Interactive Genomics Data Visualization (Epiviz)

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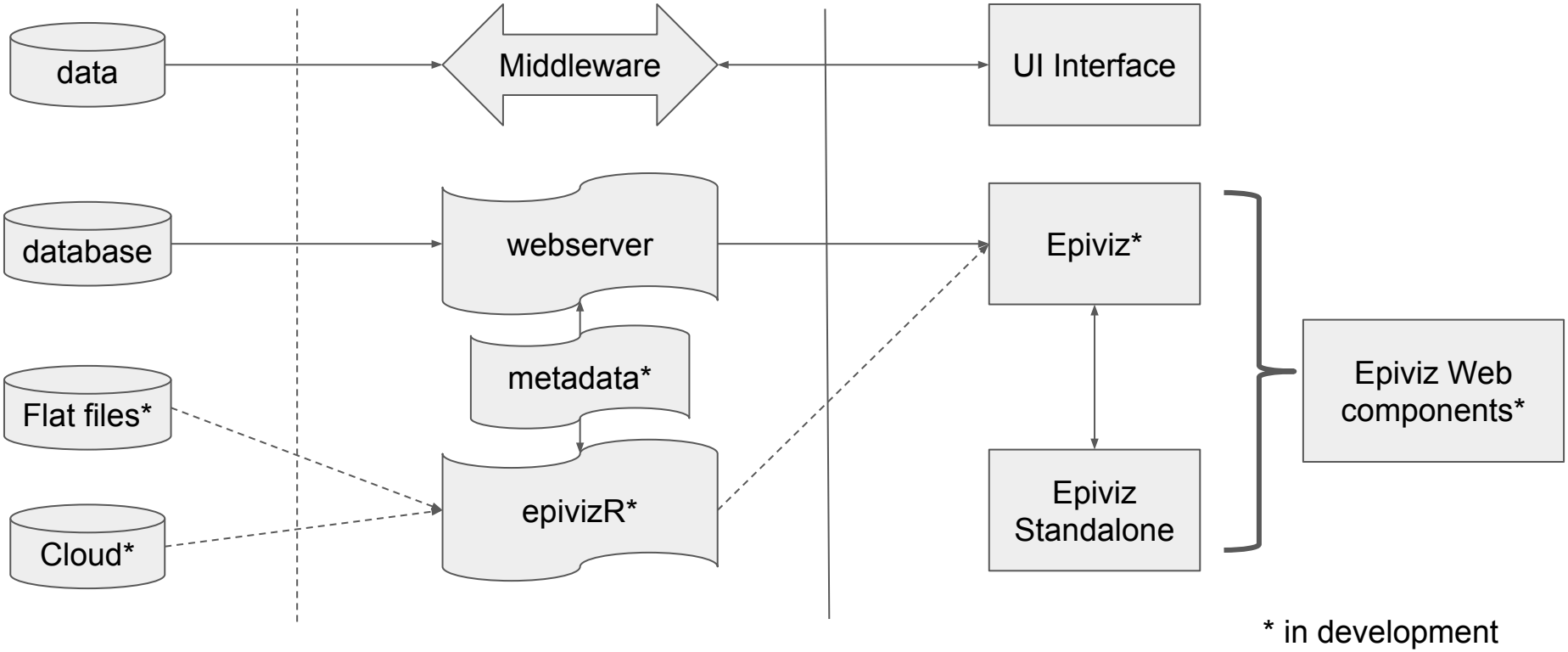
Background

- Genomic data visualization and analysis tool
- Components
  - Application (Front end)
    - Epiviz - http://www.epiviz.cbcb.umd.edu/4/
  - Service Layer
    - Epiviz webserver API
    - epivizR - R backend to interact with Epiviz (on Bioconductor)
  - Data (hosted at UMD)
    - MySQL Database

Epiviz Framework

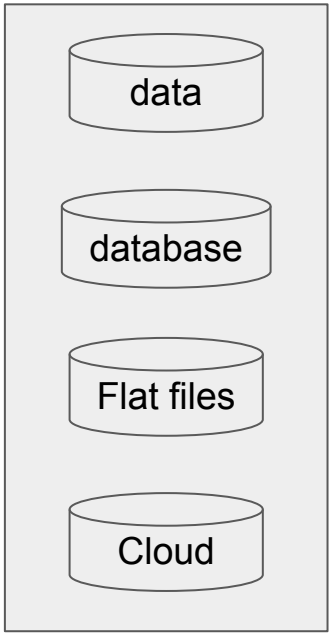


* in development

Data Layer

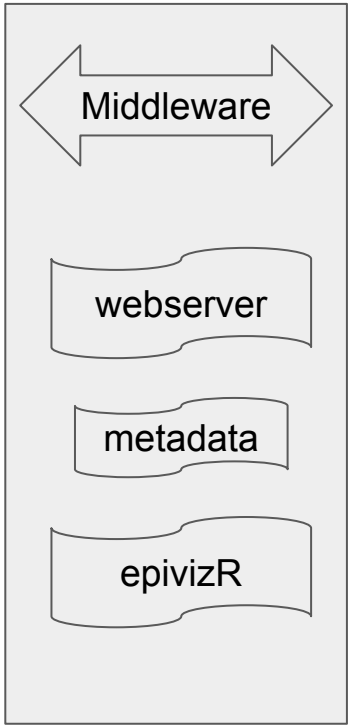
- Epiviz File Server
  - Host data files
  - Yaml description
  - API to access data
  - Devel branch - epiviz github
- External Data Providers
  - iHMP project (Justin Wagner)
  - QuiltData (https://quiltdata.com/)
  - NCI Cloud Pilot (TCGA)
    - Seven Bridges, ISB, Broad Inst.
    - http://cbiit.nci.nih.gov/ncip

```
colon blocks:
  filetype: bed
  datatype: blocks
  url: "file:///path/to/a/file.bed"
colon coverage:
  url: "file:///path/to/a/file.wig"
dnase hypersensitivity:
  url: "ah://some/annotationhub/path"
breast coverage:
  datatype: bp
  url: "file:///path/to/a/file.bam"
breast reads:
  datatype: alignment
  url: "file:///path/to/a/file.bam"
liver expression:
  datatype: summarized_experiment
  measurements:
    - normal A
    - tumor B
  url:
    rowRanges: "file:///path/to/a/file.bed"
    colData: "file:///path/to/a/file.csv"
    assay: "file:///path/to/a/file.csv"
hg19:
  filetype: gff3
  datatype: genome_annotation
  url: "file:///path/to/a/file.gtf"
mm13:
  datatype: genome_annotation
  url: "file:///path/to/a/file.rda"
```



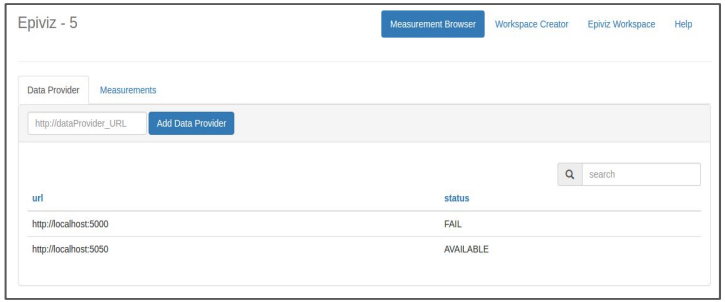
Service Layer

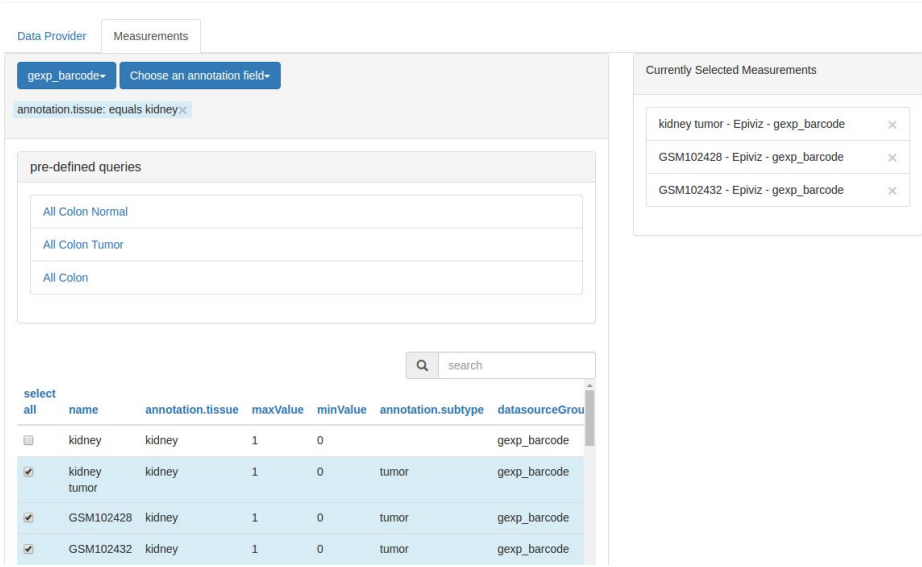
- EpivizR package
  - epivizR - epiviz UI actions
  - epivizrData - data management API
  - epivizrServer - websocket and server management
  - iHMP project (Justin Wagner)
- Metadata API
  - Services to access metadata from a data provider
    - data sources served by a provider
    - measurements
      - Filtering, sorting etc.



Application

- Measurement Browser
  - Explore metadata and measurements from data providers
  - Wrappers serving metadata from epiviz database and hmp 2 data (Justin Wagner)

