Sunshine

ReenigneArcher

Jan 30, 2023

ABOUT

CHAPTER

ONE

OVERVIEW

LizardByte has the full documentation hosted on Read the Docs.

1.1 About

Sunshine is a self-hosted game stream host for Moonlight. Offering low latency, cloud gaming server capabilities with support for AMD, Intel, and Nvidia GPUs for hardware encoding. Software encoding is also available. You can connect to Sunshine from any Moonlight client on a variety of devices. A web UI is provided to allow configuration, and client pairing, from your favorite web browser. Pair from the local server or any mobile device.

1.2 System Requirements

> **Warning:** This table is a work in progress. Do not purchase hardware based on this.

Minimum Requirements

GPU	AMD: VCE 1.0 or higher, see obs-amd hardware support
	Intel: VAAPI-compatible, see: VAAPI hardware support
	Nvidia: NVENC enabled cards, see nvenc support matrix
CPU	AMD: Ryzen 3 or higher
	Intel: Core i3 or higher
RAM	4GB or more
OS	Windows: 10+ (Windows Server not supported)
	macOS: 11.7+
	Linux/Debian: 11 (bullseye)
	Linux/Fedora: 36+
	Linux/Ubuntu: 20.04+ (focal)
Network	Host: 5GHz, 802.11ac
	Client: 5GHz, 802.11ac

4k Suggestions

GPU	AMD: Video Coding Engine 3.1 or higher
	Intel: HD Graphics 510 or higher
	Nvidia: GeForce GTX 1080 or higher
CPU	AMD: Ryzen 5 or higher
	Intel: Core i5 or higher
Network	Host: CAT5e ethernet or better
	Client: CAT5e ethernet or better

HDR Suggestions

GPU	AMD: Video Coding Engine 3.4 or higher
	Intel: UHD Graphics 730 or higher
	Nvidia: Pascal-based GPU (GTX 10-series) or higher
CPU	AMD: todo
	Intel: todo
Network	Host: CAT5e ethernet or better
	Client: CAT5e ethernet or better

1.3 Integrations

1.4 Support

Our support methods are listed in our LizardByte Docs.

1.5 Downloads

1.6 Stats

CHAPTER

TWO

INSTALLATION

The recommended method for running Sunshine is to use the *binaries* bundled with the latest release.

Attention: Additional setup is required after installation. See *Setup*.

2.1 Binaries

Binaries of Sunshine are created for each release. They are available for Linux, macOS, and Windows. Binaries can be found in the latest release.

Tip: Some third party packages also exist. See *Third Party Packages*.

2.2 Docker

Docker images are available on Dockerhub.io and ghcr.io.

See *Docker* for additional information.

2.3 Linux

Follow the instructions for your preferred package type below.

CUDA Compatibility

CUDA is used for NVFBC capture.

Tip: See CUDA GPUS to cross reference Compute Capability to your GPU.

Package	CUDA Version	Min Driver	CUDA Compute Capabilities
https://aur.archlinux.org/packages/sunshine	User dependent	User dependent	User dependent
sunshine.AppImage	11.8.0	450.80.02	50;52;60;61;62;70;75;80;86;90;35
sunshine_{arch}.flatpak	11.8.0	450.80.02	50;52;60;61;62;70;75;80;86;90;35
sunshine-debian-bullseye-{arch}.deb	11.8.0	450.80.02	50;52;60;61;62;70;75;80;86;90;35
sunshine-fedora-36-{arch}.rpm	12.0.0	525.60.13	50;52;60;61;62;70;75;80;86;90
sunshine-fedora-37-{arch}.rpm	12.0.0	525.60.13	50;52;60;61;62;70;75;80;86;90
sunshine-ubuntu-20.04-{arch}.deb	11.8.0	450.80.02	50;52;60;61;62;70;75;80;86;90;35
sunshine-ubuntu-22.04-{arch}.deb	11.8.0	450.80.02	50;52;60;61;62;70;75;80;86;90;35

2.3.1 AppImage

According to AppImageLint the supported distro matrix of the AppImage is below.

- [×] Debian oldstable (buster)
- [✓] Debian stable (bullseye)
- [✓] Debian testing (bookworm)
- [✓] Debian unstable (sid)
- [✓] Ubuntu kinetic
- [✓] Ubuntu jammy
- [✓] Ubuntu focal
- [×] Ubuntu bionic
- [×] Ubuntu xenial
- [×] Ubuntu trusty
- [×] CentOS 7

1. Download `sunshine.AppImage` to your home directory.
2. Open terminal and run the following code.

```
./sunshine.AppImage --install
```

Start:

```
./sunshine.AppImage --install && ./sunshine.AppImage
```

Uninstall:

```
./sunshine.AppImage --remove
```

2.3.2 AUR Package

1. Open terminal and run the following code.

```
git clone https://aur.archlinux.org/sunshine.git
cd sunshine
makepkg -fi
```

Uninstall:

```
pacman -R sunshine
```

2.3.3 Debian Package

1. Download `sunshine-{ubuntu-version}.deb` and run the following code.

```
sudo apt install -f ./sunshine-{ubuntu-version}.deb
```

Note: The `{ubuntu-version}` is the version of ubuntu we built the package on. If you are not using Ubuntu and have an issue with one package, you can try another.

Tip: You can double click the deb file to see details about the package and begin installation.

Uninstall:

```
sudo apt remove sunshine
```

2.3.4 Flatpak Package

1. Install Flatpak as required.
2. Download `sunshine_{arch}.flatpak` and run the following code.

   Note: Be sure to replace `{arch}` with the architecture for your operating system.

   System level (recommended)

   ```
   flatpak install --system ./sunshine_{arch}.flatpak
   ```

   User level

   ```
   flatpak install --user ./sunshine_{arch}.flatpak
   ```

   Additional installation (required)

   ```
   flatpak run --command=additional-install.sh dev.lizardbyte.sunshine
   ```

Start:

X11 and NVFBC capture (X11 Only)

```
flatpak run dev.lizardbyte.sunshine
```

KMS capture (Wayland & X11)

```
sudo -i PULSE_SERVER=unix:$(pactl info | awk '/Server String/{print$3}') flatpak run dev.lizardbyte.sunshine
```

Uninstall:

```
flatpak run --command=remove-additional-install.sh dev.lizardbyte.sunshine
flatpak uninstall --delete-data dev.lizardbyte.sunshine
```

2.3.5 RPM Package

1. Add *rpmfusion* repositories by running the following code.

```
sudo dnf install https://mirrors.rpmfusion.org/free/fedora/rpmfusion-free-release-$(rpm -E %fedora).noarch.rpm \
https://mirrors.rpmfusion.org/nonfree/fedora/rpmfusion-nonfree-release-$(rpm -E %fedora).noarch.rpm
```

2. Download `sunshine.rpm` and run the following code.

```
sudo dnf install ./sunshine.rpm
```

Tip: You can double click the rpm file to see details about the package and begin installation.

