代码托管(CodeArts Repo)

最佳实践

文档版本 01

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华为云计算技术有限公司

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表 1-1 常用最佳实践

实践	描述
批量迁移GitLab内网仓库到CodeArts Repo	CodeArts Repo现有迁仓能力只支持公网之间迁移，缺少客户内网自建代码托管平台往Repo迁移的快速方案，因此提供批量迁移内网代码托管平台仓库到Repo的脚本。
如何批量将外部仓库导入CodeArts Repo	CodeArts Repo现有迁仓能力只支持公网之间迁移，缺少客户内网自建代码托管平台往Repo迁移的快速方案，因此提供批量迁移内网代码托管平台仓库到Repo的脚本。

2 批量迁移 GitLab 内网仓库到 CodeArts Repo

背景介绍

CodeArts Repo现有迁仓能力只支持公网之间迁移，缺少客户内网自建代码托管平台往Repo迁移的快速方案，因此提供批量迁移内网代码托管平台仓库到Repo的脚本。

配置访问 CodeArts Repo 的 SSH 公钥

在进行批量迁移GitLab的代码仓到CodeArts Repo前，您需要安装Git Bash客户端，并且把本地生成的SSH公钥配置到CodeArts Repo，具体操作步骤如下：

步骤1 运行Git Bash，先检查本地是否已生成过SSH密钥。

如果选择RSA算法，请在Git Bash中执行如下命令：

```
cat ~/.ssh/id_rsa.pub
```

如果选择ED255219算法，请在Git Bash中执行如下命令：

```
cat ~/.ssh/id_ed25519.pub
```

- 如果提示“No such file or directory”，说明您这台计算机没生成过SSH密钥，请继续执行**步骤2**。
- 如果返回以ssh-rsa或ssh-ed25519开头的字符串，说明您这台计算机已经生成过SSH密钥，如果想使用已经生成的密钥请直接跳到**步骤3**，如果想重新生成密钥，请从**步骤2**向下执行。

步骤2 生成SSH密钥。如果选择RSA算法，在Git Bash中生成密钥的命令如下：

```
ssh-keygen -t rsa -b 4096 -C your_email@example.com
```

其中，-t rsa表示生成的是RSA类型密钥，-b 4096是密钥长度（该长度的RSA密钥更具安全性），-C your_email@example.com表示在生成的公钥文件中添加注释，方便识别这个密钥对的用途。

如果选择ED25519算法，在Git Bash中生成密钥的命令如下：

```
ssh-keygen -t ed25519 -b 521 -C your_email@example.com
```

其中，-t ed25519表示生成的是ED25519类型密钥，-b 521是密钥长度（该长度的ED25519密钥更具安全性），-C your_email@example.com表示在生成的公钥文件中添加注释，方便识别这个密钥对的用途。

输入生成密钥的命令后，直接回车，密钥会默认存储到~/.ssh/id_rsa或者~/.ssh/id_ed25519路径下，对应的公钥文件为~/.ssh/id_rsa.pub或者~/.ssh/id_ed25519.pub。

步骤3 复制SSH公钥到剪切板。请根据您的操作系统，选择相应的执行命令，将SSH公钥复制到您的剪切板。

- **Windows:**
  ```
  clip < ~/.ssh/id_rsa.pub
  ```
- **Mac:**
  ```
  pbcopy < ~/.ssh/id_rsa.pub
  ```
- **Linux (xclip required):**
  ```
  xclip -sel clip < ~/.ssh/id_rsa.pub
  ```

步骤4 登录并进入Repo的代码仓库列表页，单击右上角昵称，选择“个人设置” > “代码托管” > “SSH密钥”，进入配置SSH密钥页面。

也可以在Repo的代码仓库列表页，单击右上角“设置我的SSH密钥”，进入配置SSH密钥页面。

步骤5 在**“标题”**中为您的新密钥起一个名称，将您在**步骤3**中复制的SSH公钥粘贴进**“密钥”**中，单击确定后，弹出页面“密钥已设置成功，单击 立即返回，无操作3S后自动跳转”，表示密钥设置成功。

----结束

批量迁移 GitLab 内网仓库到 CodeArts Repo

步骤1 进入**Python官网**下载并安装Python3。

步骤2 登录GitLab并获取private_token，在“用户设置”里，选择“访问令牌” > “添加新令牌”。

步骤3 您需要在本地生成SSH公钥并配置到GitLab和CodeArts Repo，其中配置到CodeArts Repo可参考**配置访问CodeArts Repo的SSH公钥**。

步骤4 调试接口，通过账号的用户密码获取用户Token。参数的填写方法，您可以在接口的调试界面，单击右侧“请求示例”，填写好参数后，单击“调试”，将获取到的用户Token复制并保存到本地。

步骤5 用获取到的用户Token配置“config.json”文件。其中，source_host_url是您内网的GitLab的接口地址，repo_api_prefix是CodeArts Repo 的openAPI地址。

```
{
   "source_host_url": "http://{source_host}/api/v4/projects?page=1&per_page=5",
   "private_token": "GitLab上获取的private_token",
   "repo_api_prefix": "https://${open_api}",
   "x_auth_token": "用户Token"
}
```

步骤6 登录CodeArts首页创建项目并保存您的项目ID。

步骤7 用获取的项目ID配置“plan.json”文件，如下的示例表示两个代码仓的迁移配置，您可以根据需要进行配置。此处的g1/g2/g3表示代码组路径，如果没有提前设置，根据该配置会自动生成。

```
[
   ["path_with_namespace", "项目ID", "g1/g2/g3/目标仓库名1"],
      ["path_with_namespace", "项目ID", "g1/g2/g3/目标仓库名2"]
]
```

