

**FINOS**

Fintech  
Open Source  
Foundation



# EPAM GLUE Project, Developing a unified entity and data model for the Buy-Side

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FINOS Director of Community

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VP, Head of Digital Engagement Practice for  
Wealth & Asset Management

April 2020

# Fast Facts

FOUNDED IN

1993

US  
HEADQUARTERED  
PUBLIC COMPANY  
(NYSE:EPAM)

FY 2018  
REVENUE\*

\$1.84B

FY 2019  
REVENUE  
GUIDANCE\*\*

AT LEAST  
23% GROWTH  
REPORTED & 24%  
IN CONSTANT  
CURRENCY



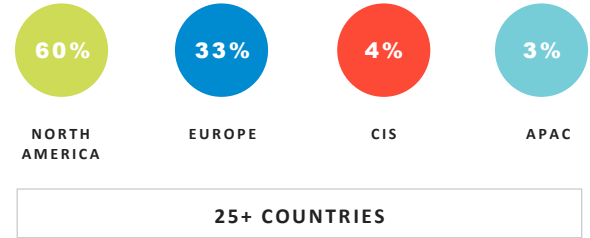
35

CONSECUTIVE  
QUARTERS OF

20+%

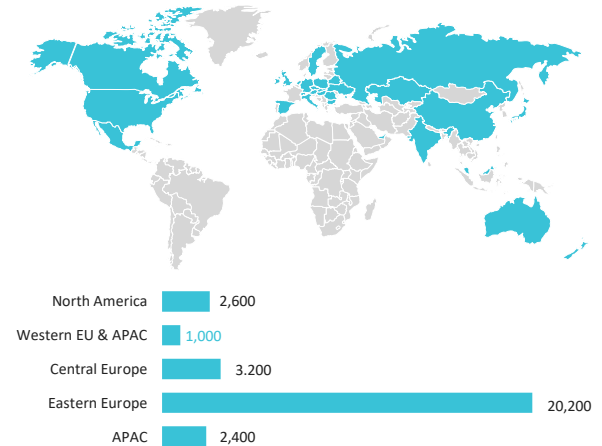
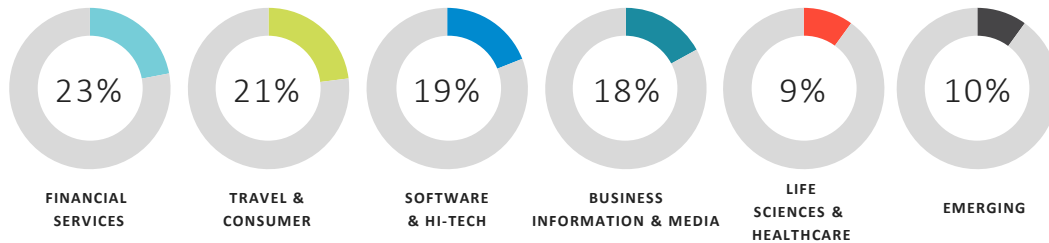
YOY  
ORGANIC GROWTH\*\*

FY 2018 REVENUE BY GEOGRAPHY\*



31,460+ Engineers, Designers and Consultants  
35,450+ EPAMers\*\*

FY 2018 REVENUE BY INDUSTRY\*



\*As of Q4 and FY 2018 Earnings Release

\*\*Data for Q3 2019

# EPAM Recognized Among Top Global Tech Companies Leading In Open Source Contributions

EPAM was ranked

# #14

in the number of employees that actively  
contributed to Open Source projects on GitHub

According to InfoWorld, EPAM had 585 active contributors to GitHub in 2017. The list was compiled using the GitHub REST API to pull public information from GitHub users with at least 10 commits to public projects last year.

Rank	Company	Employees Contributing
1	Microsoft	4,550
2	Google	2,267
3	Red Hat	2,027
4	IBM	1,813
5	Intel	1,314
6	Amazon.com	881
7	SAP	747
8	ThoughtWorks	739
9	Alibaba	694
10	GitHub	676
11	Facebook	619
12	Tencent	605
13	Pivotal	591
14	EPAM Systems	585
15	Baidu	584
16	Mozilla	469
17	Oracle	455

**WHAT IS WAVE?**

## Wealth Management clients expect tailored banking services, addressing their individual needs

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In times, where a customer can personalize every details of his or her personal life - from cars and houses to trivial things like salads or cereals - they rightfully expect personal banking services.

*“One-size-fits-all” has become “one-size-fits-none”*

Digitalization allows for customized client service and user experiences but it does not mean that a client wants to talk to a robot.



### The Response to this Challenge

- Risk Return Based approaches over Asset Allocation
- Mass Customization
- Hybrid Advisory & The Digitally Augmented Advisor
- Self-Service / Hybrid Digital Advisory Platforms

## Wealth Management is a scalability and efficiency game

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Manually servicing clients is time-intensive and expensive. Thus, only (U)HNWIs are the targeted client segment, even though the available assets of core affluents are 20x higher.

Wealth managers need to increase net new money inflows and assets under management (AuM), but increases in AuMs are tightly coupled to increases in workforce.



