Life Sciences und
Facility Management

# ZHAW School of Life Sciences and Facility Management

## Overview, Computing and Challenges

October 10th | Pascal Häussler

# Agenda

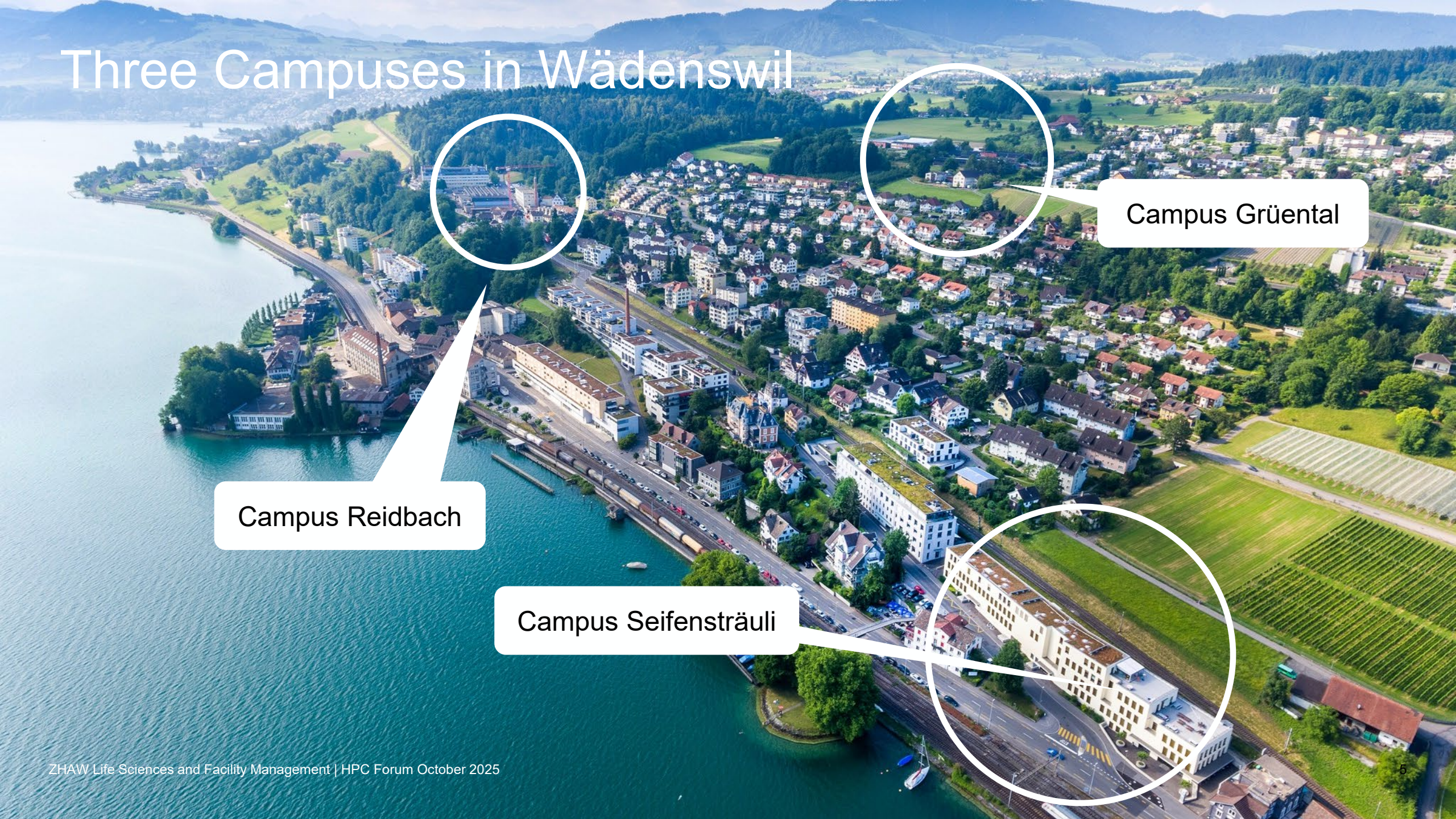
1. ZHAW & Life Sciences and Facility Management (LSFM)
2. HPC and Scientific Computing at LSFM
3. Financial challenges in a growing field

