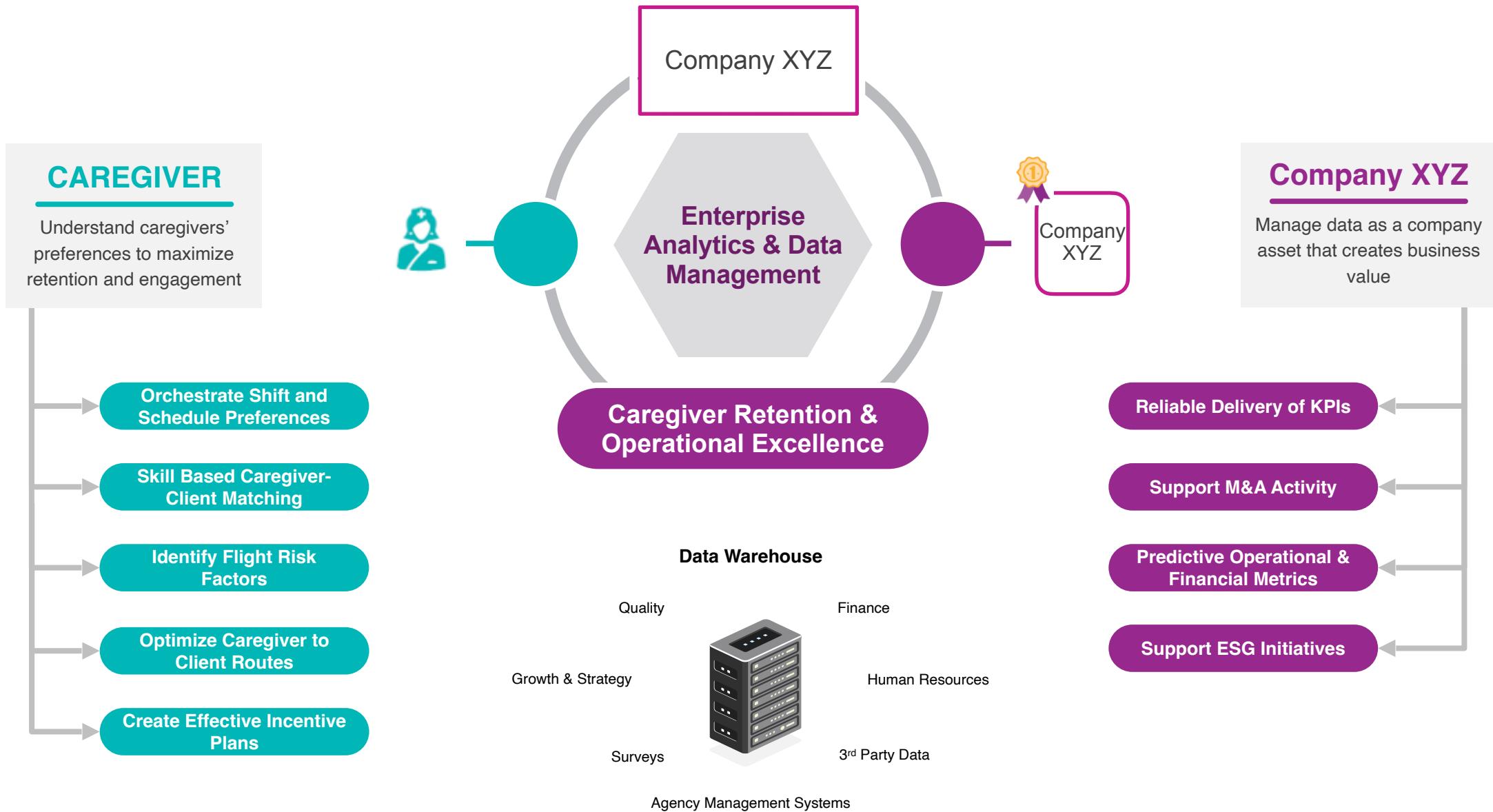
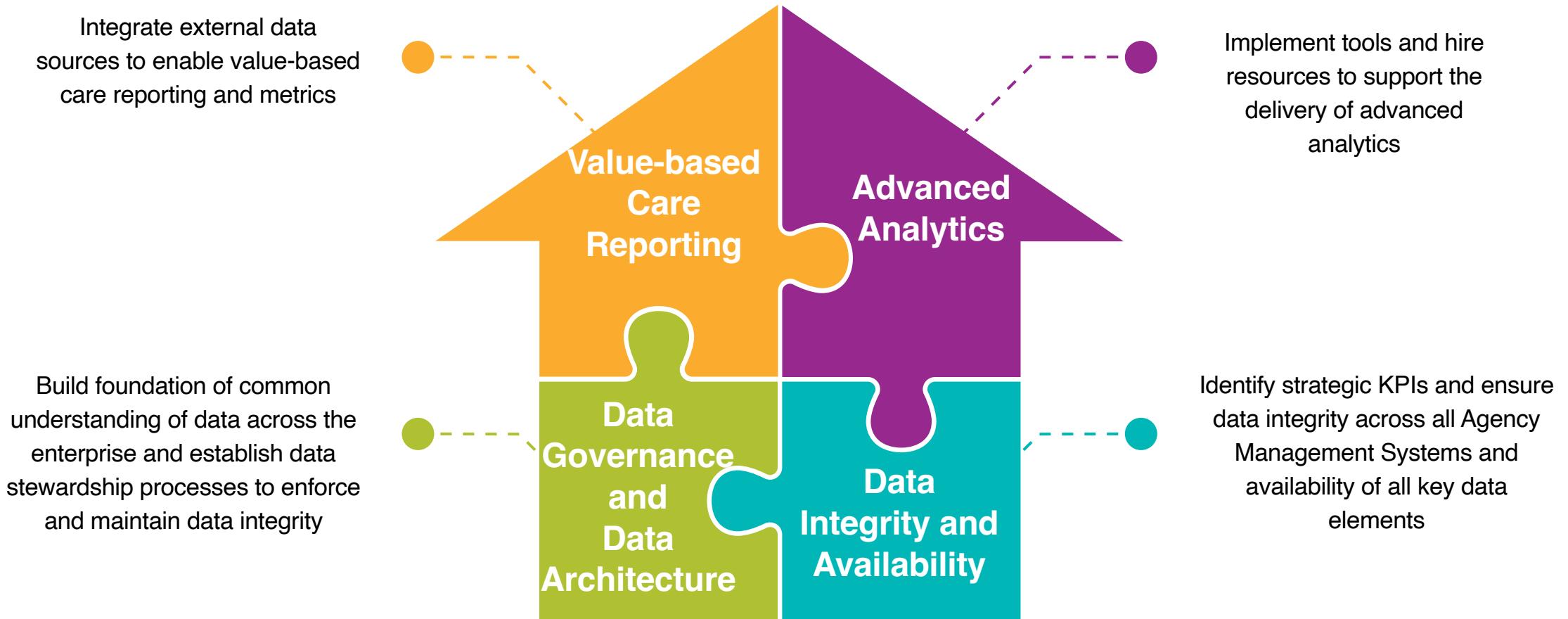


