Handling Optimistic Concurrency with ETags

Concurrency becomes an issue in high-volume systems with multiple clients accessing the same data. An Ed-Fi REST API can support an opt-in optimistic concurrency model[15] using ETags. During PUT and DELETE operations, the API will verify that the resource has not been modified by another party since it was last obtained by the client. If the resource has not changed, the operation will continue normally. If, however, the resource has changed, clients will receive an error as notification that they *must* obtain the latest version of the resource before attempting further modifications. This approach can be used to prevent "last-in-wins" update scenarios and related potential data loss.

When ETag-enabled systems respond to a GET request for an individual resource (for example, /students/{id}), the response header returned by the API must contain an ETag that uniquely identifies the version of the resource.

The following is an example response header:

```
ETag: "-8588261538364775808"
Content-Type: application/json; charset=utf-8
Cache-Control: private
Content-Length: 1398
```

The following is the body in a GET response corresponding to the example header above:

```
{
        "schoolId":12345,
        "classPeriodName":"4th Period",
        "classroomIdentificationCode":"abcde",
        "localCourseCode":"Math 101",
        "termTypeId":1,
        "schoolYear":2012,
        "uniqueSectionCode":"3FJ56",
        "sequenceOfCourse":1,
        "availableCredit":1.5
}
```

To opt-in to an optimistic update, the ETag value is added to an "If-Match" header of a subsequent PUT or DELETE request, and the operation will be processed only if the If-Match header value matches the latest ETag for the resource stored on the server.

If the ETags do not match, a 412 (Precondition Failed) response code will be returned. If the If-Match header is not specified in the request, then the operation *must* be processed and the server *must* respond with a response code of 204 (No Content) if the operation succeeds. However, the API *may* be implemented to require optimistic concurrency for updates and deletes, and if no If-Match request header is supplied by the client, it *must* respond with a general 400 Bad Request error status code.

For example, here is a header value in a PUT or DELETE request:

```
If-Match: -8588261538364775808
```

The ETag *should* be generated as a hashed representation of the resource, but it *may* be implemented as a version number, a timestamp representing the last modification to the resource, or a unique identifier that is refreshed after each modification to the resource.

---

[15] See here for a definition and links to further reading.

API Guidelines Contents

Find out more about the Ed-Fi API Design & Implementation Guidelines: