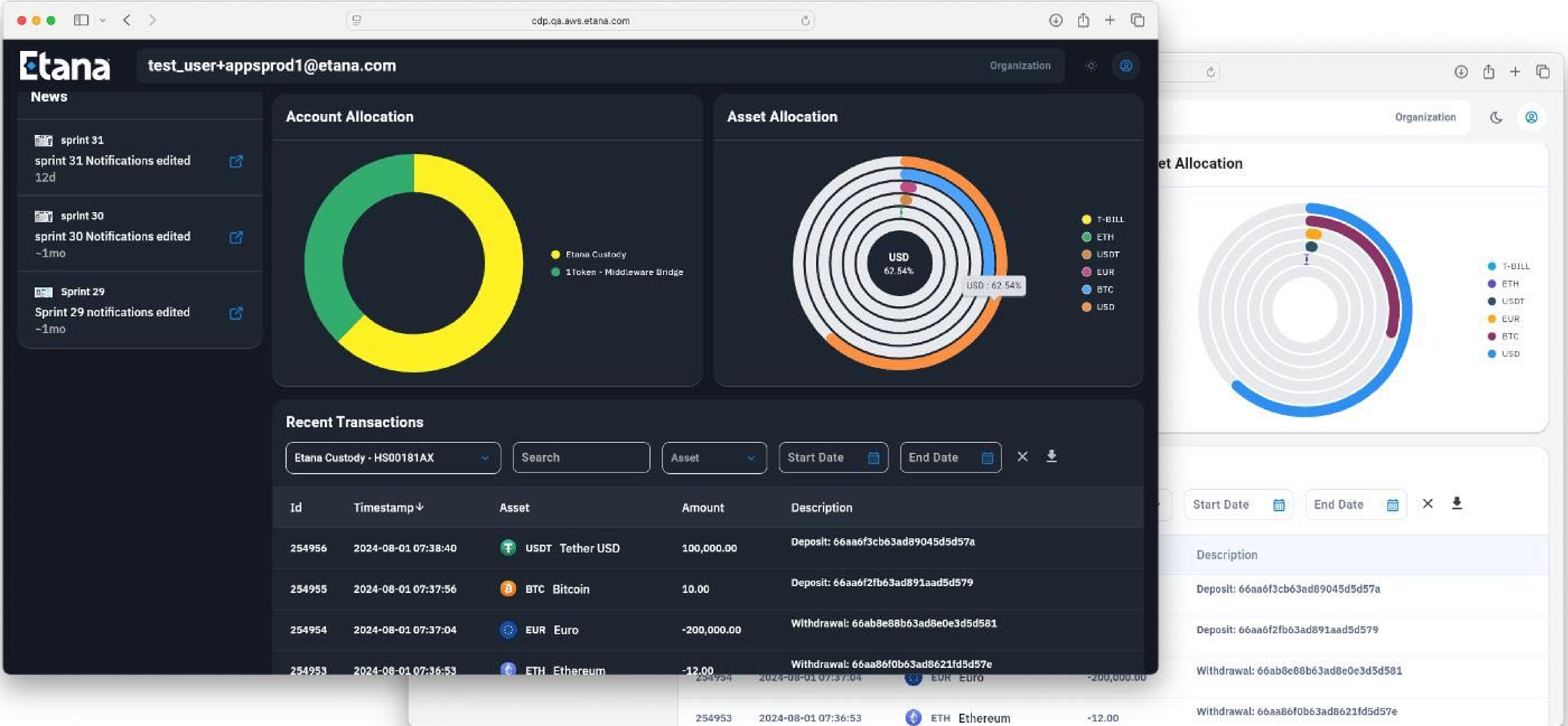# Application, Infrastructure, and Database Architecture Through the Years

