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Data Management and Interchange

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Tutorial on ISO/IEC 20944 Series Metadata Registries Interoperability and Bindings

Open Forum 2005 on Metadata Registries

Session time here

April 2005

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Overview

- Basic Concepts
- Relationship to Other Standards
- People Issues
- Technical Issues
- Structure of 20944 Series
- 20944 Walkthrough

Basic Concepts

- Metadata:
  - Data that is descriptive
  - 11179: descriptive data about data
- Metadata:
  - A “relative” term (like the relative term “above” or “below”)
  - No data is inherently “metadata”
  - Only “metadata” in relation to something (else)

Basic Concepts

- Bindings:
  - A mapping from one standard or framework to another standard or framework
- Codings (in the context of bindings):
  - Information structures
- APIs:
  - Application programming interfaces
- Protocols:
  - Communication services/interchange

Relationship To Other Standards

- 11179-*, http://metadata-standards.org/11179
  - The core features, concepts
- 20943-*, http://metadata-standards.org/20943
  - Technical reports, Gives advice/best practices
- 20944-*, http://metadata-standards.org/20944
  - Technical interoperability, Multiple “bindings”
- 19773-*, http://metadata-standards.org/19773
  - Reusable Components of MDR

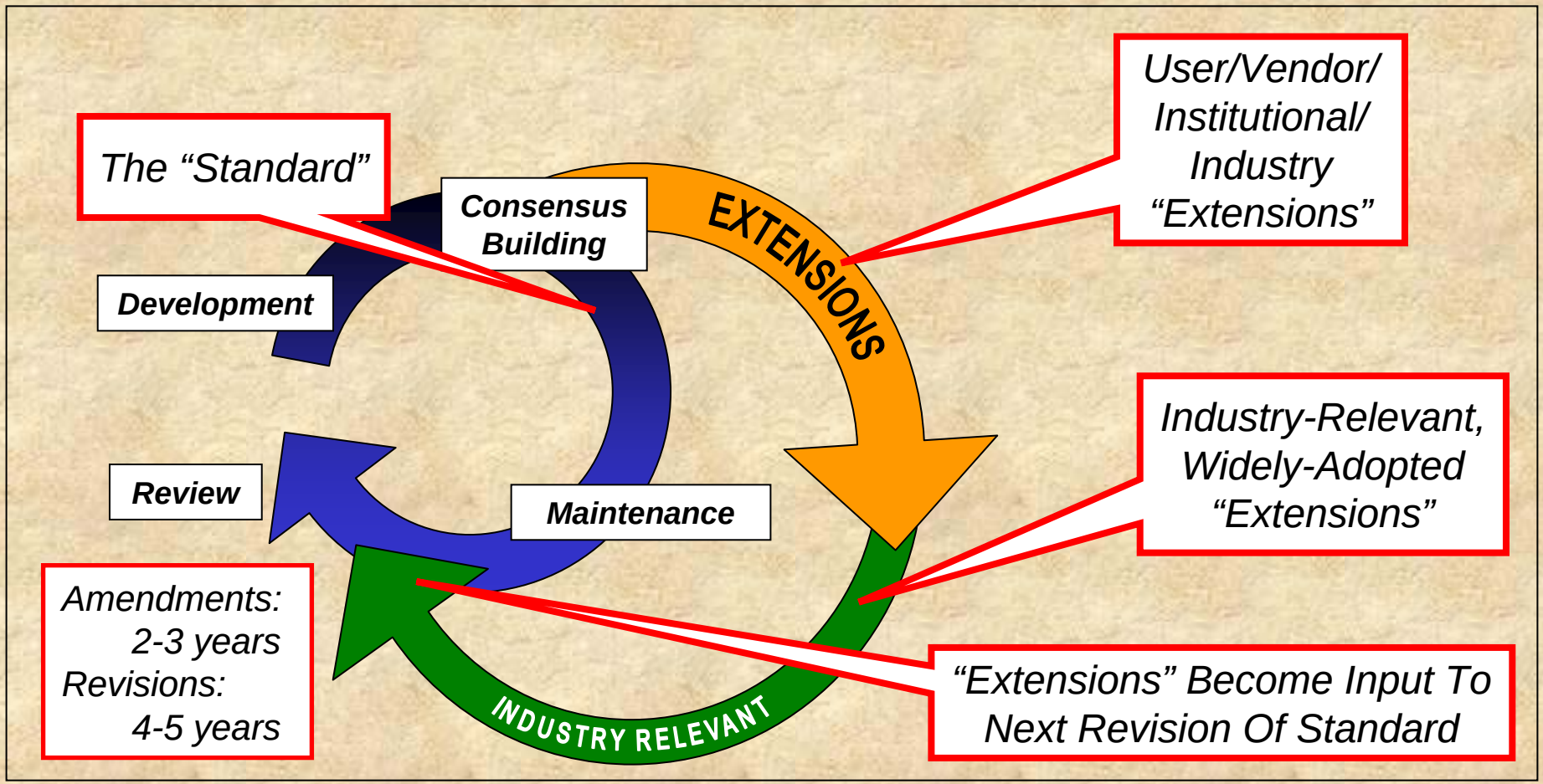
People Issues

- "Metadata Interoperability"
  - Not really a technical problem
- Agreement on meanings
  - Data elements, value domains, etc.
  - Significant "consensus-building" issue
  - Why can't organizations agree on top-level objects?
- Institutional, cultural, language issues

“Specification” Issues

- “Semantic Interoperability”
  - One doesn’t standardize semantic interoperability (just as one doesn’t standardize portability)
  - Semantic interoperability (just like portability) is a result of precise specifications (standards)
  - Business reasons for lack of precision
    - Don’t tell me how to implement my system
    - Agreed-upon need for *less* variety control in standards
    - Culture, national, regional, institutional variants
  - Conclusion: One can achieve agreement upon meaning (to the extent desired) by writing good specifications, i.e., semantic interoperability is achieved by writing good specifications

Building Standards In Several Steps



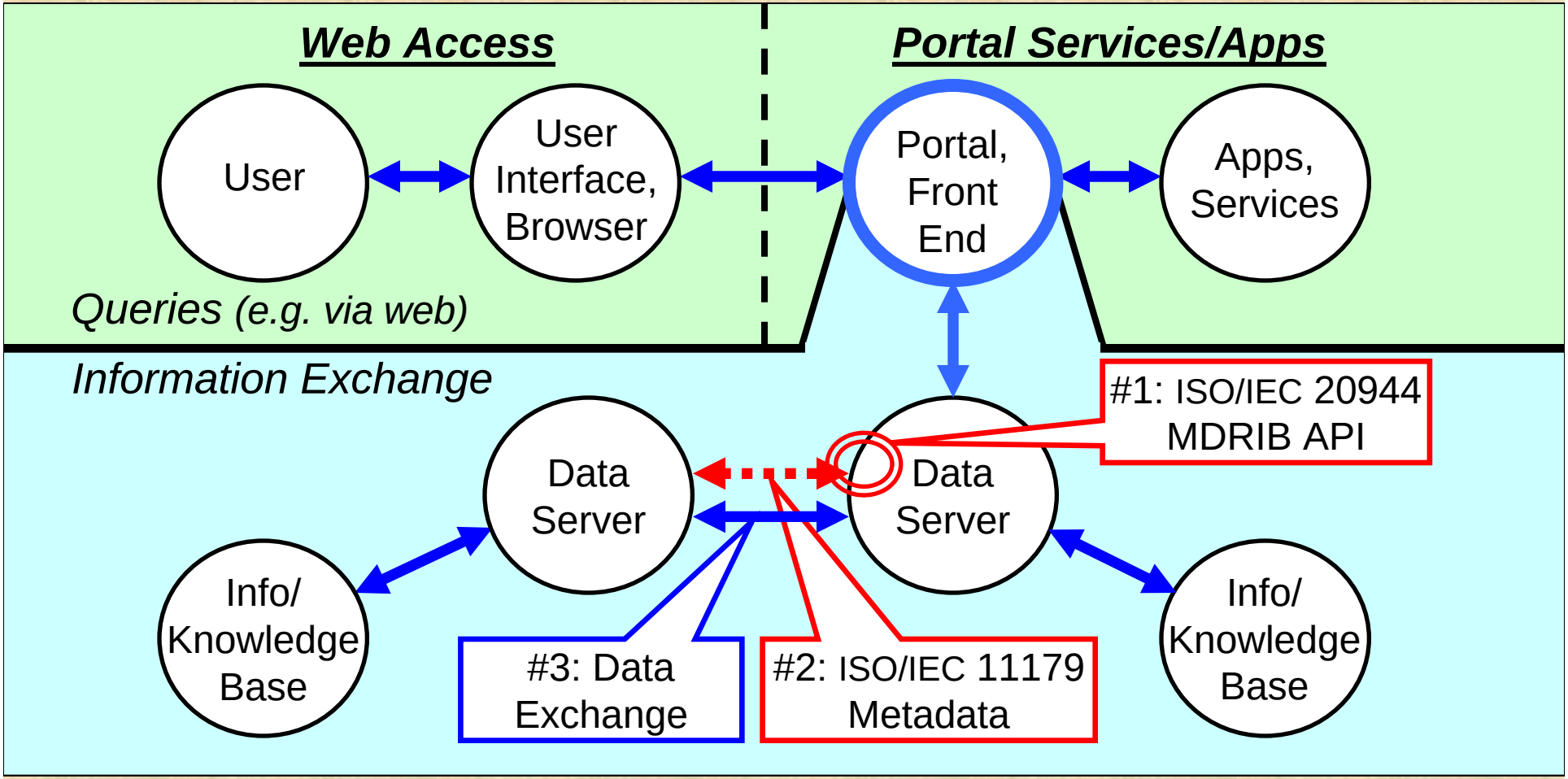
Some Strategies for Standardizing Data Models

- Partition into “application areas”
- Build standards in several steps, example:
  - Year 1: Create minimal, widely adoptable standard
  - Year 3: Create amendment that represents best and ***widely implemented*** practices
  - Year 5: Revise standard, incorporate improvements
- Support extension mechanisms
  - Permits user/vendor/institutional/industry extensions
  - Widely implemented extensions become basis for new standards amendments/revisions

Technical Issues

- How do I describe data?
  - 11179 is a standard way to describe data
  - Extra features/extensions may be necessary
- How do I share/interchange/exchange data?
  - First, need to understand structure
    - Can ask original developers
    - Can ask a metadata registry?
    - Why not use a standard metadata registry
  - What are the mechanisms for metadata interchange
    - Use 20944 codings/APIs/protocols

Example Of MDRIB, Then ISO 11179 Metadata Exchange, Then Data Exchange

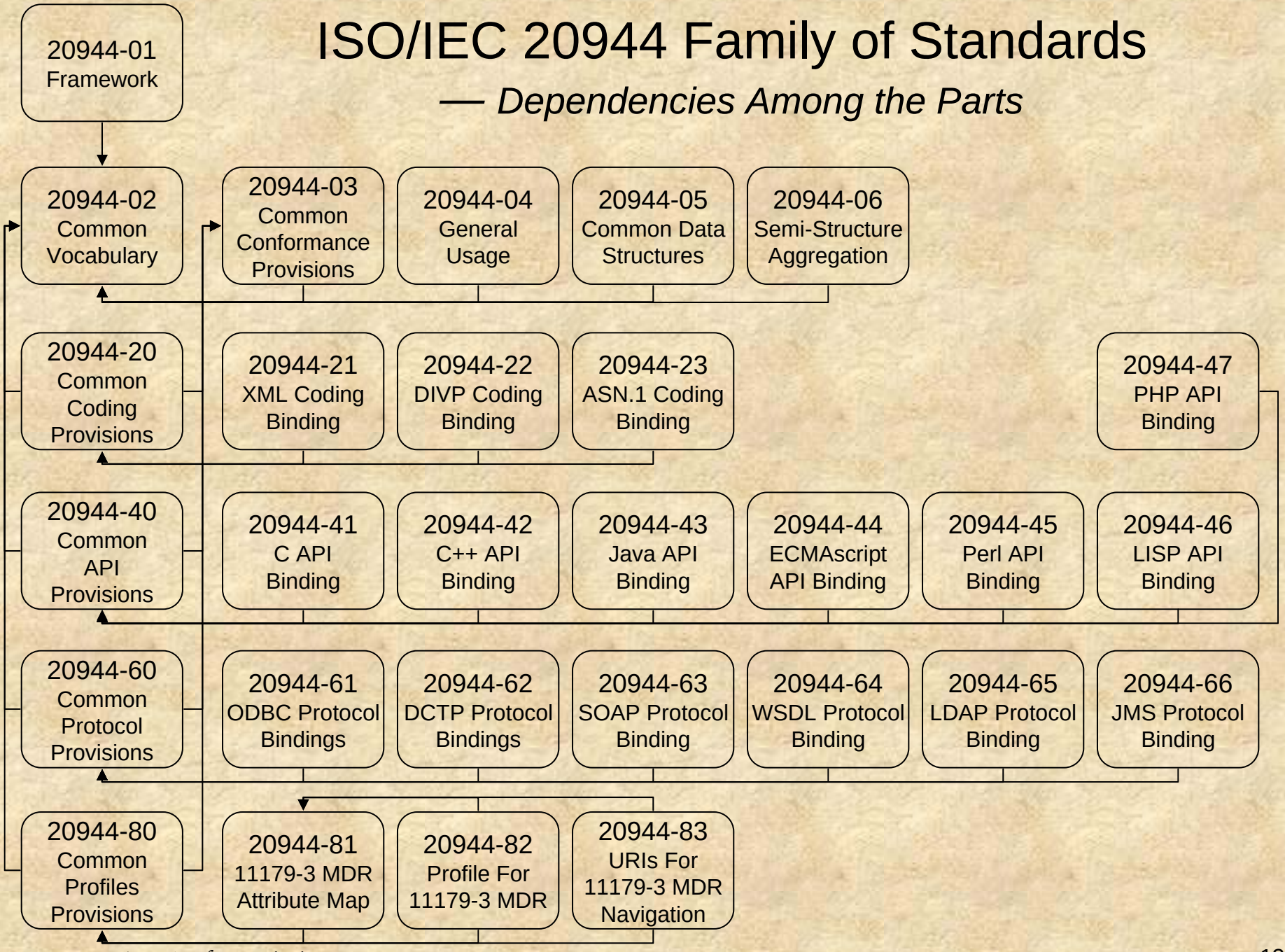


Structure of 20944 Series
Overview

- Divided into 29 parts
- Individual parts will be released in phases
- Main divisions correspond to conformity
  - For vendors: Identifying “declarations of conformity” is easy because breakdown of 20944 parts correspond to actual implementation categories
  - For users: Identifying requirements (e.g., pointing to standards) is easy because breakdown of 20944 parts correspond to the “menu” of individual features that users desire

ISO/IEC 20944 Family of Standards

— *Dependencies Among the Parts*



Structure of 20944 Series
Top-Level Structure

- Organized into 5 sub-series
  - Part 01-19: General
  - Part 20-39: Coding Bindings
  - Part 40-59: API Bindings
  - Part 60-79: Protocol Bindings
  - Part 80-99: Profiles

Structure of 20944 Series
General: Parts 01-19

- Part 01: Framework
- Part 02: Common vocabulary
- Part 03: Common provisions for conformance
- Part 04: Generic usage
- Part 05: Common data structures and services
- Part 06: Semi-structured aggregation

Structure of 20944 Series
Coding Bindings: Parts 20-39

- Part 20: Common provisions for coding bindings
- Part 21: XML coding binding
- Part 22: DIVP coding binding
- Part 23: ASN.1 coding binding

Structure of 20944 Series
Coding Bindings: Parts 40-59

- Part 40: Common provisions for application programming interface (API) bindings
- Part 41: C API binding
- Part 42: C++ API binding
- Part 43: Java API binding
- Part 44: ECMAscript API binding
- Part 45: Perl binding
- Part 46: LISP binding
- Part 47: PHP binding

Structure of 20944 Series
Protocols Bindings: Parts 60-79

- Part 60: Common provisions for protocol bindings
- Part 61: ODBC protocol binding
- Part 62: WebDAV protocol binding
- Part 63: SOAP protocol binding
- Part 64: WSDL protocol binding
- Part 65: LDAP protocol binding
- Part 66: JMS protocol binding

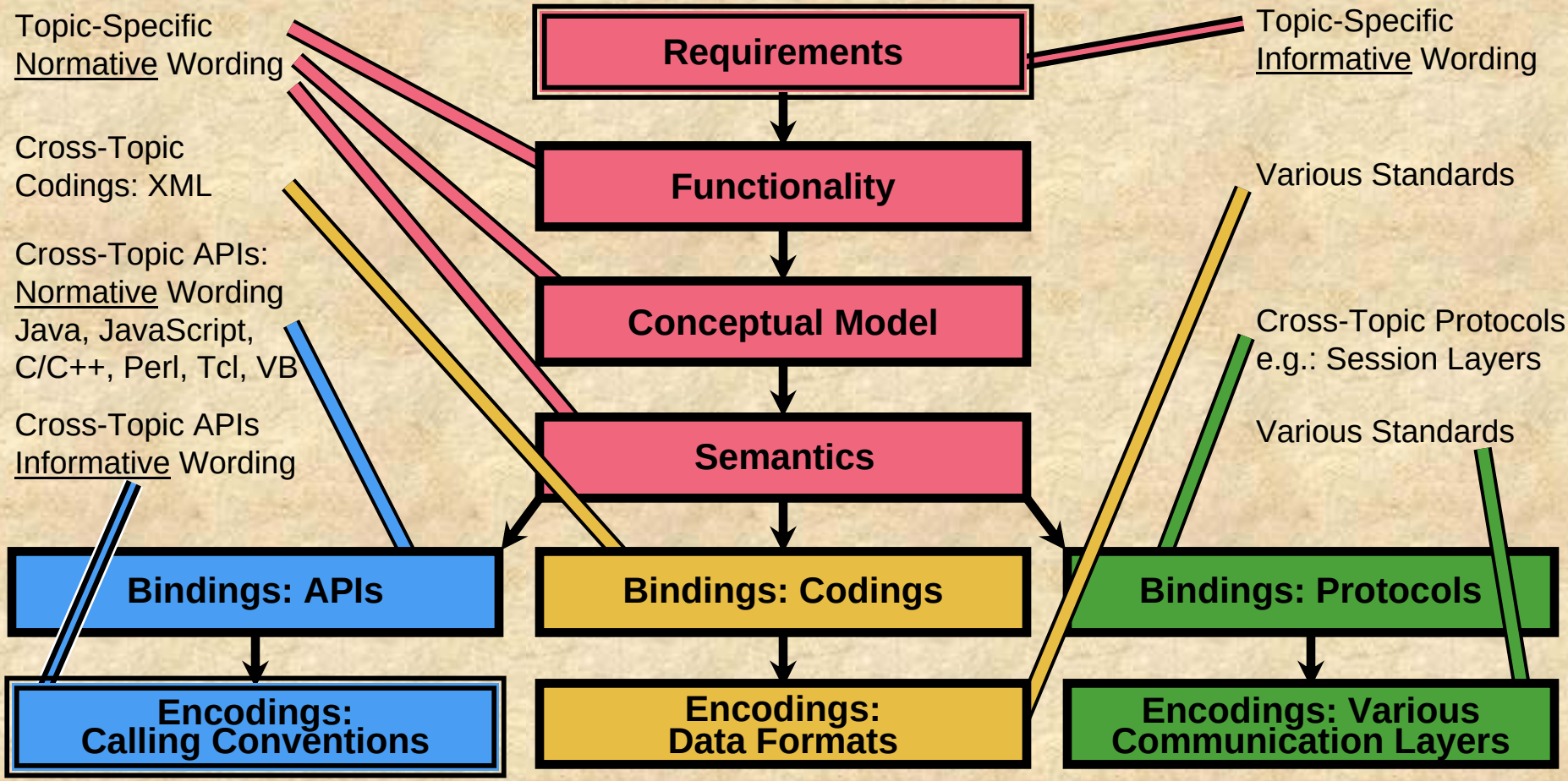
Structure of 20944 Series
Profiles: Parts 80-99

- Part 80: Common provisions for profiles
- Part 81: Attribute mapping for 11179-3 metadata registry metamodel
- Part 82: Profile for 11179-3 metadata registry metamodel
- Part 83: Uniform Resource Identifier (URI) suffixes for 11179-3 metadata registry metamodel navigation

A Framework for Harmonized/Consistent ...

Bindings: Codings, APIs, Protocols

Encodings: Calling Conventions, Data Formats, Communication Layers



Codings, APIs, Protocols — All Three Are Required

- ***Std APIs*** *may be implemented via std or proprietary* ***Protocols***
- ***Std Protocols*** *may be accessed by std or proprietary* ***APIs***
- ***Both std APIs/Protocols*** *improve wide area interoperability*

Semantics

Bindings: APIs

Bindings: Protocols

- ***Std APIs*** *may use std or proprietary* ***Codings***
- ***Std Codings*** *may be used by std or proprietary* ***APIs***
- ***Both std APIs/Codings*** *improve portable apps/data*

Bindings: Codings

Harmonized standard APIs, Codings, and Protocols promote:
- ***Application portability***
- ***Data portability***
- ***Multi-vendor, "open" solutions***
- ***Wide area, end-to-end interoperability***

- ***Std Protocols*** *may use std or proprietary* ***Codings***
- ***Std Codings*** *may be exchanged via std or proprietary* ***Protocols***
- ***Both std Protocols/Codings*** *improve system interoperability*

Prioritizing The Development Of Standards for Codings, APIs, and Protocols

Metadata Registry Interoperability Bindings

- Requirements
  - Make inquiries into repositories to determine metadata
  - Use metadata for further interoperability of repositories
  - Help facilitate metadata/data interchange among repositories
  - Harmonize with semi-structure data access
  - Harmonize with lexicon query service, terminology services

Metadata Registry Interoperability Bindings

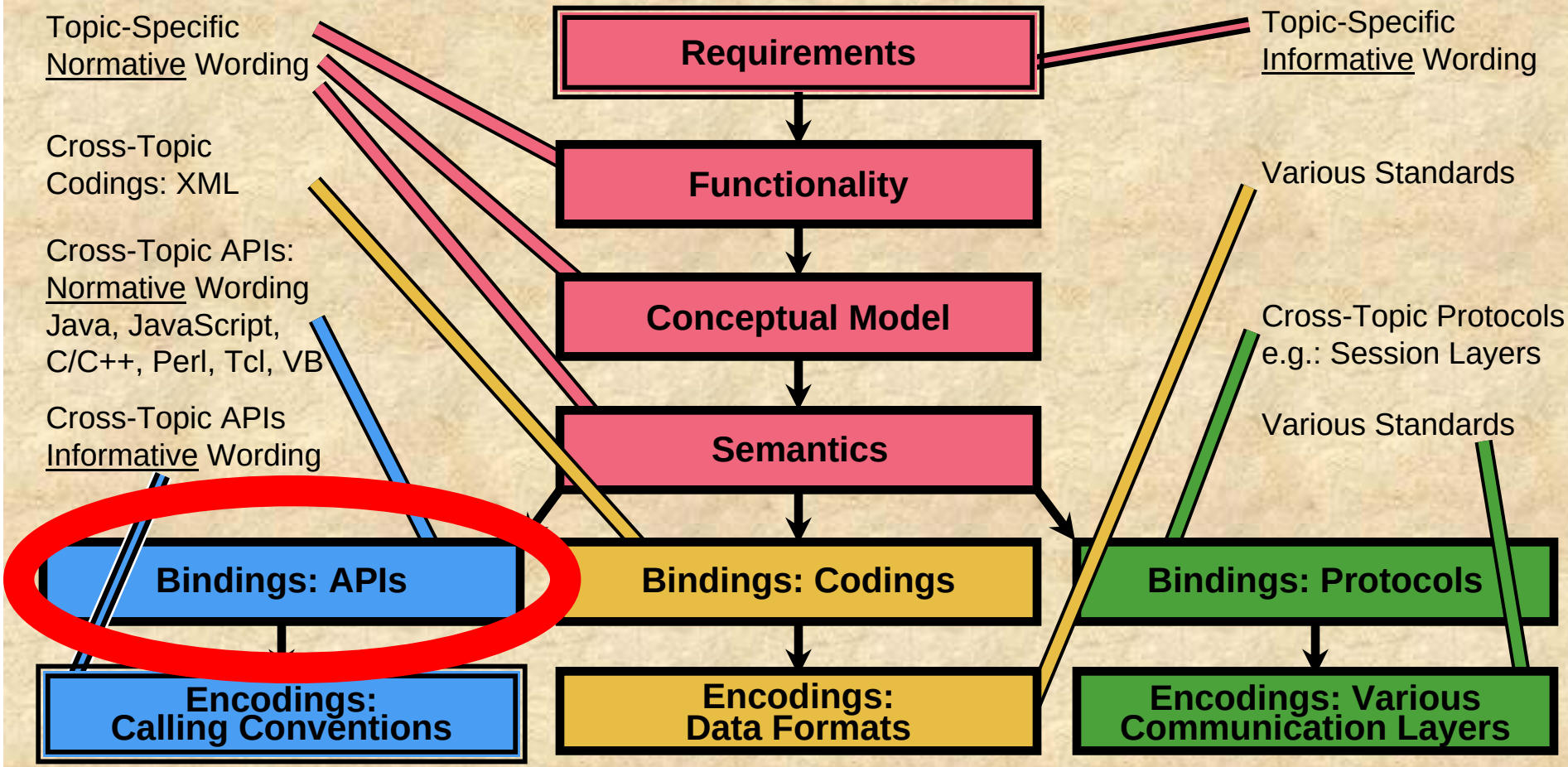
- Functionality
  - Interacts directly with repositories
  - Get (and put) metadata/data
  - Specialized query features to handle:
    - Search by type
    - Search by identifier
    - Search by label
    - Search by property (attribute)

Metadata Registry Interoperability Bindings

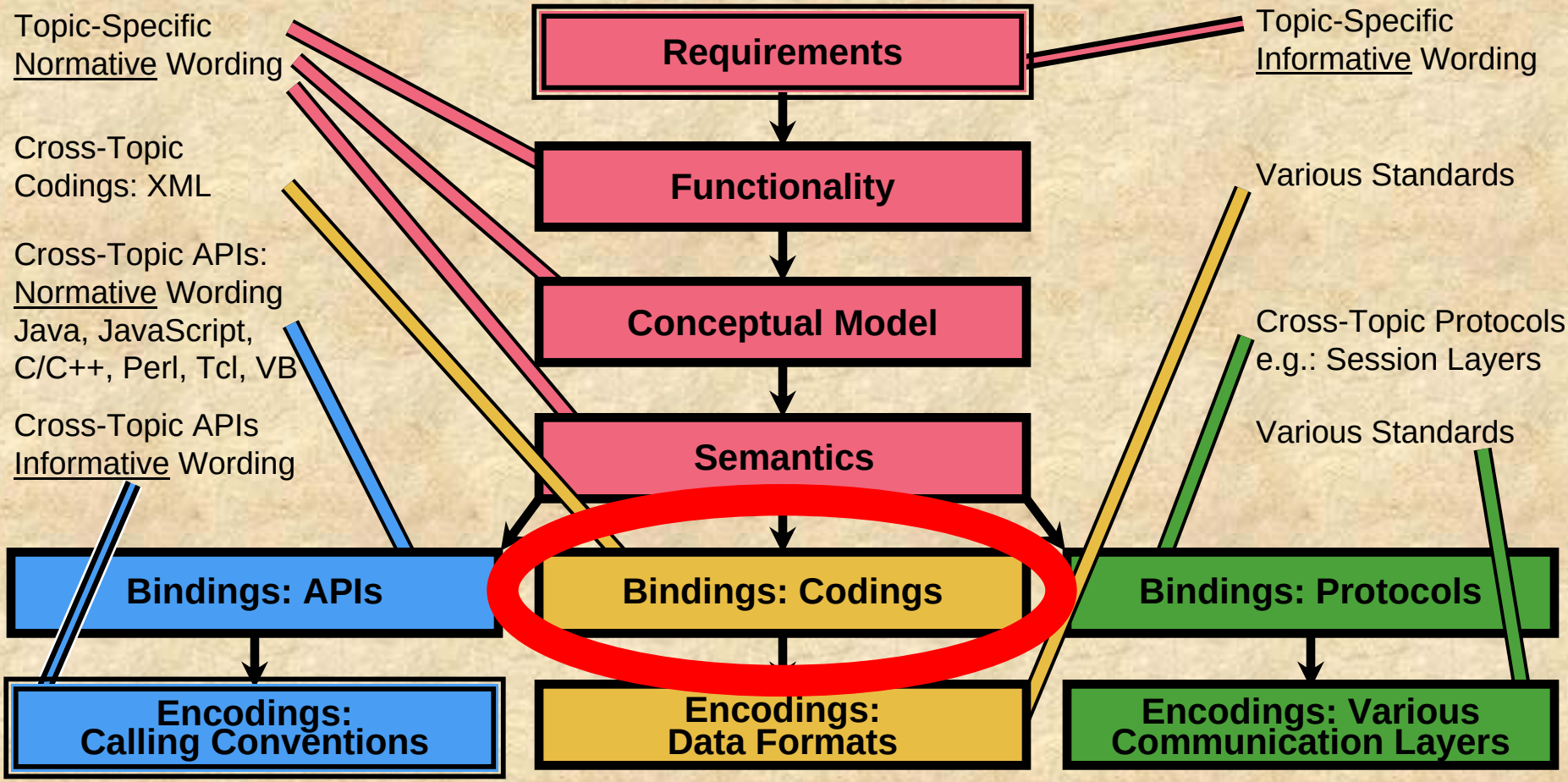
- Services Summary
  - Can be session-oriented
  - Can be session-less

- **CONNECT:** connect to repository
- **OPEN:** begin access to repository
- **SET:** set protocol parameters
- **QUERY:** query protocol parameters
- **GIVEAUTH, NEEDAUTH:** authentication
- **NOMAD:** nomadic (disconnected) access
- **PUTPATH:** change view (directory)
- **GETVAL:** get info from repository
- **PUTVAL:** put info to repository
- **LIST:** retrieve names in repository
- **EVENT:** client and server event processing
- **CLOSE:** end access to repository
- **DISCONNECT:** disconnect from repository

