Optique™

UiO : University of Oslo

TUHH
Hamburg University of Technology
Department of Telecommunications

SAPIENZA
UNIVERSITÀ DI ROMA

Freie Universität Bozen
Libera Università di Bolzano
Free University of Bozen · Bolzano

National and Kapodistrian
UNIVERSITY OF ATHENS

fluid
Operations

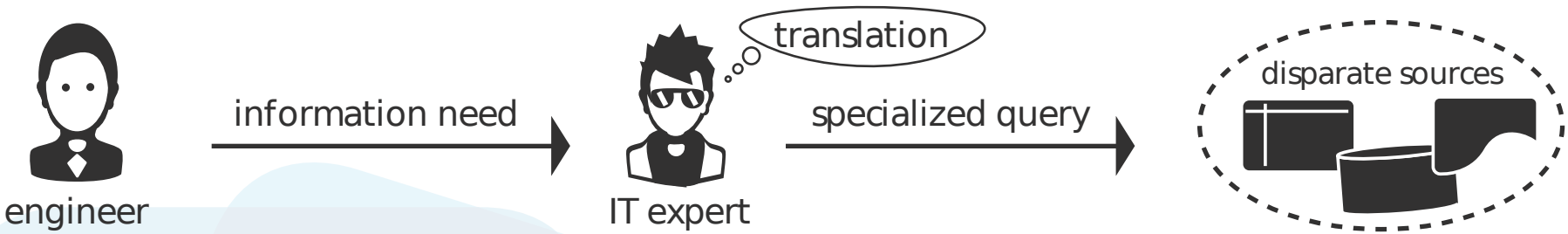
SIEMENS

Statoil

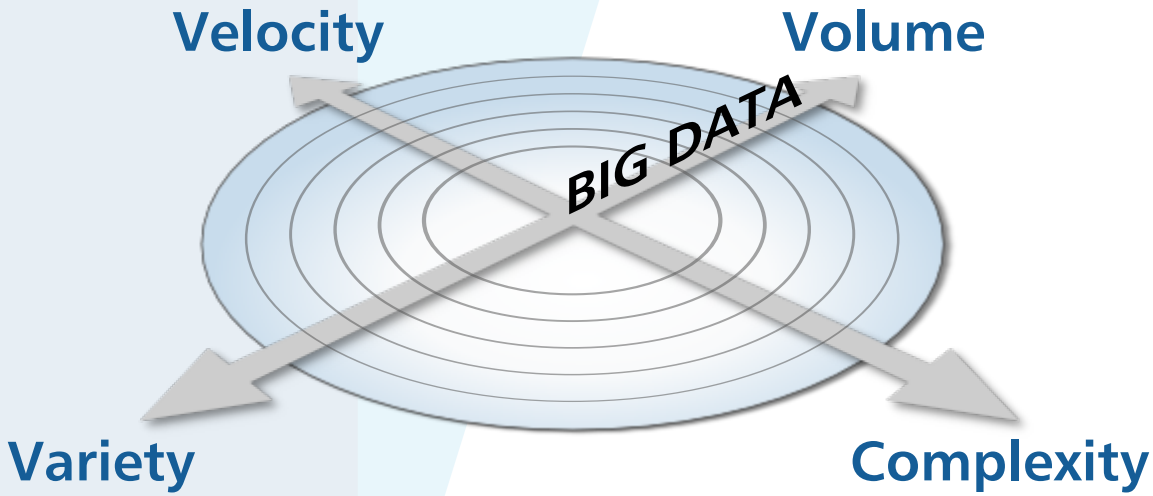
Facts about Optique

- Large-scale integrating project (IP) under FP7-ICT Objective 4.4 Intelligent Information Management
  - 155 proposals in total (IP+STREPS)
  - Optique ranked 2nd, 14 of max 15 points
  - 35 IP proposals, 2 funded
- Total budget: 13 800 000 €
- EU contribution: 9 760 000 €
- Duration: 4 years
- Start: November 1 2012
- Annual reviews in December
- Annual plenary meetings in May/June

Scalable End-user Access to Big Data



Up to **80%** of experts' time spent accessing Big Data



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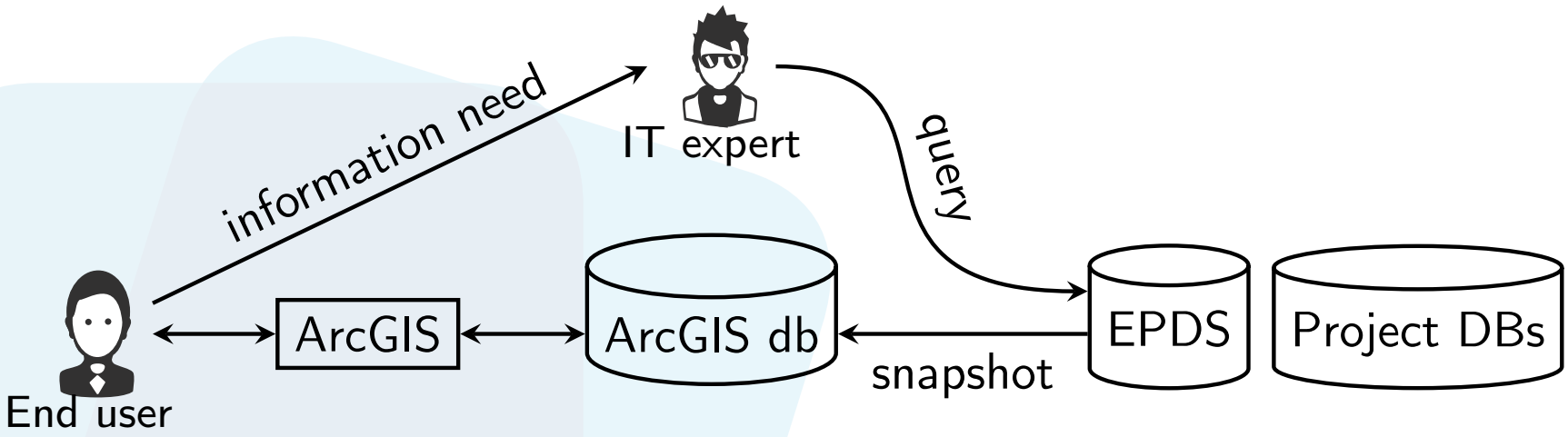
Current situation for Statoil Exploration:



- Query development takes several days
- ProSource turns out to be difficult in use
- Including other sources in queries is difficult/impossible

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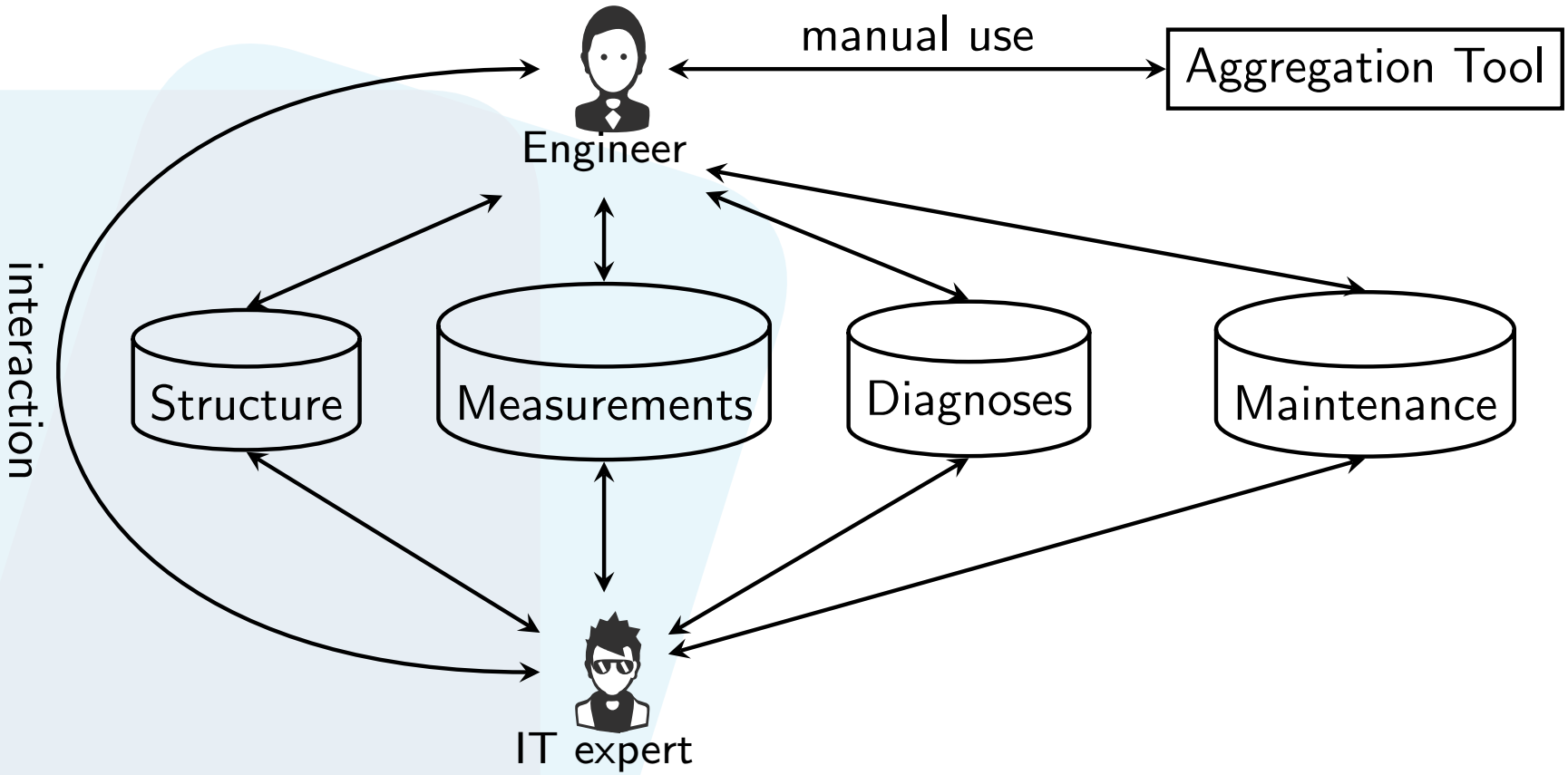
Current situation for Siemens Turbines



