IX API

# Infrastructure as Code:

## Managing IXP services using **Terraform** and the **IX-API**

amsix DE CIX linx

# Why?

- Treat the state of your **infrastructure as code:**
  - **Versions** and **change history**
  - **Collaborate** on infrastructure

- **Automate everything!**

IX API

HashiCorp
Terraform

# What is the **IX-API**?

- Joint effort by internet exchanges and others to provide a common API for configuring and provisioning infrastructure.

AMS-IX

ix-api@ams-ix.net
www.ams-ix.net

DE-CIX

api@de-cix.net
www.de-cix.net

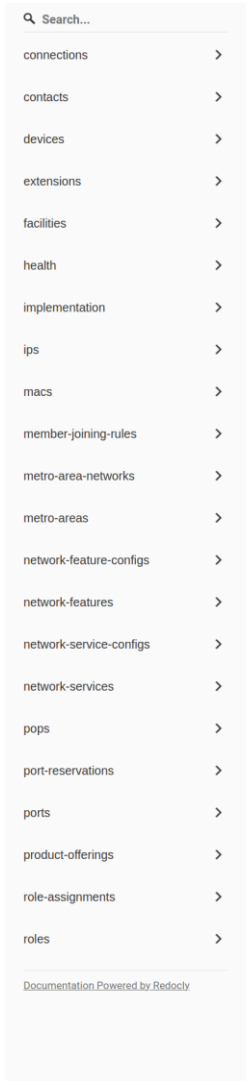
DE-CIX API accessible at https://www.de-cix.net/en/resources/de-cix-api

LINX

api@linx.net
www.linx.net

LINX API accessible at https://ix-api.linx.net/api/v1

# What is the **IX-API**?




## IX-API (2.4.1)

Download OpenAPI specification: Download

URL: https://ix-api.net | License: Apache 2.0

This API allows to configure/change/delete Internet Exchange services.

## Filters

When querying collections, the provided query parameters are validated. Unknown query parameters are ignored. Providing invalid filter values should yield a validation error.

## State

A lot of resources are stateful, indicated by the presence of a `state` property, to support the inherently asynchronous nature of provisioning, deployment and on-boarding processes.

The following table describes the meaning of each state:

| State | Meaning |
|---|---|
| requested | Resource has been requested by the customer but not yet fully reserved (sub-resources required) |
| allocated | All resources required for service are reserved |
| testing | The resource is provisioned and is currently being tested |
| production | The resource is active and can be used by the customer |
| production_change_pending | The resource is active but the customer has requested a change that is awaiting completion |
| decommission_requested | The resource is active but the customer has requested disconnection that is awaiting completion |
| decommissioned | The resource has been de-provisioned and billing is terminated or scheduled for termination |

## accounts

An `Account` represents an individual customer account, organization or partner involved with the IXP. They are used to consume services from an IXP.

Accounts can have a hierarchy, i.e. an account can have sub-accounts. The max-depth of the account-hierarchy may vary by implementer, but it's safe to assume an account can have sub-accounts.

Each `Account` has a state. Only `Account`s in state `production` or `production_change_pending` are ready to consume services.

There are `Contact`s associated with each account. Contacts can be assigned for `Role`s via `RoleAssignment`s. Depending on the IXP and the services the account wants to use, contacts with specific roles may be required. A contact with role `legal` is mandatory for an account to become operational.

Only accounts with `billing_information` present can be used as a `billing_account`.

*Sensitive Properties*: Please note, that an `Account` is a shared resource and fields marked as *sensitive* should be redacted.

## accounts_list

Retrieve a list of `Account`s.

This includes all accounts the currently authorized account is managing and the current account itself.

Also `discoverable` accounts will be included, however sensitive properties, like `address` or `external_ref` will either not be present or redacted.

AUTHORIZATIONS: ( OAuth ( `ix-api` ) ) **OR** ( Bearer )

QUERY PARAMETERS

- `id` — Array of strings. Example: `id=id1,id2,id3`. Filter by id
- `state` — string. Filter by state
- `state__is_not` — string. Filter by state__is_not
- `managing_account` — string. Filter by managing_account

## network-services

A `NetworkService` represents an instance of a `ProductOffering`.

The exchange lan is a special case in which the `NetworkService` is managed by the exchange.

All other `NetworkService`s are created and managed by an `Account`.

*Sensitive Properties*: Please note, that a `NetworkService` may be a shared resource and fields marked as *sensitive* should be redacted.

