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API Gateway

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Oracle Cloud Infrastructure
February 2020

Safe harbor statement

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Objectives

After completing this lesson, you should be able to;

- Describe Oracle Cloud Infrastructure API Gateway service
- Configure and Create API Gateway Service

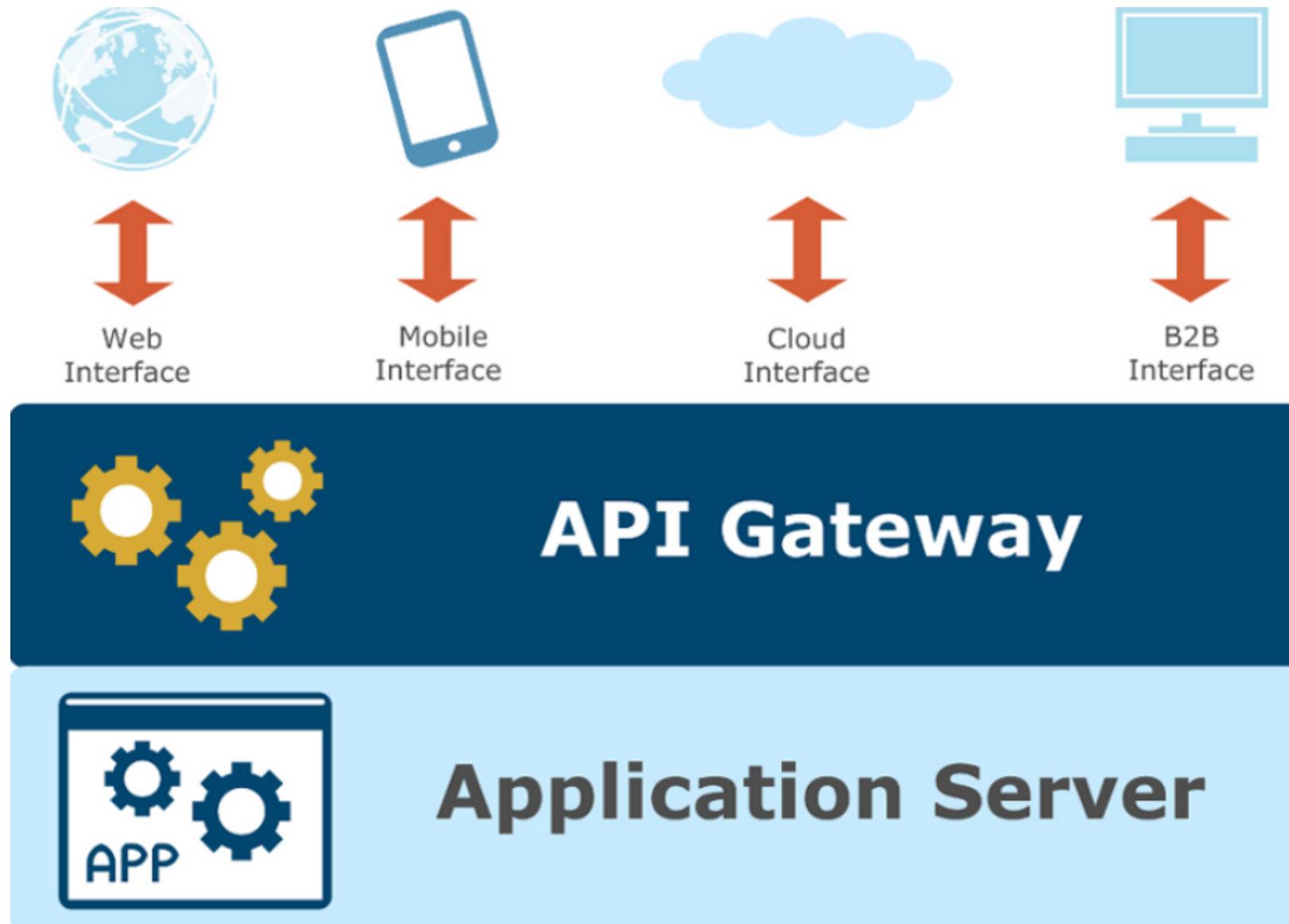
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API Gateway Service

