

# Integrative Imaging Informatics for Cancer Research (I3CR)

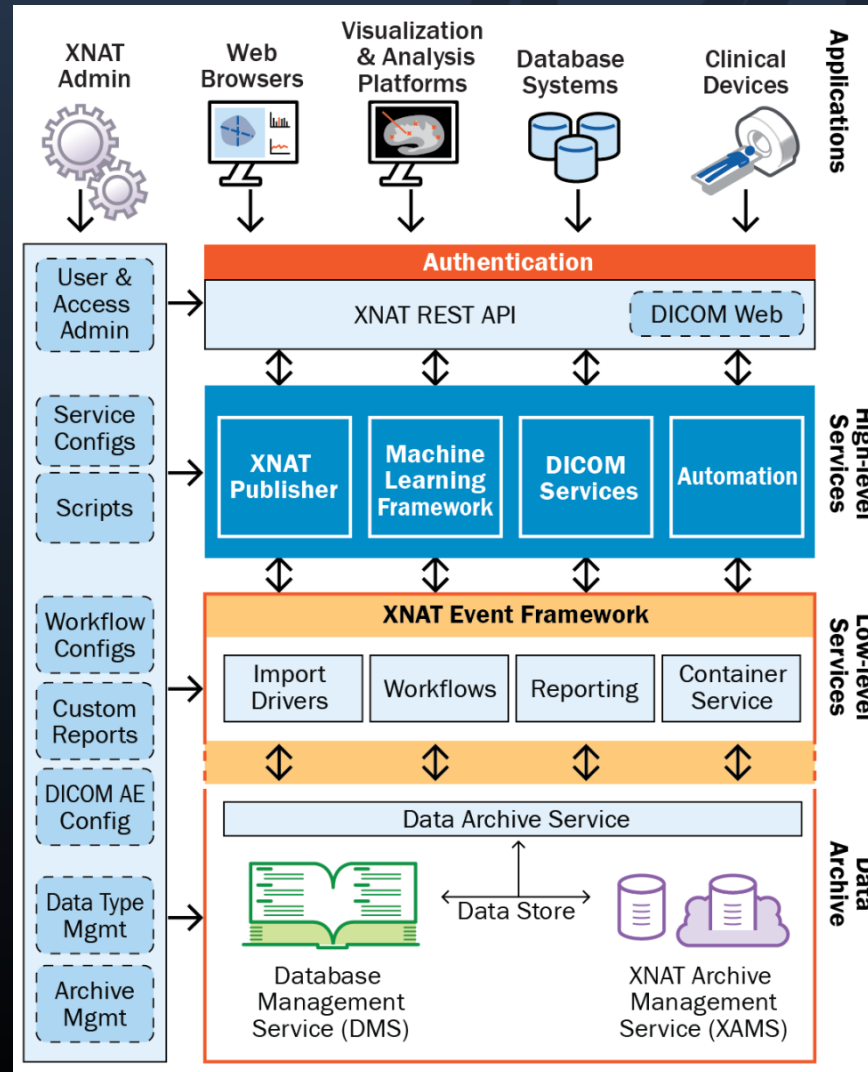
Daniel Marcus, PhD  
Richard Wahl, MD

Neuroinformatics Research Group @ Washington University  
School of Medicine

# Talk Outline

- **XNAT Overview**
- U24 Aims
- Progress
- Container Service Details and Demo

# XNAT Architecture



# Top 10 XNAT features



User Access Control



Integrated Search & Reporting



Pipeline Processing



DICOM Integration



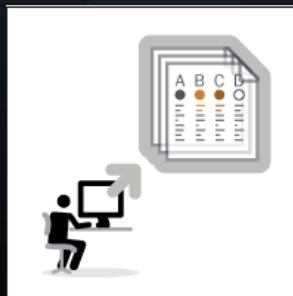
Audit Trails



Bulletproof Security



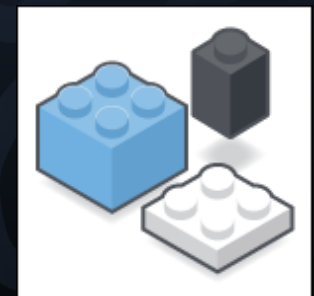
E-Signatures



Integrated Case Report Forms

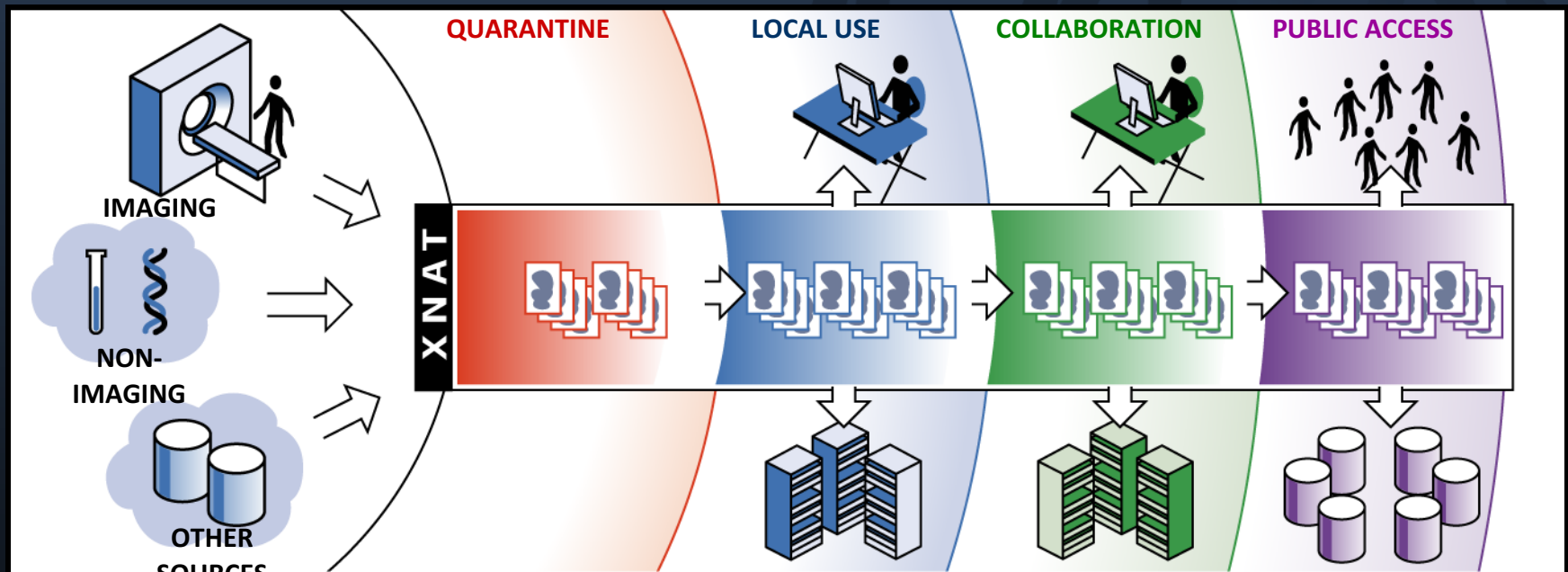


Dashboards



Extensibility

# The XNAT workflow



- Data organization
- Quality control
- Data access
- Security
- Visualization
- Automation
- Integration
- Data sharing

# XNAT Use Cases

- Institutional repositories
  - ✓ CNDA
- Data Sharing
