



WebJobs in Azure

CSCI E-94

Fundamentals of Cloud Computing - Azure

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Agenda

- Web Jobs
 - Overview
 - Configuration
 - Implementation & Execution



Overview

- Logic Apps
 - Serverless & Codeless way to build workflows
 - UI for connecting actions together
 - Usage based billing
 - Per-Action billing
 - Connectors for many common scenarios
 - Azure
 - Office 365
 - Twitter
 - Dropbox
 - Google
 - IBM 3270
 - SAP
 - Asana
 - Salesforce
 - Slack
 - Cognitive Services
 - And more...



Overview

■ Web Jobs

- Are background "jobs" that run
 - Continuously
 - Based on a trigger
 - Example triggers:
 - Integrated service event
 - Queue, Service Bus, Event Hub ...
 - Timer
 - Webhook call
 - Manual invocation
- Run within an App Service
 - Consume resources with Website / API



Overview

Web Jobs ...

- Run in Azure App Services
 - Overview of Azure App Service
 - Variety of tech stack choices
 - .cmd, .bat, .exe (using Windows cmd)
 - .ps1 (using PowerShell)
 - .sh (using Bash)
 - .php (using PHP)
 - .py (using Python)
 - .js (using Node.js)
 - .jar (using Java)



Overview

Web Jobs ...

- Scales with App Role (App Service Plan)
- Medium weight background operations
- Integration with Storage
 - Table, Queue & Blob triggered workloads
- Automatic Trigger Support
 - Service Bus
 - Event Hubs
 - CosmosDB
 - SendGrid



Overview

Web Jobs ...

- Why do you care?
 - Easy to use
 - Support for many tech stacks
 - Fully managed **PaaS**
 - Helps maximize use of App Service Plan
- How do they work
 - You write Methods
 - Methods are triggered on some event
 - Your code is executed



Overview

Web Jobs ...

- Execution Options (Webjob Types)
 - Configured via publish settings
 - Triggered, or Continuous

Hosting

Subscription	02587131-84c2-4ed7-88c6-979603a865b2
Resource group	rg-demo
Resource name	cscie94-helloworld42
WebJob Name	WebJob1
WebJob Type	Triggered
User name	\$cscie94-helloworld42
Password	*****

Site: <http://cscie94-helloworld42.azurewebsites.net>

Profile settings

Profile name	cscie94-helloworld42 - Web Deploy
Configuration	Release Any CPU
Target framework	net48
Target runtime	win7-x86
WebJob Name	WebJob1
WebJob Type	Continuous
<input checked="" type="checkbox"/> File publish o	<div>Continuous</div> <div>Triggered</div>

Save Cancel



Overview

Web Jobs ...

- Execution Options (Webjob Types) ...
 - There is also a "Scheduled option"
 - **Settings.job** file has examples
 - Requires **Always On** enabled
 - Requires **basic tier or higher**
 - Note:
 - Can't change execution mode in dashboard
 - Edit the **Settings.job** to change schedule
 - To reconfigure execution mode
 - In Visual Studio delete the file
 - properties\webjob-publish-settings.json



Overview

Web Jobs ...

- You can run WebJobs locally
 - While connecting to cloud storage account
 - React to automatic triggers
 - Process Queue and/or Blob entries
 - CosmosDB and Event Hub, etc...
 - Run continuously non triggered
 - Need to add connection strings
 - App.config



Overview

Web Jobs ...

- To support automatic invocation
 - Run with **continuous** schedule
 - **Basic tier or higher**
 - Automatic triggering setup
 - Via .NET Attributes
 - See the Functions class in Visual Studio Template
 - Functions.cs
- To run in free tier
 - Use REST API to "run" or "start" the webjob
 - Will terminate after execution or abort after a time



Overview

Web Jobs ...

■ REST API Options:

- To execute **triggered** / Test in Azure

REST API See: [Github WebJobs API](#)

- Execute POST call URL consists of
 - The **website name** with the **scm** suffix
 - The job resource is located under
 - `api/triggeredwebjobs/<web job name>/run`
 - The action to run it is **run**
 - Include the Basic Authorization key in the header
 - Key: Authorization
 - Value: **Basic** [base 64 encoded credentials]
 - credentials: [user name]:[encrypted password]
 - Include the query string parameter **arguments**
 - `POST /api/triggeredwebjobs/{job name}/run?arguments={arguments}`
 - Presented in `WEBJOBS_COMMAND_ARGUMENTS` environment variable



Overview

Web Jobs ...

