

W3C Standards

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Seminar
Ubiquitous Information
WS 00/01
ETH Zurich

What's coming up?

- All about the W3C
 - History, Members, Process, Domains
- XML Technology Primer
 - XML, XML Schemas, XML Linking, XML Style
- The Semantic Web
 - Metadata: RDF & Applications (CC/PP), XML Protocols & SOAP, The Web of Trust
- Summing Up

W3C History

- Founded 10/1994 by Tim Berners-Lee at MIT/LNCS
 - 4/95 INRIA hosts W3C Europe
 - 4/96 Keio University hosts W3C Asia
- Led by Jean-Francois Abramatic (Chairman) and Tim Berners-Lee (Director)
- Goals:
 - Universal Access
 - Semantic Web
 - Web of Trust
- More than
 - 20 specs in 5 years
 - 50 *staff members* across hosts institutions



Tim Berners-Lee



Jean-Francois Abramatic

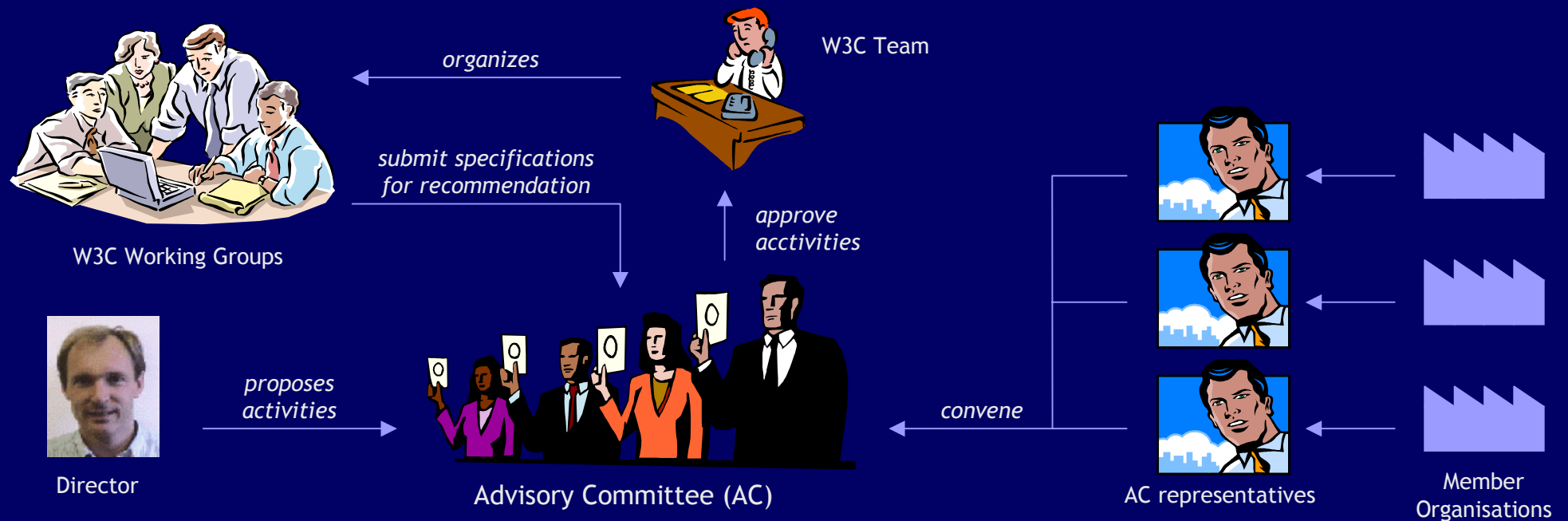


W3C Logo

W3C Members

- 497 members as of 01/2001
 - *Companies:* AOL, Appel, AT&T, Cisco, Citibank ...
 - *Universities:* MIT, Vrije Universiteit ...
 - *Governmental Agencies:* US EPA, Datenschutz-Zentrum Schleswig Holstein ...
- Yearly Membership Fee
 - US\$ 50,000.- corporate members
 - US\$ 5,000.- if annual revenues < US\$ 50'000'000
 - US\$ 5,000.- non-profit, governmental

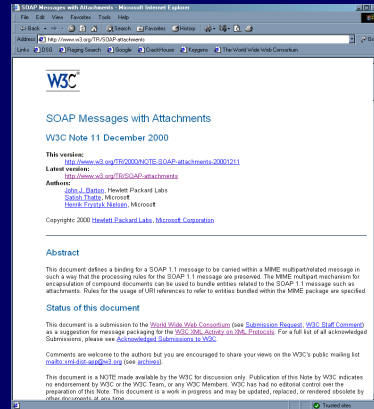
W3C Process



■ Advisory Committee

- One representative from each member
 - send submission requests from their organization
 - nominate colleagues for W3C working groups
- Reviews proposals for activities, recommendations

W3C Activities



W3C Note

acknowledges



W3C Team

Influence proposal of activities



Director



Submissions



AC representatives



Member Organisations

Submissions

- Allows members to propose technology/ideas to W3C for consideration
- Must include IPR statement
- Reviewed by W3C Team
 - If accepted, published as *W3C Note*

W3C Recommendations



Working Draft (WD)

- members only
- updated often



Public Working Draft



Last Call Draft



Recommendation (Rec)

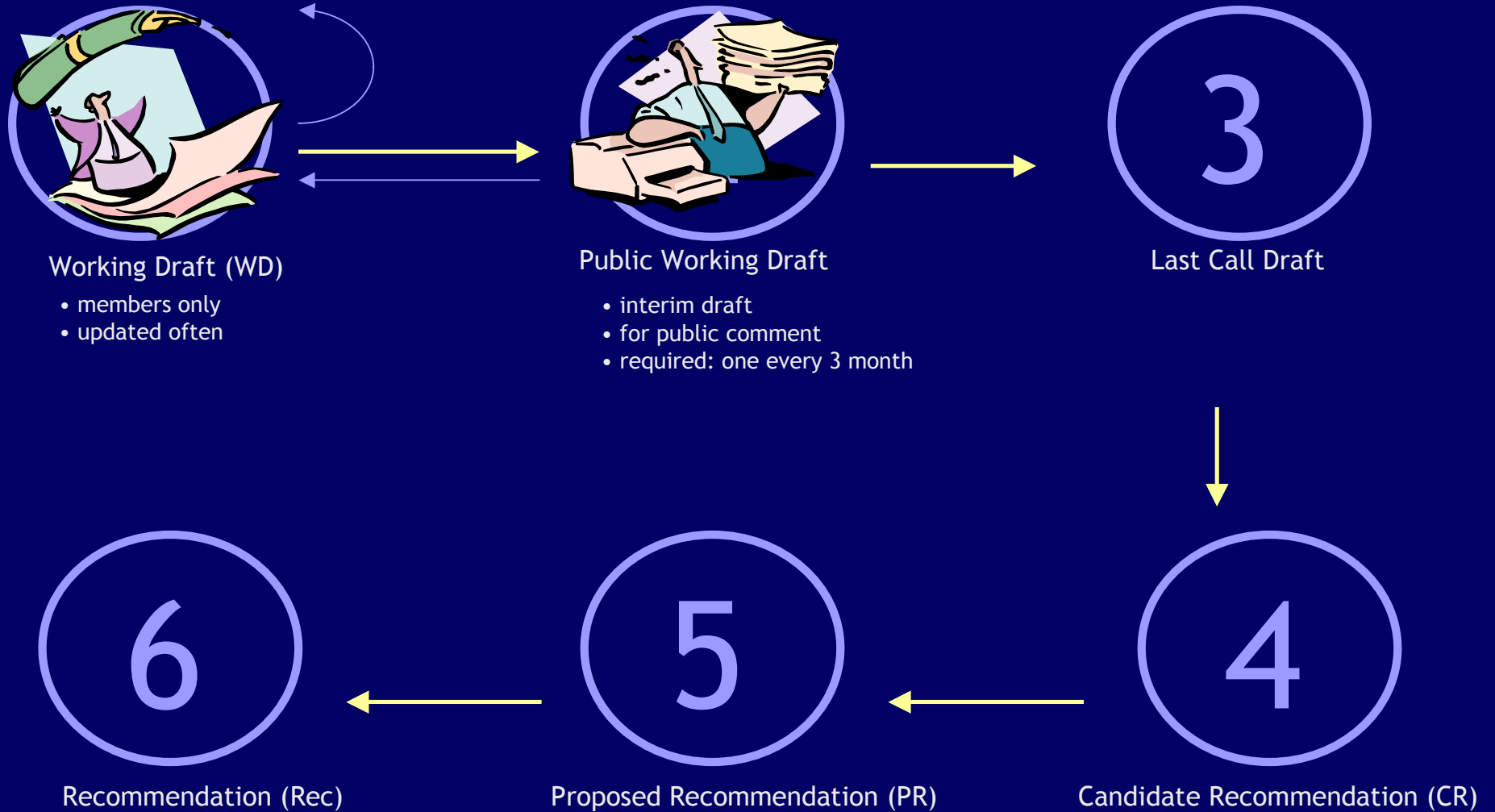


Proposed Recommendation (PR)

