Autodesk Forge on the AWS Cloud

Quick Start Reference Deployment

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AWS Quick Start Team

Contents

This Quick Start was created by Autodesk, Inc. in collaboration with Amazon Web Services (AWS).

Quick Starts are automated reference deployments that use AWS CloudFormation templates to deploy key technologies on AWS, following AWS best practices.

Quick Links

The links in this section are for your convenience. Before you launch the Quick Start, please review the architecture, security, and other considerations discussed in this guide.

- If you have an AWS account, and you're already familiar with AWS services and Autodesk Forge, you can launch the Quick Start to build the architecture shown in Figure 1 in a new or existing virtual private cloud (VPC). The deployment takes approximately 15 minutes. If you're new to AWS or to Autodesk Forge, please review the implementation details and follow the step-by-step instructions provided later in this guide.

**Launch
(for new VPC)**   **Launch
(for existing VPC)**

- If you want to take a look under the covers, you can view the AWS CloudFormation templates that automate the deployment.

**View template
(for new VPC)**   **View template
(for existing VPC)**

Overview

This Quick Start reference deployment guide provides step-by-step instructions for deploying Autodesk Forge on the AWS Cloud.

This Quick Start is for IT infrastructure architects, administrators, and DevOps professionals who are planning to implement or extend their Autodesk Forge workloads on the AWS Cloud.

Autodesk Forge on AWS

The Autodesk cloud developer platform—Forge—offers customizable building blocks in the form of web service APIs, tools, and services. With Forge, Autodesk teams, third-party developers, and customers can design and build workflows—across industries. For example, developers use Forge to overlay Internet of Things (IoT) data on top of 3D building information models, to later perform data analysis and create visual reports.

The Forge platform offers connected data and cross-platform integration in a cloud-based environment. Customers can use Forge to integrate the functionality of Autodesk and partner software as a service (SaaS) products into new workflows. They can also create or extend their own web or mobile apps using Forge service components, APIs, and tools.

3D/2D Computer-Aided Design (CAD) data requires fast computing for a seamless user experience and high availability. AWS offers a broad set of global compute, storage, database, analytics, application, and deployment services that help organizations move faster, lower IT costs, and scale applications.

AWS Costs and Licenses

You are responsible for the cost of the AWS services used while running this Quick Start reference deployment. There is no additional cost for using the Quick Start.

The AWS CloudFormation template for this Quick Start includes configuration parameters that you can customize. Some of these settings, such as instance type, will affect the cost of deployment. For cost estimates, see the pricing pages for each AWS service you will be using. Prices are subject to change.

> **Tip**   After you deploy the Quick Start, we recommend that you enable the AWS Cost and Usage Report to track costs associated with the Quick Start. This report delivers billing metrics to an S3 bucket in your account. It provides cost estimates based on usage throughout each month and finalizes the data at the end of the month. For more information about the report, see the AWS documentation.

Autodesk Forge Costs and Licenses

For information about Autodesk Forge pricing, see Pricing on the Autodesk Forge website. Get started for free. Pay for only what you need. Registering for Forge includes 100 free cloud credits that you can apply to any combination of APIs you need.

Autodesk provides Forge API usage equivalent to the number of cloud credits you specify. All cloud credits purchased for or applicable to Forge are nontransferable and redeemable for Forge APIs only. No other Autodesk cloud credits may be used for Forge APIs.

