Cloud Native & The Future of Portfolio Optimizations

Client Conference 2023

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Enterprise Technology Strategy

Tech Strategy build around three pillars to support our BHAG

Enable Growth

Assure Quality

Deliver Fast

Enterprise Technology Strategy

Objectives, Principles and Benefits
(WHAT, HOW, WHY)

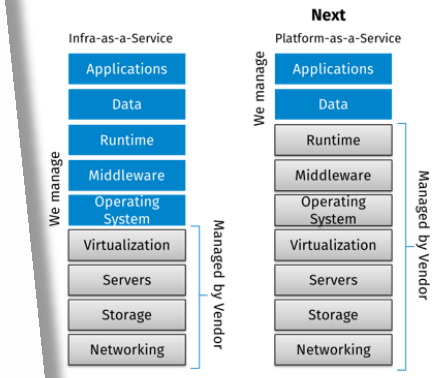
4 Enterprise Tech Strategy Overview

The following table gives an overview of the tech objectives, principles and benefits which together constitute the Enterprise Tech Strategy.

Objectives	Principles	Benefits
Enable Growth		
Scalable infrastructure	We will move from running our products with server virtualization in self-managed data centers to a managed Cloud platform service.	Our hosting supply chain can cater for any future volume of hosting in a cost-efficient manner
	We will introduce a Self-Service container platform called ORCA based on a managed OpenShift service.	Reduce lead times and facilitate the End-to-End responsibility of Solutions.
	We will introduce a specialized Platform Team which is responsible for the delivery, support and guidance of the ORCA platform and its components	Solutions can build and run high-quality services for their client base.
	We will apply open-source best practices for organizations, called Inner Source.	Enhance knowledge management, promote reusable components and stimulate collaboration across departments.
	[illegible] policy we choose to	The web architecture makes it much faster and easier to onboard new clients and roll out

3.1.1 Scalable Infrastructure

Underneath a software application lies an entire supply chain of services that needs to be operational. Figure 1 displays this chain for three distinct levels of outsourcing: from *Self-managed to IaaS to PaaS*. Currently we manage the entire supply chain ourselves for our [illegible] (left pillar). This way, hosting larger volumes requires our effort across [illegible]ply chain. With the rise of cloud computing in the last decade, an [illegible]ilable via cloud infrastructure services. The move of workloads from [illegible]ers to Infrastructure-as-a-Service in the cloud is called a 'Lift-and-[illegible] (middle pillar), one manages the supply chain from the Operating [illegible]pplications remain unaffected.



[illegible]erview of different hosting supply chain models

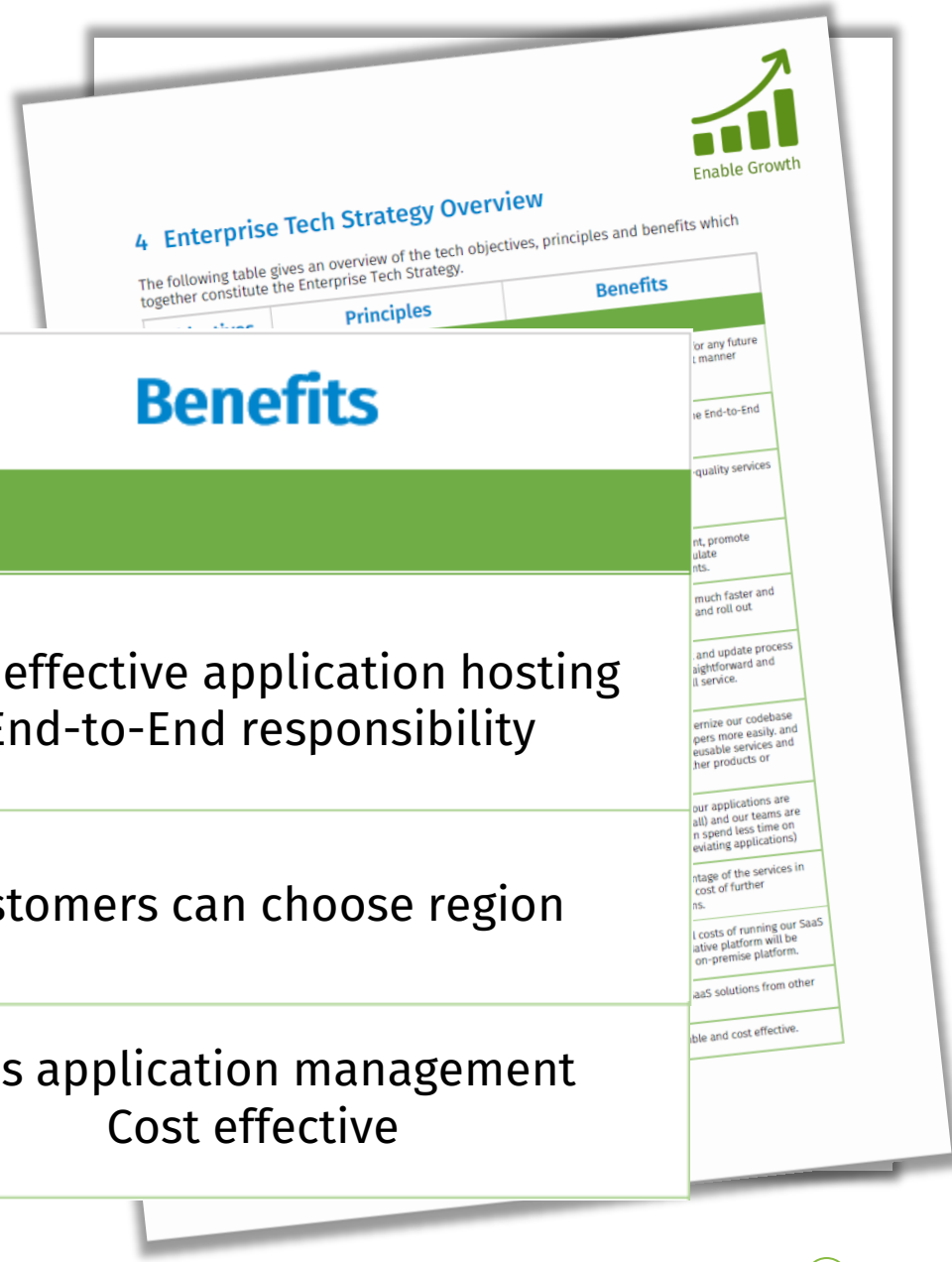
[illegible]s have made it possible to abstract even more services. [illegible]n to be the new standard for running software[3]. Fueled by a [illegible]ink and grow on demand, the container ecosystem caters for [illegible]nd orchestration of services across the entire supply chain. [illegible] container ecosystems as a service, all powered by the same [illegible]his is defined as Platform-as-a-Service (right pillar). It would [illegible]o only focus on the applications and data. These types of [illegible]tal for Cloud Native operations. Hence, they are also known [illegible]rast to the 'Lift-and-Shift' scenario, Cloud Native platforms

