HLA to FHIR: HML2FHIR

8/6/21

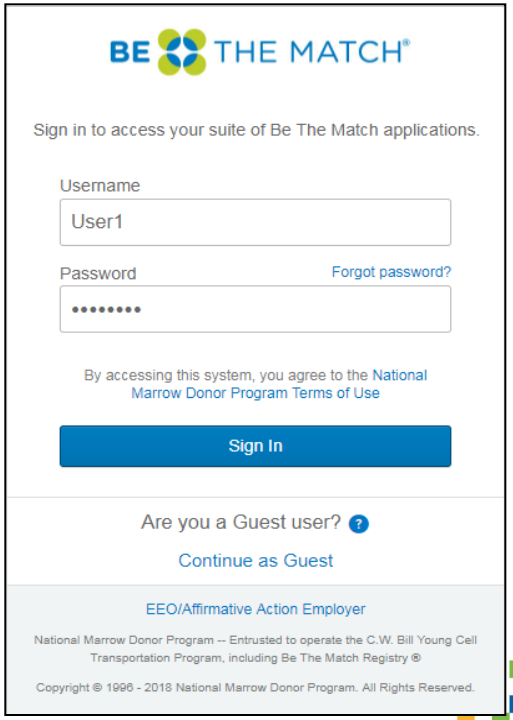
HML Gateway

HML Gateway Overview

- NMDP's test result portal for transplant center and contract labs
  - HLA, CCR, BGA (ABO/RhD) and KIR result intake at recruitment
  - Patient and donor confirmatory (CT) results for unrelated transplants
  - Donor/Recipient Pairs Project results (DRPP) for research
  - HML2FHIR for CIBMTR
- Two HML Gateway web-based applications
  a) File Uploader – HML 1.0.1 and files with a .csv extension
  b) Submission Dashboard – Test file management
- Registry and DRPP results are directed to the NMDP's CORE components for in depth test result validation
- HML2FHIR results are directed to CIT's FHIR server

The Uploader UI – Manual File Submission

- Primarily used by labs during development of HML 1.0.1 or .csv files
- Can be used as primary mode of submission
- Guest and Authorized user views
- Three major functions: convert, validate and submit
- Convert adapts a CSV file to an HML 1.0.1 file
- Validate checks for correct HML 1.0.1 structure, and is accessible to all users
- Submit sends the file to the appropriate processor for additional checks and eventual result storage



Direct REST Submission

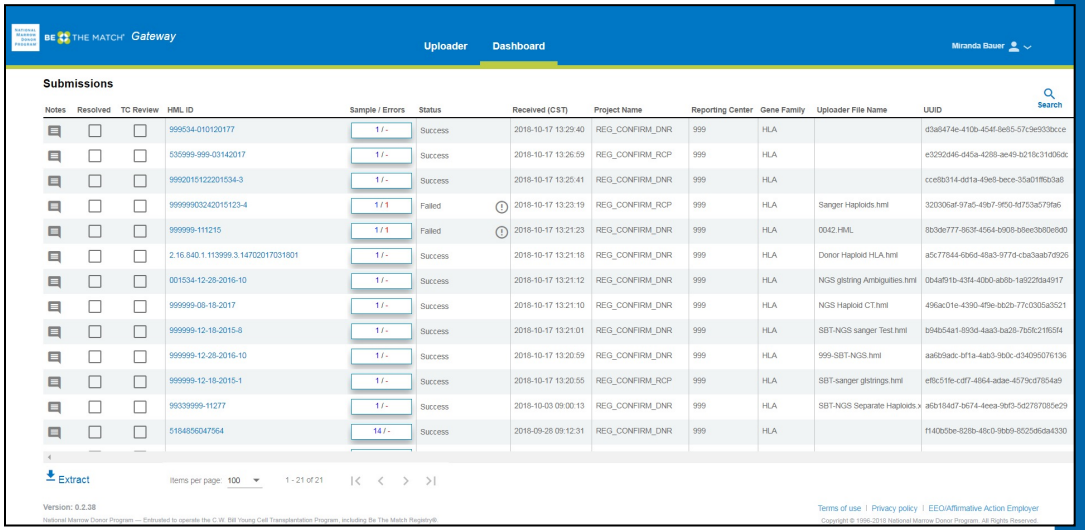
The REST payload requires:

1. HTTP “POST" request
2. Content type "application/xml"
3. Payload body which is the HML message itself
4. Okta Refresh token in the HTTP header (security/authorization)

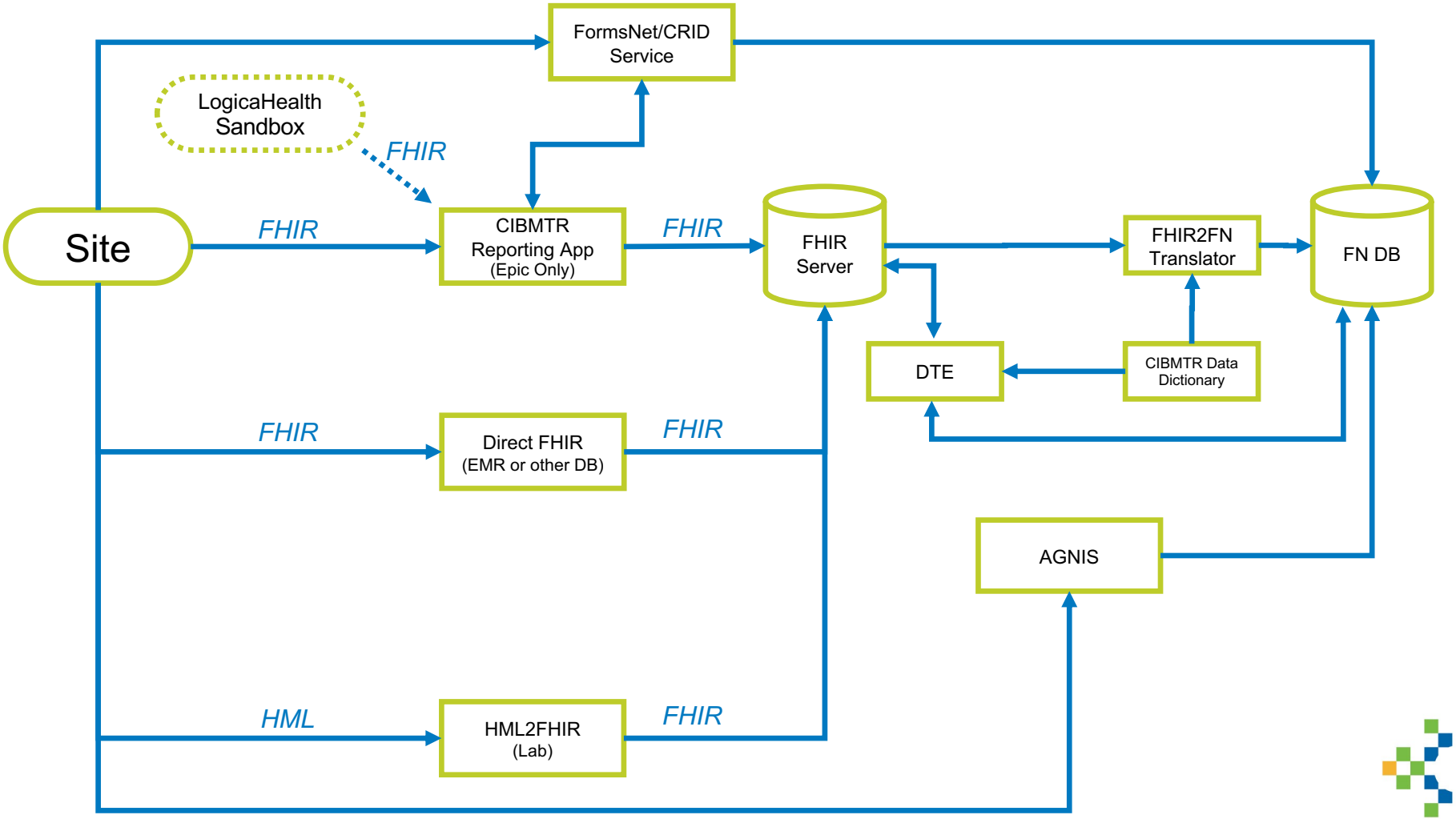
Automation of submissions is possible with Postman

HML Gateway Dashboard UI

- Submission Management
- User AD account associated with submitter and lab roles
- Retains a complete history of laboratory submissions
- Status display and error handling
- Sample and test result information
- Search functionality
- FHIR indicator



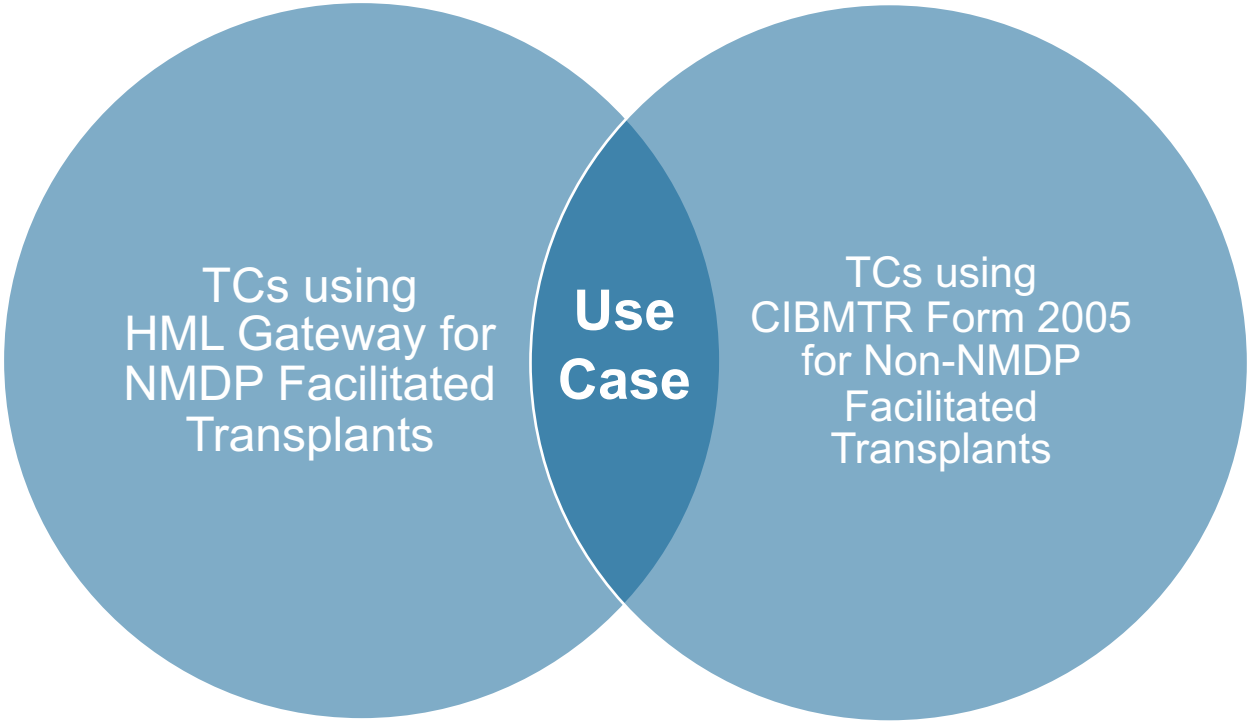
HML2FHIR


FormsNet/CRID Service
LogicaHealth Sandbox
FHIR
Site
FHIR
CIBMTR Reporting App (Epic Only)
FHIR
FHIR Server
FHIR2FN Translator
FN DB
DTE
CIBMTR Data Dictionary
FHIR
Direct FHIR (EMR or other DB)
FHIR
AGNIS
HML
HML2FHIR (Lab)
FHIR

