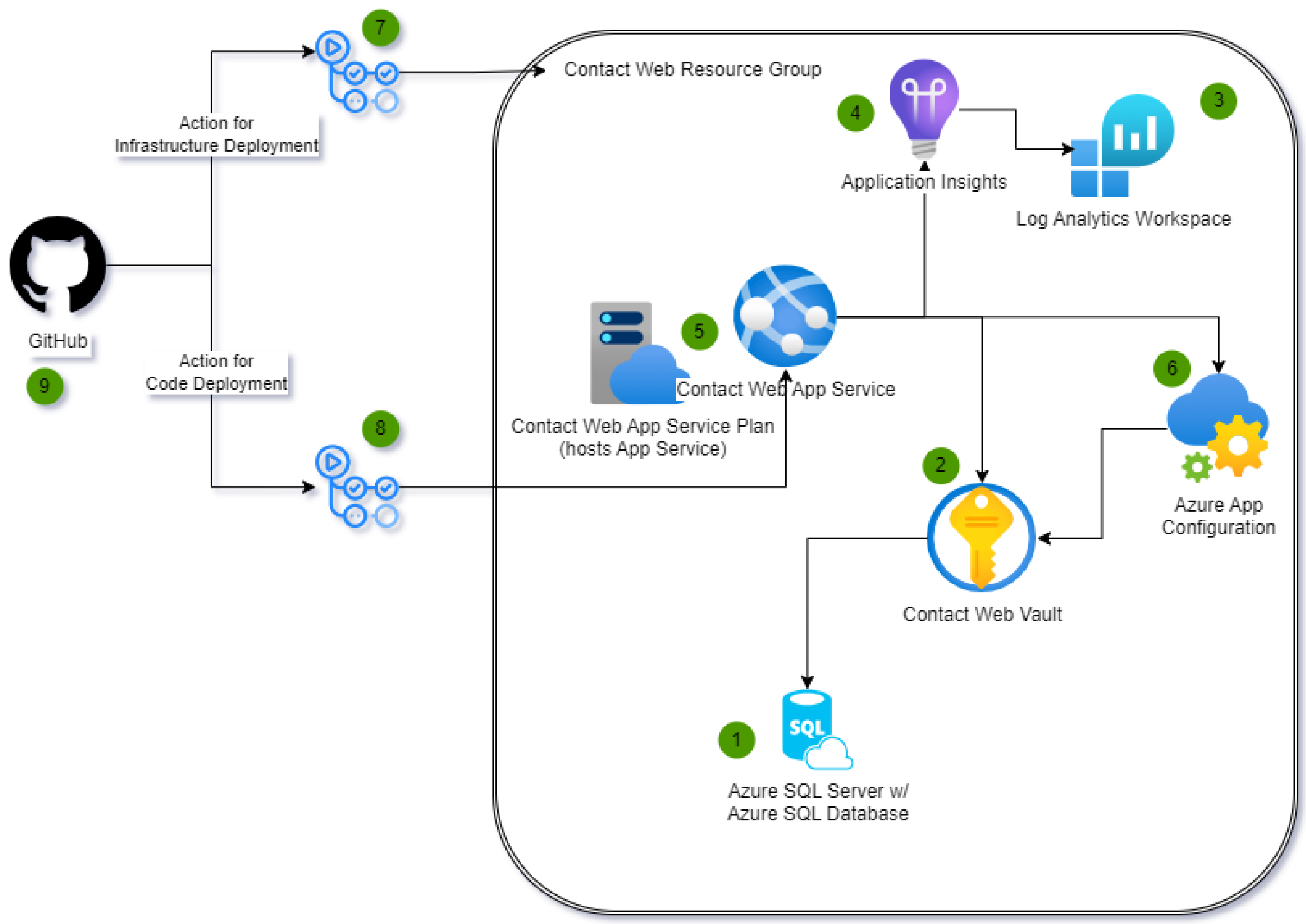
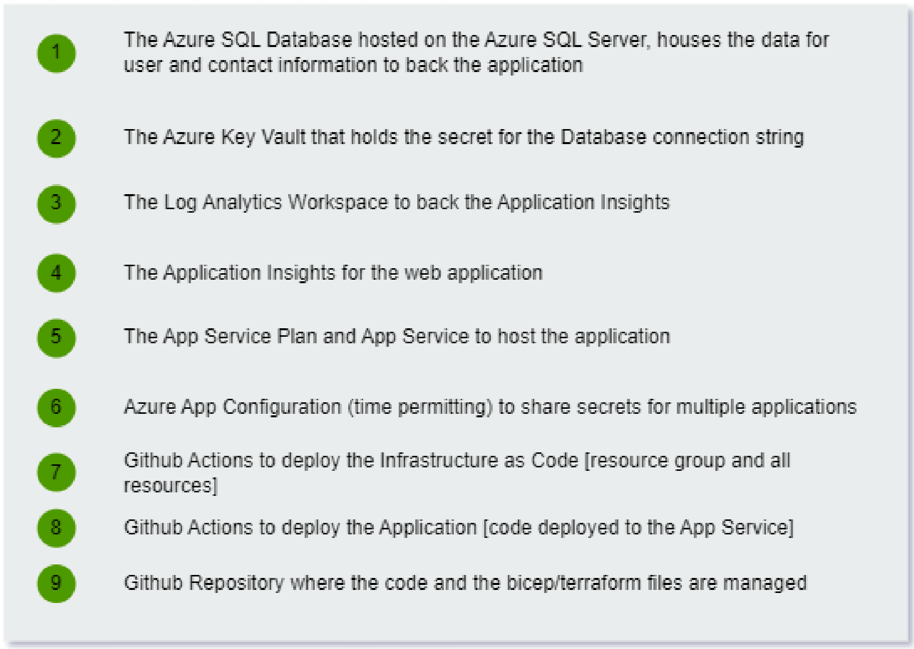
Part 2 - Building the Infrastructure

In this part you will build all the resources for implementation into Azure to host the application. You will use Bicep or Terraform to build the infrastructure.

As a reminder, this is the architecture we are building. By completing the `Part2-BuildingTheInfrastructure` walkthrough, you should already have the resource group for the application built.





1	The Azure SQL Database hosted on the Azure SQL Server, houses the data for user and contact information to back the application
2	The Azure Key Vault that holds the secret for the Database connection string
3	The Log Analytics Workspace to back the Application Insights
4	The Application Insights for the web application
5	The App Service Plan and App Service to host the application
6	Azure App Configuration (time permitting) to share secrets for multiple applications
7	Github Actions to deploy the Infrastructure as Code [resource group and all resources]
8	Github Actions to deploy the Application [code deployed to the App Service]
9	Github Repository where the code and the bicep/terraform files are managed

> *Note*: The Azure App Configuration will be added in Part 4 if there is enough time to complete the activities.

Prerequisites

You will need to have completed both Part 1 of this walkthrough and also the common Building The Infrastructure walkthrough before starting this walkthrough. If you do not already have a GitHub action that is deploying to Azure at the subscription level and creating a resource group, you will not be able to complete this walkthrough.

Other information

For simplicity, I have moved all the files except the `deployContactWebArchitecture.bicep` and `deployContactWebArchitecture.parameters.json` in my `iac` folder into subfolders to get them out of the way. You can do the same or just put all your files in the `iac` folder.

Task 1 - Deploy Azure SQL Server

In this task you will get a your Azure SQL Server with a SQL database deployed. The SQL Server and the database will be a basic tier ($5/month) so even on the free account you shouldn't have to pay anything.

The database will be named `contactwebdb` and the server will be named `contactwebdbserver`.

The server will be created with a firewall rule to allow all Azure services to access the server.

Step 1 - Create the Bicep For the SQL Server

In this step you'll create the bicep for the SQL Server and database

1. Add a new bicep file to deploy the database.

   Create a new file in the `iac` folder called

   ```
   azureSQL.bicep
   ```

2. Add the following text to the bicep file.

```
@description('Location for all resources.')
param location string = resourceGroup().location

@description('Provide a unique datetime and initials string to make your instances
unique. Use only lower case letters and numbers')
@minLength(11)
@maxLength(11)
param uniqueIdentifier string

@description('Name of the SQL Db Server')
param sqlServerName string

@description('Name of the Sql Database')
param sqlDatabaseName string

@description('Admin UserName for the SQL Server')
param sqlServerAdminLogin string

@description('Admin Password for the SQL Server')
@secure()
```

```
param sqlServerAdminPassword string

@description('Your Client IP Address to allow access to the SQL Server')
param clientIPAddress string

var sqlDBServerName = '${sqlServerName}${uniqueIdentifier}'
var dbSKU = 'Basic'
var dbCapacity = 5

resource sqlServer 'Microsoft.Sql/servers@2022-05-01-preview' = {
  name: sqlDBServerName
  location: location
  properties: {
    administratorLogin: sqlServerAdminLogin
    administratorLoginPassword: sqlServerAdminPassword
    minimalTlsVersion: '1.2'
    publicNetworkAccess: 'Enabled'
    restrictOutboundNetworkAccess: 'Disabled'
  }
}

resource sqlServerFirewallRuleAllAzureServices
'Microsoft.Sql/servers/firewallRules@2022-05-01-preview' = {
  parent: sqlServer
  name: 'AllowAllWindowsAzureIps'
  properties: {
    startIpAddress: '0.0.0.0'
    endIpAddress: '0.0.0.0'
  }
}

resource sqlServerFirewallRuleClientIP 'Microsoft.Sql/servers/firewallRules@2022-
05-01-preview' = {
  parent: sqlServer
  name: 'MyIPCanAccessServer'
  properties: {
    startIpAddress: clientIPAddress
    endIpAddress: clientIPAddress
  }
}

resource sqlDB 'Microsoft.Sql/servers/databases@2022-05-01-preview' = {
  parent: sqlServer
  name: sqlDatabaseName
  location: location
  sku: {
    name: dbSKU
    capacity: dbCapacity
  }
  properties: {
    requestedBackupStorageRedundancy: 'local'
  }
}
```

```
output sqlServerName string = sqlServer.name
```

> **Note**: As a reminder, all source files can be found in the `src/iac/bicep/Part2` folder from this repo case something is not working as expected from this walkthrough.

1. Review the file to see what is happening

    - Creating the SQL Server
    - Adding firewall rules for Azure services and your client IP address
    - Creating the database
    - Parameters for the SQL Server and database name as well as the admin username and password

Step 2 - Create the parameters file

In this step you'll create the parameters file for the SQL Server and database

1. Create a new file for the azureSQL parameters

    Create a new file in the `iac` folder called

    ```
    azureSQL.parameters.json
    ```

2. Add the following text to the parameters file.

    First add the parameters to the json

```
{
    "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentParameters.json#",
    "contentVersion": "1.0.0.0",
    "parameters": {
        "location": {
            "value": "eastus"
        },
        "uniqueIdentifier": {
            "value": "20291231acw"
        },
        "sqlServerName": {
            "value": "ContactWebDBServer"
        },
        "sqlDatabaseName": {
            "value": "ContactWebDB"
        },
        "sqlServerAdminLogin": {
            "value": "contactwebdbuser"
        },
        "sqlServerAdminPassword": {
            "value": "workshopDbPwd#54321!"
```

```
        },
        "clientIPAddress": {
            "value": "10.10.10.10"
        }
    }
}
```

> **Note:** This file is not actually necessary but will allow you to manually run a single deployment of just the database if you want to test it. Additionally, I like to keep these around so that I can see what parameters each one adds to the main deployment.

1. Copy the parameters for the sql server into the main `deployContactWebArchitecture.parameters.json` file.

   Ensure that your parameters file looks like the following:

```
{
    "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentParameters.json#",
    "contentVersion": "1.0.0.0",
    "parameters": {
        "rgName": {
            "value": "ContactWebApplicationRG"
        },
        "location": {
            "value": "eastus"
        },
        "uniqueIdentifier": {
            "value": "20291231acw"
        },
        "sqlServerName": {
            "value": "ContactWebDBServer"
        },
        "sqlDatabaseName": {
            "value": "ContactWebDB"
        },
        "sqlServerAdminLogin": {
            "value": "contactwebdbuser"
        },
        "sqlServerAdminPassword": {
            "value": "workshopDbPwd#54321!"
        },
        "clientIPAddress": {
            "value": "10.10.10.10"
        }
    }
}
```

> **Note:** Replace `10.10.10.10` with your actual public IP address so you can access the server from the portal or from SSMS if you need to. In the real world you would likely not include this firewall rule.

Step 3 - Add the deployment to the main deployment file

In order to deploy the SQL Server and database, you need to add the deployment to the main deployment file.

