XML based application to ITU-T Recommendations

TSB

November 2009

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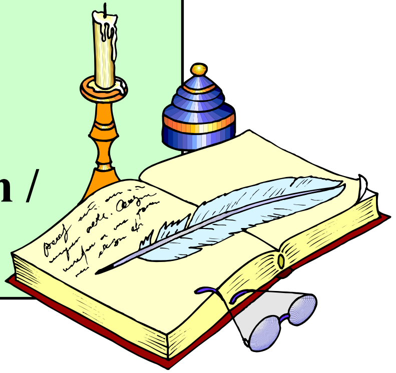
1. XML project (Project Rx) in ITU-T

1-1 Background and objectives

Background

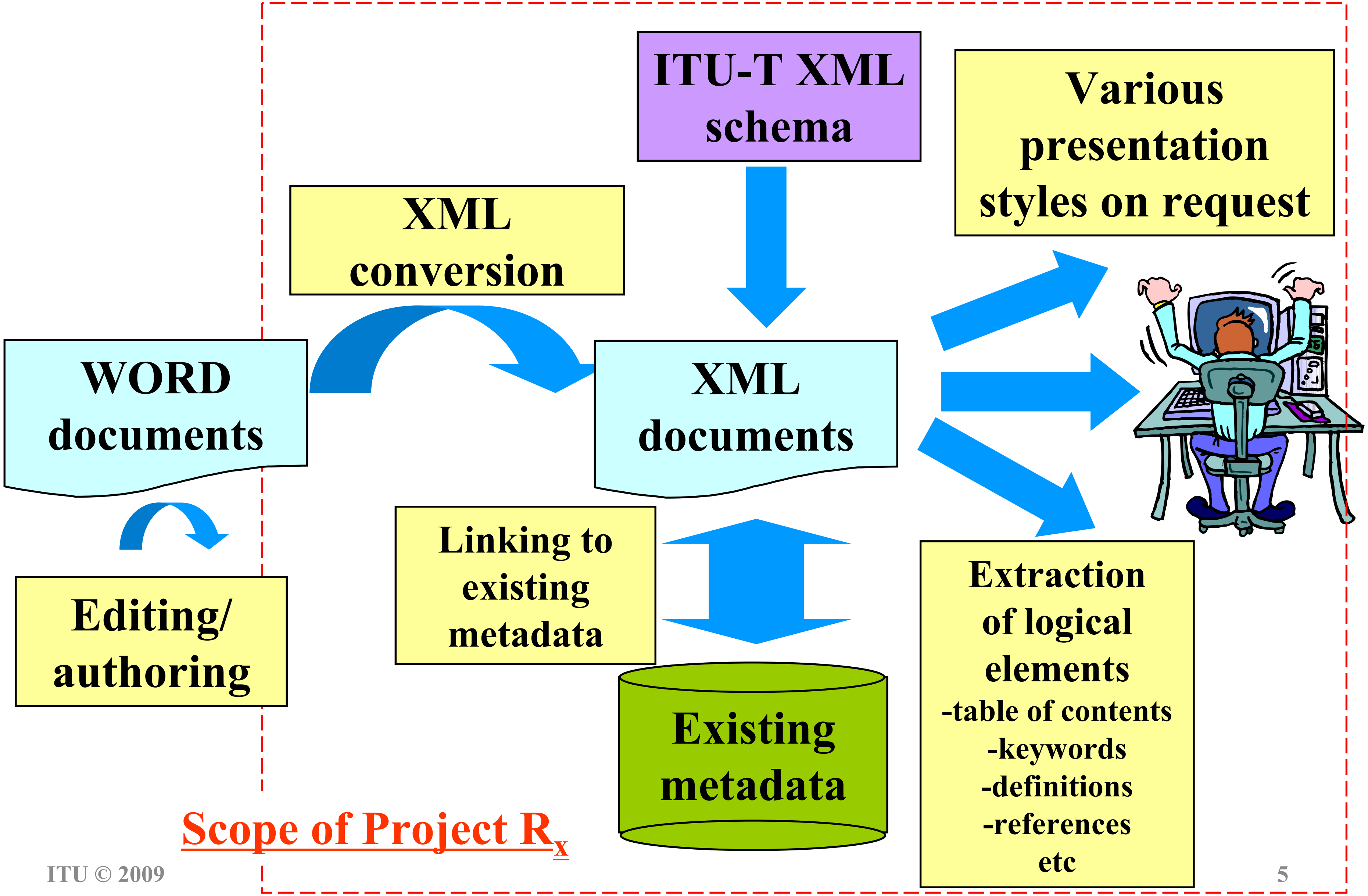
- **ITU-T membership requested changes**
- **Need to apply right technology for 21st century publication**
- **Improve utility of ITU-T output, especially through the Internet**
- **Enable topic-focused (rather than printed image-focused) research / information delivery**



Objectives

- **Establish the framework for a long term effort to from static, Microsoft WORD-based ITU-T Recommendations to dynamic, XML-based documents**
- **Define the appropriate XML Schema**
- **Develop prototype system**
  - Document conversion into ITU-T XML format
  - XML document element processing (extraction of logical elements, link to existing metadata)
  - Format conversion for various presentations (using different style sheet)

1-2 Scope and system components



ITU-T XML schema

Various presentation styles on request

XML conversion

WORD documents

XML documents

Editing/ authoring

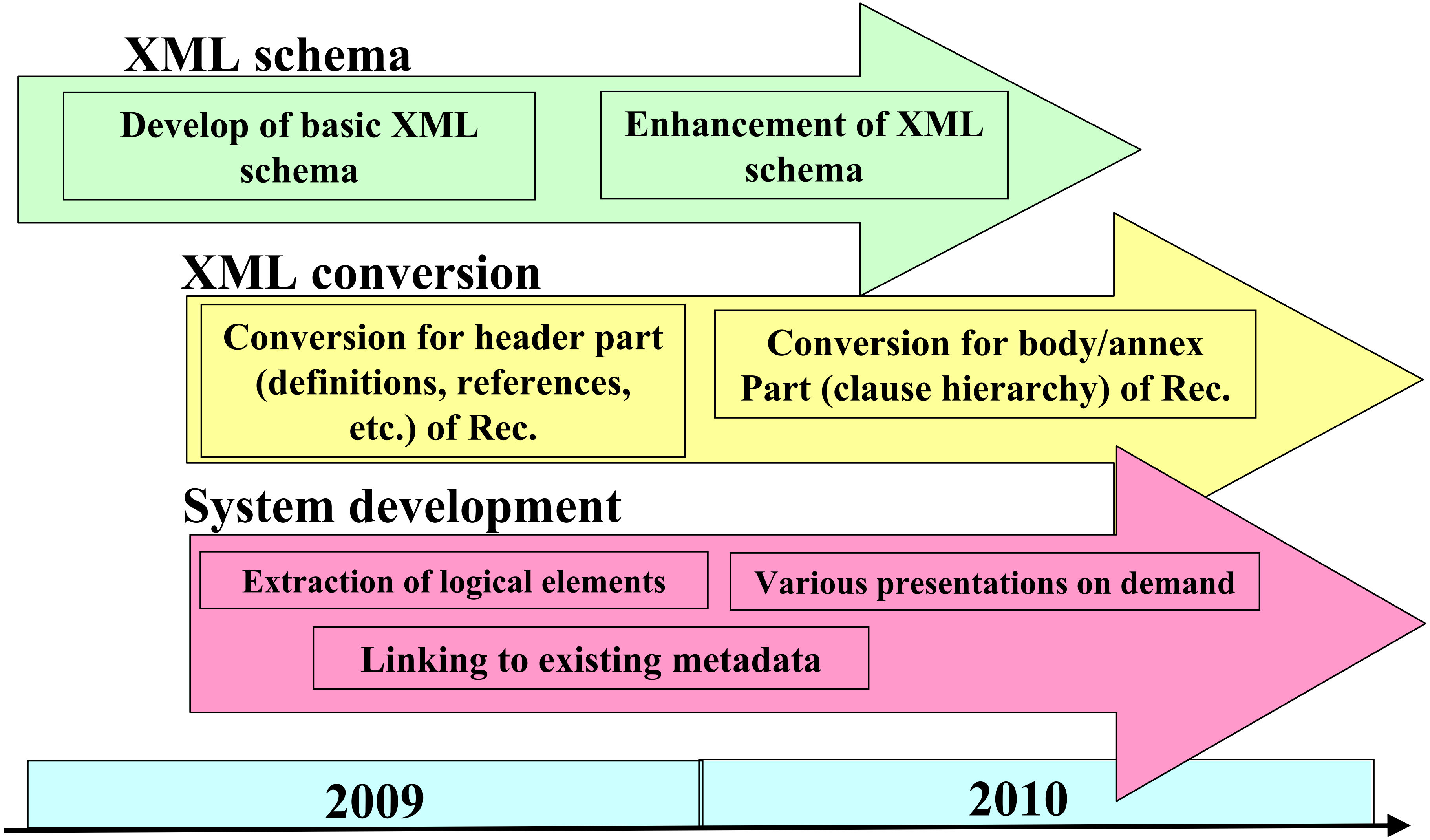
Linking to existing metadata

Existing metadata

Extraction of logical elements
-table of contents
-keywords
-definitions
-references
etc

Scope of Project R_x

1-3 Plan



XML schema

Develop of basic XML schema

Enhancement of XML schema

XML conversion

Conversion for header part (definitions, references, etc.) of Rec.

Conversion for body/annex Part (clause hierarchy) of Rec.

System development

Extraction of logical elements

Various presentations on demand

Linking to existing metadata

2009

2010

2. Conversion system

from Word documents
to ITU-T XML documents

2-1 Overview

Purpose

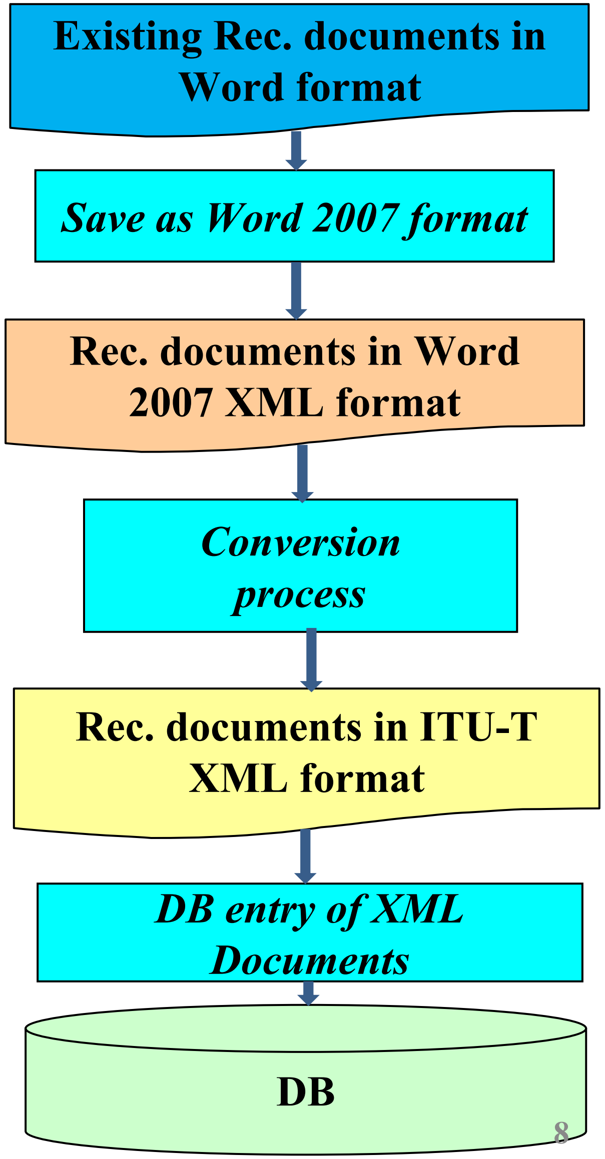
- Basic experiment to convert existing Recommendation documents (.doc) into logically structured XML documents
- Preparation for extraction of typical Recommendation elements such as references, definitions and abbreviations

