



Evaluation and validation of connected
mobility in real open systems beyond
5GS

Edge Cloud - Edge Application Management API

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1 Introduction

This document specifies the Edge Cloud *Edge Application Management* API following CAMARA specification version 0.9.3-wip (April 2025), see exact git commit for the YAML specification implemented [here](#). It is exposed by the ENVELOPE platform to manage application lifecycle (onboarding, instantiation, termination) and to discover Edge Cloud Zones and clusters.

The objective of this API is to allow application providers to easily onboard their application to the Edge Cloud platform. Once the application is available on the Edge Cloud platform, the application provider can instantiate the application. Edge Cloud providers help application providers to decide where to instantiate the applications allowing them to retrieve a list of Edge Cloud zones that meets the provided criteria.

2 API Overview

API name	Description	Modules involved	Use Cases
Name of the API	Short summary of the API	List of 5GS or other modules interacting with this API	List of Use Cases using the API
Edge Application Management	Lifecycle of applications and discovery of Edge Cloud Zones/clusters (submit apps, instantiate, deploy, terminate; list clusters and zones).	Underlying edge cloud platforms, e.g., vanilla Kubernetes clusters, aerOS, ETSI MEC.	Use cases from Greek, Dutch, and Italian sites.

3 Sequence Diagrams

3.1.1 Application

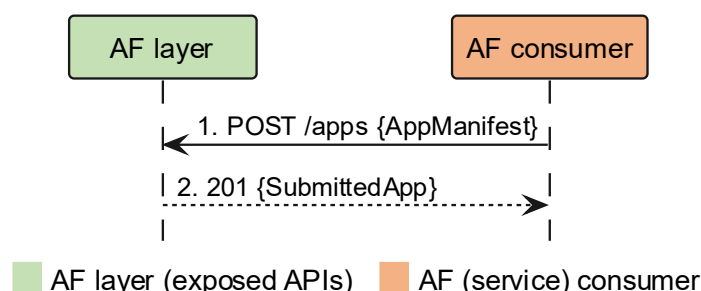


Figure 1 - Message flow for the Edge Application Management **Application** API

The message flow procedure for the Edge Application Management *Application* APIs is shown in Figure 1:

1. The AF consumer submits an application with the request body of type AppManifest.
2. The AF layer confirms the request with the payload SubmittedApp.

3.1.2 Application Instances

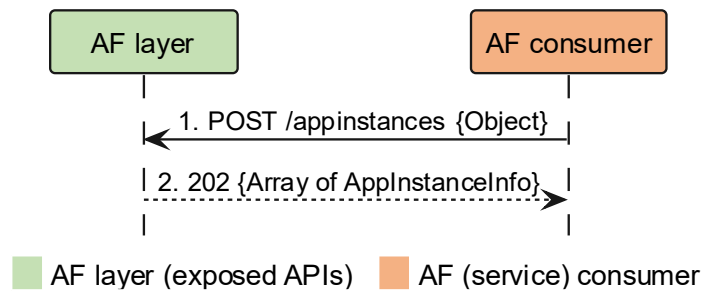


Figure 2 - Message flow for the Edge Application Management **Application Instances** API

The message flow procedure for the Edge Application Management *Application Instance* API is shown in Figure 2:

1. The AF consumer submits a request for a new application instance with the request body of type Object (as detailed in section 4.3.3.1.1).
2. The AF layer confirms the request with the payload containing an array of AppInstanceInfo.