Architecture

Deploying this Quick Start for a new virtual private cloud (VPC) with **default parameters** builds the following Autodesk Forge environment in the AWS Cloud.
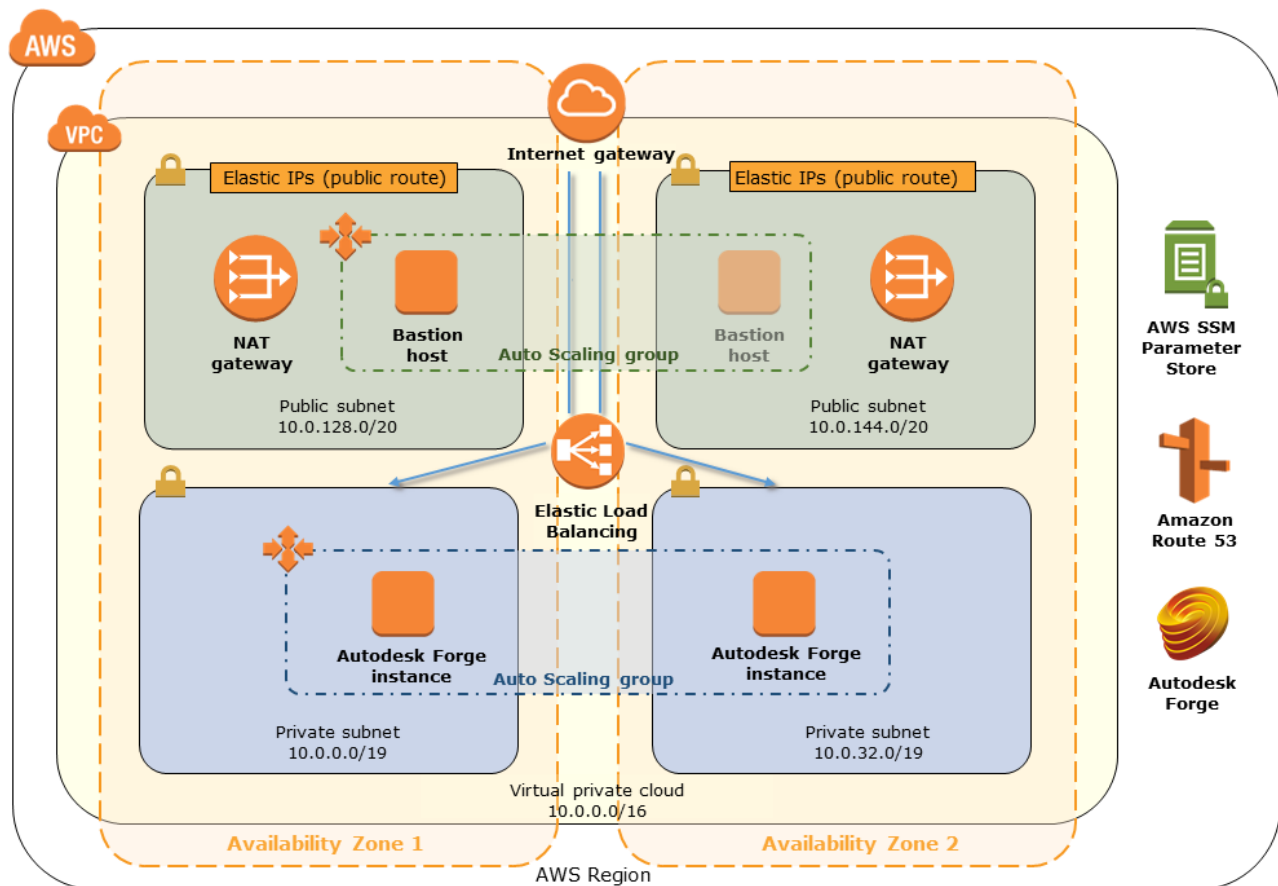

Figure 1: Quick Start architecture for Autodesk Forge on AWS

To build this architecture, the Quick Start installs and configures the following:

- A highly available architecture that spans two Availability Zones. *

- A virtual private cloud (VPC) configured across two Availability Zones. In each Availability Zone, this Quick Start provisions one public subnet and one private subnet. This creates a logically isolated networking environment that you can connect to your on-premises data centers or use as a standalone environment. *

- An internet gateway to allow access to the internet. The bastion hosts use this gateway to send and receive traffic. *

- Managed network address translation (NAT) gateways deployed into the public subnets and configured with an Elastic IP address for outbound internet connectivity. These instances provide internet access for all Amazon Elastic Compute Cloud (Amazon EC2) instances launched within the private network. *

- In the public subnets, a Linux bastion host in an Auto Scaling group to allow inbound Secure Shell (SSH) access to EC2 instances in public and private subnets. *

- In the private subnets, Autodesk Forge application server instances across both Availability Zones, to ensure high availability.

- Auto Scaling enabled for the Autodesk Forge cluster, to automatically add or remove servers based on their use. Auto Scaling provides additional servers during peak hours and lowers costs by removing servers during off hours. This functionality is tightly integrated with the Application Load Balancer, and automatically adds and removes instances from the load balancer. The default installation sets up low and high CPU-based thresholds for scaling the instance capacity up or down. You can modify these thresholds during launch and after deployment.

- The Elastic Load Balancing service, which provides HTTP and HTTPS load balancing across the Autodesk Forge instances. This Quick Start uses an Application Load Balancer, which is configured to use either HTTP or HTTPS.

- An AWS Identity and Access Management (IAM) role with fine-grained permissions for access to AWS services necessary for the deployment process.

