Web services

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Brief web services history

- 1989 - WWW invented
- 1991 - HTTP 0.9 specified
- 1992 - Internet at Masaryk University :-)
- 1993 - Mosaic web browser
- 1993 - CGI interface for executing programs
- 1995 - JavaScript introduced by Netscape
- 1996 - SSL 3.0
- 1998 - XML 1.0
- 1998 - SOAP 1.1 by Microsoft
- 2003 - SOAP 1.2 by W3C (never used)
- 2004 - WS-Interoperability Basic Profile

Brief web services history (2)

- 2000 - REST defined by Roy Fielding
- 2001 - JSON format invented
- 2004 - GMail and Google Maps
- 2004 - Web 2.0 hype, Mash-ups
- 2005 - AJAX (Asynchronous JavaScript)
- 2005 - Yahoo! offers JSON web services
- 2006 - OpenID 2.0
- 2008 - HTML5 (First Public Working Draft)
- 2010 - OAuth 1.0
- 2010 - mobile devices with Android
- 2012 - OAuth 2.0

Brief web services history (3)

- 2013 - responsive web design as answer to mobile devices with differing screen sizes
- 2006-2013 - cloud computing (Amazon 2006, Microsoft 2008, Google 2013)
- 2014 - HTML5 finalised

SOAP versus REST

- enterprises prefer complicated stack
  - XML
  - SOAP, WSDL, WS-Interoperability
  - WS-* (WS-Security, WS-Addressing, ...)
  - persistent connections - queues
  - RPC based
  - complex tools and frameworks
- Internet crowd prefers simplicity
  - JSON
  - web APIs described as HTTP requests to URLs
  - AJAX in browsers
  - transient connections - TCP/IP, HTTP
  - scalable using REST

Web APIs

- well-known APIs
  - Google APIs (Calendar, GMail, Maps, Picasa, ...)
  - Facebook API
  - Twitter API
  - based on HTTP+JSON+SSL+OAuth
- third party clients
  - web, mobile (Android, iOS, ...), desktop, embedded
- OAuth
  - developer registers an application at API provider
  - user authorises the application to use certain operations in the API, giving the application a token
  - application uses the token to use the API on behalf of the user

JSON - JavaScript Object Notation


```
{
   kind: "calendar#events",
   etag: "\"GZxpEFttRDAOmLHnWRxLHHWPGwk/vpPwPyIKi2CubgzCWOVY8MIHGPo\"",
   summary: "EGI.eu Events",
   updated: "2013-04-22T06:00:02.000Z",
   timeZone: "Europe/Amsterdam",
   accessRole: "reader",
 - items: [
    - {
         kind: "calendar#event",
         etag: "\"GZxpEFttRDAOmLHnWRxLHHWPGwk/Z2NhbDAwMDAxMjY5ODQ0NDcwMDkzMDAw\"",
         id: "vs17ehlthhfrlgke0a0o98hors",
         status: "confirmed",
         htmlLink: https://www.google.com/calendar/event?eid=dnMxN2VobHRoaGZybGdrZTBhMG85OGhvcnMgZXZlbnRzQGVnaS5ldQ,
         created: "2010-02-12T08:47:42.000Z",
         updated: "2010-03-29T06:34:30.093Z",
         summary: "EGEE to EGI Transition Meeting for User Community and Operations",
         description: "A focus on the transition of the EGEE NA2, NA3 and NA4 activities to the EGI era with significa
         followed by more general transition of EGEE operations to NGI operations from Tuesday afternoon. A detailed a
         /conferenceDisplay.py?confId=1",
         location: "Nikhef",
       - creator: {
            email: "steven.newhouse@egi.eu",
            displayName: "Steven Newhouse"
         },
       - organizer: {
            email: "events@egi.eu",
            displayName: "EGI.eu Events",
            self: true
         },
       - start: {
            dateTime: "2010-03-01T13:00:00+01:00"
         },
       - end: {
            dateTime: "2010-03-03T12:00:00+01:00"
         },
         visibility: "public",
         iCalUID: "vs17ehlthhfrlgke0a0o98hors@google.com",
         sequence: 0
      },
```

