CMPE 282 Cloud Services
Web Services: SOAP and REST

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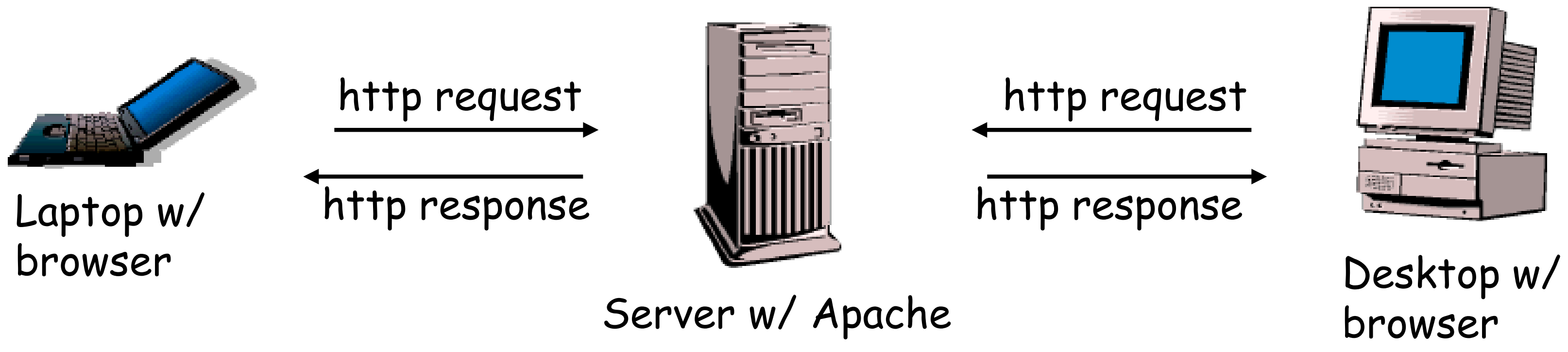
Content

- Web and HTTP
- Web Service and XML
- Web Service - SOAP
- RESTful Web Services

Introduction to HTTP



- HTTP: HyperText Transfer Protocol
  - Communication protocol between clients and servers
  - Application layer protocol for WWW
- Client/Server model:
  - Client: browser that requests, receives, displays object
  - Server: receives requests and responds to them
- Protocol consists of various operations
  - Few for HTTP 1.0 (RFC 1945, 1996)
  - Many more in HTTP 1.1 (RFC 2616, 1999)
  - Same format for both Request and Response: header + body

Request Generation

- User clicks on something
- Uniform Resource Locator (URL):
  - **`http://www.cnn.com`**
  - **`http://www.ucalgary.ca`**
  - **`https://www.google.com`**
  - **`ftp://ftp.kernel.org`**
- Different URL schemes map to different services
- Hostname is converted from a name to an IPv4 or IPv6 address (DNS lookup, if needed)
- Connection is established to server (TCP)

What Happens Next?

- Client downloads HTML document
  - Sometimes called “container page”
  - Typically in text format (ASCII)
  - Contains instructions for rendering
    (e.g., background color, frames)
  - Links to other pages
- Many have embedded objects:
  - Images: GIF, JPG (logos, banner ads)
  - Usually automatically retrieved
    - I.e., without user involvement
    - can control sometimes
      (e.g. browser options, junkbusters)

```
<html>
<head>
<meta name=“Author” content=“Erich
Nahum”>
<title>Linux Web Server Performance
</title>
</head>
<body text=“#00000”>
<img width=31 height=11
src=“ibmlogo.gif”>
<img src=“images/new.gif>
<h1>Hi There!</h1>
Here’s lots of cool linux stuff!
<a href=“more.html”>
Click here</a>
for more!
</body>
</html>
```

sample html file

Web Server Role

- Respond to client requests, typically a browser
- May have work to do on client's behalf:
  - Is the client's cached copy still good?
  - Is client authorized to get this document?
- Hundreds or thousands of simultaneous clients
- Many requests are in progress concurrently
- Hard to predict how many will show up on some day
- Server in a nutshell

```
initialize;
forever do {
  get request;
  process;
  send response;
  log request;
}
```

HTTP Request Format

```
GET /images/penguin.gif HTTP/1.0
User-Agent: Mozilla/0.9.4 (Linux 2.2.19)
Host: www.kernel.org
Accept: text/html, image/gif, image/jpeg
Accept-Encoding: gzip
Accept-Language: en
Accept-Charset: iso-8859-1,*,utf-8
Cookie: B=xh203jfsf; Y=3sdkfjej
<cr><lf>
```

- HTTP request header: typically in text
- Carriage-return and line-feed indicate end of headers
- Headers may communicate private information (browser, OS, cookie information, etc.)

Request Types

Called Methods:

- GET: retrieve a file (95% of requests)
- HEAD: just get meta-data (e.g., mod time)
- POST: submitting a form to a server
- PUT: store enclosed document as URI
- DELETE: removed named resource
- LINK/UNLINK: in 1.0, gone in 1.1
- TRACE: http “echo” for debugging (added in 1.1)
- CONNECT: used by proxies for tunneling (1.1)
- OPTIONS: request for server/proxy options (1.1)

Response Format

```
HTTP/1.0 200 OK
Server: Tux 2.0
Content-Type: image/gif
Content-Length: 43
Last-Modified: Fri, 15 Apr 1994 02:36:21 GMT
Expires: Wed, 20 Feb 2002 18:54:46 GMT
Date: Mon, 12 Nov 2001 14:29:48 GMT
Cache-Control: no-cache
Pragma: no-cache
Connection: close
Set-Cookie: PA=wefj2we0-jfjf
<cr><lf>
<data follows…>
```

- HTTP response header: text
- HTTP response body: text or binary

Response Status Code

- 1XX: Informational (def'd in 1.0, used in 1.1)

  `100 Continue,101 Switching Protocols`

- 2XX: Success

  `200 OK, 201 Created, 206 Partial Content`

- 3XX: Redirection

  `301 Moved Permanently, 304 Not Modified`

- 4XX: Client error

  `400 Bad Request, 403 Forbidden, 404 Not Found`

- 5XX: Server error

  `500 Internal Server Error, 503 Service Unavailable, 505 HTTP Version Not Supported`

Tools to capture HTTP Traffic

- Firefox
  - HttpFox
  - Web Developer -> Network
- IE
  - Developer Tool -> Network
  - HTTPWatch
- Chrome
  - Postman
- WireShark
- (many others)

Summary of Web and HTTP

- The major application on the Internet
  - Majority of traffic is HTTP (or HTTP-related)
- Client/server model:
  - Clients make requests, servers respond to them
  - Done mostly in ASCII text
- Various headers and commands
  - Too many to go into detail here
  - http://www.w3schools.com/
  - Many web books/tutorials exist (e.g., Krishnamurthy & Rexford 2001)

Web Service

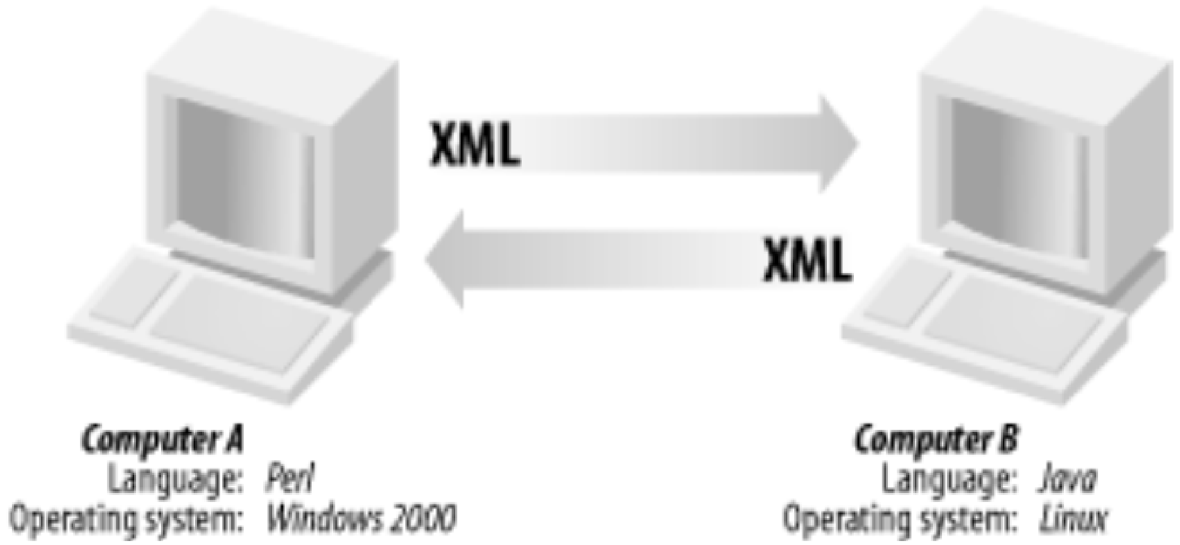
- Definition by W3C

  http://www.w3.org/TR/2004/NOTE-ws-gloss-20040211/#webservice

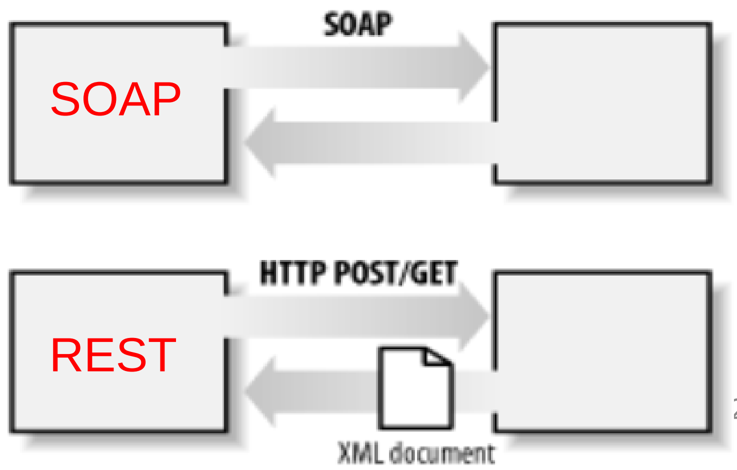
  a software system designed to support interoperable machine-to-machine interaction over a network. It has an interface described in a machine-processable format (specifically WSDL). Other systems interact with the Web service in a manner prescribed by its description using SOAP-messages, typically conveyed using HTTP with an XML serialization in conjunction with other Web-related standards.

XML and Web Service

- XML message exchange



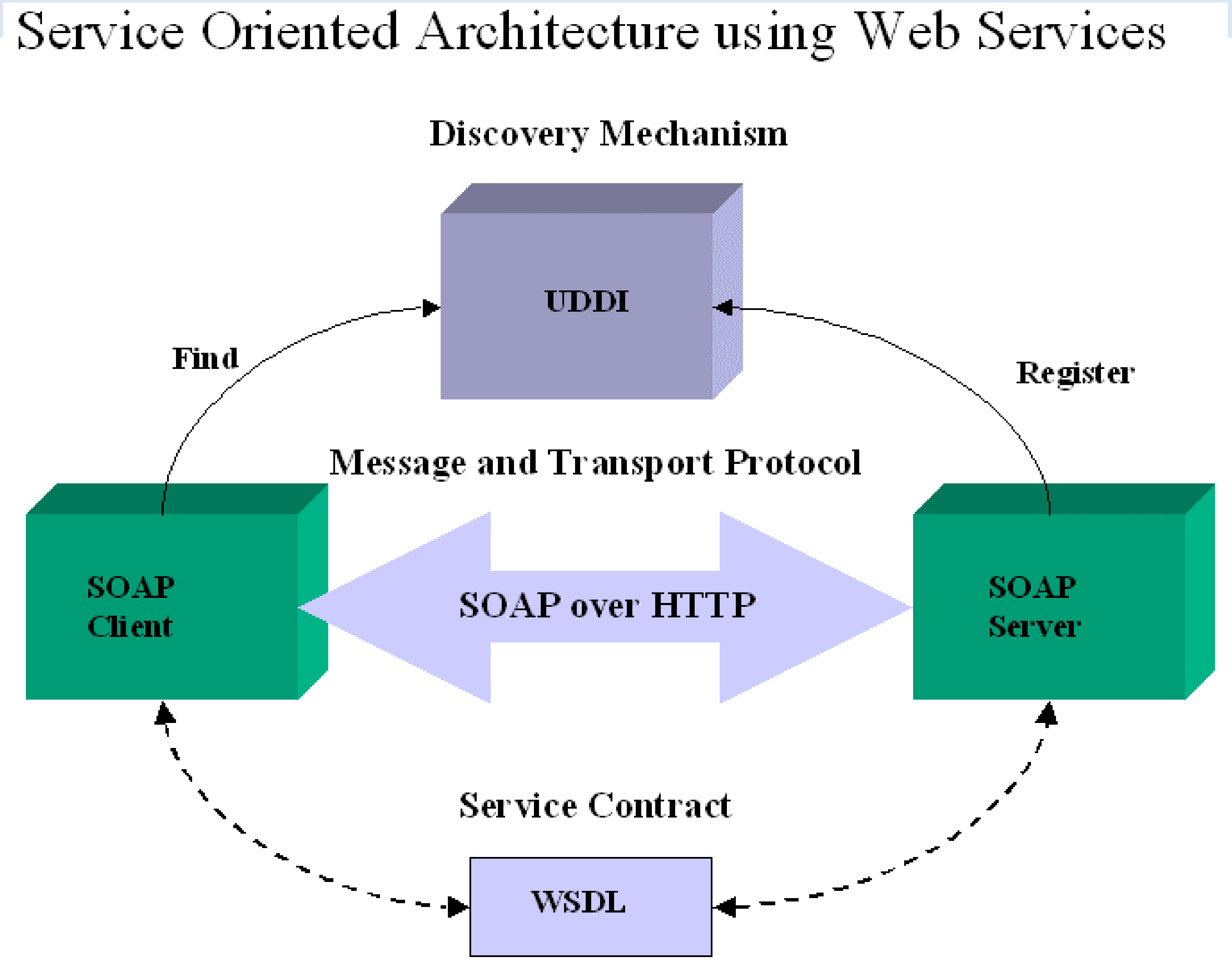
- Common Approaches
  - SOAP Web Service: XML
  - REST: XML, JSON, etc.
- Heavily used by SOA



Web Services (cont'd)

- Client / server architecture
  - Web server: accept / process request, produce response
  - Web client: send request, receive response
- Characteristics
  - Available on the internet
    - Transport: HTTP, etc
  - XML based request and response: SOAP - open protocols
    - Self contained, self describing
  - Publish: Uses XML to describe interfaces (WSDL, optional)
  - Discovery: Uses some registry for discovery (UDDI, optional)
  - Inter-op: platform/OS/language/application independent
  - Can be used by any app, can convert traditional app to web-app
  - Reusable application component
- http://www.w3.org/TR/ws-arch/
- http://www.w3schools.com/xml/xml_services.asp

Web Service Architecture



Components - SOAP

- SOAP: Simple Object Access Protocol
- Communication protocol over HTTP
  - XML-based message format
  - Via internet
- Platform / language independent
- Extensible
- No firewall issue
- W3C spec: http://www.w3.org/TR/soap/

SOAP request

```
POST /InStock HTTP/1.1
Host: www.example.org
Content-Type: application/soap+xml; charset=utf-8
Content-Length: nnn

<?xml version="1.0"?>

<soap:Envelope
  xmlns:soap="http://www.w3.org/2003/05/soap-envelope/"
  soap:encodingStyle="http://www.w3.org/2003/05/soap-
encoding">
  <soap:Body>
    <m:GetPrice
xmlns:m="http://www.w3schools.com/prices">
      <m:Item>Apple</m:Item>
    </m:GetPrice>
  </soap:Body>
</soap:Envelope>
```

SOAP response

```
HTTP/1.1 200 OK
Content-Type: application/soap+xml; charset=utf-8
Content-Length: nnn

<?xml version="1.0"?>

<soap:Envelope
  xmlns:soap="http://www.w3.org/2003/05/soap-envelope/"
  soap:encodingStyle="http://www.w3.org/2003/05/soap-
  encoding">
  <soap:Body>
    <m:GetPriceResponse
  xmlns:m="http://www.w3schools.com/prices">
      <m:Price>1.90</m:Price>
    </m:GetPriceResponse>
  </soap:Body>
</soap:Envelope>
```

Web Service Tools & Examples

- Tools:
  - soapUI (http://www.soapui.org/)
  - Firefox: HttpFox, REST Client
  - IE: HTTPWatch
  - WireShark
  - (many others)
- Examples
  - http://www.w3schools.com/xml/xml_services.asp
    - http://www.w3schools.com/xml/tempconvert.asmx
  - http://www.webservicex.net
    - http://www.webservicex.net/ConvertArea.asmx
  - http://geocoding.geo.census.gov/geocoder

Demo – browser

Demo – soapUI

RESTful Web Services

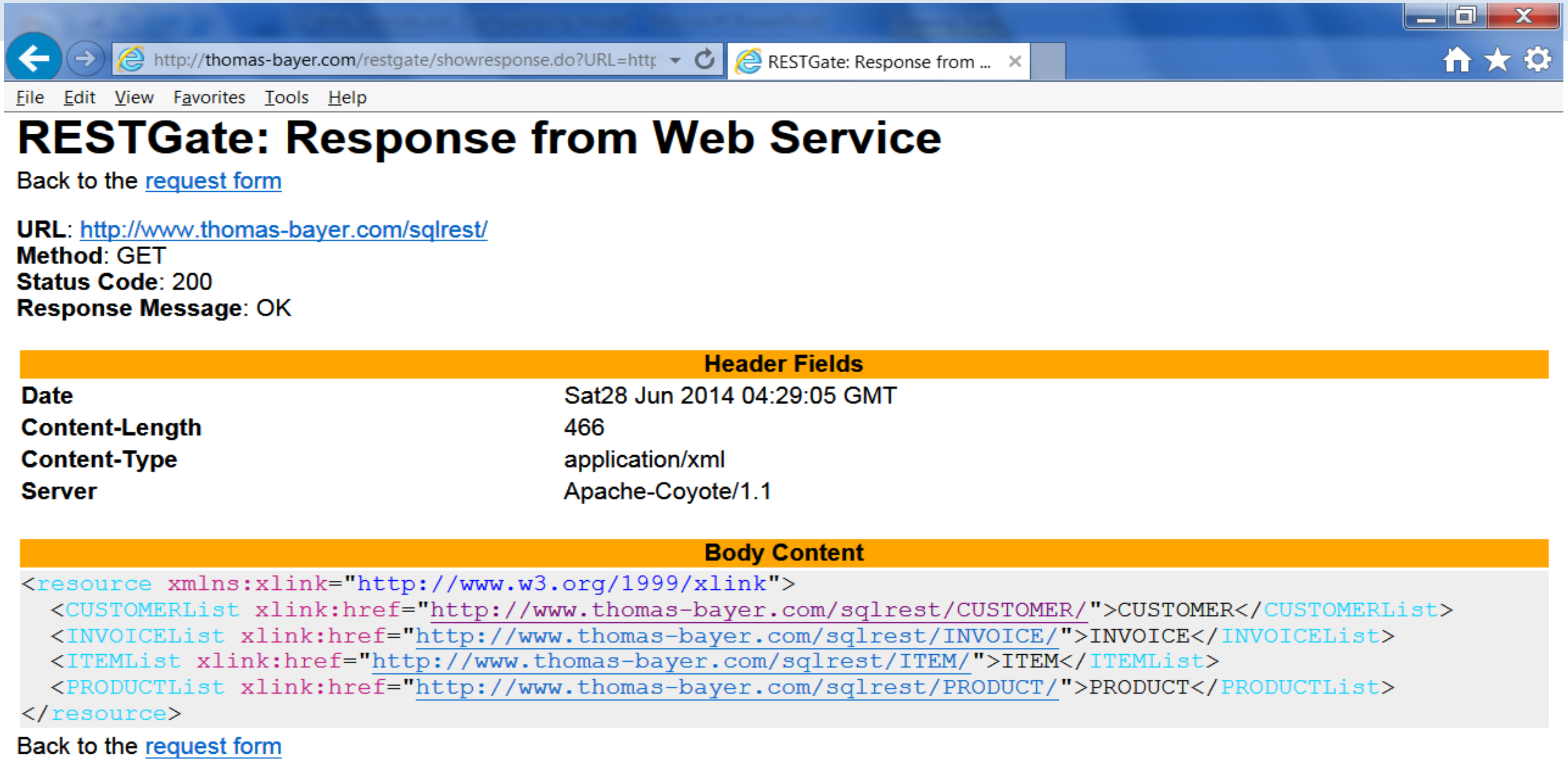
- Representational State Transfer (REST)
  - See: Roy Fielding’s PhD Thesis
- Service implementation rely on core web technology
  - URI, HTTP, XML
- Design constraints (www.whatisrest.com)
  - Client-server
  - Stateless: each request contains all necessary info
  - Cache
  - Interface/uniform contract: HTTP GET, POST, PUT, etc.
  - Layered system: proxy/cache servers can be inserted
  - Code-on-demand

RESTful API

- Request: HTTP verb + URI + (optional) content (XML, JSON, etc.)
  - GET: read; POST: create & update; PUT: create & update; DELETE: remove
- Response
  - Content: XML, JSON, etc.
  - Response code: 200 OK, 201 Created, 404 not found, etc.

Verb	URI	Usage
POST	/order	Create an new order. The content of HTTP request (i.e., post data): XML, JSON The Location header in HTTP response specifies the URI of the newly created order.
POST	/order/3	Update the order with id 3. The content of HTTP request (XML, JSON) is newly updated order detail
GET	/order/10	Retrieve the order with id 10. The content of HTTP response (XML, JSON) is order detail.
PUT	/order/12	Update the order with id 12, or create an order with id 12. The content of HTTP request (XML, JSON) is newly updated order detail.
DELETE	/order/15	Remove the order with id 15.

