### Challenges
- Cloud-secure analytics on healthcare data
- Efficient processing of vast amounts of data
- Use FHIR, the latest standard for health care data exchange from the HL7 organization

### The Use Case
- Food Coach application helps users plan and monitor their diet
- Remote interaction with a dietitian
- Users record their food consumption throughout the day in the app
- Dietitians access their clients’ data to monitor progress and make recommendations

### The Solution
- HL7 FHIR data exchange format for Electronic Health Records
- IBM FHIR server receives FHIR messages and sends to persistence layer
- Interceptor for IBM FHIR replaces supplied JDBC-based persistence layer
- Data is collected and persisted in New-line Delimited (NDJSON) format, which is transformed to a Spark dataframe and, using Parquet Modular Encryption integrated with Spark, is written to encrypted Parquet
- Master keys used for column and footer encryption/decryption stored in Hashicorp Vault key management system
- Query Gateway allows for efficient execution of SQL queries against the stored encrypted Parquet files

### Summary and Acknowledgements
Building on IBM-led work adding encryption to Apache Parquet files, ProTego (https://protego-project.eu/) has prototyped a secure infrastructure for the efficient storage and querying of healthcare data sent as FHIR messages.

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