FORGEROCK®

Deployment Planning Guide

/ Autonomous Identity 2020.10.2

Latest update: 2020.10.2

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Abstract

This guide is targeted to deployer, administrators, and system architects who must plan a production deployment of the Autonomous Identity system.

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Overview

Use this guide to plan your production Autonomous Identity deployment.

ForgeRock® Autonomous Identity is an entitlements analytics system that lets you fully manage your company's access to your data.

An entitlement refers to the rights or privileges assigned to a user or thing for access to specific resources. A company can have millions of entitlements without a clear picture of what they are, what they do, and who they are assigned to. Autonomous Identity solves this problem by using advanced artificial intelligence (AI) and automation technology to determine the full entitlements landscape for your company. The system also detects potential risks arising from incorrect or over-provisioned entitlements that lead to policy violations. Autonomous Identity eliminates the manual re-certification of entitlements and provides a centralized, transparent, and contextual view of all access points within your company.

Important

This guide is for deployers, technical consultants, and administrators who are familiar with Autonomous Identity and are responsible for architecting a production deployment.

Quick Start

Features Learn about the Autonomous Identity features.	Architecture in Brief Learn about the Autonomous Identity architecture.	Security Controls Learn about the Autonomous Identity security controls.
Topology Planning Learn about topology sizing considerations.	Deployment Checklist Learn about the Autonomous Identity deployment checklist.	Glossary Review the Autonomous Identity glossary terms

For installation instructions, see the Installation Guide.

For component versions, see the Release Notes.

Chapter 1
Features

Autonomous Identity provides the following features:

- **Broad Support for Major Identity Governance and Administration (IGA) Providers**. Autonomous Identity supports a wide variety of Identity as a Service (IDaaS) and Identity Management (IDM) data including but not limited to comma-separated values (CSV), Lightweight Directory Access Protocol (LDAP), human resources (HR), database, and IGA solutions.

- **Highly-Scalable Architecture**. Autonomous Identity deploys using a microservices architecture, either on-prem, cloud, or hybrid-cloud environments. Autonomous Identity's architecture scales linearly as the load increases.

- **Powerful UI dashboard**. Autonomous Identity displays your company's entitlements graphically on its UI console. You can immediately investigate those entitlement outliers as possible security risks. The UI also lets you quickly identify those entitlements that are good candidates for automated low-risk approvals or re-certifications. Users can also view a trend-line indicating how well they are managing their entitlements. The UI also provides an application-centric view and a single-page rules view for a different look at your entitlements.

- **Automated Workflows**. Autonomous Identity reduces the burden on managers who must manually approve new entitlements, for example, assigning access for new hires, by auto-approving high confidence, low-risk access requests and automate the re-certification of entitlements. Predictive recommendations lends itself well to automation, which saves time and cost.

- **Powerful Analytics Engine**. Autonomous Identity's analytics engine is capable of processing millions of access points within a short period of time. Autonomous Identity lets you configure the machine learning process and prune less productive rules. Customers can run analyses, predictions, and recommendations frequently to improve the machine learning process.

- **Powerful Explainable AI Algorithms**. The Analytics Engine provides transparent and explainable results that lets business users get insight into why the end-user has the access they have, or what access they should have.