- Appropriate security groups for each instance or function to restrict access to only necessary protocols and ports. For example, access to HTTP(S) server ports on Amazon EC2 web servers is limited to the Application Load Balancer.

- Optionally, Amazon Route 53 as your public Domain Name System (DNS) for resolving your Forge site's domain name. When you choose to deploy the application with a

custom domain and Security Sockets Layer (SSL) certificate, a new RecordSet in your pre-existing Route 53 Hosted Zone will be created.

- AWS Systems Manager (SSM) parameters in the AWS Systems Manager Parameter Store to securely store the Forge client ID and secret.

* The template that deploys the Quick Start into an existing VPC skips the tasks marked by asterisks and prompts you for your existing VPC configuration.

Prerequisites

Specialized Knowledge

Before you deploy this Quick Start, we recommend that you become familiar with the following AWS services. (If you are new to AWS, see Getting Started with AWS.)

- Amazon Elastic Compute Cloud (Amazon EC2)
- Amazon Elastic Block Store (Amazon EBS)
- Amazon Virtual Private Cloud (Amazon VPC)
- AWS CloudFormation
- AWS Systems Manager
- Amazon Route 53
- Elastic Load Balancing
- Amazon EC2 Auto Scaling

Deployment Options

This Quick Start provides two deployment options:

- **Deploy Autodesk Forge into a new VPC** (end-to-end deployment). This option builds a new AWS environment consisting of the VPC, subnets, NAT gateways, security groups, bastion hosts, and other infrastructure components, and then deploys Autodesk Forge into this new VPC.

- **Deploy Autodesk Forge into an existing VPC**. This option provisions Autodesk Forge in your existing AWS infrastructure.

The Quick Start provides separate templates for these options. It also lets you configure CIDR blocks, instance types, and Autodesk Forge settings, as discussed later in this guide.

Deployment Steps

Step 1. Obtain Autodesk Developer Credentials

This Quick Start requires Autodesk developer credentials.

1. If you don't have a Forge Autodesk account, sign up for an account on the Forge Developer Portal.

2. In the Forge Developer Portal, choose Create App. For your new app, you can use *http://localhost:3000/api/forge/callback/oauth* as Callback URL.

3. Take note of the Client ID and Client Secret. You will need to input these, when you launch the Quick Start.
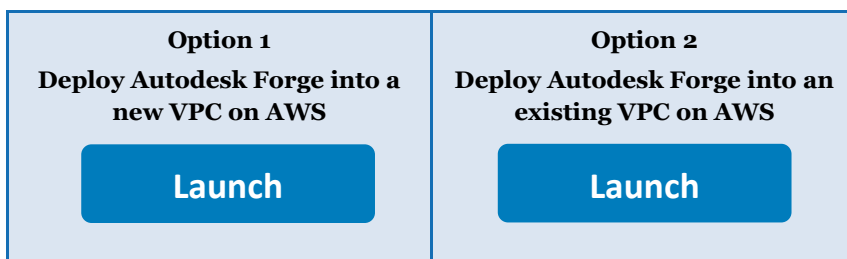
Step 2. Prepare Your AWS Account

1. If you don't already have an AWS account, create one at https://aws.amazon.com by following the on-screen instructions.

2. Use the region selector in the navigation bar to choose the AWS Region where you want to deploy Autodesk Forge on AWS.

3. Create a key pair in your preferred region.

4. If necessary, request a service limit increase for the Amazon EC2 instance types that you intend to deploy. You might need to do this if you already have an existing deployment that uses this instance type, and you think you might exceed the default limit with this deployment.

Step 3. Launch the Quick Start

> **Note**   You are responsible for the cost of the AWS services used while running this Quick Start reference deployment. There is no additional cost for using this Quick Start. For full details, see the pricing pages for each AWS service you will be using in this Quick Start. Prices are subject to change.

1. Choose one of the following options to launch the AWS CloudFormation template into your AWS account. For help choosing an option, see deployment options earlier in this guide.

Option 1	Option 2
Deploy Autodesk Forge into a new VPC on AWS	Deploy Autodesk Forge into an existing VPC on AWS
Launch	**Launch**

> **Important**   If you're deploying Autodesk Forge into an existing VPC, make sure that your VPC has two private subnets in different Availability Zones for the database instances. These subnets require NAT gateways or NAT instances in their route tables, to allow the instances to download packages and software without exposing them to the internet. You will also need the domain name option configured in the DHCP options as explained in the Amazon VPC documentation. You will be prompted for your VPC settings when you launch the Quick Start.