[illegible]w digital workloads will be deployed on cloud-native [illegible]: https://www.gartner.com/en/newsroom/press-[illegible]-will-be-the-centerpiece-of-new-digital-experiences)

Tech Strategy Overview

What, How & Why

Objectives	Principles	Benefits
Enable Growth		
Scalable infra & applications	Migrate to Cloud Native platform Self-service features	Cost effective application hosting End-to-End responsibility
Geo independence	Easy selection of Cloud Provider region	Customers can choose region
Office Automation	SaaS for office apps vs OnPrem	Less application management Cost effective



Tech Strategy Overview

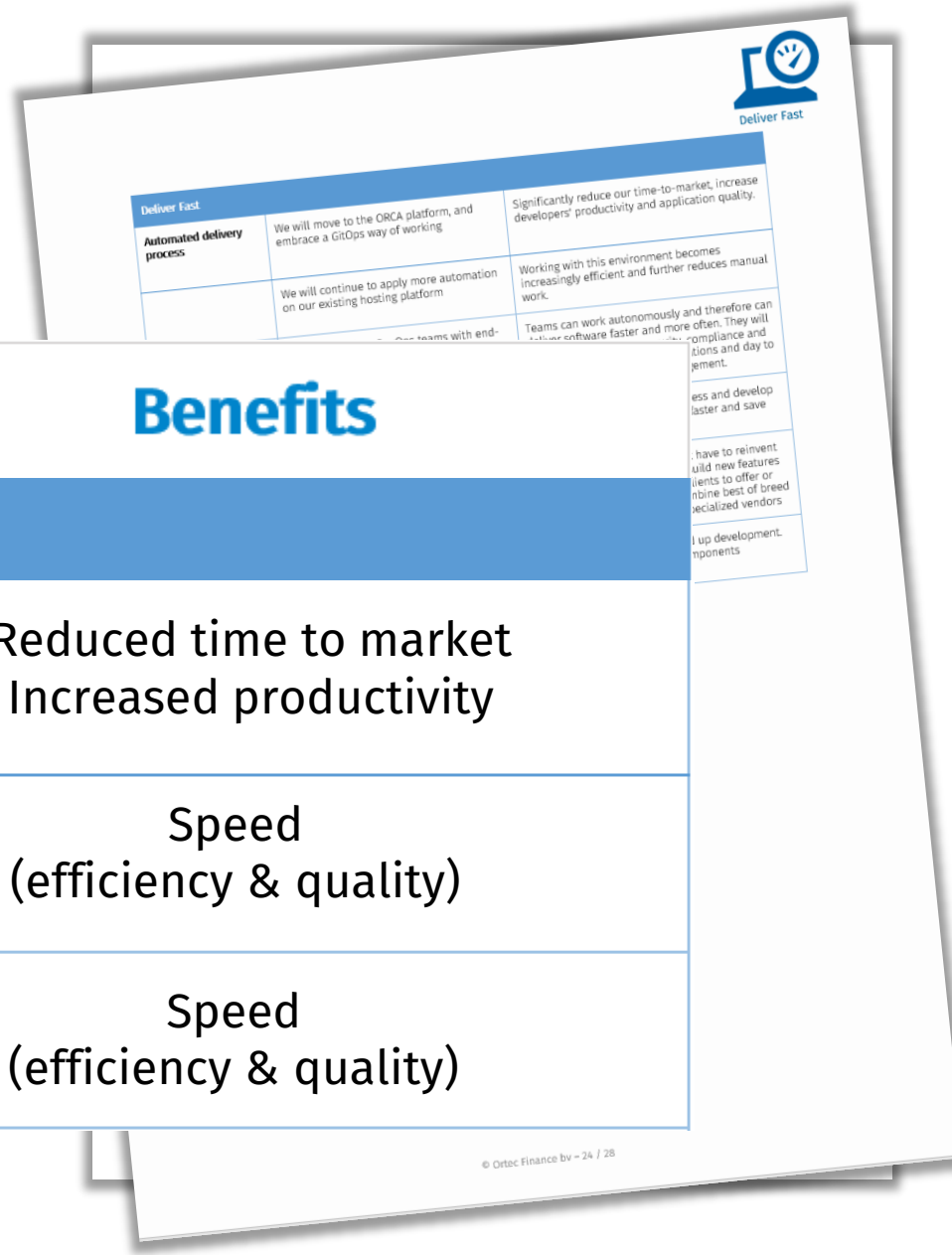
What, How & Why

Objectives	Principles	Benefits
Assure Quality		
Security by Design	Out-of-the-box security from cloud platforms	Protected against increased security threats
Automation	Automate everything! App, Config & Infra	Minimize human error Maximize consistency
Tech Stacks	Use cutting-edge tech, but.. substantial market share & actively supported	New innovative features Attract new talent

Tech Strategy Overview

What, How & Why

Objectives	Principles	Benefits
Deliver Fast		
Automated Delivery	Fully automated development process / GitOps / DevOps	Reduced time to market Increased productivity
Reusable components	Standardized platform components & API	Speed (efficiency & quality)
Smart buy/build	New components: Prefer buy over build	Speed (efficiency & quality)



Cloud Computing and Cloud-Native

Cloud Computing is the on-demand availability of computer system resources, especially data storage (cloud storage) and computing power, without direct active management by the user.