■ REST API Options

- To start **continuous** webjobs in Azure

REST API See: [Github WebJobs API](#)

- Execute POST call - URL consists of
 - The **website name** with the **scm** suffix
 - The job resource is located under
 - `api/triggeredwebjobs/<web job name>/start`
 - The action to run it is **start**
 - Include the Basic Authorization key in the header
 - Key: Authorization
 - Value: **Basic** [base 64 encoded credentials]
 - credentials: [user name]:[encrypted password]

Overview

Web Jobs ...

- Credentials and URL can be obtained here
 - Note: The URL will always have a suffix of start
 - Change it to Run for triggered jobs

Home > CSCIE94-ManualOnDemandWebJob

CSCIE94-ManualOnDemandWebJob | WebJobs ...

App Service

web

+ Add Refresh Run Properties Logs Delete

Settings

- Configuration
- WebJobs

Development Tools

- Advanced Tools
- Extensions

Monitoring

- App Service logs

WebJobs

WebJobs provide an easy way to run scripts or programs as background processes in the context of your app.

Name	Type	Status	Schedule
ManualOnDemandW...	Triggered	Completed 4 weeks ago	n/a

Properties

cscie94-manualondemandwebjob

NAME

ManualOnDemandWebJob

STATUS

Completed 4 weeks ago

TYPE

triggered

WEB HOOK

https://cscie94-manualondemandwe...

USER NAME

\$CSCIE94-ManualOnDemandWebJob

PASSWORD Show Password



Overview

Web Jobs





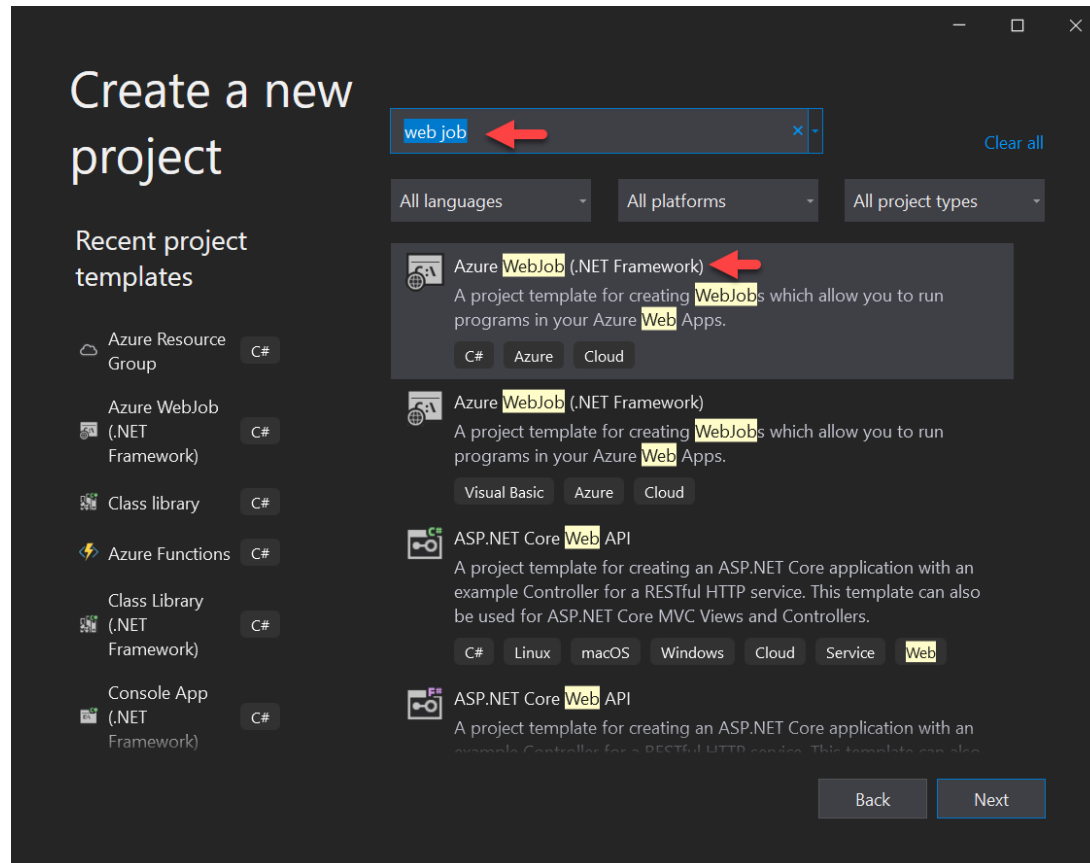
Web Jobs Configuration

- Configuration via Visual Studio
 - Create a Web Job Project under Visual Studio
 - Search: Web Job
 - Choose "Azure WebJob (.NET Framework)"
 - This creates a single WebJob
 - With two classes
 - Functions (**Functions.cs**)
 - Has a default `ProcessQueueMessage` method
 - Listens for entries into the storage queue, named `queue`
 - Program (**Program.cs**)
 - Has a `Main` method
 - That runs the job forever



Web Jobs Configuration

■ Configuration via Visual Studio





Web Jobs

Configuration ...

