Deployment Considerations for Running iFIX on a Virtual Machine

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Introduction to Virtualized Environments for iFIX

As part of our development testing and qualification, we make extensive use of virtualized environments. GE Digital products do not target any specific hardware or virtualized platform. GE Digital will support the functional operation of the product that is running on a supported operating system in a virtualized environment and will address any functional issues related to the software.

Each virtual machine (VM) instance that uses our software is required to have a valid license. Licensing in a virtualized environment will depend on access to a hardware key or a license server, depending on the selected license type.

GE Digital cannot guarantee performance of its software in a virtualized environment due to the wide range of parameters associated to the hardware, configuration, memory settings, third-party software, and the number of virtual sessions running on the same hardware, all of which can affect performance.

It is the responsibility of you, the customer, to ensure that the performance of the GE HMI/SCADA software and application are adequate to meet the needs of your runtime environment. GE does not support issues related to functionality that is not available as a result of running in a virtual machine. Examples include the functionality of card level drivers such as Genius, RMX, SA85 and functions requiring direct video access, or functionality of other software running in the same environment. It is your responsibility to check with the vendor of those applications for their ability to run in a virtualized environment.

Virtual Machine Guidelines for iFIX

The following are the recommended VM settings[1].

Setting	SCADA Server	iClient
Processors/CPUs	Intel® Core™ i5 3.0 GHz or equivalent	Intel® Core™ i5 3.0 GHz or equivalent
RAM	8 GB	4 GB
Hard disk/disk space	40 GB Note: iFIX alarm and historical data files grow dynamically. If you plan to perform extensive alarm or data collection on a node, you may need more disk space on that particular node. It is strongly recommended there be additional free space on the hard drive to avoid performance issues.	20 GB

For additional information on iFIX System Requirements, please see System Requirements for iFIX 6.5.

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Troubleshooting VM Setups for iFIX

To help with virtual machine (VM) troubleshooting, be prepared to provide the following VM settings to GE Digital support staff:

- CPU resources assigned
- Memory resources assigned
- Disk size and configuration
- Current disk space utilized on the VM

The above should be checked against recommended specifications for the product. If the current disk space utilized on the VM is approaching 90%, consider increasing the amount of available disk space.

After verifying that the VM is properly configured, check the performance of the VM. To do this select (using VMWare for example): VM > Monitor Tab > Performance > Overview and examine the resulting graphs.
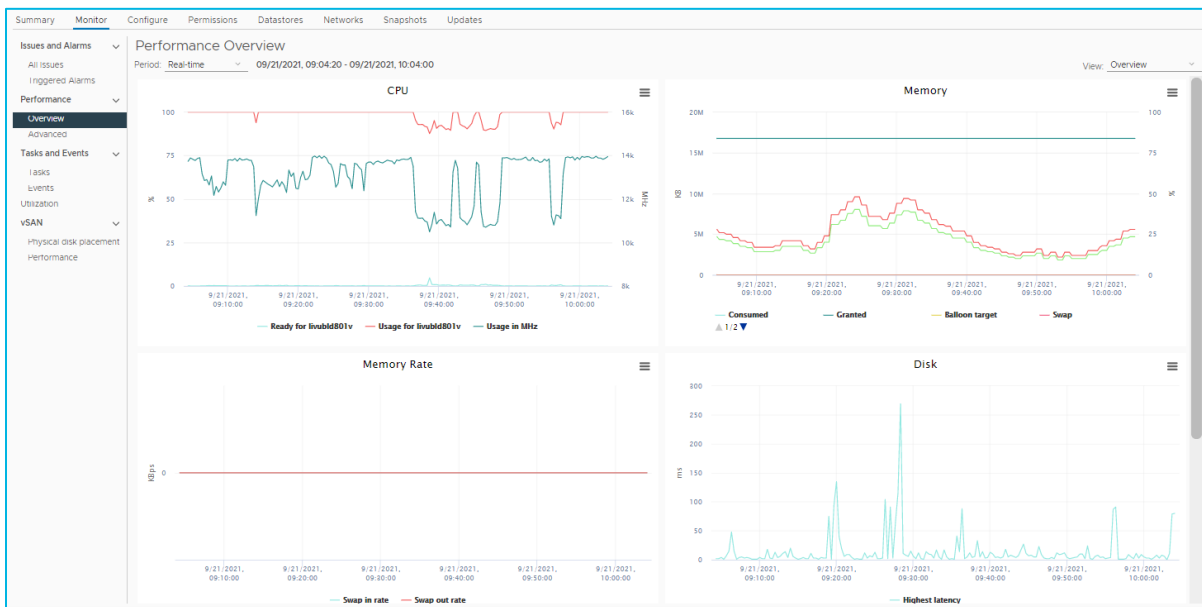

Figure 1: VM Performance Overview Graph (from VMWare)

Pay particular attention to:

- CPU usage (red line in the example) being consistently at 100%. This indicates that the VM may be undersized for the workload or that another process is consuming resources.
- Memory usage (green line) being at 100%.
- Disk highest latency (teal line) being very high for long durations. "Very high" will depend on your infrastructure and may require your infrastructure team to verify.

The final step in checking performance is to check the "CPU Ready Time" by selecting (using VMWare for example): VM > Monitor Tab > Performance > Advanced > Select View "CPU Ready". This is a measurement of how long the VM must wait before it can execute the work it needs to. High CPU

Ready time, when compared to other VMs on the same host, would suggest the host is overloaded. There is no "cutoff" value for poor performance, but it can be used to baseline against a known good system.

