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

Leon Anavi
Konsulko Group
leon.anavi@konsulko.com
leon@anavi.org
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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

<table>
<thead>
<tr>
<th>Codename</th>
<th>Version</th>
<th>Release Date</th>
<th>Support Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mickledore</td>
<td>4.2</td>
<td>April 2023</td>
<td>for 7 months (until October 2023)</td>
</tr>
<tr>
<td>Langdale</td>
<td>4.1</td>
<td>October 2022</td>
<td>Until May 2023</td>
</tr>
<tr>
<td>Kirkstone</td>
<td>4.0</td>
<td>May 2022</td>
<td>LTS (minimum April 2024)</td>
</tr>
<tr>
<td>Dunfell</td>
<td>3.1</td>
<td>April 2020</td>
<td>LTS (until Apr. 2024)</td>
</tr>
</tbody>
</table>
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`:
  ```
  ```
Using RDP

- On the target device generate RDP certificates (or generate & deploy in advance):
  ```bash
  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`:
  ```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
  ```
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/](https://wayland.freedesktop.org/)
- Weston source code
  [https://gitlab.freedesktop.org/wayland/weston](https://gitlab.freedesktop.org/wayland/weston)
- The Yocto Project
  [https://www.yoctoproject.org/](https://www.yoctoproject.org/)
- The Yocto Project releases
- Simple example Yocto/OE layer for RDP on Weston: