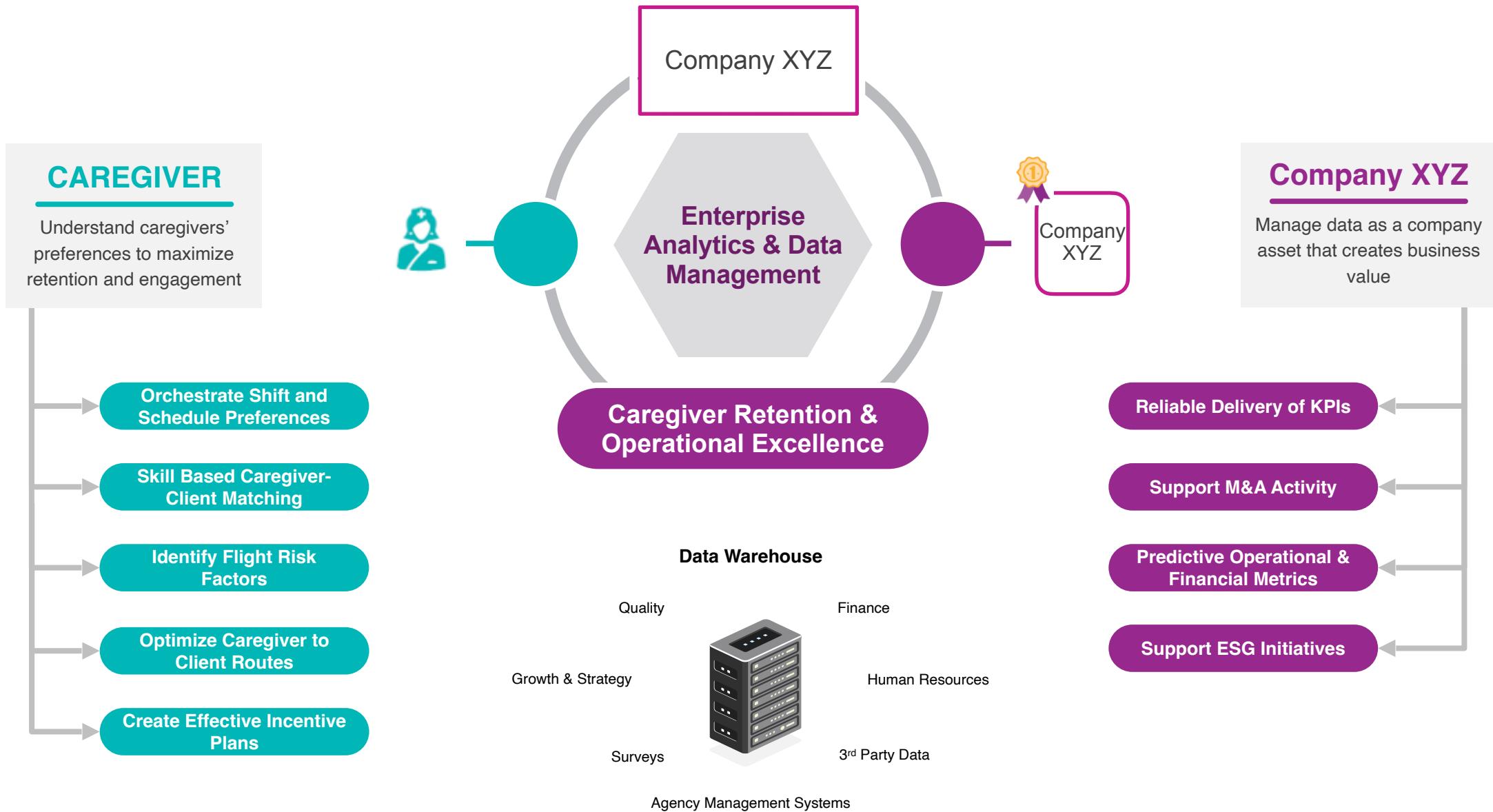
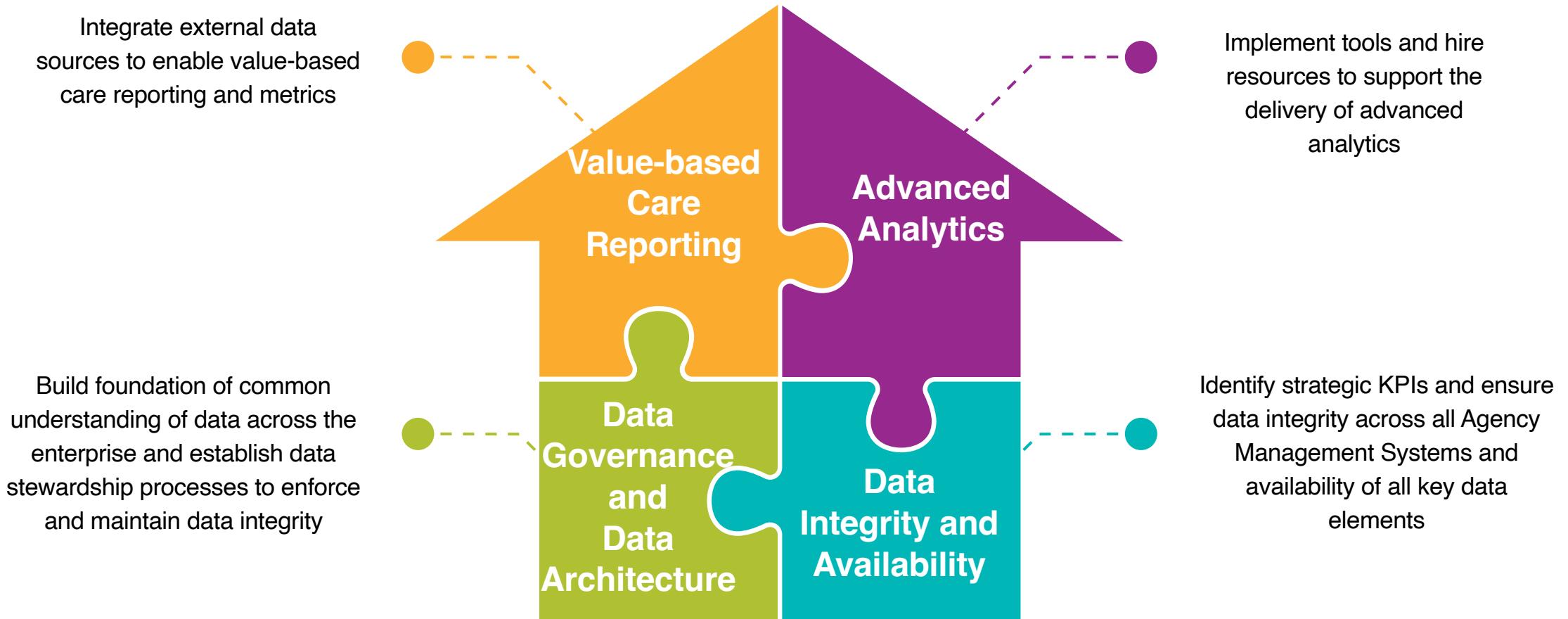


Data Marketplace

Operational Analytics – Vision - Scenario



Client Centric Analytics – Building Blocks - Scenario



Delivering Insights to Support Business Growth - Scenario

Strategy

- Provide timely and accurate data insights to support effective operations and business decisions
- Improve the integrity and availability of existing data
- Create efficient process for integrating data from new acquisitions
- Develop data architecture that allows for integration with third party data sets (e.g., HIE's, claims)
- Extend capabilities to predictive modeling and use of machine learning to enable more efficient and higher quality care for our clients