### Response to this Challenge

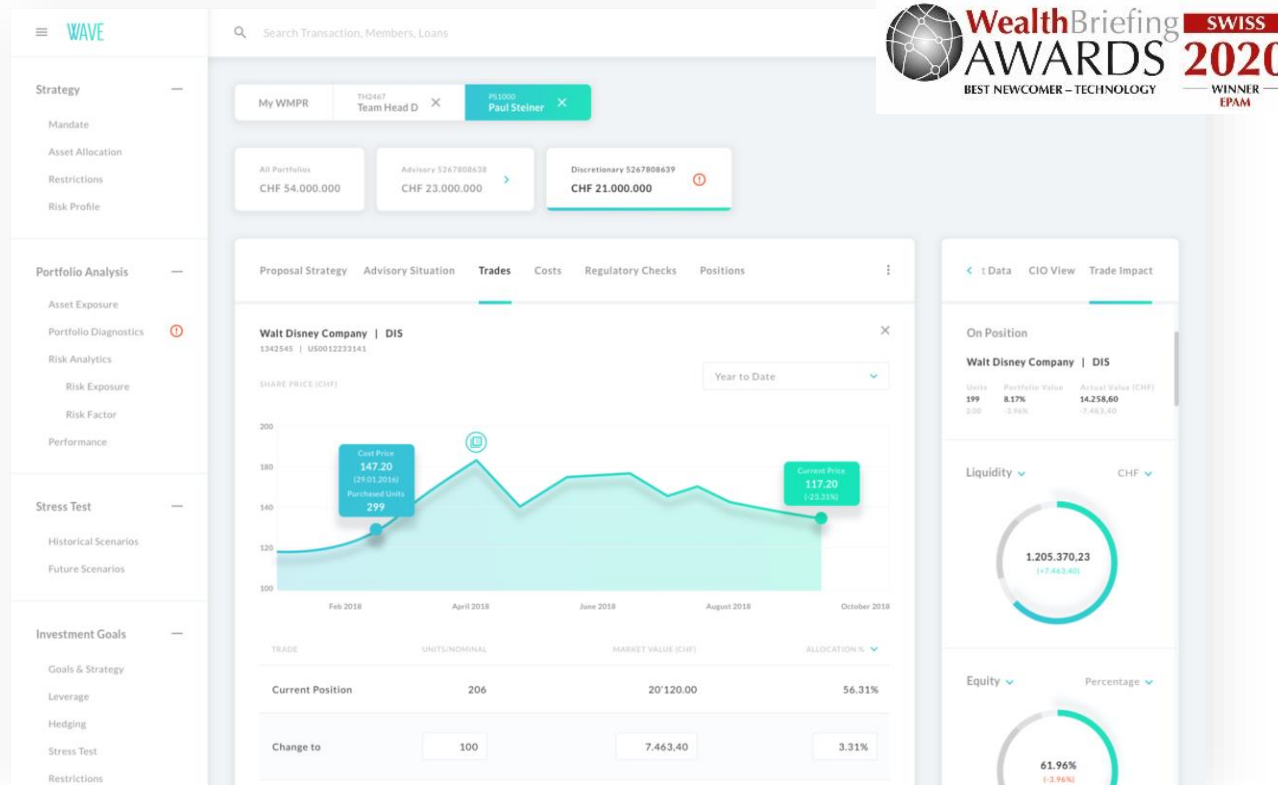
- **E2E Industrialization**  
Automate the bank's value chain with smart technologies leveraging Quantitative Engines, Artificial Intelligence, Machine Learning, and Cognitive Computing



# EPAM WAVE

To help out client on this Journey to industrialization and mass-customization EPAM joined forces with selected partners to build out an open API Investment Management Eco-system and launched the first Version of this Eco-System, EPAM Wave in 2019. Delivering market leading Capabilities in an Integrated Platform as white labeled software accelerators.

EPAM will sequentially open-source these accelerators as individual projects in the FINOS community



Next Generation Risk Analytics and Risk based Portfolio Optimization



Regulatory Rules & Compliance Engine, Regulatory Rules Management



IA, MLP, Research & News Curation, Sentiment Analysis

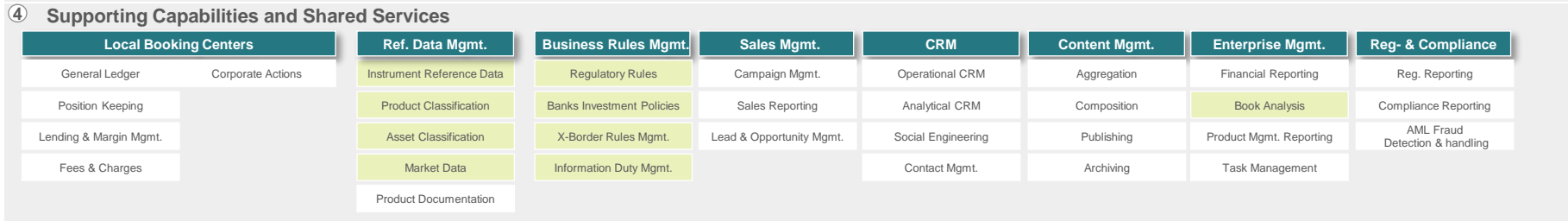
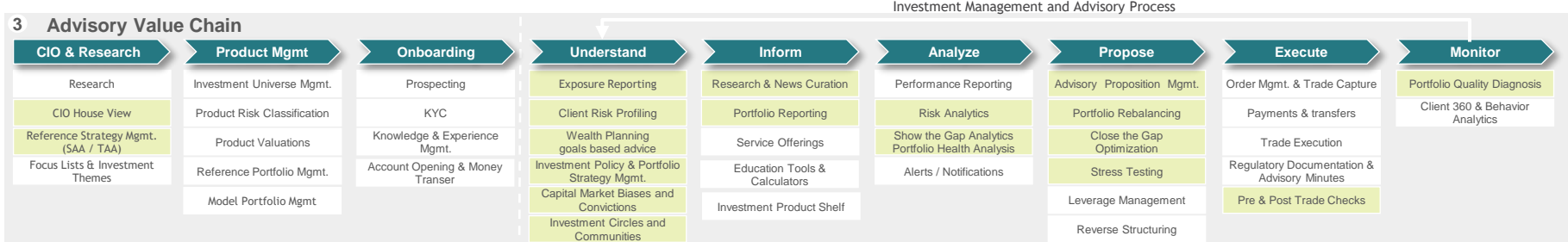
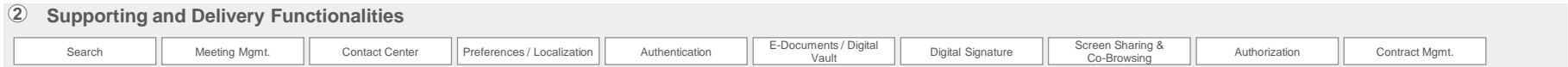


