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Troubleshooting Cerner Ignite for Millennium

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October 9, 2017

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Setup

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Setup



Code Learning Private
CODE17



http://bit.ly/chc_learning_lab

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Dos and Don'ts

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Do

- Do try to recreate (in sandbox)
- Do note the X-Request-Id or Correlation Id
- Do note the error message in the response
- Do double-check the documentation
- Do use debugging tools, if available

Don't

- Do NOT compromise PHI/PII
- Do NOT compromise secrets
- Don't ignore errors
- Don't assume it was a fluke

Help

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HTTP Spec

<https://www.w3.org/Protocols/rfc2616/rfc2616-sec10.html>

10.2.1 200 OK

The request has succeeded. The information returned with the response is dependent on the method used.

GET an entity corresponding to the requested resource is sent in the response;

HEAD the entity-header fields corresponding to the requested resource are sent in the response;

POST an entity describing or containing the result of the action;

TRACE an entity containing the request message as received by the end server.

10.2.2 201 Created

The request has been fulfilled and resulted in a new resource being created. The newly created resource is returned with its location and other meta-information in the response header. The response **SHOULD** include an entity containing a list of other resources related to the newly created resource. The format is specified by the media type given in the Content-Type header field. The origin server **SHOULD** respond with 202 (Accepted) response instead.

A 201 response **MAY** contain an ETag response header field indicating the current value of the resource.

10.2.3 202 Accepted

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Beyond HTTP Spec

https://en.wikipedia.org/wiki/List_of_HTTP_status_codes

418 I'm a teapot (RFC 2324^[9])

This code was defined in 1998 as one of the traditional IETF April Fools' jokes, in RFC 2324^[9], *Hyper Text Coffee Pot Control Protocol*. The RFC specifies this code should be returned by teapots requested to brew coffee.^[9] This HTTP status is used as an E

421 Mismatched Request (RFC 7540^[5])

The request was directed at a server that is not able to produce a response.^[5] (for example because of a connection reuse)^[5]

422 Unprocessable Entity (WebDAV; RFC 4918^[8])

The request was well-formed but was unable to be followed due to semantic errors.^[18]

423 Locked (WebDAV; RFC 4918^[8])

The resource that is being accessed is locked.^[18]

424 Failed Dependency (WebDAV; RFC 4918^[8])

The request failed due to failure of a previous request (e.g., a PROPPATCH).^[16]

426 Upgrade Required

The client must switch to a different protocol to be able to use the resource.^[16]

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HL7 FHIR Spec

<http://hl7.org/fhir/dstu2/http.html#summary>

Interaction	Response				Status Codes
	Content Type	Body	Location	Versioning	
read	R	R: Resource	N/A	R: ETag, Last-Modified	200, 404, 410
read	R	R: Resource	N/A	R: ETag, Last-Modified	200, 404
update	R if body C if no body	R: Resource (if body) C: create	R on create	R: ETag, Last-Modified	200, 201, 400, 404, 405, 409, 412, 422
delete	R if body C: OperationOutcome	C: OperationOutcome	N/A	N/A	200, 204, 404, 405, 409, 412
create	R if body C: Resource (if not)	C: Resource (if not)	R	R: ETag, Last-Modified	200, 400, 404, 405, 412
search	R	R: Bundle	N/A	N/A	200, 401
search-type	R	R: Bundle	N/A	N/A	200, 401
search-type	R	R: Bundle	N/A	N/A	200, 404
transaction	R	R: Bundle	N/A	N/A	200, 400, 404, 405, 409, 412, 422
history	R	R: Bundle	N/A	N/A	200
history-type	R	R: Bundle	N/A	N/A	200
history-all	R	R: Bundle	N/A	N/A	200
(operation)	R	R: Parameters/Response	N/A	N/A	200

Note: This table lists the status codes described here, but other status codes are possible as described by the HTTP specification. Additional codes that are likely are server errors and various codes associated with authentication protocols.

