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# Emerging Architectures for Real-Time Observability at Scale

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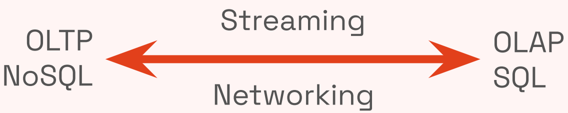
# Whoami?

**Peter Corless**, Principal Product Marketing Manager, Redpanda Data

- Currently **Redpanda Data** — Data Streaming (Kafka-compatible)
  - Note: Not OSS, but source-available
  - Integrates with a lot of OSS tools/systems
- Formerly
  - **StarTree** (Apache Pinot) — Real-Time SQL Analytics (OLAP)
  - **ScyllaDB** — Real-Time Wide Column NoSQL (OLTP)
  - **Aerospike** — Real-Time Key-Value NoSQL (OLTP)
  - **Cisco** — Routing, Switching (back in the age of dinosaurs)
- Let's get LinkedIn: linkedin.com/in/petercorless/



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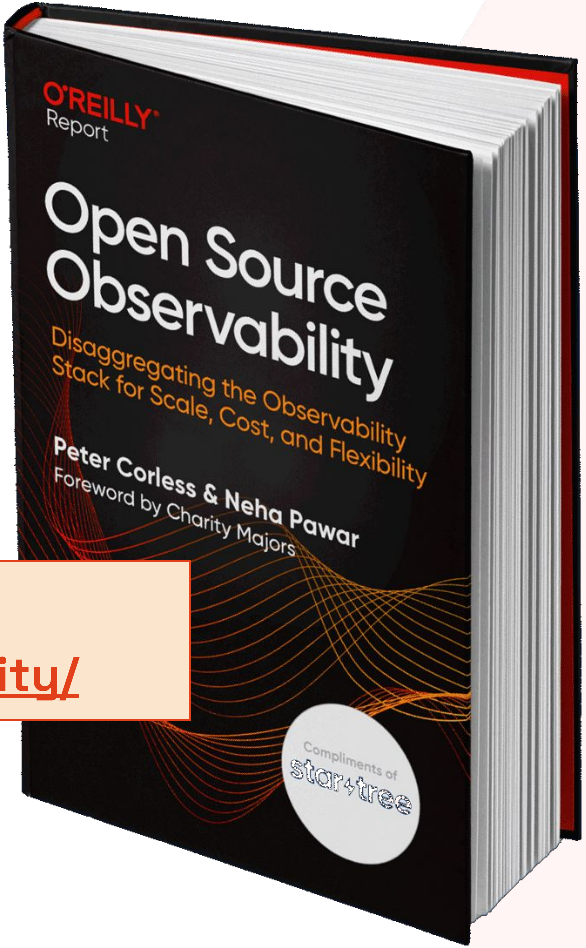
# Free O’Reilly Book


O'REILLY
Report
Open Source Observability
Disaggregating the Observability Stack for Scale, Cost, and Flexibility
Peter Corless & Neha Pawar
Foreword by Charity Majors
Compliments of
star✦tree

“Open Source Observability”
startree.ai/solutions/observability/

# Chapter 1:
# LOCK-IN

We'll own your agents

We'll own the data collection

We'll own your data

We'll own the analysis

We'll own the dashboards

We'll own the alerting

We'll own **you**

— typical Olly vendor

# Costs? Sure! It’s simple...

$$PED = \frac{(Q_1 - Q_0) / (Q_1 + Q_0) / 2}{(P_1 - P_0) / (P_1 + P_0) / 2}$$

— typical Olly vendor

# Olly as % of IT Spending

**Depends on who you ask…**

- 15%-25% of *Infra bill* (Honeycomb, 2025)
- 10%-25% of *API ops* expenses (Gravitee, 2025)
- 7%-10% of *Cloud budget* (AWS, 2024)

*Problem: All of these are just a* ***% of a %*** *of your overall IT spending; not normalized against each other; YMMV*

Only consensus:

## ***“Observability costs are too damn high!”***

— *Shahar Azulay, 2023*

# Chapter 2:
# HIT ESCAPE

# Chapter 2: (Wait. *Can* you hit escape?)

# Typical Olly Vendor Architecture Components

- Telemetry Instrument-ation
- Collection
- Transport
- Storage
- Querying/ Analytics
- Dashboards/ Response