HML2FHIR

- Converts HML 1.0.x to FHIR transaction bundle
  - FHIR R4
  - conforms to early version of Genomics Reporting IG
- Open Source
  - https://github.com/nmdp-bioinformatics/hml-fhir-app
- Stepping stone for labs/vendors to develop FHIR exports
  - Provides example code
- Currently using NMDP house rules for HML Gateway
  - e.g., one HLA locus per typing
- Integration with NMDP HML Gateway

CIBMTR HLA Use Case



CIMBTR HLA Use Case

- Electronic reporting of HLA to CIBMTR for non-NMDP facilitated transplants through the NMDP HML Gateway

- If patient/donor HLA typing has been submitted to NMDP via electronic form 22 or 117, the Transplant Center does NOT need to re-submit CIBMTR Form 2005 (CIBMTR collects this data from NMDP)

- This specification is only for reporting patients/donors/etc that are normally reported through CIBMTR FormsNet Form 2005 (non-NMDP facilitated transplants).

CIBMTR Rules for HML

- Use NMDP HML Gateway rules
  - Contact donorlabservices@nmdp.org for more information
  - If you can already successfully submit HML to the NMDP HML Gateway for submitting electronic Form 22/117, you are compliant with the rules.

- You can check your HML for compliance to HML Gateway rules using the validation end point
  - https://qa-api.nmdp.org/hml_gw/v1/validate

CIBMTR specific HML data elements

- hml project-name
  - Patient receiving the transplant
    - RES_CIBMTR_FHIR_RECIPIENT
  - Hematopoietic cell donor
    - RES_CIBMTR_FHIR_DONOR
  - Cord blood unit
    - RES_CIBMTR_FHIR_CBU
  - Mother of the cord blood unit
    - RES_CIBMTR_FHIR_CBUMOTHER
  - Non-donor, but of interest (e.g., mother of patient)
    - RES_CIBMTR_FHIR_NONDONOR

CIBMTR specific HML data elements (cont)

- sample id
  - recipient = [CRID]
    - CIBMTR Research Identifier
  - donor = [donor id] (e.g., [GRID])
    - e.g. Global Registration Identifier for Donors
    - https://www.wmda.info/professionals/optimising-search-match-connect/why-global-identifier
  - cord blood unit = [cbu id]
  - non-donor = [specimen id]
- sample center-code
  - CIBMTR center code

Optional – HML Property Elements

- HML allows for property elements containing name/value pairs. The content of this element must be coordinated between sender and receiver. This is not validated by the validator described above
  - `<property name="name" value="value"/>`
  - See http://schemas.nmdp.org/

- If the property elements described here are included for each sample, Form 2005 will be considered complete.

Optional – HML Property Elements (cont)

- For non-recipient HLA, two property elements are used to capture the CRID of the transplant recipient, and the relationship of what is being typed to the recipient.
  - name="CRID"
    - needed for non-recipient typings
    - value="[CRID]"
  - name="recipient-relationship"
    - relationship between the specimen being typed and the transplant recipient
    - value="[recipient-relationship]"

Possible values for recipient-relationship

- fraternal-twin
- identical-twin
- full-sibling
- half-sibling
- child
- cousin
- father
- mother
- uncle
- aunt
- nephew
- niece
- grandparent
- grandchild
- other-relative
- unrelated

Example: Recipient HLA (property not needed)

```
<hml xmlns="http://schemas.nmdp.org/spec/hml/1.0.1"
xmlns:proc="http://hl7.org/fhir"
xmlns:xsi="http://www.w3.org/2500/XMLSchema-instance"
xsi:schemaLocation="http://schemas.nmdp.org/spec/hml/1.0.1"
project-name="RES_CIBMTR_FHIR_RECIPIENT"
version="1.0.1">
...
    <sample id="[CRID]" center-code="[transplant center id]">
    ...
    </sample>
...
</hml>
```