Secure Client Advisor Communication, Digital Vault



Cloud Infrastructure and API Management

# EPAMs Investment Management Eco-System





# High Performance Analytical Data Layer – EPAM GLUE

## PURPOSE

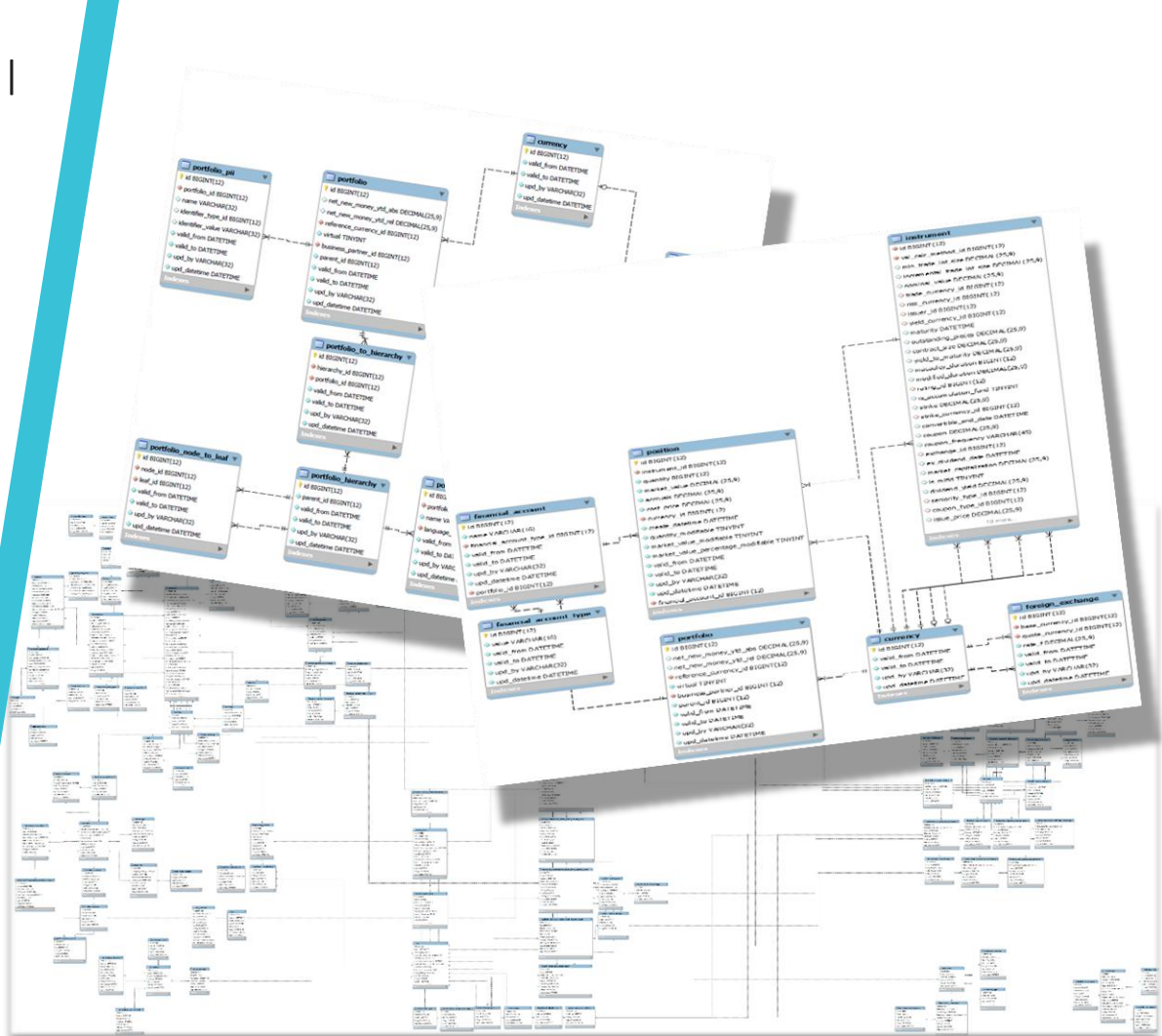
Banks are struggling to leverage their existing data residing in heterogeneous backend & ledger systems.

Traditional Data-Warehouse solutions do not provide the performance needed for modern analytical solutions exposed to the end-client.

Banks are in need of a mid & front-office platform allowing them to leverage their data for real time analytical solutions such as Portfolio Risk Management, Performance Analytics forming the basis for the digital Transformation.

## FEATURES

- High-Performance in-memory analytical data fabric powering digital advisor- and client solutions
- Enabling massive parallelization of analytical calculations in a distributed in memory store.
- Enterprise grade fault tolerance and disaster recovery . horizontal scalability
- Cloud native architecture deployable in public and private clouds.
- High degree of data security, GDPR compliant



# GENERIC CONCEPTS

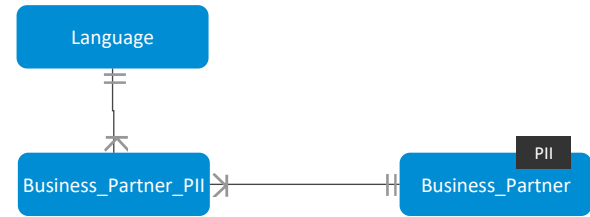
# Generic Concepts

## PII and late enrichment

- Laws dictate special handling of PII data requiring special consideration especially in MESI setups.
- PII data is stored in dedicated entities.
- These entities are stripped over multiple “partitions” hosted by several databases (such that the partition hosted in a specific country stores the PII data for this country only).
- PII data is late enriched in the presentation layer of WAVE.

