IDTOKEN Authentication in the HTCondor Software Suite (HTCSS)

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  - Need for yet another authentication method
- Basic Concepts and Usage
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  - For Users: Using IDTOKENS to utilize a remote Access Point
- Advanced Topics
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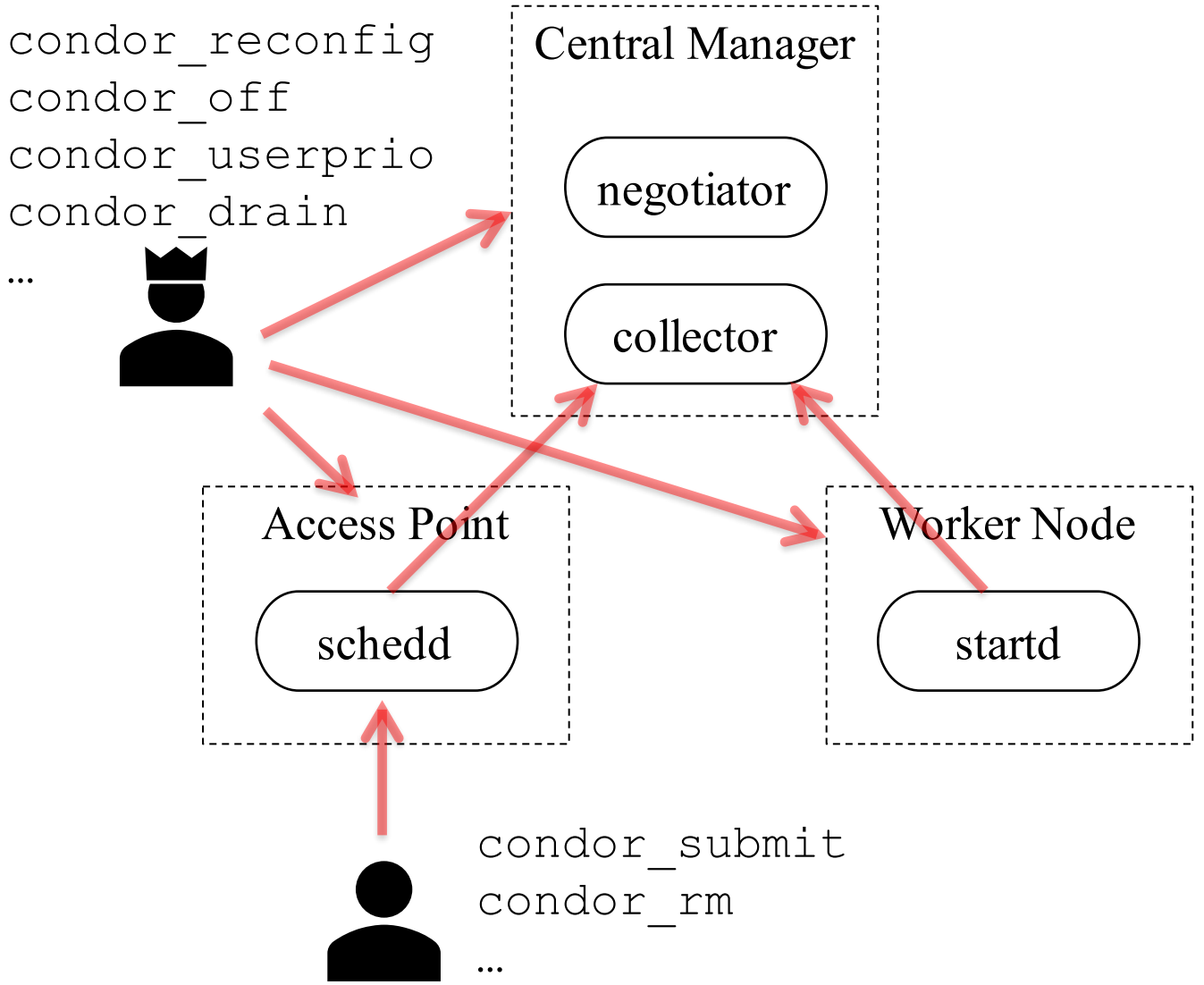
  - Multiple signing keys, multiple tokens
  - Token Requests
  - How does HTCSS securely present IDTOKENS

Introduction and Motivation

Need for Authentication in HTCSS

1. HTCondor services (aka daemons) authenticating to remote HTCondor services
   - *Only allow trusted nodes into the pool*
2. Users authenticating to an Access Point (schedd)
   - *Need to know who owns which jobs*
3. Admins authenticating to an HTCondor service
   - *Only allow trusted users to make administrative changes*



After Authentication comes Authorization

- Authentication method results an identity
- Identities are granted *authorizations* via HTCSS configuration, e.g.

```
# Processes that authenticate as user condor
# are considered services in my HTCondor Pool
ALLOW_DAEMON = condor@mysite
# Users alice and bob can submit jobs
ALLOW_WRITE = alice@mysite, bob@mysite
# root or condor can do administration
ALLOW_ADMINISTRATOR = root@mysite, condor@mysite
```

Why yet another authentication method?