说明

- 代码组的创建请进入CodeArts Repo首页，单击“新建仓库”旁的下拉框，选择“新建代码组”。
- 代码仓库的名字需要以大小写字母、数字、下划线开头，可包含大小写字母、数字、中划线、下划线、英文句点，但不能以.git、.atom或.结尾。

步骤8 在本地Python控制台，创建migrate_to_repo.py文件。

```
#!/usr/bin/python
# -*- coding: UTF-8 -*-
import json
import logging
import os
import subprocess
import time
import urllib.parse
import urllib.request
from logging import handlers

# 存在同名仓库时是否跳过
SKIP_SAME_NAME_REPO = True

STATUS_OK = 200
STATUS_CREATED = 201
STATUS_INTERNAL_SERVER_ERROR = 500
STATUS_NOT_FOUND = 404
HTTP_METHOD_POST = "POST"
CODE_UTF8 = 'utf-8'
FILE_SOURCE_REPO_INFO = 'source_repos.json'
FILE_TARGET_REPO_INFO = 'target_repos.json'
FILE_CONFIG = 'config.json'
FILE_PLAN = 'plan.json'
FILE_LOG = 'migrate.log'
X_AUTH_TOKEN = 'x-auth-token'


class Logger(object):
    def __init__(self, filename):
        format_str = logging.Formatter('%(asctime)s - %(pathname)s[line:%(lineno)d] - %(levelname)s: %
(message)s')
        self.logger = logging.getLogger(filename)
        self.logger.setLevel(logging.INFO)
        sh = logging.StreamHandler()
        sh.setFormatter(format_str)
        th = handlers.TimedRotatingFileHandler(filename=filename, when='D', backupCount=3,
encoding=CODE_UTF8)
        th.setFormatter(format_str)
        self.logger.addHandler(sh)
        self.logger.addHandler(th)


log = Logger(FILE_LOG)


def make_request(url, data={}, headers={}, method='GET'):
    headers["Content-Type"] = 'application/json'
    headers['Accept-Charset'] = CODE_UTF8
    params = json.dumps(data)
    params = bytes(params, 'utf8')
    try:
        import ssl
        ssl._create_default_https_context = ssl._create_unverified_context
        request = urllib.request.Request(url, data=params, headers=headers, method=method)
        r = urllib.request.urlopen(request)
        if r.status != STATUS_OK and r.status != STATUS_CREATED:
            log.logger.error('request error: ' + str(r.status))
            return r.status, ""
    except urllib.request.HTTPError as e:
```

```
        log.logger.error('request with code: ' + str(e.code))
        msg = str(e.read().decode(CODE_UTF8))
        log.logger.error('request error: ' + msg)
        return STATUS_INTERNAL_SERVER_ERROR, msg
    content = r.read().decode(CODE_UTF8)
    return STATUS_OK, content


def read_migrate_plan():
    log.logger.info('read_migrate_plan start')
    with open(FILE_PLAN, 'r') as f:
        migrate_plans = json.load(f)
    plans = []
    for m_plan in migrate_plans:
        if len(m_plan) != 3:
            log.logger.error("line format not match \"source_path_with_namespace\",\"project_id
\",\"target_namespace\"")
            return STATUS_INTERNAL_SERVER_ERROR, []
        namespace = m_plan[2].split("/")
        if len(namespace) < 1 or len(namespace) > 4:
            log.logger.error("group level support 0 to 3")
            return STATUS_INTERNAL_SERVER_ERROR, []
        l = len(namespace)
        plan = {
            "path_with_namespace": m_plan[0],
            "project_id": m_plan[1],
            "groups": namespace[0:l - 1],
            "repo_name": namespace[l - 1]
        }
        plans.append(plan)
    return STATUS_OK, plans


def get_repo_by_plan(namespace, repos):
    if namespace not in repos:
        log.logger.info("%s not found in gitlab, skip" % namespace)
        return STATUS_NOT_FOUND, {}

    repo = repos[namespace]
    return STATUS_OK, repo


def repo_info_from_source(config):
    if os.path.exists(FILE_SOURCE_REPO_INFO):
        log.logger.info('get_repos skip: %s already exist' % FILE_SOURCE_REPO_INFO)
        return STATUS_OK

    log.logger.info('get_repos start')
    headers = {'PRIVATE-TOKEN': config['private_token']}
    url = config['source_host_url']
    per_page = 100
    page = 1
    data = {}

    while True:
        url_with_page = "%s&page=%s&per_page=%s" % (url, page, per_page)
        status, content = make_request(url_with_page, headers=headers)
        if status != STATUS_OK:
            return status
        repos = json.loads(content)
        for repo in repos:
            namespace = repo['path_with_namespace']
            repo_info = {'name': repo['name'], 'id': repo['id'], 'path_with_namespace': namespace,
                         'ssh_url': repo['ssh_url_to_repo']}
            data[namespace] = repo_info
        if len(repos) < per_page:
            break
        page = page + 1
```

```
    with open(FILE_SOURCE_REPO_INFO, 'w') as f:
        json.dump(data, f, indent=4)
    log.logger.info('get_repos end with %s' % len(data))
    return STATUS_OK


def get_repo_dir(repo):
    return "repo_%s" % repo['id']


def exec_cmd(cmd, ssh_url, dir_name):
    log.logger.info("will exec %s %s" % (cmd, ssh_url))
    pr = subprocess.Popen(cmd + " " + ssh_url, cwd=dir_name, shell=True, stdout=subprocess.PIPE,
stderr=subprocess.PIPE)
    (out, error) = pr.communicate()
    log.logger.info("stdout of %s is:%s" % (cmd, str(out)))
    log.logger.info("stderr of %s is:%s" % (cmd, str(error)))
    if "Error" in str(error) or "err" in str(error) or "failed" in str(error):
        log.logger.error("%s failed" % cmd)
        return STATUS_INTERNAL_SERVER_ERROR
    return STATUS_OK


def clone_from_source(config, plans):
    log.logger.info('clone_repos start')
    with open(FILE_SOURCE_REPO_INFO, 'r') as f:
        repos = json.load(f)
    for plan in plans:
        status, repo = get_repo_by_plan(plan["path_with_namespace"], repos)
        if status == STATUS_NOT_FOUND:
            return status

        name = repo["name"]
        dir_name = get_repo_dir(repo)
        folder = os.path.exists(dir_name)
        if folder:
            log.logger.info("skip clone " + name)
            continue
        os.makedirs(dir_name)
        status = exec_cmd("git clone --mirror", repo['ssh_url'], dir_name)
        if status != STATUS_OK:
            return status
    log.logger.info('clone_repos end')
    return STATUS_OK


def get_groups(config, project_id):
    log.logger.info('get_groups start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    limit = 100
    offset = 0
    data = {}
    while True:
        url_with_page = "%s/v4/%s/manageable-groups?offset=%s&limit=%s" % (api_prefix, project_id, offset,
limit)
        status, content = make_request(url_with_page, headers=headers)
        if status != STATUS_OK:
            return status, dict()
        rows = json.loads(content)
        for row in rows:
            full_name = row['full_name']
            data[full_name] = row
        if len(rows) < limit:
            break
        offset = offset + len(rows)
    log.logger.info('get_groups end with %s' % len(data))
    return STATUS_OK, data
```