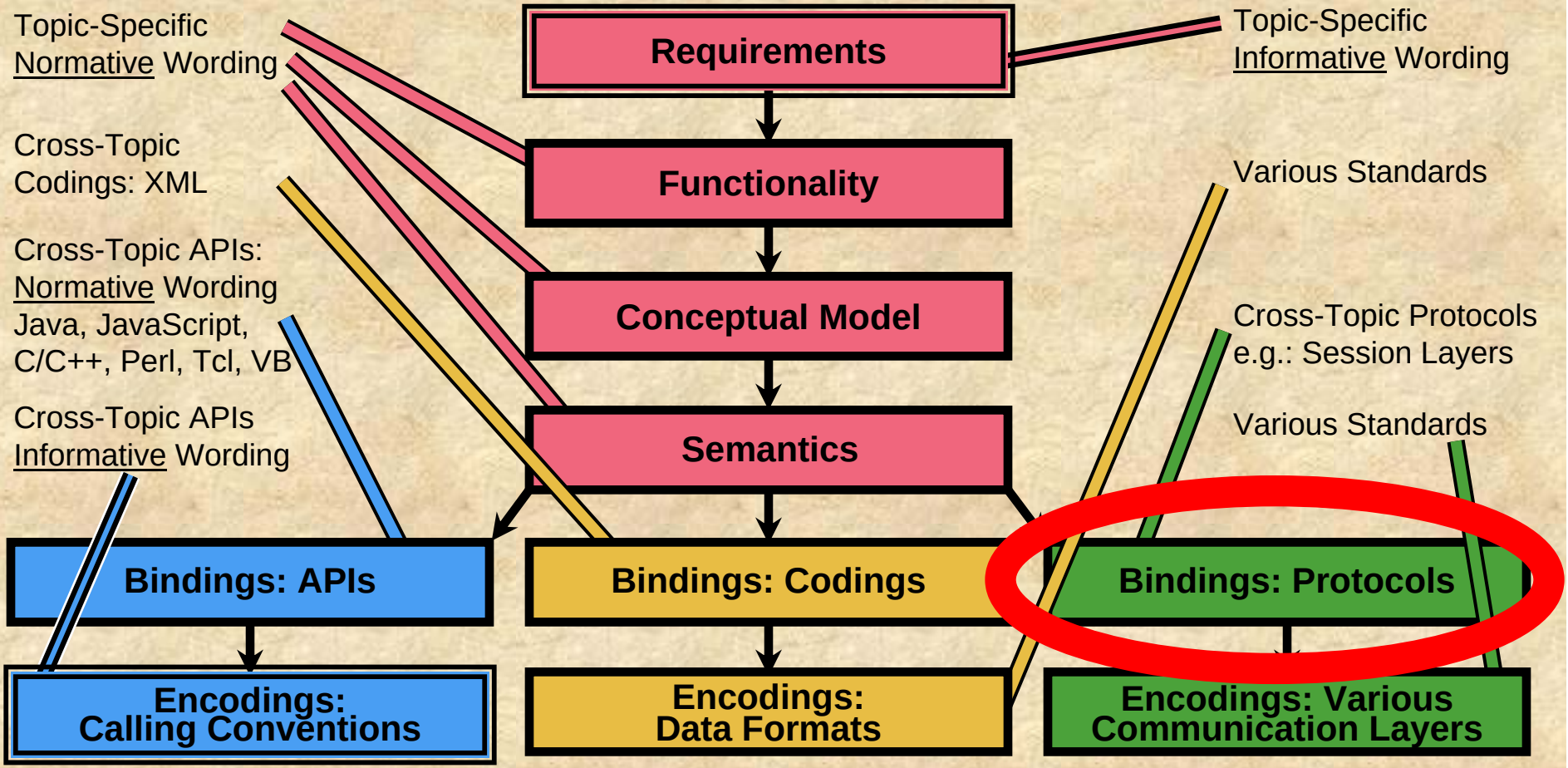
Metadata Registry Interoperability Bindings
ISO/IEC 20944-4x Series are API Bindings



Metadata Registry Interoperability Bindings
ISO/IEC 20944-2x Series are Coding Bindings



Metadata Registry Interoperability Bindings
ISO/IEC 20944-6x Series are Protocol Bindings



Role Of ISO 11179 For Data Interchange

- Description of data elements in a repository
- Used in actual implementations
- Used in metadata exchange among repositories

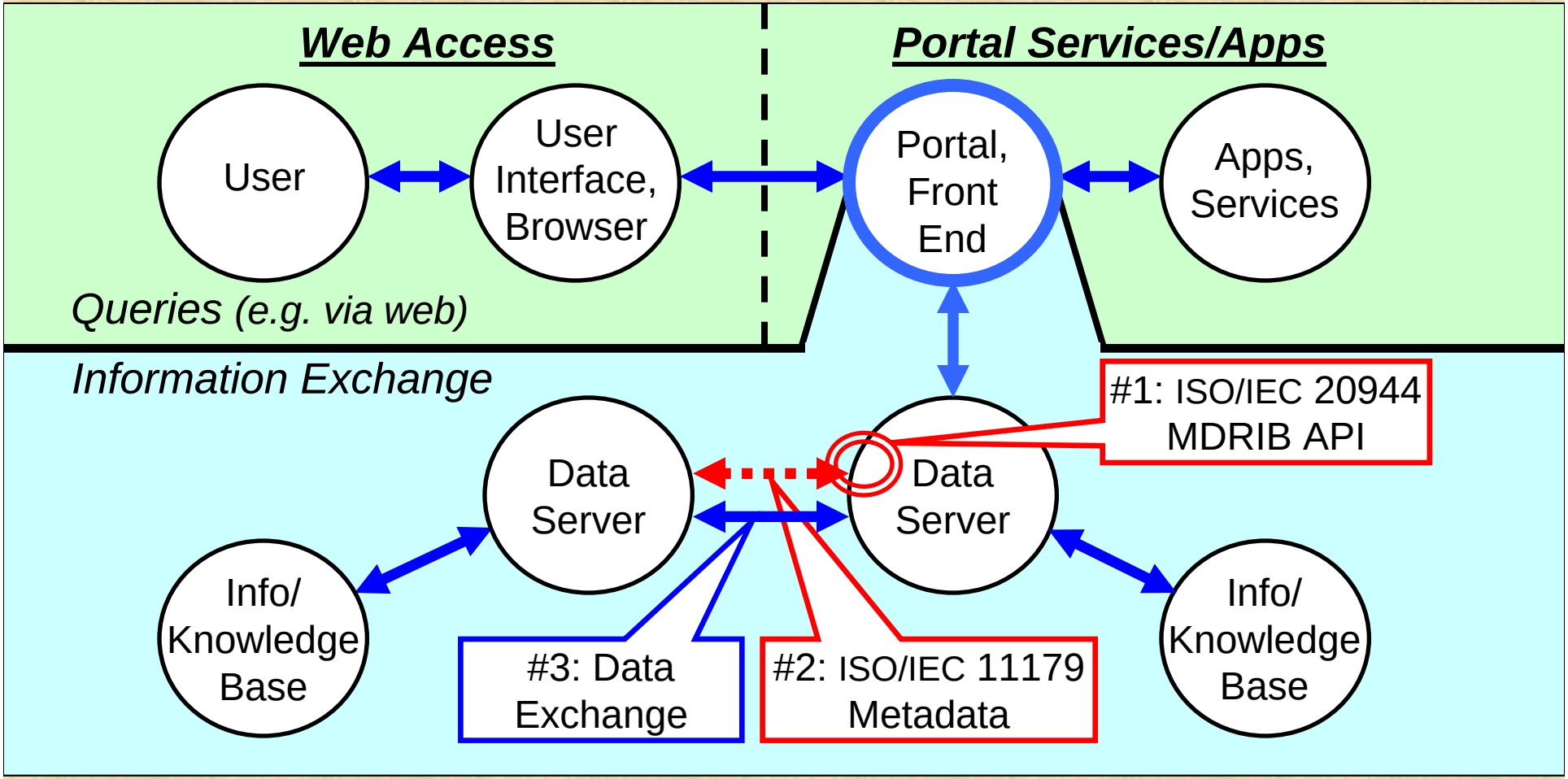
Conceptual Model (High Level)

- #1: Connect to repository; query metadata/data of repository
- #2: Determine what data to access (via metadata) and how to access
- #3: Data exchange

