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Interaction Process Automation

Technical Reference

Abstract

This document provides an overview of Interaction Process Automation and all its components. It also provides descriptions of the basic terms and concepts related to Interaction Process Automation.

For the latest version of this document, see the PureConnect Documentation Library at: <http://help.genesys.com/cic>.

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Introduction

Interaction Process Automation (IPA) provides the tools to automate just about any common process. It takes a communications-based approach to process automation, taking advantage of and building on the wealth of existing technologies and features in the PureConnect platform.

Interaction Process Automation extends existing IP communications technology to encompass process automation. The communications system becomes the process automation platform for your organization by doing the following:

- Using Customer Interaction Center features to queue and deliver work items like it does interactions.
- Providing presence management information to determine whether a person is available to perform work assigned to them.
- Using skills-based routing to route work items to the people who are best able to perform the work.

IPA and CIC Clients

You can use IPA work items with Interaction Desktop or IPA Work Item Client, a web-based application that allows users to complete tasks that are part of a process.

Note: You cannot log on to IPA Work Item Client and a CIC client at the same time.

Customer Interaction Center (CIC) supports two interaction management client applications. This documentation uses the term CIC client to refer to either Interaction Connect or Interaction Desktop.

Database Support

Interaction Process Automation supports SQL Server 2005 and later versions. Customers using CIC with SQL Server 2000 must upgrade before installing the service update that contains Interaction Process Automation. Otherwise, your database administrator has to install and run the IPA database scripts manually.

Interaction Process Automation is compatible with Oracle 9i and later versions. Process Automation Server cannot store data about processes in Oracle, though it can store and retrieve other kinds of data in Oracle.

Using Interaction Process Automation

Process automation using Interaction Process Automation includes these general steps:

1. **Decide.** Decide what information you want to track in the process. Create the process variables and assign data-level security to sensitive information.
2. **Design.** Design the user interface forms (work items) that users see. Drag and drop various interface controls onto the canvas and associate them with different pieces of process data.
3. **Define.** Define and lay out the process flow. Define the states (the high-level stages a process goes through), and select the actions and tasks within each state. Actions can include accessing a database, invoking a web service, calling a handler, interfacing with a mainframe or third-party application, sending email, queuing tasks for groups, and more.
4. **Deploy.** Once you deploy a process, assigned work items appear to users in Interaction Desktop or IPA Work Item Client.

Components

These PureConnect program components are either part of Interaction Process Automation or work directly with Interaction Process Automation in some way:

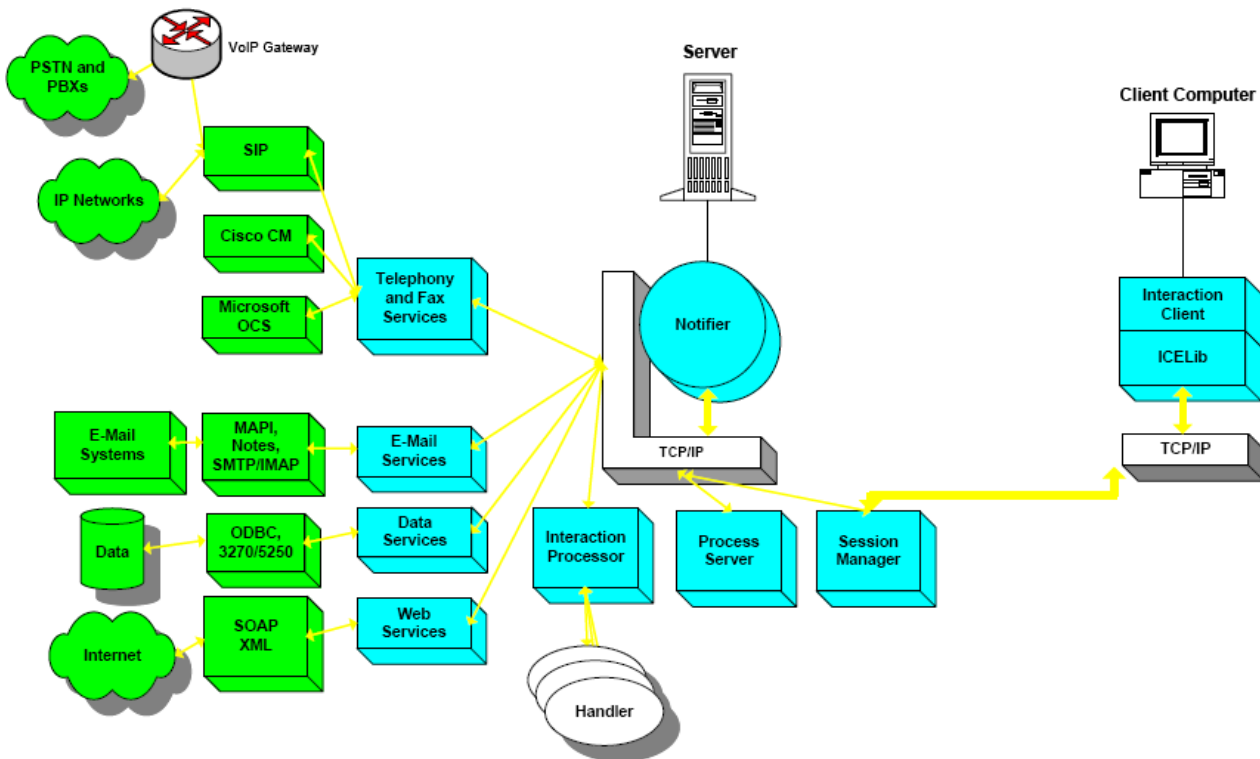
Component	Who uses it?	What does it do?
Interaction Process Automation Designer (IPA Designer)	The person who designs processes (process designer)	This module in IC Server Manager has a graphical process definition interface. It allows the process designer to: <ul style="list-style-type: none"> • Define the information necessary for the process. • Define the states through which the work moves in the process. • Define the tasks performed in each state. • Create the work items presented to users assigned to work on the tasks.
Interaction Process Automation Monitor (IPA Monitor)	Supervisors	This module is a real-time supervisory module in both IC Business Manager and IC Server Manager. This module displays the status of every process, its current state, what or who it is waiting on, how long it has been running, and more. Users can only view the data for which they have authorization.
Interaction Administrator	Administrators	This program allows the administrator to configure security, access control, licensing, and other aspects of CIC, and also includes configuration options for Interaction Process Automation.
Customer Interaction Center	(Server)	This program provides a range of built-in contact center applications including Interactive Voice Response (IVR), Automatic Call Distribution (ACD), skills-based routing, multimedia queuing, call recording, screen recording, predictive dialing, workforce optimization (agent scheduling), and speech analytics.
IPA Work Item Client	Users	The IPA Work Item Client is a web-based application that allows users to complete tasks that are part of a process. Work items represent these tasks. A work item is a form that gathers information. Work items could represent the tasks involved in processing a customer order, a loan application, an insurance claim, or other form of work.
Interaction Desktop	Users	This program is a client application for Customer Interaction Center. This desktop application allows users to access Customer Interaction Center features and acts as a graphical call manager. With IPA, it allows users to deal with their assigned work items and search for an existing or running process and see its status. Starting a process instance in Interaction Desktop “pops” a work item that allows the user to input information. It could also invoke an existing application and pre-fill it with the appropriate information.
Interaction Designer	Developers	This program is a graphical application generator you can use to write the programs (handlers) that control various interaction processing behaviors within CIC.
Interaction Attendant	Supervisors or Administrators	This program is a graphical call flow manager. It allows organizations to create IVR menus and determine how to route and queue calls, emails, and other interactions within the organization.
Interaction Supervisor	Supervisors	This program includes the ability to monitor and view queued work items.
ACD Server	(Server)	This server is a subsystem on the CIC server that can calculate agent and interaction scores quickly to route interactions effectively. ACD includes a new Work Item interaction type for Interaction Process Automation.
Process Automation Server	(Server)	This server is a subsystem on the CIC server. It does the following: <ul style="list-style-type: none"> • Parses the process definitions created in IPA Designer. • Watches for configuration changes and sends notifications to Session Manager. • Executes processes and their actions. • Creates and monitors work item interactions. • Writes process data to the database. • Calculates and sends status updates for action executions and errors to the IPA Monitor. • Enforces security specifications on data leaving the server. • PAS uses a Microsoft SQL Server database to store and retrieve data used by processes in any ODBC-compliant database.

Architecture

Interaction Process Automation is an extension of the PureConnect platform. Together, they offer both client and server-side components connected seamlessly through TCP/IP. A service-oriented architecture (SOA) interconnects all components, allowing processes to use all the power of the PureConnect platform, including:

- A SIP-based IP PBX.
- Connectivity to Microsoft Office Communications Server and Cisco Call Manager.
- The ability to send and receive telephone calls and faxes using voice over IP (VoIP).
- Integration with email systems including Microsoft Exchange, Lotus Notes, and Novell GroupWise.
- The ability to invoke web services.
- Mainframe access.