REST – Retrieve w/ GET


http://thomas-bayer.com/restgate/showresponse.do?URL=http
RESTGate: Response from ...
File Edit View Favorites Tools Help

RESTGate: Response from Web Service

Back to the request form

URL: http://www.thomas-bayer.com/sqlrest/
Method: GET
Status Code: 200
Response Message: OK

Header Fields	
Date	Sat28 Jun 2014 04:29:05 GMT
Content-Length	466
Content-Type	application/xml
Server	Apache-Coyote/1.1

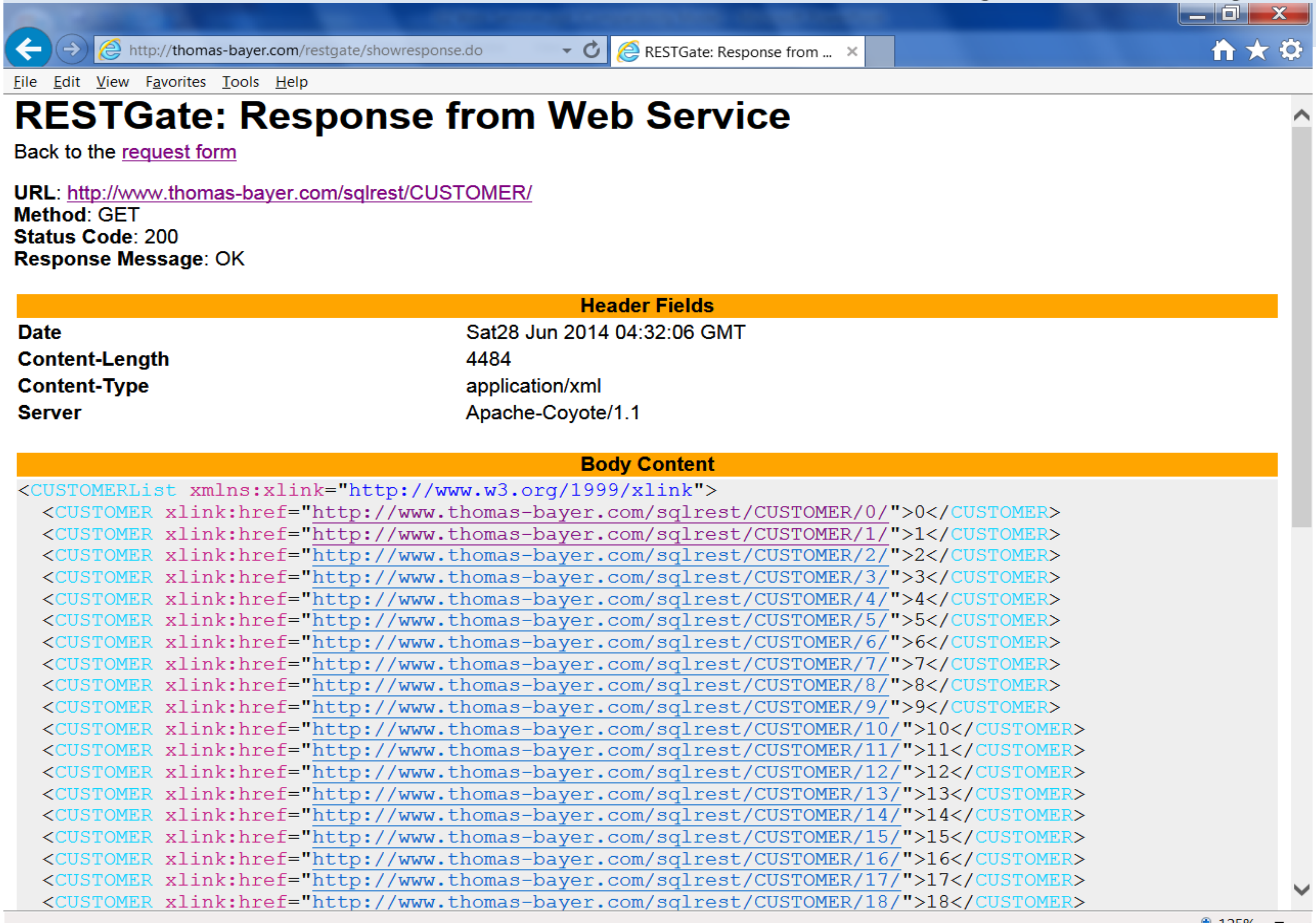
Body Content

```
<resource xmlns:xlink="http://www.w3.org/1999/xlink">
  <CUSTOMERList xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/">CUSTOMER</CUSTOMERList>
  <INVOICEList xlink:href="http://www.thomas-bayer.com/sqlrest/INVOICE/">INVOICE</INVOICEList>
  <ITEMList xlink:href="http://www.thomas-bayer.com/sqlrest/ITEM/">ITEM</ITEMList>
  <PRODUCTList xlink:href="http://www.thomas-bayer.com/sqlrest/PRODUCT/">PRODUCT</PRODUCTList>
</resource>
```

Back to the request form

http://thomas-bayer.com/restgate/index.do

REST – Retrieve w/ GET (cont'd)


http://thomas-bayer.com/restgate/showresponse.do
RESTGate: Response from ...
File Edit View Favorites Tools Help

RESTGate: Response from Web Service

Back to the request form

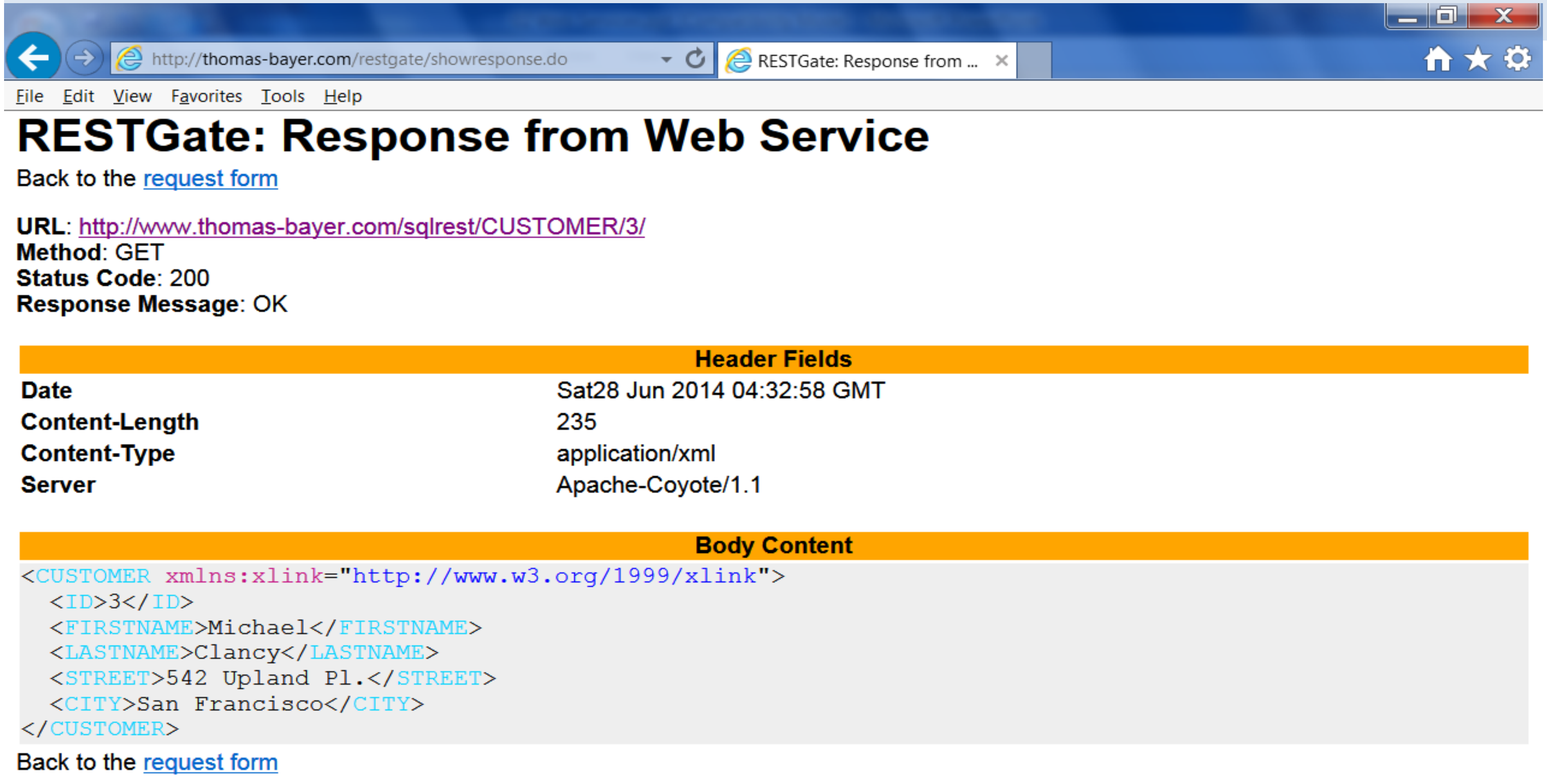
URL: http://www.thomas-bayer.com/sqlrest/CUSTOMER/
Method: GET
Status Code: 200
Response Message: OK

Header Fields	
Date	Sat28 Jun 2014 04:32:06 GMT
Content-Length	4484
Content-Type	application/xml
Server	Apache-Coyote/1.1

Body Content

```
<CUSTOMERList xmlns:xlink="http://www.w3.org/1999/xlink">
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/0/">0</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/1/">1</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/2/">2</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/3/">3</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/4/">4</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/5/">5</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/6/">6</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/7/">7</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/8/">8</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/9/">9</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/10/">10</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/11/">11</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/12/">12</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/13/">13</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/14/">14</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/15/">15</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/16/">16</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/17/">17</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/18/">18</CUSTOMER>
```

REST – Retrieve w/ GET (cont'd)


http://thomas-bayer.com/restgate/showresponse.do
RESTGate: Response from ...
File Edit View Favorites Tools Help

RESTGate: Response from Web Service

Back to the request form

URL: http://www.thomas-bayer.com/sqlrest/CUSTOMER/3/
Method: GET
Status Code: 200
Response Message: OK

