Pipelight

Windows browser plugins on Linux

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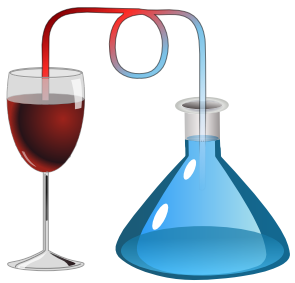

$ whoami

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Overview of Pipelight

Motivation 1/4

Have you ever tried to use a **Video On Demand (VOD)** service on Linux?

Instant Watching System Compatibility

Complete System Requirements

To watch instantly, you''ll need a computer that meets the following minimum requirements:

- Windows
  - Windows Vista or Windows 7
  - Internet Explorer 8 or higher; or the latest version of Firefox; or the latest version of Chrome
  - 1.2 GHz processor
  - 512 MB RAM
- Mac
  - An Intel-based Mac with OS 10.4.11 or later
  - Safari 4 or higher; or the latest version of Firefox; or the latest version of Chrome
  - 1 GB RAM
- Chrome OS
  - A Google Chromebook or Chromebox running Chrome OS 29 or higher

Watch instantly home page >

Source: netflix.com

Motivation 2/4

- **Why are VOD services not supported on Linux?**
- VOD services must fulfill the requirements of the content providers:
  - prevent recording of content
  - require display security (HDCP)
  - license expiration date
  - ...

  → proprietary browser-plugins (Silverlight, Widevine, ...)
- Unfortunately all those plugins are not available natively for Linux

  → here **Pipelight** comes in handy!

