Implementing a Unified Login for Windows and Unix clients

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Agenda

- Pre-requisites for our approach
  - DFN-Research project of DAASI International
  - Requirements
- Technologies needed
- Unified Login with Active Directory
- Unified Login with OpenLDAP/SAMBA
  - Why do we want to do that?
  - Problems
  - Solution
  - Zope based webgui
- Migration from Active Directory to OpenLDAP
- Experiments with SAMBA 3.0

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Pre-requisites of our work

- DAASI International Ltd.
  - Directory Applications for Advanced Security and Information management
  - A spin-off of directory related research projects at University of Tübingen
  - Performed the BMBF funded DFN project „Ausbau und Weiterbetrieb eines Directory-Kompetenzzentrums“ (DFN Directory Services)
- Part of the project was to implement a Unified Login Service for a University environment

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Aims

- A Unified Login Service
  - For the heterogenious environment of German Universities
  - For up to 40,000 users
  - Integrated in existing infrastructure
  - Scalable solution without performance loss
- Should leed to:
  - Reduction of system administration work
  - Reduction of Helpdesk effort
    - „ I forgot my password“
  - => Reduction of costs
- Less passwords to remember should lead to stronger passwords

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Requirements

- Basic operating system functions for user and group lookup
- User authentication for
  - Console logins (Unix and Windows)
  - Secure remote shells (SSH)
  - Email submission (SMTP) and retrieval (IMAP)
  - Email routing
  - Webpage access
- Integration with a white-pages service
- Passwords must not be send in clear text
- Enforcement of Password policy
- Single Sign On

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Statistics

- Daily amount of emails and logins at a university computing centre
  - Up to 70,000 email to route per day (a historic peak was 220,000 emails on one day)
  - Up to 50,000 pop3 logins per day
  - Up to 25,000 IMAP logins per day
  - This amounts to 150,000 search requests and 80,000 authentication operations per day only for email services

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Useful Technologies 1

- Kerberos
  - Network authentication protocol with strong authentication for client/server environments
  - Each participant shares a secret key with a central Key Distribution Center (KDC)
  - KDC consists of Authenticate Service and Ticket Granting Service
- GSSAPI (Generic Security Service Application Program Interface)
  - Security framework that abstracts from underlying protocols
  - Includes a Kerberos mechanism

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Useful Technologies 2

- X.509
  - Certificate based strong authentication via assymetric encryption
  - Certificate issued by a third trusted party (CA)
- Security Layers
  - Integrity and privacy protection via encryption
  - Secure Socket Layer (SSL) / Transport Layer Security (TLS)
    - X.509 Certificate based
  - Kerberos and SASL also can establish Security Layers
  - IPSec: X.509 certificate based security at the network layer

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Useful Technologies 3

- SASL (Simple Authentication and Security Layer)
  - Method for adding authentication support to connection-based protocols
  - Supported by LDAP Servers
  - Specified mechanisms:
    - PLAIN (plain text password, we don‘t want that!)
    - DIGEST-MD5 (challenge Response no clear text PW)
    - GSSAPI (and thus Kerberos)
    - EXTERNAL (e.g. X.509 certificate used in the underlying SSL / TLS)

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Useful Technologies 4

- Name Service Switch (NSS)
  - Layer in Unix C libraries that provides different means for listing or searching users, groups, IP services, networks, etc.:
    - Flat files (etc/passwd, etc.) = hard to administrate
    - NIS (Network Information Service) = security holes
    - LDAP = ☺
- Pluggable Authentication Modules (PAM)
  - Framework for login services
  - Manages authentication, accounts, sessions and passwords
  - Modules exist for LDAP, Kerberos, etc.

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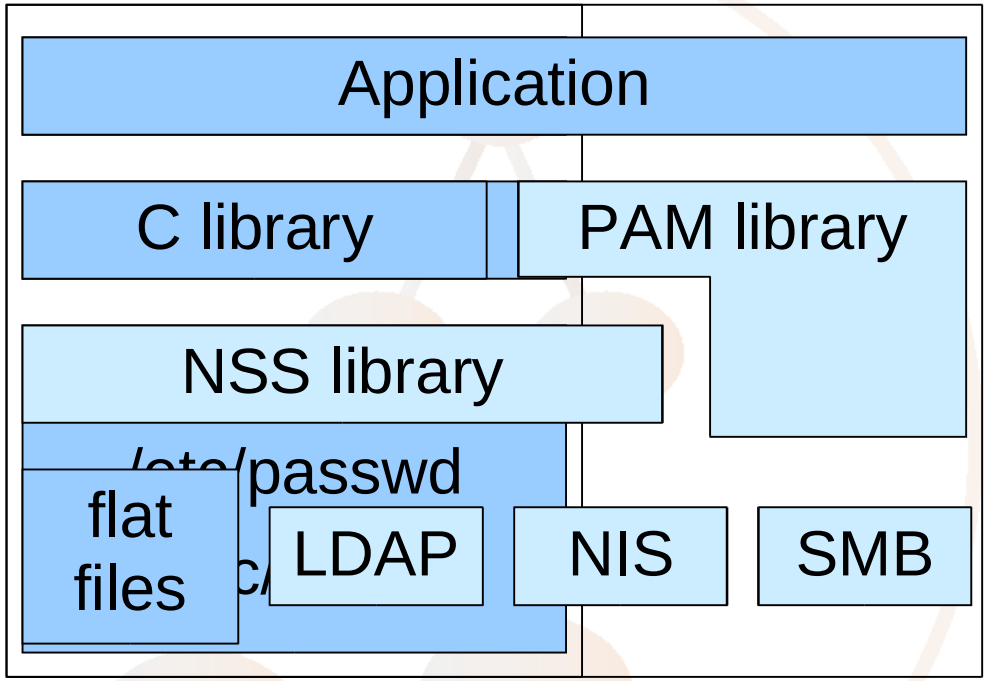
Unix authentication



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Very useful technology ☺

- LDAP (Lightweight Directory Access Protocol)
- It is a database or information model (X.500)
  - Hierarchical structure
  - Object oriented
  - Extensible for any kind of data
- It is a network protocol
  - Internet standard
  - Client/server
  - Flexibly extensible
  - Allows for distribution of data in the net (just like WWW!)
  - Allows for replication of the data in the net

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Unified Login with Active Directory (AD)

- First project result was based on AD
  - Usefull in a primarily Windows based landscape
  - Integrated Kerberos Key Distribution Center (KDC) easily provides SSO functionality
  - AD did not fully support NIS schema,
    - Open LDAP server was additionally used for NIS data
    - AD was only used for authentication
  - PAM_LDAP as well as PAM_krb5 could be used, easily switchable
  - SSO system supports Unix and Windows login, SMTP auth, IMAP auth, SSH, CVS, FTP

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Why search for something else?

- We needed a more flexible solution
  - something in which you can integrate your own code => Open Source
- No licensing problems
- Better Unix support
- Only one directory for all applications
  - Not only integrate NIS but any directory services
  - Easier administration
    - One central administration point
    - Different admins have different access rights (on subtree and on attribute level)
    - Good old log files instead of strange error messages
- Easier replication mechanism

