

using Linux under Windows

introduction

Windows has had a native Linux capability for the last few years which has proven to be stable and quite capable.

"Windows Services for Linux" (WSL) can run Linux most distributions without problems in most of the ways we might want to use it as Linux users and provides a useful adjunct to those saddled with needing to use a Windows laptop for whatever reason.

why?

There are a number of reasons, but many of these simply come down to convenience.

For most uses it can't replace a full Linux desktop but for cases where you just want to use a Unix-based workflow for certain things such as text processing as this comes more naturally, then being able to work on the same files from within Windows and Linux without having to transfer them back and forth can be quite appealing.

It is also very useful as a development environment for devops work as it's local and can be created and destroyed relatively easily, mostly without need for Windows Administrator privileges after the initial setup and required Windows features are enabled.

version differences

WSL version 1 is more like a "reverse Wine" in the sense that it's an environment that provides a system call ABI interface to a Linux binary and translates these to the equivalent calls on Windows to provide similar functionality, but this approach tends to only be able to extend so far.

WSL version 2 is a para-virtualisation environment that operates at the kernel level to provide low-level functionality into the Windows environment and is apparently based on Microsoft's work with Xen in their Azure cloud infrastructure. This allows WSL2 VMs to host X11 clients and present these on the Windows desktop alongside other native applications. WSL2 is reported to support being able to read and write native Linux filesystems directly on devices (although I've not tried this)

installing WSL

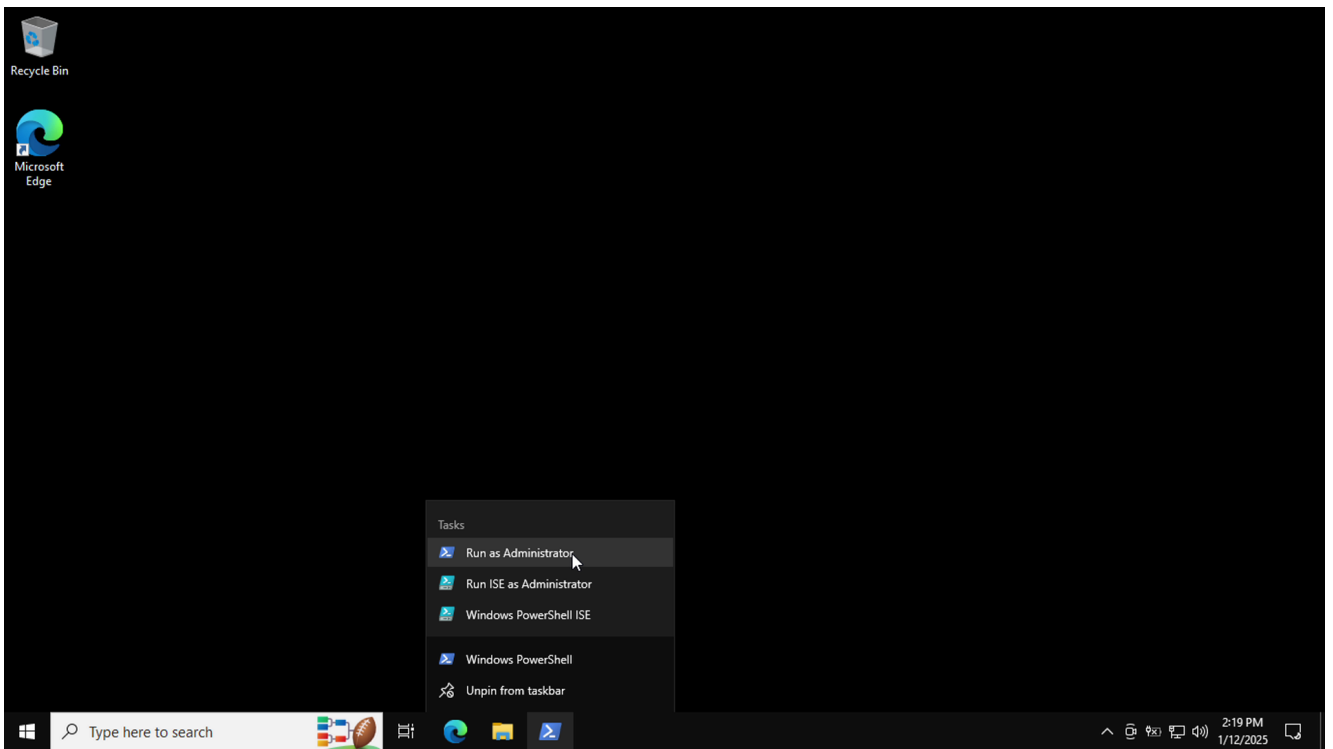
Microsoft do have a number of web pages on [WSL](#) and the [install process](#) however this page assumes some settings about your desired installation which may not be wanted

I'll be going through a manual process and describing things as we go, mostly following the [manual install process](#)

installing WSL manually

enable virtual machine features

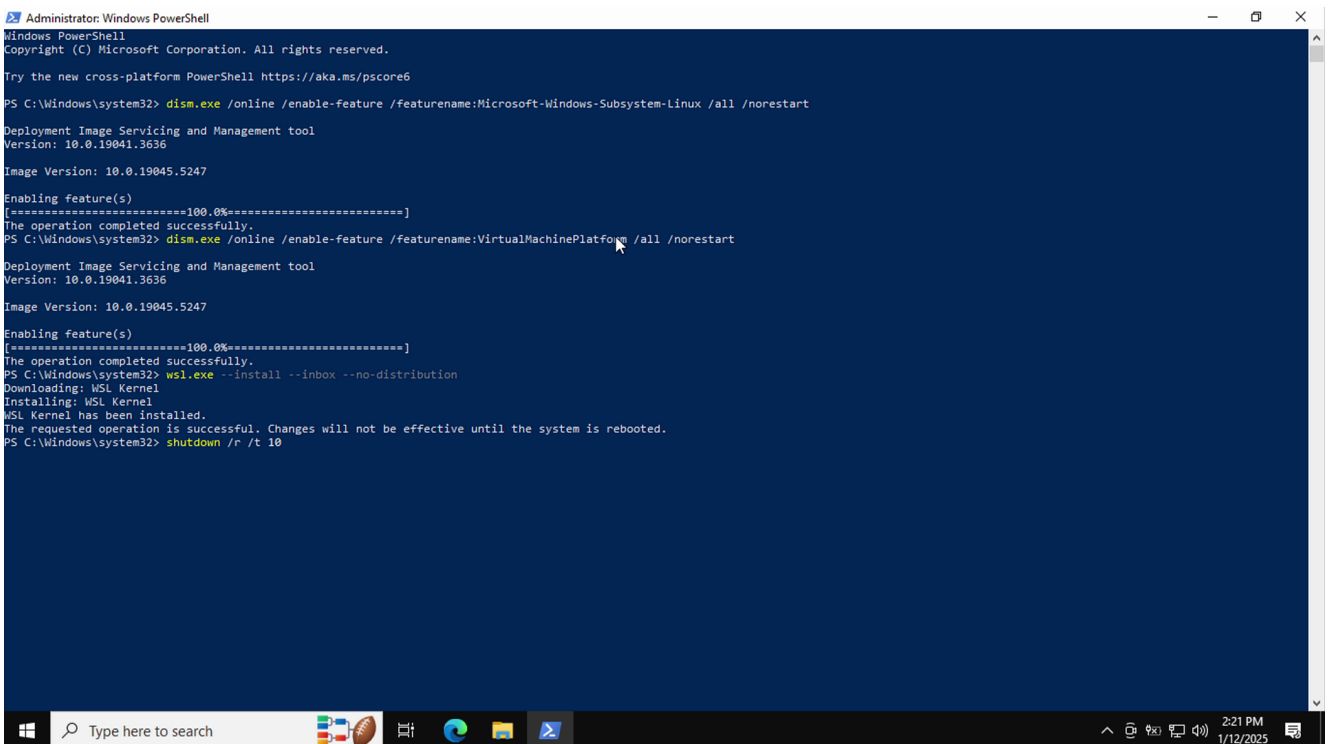
- open powershell as Administrator:



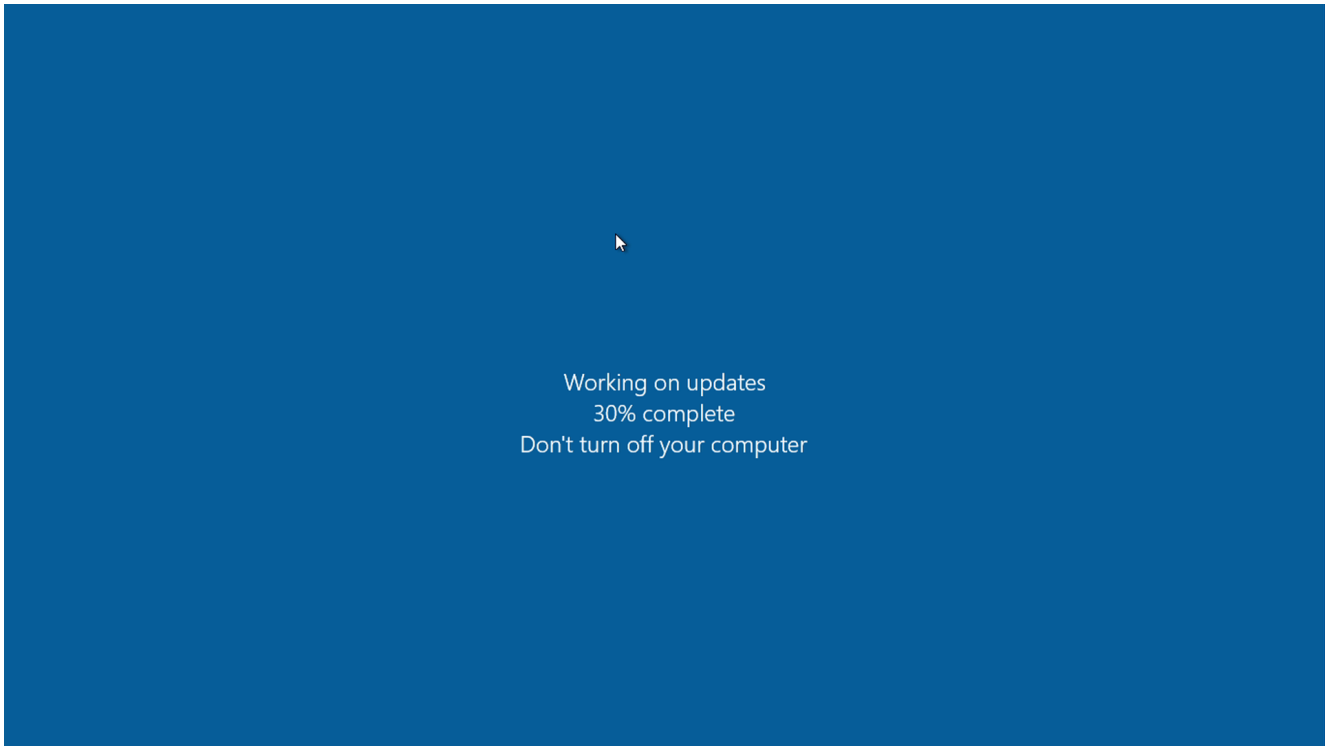
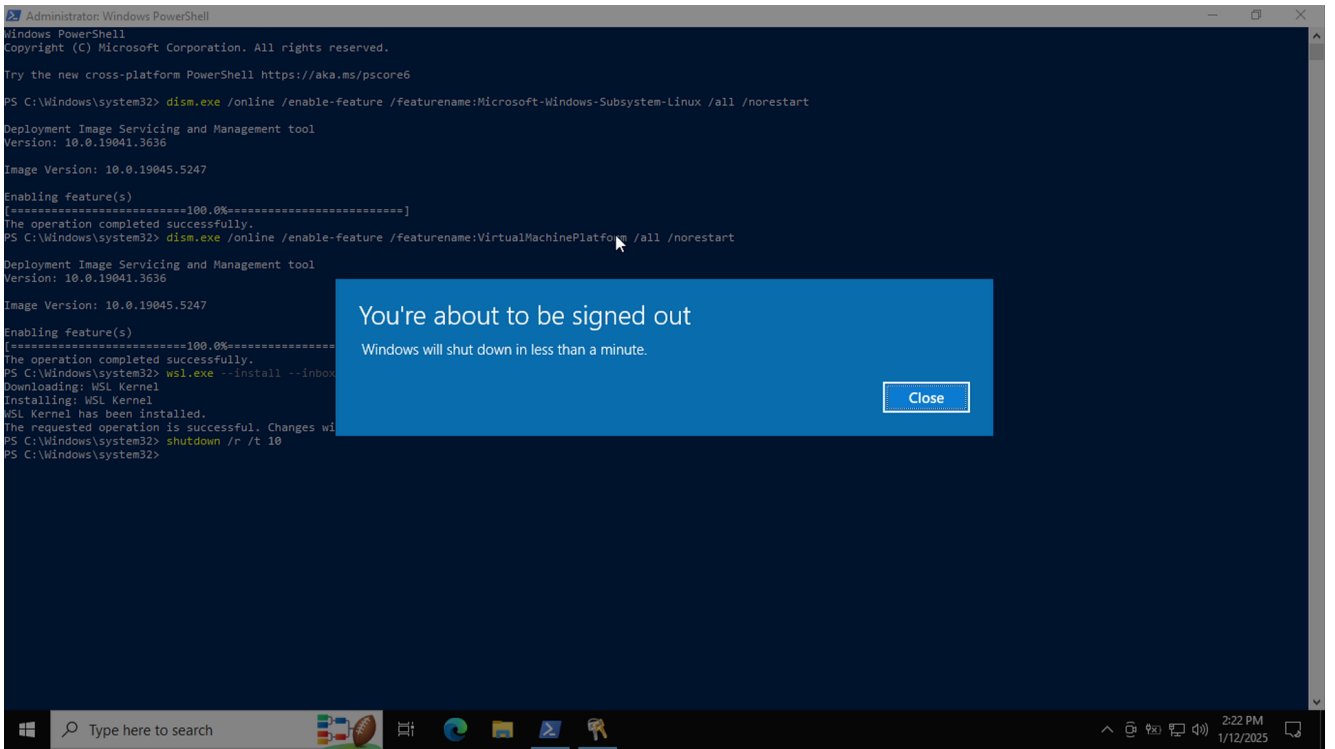
- enable virtual machine features and reboot the host

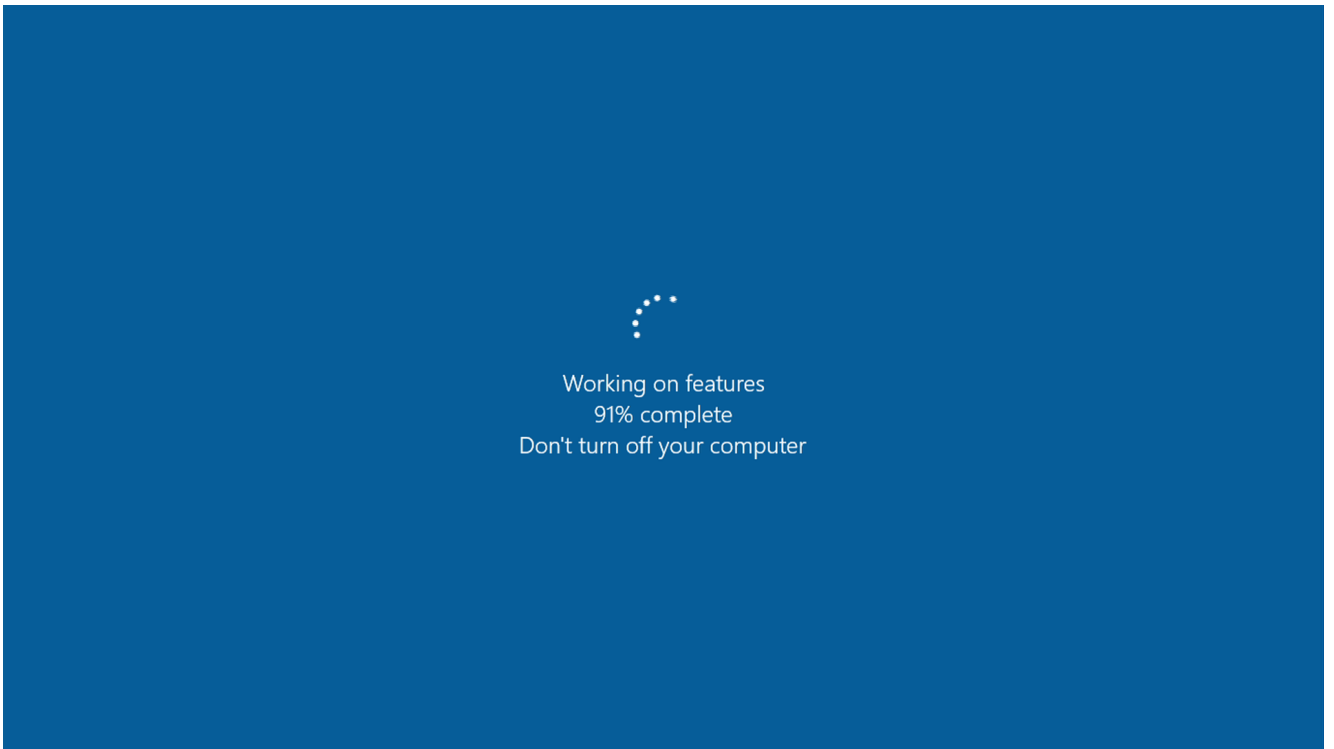
```
dism.exe /online /enable-feature /featurename:Microsoft-Windows-Subsystem-Linux /all /norestart
dism.exe /online /enable-feature /featurename:VirtualMachinePlatform /all /norestart
wsl.exe --install --inbox --no-distribution
shutdown /r /t 10
```

- for example:



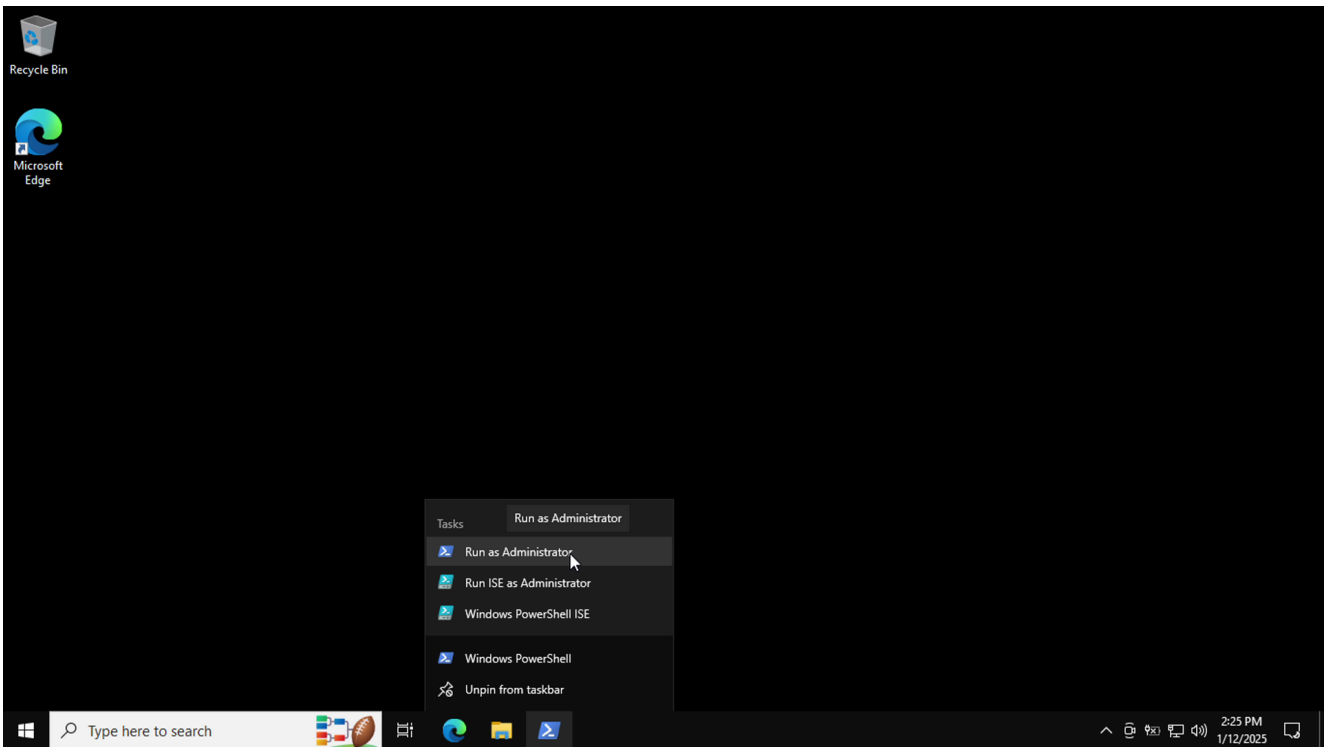
- your Windows host will perform a reconfigure reboot