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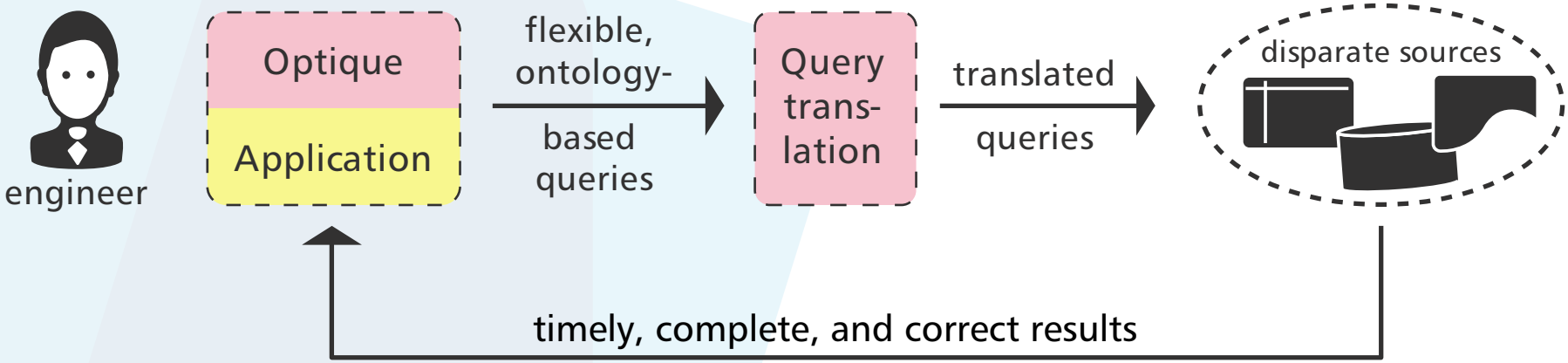
Challenging Questions for Siemens Turbines

- List all sites where a component of type "C" in version "3.2" is used, which has not been serviced within the last 6 months. *(e.g. for service planning)*
- Determine all turbines showing an error of type "X" defined by at least 5% decrease of quality "Q1" measured at component "C1" within the last month, followed by a statistically significant increase of quality "Q2".*(e.g. for turbine diagnostics)*
- List all turbines for which one of the last five services comprised action "A" followed by action "B", but not action "C".*(e.g. for maintenance quality check)*

Main Innovation: End-to-End Connection

Intelligent, integrated, scalable system:



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Turnaround times: weeks → hours

SIEMENS

Up to 80% time
on data access

Statoil

Up to 70% time
on data access

Time that should be freed for core tasks!

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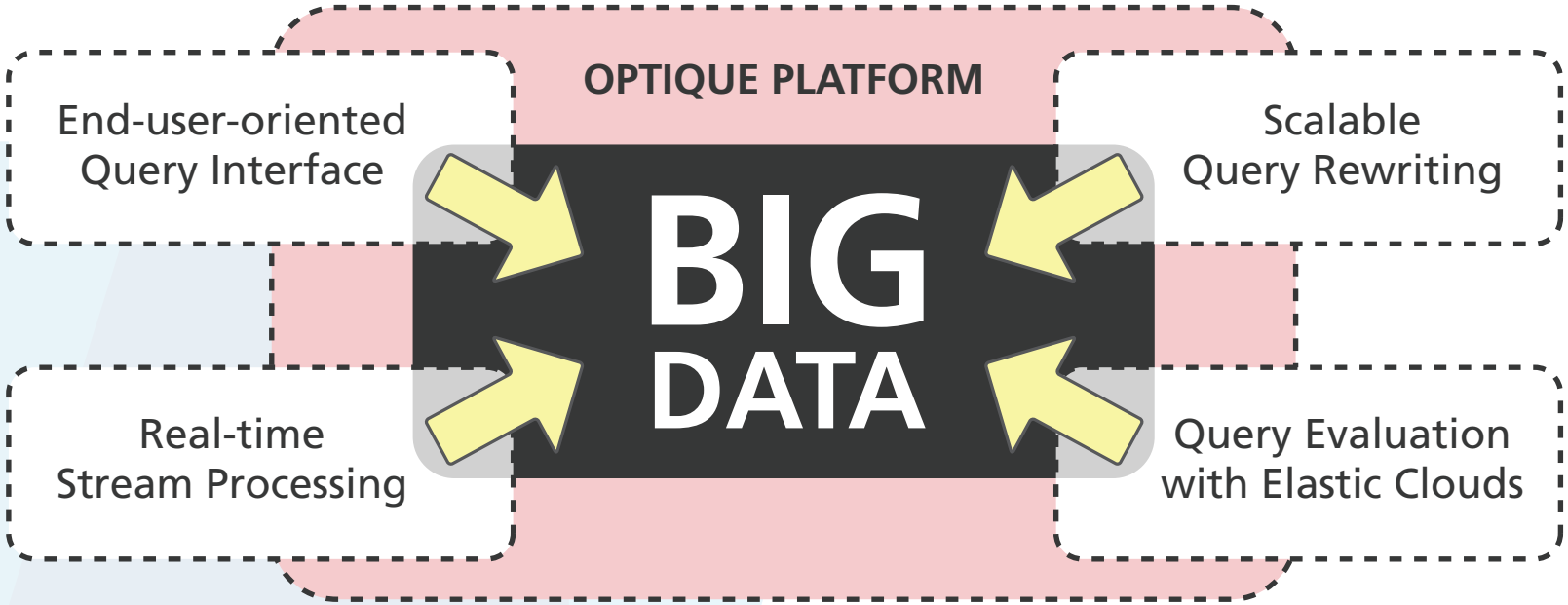
World leading Consortium