Uninstall:

```
sudo dnf remove sunshine
```

2.4 macOS

Sunshine on macOS is experimental. Gamepads do not work. Other features may not work as expected.

2.4.1 pkg

Warning: The *pkg* does not include runtime dependencies.

1. Download the `sunshine.pkg` file and install it as normal.

Uninstall:

```
cd /etc/sunshine/assets
uninstall_pkg.sh
```

2.4.2 Portfile

1. Install MacPorts
2. Update the Macports sources.

```
sudo nano /opt/local/etc/macports/sources.conf
```

Add this line, replacing your username, below the line that starts with `rsync`.
`file:///Users/<username>/ports`

`Ctrl+x`, then `Y` to exit and save changes.

3. Download the `Portfile` to `~/Downloads` and run the following code.

```
mkdir -p ~/ports/multimedia/sunshine
mv ~/Downloads/Portfile ~/ports/multimedia/sunshine/
cd ~/ports
portindex
sudo port install sunshine
```

4. The first time you start Sunshine, you will be asked to grant access to screen recording and your microphone.

Uninstall:

```
sudo port uninstall sunshine
```

2.5 Windows

2.5.1 Installer

1. Download and install `sunshine-windows.exe`

> **Attention:** You should carefully select or unselect the options you want to install. Do not blindly install or enable features.

To uninstall, find Sunshine in the list here and select "Uninstall" from the overflow menu. Different versions of Windows may provide slightly different steps for uninstall.

2.5.2 Standalone

1. Download and extract `sunshine-windows.zip`

To uninstall, delete the extracted directory which contains the `sunshine.exe` file.

CHAPTER

THREE

DOCKER

3.1 Important note

Starting with v0.18.0, tag names have changed. You may no longer use `latest`, `master`, `vX.X.X`.

3.2 Build your own containers

This image provides a method for you to easily use the latest Sunshine release in your own docker projects. It is not intended to use as a standalone container at this point, and should be considered experimental.

```
ARG SUNSHINE_VERSION=latest
ARG SUNSHINE_OS=ubuntu-22.04
FROM lizardbyte/sunshine:${SUNSHINE_VERSION}-${SUNSHINE_OS}

# install Steam, Wayland, etc.

ENTRYPOINT steam && sunshine
```

3.2.1 SUNSHINE_VERSION

- `latest`, `master`, `vX.X.X`
- `nightly`
- commit hash

3.2.2 SUNSHINE_OS

Sunshine images are available, based on the following base images.

- `debian-bullseye`
- `fedora-36`
- `fedora-37`
- `ubuntu-20.04`
- `ubuntu-22.04`

3.2.3 Tags

You must combine the `SUNSHINE_VERSION` and `SUNSHINE_OS` to determine the tag to pull. The format should be `<SUNSHINE_VERSION>-<SUNSHINE_OS>`. For example, `latest-ubuntu-22.04`.

See all our available tags on docker hub or ghcr for more info.

3.3 Where used

This is a list of docker projects using Sunshine. Something missing? Let us know about it!

- Games on Whales

3.4 Port and Volume mappings

Examples are below of the required mappings. The configuration file will be saved to `/config` in the container.

3.4.1 Using docker run

Create and run the container (substitute your `<values>`):

```
docker run -d \
  --name=<image_name> \
  --restart=unless-stopped
  -e PUID=<uid> \
  -e PGID=<gid> \
  -e TZ=<timezone> \
  -v <path to data>:/config \
  -p 47984-47990:47984-47990/tcp \
  -p 48010:48010 \
  -p 47998-48000:47998-48000/udp \
  <image>
```

3.4.2 Using docker-compose

Create a `docker-compose.yml` file with the following contents (substitute your `<values>`):

```
version: '3'
services:
  <image_name>:
    image: <image>
    container_name: sunshine
    restart: unless-stopped
    volumes:
      - <path to data>:/config
    environment:
      - PUID=<uid>
      - PGID=<gid>
      - TZ=<timezone>
```

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```
    ports:
      - "47984-47990:47984-47990/tcp"
      - "48010:48010"
      - "47998-48000:47998-48000/udp"
```

3.4.3 Parameters

You must substitute the <values> with your own settings.

Parameters are split into two halves separated by a colon. The left side represents the host and the right side the container.

Example: `-p external:internal` - This shows the port mapping from internal to external of the container. Therefore `-p 47990:47990` would expose port `47990` from inside the container to be accessible from the host's IP on port `47990` (e.g. `http://<host_ip>:47990`). The internal port must be `47990`, but the external port may be changed (e.g. `-p 8080:47990`). All the ports listed in the `docker run` and `docker-compose` examples are required.

Parameter	Function	Example Value	Required
`-p <port>:47990`	Web UI Port	`47990`	True
`-v <path to data>:/config`	Volume mapping	`/home/sunshine`	True
`-e PUID=<uid>`	User ID	`1001`	False
`-e PGID=<gid>`	Group ID	`1001`	False
`-e TZ=<timezone>`	Lookup TZ value	`America/New_York`	False

User / Group Identifiers:

When using data volumes (-v flags) permissions issues can arise between the host OS and the container. To avoid this issue you can specify the user PUID and group PGID. Ensure the data volume directory on the host is owned by the same user you specify.

In this instance `PUID=1001` and `PGID=1001`. To find yours use id user as below:

```
$ id dockeruser
uid=1001(dockeruser) gid=1001(dockergroup) groups=1001(dockergroup)
```

If you want to change the PUID or PGID after the image has been built, it will require rebuilding the image.

3.5 Supported Architectures

Specifying `lizardbyte/sunshine:latest-<SUNSHINE_OS>` or `ghcr.io/lizardbyte/sunshine:latest-<SUNSHINE_OS>` should retrieve the correct image for your architecture.

The architectures supported by these images are:

Architecture	Available
amd64 / x86_64	
arm64 / aarch64	

CHAPTER

FOUR

THIRD PARTY PACKAGES

Danger: These packages are not maintained by LizardByte. Use at your own risk.

4.1 Chocolatey

4.2 nixpkgs

4.3 Scoop

4.4 Solus

4.5 Winget

4.6 Legacy GitHub Repo

Attention: This repo is not maintained. Thank you to Loki for bringing this amazing project to life!

CHAPTER

FIVE

USAGE

1. See the *setup* section for your specific OS.
2. If you did not install the service, then start sunshine with the following command, unless a start command is listed in the specified package *installation* instructions.

   Note: A service is a process that runs in the background. Running multiple instances of Sunshine is not advised.

   Basic usage

   ```
   sunshine
   ```

   Specify config file

   ```
   sunshine <directory of conf file>/sunshine.conf
   ```

   Note: You do not need to specify a config file. If no config file is entered the default location will be used.

   Attention: The configuration file specified will be created if it doesn't exist.

3. Configure Sunshine in the web ui

   The web ui is available on https://localhost:47990 by default. You may replace *localhost* with your internal ip address.

   Attention: Ignore any warning given by your browser about "insecure website". This is due to the SSL certificate being self signed.

   Caution: If running for the first time, make sure to note the username and password that you created.

   Add games and applications.
   This can be configured in the web ui.

   Note: Additionally, apps can be configured manually. *src_assets/<os>/config/apps.json* is an example of a list of applications that are started just before running a stream. This is the directory within the GitHub

repo.

4. In Moonlight, you may need to add the PC manually.
5. When Moonlight request you insert the correct pin on sunshine:
   - Login to the web ui
   - Go to "PIN" in the Navbar
   - Type in your PIN and press Enter, you should get a Success Message
   - In Moonlight, select one of the Applications listed

5.1 Network

The Sunshine user interface will be available on port 47990 by default.

Warning: Exposing ports to the internet can be dangerous. Do this at your own risk.

5.2 Arguments

To get a list of available arguments run the following:

```
sunshine --help
```

5.3 Setup

5.3.1 Linux

The *deb*, *rpm*, *Flatpak* and *AppImage* packages handle these steps automatically. Third party packages may not.

Sunshine needs access to *uinput* to create mouse and gamepad events.

1. **Add user to group *input*, if this is the first time installing.**

   ```
   sudo usermod -a -G input $USER
   ```

2. **Create *udev* rules.**

   ```
   echo 'KERNEL=="uinput", GROUP="input", MODE="0660", OPTIONS+="static_node=uinput
   ↪"' | \
   sudo tee /etc/udev/rules.d/85-sunshine-input.rules
   ```

3. Optionally, configure autostart service
   - filename: `~/.config/systemd/user/sunshine.service`
   - **contents:**

```
[Unit]
Description=Sunshine self-hosted game stream host for Moonlight.
StartLimitIntervalSec=500
StartLimitBurst=5

[Service]
ExecStart=<see table>
Restart=on-failure
RestartSec=5s
#Flatpak Only
#ExecStop=flatpak kill dev.lizardbyte.sunshine

[Install]
WantedBy=graphical-session.target
```

package	ExecStart	Auto Configured
aur	/usr/bin/sunshine	✓
deb	/usr/bin/sunshine	✓
rpm	/usr/bin/sunshine	✓
AppImage	~/sunshine.AppImage	✓
Flatpak	flatpak run dev.lizardbyte.sunshine	✓

Start once

```
systemctl --user start sunshine
```

Start on boot

```
systemctl --user enable sunshine
```

4. **Additional Setup for KMS**

Note: `cap_sys_admin` may as well be root, except you don't need to be root to run it. It is necessary to allow Sunshine to use KMS.

Enable

```
sudo setcap cap_sys_admin+p $(readlink -f $(which sunshine))
```

Disable (for Xorg/X11)

```
sudo setcap -r $(readlink -f $(which sunshine))
```

5. **Reboot**

```
sudo reboot now
```

5.3.2 macOS

Sunshine can only access microphones on macOS due to system limitations. To stream system audio use Soundflower or BlackHole and select their sink as audio device in *sunshine.conf*.

Note: Command Keys are not forwarded by Moonlight. Right Option-Key is mapped to CMD-Key.

Caution: Gamepads are not currently supported.

Configure autostart service

MacPorts

```
sudo port load Sunshine
```

5.3.3 Windows

For gamepad support, install ViGEmBus

Sunshine firewall

Add rule

```
cd /d "C:\Program Files\Sunshine\scripts"
add-firewall-rule.bat
```

Remove rule

```
cd /d "C:\Program Files\Sunshine\scripts"
remove-firewall-rule.bat
```

Sunshine service

Enable

```
cd /d "C:\Program Files\Sunshine\scripts"
install-service.bat
```

Disable

```
cd /d "C:\Program Files\Sunshine\scripts"
uninstall-service.bat
```

5.4 Shortcuts

All shortcuts start with `CTRL + ALT + SHIFT`, just like Moonlight

- `CTRL + ALT + SHIFT + N` - Hide/Unhide the cursor (This may be useful for Remote Desktop Mode for Moonlight)
- `CTRL + ALT + SHIFT + F1/F12` - Switch to different monitor for Streaming

5.5 Application List

- Applications should be configured via the web UI.
- A basic understanding of working directories and commands is required.
- You can use Environment variables in place of values
- `$(HOME)` will be replaced by the value of `$HOME`
- `$$` will be replaced by `$`, e.g. `$$(HOME)` will be become `$(HOME)`
- `env` - Adds or overwrites Environment variables for the commands/applications run by Sunshine
- `"Variable name":"Variable value"`
- `apps` - The list of applications
- Advanced users may want to edit the application list manually. The format is `json`.
- **Example application:**

```
{
    "cmd": "command to open app",
    "detached": [
        "some-command",
        "another-command"
    ],
    "image-path": "/full-path/to/png-image",
    "name": "An App",
    "output": "/full-path/to/command-log-file",
    "prep-cmd": [
        {
            "do": "some-command",
            "undo": "undo-that-command"
        }
    ],
    "working-dir": "/full-path/to/working-directory"
}
```

  - `cmd` - The main application
  - `detached` - A list of commands to be run and forgotten about
    - If not specified, a process is started that sleeps indefinitely
  - `image-path` - The full path to the cover art image to use.
  - `name` - The name of the application/game
  - `output` - The file where the output of the command is stored

  - `prep-cmd` - A list of commands to be run before/after the application
    * If any of the prep-commands fail, starting the application is aborted
    * `do` - Run before the application
      · If it fails, all `undo` commands of the previously succeeded `do` commands are run
    * `undo` - Run after the application has terminated
      · Failures of `undo` commands are ignored
  - `working-dir` - The working directory to use. If not specified, Sunshine will use the application directory.

5.6 Considerations

- When an application is started, if there is an application already running, it will be terminated.
- When the application has been shutdown, the stream shuts down as well.
  - For example, if you attempt to run `steam` as a `cmd` instead of `detached` the stream will immediately fail. This is due to the method in which the steam process is executed. Other applications may behave similarly.
- In addition to the apps listed, one app "Desktop" is hardcoded into Sunshine. It does not start an application, instead it simply starts a stream.
- For the Linux flatpak you must prepend commands with `flatpak-spawn --host`.

5.7 HDR Support

Streaming HDR content is supported for Windows hosts with NVIDIA, AMD, or Intel GPUs that support encoding HEVC Main 10. You must have an HDR-capable display or EDID emulator dongle connected to your host PC to activate HDR in Windows.

- Ensure you enable the HDR option in your Moonlight client settings, otherwise the stream will be SDR.
- A good HDR experience relies on proper HDR display calibration both in Windows and in game. HDR calibration can differ significantly between client and host displays.
- We recommend calibrating the display by streaming the Windows HDR Calibration app to your client device and saving an HDR calibration profile to use while streaming.
- You may also need to tune the brightness slider or HDR calibration options in game to the different HDR brightness capabilities of your client's display.
- Older games that use NVIDIA-specific NVAPI HDR rather than native Windows 10 OS HDR support may not display in HDR.
- Some GPUs can produce lower image quality or encoding performance when streaming in HDR compared to SDR.

5.8 Tutorials

Tutorial videos are available here.

Community!

Tutorials are community generated. Want to contribute? Reach out to us on our discord server.

CHAPTER

SIX

ADVANCED USAGE

Sunshine will work with the default settings for most users. In some cases you may want to configure Sunshine further.

6.1 Performance Tips

6.1.1 AMD

In Windows, enabling *Enahanced Sync* in AMD's settings may help reduce the latency by an additional frame. This applies to *amfenc* and *libx264*.

6.1.2 Nvidia

Enabling *Fast Sync* in Nvidia settings may help reduce latency.

6.2 Configuration

The default location for the configuration file is listed below. You can use another location if you choose, by passing in the full configuration file path as the first argument when you start Sunshine.

The default location of the `apps.json` is the same as the configuration file. You can use a custom location by modifying the configuration file.

Default File Location

Value	Description
Docker	/config/
Linux	~/.config/sunshine/
macOS	~/.config/sunshine/
Windows	%ProgramFiles%\Sunshine\config

Example

