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**Framework for Network Resource Property Description**  
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Abstract

This memo discusses and defines a framework for cyberspace resource property description, which is suitable for the unified classification organization and description of multi-source network resource measurement information. Now, there is no unified description framework for network resource property. The objective of this draft is to establish a general model based on cyberspace identification reference, and implement the reuse of survey data in different users and occasions. Then discuss the basic methodology and propose a less mature framework for further complement and improvement

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## [1.](#) Introduction

Network space measurement is based on certain methods, techniques and standards. It uses software or hardware tools to test the composition, behavior and development of cyberspace by testing multiple indicators that characterize the state, property and relationships of various layers of cyberspace. The range of measurement can be local to the network space or global. The objects to be measured include the composition, structure, property, behavior, characteristics, laws and trends of the network space. The information obtained by measurement is a kind of typical big data. The content is diverse in format, complex in structure and rapid in change. It is difficult to understand, interact with, and disseminate the information.

Given that network measurement data may be used by many people other than producers. It is usually produced by an individual or organization and used by others or organizations. Building a unified entity encoding rule enables people or organizations that are less familiar with each other to better share data and use the data appropriately. As web measurement data producers and users process



more and more data, appropriate textual data can provide them with rich information about the data, enabling them to better manage, store, share, update and reuse data products.

This memo can support the integration and management of surveying and mapping information across departments, cross-domains, time space, multi-source and multi-scale networks through the unified description of network space property. It can be used as cyberspace management in the future. It adopts a markup language RDF for describing network resource property, and focuses on the classification and coding rules of network measurement elements and their expansion methods.

## **2. Terminology and Definition**

### **2.1. Terminology and Definition**

In this memo, individuals represent the objects of interest in the field of network mapping space, and OWL does not use the Unique Name Assumption. It must clearly indicate whether individuals are identical, otherwise their relationship is unclear.

Note: Individuals are sometimes referred to as Instances.

### **2.2. Property**

Properties are binary relationships between individuals. In the description logic, the concept of a Role is represented. Properties can be divided into the following categories:

Functional property

Functional property can only be connected to one individual.

Inverse Functional Property

The inverse functional property is that for a given individual, only at most one individual can be connected through this property. That is, the inverse property of this property is a functional property.

Inverse Property

The inverse property uses only one property name as a parameter, indicating the inversion of the relationship.

Transitive Property

Transitive property means that the property can be passed.



### Object Property

The Object property represents the relationship between instances of two classes.

### Datatype Property

Connect individual and XML Schema data type values or RDF literals, Datatype property cannot be passed, symmetric, or inverse functional.

## **2.3. Cyberspace Feature**

Cyberspace is a virtual and real space where human beings use information facilities to construct and realize the information interaction, and then influence human thoughts and behaviors. It relies on the carrier of information and communication technology infrastructure carriers such as Internet, telecommunication networks, and various control systems and devices.

In cyberspace, the use of cyberspace means to detect and perceive entities, including the Internet, telecommunications networks, industrial control networks and other types of network resources. Specifically, cyberspace resources include physical equipment such as network infrastructure and network access; information resources and network services such as audio, video, websites and text data; virtual characters, various IP-based telecommunication network equipment and industrial control systems, etc.

The feature is an abstract representation of an entity. Note: Features can appear as types or as instances. When expressing only one meaning, you should use a feature type or a feature instance. A single cyberspace resource object existing in cyberspace is a specific unit of cyberspace resource feature, and it is also the smallest component of the corresponding feature types, and can be represented by specific symbols.

## **3. Symbol and Abbreviation**

RDF: Resource Description Framework

RDFS: Resource Description Framework Schema

XML: Extensible Markup Language

OWL: Ontology Web Language

URI: Uniform Resource Identifier





DTD: Document Type Definition

IDL: Interface Description Language

OCL: Object Constraint Language

#### **4. Use cases**

The following sections highlight some of the most common framework for network resource property description use case scenarios and are in no way exhaustive.

##### **4.1. Intelligent semantic search**

The traditional search method mainly uses keyword matching to realize the retrieval of information. Therefore, it is difficult for the user to simply use the keyword or keyword string to retrieve the content that he really needs, and the natural language changes with time, region or field. The same concept can be expressed in different language expressions. For the same concept retrieval, different users may use different keywords to query, resulting in a large amount of irrelevant information being returned to the user.

Intelligent semantic search based on framework for network resource property description is an advanced form of information retrieval, which can provide users with search results in an accurate and concise natural language. When the user initiates the query, the search engine will provides unique identities for each resource, map to parse and reason the keywords of the user query, and then map it to one or a set of concepts, and then according to the concept level in the framework.

##### **4.2. Network security situational awareness**

There are many elements involved in cyber security. These elements often play a role in the attack threat. According to the order of context, the layers are progressive, and finally reflect the macro network security situation. The purpose of each element is different, and the network security situation process can be divided into several situational segments. Various situational elements are extracted through network security events.

Network security situational awareness based on framework for network resource property description can be regarded as a specific situational segment. Through the structure of the security situational, the role of various situational elements is hierarchically displayed, enabling managers to grasp the current network security more deeply and accurately.



### **4.3. Network Security**

Network viruses and worms themselves are also a kind of network resources. With the deepening of network opening and complexity, network viruses and worms are evolving constantly, and the characteristics of diversity and spatial discretization are increasing, resulting in a great hidden danger of network security.

The framework for network resources categorization can locate the network resources more accurately and distinguish the benign or malignant network resources, study the process of virus evolution and the possible effects according to the attached attributes , and provide a clearer way to safeguard the operation of network space security, such as anti virus, antivirus and so on.

## **5. Methodology for Network Resources Attribute Description**

### **5.1. Basic Principles**

#### **5.1.1. Scientific principle**

The attribute description should conform to the basic organizational rules of cyberspace resource mapping information. The selection of attribute classification perspective should meet the integration requirements of multi-source cyberspace resource mapping information, and fully take into account the traditional information classification system in various fields, thus covering network mapping information at various levels and fields.

#### **5.1.2. Systematic principle**

The methodology of Attribute description should be designed with good compatibility and can cover the requirements of the attribute representation of network measuring and mapping feature of different scales, different properties and different types. The attribute categorization system should correctly reflect the measuring and mapping feature and the vertical and horizontal architecture attributes. The level of information categorization and grading should be clear and reasonable. The same perspective should be adopted for the categorization of objects at the same level.

#### **5.1.3. Consistency principle**

The design of attribute categorization and description should meet the uniqueness of the measuring and mapping feature attributes of cyberspace resources in the same mapping system, in which the values and units of the physical domain, logical domain and cognitive domain attributes of entities should be consistent with the national and



international standards in related fields. When the scale of resources and attributes in cyberspace is modified and redirected, the description of resource attributes and the relationship between resources and attributes should be stable and semantically consistent.

#### **5.1.4. Scalability principle**

The attribute description, meta property description, resource-attribute relationship description and attribute-attribute relationship description of cyberspace resources are able to perfect and expand when facing the future development of cyberspace, multi-domain information integration and sharing, mapping of unknown resources and user requirements in different fields.

