BioCompute Objects

Public Workshop on Opportunities for Accelerating Scientific Discovery: Realizing the Potential of Advanced and Automated Workflows

Session on Standards, Governance, and Social Context

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https://biocomputeobject.org/

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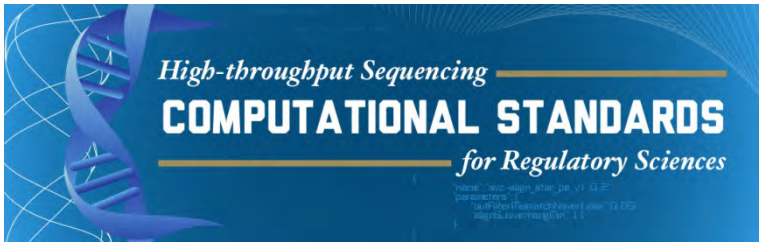
BioCompute Workshops



Purpose: *Community input on creating a standardized framework for computational analyses of HTS (NGS) data for FDA submission.*

This FRAMEWORK is known as a BioCompute object (BCO). We had hundreds workshop participants since first workshop in 2014.

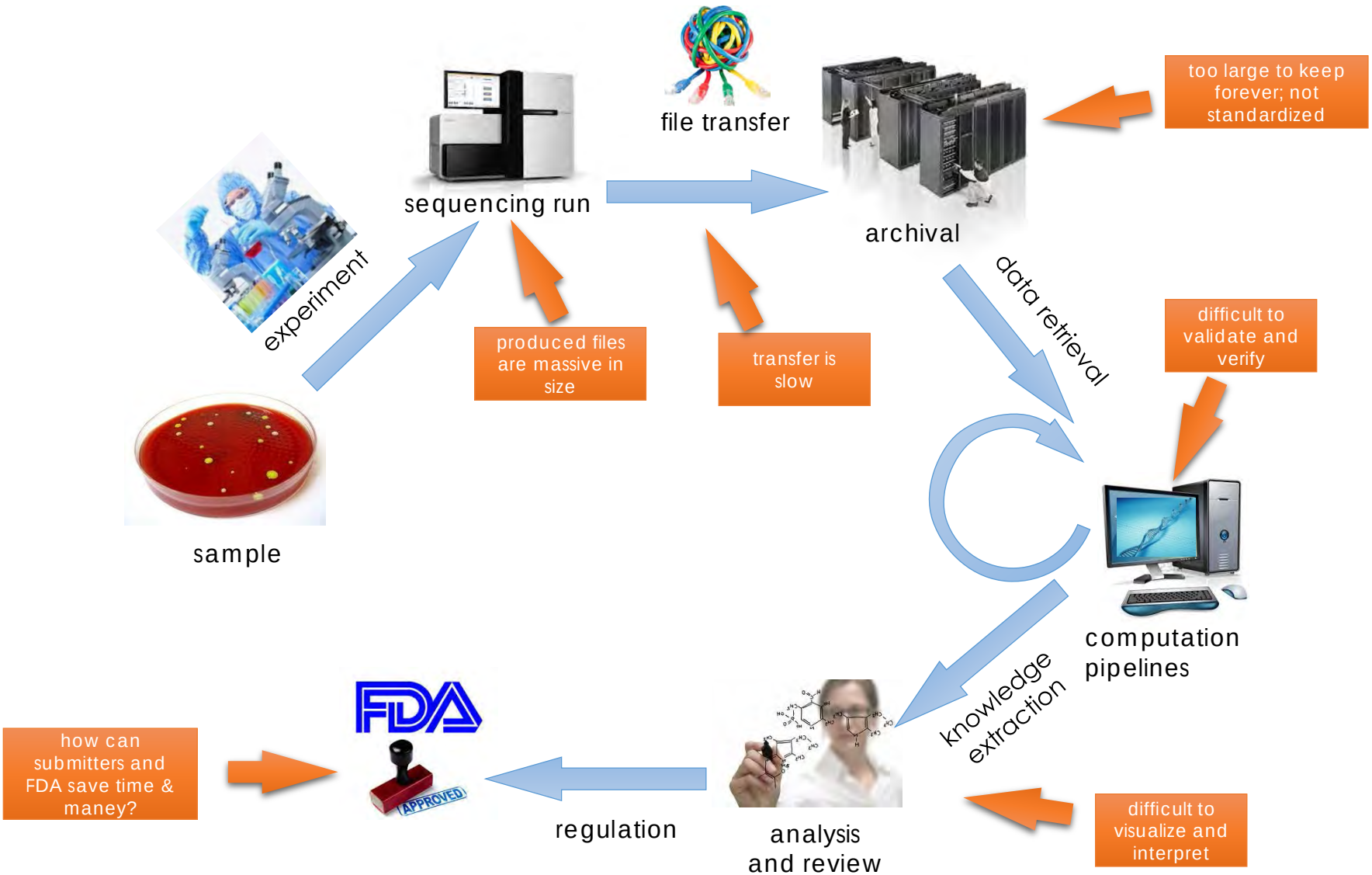
Main outcomes:

