



Integrating Human System Information with the Systems Platform for Aggregating and Relating Capabilities (SPARC)

2022 NASA Data Science Summit
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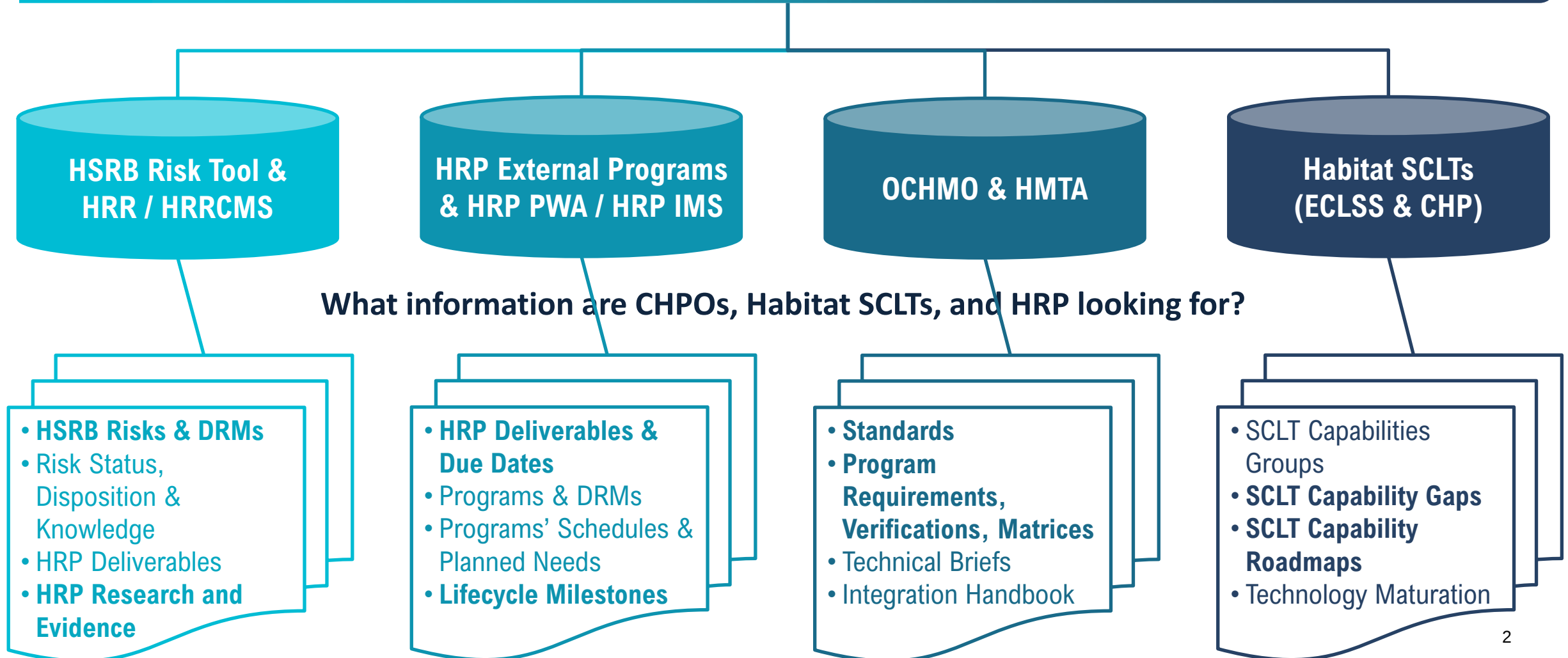
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Human Research Program (HRP)





Challenge: Existing Human System Information in Multiple Sources

Systems Platform for Aggregating and Relating Capabilities (SPARC)





Usefulness of the SPARC Application: User Stories

User (Stakeholder)	Story (Perspective)	Areas of Interest
Chief Health and Performance Officers (CHPOs), Discipline and Systems Integrators, 3001 Standards Team	A user wants to review and compare the NASA standards and exploration program requirements that are applicable to their program <u>and</u> consider and compare what other exploration programs have required to meet those standards.	• Exploration program requirements, verifications, mission phases / DRMs, timelines and milestones • NASA Space Flight Human-System Standards (NASA-STD-3001) • SCLT Capabilities Groups, Gaps, and Roadmaps • Human System Risks • HRP Research, Evidence, and External Deliverables
	A user wants to identify potential gaps within and between programs.	
ECLSS & CHP System Capability Leadership Teams (SCLTs)	A user wants to review and capture what research and technologies are currently available or are planned to be available in support of the identified capability groups, gaps, and roadmaps.	
	A user wants to consider exploration programs' requirements and timelines to support development of and updates to the capability roadmaps.	
Human System Risk Board (HSRB) and Human Research Program (HRP)	A user wants to review when and how the human system risks are planned to be mitigated to align research activities and project outcomes with the milestones in the exploration programs' lifecycles.	
	A user wants to explore the pathways across the research, evidence, products, and outcomes to help meet the demands of the future mission requests and requirements.	