Example: Unrelated Donor HLA

```
<hml xmlns="http://schemas.nmdp.org/spec/hml/1.0.1"
xmlns:proc="http://hl7.org/fhir"
xmlns:xsi="http://www.w3.org/2500/XMLSchema-instance"
xsi:schemaLocation="http://schemas.nmdp.org/spec/hml/1.0.1"
project-name="RES_CIBMTR_FHIR_DONOR"
version="1.0.1">
...
    <sample id="[donor id]" center-code="[transplant center id]">
    ...
        <property name="CRID" value="[CRID]"/>
        <property name="recipient-relationship" value="unrelated"/>
    ...
    </sample>
...
</hml>
```

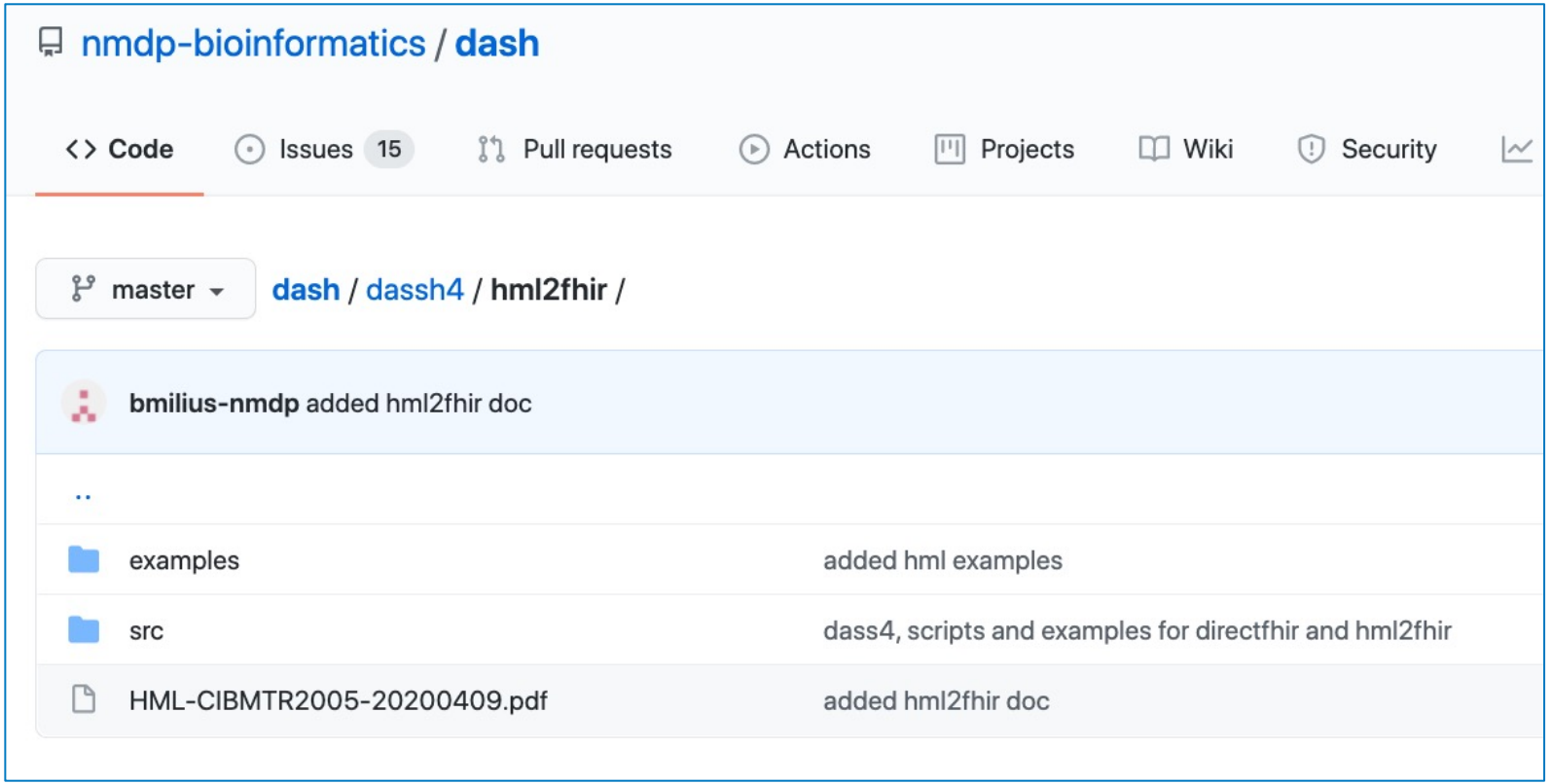
Example: Related Donor HLA (mother)

```
<hml xmlns="http://schemas.nmdp.org/spec/hml/1.0.1"
xmlns:proc="http://hl7.org/fhir"
xmlns:xsi="http://www.w3.org/2500/XMLSchema-instance"
xsi:schemaLocation="http://schemas.nmdp.org/spec/hml/1.0.1"
project-name="RES_CIBMTR_FHIR_DONOR"
version="1.0.1">
...
    <sample id="[donor id]" center-code="[transplant center id]">
    ...
        <property name="CRID" value="[CRID]"/>
        <property name="recipient-relationship" value="mother"/>
    ...
    </sample>
...
</hml>
```

