Agilisium Conversational BI Bot on AWS

Quick Start Reference Deployment

May 2019

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AWS Quick Start team

Visit our [GitHub repository](#) for source files and to post feedback, report bugs, or submit feature ideas for this Quick Start.

Contents

This Quick Start was created by Agilisium Consulting 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.

Overview

This Quick Start reference deployment guide provides step-by-step instructions for deploying the Agilisium Conversational BI Bot on the AWS Cloud.

This Quick Start is for those who would like to build a BI bot. It provisions a web-based chat interface to interact with the bot by using AWS services such as Amazon Redshift, Amazon Lex, Amazon Simple Storage Service (Amazon S3), AWS Lambda, and Amazon Cognito.

The Agilisium Conversational BI Bot is a web app. Through its interface, the user can open a chat window on the bot website, converse with the bot, and enter questions regarding sales and revenue data. The bot responds with a mix of text or visuals.

The Quick Start enables an automated deployment of the BI bot environment in about 25 minutes.

Conversational BI Bot on AWS

Timely, data-driven decisions and insights, such as those related to sales and revenue, are crucial in enterprises. Today's highly competitive environment involves complex decisions, based on ever increasing amounts of data.

This Quick Start uses an example scenario of an automotive dealership, where a stakeholder—for example, an executive—converses with the bot to derive sales and revenue insights, based on a predefined set of questions.

This Quick Start provides a sample dataset of the automotive dealership. You can use this Quick Start and dataset as a foundation to build feature-rich and advanced BI bots of your own. You can also load your own data, instead of using the sample dataset. For details, see Using your own data and FAQ, later in this guide. The custom data that you load must align to the schema as defined in the dataset. The use case—gaining sales and revenue insights—remains the same.

The Quick Start includes predefined training and table schema for this user scenario. For additional requirements, you must customize various components of the Quick Start.

SAMPLE DATASET STRUCTURE

To understand the capabilities of BI bots, the Quick Start includes a sample dataset named Classic Models. This retailer database of a car dealer contains business data such as customers, products, sales orders, sales order, and line items. The user converses through the BI bot chat-interface to query these tables in the backend.

The Classic Models sample database is open source, is made available under the terms and conditions of the Eclipse Public License Version 2.0 (EPL), and is available at: https://www.eclipse.org/legal/epl-2.0/.

BUSINESS USE CASE

Assume you're an executive in a company, with seven branches globally, that sells classic cars, vintage cars, motorcycles, planes, ships, trains, and trucks. In the deployed web app, you engage with a BI bot to get sales performance insights.

To begin with, here is a set of conversations you can have with the bot:

- What is our overall revenue for this year?

- How many orders have we received this year?

- What is our monthly average revenue?

- What is our monthly average orders received?

- What are our top performing products by revenue?

- What are our top performing products by order?

- Who are our top performing sales teams?

- What is our sales team size by each office?

The bot responds to these queries. At any point in the conversation, you can ask for "Help" to see the list of metrics the bot can provide.

Cost and licenses

You are responsible for the cost of the AWS services used while running this Quick Start reference deployment. There are no additional license costs involved 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](#).

