



cloud
lunch & learn

Marathon

Transforming regular ARM template skills into Azure Bicep

Sponsored by



Microsoft



T-FREX



Elkhan Yusubov
Principal Cloud Architect



Elkhan is a principal cloud architect and 14 times MSFT MCT with experience in cloud solutions, enterprise healthcare systems and healthcare data, and API standards (HL7 FHIR, EDI X12).

He is an active MCT, a Microsoft Tech Community Contributor and Azure SME (Architecture, DevOps, Security).

He is a frequent speaker at tech meetups and has volunteered for Give Camps, Azure Data Fest, SQL Saturday and Global Azure events.

The Cloud Marathoner:

www.thecloudmarathoner.com



Company Snapshot: T- Rex Is...

- ▶ **An Innovative NGIT Provider:** a leading solutions provider of innovative and modernizing Next Generation IT capabilities and enabling skills to the federal government
- ▶ **A first to market in migrating large federal mission applications and data** into a citizen-facing public cloud, giving the Company the capabilities and past performance to bid and win future NGIT opportunities in adjacent federal agencies
- ▶ **A Prime Contractor on 2020 Census,** one of the largest (scale) and most complex mission critical cloud/cyber/data analytics integration projects within the federal government



- ▶ **Integrated 52 mission-critical systems comprised of 200+ applications** operating in a hybrid hyper-converged data center and Amazon Web Service ("AWS") public facing GovCloud protected by a world class active cyber defense (ACD) solution. Also includes a VDI-based Office 365 solution supporting 40k+ users and MS Azure AD managing 350k+ mobile users

Achievements & Partnerships



Silver Data Analytics
Silver Application Development
Silver Data Platform

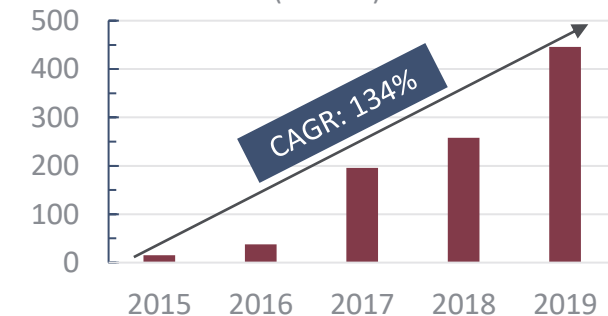


Company Info

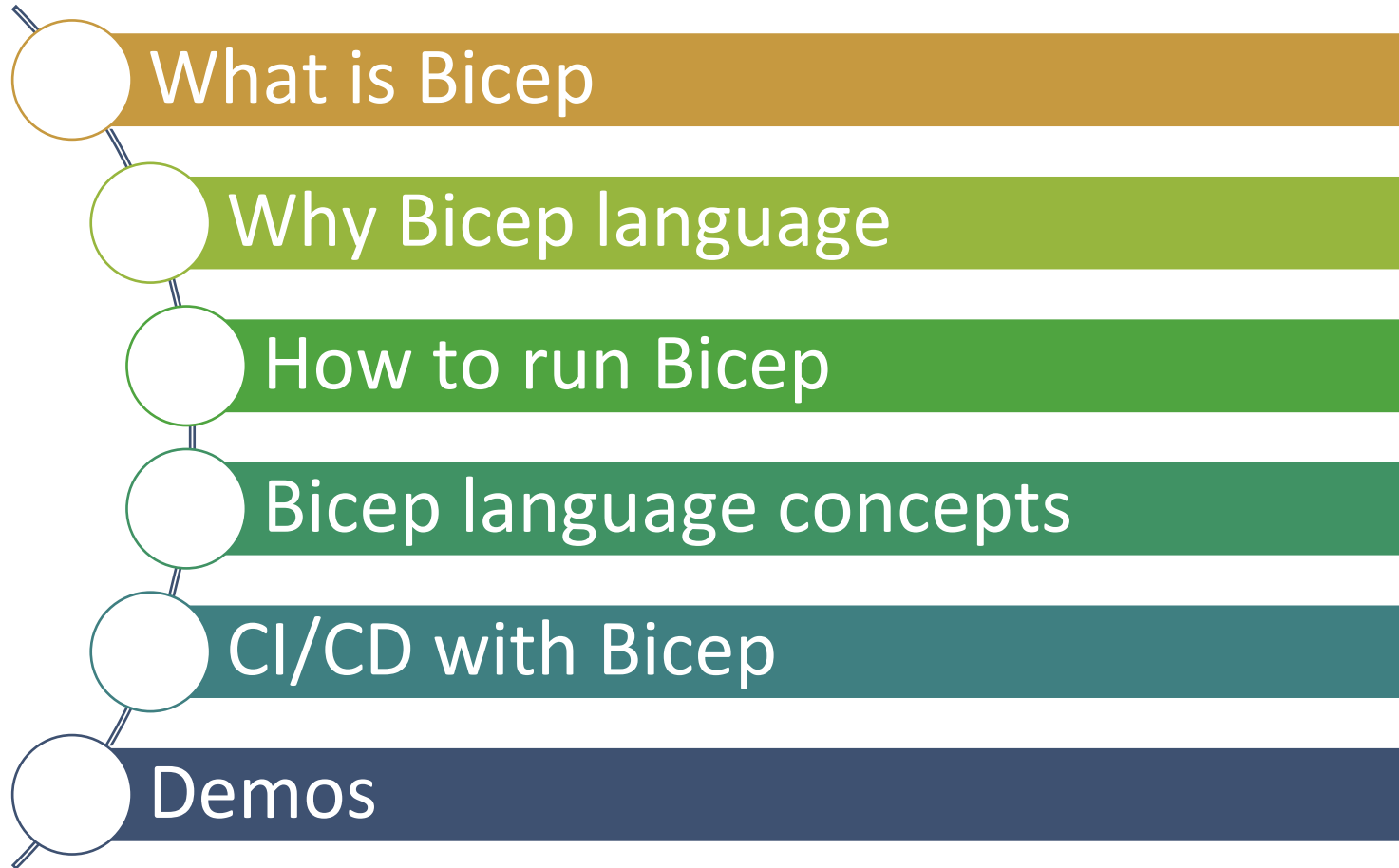
- **Established:** 1999
 - **Legal Structure:** LLC
 - **Headquarters:** Greenbelt, MD
 - **8(a)/HUBZone & SDVOSB Joint Ventures:** Ability to deliver services as a small business concern
 - **Prime/Sub (09/20):** 98.5% Prime
 - **Backlog (09/20):** \$341.6MM
- Prime Vehicles/BPAs:**
- GSA Schedule 70
 - USDA Cloud COE BPA
 - Dept of Commerce ESF

Financial Summary

T-Rex Annual Revenue (USD M)



What we will cover



What is Bicep?

- DSL for deploying Azure resources
- Transpiler of code into ARM template
- Simple way to author Azure resources

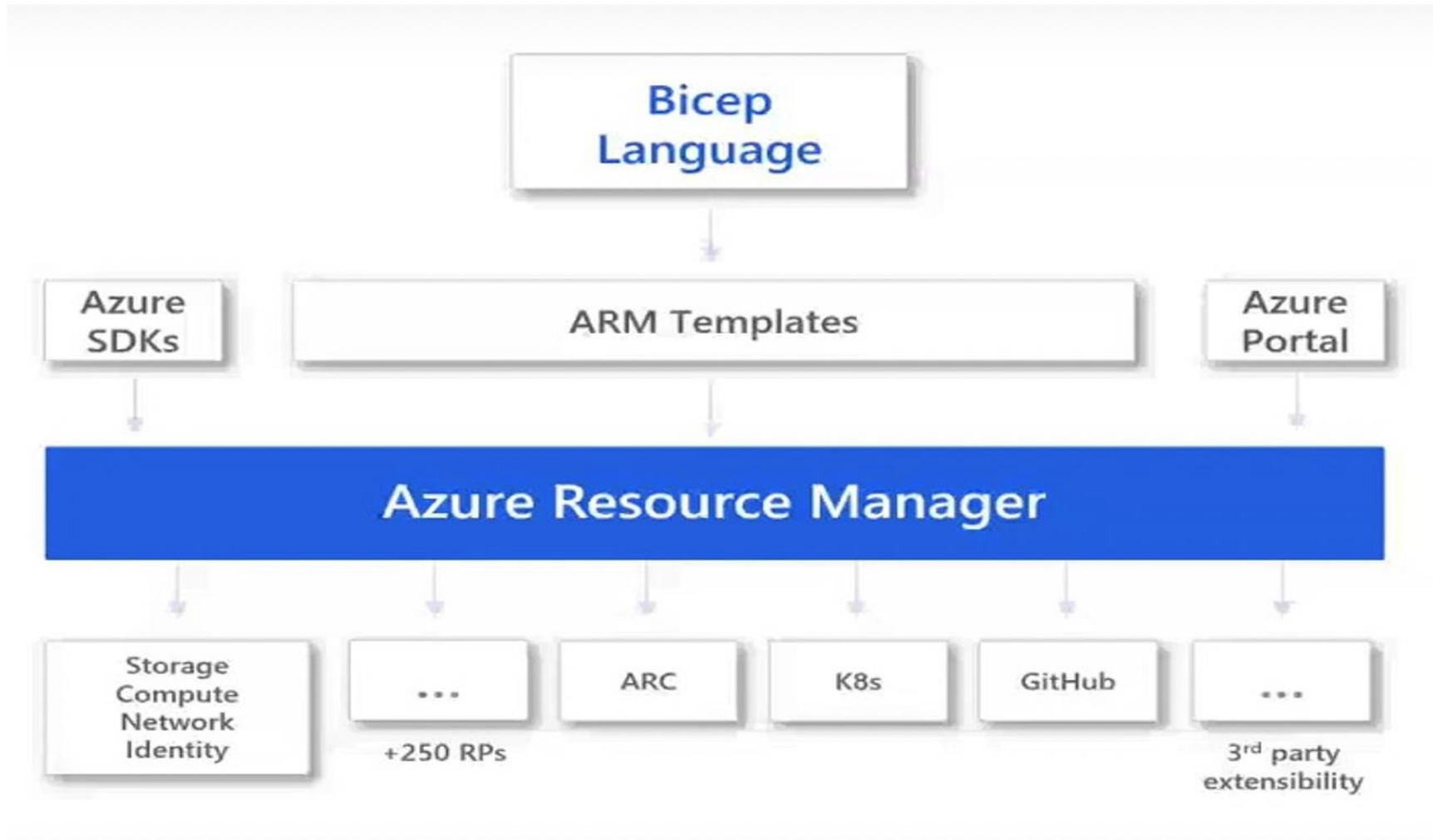


Why Bicep language?

- Easy to understand and maintain
- Day zero support
- Transparent abstraction
- Awesome tolling in VS Code
- Clean code syntax
- Code re-use and modularity
- Depp integration with Azure
- Preflight validation
- No state management
- Production support

```
1 param appName string = uniqueString(resourceGroup().id)
2 param accountName string = toLower('cosmos-${appName}')
3 param location string = resourceGroup().location
4 param dbName string = toLower('db-${appName}')
5
6 resource cosmos 'Microsoft.DocumentDB/databaseAccounts@2020-04-01' = {
7   name: accountName
8   location: location
9   properties: {
10     enableFreeTier: true
11     databaseAccountOfferType: 'Standard'
12     consistencyPolicy: {
13       defaultConsistencyLevel: 'Session'
14     }
15     locations: [
16       {
17         locationName: location
18       }
19     ]
20   }
21 }
22
23 resource cosmosdb 'Microsoft.DocumentDB/databaseAccounts/sqlDatabases@2020-04-01' = {
24   name: '${cosmos.name}/${dbName}'
25   properties: {
26     resource: {
27       id: dbName
28     }
29     options: {
30       throughput: 400
31     }
32   }
33 }
34
35 {
36   "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentschema.json",
37   "contentVersion": "1.0.0.0",
38   "metadata": {
39     "_generator": {
40       "name": "bicep",
41       "version": "0.3.255.40792",
42       "templateHash": "17325859092750274113"
43     }
44   },
45   "parameters": {
46     "appName": {
47       "type": "string",
48       "defaultValue": "[uniqueString(resourceGroup().id)]"
49     },
50     "accountName": {
51       "type": "string",
52       "defaultValue": "[toLower(format('cosmos-{0}', parameters('appName')))]"
53     },
54     "location": {
55       "type": "string",
56       "defaultValue": "[resourceGroup().location]"
57     },
58     "dbName": {
59       "type": "string",
60       "defaultValue": "[toLower(format('db-{0}', parameters('appName')))]"
61     }
62   },
63   "functions": [],
64   "resources": [
65     {
66       "type": "Microsoft.DocumentDB/databaseAccounts",
67       "apiVersion": "2020-04-01",
68       "name": "[parameters('accountName')]",
69       "location": "[parameters('location')]",
70       "properties": {
71         "enableFreeTier": true,
72         "databaseAccountOfferType": "Standard",
73         "consistencyPolicy": {
74           "defaultConsistencyLevel": "Session"
75         }
76       },
77       "locations": [
78         {
79           "locationName": "[parameters('location')]"
80         }
81       ]
82     },
83     {
84       "type": "Microsoft.DocumentDB/databaseAccounts/sqlDatabases",
85       "apiVersion": "2020-04-01",
86       "name": "[concat(parameters('accountName'), '/', parameters('dbName'))]",
87       "location": "[parameters('location')]",
88       "properties": {
89         "resource": {
90           "id": "[parameters('dbName')]"
91         },
92         "options": {
93           "throughput": 400
94         }
95       }
96     }
97   ]
98 }
```