API Gateway Overview

- Microservices and Serverless deployment at scale can result in complex series of endpoints that need to be managed for front end and mobile applications
- APIs are common software interface that allows communication with these and other API enabled end points
- Can use a single API gateway to link multiple back-end services (such as load balancers, compute instances, and Oracle Functions) into a single consolidated API endpoint.
- API Gateway act as a "single point of entry" for all clients interacting with the end points, including:
 - Private endpoints that are accessible from within your network
 - Expose with public IP addresses if you want them to accept internet traffic
- API Gateways also give you the ability to easily implement (at Gateway level):
 - API validation
 - Request and response transformation
 - CORS (Cross-Origin Resource Sharing)
 - Authentication and authorization, and request limiting

API Gateway Overview



API Gateway Use Cases

RESTful APIs for Functions

- Extend applications

- Manages security access

- No SDK required

- Manages security context

APIs for custom development

- Use with Oracle Kubernetes Engine

- API interface for services on K8s

- Use with services on Compute

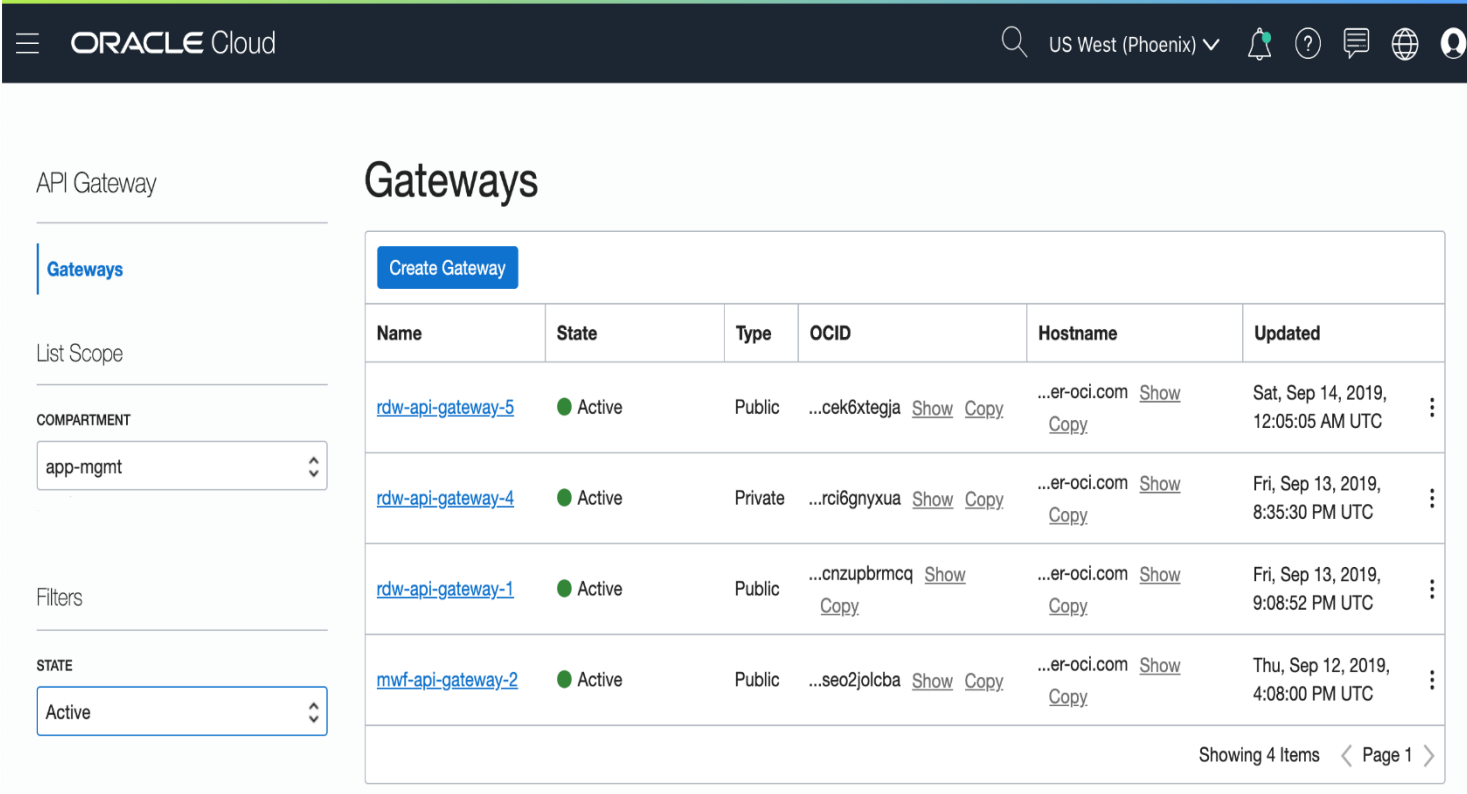
Protect SaaS Services

- Rate-limit/protect access to SaaS RESTful services

- Native service on OCI to support SaaS, and Autonomous Database

API Gateway Features

- REST APIs for OCI Services
 - Oracle Functions, K8S
 - HTTPS Back-ends
- Routing
- Rate-limiting
- Cross-origin Resource Sharing (CORS)
- Custom Authentication
- Metrics/Logging
- Fully Oracle Managed
- Terraform



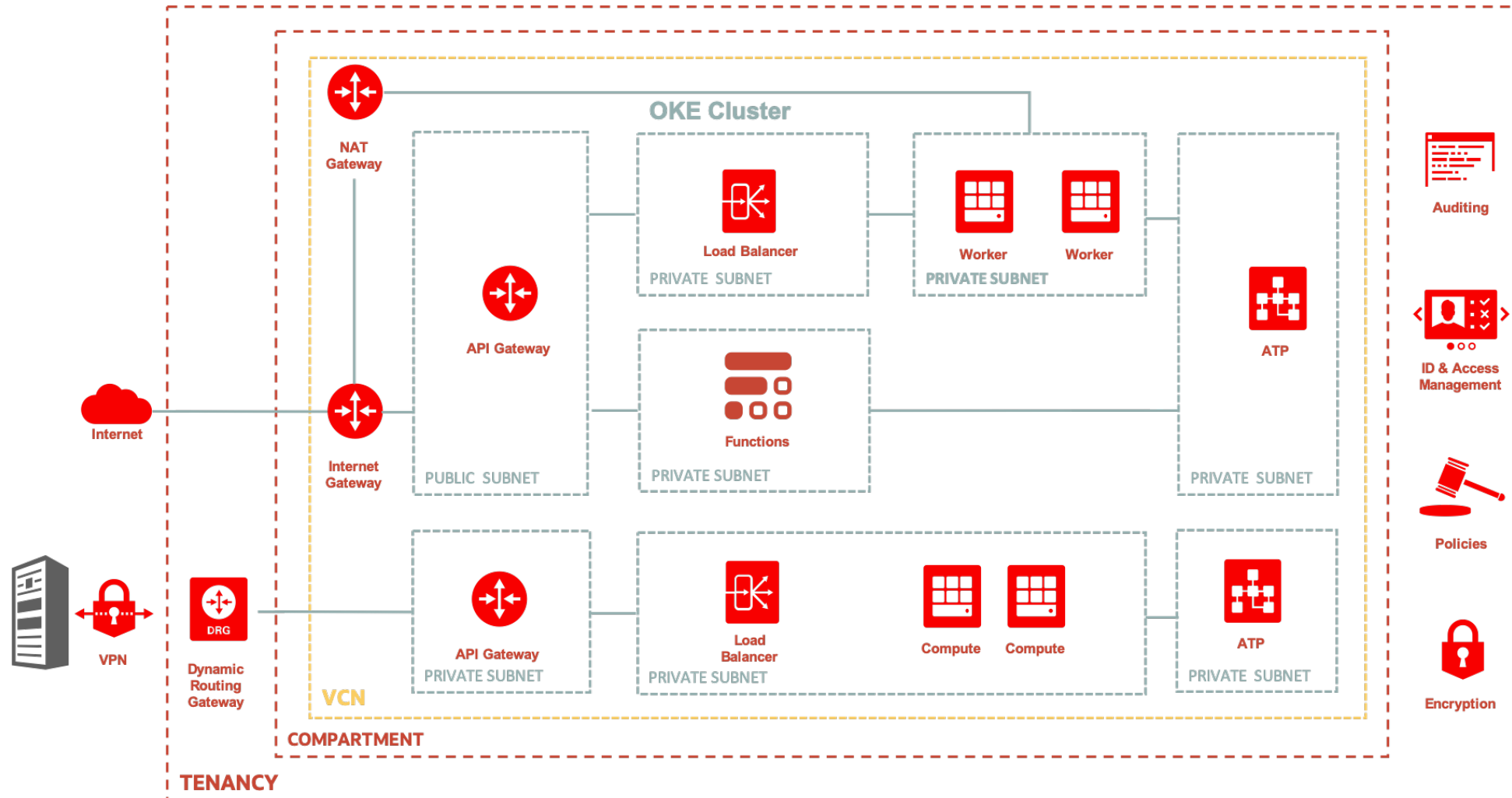
The screenshot displays the Oracle Cloud console interface for API Gateways. The top navigation bar shows the Oracle Cloud logo, a search icon, and the region 'US West (Phoenix)'. The left sidebar contains a menu with 'API Gateway' and 'Gateways' (selected). Below the sidebar, there are filters for 'List Scope' (set to 'COMPARTMENT'), 'COMPARTMENT' (set to 'app-mgmt'), 'Filters', and 'STATE' (set to 'Active'). The main content area, titled 'Gateways', features a 'Create Gateway' button and a table listing four gateways. Each gateway entry includes its name, state (Active), type (Public or Private), OCID, hostname, and update timestamp. The table also includes links to 'Show' and 'Copy' details for each gateway.

