



Modernizing an R/3 Solution with ABAP Cloud

Light & Shadow

Stephan Heinberg
December 5, 2024

Summary



Introduction

The University of Zurich is the largest university in Switzerland

- 31'000 Students
- 5'000 Lecturers

Stephan Heinberg

- Co-Product Owner, Architect & Team Lead
- 23 years within SAP universe

Software for Education & Student Management

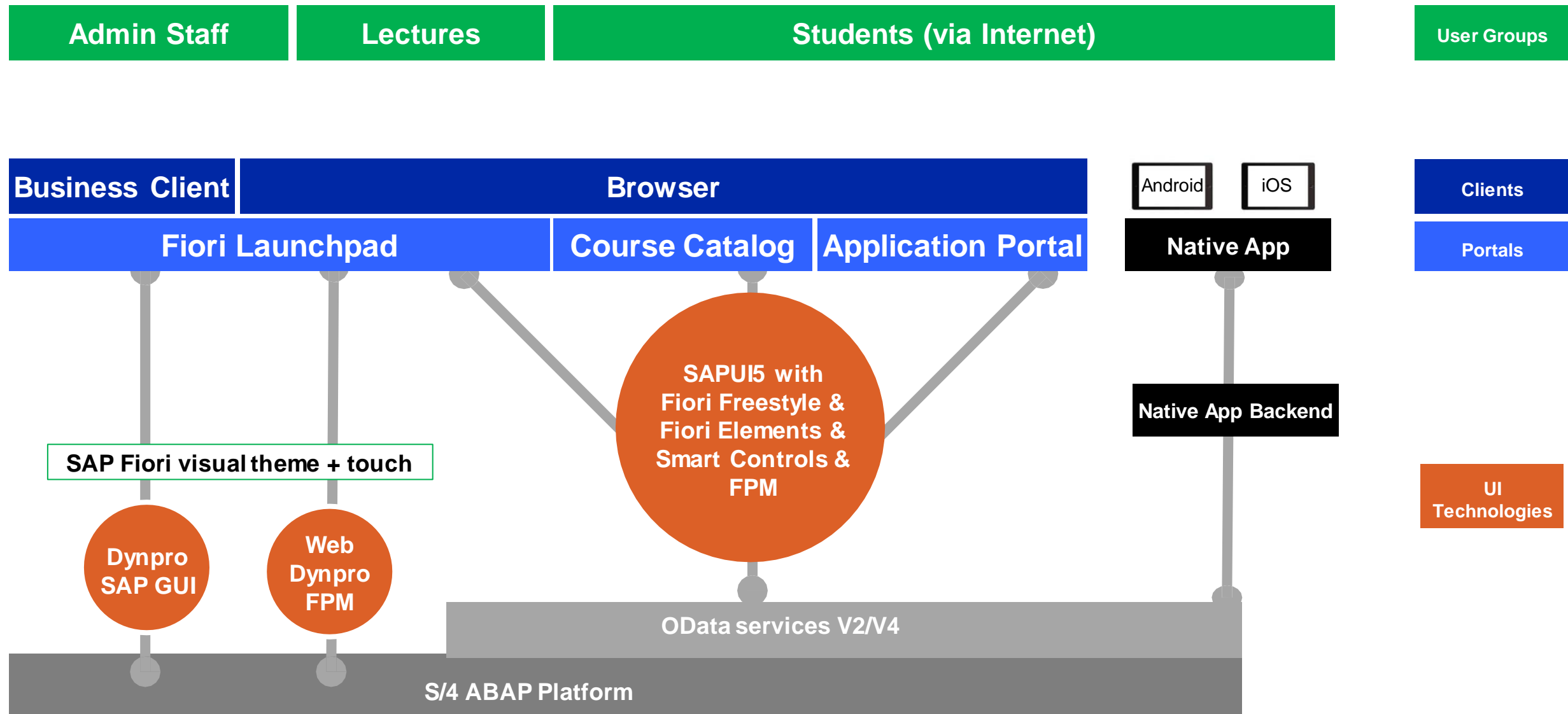
- SAP industry solution: Student Lifecycle Management (SLCM)
- 2016 SAP announced an innovation stop
- However it is part of S/4 until 2040

Our Strategy

- In 2018 we performed market research, because we need innovations
 - TINA: There Is No standard Alternative
 - **Decision: Custom Solution based on SAP SLCM & S/4 Platform**



Our UI-Strategy



It's your turn: Human Load Test

Test our product “Public Course Catalog” based on ABAP Cloud

<https://studentservices.uzh.ch/uzh/anonym/vvzsearch/>



Before S/4HANA – no full real-time data possible

Complicated Legacy Data Modell in our industry solution.
25 year old architecture.