  - ✓ Human Connectome Project
- Federated Networks
  - ✓ Dementia Platform UK
- Clinical Trials
  - ✓ XNAT CR
- Clinical/Translational
  - ✓ TIP

# Collaborations in Discussion

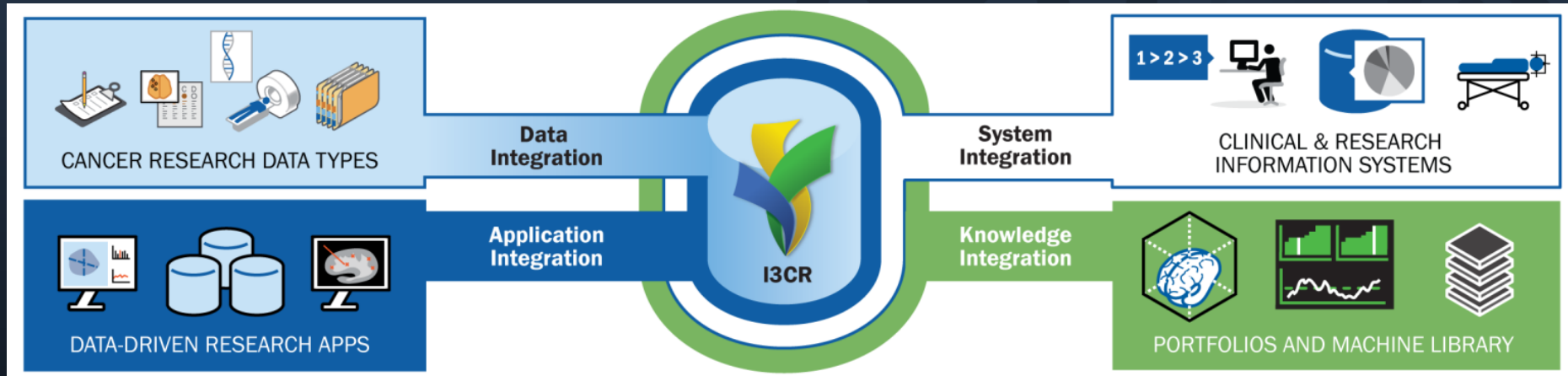
PI	Grant Number	Title
DAVATZIKOS, CHRISTOS	5U24CA189523-02	CANCER IMAGING PHENOMICS SOFTWARE SUITE: APPLICATION TO BRAIN AND BREAST CANCER
GUTMAN, DAVID	5U24CA194362-03	ADVANCED DEVELOPMENT OF AN OPEN-SOURCE PLATFORM FOR WEB-BASED INTEGRATIVE DIGITAL IMAGE ANALYSIS IN CANCER
HARRIS, GORDON	5U24CA199460-02	EXTENSIBLE OPEN-SOURCE ZERO-FOOTPRINT WEB VIEWER FOR ONCOLOGIC IMAGING
MADABHUSHI, ANANT	5U24CA199374-02	PATHOLOGY IMAGE INFORMATICS PLATFORM FOR VISUALIZATION; ANALYSIS AND MANAGEMENT
ROSEN, BRUCE	5U24CA180927-03	INFORMATICS TOOLS FOR OPTIMIZED IMAGING BIOMARKERS FOR CANCER

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# I3CR – Integrative imaging informatics to enable cancer research

