



Medical Data Architecture Project Status

M. Krihak¹, C. Middour², A. Lindsey³, N. Marker⁴, S. Wolfe³, S. Winther⁵, K. Ronzano⁵, D. Bolles³, W. Toscano³, and T. Shaw³

¹Universities Space Research Association, NASA Ames Research Center, Moffett Field, CA

²Millennium Engineering and Integration Co, NASA Ames Research Center, Moffett Field, CA

³NASA Ames Research Center, Moffett Field, CA

⁴SGT Inc., NASA Ames Research Center, Moffett Field, CA

⁵Wyle Laboratories, NASA Ames Research Center, Moffett Field, CA

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Medical Data Architecture (MDA) Project

- Background
 - ExMC Risk and Gap
 - MDA Project Objective
 - Test Bed 1 Objectives
- MDA Accomplishments
 - Risk Reduction
 - System Requirements Review (SRR)
 - System Design Review
- Summary & FY17 Plans

Exploration Medical Capability (ExMC) Risk & Gap

ExMC Element Risk:

Risk of Adverse Health Outcomes & Decrements in Performance due to Inflight Medical Conditions

MDA Need

ExMC Gap Med07: We do not have the capability to comprehensively process medical-relevant information to support medical operations during exploration missions.

MDA Goal

The MDA will develop capabilities that support autonomous data collection, and necessary functionality and challenges in executing a self-contained medical system that approaches crew health care delivery without assistance from ground support.



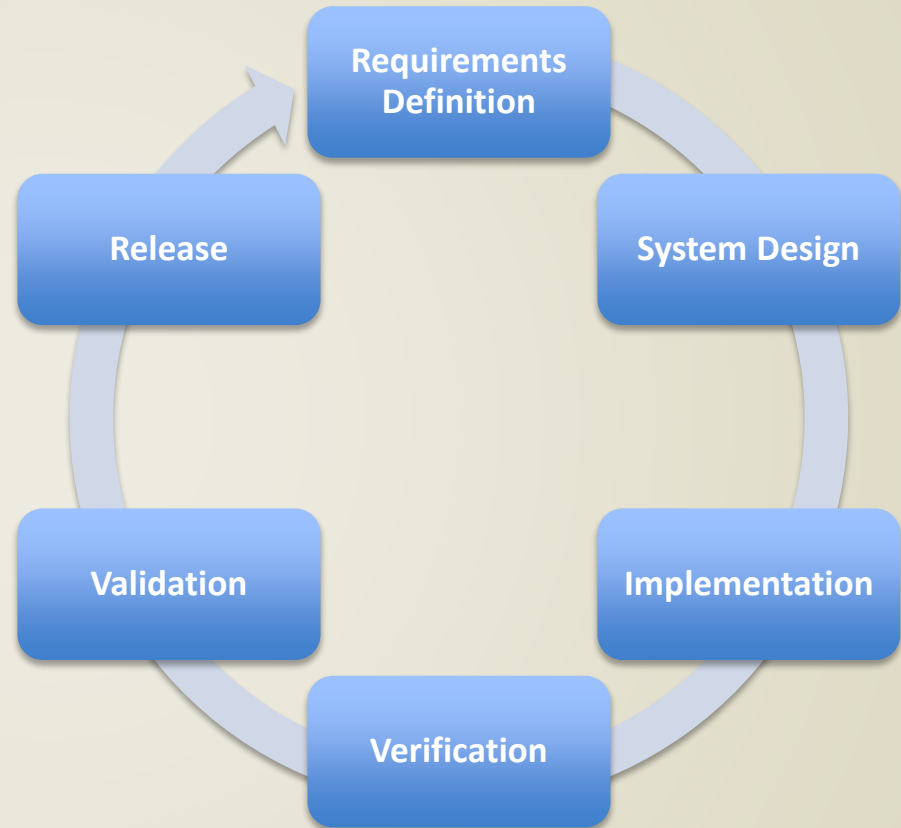
MDA Project Objectives

- The primary objectives of the Medical Data Architecture project are to establish a robust data architecture that:
 - Provides a unified ability to capture, collect, store, access, integrate, and analyze a spectrum of health-related data to create actionable insight and medical process support leading to an Exploration Medical System
 - Provides the capability to manage and process medically relevant data from a variety of sources both medical and non-medical
 - Establishes interfaces for the integration of hardware and software components
 - Enables data retrieval as meaningful information that can inform diagnosis, treatment and health management
 - Automates data transfers
 - Expands the medical system to enable sophisticated data analytics and clinical decision support capability

MDA Project Development

Approach

- Phased software lifecycle development process
- Multiple versions or test beds, where each successive version builds upon the previous test bed(s)
- Demonstration for each test bed in a laboratory and/or analog environment.



Iterative Development Process

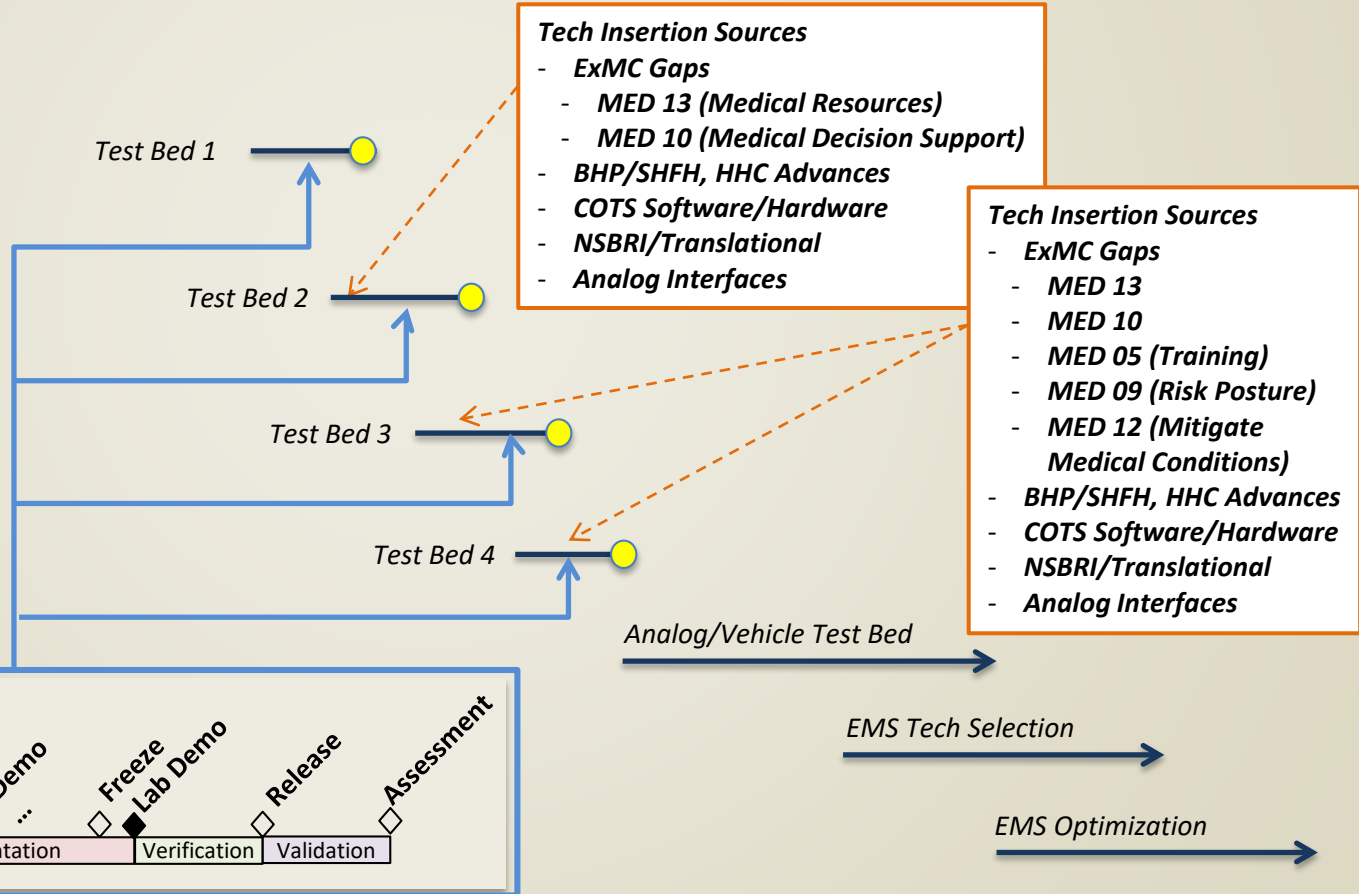
- Meets ExMC request for quick system development
- Provides customer feedback opportunities