Elements of an Infotype

■ "What is an infotype?"

→ Structure definition in Repository

→ Database table

→ Processing program (module pool)

→ Screens 1000,2000,3000

→ Table entries for control

Key fields, general fields, PSnnnn

PAnnnn or HRPnnn

MPnnnn00

MPnnnn00/1000,2000,3000

e.g T582A, T582S, T7771, T777Z, ...

Standard infotypes:

0000

0001

1000

1001

1002

Actions

Org. Assignment

Object

Relationships

Verbal Description

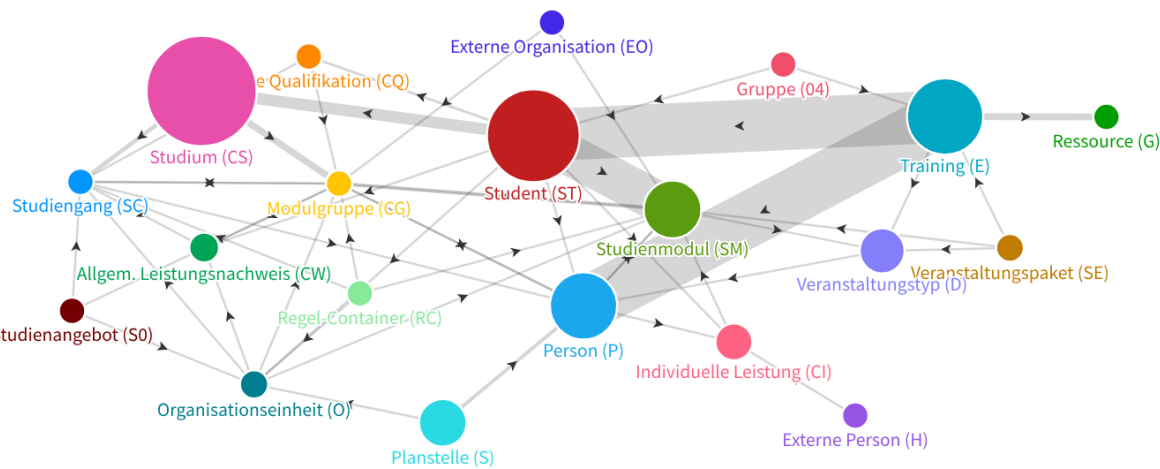
(action type)

(org. unit)

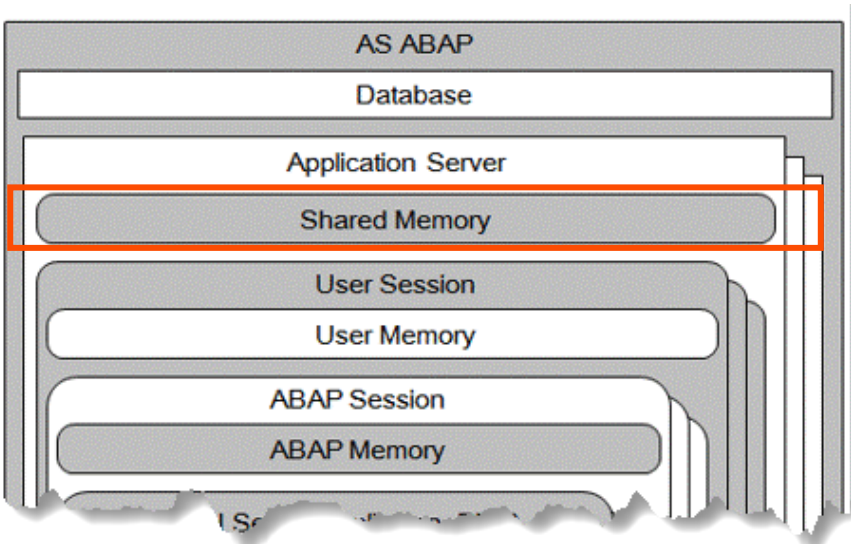
(abbreviation)

(relationship type, target object)

(text)



Non Realtime solution for Self-Service Apps possible.
We needed a Buffer.



Isolated solution – No benefits from recent SAP Innovations

Is there not a solution from SAP Technology?



Let's do this

Pre-project with POC in 2023

Project in 2023/2024

- Go-Live May 2024
- Goals
 - Real Time Access with **ABAP Cloud & HANA** on our most challenging products.
 - Modern Business Object Layer **with RAP/EML**
 - ...



What does ABAP Cloud mean for us – and what not?

RESTful

Stateless ABAP

E2E – Client to Database

What does ABAP Cloud mean for us – and what not?

CDS with custom virtual data model (VDM)

HANA SQL (Relational Engines)

RAP (Modern Business Object Layer with EML)

Fiori Elements & Smart Controls and Flexible Programming Model

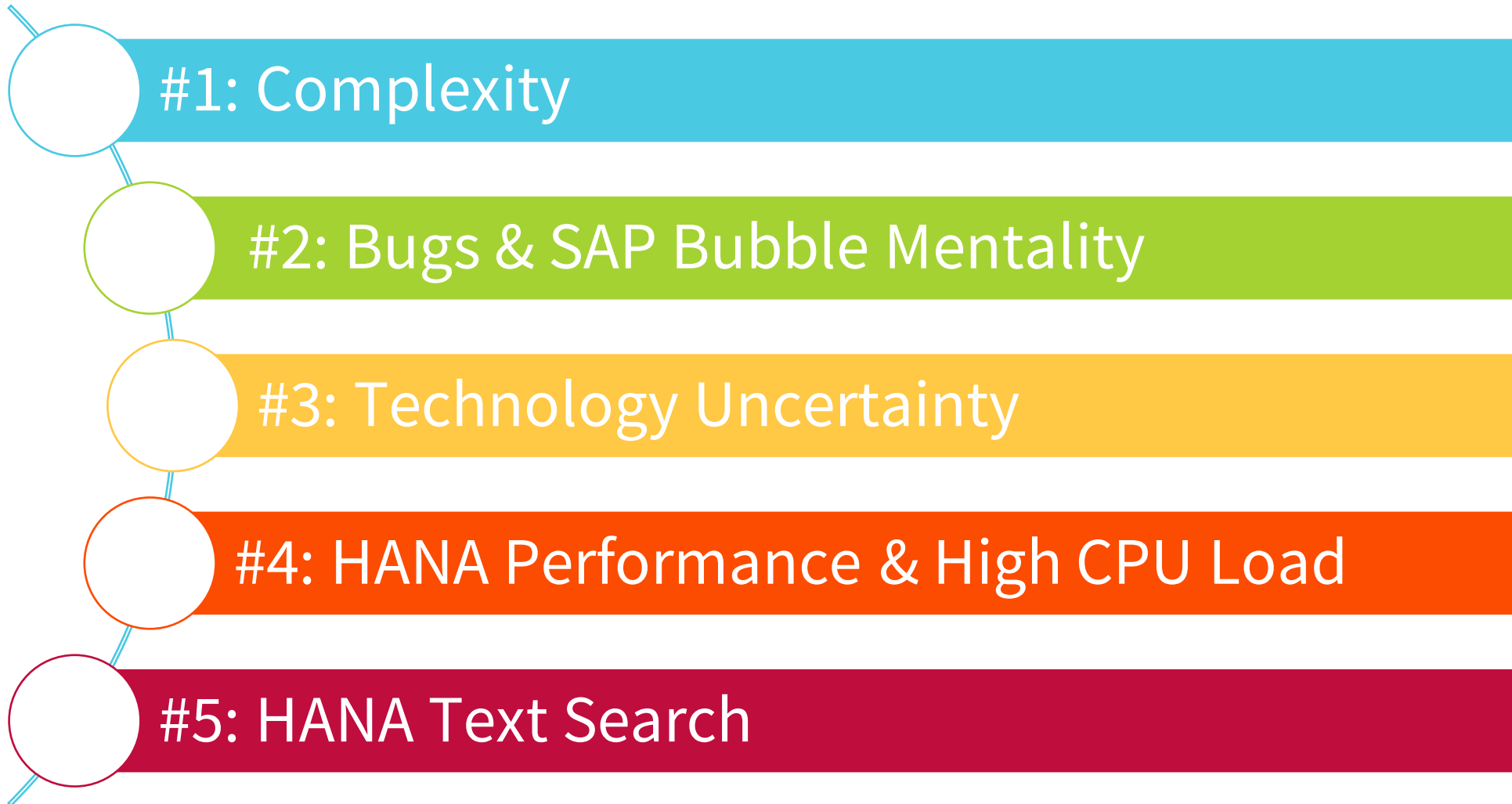
OData V2 & V4

Extensibility & Released Standard Objects RAP/CDS

Side-by-Side

Clean Core

5 Challenges



There will be 4 friends, who can help you

Challenge #1: Complexity

Student-Modules Search without values helps

Complexity Metrics

Used Data Sources

Database tables:	133
Database views:	234
CDS views with parameter:	0
CDS table functions:	0

SQL Operations

JOIN operations:	65
SET operations:	67
GROUP BY clauses:	2

Performance Related Function Calls and Operations

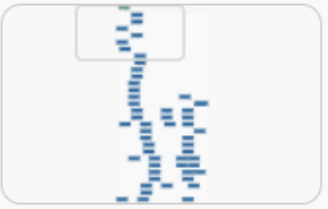
Function calls:	6
Explicit type CAST operations:	9
CASE expressions:	1

- 133 database tables
- 234 views

SQL Dependency Graph



Your Friend “The HANA Query Optimizer”



HANA PlanViz
Overview



EXECUTION SUMMARY		DATA USAGE	
Compilation Time	0.049 ms	Result Record Count	200
Compilation Summary	None	Accessed Tables	14
Execution Time (Elapsed)	57.929 ms	Virtual Tables	0
Execution Time (CPU)	110.71 ms	Cross DB Access	0
