

Advanced FHIR: Migrating FHIR Usage from DSTU2 to R4

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Agenda

Detail Changes from DSTU2 to R4

Staying Informed

Availability of R4 Capabilities

Advantages of R4



Changes from DSTU2 to R4

A look at HL7 spec differences



Changes from DSTU2 to R4 (HL7)

How to view all changes between versions

- **FHIR History**
- Complete history of FHIR spec changes
- <https://www.hl7.org/fhir/history.html>
- **Differences from DSTU2 to STU3**
- Summary of all differences
- <http://hl7.org/fhir/STU3/diff.html>
- **Differences from STU3 to R4**
- Summary of all differences
- <http://hl7.org/fhir/R4/diff.html>



Changes from DSTU2 to R4 (HL7)

HL7 specification changes

- **Conformance** is now **CapabilityStatement**
- **MedicationOrder** is now **MedicationRequest**
- Care teams represented by **CarePlan** are now represented by **CareTeam**
- **ProcedureRequest** is now **ServiceRequest**
- **AllergyIntolerance.status** was replaced by **clinicalStatus** and **verificationStatus**



Changes from DSTU2 to R4 (HL7)

HL7 specification changes

- **Accept Type**
- Changed from ‘application/json+fhir’ to ‘application/fhir+json’ in STU3
- **Introduction of Markdown strings**
- **OperationOutcome**
- Deprecated *issue.location* in favor of *issue.expression*
- **Sources on Resources**
- *Resource.meta.source* added to identify the source system of the resource.



Changes from DSTU2 to R4 (HL7)

HL7 specification changes

- **Cardinality Changes**
- **Some Codes changed to CodeableConcepts**
- **New Data Types:**
- Annotation
- Dosage
- Markdown
- Timing

Name	Flags	Card.	Type	Description & Constraints	?
Annotation	N		Element	Text node with attribution Elements defined in Ancestors: id , extension Individual responsible for the annotation	

Annotation

- author[x] Σ 0..1
 - authorReference Reference(Practitioner | Patient | RelatedPerson | Organization)
 - authorString string
- time Σ 0..1 dateTime When the annotation was made
- text Σ 1..1 markdown The annotation - text content (as markdown)

Changes from DSTU2 to R4 (HL7)

Dosage

Structure

Name	Flags	Card.	Type	Description & Constraints
Dosage	Σ TU		BackBoneElement	How the medication is/was taken or should be taken Elements defined in Ancestors: id , extension , modifierExtension
sequence	Σ	0..1	integer	The order of the dosage instructions
text	Σ	0..1	string	Free text dosage instructions e.g. SIG
additionalInstruction	Σ	0..*	CodeableConcept	Supplemental instruction or warnings to the patient - e.g. "with meals", "may cause drowsiness" SNOMED CT Additional Dosage Instructions (Example)
patientInstruction	Σ	0..1	string	Patient or consumer oriented instructions
timing	Σ	0..1	Timing	When medication should be administered
asNeeded[x]	Σ	0..1		Take "as needed" (for x) SNOMED CT Medication As Needed Reason Codes (Example)
asNeededBoolean			boolean	
asNeededCodeableConcept			CodeableConcept	
site	Σ	0..1	CodeableConcept	Body site to administer to SNOMED CT Anatomical Structure for Administration Site Codes (Example)
route	Σ	0..1	CodeableConcept	How drug should enter body SNOMED CT Route Codes (Example)
method	Σ	0..1	CodeableConcept	Technique for administering medication SNOMED CT Administration Method Codes (Example)
doseAndRate	Σ	0..*	Element	Amount of medication administered
type	Σ	0..1	CodeableConcept	The kind of dose or rate specified DoseAndRateType (Example)
dose[x]	Σ	0..1		Amount of medication per dose
doseRange			Range	
doseQuantity			SimpleQuantity	
rate[x]	Σ	0..1		Amount of medication per unit of time
rateRatio			Ratio	
rateRange			Range	
rateQuantity			SimpleQuantity	
maxDosePerPeriod	Σ	0..1	Ratio	Upper limit on medication per unit of time
maxDosePerAdministration	Σ	0..1	SimpleQuantity	Upper limit on medication per administration
maxDosePerLifetime	Σ	0..1	SimpleQuantity	Upper limit on medication per lifetime of the patient



Changes from DSTU2 to R4 (HL7)

How to determine Resource changes

Observation

<https://www.hl7.org/fhir/STU3/observation.html>

<https://www.hl7.org/fhir/R4/observation.html>

10.1.3 Resource Content

Structure	UML	XML	JSON	Turtle	R2 Diff	All
Changes since DSTU2						
Observation						
Observation.basedOn					<ul style="list-style-type: none">Added Element	
Observation.category					<ul style="list-style-type: none">Max Cardinality changed from 1 to *	
Observation.context					<ul style="list-style-type: none">Renamed from encounter to contextAdd Reference(EpisodeOfCare)	
Observation.value[x]					<ul style="list-style-type: none">Add boolean	
Observation.comment					<ul style="list-style-type: none">Renamed from comments to comment	
Observation.referenceRange.type					<ul style="list-style-type: none">Added Element	
Observation.referenceRange.appliesTo					<ul style="list-style-type: none">Renamed from meaning to appliesToMax Cardinality changed from 1 to *	
Observation.related.target					<ul style="list-style-type: none">Add Reference(Sequence)	
Observation.component.interpretation					<ul style="list-style-type: none">Added Element	