Architecture

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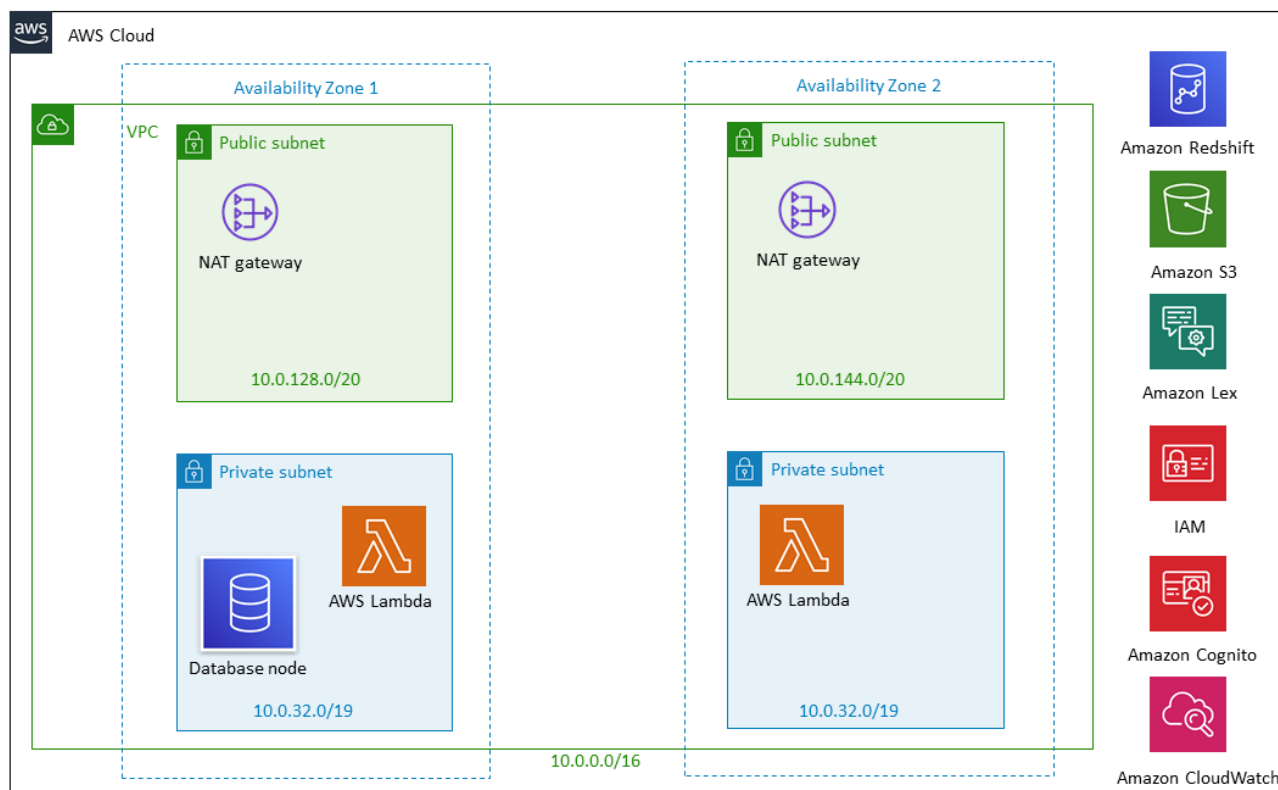

Figure 1: Quick Start architecture for the Conversational BI Bot on AWS

The Quick Start sets up the following:

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

- A VPC configured with public and private subnets according to AWS best practices, to provide you with your own virtual network on AWS.*

- In the public subnets, managed NAT gateways to allow outbound internet access for resources in the private subnets.*

- In the private subnets, serverless Lambda functions and Redshift cluster resources.

- Static webhost using Amazon S3 to provide an effective and convenient user interface of the BI bot.

- An Amazon Cognito identity pool to provide connectivity from the static webhost to access AWS resources.

- AWS Identity and Access Management (IAM) roles for the Lambda functions and Cognito pool.

- Amazon CloudWatch logs, which are created by serverless Lambda functions.

- Amazon Lex resources, including a bot, intents, and slots.

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

Planning the deployment

Specialized knowledge

This Quick Start assumes familiarity with the following AWS Services. If you're new to AWS, visit the Getting Started Resource Center and the AWS Training and Certification website for materials and programs that can help you develop the skills to design, deploy, and operate your infrastructure and applications on the AWS Cloud.

AWS account

If you don't already have an AWS account, create one at https://aws.amazon.com by following the on-screen instructions. Part of the sign-up process involves receiving a phone call and entering a PIN using the phone keypad.

