LEADING with ACTION

Inside CAISO's Journey to Efficiency and Reliability with AI

DTECH Midwest

Presented By:
Gopakumar Gopinathan (CAISO) | Abhi Thakur (OATI) | Farrokh Rahimi, Ph.D. (OATI)

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Proprietary Notice

California ISO

Disclaimer:

The CAISO is evaluating OATI Genie™ product in this pilot with the hope to understand the value it might add to the CAISO outage management system. However, the CAISO, as a policy matter, cannot and does not endorse any specific product, including OATI Genie™.

Agenda

- Our Background
- Outage Management Process at CAISO
- Challenges
- Project Objectives
- Design Methodology
- OATI Genie™ Agent Workflow
- Next Steps

About OATI

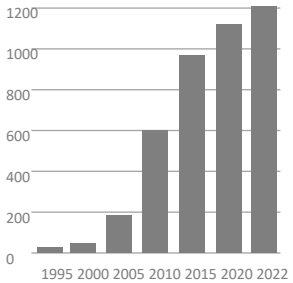
Sixth-Generation NERC CIP Data Centers

Culture of Security and Customer Service

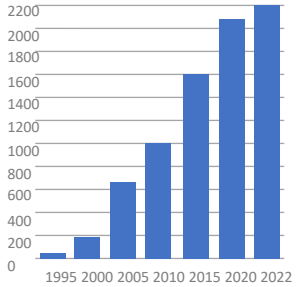
Founded in 1995

Software, Hardware, and Security

Number of Staff



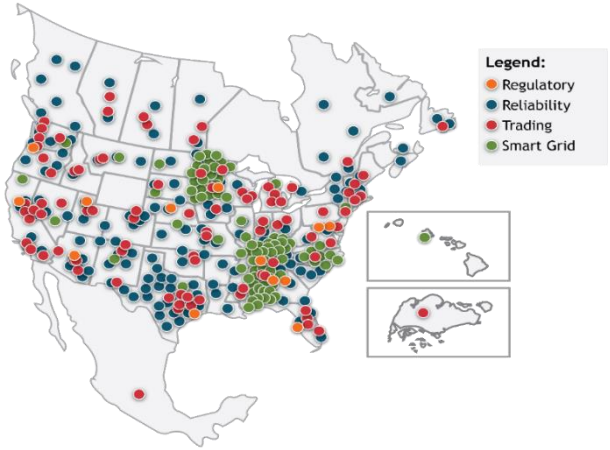
Number of Customers



2,200
Energy Industry Customers

1,200
Dedicated Staff

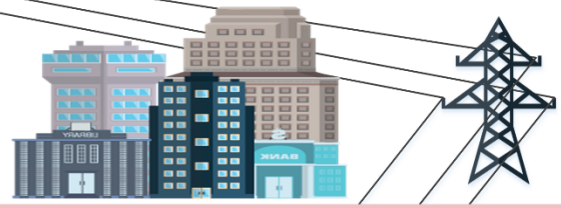
240+
Actively Managed Projects



OATI Energy Orchestration Ecosystem

Distribution & Grid-Edge Operation

- DERMS
- VPPs, Grid Services, Market Participation
- Microgrids
- EoT
- Grid Management
- Cities & Communities



Energy Trading

- Energy Trading & Risk Mgmt
- ISO/RTO Market Participation
- VPPs
- Scheduling & Optimization
- Settlements

Reliability

- Outage Management
- Dynamic Line Rating
- OASIS
- Situational Awareness
- Accounting
- E-Tag Scheduling
- Congestion Management

California ISO

As a federally regulated nonprofit organization, the ISO plans and operates the high-voltage electric grid and "keeps the lights on" for California and a portion of Nevada.

Within its balancing authority area, the California ISO:

- Maintains reliability on the grid
- Manages the flow of energy
- Oversees the transmission planning process
- Operates the wholesale electric market
- For much of the western U.S., the ISO:
- Operates the Western Energy Imbalance Market (WEIM)
- Serves as Reliability Coordinator (RC West)

