IDTOKEN Authentication in the HTCondor Software Suite (HTCSS)

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Outline

› Introduction and Motivation
  • Need for authentication in HTCSS
  • Need for yet another authentication method

› Basic Concepts and Usage
  • For Admins: Using IDTOKENS to secure your Pool
  • For Users: Using IDTOKENS to utilize a remote Access Point

› Advanced Topics
  • Invalidation
  • Multiple signing keys, multiple tokens
  • Token Requests
  • How does HTCSS securely present IDTOKENS
Introduction and Motivation
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.

```plaintext
# 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

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.
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
   • Use tool
     
     condor_token_create -identity condor@cm.myorg

2. Create an IDTOKEN file with identity "condor" on central manager

Central Manager
- negotiator
- collector

Access Point
- schedd

Worker Node
- startd

ALLOW_DAEMON = condor@cm.myorg
Example 1: IDTOKENS to secure a pool

1. Create a signing key file on the central manager
   - Use tool:
     `condor_token_create -identity condor@cm.myorg`

2. Create an IDTOKEN file with identity "condor" on central manager

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)
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_creds 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/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
› **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 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?**
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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