Name	State	Type	OCID	Hostname	Updated
rdw-api-gateway-5	Active	Public	...cek6xtegja Show Copy	...er-oci.com Show Copy	Sat, Sep 14, 2019, 12:05:05 AM UTC
rdw-api-gateway-4	Active	Private	...rci6gnyxua Show Copy	...er-oci.com Show Copy	Fri, Sep 13, 2019, 8:35:30 PM UTC
rdw-api-gateway-1	Active	Public	...cnzupbrmcq Show Copy	...er-oci.com Show Copy	Fri, Sep 13, 2019, 9:08:52 PM UTC
mwf-api-gateway-2	Active	Public	...seo2jolcba Show Copy	...er-oci.com Show Copy	Thu, Sep 12, 2019, 4:08:00 PM UTC

Showing 4 Items < Page 1 >

Deployment scenario

- Example scenario of Using API Gateway for both Private and Public End point



API Gateway Concepts

APIs

- API is a set of resources, and methods (for example, GET, PUT) that can be performed on each resource in response to requests sent by a caller (a user or system)

API Deployments

- API deployment is the means by which you deploy API on API gateway
- When you create API deployment, you define properties for the API deployment
- Can deploy multiple APIs on the same API gateway

API Deployment Specifications

- Describes some aspects of API deployment:
 - Defines one or more back-end resources
 - Route to each back-end resource
 - Methods (for example, GET, PUT) that can be performed on each resource
 - How the API gateway integrates with the back end to execute those methods
 - Can also include request and response policies
- Can create using dialogs in the Console, or using JSON file

API Gateway Concepts

Front ends

- Means by which requests flow into an API gateway.
- Can have either a public front end or a private front end:
 - A public front end exposes the APIs deployed on an API gateway via a public IP address.
 - A private front end exposes the APIs deployed on an API gateway to a VCN via a private endpoint.

Back ends

- Means by which a gateway routes requests to the back-end services that implement APIs
 - Could be a private endpoint back end
 - Could be other services such as Oracle Functions

API Callers

- A person or system that calls an API by sending requests to the API gateway

API Gateway Developers

- A user responsible for creating API deployment specifications and deploying them to API gateways

API Gateway Administrators

- A person responsible for setting up the API Gateway service. For example, by setting up IAM policies

API Gateway Concepts

Routes

- Mapping between a path, one or more methods, and a back-end service.
- Routes are defined in API deployment specification

Policies

- Different than IAM policies
- Request policy describes actions to be performed on an incoming request from a caller before it is sent to a back end. Can be used to:
 - Limit the number of requests sent to back-end services
 - Enable CORS (Cross-Origin Resource Sharing) support
 - Provide authentication and authorization
- Can add request policies to an API deployment specification that apply globally to all routes
- Response policy describes actions to be performed on a response returned from a back end before it is sent to a caller

Create API Gateway and access Oracle Function

Configuration Tasks

- Below is a list of tasks needed. We will look at Policy tasks in more detail in the next slide