10.1.3 Resource Content

Structure UML XML JSON Turtle R3 Diff All

Changes since R3

Observation	
Observation.basedOn	<ul style="list-style-type: none">Type Reference: Added Target Type ServiceRequestType Reference: Removed Target Types ProcedureRequest, ReferralRequest
Observation.partOf	<ul style="list-style-type: none">Added Element
Observation.status	<ul style="list-style-type: none">Change value set from http://hl7.org/fhir/ValueSet/observation-status to http://hl7.org/fhir/ValueSet/observation-status 4.0.1
Observation.focus	<ul style="list-style-type: none">Added Element
Observation.encounter	<ul style="list-style-type: none">Renamed from context to encounterType Reference: Removed Target Type EpisodeOfCare
Observation.effective[x]	<ul style="list-style-type: none">Add Types Timing, instant
Observation.performer	<ul style="list-style-type: none">Type Reference: Added Target Types PractitionerRole, CareTeam
Observation.value[x]	<ul style="list-style-type: none">Add Type integerRemove Type Attachment
Observation.dataAbsentReason	<ul style="list-style-type: none">Change value set from http://hl7.org/fhir/ValueSet/observation-valueabsentreason to http://hl7.org/fhir/ValueSet/data-absent-reasonChange code system for extensibly bound codes from "http://hl7.org/fhir/data-absent-reason" to "http://terminology.hl7.org/CodeSystem/data-absent-reason"
Observation.interpretation	<ul style="list-style-type: none">Max Cardinality changed from 1 to *Change code system for extensibly bound codes from "http://terminology.hl7.org/CodeSystem/v2-0078" to "http://terminology.hl7.org/CodeSystem/v3-ObservationInterpretation"
Observation.note	<ul style="list-style-type: none">Renamed from comment to noteMax Cardinality changed from 1 to *Type changed from string to Annotation
Observation.referenceRange.type	<ul style="list-style-type: none">Remove Binding http://hl7.org/fhir/ValueSet/referencerange-meaning (extensible)
Observation.hasMember	<ul style="list-style-type: none">Added Element
Observation.derivedFrom	<ul style="list-style-type: none">Added Element
Observation.component.value[x]	<ul style="list-style-type: none">Add Types boolean, integerRemove Type Attachment
Observation.component.dataAbsentReason	<ul style="list-style-type: none">Change value set from http://hl7.org/fhir/ValueSet/observation-valueabsentreason to http://hl7.org/fhir/ValueSet/data-absent-reasonChange code system for extensibly bound codes from "http://hl7.org/fhir/data-absent-reason" to "http://terminology.hl7.org/CodeSystem/data-absent-reason"
Observation.component.interpretation	<ul style="list-style-type: none">Max Cardinality changed from 1 to *Change code system for extensibly bound codes from "http://terminology.hl7.org/CodeSystem/v2-0078" to "http://terminology.hl7.org/CodeSystem/v3-ObservationInterpretation"
Observation.related	<ul style="list-style-type: none">deleted



Changes from DSTU2 to R4

A look at Cerner's R4 implementation

Empowering **beyond**



Changes from DSTU2 to R4 (Cerner)

Details specific to Cerner's implementation

- Consent is now used to represent people who are authorized to view a patient's data, not Contract.
- More specific error handling
- Can be used by developers or even passed up to end-users.
- Observation.valueAttachment does not exist in R4. It is returned as an extension.
- RelatedPerson IDs have changed.
- Removed MedicationStatement patient-friendly-display and medication-statement-category Extensions.
- Added support for Millennium proprietary codes for most CodeableConcepts
- Support mandatory US Core search parameters.

Changes from DSTU2 to R4 (Cerner)

Millennium Proprietary Codes

- <https://fhir.cerner.com/millennium/r4/proprietary-codes-and-systems/>
- **Millennium groups repetitive textual information into code sets**

Example outbound CodeableConcept displaying both standard and proprietary codes:

```
{  
  "type": {  
    "coding": [  
      {  
        "system": "http://snomed.info/sct",  
        "code": "394581000",  
        "display": "Community medicine",  
        "userSelected": false  
      },  
      {  
        "system": "https://fhir.cerner.com/<EHR source id>/codeSet/14249",  
        "code": "21265426",  
        "display": "Same Day",  
        "userSelected": true  
      }  
    ]  
  }  
}
```



Changes from DSTU2 to R4 (Cerner)

US Core Implementation Guide

- **DSTU2 to R4 Conversion Page**
- **No Guarantee that Resource IDs are Preserved**
- Client applications must plan on deduplication methods that don't rely on a common identifier across FHIR versions.
- **Expectation that DSTU2 Data is Preserved in R4**
- **Separate authorization is required. The new endpoint will bring additional/changed resource types and added scopes.**
- **Missing Data**
- DataAbsentReason provided in coded data elements



Changes from DSTU2 to R4 (Cerner)

Missing Data - DataAbsentReason provided in coded data elements

```
"category": [
  {
    "extension": [
      {
        "valueCode": "unknown",
        "url": "http://hl7.org/fhir/StructureDefinition/data-absent-reason"
      }
    ]
  },
]
```

```
"dataAbsentReason": {
  "coding": [
    {
      "system": "http://terminology.hl7.org/CodeSystem/data-absent-reason",
      "code": "unknown",
      "display": "Unknown"
    }
  ],
  "text": "Unknown"
}
```



