Web 2.0
Lecture 5: Data Structures – Atom and AtomPub

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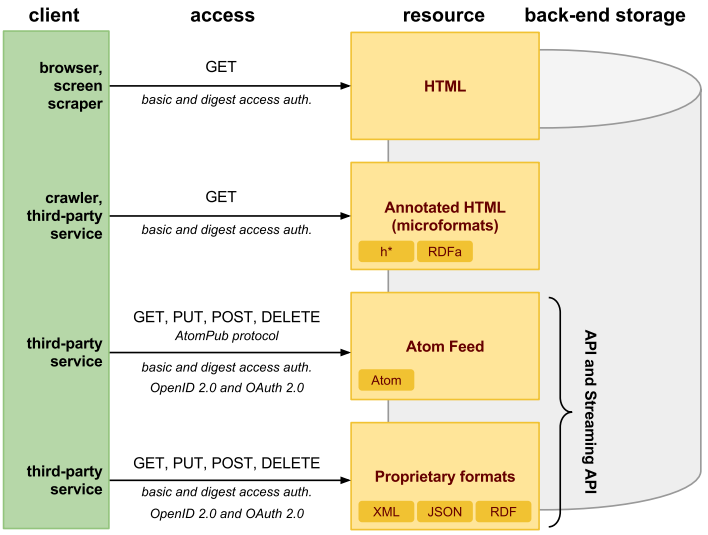
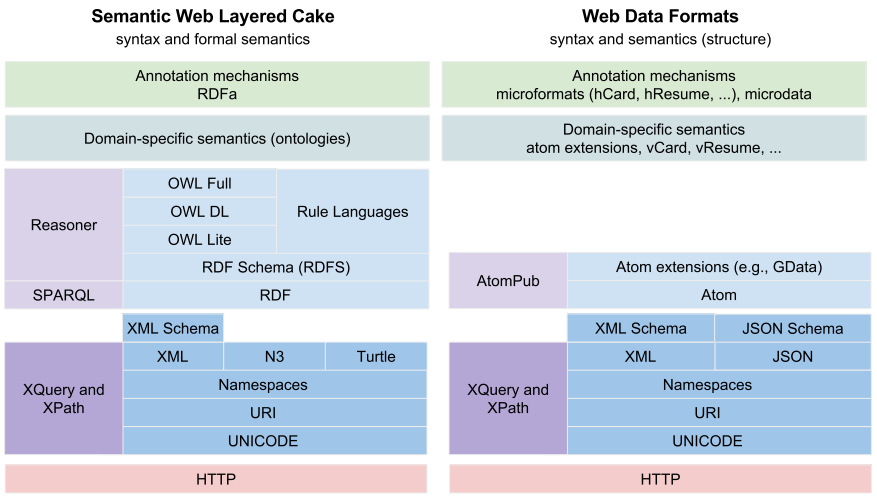
Overview

- Overview of Formats and Protocols
- Atom Syndication Format
- AtomPub Protocol

Data on the Web



Data Syntax, Structure and Semantics



Atom Standard

- A need for a standard syndication format
  - *machine-processable Web site content*
  - *Alternative to RSS*
    - → *RSS spec does not say how to encode content, strings only ASCII-encoded, not clearly defined meaning of RSS elements, etc.*
    - → *See RSS Flaws*
- IETF Atom Publishing Format and Protocol WG
  - *RFC 4287: Atom Syndication Format*
  - *RFC 5023: Atom Publishing Protocol*
- Adoption
  - *Google: Google Data Protocol (GData)*
  - *Microsoft: Open Data Protocol (OData)*

Overview

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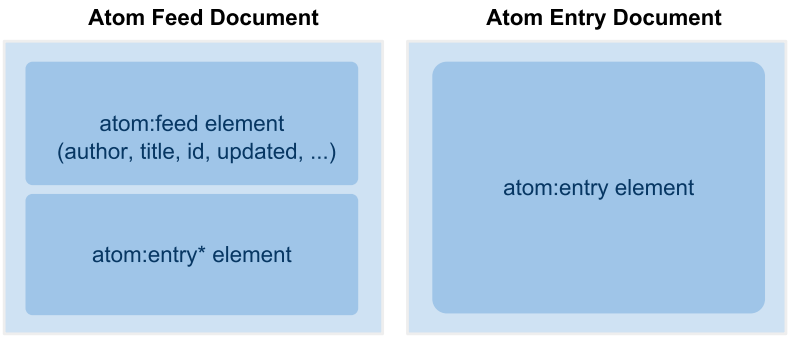
Atom Syndication Format



