



PHIN DIRECTORY EXCHANGE IMPLEMENTATION GUIDE

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1 INTRODUCTION

1.1 PHIN DIRECTORY EXCHANGE

Information held in local instances of a public health directory must be sharable to ensure that partners have the most current contact information and can support cross-jurisdictional communications. Directory exchange is aimed at increasing directory accuracy, reducing redundant maintenance of information in local directories and distributing the burden of maintenance across organizational entities.

There are three main aspects involved in directory exchange: a common exchange schema is required to describe the attributes to be exchanged, a standard exchange protocol must be used to describe the content and the action to be taken by the recipient, and the exchange must be executed in adherence with secure transport requirements.

1.2 WHAT IS AN IMPLEMENTATION GUIDE?

A public health directory exchange implementation guide is a document that describes:

- a) The circumstances under which directory exchange takes place.
- b) The data and schema for the information being exchanged.
- c) Additional specifications and guidance to assist in directory exchange implementation.

1.3 AUDIENCE

This guide is designed to be used by analysts who need a better understanding of the requirements of directory exchange, and by implementers working to develop PHIN applications.

1.4 DOCUMENT STRUCTURE

The body of this document contains the following major sections:

- Application Requirements and Data Flows: describes the context and usage for directory exchange.
- Message Definition: describes the types of messages used to define directory attributes.
- Example Messages: additional information about sample messages that will be useful to implementers.

- Appendices: contain information about DSML¹ and vocabularies.

1.5 CONTACTS

For more information on this document, please contact:

PHIN Help Desk

National Center for Public Health Informatics

Phone: 1-800-532-9929 or 770-216-1299

Email: PHINTech@cdc.gov

2 APPLICATION REQUIREMENTS AND DATA FLOWS

This guide addresses the functional requirements needed to accomplish Partner to Partner directory exchange using DSML version 1.0 for message construction and ebXML for message transmission. The diagram below outlines the functional data flows for the sending and receiving partners to implement a directory exchange process.

¹ Directory Services Markup Language v1.0 (DSMLv1) is an open standard defined by OASIS. It is an XML implementation that describes the structure of data in a directory, the state of the directory and can be used to locate data into a directory.

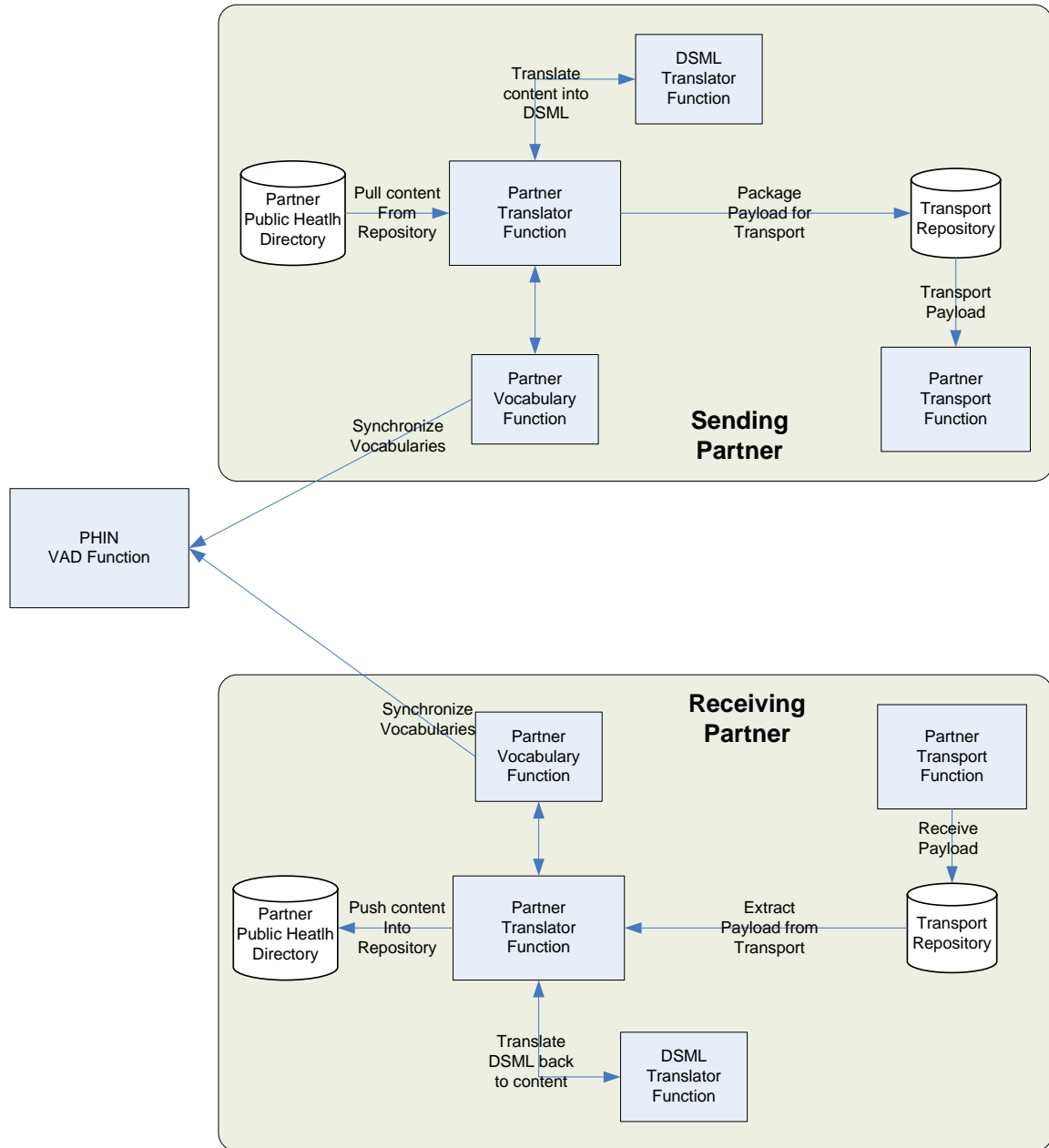


Figure 1: PHIN Directory Exchange system and process flows

The functions defined below should not be considered as a design specification. The diagram and associated functional descriptions should be used to help developers understand the functionality required to implement directory exchange. Each section will describe the responsibilities of this functional area in the overall process of directory exchange. Each partner will design a system that supports these functions.

2.1 SENDING PARTNER TRANSLATOR FUNCTION:

The sending partner translator functions are responsible for extracting People, Communication Devices and Organization information from a local version of a public health directory and putting them into a DSML version 1.0 formatted document. Please refer to section “Sending Partner DSML Translator Function” below for more information on how to generate this document.

During the development of the DSML version 1.0 document, appropriate vocabularies must be applied to define things like Organization type and communication device capabilities. Refer to the “Partner Vocabulary Services” section for a more detailed explanation of the vocabulary requirements.

In order to fulfill its responsibilities, a sending partner’s translator system needs to support the following functionalities.

- The ability to retrieve Person, Communication Devices and Organization information from the partner’s public health directory.
- The ability to support the functionality defined within the “Partner Vocabulary Services Function” defined below.
- The ability to support the “Sending Partner DSML Translator Function” defined below.
- The ability to support the functionality defined within the “Partner Transport Service Function” defined below.

2.2 PARTNER VOCABULARY FUNCTION

The Partner Vocabulary function is a set of processes that can either be implemented manually or automated to maintain vocabularies required to support directory exchange. Having consistent maintainable vocabularies between partners is an important function in any directory exchange solution. Some of the vocabularies required to support directory exchange will be stored and maintained in the PHIN VADS system while others that are more communication device specific are maintained within this implementation guide in Appendix E. Implementers of this function will be required to put a process in place to make sure the vocabularies are maintained.