**SPARC is available Agency-wide to users with
NASA credentials and network access!**

<https://sparc.ndc.nasa.gov>

Current status of SPARC development

DEMONSTRATION



Summary of Completed User Feedback Integration

Stakeholder	Feedback
All SPARC Users	✓ Keyword searching and results throughout SPARC ✓ Made the program requirements graph interactive to click on a program and see it's requirements ✓ Increase the granularity of information in Notional Program Timeline to show individual Artemis missions with the programs / elements / phases ✓ Integrate links to useful, related information, such as the Technical Briefs, Technical Standards, and other helpful resources external to SPARC ✓ Improve the visibility of the scroll bars on the Matrix and in other areas where they must be used
HRP	✓ Add filtering to the HSRB Risk Scorecard report ✓ Time-based logouts should remember user's last location in SPARC ✓ Breadcrumbs / Table of Contents should allow users to open items in a new tab ✓ Add explanation for changes in axes between the 5x5 risk matrix and the 3x4 matrix
CHP SCLT	✓ Standards-to-Programs matrix as an alternative to the CHP SCLT capability gap matrix ✓ Provide one central list of the specific sources of truth, including the document number and revision used in SPARC (added to the User Manual)
Systems Integrators	✓ Add filtering in "Explore" for discipline categories (e.g., user needed to see all standards and Artemis requirements related to "Lighting") ✓ Add links to the source of truth documents within the detailed program requirement pages ✓ Add filters to search results (e.g., user "wanted to see lighting associated with HLS, I could hover over programs and see a sub-list to select from that might say – all, Orion, Gateway, HLS, EHP etc.") ✓ Make the side panels collapsible to increase the available screen space to use for viewing the Matrices and Explore views of the information ✓ Track the standards revisions that programs use to accurately compare requirements
HSRB	✓ Include the Risk Custodians in the Detailed views of the HSRB risks ✓ Integrate and visualize the HSRB Risk Scorecard chart and generate it as a report



SPARC Capability Development Prioritization



Milestones	FY 2023							
	Q1		Q2		Q3		Q4	
	v1.9.0	v1.10.0	v1.11.0	v1.12.0	v1.13.0	v1.14.0	v1.15.0	v2.0.0
HRP	External Deliverables		Evidence Books (EBs), Publications (External Links)		CHP Mental Model Integration		EB Knowledge Graphs [TBD]	
	Medical System Foundation Model (ExMC) [TBD]		Technology / Hardware Specifications		Risk Factor Mapping Collaboration [TBD]		[Integrate HRP CMR [TBD]	
Habitat SCLTs	ECLSS Capability Groups & Gaps		CHP/HRP Roadmaps		ECLSS Roadmaps		Update HSRB Risk Traces	
OHCMO CHPOs (Systems Integrators)	Program Requirement Verifications		Program DRMs / Subsystems (e.g., ECLSS, CHP, HSR)		Program Waivers, Variations, & User-entered Notes		Program Requirements Revisions & Comparison	
	Program Automated Integrations for Real-time Updates (e.g., DOORS, Cradle, MagicDraw, etc.)							
OCHMO Standards Team	Import New Standards Revisions & Program Traces		Dynamic Relationship Generation & Workflow for Automating Integrations				Glossary/Ontology Integration & Comparisons	
	Program MORDs Trace to Standards		NASA-STD-3000 / ISS Program Reqs.		“Most Popular” Graphs (Standards, Risks, Requirements)		Dynamic Standards Figures Visualizations	
HSRB	HSRB Risk Tool Automated Integration (Read-only)		DAG Visualization (Existing Risks & Integrated View)		Integrate DAGs w/Std		[User Feedback Development*]	



