# Using X3D With S1000D

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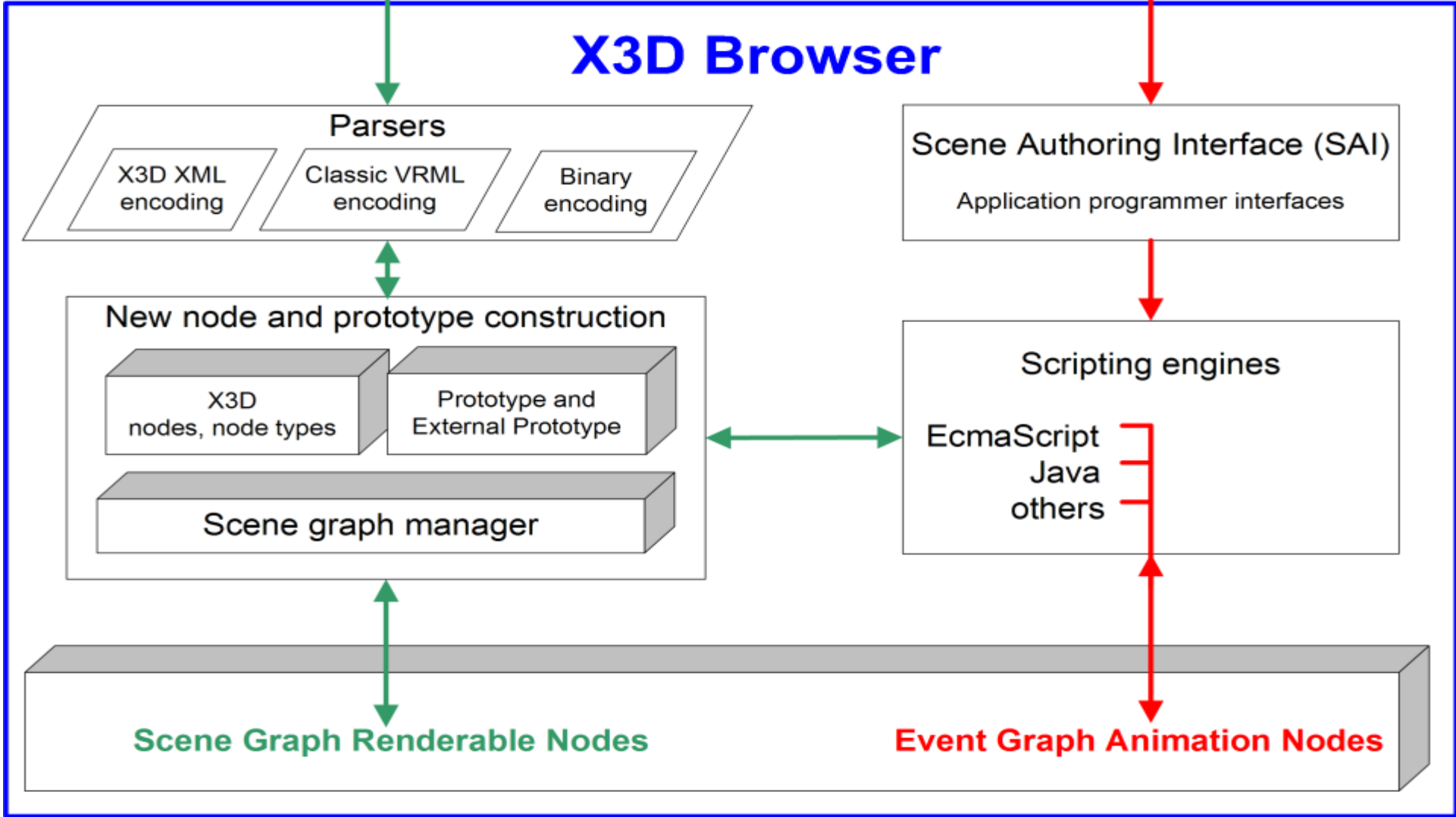E-mail: Clamb@acm.org

What is X3D?

