Developing the Next Generation of Science Data System Engineers

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Science Data System Challenges

- Architect smarter, flexible and scalable data systems; simplify components with common science data processing functions to ease evolution with emerging technology while maintaining connectivity with archival science data.
- Standardized public data access interfaces of central & distributed sources.
- Increase science findings and practical applications by enabling cross-discipline use of science data.
- Standardize the fundamentally required content and structure: common depiction of time, location and accuracy. Increasing complex remotes sensors and in-situ sensors from spacecraft, aircraft and space networks.
- Encompass data complexities of research and application discipline communities.

Data System Engineer Challenges

- Play an increasing role in developing metadata and data products. Adapt data processing and integration of science algorithms to an evolving computer industry.
- Depicting discipline specific attributes for multiple types of observational data.
- Utilize attributes that can become common across science disciplines and observation systems.
- Working with increasingly complex science data, multiple datasets and diverse sources requires a skilled workforce.
- Take technical training focused in data science and new technologies.
- Develop next generation science data systems that can serve multiple science disciplines, diverse observational data and model output.

Pathways and Perspectives

- Mission & Organization Awareness
  - Goals, Strategy & Policy
  - Software Standards & Adherence
  - Discipline Standards & Awareness
  - CCSDS, HDF

- Instrument Software Data Systems
  - Flight & Ground Data Systems
  - Data System Engineering
  - Data & Information Management
  - Systems Thinking
  - Integration
  - Collaboration

- Personal Mastery
  - Attention to Detail
  - Technical Competence
  - Ethics
  - Honesty/Loyalty
  - Continuous Learning

- Super/Team
  - Self-direction
  - Resilience
  - Flexibility
  - Self Esteem
  - Self Esteem

- Stewardship
  - Risk Management
  - External Awareness
  - System Engineering
  - Project Management
  - Mission

- Strategic Vision
  - Change Management

- Ethos
  - Customer Orientation
  - Decisiveness
  - Problem Solving
  - Quality Principles
  - Resource Management & Stewardship
  - Technology Management
  - Creativity & Innovation
  - Results Orientation
  - Process Oversight
  - Management
  - Program Development, Planning & Evaluation
  - Interpersonal
  - Interpersonal
  - Oral/Written Communication
  - Influencing
  - Negotiating
  - Partnering/Teaming
  - Political Savvy
  - Presentation/Markeing Skills
  - Organizational Representation & Liaison
  - Working within a Team

Duties/Skills

- Works in-depth on a data system component development or operation.
- Serves with specific science or instrument team.
- Offers cross training in science and computer technologies.
- Develops and operates specific components of an instrument data system.
- Integrates and tests instrument algorithms.
- Manages mission science data collections.
- Participates in professional societies.
- Works on collaborative US agency programs.
- Leads technical activities of interdisciplinary engineers developing an instrument or data system component.
- Overseas data center development, tracks costs and schedule, technical constraints.
- Leads standards development efforts.
- Serves as an instructor on data management.
- Serves as NASA representative to other US Agencies.
- Participates in International projects.
- Overseas development for a mission or multi-mission science data system.
- Plans and administers projects of national or international importance.
- Establishes long range agendas for development of large new unusually complex systems.
- Responsible for resource requirements, policies, procedures and budgets.
- Leads international projects.

Very often our candidate have been contractors.

Knowledge

- Looking for degrees in the following areas:
  - Physical Science
  - Astronomy, Astrophysics
  - Geology
  - Hydrology
  - Meteorology
  - Oceanography
  - Physics
  - Computer Engineering
  - Computer Science

- But the following fields of expertise are also useful:
  - Remote Sensing
  - Mathematics
  - Physical geography
  - Human geography

- Thorough knowledge of:
  - Science Data structures
  - Programming languages
  - Operating systems
  - Applications techniques
  - Service oriented architectures
  - Off-the-shelf and open source software (e.g., RONIS, GIS)
  - Hardware systems
  - Knows science and engineering concepts, practices:
    - Levels of processed data (0, 1, 2...)
    - Orbital mechanics, instruments
    - Map projections (Lambert, RA/DEC)
    - Instrument calibration techniques/ algorithms
    - Validation techniques
  - Physical science algorithms, modeling systems, Geographic Information Systems
  - Standard data formats (CCSDS, HDF, CDF, FITS)
  - Knows how to integrate new technologies into current systems.

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