1. Add the deployment to the main deployment file

   Add the following to the main deployment file:

```
module contactWebDatabase 'azureSQL.bicep' = {
  name: '${sqlServerName}-${sqlDatabaseName}-${uniqueIdentifier}'
  scope: contactWebResourceGroup
  params: {
    location: contactWebResourceGroup.location
    uniqueIdentifier: uniqueIdentifier
    sqlServerName: sqlServerName
    sqlDatabaseName: sqlDatabaseName
    sqlServerAdminLogin: sqlServerAdminLogin
    sqlServerAdminPassword: sqlServerAdminPassword
    clientIPAddress: clientIPAddress
  }
}
```

1. Add the missing parameters to and/or ensure the following parameters are at the top of the file after the `location` parameter:

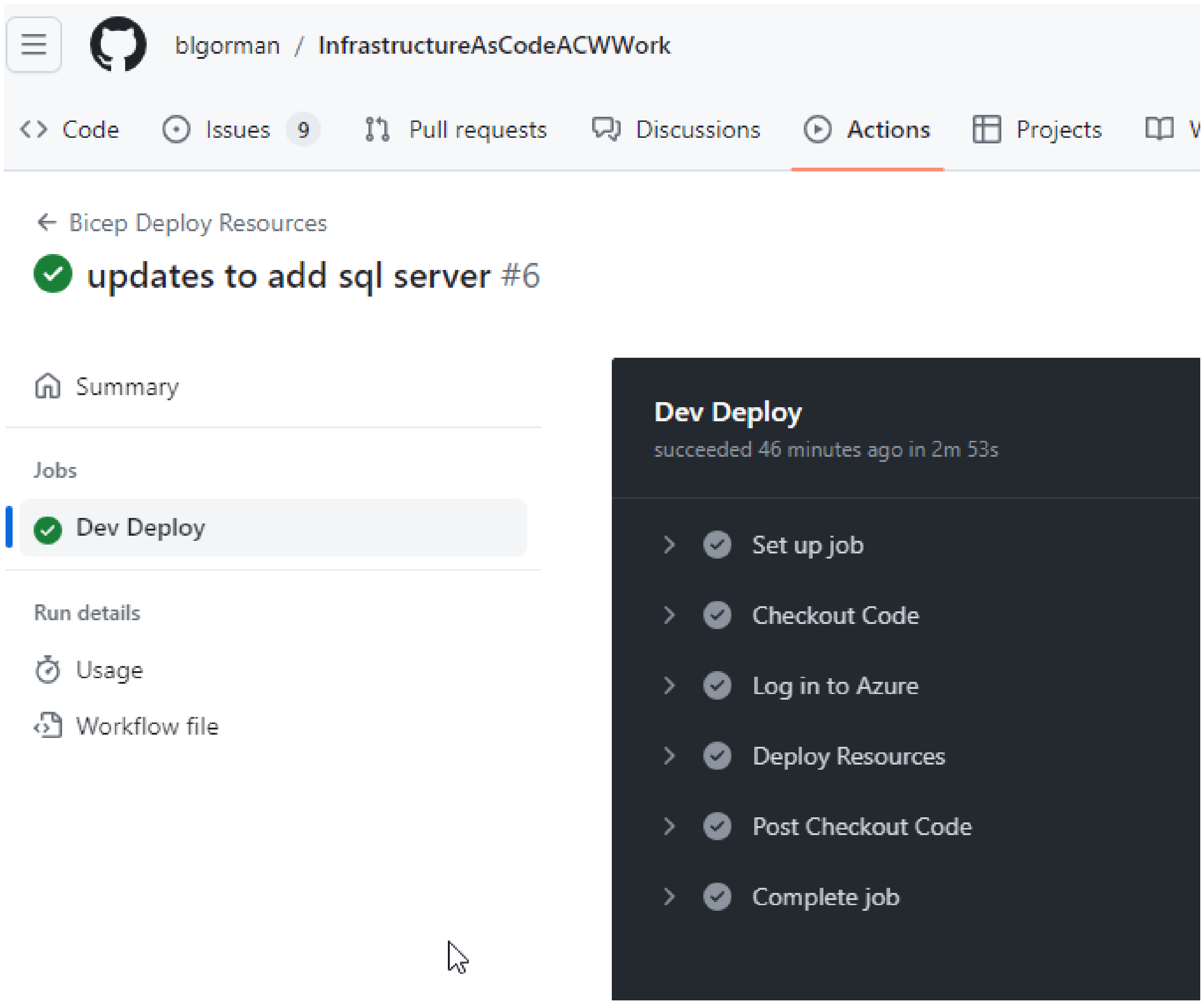
```
targetScope = 'subscription'

param rgName string
param location string

@minLength(11)
@maxLength(11)
@description('YYYYMMDD with your initials to follow (i.e. 20291231acw)')
param uniqueIdentifier string

param sqlServerName string
param sqlDatabaseName string
param sqlServerAdminLogin string
@secure()
param sqlServerAdminPassword string
param clientIPAddress string
```

> **Note:** make sure that all the parameters are in the `deployContactWebArchitecture.parameters.json` file with the values set as expected.

Step 4 - Check in and deploy

Check in the changes and the deployment should run automatically.

1. Deploy by checking in and pushing your changes.



updates to add sql server #6

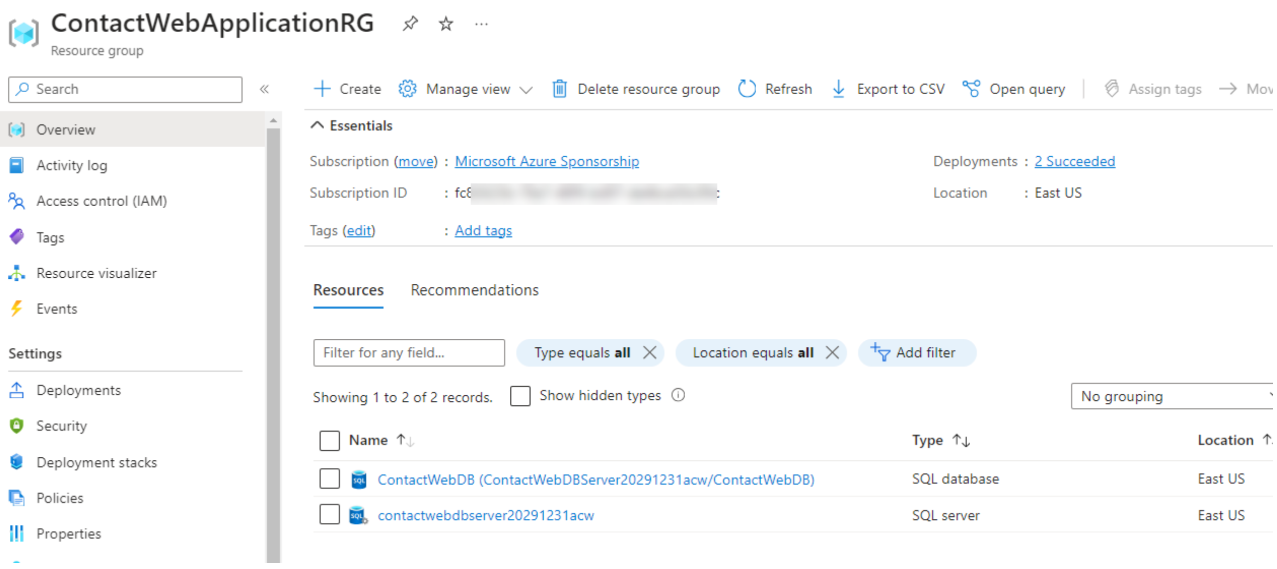
Dev Deploy

succeeded 46 minutes ago in 2m 53s

- Set up job
- Checkout Code
- Log in to Azure
- Deploy Resources
- Post Checkout Code
- Complete job

2. Validate Server

   Navigate to the resource group. You should see something like the following:



ContactWebApplicationRG
Resource group

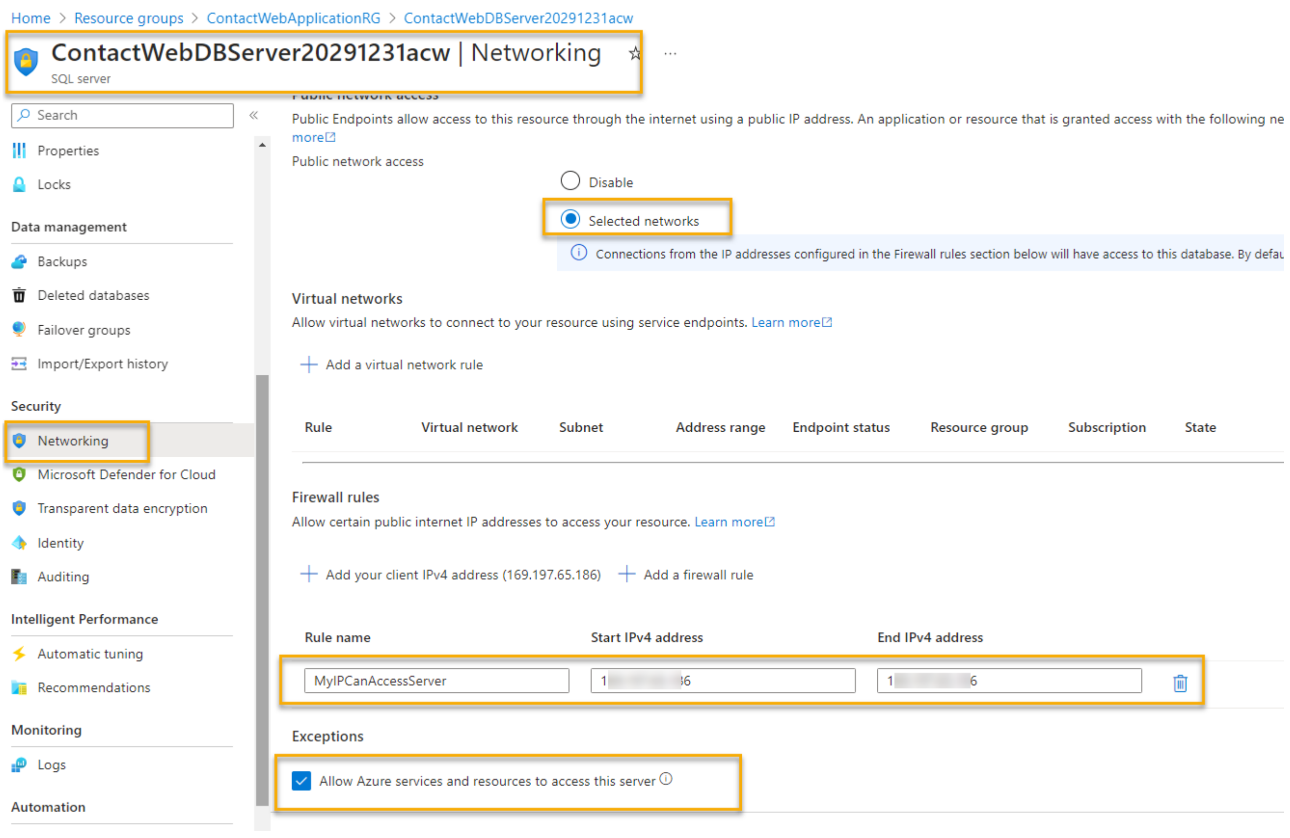
Essentials

Subscription (move) : Microsoft Azure Sponsorship
Subscription ID : fc[redacted]
Tags (edit) : Add tags
Deployments : 2 Succeeded
Location : East US

Showing 1 to 2 of 2 records. Show hidden types

Name	Type	Location
ContactWebDB (ContactWebDBServer20291231acw/ContactWebDB)	SQL database	East US
contactwebdbserver20291231acw	SQL server	East US

   Open the `SQL Server` and click on `Networking`. You should see something like the following:


Home > Resource groups > ContactWebApplicationRG > ContactWebDBServer20291231acw

ContactWebDBServer20291231acw | Networking

SQL server

Public Endpoints allow access to this resource through the internet using a public IP address. An application or resource that is granted access with the following ne more

Public network access: Disable [✓ Selected networks]

Connections from the IP addresses configured in the Firewall rules section below will have access to this database. By defau

Virtual networks

Allow virtual networks to connect to your resource using service endpoints. Learn more

+ Add a virtual network rule

Rule	Virtual network	Subnet	Address range	Endpoint status	Resource group	Subscription	State

Firewall rules

Allow certain public internet IP addresses to access your resource. Learn more

+ Add your client IPv4 address (169.197.65.186) + Add a firewall rule

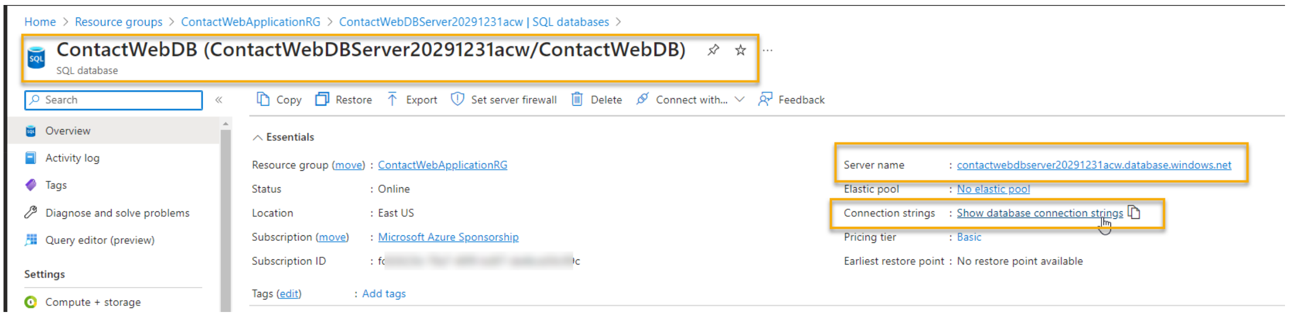
Rule name	Start IPv4 address	End IPv4 address
MyIPCanAccessServer	1[redacted]6	1[redacted]6

Exceptions

[✓] Allow Azure services and resources to access this server

3. Validate Database

   Return to the request group and click on the `SQL Database`, or go to the database from the server.