Shaping the future of ICT

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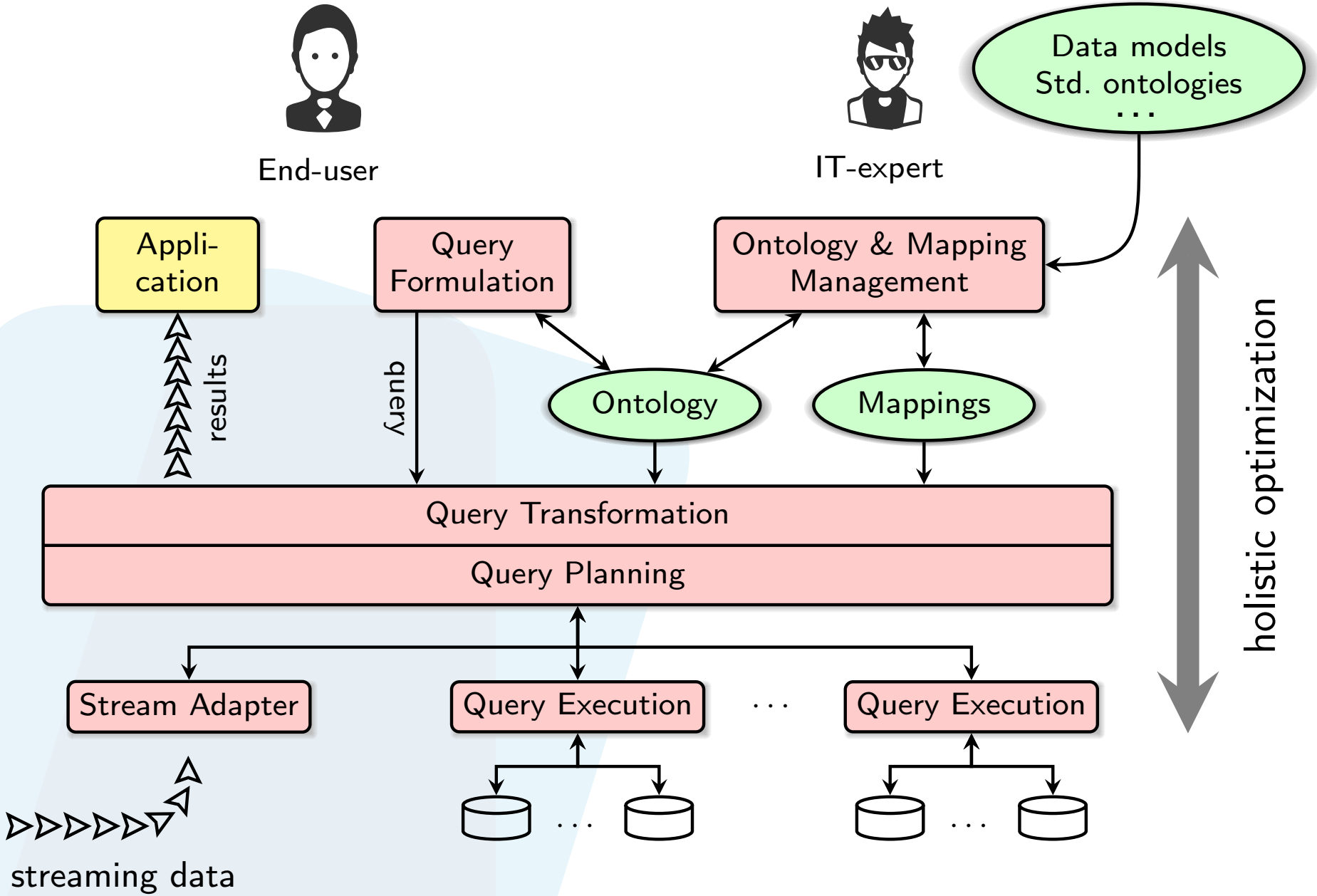
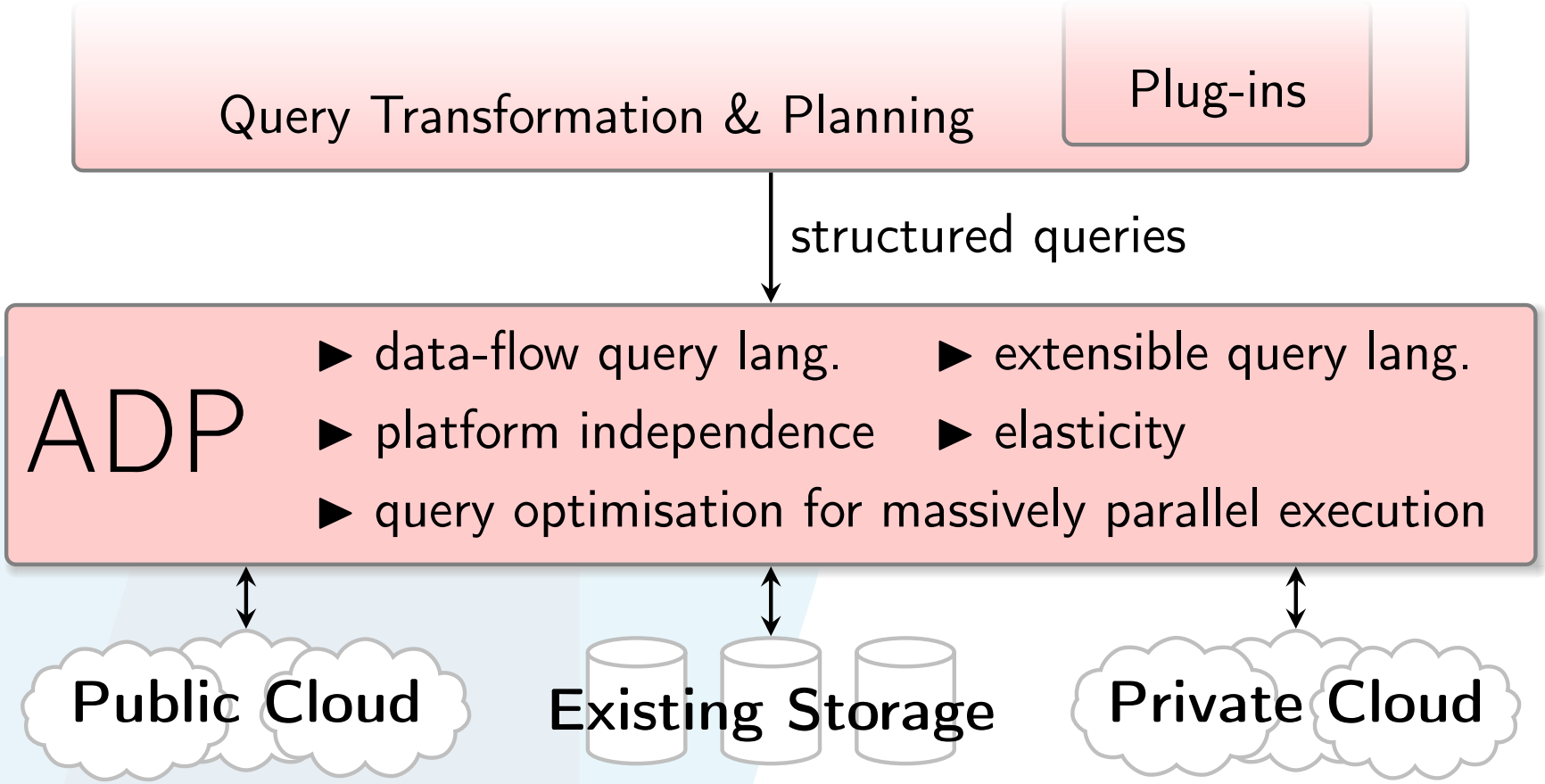

End-user
IT-expert
Data models
Std. ontologies
...
Appli-
cation
Query
Formulation
Ontology & Mapping
Management
results
query
Ontology
Mappings
Query Transformation
Query Planning
holistic optimization
Stream Adapter
Query Execution
...
Query Execution
streaming data

Optique



Optique extensions of ADP:

- ▶ federation support
- ▶ temporal queries
- ▶ continuous queries

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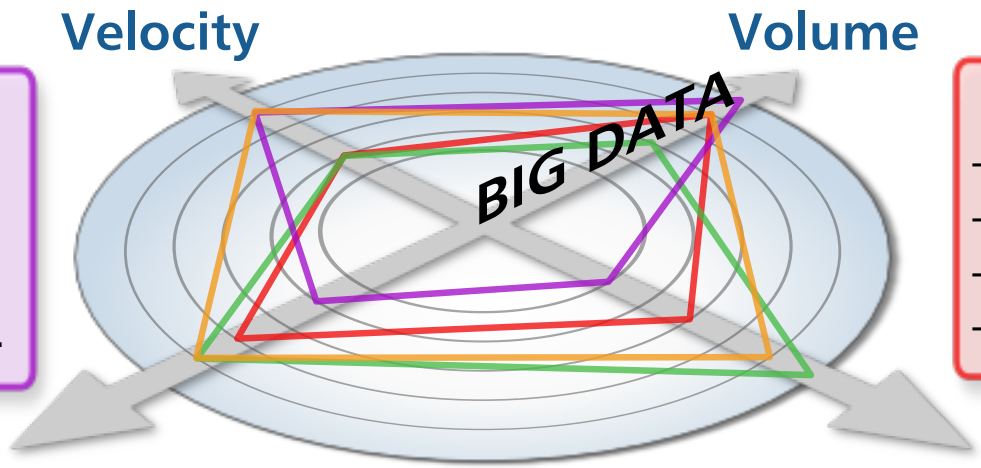
Real-time Stream Processing

Query Evaluation with Elastic Clouds



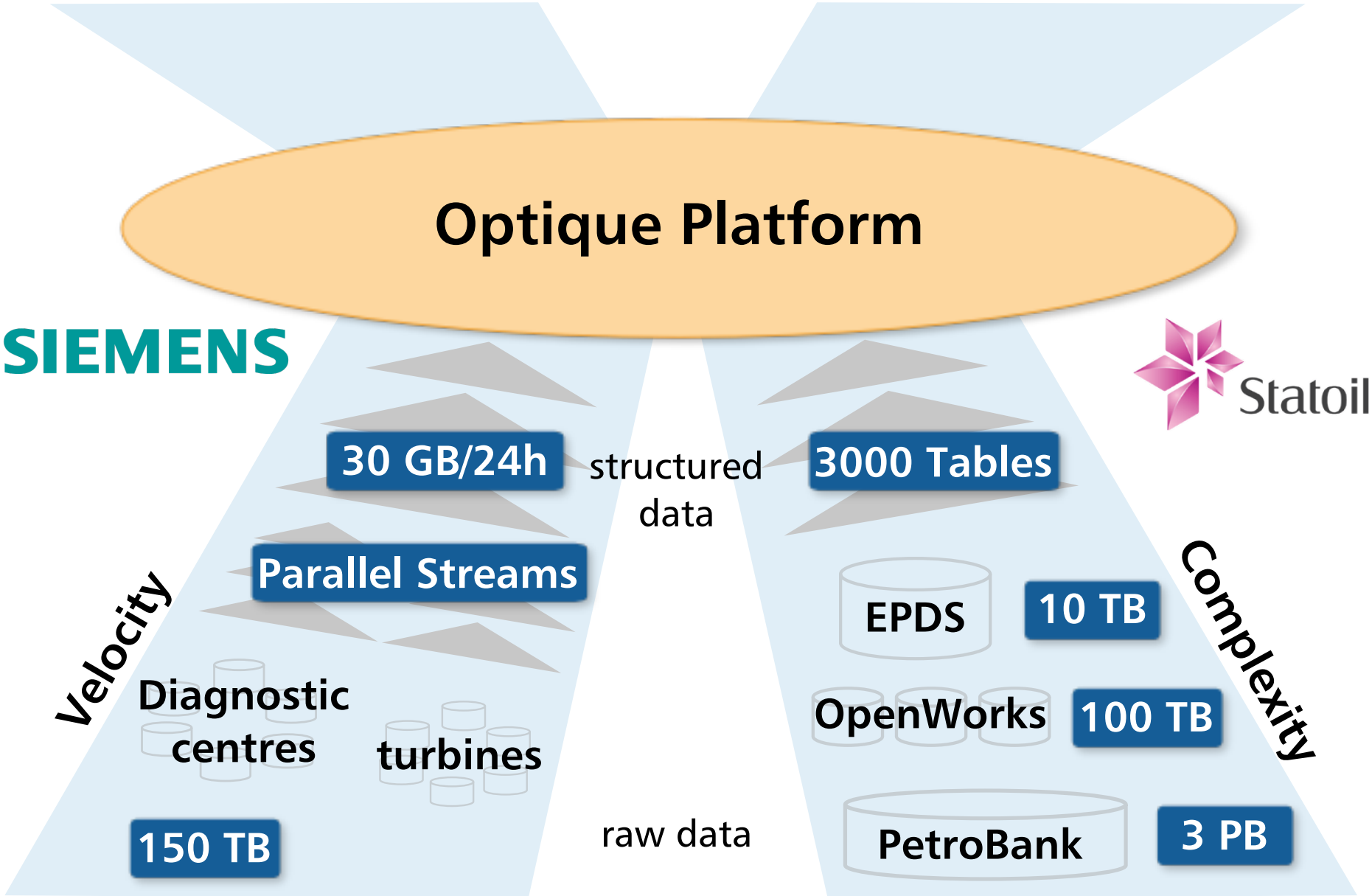
NoSQL:
+scalability
+elasticity
−weak structure
−weak query lang.