# Data Marketplace

# Operational Analytics – Vision - Example



# Client Centric Analytics – Building Blocks - Example



# Delivering Insights to Support Business Growth - Example

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

## 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 – Details

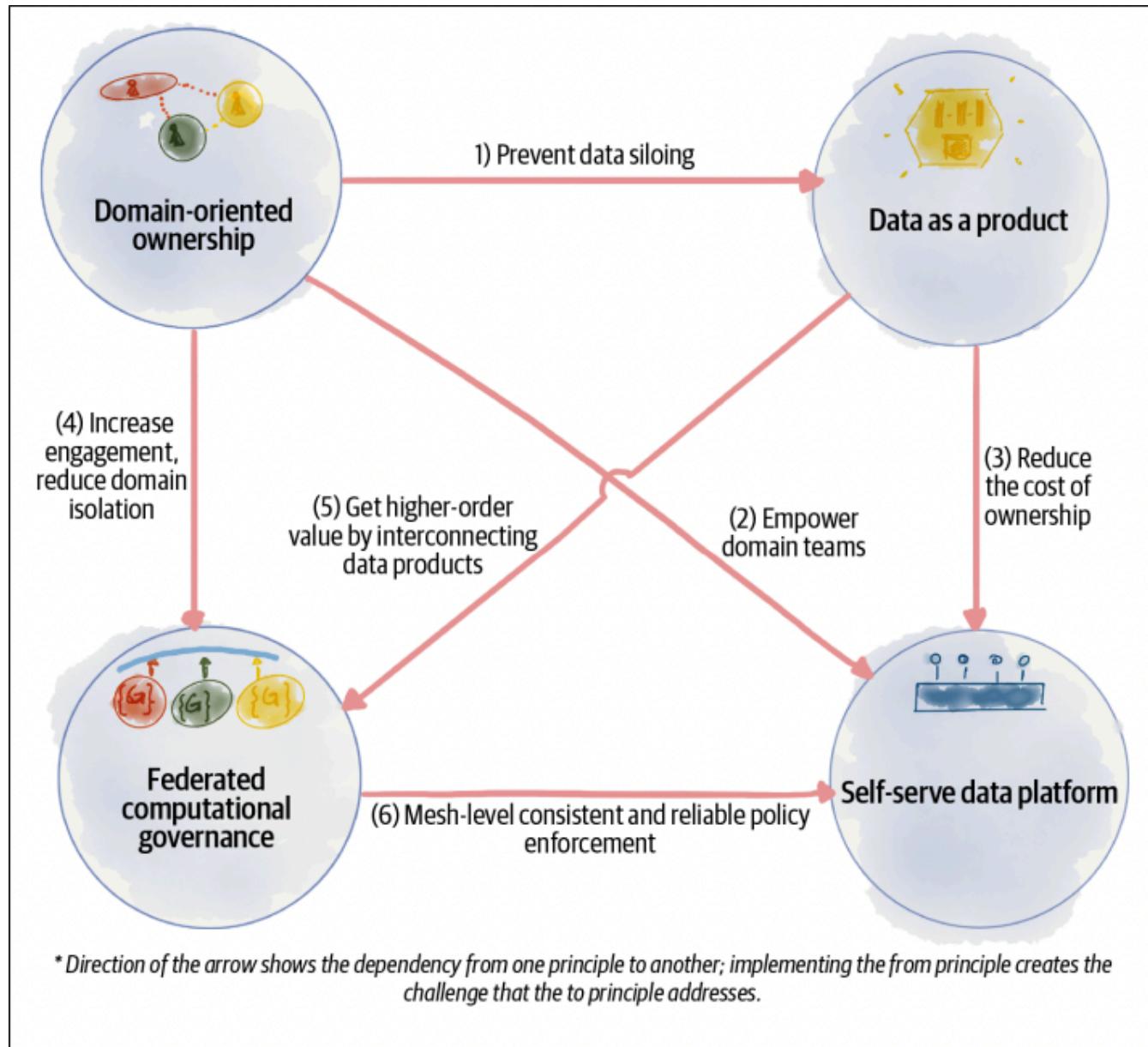
- Data management – create and implement architectures, policies, and procedures that manage the full data lifecycle needs
- Improve our overall approach to data as a “marketplace”
  - Ingest, Integrate, Curate, Share data as a share capability and a product for the enterprise
    - ◆ Broad access to data for better business decisions
    - ◆ Research and compose new business capabilities
    - ◆ Helps 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

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- 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

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- 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

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- 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 Example

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- 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?

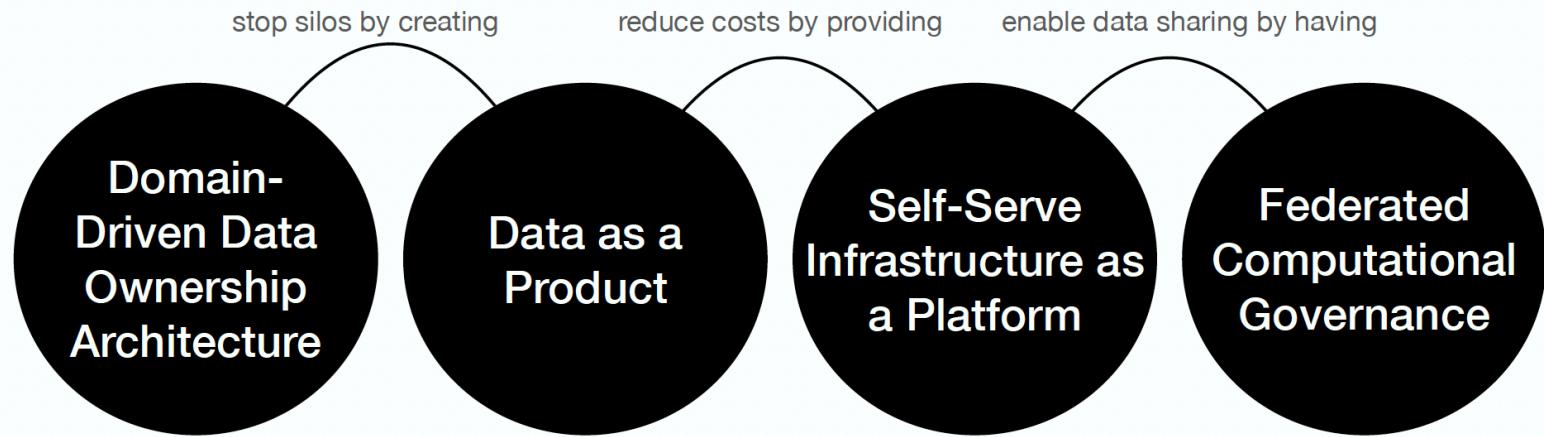
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- As a data provider, you can:
  - Publish data listings for free-to-use datasets to generate interest and new opportunities
  - Publish data listings for products that can be customized for the consumer
  - Share live datasets securely and in real-time 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*



