

Modeling Paradata and Assertions as Activities V2.0.1

Stable. See the [Change Log](#) for links to prior versions.

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Introduction

This document proposes usable representations for (1) *paradata* (contextualized usage data) about learning resources and (2) *assertions* (other facts and opinion statements about both learning resources and other objects known to the Learning Registry). Ideally a single representation can be used for both of these. Both of these types of metadata are published as resource documents and distributed through the Learning Registry network.

The proposal is that (a) the Activity Streams *concept* (designed to exchange data about individual social activities in social networking) can be used to model both paradata and assertions and that (b) the JSON encoding of the activity stream-like representation becomes a payload in a resource document for submission, transport and access in the Learning Registry network. Further, this JSON document will be interoperable with the Activity Streams specification for JSON serialization of activity streams. The goal is to develop the simplest model that can handle the majority of the use cases and meet the other criteria.

A set of example natural language paradata statements [follows](#) -- a short, informal summary of the key

components of the [current activity stream model and specification](#). The activity stream model does not incorporate all of the concepts represented in the natural language statements; thus a broader conceptual model is introduced based on the [analysis](#) of the examples. The [example statements](#) are then expressed in this conceptual model. A [JSON representation of the model](#), interoperable with the JSON serialization of activity streams follows, along with a description of how Learning Registry [services](#) process activity streams. The [examples](#) are then displayed in the full JSON. An [interoperability mapping](#) between the proposed JSON and the existing activity streams serialization completes the presentation.

If you just want a simple introduction to the paradata model, see [Paradata in 20 Minutes](#). While this document contains a paradata specification, there is a separate formal [Paradata Specification](#).

Examples

Contextualize Usage Paradata

- This resource was viewed by students in a high school geology class during a lesson on volcanoes.
- This resource was viewed during a lesson on volcanoes in a high school geology class.
- This resource was taught by a 5th grade teacher.
- This resource was bookmarked by a high school physics teacher around June 2011.
- This resource was incorporated into a lesson plan by a teacher.
- This resource was created by combining resources, X1, X2, ... XN.
- This resource was created by User1, User2, and User3.
- This resource was created by an anonymous user with these attributes.
- This resource was created by taking component_x from lesson_plan_1 and adding it to lesson_plan_2.
- Resource was favorited on the Brokers of Expertise educator portal by an educator of multiple grades and subjects.
- A comment was attached to this resource found at <http://myboe.org/go/resource/53> on the Brokers of Expertise educator portal by an educator of grade 4 (educator has chosen not to share personally identifying information).
- A resource found at <http://myboe.org/go/resource/110599> was tagged with 4 terms on the Brokers of Expertise educator portal by an educator of multiple subjects.
- A resource found at <http://myboe.org/go/resource/43766> was matched to 1 academic content standard on the Brokers of Expertise educator portal by an educator of multiple grades and subjects.
- A resource found at <http://myboe.org/go/resource/12504> was matched to 2 academic content standards on the Brokers of Expertise educator portal by the Brokers of Expertise Standards Matching Team.

Aggregate Usage Paradata

- This resource was viewed on a detail page 2200 times over the month of May 2011.
- This resource was rated an average of 4.4 out of 5 stars by 2104 users who specialize with

English learning students over the month of May 2011 on the learning management system run by NSDL.

- This resource was aligned to Common Core Learning Objective [xyz] by 15 users of the learning management system sold by Agilix.
- This resource was used by 20 teachers in country1, 30 teachers in country2, and 17 teachers in country3 in May 2011.
- This resource was adopted by 2 sixth grade teachers, 4 seventh grade teachers, and 5 eighth grade teachers.
- This resource is favorited on Twitter by 13742 University of Wisconsin students.

Assertions about Objects

- This resource supersedes that resource.
- This resource is out of date (as of May 1 2011).
- This resource is identical to that resource.
- This resource is similar to that resource.
- This resource is composed of those resources.
- This resource is an assessment of that resource.
- This resource is no longer available.
- This node is emitting spam.
- Node N has been compromised.
- This identity cannot be verified.
- This identity is fake.
- This document has been deleted.

Note: "This resource" above doesn't mean the paradata resource itself, but the resource URI referred to by the paradata expression.

Activity Streams: The Background Conceptual Model

An activity stream is collection of activity *statements*, each describing what an actor does to an object. The Activity Stream serialization formalizes these activity statements (denoted a **collection of items**). A simplified description of the activity statement model of an item follows. The description is a natural language representation consistent with the conceptual model. The terms are those used in the formal Activity Streams JSON Serialization [Specification](#). We are conceptually aligned to this approach but intentionally deviate from this specification to permit broader statements of fact and opinion, including aggregate statements by multiple parties, as well as more detail about various aspects of the statement.

In the formal Activity Stream model, an activity statement or assertion (**item** or **activity**) consists of:

- the description of the *entity* or *persona* that performed the activity [**actor**: an object, required].
- the designation of the *action* [**verb**, required with default value of **post**].
- the *thing* that the action is applied to [**object**, optional but to be implied from context if not present].

- the description of *context* for the action (where it occurs, dependent on the action) [*target*, an object, optional].
- a permanent, unique, referenceable identity for the activity [*id*, recommended].
- a *point in time* indicating when the activity statement was made available [*published*, required].

Thus, at the basic level, an activity statement is a sentence of the form: identified statement [*id*] made at point in time [*published*] that *actor* [*actor*] did *action* [*verb*] on *thing* [*object*] in *context* [*target*]. As described below, this model is not sufficient for our needs. The analysis leads to a more elaborate and descriptive model.

The Activity Stream JSON Serialization Specification includes a number of other elements which are not essential for our discussion (e.g., the icon of the actor, the generator of the statement). It also includes more detailed modeling with subobjects of some of these elements. More importantly, the specification allows elements and subelements to be added almost anywhere, providing the potential of interoperability with other models of activities. A defined list of base **verbs** (actions) and **objects** (things or contexts) is provided in the registry associated with the specification.

Analysis

The examples contain a number of concepts that both correspond to the activity stream model or that are not captured in it.

For example, the Statement:

- Teacher viewed resource xyz.

is expressed in the model as:

- Teacher [*actor*] viewed [*action*] resource xyz [*object*]

Taking a more complex example:

- Teacher of 5th grade math viewed resource xyz about volcanoes.

cannot be directly expressed in the form above, but conceptually is:

- Teacher [*actor*] 5th grade math [*actor attributes*] viewed [*action*] resource xyz [*object*] about volcanoes [*object attributes*]

And another example:

- Teachers of elementary math viewed 2200 times on a detailed page over the month of May 2011 resource xyz about volcanoes while using the NSDL site.

Which is annotated as:

- Teachers [*actor*] of elementary math [*actor attributes*] while using the NSDL site [*actor context*] viewed [*action*] 2200 times [*action count*] on a detailed page [*action context*] over the month of May 2011 [*activity time frame*] resource xyz [*object*] about volcanoes [*object attributes*]

This example could be serialized in JSON as (many other serializations are possible, and this is **not** our

final model):

```
{
  "actor": {"role": "teacher", "attributes": ["elementary", "math"], "context": ["site", "NSDL"]},
  "action": {"action-verb": "viewed", "count": 2200, "context": ["detail page"],
    "time-frame": {"start-date": "2011-05-01", "end-date": "2011-05-31"},
  "object": {"uri": "xyz", "attributes": ["volcanoes"]}]
}
```

From a more detailed analysis of the examples, a number of concepts and potential modeling structures can be identified. *Note:* the analysis does not suggest an unambiguous representation of the examples.