- Two types of atom documents
  - *Atom Feed Document*
    - → *represents an atom feed, its metadata and some or all entries associated with it.*
  - *Atom Entry Document*
    - → *represents exactly one entry, outside of context of atom feed*

Atom Syndication Format

- Atom Feed Document Example

```
1  <?xml version="1.0" encoding="utf-8"?>
2  <feed xmlns="http://www.w3.org/2005/Atom">
3
4    <title>Example Feed</title>
5    <link href="http://example.org/"/>
6    <updated>2003-12-13T18:30:02Z</updated>
7    <author>
8      <name>John Doe</name>
9    </author>
10   <id>urn:uuid:60a76c80-d399-11d9-b93C-0003939e0af6</id>
11
12   <entry>
13     <title>Example feed title</title>
14     <link href="http://example.org/2003/12/13/atom03"/>
15     <id>urn:uuid:1225c695-cfb8-4ebb-aaaa-80da344efa6a</id>
16     <updated>2003-12-13T18:30:02Z</updated>
17     <summary>Some text</summary>
18   </entry>
19 </feed>
```

Atom Elements – Atom Feed

- Specification
  - *defined as XML information set, serialized as XML 1.0*
  - *must be well-formed, no DTD/Schema → no requirements to be valid.*
- `atom:feed` element

  `(*)`: *zero or more occurencies – repeating fields*

  `(?)`: *zero or one occurence – non-repeating fields*

  `( )`: *exactly one occurence – non-repeating fields*

```
1  atomFeed =
2      element atom:feed {
3        atomCommonAttributes,
4          (atomAuthor*
5          & atomCategory*
6          & atomContributor*
7          & atomGenerator?
8          & atomIcon?
9          & atomId
10         & atomLink*
11         & atomLogo?
12         & atomRights?
13         & atomSubtitle?
14         & atomTitle
15         & atomUpdated
16         & extensionElement*),
17       atomEntry*
18     }
```


Atom Elements – Atom Entry

- `atom:entry` element

  `(*)`: *zero or more occurencies – repeating fields*

  `(?)`: *zero or one occurence – non-repeating fields*

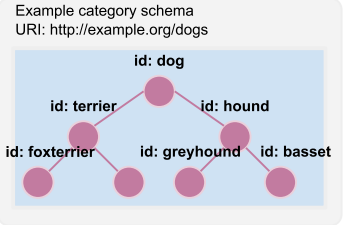
  `( )`: *exactly one occurence – non-repeating fields*

```
1  atomEntry =
2       element atom:entry {
3         atomCommonAttributes,
4           (atomAuthor*
5           & atomCategory*
6           & atomContent?
7           & atomContributor*
8           & atomId
9           & atomLink*
10          & atomPublished?
11          & atomRights?
12          & atomSource?
13          & atomSummary?
14          & atomTitle
15          & atomUpdated
16          & extensionElement*)
17     }
```

Pointers to other information

- URI identifier
  - *unique identification of things*
  - *feed/entry* id
  - author *and* contributor *(person uri)*
  - generator *(uri)*
  - category *schema (uri), term (uri)*
    example:

```
<category scheme="http://example.org/dogs"
  term="http://example.org/dogs#basset"
  label="Basset"/>
```



- Unambiguous identification of things using URIs
  - *Helps interoperability, can take advantage of wikipedia concepts*
    → *still not very common, will improve with linked data*

Atom Links

- Links to other Atom documents
  - *Atom defines simple link structure*
  - type *defines content type*
  - rel *defines relation to this resource*
    → *self, alternate, related, enclosure, via*
    → *standardized by IANA*
- Adoption by RESTful services
  - *Core for HATEOAS*
  - *Adopted in Link header, see Web Linking*
  - *More details in Lecture 4 – HATEOAS.*