Parallel SQL:
+parallel analytics
+in-DB MapReduce
−integration difficult
−no streaming

Scalable Query Rewriting

Semantic Web:
+strong reasoning
+ont.-based integration
−no streaming
−poor scalability

End-user-oriented Query Interface


Optique Platform
SIEMENS
Statoil
30 GB/24h
structured data
3000 Tables
Parallel Streams
Velocity
Complexity
EPDS
10 TB
Diagnostic centres
turbines
OpenWorks
100 TB
150 TB
raw data
PetroBank
3 PB

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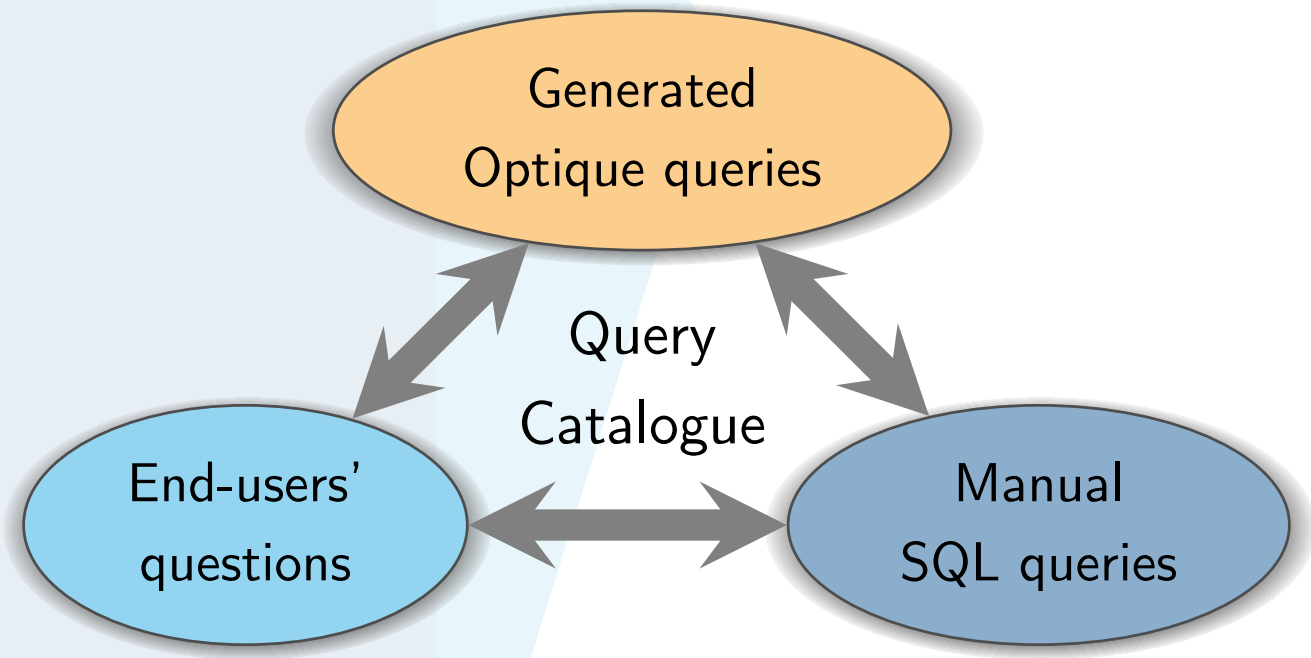
Query Catalogue for Requirements and Evaluation

Query formulation	▶	90% success
Turnaround time	▶	from weeks to hours
Data volume	▶	from TB to PB



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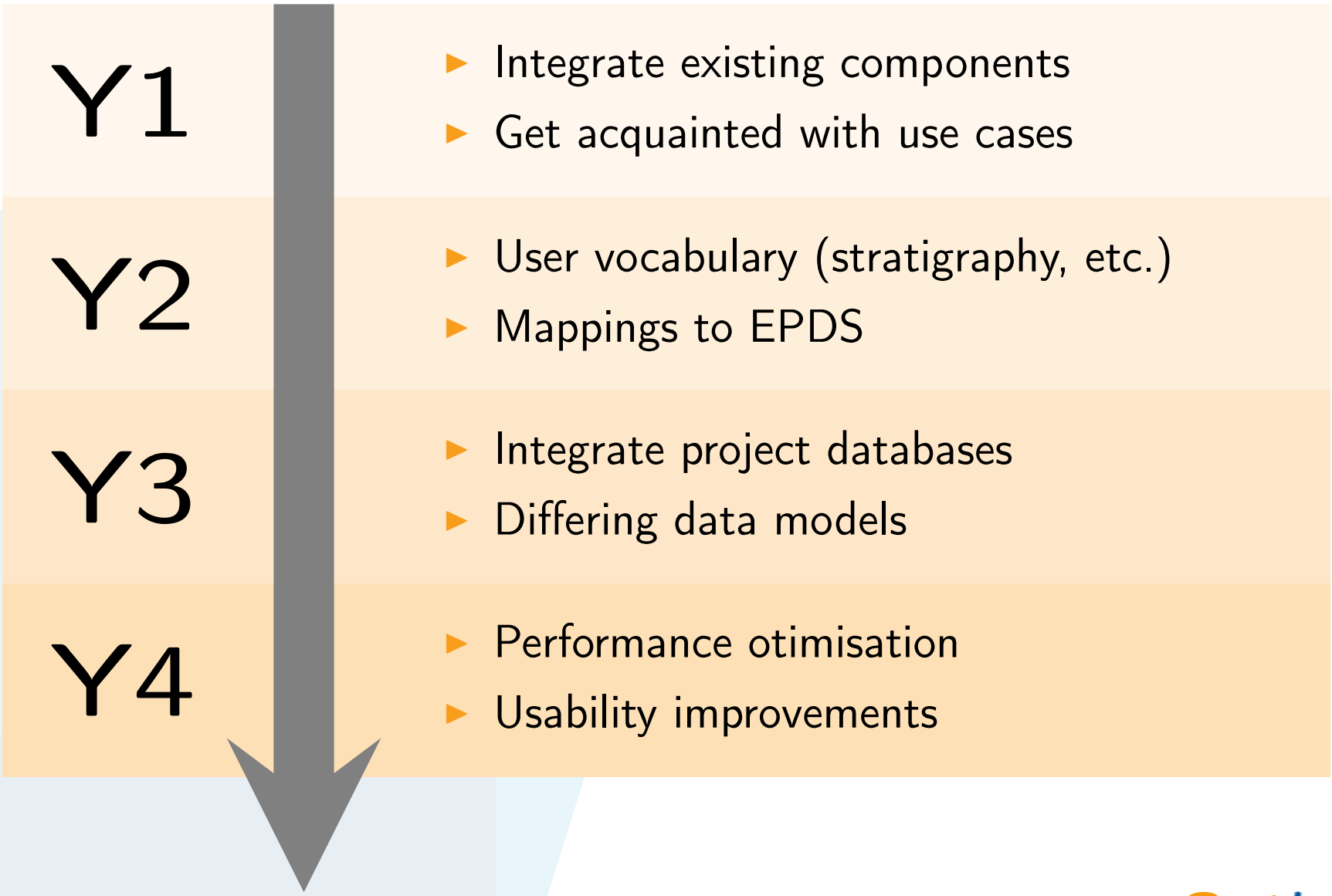
4 Project phases



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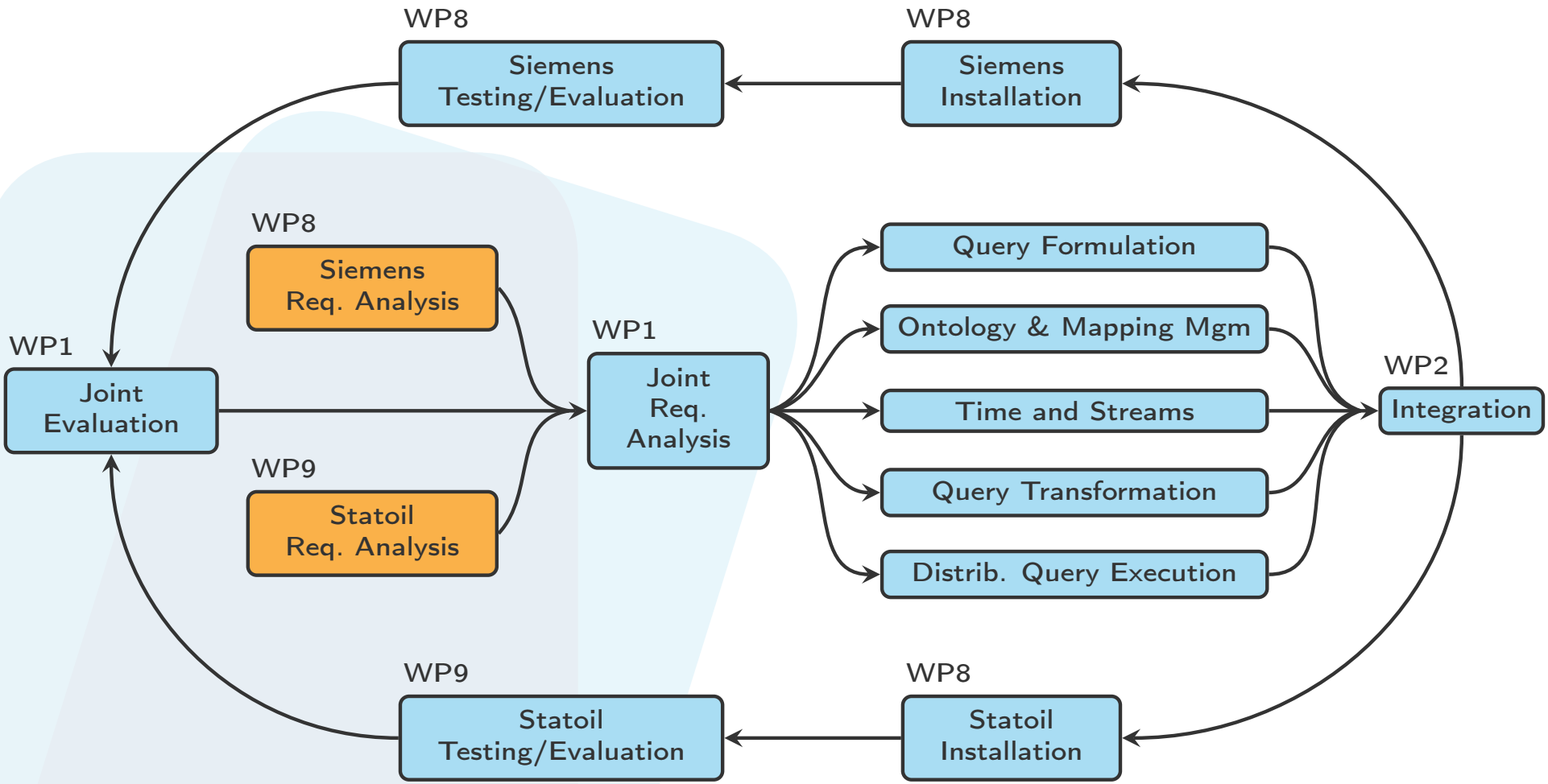
Yearly development cycle



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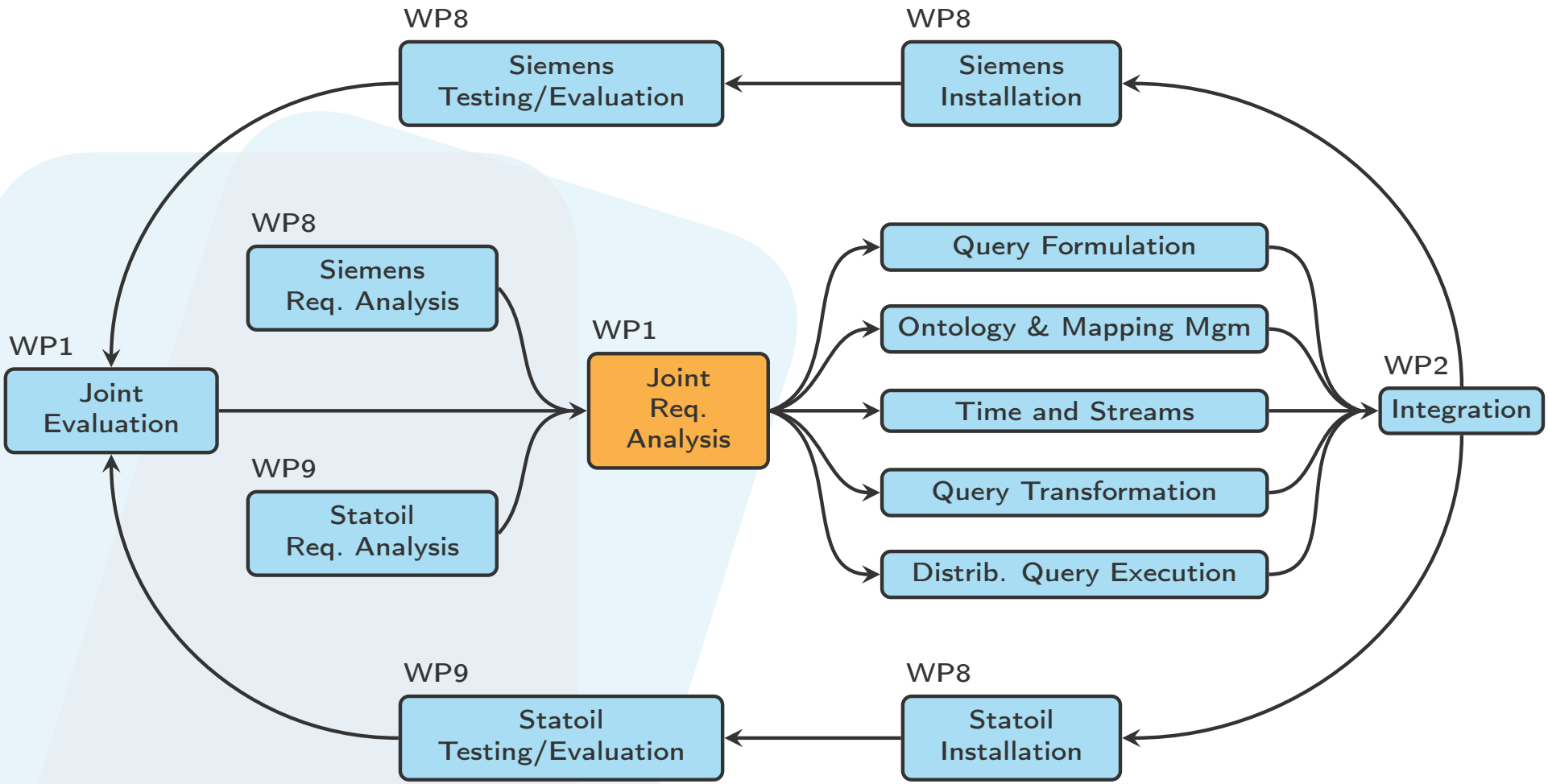

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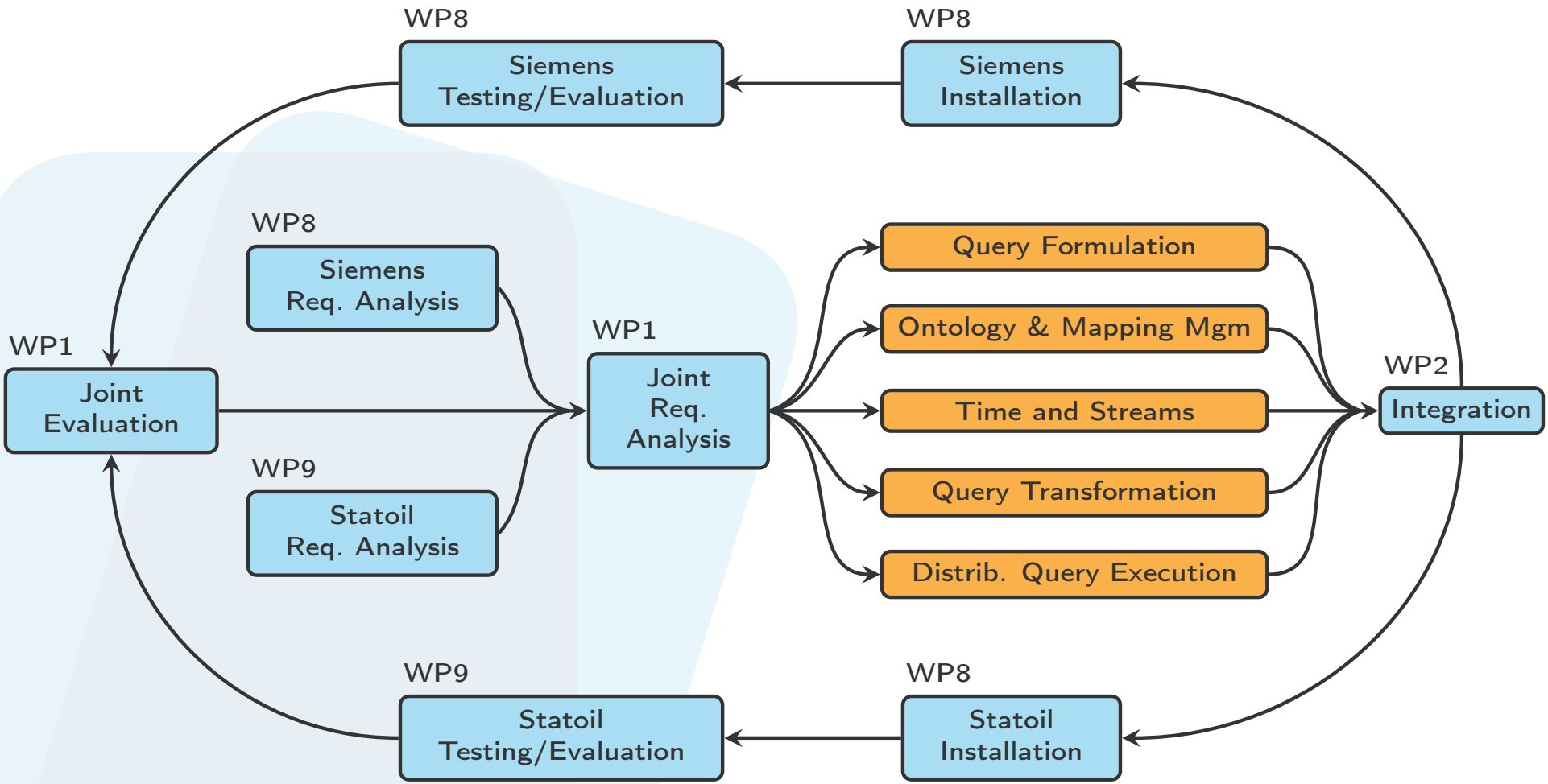
Yearly development cycle



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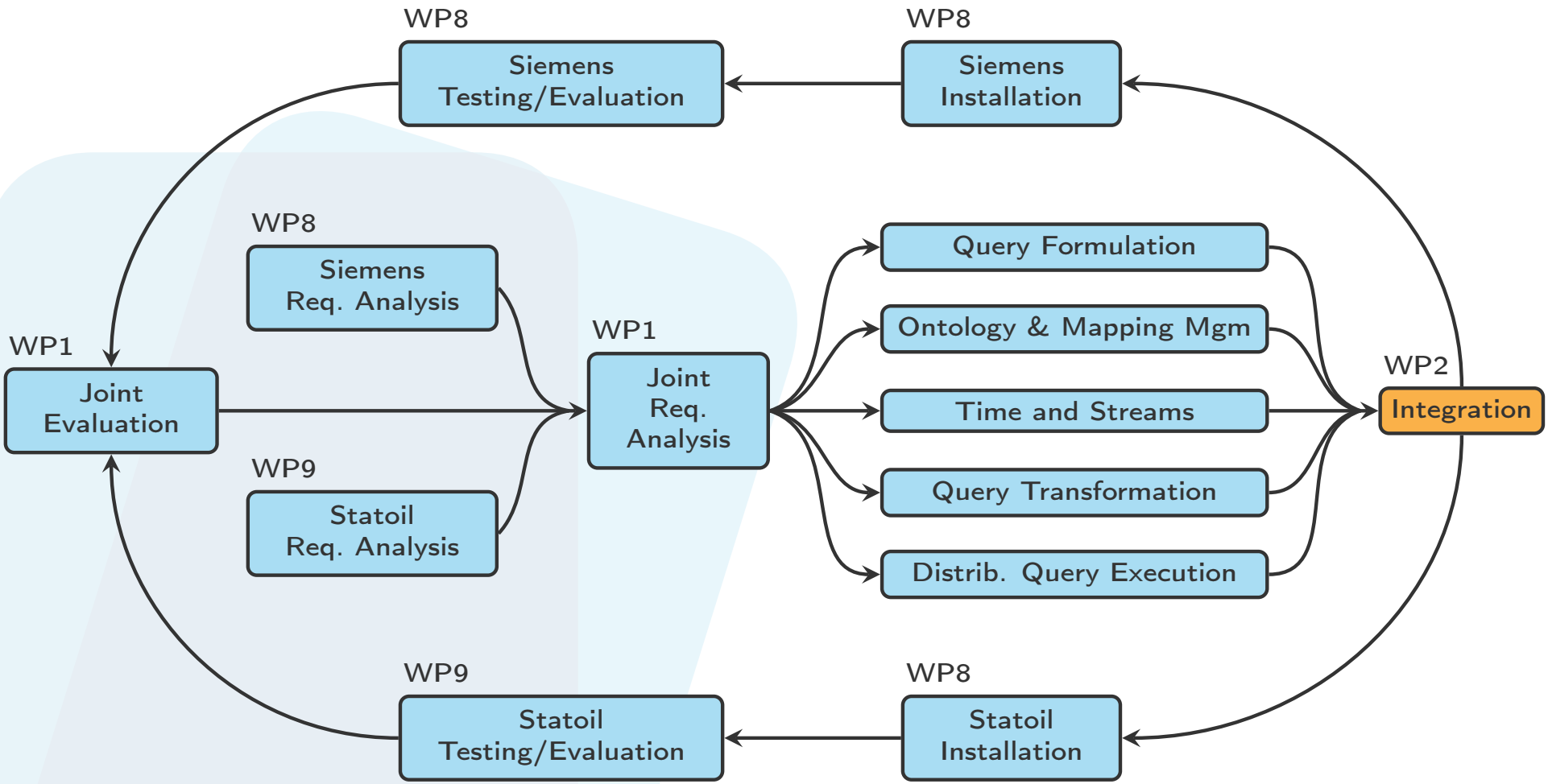
Yearly development cycle



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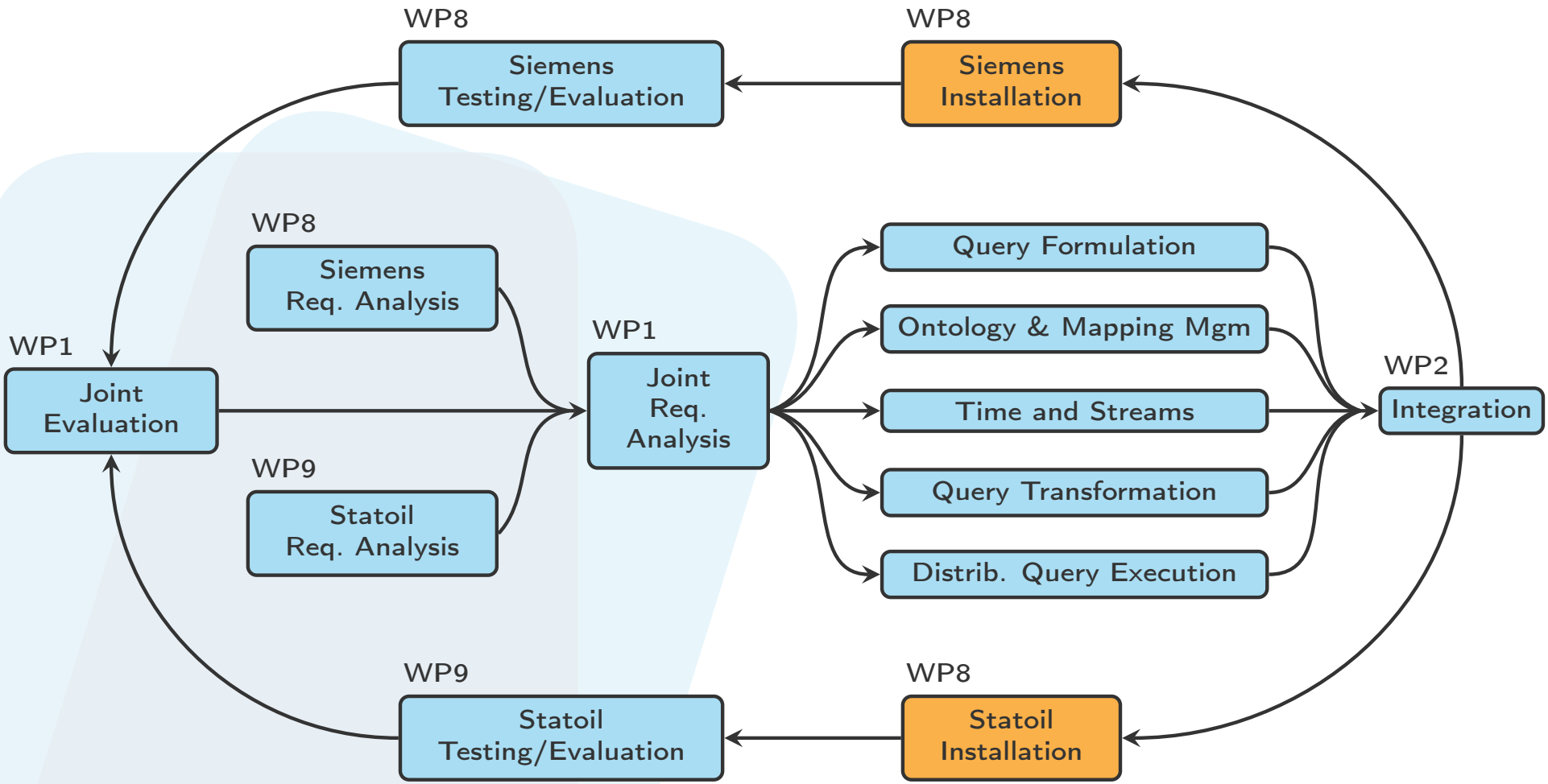

