**Learning Resource Metadata Initiative (LRMI)**

**JSON-LD Serialization Schemata**

## 

## Introduction

The Learning Resource Metadata Initiative (LRMI) is working to make it easier to publish, discover, and deliver quality educational resources on the web. Read below for a general background of the project or visit the [FAQ page](http://www.lrmi.net/about/faq).

Led by the Association of Educational Publishers and Creative Commons, and funded by the Bill & Melinda Gates Foundation and the William and Flora Hewlett Foundation, the LRMI has developed a common metadata framework for describing or “tagging” learning resources on the web. This framework is a key first step in developing a richer, more fruitful search experience for educators and learners. Once a critical mass of educational content has been tagged to a universal framework, it becomes much easier to parse and filter that content, opening up tremendous possibilities for search and delivery.

The LRMI project was spurred by the announcement last year of Schema.org, a project by Bing, Google, and Yahoo! to create a standard way of tagging online content. While not directly connected, [Schema.org](http://www.schema.org/) created the opportunity for projects like the LRMI by establishing a standard markup schema for general web content and then encouraging specialized communities and industries to extend this schema to meet their needs. It is the hope of the LRMI leadership that the metadata schema developed by this project will be incorporated into Schema.org and become the de facto standard for tagging educational resources on the web.

For more information, including the LRMI’s relation to existing education metadata schema and other initiatives that support and enable LRMI solutions, please visit the [FAQ page](http://www.lrmi.net/about/faq).

The purpose of this document is to define a serialization specification for LRMI when used as standalone metadata. As with other Schema.org formats, LRMI in microdata and microformats are well-defined for HTML usage. However, these specifications are not as clear for standalone data structures. This specification utilizes [JSON Linked Data (JSON-LD)](http://json-ld.org/) as its basis to leverage an existing, modern lightweight data serialization format supported by a number of leading technology companies and communities. With a common specification for LRMI serialization, publishers and application vendors have an agreed language to communicate and interoperate between content and the tools that consume and distribute it.

## Notation

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this Specification are to be interpreted as described in [[RFC 2119](http://www.ietf.org/rfc/rfc2119.txt)].

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## Serialization of LRMI in JSON-LD

LRMI and Schema.org provide a set of terms to describe educational resources. Serialization is the process of representing a data structure to be transmitted, stored and consumed by two or more interconnected systems. JSON-LD is a method to serialize those terms into a data structure to be utilized by applications for publishing, storing, indexing and searching LRMI metadata. For full reference of the JSON-LD format, see: <http://json-ld.org/>.

As JSON-LD is JSON, note that [RFC-4627](http://www.ietf.org/rfc/rfc4627.txt) defines JSON strings as zero or more Unicode characters. JSON strings allow for “all Unicode characters may be placed within the quotation marks except for the characters that must be escaped: quotation mark, reverse solidus, and the control characters” and “any character may be escaped.” For more information on JSON Unicode support, see Section 2.5 Strings within [RFC-4627](http://www.ietf.org/rfc/rfc4627.txt).