Encoding Textual Content

- Plain text

```
<title type="text">
  Less: &lt;
</text>
```

  – *simple text, must not contain child elements*

- HTML

```
<title type="html">
  Less: &lt;em> &amp;lt; &lt;/em>
</text>
```

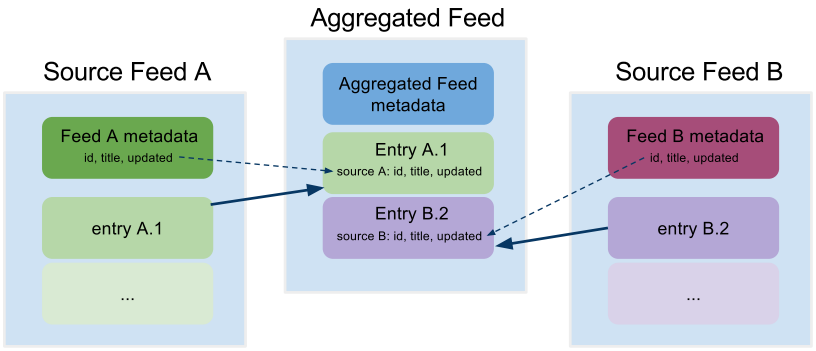
  – *html text, must not contain child elements*
  – *any markup must be escaped,*
  – *should be possible to display it as HTML inside* *element*

- XHTML

```
<title type="xhtml" xmlns:x="http://www.w3.org/1999/xhtml">
  <x:div>Less: <x:em> &amp;lt; </x:em></x:div>
</text>
```

  – *the value is a single xhtml* *element, not part of the*

Aggregation



  – *Atom feed may include entries from another atom feed*
    → *these entries do not originally belong to this feed*
  – source *element should contain at least:*
    → *required atom feed's metadata* id, title *and* updated
  – *retains information about an entry's source feed*

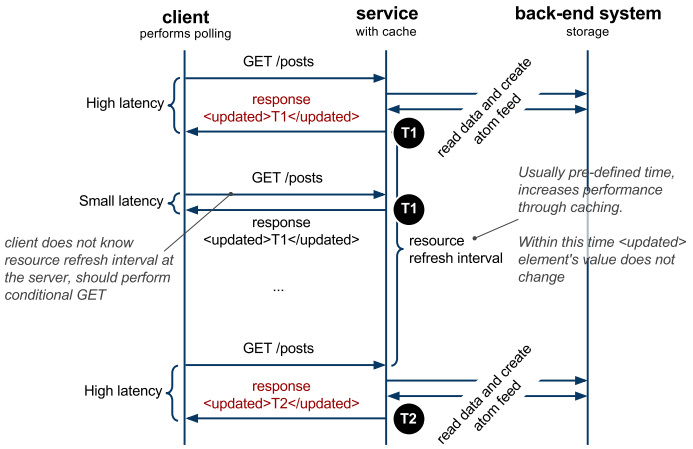
Data and Time

- Notion of time
  - *Atom document is a snapshot of resource in some time*
  - `updated` *(feed, entry) – last update of the resource*
  - `published` *(entry) – initial creation of the first availability of the resource*
- Data format
  - *Examples:*

```
<updated>2003-12-13</updated>
<updated>2003-12-13T18:30:02.25Z</updated>
<updated>2003-12-13T18:30:02.25+01:00</updated>
```

`T` *– time delimiter*
`Z` *– identifies UTC time (~GMT)*
`(+|-)hh:mm` *– defines local time and a shift in hours and minutes from the UTC time*

Polling



- `updated` *is the last updated time of the resource at the server*
- *resource refresh interval is pre-defined by the serice*

Extensions

- Possible to combine various vocabularies
  - *through namespaces* xmlns *attribute, extensions of* link.rel *attribute*
- Example: GData (PicasaWeb, Docs, ...)
  - *combines vocabularies such as Geo location*

```
1  <?xml version='1.0' encoding='UTF-8'?>
2  <feed xmlns='http://www.w3.org/2005/Atom' xmlns:gml='http://www.opengis.net/gml'
3    xmlns:gphoto='http://schemas.google.com/photos/2007'
4    xmlns:georss='http://www.georss.org/georss'>
5      <id>http://picasaweb.google.com/.../albumid/5262593967320034641</id>
6      <updated>2010-02-25T20:47:53.295Z</updated>
7      <category
8        scheme='http://schemas.google.com/g/2005#kind'
9        term='http://schemas.google.com/photos/2007#album' />
10     <title type='text'>Památkově chráněný dům v Loukově</title>
11     <link rel='http://schemas.google.com/g/2005#feed' type='application/atom+xml'
12      href='http://picasaweb.google.com/.../albumid/5262593967320034641?hl=en_US' />
13     <link rel='http://schemas.google.com/photos/2007#slideshow'
14      type='application/x-shockwave-flash'
15      href='https://picasaweb.google.com/s/c/bin/slideshow.swf?...' />
16     <georss:where>
17       <gml:Point>
18         <gml:pos>50.5576865 15.0356436</gml:pos>
19       </gml:Point>
20     </georss:where>
21     <gphoto:allowPrints>true</gphoto:allowPrints>
22     ...
23 </feed>
```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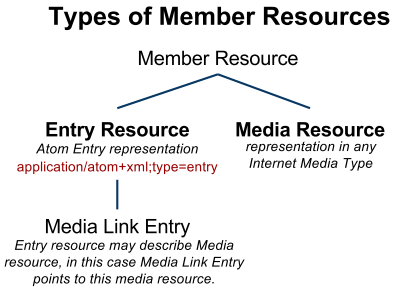
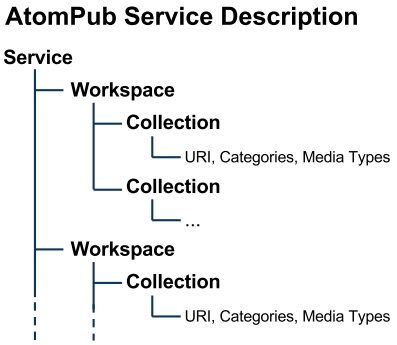
- AtomPub Protocol
  - *Extensions*