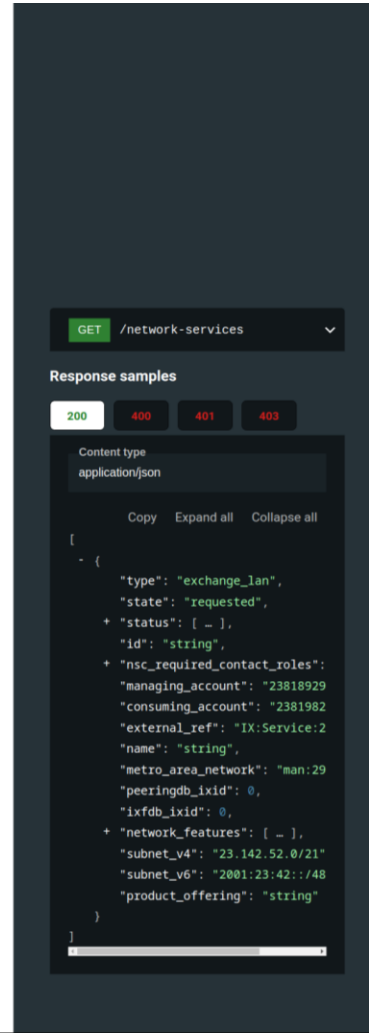
## network_services_list

List available `NetworkService`s.

AUTHORIZATIONS: ( OAuth ( `ix-api` ) ) **OR** ( Bearer )

QUERY PARAMETERS

- `id` — Array of strings. Example: `id=id1,id2,id3`. Filter by id
- `state` — string. Filter by state
- `state__is_not` — string. Filter by state__is_not
- `managing_account` — string. Filter by managing_account
- `consuming_account` — string. Filter by consuming_account
- `external_ref` — string. Filter by external_ref
- `type` — string. Enum: `"exchange_lan"` `"p2p_vc"` `"p2mp_vc"` `"mp2mp_vc"` `"cloud_vc"`. Filter by type
- `pop` — string. Filter by pop
- `product_offering` — string



# What is **Terraform**?

- **Configuration** describes the infrastructure
- **Provider** builds the infrastructure
  - Data source
  - Resource
- **State** tracks resource changes

```
# Create a AWS EC2 instance
resource "aws_instance" "app_server" {
  ami           = "ami-830c94e3"
  instance_type = "t2.micro"
  tags = {
    Name = "ExampleAppServerInstance"
  }
}

# Get a known IX-API account
data "ixapi_account" "hajnet" {
  external_ref = "c-hajnet-as-65500"
}

# Manage a MAC address for Blåhajnet Inc
resource "ixapi_mac" "hajnet_fra_gw0" {
    managing_account = data.ixapi_account.hajnet.id
    consuming_account = data.ixapi_account.hajnet.id
    address = "21:42:ff:00:23:42"
}
```

# What is a **data source**?

- **Read-Only** data
- **Declarative** query
- Use the data when declaring resources

```
# IX-API customer account
data "ixapi_account" "hajnet" {
  external_ref = "c-hajnet-as-65500"
}

# Product offering
data "ixapi_product_offering_exchange_lan" "peering_fra" {
  id = 522 # From IXP-Website
}

# Network service and network features
data "ixapi_network_service_exchange_lan" "peering_fra" {
    id = data.ixapi_product_offering_exchange_lan.peering_fra.exchange_lan_network_service
}

data "ixapi_network_features_route_server" "peering_fra" {
    network_service = data.ixapi_network_service_exchange_lan.peering_fra.id
}
```

# What is a **data source**?

```
data "ixapi_network_features_route_server" "peering_fra" {
    network_service = data.ixapi_network_service_exchange_lan.peering_fra.id
}
```

```
network_feature = {
    address_families           = [
        "af_inet",
        "af_inet6",
    ]
    asn                        = 64803
    available_bgp_session_types = [
        "active",
        "passive",
    ]
    flags                      = []
    fqdn                       = "rs1.fra.noc.function-based-discrete.net"
    id                         = "113"
    ip_v4                      = "123.168.118.131"
    ip_v6                      = "2001:cc40::a/32"
    looking_glass_url          = "https://lg.example/routeservers/rs1_fra
    name                       = "rs1-fra"
    network_service            = "58"
    nfc_required_contact_roles  = [
        "2",
    ]
    required                   = true
    session_mode               = "public"
}
```

## network_features_list

List available network features.

AUTHORIZATIONS: ( OAuth ( `ix-api` ) ) **OR** ( Bearer )

QUERY PARAMETERS

| | |
|---|---|
| id | Array of strings<br>Example: `id=id1,id2,id3`<br>Filter by id |
| type | string<br>Value: `"route_server"`<br>Filter by type |
| required | string<br>Filter by required |
| network_service | string<br>Filter by network_service |
| name | string<br>Filter by name |

### Responses

- 200 List of: Polymorphic Network Feature
- 400 ValidationError
- 401 Authentication
- 403 PermissionDenied

GET /network-features

**Response samples**

200 | 400 | 401 | 403

Content type: application/json

Copy Expand all Collapse all


```
[
 - {
      "type": "route_server",
      "id": "string",
      "name": "string",
      "required": true,
    + "nfc_required_contact_roles":
    + "flags": [ … ],
      "network_service": "string",
      "asn": 0,
      "fqdn": "rs1.moon-ix.net",
      "looking_glass_url": "https:/
    + "address_families": [ … ],
      "session_mode": "public",
    + "available_bgp_session_types"
      "ip_v4": "23.42.0.1",
      "ip_v6": "2001:23:42::1"
   }
]
```