Relationship between Bicep and ARM templates



How to start with Bicep?

- [Install Azure PowerShell](#)
- [Install Azure CLI on Windows](#)
- [Install Azure CLI on Linux](#)
- [Install Azure CLI on macOS](#)



Bicep language concepts

Parameters

Variables

Modules

Loops

Scopes

Conditionals

Quick look into Bicep concepts

Parameters

```
samples > parameterized-storage.bicep > storageSKU
1 // parameterized-storage.bicep
2 @minLength(3)
3 @maxLength(24)
4 param storageName string
5
6 @allowed([
7     'Standard_LRS'
8     'Standard_ZRS'
9 ])
10 param storageSKU string = 'Standard_LRS'
```

Template function and Variables

```
param azureRegion string = resourceGroup().location

var uniqueStorageName = '${storageName}${uniqueString(resourceGroup().id)}'
```

Modules

```
resource computeRg 'Microsoft.Resources/resourceGroups@2020-06-01' = {
  name: concat('bicep-azglobal-compute-v1-', azureRegion)
  location: azureRegion
}

var computeDeployment = 'vmLinuxDeploy'
var uniqueComputeDeployment = '${computeDeployment}${uniqueString(computeRg.id)}'

module vmWinMod './linux-vm.bicep' = {
  name: uniqueComputeDeployment
  scope: resourceGroup(computeRg.name)
  params: {
    adminUsername: 'azureuser'
    vmSize: 'Standard_B2s'
    vmName: 'myLinuxVm'
  }
}

resource databaseRg 'Microsoft.Resources/resourceGroups@2020-06-01' = {
  name: concat('bicep-azglobal-database-v1-', azureRegion)
  location: azureRegion
}
```

CI/CD with Bicep templates

Bicep Test repo @ElYusubov

The screenshot shows the GitHub repository interface for 'ElYusubov add new badge for deploy'. The repository has 2 branches and 0 tags. The file list includes .github/workflows, samples, sandbox, scripts, .gitignore, and README.md. The README.md file is open, showing the title 'Azure Bicep - simple landing zone project' and a description: 'This project is created to verify bicep file compilations into the ARM templates. Focus is on performing simple and complex IaC provisioning though authoring ARM templates via Bicep language.' Below the description, there are two badges: 'License Apache 2.0' and 'CI passing'. The 'Build and Deploy Bicep' badge is also shown as 'passing'. The instructions for running the samples in Vs Code env are listed below the badges.

Azure Bicep - simple landing zone project

This project is created to verify bicep file compilations into the ARM templates. Focus is on performing simple and complex IaC provisioning though authoring ARM templates via Bicep language.