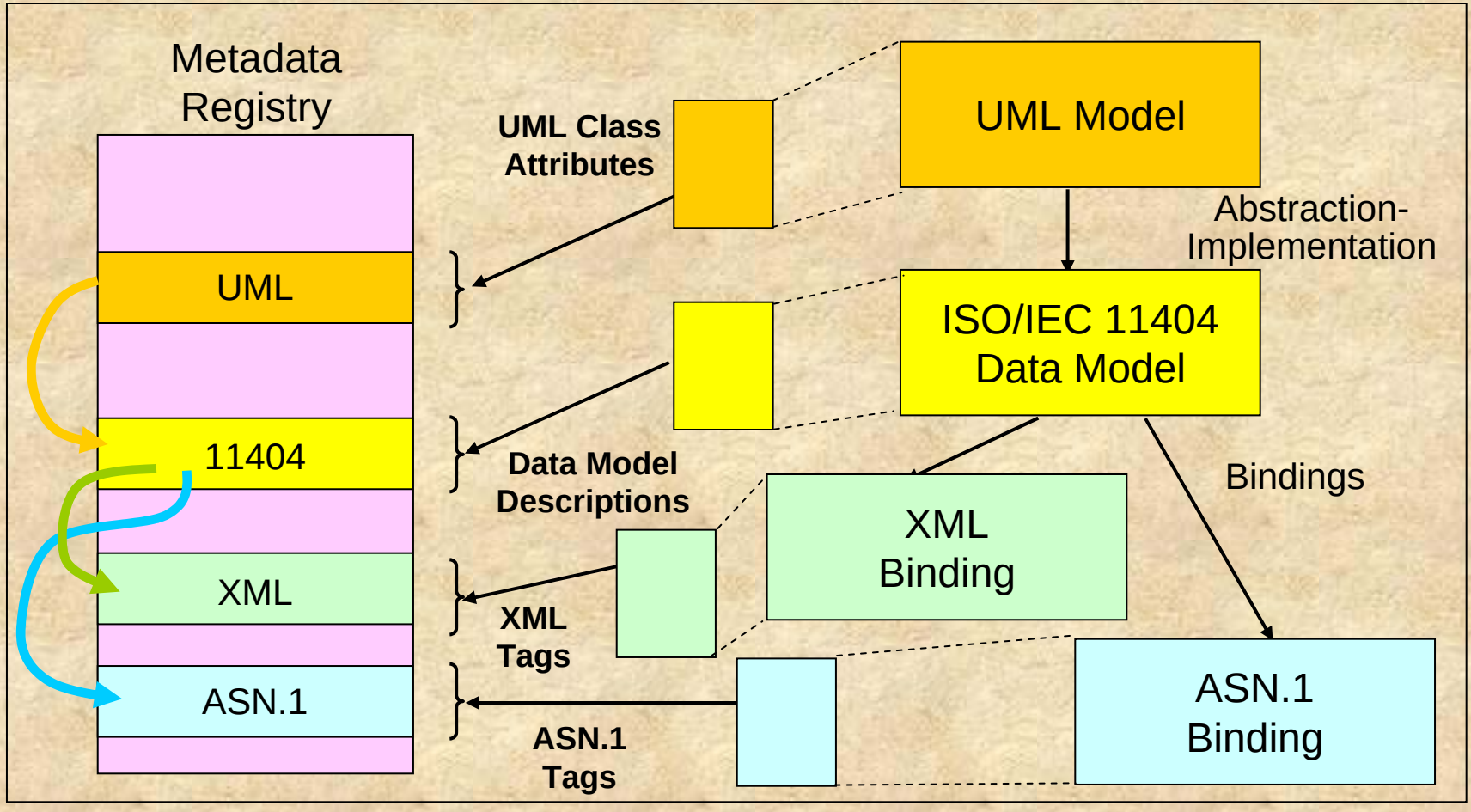
Conceptual Model (Low Level)

- Connect to repository
- Negotiate parameters (security, formats, etc.)
- Navigate the repository
- Get (and put) information
- Merge data/metadata/props namespace
- Miscellaneous data mgmt. operations

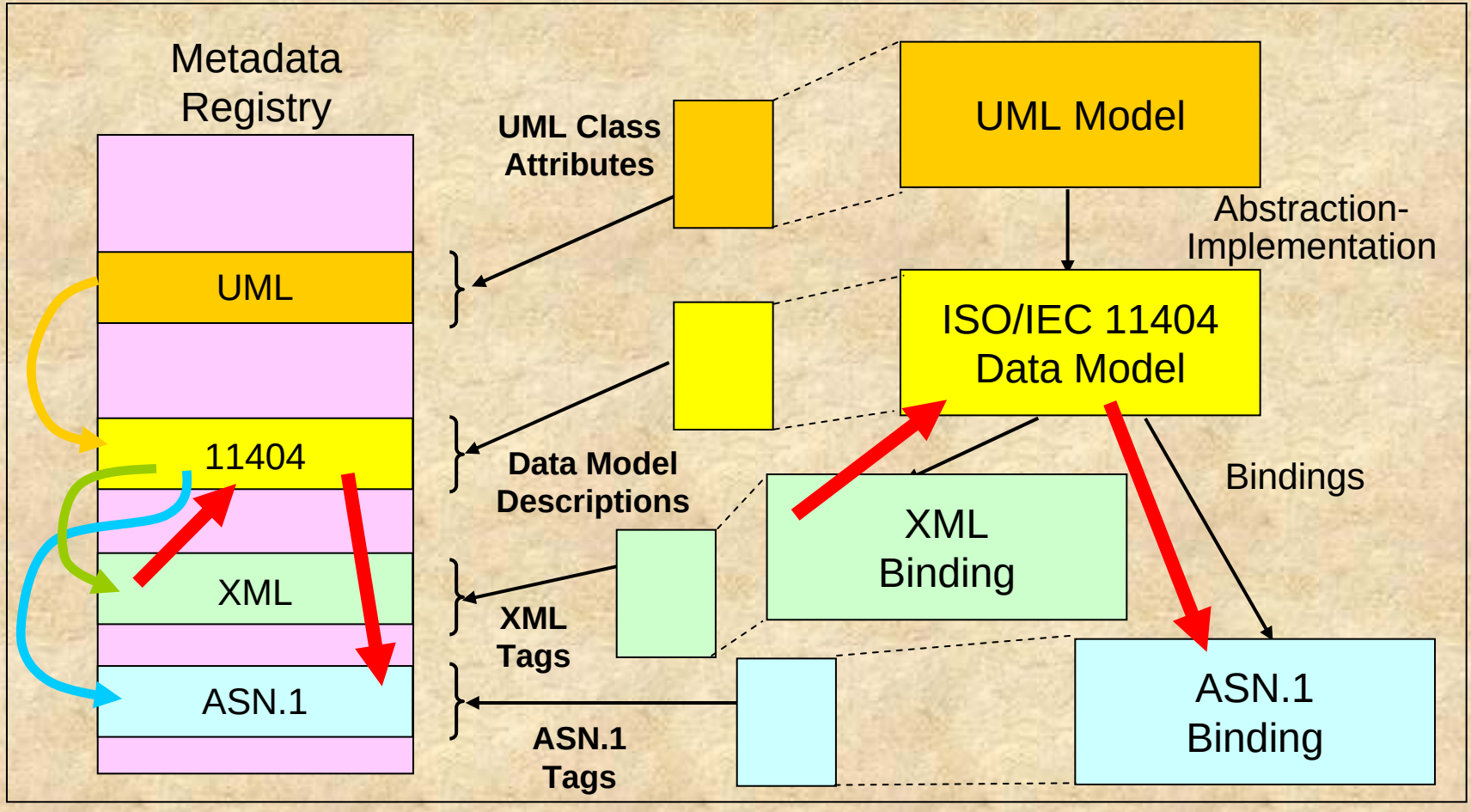
Example Of MDRIB Usage, Then ISO 11179 Metadata Exchange, Then Data Exchange



Relationship Among Metadata
Registering UML, 11404, XML, ASN.1



Example: Automated Translation — Made Possible By 11179 Metadata Registries



Sample MDR Access Illustration from 20944, Part 1

- Illustration from ISO/IEC 20944-01 (Overview)
  - "Extracting the boroughs of New York City from an 11179 Value Domain"
    - Note: "borough" is a geographic subdivision particular to New York City
  - Web-based application that queries an 11179 metadata registry and walks the registry
  - Generates HTML code for web-based presentation of value domain

Sample MDR Access
Sample C Code, Page 1/4

```
// connect to metadata registry
repository_handle = mdib_connect(
            "//nyc.gov/mdr_repository",
            "access_type=readonly"
            );
// establish session starting at value domain
session_handle = mdib_open(
            repository_handle,
            "2.3.56789.0.2", // object identifier for value domain
            ""
            );
// begin HTML select list <select ...>
printf("<select size=1 name==\"%s\">\n",
            "nyc_borough_list"
            );
```