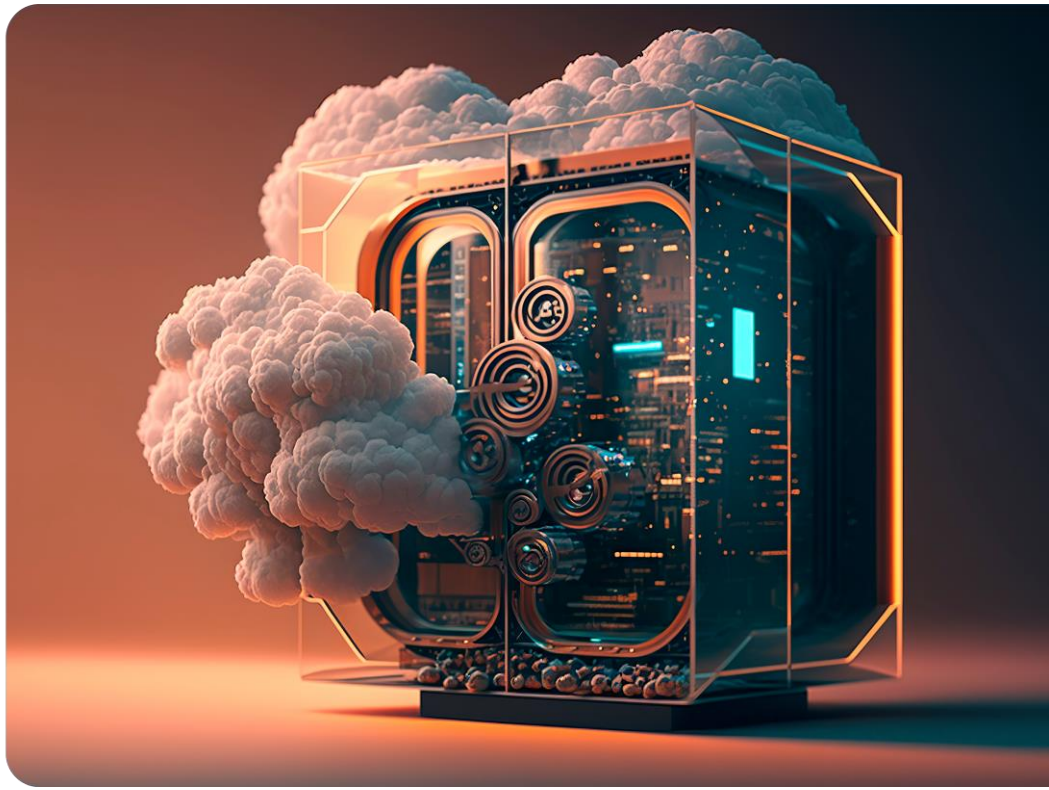
Large clouds often have functions distributed over multiple locations, each location being a data center.

Cloud Native is about optimizing the way we build and run applications that exploit the advantages of cloud computing, like scalability/elasticity, flexibility, resilience, and ease of management.

The Need for Speed

At Ortec Finance

- Calibration of Financial models
  - Dynamic Scenario Generator
  - Risk-Neutral Economic Scenario Generator
- Asset Liability Models
  - **Optimizations**
  - Larger horizons
  - Increasing balance sheet complexities



The Sailfish Project

High-performance computing for ORCA

Cloud HPC - Context and Vision

Performance

Increase the speed of computations

Innovation

Cloud-native transformation implies the need for a HPC cloud solution for all our number crunching workloads