3.1.3 Edge Cloud Zones

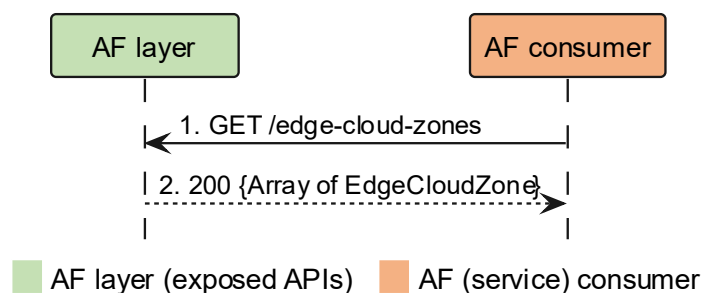


Figure 3 - Message flow for the Edge Application Management **Edge Cloud Zones** API

The message flow procedure for the Edge Application Management *Edge Cloud Zones* APIs is shown in Figure 3:

1. The AF consumer submits an request to retrieve the list of edge zones available.
2. The AF layer confirms the request and responds with the payload array of EdgeCloudZone.

3.1.4 Clusters

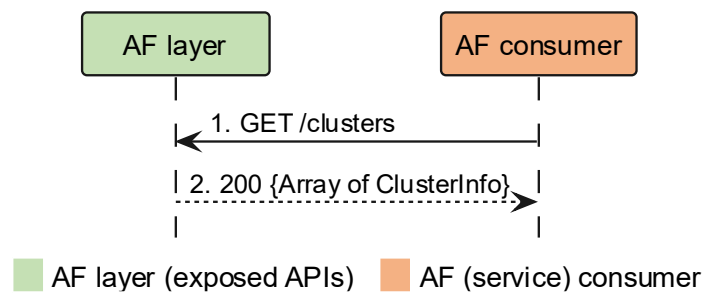


Figure 4 - Message flow for the Edge Application Management **Clusters** API

The message flow procedure for the Edge Application Management *Clusters* APIs is shown in Figure 4:

1. The AF consumer submits an request to retrieve the list of clusters (e.g., Kubernetes clusters) available.
2. The AF layer confirms the request and responds with the payload array of ClusterInfo.

4 API definition

4.1 Resource structure

4.1.1 Resource URIs

The root of the resource URIs of this API shall be:

`{apiRoot}/{apiName}/`

where `apiName` is set to `edge-application-management`

The resource URI structure of this API is introduced in Figure 5.

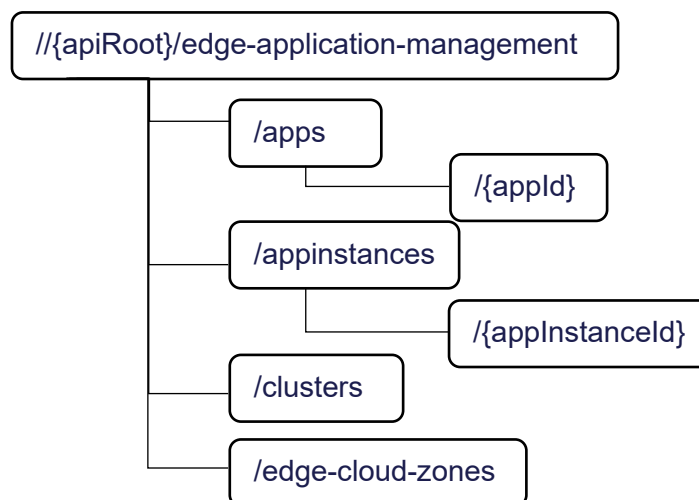


Figure 5 - Resource URI structure

Table 1 introduces an overview of the resources and of the methods.

Table 1 - Resources and methods overview

Resource name	Resource URI	HTTP method	Description
Applications	/apps	POST	Submit application metadata
Applications	/apps	GET	List applications
Individual Application	/apps/{appld}	GET	Retrieve application
Individual Application	/apps/{appld}	DELETE	Delete application
Application Instances	/appinstances	POST	Create instance(s) for an app
Application Instances	/appinstances	GET	List instances (filter by appld, applInstanceId, region)

Individual Application Instance	/appinstances/{appInstanceId}	DELETE	Terminate instance
Clusters	/clusters	GET	List clusters (filter by region, clusterRef, edgeCloudZoneId)
Edge Cloud Zones	/edge-cloud-zones	GET	List zones (filter by region, status)