Your AWS account is automatically signed up for all AWS services. You are charged only for the services you use.

Technical requirements

Before you launch the Quick Start, your account must be configured as specified in the following table. Otherwise, deployment might fail.

Resources

If necessary, request service limit increases for the following resources. You might need to do this if you already have an existing deployment that uses these resources, and you think you might exceed the default limits with this deployment. For default limits, see the AWS documentation.

AWS Trusted Advisor offers a service limits check that displays your usage and limits for some aspects of some services.

Resource	This deployment uses
VPCs	1
Elastic IP addresses	1
IAM security groups	2
IAM roles	3
S3 Bucket	2
Redshift Cluster	1
Lambda	3
Cognito Identity	1

Regions

This deployment includes Amazon Lex, which isn't currently supported in all AWS Regions. For a current list of supported regions, see AWS Regions and Endpoints in the AWS documentation.

IAM permissions

To deploy the Quick Start, you must log in to the AWS Management Console with IAM permissions for the resources and actions the templates will deploy. The *AdministratorAccess* managed policy within IAM provides sufficient permissions, although your organization may choose to use a custom policy with more restriction.

S3 buckets

Unique S3 bucket names are automatically generated based on the account number and region. If you delete a stack, **the logging buckets are not deleted** (to support security review). If you plan to re-deploy this Quick Start in the same region, you must first manually delete the S3 buckets that were created during the previous deployment; **otherwise, the re-deployment will fail**.

Deployment options

This Quick Start provides two deployment options:

- **Deploy the Conversational BI Bot 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 the Conversational BI Bot components into this new VPC.

- **Deploy the Conversational BI Bot into an existing VPC**. This option provisions the Conversational BI Bot components in your existing AWS infrastructure.

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

Deployment steps

Step 1. Sign in to your AWS account

1. Sign in to your AWS account at https://aws.amazon.com with an IAM user role that has the necessary permissions. For details, see Planning the deployment earlier in this guide.

2. Make sure that your AWS account is configured correctly, as discussed in the Technical requirements section.

Step 2. Launch the Quick Start

> **Notes**   The instructions in this section reflect the older version of the AWS CloudFormation console. If you're using the redesigned console, some of the user interface elements might be different.
>
> 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. Sign in to your AWS account, and choose one of the following options to launch the AWS CloudFormation template. For help choosing an option, see deployment options earlier in this guide.

Deploy
- new VPC
- workload

Deploy
- workload only

Deploy Conversational BI Bot into a new VPC on AWS

Deploy Conversational BI Bot into an existing VPC on AWS

> **Important**   If you're deploying the Conversational BI Bot into an existing VPC, make sure that your VPC has two private subnets in different Availability Zones for the Lambda function to connect to Redshift. Also, ensure that the subnets aren't shared. This Quick Start doesn't support shared subnets. These subnets require NAT gateways in their route tables, to allow the Lambda function to contact AWS services without exposing them to the internet. You will be prompted for your VPC settings when you launch the Quick Start.

Each deployment takes about 25 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 the Conversational BI Bot will be built. The template is launched in the US East (Virginia) Region by default.

> **Note**   This deployment includes Amazon Lex, which isn't currently supported in all AWS Regions. For a current list of supported regions, see the AWS Regions and Endpoints webpage.

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.

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

   – Parameters for deploying the Conversational BI Bot into a new VPC

   – Parameters for deploying the Conversational BI Bot into an existing VPC

   When you finish reviewing and customizing the parameters, choose **Next**.

