed in `<installdir>`.
- You have a JRE installation that can run the Administration Console
- You have Docker installed
- You can determine the IP address of your machine

You will need two windows:

- A window capable of running Docker commands to run the Docker container. I-DBC will be run inside this container.
- A window to run the Administration Console. The Administration Console will be run outside Docker. It will connect to the SPS running inside the Docker container.

Build the Base OS and I-DBC Docker Images

Open a window capable of running Docker commands. This window will be used to build the Docker images, as well as run the Docker container.

Two Docker images must be created:

- The base operating system image. The CORBA Add-on for Cloud, Containers & Virtual Environments supports the use of either CentOS or Ubuntu as the base Docker image; this example uses a CentOS base image.
- An I-DBC image, built upon the CentOS base image.

Build the Base Docker Image

Build the base Docker image, using CentOS in this example, by issuing the following command:

```
cd <installdir>/docker/common/centos_layer
docker build -t base-os-layer .
```

Note:

The '.' character is an essential part of the `docker build` command.

See "The Dockerfile for CentOS" for more information.

Build the I-DBC Docker Image

Build the I-DBC Docker image by issuing the following command.

```
cd <installdir>docker/common/idbc_layer
docker build -t idbc-layer .
```

Note:

The '.' character is an essential part of the `docker build` command.

See "The Dockerfile for I-DBC" for more information.

Run the I-DBC Docker Image

Run the Docker container in the same window where the Docker images were built, as follows:

1. Determine the IP address of your machine.
2. Run the following command, replacing <*ip_addr*> with your actual IP address:

```
docker run --name idbc_container --publish 15000:15000
--env MF_HOST_IP=<ip_addr> --env MF_IDBC_PORT=3000
-it idbc-layer
```

- This command starts a Docker container named `idbc_container`. Port 15000 is opened into the container, which will allow the Administration Console to connect from outside the Docker container.
- The command also starts an interactive shell in the container. You will see a command prompt similar to the following:

  ```
  [corba@c41afce343e6 idbc]$
  ```

Save the Current SPS Configuration

Inside the Docker container, save a "before" version of the SPS configuration file. This will allow you to use the `diff` command after the Administration Console is used to update the configuration item for the server SSL version. In the Docker container interactive shell enter:

```
cd /home/corba/microfocus/idbc/sps/adm
cp dbc.config dbc.config_before
```

Start I-DBC inside Docker

In the same window, issue the following commands to start I-DBC:

```
cd /home/corba/microfocus/idbc
./startStop.sh start
```

Look for a message similar to the following:

```
Starting ... ok
```

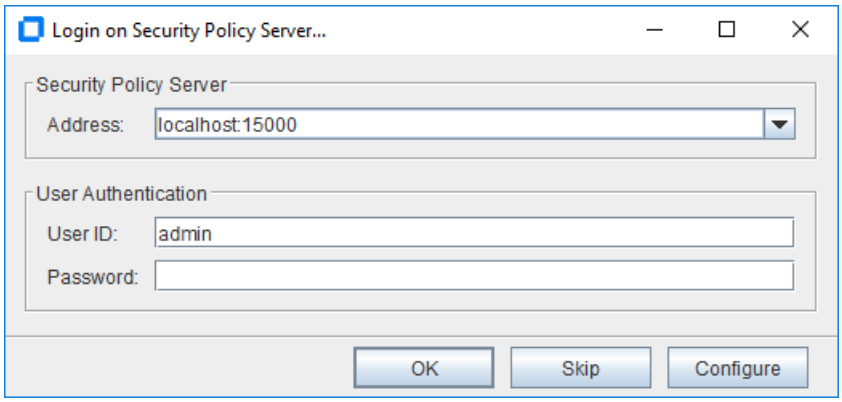
Change the Server SSL Version

Open a second window. Be sure to set the JAVA_HOME environment variable to point to a version of Java that can run the Administration Console.

