Microsoft

You Can’t Have AI Without Interoperability—And You Can’t Scale Interoperability Without AI

Exploring the synergy between AI and seamless integration

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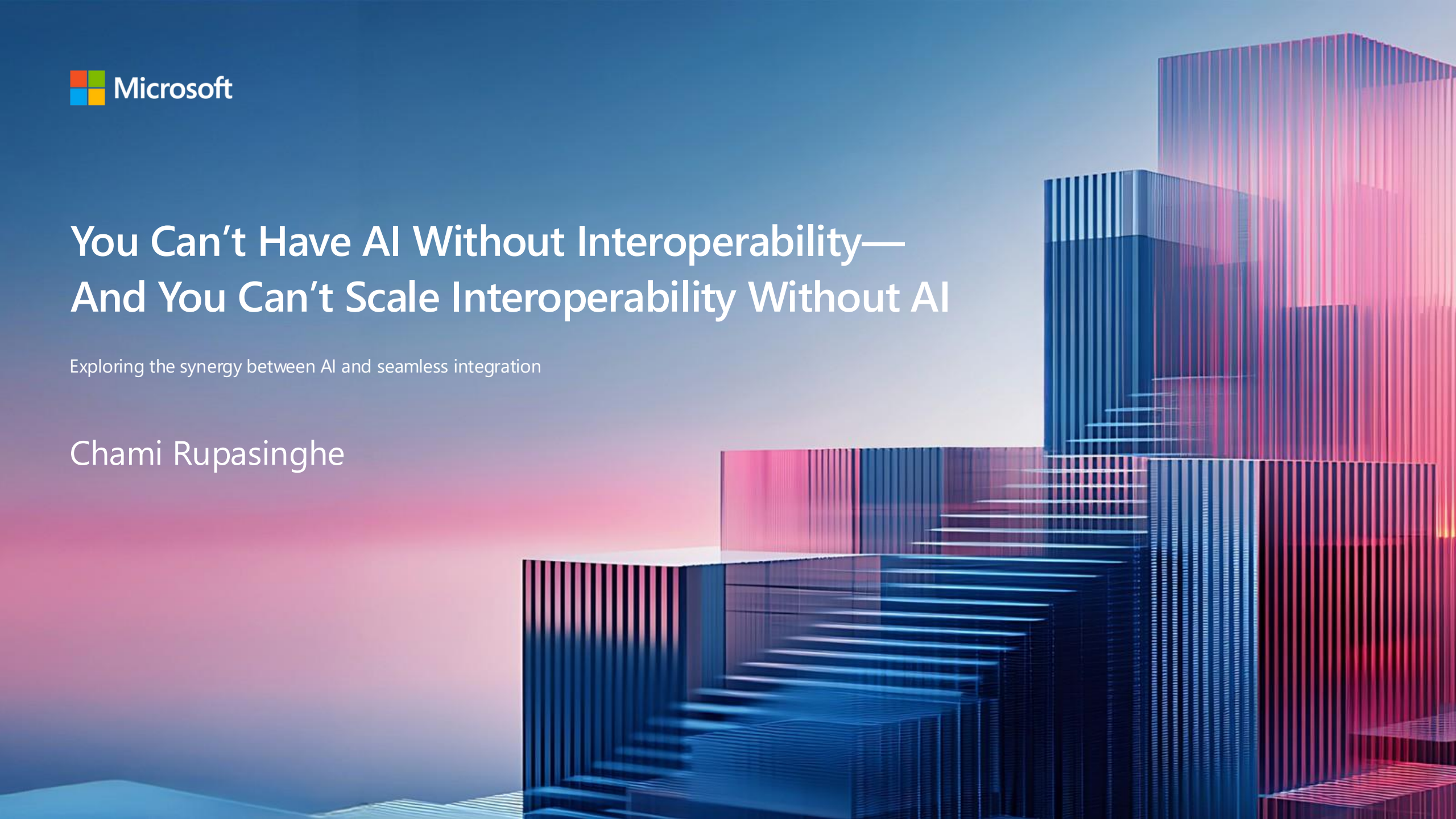

How AI Benefits from Quality Data

Better Model Accuracy

Clean, well-labeled, representative data leads to more accurate predictions.

