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

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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

Service providers:
- IT Center
- University Administration
- University Library
- eLearning Center
- Other (RWTH)
- Other (Extern)

RWTH Aachen
REST API

Student Lifecycle
E-Services
E-Learning
Student Life

Identity Management
OAuth2
Shibboleth

CMS (SOS, POS)
CMS (CAMPUS / CAMPUSOffice)
EvaSys
Workload Monitoring (StOEHN)
SharePoint
Information Displays
Support Chat
Backup
WLAN / Eduroam

Audience Response System
LMS (L²P)
LMS (Moodle)

Self Assessment
Dynexite

SelfService

Facebook
News

Homepages
RSS

Blogs

University Library

Loan, Orders and Reservations

Student Jobs
Student Life

Public Transport
Canteens
University Sports
Quiz2Go / Click it Now

IT Center
University Administration
University Library
eLearning Center
Other (RWTH)
Other (Extern)
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]

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
- Resolve (user) context of an authorization
- 4-Tuple: (Validity, Application, Identity, Service Provider)
OAuth2 in the Cooperative Workflow

(1) access application

(2) authenticate

(3) grant access

(4) issue access token

(5) access services

(6) verify authorization

User

Application

Webservices

OAuth Token Service

Identity Provider

Validity
Application
Identity
Service Provider

Data Warehouse
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

![Chart showing the 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

Users per Application and Resource

- GetWhatsNewSince
- GetStructuredMaterials
- GetEMails
- GetCourseRooms
- GetCourseRoom
- GetAnnouncements
- DownloadStructuredMaterial

*RWTHApp* | *Sync My L2P* | *Android Lab App5 WS14* | *L2P NewsTicker* | *Native L²P (i9 Mobile Learning Lab)*

0 | 1000 | 2000 | 3000 | 4000 | 5000 | 6000 | 7000 | 8000 | 9000

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Marius Politze, Bernd Decker
10. DFN Forum Kommunikationstechnologien, 31.05.2017
... App Developers

Users per Service Provider and Resource for RWTHApp

- Events
- JobOffers
- Library
- News
- Rooms
- eLearning
... and Users

Timeline of Calls per Service Provider for RWTHApp
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