

P4Transfer - Helix Core Full History Migration Tool

Perforce Professional Services

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Chapter 1. Introduction

The script [P4Transfer.py](#) solves the problem: how to transfer changes between unrelated and unconnected Perforce Helix Core repositories.

If you have a 2015.1 or greater Helix Core server then you can use the [Helix native DVCS](#) commands ([p4 clone](#)/[p4 fetch](#)/[p4 push](#)). If you have a pre-2015.1 version of Helix Core (or very large repository sizes to be transferred), then [P4Transfer.py](#) may be your best option! See next section for guidance.

While best practice is usually to have only one Perforce Server, the reality is often that many different Perforce Servers are required. A typical example is the Perforce public depot, which sits outside the Perforce Network.

Sometimes you start a project on one server and then realize that it would be nice to replicate these changes to another server. For example, you could start out on a local server on a laptop while being on the road but would like to make the results available on the public server. You may also wish to consolidate various Perforce servers into one with all their history (e.g. after an acquisition of another company).

Chapter 2. P4Transfer vs Helix native DVCS functions

Both Helix native DVCS and P4Transfer enable migration of detailed file history from a set of paths on one Helix Core server into another server.

Helix native DVCS has additional functionality, such as creating a personal micro-repo for personal use without a continuously running p4d process.



When it is an option, using Helix native DVCS is preferred. But if that can't be used for some reason, P4Transfer can pretty much always be made to work.

2.1. Guidance on tool differences

Pros for native DVCS:

- Helix native DVCS is a fully supported product feature.
- Helix native DVCS requires consistency among the Helix Core servers: Same case sensitivity setting, same Unicode mode, and same P4D version (with some exceptions).
- Helix native DVCS is easy to setup and use.
- Helix native DVCS requires particular configurables to be setup, and may be viewed as a security concern for the extraction of history (this can be controlled with pre-command triggers)
- Helix native DVCS has some limitations at larger scales (depends on server RAM as it creates zip files) - won't scale to TB requiring to be transferred.
- Helix native DVCS is generally deemed to produce the highest possible quality data on the target server, as it transfers raw journal data and archive content.
- Helix native DVCS is very fast.
- Helix native DVCS has no external dependencies.
- Helix native DVCS bypasses triggers.

When P4Transfer might be a better option:

- If Helix native DVCS hits data snags, there may not be an easy way to work around them, unless a new P4D server release address them.
- Helix native DVCS must be explicitly enabled. If not already enabled, it requires 'super' access on both Helix Core servers involved in the process.
- P4Transfer is community supported (and with paid Consulting engagements).
- P4Transfer can make timestamps more accurate if it has 'admin' level access, but does not require it.
- P4Transfer automates front-door workflows, i.e. it does would a human with a p4 command line client, fleet fingers and a lot of time could do.

- P4Transfer can work with mismatched server data sets (different case sensitivity, Unicode mode, or P4D settings) **so long as** the actual data to be migrated doesn't cause issues. (For example, if you try to copy paths that actually do have Korean glyphs in the path name to a non-Unicode server, that ain't gonna work).
- If P4Transfer does have issues with importing some data (like the above example with Unicode paths), you can manually work around those snags, and then pick up with the next changelist. If there aren't too many snags, this trial and error process is viable.
- P4Transfer is reasonably fast as a front-door mechanism.
- P4Transfer can be run as a service for continuous operation, and has successfully run for months or more.
- P4Transfer data quality is excellent in terms of detail (e.g. integration history, resolve options, etc.). However, it is an emulation of history rather than a raw replay of actual history in the native format as done by Helix native DVCS. The nuance in history differences rarely has practical implications.
- P4Transfer requires more initial setup than Helix native DVCS.
- P4Transfer requires Python (2.7 or 3.6+).
- P4Transfer can be interfered with by custom policy enforcement triggers on the target server.

Chapter 3. Implementation

The basic idea is to create a client workspace on each Perforce Server that maps the projects to be transferred. Both client workspaces must share the same root directory and client side mapping. For example:

Source client:

```
Client: workspace_server1

Root: /work/transfer

View:
    //depot/myproject/dev/... //workspace_server1/depot/myproject/dev/...
    //depot/other/dev/... //workspace_server1/depot/other/dev/...
```

Target client:

```
Client: workspace_server2

Root: /work/transfer

View:
    //import/mycode/... //workspace_server2/depot/myproject/dev/...
    //import/stuff/... //workspace_server2/depot/other/dev/...
```

These client workspaces are created automatically from the **view** entries in the config file described below.