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NOTE: more description can be found by each interaction

Ignite Documentation

<http://fhir.cerner.com/millennium/dstu2/#client-errors>

Client Errors

There are seven possible types of client errors an API calls that receive request bodies:

- 1 Failing to send a required query parameter will result in a `400 Bad Request` response.

```
HTTP/1.1 400 Bad Request
{
  "message": "no supported search parameters provided"
}
```
- 2 Requesting the access endpoint (`/oauth/token`) without valid credentials will result in a `401 Unauthorized` response.

```
HTTP/1.1 401 Unauthorized
```
- 3 Requesting data from an unknown instance or an instance where the application is not authorized will result in a `403 Forbidden` response.

OR by resource...

<http://fhir.cerner.com/millennium/dstu2/general-clinical/allergy-intolerance/#errors-2>

Errors

The common [errors](#) may be returned. In addition, [OperationOutcomes](#) may be returned in the following scenarios:

HTTP Status	Cause	Severity	Code
422	Body contained modifier extensions	error	extension
422	Body contained implicit rules	error	unsupported

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Operation Outcome

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Operation Outcomes

- It's a resource
 - <http://hl7.org/fhir/dstu2/operationoutcome.html>
- Limited use **currently**
- Fatal, error, informational, and warning

Exercise 1

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Exercise 1: Question

What error results when an AllergyIntolerance is created with a modifier extension?

Exercise 1: Answer

422, and an OperationOutcome!

<http://fhir.cerner.com/millennium/dstu2/general-clinical/allergy-intolerance/#errors-2>

Errors

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HTTP Status	Cause	Severity	Code
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Connection Issues

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Firewalls

- Especially during initial install
- Can be to your application
- Can be to OAuth, SMART, or FHIR

Narrowing it Down

- Load a URL in the browser
 - For FHIR, the metadata endpoint can be used
- ping
 - Can it connect?
 - Is it only me?
- openssl
 - More in a bit

```
PING fhir-ehr.dev.cerner.com (10.102.143.6): 56 data bytes  
Request timeout for icmp_seq 0  
Request timeout for icmp_seq 1  
Request timeout for icmp_seq 2  
^C
```

Certificates

- These can look like connection issues
- Most important: know how to debug your stack
 - Know how to add trust
- <https://www.ssllabs.com/ssltest/>
- openssl
 - `openssl s_client -showcerts -connect mysslhost.com:443`



Certificates are hard. We could spend an entire class on this.

Google is Your Friend

SUN | Monday, November 16, 2015

Install How to Trust a Certificate in IE a Java

By John Ruiz



By: James Con

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deal with digita
Furthermore, p
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to encounter is

Internet Explorer comes with some security features that check for the legitimacy of a website so you can safely share sensitive data with trusted online sources. This is useful for activities like online shopping, and it is the browser's job to make sure that it safely transmits the data to the trusted site so others won't see it. These websites use digitally signed certificates so the browser can read them and declare these sites as safe. However, other websites may use third party Certification Authorities to identify themselves as safe sites. Internet Explorer may block these third party certificates, which automatically renders the site inaccessible. You can change this behavior in

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Client Errors

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That's what the HTTP spec calls them - 4xx, errors that a client application may have caused/can resolve

400

- Syntax was wrong
 - Invalid parameters
 - Missing fields

401 and 403

- Authorization and Authentication
- 401: You need to authenticate
- 403: This isn't allowed
- or... 404?

404

- Not Found
 - Check your URL!
- Not supported
- Accessing data without permissions

406

- Not Acceptable
 - Accept header
- application/json or application/json+fhir
- _format parameter

409

- Conflict
- Update, Patch
- Updating the wrong version

- Unsupported Media Type
 - Content-type Header
- application/json or application/json+fhir

422

- Unprocessable
- JSON was fine - something else wasn't
- Most common when a value can't be interpreted
- Mappings!

Exercise 2

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Exercise 2: Question

What kind of error occurs when you request this server's metadata?

Method: GET

URL: https://fhir-open.stagingcerner.com/dstu2/fb8067d7-e012-4703-8888-17b86d11f0f8/metadata?_format=json

Headers: None



Exercise 2: Answer

Connectivity/Firewall

Could not get any response

There was an error connecting to https://f0a1-open.stagingcerner.com/distu2/fb8097d7-e012-4703-8588-17b86d110068/metadata?_format=json.

