1. Proposed Workitem: Radiology AI Metada Index (RAIMI)

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Summary

Radiology AI models and datasets are rapidly proliferating in both the research and clinical environments. Documentation describing these remains inconsistent, making it difficult to evaluate and compare available models.

This proposal recommends a new IHE profile leveraging the existing IHE Mobile access to Health Documents (MHD) profile, and metadata elements from frameworks such as the RSNA ROADMAP ontology to provide a structured vocabulary for radiology AI models and datasets. The goal is to enable querying, filtering, and comparison of AI algorithms.

There is significant market interest in this issue. CHAI (Coalition for Health AI), ACR, and RSNA are developing frameworks and guidance around this issue (e.g., Applied Model Card, DSI Registry) to promote transparency in AI.

IHE is well positioned to lead this effort by defining a standards-based profile that builds on existing architecture (MHD, MRRT) and enables interoperable metadata exchange across the radiology AI lifecycle. The profile directly addresses gaps identified in the IHE Radiology white paper on AI interoperability, providing a practical solution to support transparency, and governance of AI algorithms.

2. The Problem

Problem Summary: Artificial intelligence (AI) datasets and models are proliferating in radiology, be it in research or actual clinical practice. The documentation that describes these, however, is still often inconsistent, incomplete, and/or non-computable. The lack of a formal descriptive standard makes it exceptionally difficult for clinicians, researchers, and administrators to perform essential tasks: they cannot reliably compare AI products, assess a model's suitability for their specific patient population, discover relevant datasets for new research, or audit for potential

biases. Developers lack a coherent set of expected attributes to share with implementers to provide greater transparency about the foundations and intended use of their models.

Moreover, ensuring interoperability across systems is critical. Research image storage actors, dataset aggregators, AI training agents, and image viewers are often siloed by proprietary systems, limiting the ability to access or share datasets and models in a transparent and standardized manner. This problem has been previously identified in the IHE Radiology White Paper on AI Interoperability in Imaging, which highlights the need for computable descriptions and interoperable access to AI resources.

Value Statement: This lack of well-defined standards hinders informed purchasing decisions, slows the adoption of valuable tools, reduces scientific throughput and even poses a risk to patient safety if a model is used outside its appropriate context. This proposal aims to standardize the creation and exchange of structured, machine-readable model cards and datasheets for radiology AI. This will foster transparency and trust, enable robust evaluation and comparison of AI tools, facilitate the discovery of models and datasets, and help identify and mitigate algorithmic bias.

This proposal recommends a new profile to define a standardized method for exchanging structured machine-readable metadata about datasets and AI models. The profile will leverage the actors and transactions from the IHE Mobile access to Health Documents (MHD) profile, which follows the successful architectural pattern established by the Management of Radiology Report Templates (MRRT).

We believe this complements existing initiatives such as the Coalition for Health AI (CHAI), which is developing an Applied Model Card. We propose engaging CHAI as a partner in this effort to ensure alignment and mutual benefit. In addition, a collaboration with HL7 FHIR EHR working group project on AI Transparency on FHIR should be considered.

3. Key Use Case

3.1.1 Use Case 1: AI Model Evaluation and Selection (Current State)

A clinical informaticist must evaluate two commercial AI models for detecting intracranial hemorrhage. They to go through extensive documentation only to find inconsistent information. Model A's vendor claims a high AUC but doesn't detail the demographics or scanner types in the test set. Model B's documentation mentions a diverse dataset but provides performance metrics that are different from Model A's, making a direct comparison impossible. The process is manual, time-consuming, and fraught with uncertainty.

3.1.2 Use Case 1 : AI Model Evaluation and Selection (Proposed Solution)

Both vendors, acting as a Document Source, register their standardized model card (as a JSON file) with a central Document Responder. The clinical informaticists use Document Consumer

tool to query and retrieve both model cards from the Document Responder. The information presented in a consistent, comparable user interface, allowing them to make an informed, evidence-based recommendation in a fraction of the time.

3.2.1 Use Case 2 : Research Dataset Discovery (Current State)

A data scientist is developing a new model and needs to find existing datasets of adult chest CTs acquired with very specific settings and performed on a specific vendor scanner. This researcher manually searches various public and private repositories, each with different search methods, many with incomplete documentation of the dataset's relevant metadata. It is a very challenging task to aggregate and evaluate the discovered data.

3.2.2 Use Case 2 : Research Dataset Discovery (Proposed Solution)

Multiple institutions and public archives act as Document Sources, registering datasheets for their datasets with a central Document Responder. The data scientists use a Document Consumer to perform a query against the Document Responder, filtering by computable criteria. The responder returns a list of all matching datasets, allowing the researcher to accelerate their work. Furthermore, in a hypothetical scenario where a central repository for the datasets themselves were to exist, a RAIMI API call could be used to batch download the desired datasets directly from these results.

