



**Network Functions Virtualisation (NFV) Release 3;
Protocols and Data Models;
YAML data model specification for
descriptor-based virtualised resource management**

ETSI GS NFV-SOL 014 V3.5.1 (2021-05)
<https://standards.iteh.ai/catalog/standards/sist/ad5b0e2-4dc1-4e2b-b009-5f9af1bd604a/etsi-gs-nfv-sol-014-v3-5-1-2021-05>

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Reference

RGS/NFV-SOL014ed351

Keywords

management, model, NFV

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Foreword

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1 Scope

The present document specifies a set of YAML-based data models for descriptor-based virtualised resource management fulfilling the requirements concerning the input and output information exchanged over the virtualised resource management interfaces specified in the ETSI GS NFV-IFA 005 [1], and the ETSI GS NFV-IFA 006 [2]. The present document focuses on data models used in the virtualised resource descriptors for the Virtualised Compute interfaces, Virtualised Network interfaces and Virtualised Storage interfaces, which are used to perform orchestration and lifecycle management for consumable virtualised resources comprised of compute, network and storage. Other virtualised resource management interfaces, as well as data models for information specified in ETSI GS NFV-IFA 011 [i.5] and ETSI GS NFV-IFA 014 [i.4], are out of the scope of the present document.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <https://docbox.etsi.org/Reference>.

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The following referenced documents are necessary for the application of the present document.

- [1] ETSI GS NFV-IFA 005: "Network Functions Virtualisation (NFV) Release 3; Management and Orchestration; Or-Vi reference point - Interface and Information Model Specification".
<https://standards.ietf.org/catalog/standards/sist/ad5b0e2-4dc1-4e2b-b009-1fa0060/>
- [2] ETSI GS NFV-IFA 006: "Network Functions Virtualisation (NFV) Release 3; Management and Orchestration; Vi-Vnfm reference point - Interface and Information Model Specification".
- [3] Void.
- [4] "YAML Ain't Markup Language (YAML™) Version 1.2", 3rd Edition. Oren Ben-Kiki, Clark Evans, Ingy döt Net.

NOTE: Available at <http://www.yaml.org/spec/1.2/spec.html>.

- [5] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".

NOTE: Available at <https://tools.ietf.org/html/rfc8259>.

- [6] ETSI GS NFV-SOL 001: "Network Functions Virtualisation (NFV) Release 3; Protocols and Data Models; NFV descriptors based on TOSCA specification".
- [7] JSON Schema.

NOTE: Available at <https://json-schema.org/>.

- [8] ETSI GS NFV-SOL 013: "Network Functions Virtualisation (NFV) Release 3; Protocols and Data Models; Specification of common aspects for RESTful NFV MANO APIs".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI GS NFV 003: "Network Functions Virtualisation (NFV); Terminology for Main Concepts in NFV".

[i.2] Heat Orchestration Template (HOT) specification.

NOTE: Available at https://docs.openstack.org/heat/latest/template_guide/hot_spec.html.

[i.3] Openstack-heat - Orchestration service APIs.

NOTE: Available at <https://docs.openstack.org/api-ref/orchestration/>.

[i.4] ETSI GS NFV-IFA 014: "Network Functions Virtualisation (NFV) Release 3; Management and Orchestration; Network Service Templates Specification".

[i.5] ETSI GS NFV-IFA 011: "Network Functions Virtualisation (NFV) Release 3; Management and Orchestration; VNF Descriptor and Packaging Specification".

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3 Definition of terms, symbols and abbreviations

3.1 Terms <https://standards.iteh.ai/catalog/standards/sist/ad5b0e2-4dc1-4e2b-b009-5f9af1bd604a/etsi-gs-nfv-sol-014-v3-5-1-2021-05>

For the purposes of the present document, the terms given in ETSI GS NFV 003 [i.1] apply.

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI GS NFV 003 [i.1] and the following apply:

JSON	JavaScript Object Notation
YAML	YAML Ain't Markup Language

4 General aspects

4.1 Overview

The present document defines the data model for the following interfaces used over the Vi-Vnfm and Or-Vi reference point, using YAML [4] as a data-serialization language:

- Virtualised Compute interfaces.
- Virtualised Network interfaces.

- Virtualised Storage interfaces.