## Auditability / Historization

- For (almost) all entities, records have start / end dates and keep modification date and modifier to clearly identify their business validity.
- Data is fully historized for auditing purposes.

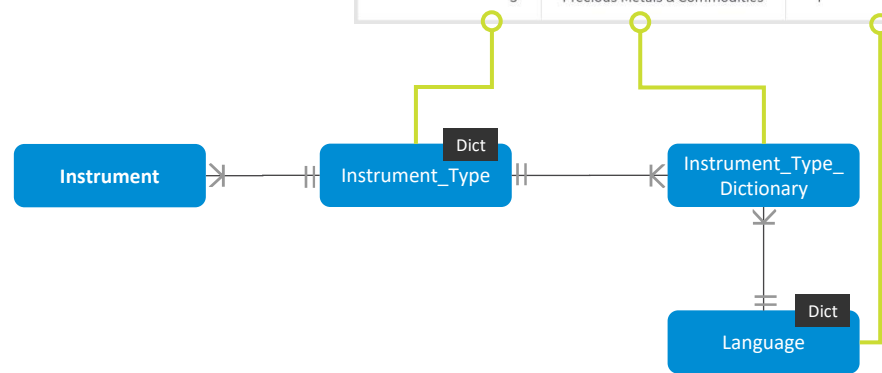


# Generic Concepts

## Language Support

- A single installation for several regions / countries with multiple languages requires multi language support.
- In WAVE, attributes requiring translations are extended by a dictionary table which contains translations.

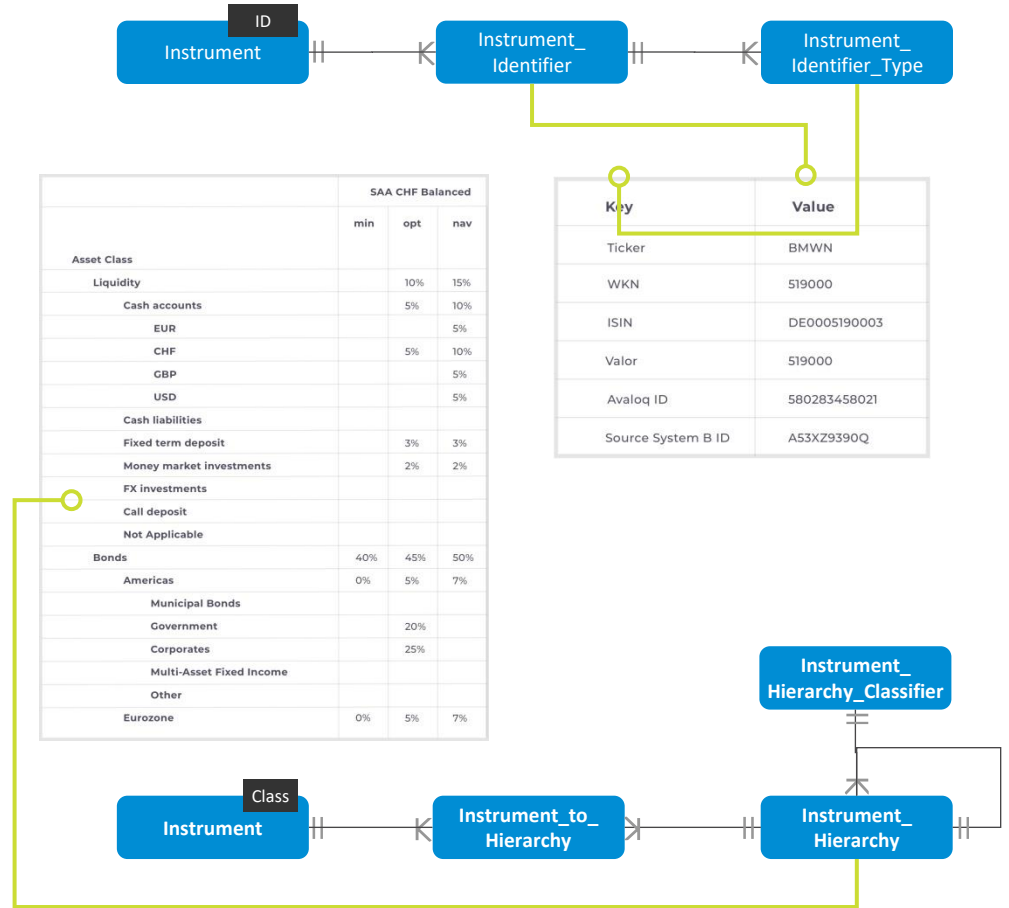
instrument_type_id	name	language
1	Equities	1
1	Aktien	2
1	l'action	3
2	Bonds	1
2	Anleihen	2
2	l'emprunt	3
3	Precious Metals & Commodities	1



# Generic Concepts

## Hierarchical Object Breakdown Structures

The model allows for the creation of flexible Object Hierarchies to allow for e.g multi-level Asset-Classifications, introduction of new Classifications and hierarchies at run-time.