Development Breakdown

	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28
MEDICAL RISK	ISS 1YM	Asteroid Phase A	CCP				EM-2	AARM	EM-3 EM-4	EM-5	ISS End	EM-6 (ARCM)		Mars Phase A	
Rev-PPBE18 + FY16Q3 Updates	Initial Concept of Operations			Integrated Medical System			ConOps for all DRMs			Pharmacy Recommendation		Select Technologies		Optimized Medical System	

07 We do not have the capability to comprehensively process medically-relevant information to support medical operations during exploration missions.



Test Bed 1 Concept of Operations Scenario

- Subject dons wearable sensors to enable the capture of vital signs.
- Subject discloses shoulder pain, at which point, the Crew Medical Office (CMO) prescribes analgesics.
- Subject asked by the CMO to apply the Electrocardiogram (ECG) Glove to capture a 12-lead ECG.
- Subject requested to update personal medication usage via the Dose Tracker software.
- During this interaction, the CMO:
 - logs into the crewmember's Electronic Health Record (EHR),
 - downloads that individual's vital signs data from the biosensors,
 - and provides data entry into the Private Medical Conference template in the Objective and Subjective sections of the note.

Levels of Care

MEDICAL CARE CAPABILITIES

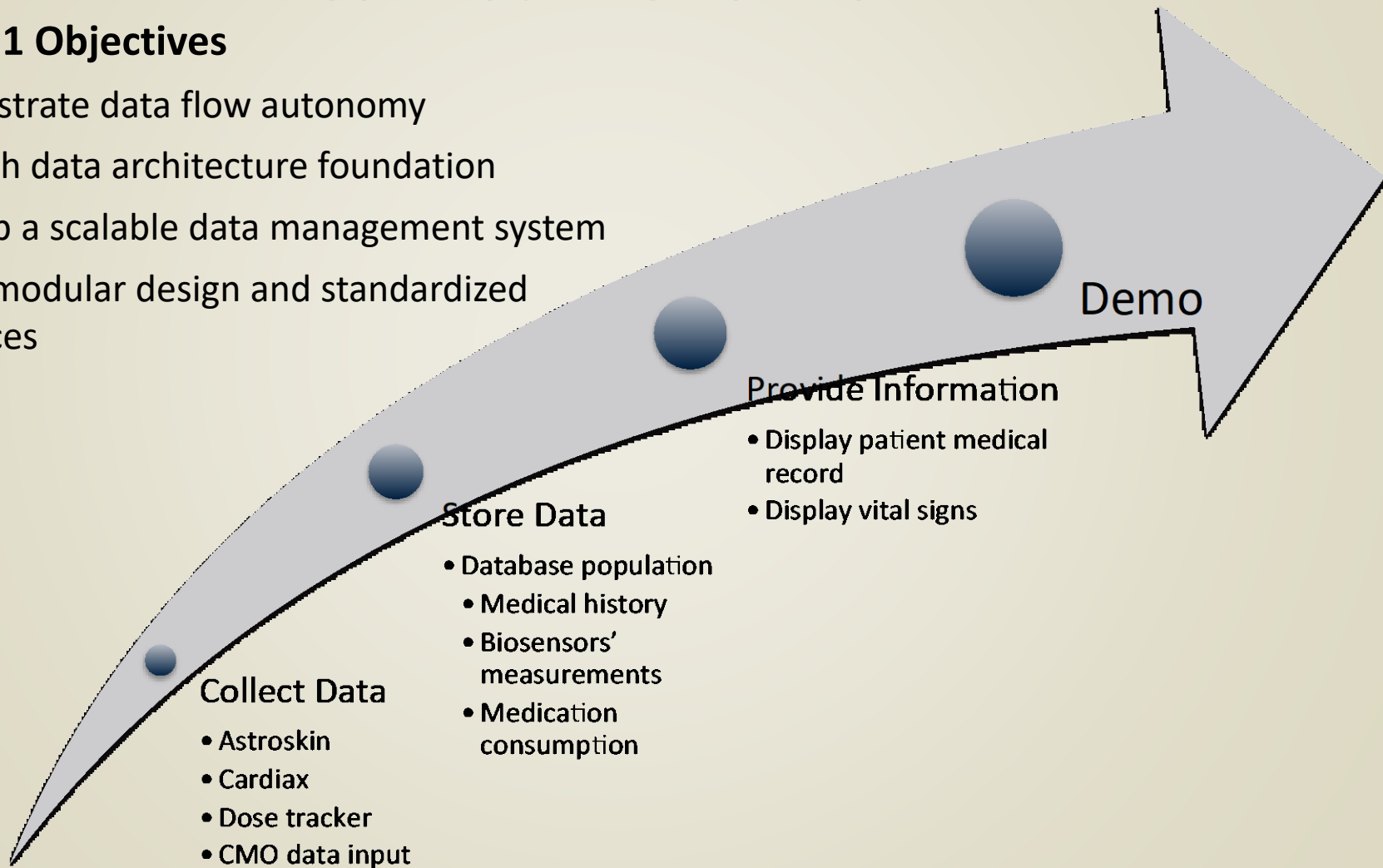
Level of Care	Mission	Capability
I	LEO < 8 days	Space Motion Sickness, Basic Life Support, First Aid, Private Audio, Anaphylaxis Response
II	LEO < 30 day	Level I + Clinical Diagnostics, Ambulatory Care, Private Video, Private Telemedicine
III	Beyond LEO < 30 day	Level II + Limited Advanced Life Support, Trauma Care, Limited Dental Care
IV	Lunar > 30 day	Level III + Medical Imaging, Sustainable Advanced Life Support, Limited Surgical, Dental Care
V	Mars Expedition	Level IV + Autonomous Advanced Life Support and Ambulatory Care, Basic Surgical Care