The design of the data model for the above interfaces is based on the information model and requirements defined in ETSI GS NFV-IFA 005 [1] and ETSI GS NFV-IFA 006 [2]. Protocols that use these data models are out of the scope of the present version of the present document.

In clause 4, general aspects are specified that apply to multiple data model on the Vi-Vnfm and Or-Vi reference point. The present document defines data models for input and output parameters derived from the above-mentioned information model. The data instances are used as input and output parameters specified in a virtualised resource descriptor, e.g. a HOT [i.2]. As an alternative, output parameters can also be obtained from an API provided by the template system of the underlying VIM implementation, e.g. the HEAT API [i.3], and be mapped to the data model defined in the present document.

In the subsequent clauses, the data model of the parameters to be used in virtualised resource descriptors as input and output for the individual interfaces are specified. Annex A provides examples of the use of the input and output parameters using HOT [i.2].

4.2 Definition of input and output parameters in YAML

4.2.1 Introduction

Clause 4.2 specifies the types and section definitions in YAML that are applicable for the present document, in particular, for the declaration of the input and output parameters.

4.2.2 Input parameters syntax definition

The set of parameters that are used as input to an operation for which a corresponding template is defined shall be prefixed by a tag named "nfv" and shall comply with the following YAML syntax definition:

```
nfv:
  <parameter_name>:
    type: <the type of parameter>
    description: <description of the parameter>
    default: <default value of the parameter>
    enum:
      - <enumerated values 1>
      - <enumerated values 2>
      ...
  <parameter_name_N>:
    ...
```

Where applicable, then name of a structured input parameter ends with the string "Data" (e.g. subnetData). A description of the syntax definition fields for declaring an input parameter follows. The fields shall comply with the provisions set out in Table 4.2.2-1.

Table 4.2.2-1: Input parameters syntax definition

Field	Required	Description
nfv	yes	The tag emphasizes a group of parameters defined in the present document.
<parameter_name_1>	yes	The name of the first parameter.
<parameter_name_N>	no	The name of the last parameter.
type	yes	The type of each parameter. It shall be a simple data type as defined in clause 4.4.2 or structured data types in clause 4.4.3.
description	yes	A human readable description for each parameter.
default	no	A default value for each parameter.
enum	no	A set of enumerated values for a parameter to restrict the value. It is applicable to parameters of type string or number.

4.2.3 Output parameters syntax definition

If a set of output parameters of an operation is defined in a template, these parameters shall comply with the following YAML [4] syntax definition:

```
<parameter_name>: value
  description: <description of the parameter>
  type: <type>
```

Where applicable, then name of a structured output parameter ends with the string "Info" (e.g. nfvSubnetInfo). A description of the syntax definition fields for declaring an output parameter follows. The fields shall comply with the provisions set out in Table 4.2.3-1.

Table 4.2.3-1: Output parameters syntax definition

Field	Required	Description
parameter_name	yes	The name of the parameter, which shall start with the prefix "nfv".
type	yes	The type of the parameter.
description	yes	A human readable description for the parameter.

4.3 Definition of output parameters as mapping to an API

The present document defines the set of attributes for each output parameter in the data model in clauses 6, 7 and 8. Besides providing the output parameters that are defined in the data model using the output parameters facility of a template (e.g. parameters in the "outputs" section of a HOT [i.2]), it is also possible to obtain these parameters via VIM-level APIs such as (such as the HEAT API [i.3]). In the latter case, the output parameters of a VIM-level API can be mapped to the data model for the output parameters defined in the present document. Taking this approach can offer performance advantages in case many resources are required to be managed by the same template. The choice of the mapping of a parameter to a template output parameter, or to a VIM-level API is a deployment decision outside the scope of the present document.

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4.4 Common data types

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4.4.1 Introduction

Clause 4.4 specifies the common data types that are used for declaring the parameters and grammar elements throughout the present document.

4.4.2 Simple data types

The present specification uses the following simple data types as defined in Table 4.4.2-1. In order to accommodate tags with a broader meaning, the YAML specification recommends JSON schema [7] to be supported as an option. JSON schema is commonly supported by modern computing languages. Virtualised resource descriptors complying with the present document shall comply with the YAML v1.2 [4] and JSON schema [7] specifications.

