

Running FreeBSD Azure

By Sepherosa Ziehau

On June 8, 2016, a standard FreeBSD 10.3 image was published into the Azure Marketplace. Microsoft published the image working as part of the FreeBSD community and in collaboration with the FreeBSD Foundation. This was a milestone representing the culmination of several years of Microsoft collaboration with the FreeBSD community. FreeBSD is leveraged as the base OS for a number of virtual appliances running in Azure, and so Microsoft has a natural interest in making sure it runs well.

How It Began

Microsoft's interest in FreeBSD started with feedback from customers and partners. Customers want to run a wide variety of operating systems, including Windows, Linux, and FreeBSD, both in on-premises environments and in the Azure public cloud. Partners have quite a lot of FreeBSD-based virtual appliances, so, of course, Microsoft wants its partners' products to run well on Hyper-V and in Azure in order to

give Microsoft's customers a full range of choices. To provide this variety of operating systems, Microsoft contributes to the relevant open-source communities. Specifically, for FreeBSD, Microsoft has developers working on the code to make sure that FreeBSD runs great on Hyper-V and in Azure.

When It Began

The initial work on FreeBSD for Hyper-V/Azure was the result of collaboration between Microsoft, NetApp, and Citrix Systems. By the end of 2011, Microsoft teamed up with NetApp and Citrix Systems to bring the "enlightened" Hyper-V device drivers to FreeBSD. Though there were challenges due to the differences between Microsoft's coding style and FreeBSD's style(9), and challenges in hooking up the device drivers to FreeBSD's device(9), this collaboration was quite successful: all of the major "enlightened" Hyper-V device drivers, i.e., bus driver, storage driver, and network driver, started to work in FreeBSD on Hyper-V/Azure. It also led to a joint presentation of FreeBSD on Hyper-V/Azure at

BSDCan 2012: <http://www.bsdcn.org/2012/schedule/events/287.en.html>. After the initial work on these “enlightened” device drivers, Microsoft developers made additional progress, and in 2013, the drivers were imported into the main FreeBSD source code tree.

Keep the Ball Rolling

Microsoft saw increasing market demand for FreeBSD on Hyper-V/Azure, and requirements to make the FreeBSD on Hyper-V/Azure performant and feature-rich to the same degree as Windows and Linux. So in the middle of 2014, Microsoft formed a team in Shanghai to focus on FreeBSD on Hyper-V/Azure. Since most of the developers came with a Linux background, they took some time to familiarize themselves with the FreeBSD on Hyper-V/Azure code before getting their hands dirty with further development. And with help from FreeBSD’s Xin Li (delphij@), various drivers for Hyper-V/Azure utilities—e.g., shutdown and KVP (key-value-pair)—were imported into the FreeBSD source code tree.

The First Monument for FreeBSD on Hyper-V/Azure

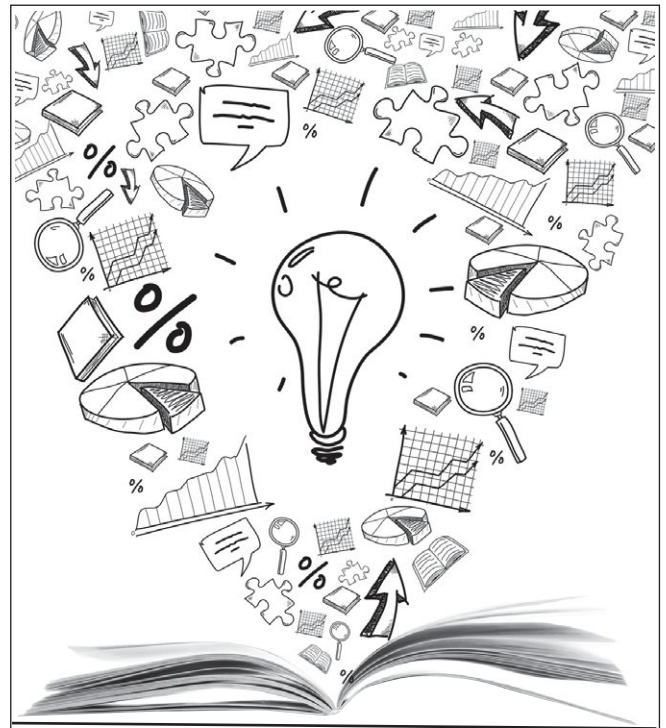
At the Microsoft TechEd 2014 conference (it is now called Microsoft Ignite), for the first time, FreeBSD on Hyper-V was formally mentioned by Microsoft in the Virtualizing Linux and FreeBSD Workloads on the Next Release of Windows Server Hyper-V talk. At that time, several FreeBSD images had already been imported into Azure’s VM Depot by FreeBSD’s Glen Barber (gjb@).

The Whirling Wheel

At the end of 2014, Microsoft teamed up with NetApp again to improve the “enlightened” storage device performance on FreeBSD. The result of this collaboration was quite exciting, producing impressive gains in storage device performance. This code was contributed to the FreeBSD source-code tree without any reservations in early 2015.

The Steep Learning Curve, and We Came, We Saw, We Conquered

After concluding the previous stage of storage device improvement, Microsoft decided to improve the performance of the “enlightened” network device driver. The development of checksum offloading and TCP segmentation offloading progressed smoothly. However, as mentioned before,



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most developers on the team came with a Linux background, and they had a hard time with the steep learning curve for the interaction between the FreeBSD network stack and the “enlightened” network device driver. That uphill battle lasted for more than half a year. More and more developers joined the combat. After the “enlightened” network device driver went through a series of serious surgeries, FreeBSD VMs could finally drive full line rate on a 10-Gbps physical network, and drive pretty decent performance on 40-Gbps physical network. The development team recorded this journey of “exit out of the rabbit hole” in a presentation at BSDCan 2016: <http://www.bsdcan.org/2016/schedule/events/681.en.html>.

The Second Monument for FreeBSD on Hyper-V/Azure

At BSDCan 2016, Microsoft announced the availability of FreeBSD 10.3 globally in the Azure Marketplace, along with many FreeBSD-based Azure virtual appliances, e.g., Citrix Systems’ Netscaler and Netgate’s pfSense.

We Are Moving On

More development for FreeBSD on Hyper-V/Azure is in the works, including, but not limited to, further improving the performance of “enlightened” storage device driver SR-IOV and many others. Microsoft also continues to help FreeBSD-based Azure virtual appliance vendors and Hyper-V users make their products run performant and stably. ●

SEIPHEROSA ZIEHAU has been a FreeBSD src committer since 2007. He helped Microsoft on their Hyper-V FreeBSD development early this year, and later joined Microsoft to keep the Hyper-V FreeBSD development moving.



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