oVirt

High Availability with No Split Brains!

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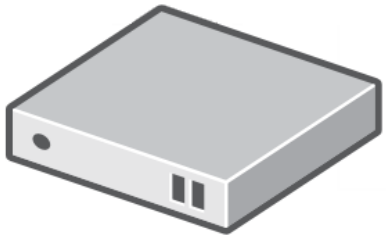
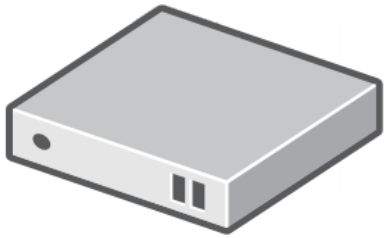
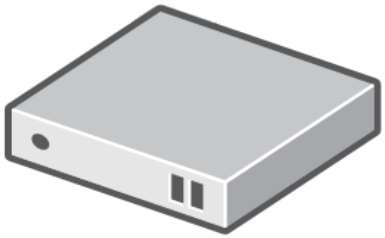
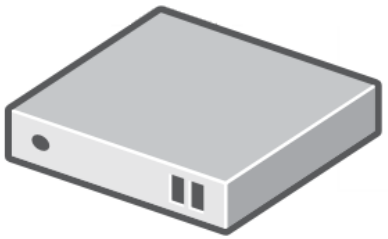
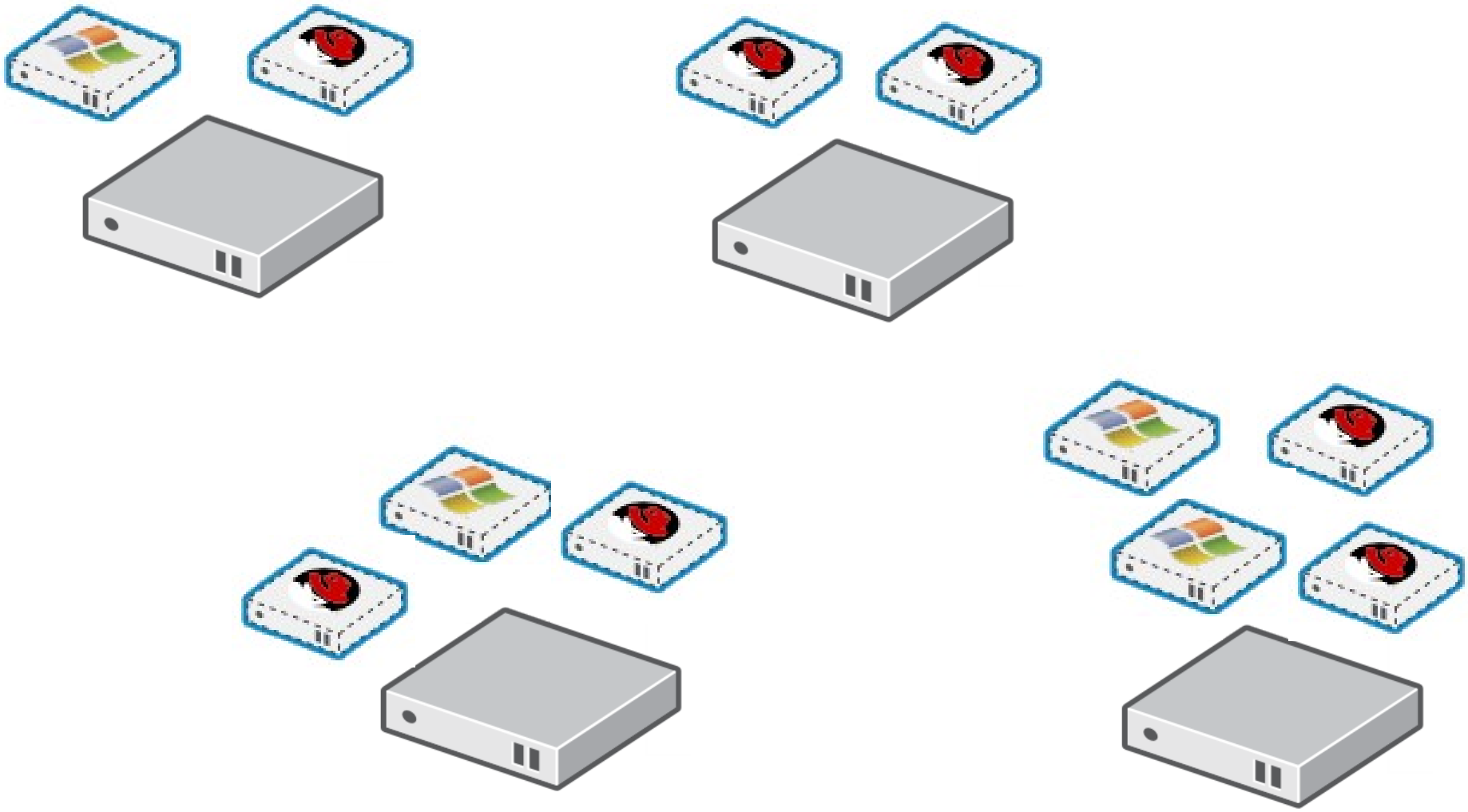
Principal Software Engineer
Red Hat
27/01/2018

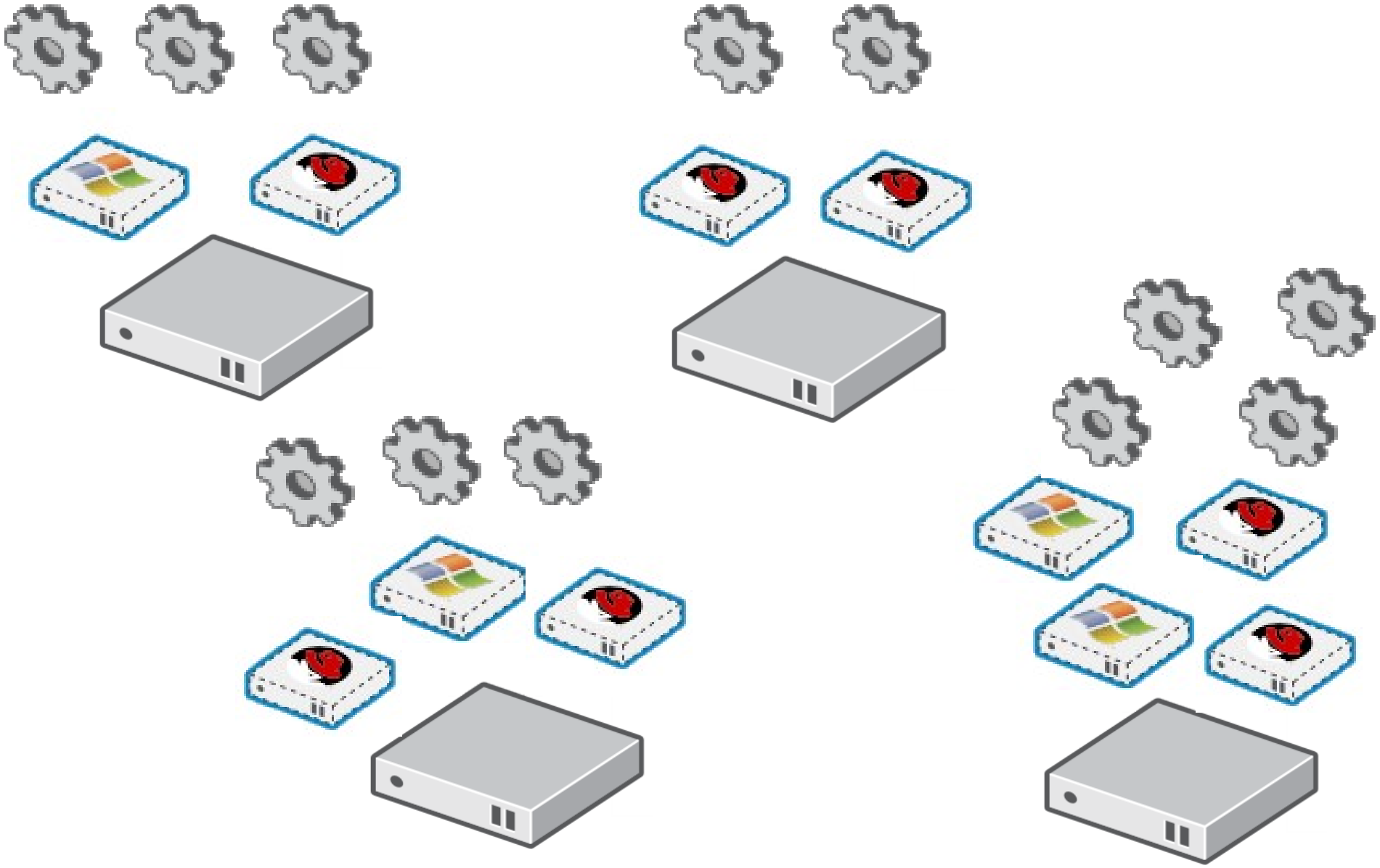
oVirt Virtual Data Center – Physical Servers

