



Grid Dynamics Solutions

Search Platforms in AWS

www.griddynamics.com



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Thought Starters: Search and Recommendations

Digital Commerce & CPG



Connect customers with products they love through semantic search



Recommend products with awareness of personal preference and fashion styles

Manufacturing & Automotive



Expedite production with visual search for vehicle/device fitment



Accelerate maintenance efforts with visual search for finding replacement parts

Media & Analytics



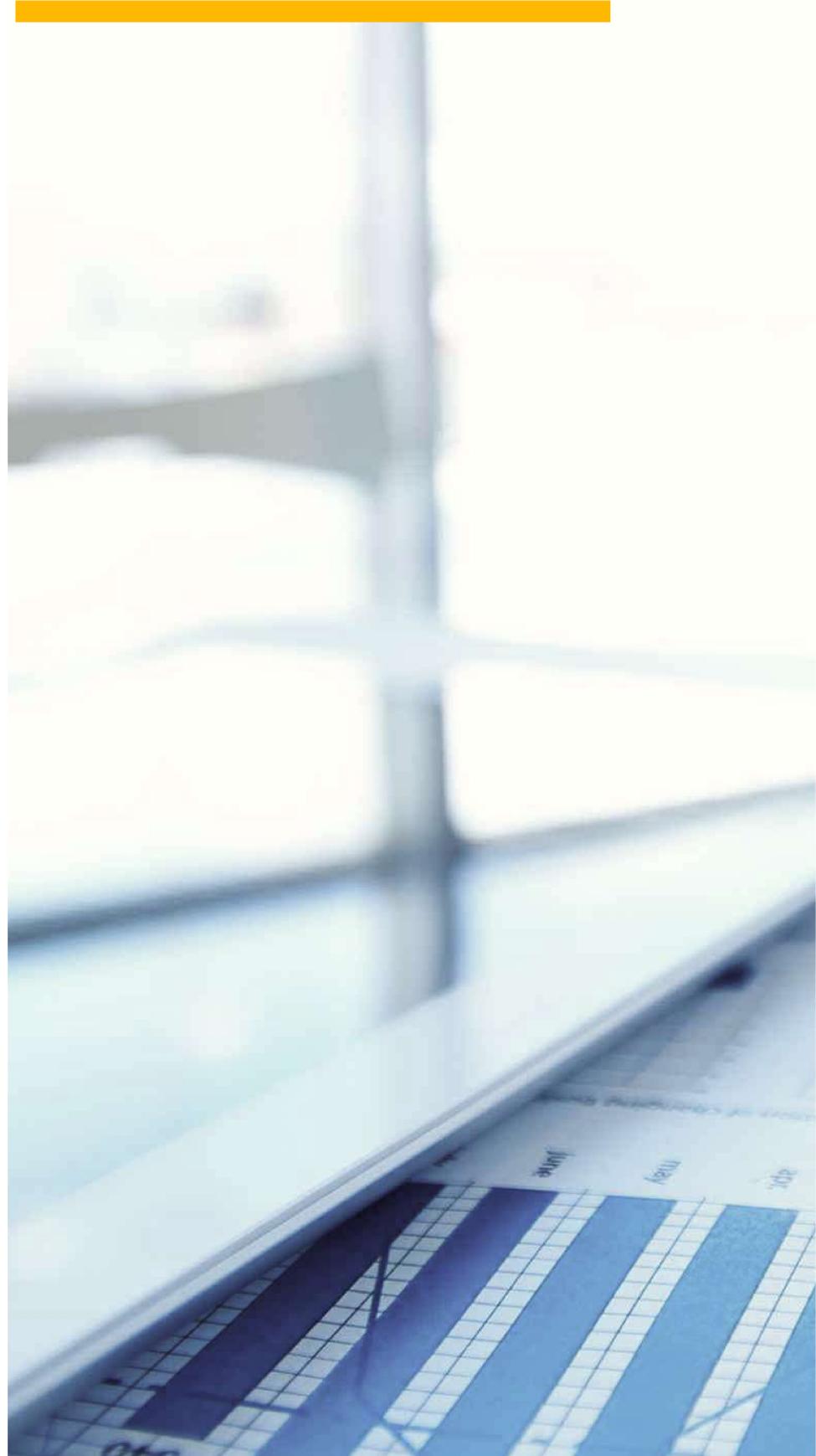
Understand complex queries with semantic search for unstructured content



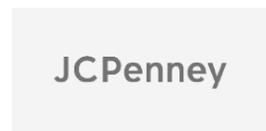
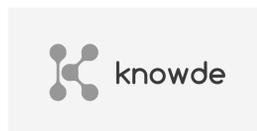
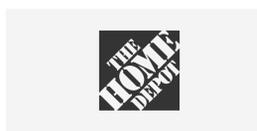
Resolve queries fast with a question answering system



Discover related content through relevant content recommendations



Some of our clients in the area of search & recommendations



AWS Opensearch Overview

Comprehensive search solutions for industry-wide applications.

