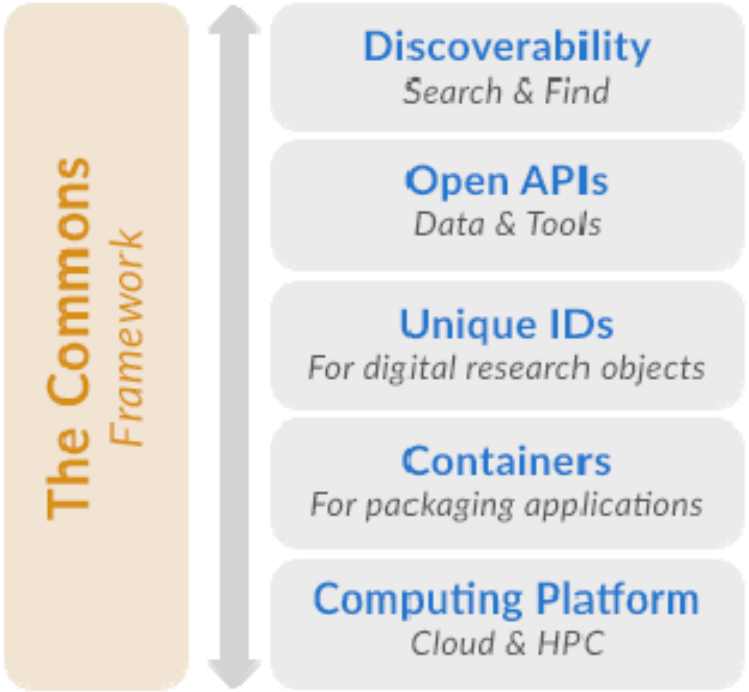
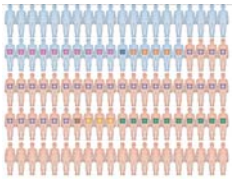
# Data Commons Framework



# Cancer Research Data Ecosystem – Cancer Moonshot BRP

| | | |
|---|---|---|
| Discovery | Patient engaged Research | Surveillance Big Data Implementation research |
| Proteogenomics Imaging data Clinical trials | Clinical Research Observational studies | EHR, Lab Data, Imaging, PROs, Smart Devices, Decision Support |
| Well characterized research data sets | Cancer cohorts | Patient data |
| **GDC** Research information donor |  Active research participation | **SEER** Learning from every cancer patient |

# Genomic Data Commons

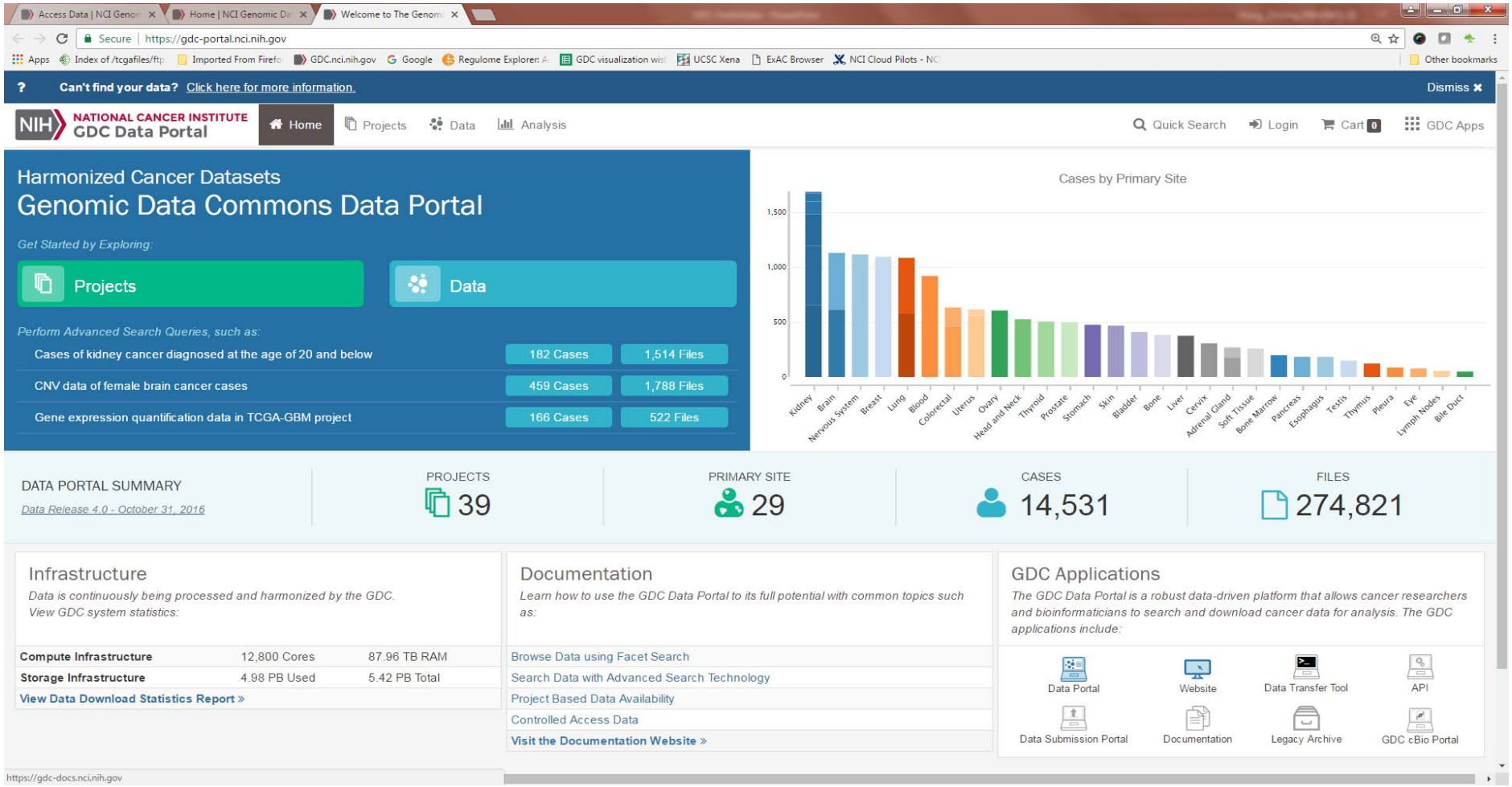
The Cancer Genomic Data Commons (**GDC**) is an existing effort to standardize and simplify submission of genomic data to NCI and follow the principles of **FAIR** – Findable, Accessible, Attributable, Interoperable, Reusable, and Provide Recognition.