```
def create_group(config, project_id, name, parent, has_parent):
    log.logger.info('create_group start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    data = {
        'name': name,
        'visibility': 'private',
        'description': ''
    }
    if has_parent:
        data['parent_id'] = parent['id']

    url = "%s/v4/%s/groups" % (api_prefix, project_id)
    status, content = make_request(url, data=data, headers=headers, method='POST')
    if status != STATUS_OK:
        log.logger.error('create_group error: %s', str(status))
        return status
    return STATUS_OK


# 指定代码组创建仓库
def create_repo(config, project_id, name, parent, has_parent):
    log.logger.info('create_repo start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    data = {
        'name': name,
        'project_uuid': project_id,
        'enable_readme': 0
    }
    if has_parent:
        data['group_id'] = parent['id']
    url = "%s/v1/repositories" % api_prefix
    status, content = make_request(url, data=data, headers=headers, method='POST')
    if "同名仓库或代码组" in content:
        log.logger.info("repo %s already exist. %s" % (name, content))
        log.logger.info("skip same name repo %s: %s" % (name, SKIP_SAME_NAME_REPO))
        return check_repo_conflict(config, project_id, parent, name)
    elif status != STATUS_OK:
        log.logger.error('create_repo error: %s', str(status))
        return status, ""
    response = json.loads(content)
    repo_uuid = response["result"]["repository_uuid"]

    # 创建后检查
    for retry in range(1, 4):
        status, ssh_url = get_repo_detail(config, repo_uuid)
        if status != STATUS_OK:
            if retry == 3:
                return status, ""
            time.sleep(retry * 2)
            continue
        break

    return STATUS_OK, ssh_url


def check_repo_conflict(config, project_id, group, name):
    if not SKIP_SAME_NAME_REPO:
        return STATUS_INTERNAL_SERVER_ERROR, ""

    log.logger.info('check_repo_conflict start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    url_with_page = "%s/v2/projects/%s/repositories?search=%s" % (api_prefix, project_id, name)
    status, content = make_request(url_with_page, headers=headers)
    if status != STATUS_OK:
        return status, ""
```

```
    rows = json.loads(content)
    for row in rows["result"]["repositories"]:
        if "full_name" in group and "group_name" in row:
            g = group["full_name"].replace(" ", "")
            if row["group_name"].endswith(g):
                return STATUS_OK, row["ssh_url"]
        elif "full_name" not in group and name == row['repository_name']:
            # 没有代码组的场景
            return STATUS_OK, row["ssh_url"]

    log.logger.info('check_repo_conflict end, failed to find: %s' % name)
    return STATUS_INTERNAL_SERVER_ERROR, ""


def get_repo_detail(config, repo_uuid):
    log.logger.info('get_repo_detail start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    url_with_page = "%s/v2/repositories/%s" % (api_prefix, repo_uuid)
    status, content = make_request(url_with_page, headers=headers)
    if status != STATUS_OK:
        return status, ""
    rows = json.loads(content)
    log.logger.info('get_repo_detail end')
    return STATUS_OK, rows["result"]["ssh_url"]


def process_plan(config, plan):
    # 获取项目下的组织列表
    project_id = plan["project_id"]
    status, group_dict = get_groups(config, project_id)
    if status != STATUS_OK:
        return status, ""
    group = ""
    last_group = {}
    has_group = False
    for g in plan["groups"]:
        # 检查目标代码组，如果存在则检查下一层
        if group == "":
            group = " %s" % g
        else:
            group = "%s / %s" % (group, g)
        if group in group_dict:
            last_group = group_dict[group]
            has_group = True
            continue
        # 不存在则创建，并更新
        status = create_group(config, project_id, g, last_group, has_group)
        if status != STATUS_OK:
            return status, ""
        status, group_dict = get_groups(config, project_id)
        if status != STATUS_OK:
            return status, ""
        last_group = group_dict[group]
        has_group = True

    status, ssh_url = create_repo(config, project_id, plan["repo_name"], last_group, has_group)
    if status != STATUS_OK:
        return status, ""

    return status, ssh_url


def create_group_and_repos(config, plans):
    if os.path.exists(FILE_TARGET_REPO_INFO):
        log.logger.info('create_group_and_repos skip: %s already exist' % FILE_TARGET_REPO_INFO)
        return STATUS_OK

    log.logger.info('create_group_and_repos start')
```

```
    with open(FILE_SOURCE_REPO_INFO, 'r') as f:
        repos = json.load(f)
        target_repo_info = {}
    for plan in plans:
        status, ssh_url = process_plan(config, plan)
        if status != STATUS_OK:
            return status

        status, repo = get_repo_by_plan(plan["path_with_namespace"], repos)
        if status == STATUS_NOT_FOUND:
            return
        repo['codehub_sshUrl'] = ssh_url
        target_repo_info[repo['path_with_namespace']] = repo

    with open(FILE_TARGET_REPO_INFO, 'w') as f:
        json.dump(target_repo_info, f, indent=4)
    log.logger.info('create_group_and_repos end')
    return STATUS_OK


def push_to_target(config, plans):
    log.logger.info('push_repos start')
    with open(FILE_TARGET_REPO_INFO, 'r') as f:
        repos = json.load(f)
    for r in repos:
        repo = repos[r]
        name = repo["name"]
        dir_name = get_repo_dir(repo)

        status = exec_cmd("git config remote.origin.url", repo['codehub_sshUrl'], dir_name + "/" + name +
".git")
        if status != STATUS_OK:
            log.logger.error("%s git config failed" % name)
            return

        status = exec_cmd("git push --mirror -f", "", dir_name + "/" + name + ".git")
        if status != STATUS_OK:
            log.logger.error("%s git push failed" % name)
            return
    log.logger.info('push_repos end')


def main():
    with open(FILE_CONFIG, 'r') as f:
        config = json.load(f)
    # read plan
    status, plans = read_migrate_plan()
    if status != STATUS_OK:
        return
    # 获取自建gitlab仓库列表，结果输出到FILE_SOURCE_REPO_INFO文件中
    if repo_info_from_source(config) != STATUS_OK:
        return
    # clone仓库到本地
    status = clone_from_source(config, plans)
    if status != STATUS_OK:
        return

    # 调用接口创建仓库，并记录仓库地址到FILE_SOURCE_REPO_INFO中
    if create_group_and_repos(config, plans) != STATUS_OK:
        return

    # 推送时使用ssh方式推送，请提前在CodeArts Repo服务配置ssh key
    push_to_target(config, plans)


if __name__ == '__main__':
    main()
```

