Best and Worst Practices - DICOMweb™

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555 Rule

- 5 seconds to find documentation
- 5 minutes to Hello World
- 5 hours to functional prototype

Supporting 5 Seconds to Documentation

- Put documentation in an easy-to-reference place
  - – i.e., http://{server}/docs
- Implement Service Info transaction

Supporting 5 Minutes to Hello World

- Lay resources out in a logical way
- Use REST simulation tools to access resources
- Show in your documentation specific URLs to call
  - Suggest appropriate test data

Supporting 5 Hours to Working Prototype

- Use test automation to guarantee consistency
- Ensure compliance to standards
  - Participate in WG-31, Conformance
- Be vigilant, yet tolerant (adaptable)
- Use descriptive error codes and payloads

Security

- Consider security throughout the development process
  - Always use HTTPS, even in secured environments
  - See next presentation !

Eat your own dogfood

- In your own server/client applications, utilize the same API methods for communication rather than developing your own
- Stronger integration for you, and a battle-tested API for your consumers

General REST Best Practices

- Self-documenting
- Nouns in path, verbs by HTTP
- Complexity under the “?”
- Errors use HTTP error code mechanism

- As simple as possible, but no simpler

User ID / Password in URL

```
GET http://server.com/studies/
     ?00100010=DOE^JOHN&user=drjones&pwd=123456
```

- Supporting insecure (yet easy) practices sets a bad precedent, no matter how many times you say “don’t use in production”

Asking for too much

- Consider the following: Client needs to know patient position on objects within a series
- WADO-RS call:

```
{s}/studies/{studyUID}/series/{seriesUID}/
   metadata
```

- QIDO-RS call:

```
{s}studies/{studyUID}/series/{seriesUID}/
   instances/?includefield=00185100
```

Incorrectly supporting errors

- Clients need to know what’s happening; make sure to use the right error code
- Even worse, reporting OK when there was an error condition might mislead clients

Avoid Proprietary Extensions

- Think it’s a good idea for adoption? Bring it to the standards organizations
  - If it is structural, bring it to DICOM WG-27
  - If it is profiling (i.e., workflow), bring it to IHE RAD
- If you’re going to do it anyway
  - Model (where possible) on existing standards
  - Refer to general REST best practices

Software Development Tools - DICOMweb™

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Disclaimer

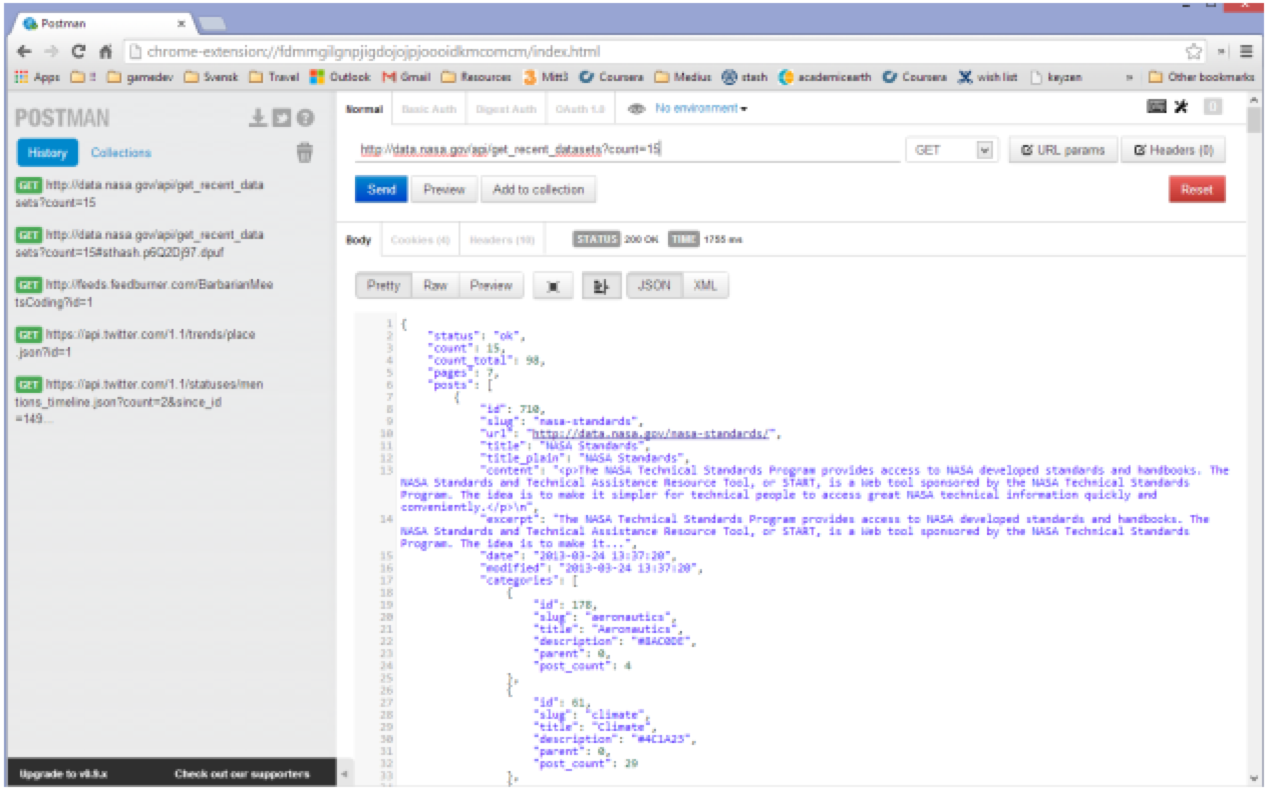
- Any tools I mention are not an official endorsement nor am I under any fiduciary relationship with any of these companies