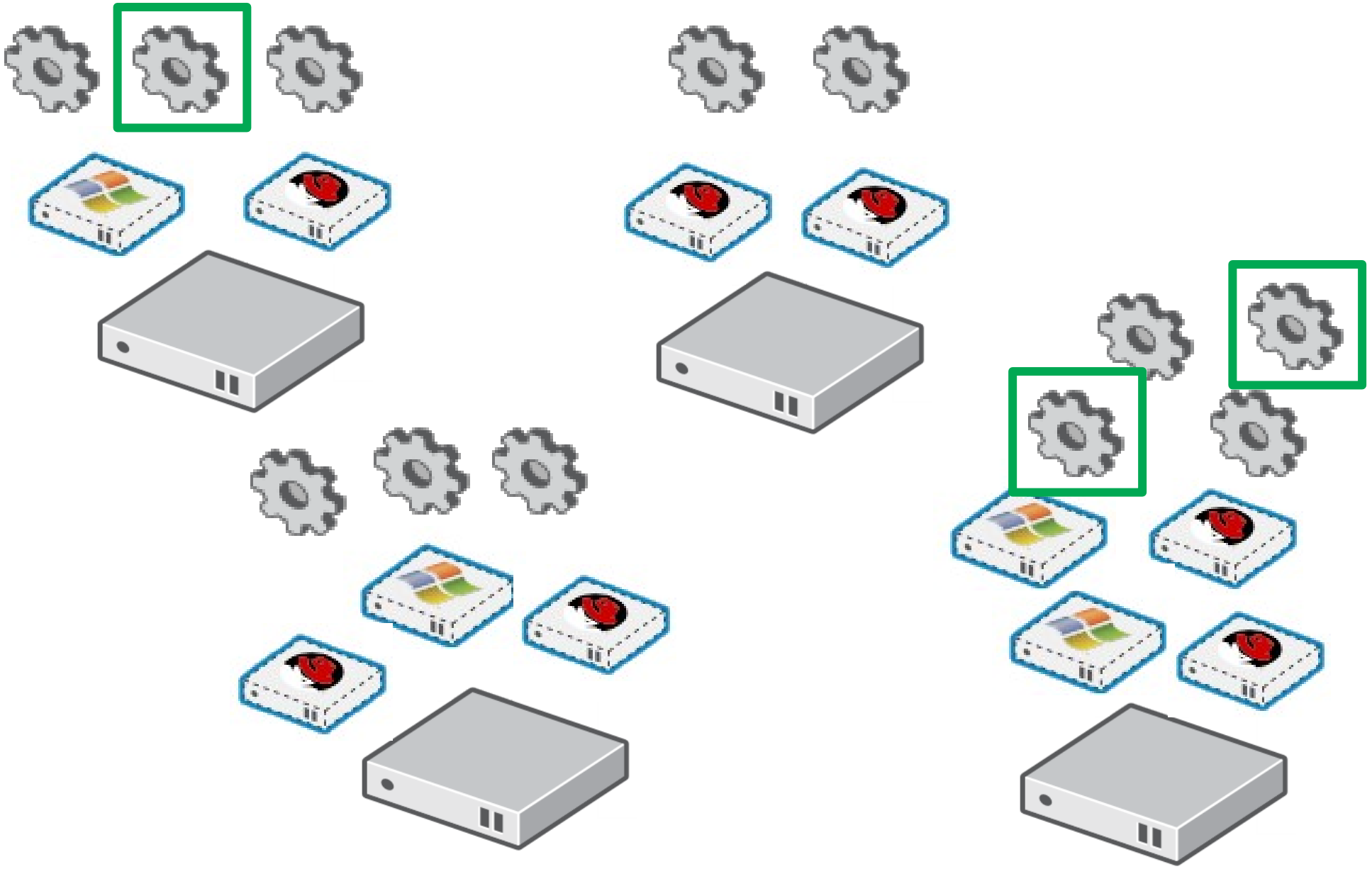
oVirt Virtual Data Center – Virtual Machines