Each deployment takes about 15 minutes to complete.

2. Check the region that's displayed in the upper-right corner of the navigation bar and change it if necessary. This is where the network infrastructure for Autodesk Forge will be built. The template is launched in the US East (Ohio) Region by default.

3. On the **Select Template** page, keep the default setting for the template URL, and then choose **Next**.

4. On the **Specify Details** page, change the stack name if needed. Review the parameters for the template. Provide values for the parameters that require input. For all other parameters, review the default settings and customize them as necessary. When you finish reviewing and customizing the parameters, choose **Next**.

In the following tables, parameters are listed by category and described separately for the two deployment options:

– Parameters for deploying Autodesk Forge into a new VPC

– Parameters for deploying Autodesk Forge into an existing VPC

- ## Option 1: Parameters for deploying Autodesk Forge into a new VPC

  [View template](#)

  VPC Network Configuration:

Parameter label (name)	Default	Description
Availability Zones (AvailabilityZones)	*Requires input*	The list of Availability Zones to use for the subnets in the VPC. The Quick Start uses two Availability Zones from your list and preserves the logical order you specify.
VPC CIDR (VPCCIDR)	10.0.0.0/16	The CIDR block for the VPC.
Private Subnet 1 CIDR (PrivateSubnet1CIDR)	10.0.0.0/19	The CIDR block for the private subnet located in Availability Zone 1. The CIDR block must be in the form x.x.x.x/16-28.
Private Subnet 2 CIDR (PrivateSubnet2CIDR)	10.0.32.0/19	The CIDR block for the private subnet located in Availability Zone 2. The CIDR block must be in the form x.x.x.x/16-28.
Public Subnet 1 CIDR (PublicSubnet1CIDR)	10.0.128.0/20	The CIDR block for the public (DMZ) subnet located in Availability Zone 1. The CIDR block must be in the form x.x.x.x/16-28.
Public Subnet 2 CIDR (PublicSubnet2CIDR)	10.0.144.0/20	The CIDR block for the public (DMZ) subnet located in Availability Zone 2. The CIDR block must be in the form x.x.x.x/16-28.
Allowed External Access CIDR (RemoteAccessCIDR)	*Requires input*	The CIDR IP range that is permitted to access the bastion hosts and Autodesk Forge. We recommend that you set this value to a trusted IP range. For example, you might want to grant only your corporate network access to the software. The CIDR block must be in the form x.x.x.x/x.

  Bastion Host Configuration:

Parameter label (name)	Default	Description
Key pair name (KeyPairName)	*Requires input*	The name of an existing public/private key pair, which allows you to securely connect to your instance after it launches.
Bastion AMI Operating System (BastionAMIOS)	Amazon-Linux-HVM	The Linux distribution for the AMI to be used for the bastion instances.
Bastion instance type (BastionInstanceType)	t2.micro	The Amazon EC2 instance type for the bastion instances.

Autodesk Forge Nodes Configuration:

Parameter label (name)	Default	Description
Forge Nodes instance type (ForgeNodeInstanceType)	t2.large	The Amazon EC2 instance type for the Autodesk Forge instances.
Forge Nodes min size (ForgeNodesMinSize)	2	The minimum number of Forge nodes in the Auto Scaling group.
Forge Nodes desired capacity (ForgeNodesDesired Capacity)	2	The desired capacity for Forge nodes in the Auto Scaling group.
Forge Nodes max size (ForgeNodesMaxSize)	4	The maximum number of Forge nodes in the Auto Scaling group.
Operator email (OperatorEmail)	*Requires input*	The email address that notifications of any scaling operations will be sent to.

Autodesk Forge Credentials:

Parameter label (name)	Default	Description
Forge Client Id (ForgeClientId)	*Requires input*	The client ID of your Forge application. You can obtain it on the Forge Developer Platform at https://developer.autodesk.com/myapps.
Forge Client Secret (ForgeClientSecret)	*Requires input*	The client secret of your Forge application. You can obtain it on the Forge Developer Platform at https://developer.autodesk.com/myapps.

[Optional] Forge Site Domain Configuration:

Parameter label (name)	Default	Description
Forge Site Domain (ForgeSiteDomain)	—	[Optional] The domain name of the Forge site. e.g. example.com. A valid fully-qualified domain name (FQDN) is required when using Security Sockets Layer (SSL).
ALB SSL Certificate ARN (ALBSSLCertificateARN)	—	[Optional] The Amazon Resource Name (ARN) of the SSL certificate to be used for the Application Load Balancer.
Route 53 Hosted Zone Id (Route53HostedZoneId)	—	[Optional] The Route53 Hosted Zone ID where the DNS record for Forge Site Domain will be added.