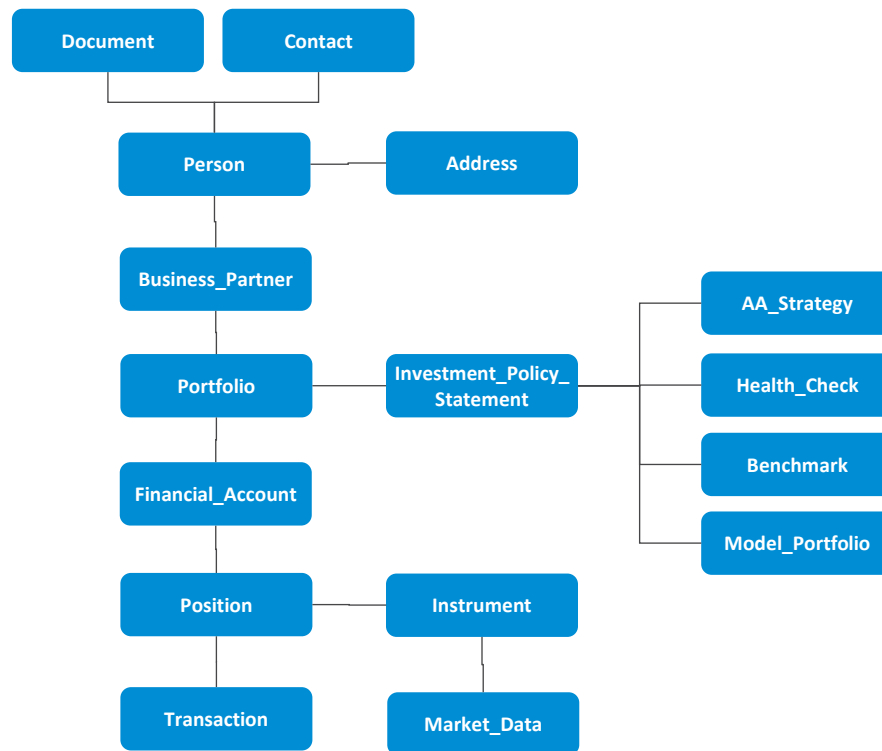


## MAIN OBJECT DOMAINS

# Main Object Domains

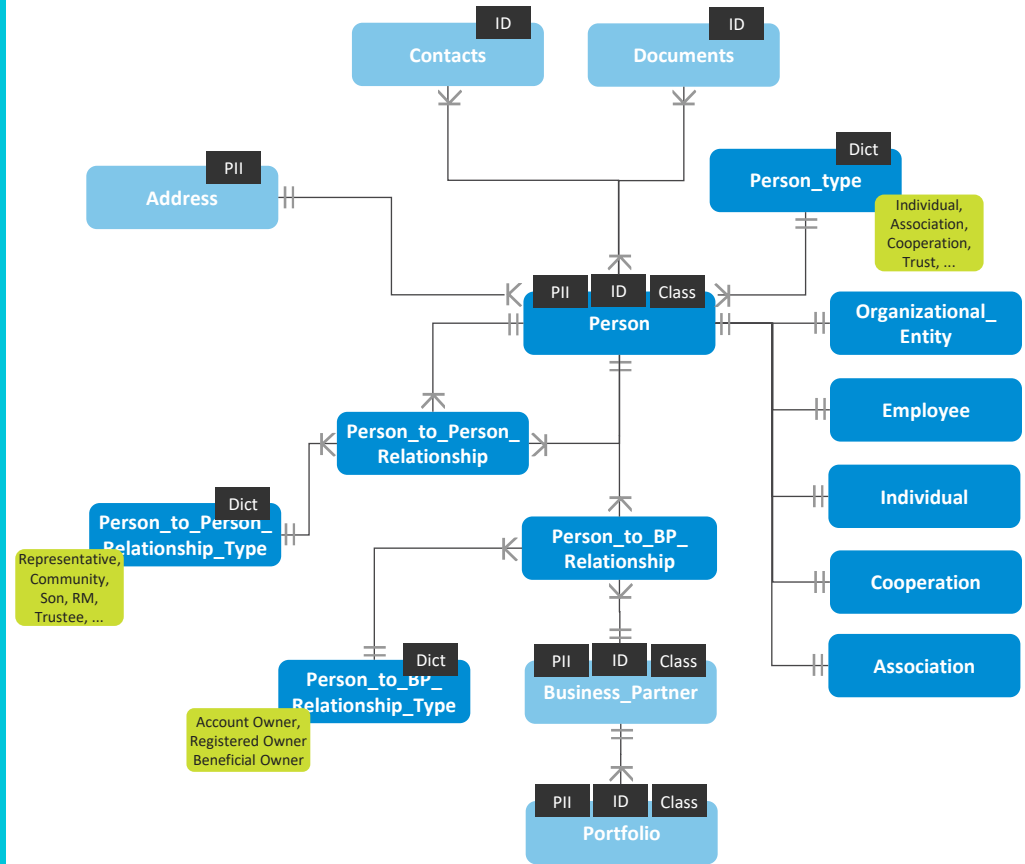
WAVE covers the following main object domains:

- Person / Business Partner
- Entitlements
- Investment Policy Statement / Strategy / Health Check
- Portfolio / Financial Account
- Position / Transactions
- Instrument / Market Data



# Person / Business Partner

- Partner (client, non-client, family bonds, business environment, ...) knowledge is becoming more and more important, e.g. for marketing, advisory and regulatory purposes.
- WAVE adopted a partner-centric approach and has the concept of a partner as well as the business relationship (account) with a partner.
- We analyzed the different types of business entities one by one:
  - Legal entities: Individual, (In-) Corporation, Limited Liability Company (LLC), ...
  - Non legal entities: Sole Proprietorship, Trust or Association (e.g. several types of Partnerships)
  - Special entities (e.g. an issuer of an instrument or internal entities such as a booking center, department, team, ...)
- And responded with a highly standardized object model.