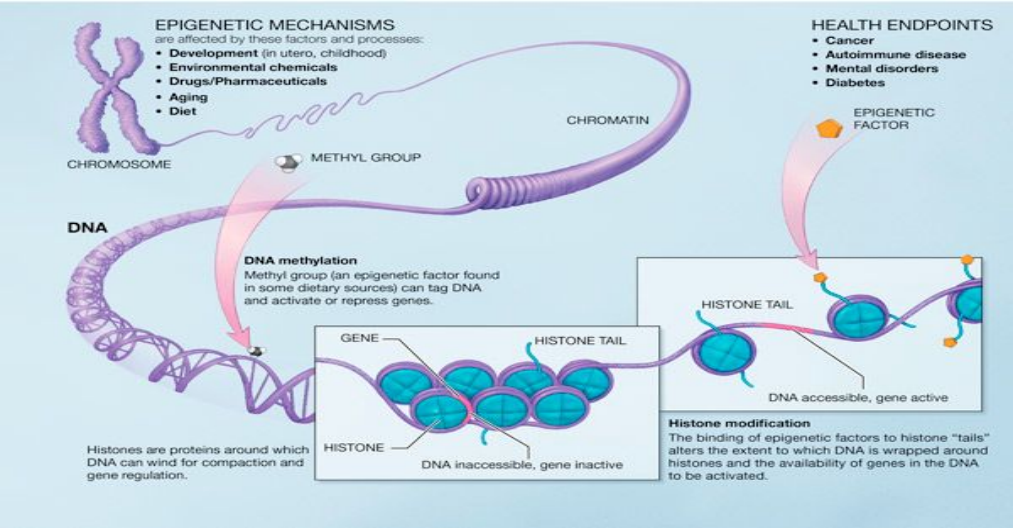




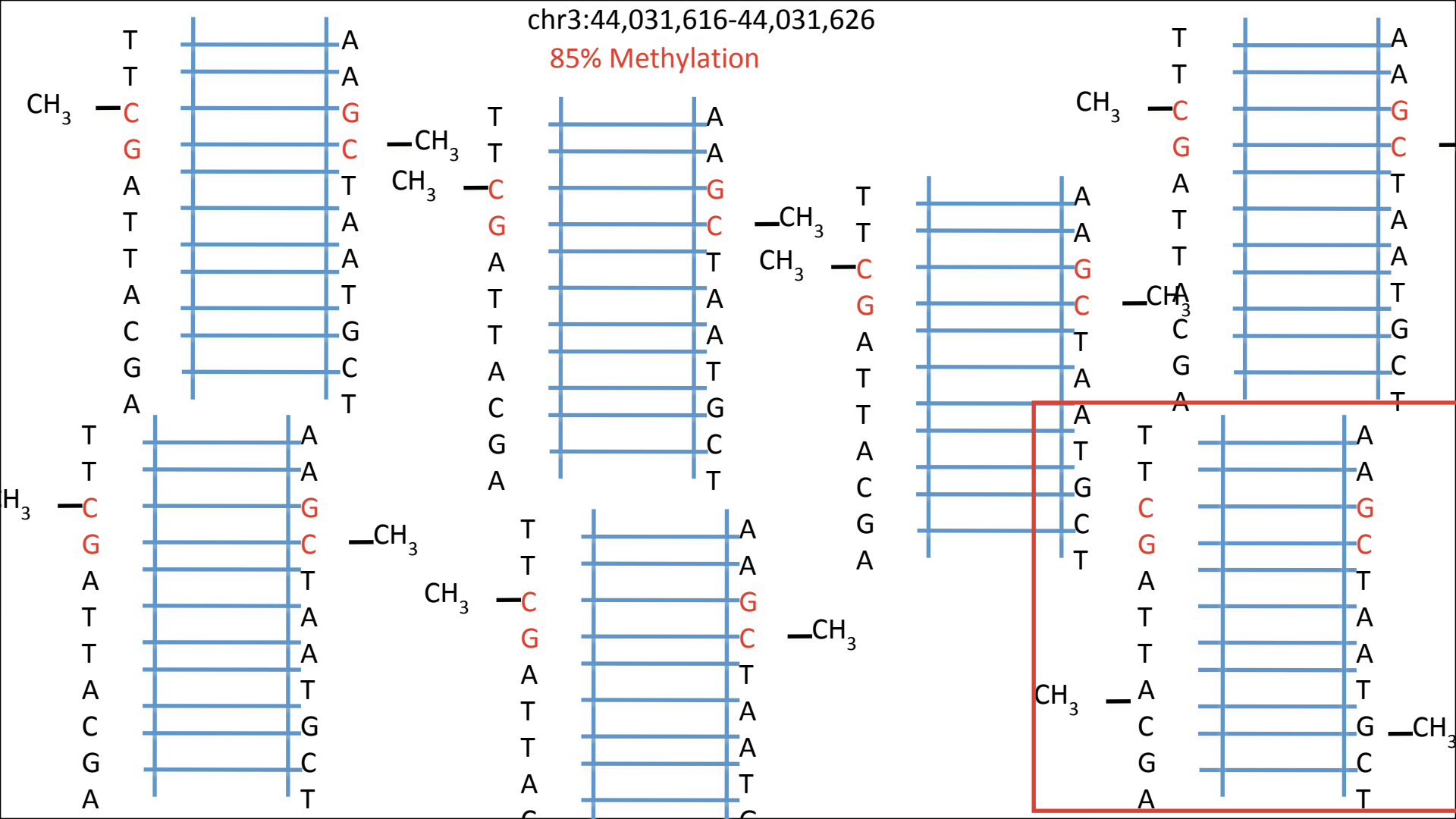
Interactive Exercise

https://github.com/HCBravoLab/ISCB_DC_workshop

Epigenetics



- DNA methylation
  - replicates after cell division
  - modified in **disease**


chr3:44,031,616-44,031,626
85% Methylation

Epiviz locally

- epivizr Standalone
  - For labs/groups to run locally
  - Run an epiviz and epivizr sessions
  - streams data using web sockets
  - Bioconductor

```
library(epivizrStandalone)
library(Mus.musculus)

app <- startStandalone(Mus.musculus, keep_seqlevels=paste0("chr",c(1:19,"X","Y")))
```

Now the web app UI serves as a mouse genome browser.

```
app$stop_app()
```

People

- Hector Corrada Bravo
- Florin Chelaru
- Justin Wagner
- Mihai Sirbu
- Morgan Walter