From the basic activity stream model:

- *Actors:* student, teacher, user
- *Actions:* viewed, taught, bookmarked, incorporated, rated, aligned, used, adopted, favorited
- *Things:* resource, identity, node, document
- *Contexts:* detail page, Twitter

Actors may be anonymous, simple, detailed, contextualized or fully identified.

- Anonymous: An unknown/unidentified person taught this resource in a lesson
- Simple: teacher taught this resource
- Detailed: A person who teaches 5th graders in a rural location taught this resource
- Contextualized: A person who uses the NSDL portal taught this resource in a lesson
- Fully identified: A person with a known identity (e.g., email address xyz@abc.com) taught this resource

Data about actors may be for an individual or an aggregated or a measured cohort, e.g., 15 users, 17 teachers, 13742 students.

Aggregate actions include use metrics and measures of the action, e.g., view 2200 times, rated 4.4 of 5.

Actions occur in a *context*, e.g., on Twitter, using the Aglix LMS.

Things may have descriptions and attributes, e.g., in a lesson on volcanoes.

Statements and actions cover a *time range* or *point in time*, e.g., June 2011, May 1, 2011.

A thing may be related to other things, e.g., resources x1, x2, xn.

Statement may also be a structural or semantic assertion, not usage data, e.g., identical, superseded, out-of-date, deleted, faked, compromised.

In addition, all statements that are carried as Resource Document Payloads in the Learning Registry

incorporate:

- *Identity* data: who owns, curated or submitted the paradata or assertion (separate from the actor in the activity), which includes provision for anonymous or fully identified submissions.
- *Weight* or confidence factor associated with the statement (positive or negative).
- Arbitrary *keywords* describing the statement.

The basic activity statement model may be extended and restructured from its core concepts of actor, action, thing, context to incorporate attributes, dates, measures and relationships. *Note:* This is not meant to be a formal JSON serialization, but a conceptual model that could be represented in JSON. The JSON follows.

As a preamble:

- The Activity Stream JSON serialization format does not use [duck typing](#). This results in more complex JSON structures for simple cases.
- There is no semantic validation of the JSON. While many of the elements of the activity streams specification have semantic constraints, the JSON elements are encoded as strings and thus the values may violate the semantics. Separate semantic processing would be needed to enforce the semantic constraints.

The conceptual model relies on both this lack of semantic validation and the potential for using duck typing.

A more complete, informal statement of the conceptual model follows.

Actors (Entities) exist:

- Actors may be generic or refer to specific known identities.
- Actors may have descriptive attributes.
- Actors may have measures or aggregation, e.g., counts of how many actors engaged in the activity (but the preferred usage is to keep all measures with the action).
- Actors may be operating in, or be a part of, a context.
- Actors may be anonymous.
- The statement of an anonymous action may omit the actor.

Actor descriptions, measures and attributes may be modeled in different ways, e.g.:

- Adding a subobject to describe an object (an actor is an object in the model).
Actor: 10 5th grade math teachers.
Actor: teachers, attributes: math, 5th grade, count: 10 .
`{"actor": {"identity": "actor name", "attributes": [{"attribute 1"}, {"attribute 2"}]}}`
`{"actor": {"identity": "teacher", "attributes": [{"math"}, {"5th grade"}], "count": 10}}`
- Describe the actor in a single string containing an arbitrary statement without explicit semantics.
Actor: 10 5th grade math teachers.
`{"actor": "actor name: attribute 1, attribute 2"}}`

```
{"actor": "teacher: math, 5th grade, 10"}}
```

While a model with sub-objects (e.g., actor attributes, context, measures) may be easier to parse, and could restrict the actors to come from a limited vocabulary, semantic validation and enforcement of the overall model will be difficult -- syntax allows the use of unstructured strings in any element -- validation requires a semantic check. The single string alternative, while simpler to create, may be difficult to parse. Thus the proposal is to allow both forms, but recommend the use of sub-objects.

Actions exist:

- The vocabulary is unstructured and unrestricted.
- Actions may have aggregate measures and attributes.
- Actions may take place at a point in time or over a period of time.
- Actions may take place in a context

Aggregate measures could be modeled as a sub-object of the action, or as a separate top-level element in the activity. Using a sub-object violates the activity stream requirement that an action be a simple term. The proposal is to use duck typing and add a sub-element aggregate or measure element when required. While this sub-element violates the activity stream JSON serialization, the same sub-element schema may be used for both actors and actions. For either modeling choice, the semantics of the aggregate are based on the action.

Things exist:

- Things are objects.
- They may have descriptions and attributes
- For consistency, things may have aggregate data, measure and date.

Contexts exist:

- Contexts are objects.
- They may have sub-objects or may be a single arbitrary string.

A activity stream concept of “target” is confusing and similar to context. The model uses only context as the single concept to describe where and how the activity takes place. While context could be added as a top-level element to the model, the proposal is that context be a sub-object of a thing, actor or action.

Date range or Point-in-time could be added as a top-level element, as a part of context, or as its own separate sub-object. The proposal is to have a specific date sub-object for an action. For consistency, while no use cases have been yet identified, the time/date may be a sub-object of thing, actor or action.

Related things are added as a top-level element to the model. Related things are objects, all of the same type.

Assertions exist.

- Assertions could be modeled as “actor *asserts* (action) thing has assertion value”, i.e., the assertion is a detailed sub-object of the thing.
- The action could be relaxed to incorporate the assertion value as a type of action, i.e., the assertion is the action.
- Generalizing action to include assertion terms is proposed as a simplified solution. All statements are some form of assertion and could be cast as a multi-level representation. Modeling all forms of statements as assertions seems to be overly complex, and thus this simplification appears to be consistent.

Compound statements are modeled as separate actions.

Thus, the model can be expressed hierarchically as;

- actor
 - description, context, measure, date
- action
 - description, context, measure, date
- thing
 - description, context, measure, date
- relations
 - list of objects of the same type

Examples Revisited

The examples are given as above, followed by informal representation using the conceptual model. The representations have no more specificity of objects or identities than given in the natural language statements. The JSON serialization is detailed after the examples. Publishing date and identity are omitted, as is Learning Registry submission data. The examples imply the use of sub-elements and the use of duck typing rather than strings that include complex statements. The different forms of the alternatives proposed are included.

Contextualize Usage Paradata

Statement: Resource X was viewed by students in a high school geology class during a lesson on volcanoes.

Note: Two alternative, equivalent forms of the statement are shown.

- *Actor:* student
 - *Description:* [high school, geology, class]
- *Action:* viewed
- *Thing:*
 - *ID:* Resource X ID
 - *Context:* lesson
 - *Description:* volcanoes

OR

- *Actor*: student: high school, geology, class
- *Action*: viewed
- *Thing*: Resource X ID: lesson on volcanoes

Statement: Resource X was viewed during a lesson on volcanoes in a high school geology class.

Note: This statement is semantically equivalent to the one above; the ordering of terms in the statement do not matter.

Statement: Resource X was taught by a 5th grade teacher.

- *Actor*: teacher
 - *Description*: 5th grade
- *Action*: taught
- *Thing*:
 - *ID*: Resource X ID

Statement: Resource X was bookmarked by a high school physics teacher around June 2011.