Purpose of Today's Stakeholder Session

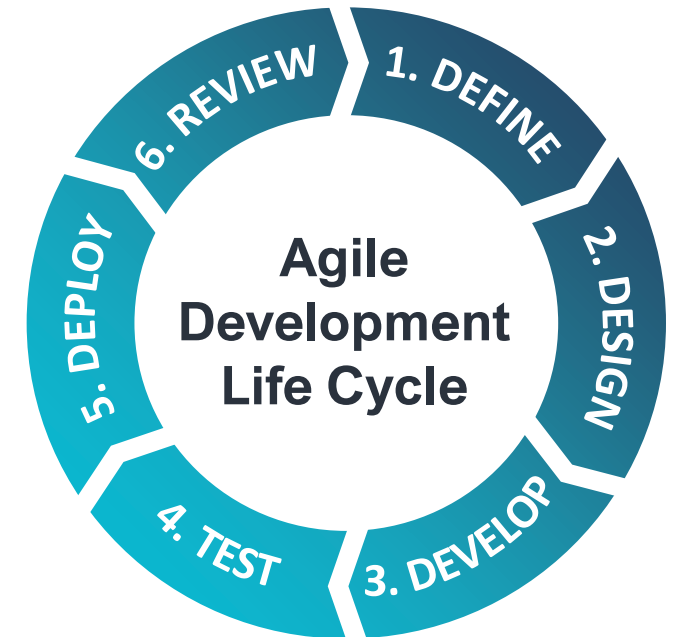
Solicit feedback from our stakeholders to **continuously improve** the vision, methodologies, and products and to **continuously align** with your needs, goals, and objectives for this project

Stakeholder feedback we're looking for today:

- Input on the designs and layout of the application
- Input on the visualizations of the related information
- Name of the application – it will be used in the URL

How to provide feedback:

- Discussion during today's presentation
- Chat messages during or after today's presentation
- Email robyn.d.atkins@nasa.gov or baraquiel.reyna-1@nasa.gov



We aim to deliver a solution that stakeholders need and want to use!



Project Overview



SCOPE: To develop a new NASA internal web application that **aggregates and relates multiple programs' human system products into one centralized platform** that can be viewed and interacted with based on the needs of human exploration missions across human system disciplines and capabilities

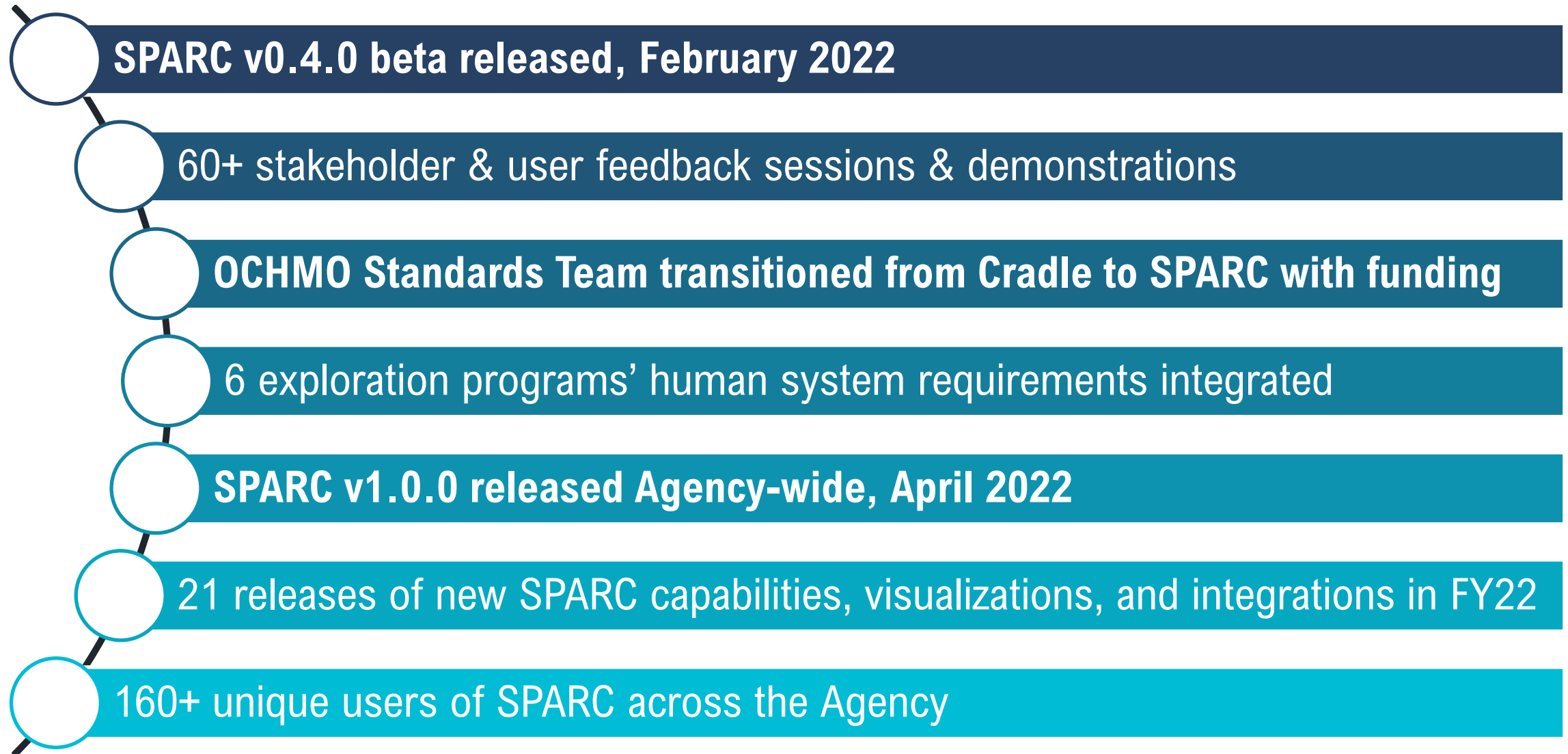
PURPOSE: To create a **visually-engaging, user-friendly, and accessible solution** for integrating existing human system data and information from multiple groups and storage systems

