SSH access with OIDC tokens

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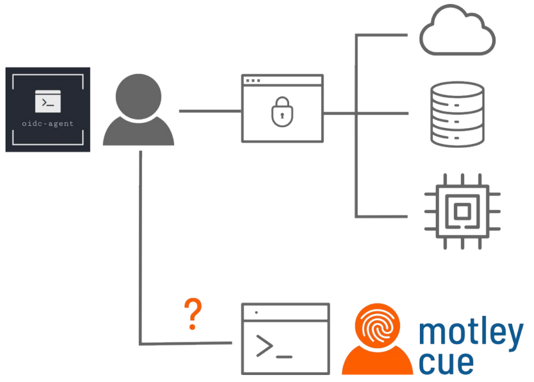
Motivation

- **Enable federated access to shell-based services**
  - Federated Identity Management → OpenID Connect (OIDC)
  - Shell-based services → Secure Shell (SSH), local identities

Our solution: server & client side tools

- Works with standard SSH software
- Uses OIDC tokens for AuthN & AuthZ
- Manages local identities



Why would you use it?

...as a user

- Single Sign-On (SSO)
- No additional service credentials
- No need for SSH key management
- No prior registration

Why would you use it?

...as a service provider

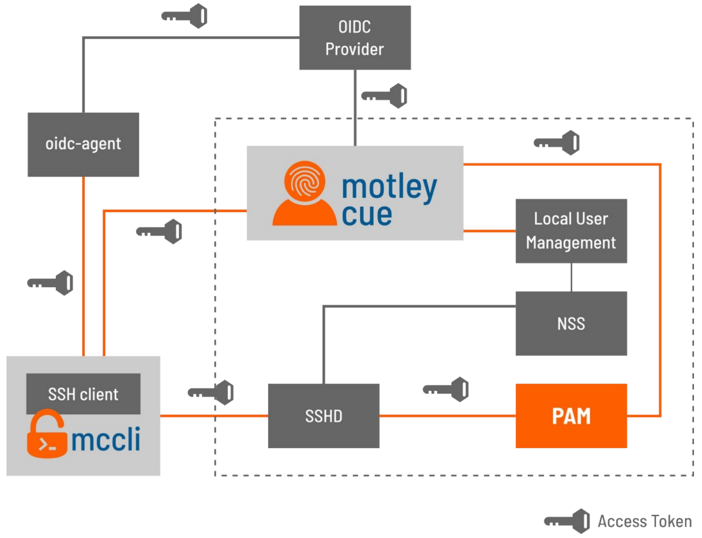
- Benefits of federated AAI
  - Offload identity management to home organisation
  - Offload authorisation management to federation (VOs)

Why would you use it?

...as a service provider

- Benefits of federated AAI
  - Offload identity management to home organisation
  - Offload authorisation management to federation (VOs)
- Bridges the gap from federated to local identity
  - Manages the mapping of federated to local accounts
  - Manages the lifecycle of local accounts (create, update, suspend)
  - Manages access control based on federated authorisation models
  - OIDC-based authentication → no need for managing additional credentials (passwords, ssh keys)

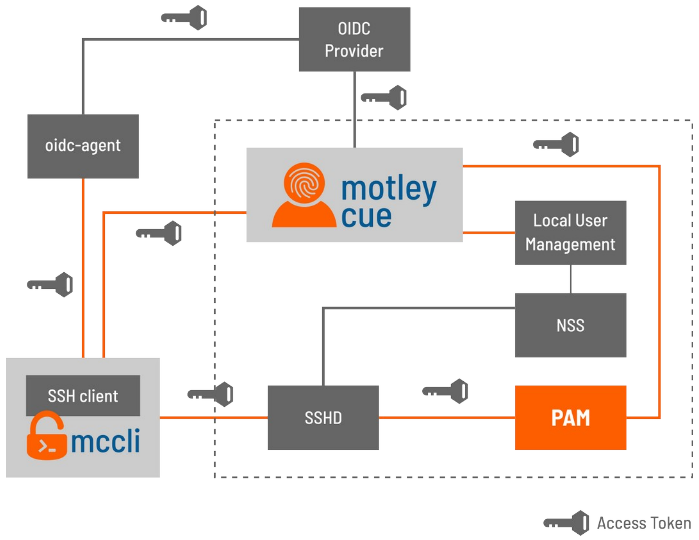
Approach



- Server side:
  - Use PAM module with oidc support: **pam-ssh-oidc** (PSNC/Pracelab.pl)[1]
  - Add REST interface to ssh-server to manage the details: **motley-cue**
- Client side:
  - **oidc-agent** for obtaining tokens
  - Enable **ssh-clients** to use tokens