The terms “required” and “recommended” are recommendations for best practices for educational metadata when utilized by learning applications. Below is a working definition of LRMI serialized in JSON-LD:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  | **{** | "@context":  {  “@vocab”: "http://schema.org/",  “url”: { @type: "@id" }  }, | | | | | | | | **Required**. Object specifying context used to define the vocabulary throughout a JSON-LD document.  *Example: the base vocabulary is defined by schema.org. URL is provided as a type of @id to allow a shortcut for the URL attribute to also serve as the id for the record. If the URL is not the @id of the record (in cases of URIs, such as “isbn:123456”), a separate @id attribute should be created.* |  |
|  |  |  | | | | | | | |  |  |
|  |  | "@type": "CreativeWork", | | | | | | | | **Required**. String or array of strings used to set the data type of a node.  *Example: CreativeWork is specified as the type from schema.org context as defined above. This aligns with LRMI as derives from the CreativeWork base type.* |  |
|  |  |  | | | | | | | |  |  |
|  |  | "url": "http://solarsystem.nasa.gov/", | | | | | | | | **Required**. String for URL of the resource.  *Example: A unique URL is provided to NASA’s Solar System Exploration web resource page.* |  |
|  |  |  | | | | | | | |  |  |
|  |  | "name": "Solar System Exploration", | | | | | | | | **Recommended**. String for the name/title of the resource.  *Example: The title of NASA’s Solar System Exploration web resource page.* |  |
|  |  |  | | | | | | | |  |  |
|  |  | "description": "Solar System Exploration features lesson plans on electro-magnetism, energy, exploration, gravity, pioneers, landforms, life, light, math ratios, matter, measurement, modeling, origin, planet surfaces, rocks and minerals, the scientific method, and triangulation.", | | | | | | | | **Recommended**. String for description for the resource.  *Example: A description of NASA’s Solar System Exploration web resource page.* |  |
|  |  |  | | | | | | | |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  | "dateCreated": "2005-05-12", | **Recommended**. String for date on which the resource was created. The string is a schema.org [Date](http://schema.org/Date) type of [ISO 8601 date format](http://en.wikipedia.org/wiki/ISO_8601).  *Example: This resource was created on May 12, 2005.* |  |
|  |  |  |  |  |
|  |  | "publisher": {  “name”: “National Aeronautics and Space Administration”,  “url”: “http://www.nasa.gov”  }, | **Recommended**. JSON object representing the publisher of the resource. Publisher is a schema.org [Organization](http://schema.org/Organization) type.  *Example: A description of NASA’s Solar System Exploration web resource page.* |  |
|  |  |  |  |  |
|  |  | "educationalAlignment": [  {  "educationalFramework" : "Common Core State Standards",  "targetName": "CCSS.ELA-Literacy.WHST.6-8.2d",  “targetUrl” :  “http://corestandards.org/ELA-Literacy/WHST/6-8/2/d”,  "alignmentType": "teaches",  "@type”: “AlignmentObject”  },  {  "educationalFramework" : "Next Generation Science Standards",  "targetName": "MS-ESS1-2",  "alignmentType": "teaches",  "@type”: “AlignmentObject”  },  {  "educationalFramework" : "Next Generation Science Standards",  "targetName": "MS-ESS1-3",  "alignmentType": "teaches",  "@type”: “AlignmentObject”  },  {  "educationalFramework" : "US K-12 Grade Levels",  "targetName": "Grade 6",  "alignmentType": "teaches",  "@type”: “AlignmentObject”  },  {  "educationalFramework" : "US K-12 Grade Levels",  "targetName": "Grade 7",  "alignmentType": "teaches",  "@type”: “AlignmentObject”  }  ], | **Recommended**. JSON object(s) representing an alignment to an educational framework. The educationalAlignment items are schema.org [AlignmentObject](http://schema.org/AlignmentObject) types. At minimum, for the AlignmentObject to be useful, specify an educationalFramework, targetName and alignmentType.   Note, it is recommended that multiple alignments under the same framework be defined as scalar values using individual alignments. This avoids ambiguous definitions when the targetUrl attribute is used.  *Example: Educational alignments to three educational frameworks: the Common Core State Standards, Next Generation Science Standards and United States K-12 Grade Levels.* |  |
|  |  |  |  |  |
|  |  | "educationalRole": “Student”, | **Recommended**. String or array of strings that describes the target audience of the content.  *Example: This resource was designed for the student as the target.* |  |
|  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | | | | | | | |  |  |
|  |  | "educationalUse": [“Reading”, “Problem Solving”, “Simulations”, “Visual/Spatial”], | | | | | | | | String or array of strings for the purpose of a work in the context of education.  *Example: An array of strings specifying a number of educational uses for this resource.* |  |
|  |  |  | | | | | | | |  |  |
|  |  | "inLanguage": "en", | | | | | | | | String specifying the primary language of the resource. Specify the language code using the [IETF BCP 47 standard](http://tools.ietf.org/html/bcp47).  *Example: The primary language of this resource is English as specified by the code “en”.* |  |
|  |  |  | | | | | | | |  |  |
|  |  | "isBasedOnUrl": "http://www.nasa.gov", | | | | | | | | String or array of strings for [a] resource(s) that was used in the creation of this resource. Could be used to specify a part of a larger collection, a derivative item or a collaborative resource.  *Example: This resource is based off of work at www.nasa.gov. (To note, this is not an ideal example as the resource “Solar System Exploration” is primary within itself. Provided as an example of the data element.)* |  |
|  |  |  | | | | | | | |  |  |
|  |  | "learningResourceType": "Website", | | | | | | | | String for predominant type or kind characterizing the learning resource.  *Example: This resource is a website with educational material.* |  |
|  |  |  | | | | | | | |  |  |
|  |  | "timeRequired": "P12H", | | | | | | | | String for approximate or typical time it takes to work with or through this learning resource for the typical intended target audience. timeRequired is a schema.org [Duration](http://schema.org/Duration) type. Specify the time required in the ISO 8601 duration format.  *Example: This resource contains 12 hours worth of educational material* |  |
|  |  |  | | | | | | | |  |  |
|  |  | "typicalAgeRange": [ “8-10”, “10-12”, “12-14”], | | | | | | | | String or array of strings for the typical range of ages the content’s intended end user.  *Example: A description of NASA’s Solar System Exploration web resource page.* |  |
|  |  |  | | | | | | | |  |  |
|  | **}** |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |

## Extending Additional Vocabularies with JSON-LD

The JSON-LD specification allows for multiple contexts that allows for the support of multiple vocabularies. LRMI, for example, has an attribute (useRightsUrl) that has not yet been adopted by Schema.org. By defining this as an additional context, it is possible to utilize this attribute. Extending the core example above, below adds an additional context of LRMI and uses the useRightsUrl attribute from that context. For full reference of multiple contexts in JSON-LD, please see the [6.7 Advanced Context Usage](http://www.w3.org/TR/json-ld/#advanced-context-usage) section in the JSON-LD specification.

In the example below:

1. The @context keyword is extended with the LRMI prefix using the IRI for the LRMI specification.
2. The useRightsUrl attribute is defined within the LRMI context.
3. The useRightsUrl attribute is then used within the metadata description.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  | **{** | "@context": [  {  “@vocab”: "http://schema.org/",  “url”: { @type: "@id" }  },  {  "lrmi": "http://lrmi.net/the-specification#",  "useRightsUrl": {"@id": "lrmi:useRightsUrl", "@type": "@id"}  }  ] | | | | | | | | **Required**. String or array of strings specifying context used to define the short-hand names that are used throughout a JSON-LD document. These short-hand names are called terms and help developers to express specific identifiers in a compact manner. Highly recommended defined as IRI or JSON object with IRIs.  *Example: schema.org is the base context, which allows for definition of LRMI CreativeWork type.* |  |
|  |  |  | | | | | | | |  |  |
|  |  | "@type": "CreativeWork", | | | | | | | | **Required**. String or array of strings used to set the data type of a node. |  |
|  |  |  | | | | | | | |  |  |
|  |  | "name": "Solar System Exploration", | | | | | | | | **Required**. String for the name/title of the resource. |  |
|  |  |  | | | | | | | |  |  |
|  |  | "url": "http://solarsystem.nasa.gov/", | | | | | | | | **Required**. String for URL of the resource. |  |
|  |  |  | | | | | | | |  |  |
|  |  | "useRightsUrl": "http://creativecommons.org/licenses/by-cc-nd/3.0/", | | | | | | | | String for URL of the resource. |  |
|  |  |  | | | | | | | |  |  |

## Defining A Graph Relationship Between Items

The JSON-LD specification defines graph relationships between related items with the @graph keyword. Using the @graph keyword, along with vocabulary items from Dublin Core, it is possible to specify item relationships with parent and/or child items. For full reference of graph relationships in JSON-LD, please see the [6.13 Named Graphs](http://www.w3.org/TR/json-ld/#named-graphs) section in the JSON-LD specification.