Interaction Process Automation runs on stock servers with built-in capabilities for redundancy and is suitable for organizations of all sizes.



Security

Interaction Process Automation uses these levels of security.

Data Access Security

Security at the data level allows an organization to control what data employees can see when processing sensitive customer information such as social security numbers, credit card information, and personal health information.

You can configure data access security by creating security specifications in Interaction Administrator and assigning them in IPA Designer to the applicable data elements. Security specifications are associated with a list of the people who have access to the related data element. Users not on the list are denied access.

Process Level Security

In addition to data security, Interaction Process Automation provides security at the process level. Only the users, workgroups, and roles with one of these access control categories assigned to them can access the corresponding features:

Category:	Users with this access category can:
Launch Process	Search for and start their own processes.
View Process	Search for and view any processes.
Manage Process	Search for, manage, cancel, and retry processes.

For more information about licensing, see [Interaction Administrator Help](#) in the PureConnect Documentation Library.

Variable Level Security

Logging of process variable values to reporting database tables is optional. This security feature works as follows:

- For new variables, the default option is not to log the values.
- For existing processes, the default option is to log the values to maintain consistency with the previous behavior.
- Trace statements that involve process variables no longer include the content of the variables.

The option to include a process variable value in the reporting database appears in IPA Designer when adding or editing a process-level variable. For more information, see [IPA Designer Help](#) in the PureConnect Documentation Library.

Installation

Interaction Process Automation installs automatically as part of a CIC installation. It updates when you apply updates. IPA components install on the CIC server and with the Customer Interaction Center CIC server and client workstation components (CIC User Applications, IC Business Manager, and IC Server Manager). It requires the appropriate IPA licensing.

Prerequisites

Before installing and running Interaction Process Automation:

- Install CIC. For instructions, see [PureConnect Installation and Configuration Guide](#) in the PureConnect Documentation Library.
- When you run IC Setup Assistant, set up a SQL or Oracle database for data storage and reporting. Review the Database Support section of this document.
- Obtain a CIC license that includes the appropriate IPA licenses.

IPA on the CIC server

The Interaction Process Automation server components install automatically when you install Customer Interaction Center 4.0 or later on the CIC server. Following the installation, perform the following tasks to get Interaction Process Automation running on the CIC server:

To install the Interaction Process Automation update on the CIC server in your test environment, do the following:

- Start CIC and then start Interaction Administrator.
- In Interaction Administrator, update the license so that IPA licensing is available.
- Set the appropriate licensing and access control for users. For more information, see [Licensing and Rights for IPA](#) and the Interaction Administrator "[Licensing](#)" help topic.
- Assign the Process Designer license and **Launch, View, and Manage Process** access rights to the CIC administrator.
- To confirm installation of all the components, continue to [Verify the Server Install](#).

Note: It is best to install IC Server Manager on a non-server operating system because IPA Designer could render pages slightly differently due to Windows Presentation Foundation (WPF) styling and video support.

Internet Explorer users

If Internet Explorer requires server verification for all sites, the install displays a warning. Add the following to the list of Trusted Sites after the install completes:

about:security_ICSystemManager.exe

The **Require server verification (https:) for all sites** option appears under **Options/Trusted Sites/Sites** in Internet Explorer. If you don't select this option, the system adds the information to the list of trusted sites during the install. Interaction Process Automation Designer requires this setting for the use of the Send Email action.

Licensing and Rights for IPA

Only agents with the appropriate licenses and rights can use Interaction Process Automation.

IPA User Licenses

You assign and configure licenses for Interaction Process Automation in Interaction Administrator. A user can have only one of the following licenses:

- Direct Routed Work Items – Users with this license can receive work items routed directly to them.
- Group Routed Work Items – Users with this license can receive work items routed to them either directly or as a member of a workgroup (similar to an ACD queue).
- Process Monitor – Users with this license can view process statuses and details in the Process Monitor.
- Process Designer – Users with this license can receive work items or create and modify processes.

The licenses are cumulative. The Group Routed Work Items license includes the Direct Routed Work Items license. The Process Monitor license includes both of the Routed Work Items licenses. The Process Designer license includes all the other licenses. The following table summarizes the differences between the licensing options.

Users with this license can:	Direct-routed Work Items	Group-Routed Work Items	IPA Monitor	IPA Designer
Start any process for which they have rights?	Yes	Yes	Yes	Yes
Receive ACD-routed work items?	No	Yes	Yes	Yes
Receive direct-routed work items?	Yes	Yes	Yes	Yes
Use IPA Monitor?	No	No	Yes	Yes
Start test processes they are designing, regardless of launch rights in IA?	No	No	No	Yes

Access Control rights

On the **Access Control** tab for users in Interaction Administrator, you can assign these access control rights:

- **Launch Process** – Users with this right can start any published process in the **Processes** list in Interaction Desktop, IPA Work Item Client or through IceLib.
- **View Process** – Users with this right can search for processes in Interaction Desktop or IPA Work Item Client.
- **Manage Process** – Users with this right can manage (for example, cancel or retry) processes in the **Process Monitor** module of Interaction Process Automation or IC Business Manager Applications.

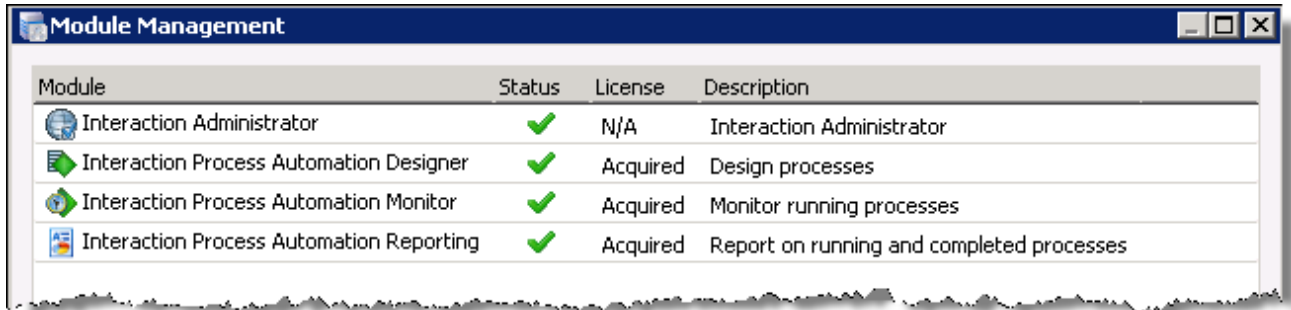
Also, the originator of a process has implied **View Process** rights. Therefore, if a user has **Launch Process** rights but does not have **View Process** rights, the user can only view the processes that the user started.

IPA requires other access control rights, such as **View Skills** or **View Workgroups**, for users to access skills or workgroups. For more information, see [Interaction Administrator Help](#) in the PureConnect Documentation Library.

Verify the Server Install

To verify installation of the IPA components on the CIC server, do the following:

1. Start Interaction Administrator on the server.
2. Verify that the **Interaction Process Automation** container exists under the **System Configuration** container, and that the **Security Specifications** container exists under the **Interaction Process Automation container**.
3. From the **Start** menu, click **Programs**, point to **PureConnect**, and then click **IC Server Manager**.
4. From the **Tools** menu in **IC Server Manager**, click **Module Management** and verify that the Interaction Process Automation components appear and that you acquired the licenses.



Module	Status	License	Description
Interaction Administrator	✓	N/A	Interaction Administrator
Interaction Process Automation Designer	✓	Acquired	Design processes
Interaction Process Automation Monitor	✓	Acquired	Monitor running processes
Interaction Process Automation Reporting	✓	Acquired	Report on running and completed processes

Note:

CIC has concurrent licensing, which means that you can only acquire IPA licenses on a single machine. For example, if a user is running Interaction Desktop on one machine and then starts IPA Designer on another machine, IPA Designer fails to load the IPA module because the license is in use on another computer. The user must run IPA Designer and Interaction Desktop on the same machine. For more information about concurrent licensing, see [PureConnect Licensing Technical Reference](#) in the PureConnect Documentation Library.

5. Start Interaction Desktop or IPA Work Item Client on the server and verify that the **Processes** menu appears and that the **My Work Items** tab appears next to the **My Interactions** tab.

IPA on Client Workstations

The Interaction Process Automation client workstation components install automatically with the CIC User Applications and IC Business Manager Applications. After running the installs or updates, no further action is necessary for CIC User Applications or the IC Business Manager Applications because licensing and access control allow Interaction Process Automation functionality.

In IC Server Manager Applications installations, however, the Interaction Process Automation feature is optional. Select Interaction Process Automation in the Custom Setup dialog when installing IC Server Manager Applications, as it doesn't install by default.