4.2 Data Model

4.2.1 AppManifest

Field	Data Type	Cardinality	Description
appId	AppId	0..1	
name	string	1	Name of the application.
appProvider	string	1	Human readable name of the Application Provider.
version	string	1	Application version information
packageType	string	1	Format of the application image package
operatingSystem	OperatingSystem	0..1	Information about the Operating System of the application image
appRepo	object	1	Repository where Application Provider stores the application image
→ type	string	1	Application repository and image URI information. PUBLICREPO is used of public urls like github, helm repo etc. PRIVATEREPO is used for private repo managed by the application developer. Private repo can be accessed by using the app developer provided username and password. Password is recommended to be the personal access token created by

			developer e.g. in Github repo.
→ imagePath	String	1	A Uniform Resource Identifier (URI) as per RFC 3986, identifies the endpoint within an Edge Cloud Zone where the user equipment may connect to the selected application instance
→ userName	string	0..1	Username to access the Helm chart, docker-compose file or VM image repository
→ credentials	string	0..1	Password or personal access token created by developer to access the app repository. API users can generate a personal access token e.g. docker clients to use them as password.
→ authType	string	0..1	The credentials can also be formatted as a Basic auth or Bearer auth in HTTP "Authorization" header.
→ checksum	string	0..1	MD5 checksum for VM and file-based images, sha256 digest for containers
requiredResources	KubernetesResources	1	Fundamental hardware requirements to be provisioned by the Application Provider. Only KubernetesResources is supported in the current implementation.
componentSpec	array of object	1	Information defined in "appRepo" point to the application descriptor e.g. Helm chart, docker-compose yaml file etc.

			The descriptor may contain one or more containers and their associated meta-data. A component refers to additional details about these containers to expose the instances of the containers to external client applications. App provider can define one or more components (via the associated network port) in componentSpec corresponding to the containers in helm charts or docker-compose yaml file as part of app descriptors.
→ componentName	string	1	Component name must be unique with an application
→ networkInterfaces	array of object	1	Each application component exposes some ports either for external users or for inter component communication. Application provider is required to specify which ports are to be exposed and the type of traffic that will flow through these ports. The underlying platform may assign a dynamic port against the "extPort" that the application clients will use to connect with edge application instance.
→→ interfaceId	string	1	Each Port and corresponding traffic protocol exposed by the component is identified by a name.

			Application client on user device requires this to uniquely identify the interface.
→→ protocol	string	1	Defines the IP transport communication protocol i.e., TCP, UDP or ANY
→→ port	integer (int32)	1	Port number exposed by the component. Edge Cloud Provider may generate a dynamic port towards the component instance which forwards external traffic to the component port.
→→ visibilityType	string	1	Defines whether the interface is exposed to outer world or not i.e., external, or internal. If this is set to "external", then it is exposed to external applications otherwise it is exposed internally to edge application components within edge cloud. When exposed to external world, an external dynamic port is assigned for UC traffic and mapped to the extPort.

4.2.2 OperatingSystem

Field	Data Type	Cardinality	Description
architecture	string	1	Type of the OS Architecture
family	string	1	Family to which OS belongs
version	string	1	Version of the OS
license	string	1	License needed to activate the OS

4.2.3 KubernetesResources

Field	Data Type	Cardinality	Description
infraKind	string	1	Type of infrastructure for the application.
applicationResources	object	1	Application resources define the resources pool required by the application to be executed in a Kubernetes clusters.
→ cpuPool	object	0..1	CPU Pool refers to the amount of application' resources that is executed in nodes with CPU only. That means the part of application that doesn't require GPU or other kind of acceleration. CPU pool is not mandatory when the application is executed exclusively in a GPU pool. A CPU pool is composed by CPU and memory.
→→ numCPU	integer	1	Total number of vcpus in whole (i.e 1) of CPU pool.
→→ memory	integer	1	Total memory in mega bytes of CPU pool.
→→ topology	object	1	CPU pool topology defines an application's CPU-based architecture. When deploying for high availability or redundancy, it allows for clustering with a configurable number of nodes and minimum CPU/memory