Sample MDR Access
Sample C Code, Page 2/4

```
// initialize counter for walking the value-meaning pairs of the value domain
index = 0;
for ( ; ; )
{
        // create navigation string to retrieved the Nth (index) value-meaning pair
        // e.g., the first value-meaning pair is "permissible_value/__index_0"
        sprintf(permissible_value_node,
                "permissible_value/__index_%d",
                index
                );
        node_handle = mdib_open(
                session_handle,
                permissible_value_node,
                ""
                );
        if ( node_handle == NULL )
        {
                // gone past last permissible_value
                break;
        }
```

Sample MDR Access
Sample C Code, Page 3/4

```
// get "value" portion of value-meaning pair
mdib_get_value_as_str8(
        value_string,
        sizeof(value_string),
        node_handle,
        "permissible_value_has_value_relation/value_item",
        ""
        );
// get "meaning" portion of value-meaning pair
mdib_get_value_as_str8(
        value_meaning_string,
        sizeof(value_meaning_string),
        node_handle,
"permissible_value_has_value_meaning_relation/value_meaning_description",
        ""
        );
```

Sample MDR Access
Sample C Code, Page 4/4

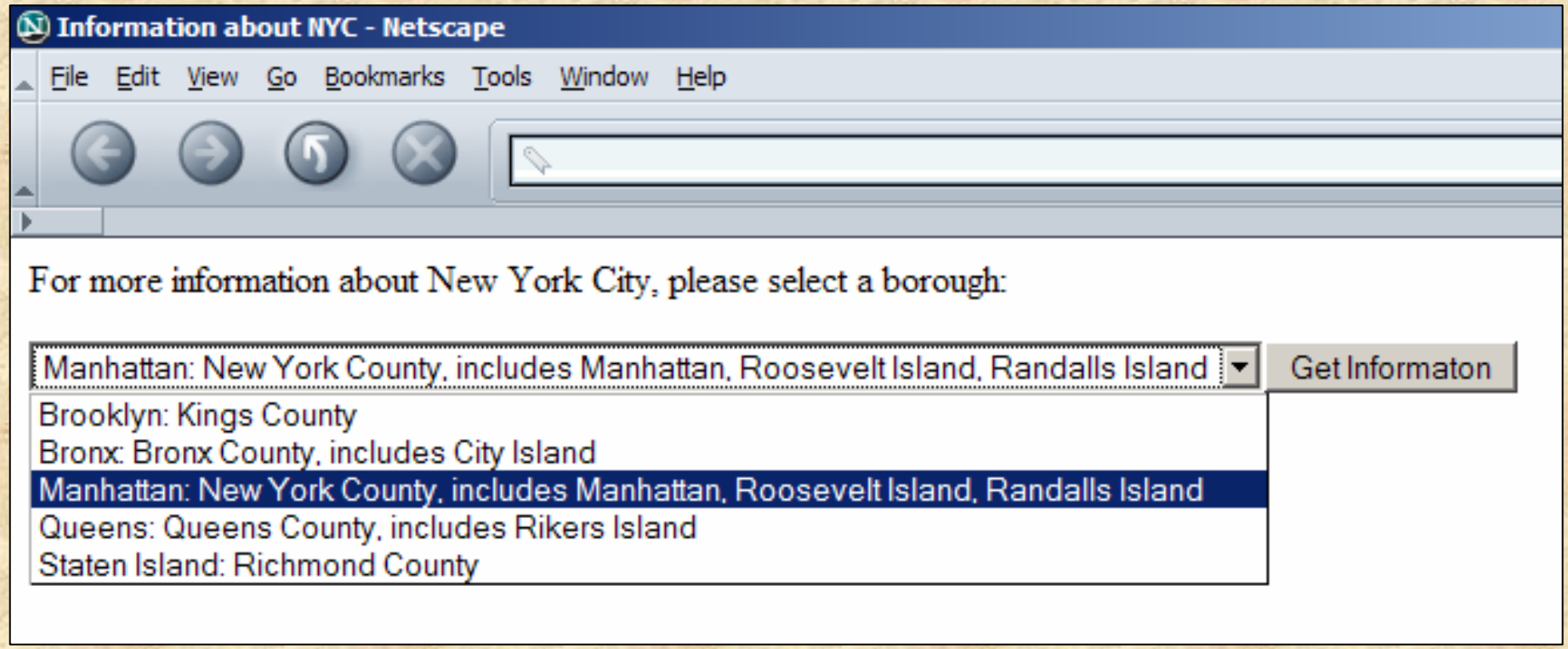
```
        // generate HTML for select item: <option value="...">...</option>
        // Example: <option value="Brooklyn">Brooklyn: Kings County</option>
        printf("<option value=\"%s\">%s: %s</option>",
                value_string,
                value_string,
                value_meaning_string
                );

        // close the cloned session
        mdib_close(
                node_handle
                );
}
```

Sample MDR Access
HTML Code Generated By Program

```
<select name="nyc_borough_list">
<option value="Brooklyn">Brooklyn: Kings County</option>
<option value="Bronx">Bronx: Bronx County, includes City Island</option>
<option value="Manhattan">Manhattan: New York County,
      includes Manhattan, Roosevelt Island, Randalls Island</option>
<option value="Queens">Queens: Queens County, includes Rikers
    Island</option>
<option value="Staten Island">Staten Island: Richmond County</option>
</select>
```

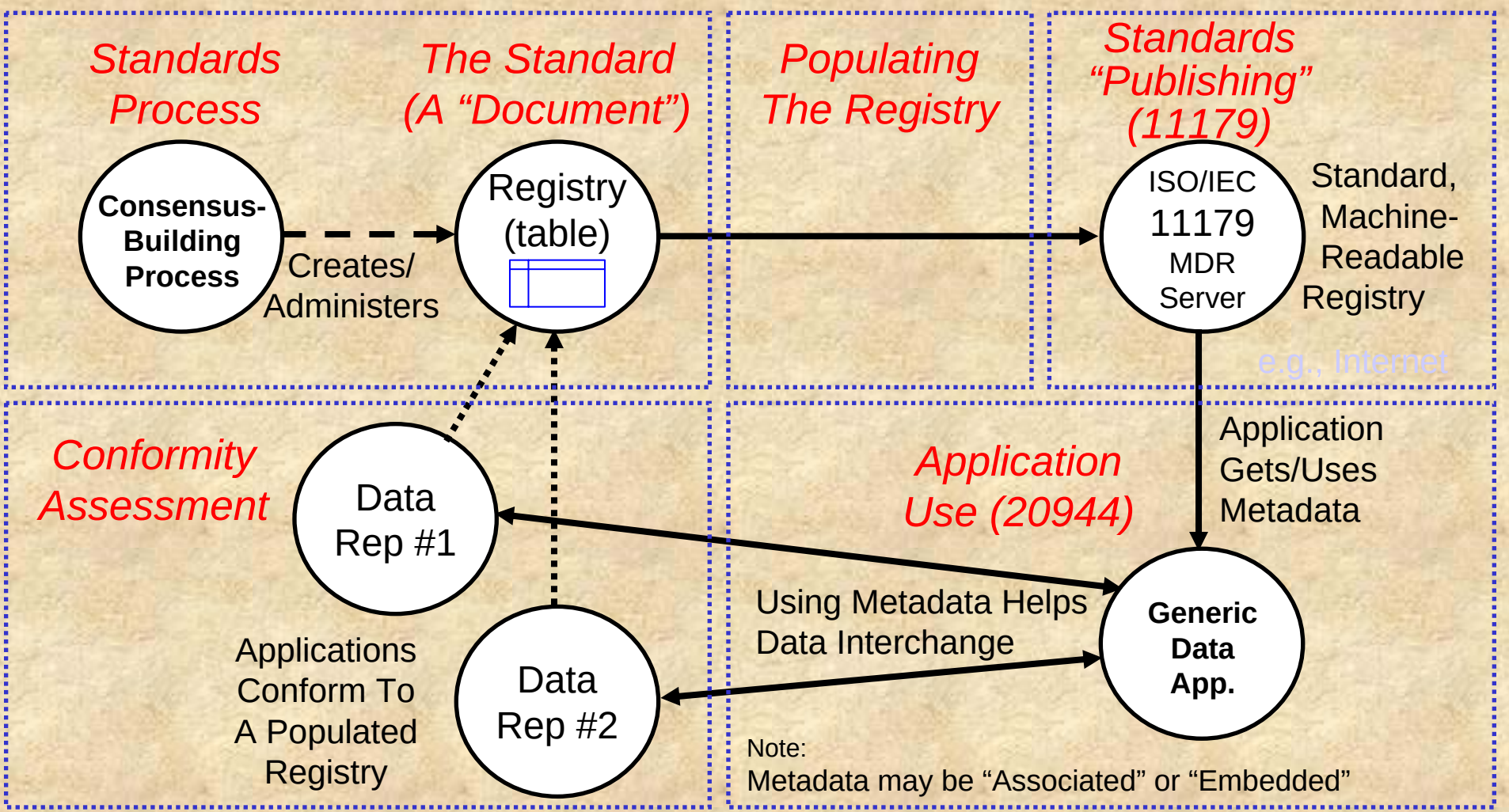
Sample MDR Access
HTML View as a Pull-Down List