OBJECTIVE: Prototype application to aggregate, relate, and visualize information integrated from the respective sources of truth

Information Set 1	Information Set 2	Source / Relationship
Human System Risks	+ CHP SCLT Capability Groups & Gaps	CHP SCLT & HRP
	+ NASA Standards 3001, Volumes 1 & 2	OCHMO 3001 Standards
Program Requirements	+ Program Verifications	CHPOs / Systems Integrators
	+ HRP Research, Evidence, & External Deliverables	HRP External Programs Integration
SCLT Capability Gaps	+ NASA Standards 3001, Volumes 1 & 2	
Mission Lifecycle Milestones	+ NASA Standards 3001, Volumes 1 & 2	



Major Milestones and Accomplishments





SPARC Technology Stack



User Interface (UI)



Angular



TypeScript



AmCharts

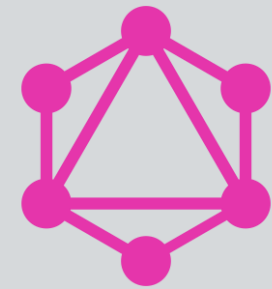
Server & Application Program Interface (API)



NodeJS



Hasura



GraphQL

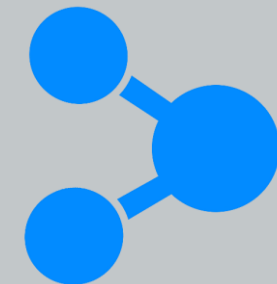
Database (DB) and Data Analyses



PostgreSQL



Python



Neo4j



OCHMO Standards Team Requirements (February 3, 2022)



- **Database that contains the following categories/data that are linked across all categories:**
 - Human risks
 - 3001 Standards
 - Program requirements
 - Program verifications
 - Program waivers
 - Technical briefs
 - Human Integration Design Handbook
- **Ability to search (by keyword or preset options – such as Human Risks, Standards categories/chapter titles) and sort/access information across all data categories and provide visual linkages**
 - Ability to have options on information to display when doing searches
 - Be able to go “forwards” and “backwards” on the linkages
- **Ability to search/show differences between Standard revisions (Track history)**
- **Ability to display Program waiver history vs. requirements and standards (this will help us determine if the standard is written appropriately)**
- **Ability to export information into Excel, Word etc.**
- **Easy access, minimum through NDC if not public**



OCHMO Standards Team Requirements & Features: Status



Completed Requirements

- ✓ Database that contains the following categories/data that are linked across all categories:
 - ✓ Human System Risks
 - ✓ 3001 Standards
 - ✓ Program Requirements
 - ✓ Technical Briefs
 - ✓ Human Integration Design Handbook (HIDH)
- ✓ Ability to export information into Excel, Word, etc.
- ✓ Easy access, minimum through NDC
- ✓ Ability to search, by keyword or preset options, such as Human Risks, Standards categories/chapter titles), and sort / access information across all data categories and provide visual linkages
 - ✓ Ability for options on information to display when searching
 - ✓ Be able to go "forwards" and "backwards" on the linkages

Completed Additional Features Requested

- ✓ Visualize program requirements traced to standards through the Hierarchy of Needs pyramid
- ✓ Click Program Requirements graph to view program's requirements
- ✓ Standards x Program Requirements matrix to Level 2 headers
- ✓ Add relationships between standards across volumes
- ✓ Visualize Hierarchy of Needs pyramid traced to standards
- ✓ Export Risk-Standards-Program Requirements Report
- ✓ Add Systems Integrators to Standards pages
- ✓ Add links to cited references from standards
- ✓ Auto-generate a new program SRD using standards for requirements, including a trace to the standards
- ✓ User notifications of new information / releases in SPARC