



Department of Lands



*Land Administration & Management  
Property & Spatial Information*

# ICSM ePlan Model and CIF Jurisdictional XML Schema Review

**PROJECT DELIVERABLE  
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## Glossary

Also see <http://www.lands.nsw.gov.au/publications/glossary>

TERM	DESCRIPTION
CIF	NRW Cadastral Information File is an instance of a LandXML document (*.xml) that represents a survey plan containing Australian jurisdictional data.
COGO	A suite of programs aimed at coordinate geometry problems in Civil Engineering. See <a href="http://en.wikipedia.org/wiki/COGO">http://en.wikipedia.org/wiki/COGO</a>
DCDB	Digital Cadastral Data Base. It is the legal parcel fabric (current subdivisional pattern) of the State of NSW supplied by the Department of Lands.
DOL	See NSW Lands.
ePlan Model	ePlan Model 1.0 is a logical representation of electronic plan data. See <a href="http://www.icsm.gov.au/icsm/membersonly/eplan">http://www.icsm.gov.au/icsm/membersonly/eplan</a>
GML	Geography Markup Language. See <a href="http://www.opengis.net/gml">http://www.opengis.net/gml</a>
ICSM	Intergovernmental Committee on Survey and Mapping. See <a href="http://www.icsm.gov.au">http://www.icsm.gov.au</a>
Lands	See NSW Lands.
LandXML	LandXML 1.1 is an XML Schema for describing XML documents that represent geospatial data. See <a href="http://www.landxml.org">http://www.landxml.org</a>

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LPI	Land and Property Information (LPI) is a division of the New South Wales Department of Lands (Lands). See <a href="http://lands.nsw.gov.au">http://lands.nsw.gov.au</a>
NRM	The Queensland Department of Natural Resources, Mines and Water. Now called NRW.
NRW	The Queensland Department of Resources, Mines and Water. Formerly called NRM. See <a href="http://nrw.qld.gov.au">http://nrw.qld.gov.au</a>
NSW	The State of New South Wales, Australia.
NSW DOL	See NSW Lands.
NSW Lands	New South Wales Department of Lands. See <a href="http://lands.nsw.gov.au">http://lands.nsw.gov.au</a>
PWC	PriceWaterhouseCoopers. See <a href="http://www.pwc.com">http://www.pwc.com</a>
QLD	The State of Queensland, Australia.
URI	Uniform Resource Identifier. See <a href="http://www.w3.org/Addressing">http://www.w3.org/Addressing</a>
URL	Uniform Resource Location. See <a href="http://www.w3.org/Addressing">http://www.w3.org/Addressing</a>
URN	Uniform Resource Name. See <a href="http://www.w3.org/Addressing">http://www.w3.org/Addressing</a>
XML	Extensible Markup Language. See <a href="http://www.w3.org/XML">http://www.w3.org/XML</a>

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XML Schema	See W3C XML Schema.
XSD	XML Schema Definition. Also refers to the XML Schema file extension (*.xsd).
W3C	World Wide Web (WWW) Consortium. See <a href="http://www.w3c.org">http://www.w3c.org</a>
W3C XML Schema	An expression language for describing the vocabulary and rules in an XML document.  NOTE: An XML Schema is written using XML syntax.  See <a href="http://www.w3.org/XML/Schema">http://www.w3.org/XML/Schema</a>
WG	Working Group



## 1 Purpose

This purpose of this document is to review the suitability of the ICSM ePlan Model (1.0) and NRW's CIF Jurisdictional XML Schemas for the NSW Lands EPlan project.

## 2 ICSM EPLAN MODEL OVERVIEW

*“Big E Plan is a plan information management system incorporating automated electronic lodgement, examination, registration and data capture for the cadastre that uses digital plan data lodged in a file modelled on the LandXML format.” – HPA (2006)*

ePlan is a Working Group (WG) of the Intergovernmental Committee on Survey and Mapping (ICSM), whose mandate is to develop the Australasian data transfer standard for cadastral survey plan data that will be used for electronic lodgement of such data.

ePlan Model 1.0 is a logical (or abstract) model of cadastral survey data that is used to capture the spatial and legal aspects of a survey plan. It is described using the Unified Modelling Language (UML).