Input document

- Word 2007 XML format saved as XML file

Output document

- ITU-T XML; basically based on schema proposed by Japan to TSAG



Existing Rec. documents in Word format

Save as Word 2007 format

Rec. documents in Word 2007 XML format

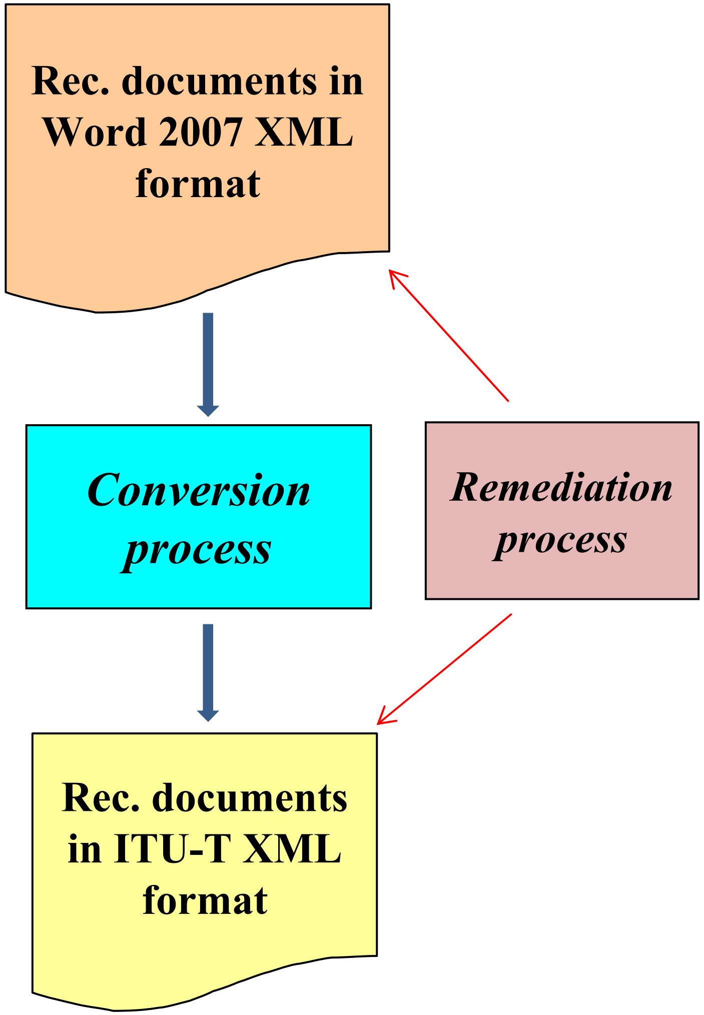
Conversion process

Rec. documents in ITU-T XML format

DB entry of XML Documents

DB

2-2 Conversion method


Rec. documents in Word 2007 XML format
Conversion process
Remediation process
Rec. documents in ITU-T XML format

Input document

- Documents are supposed to conform to “Author’s Guide” (March,2007 version) with some allowance
- Word XML as a Sequence of “paragraphs” with some “style” data

Output document

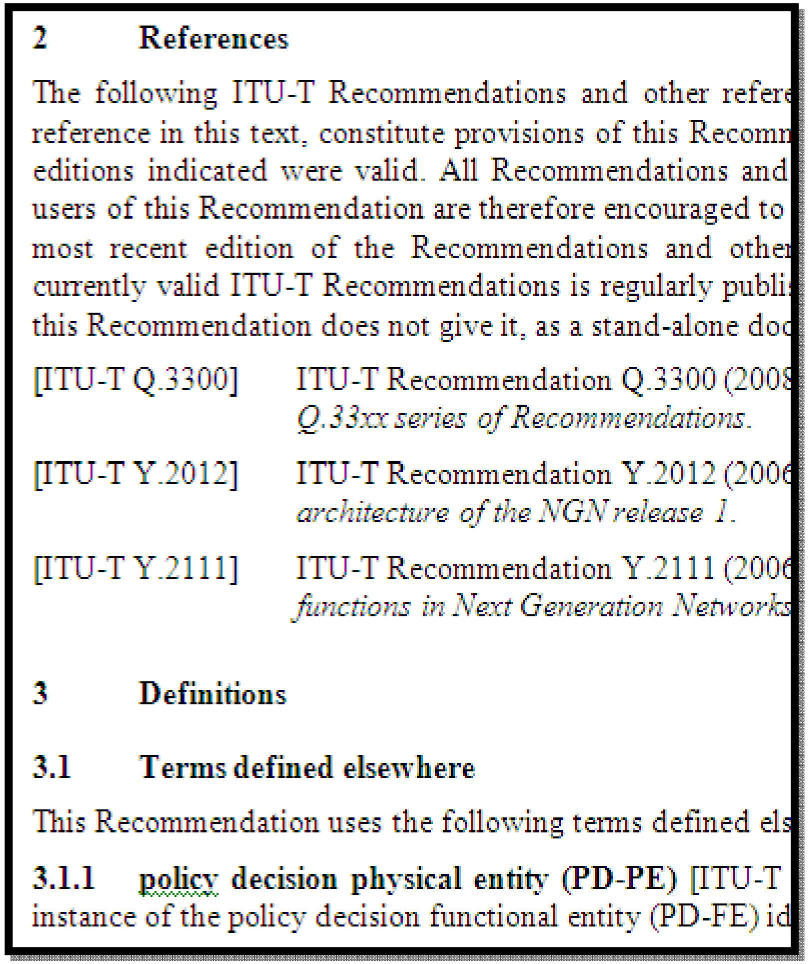
- ITU-T XML; includes metadata reflecting logically structured elements

Conversion process

- Automatic restructuring of document header elements utilizing “style” information
- Remediation by operator as supplementary process

2-2 Conversion method

-Example of Input vs Output-



2 References

The following ITU-T Recommendations and other refere
reference in this text, constitute provisions of this Recomm
editions indicated were valid. All Recommendations and
users of this Recommendation are therefore encouraged to
most recent edition of the Recommendations and other
currently valid ITU-T Recommendations is regularly publi
this Recommendation does not give it, as a stand-alone doc

[ITU-T Q.3300] ITU-T Recommendation Q.3300 (2008
Q.33xx series of Recommendations.

[ITU-T Y.2012] ITU-T Recommendation Y.2012 (2006
architecture of the NGN release 1.

[ITU-T Y.2111] ITU-T Recommendation Y.2111 (2006
functions in Next Generation Networks

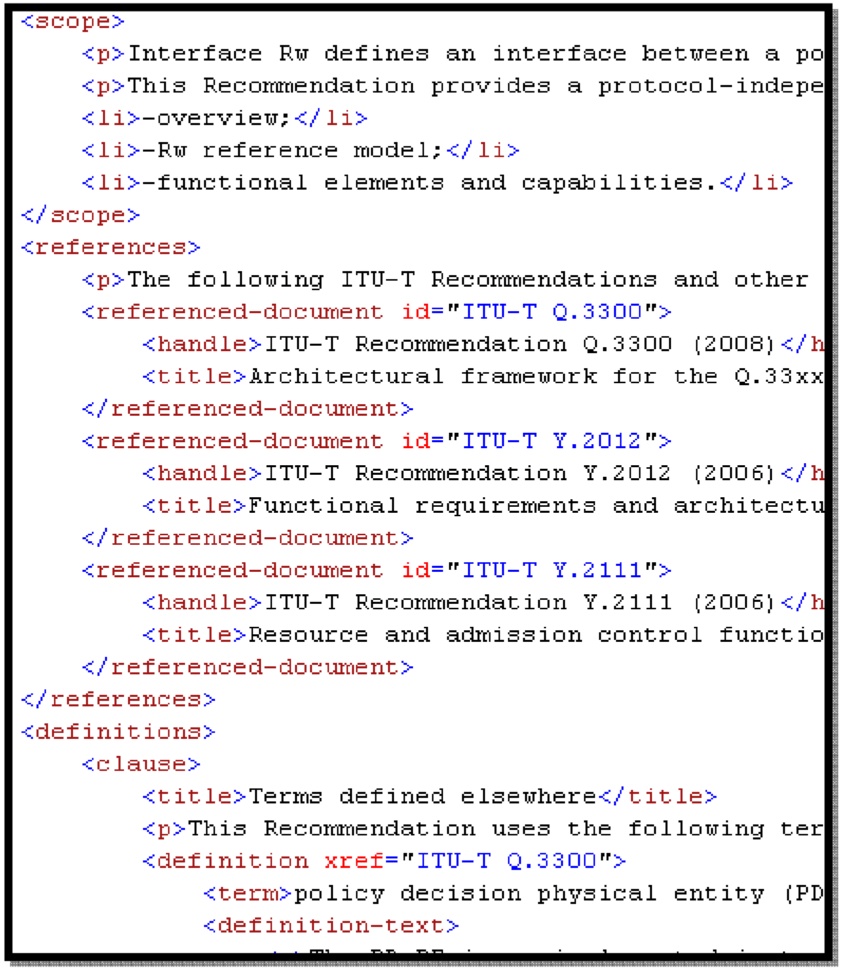
3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined els

3.1.1 policy decision physical entity (PD-PE) [ITU-T
instance of the policy decision functional entity (PD-FE) id

Word document

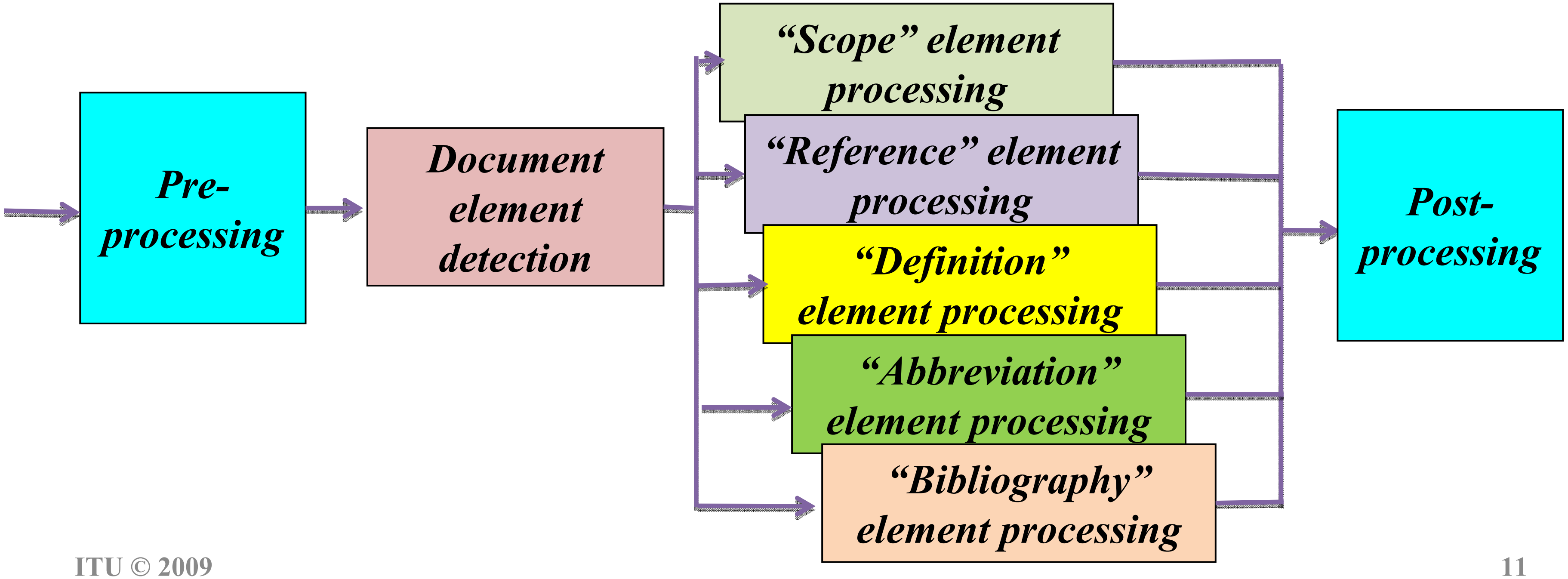


```
<scope>
    <p>Interface Rw defines an interface between a po
    <p>This Recommendation provides a protocol-indepe
    <li>-overview;</li>
    <li>-Rw reference model;</li>
    <li>-functional elements and capabilities.</li>
</scope>
<references>
    <p>The following ITU-T Recommendations and other
    <referenced-document id="ITU-T Q.3300">
        <handle>ITU-T Recommendation Q.3300 (2008)</h
        <title>Architectural framework for the Q.33xx
    </referenced-document>
    <referenced-document id="ITU-T Y.2012">
        <handle>ITU-T Recommendation Y.2012 (2006)</h
        <title>Functional requirements and architectu
    </referenced-document>
    <referenced-document id="ITU-T Y.2111">
        <handle>ITU-T Recommendation Y.2111 (2006)</h
        <title>Resource and admission control functio
    </referenced-document>
</references>
<definitions>
    <clause>
        <title>Terms defined elsewhere</title>
        <p>This Recommendation uses the following ter
        <definition xref="ITU-T Q.3300">
            <term>policy decision physical entity (PD
            <definition-text>
```

ITU-T XML document

2-3 Conversion process

- Eliminating irrelevant document elements in pre-processing
- Prototype focuses on five elements (Scope, Reference, Definition, Abbreviation and Bibliography) of header part
- Each element is analyzed and restructured into ITU-T XML form by the XSLT (XML Stylesheet Language Transformations)