- HTCSS can perform authentication via many different methods, but they all had shortcomings or complications…
  - FS (filesystem) : Cannot work over the network, since the server challenges the client to create a file with proper ownership in /tmp
  - POOL (pool password): Only for daemons, not for tools / users.
  - SSL, GSI, SCITOKENS, KERBEROS, MUNGE: Requires significant setup work and/or installations from third-party for tools/services
- Wanted a solution that is *self-contained*, works over the *network*, and works for *daemons or users using tools*
  - Thereby suitable for a "secure by default" installation

BASIC CONCEPTS AND USAGE

The IDTOKEN

```
$ condor_token_list
Header: {"alg":"HS256","kid":"POOL"}
Payload: {
issued date → "iat": 1588474719,
issuer → "iss": "pool.example.com",
unique id → "jti": "c760c2af193a1fd4e40bc9c53c96ee7c",
identity → "sub": "alice@pool.example.com"
}
```

- An IDTOKEN contains:
  - An ***Identity***. *Also*
    - *Issuer, Unique ID, Issued date, possibly an Expiration date.*
    - *Authorization limits*. If present, these reduce the authorizations configured at the server – it does NOT add authorizations.
  - All signed with a ***Digital Signature*** (using a secret ***signing key*** stored on the server) to prove authenticity
  - Serialized out as an alphanumeric string and stored in a file.
- An IDTOKEN is always presented by a *client* to a *server*.
  - The server must have access to the same secret key that was used to sign the client's token.

Two Concrete Examples

- **Example 1** - For Admins:

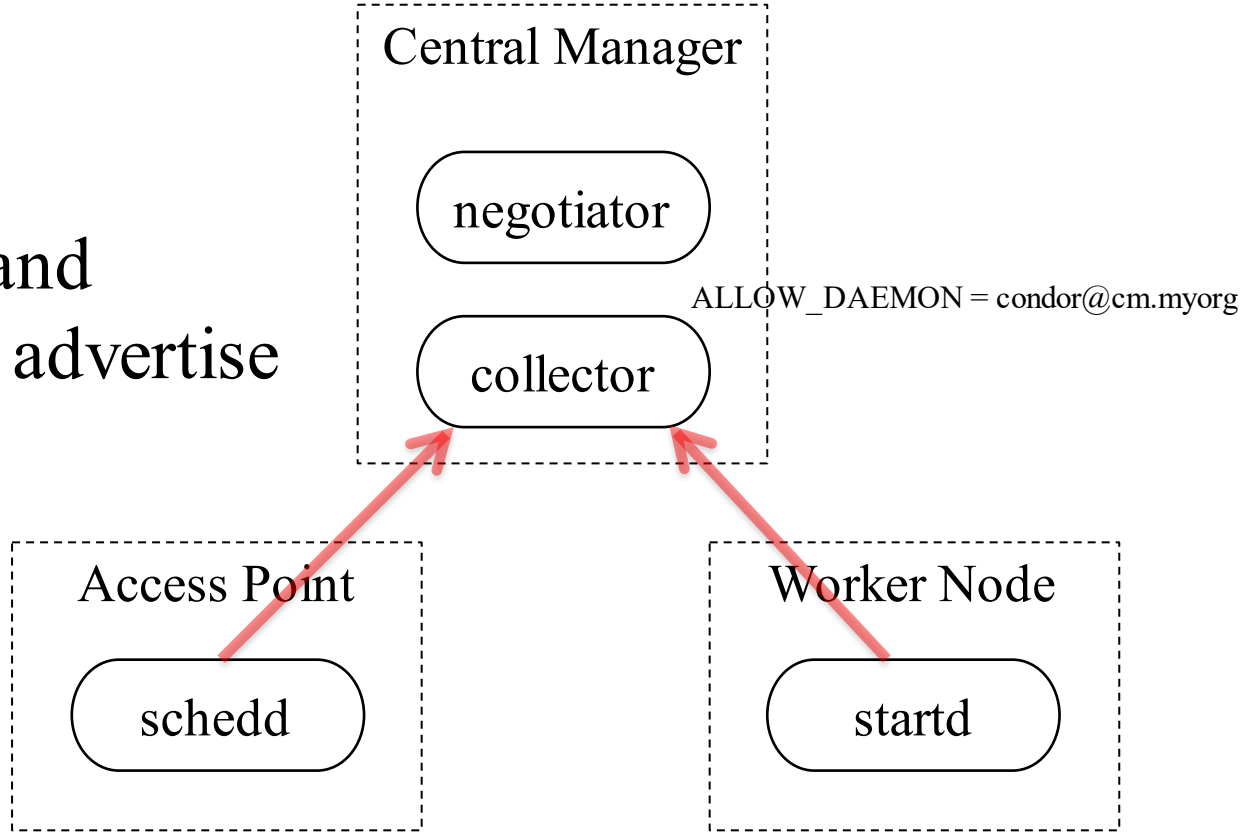
  Using IDTOKENS to secure your Pool

  (or exactly how does *get_htcondor* setup security?)
- **Example 2** - For Users:

  Using IDTOKENS to utilize a remote Access Point

Example 1: IDTOKENS to secure a pool

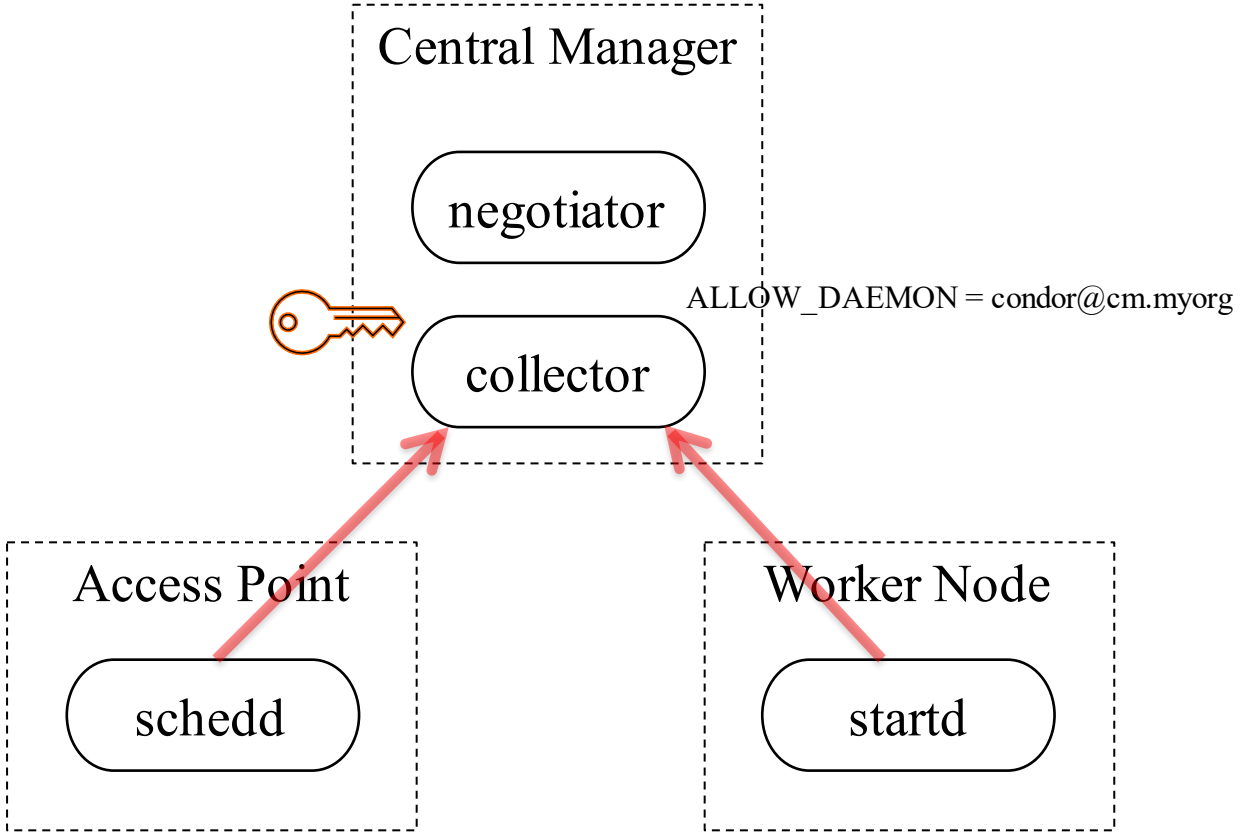
The key to a secure pool is to only allow trusted (authenticated and authorized) startds and schedds to advertise into the collector.



Example 1: IDTOKENS to secure a pool

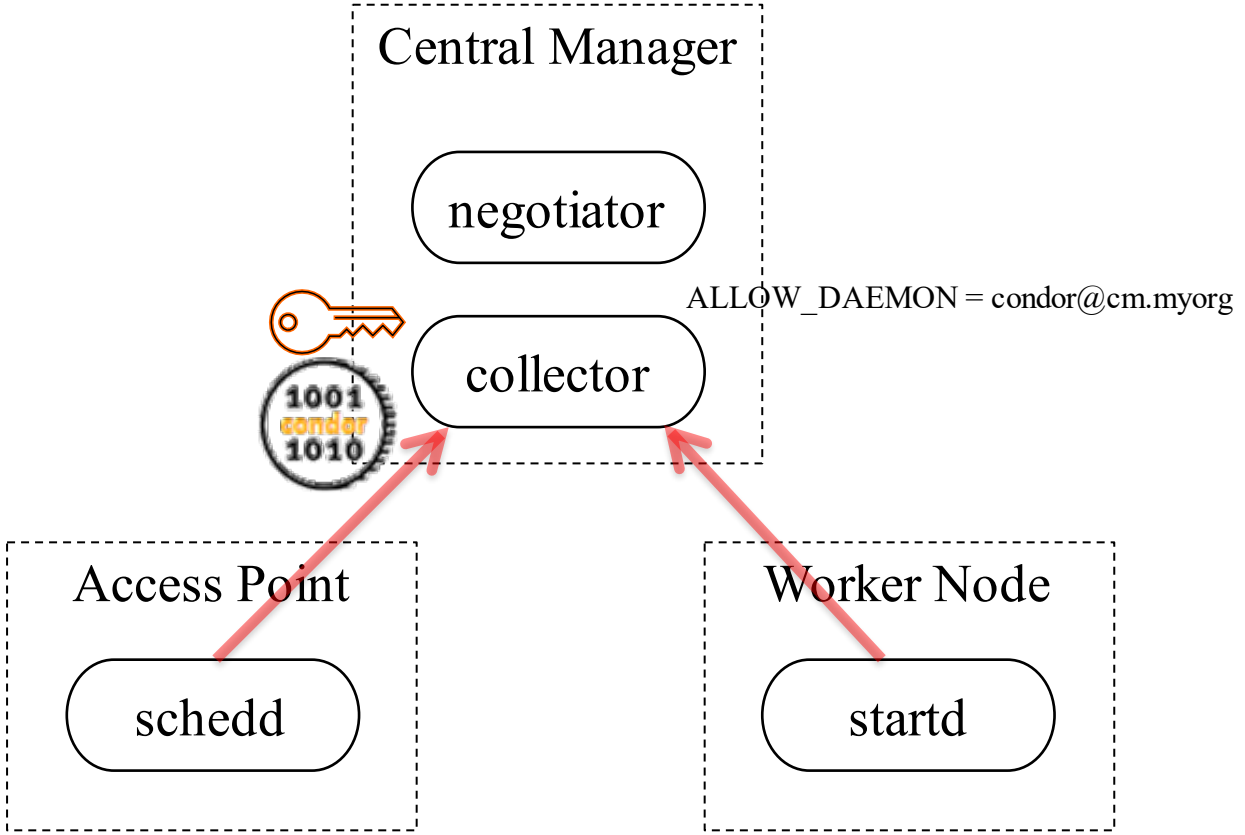
- 1. Create a signing key file on the central manager
  - A random key will be created by default at collector startup, or explicitly create with tool:

    condor_store_cred add -c
  - Signing key is stored by default in file /etc/condor/passwords.d/POOL



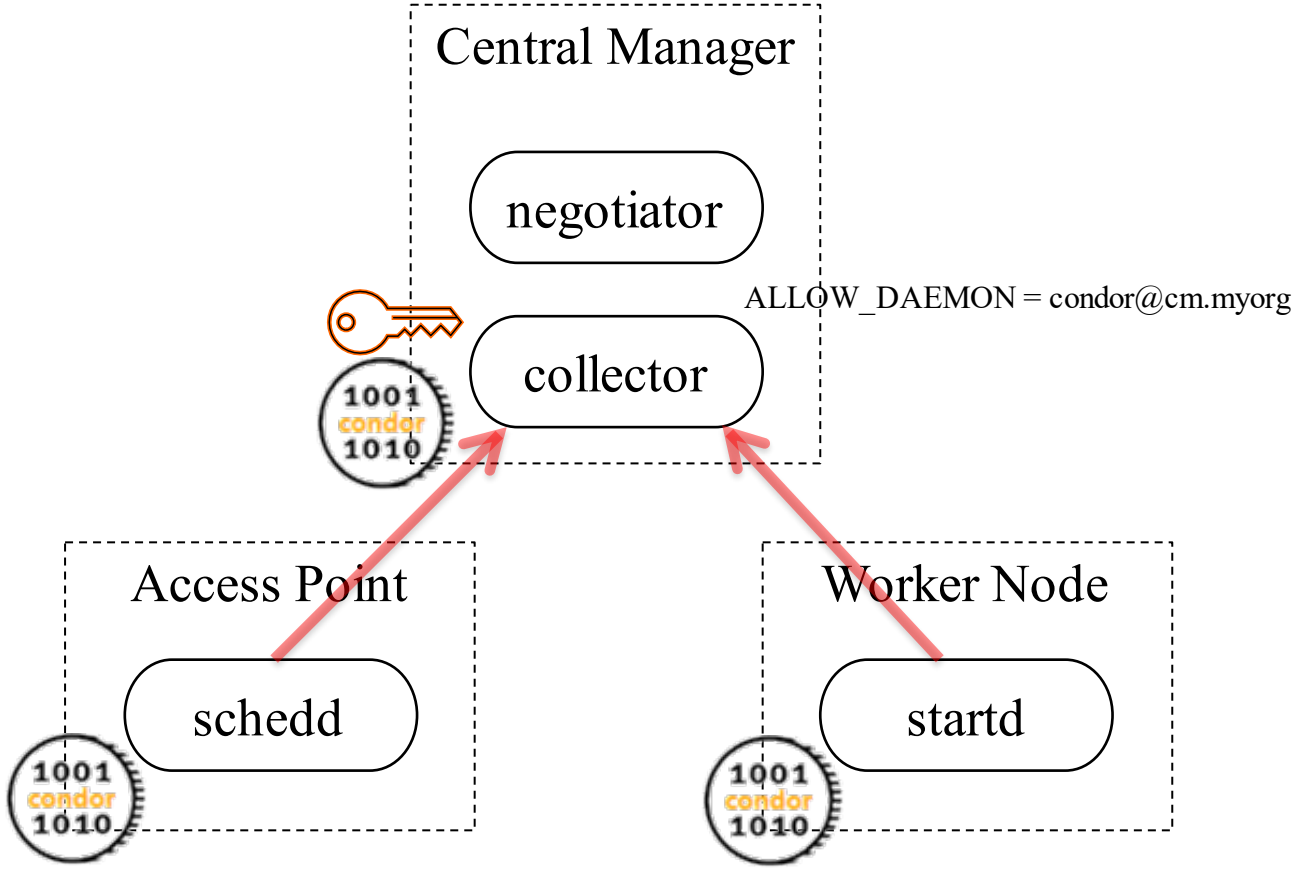
Example 1: IDTOKENS to secure a pool

- 1. Create a signing key file on the central manager
- 2. Create an IDTOKEN file with identity "condor" on central manager
  - Use tool
    condor_token_create -identity condor@cm.myorg