Crews (2006a, 2006b, 2006d) describes LandXML 1.1 as a “grass roots” geospatial industry standard which aims to specify an XML file format for civil engineering design and survey measurement data. The purposes of LandXML are:

- Transfer engineering design data between producers and consumers.
- Provide a data format suitable for long-term data archival.
- Provide a standard format for electronic design submission.

The ePlan Working Group has ratified LandXML 1.1 to physically represent ePlan Model 1.0 (Cumerford 2005). The mapping between the ePlan logical model and LandXML physical model is described by Cumerford (2005). The ePlan Working Group also considered GML, the Geography Markup Language (Open GIS Consortium 2004), but considered it did not fully support details for a survey plan.

The Queensland Department of Natural Resources and Water (NRW) is the first ePlan Working Group member to produce an Australian jurisdiction specific reference, known as the Cadastral Infrastructure File (CIF) Schema Architecture (Gray & Chowdhury 2006).

The NSW Department of Lands intends to use ePlan Model (1.0) and LandXML (1.1) as the basis for capturing electronic plan data, including NSW specific jurisdictional data (Deal. et. al. 2005).

Deal et. al. (2005, pg. 274) concluded, “The ePlan model is jurisdictionally inclusive model that is close to the structure that LPI needs to conduct all of its plan examination (sic).”

For more details on the background of the NSW EPlan project, see HPA (2005), Deal et. al. (2006) and Keenan (2007).

### 3 EPLAN WORKING GROUP PROJECT REVIEW

#### 3.1 EPLAN WORKING GROUP STATUS

The ePlan Working Group web site page does not contain any documents later than July 2004.

The ePlan Working Group web site page is restricted to registered members at URL

<http://www.icsm.gov.au/icsm/membersonly/eplan/index.html>.

#### 3.2 EPLAN WORKING GROUP PROJECT DELIVERABLES

The following table lists the deliverables defined in the EPlan Terms of Reference (Cumerford 2004) :

DELIVERABLE	STATUS
1. Implement a communication strategy.	Unknown
2. Produce a generic UML model for ePlans.	Completed
2.1 Develop UML class diagram of a cadastral survey.	Completed
2.2 Develop generic business rules for an ePlan.	Completed
2.3 Develop data dictionary, compatible with the ICSM Feature Catalogue.	Completed
3. Develop or identify standard tools based on the generic UML schema that will facilitate data capture, visualisation and validation functions with the ability for adaptation for specific jurisdictional requirements.	Completed
4. Develop an XML schema.	Completed
4.1 Develop an XML schema for cadastral survey object.	Completed
4.2 Develop an XML schema for a survey control object.	Completed
4.3 Develop an XML schema for a cadastral infrastructure object.	Completed
5. Develop a high-level business case for the adoption of an	Incomplete

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ePlan standard.	
6. Make recommendations for the implementation and ongoing review and management of the ePlan standard.	Ongoing activities
7. Provide advice on any other issues/areas where ICSM may be able to provide national leadership in the electronic transfer of land surveying data.	Ongoing activities
8. Provide ICSM with a work plan and make regular reports to ICSM on progress against that plan.	Ongoing activities

## 4 CIF JURISDICTIONAL XML SCHEMA REVIEW

### 4.1 CIF OVERVIEW

CIF (Cadastral Information File) is an instance of a LandXML document (\*.xml) that represents a survey plan containing Australian jurisdictional data. It is currently only used to represent Queensland specific jurisdictional data.

CIF is a reference implementation of ePlan Model (1.0) (Cumerford 2005). It has not (yet) been published for use by other ePlan Working Group members.

The CIF Jurisdiction XML Schemas describe the XML documents (\*.xml) containing jurisdictional data. The XML jurisdiction documents will be used by third-party applications (eg. CAD) to provide reference data (eg. pick lists) that will populate the relevant LandXML (1.1) elements and attributes.

CIF Jurisdiction XML Schemas can be used to validate the corresponding XML jurisdiction documents, but cannot be used to validate a LandXML compliant document.

Conversely, the LandXML XML Schema can be used to validate the structure of a LandXML document, but only limited business rules exist within the schema to validate the content.

Jurisdiction specific business and validation rules must be handled by the software services (or agents) that process electronic lodgement of LandXML (\*.xml) files.

The jurisdictional XML Schemas (\*.xsd) and XML documents (\*.xml) must be published to a public URL where they are available for access by third-parties, including software vendors.

### 4.2 XML SCHEMA REVIEW

This review will consider which aspects of the CIF Jurisdiction XML Schemas are suitable for NSW Lands and which could be revised.

The CIF Jurisdiction reference implementation is comprised of the following XML Schema files (Gray & Chowdhury 2006, Cumerford 2006) :

File Path & Name	Purpose
au/gov/icsm/cif/au-gov-icsm-cif.xsd	Root schema file which includes other schema files.

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<code>au/gov/icsm/cif/administrative-area/au-gov-icsm-cif-administrative-area.xsd</code>	Represents jurisdictional administrative data.
<code>au/gov/icsm/cif/annotations/au-gov-icsm-cif-annotations.xsd</code>	Represents jurisdictional plan annotations.
<code>au/gov/icsm/cif/enumerated-types/au-gov-icsm-cif-enumerated-types.xsd</code>	Represents jurisdictional enumerated type values.

### 4.2.1 Replace CIF with National Name

The acronym “CIF” (Cadastral Information File) is the *virtual* name defined by Queensland’s NRW.

A different name, which associates Australia and LandXML, may be more appropriate to national members of the ePlan Working Group.

Possible alternatives:

Australian Land Information (ALI / AUSLAND)
Australian Land Information Exchange (ALX / AUSLIX )
Australian Cadastral Information Schema (ACIS)
ePlan Information File (EIF / EPF)
Cadastral Information Object (CIO)
Cadastral Information Schema (CIS)

### 4.2.2 Include EPLAN in XML Schema Namespace

Current ePlan CIF jurisdiction XML schemas do not contain the keyword “eplan” in the namespace.

For example, consider CIF schema file “`au-gov-icsm-cif\au\gov\icsm\cif\au-gov-icsm-cif.xsd`” :

```
<xs:schema xmlns:cif="urn:au:gov:icsm:cif"
```

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```
xmlns:adminarea="urn:au:gov:icsm:cif:adminarea"  
xmlns:cifannot="urn:au:gov:icsm:cif:annotations"  
xmlns:cifenum="urn:au:gov:icsm:cif:enumerated-types"  
xmlns:landxml="http://www.landxml.org/schema/LandXML-1.1"  
xmlns:xs="http://www.w3.org/2001/XMLSchema"  
targetNamespace="urn:au:gov:icsm:cif"  
elementFormDefault="qualified"  
attributeFormDefault="unqualified">  
</xs:schema>
```

The namespace could change from “au:gov:icsm:cif” to “au:gov:icsm:eplan:cif”.

For example :

```
<xs:schema xmlns:cif="urn:au:gov:icsm:eplan:cif"  
  xmlns:adminarea="urn:au:gov:icsm:eplan:cif:admin"  
  xmlns:cifannot="urn:au:gov:icsm:eplan:cif:annot"  
  xmlns:cifenum="urn:au:gov:icsm:eplan:cif:enum"  
  xmlns:landxml="http://www.landxml.org/schema/LandXML-1.1"  
  xmlns:xs="http://www.w3.org/2001/XMLSchema"  
  targetNamespace="urn:au:gov:icsm:eplan:cif"  
  elementFormDefault="qualified"  
  attributeFormDefault="unqualified">
```

Also see section above regarding renaming CIF with national name.

### 4.2.3 Replace URN with URL in XML Schema Namespace

Replace URN in targetNamespace and xmlns attributes with a URL.

For example, consider CIF schema file “au-gov-icsm-cif\au\gov\icsm\cif\au-gov-icsm-cif.xsd” :

```
<xs:schema xmlns:cif="urn:au:gov:icsm:cif"  
  xmlns:adminarea="urn:au:gov:icsm:cif:adminarea"  
  xmlns:cifannot="urn:au:gov:icsm:cif:annotations"  
  xmlns:cifenum="urn:au:gov:icsm:cif:enumerated-types"
```

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```
xmlns:landxml=http://www.landxml.org/schema/LandXML-1.1"  
xmlns:xs=http://www.w3.org/2001/XMLSchema  
targetNamespace="urn:au:gov:icsm:cif"  
elementFormDefault="qualified"  
attributeFormDefault="unqualified">
```

URLs are preferable to URNs for XML Schema namespaces because they can be linked to an online resource which provides further details about the schema (Stephenson 2004, xFront 2006d).