Changes from DSTU2 to R4 (Cerner)

Retrieving all Medications (US Core)

- <http://hl7.org/fhir/us/core/all-meds.html>
- DSTU2 used **MedicationOrder** and **MedicationStatement**.
- R4 uses **MedicationRequest** for all medications.
- Currently returning all categories returning **MedicationRequest.intent** as “order”
- US Core changing to return **MedicationRequest.intent** as “plan” for historical or documented medications

Changes from DSTU2 to R4 (Cerner)

Care teams represented by CarePlan are now represented by CareTeam

```
GET https://fhir-open.cerner.com/dstu2/ec2458f2-1e24-41c8-b71b-0e701af7583d/CarePlan?patient=12724066&category=careteam
```

```
GET https://fhir-open.cerner.com/r4/ec2458f2-1e24-41c8-b71b-0e701af7583d/CareTeam?patient=12724066
```



Changes from DSTU2 to R4 (Cerner)

HTTP Method Override

- [**https://fhir.cerner.com/millennium/r4/#http-method-override**](https://fhir.cerner.com/millennium/r4/#http-method-override)
- Able to use POST method if there is no support for HTTP methods such as PUT, PATCH, and DELETE
- _method Parameter
- X-HTTP-Method-Override Header

Changes from DSTU2 to R4 (Cerner)

HTTP Method Override – Parameter Example

```
POST /r4/34a135c8-c081-4294-9b53-1b68b280e2a6/MedicationRequest/30739309?_method=patch HTTP/1.1
```

```
Host: fhir-ehr.cerner.com
```

```
Content-Type: application/json-patch+json
```

```
Accept: application/fhir+json
```

```
If-Match: W/"0"
```

```
Authorization: Bearer token
```

```
[
```

```
{
```

```
    "op": "replace",
```

```
    "path": "/status",
```

```
    "value": "stopped"
```

```
}
```

```
]
```



Changes from DSTU2 to R4 (Cerner)

HTTP Method Override – Header Example

```
POST /r4/34a135c8-c081-4294-9b53-1b68b280e2a6/MedicationRequest/30739309 HTTP/1.1
Host: fhir-ehr.cerner.com
Content-Type: application/json-patch+json
Accept: application/fhir+json
If-Match: W/"0"
Authorization: Bearer token
X-HTTP-Method-Override: patch

[
  {
    "op": "replace",
    "path": "/status",
    "value": "stopped"
  }
]
```



Staying Informed

Moving from DSTU2 to R4

Empowering **beyond**



Staying up-to-date with Cerner

Three ways to stay informed

- [**fhir.cerner.com**](http://fhir.cerner.com)
- API documentation
- Proprietary codes documented
- [**Cerner FHIR Developers Google Group**](#)
- Provides developer support and announcements
- [**Release Notes - Cerner Ignite APIs for Millennium**](#)
- Published release notes
- “Watching” this page will notify you of updates

Cerner FHIR R4 Release Notes

Example 1 - Observation

Observation NEW	Enhancement 1-000000221073	<p>The Observation resource is now available. The resource provides measurements or simple assertions about a patient that are useful for establishing baselines or trends, monitoring a patient's progress, and establishing diagnoses. Examples of common observations are Laboratory results (blood sugar, hemoglobin), Vital signs (temperature, blood pressure), Personal characteristics (height, weight), and Social history (tobacco and alcohol use, employment status). This resource supports the following capabilities for provider and system access:</p> <ul style="list-style-type: none">• Search by patient• Search by subject• Search by code• Search by date• Search by _lastUpdated• Search by category• Search by _count <p>The Observation resource supports <i>Cerner Millennium</i> proprietary codes for Observation.code, Observation.component.code, Observation.interpretation, and Observation.component.interpretation</p> <p>Revisions from DSTU2 for Observation Resource:</p> <ul style="list-style-type: none">• Observation.category maximum cardinality changed from 1 to many• Observation.comments renamed to note. The maximum cardinality changed from 1 to many. The type was changed from a string to an annotation• Observation.interpretation maximum cardinality changed from 1 to many.• Observation.hasMember is a new element. It replaces observation.related.type of has-member• Observation.component.interpretation is a new element• Observation.value[X] removed valueAttachment and is replaced with the extension valueAttachment
---	----------------------------	--

- **Details search parameters**
- **Lists fields that support Cerner Millennium proprietary codes**
- **Highlights Cerner specific changes from DSTU2**
- Cardinality changes
- Data-type changes
- New elements
- Replaced elements