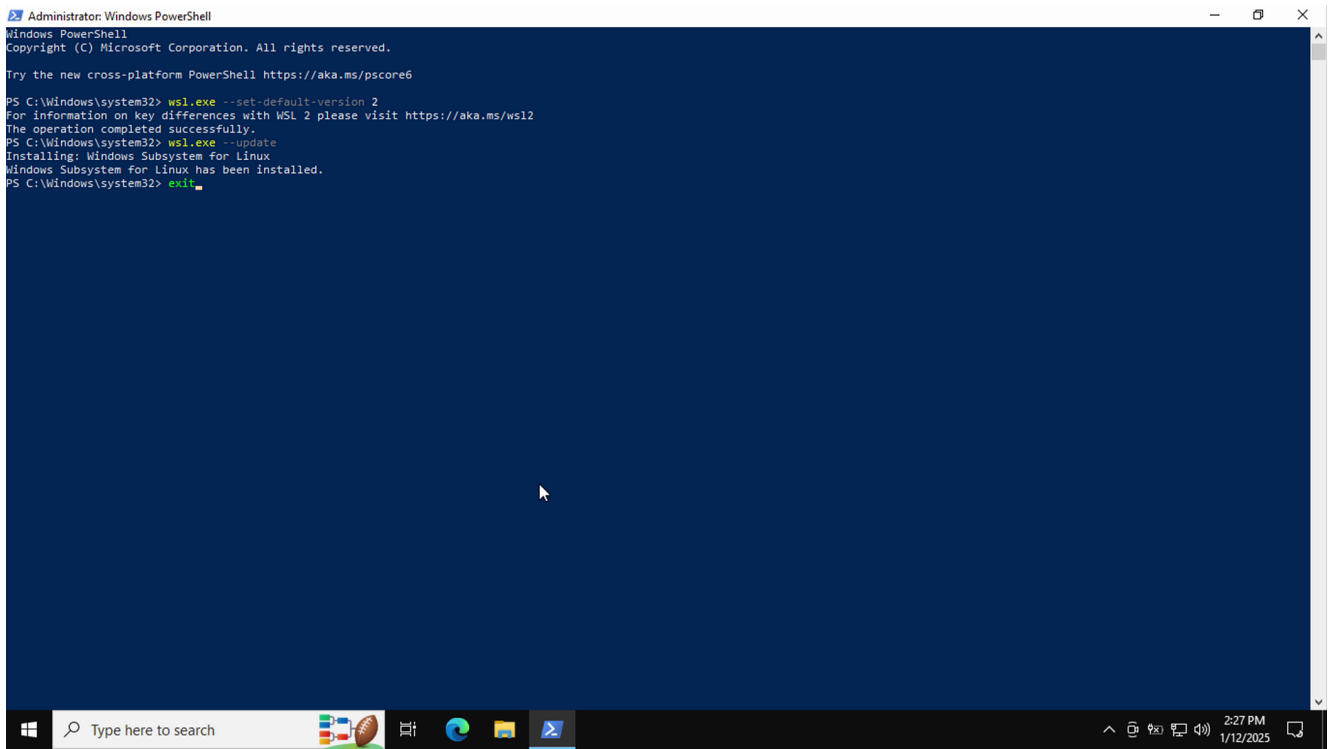
configure WSL

- start Powershell as Administrator



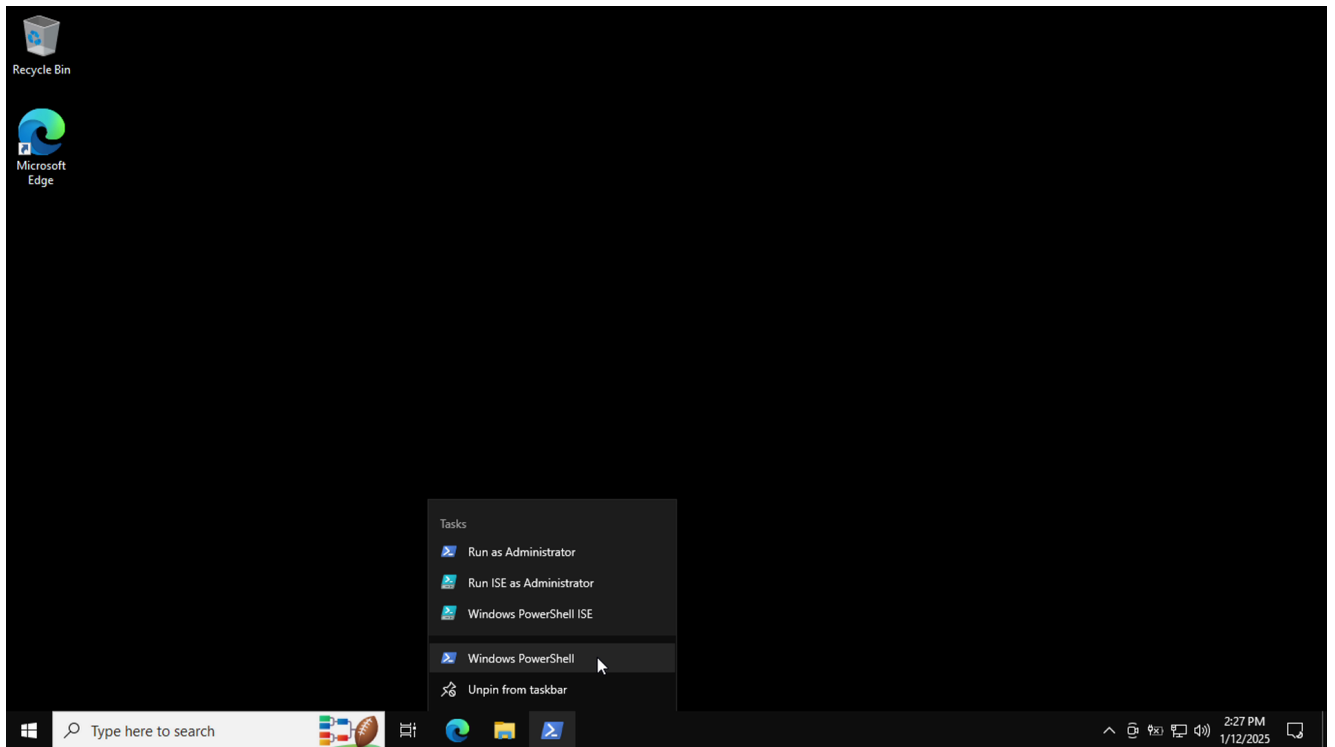
- set default version of WSL, update it and then exit the PowerShell session

```
wsl.exe --set-default-version 2  
wsl.exe --update  
exit
```



install image

- start Powershell as a non-privileged user



- list the OS images available online, install Ubuntu, then exit the PowerShell session:

```
wsl.exe --list --online
wsl.exe --install --no-launch --distribution ubuntu-22.04
exit
```

- for example:

```

Windows PowerShell
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Try the new cross-platform PowerShell https://aka.ms/pscore6

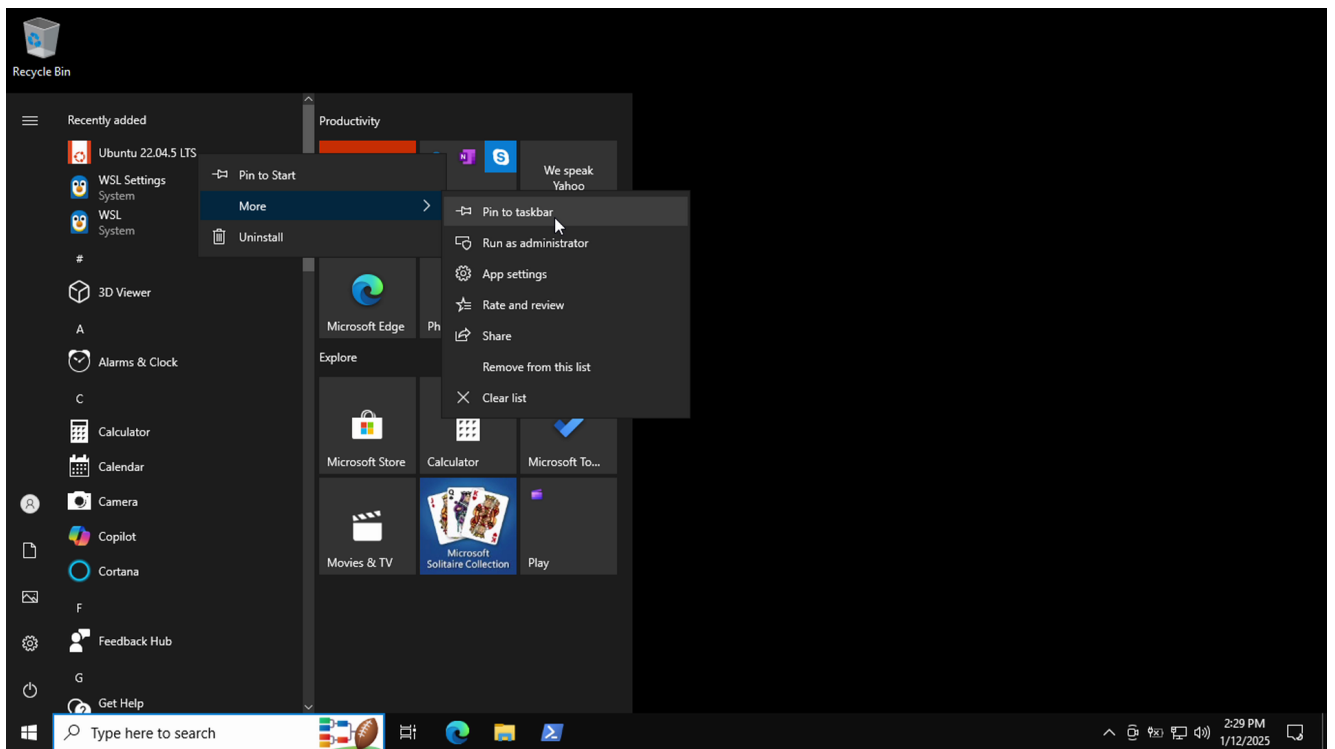
PS C:\Users\User> wsl.exe --list --online
The following is a list of valid distributions that can be installed.
Install using 'wsl.exe --install <Distro>'.

NAME                                FRIENDLY NAME
-----                                -
Ubuntu                               Ubuntu
Debian                               Debian GNU/Linux
kali-linux                           Kali Linux Rolling
Ubuntu-18.04                          Ubuntu 18.04 LTS
Ubuntu-20.04                          Ubuntu 20.04 LTS
Ubuntu-22.04                          Ubuntu 22.04 LTS
Ubuntu-24.04                          Ubuntu 24.04 LTS
OracleLinux_7_9                       Oracle Linux 7.9
OracleLinux_8_7                       Oracle Linux 8.7
OracleLinux_9_1                       Oracle Linux 9.1
openSUSE-Leap-15.6                    openSUSE Leap 15.6
SUSE-Linux-Enterprise-15-SP5          SUSE Linux Enterprise 15 SP5
SUSE-Linux-Enterprise-15-SP6          SUSE Linux Enterprise 15 SP6
openSUSE-Tumbleweed                   openSUSE Tumbleweed
PS C:\Users\User> wsl.exe --install --no-launch --distribution ubuntu-22.04
Installing: Ubuntu 22.04 LTS
Ubuntu 22.04 LTS has been installed.
The operation completed successfully.
PS C:\Users\User> exit

```

image configuration

- from the main menu, locate the new Ubuntu "app" (taskbar pinning is a convenience)