For example :

```
<xs:schema xmlns:eplan="http://www.icsm.gov.au/eplan/schema/cif"  
  xmlns:adminarea  
    ="http://www.icsm.gov.au/eplan/schema/cif/admin-area"  
  xmlns:cifannot  
    ="http://www.icsm.gov.au/eplan/schema/cif/ annotations "  
  xmlns:cifenum  
    ="http://www.icsm.gov.au/eplan/schema/cif/ enumerated-types"  
  xmlns:landxml=http://www.landxml.org/schema/LandXML-1.1  
  xmlns:xs=http://www.w3.org/2001/XMLSchema  
  targetNamespace="http://www.icsm.gov.au/eplan/schema/cif"  
  elementFormDefault="qualified"  
  attributeFormDefault="unqualified"
```

### 4.2.4 Define XML Schema with Version Labels

The CIF reference jurisdictional schemas do not use a version identifier. To assist with publishing, tracking and backwards forwards/backwards compatibility, major and minor version identifiers should be considered.

Major version labels are used to indicate changes to vocabulary and/or structure, while minor version labels indicate bug fixes and/or minor updates.

For example, consider CIF schema file "au-gov-icsm-cif\au\gov\icsm\cif\au-gov-icsm-cif.xsd" :



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```
<xs:schema xmlns:cif="urn:au:gov:icsm:cif"
  xmlns:adminarea="urn:au:gov:icsm:cif:adminarea"
  xmlns:cifannot="urn:au:gov:icsm:cif:annotations"
  xmlns:cifenum="urn:au:gov:icsm:cif:enumerated-types"
  xmlns:landxml=http://www.landxml.org/schema/LandXML-1.1"
  xmlns:xs=http://www.w3.org/2001/XMLSchema
  targetNamespace="urn:au:gov:icsm:cif"
  elementFormDefault="qualified"
  attributeFormDefault="unqualified">
```

Stephenson (2004) comments, *“The best practice for encoding these two version numbers in an evolving XML schema is to encode the major version inside the target XML namespace of the XML schema and to encode the minor version in the schema version attribute.”*

**NOTE:** This major/minor versioning approach was also adopted for LandXML

For example :

```
<xs:schema xmlns:cif="urn:au:gov:icsm:cif-1.0"
  xmlns:adminarea="urn:au:gov:icsm:cif-1.0:adminarea"
  xmlns:cifannot="urn:au:gov:icsm:cif-1.0:annotations"
  xmlns:cifenum="urn:au:gov:icsm:cif-1.0:enumerated-types"
  xmlns:landxml=http://www.landxml.org/schema/LandXML-1.1"
  xmlns:xs=http://www.w3.org/2001/XMLSchema
  targetNamespace="urn:au:gov:icsm:cif-1.0"
  elementFormDefault="qualified"
  attributeFormDefault="unqualified"
  version="1.0">
```

XML Schema versioning is discussed in more detail by Orchard (2004), Gabriel (2004) and Stephenson (2004).

#### 4.2.5 Annotate XML Schema with Version Label

For example, assuming the XML Schema was named “au-gov-icsm-eplan-cif\_1\_0.xsd” with a version label of “1.0” and was published on “18 May 2005”, or “2005-05-18” in ISO 8601 date/time format.