AWS Quick Start Configuration:

Parameter label (name)	Default	Description
Quick Start S3 bucket name (QSS3BucketName)	aws-quickstart	The S3 bucket you have created for your copy of Quick Start assets, if you decide to customize or extend the Quick Start for your own use. The bucket name can include numbers, lowercase letters, uppercase letters, and hyphens (-), but should not start or end with a hyphen.
Quick Start S3 key prefix (QSS3KeyPrefix)	quickstart-autodesk-forge/	The S3 key name prefix used to simulate a folder for your copy of Quick Start assets, if you decide to customize or extend the Quick Start for your own use. This prefix can include numbers, lowercase letters, uppercase letters, hyphens (-), and forward slashes (/).

- ## Option 2: Parameters for deploying Autodesk Forge into an existing VPC

  View template

  Network Configuration:

Parameter label (name)	Default	Description
VPC ID (VPCID)	*Requires input*	The ID of your existing VPC (e.g., vpc-0343606e).
Private Subnet 1 ID (PrivateSubnet1ID)	*Requires input*	The ID of the private subnet in Availability Zone 1 in your existing VPC (e.g., subnet-a0246dcd).
Private Subnet 2 ID (PrivateSubnet2ID)	*Requires input*	The ID of the private subnet in Availability Zone 2 in your existing VPC (e.g., subnet-b58c3d67).
Public Subnet 1 ID (PublicSubnet1ID)	*Requires input*	The ID of the public subnet 1 in Availability Zone 1 in your existing VPC (e.g., subnet-9bc642ac)
Public Subnet 2 ID (PublicSubnet2ID)	*Requires input*	The ID of the public subnet 1 in Availability Zone 2 in your existing VPC (e.g., subnet-e3246d8e).
Allowed External Access CIDR (RemoteAccessCIDR)	*Requires input*	The CIDR IP range that is permitted to access the bastions and Forge web application. We recommend that you set this value to a trusted IP range.

Security Configuration:

Parameter label (name)	Default	Description
Key pair name (KeyPairName)	*Requires input*	The name of an existing public/private key pair, which allows you to securely connect to your instance after it launches.
Bastion Security Group ID (BastionSecurityGroupID)	*Requires input*	The ID of the bastion host security group to enable SSH connections (e.g., sg-7f16e910).

Autodesk Forge Nodes Configuration:

Parameter label (name)	Default	Description
Forge Nodes instance type (ForgeNodeInstanceType)	t2.large	The Amazon EC2 instance type for the Autodesk Forge instances.
Forge Nodes min size (ForgeNodesMinSize)	2	The minimum number of Forge nodes in the Auto Scaling group.
Forge Nodes max size (ForgeNodesMaxSize)	4	The maximum number of Forge nodes in the Auto Scaling group.
Forge Nodes desired capacity (ForgeNodesDesired Capacity)	2	The desired capacity for Forge nodes in the Auto Scaling group.
Operator email (OperatorEmail)	*Requires input*	The email address that notifications of any scaling operations will be sent to.

Autodesk Forge Credentials:

Parameter label (name)	Default	Description
Forge Client Id (ForgeClientId)	*Requires input*	The client ID of your Forge application. You can obtain it on the Forge Developer Platform at https://developer.autodesk.com/myapps.
Forge Client Secret (ForgeClientSecret)	*Requires input*	The client secret of your Forge application. You can obtain it on the Forge Developer Platform at https://developer.autodesk.com/myapps.

aws

[Optional] Forge Site Domain Configuration:

Parameter label (name)	Default	Description
Forge Site Domain (ForgeSiteDomain)	—	[Optional] The domain name of the Forge site. e.g. example.com. A valid fully-qualified domain name (FQDN) is required when using Security Sockets Layer (SSL).
ALB SSL Certificate ARN (ALBSSLCertificateARN)	—	[Optional] The Amazon Resource Name (ARN) of the SSL certificate to be used for the Application Load Balancer.
Route 53 Hosted Zone Id (Route53HostedZoneId)	—	[Optional] The Route53 Hosted Zone ID where the DNS record for Forge Site Domain will be added.