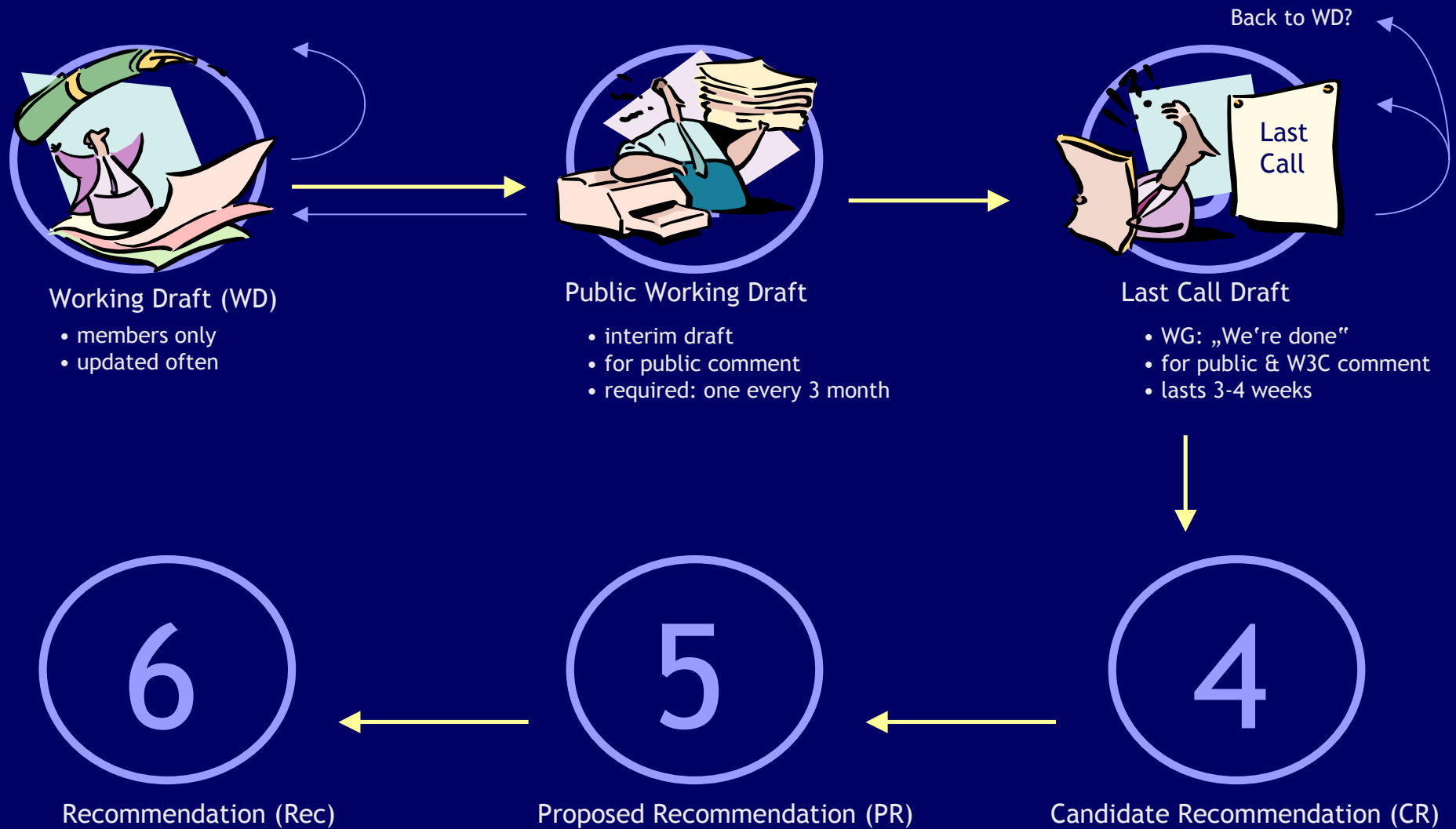


Candidate Recommendation (CR)