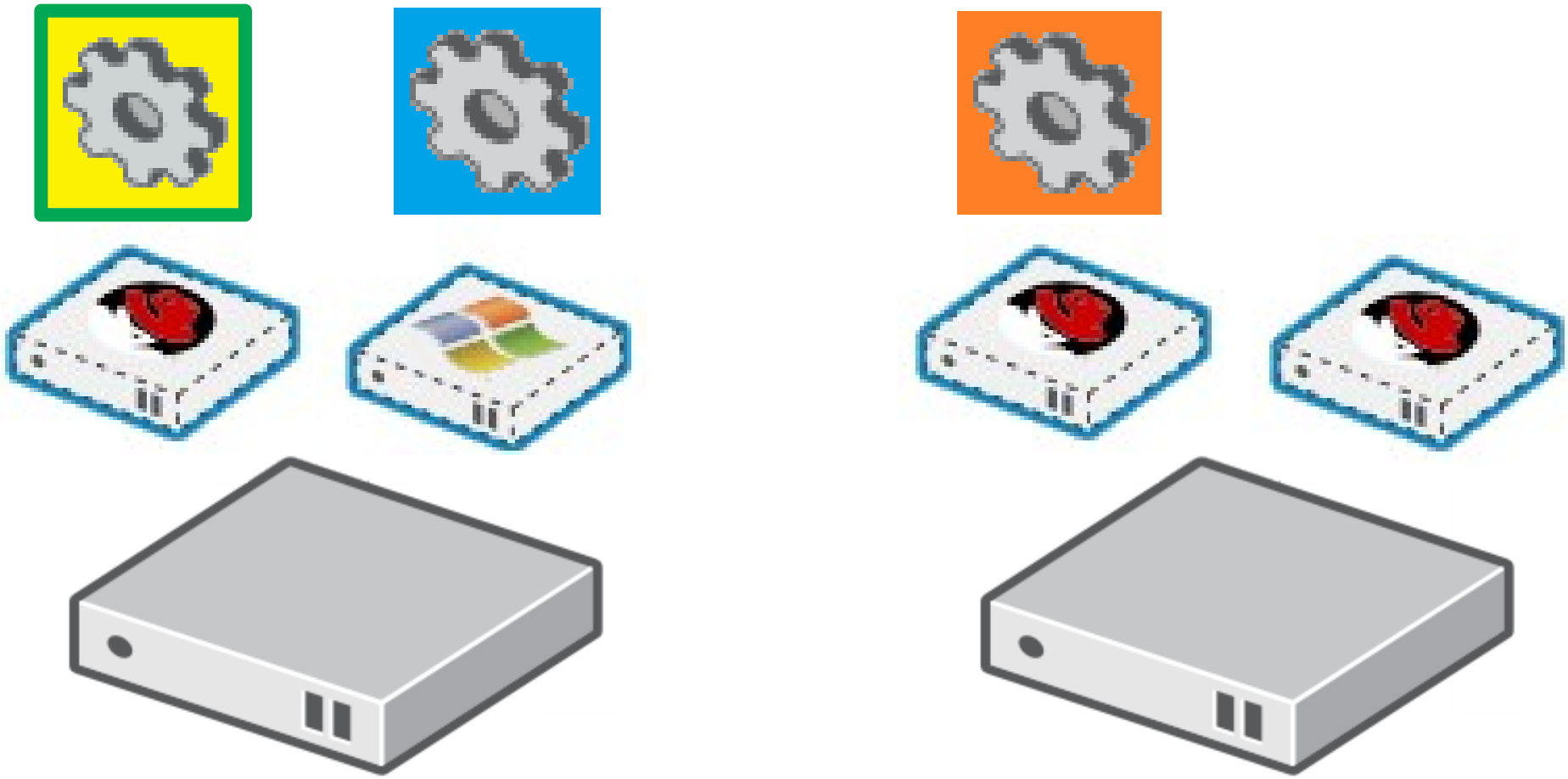
Virtual Data Center - Applications



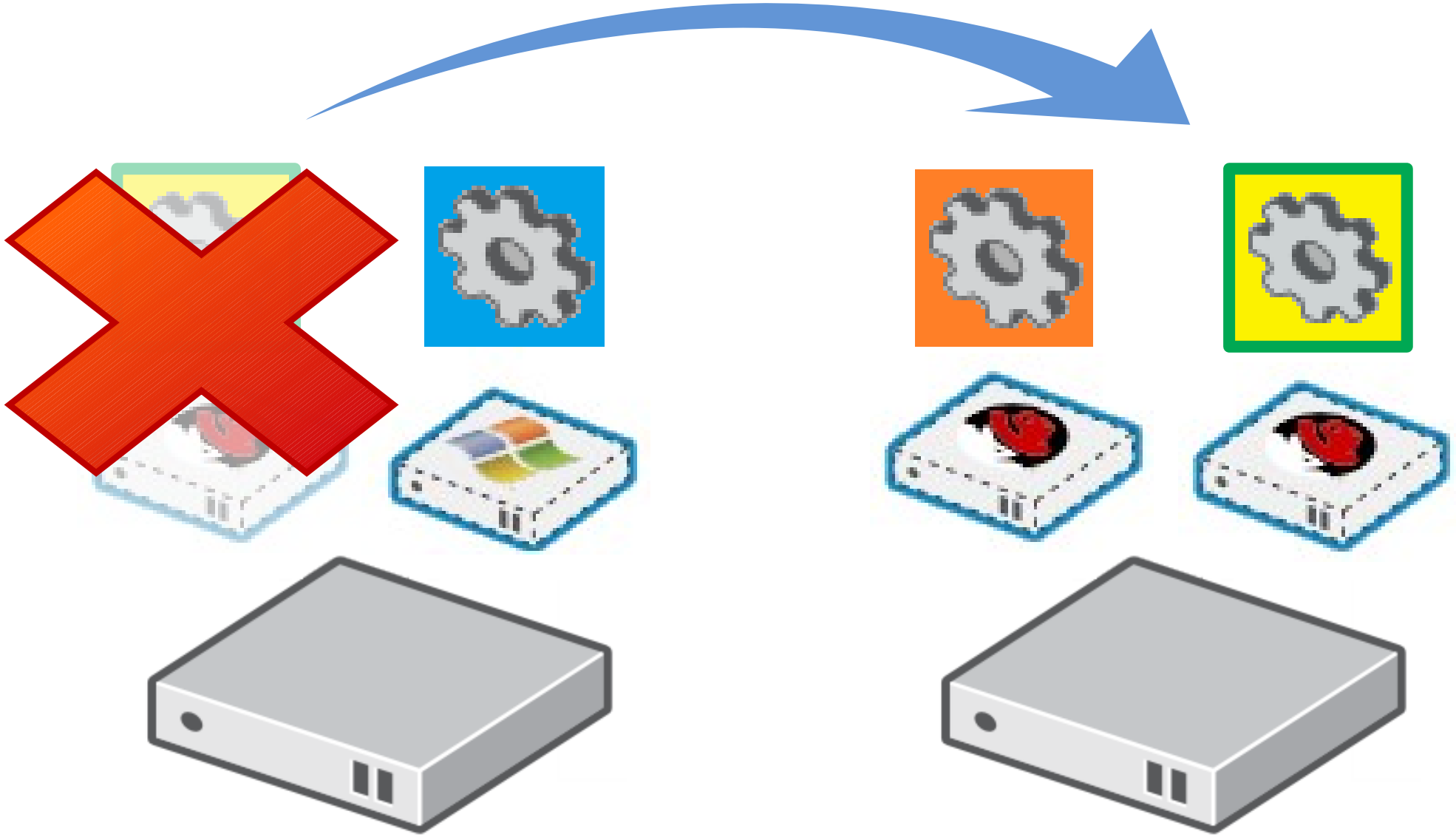
Some Applications are More Critial



High Availability - Application-Level



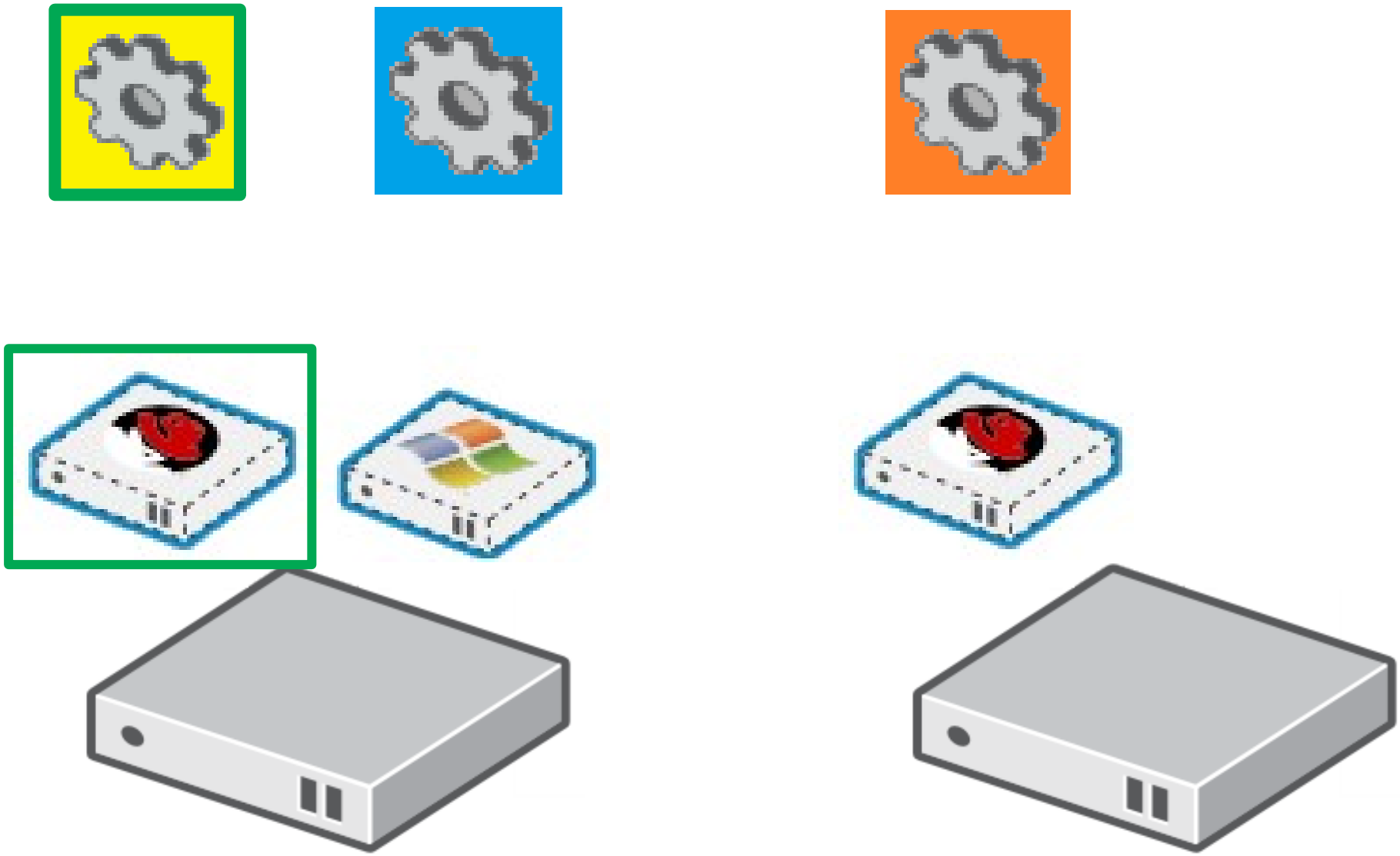
oVirt High Availability - Application-Level



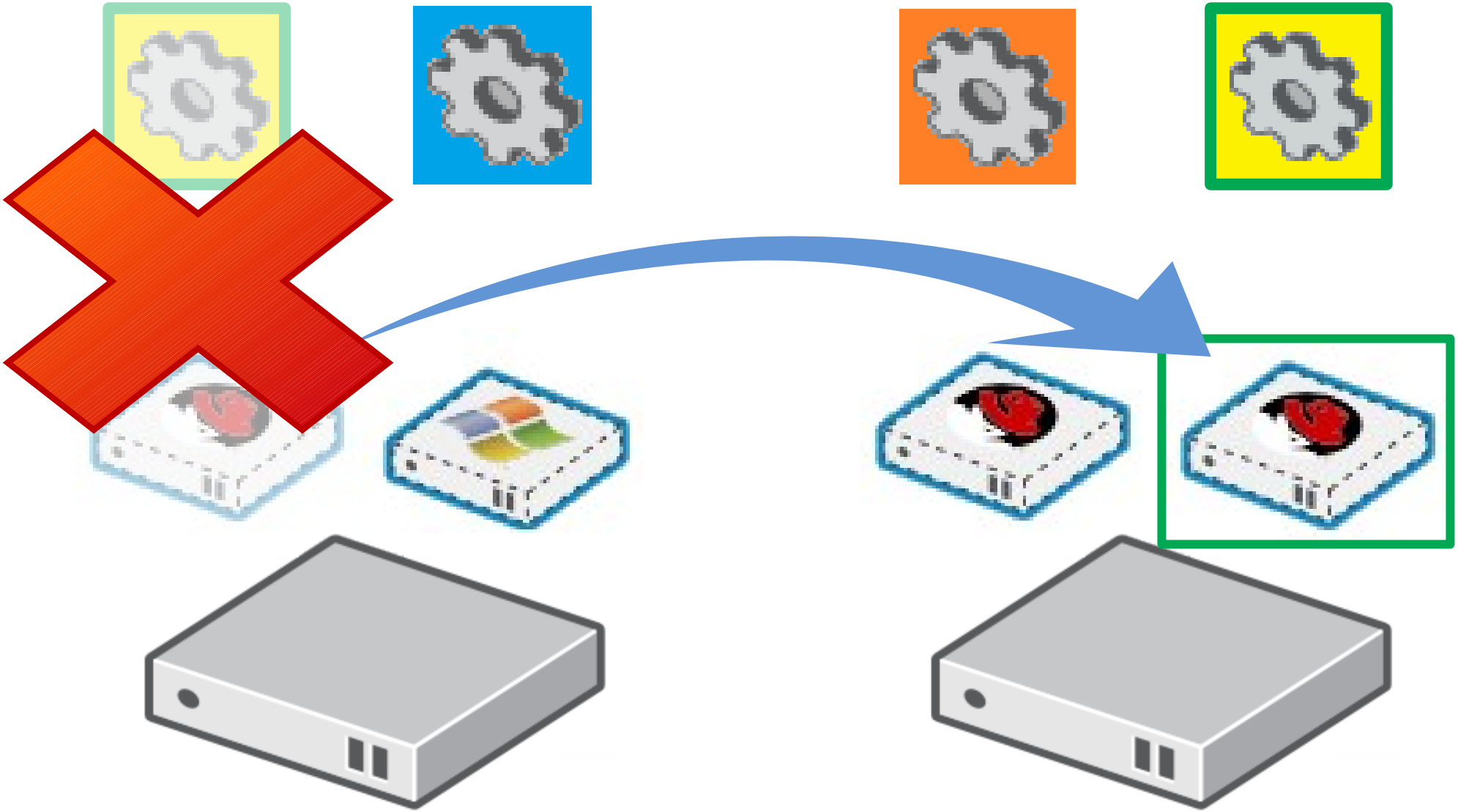
High Availability - Application-Level

- Higher resource consumption
- More responsibility on the application
- Backup lives in a different environment
  - Different IP address(es)
  - Different disk(s)