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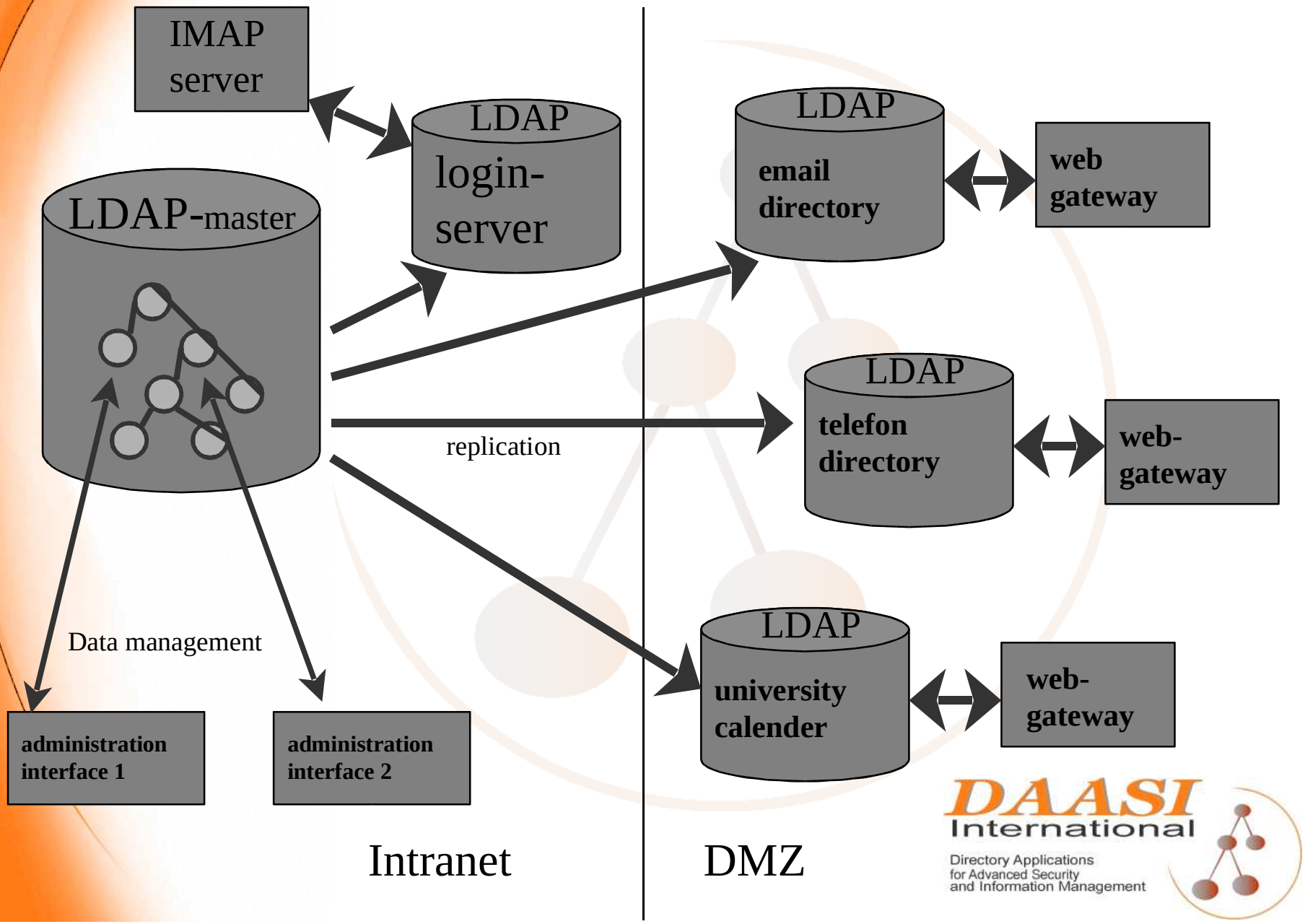
Example integration into other services



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OpenLDAP/Samba recipe

- Take a linux box with minimal linux installation
- Add the following (newer versions will also do):
  - binutils-2.11.90.0.29-15.i386.rpm
  - gcc-2.95.3 136.i386.rpm
  - glibc-devel-2.2.4-40.i386.rpm
  - make-3.79.1-180.i386.rpm
  - nss_ldap-167-54.i386.rpm
  - openldap2-2.0.12-33.i386.rpm
  - openldap2-client-2.0.12-28.i386.rpm
  - openldap2-devel-2.0.12-28.i386.rpm
  - openssl-devel-0.9.6b-62.i386.rpm
  - pam-devel-0.75-78.i386.rpm pam_
  - ldap-122-77.i386.rpm
- And don‘t forget Samba, we took 2.2.8a
- Useful are the IDEALX smbldap-tools-0.7.tgz

