**Private Pre-Shared Key Sync with Active Directory Guide**

by Tim Smith, SA – 11/29/2021 – v1.1

Overview**:**

This guide covers how to set up and run the script to sync your Active directory users with the Private Pre-shared-key (PPSK) with in ExtremeCloud IQ (XIQ). PPSK is a solution provided by Extreme Networks to fill in the gap between a Wi-Fi SSID solution using a single PSK for all users and deploying a full 802.1X solution. Extreme Networks PPSK solution allows the ability to create a dedicated key for each individual user or device on the same SSID, providing the ability to lower the number of SSIDs broadcasting in the air, minimizing the airtime consumption due to overhead management frames. This solution also adds the ability to assign VLANs based on user/device groups to avoid the need of separate SSIDs to segregate these groups.

This guide enables you to leverage your existing Active Directory security groups to create automatically a Private Pre-shared key for every AD user, remove the PPSK user if a user is disabled or removed from the group in the AD server.

Target Audience**:** Technical

# 

# Use Cases:

* Identity for IoT devices
* BYOD for employees
* Staff device onboarding
* Secure Guest Onboarding (time-based keys with employee sponsorship)
* Hospitality vertical using the hyper-segmentation feature, Private Client Groups (PCGs)
* Third-party via API integration

# 

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# Prerequisites:

* ExtremeCloud IQ Public Cloud, Private Cloud or Local (VMware) deployments  
  o Cloud & Private: The key directory can be stored in the cloud (unlimited keys) or local on
* all access points (10,000 key maximum limit)  
  o Local: The key directory is stored on all access points, 10,000 key maximum limit.
* Knowledge of XIQ by adding access points, creating network policies, and SSIDs
* XIQ PPSK SSID and associated User Groups Configured
* RadSec Proxy requires TCP Port 2083 to be open on your internet firewall
* One or more XIQ native access points
* Not supported on wired systems, A3 NAC, or campus-based Wi-Fi systems (WiNG or IdentiFi)
* Download of the following files
  + XIQ-AD-PPSK-Sync.py
    - Text

      Description automatically generatedVersion 2.0.3 is the current version. See lines 11-16 in script
  + AD\_Test.py (optional – see [troubleshooting](#_AD_Test.py) section)
    - Version 2.0.3 is the current version. Lines 5-10
  + requirements.txt (optional – see [modules](#_Installing_required_modules) section)

# 

# Scripting Environment Preparation:

### **Information**:

The XIQ-AD-PPSK-Sync.py script requires, at minimum, Python 3.6 and tested up to Python 3.9. This script can be ran manually, but ideally would be set up as a cronjob to be ran ever 8, 12, or 24 hours. This script can be ran from any device with python and the needed modules installed. This device will need to be able to reach the Active Directory server as well as reach out to ExtremeCloud IQ.

The script, when ran, will create a XIQ-AD-PPSK-Sync.log file. This log file will show information about PPSK users created and deleted. It will also show how many users were parsed from XIQ and Active Directory when ran. Any API errors experienced will also show up in the log file.

## 

## Device Choice:

This script can be ran from any device that can run python 3.6 or higher. The device could be a server running redhat, a pc/laptop running windows 10 or Mac OSX, or even a raspberry pi type device. The device will need to be on the network and be able to reach the Active Directory as well as reach ExtremeCloud IQ. This can be done through a proxy. Proxy config is beyond the scope of this guide.

## 

## Python Installation:

Depending on the device that is used, you may need to install python, or a different version of python. The easiest way to check the version of python is to open the terminal (Power Shell on Windows) and type this command.

### 

python3 --version

Below are some examples of installing python3 for Windows and Mac OSX. Linux systems that were tested all had python3.6 or higher installed by default

### Mac OSX Big Sur

* Open the terminal and enter python3 –version
  + This triggers the install of Developer Tools
* Graphical user interface, text

  Description automatically generatedClick Install
* Click Agree
* pip3 is needed to install python modules
* With Big Sur the Developer tools does not install pip3
* Mac terminal will be used to install pip3
* Running this command will check if pip is installed

pip3 --version

* Run the following command to install

curl https://bootstrap.pypa.io/get-pip.py -o get-pip.py && python3 get-pip.py

### Windows 10

* Search Microsoft store for python 3.9 and click install
* Graphical user interface, text, application, Teams

  Description automatically generatedLog in with Microsoft credentials
* The Windows store installs pip3 with python3. Pip3 will be used to install the needed modules

## Required Modules:

The **requests** and **ldap3** modules are the only modules required for the XIQ-AD-PPSK-Sync.py script. For Linux and Mac

### Checking for existing Modules

You can check to see if the required modules are installed using the terminal (PowerShell for Windows). For each module run the following command.

python3 -c “import requests”

python3 -c “import ldap3”

The module is not installed if a ‘*ModuleNotFoundError: No module named '<module name>*' error is returned.