#### **5.2. Attribute description framework**

In this memo, the attributes of cyberspace resources are described by RDF resource description framework, and metadata is described as a data model through XML syntax and RDFS. The basic RDF specification only defines the rules, and does not define the vocabularies for describing resources. It should be refined for practical application in different fields.

RDF uses Web identifiers (URI) to identify things, and attributes and attribute values to describe resources, allowing RDF to represent one or more simple statements about resources as a graph of nodes and arcs, where nodes represent resource and attribute values and arcs represent attributes.

The RDF description for the cyberspace resource attribute consists of a file, resource description, and statement three-level structure, which is serialized by RDF/XML syntax. A file can contain multiple resource descriptions, and a resource description can contain multiple statements, a statement can be expressed as a triplet composed of {subject, predicate, object} in natural language. In the cyberspace resource and the attribute description, the cyberspace resource entity is corresponding to the subject in the triplet, the cyberspace attribute type is corresponding to the predicate in the triplet, and the attribute value is corresponding to the object in the triplet, which constitute the {cyberspace resource entity, cyberspace attribute type, attribute value} triplet can accurately and unambiguously record and describe all the information obtained during the measuring and mapping process.



### **5.3. Description of association rules for attributes description**

The association rules of attributes represent the internal relations between attributes, and the possible associations or relations between things can be found behind the data. Unsupervised machine learning methods commonly found in data mining can be used for knowledge discovery and building knowledge maps. In this memo, various attribute association operations are defined: alias relationship, synonym relationship, ownership relationship, and aggregation relationship.

#### **5.3.1. Alias relationship**

- 1) Relationship name: ch: Alias
- 2) Relational meaning: representing different names of the same attribute
- 3) Constraints: optional
- 4) Range: no specific requirements

#### **5.3.2. Synonym relationship**

- 1) Relationship name: ch: Synonymy
- 2) Relational meaning: representing the same meaning of multiple attributes
- 3) Constraints: optional
- 4) Range: no specific requirements

#### **5.3.3. Ownership relationship**

- 1) Relationship name: ch: Ownership
- 2) Relational meaning: representing the inclusion relationship between attributes
- 3) Constraints: optional
- 4) Range: no specific requirements





#### **5.3.4.    Aggregation relationship**

- 1) Relationship name: ch: Aggregation
- 2) Relational meaning: representing the clustering relationship of multiple attributes
- 3) Constraints: optional
- 4) Range: no specific requirements

#### **5.4.    Meta property**

The meta property is defined as an attribute of a measuring and mapping data attribute, and is used to describe information such as a feature type, a domain, a range, a hierarchy, an aggregate, and a reference attribute.

##### **5.4.1.    Property type**

- 1) Metaproperty name: meta\_property: type
- 2) Metaproperty meaning: Representing the category of an attribute
- 3) Data type: STRING (XML Schema.    STRING)
- 4) Constraints: mandatory
- 5) Range: sub-classification results of attributes

##### **5.4.2.    Property hierarchy**

- 1) Metaproperty name: meta\_property: hierarchy
- 2) Metaproperty meaning: Representing the hierarchy to which the attribute belongs
- 3) Data type: STRING (XML Schema.    STRING)
- 4) Constraints: mandatory
- 5) Range: physics, logic, cognition and society

##### **5.4.3.    Property range**

- 1) Metaproperty name: meta\_property: range
- 2) Metaproperty meaning: Representing the attribute value range



- 3) Data type: STRING (XML Schema. STRING)
- 4) Constraints: mandatory
- 5) Range: depending on the value of the property

#### **5.4.4. Hash of property value**

- 1) Metaproperty name: meta\_property: hash
- 2) Metaproperty meaning: The hash of property
- 3) Data type: INT (XMLSchema.INT)
- 4) Constraints: mandatory
- 5) Range: 8-bit hash

#### **5.4.5. Property keyword**

- 1) Metaproperty name: meta\_property: keyword
- 2) Metaproperty meaning: Keyword that represents the value of the property; if not, fill in null
- 3) Data type: STRING (XML Schema. STRING)
- 4) Constraints: mandatory
- 5) Range: no specific requirements

#### **5.4.6. Rate of property change**

- 1) Metaproperty name: meta\_property: rate
- 2) Metaproperty meaning: Representing the frequency of change of attributes
- 3) Data type: STRING (XML Schema. STRING)
- 4) Constraints: mandatory
- 5) Range: Static, slow change, fast change, change as needed



#### **5.4.7. Property dependency**

- 1) Metaproperty name: meta\_property: depend
- 2) Metaproperty meaning: Representation attribute generation depends on additional attributes.
- 3) Data type: STRING (XML Schema. STRING)
- 4) Constraints: optional
- 5) Range: Other attribute name

### **6. Framework for Network Resources Attribute Description**

According to the state, structure and behavior characteristics of resources at different levels in cyberspace, this memo divides the properties of resources in cyberspace into four categories, namely physical domain, logical domain, cognitive domain and social domain, which are respectively used to describe the explicit and partial implicit characteristics of resources at corresponding levels. In addition to representing the properties of cyberspace resources, the memo also includes nine meta property, which represent the common features of attributes. The attribute description specifies its meaning, data type, range of values, and so on as much as possible.

#### **6.1. Physical domain attributes**

The physical domain attribute represents a subset of features that can be observed, queried, recorded, and measured in the physical space and geospatial of each resource feature constituting the cyberspace. Each attribute value is closely related to the objective existence of the corresponding resource feature in the physical world. Resources are at a higher level, the material basis of services. According to the attribute, the focus of the resource entity is reflected, and further subdivided into basic attributes, electrical attributes and security attributes..

##### **6.1.1. Basic attributes of the entity**

The basic attributes of the entity cover the general characteristics of the naming, identification, location, attribution, appearance, material, and price of the resource in the physical space. Most of the basic attributes of resources of a single entity, once determined, change little during the run and can be considered a more stable base class feature.

name



1) Attribute name: exns\_property: phys\_name

2) Attribute meaning: the name of the entity

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

#### Country

1) Attribute name: exns\_property: phys\_country

2) Attribute meaning: the country of the entity

3) Data type: string (XMLSchema.STRING)

4) Constraint: optional

5) Range of values: meet the GB/T 2659-2000 standard specification

#### Country Code

1) Attribute name: exns\_property: phys\_countrycode

2) Attribute meaning: country code of the entity

3) Data type: string (XMLSchema.STRING)

4) Constraint: optional

5) Range of values: meet the GB/T 2659-2000 standard specification

#### City

1) Attribute name: exns\_property: phys\_city

2) Attribute meaning: the city to which the entity belongs

3) Data type: string (XMLSchema.STRING)

4) Constraint: optional

5) Range of values: meet the GB/T 2659-2000 standard specification

#### Streets





- 1) Attribute name: exns\_property: phys\_street
- 2) Attribute meaning: the street to which the entity belongs
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: optional
- 5) Range of values: meet the GB/T 2659-2000 standard specification