P4Transfer works uni-directionally. The tool will inquire the changes for the workspace files and compare these to a counter.

P4Transfer uses a single configuration file that contains the information of both servers as well as the current counter values. The tool maintains its state counter using a Perforce counter on the target server (thus requiring **review** privilege as well as **write** privilege – by default it assumes **super** user privilege is required since it updates changelist owners and date/time to the same as the source – this functionality is controlled by the config file).

3.1. Classic/local target depots vs Streams targets

It is now possible to migrate streams to streams. This is done by creating a source workspace which can read any specified stream (it is just a normal workspace since syncing from any stream is possible). The target workspace is a special stream workspace which is a mainline with no **share ...** line in it, but which uses **import+** to write to all the desired target streams.

Notes/restrictions on streams:

- Currently supports streams → streams only (not classic to streams)
- Takes whole streams rather than allowing filtering of source streams
- Will auto-create target streams if necessary when you use wildcard matching (*) in source/target stream names, e.g. allowing you to take all `//streams_depot/release*` streams across easily.



Remember that humans should not be writing to the targets of a P4Transfer instance (streams or otherwise) - or the script may fail in strange ways!

Chapter 4. Setup

You will need Python 2.7 or 3.6+ and P4Python 2017.2+ to make this script work.

The easiest way to install P4Python is probably using "pip" (or "pip3") – [make sure this is installed](#). Then:

```
pip install p4python
```



If the above needs to build and fails, then this usually works for Python 3.6: `pip3 install p4python==2017.2.1615960`

Alternatively, refer to [P4Python Docs](#)

If you are on Windows, then look for an appropriate version on the Perforce ftp site (for your Python version), e.g. <http://ftp.perforce.com/perforce/r20.1/bin.ntx64/>

4.1. Installing P4Transfer.py

The easiest thing to do is to download this repo either by:

- running `git clone https://github.com/perforce/p4transfer`
- or by downloading [the project zip file](#) and unzipping.

The minimum requirements are the modules `P4Transfer.py` and `logutils.py`

If you have installed P4Python as above, then check the `requirements.txt` for other modules to install via `pip` or `pip3`.

4.2. Getting started

Note that if running it on Windows, and especially if the source server has filenames containing say umlauts or other non-ASCII characters, then Python 2.7 is required currently due to the way Unicode is processed. Python 3.6+ on Mac/Unix should be fine with Unicode as long as you are using P4Python 2017.2+

Create the workspaces for both servers, ensuring that the root directories and client views match.

Now initialize the configuration file, by default called `transfer.cfg`. This can be generated by the script:

```
python3 P4Transfer.py -sample-config > transfer.yaml
```

Then edit the resulting file, paying attention to the comments.

The password stored in P4Passwd is optional if you do not want to rely on tickets. The tool performs

a login if provided with a password, so it should work with `security=3` or `auth_check` trigger set.

Note that although the workspaces are named the same for both servers in this example, they are completely different entities.

A typical run of the tool would produce the following output:

```
C:\work\> python3 P4Transfer.py -c transfer.yaml -r
2014-07-01 15:32:34,356:P4Transfer:INFO: Transferring 0 changes
2014-07-01 15:32:34,361:P4Transfer:INFO: Sleeping for 1 minutes
```

If there are any changes missing, they will be applied consecutively.

4.3. Script parameters

P4Transfer has various options – these are documented via the `-h` or `--help` parameters.

The following text may not display properly if your are viewing this P4Transfer.adoc file in GitHub. Please refer the the .pdf version instead, or open up [help.txt](#) file directly.

```
usage: P4Transfer.py [-h] [-c CONFIG] [-n] [-m MAXIMUM] [-k] [-r] [-s]
                    [--sample-config] [-i] [--end-datetime END_DATETIME]
```

NAME:

P4Transfer.py

DESCRIPTION:

This python script (2.7/3.6+ compatible) will transfer Perforce changelists with all contents between independent servers when no remote depots are possible, and P4 DVCS commands (such as `p4 clone/fetch/zip/unzip`) are not an option.