Priorities

Data Governance & Data Architecture	Data Integrity and Availability	Value-based Care Reporting	Advanced Analytics Capabilities
<ul style="list-style-type: none">• Develop and implement Data Governance structure with clearly defined data and process owners• Develop standard data definitions across the enterprise• Create efficient data architecture that will support enforcement of standards, real time reporting and scalable and extendable data environment	<ul style="list-style-type: none">• Identify key data elements that impact enterprise level operational and financial reporting and address any known data issues• Implement automated data edits and validation at the point of entry• Work with Business to define new metrics/reports and perform analysis of existing data to identify/address data gaps	<ul style="list-style-type: none">• Identify high value external data sources• Connect with/integrate data sources containing desired data and develop reports to support operational decision making and outcome-based reporting	<ul style="list-style-type: none">• Determine business value and applicability of predictive modeling, machine learning and other advanced analytics techniques• Identify/develop appropriate tools, capabilities and knowledge to leverage enriched data sets

Operating Model

- Develop partnership with the business to enable effective data governance
- Create standard processes and support framework for efficient integrations
- Identify new tools and solutions to ensure data quality/integrity, flexible data architecture and support of advanced analytics
- Onboard new resources to support business growth and development of new capabilities

Care Coordination – Connecting Home Care and Health Care

Be the leader of technology-enabled human observations while connecting and accelerating care delivery where our clients want it the most, at home

... by being brilliant at



Amplifying the value of caregiver hours in the home



Fulfilling clinical need internally or with complementary external partner



Collecting human observations through proprietary tech-enablement



Measuring qualitative and quantitative impact



Driving actions through data interpretation and predictive analytics



Testing, learning and adapting for scale

While creating value for all key stakeholders: clients, caregivers, partners and Help at Home

Enterprise Data Management & Engineering – Team Charter

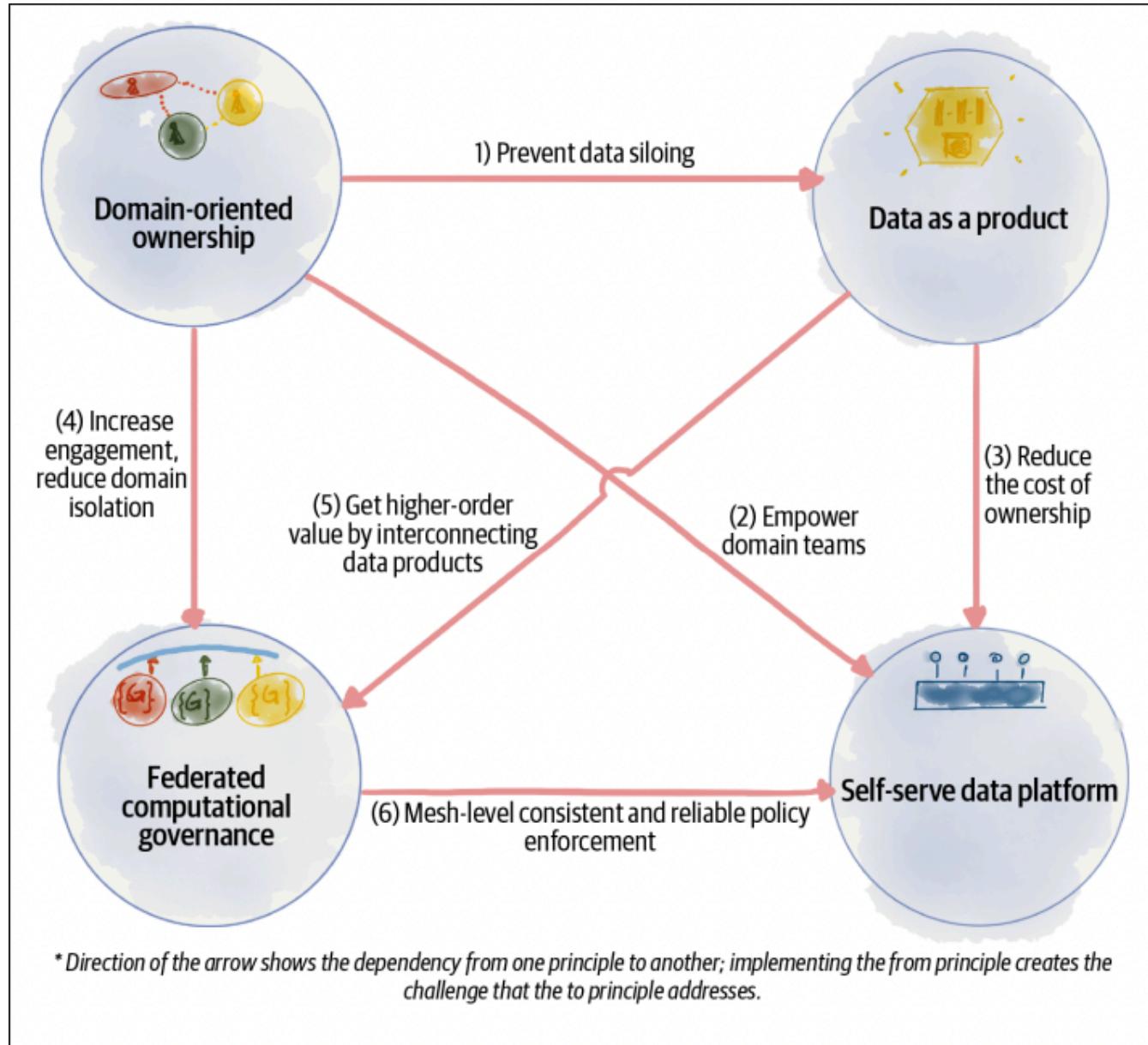
- Data management – create and implement architectures, policies, and procedures that manage the full data lifecycle needs
- Improve our overall approach to data as a “marketplace”
 - Ingest, Integrate, Curate, Share data as a shared capability and a product for the enterprise
 - ◆ Broad access to data for better business decisions
 - ◆ Research and compose new business capabilities
 - ◆ Help improve M&A activities
 - ◆ Analytics and BI needs are met quicker and evolve faster
 - ◆ Data as an asset is available for better insights and decision making
 - ◆ Sharing anonymized data externally (Licensed, cost-based)
 - Data catalogs, metadata, tagging
 - Data warehouse improvements - Better Data Domain representation (with bounded context for APIs) – Data as a Product
 - Data governance (executes on the governance policies and procedures)
 - ◆ Quality, Security, Stewardship, Transparency, Harmonization, Multi-tenancy
 - Data architecture
 - Enhance data security (encryption, anonymization of key fields)
 - Data Profiling

Data Mesh – Data Driven Value at Scale

Data mesh is a decentralized socio-technical approach to share, access, and manage analytical data in complex and large-scale environments—within or across organizations.

Data mesh is a new approach in sourcing, managing, and accessing data for analytical use cases at scale.