- Creation of the BCO specification document
- Public-private BCO-spec working groups with regular meetings
- BCO demonstration projects (for submitters and software platform developers) with community stakeholders.

Accurate **communication** is critical for regulatory evaluation of HTS (NGS) based products.

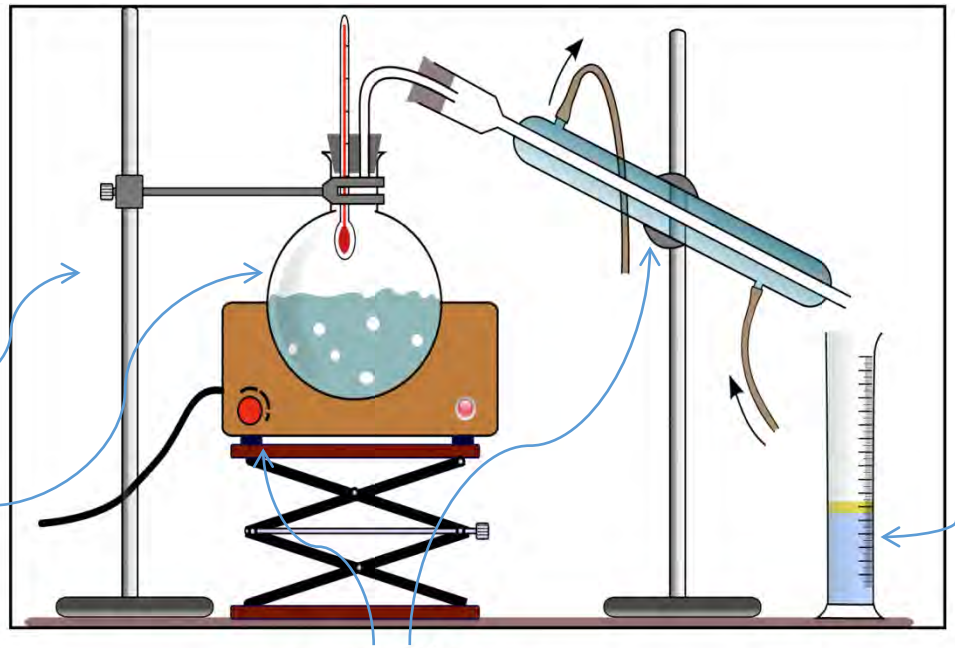
NGS lifecycle: from a biological sample to biomedical research and regulation