The same Google Cal event in XML


```
- <entry>
  - <id>
      http://www.google.com/calendar/feeds/events%40egi.eu/private/full/vs17ehlthhfrlgke0a0o98hors
    </id>
    <published>2010-02-12T08:47:42.000Z</published>
    <updated>2010-03-29T06:34:30.000Z</updated>
    <category scheme="http://schemas.google.com/g/2005#kind" term="http://schemas.google.com/g/2005#event"/>
  - <title type="text">
      EGEE to EGI Transition Meeting for User Community and Operations
    </title>
  - <content type="text">
      A focus on the transition of the EGEE NA2, NA3 and NA4 activities to the EGI era with significantly reduced EC funding during the firs
      to NGI operations from Tuesday afternoon. A detailed agenda is available - https://www.egi.eu/indico/conferenceDisplay.py?confId=1
    </content>
    <link rel="alternate" type="text/html" href="https://www.google.com/calendar/event?eid=dnMxN2VobHRoaGZybGdrZTBhMG85OGhvc
    <link rel="self" type="application/atom+xml" href="https://www.google.com/calendar/feeds/events%40egi.eu/private/full/vs17ehlthhfrlg
  - <author>
      <name>Steven Newhouse</name>
      <email>steven.newhouse@egi.eu</email>
    </author>
  - <gd:comments>
      <gd:feedLink href="https://www.google.com/calendar/feeds/events%40egi.eu/private/full/vs17ehlthhfrlgke0a0o98hors/comments"/>
    </gd:comments>
    <gd:eventStatus value="http://schemas.google.com/g/2005#event.confirmed"/>
    <gd:where valueString="Nikhef"/>
    <gd:who email="events@egi.eu" rel="http://schemas.google.com/g/2005#event.organizer" valueString="events@egi.eu"/>
    <gd:when endTime="2010-03-03T12:00:00.000+01:00" startTime="2010-03-01T13:00:00.000+01:00"/>
    <gd:transparency value="http://schemas.google.com/g/2005#event.opaque"/>
    <gd:visibility value="http://schemas.google.com/g/2005#event.public"/>
    <gCal:anyoneCanAddSelf value="false"/>
    <gCal:guestsCanInviteOthers value="true"/>
    <gCal:guestsCanModify value="false"/>
    <gCal:guestsCanSeeGuests value="true"/>
    <gCal:sequence value="0"/>
    <gCal:uid value="vs17ehlthhfrlgke0a0o98hors@google.com"/>
  </entry>
</feed>
```

AJAX

- Asynchronous JavaScript And XML
- does not need XML, uses JSON often ;-)
- based on introduction of XMLHttpRequest JavaScript object to web browsers
- asynchronous request to web server
- response processed in JavaScript
- same-origin policy (protocol,host,port)
- Cross-origin resource sharing (CORS)
- example: Google Web Toolkit (GWT)