Home > Resource groups > ContactWebApplicationRG > ContactWebDBServer20291231acw | SQL databases >

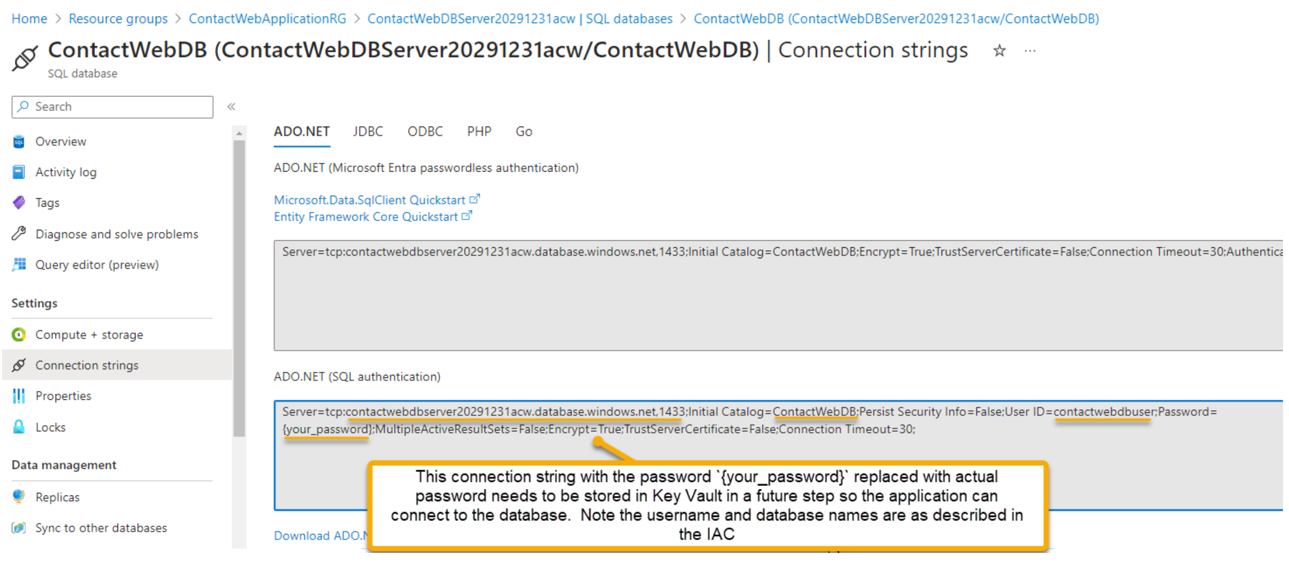
ContactWebDB (ContactWebDBServer20291231acw/ContactWebDB)

SQL database

Resource group (move)	: ContactWebApplicationRG
Status	: Online
Location	: East US
Subscription (move)	: Microsoft Azure Sponsorship
Subscription ID	: fc[redacted]c
Tags (edit)	: Add tags
Server name	: contactwebdbserver20291231acw.database.windows.net
Elastic pool	: No elastic pool
Connection strings	: Show database connection strings
Pricing tier	: Basic
Earliest restore point	: No restore point available

4. Note Connection string

   On the database connection string info, validate that you have a database with the name you specified and that you can see the connection string with all the info except the password:


Home > Resource groups > ContactWebApplicationRG > ContactWebDBServer20291231acw | SQL databases > ContactWebDB (ContactWebDBServer20291231acw/ContactWebDB)
Search
Overview
Activity log
Tags
Diagnose and solve problems
Query editor (preview)
Settings
Compute + storage
Connection strings
Properties
Locks
Data management
Replicas
Sync to other databases
ADO.NET
JDBC
ODBC
PHP
Go
Microsoft.Data.SqlClient Quickstart
Entity Framework Core Quickstart
Download ADO.N

ContactWebDB (ContactWebDBServer20291231acw/ContactWebDB) | Connection strings

SQL database

ADO.NET (Microsoft Entra passwordless authentication)

```
Server=tcp:contactwebdbserver20291231acw.database.windows.net,1433;Initial Catalog=ContactWebDB;Encrypt=True;TrustServerCertificate=False;Connection Timeout=30;Authentica
```

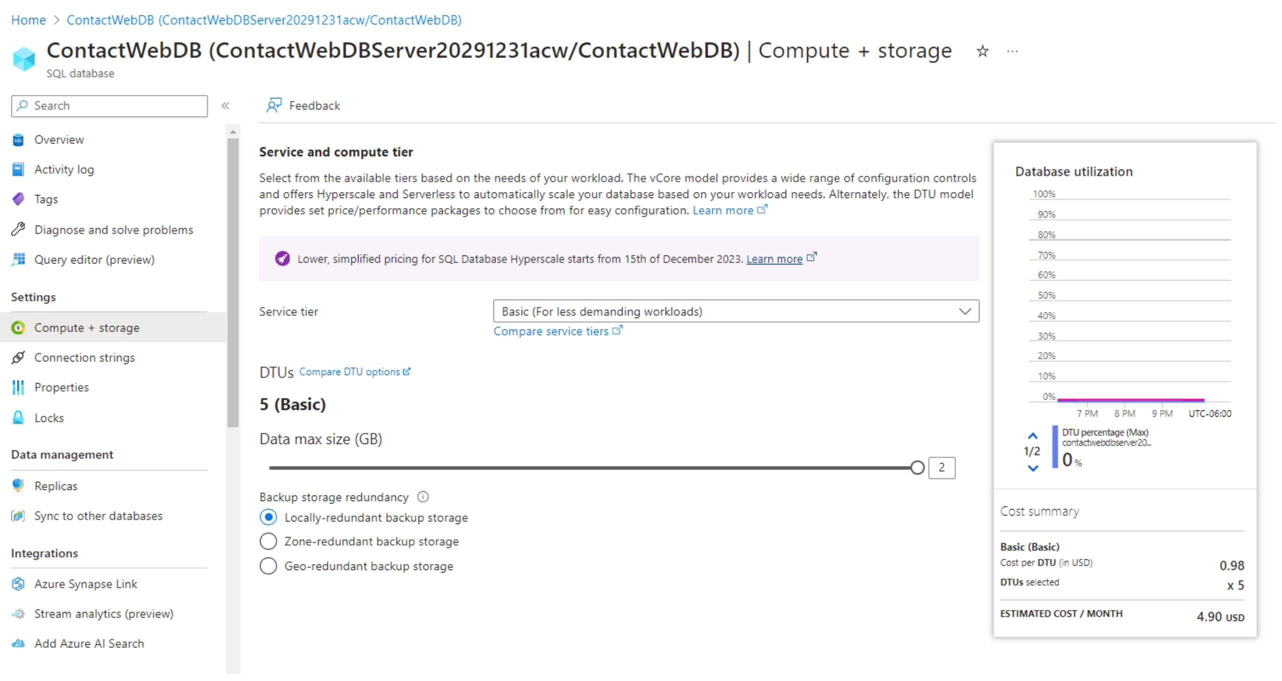
ADO.NET (SQL authentication)

```
Server=tcp:contactwebdbserver20291231acw.database.windows.net,1433;Initial Catalog=ContactWebDB;Persist Security Info=False;User ID=contactwebdbuser;Password=
{your_password};MultipleActiveResultSets=False;Encrypt=True;TrustServerCertificate=False;Connection Timeout=30;
```

This connection string with the password `{your_password}` replaced with actual password needs to be stored in Key Vault in a future step so the application can connect to the database. Note the username and database names are as described in the IAC

5. Validate Database SKU

   Make sure that you didn't accidentally create a database with a higher SKU than you wanted. You should see something like the following:



ContactWebDB (ContactWebDBServer20291231acw/ContactWebDB) | Compute + storage

SQL database

Service and compute tier

Select from the available tiers based on the needs of your workload. The vCore model provides a wide range of configuration controls and offers Hyperscale and Serverless to automatically scale your database based on your workload needs. Alternately, the DTU model provides set price/performance packages to choose from for easy configuration. Learn more

Lower, simplified pricing for SQL Database Hyperscale starts from 15th of December 2023. Learn more

Service tier: Basic (For less demanding workloads)

DTUs

5 (Basic)

Data max size (GB): 2

Backup storage redundancy

[✓ Locally-redundant backup storage]
Zone-redundant backup storage
Geo-redundant backup storage

Cost summary

Basic (Basic)	
Cost per **DTU** (in USD)	0.98
DTUs selected	x 5
ESTIMATED COST / MONTH	4.90 USD

> **Note:** we will use IAC to get and set the connection string information into the Key Vault in a future step, so you don't need to copy it or save it anywhere.

Task 2 - Log analytics/Application Insights

In order to log analytics for the web application, we need to create application insights backed by log analytics workspace. We will create the log analytics workspace first and then create the application insights, then finally create the app service.

Step 1 - Create Log Analytics Workspace

1. Add a file for the analyticsWorkspace

   Create a new file in the `iac` folder called

```
logAnalyticsWorkspace.bicep
```

2. Add the following text to the bicep file.

```
resource logAnalyticsWorkspace 'Microsoft.OperationalInsights/workspaces@2020-08-
01' = {
  name: logAnalyticsWorkspaceName
  location: location
  properties: {
    sku: {
      name: 'PerGB2018'
    }
    retentionInDays: 30
    features: {
      searchVersion: 1
      legacy: 0
      enableLogAccessUsingOnlyResourcePermissions: true
    }
  }
}

output logAnalyticsWorkspaceId string = logAnalyticsWorkspace.id
```

Step 2 - Create the parameters file

Create the parameters file.

1. Add a parameters file for the loganalytics workspace

   Create a new file in the `iac` folder called

```
logAnalyticsWorkspace.parameters.json
```

2. Add the following text to the parameters file.

```
{
    "$schema": "https://schema.management.azure.com/schemas/2019-04-
01/deploymentParameters.json#",
    "contentVersion": "1.0.0.0",
    "parameters": {
        "location": {
            "value": "eastus"
        },
        "logAnalyticsWorkspaceName": {
            "value": "contactWebAnalytics"
        }
    }
}
```

Step 3 - Deploy Log Analytics for the Web Application's Application Insights

Deploy the log analytics workspace.

1. Add the deployment to the main deployment file

   Add the following to the main deployment file:

```
module contactWebAnalyticsWorkspace 'logAnalyticsWorkspace.bicep' = {
  name: '${logAnalyticsWorkspaceName}-deployment'
  scope: contactWebResourceGroup
  params: {
    location: contactWebResourceGroup.location
    logAnalyticsWorkspaceName: logAnalyticsWorkspaceName
  }
}
```

```
Also add the parameter to the top of the file after the sql server parameters:
```

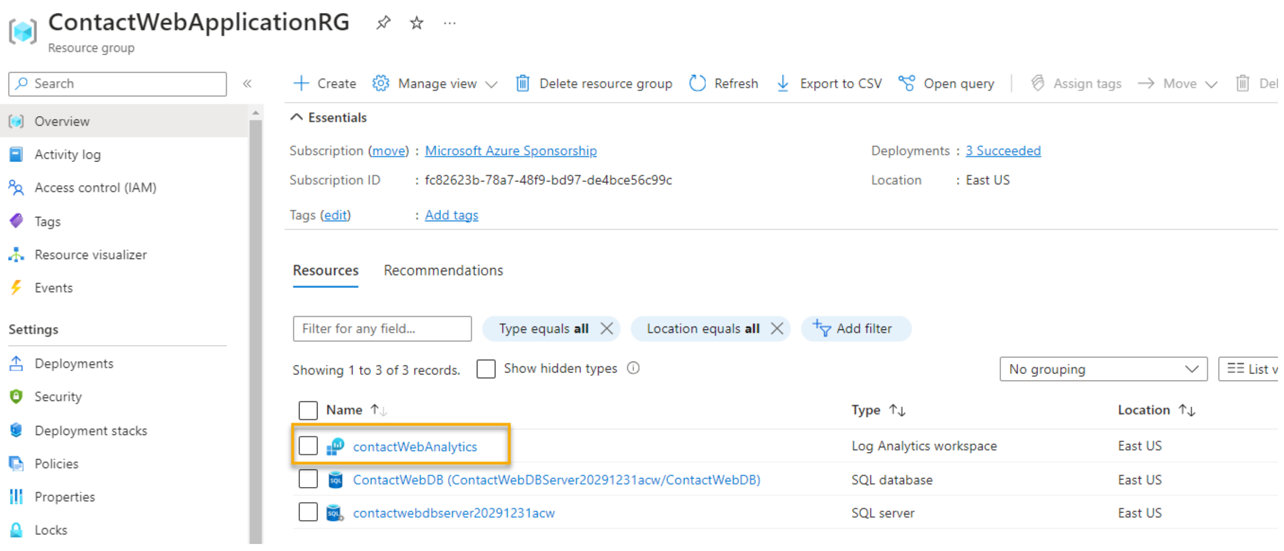
```
param logAnalyticsWorkspaceName string
```

1. Add the parameters to the deployment parameters file

   Add the following to the `deployContactWebArchitecture.parameters.json` file after the clientIPAddress parameter (don't forget the comma):

```
        "logAnalyticsWorkspaceName": {
            "value": "contactWebAnalytics"
        }
```

1. Check in and let the deployment run to validate your log analytics workspace (you can start creating the next one while it builds).


