

# From Friction to Function What We Learned Growing AVD and Bicep



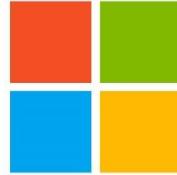
Workplace Ninja  
Summit 2025



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# About Esther Barthel

www.wpninjas.eu  
#WPNinjaS

## Focus

Cloud DevOps Engineer



## From

The Netherlands



## My Blog

<https://www.cloud-devops.ninja/>



## Certifications



## Hobbies



## Contact

@virtuEs\_IT

[github.com/cloud-devops-ninja](https://github.com/cloud-devops-ninja)



# About Freek Berson

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End User Computing, Infrastructure as Code



## Focus

End User Computing, Infrastructure as Code



From  
The Netherlands

Board games (collection of 150+ games )

## Hobbies

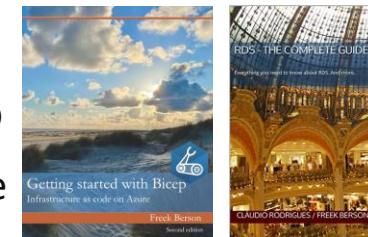


## Certifications



## Books

- Getting started with Bicep
- RDS - The Complete Guide



## Contact

@fberson

[github.com/fberson](https://github.com/fberson)



# IaC adventures 2017 (Freek)

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# IaC adventures 2017 (Esther)

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## RESTful APIs

A way to interact with an API via series of HTTP calls

- **VERB:** HTTP Method (GET, PUT, POST, DELETE, OPTIONS)
- **URI:** the URI of the resource
- **HTTP Version:** usually 1.1
- **Request Header:** contains metadata about the request
- **Request Body:** actual data

UKCUG – Autumn 2016



## NetScaler Automation w/ PowerShell & REST

```
# Load custom NITRO Module (based upon Citrix blogs samples)
Import-Module C:\Install\NITRO\NetScalerConfigurationPart5

# Connection protocol for the NetScaler
Set-NSMgmtProtocol -Protocol "http"
$NSSession = Connect-NSAppliance -NSAddress

# Create the JSON payload
$payload = (New-Object psobject | Add-Member -Type NoteProperty -Name "nsfeature" -Value "loadbalancer") | ConvertTo-Json
$jsonPayload = ConvertTo-Json $hashtablePayload

#combine all parameter information for the REST call
$restParams = @{
    Uri = "http://10.1.1.201/nitro/v1/config/loadbalancer/statistics"
    ContentType = "application/vnd.com.citrix.nitro.v1+json"
    Method = "POST"
    WebSession = $NSSession.WebSession
    ErrorVariable = "restError"
}
$restParams.Add("Body", $jsonPayload)

# Make the call
$response = Invoke-RestMethod @restParams

# Close NS Session
Disconnect-NSAppliance -NSSession $NSSession
```

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## ARM Template – Automatic deployments

Deployment failed. Click here for details

Your deployment failed

Deployment name: ARM-WVDN  
Subscription:  
Resource group: rg-wvd-infra

Deployment details (Download)

Resource
vmCreation-linkedTemplate
AVSet-linkedTemplate
Workspace-linkedTemplate
wvd-hp-demo-DAG
wvd-hp-demo

Deployment failed. Click here for details

Your deployment failed

Deployment name: vmCreation-linkedTemplate-  
Subscription:  
Resource group: rg-wvd-resources

Deployment details (Download)

Resource	Type	Status	Operation details
wvd-sh-0-nic	Microsoft.Network/network... BadRequest	BadRequest	Operation details
wvd-sh-1-nic	Microsoft.Network/network... BadRequest	BadRequest	Operation details
NSG-linkedTemplate	Microsoft.Resources/deploy...	OK	Operation details



Empowering ARM and JSON with Project 'Bicep'