4. Standards and Systems

- IHE Mobile access to Health Documents (MHD): Foundational actors and transactions for document exchange.
- IHE Management of Radiology Report Templates (MRRT): Original architectural pattern for managing shareable metadata in radiology.
- IHE AI Interoperability in Imaging White Paper.
- ROADMAP (Radiology Ontology of AI Datasets, Models and Projects) – terminology for AI "model cards" and "datasheets for datasets" (github.com/cekahn/roadmap) developed by RSNA
- JSON
- HTTP/HTTPS
- DICOM
- HL7 FHIR
- RadLex – radiology vocabulary (radlex.org)
- LOINC / RSNA Radiology Playbook – radiology procedure names (loinc.org)
- Radiology Common Data Elements (CDEs) – shared data dictionary (radelement.org)
- SNOMED Clinical Terms – snomed.org
- HL7 FHIR EHR AI Transparency project (https://build.fhir.org/ig/HL7/aitransparency-ig/)

5. Technical Approach

This section outlines the proposed technical approach to address the use cases described in Section 3 through the development of a new IHE Radiology profile: Radiology AI Metadata Index (RAIMI). The profile aims to standardize the exchange of metadata for radiology AI models (e.g., model cards) and datasets (e.g., datasheets), leveraging existing IHE infrastructure and related industry standards.

There is a critical unmet need to support interoperable AI model and dataset metadata exchange. This proposal responds to technical gaps outlined in the IHE Radiology White Paper on AI Interoperability in Imaging (notably Sections 3.1.7–3.2.7) by defining a content profile that uses MHD actors and transactions to transmit AI metadata in a structured format. This profile is not intended to standardize the AI results retrieval and display process (addressed in the IHE AI Results profile). It focuses on the exchange of model and dataset descriptors needed for algorithm evaluation and governance.

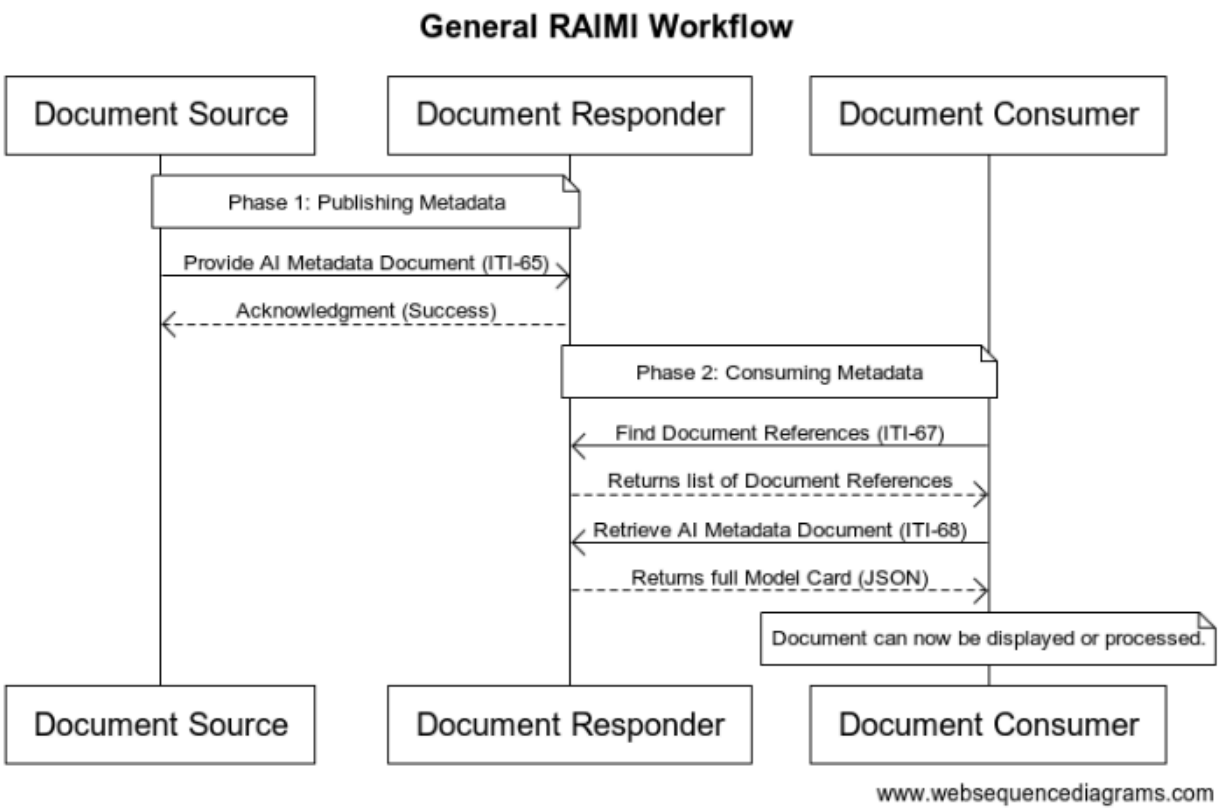
The proposal can be implemented in two phases:

- Phase 1 *: Model Cards* - with focus on standardized exchange of model metadata leveraging ROADMAP and CHAI's Applied Model Card efforts.
- Phase 2: *Dataset Datasheets* - with focus on extending the infrastructure to cover metadata for training and validation datasets, also leveraging ROADMAP Dataset Datasheet efforts.