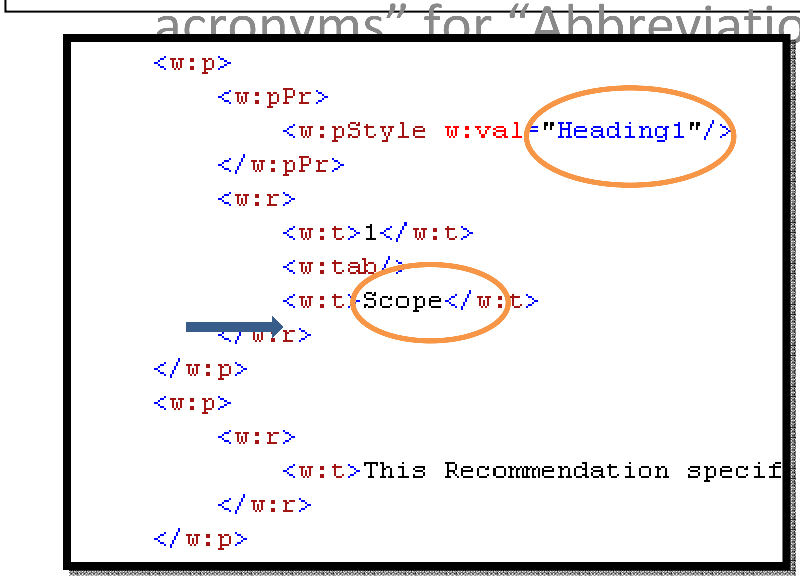

Pre-processing
Document element detection
"Scope" element processing
"Reference" element processing
"Definition" element processing
"Abbreviation" element processing
"Bibliography" element processing
Post-processing

2-3-1 Pre-processing

- Extraction of core XML document.xml from the docx files(package)
- Cleaning of the non essential MS Word markups in document.xml;
  - ➢ Word specific internal references (Bookmark etc.)
  - ➢ Soft-Hyphen
  - ➢ Unnecessary Spaces
  - ➢ Merging the neighboring same type of tags (</w:r><w:r>, </w:t><w:t>)

2-3-2 Document element detection

- To detect various document elements, “pStyle” and “t(ext)” information are utilized.
- If “pStyle”=‘Heading1’ and the second content of “t” =‘Scope’ / ‘References’ / ‘Definitions’ / ‘Abbreviations’ / ‘Bibliography, then each part is mapped into the respective element:<scope>, <references>, <definitions>, <abbreviations>and <bibliography>.
- Alternative expressions for “Heading” are allowed, e.g. “Normative references” for “References”, “Abbreviations and acronyms” for “Abbreviations”.



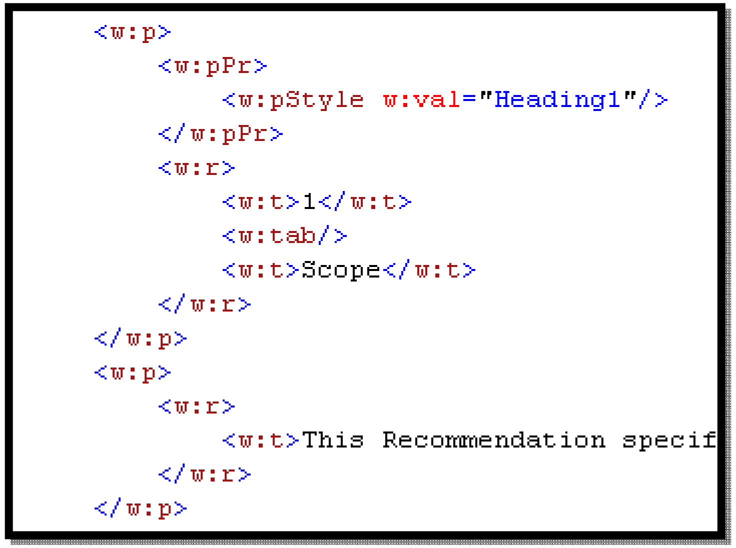
```
<w:p>
    <w:pPr>
        <w:pStyle w:val="Heading1"/>
    </w:pPr>
    <w:r>
        <w:t>1</w:t>
        <w:tab/>
        <w:t>Scope</w:t>
    </w:r>
</w:p>
<w:p>
    <w:r>
        <w:t>This Recommendation specif
    </w:r>
</w:p>
```

WordXML

Move to “Scope” part processing

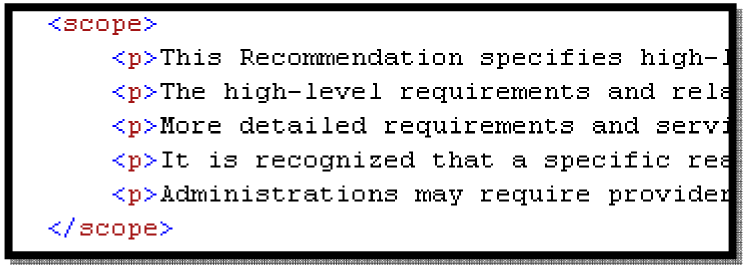
2-3-3 “Scope” element processing

- If the “scope” part contains a sub-clause structure, it is mapped into a hierarchal <clause> structure. “clauses” are identified by the “pStyle”of ‘Heading#”.
- “t(ext)” that has “pStyle” of ‘Normal’ is mapped into <p> element.
- “t” with that has certain “pStyle” characteristics such as ‘Note’, ‘Enumlevel’, ‘Figure’ and ‘Equation’ are mapped into <note>, <ol>or<ul>, <figure> and <equation>, respectively.



```
<w:p>
    <w:pPr>
        <w:pStyle w:val="Heading1"/>
    </w:pPr>
    <w:r>
        <w:t>1</w:t>
        <w:tab/>
        <w:t>Scope</w:t>
    </w:r>
</w:p>
<w:p>
    <w:r>
        <w:t>This Recommendation specif
    </w:r>
</w:p>
```

WordXML

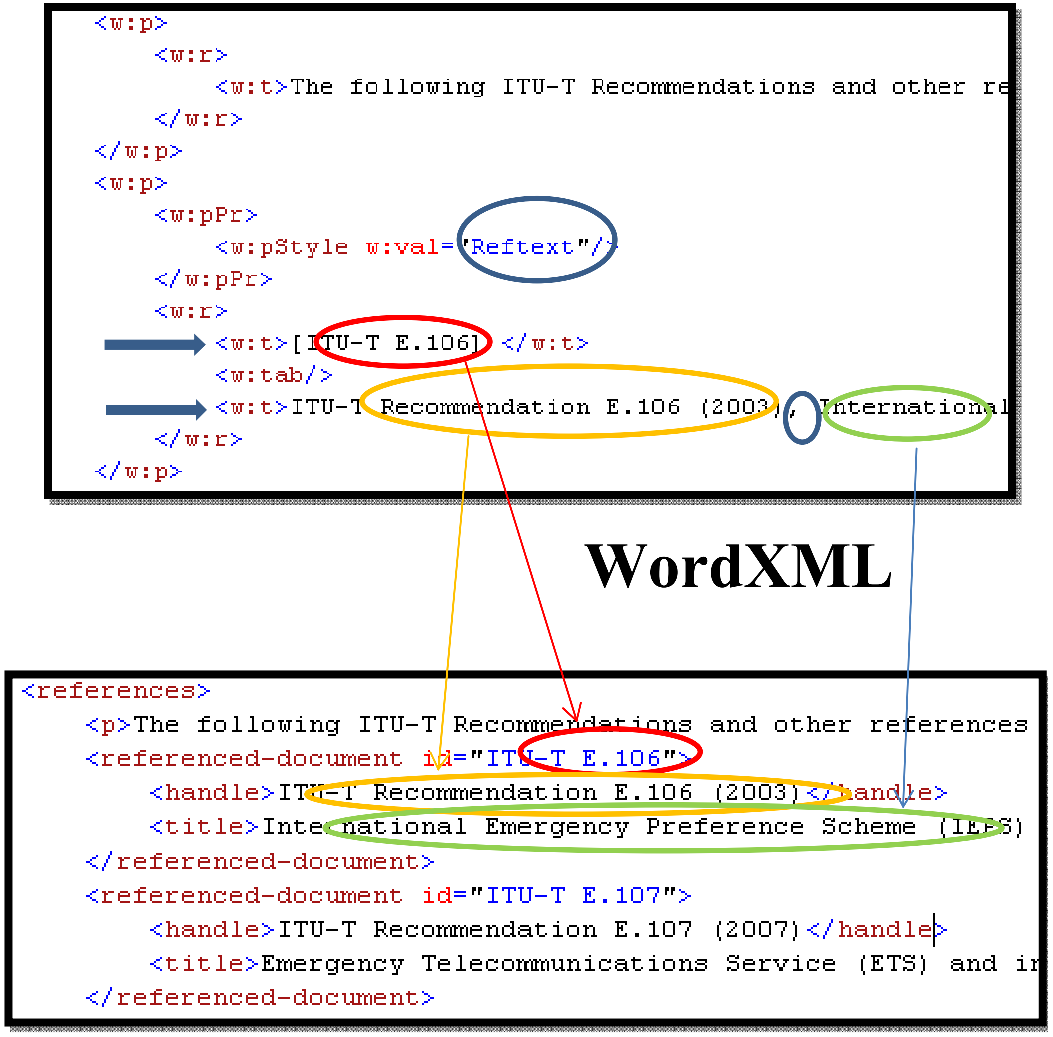


```
<scope>
    <p>This Recommendation specifies high-l
    <p>The high-level requirements and rela
    <p>More detailed requirements and servi
    <p>It is recognized that a specific rea
    <p>Administrations may require provider
</scope>
```

ITU-T XML

2-3-4 “Reference” element processing

- If the “references” part contains a sub-clause structure, it is mapped into a hierarchal <clause> structure.
- “t” that has “pStyle” of ‘Normal’ is mapped into <p>.
- “p” with ‘Reftext’ is mapped into <referenced-document>
- The first “t” is mapped into ‘id’ attribute.
- The second “t” is separated into two parts by ‘,’. The first part of the second “t” is mapped into <handle> and the second part of the second ”t” is mapped into <title>.
- If the “reference” part contains a hyperlink, it is mapped into <url>.



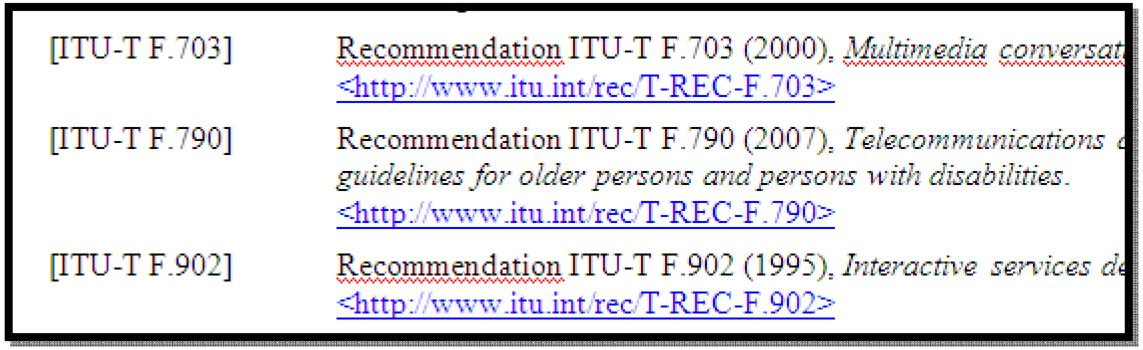
```
<w:p>
    <w:r>
        <w:t>The following ITU-T Recommendations and other re
    </w:r>
</w:p>
<w:p>
    <w:pPr>
        <w:pStyle w:val="Reftext"/>
    </w:pPr>
    <w:r>
        <w:t>[ITU-T E.106] </w:t>
        <w:tab/>
        <w:t>ITU-T Recommendation E.106 (2003), International
    </w:r>
</w:p>
```

WordXML

```
<references>
    <p>The following ITU-T Recommendations and other references
    <referenced-document id="ITU-T E.106">
        <handle>ITU-T Recommendation E.106 (2003)</handle>
        <title>International Emergency Preference Scheme (IEPS)
    </referenced-document>
    <referenced-document id="ITU-T E.107">
        <handle>ITU-T Recommendation E.107 (2007)</handle>
        <title>Emergency Telecommunications Service (ETS) and ir
    </referenced-document>
```

ITU-T XML

2-3-4 “Reference” element processing (continued)



