

Introducing APIs

Agenda

- Data Interchange Formats
 - CSV, Name/Value, YAML, XML, JSON
- Web vs APIs
- API Exploration Tools
 - Chrome, Curl, Restlet Client

CSV

http://en.wikipedia.org/wiki/Comma-separated_values

A **comma-separated values (CSV)** (also sometimes called *character-separated values*, because the separator character does not have to be a comma) file stores [tabular](#) data (numbers and text) in plain-text form. [Plain text](#) means that the file is a sequence of [characters](#), with no data that has to be interpreted instead, as binary numbers. A CSV file consists of any number of [records](#), separated by line breaks of some kind; each record consists of [fields](#), separated by some other character or string, most commonly a literal comma or [tab](#).

Usually, all records have an identical sequence of fields.

```
"mocha", "costa", 2.0, 3.5, 0
"americano", "costa", 3.0, 4.5, 1
"cappuccino", "starbucks", 4.0, 1.5, 0
```

coffees.csv

Name/Value Pairs

http://en.wikipedia.org/wiki/Attribute-value_pair

A **name–value pair**, **key–value pair**, **field–value pair** or **attribute–value pair** is a fundamental [data representation](#) in computing systems and applications. Designers often desire an open-ended [data structure](#) that allows for future extension without modifying existing code or data. In such situations, all or part of the [data model](#) may be expressed as a collection of [tuples](#) *<attribute name, value>*; each element is an attribute–value pair. Depending on the particular application and the implementation chosen by programmers, attribute names may or may not be unique.

```
db.url=jdbc:cloudbees://pacemaker
db.driver=com.mysql.jdbc.Driver
db.user=pacemaker
db.pass=pacemaker
jpa.ddl=create
```

application.conf

```
name="mocha"
shop="costa"
rating=3.5
price=2.0
favourite=0
id=1
```

coffees.conf

YAML

<http://en.wikipedia.org/wiki/YAML>

YAML ([/ˈjæməɪl/](#), rhymes with *camel*) is a [human-readable data serialization](#) format that takes concepts from programming languages such as [C](#), [Perl](#), and [Python](#), and ideas from [XML](#) and the data format of electronic mail ([RFC 2822](#)). YAML was first proposed by Clark Evans in 2001,[\[1\]](#) who designed it together with Ingy döt Net[\[2\]](#) and Oren Ben-Kiki.[\[2\]](#) It is available for several programming languages.

YAML is a [recursive acronym](#) for "YAML Ain't [Markup Language](#)". Early in its development, *YAML* was said to mean "[Yet Another](#) Markup Language",[\[3\]](#) but it was then reinterpreted ([backronyming](#) the original acronym) to distinguish its purpose as data-oriented, rather than document markup.

```
Coffee(c1):
  name      : mocha
  shop      : costa
  price     : 2.0
  rating    : 3.5
  favourite : 0

Coffee(c2):
  name      : americano
  shop      : costa
  price     : 3.0
  rating    : 4.5
  favourite : 1

Coffee(c3):
  name      : cappucino
  shop      : starbucks
  price     : 4.0
  rating    : 1.5
  favourite : 0
```

data.yaml

Extensible Markup Language (XML) is a [markup language](#) that defines a set of rules for encoding documents in a [format](#) that is both [human-readable](#) and [machine-readable](#). It is defined in the XML 1.0 Specification[3] produced by the [W3C](#), and several other related specifications,[4] all free [open standards](#). [5]

The design goals of XML emphasize simplicity, generality, and usability over the [Internet](#). [6] It is a textual data format with strong support via [Unicode](#) for the languages of the world.

Although the design of XML focuses on documents, it is widely used for the representation of arbitrary [data structures](#), for example in [web services](#).

Many [application programming interfaces](#) (APIs) have been developed to aid software developers with processing XML data, and several [schema systems](#) exist to aid in the definition of XML-based languages.