步骤9 执行如下命令，启动脚本并完成代码仓的批量迁移。

```
python migrate_to_repo.py
```

----结束

3 如何批量将本地仓库导入 CodeArts Repo

背景介绍

CodeArts Repo现有导仓能力只支持从公网导入单个仓库，缺少客户本地代码仓往Repo迁移的快速方案，因此提供批量迁移本地代码仓到Repo的脚本。

前置准备

步骤1 进入**Python官网**下载并安装Python3。

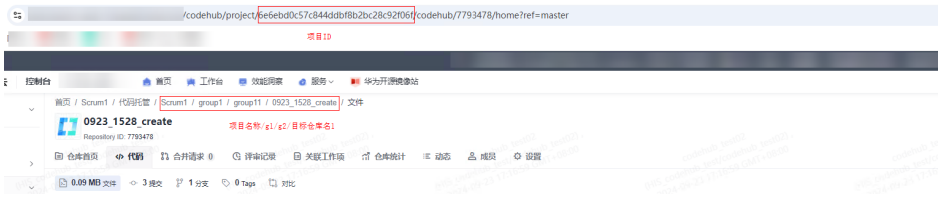
步骤2 调试接口，参考**获取IAM用户Token（使用密码）**通过账号的用户密码获取用户Token。参数的填写方法，您可以在接口的调试界面，单击右侧“请求示例”，填写好参数后，单击“调试”，将获取到的用户Token复制并保存到本地。

步骤3 用获取到的用户Token配置“config.json”文件。其中，repo_api_prefix是CodeArts Repo 的openAPI地址。“”

```
{
   "repo_api_prefix": "https://${open_api}",
   "x_auth_token": "用户Token"
}
```

步骤4 登录**CodeArts控制台**创建项目并保存您的项目ID。

步骤5 用获取的项目ID配置“plan.json”文件。如下的示例表示两个代码仓的迁移配置，您可以根据需要进行配置。此处的g1/g2表示代码组路径，可以参考**说明**进行创建。图1展示了“项目ID”和“项目名称/g1/g2/目标仓库名1”在Repo界面的获取方式。



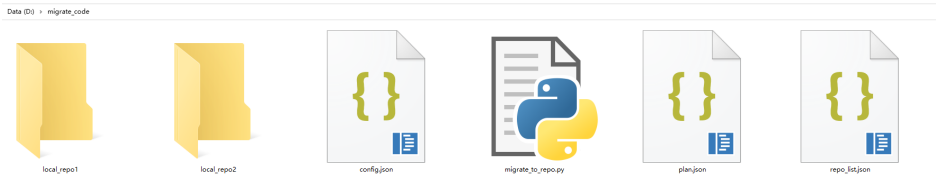

```
[
   ["项目名称/g1/g2/目标仓库名1", "项目ID", "项目名称/g1/g2/目标仓库名1"],
      ["项目名称/g1/g2/目标仓库名2", "项目ID", "项目名称/g1/g2/目标仓库名2"]
]
```

说明

- 代码组的创建请进入CodeArts Repo首页，单击“新建仓库”旁的下拉框，选择“新建代码组”。
- 代码仓库的名字需要以大小写字母、数字、下划线开头，可包含大小写字母、数字、中划线、下划线、英文句点，但不能以.git、.atom或.结尾。