- When publishing to Azure
 - Scheduling options are set in Visual Studio

Hosting

Subscription	02587131-84c2-4ed7-88c6-979603a865b2
Resource group	rg-demo
Resource name	cscie94-helloworld42
WebJob Name	WebJob1
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User name	\$cscie94-helloworld42
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Site: <http://cscie94-helloworld42.azurewebsites.net>

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Profile name	cscie94-helloworld42 - Web Deploy
Configuration	Release Any CPU
Target framework	net48
Target runtime	win7-x86
WebJob Name	WebJob1
WebJob Type	Continuous
<input checked="" type="checkbox"/> File publish o	Continuous
	Triggered

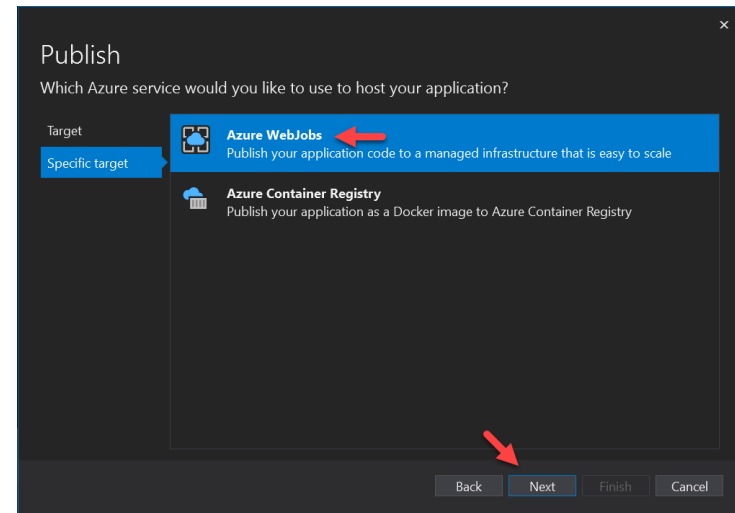
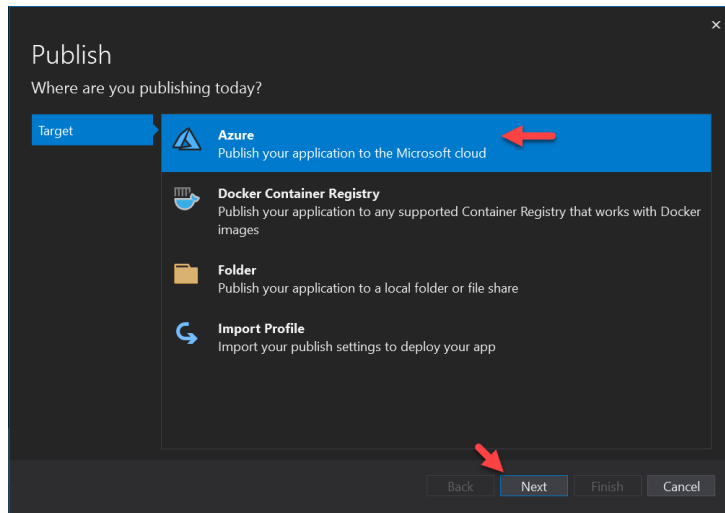
Save Cancel



Web Jobs

Configuration ...

- Next - Choose where the Web Job goes
 - *Published to Azure Websites*
 - Create a new site or publish to an existing site





Web Jobs Configuration ...

- Next - Choose where the Web Job goes
 - *Published to Azure Websites*
 - Create a new site ...

Publish

Select existing or create a new Azure WebJob

Target: Subscription name: Microsoft Azure Sponsorship 2

Specific target: Azure WebJobs

View: Resource group

Search:

App Service instances:

- rg-demo
- rg-lecture-01
- rg-lecture-02
- rg-lecture-05
- rg-lecture-07
- rg-win-lecture-03

Back Next Finish Cancel

App Service (Windows)

Create new

Name: CSCIE94-ContinuousWebJob

Subscription name: Microsoft Azure Sponsorship 2

Resource group: rg-lecture-07 (East US)

Hosting Plan: asp-win-free (East US, F1)

Export... Create Cancel



Web Jobs

Configuration ...

- Before you can run the Web Job
 - Set these entries to your storage account
 - [AzureWebJobsDashboard](#)
 - [AzureWebJobsStorage](#)
 - Set under the CONFIGURE tab
 - In the connection strings section

Connection strings

AzureWebJobsDashboard

Hidden value. Click to show.