ContactWebApplicationRG
Resource group

Subscription (move) : Microsoft Azure Sponsorship
Subscription ID : fc82623b-78a7-48f9-bd97-de4bce56c99c
Tags (edit) : Add tags
Deployments : 3 Succeeded
Location : East US

Showing 1 to 3 of 3 records.

Name	Type	Location
contactWebAnalytics	Log Analytics workspace	East US
ContactWebDB (ContactWebDBServer20291231acw/ContactWebDB)	SQL database	East US
contactwebdbserver20291231acw	SQL server	East US

Step 4 - Create Application Insights

In this step you'll build the application insights resource that will be backed by the log analytics workspace built in the previous step.

1. Create a new file for the application insights

   Create a new file in the `iac` folder called

   ```
   applicationInsights.bicep
   ```

2. Add the following text to the bicep file.

```
param location string
param appInsightsName string
param logAnalyticsWorkspaceId string

resource applicationInsights 'Microsoft.Insights/components@2020-02-02' = {
  name: appInsightsName
  location: location
  kind: 'web'
  properties: {
    Application_Type: 'web'
    WorkspaceResourceId: logAnalyticsWorkspaceId
  }
}

output applicationInsightsId string = applicationInsights.id
output applicationInsightsName string = applicationInsights.name
```

Step 5 - Create the parameters file

Create the parameters file.

1. Add a parameters file for the application insights

   Create a new file in the `iac` folder called

   ```
   applicationInsights.parameters.json
   ```

2. Add the following text to the parameters file.

```
{
    "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentParameters.json#",
    "contentVersion": "1.0.0.0",
    "parameters": {
        "location": {
            "value": "eastus"
        },
        "appInsightsName": {
            "value": "contactWebAppInsights"
        },
        "logAnalyticsWorkspaceId": {
            "value": "/subscriptions/${subscription().subscriptionId}/resourceGroups/${rgname}/providers/Microsoft.OperationalInsights/workspaces/${laWorkspaceName}"
        }
    }
}
```

> **NOTE:** You won't be able to run this one individually without first composing a valid workspace id. You could pass the name in and get the existing resource if you wanted to do it that way.

Step 6: Deploy

Deploy the application insights.

1. Add the deployment to the main deployment file

   Add the following to the main deployment file:

```
module contactWebApplicationInsights 'applicationInsights.bicep' = {
  name: '${appInsightsName}-deployment'
  scope: contactWebResourceGroup
  params: {
    location: contactWebResourceGroup.location
    appInsightsName: appInsightsName
    logAnalyticsWorkspaceId: contactWebAnalyticsWorkspace.outputs.logAnalyticsWorkspaceId
  }
}
```

> **Note:** Notice the dependency on the log analytics workspace. This is how you can ensure that the log analytics workspace is created before the application insights.

```
Also add the parameter to the top of the file after the sql server parameters:
```

```
param appInsightsName string
```

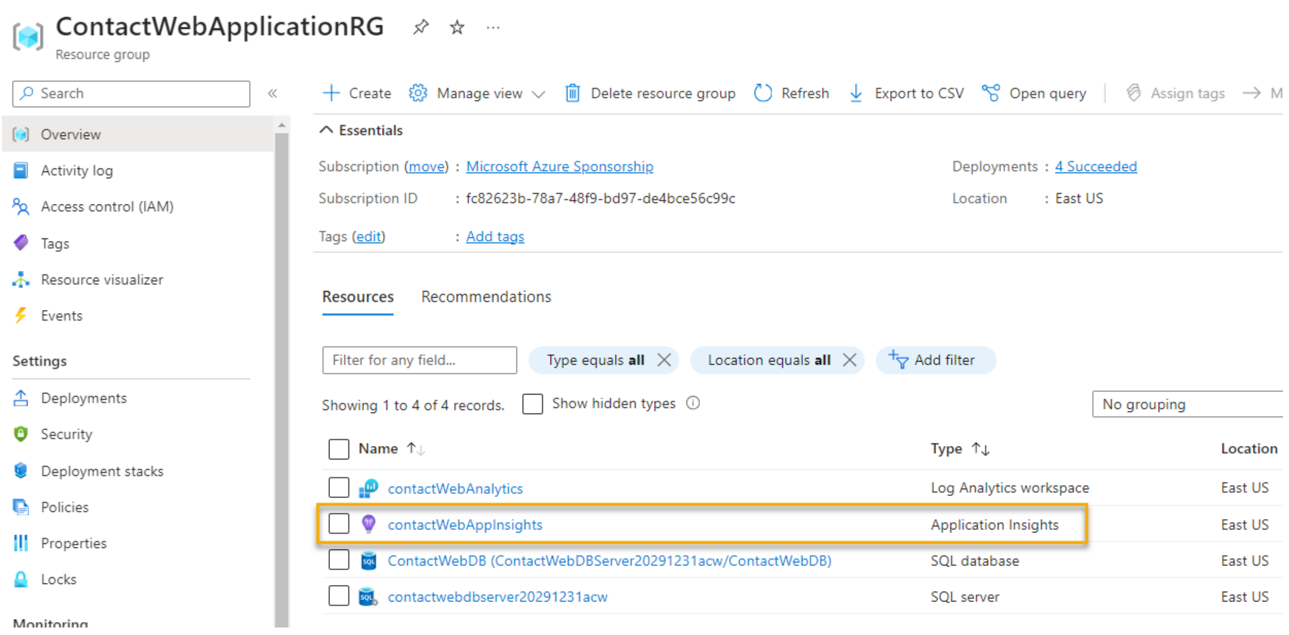
1. Add the parameters to the deployment parameters file

   Add the following to the `deployContactWebArchitecture.parameters.json` file after the logAnalyticsWorkspaceName parameter (don't forget the comma):

```
        "appInsightsName": {
            "value": "contactWebAppInsights"
        }
```

1. Check in and deploy changes

   Navigate back to the resource group and review the resources.



ContactWebApplicationRG
Resource group

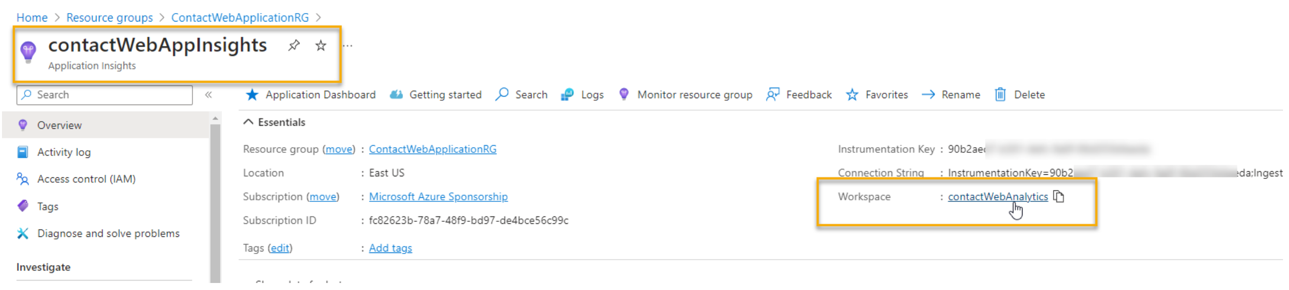
Subscription (move) : Microsoft Azure Sponsorship
Subscription ID : fc82623b-78a7-48f9-bd97-de4bce56c99c
Tags (edit) : Add tags
Deployments : 4 Succeeded
Location : East US

Showing 1 to 4 of 4 records.

Name	Type	Location
contactWebAnalytics	Log Analytics workspace	East US
contactWebAppInsights	Application Insights	East US
ContactWebDB (ContactWebDBServer20291231acw/ContactWebDB)	SQL database	East US
contactwebdbserver20291231acw	SQL server	East US

2. Validate that the Application Insights is correctly leveraging the workspace

   Open the Application Insights and review the `overview` blade.


Home > Resource groups > ContactWebApplicationRG >

contactWebAppInsights
Application Insights

Essentials

Resource group (move) : ContactWebApplicationRG
Location : East US
Subscription (move) : Microsoft Azure Sponsorship
Subscription ID : fc82623b-78a7-48f9-bd97-de4bce56c99c
Tags (edit) : Add tags

Instrumentation Key : 90b2ae[redacted]
Connection String : InstrumentationKey=90b2[redacted]da;Ingest
Workspace : contactWebAnalytics

Task 3 - Create App Service Plan and App service

At this point, the backing database and log analytics/application insights are in place. We will need to leverage them in the App Service for the two database connections and the log analytics connection string/instrumentation key.

Step 1 - Create the App Service Plan and Site

1. Review necessary information

   In order for this to work, we need to set the following values in the configuration for the app service:

   - `ConnectionStrings:DefaultConnection` - this will be the connection string for the identity database
   - `ConnectionStrings:MyContactManager` - this will be the connection string for the database
   - `APPINSIGHTS:CONNECTIONSTRING` - this will be the instrumentation key for the application insights

   These database values will be leveraged a couple of other times and it's important not to make a *typo* on these so they will need to be parameterized.

2. Create the bicep for the app service and app service plan

   Create a new file in the `iac` folder called

   ```
   contactWebAppService.bicep
   ```

3. Add the following text to the bicep file.

```
param location string
param uniqueIdentifier string
param appServicePlanName string
param appServicePlanSku string = 'F1'
param webAppName string
param appInsightsName string
param identityDBConnectionStringKey string = 'ConnectionStrings:DefaultConnection'
param managerDBConnectionStringKey string = 'ConnectionStrings:MyContactManager'
param appInsightsConnectionStringKey string = 'APPINSIGHTS:CONNECTIONSTRING'

var workerRuntime = 'dotnet'
var webAppFullName = '${webAppName}-${uniqueIdentifier}'
```

```
var identityDBConnectionStringValue = 'ContactWebIdentityDBConnectionString'
var managerDBConnectionStringValue = 'ContactWebDBConnectionString'

resource applicationInsights 'Microsoft.Insights/components@2020-02-02' existing =
{
  name: appInsightsName
}

resource hostingPlan 'Microsoft.Web/serverfarms@2023-01-01' = {
  name: '${appServicePlanName}-${uniqueIdentifier}'
  location: location
  sku: {
    name: appServicePlanSku
  }
}

resource webApp 'Microsoft.Web/sites@2023-01-01' = {
  name: webAppFullName
  location: location
  identity: {
    type: 'SystemAssigned'
  }
  properties: {
    serverFarmId: hostingPlan.id
    siteConfig: {
      metadata :[
        {
          name:'CURRENT_STACK'
          value:workerRuntime
        }
      ]
      netFrameworkVersion:'v6.0'
      appSettings: [
          {
            name: appInsightsConnectionStringKey
            value: applicationInsights.properties.ConnectionString
          }
          {
            name: identityDBConnectionStringKey
            value: identityDBConnectionStringValue
          }
          {
            name: managerDBConnectionStringKey
            value: managerDBConnectionStringValue
          }
        ]
        ftpsState: 'FtpsOnly'
        minTlsVersion: '1.2'
    }
    httpsOnly: true
  }
}

output webAppFullName string = webApp.name
```

Step 2 - Create the parameters file

1. Add a parameters file for the app service and app service plan

   Create a new file in the `iac` folder called

   ```
   contactWebAppService.parameters.json
   ```

2. Add the following text to the parameters file.

```
{
    "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentParameters.json#",
    "contentVersion": "1.0.0.0",
    "parameters": {
        "location": {
            "value": "eastus"
        },
        "uniqueIdentifier": {
            "value": "20291231acw"
        },
        "appServicePlanName": {
            "value": "contactWebASP"
        },
        "appServicePlanSku": {
            "value": "F1"
        },
        "webAppName": {
            "value": "ContactWeb"
        },
        "appInsightsName": {
            "value": "contactWebAppInsights"
        },
        "identityDBConnectionStringKey": {
            "value": "ConnectionStrings:DefaultConnection"
        },
        "managerDBConnectionStringKey": {
            "value": "ConnectionStrings:MyContactManager"
        },
        "appInsightsConnectionStringKey": {
            "value": "APPINSIGHTS:CONNECTIONSTRING"
        }
    }
}
```

