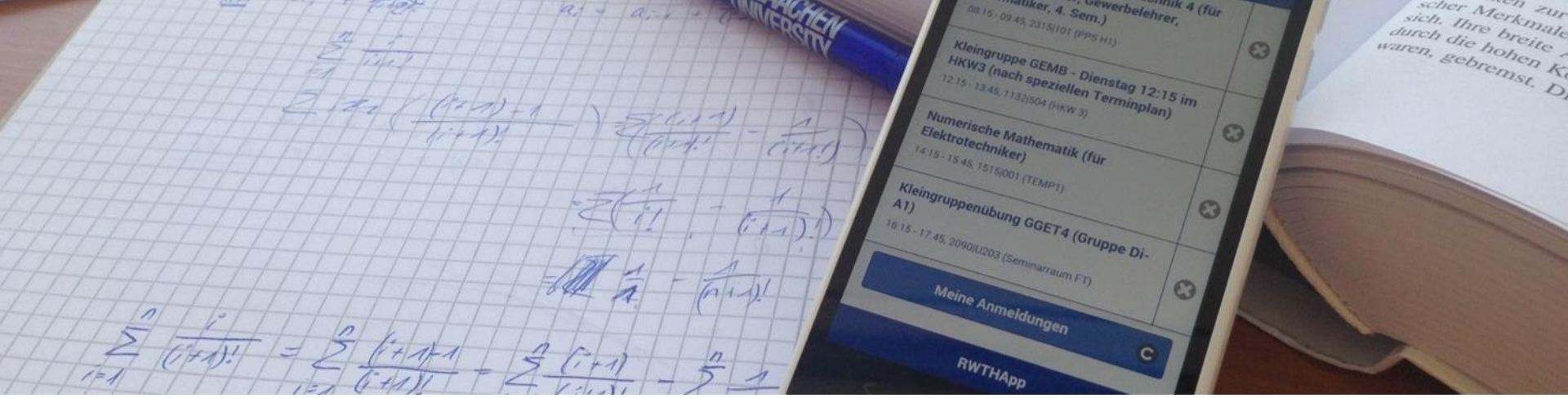


Extending the OAuth2 Workflow to Audit Data Usage for Users and Service Providers in a Cooperative Scenario

Marius Politze, Bernd Decker
IT Center RWTH Aachen University

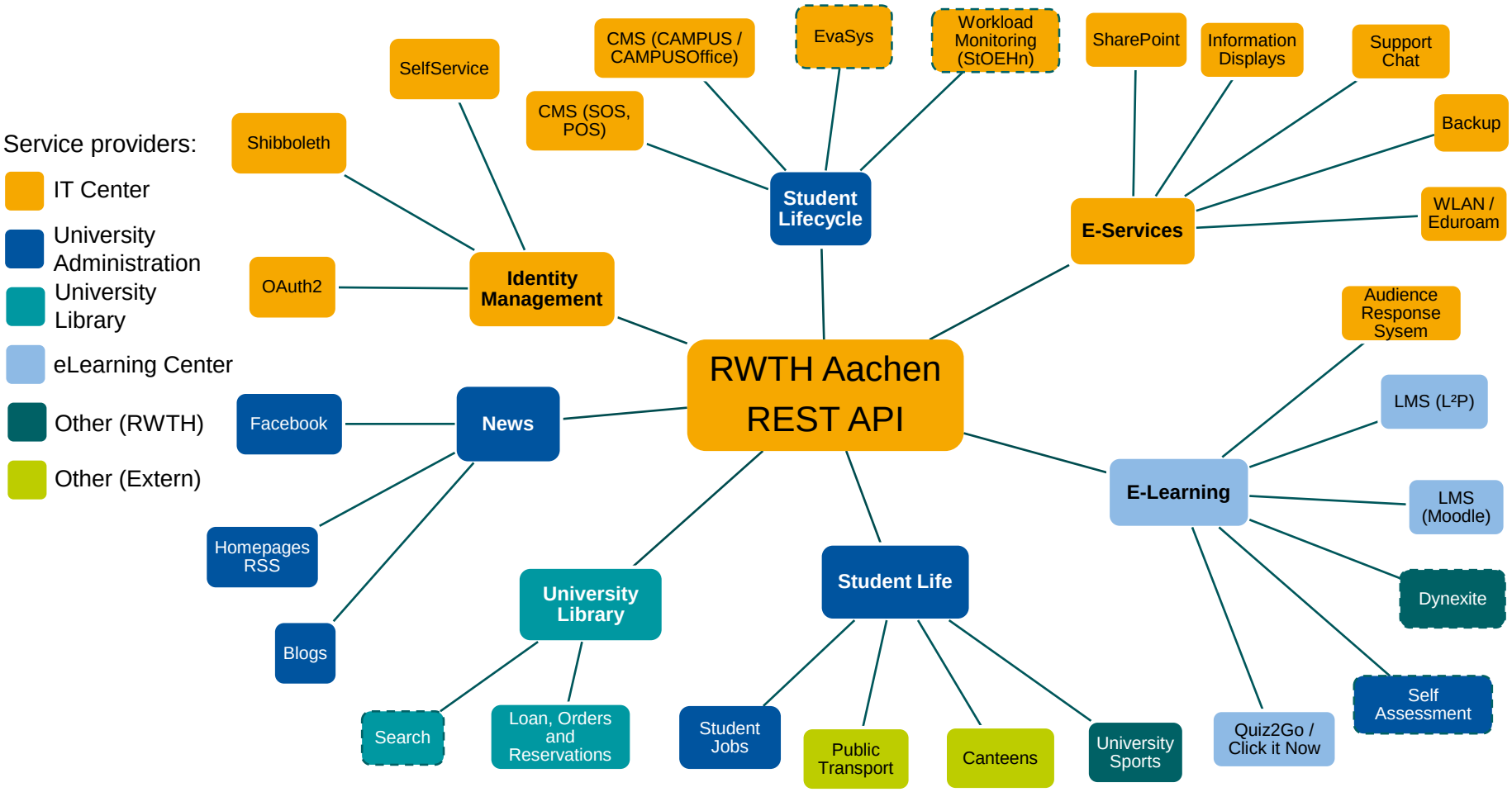
IT Center | RWTH AACHEN UNIVERSITY

Setting

Support the core processes: Teaching, Learning and Research

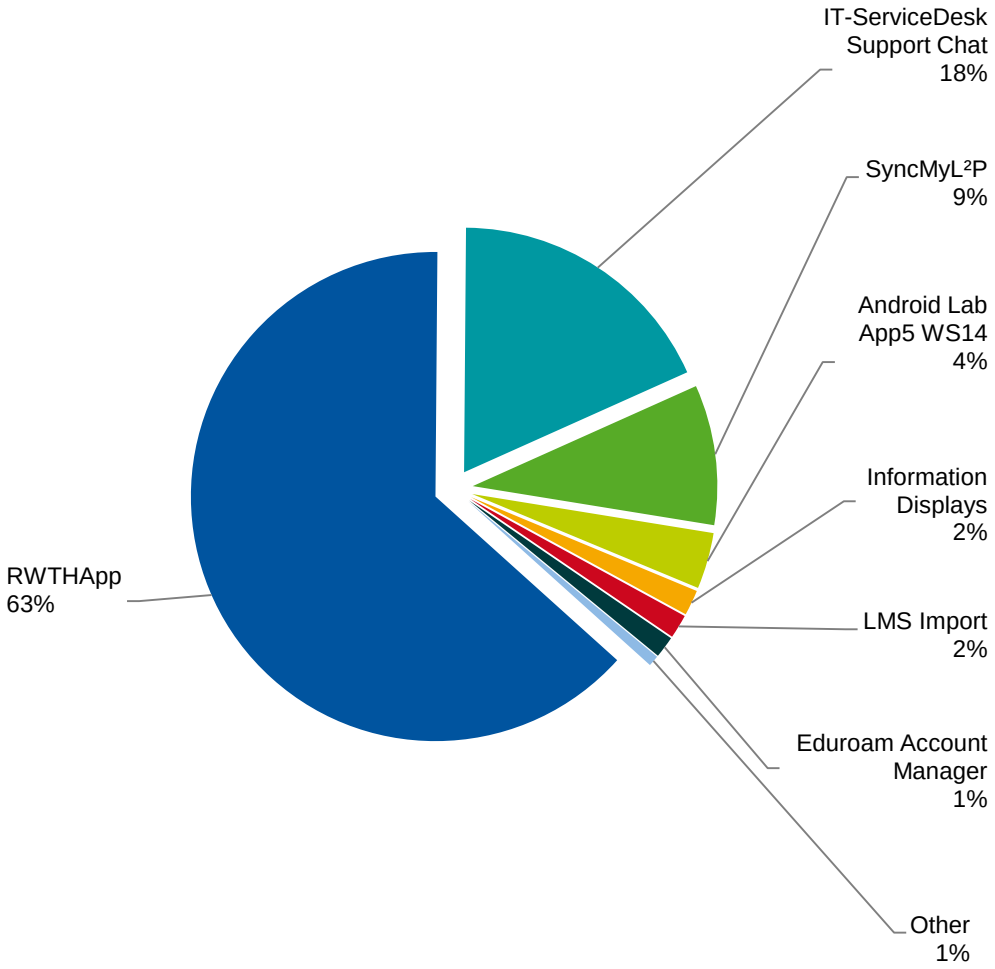
- Connect legacy systems with a single, consistent API
- Develop an SOA that fits to the processes at the university
  - Start with eLearning
  - Generalize and try to apply to other fields:
    - Campus Management, Identity Management
    - Research Data Management / eScience
- Security by design
  - Confidentiality
  - Integrity
  - Availability
- Protect personal and confidential data

System Landscape by Service Provider



App Landscape

- Since 2014 as a service
- 35 active apps
  - 10 by Institutes
  - 25 by Students
- 50.000 authorized app instances
- 22.000 active users



Authorized App-Instances in November 2016

Goals

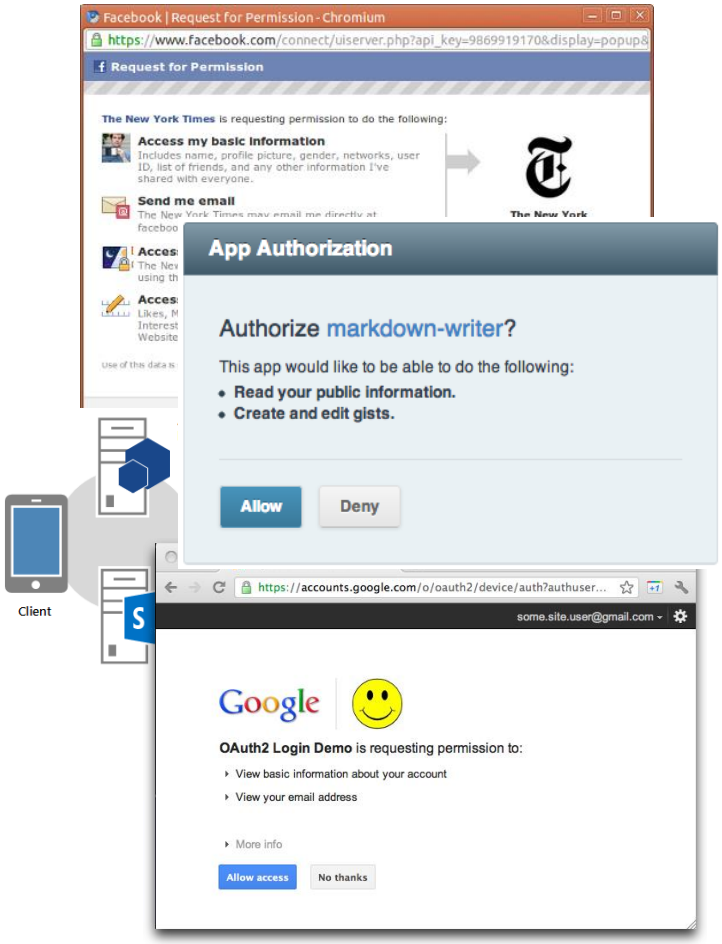
- Provide an authorization system for
  - Distributed systems
  - Processes crossing system boundaries

- Allow users to check how their data is used
  - Real time and retrospective monitoring
  - Which systems are using data on my behalf?

- Provide Data usage and Analytics for
  - User-Centric Security
  - Distributed service providers
  - and (external) app developers

OAuth2 at Commercial Service Providers

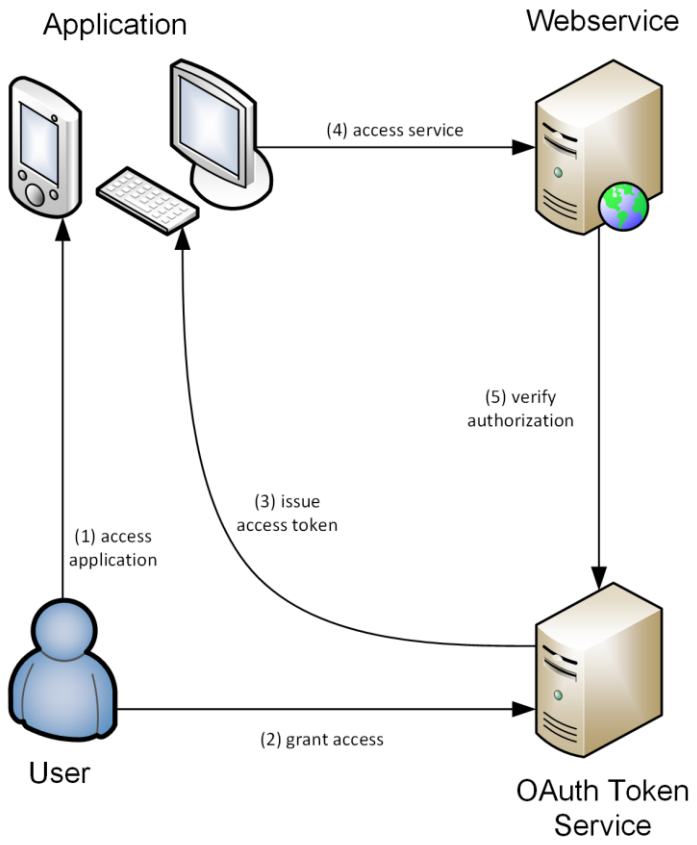
- Tightly coupled with their web services
  - Authorization for *local* scopes
  - Used for applications
- Applications using multiple services still require multiple logins
  - 1:1 mapping of services providers and logins
  - Crossing system boundaries not supported
- Authentication via authorization
  - Use *user info* supplied by a service provider to identify the user
  - Leads to possible security vulnerabilities [1]



[1] R. Yang, W. C. Lau, and T. Liu, Signing into One Billion Mobile App Accounts Effortlessly with OAuth2.0, in Black Hat Europe, 2016.

OAuth2 at RWTH Aachen University

- Secure, device based Authorizations
  - (De)Authorizations via Webinterface
  - No credentials are passed to apps
- OAuth2 as a service
  - Integrates Shibboleth as authentication
  - Possibility to provide a federative service (DFN, …)
- Established at RWTH
  - RWTHApp has ~20.000 active users
  - Procedure scales across different applications



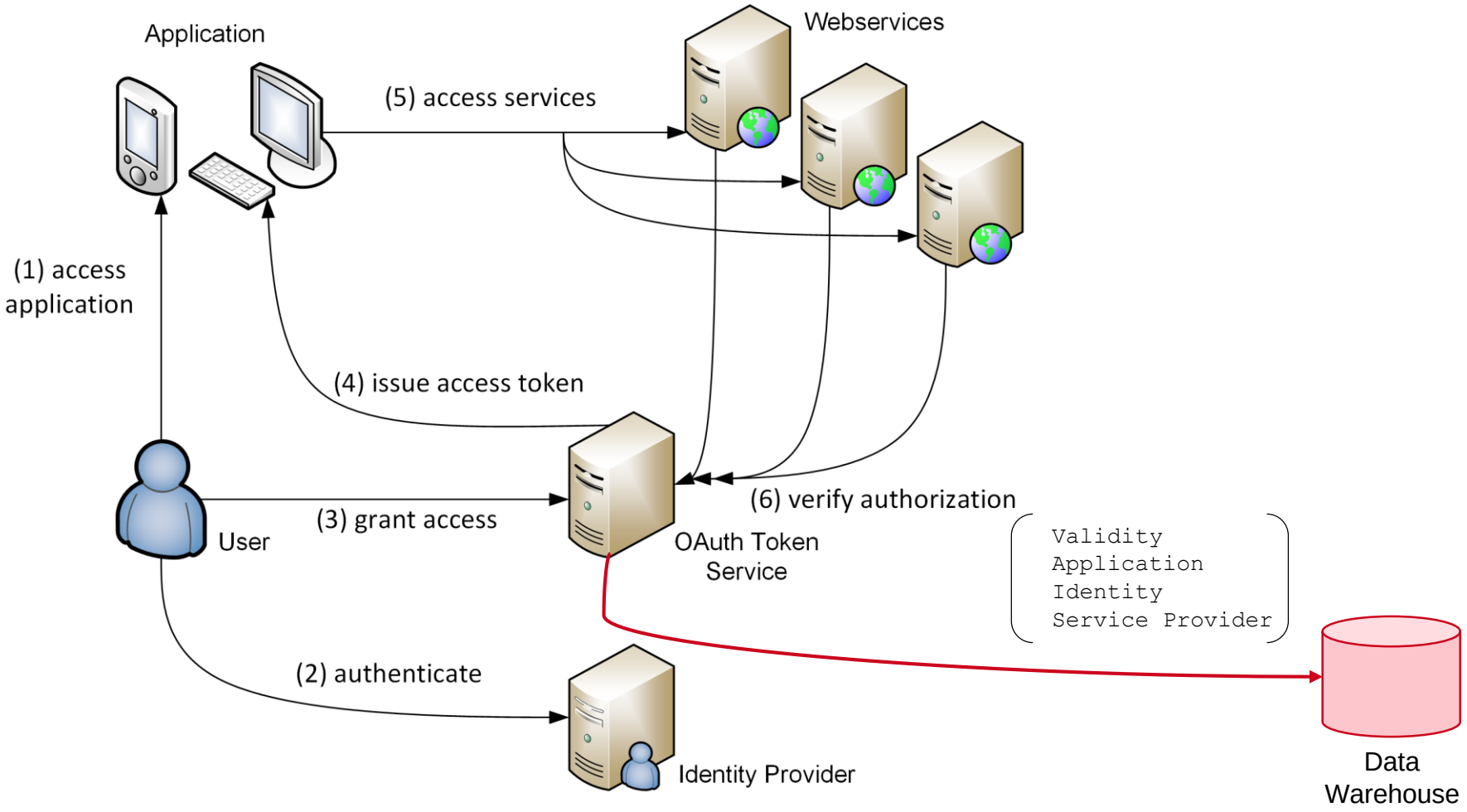
Endpoints in the Cooperative Workflow

- `Authorize`
- `Code`
- `Token`
- `TokenInfo`

} Endpoints for web application and device workflow

- `Context` — Endpoint for cooperative workflow
  - Resolve (user) context of an authorization
  - 4-Tuple: `(Validity, Application, Identity, Service Provider)`

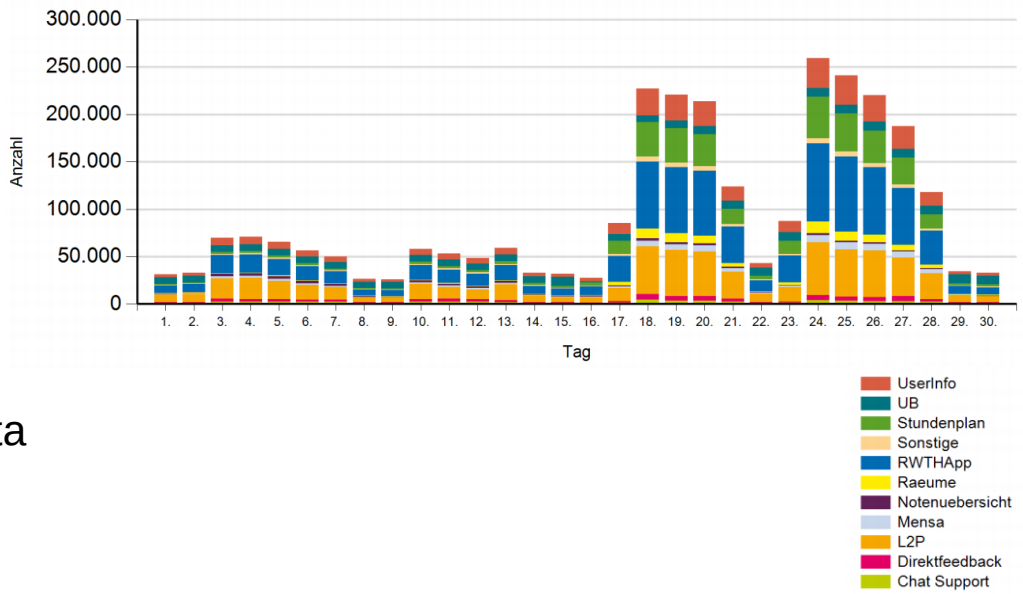
OAuth2 in the Cooperative Workflow



Auditing Data Usage in the Cooperative Workflow

- Use information about resolved contexts for auditing
  - Record existing 4-tuples
  - No information about actual data usage
- Make collected data available to
  - … service providers
  - … app developers
  - … users
- Central collection of audit data
  - OAuth2 system manages the audit data
  - Takes care of proper anonymization
  - … and data security

Number of users accessing service providers through RWTHApp



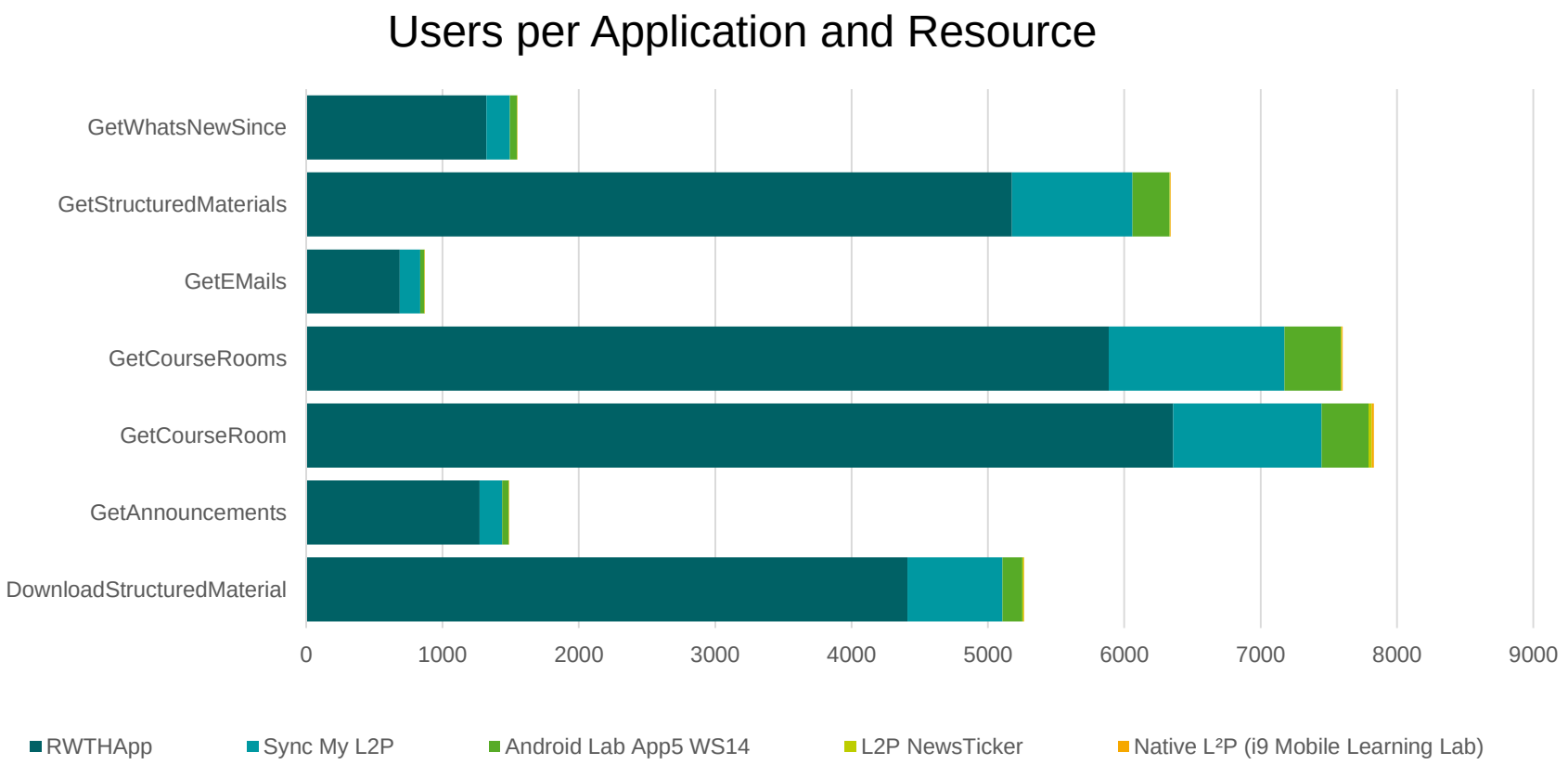
Extending Audit Logging

- Extend logged data by
  - Resource
  - Operation
  - Cost

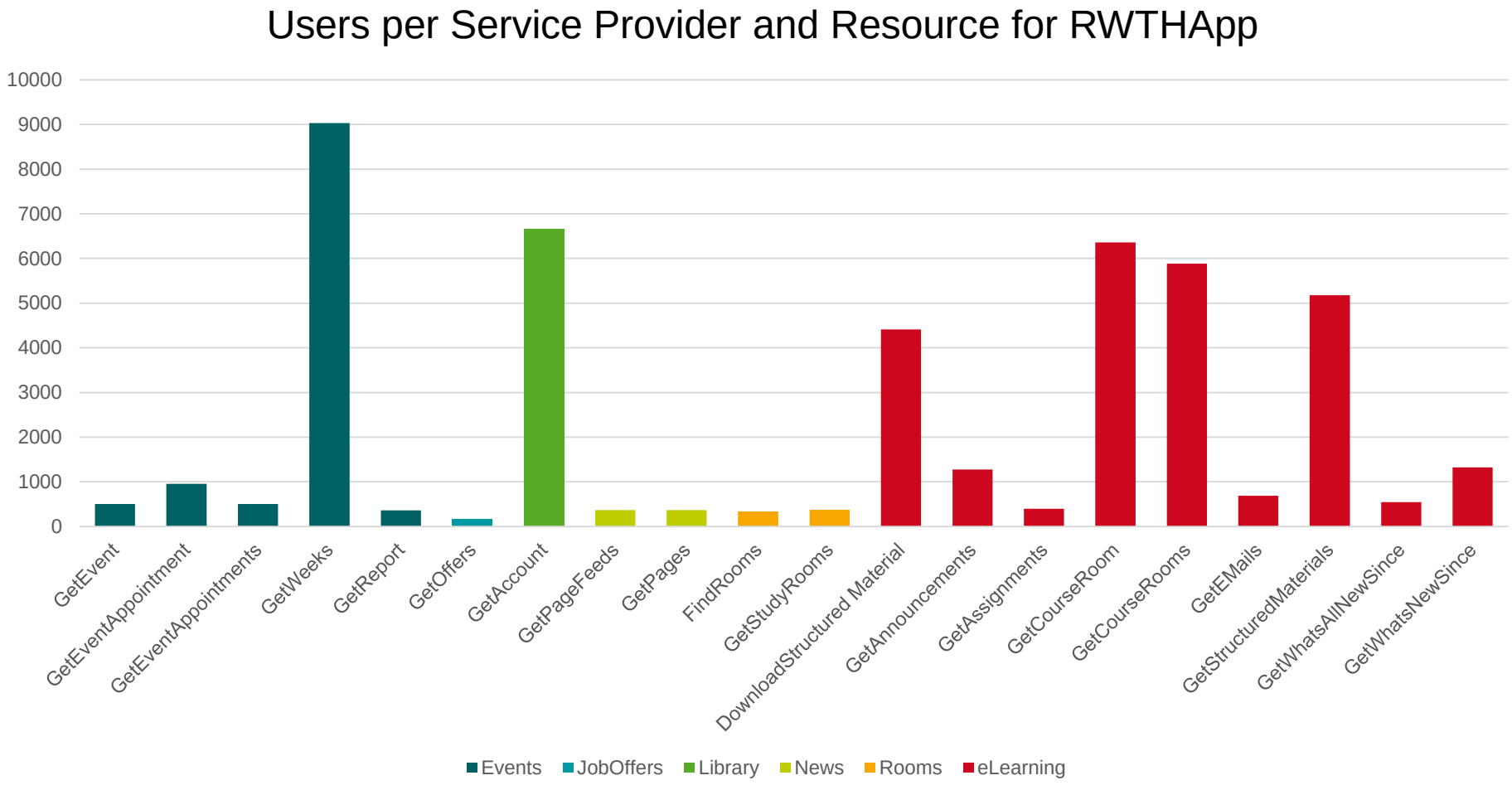
- Cannot be generated directly from OAuth2 Workflow
  - Services need to provide data
  - Interpretation and granularity up to service providers

- Keep auditing data central
  - Enforce data and privacy regulations
  - Supply information to service providers, app developers and users

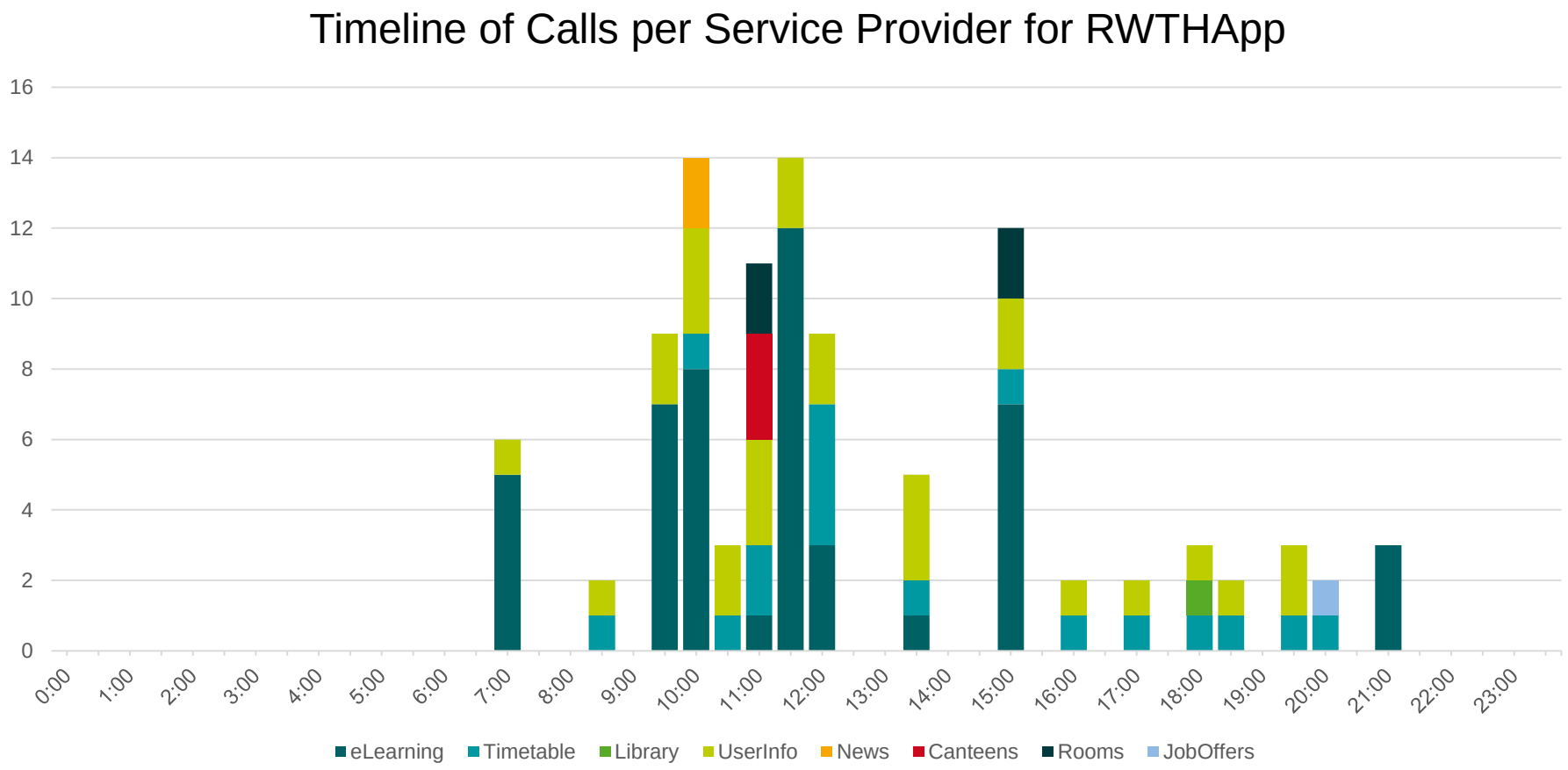
Detailed Statistics for Service Providers



… App Developers



… and Users


Timeline of Calls per Service Provider for RWTHApp
16
14
12
10
8
6
4
2
0
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
eLearning
Timetable
Library
UserInfo
News
Canteens
Rooms
JobOffers

Wrap Up

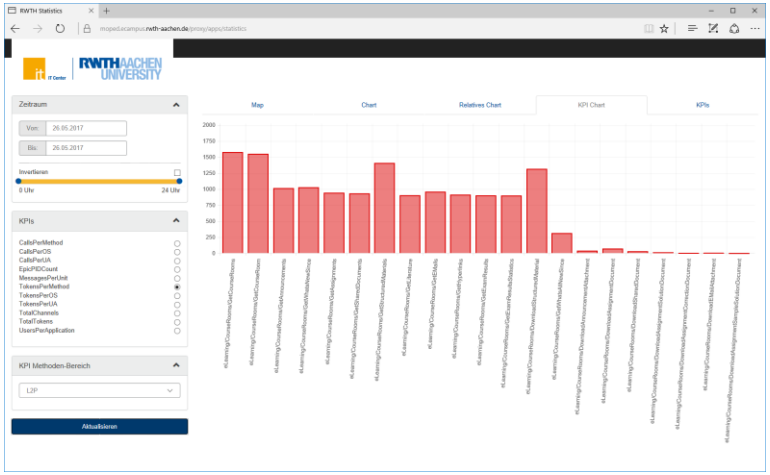
- OAuth2 cooperative workflow
  - Single OAuth2 instance manages authorizations
  - Reuse authorizations for all service providers
  - Allows processes to cross system boundaries

- Simple centralized auditing
  - User-centric: Security by Transparency
  - Allows enforcement of privacy and data protection laws

- Extended audit logging
  - Detailed reports for service providers, app developers and users
  - Additional information controlled by service providers

What's Next?

- Current Reports limited to monthly PDFs
  - More interactive web based system
  - Prototype currently available to service providers
  - Allow explorative analysis and auditing
- Extend the Reach
  - Mostly used in eLearning services
  - Currently transferring to eScience services
- Further extensions to OAuth2 Workflows
  - Allow third party service providers
  - Federative model
- Automated usage analysis?



Thank you for your attention

Vielen Dank für Ihre Aufmerksamkeit