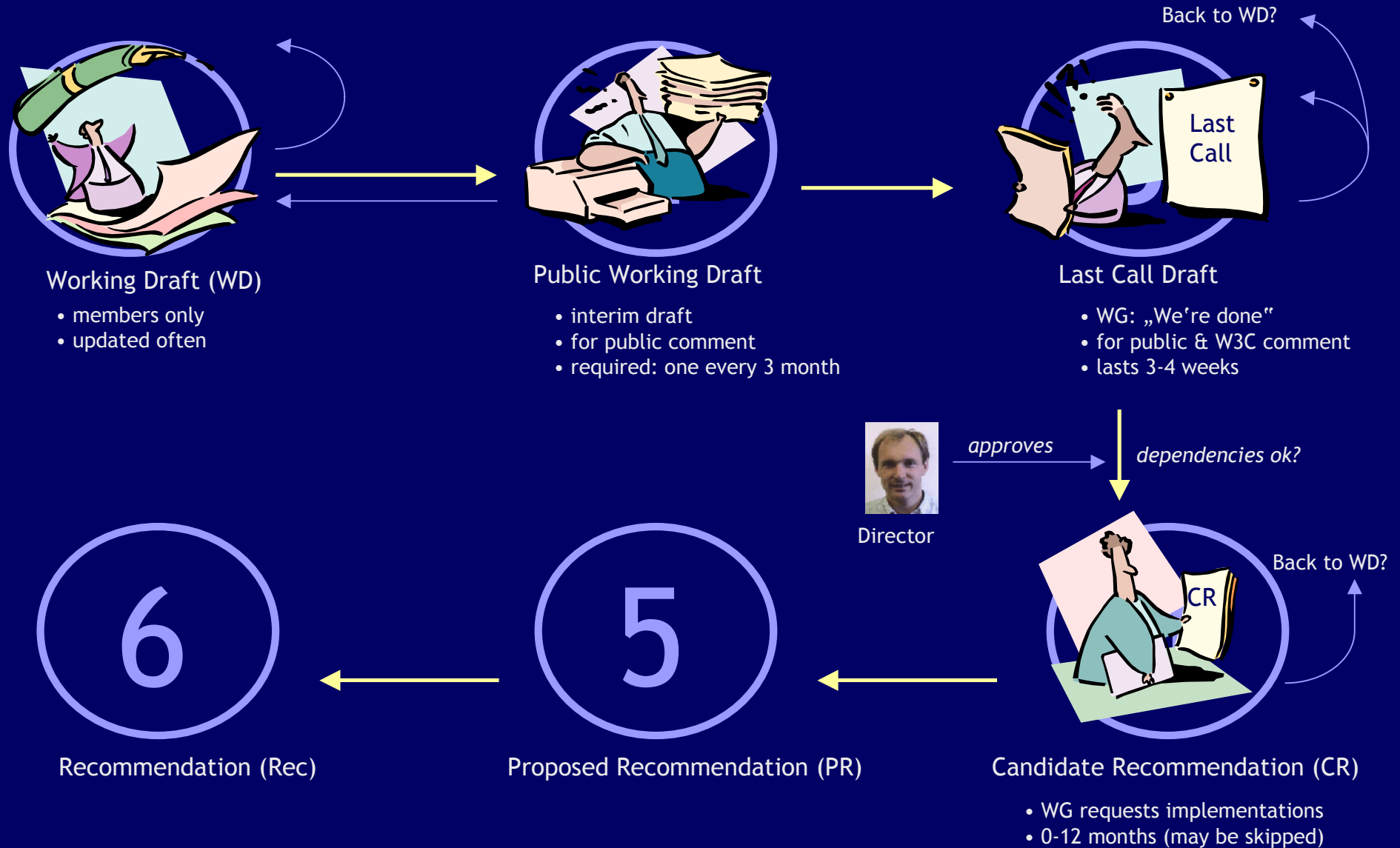
W3C Recommendations



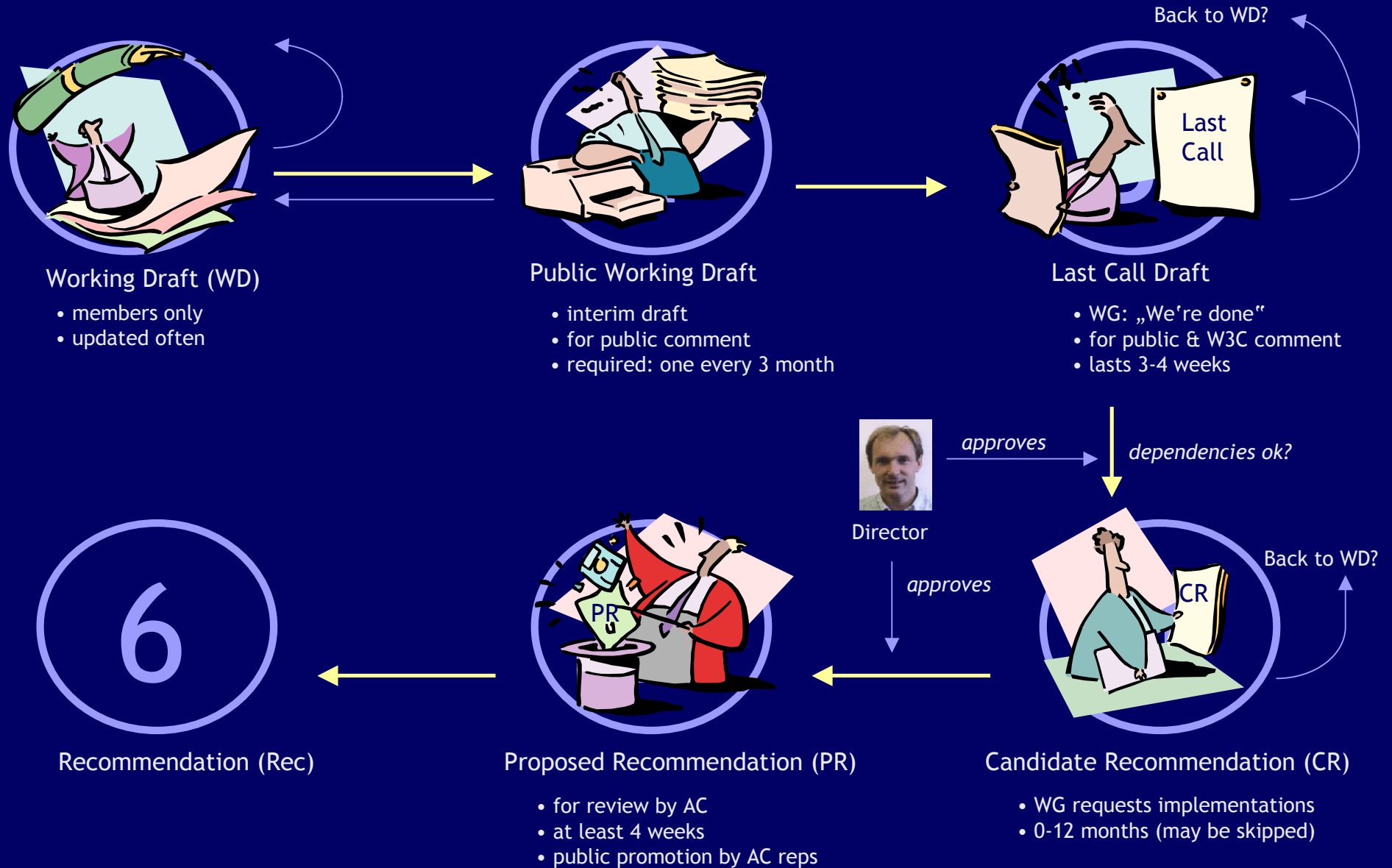
W3C Recommendations



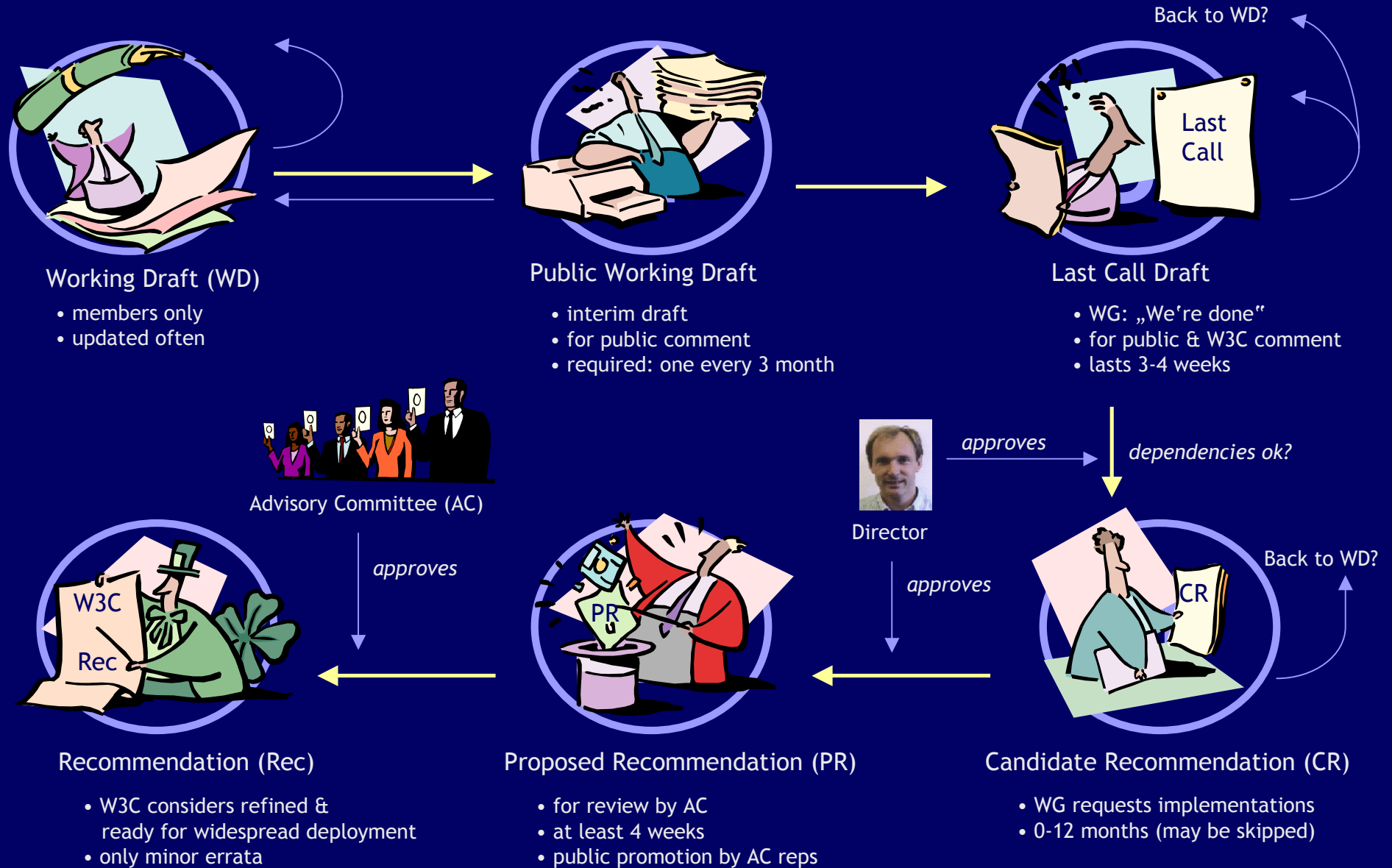
W3C Recommendations



W3C Recommendations



W3C Recommendations



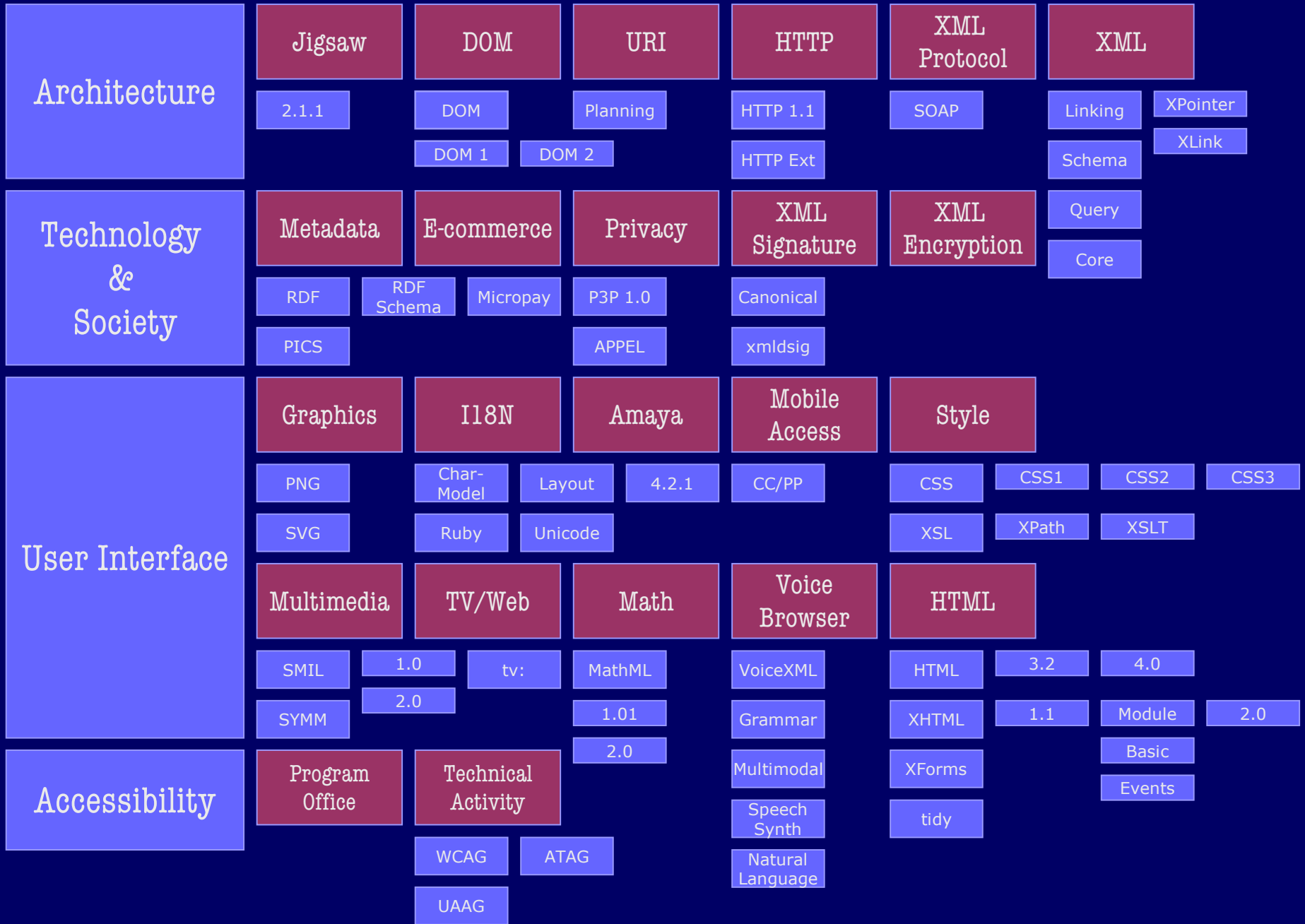
W3C Domains

- **Architecture**
 - HTTP, DOM, URI, XML, XML Protocols
- **Technology & Society Domain**
 - XML Encryption, XML Signature, Privacy (P3P), Metadata, Electronic Commerce
- **User Interface**
 - HTML, Graphics, I18N, Math, Mobile, Multimedia, Style, TV/Web, VoiceBrowser
- **Web Accessibility Initiative (WAI)**

W3C Activities

I. All about the W3C

W3C



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- Summing Up



The X-Files

- XML Core
 - DTD, Namespaces
 - XML Linking
 - XLink, XBase, XPointer, XPath
 - XML Style
 - XSL, XSLT
 - XML Schema
- More XML
 - XML Protocol
 - XML Signature
 - XML Query
 - XML Encryption
 - XHTML