# ZHAW - One university, three locations

- Three locations: Winterthur, Zurich and Wädenswil
- 8 Schools
- Founded in 2007 by a merger of schools
- 34 Bachelor’s Degree programmes
- 20 Master’s Degree programmes
- 3,655 employees
- Currently around 14,600 students enrolled
- Numerous continuing education programmes

# ZHAW and Life Sciences and Facility Management (LSFM)

# Three Campuses in Wädenswil



# Our Topics

## Life Sciences

The term encompasses scientific disciplines and areas of research that relate to the study of **living organisms**, their **life processes**, and interactions with the **environment**.

At ZHAW, this field includes: Chemistry, Biotechnology, Computational Life Sciences, Food Science, Environment and Natural Resources.

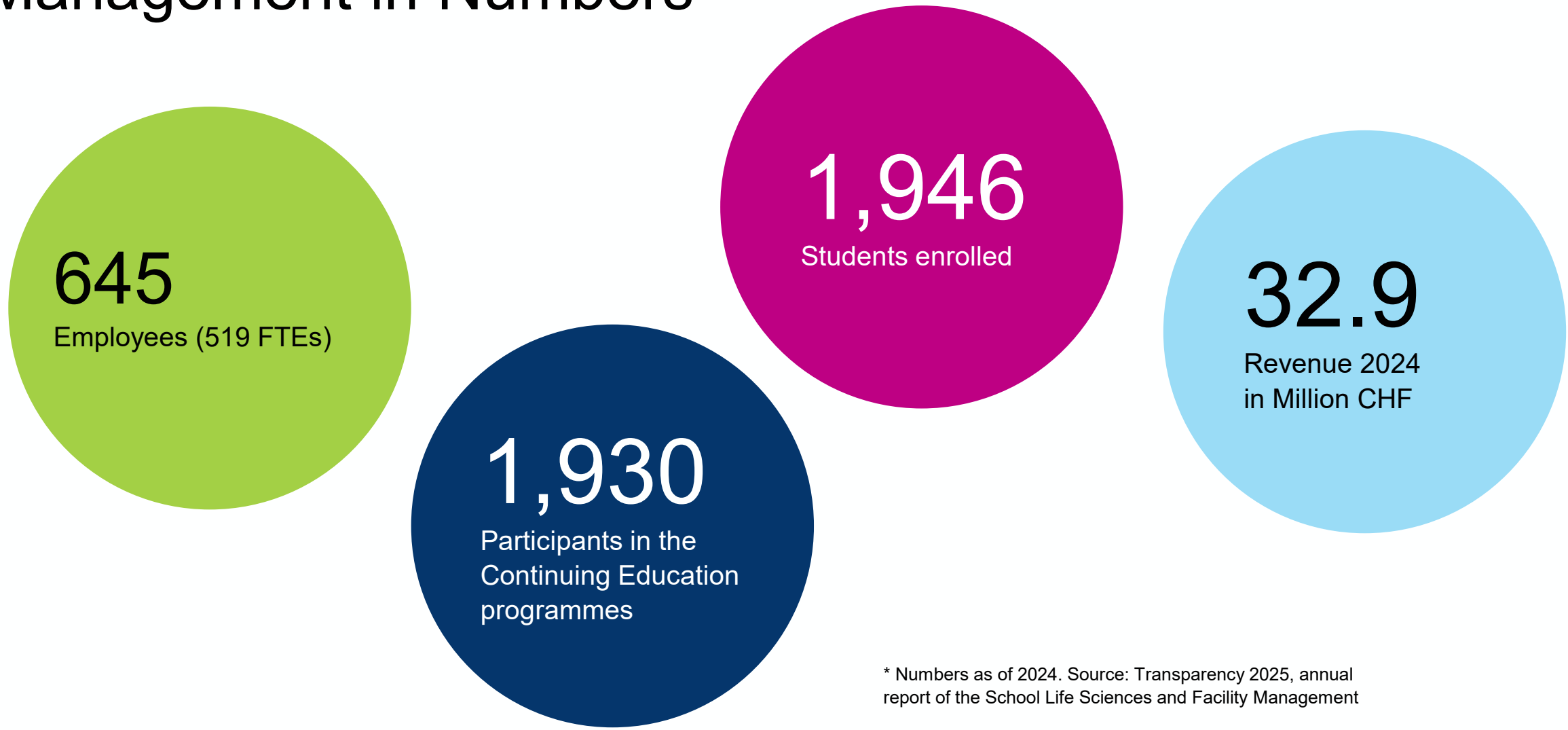
## Facility Management

The term facility management refers to the **sustainable development** and management of **healthy** living and working **environments**.

Teaching and research focus: Sustainable property management, intelligent building systems, workplace management, events and innovative service offerings.