Start the Administration Console:

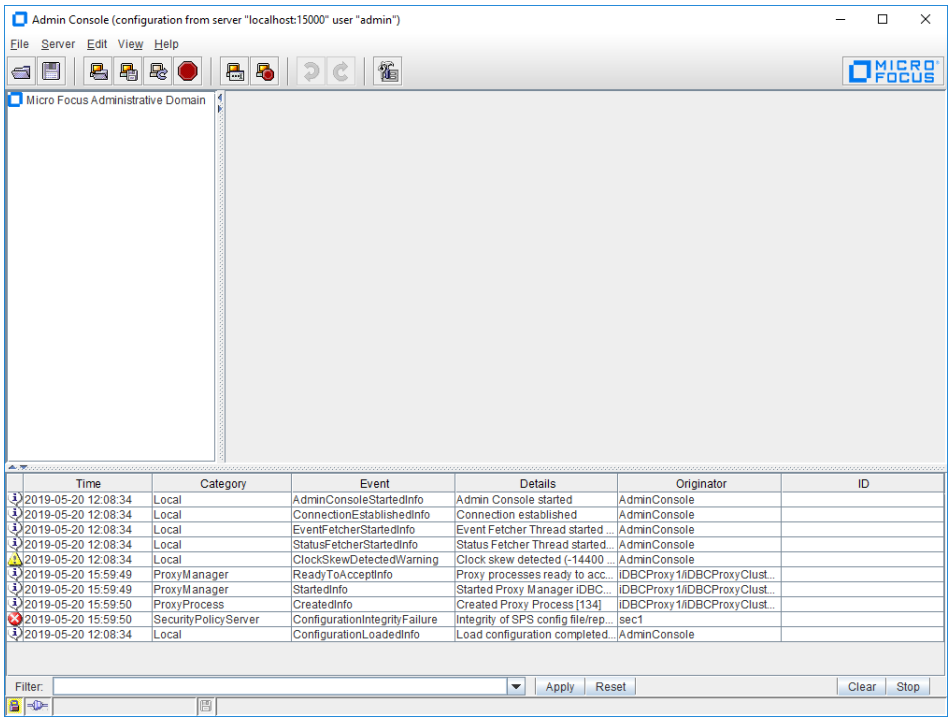
```
cd <installdir>/adminconsole/bin
./AdminConsole
```

The **Login on Security Policy Server...** window displays.

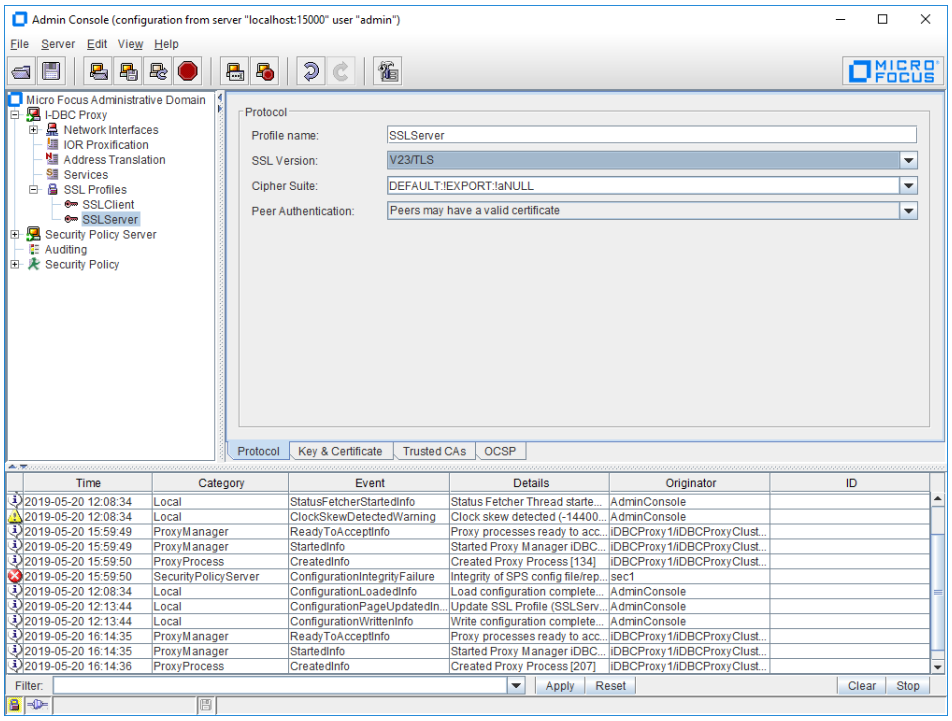


You can accept the default Address and User ID values. Enter the password (**admin**) and press **OK**. This will connect the Administration Console to the Security Policy Server running inside Docker.