# Back to the pre-Bicep days

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```
605     "hostPoolArmPath": "[resourceId('Microsoft.DesktopVirtualization/hostPools', format('{0}-REMOTEAPP', parameters('hostpoolName')))]"
606 },
607 "dependsOn": [
608     "[resourceId('Microsoft.DesktopVirtualization/hostPools', format('{0}-REMOTEAPP', parameters('hostpoolName')))]"
609 ]
610 },
611 [
612     {
613         "type": "Microsoft.DesktopVirtualization/workspaces",
614         "apiVersion": "2019-12-10-preview",
615         "name": "[parameters('workspaceName')]",
616         "location": "[parameters('AVDbackplaneLocation')]",
617         "properties": {
618             "friendlyName": "[parameters('workspaceNameFriendlyName')]",
619             "applicationGroupReferences": [
620                 "[resourceId('Microsoft.DesktopVirtualization/applicationGroups', parameters('appgroupName'))]",
621                 "[if(parameters('createRemoteAppHostpool'), resourceId('Microsoft.DesktopVirtualization/applicationGroups', format('{0}-REMOTEAPP', parameters('appgroupName'))), '')]"
622             ],
623             "dependsOn": [
624                 "[resourceId('Microsoft.DesktopVirtualization/applicationGroups', parameters('appgroupName'))]",
625                 "[resourceId('Microsoft.DesktopVirtualization/applicationGroups', format('{0}-REMOTEAPP', parameters('appgroupName')))]"
626             ]
627         }
628     }
629 },
630 ],
631 "dependsOn": [
632     "[subscriptionResourceId('Microsoft.Resources/resourceGroups', format('{0}BACKPLANE{1}', parameters('resourceGroupProdPrefix'), parameters('resourceGroupPostfix')))]"
633 ]
634 },
635 [
636     {
637         "type": "Microsoft.Resources/deployments",
638         "apiVersion": "2020-06-01",
639     }
640 ]
```





# Bicep started in Sep 2020

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Mark Russinovich @markrussinovich ...

We're working on an open source domain specific language for ARM codenamed Bicep that will greatly simplify Azure declarative modelling: "Microsoft flexes Bicep to strengthen ARM"