XML

<http://en.wikipedia.org/wiki/XML>

```
<?xml version="1.0" encoding="UTF-8"?>

<coffee objname="c1">
  <name> mocha </name>
  <shop> costa </shop>
  <price> 2.0 </price>
  <rating> 3.5</rating>
  <favourite> 0 </favourite>
</coffee>

<coffee objname="c1">
  <name> americano </name>
  <shop> costa </shop>
  <price> 3.0 </price>
  <rating> 4.5 </rating>
  <favourite> 1 </favourite>
</coffee>

<coffee objname="c1">
  <name> cappuccino </name>
  <shop> starbucks </shop>
  <price> 4.0 </price>
  <rating> 1.5 </rating>
  <favourite> 0 </favourite>
</coffee>
```

data.xml

JSON

<http://en.wikipedia.org/wiki/JSON>

JSON ([/ˈdʒeɪsən/ jay-sawn](#), [/ˈdʒeɪsən/ jay-sun](#)), or **JavaScript Object Notation**, is a text-based [open standard](#) designed for [human-readable](#) data interchange. Derived from the [JavaScript](#) scripting language, JSON is a language for representing simple [data structures](#) and [associative arrays](#), called objects. Despite its relationship to JavaScript, JSON is [language-independent](#), with parsers available for many languages.

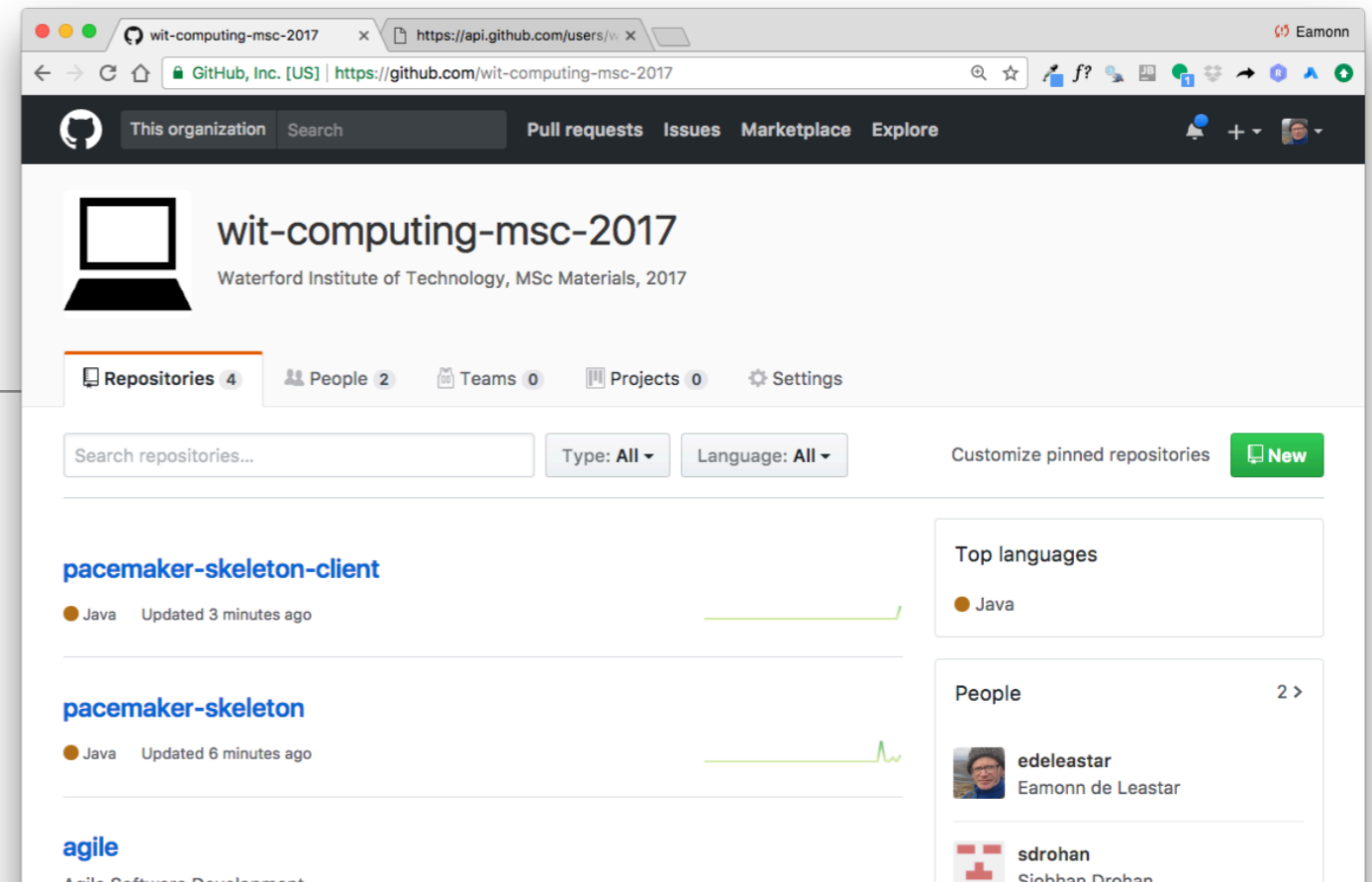
The JSON format was originally specified by [Douglas Crockford](#), and is described in [RFC 4627](#). The official [Internet media type](#) for JSON is `application/json`. The JSON filename extension is `.json`.