Scalability

Onboard new clients without purchasing new physical servers and scaled workforce

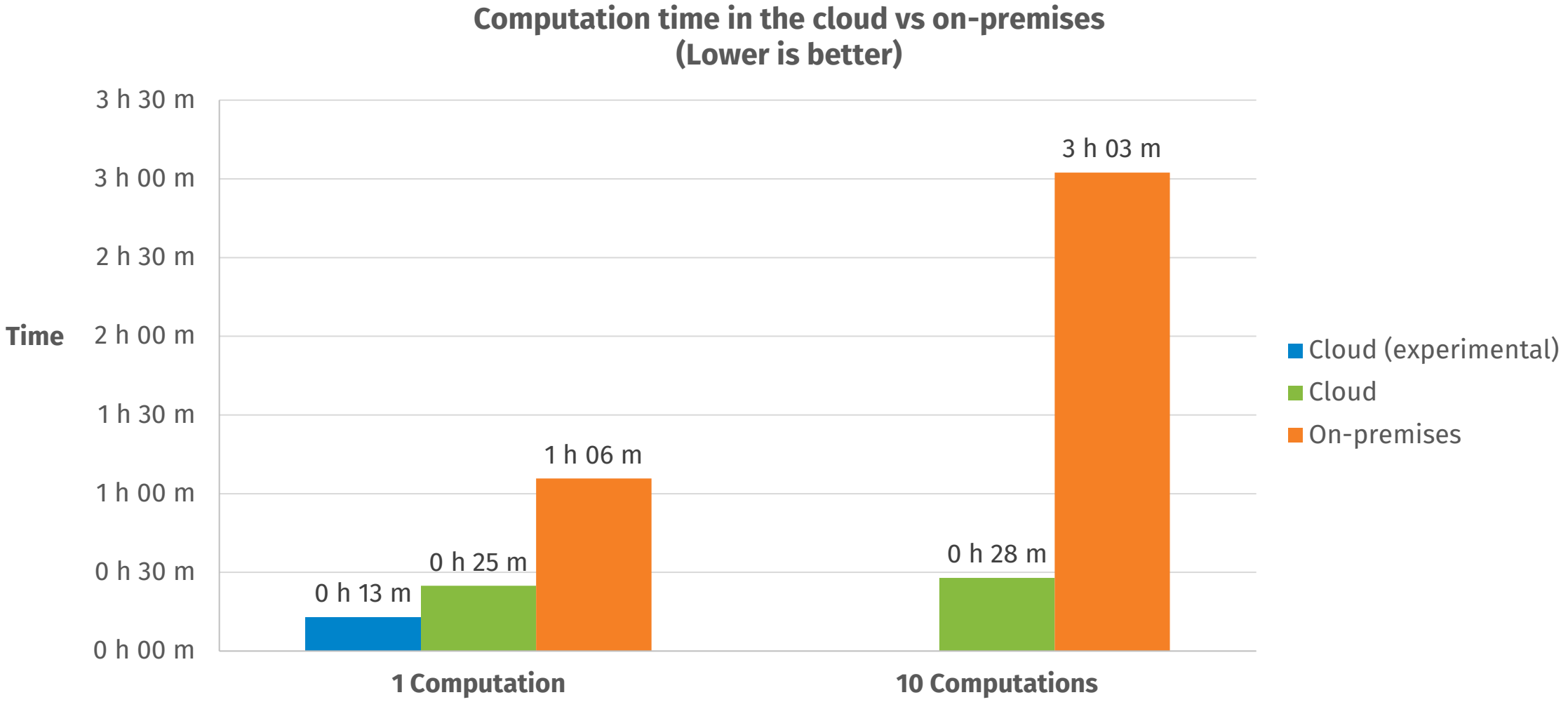
New models

Improved performance leverages the potential of new, more complex models

Vendor independence

The ability to switch vendors without substantial costs is a strategic benefit

Impact on Risk Neutral model Performance



Our mission:

Enable people to manage the complexity of investment decision making

is becoming more challenging as objectives and constraints keep growing

Decision making under uncertainty

Investors – private, institutional, or public – invest to achieve certain goals

Decision making is complex

Objectives

- Pension planning
- Solvency ratio
- ESG
- Regulation
- Liquidity
- …

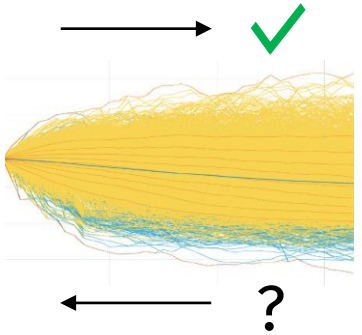
Investment strategy

- Asset allocation
- Rebalancing bandwidths
- Rebalancing frequency
- Interest, inflation, and currency overlays
- …

Problem: *What is the best investment strategy to achieve objectives?*

Approaches

Practice: scenarios/simulations



- ⊕ Complexity captured
- ⊖ Optimization difficult, not closed-form

Research/literature: analytical

$$w^T \Sigma w - q \times R^T w$$

Mean - CVaR

- ⊕ Optimization possible
- ⊖ Simplifications, or solution case-specific

A spark called Reinforcement learning

A timely match across three different fields

RD Labs have been experimenting with Machine Learning and Reinforcement Leaning in particular

We can use our OFS to train an agent that can search for optimal asset allocations in a complex setting

New possibilities in defining objectives and constraints

Clients have more complex objectives

- Driven by regulation and policy
- Advancements in investment strategy
- Rise of sustainable investing

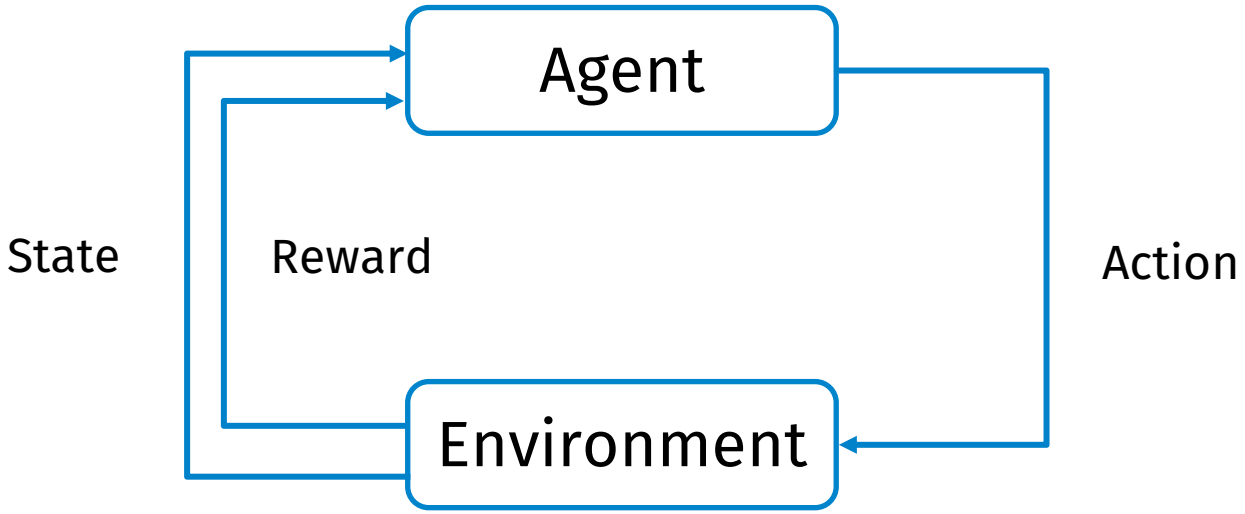
Our current optimization methodology is struggling to keep up

Our Enterprise Tech Strategy is aiming to get our solutions into the cloud

One of the advantages of the migration to the cloud is the possibility to scale resources

Early experiments show large gains can be realized when making GLASS cloud-native