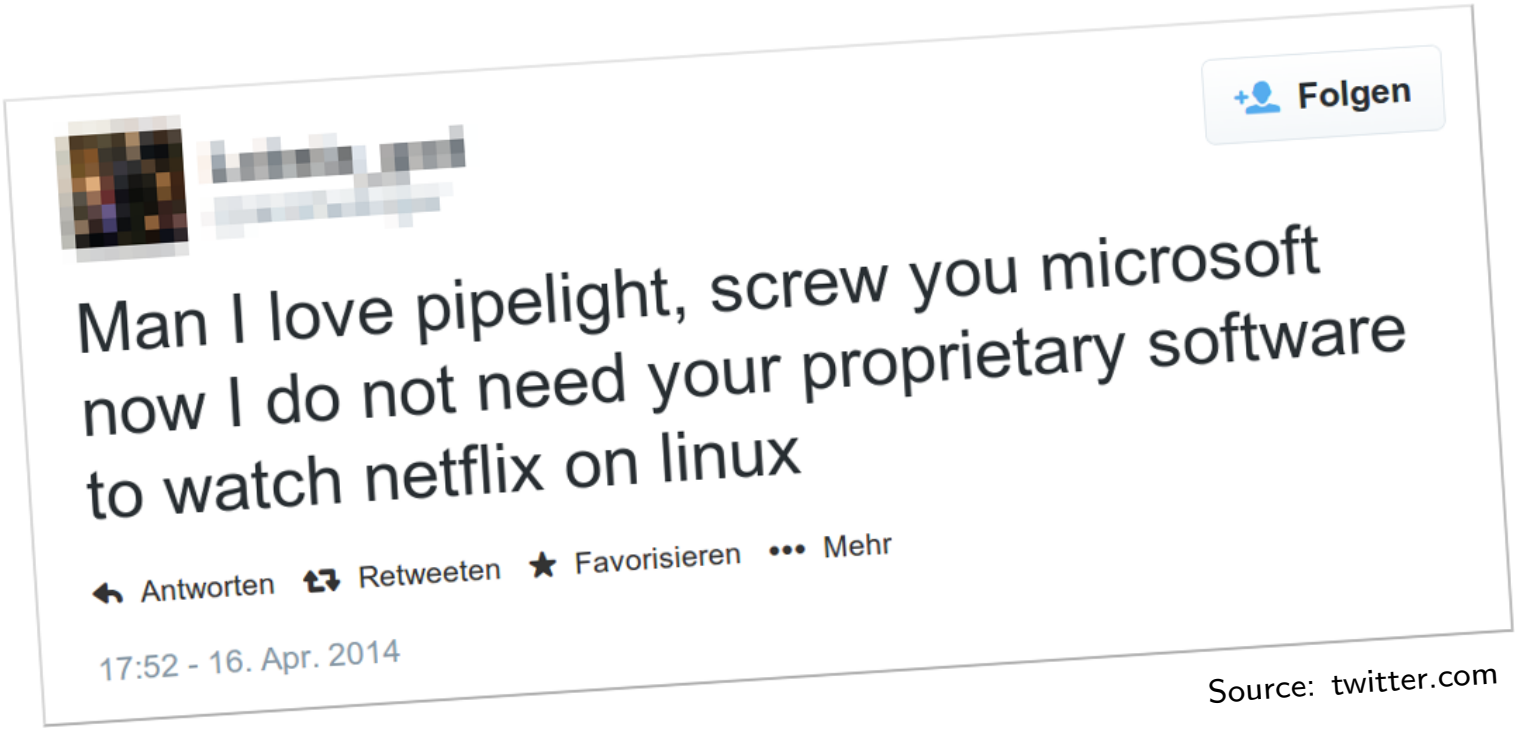
Motivation 3/4

- **Pipelight**
  - acts as wrapper to run Windows plugins in Linux browsers
  - utilizes Wine to provide a Win32 environment to the plugins
  - downloads, installs and configures the plugins
  - keeps plugins up-to-date

- Pipelight integrates so seamlessly into Linux ...

Motivation 4/4

... you won't even notice running Windows software



Source: twitter.com

Supported services and plugins

Known to work VOD services

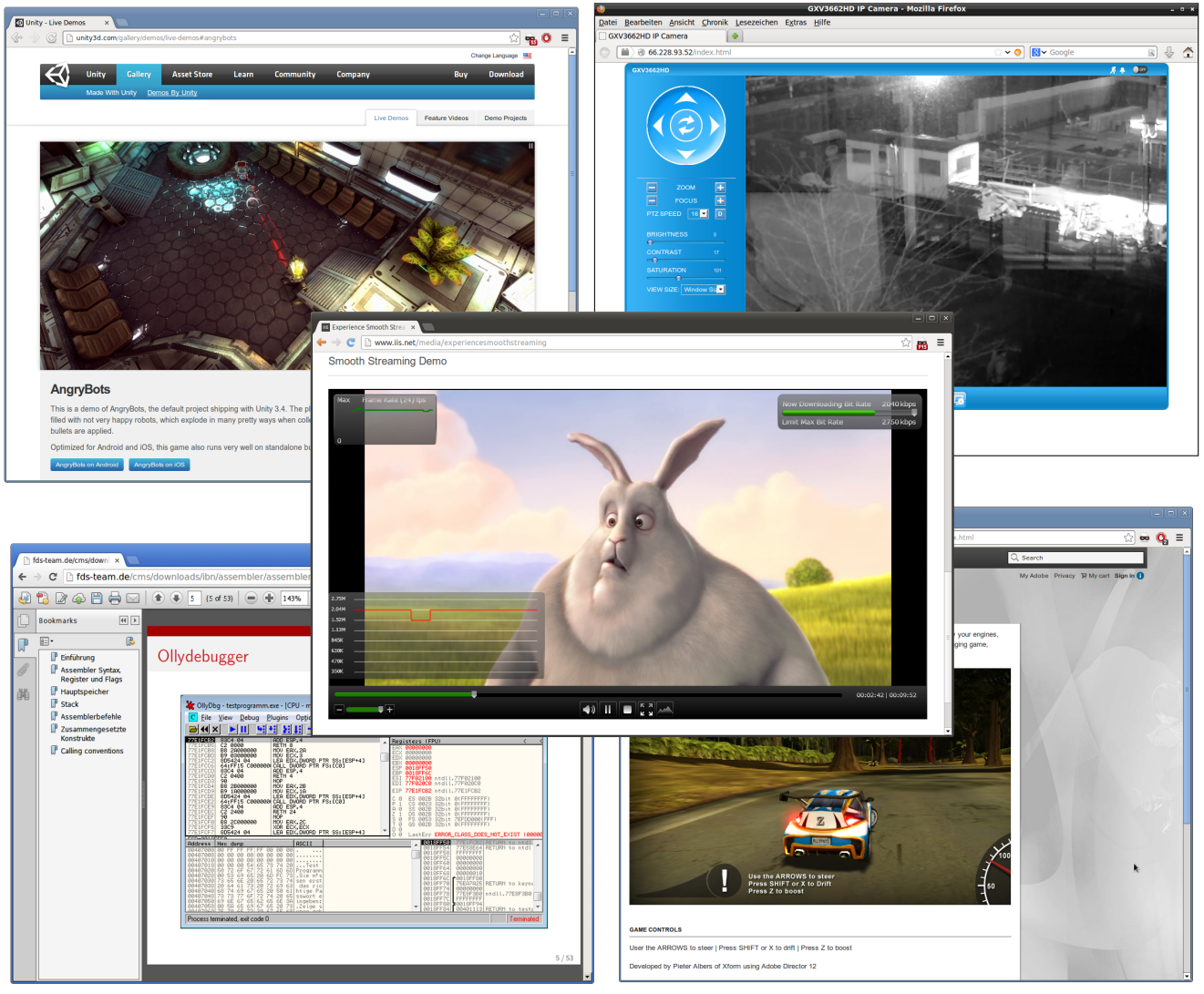
Pipelight will give you access to ...