步骤6 添加一个配置文件repo_list.json。

其中，“local_dir”表示把本地某个目录的代码文件传到目标仓库的路径，您上传的必须是一个完整的Git仓，并且需要与migrate_to_repo.py在同一级目录。如下图所示，local_repo1和local_repo2表示要上传的本地Git仓，即“local_dir”和“local_dir”的值分别为“local_repo1”和 "local_repo2"。



如下代码示例中，g1/g2表示代码组路径，对应项目id可以参考**项目ID获取方式** 获取，请根据实际情况填写。

```
[
  {
    "id": "对应项目的id",
    "namespace":"项目名称/g1/g2/目标仓库名1",
    "local_dir": "Git仓的本地路径1"
  },
  {
    "id": "对应项目的id",
    "namespace": "项目名称/g1/g2/目标仓库名2",
    "local_dir": "Git仓的本地路径2"
  }
]
```

步骤7 在本地Python控制台，创建migrate_to_repo.py文件。

```
#!/usr/bin/python
# -*- coding: UTF-8 -*-
import json
import logging
import os
import subprocess
import time
import urllib.parse
import urllib.request
import argparse
from logging import handlers


# 存在同名仓库时是否跳过
SKIP_SAME_NAME_REPO = True
STATUS_OK = 200
STATUS_CREATED = 201
STATUS_INTERNAL_SERVER_ERROR = 500
STATUS_NOT_FOUND = 404
HTTP_METHOD_POST = "POST"
CODE_UTF8 = 'utf-8'
FILE_SOURCE_REPO_INFO = 'source_repos.json'
FILE_SOURCE_REPO_INFO_TXT = 'source_repos.txt'
FILE_TARGET_REPO_INFO = 'target_repos.json'
FILE_CONFIG = 'config.json'
FILE_PLAN = 'plan.json'
FILE_LOG = 'migrate.log'
```

```
FILE_REPO_LIST = 'repo_list.json'
X_AUTH_TOKEN = 'x-auth-token'
LOG_FORMAT = '%(asctime)s - %(pathname)s[line:%(lineno)d] - %(levelname)s: %(message)s'


class Logger(object):
    def __init__(self, filename):
        format_str = logging.Formatter(LOG_FORMAT)
        self.logger = logging.getLogger(filename)
        self.logger.setLevel(logging.INFO)
        sh = logging.StreamHandler()
        sh.setFormatter(format_str)
        th = handlers.TimedRotatingFileHandler(
            filename=filename,
            when='D',
            backupCount=3,
            encoding=CODE_UTF8
        )
        th.setFormatter(format_str)
        self.logger.addHandler(sh)
        self.logger.addHandler(th)
log = Logger(FILE_LOG)


def make_request(url, data={}, headers={}, method='GET'):
    headers["Content-Type"] = 'application/json'
    headers['Accept-Charset'] = CODE_UTF8
    params = json.dumps(data)
    params = bytes(params, 'utf8')
    try:
        import ssl
        ssl._create_default_https_context = ssl._create_unverified_context
        request = urllib.request.Request(
            url,
            data=params,
            headers=headers,
            method=method
        )
        r = urllib.request.urlopen(request)
        if r.status != STATUS_OK and r.status != STATUS_CREATED:
            log.logger.error('request error: ' + str(r.status))
            return r.status, ""
    except urllib.request.HTTPError as e:
        log.logger.error('request with code: ' + str(e.code))
        msg = str(e.read().decode(CODE_UTF8))
        log.logger.error('request error: ' + msg)
        return STATUS_INTERNAL_SERVER_ERROR, msg
    except Exception as e:
        log.logger.info("request failed, e is %s", e)
        return STATUS_INTERNAL_SERVER_ERROR, "request failed"
    content = r.read().decode(CODE_UTF8)
    return STATUS_OK, content


def read_migrate_plan():
    log.logger.info('read_migrate_plan start')
    try:
        with open(FILE_PLAN, 'r') as f:
            migrate_plans = json.load(f)
    except Exception as e:
        log.logger.info("load plan.json, e is %s", e)
        return STATUS_INTERNAL_SERVER_ERROR, []
    plans = []
    for m_plan in migrate_plans:
        if len(m_plan) != 3:
            log.logger.error(
                "please check plan.json file"
            )
            return STATUS_INTERNAL_SERVER_ERROR, []
```

```
        namespace = m_plan[2].split("/")
        namespace_len = len(namespace)
        if namespace_len < 1 or namespace_len > 4:
            log.logger.error("group level support 0 to 3")
            return STATUS_INTERNAL_SERVER_ERROR, []
        plan = {
            "path_with_namespace": m_plan[0],
            "project_id": m_plan[1],
            "groups": namespace[0:namespace_len - 1],
            "repo_name": namespace[namespace_len - 1]
        }
        plans.append(plan)
    return STATUS_OK, plans


def get_repo_by_plan(namespace, repos):
    if namespace not in repos:
        log.logger.info("%s not found in gitlab, skip" % namespace)
        return STATUS_NOT_FOUND, {}
    repo = repos[namespace]
    return STATUS_OK, repo


def repo_info_from_source(source_host_url, private_token, protocol):
    log.logger.info('get repos by api start')
    headers = {'PRIVATE-TOKEN': private_token}
    url = source_host_url
    per_page = 100
    page = 1
    data = {}
    while True:
        url_with_page = "%s&page=%s&per_page=%s" % (url, page, per_page)
        status, content = make_request(url_with_page, headers=headers)
        if status != STATUS_OK:
            return status
        repos = json.loads(content)
        for repo in repos:
            namespace = repo['path_with_namespace']
            repo_info = {
                'id': repo['id'],
                'name': repo['name'],
                'path_with_namespace': namespace
            }
            if protocol == "ssh":
                repo_info["clone_url"] = repo["ssh_url_to_repo"]
            else:
                repo_info["clone_url"] = repo["http_url_to_repo"]
            data[namespace] = repo_info
        if len(repos) < per_page:
            break
        page = page + 1
    try:
        with open(FILE_SOURCE_REPO_INFO, 'w') as f:
            json.dump(data, f, indent=4)
    except Exception as e:
        log.logger.info("load source_repos.json, e is %s", e)
        return STATUS_INTERNAL_SERVER_ERROR
    log.logger.info('get_repos end with %s' % len(data))
    return STATUS_OK


def repo_info_from_file():
    log.logger.info('get repos by file start')
    data = {}
    try:
        with open(FILE_REPO_LIST, 'r') as f:
            repos = json.load(f)
    except Exception as e:
        log.logger.info("load repo_list.json, e is %s", e)
```

```
        return STATUS_INTERNAL_SERVER_ERROR
    for index, repo in enumerate(repos):
        if repo.get("id") is None:
            log.logger.error("line format not match id")
        if repo.get("namespace") is None:
            log.logger.error("line format not match namespace")
            return STATUS_INTERNAL_SERVER_ERROR
        if repo.get("local_dir") is None:
            log.logger.error("line format not match local_dir ")
            return STATUS_INTERNAL_SERVER_ERROR
        if not os.path.exists(repo.get("local_dir")):
