# Improving Business IT Resilience Using Virtual Machines

## Better Use Of Hardware plus Resilience

Typical modern computers can run multiple VMs, and distributing the overall processing load over more than one VM is a common use of the technology.

It's simple to maintain (on another machine) a 'warm spare' of each active VM, which can quickly take over in the event of an active VM outage. We have a document which explains how to do it.

Moving a VM to another computer involves just copying a set of files to it.

## What A Virtual Machine Is

A Virtual Machine is comprised of emulated computer hardware which is provided by Hypervisor software running on a physical computer.

The scheme is made possible by software being unable tell directly what hardware it's running on. It has to discover it by sending queries to a variety of destinations and evaluating the responses. For software running on a VM the Hypervisor sees all the queries and responds appropriately.

Software uses a particular hardware device by reading from, or writing data to, memory addresses associated with the device.  For software running on a VM the Hypervisor sees all such reads and writes and responds as the actual hardware device would.

## The Hypervisor

Hypervisor software is installed on the actual computer hardware. When creating a VM you specify such things as how much disk storage you want, how many CPU cores to use, how to do networking, etc.  Which results in a configuration file, plus a VHD (Virtual Hard Disk) file for each storage device.

When a hypervisor boots a VM it uses the configuration file details to set up the hardware emulation appropriately.  Operating systems and application software get installed and run on a VM the same way as on actual hardware.

## Suitable Hardware and Recommended Hypervisor

A computer with a recent Intel or AMD CPU that has mutiple cores plus hardware virtualisation, at least 16GB RAM, at least one GigaBit Ethernet port, and a suitable amount of disk storage.  Typically the machine is run headless (no display, keyboard, or mouse).

We strongly recommend using the hypervisor setup that we use : AlmaLinux or Rocky Linux 9 (minimal) plus VirtualBox 7 - and with SELinux running in Enforcing mode.

For safety the hypervisor **must not** be based on MS Windows, because of the serious risk of VM files getting attacked by some of the vast amount of Windows-targetted malware.

## A Real World Example of Resilience

We have a VM that runs all our Internet servers - web, email, messaging and VPNs. The disruptions caused by the Christchurch NZ earthquakes forced us change to using third-party hosting of it.  In August 2022, for safety and reliability reasons, we progressively returned operations to a VM running on our own hardware. Initially we used a relatively old spare machine, which was more than adequate.

In mid-October 2022 we found that PB Tech were offering an 'upgrade box' (with no OS), which was a very suitable upgrade. We bought one and set up a hypervisor as above and got it running the VM.

About 5 weeks later we were alerted to a serious problem with its SSD. Within a few minutes we had switched Internet operations to the warm spare VM running on the old machine. Then, with pressure reduced, we tackled the recovering of as much data as possible from the SSD, in particular so that we could fill in the small data gap between the primary and warm spare VMs. Thanks to the ddrescue software we lost just 3 totally unimportant small files.

## Our Motivation For Producing This

We want businesses to achieve better outcomes, regardless of whether we're directly involved in making them happen. Such outcomes can produce effects that benefit many, including ourselves.

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