The JSON format is often used for [serializing](#) and transmitting structured data over a network connection. It is used primarily to transmit data between a server and web application, serving as an alternative to [XML](#).

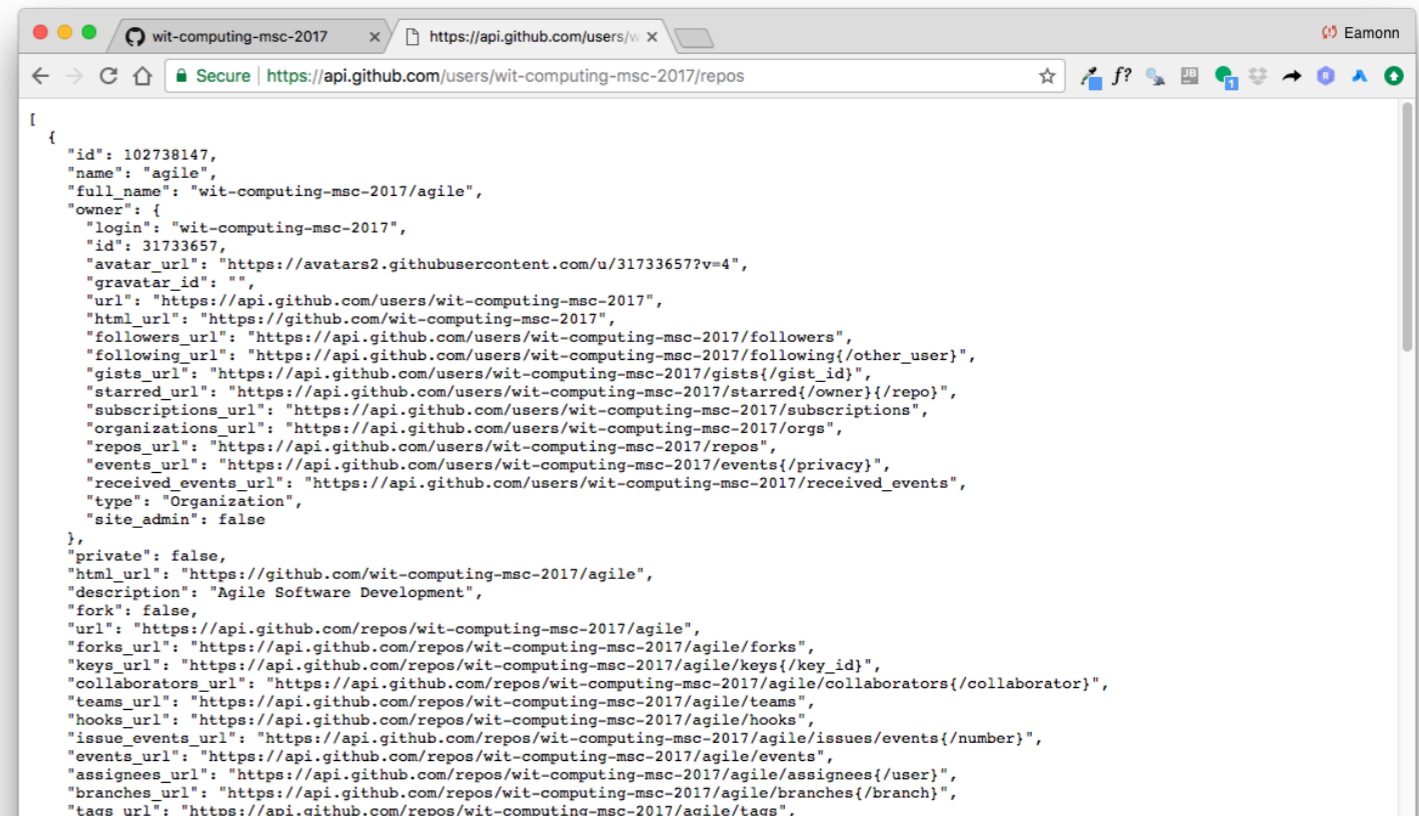
```
{
  "name": "mocha",
  "shop": "costa",
  "rating": 3.5,
  "price": 2.0,
  "favourite": 0,
  "id": 1
},
{
  "name": "americano",
  "shop": "costa",
  "rating": 4.5,
  "price": 3.0,
  "favourite": 1,
  "id": 2
},
{
  "name": "cappuccino lite",
  "shop": "starbucks",
  "rating": 1.5,
  "price": 4.0,
  "favourite": 1,
  "id": 3
}
```