In order to fulfill its responsibilities, a partner’s vocabulary system needs to support the following functionalities.

- The ability to synchronize local vocabularies with the PHIN VADS vocabulary service located at <http://www.cdc.gov/PhinVSBrowser/StrutsController.do>
- The ability to maintain a local version of vocabularies required for alerting that are not stored in the PHIN VADS system. These vocabularies are located in Appendix E.
- The ability to maintain version control for the vocabularies stored locally.

2.3 SENDING PARTNER TRANSPORT FUNCTION

The Partner Transport Function is responsible for preparing the message for transport to another exchange partner. The mechanism used to transport the data between partners must be compatible with the ebXML transport requirement identified in the PHIN Requirements.

In order to fulfill its responsibilities, a sending partner's transport system needs to support the following functionalities.

- Provide the ability to store the metadata required to send the DSML document to an appropriate partner.
- Provide the ability to send a secure electronic message.

Note: If you would like to implement the PHINMS to fulfill this requirement, please refer to the PHINMS Web Site located at <http://www.cdc.gov/phin/software-solutions/phinms/>

2.4 RECEIVING PARTNER DSML TRANSLATOR FUNCTION

Each Receiving Partner is responsible for receiving and parsing one or more DSML version 1.0 formatted documents containing Person, Communication Device and Organization information using ebXML described in the "Partner Transport Function" section of this document.

The CDC has developed a DSML translator tool that is available to support this functionality. Please refer to the "CDC DSML Translator Tool" later in this section for additional information about this tool.

In order to fulfill its responsibilities, a receiving partner's translator system needs to support the following functionalities.

- The ability to receive one or more DSML version 1.0 compliant documents from a sending partner.
- The ability to parse the DSML version 1.0 compliant documents into an appropriate format to be loaded into your local instance of a public health directory.
- The ability to use or map the vocabulary defined in the "Partner Vocabulary Function" section into a local form if needed.

2.5 RECEIVING PARTNER TRANSPORT SERVICE FUNCTION

The Receiving Partner Transport Function is responsible for receiving and extracting an ebXML compliant message from another exchange partner and

loading the data into a local instance of a public health directory. The mechanism used to transport the data between partners must be compatible with the ebXML transport requirement.

In order to fulfill its responsibilities, a receiving partner's transport system needs to support the following functionalities.

- Provide the ability to receive a secure transport in accordance with the ebXML transport requirement.
- Provide the ability to map vocabularies as defined in section "Partner Vocabulary Function" section of this document to local vocabularies if needed.
- Provide the ability to acknowledge back to the sending transport system using the ebXML transport system.

Note: If you would like to implement the PHINMS to fulfill this requirement, please refer to the PHINMS Web Site located at <http://www.cdc.gov/phin/software-solutions/phinms/>

3 CDC DSML TRANSLATOR TOOL

The CDC has a DSML translator tool available which consists of a basic database schema that defines three tables to structure People, Communication Devices and Organization information. This tool is distributed free by CDC. The tool assumes that the partner will populate this simple structure from their repository. The tool will then extract the information from the schema and generate an appropriate DSML version 1.0 compliant document suitable for transport to another partner.

The tool can also be executed on the receiving partner's side to parse the DSML version 1.0 document and populate the basic database schema previously described. The receiving partner would then be able to import the information from the basic schema back into their repository. The use of this tool is optional. Each partner can either use the tool as is, receive source code for the tool to modify as needed, or create their own tool to manage the generation of the appropriate DSML version 1.0 compliant document.

For more information on CDC's DSML translator tool please contact the PHIN Help Desk (Email: PHINTech@cdc.gov; Phone: 1-800-532-9929 or 770-216-1299)

4 MESSAGE DEFINITION

4.1 ORGANIZATION

| Attribute Name | Req | Description | Single / Multi Value | Example | Special Note |
|--|-----|--|----------------------|--|---|
| Required LDAP Attributes for Organization | | | | | |
| objectClass | Y | Object class of the entry. Used by the server to determine required and allowed attributes for an entry. | Multi | <pre><dsml:objectclass> <dsml:oc-value>top</dsml:oc-value> <dsml:oc-value>organizationalUnit</dsml:oc-value> <dsml:oc-value>PhinOrganization</dsml:oc-value> </dsml:objectclass></pre> | The Object Class for Organization is pre-defined; you must use the structure above during directory exchange |
| cn (commonName) | Y | The Organization's common name, usually references a unique identifier within the LDAP data file. | Single | <pre><dsml:attr name="cn"> <dsml:value> Centers for Disease Control and Prevention. </dsml:value> </dsml:attr></pre> | Any unique identifier can be used; however we suggest using the Organization's name. Additional information may be added to make the reference unique in those cases where there are several organizations with the same name. Although this is not guaranteed to be unique, it is the most unique of the attributes being exchanged. This DSML schema was never meant to directly populate an LDAP repository and was only intended to support structured data exchange. |

| Attribute Name | Req | Description | Single / Multi Value | Example | Special Note |
|--------------------------------|-----|---|----------------------|---|---|
| externalUID | N | The organization's Unique Identifier (UID) within the public health directory. This is a reference from the originating source of the data. | Single | <pre><dsml:attr name="externalUID"> <dsml:value> 0.1.1.1</dsml:value> </dsml:attr></pre> | This value will be used to help partners synchronize their data each time they get a new data set from a partner. Work with your exchange partner to determine the best mechanism for assigning and maintaining this attribute for each organization. |
| description | N | Text description of the organization. | Single | <pre><dsml:attr name="description"> <dsml:value> This is the Primary building for the State Health Department. </dsml:value> </dsml:attr></pre> | |
| Fax (facsimileTelephoneNumber) | N | The organization's fax number. | Single | <pre><dsml:attr name="fax"> <dsml:value>+1 732 445 3088x123</dsml:value> </dsml:attr></pre> | Phone numbers should follow the following format +1 732 445 3088x123, which is the current recommended format for LDAP. |
| l (localityName) | Y | City or town in which the organization is located. | Single | <pre><dsml:attr name="l"> <dsml:value>Atlanta</dsml:value> </dsml:attr></pre> | |

| Attribute Name | Req | Description | Single / Multi Value | Example | Special Note |
|--------------------------|-----|--|----------------------|--|---|
| postalCode | Y | The postal code for this address (e.g., United States ZIP code) | Single | <pre><dsml:attr name="postalCode"> <dsml:value>30333</dsml:value> </dsml:attr></pre> | |
| st (stateOrProvinceName) | Y | State or province in which the organization is located. | Single | <pre><dsml:attr name="st"> <dsml:value>13</dsml:value> </dsml:attr></pre> | This value is represented by the FIPS code for the associated state. |
| street | Y | Street address at which the organization is located. | Muti | <pre><dsml:attr name="street"> <dsml:value>Edward R. Royal Campus</dsml:value> <dsml:value>1600 Clifton Road, NE</dsml:value> </dsml:attr></pre> | Each line of the address should be included as a separate value to the attribute. |
| telephoneNumber | Y | The organization's primary contact telephone number. | Single | <pre><dsml:attr name="telephoneNumber"> <dsml:value>+1 732 445 3088x123</dsml:value> </dsml:attr></pre> | Phone numbers should follow the following format +1 732 445 3088x123, which is the current recommended format for LDAP. |
| county | Y | The FIPS code of the county in which an organization is located. | Single | <pre><dsml:attr name="county"> <dsml:value>13223</dsml:value> </dsml:attr></pre> | This is based on the organization's primary address. |

| Attribute Name | Req | Description | Single / Multi Value | Example | Special Note |
|-------------------------|-----|--|----------------------|--|---|
| alertingJurisdictions | Y | A list of the county FIPS codes which define an organization's jurisdictional boundary for alerting. | Multi | <pre><dsml:attr name="alertingJurisdictions"> <dsml:value>13223</dsml:value> <dsml:value>13067</dsml:value> </dsml:attr></pre> | This is used to determine what responsibility an organization has for notifying surrounding counties during an event. |
| primaryOrganizationType | Y | An organization's primary organization type. Values for this attribute will come from the standardized vocabulary lists. | Single | <pre><dsml:attr name="county"> <dsml:value>13223</dsml:value> <dsml:value>13067</dsml:value> </dsml:attr></pre> | Please refer to Appendix D for the list of vocabularies associated with this attribute |