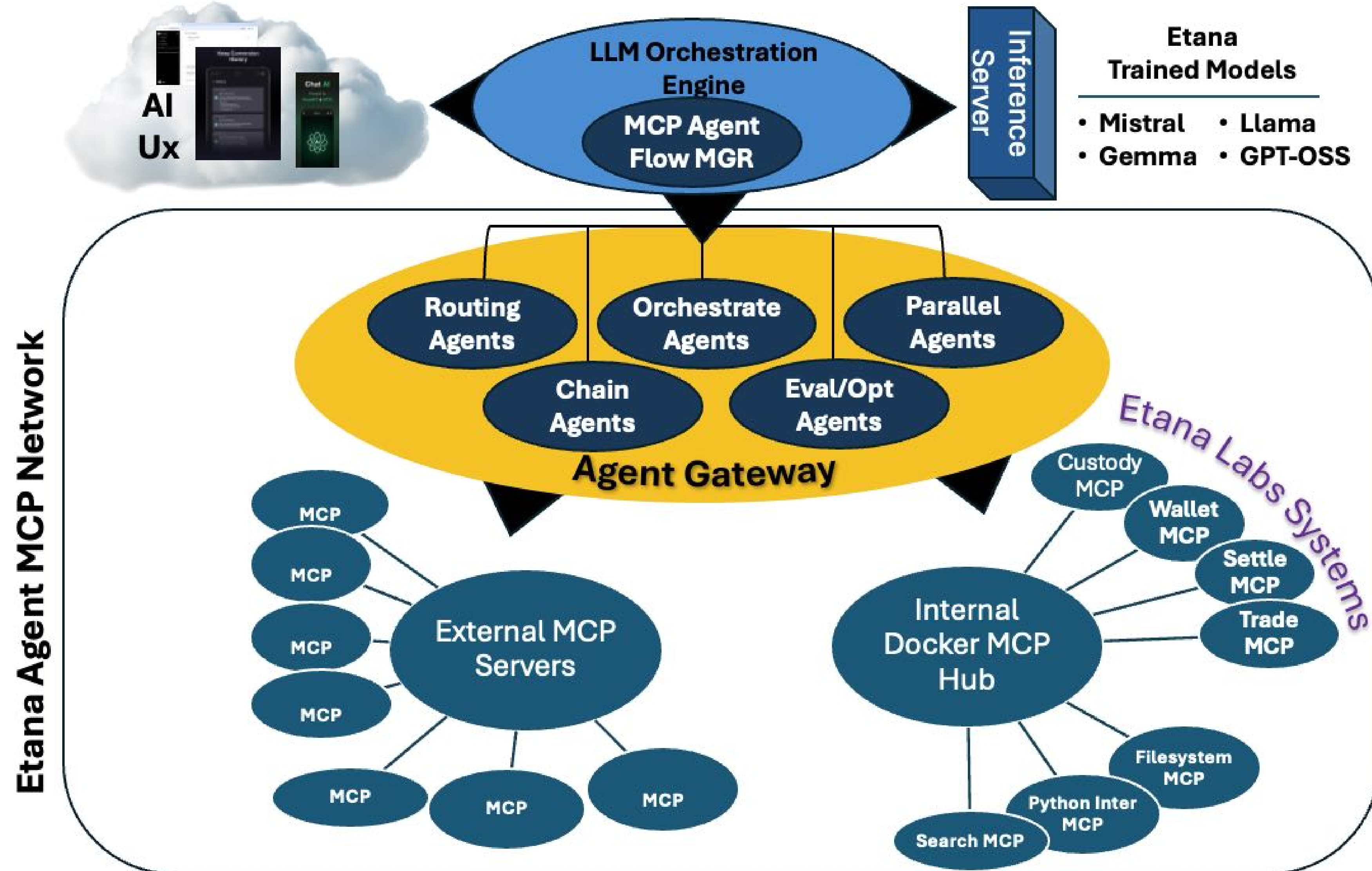*Author*

Dennis Noto

2025

Flutter Apps Dark-mode for Web/Mobile/Tablet

Den's AI Architecture PAAS

LLM Orchestration Engine

MCP Agent Flow MGR

Inference Server

Etana Trained Models
- Mistral
- Gemma
- Llama
- GPT-OSS

AI Ux

Etana Agent MCP Network

Routing Agents

Orchestrate Agents

Parallel Agents

Chain Agents

Eval/Opt Agents

Agent Gateway

Etana Labs Systems

MCP

External MCP Servers

Internal Docker MCP Hub

Custody MCP

Wallet MCP

Settle MCP

Trade MCP

Filesystem MCP

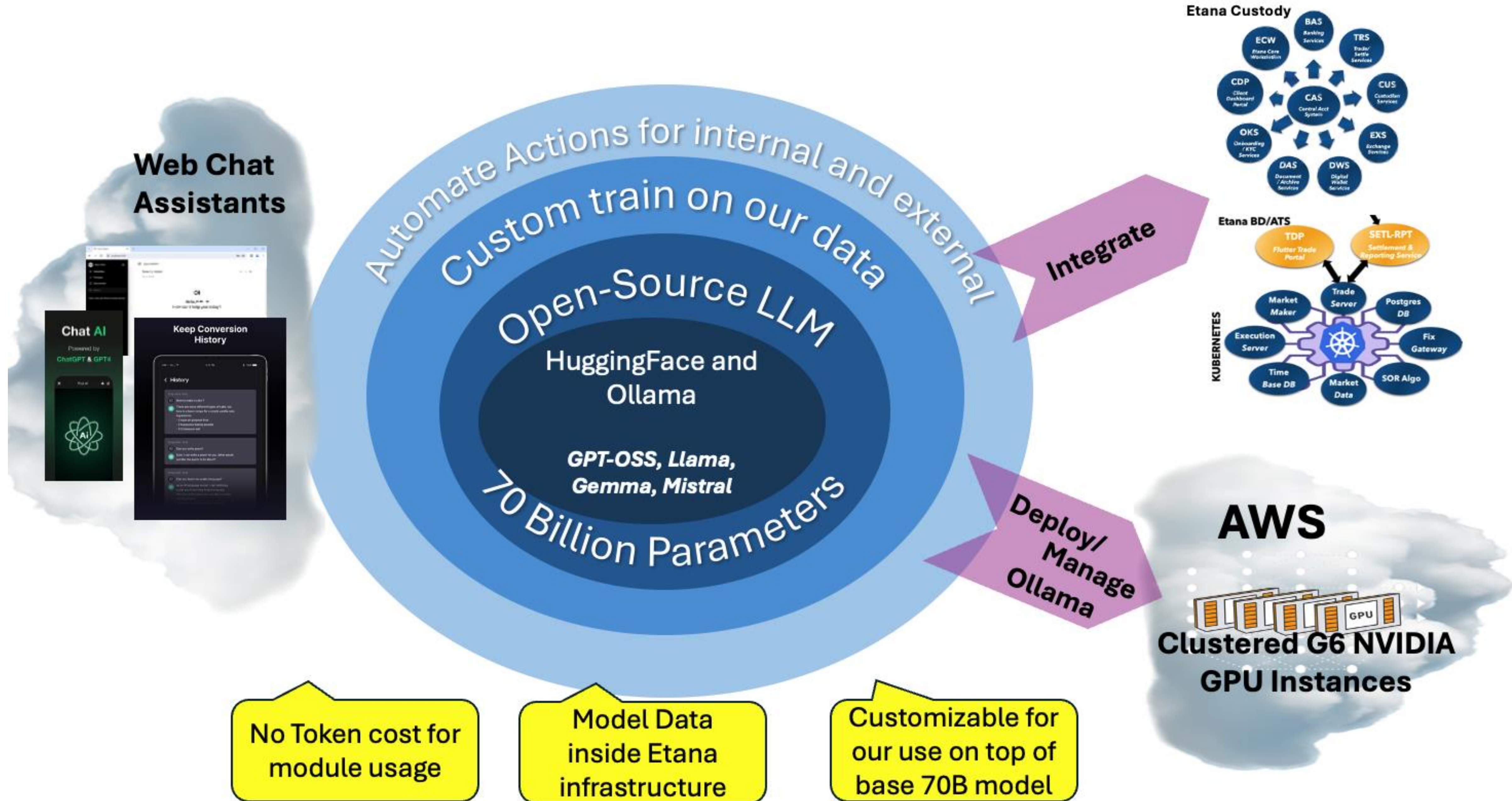Python Inter MCP

Search MCP

AI Purpose built in our AWS Infrastructure

- No dependence on commercial models
- Data stays with us
- Applications integrated into clients and internal departments conversations
- Agents crafted to automate operations, compliance, support, and user tasks
- The new UI for apps, *"Look no web dashboard needed!"* Just talk to your systems!
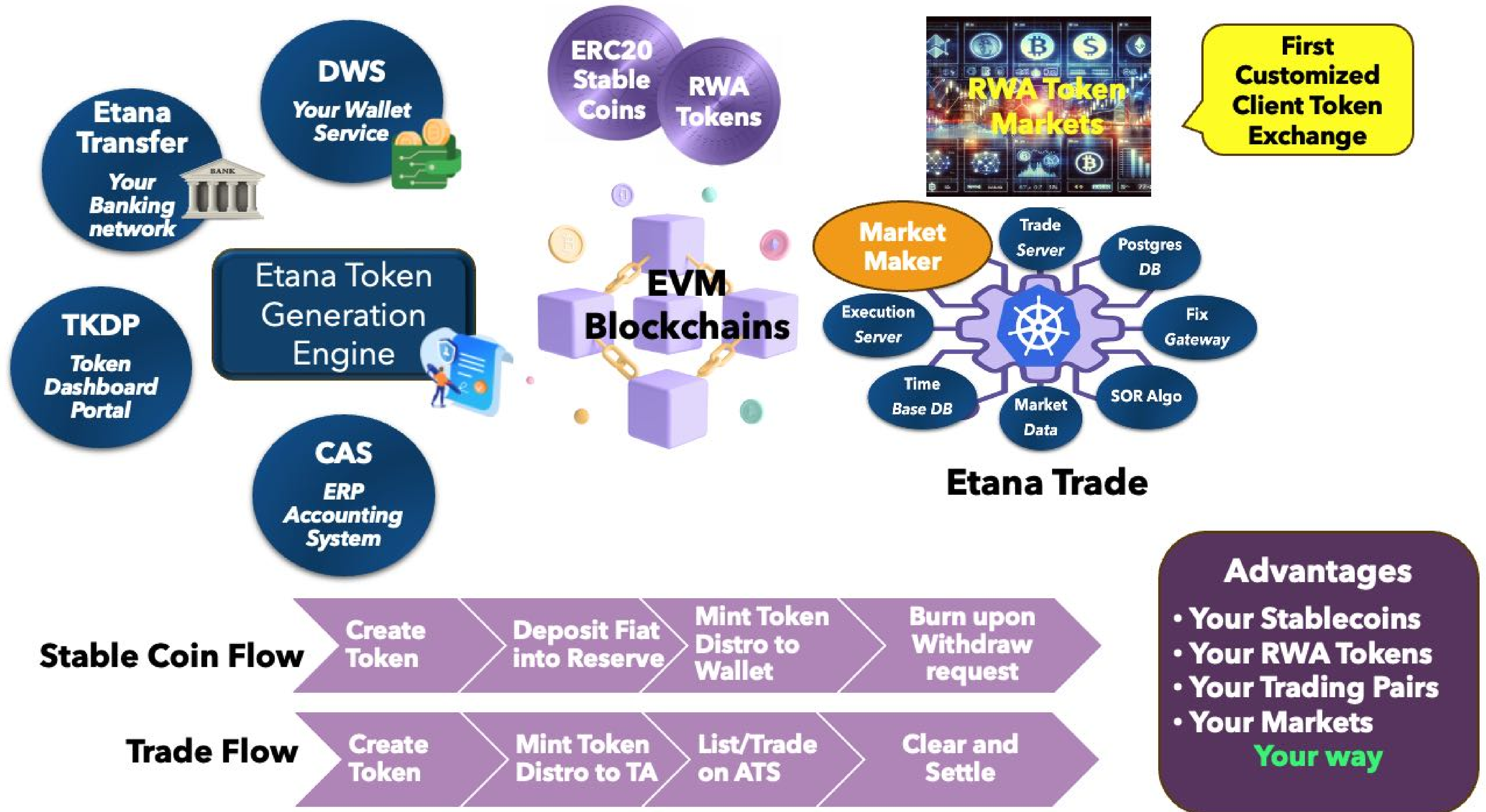- Docker driven and Kubernetes

Etana Labs White Label Solution

- We build for any Financial services company
- Your own MCP servers wired to your application APIs
- Custom Agents, Systems Prompts, and workflow
- We host in your own Kubernetes cluster.
- It's your own dedicated, secure, AI platform as a service

AI Overview

Web Chat Assistants

Chat AI
Powered by ChatGPT & GPT4

Keep Conversion History

Automate Actions for internal and external

Custom train on our data

Open-Source LLM

HuggingFace and Ollama

GPT-OSS, Llama, Gemma, Mistral

70 Billion Parameters

Integrate

Etana Custody

Etana BD/ATS

KUBERNETES

Deploy/ Manage Ollama

AWS

Clustered G6 NVIDIA GPU Instances

No Token cost for module usage

Model Data inside Etana infrastructure

Customizable for our use on top of base 70B model

Token Engine Integrated with Custody and Banking Systems

Etana Transfer — *Your Banking network*

DWS — *Your Wallet Service*

ERC20 Stable Coins

RWA Tokens

RWA Token Markets

First Customized Client Token Exchange

TKDP — *Token Dashboard Portal*

Etana Token Generation Engine

EVM Blockchains

Market Maker

Trade Server

Postgres DB

Execution Server

Fix Gateway

Time Base DB

Market Data

SOR Algo

Etana Trade

CAS — *ERP Accounting System*

Stable Coin Flow

Create Token → Deposit Fiat into Reserve → Mint Token Distro to Wallet → Burn upon Withdraw request

Trade Flow

Create Token → Mint Token Distro to TA → List/Trade on ATS → Clear and Settle

Advantages

- Your Stablecoins
- Your RWA Tokens
- Your Trading Pairs
- Your Markets

Your way

Stand-alone Wallet and Settlement System

Offerings
- Etana Cloud – Multi-tenant Settlement Network
- Etana Private – your own settlement system!

Settlement System

Trans

Banks

Stmts

CAS ERP Accounting

Bank Settle

LP/Exch Settle

Trans

Trade Settle

LP/Exchanges

Settle Data

Wallet

Custody

Orders | Fills

EtanaTrade

Wallet Advantages
- MPC vaults forward with TSS(Threshold Signature Scheme)
- Biometric Face Liveliness Approvals
- Seamless integration into all systems
- Staking top currencies – produce Yield

Settle Advantages
- Rocket towards Real Time Settlement with stablecoins
- Connect your systems to our settlement engine
- First double entry crypto accounting ERP system EVER!