AzureWebJobsStorage

Hidden value. Click to show.

- To run locally set in **app.config**



Web Jobs

Configuration ...

- Configuration takes a few more steps ...
 - Set the configuration strings to Custom
 - The storage account format looks like this
 - `AzureWebJobsDashboard`
 - `DefaultEndpointsProtocol=https;`
`AccountName=[accountname];`
`AccountKey=[accesskey]`
 - `AzureWebJobsStorage`
 - `DefaultEndpointsProtocol=https;`
`AccountName=[accountname];`
`AccountKey=[accesskey]`



Web Jobs

Configuration ...





Web Jobs

Implementation

- Implementation depends
 - Do you want to
 - Run continuously?
 - Implement a producer consumer pattern?
 - Run on a schedule
 - Run triggered, also less expensive
- `Function.cs`
 - Implements a `ProcessQueueMessage`
 - Connected to a Queue
 - Can be used to implement Producer Consumer pattern



Web Jobs

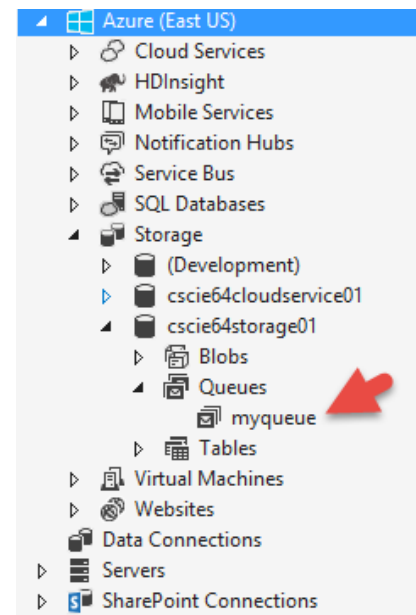
Implementation ...

■ Program.cs

- Calls `host.RunAndBlock()`
 - **Runs forever**
 - Can be used in **continuous** mode
- What about **OnDemand / Manual Trigger**?
 - Don't call `host.RunAndBlock()`
 - Unless you want to start and run forever
 - Add calls in **Main**
 - To invoke methods to execute triggered
 - Use **Logic Apps** to schedule execution

Continuous Mode: Monitoring myqueue for messages – Function.cs

```
public class Functions
{
    // This function will get triggered/executed when a new message is written
    // on an Azure Queue called queue.
    public static void ProcessQueueMessage([QueueTrigger("myqueue")]
                                           string message, TextWriter log)
    {
        log.WriteLine(message);
    }
}
```



Supporting OnDemand (Manual Trigger) – Program.cs

```
public class void Program // ← Ensure this class is public!
{
    static void Main()
    {
        var c = new JobHost();

        // Executes this call once “triggered”
        host.Call(typeof(Functions).GetMethod("ProcessQueueMessageOnDemand"));

        // Note Don't use this if running triggered
        // Disabled for triggered jobs
        // The following code ensures that the WebJob will
        // be running continuously
        // host.RunAndBlock();
    }
}
```

Supporting OnDemand (Manual Trigger) – Functions.cs

```
[NoAutomaticTrigger]
```

```
public static void ProcessQueueMessageOnDemand(TextWriter log)
{
    CloudQueue queue = GetCloudQueue();
    // Retrieve the message
    var message = queue.GetMessage();
    if (message != null)
    {
        log.WriteLine($"Message: {message.AsString}");
        // Remove the message from the queue
        queue.DeleteMessage(message);
    }
    else
    {
        log.WriteLine("No message found");
    }
}
```



Web Jobs

Implementation ...

- Manually Invoking via HTTPS POST call
 - You must base 64 encode the credentials
 - Include them in the Header
 - Include the Authorization key in the header
 - Key:
 - Authorization
 - Value
 - **Basic** [base 64 encoded credentials]
credentials: [user name]:[encrypted password]
 - Ex:
 - joe:xkeialzidiqlidizaeie
 - **Basic**
am9lOnhrZWlhbHppZGlxbGRpemFlaWUK



Web Jobs

Implementation ...

- To run via an HTTPS POST call ...
 - The URL consists of
 - The **website name** with the **scm** suffix
 - The job resource is located under
 - **api/triggeredwebjobs/<web job name>**
 - The action to run it is **run**
 - Ex:

<https://e94webjobsapidemo.scm.azurewebsites.net/api/triggeredwebjobs/WebJob1/run>



Web Jobs

Implementation ...