This script transfers changes in one direction - from a source server to a target server.

Usage:

```
python3 P4Transfer.py -h
```

The script requires a config file, by default `transfer.yaml`, that provides the Perforce connection information for both servers.

An initial example can be generated, e.g.

```
P4Transfer.py --sample-config > transfer.yaml
```

For full documentation/usage, see project doc:

<https://github.com/perforce/p4transfer/blob/main/doc/P4Transfer.adoc>

optional arguments:

```
-h, --help            show this help message and exit
-c CONFIG, --config CONFIG
                        Default is transfer.yaml
-n, --notransfer       Validate config file and setup source/target
                        workspaces but don't transfer anything
-m MAXIMUM, --maximum MAXIMUM
                        Maximum number of changes to transfer
-k, --nokeywords       Do not expand keywords and remove +k from filetype
-r, --repeat           Repeat transfer in a loop - for continuous transfer as
                        background task
-s, --stoponerror      Stop on any error even if --repeat has been specified
--sample-config        Print an example config file and exit
-i, --ignore-integrations
                        Treat integrations as adds and edits
--end-datetime END_DATETIME
                        Time to stop transfers, format: 'YYYY/MM/DD HH:mm' -
                        useful for automation runs during quiet periods e.g.
                        run overnight but stop first thing in the morning
```

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4.4. Optional Parameters

- **--notransfer** - useful to validate your config file and that you can connect to source/target p4d servers, and report on how many changes might be transferred.
- **--maximum** - useful to perform a test transfer of a single changelist when you get started (although remember this might be a changelist with a lot of files!)
- **--keywords** - useful to avoid issues with expanding of keywords on a different server. Keywords make it hard to compare source/target results, and make transfers slower due to extra work required.
- **--end-datetime** - useful to schedule a run of P4Transfer and have it stop at the desired time (e.g. run overnight and stop when users start work in the morning). Useful for scheduling long running transfers (can be many days) in quiet periods (e.g. together with Linux **at** command)

4.5. Long running jobs

On Linux, recommend you execute it as a background process, and then monitor the output:

```
nohup python3 P4Transfer.py -c transfer.yaml -r > out1 &
```

This will run in the background, and poll for new changes (according to **poll_interval** in the config file.)

You can look at the output file for progress, e.g. (avoiding long lines of text which can be output), or grep the log file:

```
tail -f out1 | cut -c -140
```

```
grep :INFO: log-P4Transfer-*.log
```

Note that if you edit the configuration file, it will be re-read the next time the script wakes up and polls for input. So you do not need to stop and restart the job.

4.6. Setting up environment

The following simple setup will allow you to cross check easily source and target servers. Assume we are in a directory: `/some/path/p4transfer`

```
export P4CONFIG=.p4config
mkdir source target
cd source
vi .p4config
```

and create appropriate values as per your config file for the source server e.g.:

```
cat .p4config
P4PORT=source-server:1666
P4USER=p4transfer
P4CLIENT=p4transfer_client
```

And similarly create a file in the `target` sub-directory.

This will allow you to quickly and easily `cd` between directories and be able to run commands against respective source and target p4d instances.

4.7. Configuration Options

The comments in the file are mostly self-explanatory. It is important to specify the main values for the `[source]` and `[target]` sections.

```
P4Transfer.py --sample-config > transfer.yaml
```

```
cat transfer.yaml
```

The following included text may not display correctly when this .adoc file is viewed in GitHub -