BioCompute Objects



Adapted from Vahan Simonyan

BioCompute Object need



experimental conduct

chemicals

yield

conditions

generalized experiment

inputs

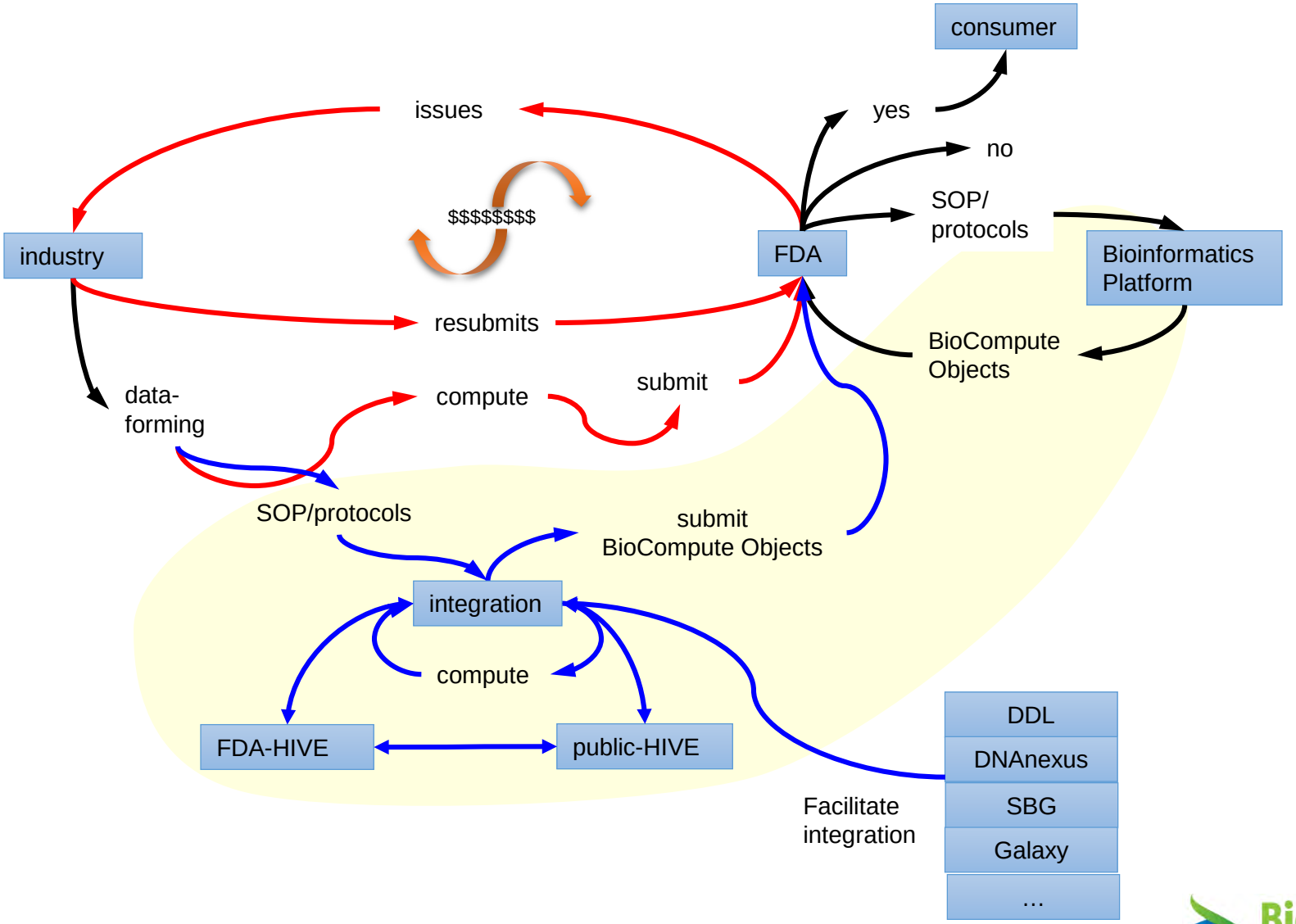
parameters

outputs

```
> my_program -i input_file1 -parameter1 value1 -parameter2 value2 -o out_file
```

Adapted from pixabay.com/en/chemistry-distillation-experiment-161575/ and Biocompute Objects-A Step Towards Evaluation and Validation of Biomedical Scientific Computations. PMID: 27974626.

BioCompute Object need



BioCompute Objects

A solution should …

- Be **human readable**: like a GenBank sequence record
- Be **machine readable**: like a GenBank sequence record. Structured information with predefined fields and associated meanings of values
- Contain enough information to interpret information, understand the computational pipelines, maintain records, and reproduce experiments
- Have a way to be sure the information has not been altered: immutable

BioCompute Objects

802.11 Analogy

- More commonly called “WiFi.” Does not standardize the platform that information is generated on, the applications that use the information.
- The only thing that it standardizes is how information is collected and communicated between two devices. From there, you can do whatever you want with it.