- Manually invoking the Web Job
 - Via [HttpClient](#)
 - Be sure to do this asynchronously
 - Remember the Web Job may take time
 - Don't make the user wait
 - Ideally notify the user when the Job is complete
 - Can pass data to the Job via the HTTP call
 - Passed using query string parameter
 - POST /api/triggeredwebjobs/{job name}/run?**arguments**={arguments}
 - Available via environment variable
 - **WEBJOBS_COMMAND_ARGUMENTS**
 - Data can also be in persistent storage
 - A Database Table, Queue, Table Storage etc...

Manual Web Job invocation

```
// Create the http client to invoke the job dynamically
HttpClient client = new HttpClient();
string encodedCredentials = "Basic " + Base64Encode(JobCredentials);

// Add the header so the job can be dynamically invoked
client.DefaultRequestHeaders.Add("Authorization", encodedCredentials);

// Retrieve the public facing Url for the mobile service
string webJobUrl= "https://e94webjobsapidemo.scm.azurewebsites.net
/api/triggeredwebjobs/WebJob1/run";

// Invoke the job dynamically
HttpResponseMessage x = await client.PostAsync(new Uri(webJobUrl), null);

// If the request failed log an error
if (!x.IsSuccessStatusCode)
{ ... }
```




Web Jobs

Implementation ...

- Logging is available per
 - WebJob
 - Per method within the WebJob
 - Can expand log information per method!

WebJobs provide an easy way to run scripts or programs as background processes in the context of your app.

NAME	STATUS	SCHEDULE
TriggeredWebJob	Triggered	Completed 1 min ago



Web Jobs

Implementation ...

- Logging is available per
 - WebJob
 - Per method within the WebJob
 - Can expand log information per method!

WebJob Details TriggeredWebJob

Run command: TriggeredWebJob.exe

Recent job runs

TIMING	STATUS
18 seconds ago (2 s running time)	Success
33 seconds ago (3 s running time)	Success
5 minutes ago (2 s running time)	Success



Web Jobs

Implementation ...

- Logging is available per
 - WebJob
 - Per method within the WebJob
 - Can expand log information per method!

WebJob Run Details TriggeredWebJob

Success 1 minute ago (2 s running time)
Run ID: 201903242149422598

Toggle Output

download

```
[03/24/2019 21:49:43 > 91b8ff: INFO] Found the following functions:  
[03/24/2019 21:49:43 > 91b8ff: INFO] TriggeredWebJob.Program.WriteLog  
[03/24/2019 21:49:43 > 91b8ff: INFO] TriggeredWebJob.Functions.ProcessQueueMessageOnDemand  
[03/24/2019 21:49:43 > 91b8ff: INFO] Executing: 'Program.WriteLog' - Reason: 'This function was programmatically called via the host APIs.'  
[03/24/2019 21:49:43 > 91b8ff: INFO] Executed: 'Program.WriteLog' (Succeeded)  
[03/24/2019 21:49:43 > 91b8ff: INFO] Executing: 'Functions.ProcessQueueMessageOnDemand' - Reason: 'This function was programmatically called via the host APIs.'  
[03/24/2019 21:49:44 > 91b8ff: INFO] Executed: 'Functions.ProcessQueueMessageOnDemand' (Succeeded)  
[03/24/2019 21:49:44 > 91b8ff: INFO] Executing: 'Program.WriteLog' - Reason: 'This function was programmatically called via the host APIs.'  
[03/24/2019 21:49:44 > 91b8ff: INFO] Executed: 'Program.WriteLog' (Succeeded)  
[03/24/2019 21:49:44 > 91b8ff: SYS INFO] Status changed to Success
```

Functions invoked during this run

FUNCTION	STATUS	STATUS DETAIL
Program.WriteLog (. Finished)	Success	1 minute ago (62 ms running time)
Functions.ProcessQueueMessageOnDemand ()	Success	1 minute ago (94 ms running time)
Program.WriteLog (. Started)	Success	1 minute ago (172 ms running time)



Web Jobs Implementation ...