California ISO

52,061 MW record peak demand on Sept. 6, 2022

237.5 million megawatt-hours of load delivered *(2023)*

76,184 MW power plant capacity

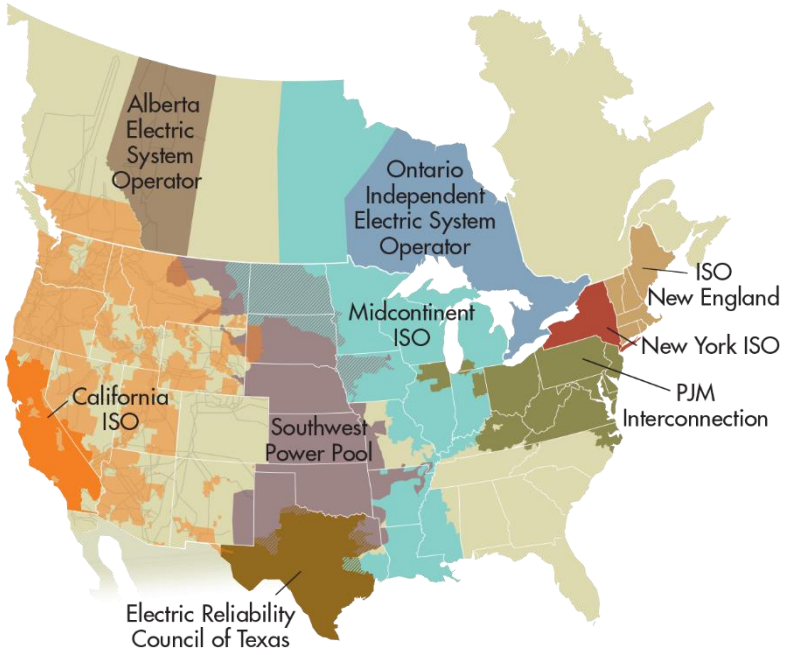
Source: ISO's Masterfile, August 2023

1,119 power plants

Source: California Energy Commission

32 million consumers served

One of **9** ISO/RTOs in North America

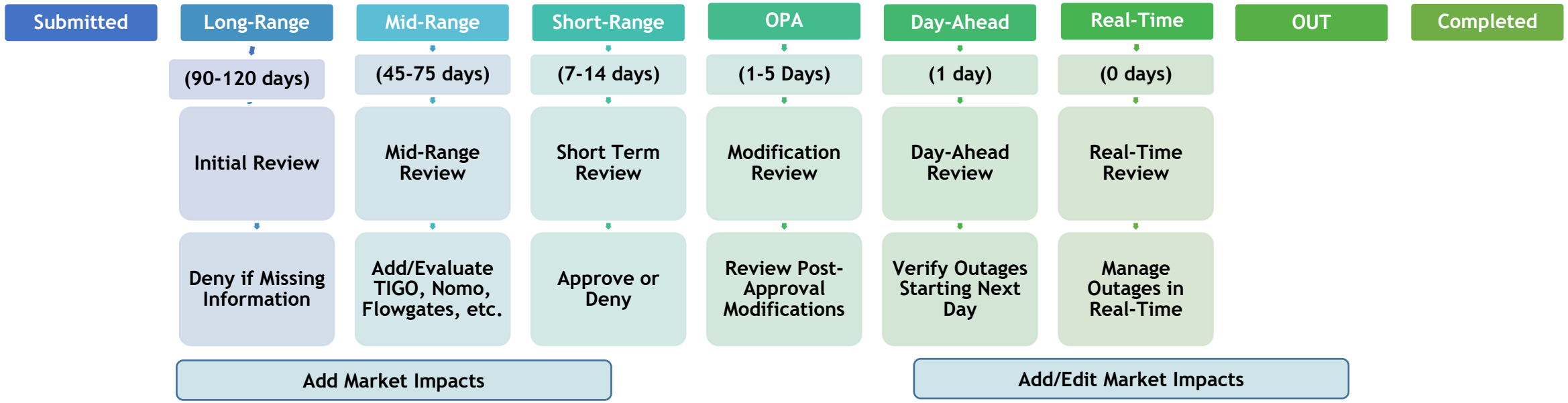


OATI and CAISO

California ISO

Outage Management Process - CAISO

Individual Outage Life Cycle



Operations Engineering – Planning

-Reliability & Market Operations Engineering
-Transmission Desk
-Generation Desk
-Reliability Coordinator Desk

Outage Management Process - CAISO

TOP/BA
Submits Outage

Outage Card

- Equipment
- Modeling
- Nature of work
- Outage Setup Notes
- .
- .

Study Process

Final Outage Card

- Additional Setup
- Contingencies
- Flowgates
- Nomograms
- Transmission Induced Generator Outages
- Path Limitations
- Equipment Rating Changes
- Etc.

Opportunity Areas

Manual Data Processing

Various teams were spending many hours weekly on routine outage validation and cross-system reconciliation

Knowledge Fragmentation

Critical operational knowledge about outages was siloed in multiple systems, operational documents and tools.

Decision Support

Complex decision-making due to incomplete information access and analysis capabilities

Process Complexity

Multi-step workflows requiring constant context switching between systems and reference materials

These challenges presented ideal for OATI Genie™ integration with potential for significant efficiency gains.