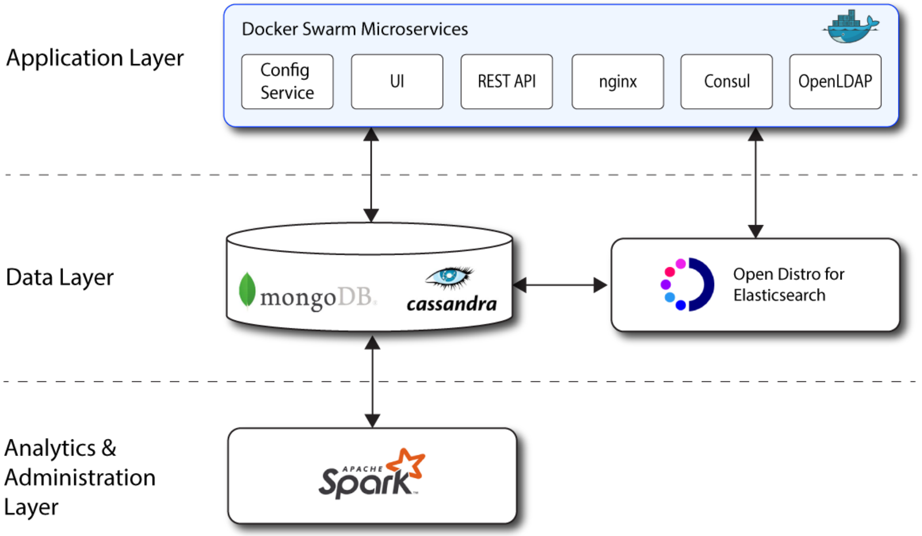
- **Broad Database Support**. Autonomous Identity supports both Apache Cassandra and MongoDB databases. Both are highly distributed databases with wide usage throughout the industry.

- **Improved Search Support**. Autonomous Identity now incorporates Open Distro for Elasticsearch, a distributed, open-source search engine based on Lucene, to improve database search results and performance.

Chapter 2
Architecture in Brief

The Autonomous Identity architecture has a simple three-layer conceptual model that provides flexible configuration and deployment in a wide-variety of environments: single-node or multi-node configurations across on-prem, cloud, hybrid, or multi-cloud environments.

Figure 1: A Conceptual Image of the Autonomous Identity Architecture

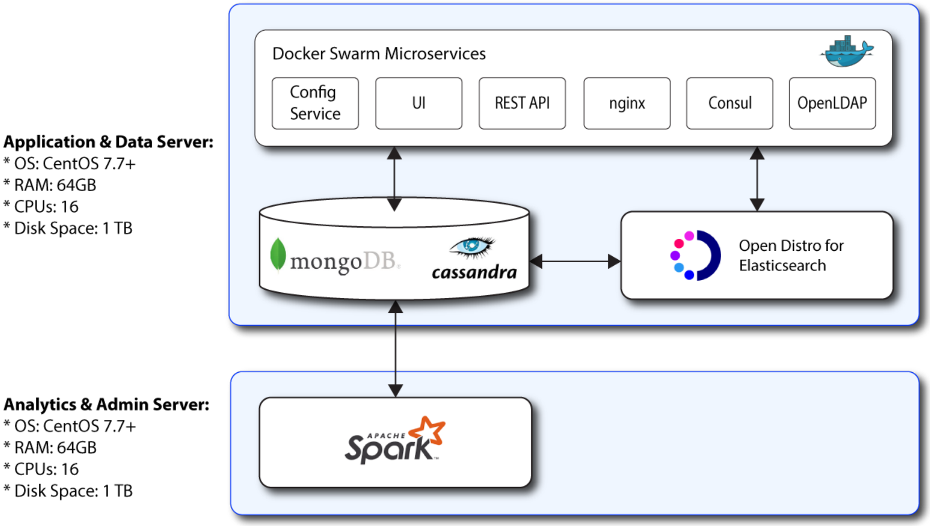


- **Application Layer**. Autonomous Identity implements a flexible Docker Swarm microservices architecture, where multiple applications run together in containers. The microservices component provides flexible configuration and end-user interaction to the deployment. The microservices components are the following:
  - **Configuration Service**. Autonomous Identity supports a configuration service that allows you to set parameters for your system and processes.
  - **Autonomous Identity UI**. Autonomous Identity supports a dynamic UI that displays the entitlements, confidence scores, and recommendations.

