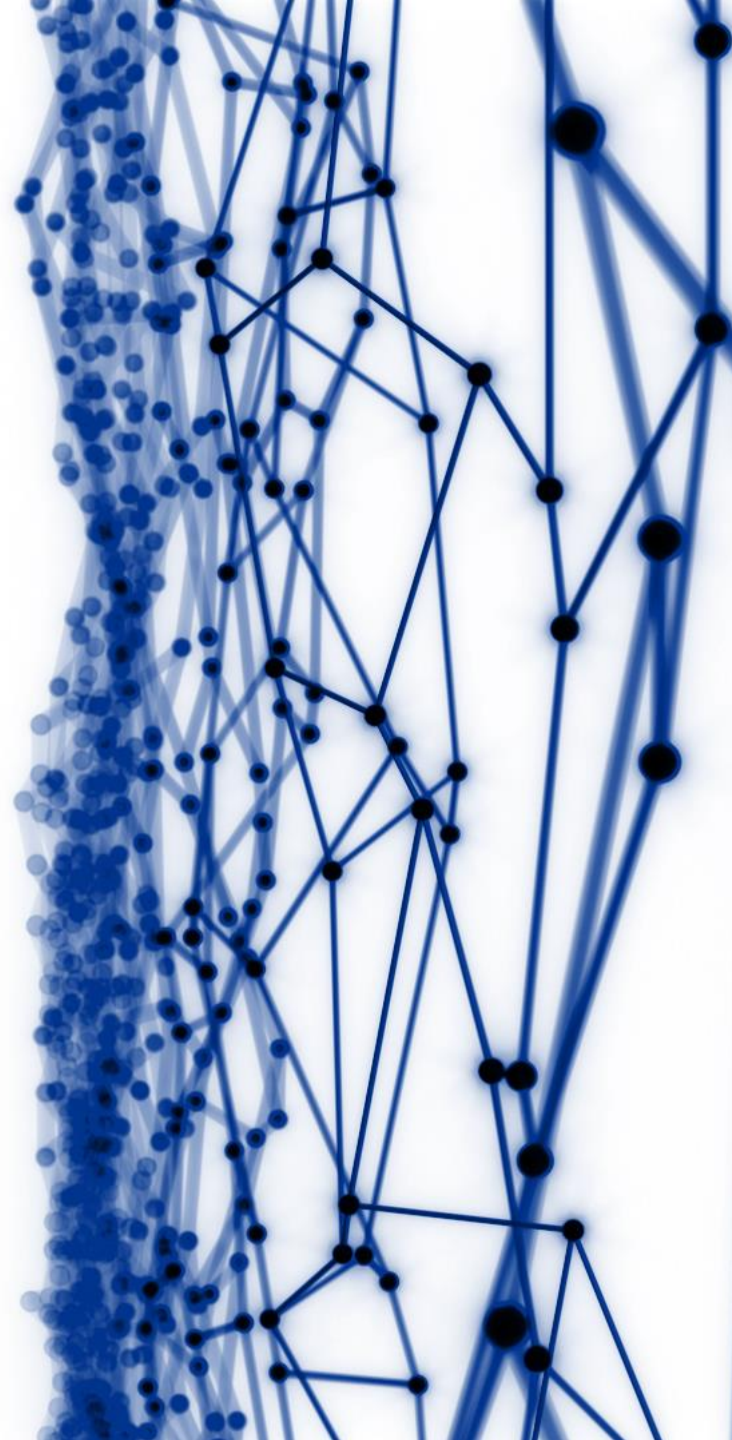
KPMG

MathWorks®

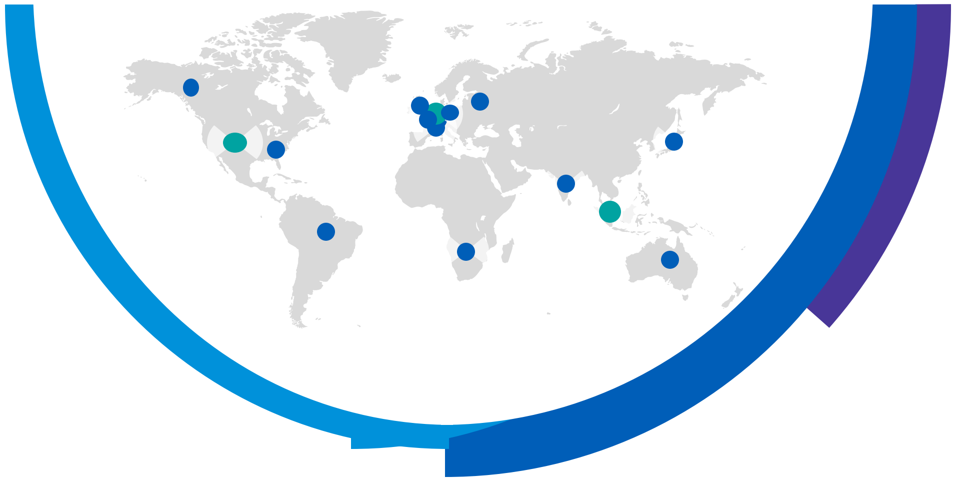
Developing and Integrating Quantitative Models with MATLAB

Creating Analytics for decision making in Quantitative Finance



KPMG Risk Services Luxembourg

Center of excellence for Quantitative Finance technologies



About KPMG Luxembourg:

- **Hub for Fund Risk Measurement solutions**
  - Risk Solutions for UCITS and AIFM
  - Wide range of models coverage
  - Standardized and tailor made approach
- **Center of excellence for Quantitative Finance**
  - Quantitative modeling experts
  - Software engineers
  - Data modeling and transformation resources

10+	5	6	50+	600+	200ks+	100ks+	150ks+
More than 10 years of presence in Luxembourg	Quantitative Risk Experts	IT Software Engeneers	Clients around Europe	Funds daily processed	Reports sent yearly	Risk measures computed daily	Lines of code in our repository

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Advanced data management
Value at Risk
Value at Risk
Derivatives Pricing

Quantitative Finance

Data visualization
Data transformation
Analytical modelling
Correlation Estimation.
Optimization
Liquidity risk modeling
Term Structure modeling
Stress test

Risk Measurement

Time Series Analysis
Regression analysis

Stochastic Process

Optimization and simulation
Cholesky decompositions
Monte Carlo simulation
Brownian Bridge
Principal Component Analysis
Garch estimation
Outlier detection
Decision modelling

The Essence of Quantitative Finance

Capturing the multidimensional complexity of the reality into a model

A model is only as successful as the data that underpins it.

Real value often only comes with scalability, repeatability and effective deployment.

We understand that algorithms and models have little or no value unless they are anchored in a strong understanding of the business context.

Turning data into competitive advantage

Data

What it is

In our domain, data mainly comes from two different sources: client vs market data provider.

Data, in the context of quantitative finance, almost always comes in the form of structured data

- Data transformation
- Data persistence
- Data availability
- Data cleansing
- Advanced data management
- Big data

Data, in the context of quantitative finance, refers to distinct quantitative and qualitative variables.

Creating insights that lead to valuable outcomes

Quantitative model

What it is

Analytics are applied to various sources of structured data to identify, extract, interpret and visualize meaningful patterns to provide advanced insights.

Quantitative analytics range from simple descriptive reporting to predictive and prescriptive algorithms that leverage the full potential of stochastic analysis.

- Statistical inference
- Mathematical Modelling
- Stochastic Analysis
- Optimization and simulation
- Algorithm assurance

Set of qualitative and quantitative techniques and processes used to enhance productivity and provide business gain.

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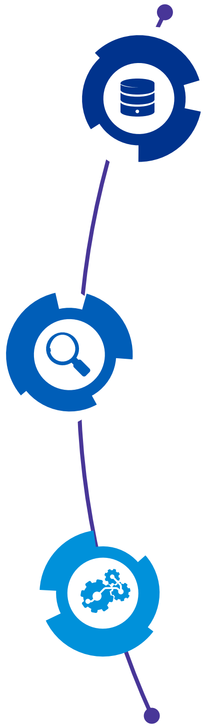
Our daily challenge

Quantitative Risk Management never stops to increase significance

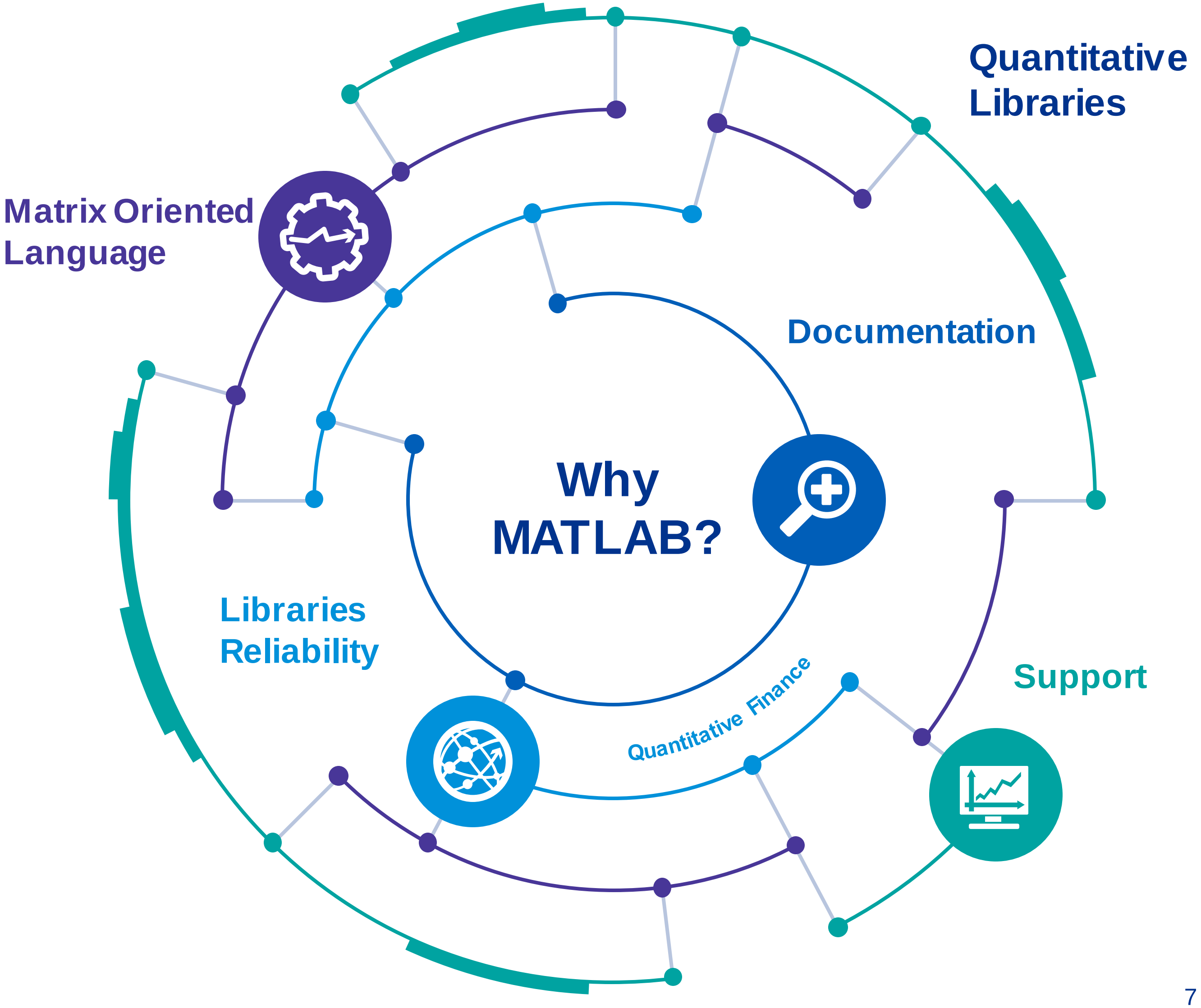
- ✓For Regulators
- ✓For Investors
- ✓For Decision Makers



To provide high quality standards and help organizations navigate regulatory requirements by optimizing risk operations, models and analytics

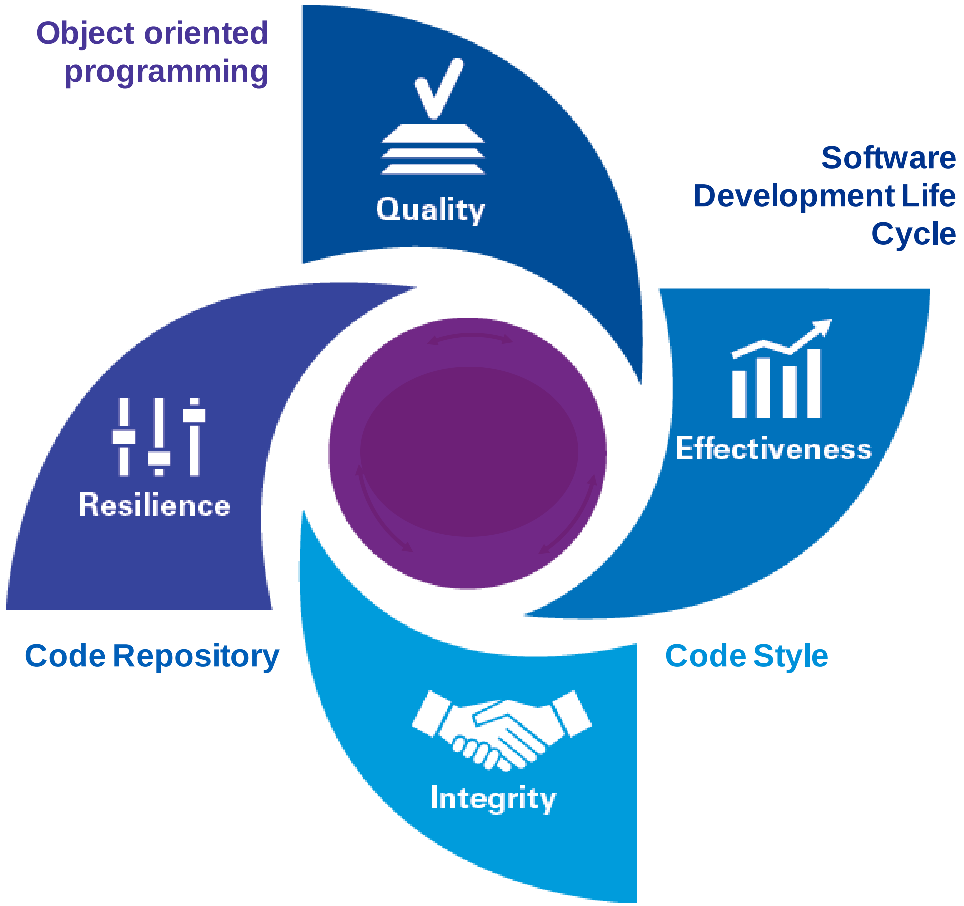
How does MATLAB help us?

- ✓ Expressive high-level language for easy expression of ideas
- ✓ Vast and reliable multi-disciplinary algorithm library
- ✓ Open, editable code library for learning and modification
- ✓ Easy deployment into production environments

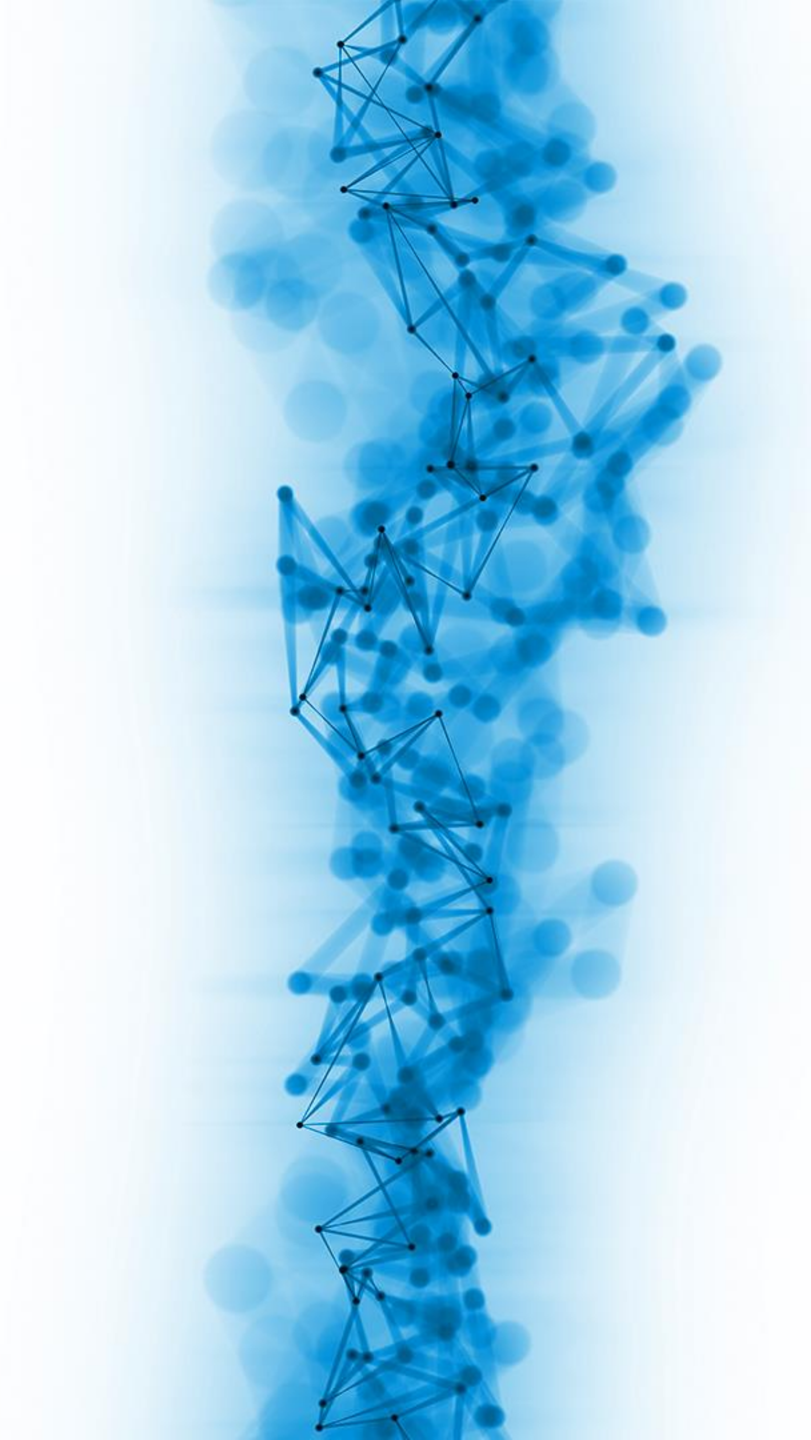


Some Best Practices to get the most out of it…

Effective analytics are grounded in four anchors of trust



How we deliver our services



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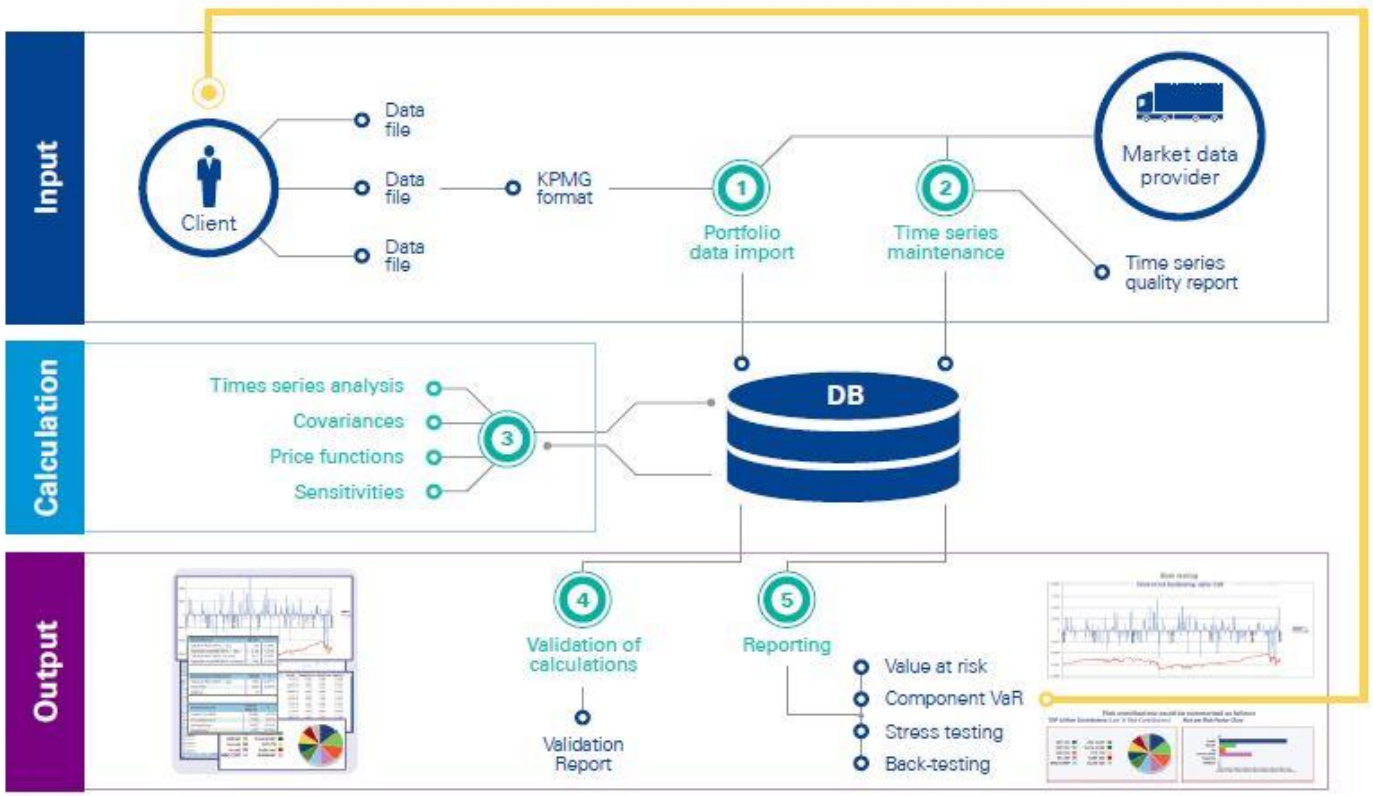
Focus on the Market Risk Engine

Our technology relies on a solid multi-layered integration technology framework



RACER Platform – Key Benefits

- ✓ One central service platform that enables reporting based on client needs
- ✓ Central source of reference data in a standard format / normalized for different service platforms and service providers
- ✓ Easy access to other tools and functions
- ✓ Benefit from common development

Micro Service Architecture

… MATLAB as Core Calculation Engine

MATLAB Core Engine

- High Performing Monte Carlo Simulation Method
- Cash Flow Simulation
- Sensitivity Analysis

Real Estate Application

- Front End: Real Estate information capturing
- Back End: Orchestration of the data flow