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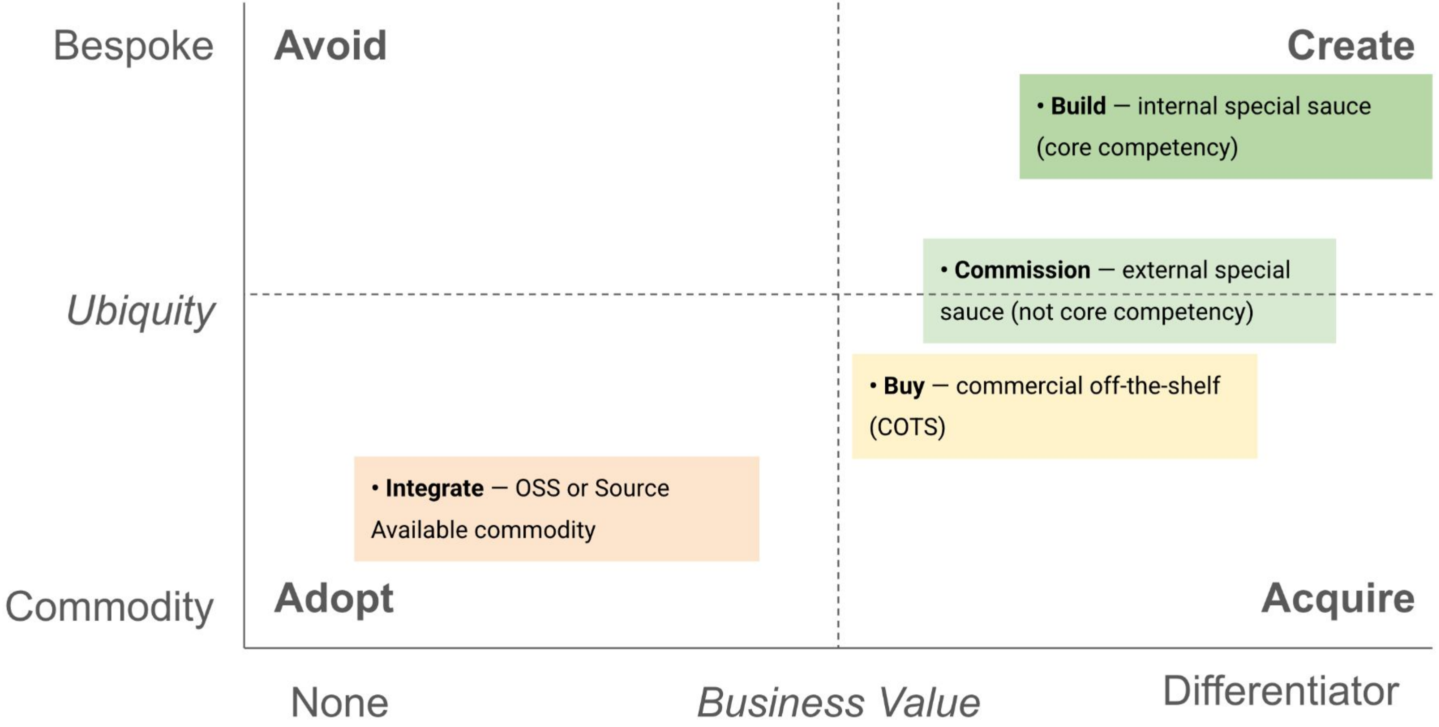
# The Choice: Build or Buy + Commission or Integrate



- **Build** — internal special sauce (core competency)
- **Commission** — external special sauce (not core competency)
- **Buy** — commercial off-the-shelf (COTS)
- **Integrate** — OSS or Source Available commodity

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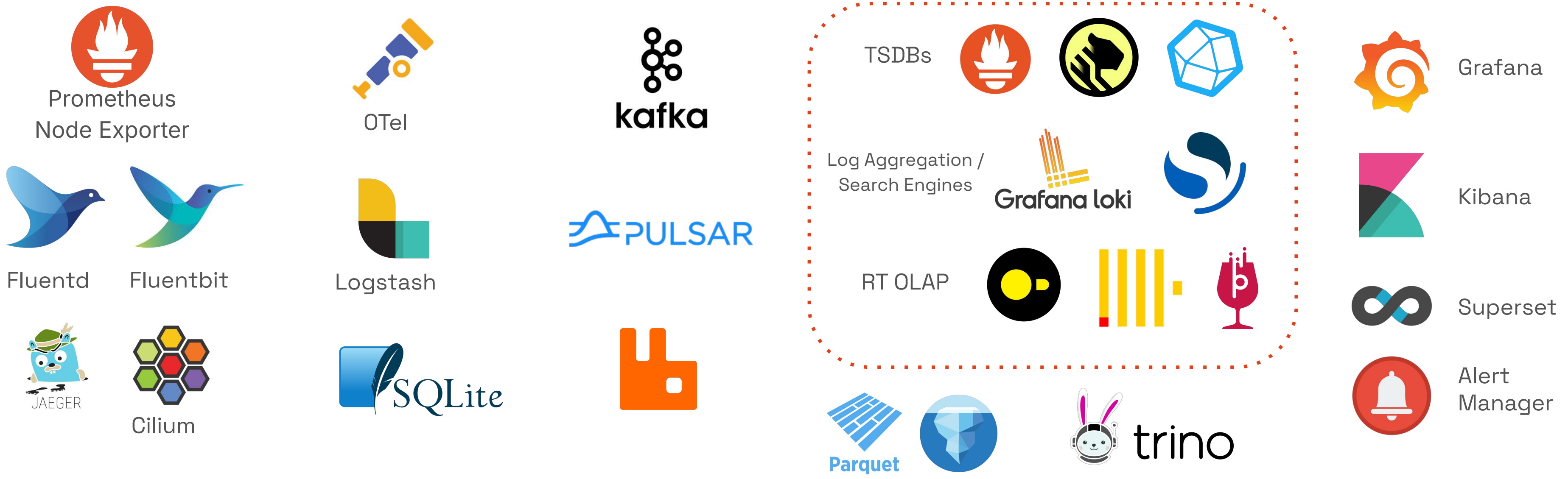
Original quadrant chart credit Rick Clark
Shoutout to Charity Majors, Honeycomb CTO, for inspiring conversation

