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H. Wu
Z. Li
J. Chen
X. Fan

China Academy of Information and Communications Technology

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Industrial Internet Identifier Node (IIIN) Data Escrow Specification
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Abstract

This document specifies the format and contents of data escrow deposits targeted primarily for Industrial Internet Identifier Node (IIIN) which provides identifier registration. However, this specification was designed to be independent of the underlying objects that are being escrowed, therefore it could be used for purposes other than IIIN.

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[Page 1]

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Table of Contents

- [1. Introduction](#) [2](#)
- [2. Conventions used in this document](#)..... [3](#)
- [3. General Conventions](#) [4](#)
 - [3.1. Date and Time](#) [4](#)
 - [3.2. IP Addresses](#) [4](#)
- [4. Protocol Description](#)..... [4](#)
 - [4.1. Root element <deposit>](#)..... [4](#)
 - [4.2. Child <watermark> element](#)..... [7](#)
 - [4.3. Child <indeMenu> element](#)..... [7](#)
 - [4.4. Child <deletes> element](#)..... [8](#)
 - [4.5. Child <contents> element](#)..... [8](#)
- [5. Formal Syntax](#) [8](#)
 - [5.1. INDE Schema](#) [8](#)
- [6. Internationalization Considerations](#)..... [12](#)
- [7. Security Considerations](#)..... [13](#)
- [8. IANA Considerations](#) [13](#)
- [9. Privacy Considerations](#)..... [14](#)
- [10. References](#) [14](#)
 - [10.1. Normative References](#)..... [14](#)
 - [10.2. Informative References](#)..... [14](#)
- [11. Acknowledgments](#) [15](#)

1. Introduction

Industrial Internet Identifier Node (IIIN) Data Escrow is the process by which an IIIN periodically submits data deposits to a third-party called an escrow agent. These deposits comprise the minimum data needed by a third-party to resume operations if the IIIN cannot function and is unable or unwilling to facilitate an orderly transfer of service. For an IIIN, the data to be deposited would include all the objects related to registered identifier.

The goal of data escrow is higher resiliency of registration services, for the benefit of Internet users. The beneficiaries of an IIIN are not just those registering information there, but all relying parties that need to identify the owners of objects.

In the context of industry identifier namespace, data escrow is a requirement for IIIN. There is also a similar requirement for IIIN accredited identifier registration node.

This document specifies a format for data escrow deposits independent of the objects being escrowed. A specification is required for each type of registry/set of objects that is expected to be escrowed.

2. Conventions used in this document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [BCP 14 \[RFC2119\]](#) [[RFC8174](#)] when, and only when, they appear in all capitals, as shown here.

Deposit. Deposits can be of two kinds: Full and Differential. For all kinds of deposits, the universe of registry objects to be considered for data escrow is those objects necessary in order to offer the registry services.

Differential Deposit. Contains data that reflects all transactions involving the database that were not reflected in the last previous Full, or Differential Deposit, as the case may be. Differential Deposit files will contain information from all database objects that were added, modified or deleted since the previous deposit was completed as of its defined Timeline Watermark.

Full Deposit. Contains the registry data that reflects the current and complete registry database and will consist of data that reflects the state of the IIIN as of a defined Timeline Watermark for the deposit.

Escrow Agent. The organization designated by the IIIN or the third-party beneficiary to receive and guard data escrow deposits from the IIIN.

Third-Party Beneficiary. Is the organization that, under extraordinary circumstances, would receive the escrow deposits the IIIN transferred to the escrow agent. This organization could be a backup IIIN, contracting party of the IIIN, etc.

Timeline Watermark. Point in time on which to base the collecting of database objects for a deposit. Deposits are expected to be consistent to that point in time.

3. General Conventions

The XML namespace prefix "inde" is used for the namespace "urn:ietf:params:xml:ns:inde-1.0", but implementations MUST NOT depend on it; instead, they should employ a proper namespace-aware XML parser and serializer to interpret and output the XML documents.

The XML namespace prefix "indeObj1" and "indeObj2" with the corresponding namespace "urn:ietf:params:xml:ns:indeObj1-1.0" and "urn:ietf:params:xml:ns:indeObj2-1.0" are used as example data escrow objects.