Cerner FHIR R4 Release Notes

Example 2 - MedicationRequest

MedicationRequest NEW	<p>Enhancements:</p> <ul style="list-style-type: none">• Read 1-00000240564• Search 1-00000240565<ul style="list-style-type: none">• Read by id• Search by _id• Search by patient• Search by status• Search by -timing-boundsPeriod• Search by _lastUpdated• Search by _count <p>The MedicationRequest resource supports <i>Cerner Millennium</i> proprietary codes for the following fields:</p> <ul style="list-style-type: none">• MedicationRequest.statusReason• Medication.form• MedicationRequest.courseOfTherapyType• MedicationRequest.dosageInstruction.timing.code• MedicationRequest.dosageInstruction.asNeededCodeableConcept• MedicationRequest.dosageInstruction.site• MedicationRequest.dosageInstruction.route <p>Rewrites from DSTU2 for MedicationOrder Resource (this resource renamed to MedicationRequest and Cerner returns all medication categories through this resource):</p> <ul style="list-style-type: none">• MedicationRequest.statusReason is a new element• MedicationRequest.category is a new element and replaces medication-statement-category extension• MedicationRequest.priority is a new element• MedicationRequest.reportedBoolean is a new element• MedicationOrder.patient renamed to MedicationRequest.subject• MedicationOrder.dateWritten renamed to MedicationRequest.authoredOn• MedicationOrder.prescriber renamed to MedicationRequest.requester• MedicationOrder.reasonCodeableConcept renamed to MedicationRequest.reasonCode and max cardinality changed from 1 to many.• MedicationRequest.courseOfTherapyType is a new element• MedicationRequest.note maximum cardinality changed from one to many. The type was changed from a string to an annotation.• MedicationRequest.dosageInstruction changed from BackBone element to Dosage element.• MedicationRequest.substitution.allowedBoolean is a new element
--	--

- **Details search parameters**
- **Lists fields that support Cerner Millennium proprietary codes**
- **Highlights Cerner specific changes from DSTU2**
- Cardinality changes
- Data-type changes
- New elements
- Replaced elements



Setting up notifications for Release Notes

Part 1

1. Navigate to <https://wiki.cerner.com/display/OpenDevRN/Cerner+Ignite+APIs+for+Millennium>
Click “Log in”



2. Click “Register Now”

A screenshot of the Cerner Wiki login page. It features a 'Log in With CernerCare' button and a 'Register Now' button, which is highlighted with a yellow border. Other options include 'Forgot your password?' and 'Mobile Website'.

3. Click “Create an account”

A screenshot of the 'Log in using CernerCare' page. It shows fields for 'Email Address' and 'Password', a 'Remember Me' checkbox, and a 'Log In' button. Below these are links for 'Forgot your password?' and 'Mobile Website'. At the bottom, there is a 'Create an account >>' button, which is highlighted with a yellow border.

4. Create account and verify email address

A screenshot of the 'CREATE ACCOUNT' registration form. It includes fields for 'Enter Email Address(es)', 'Enter Your Password', and 'Confirm Password'. The 'Email Address' field contains 'danielwhitecerner@gmail.com'. The 'Password' field is marked as 'Strong'. A note at the bottom states: 'A valid password must be at least 6 characters long and must contain at least one number or symbol.' Below the password fields is a 'Select security questions' link.



Setting up notifications for Release Notes

Part 2

5. Confirm email address

CONFIRM EMAIL ADDRESS

Enter Your Password * indicates a required field

Email Address: danielwhitecerner@gmail.com

* Password:

[Confirm](#) [Cancel](#)

6. Create Cerner Profile

<https://wiki.cerner.com/display/public/cernerprofilesHP/Creating%20Your%20Profile>

Create My Cerner Profile

To access Cerner web applications, you must create a Cerner Profile. One profile will allow you to access all your Cerner web applications. If you already have a Cerner Profile, [log in](#) using your other authentication method.

Personal Information

* Language

Select the language in which you prefer to view Cerner web applications. Web applications are displayed in this language if a translation is available. If no

7. Return to <https://wiki.cerner.com/display/OpenDevRN/Cerner+Ignite+APIs+for+Millennium> Click “Watch”



Cerner Ignite APIs for Millennium



Availability of R4 Capabilities

A look at currently published capabilities and what to expect in the future



R4 Resource Availability

<https://fhir.cerner.com/millennium/overview/>

DSTU 2 Resource	Supported Actions	R4 Resource	Supported Actions	Goal	Search	Immunization	Search	Immunization	Search + Edit
		Account	Search	Immunization	Search	Immunization	Search	Immunization	Search + Edit
AllergyIntolerance	Search + Edit	AllergyIntolerance	Search + Edit	MedicationAdministration	Search				
Appointment	Search + Edit	Appointment	Search + Create	MedicationOrder *	Search	MedicationRequest *	Search	MedicationRequest *	Search + Create
		Basic	+	MedicationStatement *	Search + Edit				
Binary	Search	Binary	Search			NutritionOrder	Search		
Conformance *	Search	CapabilityStatement *	Search	Observation	Search	Observation	Search	Observation	Search + Edit
CarePlan	Search	CarePlan	Search	OperationDefinition	Search	OperationDefinition	Search	OperationDefinition	Search
		CareTeam	Search			Organization	Search	Organization	Search + Create
Condition	Search + Edit	Condition	Search + Edit	Patient	Search + Create	Patient	Search	Patient	Search + Create
Contract	Search			Person	Search	Person	Search	Person	Search
		Coverage	Search + Create	Practitioner	Search	Practitioner	Search	Practitioner	Search + Edit
Device	Search	Device	Search	Procedure	Search	Procedure	Search	Procedure	Search + Create
DiagnosticReport	Search			RelatedPerson	Search	RelatedPerson	Search	RelatedPerson	Search
DocumentReference	Search + Create	DocumentReference	Search + Create	ProcedureRequest *	Search	ServiceRequest *	Search	ServiceRequest *	Search
Encounter	Search	Encounter	Search + Create	Schedule	Search				
		FinancialTransaction *	+	Slot	Search				



What's Next?

