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GNU TALER RELEASE CHECKLIST

Release checklists for GNU Taler:

Wallet:
• [ ] build wallet
• [ ] verify wallet works against ‘test.taler.net’
• [ ] tag repo.
• [ ] upgrade ‘demo.taler.net’ to ‘test.taler.net’
• [ ] upload new wallet release to app store
• [ ] Update bug tracker (mark release, resolved -> closed)
• [ ] Send announcement to taler@gnu.org
• [ ] Send announcement to info-gnu@gnu.org (major releases only)
• [ ] Send announcement to coordinator@translationproject.org

For exchange:
• [ ] check no compiler warnings at “-Wall”
• [ ] ensure Coverity static analysis passes
• [ ] make check.
• [ ] upgrade ‘demo.taler.net’ to ‘test.taler.net’
• [ ] make dist, make check on result of ‘make dist’.
• [ ] Change version number in configure.ac.
• [ ] make dist for release.
• [ ] tag repo.
• [ ] Upload triplet to ftp-upload.gnu.org/incoming/ftp or /incoming/alpha
• [ ] Update bug tracker (mark release, resolved -> closed)
• [ ] Send announcement to taler@gnu.org
• [ ] Send announcement to info-gnu@gnu.org (major releases only)
• [ ] Send announcement to coordinator@translationproject.org

For merchant (C backend):
• [ ] check no compiler warnings at “-Wall”
• [ ] ensure Coverity static analysis passes
• [ ] make check.
• [ ] upgrade ‘demo.taler.net’ to ‘test.taler.net’
• [ ] make dist, make check on result of ‘make dist’.
• [ ] Change version number in configure.ac.
• [ ] make dist for release.
• [ ] tag repo.
• [ ] Upload triplet to ftp-upload.gnu.org/incoming/ftp or /incoming/alpha
• [ ] Update bug tracker (mark release, resolved -> closed)
• [ ] Send announcement to taler@gnu.org
• [ ] Send announcement to info-gnu@gnu.org (major releases only)
• [ ] Send announcement to coordinator@translationproject.org

For bank:
• TBD

For Python merchant frontend:
• TBD

For PHP merchant frontend:
• TBD

For auditor:
• TBD

For libebics:
• TBD
GNU TALER DEMO UPGRADE CHECKLIST

Post-upgrade checks:

• Run `taler-deployment-arm -I` to verify that all services are running.
• Run the headless wallet to check that services are actually working:

```
taler-wallet-cli integrationtest -e https://exchange.demo.taler.net/ -m https://backend.demo.taler.net/ -b https://bank.demo.taler.net -w "KUDOS:10" -s "KUDOS:5"
```

Basics:

• Visit https://demo.taler.net/ to see if the landing page is displayed correctly
• Visit the wallet installation page, install the wallet, and see if the presence indicator is updated correctly.
• Visit https://bank.demo.taler.net/, register a new user and withdraw coins into the browser wallet.

Blog demo:

• Visit https://shop.demo.taler.net/ and purchase an article.
• Verify that the balance in the wallet was updated correctly.
• Go back to https://shop.demo.taler.net/ and click on the same article link. Verify that the article is shown and no repeated payment is requested.
• Open the fulfillment page from the previous step in an anonymous browsing session (without the wallet installed) and verify that it requests a payment again.
• Delete cookies on https://shop.demo.taler.net/ and click on the same article again. Verify that the wallet detects that the article has already purchased and successfully redirects to the article without spending more money.

Donation demo:

• Make a donation on https://donations.demo.taler.net
• Make another donation with the same parameters and verify that the payment is requested again, instead of showing the previous fulfillment page.

Survey/Tipping:

• Visit https://survey.demo.taler.net/ and receive a tip.
• Verify that the survey stats page (https://survey.demo.taler.net/survey-stats) is working, and that the survey reserve has sufficient funds.
Note: This manual contains information for developers working on GNU Taler and related components. It is not intended for a general audience.

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3.1 Bug Tracking

Bug tracking is done with Mantis (https://www.mantisbt.org/). The bug tracker is available at https://bugs.taler.net. A registration on the Web site is needed in order to use the bug tracker, only read access is granted without a login.

3.2 Code Repositories

Taler code is versioned with Git. For those users without write access, all the codebases are found at the following URL:

```
git://git.taler.net/<repository>
```

A complete list of all the existing repositories is currently found at https://git.taler.net/.

3.3 Committing code

Before you can obtain Git write access, you must sign the copyright agreement. As we collaborate closely with GNUnet, we use their copyright agreement – with the understanding that your contributions to GNU Taler are included in the assignment. You can find the agreement on the GNUnet site. Please sign and mail it to Christian Grothoff as he currently collects all the documents for GNUnet e.V.

To obtain Git access, you need to send us your SSH public key. Most core team members have administrative Git access, so simply contact whoever is your primary point of contact so far. You can find instructions on how to generate an SSH key in the Git book. If you have been granted write access, you first of all must change the URL of the respective repository to:

```
ssh://git@git.taler.net/<repository>
```

For an existing checkout, this can be done by editing the .git/config file.