Food, Health, Environment, Technology, Sustainability, Digitalisation

# The ZHAW School of Life Sciences and Facility Management in Numbers*

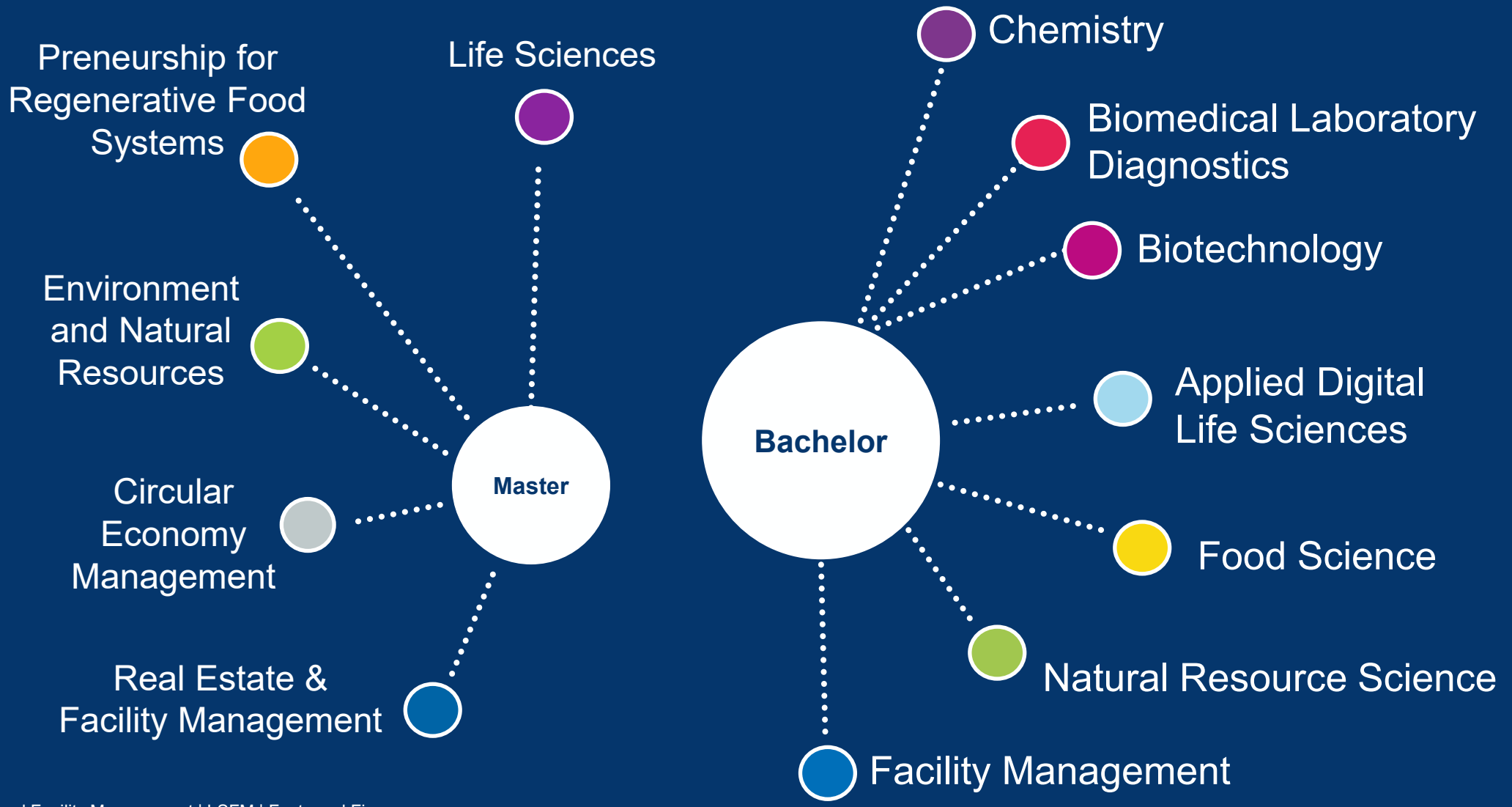



* Numbers as of 2024. Source: Transparency 2025, annual report of the School Life Sciences and Facility Management