4.2 PERSON

| Attribute Name | Req | Description | Single / Multi Value | Example | Special Note |
|----------------|-----|-------------|----------------------|---------|--------------|
|----------------|-----|-------------|----------------------|---------|--------------|

| Attribute Name | Req | Description | Single / Multi Value | Example | Special Note |
|--|-----|--|----------------------|---|---|
| Required LDAP Attributes for Person | | | | | |
| objectClass | Y | Object class of the entry. Used by the server to determine required and allowed attributes for an entry. | Multi | <pre> <dsml:objectclass> <dsml:oc-value>top</dsml:oc-value> <dsml:oc-value>person</dsml:oc-value> <dsml:oc-value>organizationalPerson</dsml:oc-value> <dsml:oc-value>inetOrgPerson</dsml:oc-value> <dsml:oc-value>PhinPerson</dsml:oc-value> </dsml:objectclass> </pre> | The Object Class for Person is pre-defined; you must use the structure above during directory exchange. |
| cn (commonName) | Y | The person's common name, which usually references a unique identifier within the LDAP data file. | Single | <pre> <dsml:attr name="cn"> <dsml:value>jsmith@someplace.com</dsml:value> </dsml:attr> </pre> | Any unique identifier can be used; however we suggest using the person's email address. Although this is not guaranteed to be unique it is the most unique of the attributes being exchanged. This DSML schema was never meant to directly populate an LDAP repository and was only intended to support structured data exchange. |

| Attribute Name | Req | Description | Single / Multi Value | Example | Special Note |
|----------------|-----|--|----------------------|--|---|
| sn (surname) | Y | The person's surname or last name. This field is required and will be used as part of a multi-field key in the de-duplication of records within the directory. | Single | <pre><dsml:attr name="sn"> <dsml:value> Smith</dsml:value> </dsml:attr></pre> | This value is part of the multi-key field used for de-duplication. The complete key is made up of the givenName , sn and email attributes. |
| externalUID | N | The person's Unique Identifier (UID) within the public health directory. This is a reference from the originating source of the data. | Single | <pre><dsml:attr name="externalUID"> <dsml:value> 0.1.1.1</dsml:value> </dsml:attr></pre> | This value will be used to help partners synchronize their data each time they get a new data set from a partner. Work with your exchange partner to determine the best mechanism for assigning and maintaining this attribute for each person. |
| description | N | Text description of the person. This often includes their role or work assignment (e.g., Manager for the IT Services group). | Single | <pre><dsml:attr name="description"> <dsml:value> John Smith is currently on assignment in New York. </dsml:value> </dsml:attr></pre> | |

| Attribute Name | Req | Description | Single / Multi Value | Example | Special Note |
|----------------|-----|---|----------------------|--|--------------|
| displayName | N | Preferred name of a person, used when displaying directory entries. This is most often a concatenation of given name and surname, but may include a nickname. | Single | <pre><dsml:attr name="displayName"> <dsml:value>John Smith</dsml:value> </dsml:attr></pre> | |
| givenName | Y | The person's given, or first, name. This field is required and will be used as part of a multi-field key in the de-duplication of records within the directory. | Single | <pre><dsml:attr name="givenName"> <dsml:value>John</dsml:value> </dsml:attr></pre> | |

| Attribute Name | Req | Description | Single / Multi Value | Example | Special Note |
|-------------------|-----|--|----------------------|---|---|
| mail | Y | The person's primary e-mail address. This field is required and will be used as part of a multi-field key in the de-duplication of records within the directory. | Single | <pre><dsml:attr name="mail"> <dsml:value>jsmith@somewhere.com</dsml:value> </dsml:attr></pre> | A person's email address can be used in association with the givenName , sn attributes to determine uniqueness. Additional information may be required to determine uniqueness based on the data being exchanged. |
| preferredLanguage | N | The person's preferred language, such as English or Spanish. | Single | <pre><dsml:attr name="preferredLanguage"> <dsml:value>EN</dsml:value> </dsml:attr></pre> | Preferred Language is defined based on the ISO 639-2 letter language code. ² Currently we are only supporting one preferred language. Future releases may support multiple language references. |
| title | N | A person's primary job title related to Public Health. | Single | <pre><dsml:attr name="title"> <dsml:value> IT SPEC. (BT, MGM)</dsml:value> </dsml:attr></pre> | This is free form text that describes a person's primary job title at the organization associated with the person. |

² Please refer to the ISO 639-2 codes defined in Appendix G at the end of this document.

| Attribute Name | Req | Description | Single / Multi Value | Example | Special Note |
|----------------|----------|---|----------------------|--|--|
| roles | N (Y) | The Public Health Role(s) a person has within their primary organization. | Single | <pre> <dsml:attr name="roles"> <dsml:value>Health Officer</dsml:value> <dsml:value>Chief Epidemiologist</dsml:value> </dsml:attr> </pre> | <p>(Only required if the person is associated with the 35 Public Health Roles. These roles are referenced in Appendix F.)</p> <p>Roles are assigned within a specific Jurisdiction. The Roles can be used during alerting to support Direct and/or Cascade alerting.</p> |

| Attribute Name | Req | Description | Single / Multi Value | Example | Special Note |
|------------------|-----|---|----------------------|--|---|
| roleJurisdiction | N | The FIPS code for the Jurisdiction where the person is assigned a role. | Single | <pre><dsml:attr name=" roleJurisdiction"> <dsml:value>13</dsml:value> </dsml:attr></pre> | <p>(Only required if the person is associated with the 35 Public Health Roles. These roles are referenced in Appendix F.)</p> <p>This attribute is used to determine the Jurisdiction where a person plays a role and/or roles defined within the “role” attribute. In the examples defined for attributes “roles” and “roleJurisdiction,” this person is assigned the roles of Health Officer and Chief Epidemiologist for the State of Georgia.</p> <p>Because this is very limiting, a new Role object will be introduced in the next release of the schema. The new Role object will allow a person to be assigned roles in multiple Jurisdictions.</p> |

| Attribute Name | Req | Description | Single / Multi Value | Example | Special Note |
|----------------|-----|--|----------------------|--|---|
| organizations | Y | Distinguished Name (DN) of the primary organization for this person. The DN is the Directory Server name to uniquely distinguish an entry. | Single | <pre><dsml:attr name="organizations"> <dsml:value> cn=Centers for Disease Control and Prevention, ou= PHINOrganizations, DC=PHIN,DC=gov </dsml:value> </dsml:attr></pre> | This attribute defines the distinguished name reference to the primary organization for this person. This will match the <dsml:entry> reference in the organization that you are associating to this person. We will only support single value references for this initial release of the schema. Future releases will be able to support references of a person to multiple organizations. |