Web vs API

- *Both use HTTP:*
 - GET, PUT, POST, DELETE etc...
- *Web*
 - request formulated by browser
 - HTML response
- *API*
 - request formulated by program (typically)
 - JSON response (typically)



Web



API

Web

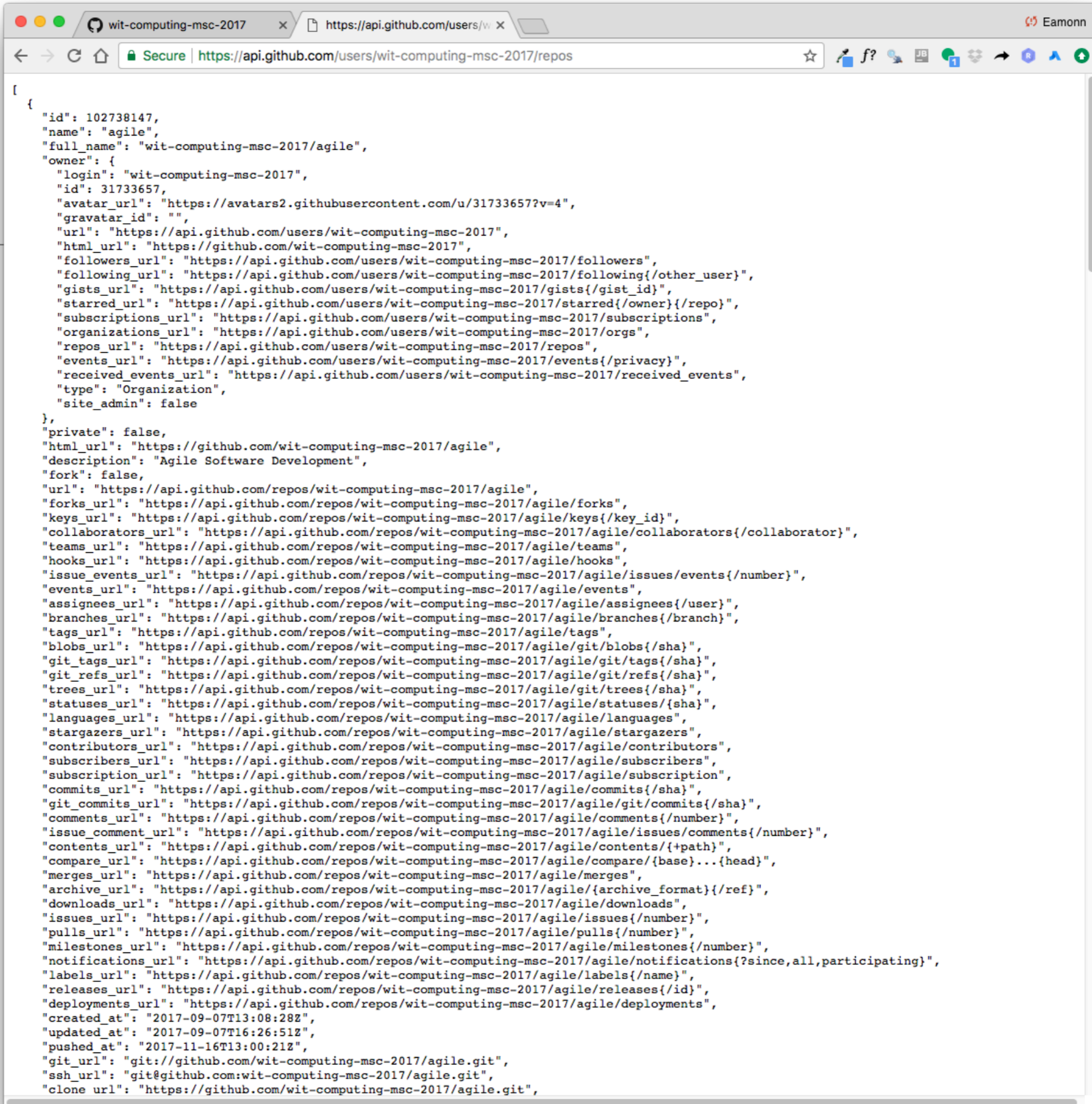
Chrome

The screenshot shows a web browser window displaying the GitHub organization page for 'wit-computing-msc-2017'. The browser's address bar shows the URL 'https://github.com/wit-computing-msc-2017'. The page header includes the GitHub logo, the organization name, and navigation links for 'Pull requests', 'Issues', 'Marketplace', and 'Explore'. Below the header, there are tabs for 'Repositories 4', 'People 2', 'Teams 0', 'Projects 0', and 'Settings'. A search bar for repositories is present, along with filters for 'Type: All' and 'Language: All'. The main content area lists four repositories: 'pacemaker-skeleton-client' (Java, updated 3 minutes ago), 'pacemaker-skeleton' (Java, updated 6 minutes ago), 'agile' (Agile Software Development, updated 4 days ago), and 'pacemaker-console' (Java, updated on 7 Oct). Each repository has a green progress bar. On the right side, there are sections for 'Top languages' (Java) and 'People' (2), listing 'edelestar' (Eamonn de Leastar) and 'sdrohan' (Siobhan Drohan). An 'Invite someone' button is located below the people list. The footer contains copyright information for GitHub, Inc. and various links like 'Terms', 'Privacy', 'Security', 'Status', 'Help', 'Contact GitHub', 'API', 'Training', 'Shop', 'Blog', and 'About'. A status bar at the bottom of the browser shows the URL 'https://github.com/orgs/wit-computing-msc-2017/projects'.

