HL7 records can be represented in various formats, depending on the version of the HL7 standard in use and the specific implementation. Here are the main formats for HL7 records:

1. HL7 Version 2.x (Delimited Format – ER7)

- Format: Pipe-delimited, plain text.

- Structure: Each segment (line) in the message represents a different type of information, and within each segment, fields are separated by the pipe (`|`) character. Sub-fields within a field can be separated by special characters like `^`, `&`, `~`, and `\`.

- Example:

```

MSH|^~\&|LABADT|MCM|IFENG|IFENG|20060529090131||ADT^A01|HL7MSG00001|P|2.5

PID|||555-44-4444||DOE^JOHN^A||19610615|M|||123 MAIN ST^^BOSTON^MA^02115||555-555-2004

```

- Usage: Widely used in healthcare, especially in legacy systems and environments where simplicity and speed are essential.

2. HL7 Version 3.x (XML Format)

- Format: XML (Extensible Markup Language).

- Structure: More hierarchical and structured compared to Version 2.x. Each data element is enclosed in XML tags, providing better readability and extensibility.

- Example:

```xml

<message>

<id extension="12345"/>

<creationTime value="20060529090131"/>

<interactionId extension="ADT\_A01"/>

<patient>

<id extension="555-44-4444"/>

<name>

<family>DOE</family>

<given>JOHN</given>

</name>

<birthTime value="19610615"/>

</patient>

</message>

```

- Usage: Provides more detailed and structured data representation, often used in environments where data integration with other XML-based standards is needed.

3. HL7 CDA (Clinical Document Architecture)

- Format: XML.

- Structure: Designed specifically for clinical documents, CDA is a more specialized use of the XML format. It defines the structure of medical records, such as discharge summaries or progress notes.

- Example:

```xml

<ClinicalDocument xmlns="urn:hl7-org:v3">

<recordTarget>

<patientRole>

<id extension="555-44-4444"/>

<patient>

<name>

<family>DOE</family>

<given>JOHN</given>

</name>

<birthTime value="19610615"/>

</patient>

</patientRole>

</recordTarget>

<component>

<structuredBody>

<component>

<section>

<code code="10160-0" displayName="History of Medication Use"/>

<text>Patient has been on antihypertensive medication.</text>

</section>

</component>

</structuredBody>

</component>

</ClinicalDocument>

```

- Usage: Commonly used for exchanging clinical documents in a standardized format, allowing for better interoperability between healthcare systems.

4. HL7 FHIR (Fast Healthcare Interoperability Resources)

- Format: JSON, XML, or RDF (Resource Description Framework).

- Structure: FHIR is more modern and flexible, supporting multiple formats and designed for use in web-based environments, including RESTful APIs.

- Example (JSON):

```json

{

"resourceType": "Patient",

"id": "example",

"text": {

"status": "generated",

"div": "<div xmlns=\"http://www.w3.org/1999/xhtml\">John Doe</div>"

},

"identifier": [

{

"use": "usual",

"system": "http://hospital.smarthealthit.org",

"value": "555-44-4444"

}

],

"name": [

{

"family": "DOE",

"given": ["JOHN"]

}

],

"birthDate": "19