Task #	Tenancy Configuration Task
1	Create Groups and Users to Use API Gateway, if these don't exist already
2	Create Compartments to Own Network Resources and API Gateway Resources in the Tenancy, if they don't exist already
3	Create a VCN to Use with API Gateway, if one doesn't exist already
4	<div>Create Policies to Control Access to Network and API Gateway-Related Resources, and more specifically:<ul style="list-style-type: none">Create a Policy to Give API Gateway Users Access to API Gateway-Related ResourcesCreate a Policy to Give API Gateway Users Access to Network ResourcesCreate a Policy to Give API Gateway Users Access to FunctionsCreate a Policy to Give a Dynamic Group of API Gateways Access to Functions</div>

Required Policy

- Before using the API Gateway service to create API gateways and deploy APIs on them, number of policies are needed.
- In addition to granting access to user you can also grant API gateways access to functions (If a user specifies a serverless function defined in Oracle Functions as the API back end)

For User access;

- Give API Gateway Users Access to API Gateway-Related Resources

Allow group <group-name> to manage api-gateway-family in compartment <compartment-name>

- Give API Gateway Users Access to Network Resources

Allow group <group-name> to manage virtual-network-family in compartment <compartment-name>

- Give API Gateway Users Access to Functions

Allow group <group-name> to use functions-family in compartment <compartment-name>

Required Policy

For function as an API back end; (Grant API gateways access to functions defined in Oracle Functions)

- First create a dynamic group Before creating the API gateway (API Gateway service verifies that the new API gateway will have access to the specified function through its membership of a dynamic group to which a policy grants appropriate access).
- Enter a rule(For Dynamic group) that includes some or all of the API gateways in the compartment
ALL {resource.type = 'ApiGateway', resource.compartment.id = '<compartment-ocid>'}
- Create a IAM policy (Ensure the compartment_name is the compartment where function was created)
Allow dynamic-group <dynamic-group-name> to use functions-family in compartment <compartment-name>
- You also have to create a policy to give users access to Oracle Functions (As described previously)

Create API Gateway and access Oracle Function

- Assuming user has already deployed an app called 'Hello World' using Oracle Fn
- We can invoke this Fn with the Fn CLI but not directly via HTTP(s) without signing the request or using the OCI SDK

```
$ curl -i -X GET https://[redacted].us-phoenix-1.functions.oci.oraclecloud.com/20181201/functions/ocid1.fnfunc.oc1.phx.../actions/invoke
HTTP/1.1 401 Unauthorized
Date: Fri, 22 Nov 2019 14:24:33 GMT
Content-Type: application/json
Content-Length: 57
Connection: keep-alive
Opc-Request-Id: /01DT9R03K21BT1A2RZJ0005QSH/01DT9R03K21BT1A2RZJ0005QSJ
Www-Authenticate: Signature headers="date (request-target) host"
```

```
{"code": "NotAuthenticated", "message": "Not authenticated"}
```

- Next, we will put this Fn behind API gateway and invoke it successfully.

Creating API Gateway

- Create a regional Public subnet that has an ingress rule for HTTPS traffic
 - Existing subnet can be used as well as long as HTTPS rule is added

Create Subnet

help

cancel

If the Route Table, DHCP Options, or Security Lists are in a different Compartment than the Subnet, enable Compartment selection for those resources: [Click here](#)

NAME

gw-demo-subnet

SUBNET TYPE

☒ REGIONAL (RECOMMENDED)

Instances in the subnet can be created in any availability domain in the region. Useful for high availability.

☐ AVAILABILITY DOMAIN-SPECIFIC

Instances in the subnet can only be created in one availability domain in the region.

CIDR BLOCK

Example: 10.0.0.0/24

ROUTE TABLE

Select a Route Table

SUBNET ACCESS

☐ PRIVATE SUBNET

Prohibit public IP addresses for Instances in this Subnet

☒ PUBLIC SUBNET

Allow public IP addresses for Instances in this Subnet

DNS RESOLUTION

☐ USE DNS HOSTNAMES IN THIS SUBNET

i

Allows assignment of DNS hostname when launching an Instance

Add Ingress Rules

cancel

Ingress Rule 1

Allows TCP traffic 443 HTTPS

☐ STATELESS

i

SOURCE TYPE

CIDR

SOURCE CIDR

0.0.0.0/0

Specified IP addresses: 0.0.0.0-255.255.255.255 (4,294,967,296 IP addresses)

IP PROTOCOL

i

TCP

SOURCE PORT RANGE

OPTIONAL

i

All

Examples: 80, 20-22

DESTINATION PORT RANGE

OPTIONAL

i

443

Examples: 80, 20-22

+ Additional Ingress Rule

Add Ingress Rules

Cancel

Creating API Gateway

- Create dynamic group and Rules (Replacing OCID appropriately)

Create Dynamic Group

[help](#) [cancel](#)

NAME

api-gw-group

No spaces. Only letters, numerals, hyphens, periods, or underscores.