The **Admin Console** window displays:

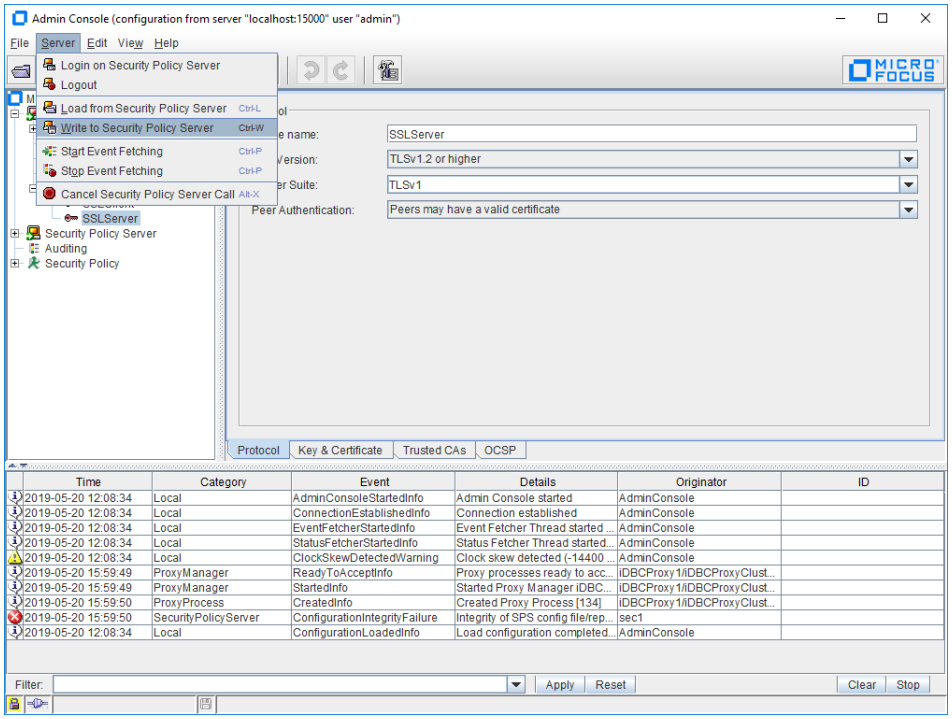


Double click **Micro Focus Administrative Domain**. Then expand **I-DBC Proxy** and **SSL Profiles**. Click on **SSLServer**.



In the **SSL Version:** drop-down, select **TLSv1.2 or higher**.

From the **Server** menu item select **Write to Security Policy Server**.



A pop-up appears indicating that DCB components need to be restarted. Press **Yes**.

The Administration Console will then work to save to updated value into the SPS configuration file inside Docker.

Diff the config file

In the window where the Docker container was started, use the interactive shell to navigate to the SPS configuration directory and run the `diff` command on the current SPS config file against the "before" copy of the file:

```
cd /home/corba/microfocus/idbc/sps/adm
diff dbc.config dbc.config_before
```

The results of the `diff` command may look something like this:

```
92d91
<       "filename" = "ProxyKey.pem"
1932,1933c1931
< -----END CERTIFICATE-----
< "
---
> -----END CERTIFICATE-----"
1993,1994c1991
< -----END CERTIFICATE-----
< "
---
> -----END CERTIFICATE-----"
1998,1999c1995,1996
<          "ciphersuite" = "TLSv1"
<          "method" = "tlsv1_2"
```

```
---
>         "ciphersuite" = "DEFAULT:!EXPORT"
>         "method" = "v23"
4141c4138
<    "version" = "3.2.0"
---
>    "version" = "3.1"
4179,4180c4176,4177
<  "version" = "1"
< }
---
>  "version" = "0"
> }
```

Even though only one configuration item was updated, the Administration Console drives multiple updates into the SPS configuration file.

Looking closely at the `diff` results, we can see `"method" = "tlsv1_2"`, which is related to the server SSL version update we just made. We have two pieces of information:

1. The SPS configuration file value for the server SSL version is: `tlsv1_2`
2. The partial SPS configuration item name for the server SSL version is: `method`

Structure of the SPS Configuration File

The full name of the server SSL version configuration item must still be determined. To get the full name, you need to traverse the SPS configuration file. In order to do that, an understanding of the structure of the SPS configuration file is helpful.