3.1. Date and Time

Numerous fields indicate "dates", such as the creation and expiry dates for objects. These fields SHALL contain timestamp indicating the date and time in UTC, specified in Internet Date/Time Format (see [\[RFC3339\]](#), [Section 5.6](#)) with the time-offset specified as "Z".

3.2. IP Addresses

The syntax for IPv4 addresses described in this document MUST conform to [\[RFC5730\]](#). The syntax for IPv6 addresses described in this document MUST conform to [\[RFC4291\]](#). Practical considerations for publishing IPv6 address information in zone files are documented in [\[RFC2874\]](#) and [\[RFC3596\]](#). A server MAY reject IP addresses that have not been allocated for public use by IANA.

4. Protocol Description

The following is a format for data escrow deposits as produced by an IIIN. The deposits are represented in XML. Only the format of the objects deposited is defined, nothing is prescribed about the method used to transfer such deposits between the IIIN and the escrow agent or vice versa.

The protocol intends to be object agnostic allowing the "overload" of abstract elements using the "substitutionGroup" attribute of the XML Schema element to define the actual elements of an object to be escrowed.

4.1. Root element <deposit>

The container or root element for an IIIN Data Escrow deposit is <deposit>. This element contains the following child elements: <watermark>, <indeMenu>, <deletes> and <contents> elements. This element also contains the following attributes:

- o A REQUIRED "type" attribute that is used to identify the kind of deposit: FULL (Full), or DIFF (Differential).
- o A REQUIRED "id" attribute that is used to uniquely identify the escrow deposit. Each IIIN is responsible for maintaining its own escrow deposits identifier space to ensure uniqueness.
- o An OPTIONAL "prevId" attribute that can be used to identify the previous Differential or Full Deposit. This attribute MUST be used in Differential Deposits ("DIFF" type).
- o An OPTIONAL "resend" attribute that is incremented each time the escrow deposit failed the verification procedure at the receiving party and a new escrow deposit needs to be generated by the IIIN for that specific date. The first time a deposit is generated the attribute is either omitted or MUST be "0". If a deposit needs to be generated again, the attribute MUST be set to "1", and so on.

Example of a Full Deposit with the two example objects indeObj1 and indeObj2:

```
<?xml version="1.0" encoding="utf-8"?>

<inde:deposit xmlns:inde="urn:ietf:params:xml:ns:inde-1.0"
xmlns:indeObj1="urn:ietf:params:xml:ns:indeObj1-1.0"
xmlns:indeObj2="urn:ietf:params:xml:ns:indeObj2-1.0" type="FULL"
id="20191017001">

  <inde:watermark>2019-12-20T00:00:00Z</inde:watermark>

  <inde:indeMenu>

    <inde:version>1.0</inde:version>

    <inde:objURI>urn:ietf:params:xml:ns:indeObj1-1.0</inde:objURI>

    <inde:objURI>urn:ietf:params:xml:ns:indeObj2-1.0</inde:objURI>

  </inde:indeMenu>

  <inde:contents>

    <indeObj1:indeObj1>

      <indeObj1:name>EXAMPLE1</indeObj1:name>

    </indeObj1:indeObj1>
```



```

<indeObj2:indeObj2>

  <indeObj2:id>EXAMPLE2</indeObj2:id>

</indeObj2:indeObj2>

</inde:contents>

```

```

</inde:deposit>

```

Example of a Differential Deposit with the two example objects indeObj1 and indeObj2:

```

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

<inde:deposit

  xmlns:inde="urn:ietf:params:xml:ns:inde-1.0"

  xmlns:indeObj1="urn:ietf:params:xml:ns:indeObj1-1.0"

  xmlns:indeObj2="urn:ietf:params:xml:ns:indeObj2-1.0"

  type="DIFF" id="20191221001" prevId="20191220001">

  <inde:watermark>2019-12-21T00:00:00Z</inde:watermark>

  <inde:indeMenu>

    <inde:version>1.0</inde:version>

    <inde:objURI>

      urn:ietf:params:xml:ns:indeObj1-1.0

    </inde:objURI>

    <inde:objURI>

      urn:ietf:params:xml:ns:indeObj2-1.0

    </inde:objURI>

  </inde:indeMenu>

  <inde:deletes>

    <indeObj1:delete>