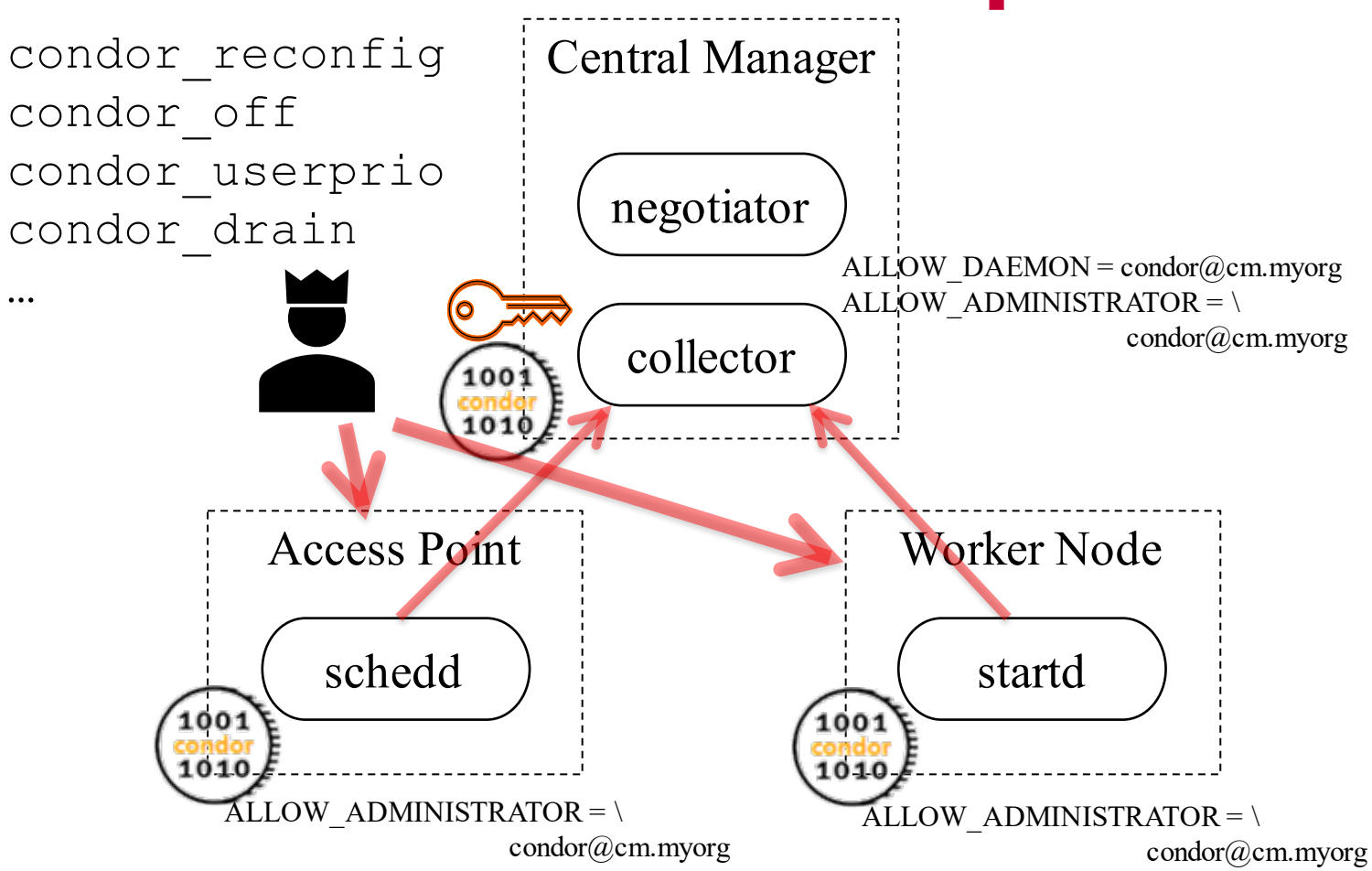
Example 1: IDTOKENS to secure a pool

- 1. Create a signing key file on the central manager
- 2. Create an IDTOKEN file with identity "condor" on central manager
  - Use tool
    condor_token_create -identity condor@cm.myorg
- 3. Copy this IDTOKEN file to each trusted server you want to join your pool
  - Place file into directory
    /etc/condor/tokens.d