<https://github.com/wit-computing-msc-2017>

API

Chrome



```
[
  {
    "id": 102738147,
    "name": "agile",
    "full_name": "wit-computing-msc-2017/agile",
    "owner": {
      "login": "wit-computing-msc-2017",
      "id": 31733657,
      "avatar_url": "https://avatars2.githubusercontent.com/u/31733657?v=4",
      "gravatar_id": "",
      "url": "https://api.github.com/users/wit-computing-msc-2017",
      "html_url": "https://github.com/wit-computing-msc-2017",
      "followers_url": "https://api.github.com/users/wit-computing-msc-2017/followers",
      "following_url": "https://api.github.com/users/wit-computing-msc-2017/following{/other_user}",
      "gists_url": "https://api.github.com/users/wit-computing-msc-2017/gists{/gist_id}",
      "starred_url": "https://api.github.com/users/wit-computing-msc-2017/starred{/owner}/{repo}",
      "subscriptions_url": "https://api.github.com/users/wit-computing-msc-2017/subscriptions",
      "organizations_url": "https://api.github.com/users/wit-computing-msc-2017/orgs",
      "repos_url": "https://api.github.com/users/wit-computing-msc-2017/repos",
      "events_url": "https://api.github.com/users/wit-computing-msc-2017/events{/privacy}",
      "received_events_url": "https://api.github.com/users/wit-computing-msc-2017/received_events",
      "type": "Organization",
      "site_admin": false
    },
    "private": false,
    "html_url": "https://github.com/wit-computing-msc-2017/agile",
    "description": "Agile Software Development",
    "fork": false,
    "url": "https://api.github.com/repos/wit-computing-msc-2017/agile",
    "forks_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/forks",
    "keys_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/keys{/key_id}",
    "collaborators_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/collaborators{/collaborator}",
    "teams_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/teams",
    "hooks_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/hooks",
    "issue_events_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/issues/events{/number}",
    "events_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/events",
    "assignees_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/assignees{/user}",
    "branches_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/branches{/branch}",
    "tags_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/tags",
    "blobs_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/git/blobs{/sha}",
    "git_tags_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/git/tags{/sha}",
    "git_refs_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/git/refs{/sha}",
    "trees_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/git/trees{/sha}",
    "statuses_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/statuses/{sha}",
    "languages_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/languages",
    "stargazers_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/stargazers",
    "contributors_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/contributors",
    "subscribers_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/subscribers",
    "subscription_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/subscription",
    "commits_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/commits{/sha}",
    "git_commits_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/git/commits{/sha}",
    "comments_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/comments{/number}",
