HURRY UP AND WAIT

OUR JOURNEY TO SAME DAY EXPERIMENTS AND BIG DATA SUPER POWERS

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LEADING HEALTH CARE TRANSFORMATION

Blue Cross and Blue Shield of North Carolina

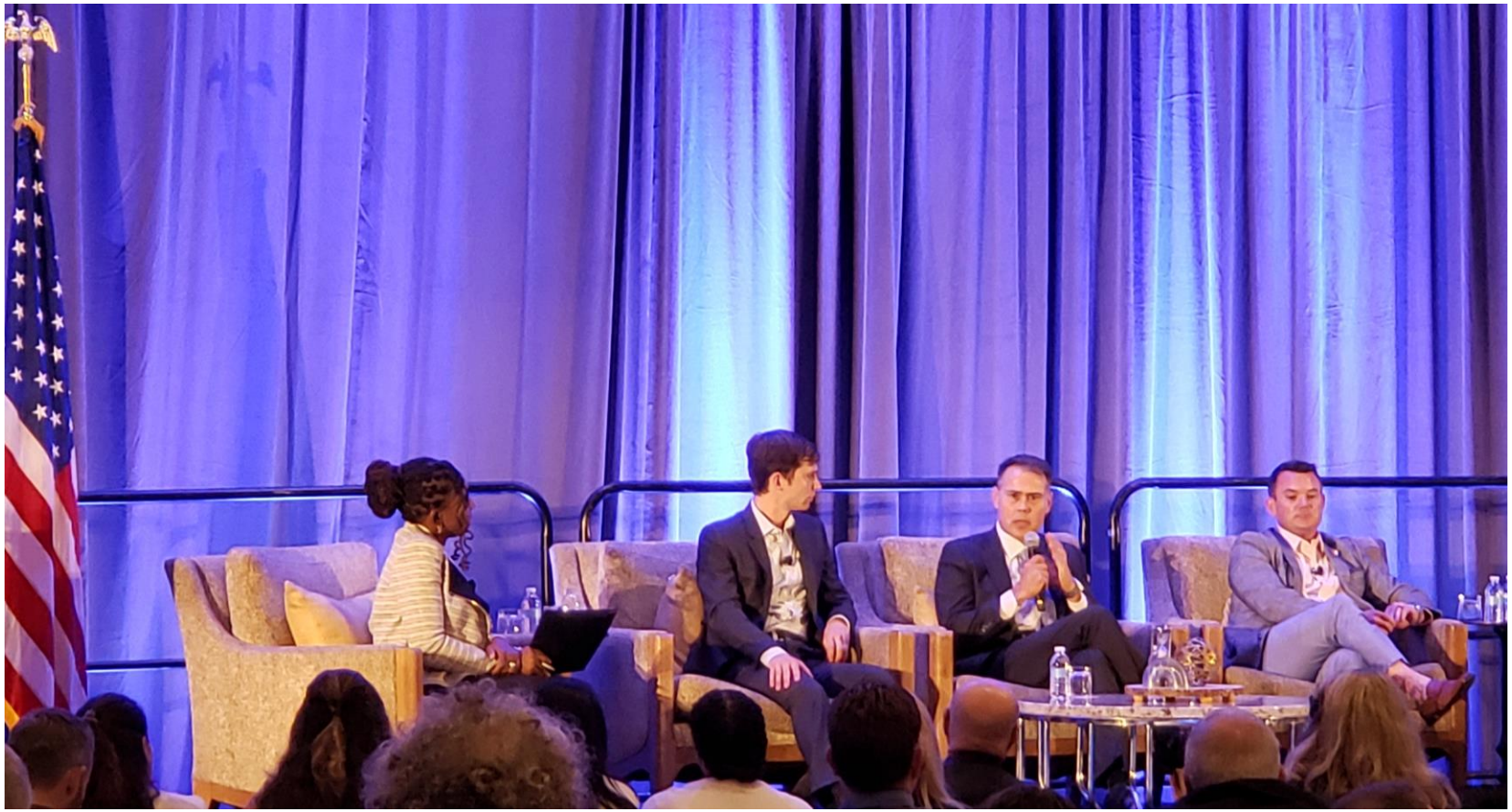
- Almost 4 million members
- Approximately 5,000 employees
- Over $10 billion revenue
- Insure majority in NC commercial market, many for most of their lives

FEDERAL PUSH TO OPEN DATA

CMS: Interoperability Rule

TACKLING THE BARRIERS

Panel at ONC



COMMITTING TO CHANGE

Our pledge to lead:

HHS Office of the Chief Techn... · 19h

These industry leaders are recognized for being influencers with Blue Button & FHIR #bbdc19 👏

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WHAT'S THE BIG DEAL?

Data at the Point of Care

Gives physicians a member's history

Continuity of care across providers

Insights into medication history and adherence

WHAT'S THE BIG DEAL?

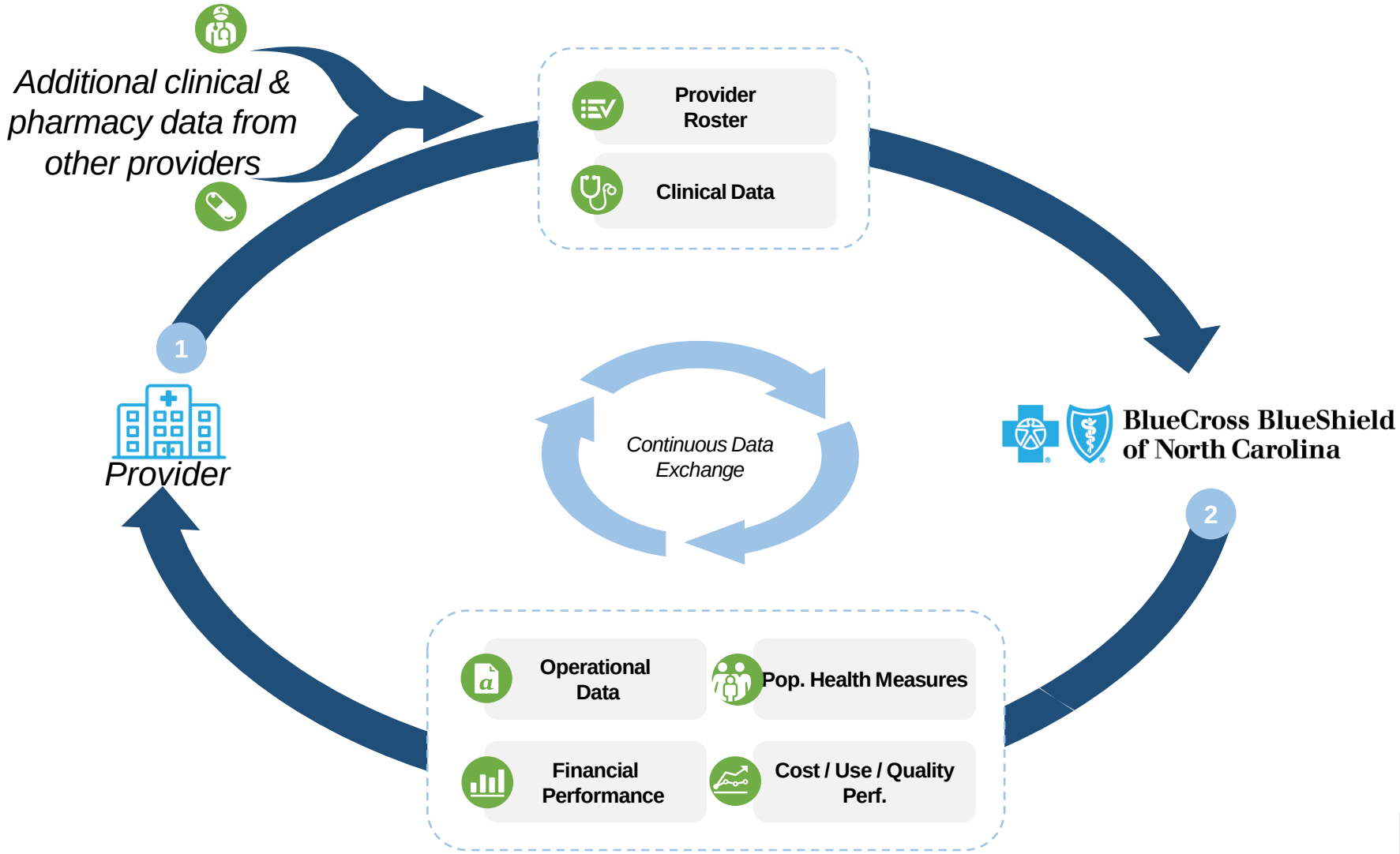
Data at the Point of Care

Reduce burden of documentation

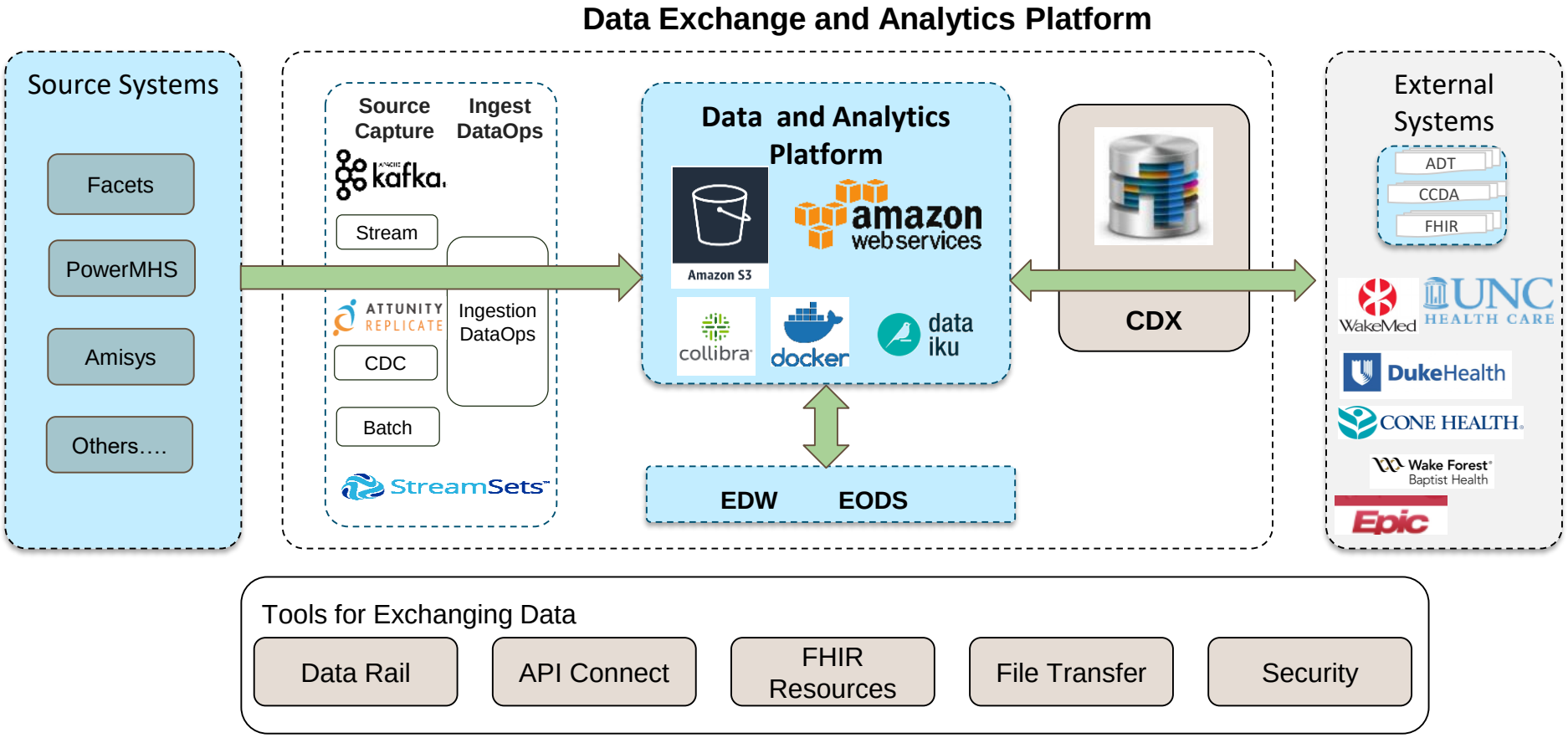
More time for patient care

Keeps the team in sync

VALUE-BASED HEALTHCARE DATA CYCLE

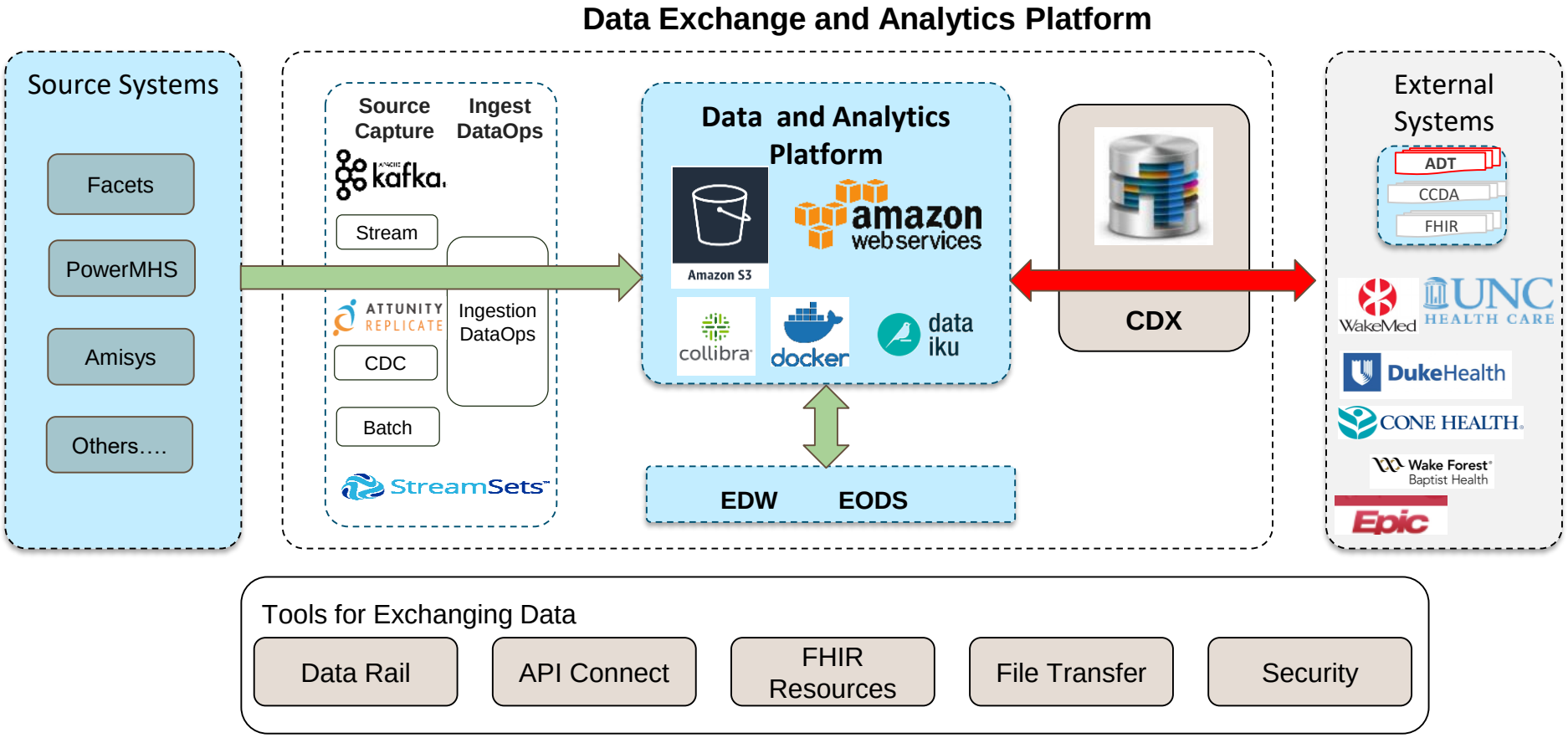


VALUE & QUALITY: OUR INTEROPERABILITY WORK

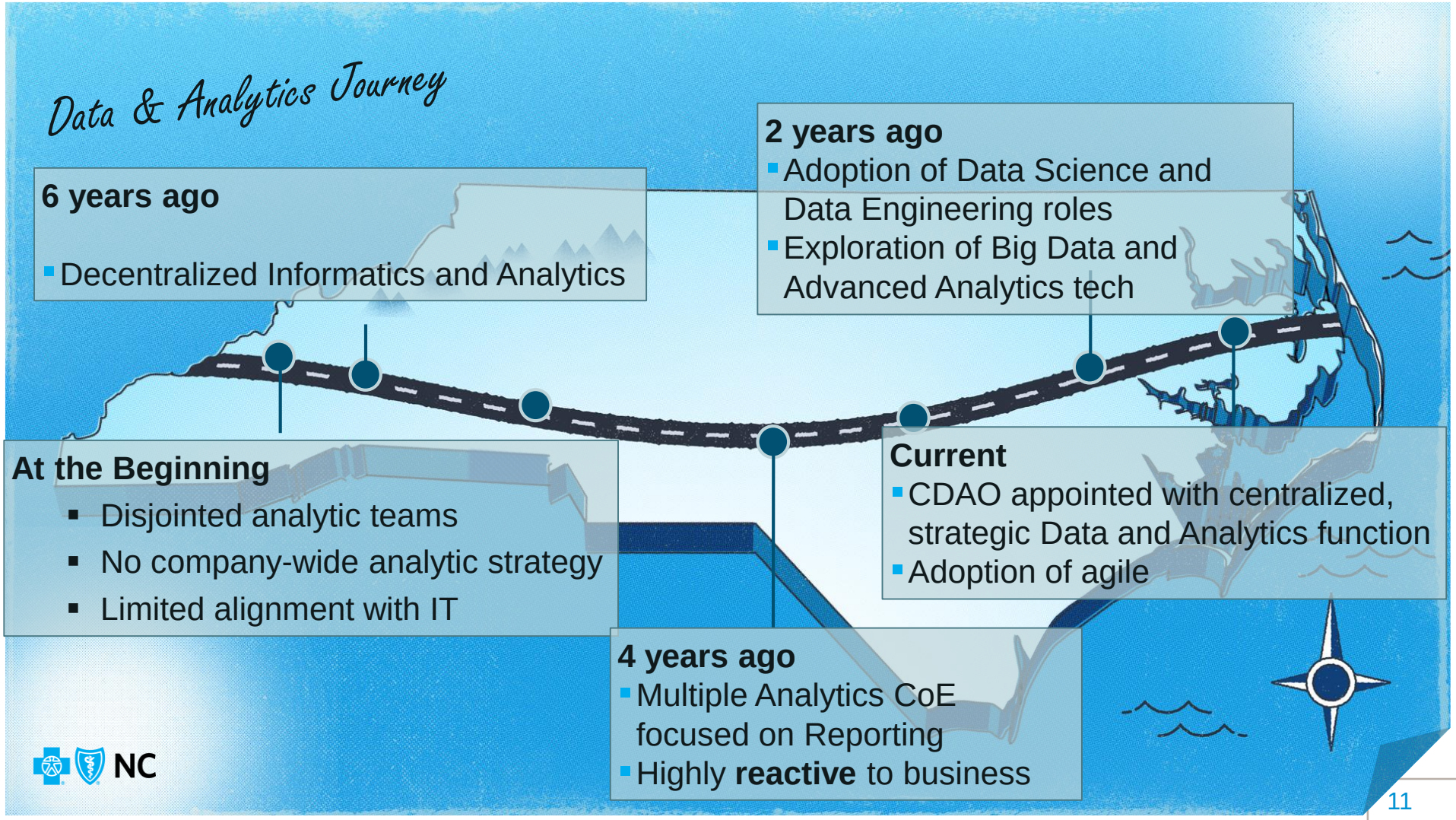


VALUE & QUALITY: OUR INTEROPERABILITY WORK

Piloting the Strategy with UNC

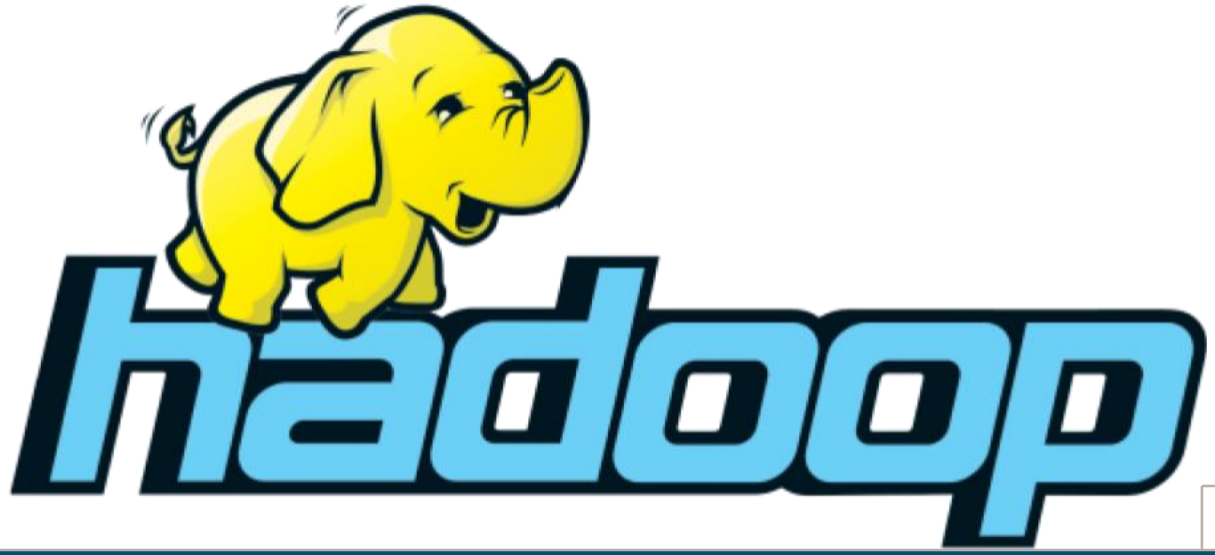


OUR ANALYTICS JOURNEY WAS MANY YEARS IN THE MAKING



-3 YEARS AGO : BIG DATA START

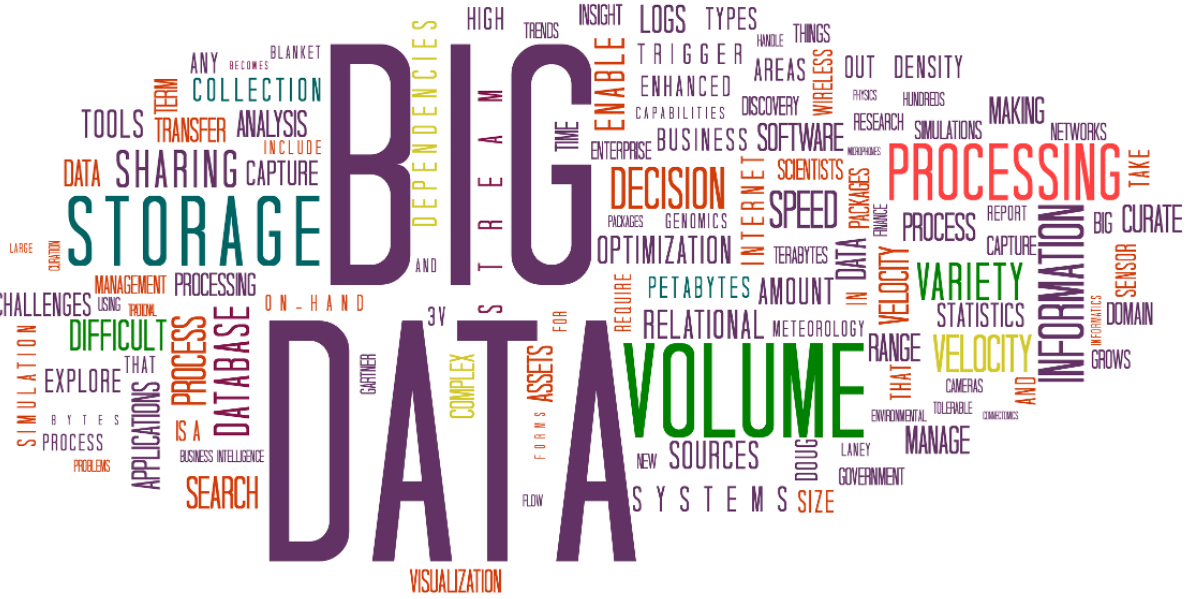
- Typical Design of an on-premise Hadoop
- Manually built, configured, and maintained
- Simple toolset for individual users
- Jupyter Notebook Server
- HUE
- R Server
- EC2 on AWS



"What's a data lake for?
So you can drown in more data even faster!"

-2.5 YEARS : QUICK LET'S GET THE DATA

- Enterprise Data Lake
- Ingestion framework – not automated
- Moderately successful
- Defeated by using secondary sources



- 2 YEARS : OUR PLATFORM PAIN POINTS

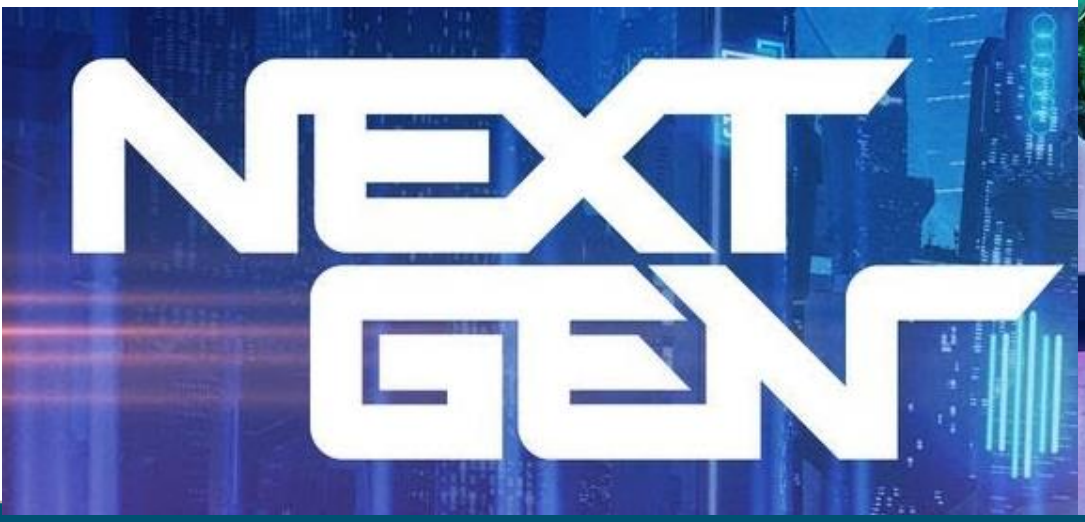
- Local HDFS storage
- “Fixed” size cluster – can not scale compute
- Kerberos – the good the bad and the ugly
- Managed Platform
- Could not test Configuration Changes
- Very slow and difficult to make Configuration Changes

- 2 YEARS : DATA INGESTION PAIN POINTS

- Slow to onboard new data
- Every source was a new battle
- No automation – legacy SDLC and changes
- Every change had to go through typical legacy processes