AWS Quick Start Configuration:

Parameter label (name)	Default	Description
Quick Start S3 bucket name (QSS3BucketName)	aws-quickstart	The S3 bucket you have created for your copy of Quick Start assets, if you decide to customize or extend the Quick Start for your own use. The bucket name can include numbers, lowercase letters, uppercase letters, and hyphens (-), but should not start or end with a hyphen.
Quick Start S3 key prefix (QSS3KeyPrefix)	quickstart-autodesk-forge/	The S3 key name prefix used to simulate a folder for your copy of Quick Start assets, if you decide to customize or extend the Quick Start for your own use. This prefix can include numbers, lowercase letters, uppercase letters, hyphens (-), and forward slashes (/).

5. On the **Options** page, you can specify tags (key-value pairs) for resources in your stack and set advanced options. When you're done, choose **Next**.

6. On the **Review** page, review and confirm the template settings. Under **Capabilities**, select the check box to acknowledge that the template will create IAM resources.

7. Choose **Create** to deploy the stack.

8. Monitor the status of the stack. When the status is **CREATE_COMPLETE**, the Autodesk Forge cluster is ready.

9. Use the URLs displayed in the **Outputs** tab for the stack, to view the resources that were created, as shown in Figure 2.

aws

Overview	Outputs	Resources	Events	Template	Parameters	Tags	Stack Policy	Change Sets

Key	Value	Description
ALBDNSName	tCaT-Appli-AMCV9Y2Q57V6-5937732 19.us-east-1.elb.amazonaws.com	ALB DNS Name
ForgeAppURL	http://tCaT-Appli-AMCV9Y2Q57V6-593 773219.us-east-1.elb.amazonaws.com	Forge Application URL

Figure 2: Stack output showing the Forge application URL

Step 4. Test the Deployment

When the AWS CloudFormation template has successfully created the stack, all server nodes will be running with the Autodesk Forge application installed in your AWS account.

To access the application, in your preferred browser, go to the Forge application URL listed in the **Outputs** tab as shown in Figure 2.

You'll see a default page that has one sample bucket created for you, as shown in Figure 3.

Figure 3: Start page for the Forge application

To test this application:

1. Create Autodesk buckets for your projects. On the Start page, choose **New bucket**, specify a bucket name, and then choose **Go ahead, create the bucket**, as shown in Figure 4.

   Note   These buckets follow the same naming convention as Amazon S3 buckets. Use unique names and all lowercase.
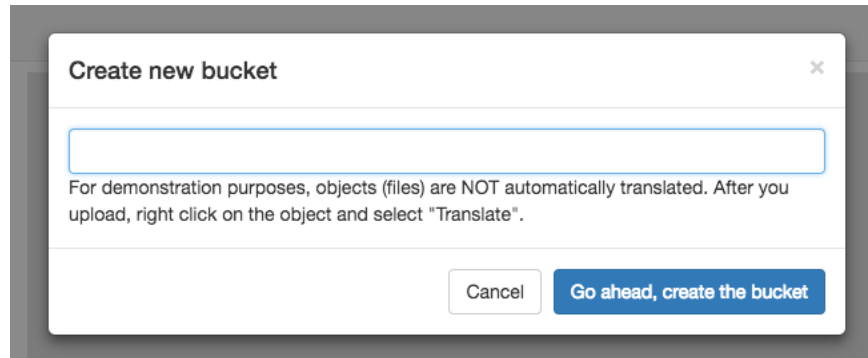
Figure 4: Creating a bucket for the Forge application

2. Upload your CAD files to the recently created Autodesk Forge bucket. For a list of supported CAD formats, see [Supported Translation Formats](#) in the Autodesk Forge Developer's Guide. You can download a sample model of a [Reciprocating Saw](#) after logging in with your Autodesk account to access the Getting Started Guide.

   Right-click your newly created bucket, choose **Upload file**, and then upload the Reciprocating Saw file that you downloaded, as shown in Figure 5.
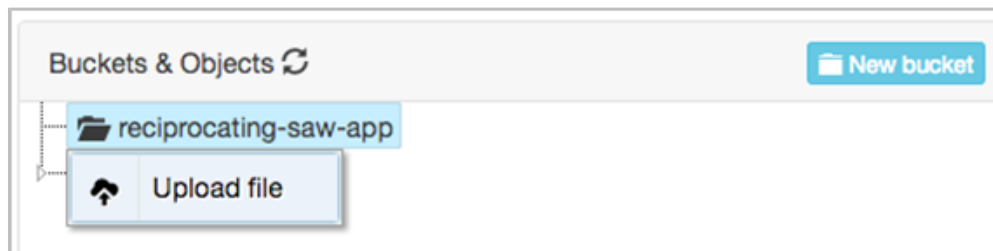
Figure 5: Uploading the model file

   It may take a minute or so for the file to show up in your bucket depending on your internet connection. You won't be able to view the downloaded file initially, until it is translated. For more information about the pricing of the Autodesk Forge Translation service, see [Pricing](#) on the Autodesk Forge website.