    "issue_comment_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/issues/comments{/number}",
    "contents_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/contents/{+path}",
    "compare_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/compare/{base}...{head}",
    "merges_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/merges",
    "archive_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/{archive_format}/{ref}",
    "downloads_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/downloads",
    "issues_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/issues{/number}",
    "pulls_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/pulls{/number}",
    "milestones_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/milestones{/number}",
    "notifications_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/notifications{?since,all,participating}",
    "labels_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/labels{/name}",
    "releases_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/releases{/id}",
    "deployments_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/deployments",
    "created_at": "2017-09-07T13:08:28Z",
    "updated_at": "2017-09-07T16:26:51Z",
    "pushed_at": "2017-11-16T13:00:21Z",
    "git_url": "git://github.com/wit-computing-msc-2017/agile.git",
    "ssh_url": "git@github.com:wit-computing-msc-2017/agile.git",
    "clone_url": "https://github.com/wit-computing-msc-2017/agile.git",
  }
]
```

<https://api.github.com/users/wit-computing-msc-2017/repos>

The screenshot shows the Chrome Developer Tools interface. The top part displays a REST client request to `https://api.github.com/users/wit-computing-msc-2017/repos`. The response is a JSON object:

```

{
  "id": 102738147,
  "name": "agile",
  "full_name": "wit-computing-msc-2017/agile",
  "owner": {
    "login": "wit-computing-msc-2017",
    "id": 31733657,
    "avatar_url": "https://avatars2.githubusercontent.com/u/31733657?v=4",
    "gravatar_id": "",
    "url": "https://api.github.com/users/wit-computing-msc-2017",
    "html_url": "https://github.com/wit-computing-msc-2017",
    "followers_url": "https://api.github.com/users/wit-computing-msc-2017/followers",
    "following_url": "https://api.github.com/users/wit-computing-msc-2017/following{/other_user}",
    "gists_url": "https://api.github.com/users/wit-computing-msc-2017/gists{/gist_id}",
    "starred_url": "https://api.github.com/users/wit-computing-msc-2017/starred{/owner}/{/repo}",
    "subscriptions_url": "https://api.github.com/users/wit-computing-msc-2017/subscriptions",
    "organizations_url": "https://api.github.com/users/wit-computing-msc-2017/orgs",
    "repos_url": "https://api.github.com/users/wit-computing-msc-2017/repos",
    "events_url": "https://api.github.com/users/wit-computing-msc-2017/events{/privacy}",
    "received_events_url": "https://api.github.com/users/wit-computing-msc-2017/received_events",
    "type": "Organization",
    "site_admin": false
  },
  "private": false,
  "html_url": "https://github.com/wit-computing-msc-2017/agile",
  "description": "Agile Software Development",
  "fork": false,
  "url": "https://api.github.com/repos/wit-computing-msc-2017/agile",
  "forks_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/forks",
}

```

The bottom part of the screenshot shows the Network tab with a timeline and a list of requests. The selected request is `repos`, and its response is displayed in the right pane, matching the JSON object shown above.