Step 3 - Deploy

Add the parameters and bicep module to the main deployment files

1. Add the deployment to the main deployment file

   Add the following to the main deployment file:

```
module contactWebApplicationPlanAndSite 'contactWebAppService.bicep' = {
  name: '${webAppName}-deployment'
  scope: contactWebResourceGroup
  params: {
    location: contactWebResourceGroup.location
    uniqueIdentifier: uniqueIdentifier
    appInsightsName: contactWebApplicationInsights.outputs.applicationInsightsName
    appServicePlanName: appServicePlanName
    appServicePlanSku: appServicePlanSku
    webAppName: webAppName
    identityDBConnectionStringKey: identityDBConnectionStringKey
    managerDBConnectionStringKey: managerDBConnectionStringKey
    appInsightsConnectionStringKey: appInsightsConnectionStringKey
  }
}
```

And add the missing parameters to the top of the file:

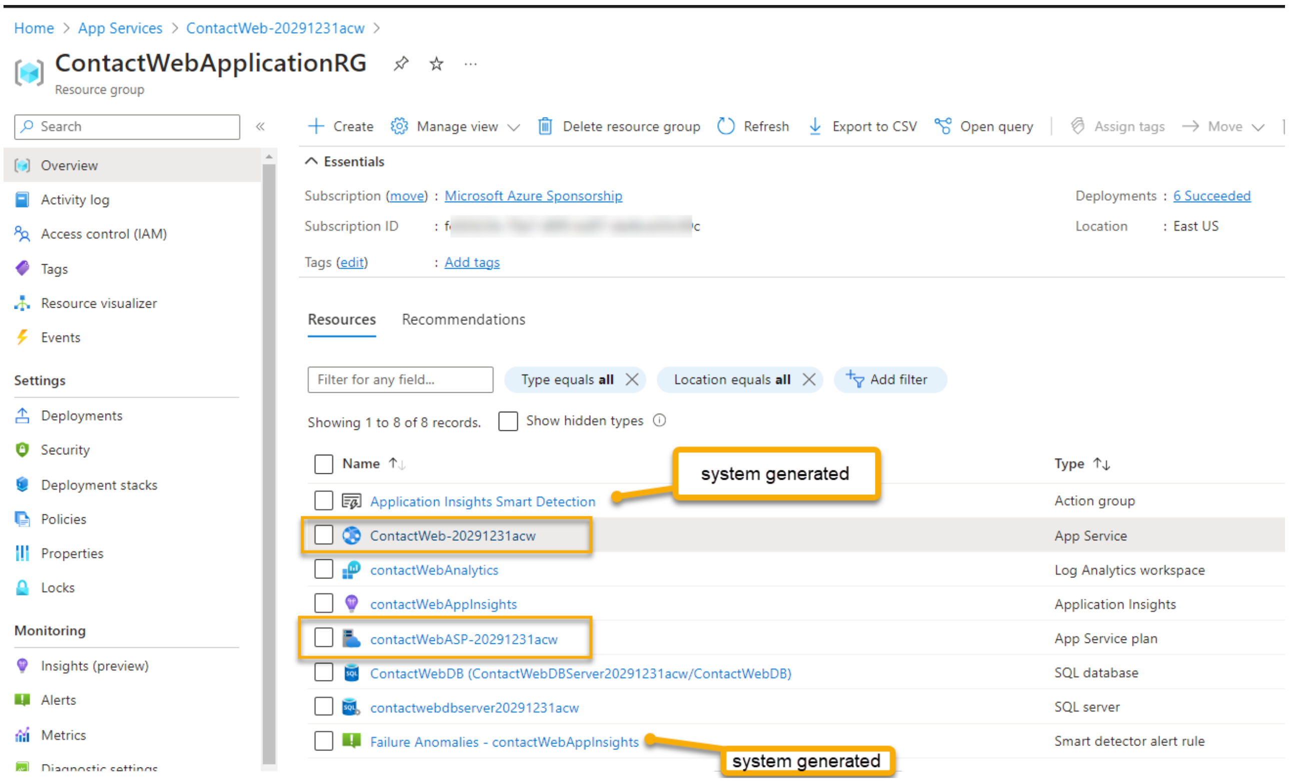
```
param webAppName string
param appServicePlanName string
param appServicePlanSku string
param identityDBConnectionStringKey string
param managerDBConnectionStringKey string
param appInsightsConnectionStringKey string
```

1. Add the parameters to the parameters file (don't forget the comma before the first setting):

```
        "appServicePlanName": {
            "value": "contactWebASP"
        },
        "appServicePlanSku": {
            "value": "F1"
        },
        "webAppName": {
            "value": "ContactWeb"
        },
        "identityDBConnectionStringKey": {
            "value": "ConnectionStrings:DefaultConnection"
        },
        "managerDBConnectionStringKey": {
            "value": "ConnectionStrings:MyContactManager"
        },
        "appInsightsConnectionStringKey": {
            "value": "APPINSIGHTS:CONNECTIONSTRING"
        }
```

1. Check in and deploy

   Navigate back to the resource group and review the resources.



Home > App Services > ContactWeb-20291231acw >

ContactWebApplicationRG
Resource group

Search

+ Create | Manage view | Delete resource group | Refresh | Export to CSV | Open query | Assign tags | Move

Overview
Activity log
Access control (IAM)
Tags
Resource visualizer
Events

Settings
Deployments
Security
Deployment stacks
Policies
Properties
Locks

Monitoring
Insights (preview)
Alerts
Metrics
Diagnostic settings

Essentials

Subscription (move) : Microsoft Azure Sponsorship
Subscription ID : [redacted]
Tags (edit) : Add tags
Deployments : 6 Succeeded
Location : East US

Resources | Recommendations

Filter for any field... | Type equals all | Location equals all | Add filter

Showing 1 to 8 of 8 records. Show hidden types

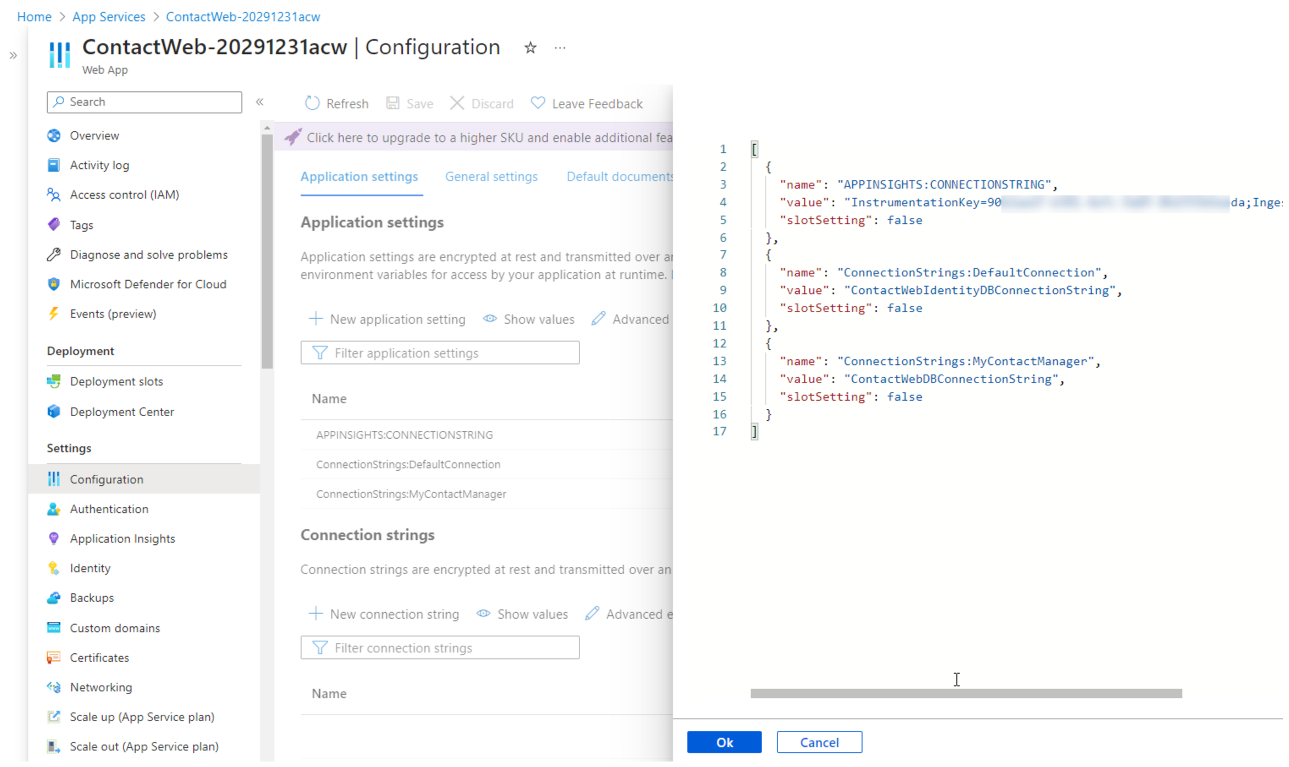
Name	Type
Application Insights Smart Detection	Action group
ContactWeb-20291231acw	App Service
contactWebAnalytics	Log Analytics workspace
contactWebAppInsights	Application Insights
contactWebASP-20291231acw	App Service plan
ContactWebDB (ContactWebDBServer20291231acw/ContactWebDB)	SQL database
contactwebdbserver20291231acw	SQL server
Failure Anomalies - contactWebAppInsights	Smart detector alert rule

2. Ensure the web app is created:

   Review the App Service Plan for free tier:

   "App Service Plan Free Sku"

   Review the App Service for settings:



Click here to upgrade to a higher SKU and enable additional fea

Application settings

Application settings are encrypted at rest and transmitted over an environment variables for access by your application at runtime.

Name
APPINSIGHTS:CONNECTIONSTRING
ConnectionStrings:DefaultConnection
ConnectionStrings:MyContactManager

Connection strings

Connection strings are encrypted at rest and transmitted over an

```
[
  {
    "name": "APPINSIGHTS:CONNECTIONSTRING",
    "value": "InstrumentationKey=90[redacted]da;Inge
    "slotSetting": false
  },
  {
    "name": "ConnectionStrings:DefaultConnection",
    "value": "ContactWebIdentityDBConnectionString",
    "slotSetting": false
  },
  {
    "name": "ConnectionStrings:MyContactManager",
    "value": "ContactWebDBConnectionString",
    "slotSetting": false
  }
]
```

Task 4 - Key vault

In this task you will create the key vault and add the secrets for the database connection strings. Additionally, you will add the identity from the web app to the key vault so that it can access the secrets.

When that is completed, you need to update the web application to use the key vault for the connection strings by updating the configuration value for the KeyVault Secret Uri.

Step 1 - Create the Key Vault

Create the Key Vault. You need to get the following accomplished with the deployment:

- Get the managed identity from app service into policy for get secrets (need list if using code access)
- Get the connection string from the database as a secret
- Create the vault with the two secrets and identity permission for the web app

1. Create a new file for the key vault

   Create a new file in the `iac` folder called

   ```
   keyVault.bicep
   ```

2. Add the following to the file:

```
param location string
@description('Provide a unique datetime and initials string to make your instances unique. Use only lower case letters and numbers')
@minLength(11)
@maxLength(11)
```

```
param uniqueIdentifier string

@minLength(10)
@maxLength(13)
param keyVaultName string

param webAppFullName string
param databaseServerName string
param sqlDatabaseName string
@secure()
param sqlServerAdminPassword string

var vaultName = '${keyVaultName}${uniqueIdentifier}'
var skuName = 'standard'
var softDeleteRetentionInDays = 7

resource webApp 'Microsoft.Web/sites@2023-01-01' existing = {
  name: webAppFullName
}

resource databaseServer 'Microsoft.Sql/servers@2023-05-01-preview' existing = {
  name: databaseServerName
}

resource keyVault 'Microsoft.KeyVault/vaults@2022-07-01' = {
  name: vaultName
  location: location
  properties: {
    enabledForDeployment: true
    enabledForDiskEncryption: false
    enabledForTemplateDeployment: true
    tenantId: subscription().tenantId
    enableSoftDelete: true
    softDeleteRetentionInDays: softDeleteRetentionInDays
    sku: {
      name: skuName
      family: 'A'
    }
    accessPolicies: [
      {
        tenantId: subscription().tenantId
        objectId: webApp.identity.principalId
        permissions: {
          keys: []
          secrets: ['Get']
          certificates: []
        }
      }
    ]
    networkAcls: {
      defaultAction: 'Allow'
      bypass: 'AzureServices'
    }
  }
}

resource identityDBConnectionSecret 'Microsoft.KeyVault/vaults/secrets@2022-11-01'
= {
  name: 'IdentityDbConnectionSecret'
  parent: keyVault
  properties: {
    value:
'Server=tcp:${databaseServer.name}${environment().suffixes.sqlServerHostname},1433
;Initial Catalog=${sqlDatabaseName};Persist Security Info=False;User
ID=${databaseServer.properties.administratorLogin};Password=${sqlServerAdminPasswo
rd};MultipleActiveResultSets=False;Encrypt=True;TrustServerCertificate=False;Conne
ction Timeout=30;'
  }
}

resource contactManagerDBConnectionSecret 'Microsoft.KeyVault/vaults/secrets@2022-
11-01' = {
  name: 'ContactManagerDbConnectionSecret'
  parent: keyVault
  properties: {
    value:
'Server=tcp:${databaseServer.name}${environment().suffixes.sqlServerHostname},1433
;Initial Catalog=${sqlDatabaseName};Persist Security Info=False;User
ID=${databaseServer.properties.administratorLogin};Password=${sqlServerAdminPasswo
rd};MultipleActiveResultSets=False;Encrypt=True;TrustServerCertificate=False;Conne
ction Timeout=30;'
  }
}

output keyVaultName string = keyVault.name
output identityDBConnectionSecretURI string =
identityDBConnectionSecret.properties.secretUri
output managerDBConnectionSecretURI string =
contactManagerDBConnectionSecret.properties.secretUri
```

Step 2 - Create the parameters file

Create the parameters file.