CAISO - OATI Project Objectives

1

Identify Pain Points

Conduct comprehensive user interviews to uncover operational inefficiencies in existing outage management system used by CAISO

2

Design AI Solutions

Develop tailored AI interventions for high-impact use cases that align with overall CAISO business objectives

3

Implement & Test

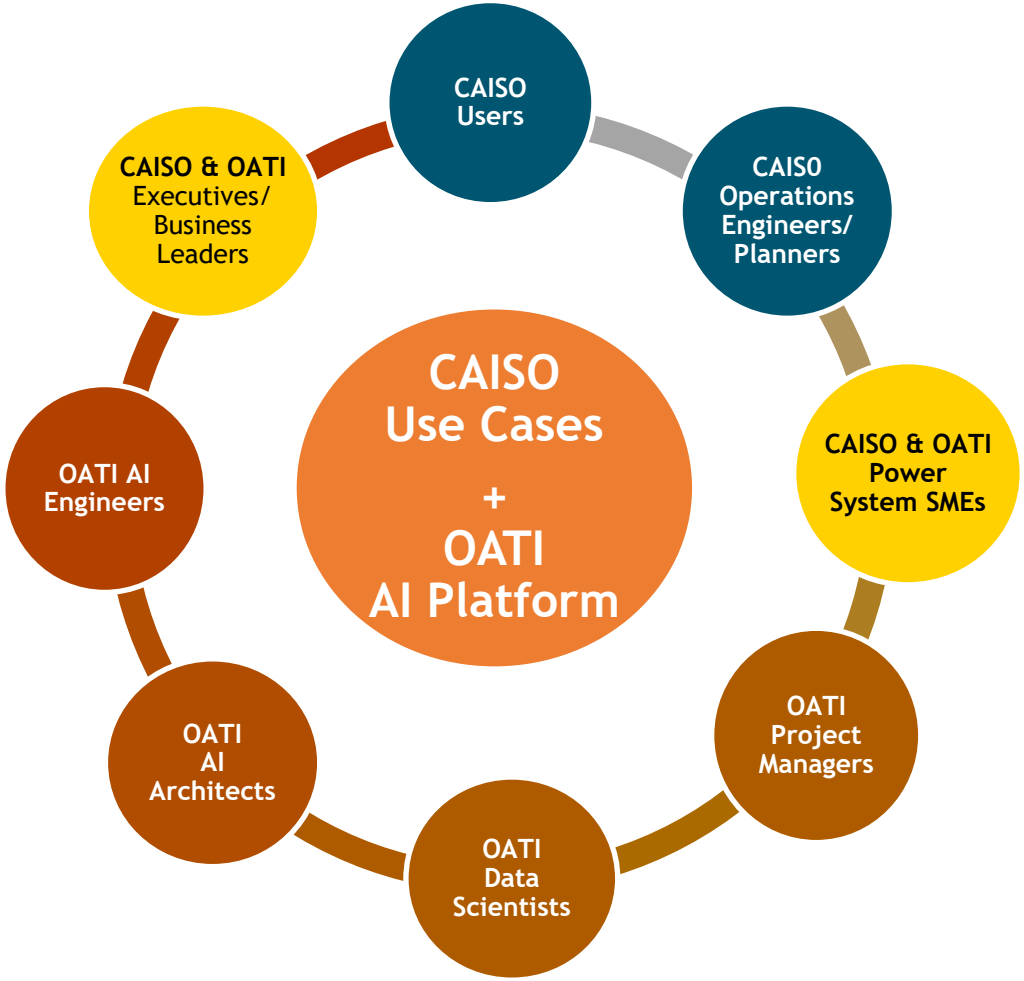
Build and integrate AI components into existing outage management software architecture with minimal disruption

4

Scale Successfully

Move from pilot to enterprise-wide deployment with measured ROI and success criteria metrics

Key Stakeholders



Uncovering the Real Problem

Finding the Pulse:

- The most critical step was identifying the true problem AI should address for the operators not just the surface-level symptom, but the root cause of the pain point.

Understanding Origins:

- It was essential to explore where and why the problem originated from by looking beyond localized issues to the broader context.

Modernizing Processes:

- By deeply understanding the real need, AI can transform entire workflows making them more efficient, effective and aligned with modern expectation

The Role of Operator Interviews

Direct Source of Real-World Data

Interviews with CAISO Operators provided first-hand information on how outage management systems are used, revealing critical data points and decision-making processes.

Understanding Challenges

Interviews uncovered the daily obstacles operators were facing, such as complex workflows, ambiguous information, and time constraints.

Informing AI Solutions

By capturing operator perspectives, the AI team ensured the AI platform built addresses the true pain points and provides more effective and modern decision-making capabilities.