In the example below, the Solar System Exploration web site is shown related to its parent of NASA.gov as well as lesson items as children.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  | **{** | "@context": [  {  “@vocab”: "http://schema.org/",  “url”: { @type: "@id" }  },  {  "dc": "http://purl.org/dc/terms/",  "hasPart": {"@id": "dc:hasPart", "@type": "@id"},  “isPartOf”: {"@id": "dc:isPartOf", "@type": "@id"}  }  ] | | | | | | | | **Required**. String or array of strings specifying context used to define the short-hand names that are used throughout a JSON-LD document. These short-hand names are called terms and help developers to express specific identifiers in a compact manner. Highly recommended defined as IRI or JSON object with IRIs.  *Example: schema.org is the base context, which allows for definition of LRMI CreativeWork type. Dublin Core extends the context with a prefix of “dc” and defined by the canonical IRI of Dublin Core terms. “hasPart” and “isPartOf” keywords are explicitly defined as type @id to allow for URLs to serve both as the unique identifier and location of the related items.* |  |
|  |  |  | | | | | | | |  |  |
|  |  | "@graph":  [  {  "@id": "http://www.nasa.gov/",  "@type": "CreativeWork",  "name": "National Aeronautics and Space Administration",  "hasPart": "http://solarsystem.nasa.gov/"  },  {  "@id": "http://solarsystem.nasa.gov/educ/lesson-view.cfm?LS\_ID=390",  "@type": "CreativeWork",  "name": "3-2-1 Liftoff! #01 Station Information",  "isPartOf": "http://solarsystem.nasa.gov/"  },  {  "@id": "http://solarsystem.nasa.gov/educ/lesson-view.cfm?LS\_ID=391",  "@type": "CreativeWork",  "name": "3-2-1 Liftoff! #02 Destination: Station",  "isPartOf": "http://solarsystem.nasa.gov/"  }  ], | | | | | | | | JSON object or array of JSON objects used to define a directed graph of related objects to the primary Solar System Exploration.  The Dublin Core “hasPart” attribute is used to define a relationship to the NASA.gov as a parent to the Solar System Exploration sub-site.  The Dublin Core “isPartOf” attribute is used to define a relationship to the “3-2-1 Liftoff! #01” lesson under the Solar System Exploration collection.  The Dublin Core “isPartOf” attribute is used to define a relationship to the “3-2-1 Liftoff! #02” lesson under the Solar System Exploration collection. |  |
|  |  |  | | | | | | | |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  | "@type": "CreativeWork", | **Required**. String or array of strings used to set the data type of a node. |  |
|  |  |  |  |  |
|  |  | "@id": "http://solarsystem.nasa.gov/", | **Required**. String used as a unique identifier for the resource. Highly recommended defined as a URI. |  |
|  |  |  |  |  |
|  |  | "name": "Solar System Exploration", | **Required**. String for the name/title of the resource. |  |
|  |  |  |  |  |
|  |  | "url": "http://solarsystem.nasa.gov/", | **Required**. String for URL of the resource. |  |
|  |  |  |  |  |

## Applying Accessibility Metadata Project Metadata to JSON-LD

Learning object accessibility features can be described with JSON-LD by adding and utilizing the Accessibility Metadata Project vocabulary (also known as “A11Y”). The JSON-LD @graph keyword may be used in conjunction with the A11Y vocabulary to specify various formats of a learning object. For full information on the Accessibility Metadata Project, see: <http://www.a11ymetadata.org/the-specification/>