# Typical OSS Observability Architecture Components



**Telemetry Instrument-ation**

Prometheus Node Exporter

Fluentd

Fluentbit

JAEGER

Cilium

**Collection**

OTel

Logstash

SQLite

**Transport**

kafka

PULSAR

**Storage** / **Querying/ Analytics**

TSDBs

Log Aggregation / Search Engines

Grafana loki

RT OLAP

Parquet

trino

**Dashboards/ Response**

Grafana

Kibana

Superset

Alert Manager

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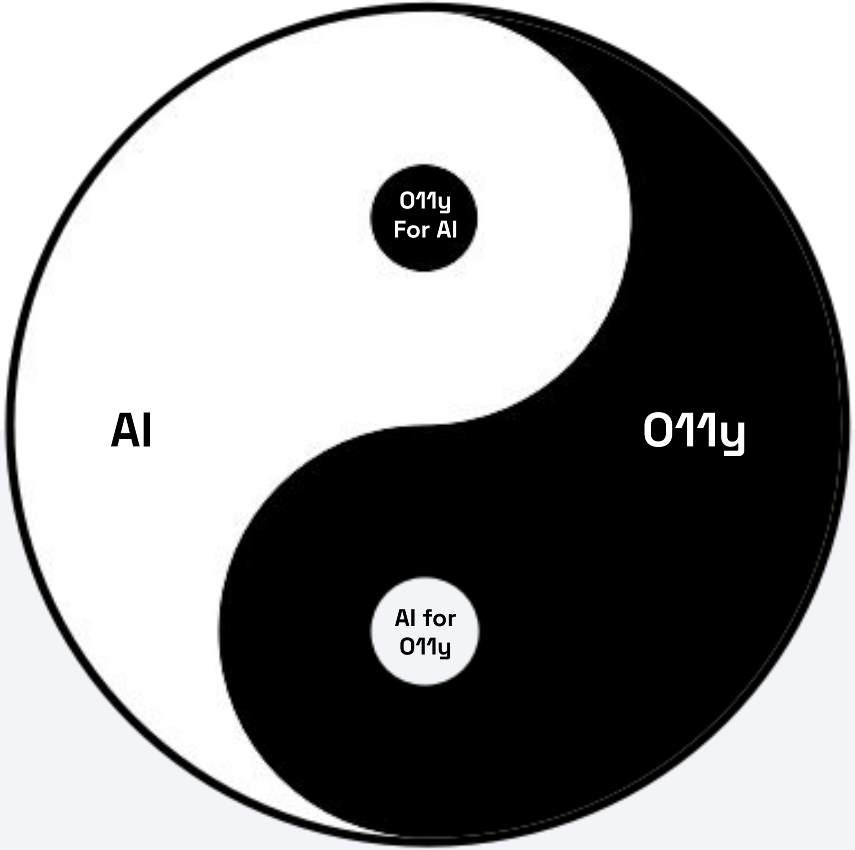
# Chapter 3: AI is Permeating Everything, Including Olly

# Olly, AI, and Your Moment of Zen



# AI Observability & Evaluation

How to use O11y to make a *better* AI

**AI Observability**

- Model Performance Tracking
  - Accuracy
  - Precision
  - Recall
- System Resource Utilization
- Tracing
- Clustering, Visualization

**AI Evaluation**

- Data Quality Monitoring
- Fairness, Bias Detection, Ethical Compliance
- Explainability (Data Drift), Transparency, Interpretability
- Multilingual Quality (BLEU)
- Perplexity [guessability of next word in sequence], Sensibleness and Specificity Average (SSA)

# A Brief Survey of OSS AI Observability Projects

Langfuse

langfuse.com

PHOENIX

phoenix.arize.com

helicone

helicone.ai

opik by comet

comet.com/site/products/opik

laminar

laminar.sh

LangChain

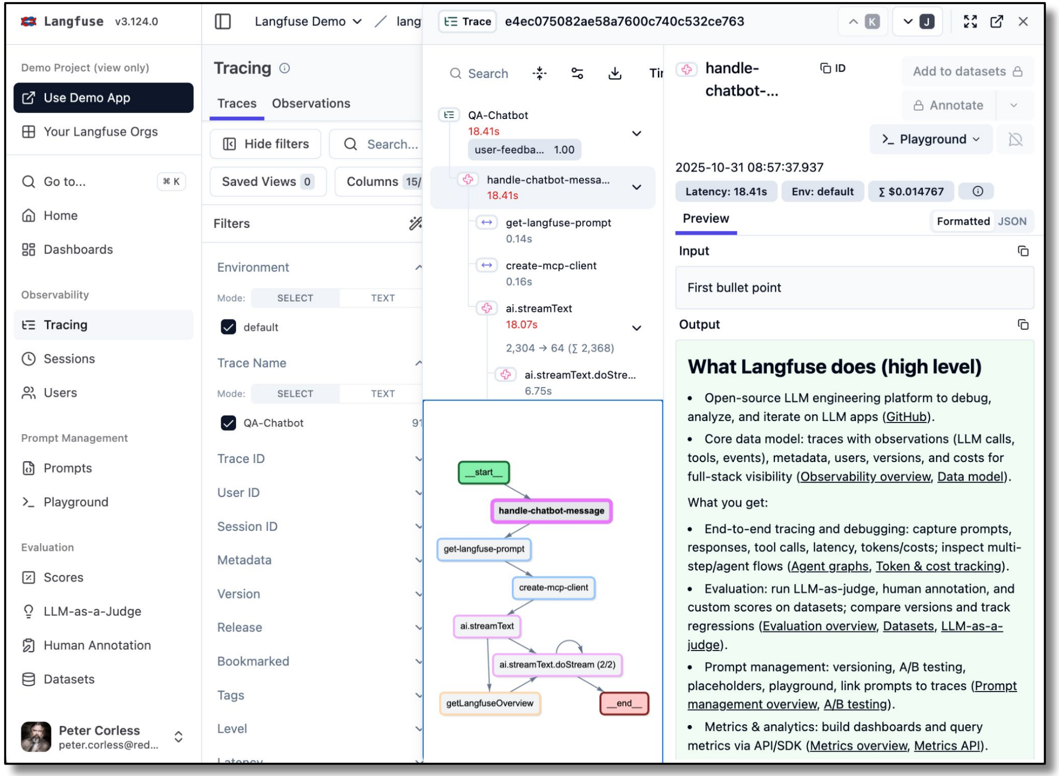
LangSmith Observability

langchain.com/langsmith/observability

Not OSS
SDK only!

# Langfuse: Tracing, Sessions, and User Analysis

LLM tracing in Langfuse lets you understand how you got the answer you got. You can see the step-by-step latency of the reply to your prompts, as well as who's using tons of tokens



First bullet point

### What Langfuse does (high level)

- Open-source LLM engineering platform to debug, analyze, and iterate on LLM apps (GitHub).
- Core data model: traces with observations (LLM calls, tools, events), metadata, users, versions, and costs for full-stack visibility (Observability overview, Data model).

What you get:

- End-to-end tracing and debugging: capture prompts, responses, tool calls, latency, tokens/costs; inspect multi-step/agent flows (Agent graphs, Token & cost tracking).
- Evaluation: run LLM-as-judge, human annotation, and custom scores on datasets; compare versions and track regressions (Evaluation overview, Datasets, LLM-as-a-judge).
- Prompt management: versioning, A/B testing, placeholders, playground, link prompts to traces (Prompt management overview, A/B testing).
- Metrics & analytics: build dashboards and query metrics via API/SDK (Metrics overview, Metrics API).

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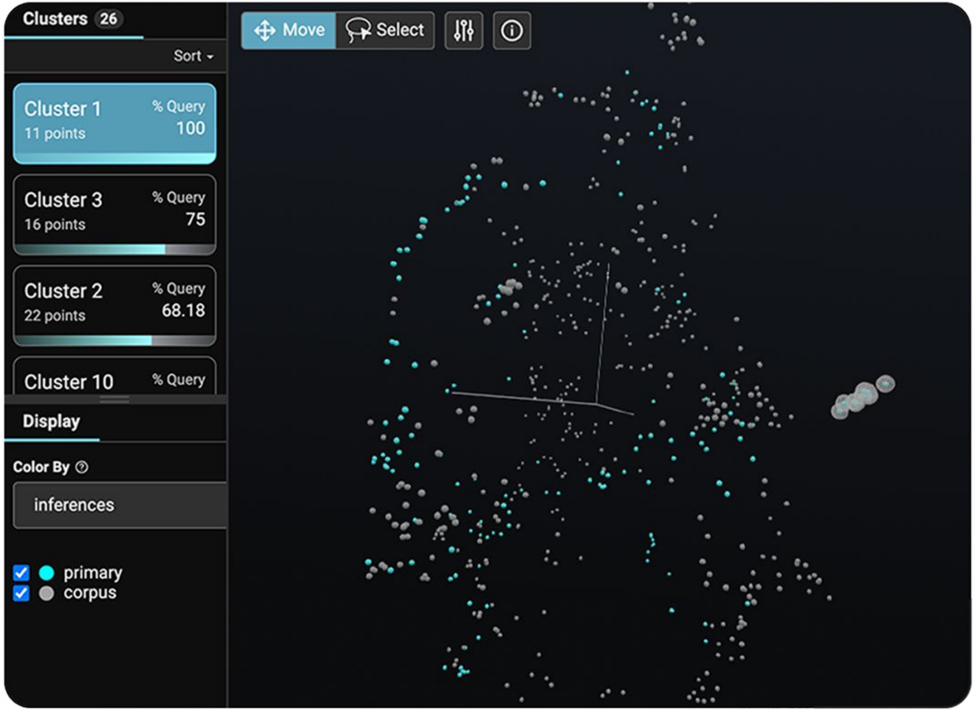
# Arize Phoenix: Dataset Clustering Visualization

Uncover semantically similar questions, document chunks, and responses using embeddings to isolate poor performance.



Clusters 26
Sort
Cluster 1 11 points % Query 100
Cluster 3 16 points % Query 75
Cluster 2 22 points % Query 68.18
Cluster 10 % Query
Display
Color By
inferences
☑ ● primary
☑ ● corpus
Move
Select

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# Chapter 4:
# Olly is Everywhere

# Data Streaming is Everywhere

Redpanda currently has customers in each of these industries

- Financial Services
- Manufacturing
- Cybersecurity
- Adtech
- Gaming & Gambling
- Energy
- Telecom
- Business Services
- Sports
- Operations
- Software Development
- Human Resources
- Insurance
- Retail
- Supply Chain
- Transportation
- Hospitality
- IT
- Blockchain
- Analytics
- Media & Entertainment
- Art & Design
- Nonprofits
- Healthcare
- Martech

# Redpanda's Core Verticals

Where data-in-motion is vital for success

- Financial Services
- Manufacturing
- Cybersecurity
- Adtech
- Gaming

# Observability is Everywhere!

O11y is a shadow deployment under every IT use case

| | | | | |
|---|---|---|---|---|
| Financial Services | Manufacturing | Cybersecurity | Adtech | Gaming |
| FinServ O11y | Manufacturing O11y | Cybersecurity O11y | Adtech O11y | Gaming O11y |

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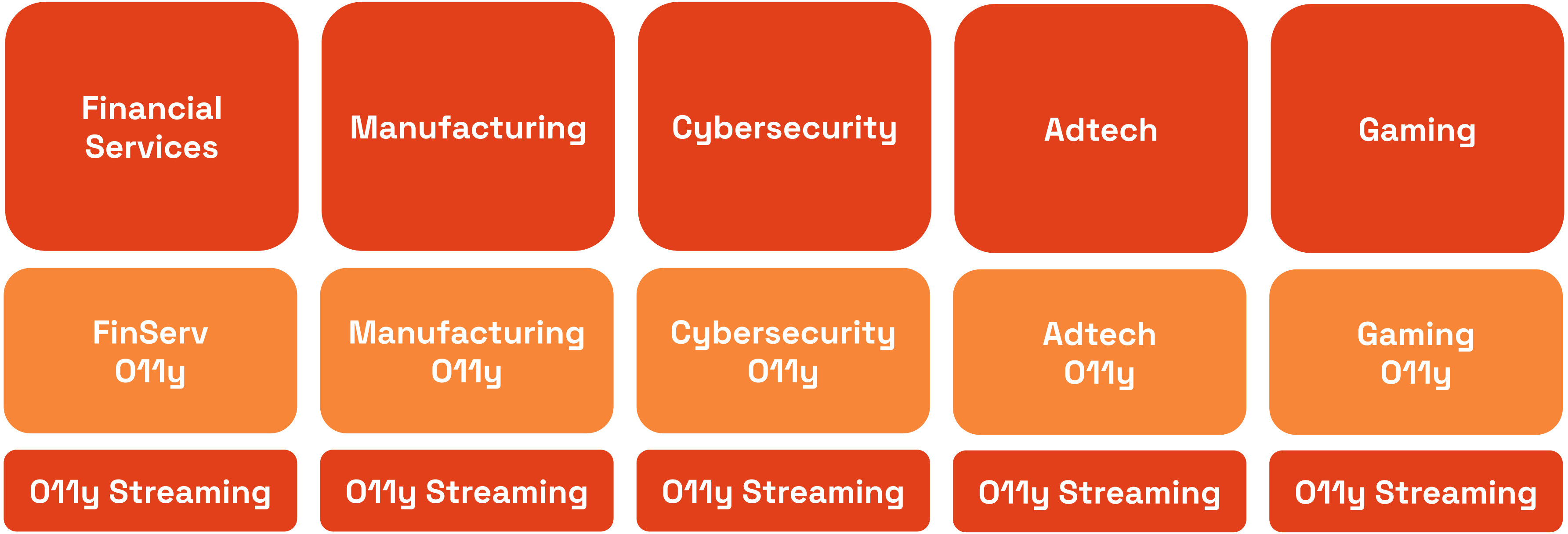
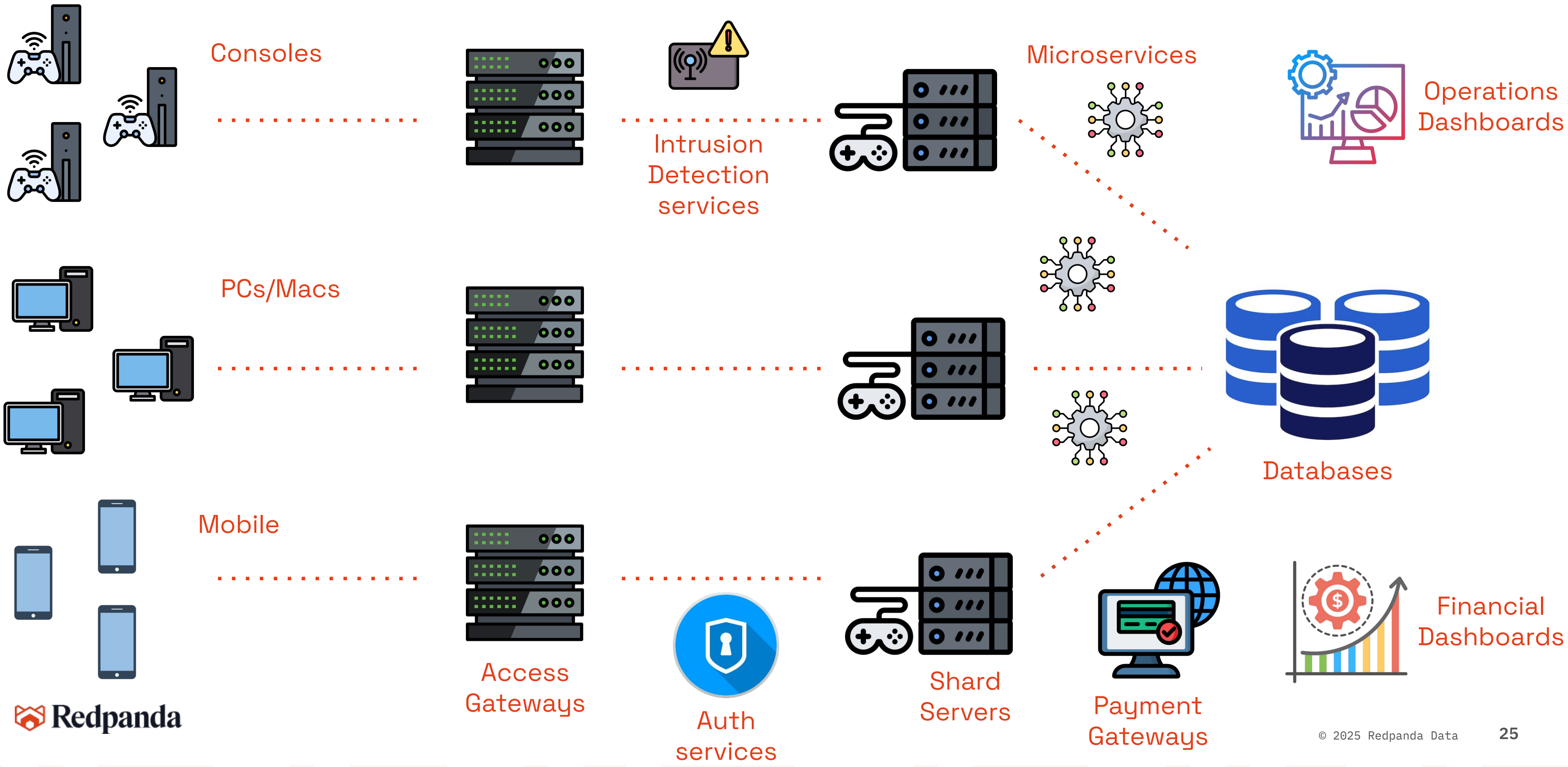
# Recursion! Data Streaming supports Olly

Streaming is a necessity for pretty much every O11y use case at scale



| | | | | |
|---|---|---|---|---|
| Financial Services | Manufacturing | Cybersecurity | Adtech | Gaming |
| FinServ O11y | Manufacturing O11y | Cybersecurity O11y | Adtech O11y | Gaming O11y |
| O11y Streaming | O11y Streaming | O11y Streaming | O11y Streaming | O11y Streaming |

# Example: Typical Game Company Observability



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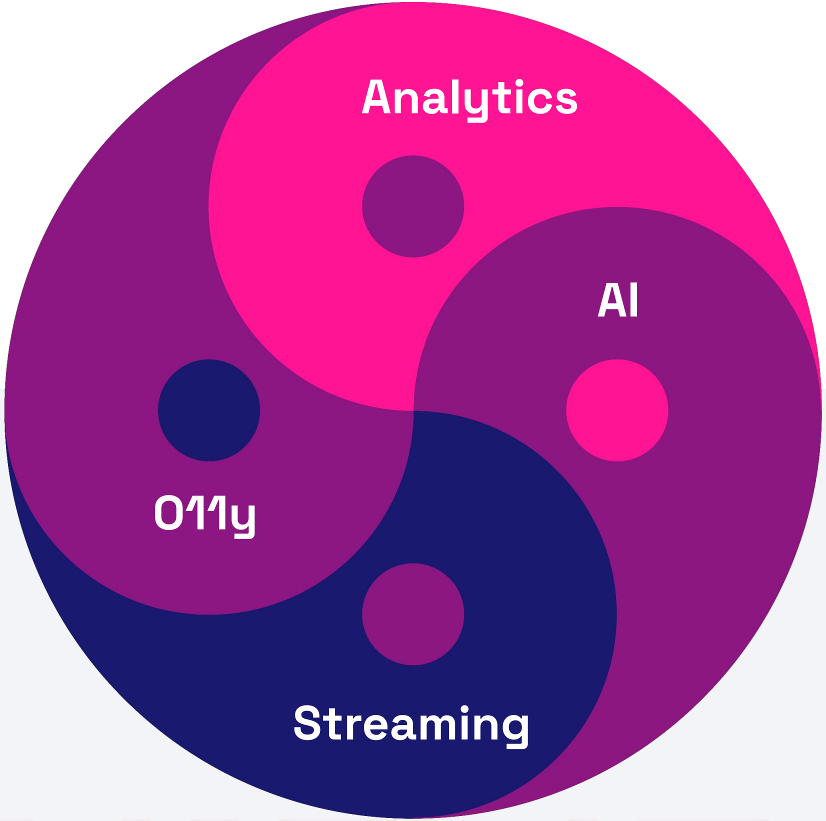
# AI, Olly, Streaming — and Analytics on top!



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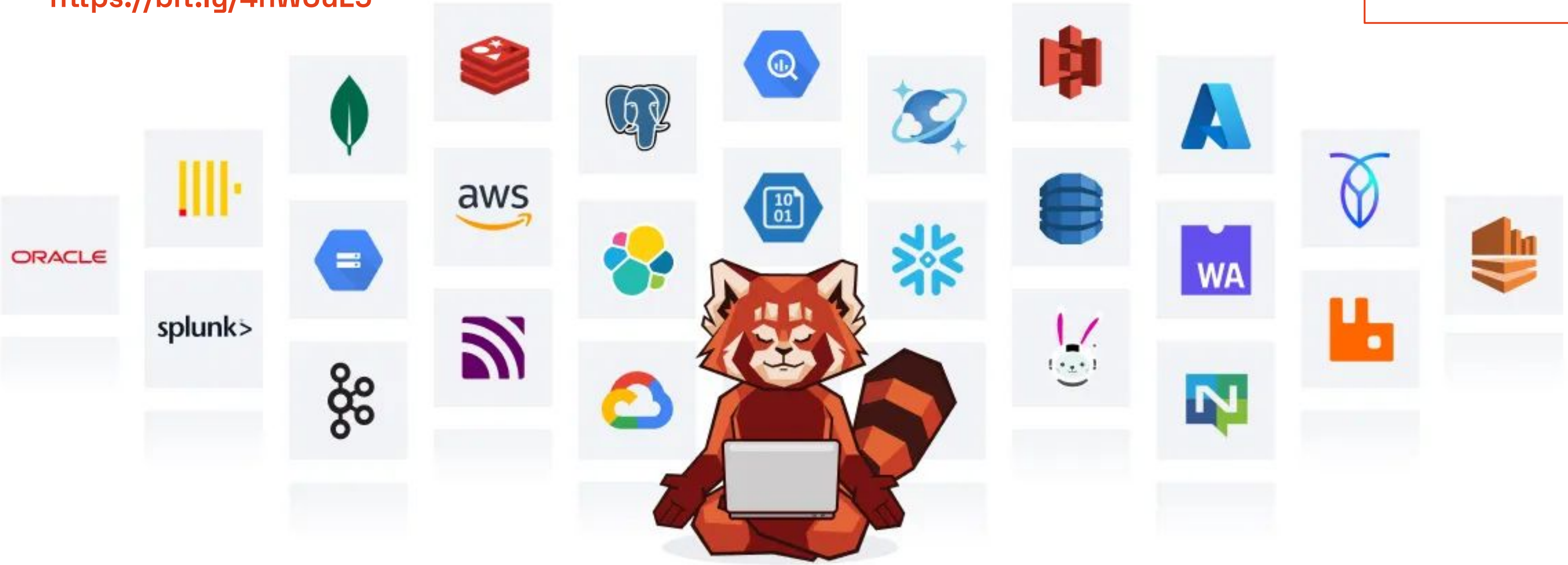
# Redpanda Connect

Hundreds of connectors to upstream and downstream systems vital for O11y

Almost all are free, OSS under Apache 2.0

Including 16 AI connectors

https://bit.ly/4hWOuE9



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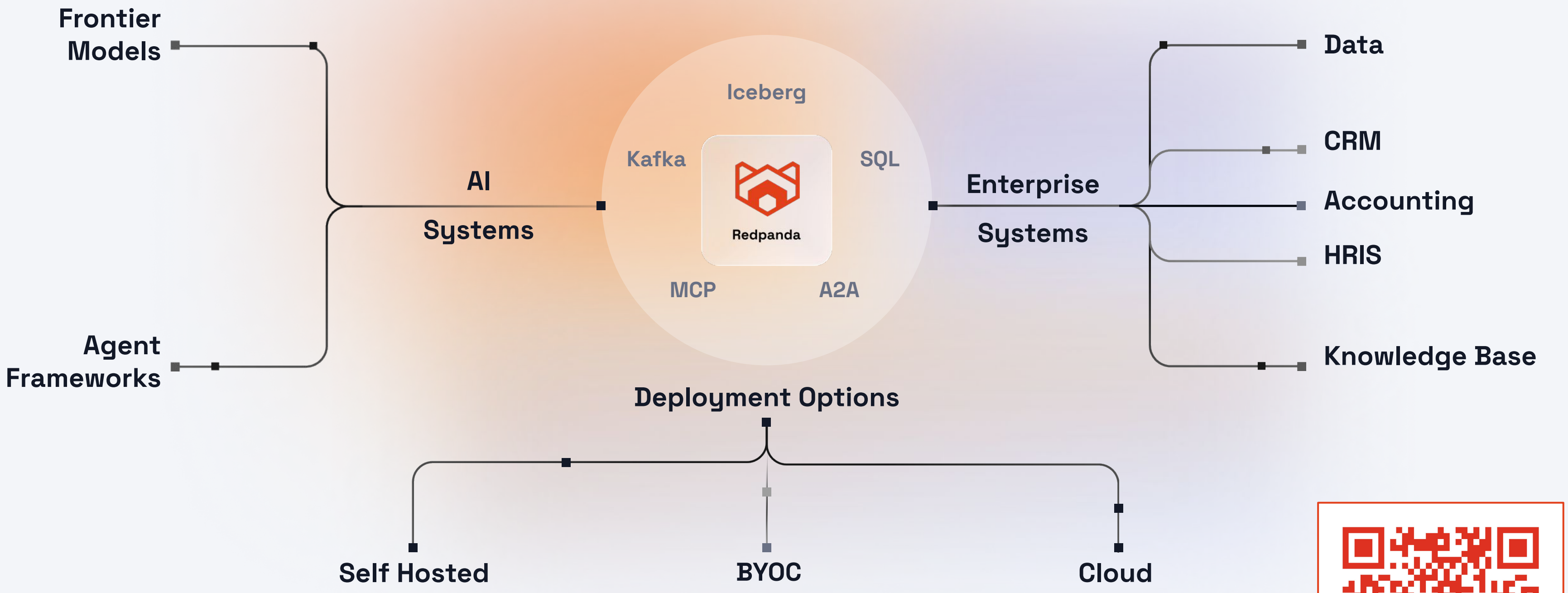
# The Redpanda Agentic Data Plane (ADP)



Frontier Models

Agent Frameworks

AI Systems

Iceberg

Kafka

SQL

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MCP

A2A

Enterprise Systems

Data

CRM

Accounting

HRIS

Knowledge Base

Deployment Options

Self Hosted

BYOC

Cloud

**A whole new concept; will integrate with OSS analytics, observability & AI systems**

*A unified, governed access layer that connects all your data systems and mediates every agentic interaction.*

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# Thanks for joining!

Let's keep in touch

🐦 @redpandadata

GitHub redpanda-data

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✉ hello@redpanda.com

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