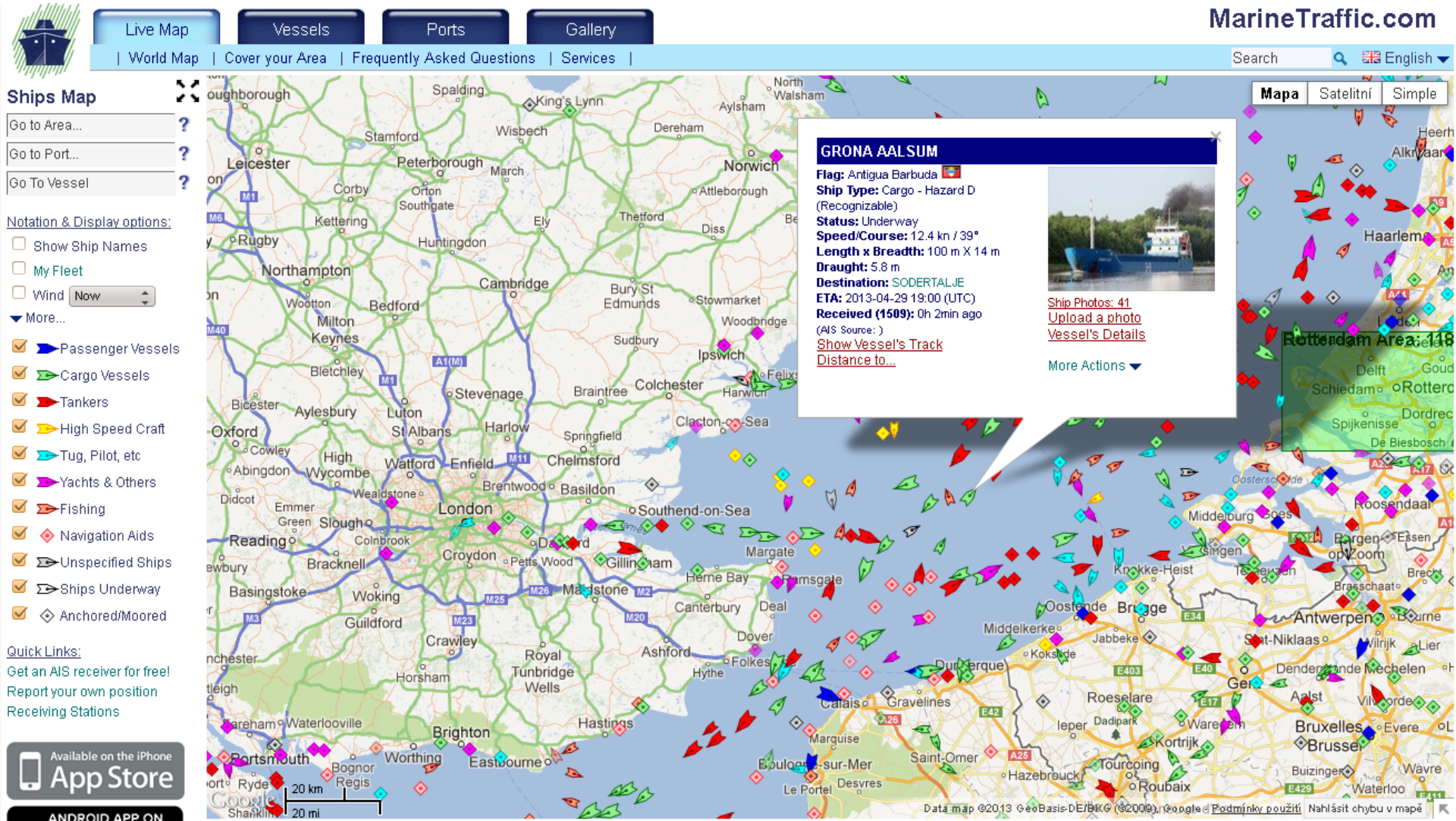
REST

- Representational State Transfer
- software *architecture style* for creating *scalable web services*
- invented by Roy Fielding, author of HTTP 1.1
- resources identified by URIs
- representations of resources as JSON, XML or other formats
- uses HTTP methods GET, PUT, DELETE and POST for manipulating resources