Why this might have happened:

- The server couldn't send a response: Ensure that the backend is working properly
- SSL connections are being blocked: Fix this by [importing SSL certificates in Chrome](#)
- Cookies not being sent: Use the Postman Interceptor extension
- Request timeout: Change request timeout in Settings > General

```
PING f0a1-open.stagingcerner.com [159.148.7.37]: 56 data bytes  
Request timeout for icmp_seq 0  
Request timeout for icmp_seq 1  
Request timeout for icmp_seq 2  
Request timeout for icmp_seq 3
```

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Exercise 3

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Exercise 3: Question

What's wrong?

Method: GET

URL: <https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/AllergyIntolerance?patient=4342012>

Headers: None



Exercise 3: Answer

406 - Not Acceptable

The screenshot displays the Chrome DevTools interface. The 'Body' tab on the left shows an error message: "The Accept type is invalid. See the document resource you are attempting to access." The 'Headers' tab on the right lists various response headers. The 'x-request-id' header, with the value 'c28a75c14d120945b8e54778ec93', is circled in red. Other visible headers include 'date', 'expires', 'keep-alive', 'pragma', 'server-response-time', 'status', 'strict-transport-security', 'transfer-encoding', 'vary', 'x-content-type-options', and 'x-frame-options'. A status bar at the top right indicates "406 Not Acceptable".

Header	Value
date	Mon, 30 Oct 2017 21:49:18 GMT
expires	Mon, 01 Jan 1990 00:00:00 GMT
keep-alive	timeout=15, max=100
pragma	no-cache
server-response-time	7.247168
status	406 Not Acceptable
strict-transport-security	max-age=631152000
transfer-encoding	chunked
vary	Origin,User-Agent,Accept-Encoding
x-content-type-options	nosniff
x-frame-options	deny
x-request-id	c28a75c14d120945b8e54778ec93
x-runtime	0.007426

format values for the

run: 406 Not Acceptable

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Exercise 3: Fix It

URL: https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/AllergyIntolerance?patient=4342012&_format=json

Headers: None

OR

URL: <https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/AllergyIntolerance?patient=4342012>

Headers: **Accept:** application/json+fhir



Exercise 4

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Exercise 4: Question

What's wrong?

Method: GET

URL: <https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/MedicationStatement?status=active>

Headers:

- Accept: application/json+fhir



Exercise 4: Answer

new key

Body Cookies

Pretty Raw

1 at least on

Parameters

Name	Required?	Type	Description
_id	This, or patient	token	The logical resource id associated with the resource.
patient	This, or _id	reference	The identifier of a patient to list statements for. Example: 12345
status	N	token	The status of the medication statement, may be a list separated by commas. Example: active, completed
_count	N	number	The maximum number of results to return. Defaults to 50.

Notes:

- Either the `_id`, or a combination of `patient`, `status`, or `_count` parameters must be provided.

Use: 400 Bad Request

<http://fhir.cerner.com/millennium/dstu2/medications/medication-statement/#parameters>

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Exercise 4: Fix It

URL: <https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/MedicationStatement?status=active&patient=4342012>

Headers:

- Accept: application/json+fhir



Exercise 5

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Exercise 5: Question

What's wrong?

Method: GET

URL: <https://fhir-ehr.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/Observation?patient=4342012>

Headers:

- Accept: application/json+fhir



Exercise 5: Answer

401 - Unauthorized

Body	Cookies	Headers (10)	Test Results
			STATUS: 401 UNAUTHORIZED
date → Mon, 09 Oct 2017 18:23:26 GMT			
expires → Mon, 01 Jan 1960 00:00:00 GMT			
keep-alive → timeout=15, max=100			
pragma → no-cache			
server-response-time → 3.800746			
status → 401 Unauthorized			
strict-transport-security → max-age=631152000			
vary → Origin, User-Agent, Accept-Encoding			
www-authenticate → Bearer realm="fhir-ehs.aandbxcerner.com"			
x-content-type-options → nosniff			

Exercise 5: Fix It

URL: <https://fhir-ehr.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/Observation?patient=4342012>

Headers:

- Accept: application/json+fhir
- **Authorization: Bearer ...**

Exercise 6

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Exercise 6: Question

What's wrong?