AtomPub Protocol

- Standard protocol for manipulation of resources
  - *Defines a service description by following constructs*
    - → service – *a set of workspaces*
    - → workspace – *a set of collections*
    - → collection – *a set of resources*
  - *Defines protocol for editing, that is: creating (POST), updating (PUT), reading (GET), deleting (DELETE)*
- Relation to Atom Syndication Format
  - *Atom Feed and Atom Entry as resource representations*
- Basis for many, such as:
  - *Google Data Protocol (GData)*
  - *Microsoft Open Protocol (OData)*

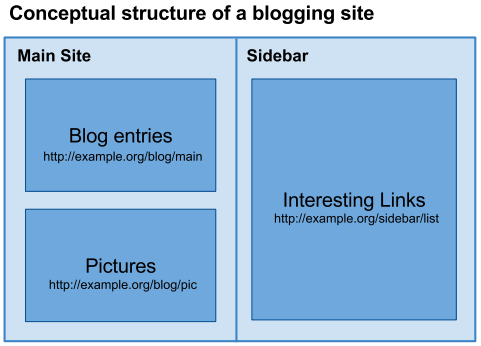
AtomPub Elements





- Collection properties and definition of constraints
  - URI – *id of the collection (Atom Feed)*
  - categories – *list of allowed categories in the collection*
  - accept – *list of Internet media types allowed in the collection*
  - ***URI points to an Atom Feed resource!***

Example Blogging Site Description



- Workspaces
  - *Main Site, Sidebar*
- Collections
  - *Blog entries, pictures, interesting links*

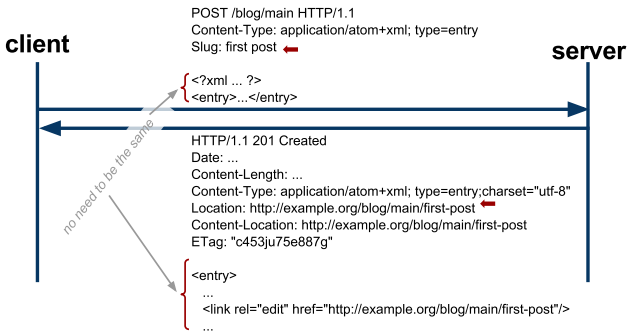
Example Blogging Site Description

```
<?xml version='1.0' encoding='UTF-8'?>
<service xmlns="http://www.w3.org/2007/app"
  xmlns:atom="http://www.w3.org/2005/Atom">
 <workspace>
  <atom:title>Main Site</atom:title>
  <collection href="http://example.org/blog/main">
   <atom:title>Blog Entries</atom:title>
   <categories
    href="http://example.com/cats" />
  </collection>
  <collection href="http://example.org/blog/pic" >
   <atom:title>Pictures</atom:title>
   <accept>image/png</accept>
   <accept>image/gif</accept>
  </collection>
 </workspace>
 <workspace>
  <atom:title>Sidebar</atom:title>
  <collection href="http://example.org/blog/sidebar" >
   <atom:title>Interesting Links</atom:title>
   <accept>application/atom+xml;type=entry</accept>
   <categories fixed="yes">
    <atom:category
     scheme="http://example.org/cats"
     term="http://example.org/cats#joke" />
    <atom:category
     scheme="http://example.org/cats"
     term="http://example.org/cats#serious" />
   </categories>
  </collection>
 </workspace>
</service>
```