Other stuff

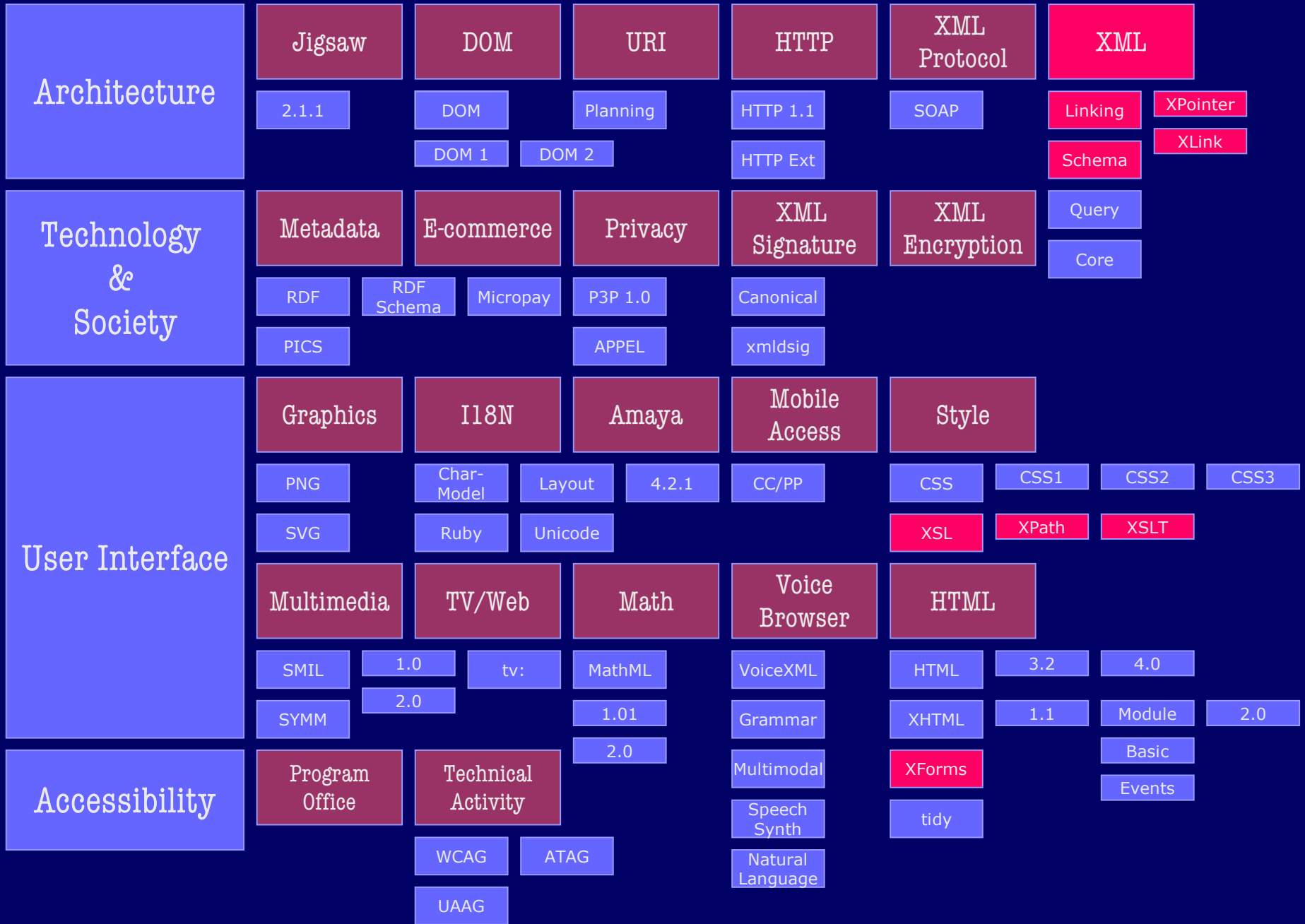
- Semantic Web
 - RDF
 - P3P
 - CC/PP
 - SOAP
- SyncML
- SVG / SMIL
- VoiceBrowser

XML Activity

- XML Query Working Group
 - XML Schema Working Group
 - XML Schema: Primer, Structures, Datatypes
 - XML Linking Working Group
 - XPointer, XLink, XML Base
 - XML Core Working Group
 - Advances XML specification. XML Fragment, XInclude, XML Information Set
 - Old: XML Namespaces, XML Style Sheets (XSL)
 - Others: XML Protocols, XML Encryption, XML Signature
-

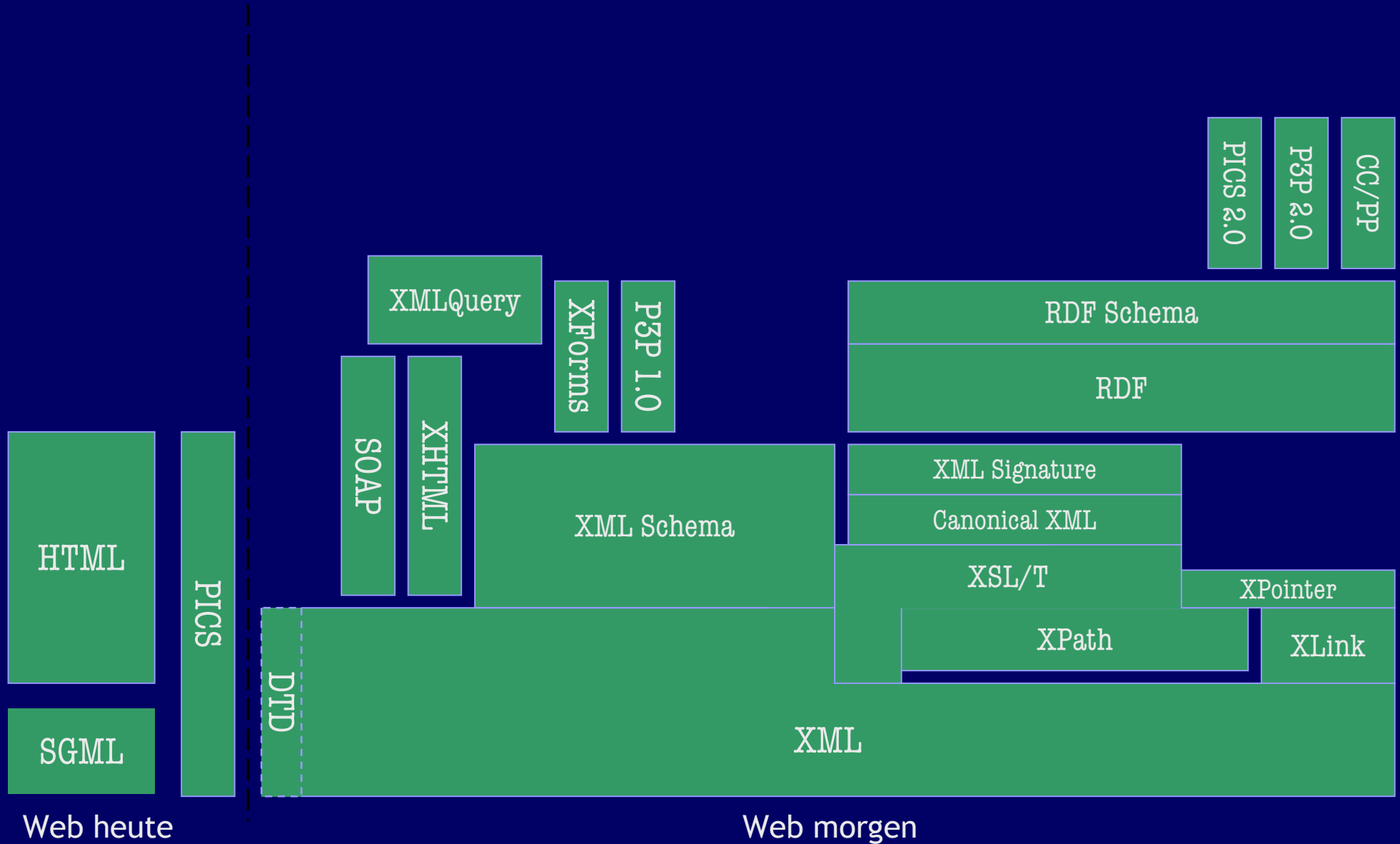
W3C Activities

W3C



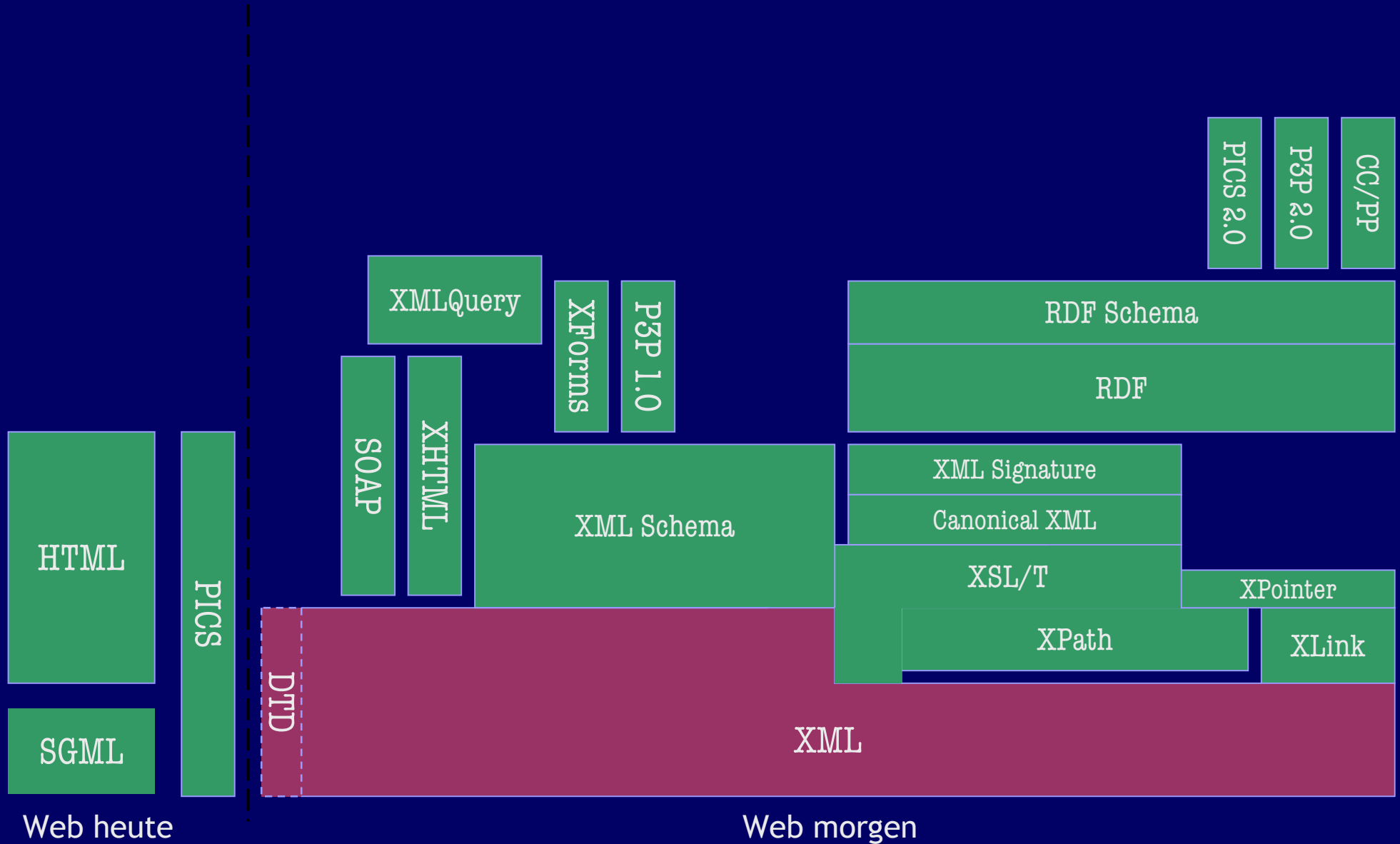
XML Tech Tree

II. XML Technology Primer



XML Tech Tree

II. XML Technology Primer



XML

- markup language for documents containing structured information
 - XML is not HTML
 - specifies neither semantics nor tag set
 - meta-language for describing markup languages
 - restricted form of SGML
 - thereby usable on the Web
-

XML structure

- Content
 - Markup
 - elements
 - attributes
 - entity references
 - comments
 - processing instructions
 - marked sections
 - document type definitions (DTDs)
-

XML (cont.)

- XML Documents can be
 - Well-formed
 - comply simplest syntactic rules
 - Valid
 - obeys the constraints of a DTD (Document Type Definition)
- DTD
 - context-free grammar
 - defines tag set for a specific markup vocabulary

XML Example

```
<?xml version="1.0"?>
<oldjoke>
  <burns>Say <quote>goodnight</quote>, Gracie.</burns> <allen><quote>Goodnight,
  Gracie.</quote></allen>
  <applause/>
</oldjoke>
```

```
<!ELEMENT oldjoke (burns+, allen, applause?)>
<!ELEMENT burns (#PCDATA | quote)*>
<!ELEMENT allen (#PCDATA | quote)*>
<!ELEMENT quote (#PCDATA)*>
<!ELEMENT applause EMPTY>
```

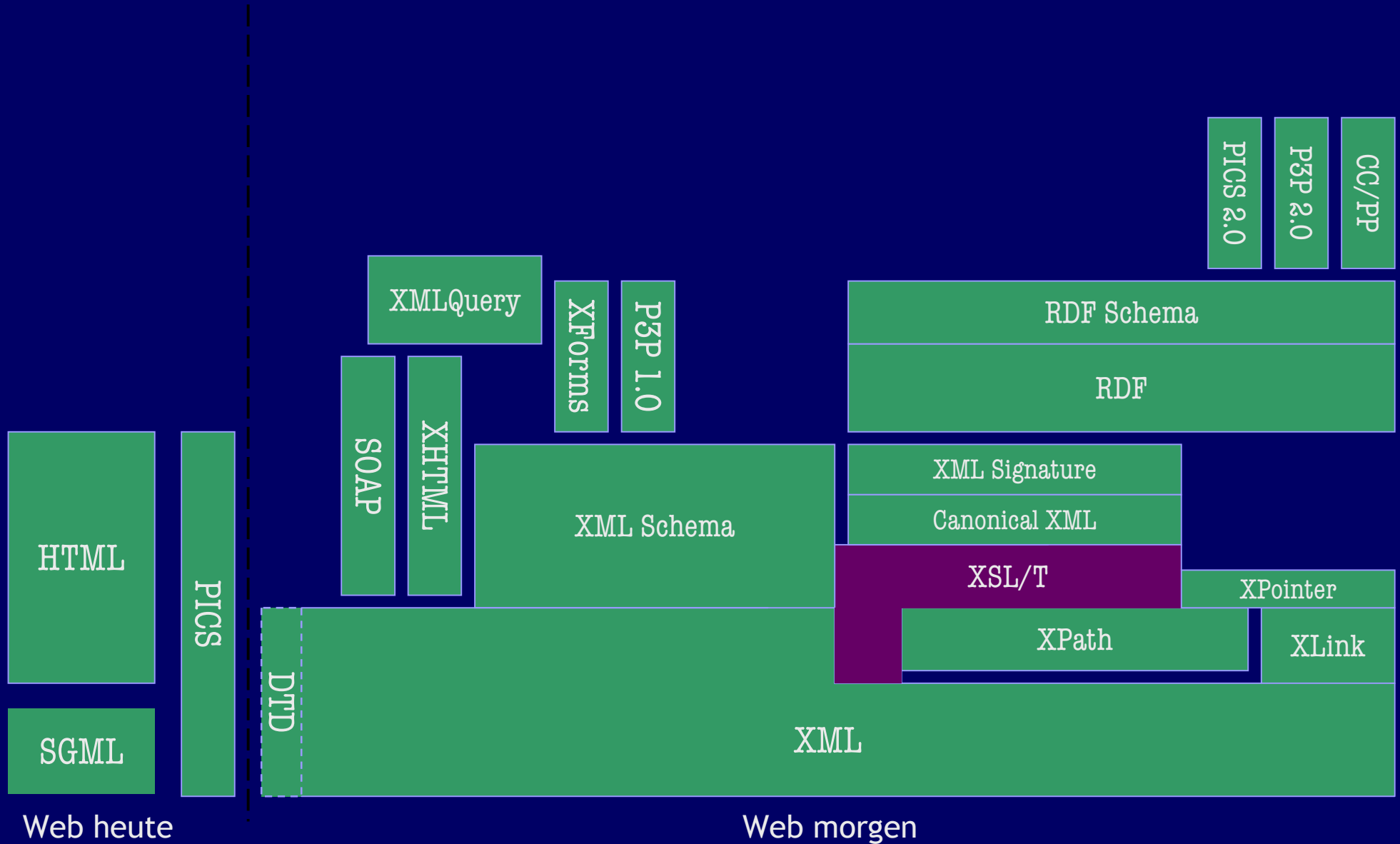
XML Namespaces

- Name collisions for XML markup
 - single XML document contains elements and attributes defined in different vocabularies
- ⇒ every tag needs to be unique
- *XML Namespace* = collection of names, uniquely identified by a URI reference
 - used in XML documents as element types and attribute names

```
<?xml version="1.0"?>
<x xmlns:edi='http://ecommerce.org/schema'>
  <!-- the "edi" prefix is bound to http://ecommerce.org/schema
        for the "x" element and contents -->
</x>
```

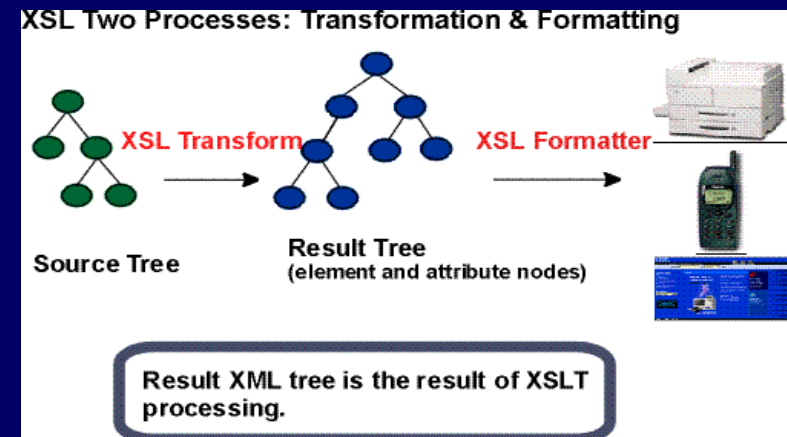
XML Tech Tree

II. XML Technology Primer



XSL

- language for expressing stylesheets, consisting of
 1. language for transforming XML documents (XSLT), and
 2. an XML vocabulary for specifying formatting semantics

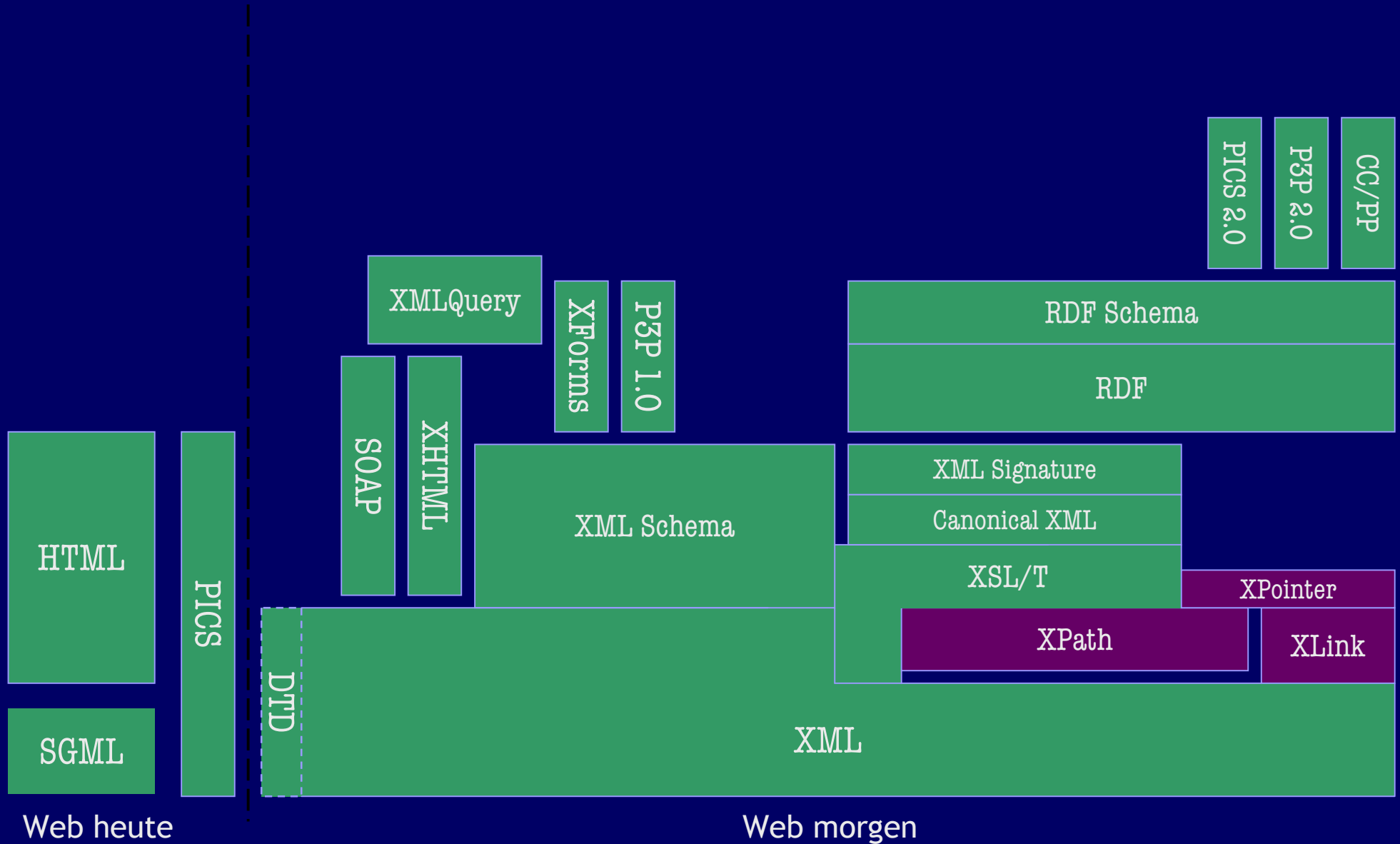


XSLT

- language for transforming XML documents into other XML documents
 - Part of XSL (which is XSLT + XML vocabulary for formatting)
 - A transformation expressed in XSLT describes rules for transforming a source tree into a result tree
 - The transformation is achieved by
 - associating patterns with templates.
 - Matching patterns against elements in the source tree.
 - Instantiating a template to create part of the result tree.
 - Separating the result tree from the source tree
-