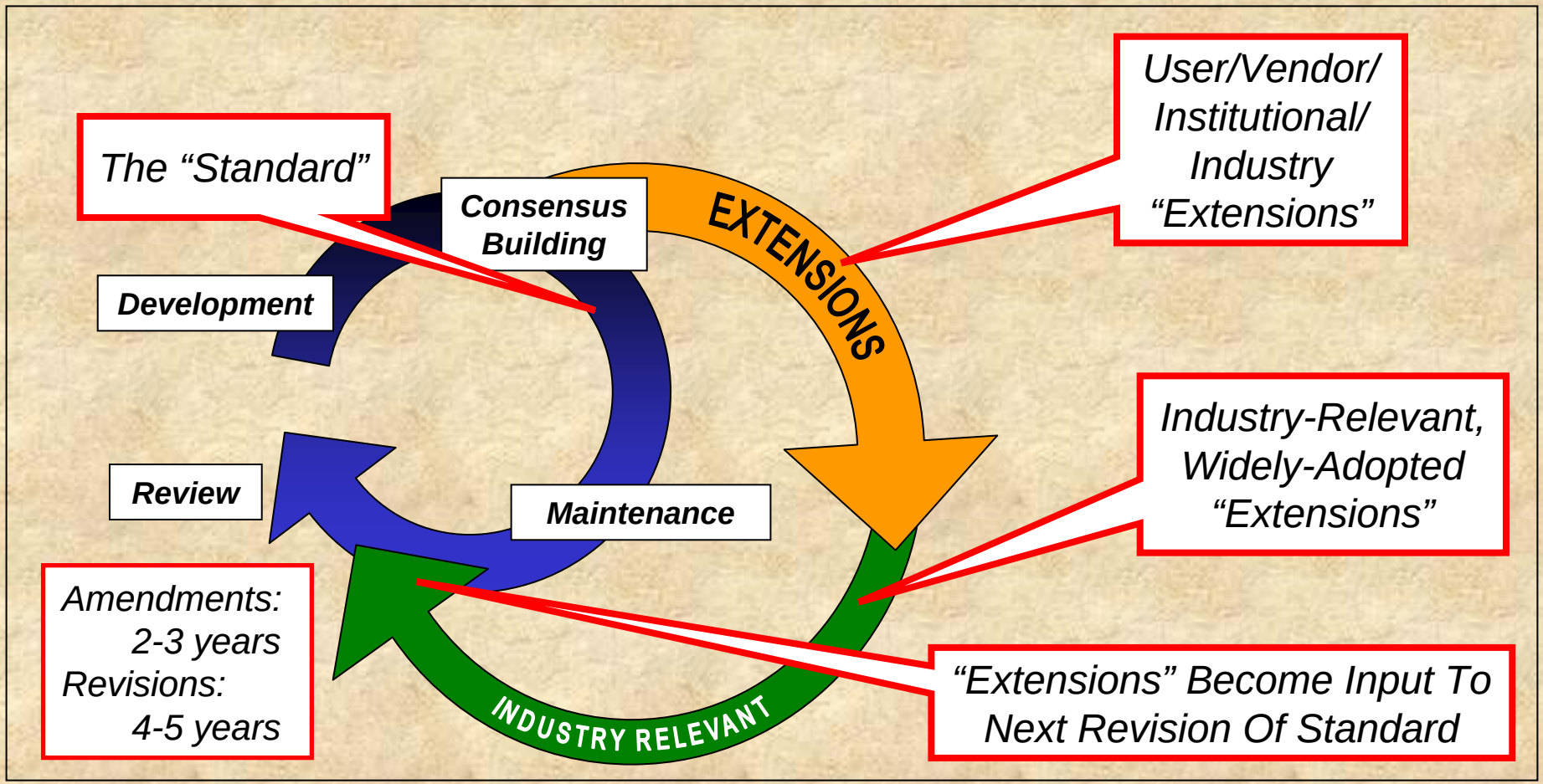
Using 11179 and 20944 To Support Standards

- Use 11179 to support definitions in standards
  - Example:
    - ISO/IEC JTC1 SC36 registry to administer/register
      - Terminology, Value Domains, Data Elements
      - Supports registration of consensus-based (e.g., standards committee) and non-consensus (e.g., organizations, companies, individuals) items
- Use 11179 and 20944 to publish metadata elements within the standard (e.g., terminology, value domains, data elements)

Data Model, Registration Authorities, and Metadata Registries



Building Standards In Several Steps

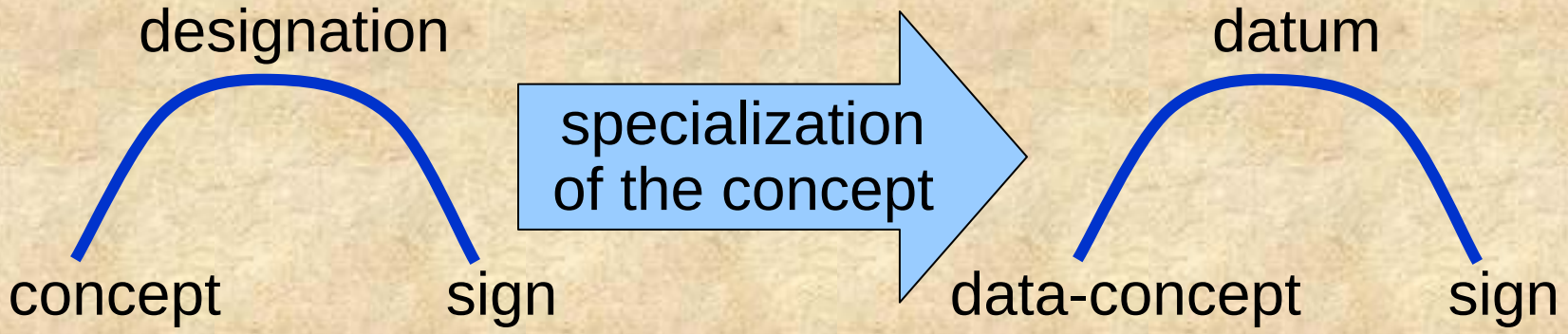


Summary

- Documents available at:
  - http://metadata-standards.org/20944
  - FAQ: http//metadata-standards.org/20944/faq
- Public availability of source code
  - [NEW] Set up location at SourceForge for WG2 implementations
  - http://metadata-stds.sourceforge.net
  - Everyone welcome to participate
  - Send E-mail to me for participation (put 20944 in Subject line)
- Public availability of standards

Some Thoughts On SC32/WG2 - TC37 Collaboration

- Overlapping views of data
  - The "Farance-Gillman Theory of Data" states:
    - **datum**: instantiation of a relationship between a concept and a sign that includes *copyability* and a definition of an *equality function*



Some Thoughts On SC32/WG2 - TC37 Collaboration

- Because of “designation” and “datum” similarity, much overlap between TC37 and WG2
- Main areas of overlap:
  - terminology vs. value domain
    - concepts, signs
    - value meaning, value
  - concept systems
    - well-defined relationships
    - navigating relationships
  - catalogues of descriptive data
    - 12620 data categories
    - 11179 metamodel attributes

For More Information

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