4.3 COMMUNICATION DEVICE

| Attribute Name | Req | Description | Single / Multi Value | Example | Special Note |
|----------------|-----|-------------|----------------------|---------|--------------|
|----------------|-----|-------------|----------------------|---------|--------------|

| Attribute Name | Req | Description | Single / Multi Value | Example | Special Note |
|--|-----|--|----------------------|--|--|
| Required LDAP Attributes for Communication Device | | | | | |
| objectClass | Y | Object class of the entry. Used by the server to determine required and allowed attributes for an entry. | Multi | <pre><dsml:objectclass> <dsml:oc-value>top</dsml:oc-value> <dsml:oc-value> AlertCommunicationDevice </dsml:oc-value> </dsml:objectclass></pre> | The Object Class for Communication Device is pre-defined; you must use the structure above during directory exchange. |
| cn (commonName) | Y | The Organization's common name, which usually references a unique identifier within the LDAP data file. | Single | <pre><dsml:attr name="cn"> <dsml:value>Email1</dsml:value> </dsml:attr></pre> | Any unique identifier can be used; however we suggest using a descriptive name for the device. Additional information may be added to make the reference unique in those cases where there are several organizations with the same name. Although this is not guaranteed to be unique it is the most unique of the attributes being exchanged. This DSML schema was never meant to directly populate an LDAP repository and was only intended to support structured data exchange. |

| Attribute Name | Req | Description | Single / Multi Value | Example | Special Note |
|----------------|-----|---|----------------------|---|---|
| description | N | Text description of the communication device. | Single | <pre><dsml:attr name="description"> <dsml:value> John Smith primary email address. </dsml:value> </dsml:attr></pre> | |
| deviceName | Y | This field contains the unique name for each device. This name will be used in most user interfaces (UI) to select the associated device. | Single | <pre><dsml:attr name="deviceName"> <dsml:value>Business Email</dsml:value> </dsml:attr></pre> | |
| deviceType | Y | This field contains the type of device (e.g., e-mail, telephone, fax, pager). | Single | <pre><dsml:attr name="deviceType"> <dsml:value>Telephone</dsml:value> </dsml:attr></pre> | Values for this attribute will come from the standardized vocabulary lists defined in Appendix E. |
| coverage | Y | This field contains the type of coverage for the device (e.g., Normal Business Hours, After Hours, 24x7). | Single | <pre><dsml:attr name="coverage"> <dsml:value>BusinessHours</dsml:value> </dsml:attr></pre> | Values for this attribute will come from the standardized vocabulary lists defined in Appendix E. |

| Attribute Name | Req | Description | Single / Multi Value | Example | Special Note |
|----------------|-----|--|----------------------|--|---|
| emailAddress | Y | This field contains the e-mail address for the device. E-mail address is only valid for devices that support email addressing. Standard e-mail formatting applies. | Single | <pre><dsml:attr name="emailAddress"> <dsml:value>User1@cdc.gov</dsml:value> </dsml:attr></pre> | <p>(Required if Device Type is Email)</p> <p>This value should only be populated when device type is equal to "E-Mail"</p> |
| areaCode | Y | This field contains the area code for the device. | Single | <pre><dsml:attr name="areaCode"> <dsml:value>404</dsml:value> </dsml:attr></pre> | <p>(Required if device type is Fax, Mobile, Pager, Satellite or Telephone)</p> <p>This value should only be populated when device type is "Fax", "Mobile", "Pager", "Satellite" or "Telephone".</p> |
| exchange | Y | This field contains the exchange for the device, made up of the first three digits in a phone number not including the area code. | Single | <pre><dsml:attr name="exchange"> <dsml:value>999</dsml:value> </dsml:attr></pre> | <p>(Required if device type is Fax, Mobile, Pager, Satellite or Telephone)</p> <p>This value should only be populated when device type is "Fax", "Mobile", "Pager", "Satellite" or "Telephone".</p> |

| Attribute Name | Req | Description | Single / Multi Value | Example | Special Note |
|----------------|-----|--|----------------------|---|---|
| line | Y | This field contains the line for the device, made up of the last four digits in a phone number. | Single | <pre><dsml:attr name="line"> <dsml:value>9999</dsml:value> </dsml:attr></pre> | <p>(Required if device type is Fax, Mobile, Pager, Satellite or Telephone)</p> <p>This value should only be populated when device type is "Fax", "Mobile", "Pager", "Satellite" or "Telephone".</p> |
| rank | N | Rank defines the contact order for devices. When contacting people, the alert system will follow this order until the person is reached. The rank is unique for all of a person's communication devices. | Single | <pre><dsml:attr name="rank"> <dsml:value>1</dsml:value> </dsml:attr></pre> | Rank should start at one and increment by one until each device is assigned. |
| pin | N | This field contains the pin associated with a device. This field is only valid for devices that require pins (e.g., pagers) | Single | <pre><dsml:attr name="pin"> <dsml:value>12345</dsml:value> </dsml:attr></pre> | |

| Attribute Name | Req | Description | Single / Multi Value | Example | Special Note |
|---------------------|-----|---|----------------------|---|---|
| countryPrefix | N | Reserved for future use. | Single | | |
| internationalNumber | N | This field contains the phone number for international numbers. This field is only valid for international phone numbers. Non-international numbers should use the areaCode, exchange and line attributes previously defined. | Single | <pre><dsml:attr name="internationalNumber"> <dsml:value>011 55 99 9999 </dsml:value> </dsml:attr></pre> | The entire international number required for dialing should be included. |
| emergencyUseInd | N | This field indicates if the device can be used for emergency contact. | Single | <pre><dsml:attr name="emergencyUseInd"> <dsml:value>>true</dsml:value> </dsml:attr></pre> | This is a Boolean field and should be set to "true" if selected. All other values will be interpreted as false. |

| Attribute Name | Req | Description | Single / Multi Value | Example | Special Note |
|----------------|-----|---|----------------------|--|---|
| homeInd | N | This field indicates if the device is associated with a person's home. This indicator should be used to protect the identity of the defined device that is associated with a person's home. | Single | <pre><dsml:attr name="homeInd"> <dsml:value>true</dsml:value> </dsml:attr></pre> | This is a Boolean field and should be set to "true" if selected. All other values will be interpreted as false. If the identity of this device needs to be protected, this indicator should be set. |
| | N | | | | |

5 EXAMPLE MESSAGES

5.1.1 Example Person Message

```
<?xml version="1.0" encoding="UTF-8"?>
<dsml:dsml xmlns:dsml="http://www.dsml.org/DSML">
  <dsml:directory-entries>
    <dsml:entry dn="uid=john.Smith@cdc.gov,ou=US,ou=phindirPeople,DC=phindir,DC=gov">
      <dsml:objectclass>
        <dsml:oc-value>top</dsml:oc-value>
        <dsml:oc-value>person</dsml:oc-value>
        <dsml:oc-value>organizationalPerson</dsml:oc-value>
        <dsml:oc-value>inetOrgPerson</dsml:oc-value>
        <dsml:oc-value>PhinPerson</dsml:oc-value>
      </dsml:objectclass>
      <dsml:attr name="cn">
        <dsml:value>John Smith</dsml:value>
      </dsml:attr>
      <dsml:attr name="sn">
        <dsml:value>Smith</dsml:value>
      </dsml:attr>
      <dsml:attr name="externalUID">
        <dsml:value>AGDR-ADRS-234T-RT67</dsml:value>
      </dsml:attr>
      <dsml:attr name="description">
        <dsml:value>John is a good Fellow!</dsml:value>
      </dsml:attr>
      <dsml:attr name="displayName">
        <dsml:value>John T. Smith</dsml:value>
      </dsml:attr>
      <dsml:attr name="givenName">
        <dsml:value>John</dsml:value>
      </dsml:attr>
      <dsml:attr name="mail">
        <dsml:value>john.Smith@cdc.gov</dsml:value>
      </dsml:attr>

      <dsml:attr name="preferredlanguage">
        <dsml:value>en</dsml:value>
      </dsml:attr>
      <dsml:attr name="title">
        <dsml:value>Program Manager</dsml:value>
      </dsml:attr>
      <dsml:attr name="roles">
        <dsml:value>Role A</dsml:value>
        <dsml:value>Role B</dsml:value>
      </dsml:attr>
      <dsml:attr name="county">
        <dsml:value>DeKalb</dsml:value>
      </dsml:attr>
      <dsml:attr name="organizations">
        <dsml:value>cn=Centers for Disease Control and
```

```

    Prevention,ou=phindirOrganizations,DC=phindir,DC=gov</dsml:value>
  </dsml:attr>
</dsml:entry>
</dsml:directory-entries>
</dsml:dsml>