Semantic Search

We leverage advanced Information Retrieval (IR), Named Entity Recognition (NER) and Machine Learning (ML) techniques to interpret search queries and product data based on meaning, not accidental word matches.

Neural Search

We develop, train and deploy state-of-the-art neural & visual search models to tackle the most challenging long-tail thematic and symptom queries.

Search Personalization

We personalize search results using implicit customer-specific preferences and recognized session intent, as well as learning-to-rank approaches.

AI Recommendations

We provide “more-like-this” visual recommendations based on artistic and fashion style, as well as behavior-based and session-based recommendations.

Searchandising

Combining search and merchandising, we develop rule engines to add control and merchandising bias to augment search and customer experience.

Smart Autocomplete

We leverage user engagement information, search query logs and product data to provide the fastest and smartest autocomplete suggestions for your customers.

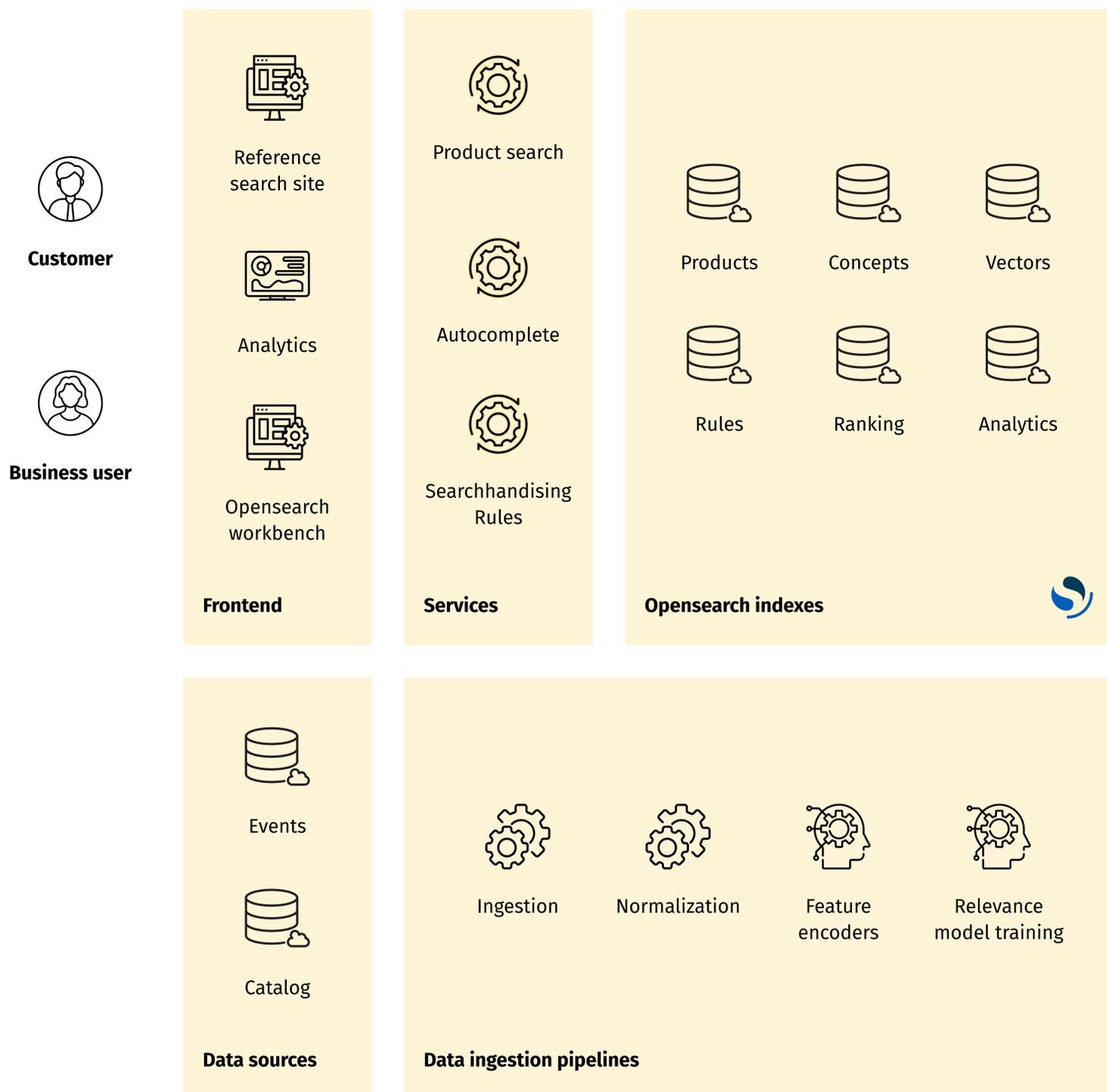
Search Features

All you need to start your AWS Opensearch implementation.