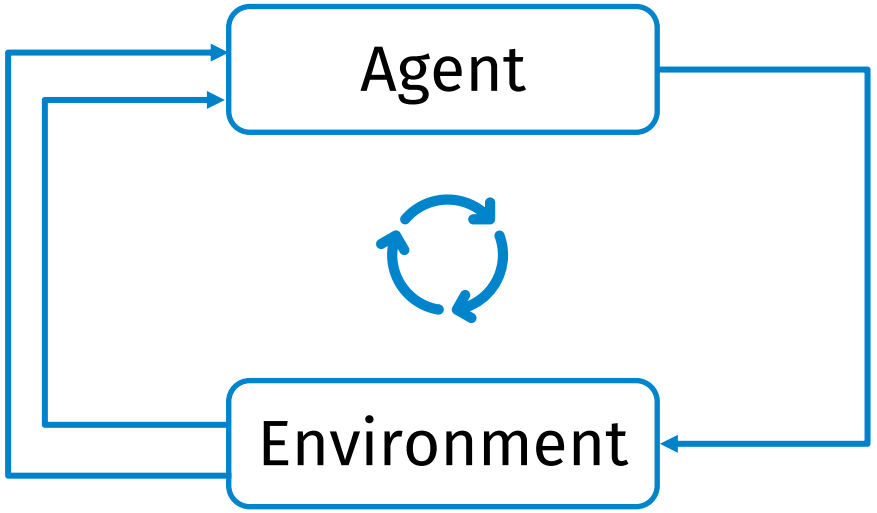
Basic concept of Reinforcement Learning



Basic concept of Reinforcement Learning

State

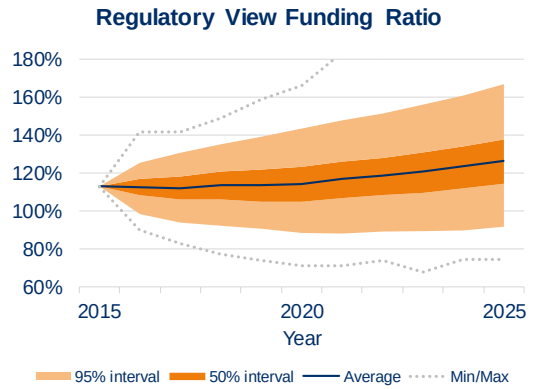
Reward



Action

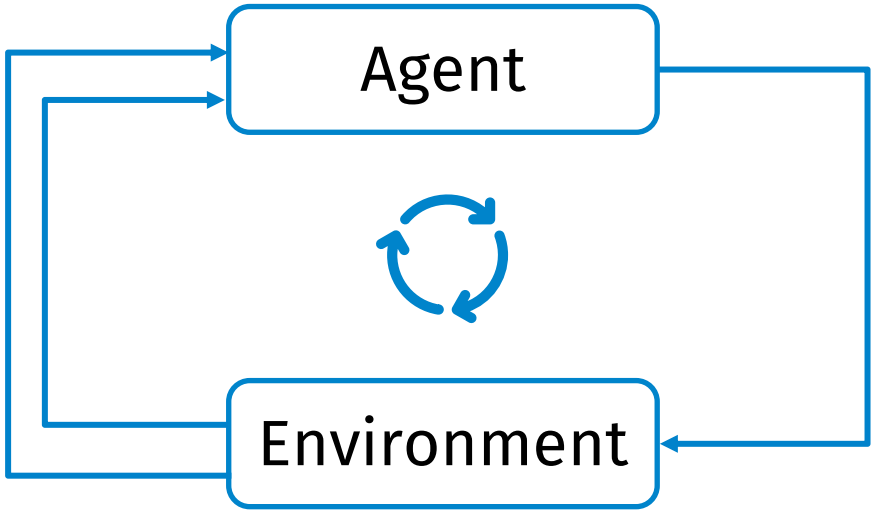
Basic concept of Reinforcement Learning

State



Reward

Free definition of simulation result



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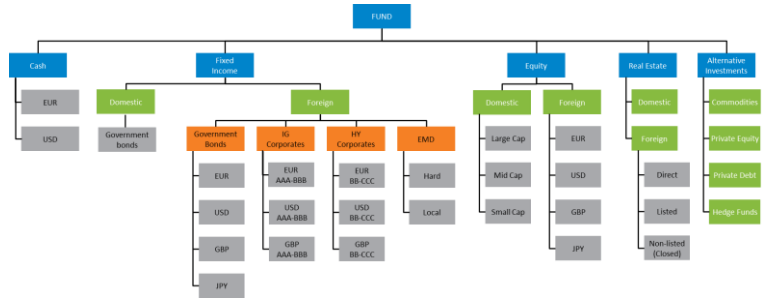
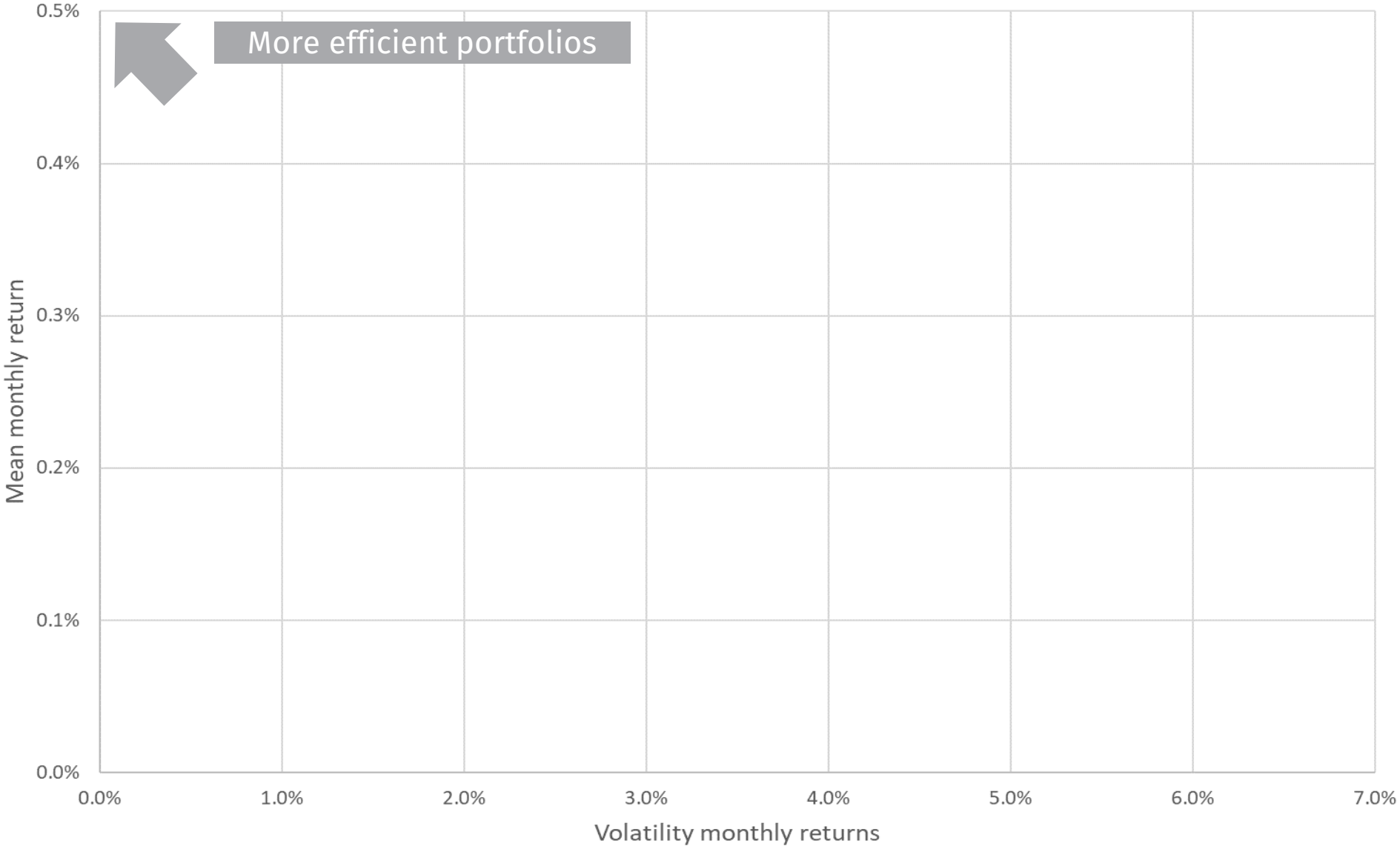