  - **Autonomous Identity REST API**. Autonomous Identity provides an API that can access endpoints using REST. This allows easy scripting and programming for your system.
  - **Nginx**. Nginx is a popular HTTP server and reverse proxy for routing HTTPS traffic.
  - **Hashicorp Consul**. Consul is a third-party system for service discovery and configuration.
  - **Backend Repository**. The backend repository stores Autonomous Identity user information. To interface with the backend repository, you can use the **phpldapadmin** tool to enter and manage users.
- **Data Layer**. Autonomous Identity supports Apache Cassandra NoSQL and MongoDB databases to serve predictions, confidence scores, and prediction data to the end user. Apache Cassandra is a distributed and linearly scalable database with no single point of failure. MongoDB is a schema-free, distributed database that uses JSON-like documents as data objects.
- **Analytics and Administration Layer**. Autonomous Identity uses a multi-source Apache Spark analytics engine to generate the predictions and confidence scores. Apache Spark is a distributed, cluster-computing framework for AI machine learning for large datasets. Autonomous Identity also uses a deployer wrapper script to launch Ansible playbooks for easy and quick deployment of the components.

For pilot deployments, we typically configure a two-server deployment with the minimum hardware and software requirements:

Figure 2: An Image of a Two-Server Autonomous Identity Pilot Architecture



Chapter 3
Security Controls Overview

Autonomous Identity uses a number of security protocols as summarized below.

Security Controls

Security	Description
Encryption Protocol	TLSv1.2
Encryption: External Data in Transit	All data in transit from Autonomous Identity to the outside world is encrypted. SSL certificates must be configured with the load balancer. Autonomous Identity configures self-signed certificates used by Nginx. Customers can also use their own certificates during deployment.
Encryption: Internal Data in Transit	Within the Autonomous Identity secure server network, most data in transit between the Autonomous Identity services is encrypted, but not all. The exception is any non-encrypted communication between Autonomous Identity servers. You can protect this communication via network firewalls. It is also recommended to disable access on network and firewall ports for services like Spark that are meant for internal access only. The rest of the services are SSL/TLS-protected including all Nginx protected services, Mongo, Cassandra, and Elasticsearch nodes.
Encryption: Data at Rest	MongoDB is not encrypted natively in Autonomous Identity, but can be encrypted via third-party disk encryption or using the MongoDB enterprise version. If encryption at rest is required, please confirm with the MongoDB vendors how this is handled in existing MongoDB clusters. Likewise, Cassandra is not natively encrypted, but can be supported through its enterprise versions.
Authentication	Autonomous Identity users various authentication methods within its systems, such as the following: • **LDAP Authentication**. User credentials (user/groups) are stored in LDAP (OpenLDAP). Users can log in with a username and password. This is mostly used for development or QA scenarios. • **OpenID Connect**. Autonomous Identity can use Single Sign-On (SSO) by integrating SSO providers like Azure AD and ForgeRock® Access Management (AM). Zoran-API service is protected by authentication handlers that support token-based access.

Chapter 4

Topology Planning

Based on existing production deployments, we have determined a suggested number of servers based on total entitlement assignments. These suggested number of servers are guidelines for your particular deployment requirements. Unique client requirements may require customization, which may differ from the listed number of servers.

For a description of possible production deployments, see "*Deployment Architectures*" in the *Installation Guide* in the Installation Guide.

Suggested Number of Servers

Data Set Ranges

	Small	Medium	Large	Custom
Total Assignments	<1M	1-5M	5-15M	15M+
Suggested # of Servers				
Application[a]	Discuss with Autonomous Identity Team (dependent on HA requirements)			
Database	2	2	3	Custom[b]
Analytics	1	2	3	Custom[b]

[a] Docker Swarm is designed to be highly available and may require 5 or more nodes. For a production deployment, the specific requirements can be discussed with the Autonomous Identity Team. Docker Swarm requirements are not correlated to data set size, but to front-end user requirements (for example, the number of users and frequency of use).

[b] For environments with more than 15 million assignments, server requirements will need to be specifically customized.