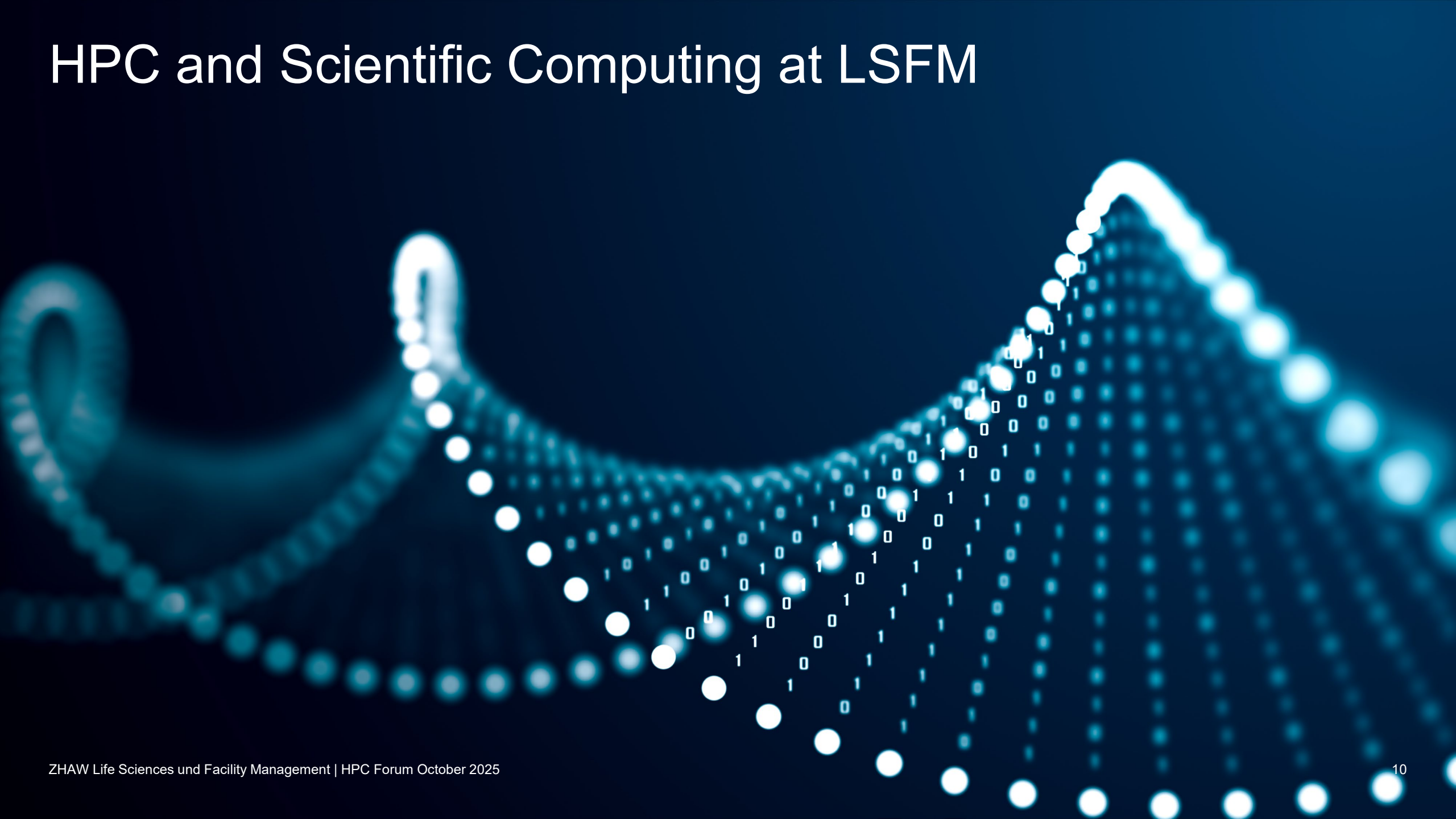
# Institutes and Departements

- ICBT Institute of Chemistry and Biotechnology
- ICLS Institute of Computational Life Sciences
- IFM Institute of Facility Management
- ILGI Institute of Food and Beverage Innovation
- IUNR Institute of Natural Resource Sciences
- ATV Department Transversalis

# Overview: Degree Programmes



# HPC and Scientific Computing at LSFM



# Computing needs

**Five institutes deliver a broad spectrum of applications. Here are <u>just a few</u>:**

- Computational fluid dynamics (CFD)
- Genome assembly and data processing
- AI and machine learning (growing fast)
- Data analytics and processing
- Image processing and pattern recognition
- Molecular and proteine configuration
