



AVEVAWORLD
PARIS

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Leveraging industrial events in CONNECT to add enterprise value

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AVEVA

CONNECT

Unifying the industrial ecosystem with data,
AI and deep domain expertise for greater sustainability and efficiency

TRUSTED INTELLIGENCE

Single source of truth for
proven applications

ACTIONABLE INSIGHT

Closing the loop for
real-world impact

UNIFIED EXPERIENCE

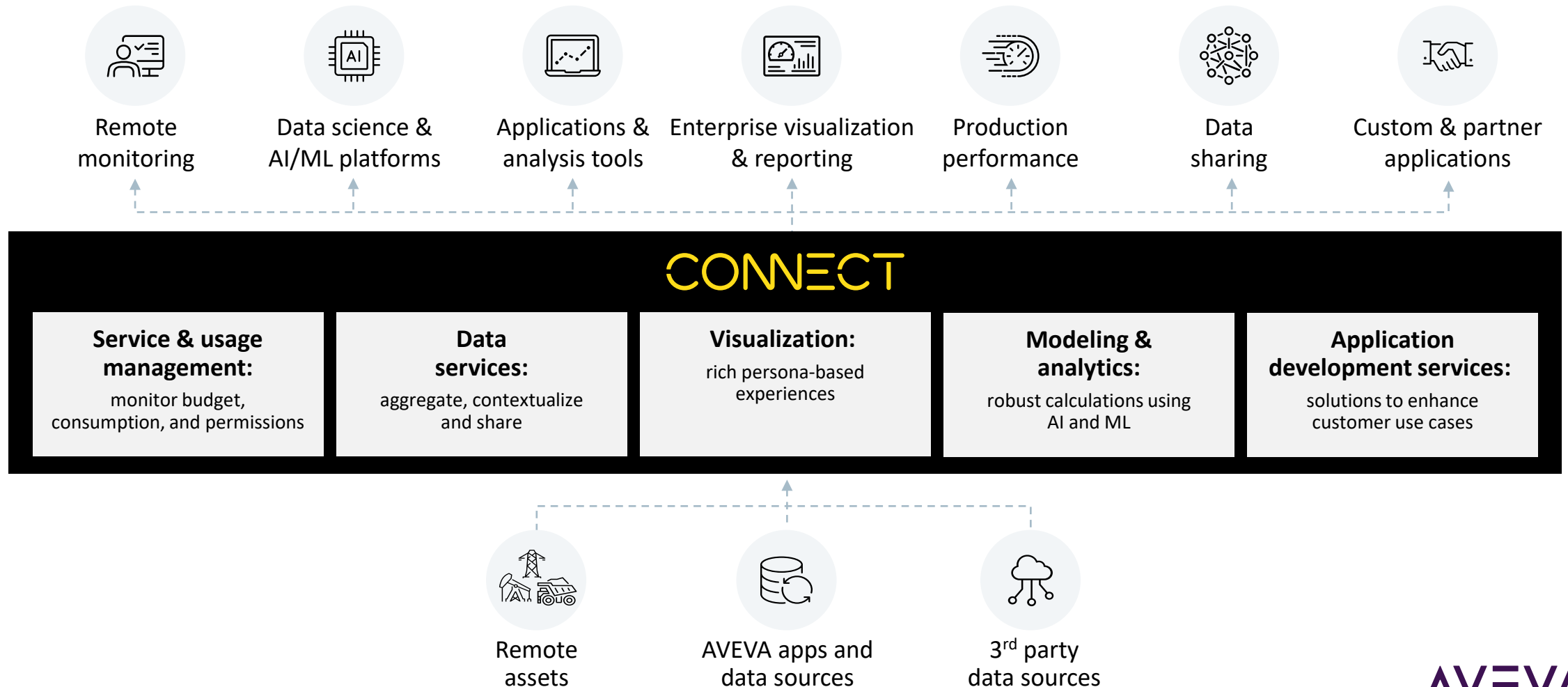
Hundreds of perspectives.
One shared reality

EMPOWERED ECOSYSTEM

Accelerating the network
effect across the value chain

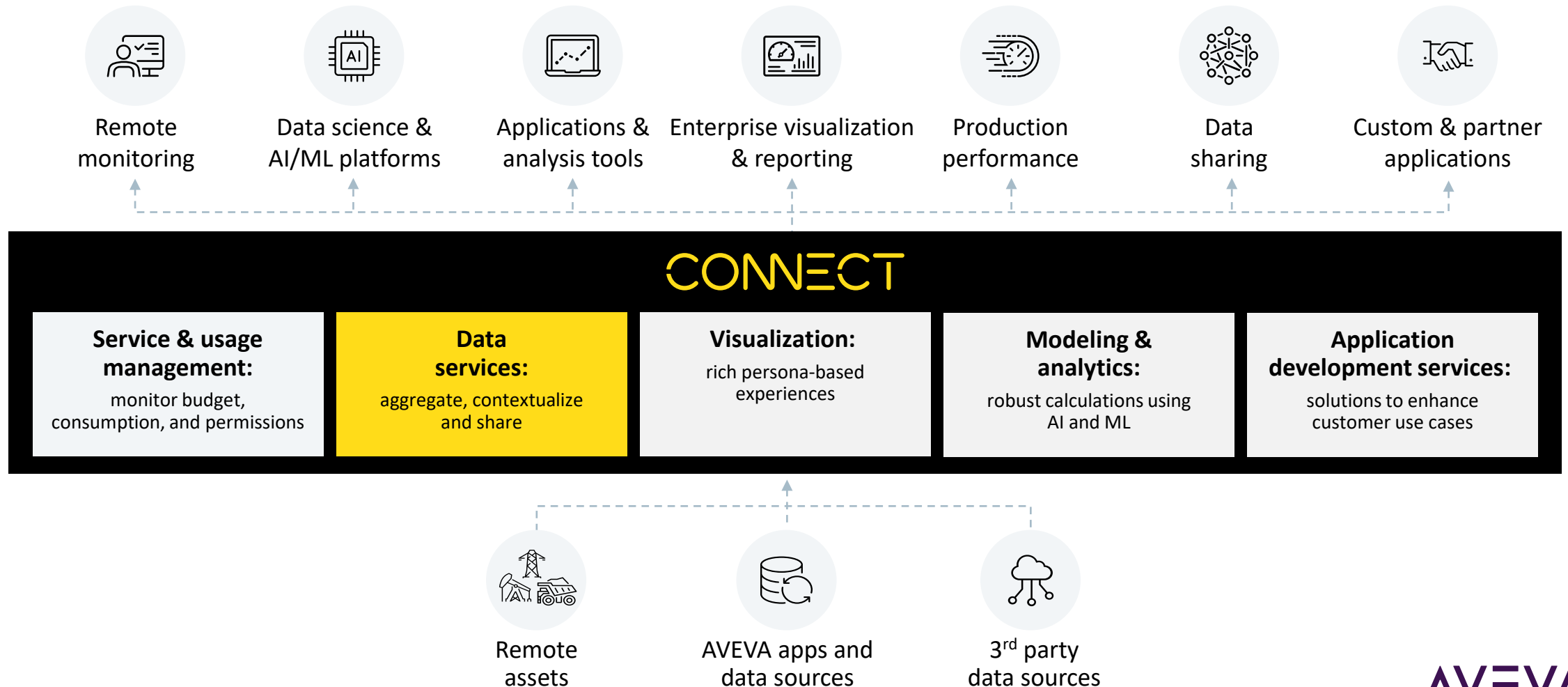
CONNECT, our industrial intelligence platform