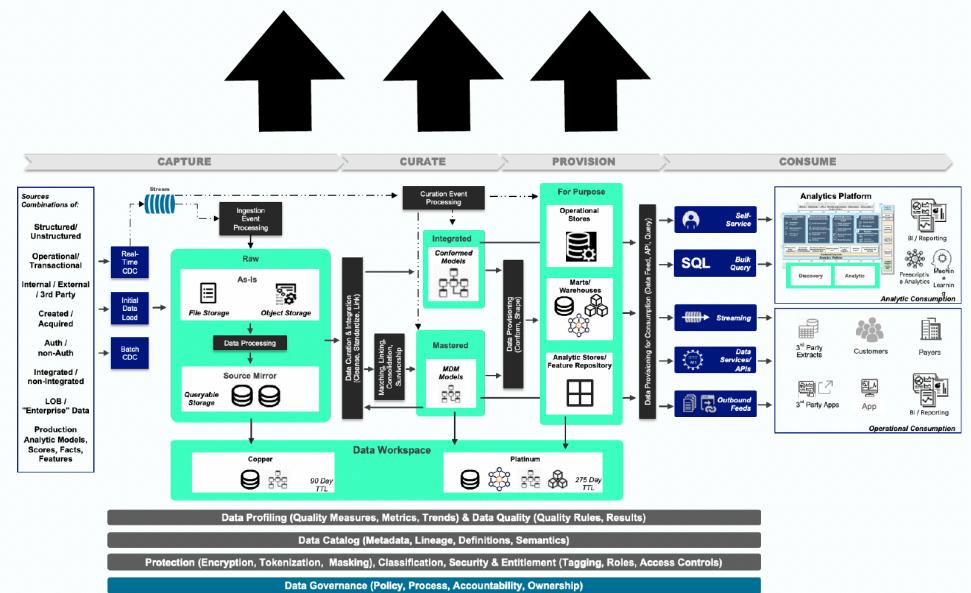
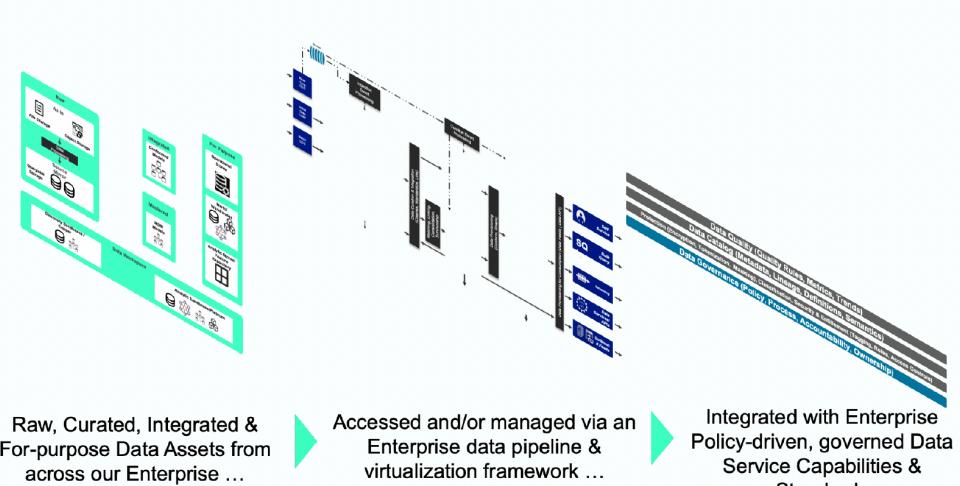
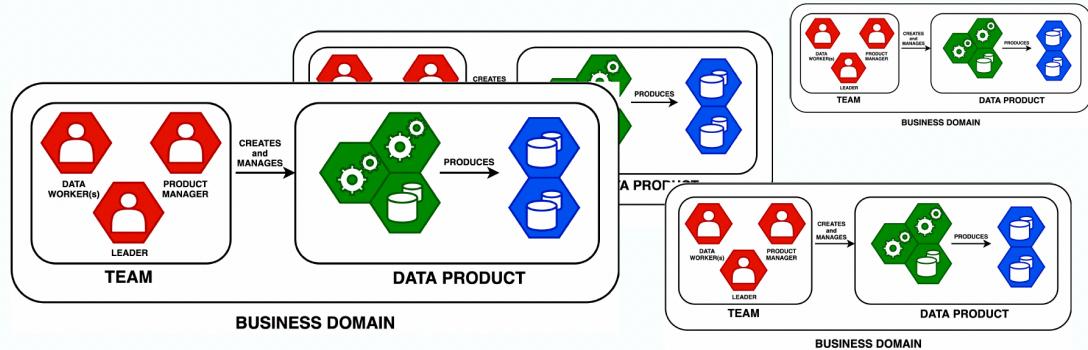
## Domain Data as a Product

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- 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



## ENTERPRISE DATA PLATFORM

- Cloud Data Patterns
- Data Movement (ETL, Streaming)
- Data Virtualization
- Data Integration & Interoperability
- Master Data Management
- Data Warehouses
- External Data Ingestion & Publication
- Data Cache Consistency Patterns