OPTION 1: PARAMETERS FOR DEPLOYING THE CONVERSATIONAL BI BOT 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 range (`PrivateSubnet1CIDR`)	10.0.0.0/19	The CIDR block for the private subnet 1 located in Availability Zone 1.
Private subnet 2 CIDR range (`PrivateSubnet2CIDR`)	10.0.32.0/19	The CIDR block for the private subnet 2 located in Availability Zone 2.
Public subnet 1 CIDR range (`PublicSubnet1CIDR`)	10.0.128.0/20	The CIDR block for the public subnet 1 located in Availability Zone 1.
Public subnet 2 CIDR range (`PublicSubnet2CIDR`)	10.0.144.0/20	The CIDR block for the public subnet 2 located in Availability Zone 2.

aws

Redshift configuration:

Parameter label (name)	Default	Description
Redshift username (`RedshiftUsername`)	*Requires input*	The Redshift user name for connecting to the cluster.
Redshift password (`RedshiftPassword`)	*Requires input*	The Redshift password for connecting to the cluster.
Redshift database name (`RedshiftDbName`)	*Requires input*	The name of the Redshift database.
Redshift port (`RedshiftPort`)	5439	The Redshift port.
Redshift node type (`RedshiftNodeType`)	dc2.large	The cluster node type for Redshift.
Redshift number of nodes (`RedshiftNumberOf Nodes`)	1	The number of nodes for the Redshift cluster.

Amazon Lex bot configuration:

Parameter label (name)	Default	Description
Prefix for Lex resources (`LexResourcesPrefix`)	lex_cft_prefix	The prefix that will be added to the Amazon Lex bot, intents, and slots. This takes care of limiting Lambda permissions to intents with specific prefix.
Parent origin (`ParentOrigin`)	*Optional*	The browser origin (for example, http://lexbot.example.com:8080) of an existing site that is allowed to send/receive data and events from the web UI in an iframe setup. This is an optional parameter. If left empty, an S3 bucket will be created to host a sample parent site embedding the webapp as an iframe.

(Optional) Custom data configuration:

Parameter label (name)	Default	Description
Load custom data flag (`LoadCustomData`)	false	Choose **true** if you want to load your own custom data from an S3 location, instead of using the default sample data. For more information, see Using your own data, later in this guide.

Parameter label (name)	Default	Description
Custom data bucket name (`CustomDataBucketName`)	—	This only applies if the LoadCustomData parameter is set to **true**. The bucket name for the custom dataset. Enter your bucket name where your custom data resides.
Custom data key prefix (`CustomDataKeyPrefix`)	—	This only applies if the LoadCustomData parameter is set to **true**. Enter your bucket prefix key where your custom data resides.

AWS Quick Start configuration:

> **Note**   We recommend that you keep the default settings for the following two parameters, unless you are customizing the Quick Start templates for your own deployment projects. Changing the settings of these parameters will automatically update code references to point to a new Quick Start location. For additional details, see the [AWS Quick Start Contributor's Guide](#).

Parameter label (name)	Default	Description
Quick Start S3 bucket name (`QSS3BucketName`)	aws-quickstart	The S3 bucket you 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-agilisium-conversational-bot/	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 THE CONVERSATIONAL BI BOT 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) where the AWS resources will be deployed through the CloudFormation templates.

Parameter label (name)	Default	Description
Private subnet 1 (PrivateSubnet1ID)	*Requires input*	The ID of the private subnet in Availability Zone 1 in your existing VPC (e.g., subnet-a0246dcd).
Private subnet 2 (PrivateSubnet2ID)	*Requires input*	The ID of the private subnet in Availability Zone 2 in your existing VPC (e.g., subnet-b58c3d67).

Redshift configuration:

Parameter label (name)	Default	Description
Redshift user name (RedshiftUsername)	*Requires input*	The Redshift user name for connecting to the cluster.
Redshift password (RedshiftPassword)	*Requires Input*	The Redshift password for connecting to the cluster.
Redshift database name (RedshiftDbName)	*Requires Input*	The name of the Redshift database.
Redshift port (RedshiftPort)	5439	The Redshift port.
Redshift node type (RedshiftNodeType)	dc2.large	The cluster node type for Redshift.
Redshift number of nodes (RedshiftNumberOfNodes)	1	The number of nodes for the Redshift cluster.