WebJob Run Details TriggeredWebJob

Success 1 minute ago (2 s running time)
Run ID: 201903242149422598

Toggle Output

download

```
[03/24/2019 21:49:43 > 91b8ff: INFO] Found the following functions:
[03/24/2019 21:49:43 > 91b8ff: INFO] TriggeredWebJob.Program.WriteLog
[03/24/2019 21:49:43 > 91b8ff: INFO] TriggeredWebJob.Functions.ProcessQueueMessageOnDemand
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```

Functions invoked during this run

FUNCTION	STATUS	STATUS DETAIL
Program.WriteLog (, Finished)	Success	1 minute ago (62 ms running time)
Functions.ProcessQueueMessageOnDemand ()	Success	1 minute ago (94 ms running time)
Program.WriteLog (, Started)	Success	1 minute ago (172 ms running time)



Web Jobs

Implementation ...

- Logging is available per
 - WebJob
 - Per method within the WebJob
 - Can expand log information per method!

Invocation Details `Functions.ProcessQueueMessageOnDemand ()`

Replay Function

Success 1 minute ago (109 ms running time)

⚡ This function was programmatically called via the host APIs.

PARAMETER	VALUE	NOTES
-----------	-------	-------

log		
-----	--	--

Toggle Output

download

[.] Container needed to be created: False



Web Jobs

Implementation ...

- You can also Trigger based on a timer
See: [Scheduling a triggered WebJob](#)
 - Configured in **settings.job**
 - CRON syntax