infoworld.com  
**Microsoft flexes Bicep to strengthen ARM**  
Azure gets a new infrastructure as code language that can help deploy and manage complex architectures

10:23 PM · Sep 8, 2020 · TweetDeck

162 Retweets 21 Quote Tweets 458 Likes



# Initial Bicep goals and “un-goals”

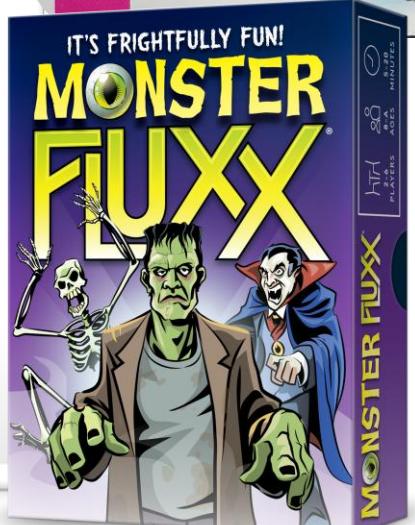
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## Goals

- Reduce current pain
- Ease of adoption
- Compatible with existing templates
- Transparent Abstraction: Leverage all the benefits of Fluxx
- Modular: Abstract common blocks of config into reusable components

## Non-Goals

- One language to rule them all
- General purpose language to meet any need
- Invent new technology





# 5 years ago

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## Project 'Bicep'

Simple declarative language to provision infrastructure on Azure

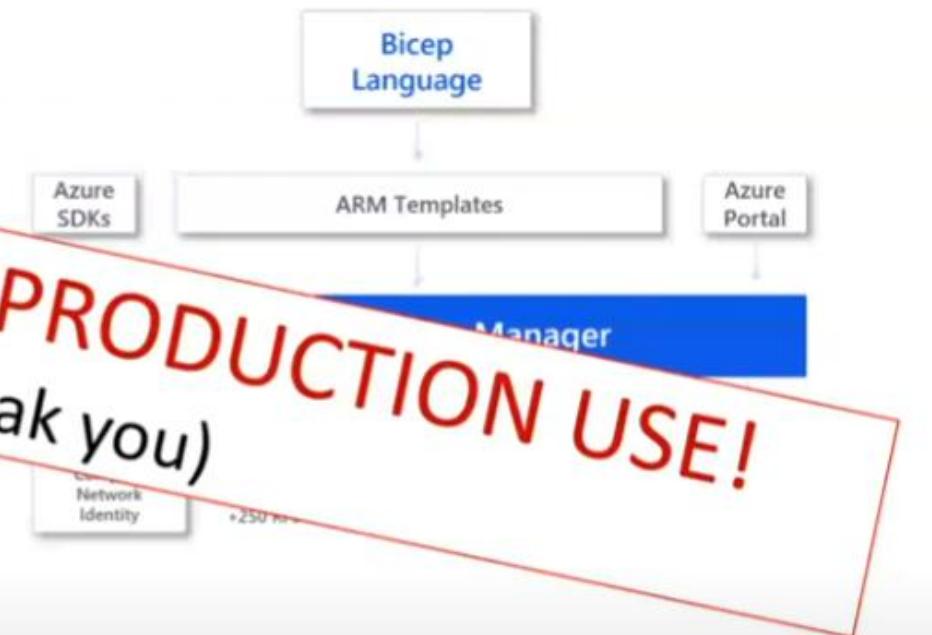
**NOT APPROVED FOR PRODUCTION USE!**  
*(we will break you)*

Currently at 0.1 release. Look for syntax feedback as possible. Now is the time for breaking syntax changes

Working towards more stable 0.3: 1:1 with ARM templates, less breaking changes

### Lots of ways to contribute:

- Open issues for syntax discussions, bugs, etc.
- Submit PRs to the examples directory
- Take a look at "Good first issue" label for feature PRs



Learn more: [aka.ms/Bicep](https://aka.ms/Bicep)



# Bicep 0.1

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- No Intellisense
- No Modules
- No Validation of resource types
- No AZ CLI integration
- Manually transpile using Bicep Build

...Also, W365 did not exist, AVD was still called WVD, and Azure RemoteApp was retired only 3 years ago ☺



# Back in the days ☺

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bersonapps PREVIEW

DASHBOARD USER ACCESS REMOTEAPP PROGRAMS SESSIONS

NAME	STATUS	RESOURCE PATH
Word	✓ Published	%SYSTEMDRIVE%\Pro
Visio	✓ Published	%SYSTEMDRIVE%\Pro
Project	✓ Published	%SYSTEMDRIVE%\Pro