- Amazon Instant
- arte
- Caiway
- CANAL+ yomvi
- Channel 4od
- Eurosport
- Filmstriben
- Katsomo
- Magine
- MTV Videótár
- Netflix
- Quickflix
- Rai.tv
- redbox instant
- SF ANYTIME
- Sky NOW TV
- SkyGo
- Sky Snap
- Sumo 2
- Telecine Play
- TV d'Orange
- UPC Horizon TV
- Viaplay
- VIDEOBUSTER
- Videoload
- WATCHEVER
- Yelo TV

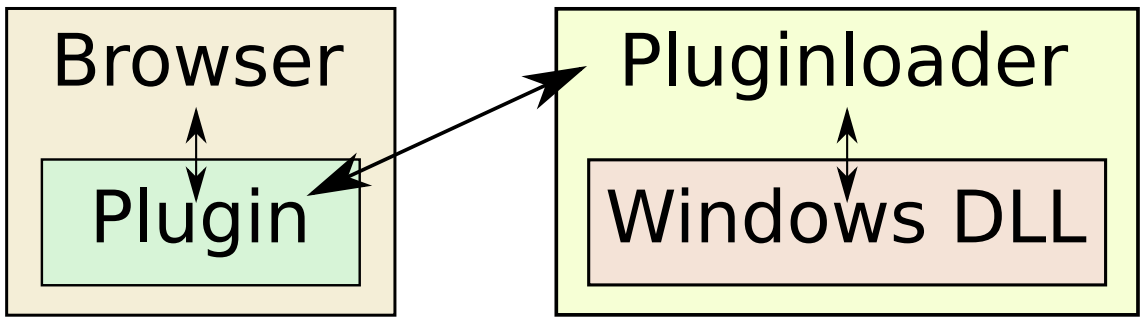
... but Pipelight is not only about VOD, we support **a lot more** ...

Supported plugins

1. Silverlight
2. Flash
3. Widevine
4. Unity3D
5. Shockwave
6. Adobe Reader
7. ViewRight
8. ...



How does it work?



1. Linux
   - Browser loads Pipelight plugin, which then starts up Wine
   - acts as a bridge to the `pluginloader.exe` process (in Wine)
2. Custom Wine version (called “wine-compholio”)
   - `pluginloader.exe` loads the requested plugin DLLs
3. Communication via **Pipes**!

wine-compholio: Features

Wine provides the **basic functionality** for Pipelight to work,
... but does not (yet) provide all the features we need:

- Special XEMBED support (all Pipelight plugins)
- Support for PulseAudio audio backend (all Pipelight plugins)
- Support for notifications when network interfaces are added/removed (Silverlight)
- Support for stored Access Controlled Lists (ACLs) (Silverlight)
- Support for inherited file ACLs (Silverlight)
- Workaround for relative UrlCombine URLs (Silverlight)
- Addition of Arial font (Silverlight)
- Reduced SetTimer minimum timeout to 5 ms (better Silverlight performance)
- Workaround for TransactNamedPipe (Unity3D)
- Support for junction points (bonus)
- Support for TransmitFile (bonus)
- Support for GetVolumePathName (bonus)

wine-compholio: Accepted upstream features

Also non-Pipelight users benefit from our **patches that got upstream** ...