- *Actor*: teacher
 - *Description*: [high school, physics]
- *Action*: bookmarked
 - *Date*: 2011-06-01 / 2011-06-30
- *Thing*: Resource X ID

Statement: Resource X was incorporated into a lesson plan by a teacher.

Note: The specific lesson plan is not specified. If it were specified, it would be the related object of type lesson plan.

- *Actor*: teacher
- *Action*: aligned
- *Thing*:
 - *ID*: Resource X ID
 - *Context*: lesson plan

Statement: Resource X was created by combining resources, X1, X2, ... XN.

Note: The actor is not specified.

- *Actor*: anonymous
- *Action*: assembled-from
- *Thing*: Resource X ID
- *Related*:
 - *Type*: Resource

- List: [X1, X2, ..., XN]

Statement: Resource X was created by User1, User2, and User3.

Note: This is metadata.

Note: The statement must be split into multiple statements, only one is given.

Note: Assuming that user x is a generic description and that the statement does not model the identity.

- *Actor:* User x
- *Action:* authored
- *Thing:* Resource X

Statement: Resource X was created by an anonymous user with these attributes.

Note: This is metadata.

- *Actor:*
 - *Description:* [attribute, attribute]
- *Action:* authored
- *Thing:* Resource X

Statement: Resource X was created by taking component_x from lesson_plan_1 and adding it to lesson_plan_2.

Note: Two alternative forms are shown. In the first, the main object is the target lesson plan. In the second, the object in the activity is the resource that is in the lesson plan.

- *Actor:* unknown
- *Action:* add resource
- *Thing:*
 - *Type:* Lesson plan
 - *ID:* lesson plan 2 ID
- *Related:* component x

OR

- *Action:* create resource
- *Thing:* Resource X
 - *Description:* component_x from lesson plan 1
 - *Context:* lesson plan 2

Statement: Resource was favorited on the Brokers of Expertise educator portal by an educator of multiple grades and subjects.

- *Actor:* Educator
 - *Description:* Multiple grades and subjects
- *Action:* favorited
 - *Context:* Brokers of Expertise educator portal

- *Thing*: Resource @ URL

Statement: A comment was attached to this resource found at <http://myboe.org/go/resource/53> on the Brokers of Expertise educator portal by an educator of grade 4

Note: The educator has chosen not to share personally identifying information.

- *Actor*: Educator
 - *Description*: Grade 4
- *Action*: commented
 - *Context*: Brokers of Expertise educator portal
- *Thing*: Resource @ <http://myboe.org/go/resource/53>
- *Related*: Comment
 - *Comment*: Comment URL

Statement: Resource found at <http://myboe.org/go/resource/110599> was tagged with 4 terms on the Brokers of Expertise educator portal by an educator of multiple subjects.

- *Actor*: Educator
 - *Description*: Multiple grades and subjects
- *Action*: tagged
 - *Context*: Brokers of Expertise educator portal
 - *Description*: ["term", "term", "term", "term"]
- *Thing*: Resource @ <http://myboe.org/go/resource/110599>

Statement: Resource found at <http://myboe.org/go/resource/43766> was matched to 1 academic content standard on the Brokers of Expertise educator portal by an educator of multiple grades and subjects.

- *Actor*: Educator
 - *Description*: Multiple grades and subjects
- *Action*: aligned
 - *Context*: Brokers of Expertise educator portal
- *Thing*: Resource @ <http://myboe.org/go/resource/43766>
- *Related*: Academic standard
 - *Description*: Standard description

Statement: Resource found at <http://myboe.org/go/resource/12504> was matched to 2 academic content standards on the Brokers of Expertise educator portal by the Brokers of Expertise Standards Matching Team.

Note: The match is expressed in two separate statements.

- *Actor*: Brokers of Expertise Standards Matching Team
- *Action*: aligned
 - *Context*: Brokers of Expertise educator portal
- *Thing*: Resource @ <http://myboe.org/go/resource/12504>
- *Related*: Academic standard

- *Description*: Standard description

Aggregate Usage Paradata

Statement: Resource X was viewed on a detail page 2200 times over the month of May 2011.

- *Actor*: multiple users
- *Action*: viewed
 - *Measure*:
 - *Type*: count
 - *Value*: 2200
 - *Date*: 2011-05-01 / 2011-05-31
 - *Context*: detail page
- *Thing*:
 - *ID*: Resource X ID

Statement: Resource X was rated an average of 4.4 out of 5 stars by 2104 users who specialize with English learning students over the month of May 2011 on the learning management system run by NSDL.

Note: Two alternatives are presented. In the first, the number of users who rated the resource is part of the description of the actor. In the second, the sample size is part of the measure. The second form is preferred.

- *Actor*: multiple users
 - *Description*: English learning students
 - *Measure*:
 - *Type*: count
 - *Value*: 2104
- *Action*: rated
 - *Measure*:
 - *Type*: star average
 - *Value*:
 - *Avg*: 4.4
 - *Scale Min*: 1
 - *Scale Max*: 5
 - *Context*: LMS, NSDL
 - *Date*: 2011-05-01 / 2011-05-31
- *Thing*:
 - *ID*: Resource X ID

OR

- *Actor*: students
 - *Description*: English learning

- *Action*: rated
 - *Measure*:
 - *Type*: star average
 - *Value*:
 - *Avg*: 4.4[related](#):
 - *Scale Min*: 1
 - *Scale Max*: 5
 - *Sample Size*: 2104
 - *Context*: LMS, NSDL
 - *Date*: 2011-05-01 / 2011-05-31
- *Thing*:
 - *ID*: Resource X ID

Statement: This resource was aligned to Common Core Learning Objective [xyz] by 15 users of the learning management system sold by Agilix.

- *Actor*: users
 - *Description*: learning management system; sold by Agilix
- *Action*: aligned
 - *Measure*:
 - *Type*: count
 - *Value*: 15
- *Thing*:
 - *ID*: Resource X ID
- *Related*: Common Core Learning Objective
 - *Description*: Objective xyz

Statement: Resource X was used by 20 teachers in country1, 30 teachers in country2, and 17 teachers in country3 in May 2011.

Note: The statement must be split into multiple statements, only one is given.

Note: Two alternative forms are shown. In the first the count is associate with the actors. In the second it is associated with the action. The second is form is preferred.

- *Actor*: teachers
 - *Description*: county 1
 - *Measure*:
 - *Type*: count
 - *Value*:20
- *Action*: used
- *Thing*: Resource X ID

OR

- *Actor*: teachers
 - *Description*: county 1
- *Action*: used
 - *Measure*:
 - *Type*: count
 - *Value*:20
- *Thing*: Resource X ID

Statement: Resource X was adopted by 2 sixth grade teachers, 4 seventh grade teachers, and 5 eighth grade teachers.

Note: The statement must be split into multiple statements, only one is given.

- *Actor*: teachers
 - *Description*: 6th grade
- *Action*: adopted
 - *Measure*:
 - *Type*: count
 - *Value*: 2
- *Thing*: Resource X ID

Statement: Resource X is favorited on Twitter by 13742 University of Wisconsin students.

- *Actor*: student
 - *description*: University of Wisconsin
- *Action*: favorited
 - *Context*: Twitter
 - *Measure*:
 - *Type*: count
 - *Value*: 13742
- *Thing*: Resource X ID

Assertions about Objects

Statement: Organization A asserts Resource X supercedes Resource Y.

- *Actor*: Organization A
- *Action*: supercedes
- *Thing*: Resource X ID
- *Related*: [Resource Y ID]

Statement: Organization A asserts Resource X is out of date (as of May 1 2011).

- *Actor*: Organization A
- *Action*: out of date
 - *Date*: 2011-05-01

- *Thing*: Resource X ID

Statement: Organization A asserts Resource X is identical to Resource Y.

Note: Selecting which item is the thing and which is the same is arbitrary.

- *Actor*: Organization A
- *Action*: same as
- *Thing*: Resource X ID
- *Related*: [Resource Y ID]

Statement: Organization A asserts Resource X is similar to Resource Y.

Note: Selecting which item is the thing and which is similar is arbitrary.

- *Actor*: Organization A
- *Action*: similar
- *Thing*: Resource X ID
- *Related*: [Resource Y ID]

Statement: Organization A asserts Resource X is composed of Resources M, N, O.

- *Actor*: Organization A
- *Action*: composed of
- *Thing ID*: Resource X ID
- *Related*: [Resource M ID, Resource N ID, Resource O ID]

Statement: Organization A asserts Resource X is an assessment of Resource Y.

- *Actor*: Organization A
- *Action*: assessment of
- *Thing*: Resource X ID
- *Related*: [Resource Y ID]

Statement: Organization A submits statement that Resource X is no longer available.

Note: Who submitted the statement is part of the resource document and not part of the activity.

- *Action*: not available
- *Thing*: Resource X ID

Statement: Organization A submits statement that Node N is emitting spam.

Note: Who submitted the statement is part of the resource document and not part of the activity.

- *Action*: spammer
- *Thing*:
 - Type: Node
 - ID: Node N ID
- *Submitter (in resource document, not paradata)*: Organization A

Statement: Organization A submits statement that Node N is compromised.

Note: Who submitted the statement is part of the resource document and not part of the activity.

- *Action:* compromised
- *Thing:*
 - Type: node
 - ID: Node N ID
- *Submitter (in resource document, not paradata):* Organization A

Statement: Organization A asserts identity I cannot be verified.

Note: A weight indicating falsehood of the verification is part of the resource document.

- *Actor:* Organization A
- *Action:* verified
- *Thing:*
 - Type: identity
 - ID: Identity I ID
- *Weight (in resource document, not paradata):* -100

Statement: Organization A asserts identity I is fake.

- *Actor:* Organization A
- *Action:* fake
- *Thing:*
 - Type: identity
 - ID: Identity I ID

Statement: Organization A asserts Document D has been deleted.

- *Actor:* Organization A
- *Action:* deleted
- *Thing:*
 - Type: document
 - ID: Document D ID

Conceptual Model

The complete conceptual model follows.

Activity Statement:

- The description of the complete activity
- JSON element **activity**
- A JSON object with subelements:
 - Actor, Action, Object, Related -- as detailed below
 - Any additional subelements are permitted

Actor:

- The description of the *entity* or *persona* that performed the activity
- JSON element **actor**
- Duck type as either a string (any statement) or an **object** (includes **description**, **measure**, **context** and **date**)
- Optional
- Assumed to be **submitter** identity (or other identity) from the resource document if omitted

Action:

- The designation of the *action* or *assertion*
- JSON element **verb**
- Duck type as either a string (any statement) or an **object** (includes **description**, **measure**, **context** and **date**)
- If duck typed as an object, the action verb is a JSON key value pair with the key **action** and the action value (the verb) being a string
- Required
- Recommended value of **action** to come from the Activity Stream based list

Thing:

- The *thing* that the action is applied to
- JSON element **object**
- Duck type as either a string (any statement) or an **object** (includes **description**, **measure**, **context** and **date**)
- Optional
- Implied from context if not present
- Is a learning resource if type is not specified

Related:

- The *related objects*
- JSON element **related**
- An unordered list of objects (an array)
- If only identities are given, all are of the same type, that being the type of the *thing* (defaults to learning resource)
- Optional

Statement Identity

- A permanent, unique, reference-able identity for the activity
- JSON element **id**
- Recommended
- Taken from the JSON serialization specification from Activity Streams for compatibility

Published Time

- A *point-in-time* indicating when the activity statement was made available
- JSON element **published**
- Optional
- Use **submit_time** from the resource document if omitted and needed
- Taken from the JSON serialization specification from Activity Streams for compatibility

Actor, *action*, *thing*, *context* and *related* are all modeled as objects (duck typed alternative to a simple string representation from an uncontrolled vocabulary).

An action may be a term from an uncontrolled vocabulary.

An object (actor, thing, related) may be a term from an uncontrolled vocabulary (e.g., a teacher), or it may be a type (which defaults to *learning resource*) and the identity of a specific item of that type (given as an identifier). The object model contains:

Object ID

- The identity of the object
- JSON element **id**
- Optional
- Default value is based on the object, e.g., is the submitter identity for an actor, the resource ID for related objects

Object Type

- The type of object
- JSON element **objectType**
- Optional
- Default value is based on the object, e.g., is “submitter” for a actor and is “resource” for a thing, context or related.

Description

- A description of the object
- Is a sub-object of actor, action or thing
- JSON element **description**
- An array of strings, order in the array is meaningless
- Optional

Measure

- Numeric measures of the object
- Is a sub-object of actor, action or thing

- Best practice is to provide measure only for action.
- JSON element **measure**
- A structured element with a **type** and set of other keys determined by the type, e.g., counts, ranges, min, max, ...
- The measure types and their structure is an open vocabulary
- Optional

Context:

- The *context* of the action or activity (where it occurs, dependent on the action and actors)
- Is a sub-object of actor, action or thing
- Best practice is to use context only for action
- JSON element **context**
- Duck type as either a string (any statement) or an **object** (includes **description** and **measure**)
- Optional, no default value

Date:

- The *date* or *point-in-time* that covers the activity
- Is a sub-object of actor, action or thing
- Best practice is to provide date only for action (there are no uses cases for a date for other elements)
- JSON element **date**
- An encoding of a point in time value, or a date range (encoding from ISO 8601 and [RFC 3339](#))
 - A point in time is encoded as:
 - UTC: YYYY-MM-DDThh:mm:ss.sZ
 - Local Time: YYYY-MM-DDThh:mm:ss.s+HH:MM
 - The time part is optional, but if present (indicated by the T), it must be given to the second (fractional part [.s] is optional)
 - UTC time must include the Z time offset
 - For local time, the minute part (:MM) is optional
 - For local time, the offset can be + or -
 - The date part must include year, month and day
 - A date range is two points in time (start, end) separated by a /
 - ISO 8601 P duration formats should not be used
 - Range is inclusive to the precision given
- Optional

Optional Elements:

- The object may be extended to include other elements, any of which can be a simple JSON type, an array or an object (that could include nested subobjects).

In the simple form of an object having a single value, if the value is a URL, it is the object ID, otherwise it

is the object type.

All of the other elements from the JSON Serialization Specification for Activity Streams may be used (but none appear in any of the examples or are required for the given use cases). Learning Registry best practices will indicate which of these should be used, and how.

If required, multiple activities can be combined into a collection. The collection object contains an array of items. Each item is an activity, as described above. This follows directly from the activity streams JSON serialization.