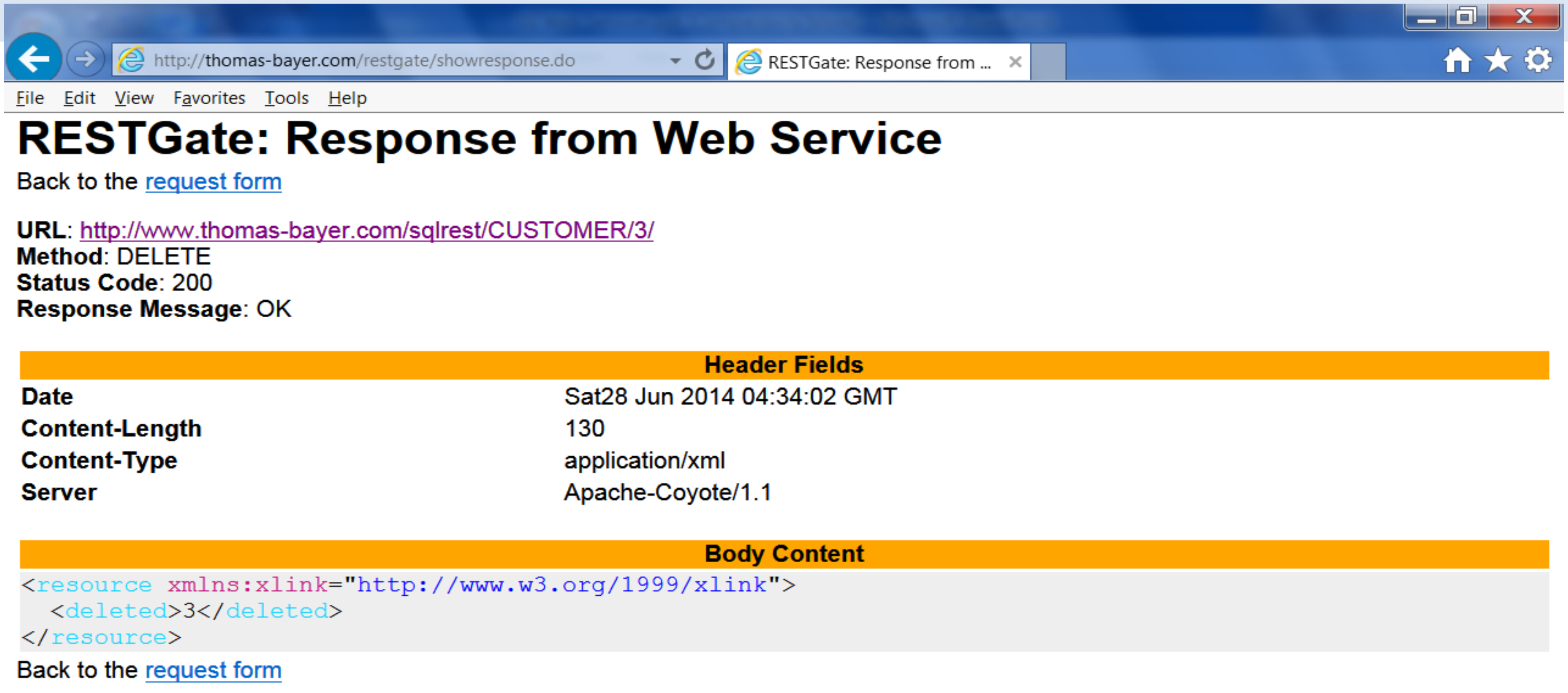
Header Fields	
Date	Sat28 Jun 2014 04:32:58 GMT
Content-Length	235
Content-Type	application/xml
Server	Apache-Coyote/1.1

Body Content

```
<CUSTOMER xmlns:xlink="http://www.w3.org/1999/xlink">
  <ID>3</ID>
  <FIRSTNAME>Michael</FIRSTNAME>
  <LASTNAME>Clancy</LASTNAME>
  <STREET>542 Upland Pl.</STREET>
  <CITY>San Francisco</CITY>
</CUSTOMER>
```

Back to the request form

REST – Remove w/ DELETE


http://thomas-bayer.com/restgate/showresponse.do
RESTGate: Response from ...
File Edit View Favorites Tools Help

RESTGate: Response from Web Service

Back to the request form

URL: http://www.thomas-bayer.com/sqlrest/CUSTOMER/3/
Method: DELETE
Status Code: 200
Response Message: OK

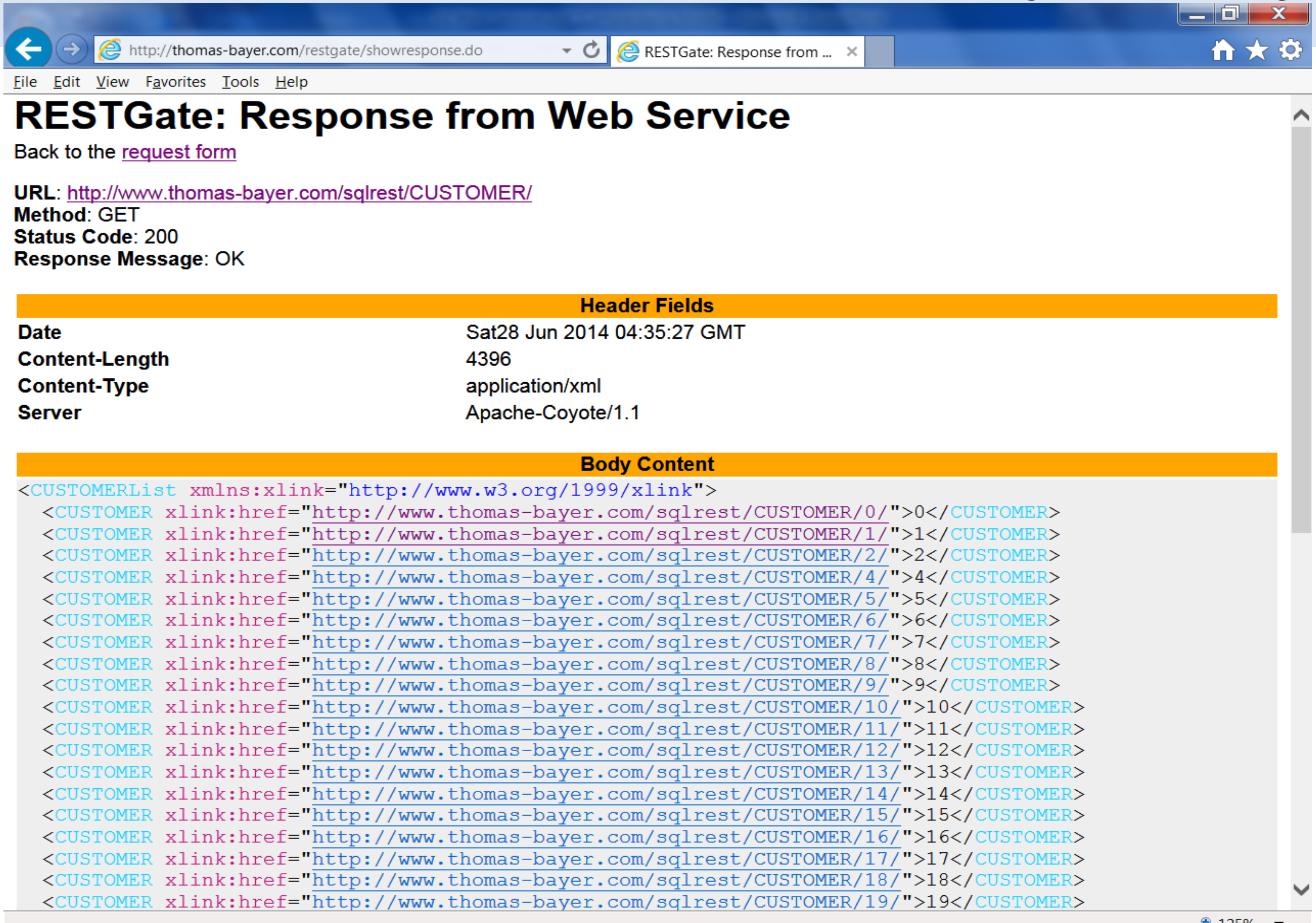
Header Fields	
Date	Sat28 Jun 2014 04:34:02 GMT
Content-Length	130
Content-Type	application/xml
Server	Apache-Coyote/1.1

Body Content

```
<resource xmlns:xlink="http://www.w3.org/1999/xlink">
  <deleted>3</deleted>
</resource>
```

Back to the request form

REST – Remove w/ DELETE (cont'd)


http://thomas-bayer.com/restgate/showresponse.do
RESTGate: Response from ...
File Edit View Favorites Tools Help

RESTGate: Response from Web Service

Back to the request form

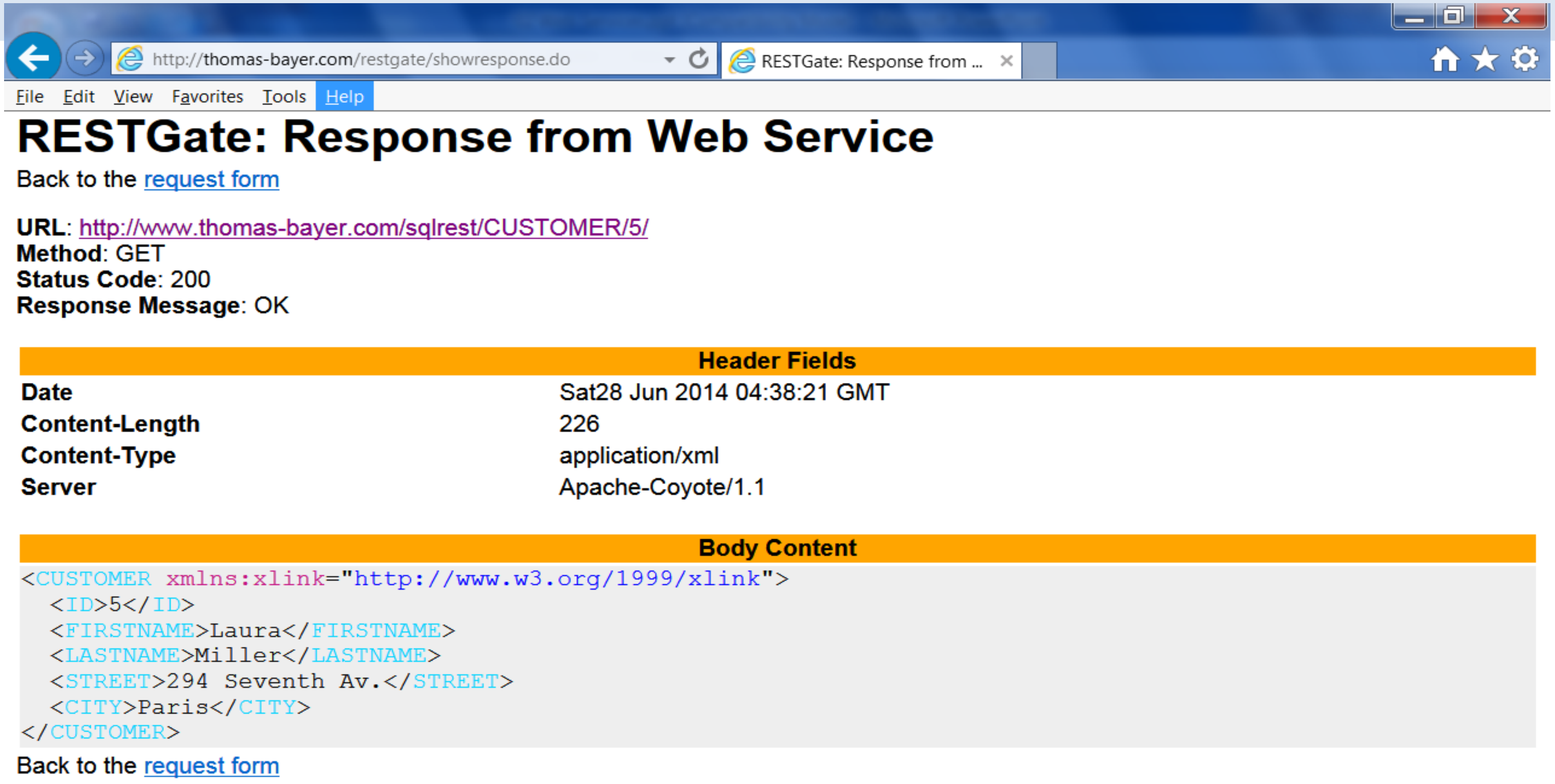
URL: http://www.thomas-bayer.com/sqlrest/CUSTOMER/
Method: GET
Status Code: 200
Response Message: OK