Amazon Lex bot configuration:

Parameter label (name)	Default	Description
Prefix for Lex resources (LexResourcesPrefix)	lex_cft_prefix	The prefix that will be added to the Amazon Lex bot, intents, and slots. This takes care of limiting Lambda permissions to intents with specific prefix.
Parent origin (ParentOrigin)	*Optional*	The browser origin (for example, http://lexbot.example.com:8080) of an existing site that is allowed to send/receive data and events from the web UI in an iframe setup. This is an optional parameter. If left empty, an S3 bucket will be created to host a sample parent site embedding the webapp as an iframe.

aws

(Optional) Custom data configuration:

Parameter label (name)	Default	Description
Load custom data flag (`LoadCustomData`)	false	Choose **true** if you want to load your own custom data from an S3 location, instead of using the default sample data. For more information, see Using your own data, later in this guide.
Custom data bucket name (`CustomDataBucketName`)	—	This only applies if the LoadCustomData parameter is set to **true**. The bucket name for the custom dataset. Enter your bucket name where your custom data resides.
Custom data key prefix (`CustomDataKeyPrefix`)	—	This only applies if the LoadCustomData parameter is set to **true**. Enter your bucket prefix key where your custom data resides.

AWS Quick Start configuration:

> **Note**   We recommend that you keep the default settings for the following two parameters, unless you are customizing the Quick Start templates for your own deployment projects. Changing the settings of these parameters will automatically update code references to point to a new Quick Start location. For additional details, see the AWS Quick Start Contributor's Guide.

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-agilisium-conversational-bot/	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 two check boxes to acknowledge that the template will create IAM resources and that it might require the capability to auto-expand macros.

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

8. Monitor the status of the stack. When the status is **CREATE_COMPLETE**, the Conversational BI Bot is ready.

9. Use the URLs displayed in the **Outputs** tab for the stack to view the resources that were created.
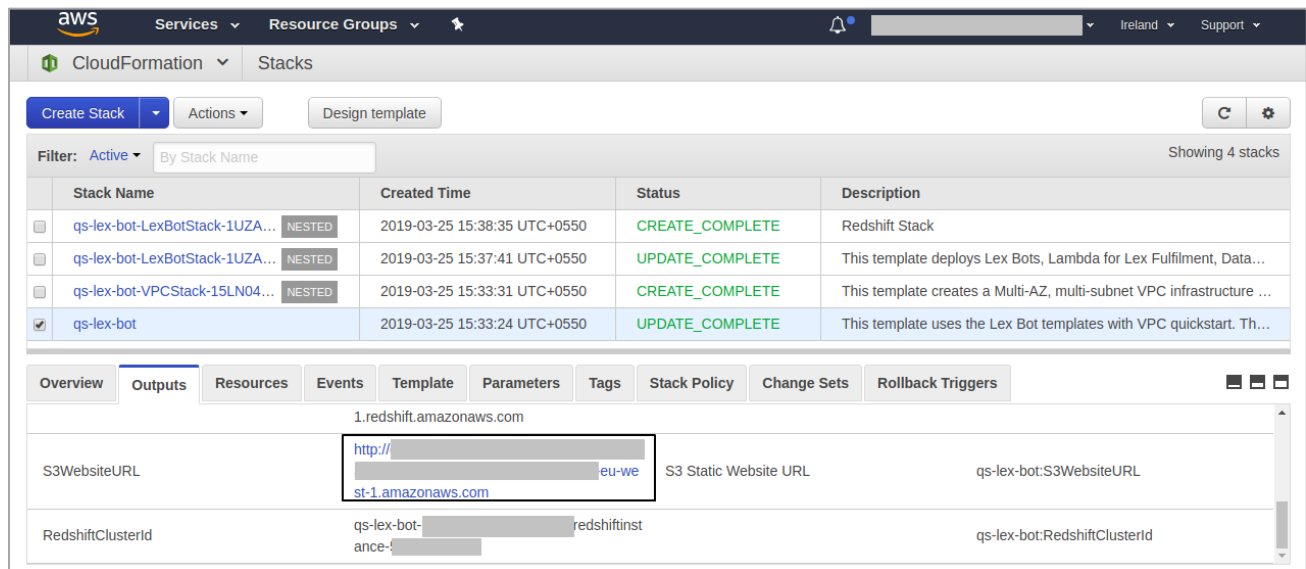

