Ups and Downs with Remote Desktop Protocol (RDP) on Wayland, Weston and the Yocto Project

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Wayland & Weston

- Wayland is a display protocol that specifies the communication between a display server and its clients

- Started in 2008 with the aim to replace the X Window System in GNU/Linux and Unix-based distributions

- Security by design through isolation of the input and output of every window

- Weston is the reference Wayland compositor, there are many other compositors

Remote Desktop Protocol (RDP)

- Proprietary protocol from Microsoft for graphical desktop-sharing

- Based and extending the ITU-T T.128 application-sharing protocol

- Semantic protocol that is aware of controls, fonts and other graphical primitives

- Uses RSA Security's RC4 cipher (a stream cipher designed to efficiently encrypt small amounts of data)

The Yocto Project

- Open source collaborative project of the Linux foundation for creating custom Linux-based distributions for embedded devices using the OpenEmbedded Build System

- **OpenEmbedded** Build System includes BitBake and OpenEmbedded Core

- **Poky** is a reference distribution of the Yocto Project provided as metadata, without binary files, to bootstrap your own distribution for embedded devices

- Bi-annual release cycle

- Long term support (LTS) release covering two-year period

The Yocto Project Releases

Codename	Version	Release Date	Support Level
Mickledore	4.2	April 2023	for 7 months (until October 2023)
Langdale	4.1	October 2022	Until May 2023
Kirkstone	4.0	May 2022	LTS (minimum April 2024)
Dunfell	3.1	April 2020	LTS (until Apr. 2024)

Bitbaking Weston with RDP

Extend the recipe for building Weston:

- Enable RDP backend:

   PACKAGECONFIG:append = " rdp"

- This will enable -Dbackend-rdp=true and add freerdp (from layer meta-oe) as a build dependency

- For example, weston_%.bbappend:
   https://github.com/leon-anavi/meta-weston-rdp/blob/main/recipes-graphics/wayland/weston_%25.bbappend

Using RDP

- On the target device generate RDP certificates (or generate & deploy in advance):

```
mkdir -p /etc/freerdp/keys/
winpr-makecert -rdp -path /etc/freerdp/keys/
```

- Rename the generated files to server.crt and server.key

- Enable RDP screen sharing in /etc/xdg/weston/weston.ini:

```
[screen-share]
command=/usr/bin/weston --backend=rdp-backend.so
--rdp-tls-cert=/etc/freerdp/keys/server.crt --rdp-tls-key=/etc/freerdp/keys/server.key
--shell=fullscreen-shell.so –no-clients-resize
```

- After loading Weston, press ctrl+alt+s to launch RDP

RDP Automatic Startup

- Launch Weston with screen-share.so, for example in Weston systemd service:

  ExecStart=/usr/bin/weston --modules=systemd-notify.so,screen-share.so

- Add start-on-startup=true to section [screen-share] in weston.ini:

```
[screen-share]
command=/usr/bin/weston --backend=rdp-backend.so
--rdp-tls-cert=/etc/freerdp/keys/server.crt --rdp-tls-key=/etc/freerdp/keys/server.key
--shell=fullscreen-shell.so --no-clients-resize
start-on-startup=true
```