A file format and runtime architecture for interactive 3D graphics

- Open ISO standard

- XML and other encodings

- Scene graph for objects -- event graph for animation and interaction

- Successor to VRML

- Proposed for inclusion in HTML5

- Extensible

- Texture mapping and various lighting models

- Embedded ECMAScript and external APIs
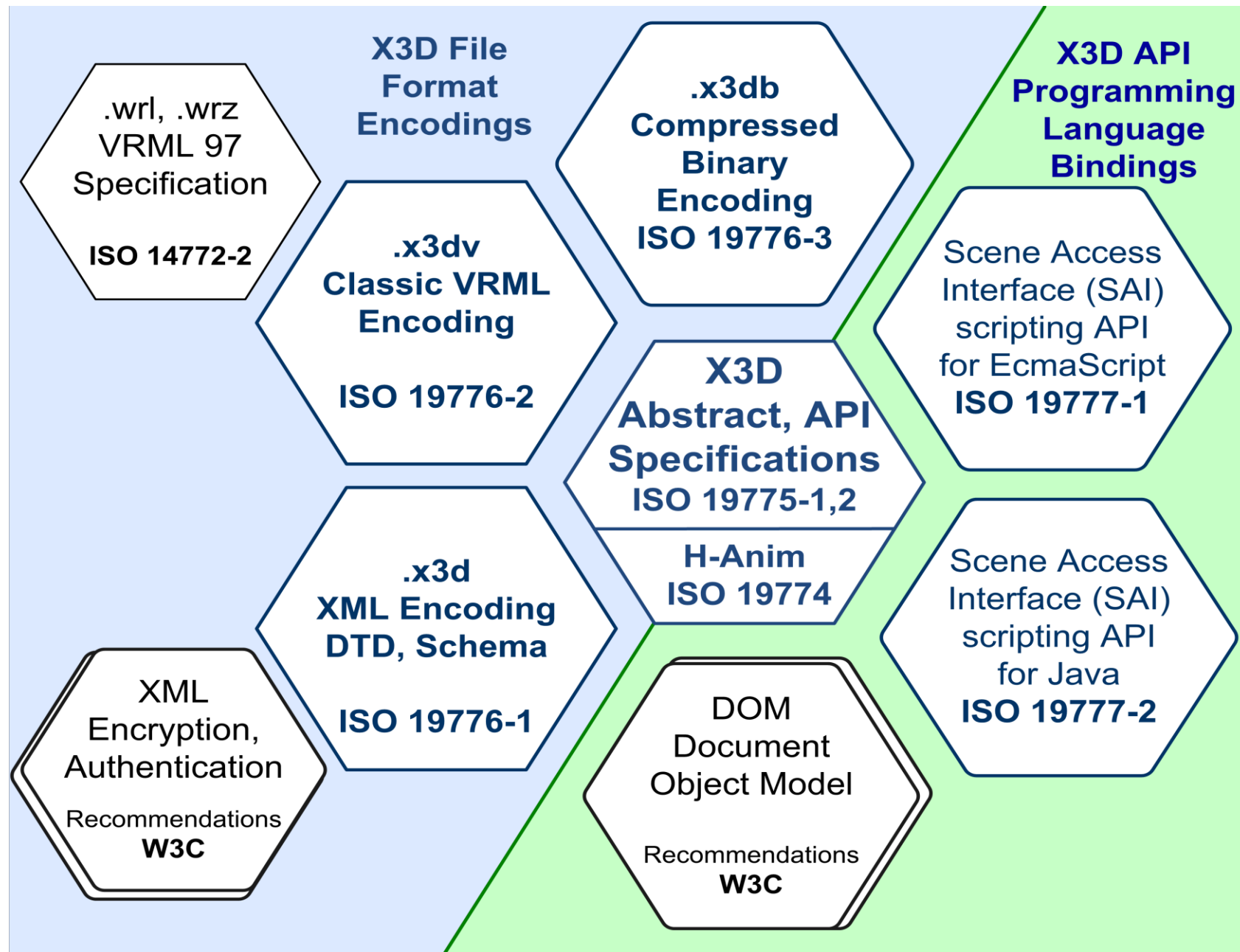
X3D scenes, X3D streams

Event passing with external HTML Web pages or applications

X3D Browser

Parsers

- X3D XML encoding
- Classic VRML encoding
- Binary encoding

New node and prototype construction

- X3D nodes, node types
- Prototype and External Prototype
- Scene graph manager

Scene Authoring Interface (SAI)

Application programmer interfaces

Scripting engines

- EcmaScript
- Java
- others

Scene Graph Renderable Nodes

Event Graph Animation Nodes

X3D Browsers

Commercial, free, and open source browsers

- Stand-alone programs for Windows, Mac-OS, and various UNIX-like operating systems.