- Amazon HIPAA BAA surprised some that it required end to end encryption for data in flight not just at rest
- SSL missing on RDBMS servers

DNA NEXT GENERATION PLATFORM PRINCIPLES

- Own It
- Prototype
- Prove or Fail Fast
- Adapt to Change
- Repeatable



-1.5 YEARS : NEXT GENERATION PLATFORM

- Open Source Software Stack (Hadoop, Spark, Git, Jenkins, Ansible, Docker, Kubernetes, etc.)
- Elastic Compute Environments
- Cloud Native Architecture
- Infrastructure as Code
- Flexible Security
- Container Based Solution Where Possible

-1 YEARS : DATA CATALOG AND GOVERNANCE

You need to start with security, catalog, and governance in mind.

- Collibra as the Blue Cross Standard
- Atlas & other emerging projects

- ODPi: creates open source standards to use data across all platforms
- X-App Metadata is hard

- 1 YEARS : DATA SUPPLY CHAIN

NC

Data Governance

Mastering | Stewardship | MetadataLineage | Validation | Business rules | Security | Tagging | Data Quality | Issue Management | Catalog

DevOps/DataOps = Build/Deploy/Monitor

Code Management Source Control | Continuous Integration | Continuous Delivery | Containers | Orchestration

Data Sources

(SUPPLY)

RDBMS

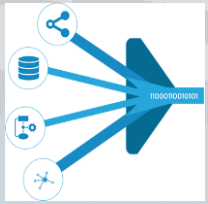
API

Data Files

Queue

IOT

- Claims
- Clinical
- Operations
- Financials
- 3rd Party
- Wearables
- Monitoring
- Metrics
- Demographic
- Weather



Data Ingestion

- Rapid onboarding
- Near to real time
- Continuous
- Low-impact
- DevOps friendly
- Configuration based
- Evolution enabled