- start the app, which will then do the initial OS build:
 - use a proper non-privileged username (don't use root)
 - use a unique password
- for example:

```
user@DESKTOP-D0KD7UU: ~
Installing, this may take a few minutes...
Please create a default UNIX user account. The username does not need to match your Windows username.
For more information visit: https://aka.ms/wslusers
Enter new UNIX username: user
New password:
Retype new password:
passwd: password updated successfully
Installation successful!
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

Welcome to Ubuntu 22.04.5 LTS (GNU/Linux 5.15.167.4-microsoft-standard-WSL2 x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Sun Jan 12 14:30:32 AEDT 2025

System load:  0.61          Processes:      31
Usage of /:   0.1% of 1006.85GB  Users logged in:  0
Memory usage: 11%          IPv4 address for eth0: 172.17.132.82
Swap usage:   0%

This message is shown once a day. To disable it please create the
/home/user/.hushlogin file.
user@DESKTOP-D0KD7UU:~$ uname -a
Linux DESKTOP-D0KD7UU 5.15.167.4-microsoft-standard-WSL2 #1 SMP Tue Nov 5 00:21:55 UTC 2024 x86_64 x86_64 x86_64 GNU/Linux
user@DESKTOP-D0KD7UU:~$
```

• do the usual maintenance:

```
sudo -i
apt-get update && apt-get upgrade -y
```

• for example:

```
root@DESKTOP-D0KD7UU: ~
New password:
Retype new password:
passwd: password updated successfully
Installation successful!
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

Welcome to Ubuntu 22.04.5 LTS (GNU/Linux 5.15.167.4-microsoft-standard-WSL2 x86_64)

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user@DESKTOP-D0KD7UU:~$ uname -a
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user@DESKTOP-D0KD7UU:~$ sudo -i
[sudo] password for user:
Welcome to Ubuntu 22.04.5 LTS (GNU/Linux 5.15.167.4-microsoft-standard-WSL2 x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Sun Jan 12 14:31:59 AEDT 2025

System load:  0.39          Processes:      32
Usage of /:   0.1% of 1006.85GB  Users logged in:  1
Memory usage: 10%          IPv4 address for eth0: 172.17.132.82
Swap usage:   0%

This message is shown once a day. To disable it please create the
/root/.hushlogin file.
root@DESKTOP-D0KD7UU:~# apt-get update && apt-get upgrade -y
```

```
user@DESKTOP-D0KD7UU: ~
Setting up bind9-libs:amd64 (1:9.18.30-0ubuntu0.22.04.1) ...
Setting up libgbm1:amd64 (23.2.1-1ubuntu3.1~22.04.3) ...
Setting up libglib2.0-0:amd64 (2.72.4-0ubuntu2.4) ...
Setting up distro-info-data (0.52ubuntu0.8) ...
Setting up libpackagekit-glib2-18:amd64 (1.2.5-2ubuntu3) ...
Setting up libcurl3-gnutls:amd64 (7.81.0-1ubuntu1.20) ...
Setting up xxd (2:8.2.3995-1ubuntu2.21) ...
Setting up gir1.2-packagekitglib-1.0 (1.2.5-2ubuntu3) ...
Setting up libglib2.0-data (2.72.4-0ubuntu2.4) ...
Setting up vim-common (2:8.2.3995-1ubuntu2.21) ...
Setting up python3-twisted (22.1.0-2ubuntu2.6) ...
Setting up libpython3.10-minimal:amd64 (3.10.12-1~22.04.7) ...
Setting up libglapi-mesa:amd64 (23.2.1-1ubuntu3.1~22.04.3) ...
Setting up python3-urllib3 (1.26.5-1~exp1ubuntu0.2) ...
Setting up nano (6.2-1ubuntu0.1) ...
Setting up libcurl4:amd64 (7.81.0-1ubuntu1.20) ...
Setting up curl (7.81.0-1ubuntu1.20) ...
Setting up dmidecode (3.3-3ubuntu0.2) ...
Setting up vim-runtime (2:8.2.3995-1ubuntu2.21) ...
Setting up bind9-host (1:9.18.30-0ubuntu0.22.04.1) ...
Setting up libgstreamer1.0-0:amd64 (1.20.3-0ubuntu1.1) ...
Setcap worked! gst-ptp-helper is not suid!
Setting up libgl1-mesa-dri:amd64 (23.2.1-1ubuntu3.1~22.04.3) ...
Setting up libglib2.0-bin (2.72.4-0ubuntu2.4) ...
Setting up vim-tiny (2:8.2.3995-1ubuntu2.21) ...
Setting up python3.10-minimal (3.10.12-1~22.04.7) ...
Setting up libpython3.10-stdlib:amd64 (3.10.12-1~22.04.7) ...
Setting up libegl-mesa0:amd64 (23.2.1-1ubuntu3.1~22.04.3) ...
Setting up packagekit (1.2.5-2ubuntu3) ...
Setting up bind9-dnsutils (1:9.18.30-0ubuntu0.22.04.1) ...
Setting up packagekit-tools (1.2.5-2ubuntu3) ...
Setting up libpython3.10:amd64 (3.10.12-1~22.04.7) ...
Setting up libglx-mesa0:amd64 (23.2.1-1ubuntu3.1~22.04.3) ...
Setting up vim (2:8.2.3995-1ubuntu2.21) ...
Setting up python3.10 (3.10.12-1~22.04.7) ...
Processing triggers for libc-bin (2.35-0ubuntu3.8) ...
Processing triggers for rsyslog (8.2112.0-2ubuntu2.2) ...
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for dbus (1.12.20-2ubuntu4.1) ...
Processing triggers for install-info (6.8-4build1) ...
Processing triggers for hicolor-icon-theme (0.17-2) ...
root@DESKTOP-D0KD7UU:~# exit
logout
user@DESKTOP-D0KD7UU:~$ exit
```

X11 support

- install the x11-apps package and dependencies


```
sudo -i
apt-get install x11-apps
```

- for example:

```
root@DESKTOP-D0KD7UU: ~
user@DESKTOP-D0KD7UU:~$ which jq
user@DESKTOP-D0KD7UU:~$ sudo -i
[sudo] password for user:
root@DESKTOP-D0KD7UU:~# apt-get install jq x11-apps
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  libice6 libjq1 libonig5 libsm6 libxaw7 libxft2 libxkbfile1 libxmu6 libxpm4 libxt6 xbitmaps
Suggested packages:
  mesa-utils
The following NEW packages will be installed:
  jq libice6 libjq1 libonig5 libsm6 libxaw7 libxft2 libxkbfile1 libxmu6 libxpm4 libxt6 x11-apps xbitmaps
0 upgraded, 13 newly installed, 0 to remove and 0 not upgraded.
Need to get 1727 kB of archives.
After this operation, 5539 kB of additional disk space will be used.
Do you want to continue? [Y/n]
```


- confirm that xclock is functional


```
user@DESKTOP-D0KD7UU: ~
Preparing to unpack .../05-libxt6_1%3a1.2.1-1_amd64.deb ...
Unpacking libxt6:amd64 (1:1.2.1-1) ...
Selecting previously unselected package libxmu6:amd64.
Preparing to unpack .../06-libxmu6_2%3a1.1.3-3_amd64.deb ...
Unpacking libxmu6:amd64 (2:1.1.3-3) ...
Selecting previously unselected package libxpm4:amd64.
Preparing to unpack .../07-libxpm4_1%3a3.5.12-1ubuntu0.22.04.2_amd64.deb ...
Unpacking libxpm4:amd64 (1:3.5.12-1ubuntu0.22.04.2) ...
Selecting previously unselected package libxaw7:amd64.
Preparing to unpack .../08-libxaw7_2%3a1.0.14-1_amd64.deb ...
Unpacking libxaw7:amd64 (2:1.0.14-1) ...
Selecting previously unselected package libxft2:amd64.
Preparing to unpack .../09-libxft2_2.3.4-1_amd64.deb ...
Unpacking libxft2:amd64 (2.3.4-1) ...
Selecting previously unselected package libxkbfile1:amd64.
Preparing to unpack .../10-libxkbfile1_1%3a1.1.0-1build3_amd64.deb ...
Unpacking libxkbfile1:amd64 (1:1.1.0-1build3) ...
Selecting previously unselected package x11-apps.
Preparing to unpack .../11-x11-apps_7.7+8build2_amd64.deb ...
Unpacking x11-apps (7.7+8build2) ...
Selecting previously unselected package xbitmaps.
Preparing to unpack .../12-xbitmaps_1.1.1-2.1ubuntu1_all.deb ...
Unpacking xbitmaps (1.1.1-2.1ubuntu1) ...
Setting up libice6:amd64 (2:1.0.10-1build2) ...
Setting up libxft2:amd64 (2.3.4-1) ...
Setting up libxpm4:amd64 (1:3.5.12-1ubuntu0.22.04.2) ...
Setting up libxkbfile1:amd64 (1:1.1.0-1build3) ...
Setting up libs6:amd64 (2:1.2.3-1build2) ...
Setting up libonig5:amd64 (6.9.7.1-2build1) ...
Setting up xbitmaps (1.1.1-2.1ubuntu1) ...
Setting up libjq1:amd64 (1.6-2.1ubuntu3) ...
Setting up libxt6:amd64 (1:1.2.1-1) ...
Setting up jq (1.6-2.1ubuntu3) ...
Setting up libxmu6:amd64 (2:1.1.3-3) ...
Setting up libxaw7:amd64 (2:1.0.14-1) ...
Setting up x11-apps (7.7+8build2) ...
Processing triggers for libc-bin (2.35-0ubuntu3.8) ...
Processing triggers for man-db (2.10.2-1) ...
root@DESKTOP-D0KD7UU:~#
root@DESKTOP-D0KD7UU:~# exit
logout
user@DESKTOP-D0KD7UU:~$ xclock
Warning: Missing charsets in String to FontSet conversion
```