            log.logger.warning("local dir %s non-existent" % repo.get("local_dir"))
            continue
        namespace = repo.get("namespace")
        repo_info = {
            'id': repo.get("id"),
            'name': namespace.split("/")[-1],
            'path_with_namespace': namespace,
            'clone_url': "",
            'local_dir': repo.get("local_dir")
        }
        data[namespace] = repo_info
    try:
        with open(FILE_SOURCE_REPO_INFO, 'w') as f:
            json.dump(data, f, indent=4)
    except Exception as e:
        log.logger.info("load source_repos.json, e is %s", e)
        return STATUS_INTERNAL_SERVER_ERROR
    log.logger.info('get_repos end with %s' % len(data))
    return STATUS_OK


def get_repo_dir(repo):
    return "repo_%s" % repo['id']


def exec_cmd(cmd, ssh_url, dir_name):
    log.logger.info("will exec %s %s" % (cmd, ssh_url))
    pr = subprocess.Popen(
        cmd + " " + ssh_url,
        cwd=dir_name,
        shell=True,
        stdout=subprocess.PIPE,
        stderr=subprocess.PIPE
    )
    (out, error) = pr.communicate()
    log.logger.info("stdout of %s is:%s" % (cmd, str(out)))
    log.logger.info("stderr of %s is:%s" % (cmd, str(error)))
    if "Error" in str(error) or "err" in str(error) or "failed" in str(error):
        log.logger.error("%s failed" % cmd)
        return STATUS_INTERNAL_SERVER_ERROR
    return STATUS_OK


def clone_from_source(plans):
    log.logger.info('clone_repos start')
    with open(FILE_SOURCE_REPO_INFO, 'r') as f:
        repos = json.load(f)
    for plan in plans:
        status, repo = get_repo_by_plan(plan["path_with_namespace"], repos)
        if status == STATUS_NOT_FOUND:
            return status
        name = repo["name"]
        dir_name = get_repo_dir(repo)
        folder = os.path.exists(dir_name)
        if folder:
            log.logger.info("skip clone " + name)
            continue
        os.makedirs(dir_name)
```

```
        status = exec_cmd("git clone --mirror", repo['clone_url'], dir_name)
        if status != STATUS_OK:
            return status
    log.logger.info('clone_repos end')
    return STATUS_OK


def get_groups(config, project_id):
    log.logger.info('get_groups start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    limit = 100
    offset = 0
    data = {}
    while True:
        url_with_page = "%s/v4/%s/manageable-groups?offset=%s&limit=%s" % (
            api_prefix,
            project_id,
            offset,
            limit
        )
        status, content = make_request(url_with_page, headers=headers)
        print(url_with_page, status, content)
        if status != STATUS_OK:
            return status, dict()
        rows = json.loads(content)
        for row in rows:
            full_name = row['full_name']
            data[full_name] = row
        if len(rows) < limit:
            break
        offset = offset + len(rows)
    log.logger.info('get_groups end with %s' % len(data))
    return STATUS_OK, data


def create_group(config, project_id, name, parent, has_parent):
    log.logger.info('create_group start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    data = {
        'name': name,
        'visibility': 'private',
        'description': ''
    }
    if has_parent:
        data['parent_id'] = parent['id']
    url = "%s/v4/%s/groups" % (api_prefix, project_id)
    status, content = make_request(
        url,
        data=data,
        headers=headers,
        method='POST'
    )
    if status != STATUS_OK:
        log.logger.error('create_group error: %s', str(status))
        return status
    return STATUS_OK


# 指定代码组创建仓库
def create_repo(config, project_id, name, parent, has_parent):
    log.logger.info('create_repo start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    data = {
        'name': name,
        'project_uuid': project_id,
        'enable_readme': 0
```

```
    }
    if has_parent:
        data['group_id'] = parent['id']
    url = "%s/v1/repositories" % api_prefix
    status, content = make_request(
        url,
        data=data,
        headers=headers,
        method='POST'
    )
    if "同名仓库或代码组" in content:
        log.logger.info("repo %s already exist. %s" % (name, content))
        log.logger.info("skip same name repo %s: %s" % (
            name,
            SKIP_SAME_NAME_REPO
            )
        )
        return check_repo_conflict(config, project_id, parent, name)
    elif status != STATUS_OK:
        log.logger.error('create_repo error: %s', str(status))
        return status, ""
    response = json.loads(content)
    repo_uuid = response["result"]["repository_uuid"]
    # 创建后检查
    for retry in range(1, 4):
        status, ssh_url = get_repo_detail(config, repo_uuid)
        if status != STATUS_OK:
            if retry == 3:
                return status, ""
            time.sleep(retry * 2)
            continue
        break
    return STATUS_OK, ssh_url


def check_repo_conflict(config, project_id, group, name):
    if not SKIP_SAME_NAME_REPO:
        return STATUS_INTERNAL_SERVER_ERROR, ""
    log.logger.info('check_repo_conflict start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    url_with_page = "%s/v2/projects/%s/repositories?search=%s" % (
        api_prefix,
        project_id,
        name
    )
    status, content = make_request(url_with_page, headers=headers)
    if status != STATUS_OK:
        return status, ""
    rows = json.loads(content)
    for row in rows["result"]["repositories"]:
        if "full_name" in group and "group_name" in row:
            g = group["full_name"].replace(" ", "")
            if row["group_name"].endswith(g):
                return STATUS_OK, row["ssh_url"]
        elif "full_name" not in group and name == row['repository_name']:
            # 没有代码组的场景
            return STATUS_OK, row["ssh_url"]
    log.logger.info('check_repo_conflict end, failed to find: %s' % name)
    return STATUS_INTERNAL_SERVER_ERROR, ""


def get_repo_detail(config, repo_uuid):
    log.logger.info('get_repo_detail start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    url_with_page = "%s/v2/repositories/%s" % (api_prefix, repo_uuid)
    status, content = make_request(url_with_page, headers=headers)
    if status != STATUS_OK:
```

```
        return status, ""
    rows = json.loads(content)
    log.logger.info('get_repo_detail end')
    return STATUS_OK, rows["result"]["ssh_url"]