[1] developed at PSNC

Approach



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No modifications of ssh or sshd

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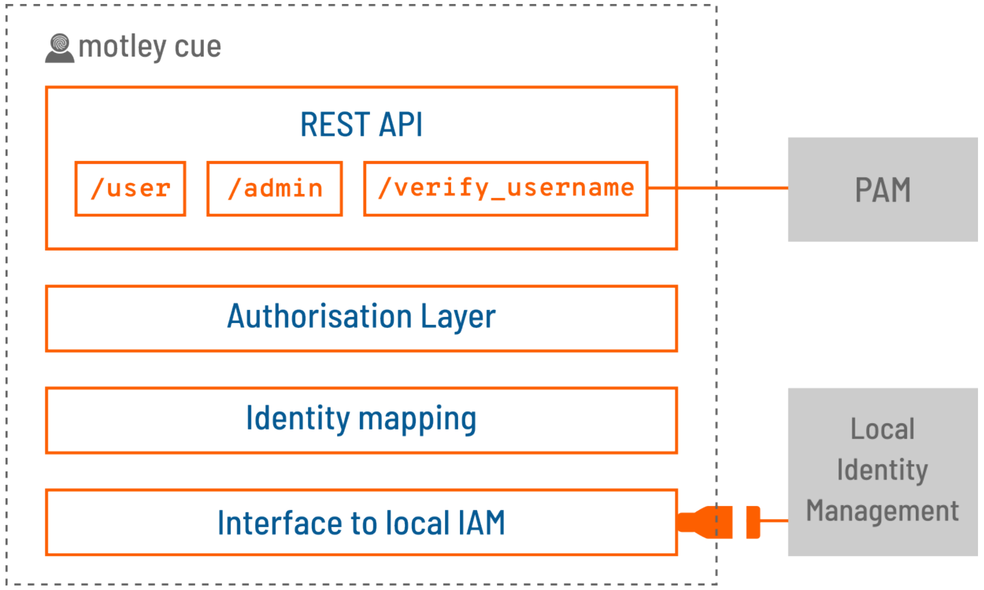
Server Side

motley-cue architecture



Authorisation

- Support for multiple OIDC Providers
- Based on VO membership
- Based on assurance
- Individual users via sub+iss

Account provisioning

- Interface to site-local identity management systems
  - Extensible, plug-in architecture
  - Supported identity backends: UNIX accounts, LDAP, KIT RegApp

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- Interface to site-local identity management systems
  - Extensible, plug-in architecture
  - Supported identity backends: UNIX accounts, LDAP, KIT RegApp
- Identity mapping: **`sub + iss → local username`**
  - Stored directly in the local IdM system
  - username generation strategies → uniqueness
    - Friendly: preferred username, first_last, ...
    - Pooled: egi001, egi002, ...
  - VOs mapped to local groups

Advanced features

- Approval workflow → admins oversee all deployment requests
- LDAP backend → for managing local accounts
- Audience → restrict access to tokens released for configured audience
- Long tokens → 1kB too long for SSH, generate one-time tokens

