ARM Infrastructure as code

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What are ARM Templates?

- They are Azure's *Infrastructure as Code*
- They are *declarative*
- They are *idempotent*
- They allow deployment of complex resources
- They can be nested (call other templates)
- You can do clever stuff with sequencing
- They are part of a healthy balanced DevOps diet
- They are authored in ***J**ava **S**cript **O**bject **N**otation*

Quickly deploying through Azure Portal

Demo

Parameters

```
"parameters": {
    "NamePrefix": {
      "type": "string",
      "minLength": 1,
      "defaultValue": "Env1"
      "metadata": {
        "description": "Used to construct all resource names as prefix+service.
Should be all lowercase to avoid naming issues"
      }
    }
  }
```

Variables

```
"variables": {
    "WebSiteName": "[concat(parameters('NamePrefix'),'WebSite')]",
    "AppPlanName":
"[concat(parameters('NamePrefix'),'AppPlan',uniqueString(resourceGroup().id))]",
    "RedisCache": {
      "Name":
"[concat(parameters('NamePrefix'),'Redis',uniqueString(resourceGroup().id))]",
      "SKUName": "Basic",
      "SKUFamily": "C",
      "SKUCapacity": 0
    }
  }
```

Functions

```
"functions": [
  {
    "namespace": "sampleFunction",
    "members": {
      "getNicName": {
        "parameters": [
          { "name": "prefix",
            "type": "string"
          },
          { "name": "id",
            "type": "string"
          }
        ],
        "output": {
          "type": "string",
          "value": "[concat(toLower(parameters('prefix')),'-nic-',padLeft(parameters('id'),2,'0'))]"
        }
      }
    }
  }
]
```

Resources

```
"resources": [
    {
      "name": "[variables('AppPlanName')]",
      "type": "Microsoft.Web/serverfarms",
      "location": "[resourceGroup().location]",
      "apiVersion": "2014-06-01",
      "dependsOn": [],
      "tags": {
        "displayName": "AppPlan"
      },
      "properties": {
        "name": "[variables('AppPlanName')]",
        "sku": "[parameters('AppPlanSKU')]",
        "workerSize": "[parameters('AppPlanWorkerSize')]",
        "numberOfWorkers": 1
      }
    }
]
```

Outputs

```
 "outputs": {
    "WebsiteHostName": {
      "value":
"[reference(resourceId('Microsoft.Web/sites',variables('WebSiteName'))).hostNames[
0]]",
      "type": "string"
    }
  }
```

Template Tips

- Small numbers of parameters
- Make use of objects in variables
- If your template is huge, consider splitting
- Use clear naming, especially if using references and outputs
- Avoid Parameters.json
- Accept the azuredeploy.json naming
- Know and love Resource Explorer

Automation Script and Resource Explorer

Demo

Getting Clever: Copy

- Copy loops allow you to create multiple copies of a given resource with unique properties
  e.g. The same web site in multiple regions

```
"apiVersion": "2015-08-01",
"name": "[concat(variables('WebSiteName'), copyIndex(),'/staging')]",
"copy": {
        "count": "[length(parameters('WebLocations'))]",
        "name": "WebSlotLoop"
},
"type": "Microsoft.Web/sites/slots",
"location": "[parameters('WebLocations')[copyIndex()]]",
"dependsOn": ["WebAppLoop"],
"properties": {}
```

Getting Clever: Sequencing

01

A resource can only be defined once in a deployment

02

Nested deploys allow you to define it more than once

03

Dependencies and references allow you to *redefine* resource properties
e.g. change the DNS value of vNet based on the IP of a new VM

Getting Clever: Condition, If

- Pass different JSON into the final template based on logic

```
"apiVersion": "2017-06-01",
      "condition": "[greater(length(parameters('WebLocations')),1)]",
      "type": "Microsoft.Network/trafficManagerProfiles",
      "name": "[variables('TrafficMgr').Name]“

"TrafficMgrFQDN": {
      "type": "string",
      "value":
"if(greater(length(parameters('WebLocations')),1),[reference(resourceId('Microsoft.
Network/trafficManagerProfiles', variables('TrafficMgr').Name)).dnsConfig.fqdn,
json('null'))]"
    }
```

Getting Clever: Undocumented Stuff

Automation Script doesn’t give you everything

Not everything is fully documented (yet)

Resource Explorer is your friend

Parameter Usage

👌 `parameters` accept inputs

👍 `parameters` pass data to `variables`

👍 `variables` transform/isolate `parameters`

👎 ~~`parameters` used directly with `resources`~~

👍 `variables` used directly with `resources`

```
{
  "$schema": "...",
  "contentVersion": "...",
  "parameters": {},
  "variables": {},
  "functions": [],
  "resources": [],
  "outputs": {}
}
```

ARM Functions

- Simplifies complex expressions
- Reusable within the template

```
"functions": [
  {
    "namespace": "sampleFunction",
    "members": {
      "getName": {
        "parameters": [
          { "name": "prefix",
            "type": "string"
          },
          { "name": "id",
            "type": "string"
          }
        ],
        "output": {
          "type": "string",
          "value": "[concat(toLower(parameters('prefix')),'-nic-',padLeft(parameters('id'),2,'0'))]"
        }
      }
    }
  }
]
```

ARM Functions Usage

- Simplifies complex expressions
- Reusable within the template

```
"variables": {
 "fullname": "[concat(parameters('prefix'), '-{0}-', parameters('location'))]",
  "nickname": "[sampleFunction.getName(variables('fullname'), 'nic')]",
  "nsgName": "[sampleFunction.getName(variables('fullname'), 'nsg')]",
}
```