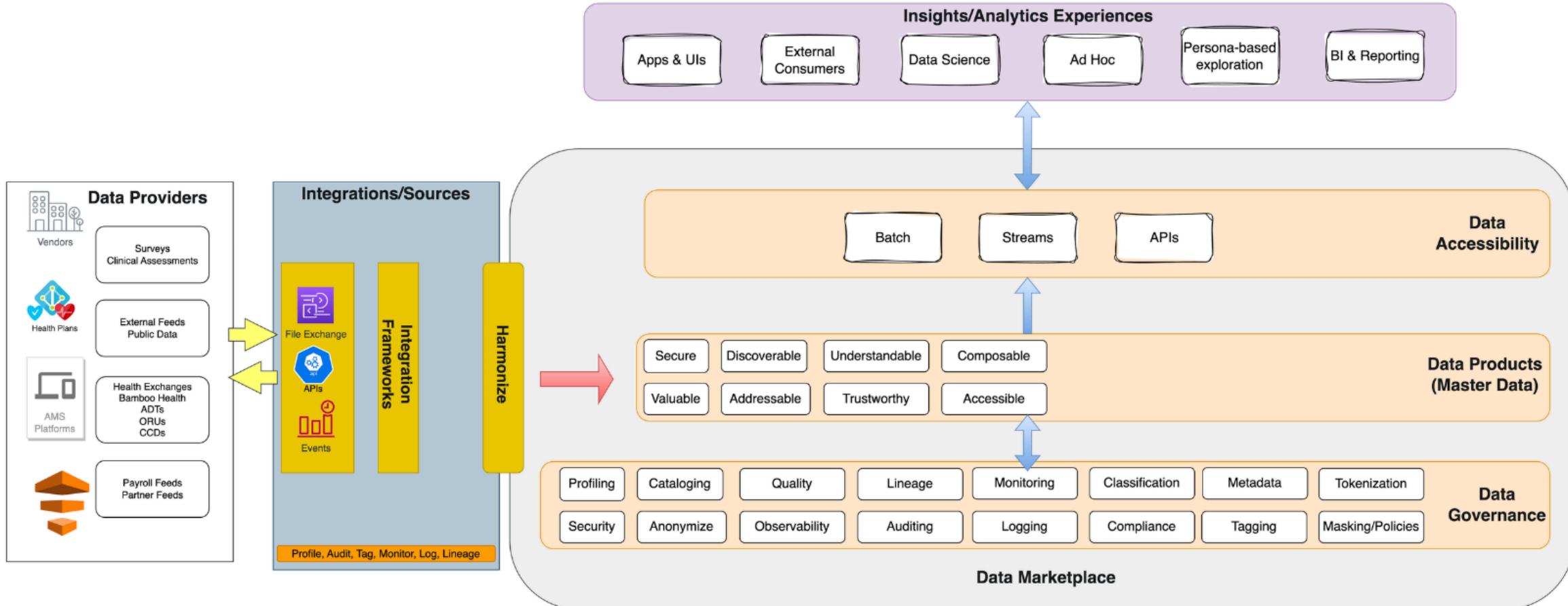
- Focus on:
 - Data Marketplace & Data Products
 - Ownership and accountability
 - Platform for common frameworks and pipelines (ingestion, curation, sharing)
 - Federated Governance



Data Marketplace

- A data marketplace gives various personas (data scientists, business intelligence, explorers, engineers and analytics professionals), processes and applications access to internal and external data
- It provides access to licensed, specialized data to external entities as well
- It is data that is discoverable, explorable and accessible
- You can discover and access a variety of datasets, so you can:
 - Make those datasets available for your immediate needs
 - Join the datasets with your own data
 - Create new data and promote it in the marketplace
 - Increase visibility of your data
- The marketplace will adhere to, enable, and enforce many of the data management concerns like security, governance, lineage, metadata (through cataloging), data quality metrics, data retention rules
- A data marketplace is realized through target architectures and technology enablers

Data Marketplace



Data Marketplace

- A data marketplace provides access to Data Products:
 - Supports PHI/IPI
 - Supports producers and consumers of data
 - Is Governed
 - Community sized
 - Registered datasets
 - Discoverable
 - Licensing (Internal/External)
 - ◆ Fixed usage model
 - ◆ Policy based
 - ◆ Revocable consumption of data
 - ◆ Are copies allowed?
 - ▶ Catch users of data through canary rows

Data Marketplace

- A data marketplace provides access to Data Products:
 - Build a path from data accumulation to analytics and the type of analytics
 - The result of the analytics to be shared through events/APIs
 - Build APIs for data feed for marketplace
 - Focus on NRT and streaming vs batch.
 - <https://paperswithcode.com/datasets> - Example

Why do we need a Data Marketplace? - Connecting to the scenario

- Reduce integration time for M&As, new system implementations and integrations
- Composing new business capabilities in support of larger strategies (Care Coordination, Payor)
- Organize data as data products with domain bounded context
 - Clean, quality, conformed, catalogued data
 - Access data through APIs, batch or streams (events)
- Make data available for BI, Analytics
- Be able to share data through clean interfaces internally/externally
- Consistent approach to data ingestion, curation and sharing
- Consistent approach to multi-tenancy
- Consistent approach to security
 - Encrypt, anonymize data for external share
 - Anonymize data for better testing
 - Tokenize data for internal use

What can I do in a Marketplace?

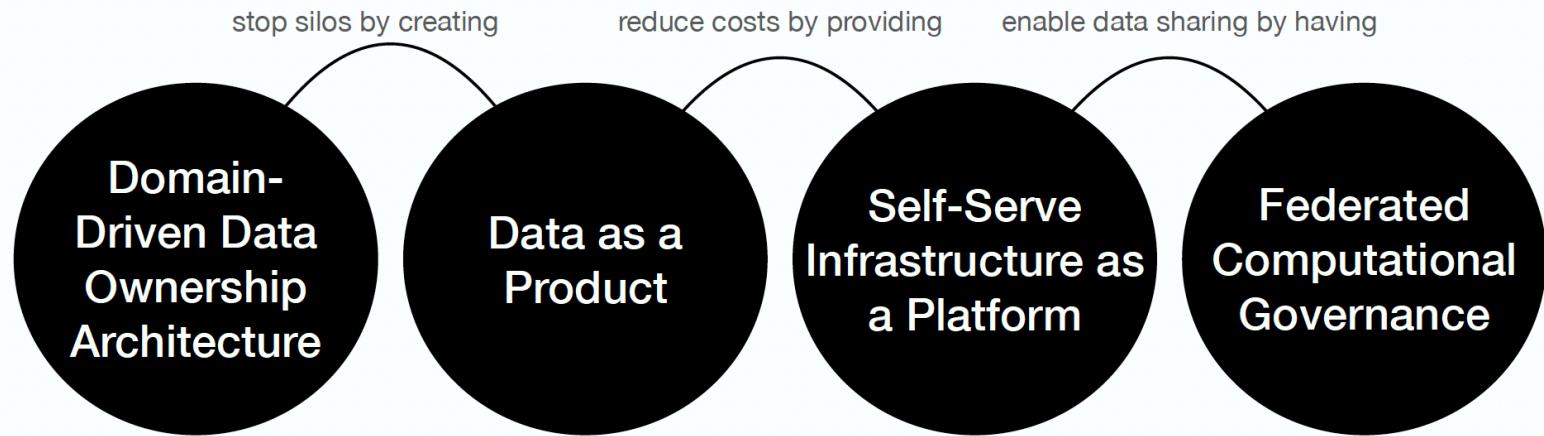
- As a data provider, you can:
 - Publish data listings for free-to-use datasets to generate interest and new opportunities
 - Publish data listings for products that can be customized for the consumer
 - Share live datasets securely and in real-time without creating copies of the data or imposing data integration tasks onto the consumer
 - Eliminate the costs of building and maintaining APIs and data pipelines to deliver data to customers