Figure 2: Conversational BI Bot outputs after successful deployment

Step 3. Test the deployment

After you've successfully deployed the AWS CloudFormation template, test the deployment by performing the following steps:

1. Check the status of all stacks associated with the Quick Start in the AWS CloudFormation console to make sure they're CREATE_COMPLETE and display no errors.

2. From the Outputs section of the master template, look for "S3WebsiteURL" whose value is the Conversational BI Bot webpage that interacts with Amazon Lex.

    Paste the URL value in the browser, and make sure the page displays as shown in the following screenshot.
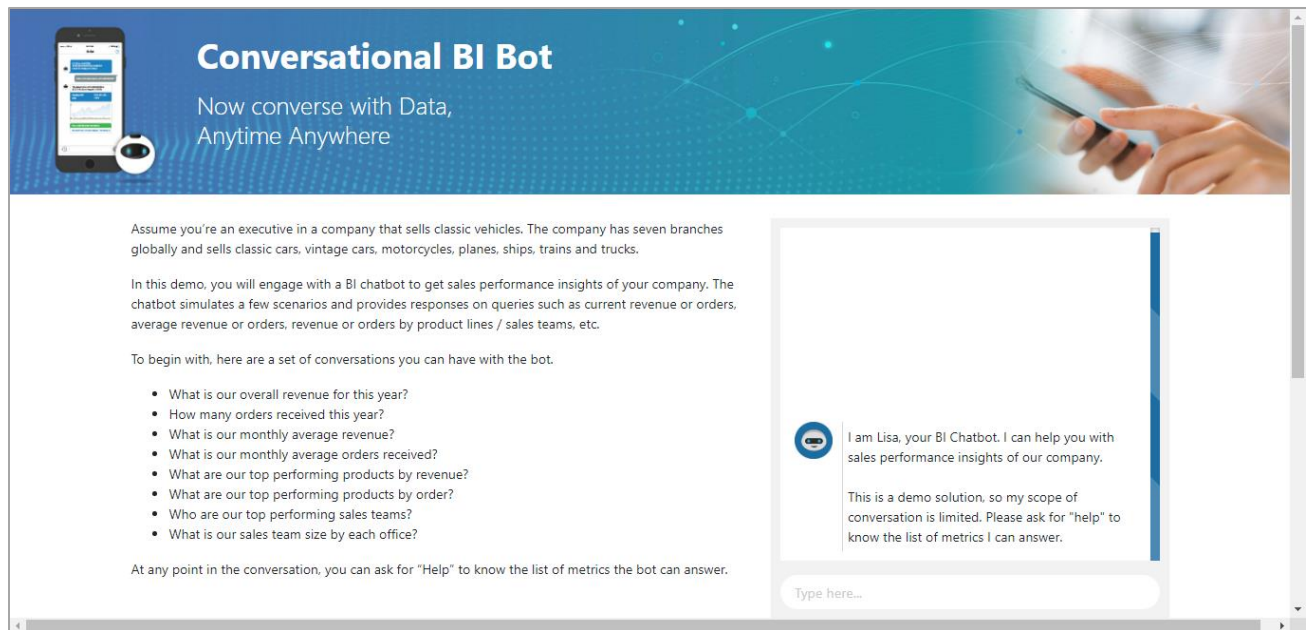
Figure 3: Conversational BI Bot webpage

