

Laboratorio de infraestructura en la nube y automatización de procesos.

Prueba dummy

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**Área
Cloud and DevOps**

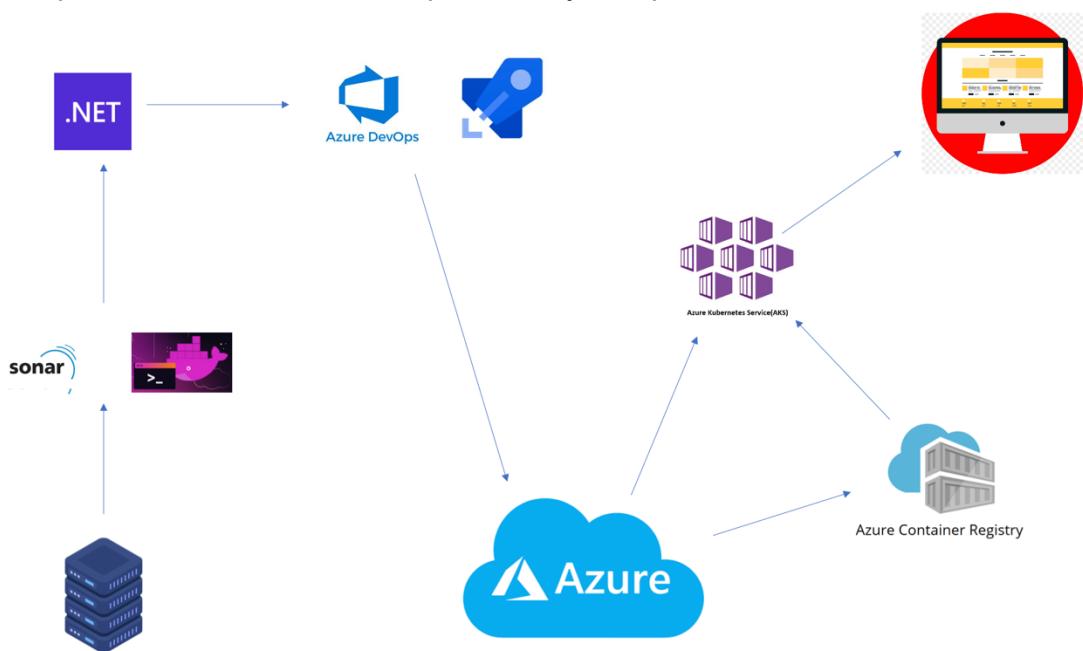
**Año
2023**

Tabla de contenido

<u>1. INTRODUCCIÓN</u>	<u>3</u>
<u>2. HERRAMIENTAS DEL SERVIDOR.....</u>	<u>4</u>
<u>3. RECURSOS DE AZURE CLOUD.....</u>	<u>5</u>
<u>4. REPOSITORIO DE AZURE DEVOPS.....</u>	<u>8</u>
<u>5. EJECUCIÓN DE PIPELINE</u>	<u>12</u>
<u>6. CONCLUSIÓN</u>	<u>16</u>
<u>7. ANEXOS.....</u>	<u>16</u>

1. Introducción

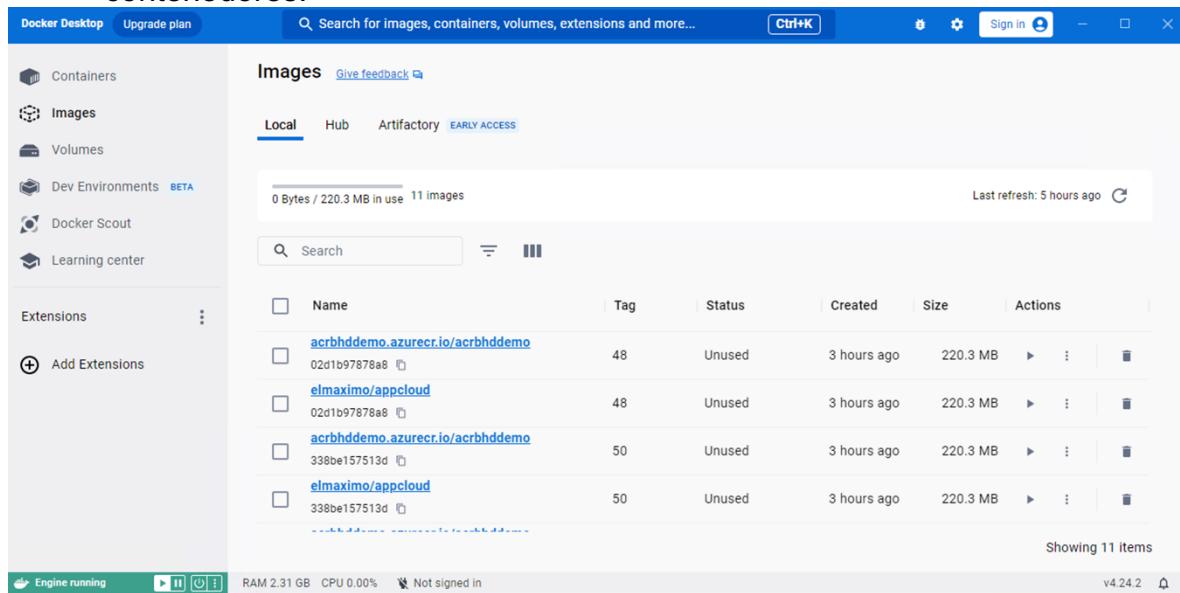
Este documento tiene como finalidad mostrar el proceso de creación de la infraestructura demostrativa para la prueba dummy, se describirán los componentes necesarios y las configuraciones aplicadas según los requerimientos solicitados en la documentación de la prueba. A continuación, se muestra un esquema para tener claridad de los procesos y componentes desarrollados.