Technical details

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```
$ apt install motley-cue pam-ssh-oidc
$ vim /etc/motley_cue/motley_cue.conf
$ systemctl restart motley-cue
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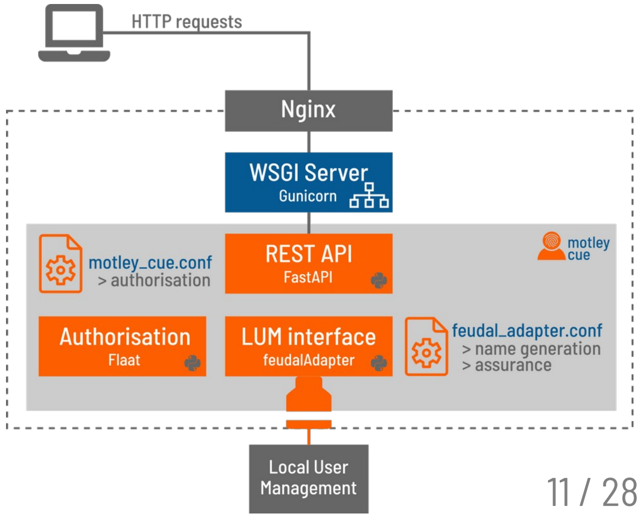


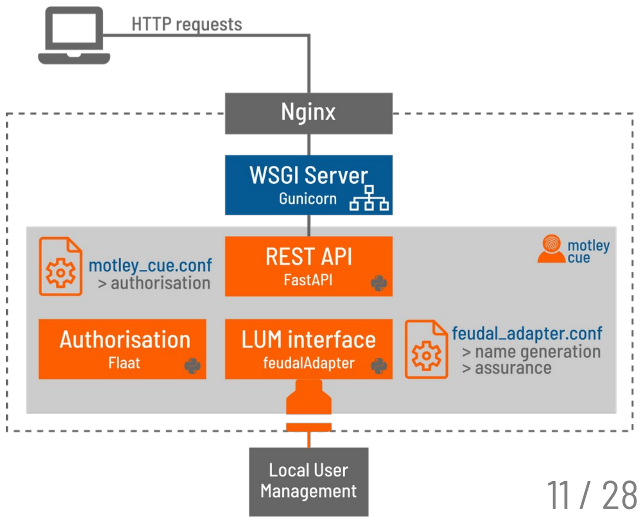
Technical details

http://repo.data.kit.edu

- Easy deployment
  - Packages for most common Linux distributions
  - systemd integration
- Python, FastAPI
- Nice to know
  - SSH daemon is not modified
  - PAM module may be combined with other modules

```
$ apt install motley-cue pam-ssh-oidc
$ vim /etc/motley_cue/motley_cue.conf
$ systemctl restart motley-cue
```

```
Possible:
ssh-key + password + OIDC + 2nd factor (linotp)
```



Client Side

SSH Clients

- 2 Simple changes on the command line:
  - add our wrapper tool mccli
  - replace username with identity provider

    Old: ssh **diana@**ssh-oidc-demo.data.kit.edu

    New: **mccli** ssh ssh-oidc-demo.data.kit.edu **--oidc egi**
- Tools to install:

```
$ pip install mccli
$ apt-get install oidc-agent
```

- Again: packages provided for all major Operating Systems

SSH Clients

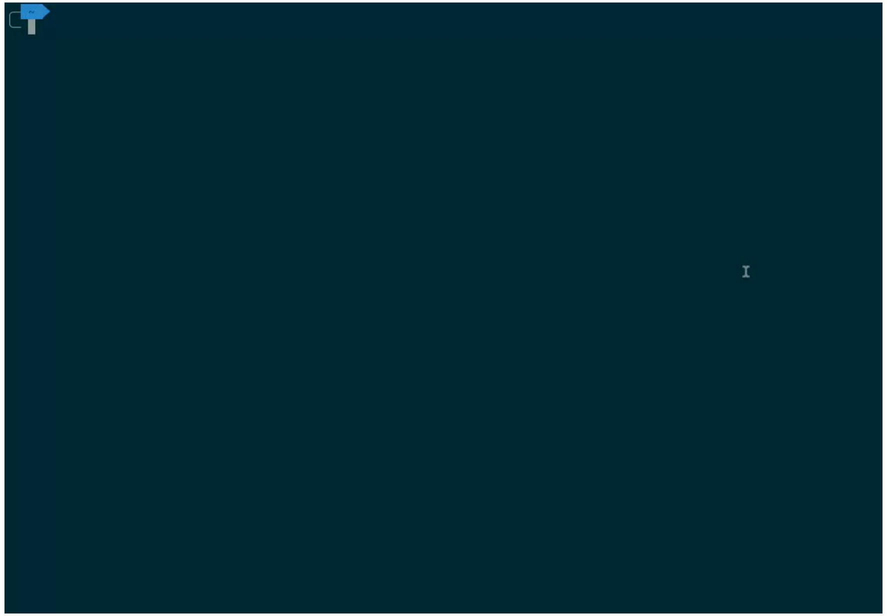
- Everything is different on Windows ;)
- PuTTY SSH client required source code modifications
  - Joint effort with Simon Tatham (PuTTY main developer)
  - General Plugin Interface (available in putty-0.78: `https://www.chiark.greenend.org.uk/~sgtatham/putty/prerel.html`)
- Plugin and oidc-agent installed and shipped together `http://repo.data.kit.edu/windows/oidc-agent`