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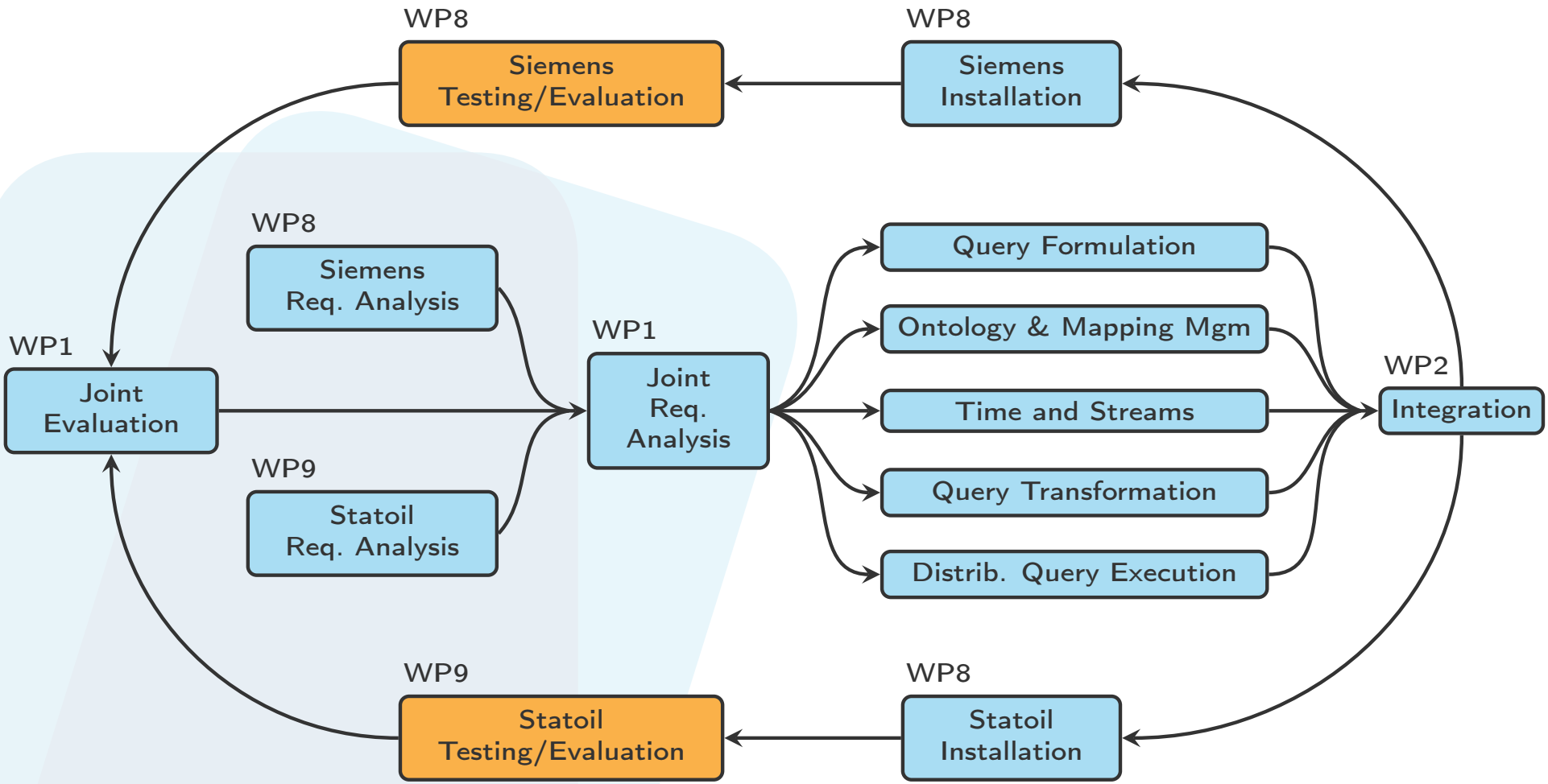

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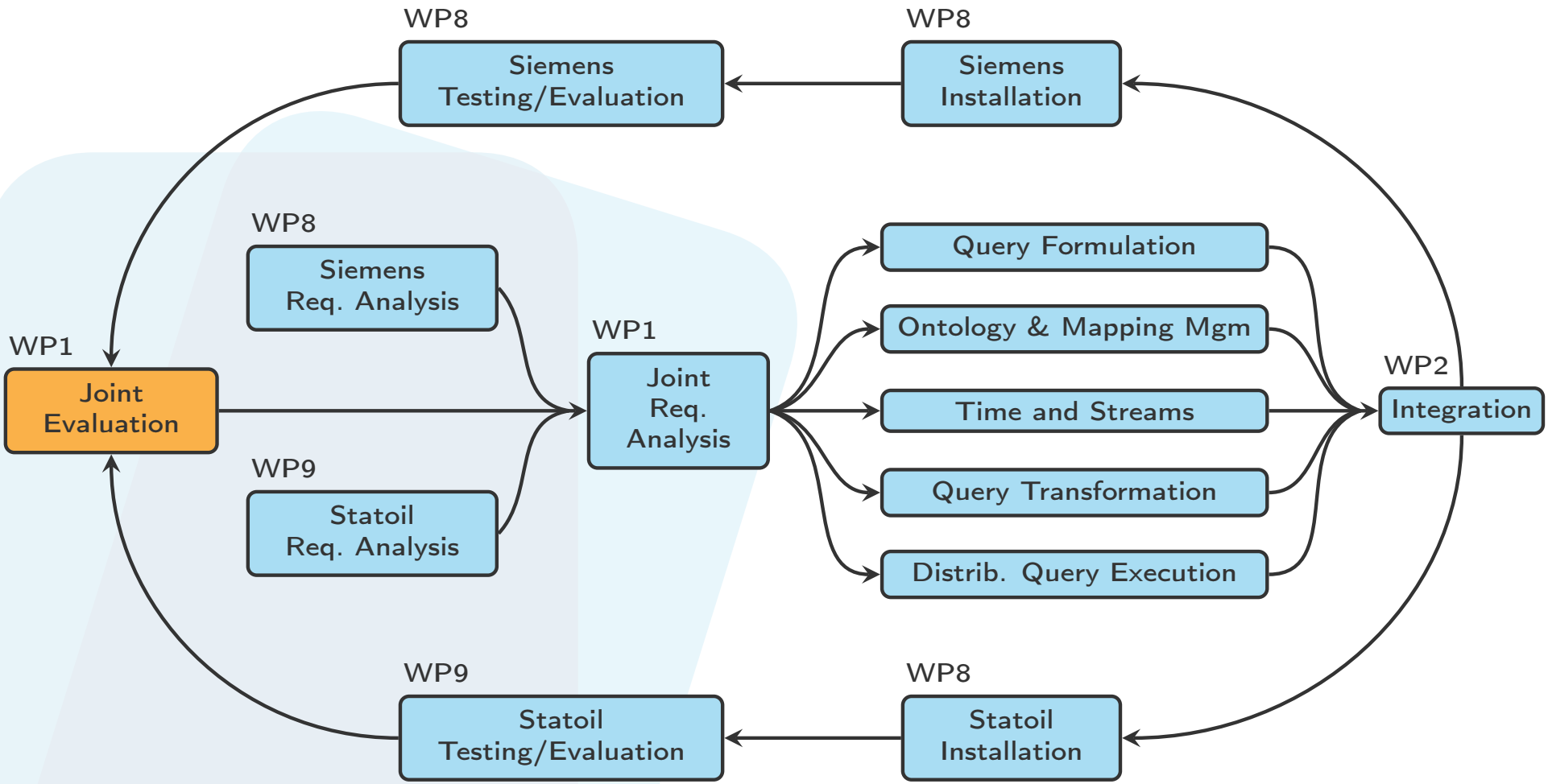
Yearly development cycle



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WP3: Query Formulation

What: Front-end component to help non-technical users formalize their information needs

How:

- Query by Navigation
  - Query by Example?
  - Faceted Querying?
- Direct Editing for experts
- Query-driven ontology construction

Who: Oxford University, University of Oslo

WP4: Ontology and Mapping Management

What: Creation, evolution, transformation & management of

- ontologies
- mappings

How:

- "Bootstrapping" of ontologies and mappings from existing models using ontology alignment and approximation techniques
- Bottom-up refinements on demand
- New framework/metamodel for analysing and manipulating sets of mappings

Who: Sapienza Univ. of Rome, most of the partners

WP5: Time and Streams

What: Semantics, Queries, and Query Rewriting for

- time-stamped (historical) data
- streaming (real-time) data

How:

- Extended query language (C-SPARQL?)
- Optimization of query rewriting for temporal data
- Data mining and query log analysis (caching)

Who: TU Hamburg-Harburg, Siemens, Univ. of Athens

WP6: Query Transformation

What: Rewriting user queries to data source queries

- efficient rewriting
- efficient queries output

How:

- Established OBDA methodology
- + utilize existing structure in sources
- + storing auxiliary information in data sources

Who: Free Univ. Bolzaono, Sapienza Univ. of Rome

WP7: Distributed Query Execution

What: Query planning and execution

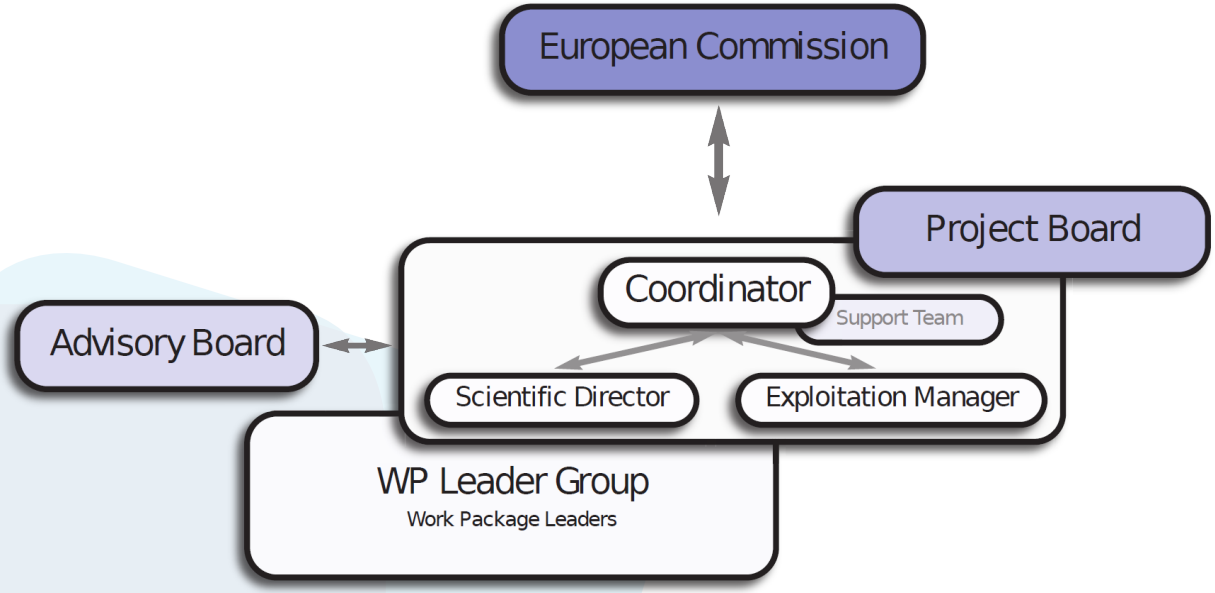
- "standard"/temporal/continuous
- distribution to disparate sources (federation)
- highly scalable