Use Case List

#	Use Case	Severity
1	BA Capacity Forecast for next day for all BAs in RC area.	High
2	Nightly Review of Outages Starting or Ending the next day.	High
3	Utilize OMS historical data to identify potential reliability and market impacts for new outages.	Medium
4	Reminders to follow up on certain critical outages.	High
5	Have AI be knowledgeable of combined (transmission and generation) outages in certain problem areas.	Medium
6	Check notes for key buzzwords and being able to make sense of them (nightly review).	High
7	Ask any questions about outage attributes in the outage card.	High
8	Creating outage management cards using OATI Genie™ Prompts.	Low

OATI Genie

- OATI Artificial Intelligence Assistant
- Powered by Generative / Agentic AI
- LLM-based, Retrieval-Augmented Generation (RAG), and Multi Agents

OATI Genie™ - Project Objectives

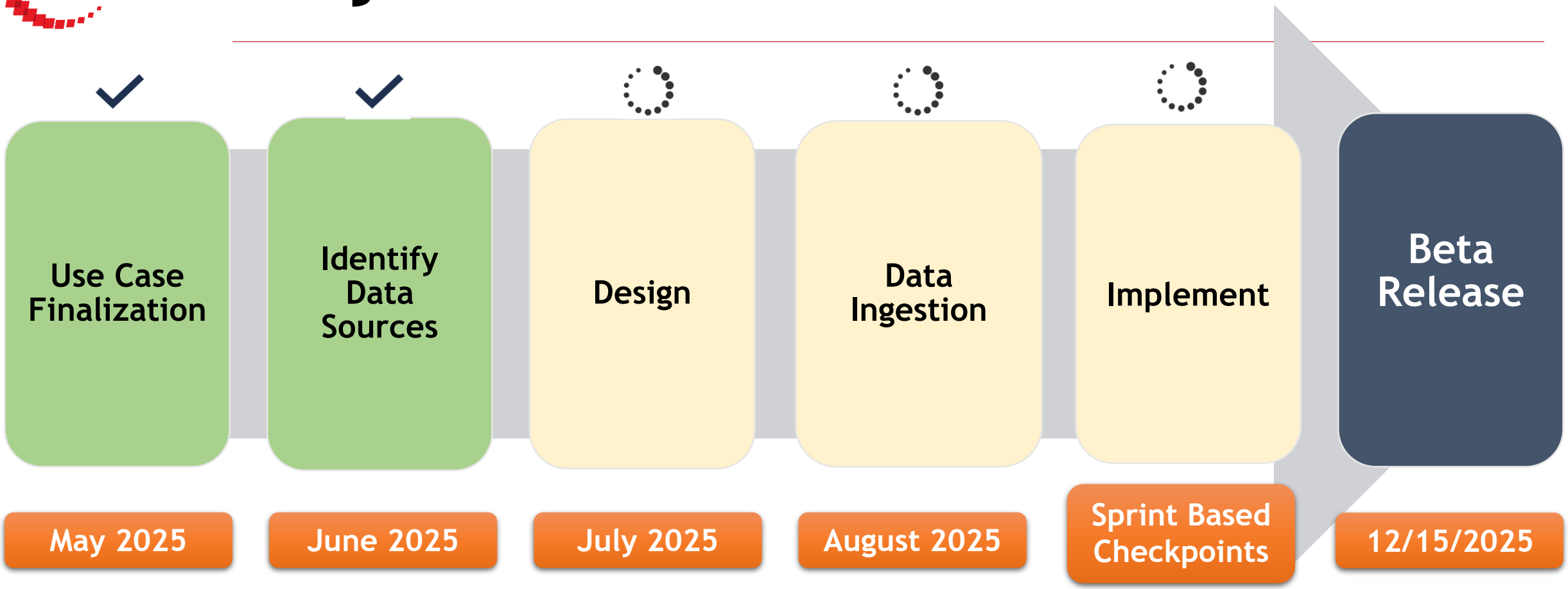
- **Comprehensive Data Analysis:** Analyze all relevant outage management data
- **Operational Efficiency:** Provide insights to assist operators in managing outages more efficiently
- **Seamless Integration:** Enhance, not replace existing outage management application (webOMS)
- **Empowering Operators:** Embed OATI Genie™ in outage management application to support daily outage management workflows and give operators insight into information that they would not have otherwise.

Goal: *Better, Faster, Smarter* Operations

OATI Genie™ - Benefits

- Augments operator capabilities with
  - *Real-time insights not easily visible today*
  - *Context-aware suggestions and automation*
  - *Provide cross-over capability across multiple applications for improved analysis and decision making*
  - *Proactive assistance based on evolving situations*

Project - Phases and Milestones



OATI Genie™ - Operator Interview

Goal of these sessions.