#### Latitude

- 1) Attribute name: exns\_property: phys\_latitude
- 2) Attribute meaning: the geographic latitude of the entity
- 3) Data type: floating point number (XMLSchema.FLOAT)
- 4) Constraint: optional
- 5) Range of values: meet the GB/T 28589-2012 standard specification

#### Longitude

- 1) Attribute name: exns\_property: phys\_longitude
- 2) Attribute meaning: the geographical longitude of the entity
- 3) Data type: floating point number (XMLSchema. FLOAT)
- 4) Constraint: optional
- 5) Range of values: meet the GB/T 28589-2012 standard specification

#### Affiliation

- 1) Attribute name: exns\_property: phys\_organization
- 2) Attribute meaning: the Chinese name of the organization to which the entity belongs
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

#### Manufacturer



- 1) Attribute name: exns\_property: phys\_manufacturer
- 2) Attribute meaning: the manufacturer of the entity
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

Model code

- 1) Attribute name: exns\_property: phys\_entity\_model
- 2) Attribute meaning: the specific model code of the entity
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: required
- 5) Range of values: no specific requirements

Date of manufacture

- 1) Attribute name: exns\_property: phys\_manufacturedata
- 2) Attribute meaning: the date of production of the entity
- 3) Data type: date type (XMLSchema.DATETIME)
- 4) Constraint: optional
- 5) Range of values: meet the GB/T 7408-1994 standard specification

#### **6.1.2. Electrical attributes of the entity**

The electrical attributes of the entity are used to describe the component characteristics, signal characteristics, electrical characteristics, connection characteristics, energy conversion characteristics, etc. necessary for the resource to support the operation of the network space. These characteristics reflect and constrain the realization level of the function and performance of the resource entity at a higher level.

Boot date

- 1) Attribute name: exns\_property: phys\_startdate



- 2) Attribute meaning: the boot date of the entity
- 3) Data type: date type (XMLSchema.DATETIME)
- 4) Constraint: optional
- 5) Range of values: meet the GB/T 7408-1994 standard specification

#### Chip temperature

- 1) Attribute name: exns\_property: phys\_chiptemperature
- 2) Attribute meaning: physical sensor chip temperature
- 3) Data type: floating point number (XMLSchema.FLOAT)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

#### Power consumption

- 1) Attribute name: exns\_property: phys\_power
- 2) Attribute meaning: average power consumption of physical work
- 3) Data type: floating point number (XMLSchema.FLOAT)
- 4) Constraint: optional
- 5) Range of values: greater than zero

#### Input voltage

- 1) Attribute name: exns\_property: phys\_inputvoltage
- 2) Attribute meaning: physical input voltage
- 3) Data type: floating point number (XMLSchema.FLOAT)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

#### The output voltage

- 1) Attribute name: exns\_property: phys\_outputvoltage



- 2) Attribute meaning: the output voltage of the entity
- 3) Data type: floating point number (XMLSchema.FLOAT)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

#### Input Current

- 1) Attribute name: exns\_property: phys\_inputcurrent
- 2) Attribute meaning: physical input current
- 3) Data type: floating point number (XMLSchema.FLOAT)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

#### Output current

- 1) Attribute name: exns\_property: phys\_outputcurrent
- 2) Attribute meaning: the output current of the entity
- 3) Data type: floating point number (XMLSchema.FLOAT)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

#### Baud rate

- 1) Attribute name: exns\_property: phys\_baudrate
- 2) Attribute meaning: physical serial communication baud rate
- 3) Data type: floating point number (XMLSchema.FLOAT)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

#### Firmware

- 1) Attribute name: exns\_property: phys\_firmware





- 2) Attribute meaning: firmware version of the entity
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

#### **6.1.3. Environmental adaptation attributes of the entity**

The environmental adaptation attributes of the entity reflect the relevant characteristics of the entity itself to avoid the impact and destruction of the source from the physical world in anticipation and unanticipated circumstances, and to avoid the disruption of the integrity and availability of its functions within certain limits, and reflects the self-protection ability of the entity in the physical world.

##### Stability

- 1) Attribute name: exns\_property: phys\_safe\_stability
- 2) Attribute meaning: characterize the stability of the entity in the physical domain
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

##### Heat resistance

- 1) Attribute name: exns\_property: phys\_ safe\_heatresistance
- 2) Attribute meaning: characterize the heat resistance of the entity in the physical domain, the highest temperature at which the entity works normally.
- 3) Data type: floating point number (XMLSchema. FLOAT)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

##### High frequency oscillation

- 1) Attribute name: exns\_property: phys\_ safe\_oscillationresistance



2) Attribute meaning: characterize the highest oscillation frequency that the entity can withstand

3) Data type: floating point number (XMLSchema. FLOAT)

4) Constraint: optional

5) Range of values: no specific requirements

Resistance to surge

1) Attribute name: exns\_property: phys\_ safe\_surgeresistance

2) Attribute meaning: characterizing the immunity of the entity in the physical domain

3) Data type: string (XMLSchema.STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Corrosion resistance

1) Attribute name: exns\_property: phys\_ safe\_corrosionistance

2) Attribute meaning: characterize the corrosion resistance of the entity in the physical domain

3) Data type: string (XMLSchema.STRING)

4) Constraint: optional

5) Range of values: no specific requirements

## **6.2. logical domain attributes**

The logical attributes describe the characteristics inherent, endowed, maintained or changed in the process of the generation, transmission, storage, exchange, use and clearing of the data and information of the various resource features constituting the cyberspace. Including the basic attributes of network equipment, network service attributes, network performance attributes, network topology attributes and network security attributes.



### **6.2.1. Basic attributes of network devices**

The basic attributes of network devices are the basic characteristics of the naming, address, structure and composition of resource entities in cyberspace, which are used to realize the ability of identification, query and communication, etc., and are generally shared by all network devices.

MAC address

- 1) Attribute name: exns\_property: logi\_mac
- 2) Attribute meaning: MAC address of the network device
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: required
- 5) Range of values: conforms to the unified mac address format provided by TCP/IP protocol

IP address

- 1) Attribute name: exns\_property: logi\_ip
- 2) Attribute meaning: IP address of the network device
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: required
- 5) Range of values: in accordance with IP address notation

Subnet mask

- 1) Attribute name: exns\_property: logi\_mask
- 2) Attribute meaning: subnet mask of the network device
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: required
- 5) Range of values: conforms to the subnet mask representation specification

Gateway address



- 1) Attribute name: exns\_property: logi\_gateway
- 2) Attribute meaning: gateway address of the network device
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: required
- 5) Range of values: in accordance with IP address notation

DNS address

- 1) Attribute name: exns\_property: logi\_dns
- 2) Attribute meaning: domain name server address of the network device
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: required
- 5) Range of values: in accordance with IP address notation

DHCP address

- 1) Attribute name: exns\_property: logi\_dhcp
- 2) Attribute meaning: Dynamic allocation of IP server address of network device
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: optional
- 5) Range of values: in accordance with IP address notation

host name

- 1) Attribute name: exns\_property: logi\_hostname
- 2) Attribute meaning: host name of the network device
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements





domain name

- 1) Attribute name: exns\_property: logi\_domain
- 2) Attribute meaning: the name of the domain to which the network device belongs
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

#### **6.2.2. Attributes of network services**

The attributes of network services are used to describe the mechanism, mode, scope, condition and other characteristics of the interaction between entity resources and other entities in the network, including but not limited to the processes of establishing connections, providing data, obtaining data, and transferring data.