3. Choose the uploaded object on the left pane, and choose **Start translation**, as shown in Figure 6. This may take a while, depending on the size of your model. For the reciprocating saw model, wait about 2 minutes.
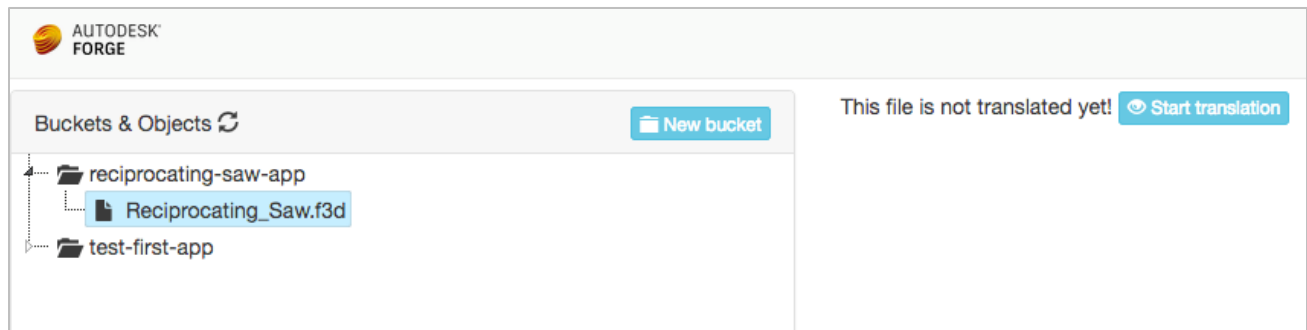
Figure 6: Starting the model translation

4. Load the translated CAD file in the Autodesk Forge Viewer, as shown in Figure 7.
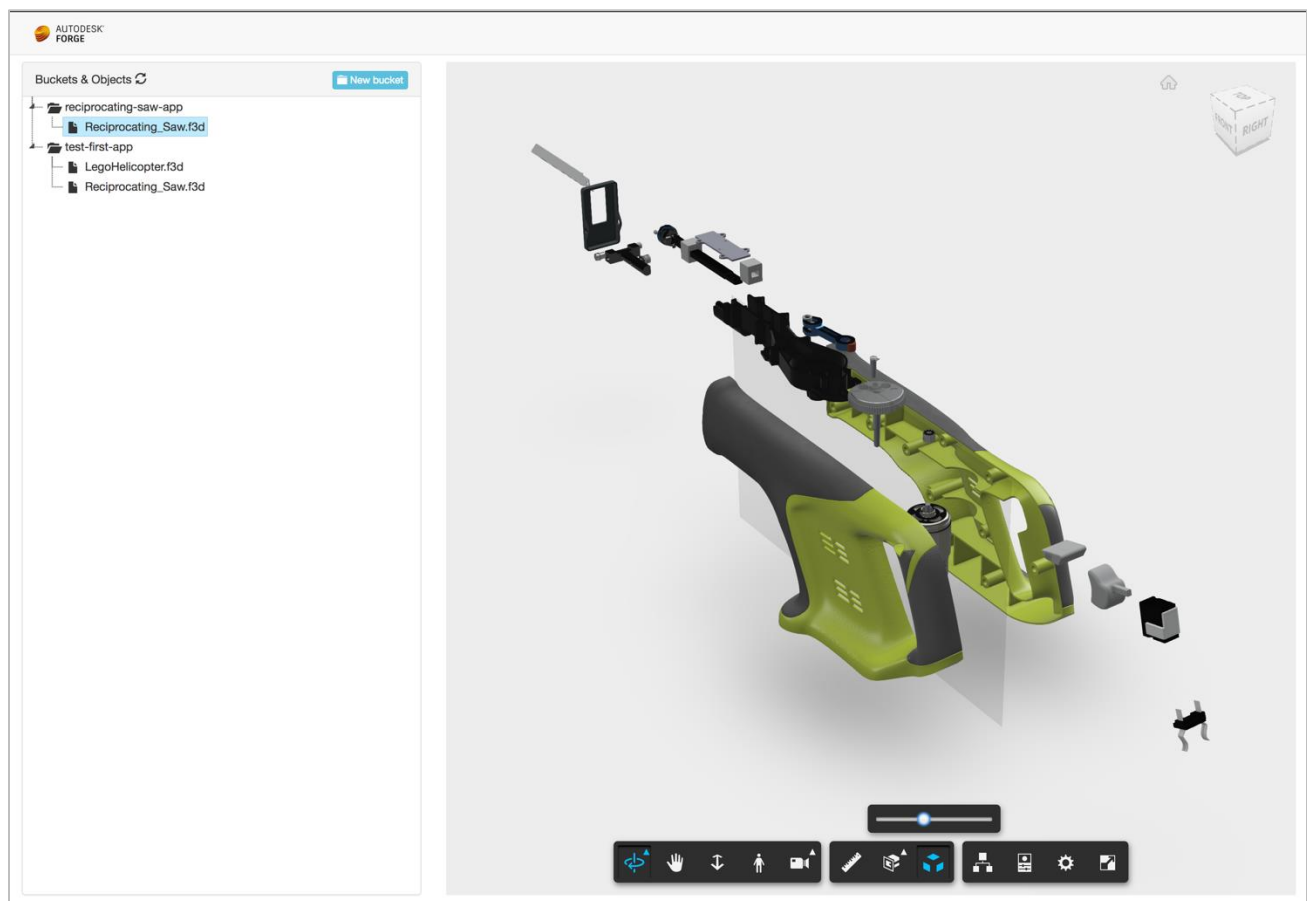