oVirt High Availability - VM-Level



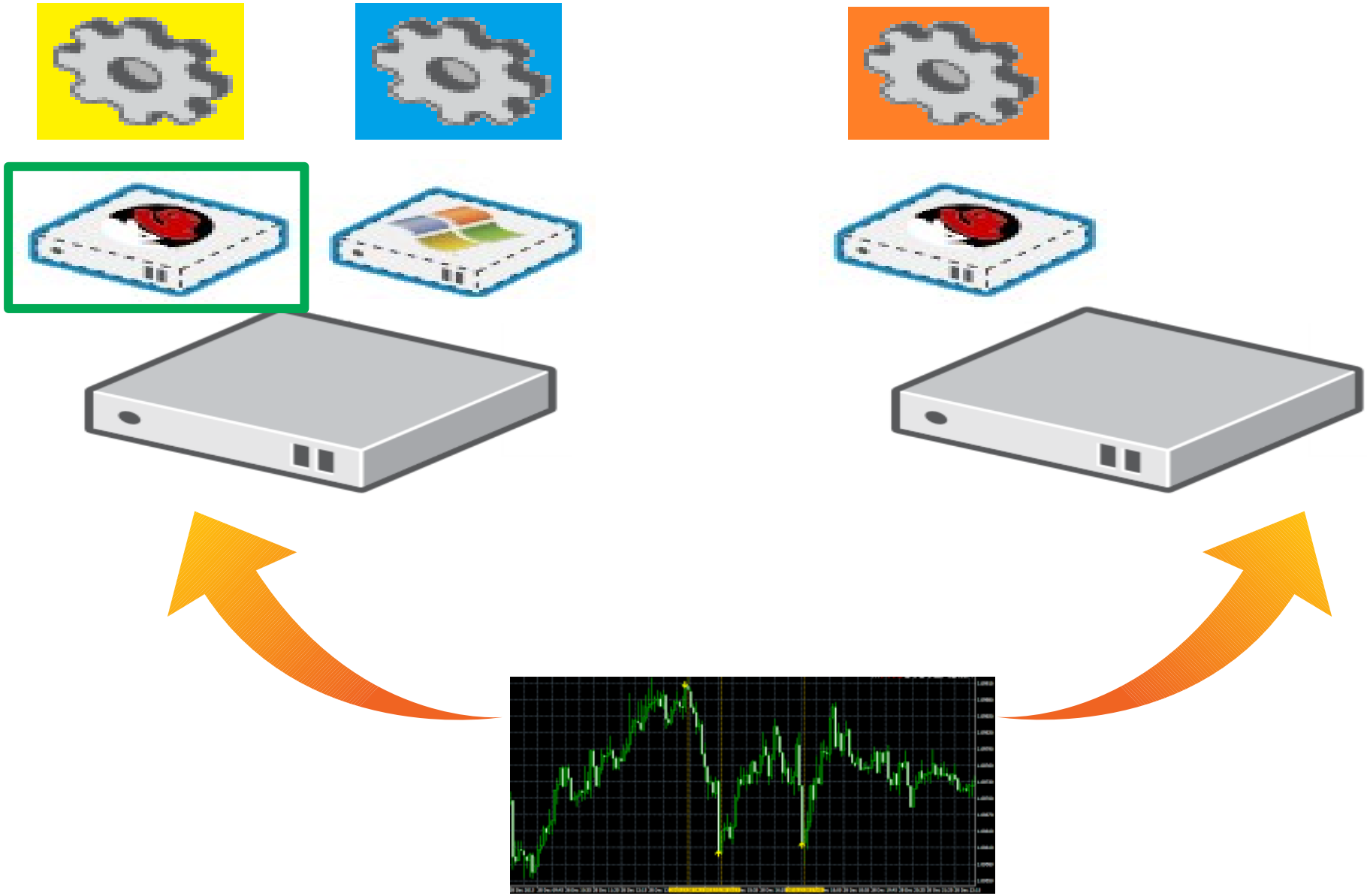
oVirt High Availability - VM-Level



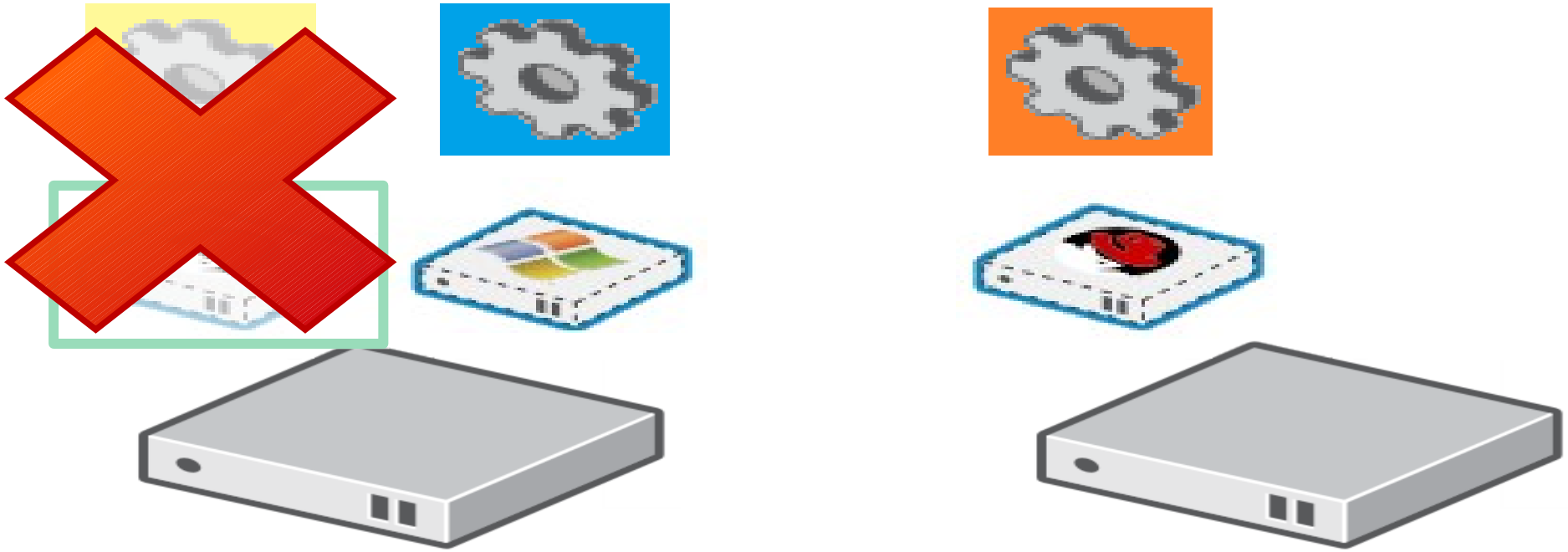
High Availability - VM-Level

- More efficient resource consumption
- Solution in the infrastructure level
- Backup starts in the same environment
  - Same IP address(es)
  - Same disk(s)

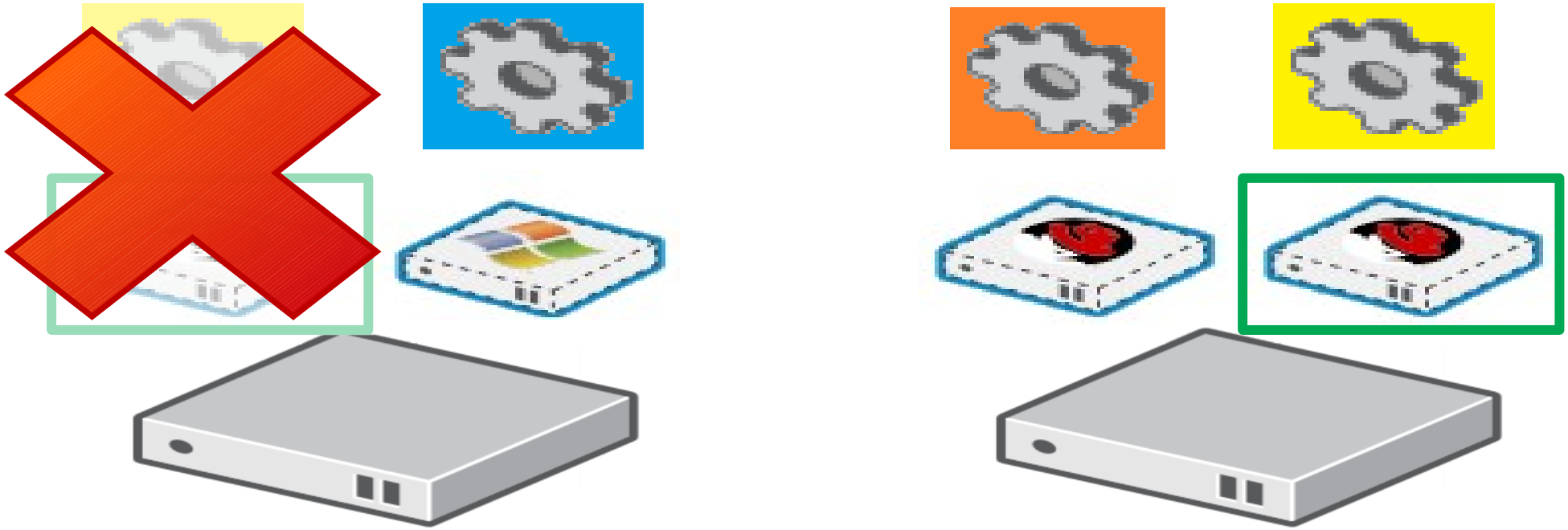
oVirt Central Monitoring Unit



oVirt Fault Detection



oVirt Automatic Restart

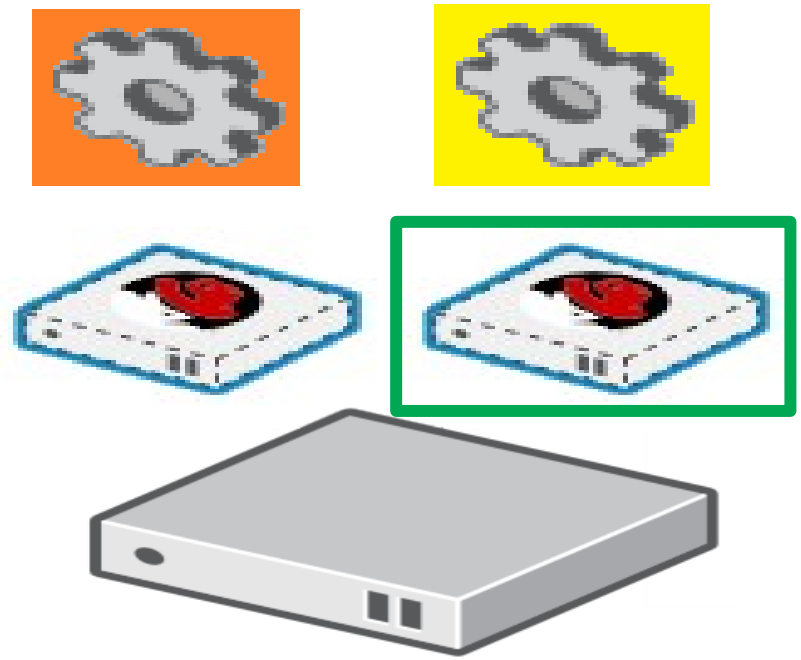


Restart the VM

oVirt Automatic Restart – Not That Simple

What if:

- Inaccessible resources
- VM is locked
- VM is being intentionally shut down



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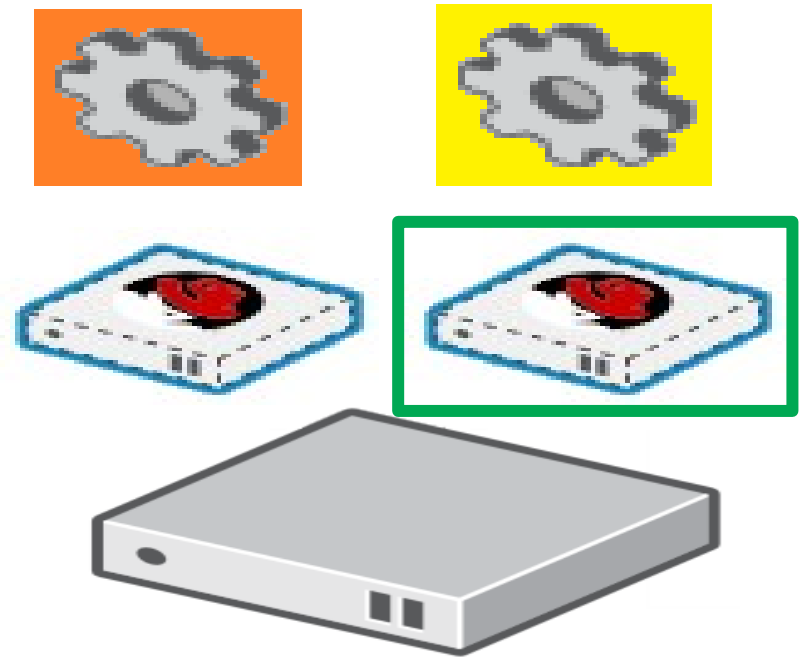
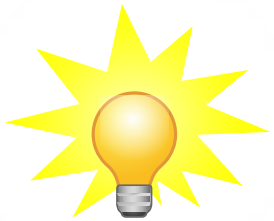
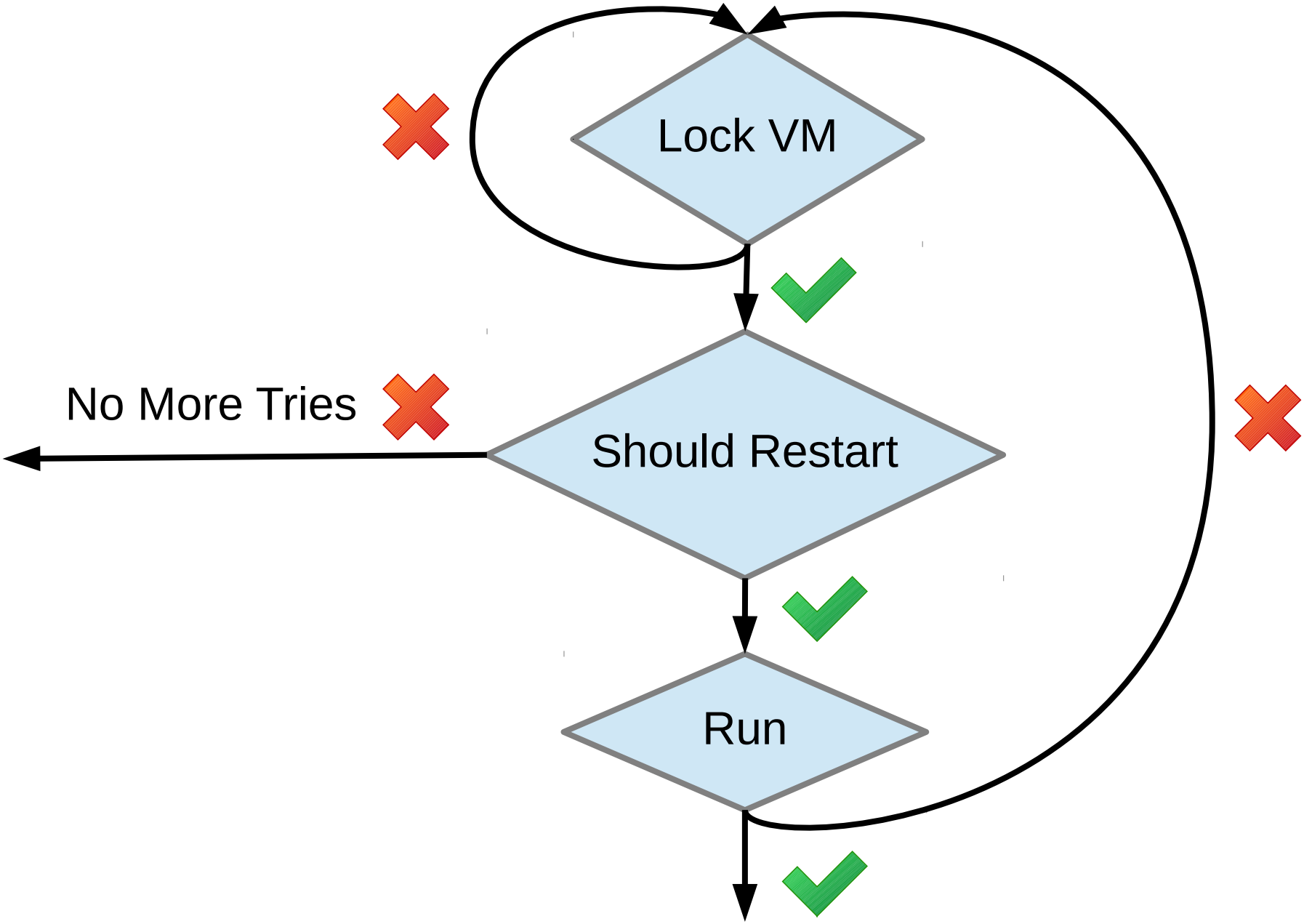