Den's Vision for an All-inclusive Data Fabric Design

Data Fabric Network Reference Architecture

Consumption Layer

BI Dashboard Sys RPA Insights Engine Prediction Engine

Processing Layer

Spark Thrift Business Rules Engines Business Process Sys Sage Maker TF Serving

Store/ Catalog Layer

Enterprise Domain Ontology Catalog System

Delta Lake ACID Layer | Azure Data Lake Storage

Databricks Transformation

Engine → Data Warehouse

→ Spark Analytics

→ Graph Database

Ingestion Layer

Structured
ETL | Streaming | API | Messaging | Batch

Unstructured/Binary
Omnichannel Conversation Gateway

Data Source

SaaS Applications CRM OLTP LOB Files Social VA Web Content Images iOT Devices Voice

Den's Vision for Blockchain Reference Architecture

Blockchain Application Component Architecture

UI/UX Tier
React JS
React JS
React JS
AWS CloudFront

Business Logic Tier
Amazon EKS
docker
Api Workflow Engine
node
node
node
Session Cache
iOT
Microservices

External Adaptor via Transact

HYPERLEDGER FABRIC
Private Blockchain Network

BI Reporting Tier
exago

Database Tier
ODS Postgres
OffChain/BI MongoDB

Selective AIML Services

Watson
STT NLU
Dialog
TTS ML

MS Luis
NLU
Dialog
ML

Google
STT NLU
Dialog
TTS ML

RASA
NLU
Dialog

Designed for a startup

Delta Data Lake Architecture on GCP

Data Quality Levels

Bronze — Row Ingestion

Silver — Filter, Cleaned Augmented

Gold — Bussiness-level Aggragates

Streaming analytics

AI & Reporting

LANDING AREA AND DELTA CDC

STAGE AND WORK AREA

DATA QUALITY & DATA GOVERNANCE

DB

Database

Cloud Data Fusion

Cloud Storage

Cloud Data Fusion

Cloud Dataprep

Stage Area

Cloud Data Fusion

BI

ML

Apps and SQL Tools

Data Science

Cloud Data Catalog

Startup Beginning Architecture upon Arrival

Current Development Challenge (The Perfect Storm)

Mobile
- Android
- iOS
- Android
- iOS

Front End
- Angular
- React
- Angular
- React

Back End

PROD
QA
Dev Int
Stage

Fleets/KFG

10/12 Branch — Ref A / Ref Arch

10/29 Branch — Ref A / Ref Arch

BASE — Ref Arch

PROD
QA
Dev Int
Stage

MSSQL Postgres Infux

Prod · Qa · Dev · Stage
Prod · Qa · Dev · Stage
Prod · Qa · Dev Int · Stage

Prod · Qa · Dev · Stage
Prod · Qa · Dev · Stage
Prod · Qa · Dev Int · Stage

Perfect Storm = ((2 code bases + 2 release branches + 3 Ref Architectures + 2 Ui's + 3 datasources) * 4 environments) * 3 mobile

Justification for Architecture Redesign

Enterprise Global Kubernetes Architecture Today

GetSwift Target Architecture

World Wide Routable Clusters

Micro Services Scalable/Self-Healing
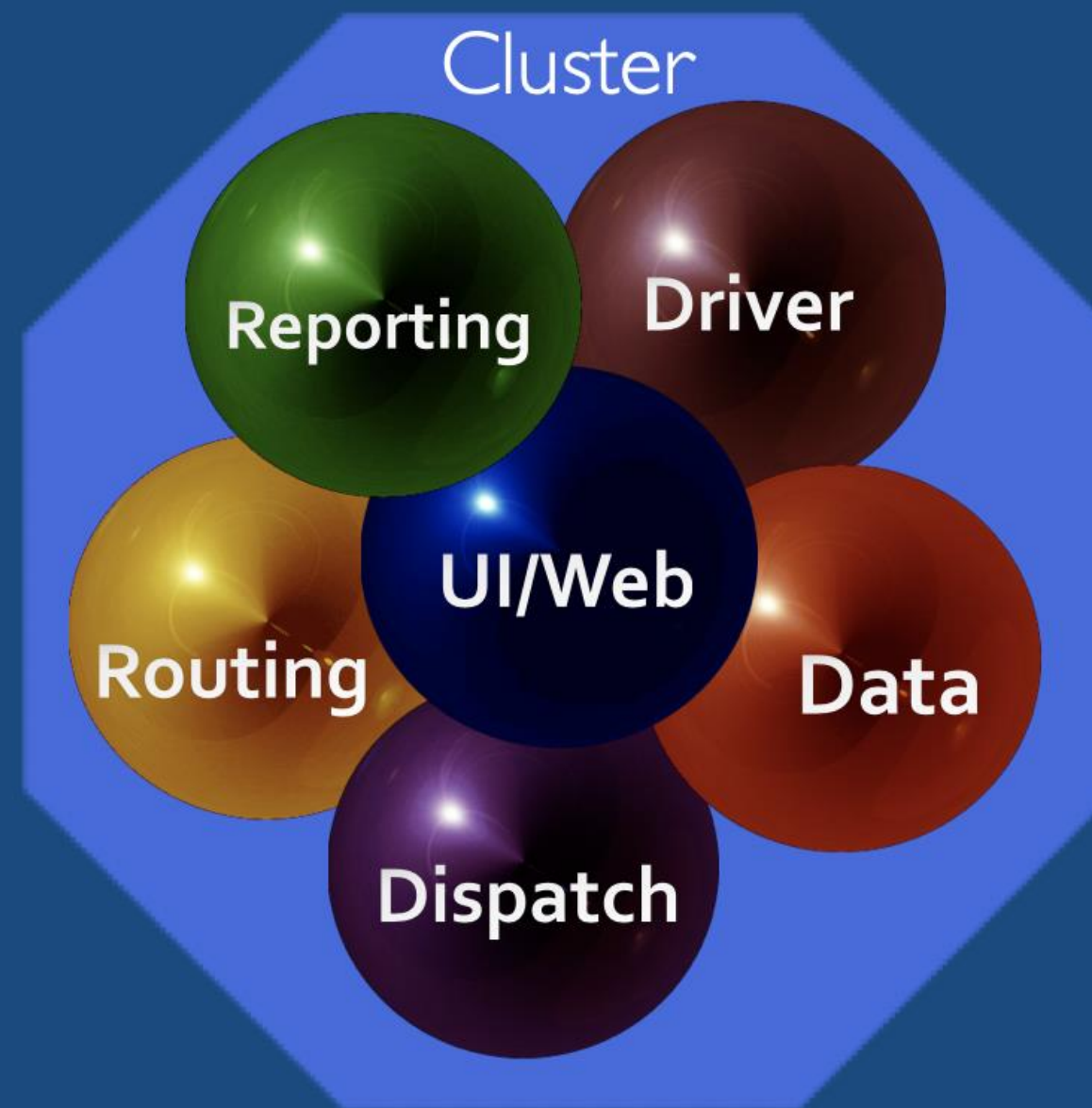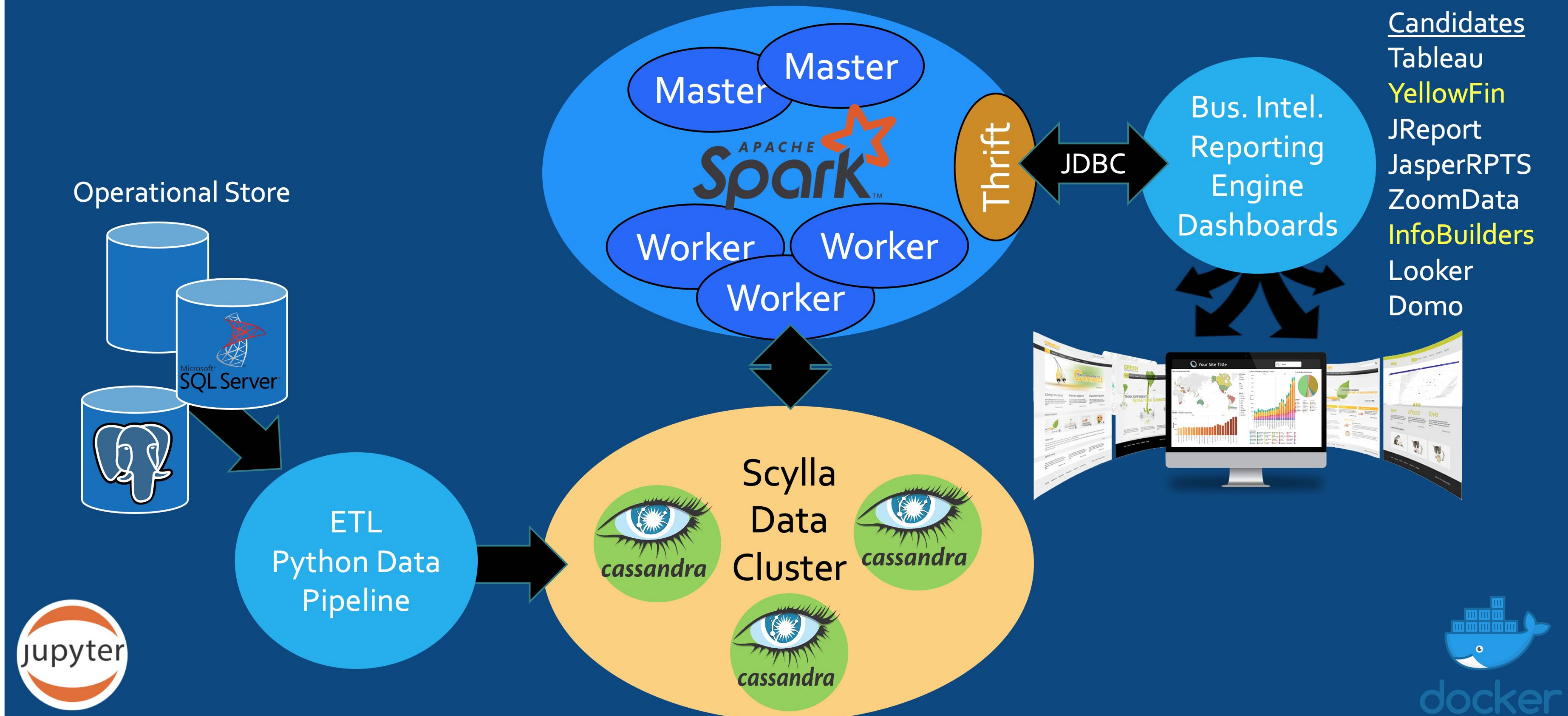
Enterprise Technology Service Oriented Architecture