The GDC is part of the NIH Big Data to Knowledge (**BD2K**) initiative and an example of the **NIH Commons**

*Microattribution, nanopublications (DOIs), tracking the use of data, annotation of data, use of algorithms, supports the data /software /metadata life cycle to provide credit and analyze impact of data, software, analytics, algorithm, curation and knowledge sharing*

Force11 white paper
https://www.force11.org/group/fairgroup/fairprinciples

# GDC overview



# NCI Genomic Data Commons

- **The GDC went live on June 6, 2016 with approximately 4.1 PB of data.**
- 577,878 files about 14194 cases (patients), in 42 cancer types, across 29 primary disease sites, 400 clinical data elements
- 10 major data types, ranging from Raw Sequencing Data, Raw Microarray Data, to Copy Number Variation, Simple Nucleotide Variation and Gene Expression.
- Data are derived from 17 different experimental strategies, with the major ones being RNA-Seq, WXS, WGS, miRNA-Seq, Genotyping Array and Expression Array.
- **Foundation Medicine announced the release of 18,000 genomic profiles to the GDC at the Cancer Moonshot Summit, June 29th, 2016**
- **The Multiple Myeloma Research Foundation announced it would be releasing its CoMMpass study of more than 1000 cases of Multiple Myeloma on Sept 29, 2016.**

# GDC Monthly Usage

| URL | Month | Unique Visitor | Number of Visits | Pages | Hits | Data Volume over F5 |
|---|---|---|---|---|---|---|
| gdc.cancer.gov | December 2016 | 9,383 | 16,363 | 70,690 | 617,051 | 28.29GB |
| gdc-api.nci.nih.gov | | 11,643 | 26,220 | 2,284,424 | 2,284,425 | 3667.11GB |
| gdc-portal.nci.nih.gov | | 11,065 | 21,541 | 473,283 | 618,056 | 8.11GB |
| docs.gdc.cancer.gov | | 3,566 | 5,519 | 50,592 | 301,019 | 26GB |
| cbioportal.gdc.cancer.gov | | 1,791 | 2,289 | 96,937 | 373,021 | 8.96GB |

# GDC storage

| Solution | Size | Available | Used | % Used |
|---|---|---|---|---|
| IBM COS | 8.75PiB | 2.26PiB | 6.49PiB | 74% |
| CephB | 760TB | 223TB | 536.7TB | 71% |

# GDC data download statistics (since launch)

| Disease Type | # Requests | File Size |
|---|---|---|
| Breast Invasive Carcinoma | 4,630,548 | 289.76 TB |
| Glioblastoma Multiforme | 1,820,418 | 267.80 TB |
| Kidney Renal Clear Cell Carcinoma | 1,369,223 | 240.78 TB |
| Kidney Renal Papillary Cell Carcinoma | 604,056 | 136.60 TB |
| Cervical Squamous Cell Carcinoma and Endocervical Adenocarcinoma | 546,272 | 76.91 TB |
| Rectum Adenocarcinoma | 363,502 | 73.09 TB |
| Sarcoma | 335,382 | 23.18 TB |
| Pancreatic Adenocarcinoma | 335,078 | 20.12 TB |
| Esophageal Carcinoma | 247,170 | 38.75 TB |
| Adrenocortical Carcinoma | 218,321 | 3.14 TB |
| Kidney Chromophobe | 119,718 | 62.34 TB |
| Mesothelioma | 89,720 | 819.94 GB |
| Lymphoid Neoplasm Diffuse Large B-cell Lymphoma | 79,542 | 17.31 TB |
| Not Applicable | 38,116 | 211.71 GB |
| Chronic Lymphocytic Leukemia | 5,430 | 6.47 TB |
| Multiple Myeloma | 1,532 | 1.59 TB |
| Neuroblastoma | 441 | 6.08 TB |
| Rhabdoid Tumor | 300 | 294.89 GB |

# Foundation Medicine, Inc. (FMI)

FMI agreed to donate data to GDC (press release June 29, 2016)

Data

- 18,004 cases
- Clinical data: age, gender and diagnosis
- Genomic data: mutation calls (no raw sequence data)

Current status

- All data have been transferred to GDC
- GDC finished lift-over from HG19 to HG38 so genomic coordinates are compatible with other genomic data in GDC
- Final phase of data QC

# Multiple Myeloma Research Foundation

MMRF agreed to donate data to GDC (Press release September 28, 2016)

GDC and MMRF are currently working together on

- Clinical data elements mapping and harmonization

- Biospecimen metadata ETL (Excel format to XML)

- Genomic data migration testing
  - Sample DNAseq BAM submission and re-alignment successful
  - Sample RNAseq FASTQ submission and re-alignment successful