Control & data routing service

- Authentication
- Request Handling
- Monitoring
- Data Routing

Market Data Service

- Interest Rate Curves
- Inflation indicators
- Tenant Default Rates

Client Data Storage

- Real Estate Portfolio Information
- Client Specific Information
- Calculation Results

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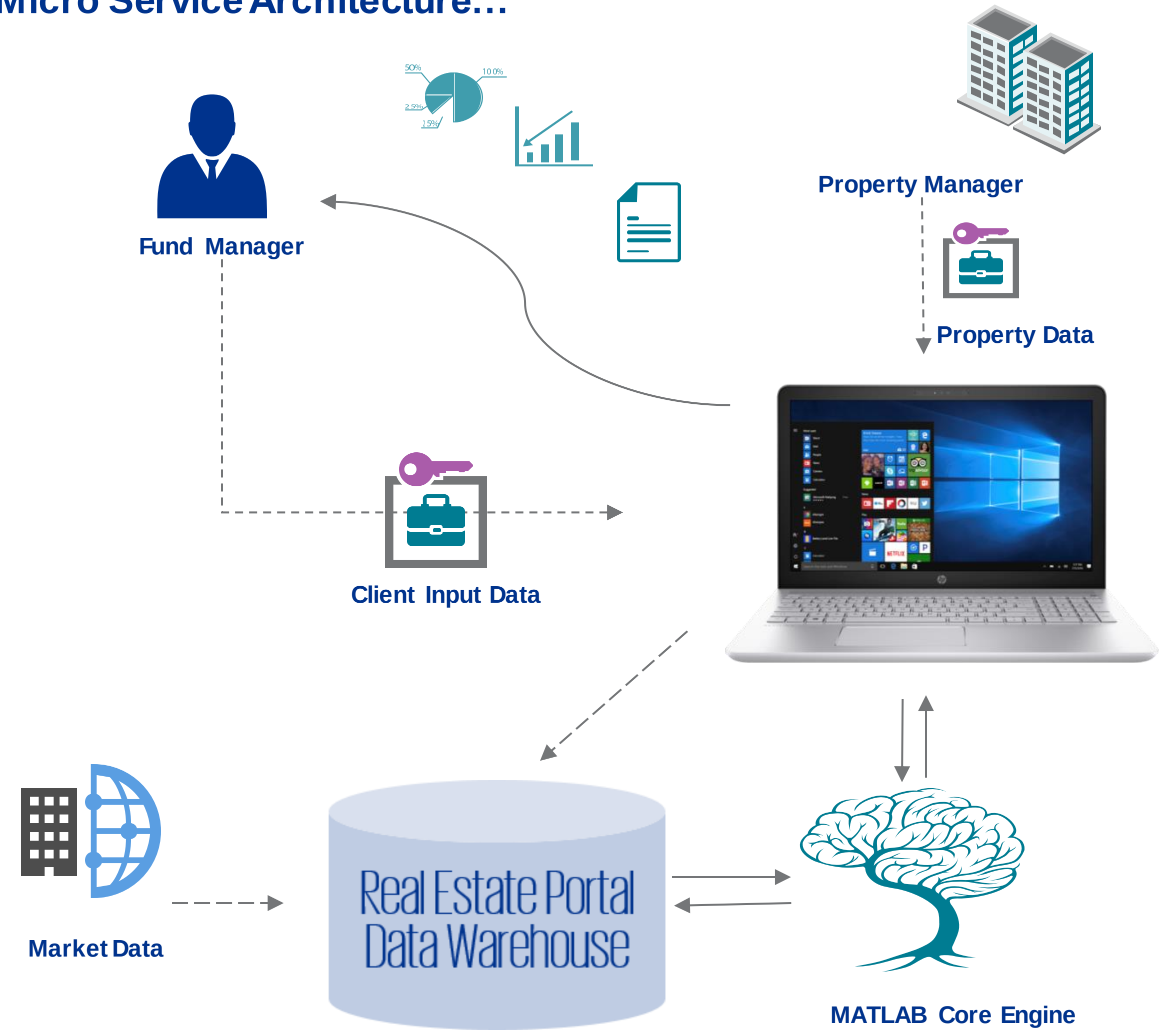
A practical example: Real Estate Application