Reduced Bias

Diverse, balanced datasets help minimize harmful biases in AI outputs.

Improved Generalization

High-quality data helps models perform well on new, unseen inputs.

Greater Trust & Reliability

Outputs grounded in accurate data perform better in real-world applications.

Faster Training & Lower Maintenance Costs

Well-structured, noise-free data helps models converge faster, saving compute time and cost. Models trained on clean data require less retraining over time.

Why AI Under-Delivers in Healthcare

Fragmented Data Systems

Healthcare data is scattered across multiple incompatible systems, leading to incomplete inputs for AI models.

Inconsistent Data Definitions

Varying formats and standards for diagnoses and procedures hinder AI's ability to interpret data accurately.

Lack of Contextual Linkage

Absence of connected patient data prevents AI from forming a complete health journey picture.

Need for Data Interoperability

Improving AI outcomes requires consistent, accessible, and context-rich healthcare data through interoperability solutions.

Limits of Traditional Interoperability

Static Mappings Challenges

Static mappings are difficult to create and maintain as data standards evolve and new systems emerge.

Manual Integration Limitations

Manual pipelines are prone to errors and lack flexibility, reducing efficiency in dynamic healthcare environments.

Resource-Intensive Quality Assurance

Extensive testing and validation slow down innovation and require significant resources and time.

Lack of Observability

Traditional systems rarely provide real-time monitoring, making issue detection and resolution difficult.

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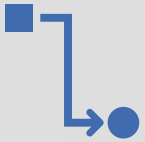
The Interoperability – AI Flywheel