instead download the PDF version of this doc, or open [transfer.yaml](#) directly.

```
# Save this output to a file to e.g. transfer.yaml and edit it for your configuration

# counter_name: Unique counter on target server to use for recording source changes
# processed. No spaces.
#   Name sensibly if you have multiple instances transferring into the same target p4
# repository.
#   The counter value represents the last transferred change number - script will
# start from next change.
#   If not set, or 0 then transfer will start from first change.
counter_name: p4transfer_counter

# instance_name: Name of the instance of P4Transfer - for emails etc. Spaces allowed.
instance_name: Perforce Transfer from XYZ

# For notification - if smtp not available - expects a pre-configured nms FormMail
# script as a URL
#   E.g. expects to post using 2 fields: subject, message
# Alternatively, use the following entries (suitable adjusted) to use Mailgun for
# notifications
#   api: "<Mailgun API key>"
#   url: "https://api.mailgun.net/v3/<domain or sandbox>"
#   mail_from: "Fred <fred@example.com>"
#   mail_to:
#     - "fred@example.com"
mail_form_url:

# The mail_* parameters must all be valid (non-blank) to receive email updates during
# processing.
# mail_to: One or more valid email addresses - comma separated for multiple values
#   E.g. somebody@example.com,somebody-else@example.com
mail_to:

# mail_from: Email address of sender of emails, E.g. p4transfer@example.com
mail_from:

# mail_server: The SMTP server to connect to for email sending, E.g.
# smtpserver.example.com
mail_server:

# =====
# Note that for any of the following parameters identified as (Integer) you can
# specify a
# valid python expression which evaluates to integer value, e.g.
#   "24 * 60"
#   "7 * 24 * 60"
# Such values should be quoted (in order to be treated as strings)
# -----
# sleep_on_error_interval (Integer): How long (in minutes) to sleep when error is
```

```

encountered in the script
sleep_on_error_interval: 60

# poll_interval (Integer): How long (in minutes) to wait between polling source server
for new changes
poll_interval: 60

# change_batch_size (Integer): changelists are processed in batches of this size
change_batch_size: 1000

# The following *_interval values result in reports, but only if mail_* values are
specified
# report_interval (Integer): Interval (in minutes) between regular update emails being
sent
report_interval: 30

# error_report_interval (Integer): Interval (in minutes) between error emails being
sent e.g. connection error
#   Usually some value less than report_interval. Useful if transfer being run with
--repeat option.
error_report_interval: 15

# summary_report_interval (Integer): Interval (in minutes) between summary emails
being sent e.g. changes processed
#   Typically some value such as 1 week (10080 = 7 * 24 * 60). Useful if transfer
being run with --repeat option.
summary_report_interval: 7 * 24 * 60

# sync_progress_size_interval (Integer): Size in bytes controlling when syncs are
reported to log file.
#   Useful for keeping an eye on progress for large syncs over slow network links.
sync_progress_size_interval: 500 * 1000 * 1000

# max_logfile_size (Integer): Max size of file to (in bytes) after which it should be
rotated
#   Typically some value such as 20MB = 20 * 1024 * 1024. Useful if transfer being
run with --repeat option.
max_logfile_size: 20 * 1024 * 1024

# change_description_format: The standard format for transferred changes.
#   Keywords prefixed with $. Use \n for newlines. Keywords allowed:
#   $sourceDescription, $sourceChange, $sourcePort, $sourceUser
change_description_format: $sourceDescription\n\nTransferred from
p4://$sourcePort@$sourceChange

# change_map_file: Name of an (optional) CSV file listing mappings of source/target
changelists.
#   If this is blank (DEFAULT) then no mapping file is created.
#   If non-blank, then a file with this name in the target workspace is appended to
#   and will be submitted after every sequence (batch_size) of changes is made.
#   Default type of this file is text+CS32 to avoid storing too many revisions.

```

```

# File must be mapped into target client workspace.
# File can contain a sub-directory, e.g. change_map/change_map.csv
# Note that due to the way client workspace views are created the local filename
# should include a valid source path including depot name, e.g.
# //depot/export/... -> depot/export/change_map.csv
change_map_file:

# superuser: Set to n if not a superuser (so can't update change times - can just
# transfer them).
superuser: y

# ignore_files: An array of regex patterns which are used to ignore any matching
# files.
# Allows you to ignore some issues which cause transfer problems.
# E.g.
# ignore_files:
# - "some/files/to/*ignore$"
ignore_files:

source:
# P4PORT to connect to, e.g. some-server:1666 - if this is on localhost and you
just
# want to specify port number, then use quotes: "1666"
p4port:
# P4USER to use
p4user:
# P4CLIENT to use, e.g. p4-transfer-client
p4client:
# P4PASSWD for the user - valid password. If blank then no login performed.
# Recommended to make sure user is in a group with a long password timeout!.
# Make sure your P4TICKETS file is correctly found in the environment
p4passwd:
# P4CHARSET to use, e.g. none, utf8, etc - leave blank for non-unicode p4d
instance
p4charset:

target:
# P4PORT to connect to, e.g. some-server:1666 - if this is on localhost and you
just
# want to specify port number, then use quotes: "1666"
p4port:
# P4USER to use
p4user:
# P4CLIENT to use, e.g. p4-transfer-client
p4client:
# P4PASSWD for the user - valid password. If blank then no login performed.
# Recommended to make sure user is in a group with a long password timeout!
# Make sure your P4TICKETS file is correctly found in the environment
p4passwd:
# P4CHARSET to use, e.g. none, utf8, etc - leave blank for non-unicode p4d
instance