def process_plan(config, plan):
    # 获取项目下的组织列表
    project_id = plan["project_id"]
    status, group_dict = get_groups(config, project_id)
    if status != STATUS_OK:
        return status, ""
    group = ""
    last_group = {}
    has_group = False
    for g in plan["groups"]:
        # 检查目标代码组，如果存在则检查下一层
        if group == "":
            group = " %s" % g
        else:
            group = "%s / %s" % (group, g)
        if group in group_dict:
            last_group = group_dict[group]
            has_group = True
            continue
        # 不存在则创建，并更新
        status = create_group(config, project_id, g, last_group, has_group)
        if status != STATUS_OK:
            return status, ""
        status, group_dict = get_groups(config, project_id)
        if status != STATUS_OK:
            return status, ""
        last_group = group_dict[group]
        has_group = True
    status, ssh_url = create_repo(
        config,
        project_id,
        plan["repo_name"],
        last_group,
        has_group
    )
    if status != STATUS_OK:
        return status, ""
    return status, ssh_url


def create_group_and_repos(config, plans):
    if os.path.exists(FILE_TARGET_REPO_INFO):
        log.logger.info(
            '%s skip: %s already exist' % (
                "create_group_and_repos",
                FILE_TARGET_REPO_INFO
            )
        )
        return STATUS_OK
    log.logger.info('create_group_and_repos start')
    with open(FILE_SOURCE_REPO_INFO, 'r') as f:
        repos = json.load(f)
        target_repo_info = {}
    for plan in plans:
        status, ssh_url = process_plan(config, plan)
        if status != STATUS_OK:
            return status
        status, repo = get_repo_by_plan(plan["path_with_namespace"], repos)
        if status == STATUS_NOT_FOUND:
            return
        repo['codehub_sshUrl'] = ssh_url
        target_repo_info[repo['path_with_namespace']] = repo
    with open(FILE_TARGET_REPO_INFO, 'w') as f:
```

```
        json.dump(target_repo_info, f, indent=4)
    log.logger.info('create_group_and_repos end')
    return STATUS_OK


def push_to_target():
    log.logger.info('push_repos start')
    with open(FILE_TARGET_REPO_INFO, 'r') as f:
        repos = json.load(f)
    for r in repos:
        repo = repos[r]
        name = repo["name"]
        dir_name = get_repo_dir(repo)
        status = exec_cmd(
            "git config remote.origin.url",
            repo['codehub_sshUrl'],
            dir_name + "/" + name + ".git"
        )
        if status != STATUS_OK:
            log.logger.error("%s git config failed" % name)
            return
        status = exec_cmd("git push --mirror -f", "", dir_name + "/" + name + ".git")
        if status != STATUS_OK:
            log.logger.error("%s git push failed" % name)
            return
    log.logger.info('push_repos end')


def push_to_target_with_local():
    log.logger.info('push_repos start')
    with open(FILE_TARGET_REPO_INFO, 'r') as f:
        repos = json.load(f)
    for r in repos:
        repo = repos[r]
        dir_name = repo["local_dir"]
        status = exec_cmd(
            "git config remote.origin.url",
            repo['codehub_sshUrl'],
            dir_name
        )
        if status != STATUS_OK:
            log.logger.error("%s git config failed" % dir_name)
            return
        status = exec_cmd("git push --all -f", "", dir_name)
        if status != STATUS_OK:
            log.logger.error("%s git push failed" % dir_name)
            return
    log.logger.info('push_repos end')


def get_args_from_command_line(args_list):
    # 解析命令行参数
    parser = argparse.ArgumentParser()
    parser.add_argument(
        '-p',
        '--protocol',
        dest='protocol',
        default="SSH",
        choices=['SSH', 'HTTP', "ssh", "http"],
        required=False,
        help='protocol specified for clone or push'
    )
    parser.add_argument(
        '-m',
        '--mode',
        dest='mode',
        default="FILE",
        choices=['FILE', "file"],
        required=False,
```

```
        help='import mode'
    )
    return parser.parse_args(args_list)


if __name__ == '__main__':
    if not os.path.exists(FILE_CONFIG):
        log.logger.info("config.json must be present")
        exit(1)
    if not os.path.exists(FILE_PLAN):
        log.logger.info("plan.json must be present")
        exit(1)

    # 获取映射, 仓库信息和namespace
    status, plans = read_migrate_plan()
    if status != STATUS_OK:
        log.logger.info("load plan.json failed")
        exit(1)

    # 加载配置文件
    try:
        with open(FILE_CONFIG, 'r') as f:
            config = json.load(f)
    except Exception as e:
        log.logger.info("load config.json, e is %s", e)
        exit(1)
    if config.get("repo_api_prefix") is None:
        log.logger.error("config.json not match repo_api_prefix")
        exit(1)
    if config.get("x_auth_token") is None:
        log.logger.error("config.json not match x_auth_token")
        exit(1)

    args = get_args_from_command_line(None)
    protocol = args.protocol
    mode = args.mode
    if mode.lower() == "api":
        log.logger.error("not allow mode is api")
        exit(1)
        if config.get("source_host_url") is None:
            log.logger.error("config.json not match source_host_url")
            exit(1)
        if config.get("private_token") is None:
            log.logger.error("config.json not match private_token")
            exit(1)
        if repo_info_from_source(
            config["source_host_url"],
            config["private_token"],
            protocol.lower()
        ) != STATUS_OK:
            exit(1)
        try:
            # clone仓库到本地
            status = clone_from_source(plans)
            if status != STATUS_OK:
                exit(1)
        except Exception as e:
            log.logger.info("clone_from_source fail, e is %s", e)
            exit(1)
    else:
        if repo_info_from_file() != STATUS_OK:
            exit(1)

    try:
        if create_group_and_repos(config, plans) != STATUS_OK:
            exit(1)
    except Exception as e:
        log.logger.info("create_group_and_repos fail, e is %s", e)
        exit(1)
```

```
try:
    if mode.lower() == "api":
        push_to_target()
    else:
        push_to_target_with_local()
except Exception as e:
    log.logger.info("push_to_target fail, e is %s", e)
    exit(1)
```