Execution Start Time	Sat, 30 Nov 2024 14:31:48.435 GMT		
Total Allocated Memory	69.354 MB	DISTRIBUTION	
Number of Operators	816	Total Network Traffic	0
Number of Edges	697	Involved Services	Show All (1)

- 14 accessed tables
- 58 ms execution time

Challenge #2: Bugs & SAP Bubble Mentality

HANA Sorting Bug

- SPS00-SPS07.078 (2016-2024): **AZazÄä**
- Correct solution: **AaÄäZz**

Suche Veranstaltungen

Frühjahrssemester 2024

Gefiltert nach (2): Fakultät, Kategorie

Suche nach Titel, Kürzel, Beschreibung, V-Nr, Dozierende

Filterleiste ausblenden Zurücksetzen

Studienstufe:

Philosophisch...

Fakultät:

Arbeit

Kategorie:

Sprache:

Tage:

Veranstaltungsmerkmale:

Zeit Start:

z.B. 23:59

Zeit Ende:

z.B. 23:59

Heute:

In veranstaltungsfreier Zeit:

Veranstaltungen (7)

V-Nr	Titel / Veranstaltungskürzel	Dozierende/r	Kategorie	Termine	Raum	Merken
259	Masterarbeit 06QO271-MAa - Deutsch, Englisch		Master Paper / MA-Arbeit	gemäss Ankündigung oder indiv. Vereinbarung		★
265	Masterarbeit (Fortsetzung aus HS23) 06QO615-MAa - Deutsch		Master Paper / MA-Arbeit	gemäss Ankündigung oder indiv. Vereinbarung		★
272	Memoire de Master 06QO390-MAa - Französisch		Master Paper / MA-Arbeit	gemäss Ankündigung oder indiv. Vereinbarung		★
278	Mémoire de Bachelor 06QO390-BAa - Französisch		Bachelor Paper / BA-Arbeit	gemäss Ankündigung oder indiv. Vereinbarung		★
393	Tesi di Master 06QO410-MAa - Italienisch		Master Paper / MA-Arbeit	gemäss Ankündigung oder indiv. Vereinbarung		★
394	Tesis de Maestría 06QO427-MAa - Spanisch		Master Paper / MA-Arbeit	gemäss Ankündigung oder indiv. Vereinbarung		★
260	Österarbeit 06QO500-MAa - Deutsch		Master Paper / MA-Arbeit	gemäss Ankündigung oder indiv. Vereinbarung		★