```

```

p4charset:

# workspace_root: Root directory to use for both client workspaces.
#   This will be used to update the client workspace Root: field for both
source/target workspaces
#   They must be the same.
#   Make sure there is enough space to hold the largest single changelist that will
be transferred!
workspace_root: /work/transfer

# views: An array of source/target view mappings
#   You are not allowed to specify both 'views' and 'stream_views' - leave one or
other blank!!
#   Each value is a string - normally quote. Standard p4 wildcards are valid.
#   These values are used to construct the appropriate View: fields for source/target
client workspaces
#   It is allowed to have exclusion mappings - by specifying the '-' as first
character in 'src'
#   entry - see last example below.
views:
- src: //depot/source_path1/...
  targ: //import/target_path1/...
- src: //depot/source_path2/...
  targ: //import/target_path2/...
- src: -//depot/source_path2/exclude/*.tgz
  targ: //import/target_path2/exclude/*.tgz

# transfer_target_stream: The name of a special target stream to use - IT SHOULD NOT
CONTAIN FILES!!
#   This will be setup as a mainline stream, with no sharing and with import+
mappings
#   It is in standard stream name format, e.g. //<depot>/<name> or
//<depot>/<mid>/<name>
#   e.g. transfer_target_stream: //targ_streams/transfer_target
transfer_target_stream:

# stream_views: An array of source/target stream view mappings and other record
fields.
#   You are not allowed to specify both 'views' and 'stream_views' - leave one or
other blank
#   Each src/targ value is a string with '*' p4 wildcards to match stream names (like
'p4 streams //depot/rel*')
#   Multiple wildcards are allowed, but make sure the number of wildcards matches
between source and target.
#   Please note that target depots must exist.
#   Target streams will be created as required using the specified type/parent
fields.
#   Field 'type:' has allowed values: mainline, development, release
#   Field 'parent:' should specify a suitable parent if you are creating development
or release streams.
stream_views:

```

```
- src: //streams_src/main
  targ: //streams_targ/main
  type: mainline
  parent: ''
- src: //streams_src2/release*
  targ: //streams_targ2/rel*
  type: mainline
  parent: //streams_targ2/main
- src: //src3_streams/*rel*
  targ: //targ3_streams/*release*
  type: mainline
  parent: //targ3_streams/main
```

4.7.1. Changelist comment formatting

In the `[general]` section, you can customize the `change_description_format` value to decide how transferred change descriptions are formatted.

Keywords in the format string are prefixed with `$`. Use `\n` for newlines. Keywords allowed are: `$sourceDescription`, `$sourceChange`, `$sourcePort`, `$sourceUser`.

Assume the source description is “Original change description”.

Default format:

```
$sourceDescription\n\nTransferred from p4://$sourcePort@$sourceChange
```

might produce:

```
Original change description
```

```
Transferred from p4://source-server:1667@2342
```

Custom format:

```
Originally $sourceChange by $sourceUser on $sourcePort\n$sourceDescription
```

might produce:

```
Originally 2342 by FBlogs on source-server:1667
Original change description
```


4.7.2. Recording a change list mapping file

There is an option in the configuration file to specify a `change_map_file`. If you set this option (default is blank), then P4Transfer will append rows to the specified CSV file showing the relationship between source and target changelists, and will automatically check that file in after every process.

```
change_map_file = depot/import/change_map.csv
```

The result change map file might look something like this:

```
$ head change_map.csv
sourceP4Port,sourceChangeNo,targetChangeNo
src-server:1666,1231,12244
src-server:1666,1232,12245
src-server:1666,1233,12246
src_server:1666,1234,12247
src-server:1666,1235,12248
```

It is very straight forward to use standard tools such as `grep` to search this file. Because it is checked in to the target server, you can also use “`p4 grep`”.