- *Identify High-Impact Use Cases: Focus on covering daily operational pain points where OATI AI Genie can make a real difference*

What these sessions were NOT about?

- *Addressing Existing Product Refinement or Technical Issues in webOMS*

What did we target to accomplish?

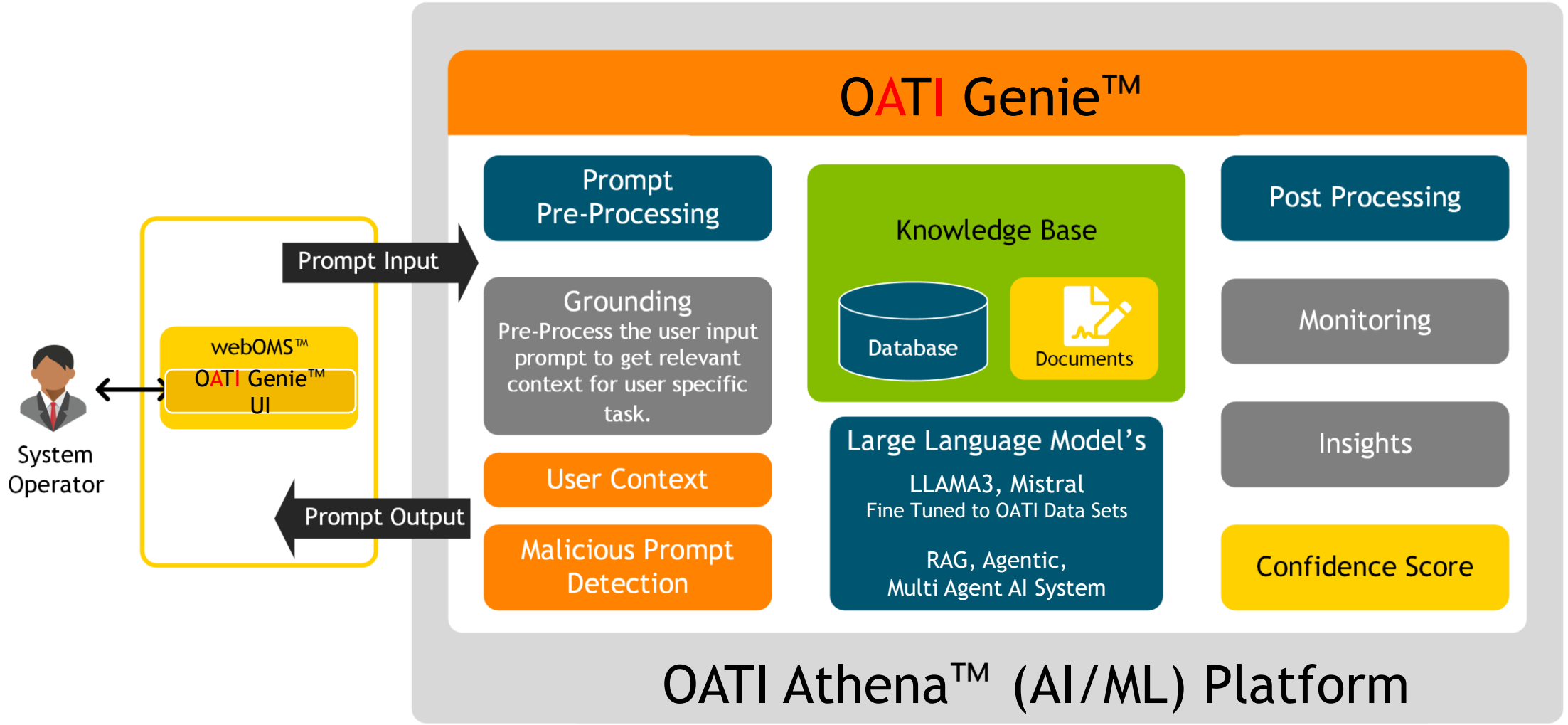
- *Real world challenges in the control room at CAISO for real-time operations*
- *Gaps in visibility that AI could help fill by providing actionable insights or suggestions*

OATI Genie™ - Use Case Identification

Operators were asked to think about the future operations of outage management
"Imagine how OATI Genie™ could transform your tasks and workflows"