Data Format

- 1) Attribute name: exns\_property: logi\_datatype
- 2) Attribute meaning: end-to-end data format
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

Projection entity

- 1) Attribute name: exns\_property: logi\_projectiveentity
- 2) Attribute meaning: network equipment providing network services
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

Service type

- 1) Attribute name: exns\_property: logi\_servicetype



2) Attribute meaning: the protocol type of the network service, for example: ftp, http, https, etc.

3) Data type: string (XMLSchema.STRING)

4) Constraint: optional

5) Range of values: no specific requirements

#### Known port

1) Attribute name: exns\_property: logi\_port \_wellknow

2) Attribute meaning: a recognized port open to the network device

3) Data type: integer array (XMLSchema.INT)

4) Constraint: optional

5) Range of values: range from 0 to 1023

#### Registered port

1) Attribute name: exns\_property: logi\_port\_registered

2) Attribute meaning: the registered port of the network device is open to the outside world.

3) Data type: integer array (XMLSchema.INT)

4) Constraint: optional

5) Range of values: range from 1024 to 49151

#### Dynamic port

1) Attribute name: exns\_property: logi\_port \_dynamic

2) Attribute meaning: dynamic port open to network devices

3) Data type: integer array (XMLSchema.INT)

4) Constraint: optional

5) Range of values: ranging from 49152 to 65535

#### Port banner information



- 1) Attribute name: exns\_property: logi\_port\_banner
- 2) Attribute meaning: banner information that the network device is open to the outside world
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

#### Port rate

- 1) Attribute name: exns\_property: logi\_port\_rate
- 2) Attribute meaning: real-time rate of network device open port
- 3) Data type: floating point number (XMLSchema.FLOAT)
- 4) Constraint: optional
- 5) Range of values: rate statistics should be greater than zero, generally in MB/S units

#### Port throughput

- 1) Attribute name: exns\_property: logi\_port\_flux
- 2) Attribute meaning: traffic statistics of network device open ports
- 3) Data type: floating point number (XMLSchema.FLOAT)
- 4) Constraint: optional
- 5) Range of values: Traffic statistics should be greater than zero, generally in MB units

#### Port transfer protocol

- 1) Attribute name: exns\_property: logi\_port\_transportprotocol
- 2) Attribute meaning: the transmission protocol of the open port of the network device, for example: udp, tcp, etc.
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: optional



- 5) Range of values: no specific requirements

Service address

- 1) Attribute name: exns\_property: logi\_url
- 2) Attribute meaning: the access address provided by the network service
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

### **6.2.3. Attributes of network performance**

The attributes of network performance are used to describe the different characteristics of capacity, efficiency and ability of resource entities to perform various logical domain network operations and activities, which can indirectly reflect the value and importance of resources in cyberspace.

Backplane bandwidth

- 1) Attribute name: exns\_property: logi\_backplane\_bandwidth
- 2) Attribute meaning: backplane bandwidth of the network device
- 3) Data type: floating point number (XMLSchema.FLOAT)
- 4) Constraint: optional
- 5) Range of values: greater than zero

Packet forwarding rate

- 1) Attribute name: exns\_property: logi\_forwarding\_rate
- 2) Attribute meaning: packet forwarding rate of network devices
- 3) Data type: floating point number (XMLSchema.FLOAT)
- 4) Constraint: optional
- 5) Range of values: greater than zero

Forwarding delay





- 1) Attribute name: exns\_property: logi\_forwarding\_delay
- 2) Attribute meaning: forwarding delay of network equipment
- 3) Data type: floating point number (XMLSchema.FLOAT)
- 4) Constraint: optional
- 5) Range of values: greater than zero

QoS packet forwarding rate

- 1) Attribute name: exns\_property: logi\_qosforwarding\_rate
- 2) Attribute meaning: qos packet forwarding rate of network devices
- 3) Data type: floating point number (XMLSchema.FLOAT)
- 4) Constraint: optional
- 5) Range of values: greater than zero

Packet loss rate

- 1) Attribute name: exns\_property: logi\_packet\_loss
- 2) Attribute meaning: packet loss rate of network devices
- 3) Data type: floating point number (XMLSchema.FLOAT)
- 4) Constraint: optional
- 5) Range of values: percentage

Throughput

- 1) Attribute name: exns\_property: logi\_throughput
- 2) Attribute meaning: throughput of network equipment
- 3) Data type: floating point number (XMLSchema.FLOAT)
- 4) Constraint: optional
- 5) Range of values: greater than zero

Maximum bandwidth



- 1) Attribute name: exns\_property: logi\_max\_bandwidth
- 2) Attribute meaning: the maximum bandwidth of the network device
- 3) Data type: floating point number (XMLSchema.FLOAT)
- 4) Constraint: optional
- 5) Range of values: greater than zero

Maximum number of connections

- 1) Attribute name: exns\_property: logi\_max\_link
- 2) Attribute meaning: the maximum number of connections of the network device
- 3) Data type: integer (XMLSchema.INT)
- 4) Constraint: optional
- 5) Range of values: greater than zero

Link rate

- 1) Attribute name: exns\_property: logi\_link\_rate
- 2) Attribute meaning: the amount of information transmitted on the link per unit time
- 3) Data type: floating point number (XMLSchema.FLOAT)
- 4) Constraint: optional
- 5) Range of values: greater than zero

Transmission delay

- 1) Attribute name: exns\_property: logi\_transmission\_delay
- 2) Attribute meaning: transmission delay of network equipment
- 3) Data type: floating point number (XMLSchema.FLOAT)
- 4) Constraint: optional
- 5) Range of values: greater than zero



#### Operating mode

- 1) Attribute name: exns\_property: logi\_working\_mode
- 2) Attribute meaning: working mode of network equipment
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: optional
- 5) Range of values: full or half duplex

#### **6.2.4. Attributes of network topology**

The attributes of network topology are used to describe self-formed, human-made or on-demand configured topology features consisting of multiple resource entities and links containing a certain structure. Such attributes usually reflect the state, development and law of the static and dynamic structure of corresponding cyberspace resources.

#### Autonomous domain name

- 1) Attribute name: exns\_property: logi\_as\_name
- 2) Attribute meaning: the naming of the autonomous domain of the entity
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: optional
- 5) Range of values: global autonomous domain

#### Autonomous domain number

- 1) Attribute name: exns\_property: logi\_asn
- 2) Attribute meaning: the autonomous system asn number of the entity
- 3) Data type: number (XMLSchema.INT)
- 4) Constraint: optional
- 5) Range of values: Global Autonomous System ASN numbering table

#### Autonomous domain type

- 1) Attribute name: exns\_property: logi\_asn\_type



2) Attribute meaning: the AS type of the autonomous system to which the entity belongs

3) Data type: string (XMLSchema.STRING)

4) Constraint: optional

5) Range of values: type of autonomous domain

#### ISP

1) Attribute name: exns\_property: isp

2) Attribute meaning: entity's Internet service provider

3) Data type: string (XMLSchema.STRING)

4) Constraint: optional

5) Range of values: no specific requirements

#### Route prefix

1) Attribute name: exns\_property: logi\_routedprefix

2) Attribute meaning: the route prefix of the entity

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: Specification format conforming to IP plus mask

#### Router level

1) Attribute name: exns\_property: logi\_router\_level

2) Attribute meaning: The level of the router in the network, for example: access level, aggregation level, backbone level, and so on.