You will need to ensure that the `change_map` filename is properly mapped in the local workspace - thus it must include `<depot>` and other pathname components in the path. When you have created your target workspace, run `p4 client -o` to check the view mapping.

Chapter 5. Misc Usage Notes

Note that since labeling itself is not versioned no labels or tags are transferred.

5.1. Integration Recrods

Branching and integrating with is implemented, as long as both source and target are within the workspace view. Otherwise, the integrate action is downgraded to an add or edit.

5.2. Setting up as a service on Windows

P4Transfer can be setup as a service on Windows using `srvinst.exe` and `srvanay.exe` to wrap the Python interpreter, or [NSSM - The Non-Sucking Service Manager](#)

Please contact consulting@perforce.com for more details.

Chapter 6. Support

Any errors in the script are highly likely to be due to some unusual integration history, which may have been done with an older version of the Perforce server.

If you have an error when running the script, please use `summarise_log.sh` to create a summary log file to send. E.g.

```
summarise_log.sh log-P4Transfer-20141208094716.log > sum.log
```

If you get an error message in the log file such as:

```
P4TLogicException: Replication failure: missing elements in target changelist:
/work/p4transfer/main/applications/util/Utils.java
```

or

```
P4TLogicException: Replication failure: src/target content differences found: rev = 1
action = branch type = text depotFile = //depot/main/applications/util/Utils.java
```

Then please also send the following:

A Revision Graph screen shot from the source server showing the specified file around the changelist which is being replicated. If an integration is involved then it is important to show the source of the integration.

Filelog output for the file in the source Perforce repository, and filelog output for the source of the integrate being performed. e.g.

```
p4 -ztag filelog /work/p4transfer/main/applications/util/Utils.java@12412
p4 -ztag filelog /work/p4transfer/dev/applications/util/Utils.java@12412
```

where 12412 is the changelist number being replicated when the problem occurred.

6.1. Re-running P4Transfer after an error

When an error has been fixed, you can usually re-start P4Transfer from where it left off. If the error occurred when validating changelist say 4253 on the target (which was say 12412 on the source) but found to be incorrect, the process is:

```
p4 -p target-p4:1666 -u transfer_user -c transfer_workspace obliterate
//transfer_workspace/...@4253,4253
```

(re-run the above with the -y flag to actually perform the obliterate)

Ensure that the counter specified in your config file is set to a value less than 4253 such as the changelist immediately prior to that changelist. Then re-run P4Transfer as previously.

Chapter 7. Contributor's Guide

Pull Requests are welcome. Code changes should normally be accompanied by tests.

See [TestP4Transfer.py](#) for unit/integration tests.

Most tests generate a new **p4d** repository with source/target servers and run test transfers.

The use the "[rsh](#)" [hack](#) to avoid having to spawn p4d on a port.

7.1. Test dependencies

Tests assume there is a valid **p4d** in your current PATH.

7.2. Running a single test

Pick your single test class (e.g. **testAdd**):

```
python3 TestP4Transfer.py TestP4Transfer.testAdd
```

This will:

- generate a single log file: **log-TestP4Transfer-*.log**
- create a test sub-directory **_testrun_transfer** with the following structure:

```
source/
  server/      # P4ROOT and other files for server - uses rsh hack for p4d
  client/      # Root of client used to checkin files
  .p4config    # Defines P4PORT for source server
target/        # Similar structure to source/
transfer_client/ # The root of shared transfer client
```

This test directory is created new for each test, and then left behind in case of test failures. If you want to manually do tests or view results, then **export P4CONFIG=.p4config**, and **cd** into the source/target directory to be able to run normal **p4** commands as appropriate.

7.3. Running all tests

```
python3 TestP4Transfer.py
```

It will generate many log files (**log-TestP4Transfer-*.log**) which can be examined in case of failure or removed.