Cluster

Reporting
Driver
UI/Web
Routing
Data
Dispatch

Mobile — React Native

UI/UX — React

Service

GetSwift Enterprise

Release Trunk

Reference Framework

PROD
QA
Dev Int
Stage

Data Cluster — Inx Ts Srch / Inx Ts Srch / Inx Ts Srch
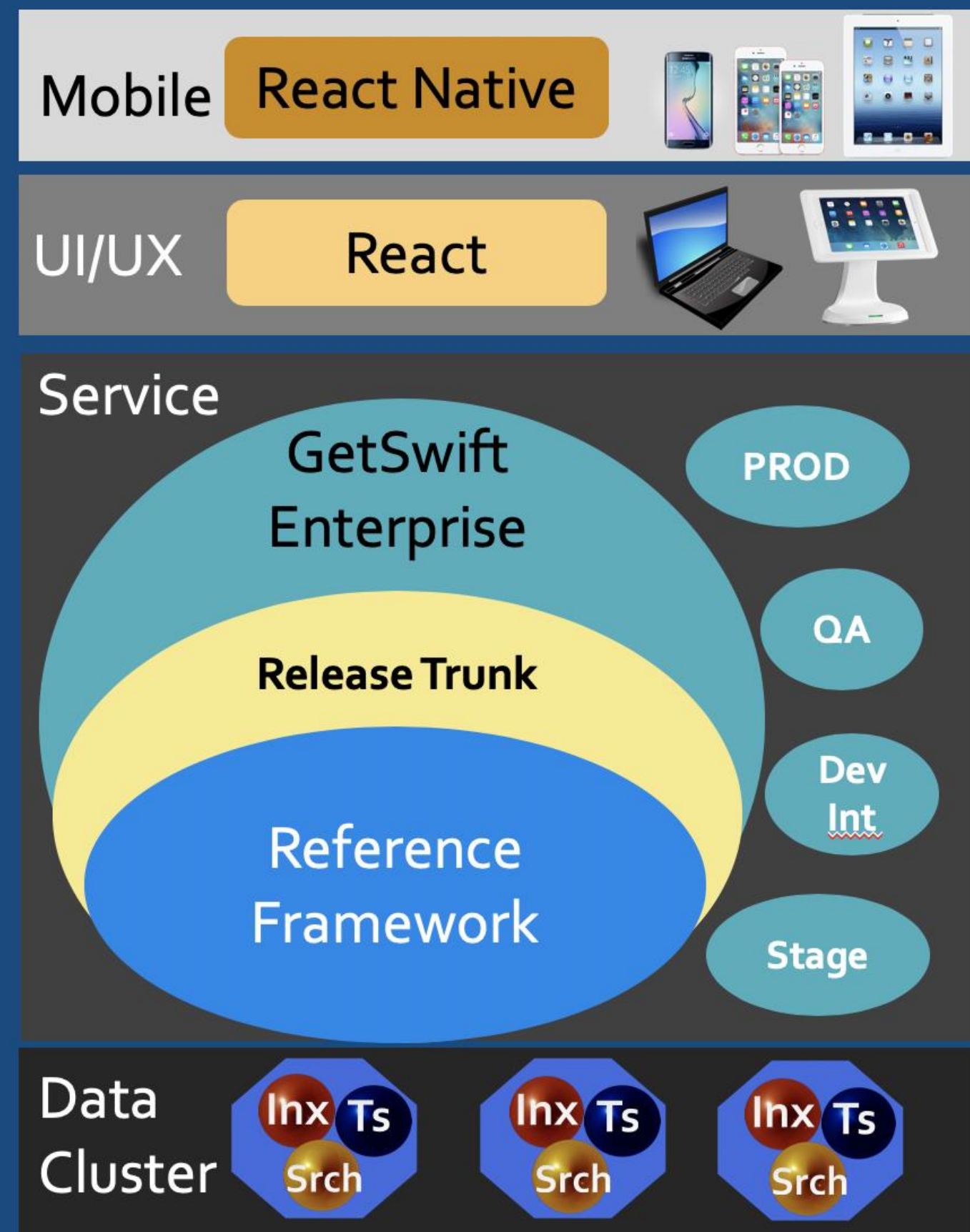
Completed in 1.5 years

Startup Spark driven NoSQL BI Architecture

GetSwift
Analytics and Reporting

Operational Store

Master Master

Spark
APACHE

Worker Worker

Worker

Thrift

JDBC

Bus. Intel.
Reporting
Engine
Dashboards

Candidates
Tableau
YellowFin
JReport
JasperRPTS
ZoomData
InfoBuilders
Looker
Domo

Microsoft SQL Server

ETL
Python Data
Pipeline

Scylla
Data
Cluster

cassandra   cassandra

cassandra

jupyter

docker

After completing POC work, DB group built first deploy in 6 months

Startup Infrastructure Overview

Android/iOS Apps

Browser Web UIs

AWS EKS
Kubernetes Regional Clusters

Kubernetes Cluster

Domain Ingress Controllers

Service Load Balancers

Deployments/Pods

Corweb
Routing, Dispatch, Tracking
.net Core

Apache Kafka
Stream Processing
Application Events

Ecommerce Web
300 containers
php

Scheduling +
NodeJS

Assignment Engine
GO

Integration Services
C#

Driver Locations
GO

Geo-Fencing
GO

Routing Engine
Valhalla
Java

AWS RDS DB
Regional Services

Postgres
Operational
Datastore

InfluxDB
Time Series
Driver/Location Events

Postgres
Job stats
Job Sync

Other Cloud
Services

AWS EMR
Spark
Analytics Store

Scylladb
Cassandra
Data warehouse

Distributed
Cache
Shared State
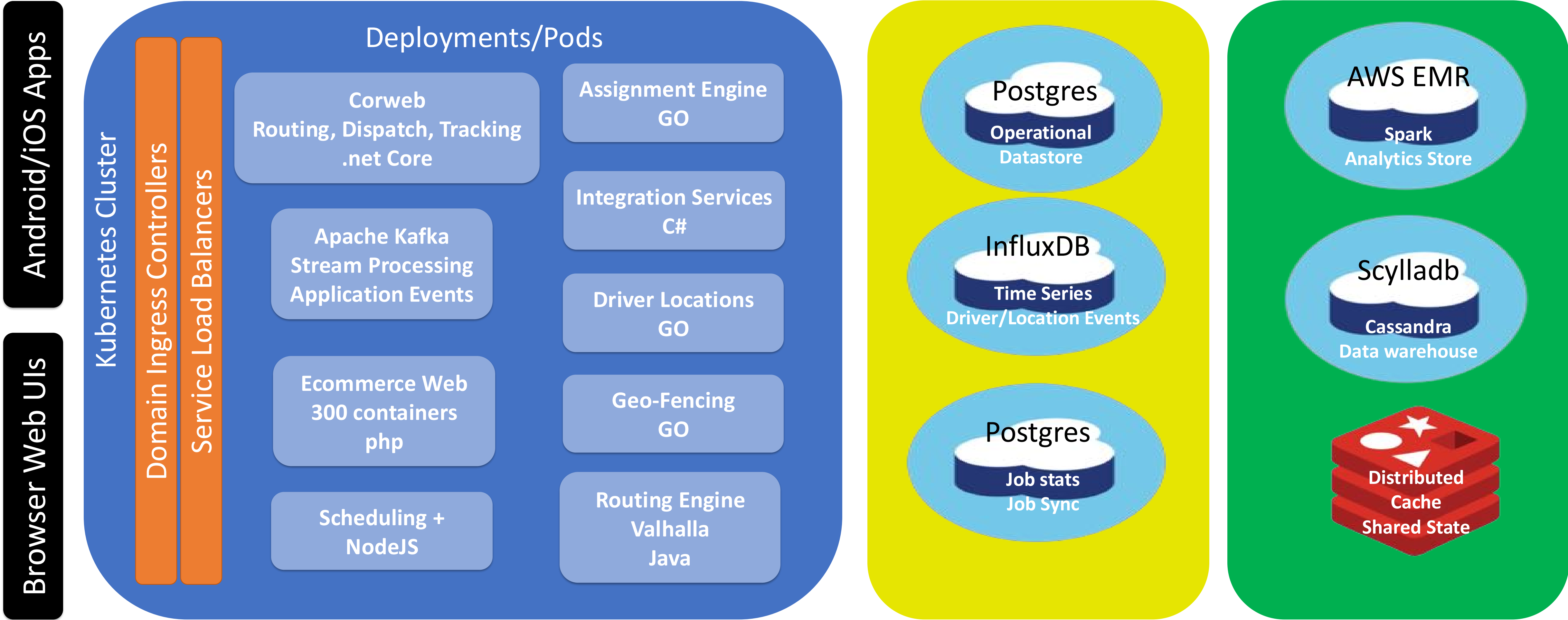
AI/ML Architecture Designed for IBM
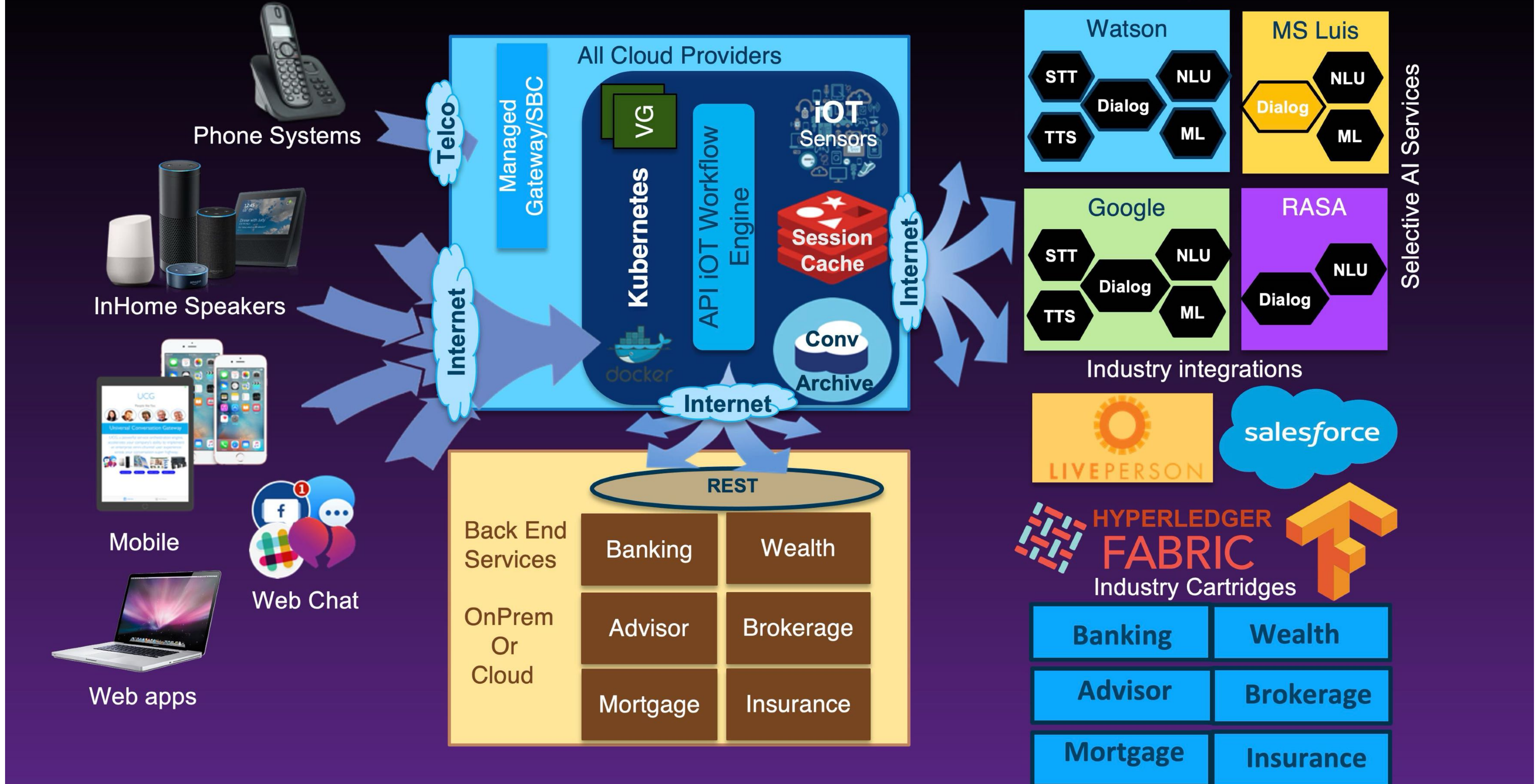
Just finished V2 - code name: "Valari" - http://notovision.com
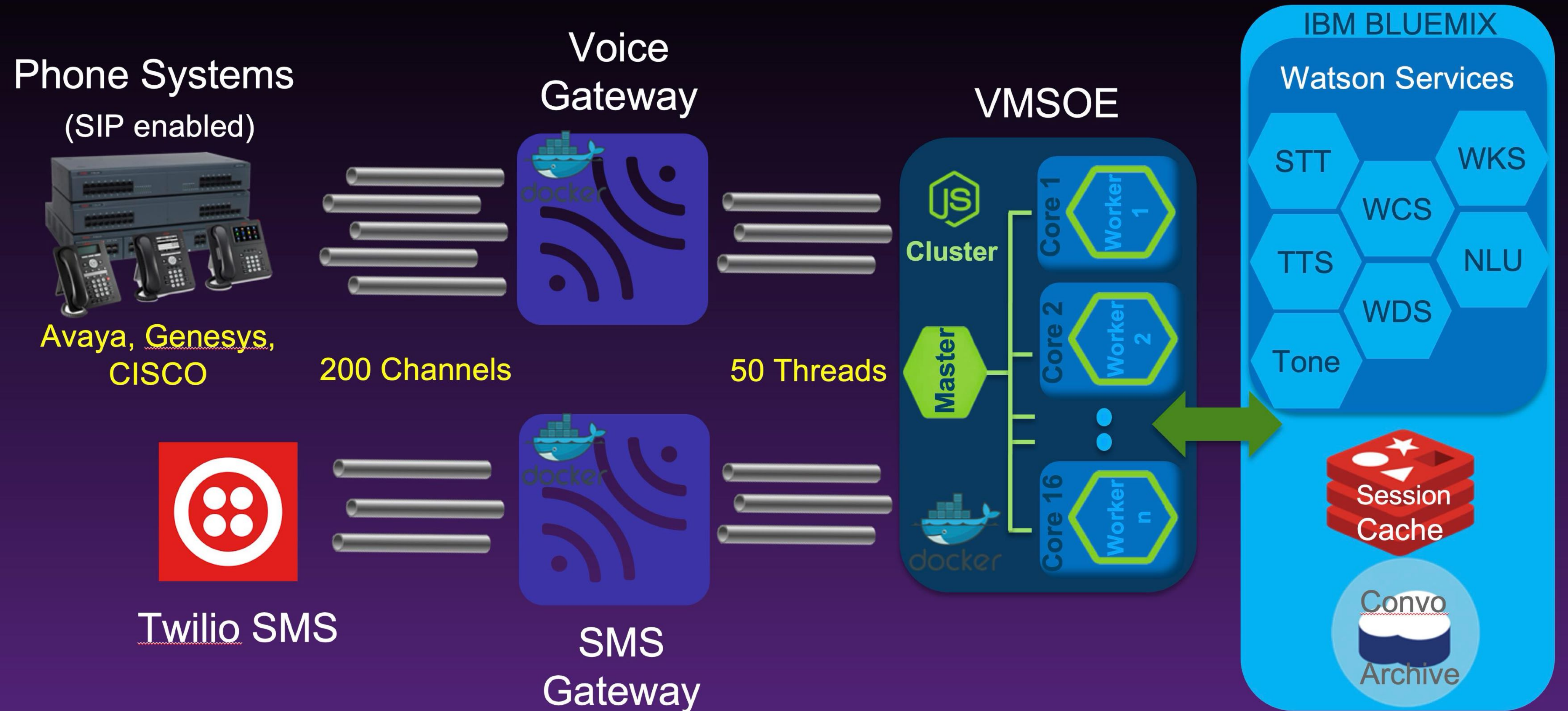
NodeRed API/ioT Orchestration

Vertical and Horizontal Scaling
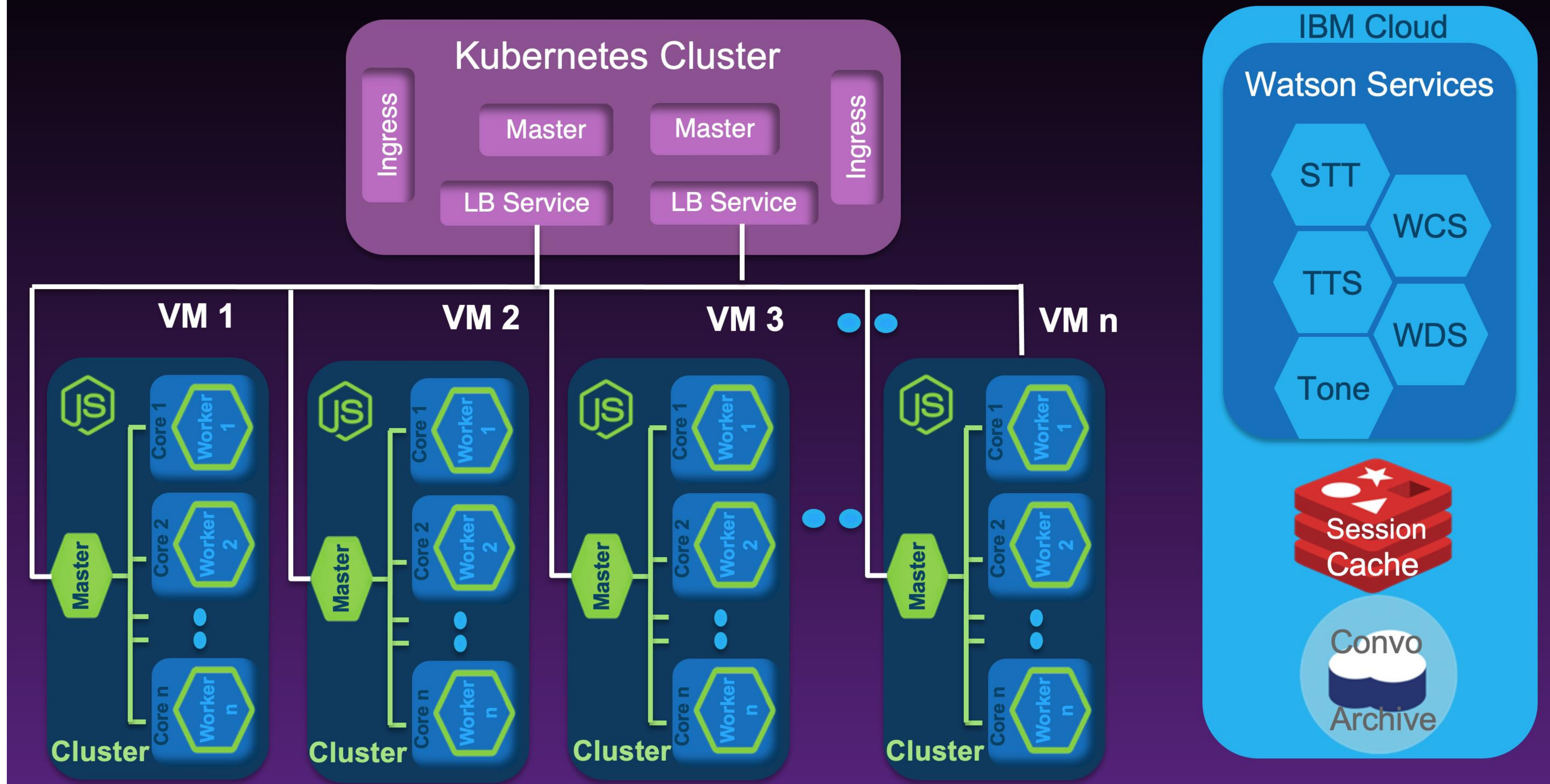
Gateways Designed for IBM

IBM Voice/SMS Gateway Integration

**Phone Systems** (SIP enabled)

Avaya, Genesys, CISCO

200 Channels

Twilio SMS

Voice Gateway

docker

50 Threads

SMS Gateway

docker

VMSOE

JS Cluster

Master

Core 1 — Worker 1

Core 2 — Worker 2

Core 16 — Worker n

docker

IBM BLUEMIX

Watson Services

STT WKS
WCS
TTS NLU
WDS
Tone

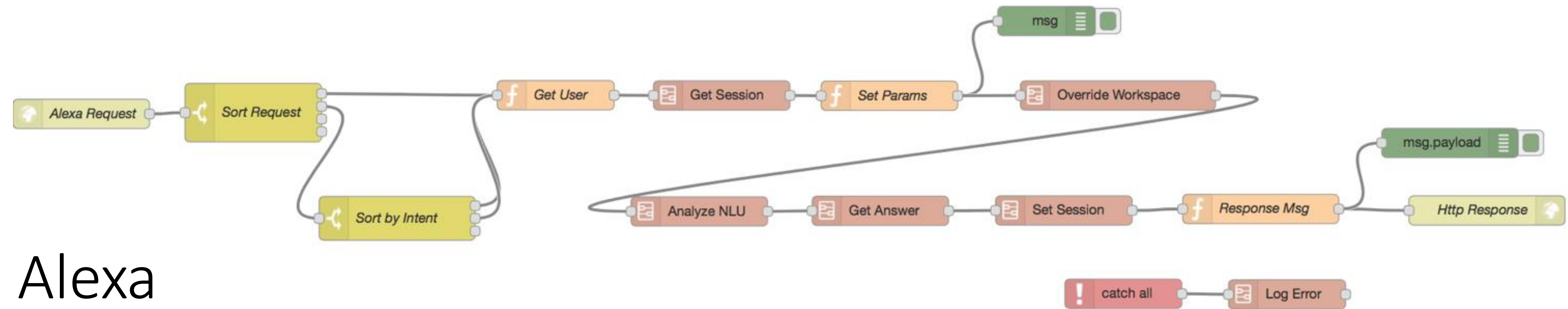Session Cache

Convo Archive

Only 1 Container pictured, scale by adding containers

Currently deployed at First Data, MetLife, Quicken Loans, Regions Bank

VA Rest API Flow Orchestration Via NodeRed
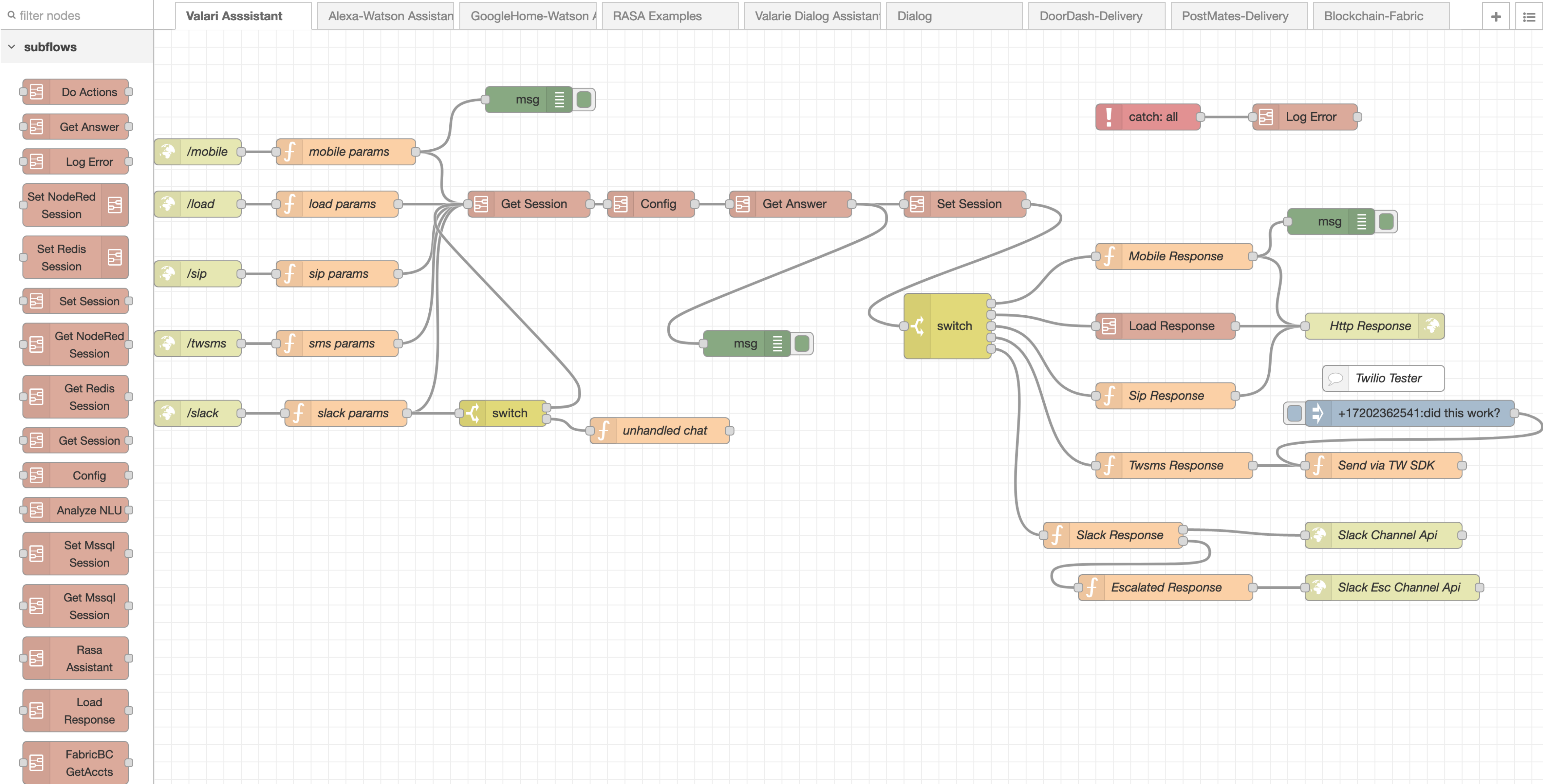
In-home Speaker Orchestration Flows

Alexa

Google Home
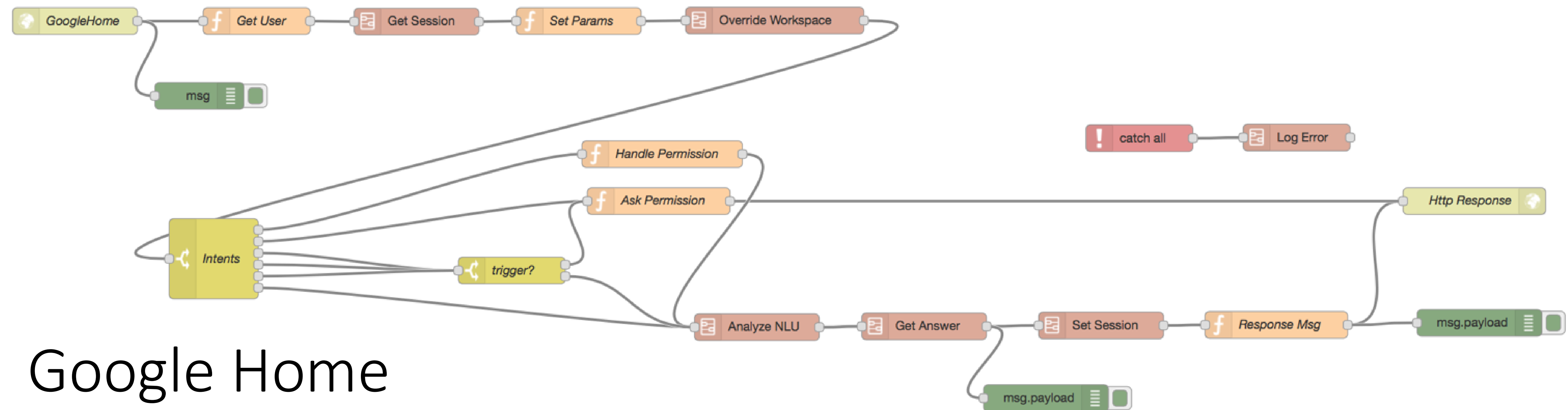
Jmeter Kubernetes Orchestration Load Test

Jmeter Test
New User Rate : 50/sec

Rate : 80/Sec

Concurrent
Scenarios: 20,000

Duration : 10 minutes

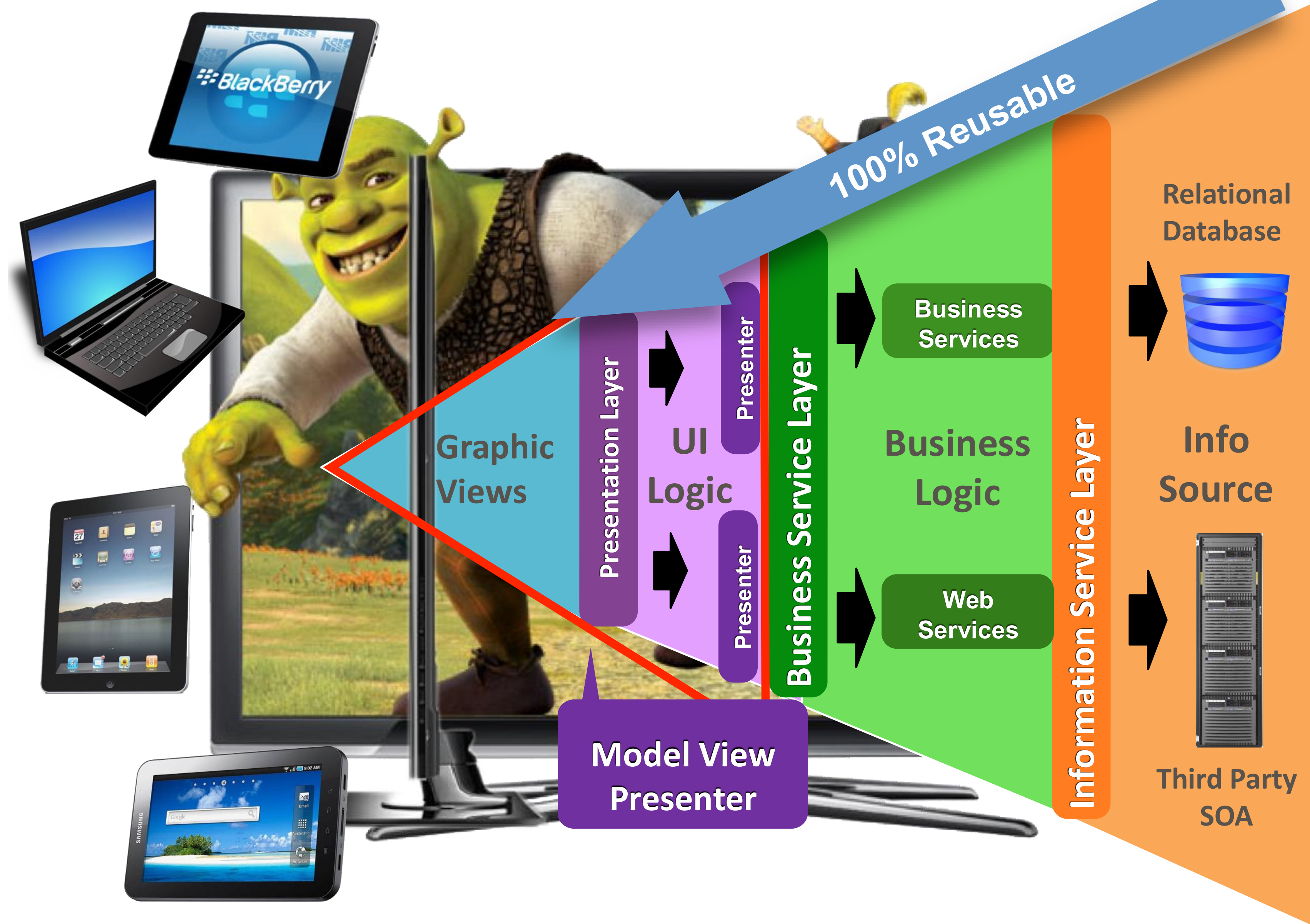Achieved 20,000 concurrent Convos with 8 WCS turns

Response Time 1-2 Secs

Load Balanced on 20 NodeRed Containers
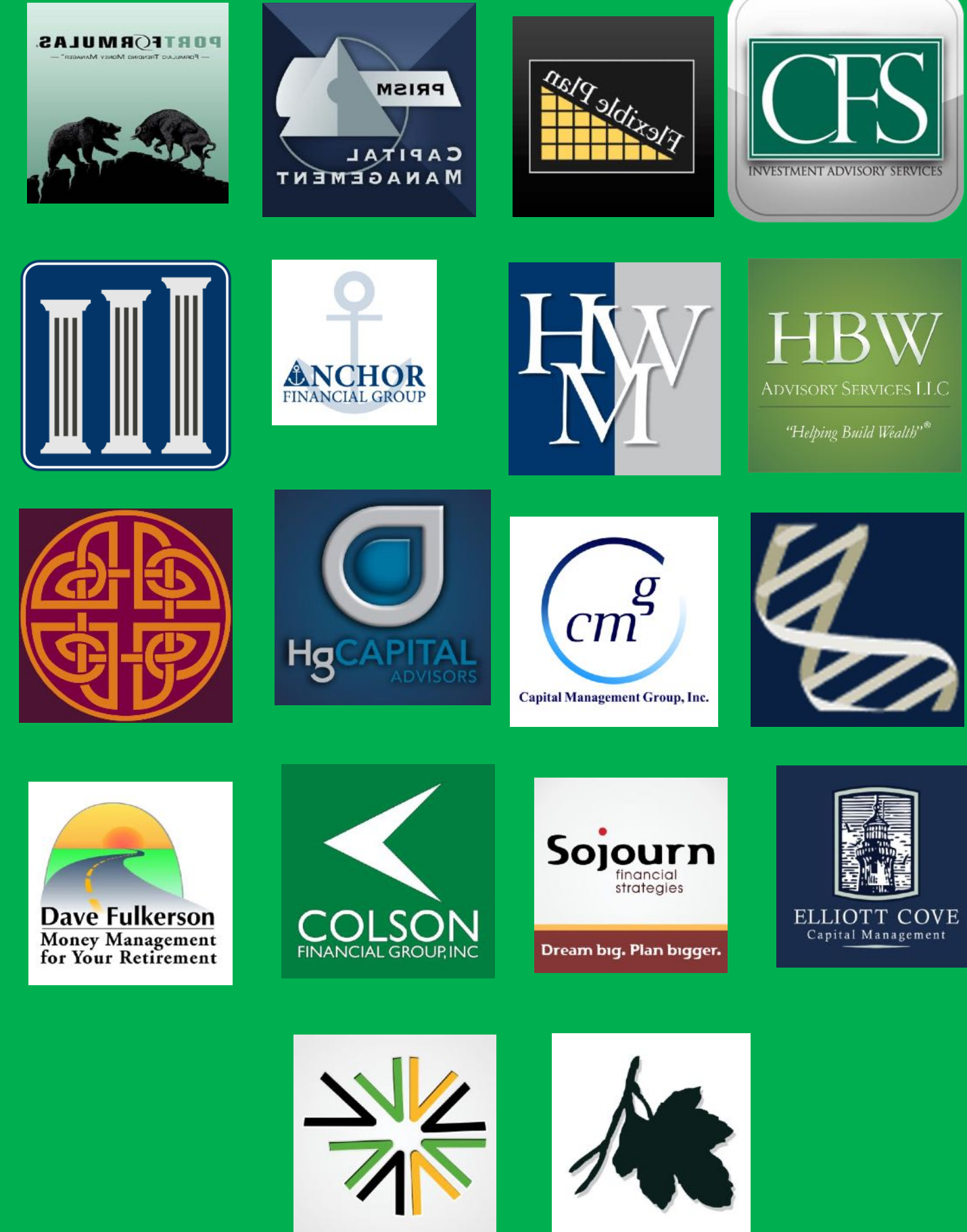
Achieved 150 requests/sec

Blew up IBM Tone & NLU microservices – How demonstrated IBM Watson Scaling issues

TCA "Just Before the Glass" Mobile/Web UI Architecture

100% Reusable

Graphic Views

Presentation Layer

UI Logic

Presenter

Presenter

Model View Presenter

Business Service Layer

Business Services

Business Logic

Web Services

Information Service Layer

Relational Database

Info Source

Third Party SOA

150 Apps in Customer Apps Store

White Label Mobile Apps - CIO Magazine Award

LPL Data Model Conceptional Overview

LPL ESB Microservice Redesign

External Entities

Direct Biz

Batch Feeds

BETA

In Flight Transactions

Oracle Exadata Platform
- Data Warehouse
- MDM

Master Data

Data Warehouse

Legacy SQL Server Platform
- Branchnet
- Clientworks
- Others ...

Branchnet

BODS

AXA

CRM

LPL SQL

Legacy Oracle Platform
- Mantis
- Commissions

CSO Data

CSO Apps

TIBCO ESB SERVICES

LPL Applications Systems Landscape

Legacy replaced by
- MDM/Data Warehouse
- TIBCO ESB MS Services
- ClientWorks

Master Data is made up of the Entities that participate in business processes
- *Party (Account, Client)*
- *Groups*
- *Securities*

Transactions live in LPL SQL today
- *Positions / Investments*
- *Transactions / Activity*

RoboAdvisor

ClientWorks

Scottrade XML Report System Reference Architecture
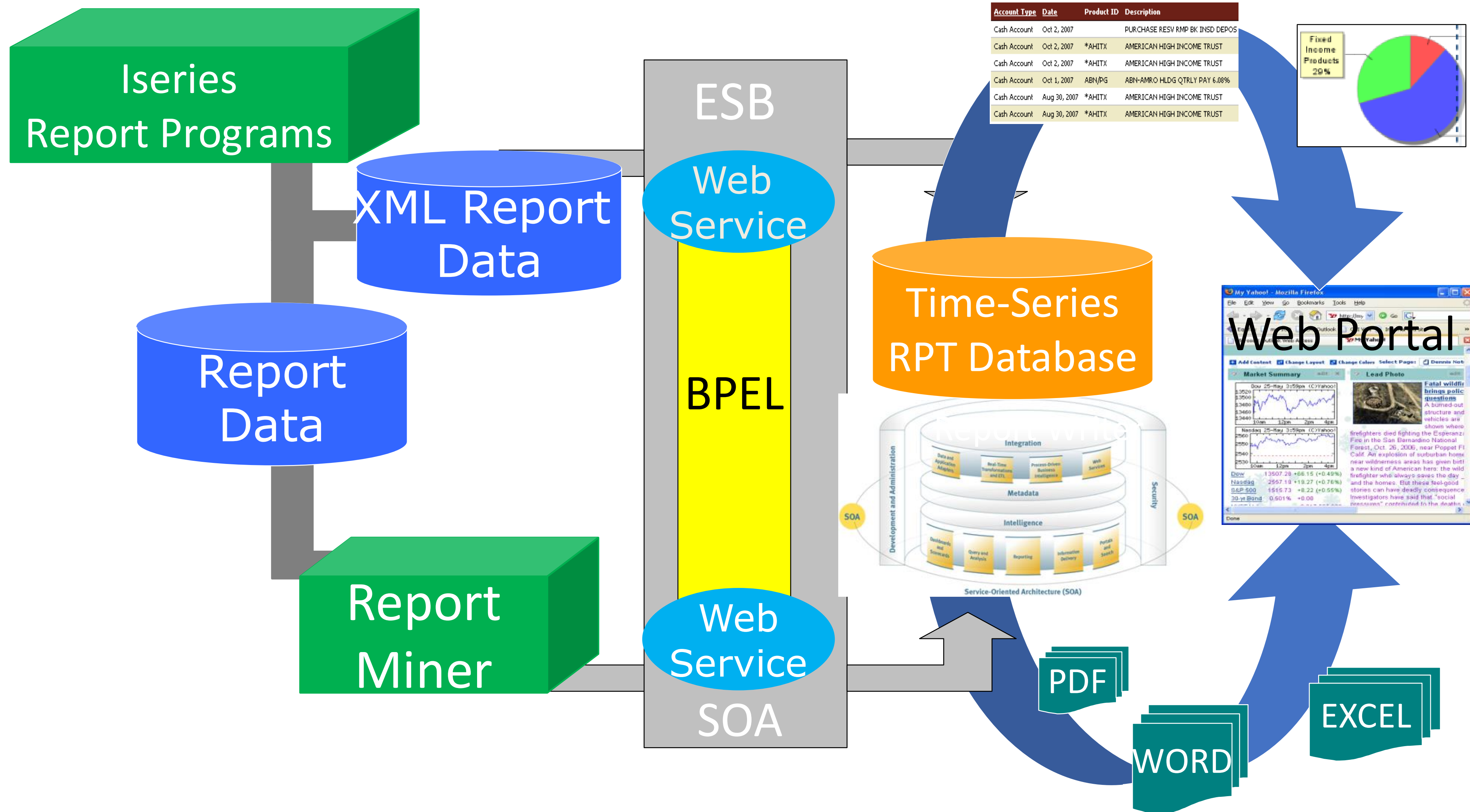
Scottrade Re-Architecture IO Switch and SOA microservices

Isolation Modernization Layers

Three core areas to isolate code.

Cuts down business logic complexity and fosters re-use.

Leveraged PAAS/SAAS computing.

Re-engineered Data
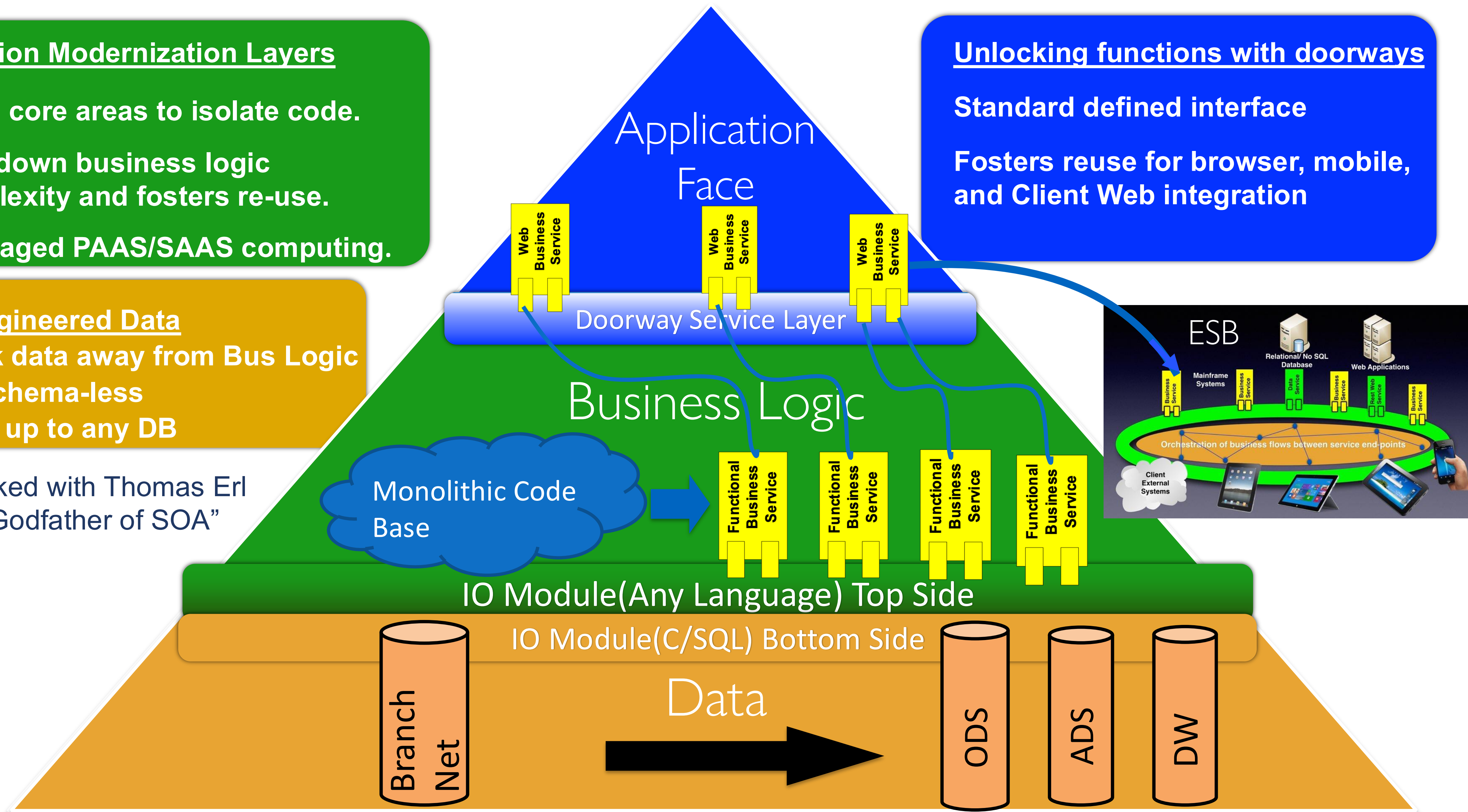**Break data away from Bus Logic**
Go Schema-less
Open up to any DB

Worked with Thomas Erl
"Godfather of SOA"

Unlocking functions with doorways

Standard defined interface

Fosters reuse for browser, mobile, and Client Web integration

Application Face

Web Business Service

Web Business Service

Web Business Service

Doorway Service Layer

Business Logic

Monolithic Code Base

Functional Business Service

Functional Business Service

Functional Business Service

Functional Business Service

IO Module(Any Language) Top Side

IO Module(C/SQL) Bottom Side

Data

Branch Net

ODS

ADS

DW

ESB

Mainframe Systems

Relational/ No SQL Database

Web Applications

Business Service

Business Service

Data Service

Business Service

Rest Web Service

Business Service

Orchestration of business flows between service end-points

Client External Systems

ADP/SIS Broker Web Architecture

Cisco Load Balancing Content Switches

ADP/SIS Posse Web Servers

BEA Weblogic

BEA Weblogic

HP NSK

Pathway

OSS Posix

BEA Tux/Jolt

BEA Tux/Jolt

LDAP

TUX/LDAP Server

SYBASE

JAVA Expresso

Advantage Server

HP NSK

MQ

Pathway ServerClasses

Enscribe/SQLMX
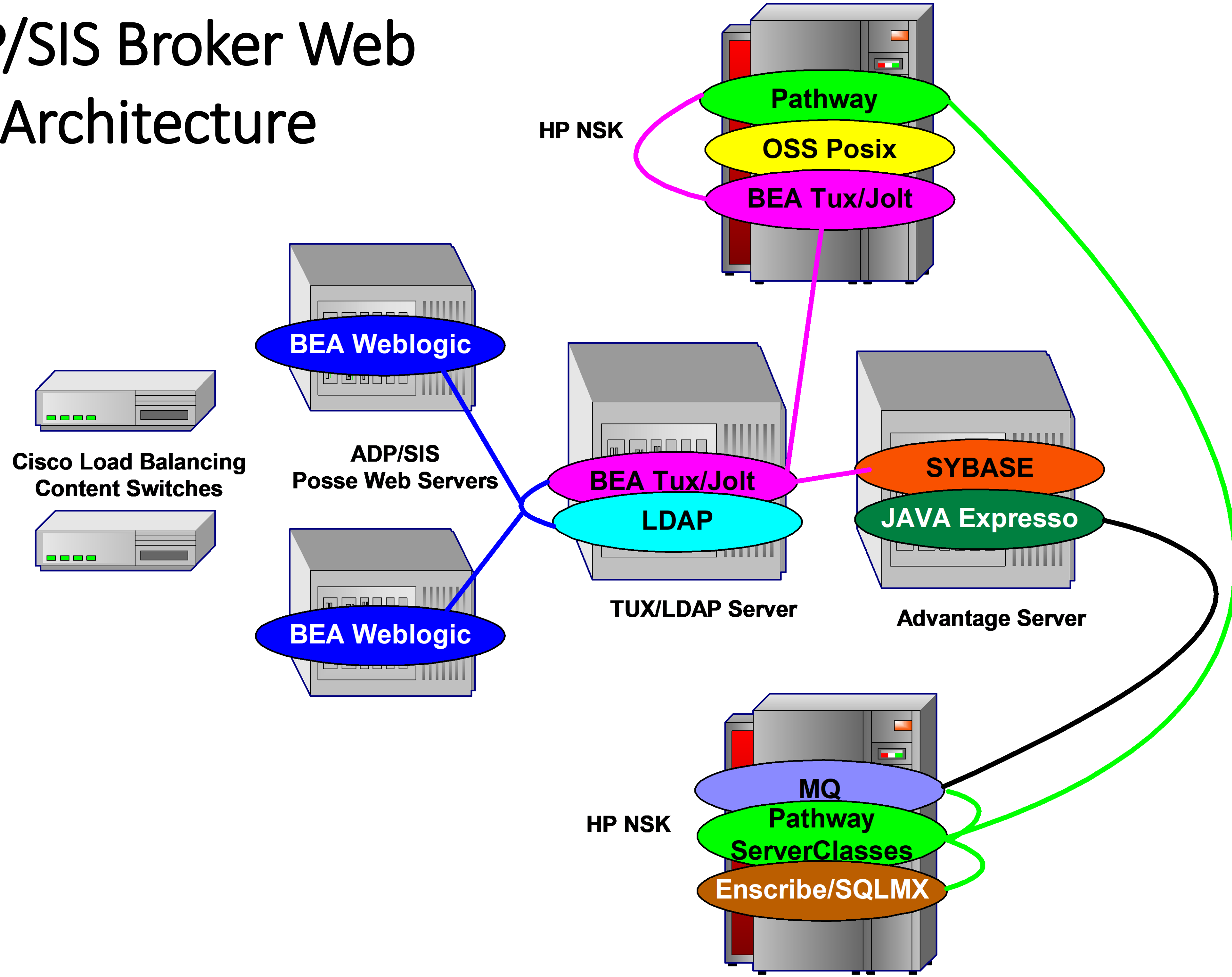
ADP ADVANTAGE Data Service Architecture

HP NSK S76000

IBM AIX P Series

Batch

BATXFER

FTP

A P I

J A V A

Real-Time

Servers

S01XFER

MQ

SYBASE Gold Standard

Sybase Replication

Service Demarcation

Reasons for the Gold Standard

- **Client DB Recovery**

- **Access only by Stored Procs with known   performance profiles**

- **Provides data for various ADP/SIS front-ends**

- **Capability to replicate to multiple data centers.**

- **Reconciliation capable**

SYBASE Read-Only Copy

Client Remote DB Server