Production Technical Specifications

Autonomous Identity 2020.10.2 has the following technical specifications for production deployments:

Production Technical Specifications

	Application	**Database**	**Database**	**Analytics**
Installed Components	Docker	Cassandra	MongoDB	Spark/Docker (Spark Master)
OS	CentOS	CentOS	CentOS	CentOS

# of Servers	See "Suggested Number of Servers"	See "Suggested Number of Servers"	See "Suggested Number of Servers"	See "Suggested Number of Servers"
RAM (GB)	32	32	32	64
CPUs	8	8	8	16
Non-OS Disk Space (GB)[a]	1000	1000	1000	1000
NFS Shared Mount	Application layer services require acess to the shared mount directory for analytics.	N/A	N/A	1 TB NFS mount shared across all Docker Swarm nodes (if more than 1 node is provisioned) at location separate from the non-OS disk space requirement. For example, `/shared`.
Networking	nginx: 443 Docker Manager: 2377 (TCP) Docker Swarm: 7946 & 4789 (UDP) + 7946 & 2049 (TCP)	Client Protocol Port: 9042 Cassandra Nodes: 7000	Client Protocol Port: 27017 MongoDB Nodes: 30994	Spark Master: 7077 Spark Worders: Randomly assigned ports
Licensing	N/A using Docker CE free version	N/A	N/A	N/A
Software Version	Docker: 19.03.8	Cassandra: 3.11.2	MongoDB: 4.4	Spark: 2.4.4 Docker: 19.03.8
Component Reference	See below.[b]	See below. [c]	See below. [d]	See below. [e]

[a] At root directory "/"

[b] https://docs.docker.com/ee/ucp/admin/install/system-requirements/

[c] http://cassandra.apache.org/doc/latest/operating/hardware.html

https://docs.datastax.com/en/dse-planning/doc/planning/planningHardware.html

[d] https://docs.opsmanager.mongodb.com/v4.0/core/requirements/

[e] https://spark.apache.org/docs/2.2.0/hardware-provisioning.html

https://spark.apache.org/docs/latest/security.html#configuring-ports-for-network-security

Chapter 5
Deployment Checklist

Use the following checklist to ensure key considerations are covered for your 2020.10.2 deployment:

Deployment Checklist

Check ✔	Requirement	Details
Access		
□	Remote Access	The Autonomous Identity Team is a global team. To support the needs of client teams, remote access to all servers is required for deployment and support of product.
□	Root Access	Root access is required to run required package installations (YUM), perform Docker installation, Docker Swarm-based installation applicable boxes, and potential troubleshooting. Please discuss with delivery team if this requirement is a concern. If so, submit a specified contact to run admin tasks.
□	Service Account	The Autonomous Identity Team should have access to a single service account user (e.g., "autoid"), which will be used throughout as the primary owner of Autonomous Identity specific directories. Specific requirements regarding the service account are specified in this section.
□	File Transfer Process	The Autonomous Identity Team require access to a file transfer process, which lets specified packages be transferred from the vendor to the client infrastructure.
Service Account		
□	Autonomous Identity Team Access	Autonomous Identity team members must be able to switch to this user after logging in to the servers
□	SSH Ability	The service account must be able to passwordless SSH between all Autonomous Identity servers; preferred method is RSA SSH key authentication.
□	Default Shell	The default shell of the service account must be Bash.
□	Docker Commands	The service account must have permissions to run Docker commands. Note that Docker should NOT need to be installed as a prerequisite; this will be installed by deployment team.
□	Directory Ownership	Ownership of the following directories must be given to the Service Account. • /data (all servers)