Search Platform Starter Kit

We combined a decade of our experience in search and product discovery solutions with AWS Opensearch platform capabilities to build a comprehensive starter kit for in-house search solutions.

The AWS Opensearch Starter Kit includes all the building blocks necessary to implement a modern, open source product discovery solution.



Under The Hood: Semantic Query Parsing

We build AWS OpenSearch solutions for leading retailers, marketplaces and finance companies.

Semantic query graph

A semantic query graph builds comprehensive, human-readable interpretations of queries.

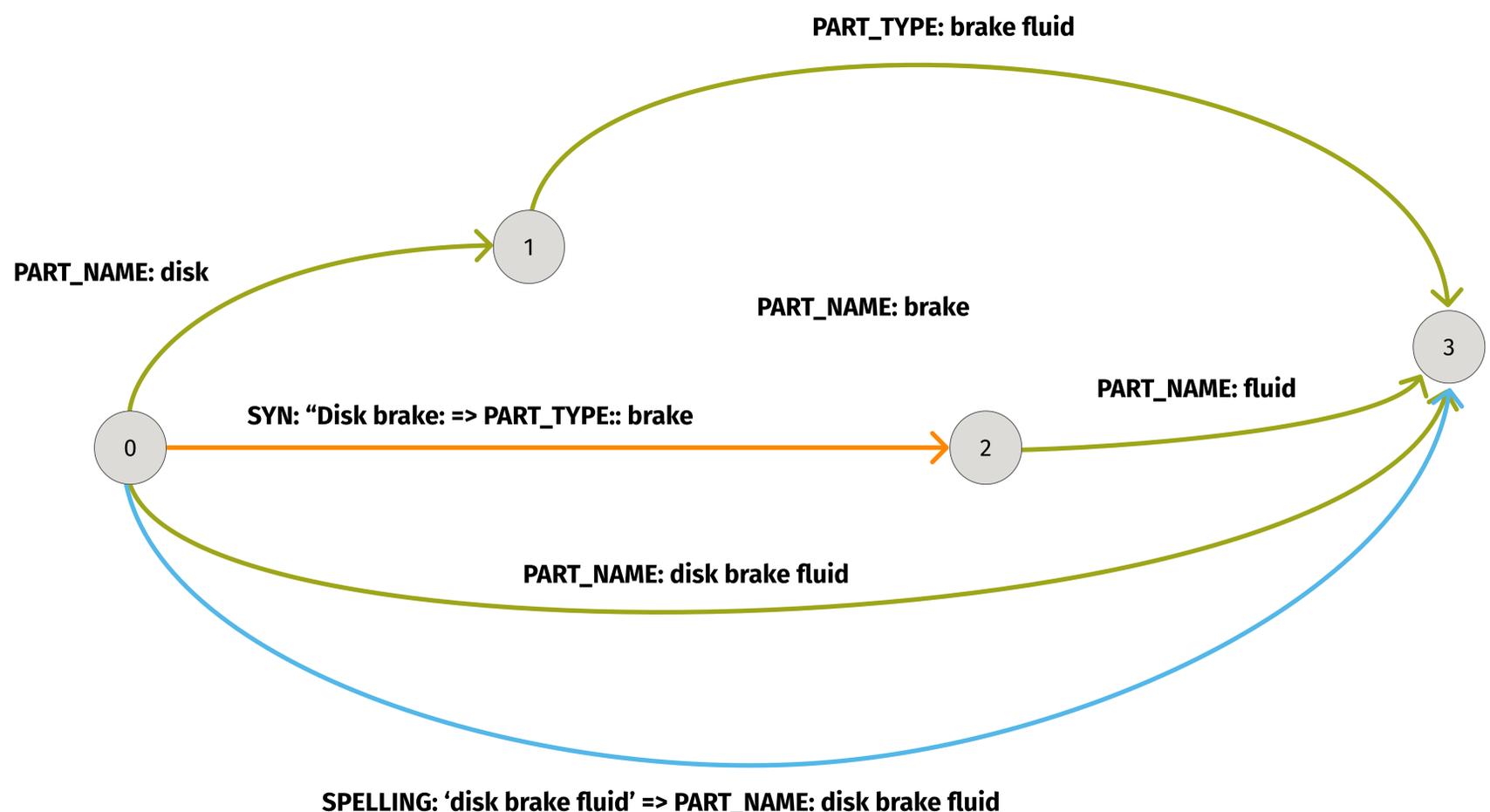
It is a uniform, extendable and comprehensible way to represent query interpretation and normalization results, and to organize query processing steps into a pipeline.

Leveraging this representation, our search solution can create a high-precision query for the OpenSearch engine to retrieve the most relevant results.

Additionally, a semantic query graph helps to explain search results in an intuitive and visual way.



Q disk brake fluid



Under The Hood: Neural Search

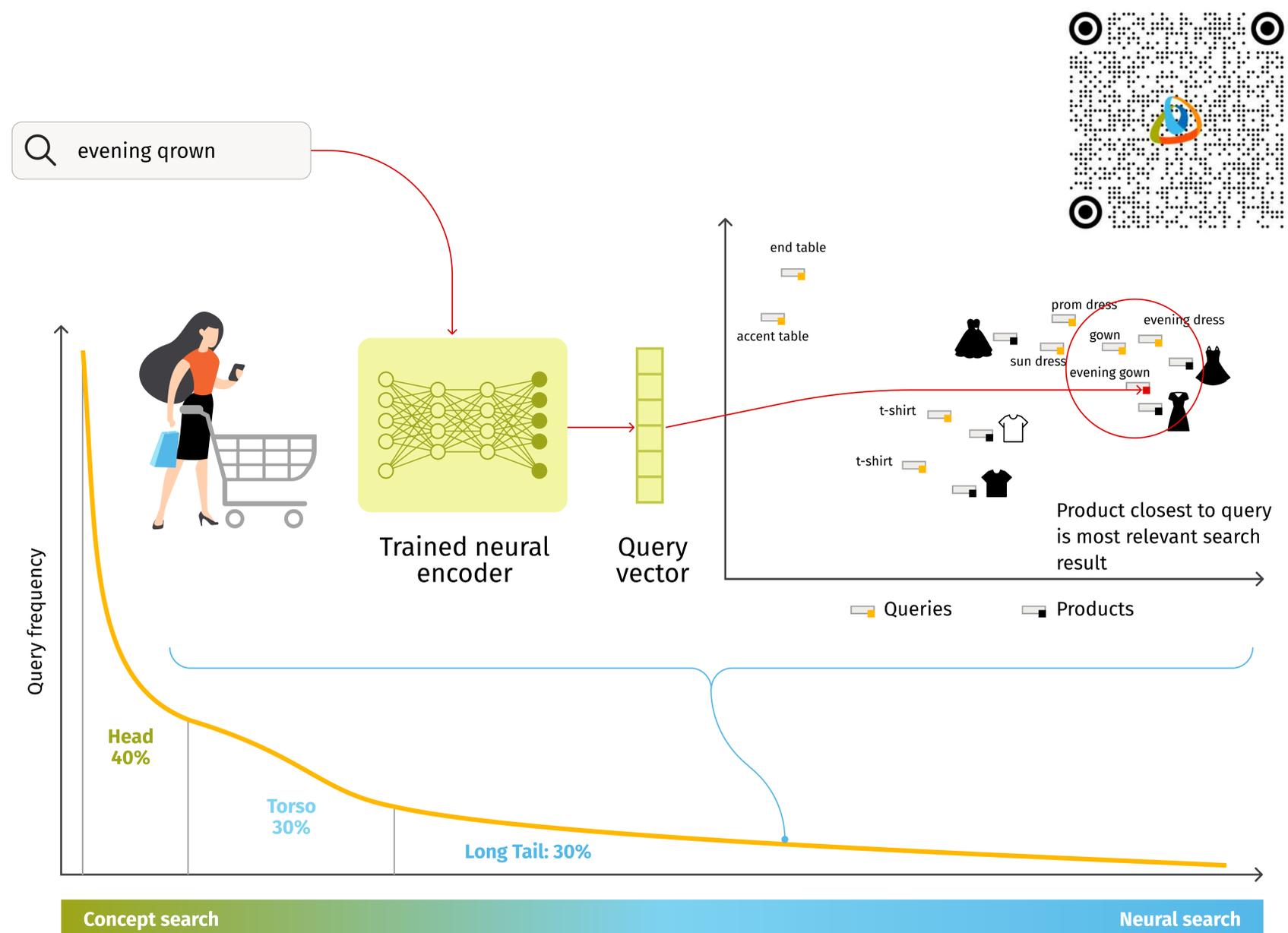
Deep learning retrieval models to tackle the most challenging queries.

Neural Search

Neural search is a cutting-edge search approach that has gained quick traction in the search industry. Neural search leverages deep learning models to encode both queries and products as semantic vectors, and represents them in such a way that similar products and queries are clustered together, where nearest neighbors are the most relevant matches.

Using all available product data, including images, the most complicated long-tail queries (such as out-of-vocabulary, symptom and thematic searches) can be understood - something that traditional retrieval methods struggle to do.

Our search solution provides all essential capabilities to train and run deep learning encoders and vector indexes for neural search.



Under The Hood: Multi-level Results Ranking

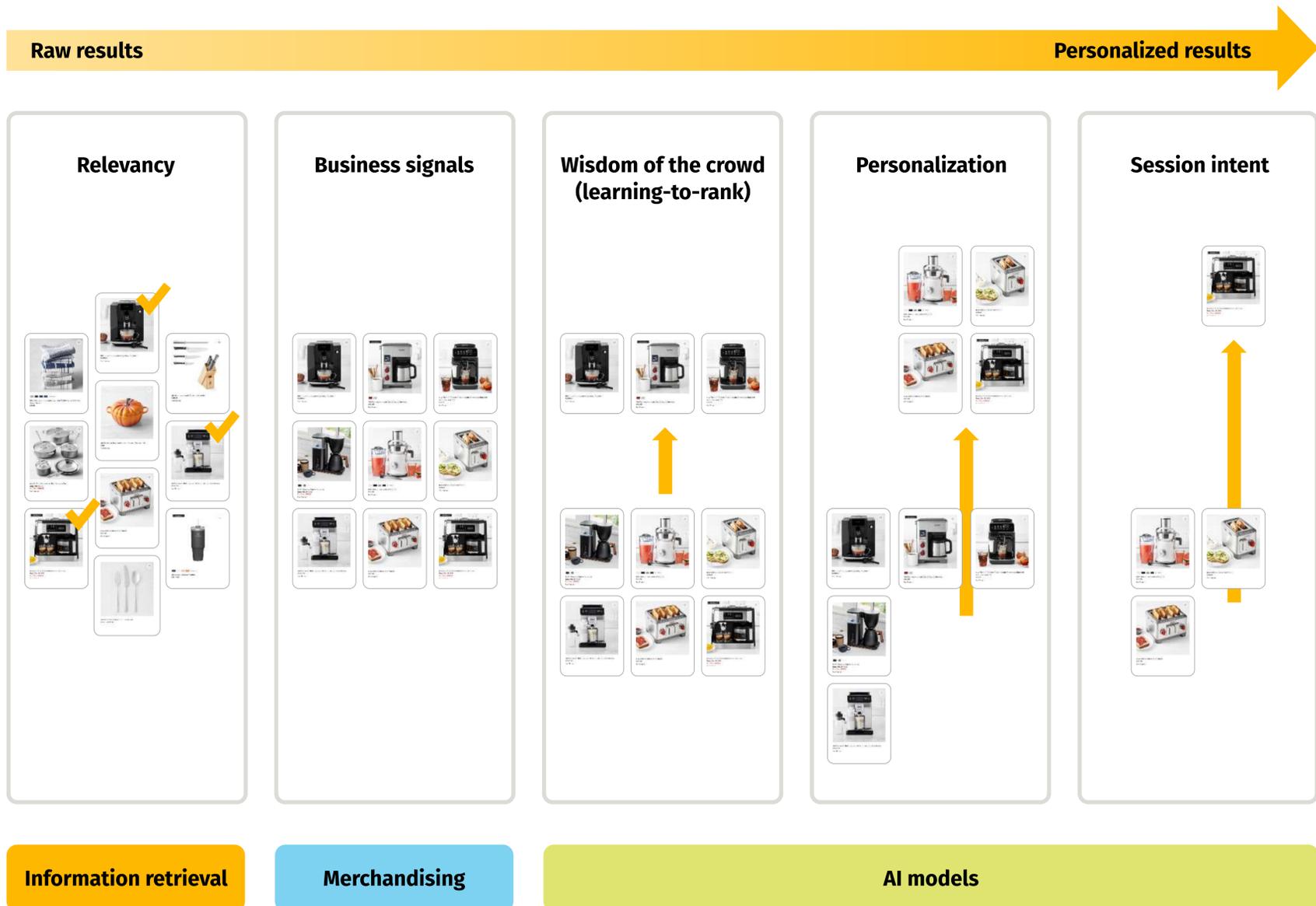
Semantic understanding, merchandising bias, wisdom of the crowd and personalization for the best results ranking.

Relevancy Tier Ranking

Semantic query understanding enables splitting search results into relevance tiers.

Additional ranking happens inside those relevance tiers, which prevents irrelevant items appearing in the top results.

Our search solution combines multiple rankers based on rules and business signals with AI models such as wisdom of the crowd, personalization models and session intent models.



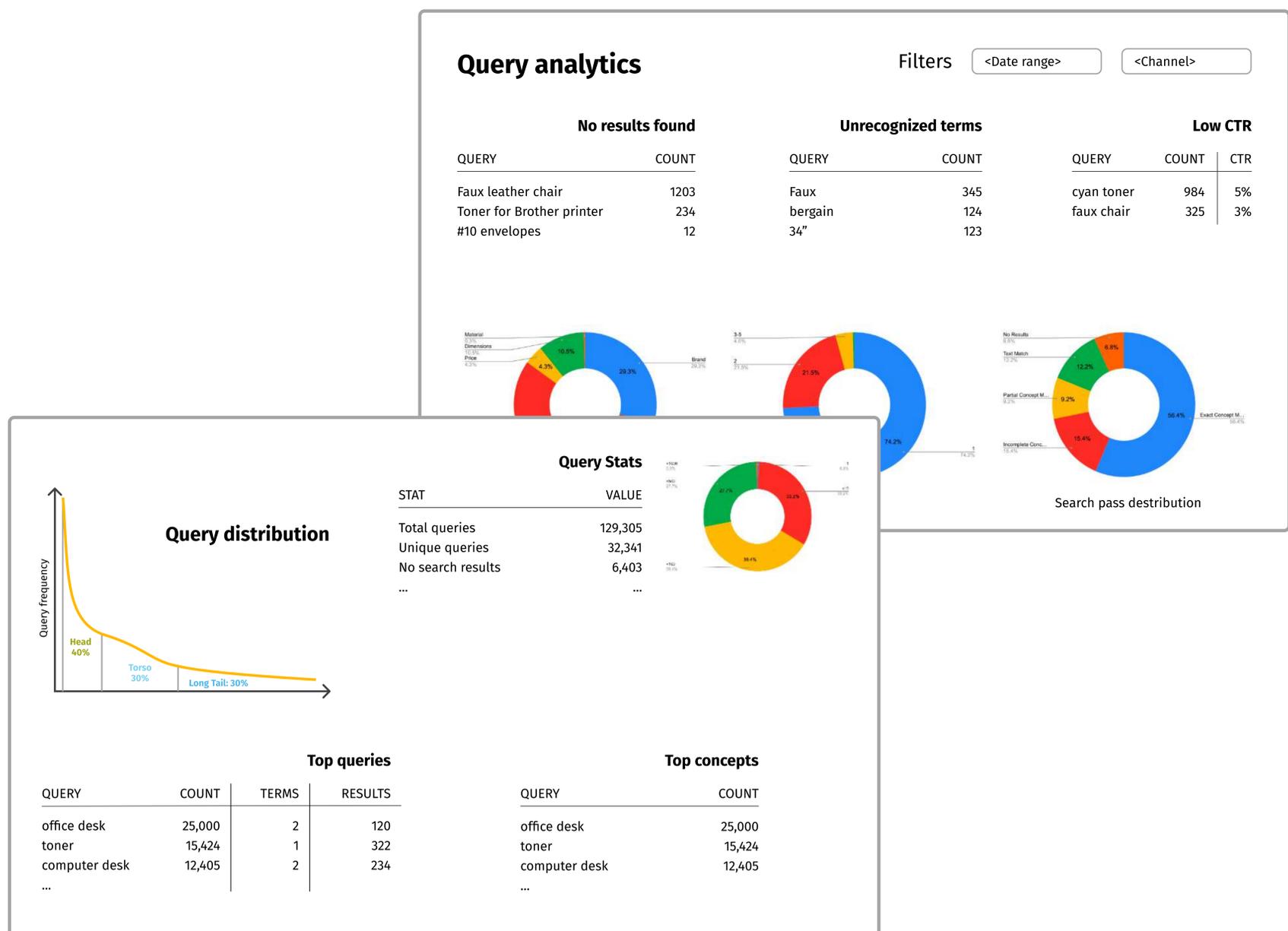
Under The Hood: Search Analytics

Actionable insights for search relevance tuning.