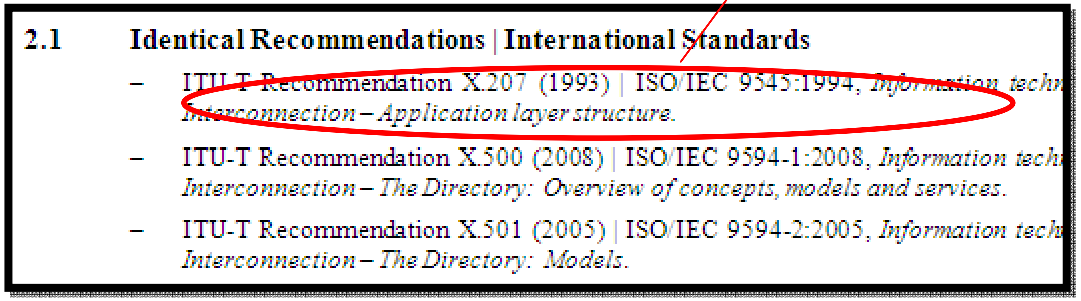
[ITU-T F.703] Recommendation ITU-T F.703 (2000), *Multimedia conversat*
<http://www.itu.int/rec/T-REC-F.703>

[ITU-T F.790] Recommendation ITU-T F.790 (2007), *Telecommunications a guidelines for older persons and persons with disabilities.*
<http://www.itu.int/rec/T-REC-F.790>

[ITU-T F.902] Recommendation ITU-T F.902 (1995), *Interactive services de*
<http://www.itu.int/rec/T-REC-F.902>

Standard case

The “pStyle is to be set to ‘enumlev1’



2.1 Identical Recommendations | International Standards

– ITU-T Recommendation X.207 (1993) | ISO/IEC 9545:1994, *Information techn Interconnection – Application layer structure.*

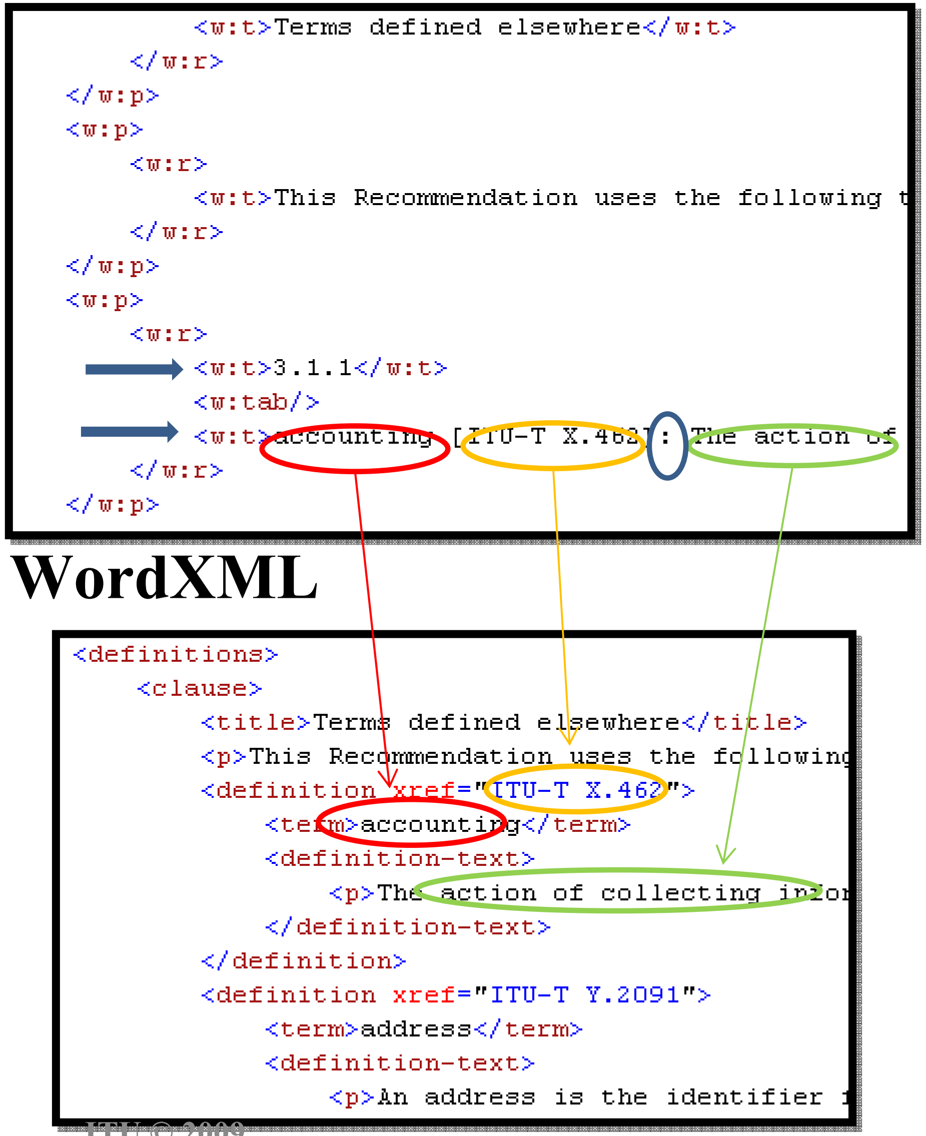
– ITU-T Recommendation X.500 (2008) | ISO/IEC 9594-1:2008, *Information techn Interconnection – The Directory: Overview of concepts, models and services.*

– ITU-T Recommendation X.501 (2005) | ISO/IEC 9594-2:2005, *Information tech Interconnection – The Directory: Models.*

Common text with ISO

- The format of reference for the common text with ISO is different from one of ITU-T standard format. But it is allowed.

2-3-5 “Definition” element processing



```
        <w:t>Terms defined elsewhere</w:t>
    </w:r>
</w:p>
<w:p>
    <w:r>
        <w:t>This Recommendation uses the following t
    </w:r>
</w:p>
<w:p>
    <w:r>
        <w:t>3.1.1</w:t>
        <w:tab/>
        <w:t>accounting [ITU-T X.462]: The action of
    </w:r>
</w:p>
```

WordXML

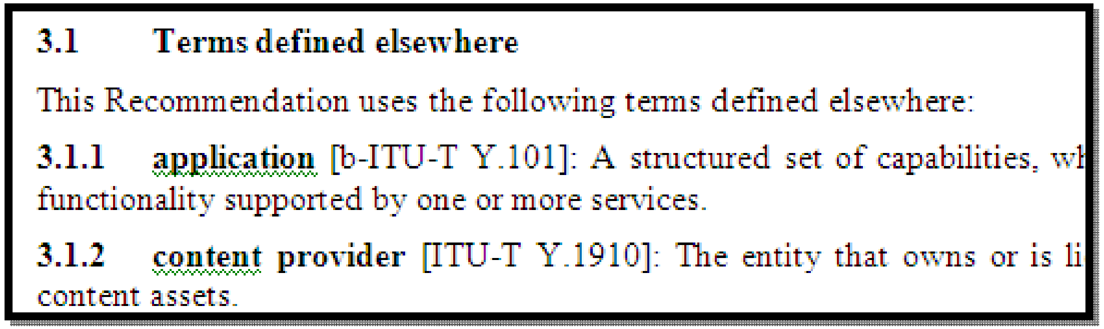
```
<definitions>
    <clause>
        <title>Terms defined elsewhere</title>
        <p>This Recommendation uses the following
        <definition xref="ITU-T X.462">
            <term>accounting</term>
            <definition-text>
                <p>The action of collecting infor
            </definition-text>
        </definition>
        <definition xref="ITU-T Y.2091">
            <term>address</term>
            <definition-text>
                <p>An address is the identifier f
```

ITU-T XML

- If the “definition” part contains a sub-clause structure, it is mapped into a hierarchal <clause> structure.
- If the “p” contains more than one “t”, it is mapped into <definition>.
- The second “t” is separated into two parts by ‘:’.
- The first part is mapped into <term>, and if it contains part surrounded by’[]’, it is mapped into ‘xref’ attribute.
- The second part is mapped into <definition-text>.
- <definition-text> may includes <p>, <note>, <ol>/<ul>, <figure> and <equation> in accordance with the input WordXML.

2-3-5 “Definition” element processing (continued)

-Various format for “Terms defined elsewhere”-

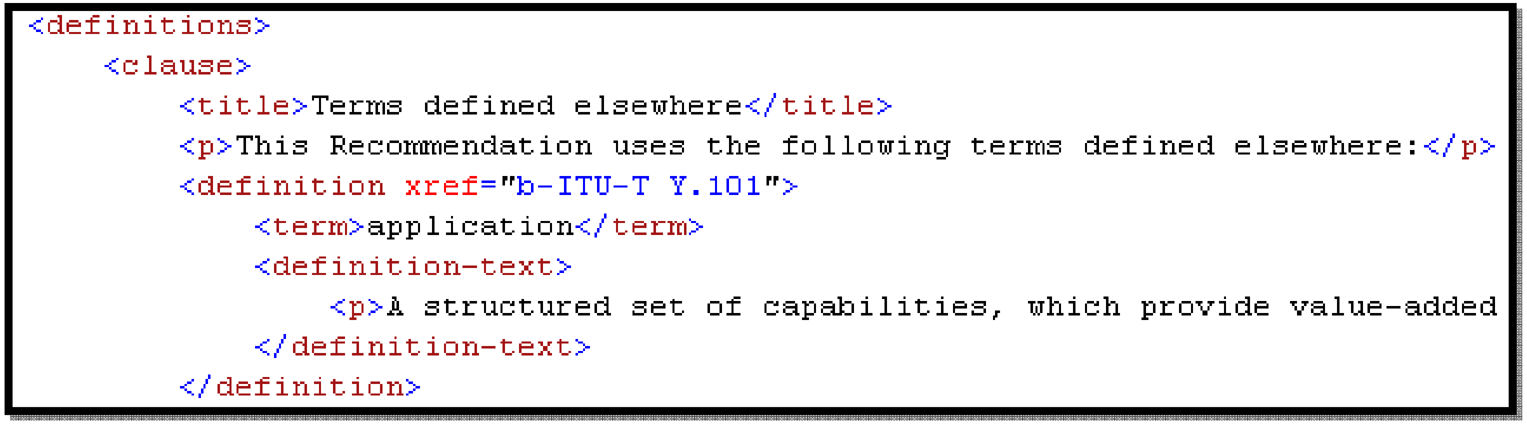


3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 application [b-ITU-T Y.101]: A structured set of capabilities, wh
functionality supported by one or more services.

3.1.2 content provider [ITU-T Y.1910]: The entity that owns or is li
content assets.

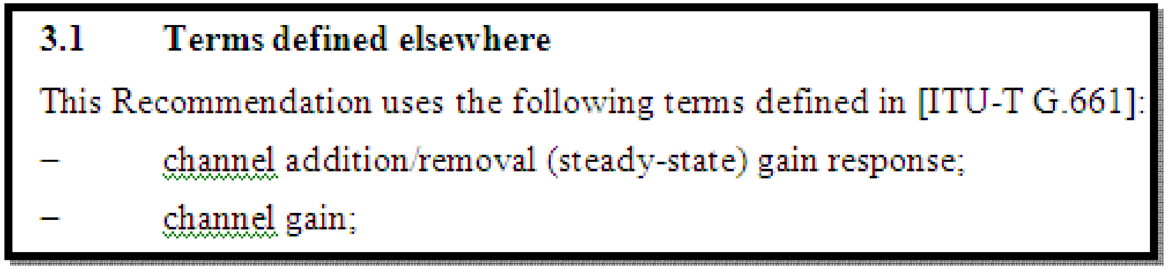


```
<definitions>
    <clause>
        <title>Terms defined elsewhere</title>
        <p>This Recommendation uses the following terms defined elsewhere:</p>
        <definition xref="b-ITU-T Y.101">
            <term>application</term>
            <definition-text>
                <p>A structured set of capabilities, which provide value-added
            </definition-text>
        </definition>
```

(a)Standard case

2-3-5 “Definition” element processing (continued)

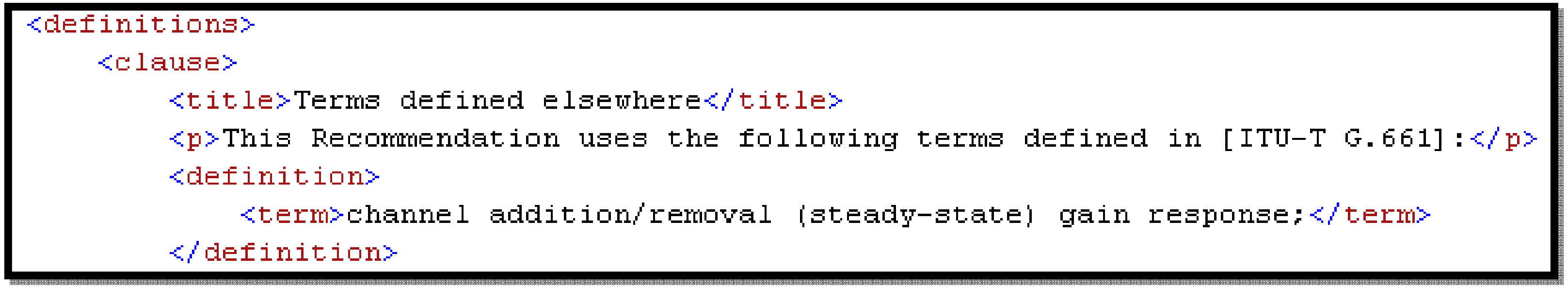
-Various format for “Terms defined elsewhere”-