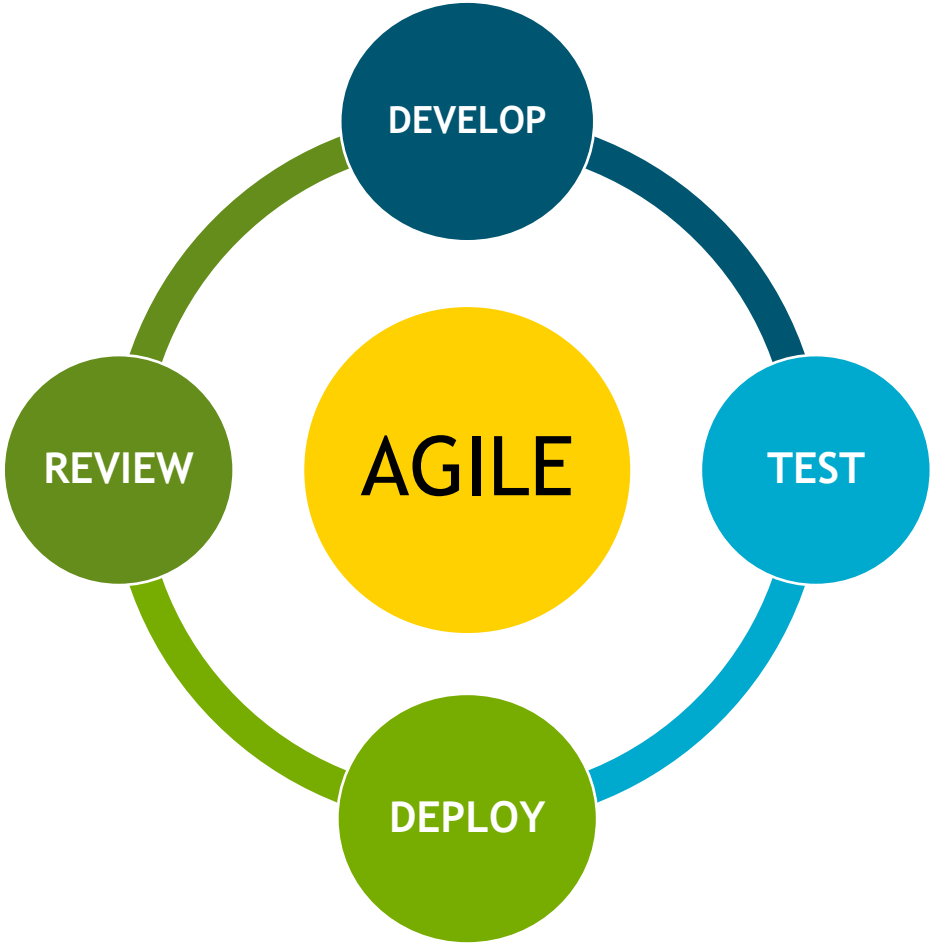
- What are the key operational decisions being made?
- What complexity is involved in making them?
- Who makes the decision?
- What are outcomes of the decision?
- What time constraints are there to make the decision?

OATI Genie™ - webOMS Integration



Project - Methodology

- Short Sprints (2 – 4 weeks)
- Collaborative Brainstorming and Planning
- Focus on High impact use cases first
- Rapid Prototyping
- Minimum Viable Product (MVP)



Project - Deliverables

Prompt Based AI Chat Interface

- For operator assistance in outage management system.

Data Analysis and Visualization

- Visual tools to help with identification of key patterns in outage management and provide actionable insights