PowerPoint	✓ Published	%SYSTEMDRIVE%\Pro
Outlook	✓ Published	%SYSTEMDRIVE%\Pro
OneNote	✓ Published	%SYSTEMDRIVE%\Pro
Excel	✓ Published	%SYSTEMDRIVE%\Pro

bersontest

DASHBOARD USER ACCESS PUBLISHING SESSIONS SCALE SUPPORT

Your RemoteApp collection is being created.  
Follow these steps to get started.

Skip Quick Start the next time I visit

- 1 Link a template image ?  
[link a template image](#)
- 2 Publish RemoteApp Programs ?  
[publish remoteapp programs](#)  
[configure user access](#)
- 3 Remote Desktop client download URL  
<https://www.remoteapp.windowsazure.com/>

Support Forums ?  
[Create a new topic](#)

Microsoft RemoteApp - freekberson@hotmail.com

File Home

Refresh App invitations Sign out Send feedback

Work Resources

Excel OneNote Outlook PowerPoint Project Visio



## Putting Project 'Bicep' 0.2 to the test, a WVD deployment use case.



Freek Berson

Empowering hybrid and remote workforces with a digital workspace from any device, anywhere. EUC Enthusiast, Microsoft MVP, public...



November 23, 2020

A couple of weeks ago I posted an article on my first experiences with Project 'Bicep'. Back then, Project 'Bicep' was just released as an 0.1 Alpha version. In case you missed that article, follow [this link](#).

**TODAY!**

**v0.2**

Validation of all Azure resource types

IntelliSense

Modules

Code formatting

Scopes

Recently, version 0.2 was released which contains some great features as listed on the left. I was especially looking forward to the option of using Modules and Scopes and having IntelliSense and code formatting to improve the overall authoring experience.

To get started, install the latest Bicep 0.2 release using the URL below.

<https://github.com/Azure/bicep/blob/main/docs/installing.md>