```
sunshine ~/sunshine_config.conf
```

To manually configure sunshine you may edit the *conf* file in a text editor. Use the examples as reference.

Hint: Some settings are not available within the web ui.

6.3 General

6.3.1 sunshine_name

Description
The name displayed by Moonlight

Default
PC hostname

Example

```
sunshine_name = Sunshine
```

6.3.2 min_log_level

Description
The minimum log level printed to standard out.

Choices

Value	Description
verbose	verbose logging
debug	debug logging
info	info logging
warning	warning logging
error	error logging
fatal	fatal logging
none	no logging

Default
`info`

Example

```
min_log_level = info
```

6.3.3 log_path

Description
The path where the sunshine log is stored.

Default
`sunshine.log`

Example

```
log_path = sunshine.log
```

6.4 Controls

6.4.1 gamepad

Description

The type of gamepad to emulate on the host.

> **Caution:** Applies to Windows only.

Choices

Value	Description
x360	xbox 360 controller
ds4	dualshock controller (PS4)

Default

`x360`

Example

```
gamepad = x360
```

6.4.2 back_button_timeout

Description

If, after the timeout, the back/select button is still pressed down, Home/Guide button press is emulated.

On Nvidia Shield, the home and power button are not passed to Moonlight.

> **Tip:** If back_button_timeout < 0, then the Home/Guide button will not be emulated.

Default

`2000`

Example

```
back_button_timeout = 2000
```

6.4.3 key_repeat_delay

Description

The initial delay in milliseconds before repeating keys. Controls how fast keys will repeat themselves.

Default

`500`

Example

```
key_repeat_delay = 500
```

6.4.4 key_repeat_frequency

Description
How often keys repeat every second.

Tip: This configurable option supports decimals.

Default

Todo: Unknown

Example

```
key_repeat_frequency = 24.9
```

6.4.5 keybindings

Description
Sometimes it may be useful to map keybindings. Wayland won't allow clients to capture the Win Key for example.

Tip: See virtual key codes

Hint: keybindings needs to have a multiple of two elements.

Default
None

Example

```
keybindings = [
  0x10, 0xA0,
  0x11, 0xA2,
  0x12, 0xA4,
  0x4A, 0x4B
]
```

6.4.6 key_rightalt_to_key_win

Description

It may be possible that you cannot send the Windows Key from Moonlight directly. In those cases it may be useful to make Sunshine think the Right Alt key is the Windows key.

Default

None

Example

```
key_rightalt_to_key_win = enabled
```

6.5 Display

6.5.1 adapter_name

Description

Select the video card you want to stream.

Tip: To find the name of the appropriate values follow these instructions.

Linux + VA-API

Unlike with *amdvce* and *nvenc*, it doesn't matter if video encoding is done on a different GPU.

```
ls /dev/dri/renderD*  # to find all devices capable of VAAPI

# replace ``renderD129`` with the device from above to lists the name and␣
↪capabilities of the device
vainfo --display drm --device /dev/dri/renderD129 | \
  grep -E "((VAProfileH264High|VAProfileHEVCMain|VAProfileHEVCMain10).
↪*VAEntrypointEncSlice)|Driver version"
```

To be supported by Sunshine, it needs to have at the very minimum: `VAProfileH264High : VAEntrypointEncSlice`

Todo: macOS

Windows

```
tools\dxgi-info.exe
```

Default

Sunshine will select the default video card.

Examples

Linux

```
adapter_name = /dev/dri/renderD128
```

Todo: macOS

Windows

```
adapter_name = Radeon RX 580 Series
```

6.5.2 output_name

Description
Select the display number you want to stream.

Tip: To find the name of the appropriate values follow these instructions.

Linux

```
xrandr --listmonitors
```

Example output: `0:  +HDMI-1 1920/518x1200/324+0+0 HDMI-1`

You need to use the value before the colon in the output, e.g. `0`.

Todo: macOS

Windows

```
tools\dxgi-info.exe
```

Default
Sunshine will select the default display.

Examples

Linux

```
output_name = 0
```

Todo: macOS

Windows

```
output_name  = \\.\DISPLAY1
```

6.5.3 fps

Description
The fps modes advertised by Sunshine.

Note: Some versions of Moonlight, such as Moonlight-nx (Switch), rely on this list to ensure that the requested fps is supported.

Default

Todo: Unknown

Example

```
fps = [10, 30, 60, 90, 120]
```

6.5.4 resolutions

Description
The resolutions advertised by Sunshine.

Note: Some versions of Moonlight, such as Moonlight-nx (Switch), rely on this list to ensure that the requested resolution is supported.

Default

Todo: Unknown

Example

```
resolutions = [
  352x240,
  480x360,
  858x480,
  1280x720,
  1920x1080,
  2560x1080,
  3440x1440,
  1920x1200,
  3860x2160,
  3840x1600,
]
```

6.5.5 dwmflush

Description

Invoke DwmFlush() to sync screen capture to the Windows presentation interval.

> **Caution:** Applies to Windows only. Alleviates visual stuttering during mouse movement. If enabled, this feature will automatically deactivate if the client framerate exceeds the host monitor's current refresh rate.

Note: If you disable this option, you may see video stuttering during mouse movement in certain scenarios. It is recommended to leave enabled when possible.

Default

`enabled`

Example

```
dwmflush = enabled
```

6.6 Audio

6.6.1 audio_sink

Description

The name of the audio sink used for audio loopback.

Tip: To find the name of the audio sink follow these instructions.

Linux + pulseaudio

```
pacmd list-sinks | grep "name:"
```

Linux + pipewire

```
pactl info | grep Source
# in some causes you'd need to use the `Sink` device, if `Source` doesn't work, so␣
↪try:
pactl info | grep Sink
```

macOS

Sunshine can only access microphones on macOS due to system limitations. To stream system audio use Soundflower or BlackHole.

Windows