Tools of the Web Developer

- Playgrounds
- Editors
- Scaffolding
- Builders
- Testing
- Other Useful Tools

Playgrounds

- Postman
- Curl
- JSFiddle
- CodePen



chrome-extension://fdmmgilgnpjigdojojpjoooidkmcomcm/index.html

GET http://data.nasa.gov/api/get_recent_datasets?count=15

GET http://data.nasa.gov/api/get_recent_datasets?count=15#sthash.p6Q2Dj97.dpuf

GET http://feeds.feedburner.com/BarbarianMeetsCoding?id=1

GET https://api.twitter.com/1.1/trends/place.json?id=1

GET https://api.twitter.com/1.1/statuses/mentions_timeline.json?count=2&since_id=149...

http://data.nasa.gov/api/get_recent_datasets?count=15

GET

URL params

Headers (0)

STATUS 200 OK TIME 1755 ms

```
{
    "status": "ok",
    "count": 15,
    "count_total": 98,
    "pages": 7,
    "posts": [
        {
            "id": 710,
            "slug": "nasa-standards",
            "url": "http://data.nasa.gov/nasa-standards/",
            "title": "NASA Standards",
            "title_plain": "NASA Standards",
            "content": "<p>The NASA Technical Standards Program provides access to NASA developed standards and handbooks. The NASA Standards and Technical Assistance Resource Tool, or START, is a Web tool sponsored by the NASA Technical Standards Program. The idea is to make it simpler for technical people to access great NASA technical information quickly and conveniently.</p>\n",
            "excerpt": "The NASA Technical Standards Program provides access to NASA developed standards and handbooks. The NASA Standards and Technical Assistance Resource Tool, or START, is a Web tool sponsored by the NASA Technical Standards Program. The idea is to make it...",
            "date": "2013-03-24 13:37:20",
            "modified": "2013-03-24 13:37:20",
            "categories": [
                {
                    "id": 178,
                    "slug": "aeronautics",
                    "title": "Aeronautics",
                    "description": "#8AC0DE",
                    "parent": 0,
                    "post_count": 4
                },
                {
                    "id": 61,
                    "slug": "climate",
                    "title": "Climate",
                    "description": "#4C1A23",
                    "parent": 0,
                    "post_count": 29
                },
```

Editors

- Integrated Developer Environment (IDE)
  - Eclipse
  - Netbeans
  - IntelliJ
  - Visual Studio
- Lightweight Editors
  - Sublime
  - Notepad++

Scaffolding

- Tools that will lay out your project (i.e., directory structure).
  - Yeoman: Web applications
  - Maven: Java applications
  - Nuget: .Net applications
- Dependency management comes into play
  - Bower, NPM, require.js

Builders

- Tools that compile, test (via automation) and preview your application
  - Grunt
  - Gulp
  - Ant
- Many helpers run as part of the build process
  - JSLint / JSHint
  - Minify (JS / CSS)
  - Uglify

Testing

- Karma: Testing framework
  - Jasmine / Mocha / QUnit
- PhantomJS: Headless website testing
- Selenium: Browser automation
  - SauceLabs: Cloud-based browser testing

Other Useful Tools

- Code repositories
  - GitHub / Bitbucket
- Virtual server environment
  - Virtual Box
  - Docker, Vagrant
- Troubleshooting
  - Chrome development tools
  - Postman
  - Fiddler / Firebug

DICOMweb™ Specific Tools

- Available open-source server libraries
  - – dcm4chee
  - – Orthanc
- Available open-source client libraries
  - – Cornerstone

Great resource: https://github.com/chafey/dicomWeb

DICOMweb™ Vagrants

- dcm4chee https://github.com/mohannadhussain/dcm4chee4-quick-start-vagrant
- Orthanc https://github.com/chafey/orthanc-vagrant