- As a data consumer, you can:
 - Discover and test third party data sources
 - Receive frictionless access to raw data products from vendors and other producers
 - Combine new datasets with your existing data to derive new business insights
 - Have datasets available instantly and updated continually for users
 - Eliminate the costs of building and maintaining various APIs and data pipelines to load and update data
 - Use data science and BI tools as needed

Data + Domain Driven Design

Data + Product Thinking

Data + Platform Thinking



Domain Data as a Product

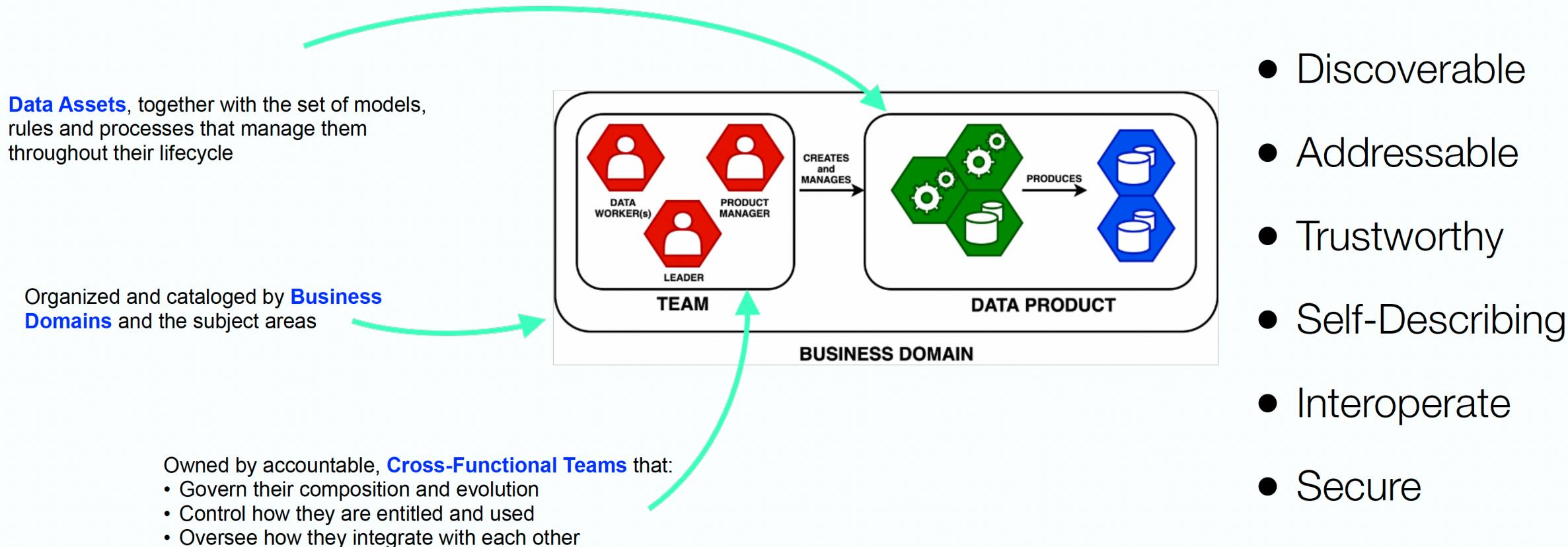
- Alignment of data closest to the source or business owner/domains
- The owner manages the lifecycle, access and changes to data
- Align to the people that know the data best
- The data as a product is an individual, authoritative and curated data set
- Is the source of truth with a clearly defined schema, glossary and metadata
- A data domain (like payor, client or caregiver) has all the data products that domain needs to be considered complete

Data should be treated as a product - produced and owned by cross-functional product teams - domain owners

Domain Data as a Product

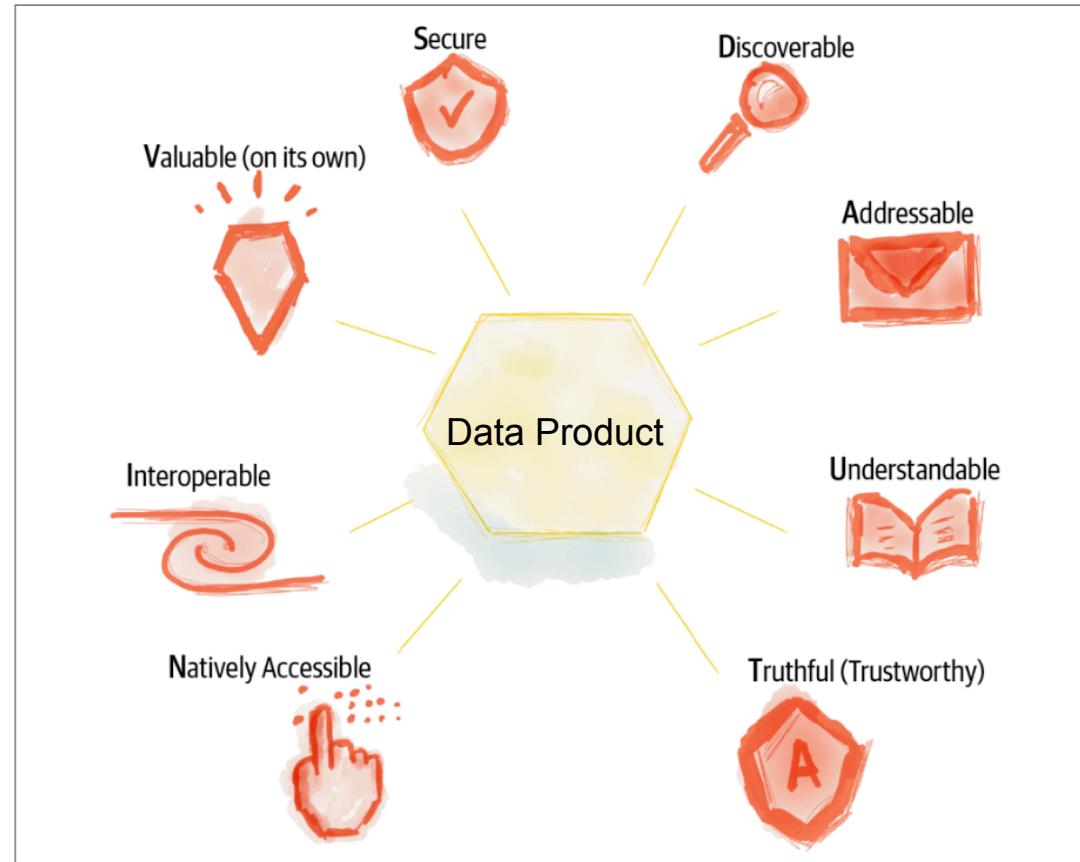
Data Products | Domain-oriented Decentralized Data Ownership

Enterprise management of Data apart from its application requires focus on Data Products:

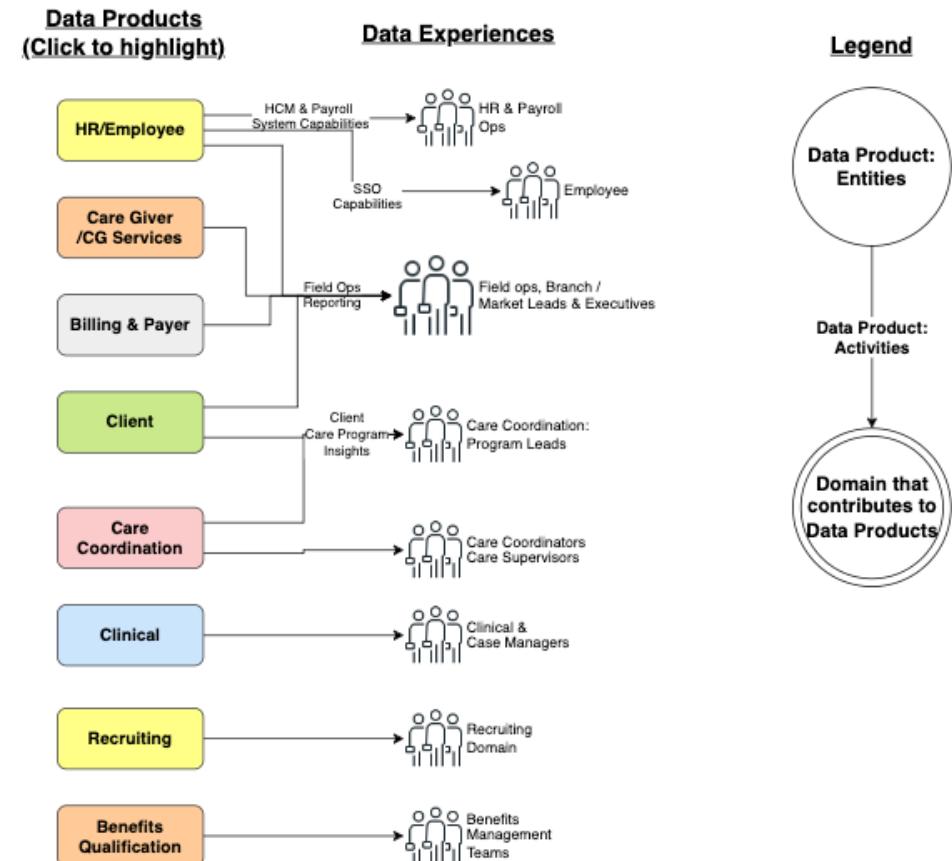
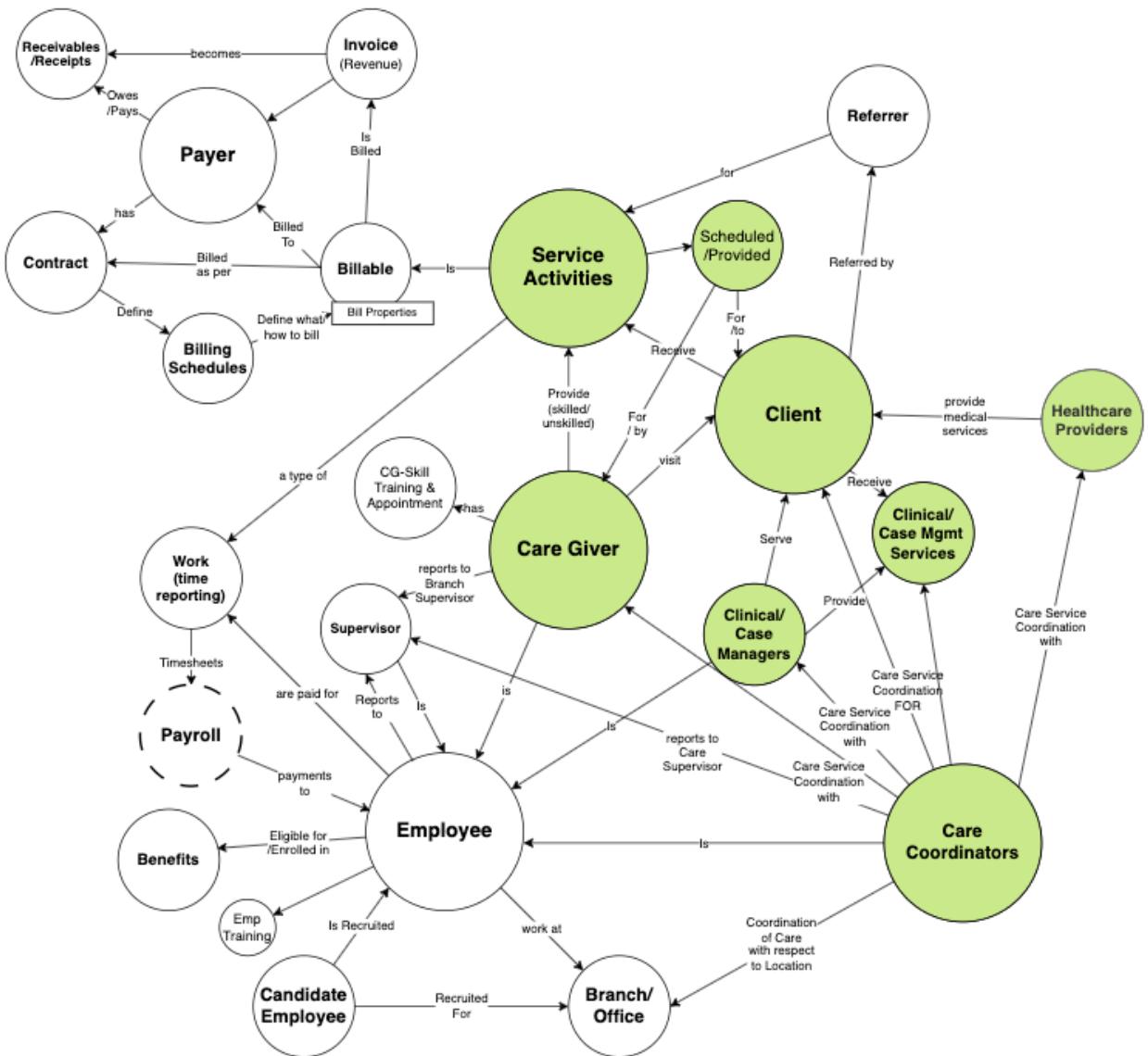


Data as a Product – Usability Attributes

- **Discoverable** – Ability to discover and access the data product
- **Addressable** – Programmatically or manually accessible via API, SQL etc
- **Understandable** - Know the semantics of the data, as well as the syntax in which the datasets are presented to the data user and the data schema.
- **Interoperable** – Compliance with standards, domain models, harmonized and composable
- **Valuable** – on its own. Without being joined or correlated. Valuable and meaningful to the business and consumer it serves
- **Natively accessible** – Access by persona
- **Trustworthy** – SLAs, metrics around quality, change, timeliness. lineage, completeness and operational metrics like availability, freshness
- **Secure** – Authenticated, authorized and encrypted access



Domain Data as a Product



Composable Business Capabilities

- Data products are shareable and usable for any use case
- Data products are composable into business capabilities
- Data products are domain centered datasets that are
 - Discoverable
 - Addressable
 - Trustworthy
 - Self-Describing
 - Interoperate
 - Secure
- Data Products are shareable
 - APIs
 - Event-driven
 - Batch