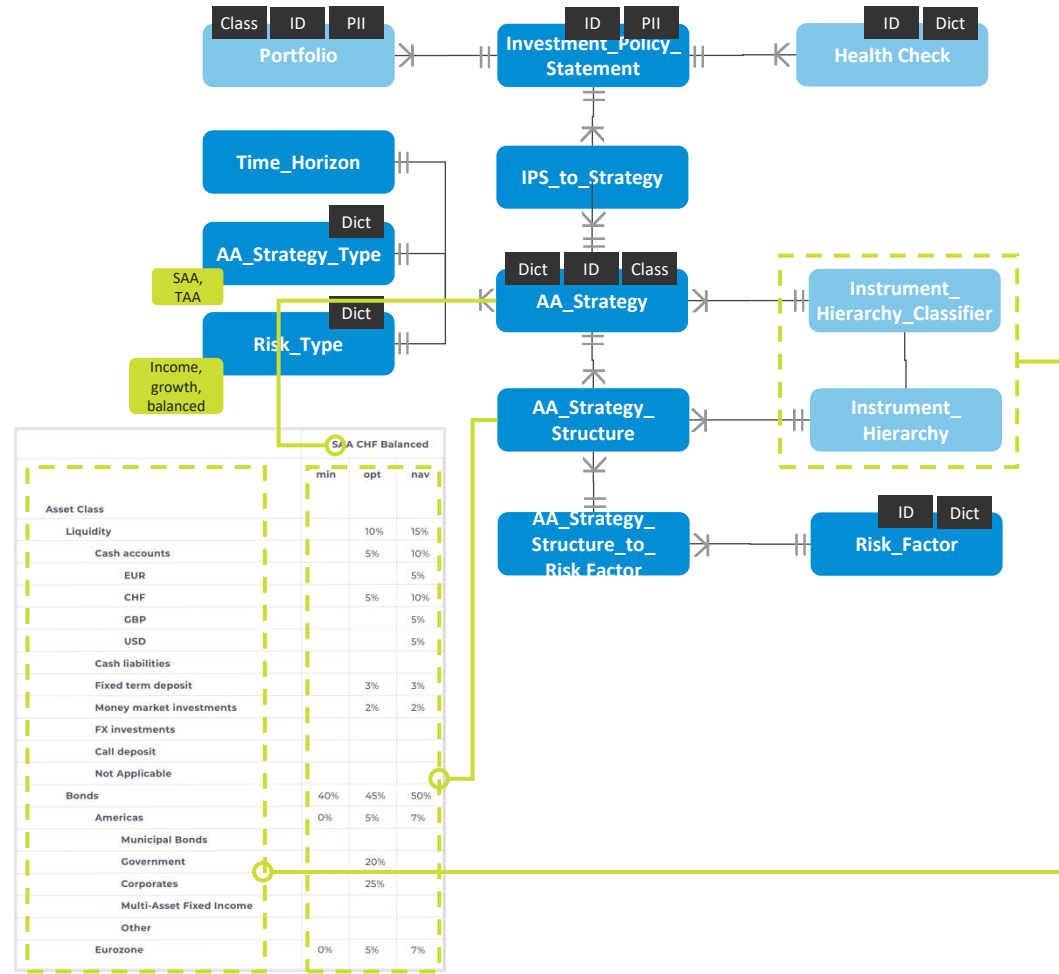
# Person / Business Partner

- Legal entities obviously have a dedicated Person object.
- Non-legal entities such as a Trust or an Association (e.g. a Shared Account) have a dedicated Person object in addition to the Person objects for the legal entities involved in here. This is to be clear e.g. about domicile address or legal form.
- Special entities, such as the Issuer of instruments, employees, organizational entities within the bank are also represented by dedicated Person objects.



# Strategy

- Defines the breakdown of the asset universe into e.g. instrument types, regions, currencies, sectors, ratings and min / opt / max weight for each category.
- Wave provides full flexibility to define as many strategies (even client-specific) as desired.
- Full flexibility to define hierarchical breakdown of asset universe individually (if needed) for each strategy and assign min / opt / max weights.



THANK YOU FOR HAVING THE OPPORTUNITY  
TO PRESENT OUR CONCEPTS AND MODEL

# APPENDIX

# Our Wealth Management Accelerators (1/5)

## AREA

## CHALLENGE

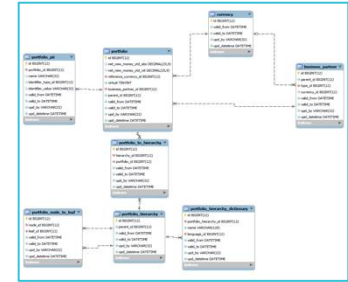
## SOLUTION

## EXAMPLE

### EPAM GLUE Core Platform and High-Performance Analytical Data Layer

- Banks are struggling to leverage their existing Data residing in heterogeneous ledger systems.
- Traditional Data-Warehouse solutions don't provide the performance needed for modern analytical solutions exposed to the end-client
- Banks are in need of a mid & front-office platform allowing them to leverage their data for real time analytical solutions such as Portfolio Risk Management, Performance analytics forming the basis for the digital Transformation

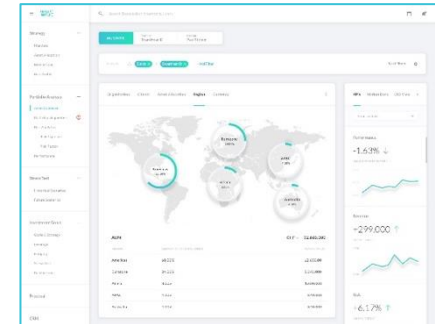
- High Performance in memory analytical Data Fabric powering digital Advisor- and Client solutions
- Enabling massive parallelization of Analytical Calculations in a distributed in memory store.
- Enterprise grade fault tolerance and disaster recovery . Horizontal Scalability
- Cloud Native architecture deployable in public and private clouds.
- High degree of data security, GDPR compliant



### Real Time Portfolio Performance and Risk Analytics

- Overnight Batch calculation of Performance, contribution, attribution and ex-post risk is not sufficient for todays demands of flexible digital solutions.
- Collaborative Portfolio analysis allowing for free slicing and dicing and Realtime contribution and attribution analysis with flexible Benchmark selection, is a key differentiator not only for Institutional Investors.