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  | **{** | "@context": [  {  “@vocab”: "http://schema.org/",  “url”: { @type: "@id" }  },  “a11y”: “http://www.a11ymetadata.org/the-specification/",  {  "accessMode": { "@id": "a11y:accessMode" },  "hasAdaptation": { "@id": "a11y:hasAdaptation"},  "isAdaptationOf": { "@id": "a11y:isAdaptationOf" },  "mediaFeature": { "@id": "a11y:mediaFeature" }  }  ] | | | | | | | | **Required**. String or array of strings specifying context used to define the short-hand names that are used throughout a JSON-LD document. These short-hand names are called terms and help developers to express specific identifiers in a compact manner. Highly recommended defined as IRI or JSON object with IRIs.  *Example: schema.org is the base context, which allows for definition of LRMI CreativeWork type.* |  |
|  |  |  | | | | | | | |  |  |
|  |  | "@graph":  [  {  "url": "https://www.bookshare.org/download/book?  titleInstanceId=455557&downloadFormat=DAISY",  "accessMode": "textual",  "mediaFeature": "structuralNavigation",  "bookFormat": "http://schema.org/EBook/DAISY3",  "isAdaptationOf":  "https://www.bookshare.org/browse/book/455557",  "@type": "http://schema.org/Book"  },  {  "url": "https://www.bookshare.org/download/book?  titleInstanceId=455557&downloadFormat=DAISY\_AUDIO",  "accessMode": "auditory",  "mediaFeature": "structuralNavigation",  "bookFormat": "http://schema.org/EBook/DAISY3",  "isAdaptationOf":  "https://www.bookshare.org/browse/book/455557",  "@type": "http://schema.org/Book"  },  {  "url": "https://www.bookshare.org/download/book?  titleInstanceId=455557&downloadFormat=BRF",  "accessMode": "tactile",  "bookFormat": "http://schema.org/EBook/BRF",  "isAdaptationOf":  "https://www.bookshare.org/browse/book/455557",  "@type": "http://schema.org/Book"  } ], | | | | | | | | JSON object or array of JSON objects used to define a directed graph of related objects to the primary book item with A11Y accessibility attributes.  The Dublin Core “hasPart” attribute is used to define a relationship to the NASA.gov as a parent to the Solar System Exploration sub-site.  The Dublin Core “isPartOf” attribute is used to define a relationship to the “3-2-1 Liftoff! #01” lesson under the Solar System Exploration collection.  The Dublin Core “isPartOf” attribute is used to define a relationship to the “3-2-1 Liftoff! #02” lesson under the Solar System Exploration collection. |  |
|  |  |  | | | | | | | |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  | "@type": "CreativeWork", | **Required**. String or array of strings used to set the data type of a node. |  |
|  |  |  |  |  |
|  |  | "name": "Experience And Education", | **Recommended**. String for the name/title of the resource. |  |
|  |  |  |  |  |
|  |  | "url": "https://www.bookshare.org/browse/book/528425", | **Required**. String for URL of the resource. |  |
|  |  |  |  |  |
|  |  | "hasAdaptation":  [  "https://www.bookshare.org/download/book?  titleInstanceId=455557&downloadFormat=DAISY",  "https://www.bookshare.org/download/book?  titleInstanceId=455557&downloadFormat=DAISY\_AUDIO",  "https://www.bookshare.org/download/book?  titleInstanceId=455557&downloadFormat=BRF"  ] | String for URL of the resource. |  |
|  |  |  |  |  |

## Learning Registry Submission

The Learning Registry is technology to provide a network of digital learning resources submitted by a multitude of content publishers. The Learning Registry is a system that utilizes metadata within education tools and applications to provide searches and recommendations to educators. This LRMI JSON-LD specification provides a method to describe LRMI metadata when submitted to the Learning Registry.

For LRMI submissions into the Learning Registry, the LRMI metadata must be enclosed within a Learning Registry envelope. LRMI metadata is placed within the “resource\_data” attribute of the Learning Registry envelope. For full reference of the Learning Registry envelope, see the Learning Registry Resource Data Model at: <http://docs.learningregistry.org/en/latest/spec/Resource_Data_Data_Model/index.html>.