Data Mesh Architecture

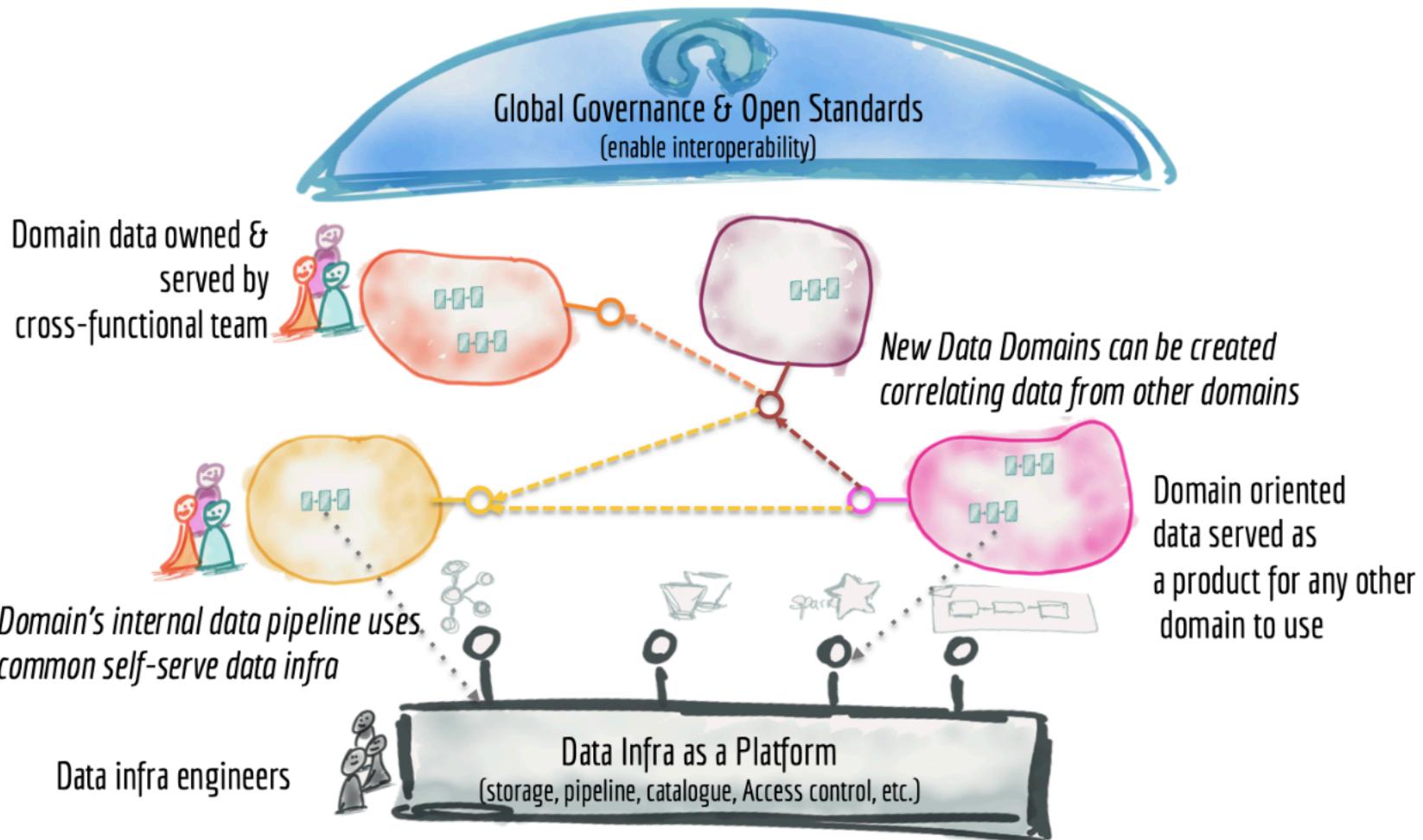
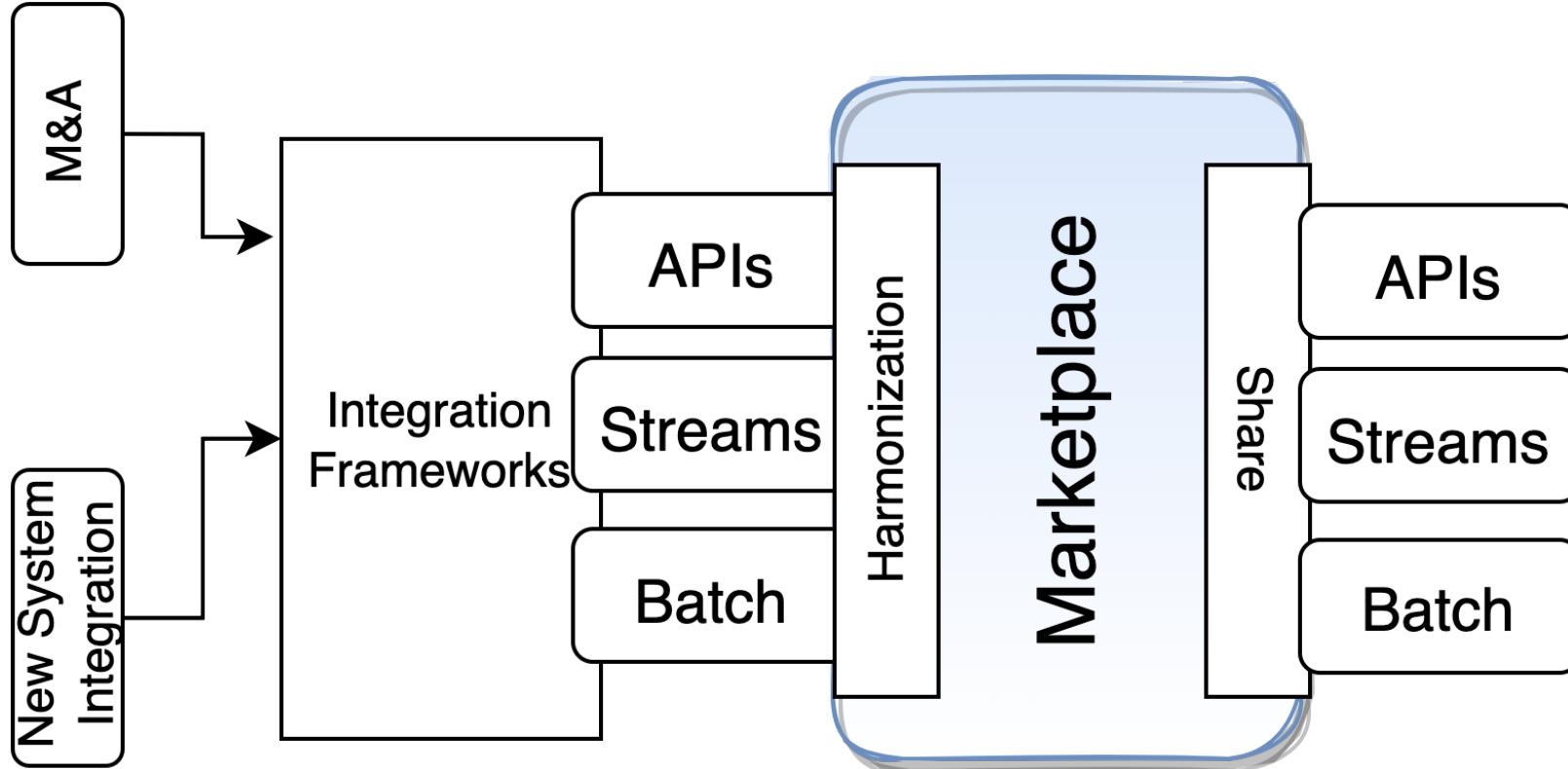


