



Modernizing Nuclear Security Data Workflows with Oracle APEX

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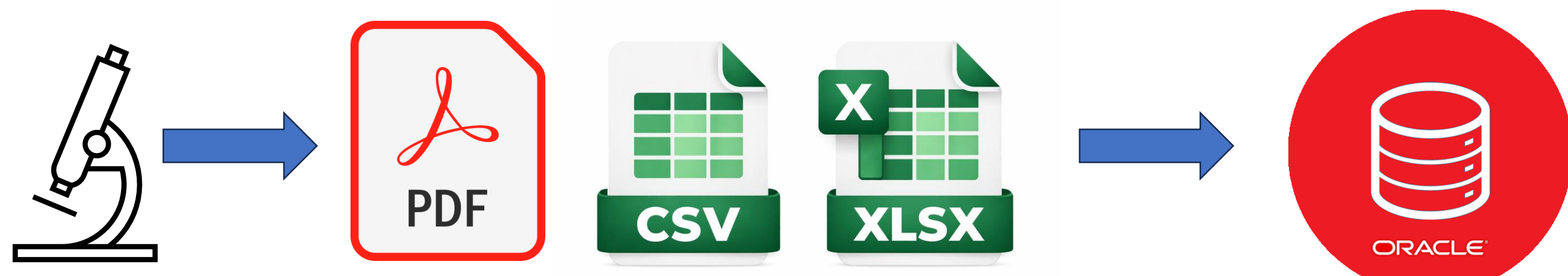
Oracle APEX

Nuclear forensic signature data is inherently fragmented. Individual samples are distributed across multiple laboratories, partitioned into aliquots, and analyzed with a range of techniques and instruments. We have developed an Oracle Database and Oracle APEX based framework for building centralized data repositories, improving data integration, provenance tracking, and enabling more efficient discovery of technical insights.

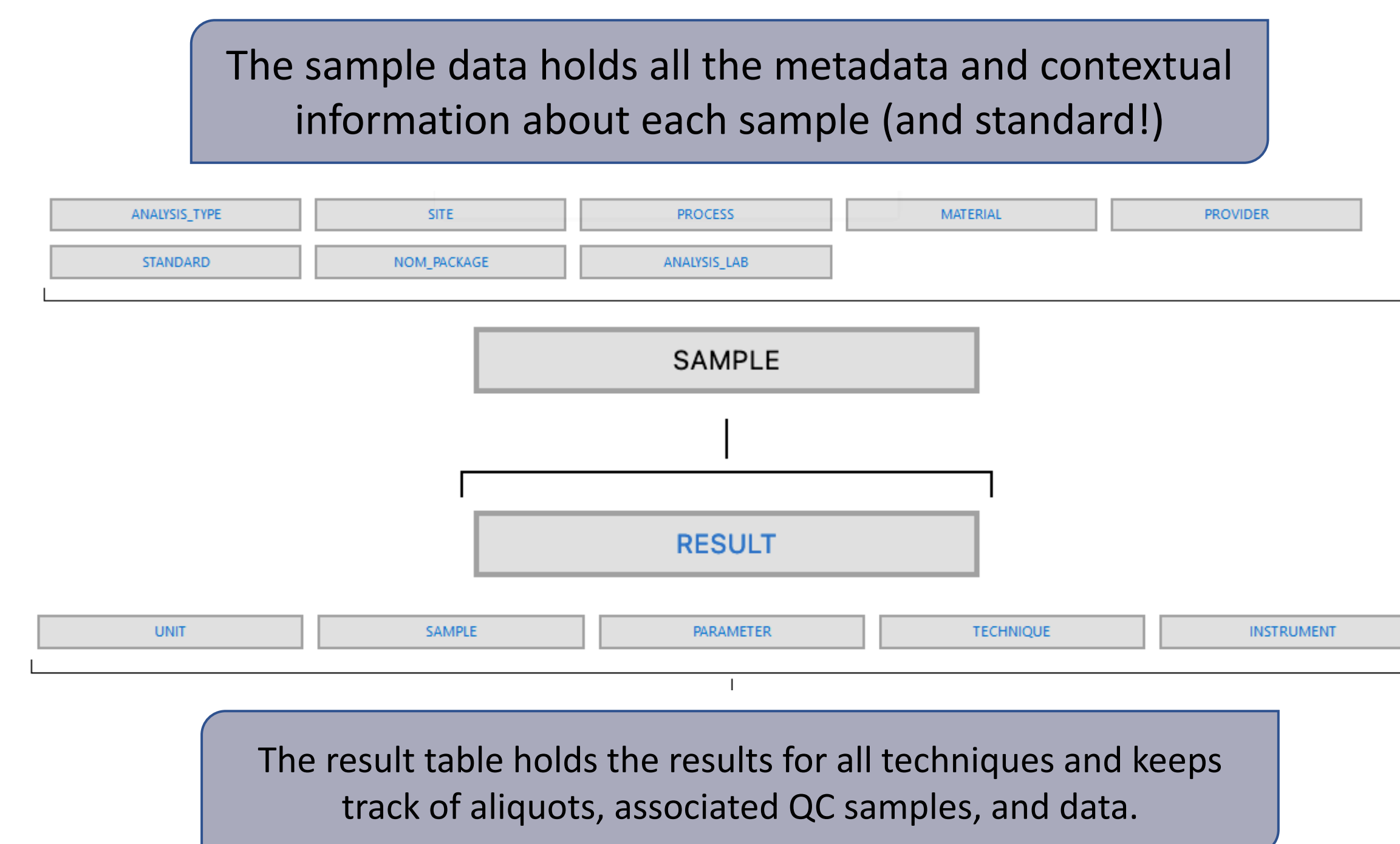
Premise: Nuclear Forensics Analysis Data is Unstructured...