The server is configured to reject all commits that have not been signed with GnuPG. If you do not yet have a GnuPG key, you must create one, as explained in the GNU Privacy Handbook. You do not need to share the respective public key with us to make commits. However, we recommend that you upload it to key servers, put it on your business card and personally meet with other GNU hackers to have it signed such that others can verify your commits later.

To sign all commits, you should run

```
$ git config --global commit.gpgsign true
```
You can also sign individual commits only by adding the `-S` option to the `git commit` command. If you accidentally already made commits but forgot to sign them, you can retroactively add signatures using:

```
$ git rebase -S
```

Whether you commit to a personal branch, a feature branch or to master should depend on your level of comfort and the nature of the change. As a general rule, the code in master must always build and tests should always pass, at least on your own system. However, we all make mistakes and you should expect to receive friendly reminders if your change did not live up to this simple standard. We plan to move to a system where the CI guarantees this invariant in the future.

In order to keep a linear and clean commits history, we advise to avoid merge commits and instead always rebase your changes before pushing to the master branch. If you commit and later find out that new commits were pushed, the following command will pull the new commits and rebase yours on top of them.

```
# -S instructs Git to (re)sign your commits
$ git pull --rebase -S
```

### 3.4 Observing changes

Every commit to the master branch of any of our public repositories (and almost all are public) is automatically sent to the `gnunet-svn@gnu.org` mailinglist. That list is for Git commits only, and must not be used for discussions. It also carries commits from our main dependencies, namely GNUnet and GNU libmicrohttpd. While it can be high volume, the lists is a good way to follow overall development.

### 3.5 Communication

We use the `#taler` channel on the Freenode IRC network and the `taler@gnu.org` public mailinglist for discussions. Not all developers are active on IRC, but all developers should probably subscribe to the low-volume Taler mailinglist. There are separate low-volume mailinglists for gnunet-developers (@gnu.org) and for libmicrohttpd (@gnu.org).
This section describes the GNU Taler deployment on `gv.taler.net`. `gv` is our server at BFH. It hosts the Git repositories, Web sites, CI and other services. Developers can receive an SSH account and e-mail alias for the system. As with Git, ask your primary team contact for shell access if you think you need it.

Our old server, *tripwire*, is currently offline and will likely go back online to host production systems for operating real Taler payments at BFH in the future.

### 4.1 DNS

DNS records for `taler.net` are controlled by the GNU Taler maintainers, specifically Christian and Florian. If you need a sub-domain to be added, please contact one of them.

### 4.2 User Accounts

On `gv.taler.net`, there are four system users that are set up to serve Taler on the Internet:

- `taler-test`: serves `*.test.taler.net` and gets automatically built by Buildbot.
- `taler-internal`: serves `*.int.taler.net`, and does *NOT* get automatically built.

The following two users are *never* automatically built, and they both serve `*.demo.taler.net`. At any given time, only one is active and serves the HTTP requests from the outside; the other one can be compiled without any downtime. If the compilation succeeds, the inactive user can be switched to become active (see next section), and vice versa.

- `demo-blue`
- `demo-green`
Upgrading the demo environment should be done with care, and ideally be coordinated on the mailing list before. It is our goal for demo to always run a “working version” that is compatible with various published wallets.

Before deploying on demo, the same version of all components must be deployed and tested on int.

Please use the demo upgrade checklist to make sure everything is working.

5.1 Tagging components

All Taler components must be tagged with git before they are deployed on the demo environment, using a tag of the following form:

```
demo-YYYY-MM-DD-SS
```

- **YYYY** = year
- **MM** = month
- **DD** = day
- **SS** = serial

5.2 Environment Layout

Environments have the following layout:

```
$HOME/
 deployment (deployment.git checkout)
 envcfg.py (configuration of the Taler environment)
 activate (bash file, sourced to set environment variables)
 logs/ (log files)
 local/ (locally installed software)
 sources/ (sources repos of locally build components)
 sockets/ (unix domain sockets of running components)
 taler-data (on-disk state, public and private keys)
 .config/taler.conf (main Taler configuration file)
```

On demo-blue and demo-green, taler-data is a symlink pointing to $HOME/demo/shared-data instead of a directory.
5.3 Using envcfg.py

The $HOME/envcfg.py file contains (1) the name of the environment and (2) the version of all components we build (in the form of a git rev).

The envcfg.py for demo looks like this:

```python
env = "demo"
tag = "demo-2019-10-05-01:"
tag_gnunet = tag>tag_libmicrohttpd = tag>tag_exchange = tag>tag_merchant = tag>tag_bank = tag>tag_twister = tag>tag_landing = tag>tag_donations = tag>tag_blog = tag>tag_survey = tag>tag_backoffice = tag>tag_sync = tag
```

Currently only the variables env and tag_${component} are used.

When deploying to demo, the envcfg.py should be committed to deployment.git/envcfg/envcfg-demo-YYYY-MM-DD-SS.py.