Health Data Transformation Pipeline

Syntactic Interoperability



Transformation Service

Interoperate health systems, apps, medical devices, data platforms

Semantic Interoperability

Terminology Service

Normalize Terminology codes

Code medical terms

Normalize Units

Master Data Management

Patient Record Management

Identification of existing Patient ID or create new

De-duplicate data

Merge or Patch to existing

Intelligent Operations

De-Identification

De-identification

Transformation Service

Source

Design-Time

Create Template

Configure Template

Processing

Read from source

Process Through Template

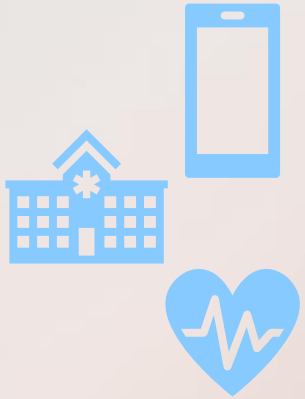
Output Result

Post-Processing

Validate

Modify Result

Post Result



Destination

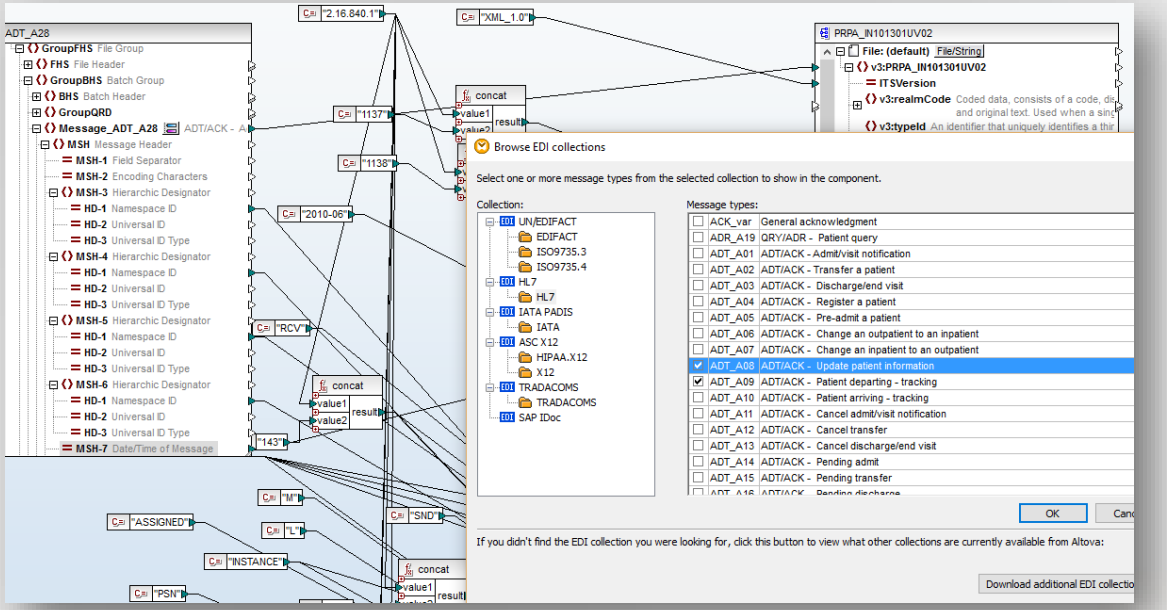
Friction / Effort

Low

Medium

High

Design Time UX in Market Today

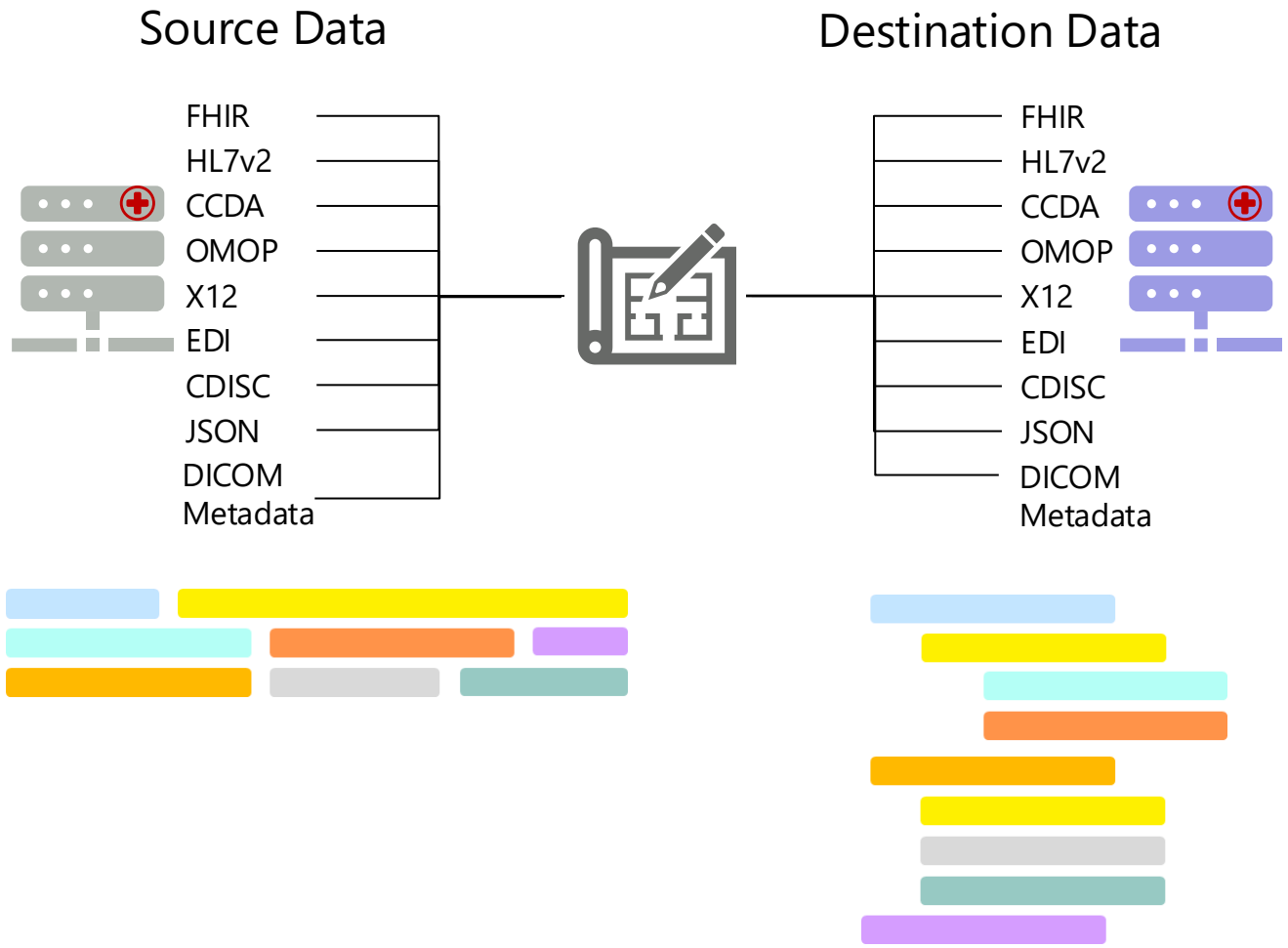


Data Mappers

```
{
    "resourceType": "Bundle",
    "type": "batch",
    {% if firstSegments.MSH.7 -%}
        "timestamp":"{{ firstSegments.MSH.7.Value | format_as_date_time }}",
    {% endif -%}
    "identifier":
    {
        "value":"{{ firstSegments.MSH.10.Value }}",
    },
    "id":"{{ bundleID }}",
    "entry": [

        {% evaluate patientId using 'ID/Patient' PID: firstSegments.PID, type: 'First' -%}
        {% assign fullPatientId = patientId | prepend: 'Patient/' -%}
        {% evaluate messageHeaderId using 'ID/MessageHeader' MSH: firstSegments.MSH -%}

        {% if firstSegments.MSH -%}

            {% include 'Resource/MessageHeader' MSH: firstSegments.MSH, ID: messageHeaderId -%}
            {% evaluate provenanceId using 'ID/Provenance' MSH: firstSegments.MSH, baseId: patientId -%}
            {% include 'Resource/Provenance' Root_Template: 'ADT_A01', MSH: firstSegments.MSH, REF_BUNDLE: bundleID, ID: provenanceId -%}

                {% if firstSegments.MSH.4 -%}
                    {% if firstSegments.MSH.4.1 != "" and firstSegments.MSH.4.1 != null or firstSegments.MSH.4.2 != "" and firstSegments.MSH.4.2 != null or firstSegment
                        {% evaluate organization_ID_MSH_4 using 'ID/Organization' HD: firstSegments.MSH.4 -%}
                        {% include 'Resource/Organization' MSHHD1: firstSegments.MSH.4, MSH: firstSegments.MSH, ID: organization_ID_MSH_4 -%}