- GIPS compliant Performance and Risk.
- Real-Time flexible analysis of all major KPIs, contribution and attribution analysis down to Position level.
- Free selection of Benchmarks and allowing for composite Benchmarks.
- Ultra fast analytics based on. EPAMs GLUE Platform. Allowing on the fly analysis of Individual Portfolios or the entire Book.



# Our Wealth Management Accelerators (2/5)

## AREA

## CHALLENGE

## SOLUTION

## EXAMPLE

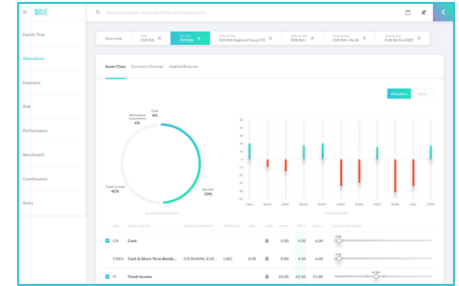
### CIO Cockpit

A tool for the Chief Investment Office to manage strategies and model portfolios for discretionary and advisory mandates

Define your forward-looking *House View* based on a vast series of market and economic risk factors (e.g. expected returns, regional biases, volatility, correlations, etc.)

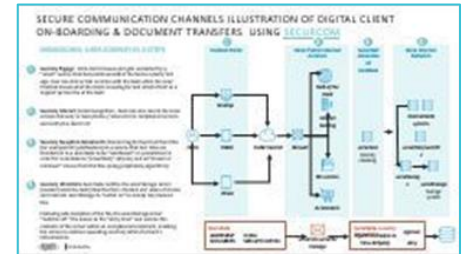
A quant engine translates your *Views* into portfolios based on an Entropy Pooling Approach, powered by our partner swissQuant.

Use our *rules- and risk-based derivation* framework to construct dependent strategies and portfolios under consideration of regional or client-specific requirements (black- / white lists, replacements, restrictions, etc.)

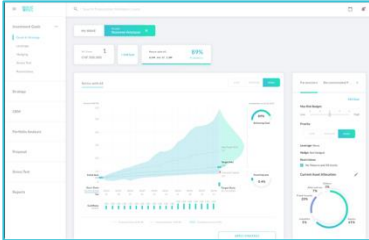


### Secure Client-Advisor Collaboration


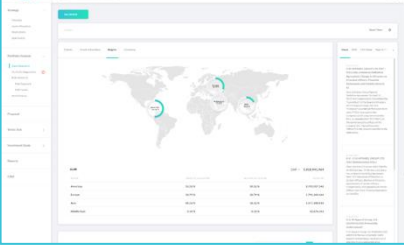
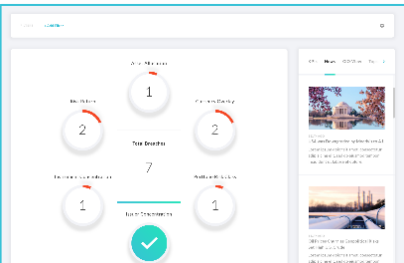
- Clients expect the convenience of and immediacy of services such as WhatsApp also in their banking interactions
- However, a secure online environment is critical to ensuring data privacy and communication integrity
- Documents shall be sent electronically with automated security scanning, versioning and secure storage
- securChat for secure and encrypted messaging
- securCall for voice and video with integrated auditing and recording
- securID for biometric authentication using facial recognition and machine learning
- securFile for file transfer and digital signature
- securGate for virus stripping and malware/virus scanning
- securStorage for document storage



# Our Wealth Management Accelerators (3/5)

AREA	CHALLENGE	SOLUTION	EXAMPLE
<p><b>Goal-based Advisory</b></p>	<ul style="list-style-type: none"> <li>Investment Strategy and Risk profiling discussion can be difficult and tedious with unexperienced client segments.</li> <li>Engaging with clients based on their individual goals is often a more promising approach and is a way to engage clients in to long-term relationship</li> </ul>	<ul style="list-style-type: none"> <li>Capturing of clients investment goals as a sequence of future cash-flow events.</li> <li>Visualize impact of Risk-budget, investment volume and savings rate on likelihood of goal-achievement.</li> <li>Impact of hedging and leverage on goals.</li> <li>Dynamic strategy monitoring and adjustments to optimize likelihood of Goals-Achievement.</li> </ul>	
<p><b>Structured Product Reverse Engineering</b></p>	<ul style="list-style-type: none"> <li>Distribution of high margin structure products is a more and more difficult task in times where there is a tendency to move to less complex products and with regulators demanding complete transparency.</li> <li>Banks need ways to clearly explain the benefits that an SP brings in a portfolio context, have flexibility in constructing bespoke SPs and show the risk impact on the Portfolio pre-issuance.</li> </ul>	<ul style="list-style-type: none"> <li>Creation of bespoke structured Products.</li> <li>Pre-Issuance Portfolio Risk impact analysis</li> <li>Reverse structuring of Structured products to improve the Portfolios Risk-Profile based on client preferences on underlying's</li> <li>Minimize Portfolio Turn-over with Structured Product optimization</li> </ul>	
<p><b>Enhance Risk Analytics &amp; Stress Testing</b></p>	<ul style="list-style-type: none"> <li>In low interest rate markets, investors search for alternative ways to achieve the required rate of return</li> <li>These may comprise of alternative asset classes, increased leverage, structured products and similar</li> <li>These new investments and allocation require more sophisticated risk concepts to measure and understand portfolio risk</li> </ul>	<ul style="list-style-type: none"> <li>EPAM leverages Deltix to provide highly sophisticated risk and stress testing capabilities</li> <li>The solution combines latest research in quantitative finance with state-of-the-art technologies like machine learning to overcome Modern Finance drawbacks</li> <li>The CIO can transport its house view into client strategies and portfolio allocations</li> </ul>	

