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Theoretical Implementation of AI in Clinical Systems: Solutions and Elements to Consider

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Disclosures

- No Financial Disclosures

Learning Objectives

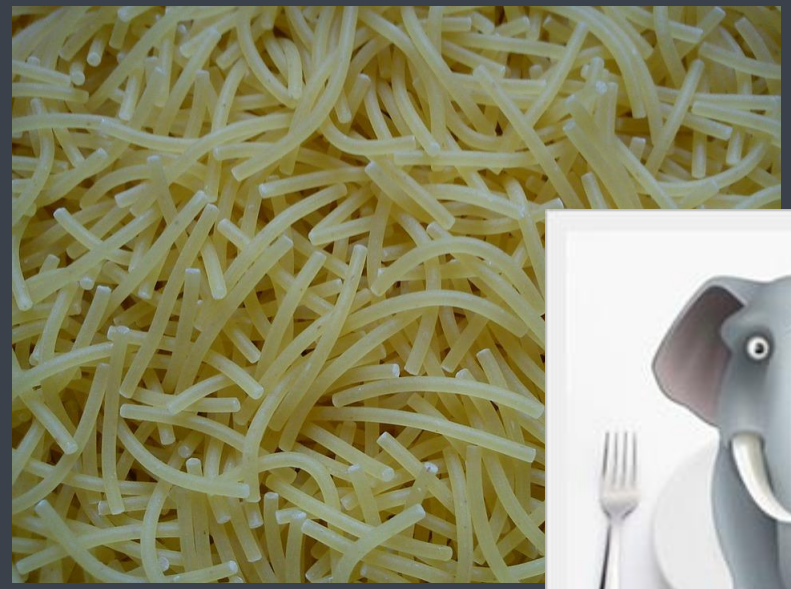
- Understand how enterprise imaging requires normalization and governance to implement a logical, supportable AI integration
- Understand the different options, gaps and potentials given solution environment
- Describe how multiple imaging verticals can leverage the same AI platform integration

Why is Enterprise AI Integration Theoretical?