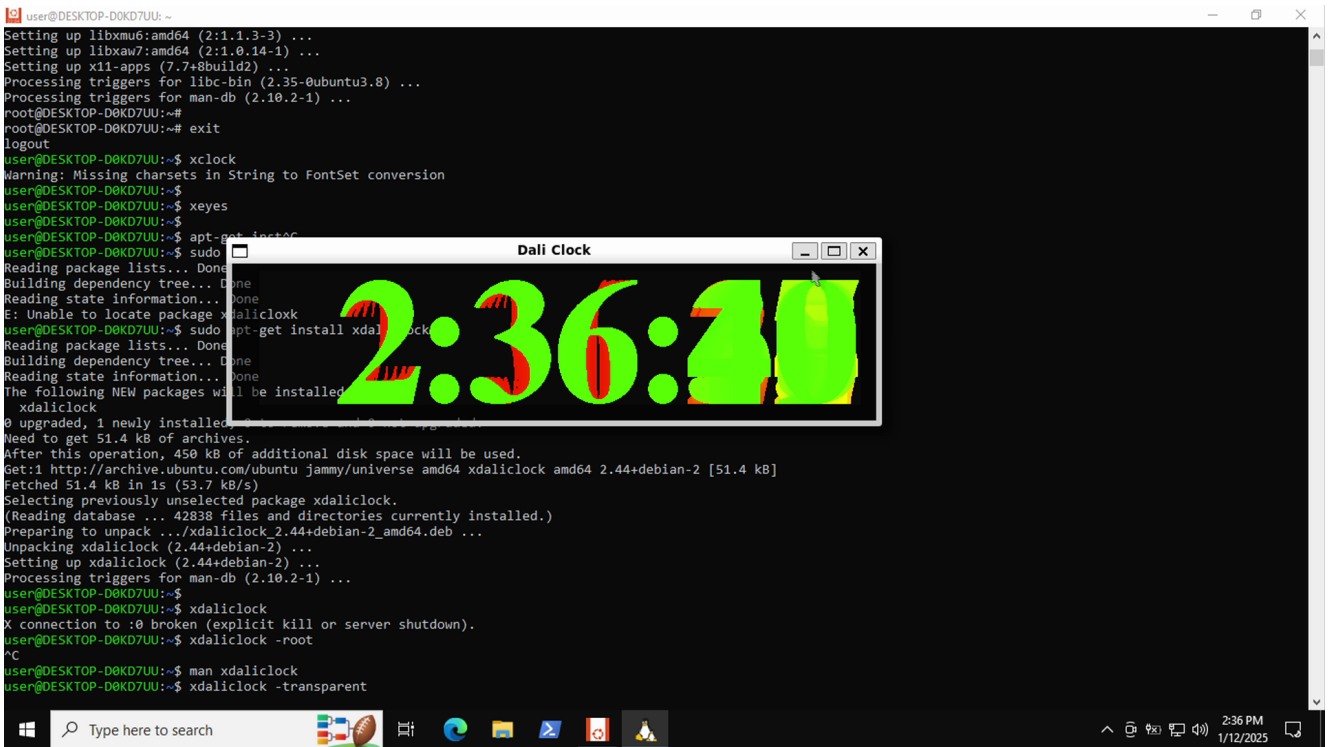
A small window titled 'xclock' showing a simple analog clock face with a black dial and white hands.

- keyes sort of works also

```
user@DESKTOP-D0KD7UU: ~
Selecting previously unselected package libxmu6:amd64.
Preparing to unpack .../06-libxmu6_2%3a1.1.3-3_amd64.deb ...
Unpacking libxmu6:amd64 (2:1.1.3-3) ...
Selecting previously unselected package libxpm4:amd64.
Preparing to unpack .../07-libxpm4_1%3a3.5.12-1ubuntu0.22.04.2_amd64.deb ...
Unpacking libxpm4:amd64 (1:3.5.12-1ubuntu0.22.04.2) ...
Selecting previously unselected package libxaw7:amd64.
Preparing to unpack .../08-libxaw7_2%3a1.0.14-1_amd64.deb ...
Unpacking libxaw7:amd64 (2:1.0.14-1) ...
Selecting previously unselected package libxft2:amd64.
Preparing to unpack .../09-libxft2_2.3.4-1_amd64.deb ...
Unpacking libxft2:amd64 (2.3.4-1) ...
Selecting previously unselected package libxkbfile1:amd64.
Preparing to unpack .../10-libxkbfile1_1%3a1.1.0-1build3_amd64.deb ...
Unpacking libxkbfile1:amd64 (1:1.1.0-1build3) ...
Selecting previously unselected package x11-apps.
Preparing to unpack .../11-x11-apps_7.7+8build2_amd64.deb ...
Unpacking x11-apps (7.7+8build2) ...
Selecting previously unselected package xbitmaps.
Preparing to unpack .../12-xbitmaps_1.1.1-2.1ubuntu1_all.deb ...
Unpacking xbitmaps (1.1.1-2.1ubuntu1) ...
Setting up libice6:amd64 (2:1.0.10-1build2) ...
Setting up libxft2:amd64 (2.3.4-1) ...
Setting up libxpm4:amd64 (1:3.5.12-1ubuntu0.22.04.2) ...
Setting up libxkbfile1:amd64 (1:1.1.0-1build3) ...
Setting up libs6:amd64 (2:1.2.3-1build2) ...
Setting up libonig5:amd64 (6.9.7.1-2build1) ...
Setting up xbitmaps (1.1.1-2.1ubuntu1) ...
Setting up libjq1:amd64 (1.6-2.1ubuntu3) ...
Setting up libxt6:amd64 (1:1.2.1-1) ...
Setting up jq (1.6-2.1ubuntu3) ...
Setting up libxmu6:amd64 (2:1.1.3-3) ...
Setting up libxaw7:amd64 (2:1.0.14-1) ...
Setting up x11-apps (7.7+8build2) ...
Processing triggers for libc-bin (2.35-0ubuntu3.8) ...
Processing triggers for man-db (2.10.2-1) ...
root@DESKTOP-D0KD7UU:~#
root@DESKTOP-D0KD7UU:~# exit
logout
user@DESKTOP-D0KD7UU:~$ xclock
Warning: Missing charsets in String to FontSet conversion
user@DESKTOP-D0KD7UU:~$
user@DESKTOP-D0KD7UU:~$ xeyes
```

A window titled 'xeyes' showing two large, white, cartoonish eyes with black pupils and eyelids, following the mouse cursor.

- xdaliclock also sort of works also



caveats

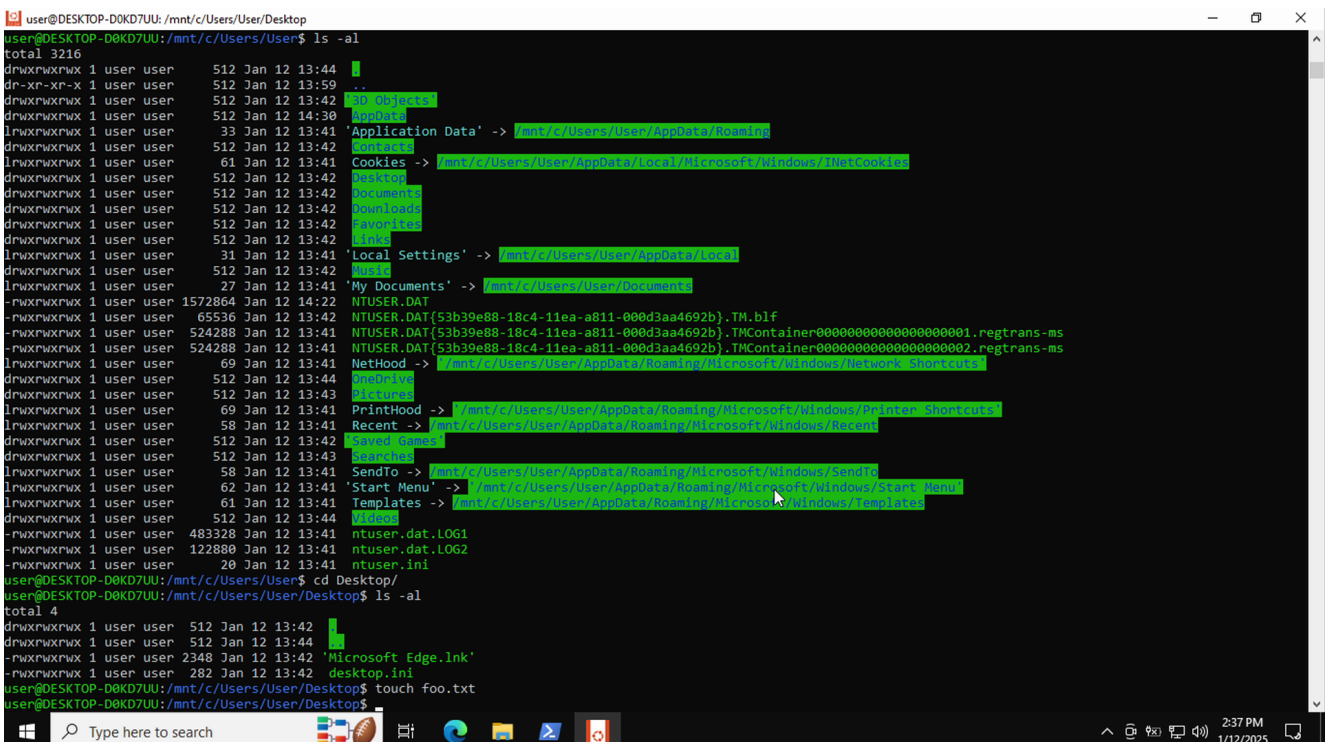
There is no apparent support for some things