A simple example, short form

“Resource @ URL X was taught by a high school physics teacher”

```
{
  "actor": "teacher: high school, physics",
  "verb": "taught",
  "object": "http://resourceXURL/"
}
```

A simple example, complete form

“Resource @ URL X was taught by a high school physics teacher”

```
{
  "actor": {
    "objectType": "teacher",
    "description": ["high school", "physics"]},
  "verb": "taught",
  "object": {
    "objectType": "resource",
    "id": "http://resourceXURL/"
  }
}
```

A simple assertion, short form, all default values

“The submitter asserts that Resource @ URL X is authoritative”

```
{
  "verb": "is authoritative",
  "object": "http://resourceXURL/"
}
```

A complex example

“The identified cohort X of 15 high school physics teachers ranked 7 on a scale of 1:10 the assessment Resource @ URL X from Feinman Physics Curriculum during August 2010 through June 2011 when used in 3 AP Physics Courses”

```
{
  "actor": {
    "id": "uniquecohortXID",
```

```

      "objectType": "teacher",
      "description": ["high school", "physics"]},
  "verb": {
    "action": "ranked",
    "measure": {
      "measureType": "scaled",
      "value": 7,
      "scaleMin": 1,
      "scaleMax": 10,
      "sampleSize": 15},
    "date": "2010-08-01/2011-06-30",
    "context": {
      "description": ["AP Physics Course"],
      "measure": {
        "measureType": "count",
        "value": 3}},
    "object": {
      "objectType": "assessment",
      "id": "http://resourceXURL/",
      "description": ["Feynman Physics Curriculum"]
    }
  }
}

```

Services

The existing Learning Registry publish and access services are fully compatible with using the JSON format for activity data as a payload in a resource description document. The activity data can be published to the Learning Registry via publish, or can be accessed via obtain, basic harvest, or slice.

A data pump that takes a activity stream (multiple activities), and publishes each item in the stream as a resource document can be created. A process that monitors a Atom feed could also be developed (transforming the Atom XML to JSON). The processes need to translate the activity stream terms to those defined herein, but the mappings are direct.

A service that outputs the activity stream could be developed. Options include:

- a new service that takes a date range (like harvest) and outputs the activity stream in JSON.
 - The service can either produce the form described herein or output data that conforms to the requirements of the JSON Serialization Specification for Activity Streams.
- extending the OAI-PMH service to output the ATOM XML representation of the activity stream payloads.

Resource Document Examples in JSON

The same example are repeated. Many have additional details not included above, but included in these examples. The resource documents omit some details, like the digital signature. Other elements, like the identity, are illustrative placeholders. *Note:* you need to verify the resource document structure against the specific version that you are using.

The examples of the activity objects are shown using the different uses of duck typing and default values. *Note:* there may be valid alternative ways to expressing the statement. The activity JSON object is highlighted.

Contextualize Usage Paradata

Statement: Resource @ URL X was viewed by students in a high school geology class during a lesson on volcanoes.

Note: Only the more complex form from above is shown.

```
{
  "doc_type": "resource_data",
  "doc_version": "0.50.0",
  "resource_data_type": "paradata",
  "active": true,
  "identity": {
    "submitter_type": "user",
    "submitter": "<identity of the submitter - a string>"},
  "digital_signature": { ... },
  "resource_locator": "http://resourceurl/resourceX/",
  "payload_placement": "inline",
  "payload_schema": ["LR Paradata 1.0"],
  "resource_data": {
    "activity": {
      "actor": {
        "objectType": "student",
        "description": ["high school", "geology", "class"]},
      "verb": {"action": "viewed",
        "context": {
          "objectType": "lesson",
          "description": ["volcanoes"]}},
      "object": {
        "id": "http://resourceurl/resourceX/",
        "content": "Resource @ URL X was viewed by students in a high school geology class during a lesson on volcanoes"
      }
    }
  }
}
```

Statement: Resource @ URL X was taught by a 5th grade teacher.

```
{
  "doc_type": "resource_data",
  "doc_version": "0.50.0",
  "resource_data_type": "paradata",
  "active": true,
  "identity": {
    "submitter_type": "user",
    "submitter": "<identity of the submitter - a string>"},
```

```

"digital_signature": { ... },
"resource_locator": "http://resourceurl/resourceX/",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
    "actor": {
      "objectType": "teacher",
      "description": ["5th grade"]},
    "verb": "taught",
    "object": {
      "id": "http://resourceurl/resourceX/"},
    "content": "Resource @ URL X was taught by a 5th grade teacher"
  }
}
}
}

```

Statement: Resource @ URL X was bookmarked on Delicious by a high school physics teacher around June 2011.

Note: The example is more specific than above; the context of the bookmark action is specified.

```

{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,
"identity": {
  "submitter_type": "user",
  "submitter": "<identity of the submitter - a string>"},
"digital_signature": { ... },
"resource_locator": "http://resourceurl/resourceX/",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
    "actor": {
      "objectType": "teacher",
      "description": ["high school", "physics"]},
    "verb": {
      "action": "bookmarked",
      "context": {
        "id": "http://www.delicious.com/"},
      "date": "2011-06-01/2011-06-30"},
    "object": {
      "id": "http://resourceurl/resourceX/"},
    "content": "Resource @ URL X was bookmarked on Delicious by a high school physics teacher
around June 2011"
  }
}
}
}

```

Statement: Resource @ URL X was incorporated into a lesson plan by a teacher.

```

{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,
"identity": {
  "submitter_type": "user",
  "submitter": "<identity of the submitter - a string>",
"digital_signature": { ... },
"resource_locator": "http://resourceurl/resourceX/",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
    "actor": "teacher",
    "verb": {
      "action": "incorporated",
      "context": "lesson plan",
    "object": "http://resourceurl/resourceX/",
    "content": "Resource @ URL X was incorporated into a lesson plan by a teacher"
  }
}
}
}

```

Statement: Resource @ URL X was created by combining resources, X1, X2, ... XN.

```

{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,
"identity": {
  "submitter_type": "user",
  "submitter": "<identity of the submitter - a string>",
"digital_signature": { ... },
"resource_locator": "http://resourceurl/resourceX/",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
    "verb": "assembled from",
    "object": "http://resourceurl/resourceX/",
    "related": [
      {"object": {
        "objectType": "resource",
        "id": "http://resourceurl/X1/" }},
      {"object": {
        "objectType": "resource",
        "id": "http://resourceurl/X2/" }},
      {"object": {

```

```

        "objectType": "resource",
        "id": "http://resourceurl/XN/" } } ],
    "content": "Resource @ URL X was created by combining resources, X1, X2, ... XN"
  } } }

```

Statement: Resource @ X was created by taking component_x from lesson_plan_1 and adding it to lesson_plan_2.

Note: In the example shown, the lesson plan is the object of the activity.

```

{
  "doc_type": "resource_data",
  "doc_version": "0.50.0",
  "resource_data_type": "paradata",
  "active": true,
  "identity": {
    "submitter_type": "user",
    "submitter": "<identity of the submitter - a string>",
    "digital_signature": { ... },
    "resource_locator": "http://resourceurl/resourceX/",
    "payload_placement": "inline",
    "payload_schema": ["LR Paradata 1.0"],
    "resource_data": {
      "activity": {
        "verb": {
          "action": "add resource",
          "context": {
            "objectType": "lesson plan",
            "description": ["lesson plan 1"]} },
          "object": "http://resourceurl/resourceX/",
          "related": [ {
            "object": {
              "id": "http://resourceurl/componentX/",
              "description": ["in lesson plan 2"] } } ],
          "content": "Resource @ X was created by taking component_x from lesson_plan_1 and adding it to lesson_plan_2"
        }
      }
    }
  }
}

```

Statement: Resource was favorited on the Brokers of Expertise educator portal by an educator of multiple grades and subjects on May 1, 2011.