Chrome Developer tools

Curl: <https://curl.haxx.se/>



command line tool and library
for transferring data with URLs

Supports...

DICT, FILE, FTP, FTPS, Gopher, HTTP, HTTPS, IMAP, IMAPS, LDAP, LDAPS, POP3, POP3S, RTMP, RTSP, SCP, SFTP, SMB, SMTP, SMTPS, Telnet and TFTP. curl supports SSL certificates, HTTP POST, HTTP PUT, FTP uploading, HTTP form based upload, proxies, HTTP/2, cookies, user+password authentication (Basic, Plain, Digest, CRAM-MD5, NTLM, Negotiate and Kerberos), file transfer resume, proxy tunneling and more.

What's curl used for?

curl is used in command lines or scripts to transfer data. It is also used in cars, television sets, routers, printers, audio equipment, mobile phones, tablets, settop boxes, media players and is the internet transfer backbone for thousands of software applications affecting *billions of humans* daily.

Who makes curl?

curl is free and [open source](#) software and exists thanks to [thousands of contributors](#). The curl project [follows well established open source best practises](#).

What's the latest curl?

The most recent stable version is **7.50.2**, released on 7th of September 2016. Currently, 87 of the listed [downloads](#) are of the latest version.

Where's the code?

Check out the latest [source code from github](#).

Command
Line
Application

```
$ curl https://api.github.com/users/wit-computing-msc-2017/repos
```

```
$ curl https://api.github.com/users/wit-computing-msc-2017/repos
```

```
1. bash
Last login: Fri Nov 17 08:24:22 on ttys000
mainimac:~ edeleastar$ curl https://api.github.com/users/wit-computing-msc-2017/repos
[
  {
    "id": 102738147,
    "name": "agile",
    "full_name": "wit-computing-msc-2017/agile",
    "owner": {
      "login": "wit-computing-msc-2017",
      "id": 31733657,
      "avatar_url": "https://avatars2.githubusercontent.com/u/31733657?v=4",
      "gravatar_id": "",
      "url": "https://api.github.com/users/wit-computing-msc-2017",
      "html_url": "https://github.com/wit-computing-msc-2017",
      "followers_url": "https://api.github.com/users/wit-computing-msc-2017/followers",
      "following_url": "https://api.github.com/users/wit-computing-msc-2017/following{/other_user}",
      "gists_url": "https://api.github.com/users/wit-computing-msc-2017/gists{/gist_id}",
      "starred_url": "https://api.github.com/users/wit-computing-msc-2017/starred{/owner}/{repo}",
      "subscriptions_url": "https://api.github.com/users/wit-computing-msc-2017/subscriptions",
      "organizations_url": "https://api.github.com/users/wit-computing-msc-2017/orgs",
      "repos_url": "https://api.github.com/users/wit-computing-msc-2017/repos",
      "events_url": "https://api.github.com/users/wit-computing-msc-2017/events{/privacy}",
      "received_events_url": "https://api.github.com/users/wit-computing-msc-2017/received_events",
      "type": "Organization",
      "site_admin": false
    },
    "private": false,
    "html_url": "https://github.com/wit-computing-msc-2017/agile",
    "description": "Agile Software Development",
    "fork": false,
    "url": "https://api.github.com/repos/wit-computing-msc-2017/agile",
    "forks_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/forks",
    "keys_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/keys{/key_id}",
    "collaborators_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/collaborators{/collaborator}",
    "teams_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/teams",
    "hooks_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/hooks",
    "issue_events_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/issues/events{/number}",
    "events_url": "https://api.github.com/repos/wit-computing-msc-2017/agile/events",
```



