Informatica Architecture: Nodes and Domains
Abstract

The Informatica domain consists of one or more servers, one or more installations of the Informatica software, and at least one relational database. This article is a discussion of how nodes work with the database, communications between nodes, what happens when a node dies, and basic troubleshooting on your domain.

Supported Versions

- Informatica 9.x

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Nodes and Domains Architecture

When you install and run the Informatica services, the installation is known as a node. The node becomes part of an Informatica domain. A domain is a grouping of one or more nodes. The domain forms the environment upon which the Informatica service processes run. One of the nodes in the domain connects to a relational database. The database holds the tables for the domain configuration repository. You can add nodes to the domain when you install the node, or you can change an existing node and add it to a another domain.

A node in the domain can be a worker node or a gateway node. A gateway node can connect to the domain database and change the metadata stored in the domain tables. A gateway node can also be a master gateway node. The master gateway node runs management services for the rest of the domain and it is the one node in the domain that updates the domain database. A worker node runs service processes and it also connects to the master gateway node. A domain can have any number of worker nodes and gateway nodes, but it can have only one master gateway node at a time.

The running domain requires a master gateway node to be running as well. If the domain has more than one gateway node, and the master gateway fails, one the other gateway nodes elect a new master gateway node.

Domain Basics

The most basic description of an Informatica domain is this: There is a node, and there is a domain database. The node is where stuff runs. The database is where the node keeps stuff.

The domain database is a standard relational database. Informatica supports Oracle, IBM DB2, Sybase, and MSSQLServer for domain databases. For more information about supported databases, see the Product Availability...
Matrix at the following link:

The node connects to the domain database through JDBC. It does not use native database connectivity, and it does not use ODBC. In all but a few rare situations, the supported JDBC drivers are the ones that Informatica has licensed from DataDirect, and they are the ones that you should use for the Informatica domain.

The domain database is like a 'backbone' that supports all of the moving parts in the domain. It holds metadata for services that run on the node. It also stores records of jobs that ran on that node, as well as other data.

The JDBC connection string for the domain database requires the following parameters: user name, password, database host name, database service name and database port number. Optional parameters are available for troubleshooting or optimizing performance, but these are the minimum required for connecting to the domain database.

Validation of the connection string occurs when the node tries to connect to the domain database.

The Node

The node is a logical representation of the Informatica installation on a server. It is run by Apache Tomcat, a servlet container. Every node runs at least one Java process. The first Java process is known as the Service Manager.

The node uses the following configuration files to tell it what to do and what other nodes are in the domain:

- **nodemeta.xml**
  
  The node uses nodemeta.xml to configure itself as either a gateway node or a worker node. nodemeta.xml always lives in INFA_HOME/sp/config.

  It contains the following settings:

  - Http port that the node uses for communications with other nodes in the domain.
  - Node port that the node uses for client connectivity. The client tools will connect to the node on that port.
  - JDBC connection information for updating the contents of the domain database. This setting applies to gateway nodes.
  - The Informatica Administrator port number and the Administrator tool shutdown port number. This setting applies to gateway nodes.

- **domains.infa**
  
  domains.infa contains connection information about the other nodes in the domain, and it lives in the INFA_HOME directory. The node uses this file when communicating with the other nodes in the domain, especially the master gateway node.

  **Note:** If you manually modify either of these files, you can change how the node connects to other nodes in the domain or connectivity to the master gateway node. If you need to make these changes, run either infasetup updategatewaynode or infasetup updateworkernode.

Two Kinds of Nodes

There are two kinds of nodes, the gateway node and the worker node. The gateway nodes can run management services for the domain, and they are also the ones that communicate with the domain database. The worker node can run application services, but cannot communicate with the domain database.

Only one gateway node can run the management services at a time, and only one node can talk to the domain database at a time, regardless of how many nodes are in the domain. The node that performs these tasks is the master gateway node. While there is no upper limit on the number of nodes in a domain, each domain has a minimum of one gateway node.
**Worker Nodes**

A worker node runs a Service Manager process, and it can run application services. The worker node cannot run the extra management processes, nor does it communicate with the domain database. This can be good, because it does not require the extra resources for management, but it cannot take over as a master gateway node.