If you installed IC Server Manager Applications and didn't select the Interaction Process Automation feature, follow these steps to enable IPA in Server Manager applications:

1. From the **Start** menu, click **Control Panel**, and then click **Add or Remove Programs**.
2. Locate **Interaction Center Server Manager Applications** under **Currently Installed Programs**.
3. Click **Change** to start the Server Manager Applications install.
4. Click **Next** at the Welcome screen, and then click **Change** to change the list of installed features.
5. From the list of features, select **Interaction Process Automation**, and then complete the install.

Working with the Process Automation Server

The Process Automation Server (PAS) runs processes created in Interaction Process Automation Designer. It uses a Microsoft SQL Server database to store and retrieve data about processes, and can use any ODBC-compliant database to store and retrieve data used by processes.

- [IPA Process Automation Server Version 2](#)
- [Disk Space and Memory Requirements](#)
- [Changes in Process Automation Server Version 2](#)
- [Upgrade to Process Automation Server Version 2](#)

IPA Process Automation Server Version 2

CIC 2015 R3 introduced Version 2 of the Process Automation Server. CIC 2015 R3 to CIC 2016 R4 supported both Versions 1 and 2. In CIC 2017 R1, IPA Process Automation Server version 2 replaced version 1. CIC 2017 R1 no longer includes Process Automation Server version 1 in the installation, and Process Automation Server version 2 installs by default. If you upgrade to CIC 2017 or later, it is not possible to roll back Process Automation Server from version 2 to version 1.

Important!

Customers who use Process Automation Server version 1 should upgrade to Process Automation Server version 2 using the migration tools before upgrading to CIC 2017 R1 or later versions.

For more information about the differences between the two versions of Process Automation Server and migration tools, see *Changes in Process Automation Server Version 2 And Upgrade to Process Automation Server Version 2*. Note that software updates for CIC 2017 R1 and later apply only to Process Automation Server version 2. There are no restrictions on the sale of Interaction Process Automation licenses.

Disk Space and Memory Requirements

Process Automation Server can use astronomical amounts of memory: its limit is 16 exabytes. If processes need more RAM than your server has available, Process Automation Server pages the extra data to disk. However, ensure that adequate disk space is available. In the improbable event that PAS runs out of both RAM and disk space, it fails.

Process Automation Server has these enhancements:

IPA Monitor

Instead of monitoring every workflow in the system constantly, create filters to show only the flows that you want to monitor. The server is then more scalable and reliable.

Note:

If your filter is too loose and too many flows start showing up, PAS cancels your filter because it returns too many results. Create a more narrow filter.

PAS is 64-bit

If you use Database actions in your workflows and connect to an Oracle database, the computer with Process Automation Server must have the 64-bit version of the Oracle ODBC driver available. SQL Server doesn't require any special steps.

Process Automation Server stores data about workflows only in a Microsoft SQL Server database, though it can use any ODBC-compliant database for other kinds of data.

Easier and more fault-tolerant switchovers

- For planned switchovers, Process Automation Server requires no special actions.
- For unplanned switchovers, Process Automation Server requires no special actions if you can start the now-backup-server.
- If you cannot start the now-backup server for unplanned switchovers, run the `flow_admin.exe` tool and follow the prompts to restart flows from the backup server.

Changes in Process Automation Server Version 2

Here's a summary of the changes from Process Automation Server version 1 to Process Automation Server version 2:

Feature	Process Automation Server Version 1	Process Automation Server Version 2
Oracle	Data used by processes. Process metadata is in persistence files separate from the database.	Only data used by processes. Process metadata must be on Microsoft SQL Server.
64-bit	No. 32-bit application with a practical limit of 4GB memory.	Yes. Better memory utilization. Theoretical 16 Exabyte limit.
IPA Monitor	Monitors all workflows.	Monitors no workflows by default. The user creates filters to monitor selected workflows.
Switchover	If backup server won't start, set a server parameter in Interaction Administrator.	No special action required unless a crash required the switchover and the backup server doesn't start; if so, run the Flow_admin tool.
Location of persistence data	Persistence files.	Microsoft SQL Server database.
Ports for talking to the database	Uses the data sources set by Interaction Administrator.	No change from Process Automation Server version 1.
New tools	N/A	<ul style="list-style-type: none"> Flow_admin: see the row about switchover. Migration tool to move from Process Automation Server version 1 to version 2.
Are process definition files compatible with both versions?	Compatible.	Compatible.
Scalability	Only one primary Process Automation Server version 1 server can be active. Runs only on the IC server.	Cluster scalable (n+1). Can run off-host. Can run multiple Process Automation Server version 2 servers in parallel with workload balancing.

Process Automation Server Version 2 (PAS v2) has these enhancements:

- **IPA Monitor:** Instead of monitoring every workflow in the system at all times, you create filters to show only the flows you want to monitor. This makes the server more scalable and reliable.

Note: If your filter is too loose and too many flows start showing up, PAS v2 cancels your filter because it returns too many results. You must make a new, narrower filter.

- **PAS v2 is 64-bit:** If you use Database actions in your workflows and connect to an Oracle database, the machine with Process Automation Server version 2 must have the 64-bit version of the Oracle ODBC driver available. No special steps are needed for SQLServer.

Process Automation Server version 2 stores data about workflows only in a Microsoft SQL Server database, though it can use any ODBC-compliant database for other kinds of data.

Easier and more fault-tolerant switchovers:

- For planned switchovers, Process Automation Server version 2 requires no special actions.
- For unplanned switchovers, Process Automation Server version 2 requires no special actions if you can start the now-backup-server.
- For unplanned switchovers if you cannot start the now-backup server, you can run the "flow_admin.exe" tool and follow the prompts to restart flows from the backup server.

Upgrade to Process Automation Server Version 2

You can install PASv2 either on your CIC server or on a non-CIC server. PASv2 is included in the CIC installation. An installation program is available for installing PASv2 on a non-CIC server. For more information, see [Install PASv2 on a non-CIC server](#).

After installing PASv2, configure and activate PASv2. Process Automation Server version 1 remains the active server until you manually activate Process Automation Server version 2. For more information, see [Complete upgrade process and activate PASv2](#).

To upgrade to PASv2 on your CIC server, see [Complete upgrade process and activate PASv2](#).

Note: Process Automation Server version 2 can store data about workflows only in a Microsoft SQL Server database. However, it can use any ODBC-compliant database for other data.

- [Install PASv2 on a non-CIC server](#)
- [Complete upgrade process and activate PASv2](#)

Install PASv2 on a non-CIC server

Starting with CIC 2016 R2, an install is available for installing PASv2 on a non-CIC server.

Note about switchover: If you have a switchover environment, complete the following steps for both servers in the switchover pair.

Step 1: Run the PASv2 installation program

1. If you have not done so already:
 - a. Download the CIC 2016 R2 or later .iso file from the Product Information site at <https://my.inin.com/products/Pages/Downloads.aspx>.
 - b. Copy the .iso file to a file server (non-CIC server) with a high bandwidth connection to the server(s) on which you plan to run the CIC 2016 R2 or later installs.
 - c. Mount the .iso file and share the contents to make them accessible to the server(s) on which you plan to run the CIC 2016 R2 or later installs.
2. Navigate to the \Installs\Off-ServerComponents directory on the file server.
3. Copy the Process Automation Server.msi file, for example, ProcessAutomationServer2_2016_R2.msi to the server on which you plan to run this install and double-click to launch it.
4. On the **Welcome** page, click **Next**.
5. Click **Next** to accept the default installation location.
6. Type the user name and password of an account with administrative privileges on the system and then click **Next**.
7. Type the name of the CIC server.
8. Choose a location for logging files and then click **Next**.
9. Click **Install** to begin the installation.
10. When the installation is complete, click **Finish** to exit the installation program.

Step 2: Trust the off-host certificates in Interaction Administrator

1. In Interaction Administrator, click the **System Configuration** container.
2. Double-click **Configuration** in the list view.
3. Click **Certificate Management**.
4. Next to **Subsystem Certificates Configuration** click **Modify**.
5. Select the certificates for the system you installed PASv2 on and then click **Trust**.
6. After installing PASv2, ensure that your PASv2 servers have the network permissions required to access any databases or web services that your processes need.
7. Complete the steps in [Complete upgrade process and activate PASv2](#).

Complete upgrade process and activate PASv2

1. Update every server in your organization to the latest CIC release.

Genesys recommends that you update agent workstations but it is not a requirement for Process Automation Server version 2.

2. Decide where to store Process Automation Server version 2 data.

By default, PASv2 creates the required tables in the same database that IC Tracker uses, but you can select an alternate database.