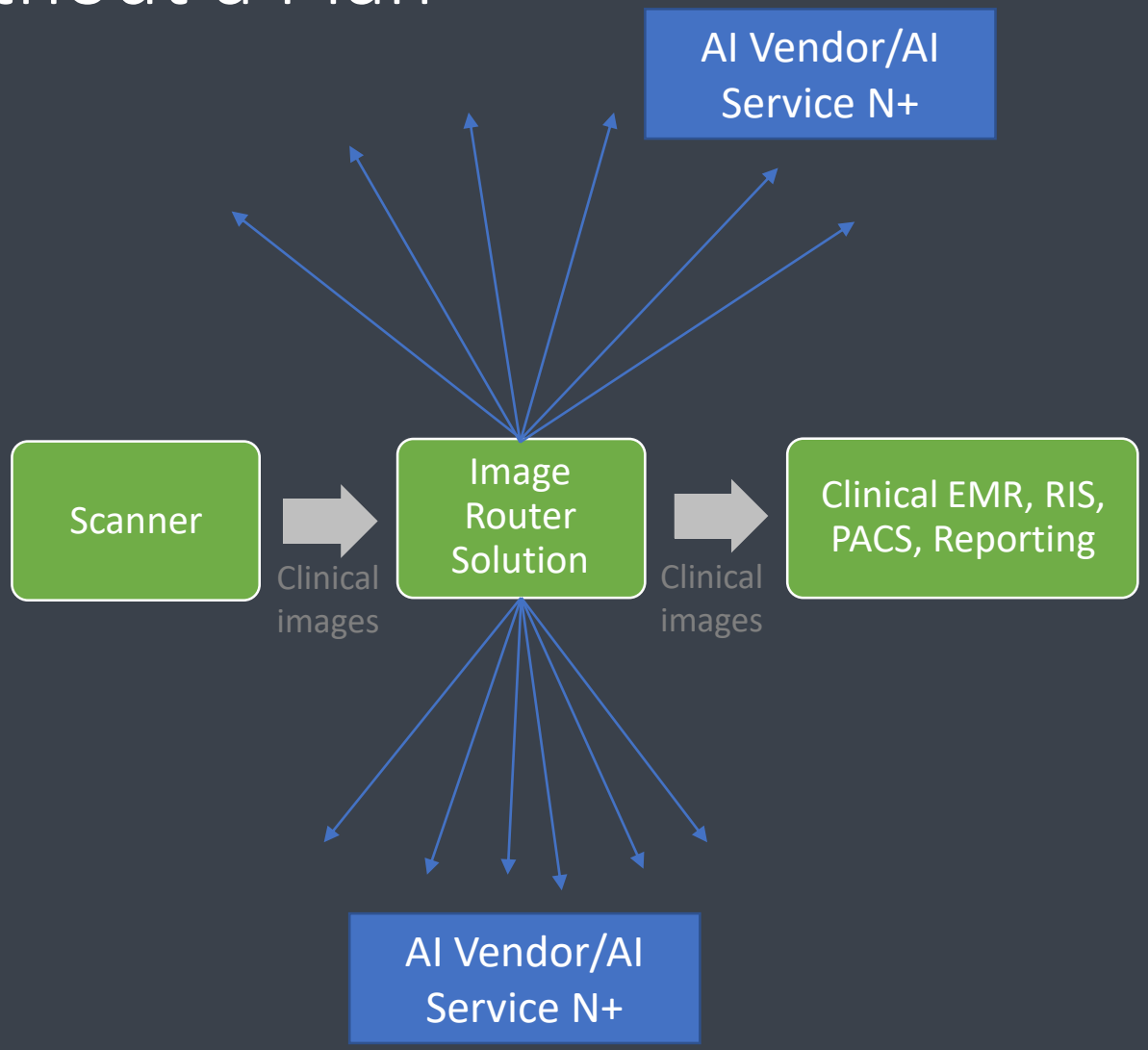
- Most solutions are vendor Silo
- Most solutions address a single discrete vendor
- Some are specific implementations
- No Standards to follow
- Implementation and Support is largely undefined
- Enterprise Direction is every direction typically

Execution Without a Plan

- Requests for AI routes, implementation made one at a time
- Occurs slowly over time
- No Enterprise plan or approach
- Non Standard deployment, ad hoc
- Very difficult to unravel
- Data remediation is costly and complex



Execution Without a Plan



Governance Engagement

- Data Governance
  - Required for data normalization requirements and management of enterprise data specifications
- Solution Governance
  - Governance that leverages the solution platform and integrates the Data Governance requirements
- AI Implementation Governance
  - Leverages the Data and Solution Governance
  - Defines, Acquisition, Clinical Critical/Research, Q/A and Prospective dataflows.
    - Each may impact how best to clinically utilize the results
    - All require Q/A metrics for validation

Why Normalize?

- Normalization has several benefits
  - Consistent SIUID
  - Consistent Body Parts
  - Consistent Procedure descriptions
  - Implementation of Dicom Sequences defined in organization or specific purpose
  - Removes DICOM Inconsistencies from the sources
  - Provides consistent values for rules creation

Understanding the Dataflow and Requirements

- Depends on Solution
  - Standalone PACS limits enterprise imaging for the purpose of AI
  - Router Application and/or VNA available
    - VNA implementation method
- Clinical Diagnostic
  - Worklist sorting/GUI presentation / External EHR workflows
  - Markup, image overlay/CAD objects available at Clinical diagnosis
  - Emergent Presentation
- Clinical Validation
  - Secondary finding validation
  - Data enrichment- labeling etc.