Mean Variance Optimization (MVO)



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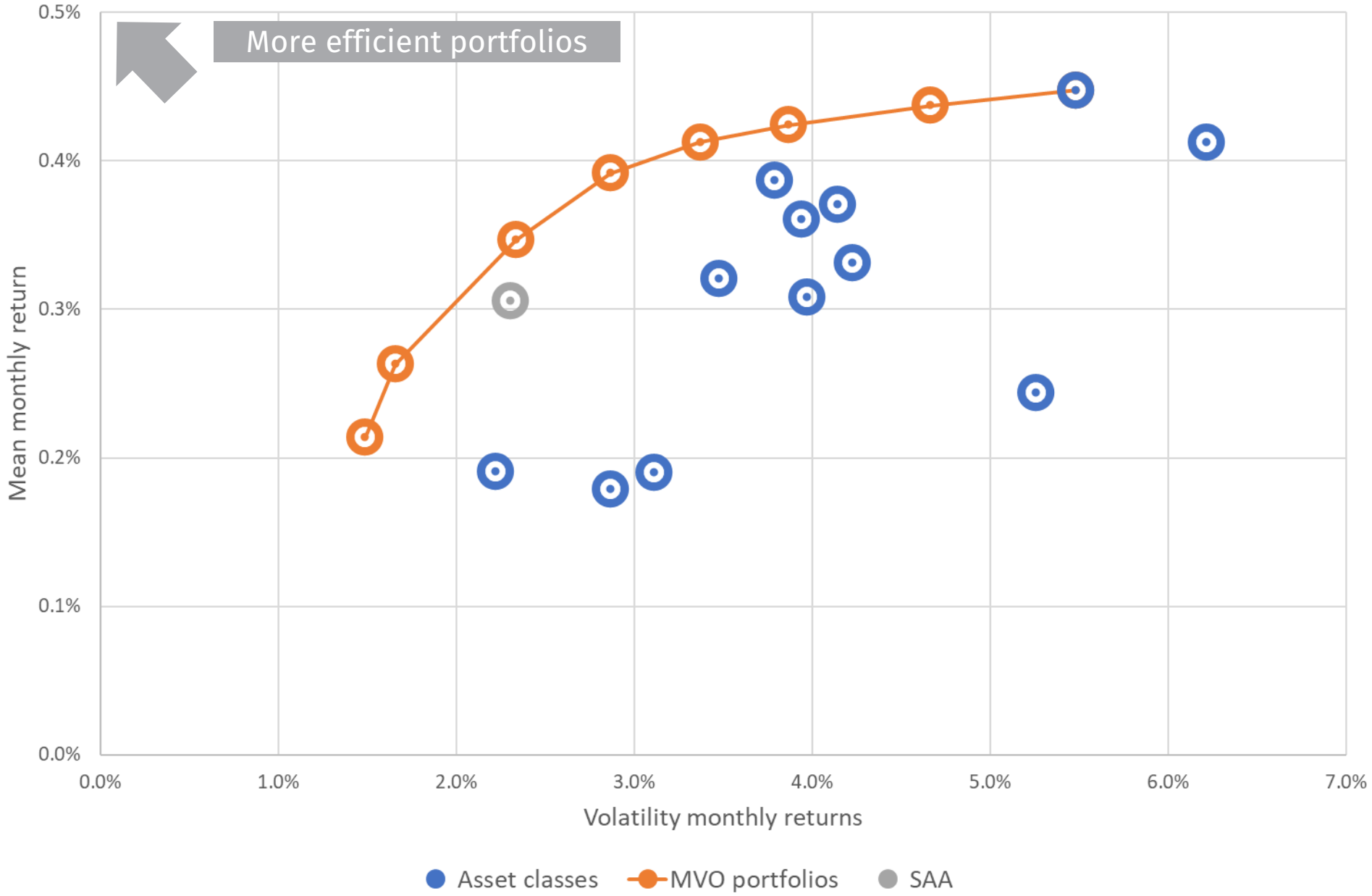
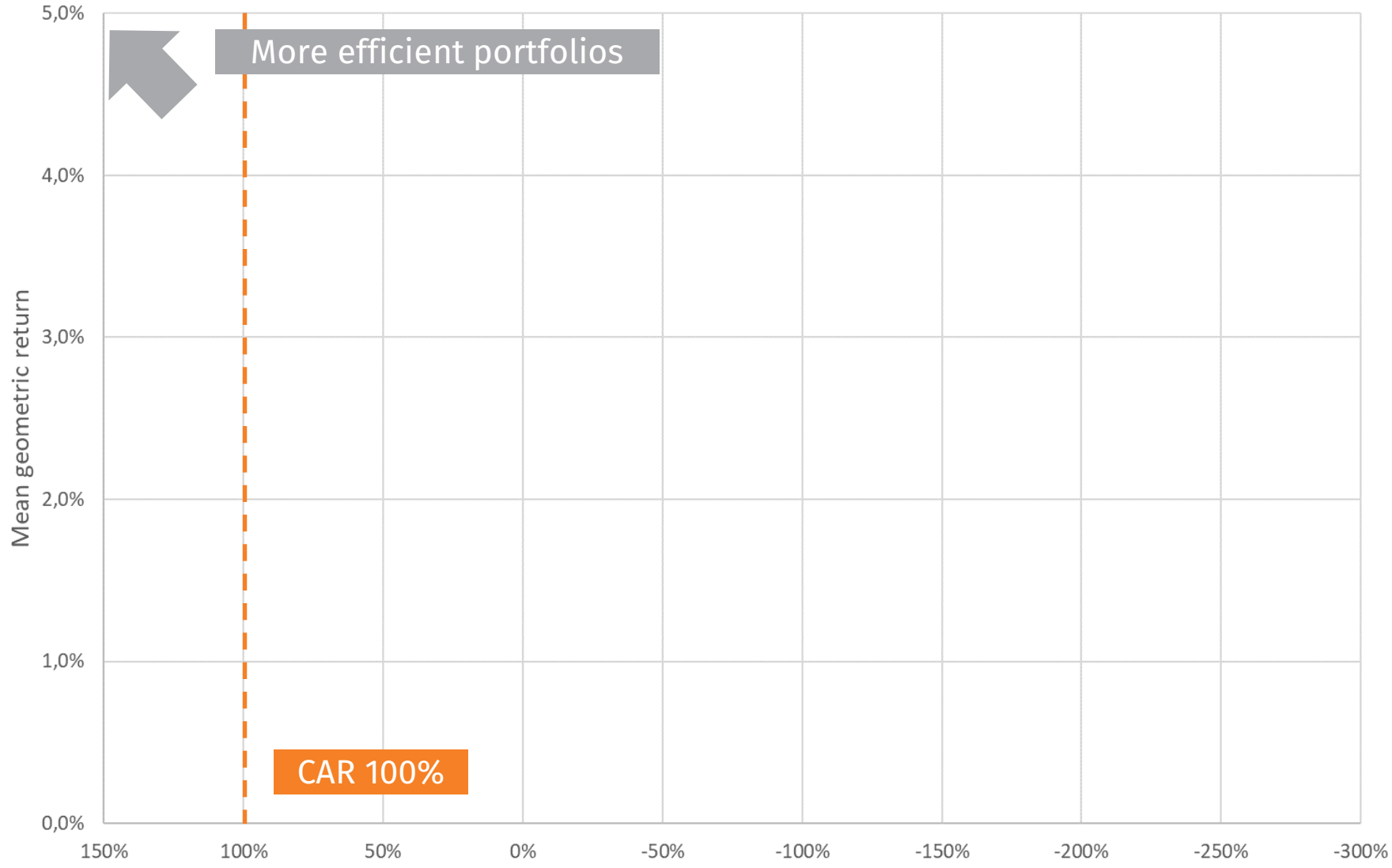