Figure 12: Data mesh architecture from 30,000 foot view

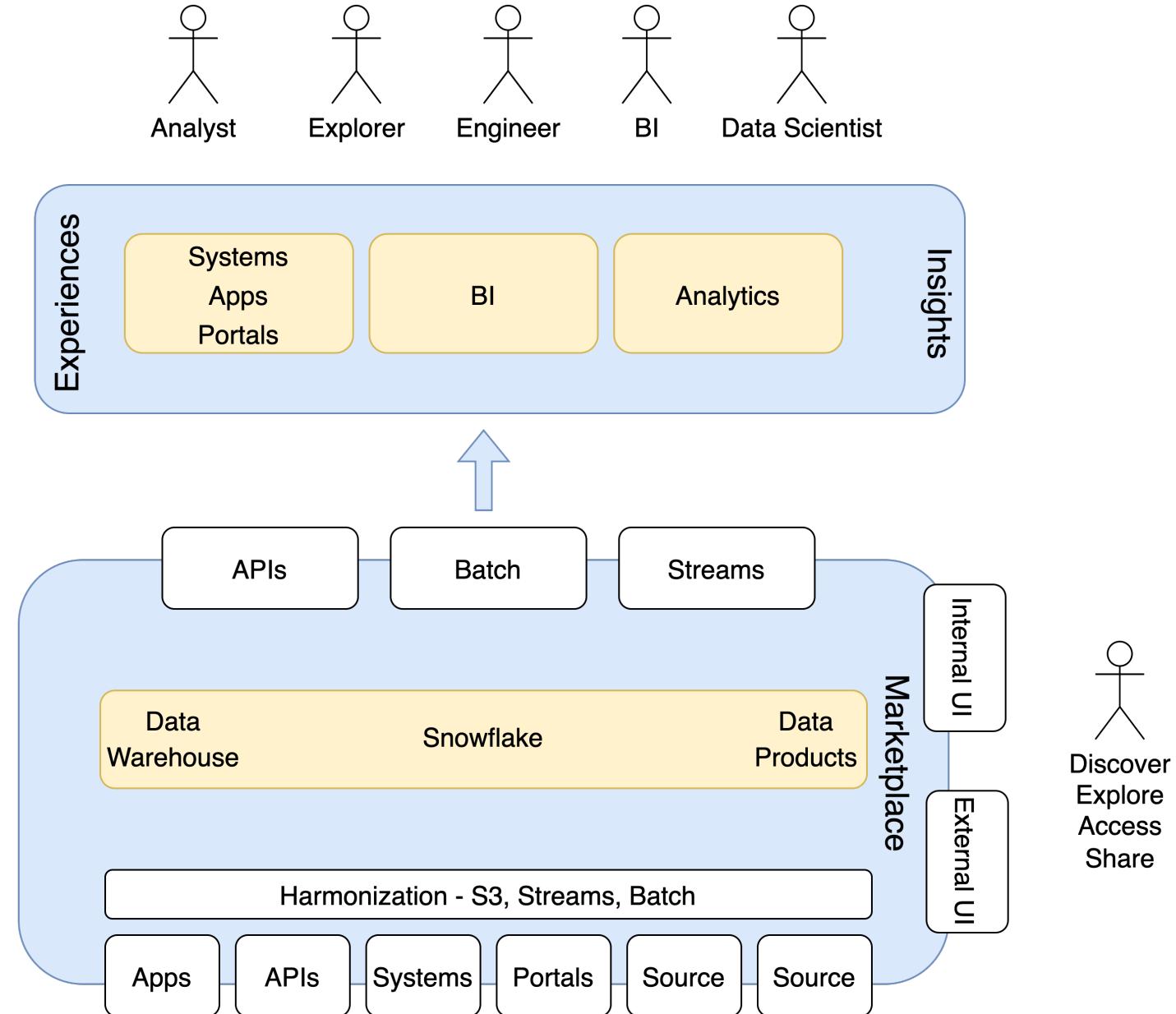
Data Infrastructure as a Platform

- There is a long list of capabilities that a self-serve data infrastructure as a platform provides to its users, a domain's data engineers. Here are a few of them:
 - Scalable polyglot big data storage
 - Encryption for data at rest and in motion
 - Data product versioning
 - Data product schema
 - Data product de-identification
 - Unified data access control and logging
 - Data pipeline implementation and orchestration
 - Data product discovery, catalog registration and publishing
 - Data governance and standardization
 - Data product lineage
 - Data product monitoring/alerting/log
 - Data product quality metrics (collection and sharing)
 - In memory data caching
 - Federated identity management
 - Compute and data locality

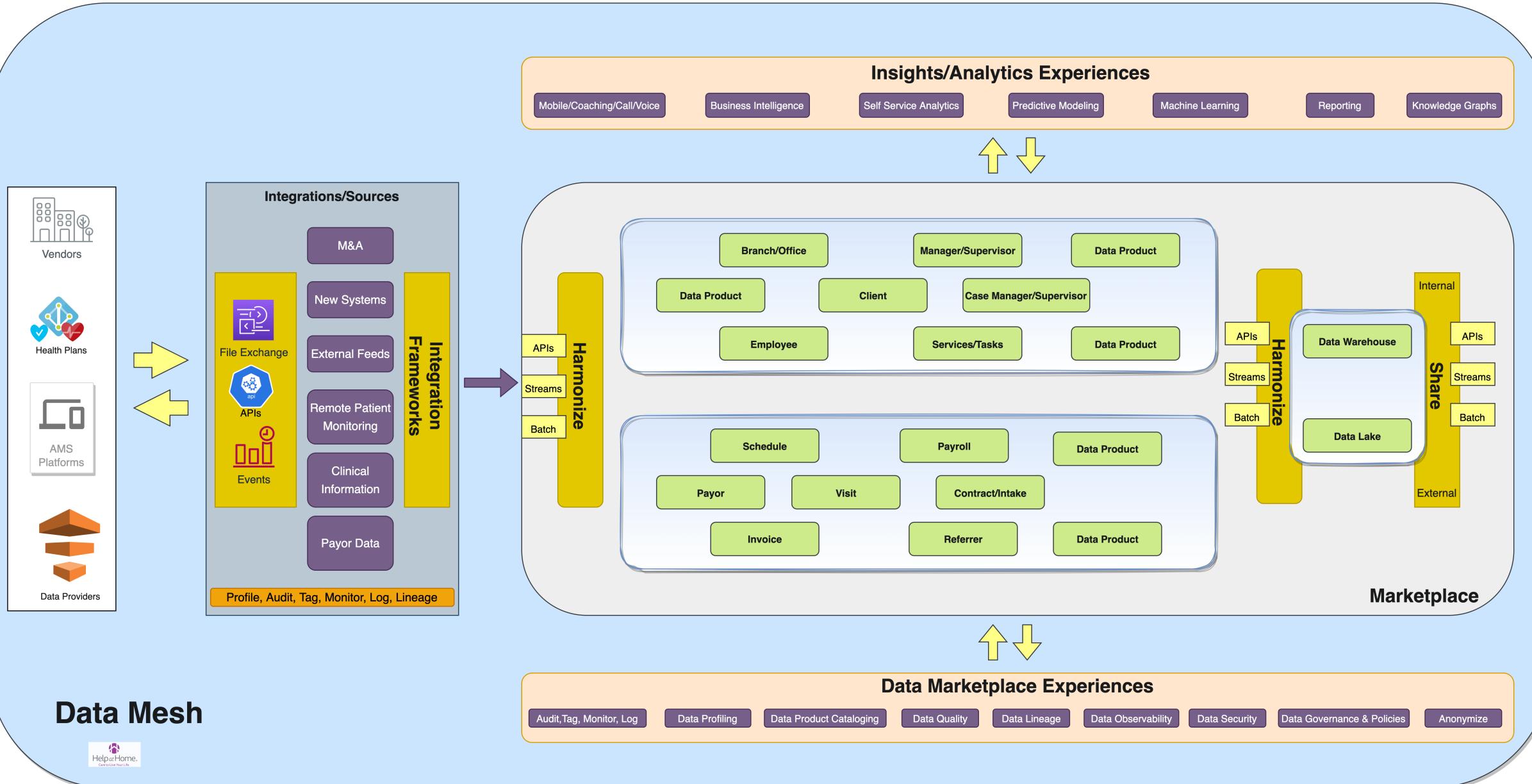
Develop a technology platform that will support the Business Strategy



Develop a technology platform that will support the Business Strategy



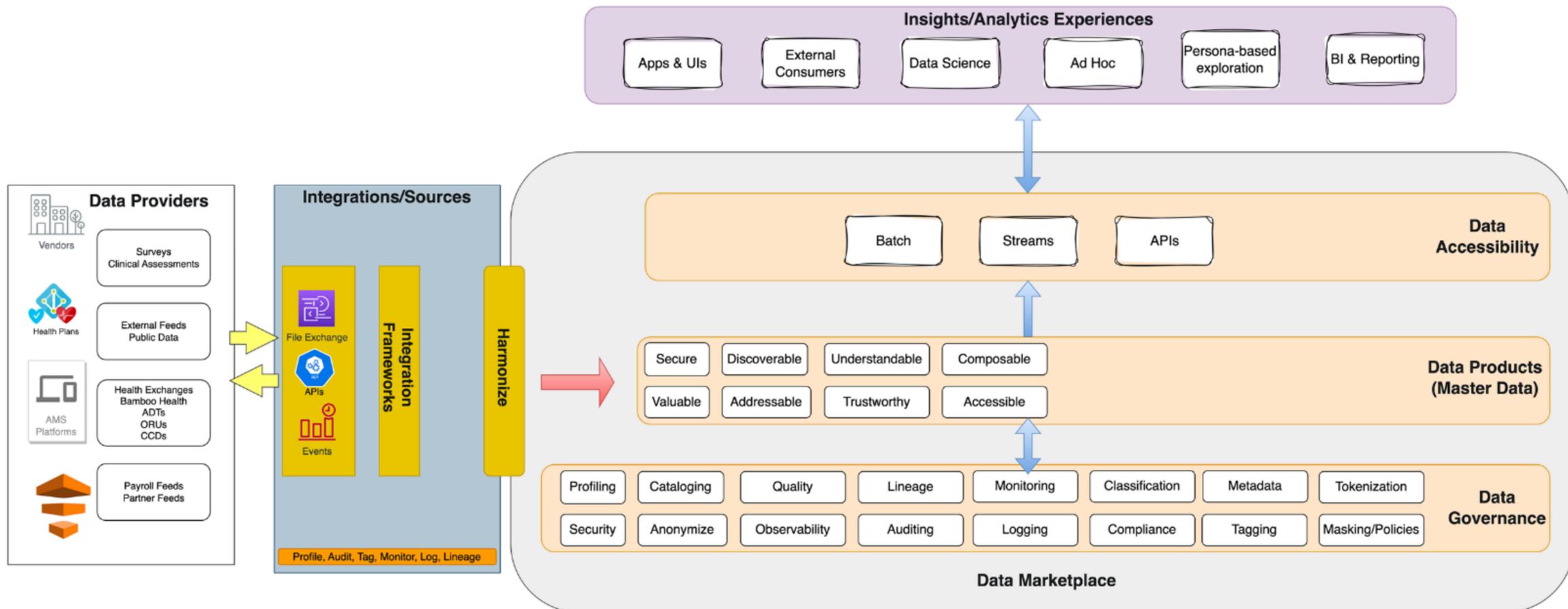
Data Mesh Architecture to Support the Business Strategy



Data Mesh

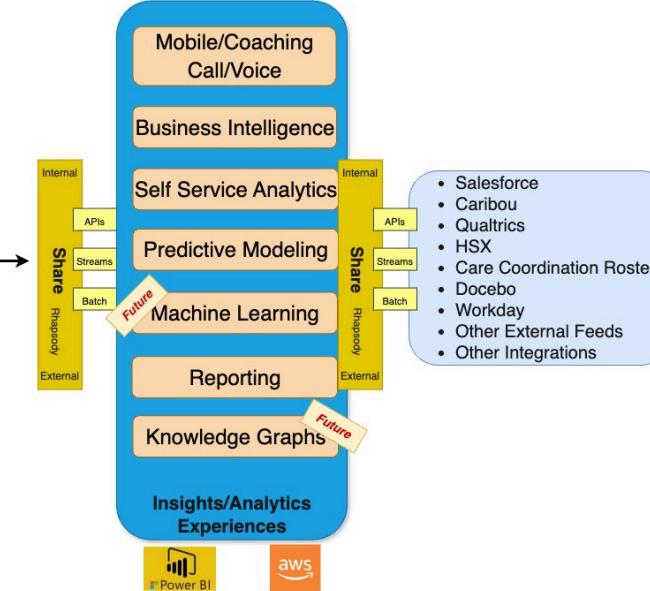
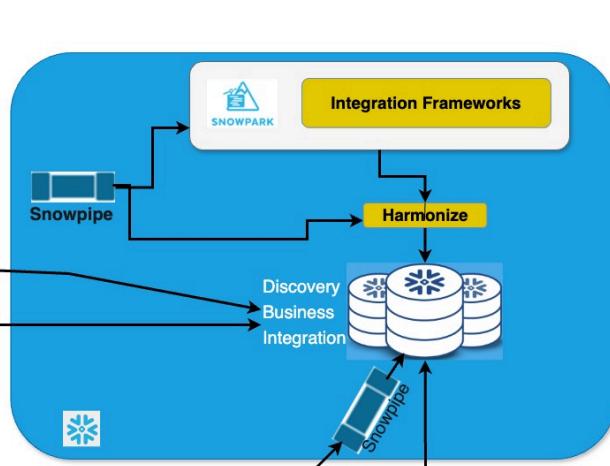
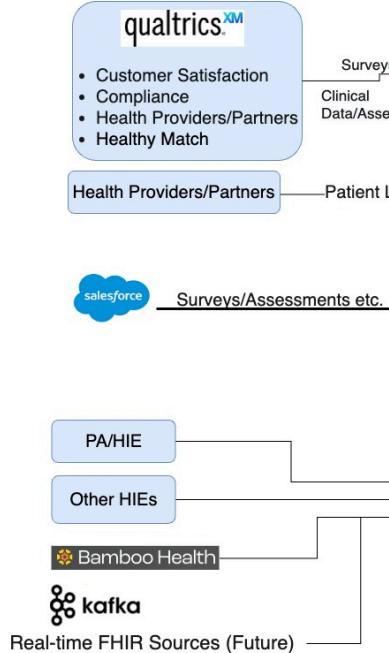


Data Mesh Architecture to Support the Business Strategy



Implementation Approach

Data Providers & Integrations/Sources



Data Providers & Integrations/Sources