			resource per Kubernetes node requirements.
→→→ minNumberOfNodes	integer	1	Minimum number of worker nodes required by the application.
→→→ minNodeCpu	integer	1	Minimum number of vcpus in whole (i.e 1) per cluster node in CPU pool.
→→→ minNodeMemory	integer	1	Minimum memory in mega bytes per cluster node in CPU pool.
→ gpuPool	object	0..1	GPU Pool refers to the amount of resources of the application that is executed in nodes with GPU. GPU Pool is not mandatory when the application is executed exclusively in a CPU pool. A GPU pool is composed by memory, CPU and GPU memory
→→ numCPU	integer	1	Total Number of vcpus in whole (i.e 1) of GPU pool.
→→ memory	integer	1	Total memory in mega bytes of GPU pool.
→→ gpuMemory	integer	1	Total GPU memory in giga bytes of GPU pool.
→→ topology	object	1	GPU pool topology defines an application's GPU-based architecture. When deploying for high availability or redundancy, it allows for clustering with a configurable number of nodes and minimum CPU/memory/GPU

			memory resource per Kubernetes node requirements.
→→→ minNumberOfNodes	integer	1	Minimum number of worker nodes with GPU required by the application.
→→→ minNodeCpu	integer	1	Minimum number of vcpus in whole (i.e 1) per cluster node in GPU pool.
→→→ minNodeMemory	integer	1	Minimum memory in mega bytes per cluster node in GPU pool.
→→→ minNodeGpuMemory	integer	1	Minimum memory in giga bytes per cluster node in GPU pool.
isStandalone	boolean	1	Define if the Kubernetes clusters can be reused by other applications.
version	string	0..1	Minimum Kubernetes Version.
additionalStorage	string	0..1	Amount of persistent storage allocated to the Kubernetes PVC.
networking	K8sNetworking	0..1	
addons	K8sAddons	0..1	
→ monitoring	boolean	0..1	Enable monitoring for Kubernetes cluster.
→ ingress	boolean	0..1	Enable ingress for Kubernetes cluster.

4.2.4 K8sNetworking

Field	Data Type	Cardinality	Description
primaryNetwork	object	0..1	Definition of Kubernetes primary Network
→ provider	string	0..1	CNI provider name
→ version	string	0..1	CNI provider version
additionalNetworks	array of object	0..1	Additional Networks for the Kubernetes cluster.

→ name	string	0..1	Additional Network Name
→ interfaceType	string	0..1	Type of additional Interface: netdevice: (SR-IOV) A regular kernel network device in the Network Namespace (netns) of the container vfio-pci: (SR-IOV) A PCI network interface directly mounted in the container interface: Additional interface to be used by cni plugins such as macvlan, ipvlan Note: The use of SR-IOV interfaces automatically configure the required kernel parameters for the nodes.

4.2.5 SubmittedApp

Field	Type	Cardinality	Description
appld	String (uuid)	0..1	Unique application identifier

4.2.6 ApplInstanceInfo

Field	Data Type	Cardinality	Description
applInstanceid	String (uuid)	0..1	A globally unique identifier associated with a running instance of an application. Edge Cloud Platform generates this identifier when the instantiation in the Edge Cloud Zone is successful.
status	string	0..1	Status of the application instance

			(default is 'unknown')
componentEndpointInfo	array of object	0..1	Information about the IP and Port exposed by the Edge Cloud Platform. Application Client shall use these access points to reach this application instance
→ interfaceId	string	1	This is the interface Identifier that Application Provider defines when application is being submitted.
→ accessPoints	AccessEndpoint	1	
kubernetesClusterRef	String (uuid)	0..1	A global unique identifier associated with a Kubernetes cluster infrastructure.
edgeCloudZone	EdgeCloudZone	0..1	

4.2.7 AccessEndpoint

Field	Data Type	Cardinality	Description
port	integer	1	Port to establish the connection
fqdn	string	0..1	Full qualified domain name of an application instance
ipv4Addresses	array of strings	0..1	IP version 4 address(es) of an application instance
ipv6Addresses	array of strings	0..1	IP version 6 address(es) of an application instance.