```
tools\audio-info.exe
```

Default

Sunshine will select the default audio device.

Examples

Linux

```
audio_sink = alsa_output.pci-0000_09_00.3.analog-stereo
```

macOS

```
audio_sink = BlackHole 2ch
```

Windows

```
audio_sink = {0.0.0.00000000}.{FD47D9CC-4218-4135-9CE2-0C195C87405B}
```

6.6.2 virtual_sink

Description

The audio device that's virtual, like Steam Streaming Speakers. This allows Sunshine to stream audio, while muting the speakers.

Tip: See *audio_sink*!

Default

Todo: Unknown

Example

```
virtual_sink = {0.0.0.00000000}.{8edba70c-1125-467c-b89c-15da389bc1d4}
```

6.7 Network

6.7.1 external_ip

Description

If no external IP address is given, Sunshine will attempt to automatically detect external ip-address.

Default

Automatic

Example

```
external_ip = 123.456.789.12
```

6.7.2 port

Description
Set the family of ports used by Sunshine. Changing this value will offset other ports per the table below.

Port Description	Default Port	Difference from config port
HTTPS	47984 TCP	-5
HTTP	47989 TCP	0
Web	47990 TCP	+1
RTSP	48010 TCP	+21
Video	47998 UDP	+9
Control	47999 UDP	+10
Audio	48000 UDP	+11
Mic (unused)	48002 UDP	+13

Attention: Custom ports are only allowed on select Moonlight clients.

Default
`47989`

Example

```
port = 47989
```

6.7.3 pkey

Description
The private key. This must be 2048 bits.

Default

Todo: Unknown

Example

```
pkey = /dir/pkey.pem
```

6.7.4 cert

Description
The certificate. Must be signed with a 2048 bit key.

Default

Todo: Unknown

Example

```
cert = /dir/cert.pem
```

6.7.5 origin_pin_allowed

Description
The origin of the remote endpoint address that is not denied for HTTP method /pin.

Choices

Value	Description
pc	Only localhost may access /pin
lan	Only LAN devices may access /pin
wan	Anyone may access /pin

Default
`pc`

Example

```
origin_pin_allowed = pc
```

6.7.6 origin_web_ui_allowed

Description
The origin of the remote endpoint address that is not denied for HTTPS Web UI.

Choices

Value	Description
pc	Only localhost may access the web ui
lan	Only LAN devices may access the web ui
wan	Anyone may access the web ui

Default
`lan`

Example

```
origin_web_ui_allowed = lan
```

6.7.7 upnp

Description
Sunshine will attempt to open ports for streaming over the internet.

Choices

Value	Description
on	enable UPnP
off	disable UPnP

Default
`off`

Example

```
upnp = on
```

6.7.8 ping_timeout

Description
How long to wait in milliseconds for data from Moonlight before shutting down the stream.

Default
`10000`

Example

```
ping_timeout = 10000
```

6.8 Encoding

6.8.1 channels

Description
This will generate distinct video streams, unlike simply broadcasting to multiple Clients.

When multicasting, it could be useful to have different configurations for each connected Client.

For instance:

- Clients connected through WAN and LAN have different bitrate constraints.
- Decoders may require different settings for color.

> **Warning:** CPU usage increases for each distinct video stream generated.

Default
1

Example

```
channels = 1
```

6.8.2 fec_percentage

Description
Percentage of error correcting packets per data packet in each video frame.

> **Warning:** Higher values can correct for more network packet loss, but at the cost of increasing bandwidth usage.

Default
`20`

Range
`1-255`

Example

```
fec_percentage = 20
```

6.8.3 qp

Description
Quantization Parameter. Some devices don't support Constant Bit Rate. For those devices, QP is used instead.

> **Warning:** Higher value means more compression, but less quality.

Default
`28`

Example

```
qp = 28
```

6.8.4 min_threads

Description
Minimum number of threads used for software encoding.

> **Note:** Increasing the value slightly reduces encoding efficiency, but the tradeoff is usually worth it to gain the use of more CPU cores for encoding. The ideal value is the lowest value that can reliably encode at your desired streaming settings on your hardware.

Default
`1`

Example

```
min_threads = 1
```

6.8.5 hevc_mode

Description
Allows the client to request HEVC Main or HEVC Main10 video streams.

> **Warning:** HEVC is more CPU-intensive to encode, so enabling this may reduce performance when using software encoding.

Choices

Value	Description
0	advertise support for HEVC based on encoder
1	do not advertise support for HEVC
2	advertise support for HEVC Main profile
3	advertise support for HEVC Main and Main10 (HDR) profiles

Default
`0`

Example

```
hevc_mode = 2
```

6.8.6 encoder

Description
Force a specific encoder.

Choices

Value	Description
nvenc	For NVIDIA graphics cards
quicksync	For Intel graphics cards
amdvce	For AMD graphics cards
software	Encoding occurs on the CPU

Default
Sunshine will use the first encoder that is available.

Example

```
encoder = nvenc
```

6.8.7 sw_preset

Description
The encoder preset to use.

Note: This option only applies when using software *encoder*.

Note: From FFmpeg.

A preset is a collection of options that will provide a certain encoding speed to compression ratio. A slower preset will provide better compression (compression is quality per filesize). This means that, for example, if you target a certain file size or constant bit rate, you will achieve better quality with a slower preset. Similarly, for constant quality encoding, you will simply save bitrate by choosing a slower preset.

Use the slowest preset that you have patience for.

Choices

Value	Description
ultrafast	fastest
superfast	
veryfast	
superfast	
faster	
fast	
medium	
slow	
slow	
slower	
veryslow	slowest

Default
`superfast`

Example

```
sw_preset  = superfast
```

6.8.8 sw_tune

Description
The tuning preset to use.

Note: This option only applies when using software *encoder*.

Note: From FFmpeg.

You can optionally use -tune to change settings based upon the specifics of your input.

Choices

Value	Description
film	use for high quality movie content; lowers deblocking
animation	good for cartoons; uses higher deblocking and more reference frames
grain	preserves the grain structure in old, grainy film material
stillimage	good for slideshow-like content
fastdecode	allows faster decoding by disabling certain filters
zerolatency	good for fast encoding and low-latency streaming

Default

`zerolatency`

Example

```
sw_tune    = zerolatency
```

6.8.9 nv_preset

Description

The encoder preset to use.

Note: This option only applies when using nvenc *encoder*. For more information on the presets, see nvenc preset migration guide.

Choices

Value	Description
p1	fastest (lowest quality)
p2	faster (lower quality)
p3	fast (low quality)
p4	medium (default)
p5	slow (good quality)
p6	slower (better quality)
p7	slowest (best quality)

Default

`p4`

Example

```
nv_preset = p4
```

6.8.10 nv_tune

Description
The encoder tuning profile.

Note: This option only applies when using nvenc *encoder*.

Choices

Value	Description
hq	high quality
ll	low latency
ull	ultra low latency
lossless	lossless

Default
`ull`

Example