### Installing required modules

The required modules can be installed using pip3 using the downloaded requirements.txt file with the following command.

## 

pip3 install -r requirements.txt

Or the modules can be installed individually using

pip3 install requests

pip3 install ldap3

# Script Variables:

The Global Variable section of the script will need to be updated with the correct values. We will briefly cover each of these and for some will go into more detail below.

**Lines 14 – 17** are info for the Active Directory Server

1. **Text

   Description automatically generatedserver\_name** – This can be the FQDN or IP address of the Active Directory Server
2. **domain\_name** – The configured Domain on the AD server – The domain portion of the FQDN

**Lines 19 – 23** are for XIQ authentication. There are 2 methods that could be used, but the token method is recommended.

1. XIQ username and password –
   * **Lines 19 and 20** - uncomment by deleted the **#** at the beginning of the line. Then fill in the username and password
   * **Line 23** - comment out line by adding # to the begging of the line.
2. Token method – a token can be generated to only allow access to view/create/delete PPSK users. This is the preferred method. Details on how to generate this token is below in the [Generating the XIQ Token](#_Generating_the_XIQ) and specifically the [Generating Specific Tokens](#_Generating_Specific_Tokens) sub section.

**Lines 25 – 29** are where we will define which AD groups to sync with which XIQ User Groups. Note that the brackets around the groups create a list. Each set of groups should be in a set of parentheses and be separated by a coma. Each set of groups should be separated by a coma. If only one set of groups is required, **line 28** can be deleted and the coma at the end of 27 removed.

* We will cover how to get the needed AD Group distinguished Name in the [AD Group Distinguished Name](#_AD_Group_Distinguished) section
* We will cover how to get the XIQ User Group ID in the [XIQ User Group ID](#_XIQ_User_Group) section
* **NOTE**: The order is very important here. If the same AD user is in multiple groups, the user will be put in the first XIQ User Group in the list. XIQ users can only be in one PPSK User group.

## Generating the XIQ Token

#### Swagger

We will use the swagger interface to generate the token   
<https://api.extremecloudiq.com/swagger-ui/index.html?configUrl=/openapi/swagger-config#/>  
In the swagger page, clicking on any API will expand out information about the API as well as give you the ability to try it. Clicking the “Try it out” button, fill out any needed information, and then click the execute button will allow you to try that specific API call.

The 2nd generation APIs are based on access tokens that are generated by a local administrator XIQ account. Currently these tokens can only be generated through the */login* POST API request. They cannot be generated through the XIQ GUI. They also cannot be generated by an external admin user.

Graphical user interface

Description automatically generated with medium confidence

##### Login

*Request Body*

{  
 "username": "xiq@example.com",  
 "password": "changeme"  
}

The */login* POST request is used to generate an access token. In the request body enter a local administrator XIQ account username and password and the API will respond with an access token that can be used for any following calls. This token will be valid for 24 hours after creation. This token will have the ability to be used for **any** of the API calls the user is authorized for within XIQ.

For this script we will use this token to generate a sperate token with limited access and a specified expiration time.

##### Authorize in Swagger

At the top of the Swagger page, click the authorize button. A window will pop up allowing you to paste the access token and click “Authorize” Swagger will now use the added access token for the API calls on the page.

Graphical user interface, application, Teams

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##### Generating Specific Tokens



The */auth/apitoken* POST request allows you to specify an expire time as well as set permissions for a token. This is a great way to create a token for a specific application or script, only allowing the token to perform the needed tasks.

The expire time uses Epoch time, which is the number of seconds since midnight on Jan 1, 1970 (UTC). <https://www.epochconverter.com/> is a webpage that can be used to convert a readable time to epoch time or epoch time to a more readable time. Set a time for 1 year out and get the epoch time.