AI Compute Infrastructure

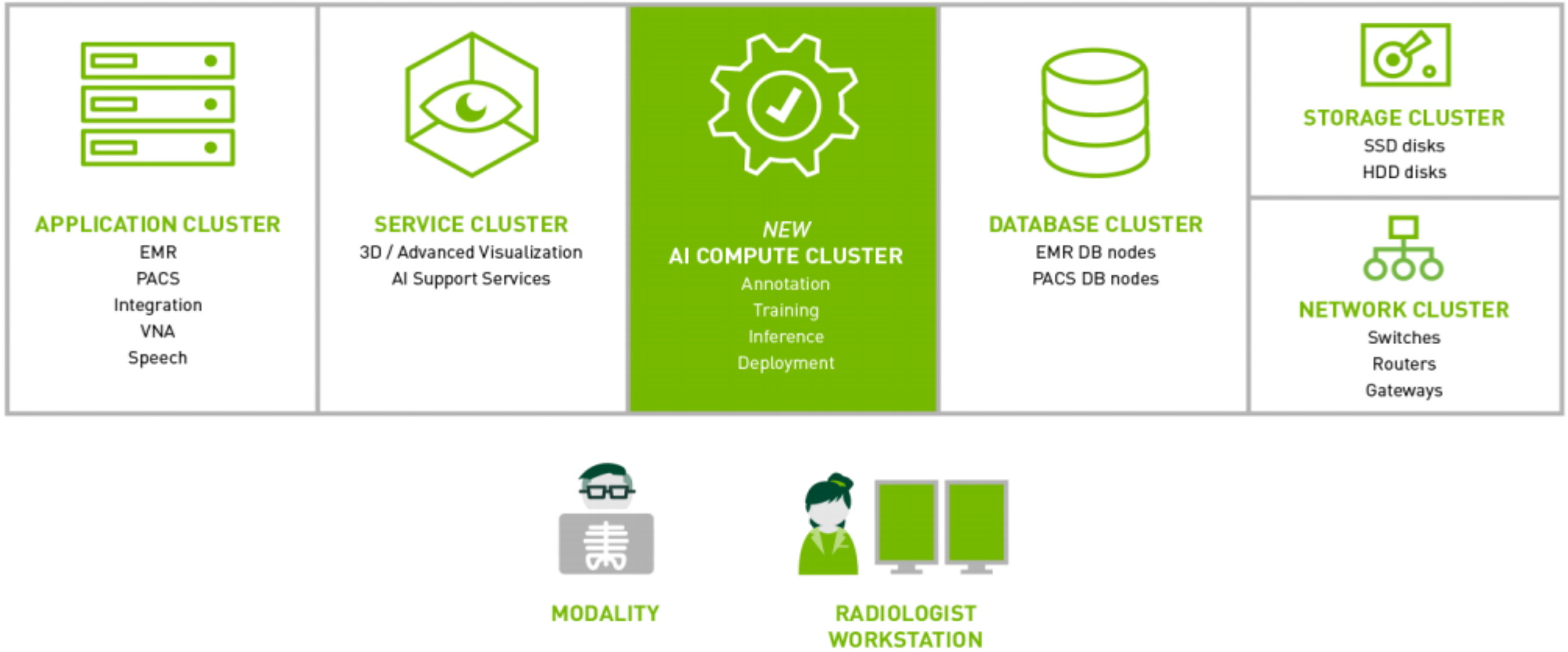


Figure 1: General hospital topology with AI Compute infrastructure.

https://www.acrdsi.org/-/media/DSI/Files/PDFs/AI-LAB-Reference-Architecture-Framework.pdf?la=en