Example: Cord Blood Unit

(property recipient-relationship not needed)

```
<hml xmlns="http://schemas.nmdp.org/spec/hml/1.0.1"
xmlns:proc="http://hl7.org/fhir"
xmlns:xsi="http://www.w3.org/2500/XMLSchema-instance"
xsi:schemaLocation="http://schemas.nmdp.org/spec/hml/1.0.1"
project-name="RES_CIBMTR_FHIR_CBU"
version="1.0.1">
...
    <sample id="[CBU id]" center-code="[transplant center id]">
    ...
        <property name="CRID" value="[CRID]"/>
    ...
    </sample>
...
</hml>
```


nmdp-bioinformatics / dash
Code
Issues 15
Pull requests
Actions
Projects
Wiki
Security
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dash / dassh4 / hml2fhir /
bmilius-nmdp added hml2fhir doc
..
examples
added hml examples
src
dass4, scripts and examples for directfhir and hml2fhir
HML-CIBMTR2005-20200409.pdf
added hml2fhir doc

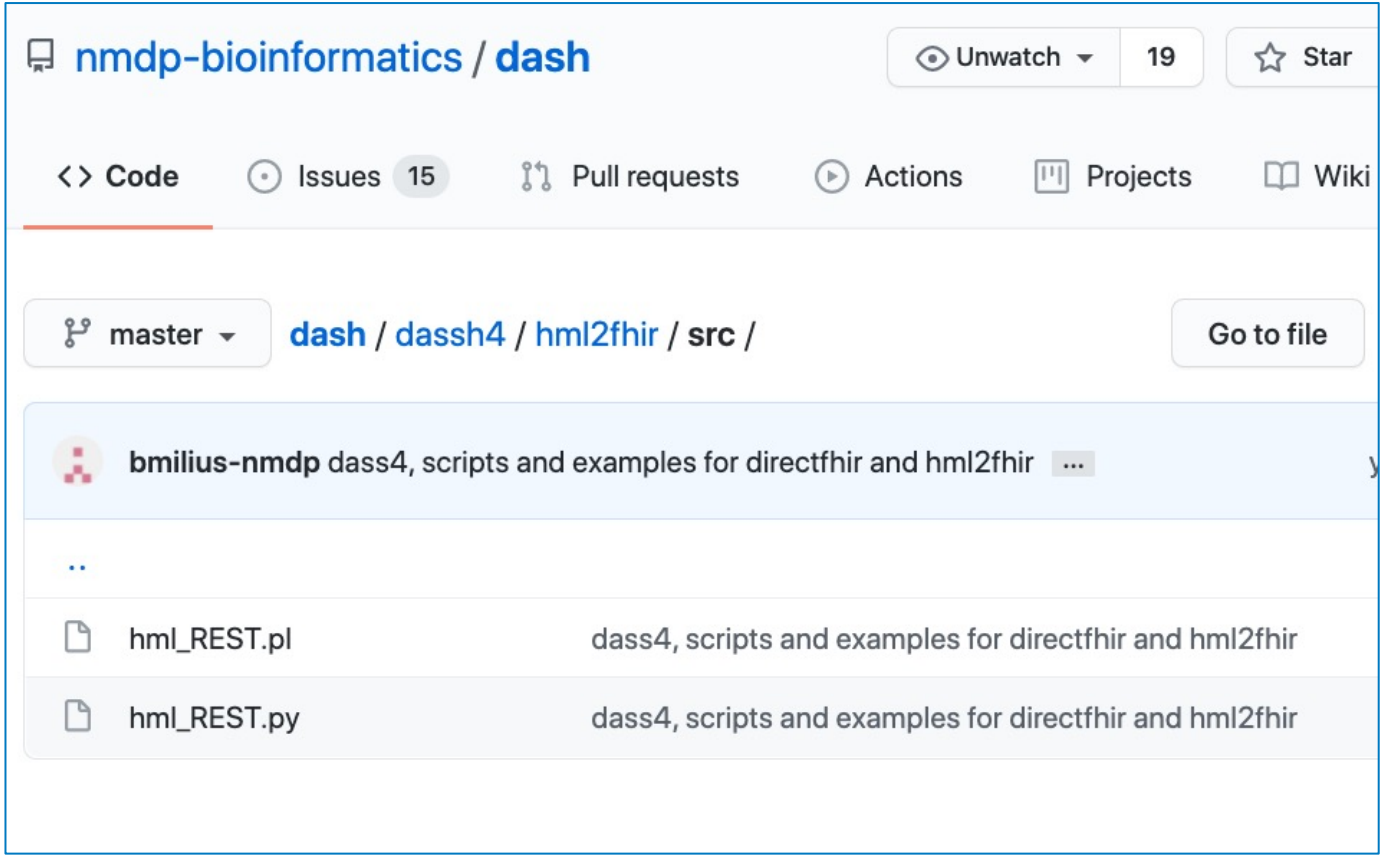
nmdp-bioinformatics / **dash**

<> Code | Issues 15 | Pull requests | Actions | Projects | Wiki

master ▾ **dash** / dassh4 / hml2fhir / **examples** /

bmilius-nmdp added hml examples

..	
DaSSH_CIBMTR_HML_Donor.hml.xml	added hml examples
DaSSH_CIBMTR_Recipient_1.hml.xml	added hml examples
DaSSH_CIBMTR_Recipient_3_Class_I_PacBio.hml.xml	added hml examples
DaSSH_CiBMTR_Recipient_2.hml.xml	added hml examples
E22_glstring_example.hml.xml	added hml examples
E22_glstring_example_cibmtr.hml.xml	added hml examples
E22_haploid_example1.hml.xml	added hml examples
E22_haploid_example1_cibmtr.hml.xml	added hml examples
E22_haploid_example2.hml.xml	added hml examples
E22_haploid_example2_cibmtr.hml.xml	added hml examples


nmdp-bioinformatics / dash
Unwatch
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Star
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Pull requests
Actions
Projects
Wiki
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dash / dassh4 / hml2fhir / src /
Go to file
bmilius-nmdp dass4, scripts and examples for directfhir and hml2fhir
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hml_REST.pl
dass4, scripts and examples for directfhir and hml2fhir
hml_REST.py
dass4, scripts and examples for directfhir and hml2fhir

Thank you!