Header Fields	
Date	Sat28 Jun 2014 04:35:27 GMT
Content-Length	4396
Content-Type	application/xml
Server	Apache-Coyote/1.1

Body Content

```
<CUSTOMERList xmlns:xlink="http://www.w3.org/1999/xlink">
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/0/">0</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/1/">1</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/2/">2</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/4/">4</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/5/">5</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/6/">6</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/7/">7</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/8/">8</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/9/">9</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/10/">10</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/11/">11</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/12/">12</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/13/">13</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/14/">14</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/15/">15</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/16/">16</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/17/">17</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/18/">18</CUSTOMER>
  <CUSTOMER xlink:href="http://www.thomas-bayer.com/sqlrest/CUSTOMER/19/">19</CUSTOMER>
```

REST – Alter w/ POST


http://thomas-bayer.com/restgate/showresponse.do
RESTGate: Response from ...
File Edit View Favorites Tools Help

RESTGate: Response from Web Service

Back to the request form

URL: http://www.thomas-bayer.com/sqlrest/CUSTOMER/5/
Method: GET
Status Code: 200
Response Message: OK

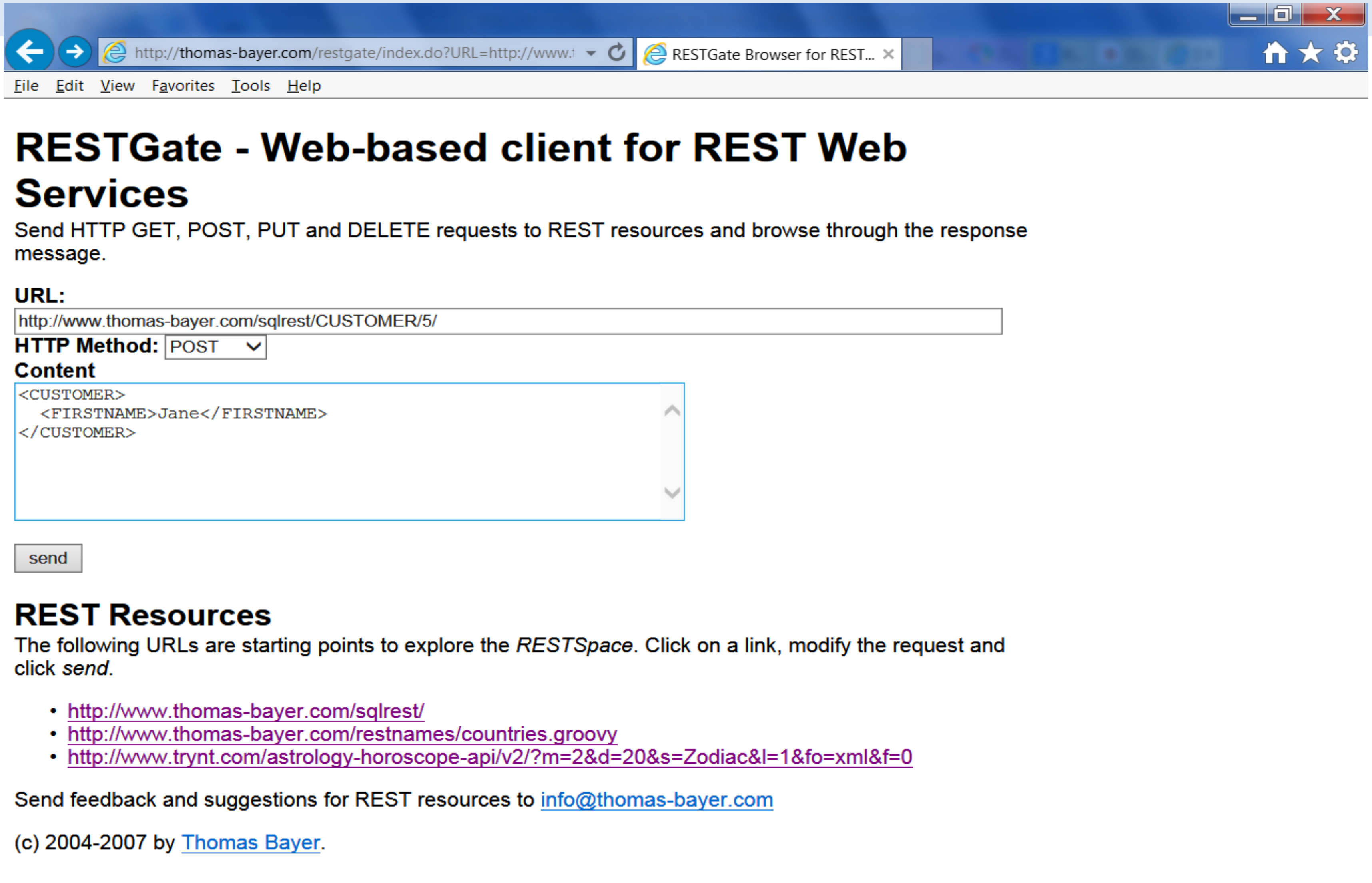
Header Fields	
Date	Sat28 Jun 2014 04:38:21 GMT
Content-Length	226
Content-Type	application/xml
Server	Apache-Coyote/1.1

Body Content

```
<CUSTOMER xmlns:xlink="http://www.w3.org/1999/xlink">
  <ID>5</ID>
  <FIRSTNAME>Laura</FIRSTNAME>
  <LASTNAME>Miller</LASTNAME>
  <STREET>294 Seventh Av.</STREET>
  <CITY>Paris</CITY>
</CUSTOMER>
```

Back to the request form

REST – Alter w/ POST (cont’d)


http://thomas-bayer.com/restgate/index.do?URL=http://www.t
RESTGate Browser for REST...
File Edit View Favorites Tools Help

RESTGate - Web-based client for REST Web Services

Send HTTP GET, POST, PUT and DELETE requests to REST resources and browse through the response message.

URL: http://www.thomas-bayer.com/sqlrest/CUSTOMER/5/

HTTP Method: POST

Content

```
<CUSTOMER>
  <FIRSTNAME>Jane</FIRSTNAME>
</CUSTOMER>
```

send

REST Resources

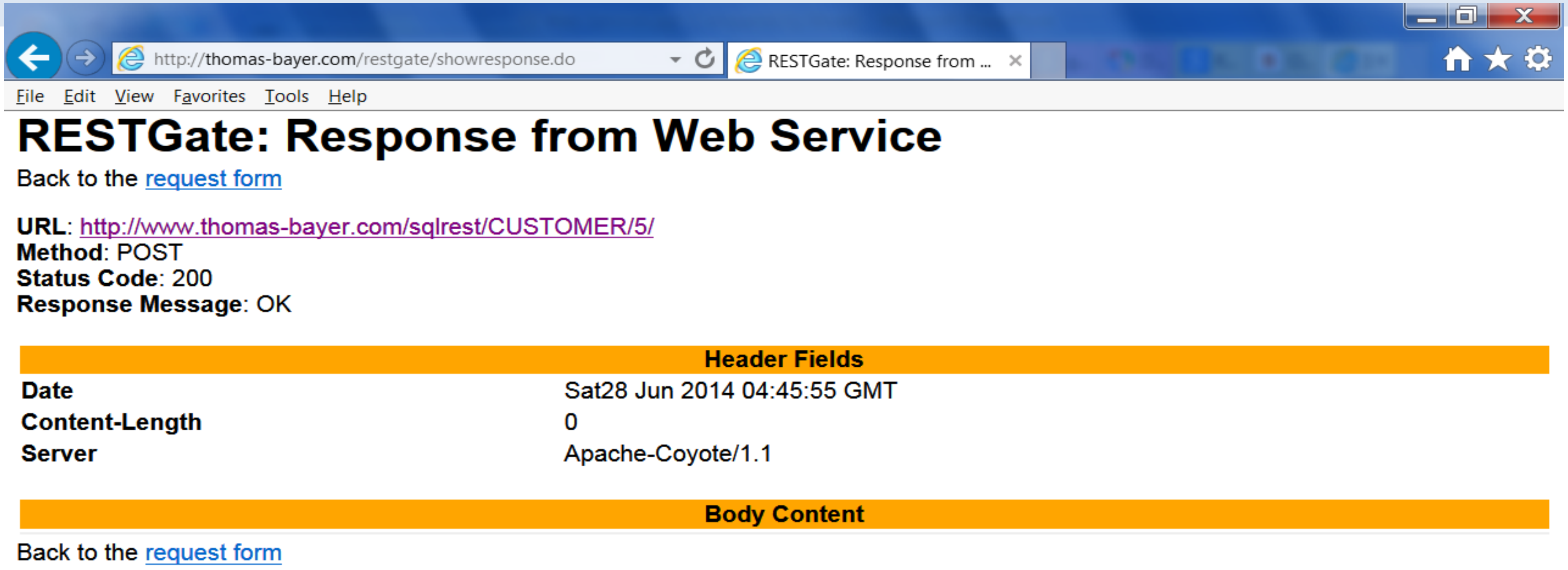
The following URLs are starting points to explore the *RESTSpace*. Click on a link, modify the request and click *send*.

- http://www.thomas-bayer.com/sqlrest/
- http://www.thomas-bayer.com/restnames/countries.groovy
- http://www.trynt.com/astrology-horoscope-api/v2/?m=2&d=20&s=Zodiac&l=1&fo=xml&f=0

Send feedback and suggestions for REST resources to info@thomas-bayer.com

(c) 2004-2007 by Thomas Bayer.