Components of AI Infrastructure

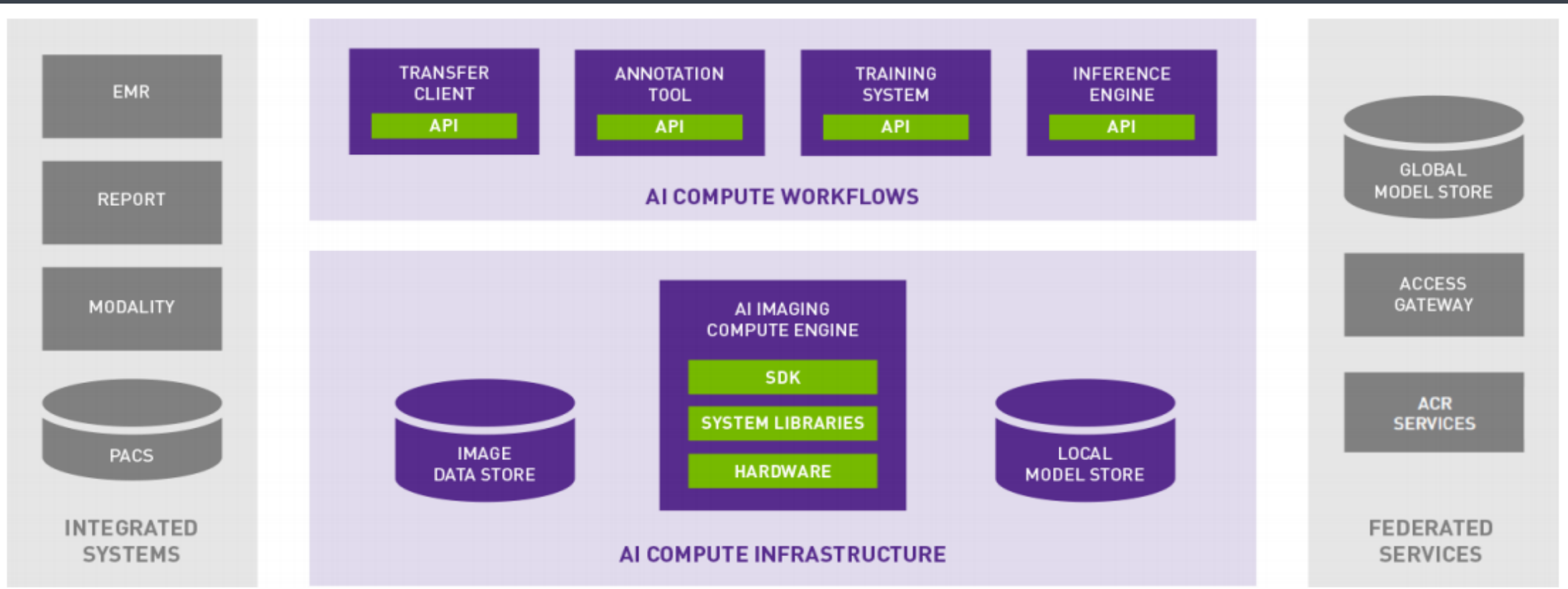


Figure 2: Key components of AI Compute infrastructure.

https://www.acrdsi.org/-/media/DSI/Files/PDFs/AI-LAB-Reference-Architecture-Framework.pdf?la=en

Simplified Workflow Chain

Figure 3: Simplified AI workflow chain.