In Progress

(Targeted Production release in 3-6 months)

- **CareTeam (Read/Search)**
- **Consent (Read/Search)**
- **DiagnosticReport (Create/Update/Read/Search)**
- **Goal (Read/Search)**
- **Location (Read/Search)**
- **Provenance (Create/Read/Search)**
- **RelatedPerson (Create/Update)**
- **Schedule (Read/Search)**
- **Slot (Read/Search)**

In Design

(Targeted Production release in 6-9 months)

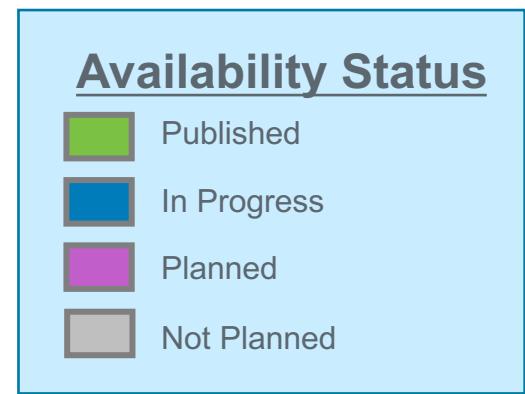
- **Communication (Create/Read/Search)**
- **Contract (Read/Search)**
- **Chargeltem (Create/Update/Read/Search)**
- **MedicationAdministration (Read/Search)**
- **Slot (Update)**



R4 Resource Availability

	Read	Search	Create	Patch \ Update	Delete
Account	Published	Published	Not Planned	Not Planned	Not Planned
AllergyIntolerance	Published	Published	Published	Published	Not Planned
Appointment	Published	Published	Published	Published	Not Planned
Binary	Published	In Progress	Not Planned	Not Planned	Not Planned
CarePlan	Published	Published	Not Planned	Not Planned	Not Planned
CareTeam	In Progress	In Progress	Not Planned	Not Planned	Not Planned
ChargeItem	Planned	Planned	Planned	Planned	Not Planned
Communication	Planned	Planned	Planned	Not Planned	Not Planned
Condition	Published	Published	Published	Published	Not Planned
Consent	In Progress	In Progress	Not Planned	Not Planned	Not Planned
Contract	Planned	Planned	Not Planned	Not Planned	Not Planned
Coverage	Not Planned	Published	Published	Published	Published
Device	Published	Published	Not Planned	Not Planned	Not Planned
DiagnosticReport	In Progress	In Progress	In Progress	Not Planned	Not Planned
DocumentReference	Published	Published	In Progress	Not Planned	Not Planned
Encounter	Published	Published	Published	Published	Not Planned
FinancialTransaction (Basic)	In Progress	In Progress	Not Planned	Not Planned	Not Planned

	Read	Search	Create	Patch \ Update	Delete
Goal	In Progress	In Progress	Not Planned	Not Planned	Not Planned
Immunization	Published	Published	Published	Published	Not Planned
Location	In Progress	In Progress	Not Planned	Not Planned	Not Planned
MedicationAdministration	Planned	Planned	Not Planned	Not Planned	Not Planned
MedicationRequest	Published	Published	Published	Published	Not Planned
NutritionOrder	Published	Published	Not Planned	Not Planned	Not Planned
Observation	Published	Published	Published	In Progress	Not Planned
Organization	Published	Published	Published	Not Planned	Not Planned
Patient	Published	Published	Published	Published	Not Planned
Person	Published	Published	Not Planned	Not Planned	Not Planned
Practitioner	Published	Published	Published	Not Planned	Not Planned
Procedure	Published	Published	Published	Not Planned	Not Planned
Provenance	In Progress	In Progress	In Progress	Not Planned	Not Planned
RelatedPerson	Published	Published	In Progress	In Progress	Not Planned
Schedule	In Progress	In Progress	Not Planned	Not Planned	Not Planned
ServiceRequest	Published	Published	Not Planned	Not Planned	Not Planned
Slot	In Progress	In Progress	Not Planned	Planned	Not Planned



Advantages of R4

Empowering **beyond**



Advantages of R4

- **Cerner will only be adding new capabilities to R4**
- Only R4 will get new resources and new functionality on existing resources
- DSTU2 implementation is in maintenance mode
- **Ability to use a hybrid development environment**
- New capabilities in R4 can be used to create test-cases for DSTU2
- **Improved error handling**
- Detailed OperationOutcome error responses can be used by developers or passed onto end-users
- **21st Century Cures Act requires clients to be using R4**

Advantages of R4

Improved R4 error handling

- **Returning OperationOutcomes for all 4** responses**
- **Clearer information on type of error**
- Response Code 400 – FHIR spec violation
- Response Code 422 – Cerner business rule violation

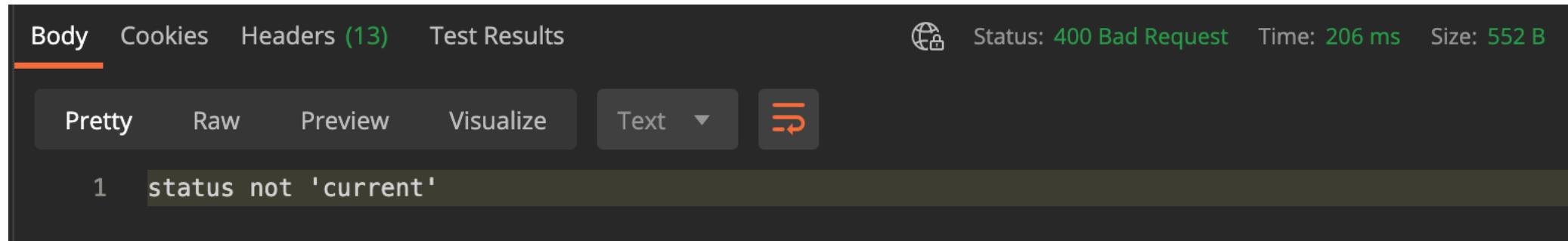
Advantages of R4 – Improved Error Handling