MVO portfolios not efficient i.t.o. solvency risk



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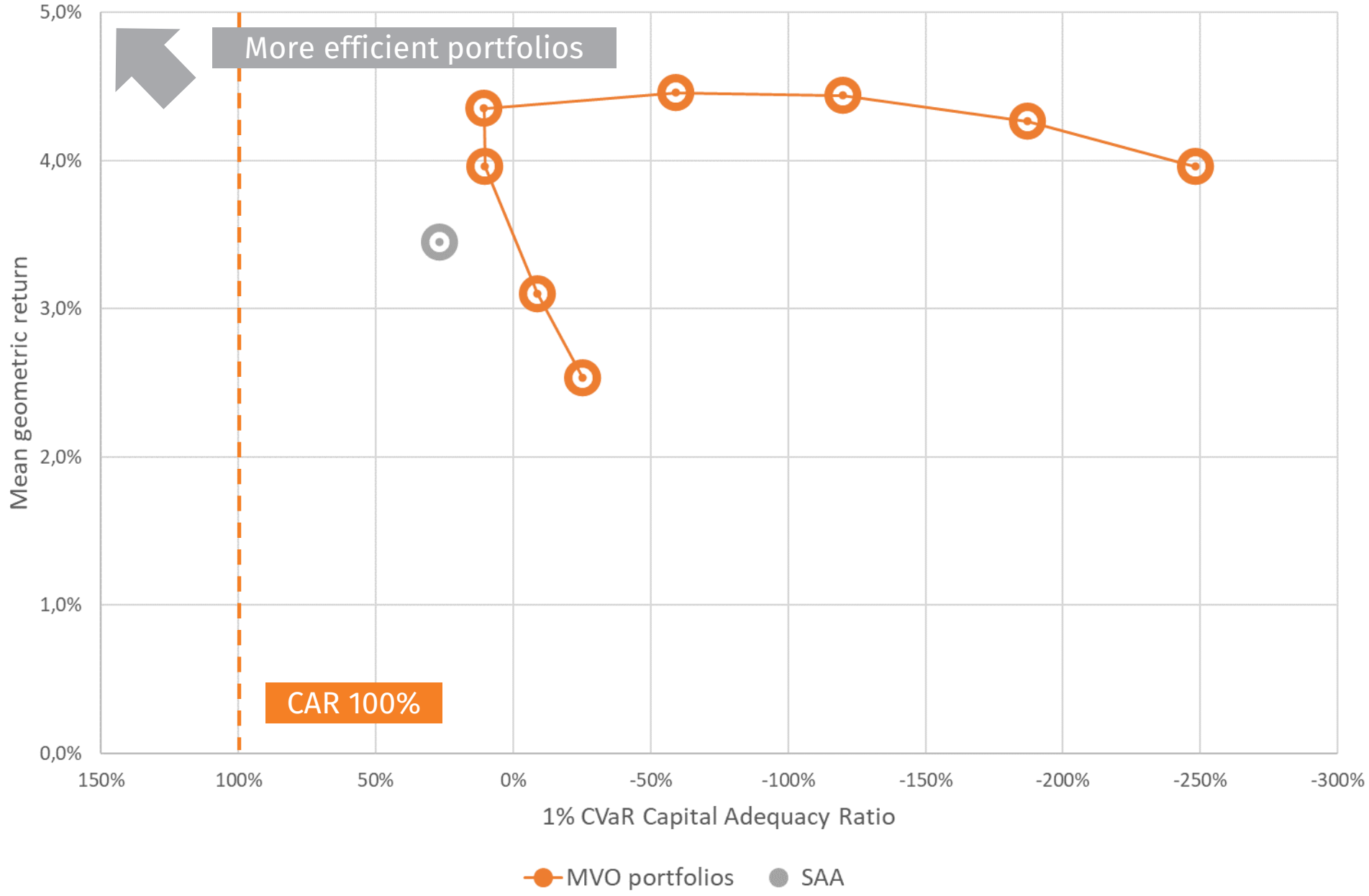