1. Add a parameters file for the key vault

   Create a new file in the `iac` folder called

   ```
   keyVault.parameters.json
   ```

2. Add the following text to the parameters file.

```
{
    "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentParameters.json#",
    "contentVersion": "1.0.0.0",
    "parameters": {
        "location": {
            "value": "eastus"
        },
        "uniqueIdentifier": {
            "value": "20291231acw"
        },
        "keyVaultName": {
            "value": "KV-ContactWeb"
        },
        "databaseServerName": {
            "value": "ContactWebDBServer20291231acw"
        },
        "webAppName": {
            "value": "ContactWeb-20291231acw"
        },
        "sqlDatabaseName": {
            "value": "ContactWebDB"
        },
        "sqlServerAdminPassword": {
            "value": "workshopDbPwd#54321!"
        }
    }
}
```

Step 3 - Deploy

Add the parameters and bicep module to the main deployment files

1. Add the deployment to the main deployment file

   Add the following to the main deployment file:

```
module contactWebVault 'keyVault.bicep' = {
  name: '${keyVaultName}-deployment'
  scope: contactWebResourceGroup
  params: {
    location: contactWebResourceGroup.location
    uniqueIdentifier: uniqueIdentifier
    webAppFullName: contactWebApplicationPlanAndSite.outputs.webAppFullName
    databaseServerName: contactWebDatabase.outputs.sqlServerName
    keyVaultName: keyVaultName
    sqlDatabaseName: sqlDatabaseName
    sqlServerAdminPassword: sqlServerAdminPassword
  }
}
```

And add the missing parameters to the top of the file:

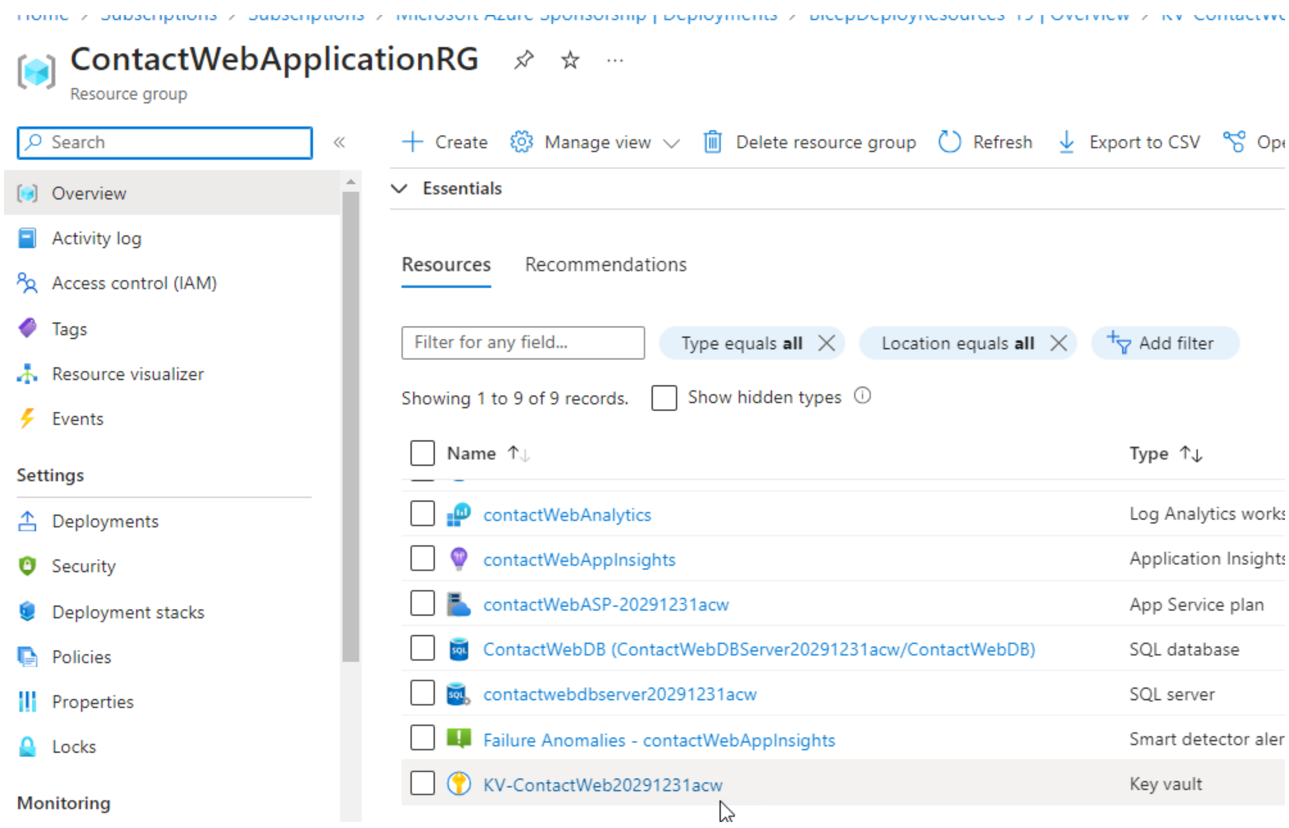
```
param keyVaultName string
```

1. Add the parameters to the parameters file (don't forget the comma):

```
        "keyVaultName": {
            "value": "KV-ContactWeb"
        }
```

1. Validate the deployment of the vault

   The vault should deploy as required.



ContactWebApplicationRG
Resource group

Search | Create | Manage view | Delete resource group | Refresh | Export to CSV | Ope

Overview
Activity log
Access control (IAM)
Tags
Resource visualizer
Events
Settings
Deployments
Security
Deployment stacks
Policies
Properties
Locks
Monitoring

Essentials

Resources | Recommendations

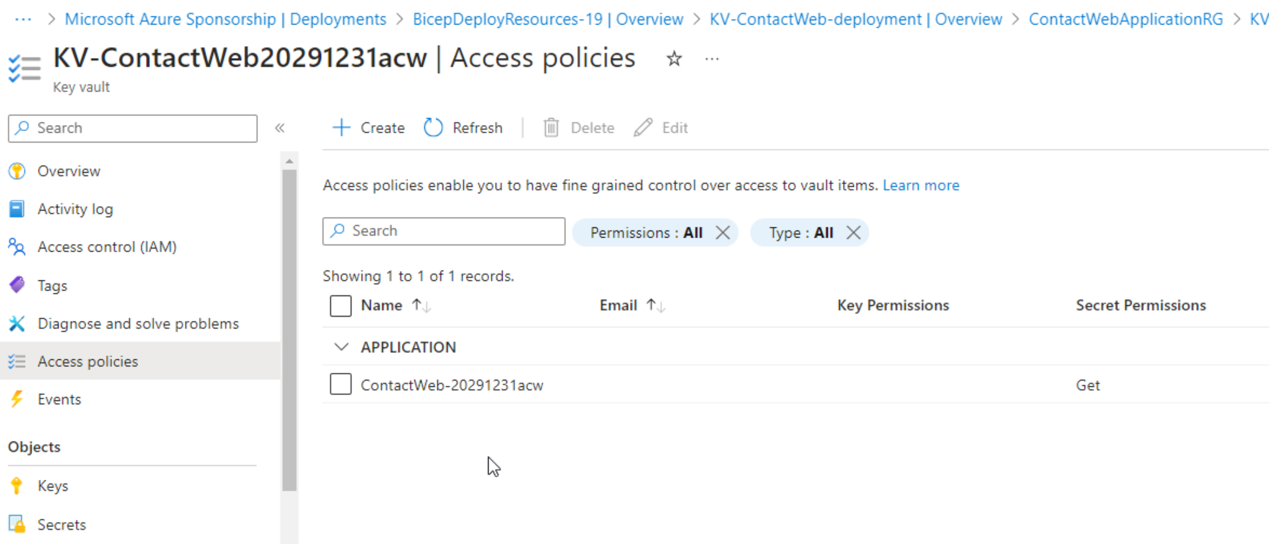
Filter for any field... | Type equals **all** | Location equals **all** | Add filter

Showing 1 to 9 of 9 records. Show hidden types

Name	Type
contactWebAnalytics	Log Analytics works
contactWebAppInsights	Application Insights
contactWebASP-20291231acw	App Service plan
ContactWebDB (ContactWebDBServer20291231acw/ContactWebDB)	SQL database
contactwebdbserver20291231acw	SQL server
Failure Anomalies - contactWebAppInsights	Smart detector aler
KV-ContactWeb20291231acw	Key vault

2. Verify access policies (make sure web app is authorized)

   Validate that the Web App has access to get secrets from the Key Vault


... > Microsoft Azure Sponsorship | Deployments > BicepDeployResources-19 | Overview > KV-ContactWeb-deployment | Overview > ContactWebApplicationRG > KV
KV-ContactWeb20291231acw | Access policies
Key vault
Search
Overview
Activity log
Access control (IAM)
Tags
Diagnose and solve problems
Access policies
Events
Objects
Keys
Secrets
Create
Refresh
Delete
Edit
Search
Permissions : All
Type : All

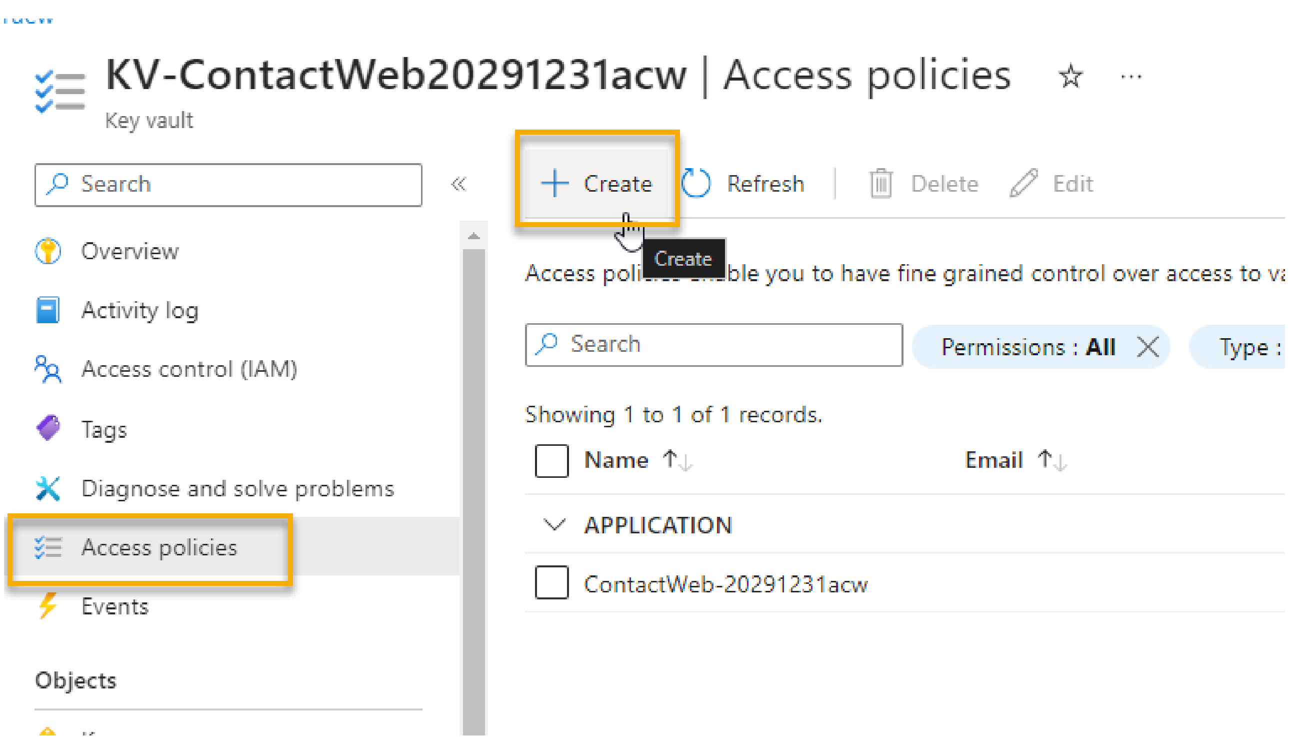
Access policies enable you to have fine grained control over access to vault items. Learn more

Showing 1 to 1 of 1 records.

Name	Email	Key Permissions	Secret Permissions
APPLICATION			
ContactWeb-20291231acw			Get

3. Verify secrets (need to add your credential)

   Modify the access policies to allow your user to view the secrets. You can do this by adding your user to the access policies and giving it the `Get` and `List` permission (or just check them all since it's you). Then you can view the secrets.