5.4 Bootstrapping an Environment

```bash
$ git clone https://git.taler.net/deployment.git ~/deployment
$ cp ~/deployment/envcfg/$ENVCFGFILE ~/envcfg.py
$ ./deployment/bin/taler-deployment bootstrap
$ source ~/activate
$ taler-deployment build
$ taler-deployment-prepare
$ taler-deployment-start
$ taler-deployment-arm -I # check everything works
```

5.5 Upgrading an Existing Environment

```bash
$ rm -rf ~/sources ~/local
$ git -C ~/deployment pull
$ cp ~/deployment/envcfg/$ENVCFGFILE ~/envcfg.py
$ taler-deployment bootstrap
$ taler-deployment build
$ taler-deployment-prepare
$ taler-deployment-restart
$ taler-deployment-arm -I # check everything works
```
5.6 Switching Demo Colors

As the demo user, to switch to color `${COLOR}`, run the following script from deployment/bin:

```
$ taler-deployment-switch-demo-${COLOR}
```
6.1 Documentation Builder

All the Taler documentation is built by the user `docbuilder` that runs a Buildbot worker. The following commands set the `docbuilder` up, starting with a empty home directory.

```bash
# Log-in as the 'docbuilder' user.
$ cd $HOME
$ git clone git://git.taler.net/deployment
$ ./deployment/bootstrap-docbuilder

# If the previous step worked, the setup is complete and the Buildbot worker can be started.
$ buildbot-worker start worker/
```

6.2 Website Builder

Taler Websites, `www.taler.net` and `stage.taler.net`, are built by the user `taler-websites` by the means of a Buildbot worker. The following commands set the `taler-websites` up, starting with a empty home directory.

```bash
# Log-in as the 'taler-websites' user.
$ cd $HOME
$ git clone git://git.taler.net/deployment
$ ./deployment/bootstrap-sitesbuilder

# If the previous step worked, the setup is complete and the Buildbot worker can be started.
$ buildbot-worker start worker/
```
6.3 Code coverage

Code coverage tests are run by the lcovworker user, and are also driven by Buildbot.

# Log-in as the 'lcovworker' user.
$ cd $HOME
$ git clone git://git.taler.net/deployment
$ ./deployment/bootstrap-taler lcov

# If the previous step worked, the setup is complete and the Buildbot worker can be started.
$ buildbot-worker start worker/

The results are then published at https://lcov.taler.net/.

6.4 Service Checker

The user demo-checker runs periodic checks to see if all the *.demo.taler.net services are up and running. It is driven by Buildbot, and can be bootstrapped as follows.

# Log-in as the 'demo-checker' user
$ cd $HOME
$ git clone git://git.taler.net/deployment
$ ./deployment/bootstrap-demochecker

# If the previous step worked, the setup is complete and the Buildbot worker can be started.
$ buildbot-worker start worker/

6.5 Tipping reserve top-up

Both ‘test’ and ‘demo’ setups get their tip reserve topped up by a Buildbot worker. The following steps get the reserve topper prepared.

# Log-in as <env>-topper, with <env> being either 'test' or 'demo'
$ git clone git://git.taler.net/deployment
$ ./deployment/prepare-reservetopper <env>

# If the previous steps worked, then it should suffice to start the worker, with:
$ buildbot-worker start worker/
### 6.6 Producing auditor reports

Both ‘test’ and ‘demo’ setups get their auditor reports compiled by a Buildbot worker. The following steps get the reports compiler prepared.

```
# Log-in as <env>-auditor, with <env> being either 'test' or 'demo'

$ git clone git://git.taler.net/deployment
$ ./deployment/prepare-auditorreporter <env>

# If the previous steps worked, then it should suffice to start
# the worker, with:

$ buildbot-worker start worker/
```

### 6.7 Database schema versioning

The Postgres databases of the exchange and the auditor are versioned. See the 0000.sql file in the respective directory for documentation.

Every set of changes to the database schema must be stored in a new versioned SQL script. The scripts must have contiguous numbers. After any release (or version being deployed to a production or staging environment), existing scripts MUST be immutable.

Developers and operators MUST NOT make changes to database schema outside of this versioning.
7.1 Release Process and Checklists

Please use the *release checklist*

This document describes the process for releasing a new version of the various Taler components to the official GNU mirrors.

The following components are published on the GNU mirrors

- taler-exchange (exchange.git)
- taler-merchant (merchant.git)
- talerdonations (donations.git)
- talerblog (blog.git)
- taler-bank (bank.git)
- taler-wallet-webex (wallet-webex.git)

7.2 Tagging

Tag releases with an *annotated* commit, like

```
git tag -a v0.1.0 -m "Official release v0.1.0"
git push origin v0.1.0
```

7.3 Database for tests

For tests in the exchange and merchant to run, make sure that a database *talercheck* is accessible by $USER. Otherwise tests involving the database logic are skipped.
7.4 Exchange, merchant

Set the version in configure.ac. The commit being tagged should be the change of the version.