If you want to use an alternate location for Process Automation Server version 2 data:

- In Interaction Administrator, set the IC Workflows data source to the alternate SQLServer database.
- Run the provided .SQL script to create the required tables, indexes, and sprocs in the alternate database.

3. To allow rolling back to Process Automation Server version 1, back up your persistence files to a safe location.

4. Use the Persistence File Migration Tool to migrate process instances.

This tool converts your Process Automation Server version 1 persistence files into .SQL files that you can apply them to your Process Automation Server version 2 database. For more information, see [Appendix A: The Persistence File Conversion Tool \(PFCT\)](#).

You can use process definitions as-is. You do not need to migrate them.

5. Modify your disaster recovery strategy to back up your SQLServer database.

- Process Automation Server version 2 uses three tables you need to back up: flowexec_Flows, flowexec_Storage, and flowexec_Completion.
- After a catastrophic failure, turn off Process Automation Server version 2, restore the tables, and turn Process Automation Server version 2 back on.

6. Restart CIC.

Process Automation Server version 2 is now ready to use.

Concepts and Terminology

This section defines and describes the major concepts and terms related to Interaction Process Automation.

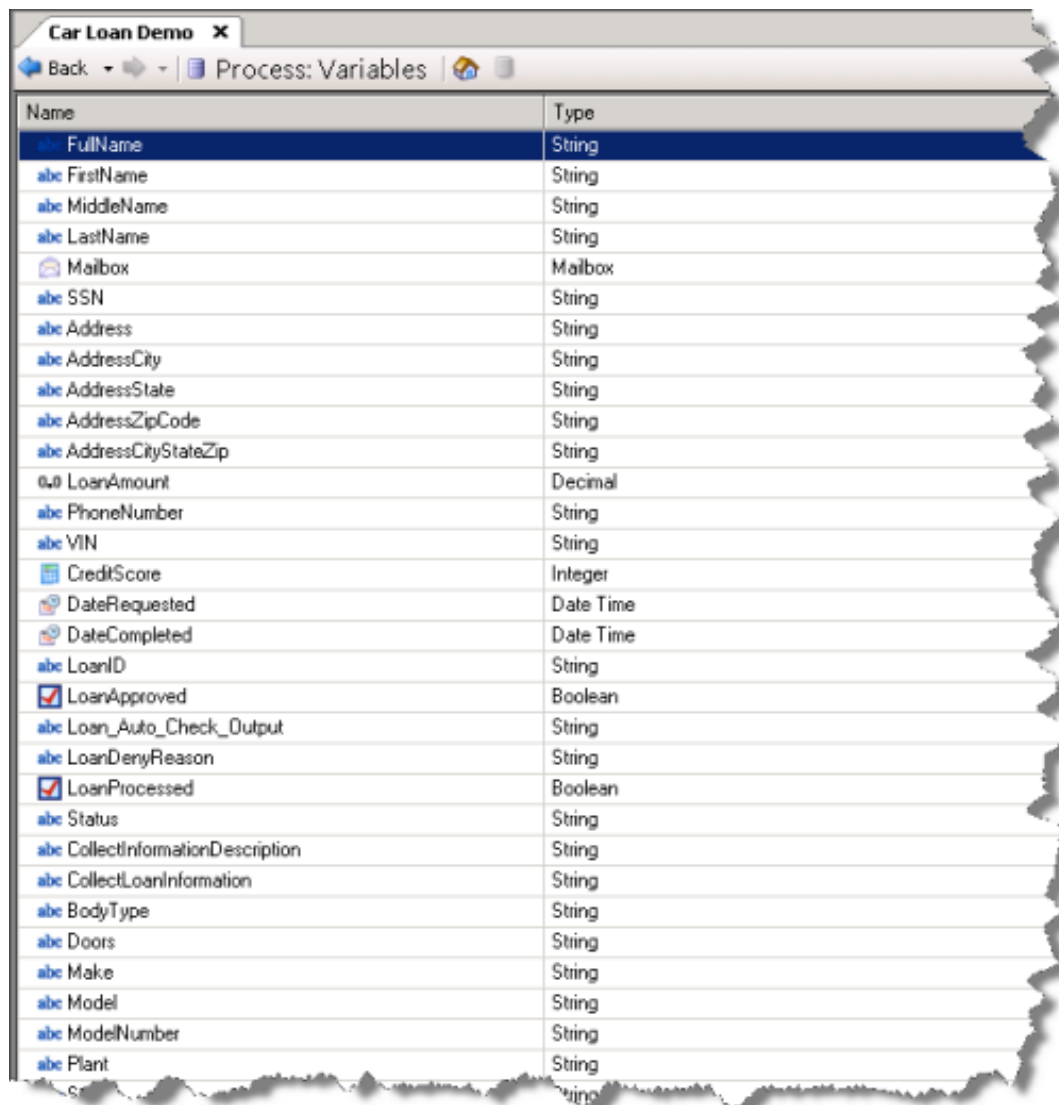
- [Process Variables](#)
- [States](#)
- [Tasks](#)
- [Actions](#)
- [Work Items](#)
- [Related Interactions](#)

Process Variables

Process variables are the placeholders for the information you want to store and track in a process. Every process must define a list of data variables and any restrictions on those variables.

A process can include both global and local data variables. Global variables are available to an entire process, while local variables are only available within the scope of the object (state or task) in which you defined them.

In a Car Loan process, for example, you can have variables to track the customer's information, and information about the loan request, the vehicle, and the loan status.



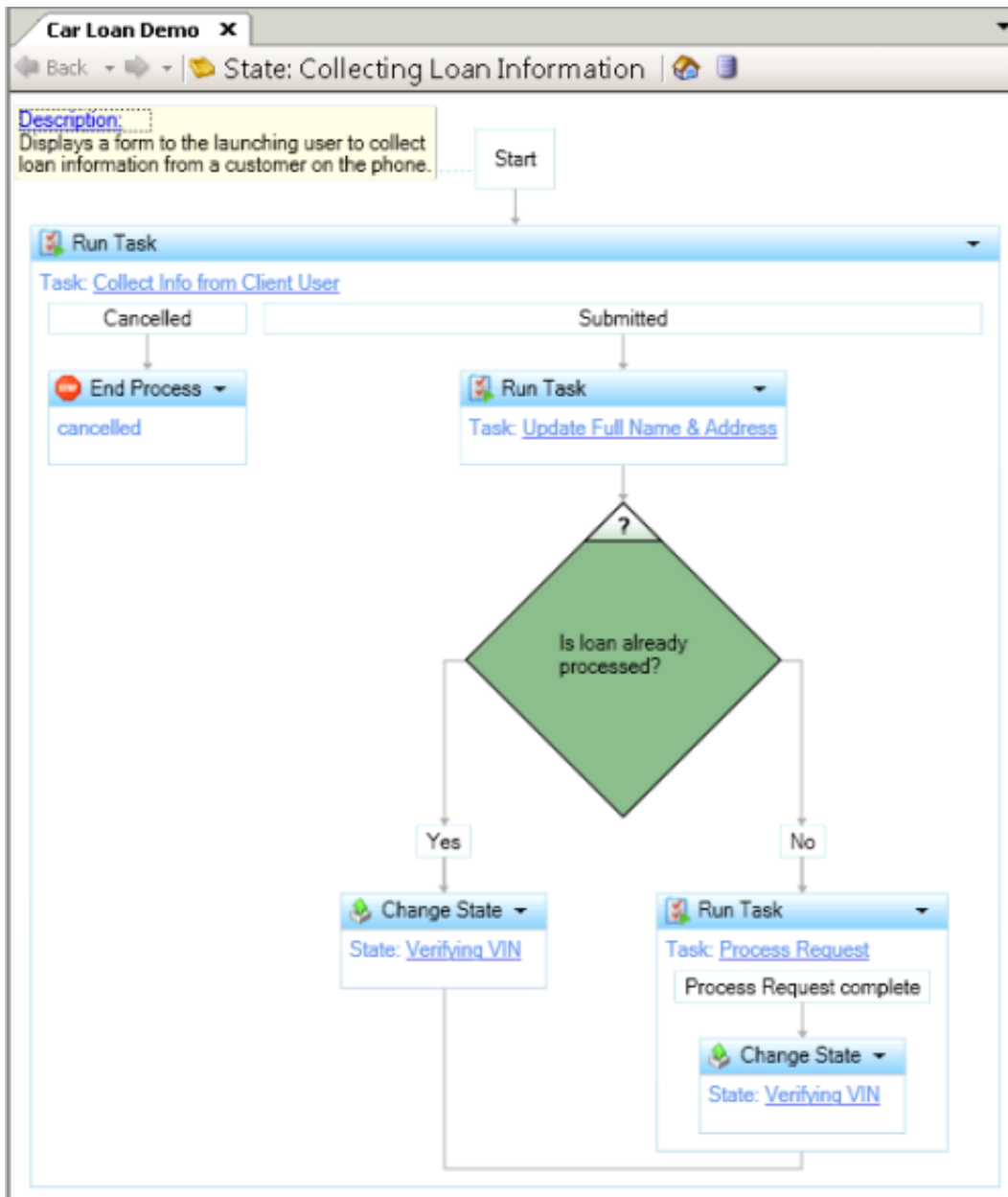
Name	Type
FullName	String
abc FirstName	String
abc MiddleName	String
abc LastName	String
Mailbox	Mailbox
abc SSN	String
abc Address	String
abc AddressCity	String
abc AddressState	String
abc AddressZipCode	String
abc AddressCityStateZip	String
LoanAmount	Decimal
abc PhoneNumber	String
abc VIN	String
CreditScore	Integer
DateRequested	Date Time
DateCompleted	Date Time
abc LoanID	String
<input checked="" type="checkbox"/> LoanApproved	Boolean
abc Loan_Auto_Check_Output	String
abc LoanDenyReason	String
<input checked="" type="checkbox"/> LoanProcessed	Boolean
abc Status	String
abc CollectInformationDescription	String
abc CollectLoanInformation	String
abc BodyType	String
abc Doors	String
abc Make	String
abc Model	String
abc ModelNumber	String
abc Plant	String