3.1 Terms defined elsewhere

This Recommendation uses the following terms defined in [ITU-T G.661]:

- channel addition/removal (steady-state) gain response;
- channel gain;

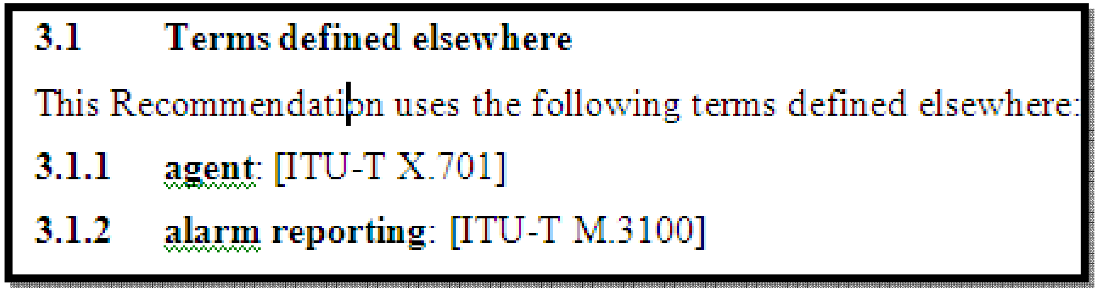


```
<definitions>
    <clause>
        <title>Terms defined elsewhere</title>
        <p>This Recommendation uses the following terms defined in [ITU-T G.661]:</p>
        <definition>
            <term>channel addition/removal (steady-state) gain response;</term>
        </definition>
```

(b)Case with only ‘term’ (without ‘id’ and ‘definition-text’)

2-3-5 “Definition” element processing (continued)

-Various format for “Terms defined elsewhere”-

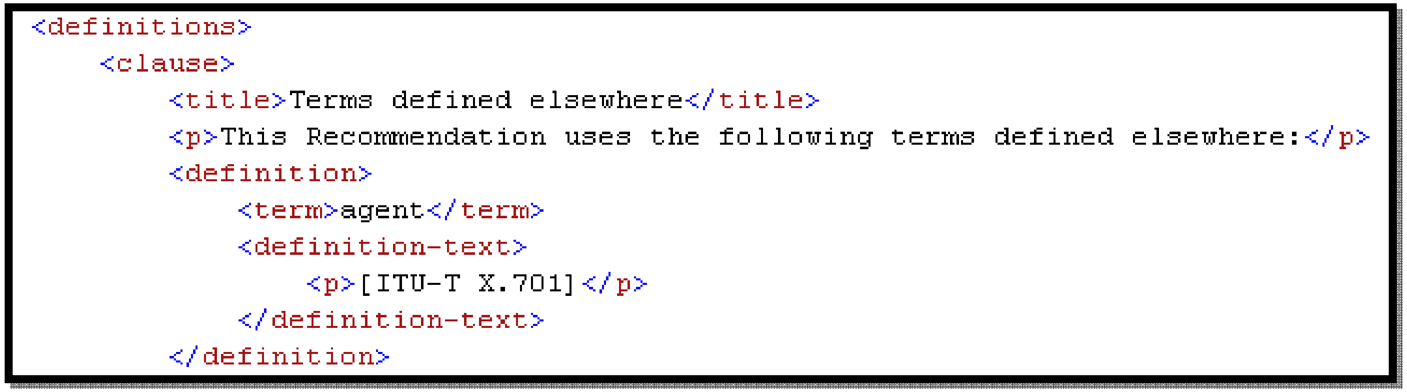


3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 agent: [ITU-T X.701]

3.1.2 alarm reporting: [ITU-T M.3100]

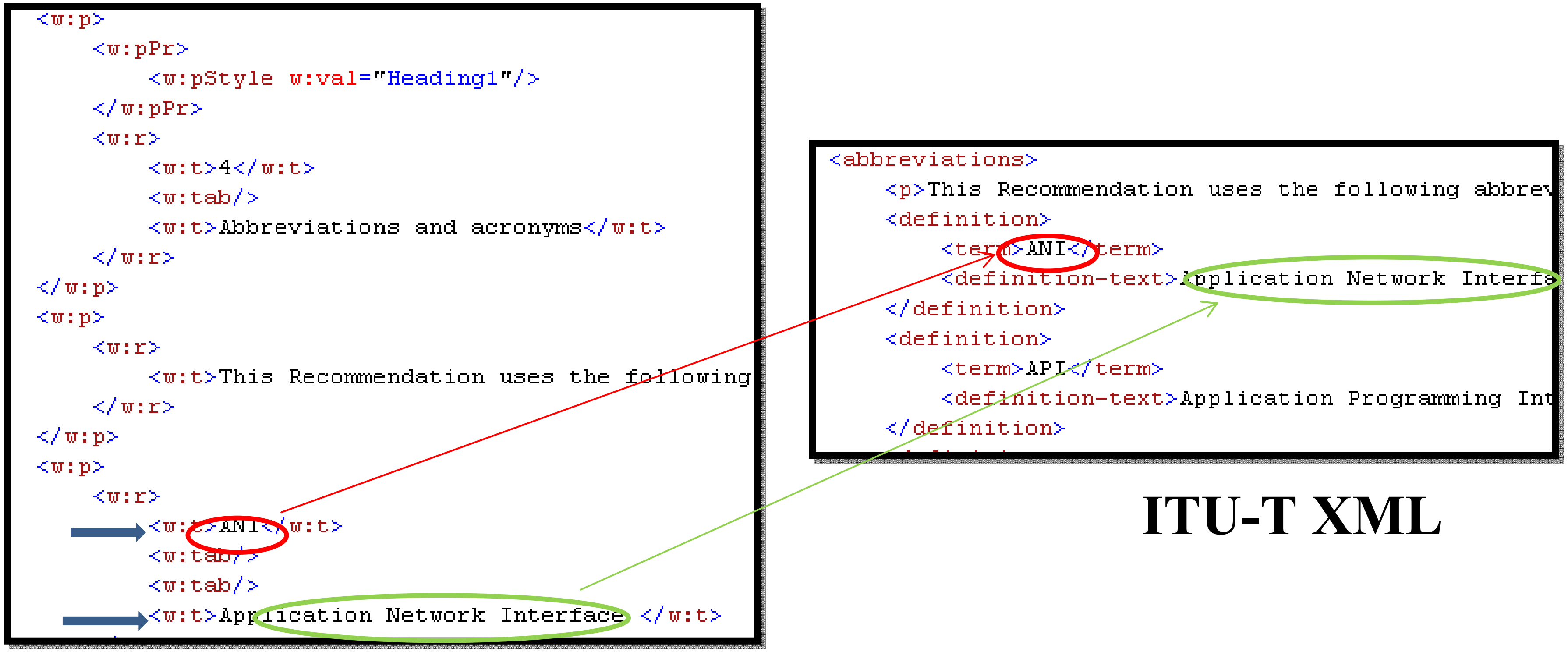


```
<definitions>
    <clause>
        <title>Terms defined elsewhere</title>
        <p>This Recommendation uses the following terms defined elsewhere:</p>
        <definition>
            <term>agent</term>
            <definition-text>
                <p>[ITU-T X.701]</p>
            </definition-text>
        </definition>
```

(b)Case with ‘term’ and ‘definition-text’, but this ‘definition-text ’ is just ‘reference’

2-3-6 “Abbreviation” element processing

- If the “Abbreviation” part contains a sub-clause structure, it is mapped into a hierarchal <clause> structure.
- If the “p” contains more than one “t”, it is mapped into <definition>.
- The first part is mapped into <term>.
- The second part is mapped into <definition-text>.



```
<w:p>
    <w:pPr>
        <w:pStyle w:val="Heading1"/>
    </w:pPr>
    <w:r>
        <w:t>4</w:t>
        <w:tab/>
        <w:t>Abbreviations and acronyms</w:t>
    </w:r>
</w:p>
<w:p>
    <w:r>
        <w:t>This Recommendation uses the following
    </w:r>
</w:p>
<w:p>
    <w:r>
        <w:t>ANI</w:t>
        <w:tab/>
        <w:tab/>
        <w:t>Application Network Interface </w:t>
```

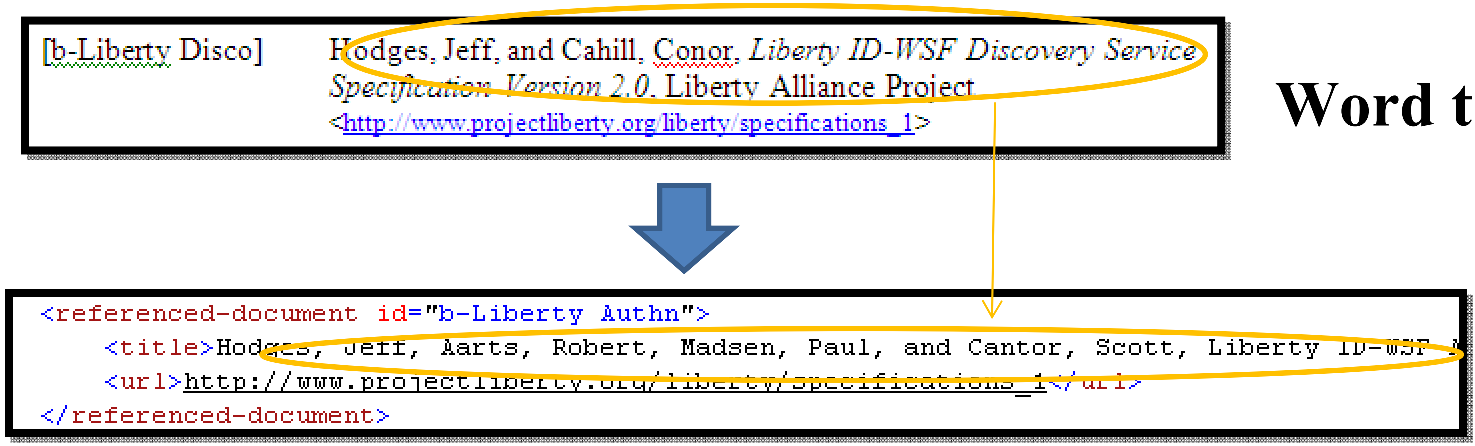
WordXML

```
<abbreviations>
    <p>This Recommendation uses the following abbrev
    <definition>
        <term>ANI</term>
        <definition-text>Application Network Interfa
    </definition>
    <definition>
        <term>API</term>
        <definition-text>Application Programming Int
    </definition>
```

ITU-T XML

2-3-7 “Bibliography” element processing

- “Bibliography” element is processed in the same way as the “Reference” element.
- Should there be multiple commas(‘,’) in the reference element, it is not possible to distinguish the <handle> from the <title>. Therefore, we treat the item as having a <<null>><handle>.



[b-Liberty Disco] Hodges, Jeff, and Cahill, Conor, *Liberty ID-WSF Discovery Service Specification Version 2.0*. Liberty Alliance Project <http://www.projectliberty.org/liberty/specifications_1>