Remote Connection

From another computer in the same network connect to the embedded device using a Remote Desktop Protocol (RDP) client, for example:
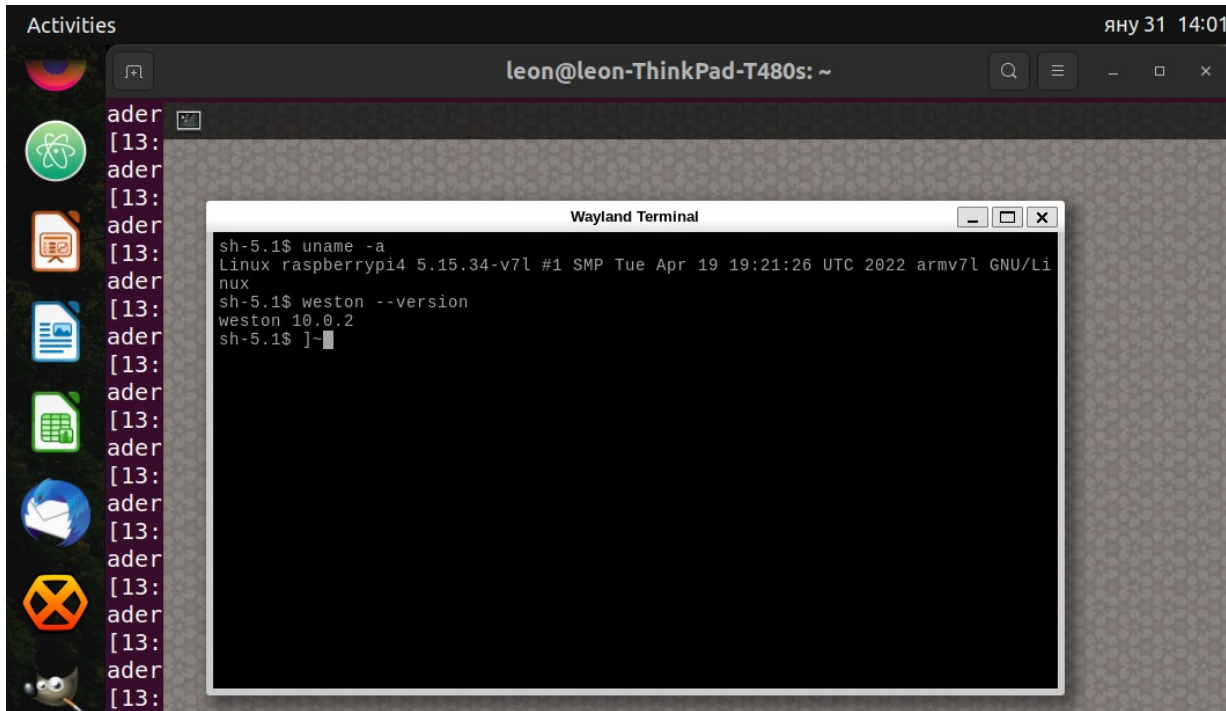
- If you are running Wayland on Linux (replace <ip>):

  wlfreerdp /v:<ip>

- If you are running X11 on Linux (replace <ip>):
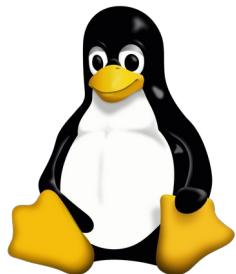
  xfreerdp /v:<ip> /u:weston

RDP Demo

- Wlfreerdp on Ubuntu 22.04 with Wayland and GNOME 42.5

- core-image-weston built from Yocto Project LTS release Kirkstone with Weston version 10.0.2 on Raspberry Pi 4

Conclusions

- RDP is a proprietary semantic protocol for graphical desktop-sharing that works with Wayland and Weston

- Newer Weston version support automatic start of RDP screen sharing even in there are no input devices connected to the embedded Linux device

- The Yocto Project and OpenEmbedded provide the necessary tools to build core-image-weston and enable RDP

- The Yocto Project has a steep learning curve but offers great flexibility and a huge existing source code base, including BSP, to bootstrap a custom embedded GNU/Linux distribution

- Yocto LTS release like Kirkstone is recommended for RDP on Weston

Thank You!

Useful links

- Wayland
  https://wayland.freedesktop.org/

- Weston source code
  https://gitlab.freedesktop.org/wayland/weston

- The Yocto Project
  https://www.yoctoproject.org/

- The Yocto Project releases
  https://wiki.yoctoproject.org/wiki/Releases

- Simple example Yocto/OE layer for RDP on Weston:
  https://github.com/leon-anavi/meta-weston-rdp