SAP Support Case with SAP Bubble Mentality



Your Friend “The Bug Fix”

- [3501346 - Unexpected Sorted Results Are Returned With LOCALE Parameter](#)
- Solution SAP HANA 2: Revisions >= 079.00 (SPS07), Released July 2024
 - Affected engines: ROW/ESX/HEX, not COLUMN



Challenge #3: Technology Uncertainty

OData V2 Service with Default User (anonymous login) works, we are live since 2016

OData V4 Service with Default User (anonymous login) not working

Interim Solution: Modification

— Your Friend:



SAP solution is still open

- Case opened, last response from SAP
 - *we are planning to include the 'anonymous' login feature in the next OnPrem release.*

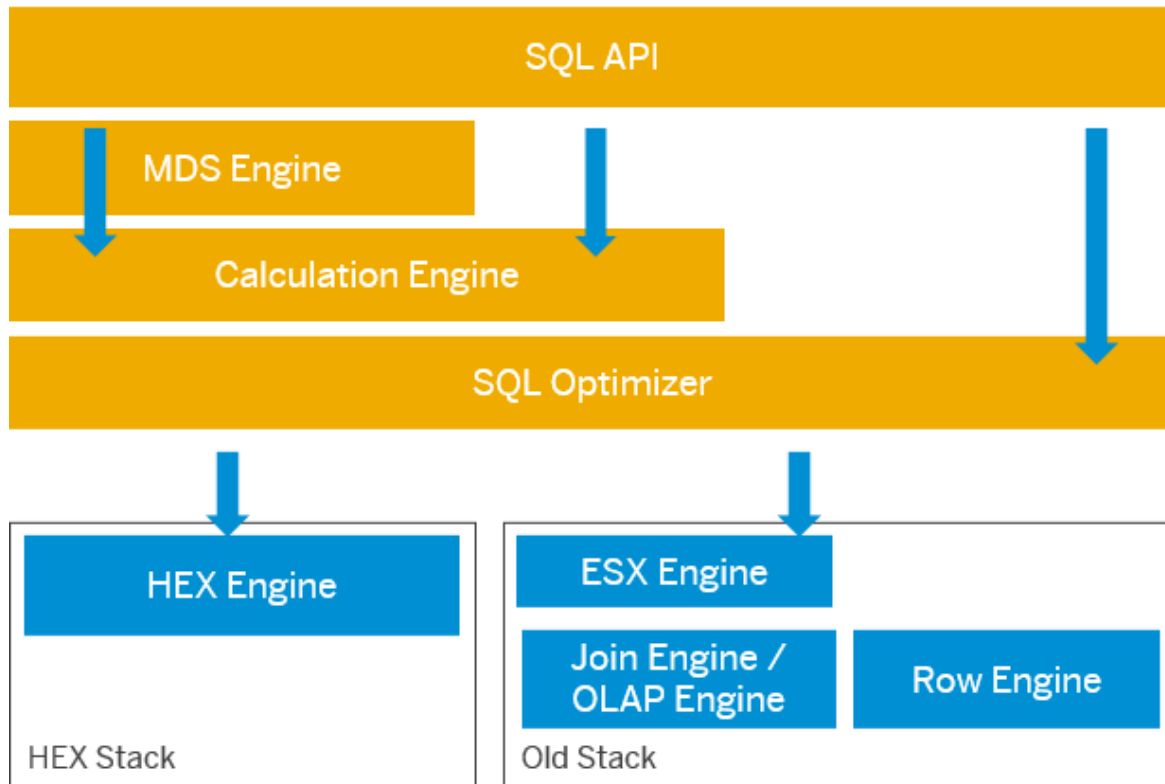


Challenge #4: HANA Performance & High CPU Load

Our HANA Server was overloaded

— Two times a year we have an event with a lot of concurrent users

HANA Engines: ESX vs. HEX



Your Friend “The HANA Hex Engine”

Helped us to **reduce HANA CPU Time by 300% and accelerated response by almost 100%** on complex CDS views



Let me tell you a secret, how to activate HEX for SADL

- HANA Revision ≥ 075.00 (SPS07) (Released April 2023)
- HANA configuration ‘hex_enable_with_parameters_locale’ = ‘true’
- Use HANA hint `USE_HEX_PLAN` in every relevant SQL statement
 - SADL: Annotation for exposed CDS Views:
`@consumption.dbhints: ['USE_HEX_PLAN']`
 - ABAP SQL: with hint ‘USE_HEX_PLAN’

Challenge #4: HANA Performance & High CPU Load

Good explaining Note

[3513507 - HANA HEX Engine not Used for Queries Containing "WITH PARAMETERS\('LOCALE' = <code> \) "](#)

— Released: September 2024

SAP can do better

— Why can HEX engine not help automatically?



Challenge #5: HANA Text Search: Our Customer want ‘CONTAINS’ Not ‘Fuzzy’

Search

🔍

Semester:

Fa24

Object abbreviation:

oec

offered:

Yes

Studienmodule (138)

Semester	Object ID	Object abbreviation	Objekt Titel	Category
Fa24	50019707	03SMBOEC9047	Tutorat Corporate Finance	Tutorat (0222)
Fa24	50300624	03SMBOEC9025	Tutorat in Mathematik I (Assessment)	Tutorat (0222)
Fa24	50300685	03SMBOEC9021	Tutorat in Mikroökonomik I	Tutorat (0222)
Fa24	50354095	03SMBOECBA18	Bachelorarbeit in Wirtschaftswissenschaften (Bachelor's Thesis)	Bachelor Paper / B.

oec

✕

🔍

Semester:

Fa24

Object abbreviation:

offered:

Yes

Studienmodule (18)

Semester	Object ID	Object abbreviation	Objekt Titel	Category
Fa24	50804071	03SMBA_IOE	Bachelorarbeit Informatik und Ökonomik (Bachelor's Thesis Computing and Economics)	Bachelor Paper / B.
Fa24	50804195	03SMBA_OEC	Bachelorarbeit Wirtschaftswissenschaften (Bachelor's Thesis)	Bachelor Paper / B.
Fa24	50804196	03SMMA_OEC	Masterarbeit Wirtschaftswissenschaften (Master's Thesis)	Master Paper / MA-
Fa24	50840778	03SMDOEC0718	Microeconomic Foundations of Economics of Education (S)	Doktorandensemin

@Search.fuzzinessThreshold: 0.8 – 1.0

Modulbuchungstyp:

Primäre Disziplin:

fina

Disziplin	Disziplin (Bezeich.)
3021	Finance
3730	Banking and Finance
7256	**Inaktiv** (Theorie und Geschichte des Films)
8163	Versicherungs- und Finanzmathematik

Alle Elemente anzeigen

Much More Custom Fiori Apps in the Launchpad based on ABAP Cloud

UZH

Text Maintenance

Text Maintenance

Object: Module
ObjectID: 50026110
Short: 07SMMAT182
Description: MAT 182 Analysis for Natural Sciences

Texts (20)

Text type	Period	Content DE	Content EN
General description 0001	01.08.2018 - 31.12.9999	Es wird das für die Anwendungen in den Naturwissenschaften en notwendige mathematische Rüstzeug aus der...	
General description 0001	01.09.2006 - 31.07.2018	Es wird das für die Anwendungen in den Naturwissenschaften en notwendige mathematische Rüstzeug aus der...	
General description 0001	01.01.1980 - 31.08.2006	Es wird das für die Anwendungen in den Naturwissenschaften en notwendige mathematische Rüstzeug aus der...	
Notes 0003	01.02.2021 - 31.12.9999	http://www.math.uzh.ch/mat182.1	
Notes 0003	01.08.2020 - 31.01.2021	SPEZIELLE ANPASSUNGEN IM HS20: Die Veranstaltungen	

General description
0001

Period: 01.08.2018 - 31.12.9999

Content DEContent EN

B*I*U

Es wird das für die Anwendungen in den Naturwissenschaften notwendige **mathematische Rüstzeug aus der Analysis vermittelt**. Im Einzelnen werden folgende Themen behandelt:

1. Vektoren

2. Differentialrechnung

3. Integralrechnung

4. Differentialgleichungen

5. Anwendungen

6. Differentialrechnung von Funktionen von mehreren Variablen

Die Übungen bilden einen wichtigen Teil der Lehrveranstaltung und sollen mit verschiedenen Anwendungen des Vorlesungsstoffes vertraut machen.

Last changed 03.04.2018, Simone Von Burg Black

CONTENT EN

B*I*U

SaveCancel

UZH

Modulliste pro Semester

Standard*

Search

Semester: Fa24

Object abbreviation:

offered: Yes

In Catalog:

Discipline:

Go

Adapt Filters (2)

Studienmodule (3,912)

Semester	Object ID	Object abbreviation	Objekt Titel	Category
Fa24	50018319	04SM50FAN102	Clinical Examination Course on the Human Musculoskeletal System	Kurs (0102)
Fa24	50018694	07SMCHE207	CHE 207 Application of Spectroscopic Methods in Chemistry	Lecture with Practical Exercises (0241)
Fa24	50018697	07SMCHE211	CHE 211 Practical course in Physical Chemistry	Praktikum (0151)
Fa24	50018713	07SMCHE205	CHE 205 Physical Chemistry I: Thermodynamics	Lecture with Practical Exercises (0241)
Fa24	50018734	07SMCHE304	CHE 304 Organic Chemistry III: Voyage into the Physical Realm	Lecture with Practical Exercises (0241)
Fa24	50019061	04SM03CHE102	Lecture in General Chemistry for Students of Medicine, Dentistry and Veterinary Medicine	Lecture with Practical Exercises (0241)
Fa24	50019064	05SM.112_che	CHE 160 General Chemistry for Students of Veterinary Medicine	Lecture with Practical Exercises (0241)
Fa24	50019260	07SMCHE303	CHE 303 Inorganic Chemistry III: Synthesis and Reactivity of Elements from across the Periodic Table	Lecture with Practical Exercises (0241)
Fa24	50019707	03SMBOEC9047	Tutorat Corporate Finance	Tutorat (0222)
Fa24	50020536	05SMFWB109	Diagnostic Cytology	Block Course (0022)
Fa24	50025938	07SMPHY113	PHY 113 Mechanical Workshop I	Block Course (0022)
Fa24	50026110	07SMMAT182	MAT 182 Analysis for Natural Sciences	Lecture with Practical Exercises (0241)
Fa24	50026307	07SMMAT491	MAT 491 Master thesis	Master Paper / MA-Arbeit MNF (0119)
Fa24	50026310	07SMMAT499	MAT 499 Master exam	Mündliche Prüfung (0121)
Fa24	50026315	07SMPHY311	PHY 311 Mechanics	Lecture with Practical Exercises (0241)
Fa24	50026322	07SMDVU221	DMV 221 Data Analysis	Lecture with Practical Exercises (0241)

University of Zurich

2024-12-05 | 18

ABAP Cloud @ University of Zurich: Light

Industry Solution (SLCM) part of S/4HANA

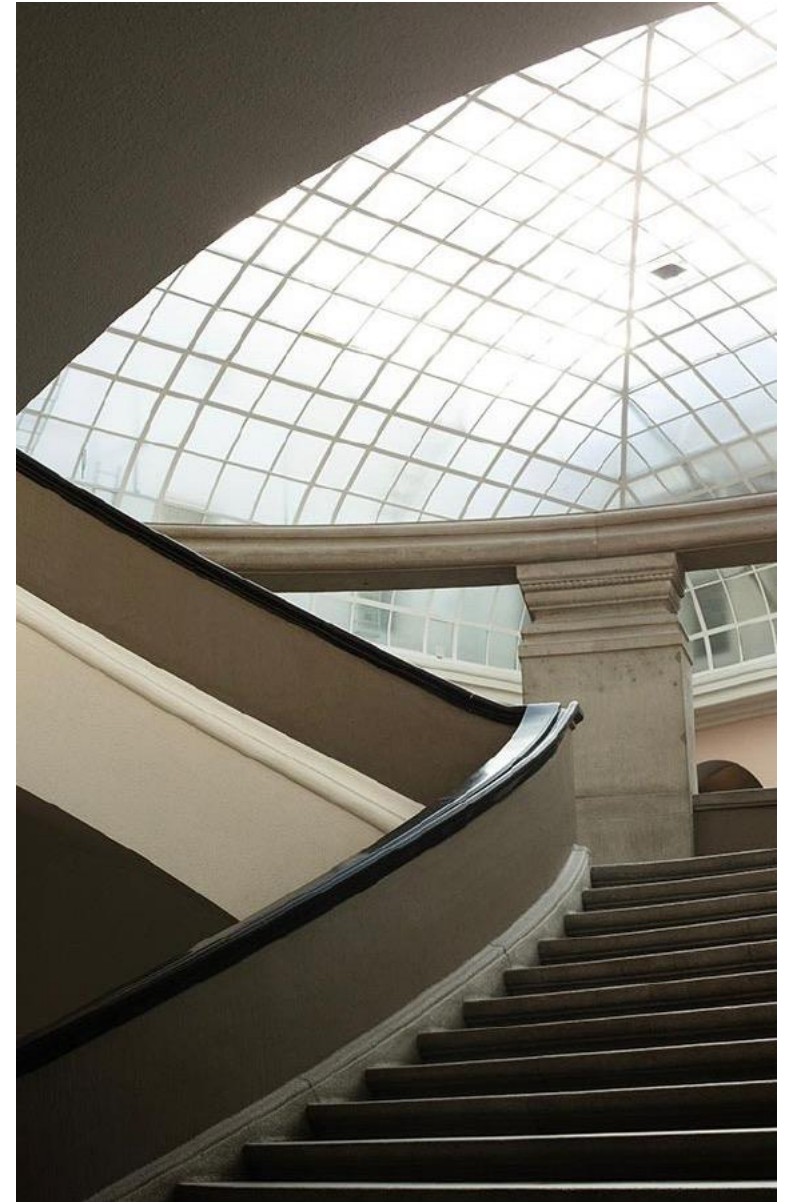
It runs, we are live since May 2024

RESTful now works really well with ABAP

Performance & Efficiency of HANA HEX Engine

Thanks to SAP people participate in ABAPConf

Devtoberfest ABAP & HANA Sessions, also for the past years





ABAP Cloud @ University of Zurich: Shadow

SAP Bubble Mentality (some SAP teams do not have a holistic view of the customer)

- SADL vs. HANA (Sorting Bug & Performance with LOCALE)
- Fiori Elements vs. UI5
- ABAP Cloud, e.g. RAP Stream Support
 - Binary documents don't belong on primary HANA Database and the UI can be improved.

Cloud first becomes Cloud only! We made our strategy with SAP's maintenance promise for S/4 OnPrem until 2040

- 2-year release for technology stack is painful for us, e.g. UI5, ABAP Platform Features
 - It's like a "communist planned economy": 2025, 2027, 2029
- Do we have a Code Split between S/4 on Prem vs. Private Cloud, because of Joule?
- It hurts, that SAP trashes a Fiori Elements Rapid Prototyping Tool, after buying AppGyver.

Please invest more in ABAP Cloud

- SAP is asking customers to invest in S/4HANA, in clean core and in the ABAP Cloud. SAP needs to ensure adequate investment on their side as well.
- The roadmap is behind schedule
 - Fiori UIs with Multiple Business Objects, Collaborative Draft, Change Documents etc.
- CAP is ahead in some features. It is more fun to code. It is more attractive for young developers.



Thank you!