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

#### Number of network nodes





- 1) Attribute name: exns\_property: logi\_nodenum
- 2) Attribute meaning: the number of nodes in the entity's network
- 3) Data type: integer (XMLSchema. INT)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

Number of network sides

- 1) Attribute name: exns\_property: logi\_edgenumber
- 2) Attribute meaning: the number of connected sides in the entity's network
- 3) Data type: integer (XMLSchema. INT)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

Center degree

- 1) Attribute name: exns\_property: logi\_centerdegree
- 2) Attribute meaning: the central degree of the network segment
- 3) Data type: integer (XMLSchema. INT)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

Node degree

- 1) Attribute name: exns\_property: logi\_nodedegree
- 2) Attribute meaning: the node degree of the network segment
- 3) Data type: integer (XMLSchema. INT)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

AS boundary



- 1) Attribute name: exns\_property: logi\_as\_edge
- 2) Attribute meaning: whether the router is an as border router
- 3) Data type: Boolean (XMLSchema.BOOLEAN)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

#### Country gateway

- 1) Attribute name: exns\_property: logi\_nationalgateway
- 2) Attribute meaning: whether the network device is a country gateway
- 3) Data type: Boolean (XMLSchema.BOOLEAN)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

#### Segment address

- 1) Attribute name: exns\_property: logi\_segment\_address
- 2) Attribute meaning: address information of the network segment
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

#### Segment mask

- 1) Attribute name: exns\_property: logi\_segment\_mask
- 2) Attribute meaning: mask information of the network segment
- 3) Data type: string (XMLSchema.STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

#### Network segment router number



- 1) Attribute name: exns\_property: logi\_ segment\_router
- 2) Attribute meaning: router number information of the network segment
- 3) Data type: integer (XMLSchema. INT)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

Network segment IP number

- 1) Attribute name: exns\_property: logi\_ segment \_num
- 2) Attribute meaning: the number of IP addresses contained in the network segment
- 3) Data type: integer (XMLSchema. INT)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

Neighbor network segment

- 1) Attribute name: exns\_property: logi\_ segment \_ neighbor
- 2) Attribute meaning: whether the router is an anonymous router
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

Topology

- 1) Attribute name: exns\_property: logi\_ topological
- 2) Attribute meaning: network topology
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: bus type, ring, star type



#### **6.2.5. Attributes of network security**

The attributes of network security reflect the ability of entity itself to the expected and unexpected response to information from the data under the condition of operation, the influence of the exchange and transfer the source and damage, in a certain limits to avoid its function of integrity, and availability is damaged, or their own responsible for generation and transmission or processing the confidentiality, integrity and availability of information related to the characteristics of the damage. These attributes represent the self-protection and information protection capabilities of entities in the logical domain of cyberspace.

##### Encryption Algorithm

- 1) Attribute name: exns\_property: logi\_ safe\_ encryptionalgorithm
- 2) Attribute meaning: encryption algorithm for data transmission
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: AES, DES, RSA

##### Key length

- 1) Attribute name: exns\_property: logi\_ safe\_ keylength
- 2) Attribute meaning: key length of the encryption algorithm
- 3) Data type: integer (XMLSchema. INT)
- 4) Constraint: optional
- 5) Range of values: 64, 128, 256

##### Key replacement time

- 1) Attribute name: exns\_property: logi\_ safe\_ keychangetime
- 2) Attribute meaning: key replacement time
- 3) Data type: date type (XMLSchema.DATETIME)
- 4) Constraint: optional
- 5) Range of values: meet the GB/T 7408-1994 standard specification





## Key distribution mechanism

- 1) Attribute name: exns\_property: logi\_ safe\_ keydistribution
- 2) Attribute meaning: key replacement time
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

## Authentication method

- 1) Attribute name: exns\_property: logi\_ safe\_ authenticationmethod
- 2) Attribute meaning: the identity authentication method adopted by the security system
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: one-way, two-way

## Authentication mechanism

- 1) Attribute name: exns\_property: logi\_ safe\_ authenticationmechanism
- 2) Attribute meaning: the identity authentication mechanism adopted by the security system
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: password, certificate, bio, hybrid

## Authentication requirements

- 1) Attribute name: exns\_property: logi\_ safe\_ authenticationrequire
- 2) Attribute meaning: identity authentication requirements adopted by the security system
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional



5) Range of values: USBKey, digital certificate, trusted module

#### Certificate type

1) Attribute name: exns\_property: logi\_ safe\_certificatetype

2) Attribute meaning: the type of identity authentication certificate adopted by the security system

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: X.509, LDAP

#### Access control type

1) Attribute name: exns\_property: logi\_ safe\_ accesscontroltype

2) Attribute meaning: the type of access control adopted by the security system

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: MAC, DAC, RBAC, ABAC, IBAC

#### Security policy level

1) Attribute name: exns\_property: logi\_ safe\_ policylevel

2) Attribute meaning: the policy level adopted by the security system

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: high, medium and low

#### Patch update time

1) Attribute name: exns\_property: logi\_ safe\_ patchupdatetime

2) Attribute meaning: system patch update time

3) Data type: date type (XMLSchema.DATETIME)



4) Constraint: optional

5) Range of values: meet the GB/T 7408-1994 standard specification

#### Patch installation

1) Attribute name: exns\_property: logi\_ safe\_ patchinfo

2) Attribute meaning: system patch installation patch, including installed patches and no patches installed

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

#### Patch source address

1) Attribute name: exns\_property: logi\_ safe\_ patchaddr

2) Attribute meaning: the address of the system patch download

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

#### Patch update mechanism

1) Attribute name: exns\_property: logi\_ safe\_ patchmethod

2) Attribute meaning: the way the system patch is updated

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: subscription, push, offline

#### Firewall type

1) Attribute name: exns\_property: logi\_ safe\_ firewalltype

2) Attribute meaning: the way the system patch is updated

3) Data type: string (XMLSchema. STRING)



4) Constraint: optional

5) Range of values: operating system comes with, host firewall, no firewall

#### Intrusion detection type

1) Attribute name: exns\_property: logi\_ safe\_idstype

2) Attribute meaning: type of intrusion detection adopted by the security system

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: None, HIDS, NIDS, IPS

#### Host monitoring type

1) Attribute name: exns\_property: logi\_ safe\_monitortype

2) Attribute meaning: Host monitoring type adopted by the security system

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: None, Behavior, Network, All