```

```
<indeObj1:name>EXAMPLE1</indeObj1:name>

</indeObj1:delete>

<indeObj2:delete>

  <indeObj2:id>EXAMPLE2</indeObj2:id>

</indeObj2:delete>

</inde:deletes>

<inde:contents>

  <indeObj1:indeObj1>

    <indeObj1:name>EXAMPLE3</indeObj1:name>

  </indeObj1:indeObj1>

  <indeObj2:indeObj2>

    <indeObj2:id>EXAMPLE4</indeObj2:id>

  </indeObj2:indeObj2>

</inde:contents>

</inde:deposit>
```

4.2. Child <watermark> element

A REQUIRED <watermark> element contains the data-time corresponding to the Timeline Watermark of the deposit.

4.3. Child <indeMenu> element

This element contains auxiliary information of the data escrow deposit. A REQUIRED <indeMenu> element contains the following child elements:

- o A REQUIRED <version> element that identifies the INDE protocol version.
- o One or more <objURI> elements that contain namespace URIs representing the <contents> and <deletes> element objects.

4.4. Child <deletes> element

This element SHOULD be present in deposits of type Differential. It contains the list of objects that were deleted since the base previous deposit. Each object in this section SHALL contain an identifier for the object deleted.

This section of the deposit SHOULD NOT be present in Full Deposits. When rebuilding an IIIN it SHOULD be ignored if present in a Full Deposit.

The specification for each object to be escrowed MUST declare the identifier to be used to reference the object to be deleted.

4.5. Child <contents> element

This element of the deposit contains the objects in the deposit. It MUST be present in all type of deposits. It contains the data for the objects to be escrowed. The actual objects had to be specified individually.

In the case of Differential Deposits, the objects indicate whether the object was added or modified after the base previous deposit. In order to distinguish between one and the other, it will be sufficient to check existence of the reference object of the previous deposit.

When applying Differential Deposits (when rebuilding the IIIN from data escrow deposits) the relative order of the <deletes> elements is important, as is the relative order of the <contents> elements. All the <deletes> elements MUST be applied first, in the order that they appear. All the <contents> elements MUST be applied next, in the order that they appear.

If an object is present in the <contents> section of several deposits (e.g. Full and Differential) the IIIN data from the latest deposit (as defined by the Timeline Watermark) SHOULD be used when rebuilding the IIIN.

5. Formal Syntax

5.1. INDE Schema

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BEGIN

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

<schema targetNamespace="urn:ietf:params:xml:ns:inde-1.0"

  xmlns:inde="urn:ietf:params:xml:ns:inde-1.0"

  xmlns="http://www.w3.org/2001/XMLSchema"

  elementFormDefault="qualified">

  <annotation>

    <documentation>

      Industrial Internet Identifier Node (IIIN) Data Escrow Schema

    </documentation>
```



```
</annotation>

<!-- Root element -->

<element name="deposit" type="inde:escrowDepositType"/>

<!-- INDE types -->

<complexType name="escrowDepositType">
  <sequence>
    <element name="watermark" type="dateTime"/>
    <element name="indeMenu" type="inde:indeMenuType"/>
    <element name="deletes" type="inde:deletesType"
      minOccurs="0"/>
    <element name="contents" type="inde:contentsType"/>
  </sequence>
  <attribute name="type" type="inde:depositTypeType"
    use="required"/>
  <attribute name="id" type="inde:depositIdType"
    use="required"/>
  <attribute name="prevId" type="inde:depositIdType"/>
  <attribute name="resend" type="unsignedShort" default="0"/>
</complexType>

<!-- Menu type -->

<complexType name="indeMenuType">
  <sequence>
    <element name="version" type="inde:versionType"/>
    <element name="objURI" type="anyURI" maxOccurs="unbounded"/>
  </sequence>
</complexType>
```

```
<!-- Deletes Type -->

<complexType name="deletesType">
  <sequence minOccurs="0" maxOccurs="unbounded">
    <element ref="inde:delete"/>
  </sequence>
</complexType>

<element name="delete" type="inde:deleteType" abstract="true" />

<complexType name="deleteType">
  <complexContent>
    <restriction base="anyType"/>
  </complexContent>
</complexType>