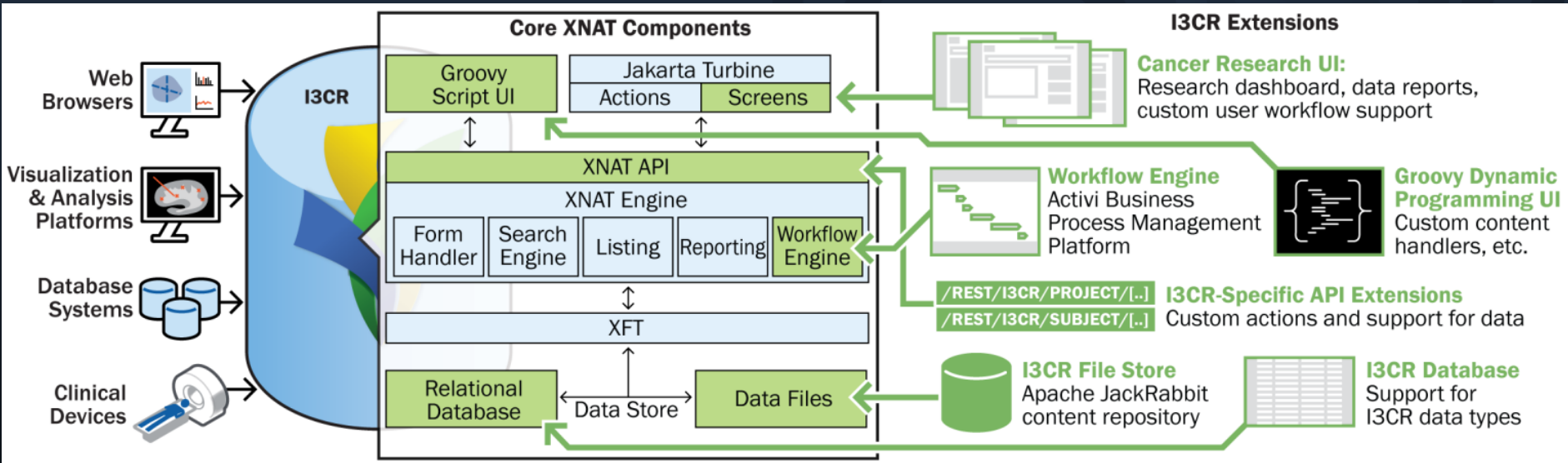


**Aim 1: Data Management Platform (DMP).**

**Aim 2: Knowledge Management Platform (KMP).**

**Aim 3: I3CR Pilot Network.**

# I3CR builds on XNAT





# Aim 1. Data Management Platform

# Application integration

1. External application uses XNAT as a database (e.g. image viewer)
2. XNAT executes the application as a workflow (e.g. pipelines)

# Application integration: external applications

## Visualization / Analysis (Planned)

1. 3D Slicer
  2. ePAD
  3. ClearCanvas
  4. OHIF
- Standard DICOM interfaces
  - Extensions to XNAT RESTful API