```
{
  //See: https://en.wikipedia.org/wiki/Cron#CRON\_expression
  //The /5 means every 5 seconds
  //The format of the CRON Expression is:
  //{second} {minute} {hour} {day} {month} {day-of-week}
  //The */5 in the first position means every 5 seconds
  "schedule": "*/5 * * * * *"
}
```



Web Jobs

Implementation ...

- Requires **always on** to be set
See: [Configure general settings](#)
 - Webjobs will stop after about 20 minutes
 - Note: **Continuous** also requires **always on**

The screenshot shows the 'Configuration' page for a CronWebJob in the Azure Portal. The left sidebar contains navigation links for Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Security, Deployment, Quickstart, Deployment slots, Deployment Center, Settings, Configuration, Authentication / Authorization, Application Insights, Identity, and Backup. The main content area is titled 'CSCIE94-CronWebJob | Configuration' and includes a search bar and action buttons (Refresh, Save, Discard). The 'General settings' tab is selected, showing 'Stack settings' (Stack: .NET, .NET Framework version: V4.7) and 'Platform settings' (Platform: 32 Bit, Managed pipeline version: Integrated, FTP state: All allowed, HTTP version: 1.1). At the bottom, the 'Always on' setting is shown with radio buttons for 'On' and 'Off'. The 'On' button is selected and highlighted with a red box and a red arrow. A tooltip for the 'Always on' setting states: 'Prevents your app from being idled out due to inactivity. Learn more'.



Web Jobs Implementation ...

- Can't use the free plan
 - B1 or above
 - Windows App Service
 - Support for Linux is in preview

asp-demowindows | Scale up (App Service plan) ☆ ...

App Service plan

sca

Settings

Scale up (App Service plan) ☆

Scale out (App Service plan)

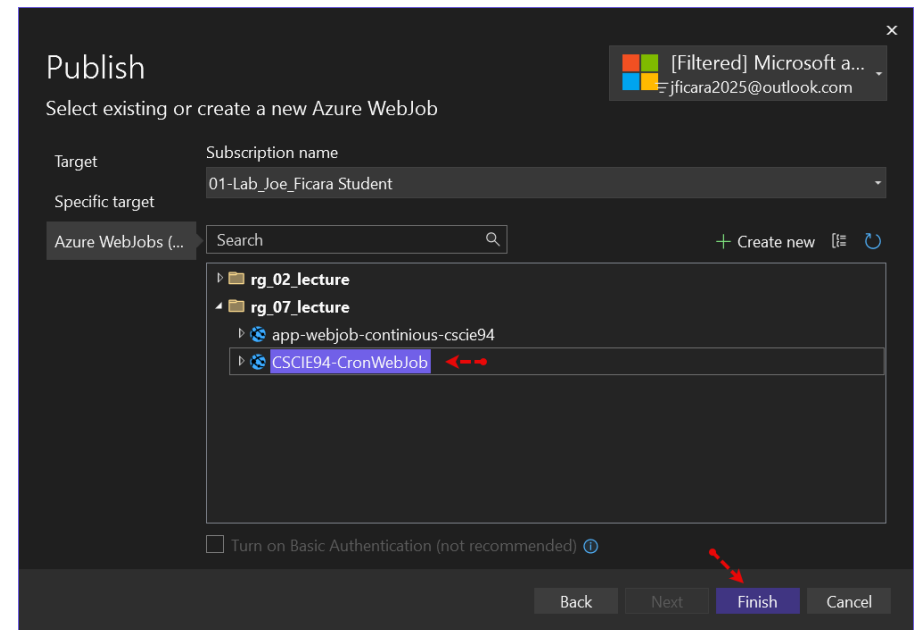
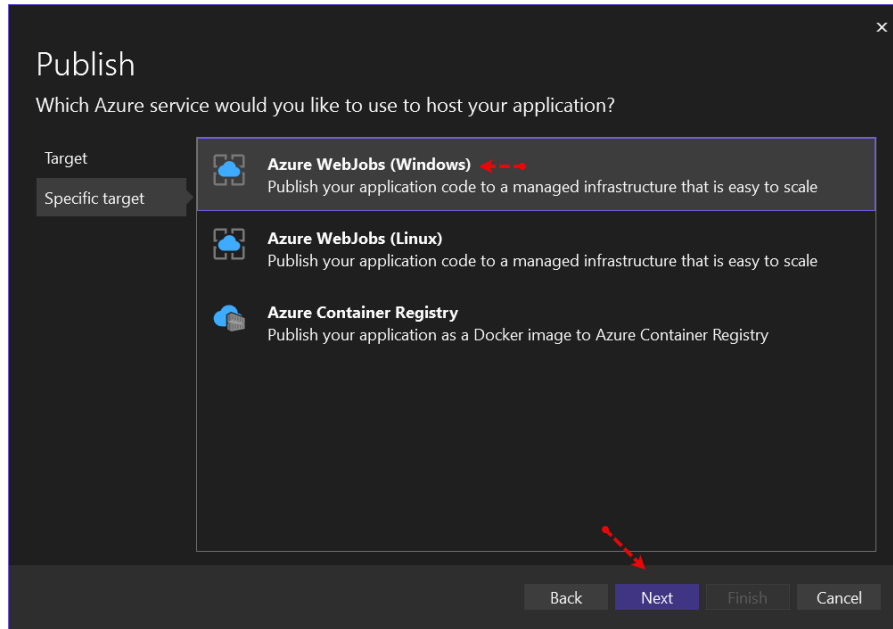
Hardware view Feature view

Showing 18 App Service pricing plans

Name	ACU/vCPU	vCPU	Memory (GB)	Remote Storage (GB)	Scale (instance)	SLA	Cost per hour (instance)	Cost per month (instance)
Dev/Test (For less demanding workloads)								
Free F1	60 minutes/day core	N/A	1	1	N/A	N/A	Free	Free
Shared D1	240 minutes/day core	N/A	1	1	N/A	N/A	0.013 USD	9.49 USD
Basic B1	100	1	1.75	10	3	99.95%	0.075 USD	54.75 USD
Basic B2	100	2	3.5	10	3	99.95%	0.15 USD	109.50 USD
Basic B3	100	4	7	10	3	99.95%	0.30 USD	219.00 USD

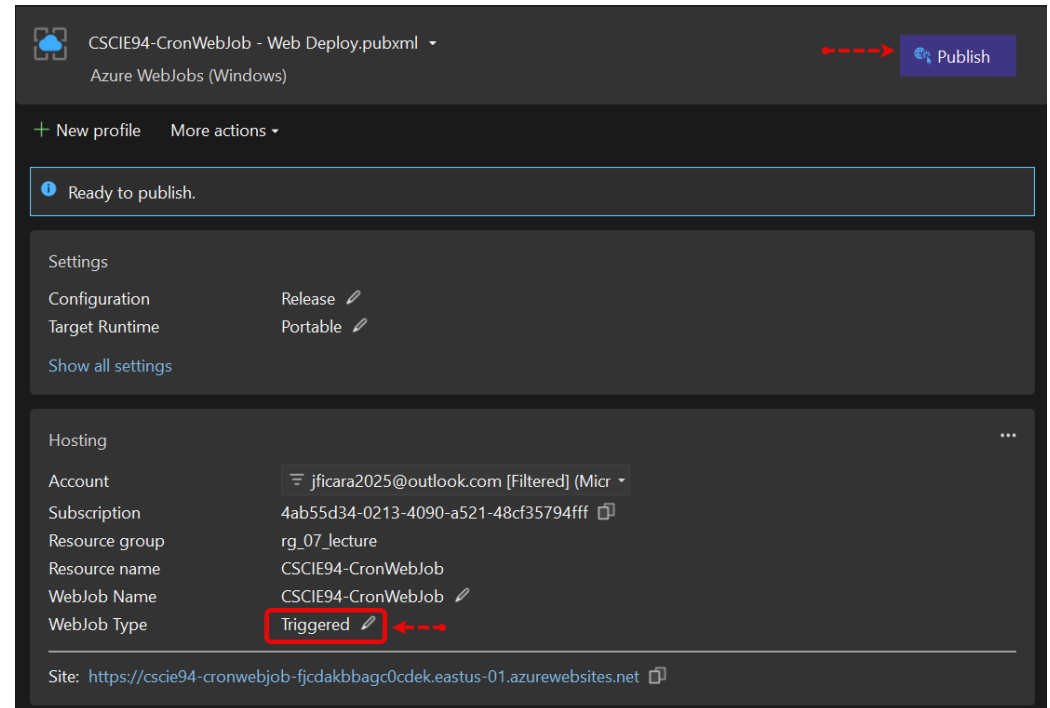
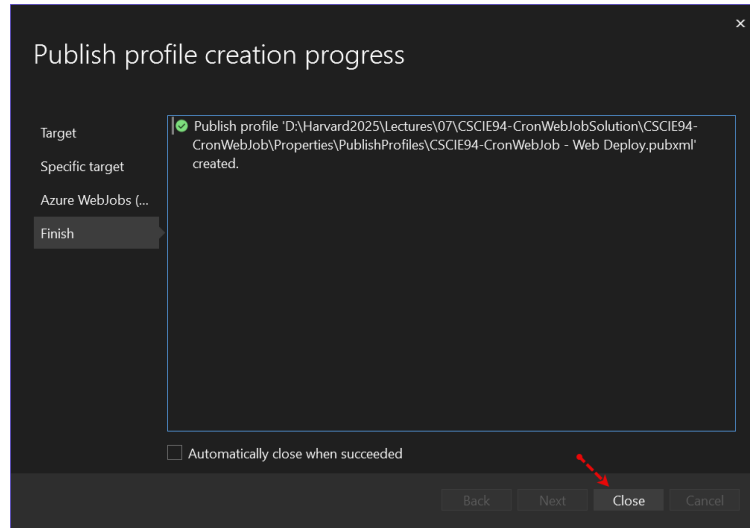


Web Jobs Implementation ...





Web Jobs Implementation ...





Web Jobs

Implementation ...

- Portal indicates schedule