```
<xs:schema . . .>
  <xsd:annotation>
    <xsd:documentation>
      @(#)au-gov-icsm-eplan-cif_1_0.xsd 1.0 2005-05-18
    </xsd:documentation>
  </xsd:annotation>
</xs:schema>
```

Stephenson (2004) comments, *“It is good practice to place human/computer readable documentation about the schema in the schema document, for example, owner, change log, etc. This information can be held in a special schema header element which would go in an annotation/appinfo element. There is no industry standard for such an element.”*

#### 4.2.6 Revise CIF File Paths and Names

The CIF jurisdictional components are not consistent across file names, file paths.

To assist, the following paths and names could be used:

Old File Path and Name	Proposed File Path and Name
au/gov/icsm/cif/au-gov-icsm-cif.xsd	au/gov/icsm/eplan/cif/cif.xsd
au/gov/icsm/cif/administrative-area/au-gov-icsm-cif-administrative-area.xsd	au/gov/icsm/eplan/cif/admin-area/admin-area.xsd
au/gov/icsm/cif/annotations/au-gov-icsm-cif-annotations.xsd	au/gov/icsm/eplan/cif/annotation/annot.xsd

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au/gov/icsm/cif/enum-  
erated-types/au-  
gov-icsm-cif-  
enumerated-types.xsd

au/gov/icsm/eplan/cif/e-  
num-types/enum-types.xsd

### 4.2.7 Revise CIF XML Schema Namespaces

The CIF jurisdictional components are not consistent across XML schema namespaces.

To assist, the following XML Scheme namespaces could be used:

Old Namespace	Proposed Namespace
au-gov-icsm-cif	au-gov-icsm-eplan-cif
au-gov-icsm-if-administrative-area	au-gov-icsm-eplan-cif-admin-area
au-gov-icsm-cif-annotations	au-gov-icsm-eplan-cif-annot
au-gov-icsm/-if-enum-erated-types	au-gov-icsm-eplan-cif-enum-types

### 4.2.8 Adopt National ePlan / CIF XML Schema Namespaces

The follow table shows suggested XML Schema namespace for the various Australian jurisdictions.

Jurisdiction Code	Jurisdiction Name	Proposed Namespace
ACT	Australian Capital Territory	<a href="http://au/gov/act/icsm/eplan/cif">http://au/gov/act/icsm/eplan/cif</a>
NSW	New South Wales	<a href="http://au/gov/nsw/icsm/eplan/cif">http://au/gov/nsw/icsm/eplan/cif</a>
NT	Northern Territory	<a href="http://au/gov/nt/icsm/eplan/cif">http://au/gov/nt/icsm/eplan/cif</a>
QLD	Queensland	<a href="http://au/gov/qld/icsm/eplan/cif">http://au/gov/qld/icsm/eplan/cif</a>

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SA	South Australia	<a href="http://au/gov/sa/icsm/eplan/cif">http://au/gov/sa/icsm/eplan/cif</a>
TAS	Tasmania	<a href="http://au/gov/tas/icsm/eplan/cif">http://au/gov/tas/icsm/eplan/cif</a>
WA	Western Australia	<a href="http://au/gov/wa/icsm/eplan/cif">http://au/gov/wa/icsm/eplan/cif</a>
VIC	Victoria	<a href="http://au/gov/vic/icsm/eplan/cif">http://au/gov/vic/icsm/eplan/cif</a>

### 4.2.9 Replace Inline Comments with Annotations

Currently compliant - no changes required.

Ensure inline comments, such as this