                    {% endif -%}
                {% endif -%}

                {% if firstSegments.MSH.6 %}
                    {% if firstSegments.MSH.6.1 != "" and firstSegments.MSH.6.1 != null or firstSegments.MSH.6.2 != "" and firstSegments.MSH.6.2 != null or firstSegment
                        {% evaluate organization_Id_MSH_6 using 'ID/Organization' HD: firstSegments.MSH.6 -%}
                        {% include 'Resource/Organization' MSHHD2: firstSegments.MSH.6, MSH: firstSegments.MSH, ID: organization_Id_MSH_6 -%}
                    {% endif -%}
                {% endif -%}
```

Microsoft OSS liquid templates

Generating a Configured Template



Premise: If the attributes can be identified by inspecting a sample set of values, then the data can be structured into any standard.

Machine Learning is used for:

1. Entity recognition to understand how a customer has designed each schema and relate the like entities via the template.

2. Code generation to create a template

As large language models evolve, model customization gets better, and with more sophisticated prompting the dev hours required will be negligible.

Variables That Impact Transformation Accuracy

Data Inputs & Structuring

- Structuring HL7v2 as JSON improves LLM accuracy.
- Deterministic FHIR skeleton extraction outperforms model-only approaches.
- More samples does not mean higher accuracy — performance plateaus.

Pipeline Architecture

- Correlated data pairs yield higher baseline accuracy vs. non-correlated.
- Code system enrichment and schema validation close the gap.
- Template language matters — Python outperforms Liquid for LLM comprehension.

Human × AI Feedback Loop

- The single largest accuracy driver.
- Users modify output results rather than templates directly.
- Verified FHIR bundles become unit tests for final template generation.

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Impact and Future Vision

The Future of Interoperability

From Months to Minutes

AI-generated transformation templates will collapse the design-time overhead of health data integrations. What once took teams of engineers weeks will become an AI-assisted workflow completed in minutes, with human expertise focused on validation rather than construction.