#### Security audit mechanism

1) Attribute name: exns\_property: logi\_ safe\_audittype

2) Attribute meaning: the type of security audit adopted by the security system

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: None, traffic, protocol, behavior

#### Security management port

1) Attribute name: exns\_property: logi\_ safe\_adminport





2) Attribute meaning: the management interface provided by the security system

3) Data type: integer (XMLSchema.INT)

4) Constraint: optional

5) Range of values: 0-65535

Security management method

1) Attribute name: exns\_property: logi\_safe\_admintype

2) Attribute meaning: the security management organization or company adopted by the security system

3) Data type: string (XMLSchema.STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Security management mechanism

1) Attribute name: exns\_property: logi\_safe\_adminmethod

2) Attribute meaning: the security management mechanism adopted by the security system

3) Data type: string (XMLSchema.STRING)

4) Constraint: optional

5) Range of values: peer, cascade, autonomous

### **6.3. Cognitive domain attributes**

The subject attributes in the cognitive domain are quite different from the physical domain and the logical domain, mainly reflecting the knowledge, thoughts, emotions and beliefs acquired, exchanged and formed by the projected entities in cyberspace in the form of virtual subjects in the cognitive domain. Due to the use of the diversity of the subject and the object information semantic complexity greatly deepened, and the related attributes with more categories, mainly includes the basic attributes of the virtual subject, the basic attributes of the projected entity, the behavioral attributes of the virtual subject, and the projection. The emotional attributes of the projected entity, the conceptual attributes of the projected entity,



the attributes of the web service content, and the attributes of the data resource content, etc.

#### **6.3.1. Cognitive domain attributes**

The basic attributes of the virtual subject are used to describe the effective and meaningful assets, status and activity information of the virtual subject only in the cyberspace category. This information is stored and maintained by various network services, and thus has the characteristics of volatility and variability.

Virtual principal account

- 1) Attribute name: exns\_property: cogi\_virtualsubject\_id
- 2) Attribute meaning: virtual subject account
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: required
- 5) Range of values: no specific requirements

Virtual principal password

- 1) Attribute name: exns\_property: cogi\_virtualsubject\_password
- 2) Attribute meaning: the password of the virtual subject's account
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

Virtual subject location

- 1) Attribute name: exns\_property: cogi\_virtualsubject\_place
- 2) Attribute meaning: the login location of the virtual subject
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: meet the GB/T 2659-2000 standard specification

Virtual body login time



1) Attribute name: exns\_property: cogi\_virtualsubject\_date

2) Attribute meaning: login time of virtual subject

3) Data type: date type (XMLSchema.DATETIME)

4) Constraint: optional

5) Range of values: meet the GB/T 7408-1994 standard specification

Virtual subject online time

1) Attribute name: exns\_property: cogi\_virtualsubject\_onelinetime

2) Attribute meaning: online time of virtual subject

3) Data type: date type (XMLSchema.DATETIME)

4) Constraint: optional

5) Range of values: meet the GB/T 7408-1994 standard specification

Virtual subject registration time

1) Attribute name: exns\_property: cogi\_virtualsubject\_registeddate

2) Attribute meaning: registration time of virtual subject

3) Data type: date type (XMLSchema.DATETIME)

4) Constraint: optional

5) Range of values: meet the GB/T 7408-1994 standard specification

Virtual principal name

1) Attribute name: exns\_property: cogi\_virtualsubject\_name

2) Attribute meaning: the name of the virtual subject

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Virtual body type



1) Attribute name: exns\_property: cogi\_virtualsubject\_type

2) Attribute meaning: type of virtual subject

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Virtual subject role

1) Attribute name: exns\_property: virtualsubject\_function

2) Attribute meaning: virtual subject works in virtual group

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Virtual subject activity

1) Attribute name: exns\_property: cogi\_virtualsubject\_activity

2) Attribute meaning: the activity of the virtual subject in the virtual group

3) Data type: floating point type (XMLSchema.FLOAT)

4) Constraint: optional

5) Range of values: no specific requirements

Virtual principal platform

1) Attribute name: exns\_property: cogi\_virtualsubject\_platform

2) Attribute meaning: the platform where the virtual subject is located

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements





### **6.3.2. Basic attributes of the projected entity**

The basic attributes of the projected entity are used to characterize the various characteristics of natural persons that exist in the physical world that participate in the activities of cyberspace, use the services of cyberspace, and manage the states of cyberspace. The basic attributes of the projected entity can guide and regulate the basic attributes of related virtual subjects.

The name of the projection entity

- 1) Attribute name: exns\_property: cogi\_mappingentity\_name
- 2) Attribute meaning: the name of the projection entity
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

Projecting entity gender

- 1) Attribute name: exns\_property: cogi\_mappingentity\_sex
- 2) Attribute meaning: the gender of the projected entity
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: male/female

Projection entity's ID number

- 1) Attribute name: exns\_property: cogi\_mappingentity\_id
- 2) Attribute meaning: the document number of the projection entity
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: Code number specification for nationality

Projection entity occupation

- 1) Attribute name: exns\_property: cogi\_mappingentity\_profession



- 2) Attribute meaning: the occupation of the projection entity
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

The social level of the projected entity

- 1) Attribute name: exns\_property: cogi\_mappingentity\_sociallevel
- 2) Attribute meaning: the social level of the projected entity
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: medium, low, high level

The age of the projected entity

- 1) Attribute name: exns\_property: cogi\_mappingentity\_age
- 2) Attribute meaning: age of the projection entity
- 3) Data type: integer (XMLSchema.INT)
- 4) Constraint: optional
- 5) Range of values: greater than zero

Nationality of the projected entity

- 1) Attribute name: exns\_property: cogi\_mappingentity\_nationality
- 2) Attribute meaning: nationality of the projection entity
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: meet the GB/T 2659-2000 standard specification

The language of the projected entity

- 1) Attribute name: exns\_property: cogi\_mappingentity\_language



- 2) Attribute meaning: common language of the projection entity
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

Projecting entity accent

- 1) Attribute name: exns\_property: mappingentity\_accent
- 2) Attribute meaning: accent of the projected entity
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

Projecting the skin's skin tone

- 1) Attribute name: exns\_property: cogi\_mappingentity\_ colour
- 2) Attribute meaning: the skin color of the projected entity
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

Projected entity

- 1) Attribute name: exns\_property: cogi\_mappingentity\_ posture
- 2) Attribute meaning: the body state of the projected entity
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

The health of the projected entity

- 1) Attribute name: exns\_property: cogi\_mappingentity\_ health



2) Attribute meaning: the health of the projected entity

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: excellent / good / poor

Projecting entity intelligence

1) Attribute name: exns\_property: cogi\_mappingentity\_intelligence

2) Attribute meaning: the intelligence level of the projected entity

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: excellent / good / poor

#### **6.3.3. Behavioral attributes of the virtual subject**

The behavioral attributes of the virtual subject are used to describe the behavioral choices, behavioral rules, behavioral effects and other characteristics of the virtual subject when it participates in various activities in the cyberspace, and represent the trajectory and influence of the virtual subject in the cyberspace.