- Support for additional XEMBED events (all Pipelight plugins)
- Fixes for embedded window support (all Pipelight plugins)
- Now sending focus request for embedded windows (all Pipelight plugins)
- Proper support for SPFILENOTIFY_FILEEXTRACTED file targets (Silverlight)
- Nanosecond precision file time storage (Silverlight)
- Proper support for semicolons in InternetCrackUrl (Silverlight)
- Support for SetSecurityInfo (Silverlight)
- Support for [Get|Set]NamedSecurityInfo (Silverlight)
- Proper minimum SetTimer timeout support (Silverlight)
- Fix IFilterGraph2::AddFilter call to IBaseFilter::JoinFilterGraph (Silverlight)
- Support for quotations in UrlCombine (Silverlight)
- Support for VMR7MonitorConfig (Silverlight)
- Create directories with the requested security attributes (Silverlight)
- Support for additional CompareStringEx flags (Silverlight)
- Support for IDirect3DSwapChain9Ex (Silverlight GPU acceleration)
- Support for Video Mixing Renderer 7 (Silverlight GPU acceleration)
- Give each VMR7 monitor a unique id (Silverlight GPU acceleration)

Installing and using Pipelight

Installation

- Pipelight itself is very **“lightweight”**, nevertheless
  - compiling Wine is time consuming and difficult (at least on 64-bit)

$\Rightarrow$ We therefore provide packages for the following systems:

- Arch Linux
- AVLinux
- CentOS 6
- Debian
- Fedora
- Mageia 4
- openSUSE
- Slackware
- SteamOS
- Ubuntu

(see http://fds-team.de/cms/pipelight-installation.html)

Installation - Example

- The following steps will install Pipelight on Ubuntu / Mint:

```
sudo add-apt-repository ppa:pipelight/stable
sudo apt-get update
sudo apt-get install --install-recommends pipelight-multi
```

- Now grab a recent plugin database from the server:

```
sudo pipelight-plugin --update
```

- Enable the plugins you want to use:

```
sudo pipelight-plugin --enable silverlight
```

- You are done!

Typical problems

- Error message: *Your operating system is not supported!*
  - → Install an user agent switcher and set it to Windows
- *Silverlight crashes while loading a DRM protected video*
  - → Disable HTTPS Everywhere / NoScript / ...
- *Plugin crashes when loading a video / bad performance*
  - → Install the 32 bit graphic driver libraries
  - → PulseAudio is causing trouble, run: `pulseaudio -k`