Open and neutral, providing rich data insights for your unified industrial ecosystem

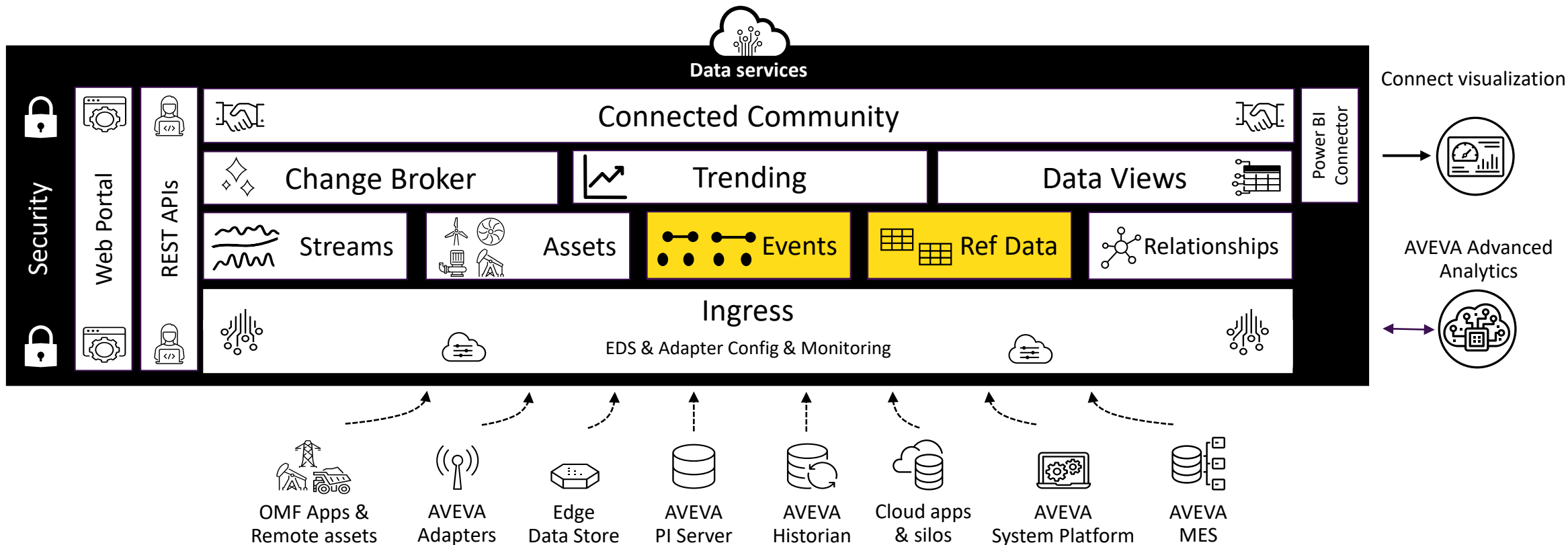


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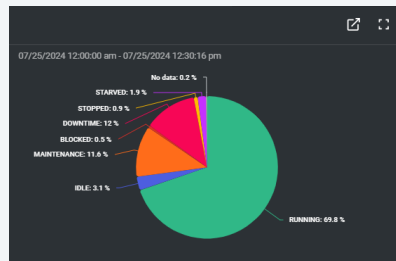
CONNECT data services – Capabilities



Events capture meaningful industrial context & observations

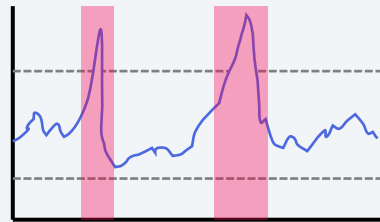
Equipment Utilization

Track equipment downtime for reporting and analytics



Process Excursions

Identify process excursions and take action



MES

Visualize and analyze production events across the enterprise



And more...

Your
Industrial
Events
Here

CONNECT

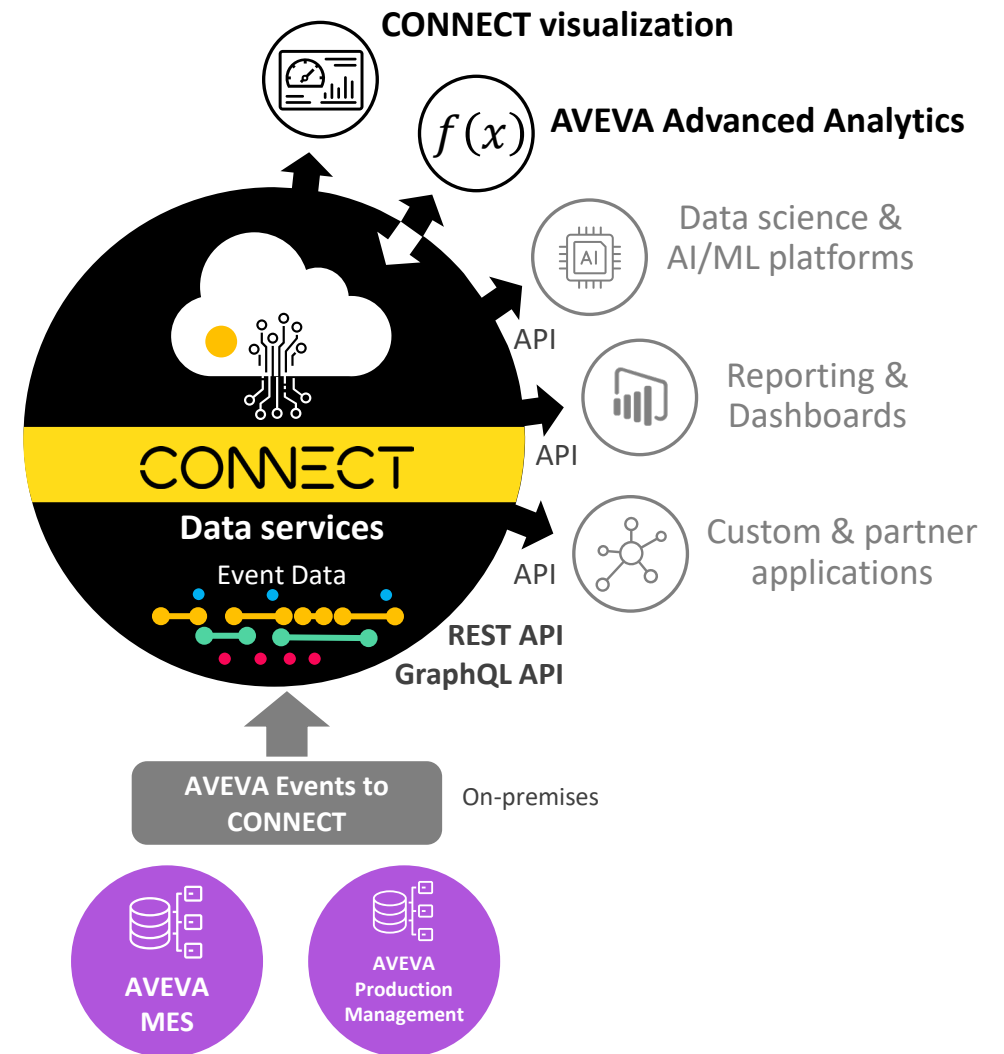
Industrial Events in CONNECT

✓ Scalable Ingress and Storage

✓ Flexible data model

✓ Enrichment through visualization and analytics

✓ Developer-friendly APIs



Events scaled for your industrial enterprise

Multisite / Enterprise Use Cases

Production Performance

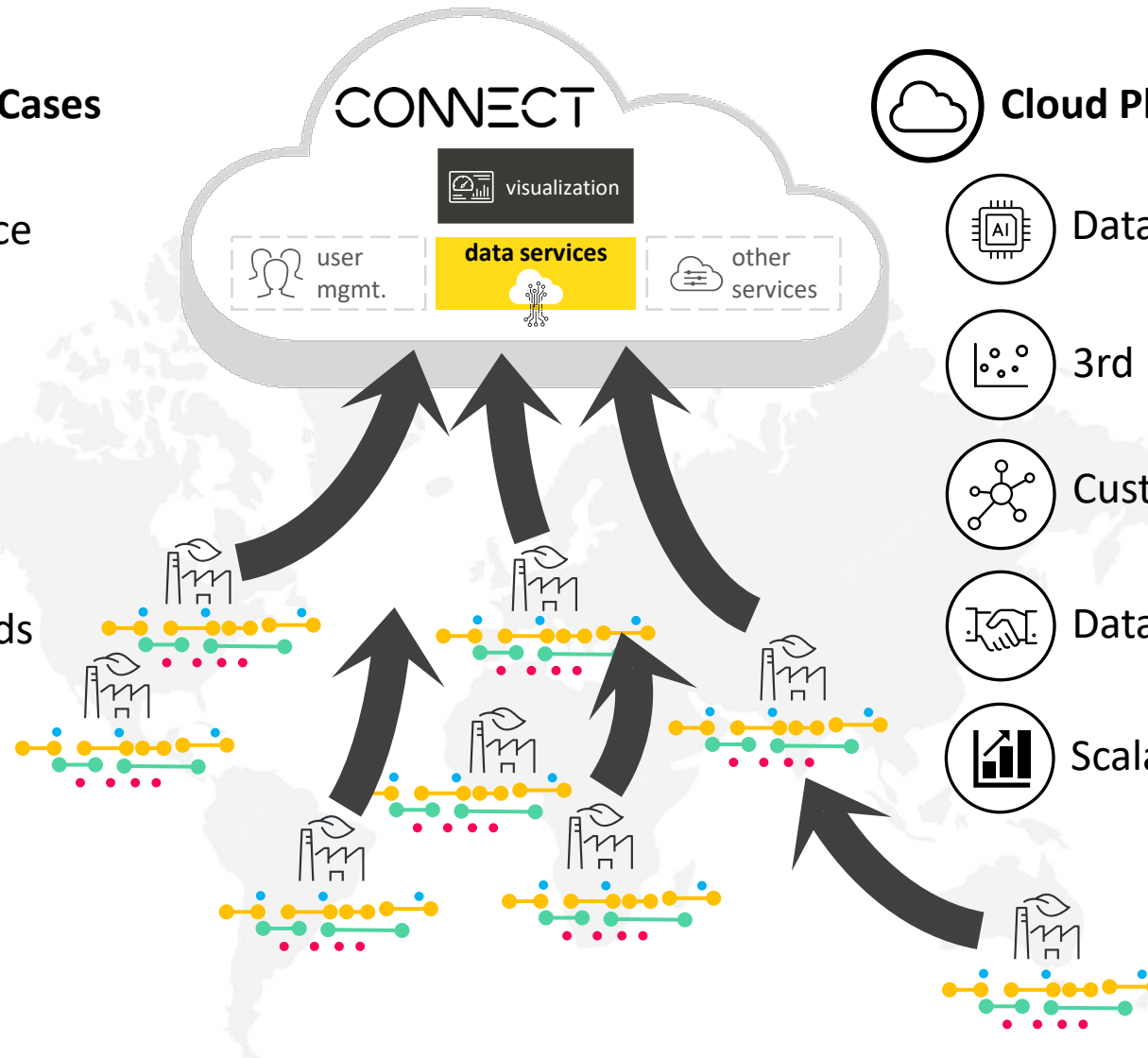
Product Quality

Sustainability

Reporting & Dashboards

Visualization

and more ...



Cloud Platform Advantages

Data science & AI/ML platforms

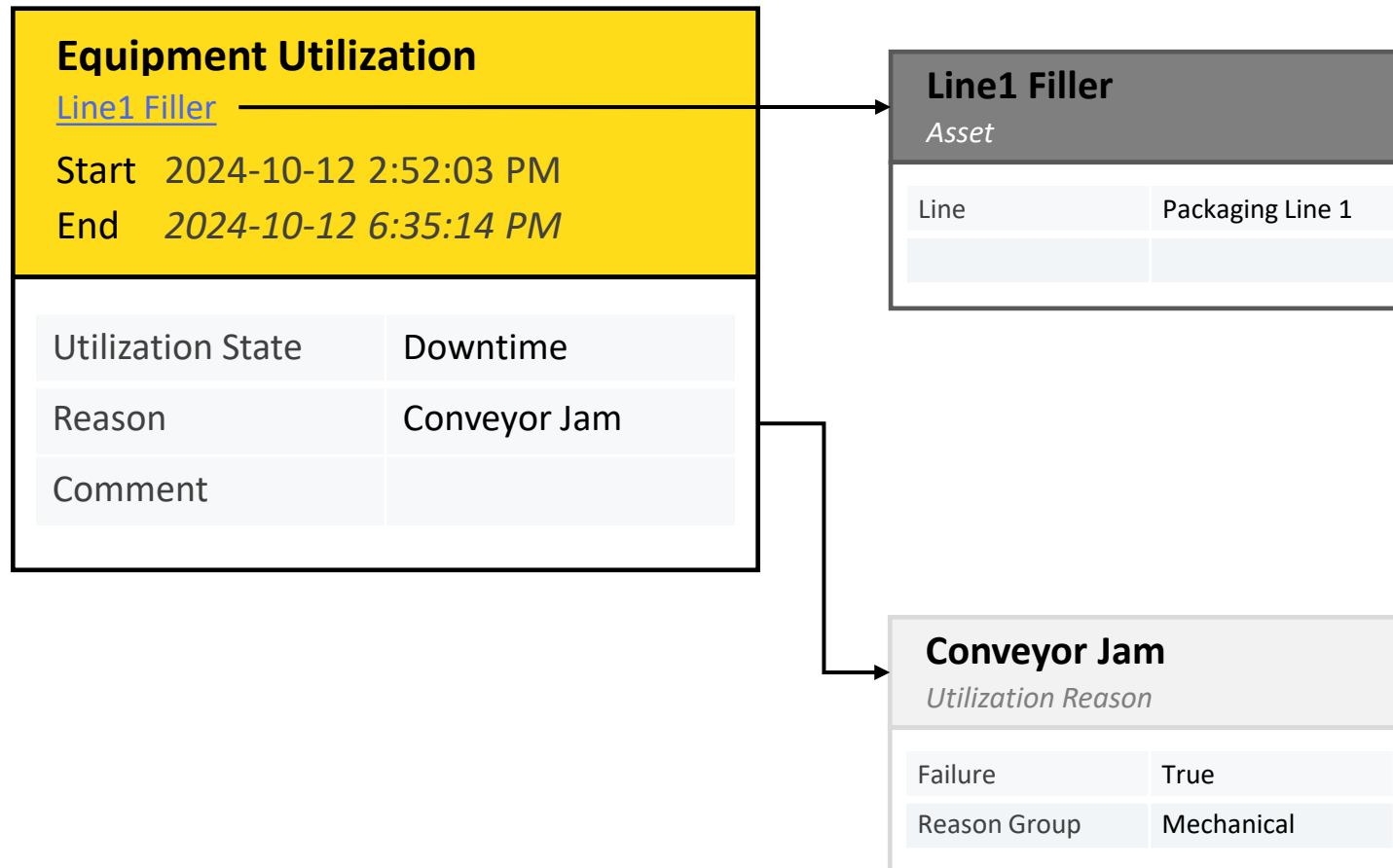
3rd party analytic tools

Custom & partner applications

Data sharing with business partners

Scalability

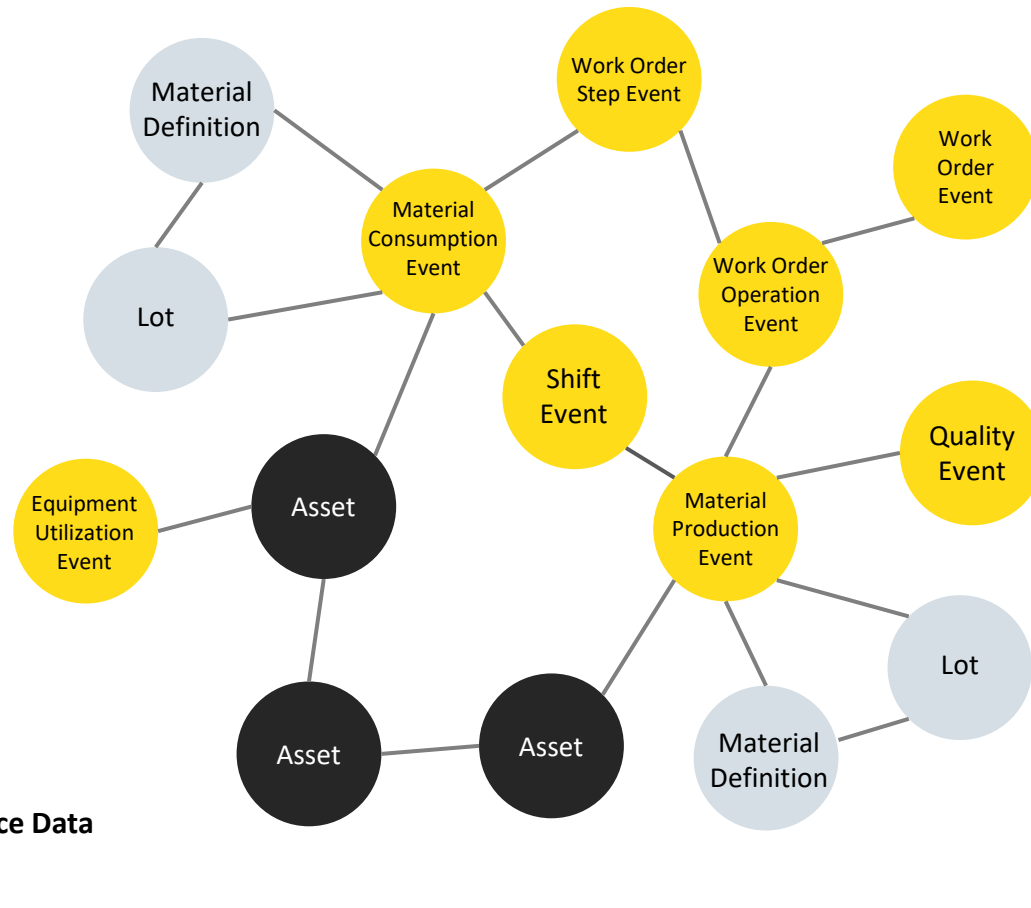
Flexible schema for modeling industrial events in context



- **Flexible Data Model**
Capture industrial events from any source
- **Integration with Assets and Reference Data**
Capture relationships in your data and connect real-time process data with industrial events

Capturing industrial events in context

Modeling unique relationships in industrial event data



- **Flexible Relationships**

Model the unique or complex relationships in your data

- **Powerful Queries**

Query across related events, assets and reference data powered by our GraphQL API



Amcor increases equipment effectiveness and reduces downtime by 1 - 2%

Challenge

- Certain types of molding equipment have a high number of recurring faults with costly repair and maintenance. There are more than 160 such assets.
- Upstream processes affect molding lines, and downtime shuts down the entire plant.
- Amcor needed timely information from analytics to avoid such faults.

Solution

- CONNECT data services assembles events and process data from multiple plants.
- CONNECT visualization services informs operations and analysts about performance.
- AVEVA Advanced Analytics predicts and notifies about failures and quality anomalies.

Results

- **Deployed CONNECT cloud-based system using the Lighthouse program to coordinate and analyze operational data, helping to decrease downtime by 1-2%.**
- **AVEVA AI Assistant provides otherwise unseen insights to data scientists.**
- **Successful Lighthouse engagement covered four assets over two plants. At enterprise scale, the savings would be “astronomical” – tens of \$MM USD annually.**



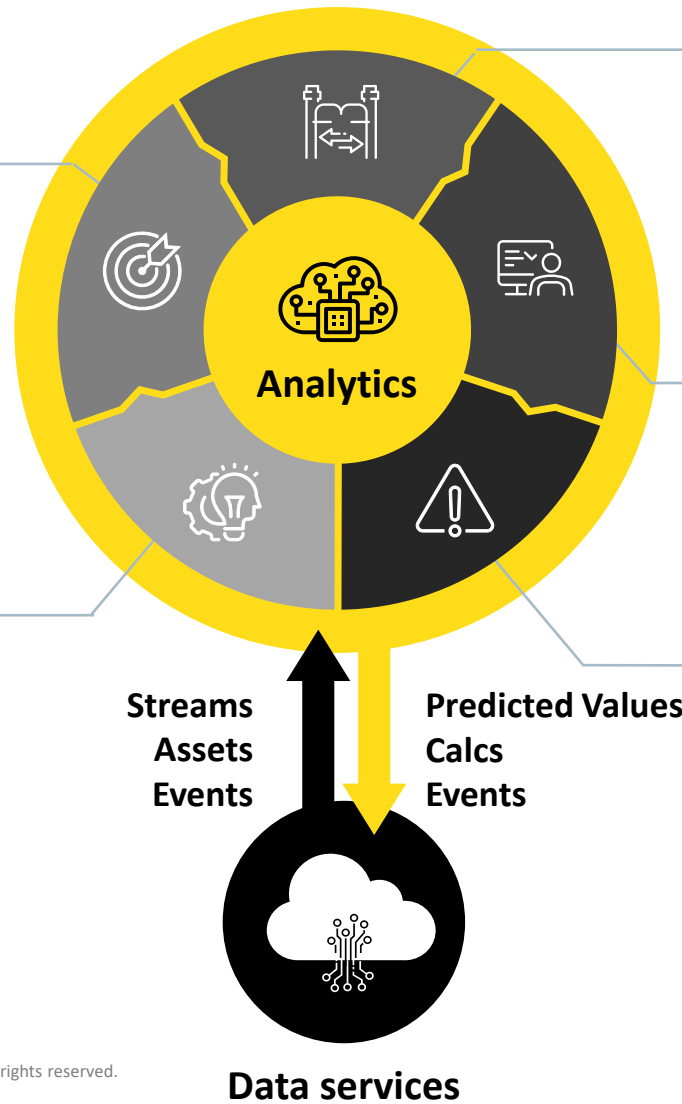
CONNECT modeling & analytics (AVEVA Advanced Analytics)

② Solve

Consolidate learnings and apply solutions that mitigate problems and improve performance

① Learn

Automate investigations and understanding of performance drivers with ML



③ Model

Combine data from multiple sources to mirror physical assets & processes on digital twins

④ Monitor

Apply algorithms & logic to continuously assess performance

⑤ Alert

Give early warnings of performance issues with improvement suggestions

Combine existing data with AI for faster and smarter decisions

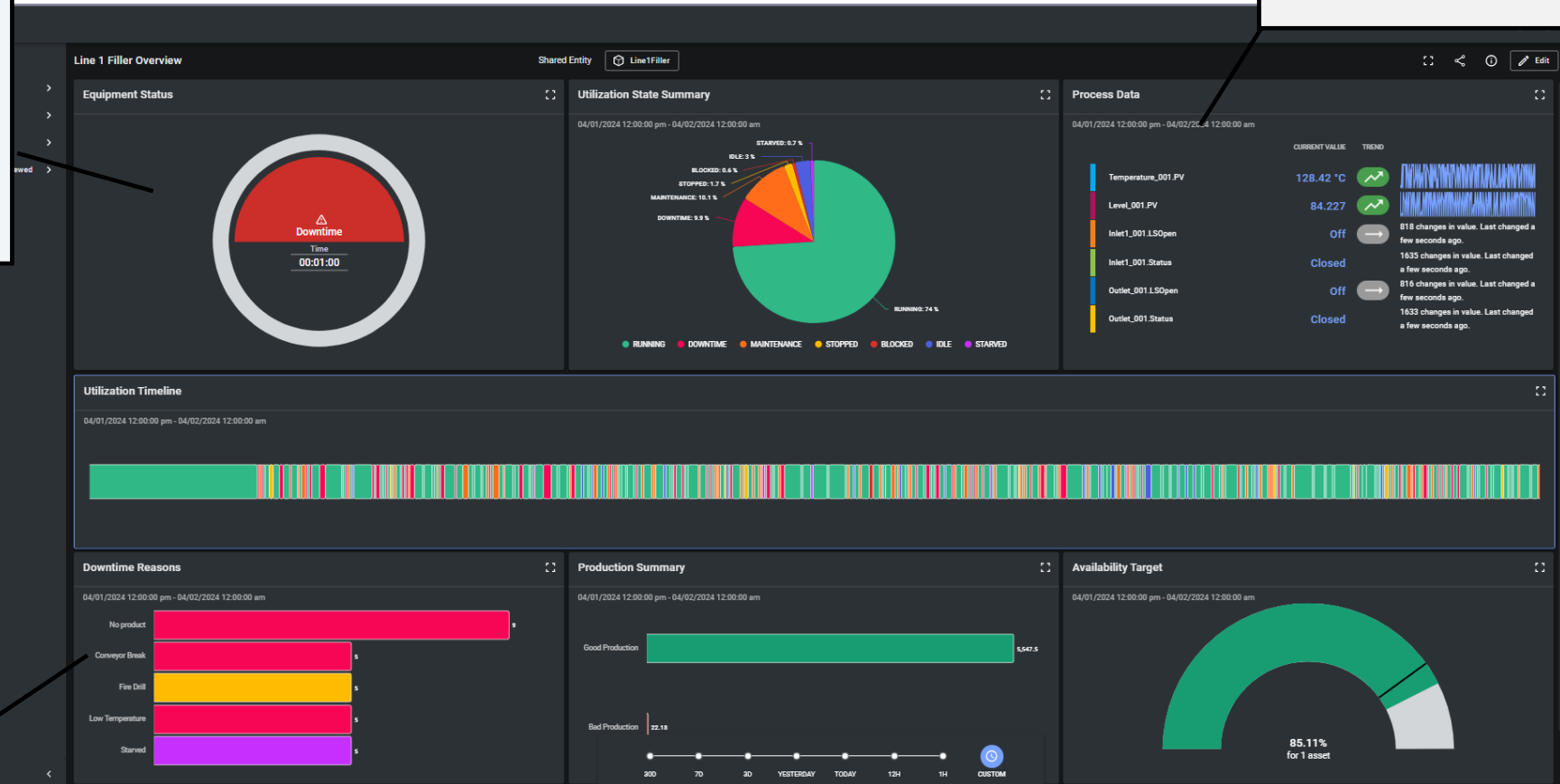
- Utilize AI and ML to improve process efficiency
- Understand production outcomes and get recommended corrective actions
- Collaborate with trusted partners to enable cross-company collaboration and discover new opportunities

Enterprise Visualization for Industrial Events

CONNECT Visualization

Visualize real-time operations data alongside industrial events

Summarize equipment status and utilization history



Analyze equipment downtime reasons

Data Ingress for Industrial Events in CONNECT

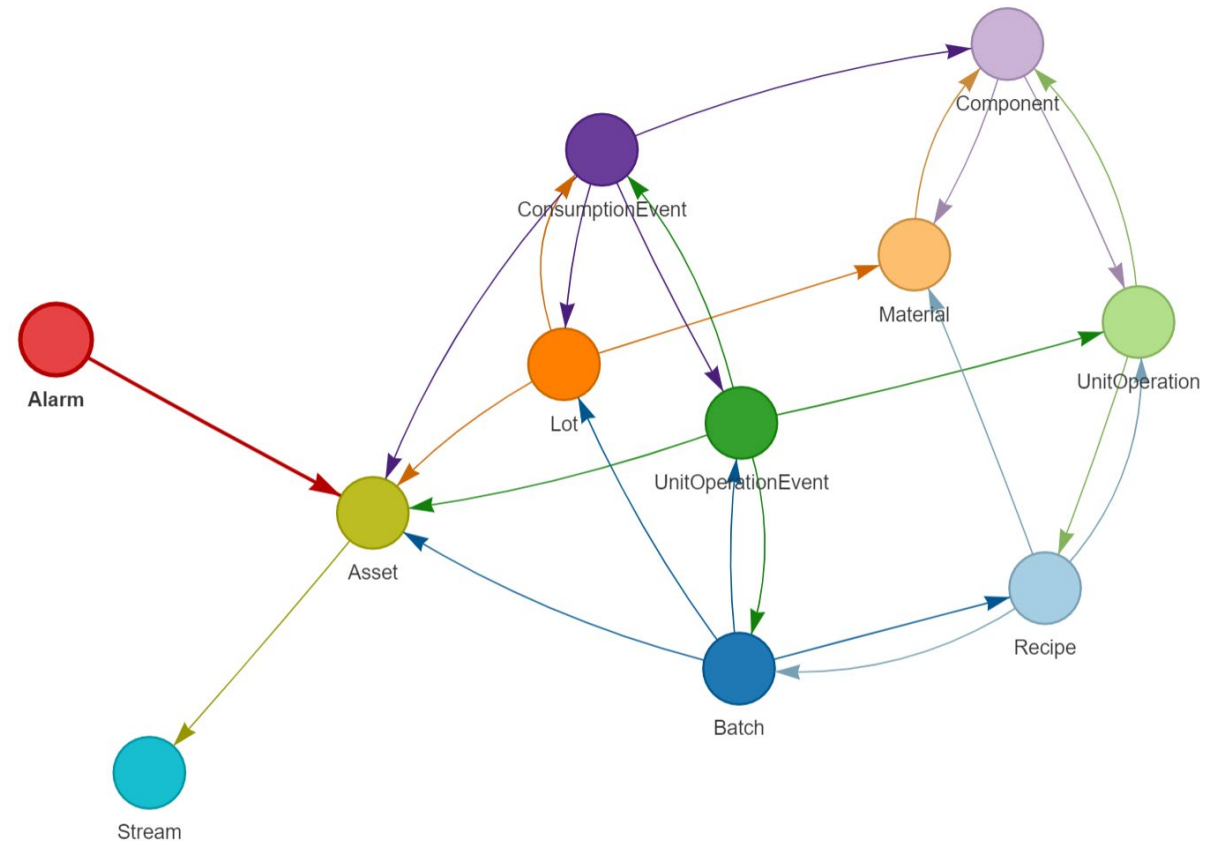
Multiple ways to ingest events into CONNECT (more to come in future)



Creating a graph data model for your domain

Developer Technologies for Events

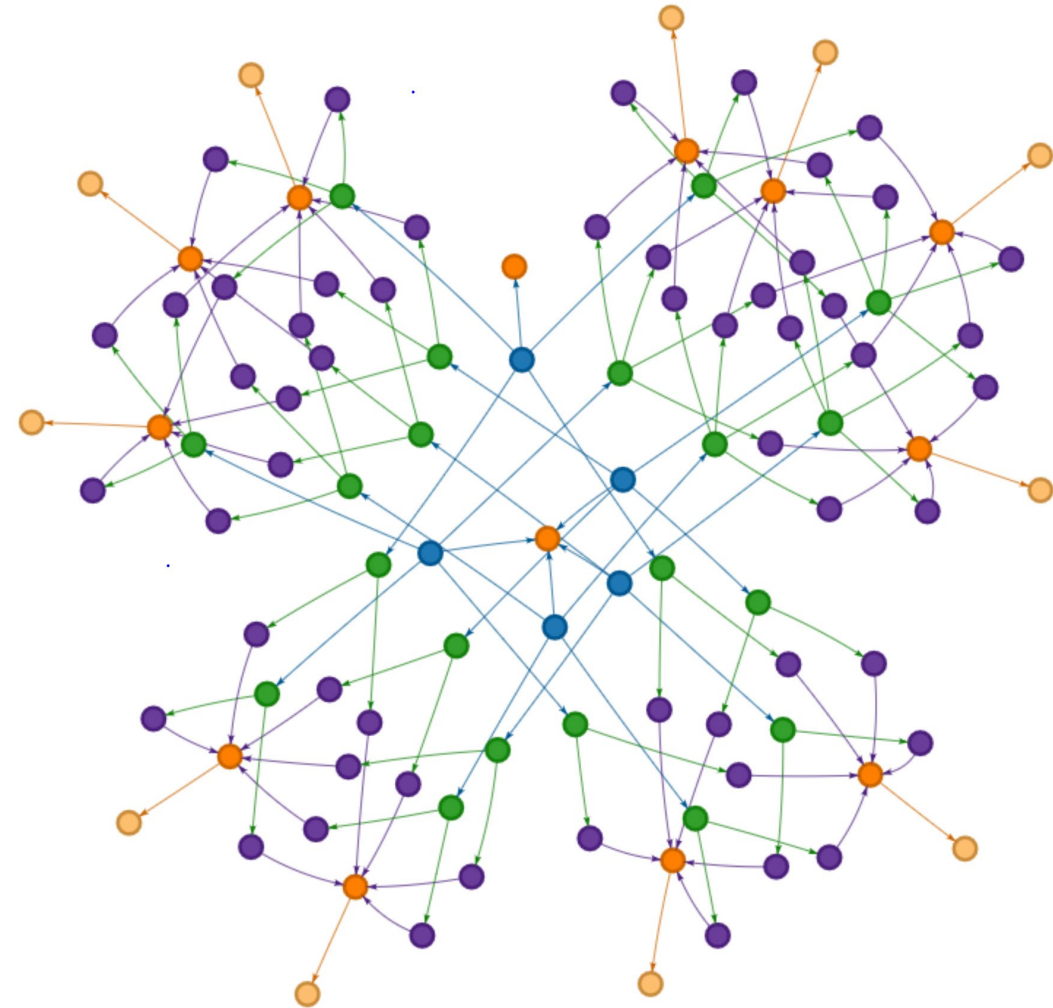
- The TypeStore REST API allows you to create a custom set of industrial entities that accurately model your domain
- Using your industry's vocabulary, you define the shape of your events and surrounding context as reference data
- Relationships allow you to connect events with surrounding master data, physical assets, and streams to form a domain-specific industrial graph data model
- The API allows you to define a complete graph data model from scratch or enhance an existing model offered by other compatible AVEVA products



Populating the graph

Developer Technologies for Events

- Once a graph data model has been defined, you can populate the graph using a set of REST APIs
- The Asset REST API allows you to create instances representing your physical equipment and connect them to streaming data
- The Reference Data REST API allows you to populate master data and other industrial context
- The Event REST API allows you to constantly stream events observed in your process
- An optional set of GraphQL mutations can be used to ingress related Events and Reference Data in a single operation



Traversing the graph

Developer Technologies for Events

- The platform exposes a custom GraphQL schema generated from your configured industrial types
- The GraphQL query operations allow you to search the graph for any event, asset, or surrounding context
- Relationships allow you to traverse the graph for related entities or stream data
- The GraphQL API also exposes features to rollup event summaries over time

The screenshot displays the GraphQL Console interface for 'CONNECT Data services'. It is divided into three main sections: GraphQL Explorer, Request, and Response.

- GraphQL Explorer:** Shows a query with a 'queryBatch: [Batch!]' parameter. A sidebar on the left lists various fields with checkboxes, including 'id: ID!', 'startTime: DateTime', 'endTime: DateTime', and 'duration: TimeSpan', which are currently checked.
- Request:** Displays the GraphQL query in a code editor. The query is:

```
1 {
2   events {
3     queryBatch(options: {
4       sort: {
5         createdAt: DESC
6       }) {
7         count: 5
8       }
9     }
10    id
11    number
12    startTime
13    endTime
14    duration
15    unitOperationEvents {
16      id
17      name
18      startTime
19      endTime
20      duration
21      consumptionEvents {
22        id
23        startTime
24        endTime
25        name
26      }
27    }
28    lot {
29      id
30      number
31    }
32  }
33 }
```
- Response:** Shows the JSON response body. The response is a nested structure:

```
1 {
2   "data": {
3     "events": {
4       "queryBatch": [
5         {
6           "id": "BATCH-GenTherapyARecipe-009-003-2024-04-05T14:59:41.672866Z",
7           "number": "BATCH-GenTherapyARecipe-009-003-2024-04-05T14:59:41.672866Z",
8           "startTime": "2024-04-05T14:59:41.672866Z",
9           "endTime": "2024-04-19T14:59:41.672866Z",
10          "duration": "14.00:00:00",
11          "unitOperationEvents": [
12            {
13              "id": "UOP-BATCH-GenTherapyARecipe-009-003-2024-04-05T14:59:41.672866Z",
14              "name": "Fermentation",
15              "startTime": "2024-04-05T14:59:41.672866Z",
16              "endTime": "2024-04-15T14:59:41.672866Z",
17              "duration": "10.00:00:00",
18              "consumptionEvents": [
19                {
20                  "id": "BATCH-GenTherapyARecipe-009-003-2024-04-05T14:59:41.672866Z",
21                  "startTime": "2024-04-05T14:59:41.672866Z",
22                  "endTime": "2024-04-05T20:59:41.672866Z",
23                  "name": "Glucose"
24                },
25                {
26                  "id": "BATCH-GenTherapyARecipe-009-003-2024-04-05T14:59:41.672866Z",
27                  "startTime": "2024-04-05T14:59:41.672866Z",
28                  "endTime": "2024-04-05T20:59:41.672866Z",
29                  "name": "Cell"
30                }
31              ]
32            }
33          ]
34        }
35      ]
36    }
37  }
```

