Crew Health and Performance Integrated Data System Platform (CHP-IDSP): Project Updates

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2025 Human Research Program
Investigators' Workshop

Characterizing the Problem

- For 60 years, crew have relied on 80+ expert ground personnel to provide **real-time** guidance
- Exploration mission communication delays necessitate a **paradigm shift** from ground to onboard
- Crew will be **more reliant on in-flight data** to execute complex tasks, make time-critical decisions, and troubleshoot anomalies
- Exploration mission **data constraints** include limited processing, storage and channel capacity
- Ground personnel must maintain **situation awareness** of issues that may impact crew health and performance
- Currently, data is spread across many systems and often requires cumbersome transfer and packaging; crew often cannot access this data

CHP-IDSP Goals for Exploration Missions

The **Crew Health and Performance Integrated Data System Platform (CHP-IDSP)** is a cohesive *back-end platform* for *acquiring, processing, storing,* and *distributing* integrated CHP data from *disparate sources* for *both crew* and *ground users*.

Goals for Exploration Missions:

- To *integrate* CHP relevant data from disparate sources, systems, and applications to enable advanced analytics and support tools.
- To *provide a platform* for CHP application developers and authorized end users to *access the data they need* to meet specific mission needs.
- To *synchronize* CHP mission data, as part of the larger space mission architecture, *across vehicles, habitats, and on the ground*.

CHP-IDSP Project History

- **2019**
  - Identified problem space
  - Application extended beyond “medical”
  - Prototype used in CDSS research
  - MDA & CDSS End
- **2021**
  - CHP-IDA spins up “path-to-flight”
  - Architecture work begins
  - Prototype helps define architecture requirements and design
  - Prototype demo as “V1”
  - PersEIDS demo
  - Prototype core subsystems
- **2023**
  - CHP-IDA becomes CHP-IDSP
- **2024**
  - Begin implementation for flight tech demo
  - Chiron demo

Medical Data Architecture (MDA) → **Crew Health & Performance Integrated Data Architecture (IDA)** → **Crew Health & Performance Integrated Data System Platform (CHP-IDSP)**

ExMC + HRP | **XMIPT + ExMC + HRP**

Fiscal Year ‘24 Objectives

- Continue to incorporate human-centered design process to better understand end user workflows and data needs
- Demonstrate coverage of capabilities through Periodic Health Status (PHS) Exam and CO_2 (Notification and Sleep) scenarios
- Solidify core services (Sync Management, Notification Management)
- Provide resources enabling other projects to develop using our platform
  - Interface Definition Document (IDD)
  - Further configuration of our Test Bed (Johnson Space Center, Building 15)

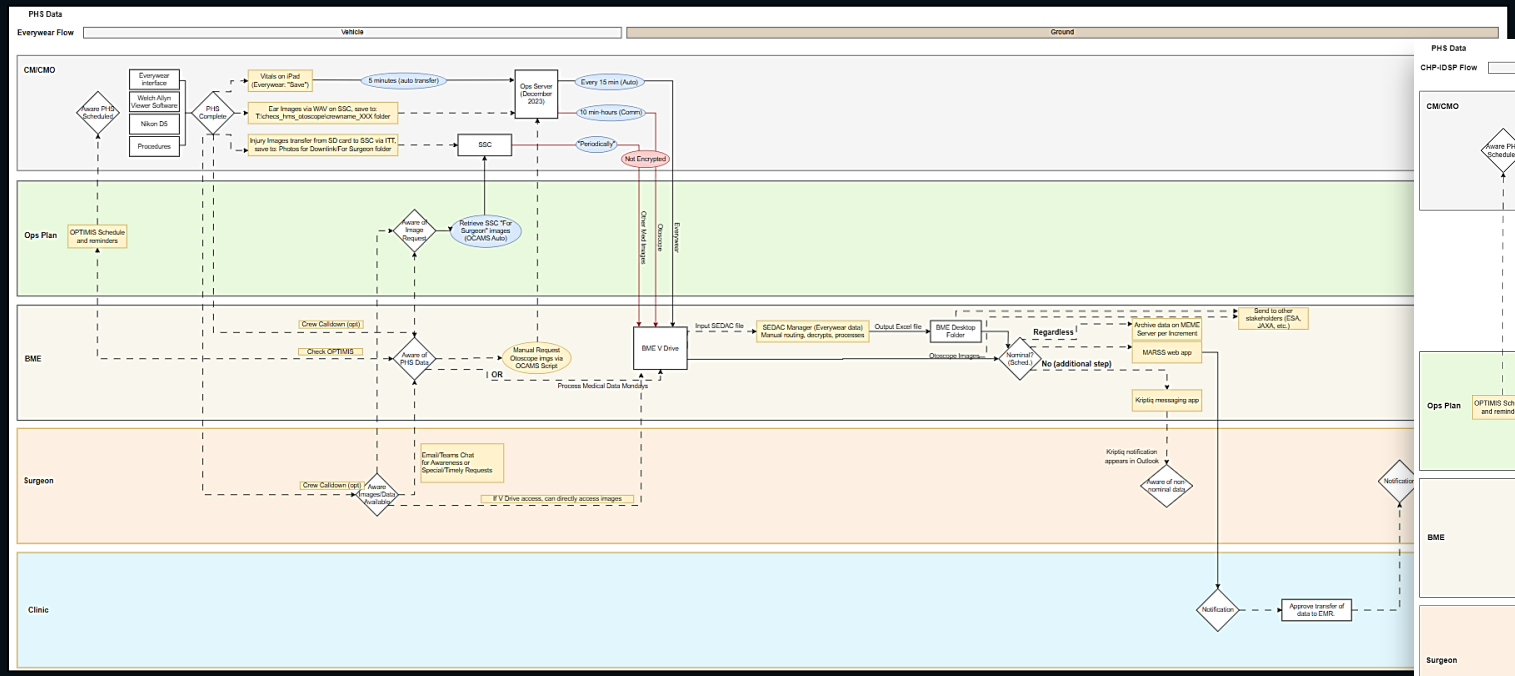
Human-Centered Design Process

Research	Task & Flow	Scenario & Core	Develop & Demo
Build the mental model of *important activities, related data, transfer processes, inefficiencies, and pain points* across user roles within each CHP domain.	Identify current *data sources* and *data types* to understand how information is *transferred and consumed* for successful task completion.	Identify *use cases* that *communicate* how CHP-IDSP core platform services can *enable new technologies* and *improve workflow*.	Support software development and end-to-end (E2E) demonstrations through *gathering representative data* and *prototyping*.
• Crew Comments Database reports • Procedures • Meet with domain SMEs	• Diagram ISS flow across user roles • Create task lists	• Select scenarios with stakeholder input • Create hypothetical CHP-IDSP data flows and task lists	• Incorporate representative data sets • Utilize prototypes to communicate IDSP narrative

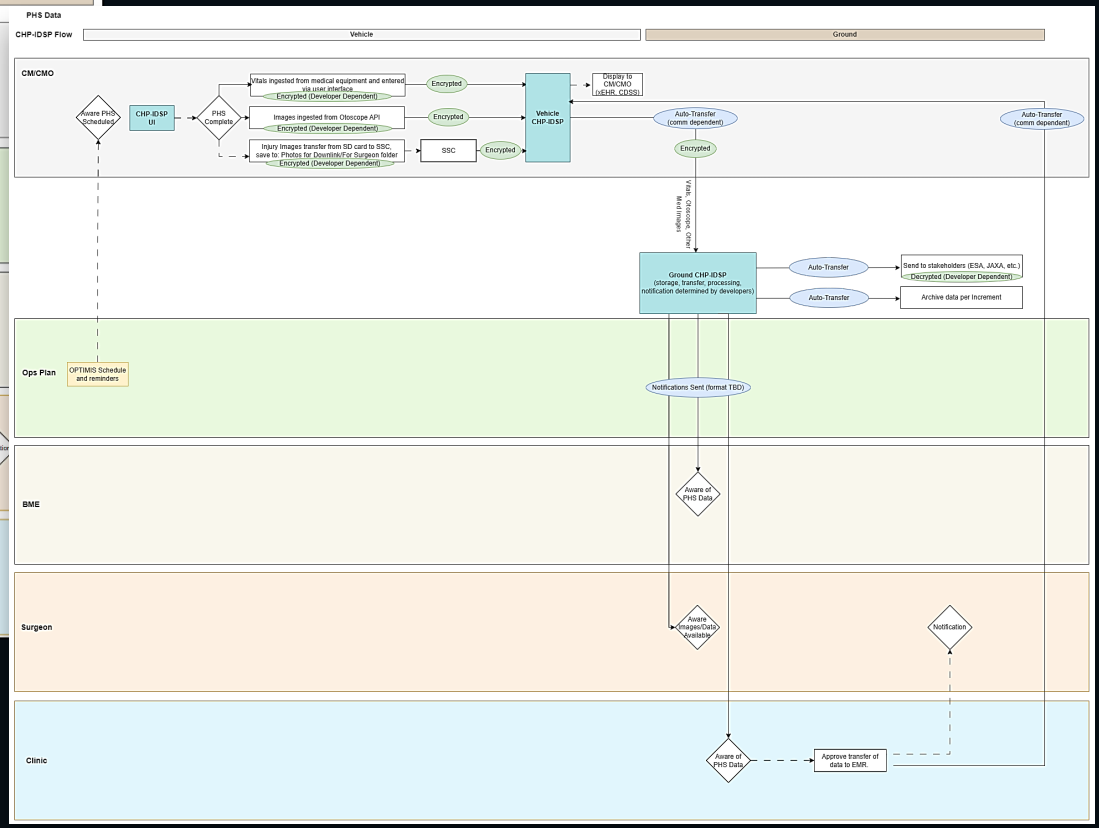
Periodic Health Status Exam | Research

- Manual data collection and transfer via multiple systems (e.g., sensors, otoscope, survey)
- Data transfer process is inefficient and time consuming
- No notifications provided (e.g., data available, event occurred)
- Images are not encrypted
- Manual data decryption, archiving, correlation, packaging
- Data occasionally missing/delayed

Periodic Health Status Exam | Data Flows



Current ISS Flow



Hypothetical ISS Flow with CHP-IDSP

Periodic Health Status Exam | Capabilities

Data Ingestion & File Management

- Crew Medical Officer (CMO) uses a personal computing device (PCD) and a multifunction tool, *both integrated to the vehicle's CHP-IDSP* to conduct a PHS
- Heart rate, blood pressure, temperature, blood oxygen levels, ear and tympanic membrane images (via otoscope), open-ended exam form, are all collected data *packaged as the crew member's patient file*

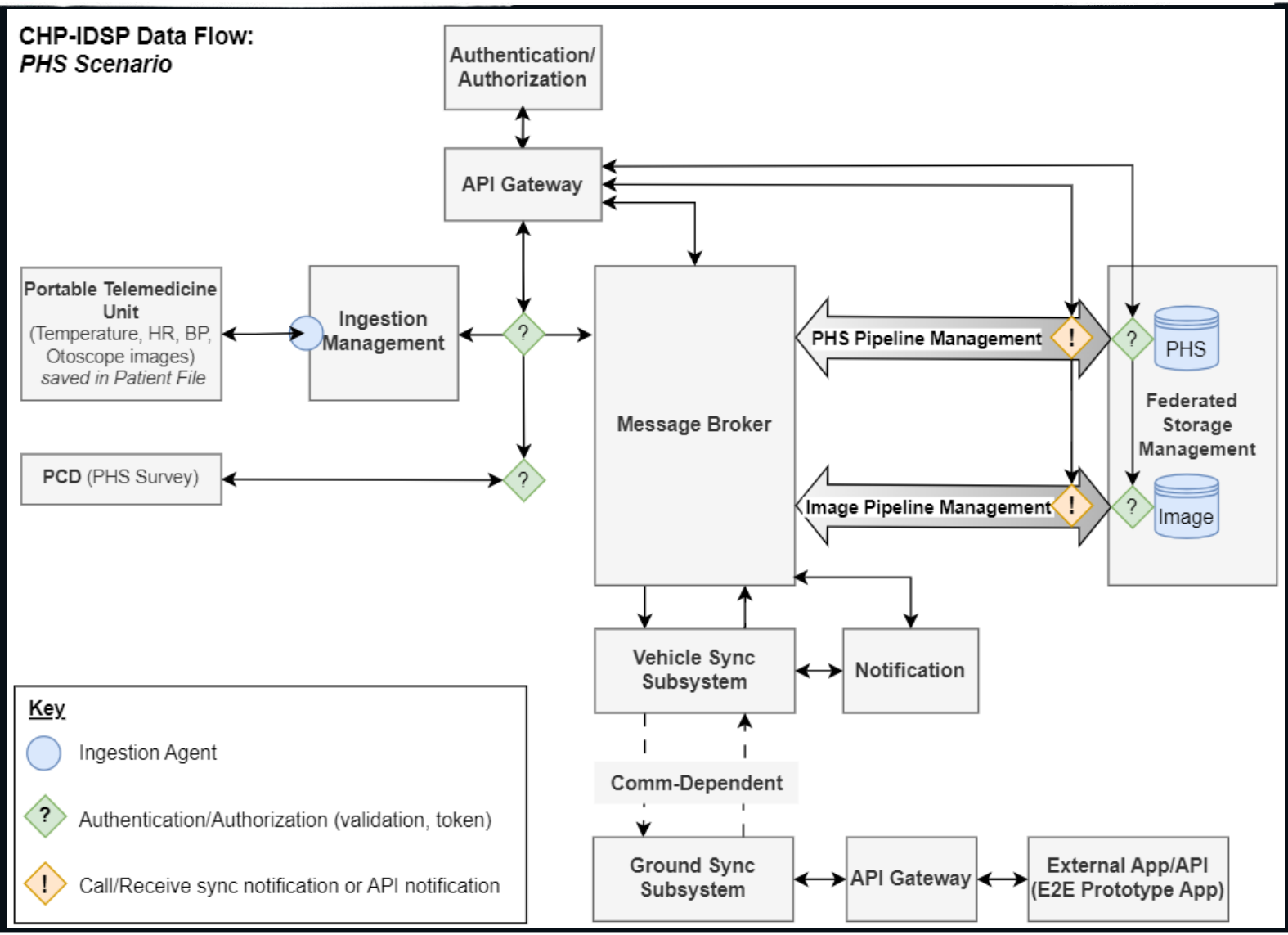
Schedule & Prioritize Data Synchronization

- Upon completion of PHS, CMO clicks a button to *send exam information to the vehicle's CHP-IDSP*, which *manages transfer* of this information to CHP-IDSP on the ground
- CHP-IDSP on the ground *generates a notification* that data has been successfully transferred and is available to *view by authorized personnel*

Notifications & Authentication

- A Flight Surgeon reviews the data, compares it to previously collected data, updates the patient file with recommendations, and *sends the updated file to ground CHP-IDSP*
- Ground CHP-IDSP *manages transfer* back to CHP-IDSP on vehicle
- CHP-IDSP on the vehicle *generates a notification* that data has been successfully transferred and is available to *view by authorized personnel*

Periodic Health Status Exam:
Subsystem Data Flow



Current Integrations

- **Chiron:** utilizing CHP-IDSP as its platform of core services to accelerate their development
- **Orion Medical Kit equipment:** provides Chiron and CHP-IDSP a first pass opportunity to integrate flight selected devices into the system for demonstration with medical scenarios

Future Work

Upcoming Targets:

- **MAVRIIC:** Looking to identify a Statement of Work by the End of Year ‘25 for stakeholder review
- **PersEIDS:** Working toward integration plan for Fiscal Year ‘26
- **Flight Tech Demo:** will likely include Chiron, Orion Medical Kit devices, and possibly MAVRIIC and PersEIDS, utilizing ISS as the test environment
- **Test Bed:** functional for outside users
- **Next focused scenario:** chest pain

Thank you!

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