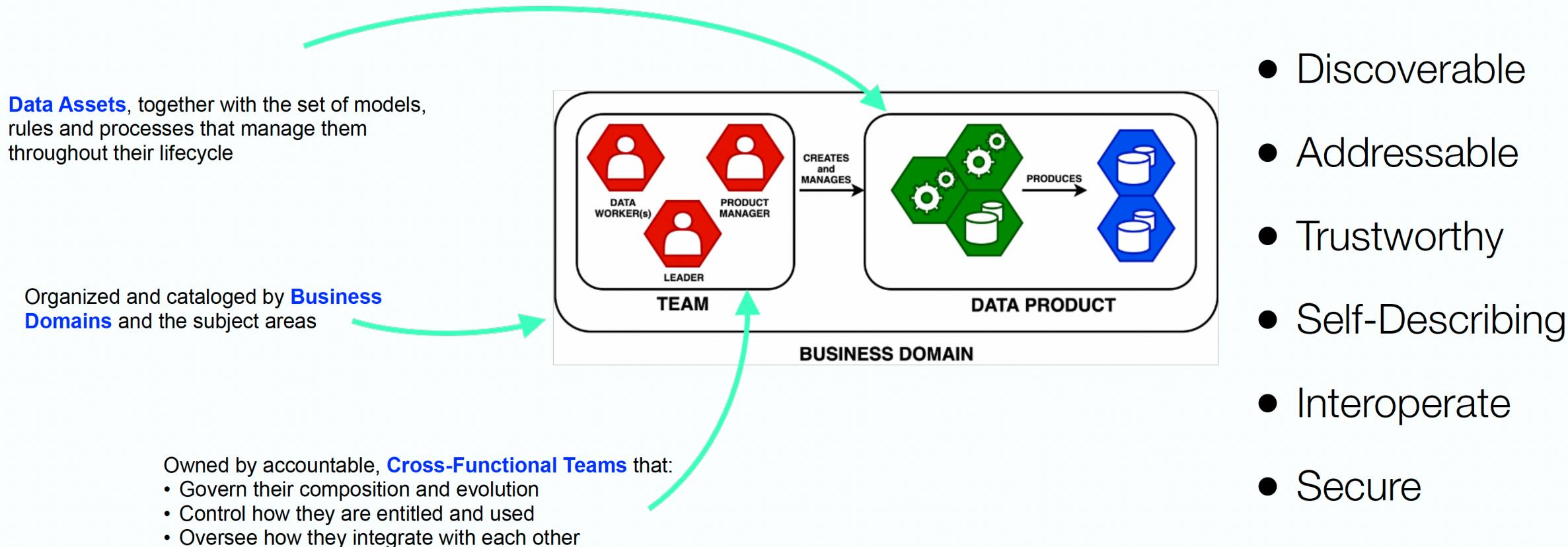
## ANALYTICS PLATFORM

- Cloud Processes & Tooling
- Data Prep & Exploration
- Model Development & Deployment
- AI/ML Recommendations
- Data Visualization & Dashboarding
- Business Operationalization Outcome Measurement

## Domain Data as a Product

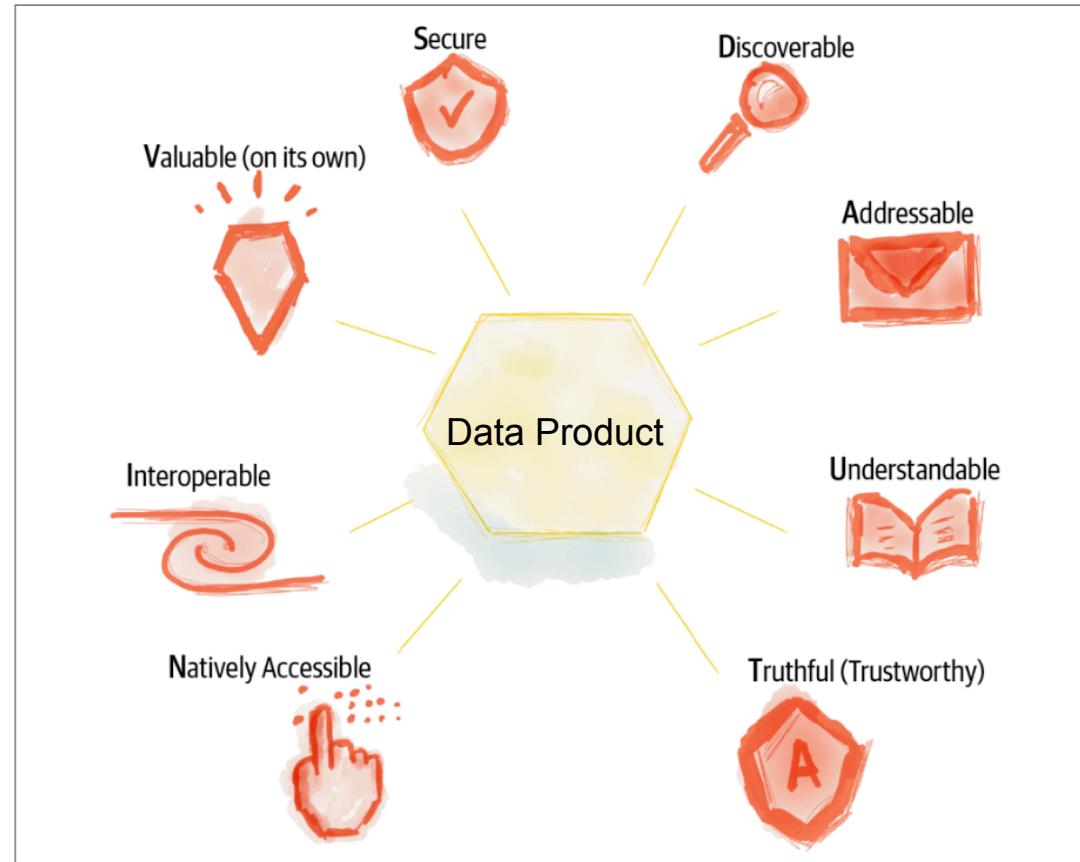
# Data Products | Domain-oriented Decentralized Data Ownership