Protocol Operations

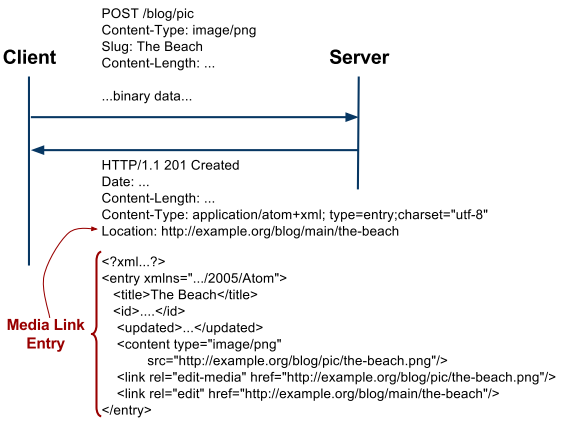
- Operations to manipulate resources
  - *Retrieving a service document (is obvious, GET)*
  - *Listing collection members (filtering and projections)*
  - *Creating a resource (entry and media)*
  - *Editing a resource (is obvious, PUT and DELETE)*
- AtomPub **does not define:**
  - *Any manipulation with*
    - → *service documents, workspaces and collections*
  - *How service documents are discovered*
- AtomPub may be used w/o service descriptions
  - *They're good for discovering constraints on the service*
  - *They're not a requirement*
  - *For example, GData does not have them*

Creating Entry Resource



- *Server checks constraints of the collection*
- *Server may modify member representation*
  - → *such as changes* `id`*, adds* `updated` *element*
- *if* `Content-Location` *is not equal to* `Location` *the request and response representation are not the same!*
- `ETag` *should be used for*
  - → *conditional GET and PUT (see lecture 4 – scalability)*

Creating Media Resource



- *Server checks the constraints of the collection*
  - → *may return* 415 Unsupported Media Type *if not accepted*
- *Media Link Entry is an Entry resource that describes metadata about media resource (such as a picture)*

Listing Collection

- Must provide representation in Atom Feed
- Contains list of Atom Entry elements
  - *must have* link *with attribute* edit
  - *must have* edited*, order of entries by this date*
    - → *is not the same as* Last-Modified *header*
- Entries in collection are not full representations
  - *clients should retrieve them using GET on entry URI*
- To limit amount of entries
  - *links with semantics for navigation through the whole list*

```
1 <feed xmlns="http://www.w3.org/2005/Atom">
2   <link rel="first"    href="http://example.org/blog/main/" />
3   <link rel="previous" href="http://example.org/blog/main/3" />
4   <link rel="self"     href="http://example.org/blog/main/4" />
5   <link rel="next"     href="http://example.org/blog/main/5" />
6   <link rel="last"     href="http://example.org/blog/main/10" />
7 </feed>
```

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Extensions

- OpenSearch
  - *Specification: OpenSearch*
  - *Search service description and search results*
- Google Data Protocol
  - *Filtering, partial response and partial update*
  - *Entity tag attribute for* `<feed>` *and* `<entry>` *elements*
  - *HTTP methods overriding*

OpenSearch

- Open Search Specification
  - ***Open Search Description Document (OSDD)***
    → *description of a search service*
  - ***OpenSearch Response Document***
    → *Standard description of search results by search services*
    → *extension of syndication formats, RSS and Atom*
- Adoption
  - *Browsers such as IE, Google Chrome – search engines you can use to search various sites.*
  - *APIs such as Bing API, Google Docs, etc. – description of search results.*

OpenSearch Description Document

- Example:

```
1  <?xml version="1.0" encoding="UTF-8"?>
2  <OpenSearchDescription xmlns="http://a9.com/-/spec/opensearch/1.1/">
3    <ShortName>Web Search</ShortName>
4    <Description>Use Example.com to search the Web.</Description>
5    <Tags>example web</Tags>
6    <Contact>admin@example.com</Contact>
7    <Url type="application/atom+xml"
8         template="http://example.com/?q={searchTerms}&pw={startPage?}&format=atom"/>
9    <Url type="application/rss+xml"
10        template="http://example.com/?q={searchTerms}&pw={startPage?}&format=rss"/>
11   <Url type="text/html"
12        template="http://example.com/?q={searchTerms}&pw={startPage?}"/>
13   <Image height="64" width="64" type="image/png">
14        http://example.com/websearch.png
15   </Image>
16   <Query role="example" searchTerms="cat" />
17   <Developer>Example.com Development Team</Developer>
18   <AdultContent>false</AdultContent>
19   <Language>en-us</Language>
20   <OutputEncoding>UTF-8</OutputEncoding>
21   <InputEncoding>UTF-8</InputEncoding>
22 </OpenSearchDescription>
```

  - `searchTerms` *is a free text*

OpenSearch Response Document

- Example:
  - *Result in Atom format of a search query*

```xml
<?xml version="1.0" encoding="UTF-8"?>
<feed xmlns="http://www.w3.org/2005/Atom"
      xmlns:opensearch="http://a9.com/-/spec/opensearch/1.1/">
  <title>Example.com Search: New York history</title>
  <updated>2003-12-13T18:30:02Z</updated>
  <author>
    <name>Example.com, Inc.</name>
  </author>
  <id>urn:uuid:60a76c80-d399-11d9-b93C-0003939e0af6</id>
  <opensearch:totalResults>4230000</opensearch:totalResults>
  <opensearch:startIndex>21</opensearch:startIndex>
  <opensearch:itemsPerPage>10</opensearch:itemsPerPage>
  <opensearch:Query role="request" searchTerms="New York History" />
  ...
  <link rel="search" type="application/opensearchdescription+xml"
        href="http://example.com/opensearchdescription.xml"/>
  <entry>
    <title>New York History</title>
    ...
  </entry>
</feed>
```


GData Protocol: Advanced Search Query

- OpenSearch does not specify syntax for search query
  - *It can be anything, free text*
  - *GData Protocol further allows for filtering and projection*
- Filtering
  - *Fine-grained conditions based on values of various elements*
    - → *such as* author, category, max-results, *min and max of* published *and* updated *elements.*

```
http://www.example.com/feeds/jo?q=Darcy&updated-min=2005-04-19T15:30:00Z
http://www.example.com/feeds?category=Fritz%7CLaurie // URL encoded OR
http://www.example.com/feeds?category=Fritz,CLaurie  // AND
```

- Partial Response (~Projection)
  - *Which elements of an entry should appear in the search result*
  - *A language based on XPath syntax (subset of a valid XPath expression)*

```
http://example.org/blog/main?fields=link,entry(@gd:etag,updated,link[@rel='edit']))
```

GData Protocol: Partial Update

- PATCH HTTP Method
  - *IETF specification, see PATCH Method for HTTP*
  - *Add, modify or delete selected elements of an entry*
- Examples
  - *To delete a description element and add a new title element*
  - gd:fields *uses partial response syntax*

```
PATCH /myFeed/1/1/
Content-Type: application/xml

<entry xmlns='http://www.w3.org/2005/Atom'
    xmlns:gd='http://schemas.google.com/g/2005'
    gd:fields='description'>
  <title>New title</title>
</entry>
```

- Rules
  - *Fields not already present are added*
  - *Non-repeating fields already present are updated*
  - *Repeating fields already present are appended*

GData Protocol: Entity Tags

- Resource Versioning
  - *Conditional GET and PUT (concurrencyl control)*
    - → *See Lecture 4 – scalability*
  - *Etgas on atom and entry elements*
- Example

```
GData-Version: 2.0
ETag: W/"C0QBRXcycSp7ImA9WxRVFUk."
...
<?xml version='1.0' encoding='utf-8'?>
<feed xmlns='http://www.w3.org/2005/Atom'
    xmlns:gd='http://schemas.google.com/g/2005'
    gd:etag='W/"C0QBRXcycSp7ImA9WxRVFUk."'>
  ...
  <entry gd:etag='"CUUEQX47eCp7ImA9WxRVEkQ."'>
    ...
  </entry>
</feed>

```

  - *It is possible to do a conditional GET/PUT on the entry by using the ETag* "CUUEQX47eCp7ImA9WxRVEkQ."

GData Protocol: HTTP Methods Overriding

- Firewall restrictions
  - *Some firewall configurations do not allow to send HTTP request other than GET and POST*
- HTTP methods overriding through POST

```
X-HTTP-Method-Override: PUT
X-HTTP-Method-Override: DELETE
X-HTTP-Method-Override: PATCH
```

- Example

```
1 POST /myfeed/1/1/
2 X-HTTP-Method-Override: PATCH
3 Content-Type: application/xml
4 ...
```