Demo

https://ssh-oidc-demo.data.kit.edu/

https://youtu.be/IrwmnHmxbTQ

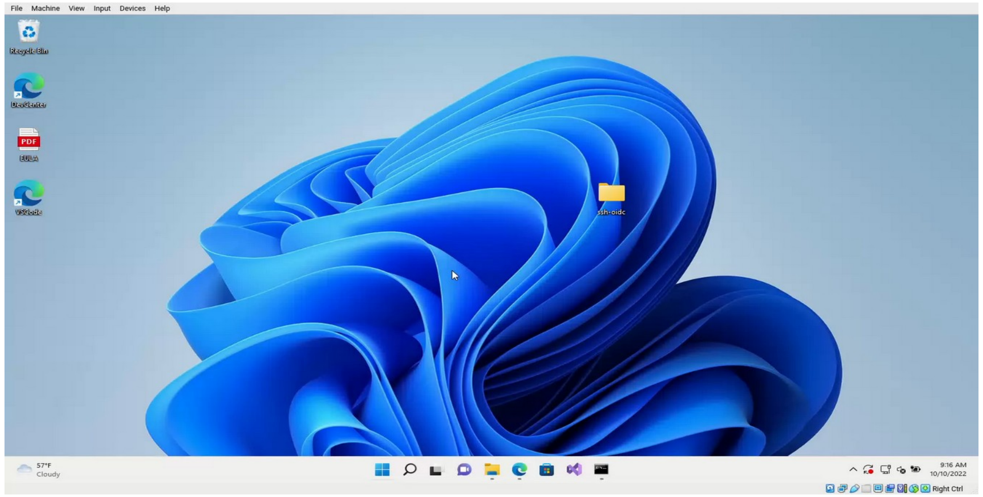
Demo Linux



https://youtu.be/9wUN2Vyghsg

Demo Windows

- Short version of demo: assume oidc-agent already set up
- Choices are cached. User only enters password **once** (for each windows reboot)



Additional requirements

- ✔ Mitigate sharing of SSH keys → by not using SSH keys, but access tokens for AuthN
- ✔ Non-interactive client logins → with oidc-agent integration
- ✔ Delegation → via oidc-agent forwarding, the token is available on server
- ✔ MFA → possible with additional PAM modules
- ✔ Revocation → two options:
    - Revocation of tokens (access token / refresh token) possible
    - /admin endpoint to suspend/resume users

Contributors

- **PAM module (pam-ssh-oidc):** Pracelab.PL (Pawel Wolniewicz (PSNC), Damian Kaliszan (PSNC))
- **User provisioning (feudal):** KIT (Lukas Burgey, Joshua Bachmeier, Diana Gudu, Marcus Hardt)
- **Integration serverside (motley_cue):** HIFIS (Diana Gudu (KIT), Andreas Klotz (HZB))
- **HPC Integration and testing:** EOSC-Synergy (Diana Gudu (KIT), Rubén Díez, CESGA))
- **Integration, consulting, and review:** Enol Fernandez (EGI), Viet Tran (IISAS), Mario David (LIP), Mischa Salle (Nikhef)
- **Infrastructure Manager Integration:** Miguel Caballer (UPV), German Molto(UPV)
- **oidc-agent integration:** KIT (Gabriel Zachmann (KIT))
- **putty-integration:** Dmytro Dehtyarov (KIT/GEANT), Jonas Schmitt (KIT), Simon Tatham (Putty)