400 (Bad Request) – DSTU2 FHIR spec violation example

POST DocumentReference

```
"status": 123,
```

DSTU2 Response:



The screenshot shows a REST client interface with the following details:

- Body tab is selected.
- Cookies, Headers (13), and Test Results tabs are visible.
- Status bar: Status: 400 Bad Request, Time: 206 ms, Size: 552 B.
- Toolbar buttons: Pretty, Raw, Preview, Visualize, Text dropdown set to Text, and a copy icon.
- Response body:

```
1 status not 'current'
```

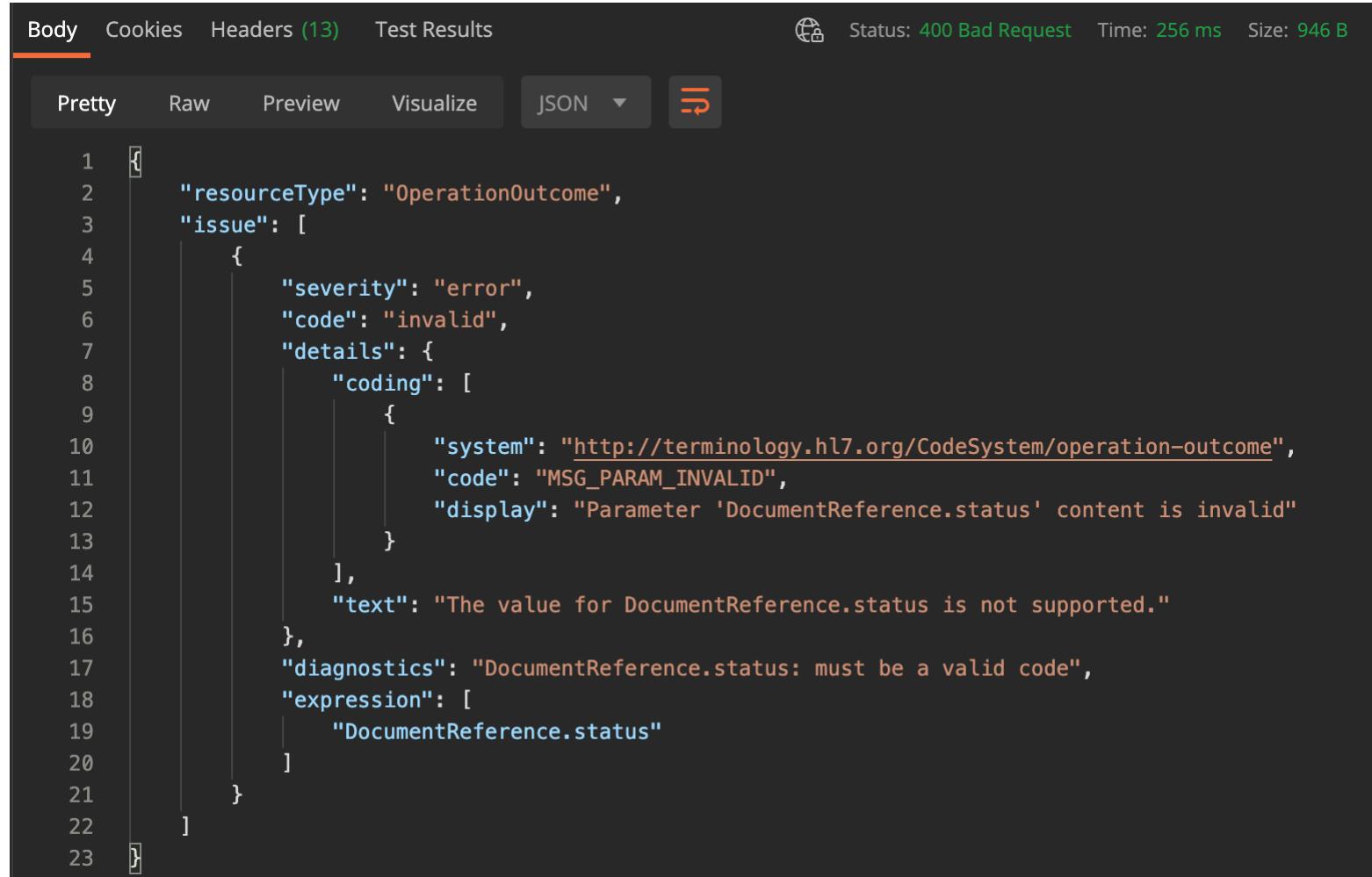
Advantages of R4 – Improved Error Handling

400 (Bad Request) – R4 FHIR spec violation example

POST DocumentReference

```
"status": 123,
```

R4 Response:



The screenshot shows a browser developer tools Network tab with a 400 Bad Request status. The response body is a JSON object representing an OperationOutcome resource. It has one issue where the 'status' field is invalid. The JSON is displayed in a pretty-printed format with line numbers from 1 to 23.

```
1  "resourceType": "OperationOutcome",
2  "issue": [
3    {
4      "severity": "error",
5      "code": "invalid",
6      "details": {
7        "coding": [
8          {
9            "system": "http://terminology.hl7.org/CodeSystem/operation-outcome",
10           "code": "MSG_PARAM_INVALID",
11           "display": "Parameter 'DocumentReference.status' content is invalid"
12         }
13       ],
14       "text": "The value for DocumentReference.status is not supported."
15     },
16     "diagnostics": "DocumentReference.status: must be a valid code",
17     "expression": [
18       "DocumentReference.status"
19     ]
20   }
21 }
22 ]
23 }
```

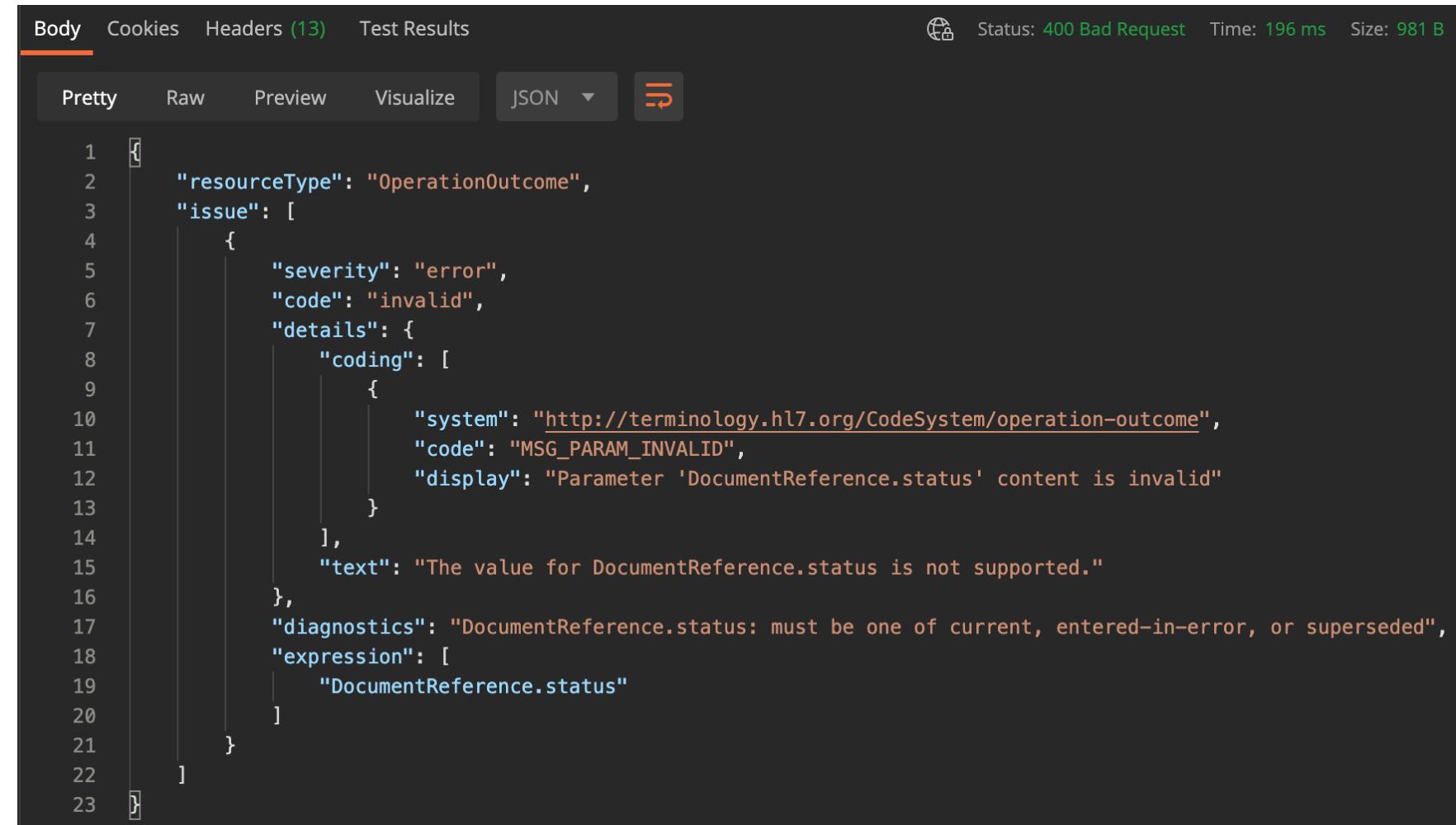
Advantages of R4 – Improved Error Handling

400 (Bad Request) – R4 FHIR spec violation example

POST DocumentReference

```
"status": "invalid",
```

R4 Response:



The screenshot shows a REST client interface with the following details:

- Body:** The tab is selected.
- Headers (13):** 13 headers are present.
- Status:** 400 Bad Request
- Time:** 196 ms
- Size:** 981 B

The JSON response body is:

```
1  {
2      "resourceType": "OperationOutcome",
3      "issue": [
4          {
5              "severity": "error",
6              "code": "invalid",
7              "details": {
8                  "coding": [
9                      {
10                         "system": "http://terminology.hl7.org/CodeSystem/operation-outcome",
11                         "code": "MSG_PARAM_INVALID",
12                         "display": "Parameter 'DocumentReference.status' content is invalid"
13                     }
14                 ],
15                 "text": "The value for DocumentReference.status is not supported."
16             },
17             "diagnostics": "DocumentReference.status: must be one of current, entered-in-error, or superseded",
18             "expression": [
19                 "DocumentReference.status"
20             ]
21         }
22     ]
23 }
```