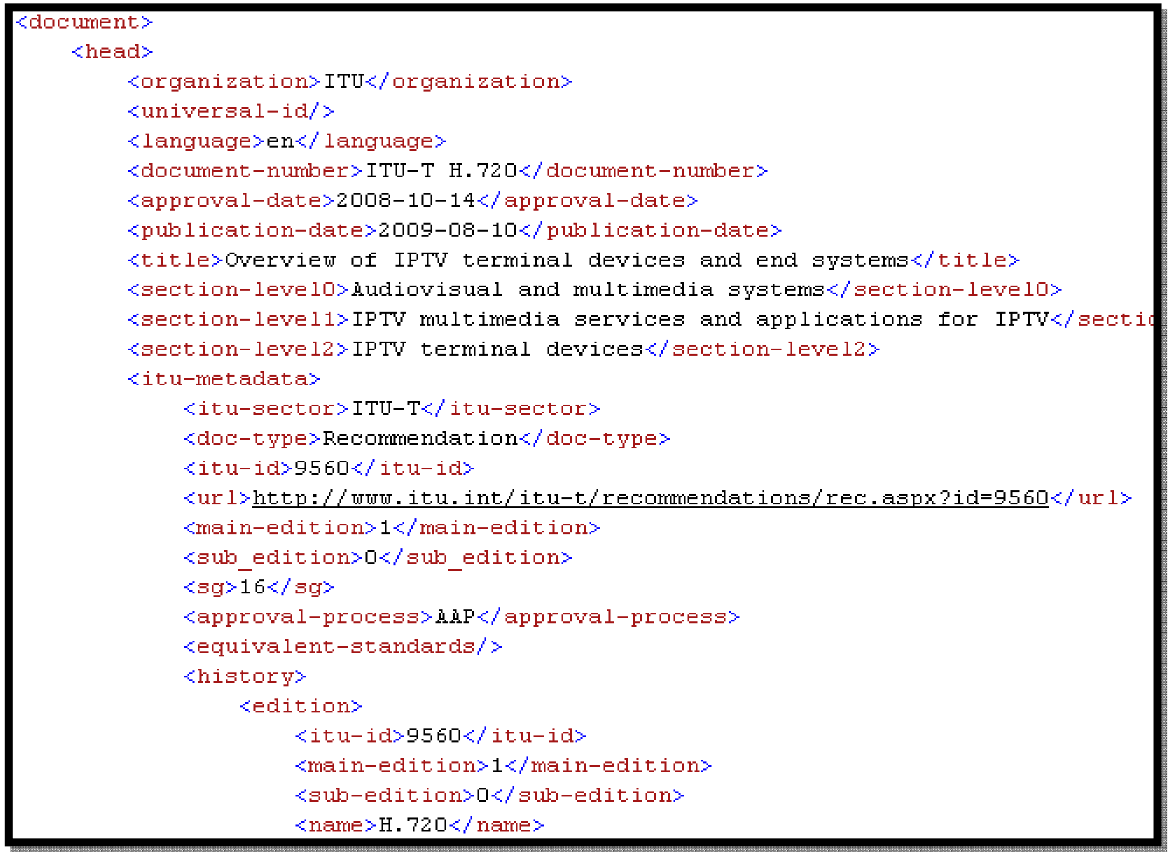
Word text

```
<referenced-document id="b-Liberty Authn">
    <title>Hodges, Jeff, Aarts, Robert, Madsen, Paul, and Cantor, Scott, Liberty ID-WSF
    <url>http://www.projectliberty.org/liberty/specifications_1</url>
</referenced-document>
```

ITU-T XML

2-3-8 Post-processing

- Building of the ITU metedata from SQL Server
- Insertion of the ITU metadata block into document.xml
- Saving of this XML document as a custom XML part into the docx package



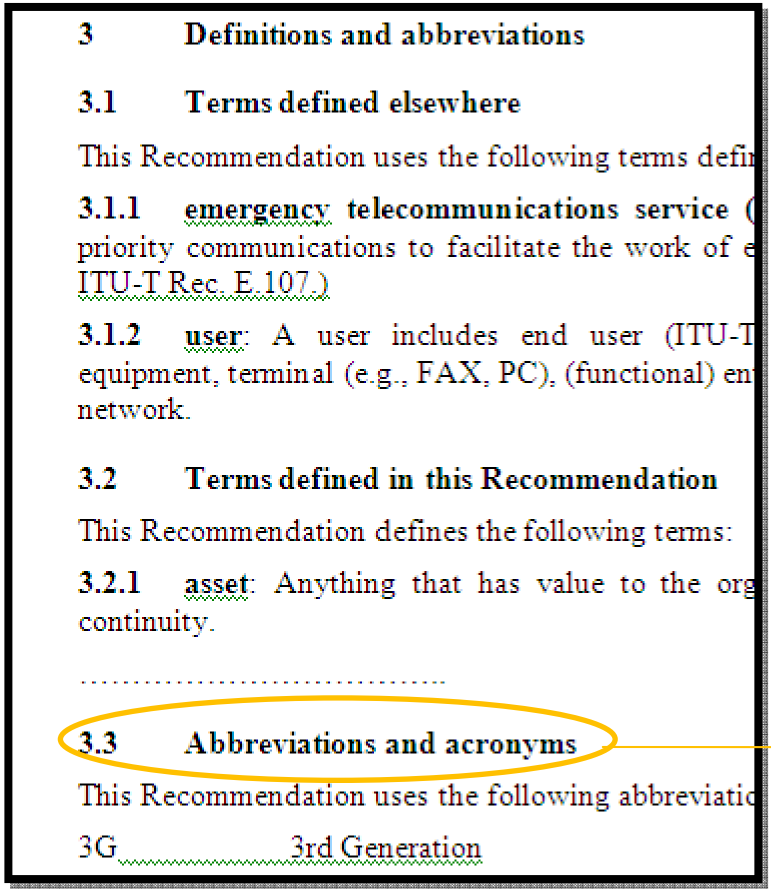
```
<document>
    <head>
        <organization>ITU</organization>
        <universal-id/>
        <language>en</language>
        <document-number>ITU-T H.720</document-number>
        <approval-date>2008-10-14</approval-date>
        <publication-date>2009-08-10</publication-date>
        <title>Overview of IPTV terminal devices and end systems</title>
        <section-level0>Audiovisual and multimedia systems</section-level0>
        <section-level1>IPTV multimedia services and applications for IPTV</secti
        <section-level2>IPTV terminal devices</section-level2>
        <itu-metadata>
            <itu-sector>ITU-T</itu-sector>
            <doc-type>Recommendation</doc-type>
            <itu-id>9560</itu-id>
            <url>http://www.itu.int/itu-t/recommendations/rec.aspx?id=9560</url>
            <main-edition>1</main-edition>
            <sub_edition>0</sub_edition>
            <sg>16</sg>
            <approval-process>AAP</approval-process>
            <equivalent-standards/>
            <history>
                <edition>
                    <itu-id>9560</itu-id>
                    <main-edition>1</main-edition>
                    <sub-edition>0</sub-edition>
                    <name>H.720</name>
```

Example of metadata block in output XML document

2-4 Remediation process

-Example requiring remediation at input level-

- In the case that “Definitions” and “Abbreviations” are mixed into one section.



3 Definitions and abbreviations

3.1 Terms defined elsewhere

This Recommendation uses the following terms defi

3.1.1 emergency telecommunications service (priority communications to facilitate the work of e ITU-T Rec. E.107.)

3.1.2 user: A user includes end user (ITU-T equipment, terminal (e.g., FAX, PC), (functional) en network.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

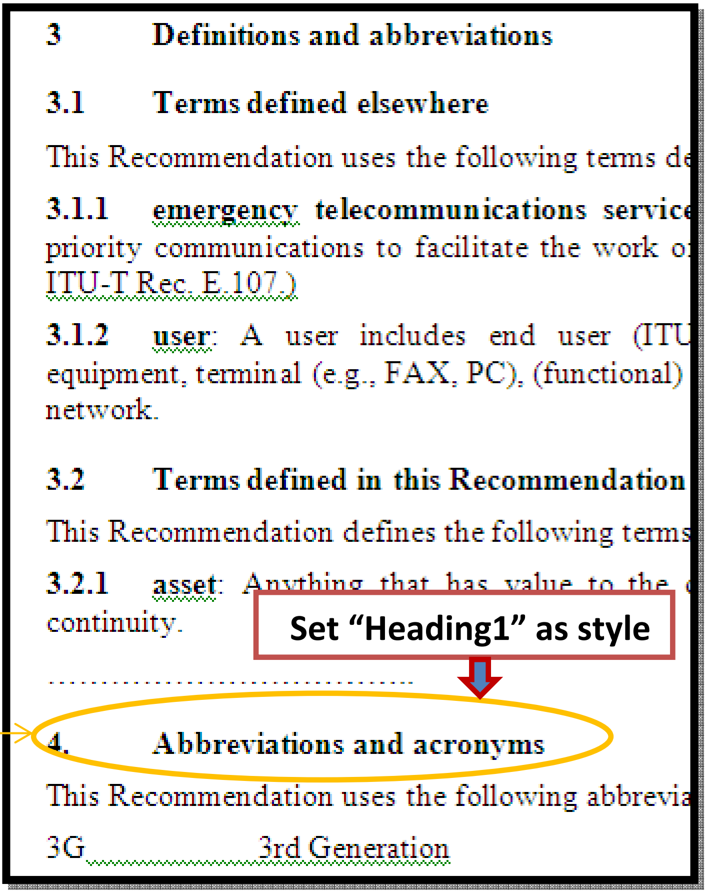
3.2.1 asset: Anything that has value to the org continuity.

....

3.3 Abbreviations and acronyms

This Recommendation uses the following abbreviatio

3G 3rd Generation



3 Definitions and abbreviations

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This Recommendation defines the following terms

3.2.1 asset: Anything that has value to the continuity.

....

4. Abbreviations and acronyms

This Recommendation uses the following abbrevia

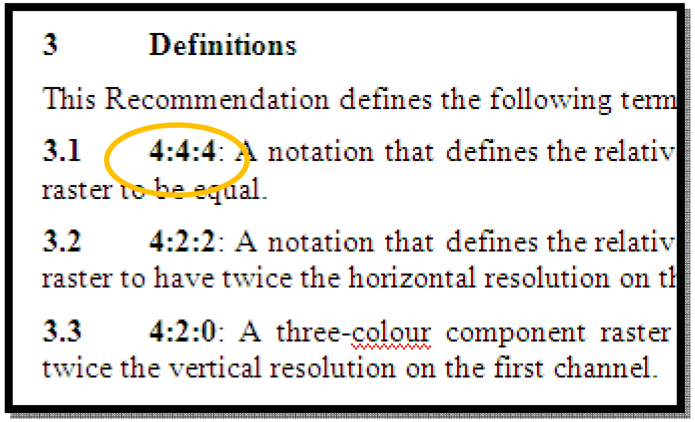
3G 3rd Generation

Set “Heading1” as style

Word

2-4 Remediation process
-Example requiring remediation at output level-

- If the definition part include more than two ':', it isn't properly processed.



3 **Definitions**

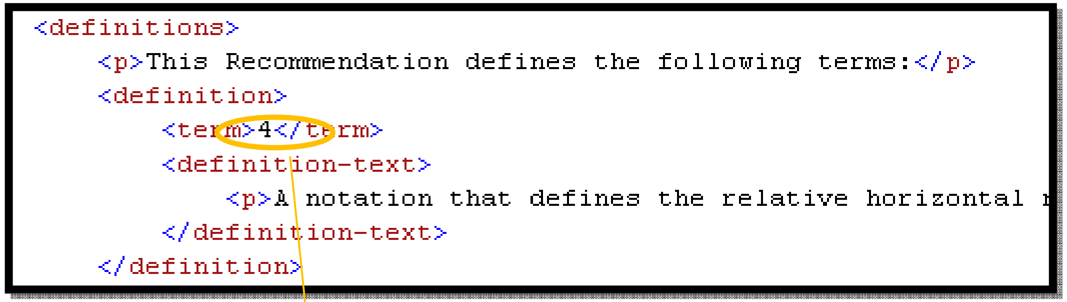
This Recommendation defines the following term

3.1 **4:4:4**: A notation that defines the relativ
raster to be equal.

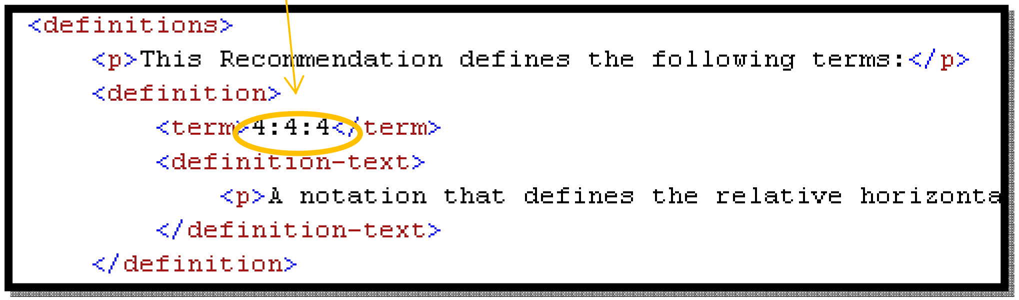
3.2 **4:2:2**: A notation that defines the relativ
raster to have twice the horizontal resolution on th

3.3 **4:2:0**: A three-colour component raster
twice the vertical resolution on the first channel.