⇒ More information are available in our FAQ section

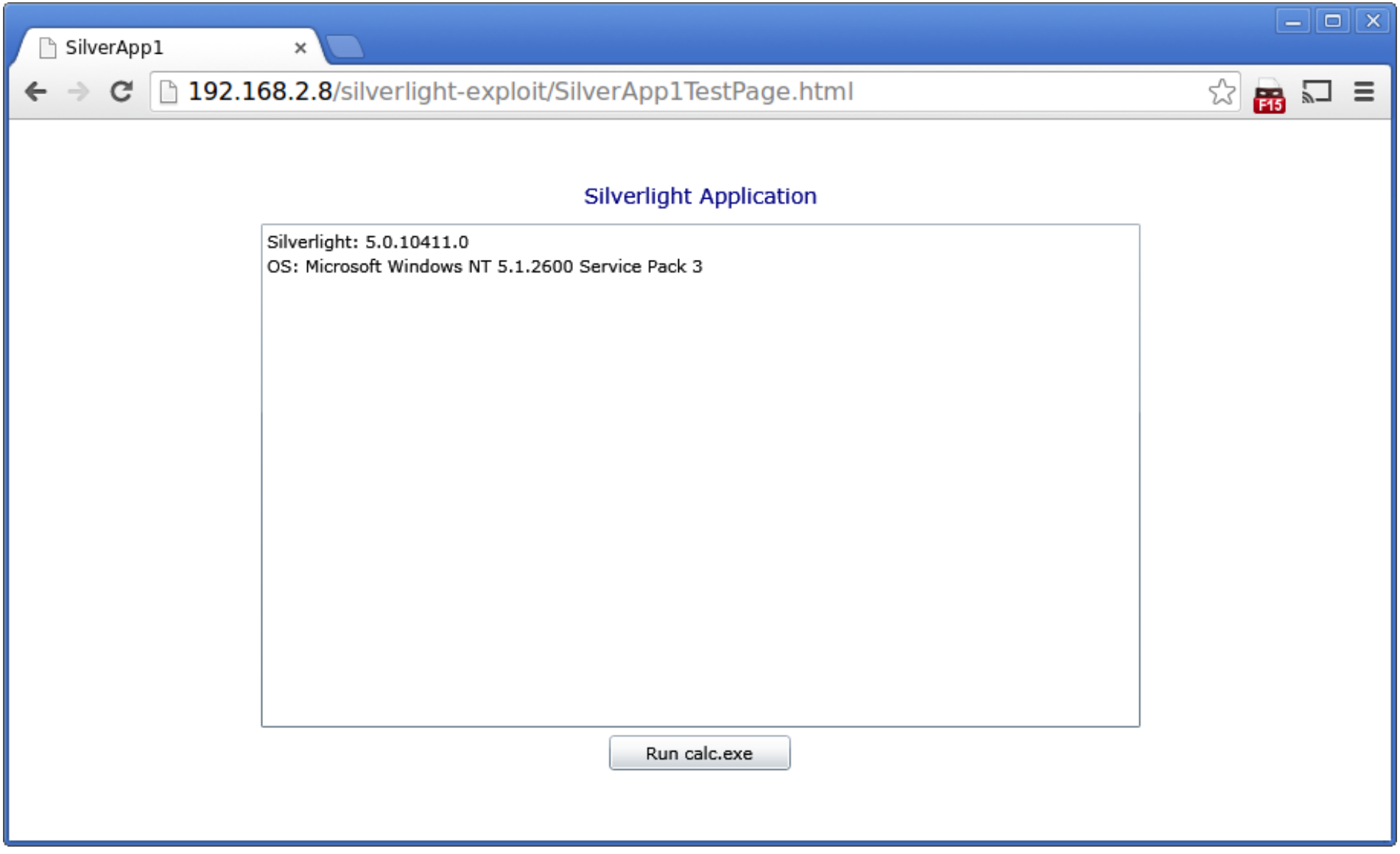
Security

Security

- Browsers are getting more and more secure, but what about plugins?
- Plugins exploits increasingly interesting for attackers, especially ...
  - Flash
  - Java
  - but Silverlight has also gained some interest
- So what about **plugin vulnerabilities and Pipelight**?

  $\rightarrow$ Lets take a look at a Silverlight exploit published some months ago

Silverlight Exploit - Screenshot



Silverlight Exploit - Pipelight

- What happens if you execute this exploit in Pipelight?
  - → Pipelight hits an internal assertion and aborts. Why?
- Explanation:
  - normally all NPAPI objects have to be created by the browser
  - exploit was based on an error, where an object was created by Silverlight instead
  - → Pipelight detects the invalid pointer and terminates the plugin
  - → The exploit was not able to execute its payload :-)

⇒ This was just luck, is there a more reliable protection against exploits?

Pipelight-Sandbox [beta]

- Pipelight-Sandbox runs plugins in a secure way using namespaces:
  - **PID namespace** — Other processes are not visible
  - **Mount namespace** — Filesystem is readonly (except `WINEPREFIX`)
  - **IPC namespace** — Other Sockets are not accessible
  - **Network namespace** — Restricted network access (i.e. blocked 192.168.*, 10.*, ...)
- Not only useable with Pipelight!

→ Should protect against any kind of manipulation

Pipelight-Sandbox [beta]

- Pipelight-Sandbox can run any Linux program and is highly configurable:
  - Allow X server access?
  - Allow Pulseaudio access?
  - Allow network access?
  - Define writeable directories
- When using with Wine: only writeaccess to `WINEPREFIX` required.
- Issues left:
  - allowing network access makes it possible to steal information
  - everything still **beta**, so use it at your own risk!