Virtual subject access preferences

1) Attribute name: exns\_property: cogi\_mappingentity\_preference

2) Attribute meaning: a frequently visited URL that characterizes a virtual subject

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: URL

Total number of tweets for virtual subjects

1) Attribute name: exns\_property: cogi\_mappingentity\_blog\_num

2) Attribute meaning: total number of tweets that represent virtual subjects





3) Data type: integer (XMLSchema.INT)

4) Constraint: optional

5) Range of values: greater than zero

Original tweet proportion of virtual subject

1) Attribute name: exns\_property: cogi\_mappingentity\_blog\_original

2) Attribute meaning: the proportion of original tweets that characterize the virtual subject

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: percentage

Number of concerns of the virtual subject

1) Attribute name: exns\_property: cogi\_mappingentity\_blog\_concerns

2) Attribute meaning: the number of concerns that characterize the essay of the virtual subject

3) Data type: integer (XMLSchema.INT)

4) Constraint: optional

5) Range of values: greater than zero

Number of fans of virtual subjects

1) Attribute name: exns\_property: cogi\_mappingentity\_blog\_fans

2) Attribute meaning: the number of fans who represent the virtual subject

3) Data type: integer (XMLSchema.INT)

4) Constraint: optional

5) Range of values: greater than zero

Topic engagement of virtual subjects



1) Attribute name: exns\_property:  
cogi\_mappingentity\_blog\_participation

2) Attribute meaning: characterizing the topic participation of the virtual subject

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: strong, general, indifferent

Text usage preferences of virtual subjects

1) Attribute name: exns\_property: cogi\_mappingentity\_text\_preference

2) Attribute meaning: characterizing the text usage preferences of the virtual subject

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: URL

Average dynamic number of virtual subjects

1) Attribute name: exns\_property: cogi\_mappingentity\_dynamic\_num

2) Attribute meaning: the average dynamic number of the virtual subject

3) Data type: integer (XMLSchema.INT)

4) Constraint: optional

5) Range of values: greater than zero

Number of comments by virtual subject

1) Attribute name: exns\_property: cogi\_mappingentity\_blog\_comment

2) Attribute meaning: the number of Weibo comments that represent the virtual subject

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional



5) Range of values: URL

The tweet of the virtual subject

1) Attribute name: exns\_property: cogi\_mappingentity\_blog\_praisenum

2) Attribute meaning: the microblogging point number that represents the virtual subject

3) Data type: integer (XMLSchema.INT)

4) Constraint: optional

5) Range of values: greater than zero

The number of tweets forwarded by the virtual principal

1) Attribute name: exns\_property: cogi\_mappingentity\_blog\_forwardnum

2) Attribute meaning: the number of tweets forwarded to the virtual subject

3) Data type: integer (XMLSchema.INT)

4) Constraint: optional

5) Range of values: greater than zero

#### **6.3.4. Emotional attributes of the projected entity**

The emotional attributes of the projected entity are used to characterize the long-term, relatively stable inner emotional tendency and temperament characteristics of the projected entity formed in the growth and living environment, which can directly and indirectly affect the concept, view, thought and behavior of the projected entity in the cyberspace. The difference between emotional attributes and conceptual attributes is that emotional attributes are often contained by themselves, from the outside to the inside, while conceptual attributes are summarized from the inside to the outside for the characteristics of objects and objects.

Reflexive spirit of the projection entity

1) Attribute name: exns\_property: cogi\_mappingentity\_spirit

2) Attribute meaning: the degree of rebellious spirit of the projected entity



3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: strong, general, weak

Projection entity happiness

1) Attribute name: exns\_property: cogi\_mappingentity\_ happiness

2) Attribute meaning: the degree of characterization of the happiness of the projected entity

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: strong, general, unhappy

Projection entity pride

1) Attribute name: exns\_property: cogi\_mappingentity\_ride

2) Attribute meaning: the degree of characterization of the happiness of the projected entity

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: strong, general, inferior

Projection entity security

1) Attribute name: exns\_property: cogi\_mappingentity\_ safty

2) Attribute meaning: the degree of security of the projected entity

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: strong, general, insecure

Projection entity

1) Attribute name: exns\_property: cogi\_mappingentity\_ belonging





2) Attribute meaning: the degree of attribution of the sense of belonging of the projected entity

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: strong, general, no sense of belonging

Projection entity's sense of humor

1) Attribute name: exns\_property: cogi\_mappingentity\_ humor

2) Attribute meaning: the degree of humor that characterizes the projected entity

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: humor, general, old-fashioned

Projection entity's internal and external directions

1) Attribute name: exns\_property: cogi\_mappingentity\_ internal

2) Attribute meaning: the degree of internal and external characterization of the projected entity

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: introverted, general, outgoing

Projection entity's self-esteem

1) Attribute name: exns\_property: cogi\_mappingentity\_ selfrespect

2) Attribute meaning: the degree of self-esteem of the projected entity

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: strong, general, no self-esteem



#### Projection entity self-confidence

- 1) Attribute name: exns\_property: cogi\_mappingentity\_ selfconfidence
- 2) Attribute meaning: the degree of self-confidence that characterizes the projected entity
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: strong, general, no confidence

#### **6.3.5. Conceptual attributes of the projected entity**

The conceptual attribute of the projected entity is used to describe the tensional views, opinions and choices of the projected entity for various objects, relationships, phenomena and laws in the real world, the virtual world and the spiritual world, which are the psychological basis for virtual subjects to carry out various activities in cyberspace. The difference between the conceptual attribute and the affective attribute is that the conceptual attribute must contain one or more object objects, which are concluded from the inner to the outer features, while the affective attribute is usually independent of the object objects, while the projected entity itself contains the mental state from the outer to the inner.

#### Projection entity patriotism

- 1) Attribute name: exns\_property: cogi\_mappingentity\_patriotism
- 2) Attribute meaning: the degree of love of the motherland that represents the projection entity
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: fanaticism, affection, generality, indifference, disgust

#### The political claim of the projection entity

- 1) Attribute name: exns\_property: cogi\_mappingentity\_ political
- 2) Attribute meaning: the political claim of the projection entity



3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

The ideology orientation of the projection entity

1) Attribute name: exns\_property: cogi\_mappingentity\_ ideology

2) Attribute meaning: the ideology of the projected entity

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Party orientation of the projection entity

1) Attribute name: exns\_property: cogi\_mappingentity\_ party

2) Attribute meaning: the party in which the projection entity participates

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Social group orientation of projection entities

1) Attribute name: exns\_property: cogi\_mappingentity\_ group

2) Attribute meaning: social groups in which the projection entity participates

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Projection entity belief

1) Attribute name: exns\_property: cogi\_mappingentity\_ belief



2) Attribute meaning: the belief of the projection entity

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Projection entity values

1) Attribute name: exns\_property: cogi\_mappingentity\_ values

2) Attribute meaning: the belief of the projection entity

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Projection entity's outlook on life

1) Attribute name: exns\_property: cogi\_mappingentity\_ life

2) Attribute meaning: the outlook of life of the projected entity

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

#### **6.3.6. Attributes of the web service content**

The attributes of the web service content are used to characterize the types, scopes, capabilities, mechanisms of resource entities to generate, receive, accommodate, transmit and provide information content at the cognitive level. As the carrier of the data resource, the attributes of the network service content determine the basic information of relevant forms, structures, uses and virtual subjects of the data resources on it.