- Web browser plugins for Internet Explorer, Chrome, and Firefox.

- X3DOM, X_ITE
  - Open source and free
  - Embed X3D in HTML
  - No plugin required

X3D File Formats

- XML
- Classic VRML
- Compressed Binary
- JSON (not yet standard)

X3D External APIs

- ECMAScript (JavaScript)

- Java

- Others in progress

X3D Object Structure

```
<Scene>
    <Shape>
        <Box size="1 1 1"/>
        <IndexedFaceSet coordIndex='0 2 6 -1 3 4 8 7 …
            <Coordinate point='0.0 0.174 0.003 0.0 …
        </IndexedFaceSet>
        <Appearance>
            <Material diffusecolor="0.1 0.5 1"/>
        </Appearance>
    </Shape>
</Scene>
```

Other X3D Concepts

`<Viewpoint>` Sets viewpoint, transition, and navigation parameters

`<Anchor>` Allows linking—both external and internal

Use Single X3D File For What With S1000D?

- For object geometry only?

- Object appearance and lighting?

- Animation?

- Interaction?

What Does an ICN Refer To?

- Geometry of object, appearance, and lighting and single effect.

- Geometry of object, appearance, and lighting but no effects. Effect framework and details generated from Data Module and incorporated at run time.

- The above plus framework for effects. Effect details generated from Data Module and incorporated at run time.

- The above plus all effect details. Selection of active effect done from Data Module at run time.

Coding screen tip / rollover (DM)

ICN Metadata File

```
<icnObject icnObjectIdent="part022"
icnObjectTitle="SEAT"/>
```

Data Module

```
<multimediaObject infoEntityIdent="ICN....">
   <parameter parameterident="part022"
parameterValue="screentip: SEAT" />
</multimediaobject>
```

or

```
<multimediaObject infoEntityIdent="ICN....">
   <hotspot applicationStructureIdent="part022"
hotspotTitle="SEAT" />
</multimediaobject>
```

Coding screen tip / rollover (X3D)

```
<!-- code to turn screen tip off and on -->

<Text DEF='part022Label' string='"SEAT"'>

<TouchSensor DEF='part022Sensor' />
description='Frame1'/>
<IndexedFaceSet DEF='part022'...>
```

Coding Link (DM)

ICN Metadata File

```
<icnObject icnObjectIdent="part022">
    <internalRef internalRefId="par-29"/>
<icnObject/>
```

Data Module

```
<multimediaObject infoEntityIdent="ICN....">
   <parameter parameterident="part022" parameterValue="link: par-29" />
</multimediaobject>
```

or

```
<multimediaObject infoEntityIdent="ICN....">
    <hotspot applicationStructureIdent="part022">
        <internalRef="par-29"/>
    </hotspot>
</multimediaobject>
```

Coding Link (X3D)

X3D embedded in HTML

```
<Anchor url="#par-29"/>
    <IndexedFaceSet DEF='part022'...>
</Anchor>
```

X3D not embedded in HTML

```
<Anchor url="file:DMfilename.htm#par-29"/>
    <IndexedFaceSet DEF='part022'...>
</Anchor>
```

Coding animation (DM)

ICN Metadata File

```
<icnObject icnObjectIdent="part022"/>
   <icnSourceFiles icnSourceFileType="irft51">
      <refs>
         <externalPubRef>
            <externalPubRefIdent>
               <externalPubCode>animation1
               </externalPubCode>
            </externalPubRefIdent>
         </externalPubRef>
      </refs>
   </icnSourceFile>
```

Data Module

```
<multimediaObject infoEntityIdent="ICN....">
    <parameter parameterident="part022"
parameterValue="anim: animation1" />
</multimediaobject>
```

Coding Animation (X3D)

Change

```
<timeSensor DEF="frontWheel" enabled="false"/>
```

to

```
<timeSensor DEF="frontWheel" enabled="true"/>
```

Or just insert pre-written animation code into model object.

Resources

Examples: Clamb.name/S1000D

My email: Clamb@acm.org

Web 3D consortium: web3d.org

Thank you

for your attention!

Questions?