The chat screen takes bot questions, and shows you responses, such as those in the following screenshot.
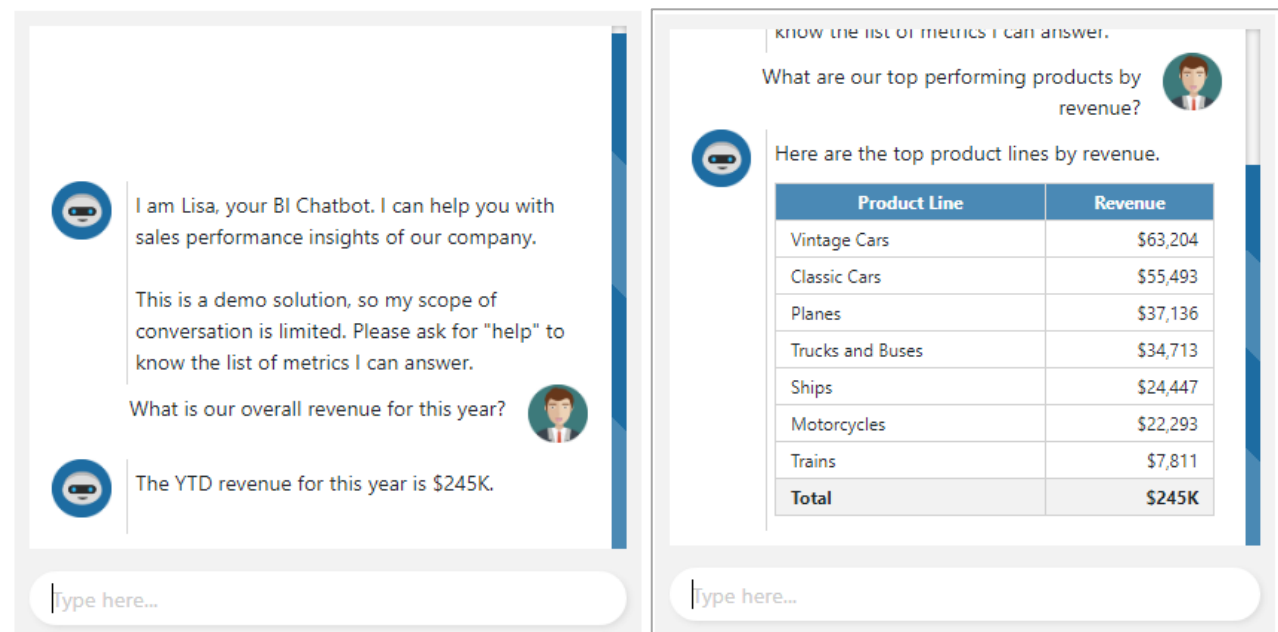

Figure 4: Conversational BI Bot chat screens

Step 4: Customize the Conversational BI Bot on AWS

MODIFYING THE PORTAL PAGE

To add new webpages or modify a Conversational BI Bot webpage, look for "S3WebBucket" on the **Resources** tab of the LexBot child stack, and make the necessary changes to the files in the bucket.

USING YOUR OWN DATA

The Conversational BI Bot uses Redshift as the data source from which data is pulled by LexFulfillmentLambda.

The Quick Start offers sample data loaded in Redshift. The dataset consists of the following tables:

- **Customers**: Stores customer's data.

- **Products**: Stores a list of scale model cars.

- **ProductLines**: Stores a list of product line categories.

- **Orders**: Stores sales orders placed by customers.

- **OrderDetails**: Stores sales order line items for each sales order.

- **Payments**: Stores payments made by customers based on their accounts.

- **Employees**: Stores all employee information and organization structure such as who reports to whom.

- **Offices**: Stores sales office data.

You can see the structure of the dataset from Eclipse Foundation at https://www.eclipse.org/birt/img/documentation/sample-database/ClassicModelsDBSchema.jpg.

To use your own customized data, perform the following steps:

1. Go to the GitHub repository for this Quick Start, and look for the files under assets/data.

2. Go to the Outputs section of the master stack, and look for Redshift credentials.

3. Connect to Redshift using Query Editor in the Redshift console and your Redshift credentials. Modify the data as needed in the tables.

4. The tables have the same name as the files that are under assets.

> **Note**   To inject your own data into Redshift, set the LoadCustomData parameter to **true**. Enter the source bucket name and prefix key (optional) from which the data is to be loaded.
>
> To have additional tables with new data, you must update the LexFulfillmentLambda resource mentioned in lex-bibot.template. The Lambda code must be modified to handle additional tables.
>
> Amazon Lex is trained based on the default data that we provide. Training Amazon Lex and modifying the fulfilment Lambda is required, before you can converse with your new data.

CUSTOMIZING AMAZON LEX

This Quick Start uses a sample Amazon Lex bot with intents and slots. The lex_aws_quickstart.json file is in the [GitHub repository](#) for this Quick Start under assets/lex.

To customize it, go to the Amazon Lex console, and add new intents and slots.

To fulfill new intents, you must change the LexFulfillmentLambda resource mentioned in the lex-bibot.template. The Lambda code must be modified to handle additional responses for new intents.

Security

Redshift and Lex fulfillment serverless Lambda functions run in private subnets inside a new or existing VPC.

The Conversational BI Bot S3 website is hosted in Amazon S3. Do not place any objects other than website files because this will enable access to unnecessary objects.

Redshift credentials are provided to the Lex fulfillment Lambda functions as environment parameters. Having this additionally encrypted with AWS Key Management Service (AWS KMS) enhances security to avoid exposing Redshift credentials.

FAQ

Q. I encountered a CREATE_FAILED error when I launched the Quick Start.

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 stack will be left running, so you can troubleshoot the issue

> **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.

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](#).

Q. The stack is taking long time to delete.

A. The Lambda functions run within the VPC to connect to Redshift. The delay is normal, since there's a lag between the time that the Lambda function runs and Elastic Network Interface (ENI) deletion when run within the VPC.

Q. The bot isn't responding to a question.

A. The bot is configured with preset of intents and dynamic responses using data stored in Redshift. If any existing intent is not working, please check the logs of LexFulfillmentLambda in CloudWatch for any issue.

Q. How do I load my own custom data, instead of using the sample data that the Quick Start provides?

A. There's an optional parameters section to handle the custom data inputs. LoadCustomData is a boolean parameter, and is set to **false** by default. To load custom data, set it to **true** and provide the custom data bucket name in

CustomDataBucketName, and optionally the **CustomDataKeyPrefix** parameter. Ensure that read permissions are available on the custom bucket and objects. Also, the bucket should be in the same region as that of the CloudFormation deployment.

Q. I encountered a failure that says "**Unexpected error: Failed to create or load data.**"

A. The AWS CloudFormation template fails and returns this error when the data loaded into Redshift doesn't match the schema defined for the Quick Start. This scenario arises when you try to load your own data. To fix this error, check that the data tables being loaded match the schema, as defined in Using your own data, earlier in this guide. You must launch the CloudFormation template again, after the error is fixed.

Send us feedback

To post feedback, submit feature ideas, or report bugs, use the **Issues** section of the GitHub repository for this Quick Start. If you'd like to submit code, please review the Quick Start Contributor's Guide.

Additional resources

AWS resources

- Getting Started Resource Center

- AWS General Reference

- AWS Glossary

AWS services

- AWS CloudFormation

- Amazon Lex

- AWS Lambda

- IAM

- Amazon Redshift

- Amazon Cognito

- Amazon VPC

aws

Conversational BI Bot webpage

- https://www.agilisium.com/

Other Quick Start reference deployments

- AWS Quick Start home page

Document revisions

Date	Change	In sections
May 2019	Initial publication	—