Generative AI/ML Platform

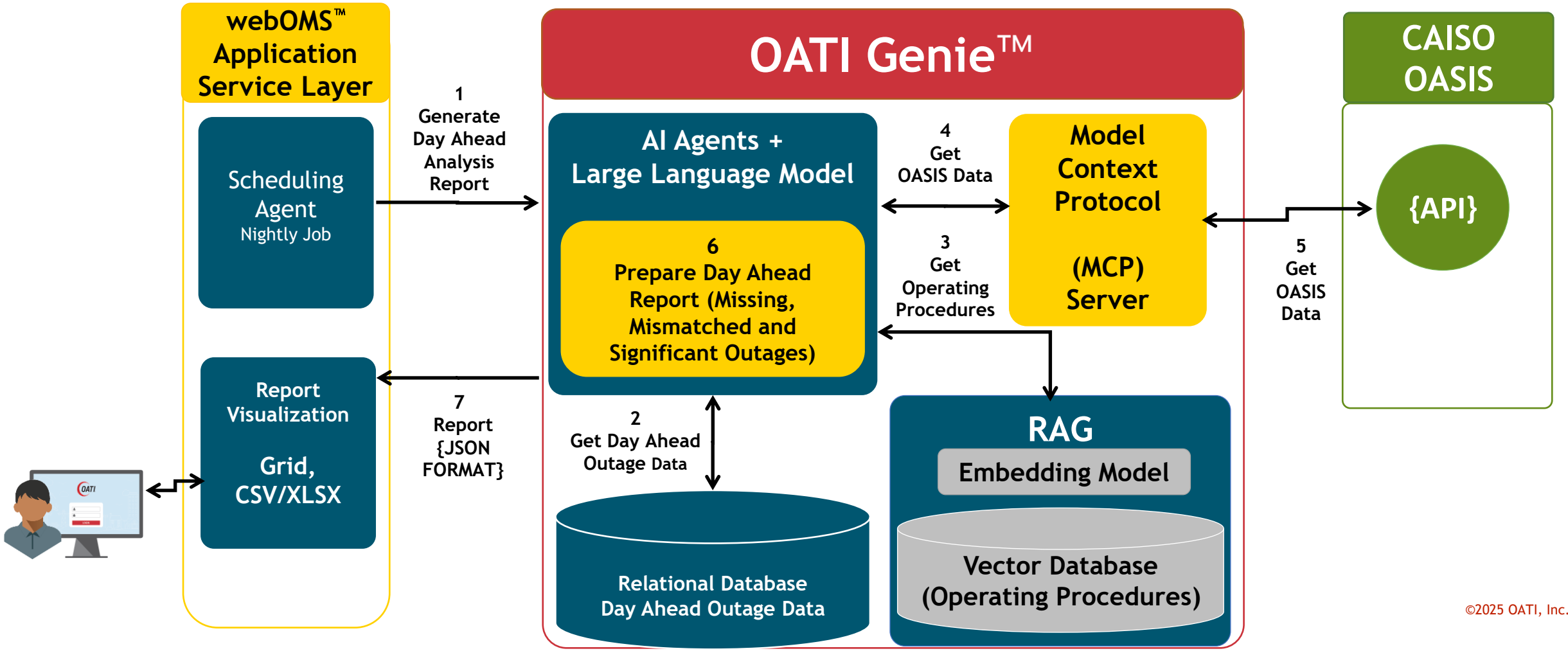
- Retrieval Augmented Generation (RAG), Agentic capabilities, and Large Language Models (LLMs) that has ability to refine and learn from real-time data

Evaluation Report

- Comprehensive evaluation report detailing the performance and assessment of the project.

OATI Genie™ Solution & Agent Workflows

Use Case #2 - High Level Workflow



Historical Outage Data Training

Training ->

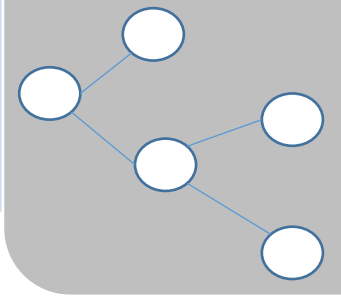
Past Outages
Switches
Equipment's
TIGOS
Etc.

Offline Training Historical Data

Categorical Labeling

LLM Model Training

Learn Correlation



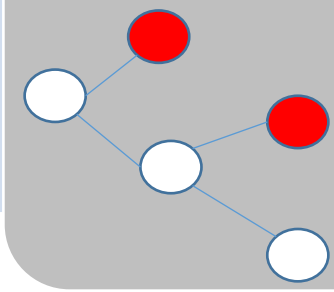
Inference ->

Day Ahead Outages

Live Data

LLM Model Inference

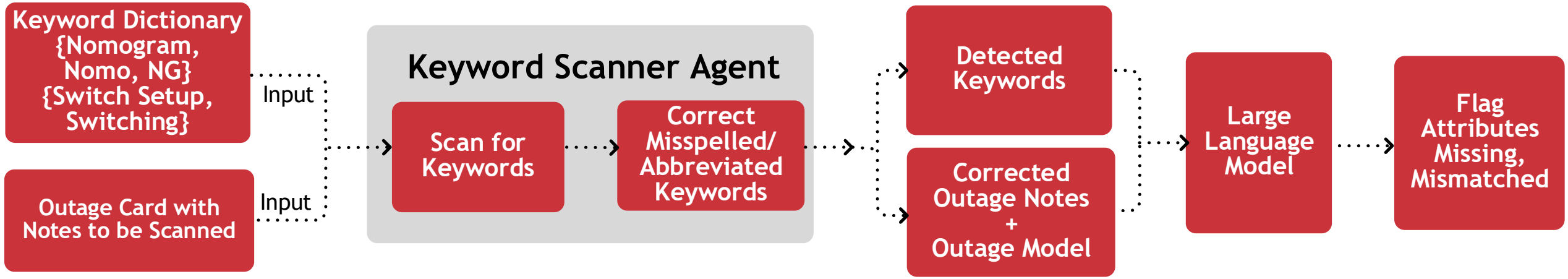
Anomaly Detection



Keyword Scanning Agent

1. Create the dictionary of keywords (Nomogram, Contingencies…..)
2. Perform N-gram frequency detection analysis on Historical Outages on the keywords.
3. Evaluation of Fuzzy Match Libraries - Spelling Check | Correction
4. Using Large Language Model to find inconsistencies between notes and outage card modeling.