States

You define a process first in terms of states. States define the pipeline through which work flows. Each state contains a series of tasks and actions. States can relate to the following:

- The department involved with processing a portion of the process.
- The industry-defined portion of a process.
- The portion of a process that best practices defines.

State definitions appear graphically in the IPA Designer module in IC Server Manager.



A state can have local data variables, which are variables that only the state uses. States can have inputs to allow local variables to populate them from the calling state or task.

All processes must contain at least one state. The user who designs the process can select the starting state, and that state can call other states or tasks.

Tasks

Tasks are the fundamental building blocks in a process definition. You define a process in terms of the tasks involved, the sequence of those tasks, and the process control objects that exist between them.

You can only place tasks under states and tasks can only call other tasks. Tasks are reusable within the same process.

A task consists of:

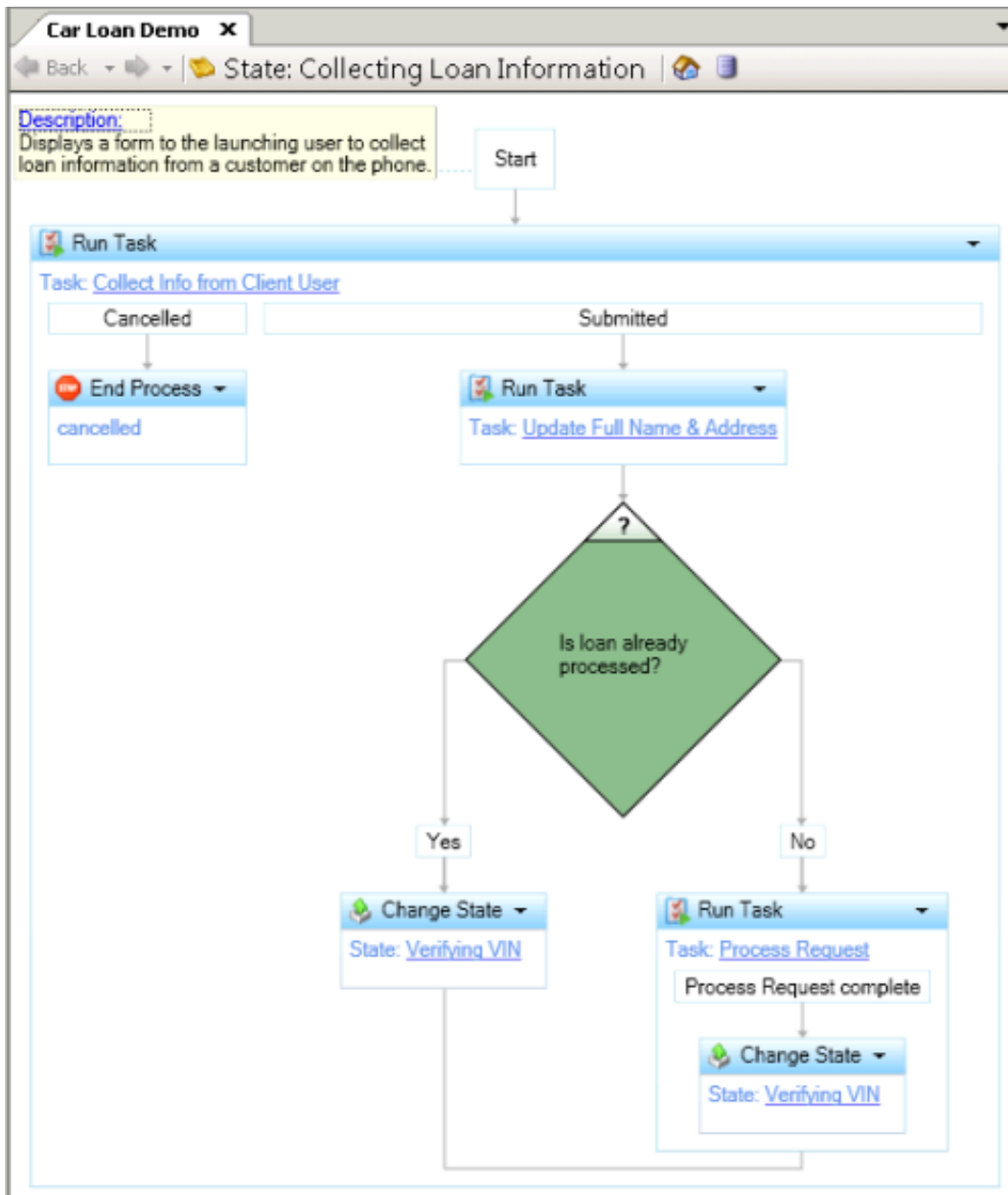
- A name
- A description
- Actions

Note:

The **ChangeState** and **EndProcess** actions are state-level actions and you cannot add them to a task.

- Local variables, which are variables assigned only to that task
- Inputs and outputs that populate local variables from the calling state or task

Tasks definitions appear graphically in IPA Designer:



Actions

Actions are the smallest unit of work in process automation. Actions are similar to programming statements in a programming language. They can do things like:

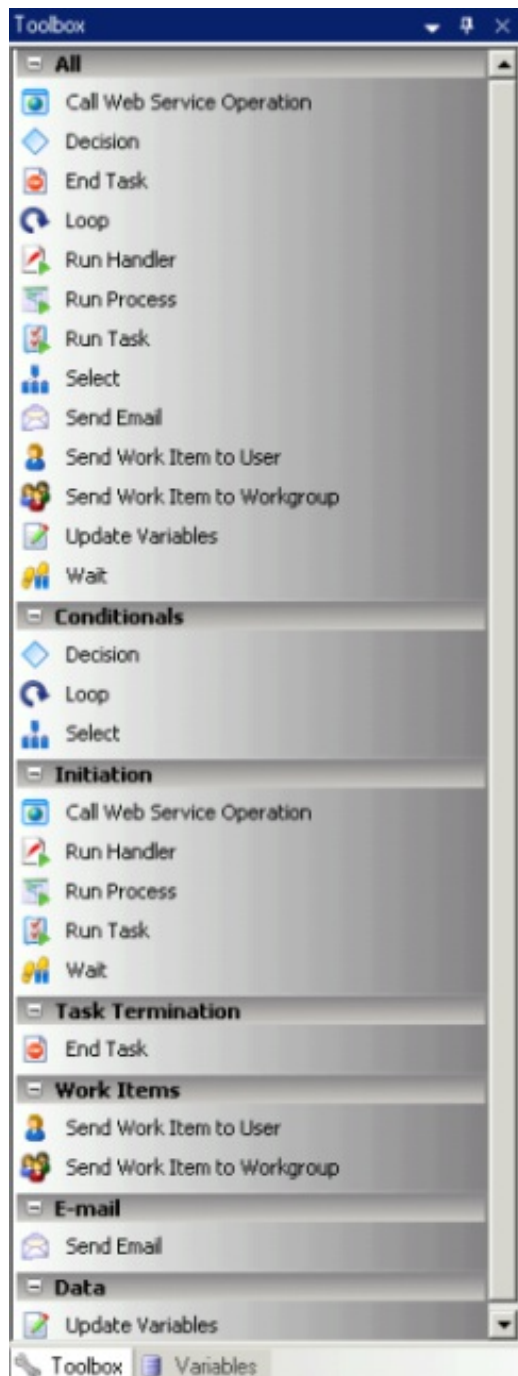
- Assign a value to a data element.
- Invoke another task, a handler, or a subprocess.
- Route a form to a queue.
- Invoke a web service. Web services are remote services that are available on the Internet. They are easily accessible from computer applications for conducting various high-level transactions.