Note: The information that the action took place on the Brokers of Expertise portal is implicit from the identity information in the resource data description and is not provided as the context of the activity.

Note: The example includes details of the educator not included in the statement.

```

{
  "doc_type": "resource_data",
  "doc_version": "0.50.0",
  "resource_data_type": "paradata",
  "active": true,

```

```

"identity": {
  "owner": "Public Broadcasting Service (U.S.)",
  "curator": "National Science Digital Library (NSDL)",
  "submitter": "Brokers of Expertise",
  "submitter_type": "agent",
  "signer": "Brokers of Expertise"},
"digital_signature": { ... },
"resource_locator": "http://www.pbs.org/teachers/mathline/concepts/space2/activity3.shtm",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
    "actor": {
      "objectType": "educator",
      "description": ["grade 7", "grade 8", "grade 9", "grade 10", "grade 11", "grade 12",
        "English-Language Arts", "Visual Arts & Performing Arts"]},
    "verb": {
      "action": "favorite",
      "date": "2011-05-01"},
    "object": {
      "id": "http://www.pbs.org/teachers/mathline/concepts/space2/activity3.shtm",
      "content": "Resource was favorited on the Brokers of Expertise educator portal by an educator of
        multiple grades and subjects on May 1 2011"
    }
  }
}
}
}
}

```

Statement: A comment was attached to this resource found at <http://myboe.org/go/resource/53> on the Brokers of Expertise educator portal by an educator of grade 4 at 9:12:01 UTC on June 6 2009.

Note: The information that the action took place on the Brokers of Expertise portal is implicit from the identity information in the resource data description and is not provided as the context of the activity.

Note: The educator has chosen not to share personally identifying information.

```

{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,
"identity": {
  "submitter": "Brokers of Expertise",
  "submitter_type": "agent",
  "signer": "Brokers of Expertise"},
"digital_signature": { ... },
"resource_locator": "http://www.pbs.org/teachers/mathline/concepts/space2/activity3.shtm",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
    "actor": {
      "objectType": "educator",

```

```

      "description": ["grade 4"]},
    "verb": {
      "action": "comment",
      "date": "2009-06-06T09:12:01Z",
      "comment": "A nice end of the year sort of activity or even through the year.Students used
        this within my fourth grade class to go ahead and write pages for their memory
        pages.They didn't even think of it as writing, which in a way is a success for some!
        To add to it, you can leave room for little pictures.It adds a nice touch."},
    "object": {
      "id":
"http://www.readwritethink.org/classroom-resources/lesson-plans/once-they-hooked-reel-995.html"},
    "content": "A comment was attached to this resource found at http://myboe.org/go/resource/53 on
      the Brokers of Expertise educator portal by an educator of grade 4 at 9:12:01 UTC on
      June 6 2009"
  }}}

```

Statement: Resource found at <http://myboe.org/go/resource/110599> was tagged with 4 terms on the Brokers of Expertise educator portal by an educator of multiple subjects at 9:12:00 local time on June 6 2009.

Note: In this example., the context of the activity shows that it happened on the Brokers of Expertise portal.

Note: The example includes details of the educator and the tags not included in the statement.

```

{
  "doc_type": "resource_data",
  "doc_version": "0.50.0",
  "resource_data_type": "paradata",
  "active": true,
  "identity": {
    "submitter": "Brokers of Expertise",
    "submitter_type": "agent",
    "signer": "Brokers of Expertise"},
  "digital_signature": { ... },
  "resource_locator": "http://www.pbs.org/teachers/mathline/concepts/space2/activity3.shtm",
  "payload_placement": "inline",
  "payload_schema": ["LR Paradata 1.0"],
  "resource_data": {
    "activity": {
      "actor": {
        "objectType": "educator",
        "description": ["Technology", "Science", "English-Language Arts"]},
      "verb": {
        "action": "tagged",
        "date": "2009-06-06T09:12:00",
        "context": "Brokers of Expertise Portal",
        "description": ["9 11", "911", "September 11th", "september 11"] },
      "object": {"id":
"http://www.readwritethink.org/classroom-resources/lesson-plans/once-they-hooked-reel-995.html"},

```

```
"content": "Resource found at http://myboe.org/go/resource/110599 was tagged with 4 terms on the Brokers of Expertise educator portal by an educator of multiple subjects at 9:12:00 local time on June 6 2009"
```

```
}}
```

Statement: Resource found at <http://myboe.org/go/resource/43766> was matched to the academic content standard with ID <http://purl.org/ASN/resources/S1010CC1> on the Brokers of Expertise educator portal by an educator of multiple grades and subjects on August 25, 2010.

Note: The example includes details of the educator not included in the statement.

```
{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,
"identity": {
  "submitter": "Brokers of Expertise",
  "submitter_type": "agent",
  "signer": "Brokers of Expertise"},
"digital_signature": { ... },
"resource_locator": "http://www.pbs.org/teachers/mathline/concepts/space2/activity3.shtm",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
    "actor": {
      "objectType": "educator",
      "displayName": "Mary Kay Monson",
      "url": "http://myboe.org/go/people/564",
      "description": ["English-Language Arts", "Early Childhood Education", "grade K", "grade 1", "grade 2", "grade 3", "grade 4", "grade 5"] },
    "verb": {
      "action": "aligned",
      "context": "Brokers of Expertise Portal",
      "date": "2010-08-25"},
    "related": [ {
      object: {
        "objectType": "academic standard",
        "id": "http://purl.org/ASN/resources/S1010CC1",
        "content": "Write brief narratives (e.g., fictional, autobiographical) describing an experience." } } ],
    "object": {"id":
"http://www.readwritethink.org/classroom-resources/lesson-plans/once-they-hooked-reel-995.html"},
    "content": "Resource found at http://myboe.org/go/resource/43766 was matched to the academic content standard with ID http://purl.org/ASN/resources/S1010CC1 on the Brokers of Expertise educator portal by an educator of multiple grades and subjects on August 25, 2010"
```

```
}}
```

Statement: Resource found at <http://myboe.org/go/resource/12504> was matched to 2 academic content standards on the Brokers of Expertise educator portal by the Brokers of Expertise Standards Matching Team on August 25, 2010.