Roadmap: What's next for Industrial Events in **CONNECT**

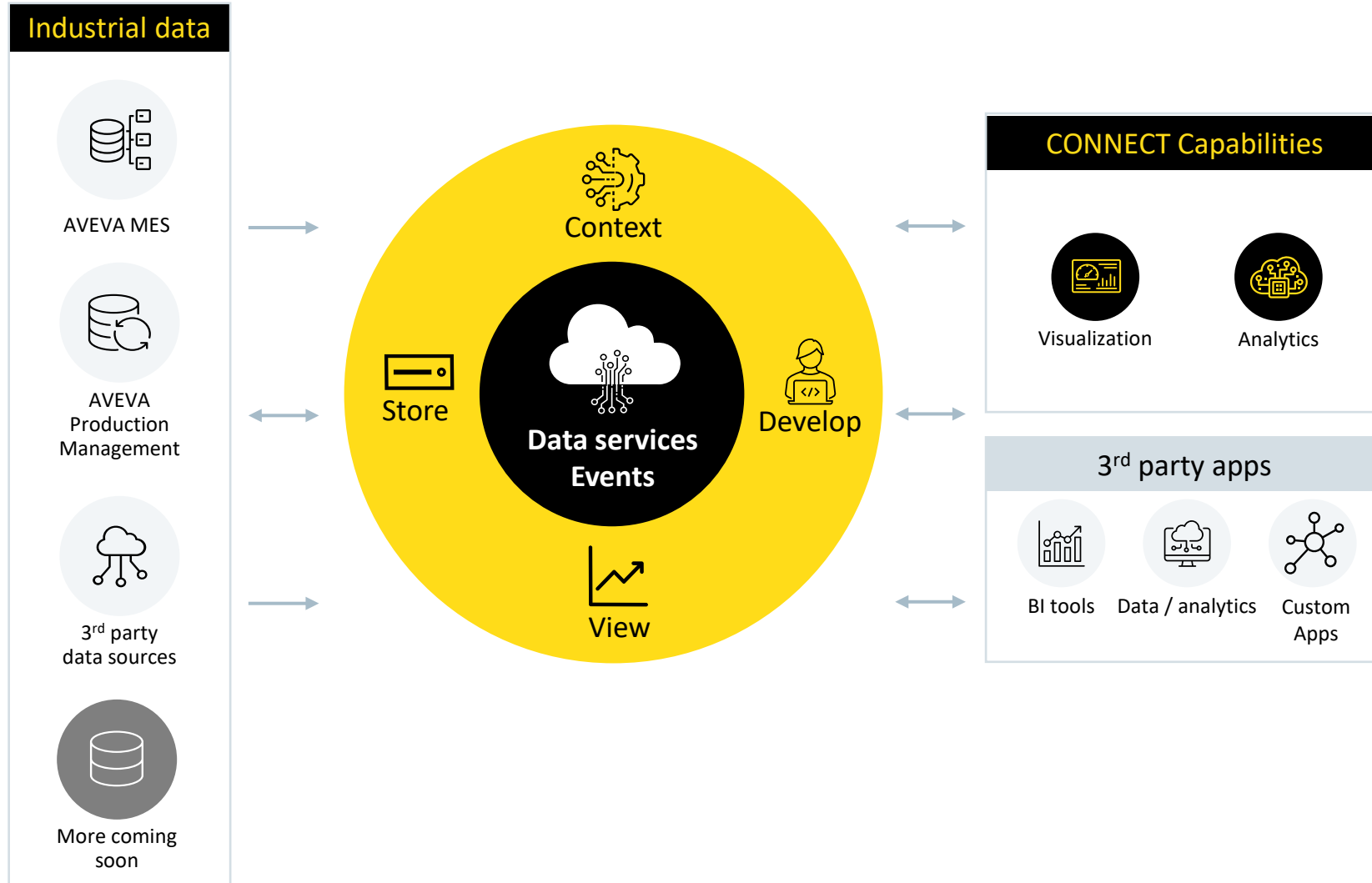
Available now

- **Event Data Store:** Store event & reference data and provide a rich contextual search GraphQL API for retrieving information
- **Hybrid MES:** Integration with AVEVA MES enabling enterprise production performance reporting
- **AVEVA Production Management:** Integration with AVEVA Production Management enabling analytics and visualization
- **AVEVA Events to CONNECT:** Enable integration with industrial events data sources
- **Visualization enhancements:** Data visualization for industrial events including event grid, column chart, line chart, gauge, pie chart
- **AVEVA Advanced Analytics:** Enable no-code analytics, machine learning, and AI applications from platform industrial data. Industrial events data as analytics model input or output.

In development

- **PI Event Frames to CONNECT:** Transfer event frame data to CONNECT data services events from PI

Industrial Events in CONNECT



Aggregate industrial events across the enterprise

- Capture complex context and relationships in industrial event data
- Build analytics models to optimize operations and improve quality
- Centralized visualization for industrial events and real-time data from across the enterprise
- Rich APIs for custom development and integrations

Q&A

Contact



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Recommended Sessions

AVEVA: Unlocking your industrial Digital Twin

Tuesday, October 15 @ 1:30pm

Amcor: Enterprise analytics and visualizations of MES / process data

Tuesday, October 15 @ 2:15pm

AVEVA hybrid MES and CONNECT data and visualization services

Tuesday, October 15 @ 3:15pm

AVEVA: Increasing industrial information effectiveness through enterprise visualization

Wednesday, October 16 @ 10:45am

CONNECT data services for a data analytics platform at F. Hoffman-La Roche

Wednesday, October 16 @ 11:30am

Databricks & AVEVA: Future of Industrial AI & Data Collaboration

Wednesday, October 16 @ 1:15pm



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ABOUT AVEVA

AVEVA is a world leader in industrial software, providing engineering and operational solutions across multiple industries, including oil and gas, chemical, pharmaceutical, power and utilities, marine, renewables, and food and beverage. Our agnostic and open architecture helps organizations design, build, operate, maintain and optimize the complete lifecycle of complex industrial assets, from production plants and offshore platforms to manufactured consumer goods.

Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life's essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world's most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. The company is headquartered in Cambridge, UK.

Learn more at www.aveva.com