Como podemos observar se configura un servidor virtual en el cual se instaló un agente auto hospedado de Azure DevOps y las herramientas de Sonar Cube y Docker Desktop, así como los componentes necesarios para que estas herramientas se pudieran ejecutar en el caso de Docker activar las características de Hyper-V y el complemento de WSL para SonarCube se requiere openlogic jre 17 y para la compatibilidad de ejecutar las tareas de escaneo a nivel de Azure DevOps se instaló Oracle jdk 17 y node.js.

2. Herramientas del servidor

- Docker: Herramienta para crear imágenes de aplicaciones para contenedores.



- Sonar cube: Herramienta para escanear las vulnerabilidades y malas prácticas de codificación

The screenshot shows the SonarQube dashboard for the project 'BHDDummy'. The main header includes links for Projects, Issues, Rules, Quality Profiles, Quality Gates, Administration, More, and a search bar. A banner at the top right indicates 'The last analysis has warnings. See details' and 'Version 1.0'. Below the header, there are tabs for Overview, Issues, Security Hotspots, Measures, Code, and Activity. The 'Measures' tab is selected. On the left, a large box displays the 'Quality Gate Status' as 'Passed' with a green checkmark icon. It also features a decorative icon of a monitor with code and a checkmark. Below this, a message says 'Enjoy your sparkling clean code!'. To the right, under 'Measures', there are six boxes: 'Reliability' (0 Bugs, grade A), 'Maintainability' (5 Code Smells, grade A), 'Security' (0 Vulnerabilities, grade A), 'Security Review' (6 Security Hotspots, grade E), 'Coverage' (0.0% Coverage, grade O, coverage on 33 lines), and 'Duplications' (0 Duplicated Blocks, grade O, duplications on 297 lines). The 'Project Settings' and 'Project Information' tabs are visible at the top right.

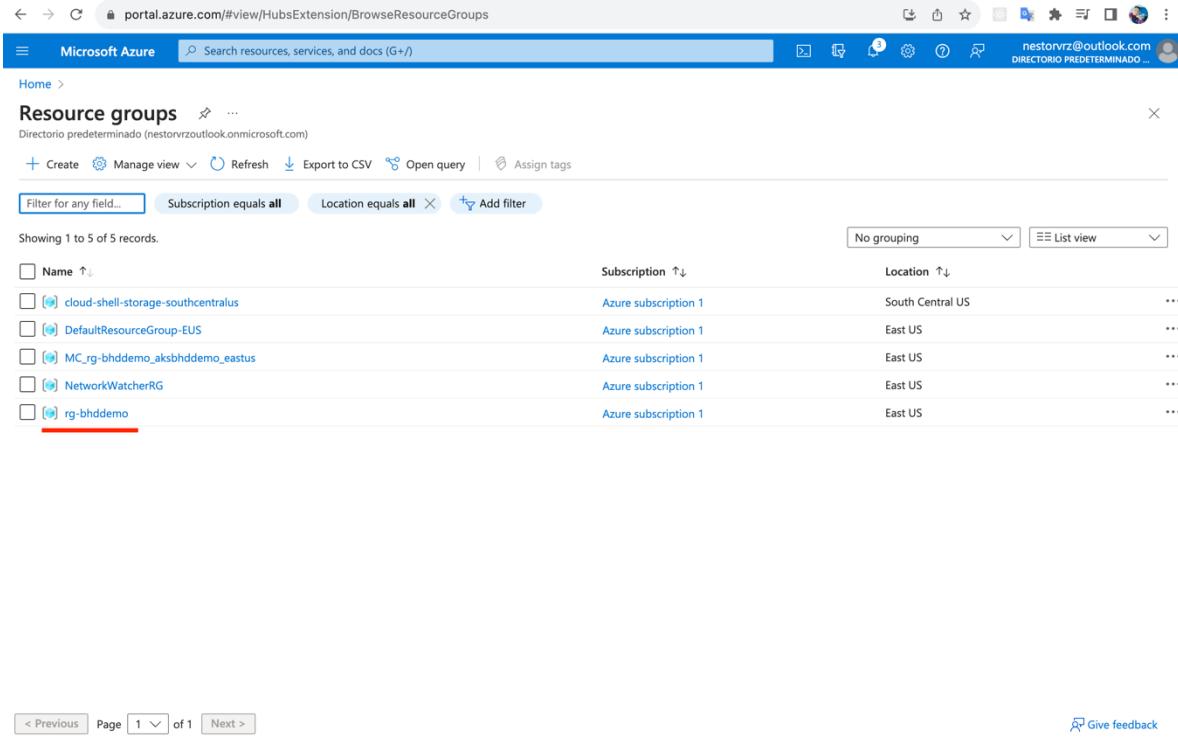
- Agente auto hospedado de Azure DevOps: esta herramienta permite la conexión entre Azure y el servidor virtual para la ejecución de las tareas programadas en los pipelines.

The screenshot shows the Windows Services application window titled 'Servicios'. The menu bar includes Archivo, Acción, Ver, Ayuda. The main area displays a list of local services. One service, 'Azure Pipelines Agent (nestorvrzprojects.DummyBHD.VM-DUMMY-SERVER)', is highlighted. Its dependencies are listed below it: 'Aislamiento de claves CNG', 'Aplicación auxiliar de NetBIOS sobre TCP/IP', 'Aplicación auxiliar IP', 'Aplicación del sistema COM+', 'AppX Deployment Service (AppXSVC)', 'Asignador de detección de topologías de nivel de vínculo', 'Asignador de extremos de RPC', 'Asistente para la conectividad de red', 'AssignedAccessManager Service', 'Audio de Windows', 'Autenticación natural', 'Ayuda del Panel de control de Informes de problemas', 'Ayudante especial de la consola de administración', 'Ayudante para el inicio de sesión de cuenta Microsoft', and 'Azure Pipelines Agent (nestorvrzprojects.DummyBHD.VM-DUMMY-SERVER)'. The table columns are Nombre, Descripción, Estado, Tipo de inicio, and Iniciar sesi... . The bottom of the window shows tabs for 'Extendido' and 'Estándar'.