5.1 Actors

- Document Responder: Centralized repository that stores and manages the metadata document
- Document Source: System that creates and registers metadata documents (ROADMAP-compliant JSON documents for model cards and datasheets) with the Document Responder
- Document Consumer: System that queries and retrieves metadata documents with the Document Responder
- Document Recipient: receives documents and metadata sent by the Document Source

The actors are similar to those defined in the previously published IHE MHD actor/transaction diagram below:



5.2 Transactions

These transactions are similar to those defined in the previously published IHE MHD actor/transaction diagram shown in section 5.1.

Provide AI Metadata Document: From Document Source to Recipient - Similar to the MHD "Provide Document Bundle ITI-65" transaction, this transaction is used to transfer documents and metadata.

Query AI Metadata Document: From Document Consumer to Responder - Similar to the MHD "Find Document Lists ITI-66" transaction, this transaction queries the model parameters and results in a list resource representing a SubmissionSet or a Folder.

Find Document References: From Document Consumer to Responder - This is the same transaction as the MHD "Find Document References ITI-67" transaction. It is used to issue parameterized queries that result in a list of Document Reference resources.

Retrieve AI Metadata Document: From Document Consumer to Responder - Similar to the MHD "Retrieve Document ITI-68" transaction, this transaction retrieves the JSON metadata document for downstream ingestion.

Simplified Publish: From Document Source to Recipient - This is the same transaction as the MHD "Simplified Publish ITI-105" transaction. This transaction is used to publish a document

and the document metadata. This transaction does not support publishing multiple documents. This transaction will produce a simplified SubmissionSet based solely on the DocumentReference, security context between Document Source and Document Recipient, and local configuration for metadata conversion.

Generate Metadata: From Document Source to Recipient - This is the same transaction as the MHD “Generate Metadata ITI-106” transaction. This transaction is used to generate DocumentReference metadata given a document. The Document Source provides a document. The Document Responder will create, update, or use an existing DocumentReference instance.

5.3 Profile

The Radiology AI Metadata Index (RAIMI) profile introduces a new module that defines the parameters for the documents exchanged. The format used will be JSON, consistent with the ROADMAP ontology and HL7 AI Transparency Implementation Guide. The profile components will be:

-*Model Card* : fields will include model task, inputs/outputs, training/testing data characteristics, performance, intended use, regulatory status, version history.

-*Dataset Datasheet*: fields will include imaging modality, acquisition parameters, demographics, annotations, licensing, known limitations.

FHIR mappings with extensions to support CHAI’s Applied Model Card and HL7 profiles will be included, where appropriate.

5.4 Decisions / Topics / Uncertainties

IHE is well positioned to harmonize the various AI standardization efforts and to create an approach that will address unmet needs for radiology AI systems in particular. The framework developed can then be extended beyond radiology to address other medical imaging domains and biomedical AI applications more broadly.

This profile will: 1) utilize the existing actors from the MHD profile; 2) use the standard MHD for the exchange of metadata; and 3) define a new content module that specifies the "document" being exchanged is a JSON object conforming to the RSNA ROADMAP ontology for either a model card or a datasheet.This approach significantly de-risks the proposal and lowers the barrier to adoption for vendors who have already implemented the MHD profile.

6. Support & Resources

The proposed profile will leverage existing IHE profiles. It incorporates the actors and transactions from the IHE Mobile access to Health Documents (MHD) profile, which follows the architectural pattern established by the Management of Radiology Report Templates (MRRT).

This proposal complements existing initiatives such as the Coalition for Health AI (CHAI), which is developing an Applied Model Card. We propose engaging CHAI as a partner in this effort. In addition, a collaboration with the HL7 FHIR EHR working group project on AI Transparency on FHIR should be considered.

7. Risks

IHE is the ideal venue to solve this problem. It is fundamentally an issue of interoperability that involves all key players (vendors, clinicians, and researchers) and addressing it can improve the efficiency of patient care. IHE's role would be to formalize the technical specifications, and promote the adoption of this new standard.

However, there are important risks and open issues to be addressed. The primary risk is low adoption of the standard, especially if creating the detailed description files proves too cumbersome for researchers and vendors. Furthermore, key open issues that require thorough discussion include the long-term maintenance and governance of the standard, as well as the process for verifying the claims made within these model cards.