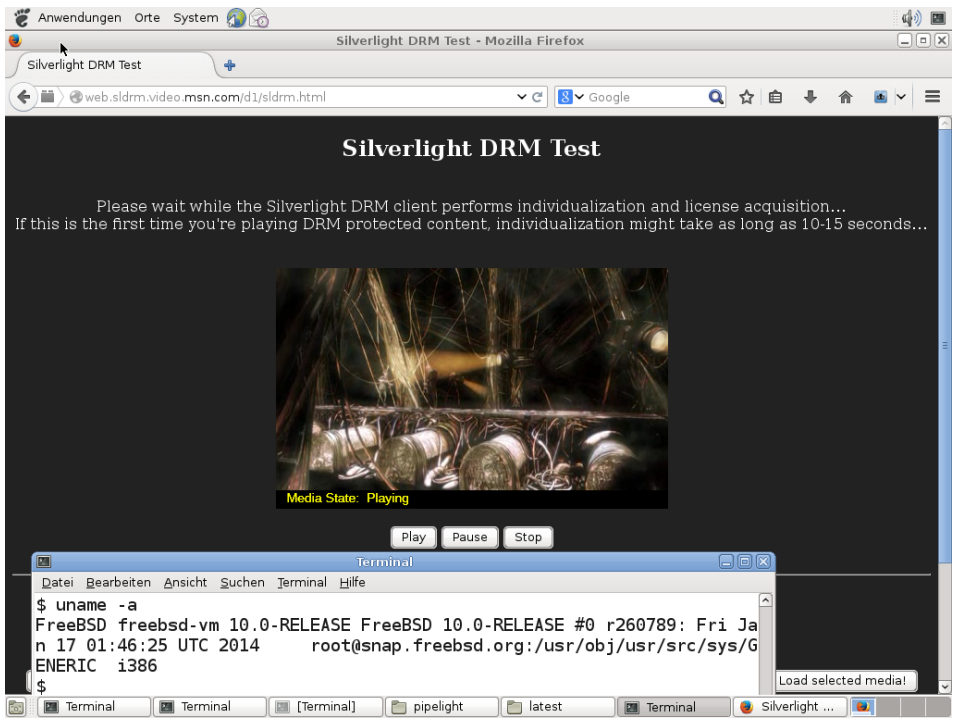
Future Ideas & Problems

GPU decoding

- **Accelerated video decoding**
  - not to be confused with video rendering (already supported)
  - DXVA2 $\leftrightarrow$ **VAAPI** translation
  - supports Intel (natively), NVIDIA and AMD (through wrappers)
- Current state:
  - working prototype for MPEG2
- Future work:
  - still lacks a proper integration into wined3d
  - support for other codecs

Support more systems / platforms

- **Porting Pipelight / Wine patches to other platforms**
  - FreeBSD (almost done)
  - MacOS (how to solve embedding?)



Add Darling support

- **What about running MacOS plugins on Linux?**
  - Darling (http://darlinghq.org) allows running MacOS binaries on Linux
  - APIs are much more similar → better performance, less bugs?
  - no DirectX to OpenGL translation!

- Current state:
  - very early stage, not yet useable for Pipelight

  ⇒ Help Luboš Doležel and contribute to his project to speedup the development :-)

End of NPAPI = End of Pipelight?

- **What if browsers drop NPAPI?**
  - Chrome already dropped it in their latest beta version
  - Firefox also had plans to discontinue NPAPI
- Possible solutions:
  - add translation NPAPI $\leftrightarrow$ PPAPI / NaCL
  - patch browser to reimplement / reenable NPAPI
  - provide users with a “custom” NPAPI browser

PPAPI / NaCL Translation Difficulties

APIs like PPAPI are **much more locked down** than NPAPI, this increases security but simultaneously breaks many commonly-used NPAPI features

- Wine can not be executed inside a NaCL / PPAPI sandbox
- Hacks are needed to get around these restrictions
  - break out of the sandbox?
  - communication with external process?
- Still PPAPI lacks some NPAPI features or restricts them, resulting in new bugs

$\Rightarrow$ Patching the browser is a much cleaner approach

Custom NPAPI Browser

We provide some **patches for Chromium** that support most of the Pipelight features

- Most other browsers still provide NPAPI support

  (Firefox, Midori, Uzbl, ...)

  - but what if they all have dropped support?

- Possible solution: Custom NPAPI browser ("pipelight-browser")
  - a special-purpose Firefox (or patched Chrome) for Windows plugins
  - more user-friendly: everything preconfigured and sandboxed
  - "netflix-desktop" already implements a lot of these features, can be updated to better support multiple plugins

Conclusion

Conclusion

- **Pipelight/wine-compholio provides** ...
  - better performance than using Wine directly
  - fixes for lots of bugs you would encounter with vanilla Wine
  - user-friendly way to install and use Windows plugins on Linux
- Nevertheless, Pipelight is not finished yet!
  - Review and finalize sandboxing
  - GPU accelerated video decoding
  - FreeBSD/MacOS support
  - support for MacOS plugins on Linux (Darling)
  - continue support after end of NPAPI

Questions?

Contact us

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- Find out more about Pipelight:
  - https://launchpad.net/pipelight
  - http://fds-team.de
- Sourcecode:
  - https://bitbucket.org/mmueller2012/pipelight
  - https://bitbucket.org/mmueller2012/pipelight-sandbox
  - https://github.com/compholio/wine-compholio-daily
  - **Contributions are welcome!**