3. Recursos de Azure Cloud

En esta sección se muestran los recursos necesarios creados en el portal de Azure Cloud

- Grupo de recurso: se crea para agrupar los componentes en este caso el grupo de recurso empleado se llama rg-bhddemo



The screenshot shows the Microsoft Azure portal interface for managing Resource Groups. The URL in the address bar is `portal.azure.com/#view/HubsExtension/BrowseResourceGroups`. The top navigation bar includes links for Home, Resource groups, and other account information. Below the navigation is a toolbar with Create, Manage view, Refresh, Export to CSV, Open query, and Assign tags buttons. A search bar at the top right says "Search resources, services, and docs (G+/".

The main content area displays a table of resource groups. The columns are Name, Subscription, and Location. There are filters at the top of the table: "Subscription equals all" and "Location equals all". The table shows the following data:

Name	Subscription	Location
cloud-shell-storage-southcentralus	Azure subscription 1	South Central US
DefaultResourceGroup-EUS	Azure subscription 1	East US
MC_rg-bhddemo_aksbhddemo_eastus	Azure subscription 1	East US
NetworkWatcherRG	Azure subscription 1	East US
rg-bhddemo	Azure subscription 1	East US

At the bottom of the page, there are navigation buttons for < Previous, Page 1 of 1, Next >, and a "Give feedback" link.

- Azure Container Registry: este será el almacén de contenedores donde se guardarán las imágenes de Docker en la nube.

portal.azure.com/#@nestorvrzoutlook.onmicrosoft.com/resource/subscriptions/bde64cb7-4a67-4843-8458-e90d31fe95b8/resourceGroups/rg-bhddemo/providers/Microsoft.ContainerRegistry/registries/acrbhddemo

acrbhddemo Container registry

Essentials

- Resource group (move) : rg-bhddemo
- Location : East US
- Subscription (move) : Azure subscription 1
- Subscription ID : bde64cb7-4a67-4843-8458-e90d31fe95b8
- Soft delete (Preview) : Disabled
- Tags (edit) : Add tags

Usage

Included in Pricing ...	Used 0.08 GB	Additional storage 0.00 GB
-------------------------	--------------	----------------------------

ACR Tasks

Build, Run, Push and Patch containers in Azure with ACR Tasks. Tasks supports Windows, Linux and ARM with QEMU.

[Learn more](#)

Container security integrations

Microsoft Defender for Cloud

Vulnerability management, runtime protection, and hardening recommendations for your containers and container environments.

[Learn more](#)

- Azure Kubernetes: este componente publicara la aplicación dockerizada a nivel de internet.

portal.azure.com/#@nestorvrzoutlook.onmicrosoft.com/resource/subscriptions/bde64cb7-4a67-4843-8458-e90d31fe95b8/resourceGroups/rg-bhddemo/providers/Microsoft.ContainerService/managedClusters/aksbhddemo

aksbhddemo Kubernetes service

Essentials

- Resource group : rg-bhddemo
- Status : Succeeded (Running)
- Location : East US
- Subscription : Azure subscription 1
- Subscription ID : bde64cb7-4a67-4843-8458-e90d31fe95b8
- Tags (edit) : Add tags

Kubernetes resources

- Namespaces
- Workloads
- Services and ingresses
- Storage
- Configuration
- Custom resources
- Events
- Run command

Properties

- Get started
- Properties
- Monitoring
- Capabilities (4)
- Recommendations
- Tutorials

Kubernetes services

- Encryption type : Encryption at-rest with a platform-managed key
- Virtual node pools : Not enabled

Node pools

- Node pools : 1 node pool
- Kubernetes versions : 1.26.6
- Node sizes : Standard_DS2_v2

Configuration

- Kubernetes version : 1.26.6
- Auto Upgrade Type : Patch
- Authentication and Authorization : Local accounts with Kubernetes RBAC
- Local accounts : Enabled

Networking

- API server address : aksbhddemo-dns-dou3ntei.hcp.eastus.azmk8s.io
- Network type (plugin) : Kubenet
- Pod CIDR : 10.244.0.0/16
- Service CIDR : 10.0.0.0/16
- DNS service IP : 10.0.0.10
- Docker bridge CIDR : -
- Network Policy : Calico
- Load balancer : Standard
- HTTP application routing : Enabled
- Private cluster : Not enabled
- Authorized IP ranges : Not enabled
- Application Gateway : Not enabled
- ingress controller

El siguiente paso es enlazar el ACR con el AKS, esto debido a que el AKS necesita extraer las imágenes del almacén ACR y necesita permisos, con el siguiente comando se creara dentro del ACR el rol de AcrPull para el AKS. Este comando podemos ejecutarla en una Azure Powershell directamente en el portal

```
az aks update -n myAKSCluster -g myResourceGroup --attach-acr <acr-name>
```

Luego de aplicar la configuración anterior podremos ver en la sección de acceso control en el ACR que se ha creado el roll.

Name	Type	Role	Scope	Condition
aksbhddemo-agentpool /subscriptions/bde64cb7... User-assigned Managed Identity	User-assigned Managed Identity	AcrPull	This resource	None
nestorvrzprojects-BHDDun App	App	AcrPush	This resource	None
nestorvrzprojects-BHDDun App	App	Contributor	Subscription (Inherited)	None
nestorvrzprojects-prodem App	App	Contributor	Subscription (Inherited)	None
Francisco Valle Ruiz nestorvrz_outlook.com#... User	User	Owner	Subscription (Inherited)	None

4. Repositorio de Azure DevOps

En esta sección se explican los archivos utilizados y versionados en el repositorio empleados para la construcción de la imagen de Docker automática y sus despliegues hacia Azure Container Registry, Azure Kubernetes y Docker Hub.