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

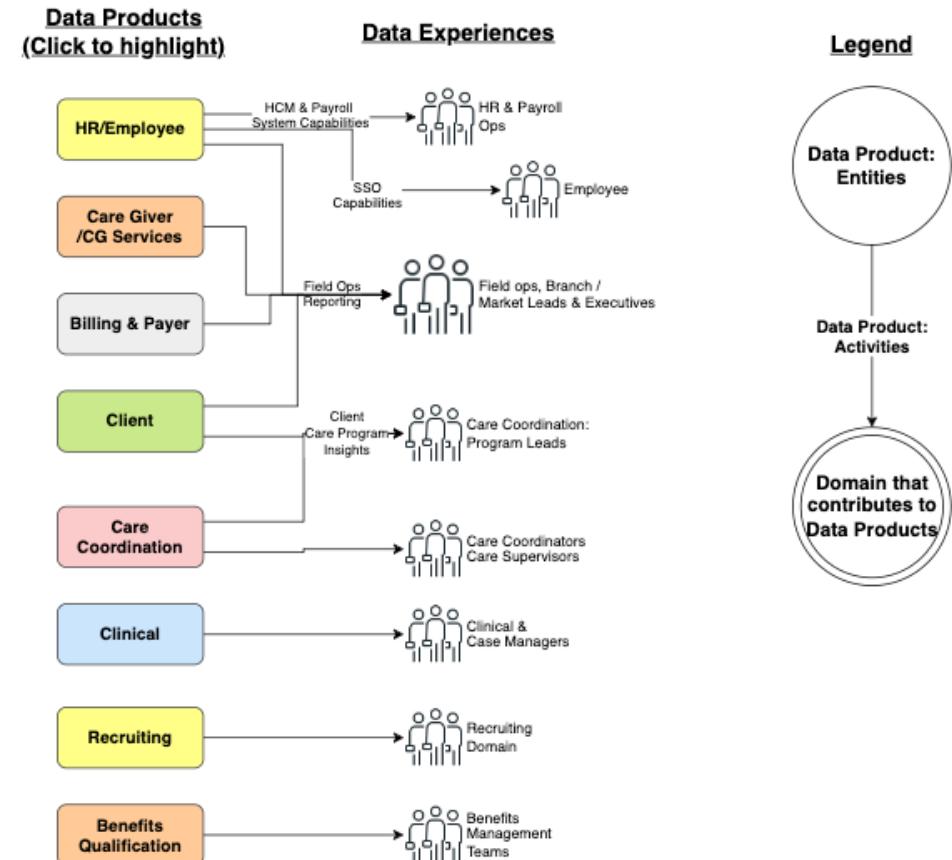
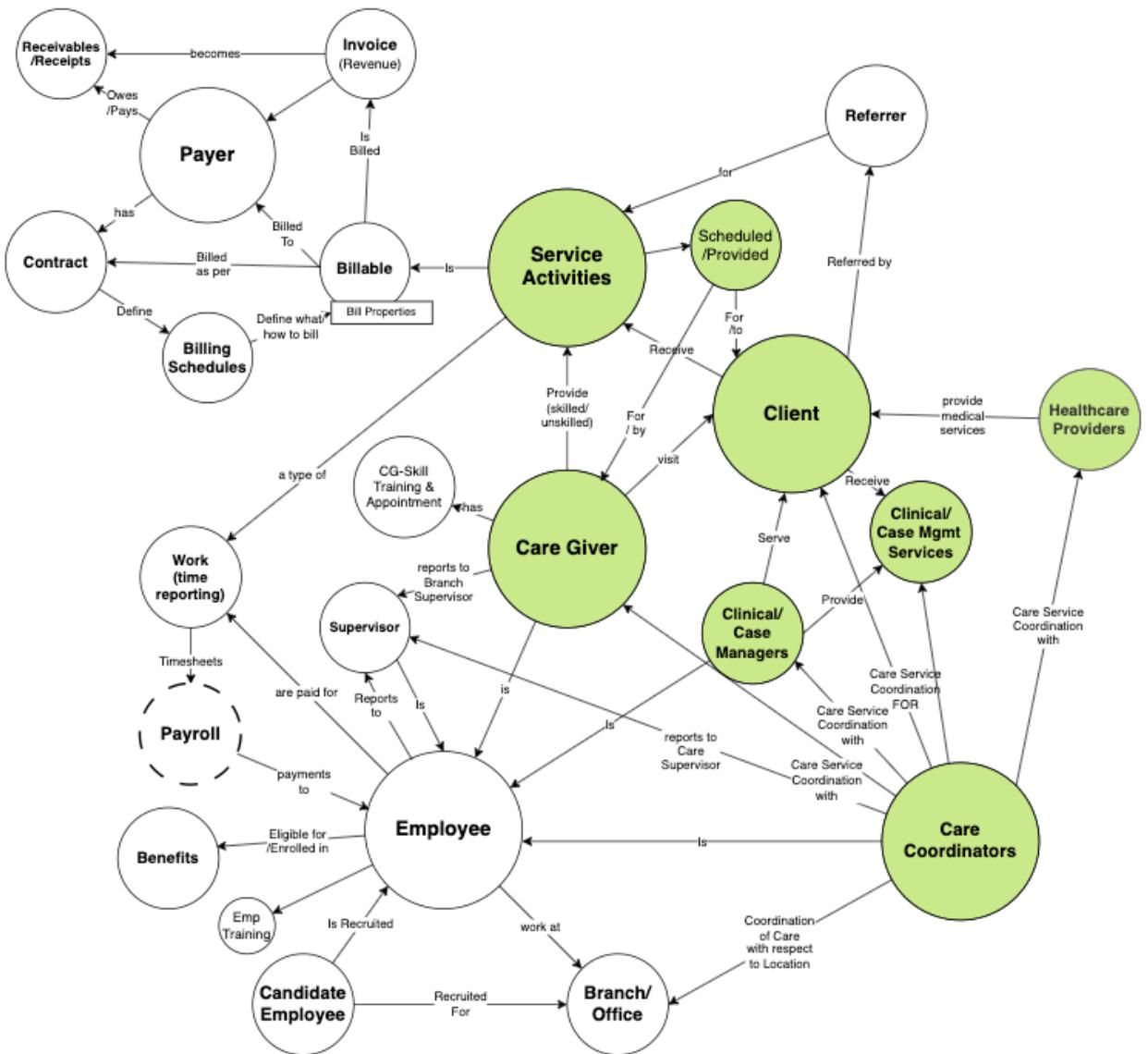


# Data as a Product – Usability Attributes

- **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

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- 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