Below is an example of CPU ready where there is a spike in CPU ready, but it is not consistently high.
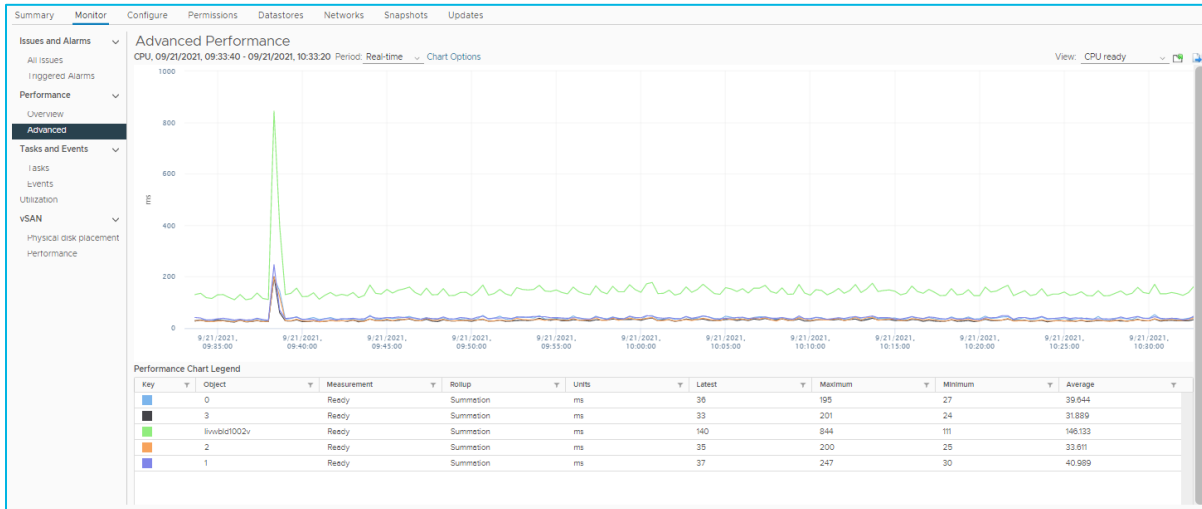

Figure 2: CPU Ready with intermittent spike

VM Processor Scheduling for iFIX

Using VMWare as the example, the virtualization layer schedules the virtual processors in the image against physical processors. All processors need to run at the same time.

For example, if four processors are required (based on the setting) and there are only two available, it will wait until four are available.

As illustrated below, a VM requiring four CPUs would get only three time slices (shown in green) on the CPUs. The VM requiring two CPUs would get eight time slices. This shows how configuring fewer CPUs (e.g., two) can be more efficient than having more CPUs (e.g., four).
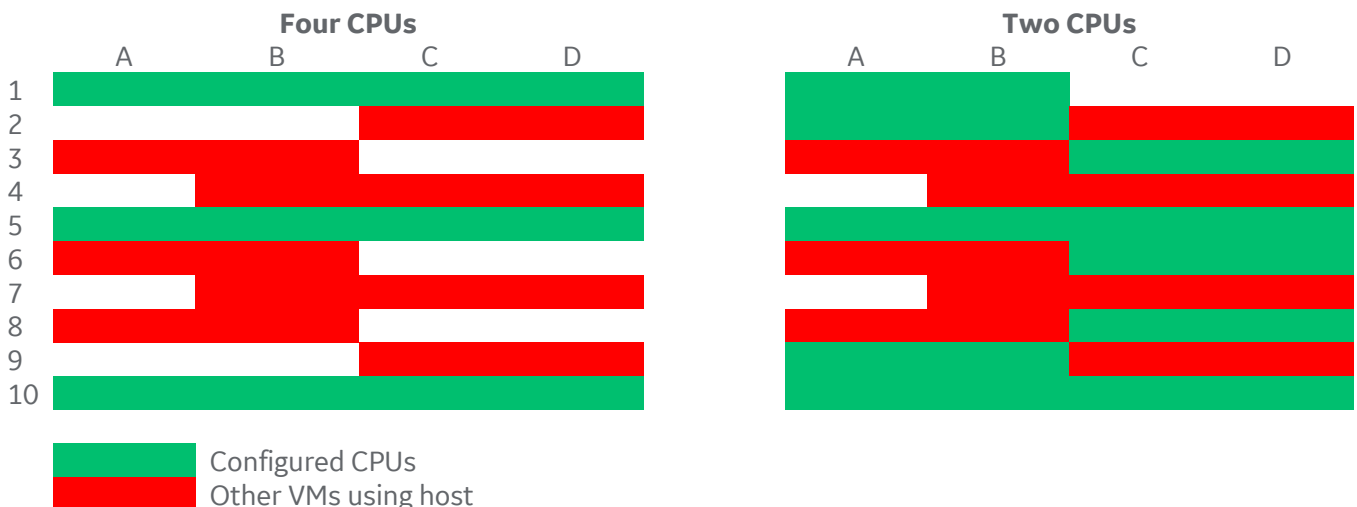
Enhancing VMWare Performance with iFIX

Additional considerations when investigating your virtual environment.

- **Shares**: VMware has the concept of "shares" to help prioritize workloads. For occasional use, these can be helpful to make sure a workload runs correctly, however these should not be used, as running everything with high priority makes them all equal. The same applies if you have a large number of VMs with high shares and a VM is normal; it will be last to be scheduled, which could impact performance.
- **Reservation**: VMware can "reserve" CPU time for a VM. As with "shares", a VM could be slow if too many other VMs have shares on the same host as the VM with the product on it.
- **CPU Limits**: VMware can limit the amount of CPU time for a VM. If a limit is set, it could mean the VM needs more resources, but cannot get them.
- **Compatibility**: Ensure your virtualization software is up to date on all systems. Images with different compatibility may behave differently on other host systems (depending on the VM application installed on that host).