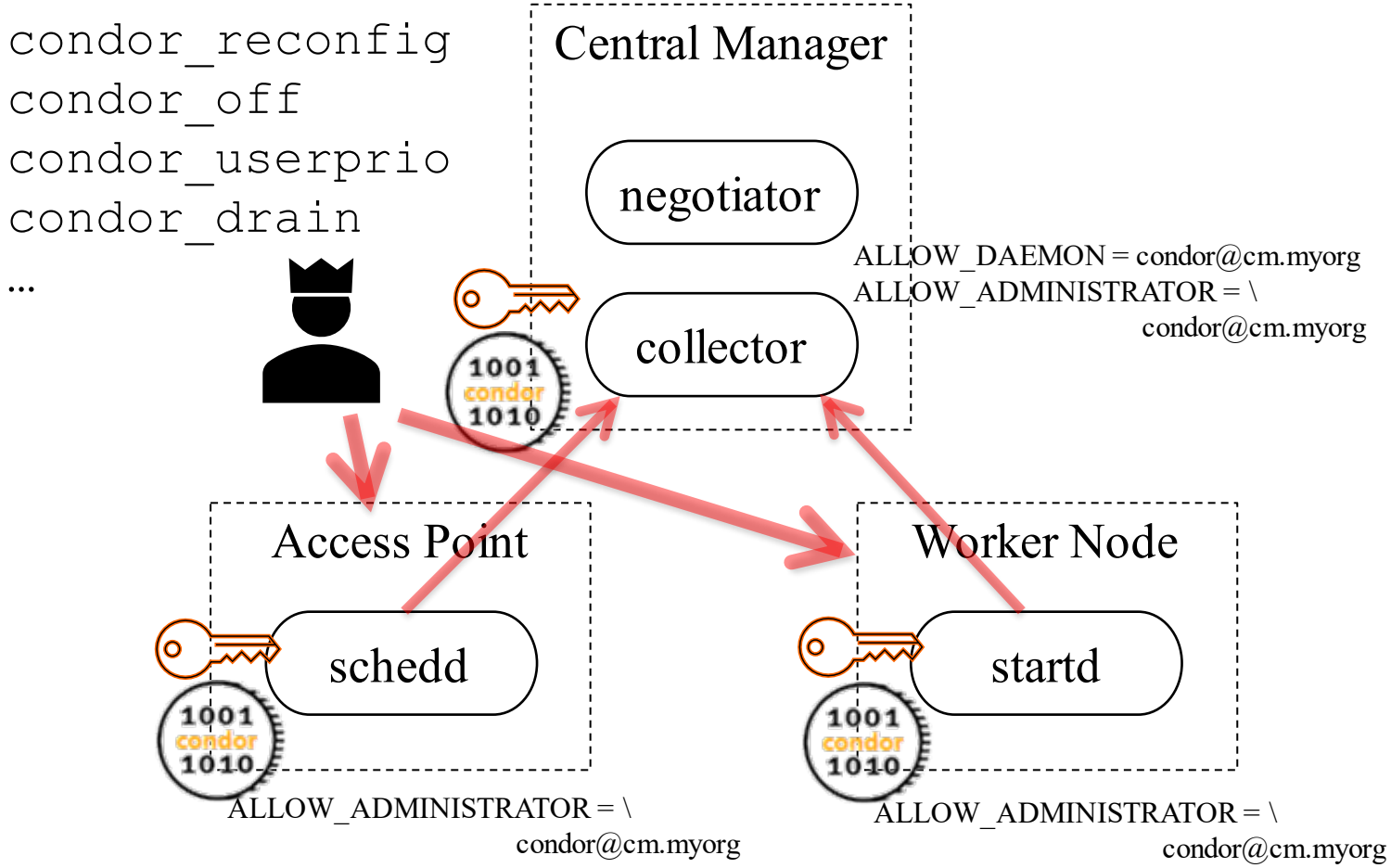
Example 1: IDTOKENS to secure a pool

- What about securing administrator commands?
- Say we want root on the central manager to be able to issue admin commands to remote access points and worker nodes…. ?
  - Hint: It won't work – the access point and worker nodes cannot validate the token (no signing key)



Example 1: IDTOKENS to secure a pool

- What about securing administrator commands?
- Say we want root on the central manager to be able to issue admin commands to remote access points and worker nodes…. ?
  - Hint: It won't work – the access point and worker nodes cannot validate the token (no signing key)
  - A Solution: Place the signing key on all trusted nodes in your pool! Voila!