Note: The statement is expressed in two separate activities.

```
{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,
"identity": {
  "submitter": "Brokers of Expertise",
  "submitter_type": "agent",
  "signer": "Brokers of Expertise"},
"digital_signature": { ... },
"resource_locator": "http://www.pbs.org/teachers/mathline/concepts/space2/activity3.shtm",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
    "actor": {
      "objectType": "group",
      "displayName": "Brokers of Expertise Standards Matching Group",
      "url": "http://myboe.org/go/groups/standards_matchers"},
    "verb": {
      "action": "aligned",
      "context": "Brokers of Expertise Portal",
      "date": "2010-08-25"},
    "related": [ {
      "object": {
        "objectType": "academic standard",
        "id": "http://purl.org/ASN/resources/S1021281",
        "content": "Edit and revise selected drafts to improve coherence and progression
          by adding, deleting, consolidating, and rearranging text." } },
      "object": {
        "id":
"http://www.readwritethink.org/classroom-resources/lesson-plans/once-they-hooked-reel-995.html"},
        "content": "Resource found at http://myboe.org/go/resource/12504 was matched to the academic
          content standard with ID http://purl.org/ASN/resources/S1021281 on the Brokers of
          Expertise educator portal by the Brokers of Expertise Standards Matching Team on August
          25, 2010"
      }
    ]
  }
}
}
}
```

```

"active": true,
"identity": {
  "submitter": "Brokers of Expertise",
  "submitter_type": "agent",
  "signer": "Brokers of Expertise"},
"digital_signature": { ... },
"resource_locator": "http://www.pbs.org/teachers/mathline/concepts/space2/activity3.shtm",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
    "actor": {
      "objectType": "group",
      "displayName": "Brokers of Expertise Standards Matching Group",
      "url": "http://myboe.org/go/groups/standards_matchers"},
    "verb": {
      "action": "aligned",
      "context": "Brokers of Expertise Portal",
      "date": "2010-08-25"},
    "related": [ {
      "object": {
        "objectType": "academic standard",
        "id": "http://purl.org/ASN/resources/S1010CC1",
        "content": "Write narratives: a) Provide a context within which an action takes
place.
b) Include well chosen details to develop the plot. c) Provide insight into why the
selected incident is memorable." } } ],
      "object": {
        "id":
"http://www.readwritethink.org/classroom-resources/lesson-plans/once-they-hooked-reel-995.html",
        "content": "Resource found at http://myboe.org/go/resource/12504 was matched to the academic
content standard with ID http://purl.org/ASN/resources/S1010CC1 on the Brokers of
Expertise educator portal by the Brokers of Expertise Standards Matching Team on August
25, 2010"
      }
    }
  }
}

```

Aggregate Usage Paradata

Statement: Resource @ URL X was viewed on a detail page 2200 times over the month of May 2011.

```

{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,
"identity": {
  "submitter_type": "user",
  "submitter": "<identity of the submitter - a string>"},

```

```

"digital_signature": { ... },
"resource_locator": "http://resourceurl/resourceX/",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
    "verb": {
      "action": "viewed",
      "measure": {
        "measureType": "count",
        "value": 2200},
      "context": "detail page",
      "date": "2011-05-01/2011-05-31"},
    "object": "http://resourceurl/resourceX/",
    "content": "Resource @ URL X was viewed on a detail page 2200 times over the month of May 2011"
  }
}
}
}

```

Statement: Resource @ URL X was rated an average of 4.4 out of 5 stars by 2104 users who specialize with English learning students over the month of May 2011 on the learning management system run by NSDL.

Note: The example shows the number of users performing the action as part of the details of the action.

```

{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,
"identity": {
  "submitter_type": "user",
  "submitter": "<identity of the submitter - a string>",
"digital_signature": { ... },
"resource_locator": "http://resourceurl/resourceX/",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
    "actor": {
      "description": ["English learning students"]},
    "verb": {
      "action": "rated",
      "measure": {
        "measureType": "star average",
        "value": 4.4,
        "scaleMin": 1,
        "scaleMax": 5,
        "sampleSize": 2104},
      "context": {

```

```

        "objectType": "LMS",
        "id": "http://NSDLLMSURL/",
        "date": 2011-05-01/2011-05-31",
        "object": "http://resourceurl/resourceX/",
        "content": "Resource @ URL X was rated an average of 4.4 out of 5 stars by 2104 users who
        specialize with English learning students over the month of May 2011 on the learning management
        system run by NSDL"
    }
}
}

```

Statement: The Resource @ URL X was aligned to Common Core Learning Objective xyz by 15 users of the learning management system sold by Agilix.

```

{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,
"identity": {
    "submitter_type": "user",
    "submitter": "<identity of the submitter - a string>",
"digital_signature": { ... },
"resource_locator": "http://resourceurl/resourceX/",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
    "activity": {
    "actor": {
        "description": ["user", "Agilix LMS"]},
    "verb":{
        "action": "aligned",
        "context": {
            "objectType": "curriculum",
            "id": "http://commoncoreXYZURL/",
            "description"" "Common Core Objective XYZ"},
        "measure": {
            "measureType": "count",
            "value": 15}},
        "object": "http://resourceurl/resourceX/",
        "content": "The Resource @ URL X was aligned to Common Core Learning Objective xyz by 15
        users of the learning management system sold by Agilix"
    }
}
}
}

```

Statement: Resource @ URL X was used by 20 teachers in country 1.

```

{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,

```

```

"identity": {
  "submitter_type": "user",
  "submitter": "<identity of the submitter - a string>",
"digital_signature": { ... },
"resource_locator": "http://resourceurl/resourceX/",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
  "actor": {
    "objectType": "teacher",
    "measure": {
      "measureType": "count",
      "value": 20}},
  "verb": {
    "action": "used",
    "context": "Country 1",
    "object": "http://resourceurl/resourceX/",
    "content": "Resource @ URL X was used by 20 teachers in country 1"
  }}}

```

Statement: Resource @ URL X was adopted by 2 sixth grade teachers.

```

{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,
"identity": {
  "submitter_type": "user",
  "submitter": "<identity of the submitter - a string>",
"digital_signature": { ... },
"resource_locator": "http://resourceurl/resourceX/",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
  "actor": {
    "objectType": "teacher",
    "description": ["6th grade"],
    "measure": {
      "measureType": "count",
      "value": 2}},
  "verb": "adopted",
  "object": "http://resourceurl/resourceX/",
  "content": "Resource @ URL X was adopted by 2 sixth grade teachers"
  }}}

```

Statement: Resource @ URL X is favorited on Twitter by 13742 University of Wisconsin students.

```
{
  "doc_type": "resource_data",
  "doc_version": "0.50.0",
  "resource_data_type": "paradata",
  "active": true,
  "identity": {
    "submitter_type": "user",
    "submitter": "<identity of the submitter - a string>",
  },
  "digital_signature": { ... },
  "resource_locator": "http://resourceurl/resourceX/",
  "payload_placement": "inline",
  "payload_schema": ["LR Paradata 1.0"],
  "resource_data": {
    "activity": {
      "actor": {
        "objectType": "student",
        "description": ["University of Wisconsin"],
        "measure": {
          "measureType": "count",
          "value": 13742},
      },
      "verb": {
        "action": "favorited",
        "context": "Twitter",
        "object": "http://resourceurl/resourceX/",
        "content": "Resource @ URL X is favorited on Twitter by 13742 University of Wisconsin students"
      }
    }
  }
}
```

Assertions about Objects

Statement: Organization A asserts Resource @ URL X supercedes Resource @ URL Y.

```
{
  "doc_type": "resource_data",
  "doc_version": "0.50.0",
  "resource_data_type": "paradata",
  "active": true,
  "identity": {
    "submitter_type": "user",
    "submitter": "<identity of Organization X>",
  },
  "digital_signature": { ... },
  "resource_locator": "http://resourceurl/resourceX/",
  "payload_placement": "inline",
  "payload_schema": ["LR Paradata 1.0"],
  "resource_data": {
    "activity": {
      "verb": "superceded",
      "object": "http://resourceurl/resourceX/",
    }
  }
}
```

```
    "related": ["http://resourceurl/resourceY/"]
  }
}
```

Statement: Organization A asserts Resource @ URL X is out of date (as of May 1 2011).

```
{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,
"identity": {
  "submitter_type": "user",
  "submitter": "<identity of Organization X>"},
"digital_signature": { ... },
"resource_locator": "http://resourceurl/resourceX/",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
    "verb": {
      "action": "out of date",
      "date": "2011-05-01"},
    "object": "http://resourceurl/resourceX/"
  }
}
}
```

Statement: Organization A asserts Resource @ URL X is identical to Resource @ URL Y.