Keyword Scanning Agent Workflow



Similarity Search Agent

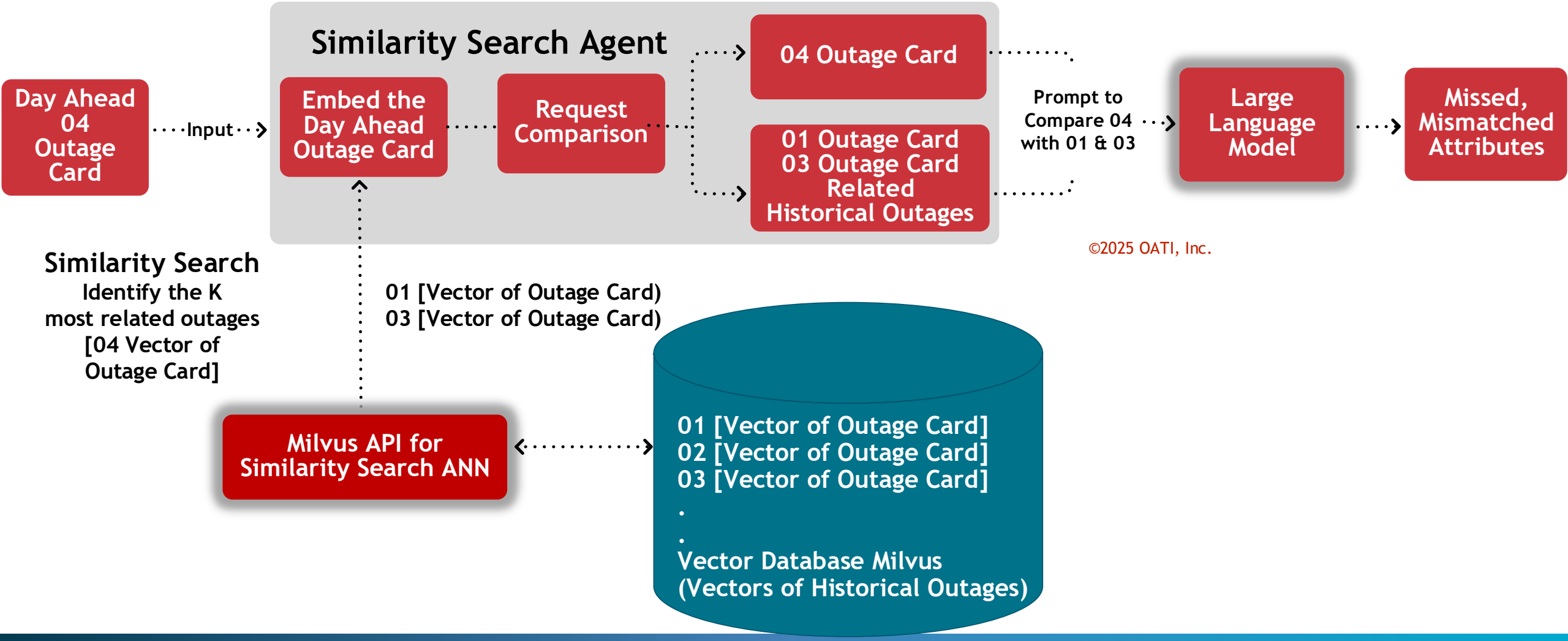
Similarity search

- Determine the k outages in history most closely related to the given day-ahead outage

Language Modeling

- Use language model to detect inconsistencies and mismatches between the given day-ahead outage and the k historical outages retrieved from similarity search

Similarity Search Agent Workflow



OATI Genie™ - Scalable Potential

Versatile Solution

- The OATI Genie™ platform is designed to address a wide spectrum of challenges across different domains, not just a single isolated problem.

Growing Capabilities

- The OATI Genie™ platform can evolve to meet new use cases with its modular architecture and flexible design.

Customizable & Scalable

- The OATI Genie™ platform supports customization for unique requirements while maintaining the ability to scale.

Future-Ready

- By continuously learning and adapting AI models, the OATI Genie™ platform is a powerful tool for continuing innovation and efficiency.

Next Steps

- Evaluation of results
  - *Accuracy*
  - *Latency*
  - *Grounding*
  - *UI/UX experience*

Questions

Thank you