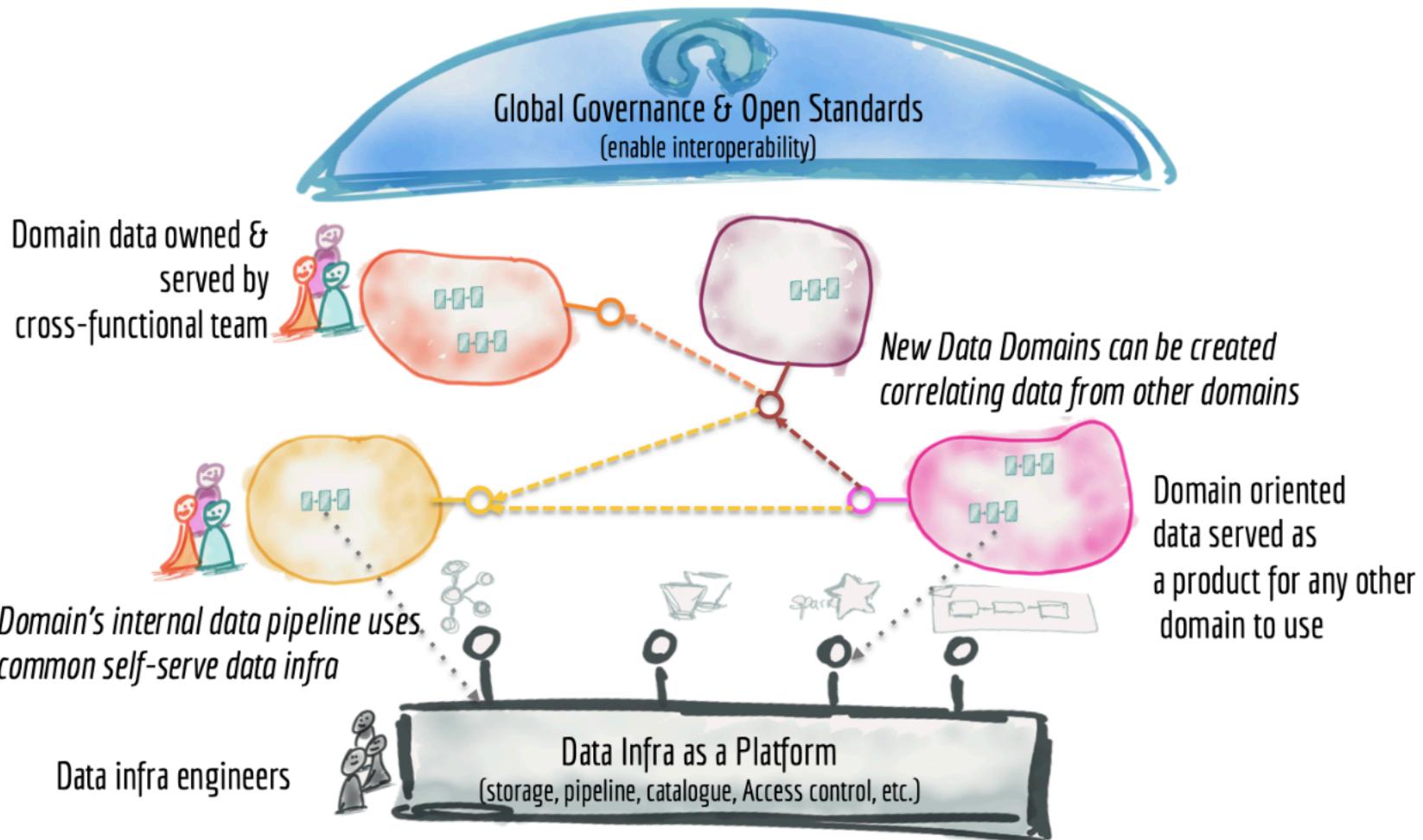


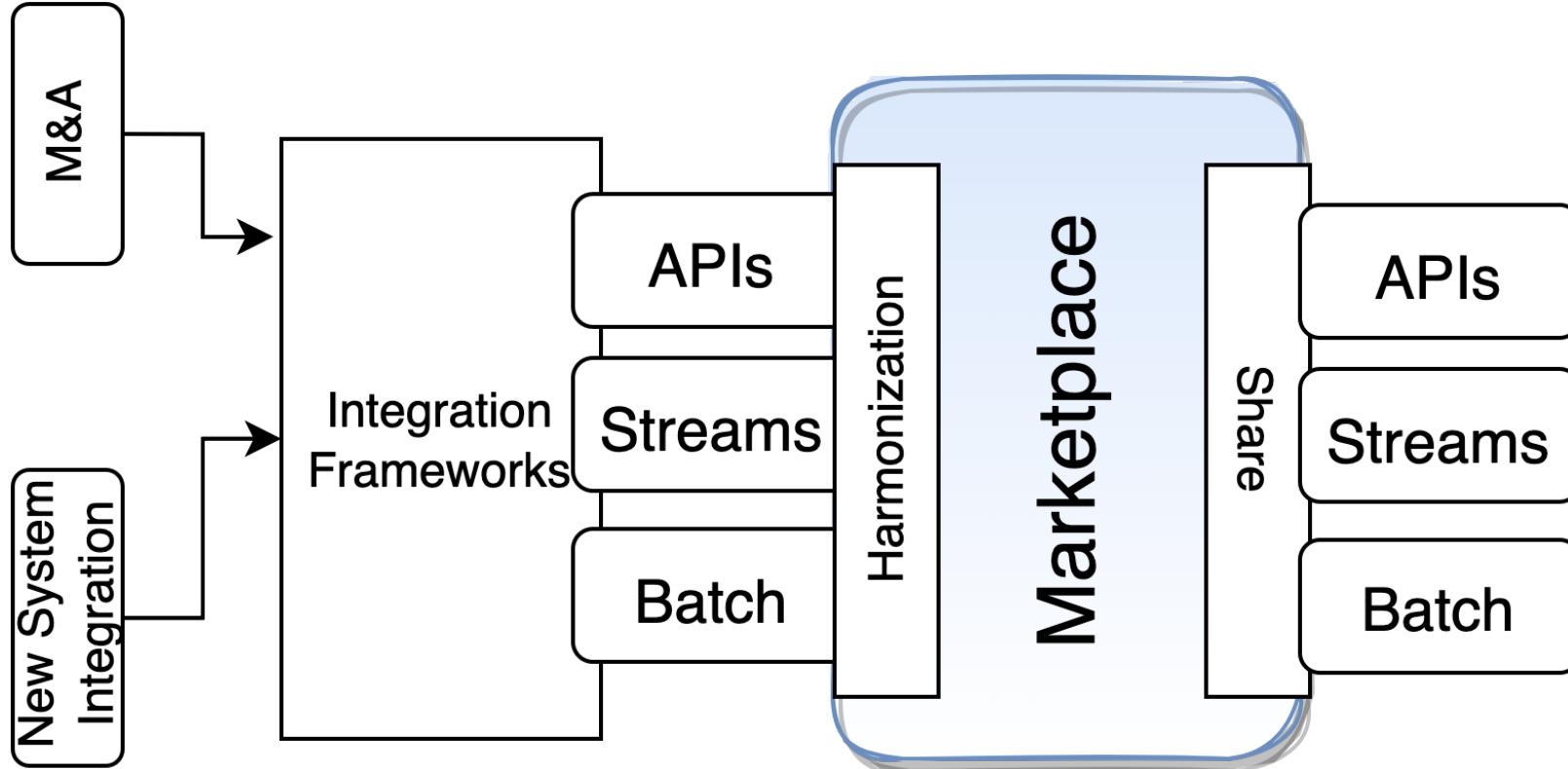
Figure 12: Data mesh architecture from 30,000 foot view