```

5.1.2 Example Communication Device / Telephone Message

```

<?xml version="1.0" encoding="UTF-8"?>
<dsml:dsml xmlns:dsml="http://www.dsml.org/DSML">
  <dsml:directory-entries>
    <dsml:entry
dn="uid=Telephone1,uid=john.Smith@cdc.gov,ou=US,ou=phindirPeople,DC=phindir,DC=gov">
      <dsml:objectclass>
        <dsml:oc-value>top</dsml:oc-value>
        <dsml:oc-value>AlertCommunicationDevice</dsml:oc-value>
      </dsml:objectclass>
      <dsml:attr name="cn">
        <dsml:value>Telephone1</dsml:value>
      </dsml:attr>
      <dsml:attr name="description">
        <dsml:value>Main point of contact.</dsml:value>
      </dsml:attr>
      <dsml:attr name="deviceType">
        <dsml:value>Telephone</dsml:value>
      </dsml:attr>
      <dsml:attr name="coverage">
        <dsml:value>BusinessHours</dsml:value>
      </dsml:attr>
      <dsml:attr name="areaCode">
        <dsml:value>404</dsml:value>
      </dsml:attr>
      <dsml:attr name="exchange">
        <dsml:value>444</dsml:value>
      </dsml:attr>
      <dsml:attr name="line">
        <dsml:value>7777</dsml:value>
      </dsml:attr>
      <dsml:attr name="rank">
        <dsml:value>1</dsml:value>
      </dsml:attr>
    </dsml:entry>
  </dsml:directory-entries>
</dsml:dsml>

```

5.1.3 Example Communication Device / Email Message

```

<?xml version="1.0" encoding="UTF-8"?>

```

```

<dsml:dsml xmlns:dsml="http://www.dsml.org/DSML">
  <dsml:directory-entries>
    <dsml:entry
dn="uid=email1,uid=john.Smith@cdc.gov,ou=US,ou=phindirPeople,DC=phindir,DC=gov">
      <dsml:objectclass>
        <dsml:oc-value>top</dsml:oc-value>
        <dsml:oc-value>AlertCommunicationDevice</dsml:oc-value>
      </dsml:objectclass>
      <dsml:attr name="cn">
        <dsml:value>email1</dsml:value>
      </dsml:attr>
      <dsml:attr name="description">
        <dsml:value>I can receive this e-mail on my blackBerry 24 hours a
day</dsml:value>
      </dsml:attr>
      <dsml:attr name="deviceType">
        <dsml:value>eMail</dsml:value>
      </dsml:attr>
      <dsml:attr name="coverage">
        <dsml:value>24x7</dsml:value>
      </dsml:attr>
      <dsml:attr name="emailAddress">
        <dsml:value>john.Smith@cdc.gov</dsml:value>
      </dsml:attr>
      <dsml:attr name="rank">
        <dsml:value>2</dsml:value>
      </dsml:attr>
      <dsml:attr name="emergencyUseInd">
        <dsml:value>>true</dsml:value>
      </dsml:attr>
      <dsml:attr name="homeInd">
        <dsml:value>>false</dsml:value>
      </dsml:attr>
    </dsml:entry>
  </dsml:directory-entries>
</dsml:dsml>

```

5.1.4 Example Organization Message

```

<?xml version="1.0" encoding="UTF-8"?>
<dsml:dsml xmlns:dsml="http://www.dsml.org/DSML">
  <dsml:directory-entries>
    <dsml:entry dn="cn=Centers for Disease Control and
      Prevention,ou=phindirOrganizations,DC=phindir,DC=gov">
      <dsml:objectclass>
        <dsml:oc-value>top</dsml:oc-value>
        <dsml:oc-value>organizationalUnit</dsml:oc-value>
        <dsml:oc-value>PhinOrganization</dsml:oc-value>
      </dsml:objectclass>
      <dsml:attr name="cn">
        <dsml:value>Centers for Disease Control and Prevention</dsml:value>

```

```
</dsml:attr>
<dsml:attr name="externalUID">
  <dsml:value></dsml:value>
</dsml:attr>
<dsml:attr name="description">
  <dsml:value>CDC Headquarters</dsml:value>
</dsml:attr>
<dsml:attr name="street">
  <dsml:value>Edward R. Roybal Campus</dsml:value>
  <dsml:value>1600 Clifton Road, NE</dsml:value>
</dsml:attr>
<dsml:attr name="st">
  <dsml:value>13</dsml:value>
</dsml:attr>
<dsml:attr name="l">
  <dsml:value>Atlanta</dsml:value>
</dsml:attr>
<dsml:attr name="postalCode">
  <dsml:value>30333</dsml:value>
</dsml:attr>
<dsml:attr name="county">
  <dsml:value>13089</dsml:value>
</dsml:attr>
<dsml:attr name="telephoneNumber">
  <dsml:value>404-639-3311</dsml:value>
</dsml:attr>
<dsml:attr name="fax">
  <dsml:value>555-123-4567</dsml:value>
</dsml:attr>
<dsml:attr name="alertingJurisdictions">
  <dsml:value></dsml:value>
</dsml:attr>
<dsml:attr name="primaryOrganizationType">
  <dsml:value>Fed (HHS) CDC</dsml:value>
</dsml:attr>
</dsml:entry>
</dsml:directory-entries>
</dsml:dsml>
```


6 APPENDIX A - DIRECTORY SERVICES MARKUP LANGUAGE (DSML)

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6.1 INTRODUCTION

The **Directory Services Markup Language**, or **DSML**, provides a means for representing directory structural information as an XML document. The intent of DSML is to allow XML-based enterprise applications to leverage profile and resource information from a directory in their native environment. DSML allows XML and directories to work together and provides a common ground for all XML-based applications to make better use of directories.

DSML is intended to be a simple XML schema definition that will enable directories to publish basic profile information in the form of an XML document so that it can be easily shared via native Internet protocols (such as HTTP or SMTP), as well as used by other applications. The principal goal is to ensure that directories are able to make a growing breed of XML based applications directory aware.

It is not an initial goal of DSML to specify the attributes that all directories must contain, or the method with which the directory information is accessed from the directory. The expectation is that standard protocols (such as LDAP), proprietary access protocols (such as Novell's NDAP) and proprietary APIs (such as Microsoft's ADSI) could produce DSML documents as an optional output.

6.2 A NOTE ON AMBIGUOUS TERMINOLOGY

Because this specification discusses both XML and directories, there is a danger of terminology from one domain being confused with that from the other. In particular, the words "attribute" and "schema" have meaning in both the XML and directory domains. For this reason, this specification always qualifies the word "attribute" as either *XML* attribute or a *directory* attribute and likewise with the word "schema".