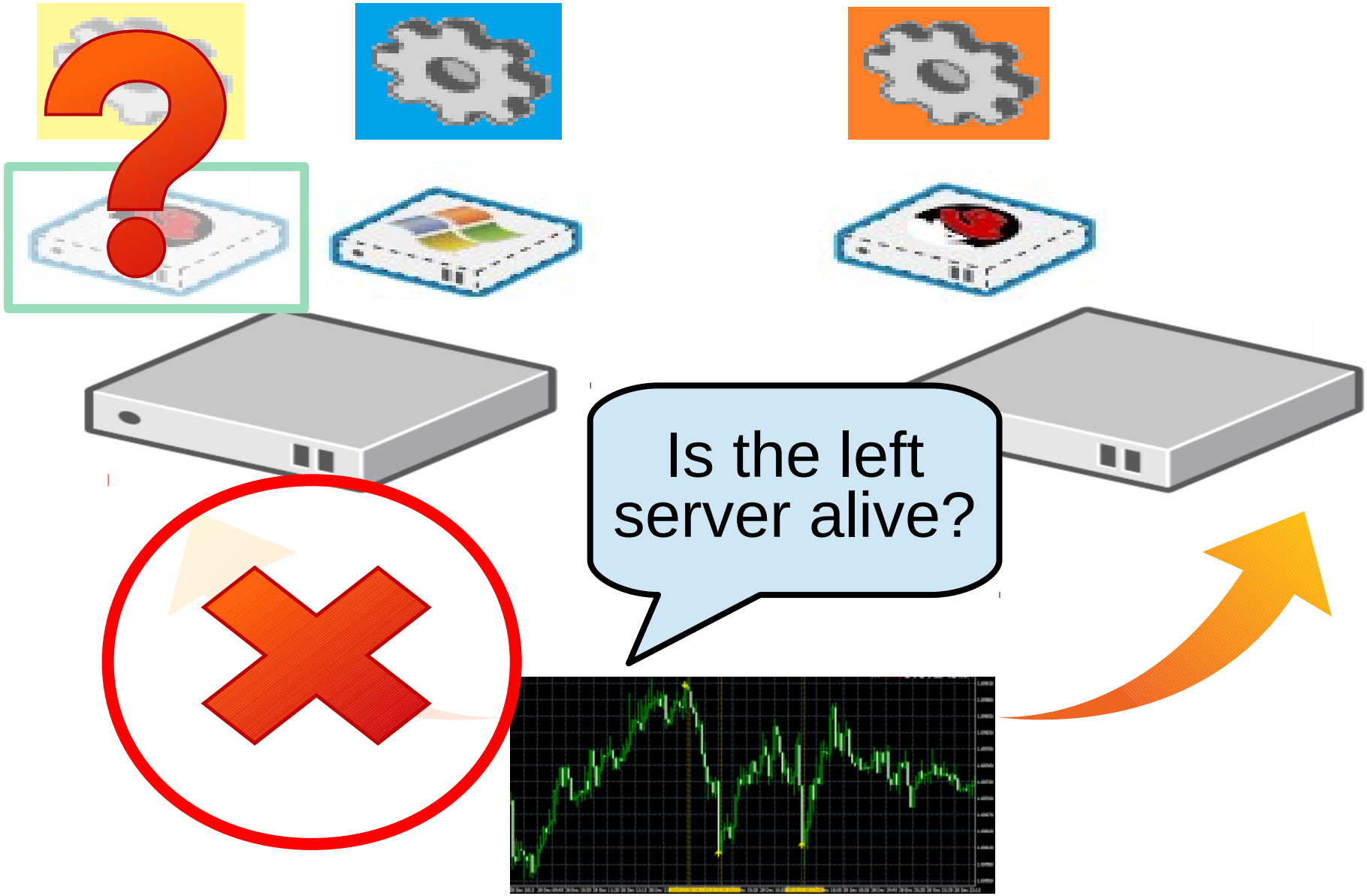
AutoStartVmsRunner

https://github.com/oVirt/ovirt-engine/blob/master/backend/manager/modules/bll/src/main/java/org/ovirt/engine/core/bll/AutoStartVmsRunner.java