----结束

配置访问 CodeArts Repo 的 SSH 公钥

步骤1 运行Git Bash，先检查本地是否已生成过SSH密钥。

如果选择RSA算法，请在Git Bash中执行如下命令：

```
cat ~/.ssh/id_rsa.pub
```

如果选择ED255219算法，请在Git Bash中执行如下命令：

```
cat ~/.ssh/id_ed25519.pub
```

- 如果提示“No such file or directory”，说明您这台计算机没生成过SSH密钥，请继续执行 **步骤2**
- 如果返回以ssh-rsa或ssh-ed25519开头的字符串，说明您这台计算机已经生成过SSH密钥，如果想使用已经生成的密钥请直接跳到**步骤3**，如果想重新生成密钥，请从**步骤2**向下执行。

步骤2 生成SSH密钥。如果选择RSA算法，在Git Bash中生成密钥的命令如下：

```
ssh-keygen -t rsa -b 4096 -C your_email@example.com
```

其中，-t rsa表示生成的是RSA类型密钥，-b 4096是密钥长度（该长度的RSA密钥更具安全性），-C your_email@example.com表示在生成的公钥文件中添加注释，方便识别这个密钥对的用途。

如果选择ED25519算法，在Git Bash中生成密钥的命令如下：

```
ssh-keygen -t ed25519 -b 521 -C your_email@example.com
```

其中，-t ed25519表示生成的是ED25519类型密钥，-b 521是密钥长度（该长度的ED25519密钥更具安全性），-C your_email@example.com表示在生成的公钥文件中添加注释，方便识别这个密钥对的用途。

输入生成密钥的命令后，直接回车，密钥会默认存储到~/.ssh/id_rsa或者~/.ssh/id_ed25519路径下，对应的公钥文件为~/.ssh/id_rsa.pub或者~/.ssh/id_ed25519.pub。

步骤3 复制SSH公钥到剪切板。请根据您的操作系统，选择相应的执行命令，将SSH公钥复制到您的剪切板。

- **Windows：**
  ```
  clip < ~/.ssh/id_rsa.pub
  ```
- **Mac：**
  ```
  pbcopy < ~/.ssh/id_rsa.pub
  ```
- **Linux (xclip required):**
  ```
  xclip -sel clip < ~/.ssh/id_rsa.pub
  ```

步骤4 登录并进入Repo的代码仓库列表页，单击右上角昵称，选择“个人设置” > “代码托管” > “SSH密钥”，进入配置SSH密钥页面。

也可以在Repo的代码仓库列表页，单击右上角“设置我的SSH密钥”，进入配置SSH密钥页面。

步骤5 在**“标题”**中为您的新密钥起一个名称，将您在**步骤3**中复制的SSH公钥粘贴进**“密钥”**中，单击确定后，弹出页面“密钥已设置成功，单击 立即返回，无操作3S后自动跳转”，表示密钥设置成功。

----结束

开始批量迁移

步骤1 执行如下命令，查看脚本参数。

```
python migrate_to_repo.py -h

usage: migrate_to_repo.py [-h] [-p {SSH,HTTP,ssh,http}]
                          [-m {API,FILE,api,file}]

optional arguments:
  -h, --help            show this help message and exit
  -p {SSH,HTTP,ssh,http}, --protocol {SSH,HTTP,ssh,http}
                        protocol specified for clone or push
  -m {API,FILE,api,file}, --mode {API,FILE,api,file}
                        import mode

# 参数说明
# -p 协议，默认是SSH协议，可选为SSH/ssh/HTTP/http
```

----结束