- Optimization problems in various domains
- Workflows and automation
- …

# Strategic dimension and capabilities

- Life sciences undergow a significant digital transformation
- ZHAW in 2016 (and today) does not provide a central scientific computing infrastructure and services

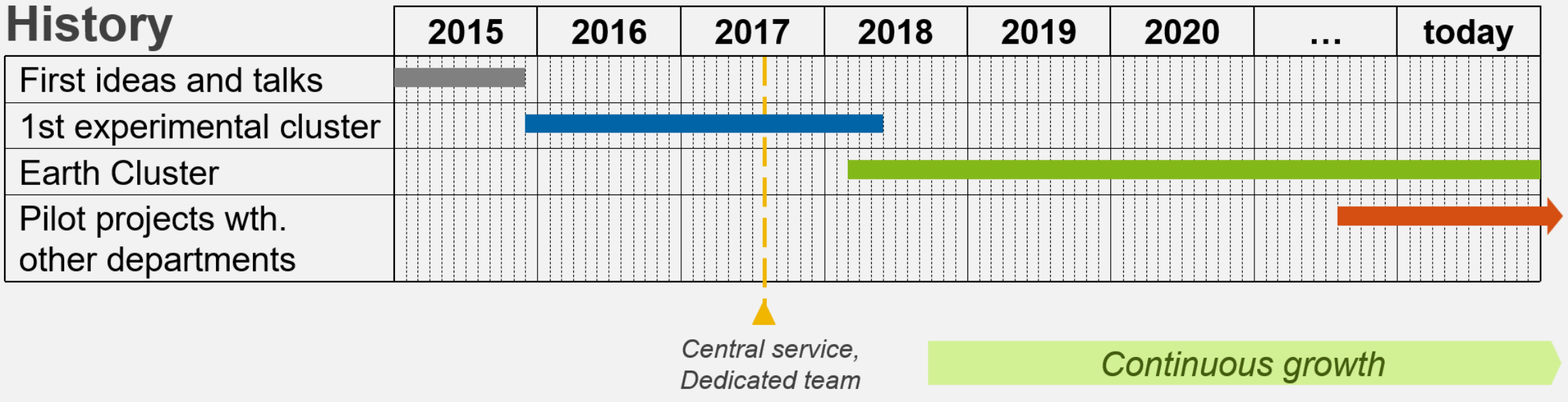
**Vision in 2016**

- We use modern instruments and methods of scientific computing in our «Digital Lab» as an extention of our spectrum of tools to create new insights and discovery
- Researchers and students aquire know how in key technologies and methods of «digital research and development»
- For others, we are a competent research partner and companion in the field of future-relevant digital methods