# Application integration: automation

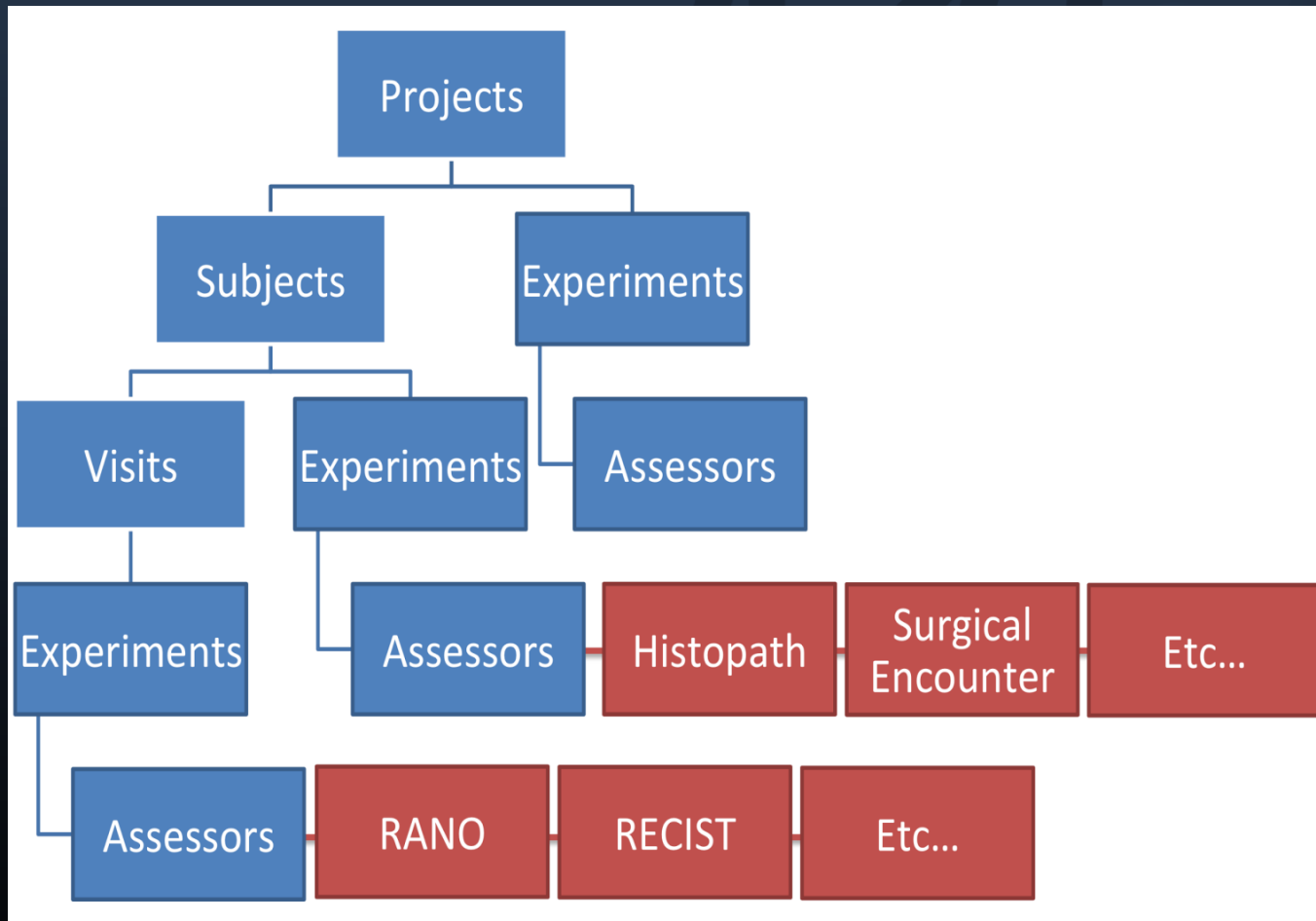
## 1. Pipelines

1. Existing architecture
2. For example: Matlab

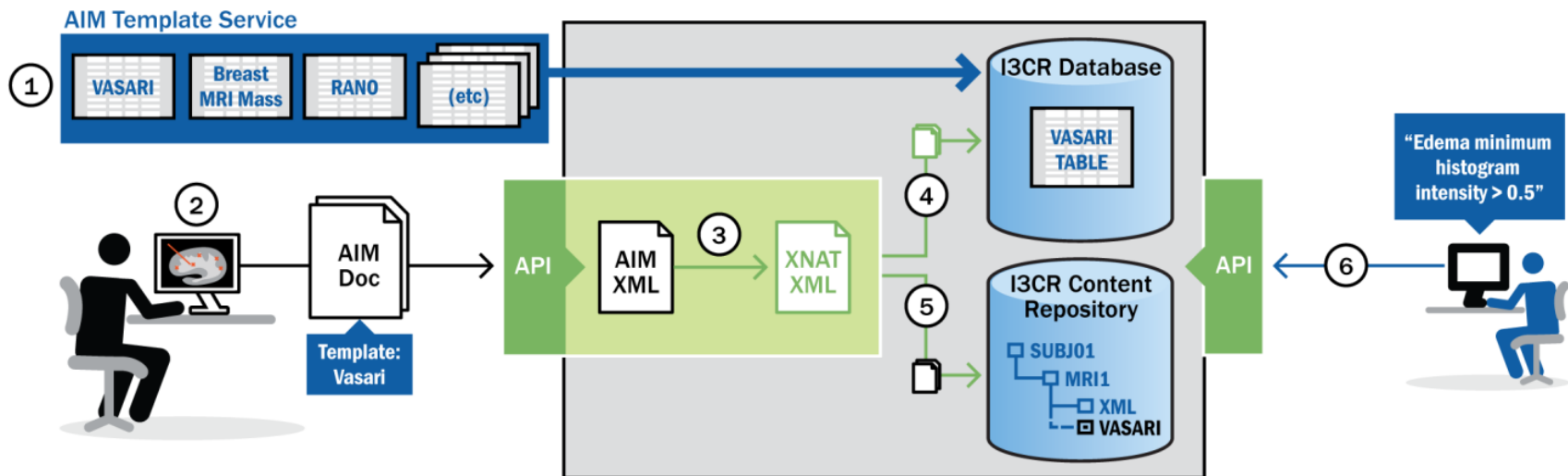
## 2. Docker Containers

1. Details and demo to follow

# Data integration



# Data integration: AIM



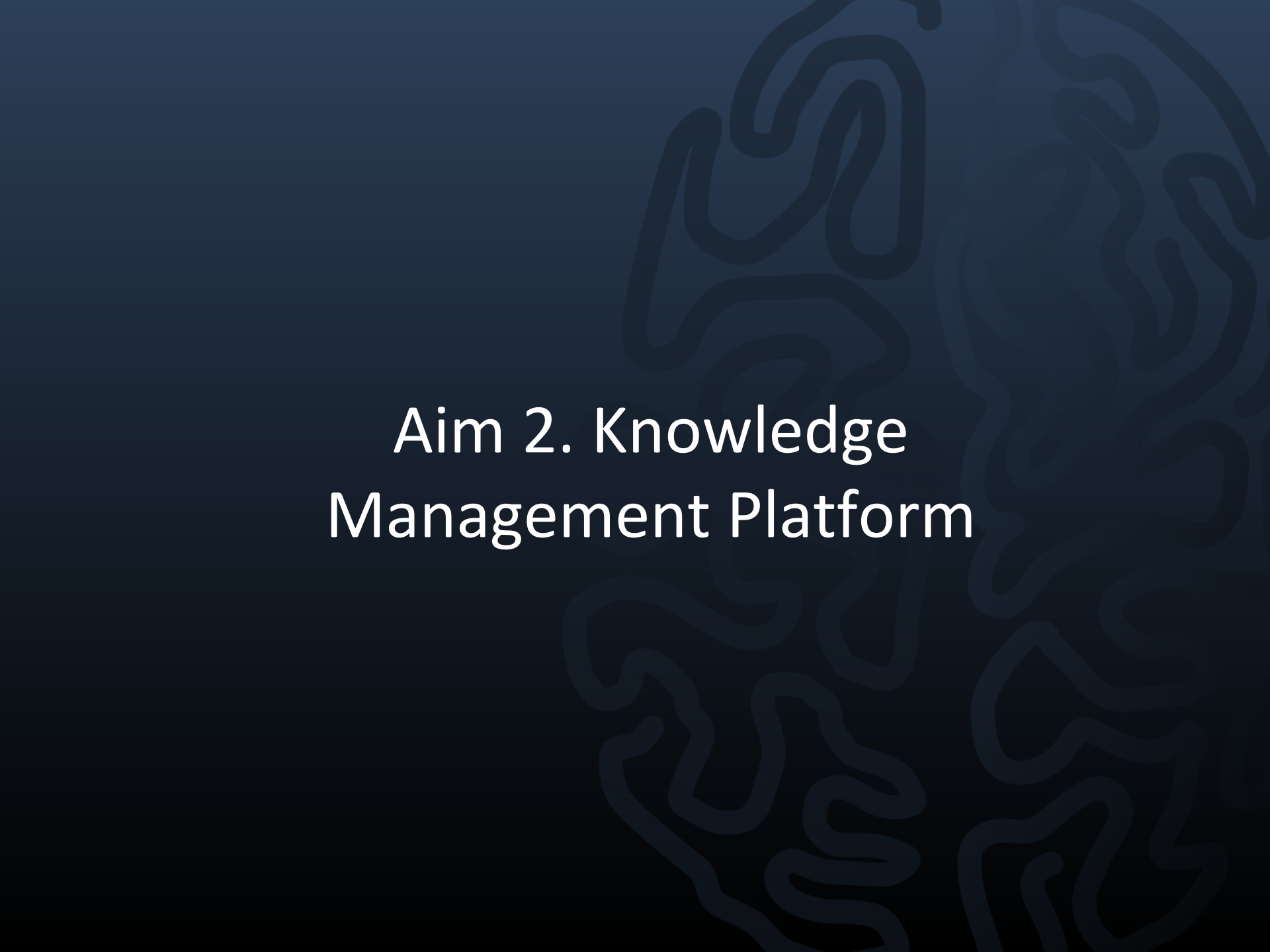


# System integration

- Clinical databases (e.g. I2B2, REDCap)
- Image repositories (e.g. PACS, TCIA)
- Clinical treatment systems (surgical navigation, radiation therapy)
- Federated DMPs