Data Management and Execution

- Infinite Storage
- Structured
- Stream Engine
- Unstructured
- SQL Engine
- NoSql Engine
- Configuration based
- Evolution enabled
- On Demand Compute Resources
- Big Data Engine
- Data Warehouse
- Virtual Data Lab

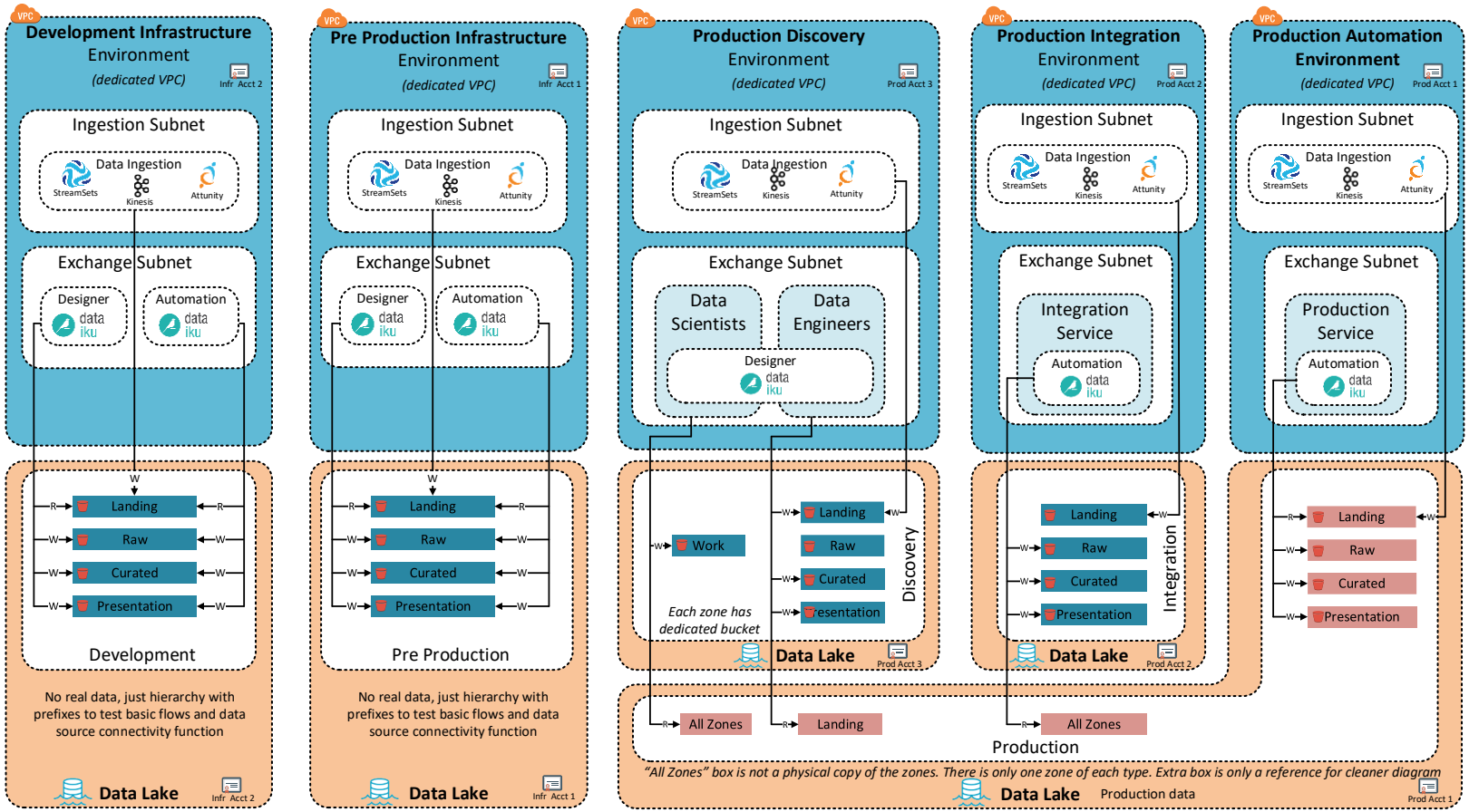
Data Services

(DEMAND)

- Analytics Workbench
- Real Time Analytics
- API Resources
- Visualization
- Data Sharing
- Data Warehouse
- Event Alerting