XML Tech Tree

II. XML Technology Primer



XLink

- XML application
 - Defines additional attributes, rules, for linking two or more XML resources
 - HTML Link: `bar`
 - XLink: `<my:baz xlink:type=„locator“ xlink:label=„buzz“
xlink:href=„foo.xml“>bar</my:baz>
<my:gogo xlink:type=„arc“ xlink:to=„buzz“/>`
 - Use XPointer or XPath for fine-grained linking!
-

XPath

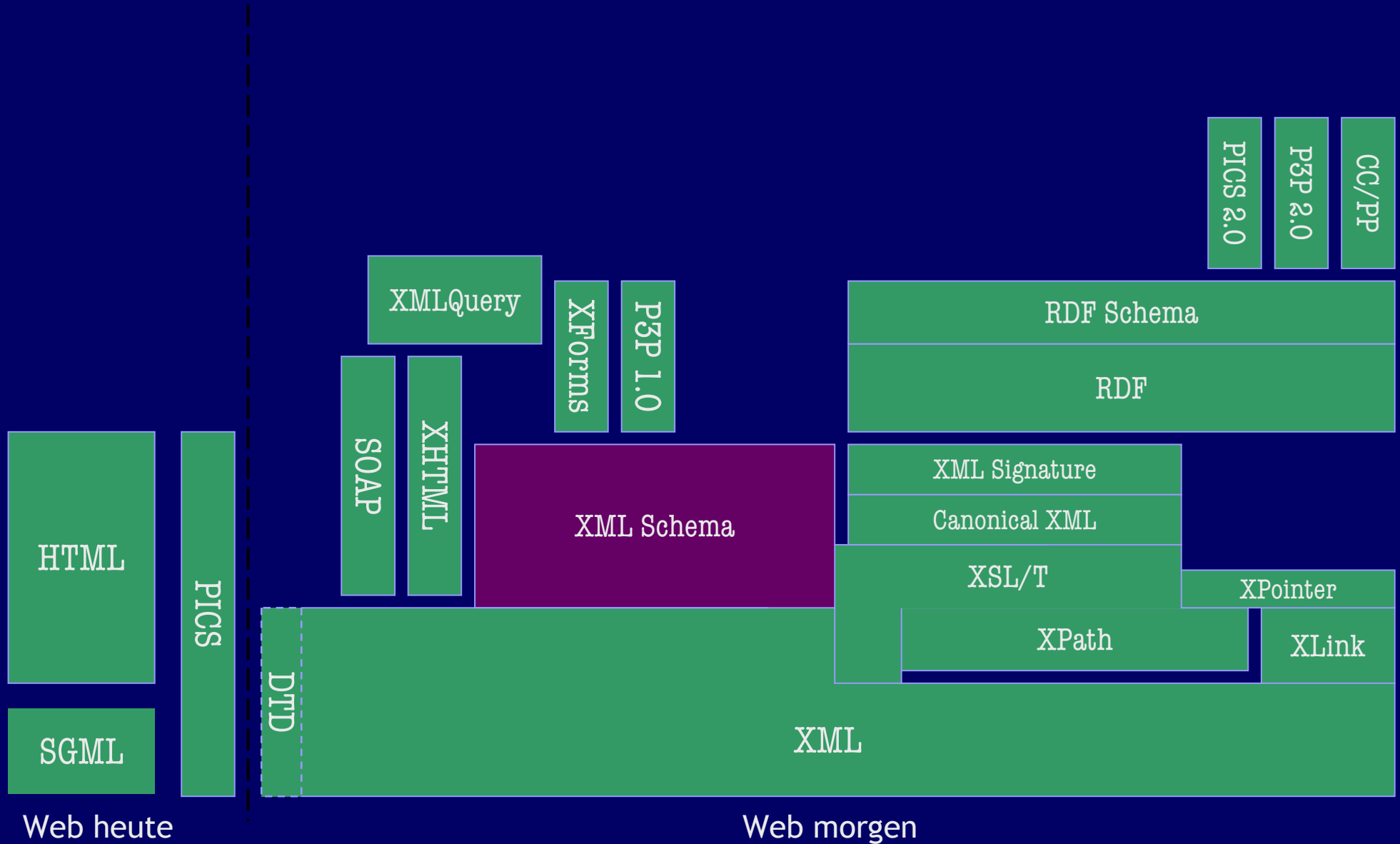
- Common syntax and semantics for XSLT and XPointer
 - Addresses parts of XML document
 - Provides basic facilities to manipulate strings, numbers and booleans
 - Can also be used for matching parts of XML document (used XSLT)
-

XPointer

- language to be used as the basis for a fragment identifier
- Based on XPath
- Adds arbitrary referencing inside XML documents (e.g. for continuous selection with a mouse, which crosses element boundaries)
- DOES NOT USE XML itself, but rather URI structure (since it will be embedded in e.g. href attributes)
- ```
<button
 xlink:type="simple,,
 xlink:href="#xpointer (here () /ancestor::slide [1] /preceding::slide [1]) ">
Previous
</button>
```

# XML Tech Tree

## II. XML Technology Primer



# XML Schema

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- XML language for describing and constraining the content of XML documents
- Def. „Schema“: enumeration, structure and definition of terms used to make (metadata) assertions.
- XML Spec defines valid, well-formed XML Syntax. XML Schema adds (few) semantics.

# DTD drawbacks

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- DTD

- does not support data types beyond character data

```
<year>Hello world!</year>
```

- no support for Namespaces
  - is (only) CF-grammar
  - (DTD != XML) => XML technologies (DOM, SAX) cannot parse and expose DTD
-

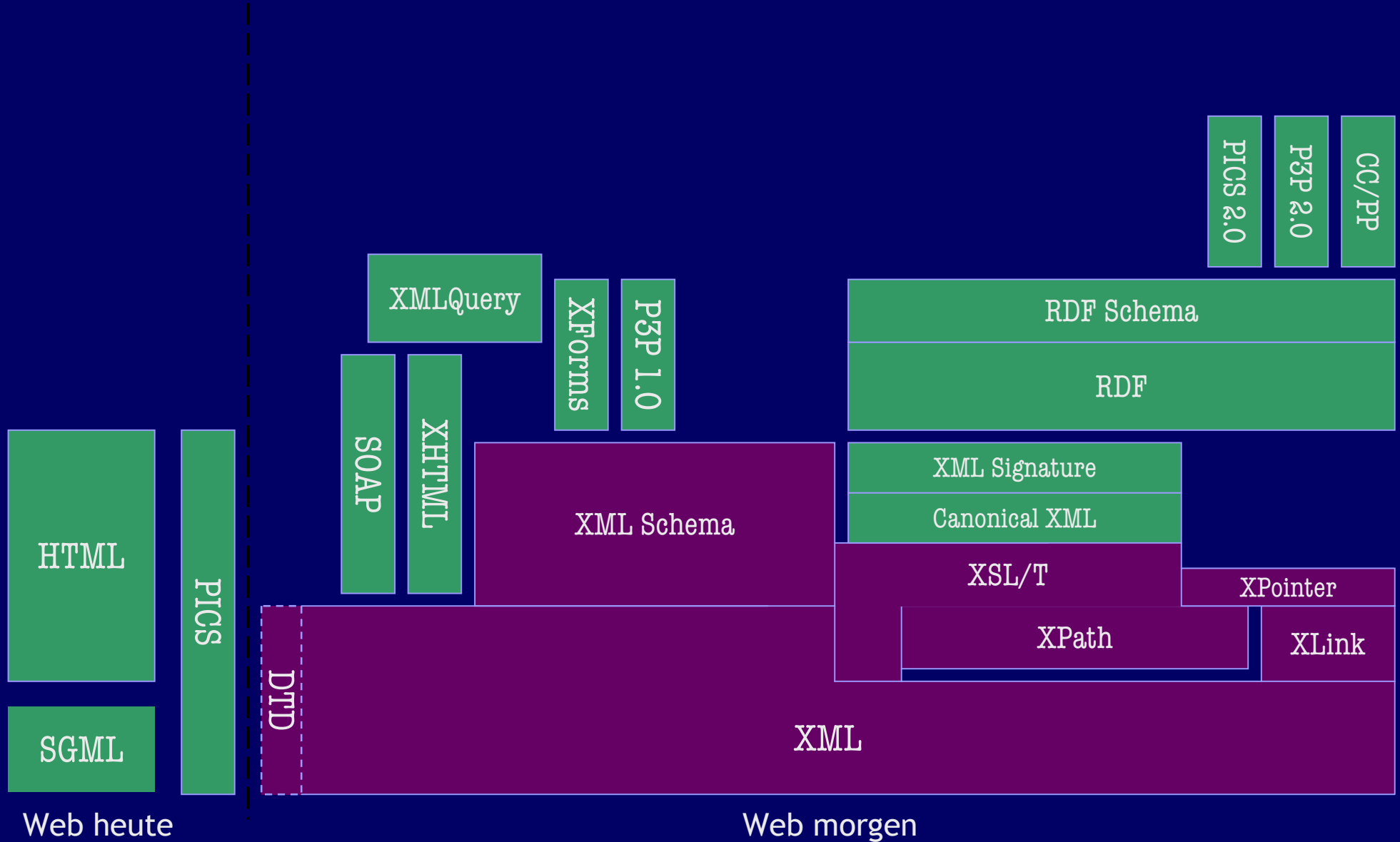
# XML Schema improvements

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- New built-in data types, based on SQL and Java data types
    - also User-defined data types
  - Explicit support for namespaces
  - Schema constructs can be imported from existing schemas
  - Elements can inherit content and attributes of other elements through refinement
-

# XML Tech Tree

## II. XML Technology Primer



# What's coming up?

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- All about the W3C
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  - XML Technology Primer
    - XML, XML Schemas, XML Linking, XML Style
  - The Semantic Web
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  - Summing Up
-

# The Semantic Web

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- Tim Berners-Lee's Vision

- „... the Semantic Web approach develops languages for expressing information in a machine processable form.“



Tim Berners-Lee

- Tools

- Universal Addressing Scheme (URIs)
- Universal Data Format (XML)
- Ontologies (RDF, RDF Schemas)
- Object Protocols, Communication (SOAP)



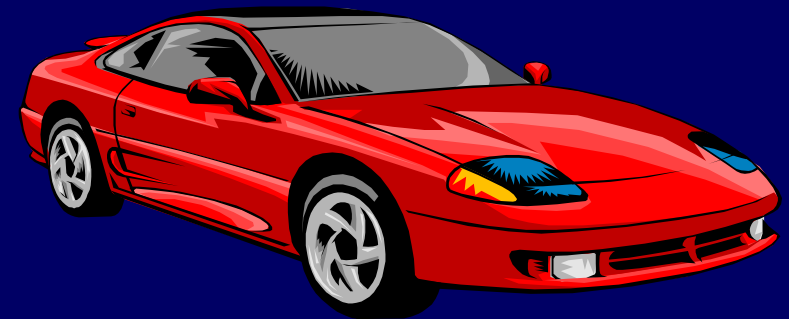
# Why RDF?

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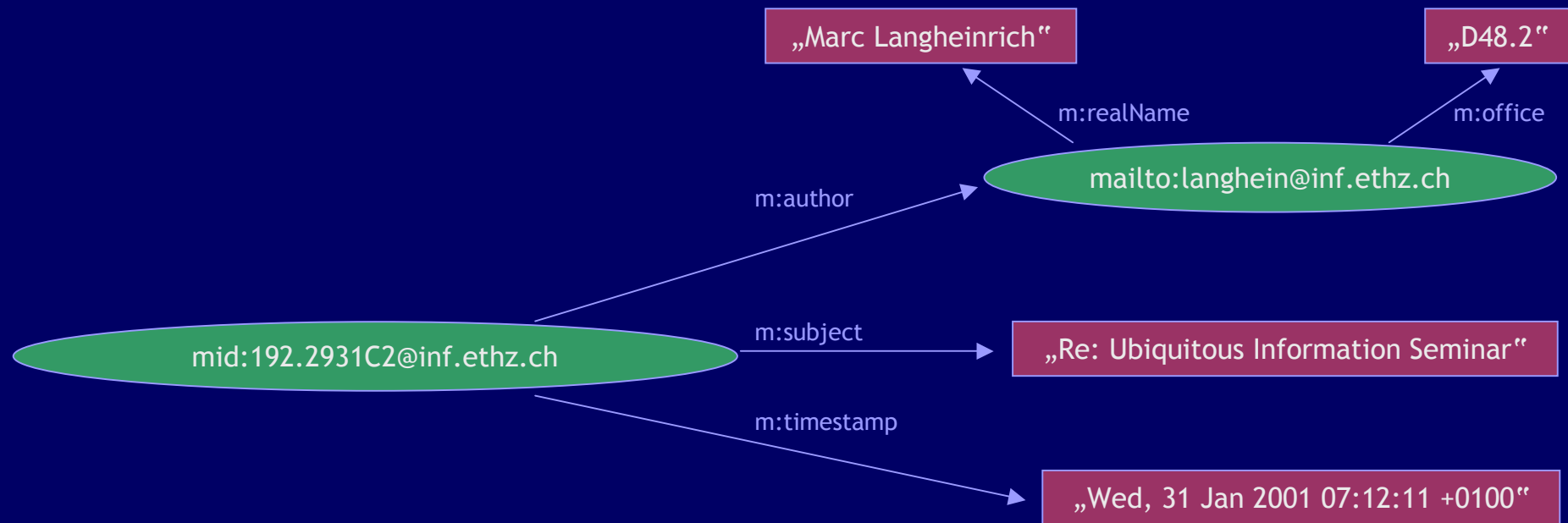
- „Resource Description Framework“
    - Describing Resources („Things“)
    - Metadata - Data about Data
  - Metadata helps us finding things
    - Yellow Pages
    - Library Card Catalog
  - RDF is Metadata for the Web
    - Structure instead of Brute-force Text Indexing or Manual Directories
-

# Why not use XML?

- There's more than one way to do it (in XML):
  - `<car color="red" />`
  - `<car><color>red</color></car>`
  - `<car color="#cc" />`  
`<color id="cc" shade="red" />`
- The RDF way of things
  - *Resource*: car
  - *Property*: color
  - *Statement*: red
- RDF: `<Subject>` has `<Predicate>``<Object>`



# RDF Core Concepts



## Resource

- referenced by URI
- grouping possible
  - Bags (unordered)
  - Sequences
  - Alternatives

## Property

- Uses XML namespaces
- Implicitly referenced by URI

## Statement

- Application of Property with Value
- Value can be
  - Strings, or
  - Other Resources

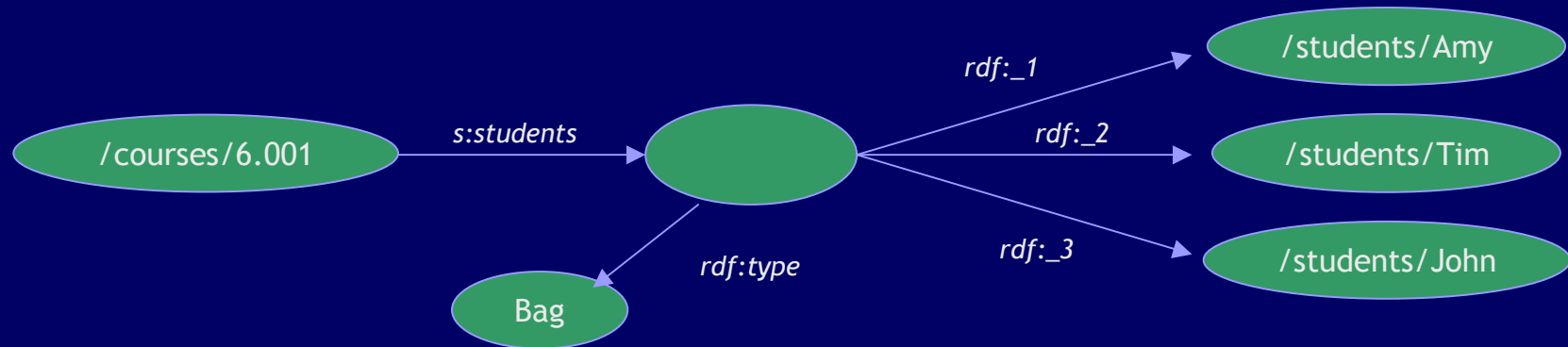
# RDF/XML

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- RDF = Structured graphs (ER-Model)
- RDF/XML = serialized RDF
  - Other serializations possible, e.g. SOAP
- RDF/XML
  - doesn't look different than XML - it *is* XML,
  - but with particular **data model** and
  - predefined set of **element types**

# RDF/XML Example

- The students in course 6.001 are Amy, Tim, John, Mary, and Sue



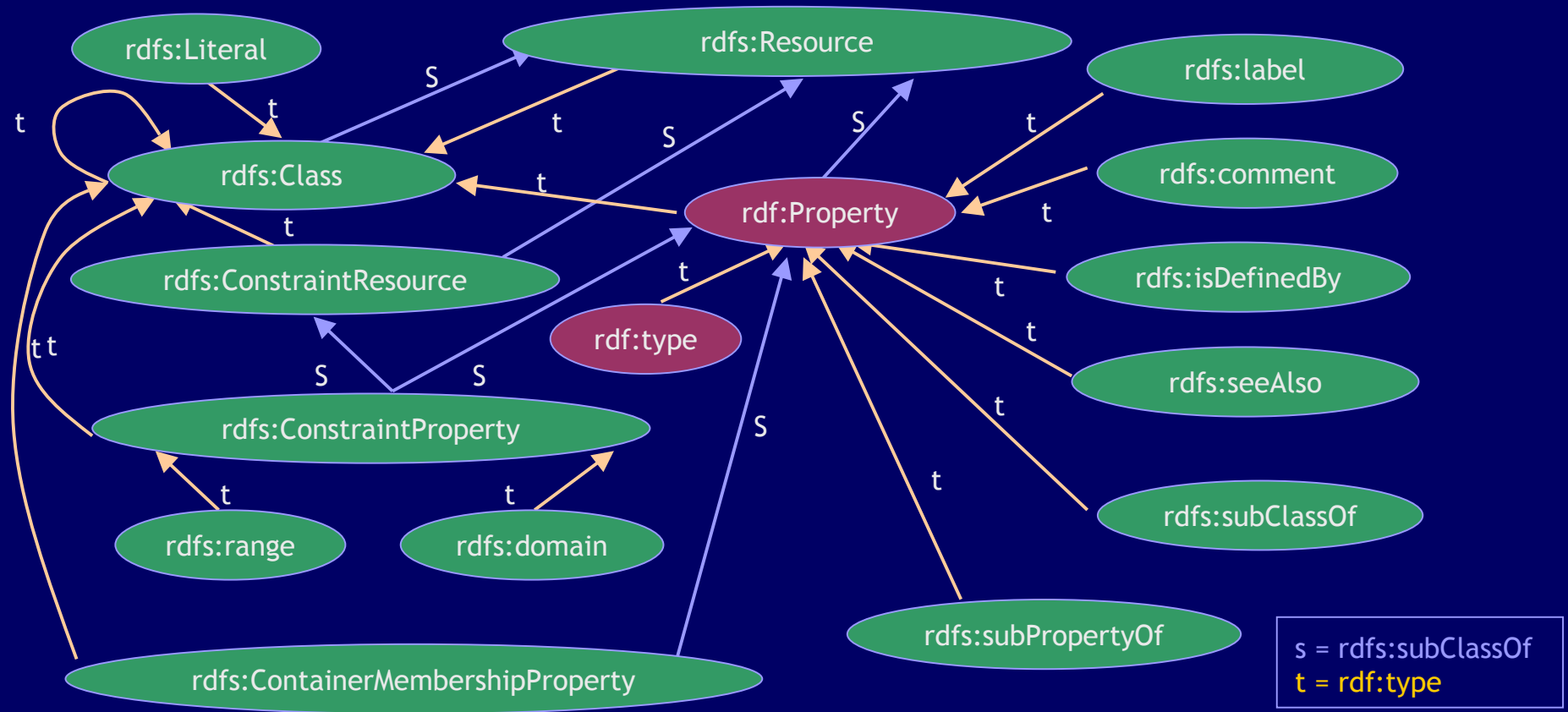
- ```
<rdf:RDF
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:s="http://mycollege.edu/schema/students">
  <rdf:Description about="http://mycollege.edu/courses/6.001">
    <s:students>
      <rdf:Bag>
        <rdf:li resource="http://mycollege.edu/students/Amy"/>
        <rdf:li resource="http://mycollege.edu/students/Tim"/>
        <rdf:li resource="http://mycollege.edu/students/John"/>
      </rdf:Bag>
    </s:students>
  </rdf:Description>
</rdf:RDF>
```