# HPC @ LSFM time line

– Building a HPC infrasgtructure at Wädenswil

– Completely realized by the depratment LSFM



# Central HPC team

## Infrastructure

- Architecture, design and solutions
- Operation, monitoring and maintenance
- User Software Stack development and deployment
- Capacity planning and life cycle
- Financial planning and procurement
- Collaboration with partners inside and outside ZHAW

## Services and support

- Support for users (employees and students, external partners)
- Methods and possibilities advisory, collaboration and support
- Help taking the «learning curve» into HPC
- High Performance Computing lecture in the Applied Digital Life Science (ADLS) study programme

# Earth Cluster & LSFM Archive

## Earth Cluster

- Linux cluster with Slurm workload management
- CPU and GPU compute nodes
- InfiniBand networks and fast Ethernet
- Cluster storage based on BeeGFS
- Virtualized head login nodes
- User Software Stacks (USS) built mainly with Spack
- Extensive user documentation

## LSFM Archive

- Long-term storage of important reserarch data
- Multi-tier archive solution with policy-based data moving
- Disk storage with separate metadata
- Two LTO tape libraries (two-site), 1 PB capacity each
- At minimum two copies of all files
- High-speed connection to the HPC cluster

# Experiences from 8+ years

- Application spectrum at LSFM is very diverse – and hence exciting!
- «Digital Lab» methods, processes and tools overarch all institutes and will **increasinly transform** what we do and how we do it
- Required is not «just HPC» but «Scientific Computing» in all it‘s **broadness**
- Needs and possibilities are subject to **constant change**
- Collaboration, closeness **between and among** researchers, studens and the HPC team is a **key success** factor
- The most significant created value from the past years is the **aquired know-how and experience**, not computers.

# Financial challenges in a growing field

# Cost areas and coverage

- Facilty, power, cooling % humidity
- HPC cluster, networks and  LSFM archive hardware infrastructure
- Software licenses and support/maintenance contracts
- HPC team

**At LSFM, we needs to cover this by ourselves. There is no “central ZHAW budget”.**

# Suppliers, vendors, submissions …

- Being small makes it more difficult to obtain attractive pricing: Volumes are smaller, we are not a «strategically important» customer
- Being small does not help when it comes to support quality and access to elevated support levels (escalation)
- We made public submissions to find a strategic supplier, this improves the situation, nevertheless, the effects addressed above remain

**Could there be models where multiple “small ones” join together to mitigate the “being small” drawbacks?**

# Support & maintenance contracts

- Vendor support contracts, in particular to secure spare part availability are an expensive component in our procurement
- Contracts are critical:
  - We are **large enough** to be rquired to ensure a high availability of services
  - We can’t afford to have long outages due to waiting for replacement systems/parts
  - We are **too small** to replace contracts with self-stored replacement systems/parts

**5 year contracts for hardware are a major cost contribution which impacts the overall service price but is not so easy to grasp for users.**

# The cost distribution problem

- We are on a journey into more and more scientific computing a digital transformation in our fields of activity in both, research and education
- This is a process of **change**, requires **learning** and development – it requires significant efforts
- As in any change process, there are poineers, early adopters, and people who remain with the status quo

**Introducing HPC and strengthening scientific computing comes at significant cost. This is a challenge with respect to cost distribution within LSFM**

# The cost distribution problem

- Direct 1:1 full cost attribution to the **effective** users or groups would make the service unafordable
- As a consequence, **wanted** development and transformation could starve
- Top-level distribuion of costs over the department – regardless of the effective usage – may be experienced as unfair by some

**Strategic overall goals and “financial fairness” rise a field of tension**

# Q&A