# Our Wealth Management Accelerators (4/5)

AREA	CHALLENGE	SOLUTION	EXAMPLE
<p><b>Credit Risk Mgmt.</b></p>	<ul style="list-style-type: none"> <li>Traditional credit risk model fail in negative interest environments and markets of increased volatility</li> <li>Interest rate pricing model like White-Hull capture parallel shifts but fail for twists and curvature</li> <li>Complex products like Swaptions are inaccurately priced; basis risk is biased as interest rates are not stochastic</li> </ul>	<ul style="list-style-type: none"> <li>EPAMCRED employs a simulation-based credit risk system</li> <li>Decompose interest rates into principal components</li> <li>Calibrate them on historical data using different weighting schema</li> <li>Run Monte Carlo simulations</li> <li>Combine PCAs back into interest rates</li> </ul>	 <p><b>REENGINEERING COMPLEX CREDIT RISK SYSTEM</b></p> <p><b>REENGINEER SOLUTION</b></p> <ul style="list-style-type: none"> <li>Decompose interest rates into principal components</li> <li>Calibrate them on historical data using different weighting schema</li> <li>Run Monte Carlo simulations</li> <li>Combine PCAs back into interest rates</li> </ul> <p><b>KEY BENEFITS</b></p> <ul style="list-style-type: none"> <li>Reimagining and combining different elements into logical pieces that can be understood across right audiences by different teams (Risk/Model/Global)</li> <li>More precise market parameters (based on real data feeds, more comprehensive calibration parameters and define market terms suitable for FX, FI, equity, etc.)</li> <li>Even though new models are much more computationally intensive, system performance and SLA has been preserved due to the modular scalability in use of the new coding approaches and calculation optimization</li> </ul>
<p><b>Book Analysis</b></p>	<ul style="list-style-type: none"> <li>Clients and client advisor require full transparency on holdings and underlying risk drivers</li> <li>These drivers come from multiple dimension like asset classes, product types, regional, currency or industry exposure</li> <li>Analytical bank-wide use cases require the handling of millions of positions</li> </ul>	<ul style="list-style-type: none"> <li>epam360 is a highly performant position and portfolio aggregator for analytics</li> <li>Allowing multidimensional Exposure and Book analytics.</li> <li>EPAM 360 also supports definition of target segments for CRM Campaigns, cluster- and Client Profitability analysis</li> <li>The functionality can drive both internal and external offerings such as E-Banking.</li> </ul>	
<p><b>Health Checks</b></p>	<ul style="list-style-type: none"> <li>FIDLEG (CH) and MiFID II (EU) require continuous monitoring of client portfolio's risk and return</li> <li>In addition, banks enter into contractual agreements with the client to provide sound and continuous investment advice</li> <li>Continuous Portfolio Health-Check monitoring is a core value proposition for any fee-based advisory service</li> </ul>	<ul style="list-style-type: none"> <li>epamHealth is a fully flexible restriction engine that monitors and checks portfolio health along multiple dimensions like asset allocation, risk / return, issuer concentration or bulk risk.</li> <li>These checks can be freely configured and are run either in batch mode for an entire book analysis or in real time as pre-deal on the fly evaluation of investment proposals</li> </ul>	



# Our Wealth Management Accelerators (4/5)

## AREA

## CHALLENGE

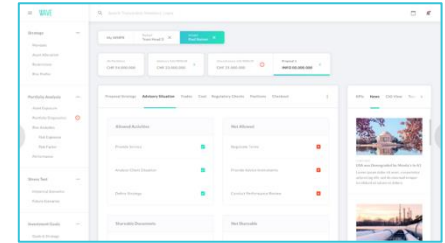
## SOLUTION

## EXAMPLE

### Investment Proposition with Regulatory Checks

- Regulatory compliance consumes massive resources and bears significant financial and reputational risk if done manually (321bn fines paid since 2007, 100bn in compliance cost for the industry in 2016)
- Clients rely on sound and pre-deal compliant investment advice
- Client advisors are faced with increasing complexity of regulatory frameworks

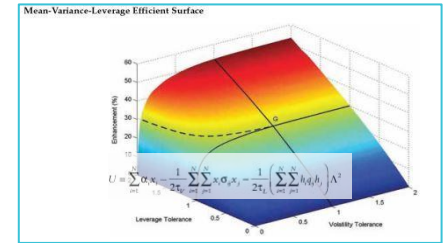
- EPAM partners with APIAX to digitalize, manage, and distribute digital rules
- Those rules are integrated with EPAMs Investment Proposition capability that can be used with quant-based optimization engines to produce compliant proposals with one click
- Best to be combined with EPAMs Quant Optimization, powered by Deltix



### Leverage Optimization

- Investors look for alternative approaches to increase their required rate of return during low interest rate market phases
- Bank's at the same time suffer from lower margins on their traditional business due to ETFs and robo advice offerings
- Sophisticated investment advice including leverage advice benefits both clients and wealth managers

- The expected utility function for investors is extended with a term for leverage
- The appetite of leverage of an investor can be used to solve this multi-dimensional problem using optimization algorithms
- EPAM leverages Deltix to offer a quant-based optimization engine incorporating leverage & transaction costs



### Content Curation Engine

- Get insight into financial instruments to determine whether now is the time to act
- Receive real-time personalized investment news and insights
- Give your clients confidence in your services by staying on top of industry and market trends
- Link client portfolios and research to receive only tailored news

- EPAMs InfoNgen - Powerful AI-Based Text Analytics Platform leveraging NLP and Machine Learning
- Pre-built Finance-Specific Taxonomies
- 200 000+ web and social media sources
- Intelligent Indexing, deduplication & clustering of similar content
- Powerful content enrichment and sentiment analysis