**Gateway Nodes**

A gateway node can run application services, and it runs its own Service Manager Process. When you start the master gateway node, the management services log their startup progress to node.log and catalina.out. You can find both of these log files in INFA_HOME/tomcat/logs.

The following log segment came from a catalina.out file, and it illustrates the startup process for a master gateway node:

2013-Jun-12 09:47:20.031 Starting Tomcat on HTTP port [9005].
[2013-Jun-12 09:47:42.353] Log service init method is called.
[2013-Jun-12 09:47:42.377] User Management service init method is called.
[2013-Jun-12 09:47:43.394] Edr service init method is called.
[2013-Jun-12 09:47:43.841] Licensing service init method is called.
[2013-Jun-12 09:47:44.433] Plugin Registry service init method is called.
[2013-Jun-12 09:47:44.444] Master Core services enabled.
[2013-Jun-12 09:47:45.023] LogServiceAgent init method is called.

The following services run on the master gateway node:

- **Master Core Services.** Master Core Services are the services that are in this list.
- **Domain Configuration Service.** The Domain Configuration Service sets aside resources from the node to run these services. It also holds the metadata that describes the services in this list.
- **The Log Service.** The Log Service writes logs for the domain, PowerCenter Integration Services, PowerCenter Repository Service, and other application service logs. On startup, it validates the common log location on the file system. If the domain contains multiple nodes, all nodes write logs to this directory. Users usually retrieve Service and Domain logs in the Administrator tool.
- **The User Management Service.** The User Management Service manages users for the domain. Users can either exist in the domain database, or they can live in an external LDAP server. In that case, the LDAP server performs user validation. For more information about supported LDAP servers, see the Product Availability Matrix: [https://communities.informatica.com/docs/DOC-10087](https://communities.informatica.com/docs/DOC-10087)
- **The EDR Service.** The EDR Service contains Data Quality connection objects. It manages Data Quality client connectivity.
- **The Alert Domain Function.** The Alert Domain Function handles alerts for the users that have subscribed to alerts in the domain.
- **The Licensing Service.** The Licensing Service runs the license and ensures that the end users can only use the functionality that they have paid to license. It also ensures that the license key is current and valid.
- **The Monitoring Service.** The Monitoring Service handles run-time statistics for integration objects in the Model repository. The Service Manager stores the monitoring configuration in the Model repository.
- **The Plugin Registry Service.** The Plugin Registry Service manages the plugins for the application services. If the error severity level for this node is ‘DEBUG’, then the Plugin Registry Service lists all of the plugins on startup. Otherwise, it lists only the most recently added plugins.

On the master gateway node, a second Java process starts the Administrator tool. You can easily find the Administrator tool in the running processes on the operating system because the parent process ID is the same as the process ID for the Service Manager.
Master Gateway Node

Any gateway node can also be a master gateway node. The master gateway node differs from a worker node or an ordinary gateway node in the following ways:

- A worker node runs a Service Manager task. It does not run any management tasks, nor does it run the Administrator tool. The worker node also cannot connect to the domain database because it lacks the functionality to do so. There can be any number of worker nodes in a domain, provided that there is a minimum of one gateway node. You can change a worker node to a gateway node, and you can change a gateway node to a worker node, but not dynamically. See the sections in the Command Reference for ‘infacmd SwitchToGatewayNode’ and ‘infacmd SwitchToWorkerNode’ to address these changes.

- A gateway node can run the management tasks, the Administrator tool, and update the domain database, but that does not necessarily mean that it does. A running gateway node is prepared to perform those tasks, only if needed, in addition to any application services that it is also running.

- A master gateway node performs the management tasks. It runs the Administrator tool, updates the domain database, and runs the management tasks. A domain can have an unlimited number of worker nodes, an unlimited number of gateway nodes, and one master gateway node.