A simplified configuration file looks like this example:

```
{
  "Scope1" = {
   "config_item1" = "value1"
   "config_item1 = "value2"
  }
  "Scope2" = {
   "config_item3" = "value3"
   "Scope3" = {
    "config_item4" = "value4"
   }
 }
}
```

The configuration file is divided into *scopes*. Each scope begins with '{' and ends with '}'. Except for the scope at the beginning of the file - the *main* scope - each scope has a name.

Inside each scope there are configuration items with their corresponding values. A scope can also contain a scope.

In the simplified configuration file:

- There are 3 scopes: Scope1, Scope2 and Scope 3
- Scope3 is a "sub-scope" contained within Scope2, where Scope2 is the "parent scope".
- Scope1 and Scope2 are "sibling" scopes where they share the same parent - the "main" scope.

The name of a configuration item depends on the scope it is in, as well as all the scopes it is contained in.

Consider "config_item4". It is contained in "Scope3", which itself is contained in "Scope2". So the full configuration item name for "config_item4" is: **Scope2.Scope3.config_item4**

Determine the Full Name of the Server SSL Version Configuration Item

The output of the `diff` command (see "Diff the config file") showed that:

- The SPS configuration file value for the server SSL version is `tlsv1_2`
- The partial SPS configuration item name for the server SSL version is `method`

We know that part of the server SSL version configuration item is "`method`". We need to traverse all the scopes in the configuration file to determine the full name.

Start by using the `vi` editor to edit the SPS configuration file, using the following commands:

```
cd /home/corba/microfocus/idbc/sps/adm
vi dbc.config
```

Use the vi '/' command to find "tlsv1_2" in the configuration file:

```
/tlsv1_2
```

The cursor will land on the "`method" = "tlsv1_2"` line in the configuration file:

```
…
 }
 "ciphersuite" = "TLSv1"
 "method" = "tlsv1_2"
}
…
```

Use the vi '%' command to determine the scope containing the "method" configuration item. Move the cursor onto the '}' character below the "method" configuration item. Type '%".

The cursor will land on the `"crypto" = {` line in the configuration file:

```
…
}
"SSLServer" = {
 "crypto" = {
  "RSA" = {
   "keyFiles" = {
    "certificate" = {
…
```

The "`method`" configuration item is contained in the "`crypto`" scope.

Begin to build the server SSL version configuration item name `crypto.method`

Just above "`crypto`" in the file, we see the "`SSLServer`" scope is the parent scope for the "`crypto`" scope. Continue to build the server SSL version configuration item name `SSLServer.crypto.method`

Move the cursor onto the '}' character above the "SSLServer" scope. Type '%'.

The cursor will land on the "SSLClient" scope in the configuration file:

```
…
}
"SSL" = {
 "SSLClient" = {
…
```

"SSLClient" is a sibling scope to "SSLServer". Both scopes are contained within the "SSL" scope. The server SSL version configuration item name is now: SSL.SSLServer.crypto.method

Move the cursor onto the '}' character above the "SSL" scope. Type '%'.

The cursor will land on the "CSIv2" scope in the configuration file:

```
…
}
"CSIv2" = {
 "CSS" = {
…
```

Scope "CSIv2" is a sibling scope to "SSL". But we need to find the parent scope of "SSL".

Move the cursor onto the '}' character above the "CSIv2" scope. Type '%'.

The cursor will land on the "ADF" scope in the configuration file:

```
…
}
"proxy" = {
 "ADF" = {
  "cache" = {
…
```

Scope "ADF" is a sibling scope to "SSL". We can see that scope "proxy" is the parent scope of "ADF". Since "ADF" is a sibling scope to "SSL", "proxy" is also the parent scope of "SSL". The server SSL version configuration item name is now:

```
proxy.SSL.SSLServer.crypto.method
```

Put the cursor on the '}'character above "proxy" and use '%" to get the sibling scope to "proxy".

The cursor will land on the "nodeManager" scope in the configuration file:

```
…
}
"shared" = {
 "nodeManager" = {
  "PAM" =
…
```

Scope "nodeManager" is a sibling scope to "proxy". We can see that scope "shared" is the parent scope of "nodeManager". Since "nodeManager" is a sibling scope to "proxy", "shared" is also the parent scope of "proxy". The server SSL version configuration item name is now:

```
shared.proxy.SSL.SSLServer.crypto.method
```

Put the cursor on the '}'character above "shared" and use '%" to get the sibling scope to "shared".