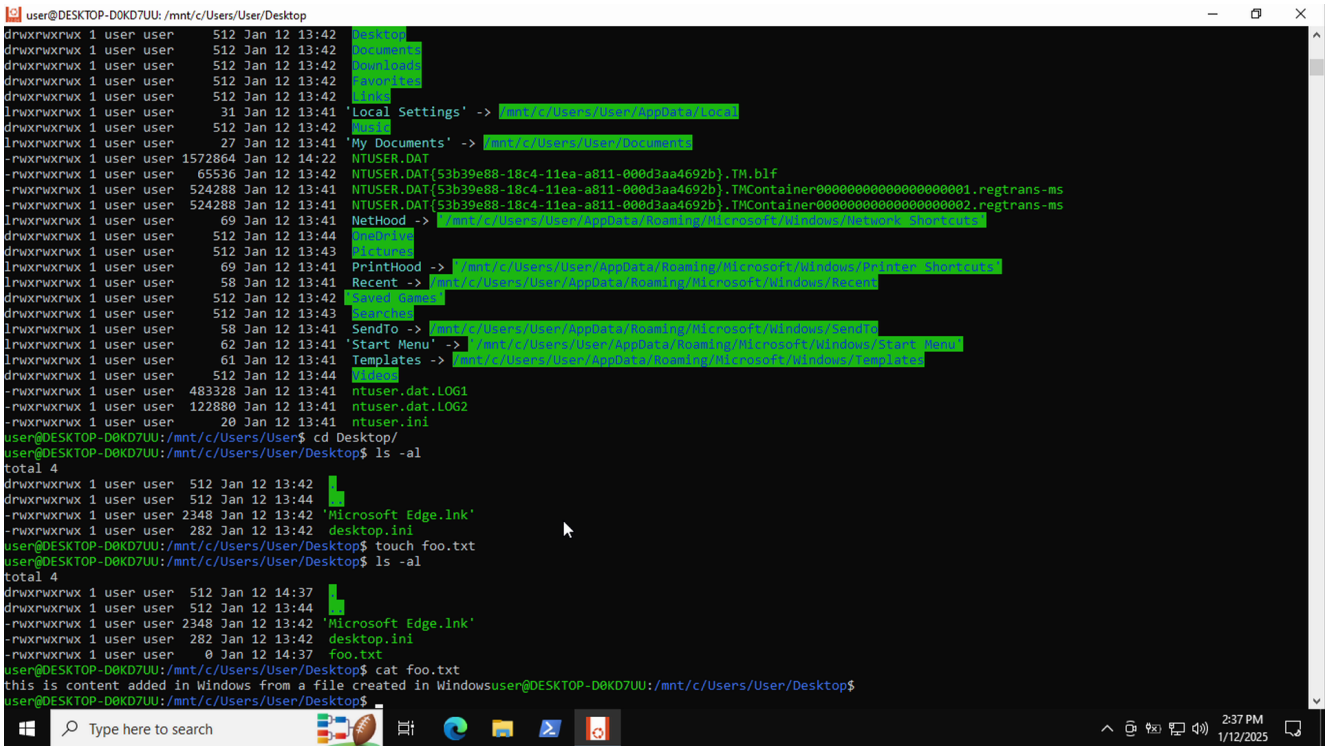
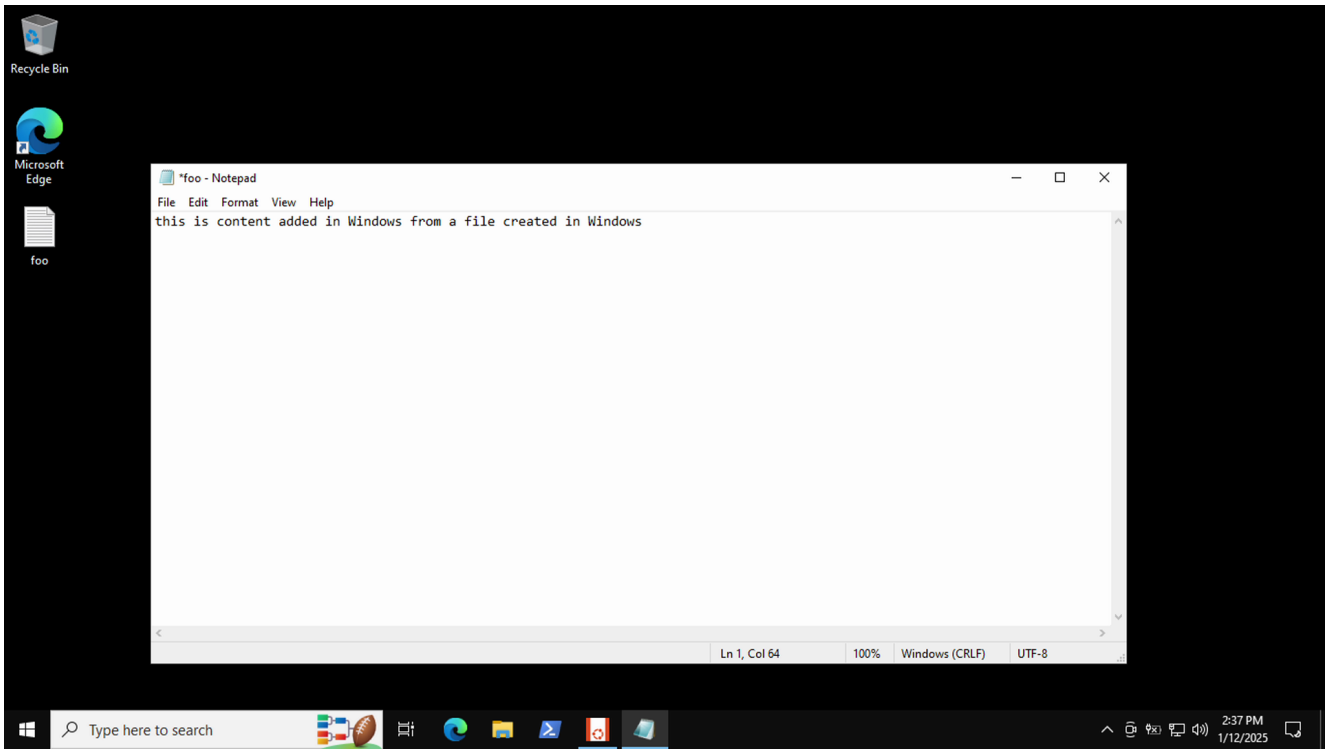
- root window, so no changing background parameters
- limited shape support, `xdaliclock` does work, but I'd not rely on it
- transparency support seems to be non-existent
- client snooping the mouse pointer outside of their own window (as per `xeyes`)

interoperability

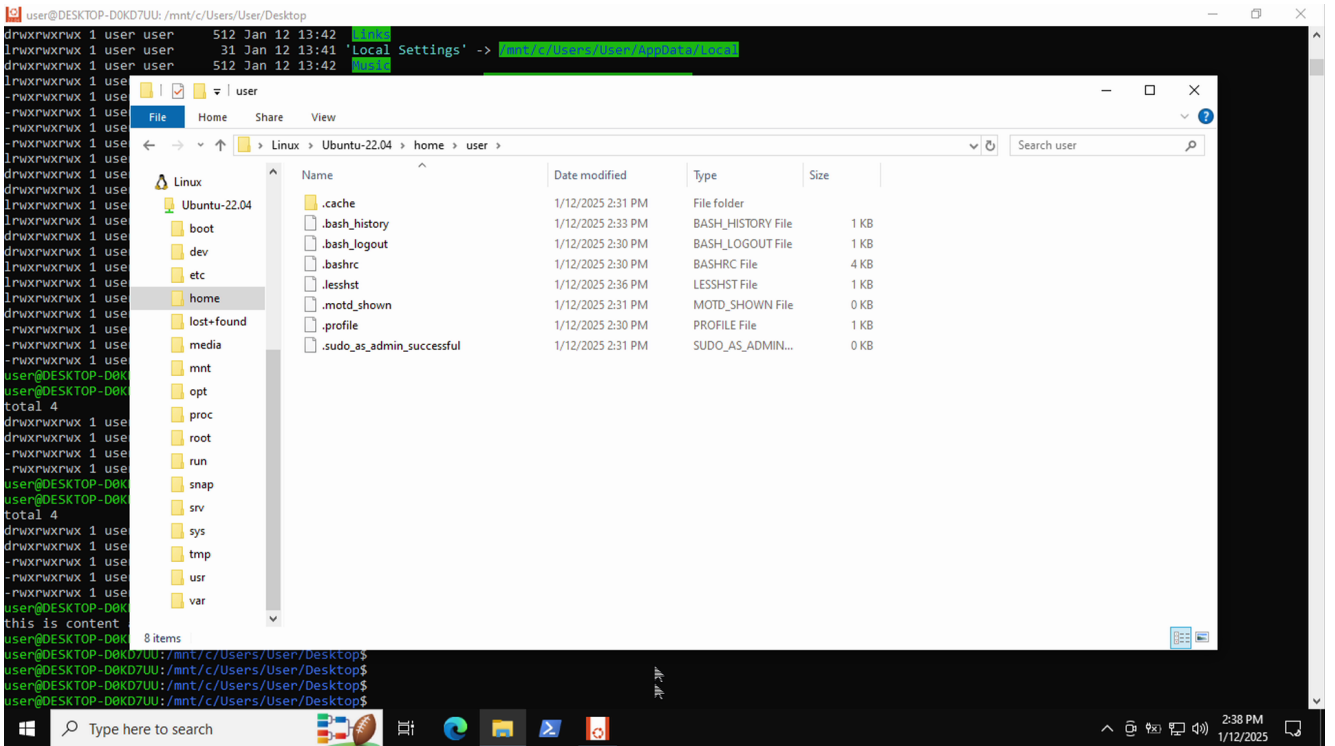
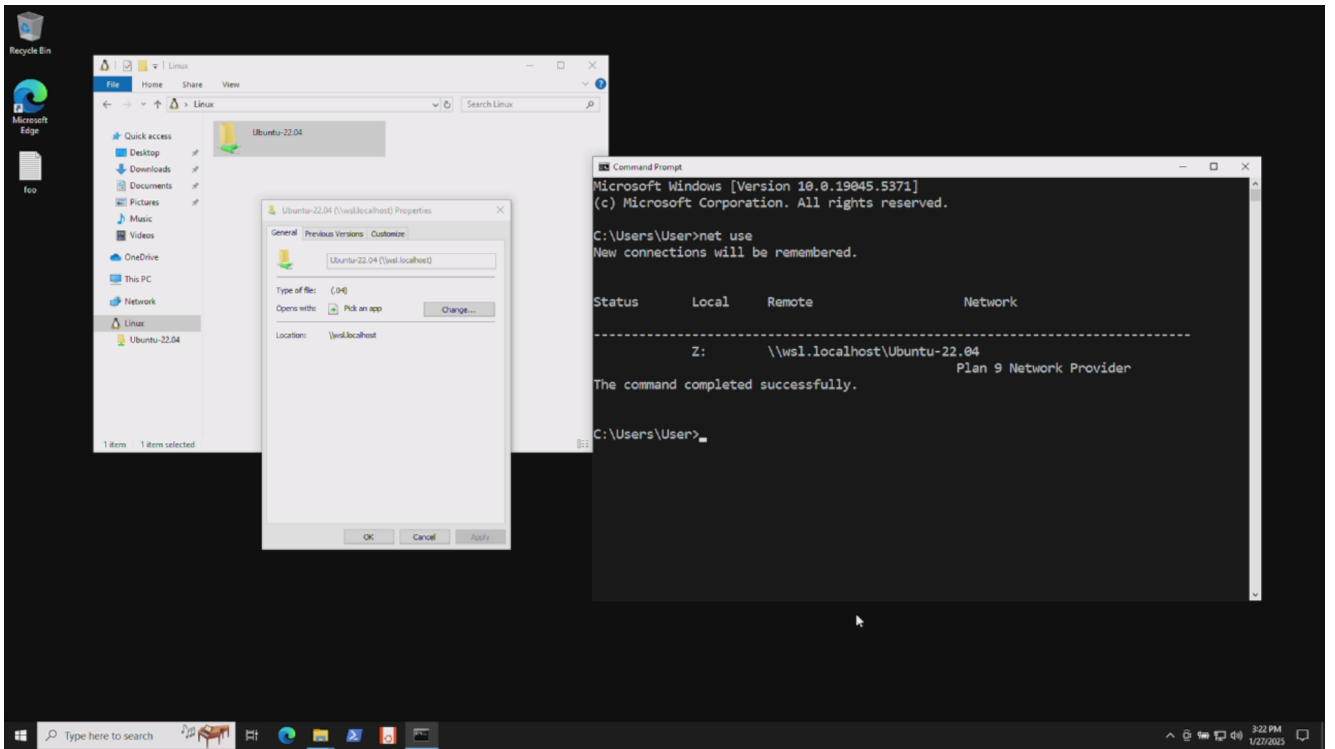
file sharing