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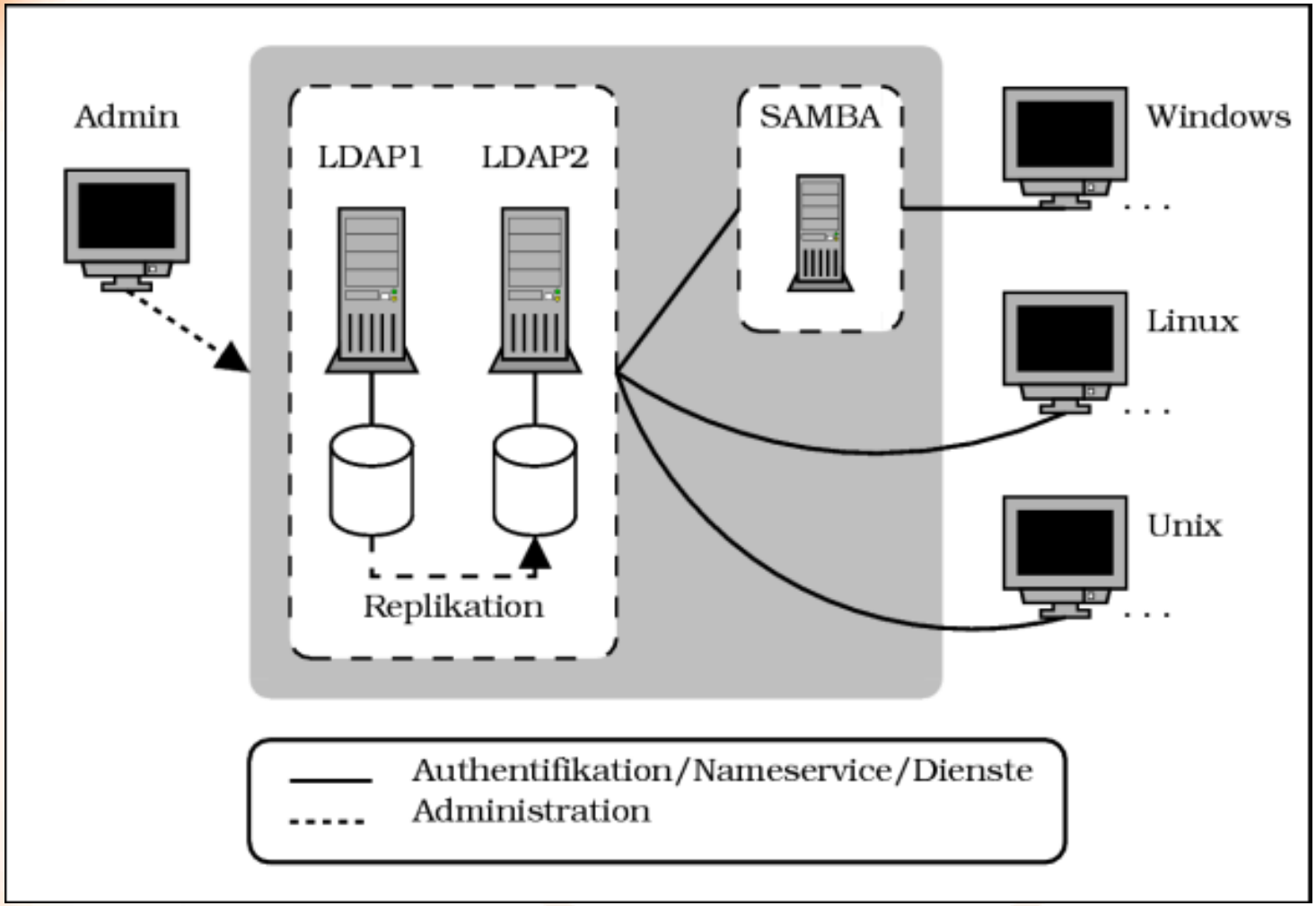
The big picture



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Client platforms that work

- Unix:
  - Linux
  - FreeBSD
  - OpenBSD
  - NetBSD
  - Solaris
  - HP-UX
  - AIX
- Windows:
  - 2000
  - XP

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Production service

- We currently use central authentication for:
  - Linux client login
  - BSD client login
  - Win2k client login
  - Cyrus-imapd
  - Sendmail smtp auth
  - sshd
  - cyrus-sasl
  - tutos (open source project planner / CRM)
- We do cashing via Name Service Casheing Daemon (nscd)

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Problems

- Memory allocation reentrance bug in SASL made the following authentication chain crash: cyrus-imapd -> cyrus-sasl -> pam -> pam_ldap
- Either redesign the SASL library (☹) or use the work around patch of Rein Tollevik

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Zope based user/admin interface

- Easy to use interface for users and admins
- Using Zope
  - Very portable
  - Nice CMS functions
  - Has an LDAP API („LDAPUserFolder“)
- Interface uses SSL/TLS
- Manages any kind of data