Self-Healing Pipelines

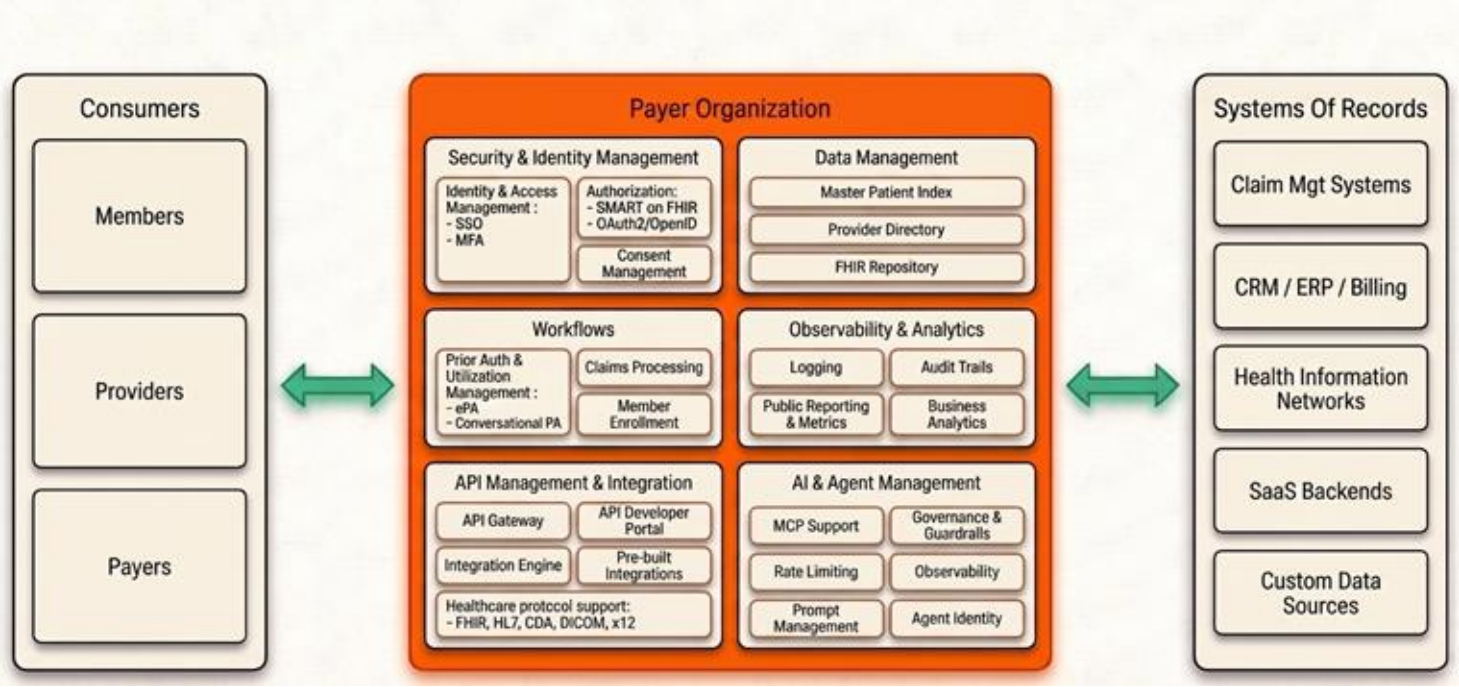
Continuous AI monitoring will detect schema drift, errant source data, and API version changes in real time. Transformation pipelines will self-correct autonomously, shifting from reactive maintenance to proactive resilience.

Intelligence at the Platform Layer

Interoperability becomes a strategic platform capability, enriched by terminology services, and powered by increasingly efficient models that drive down cost while raising accuracy.

WSO2 Open Healthcare Platform for Payers

An AI-driven interoperability solution combining core API, Integration, and IAM capabilities.



Key Capabilities

Platform of platforms

Built on API, Integration, and Identity platforms.

Foundation for Agentic Enterprise

Core build, run, manage, govern, and secure agents.

Healthcare Native

Accelerators for FHIR, HL7, X12, and more.

Flexible Deployment: Available as SaaS or open source software.