Badges

License Apache 2.0 CI passing Build and Deploy Bicep passing

To get running the samples do the following in Vs Code env:

- Fork the branch (aka, starting from obvious ;)
- Install Bicep runtime on you machine
- Install Bicep extension

GitHub Workflows

The screenshot shows the GitHub Actions workflow page for 'Build and Deploy Bicep'. The workflow is named 'deployBicep.yaml'. It shows 5 workflow runs. The first two runs are successful (green checkmark) and the last three are failed (red X). The workflow runs are listed in a table with columns: Event, Status, Branch, and Actor.

Event	Status	Branch	Actor
add new badge for deploy	Success	main	ElYusubov
update old files	Success	main	ElYusubov
update package version	Failure	main	ElYusubov
change naming in pipline details	Failure	main	ElYusubov
add build badge and create bicep sample build	Success	main	ElYusubov

Securing pipline with Secrets

The screenshot shows the GitHub repository secrets page. It lists two secrets: 'MCT_SUB_ID' and 'MCT_SUB_JSON'. Both secrets are updated 2 days ago. The page has buttons for 'Update' and 'Remove' for each secret.

Secret Name	Updated	Update	Remove
MCT_SUB_ID	Updated 2 days ago	Update	Remove
MCT_SUB_JSON	Updated 2 days ago	Update	Remove



Demo 1 – Getting started with Bicep on VS Code

Quick starter demo with storage account and parameterization



Demo 2 – Parametrized Bicep modules (re-use)

Look into parametrized deployment scenarios



Demo 3 – Deployments (security policies)

More modules and security policies for the deployment



```
TERMINAL  DEBUG CONSOLE  PROBLEMS  OUTPUT

PS C:\Work\Bicep-Starter> az deployment sub create --location eastus2 --template-file .\samples\custom-locations.bicep
The system cannot find the path specified.
Please provide string value for 'policyEffect' (? for help):
[1] Audit
[2] Deny
Please enter a choice [Default choice(1)]: 2
{
  "id": "/subscriptions/751fab54-447d-4b8f-8d44-12172466e856/providers/Microsoft.Resources/deployments/custom-locations",
  "location": "eastus2",
  "name": "custom-locations",
  "properties": {
    "correlationId": "df1bc4a1-f8d2-4320-8606-ec9a7d2135db",
    "debugSetting": null,
    "dependencies": [
      {
        "dependsOn": [
          {
            "id": "/subscriptions/751fab54-447d-4b8f-8d44-12172466e856/providers/Microsoft.Authorization/policyDefinitions/c",
            "resourceName": "custom-allowed-location",
            "resourceType": "Microsoft.Authorization/policyDefinitions"
          }
        ],
        "id": "/subscriptions/751fab54-447d-4b8f-8d44-12172466e856/providers/Microsoft.Authorization/policyAssignments/Resou",
        "resourceName": "Resource-location-restriction",
        "resourceType": "Microsoft.Authorization/policyAssignments"
      }
    ],
    "duration": "PT1.6436266S"
  }
}
```

Demo 4 – CI/CD GitHub workflows



ELYusubov / BicepTest

Unwatch 1 Star 0 Fork 0

Code Issues Pull requests **Actions** Projects Wiki Security Insights Settings

add new badge for deploy Build and Deploy Bicep #5

Summary

Jobs

- build-arm
- deploy-resources

Triggered via push 3 days ago

ELYusubov pushed · e3bf253 main

Status: Success

Total duration: 8m 5s

deployBicep.yaml

on: push

build-arm 33s

deploy-resources 7m 9s

Artifacts

Produced during runtime

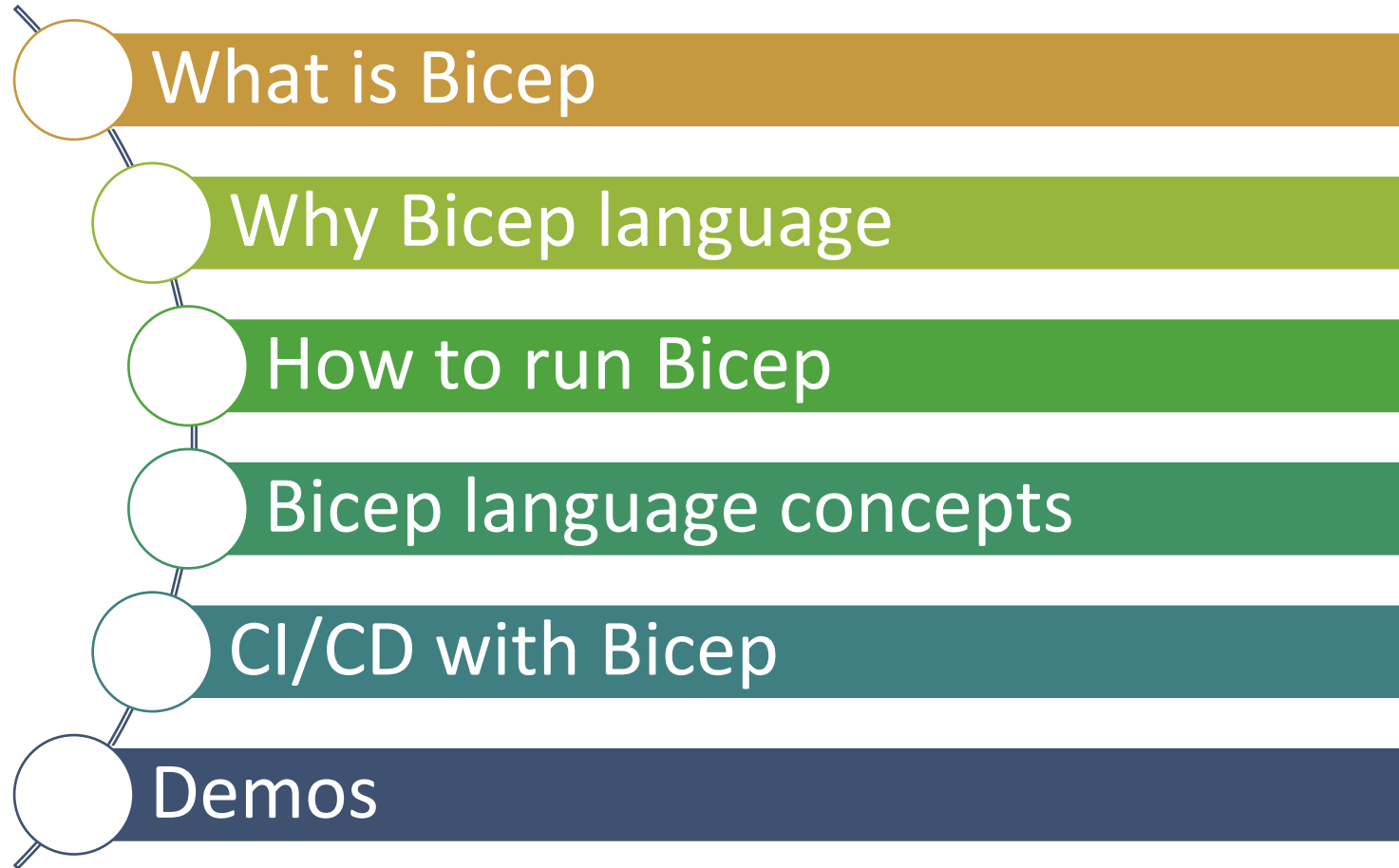
Name	Size
bicep-artifacts	180 KB

Workflows

Event	Status	Branch	Actor
push	Success	main	ELYusubov
push	Success	main	ELYusubov
push	Success	main	ELYusubov
push	Success	main	ELYusubov
push	Success	main	ELYusubov



What we have covered

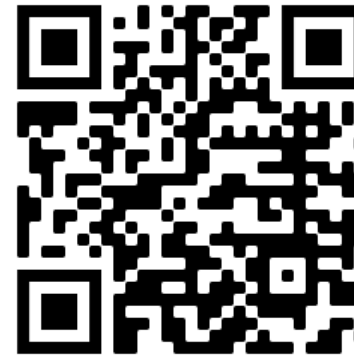


What is next?

Azure Bicep Demo GitHub



Let's Connect  



Bicep project on GitHub



Tutorial on Azure Bicep



Project Bicep with DevOps



T-FREX

Q & A



Elkhan Yusubov
Principal Cloud Architect
T-Rex Solutions

 @ElYusubov

 ElkhanYusubov

 ElYusubov



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