REST – Alter w/ POST (cont'd)


http://thomas-bayer.com/restgate/showresponse.do
RESTGate: Response from ...
File Edit View Favorites Tools Help

RESTGate: Response from Web Service

Back to the request form

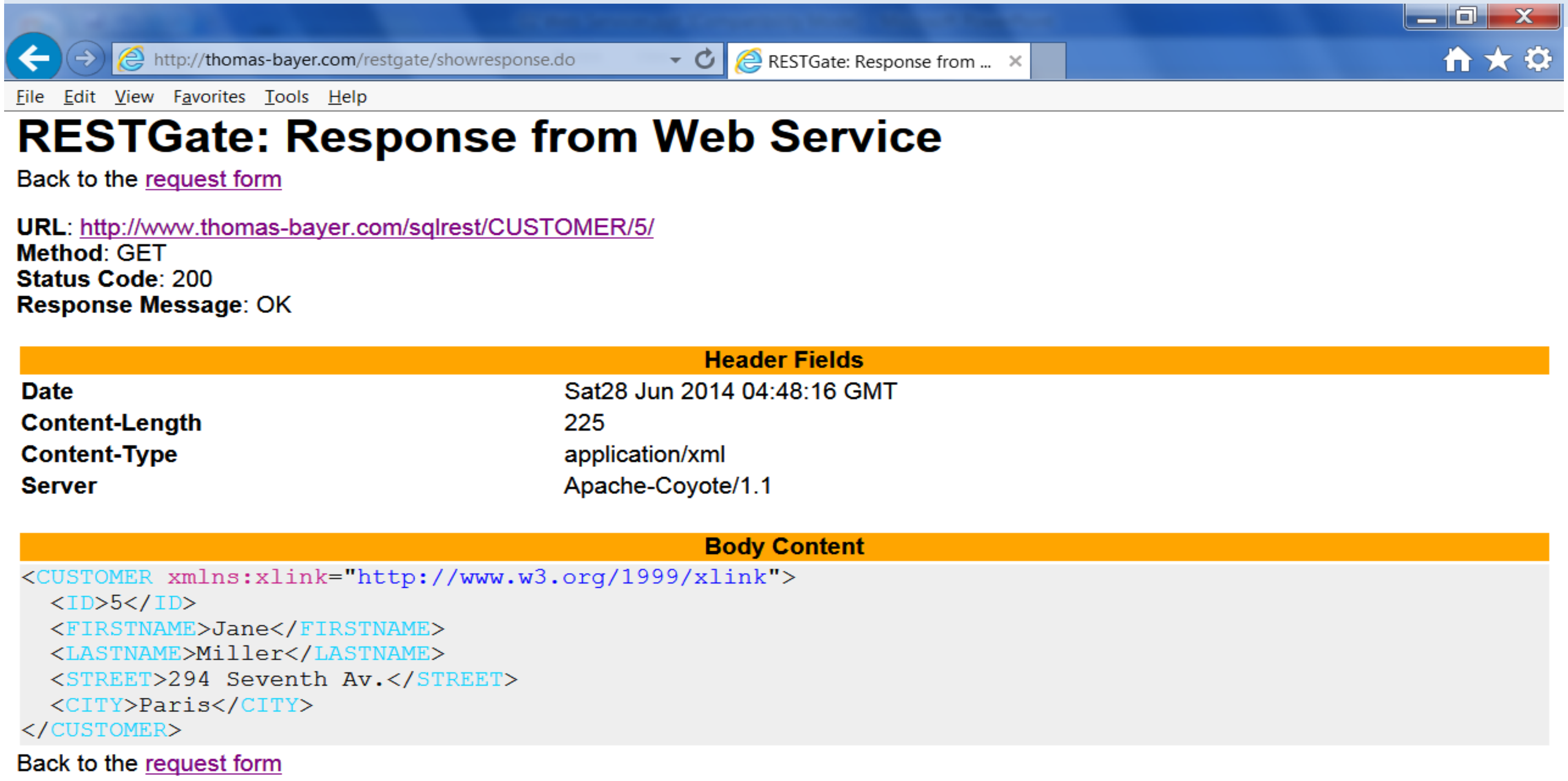
URL: http://www.thomas-bayer.com/sqlrest/CUSTOMER/5/
Method: POST
Status Code: 200
Response Message: OK

Header Fields	
Date	Sat28 Jun 2014 04:45:55 GMT
Content-Length	0
Server	Apache-Coyote/1.1

Body Content

Back to the request form

REST – Alter w/ POST (cont'd)


http://thomas-bayer.com/restgate/showresponse.do
RESTGate: Response from ...
File Edit View Favorites Tools Help

RESTGate: Response from Web Service

Back to the request form

URL: http://www.thomas-bayer.com/sqlrest/CUSTOMER/5/
Method: GET
Status Code: 200
Response Message: OK

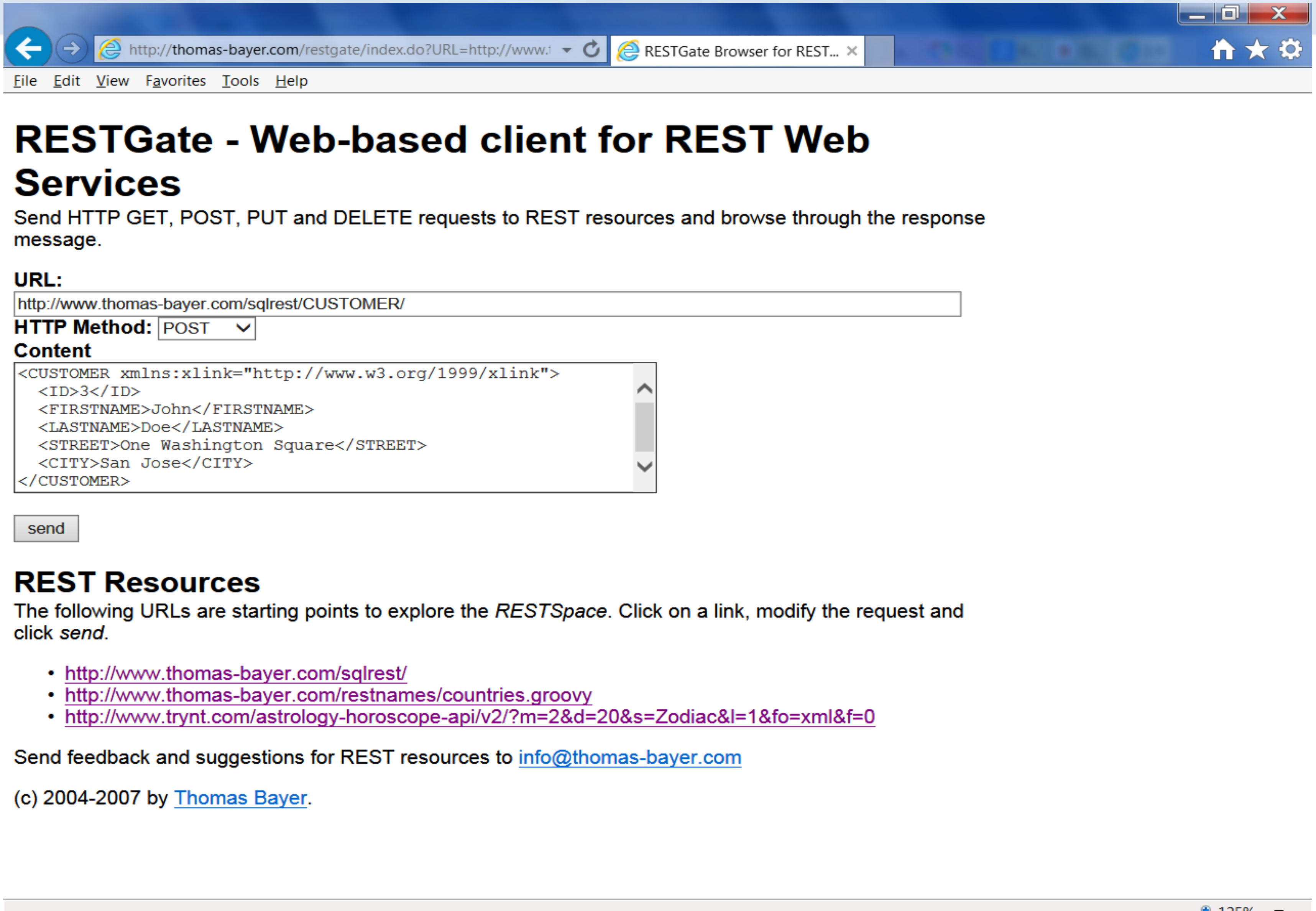
Header Fields	
Date	Sat28 Jun 2014 04:48:16 GMT
Content-Length	225
Content-Type	application/xml
Server	Apache-Coyote/1.1

Body Content

```
<CUSTOMER xmlns:xlink="http://www.w3.org/1999/xlink">
  <ID>5</ID>
  <FIRSTNAME>Jane</FIRSTNAME>
  <LASTNAME>Miller</LASTNAME>
  <STREET>294 Seventh Av.</STREET>
  <CITY>Paris</CITY>
</CUSTOMER>
```

Back to the request form

REST – Create w/ POST


http://thomas-bayer.com/restgate/index.do?URL=http://www.t
RESTGate Browser for REST...
File Edit View Favorites Tools Help

RESTGate - Web-based client for REST Web Services

Send HTTP GET, POST, PUT and DELETE requests to REST resources and browse through the response message.

URL: http://www.thomas-bayer.com/sqlrest/CUSTOMER/

HTTP Method: POST

Content

```
<CUSTOMER xmlns:xlink="http://www.w3.org/1999/xlink">
  <ID>3</ID>
  <FIRSTNAME>John</FIRSTNAME>
  <LASTNAME>Doe</LASTNAME>
  <STREET>One Washington Square</STREET>
  <CITY>San Jose</CITY>
</CUSTOMER>
```