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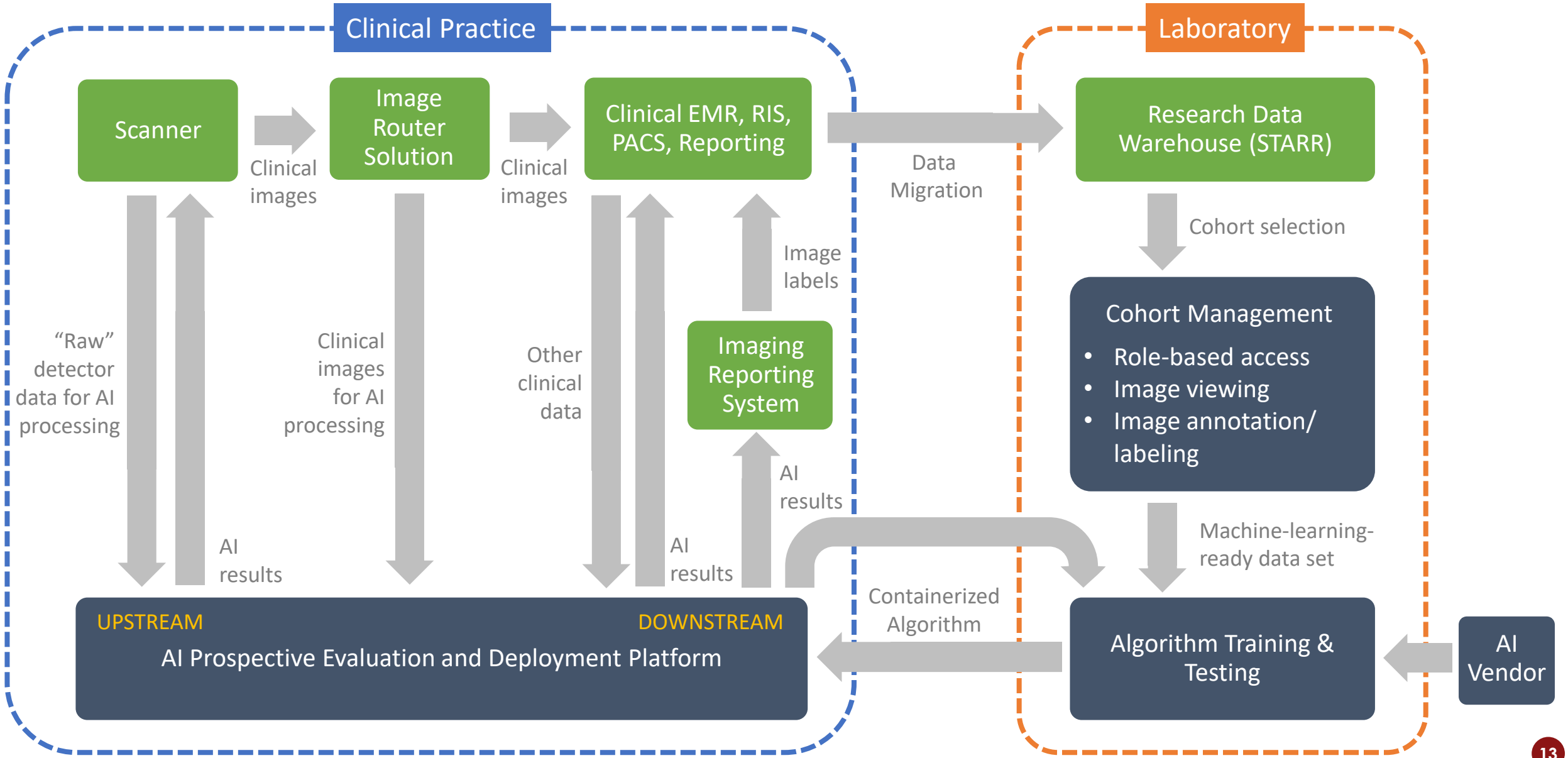
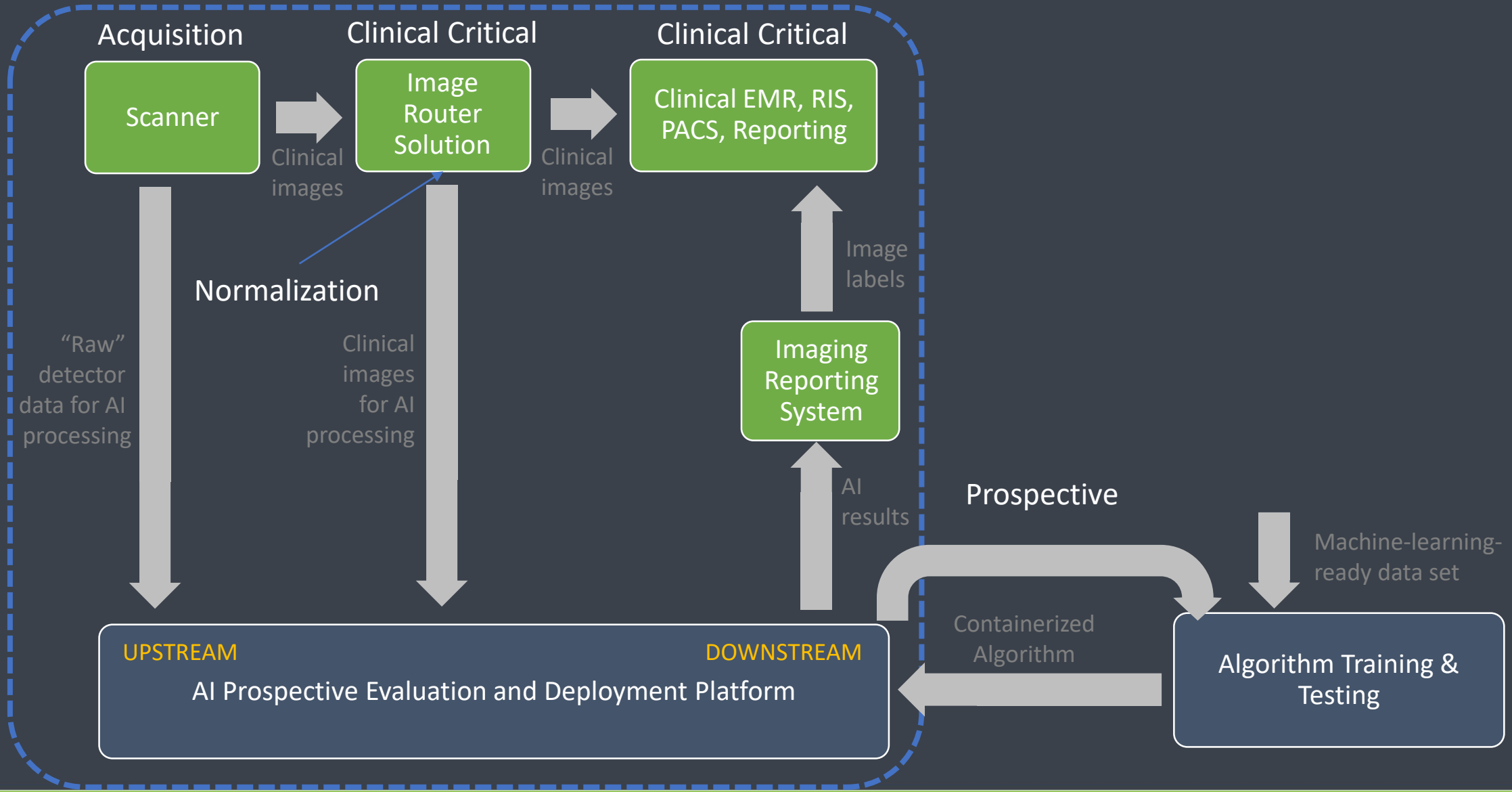
Infrastructure for AI in Medical Imaging



Dataflow for AI Learning System

- As data flows, is annotated, trained, validated and Deployed, it should be resubmitted into the training environment. Checks and balances will need to exist to keep the curation of data healthy and remove aberrant/biased data.
- Types of AI Outputs for interoperability:
  - DICOM-PS
  - Secondary Capture
  - Json
  - DICOM – SR

Acquisition, Inline and Prospective Dataflow



Gaps in the Industry

- Independent App stores exist for specific products
  - Some app stores expand outside of the vendor offering
- Extensible platforms currently deployed
  - Introduction of a platform in a critical clinical workflow adds another point of failure and potential for data presentation delay
    - Potential for products responsible for data distribution to implement critical AI components within their product to leverage existing infrastructure/ dataflow components

Deploying the Standards Across Multiple Imaging Verticals

- Non Radiology Data
- Repository
- Research/QA learning system
- AI dataflow for non Dicom objects/solutions