Table 4.4.2-1: Simple data types

Type name	Description	Example(s)
String	A string as defined in YAML v1.2 [4].	"a string"
Number	A number as defined in IETF RFC 8259 [5] referred in JSON Schema [7].	"23", "-1.023E3"
Boolean	A data type that can take the following values: true, false. The type is defined in JSON Schema [7] and referred in YAML v1.2 [4].	"true", "false"

4.4.3 Structured data types

Following the format stated with the label of "nfv" in Table 4.4.3-1, individual structured data type is represented in the present document using ">" recursively as inline definition.

Table 4.4.3-1: Input or Output data model for {parameter name}

Parameter Name and Attributes	Type	Description
{parameter name}	{object, array}	Type of the parameter
{description}	-	Description of the parameter
{attribute}	{attribute type}	Type of {attribute}
>{sub attribute}	{sub attribute type in the attribute}	Type of {sub attribute}

object in JSON schema [7] is a type representing mapping from "keys" to "values". The syntax of object for parameter definition is represented with the following definition:

```
{parameter name}:
  description: <description of the parameter>
  type: object
  required:
    - {1st mandatory attribute}
    - {2nd mandatory attribute}
    - ...
  properties:
    {1st attribute}:
      type: e.g. object
      properties:
        {sub attribute}
    {2nd attribute}:
    ...
```

array in JSON schema [7] is a type representing an ordered list of elements. The syntax of array for parameter definition is represented with the following definition:

```
{parameter name}:
  description: <description of the parameter>
  type: array
  minItems: {lower bound of cardinality}
  maxItems: {upper bound of cardinality}
  items:
    - type: e.g. object
      properties:
        {sub attribute}
    ...
```

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5 Common data model

5.1 Description

This clause specifies data models for input and output parameters commonly used in different resource management.

5.2 Parameters to be used as input

5.2.1 Parameter: reservationId

The parameter used when pointing to a virtualised compute, network or storage resource shall follow the indications provided in Table 5.2.1-1.

Table 5.2.1-1: Input data model for reservationId

Parameter Name and Attributes	Type	Description
reservationId	String	Identifier of the resource reservation applicable to this virtualised resource management operation

The syntax of the reservationId shall comply with the following definition:

```
reservationId:
  type: string
  description: >
    Identifier of the resource reservation applicable to this virtualised resource
  management operation
  default: ""
```

5.2.2 Parameter: resourceGroupId

The parameter used when pointing to a logical grouping of virtual resources assigned to a tenant shall follow the indications provided in Table 5.2.2-1.

Table 5.2.2-1: Input data model for resourceGroupId

Parameter Name and Attributes	Type	Description
resourceGroupId	String	Unique identifier of the "infrastructure resource group", logical grouping of virtual resources assigned to a tenant within an Infrastructure Domain

The syntax of the resourceGroupId shall comply with the following definition:

```
resourceGroupId:
  description: >
    The identifier of the infrastructure resource group, logical grouping of virtual
    resources assigned to a tenant within an Infrastructure Domain of this
    virtualised resource management operation
  type: string
  default: ""
```

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5.2.3 Parameter: groupName (standards.iteh.ai)

The parameter used when giving a group name of a virtualised compute, network or storage resource affinity or anti-affinity constraints group to be created shall follow the indications provided in Table 5.2.3-1.

Table 5.2.3-1: Input data model for groupName

Parameter Name and Attributes	Type	Description
groupName	String	Name of the group, given by the consumer

The syntax of the groupName shall comply with the following definition:

```
groupName:
  type: string
  description: >
    Name of the group, given by the consumer
  default: ""
```

5.2.4 Parameter: typeOfAffinityOrAntiAffinityConstraints

The parameter used when indicating whether this is an affinity or anti-affinity group for virtualised compute, network or storage resources shall follow the indications provided in Table 5.2.4-1.

Table 5.2.4-1: Input data model for typeOfAffinityOrAntiAffinityConstraints

Parameter Name and Attributes	Type	Description
typeOfAffinityOrAntiAffinityConstraints	String	Indicates whether this is an affinity or anti-affinity group

The syntax of the `typeOfAffinityOrAntiAffinityConstraints` shall comply with the following definition:

```
typeOfAffinityOrAntiAffinityConstraints:
  description: >
    Indicates whether this is an affinity or anti-affinity group.
  type: string
  enum:
    - affinity
    - anti-affinity
```

5.3 Parameters to be used as output

None.