Update the Texinfo documentation using the files from docs.git:

```bash
# Get the latest documentation repository
cd $GIT/docs
git pull
make texinfo
# The * .texi files are now in _build/texinfo
# This checks out the prebuilt branch in the prebuilt directory
git worktree add prebuilt prebuilt
cd prebuilt
# Copy the pre-built documentation into the prebuilt directory
cp -r ../_build/texinfo .
# Push and commit to branch
git commit -a -S -m "updating texinfo"
git status
# Verify that all files that should be tracked are tracked,
# new files will have to be added to the Makefile.am in
# exchange.git as well!
git push
# Remember $REVISION of commit
#
# Go to exchange
cd $GIT/exchange/doc/prebuilt
# Update submodule to point to latest commit
git checkout $REVISION
```

Finally, the Automake Makefile.am files may have to be adjusted to include new * .texi files or images.

For the exchange test cases to pass, `make install` must be run first. Without it, test cases will fail because plugins can’t be located.

```bash
./bootstrap
./configure # add required options for your system
make dist
tar -xf taler-$COMPONENT-$VERSION.tar.gz
cd taler-$COMPONENT-$VERSION
make install check
```

7.5 Wallet WebExtension

The version of the wallet is in manifest.json. The version_name should be adjusted, and `version` should be increased independently on every upload to the WebStore.

```bash
./configure
make dist
```
7.6 Upload to GNU mirrors

See https://www.gnu.org/prep/maintain/maintain.html#Automated-FTP-Uploads

Directive file:

```
version: 1.2
directory: taler
filename: taler-exchange-0.1.0.tar.gz
```

Upload the files in **binary mode** to the ftp servers.
CI is done with Buildbot (https://buildbot.net/), and builds are triggered by the means of Git hooks. The results are published at https://buildbot.taler.net/.

In order to avoid downtimes, CI uses a “blue/green” deployment technique. In detail, there are two users building code on the system, the “green” and the “blue” user; and at any given time, one is running Taler services and the other one is either building the code or waiting for that.

There is also the possibility to trigger builds manually, but this is only reserved to “admin” users.
Internationalization (a.k.a “Translation”) is handled with Weblate (https://weblate.org) via our instance at https://weblate.taler.net/.

At this time, this system is still very new for Taler.net and this documentation may be incorrect and is certainly incomplete.

9.1 Who can Register

At this time, anyone can register an account at https://weblate.taler.net/ to create translations. Registered users default to the Users and Viewers privilege level.

9.2 About Privilege Levels

This is the breakdown of privilege levels in Weblate:

- **Users/Viewers** = Can log in, view Translations (*applies to new users*)
- **Reviewers** = Can contribute Translations to existing Components
- **Managers** = Can create new Components of existing Projects
- **Superusers** = Can create new Projects

9.3 Upgrading Privileges

To upgrade from Users/Viewers, a superuser must manually augment your privileges. At this time, superusers are Christian, Florian, and Buck.
9.4 How to Create a Project

The GNU Taler project is probably the correct project for most Components andTranslations falling under this guide. Please contact a superuser if you need another Project created.

9.5 How to Create a Component

Reference: https://docs.weblate.org/en/weblate-4.0.3/admin/projects.html#component-configuration

In Weblate, a Component is a subset of a Project and each Component contains N translations. A Component is generally associated with a Git repo.

To create a Component, log into https://weblate.taler.net/ with your Manager or higher credentials and choose Add from the upper-right corner.

What follows is a sort of Wizard. You can find detailed docs at https://docs.weblate.org/. Here are some important notes about connecting your Component to the Taler Git repository:

Under https://weblate.taler.net/create/component/vcs/:

- **Source code repository** - Generally git+ssh://git@git.taler.net/. Check with git remote -v.
- **Repository branch** - Choose the correct branch to draw from and commit to.
- **Repository push URL** - This is generally git+ssh://git@git.taler.net/ Check with git remote -v.
- **Repository browser** - This is the www URL of the Git repo’s file browser. Example https://git.taler.net/<repositoryname>/git/tree/{filename}?h={branch}\#n{{line}} where <repository-name> gets replaced but {{filename}} and other items in braces are actual variables in the string.
- **Merge style** - Rebase, in line with GNU Taler development procedures
- **Translation license** - GNU General Public License v3.0 or Later
- **Adding new translation** - Decide how to handle adding new translations

9.6 How to Create a Translation

1 - Log into https://weblate.taler.net
2 - Navigate to Projects > Browse all projects
3 - Choose the Project you wish to contribute to.
4 - Choose the Component you wish to contribute to.
5 - Find the language you want to translate into. Click “Translate” on that line.
6 - Find a phrase and translate it.

You may also wish to refer to https://docs.weblate.org/.
9.7 Translation Standards and Practices

By default, our Weblate instance is set to accept translations in English, French, German, Italian, Russian, Spanish, and Portuguese. If you want to contribute a translation in a different language, navigate to the Component you want to translate for, and click “Start new translation” to begin. If you require a privilege upgrade, please contact a superuser with your request.

When asked, set the license to GPLv3 or later.

Set commit/push to manual only.

