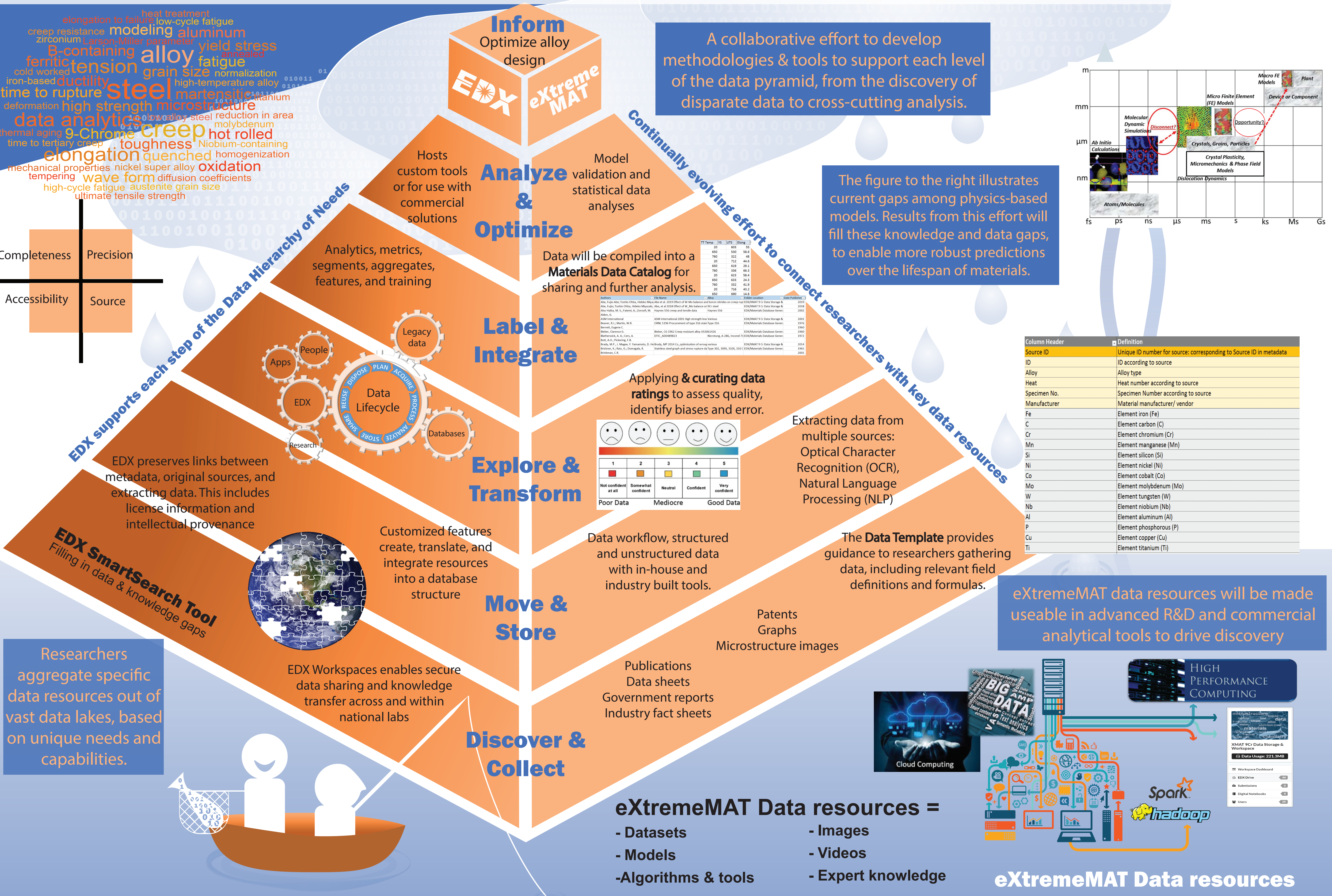


## Data Computing for eXtremeMAT R&D

Advanced data acquisition, transformation and analytics for advanced materials discovery

Extreme Materials (eXtremeMAT) which are capable of withstanding hostile environments, improve the operational efficiency, lifespan, and capabilities of FE power generation technologies. Traditional metal alloy development relies on decades worth of iterative experimental processes, testing, and expertise. Thermo-mechanical models often require proprietary data and focus on specific scales, mechanical properties, and chemical compositions. Improving computational abilities, researchers across seven national laboratories are collaborating to leverage expert knowledge, established best practices, and data sciences bridge the gap between design and utility for materials development. This project is facilitated and securely hosted through NETL's online data collaboration ecosystem, Energy Data eXchange (EDX), which enables researchers to easily share, curate, and interact with ongoing project data and information.

As data products from this portfolio mature, EDX also serves as DOE FE's data resource (datasets, tools, models etc) publication and curation platform in compliance with Executive and Department orders. Each resource can be published via EDX, with a corresponding, Datacite.org formatted, citation with DOI number. These published data resources can be cited in traditional journal publications, and are made discoverable via other domestic and international authoritative data curation platforms (e.g. OSTI, Re3data.org, etc). Supporting the advancement of data analytics with eXtremeMAT, EDX offers a flexible platform for hosting data transformation, visualization, and resulting tools, including machine learning capabilities. This poster highlights the progress of eXtremeMAT via EDX and how both the project is following the data science hierarchy of needs, from collection and management, to applying advanced analytics ( using custom or commercial resources) to help drive future of materials development.



### Foundational Elements of Data Curation developed for eXtremeMAT to date:

1. Data template
2. Data Quality metrics
3. Materials Data Catalog
4. Resource private workspaces

- The ability to store and share data resources in a structured and secure environment
- Reduces redundancy
  - Provides direct access to data resources
  - Keeps data consistent with staff turnover
  - Enhances collaboration abilities
  - Enables the curation of data and knowledge
  - Follows DOE FE data management and IP protocols through a robust & mature governance protocol

- eXtremeMAT Data resources collected to date:**
- 17,138 data points from 74 data sources including National Institute for Materials Science in Japan, NETL, & General Electric
  - 213 data sources identified & metadata saved in Materials Data Catalog
  - 150 sources downloaded
  - 66 sources from literature in process of data extraction

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