4.2.8 EdgeCloudZone

Field	Data Type	Cardinality	Description
edgeCloudZoneId	string (uuid)	1	Unique identifier created by the Edge Cloud Platform to identify an Edge Cloud Zone within an Edge Cloud.

edgeCloudZoneName	string	1	Human readable name of the geographical zone of the Edge Cloud. Defined by the Edge Cloud Provider.
edgeCloudZoneStatus	string	0..1	Status of the Edge Cloud Zone (default is 'unknown')
edgeCloudProvider	string	1	Human readable name of the Edge Cloud Provider.
edgeCloudRegion	string	0..1	Human readable name of the geographical Edge Cloud Region of the Edge Cloud. Defined by the Edge Cloud Provider.

4.2.9 ClusterInfo

Field name	Data Type	Cardinality	Description
name	string	1	Name of the Cluster, scoped to the Provider
provider	string	1	Human readable name of the Application Provider.
clusterRef	String (uuid)	1	A global unique identifier associated with a Kubernetes cluster infrastructure.
edgeCloudZoneId	string (uuid)	1	Unique identifier created by the Edge Cloud Platform to identify an Edge Cloud Zone within an Edge Cloud.
edgeCloudRegion	string	0..1	Human readable name of the geographical Edge Cloud Region of the Edge Cloud. Defined by the Edge Cloud Provider.

version	string	0..1	Kubernetes version of the cluster.
nodePools	array of KubernetesNodePool	0..1	Node Pools in the cluster.

4.2.10 KubernetesNodePool

Field name	Data Type	Cardinality	Description
name	string	1	Human readable name of the Kubernetes Node Pool.
numNodes	integer	1	Number of nodes in the Node Pool.
scalable	boolean	1	Indicates if the node pool can be dynamically scaled up by the system to accommodate more applications, and dynamically scaled down by the system when there are unused resources.
nodeResources	object	1	Resource configuration of a node.
→ numCPU	integer	1	Number of whole vcpus for the node.
→ memory	integer	1	Amount of system memory in megabytes for the node.

4.2.11 ErrorInfo

Field	Data Type	Cardinality	Description
status	integer	1	HTTP status code returned along with this error response
code	string	1	Code given to this error
message	string	1	Detailed error description

4.3 API operations

4.3.1 Resource: Applications

Resource URI: {apiRoot}/edge-application-management/apps

4.3.1.1 Resource methods

4.3.1.1.1 POST – Submit application

Create a new application definition.

Parameters:

Name	Data Type	Cardinality	Notes
x-correlator	string	0..1	Correlation id for the different services

Request body	Data type	Cardinality	Notes
	AppManifest	1	

	Data type	Cardinality	Response Codes	Notes
Response body	SubmittedApp	1	201	Application created successfully
	ErrorInfo	0..1	400	Problem with the client request
	ErrorInfo	0..1	401	Authentication problem with the client request
	ErrorInfo	0..1	403	Client does not have sufficient permission
	ErrorInfo	0..1	409	Conflict
	ErrorInfo	0..1	500	Internal server error
	ErrorInfo	0..1	501	Service not implemented
	ErrorInfo	0..1	503	Service unavailable

4.3.1.1.2 GET – List applications

Retrieve a list of existing Applications. Get the list of all existing Application definitions from the Edge Cloud Provider that the user has permission to view.

Parameters:

Name	Data Type	Cardinality	Notes
x-correlator	string	0..1	Correlation id for the different services

Request body: No request body

Response body	Data type	Cardinality	Response Codes	Notes
	Array of AppManifest	1	200	List of existing applications
	ErrorInfo	0..1	401	Authentication problem with the client request
	ErrorInfo	0..1	403	Client does not have sufficient permission
	ErrorInfo	0..1	404	Not found
	ErrorInfo	0..1	500	Internal server error
	ErrorInfo	0..1	501	Service not implemented
	ErrorInfo	0..1	503	Service unavailable

4.3.2 Resource: Individual Application

Resource URI: {apiRoot}/edge-application-management/apps/{appld}

4.3.2.1 Resource methods

4.3.2.1.1 GET – Retrieve application

Get details of a specific application.

Parameters:

Name	Data Type	Cardinality	Notes
x-correlator	string	0..1	Correlation id for the different services
appld	String (uuid)	1	A globally unique identifier associated with the application. Edge Cloud Provider generates this identifier when the application is submitted.

Request body: No request body

Response body	Data type	Cardinality	Response Codes	Notes
	AppManifest	1	200	Application information
	ErrorInfo	0..1	401	Authentication problem with the client request
	ErrorInfo	0..1	403	Client does not have sufficient permission
	ErrorInfo	0..1	404	Not found
	ErrorInfo	0..1	500	Internal server error
	ErrorInfo	0..1	501	Service not implemented
	ErrorInfo	0..1	503	Service unavailable

4.3.2.1.2 DELETE – Delete application

Delete an Application from an Edge Cloud Provider. Delete all the information and content related to an Application

Parameters:

Name	Data Type	Cardinality	Notes
x-correlator	string	0..1	Correlation id for the different services
appld	String (uuid)	1	A globally unique identifier associated with the application. Edge Cloud Provider generates this identifier when the application is submitted.

Request body: No request body

Response body	Data type	Cardinality	Response Codes	Notes
		1	202	Request accepted
		1	204	Application deleted
	ErrorInfo	0..1	400	Bad request
	ErrorInfo	0..1	401	Authentication problem with the client request
	ErrorInfo	0..1	403	Client does not have sufficient permission
	ErrorInfo	0..1	404	Not found
	ErrorInfo	0..1	409	Conflict
	ErrorInfo	0..1	500	Internal server error
	ErrorInfo	0..1	503	Service unavailable

4.3.3 Resource: Application Instances

Resource URI: {apiRoot}/edge-application-management/appinstances

4.3.3.1 Resource methods

4.3.3.1.1 POST – Create application instance

Instantiate an app in a given Edge Cloud Zone (or via cluster ref).

Parameters:

Name	Data Type	Cardinality	Notes
x-correlator	string	0..1	Correlation id for the different services

	Data type	Cardinality	Notes
Request body	Object: <pre>{ "appId" (uuid string), "appZones": [{ "kubernetesClusterRef" (uuid string), "EdgeCloudZone" (object as described in 4.2.8) }] }</pre>	1	The Application ID and the array of Edge Cloud Zones to deploy

	Data type	Cardinality	Response Codes	Notes
Response body	Array of AppInstanceInfo	1	202	Application instantiation accepted
	ErrorInfo	0..1	400	Problem with the client request
	ErrorInfo	0..1	401	Authentication problem with the client request
	ErrorInfo	0..1	403	Client does not have sufficient permission
	ErrorInfo	0..1	409	Conflict
	ErrorInfo	0..1	500	Internal server error
	ErrorInfo	0..1	501	Service not implemented
	ErrorInfo	0..1	503	Service unavailable

4.3.3.1.2 GET – List instances

List instances filtered by appld, applInstanceid, or region.

Parameters:

Name	Data Type	Cardinality	Notes
x-correlator	string	0..1	Correlation id for the different services
appld	string	0..1	A globally unique identifier associated with the application. Edge Cloud Provider generates this identifier when the application is submitted.
applInstanceid	string	0..1	A globally unique identifier associated with a running instance of an application within an specific Edge Cloud Zone. Edge Cloud Provider generates this identifier.
region	string	0..1	Human readable name of the geographical Edge Cloud Region of the Edge Cloud. Defined by the Edge Cloud Provider.

Request body: No request body

Response body	Data type	Cardinality	Response Codes	Notes
	Array of ApplInstanceInfo	1	200	List of application instances. Returns an empty list if no instances were found or none match the specified query parameters.
	ErrorInfo	0..1	401	Authentication problem with the client request
	ErrorInfo	0..1	403	Client does not have sufficient permission
	ErrorInfo	0..1	404	Not found
	ErrorInfo	0..1	500	Internal server error
	ErrorInfo	0..1	501	Service not implemented
	ErrorInfo	0..1	503	Service unavailable

4.3.4 Resource: Individual Application Instance

Resource URI: {apiRoot}/edge-application-management/appinstances/{appInstanceId}

4.3.4.1 Resource methods

4.3.4.1.1 DELETE – Terminate instance

Terminate a running instance in a zone.

Parameters:

Name	Data Type	Cardinality	Notes
x-correlator	string	0..1	Correlation id for the different services
appInstanceId	String (uuid)	1	Identification of the specific application instance that will be terminated

Request body: No request body

Response body	Data type	Cardinality	Response Codes	Notes
		1	202	Request accepted
		1	204	Application instance deleted
	ErrorInfo	0..1	400	Bad request
	ErrorInfo	0..1	401	Authentication problem with the client request
	ErrorInfo	0..1	403	Client does not have sufficient permission
	ErrorInfo	0..1	404	Not found
	ErrorInfo	0..1	409	Conflict
	ErrorInfo	0..1	500	Internal server error
	ErrorInfo	0..1	503	Service unavailable

4.3.5 Resource: Clusters

Resource URI: {apiRoot}/edge-application-management/clusters

4.3.5.1 Resource methods

4.3.5.1.1 GET – List clusters

Retrieve cluster information filtered by region, clusterRef, or edgeCloudZoneId.

Parameters:

Name	Data Type	Cardinality	Notes
x-correlator	string	0..1	Correlation id for the different services
region	string	0..1	Human readable name of the geographical Edge Cloud Region of the Edge Cloud. Defined by the Edge Cloud Provider.
clusterRef	string	0..1	A globally unique identifier for the Cluster.
edgeCloudZoneId	string	0..1	Edge Cloud Zone identifier.

Request body: No request body

	Data type	Cardinality	Response Codes	Notes
Response body	Array of ClusterInfo	1	200	Successful response, returning the cluster's information. Returns an empty list if no clusters were found or none match the specified query parameters.
	ErrorInfo	0..1	401	Authentication problem with the client request
	ErrorInfo	0..1	403	Client does not have sufficient permission
	ErrorInfo	0..1	404	Not found
	ErrorInfo	0..1	500	Internal server error
	ErrorInfo	0..1	501	Service not implemented
	ErrorInfo	0..1	503	Service unavailable

4.3.6 Resource: Edge Cloud Zones

Resource URI: {apiRoot}/edge-application-management/edge-cloud-zones

4.3.6.1 Resource methods

4.3.6.1.1 GET – List edge cloud zones

List operator zones ordered by location; filter by status (active/inactive/unknown) and/or region.

Parameters:

Name	Data Type	Cardinality	Notes
x-correlator	string	0..1	Correlation id for the different services
region	string	0..1	Human readable name of the geographical Edge Cloud Region of the Edge Cloud. Defined by the Edge Cloud Provider.
status	string	0..1	Human readable status of the Edge Cloud Zone

Request body: No request body

Response body	Data type	Cardinality	Response Codes	Notes
	Array of EdgeCloudZone	1	200	Successful response, returning the Available Edge Cloud Zones.
	ErrorInfo	0..1	401	Authentication problem with the client request
	ErrorInfo	0..1	403	Client does not have sufficient permission
	ErrorInfo	0..1	404	Not found
	ErrorInfo	0..1	500	Internal server error
	ErrorInfo	0..1	503	Service unavailable