But the following fields of expertise are also useful: • Remote Sensing • Geomatics • Physical geography • Human geography

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

Knowledge

• Requires knowledge of: • Science Data structures • Programming languages • Operating systems • Applications techniques • Service-oriented architectures • Off-the-shelf and opensource software (e.g., RDM, GIS) • Hardware systems • Knocks science and engineering concepts, practices: • Levels of processed data (0, 1, 2...) • Orbital mechanics, instruments • Map projections (LatLon, RA/DEC) • Instrument calibration techniques/algorithm • 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

Thorough knowledge of:

• Software engineering design and development methodologies, paradigms, tools
• Sufficient to conceive, apply experimental theories to resolve unique or novel problems, significantly alter standard practices
• Knocks science information processing standards and policies
• Knocks software engineering lifecycle
• Focus on particular domain to become expert
• Data software storage
• Science Data formats
• Science metadata
• Data Management Expert
• Has experience with NASA science data and understand provenance issues, data quality

Thorough knowledge of software engineering design and development methodologies, paradigms, tools

• Software engineering design and development methodologies
• Agency information processing policies and standards
• Science data system architectures, science data storage, data formats, science metadata
• Recognized Subject Matter Expert
• Science Domain
• Recognized Subject Matter Expert
• Data systems and operations
• Data Management
• Data Manipulation and Services
• Extensive understanding of instrument and physical science discipline data formats, analytical methods, computations science
• Extends discipline knowledge boundary
• Project Management expertise

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.

Career Track Guidance

Suggestions on how to find a career path:

• Develop a long-term vision with a short term plan.
• Review your career plan annually.
• Listen to what others have done. Find a mentor, be a mentor.
• Improve your skills through continuing education.
• Challenge yourself, don’t be afraid to change, be willing to take a risk.

Career Path at NASA/GSFC

Engineer

Journeyman Engineer

Senior Engineer

Principal Engineer

Pathways and Perspectives

Knowledge

Career encompasses more than technical knowledge

Supervision/Team

Personal Mastery

Mission

Pathways & Portfolio

External Awareness

Risk Management

Domain Knowledge

Instrument Software Data Systems

Flight & Ground Data Systems

Systems Engineering

Data & Information Management

Systems Thinking

Integration

Collaboration

Mission & Organization Awareness

Goals, Strategy & Policy

Software Standards Adherence

e.g. CCSDS, Discipline Standards Awareness e.g. CCSDS, ISO19115, HDF

Customer Orientation

Decisionmaking

Problem Solving

Quality Principles

Resource Management & Stewardship

Technology Management

Creativity & Innovation

Results Orientation

Process Oversight Management

Program Development, Planning & Evaluation

Coaching/Counseling/Mentoring

Team Building

Conflict Management

Human Resources Management

Diversity Awareness

Situational Leadership

Self-direction

Reasoning

Resilience

Flexibility

Ethics/Professional Core Values

Honesty/Loyalty

Continual Learning

Interpersonal skills

Oral/Written Communication

Influencing/Negotiating

Participating/Teaming

Political Savvy

Presentation/Marketing Skills

Organizational Representation & Liaison

Working within a Team

www.nasa.gov

ESIP Winter Meeting
January 6-8, Washington, D.C.

Developing the Next Generation of Science Data System Engineers

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NASA/Goddard Space Flight Center

Science Data System Challenges

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