# System integration: Goals

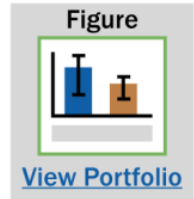
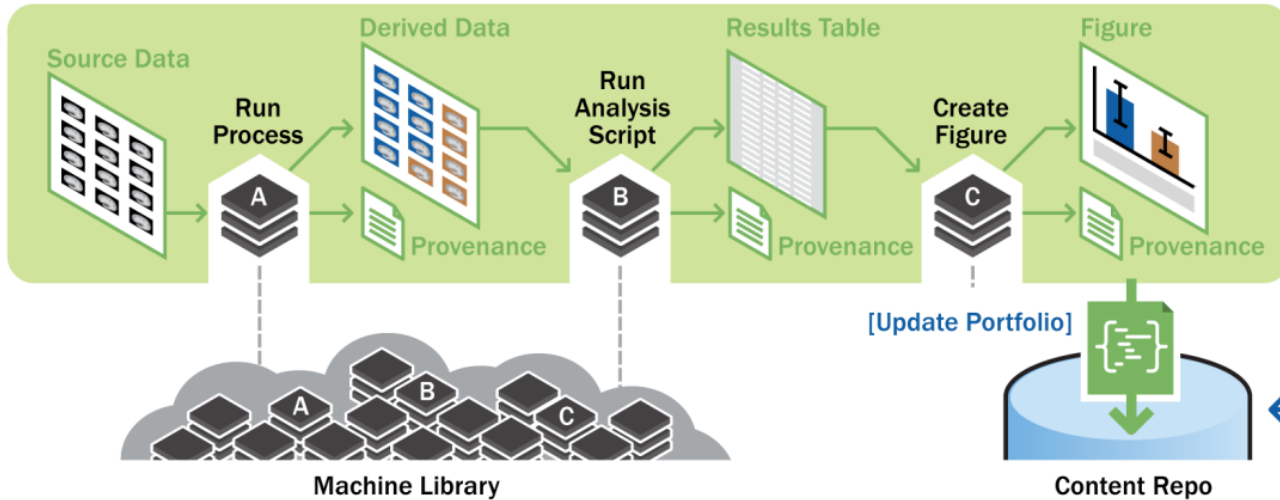
- Partner with academic and industry partners
- Link DMP with workstation, treatment planning, navigation, and therapy systems
- Enable full-cycle workflow to embed quantitative routines in clinical workflows
- Link DMP instances across institutions to enable data and tool sharing and federation



## Aim 2. Knowledge Management Platform

# I3CR Knowledge Management Platform (KMP)

[Create Portfolio]



[Query Portfolio]

Content Repo

Machine Library



# Aim 3. I3CR Pilot Network

# I3CR Pilot Network

- Quantitative imaging studies (e.g. QIN)
- Quantitative imaging informatics (e.g. ITCR)
- Two pilot projects
  1. Radiation therapy dose optimization
  2. Multi-modal GBM mapping

# I3CR Pilot Network

Program	PI	Disease Focus	Therapeutic Focus
QIN – MGH	Rosen	GBM	DSC-MRI
QIN – BWH	Fennessy	Prostate	Multi-parametric MRI
QIN – Iowa	Buatti	Head and Neck	Multi-tracer PET
QIN – Stanford	Rubin	Lymphoma, Colon	Multiple
QIN – Michigan	Cao	Head and Neck	DCE-, DW-MRI
QIN – OHSU	Huang	Breast, soft tissue sarcoma	DCE-MRI
CONDR -- WashU	Marcus, Fouke	GBM	Image-guided surgery
Inst. for Cancer Research	Doran	Breast, Others	RT
Univ. College London	Ourselin	Multiple	Multiple
DR THERAPAT	Multiple	Prostate, Cervical	RT
QICCR	Kikinis	Multiple	Multiple
Varian	Khuntia	Multiple	RT
Elekta	Gilmore-Lawless	Multiple	RT
Medtronic	Simon	Multiple	Surgical Navigation

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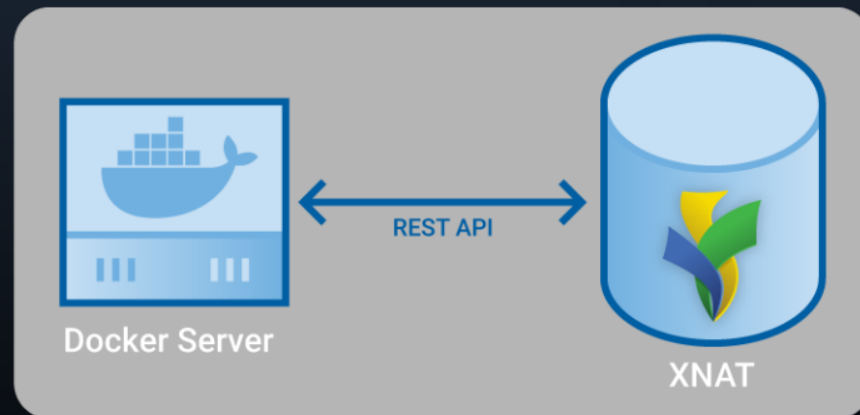
# Progress Toward U24 goals

- XNAT 1.7 includes architectural enhancements
  - Plugin architecture will support new data types
  - XNAT to XNAT project data synchronization
  - REST API
- Support for DICOM segmentation objects
- Docker containers
- Collaborative meetings concerning DOI management (for data references)