```
nv_tune = ull
```

6.8.11 nv_rc

Description
The encoder rate control.

Note: This option only applies when using nvenc *encoder*.

Choices

Value	Description
constqp	constant QP mode
vbr	variable bitrate
cbr	constant bitrate

Default
`cbr`

Example

```
nv_rc = cbr
```

6.8.12 nv_coder

Description
The entropy encoding to use.

Note: This option only applies when using H264 with nvenc *encoder*.

Choices

Value	Description
auto	let ffmpeg decide
cabac	context adaptive binary arithmetic coding - higher quality
cavlc	context adaptive variable-length coding - faster decode

Default
`auto`

Example

```
nv_coder = auto
```

6.8.13 qsv_preset

Description
The encoder preset to use.

Note: This option only applies when using quicksync *encoder*.

Choices

Value	Description
veryfast	fastest (lowest quality)
faster	faster (lower quality)
fast	fast (low quality)
medium	medium (default)
slow	slow (good quality)
slower	slower (better quality)
veryslow	slowest (best quality)

Default
`medium`

Example

```
qsv_preset = medium
```

6.8.14 qsv_coder

Description
The entropy encoding to use.

Note: This option only applies when using H264 with quicksync *encoder*.

Choices

Value	Description
auto	let ffmpeg decide
cabac	context adaptive binary arithmetic coding - higher quality
cavlc	context adaptive variable-length coding - faster decode

Default
`auto`

Example

```
qsv_coder = auto
```

6.8.15 amd_quality

Description
The encoder preset to use.

Note: This option only applies when using amdvce *encoder*.

Choices

Value	Description
speed	prefer speed
balanced	balanced
quality	prefer quality

Default
`balanced`

Example

```
amd_quality = balanced
```

6.8.16 amd_rc

Description
The encoder rate control.

Note: This option only applies when using amdvce *encoder*.

Choices

Value	Description
cqp	constant qp mode
cbr	constant bitrate
vbr_latency	variable bitrate, latency constrained
vbr_peak	variable bitrate, peak constrained

Default
`vbr_latency`

Example

```
amd_rc = vbr_latency
```

6.8.17 amd_coder

Description
The entropy encoding to use.

Note: This option only applies when using H264 with amdvce *encoder*.

Choices

Value	Description
auto	let ffmpeg decide
cabac	context adaptive variable-length coding - higher quality
cavlc	context adaptive binary arithmetic coding - faster decode

Default
`auto`

Example

```
amd_coder = auto
```

6.8.18 vt_software

Description
Force Video Toolbox to use software encoding.

Note: This option only applies when using macOS.

Choices

Value	Description
auto	let ffmpeg decide
disabled	disable software encoding
allowed	allow software encoding
forced	force software encoding

Default
`auto`

Example

```
vt_software = auto
```

6.8.19 vt_realtime

Description
Realtime encoding.

Note: This option only applies when using macOS.

Warning: Disabling realtime encoding might result in a delayed frame encoding or frame drop.

Default
`enabled`

Example

```
vt_realtime = enabled
```

6.8.20 vt_coder

Description
The entropy encoding to use.

Note: This option only applies when using macOS.

Choices

Value	Description
auto	let ffmpeg decide
cabac	
cavlc	

Default
`auto`

Example

```
vt_coder = auto
```

6.9 Advanced

6.9.1 file_apps

Description
The application configuration file path. The file contains a json formatted list of applications that can be started by Moonlight.

Default
OS and package dependent

Example

```
file_apps = apps.json
```

6.9.2 file_state

Description
The file where current state of Sunshine is stored.

Default
`sunshine_state.json`

Example

```
file_state = sunshine_state.json
```

6.9.3 credentials_file

Description
The file where user credentials for the UI are stored.

Default
`sunshine_state.json`

Example

```
credentials_file = sunshine_state.json
```

CHAPTER

SEVEN

GAMESTREAM

Nvidia announced that their GameStream service for Nvidia Games clients will be discontinued in February 2023. Luckily, Sunshine performance is now on par with Nvidia GameStream. Many users have even reported that Sunshine outperforms GameStream, so rest assured that Sunshine will be equally performant moving forward.

7.1 Migration

We have developed a simple migration tool to help you migrate your GameStream games and apps to Sunshine automatically. Please check out our GSMS project if you're interested in an automated migration option. At the time of writing this GSMS offers the ability to migrate your custom games and apps. The working directory, command, and image are all set in Sunshine's `apps.json` file. The box-art image is also copied to a specified directory.

7.2 Limitations

Sunshine does have some limitations, as compared to Nvidia GameStream.

- Automatic game/application list.
- Changing game settings automatically, to optimize streaming.

CHAPTER

EIGHT

GENERAL

8.1 Forgotten Credentials

If you forgot your credentials to the web UI, try this.

```
sunshine --creds <new username> <new password>
```

8.2 Web UI Access

Can't access the web UI?

1. Check firewall rules.

8.3 Nvidia issues

NvFBC, NvENC, or general issues with Nvidia graphics card.

- Consumer grade Nvidia cards are software limited to a specific number of encodes. See Video Encode and Decode GPU Support Matrix for more info.
- You can usually bypass the restriction with a driver patch. See Keylase's Linux or Windows patches for more guidance.

CHAPTER

NINE

LINUX

9.1 KMS Streaming fails

If screencasting fails with KMS, you may need to run the following to force unprivileged screencasting.

```
sudo setcap -r $(readlink -f $(which sunshine))
```

CHAPTER

TEN

MACOS

10.1 Dynamic session lookup failed

If you get this error:

> *Dynamic session lookup supported but failed: launchd did not provide a socket path, verify that org.freedesktop.dbus-session.plist is loaded!*

Try this.

```
launchctl load -w /Library/LaunchAgents/org.freedesktop.dbus-session.plist
```

CHAPTER

ELEVEN

WINDOWS

11.1 No gamepad detected

1. Verify that you've installed ViGEmBus.

CHAPTER

TWELVE

BUILD

Sunshine binaries are built using CMake. Cross compilation is not supported. That means the binaries must be built on the target operating system and architecture.

12.1 Building Locally

12.1.1 Clone

Ensure git is installed and run the following:

```
git clone https://github.com/lizardbyte/sunshine.git --recurse-submodules
cd sunshine && mkdir build && cd build
```

12.1.2 Compile

See the section specific to your OS.

- *Linux*
- *macOS*
- *Windows*

12.2 Remote Build

It may be beneficial to build remotely in some cases. This will enable easier building on different operating systems.

1. Fork the project
2. Activate workflows
3. Trigger the *CI* workflow manually
4. Download the artifacts/binaries from the workflow run summary

CHAPTER

THIRTEEN

LINUX

13.1 Requirements

13.1.1 Debian Bullseye

End of Life: TBD

Install Requirements