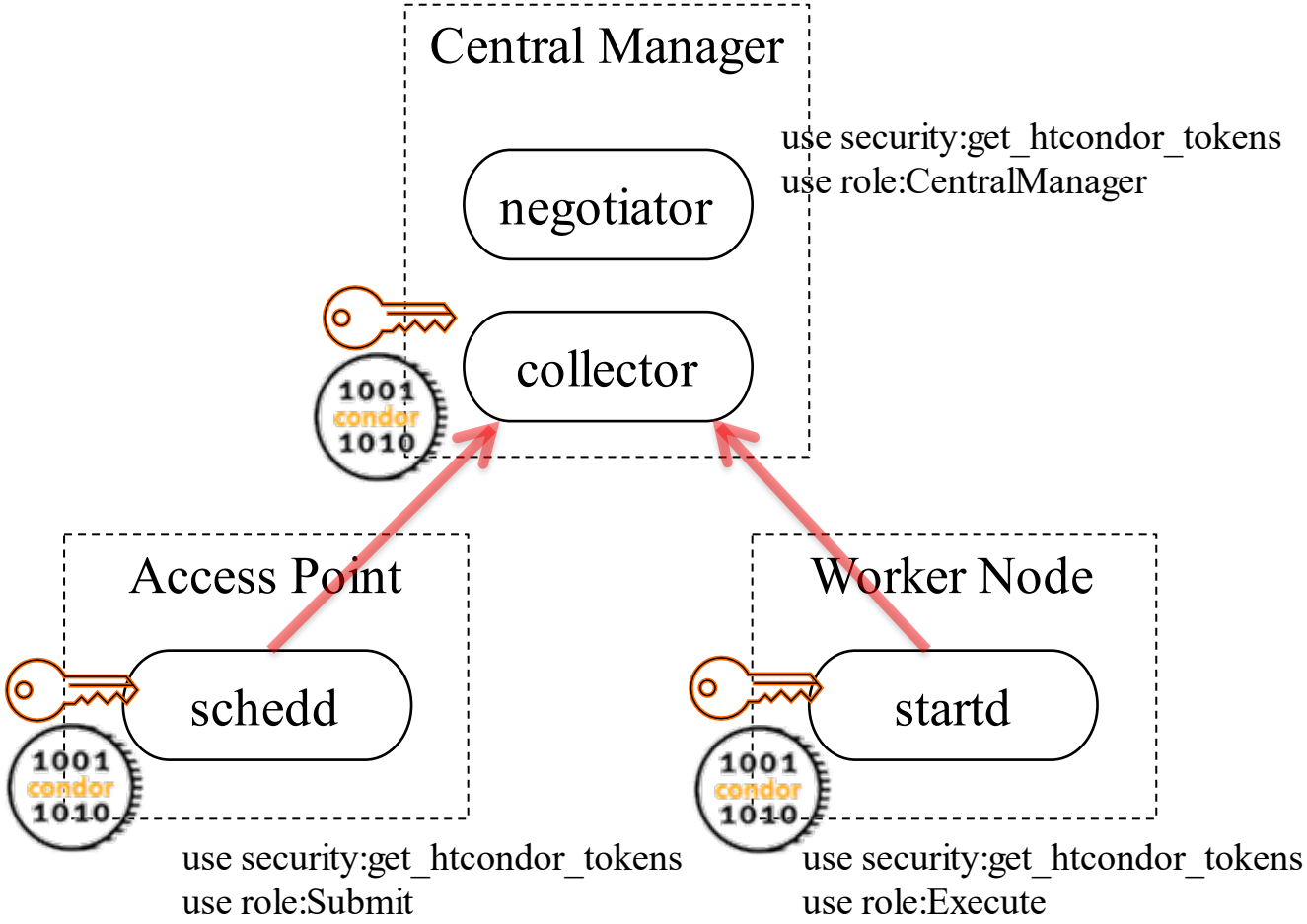
Example 1: IDTOKENS to secure a pool

- This diagram depicts how a pool is configured for security after installing via the *get_htcondor* tool!
- You can learn a lot by inspecting output from

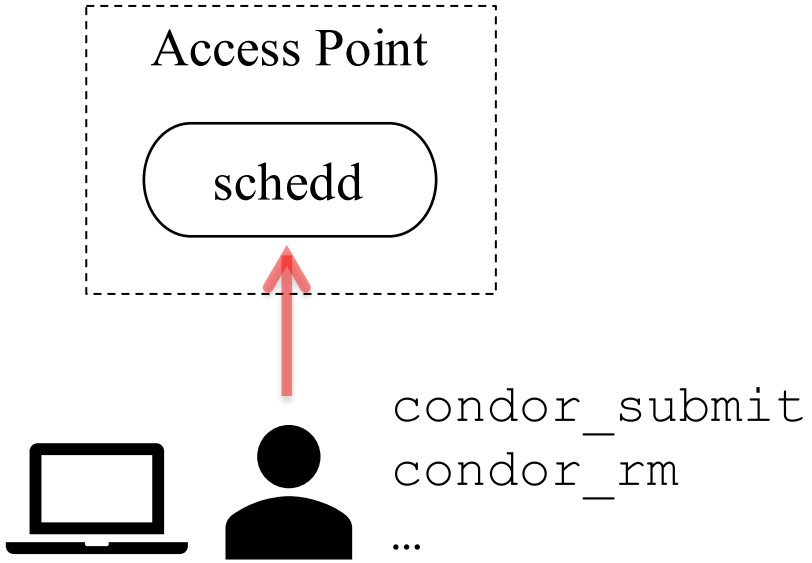
curl -fsSL get.htcondor.org | bash -s -- --execute cm.org

and

condor_config_val use security:get_htcondor_idtokens



Example 2: Using a remote Access Point

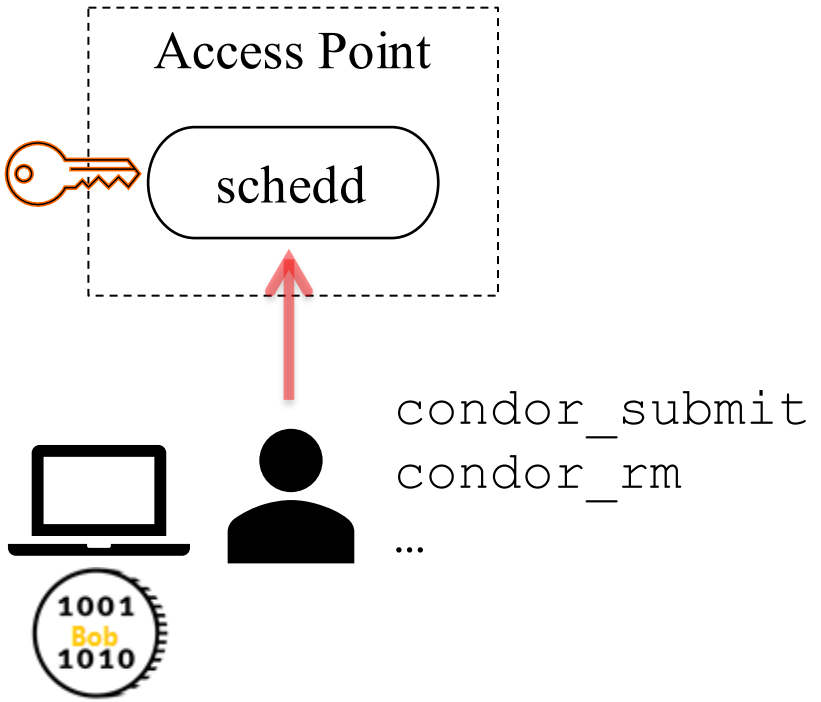


Bob is a normal user (no root access)
Bob can ssh into an access point and submit.
But he wants to submit from his laptop…

Example 2: Using a remote Access Point

- Step 1: Bob does a ssh login to his access point
  - He cannot use `condor_token_create`; only root can read signing keys in /etc/condor/passwords.d … so instead…
- Step 2: Bob creates an IDTOKEN with identity "Bob" via `condor_token_fetch` tool
  - `condor_token_fetch` authenticates to the schedd (via FS, filesystem auth), asks the schedd to create an IDTOKEN on behalf of the user's identity. Resulting IDTOKEN identity is identical to authenticated identity.
- Step 3: Bob copies output from `condor_token_fetch` to his laptop, storing it in a file in directory `~/.condor/tokens.d`. Bob can now access the remote schedd as "Bob".