The cursor will land on the "description" scope in the configuration file:

```
…
}
"description" = {
 "edition" = "enterprise"
…
```

Scope "description" is a sibling scope to "shared". But we need to find the parent scope of "shared".

Move the cursor onto the '}' character above the "description" scope. Type '%'.

The cursor will land on the "DBCs" scope in the configuration file:

```
…
}
"configs" = {
 "iDBCProxyCluster1" = {
  "DBCs" = {
   "iDBCProxy1" = {
}
…
```

Scope "DCBS" is a sibling scope to "shared". We can see that scope "iDBCProxyCluster1" is the parent scope of "DBCs". Since "DBCs" is a sibling to scope "shared", "iDBCProxyCluster1" is also the parent of scope "shared". Further, we can see that scope "configs" is the parent of scope "iDBCProxyCluster1".

Note that the parent scope of "configs" is the main scope. So we now have the complete name of the server SSL version configuration item:

```
configs.iDBCProxyCluster1.shared.proxy.SSL.SSLServer.
crypto.method
```

Using the Configuration Item Name and Value

We have determined the following:

- The SPS configuration file value for server SSL version is `tlsv1_2`
- The full SPS configuration item name for the server SSL version is `configs.iDBCProxyCluster1.shared.proxy.SSL.SSLServer.crypto.method`

As shown in the `entrypoint_common.sh`, the Set Dictionary Value command - `setdictvalue` - can be used to set a configuration item in the SPS configuration item. The steps to using `setdictvalue` to update a configuration item are:

1. Rename the SPS configuration file as we will create a new configuration file
2. Use the `cat` command to pipe the contents of the renamed SPS configuration file into the `setdictvalue` command
3. The `setdictvalue` command will use the configuration item name and value to update the configuration file
4. Pipe the results of `setdictvalue` into the new configuration file
5. Remove the renamed configuration file

You must perform these steps **before** starting I-DBC.

For example:

```
cd /home/corba/microfocus/idbc/sps/adm
mv dbc.config dbc.config.tmp
cat dbc.config.tmp | setdictvalue "-" "
configs.iDBCProxyCluster1.shared.proxy.SSL.SSLServer.
crypto.method " " tlsv1_2" > dbc.config
rm dbc.config.tmp
```

Published Ports with Docker

When you ran the Docker container in the example above (see "Run the I-DBC Docker Image"), the command was as follows:

```
docker run --name idbc_container --publish 15000:15000 --
env MF_HOST_IP=<ip_addr> --env MF_IDBC_PORT=3000 -it idbc-
layer
```

This particular Docker command published port 15000, which allows the Administration Console to connect to the Security Policy Server. While your application will require other ports to be opened in order to access it from outside Docker, it might be considered a security risk for your application to have port 15000 published.

Once you understand all the SPS configuration item names and values that need to be set for your application to work correctly, and you have automated the process of setting those configuration items, you may want to consider removing port 15000 as one of the published ports when running a Docker container.

Using I-DBC to Proxify Transient and Persistent IORs

Usually a Docker container will have its own network that makes it challenging for a CORBA client running outside of the Docker container to contact a CORBA server running inside the Docker container.

IORs created inside of the Docker container are "proxified", providing an address and port that is accessible outside of the Docker container. Invocations from clients using the proxified IOR will pass though I-DBC running inside the Docker container and passed along to the server.

A proxified IOR can be either "transient" or "persistent". A "transient" IOR is only valid for the lifetime of the server that created the IOR. A "persistent" IOR is valid over successive instantiations of the target server and POA.

The `entrypoint_common.sh` file has a `proxify_ior` function. The `spsclient` command line tool is used to proxify an IOR. Currently this function proxifies all IORs as "transient" by using the `deployTransient` subcommand of `spsclient`. This means that:

- Docker "forgets" about all proxified IORs when the Docker container is stopped.
- If a Docker container is stopped and subsequently restarted, all IORs are proxified as "transient" IORs again, allowing for an orderly restart of I-.

If "persistent" proxified IORs are preferred, then the `proxify_ior` function in `entrypoint_common.sh` can use the `deploy` subcommand of `spsclient` instead of `deployTransient`. (Alternatively you may have your own implementation to produce the same effect).

Be aware that when a Docker container is stopped, I-DBC will remember all "persistent" proxified IORs. If the Docker container is restarted, then care must be taken not to reproxify any "persistent" IORs, as I-DBC is already aware of them.

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