How:

- existing ADP framework for cloud storage/querying
- + federation support
- + temporal queries
- + continuous queries

Who: Univ. of Athens, Sapienza Univ. of Rome

Management structure



Management:

- One from each partner in WP leader group and in Board
- Board meetings twice a year at plenary meetings
- WP leader meetings at least every 3rd week, virtual
- Advisory Board meets once a year

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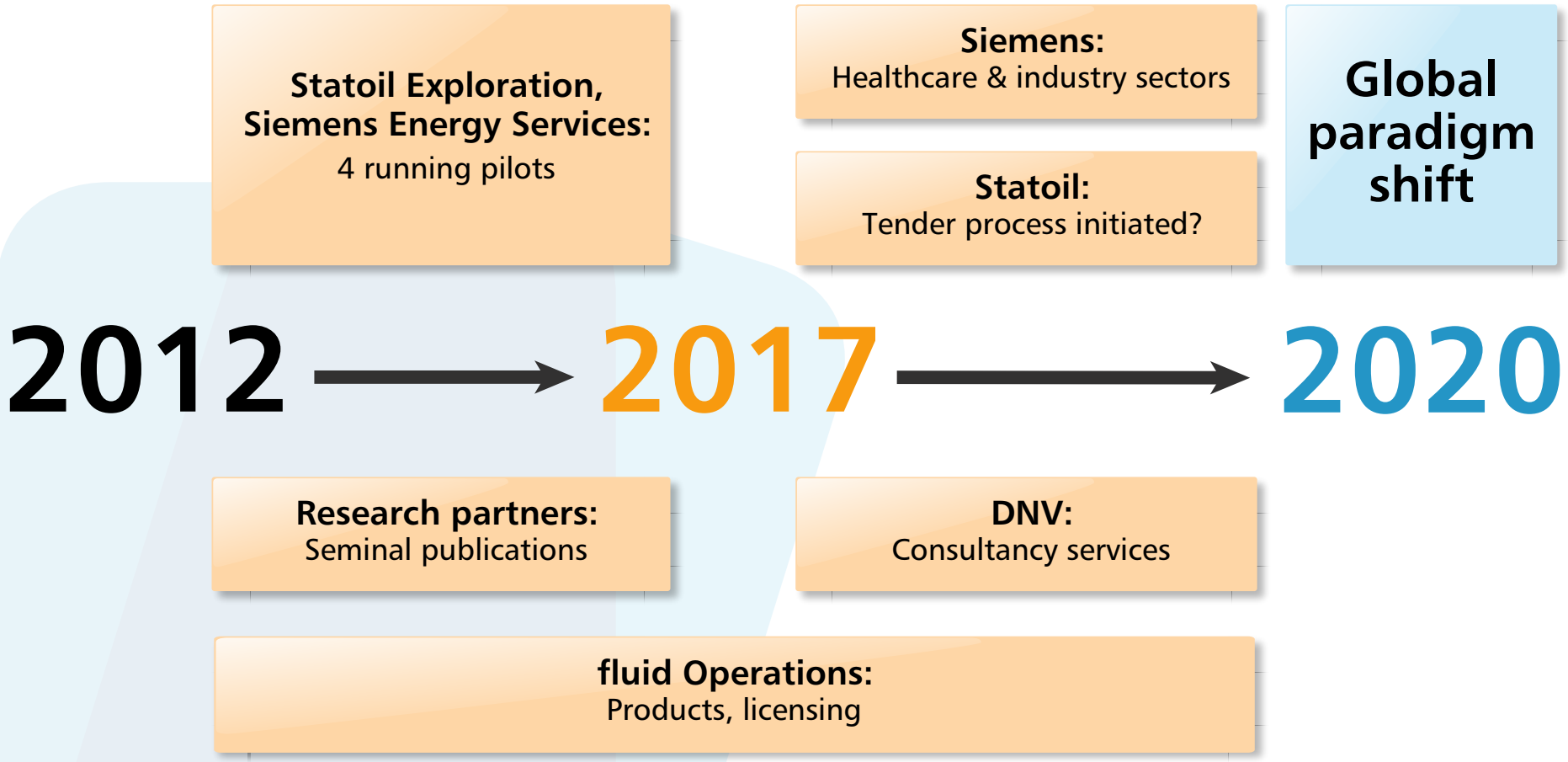
Advisory Board

- Morten Thorkildsen, Country general Manager, IBM Norway
- Joe King, Director of Strategy, Landmark R&D
- Bjørn Olstad, General Manager for Search and Enterprise Content Management, Microsoft Development Center Norway
- Rune Syverinsen, Technical Director, Oracle Nordics
- Vasu Guruswamy, Vice President Schlumberger Information Solutions

Towards a Global Paradigm Shift



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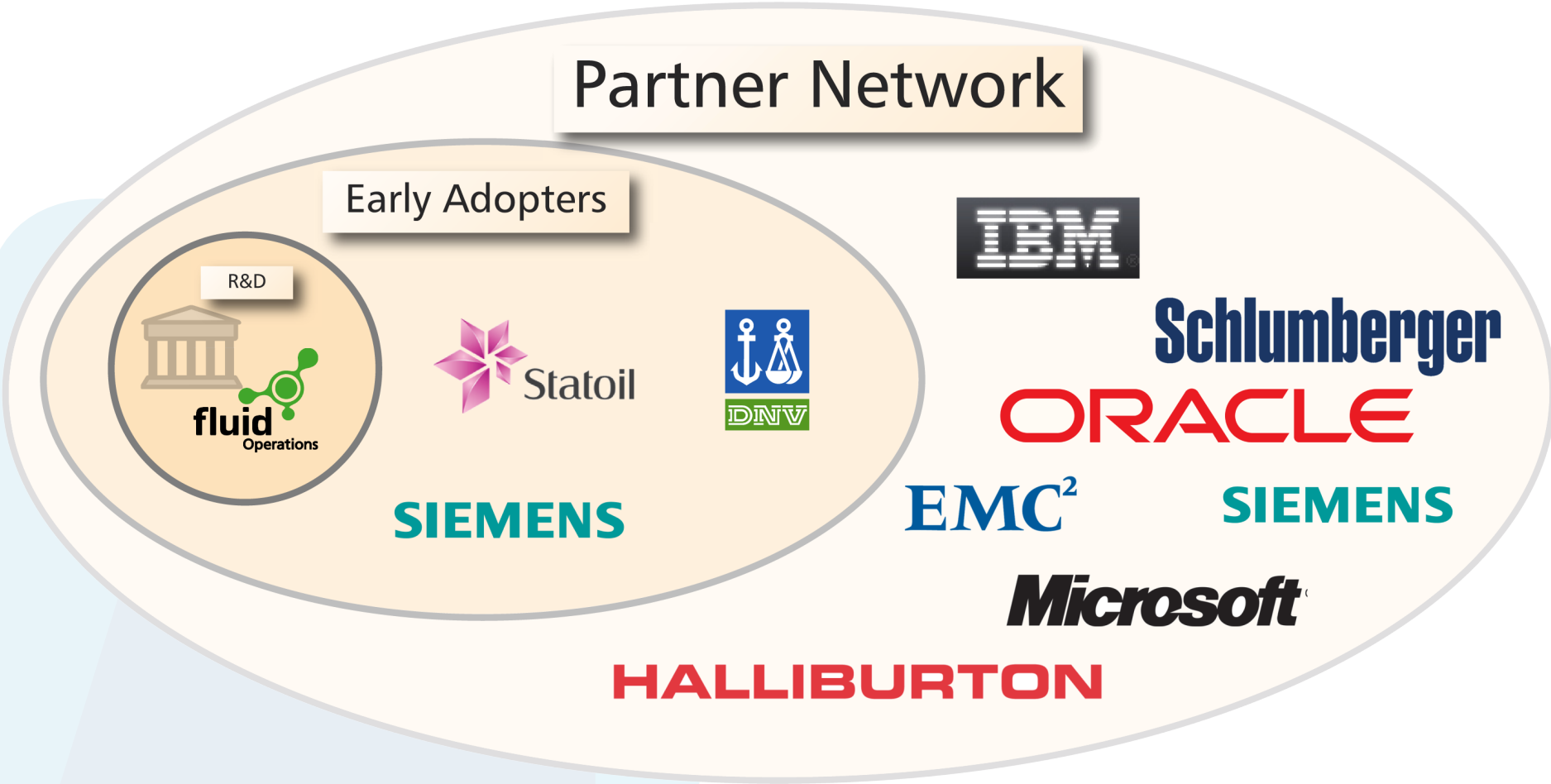
Exploitation through the Optique Ecosystem



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