9.8 GPG Signing of Translations

weblate.taler.net signs GPG commits with the GPG key CD33CE35801462FA5EB0B695F2664BF474BFE502, and the corresponding public key can be found at https://weblate.taler.net/keys/.

This means that contributions made through weblate will not be signed with the individual contributor’s key when they are checked into the Git repository, but with the weblate key.
10.1 Android App Nightly Builds

There are currently three Android apps in the official Git repository:

- Wallet [CI]
- Merchant PoS Terminal [CI]
- Cashier [CI]

Their git repositories are mirrored at Gitlab to utilize their CI and F-Droid’s Gitlab integration to publish automatic nightly builds for each change on the master branch.

All three apps publish their builds to the same F-Droid nightly repository (which is stored as a git repository): https://gitlab.com/gnu-taler/fdroid-repo-nightly

You can download the APK files directly from that repository or add it to the F-Droid app for automatic updates by clicking the following link (on the phone that has F-Droid installed).

GNU Taler Nightly F-Droid Repository

Note: Nightly apps can be installed alongside official releases and thus are meant only for testing purposes. Use at your own risk!

10.2 Building apps from source

Note that this guide is different from other guides for building Android apps, because it does not require you to run non-free software. It uses the Merchant PoS Terminal as an example, but works as well for the other apps if you replace merchant-terminal with wallet or cashier.

First, ensure that you have the required dependencies installed:

- Java Development Kit 8 or higher (default-jdk-headless)
- git
- unzip

Then you can get the app’s source code using git:
# Start by cloning the Android git repository

```bash
git clone https://git.taler.net/taler-android.git
```

# Change into the directory of the cloned repository

```bash
cd taler-android
```

# Find out which Android SDK version you will need

```bash
grep -i compileSdkVersion merchant-terminal/build.gradle
```

The last command will return something like `compileSdkVersion 29`. So visit the Android Rebuilds project and look for that version of the Android SDK there. If the SDK version is not yet available as a free rebuild, you can try to lower the `compileSdkVersion` in the app’s `merchant-terminal/build.gradle` file. Note that this might break things or require you to also lower other versions such as `targetSdkVersion`.

In our example, the version is 29 which is available, so download the “SDK Platform” package of “Android 10.0.0 (API 29)” and unpack it:

```bash
# Change into the directory that contains your downloaded SDK
cd $HOME

# Unpack/extract the Android SDK
unzip android-sdk_eng.10.0.0_r14_linux-x86.zip

# Tell the build system where to find the SDK
export ANDROID_SDK_ROOT="$HOME/android-sdk_eng.10.0.0_r14_linux-x86"

# Change into the directory of the cloned repository
cd taler-android

# Build the merchant-terminal app
./gradlew :merchant-terminal:assembleRelease
```

If you get an error message complaining about build-tools

> Failed to install the following Android SDK packages as some licences have not been accepted.

```
built-tools;29.0.3 Android SDK Build-Tools 29.0.3
```

you can try changing the `buildToolsVersion` in the app’s `merchant-terminal/build.gradle` file to the latest “Android SDK build tools” version supported by the Android Rebuilds project.

After the build finished successfully, you will find your APK in `merchant-terminal/build/outputs/apk/release/`.
Code coverage is done with the Gcov / Lcov (http://ltp.sourceforge.net/coverage/lcov.php) combo, and it is run nightly (once a day) by a Buildbot worker. The coverage results are then published at https://lcov.taler.net/.
GNU Taler is developed primarily in C, Kotlin, Python and TypeScript.

12.1 Components written in C

These are the general coding style rules for Taler.

- Baseline rules are to follow GNU guidelines, modified or extended by the GNUnet style: https://docs.gnunet.org/handbook/gnunet.html#Coding-style

12.1.1 Naming conventions

- include files (very similar to GNUnet):
  - if installed, must start with “taler_” (exception: platform.h), and MUST live in src/include/
  - if NOT installed, must NOT start with “taler_” and MUST NOT live in src/include/ and SHOULD NOT be included from outside of their own directory
  - end in “_lib” for “simple” libraries
  - end in “_plugin” for plugins
  - end in “_service” for libraries accessing a service, i.e. the exchange

- binaries:
  - taler-exchange-xxx: exchange programs
  - taler-merchant-xxx: merchant programs (demos)
  - taler-wallet-xxx: wallet programs
  - plugins should be libtaler_plugin_xxx_yyy.so: plugin yyy for API xxx
  - libtalerxxx: library for API xxx

- logging
  - tools use their full name in GNUNET_log_setup (i.e. ‘taler-exchange-keyup’) and log using plain ‘GNUNET_log’.
  - pure libraries (without associated service) use ‘GNUNET_log_from’ with the component set to their librarian name (without lib or ‘.so’), which should also be their directory name (i.e. ‘util’)
  - plugin libraries (without associated service) use ‘GNUNET_log_from’ with the component set to their type and plugin name (without lib or ‘.so’), which should also be their directory name (i.e. ‘exchangedb-postgres’)

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– libraries with associated service) use ‘GNUNET_log_from’ with the name of the service, which should also be their directory name (i.e. ‘exchange’)

• configuration
  – same rules as for GNUnet

• exported symbols
  – must start with TALER_[SUBSYSTEMNAME] where SUBSYSTEMNAME MUST match the subdirectory of src/ in which the symbol is defined
  – from libtalerutil start just with TALER_, without subsystemname
  – if scope is ONE binary and symbols are not in a shared library, use binary-specific prefix (such as TMH = taler-exchange-httpd) for globals, possibly followed by the subsystem (TMH_DB_xxx).

• structs:
  – structs that are ‘packed’ and do not contain pointers and are thus suitable for hashing or similar operations are distinguished by adding a “P” at the end of the name. (NEW) Note that this convention does not hold for the GNUnet-structs (yet).
  – structs that are used with a purpose for signatures, additionally get an “S” at the end of the name.

• private (library-internal) symbols (including structs and macros)
  – must not start with TALER_ or any other prefix

• testcases
  – must be called “test_module-under-test_case-description.c”

• performance tests
  – must be called “perf_module-under-test_case-description.c”

### 12.2 Shell Scripts

Shell scripts should be avoided if at all possible. The only permissible uses of shell scripts in GNU Taler are:

• Trivial invocation of other commands.

• Scripts for compatibility (e.g. ./configure) that must run on as many systems as possible.

When shell scripts are used, they MUST begin with the following set command:

```
# Make the shell fail on undefined variables and
# commands with non-zero exit status.
set -eu
```
12.3 Kotlin

We so far have no specific guidelines, please follow best practices for the language.

12.4 Python

12.4.1 Supported Python Versions

Python code should be written and build against version 3.7 of Python.

12.4.2 Style

We use yapf to reformat the code to conform to our style instructions. A reusable yapf style file can be found in build-common, which is intended to be used as a git submodule.

12.4.3 Python for Scripting

When using Python for writing small utilities, the following libraries are useful:

- click for argument parsing (should be preferred over argparse)
- pathlib for path manipulation (part of the standard library)
- subprocess for “shelling out” to other programs. Prefer subprocess.run over the older APIs.
This chapter is a VERY ABSTRACT description of how testing is implemented in Taler, and in NO WAY wants to substitute the reading of the actual source code by the user.

In Taler, a test case is an array of `struct TALER_TESTING_Command`, informally referred to as `CMD`, that is iteratively executed by the testing interpreter. This latter is transparently initiated by the testing library.

However, the developer does not have to define CMDs manually, but rather call the proper constructor provided by the library. For example, if a CMD is supposed to test feature \(x\), then the library would provide the `TALER_TESTING_cmd_\(x\)` constructor for it. Obviously, each constructor has its own particular arguments that make sense to test \(x\), and all constructors are thoroughly commented within the source code.

Internally, each CMD has two methods: `run()` and `cleanup()`. The former contains the main logic to test feature \(x\), whereas the latter cleans the memory up after execution.

In a test life, each CMD needs some internal state, made by values it keeps in memory. Often, the test has to share those values with other CMDs: for example, CMD1 may create some key material and CMD2 needs this key material to encrypt data.

The offering of internal values from CMD1 to CMD2 is made by `traits`. A trait is a `struct TALER_TESTING_Trait`, and each CMD contains a array of traits, that it offers via the public trait interface to other commands. The definition and filling of such array happens transparently to the test developer.

For example, the following example shows how CMD2 takes an amount object offered by CMD1 via the trait interface.

Note: the main interpreter and the most part of CMDs and traits are hosted inside the exchange codebase, but nothing prevents the developer from implementing new CMDs and traits within other codebases.

```c
/* Without loss of generality, let's consider the */
/* following logic to exist inside the run() method of CMD1 */
... 

struct TALER_Amount *a;
/**
* the second argument (0) points to the first amount object offered,
* in case multiple are available.
*/
if (GNUNET_OK != TALER_TESTING_get_trait_amount_obj (cmd2, 0, &a))
  return GNUNET_SYSERR;
...

use(a); /* 'a' points straight into the internal state of CMD2 */
```

In the Taler realm, there is also the possibility to alter the behaviour of supposedly well-behaved components. This is needed when, for example, we want the exchange to return some corrupted signature in order to check if the merchant backend detects it.
This alteration is accomplished by another service called *twister*. The twister acts as a proxy between service A and B, and can be programmed to tamper with the data exchanged by A and B.

Please refer to the Twister codebase (under the `test` directory) in order to see how to configure it.
CHAPTER FOURTEEN

USER-FACING TERMINOLOGY

This section contains terminology that should be used and that should not be used in the user interface and help materials.