6.3 THE DSML NAMESPACE URI

In this specification, the prefix "dsml" is used on XML elements to indicate that they belong to the **DSML Namespace**. The prefix (as with all XML Namespace prefixes) is arbitrary and any suitable prefix may be used (or the namespace declared as default). It is the URI which ultimate identifies the namespace, not the prefix.

6.4 CONCEPTUAL OVERVIEW

A DSML document describes directory **entries**, a directory **schema** or both.

Each directory entry has a universally unique name called its **distinguished name**. A directory entry has a number of property-value pairs called directory **attributes**. Every directory entry is a member of a number of **object classes**. An entry's object classes constrain the directory attributes the entry may take. Such constraints are described in a directory **schema** which may be included in the same DSML document or may be in a separate document.

6.5 TOP-LEVEL STRUCTURE

The document element of DSML is of the type `dsml` which may have a child element of the type `directory-entries`. This element, in turn, has child elements of the type `entry`. The `dsml` element may also (if the document contains a directory schema) have a child element of the type `directory-schema` which, in turn, has child elements of the type's `class` and `attribute-type`.

At the top-level, the structure of a DSML document is thus:

```
<dsml:dsml xmlns:dsml="http://www.dsml.org/DSML">
  <!-- a document with only directory entries -->
  <dsml:directory-entries>
    <dsml:entry dn="...">...</dsml:entry>
    <dsml:entry dn="...">...</dsml:entry>
    <dsml:entry dn="...">...</dsml:entry>
    ...
  </dsml:directory-entries>
</dsml:dsml>

<dsml:dsml xmlns:dsml="http://www.dsml.org/DSML">
  <!-- a document with only a directory schema -->
  <dsml:directory-schema>
    <dsml:class id="..." ...>...</dsml:class>
    <dsml:attribute-type id="..." ...>...</dsml:attribute-type>
    ...
  </dsml:directory-schema>
</dsml:dsml>

<dsml:dsml xmlns:dsml="http://www.dsml.org/DSML">
  <!-- a document with both -->
  <dsml:directory-schema>
    <dsml:class id="..." ...>...</dsml:class>
    <dsml:attribute-type id="..." ...>...</dsml:attribute-type>
  </dsml:directory-schema>
  <dsml:directory-entries>
    <dsml:entry dn="...">...</dsml:entry>
    <dsml:entry dn="...">...</dsml:entry>
    <dsml:entry dn="...">...</dsml:entry>
    ...
  </dsml:directory-entries>
```

```
<dsml:dsml>
```

The top-level element dsml takes an optional XML attribute complete. A value of true indicates that the entries under directory-entries contain no external references. Either all attribute-types and classes referenced are found in the directory-schema section of the document or there are no references at all. A value of false indicates that at least one reference is to an external DSML document containing a directory schema. The default value is true.

6.6 DIRECTORY ENTRIES

6.6.1 The entry element type

Each entry represented in a DSML document is done so using an element of the type entry. The entry element contains elements representing the entry's directory attributes. The **distinguished name** of the entry is indicated by the XML attribute dn.

NOTE: This specification does not provide a canonical form for distinguished names. Because normalization and ordering can vary between producers of DSML, some form of canonicalization would need to be performed by a consumer of DSML before string matching the values of the XML attribute dn.

It was decided to express the distinguished name as an XML attribute rather than a child element because of its identifying characteristic.

```
<dsml:entry dn="uid=prabbit,ou=development,o=bowstreet,c=us">
  <dsml:objectclass>
    <dsml:oc-value>top</dsml:oc-value>
    <dsml:oc-value>person</dsml:oc-value>
    <dsml:oc-value>organizationalPerson</dsml:oc-value>
    <dsml:oc-value>inetOrgPerson</dsml:oc-value>
  </dsml:objectclass>
  <dsml:attr name="sn"><dsml:value>Rabbit</dsml:value></dsml:attr>
  <dsml:attr name="uid"><dsml:value>prabbit</dsml:value></dsml:attr>
  <dsml:attr
name="mail"><dsml:value>prabbit@dsml.org</dsml:value></dsml:attr>
  <dsml:attr name="givenname"><dsml:value>Peter</dsml:value></dsml:attr>
  <dsml:attr name="cn"><dsml:value>Peter Rabbit</dsml:value></dsml:attr>
</dsml:entry>
```

6.6.2 Entry Object Class

The object classes of an entry are represented by oc-value child elements of an objectclass element. The content of each oc-value element indicates an object class to which the entry belongs. In the case where an object class has more than one name, only one name need be used. Both objectclass and oc-value have an optional XML attribute ref. An oc-value's ref is a URI Reference to a class element that defines the object class. An objectclass's ref is a URI

Reference to an attribute-type defining the objectclass directory attribute. The latter would not often be used but is provided to allow for extension of the objectclass directory attribute.

```
<dsml:objectclass ref="#objectclass">
  <dsml:oc-value ref="#person">person</dsml:oc-value>
  <dsml:oc-value ref="#org-person">organizationalPerson</dsml:oc-value>
</dsml:objectclass>
```

6.6.3 Directory Attributes

Directory attributes (with the exception of "objectclass") are represented by an attr element. This element has a mandatory XML attribute name which indicates a name of the directory attribute. (A directory attribute may have more than one name, but only one need be expressed in the name attribute.)

The value or values of a directory attribute are expressed in child elements of the type value.

NOTE: the content of value is PCDATA and hence any XML markup (or characters that could be treated as markup, namely < or &) must be escaped via CDATA section, character reference or pre-defined entity.

Each attr element may have an optional ref XML attribute whose value is a URI reference (URI + XPointer) pointing to an attribute-type definition in a directory-schema in the same or different DSML document.

For example, if a DSML document with a directory-schema accessible at the URL <http://www.bowstreet.com/schemata/physical-attributes.dsml> has the attribute-type definition

```
<dsml:attribute-type id="eye-color">
  <dsml:name>eyecolor</dsml:name>
  <dsml:description>The color of the person's eyes</dsml:description>
  ...
</dsml:attribute-type>
```

then an entry in directory-entries might have a child element

```
<dsml:attr name="eyecolor" ref="http://www.bowstreet.com/schemata/physical-
attributes.dsml#eye-color">
  <dsml:value>blue</dsml:value>
</dsml:attr>
```

6.6.4 Multi-valued Attributes

Where an entry has multiple values for a particular attribute, that attr element has multiple value children.

```
<dsml:entry dn="uid=prabbit,ou=development,o=bowstreet,c=us">
```

```

<dsml:objectclass>
  <dsml:oc-value>top</dsml:oc-value>
  <dsml:oc-value>person</dsml:oc-value>
  <dsml:oc-value>organizationalPerson</dsml:oc-value>
  <dsml:oc-value>inetOrgPerson</dsml:oc-value>
</dsml:objectclass>
<dsml:attr name="sn"><dsml:value>Rabbit</dsml:value></dsml:attr>
<dsml:attr name="uid"><dsml:value>prabbit</dsml:value></dsml:attr>
<dsml:attr name="mail">
  <dsml:value>prabbit@dsml.org</dsml:value>
  <dsml:value>peterr@home.com</dsml:value>
</dsml:attr>
<dsml:attr name="givenname"><dsml:value>Peter</dsml:value></dsml:attr>
<dsml:attr name="cn"><dsml:value>Peter Rabbit</dsml:value></dsml:attr>
</dsml:entry>

```

6.6.5 Binary Data

Directory attributes containing binary data are encoded using an encoding scheme identified by an XML attribute encoding on the value element. At present, DSML supports only base64 as a value, but the encoding XML attribute is included in order to enable support for other encoding schemes in the future.