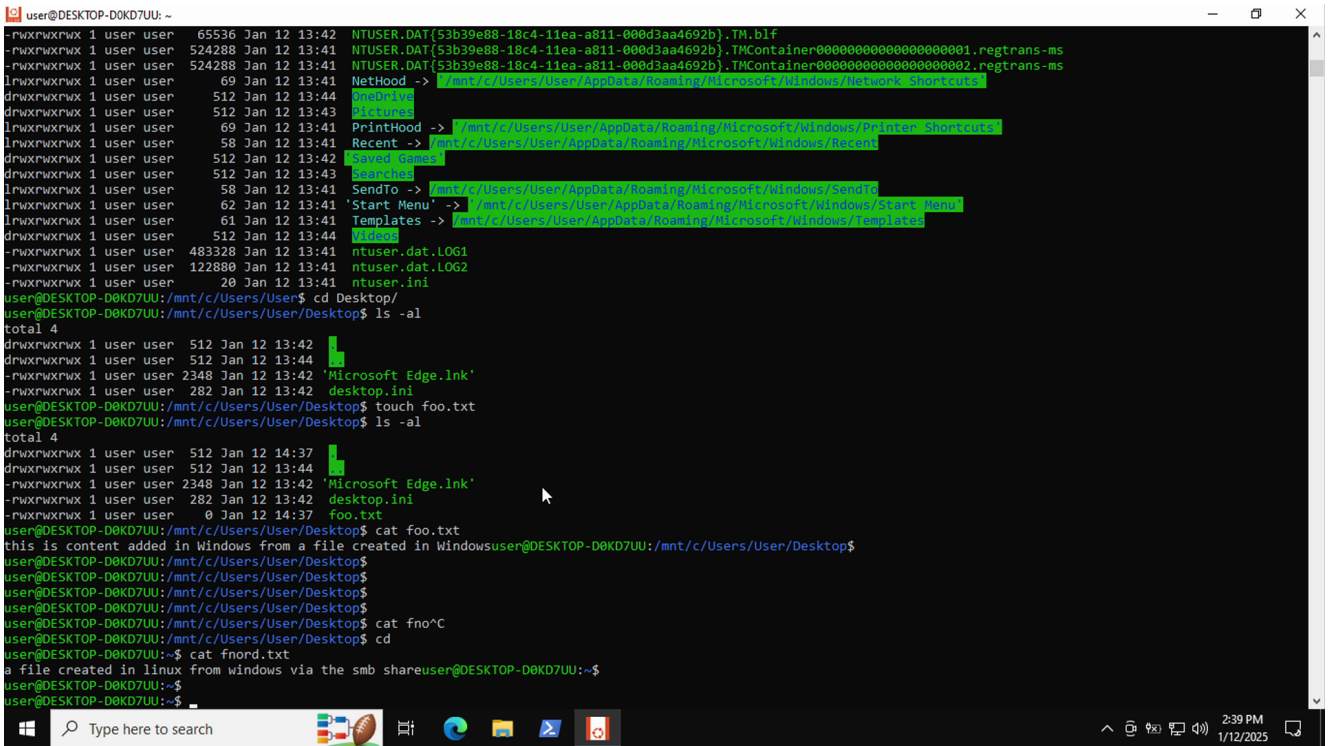
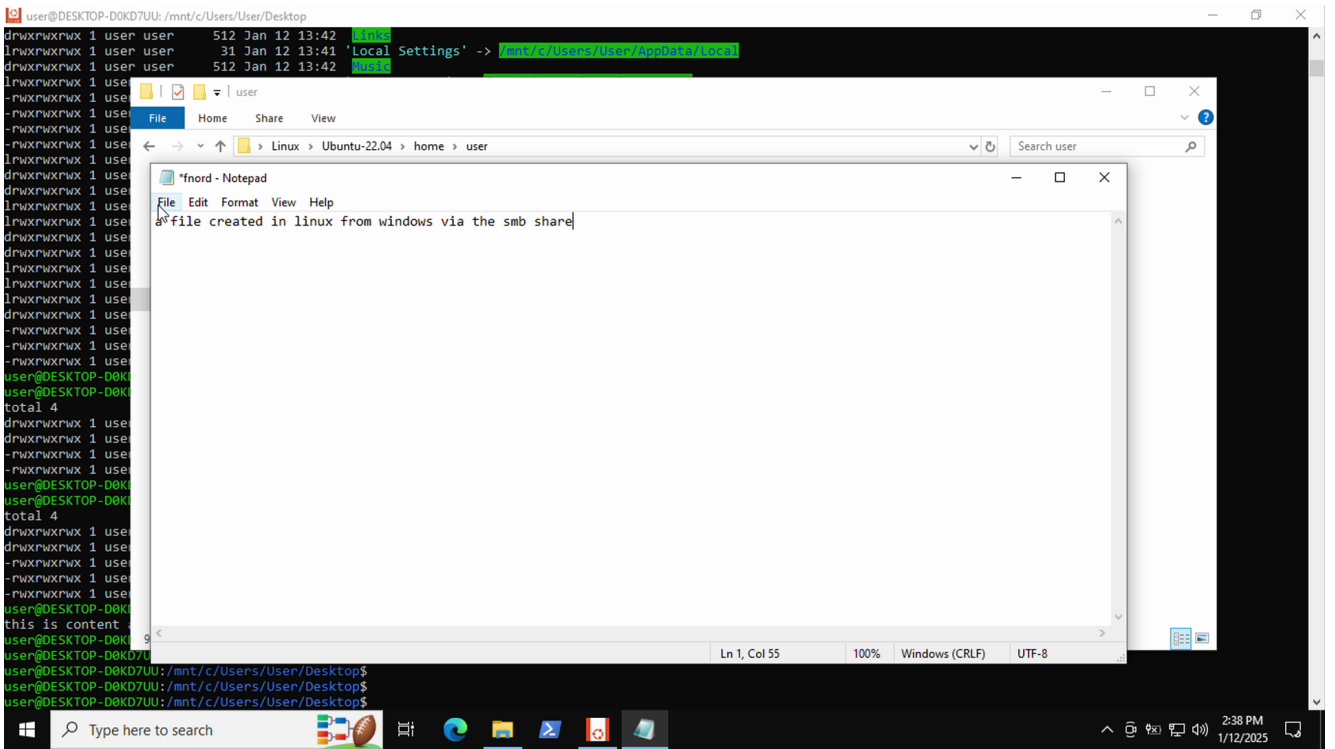
- Windows file system is available from within WSL as `/mnt/c`





- WSL file system is available via a network share `\\wsl.localhost\` as follows:





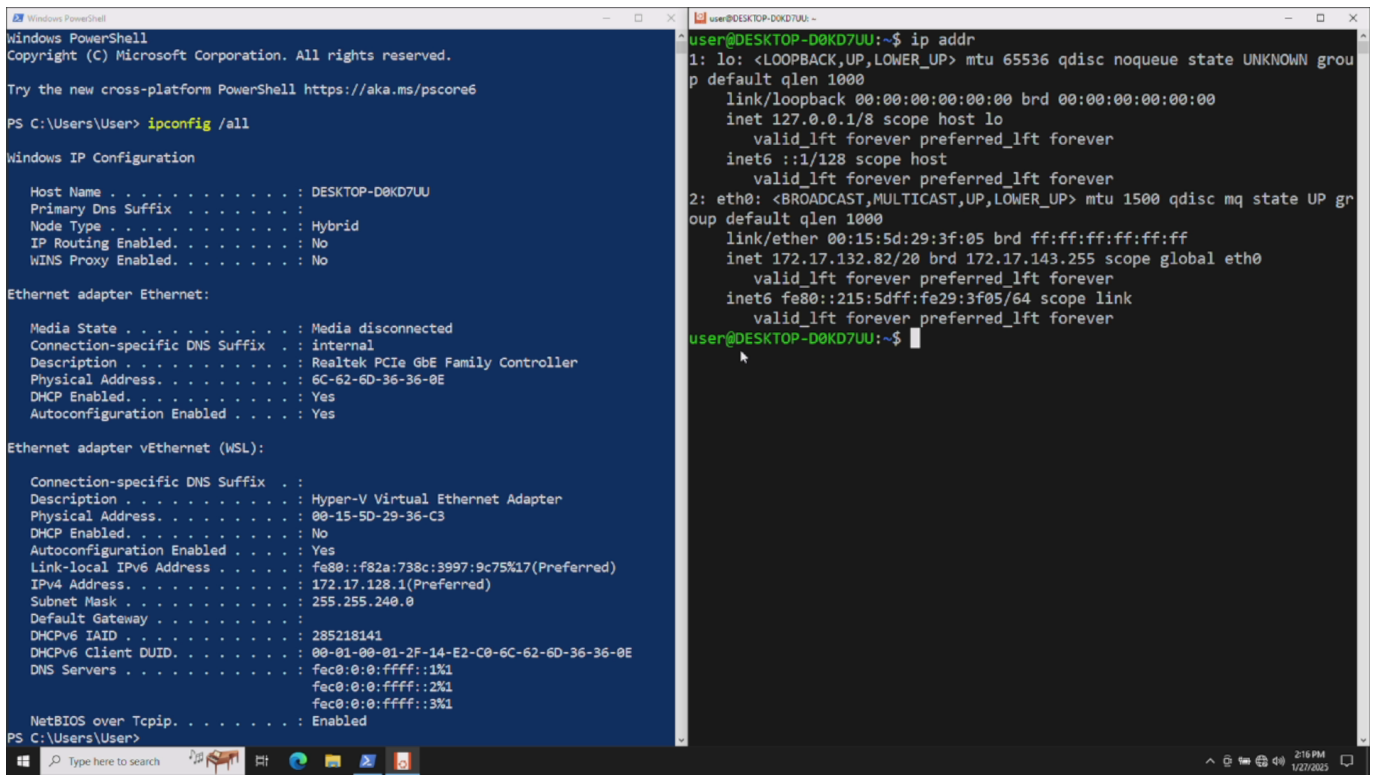
filesharing caveats

Modern Windows command-line tools output text as UTF-16 (for example, `netstat -r`) while Linux text tools tend to use UTF-8 - so you will need to use `iconv` on files generated under Windows or Linux tools such as `grep` will be unable to work with them:

```
$ iconv -f UTF-16le -t UTF-8
```