14.1 Terms to Avoid

- **Refreshing** Refreshing is the internal technical terminology for the protocol to give change for partially spent coins
  - Use instead: “Obtaining change”
- **Coin** Coins are an internal construct, the user should never be aware that their balance is represented by coins if different denominations.
  - Use instead: “(Digital) Cash” or “(Wallet) Balance”
- **Consumer** Has bad connotation of consumption.
  - Use instead: Customer or user.
- **Proposal** The term used to describe the process of the merchant facilitating the download of the signed contract terms for an order.
  - Avoid. Generally events that relate to proposal downloads should not be shown to normal users, only developers. Instead, use “communication with merchant failed” if a proposed order can’t be downloaded.
- **Anonymous E-Cash** Should be generally avoided, since Taler is only anonymous for the customer. Also some people are scared of anonymity (which as a term is also way too absolute, as anonymity is hardly ever perfect).
  - Use instead: “Privacy-preserving”, “Privacy-friedly”
- **Payment Replay** The process of proving to the merchant that the customer is entitled to view a digital product again, as they already paid for it.
  - Use instead: In the event history, “re-activated digital content purchase” could be used. (FIXME: this is still not nice.)
- **Session ID** See Payment Replay.
- **Order** Too ambiguous in the wallet.
  - Use instead: Purchase
- **Fulfillment URL** URL that the serves the digital content that the user purchased with their payment. Can also be something like a donation receipt.
14.2 Terms to Use

**Auditor**  Regulatory entity that certifies exchanges and oversees their operation.

**Exchange Provider**  The entity/service that gives out digital cash in exchange for some other means of payment.

In some contexts, using “Issuer” could also be appropriate. When showing a balance breakdown, we can say “100 Eur (issued by exchange.euro.taler.net)”. Sometimes we may also use the more generic term “Payment Service Provider” when the concept of an “Exchange” is still unclear to the reader.

**Refund**  A refund is given by a merchant to the customer (rather the customer’s wallet) and “undoes” a previous payment operation.

**Payment**  The act of sending digital cash to a merchant to pay for an order.

**Purchase**  Used to refer to the “result” of a payment, as in “view purchase”. Use sparingly, as the word doesn’t fit for all payments, such as donations.

**Contract Terms**  Partially machine-readable representation of the merchant’s obligation after the customer makes a payment.

**Merchant**  Party that receives a payment.

**Wallet**  Also “Taler Wallet”. Software component that manages the user’s digital cash and payments.
This glossary is meant for developers. It contains some terms that we usually do not use when talking to end users or even system administrators.

**absolute time** method of keeping time in GNUnet where the time is represented as the number of microseconds since 1.1.1970 (UNIX epoch). Called absolute time in contrast to *relative time*.

**aggregate** the exchange combines multiple payments received by the same *merchant* into one larger *wire transfer* to the respective merchant’s *bank* account.

**auditor** trusted third party that verifies that the *exchange* is operating correctly.

**bank** traditional financial service provider who offers wire *transfers* between accounts.

**close**

**closes**

**closed**

**closing** operation an *exchange* performs on a *reserve* that has not been *drained* by *withdraw* operations. When closing a reserve, the exchange wires the remaining funds back to the customer, minus a *fee* for closing.

**coin**

**coins** coins are individual token representing a certain amount of value, also known as the *denomination* of the coin.

**commitment**

**refresh commitment** data that the wallet commits to during the *melt* stage of the *refresh* protocol where it has to prove to the *exchange* that it is deriving the *fresh* coins as specified by the Taler protocol. The commitment is verified probabilistically (see: *kappa*) during the *reveal* stage.

**contract**

**contracts** formal agreement between *merchant* and *customer* specifying the *contract terms* and signed by the merchant and the *coins* of the customer.

**contract terms** the individual clauses specifying what the buyer is purchasing from the *merchant*.

**customer** individual in control of a Taler *wallet*, usually using it to *spend* the *coins* on *contracts*.

**denomination** unit of currency, specifies both the currency and the face value of a *coin*, as well as associated fees and validity periods.

**denomination key** (RSA) key used by the exchange to certify that a given *coin* is valid and of a particular *denomination*.

**deposit**

**deposits**
depositing operation by which a merchant passes coins to an exchange, expecting the exchange to credit his bank account in the future using an aggregate wire transfer

dirty

dirty coin a coin is dirty if its public key may be known to an entity other than the customer, thereby creating the danger of some entity being able to link multiple transactions of coin’s owner if the coin is not refreshed

drain

drained a reserve is being drained when a wallet is using the reserve’s private key to withdraw coins from it. This reduces the balance of the reserve. Once the balance reaches zero, we say that the reserve has been (fully) drained. Reserves that are not drained (which is the normal process) are closed by the exchange.

exchange Taler’s payment service provider. Issues electronic coins during withdrawal and redeems them when they are deposited by merchants

expired

expiration Various operations come with time limits. In particular, denomination keys come with strict time limits for the various operations involving the coin issued under the denomination. The most important limit is the deposit expiration, which specifies until when wallets are allowed to use the coin in deposit or refreshing operations. There is also a “legal” expiration, which specifies how long the exchange keeps records beyond the deposit expiration time. This latter expiration matters for legal disputes in courts and also creates an upper limit for refreshing operations on special zombie coin

fakebank implementation of the bank API in memory to be used only for test cases.

fee an exchange charges various fees for its service. The different fees are specified in the protocol. There are fees per coin for withdrawing, depositing, melting, and refunding. Furthermore, there are fees per wire transfer for closing a reserve: and for aggregate wire transfers to the merchant.

fresh

fresh coin a coin is fresh if its public key is only known to the customer

GNUnet Codebase of various libraries for a better Internet, some of which GNU Taler depends upon.

json

JavaScript Object Notation serialization format derived from the JavaScript language which is commonly used in the Taler protocol as the payload of HTTP requests and responses.

kappa security parameter used in the refresh protocol. Defined to be 3. The probability of successfully evading the income transparency with the refresh protocol is 1:kappa.