Concept-oriented analytics

Semantic query understanding opens opportunities for concept-oriented query analytics, helping to identify trending concepts, data gaps and unrecognized terms, and to guide search relevance tuning efforts.

Integration with customer engagement signals can also identify overexposed and underexposed content, and perform corrective actions.



Modernized search platform for an iconic footwear brand

The website and apps of this influential brand are used by millions of customers worldwide to find, research and purchase footwear & apparel products. Customers bring their own vocabulary, experiences and interests. The brand needed an innovative search solution to connect customers with the products they love across countries and languages.

600M
searches/year

40+
countries

25+
languages

Outcomes

5-10%
conversion uplift

-50%
null results

+\$100M
incremental revenue

- Grid Dynamics modernized the search platform with semantic search, engagement-based ranking and smart autocomplete capabilities.
- Enriched results relevance improved conversion rates across all channels.
- The neural search approach based on deep learning proved especially efficient for complex queries, cutting zero results and further uplifting conversions.





Semantic search for a leading chemical marketplace

Knowde, a leading digital marketplace with the world's largest catalog of chemicals, polymers and ingredients for a range of industries was looking to upgrade their baseline keyword matching search approach to modern semantic search specifically tuned for the domain of chemical compounds.

15,000
brands

10,000+
suppliers

150,000
products

250,000
documents

Outcomes

80% ▲

relevant results on first page

30% ▲

click-through uplift

60% ▼

page change reduction

- Grid Dynamics implemented and integrated a new semantic search platform.
- Query expansion using knowledge graph and special query parsing techniques greatly improved domain-specific query understanding.
- The new solution achieved 92% relevant search results on the first page, an 80% uplift from initial results.
- The click-through ratio increased by 30%, indicating high relevance of provided results.

Real-time recommendations for a tier-1 US department store

An iconic Fortune 500 department store was looking to improve the quality of product recommendations based on real-time customer behavior. Typical for department stores, the vast and diverse product catalog and sparse interaction data made traditional historical recommendation models less effective. Therefore, the upgraded recommendations solution needed to capture session intent.

100,000+
products

<400 ms
SLA

dozens
of recommendation
touchpoints

Outcomes

10%+ ▲
desktop CTR uplift

15%+ ▲
mobile CTR uplift

3%+ ▲
revenue per visitor

- Grid Dynamics developed, trained and deployed 40+ real-time, session-aware models to learn and utilize session intent in recommendations.
- The models were deployed across all recommendation zones.
- The recommendation system achieves a good balance between optimizing the click-through rate and the conversion rate.
- The recommendation system supports 1200 requests/second with low latency.





Engage with Grid Dynamics

1

Our team of search data experts work with you to **define a strategy** and **create roadmaps** for data-rich search and recommendation solutions.

2

We work with you to define an optimal **engagement model** that can include both your and Grid Dynamics teams. We leverage our **starter kits** built using open source and cloud-native components to accelerate the implementation.

3

We deploy **cross-functional teams** with proper domain/technology leadership to execute projects from the roadmaps and deliver solutions end-to-end. Our teams usually work with client's stakeholders and product owners in a **co-innovation** model.

4

We focus on **iterative execution** of the roadmaps to deliver business value in short phases, but also continuously **refine the strategy** and come up with improvement proposals.

5

The co-innovation approach helps you to **establish a strong technology culture** in your organization, efficiently manage the roadmaps, and scale your search and recommendations capabilities.

About Grid Dynamics

Grid Dynamics is a global digital engineering company that co-innovates with the most respected brands in the world to solve complex problems, optimize business operations, and better serve customers. Driven by business impact and agility, we create innovative, end-to-end solutions in digital commerce, AI, data, and cloud to help clients grow.