DESCRIPTION

a dynamic group for API gateway

Matching Rules

Rules define what resources are members of this dynamic group. All instances that meet the criteria are added automatically.

Example: ANY {instance.id = 'ocid1.instance.region1.sea.abzwnkljrobrgevdin34ftbzurf6vqutavt-fqadaa2xlj3e65qwudvljkffja', instance.compartment.id = 'ocid1.compartment.oc1..aaaaaaaas7hvwdo2uv6bjiozsctqu7tdf2gwgejioihvrlmzcvyf72c7rpq'}


RULE 1

[Rule Builder](#)

all { resource.type = 'ApiGateway', resource.compartment.id = ocid1.compartment.oc1....' }

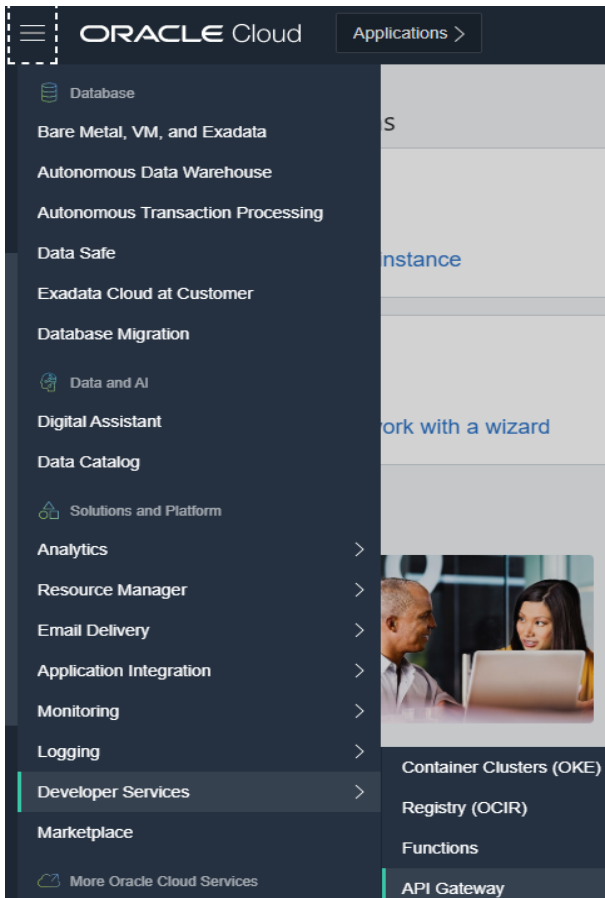
+ Additional Rule

- Also create IAM Policies as described earlier (Not covered in this Presentation)



Creating API Gateway

- Can use Console, CLI or SDK
- From OCI console, navigate to 'Developer Services' and then 'API Gateway'



Creating API Gateway

- Once Gateway is available, Click 'Deployments' then 'Create Deployment'
- You have option to create 'From scratch' or upload a JSON file. We will use 'From Scratch'
 - Json Example file is shown later on
- Fill out the multi screen dialog box to configure your Gateway. Under 'Basic Information':
 - Provide a 'Name', 'Path Prefix' and 'compartment' (where Fn is deployed)
 - Can leave optional parameters under 'API Request Policies' and 'API Logging policy' to default

The screenshot displays a multi-step configuration dialog for an API Gateway. On the left, a vertical sidebar shows three steps: '1 Basic Information' (active), '2 Routes', and '3 Review'. The main content area is divided into two sections. The 'Basic Information' section contains three input fields: 'NAME' with the value 'demo-deployment', 'PATH PREFIX' with a help icon and the value '/v1', and 'COMPARTMENT' with a dropdown menu showing 'Umais-Siddiqui' and a subtext 'ociobenablement (root)/Umais-Siddiqui'. The 'API Request Policies' section is currently empty, showing headers for 'Authentication' and 'CORS' with their respective descriptions and 'Add' buttons. At the bottom left, there are 'Next' and 'Cancel' buttons.