NASA-STD-3001 Vol 1, Rev A

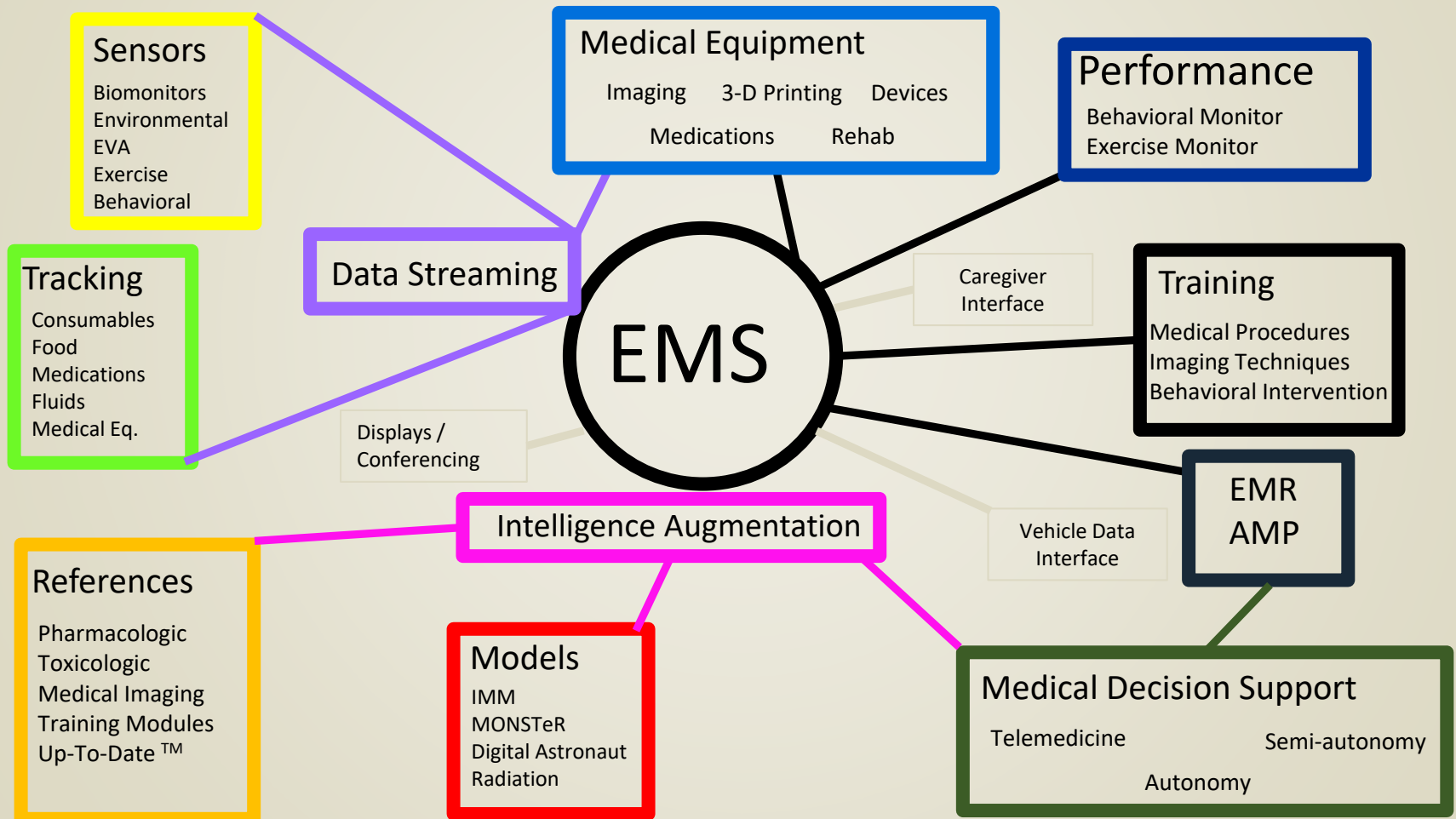
Test Bed 1 Overview

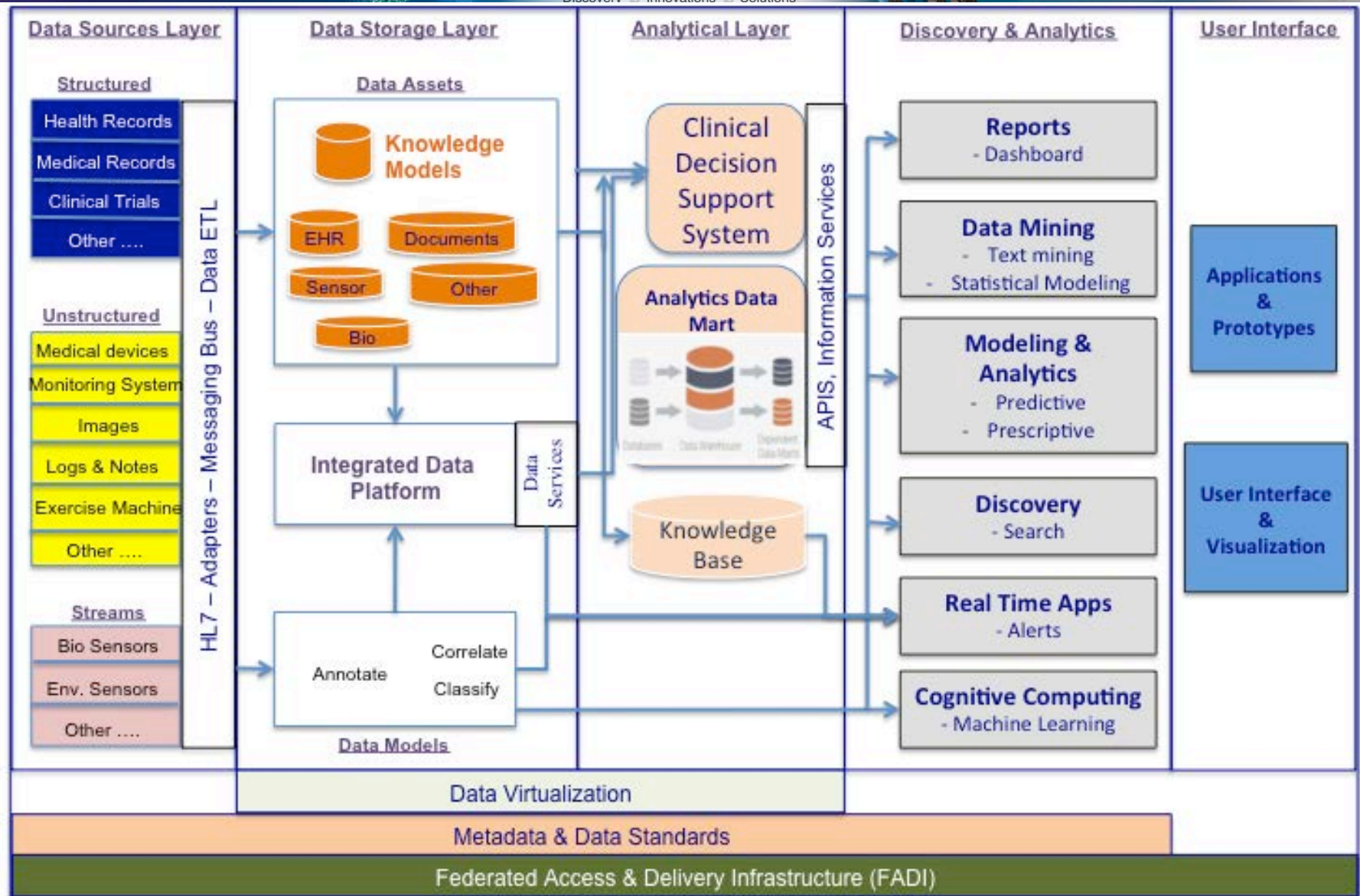
Test Bed 1 Objectives

- Demonstrate data flow autonomy
- Establish data architecture foundation
- Develop a scalable data management system
- Utilize modular design and standardized interfaces



Medical System Capture Diagram





Summary of FY16 Accomplishments

- MDA Project Risk Reduction Activity
 - Developed software compliance and project management documentation
 - Deployed software components and evaluate interfaces
 - Enabled development of the laboratory environment
 - Refined ‘sprint style’ planning and execution
- MDA Project Completed SRR and Design Review Milestones for Test Bed 1
 - System requirements focused on the first in a series of test beds, which will incrementally add capability as the medical system definition advances and matures
 - Class C Software Project, software quality assurance, verification and validation plans in place
- Initiated Test Bed 1 Build
 - System demonstrations provided to ExMC management

FY17 Plans

Milestones

- System Design Review held November 2017
- Test Bed 1 demonstration scheduled for April 2017
- Complete Test Bed 1
 - Release 1.0 – Astroskin, CARDIAX and OpenEMR integration
 - Patch release 1.1 – add Dose Tracker
 - Final patch release 1.2 – maintenance
- Develop milestones, deliverables and requirements for Test Bed 2
- Prepare for Test Bed 2 System Requirements Review