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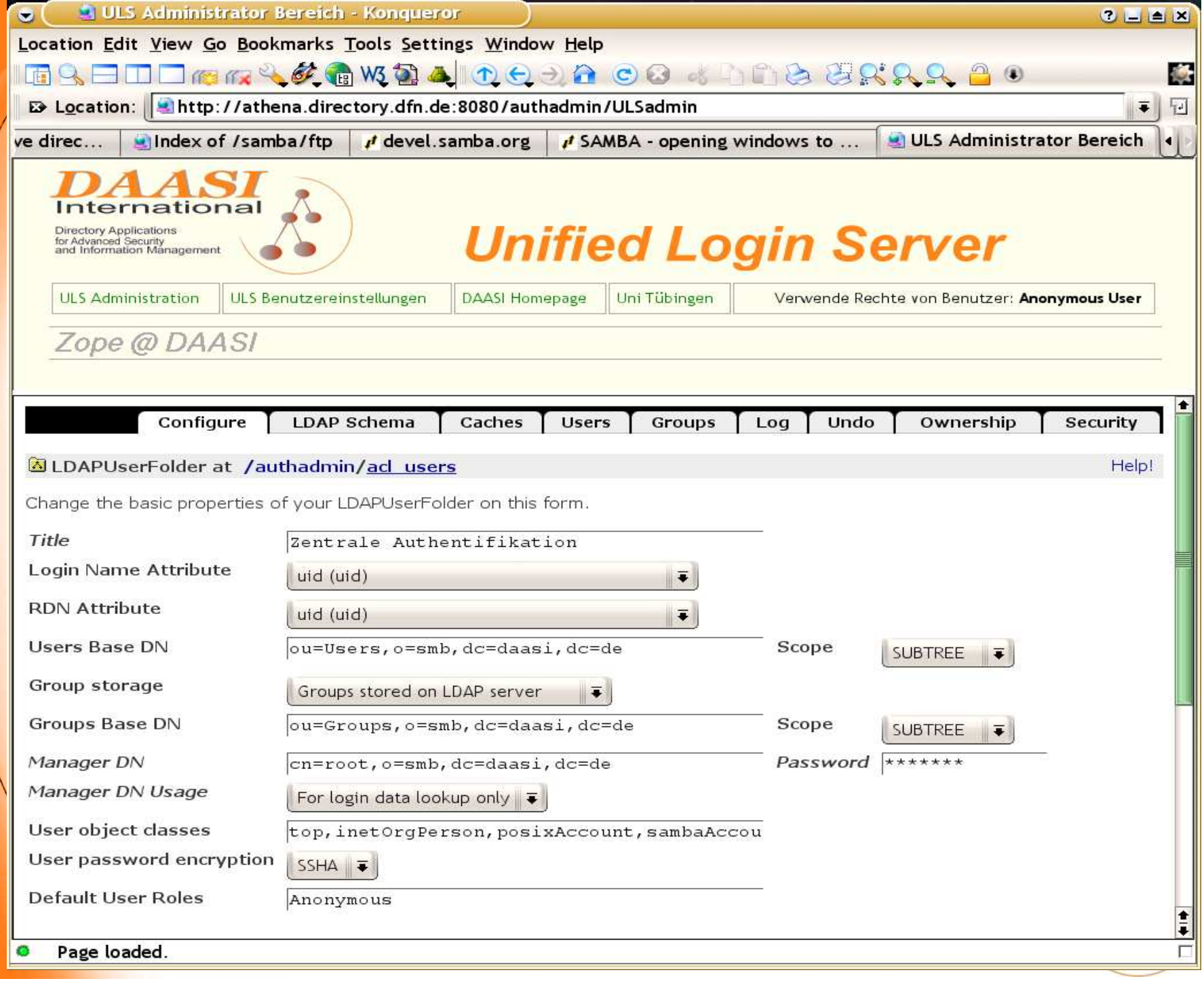
ULS Administrator Bereich - Konqueror
Location Edit View Go Bookmarks Tools Settings Window Help
Location: http://athena.directory.dfn.de:8080/authadmin/ULSadmin
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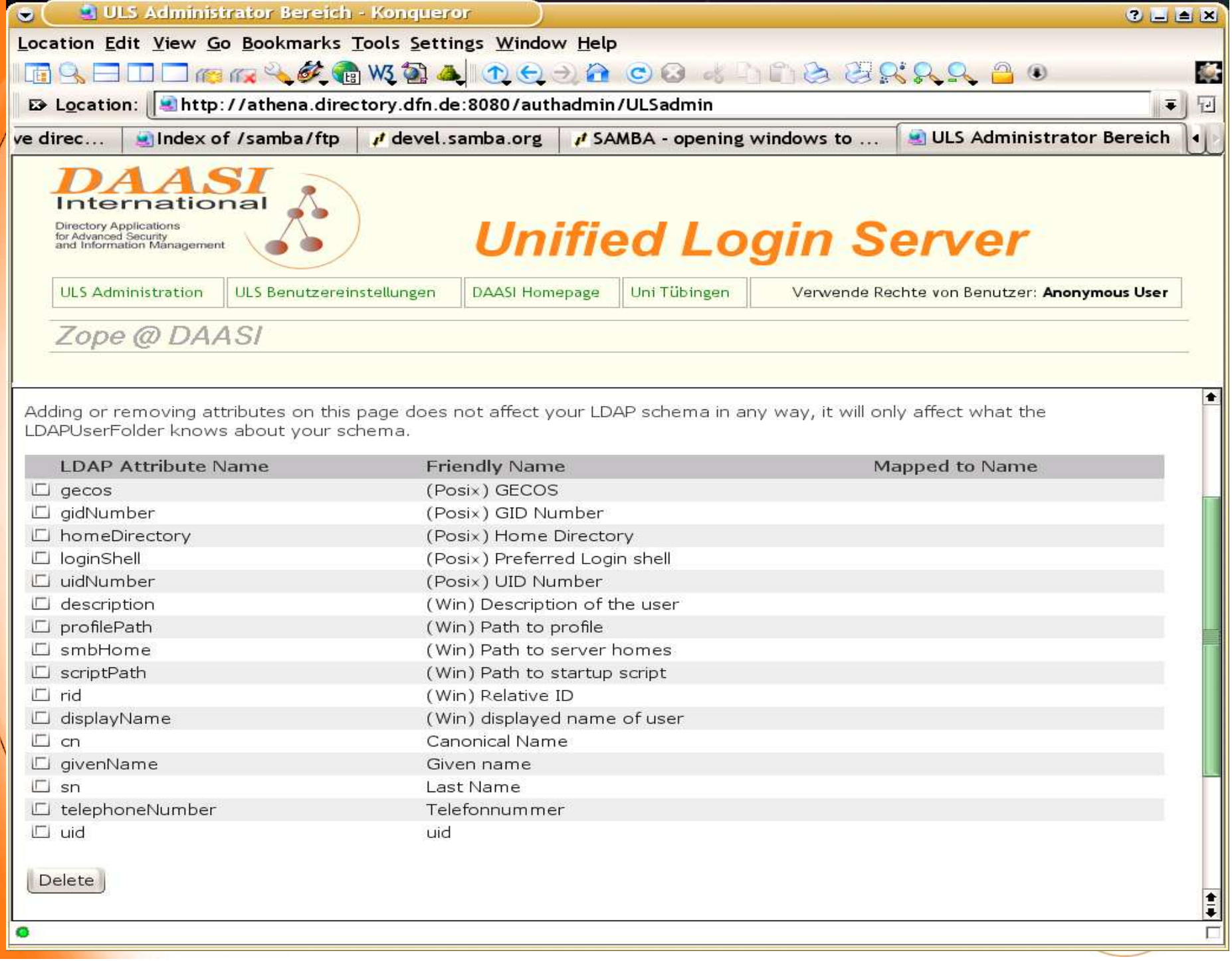
Unified Login Server
ULS Administration | ULS Benutzereinstellungen | DAASI Homepage | Uni Tübingen | Verwende Rechte von Benutzer: Anonymous User
Zope @ DAASI
Configure | LDAP Schema | Caches | Users | Groups | Log | Undo | Ownership | Security
LDAPUserFolder at /authadmin/acl_users
Help!
Change the basic properties of your LDAPUserFolder on this form.
Title
Zentrale Authentifikation
Login Name Attribute
uid (uid)
RDN Attribute
uid (uid)
Users Base DN
ou=Users,o=smb,dc=daasi,dc=de
Scope
SUBTREE
Group storage
Groups stored on LDAP server
Groups Base DN
ou=Groups,o=smb,dc=daasi,dc=de
Scope
SUBTREE
Manager DN
cn=root,o=smb,dc=daasi,dc=de
Password
****
Manager DN Usage
For login data lookup only
User object classes
top,inetOrgPerson,posixAccount,sambaAccou
User password encryption
SSHA
Default User Roles
Anonymous
Page loaded.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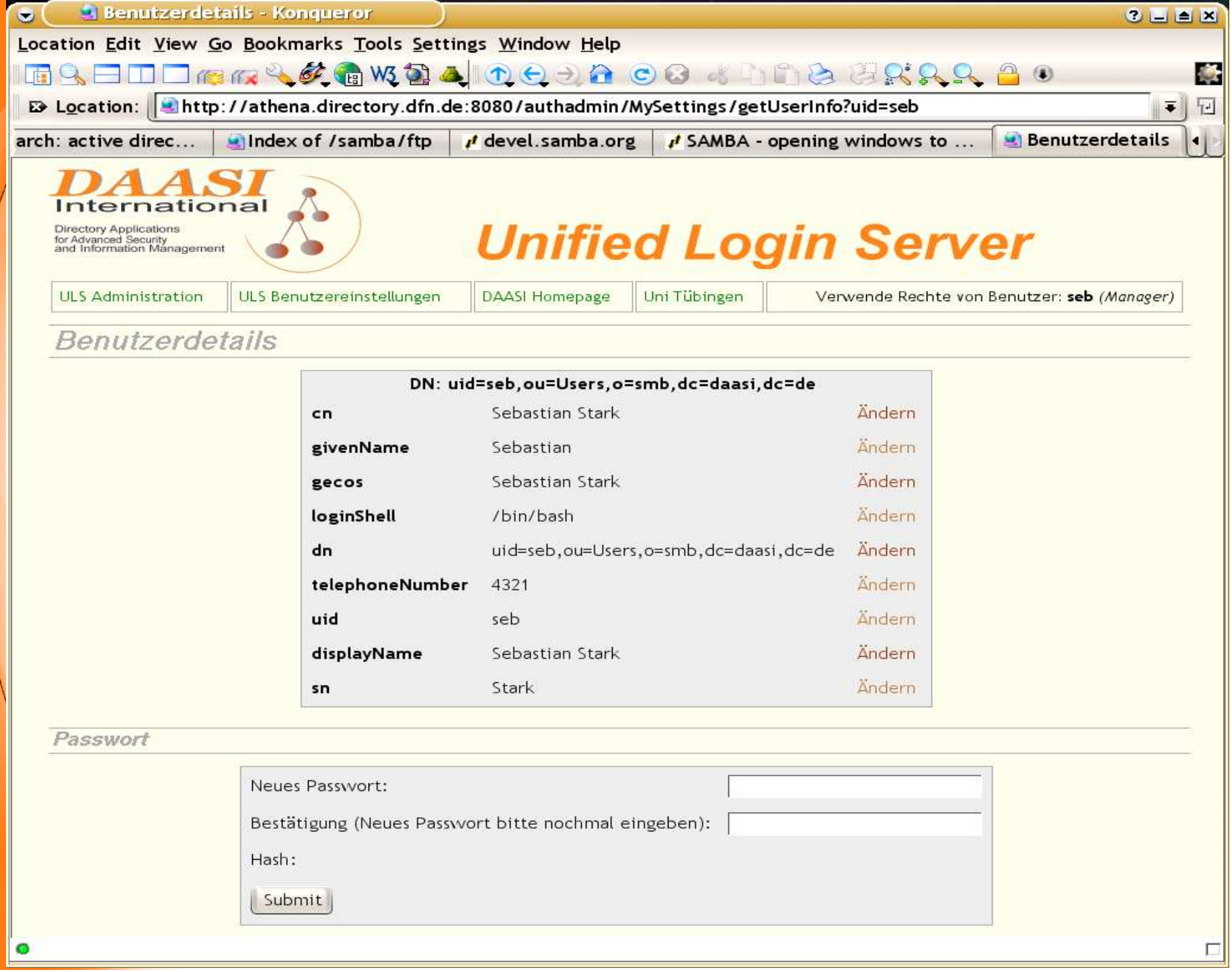
Unified Login Server
ULS Administration
ULS Benutzereinstellungen
DAASI Homepage
Uni Tübingen
Verwende Rechte von Benutzer: Anonymous User
Zope @ DAASI
Adding or removing attributes on this page does not affect your LDAP schema in any way, it will only affect what the LDAPUserFolder knows about your schema.
LDAP Attribute Name
Friendly Name
Mapped to Name
gecos (Posix) GECOS
gidNumber (Posix) GID Number
homeDirectory (Posix) Home Directory
loginShell (Posix) Preferred Login shell
uidNumber (Posix) UID Number
description (Win) Description of the user
profilePath (Win) Path to profile
smbHome (Win) Path to server homes
scriptPath (Win) Path to startup script
rid (Win) Relative ID
displayName (Win) displayed name of user
cn Canonical Name
givenName Given name
sn Last Name
telephoneNumber Telefonnummer
uid uid
Delete


Benutzerdetails - Konqueror
Location Edit View Go Bookmarks Tools Settings Window Help
Location: http://athena.directory.dfn.de:8080/authadmin/MySettings/getUserInfo?uid=seb
arch: active direc...
Index of /samba/ftp
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SAMBA - opening windows to ...
Benutzerdetails
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ULS Administration
ULS Benutzereinstellungen
DAASI Homepage
Uni Tübingen
Verwende Rechte von Benutzer: seb (Manager)
Benutzerdetails
DN: uid=seb,ou=Users,o=smb,dc=daasi,dc=de
cn Sebastian Stark Ändern
givenName Sebastian Ändern
gecos Sebastian Stark Ändern
loginShell /bin/bash Ändern
dn uid=seb,ou=Users,o=smb,dc=daasi,dc=de Ändern
telephoneNumber 4321 Ändern
uid seb Ändern
displayName Sebastian Stark Ändern
sn Stark Ändern
Passwort
Neues Passwort:
Bestätigung (Neues Passwort bitte nochmal eingeben):
Hash:
Submit

Migration from AD to OpenLDAP

- IDEALX tools help to migrate passwords
- We wrote a script that migrates all infos stored in AD to the OpenLDAP server
- You can in theory also migrate the profiles since samba supports the roaming profile feature (we are still working on that)

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Results

- Stable service via replicated LDAP server
- No performance problems via cashing
- Both directory implementations (AD and OpenLDAP) are fast enough for the requirements of a university

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Pros and cons

- Advantages:
  - User remebers only one password
  - Admin‘s and helpdesk‘s life is far easier
  - Unification of authentication processes
  - Central point for password evaluation
  - Before implementation you need a concept
- Caveats:
  - single point of failure (if without replication)
  - You need to enforce password policy (not yet implemented in OpenLDAP)
  - Admin access to clients should use local passwords

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Our view on Samba 3.0

- The "ldap passwd sync" feature main reason to switch to Samba 3.0.
  - Users can change their password using the standard windows password change dialog.
  - Samba cares for the necessary steps to update both, the passwords used by windows (LDAP attributes: ntPassword and lmPassword) an the userPassword attribute that is used by Unix clients.
  - Samba can delete a complete dn if the user is to be deleted from the Samba account database (= ldapsam) or only remove the attributes concerning windows.

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Samba 3.0 (contd.)

- The "ldap trust ids" feature
  - assumes that user ids returned from the LDAP database are always correct
  - So no need to lookup the corresponding Unix user.
  - This is very useful for our setup since we use nss_ldap and thus have valid UIDs in our database anyway.
- The upgrade process was clean and easy.
  - Having the account data in an LDAP directory does really help this process.
- Now the Code must prove its stability in our production environment.
- Not yet experimented with:
  - PDC replication stuff to set up a multimaster environment with Samba.
  - Samba Active Directory emulation.
  - group mapping of Samba 3.0 (still incomplete ?)

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Where to go from here ?

- Use Samba 3.0 in production service
- We are about to include SSO functionality via Kerberos
- Password policy in OpenLDAP!
- What about a complete domain controller simulation via Samba?
  - AD replication!

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References

- RFC 1510, „The Kerberos Network Authentication Service (V5)“
- RFC 1964, „The Kerberos Version 5 GSS-API Mechanism“
- RFC 2222, „Simple Authentication and Security Layer (SASL)“
- RFC 2246, „The TLS Protocol Version 1.0“
- RFC 2307, „An Approach for Using LDAP as a Network Information Service“
- RFC 2743, „Generic Security Service Application Program Interface Version 2, Update 1“
- RFC 2829, „Authentication Methods for LDAP“
- RFC 2830: „Lightweight Directory Access Protocol (v3): Extension for Transport Layer Security“
- RFC 2831, „Using Digest Authentication as a SASL Mechanism“
- RFC 3377, „Lightweight Directory Access Protocol (v3) Technical Specification“

More references

- Samba: www.samba.org
  - IDEALX tools: www.idealx.org/prj/samba/index.en.html
- LDAP:
  - New drafts: www.ietf.org/html.charters/ldapbis-charter.html
  - OpenLDAP: www.openldap.org
  - NSS_LDAP: www.padl.com/OSS/nss_ldap.html
  - PAM_LDAP: www.padl.com/OSS/pam_ldap.html
  - Reentry patch from Rein Tollevik: www.openldap.org/lists/openldap-software/200108/msg00594.html
- X.509:
  - www.ietf.org/html.charters/pkix-charter.html
- Cyrus project (SASL, IMAP): asg.web.cmu.edu/cyrus/
- Zope: www.zope.org
- Tutos: www.tutos.org

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Yet one more reference

- Diploma thesis on the subject, which was made inside the project:

  Norbert Klasen: „Directory Services for Linux in comparison with Novell NDS and Microsoft Active Directory“, www.daasi.de/staff/norbert/thesis/

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THANKS FOR YOUR ATTENTION

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  - http://www.daasi.de
  - Info@daasi.de
- DFN Directory Services
  - http://www.directory.dfn.de
  - Info@directory.dfn.de

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