Note: Selecting which item is the thing and which is the same is arbitrary.

```
{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,
"identity": {
  "submitter_type": "user",
  "submitter": "<identity of Organization X>"},
"digital_signature": { ... },
"resource_locator": "http://resourceurl/resourceX/",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
    "verb": "same as",
    "object": "http://resourceurl/resourceX/",
    "related": ["http://resourceurl/resourceY/"]
  }
}
}
```

Statement: Organization A asserts Resource @ URL X is similar to Resource @ URL Y.

Note: Selecting which item is the thing and which is similar is arbitrary.

```

{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,
"identity": {
    "submitter_type": "user",
    "submitter": "<identity of Organization X>",
"digital_signature": { ... },
"resource_locator": "http://resourceurl/resourceX/",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
    "activity": {
        "verb": "similar to",
        "object": "http://resourceurl/resourceX/",
        "related": ["http://resourceurl/resourceY/"]
    }
}
}
}

```

Statement: Organization A asserts Resource @ URL X is composed of Resources @ URL M, N, O.

```

{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,
"identity": {
    "submitter_type": "user",
    "submitter": "<identity of Organization X>",
"digital_signature": { ... },
"resource_locator": "http://resourceurl/resourceX/",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
    "activity": {
        "verb": "composed of",
        "object": "http://resourceurl/resourceX/",
        "related": ["http://resourceurl/resourceM/", "http://resourceurl/resourceN/",
        "http://resourceurl/resourceO/"]
    }
}
}
}

```

Statement: Organization A asserts Resource @URL X is an assessment of Resource @ URL Y.

```

{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,
"identity": {

```

```

    "submitter_type": "user",
    "submitter": "<identity of Organization X>",
    "digital_signature": { ... },
    "resource_locator": "http://resourceurl/resourceX/",
    "payload_placement": "inline",
    "payload_schema": ["LR Paradata 1.0"],
    "resource_data": {
      "activity": {
        "verb": "assessment of",
        "object": "http://resourceurl/resourceX/",
        "related": [ {
          "object": {
            "objectType": "assessment",
            "id": "http://resourceurl/resourceO" } } ]
      }
    }
  }
}

```

Statement: Organization A submits statement that Resource @ URL X is no longer available.

Note: Who submitted the statement is part of the resource document and not part of the activity.

```

{
  "doc_type": "resource_data",
  "doc_version": "0.50.0",
  "resource_data_type": "paradata",
  "active": true,
  "identity": {
    "submitter_type": "user",
    "submitter": "<identity of Organization X>",
    "digital_signature": { ... },
    "resource_locator": "http://resourceurl/resourceX/",
    "payload_placement": "inline",
    "payload_schema": ["LR Paradata 1.0"],
    "resource_data": {
      "activity": {
        "verb": "not available",
        "object": "http://resourceurl/resourceX/"
      }
    }
  }
}

```

Statement: Organization A submits statement that Node N is emitting spam.

Note: Who submitted the statement is part of the resource document and not part of the activity.

```

{
  "doc_type": "resource_data",
  "doc_version": "0.50.0",
  "resource_data_type": "paradata",
  "active": true,
  "identity": {
    "submitter_type": "user",
    "submitter": "<identity of Organization X>",
    "digital_signature": { ... },

```

```

"resource_locator": "NodeID",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
    "verb": "spamming",
    "object": {
      "objectType": "node",
      "id": "NodeNID"}
    }
  }
}

```

Statement: Organization A submits statement that Node N is compromised.

Note: Who submitted the statement is part of the resource document and not part of the activity.

```

{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,
"identity": {
  "submitter_type": "user",
  "submitter": "<identity of Organization X>"},
"digital_signature": { ... },
"resource_locator": "NodeID",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
    "verb": "compromised",
    "object": {
      "objectType": "node",
      "id": "NodeNID"}
    }
  }
}

```

Statement: Organization A asserts identity I cannot be verified.

Note: A weight indicating falsehood of the verification is part of the resource document.

```

{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,
"identity": {
  "submitter_type": "user",
  "submitter": "<identity of Organization X>"},
"digital_signature": { ... },
"resource_locator": "IdentityI",
"weight": -100,
"payload_placement": "inline",

```

```
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
    "verb": "verified",
    "object": {
      "objectType": "identity",
      "id": "IdentityI"}
    }
  }
}
```

Statement: Organization A asserts identity I is fake.

```
{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,
"identity": {
  "submitter_type": "user",
  "submitter": "<identity of Organization X>",
"digital_signature": { ... },
"resource_locator": "IdentityI",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
    "verb": "fake",
    "object": {
      "objectType": "identity",
      "id": "Identity I"}
    }
  }
}
```

Statement: Organization A asserts Document D has been deleted.

```
{
"doc_type": "resource_data",
"doc_version": "0.50.0",
"resource_data_type": "paradata",
"active": true,
"identity": {
  "submitter_type": "user",
  "submitter": "<identity of Organization X>",
"digital_signature": { ... },
"resource_locator": "documentDID",
"payload_placement": "inline",
"payload_schema": ["LR Paradata 1.0"],
"resource_data": {
  "activity": {
    "verb": "deleted",
    "object": {
```

```

    "objectType": "document",
    "id": "documentDID"}
  }}}

```

Activity Streams Interoperability

If you have data in the activity stream JSON serialization, you can insert it “as is” as the payload in a resource document. The value of "payload_schema" should be "JSON Activity Streams 1.0"

To recast activity stream JSON into the proposed format, convert the **target** object to a sub-object of **verb** called **context**. The structure of the **target** object is not changed, only its placement and name change. No changes need be made to other objects. No data is lost.

To recast the proposed format into the activity stream JSON, several transforms are needed. One possible set of transforms is:

- If the value of **actor** is a string (not an object), create a sub-object of **actor** called **description** and make its value the string. (If **actor** is an object, no changes are needed.)
- If the **actor** is missing, use one of the non empty values from **identity**: **curator**, **owner** or **submitter**, in that order as the value of the **id** property of **actor**.
- If the value of **object** is a string (not an object), create a sub-object of **object** called **description** and make its value the string. (If **object** is an object, no changes are needed.)
- If the **object** is missing, use the value of **resource_locator** as the value of the **id** property of **object**.
- If the value of **verb** is an object, make the value of **verb** the value of the **action** property (the string value) and promote all of the other parts of the object (**description**, **measure**, ...) to top level objects in the **activity**.

No other changes are needed. No data is lost.

Change Log

Version	Date	Author	Description
1.1	20110911	DR,AS,SM	Initial version. Archive Copy
2.0	20111025	DR,SM, JH	Restructured model to combine target and context and reduce to 4 top level elements (actor, action, object, relations) each of which has 3 subobjects (date, measure, attributes
2.0.1	20111109	DR	Editorial