For this script we will want to have the following permissions - ssids, pcg-key-based  
This will give us access to view, create, and delete ppsk users as well as view,create, and delete pcg-key-based users if necessary.

Adding the desired expire time and a list of permissions, this API will return a token that will only be usable by the specified APIs.

*Request Body*

{  
 "description": "Token for XIQ-AD-PPSK-Sync.py script",  
 "expire\_time": 1628186428,  
 "permissions": [  
 "enduser”,  
 “pcg:key”  
 ]  
}

*Response Body*

**{**

**"access\_token": "eyJhbGciOiJIUzI1NiJ9.eyJzdWIiOiJ0aW1qc21pdGgyNEBwcm90b25tYWlsLmNvbSIsInNjb3BlcyI6WyJhY2NvdW50OnIiXSwidXNlcklkIjoyMTc5MjMyMSwicm9sZSI6IkFkbWluaXN0cmF0b3IiLCJjdXN0b21lcklkIjoyMTc5MTk3MSwiY3VzdG9tZXJNb2RlIjowLCJoaXFFbmFibGVkIjpmYWxzZSwib3duZXJJZCI6MTc5MTYxLCJvcmdJZCI6MCwiZGF0YUNlbnRlciI6IklBX0dDUCIsImlzcyI6ImV4dHJlbWVjbG91ZGlxLmNvbSIsImlhdCI6MTYyODE4MzA4OSwiZXhwIjoxNjI4MTg2NDI4fQ.CtBGq4YVGB9FzCodr6Oi5IG8yy1-4B-77AWl5rVG3S0",**

**"create\_time": "2021-11-29T15:47:57.000+0000",**

**"expire\_time": "2021-11-29T16:10:08.000+0000",**

**"creator\_id": 21792321,**

**"customer\_id": 21791971,**

**"description": "Token for XIQ-AD-PPSK-Sync.py script",**

**"permissions": [**

**"enduser",**

**"pcg:key"**

**]**

**}**

Copy the newly created access\_token and add it to the XIQ\_token variable in the script.

## AD Group Distinguished Name

The distinguished name includes more details than just the name of the group. It includes any OUs or folders the AD group is located under as well as the domain controllers. These are all needed by the script to locate and query the group details.Graphical user interface, application, Word

Description automatically generated

An easy way to get the Distinguished name is to use the find objects and search for the group name. The full distinguished name will be shown in the Search results.

Once that is obtained add it into the group\_roles object in the script.

group\_roles = [  
 # AD GROUP Distinguished Name, XIQ group ID  
 ("CN=Staff\_User,CN=Users,DC=SmithHome,DC=local", "XIQ User Group ID"),  
 ("AD Group Distinguished Name", "XIQ User Group ID")  
]

## XIQ User Group ID

Each XIQ User Group will be assigned a unique ID when it gets created. This is something that gets used by the backend systems and not seen in the GUI. The easiest way to get the ID is from the swagger page.

Go back to the swagger page and scroll down to the **Configuration – User Management** section and find the */usergroups* GET request.   
Click the “Try it out” button then the “execute” button. When you find the Name of the XIQ User Group you would like to use, it will be located inside of a pair of {curly brackets}. Inside the same pair of curly brackets will be an element called **id**. This is the ID that is needed.

*Response Body*

**{**

**"page": 1,**

**"count": 10,**

**"data": [**

**{**

**"id": 769490635824436,**

**"name": "Home\_Hive",**

**"description": "",**

**"predefined": false,**

**"create\_time": "2021-10-11T18:24:33.000+0000",**

**"update\_time": "2021-10-11T18:24:33.000+0000",**

**…**

Once that is obtained add it into the group\_roles object in the script.

group\_roles = [  
 # AD GROUP Distinguished Name, XIQ group ID  
 ("CN=Staff\_User,CN=Users,DC=SmithHome,DC=local", "769490635824438"),  
 ("AD Group Distinguished Name", "XIQ User Group ID")  
]

Continue to gather other AD Group Distinguished Names and XIQ User Group IDs if needed. Enter them in the same format with each set enclosed in parentheses. All but the last one should be followed by a coma.