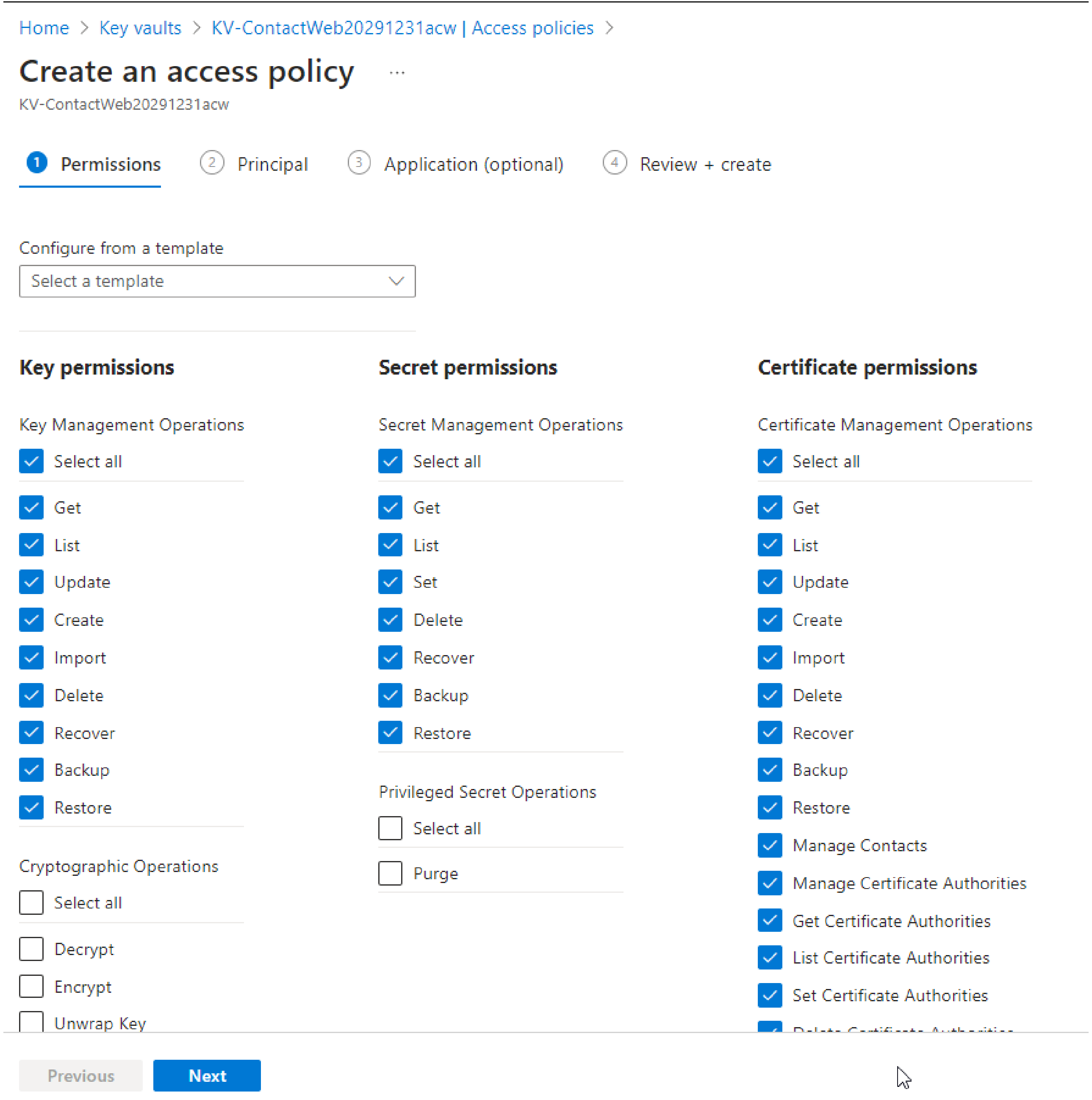
KV-ContactWeb20291231acw | Access policies

Key vault

Access policies enable you to have fine grained control over access to va

Showing 1 to 1 of 1 records.

Name	Email
APPLICATION	
ContactWeb-20291231acw	



Home > Key vaults > KV-ContactWeb20291231acw | Access policies >

Create an access policy

KV-ContactWeb20291231acw

Configure from a template: Select a template

Key permissions

Key Management Operations
- [✓] Select all
- [✓] Get
- [✓] List
- [✓] Update
- [✓] Create
- [✓] Import
- [✓] Delete
- [✓] Recover
- [✓] Backup
- [✓] Restore

Cryptographic Operations
- [ ] Select all
- [ ] Decrypt
- [ ] Encrypt
- [ ] Unwrap Key

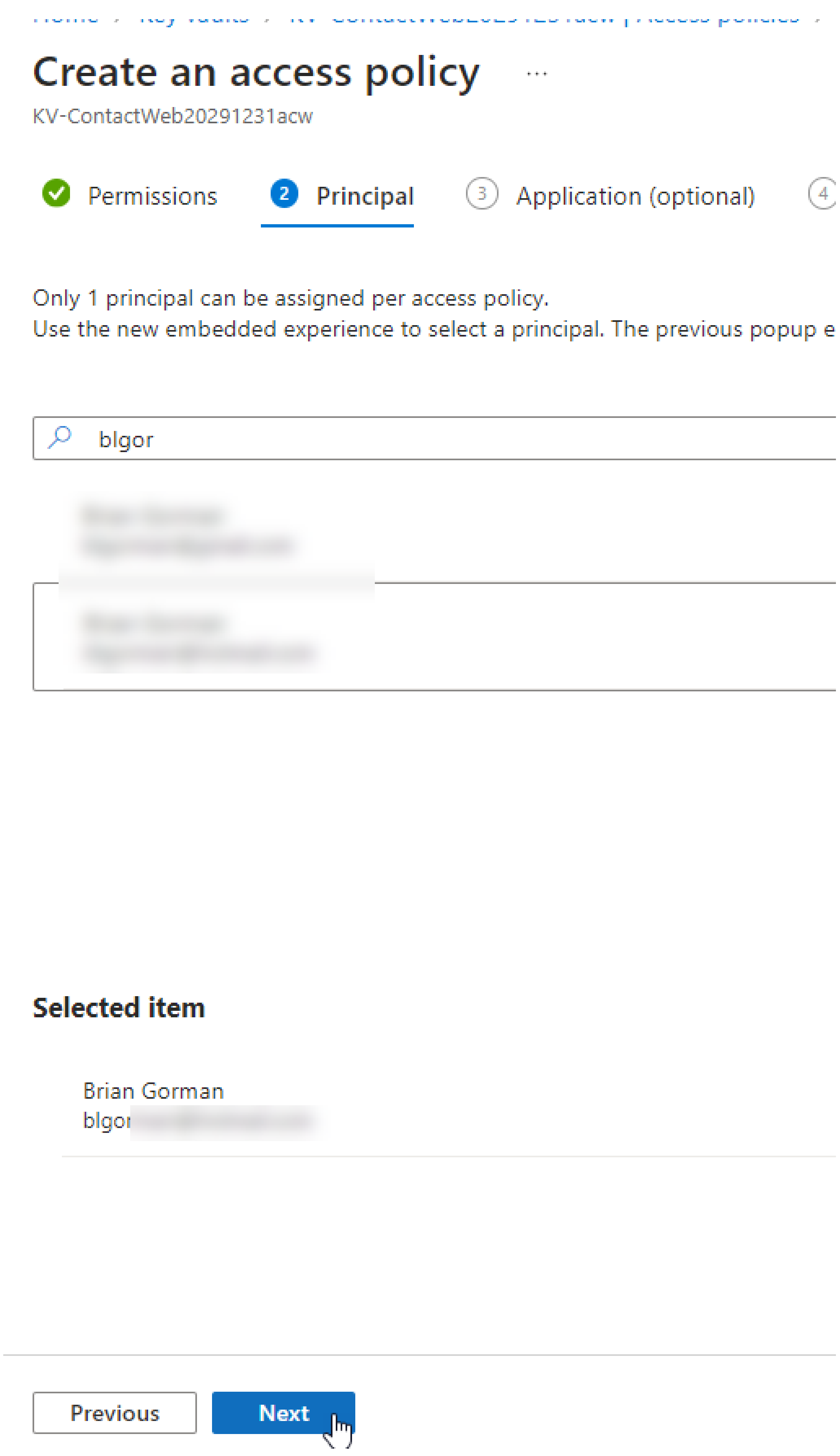
Secret permissions

Secret Management Operations
- [✓] Select all
- [✓] Get
- [✓] List
- [✓] Set
- [✓] Delete
- [✓] Recover
- [✓] Backup
- [✓] Restore

Privileged Secret Operations
- [ ] Select all
- [ ] Purge

Certificate permissions

Certificate Management Operations
- [✓] Select all
- [✓] Get
- [✓] List
- [✓] Update
- [✓] Create
- [✓] Import
- [✓] Delete
- [✓] Recover
- [✓] Backup
- [✓] Restore
- [✓] Manage Contacts
- [✓] Manage Certificate Authorities
- [✓] Get Certificate Authorities
- [✓] List Certificate Authorities
- [✓] Set Certificate Authorities



Create an access policy ···

KV-ContactWeb20291231acw

Only 1 principal can be assigned per access policy.
Use the new embedded experience to select a principal. The previous popup e

blgor

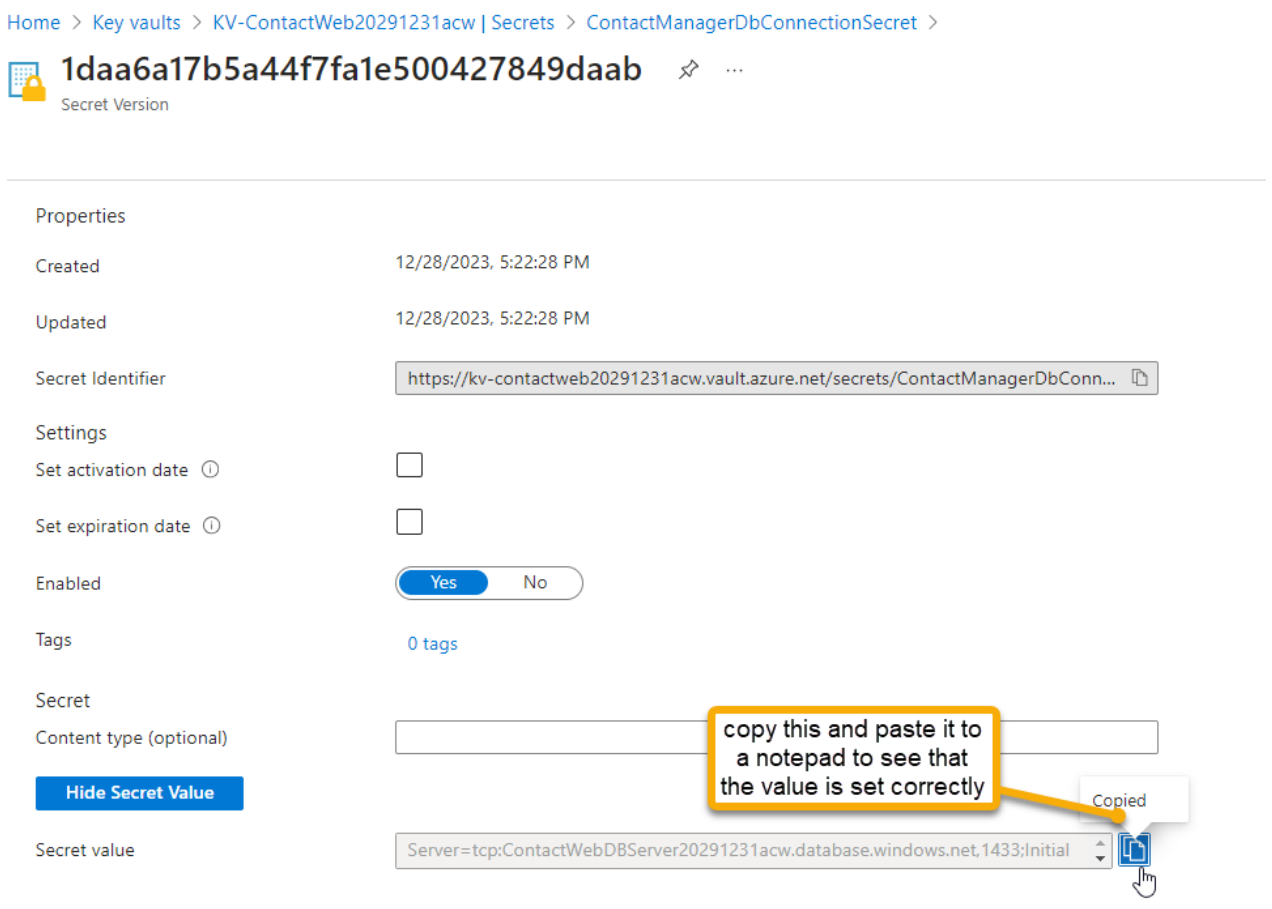
[redacted]

[redacted]

Selected item

Brian Gorman
blgor[redacted]

Open the secrets and validate they have the correct value as expected.