```
sudo apt update && sudo apt install \
    build-essential \
    cmake \
    libavdevice-dev \
    libboost-filesystem-dev \
    libboost-log-dev \
    libboost-program-options-dev \
    libboost-thread-dev \
    libcap-dev \  # KMS
    libcurl4-openssl-dev \
    libdrm-dev \  # KMS
    libevdev-dev \
    libmfx-dev \  # x86_64 only
    libnuma-dev \
    libopus-dev \
    libpulse-dev \
    libssl-dev \
    libva-dev \
    libvdpau-dev \
    libwayland-dev \  # Wayland
    libx11-dev \  # X11
    libxcb-shm0-dev \  # X11
    libxcb-xfixes0-dev \  # X11
    libxcb1-dev \  # X11
    libxfixes-dev \  # X11
    libxrandr-dev \  # X11
    libxtst-dev \  # X11
    nodejs \
    npm \
    nvidia-cuda-dev \  # Cuda, NvFBC
    nvidia-cuda-toolkit  # Cuda, NvFBC
```

13.1.2 Fedora 36, 37

End of Life: TBD

Install Requirements

```
sudo dnf update && \
sudo dnf group install "Development Tools" && \
sudo dnf install \
    boost-devel \
    boost-static \
    cmake \
    gcc \
    gcc-c++ \
    libcap-devel \
    libcurl-devel \
    libdrm-devel \
    libevdev-devel \
    libva-devel \
    libvdpau-devel \
    libX11-devel \  # X11
    libxcb-devel \  # X11
    libXcursor-devel \  # X11
    libXfixes-devel \  # X11
    libXi-devel \  # X11
    libXinerama-devel \  # X11
    libXrandr-devel \  # X11
    libXtst-devel \  # X11
    mesa-libGL-devel \
    npm \
    numactl-devel \
    openssl-devel \
    opus-devel \
    pulseaudio-libs-devel \
    rpm-build \  # if you want to build an RPM binary package
    wget \  # necessary for cuda install with `run` file
    which \  # necessary for cuda install with `run` file
    # libmfx-devel is not listed for fedora, this is for x86_64 only
    https://kojipkgs.fedoraproject.org//packages/libmfx/1.25/4.el8/x86_64/libmfx-
↪devel-1.25-4.el8.x86_64.rpm
```

13.1.3 Ubuntu 20.04

End of Life: April 2030

Install Requirements

```
sudo apt update && sudo apt install \
    build-essential \
    cmake \
    g++-10 \
    libavdevice-dev \
    libboost-filesystem-dev \
```

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```
    libboost-log-dev \
    libboost-thread-dev \
    libboost-program-options-dev \
    libcap-dev \  # KMS
    libdrm-dev \  # KMS
    libevdev-dev \
    libmfx-dev \  # x86_64 only
    libnuma-dev \
    libopus-dev \
    libpulse-dev \
    libssl-dev \
    libva-dev \
    libvdpau-dev \
    libwayland-dev \  # Wayland
    libx11-dev \  # X11
    libxcb-shm0-dev \  # X11
    libxcb-xfixes0-dev \  # X11
    libxcb1-dev \  # X11
    libxfixes-dev \  # X11
    libxrandr-dev \  # X11
    libxtst-dev \  # X11
    nodejs \
    npm \
    wget  # necessary for cuda install with `run` file
```

Update gcc alias

```
update-alternatives --install \
  /usr/bin/gcc gcc /usr/bin/gcc-10 100 \
  --slave /usr/bin/g++ g++ /usr/bin/g++-10 \
  --slave /usr/bin/gcov gcov /usr/bin/gcov-10 \
  --slave /usr/bin/gcc-ar gcc-ar /usr/bin/gcc-ar-10 \
  --slave /usr/bin/gcc-ranlib gcc-ranlib /usr/bin/gcc-ranlib-10
```

13.1.4 Ubuntu 22.04

End of Life: April 2027

Install Requirements

```
sudo apt update && sudo apt install \
    build-essential \
    cmake \
    libavdevice-dev \
    libboost-filesystem-dev \
    libboost-log-dev \
    libboost-thread-dev \
    libboost-program-options-dev \
    libcap-dev \  # KMS
    libdrm-dev \  # KMS
    libevdev-dev \
```

(continues on next page)

(continued from previous page)

```
    libmfx-dev \  # x86_64 only
    libnuma-dev \
    libopus-dev \
    libpulse-dev \
    libssl-dev \
    libwayland-dev \  # Wayland
    libx11-dev \  # X11
    libxcb-shm0-dev \  # X11
    libxcb-xfixes0-dev \  # X11
    libxcb1-dev \  # X11
    libxfixes-dev \  # X11
    libxrandr-dev \  # X11
    libxtst-dev \  # X11
    nodejs \
    npm \
    nvidia-cuda-dev \  # CUDA, NvFBC
    nvidia-cuda-toolkit  # CUDA, NvFBC
```

13.2 CUDA

If the version of CUDA available from your distro is not adequate, manually install CUDA.

Tip: The version of CUDA you use will determine compatibility with various GPU generations. See CUDA compatibility for more info.

Select the appropriate run file based on your desired CUDA version and architecture according to CUDA Toolkit Archive.

```
wget https://developer.download.nvidia.com/compute/cuda/11.4.2/local_installers/cuda_11.
↪4.2_470.57.02_linux.run \
  --progress=bar:force:noscroll -q --show-progress -O ./cuda.run
chmod a+x ./cuda.run
./cuda.run --silent --toolkit --toolkitpath=/usr --no-opengl-libs --no-man-page --no-drm
rm ./cuda.run
```

13.3 npm dependencies

Install npm dependencies.

```
npm install
```

13.4 Build

Attention: Ensure you are in the build directory created during the clone step earlier before continuing.

```
cmake ..
make -j ${nproc}

cpack -G DEB  # optionally, create a deb package
cpack -G RPM  # optionally, create a rpm package
```

CHAPTER

FOURTEEN

MACOS

14.1 Requirements

macOS Big Sur and Xcode 12.5+

Use either MacPorts or Homebrew

14.1.1 MacPorts

Install Requirements

```
sudo port install avahi boost180 cmake curl libopus npm9 pkgconfig
```

14.1.2 Homebrew

Install Requirements

```
brew install boost cmake node opus
# if there are issues with an SSL header that is not found:
cd /usr/local/include
ln -s ../opt/openssl/include/openssl .
```

14.2 npm dependencies

Install npm dependencies.

```
npm install
```

14.3 Build

Attention: Ensure you are in the build directory created during the clone step earlier before continuing.

```
cmake ..
make -j ${nproc}

cpack -G DragNDrop  # optionally, create a macOS dmg package
```

If cmake fails complaining to find Boost, try to set the path explicitly.
`cmake -DBOOST_ROOT=[boost path] ..`, e.g., `cmake -DBOOST_ROOT=/opt/local/libexec/boost/1.80 ..`

CHAPTER

FIFTEEN

WINDOWS

15.1 Requirements

First you need to install MSYS2, then startup "MSYS2 MinGW 64-bit" and execute the following codes.

Update all packages:

```
pacman -Suy
```

Install dependencies:

```
pacman -S base-devel cmake diffutils gcc git make mingw-w64-x86_64-binutils \
mingw-w64-x86_64-boost mingw-w64-x86_64-cmake mingw-w64-x86_64-curl \
mingw-w64-x86_64-libmfx mingw-w64-x86_64-openssl mingw-w64-x86_64-opus \
mingw-w64-x86_64-toolchain
```

15.2 npm dependencies

Install nodejs and npm. Downloads available here.

Install npm dependencies.

```
npm install
```

15.3 Build

Attention: Ensure you are in the build directory created during the clone step earlier before continuing.

```
cmake -G "MinGW Makefiles" ..
mingw32-make -j$(nproc)

cpack -G NSIS  # optionally, create a windows installer
cpack -G ZIP  # optionally, create a windows standalone package
```

CHAPTER

SIXTEEN

CONTRIBUTING

Read our contribution guide in our organization level docs.

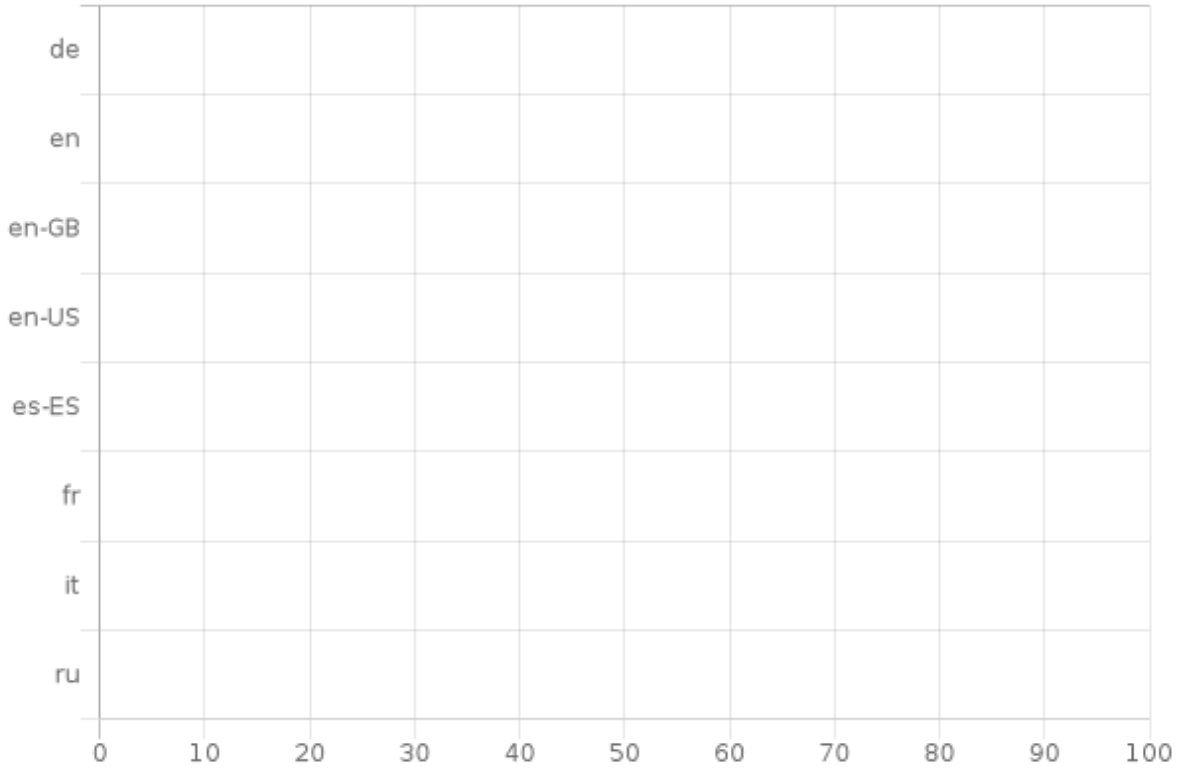
CHAPTER

SEVENTEEN

LOCALIZATION

Sunshine is being localized into various languages. The default language is *en* (English) and is highlighted green.

Graph



17.1 CrowdIn

The translations occur on CrowdIn. Feel free to contribute to localization there. Only elements of the API are planned to be translated.

> **Attention:** The rest API has not yet been implemented.

Translations Basics

- The brand names *LizardByte* and *Sunshine* should never be translated.
- Other brand names should never be translated. Examples:
  - AMD
  - Nvidia

CrowdIn Integration

How does it work?

When a change is made to sunshine source code, a workflow generates new translation templates that get pushed to CrowdIn automatically.

When translations are updated on CrowdIn, a push gets made to the *l10n_nightly* branch and a PR is made against the *nightly* branch. Once PR is merged, all updated translations are part of the project and will be included in the next release.

17.2 Extraction

There should be minimal cases where strings need to be extracted from source code; however it may be necessary in some situations. For example if a system tray icon is added it should be localized as it is user interfacing.

- **Wrap the string to be extracted in a function as shown.**

```
#include <boost/locale.hpp>
boost::locale::translate("Hello world!")
```

> **Tip:** More examples can be found in the documentation for boost locale.

> **Warning:** This is for information only. Contributors should never include manually updated template files, or manually compiled language files in Pull Requests.

Strings are automatically extracted from the code to the *locale/sunshine.po* template file. The generated file is used by CrowdIn to generate language specific template files. The file is generated using the *.github/workflows/localize.yml* workflow and is run on any push event into the *nightly* branch. Jobs are only run if any of the following paths are modified.

```
- 'src/**'
```

When testing locally it may be desirable to manually extract, initialize, update, and compile strings. Python is required for this, along with the python dependencies in the *./scripts/requirements.txt* file. Additionally, xgettext must be installed.

Extract, initialize, and update

```
python ./scripts/_locale.py --extract --init --update
```

Compile

```
python ./scripts/_locale.py --compile
```

CHAPTER

EIGHTEEN

TESTING

18.1 Clang Format

Source code is tested against the *.clang-format* file for linting errors. The workflow file responsible for clang format testing is *.github/workflows/cpp-clang-format-lint.yml*.

Test clang-format locally.

```
find ./ -iname *.cpp -o -iname *.h -iname *.m -iname *.mm | xargs clang-format -i
```

18.2 Sphinx

Sunshine uses Sphinx for documentation building. Sphinx, along with other required documentation depencies are included in the *./docs/requirements.txt* file. Python is required to build sphinx docs. Installation and setup of python will not be covered here.

The config file for Sphinx is *docs/source/conf.py*. This is already included in the repo and should not be modified.

Test with Sphinx

```
cd docs
make html
```

Alternatively

```
cd docs
sphinx-build -b html source build
```

18.3 Unit Testing

Todo: Sunshine does not currently have any unit tests. If you would like to help us improve please get in contact with us, or make a PR with suggested changes.

CHAPTER

NINETEEN

LEGAL

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