group\_roles = [  
 # AD GROUP Distinguished Name, XIQ group ID  
 ("CN=Staff\_User,CN=Users,DC=SmithHome,DC=local", "769490635824438"),  
 ("CN=Testing,OU=Sub1,OU=Special,DC=Smithhome,DC=local", "769490635824436"),  
 ("CN=WIFI\_admins,CN=Users,DC=SmithHome,DC=local", "769490635824395")  
]

## Active Directory Disable Codes

Each user in Active Directory has a userAccountControl number assigned to it that provides the status of the user. Information on this number can be seen here <https://docs.microsoft.com/en-us/troubleshoot/windows-server/identity/useraccountcontrol-manipulate-account-properties>

The script has 4 codes for Users that are disabled. Depending on use case other numbers may need to be added.

* 514 – NORMAL\_ACCOUNT (512) + ACCOUNTDISABLED (2)
* 642 - NORMAL\_ACCOUNT (512) + ACCOUNTDISABLED (2) + ENCRYPTED\_TEXT\_PWD\_ALLOWED (128)
* 66050 - NORMAL\_ACCOUNT (512) + ACCOUNTDISABLED (2) + DONT\_EXPIRE\_PASSWORD (65536)
* 66178 - NORMAL\_ACCOUNT (512) + ACCOUNTDISABLED (2) + DONT\_EXPIRE\_PASSWORD (65536) + ENCRYPTED\_TEXT\_PWD\_ALLOWED (128)

If any other disabled codes are needed, they can be added inside the bracket to **line 42**.

ldap\_disable\_codes = ['514','642','66050','66178',’2562’]

If disabled users are not being removed, you can use the AD\_Test.py script and see details about the users in the AD group. Looking at the ‘*userAccountControl*’ element to see the number associated with the disabled user. This number may need to be added to the ‘*ldap\_disable\_codes*’ list.

See the [Troubleshooting](#_AD_Test.py) Section for more info on the AD\_Test.py script

The script variables should be completed.

# Running the Script:

To run the script, open the terminal (PowerShell for Windows) to the location of the script and run:

Python3 XIQ-AD-PPSK-Sync.py

chmod +x XIQ-AD-PPSK-Sync.py

You can also make the script executable by running

Then you can run the script by typing

./XIQ-AD-PPSK-Sync.py

The script will print to the screen how many PPSK users were parsed and how many AD users were parsed. If there are any users in the list of AD users and not in the list of PPSK users, an API call will be made to create the PPSK user. The script will print on the screen for each user it successfully creates.

successfully created PPSK user Tim Smith

If there are any users in the list of PPSK users that are not in the list of AD users or in the list of disabled AD users, an API call will be made to delete the PPSK user. The script will print on the screen for each user it successfully deletes. – This will be the email address of the user.

User timjsmith24@gmail.com was successfully deleted.

The AD user needs to have an email address assigned or the PPSK user will not be created. A message will print on the screen.

User Sega Smith doesn't have an email set and will not be created in xiq

## Text Description automatically generatedLog File

Upon running the script, a log file will be created named XIQ-AD-PPSK-Sync.log. Additional runs of the script will append to this log file. This file will contain this same information that prints to the screen as well as any error received when making the API calls. This is a good place to look if issues are seen.

# Scheduling Script to Run

## Mac & Linux based Systems

A Cron job can be setup to automatically run the script at a specified interval. Ideally this could be set for every 8, 12, or 24 hours. This would make sure the AD group and PPSK user group would stay in sync. The script can also be ran manually between those times if a user needed to be added right away or removed right away.

### Setting up a Cron Job

Open and edit the crontab and configure the job with arrangement for the command you want to run. From the terminal window enter the following command.

crontab -e

There are 3 parts to a cron job configuration.

#### Cron Job Time Format

Part 1 of the cron job

The first 5 characters a b c d e represent the time, date, and repetition of the job

a – Minute (0-59)   
b – Hour (0-23)

c – Day (0-31)

d – Month(0-12) – 0=None and 12 = December

e – Day of the Week(0-7) – 0=Sunday and 7=Sunday

* **An asterisk (\*)** stands for all values. Use this operator to keep tasks running during all months, or all days of the week.
* **A forward-slash (/)** is used to divide a value into steps. (\*/2 would be every other value, \*/3 would be every third, \*/10 would be every tenth, etc.)