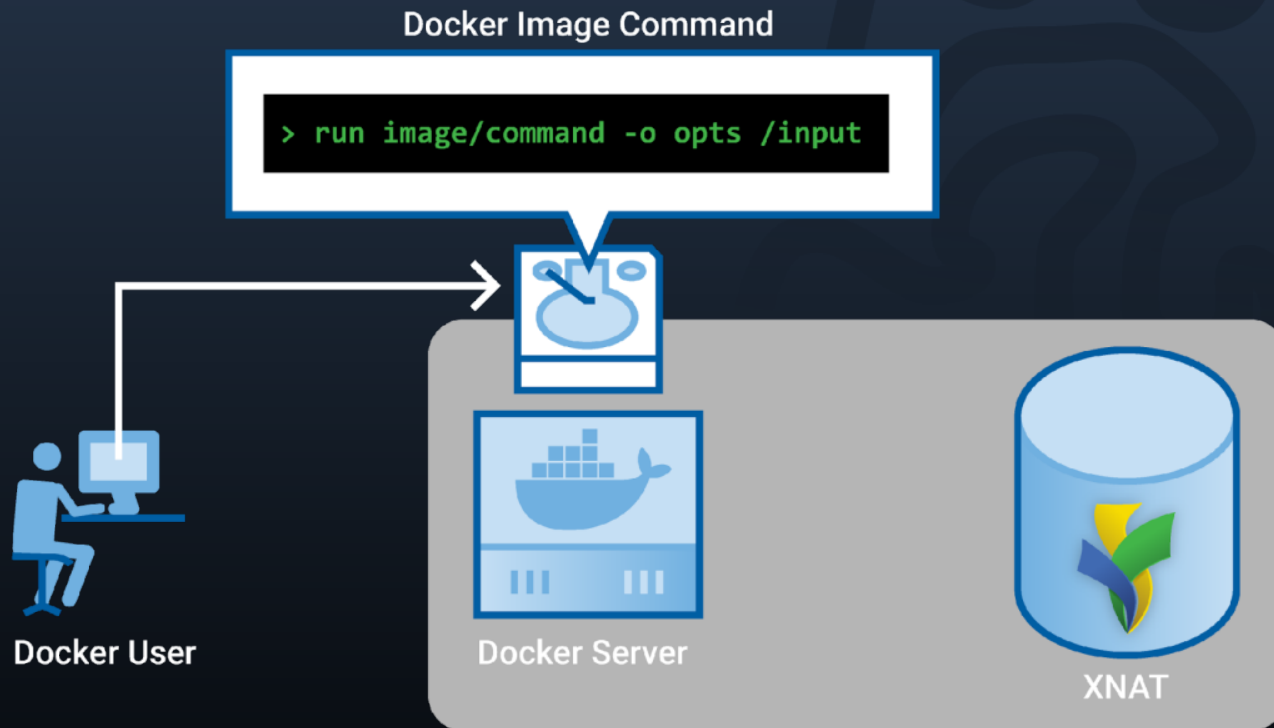
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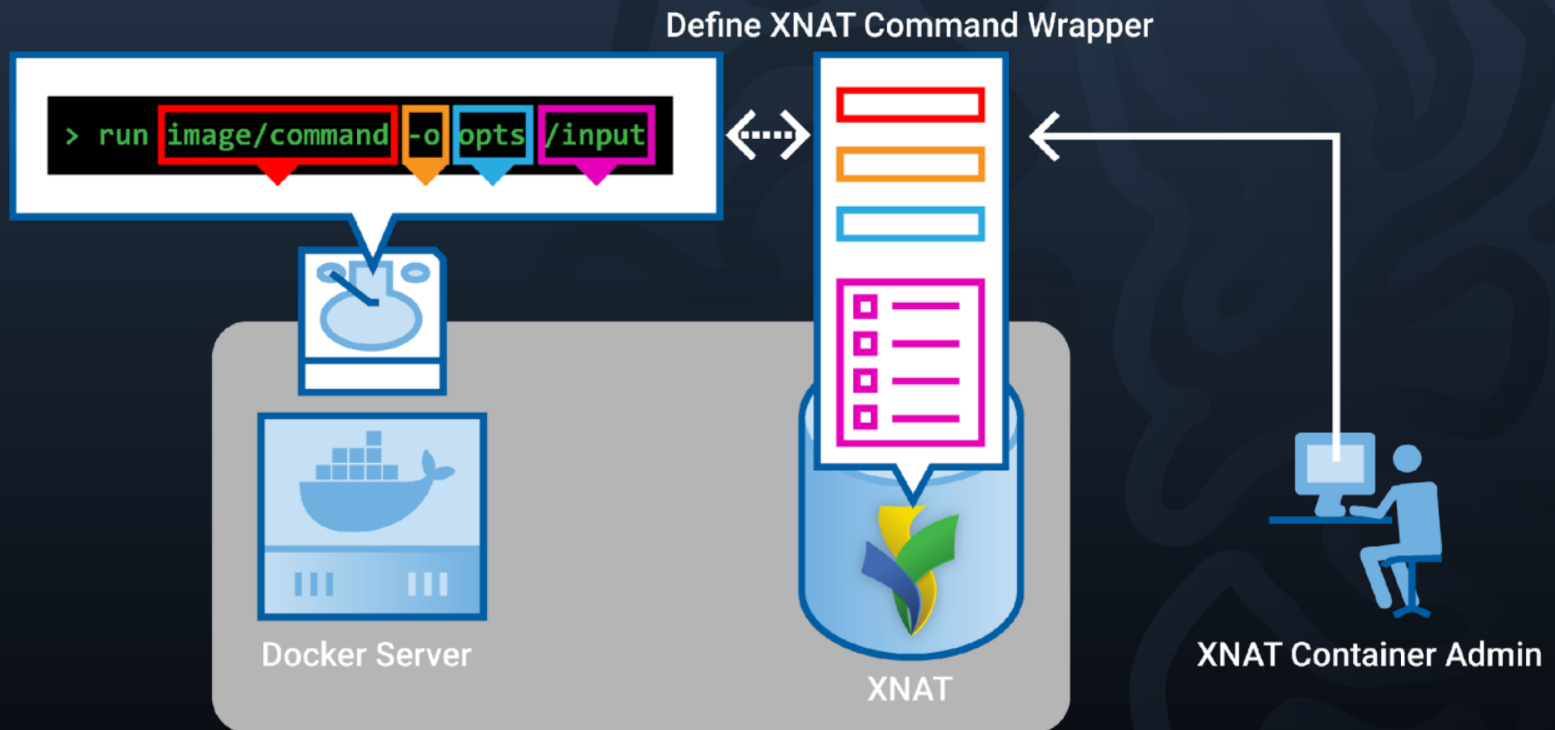
# XNAT Container Service