Below is a sample that provides an example Learning Registry submission of LRMI metadata in the JSON-LD format:

|  |  |
| --- | --- |
|  | {  "TOS": {  "submission\_TOS": "http://www.learningregistry.org/tos/cc0/v0-5/"  },  "active": true,  "doc\_type": "resource\_data",  "doc\_version": "0.49.0",  "identity": {  "owner": "National Aeronautics and Space Administration",  "submitter": "National Aeronautics and Space Administration",  "signer": "National Aeronautics and Space Administration",  "submitter\_type": "agent"  },  "keys": [  "LRMI", "Solar System", “gravity”, “energy” ],  "payload\_placement": "inline",  "payload\_schema": [ "LRMI”, “JSON-LD” ]  "resource\_data": "  {    “@vocab”: “http://schema.org/”,  “url”: { “@type”: "@id" },  "@type": "CreativeWork",  "name": "Solar System Exploration",  "url": "http://solarsystem.nasa.gov/",  ***[ … additional attributes ... ]***  }  ",  "resource\_data\_type": "metadata",  "resource\_locator": "http://solarsystem.nasa.gov/"  } |
|  |  |

## Example of a LRMI Item

Below is an example of the resource used above using multiple contexts and related items described in a graph.

|  |  |
| --- | --- |
|  | {  "@context": [  {  “@vocab”: "http://schema.org/",  “url”: { @type: "@id" }  },  {  "lrmi": "http://lrmi.net/the-specification#",  "useRightsUrl": {  "@id": "lrmi:useRightsUrl",  "@type": "@id"  }  },  {  "dc": "http://purl.org/dc/terms/",  "hasPart": {  "@id": "dc:hasPart",  "@type": "@id"  },  "isPartOf": {  "@id": "dc:isPartOf",  "@type": "@id"  }  }  ],  "@graph": [  {  "url": "http://www.nasa.gov/",  "@type": "CreativeWork",  "name": "National Aeronautics and Space Administration",  "hasPart": "http://solarsystem.nasa.gov/"  },  {  "url": "http://solarsystem.nasa.gov/educ/lesson-view.cfm?LS\_ID=390",  "@type": "CreativeWork",  "name": "3-2-1 Liftoff! #01 Station Information",  "isPartOf": "http://solarsystem.nasa.gov/"  },  {  "url”: "http://solarsystem.nasa.gov/educ/lesson-view.cfm?LS\_ID=391",  "@type": "CreativeWork",  "name": "3-2-1 Liftoff! #02 Destination: Station",  "isPartOf": "http://solarsystem.nasa.gov/"  }  ],  "@type": "CreativeWork",  "name": "Solar System Exploration",  "url": "http://solarsystem.nasa.gov/",  "description": "Solar System Exploration features lesson plans on electro-magnetism, energy, exploration, gravity, pioneers, landforms, life, light, math ratios, matter, measurement, modeling, origin, planet surfaces, rocks and minerals, the scientific method, and triangulation. Classroom and informal learning activities focus on meteorites, comets, the sun, planet change and constancy, the search for life in the solar system, and missions to outer planets.",  "dateCreated": "2005-05-12",  "publisher": {  "name": "National Aeronautics and Space Administration",  "url": "http://www.nasa.gov"  },  "educationalAlignment": [  {  "educationalFramework" : "Common Core State Standards",  "targetName": "CCSS.ELA-Literacy.WHST.6-8.2d",  “targetUrl” :  “http://corestandards.org/ELA-Literacy/WHST/6-8/2/d”,  "alignmentType": "teaches",  "@type”: “AlignmentObject”  },  {  "educationalFramework" : "Next Generation Science Standards",  "targetName": "MS-ESS1-2",  "alignmentType": "teaches",  "@type”: “AlignmentObject”  },  {  "educationalFramework" : "Next Generation Science Standards",  "targetName": "MS-ESS1-3",  "alignmentType": "teaches",  "@type”: “AlignmentObject”  },  {  "educationalFramework" : "US K-12 Grade Levels",  "targetName": "Grade 6",  "alignmentType": "teaches",  "@type”: “AlignmentObject”  },  {  "educationalFramework" : "US K-12 Grade Levels",  "targetName": "Grade 7",  "alignmentType": "teaches",  "@type”: “AlignmentObject”  }  ],  "educationalRole": "Student",  "educationalUse": [  "Reading",  "Problem Solving",  "Simulations",  "Visual/Spatial"  ],  "inLanguage": "en",  "isBasedOnUrl": "http://www.nasa.gov",  "learningResourceType": "Website",  "timeRequired": "P12H",  "typicalAgeRange": [  "8-10",  "10-12",  "12-14"  ],  "useRightsUrl": "http://www.nasa.gov/audience/formedia/features/MP\_Photo\_Guidelines.html"  } |