NOTE: base64 encoding, as described in RFC 1521, allows for whitespace characters which are to be ignored by any decoding software. Furthermore, base64 encoding does not introduce < or & characters and therefore no additional encoding is necessary to include base64 in XML character data.

```

<dsml:attr name="cacertificate">
  <dsml:value encoding="base64">
    MIICJCCAY+...
  </dsml:value>
</dsml:attr>

```

6.7 DIRECTORY SCHEMA

6.7.1 Object Classes

Each directory entry has a number of object classes, indicated by elements of the type objectclass.

An object class is defined with a class element in a directory-schema. The class element takes an ID XML attribute id to make referencing easier.

The object class definition for the "person" object class might look like:

```

<dsml:class
  id="person"

```

```
    superior="#top"
    type="structural">
<dsml:name>person</dsml:name>
<dsml:description>...</dsml:description>
<dsml:object-identifier>2.5.6.6</object-identifier>
<dsml:attribute ref="#sn" required="true"/>
<dsml:attribute ref="#cn" required="true"/>
<dsml:attribute ref="#userPassword" required="false"/>
<dsml:attribute ref="#telephoneNumber" required="false"/>
<dsml:attribute ref="#seeAlso" required="false"/>
<dsml:attribute ref="#description" required="false"/>
</dsml:class>
```

1. id (XML attribute)

A locally unique identifier for the object class. This enables the object class to be referenced across the Web, in particular from the ref XML attribute of an entry's objectclass or a subclass's superior XML attribute.

2. superior (XML attribute)

The URI Reference of class(es) from which this one is derived.

3. type (XML attribute)

One of structural, abstract or auxiliary.

4. obsolete (XML attribute)

One of true or false. Defaults to false.

5. name (child element)

The NAME of the object class.

6. description (child element)

The optional DESC of the object class.

7. object-identifier (child element)

The object identifier (OID) of the object class.

8. attribute (child element)

A directory attribute type that entries of this class may or must have.

9. ref (XML attribute on attribute element)

The URI Reference of the directory attribute type.

10. required (XML attribute on attribute element)

One of true or false. Indicates whether entries of this class are required to have the directory attribute or not.

XML attributes were chosen in those cases where the information provides unique identification (using an ID attribute not only ensures uniqueness but allows for ease of reference via XPointer), is an enumeration (which, in a DTD, can only be constrained for attributes) or is a reference.

6.7.2 Attribute Type Definitions

Directory attribute types are defined in a similar way to object classes.

For example:

```
<dsml:attribute-type
  id="cn"
  superior="...#name">
  <dsml:name>cn</dsml:name>
  <dsml:description>...</dsml:description>
  <dsml:object-identifier>2.5.4.3</dsml:object-identifier>
</dsml:attribute-type>
```

```
<dsml:attribute-type
  id="mail">
  <dsml:name>mail</dsml:name>
  <dsml:description>...</dsml:description>
  <dsml:object-identifier>0.9.2342.19200300.100.1.3</dsml:object-identifier>
  <dsml:syntax bound="256">0.9.2342.19200300.100.3.5</dsml:syntax>
</dsml:attribute-type>
```

1. id (XML attribute)

A locally unique identifier for the attribute type. This enables the attribute type to be referenced across the Web, in particular from the ref XML attribute of an entry's attr or a derived directory attribute's superior XML attribute.

2. superior (XML attribute)

The URI Reference of attribute type from which this one is derived.

3. obsolete (XML attribute)

One of true or false. Defaults to false.

4. single-value (XML attribute)

One of true or false. Defaults to false.

5. user-modification (XML attribute)

One of true or false. Defaults to true.

6. name (child element)

The NAME of the attribute type.

7. description (child element)

The optional DESC of the attribute type.

8. object-identifier (child element)

The object-identifier (OID) of the object class.

9. syntax (child element)

An OID indicating the allowed syntax of values of this attribute type.

10. bound (XML attribute on syntax)

The suggested minimum upper bound for the attribute type.

11. equality (child element)

An OID indicating the equality matching rule.

12. ordering (child element)

An OID indicating the equality matching rule.

13. substring (child element)

An OID indicating the equality matching rule.

XML attributes were chosen in those cases where the information provides unique identification (using an ID attribute not only ensures uniqueness but allows for ease of reference via XPointer), is an enumeration (which, in a DTD, can only be contained for attributes) or is a reference.

6.8 CONFORMANCE

In defining conformance, it is useful to divide DSML documents into four types:

1. Documents containing neither directory schema nor any references to an external schema.
2. Documents containing no directory schema but containing at least one reference to an external schema.
3. Documents containing only a directory schema.
4. Documents containing both a directory schema and entries.

A **producer** of DSML must be able to produce documents of type 1. A producer of DSML may, in addition, be able to produce documents of types 2 thru 4.

A producer that can produce documents of type 1 is said to be a **level 1** producer. A producer that can produce documents of all four types is said to be a **level 2** producer.

Future specifications will provide a mechanism for specifying during a request to a level 2 producer, which type of document is to be returned.

A **consumer** of DSML must be able to handle all four document types although it need not be able to make use of the directory schema information (either local or externally referenced).

A consumer that can handle DSML documents of all four types is said to be a **level 1** consumer. A consumer that can additionally make use of the directory schema information (either local or externally referenced) is said to be a **level 2** consumer.