  Voila!



Summary of Commands

- condor_store_cred add –c : Command to store a signing key.
- condor_token_create : Allows anyone who can read a signing key (usually just root) to create and sign an IDTOKEN with any given identity. Example with attenuation (auth limits, expiration):

```
$ sudo condor_token_create \
    -identity brian.bockelman@collector.example.com \
    -lifetime 3600 \
    -authz READ -authz WRITE
```

- condor_token_fetch : Authenticate with a daemon and create an IDTOKEN on behalf of the user's identity.
- condor_token_list : display properties of available IDTOKENS by scanning IDTOKEN directories

Summary of Default Pathnames

- /etc/condor/passwords.d/ : Directory containing signing keys. Default signing key is in a file named "POOL" in this directory. Only readable/writeable by root.
- /etc/condor/tokens.d : Directory containing IDTOKEN files used by process *with* root access (HTCSS daemons, administrators with sudo). Only readable/writeable by root.
- ~/.condor/tokens.d : Directory in a user's home directory containing IDTOKEN files used by a process *without* root access (unprivileged users). Only readable/writeable by that user.

All default path locations can be changed via configuration

ADVANCED TOPICS

Advanced Q&A

- How does a client *securely* present IDTOKENS to a remote server?
  - The digital signature of the token is used as a shared secret to initiate a secure communication channel over the network (via the AKEP2 protocol).
- How can I perform Token Revocation?
  - You could remove authorization of the identity, e.g., in the config put
    DENY_WRITE = todd@cm.my.org
  - A classad constraint expression that can conditionally refuse tokens based on any attribute, such as identity, date range when issued, serial number.
    - See examples in the IDTOKENS section of the HTCSS Manual: https://tinyurl.com/ygqsc94j
  - You can remove the signing key file, which effectively invalidates all tokens signed with that key
- How does a client decide which token to use?
  - If the tokens.d directory has multiple files, they are scanned in lexical order, and first token that was issued from the server's trust domain and signed by a key file still present on the server is selected.
- IDTOKENS are follow the JSON Web Token (JWT) standard. Why do I care?
- Is there an alternative to users doing scp or copy-n-paste of tokens?

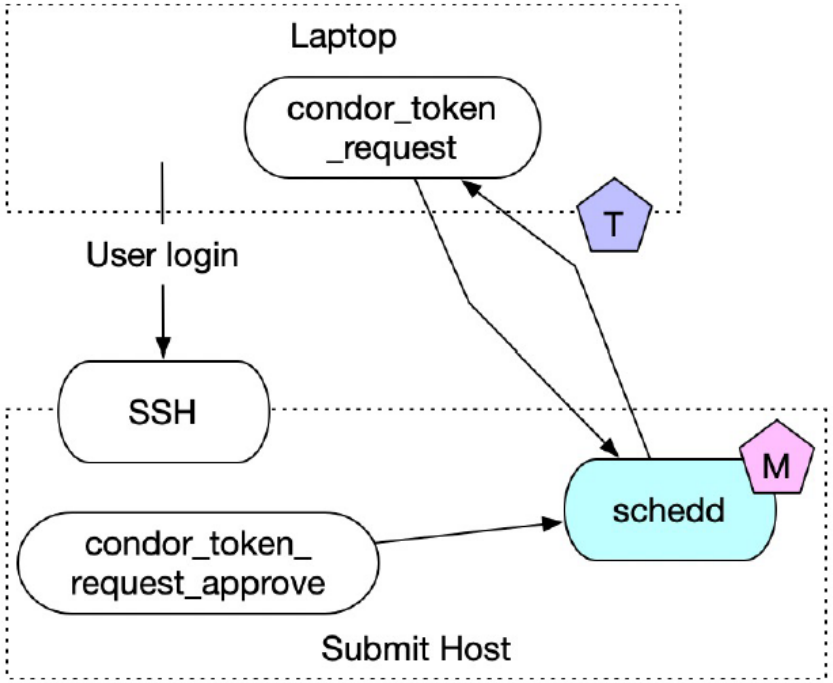
Requesting an IDTOKEN

Slide courtesy of Brian Bockelman's talk "*Security in HTCondor 9.0*" at HTCondor Week 2021…

Want to get an IDTOKEN on a machine without authenticating?

- **condor_token_request** allows an anonymous user to request a token for an arbitrary identity X.
  - The token request can be approved either by an admin or a user authenticated as X.
  - Anyone can ask. Few can approve!
- **Use case**: I have an SSH login on a schedd and want to start submitting jobs from my laptop.
  - **Solution**: Request a token from my laptop; login to the submit host and approve the request.
- ***DO NOT COPY/PASTE TOKENS.*** Instead, use **condor_token_request**!

The startd, master, and schedd will automatically request tokens from the collector if authentication fails.



Gotcha: to work, the client needs to trust the server – typically, this implies SSL authentication (which is tricky to setup). Look forward to new tricks in v9.x…

Thank You!

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