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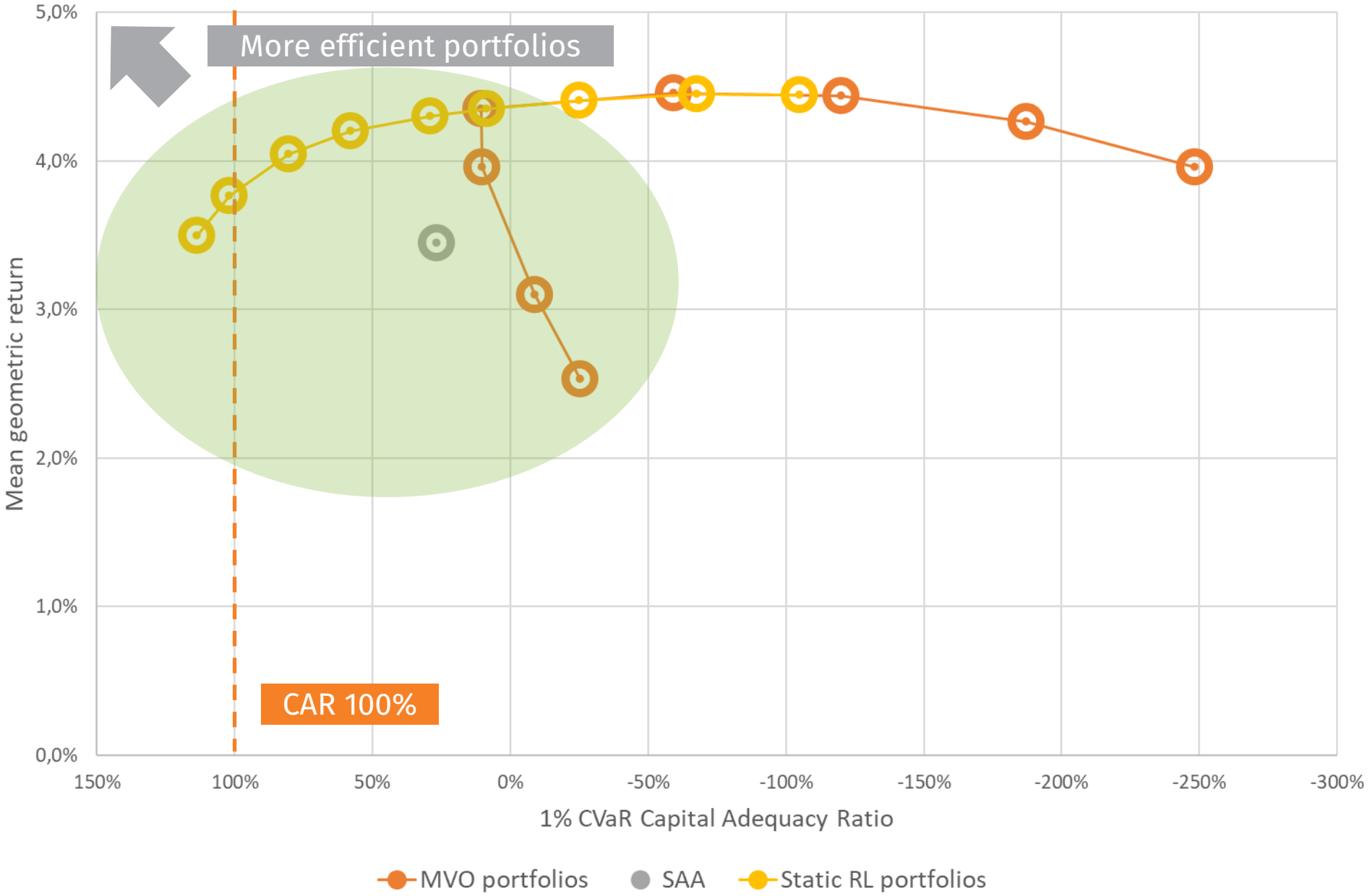

Current status

Reinforcement Learning can be a promising new technique, but requires more validation through client cases

Proof of Concept with client(s)

- Better understanding of possibilties
- Connect setup to GLASS platform
- Extend use cases to more complex asset structures and return objectives
- Get more insight into interpretability