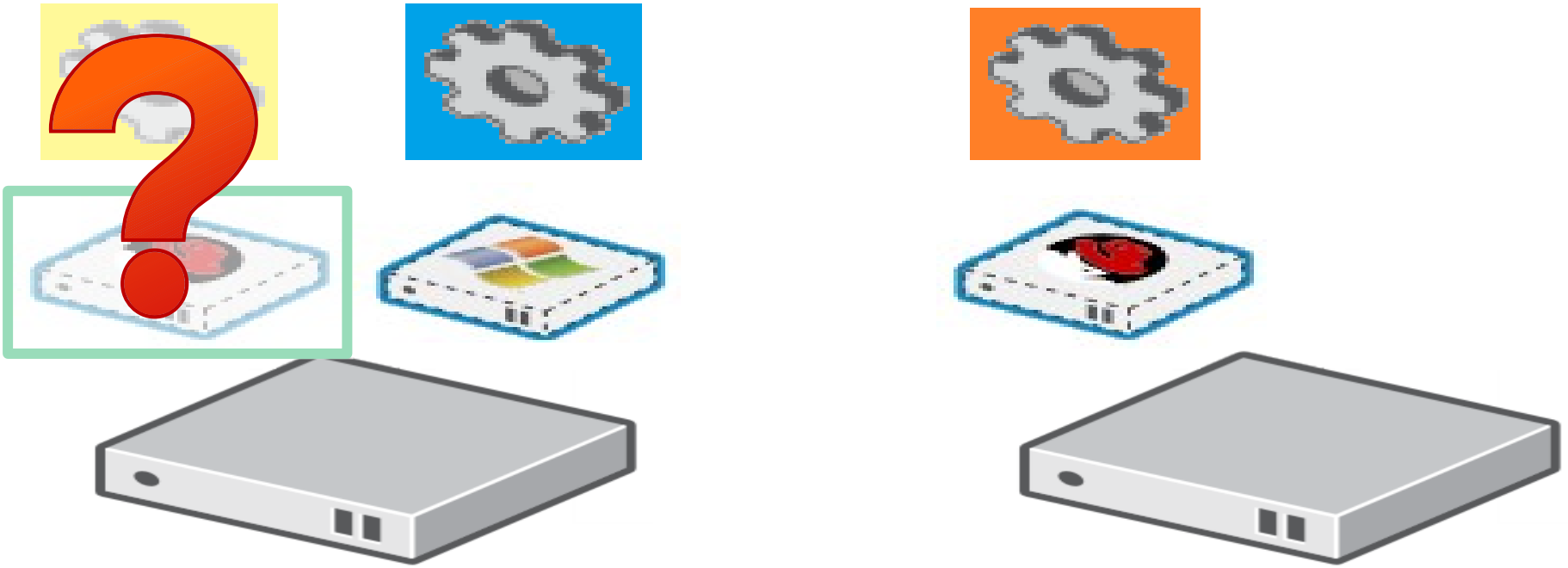
AutoStartVmsRunner



oVirt Fault Detection – Even More Complex

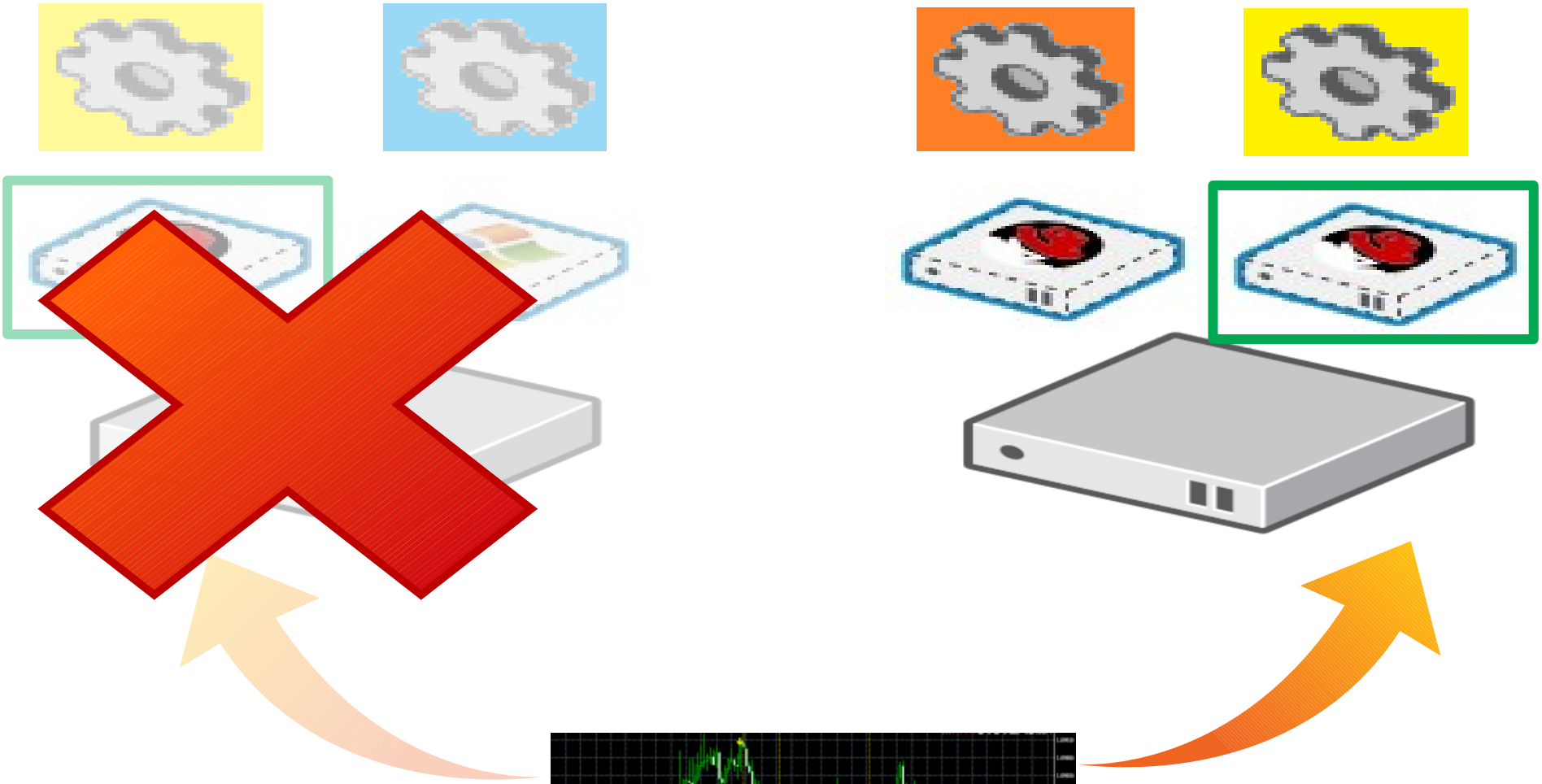


oVirt Fault Detection – Manual Confirmation



The server has been rebooted

oVirt Fault Detection – Manual Confirmation



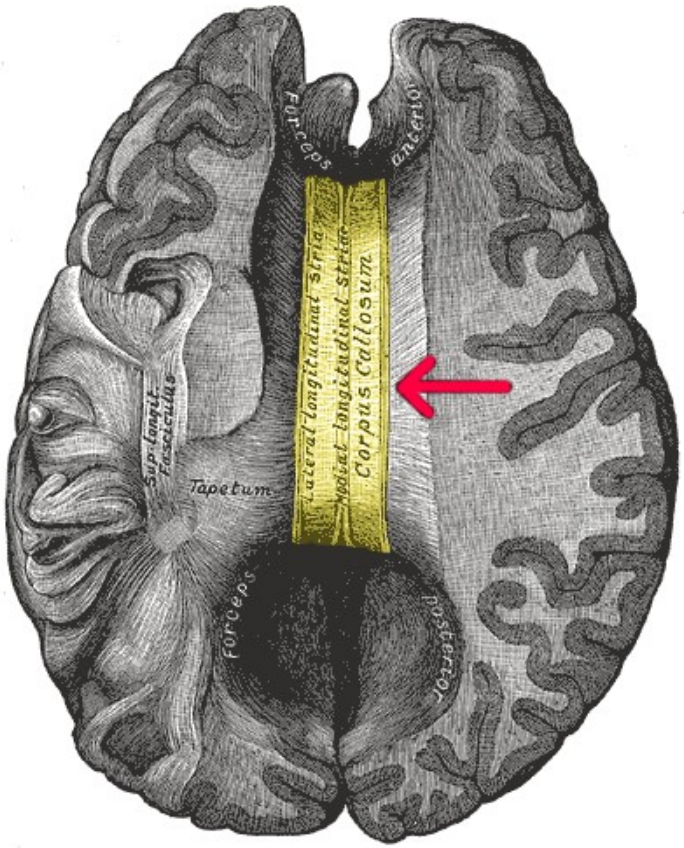
Restart the VM

Fault Detection – Manual Confirmation

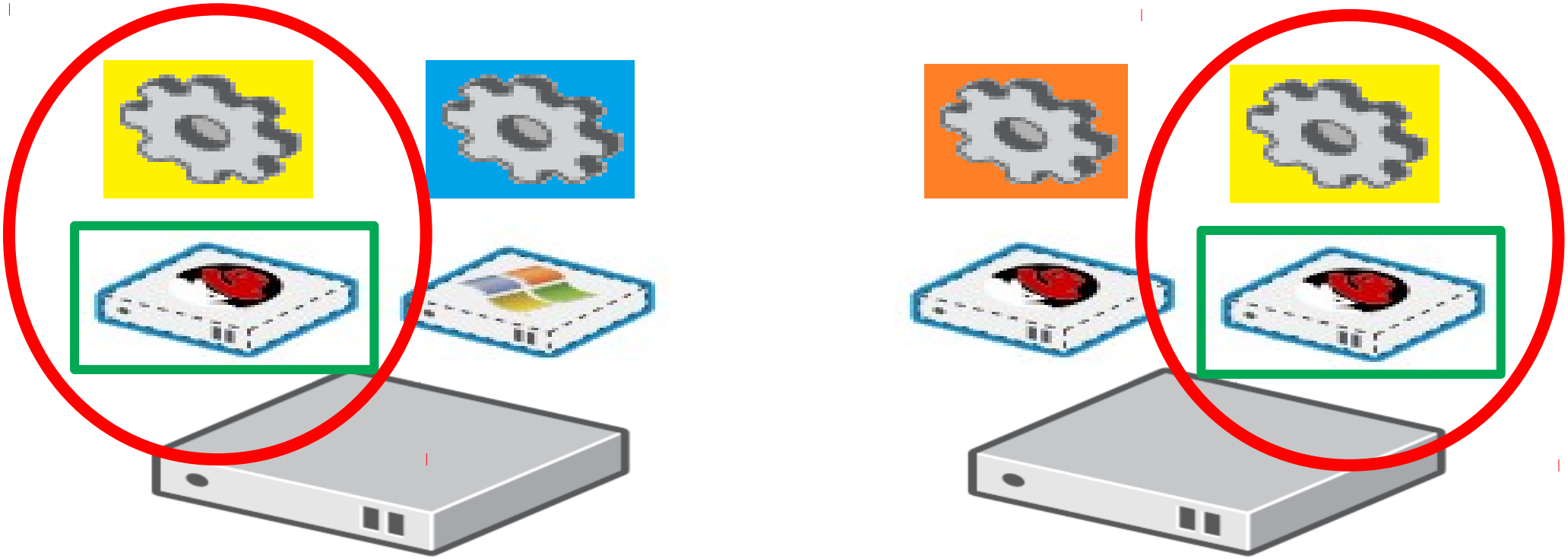
- Slow
- Error-prone
  - Mistakes may lead to a split-brain

Split Brain of Virtual Machines

A scenario in which several VMs that may write to the same disk(s) are running simultaneously



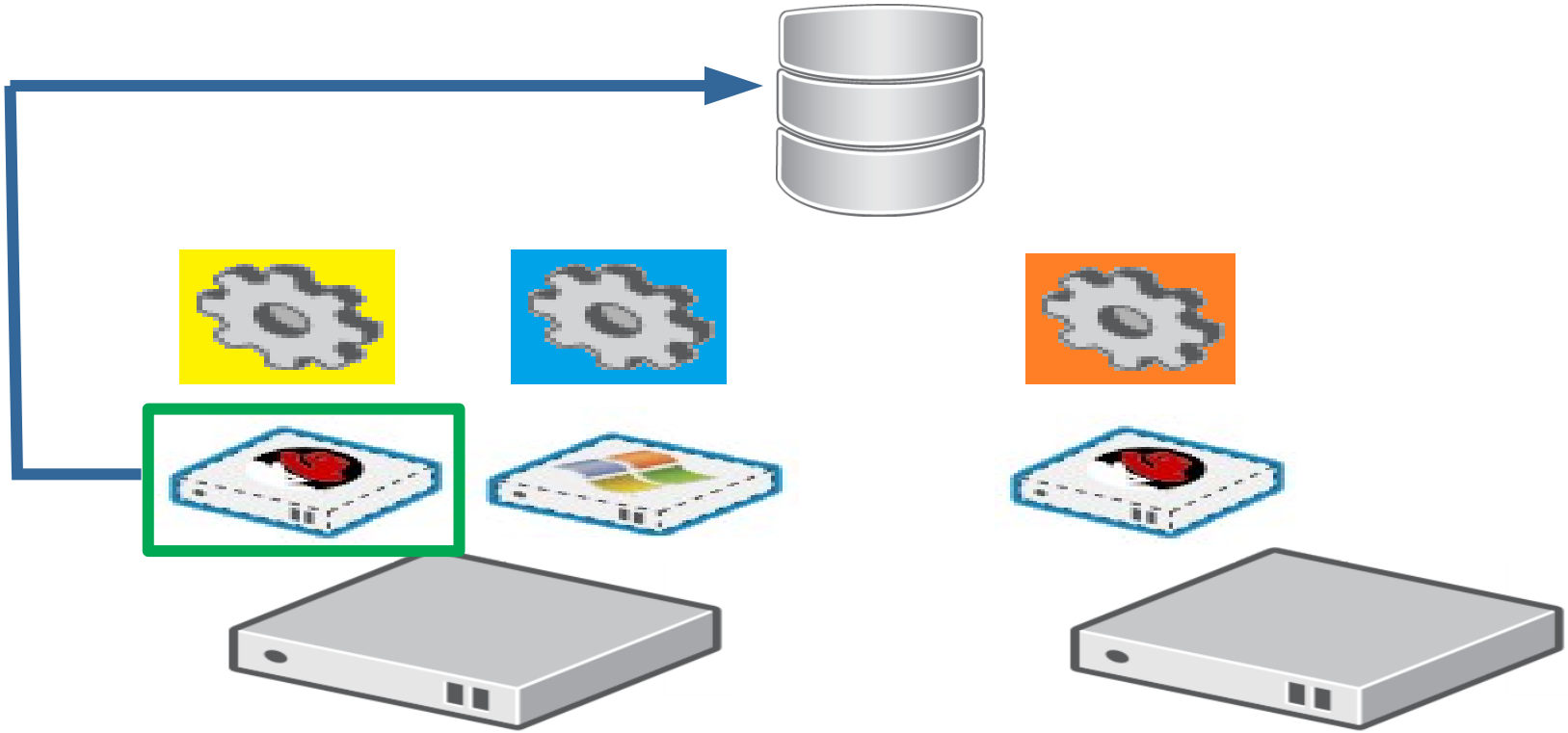
Split Brain



oVirt Split Brain

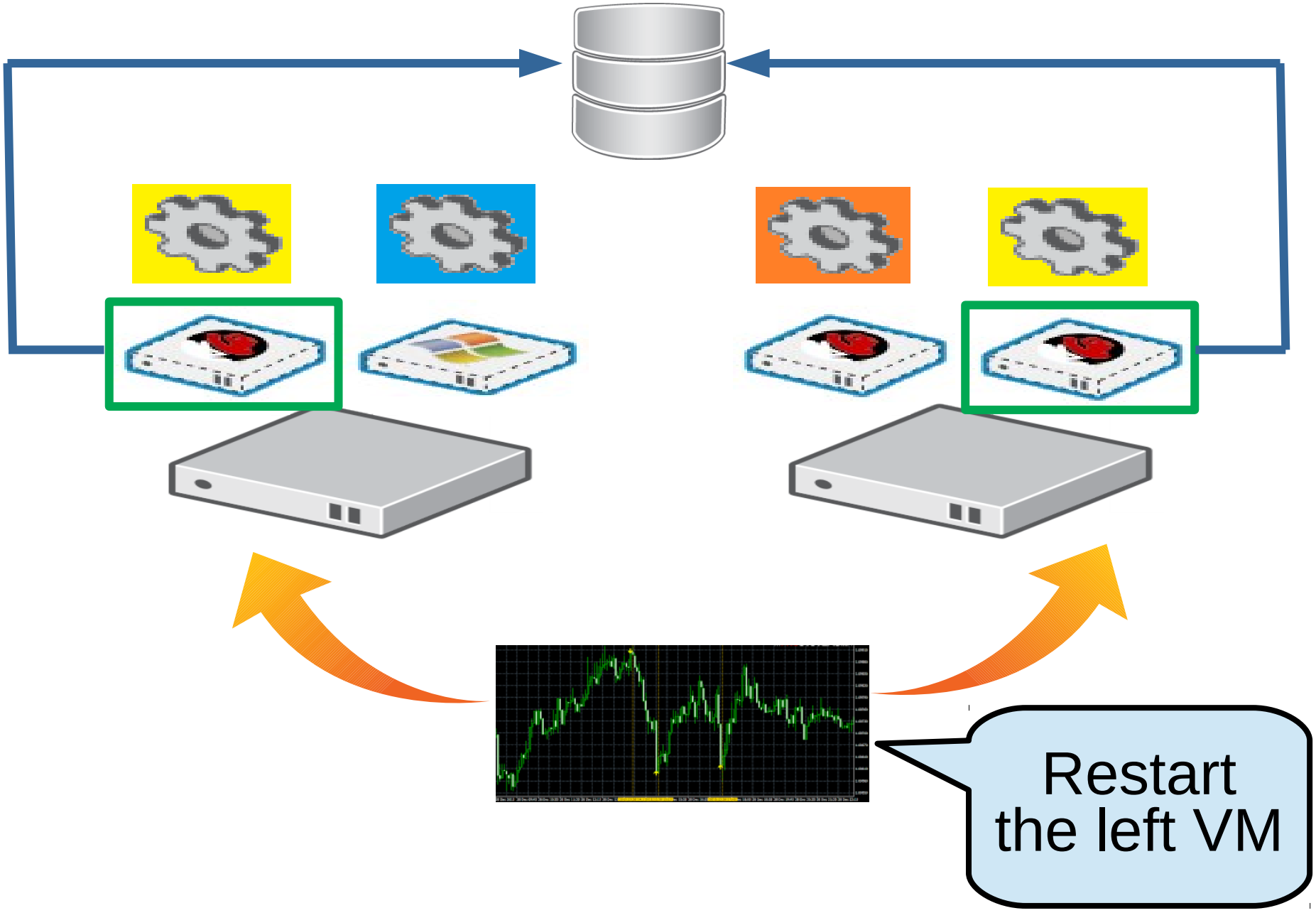
May lead to data corruption!