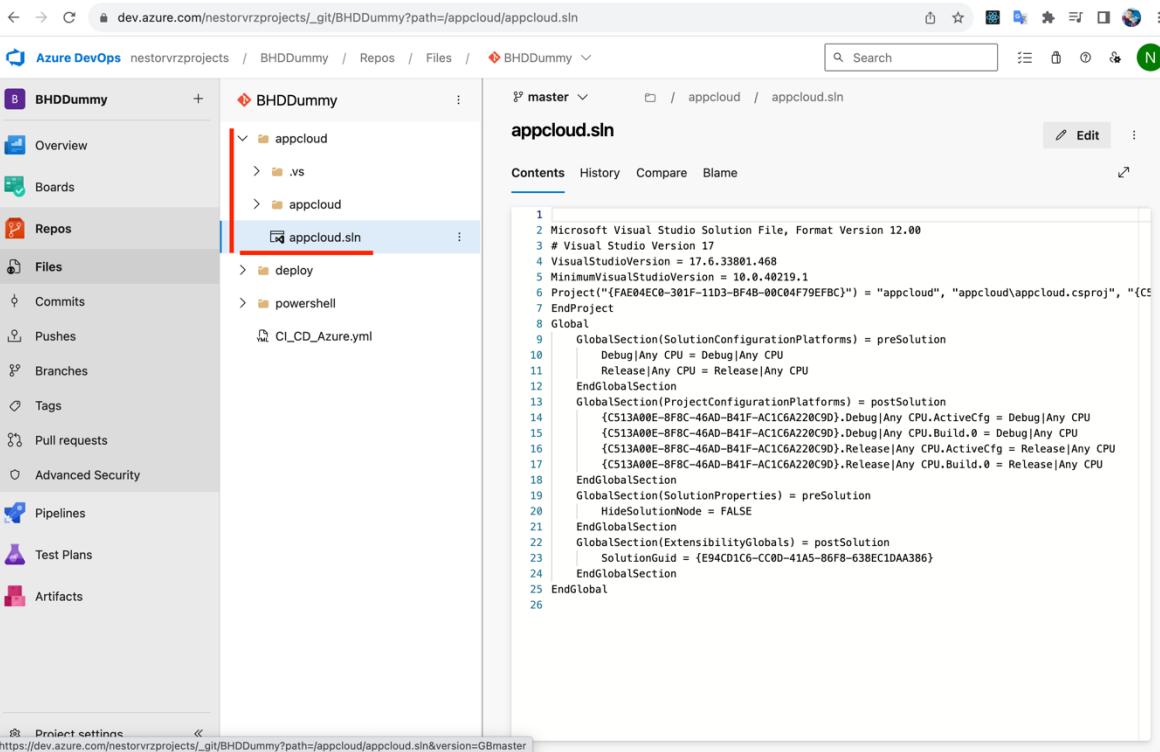
Se debe crear una plantilla de Team Project donde se almacenará todo el proyecto y se ejecutarán los procesos en este caso usaremos la plantilla BHDDummy.

The screenshot shows the Azure DevOps organization dashboard for 'nestorvrzprojects'. On the left, there's a sidebar with 'nestorvrzprojects' selected. The main area displays two project cards: 'BHDDummy' (purple icon) and 'prodemo' (green icon). Each card has a small preview of its contents. At the top right, there's a search bar and a '+ New project' button. Below the projects, there are links for 'Organization settings' and 'New organization'.

En la siguiente imagen se muestran los service conexión necesarios que se deben configurar antes de iniciar los procesos en los pipelines para tener claro hacia donde enviaremos la imagen de Docker.

The screenshot shows the 'Service connections' page within the 'BHDDummy' project settings. The left sidebar lists various project settings like General, Boards, Pipelines, and Repos. The 'Service connections' section is currently selected. It shows a list of existing service connections: 'Azure subscription 1(bde64cb7-4a67-4843-8458-e90d31fe95b8)', 'sc_acrbhdemo', 'SC_DockerHub', and 'SC_SonarCube'. There are also buttons for 'New service connection' and 'Convert your existing Azure Resource Manager service connections which use secrets to authenticate to leverage Workload Identity federation instead, for improved security and simplified maintenance.'

- En la siguiente imagen se observa la aplicación net Core que se utilizada para el proceso de creación imagen de Docker.



The screenshot shows the Azure DevOps interface for a project named 'BHDDummy'. The left sidebar is the navigation menu with options like Overview, Boards, Repos (selected), Files, Commits, Pushes, Branches, Tags, Pull requests, Advanced Security, Pipelines, Test Plans, and Artifacts. The main area displays the contents of the 'appcloud' folder under the 'Repos' section. The 'appcloud.sln' file is selected and shown in a code editor window. The code content is as follows:

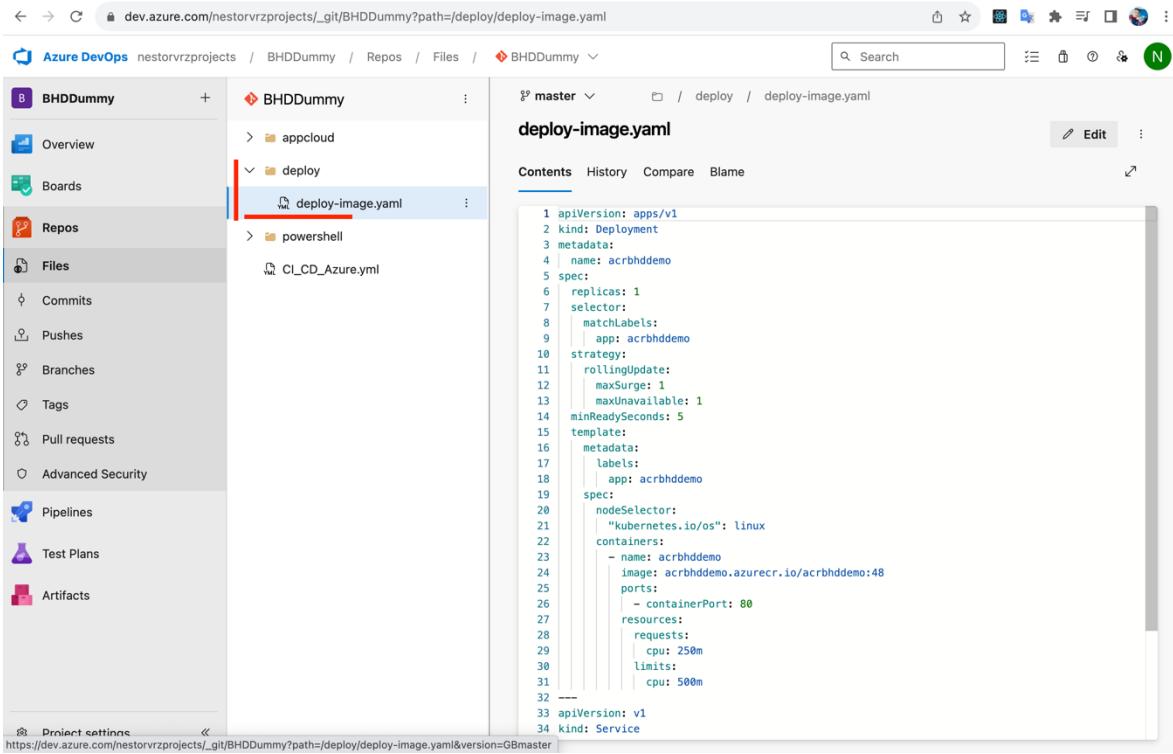
```

1 Microsoft Visual Studio Solution File, Format Version 12.00
2 # Visual Studio Version 17
3 VisualStudioVersion = 17.6.33801.468
4 MinimumVisualStudioVersion = 10.0.40219.1
5 Project("{FAE04EC0-301F-11D3-BF4B-00C04F79EFBC}") = "appcloud", "appcloud\appcloud.csproj", "{C5
6 EndProject
7 Global
8 GlobalSection(SolutionConfigurationPlatforms) = preSolution
9     Debug|Any CPU = Debug|Any CPU
10    Release|Any CPU = Release|Any CPU
11 EndGlobalSection
12 GlobalSection(ProjectConfigurationPlatforms) = postSolution
13     {C513A00E-8F8C-46AD-B41F-AC1C6A22C9D}.Debug|Any CPU.ActiveCfg = Debug|Any CPU
14     {C513A00E-8F8C-46AD-B41F-AC1C6A22C9D}.Debug|Any CPU.Build.0 = Debug|Any CPU
15     {C513A00E-8F8C-46AD-B41F-AC1C6A22C9D}.Release|Any CPU.ActiveCfg = Release|Any CPU
16     {C513A00E-8F8C-46AD-B41F-AC1C6A22C9D}.Release|Any CPU.Build.0 = Release|Any CPU
17 EndGlobalSection
18 GlobalSection(SolutionProperties) = preSolution
19     HideSolutionNode = FALSE
20 EndGlobalSection
21 GlobalSection(ExtensibilityGlobals) = postSolution
22     SolutionGuid = {E94CD1C6-CC0D-41A5-86F8-638EC1DA386}
23 EndGlobalSection
24 EndGlobal
25 EndGlobal
26

```

The URL at the bottom of the browser window is: https://dev.azure.com/nestorvrzprojects/_git/BHDDummy?path=appcloud/appcloud.sln&version=GBmaster

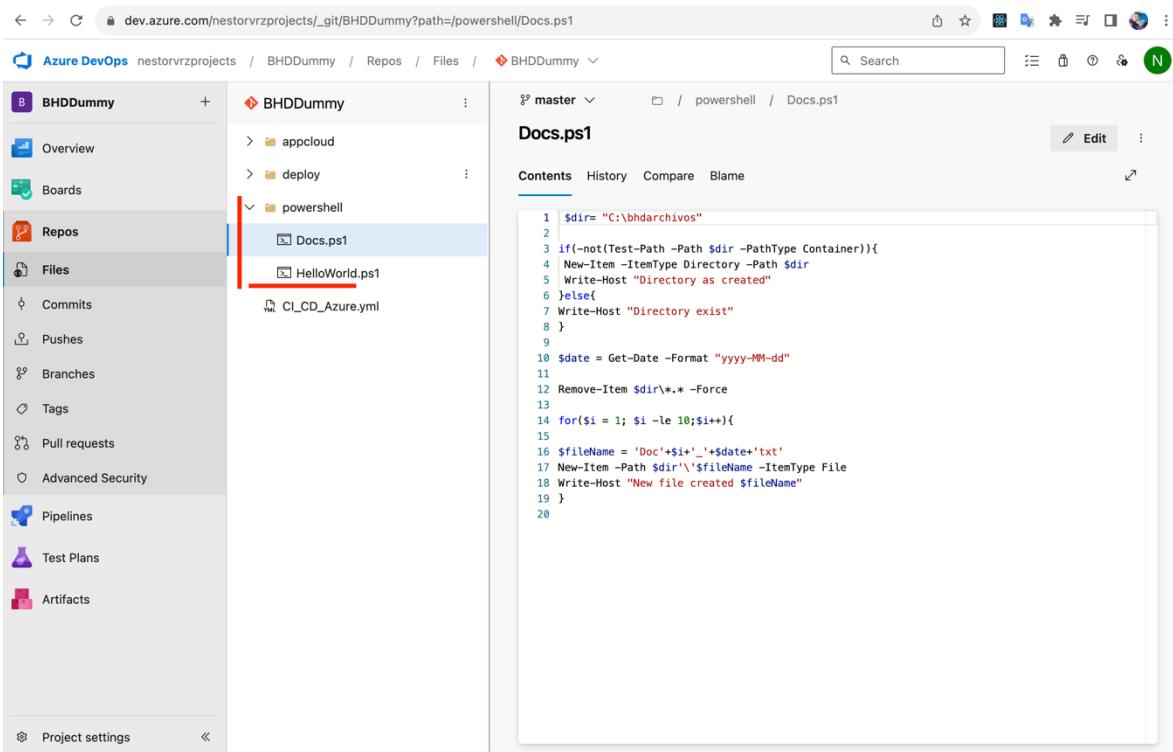
- En la siguiente imagen se muestra en la carpeta deploy la plantilla de configuración para levantar la aplicación o el contenedor enlazándola al kubernetes.