<!-- Contents Type -->

<complexType name="contentsType">
  <sequence maxOccurs="unbounded">
    <element ref="inde:content"/>
  </sequence>
</complexType>

<element name="content"
type="inde:contentType" abstract="true" />

<complexType name="contentType">
  <complexContent>
    <restriction base="anyType"/>
  </complexContent>
</complexType>
```

```
<!-- Type of deposit -->

<simpleType name="depositTypeType">
  <restriction base="token">
    <enumeration value="FULL"/>
    <enumeration value="DIFF"/>
  </restriction>
</simpleType>

<!-- Deposit identifier type -->

<simpleType name="depositIdType">
  <restriction base="token">
    <pattern value="\w{1,13}"/>
  </restriction>
</simpleType>

<!--INDE version number is a dotted pair of decimal numbers -->

<simpleType name="versionType">
  <restriction base="token">
    <pattern value="[1-9]+\.[0-9]+"/>
    <enumeration value="1.0"/>
  </restriction>
</simpleType>

</schema>

END
```

6. Internationalization Considerations

Data escrow deposits are represented in XML, which provides native support for encoding information using the Unicode character set and its more compact representations including UTF-8. Conformant XML

processors recognize both UTF-8 and UTF-16. Though XML includes provisions to identify and use other character encodings through use of an "encoding" attribute in an `<?xml?>` declaration, use of UTF-8 is RECOMMENDED.

7. Security Considerations

This specification does not define the security mechanisms to be used in the transmission of the data escrow deposits, since it only specifies the minimum necessary to enable the rebuilding of an IIIN from deposits without intervention from the original IIIN.

Depending on local policies, some elements or most likely, the whole deposit will be considered confidential. As such the IIIN transmitting the data to the escrow agent SHOULD take all the necessary precautions like encrypting the data itself and/or the transport channel to avoid inadvertent disclosure of private data.

It is also of the utmost importance the authentication of the parties passing data escrow deposit files. The escrow agent SHOULD properly authenticate the identity of the IIIN before accepting data escrow deposits. In a similar manner, the IIIN SHOULD authenticate the identity of the escrow agent before submitting any data.

Additionally, the IIIN and the escrow agent SHOULD use integrity checking mechanisms to ensure the data transmitted is what the source intended. Validation of the contents by the escrow agent is RECOMMENDED to ensure not only the file was transmitted correctly from the IIIN, but also the contents are also "meaningful".

8. IANA Considerations

This document uses URNs to describe XML namespaces and XML schemas conforming to a registry mechanism described in [[RFC3688](#)]. Two URI assignments need to be registered by the IANA.

Registration request for the INDE namespace:

URI: urn:ietf:params:xml:ns:inde-1.0

Registrant Contact: See the "Author's Address" section of this document.

XML: None. Namespace URIs do not represent an XML specification.

Registration request for the INDE XML schema:

URI: urn:ietf:params:xml:schema:inde-1.0

Registrant Contact: See the "Author's Address" section of this document.

XML: See the "Formal Syntax" section of this document.

9. Privacy Considerations

This specification defines a format that may be used to escrow personal data. The process of data escrow is governed by a legal document agreed by the parties, and such legal document must regulate the particularities regarding the protection of personal data.

10. References

10.1. Normative References

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Authors' Address

Hongjie Wu
CAICT
No.52 Huayuan North Road, Haidian District
Beijing, Beijing, 100191
China

Phone: +86 186 0106 5934
Email: wuhongjie@caict.ac.cn

Jian Chen
CAICT
No.52 Huayuan North Road, Haidian District
Beijing, Beijing, 100191
China

Phone: +86 138 1103 3332
Email: chenjian3@caict.ac.cn

Xiaotian Fan
CAICT
No.52 Huayuan North Road, Haidian District
Beijing, Beijing, 100191
China

Phone: +86 134 0108 6945
Email: fanxiaotian@caict.ac.cn

Menlan Chen
CAICT
No.52 Huayuan North Road, Haidian District
Beijing, Beijing, 100191
China

Phone: +86 139 1143 7301
Email: chenmeilan@caict.ac.cn

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June 2023

Zhiping Li

CAICT

No.52 Huayuan North Road, Haidian District

Beijing, Beijing, 100191

China

Phone: +86 185 1107 1386

Email: lizhiping@caict.ac.cn