To set the Cron job to run every 8 hours the time format would look like this.

0 \*/8 \* \* \*

To set the Cron job to run every night at midnight the time format would look like this.

0 0 \* \* \*

#### Cron Job Script and Script Location

Part 2 of the cron job

The next part is where you enter the script that you want to run and its location

python3 /home/admin/documents/scripts/XIQ-AD-PPSK-Sync.py

You can make the script executable, so you don’t have to type python3 before entering the script. Instead, you will just enter a period before the location.

chmod +x /home/admin/documents/scripts/XIQ-AD-PPSK-Sync.py

./home/admin/documents/scripts/XIQ-AD-PPSK-Sync.py

#### Cron Job Output and Job Completion

Optional Part 3 of the cron job

The last part is an optional part that specifies where the output and completion of the script should go. If not specified, the cron will send an email to the owner of the crontab file.

To avoid filling up the inbox on the server, it is recommended to have something set for the output. This can be set to append to a file

>> /home/admin/documents/scripts/XIQ-AD-PPSK-Sync-Output.txt

Or can be set just turn off the email output

> /dev/null 2>&1

#### Cron Job Command Example

The command should be entered in a single line and then save the crontab file.

*Every 8 hours turning off output*

0 \*/8 \* \* \* python /home/admin/documents/scripts/XIQ-AD-PPSK-Sync.py > /dev/null 2>&1

*Every 12 hours with saved output*

0 \*/12 \* \* \* ./home/admin/documents/scripts/XIQ-AD-PPSK-Sync.py >> /home/admin/documents/scripts/XIQ-AD-PPSK-Sync-Output.txt

## Windows based Systems

A Windows task schedule can be setup to automatically run the script at a specified interval. Ideally this could be set for every 8, 12, or 24 hours, this would make sure the AD group and PPSK user group would stay in sync. The script can also be ran manually between those times if a user needed to be added right away or removed right away.

### Setting up Windows Task Scheduler

Open Control Panel > System and Security > Administrative Tools > Task Scheduler

Selected ‘Create basic task…’

Give you task a name like ‘AD-PPSK-Sync’ and click ‘Next’

Leave the Trigger set to daily and click ‘Next’ – We will come back and adjust this

Click ‘Next’ leaving recur every 1 day

Select ‘Start a program and click ‘Next’

#### Start a Program

For the Program/script: section enter the path of your python.exe file.

Graphical user interface, text, application, email

Description automatically generatedThe location of your python.exe file depends on how it was installed. An easy way to find this location is to open Windows PowerShell and enter python3. This will open the python interpreter. In the interpreter enter then

sys.executable

Import sys

exit()

This will output the location of the python.exe file. Enter to exit the interpreter.

Enter the full path of the python.exe file in the Program/Script: field.

XIQ-AD-PPSK-Sync.py

In the Add arguments (optional): field, enter the name of the script.

In the Start in (optional): field, enter the location of the script.

C:\user\your\_python\_project\_path

Graphical user interface, text, application

Description automatically generated

#### Editing the Time

Once the task is saved, open the Task Scheduler Library folder and find the newly created AD-PPSK-Sync task. Click on it to open and select the Trigger tab and edit the Daily trigger. Here you can set what time you want it to run.

If you want the script to run every 8 or 12 hours check the box next to ‘Repeat task every:’ and enter ‘*8 hours’* or *’12 hours’*

Graphical user interface, application

Description automatically generated

# Troubleshooting:

## Log File

The XIQ-AD-PPSK-sync.log file is a good place to look for potential issues. This log file will update whenever the script is ran, whether manually or on a schedule.

### Invalid XIQ token

2021-11-05 16:58:27: root - ERROR - Error retrieving PPSK users from XIQ - HTTP Status Code: 401

2021-11-05 16:58:27: root - WARNING - {'error\_code': 'AuthInvalidToken', 'error\_id': 'cda656a5157d4c87a5143252aad71bff', 'error\_message': 'Unable to read JSON value: ?[\x19???\x14?M??'}

Check token using [Swagger](#_Swagger)

### Invalid XIQ token format

2021-11-08 13:56:36: root - ERROR - Error retrieving PPSK users from XIQ - HTTP Status Code: 401

2021-11-08 13:56:36: root - WARNING - {'error\_code': 'AuthInvalidToken', 'error\_id': '555d1ce9f67b40ef83caf4a89ca92b04', 'error\_message': 'JWT strings must contain exactly 2 period characters. Found: 0'}

This may mean that you are trying to use XIQ Username and Password but did not comment out line 23. Add a # infront of **line 23**.

### 

### Expired XIQ token

2021-11-08 14:14:16: root - ERROR - Error retrieving PPSK users from XIQ - HTTP Status Code: 401

2021-11-08 14:14:16: root - WARNING - {'error\_code': 'AuthTokenExpired', 'error\_id': '78d8b818a03940dd8d4accfc1b3ffb7e', 'error\_message': 'JWT expired at 2021-11-08T19:14:11Z.

The XIQ token has expired. Generate a new token using [Swagger](#_Swagger)

### Invalid XIQ Username/password

2021-11-08 13:55:15: root - ERROR - Error getting access token - HTTP Status Code: 401

2021-11-08 13:55:15: root - WARNING - <Response [401]>

Check username and password for XIQ. – recommend using XIQ Token

### Unable to reach AD server

2021-11-08 13:46:07: root - ERROR - Unable to reach server DADOH-D.SmithHome.local

Check the IP address or server name entered on **Line 14**

### XIQ User Failed to Create

2021-11-08 14:19:35: root - INFO - Successfully parsed 0 XIQ users

2021-11-08 14:19:36: root - INFO - Successfully parsed 4 LDAP users

2021-11-08 14:19:36: root - ERROR - Error adding PPSK user Tim Smith - HTTP Status Code: 400

2021-11-08 14:19:36: root - WARNING - {'error\_code': 'UNKNOWN', 'error\_id': None, 'error\_message': 'UNKNOWN'}

2021-11-08 14:19:36: root - ERROR - failed to create Bauer Smith: Error adding PPSK user Tim Smith - HTTP Status Code: 400

There are a couple possibilities when you see this error. As you can see above there were 0 XIQ users parsed, and the user failed to create. In this instance the XIQ User Group ID was incorrect. If XIQ users parsed was 0 and you have configured users in the user group check the user group ID in the group\_roles list on **Lines 25-30**

The other thing that could cause this Error/Warning is if the username already exists in XIQ PPSK users within a different user group.

### XIQ Timeout Error

2021-10-08 12:39:29: root - ERROR - Error deleting PPSK user 769490635824383 - HTTP Status Code: 504

2021-10-08 12:39:29: root - WARNING - <Response [504]>

2021-10-08 12:39:29: root - ERROR - Failed to delete user timjsmith24@gmail.com with error Error deleting PPSK user 769490635824383 - HTTP Status Code: 504

2021-10-08 12:43:05: root - ERROR - Failed retrieving PPSK users from XIQ - HTTP Status Code: 504

2021-10-08 12:43:05: root - WARNING - <Response [504]>

A HTTP Status Code: **504** is a timeout from XIQ. If XIQ cannot respond to the API call within 60 secs it will send these **504** errors. The script will need to be ran again with no changes.

### Email is not set for AD User

2021-11-08 14:42:39: root - WARNING - User Tim Smith doesn't have an email set and will not be created in xiq

Check the AD User and see if email is set.

## AD\_Test.py

This script was written to help troubleshoot issues with collecting data from AD. The variables are the same in this script. Except the AD Group Distinguished name should be added to the **Distinguished\_name** variable instead of in the group\_roles list.

This script will test resolving the ip address for the server\_name. If an IP address is entered it will try and resolve the DNS name.

The connection to the AD Server will be performed.

If there are any errors, they will print to the screen. Otherwise, the collected data from the AD server will print on screen. If empty [] brackets print, check the [distinguished name](#_AD_Group_Distinguished) and validate that it is correct.

Using this output, you can check the [User Account Control Number](#_Active_Directory_Disable) if disabled users are not being removed from XIQ. You can validate there is an email set for the user. And overall check that information is being returned.

The ip address for DADOH-DC.SmithHome.local is 192.168.10.5

Kayce Smith {'userAccountControl': '512', 'email': 'timjsmith24+kayce@gmail.com', 'username': 'kmsmith'}

Tim Smith {'userAccountControl': '512', 'email': '[]', 'username': 'tismith'}