More information

- Download oidc-agent for Windows & PuTTY

  https://repo.data.kit.edu/windows/oidc-agent

- Documentation

  https://github.com/EOSC-synergy/ssh-oidc

- Contact

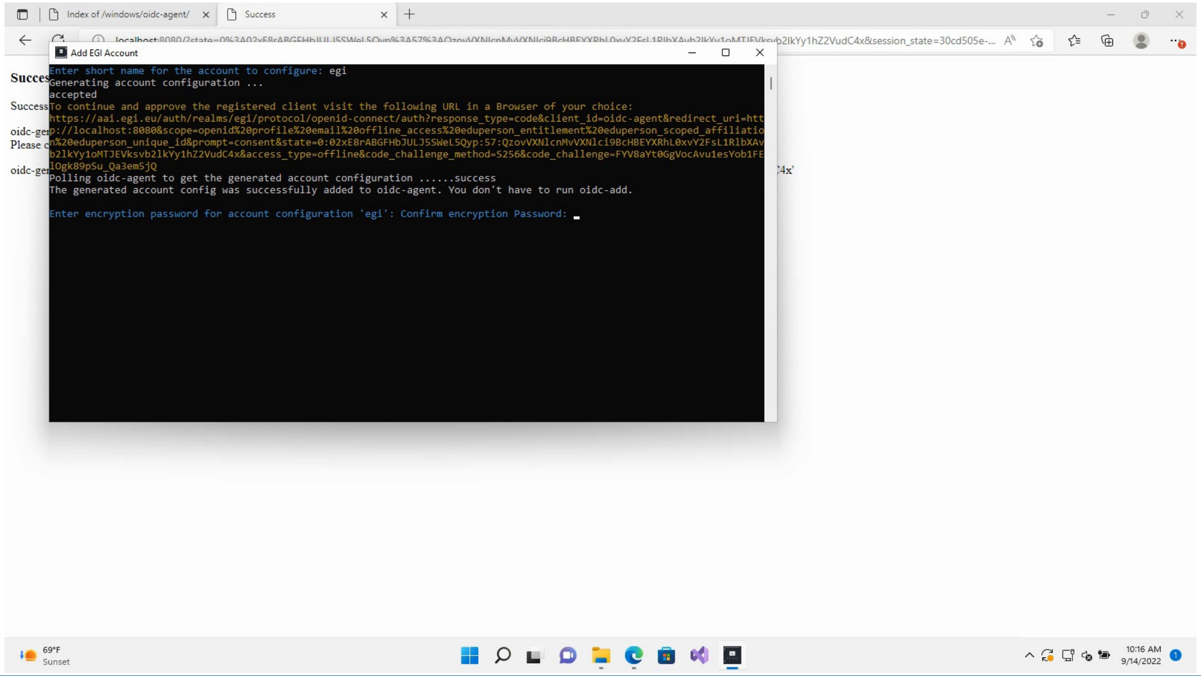
  m-contact@lists.kit.edu

Backup slides

https://youtu.be/OUaEcm1nbNw

Demo Windows

- This demo shows the first-time setup on Windows
- Choices are cached. User only enters password **once** (for each windows reboot)



```
Enter short name for the account to configure: egi
Generating account configuration ...
accepted
To continue and approve the registered client visit the following URL in a Browser of your choice:
https://aai.egi.eu/auth/realms/egi/protocol/openid-connect/auth?response_type=code&client_id=oidc-agent&redirect_uri=htt
p://localhost:8080&scope=openid%20profile%20email%20offline_access%20eduperson_entitlement%20eduperson_scoped_affiliatio
n%20eduperson_unique_id&prompt=consent&state=0:02xE8rABGFHbJULJ5SWeL5Qyp:57:QzovVXNlcnMvVXNlci9BcHBEYXRhL0xvY2FsL1RlbXAv
b2lkYy1oMTJEVksvb2lkYy1hZ2VudC4x&access_type=offline&code_challenge_method=S256&code_challenge=FYV8aYt0GgVocAvu1esYob1FE
lOgk89pSu_Qa3em5jQ
Polling oidc-agent to get the generated account configuration ......success
The generated account config was successfully added to oidc-agent. You don't have to run oidc-add.

Enter encryption password for account configuration 'egi': Confirm encryption Password:
```