		• /opt/autoid (all servers) • /shared (if applicable - Docker & Spark servers • /tmp (20 GB of disk allocated to /tmp, NOEXEC flag removed, and R/W/E required at least for the service account)
Networking/Internet		
□	Access to the Internet	If available, the front-end servers downloads the required Docker images from the official Autonomous Identity image repository.
□	SSL Certificates	If SSL is being implemented, SSL certificates are required for the UI, Cassandra or MongoDB nodes, and Spark nodes. These certificates can be generated using one of the following four options: • Self-signed certificates for all 3 components • Valid certificate for the UI and self-signed certificates for Cassandra, MongoDB, and Spark nodes (self-signed certs only used in server-server traffic) • Valid and separate certificates for the UI, Cassandra, MongoDB, and Spark • *.domainname.com certificate (wildcard)
□	Ports Open (Internal)	All internal ports specified in the Networking section of the Environment Specifications need to be opened for the specified servers.
□	Ports Open (external browser)	The following ports must be accessible from a web browser within the client network: • 443 (Front-end) • 8080 (Spark) • 8081 (Spark)
Required Packages		
□	Dependencies	The following packages must be installed on specified servers as prerequisites: • All Servers: Python 2.7 or Python 3 (3.5+) • Cassandra Servers: java-1.8.0-openjdk-devel.x86_64 • MongoDB: see Deployment Prerequisites. • Analytics Servers: java-1.8.0-openjdk-devel.x86_64
Other		
□	Infrastructure Support POC	A point-of-contact (POC) with sufficient access to the infrastructure is required. The POC can support in case of infrastructure blockers arise (e.g., proxy, account access, or port issues).

▢	SELinux	SELinux must be disabled on the Docker boxes. The package "container-selinux" must be present (this can be done as part of the root scripts described in the "Root Access" category).
▢	Components Not Pre-installed	The following software must NOT be pre-installed on the box: • Docker • Cassandra • MongoDB • Spark If any do come pre-installed, discuss the details with the Delivery Team ahead of time.

Glossary

anomaly report

A report that identifies potential anomalous assignments.

as-is predictions

A process where confidence scores are assigned to the entitlements that users have.

auto-certify

An action that an entitlement owner can do to approve a justification. Auto-certify indicates that anyone who has the justification is automatically approved for the entitlement.

auto-request

An action that an entitlement owner can do to approve a justification. Auto-request indicates that anyone who matches these justification attributes but may not already have access should automatically get provisioned for this entitlement.

confidence score

A score from a scale from 0 to 100% that indicates the strength of correlation between an assigned entitlement and a user's data profile.

data audit

A pre-analytics process that audits the seven data files to ensure data validity with the client.

data ingestion

A pre-analytics process that pushes the seven .csv files into the Cassandra database. This allows the entire training process to be performed from the database.

data sparsity

A reference to data that has null values. Autonomous Identity requires dense, high quality data with very few null values in the user attributes to get accurate analysis scores.

data validation

A pre-analytics process that tests the data to ensure that the content is correct and complete prior to the training process.

driving factor

An association rule that is a key factor in a high entitlement confidence score. Any rule that exceeds a confidence threshold level (e.g., 75%) is considered a driving factor.

entitlement

An entitlement is a specialized type of `assignment`. A user or device with an entitlement gets access rights to specified resources.

insight report

A report that provides metrics on the rules and predictions generated in the analytics run.

recommendation

A process run after the as-is predictions that assigns confidence scores to all entitlements and recommends entitlements that users do not currently have. If the confidence score meets a threshold, set by the `conf_thresh` property in the configuration file, the entitlement will be recommended to the user in the UI console.

resource

An external system, database, directory server, or other source of identity data to be managed and audited by an identity management system.

REST

Representational State Transfer. A software architecture style for exposing resources, using the technologies and protocols of the World Wide Web. REST describes how distributed data objects, or resources, can be defined and addressed.

stemming

A process that occurs after training that removes similar association rules that exist in a parent-child relationship. If the child meets three criteria, then it will be removed by the system. The criteria are: 1) the child must match the parent; 2) the child (e.g., [San Jose, Finance]) is a superset of the parent rule. (e.g., [Finance]); 3) the child and parent's confidence scores are within a +/- range of each other. The range is set in the configuration file.

training

A multi-step process that generates the association rules with confidence scores for each entitlement. First, Autonomous Identity models the frequent itemsets that appear in the user attributes for each user. Next, Autonomous Identity merges the user attributes with the entitlements that were assigned to the user. It then applies association rules to model the sets of user attributes that result in an entitlement access and calculates confidence scores, based on their frequency of appearances in the dataset.