6.9 XML SCHEMA FOR DSML

See <http://www.dsml.org/1.0/dsml.xsd>

6.10 DTD FOR DSML

See <http://www.dsml.org/1.0/dsml.dtd>

7 APPENDIX B - DSML VERSION 1.0 SCHEMA.

```
<?xml version="1.0"?>

<!-- XML Schema Description for DSML -->
<!-- Last updated: 1999-11-30      -->

<schema
  targetNS="http://www.dsml.org/DSML"
  version="1.0"
  xmlns="http://www.w3.org/1999/09/24-xmlschema">

  <!-- DATA TYPES -->

  <datatype name="true-false">
    <basetype name="string"/>
    <enumeration>
      <literal>true</literal>
      <literal>>false</literal>
    </enumeration>
  </datatype>

  <datatype name="oid">
    <basetype name="string"/>
  </datatype>

  <datatype name="uri-ref">
    <basetype name="string"/>
  </datatype>

  <datatype name="distinguished-name">
    <basetype name="string"/>
  </datatype>

  <!-- DOCUMENT ELEMENT -->

  <element name="dsml">
    <archetype>
      <element ref="directory-schema" minOccurs="0"/>
      <element ref="directory-entries" minOccurs="0"/>
      <attribute name="complete" type="true-false"/>
    </archetype>
  </element>

  <!-- SCHEMA -->

  <element name="directory-schema">
    <archetype>
      <group order="choice" minOccurs="0" maxOccurs="*">
        <element ref="class"/>
        <element ref="attribute-type"/>
      </group>
    </archetype>
  </element>
```

```
<!-- element types common to class and attribute-type -->
<element name="name" type="string"/>
<element name="description" type="string"/>
<element name="object-identifier" type="oid"/>

<element name="class">
  <archetype>
    <element ref="name" maxOccurs="*" />
    <element ref="description" minOccurs="0" />
    <element ref="object-identifier" minOccurs="0" />
    <element ref="attribute" minOccurs="0" maxOccurs="*" />
    <attribute name="id" type="id" minOccurs="1" />

    <attribute name="sup" type="uri-ref" />
    <attribute name="obsolete" type="true-false" default="false" />
    <attribute name="type" type="NCName" minOccurs="1">
      <enumeration>
        <literal>structural</literal>
        <literal>abstract</literal>
        <literal>auxiliary</literal>
      </enumeration>
    </attribute>
  </archetype>
</element>

<element name="attribute">
  <archetype content="empty">
    <attribute name="ref" type="uri-ref" minOccurs="1" />
    <attribute name="required" type="true-false" minOccurs="1" />
  </archetype>
</element>

<element name="attribute-type">
  <archetype>
    <element ref="name" maxOccurs="*" />
    <element ref="description" minOccurs="0" />
    <element ref="object-identifier" minOccurs="0" />
    <element name="syntax" type="oid" minOccurs="0" />
    <element name="equality" type="oid" minOccurs="0" />
    <element name="ordering" type="oid" minOccurs="0" />

    <element name="substring" type="oid" minOccurs="0" />
    <attribute name="id" type="id" minOccurs="1" />
    <attribute name="sup" type="uri-ref" />
    <attribute name="obsolete" type="true-false" default="false" />
    <attribute name="single-value" type="true-false" default="false" />
    <attribute name="user-modification" type="true-false" default="true" />
  </archetype>
</element>

<!-- ENTRIES -->

<element name="directory-entries">
  <archetype>
    <element ref="entry" minOccurs="0" maxOccurs="*" />
  </archetype>
</element>
```

```
<element name="entry">
  <archetype>
    <!-- minimum occur for objectclass and attr are zero to allow for
         an entry that only expresses objectclasses or non-objectclass
         directory attributes -->
    <element ref="objectclass" minOccurs="0" maxOccurs="*" />

    <element ref="attr" minOccurs="0" maxOccurs="*" />
    <attribute name="dn" type="distinguished-name" minOccurs="1" />
  </archetype>
</element>

<element name="objectclass">
  <archetype>
    <attribute name="ref" type="uri-ref" />
    <element name="oc-value" maxOccurs="*" type="string">
      <archetype>
        <attribute name="ref" type="uri-ref" />
      </archetype>
    </element>
  </archetype>
</element>

<element name="attr">
  <archetype>
    <element ref="value" maxOccurs="*" />
    <attribute name="name" type="string" minOccurs="1" />
    <attribute name="ref" type="uri-ref" />

  </archetype>
</element>

<element name="value" type="string">
  <archetype>
    <attribute name="encoding" type="string" />
  </archetype>
</element>

</schema>
```

8 APPENDIX C - DSML VERSION 1.0 DTD.

```

<!-- DTD for DSML -->
<!-- Last updated: 1999-11-30 -->

<!ENTITY % distinguished-name "CDATA">
<!ENTITY % uri-ref "CDATA"> <!-- [URI]#XPointer -->
<!ENTITY % oid "#PCDATA">

<!ELEMENT dsml (directory-schema?,directory-entries?)>
<!ATTLIST dsml
  complete (true|false) "true"
>

<!-- SCHEMA -->
<!ELEMENT directory-schema (class|attribute-type)*>

<!-- element types common to class and attribute-type -->
<!ELEMENT name (#PCDATA)>
<!ELEMENT description (#PCDATA)>

<!ELEMENT object-identifier (%oid;)>

<!ELEMENT class (name+,description?,object-identifier?, attribute*)>
<!ATTLIST class
  id ID #REQUIRED
  superior %uri-ref; #IMPLIED
  obsolete (true|false) "false"
  type (structural|abstract|auxiliary) #REQUIRED
>

<!ELEMENT attribute EMPTY>
<!ATTLIST attribute
  ref %uri-ref; #REQUIRED
  required (true|false) #REQUIRED
>

<!ELEMENT attribute-type
( name+,
  description?,
  object-identifier?,
  syntax?,
  equality?,
  ordering?,
  substring? )>

<!ATTLIST attribute-type
  id ID #REQUIRED
  superior %uri-ref; #IMPLIED
  obsolete (true|false) "false"
  single-value (true|false) "false"
  user-modification (true|false) "true"
>

<!ELEMENT syntax (%oid;)>
<!ELEMENT equality (%oid;)>
<!ELEMENT ordering (%oid;)>

```

```
<!ELEMENT substring (%oid;)>

<!-- ENTRIES -->
<!ELEMENT directory-entries (entry*)>

<!ELEMENT entry (objectclass*,attr*)>
<!-- minimum occur for objectclass and attr are zero to allow for
      an entry that only expresses objectclasses or non-objectclass
      directory attributes -->
<!ATTLIST entry
  dn %distinguished-name; #REQUIRED
>

<!ELEMENT objectclass (oc-value+)>
<!ATTLIST objectclass
  ref %uri-ref; #IMPLIED
>

<!ELEMENT oc-value (#PCDATA)>
<!ATTLIST oc-value
  ref %uri-ref; #IMPLIED
>

<!ELEMENT attr (value+)>
<!ATTLIST attr
  name CDATA #REQUIRED
  ref %uri-ref; #IMPLIED
>

<!ELEMENT value (#PCDATA)>

<!ATTLIST value
  encoding CDATA "base64"
>
```

9 APPENDIX D - ORGANIZATION TYPES

PHIN has defined the following organization types:

- Academic/Research Organization
- CDC all campuses
- CDC Field Assignee
- Clinic
- Clinical Professional Organization (such as AMA)
- Fed HHS (CDC)
- Federal Government Agency
- Foundation/Institute
- Health Care Facility
- Hospital
- International Organization
- Law Enforcement Agencies
- Local Department of Health
- News Organization
- Non-Government Organization (NGO)
- Non-Profit Organization
- Other
- Other Federal Government
- Other Public Health Service Agency
- Other State/Local Agency
- Private health laboratory
- Professional (and Advocacy) Organization
- Protective and Social Services
- Public health laboratory
- State Department of Health
- University
- Veterans Health Administration (VHA)

10 APPENDIX E - DEVICE TYPES / COVERAGE'S

10.1 DEVICE TYPES

PHIN has defined the following device types for communication devices:

- E-mail
- Fax
- Mobile
- Pager
- Satellite
- Telephone

10.2 COVERAGE'S

The coverage attribute defines the time period the communication device covers.

- 24x7
- After Hours
- Business Hours

11 APPENDIX F - PUBLIC HEALTH ROLES

The following roles were defined by the Alerts and Communication workgroup for common use by the partners:

- Animal Control Director
- Behavioral Health Director
- BioTerrorism Coordinator
- Border Health Director
- Chief Epidemiologist
- Chief Veterinarian
- Communicable/Infectious Disease Coordinator
- Emergency Management Coordinator
- Emergency Medical Services Authority
- Emergency Operations Center Coordinator
- Emergency Room Director
- Emergency Training Coordinator
- Environmental Health Director
- Epidemiologist
- FBI WMD/BT Agent
- Health Alert and Communications Coordinator
- Health Officer
- Immunization Director
- Infection Control Practitioner
- Laboratory BT
- Laboratory Director
- Medical Director
- Medical Examiner/Coroner
- Medical Society
- Microbiologist
- Poison Control Center
- Public Health Administrator
- Public Health Investigator/Contact Tracer
- Public Health Nursing Director
- Public Information Officer
- Quarantine Officer
- School District Nurse
- Strategic National Stockpile Coordinator
- Technical Training Liaison
- Weapons of Mass Destruction Coordinator

12 APPENDIX G - ISO 639-2 LANGUAGE CODES

The full list of languages and their associated ISO 639-2 codes can be found at the Library of Congress site:

<http://www.loc.gov/standards/iso639-2/englangn.html>