Requirements on federated identity

- We support a long list of OPs
  - Helmholtz AAI, EGI Check-in, DEEP IAM, WLCG, Google, ...
- Only require a valid AT (JWT or not → e.g. Google)
- AuthZ based on: VO membership, assurance, user whitelisting
  - federated identity should support this
  - AT should contain required scopes
    - typically: groups/eduperson_entitlement, eduperson_assurance
- Audience only if supported

Client requirements

- Supported platforms: Linux, MacOS, Windows
- Requirements Linux & MacOS:
  - python + oidc-agent + mccli
  - unmodified SSH client
  - can also use bare SSH for subsequent logins with user interaction if
    - local account deployed & known, and
    - AT can be obtained from other sources
- Requirements Windows:
  - PuTTY v0.78 (currently pre-release)
  - oidc-agent (also installs oidc-plugin for PuTTY)

Server requirements

- Supported platforms: Linux
- Additional software:
  - motley-cue
  - nginx
  - pam-ssh-oidc
- Unmodified ssh server
- Configuration:
  - sshd with challenge response authentication
  - Custom PAM module
  - Open port for HTTP requests

PAM-OIDC

- Based on OIDC access token authentication
  - user is prompted for an Access Token instead of Password
- Written in C
- Query motley_cue service API for:
  - token validation
  - authorisation
  - username match

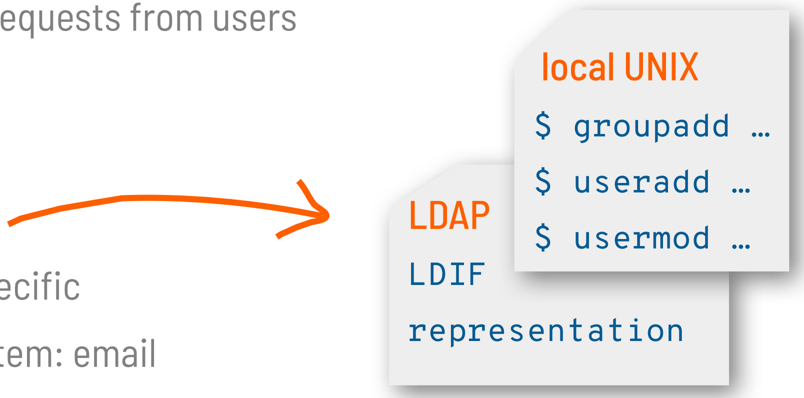
```
$ curl -X 'GET' \
    $motley_cue_endpoint/verify_user&username=$username \
    -H “Authorization: Bearer $token”

{
  "state": "deployed",
  "verified": true
}
```

Approval workflow

https://github.com/dianagudu/egi-2022-demo

- Admins can oversee all deployment requests from users
- How it works:
  - User triggers **deployment**
  - Admin (and user) is **notified**
    - notification is backend-specific
    - supported notification system: email
  - Admin **accepts** or **rejects** the request manually
  - Users are *not* notified of acceptance/rejection → pull model
- Subsequent deployment requests
  - notify the admin only when updates are necessary



```
$ groupadd …
$ useradd …
$ usermod …
```

```
LDIF
representation
```

LDAP backend

https://github.com/dianagudu/egi-2022-demo

- Local accounts are managed in an LDAP
  - OIDC unique ID stored in a configurable attribute
  - Required LDAP schemas: inetOrgPerson, posixAccount, posixGroup
- Modes
  - read-only: local user management fully controlled by LDAP admins, including mapping
  - pre-created: motley-cue adds the mapping information to pre-created accounts
  - full-access: motley-cue has full control to provision users and groups in LDAP