6 Data model for Virtualised Compute Management

6.1 Description

This clause specifies data models for input and output parameters for Virtualised Compute Management.

6.2 Parameters to be used as input

6.2.1 Parameter: `computeName`

The parameter used when providing a name for a virtualised compute resource to be allocated shall follow the indications provided in Table 6.2.1-1.

Table 6.2.1-1: Input data model for `computeName`

Parameter Name and Attributes	Type	Description
<code>computeName</code>	String	Name for a virtualised compute resource to be allocated

The syntax of the `computeName` shall comply with the following definition:

```
computeName:
  type: string
  description: >
    Name provided by the consumer for the virtualised compute resource to
    allocate
  default: ""
```

6.2.2 Parameter: `computeFlavourId`

The parameter used when providing an identifier of the Compute Flavour for a virtualised compute resource to be allocated shall follow the indications provided in Table 6.2.2-1.

Table 6.2.2-1: Input data model for `computeFlavourId`

Parameter Name and Attributes	Type	Description
<code>computeFlavourId</code>	String	Identifier of the Compute Flavour that provides information about the particular memory, CPU and disk resources for virtualised compute resource to allocate

The syntax of the computeFlavourId shall comply with the following definition:

```
computeFlavourId:
  type: string
  description: >
    Identifier of the Compute Flavour that provides information about the particular
    memory, CPU and disk resources for virtualised compute resource to allocate
  default: ""
```

6.2.3 Parameter: vclmageld

The parameter used when providing an identifier of the virtualisation container software image for a virtualised compute resource to be allocated shall follow the indications provided in Table 6.2.3-1.

Table 6.2.3-1: Input data model for vclmageld

Parameter Name and Attributes	Type	Description
vclmageld	String	Identifier of the virtualisation container software image

The syntax of the vcImageId shall comply with the following definition:

```
vcImageId:
  type: string
  description: >
    Identifier of the virtualisation container software image
  default: ""
```

6.2.4 Parameter: locationConstraints

The parameter used when providing a location constraints for a virtualised compute resource to be allocated shall follow the indications provided in Table 6.2.4-1.

Table 6.2.4-1: Input data model for locationConstraints

Parameter Name and Attributes	Type	Description
locationConstraints	String	If present, it defines location constraints for the resource(s) is (are) requested to be allocated, e.g. in what particular resource zone

The syntax of the locationConstraints shall comply with the following definition:

```
locationConstraints:
  type: string
  description: >
    If present, it defines location constraints for the resource(s) is (are)
    requested to be allocated, e.g. in what particular resource zone.
  default: ""
```

6.2.5 Parameter: affinityOrAntiAffinityConstraintsForCompute

The parameter used when giving resource affinity or anti-affinity constraints related to virtualised compute resources shall follow the indications provided in Table 6.2.5-1. The parameter is a list of elements with affinity or anti affinity information of the virtualised compute resource to be allocated ETSI GS NFV-IFA 005 [1] and ETSI GS NFV-IFA 006 [2]. All the listed constraints shall be fulfilled for a successful operation.

Table 6.2.5-1: Input data model for affinityOrAntiAffinityConstraintsForCompute

Parameter Name and Attributes	Type	Description
affinityOrAntiAffinityConstraintsForCompute	Array of Object	Name of the parameter.
>typeOfAffinityOrAntiAffinityConstraintForCompute	String	Indicates whether this is an affinity or anti-affinity constraint. Allowed to affinity and anti-affinity.
>scopeOfAffinityOrAntiAffinityConstraintForCompute	String	Qualifies the scope of the constraint. In case of compute resource: e.g. "NFVI-PoP" or "NFVI-Node". Allowed to NFVI-PoP, NFVI-Node. Defaults to "NFVI-Node" if absent.
>affinityAntiAffinityResourceList	Object	Consumer-managed list of identifiers of virtualised resources with which the actual resource is requested to be affine or anti-affine. See note and condition.
>>resource	Array of Object	List of identifiers of virtualised resources.
>affinityAntiAffinityResourceGroup	String	Identifier of the producermanaged group of virtualised resources with which the actual resource is requested to be affine or anti-affine. See note and condition.
NOTE:	It is a prerequisite for the consumer to create a VirtualisedComputeResourceAffinityOrAntiAffinityConstraintsGroup and get groupIdentifier using the appropriate operation, Create Virtualised Compute Resource Affinity Or AntiAffinity Constraints Group, defined in ETSI GS NFV-IFA 005 [1] and ETSI GS NFV-IFA 006 [2].	
CONDITION:	If explicit resource lists for affinity/anti-affinity (see clause 8.4.8.1 in ETSI GS NFV-IFA 005 [1] and ETSI GS NFV-IFA 006 [2]) are supported, the affinityAntiAffinityResourceList shall be supported. If named resource groups for affinity/anti-affinity (see clause 8.4.8.1 in ETSI GS NFV-IFA 005 [1] and ETSI GS NFV-IFA 006 [2]) are supported, affinityAntiAffinityResourceGroup shall be supported. The mechanisms shall not be mixed in the scope of a resourceGroup (aka VIM tenant).	