Word text



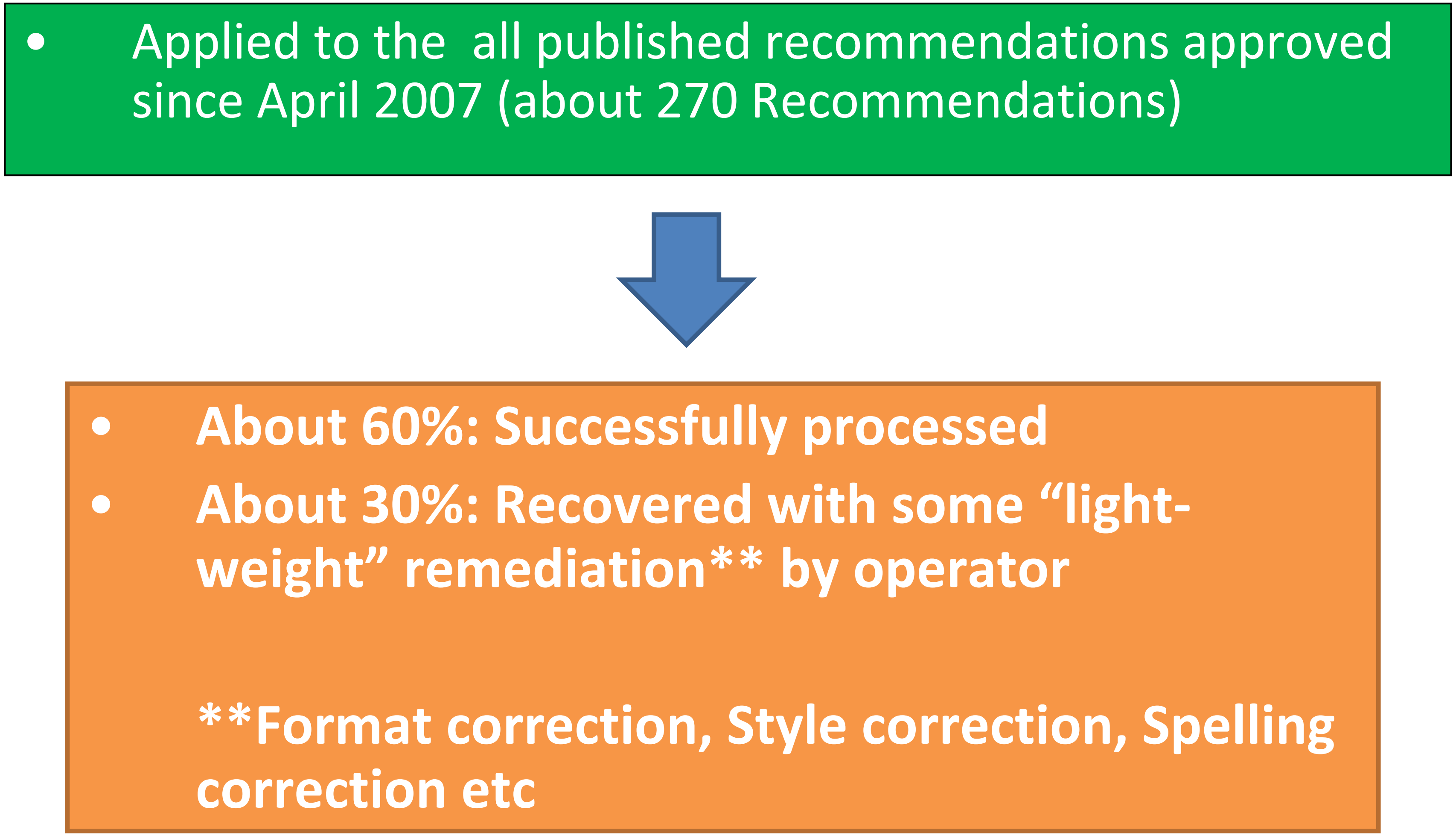
```
<definitions>
    <p>This Recommendation defines the following terms:</p>
    <definition>
        <term>4</term>
        <definition-text>
            <p>A notation that defines the relative horizontal r
        </definition-text>
    </definition>
```



```
<definitions>
    <p>This Recommendation defines the following terms:</p>
    <definition>
        <term>4:4:4</term>
        <definition-text>
            <p>A notation that defines the relative horizonta
        </definition-text>
    </definition>
```

ITU-T XML

2-5 Experimental results



- Applied to the all published recommendations approved since April 2007 (about 270 Recommendations)

- **About 60%: Successfully processed**
- **About 30%: Recovered with some “light-weight” remediation** by operator**

****Format correction, Style correction, Spelling correction etc**

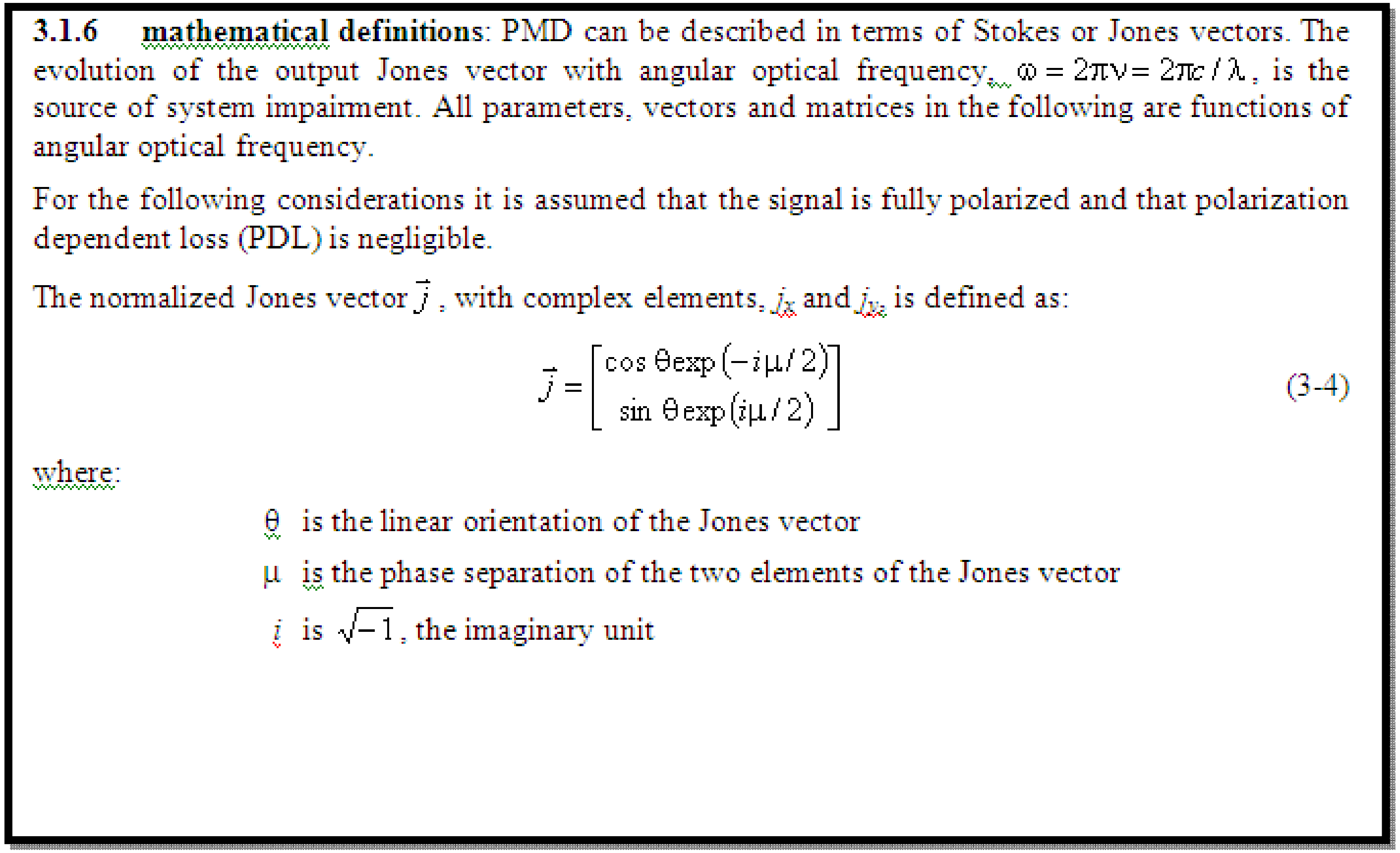
2-5 Experimental results

-Remaining issues (the other 10%) -

- Non-standard document structure
- Unexpected format
- Equation
- Figure
- Table
- Special font(Symbols)
- File size

2-5 Experimental results

-Examples of difficult cases(1)-



3.1.6 mathematical definitions: PMD can be described in terms of Stokes or Jones vectors. The evolution of the output Jones vector with angular optical frequency, $\omega = 2\pi\nu = 2\pi c / \lambda$, is the source of system impairment. All parameters, vectors and matrices in the following are functions of angular optical frequency.

For the following considerations it is assumed that the signal is fully polarized and that polarization dependent loss (PDL) is negligible.

The normalized Jones vector $\vec{j}$, with complex elements, j_x and j_y, is defined as:

$$\vec{j} = \begin{bmatrix} \cos\theta \exp(-i\mu/2) \\ \sin\theta \exp(i\mu/2) \end{bmatrix} \qquad (3\text{-}4)$$

where:

θ is the linear orientation of the Jones vector

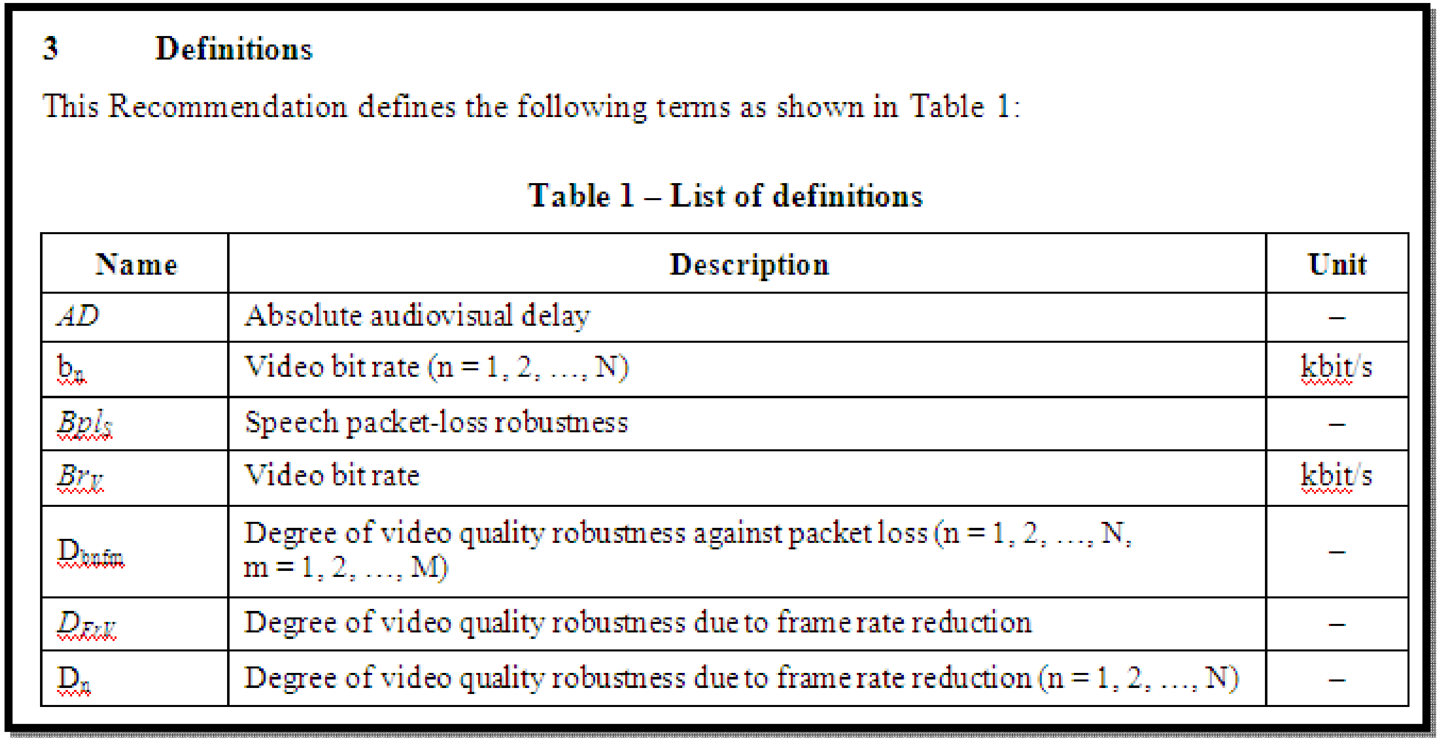
μ is the phase separation of the two elements of the Jones vector

i is $\sqrt{-1}$, the imaginary unit

- “Definition text “ includes “Equations”.