The name of the service content

1) Attribute name: exns\_property: cogi\_networkservice\_ name

2) Attribute meaning: the name of the external service provided by the network service





- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

#### Service content function

- 1) Attribute name: exns\_property: cogi\_networkservice\_function
- 2) Attribute meaning: external service function of network service
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

#### Audience of service content

- 1) Attribute name: exns\_property: cogi\_networkservice\_audience
- 2) Attribute meaning: the audience of the external service provided by the network service
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

#### Publisher of service content

- 1) Attribute name: exns\_property: cogi\_networkservice\_publisher
- 2) Attribute meaning: the publisher of the external service of the network service
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

#### Editor of the service content

- 1) Attribute name: exns\_property: cogi\_networkservice\_editor



2) Attribute meaning: the editor of the external service of the network service

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Form of service content

1) Attribute name: exns\_property: cogi\_networkservice\_ type

2) Attribute meaning: the form of external service provided by network service

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Service content release time

1) Attribute name: exns\_property: cogi\_networkservice\_ date

2) Attribute meaning: the release time of the content of the network service

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: meet the GB/T 7408-1994 standard specification

#### **6.3.7. Attributes of the data resource content**

The attributes of the data resource content are used to characterize the various characteristics that the data resource can be recognized by other projected entities at the content level. It can be used to establish a wide range of correlations between content and content, between content and resources, and between content and projected entities/virtual subjects.

Content publisher

1) Attribute name: exns\_property: cogi\_content\_ publisher



2) Attribute meaning: the content of the cloth

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Speed of content

1) Attribute name: exns\_property: cogi\_content\_ speed

2) Attribute meaning: the speed of content propagation

3) Data type: floating point number (XMLSchema.FLOAT)

4) Constraint: optional

5) Range of values: no specific requirements

Emotional color of content

1) Attribute name: exns\_property: cogi\_content\_ emotion

2) Attribute meaning: the emotional color conveyed by the content

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Content impact

1) Attribute name: exns\_property: cogi\_content\_ effect

2) Attribute meaning: the social influence brought by the content

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Content evaluation

1) Attribute name: exns\_property: cogi\_content\_ evaluate



2) Attribute meaning: evaluation of content

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Content operation form

1) Attribute name: exns\_property: cogi\_content\_ form

2) Attribute meaning: the operating form of the content

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Legality of content

1) Attribute name: exns\_property: cogi\_content\_ legality

2) Attribute meaning: whether the content complies with relevant laws and regulations

3) Data type: Boolean (XMLSchema. BOOLEAN)

4) Constraint: optional

5) Range of values: no specific requirements

Value orientation of content

1) Attribute name: exns\_property: cogi\_content\_ value

2) Attribute meaning: content value orientation

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Content ethics

1) Attribute name: exns\_property: cogi\_content\_ ethics





2) Attribute meaning: the ethical influence of content

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Field of content

1) Attribute name: exns\_property: cogi\_content\_ domain

2) Attribute meaning: the domain of the content

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Political color of content

1) Attribute name: exns\_property: cogi\_content\_ political

2) Attribute meaning: the political color of content

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Ideology of content

1) Attribute name: exns\_property: cogi\_content\_ ideology

2) Attribute meaning: the ideology of content reaction

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Authenticity of content

1) Attribute name: exns\_property: cogi\_content\_ truth



- 2) Attribute meaning: the authenticity of the content
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

#### **6.4. social domain attributes**

The social domain attribute is used to describe various social groups (especially virtual crowd) with strong sociality in the cyberspace, and to describe the new features that emerge after multiple virtual subjects gather into groups due to internal factors such as emotions and concepts, or external factors such as events and pressures.

##### **6.4.1. Attributes of virtual crowd**

The virtual crowd refers to a new type of organization with the same interest and similar ideas formed by the virtual network as the medium and relying on the network social media. It consists of two layers: one is the networking of the realistic group, which is the extension of the realistic group in the cyberspace; the second is the group born based on the network, that is, the group bound by and because of the network.

Organization name of the virtual crowd

- 1) Attribute name: exns\_property: soci\_virtualcrowd\_name
- 2) Attribute meaning: the organization name of the virtual crowd
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional
- 5) Range of values: no specific requirements

Common interest of the virtual crowd

- 1) Attribute name: exns\_property: soci\_virtualcrowd \_ support
- 2) Attribute meaning: the common interest of the virtual crowd, the source of formation
- 3) Data type: string (XMLSchema. STRING)
- 4) Constraint: optional



5) Range of values: no specific requirements

#### Virtual crowd ID

1) Attribute name: exns\_property: soci\_virtualcrowd \_ id

2) Attribute meaning: the unique ID of the virtual crowd in cyberspace

3) Data type: integer (XMLSchema. INT)

4) Constraint: optional

5) Range of values: no specific requirements

#### Virtual crowd gathering place

1) Attribute name: exns\_property: soci\_virtualcrowd \_ place

2) Attribute meaning: virtual crowd in the network gathering place, WeChat group / Weibo / forum / chat room / live room

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

#### Virtual population connection strength

1) Attribute name: exns\_property: soci\_virtualcrowd \_ link

2) Attribute meaning: the strength of the connection of the virtual crowd

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: compact, general, loose

#### Opinion leader of the virtual crowd

1) Attribute name: exns\_property: soci\_virtualcrowd \_ leader

2) Attribute meaning: the leader of group thinking, behavior or speech



3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Secondary leader of the virtual crowd

1) Attribute name: exns\_property: soci\_virtualcrowd \_ subleader

2) Attribute meaning: the second-level leader of group thinking, behavior or speech

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Active time of the virtual crowd

1) Attribute name: exns\_property: soci\_virtualcrowd \_ activetime

2) Attribute meaning: the usual time for group status update

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: meet the GB/T 7408-1994 standard specification

Offline activities of virtual people

1) Attribute name: exns\_property: soci\_virtualcrowd \_ Offline

2) Attribute meaning: whether offline activities

3) Data type: Boolean (XMLSchema. BOOLEAN)

4) Constraint: optional

5) Range of values: no specific requirements

Virtual population mobility

1) Attribute name: exns\_property: soci\_virtualcrowd \_ mobility





2) Attribute meaning: stability of group members, strong, medium and weak

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

Virtual population vulnerability

1) Attribute name: exns\_property: soci\_virtualcrowd\_vulnerability

2) Attribute meaning: the group members' thoughts are shaken, strong, medium and weak

3) Data type: string (XMLSchema. STRING)

4) Constraint: optional

5) Range of values: no specific requirements

## **7. Acknowledgements**

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## **8. IANA Considerations**

This memo includes no request to IANA.

## **9. Security Considerations**

This document only defines a framework for network resource property description. This document itself does not directly introduce security issues.

## **10. Normative References**

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