Basic Information

NAME
demo-deployment

PATH PREFIX ⓘ
/v1

COMPARTMENT
Umais-Siddiqui
ociobenablement (root)/Umais-Siddiqui

API Request Policies

Authentication
Configures authentication
Add

CORS
Configures CORS access
Add

Next Cancel

Creating API Gateway

- In 'Routes' screen, Under 'Route 1'
 - Provide 'Path' (is relative to the deployment 'path prefix')
 - 'Methods' is GET, 'Type' is Oracle Functions
 - Choose the Application and Function Name using drop down

The screenshot shows the 'Routes' configuration page for 'Route 1'. On the left, a sidebar contains three steps: 'Basic Information' (checked), 'Routes' (active, highlighted with a blue circle and '2'), and 'Review' (highlighted with a grey circle and '3'). The main area is titled 'Route 1' and contains the following fields:

- PATH** (with an info icon): A text input field containing '/hello'.
- METHODS**: A dropdown menu showing 'GET' with a close icon (x) and a downward arrow.
- TYPE**: A dropdown menu showing 'Oracle Functions'. Below it is a small text note: 'Specifies the type of the backend service. [Learn more](#) about the Oracle Functions backend.'
- APPLICATION IN UMAIR-SIDDIQUI** (with a [CHANGE COMPARTMENT](#) link): A dropdown menu showing 'hello-world'.
- FUNCTION NAME**: A dropdown menu showing 'helloworld-func'.

At the bottom of the main area, there are two links: [Show Route Request Policies](#) and [Show Route Logging Policies](#).

The footer contains three buttons: 'Previous' (disabled), 'Next' (active, blue), and 'Cancel' (blue text link).

Creating API Gateway

- Review the information and click 'Create'

- ✓ [Basic Information](#)
- ✓ [Routes](#)
- 3 **Review**

Deployment

[Edit](#)

Basic Information

Name: demo-deployment

Tags

Free-form Tags: *Not specified*

Defined Tags: *Not specified*

Route 1

[Edit](#)

Path: /hello

Methods: GET

Type: Oracle Functions

Function Id: ...p7oxbfvlaa [Show](#) [Copy](#)

Creating API Gateway

- Once Deployment is 'Ready', copy the 'End Point'.

Resources	Deployments				
Metrics Deployments Work Requests	Create Deployment				
Filters	Name	Path Prefix	State	Endpoint	Deployed
	demo-deployment	/v1	● Active	https://bhlmqnuwfmriudu77kpfu7q4aq.apigateway.us-ashburn-1.oci.customer-oci.com/v1 Hide Copy	Fri, Jan 10, 2020, 6:06:24 PM UTC

- Access the App again, replacing the end point and verifying Function was invoked

```
1 $ curl -i -X GET https://[redacted].apigateway.us-phoenix-1.oci.customer-oci.com/v1/hello
2 HTTP/1.1 200 OK
3 Date: Fri, 22 Nov 2019 15:04:11 GMT
4 Content-Type: application/json
5 Connection: keep-alive
6 Content-Length: 25
7 Server: Oracle API Gateway
8 Strict-Transport-Security: max-age=31536000
9 X-XSS-Protection: 1; mode=block
10 X-Frame-Options: sameorigin
11 X-Content-Type-Options: nosniff
12 opc-request-id: /429E9723BB6BED8DB8D237876894DDF6/3E4A5D8760D59242A98AB8A91E2B0107
13
14 {"message":"Hello World"}
```


Creating API Gateway

- Example JSON file

```
{
  "requestPolicies": {},
  "routes": [
    {
      "path": "<api-route-path>",
      "methods": ["<method-list>"],
      "backend": {
        "type": "<backend-type>",
        "<backend-target>": "<identifier>"
      },
      "requestPolicies": {}
    }
  ]
}
```

Trouble Shooting API Gateway

- Ensure your API Gateway is created in a VCN with at least 1 public subnet
- Ensure port 443 is open in Security list for the subnet
- Ensure ALL IAM policies are defined
- Ensure dynamic group is created

Additional Information

- For additional information on API Gateway, please refer to:

<https://docs.cloud.oracle.com/iaas/Content/APIGateway/Concepts/apigatewayoverview.htm>



Oracle Cloud always free tier:

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education.oracle.com/oracle-certification-path/pFamily_647

OCI hands-on labs:

ocitraining.qcloudable.com/provider/oracle

Oracle learning library videos on YouTube:

youtube.com/user/OracleLearning

Thank you