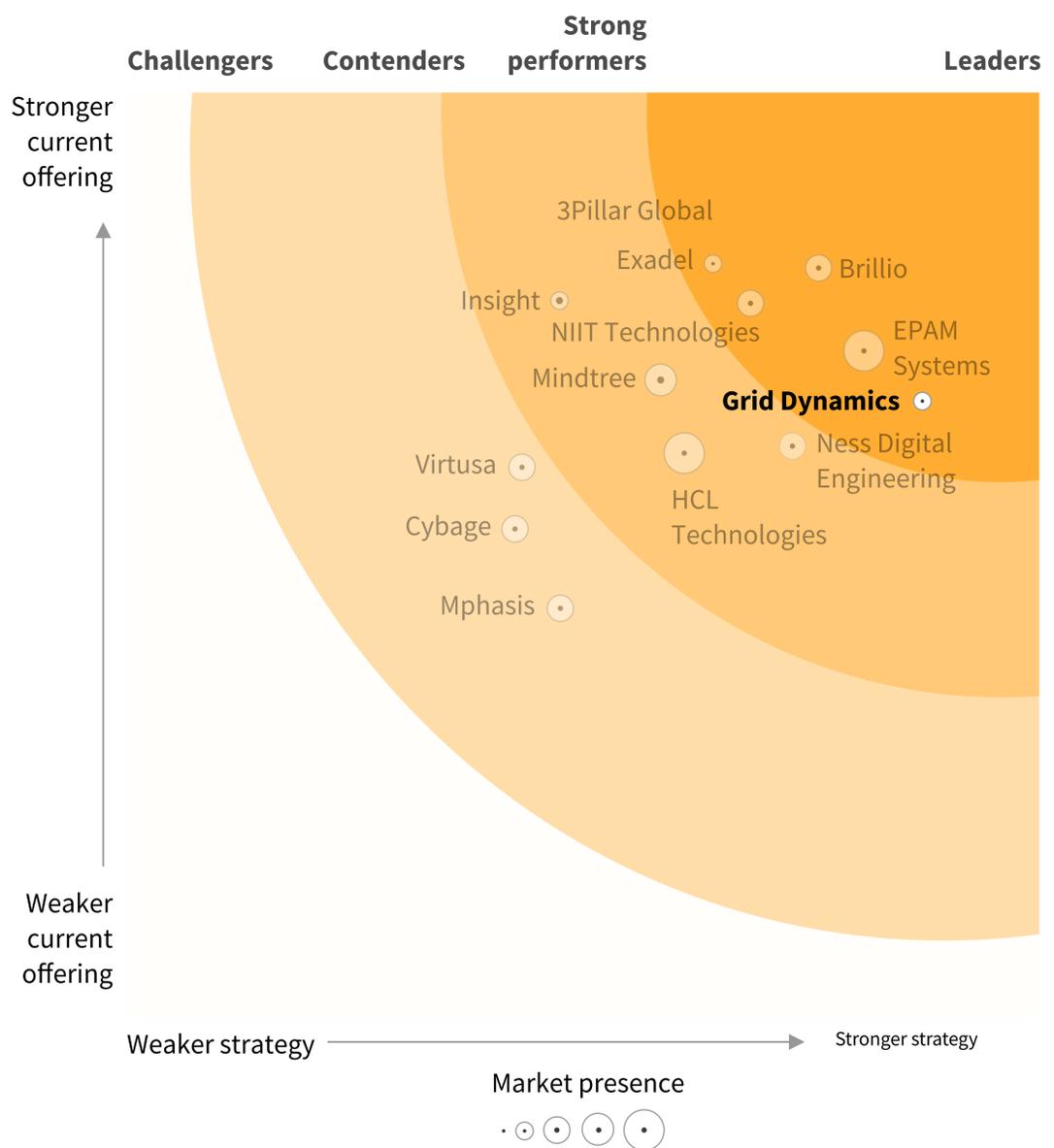
Headquartered in Silicon Valley, with delivery centers located throughout the globe, Grid Dynamics is known for architecting revolutionary digital technology platforms for 7 of the 25 largest retailers in the US and 3 of the 10 largest consumer goods companies in the world, as well as leading brands in the digital commerce,

manufacturing, finance, healthcare, and high tech sectors.

Our secret sauce? We hire the top 10% of global engineering talent and employ our extensive expertise in emerging technology, lean software development practices, a high-performance product and agile delivery culture, and strategic partnerships with leading technology service providers like Google, Amazon, and Microsoft.

In 2019, Forrester named Grid Dynamics a leader among midsize agile development service providers. In 2020, Grid Dynamics went public and is trading on the NASDAQ under the GDYN ticker.

The Forrester wave™ Midsize Agile Development Service Providers Q2 2019





About Grid Dynamics

Key facts

- 13 countries across North America, Europe, and Asia
- 3,800 employees in Q3 2022
- Forrester Leader Midsize Agile Software Development Service Provider Q2 2019
- Proprietary starter kits developed in collaboration with AWS other partners

Areas of expertise

- **Experience engineering**
Web | Mobile | AR/VR
- **Data Science and AI**
Search | Personalization | Supply chain | IoT
- **Platform engineering**
Microservices | MACH | Composable
- **Data engineering**
Big data | Streaming | MLOps
- **Cloud and DevOps**
CICD | AIOps | SRE | QE

Clients

| | | |
|---|---|---|
|  | Google |  |
| align |  |  |
| RAYMOND JAMES |  | AMERICAN EAGLE |
| LVMH |  |  |



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PREPARE TO GROW



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