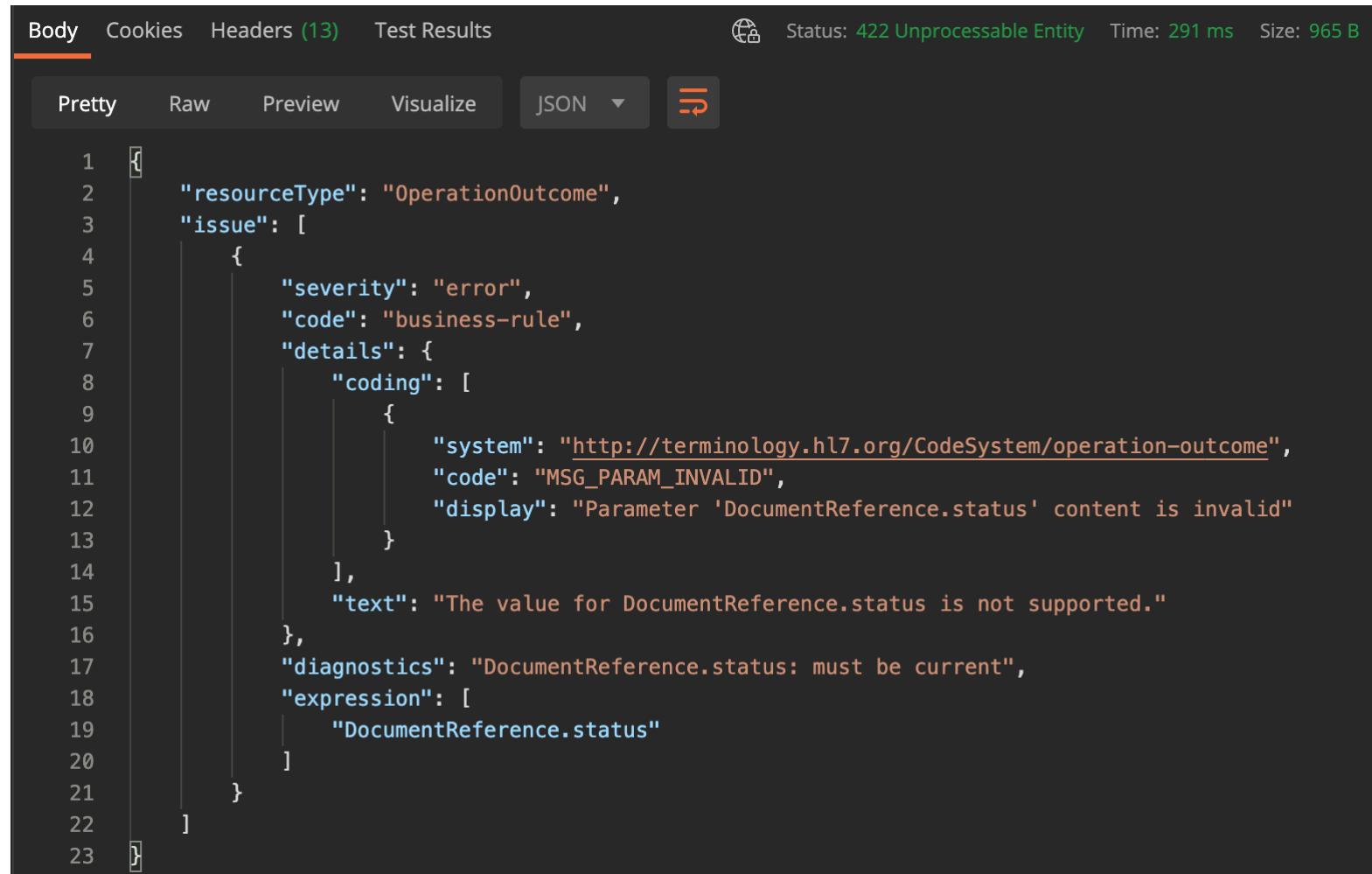
Advantages of R4 – Improved Error Handling

422 (Unprocessable Entity) – Cerner business violation example

POST DocumentReference

```
"status": "entered-in-error",
```

R4 Response:



The screenshot shows a browser developer tools Network tab with the following details:

- Body tab is selected.
- Status: 422 Unprocessable Entity
- Time: 291 ms
- Size: 965 B

The response body is a JSON object:

```
1  {
2      "resourceType": "OperationOutcome",
3      "issue": [
4          {
5              "severity": "error",
6              "code": "business-rule",
7              "details": {
8                  "coding": [
9                      {
10                         "system": "http://terminology.hl7.org/CodeSystem/operation-outcome",
11                         "code": "MSG_PARAM_INVALID",
12                         "display": "Parameter 'DocumentReference.status' content is invalid"
13                     }
14                 ],
15                 "text": "The value for DocumentReference.status is not supported."
16             },
17             "diagnostics": "DocumentReference.status: must be current",
18             "expression": [
19                 "DocumentReference.status"
20             ]
21         }
22     ]
23 }
```

</presentation>

Empowering **beyond**