LibEuFin FIXME: explain

link

linking specific step in the refresh protocol that an exchange must offer to prevent abuse of the refresh mechanism. The link step is not needed in normal operation, it just must be offered.

master key offline key used by the exchange to certify denomination keys and message signing keys

melt

melted

melting step of the refresh protocol where a dirty coin is invalidated to be reborn fresh in a subsequent reveal step.

merchant party receiving payments (usually in return for goods or services)

message signing key key used by the exchange to sign online messages, other than coins
order  FIXME: to be written!

owner  a coin is owned by the entity that knows the private key of the coin

planchet  precursor data for a coin. A planchet includes the coin’s internal secrets (coin private key, blinding factor), but lacks the RSA signature of the exchange. When withdrawing, a wallet creates and persists a planchet before asking the exchange to sign it to get the coin.

privacy policy  Statment of an operator how they will protect the privacy of users.

proof  Message that cryptographically demonstrates that a particular claim is correct.

proposal  a list of contract terms that has been completed and signed by the merchant backend.

purchase  Refers to the overall process of negotiating a contract and then making a payment with coins to a merchant.

recoup  Operation by which an exchange returns the value of coins affected by a revocation to their owner, either by allowing the owner to withdraw new coins or wiring funds back to the bank account of the owner.

refresh

refreshing  operation by which a dirty coin is converted into one or more fresh coins. Involves melting the dirty coin and then revealing so-called transfer keys.

refund

refunding  operation by which a merchant steps back from the right to funds that he obtained from a deposit operation, giving the right to the funds back to the customer

refund transaction id  unique number by which a merchant identifies a refund. Needed as refunds can be partial and thus could be multiple refunds for the same purchase.

relative time  method of keeping time in GNUnet where the time is represented as a relative number of microseconds. Thus, a relative time specifies an offset or a duration, but not a date. Called relative time in contrast to absolute time.

reserve  Funds set aside for future use; either the balance of a customer at the exchange ready for withdrawal, or the funds kept in the exchange’s bank account to cover obligations from coins in circulation.

reserve  accounting mechanism used by the exchange to track customer funds from incoming wire transfers. A reserve is created whenever a customer wires money to the exchange using a well-formed public key in the subject. The exchange then allows the customer’s wallet to withdraw up to the amount received in fresh coins from the reserve, thereby draining the reserve. If a reserve is not drained, the exchange eventually closes it.

reveal

revealing  step in the refresh protocol where some of the transfer private keys are revealed to prove honest behavior on the part of the wallet. In the reveal step, the exchange returns the signed fresh coins.

revoke

revocation  exceptional operation by which an exchange withdraws a denomination from circulation, either because the signing key was compromised or because the exchange is going out of operation; unspent coins of a revoked denomination are subjected to recoup.

sharing  users can share ownership of a coin by sharing access to the coin’s private key, thereby allowing all co-owners to spend the coin at any time.

spend

spending  operation by which a customer gives a merchant the right to deposit coins in return for merchandise

terms  the general terms of service of an operator, possibly including the privacy policy. Not to be confused with the contract terms which are about the specific purchase.

transaction  method by which ownership is exclusively transferred from one entity
transfer

transfers

wire transfer

wire transfers method of sending funds between bank accounts

transfer key

transfer keys special cryptographic key used in the refresh protocol, some of which are revealed during the reveal step. Note that transfer keys have, despite the name, no relationship to wire transfers. They merely help to transfer the value from a dirty coin to a fresh coin

version Taler uses various forms of versioning. There is a database schema version (stored itself in the database, see *-0000.sql) describing the state of the table structure in the database of an exchange, auditor or merchant. There is a protocol version (CURRENT:REVISION:AGE, see GNU libtool) which specifies the network protocol spoken by an exchange or merchant including backwards-compatibility. And finally there is the software release version (MAJOR.MINOR.PATCH, see https://semver.org/) of the respective code base.

wallet software running on a customer’s computer; withdraws, stores and spends coins

WebExtension Cross-browser API used to implement the GNU Taler wallet browser extension.

wire gateway FIXME: explain

wire transfer identifier

wtid Subject of a wire transfer from the exchange to a merchant; set by the aggregator to a random nonce which uniquely identifies the transfer.

withdraw

withdrawing

withdrawal operation by which a wallet can convert funds from a reserve to fresh coins

zombie

zombie coin coin where the respective denomination key is past its deposit expiration time, but which is still (again) valid for an operation because it was melted while it was still valid, and then later again credited during a recoup process
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