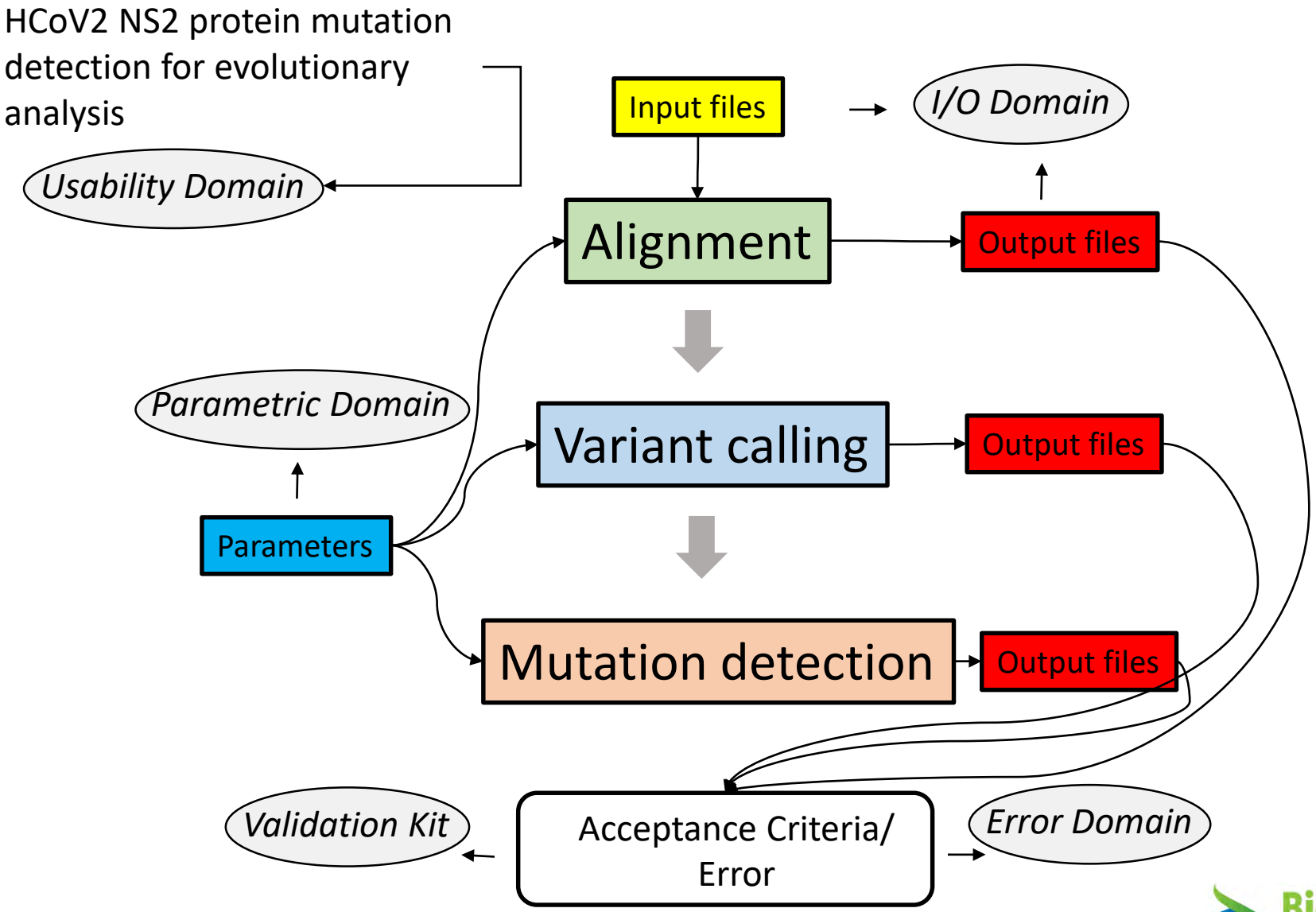
BioCompute Objects

BioCompute

- Standard for communicating computational analysis workflows
- Acts like an envelope for entire pipeline
  - Can incorporate other ontologies, standards (e.g. CWL, RO, DO, GA4GH, SEQC2…)
- Built with input from FDA, academia and industry
- Human and machine readable
  - Written in JSON
  - Unique IDs for versioning
- Categorized by domains (Usability, Execution, Error Domain etc.); Interoperable; Adaptable; …
- IEEE approved standard for communicating genomic analysis workflows (https://standards.ieee.org/standard/2791-2020.html)

BioCompute Objects

What is a BioCompute Object?