Node Communication

The master gateway node is the one node in the domain that communicates with the domain database, and it does so through JDBC. It periodically performs a heartbeat check against the domain database. The default interval for this check is every eight seconds.

All non master gateway nodes in the domain check with the master gateway node to verify that the master gateway node is still running. This check is the 'greeting exchange'. The nodes use the HTTP port of the master gateway node, as defined in domains.infa, to send the greeting exchange message. By default, the nodes send this exchange every 15 seconds.
Adding a Node to a Domain

There are two ways to add extra nodes to an existing domain:

- A node can be added to an existing domain during the installation process. The person installing the node will provide the credentials to connect to the current master gateway node. If they are installing a gateway node then they will also provide the JDBC connection credentials.
- When the media are already available on the server, the administrator can either run infasetup defineworkernode or infasteup definegatewaynode and then run infacmd addnode to add the new node to the domain.

When a worker node is added to a domain, it contacts the current master gateway node. It retrieves the complete contents of domains.infa from the master gateway node. When that is complete, it can work with any node that becomes the master gateway, and send the greeting exchanges to the correct node.

When a gateway node is added to the domain, it queries the domain database for the name of the current master gateway node. It then contacts that master gateway and queries for the full contents of domains.infa to populate its own domains.infa.

What Happens When a Node Goes Down?

There are many ways to answer this question, and the answer becomes more complicated on domains that host a larger number of nodes.

Single-node domain
- When the one node in a single-node domain goes down, the domain dies. Any services running on that node go down as well.

Two-node domain with a worker node and a gateway node
- In a domain with one gateway node and one worker node, if the lone gateway node goes down, so does the worker node and any application services. If the worker node goes down, then the gateway node will continue running.

Two-node domain with two gateway nodes
- In a domain with two gateway nodes, and the master gateway node goes down, the second gateway node will take over for the first one.

Multiple-node domain with more than two gateway nodes
- In a domain with more than two gateway nodes, where the master gateway dies, the remaining gateway nodes hold an election to select the next master gateway node.

Example: Four-node Domain

Let's say that the domain has four nodes: N_1, N_2, N_3, and N_4. N_1 is the master gateway node. Nodes 2 and 3 are also gateway nodes. Node 4 is a worker node. Node 1 stops responding to the greeting exchanges. Nodes 2 and 3 start checking with the domain database. The two gateway nodes connect to the domain database and they both check the ISP_MASTER_ELECTION table to find out which node is the new master gateway node. By default, the nodes check every eight seconds. The gateway nodes go through four cycles of check the master gateway/check the domain database. Four cycles of eight seconds each means that the gateway nodes elect a new master gateway node.
within 32 seconds. That node sends an alert to the other the nodes in the domain and announces that it is the new master gateway node.

Troubleshooting

The master gateway node in my domain loses connectivity to the domain database. How should I start troubleshooting this problem?

If there is a loss of connectivity to the domain database, the issue has already been isolated to the master gateway node, because it is the only node to communicate with the domain database.

- Check the node.log in the master gateway installation, and look for errors there.
- Test connectivity to the domain database by using a JDBC test tool. For more information about a JDBC test tool, see the Informatica Knowledge Base article 150155.

One of the nodes in my domain stops communicating with the master gateway node. What should I check?

If there is a failure on a particular node, check node.log for errors. Can the node connect to the master gateway node on the http port? Test that connectivity with the telnet test:

```
$t elnet <host name> <http port number>
```

The test yields errors on failure. If it is successful, the window sits, open, as the host waits for incoming packets.
I have multiple gateway nodes in my domain. I think that they might not be able to communicate with each other. What can I check?

If there is a loss of connectivity between nodes. Use the telnet test to verify that the nodes can connect to each other using the ports in the local domains.infa files.

I think that network problems might be causing node failures because the nodes fail when they cannot update the gateway node within the default time period. What can I do to resolve this?

Informatica cannot resolve a third-party network issue, but we might be able to provide a workaround to mitigate the symptoms. Contact Global Customer Support, and describe the failures. They might be able to provide configuration changes to increase the time limits that nodes use to communicate with each other and with the domain database.

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