# Bicep 0.2

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The screenshot shows a GitHub repository page for 'wvd/BicepModules'. The repository has 2 issues, 1 pull request, and 1 action. The master branch is selected. A commit by 'fberson' titled 'Changes to correct filenames' is shown, dated 4e5c2c6 · 4 years ago. The commit history lists several files: '1. Deploy-Modules.bicep', '1. Deploy-Modules.json', '1.1 wvd-backplane-module.bicep', '1.2. wvd-network-module.bicep', '1.3. wvd-filenservices-module.bicep', '1.4. wvd-LogAnalytics.bicep', '1.4.1. wvd-monitor-diag.bicep', and 'README.md'. Each file entry includes its name, last commit message, and last commit date.

Name	Last commit message	Last commit date
..		
1. Deploy-Modules.bicep	Changes to correct filenames	4 years ago
1. Deploy-Modules.json	1st release of "1. Deploy-Modules.json"	5 years ago
1.1 wvd-backplane-module.bicep	Changes to correct filenames	4 years ago
1.2. wvd-network-module.bicep	1st release of "1.2. wvd-network-module.bicep"	5 years ago
1.3. wvd-filenservices-module.bicep	1st release of "1.3. wvd-filenservices-module.bicep"	5 years ago
1.4. wvd-LogAnalytics.bicep	Changes to correct filenames	4 years ago
1.4.1. wvd-monitor-diag.bicep	1st release of "1.4.1. wvd-monitor-diag.bicep"	5 years ago
README.md	Added more details per file	5 years ago



- Massive spike in demand due to pandemic
- Azure Portal integration
- ARM based WVD resources -> WVD Spring Update
- MSIX app attach preview



# Bicep 0.3

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- Feature parity with ARM Templates
- Ready for production use
- Existing keyword
- Loops
- Decompile options
- Bicep visualizer
- Scaffolding
- Module output support





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## Road map

Current release: CLI version 0.2.328

~90% of ARM template capabilities implemented!

V0.1

Alpha Release available on August 31st

V0.2  
(Oct/Nov)

- VSCode Intellisense  
- Support for modules

V0.3 (Feb/March)

- Loops  
- Conditionals  
- Decompiler  
- Production usage

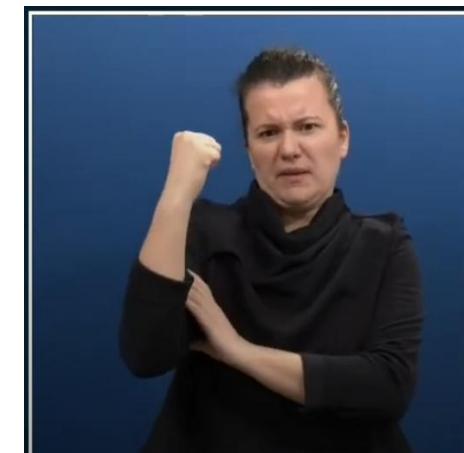
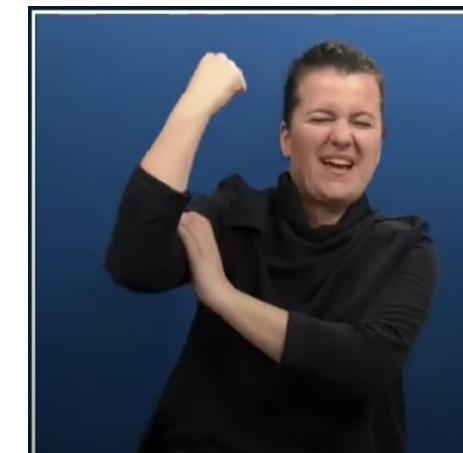


Empowering ARM and JSON with Project 'Bicep'



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# IaC adventures 2022

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## Road map