ARM Outputs

- Visualize the results of the deployments
- Exposes Data to be consumed by next stage efforts

```
"outputs": {
    "websiteHostName": {
      "value": "[reference(resourceId('Microsoft.Web/sites',variables('WebSiteName'))).hostNames[0]]",
      "type": "string"
    },
    "storageAccountKey": {
      "value": "[listKeys('resourceId', 'apiVersion').keys[0].value]",
      "type": "string"
    },
    "appInsightsKey": {
      "value": "[reference('resourceName').instrumentationKey]",
      "type": "string"
    }
}
```

Complex Templates

Demo

Authoring Considerations

Consider Yet Another Markup Language

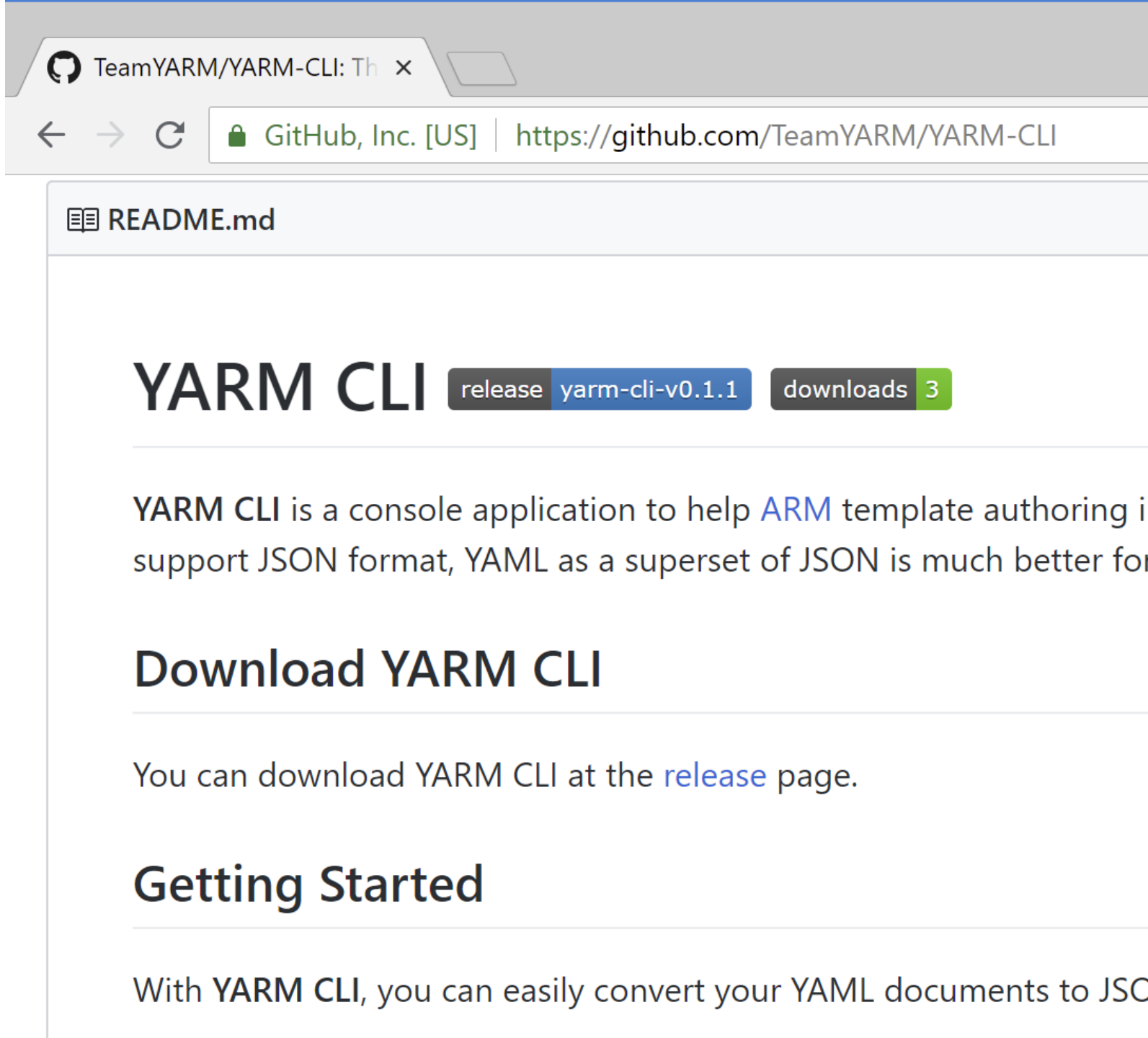
- Author in YAML
- Superset of JSON
- Python Pretty Code Compliant
  - Delimited using Spaces
  - No complex nest of braces {[(..]})
  - Supports Comments
  - Much easier read
  - Easily convertible to and from JSON/YAML

Use in Deployment Automation

- Avoid parameters.json in code repo
- PowerShell supports inferred parameters
- Store your parameter values in your release pipeline
- Use the same template for dev, test, release

YAML for ARM

- CLI Interface
- Cross Platform
- Pipeline Compliant



Useful Links

Reference
https://github.com/rjmax

Azure QuickStart Templates
https://github.com/Azure/azure-quickstart-templates
http://azure.microsoft.com/en-us/documentation/templates/

ARM Template Documentation
https://docs.microsoft.com/en-us/azure/templates/

Azure Resource Explorer
https://resources.azure.com/

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