## Terminology Definition

Below is a list of term referenced in this document (as defined by the Wikipedia community):

**IRI** - [Internationalized Resource Identifier](http://en.wikipedia.org/wiki/Internationalized_Resource_Identifier) is a generalization of the Uniform Resource Identifier (URI) allowing the use of Unicode

**JSON** - [JavaScript Object Notation](http://en.wikipedia.org/wiki/JSON) is a text-based open standard designed for human-readable data interchange.

**JSON-LD** - [JavaScript Object Notation for Linked Data](http://en.wikipedia.org/wiki/JSON-LD) is a method of transporting Linked Data using JSON.

**LRMI** – [Learning Resource Metadata Initiative](http://en.wikipedia.org/wiki/Learning_Resource_Metadata_Initiative) is a project led by Creative Commons (CC) and the Association of Educational Publishers (AEP) to establish a common vocabulary for describing learning resources.

**URI** – [Uniform Resource Identifier](http://en.wikipedia.org/wiki/URI) is a string of characters used to identify a name or a web resource

**URL** – [Uniform Resource Locator](http://en.wikipedia.org/wiki/URL) is a specific character string that constitutes a reference to a resource.

## Related Links

Below are links to initiatives and technology that utilize LRMI in a JSON serialized context:

* [Learning Resource Metadata Initiative (LRMI)](http://www.lrmi.net/)
* [JSON Linked Data (JSON-LD)](http://json-ld.org/)
* [Learning Registry](http://learningregistry.org/)
  + [Learning Registry in 20 Minutes or Less](http://docs.learningregistry.org/en/latest/start/20min.html)
  + [Learning Registry Resource Data Model](http://docs.learningregistry.org/en/latest/spec/Resource_Data_Data_Model/index.html)
  + [Learning Registry on GitHub](https://github.com/learningregistry)

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## Document History

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| --- | --- | --- |
| **Version** | **Update** | **Contributor** |
| v1.0 | Initial Documentation | Jason Hoekstra @ inBloom |
| v1.1 | Fix to Graph Relationships | Jason Hoekstra @ inBloom |
| v1.2 | Define JSON-LD document using the @vocab construct as a @context document has not yet been defined at schema.org. Fix in educationAlignment(s) to use scalar values per alignment instead of array to properly align targetUrl attributes if specified. Added @type of AlignmentObjects on educationAlignment(s). Removed @id as shorthand definition of “url” allows attribute to serve both. | Jim Klo @ SRI |
| v1.3 | Added text specifying JSON Unicode support and escaping. | Rob Koberg |
| v1.4 | Changed Schema.org “name” to recommendation recognizing not all learning object collections have titles for the items. Learning Registry envelope addition of “JSON-LD” along with “LRMI” within “payload\_schema” to clearly denote payload format. | Dave Finke @ NSDL |
| v1.5 | A11Y example of JSON-LD vocabulary extensions. | Martin Quiazon @ Benetech |