# XNAT Container Service

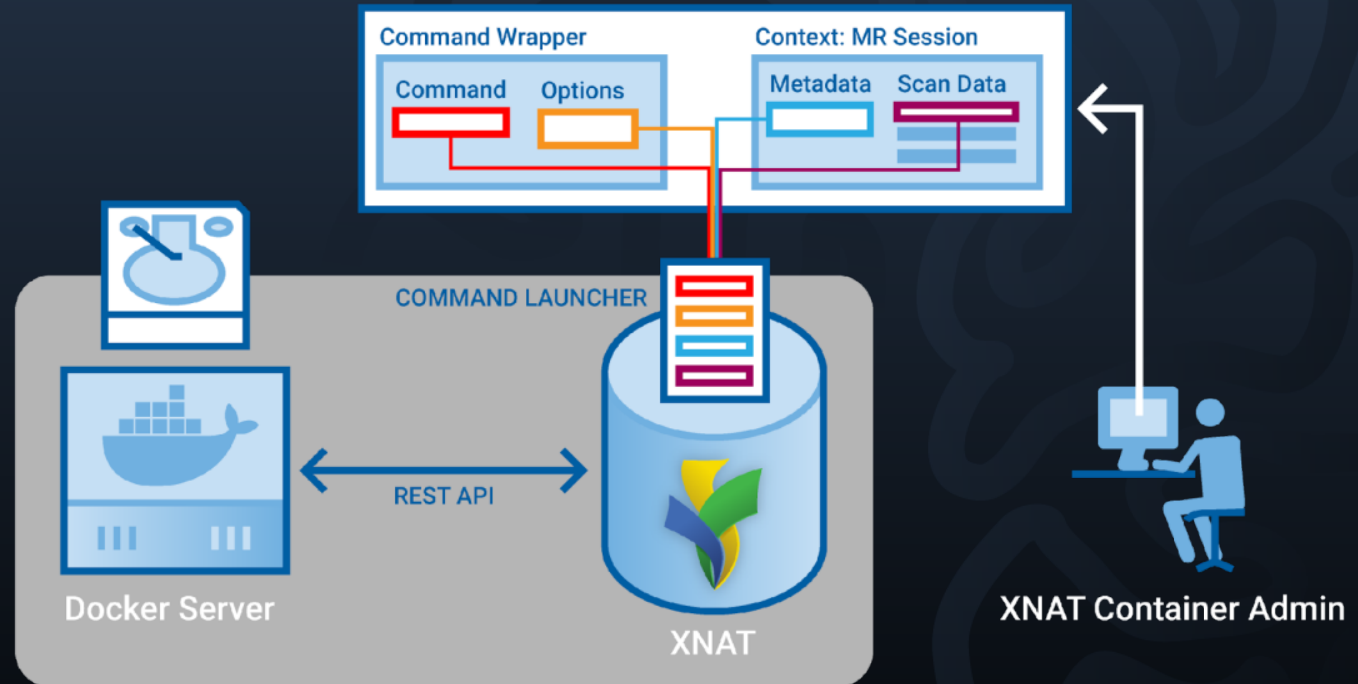


# XNAT Container Service

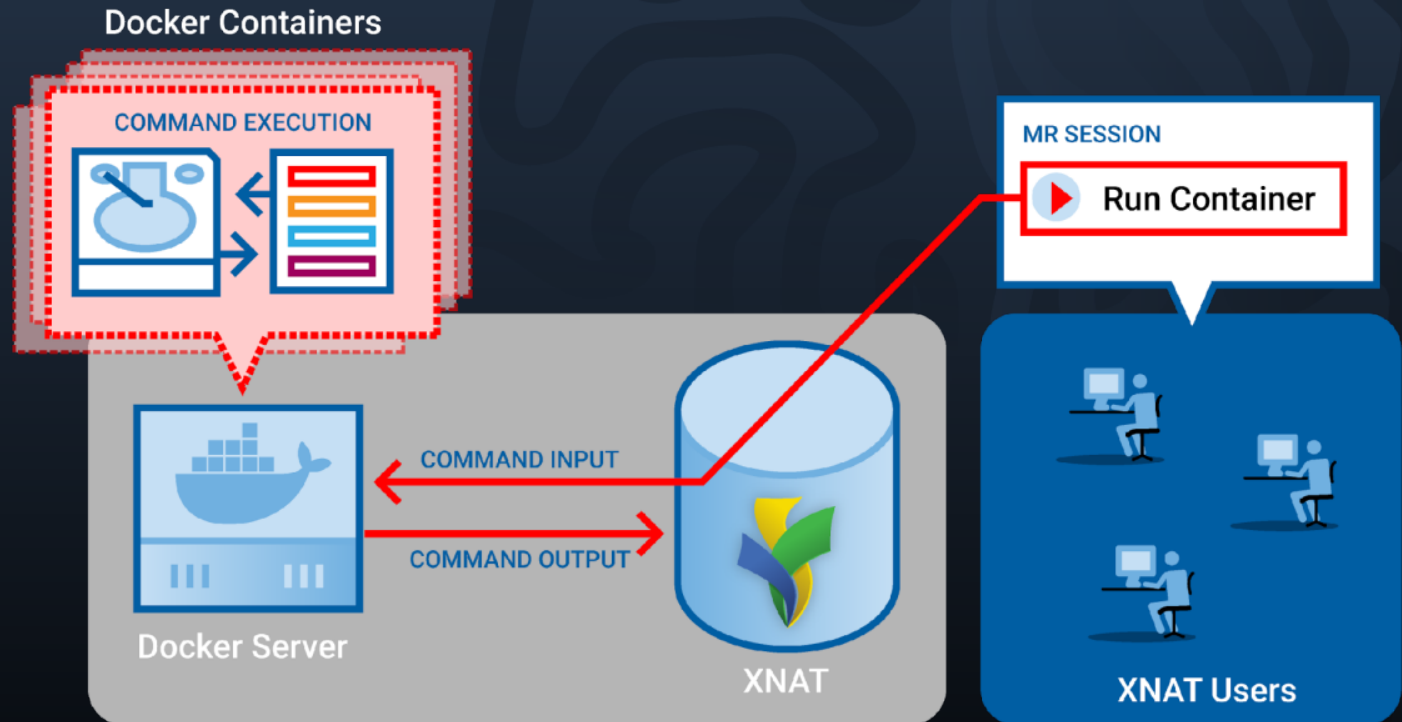


# XNAT Container Service

Define Command Launcher in Context of XNAT Data



# XNAT Container Service





# Using The Container Service in XNAT

MAY 30, 2017



# Acknowledgments

- NCI: U24 CA204854-01