Method: POST

URL: <https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/MedicationStatement>

Body: ... (see wiki)

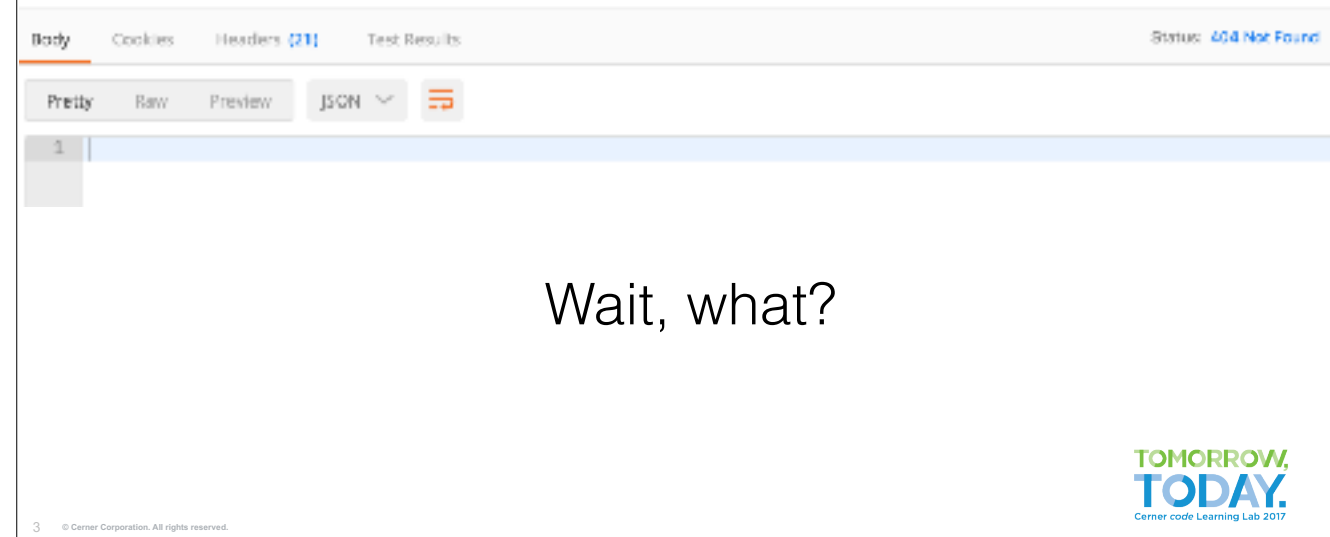
Headers:

- Accept: application/json+fhir
- Content-type: application/json+fhir



Exercise 6: Answer

404 - Not Found



This is our open endpoint, we just tried to write - it's not available there.

Server Errors

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5xx

- 500: Internal Server Error
- 503: Server Unavailable
- Correlation or X-Request-Id!!

Asking For Help

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Google Group

- Google Group
- <https://groups.google.com/forum/#!forum/cerner-fhir-developers>

Welcome to the Cerner FHIR Developers C

This group is here to support and answer questions about the Cerner implementations of SMART and FHIR.

First, a few rules...

- Do NOT post your OAuth Bearer token or other security credentials on this group.
- Do NOT post any patient data (FHIR request bodies or response bodies), outside of our open sandbox value from our server response.
- Do NOT post URLs that are not part of our publicly available in this group. We can get versioned from the
- Do NOT post recruiting requests, job seeking requests, or advertisements.

All the guidelines above are here to protect security and sensitive patient data. It's best to get in the habit of being specific to this group, they would apply to all data your application will have access to, other public groups, and

How to ask a Question

In order to enable us to help everyone, we ask that you follow these guidelines when asking a question here:

1. **RIGHT PLACE?** Make sure the question belongs in this group.
 - For more general questions about FHIR, you may want to contact the FHIR groups documented
 - For more general questions about SMART, see the SMART on FHIR group here: <https://groups.g>
 - We do NOT comment on future timelines in this group.
2. **SEARCH.** Has the question already been answered?
 - Make sure to search the existing posts to see if someone else already asked this question, and if
 - Please read our documentation at <http://fhir.cerner.com/> to see if the documentation answers your parameters we support are documented, along with FAQs, SMART, and Authorization document
3. **TAG.** Make sure to select the tag that best applies to your question or discussion.
4. **INVESTIGATE and DOCUMENT.** For Troubleshooting requests: provide a summary of any investigation checked!
 - Link to any documentation you're referencing.
 - Link to your application in the code console, if applicable.
5. **EXAMPLE.** For Troubleshooting requests: Provide a simple example that recreates the issue
 - Ensure the simple example is in our public sandbox, not from a client site.
 - If you have the example of an actual failure, provide the Callstack and/or release do not provide any