- Data comes from multiple sources and in various formats.
- Queries are time consuming when data is not centralized.
- Inconsistent validation and curations compromising data integrity.

Oracle Database + APEX = Centralized Data

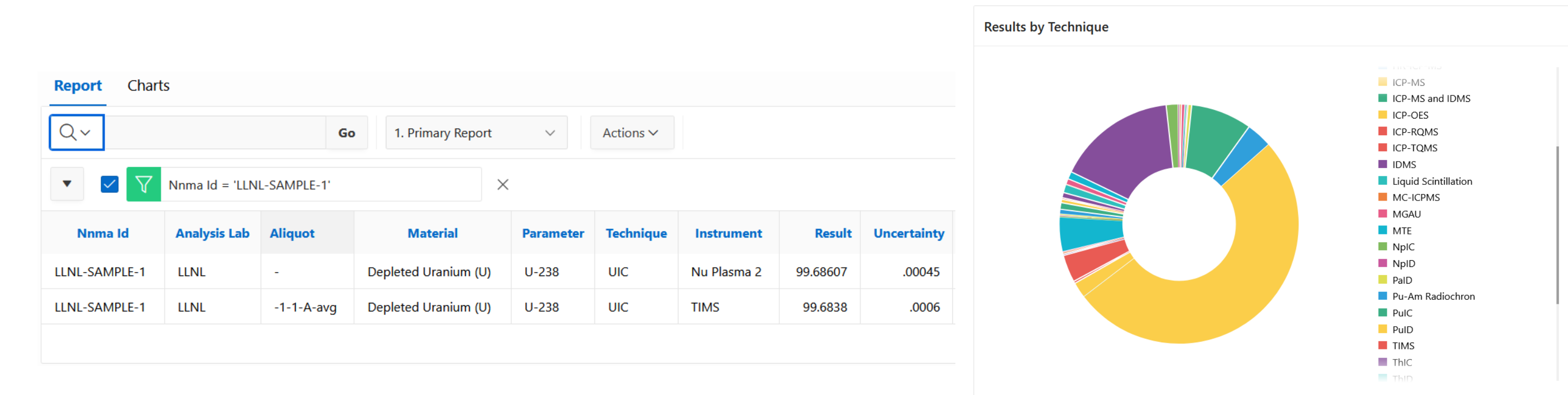


Data Model: A Simple & Flexible Structure



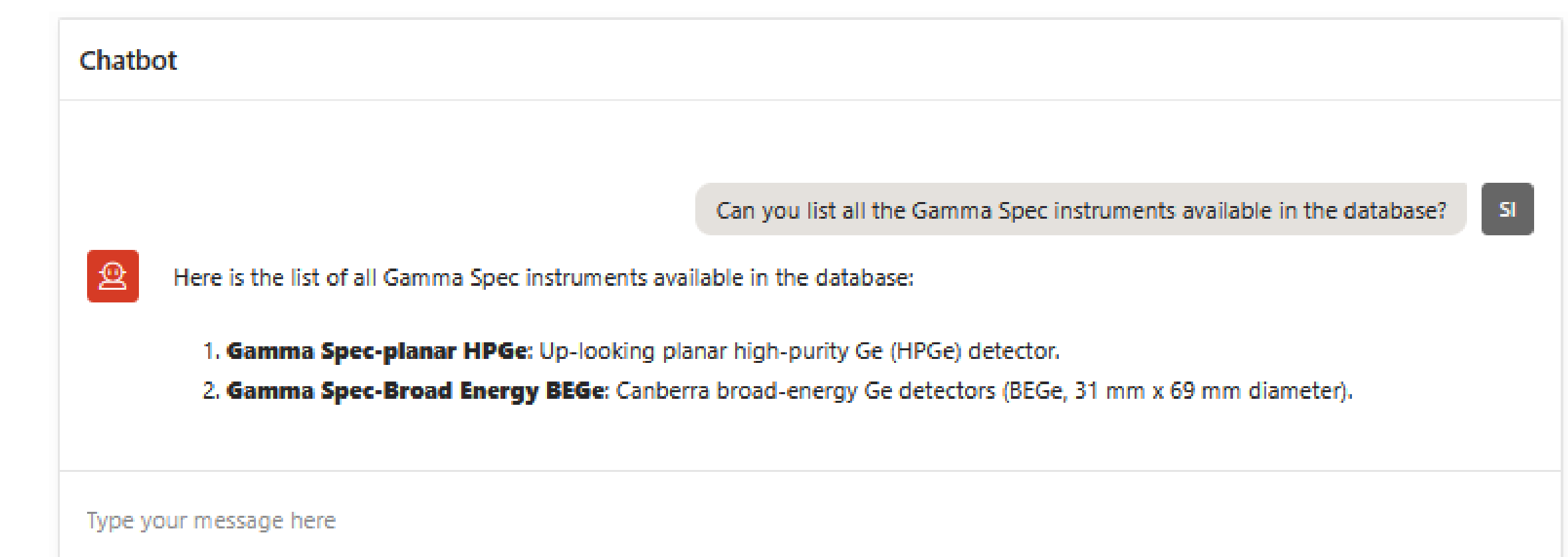
Reporting and Visualizations

- Interactive reports allow for intuitive data searching and customized reporting.
- Oracle JET Charts provide meaningful metrics visualizations.



GenAI Integration

- Generative AI integration allows for AI service creation within APEX applications.
- Agents reference RAG sources to provide insights dynamically.



Summary

- The Oracle database and APEX provide a pathway to structured centralized data.
- Data import processes and approval workflows allow for data validation and curation.
- Customizable interactive reports and charts give you multiple ways to interact with data.
- AI integration provides another layer of simplification if desired.

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Data Import & Validation Workflow

- Standardized template for uploads.
- Data mutation and manipulation via PL/SQL.
- Traceability of imports.
- Human approvals for data curation.
- Configurable validations:
 - Type and range checks.
 - Referential integrity.
 - Business rule enforcement.



Q	Go	Actions	Error	Cell Value	Column Name	Row #
The following sample id already exists in the database: LL-SAMPLE-2020-2-2				N/A	N/A	2
Invalid number.				TEST	MASS_RECEIVED_GRAMS	2
1 - 2						

The NNMA Database Program



Sample characterization (laboratory based)



Compilation of Information (database)



Assessment of materials signatures (analytical tools and SMEs)

Creating a pathway to structured data to facilitate insights