Note: In the initial release, the system limits support for web services to non-HTTPS SOAP-based web services. Interaction Process Automation is designed to work well with web services that WCF creates.

An action can be part of a state, a task, another action, or can occur between work items.

IPA Designer checks actions for validity and indicates when actions are in error. For example, you can't add an **End Process** action anywhere but in a state, and you can't call **End Process** inside a task.

IPA Designer provides a toolbox containing actions you can use in a process.



Work Items

You design and create work items in IPA Designer, and then display them to the user in Interaction Desktop or IPA Work Item Client. Work items gather input when a user starts a process.

Work items can include the following:

- A category.
- Description of the work item.
- A form that includes:
 - Input fields for the data to gather.
 - Buttons (for example, **Approve** and **Deny**) that become exit paths from the **Send Work Item to User** and **Send Work Item to Workgroup** actions.
 - Other controls bound to process variables with security restrictions that the user interface enforces.

When a user starts the corresponding process in Interaction Desktop or IPA Work Item Client, work items appear in the **My Work Items** tab. Work items appear as interactions in Interaction Desktop or IPA Work Item Client, similar to calls, emails, and other interaction types.

Related Interactions

A user can associate an interaction with a process in Interaction Desktop. Then, when viewing the process details later, the associated interactions appear.

Persistence/Recovery

Interaction Process Automation was designed to recover any processes that are running when an outage occurs with the CIC server, network, or client application. When resources return to availability, Interaction Process Automation can restore the data and state information.

It is important that you don't turn off your server intentionally without turning it off properly. However, unforeseen outages such as power failures can occur. The following scenarios describe how Interaction Process Automation recovers from an outage.

Switchover

In a switchover environment, one server runs in primary mode and the other runs in backup mode.

There are two types of switchover:

- An automated switchover occurs when there is a failure on the primary CIC server.
- A manual switchover occurs when the administrator purposely shuts down the primary CIC server to perform maintenance or install an update.

For general information about switchover, see [CIC Automated Switchover System Technical Reference](#) in the PureConnect Documentation Library.

Manual Switchover

A CIC administrator can trigger a manual switchover using the Switchover Control Panel (for example, to allow for maintenance on a server or to install a CIC service update).

For information about using the Switchover Control Panel, see [CIC Automated Switchover System Technical Reference](#) in the PureConnect Documentation Library.

Items that Require Special Handling

There are a few items and actions that create or use external resources and therefore require special handling when restored following an outage.

Routed Work Items

If the work item exists on the CIC server, then the Process Automation Server reconnects to the existing work item in the current state. If the work item doesn't exist on the CIC server, the Process Automation Server creates the work item and uses the last saved attributes to determine the new state of the work item.

Work items that route directly to a user and are in the processing or held state restore to the same user in the held state. Work items that route to a workgroup and that are in the processing or held state restore to the workgroup in the held state.

Web Services and Run Handler Actions

Actions that run Web services and handlers can take the longest to run and are the most likely to be affected in the event of an outage. If either type of action is running when the server goes down, the system restores the action to the `restored in error` state since it is not possible to determine the extent to which the service or handler has run.

You can use IPA Monitor to retry/rerun these actions. For more information, see [IPA Monitor](#).

CIC Client

If there is an outage with the Process Automation Server, work items that appear in Interaction Desktop or IPA Work Item Client remain open. However, users cannot commit work item data or change the state of a work item. The Process Automation Server reconnects to the existing work items when restarted.

If there is a switchover event, work items that appear in Interaction Desktop or IPA Work Item Client disappear and the connection to the failed server drops. Interaction Desktop or IPA Work Item Client reconnects to the new primary server when it is available and users can process the new work items. Work items started before the switchover event don't reappear until after the failed primary server fully restarts as the backup server and the persistence data synchronizes.

IPA Monitor

If there is an outage with the Process Automation Server, IPA Monitor displays a message indicating that Process Automation Server is unavailable. The monitor reconnects and displays active processes again once the Process Automation Server restarts.

If there is a switchover event, processes that appear in the Process Monitor disappear and the connection to the failed server drops. The Process Monitor reconnects to the new primary server when it is available and new processes can start. However, processes started before the switchover event don't reappear until the failed primary server fully restarts as the backup server and the persistence data synchronization occurs.

Optional Server Parameters

In addition to switchover-related server parameters, the following optional server parameters are available. For more information about server parameters, see the *Interaction Administrator* documentation.

PAS_blockLaunchDuringRestore

Boolean. If the value is **True**, **1**, or **Yes**, Process Automation Server blocks new user flow starts until it finishes restoring previously existing flows. This action prevents agents from starting extra flows instead of waiting for the restore.

PAS_DepthThreshold

Specify an integer for this parameter to indicate the number of spawned levels that a process can drill down to before Process Automation Server indicates an error for excessive recursion.

PAS_HandlerResponseTimeout

Note: Only processes migrated from Interaction Process Automation 3.0 use this parameter. Interaction Process Automation lets users configure timeout values for each action individually.

Use this parameter with the **Run Handler** action to specify how long Interaction Process Automation waits before displaying an error for the **Run Handler** action when the action doesn't run successfully.

Parameter Value	Description
N	IPA waits N seconds before displaying an error.
(not set)	IPA defaults to a wait time of 30 seconds.
0	IPA does not display an error. The wait time is unlimited.

For more information about the **Run Handler** action, see *IPA Designer Help*.

PAS Maximum Monitored Flows

Integer. Overrides the default maximum of 5,000 monitored flows in IPA Monitor. Create this parameter in Interaction Administrator's **Server Parameters** container. If you do not create this parameter and assign a value to it, IPA Monitor uses the default maximum of 5,000 monitored flows. The minimum value is 100.

PAS_LoadBalanceThreshold

This server parameter controls the load balancing of running process instances among off-servers. Set this parameter to the maximum number of process instances that must occur before load balancing occurs between off servers. The default is 5000. Do not set the value of this server parameter to less than 1000.

Event Log Messages

The following table describes various event messages that the Process Automation Server subsystem can record in the **Windows Event Log** on the Windows server.

Event ID	Type	Message details
41043	Error	Process Automation Server cannot start because the database connection string for Workflow storage is missing.
41044	Informational	Process Automation Server is attempting to use the default CIC database for Workflow storage. The preferred method is to provide a CIC Data Source named %1 to direct the Workflow storage to the preferred database.
41045	Error	Process Automation Server is attempting to open the storage database, but the connection has failed. For more information about the error, see the subsystem log.
41046	Error	Process Automation Server is attempting to use the storage database, and executing a required stored procedure failed. It is likely that either the Process Automation Server tables and procedures don't exist in that database, or that you didn't set the permission to execute the procedures properly. For more information about the error, see the subsystem log.

Adding a Certification Authority to Process Automation Server

If your organization plans to invoke processes that call secure web services using the HTTPS protocol, add the certificate from a certificate authority into the Certificate Authorities bundle file. The Certificate Authorities bundle file is on both the primary and backup servers that are running the Process Automation Server subsystem. The bundle file must contain a certificate from each secure web service used.

Obtaining the Certificate

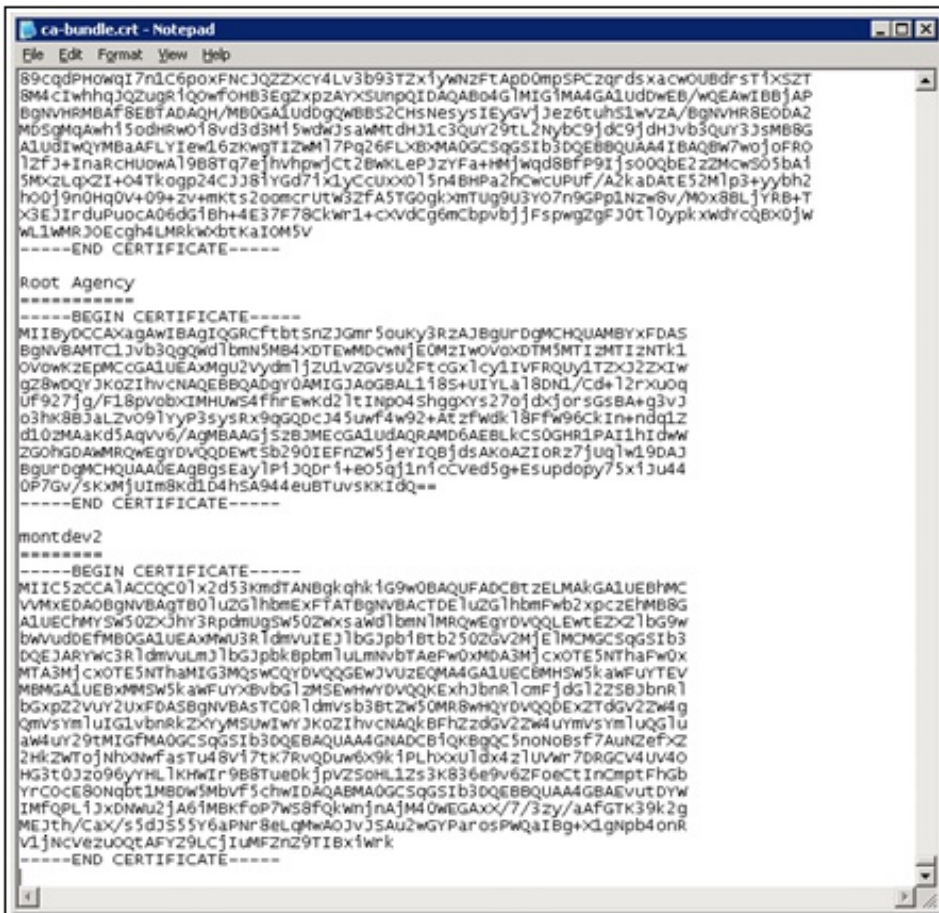
This document does not describe how to get a certification authority's certificate. The administrator of the web service you use can provide its customers with a file that contains the certification authority certificate. If not, they can provide the URL for the certificate authority used to sign the web server's certificate.