 - Showing the CRON setting
 - From **setting.job** file
 - Modify schedule in **settings.job** file

Dashboard > CSCIE94-CronWebJob | WebJobs

CSCIE94-CronWebJob | WebJobs
App Service

web

Settings

- Configuration
- WebJobs**

Development Tools

- Advanced Tools
- Extensions

+ Add Refresh Properties Logs Delete

WebJobs

WebJobs provide an easy way to run scripts or programs as background processes in the context of your app.

Name	Type	Status	Schedule
CSCIE94-CronWebJob	Triggered	Running	*/* * * * *



Demo

Web Jobs

ContinuousWebJobSolution

ManualOnDemandWebJobSolution

RunWebJobSolution

CSCIE94-CronWebJobSolution



Web Jobs

.NET Core Web Job ...

- There is no built-in template
- We need to
 - Build a .NET 9 Console Application
 - Add some nuget packages
 - `Microsoft.Azure.WebJobs.Extensions`
 - `Microsoft.Azure.WebJobs.Extensions.Storage`
 - `Microsoft.Extensions.Configuration.UserSecrets`
 - `Microsoft.Extensions.Logging.Console`



Web Jobs

.NET Core Web Job ...

- Configure the code in **program.cs**
 - Create a HostBuilder()
 - Register services
 - Configure
 - Logging, Storage SDK
 - Settings location & Dependency Injection
- Add Function classes
- Let's walk through the code



Web Jobs

.NET Core Web Job ...

- Note:
 - Deploy as "continuous"

Hosting	
Subscription	9458ba88-d3e9-43ed-84db-b00e9ea84153
Resource group	rg_lecture07
Resource name	app-webjobnetcoredemo-cscie94
WebJob Name	WebJobNetCoreDemo
WebJob Type	Continuous
User name	\$app-webjobnetcoredemo-cscie94
Password	*****
Site: https://app-webjobnetcoredemo-cscie94.azurewebsites.net	



Demo

.NET Core Web Jobs

WebJobNetCoreDemoSolution



Web Jobs

■ Remember

- **Base 64 Encode** your messages
 - Before sending them from your App Service
- **Enable SCM Basic Auth** Publishing Credentials
 - To obtain Credentials from the portal
- **Add environment variable app settings**
 - With the storage connection string
 - AzureWebJobsDashboard
 - AzureWebJobsStorage



Azure Webjobs





Links & Resources

- Web Jobs
 - .NET Core Web Jobs
 - [Tutorial: Get started with the Azure WebJobs SDK for event-driven background processing](#)
 - Create a .NET WebJob in Azure App Service
 - [Run background tasks with WebJobs in Azure App Service](#)
 - Deploying webjobs
 - [Develop and deploy WebJobs using Visual Studio](#)
 - Using Webjobs with Kudu API
 - [WebJobs API · projectkudu/kudu Wiki \(github.com\)](#)
 - Trouble shooting
 - No functions found in trigger-less job
 - [Azure WebJobs - No functions found - How do I make a trigger-less job?](#)