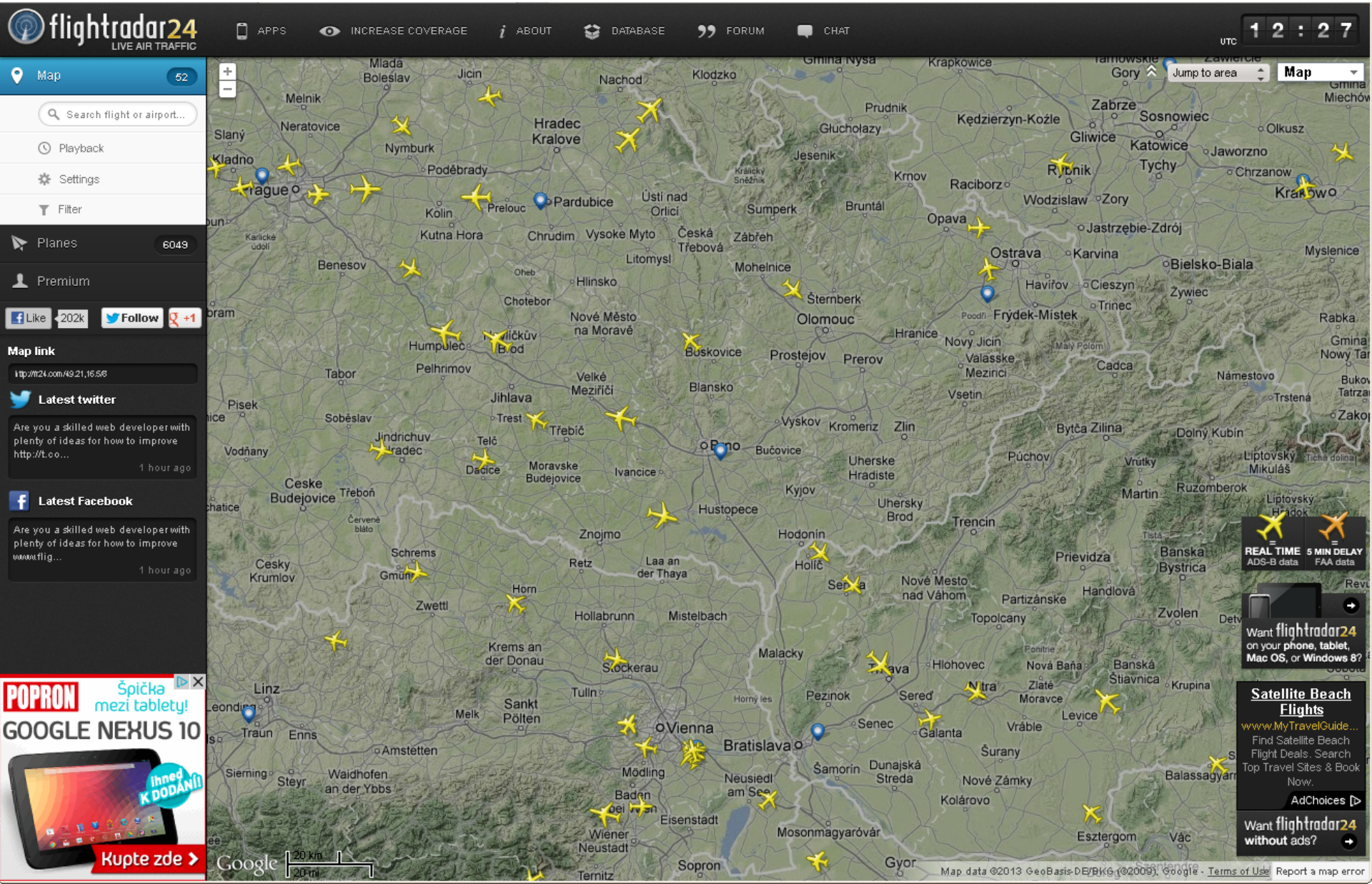
Mash ups

- combine data from various sources
- typically a Google map with some geospatial data
  - ships - http://www.marinetraffic.com/
  - aircrafts - http://www.flightradar24.com/

www.marinetraffic.com



www.flightradar24.com



Federated identity

- many authentication mechanisms were developed for the web
  - username+password (hard to remember)
  - X509 digital certificate (complicated to get)
  - digest, Kerberos etc. (not much support in browsers)
- users forget passwords to rarely used accounts
- in federated identity, account from one organisation can be reused at others
- identity providers
  - OAuth - Google, Facebook, Twitter, ...
  - OpenID - Google, MojeID.cz, Seznam.cz, anybody
  - SAML - in academia - universities, Academy etc.

SOAP/WSDL web services

- preferred in the enterprise world
- used as API for the Czech eGovernment "Data Boxes"
- SOAP is Simple Object Access Protocol
- WSDL is Web Service Description Language
- WS-Interoperability Basic Profile needed to ensure interoperability
  - requires SOAP1.1
- many WS-* extensions