The screenshot shows the Azure DevOps interface for a project named "BHDDummy". The left sidebar has "Files" selected. The main area shows a file tree under "deploy": "appcloud", "deploy", and "powershell". "deploy-image.yaml" is selected and highlighted with a red border. The right pane displays the YAML content of "deploy-image.yaml".

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: acrbhddemo
spec:
  replicas: 1
  selector:
    matchLabels:
      app: acrbhddemo
  strategy:
    rollingUpdate:
      maxSurge: 1
      maxUnavailable: 1
    minReadySeconds: 5
  template:
    metadata:
      labels:
        app: acrbhddemo
    spec:
      nodeSelector:
        "kubernetes.io/os": linux
      containers:
        - name: acrbhddemo
          image: acrbhddemo.azurecr.io/acrbhddemo:48
          ports:
            - containerPort: 80
          resources:
            requests:
              cpu: 250m
            limits:
              cpu: 500m
apiVersion: v1
kind: Service
```

- En la siguiente imagen se muestran los scripts PowerShell que ejecutaran las tareas de imprimir texto y crear archivos.

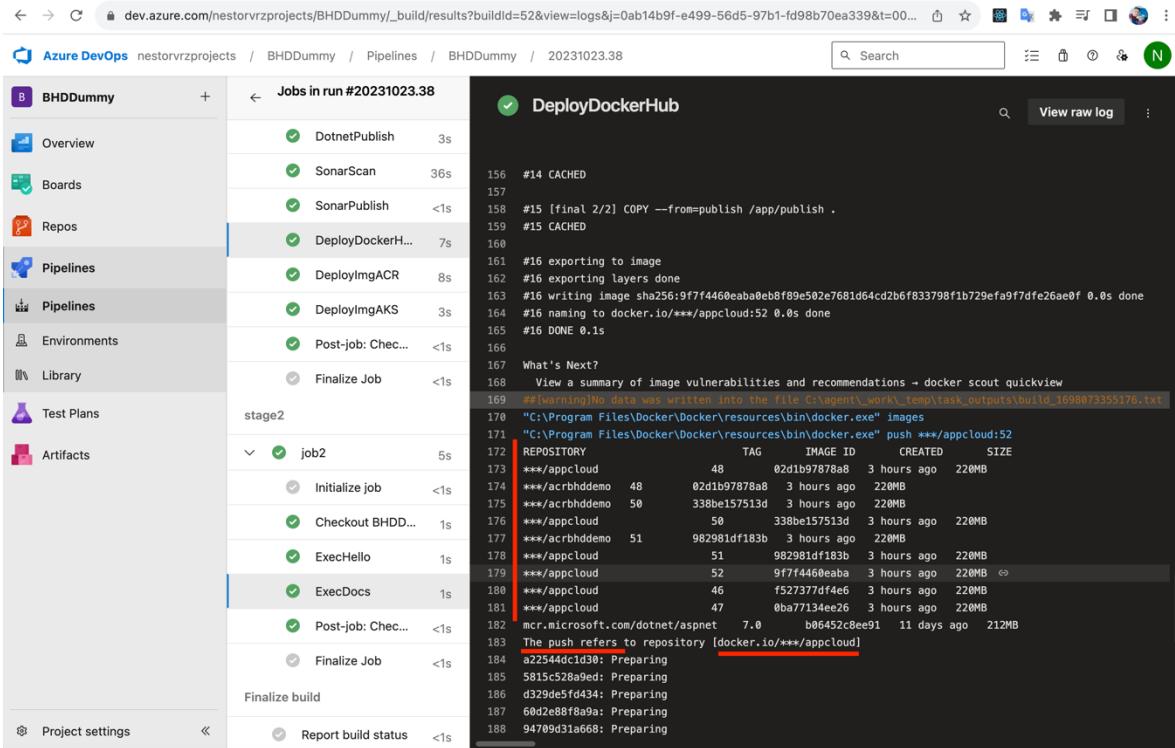


The screenshot shows the Azure DevOps interface for the same project "BHDDummy". The left sidebar has "Files" selected. The main area shows a file tree under "powershell": "Docs.ps1" and "HelloWorld.ps1". "Docs.ps1" is selected and highlighted with a red border. The right pane displays the PowerShell script content of "Docs.ps1".

```
$dir= "C:\bhddarchivos"
if(-not(Test-Path -Path $dir -PathType Container)){
  New-Item -ItemType Directory -Path $dir
  Write-Host "Directory as created"
} else{
  Write-Host "Directory exist"
}
$date = Get-Date -Format "yyyy-MM-dd"
Remove-Item $dir\*.* -Force
for($i = 1; $i -le 10;$i++){
  $fileName = 'Doc'+$i+'_'+$date+'txt'
  New-Item -Path $dir\$fileName -ItemType File
  Write-Host "New file created $fileName"
}
```

5. ejecución de pipeline

En la siguiente imagen se muestran las diferentes ejecuciones de las tareas configuradas en la canalización. Se muestra la tarea finalizada de la creación imagen de Docker y su envió a Docker Hub



The screenshot shows the Azure DevOps interface for a pipeline named 'BHDDummy'. The left sidebar lists various project components like Overview, Boards, Repos, Pipelines, Environments, Library, Test Plans, and Artifacts. The main area displays the 'Jobs in run #20231023.38' for the 'DeployDockerHub' task. The log output shows the following steps:

```
156 #14 CACHED
157
158 #15 [final 2/2] COPY --from=publis... /app/publish .
159 #15 CACHED
160
161 #16 exporting to image
162 #16 exporting layers done
163 #16 writing image sha256:9f7f4460eaba0eb8f89e502e7681d64cd2b6f833798f1b729efa9f7dfe26ae0f 0.0s done
164 #16 naming to docker.io/**/appcloud:52 0.0s done
165 #16 DONE 0.1s
166
167 What's Next?
168 View a summary of image vulnerabilities and recommendations - docker scout quickview
169 ##[warning]No data was written into the file C:\agent\_work\temp\task_outputs\build_1698873355176.txt
170 "C:\Program Files\Docker\bin\docker.exe" images
171 "C:\Program Files\Docker\bin\docker.exe" push **/appcloud:52
172 REPOSITORY TAG IMAGE ID CREATED SIZE
173 ***/appcloud 48 02d1b97878a8 3 hours ago 220MB
174 ***/acrbddemo 48 02d1b97878a8 3 hours ago 220MB
175 ***/acrbddemo 50 338be157513d 3 hours ago 220MB
176 ***/appcloud 50 338be157513d 3 hours ago 220MB
177 ***/acrbddemo 51 982981df183b 3 hours ago 220MB
178 ***/appcloud 51 982981df183b 3 hours ago 220MB
179 ***/appcloud 52 9f7f4460eaba 3 hours ago 220MB
180 ***/appcloud 46 f527377df4e6 3 hours ago 220MB
181 ***/appcloud 47 0b477134ee26 3 hours ago 220MB
182 mcr.microsoft.com/dotnet/aspnet 7.0 b06452c8e91 11 days ago 212MB
183 The push refers to repository [docker.io/**/appcloud]
184 a22544dc1d30: Preparing
185 5815c528a9ed: Preparing
186 d329de5fd434: Preparing
187 60d2e88fb89a: Preparing
188 94709d31a668: Preparing
```

En la siguiente imagen podemos observar que ya se encuentra en el repositorio de Docker Hub.

The screenshot shows the Docker Hub interface. At the top, there's a search bar with "Search Docker Hub" and a "Create repository" button. Below the search bar, there are dropdown menus for "elmaximo" and "All Content". The main area displays two repository cards:

- elmaximo / appcloud**: Contains: Image | Last pushed: 12 hours ago. Status: Inactive. Stars: 0. Forks: 19. Public.
- elmaximo / netcoreapp**: Contains: Image | Last pushed: 2 days ago. Status: Inactive. Stars: 0. Forks: 20. Public.

La siguiente tarea muestra la impresión de mensajes utilizando scripting PowerShell.

The screenshot shows the Azure DevOps Pipelines interface. On the left, there's a sidebar with options like Overview, Boards, Repos, Pipelines, Pipelines (selected), Environments, Library, Test Plans, and Artifacts. The main area shows a build log for job #20231023.38. The log title is "ExecHello". The log content shows the following PowerShell script execution:

```
1 Starting: ExecHello
2 =====
3 Task      : PowerShell
4 Description : Run a PowerShell script on Linux, macOS, or Windows
5 Version   : 2.229.4
6 Author    : Microsoft Corporation
7 Help      : https://docs.microsoft.com/azure/devops/pipelines/tasks/utility/powershell
8 =====
9 Generating script.
10 Formatted command: . 'C:\agent\_work\1\s\powershell\HelloWorld.ps1'
11 =====
12 "C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe" -NoLogo -NoProfile -NonInteractive -Execution
13 Hello world
14 Hello world
15 Hello world
16 Hello world
17 Hello world
18 Hello world
19 Hello world
20 Hello world
21 Hello world
22 Hello world
23 Finishing: ExecHello
```

La siguiente tarea muestra la creación de archivos simultáneamente con la fecha incluida en su nombre estos procesos son ejecutados con scripting PowerShell.

The screenshot shows the Azure DevOps interface for a pipeline named BHDDummy. The left sidebar lists various project sections like Overview, Boards, Repos, Pipelines, Environments, Library, Test Plans, and Artifacts. The main area displays a list of tasks in a run, with the 'ExecDocs' task currently selected. The log for 'ExecDocs' shows the following output:

```

20 d----- 23/10/2023 15:03 bhdarchivos
21 Directory as created
22
23 Directorio: C:\bhdarchivos
24
25
26 Mode LastWriteTime Length Name
27 ----
28
29 -a---- 23/10/2023 15:03 0 Doc1_2023-10-23txt
30 New file created Doc1_2023-10-23txt
31 -a---- 23/10/2023 15:03 0 Doc2_2023-10-23txt
32 New file created Doc2_2023-10-23txt
33 -a---- 23/10/2023 15:03 0 Doc3_2023-10-23txt
34 New file created Doc3_2023-10-23txt
35 -a---- 23/10/2023 15:03 0 Doc4_2023-10-23txt
36 New file created Doc4_2023-10-23txt
37 -a---- 23/10/2023 15:03 0 Doc5_2023-10-23txt
38 New file created Doc5_2023-10-23txt
39 -a---- 23/10/2023 15:03 0 Doc6_2023-10-23txt
40 New file created Doc6_2023-10-23txt
41 -a---- 23/10/2023 15:03 0 Doc7_2023-10-23txt
42 New file created Doc7_2023-10-23txt
43 -a---- 23/10/2023 15:03 0 Doc8_2023-10-23txt
44 New file created Doc8_2023-10-23txt
45 -a---- 23/10/2023 15:03 0 Doc9_2023-10-23txt
46 New file created Doc9_2023-10-23txt
47 -a---- 23/10/2023 15:03 0 Doc10_2023-10-23txt
48 New file created Doc10_2023-10-23txt
49
50
51 Finishing: ExecDocs

```

En la siguiente imagen se muestra la tarea que despliega la imagen de Docker hacia el Kubertene y configura su inicio esta misma configura el endpoint ip que lo expone.

The screenshot shows the Azure DevOps interface for the same pipeline. The 'DeployImgAKS' task is selected in the log view. The log output is as follows:

```

303     "ipFamilies": [
304         "IPv4"
305     ],
306     "ipFamilyPolicy": "SingleStack",
307     "ports": [
308         {
309             "nodePort": 30282,
310             "port": 80,
311             "protocol": "TCP",
312             "targetPort": 80
313         },
314     ],
315     "selector": {
316         "app": "acrbhddemo"
317     },
318     "sessionAffinity": "None",
319     "type": "LoadBalancer"
320 },
321     "status": {
322         "loadBalancer": {
323             "ingress": [
324                 {
325                     "ip": "20.246.231.139"
326                 }
327             ]
328         }
329     }
330 }
331 ]
332 }
333
334 Finishing: DeployImgAKS

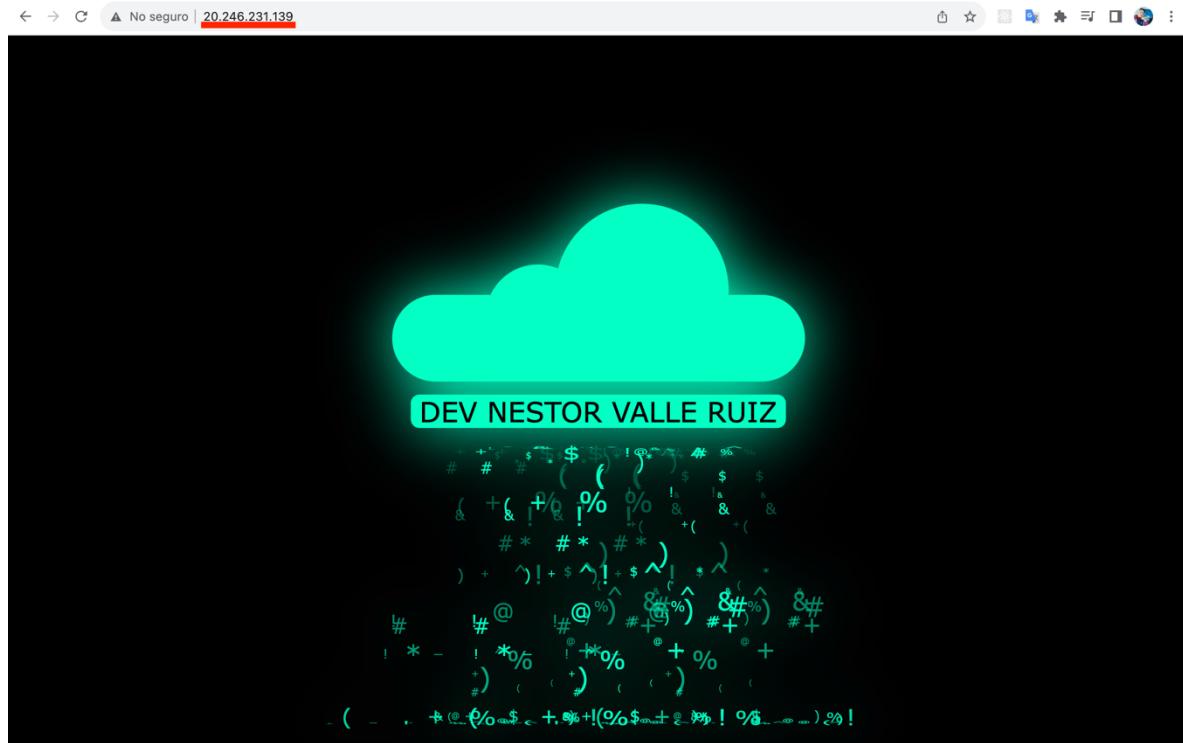
```

En la siguiente imagen se muestra en el clúster de Kubernetes la imagen que se creó y el estado.

The screenshot shows the Azure portal interface for managing a Kubernetes service named 'aksbhddemo'. On the left, there's a sidebar with navigation links for Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Microsoft Defender for Cloud, Kubernetes resources (Namespaces, Workloads, Services and ingresses, Storage, Configuration, Custom resources, Events, Run command), and Settings (Node pools, Cluster configuration, Networking). The main content area has tabs for Deployments, Pods, Replica sets, Stateful sets, Daemon sets, Jobs, and Cron jobs. Under Deployments, there are filters for deployment name ('Enter the full deployment name') and namespace ('All namespaces'). A table lists the following data:

Name	Namespace	Ready	Up-to-date	Available	Age
coredns	kube-system	✓ 2/2	2	2	18 hours
coredns-autoscaler	kube-system	✓ 1/1	1	1	18 hours
konnectivity-agent	kube-system	✓ 2/2	2	2	18 hours
metrics-server	kube-system	✓ 2/2	2	2	18 hours
tigera-operator	tigera-operator	✓ 1/1	1	1	18 hours
calico-kube-controllers	calico-system	✓ 1/1	1	1	18 hours
calico-typha	calico-system	✓ 1/1	1	1	18 hours
addon-http-application-routing-external-dns	kube-system	✓ 1/1	1	1	18 hours
addon-http-application-routing-nginx-ingress-controller	kube-system	✓ 1/1	1	1	18 hours
acrbhddemo	default	✓ 1/1	1	1	15 hours

Y como resultado de la exposición de la aplicación a internet podemos entrar a la web con la dirección ip mencionada anteriormente en la tarea de despliegue de Kubernetes.



6. Conclusión

Esta prueba dummy mezcla diferentes conceptos de arquitectura de componentes en el entorno nube y automatización de procesos, se trata de enlazar cada uno de los procedimientos para ir creando un ambiente de prueba que tiene un flujo considerable de procesos definidos, en oportunidades de mejora continua se visualiza la automatización de la creación de recursos en Azure mediante scripting Terraform y la incorporación de plantillas Kustomize.

7. Anexos

Video explicativo over view de la infraestructura realizada:

<https://www.youtube.com/watch?v=RWFe9486aiA>

Endpoint de la App dockerizada y desplegada en el clúster de Kurnetee

<http://20.246.231.139/>