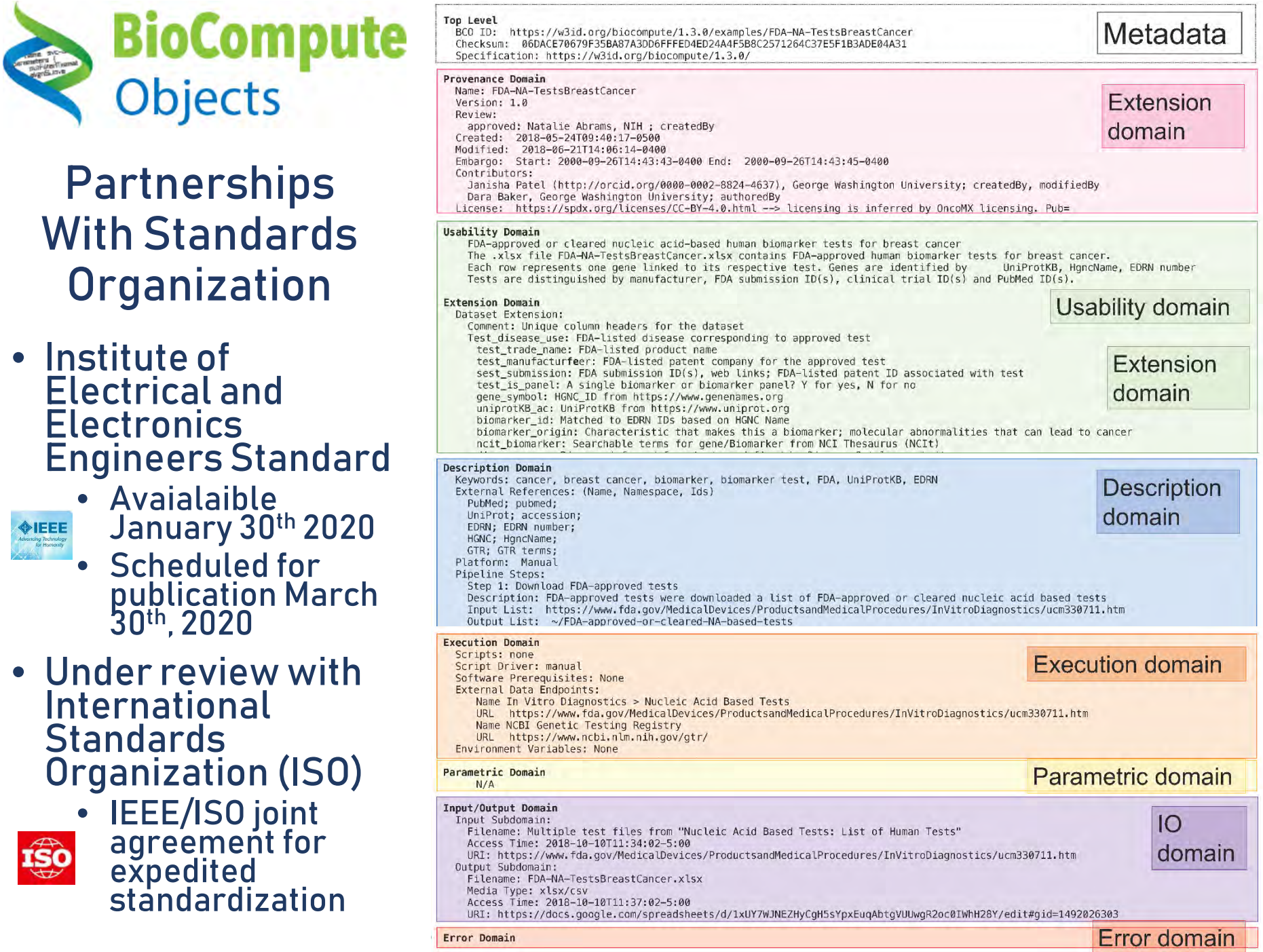


BioCompute Objects

BioCompute Objects

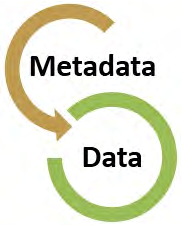
Partnerships With Standards Organization

- Institute of Electrical and Electronics Engineers Standard
  - Avaialaible January 30th 2020
  - Scheduled for publication March 30th, 2020
- Under review with International Standards Organization (ISO)
  - IEEE/ISO joint agreement for expedited standardization



Salient Features of BioCompute

- Provides important metadata required for reproducing data



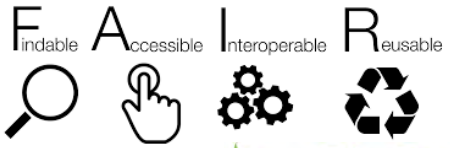
- Provides seamless communication and collaboration opportunities

- Provides appropriate attribution

- Available in machine readable and human readable format

- Provides license details that helps others to use the data accordingly

- Data and metadata can follow FAIR principles



BioCompute Objects

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Biocompute Objects–A Step Towards Evaluation and Validation of Biomedical Scientific Computations

Vahan Simonyan [1], Jeremy Goecks [2], Raja Mazumder [3]

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Enabling precision medicine via standard communication of HTS provenance, analysis, and results

Gil Alterovitz, Dennis Dean, Carole Goble, Michael R. Crusoe, Stian Soiland-Reyes, Amanda Bell, Anais Hayes, Anita Suresh, Anjan Purkayastha, Charles H. King, Dan Taylor, Elaine Johanson, Elaine E. Thompson, [...], Raja Mazumder [view all]

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