2-5 Experimental results

-Examples of difficult cases(2)-



3 Definitions

This Recommendation defines the following terms as shown in Table 1:

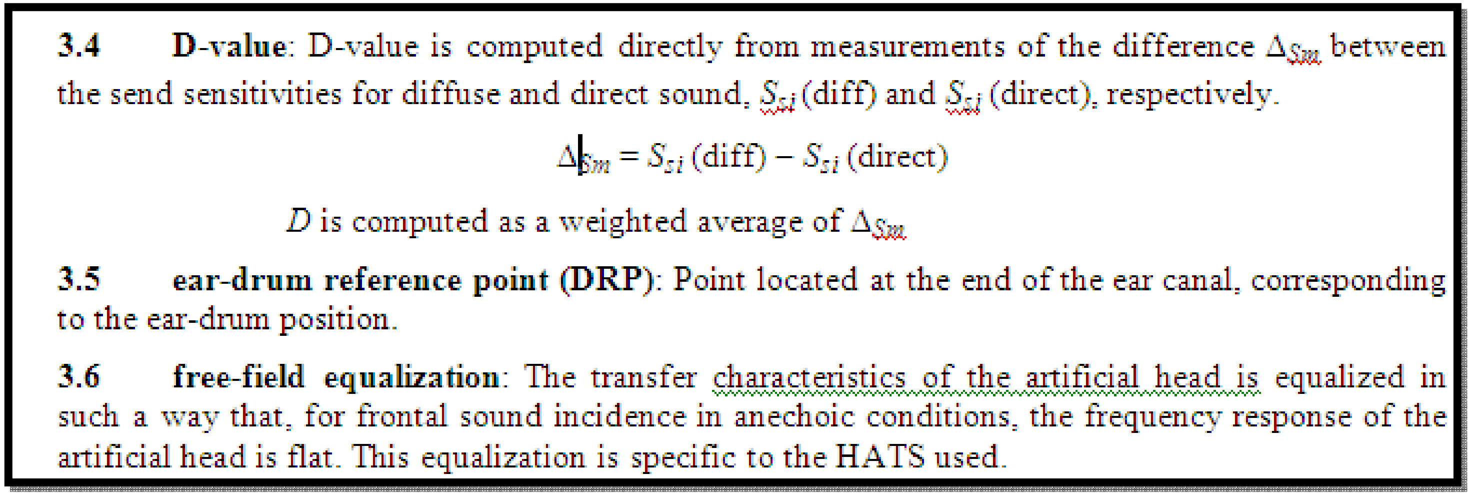
Table 1 – List of definitions

Name	Description	Unit
AD	Absolute audiovisual delay	–
b_n	Video bit rate (n = 1, 2, …, N)	kbit/s
Bpl_S	Speech packet-loss robustness	–
Br_V	Video bit rate	kbit/s
D_{bnfm}	Degree of video quality robustness against packet loss (n = 1, 2, …, N, m = 1, 2, …, M)	–
D_{FrV}	Degree of video quality robustness due to frame rate reduction	–
D_n	Degree of video quality robustness due to frame rate reduction (n = 1, 2, …, N)	–

- “Definitions“ are represented as a “Table”.

2-5 Experimental results

-Examples of difficult cases(3)-



3.4 **D-value**: D-value is computed directly from measurements of the difference Δ_{Sm} between the send sensitivities for diffuse and direct sound, S_{si} (diff) and S_{si} (direct), respectively.

$$\Delta_{Sm} = S_{si}\,(\text{diff}) - S_{si}\,(\text{direct})$$

D is computed as a weighted average of Δ_{Sm}

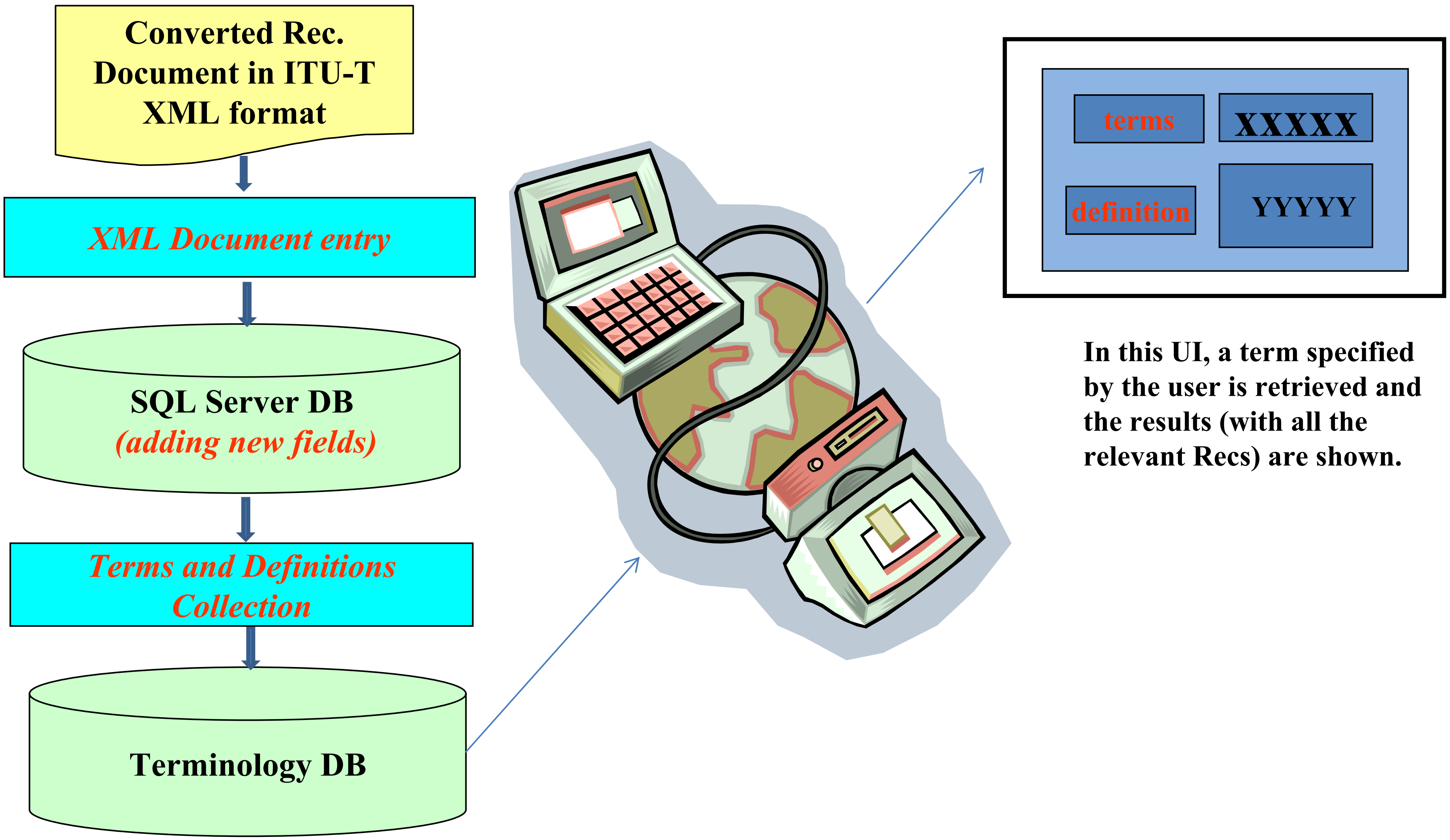
3.5 **ear-drum reference point (DRP)**: Point located at the end of the ear canal, corresponding to the ear-drum position.

3.6 **free-field equalization**: The transfer characteristics of the artificial head is equalized in such a way that, for frontal sound incidence in anechoic conditions, the frequency response of the artificial head is flat. This equalization is specific to the HATS used.

- “Definitions“ includes some “special symbols”.

3. Application to terms and definitions processing

3-1 terms and definitions processing



Converted Rec. Document in ITU-T XML format

XML Document entry

SQL Server DB
(adding new fields)

Terms and Definitions Collection

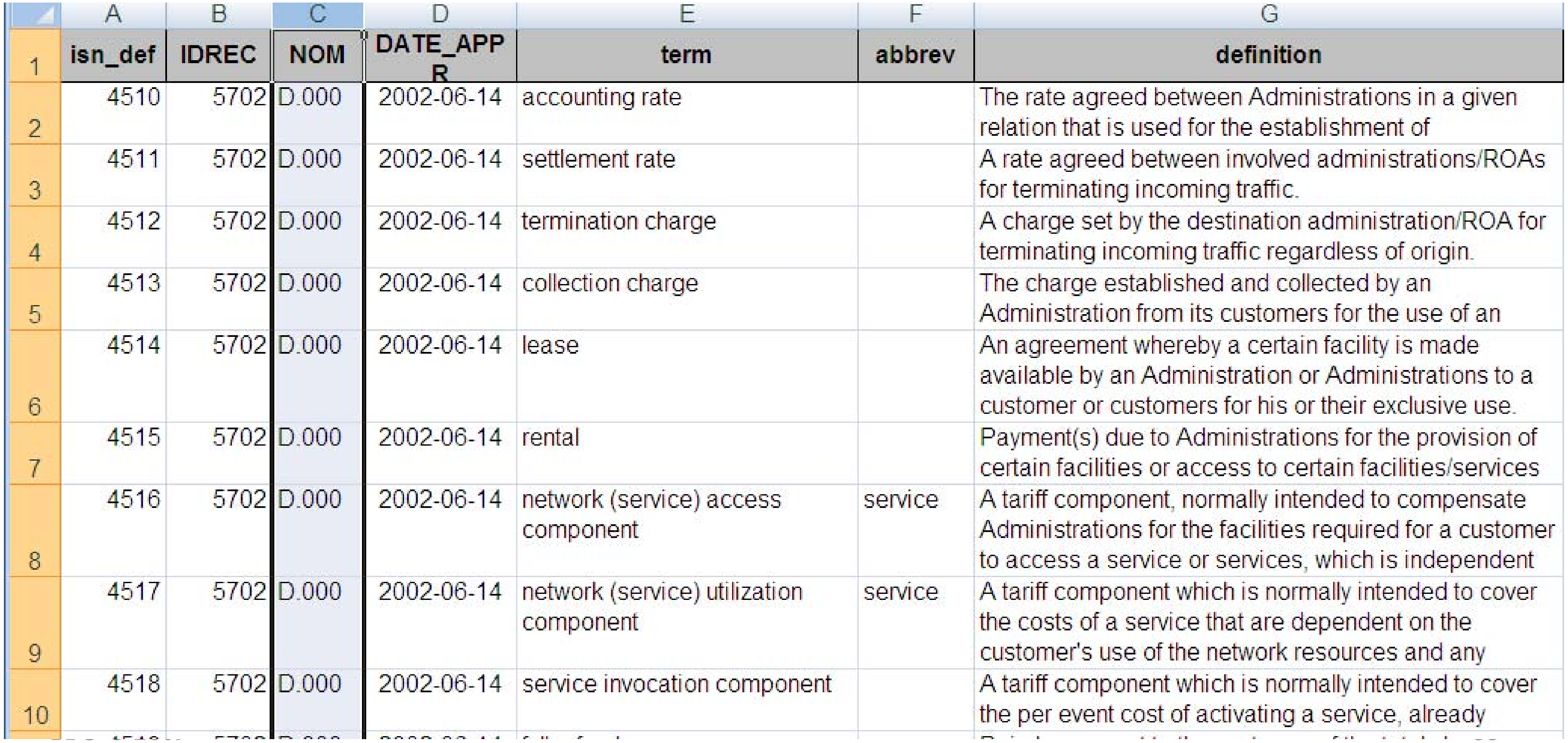
Terminology DB

terms	XXXXX
definition	YYYYY

In this UI, a term specified by the user is retrieved and the results (with all the relevant Recs) are shown.

3-2 Experimental results

- From the output XML documents(about 200 Recommendations), about 2800 terms and definitions are newly extracted.



	A	B	C	D	E	F	G
1	isn_def	IDREC	NOM	DATE_APPR	term	abbrev	definition
2	4510	5702	D.000	2002-06-14	accounting rate		The rate agreed between Administrations in a given relation that is used for the establishment of
3	4511	5702	D.000	2002-06-14	settlement rate		A rate agreed between involved administrations/ROAs for terminating incoming traffic.
4	4512	5702	D.000	2002-06-14	termination charge		A charge set by the destination administration/ROA for terminating incoming traffic regardless of origin.
5	4513	5702	D.000	2002-06-14	collection charge		The charge established and collected by an Administration from its customers for the use of an
6	4514	5702	D.000	2002-06-14	lease		An agreement whereby a certain facility is made available by an Administration or Administrations to a customer or customers for his or their exclusive use.
7	4515	5702	D.000	2002-06-14	rental		Payment(s) due to Administrations for the provision of certain facilities or access to certain facilities/services
8	4516	5702	D.000	2002-06-14	network (service) access component	service	A tariff component, normally intended to compensate Administrations for the facilities required for a customer to access a service or services, which is independent
9	4517	5702	D.000	2002-06-14	network (service) utilization component	service	A tariff component which is normally intended to cover the costs of a service that are dependent on the customer's use of the network resources and any
10	4518	5702	D.000	2002-06-14	service invocation component		A tariff component which is normally intended to cover the per event cost of activating a service, already

4. Conclusion

4 Conclusion

- The prototype system realizes the conversion from the existing Recommendations in Word format to ITU-T XML documents, which have the ITU-T Recommendation specific logical structure.
- The more the documents are conforming to the standard format, the less the operator’s assistance is necessary. (-> Newly created Recommendations are strongly recommended to conform to the Guideline.)
- An example of application – Terms and Definitions processing – utilizing the output XML documents is shown. This indicates the potential usability of the XML documents.(-> This process would be introduced into the ordinary Editing / Publishing process.)
- The harmonization with the similar effort in ISO is continuously pursued.