## Data Infrastructure as a Platform

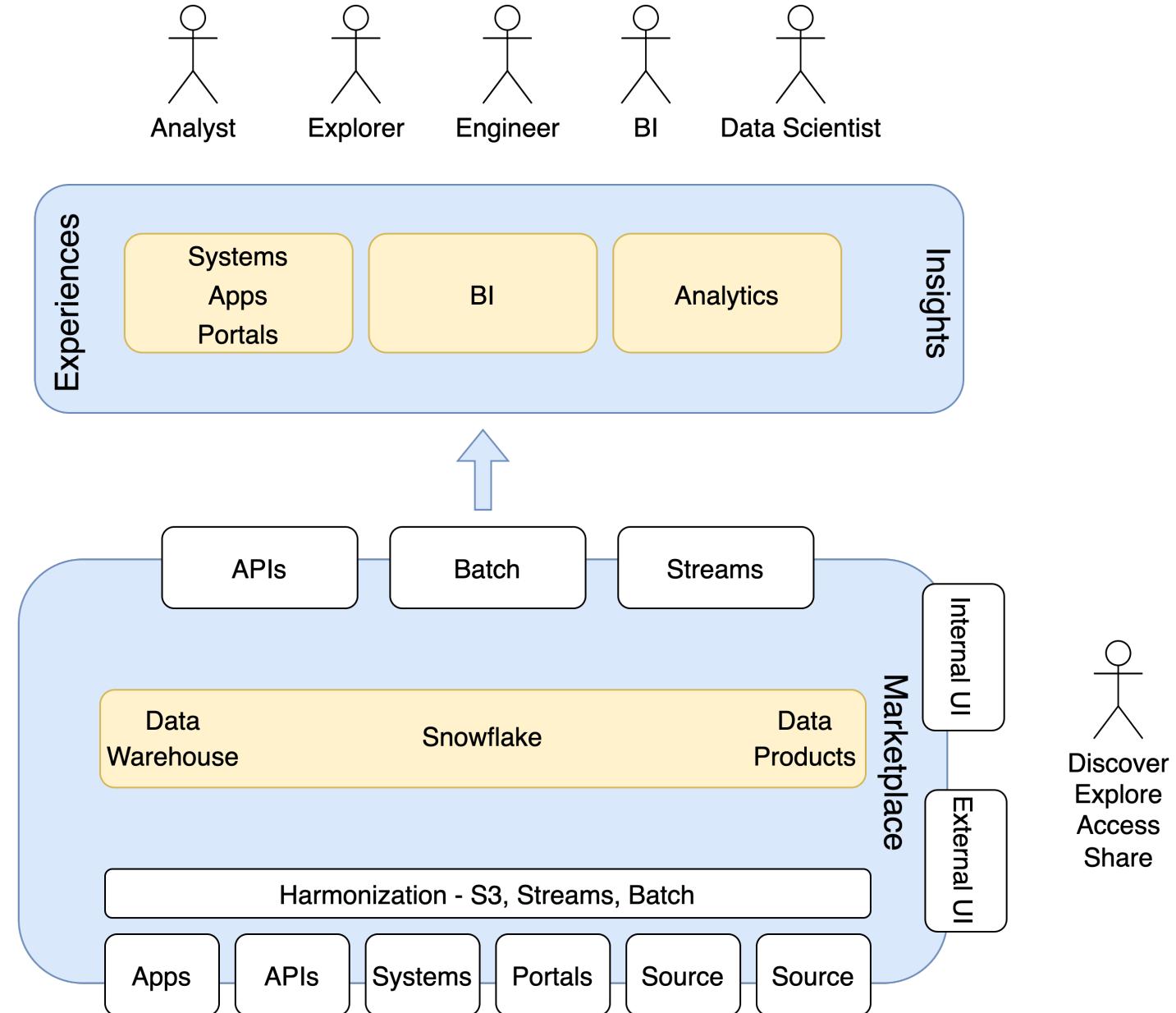
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- There is a long list of capabilities that a self-serve data infrastructure as a platform provides to its users, a domain's data engineers. Here are a few of them:
  - Scalable polyglot big data storage
  - Encryption for data at rest and in motion
  - 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

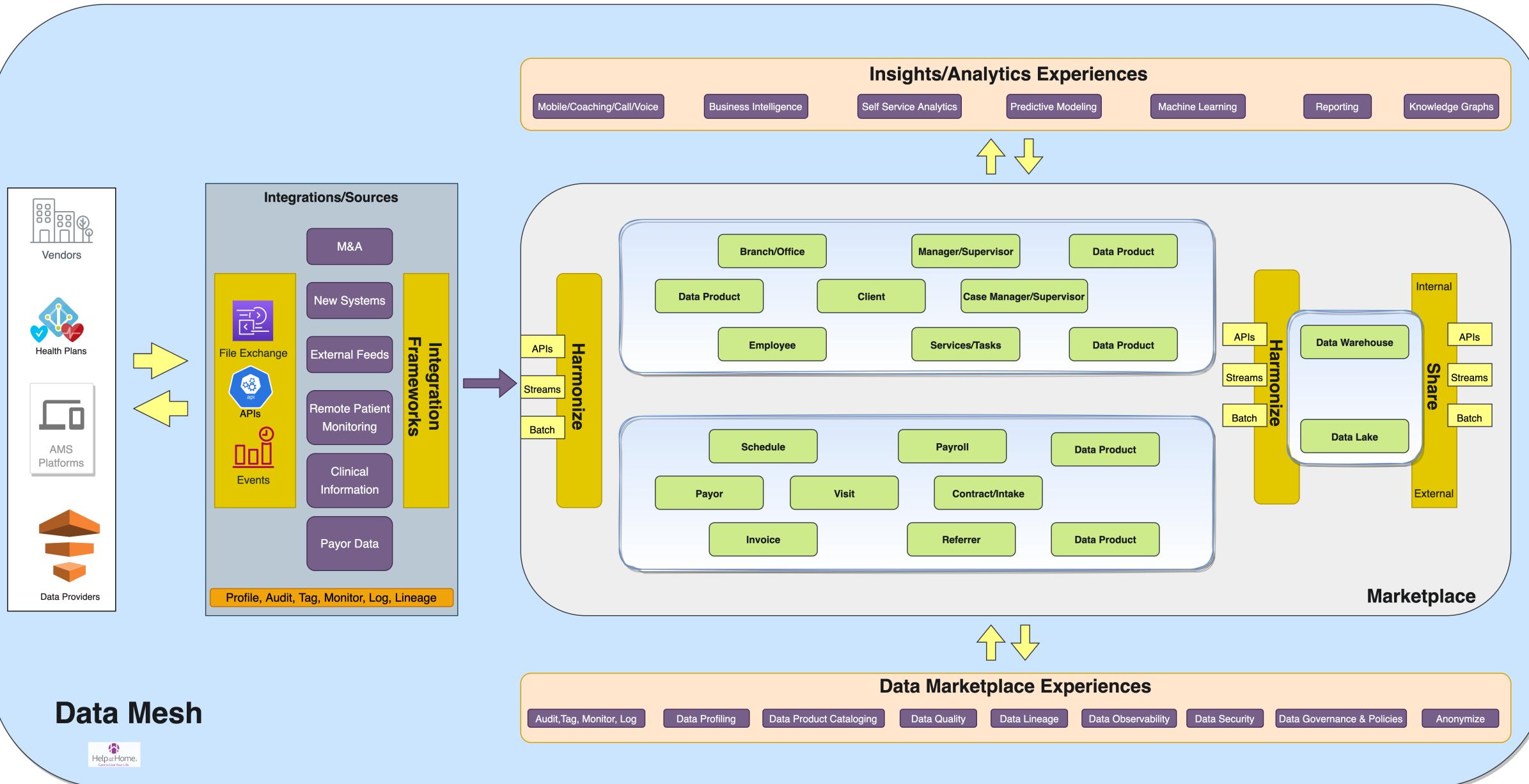
# Develop a technology platform that will support the Business Strategy



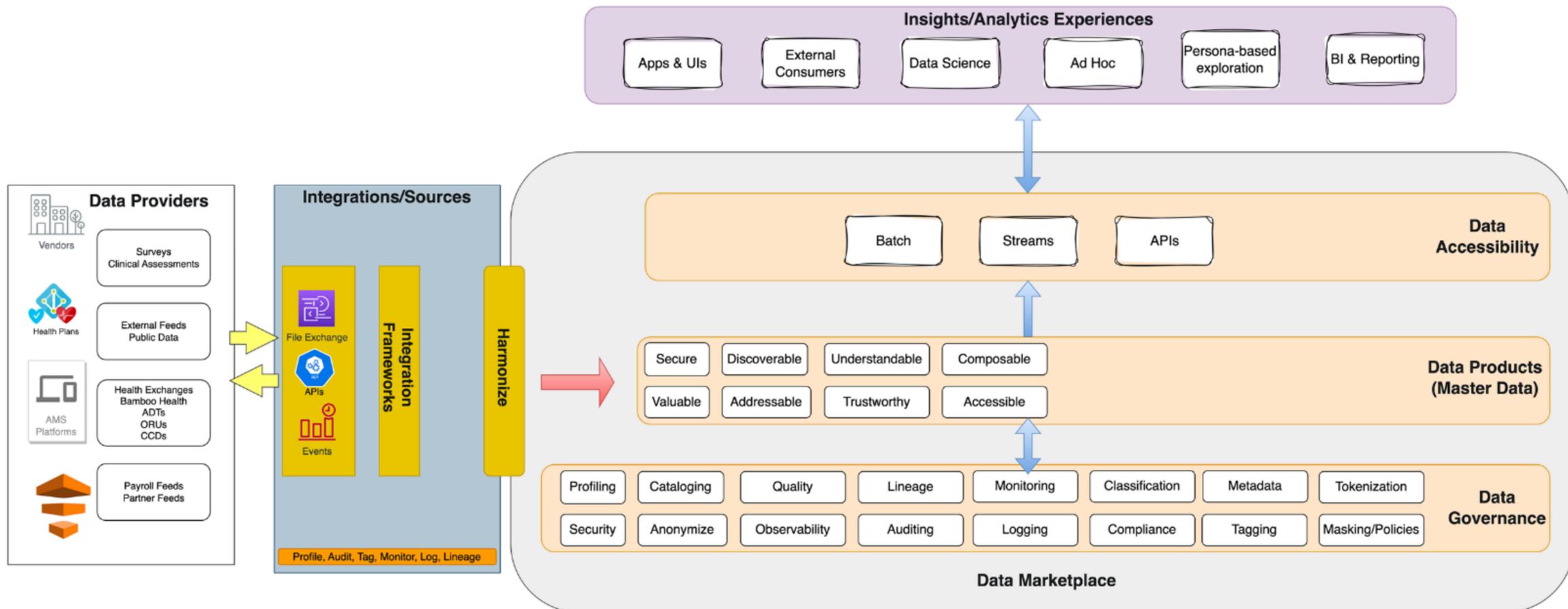
# Develop a technology platform that will support the Business Strategy



# Data Mesh Architecture to Support the Business Strategy

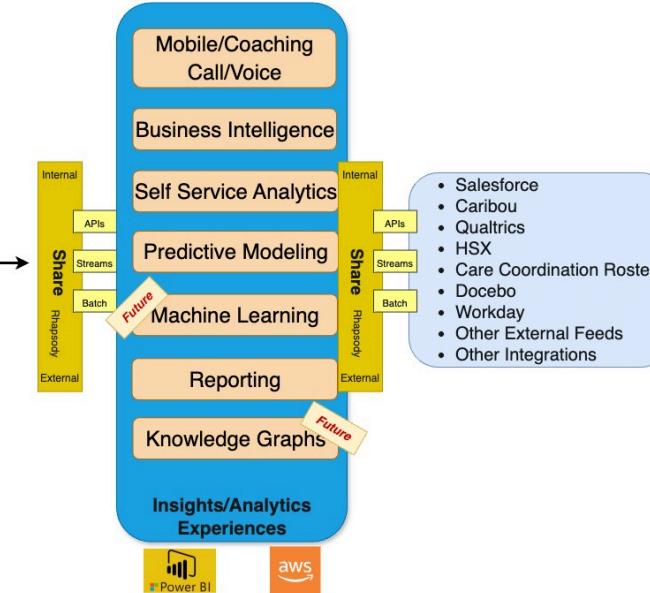
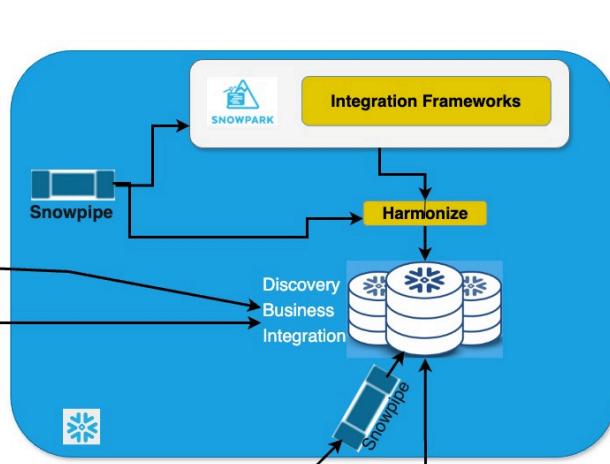
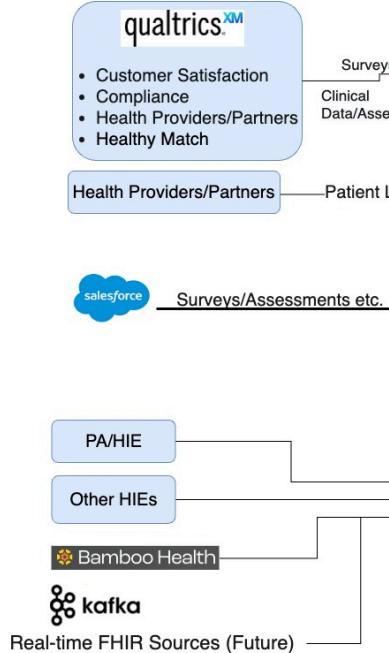


# Data Mesh Architecture to Support the Business Strategy



# Implementation Approach

## Data Providers & Integrations/Sources



## Data Providers & Integrations/Sources