Figure 7: CAD file loaded in viewer

Troubleshooting

Q. I encountered a CREATE_FAILED error when I launched the Quick Start. What should I do?

A. If AWS CloudFormation fails to create the stack, we recommend that you relaunch the template with **Rollback on failure** set to **No**. (This setting is under **Advanced** in the AWS CloudFormation console, **Options** page.) With this setting, the stack's state will be retained and the instance will be left running, so you can troubleshoot the issue. (Look at the log files in %ProgramFiles%\Amazon\EC2ConfigService and C:\cfn\log.)

> **Important**   When you set **Rollback on failure** to **No**, you will continue to incur AWS charges for this stack. Please make sure to delete the stack when you finish troubleshooting.

For additional information, see [Troubleshooting AWS CloudFormation](#) on the AWS website.

Q. I encountered a size limitation error when I deployed the AWS CloudFormation templates. What should I do?

A. We recommend that you launch the Quick Start templates from the links in this guide or from another S3 bucket. If you deploy the templates from a local copy on your computer or from a non-S3 location, you might encounter template size limitations when you create the stack. For more information about AWS CloudFormation limits, see the [AWS documentation](#).

GitHub Repository

You can visit our [GitHub repository](#) to download the templates and scripts for this Quick Start, to post your comments, and to share your customizations with others.

Additional Resources

AWS services

- Amazon EBS
  https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/AmazonEBS.html

- Amazon EC2
  https://aws.amazon.com/documentation/ec2/

- Amazon VPC
  https://aws.amazon.com/documentation/vpc/
- AWS CloudFormation
  https://aws.amazon.com/documentation/cloudformation/
- AWS Systems Manager

  https://docs.aws.amazon.com/systems-manager/latest/userguide/what-is-systems-manager.html
- Amazon Route 53
  https://docs.aws.amazon.com/route53/
- Elastic Load Balancing

  https://docs.aws.amazon.com/elasticloadbalancing/latest/application/introduction.html
- Amazon EC2 Auto Scaling

  https://docs.aws.amazon.com/autoscaling/ec2/userguide/what-is-amazon-ec2-auto-scaling.html

Autodesk Forge documentation

- Forge Developer Platform
  https://forge.autodesk.com/
- Forge Platform GitHub Repositories

  https://github.com/Autodesk-Forge
- Introduction to 3D modeling Getting Started Guide

  https://f360ap.autodesk.com/courses/introduction-to-3d-modeling
- Forge Getting Started Guide

  https://learnforge.autodesk.io
- Forge NodeJS Application

  https://github.com/Autodesk-Forge/autodesk.forge.aws-cloudformation.nodejs

Quick Start reference deployments

- AWS Quick Start home page
  https://aws.amazon.com/quickstart/

Document Revisions

Date	Change	In sections
October 2018	Initial publication	—

Notices