send

REST Resources

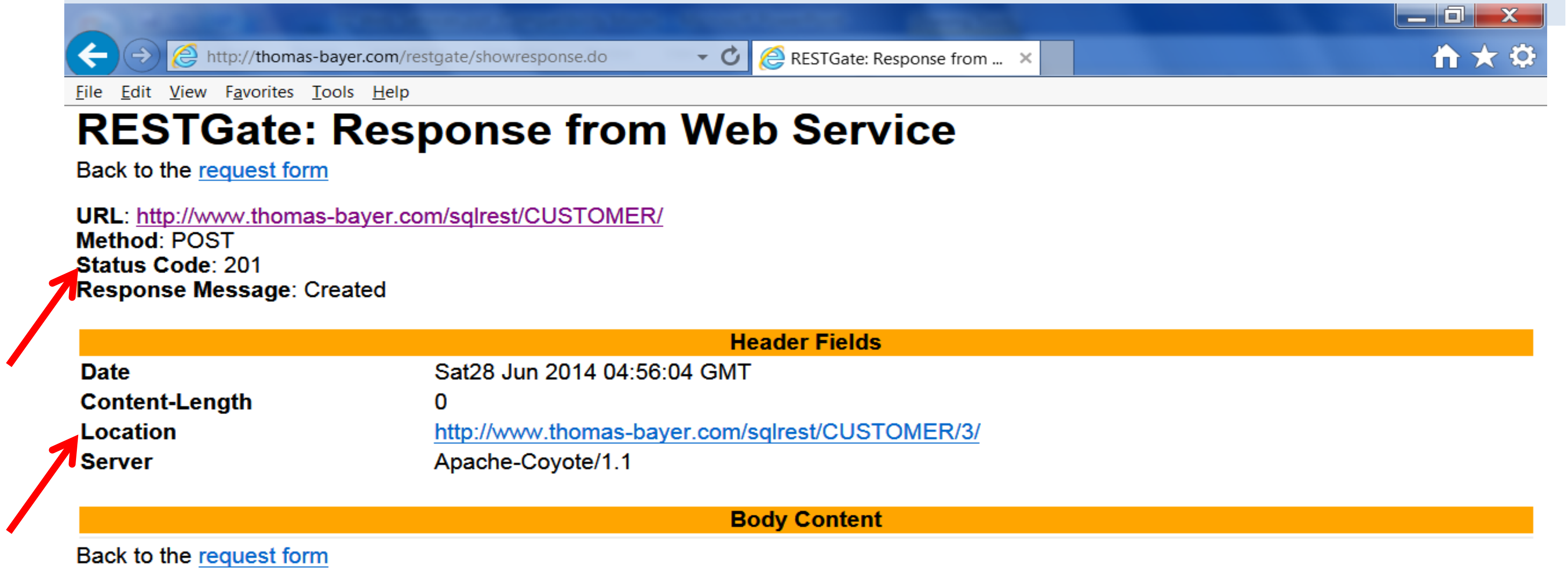
The following URLs are starting points to explore the *RESTSpace*. Click on a link, modify the request and click *send*.

- http://www.thomas-bayer.com/sqlrest/
- http://www.thomas-bayer.com/restnames/countries.groovy
- http://www.trynt.com/astrology-horoscope-api/v2/?m=2&d=20&s=Zodiac&l=1&fo=xml&f=0

Send feedback and suggestions for REST resources to info@thomas-bayer.com

(c) 2004-2007 by Thomas Bayer.

REST – Create w/ POST (cont'd)



http://thomas-bayer.com/restgate/showresponse.do

RESTGate: Response from ...

File Edit View Favorites Tools Help

RESTGate: Response from Web Service

Back to the request form

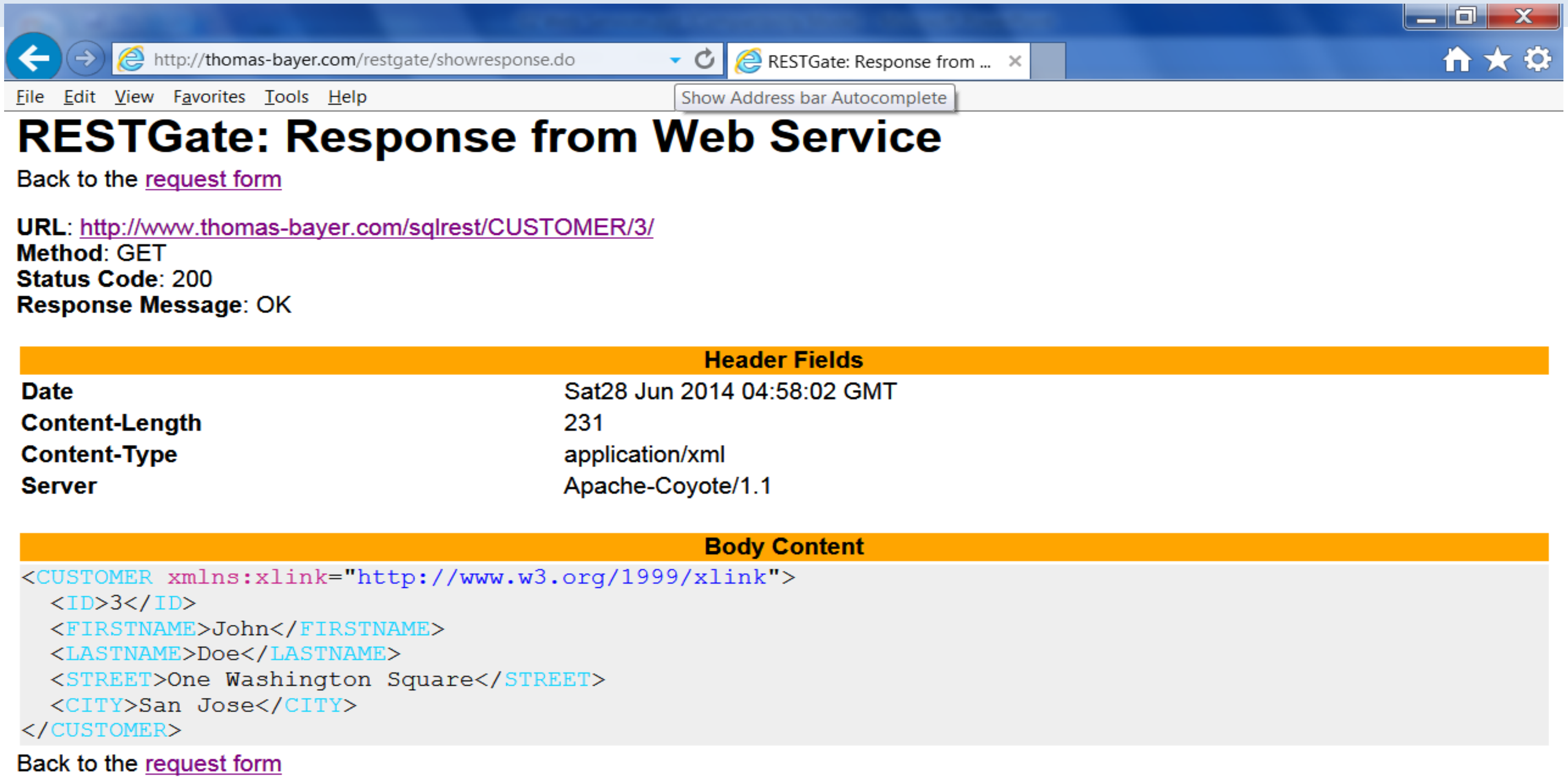
URL: http://www.thomas-bayer.com/sqlrest/CUSTOMER/
Method: POST
Status Code: 201
Response Message: Created

Header Fields	
Date	Sat28 Jun 2014 04:56:04 GMT
Content-Length	0
Location	http://www.thomas-bayer.com/sqlrest/CUSTOMER/3/
Server	Apache-Coyote/1.1

Body Content

Back to the request form

REST – Create w/ POST (cont'd)


http://thomas-bayer.com/restgate/showresponse.do
RESTGate: Response from ...
File Edit View Favorites Tools Help
Show Address bar Autocomplete

RESTGate: Response from Web Service

Back to the request form

URL: http://www.thomas-bayer.com/sqlrest/CUSTOMER/3/
Method: GET
Status Code: 200
Response Message: OK

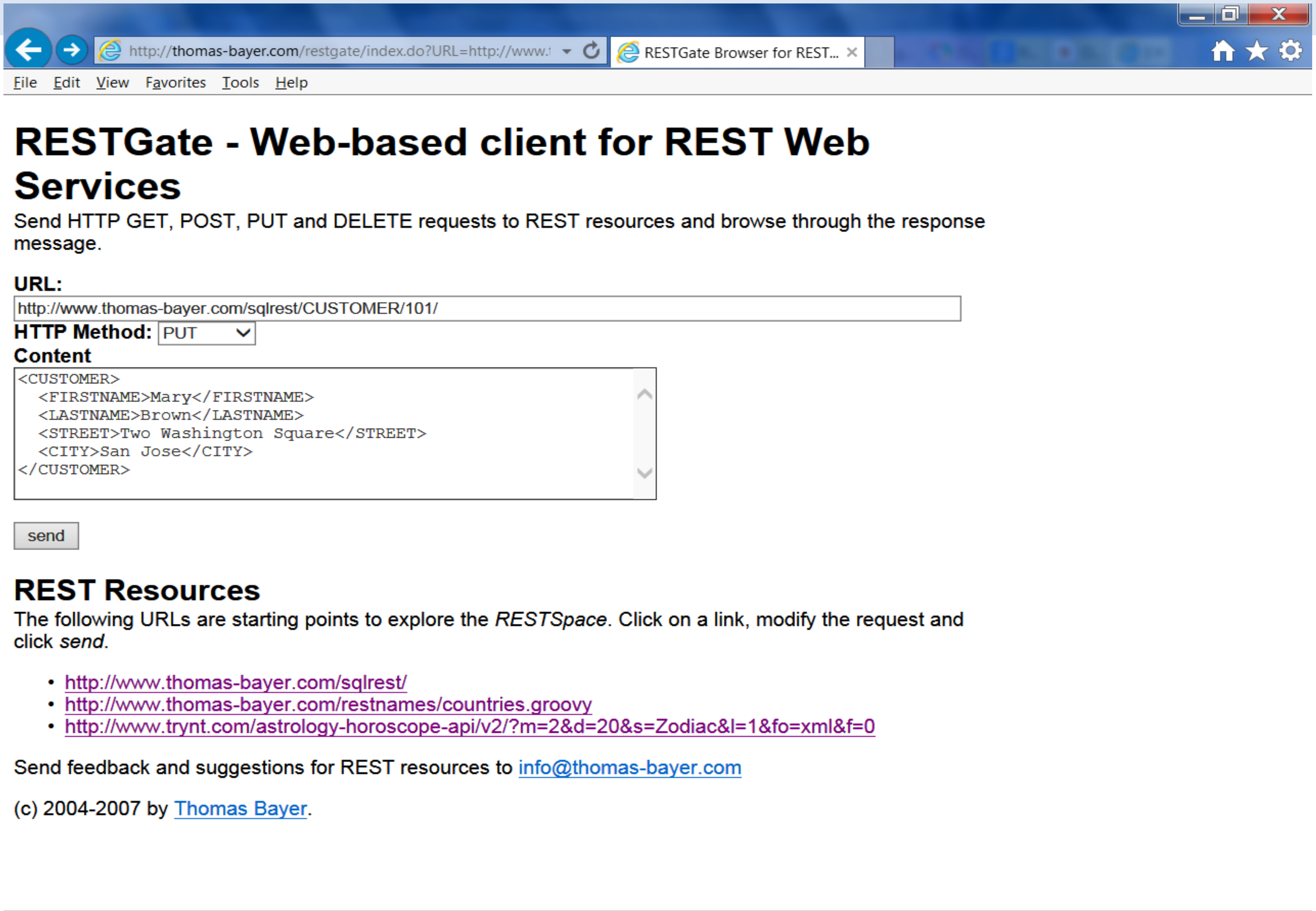
Header Fields	
Date	Sat28 Jun 2014 04:58:02 GMT
Content-Length	231
Content-Type	application/xml
Server	Apache-Coyote/1.1

Body Content

```
<CUSTOMER xmlns:xlink="http://www.w3.org/1999/xlink">
  <ID>3</ID>
  <FIRSTNAME>John</FIRSTNAME>
  <LASTNAME>Doe</LASTNAME>
  <STREET>One Washington Square</STREET>
  <CITY>San Jose</CITY>
</CUSTOMER>
```

Back to the request form

REST – Create w/ PUT


http://thomas-bayer.com/restgate/index.do?URL=http://www.t
RESTGate Browser for REST...
File Edit View Favorites Tools Help

RESTGate - Web-based client for REST Web Services

Send HTTP GET, POST, PUT and DELETE requests to REST resources and browse through the response message.

URL: http://www.thomas-bayer.com/sqlrest/CUSTOMER/101/

HTTP Method: PUT

Content

```
<CUSTOMER>
  <FIRSTNAME>Mary</FIRSTNAME>
  <LASTNAME>Brown</LASTNAME>
  <STREET>Two Washington Square</STREET>
  <CITY>San Jose</CITY>
</CUSTOMER>
```

send

REST Resources

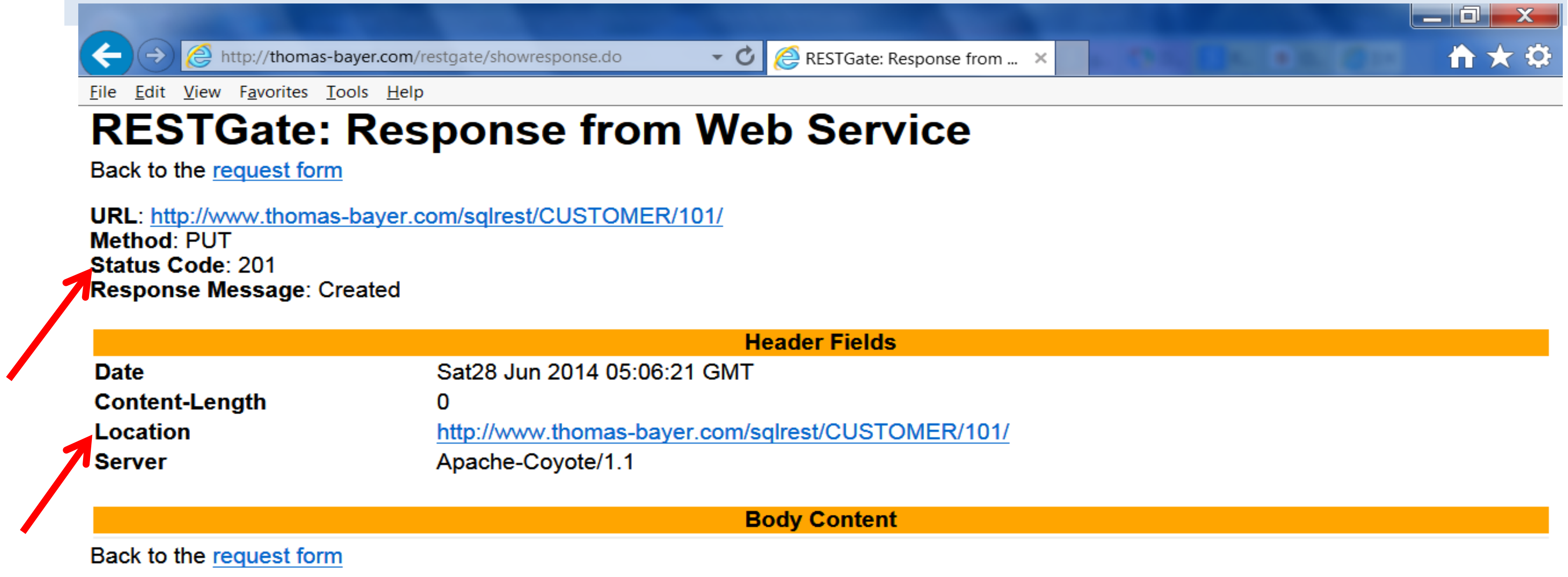
The following URLs are starting points to explore the *RESTSpace*. Click on a link, modify the request and click *send*.

- http://www.thomas-bayer.com/sqlrest/
- http://www.thomas-bayer.com/restnames/countries.groovy
- http://www.trynt.com/astrology-horoscope-api/v2/?m=2&d=20&s=Zodiac&l=1&fo=xml&f=0

Send feedback and suggestions for REST resources to info@thomas-bayer.com

(c) 2004-2007 by Thomas Bayer.

REST – Create w/ PUT (cont'd)


http://thomas-bayer.com/restgate/showresponse.do
RESTGate: Response from ...
File Edit View Favorites Tools Help

RESTGate: Response from Web Service

Back to the request form

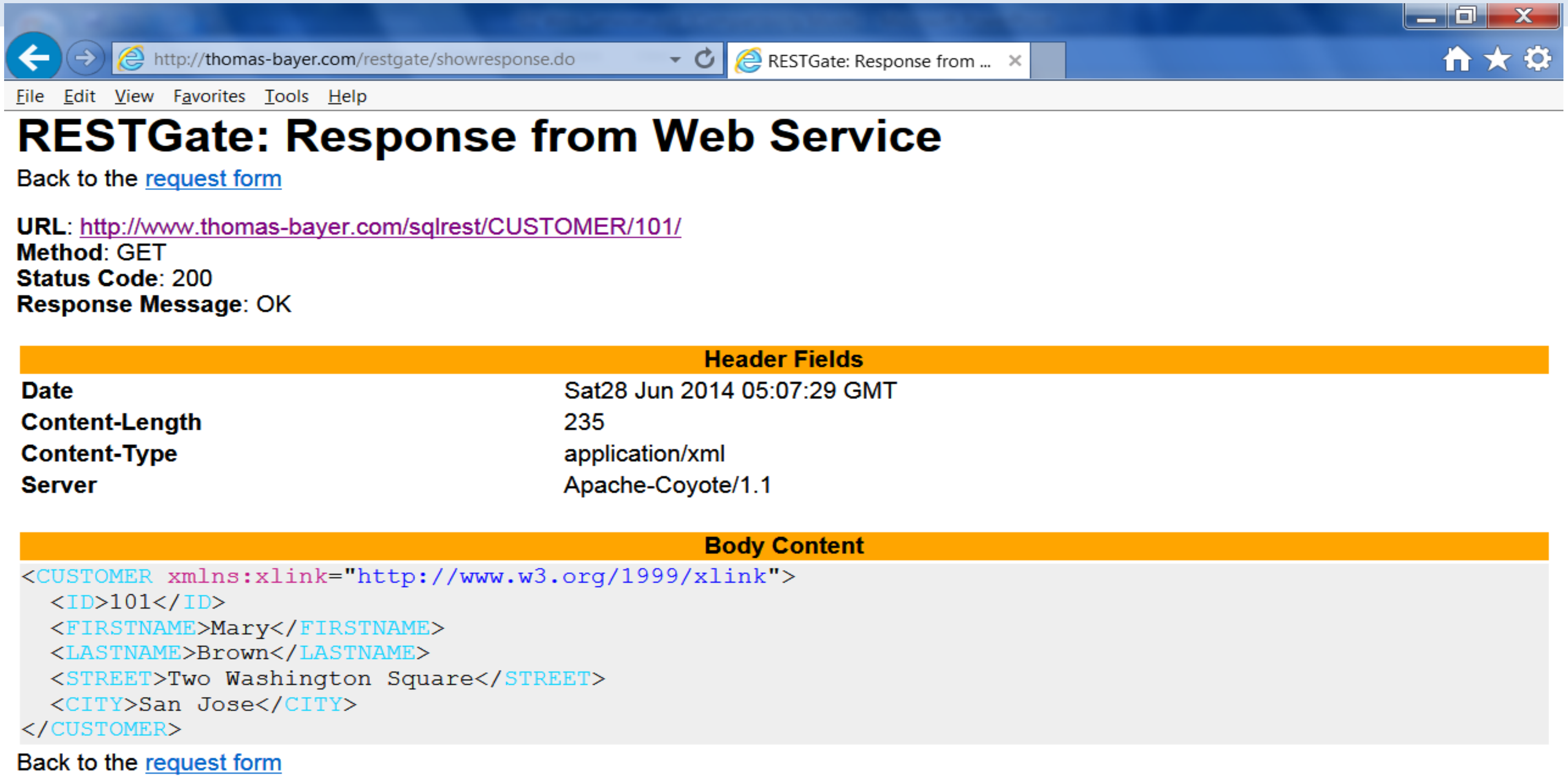
URL: http://www.thomas-bayer.com/sqlrest/CUSTOMER/101/
Method: PUT
Status Code: 201
Response Message: Created

Header Fields	
Date	Sat28 Jun 2014 05:06:21 GMT
Content-Length	0
Location	http://www.thomas-bayer.com/sqlrest/CUSTOMER/101/
Server	Apache-Coyote/1.1

Body Content

Back to the request form

REST – Create w/ PUT (cont'd)



http://thomas-bayer.com/restgate/showresponse.do
RESTGate: Response from ...
File Edit View Favorites Tools Help

RESTGate: Response from Web Service

Back to the request form

URL: http://www.thomas-bayer.com/sqlrest/CUSTOMER/101/
Method: GET
Status Code: 200
Response Message: OK

Header Fields	
Date	Sat28 Jun 2014 05:07:29 GMT
Content-Length	235
Content-Type	application/xml
Server	Apache-Coyote/1.1

Body Content

```
<CUSTOMER xmlns:xlink="http://www.w3.org/1999/xlink">
  <ID>101</ID>
  <FIRSTNAME>Mary</FIRSTNAME>
  <LASTNAME>Brown</LASTNAME>
  <STREET>Two Washington Square</STREET>
  <CITY>San Jose</CITY>
</CUSTOMER>
```

Back to the request form

REST Tools & Examples

- Tools:
  - soapUI (Windows, Mac, Linux): http://www.soapui.org/
  - browser + extension/plug-in
    - Firefox + RESTClient
    - Chrome browser + Postman
  - Command line util: curl
- Examples
  - http://www.restapitutorial.com
  - http://sqlrest.sourceforge.net/5-minutes-guide.htm
    - http://thomas-bayer.com/restgate/index.do
    - http://www.thomas-bayer.com/sqlrest/
  - http://jsonplaceholder.typicode.com/
  - http://httpbin.org/

Demo –
browser, soapUI

SOAP vs REST

	SOAP	REST
Request format	XML	Any (XML, JSON, etc.)
Response format	XML	Any (XML, JSON, etc.)
Application layer protocol	HTTP(S), SMTP, etc	HTTP(S)
weight	Heavy weight	Light weight
extensibility	High • security: WS-Security*, etc • reliability: WS-ReliableMessage, etc • transaction: WS-Transaction*, etc. • …	Low • security: HTTPS • reliability: explicit retry • transaction: N/A
Complexity	High (smart IDE to the rescue?)	Low
Message size	High (XML markup)	Low

References

- Eri Chapter 5.4, 5.6

HW

- See Canvas