The syntax of the affinityOrAntiAffinityConstraintsForCompute shall comply with the following definition:

```

affinityOrAntiAffinityConstraintsForCompute:
  description: >
    A list of elements with affinity or antiaffinity information of
    the virtualised compute resource to allocate.
  oneOf:
    - type: array
      minItems: 0 # lower bound of cardinality
      maxItems: N # upper bound of cardinality
      items:
        type: object
        required:
          - typeOfAffinityOrAntiAffinityConstraintForCompute
        properties:
          typeOfAffinityOrAntiAffinityConstraintForCompute:
            type: string
            enum:
              - affinity
              - anti-affinity
          scopeOfAffinityOrAntiAffinityConstraintForCompute:
            type: string
            enum:
              - NFVI-PoP
              - NFVI-Node
            default: NFVI-Node
          affinityAntiAffinityResourceList:
            type: object
            required:
              - resource
            properties:
              resource:
                type: array
                minItems: 1 # lower bound of cardinality
                maxItems: N # upper bound of cardinality
                items:
                  type: string
    - type: array
      minItems: 0 # lower bound of cardinality

```

```

maxItems: N # upper bound of cardinality
items:
  type: object
  required:
    - typeOfAffinityOrAntiAffinityConstraintForCompute
  properties:
    typeOfAffinityOrAntiAffinityConstraintForCompute:
      type: string
      enum:
        - affinity
        - anti-affinity
    scopeOfAffinityOrAntiAffinityConstraintForCompute:
      type: string
      enum:
        - NFVI-PoP
        - NFVI-Node
      default: NFVI-Node
    affinityAntiAffinityResourceGroup:
      type: string

```

6.2.6 Parameter: interfaceData

The parameter used when giving interfaceData related to virtualised compute resources shall follow the indications provided in Table 6.2.6-1. The parameter is a list of data about network interface data which are specific to a Virtual Compute Resource instance.

NOTE: ">" is used to specify an "inline definition".

Table 6.2.6-1: Input data model for interfaceData

Parameter Name and Attributes	Type	Description
interfaceData	Array of Object	Name of the parameter.
>ipAddress	Array of Object	The virtual network interface can be configured with specific IP address(es) associated to the network to be attached to.
>macAddress	String	The MAC address desired for the virtual network interface.

<https://standards.iteh.ai/catalog/standards/sist/ad5b0e2-4dc1-4e2b-b009-5dab0004/etsi-gs-nfv-sol-014-v3-5-1-2021-05>

The syntax of the interfaceData shall comply with the following definition:

```

interfaceData: # VirtualInterfaceData IE in ETSI GS NFV-IFA 005 and ETSI GS NFV-IFA 006
  description: >
    The data of network interfaces which are specific to a Virtual Compute
    Resource instance
  type: array
  minItems: 0 # lower bound of cardinality
  maxItems: N # upper bound of cardinality
  items:
    type: object
    properties:
      ipAddress: # IPAddress IE in SOL013
        type: array
        minItems: 0 # lower bound of cardinality
        maxItems: N # upper bound of cardinality
        items:
          type: string
      macAddress: # MacAddress IE in ETSI GS NFV-SOL 013
        type: string

```

6.2.7 Parameter: computeId

The parameter used when pointing to an identifier of the virtualised compute resource to operate shall follow the indications provided in Table 6.2.7-1.

Table 6.2.7-1: Input data model for computeId

Parameter Name and Attributes	Type	Description
computeId	String	Identifier of the virtualised compute resource to operate