RDF/XML Syntax

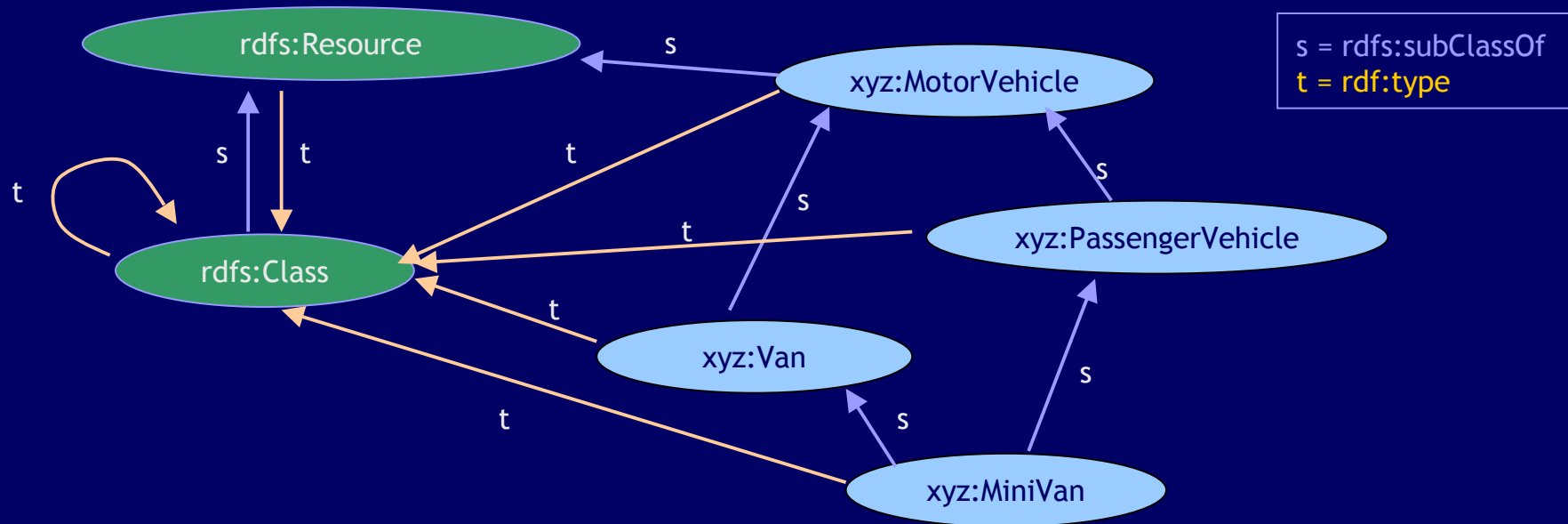
- `<rdf:RDF>`
- `<rdf:Description>`
 - `ID=string`
 - `about=#URI`
 - `aboutEach)#URI`
 - `abouteachPrefix=string`
- `<x:property> ... </x:property>`
- `<x:property resource=#URI />`
- `<rdf:Bag>`
- `<rdf:Seq>`
- `<rdf:Alt>`
- `<rdf:li>`

RDF Schema

- Schema definition language
- Basic type system
- Written in RDF
- Example: Schema for RDF Schema



RDF Schema Example



```
<rdf:Description ID="MotorVehicle">
  <rdf:type resource="http://www.w3.org/2000/01/rdf-schema#Class"/>
  <rdfs:subClassOf
    rdf:resource="http://www.w3.org/2000/01/rdf-schema#Resource"/>
</rdf:Description>
```

```
<rdf:Description ID="PassengerVehicle">
  <rdf:type resource="http://www.w3.org/2000/01/rdf-schema#Class"/>
  <rdfs:subClassOf rdf:resource="#MotorVehicle"/>
</rdf:Description>
```

```
<rdf:Description ID="Van">
  <rdf:type resource="http://www.w3.org/2000/01/rdf-schema#Class"/>
  <rdfs:subClassOf rdf:resource="#MotorVehicle"/>
</rdf:Description>
```

```
<rdf:Description ID="MiniVan">
  <rdf:type resource="http://www.w3.org/2000/01/rdf-schema#Class"/>
  <rdfs:subClassOf rdf:resource="#Van"/>
  <rdfs:subClassOf rdf:resource="#PassengerVehicle"/>
</rdf:Description>
```


RDF Applied: CC/PP

■ CC/PP

- Composite Capabilities/Preferences Profile
- part of W3C Mobile Access Activity
- „user preferences and device capabilities“

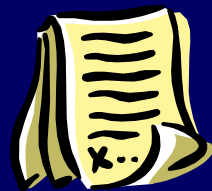
Device Profiles

a device profile lists the (display) abilities of a particular device

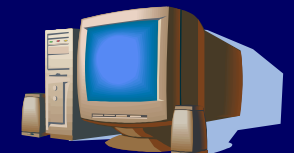


Document Profiles

a document exists in different variants, each including a document profile, describing the browser support it needs to display it



Negotiate
Correct
Content for
Device



CC/PP

■ Idea

- Device sends Pointer to Device Profile along with request
- Server replies with best matching document
- Device Profiles written in RDF
- UAProf Specification (WAP Forum) defines Client Capabilities for Mobile Phones

■ Example:

```
<ccpp:component>
  <Description about="http://www.example.com/TerminalHardware">
    <type resource="http://www.example.com/Schema#HardwarePlatform" />
    <ccpp:Defaults rdf:resource="http://www.nokia.com/profiles/2000k" />
    <uaprof:ScreenSize>640x400</uaprof:ScreenSize>
  </Description>
</ccpp:component>
```

Needed: Infrastructure

- **Vocabularies**
 - CC/PP, P3P, PICS
- **Query Language**
 - RDF Query efforts
- **Data Storage**
 - Rdfdb, Redland
- **Characterization**
 - How much do I know?

XML Protocols Activity

- XML Protocol Activity
 - Since May 2000
 - Deliverables
 - An envelope to encapsulate XML data for transfer
 - an operating system-neutral convention for the content of the envelope when used for RPC
 - A mechanism to serialize data based on XML Schema datatypes
 - a non-exclusive mechanism layered on HTTP transport
 - Starting Point: SOAP/1.1
-

SOAP 1.1

- Microsoft, IBM, et al.
 - „mechanism for exchanging structured and typed information between peers in a distributed environment using XML“
 - <http://msdn.microsoft.com/soap/>
 - part of Microsoft's .NET framework



SOAP Message Example

```
POST /StockQuote HTTP/1.1
Host: www.stockquoteserver.com
Content-Type: text/xml; charset="utf-8"
Content-Length: nnnn
SOAPAction: "Some-URI"

<SOAP-ENV:Envelope
  xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
  SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/">
  <SOAP-ENV:Body>
    <m:GetLastTradePrice xmlns:m="Some-URI">
      <symbol>DIS</symbol>
    </m:GetLastTradePrice>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

SOAP 1.1 Message Embedded in HTTP Request

RPC Call to m::GetLastTradePrice method

- SOAP Envelope Framework
 - what is in a message
 - who should deal with it
 - whether it is optional or mandatory
 - error handling („faults“)

SOAP Serialization

- Defines XML Schema for
 - Simple Types
 - Strings, Integer, Floats
 - Enumeration
 - Byte Arrays
 - Compound Types
 - Structs
 - Arrays

Data Type „String“ from XML Schema

```
<SOAP-ENC:Array SOAP-ENC:arrayType="xsd:string[,] [4]">  
  <SOAP-ENC:Array SOAP-ENC:position="[2]" SOAP-ENC:arrayType="xsd:string[10,10]">  
    <item SOAP-ENC:position="[2,2]">Third row, third col</item>  
    <item SOAP-ENC:position="[7,2]">Eighth row, third col</item>  
  </SOAP-ENC:Array>  
</SOAP-ENC:Array>
```

SOAP 1.1 Array Type Example

More non-W3C Stuff

- ebXML (e-business XML, „SOAP+“)
 - www.ebxml.org
 - UDDI (Description & Discovery)
 - www.uddi.org
 - WSDL (Web Services Descr. Language)
 - <http://msdn.microsoft.com/xml/general/wsdl.asp>
 - integrates with SOAP
 - CORBA/SOAP
 - OMG request for proposals
-

No more time for:

- XML Signature
 - Canonical XML, Requirements (since 06/1999)
 - XML Encryption
 - Goal: Encrypting *Parts* of XML (since 01/2001)
 - XML Query
 - Requirements, Algebra & Data Model done
 - XForms
 - replaces HTML/XHTML forms
 - XHTML
 - XHTML 1.1 done
 - now working on modularizing, XHTML 2.0
-

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Take Home Message

- W3C
 - almost 500 members, more than 1000 participants in Working Groups
- The Semantic Web
 - XML as universal exchange language
 - RDF as (weak) semantics
 - SOAP et al as lightweight CORBA
 - Description and Discovery Standards emerging
- We're just getting started!!

Building the Web of Trust