Real Estate Application

Based on Micro Service Architecture…



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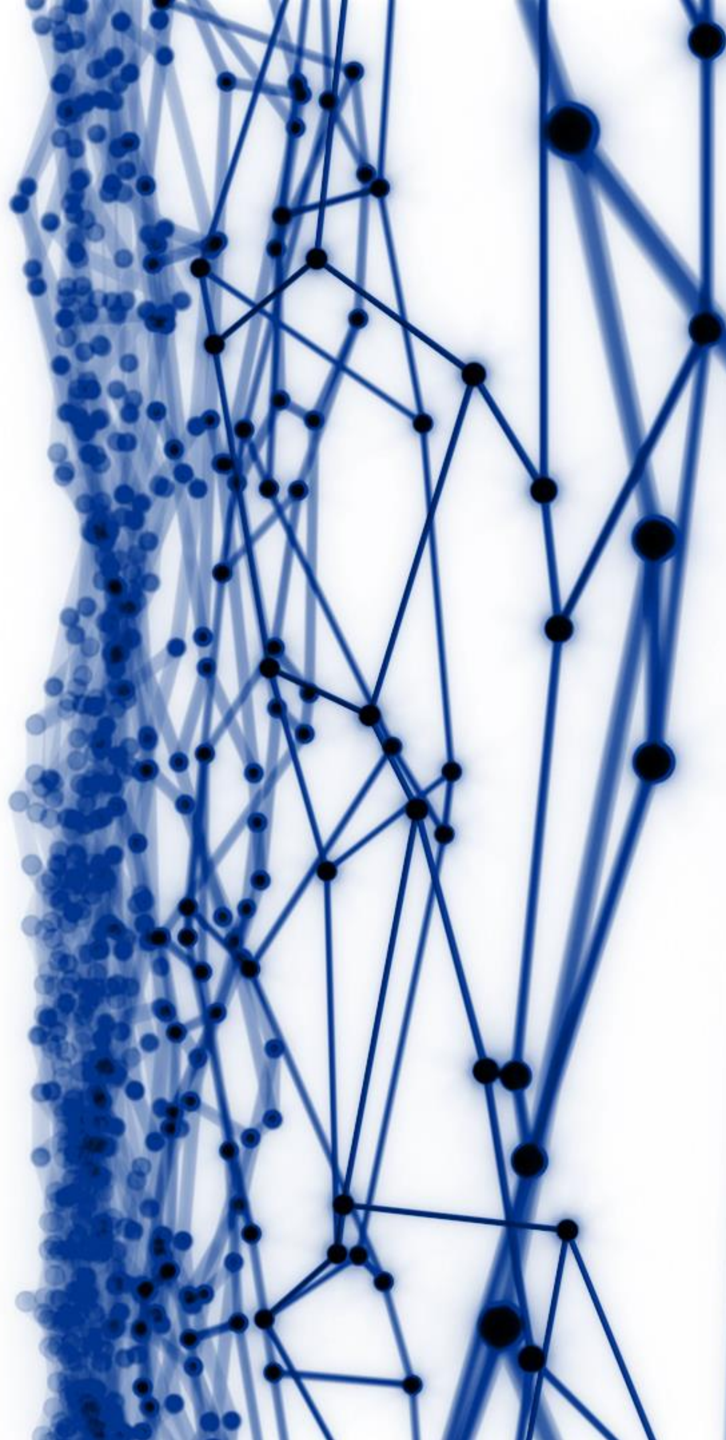
Anticipate tomorrow, deliver today

Unlocking the future with data-driven technologies



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Further questions? Contact us!

KPMG Risk Services Luxembourg

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