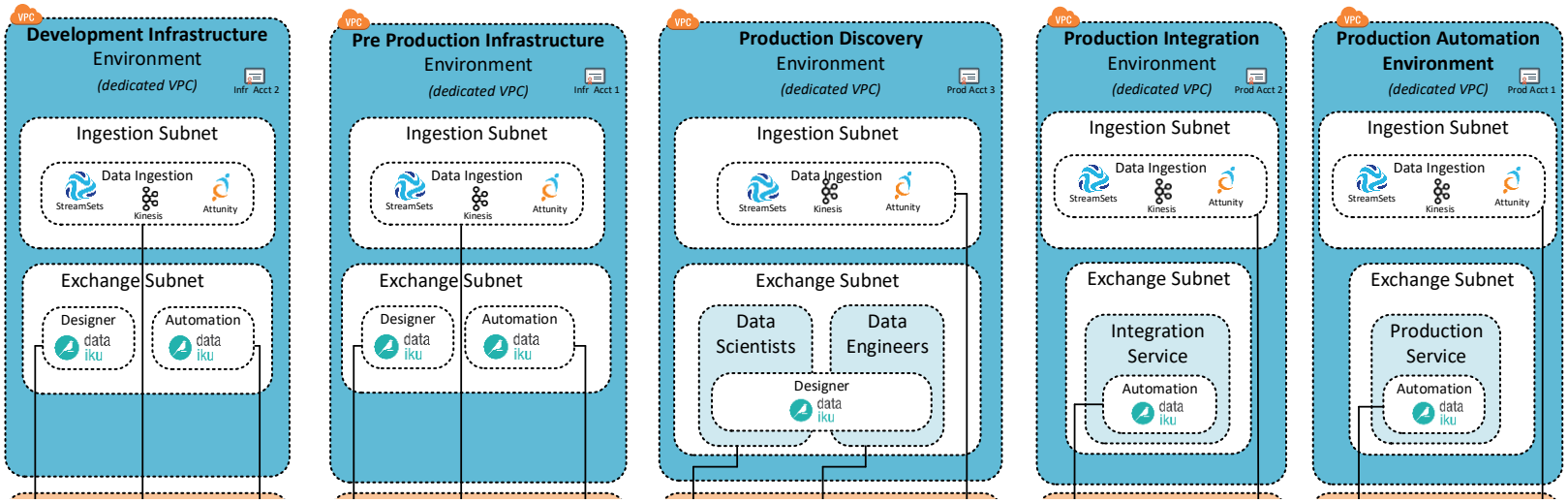
- .5 YEAR : PLATFORM 2.0 ENVIRONMENTS

DEVOPS AND SHARED SERVICES



-0.5 YEAR : PLATFORM 2.0

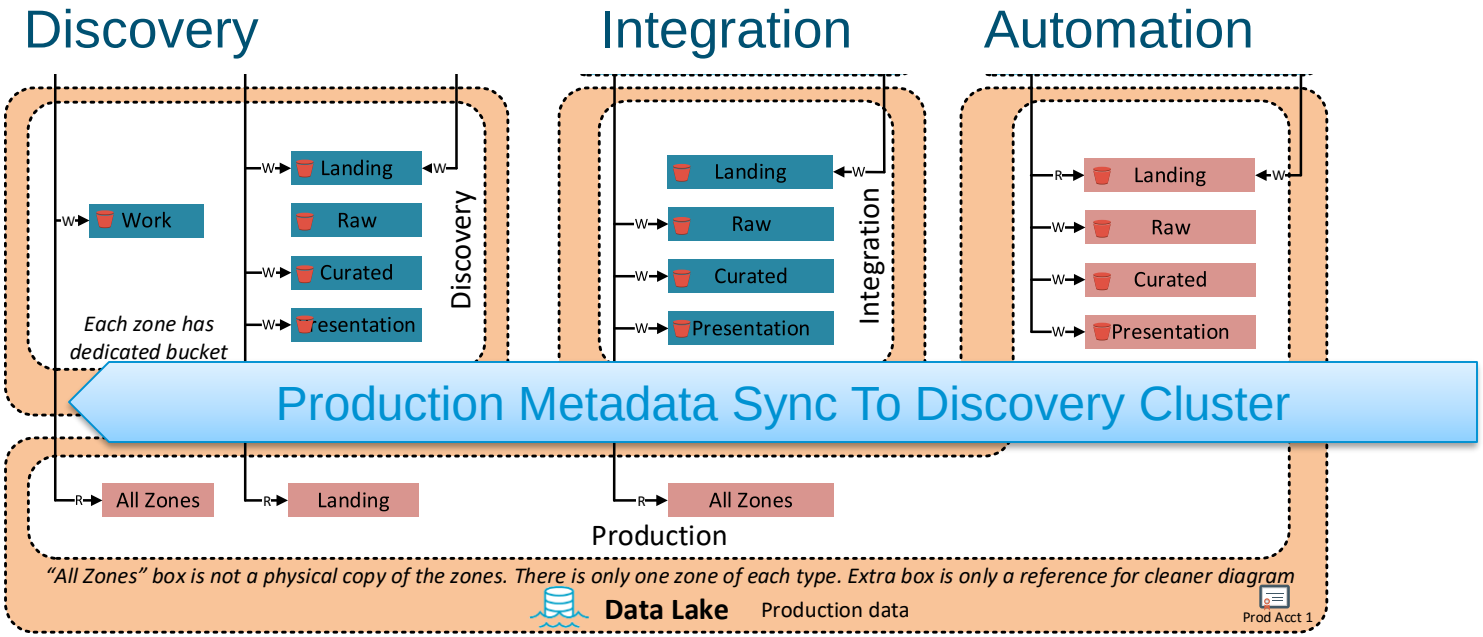
INFRASTRUCTURE UNDER DEVOPS



CI/CD Infrastructure Pipeline

-.5 YEAR : PLATFORM 2.0 SHARED PRODUCTION

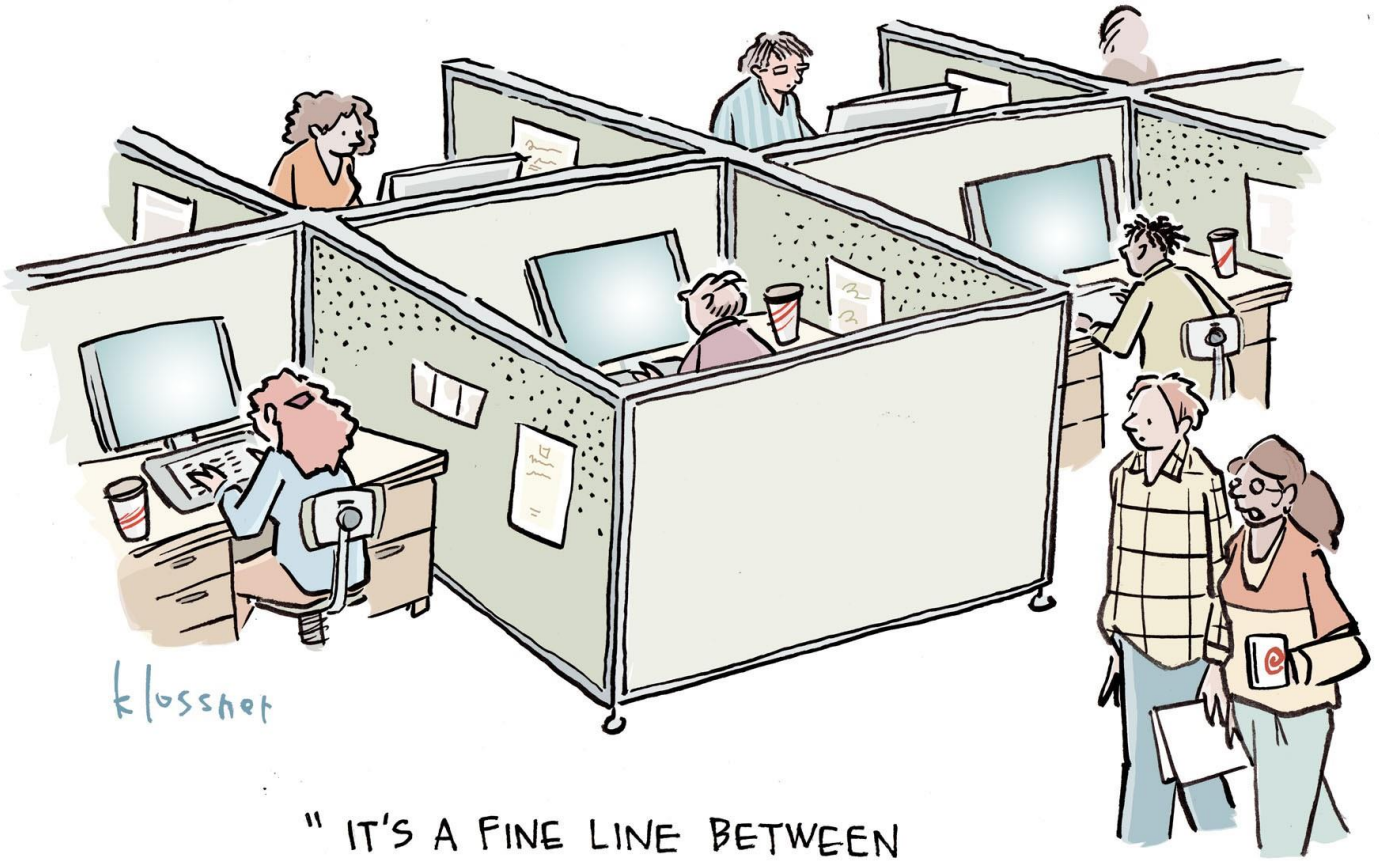
DATA PIPELINE UNDER DEVOPS



CI/CD Data Engineering Pipeline

https://github.com/HotelsDotCom/waggle-dance
https://tech.ebayinc.com/engineering/bigdata-governance-hive-metastore-listener-for-apache-atlas-use-cases/

0 YEAR : PLATFORM SECUIRTY



0 YEAR : PLATFORM NEXT STEPS

- Cell Level Encryption and Security
- Legacy ETL Offload -> ELT In Platform
- Performant Layer
- Product Catalog
- Data Warehouse on Demand Side
- Data Lake Lamba Ingest Design
  - Stream/Batch/Versioning

+1 YEAR : PLATFORM PORTAL

- Self Service
- Data Journey
- Governance
- Catalog

OPEN DATA AND INTEROPERABILITY

How to leverage all the data in the world?

- Common Data Model
- Standard Data Exchange Services
- Open Application Platform
- Community Based Research and Analytics

SERVICES AND APPS

https://smarthealthit.org/

https://wiki.hl7.org/Publicly_Available_FHIR_Servers_for_testing
https://www.hl7.org/fhir/overview.html

Open EHR and shared model/research platform
https://www.openehr.org/
https://www.openehr.org/ckm/

FHIR OPEN TEST SERVERS

- **Smarthealth (Anonymous)**
- https://r4.smarthealthit.org/Patient/c931bf62-c468-49f1-9ef7-93ccbc949a87
- https://r4.smarthealthit.org/MedicationRequest/5427b735-6aa5-4701-aa49-4041c073cd01
- https://r4.smarthealthit.org/CarePlan/31d81796-8851-4ab1-a55d-3f1819466a00
-
- **hapi.fhir.org (Anonymous)**
- http://hapi.fhir.org/baseR4/Patient/57
- http://hapi.fhir.org/baseR4/MedicationRequest/29870
- http://hapi.fhir.org/baseR4/CarePlan/1393

COMMON DATA MODEL

More Open Data stuff

- HIE – Health Information Exchange – Consolidated and Federated Models

- OHDSI - OMOP
- openEHR foundation
- Clinical Information Modelling Initiative (CIMI)
- ISO Health Informatics Profiling Framework

OPEN ANALYTICS

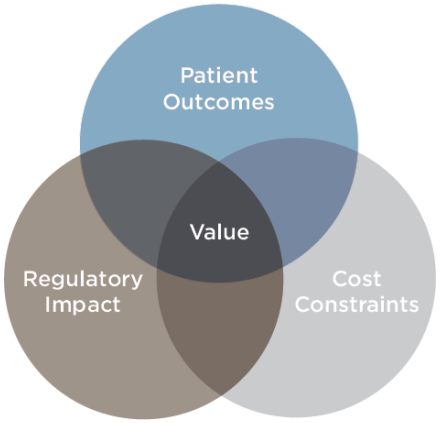
The Observational Health Data Sciences and Informatics (or OHDSI, pronounced "Odyssey") program is a multi-stakeholder, interdisciplinary collaborative to bring out the value of health data through large-scale analytics. All our solutions are open-source.

Observational Health Data Science and Informatics
https://www.ohdsi.org/

OMOP – Common Data Model

DAVINCI PROJECT

Interoperability challenges have limited many stakeholders in the healthcare community from achieving better care at lower cost. The dual challenges of data standardization and easy information access are compromising the ability of both payers and providers to create efficient care delivery solutions and effective care management models. The goal of the Da Vinci project is to help payers and providers to positively impact clinical, quality, cost and care management outcomes.



WE ARE STILL ON A JOURNEY

WE WILL CONTINUE TO USE **DATA AND TECHNOLOGY** TO **DRIVE OUR MISSION**