The road map illustrates the evolution of Bicep from its initial alpha release to its first major version. Each version is marked with a blue hexagonal icon containing a wrench and a gear.

- v0.1** (Aug '20)  
Alpha Release available on August 31st
  - Support for modules
- v0.2** (Oct '20)
  - VSCode Intellisense
  - Decomplier
  - Production usage
- v0.3** (March '21)
  - Loops
  - Conditionals
  - Snippets & resource scaffolding
  - Merging ARM Quickstarts & bicep
  - IncludeFile() support
- v0.4**
  - Quality release
  - Learn module
  - Linter (TTK successor)
  - Passing resource to module
  - LoadTextContent(...)
- NOV '21 v0.5**
  - Public & private Module Registry
  - Linter vNext
  - Bicep Extensibility preview
- March 2022 V1.0**
  - Strict change policy
  - Separate type & core updates
  - Bicep Extensibility preview

**1.0?** 😂

Infrastructure as Code with Bicep - on tour!

Slide 17 of 20

12:56  
3/4/2022

BB CV MM GO GO

Chen V Markus Sveinn Markússon Gunnar Már Óttarsson Gisli Olafsson

54:27 / 59:28



# Bicep 0.4

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- Linter rules
- More code snippets
- json templates as modules
- Private Module registry
- Insert Resource option
- "What-if" support
- "build" command to tab context menu



- WVD rebranded to AVD
- AVD becomes one of the fastest-growing Azure services
- ARM-based management (instead of the “classic” model)
- Azure AD join preview
- Start VM on connect
- Azure Monitor and Log Analytics support for AVD
- ...



# IaC adventures 2022

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## Summary

*On the **first** day of Christmas, Microsoft sent to me ...  
... one Bicep CLI to create ARM templates easy as can be!  
... vscode extension  
...scaffolding and code snippets  
...linter checks  
...Parameter decorators  
...conditional deployments  
...existing keywords  
...modules keywords  
...loops  
...decompiling  
...a visualizer  
...a private module registry!*



✿ Twelve features of Bicep – Christmas edition ✿