# Using the **ix-api-client**

```go
func main() {
    ctx := context.Background()

    fmt.Println("ix-api list network services")

    c := ixapi.NewClient("http://localhost:8000/api/v2")

    if err := c.Authenticate(ctx, &ixapi.AuthAPIKeySecret{
        Key:    os.Getenv("IX_API_KEY"),
        Secret: os.Getenv("IX_API_SECRET"),
    }); err != nil {
        log.Fatal(err)
    }

    // Network services
    ns, err := c.NetworkServicesList(ctx)
    if err != nil {
        log.Fatal(err)
    }
    for _, n := range ns {
        // We are only interested in exchange lan network services
        ens, ok := n.(*ixapi.ExchangeLanNetworkService)
        if !ok {
            continue
        }
        // Get required features for network services
        nfs, err := c.NetworkFeaturesList(ctx, &ixapi.NetworkFeaturesListQuery{
            NetworkService: ens.ID,
            Required:       "true",
        })
        if err != nil {
            log.Fatal(err)
        }
        fmt.Println("Required network features for exchange-lan:", ens.Name)
        for _, nf := range nfs {
            rsnf, ok := nf.(*ixapi.RouteServerNetworkFeature)
            if !ok {
                continue
            }
            fmt.Println(" * ", rsnf.Name, "ID:", rsnf.ID)
        }
    }
}
```

Get a list of all **polymorphic network services**

Query **network features**

Show required **route server** network features for **exchange lan** network services

https://gitlab.com/ix-api/ix-api-client-go

# What is a **resource**?

- Managed by terraform, **Read-Write**
- **Config** is **Source Of Truth**
- **Changes** in config will **affect infrastructure**

```
data "ixapi_account" "hajnet" {
    external_ref = "demo_reseller"
}

resource "ixapi_mac" "hajnet_fra_gw1" {
    managing_account = data.ixapi_account.hajnet.id
    consuming_account = data.ixapi_account.hajnet.id
    address = "22:42:69:70:f3:df"
}
```

# What is a **resource**?

```
resource "ixapi_mac" "hajnet_fra_gw1" {
    managing_account = data.ixapi_account.hajnet.id
    consuming_account = data.ixapi_account.hajnet.id
    address = "22:42:69:70:f3:df"
}
```

```
hajnet_mac_gw1_fra = {
    address           = "22:42:69:70:f3:df"
    consuming_account = "17"
    external_ref      = null
    id                = "4"
    managing_account  = "17"
    valid_not_after   = null
    valid_not_before  = "2022-10-24T18:08:16Z"
}
```

macs_create

Register a mac address.

AUTHORIZATIONS: ( OAuth ( ix-api ) ) OR ( Bearer )

REQUEST BODY SCHEMA: application/json

MAC-Address Request

- managing_account (required) — string — The `id` of the account responsible for managing the service via the API. A manager can read and update the state of entities.
- consuming_account (required) — string — The `id` of the account consuming a service. Used to be `owning_customer`.
- external_ref — string or null <= 128 characters — Reference field, free to use for the API user. *(Sensitive Property)*
- address (required) — string — Unicast MAC address, formatted hexadecimal values with colons.
- valid_not_before — string or null <date-time>
- valid_not_after — string or null <date-time>

Responses

- 201 MAC-Address
- 400 ValidationError
- 401 Authentication
- 403 PermissionDenied

POST /macs

Request samples

Payload

Content type: application/json

Copy Expand all Collapse all

```
{
    "managing_account": "238189294",
    "consuming_account": "2381982",
    "external_ref": "IX:Service:23042",
    "address": "42:23:bc:8e:b8:b0",
    "valid_not_before": "2019-08-24T1
    "valid_not_after": "2019-08-24T14
}
```

Response samples

201 400 401 403

Content type: application/json

Copy Expand all Collapse all

```
{
    "managing_account": "238189294",
    "consuming_account": "2381982",
    "external_ref": "IX:Service:23042",
    "address": "42:23:bc:8e:b8:b0",
    "valid_not_before": "2019-08-24T1
    "valid_not_after": "2019-08-24T14
    "id": "string"
}
```

# Demo

# It's **Open Source**

- **https://docs.ix-api.net**

- **https://gitlab.com/ix-api**
  - ix-api-sandbox-v2
  - ix-api-schema
  - ix-api-client-go

- **https://github.com/ix-api-net/terraform-provider-ix-api**

IX API

# Thank you!

# Questions?

# Keeping up with **API changes**

- Currently supported is **v2**
- Generated code from **IX-API OpenAPI schema**
  - **IX-API Client**
  - **Terraform Schema**
- Glue code changes only required for new resources or changed behaviors.