A certificate file typically has an extension of `.cer` or `.pem`.

Procedure for Adding a Certificate

A CIC administrator must follow these steps once the certification authority certificate is available.

1. Use a text editor to open the IPA server certification authority file at this location:
IC Installation\Certificates\ProcessAutomationServer\ca-bundle.crt
2. In the open file, add an entry for the certification authority. This entry is typically the name of the certification authority.
3. Open the certification file in another text editor session and copy the text delimited by `-----BEGINCERTIFICATE-----` and `-----ENDCERTIFICATE-----`. Include the delimiters in the copied text.
4. Paste the copied content into the `ca-bundle.crt` file below the entry you created in Step 2.



5. Save the changes. The Process Automation Server can now invoke processes that contain web service actions that call that web server using the HTTPS protocol.

Appendix A: The Persistence File Conversion Tool (PFCT)

Note: Using the Persistence File Conversion Tool requires a certain amount of preparation, including the relevant tools and information. Read this appendix before you start using the tool.

This appendix describes how to convert persistence data for live, running process instances from Process Automation Server version 1 to Process Automation Server version 2. It explains the IPA Persistence File Conversion Tool (PFCT), and the manual steps required to ensure correct conversion of the persistence data.

As noted earlier in the IPA Technical Reference, Process Automation Server version 2 requires Microsoft SQL Server and does not work with Oracle databases. If your process automation uses an Oracle database, continue to use Process Automation Server version 1.

- [Prerequisites and Assumptions](#)
- [Converting the Persistence Data](#)

Prerequisites and Assumptions

This section lists the prerequisites and assumptions necessary before using the tool.

- [Stop Process Automation Server and Get Snapshot of Persistence Files](#)
- [Verify You Have a Build That Supports the Tool](#)
- [Ensure that the Process Definitions Migrated](#)
- [Have a Way to Batch-Import Microsoft SQL Server .SQL Files](#)

Stop Process Automation Server and Get Snapshot of Persistence Files

If the Process Automation Server version 1 or Process Automation Server version 2 services are running on the CIC server, the IC System Manager lists them with the following names:

- **Process Automation Server**
- **Process Automation Server v2.0**

If the Process Automation Server version 1 or Process Automation Server version 2 services are running, stop them on both the primary and backup servers.

Warning!

Trying to convert persistence data while the Process Automation Server version 1 or Process Automation Server version 2 services are running could cause loss or corruption in process instances and the related data. The tool uses a snapshot of the persistence data. Stop the Process Automation Server so that the snapshot does not change as the tool is running.

After stopping the Process Automation Server, get a snapshot of the persistence data and protect it by renaming the existing persistence folder. The **PAS_PersistencePath** server parameter in Interaction Administrator sets the persistence folder so it could differ from the default folder shown here. Rename the folder from:

C:\I3\IC\Persistence\ProcessAutomationServer

to:

C:\I3\IC\Persistence\ProcessAutomationServer-Original

After you rename the folder, make the folder and its contents read-only. This action protects the original persistence files so that you can revert to Process Automation Server version 1 if necessary. However, Process Automation Server version 2 keeps its data in the database, so it does not use a persistence files folder.

Note: The number of persistence files is based on the number of running process instances and the complexities of the running processes. The folder could contain thousands of persistence files.

Verify You Have a Build That Supports the Tool

The Persistence File Conversion Tool (PFCT) consists of three files. Verify that your build of CIC includes these files:

- ININ.ProcessAutomation.PersistenceFileConversionTool.Common.dll
- ININ.ProcessAutomation.PersistenceFileConversionTool.Console.exe
- ININ.ProcessAutomation.PersistenceFileConversionTool.Gui.exe

These files were not available before CIC 2015 R3. Starting with CIC 2015 R3, the following program installs include these files:

- CIC server (C:\I3\IC\Server)
- IC Business Manager Apps
C:\Program Files (x86)\Interactive Intelligence\BusinessManagerApps
- IC Server Manager Apps
C:\Program Files (x86)\Interactive Intelligence\ServerManagerApps

If you do not have these files, update to the latest 2015 R3 or later patch.

Ensure that the Process Definitions Migrated

The process definitions files are typically in this location on the server:

C:\I3\IC\Server\Flows\Workflows

Directory Services (DS) has entries that point to the files and mark the active process definitions (processes available to start). Use Interaction Migrator to migrate the process definitions and related DS entries. If the files and entries didn't migrate, Process Automation Server cannot restore the process instances after conversion of the persistence files.

Have a Way to Batch-Import Microsoft SQL Server .SQL Files

The PFCT outputs a set of .SQL script files. You must have a SQL tool that imports the files into SQL Server. Microsoft SQL Server has this tool, as does the Microsoft SQL Server Management Studio:

sqlcmd.exe

[Step 8: Import the SQL Files](#) has a simple batch script that uses the sqlcmd tool to import the .SQL files.

Converting the Persistence Data

This section shows the steps to convert Process Automation Server version 1 persistence data into Process Automation Server version 2 persistence data.

If your CIC software is not on the C: drive, adjust the paths as needed.

[Step 1: Copy the PASv1 Persistence Folder](#)

[Step 2: Starting the Persistence File Conversion Tool](#)

[Step 3: Setting the Source Folder](#)

[Step 4: Setting the Output Folder](#)

[Step 5: Setting the Output Folder Options](#)

[Step 6: Convert the Files](#)

[Step 7: Review the Log](#)

[Step 8: Import the SQL Files](#)

[Step 9: Start Process Automation Server with the Storage ID](#)

[Step 10: Verify Successful Conversion](#)

[Step 11: Start Process Automation Server \(The Normal Way\)](#)

[Step 12: Cleanup](#)

Step 1: Copy the PASv1 Persistence Folder

You previously made a snapshot of the existing Process Automation Server version 1 persistence data:

```
C:\I3\IC\Persistence\ProcessAutomationServer-Original
```

That folder stores and protects the persistence files. Make a working copy of the files and use the tool against the copy instead of the original files in the folder.

You can run the PFCT on the server (CIC server install) or on a separate machine (IC Business Manager Applications or IC Server Manager Applications installs). Run it on the same machine as the working files. If you copy the files to a machine other than the server, have the PFCT on that machine.

The PFCT creates verbose file names for output files to help with debugging. Therefore, use a short folder name for the files, such as:

```
C:\PASv1
```

If you made the original working files read-only, make the working copy of the folder writable.

Step 2: Starting the Persistence File Conversion Tool

There are two PFCT applications: console and GUI. They do the same thing. Use the GUI application unless you need the console program.

As you use the GUI tool, it shows equivalent command-line parameters for the console tool. To see all command-line parameters, use the Windows command prompt to type this command from the folder that has the console tool:

```
InIn.ProcessAutomation.PersistenceFileConversionTool.Console.exe /?
```

These steps assume that you are using the GUI tool. To start the tool, run the following application from the folder that contains the tool:

```
InIn.ProcessAutomation.PersistenceFileConversionTool.Gui.exe
```

Step 3: Setting the Source Folder

The PFCT converts Process Automation Server version 2 persistence files from the source folder, and outputs SQL files in the Output Folder. Set the folder with the working copy of the Process Automation Server version 1 persistence files as the source folder:

```
C:\PASv1
```

Step 4: Setting the Output Folder

By default, the output folder is a subfolder underneath the source folder. The PFCT creates `.SQL` files in the output folder. Unless you have to change the output folder to a different physical disk because of disk space limitations, leave the default value.

```
C:\PASv1\PFCT
```

Step 5: Setting the Output Folder Options

The GUI tool includes the following options for specifying what to do about existing files in the output folder:

- Keep existing files in the output folder.
- Erase existing files in output folder.
- Create a timestamped subfolder in the output folder.