Restlet Client - REST API Testing

offered by [Restlet](#)

★★★★★ (2353)

[Developer Tools](#)

294,021 users

ADDED TO CHROME



OVERVIEW

REVIEWS

SUPPORT

RELATED



The screenshot displays the Restlet Client interface. At the top, there are tabs for CLIENT, REQUESTS, and SCENARIOS. The REQUESTS tab is active, showing a list of requests on the left and a detailed view of a selected request on the right. The request details include the method (POST), URL (https://my-company.apispark.net:443/v1/contacts), headers (Authorization and Content-Type), and a JSON body. Below the request details, the response is shown with a status of 200 OK and a JSON body containing user information.

Chrome Extension

- ⚡ Runs Offline
- 📱 Compatible with your device

Visually create and run single HTTP requests as well as complex scenarios. Automate your API tests with our CI/CD plugin.

[Please scroll down for permissions explanation]

Restlet Client is designed and developed by developers for developers to make direct HTTP / REST resource discovery, testing and test automation easier. Restlet Client's main functions include:

- [Website](#)
- [Report Abuse](#)

Additional Information

Version: 2.11.2
 Updated: November 14, 2017
 Size: 4.67MiB
 Language: English

RELATED

- HTTP Spy ★★★★★ (55)
- User-Agent Switcher ★★★★★ (329)
- New Tab Redirect ★★★★★ (3119)
- Custom New Tab & Google™ Background ★★★★★ (57344)

Chrome Extension

The screenshot displays the Restlet Client Chrome extension interface. The top navigation bar includes 'CLIENT', 'REQUESTS', 'SCENARIOS', 'Settings', 'Pricing', 'Help', and 'Sign in'. The main area is titled 'get users' and shows a request configuration for the endpoint `https://api.github.com/users/wit-computing-msc-2017/repos` using the GET method. The response is a 200 OK status with a JSON body containing repository information for 'agile'.

Request Configuration:

- Method: GET
- URL: `https://api.github.com/users/wit-computing-msc-2017/repos` (length: 57 bytes)
- Headers: Form view
- Body: XHR does not allow payloads for GET request.

Response: 200 OK (Cache Detected - Elapsed Time: 139ms)

Response Headers:

```
Server: GitHub.com
Date: Mon, 20 Nov 2017 08:49:24 GMT -2s
Content-Type: application/json; charset=utf-8
Transfer-Encoding: chunked
Status: 200 OK
X-RateLimit-Limit: 60
X-RateLimit-Remaining: 52
X-RateLimit-Reset: 1511170570
Cache-Control: public, max-age=1m, s-maxage=1m
Vary: Accept
ETag: W/"8e59e6ef4c7383c013d5a91d1a3f17f4"
X-GitHub-Media-Type: github.v3; format=json
Access-Control-Expose-Headers: ETag, Link, Retry-After, X-GitHub-OTP, X-RateLimit-Limit, X-RateLimit-Remaining, X-RateLimit-Reset, X-OAuth-Scopes, X-Authenticated-User, X-Poll-Interval
```

Response Body (JSON):

```
[
  {
    id: 102738147,
    name: "agile",
    full_name: "wit-computing-msc-2017/agile",
    owner: {login: "wit-computing-msc-2017", id: 31733657, avatar_url: "https://avatars.githubusercontent.com/u/31733657?v=3"},
    private: false,
    html_url: "https://github.com/wit-computing-msc-2017/agile",
    description: "Agile Software Development",
    fork: false,
    url: "https://api.github.com/repos/wit-computing-msc-2017/agile",
    forks_url: "https://api.github.com/repos/wit-computing-msc-2017/agile/forks",
    key: "agile",
    teams_url: "https://api.github.com/repos/wit-computing-msc-2017/agile/teams"
  }
]
```

HTTP History:

```
GET /users/wit-computing-msc-2017/repos HTTP/1.1
Host: api.github.com

HTTP/1.1 200 OK
Server: GitHub.com
Date: Mon, 20 Nov 2017 08:49:24 GMT
Content-Type: application/json; charset=utf-8
```