Home > Key vaults > KV-ContactWeb20291231acw | Secrets > ContactManagerDbConnectionSecret >

1daa6a17b5a44f7fa1e500427849daab

Secret Version

Properties

Created	12/28/2023, 5:22:28 PM
Updated	12/28/2023, 5:22:28 PM
Secret Identifier	https://kv-contactweb20291231acw.vault.azure.net/secrets/ContactManagerDbConn...

Settings

Set activation date	☐
Set expiration date	☐
Enabled	[✓ Yes] No
Tags	0 tags

Secret

Content type (optional)	
Secret value	Server=tcp:ContactWebDBServer20291231acw.database.windows.net,1433;Initial

Hide Secret Value
copy this and paste it to a notepad to see that the value is set correctly
Copied

Task 5: Update the web app to use the key vault for the connection strings

With the vault deployed and the secrets in place, you need to complete the deployment by updating the web app to use the key vault for the connection strings.

Step 1 - Create the bicep file to merge the settings

This first file will take parameters of two app settings objects and merge them together. This will allow us to merge the current app settings that already exist with the new app settings/values we want to modify or add based on KeyVault secrets that were created.

1. Create a new file to merge the web app settings

   Create a new file in the `iac` folder called

   ```
   contactWebAppServiceSettingsMerge.bicep
   ```

2. Add the following text to the bicep file.

```
param webAppName string
param appSettings object
param currentAppSettings object
```

```
resource webApp 'Microsoft.Web/sites@2023-01-01' existing = {
  name: webAppName
}

//merge the current app settings with the new app settings
resource siteconfig 'Microsoft.Web/sites/config@2023-01-01' = {
  parent: webApp
  name: 'appsettings'
  properties: union(currentAppSettings, appSettings)
}
```

Step 2 - Create the bicep file to update the app settings

This file will create new values for existing app settings (could add new ones if desired as well). The file will then pass the new values and the existing values to the merge file to be combined via a `union` operation.

1. Create a new file in the `iac` folder to update/add new settings for merge with existing settings

   ```
   contactWebAppServiceSettingsUpdate.bicep
   ```

2. Add the following text to the bicep file.

```
param webAppName string
param defaultDBSecretURI string
param managerDBSecretURI string
param identityDBConnectionStringKey string
param managerDBConnectionStringKey string

resource webApp 'Microsoft.Web/sites@2023-01-01' existing = {
  name: webAppName
}

module updateAndMergeWebAppConfig 'contactWebAppServiceSettingsMerge.bicep' = {
  name: 'webAppSettings-${webAppName}'
  params: {
    currentAppSettings: list('${webApp.id}/config/appsettings', '2023-01-
01').properties
    appSettings: {
      '${identityDBConnectionStringKey}' :
'@Microsoft.KeyVault(SecretUri=${defaultDBSecretURI})'
      '${managerDBConnectionStringKey}':
'@Microsoft.KeyVault(SecretUri=${managerDBSecretURI})'
    }
    webAppName: webApp.name
  }
}
```

```
Note that this file will set the value of the connection strings to the secret uri
for the key vault secret using the latest/current version.  This will allow us to
merge the current app settings with the new app settings/values.

This does rely on baked-in KeyVault from the app service and does not leverage
code.  However, with the code from this application looking for specific
configuration values this is easier than modifying the code to look for the key
vault secret by name (which is also possible and may be more reliable in
production scenarios).
```

Step 3 - Deploy the App Settings Update Files

1. Add the call to the update file to the main deployment file

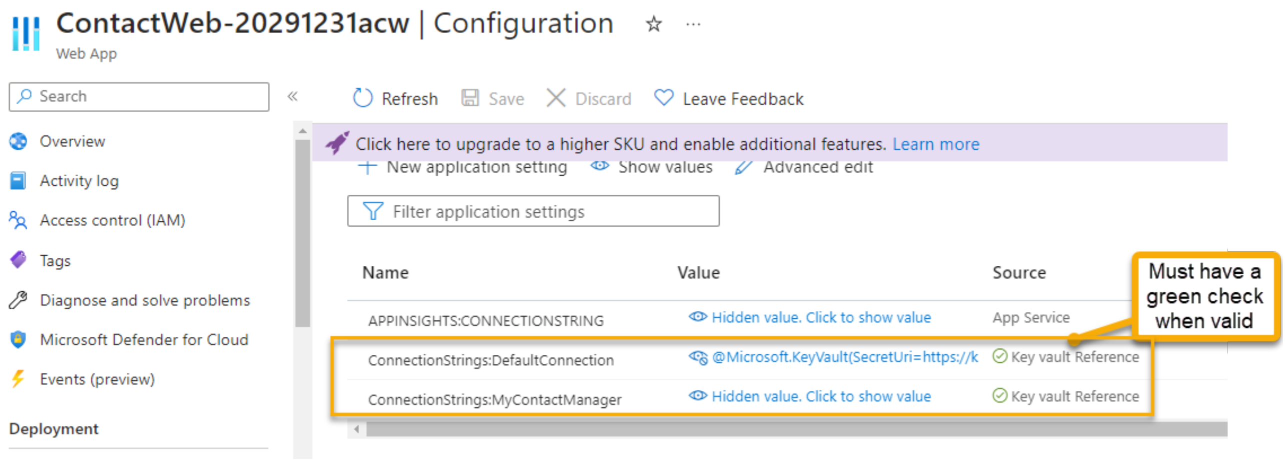
   Add the following to the main deployment file:

```
module updateContactWebAppSettings 'contactWebAppServiceSettingsUpdate.bicep' = {
  name: '${webAppName}-updatingAppSettings'
  scope: contactWebResourceGroup
  params: {
    webAppName: contactWebApplicationPlanAndSite.outputs.webAppFullName
    defaultDBSecretURI: contactWebVault.outputs.identityDBConnectionSecretURI
    managerDBSecretURI: contactWebVault.outputs.managerDBConnectionSecretURI
    identityDBConnectionStringKey: identityDBConnectionStringKey
    managerDBConnectionStringKey: managerDBConnectionStringKey
  }
}
```

> **Note:** the parameters and values should already be in place from earlier in this part.

1. Deploy the solution

   Check in your changes to deploy the solution. Once the deployment is complete, you can validate the settings in the app service by clicking in the portal.


ContactWeb-20291231acw | Configuration
Web App
Search
Overview
Activity log
Access control (IAM)
Tags
Diagnose and solve problems
Microsoft Defender for Cloud
Events (preview)
Deployment
Refresh
Save
Discard
Leave Feedback
Click here to upgrade to a higher SKU and enable additional features. Learn more
New application setting
Show values
Advanced edit
Filter application settings
Must have a green check when valid

Name	Value	Source
APPINSIGHTS:CONNECTIONSTRING	Hidden value. Click to show value	App Service
ConnectionStrings:DefaultConnection	@Microsoft.KeyVault(SecretUri=https://k	✓ Key vault Reference
ConnectionStrings:MyContactManager	Hidden value. Click to show value	✓ Key vault Reference

2. Validation and Troubleshooting

> **IMPORTANT**: You must see the green check mark with the `Key Vault Reference` for each of the connection string settings or the value is not actually working from Key Vault. If you see a red `x` you likely didn't get your permission for the app registration set correctly. Make sure the web app has a system managed identity and that the system managed identity is authorized to `Get` secrets in the Key Vault access policies.

Additional troubleshooting steps:

- validate you don't have any typos
  - `@Microsoft.KeyVault(SecretUri=...)` is case sensitive so don't miss the capital `S` in `SecretUri` and the small 'ri' in Uri, as well as `Microsoft` and `KeyVault`.
- validate that the secret is in the key vault with the correct name and value is set to a connection string
- validate that the secret URI is actually the correct URI of the secret in the key vault

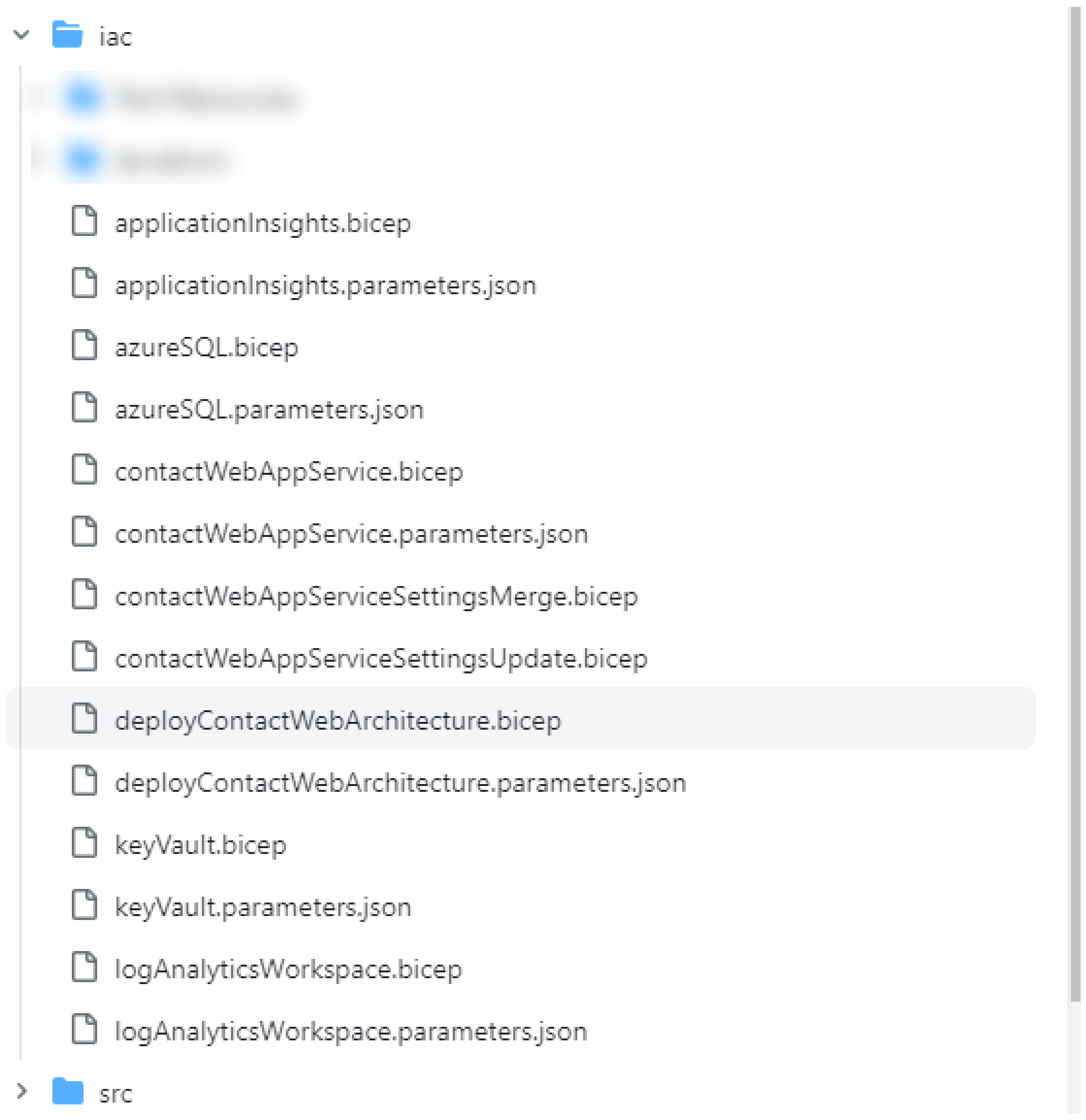
Completion Check

Make sure that the following resources and connections are created:

At the end of this step, you should have the following resources:

- Resource Group
- Log Analytics Workspace
- Application Insights
- App Service Plan
  - F1 Tier for free deployment
- App Service
  - leverages application insights instrumentation key/connection string
- Azure SQL Server
  - basic tier ($5/month)
- Key Vault
  - secret for database connection string
  - permission for app service to get/list secrets

The files as they exist in the repository should look similar to this:



```
iac
  [redacted]
  [redacted]
  applicationInsights.bicep
  applicationInsights.parameters.json
  azureSQL.bicep
  azureSQL.parameters.json
  contactWebAppService.bicep
  contactWebAppService.parameters.json
  contactWebAppServiceSettingsMerge.bicep
  contactWebAppServiceSettingsUpdate.bicep
  deployContactWebArchitecture.bicep
  deployContactWebArchitecture.parameters.json
  keyVault.bicep
  keyVault.parameters.json
  logAnalyticsWorkspace.bicep
  logAnalyticsWorkspace.parameters.json
src
```

- applicationInsights.bicep
- applicationInsights.parameters.json
- azureSQL.bicep
- azureSQL.parameters.json
- contactWebAppService.bicep
- contactWebAppService.parameters.json
- contactWebAppServiceSettingsMerge.bicep
- contactWebAppServiceSettingsUpdate.bicep
- deployContactWebArchitecture.bicep
- deployContactWebArchitecture.parameters.json
- keyVault.bicep
- keyVault.parameters.json
- logAnalyticsWorkspace.bicep
- logAnalyticsWorkspace.parameters.json

Congratulations! You have completed the infrastructure deployment for the application. You can now move on to the next part of the walkthrough to deploy the application code into the App Service.