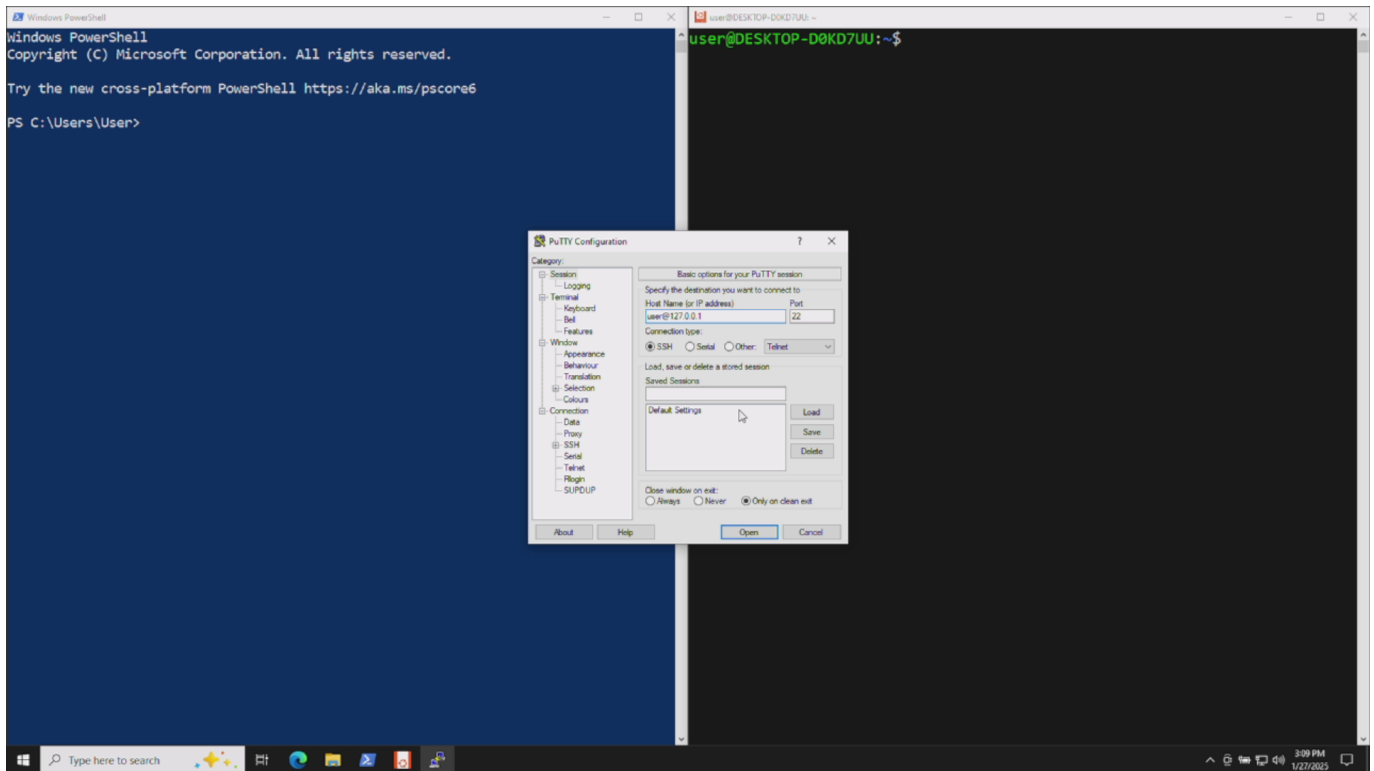
network

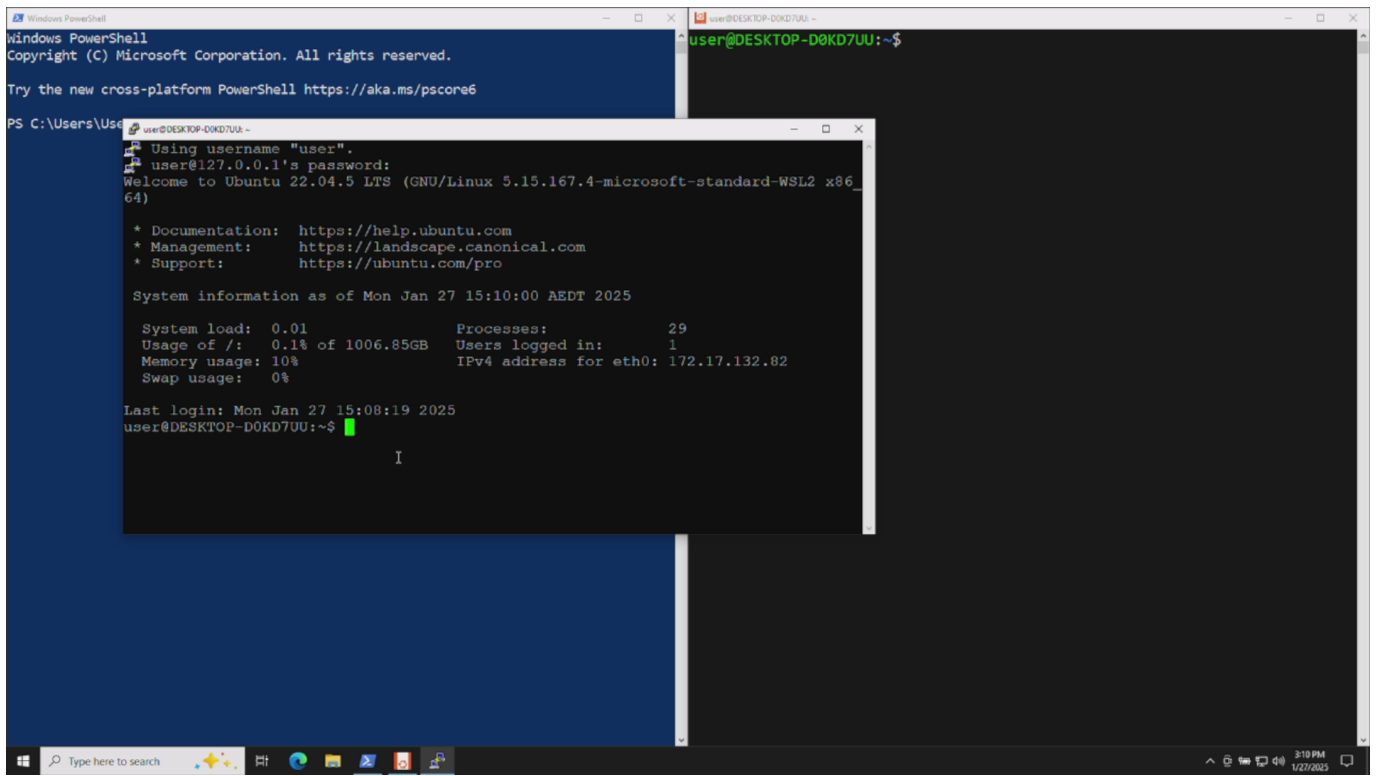
In the default configuration it seems that the WSL guest uses NAT to talk to the outside world as below:



access from Windows

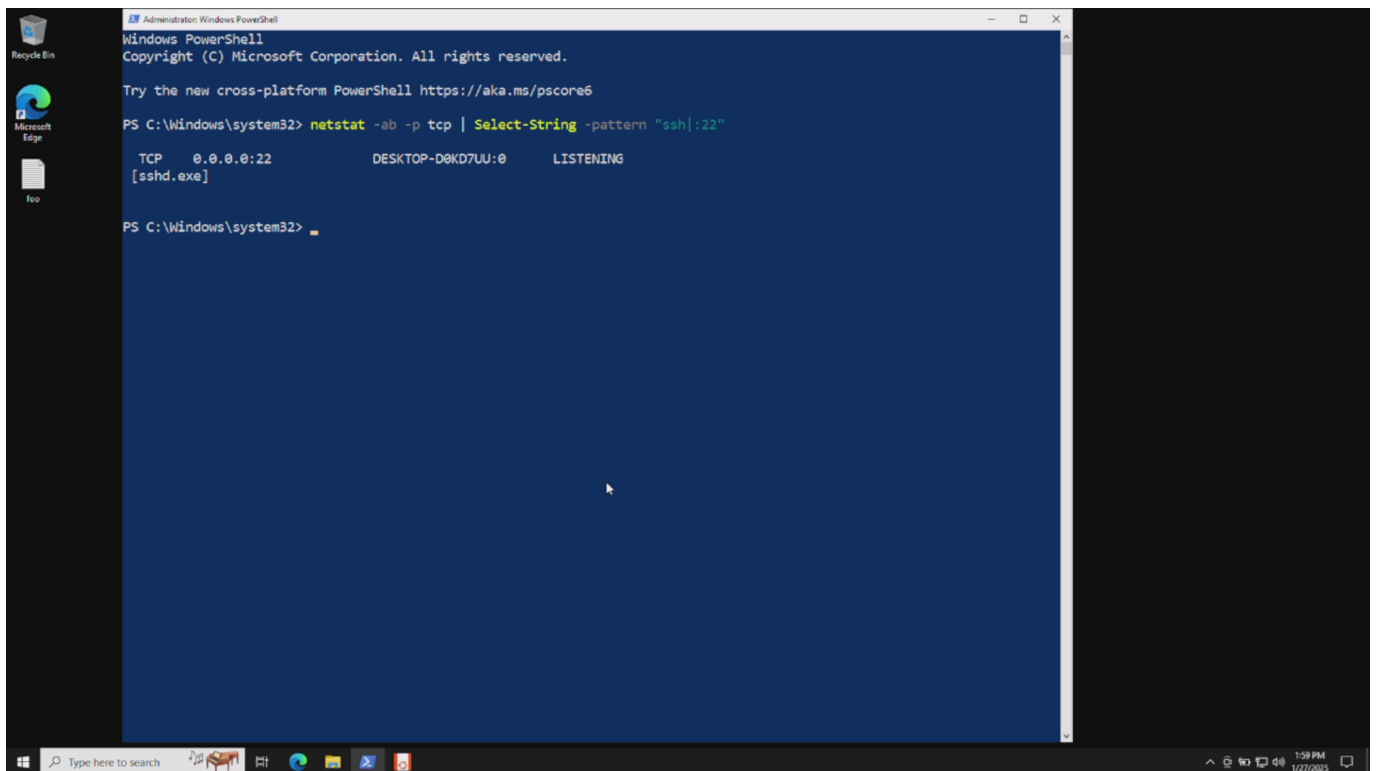
Oddly, WSL2 guest bindings to 127.0.0.1 seem to be honoured with routing to take precedence over those of the local Windows machine, because you can (for example) totally use PuTTY to talk to your Ubuntu guest directly:





external access

In the default configuration, getting at your guest from outside the Windows host can be a tad tricky due to the NAT, however this is doable when you install the Windows `openssh` server feature. This binds to `0.0.0.0:22` as below (this required admin privileges)



Once configured, you can get to your Ubuntu guest with the following

```
$ ssh -J <windows-user>@<windows-external-ip> <ubuntu-user>@<ubuntu-internal-ip>
```

For example, this is from my laptop:

```
mjch@yotta:~$ ssh -J user@172.31.4.140 user@172.17.132.82
user@172.31.4.140's password:
The authenticity of host '172.17.132.82 (<no hostip for proxy command>)' can't be established.
ED25519 key fingerprint is SHA256:H0320P4YgBHbBqFGpCPYLILQzVRXZ7pmp/VmovzPAm4.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '172.17.132.82' (ED25519) to the list of known hosts.
user@172.17.132.82's password:
Welcome to Ubuntu 22.04.5 LTS (GNU/Linux 5.15.167.4-microsoft-standard-WSL2 x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Mon Jan 27 14:19:42 AEDT 2025

System load:  0.0          Processes:            29
Usage of /:   0.1% of 1006.85GB  Users logged in:    1
Memory usage: 11%          IPv4 address for eth0: 172.17.132.82
Swap usage:   0%

Last login: Mon Jan 27 14:15:04 2025
user@DESKTOP-D0KD7UU:~$ sudo shutdown -h -P now
[sudo] password for user:
Connection to 172.17.132.82 closed by remote host.
Connection to 172.17.132.82 closed.
mjch@yotta:~$
```

networking caveats

You will probably want to secure an OpenSSH daemon running on windows as this demo assumes that we're fine with allowing password-based logins which might not be to your taste

You might not even need to do this if the Ubuntu guest can be given an actual NIC, or at least a bridged virtual NIC, but I haven't explored that.

live demo

- bwahahahah

breadcrumbs

- <https://learn.microsoft.com/en-us/windows/wsl/install>
- <https://learn.microsoft.com/en-us/windows/wsl/install-manual>
- https://learn.microsoft.com/en-us/windows-server/administration/openssh/openssh_install_firstuse