```
<!-- This is a comment -->
```

with this

```
<xsd:annotation>  
  <xsd:documentation>This is a comment.</xsd:documentation>  
</xsd:annotation>
```

### 4.2.10 Qualify Namespaces

Currently compliant - no changes required.

The `<xs:schema>` attribute `elementFormDefault` is already declared with value "qualified", the accepted norm.

The `<xs:schema>` attribute `attributeFormDefault` is already declared with value "unqualified", the accepted norm.

**NOTE:** The `attributeFormDefault` attribute is redundant in this case, as the default value is also "unqualified", however, declaring the attribute makes the intended usage clear.

Also see xFront (2006c) and Obasanjo (2002).

### 4.3 REVIEW SUMMARY

The following items should be considered :

- Replace CIF with National Name
- Include EPLAN in XML Schema Namespace
- Replace URN with URL in XML Schema Namespace
- Define XML Schema with Version Labels
- Annotate XML Schema with Version Label
- Revise CIF File Paths and Names
- Revise CIF XML Schema Namespaces
- Adopt National ePlan / CIF XML Schema Namespaces
- Replace Inline Comments with Annotations
- Qualify Namespaces

## 5 SUMMARY

The ICSM ePlan Working Group (WG) web site has not been revised since September 2005. Online documents do not portray current state of ePlan Model or WG agenda.

It is expected the ePlan Model and LandXML will change in the future. Deal et. al. (2006, pg. 275) comment, *"It has been widely stated and understood in the ePlan working group meetings that both the ePlan model and the LandXML schema can, and will, change."*

ePlan Model (1.0) and LandXML (1.1) capture the required plan and jurisdictional details for NSW Lands Big E Plan (HPA 2005, Deal et. al. 2005).

Various implementation issues should be addressed before adopting the CIF Jurisdiction XML Schema reference model for NSW jurisdictional data.

## 6 RECOMMENDATIONS

**NOTE:** *This document should be considered a checkpoint for ePlan Model (1.0) and the CIF Jurisdictional XML Schemas. Any recommendations outlined in this document may not be appropriate for future iterations of the ePlan Model or the CIF Jurisdictional XML Schemas.*

### 6.1 EPLAN WORKING GROUP PROJECT

The ePlan Working Group (WG) should appoint a content manager for the ICSM ePlan web site to ensure that current documentation is made available to participating members.

The ePlan Working Group (WG) should consider revising the structure and content of the ICSM ePlan web site as follows:

- Split ePlan web site into public and restricted sections. The current web site at <http://www.icsm.gov.au/icsm/membersonly/eplan/index.html> is restricted to registered members.
- Link public section of ePlan web site to restricted section.
- Link public ePlan web site to LandXML web site at <http://www.landxml.org>. This will require co-ordination with the LandXML web site content manager,
- Create jurisdiction specific web pages and link them to the ICSM ePlan web site.
- If URLs are adopted for CIF Jurisdictional XML Schema namespaces, the URLs should link to web pages in the ICSM ePlan web site.

### 6.2 CIF JURISDICTIONAL XML SCHEMA REVIEW

NSW Lands should consider using the CIF Jurisdictional XML Schema reference implementation as the basis for representing NSW jurisdictional data. Cumerford (2007) commented that the CIF Jurisdictional XML Schemas may be used by the LandXML committee as their reference implementation for international jurisdictional XML Schemas and other enumerated values. This is a good indicator of the merits of the CIF jurisdictional XML Schema approach.

The CIF Jurisdictional XML Schema should be reviewed by all members of the ePlan Working Group and the outcomes shared with other members.

### ICSM ePlan Model and CIF Jurisdictional XML Schema Review

The jurisdictional XML Schemas (\*.xsd) and XML instance documents (\*.xml) must be published to a public URL where they are accessible by third-parties, including software vendors.

The suggestions listed in the CIF Review section should be considered before any such implementation, paying particular attention to naming and versioning conventions as they will have short- medium- and long-term impacts on implementation and archiving.

**NOTE:** *This major / minor versioning approach has already been adopted by the LandXML committee. For more details, see the LandXML XML Schema published at <http://www.landxml.org>*



## 7 REFERENCES

**NOTES:** *These references are defined according to the Harvard Referencing Standard. For more details, see [http://en.wikipedia.org/wiki/Harvard\\_referencing](http://en.wikipedia.org/wiki/Harvard_referencing) and <http://library.curtin.edu.au/referencing/harvard.pdf>*

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## 8 APPENDIX A - XML SCHEMA BEST PRACTICES

The following contains a list of some XML Schema Best Practices.

### **xFront (2006a, 2006b)**

Make targetNamespace the default namespace

Publish Unqualified and Qualified Schemas

Uniquely Identify All Schema Components With the ID Attribute.

Postpone Namespace Binding Until Necessary

Create Extensible Schemas.

W3C XML Schema 1.0 Cannot Express All Business Rules

Use URLs For XML Schema Namespaces

XML Schema Versioning Best Practices

### **Stephenson (2004)**

Namespaces URI, URL vs. URN

Attributes vs. elements

Qualified element names

Qualified attribute names

Global elements vs. local elements

Named types vs. anonymous types

Extensible content models, wildcards, anyAttribute

Constraints: max, min, length, pattern, etc

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Graph data structures

Identifiers in XML schemas

Default/fixed attributes value and default element values

Versioning

Mixed content

Simple type code lists

Complex type code lists

Generic containers

Model groups <sequence>, <choice>, and <all>

DTD

Extension vs. restriction for complex types

Type hierarchies vs. composition

Must understand attribute

Nil

Elements with simple content

Schema header

Import/include

Supplemental schema constraints

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