Genesys recommends that you choose the option for creating a timestamped subfolder unless there's a specific reason to choose one of the other options. These steps assume that you chose the third option.

Step 6: Convert the Files

The PFCT GUI has a **Shell Command** group box. It shows you the selected console command and options. It lets you copy the command to the Clipboard for later use. To run the conversion process directly from the GUI, click **Execute**. The **Execute** option in the GUI and the shell command do the same thing.

To cancel a conversion in progress, click **Stop** in the GUI or press **Escape** in the console program. It's possible that the conversion won't stop immediately. The PFCT detects the **Cancel** order, but waits for any running jobs to finish before it stops.

Step 7: Review the Log

The PFCT Execution Results section contains a log that it updates as conversions execute.

The logs show conversion errors (if any) and statistical updates. The log shows conversion errors as the system detects them, but statistical updates occur only every few seconds. If processes or their relationships are complex, statistical updates are less frequent. More complex cases can take a few minutes.

After conversion is complete, look in the GUI's Execution Results section or click **Open Log File** to review the end of the log. The last traces provide information about the files generated, any errors, and so forth. The log file that the tool created during the conversion is in the same folder as the output `.SQL` files.

Warning!

If the log shows errors, it's possible that the corresponding process instances aren't in Process Automation Server version 2 when importing the generated SQL files.

The PFCT created `.SQL` files in the output folder. If you used the suggested values, the output files are here:

```
C:\PASv1\PFCT\Conversion on YYYY-MM-DD HH-MM-SS
```

Note: If you chose the timestamped subfolder option, the folder name includes a date and time (GMT).

Step 8: Import the SQL Files

At this point, Microsoft SQL Server is running and you can batch-import an entire folder of `.SQL` files. This section describes one method, using the "sqlcmd" tool included in Microsoft SQL Server.

1. Create a batch file named `import.bat`, in the same folder as the generated `.SQL` files.
2. Add the following line to the batch file, where you provide appropriate values for {server}, {database}, {user} and {password}:

Note: Type this command on a single command line with no line breaks:
for %i IN (*.sql) Do sqlcmd -S {server} -d {database} -U {user} -P {password} -i "%i" >> import.log

3. Run the batch file.
4. Check the `import.log` file to ensure that no errors occurred. The generated SQL files are now in the database.

Step 9: Start Process Automation Server with the Storage ID

In Process Automation Server version 2, a specific Process Automation Server version 2 server instance owns each process instance. They link to the server's storage ID. As a result, each Process Automation Server version 2 server instance also owns all the process instance database records associated with its storage ID.

The PFCT uses its own storage ID in SQL files that it creates. The tool always uses this storage ID, and only the PFCT uses it:

```
d094e0a7-85ac-4be9-b7b3-30933b6cf0f5
```

Since only the PFCT uses the PFCT storage ID, no server instance owns the converted records initially; their storage ID doesn't match that of any server instance.

To back out the records, isolating all the PFCT-generated records keeps them separate from existing records. You can use a database query to remove converted database records.

To migrate converted records into the ownership of a server instance, run the "flow_admin.exe" tool with no arguments. It lists the migrated process instances as associated with its own dummy server inside the tool. It asks whether you want to transfer the ownership of those instances to the ownership of a running Process Automation Server. If you click **Yes**, the tool contacts a running Process Automation Server instance and assigns it ownership.

Step 10: Verify Successful Conversion

After Process Automation Server version 2 starts, the process instances are available. The instances appear in Process Monitor, while work items appear in clients. You can view Process Details in Process Monitor and pick up work items. However, only converted processes appear. If you started process instances under Process Automation Server version 2 instead of converting them from PASv1, that persistence information is in the database but the instances don't appear because they have a different storage ID.

Warning!

If there is something wrong, do not continue. Once you merge the PFCT well-known storage ID with the normal storage ID for Process Automation Server running on the server, it's difficult to back out the changes.

Step 11: Start Process Automation Server (The Normal Way)

Process Automation Server version 2 previously started from the command line with a special, well-known storage ID. That instance of Process Automation Server version 2 remains running.

Transfer the database from the PFCT's storage ID to the one for Process Automation Server version 2 running on the server.

Start a normal instance of Process Automation Server version 2 by starting Process Automation Server v2.0 from IC System Manager.

Give the new instance of Process Automation Server version 2 time to start. After it shows as Started in IC System Manager, turn off the other instance of Process Automation Server version 2 that you used to test the converted process instances:

1. Locate the command-line window that is running that Process Automation Server version 2 instance.
2. Press **Ctrl+C** to stop that instance of Process Automation Server version 2 in a controlled manner.

Warning!

Allow that instance of Process Automation Server version 2 to stop completely before closing the command window. If you close the window too early, it's possible that the database records didn't transfer properly to the other storage ID.

Note: There is also a "flow_admin" tool that you can use to move the database records between storage IDs. However, if two Process Automation Server version 2 instances are running, the records from the instance that you turned off transfer automatically to the remaining, running instance.

Step 12: Cleanup

Once all process instances migrate and you verified that you did not lose process instances or their data, delete the original persistence files, working persistence files, and generated SQL files.

Deleting the files provides better security because they contain plain-text batch instructions that can have passwords and other sensitive information. Leaving that information available is a security risk. However, if you encounter a conversion problem later, it helps to have the files. If you choose to keep the files instead of deleting them, consider encrypting them or using some other method to protect the information that they contain. The files are:

- C:\I3\IC\Persistence\ProcessAutomationServer-Original
- C:\PASv1
- C:\PASv1\PFCT\
- C:\PASv1\PFCT\Conversion on YYYY-MM-DD HH-MM-SS

Change Log

The following table lists the changes to this document since its initial release.

Date	Changes
17-November-2011	Initial Release
08-March-2012	<ul style="list-style-type: none"> • Updated for switchover enhancements. • Added recovery procedure for situations where failed primary server data is not accessible to recover. • Added manual switchover information • Added new server parameters.
09-August-2012	<ul style="list-style-type: none"> • Added Troubleshooting section. • Added descriptions of new server parameters.
11-September-2012	Added process-level security feature for PCI compliance.
27-September-2012	Added information about server parameters.
14-February-2013	Added persistence recovery information about test processes
24-April-2013	<ul style="list-style-type: none"> • Added step to stop process automation server in section "What to Do When you Cannot Recover Data from the Failed Server." • Added note about enhanced security warning during server install.
16-August-2013	In the Persistence/Recovery section, added a note about using the replica copy of the persistence recovery files on the backup server in the event that the files on the primary server are corrupt or unreadable.
08-May-2014	<ul style="list-style-type: none"> • Updated "Additional Server Parameters" to say that only migrated 3.0 prs use the <code>PAS_HandlerResponseTimeout</code> parameter. • Rechecked all other content. • Added coverage of how CIC handles queued IPA processes when there is a switchover (automatic or manual).
28-July-2014	Added several new server parameters.
01-September-2014	Updated documentation to reflect changes required in the transition from version 4.0 SU# to CIC 2015 R1, such as updates to product version numbers, system requirements, installation procedures, references to Product Information site URLs, and copyright and trademark information.
06-January-2015	Added information about Process Automation Server version 2 and new server parameters but holding for 2015 R3.
09-March-2015	Updated copyrights and made minor tweaks.
23-March-2015	<ul style="list-style-type: none"> • Added Appendix A about the Persistence File Conversion Tool. • Made other minor updates. • Added a section about the IPA Web Client.
23-April-2015	Expanded sections about the Process Automation Server. Made other minor tweaks and updates.
09-September-2015	Updated documentation to reflect the removal of Interaction Client .NET Edition, and clarified that work items can be used with Interaction Desktop or IPA Work Item Client.
15-October-2015	Added section about PASv2 off-server install.
24-August-2016	<ul style="list-style-type: none"> • Added IPA Process Automation Server Version 2 section. • Removed Rollback from Process Automation Server version 2 to PASv1 section.
06-April-2017	<ul style="list-style-type: none"> • Added <code>PAS_LoadBalanceThreshold</code> optional parameter. • Updated copyright page. • Removed reference to Interaction Client .Net Edition and Interaction Client Web Edition in IPA and CIC Clients section.

15-August-2017	<ul style="list-style-type: none">• Rebranded to Genesys.• Removed server parameter: PAS_usev2.
30-May-2018	<ul style="list-style-type: none">• Updated Appendix A.• Removed Troubleshooting section. PASv2 doesn't support the server parameters in this section.
1-October-2018	Updated certificate file location in Step 1 of Procedure for Adding a Certificate.
22-May-2019	Reorganized the content only, which included combining some topics and deleting others. For more details, see CICDOC-190 .