# Bicep 0.5 – 0.8

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- Bicep Public Registry
- bicep file from VSCode file context menu
- Decorators introduced (new syntax pattern, @)
- Multi-Line Array support
- LoadJsonContent(), and
- loadtextContent() funtions





# Been there, done that (almost created the t-shirt)

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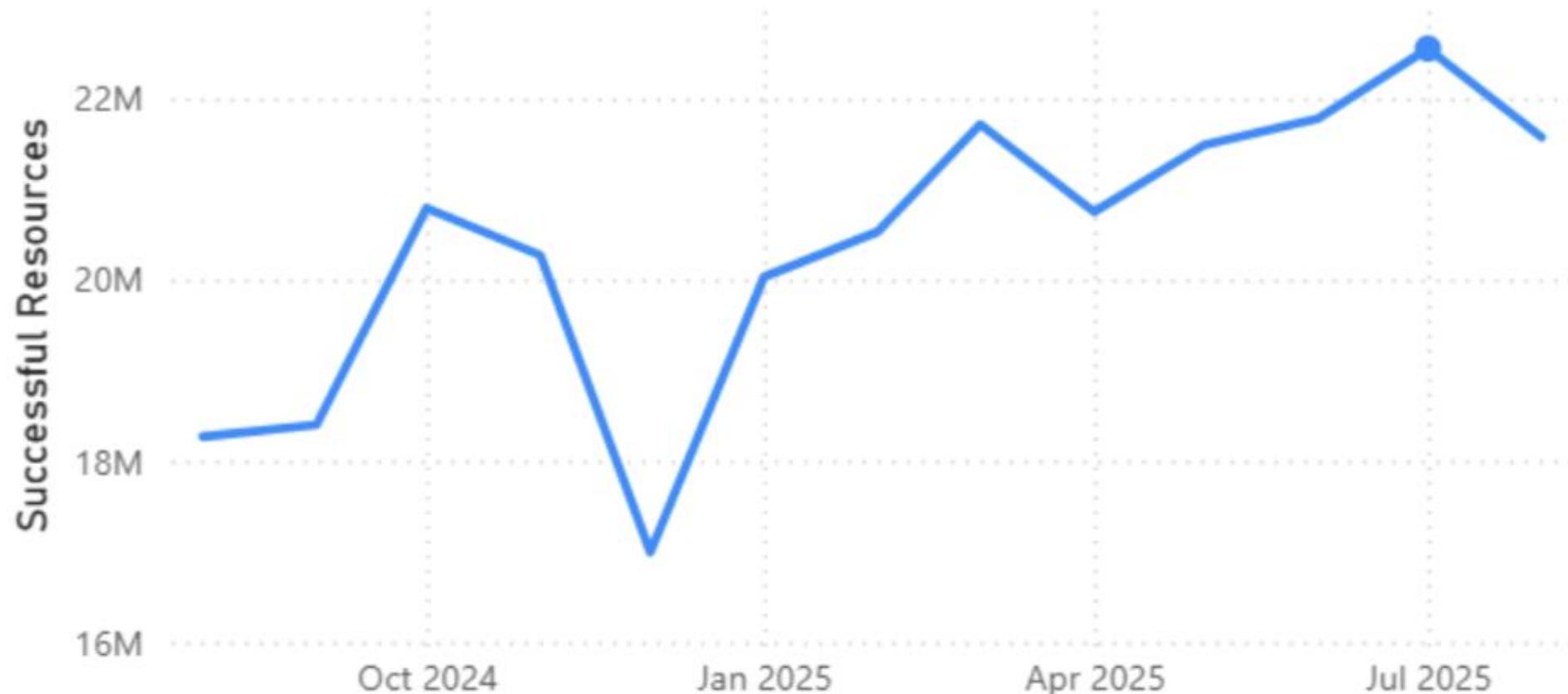


# Adoption rate

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## Successful Deployed Resources

deploymentMethod ● bicep



After careful consideration, we've made the difficult decision to deprecate Azure Resource Manager (ARM) Tools for Visual Studio Code effective Oct 1, 2025.



# Bicep 0.9 and beyond

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- Bicep parameter files, Bicepparam decompiler
- Deployment Pane UI
- DependsOn for existing resources
- Paste as Bicep
- Deployment stacks





# Theres much more! Join us tomorrow!

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## 1. Bicep innovations

- Snapshot & snapshot validation
- User-defined types and functions
- Resource Derived types
- Deployer() function
- Fail() Function
- Hidden title tag User-defined
- @secure() decorator on module outputs!
- Optional Module Names

## 2. Bicep in an AI, MCP, and prompt world

- MS Graph Extensibility
- Graph API like a pro
- Bicep Copilot
- Bicep MCP server + custom prompts
- Azure Verified Modules

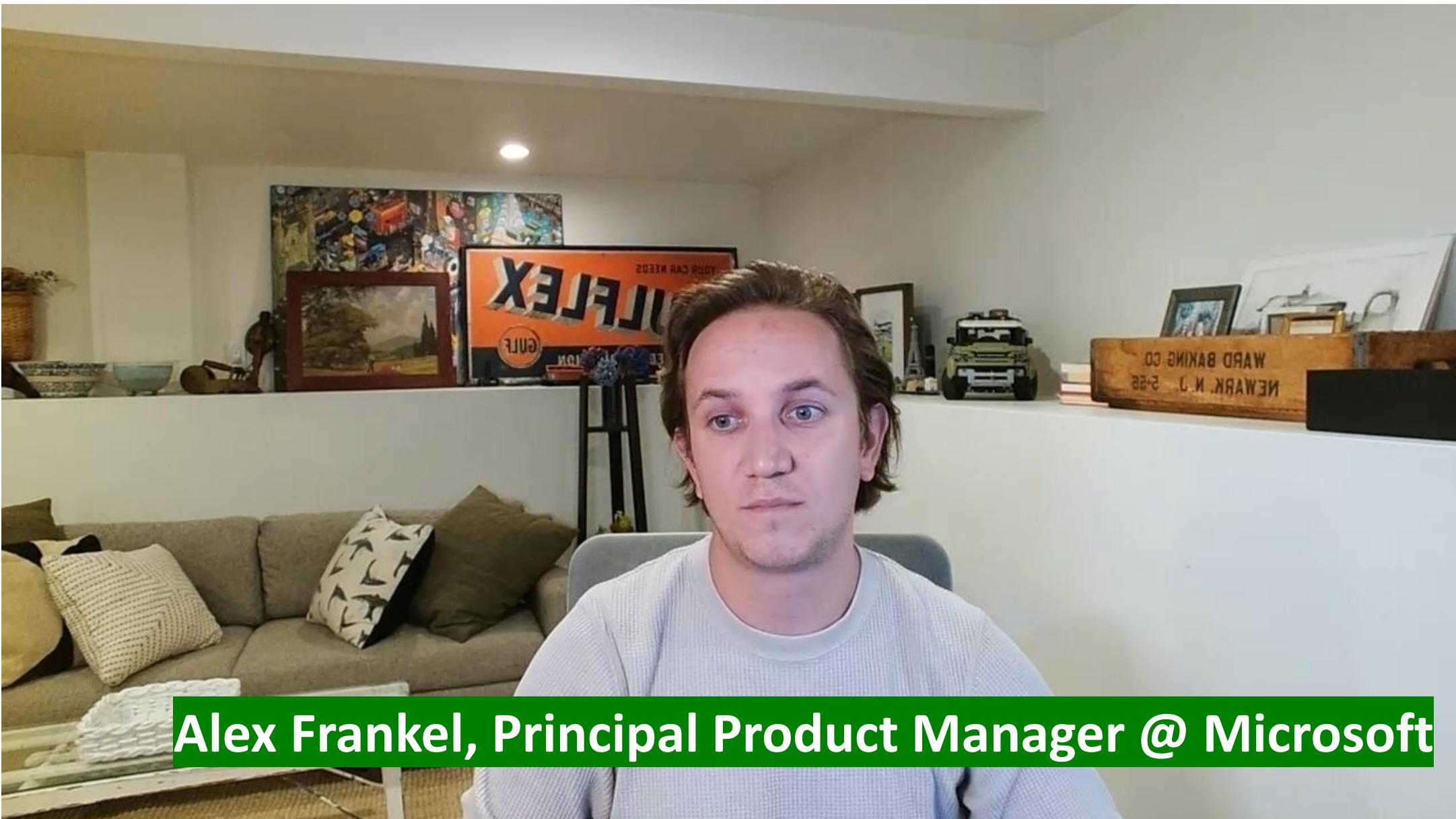
📅 Wednesday September 24, 2025 11:10  
📍 Hertz





# Special message!

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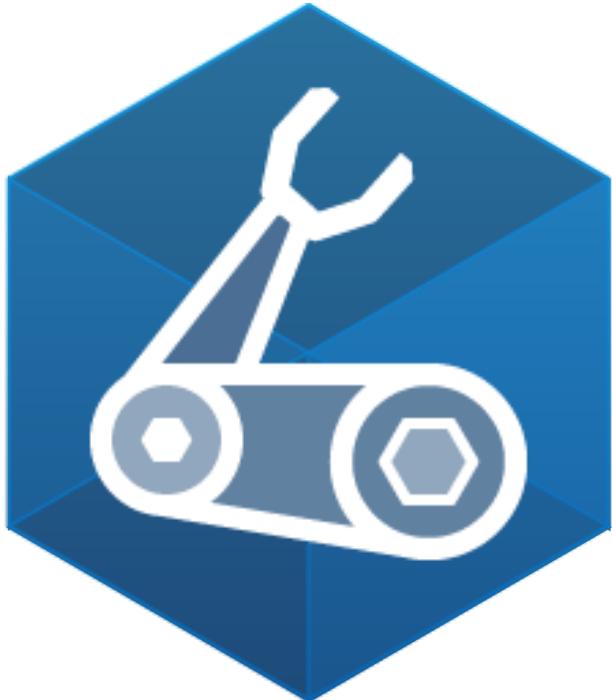


Alex Frankel, Principal Product Manager @ Microsoft



# One more thing ...

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## We love Feedback

<https://wpninja24.sched.com/>



Great Session!



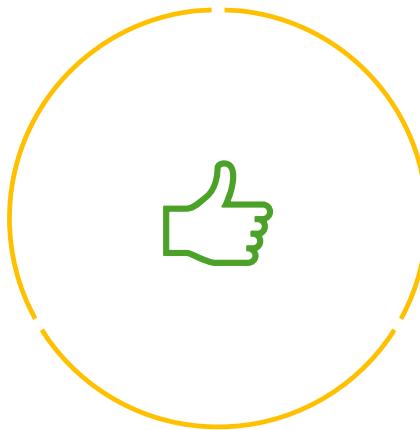
Okay Session!



Not so okay Session!



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# Thank You



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