No PHI/PHI

Correlation or X-Request-Id

Log a Service Record

- Found a possible issue?
- In eService:
 - For Solution Family, select Open Development Services
 - For Solution, select Ignite APIs for Mill

OAuth

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OAuth

- Display to user
- error_uri
- Correlation Id
- <http://fhir.cerner.com/authorization/>
- Compare to examples
- Watch your scopes!



Scopes: can't conflict (eg user/patient.read, patient/patient.read), can't request patient/* if no SMART scopes (launch, launch/patient). Can't request launch without providing a launch code. etc...

Exercise 7

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Exercise 7: Question

What's wrong?

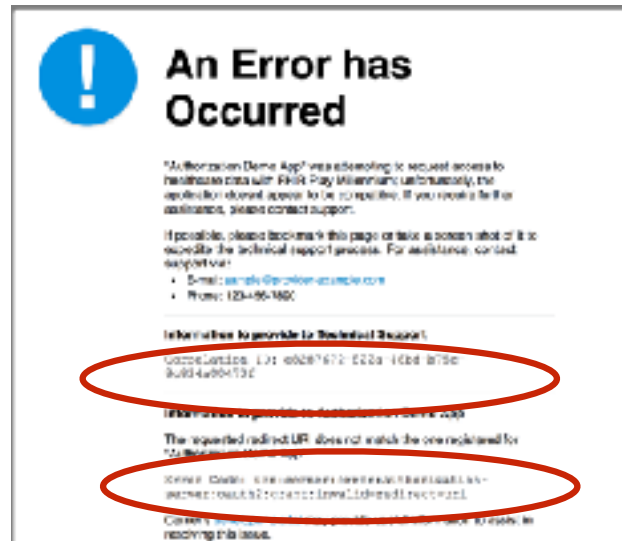
Method: NA - Just use browser

URL: https://authorization.sandboxcerner.com/tenants/a758f80e-aa74-4118-80aa-98cc75846c76/protocols/oauth2/profiles/smart-v1/personas/provider/authorize?client_id=c4093c13-1ed1-47ef-95a6-a225d3e47023&response_type=code&redirect_uri=http://localhost:8080/foo



Exercise 7: Answer

Authorization error



The correlation id is on the page - you can copy that and provide it with a question.

The Error code also gives information (this will also be returned to the application itself)

More on this in the OAuth Class!

SMART

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Read Up!

- <http://fhir.cerner.com/smart/>
- Know your developer tools

SMART[®]

I. General

- 1. Introduction
- 2. SaaS Model
- 3. Authentication Model
- 4. Access Points
- 5. SMART App Data Retrieval
- 6. SMART Without FHIR

II. Technical

- 1. Screen Resolution
- 2. Browser Requirement
- 3. Single Sign-On (SSO)
- 4. Embedded Browser Control
- 5. HTML5 DOCTYPE
- 6. X-UA-Compatible Tag
- 7. Technology and Framework for SMART Apps
- 8. Open Source FHIR Client Libraries
- 9. Tutorial
- 10. Code Conventions and Standards
- 11. Launch Context

III. Testing

There is a lot that can happen app side. The SMART FAQ talks through some of this and technical requirements. EG: X-UA-Compatible header to get IE to the Edge browser.

If you work in a browser, get to know the development tools that come with the browser

The Errors that Weren't

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No Data

- Scenario: 200 response, but no data!
- Causes:
 - No access?
 - No data?
 - No data that matches filters?
 - Data that's not mapped...

Missing Data

- Scenario: 200 Response, but I don't see everything I expect!
- Causes:
 - User permissions
 - Security
 - Some data not mapped

Bad Data

- Scenario:
 - Data is returned, but no codes
 - Data is returned, but some fields are empty
 - Data is returned, but not as expected

Bad Data Cont...

- Cause:
 - Most common: data is not mapped
 - Sanity check: ensure you see the data in Millennium (within PowerChart, for example)

Questions?

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