Split Brains May Happen Due to Bugs

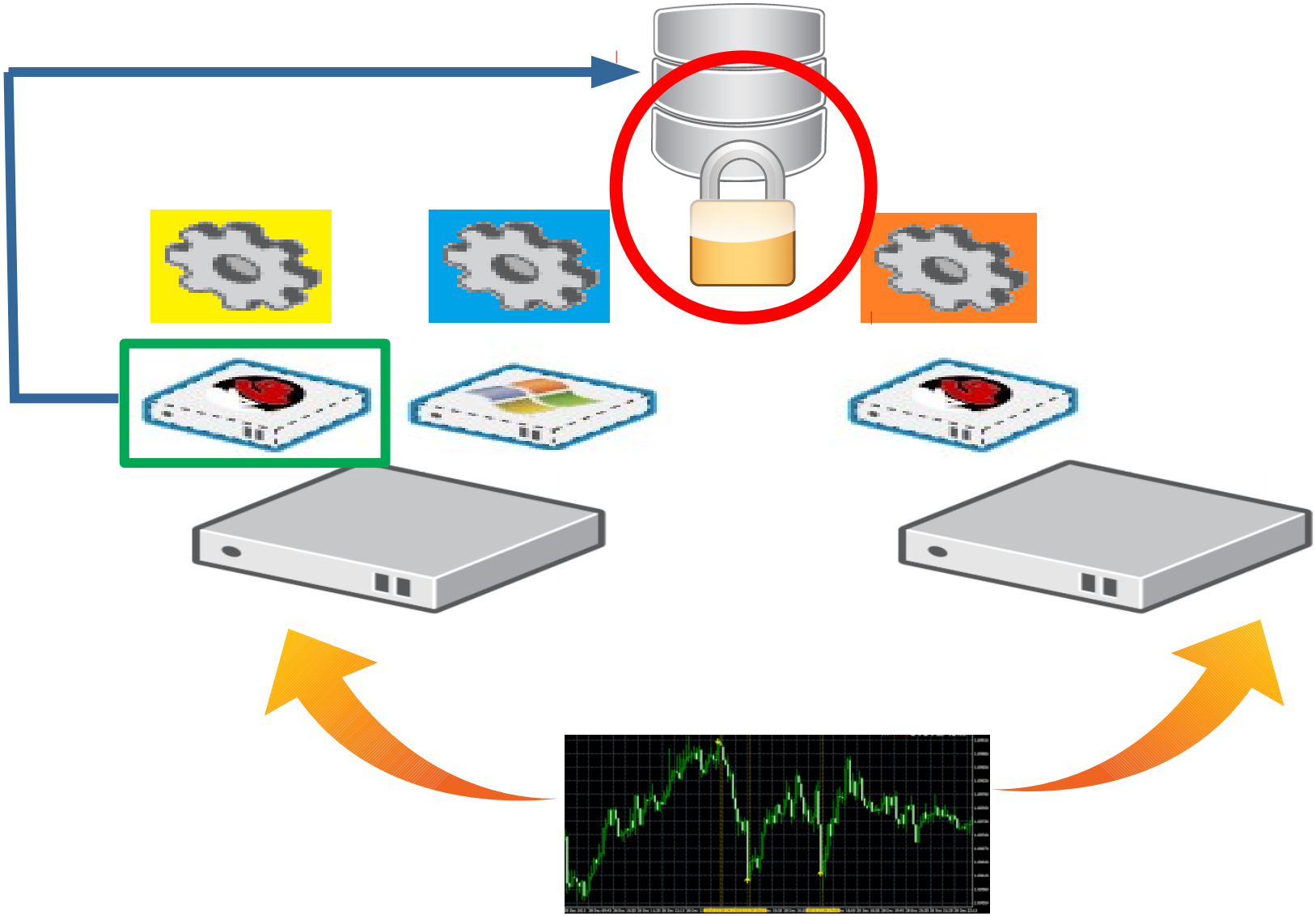


Only the right VM is reported (on startup)

Split Brains May Happen Due to Bugs



Our Solution to Split Brains: VM Leases



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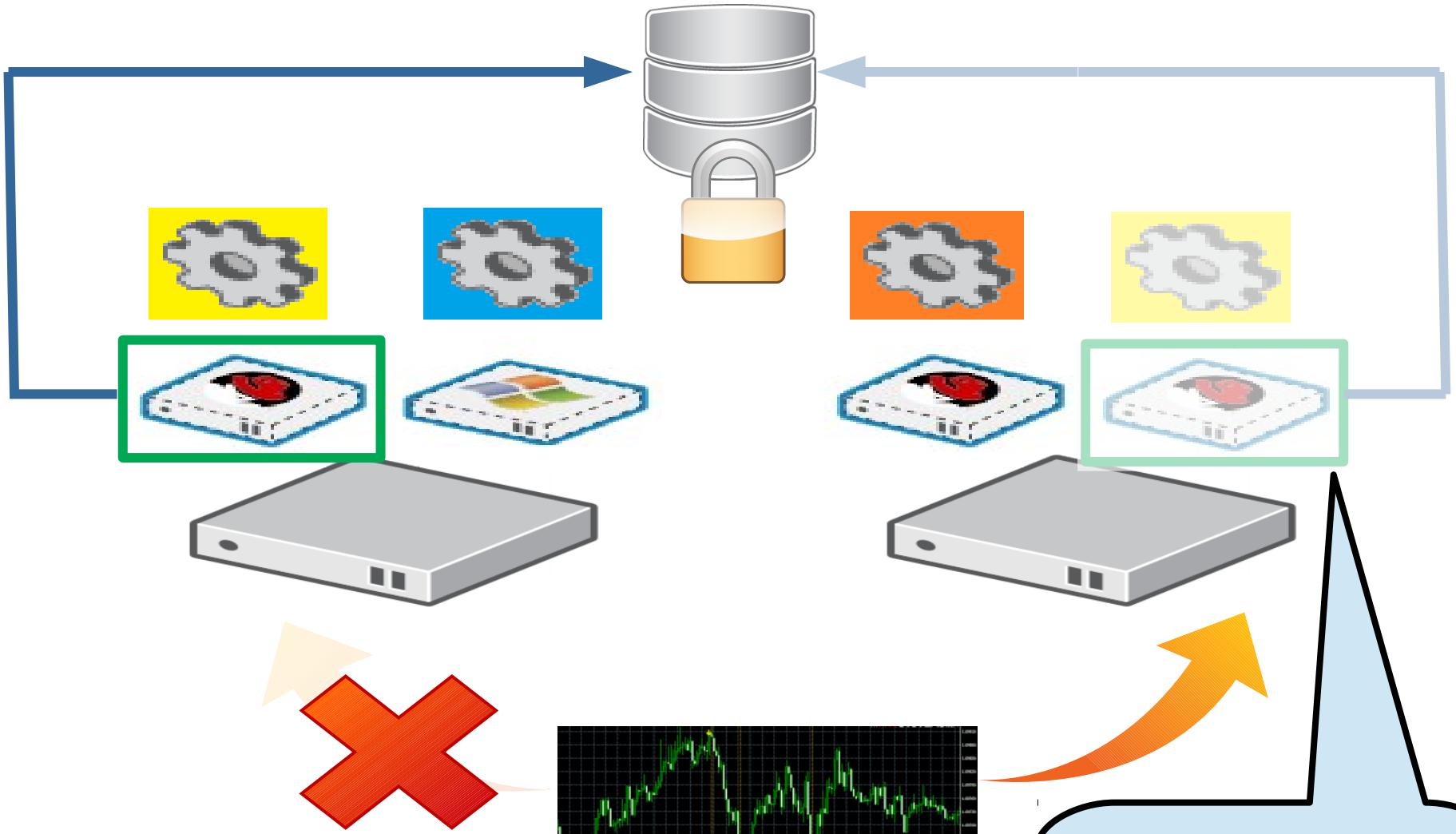
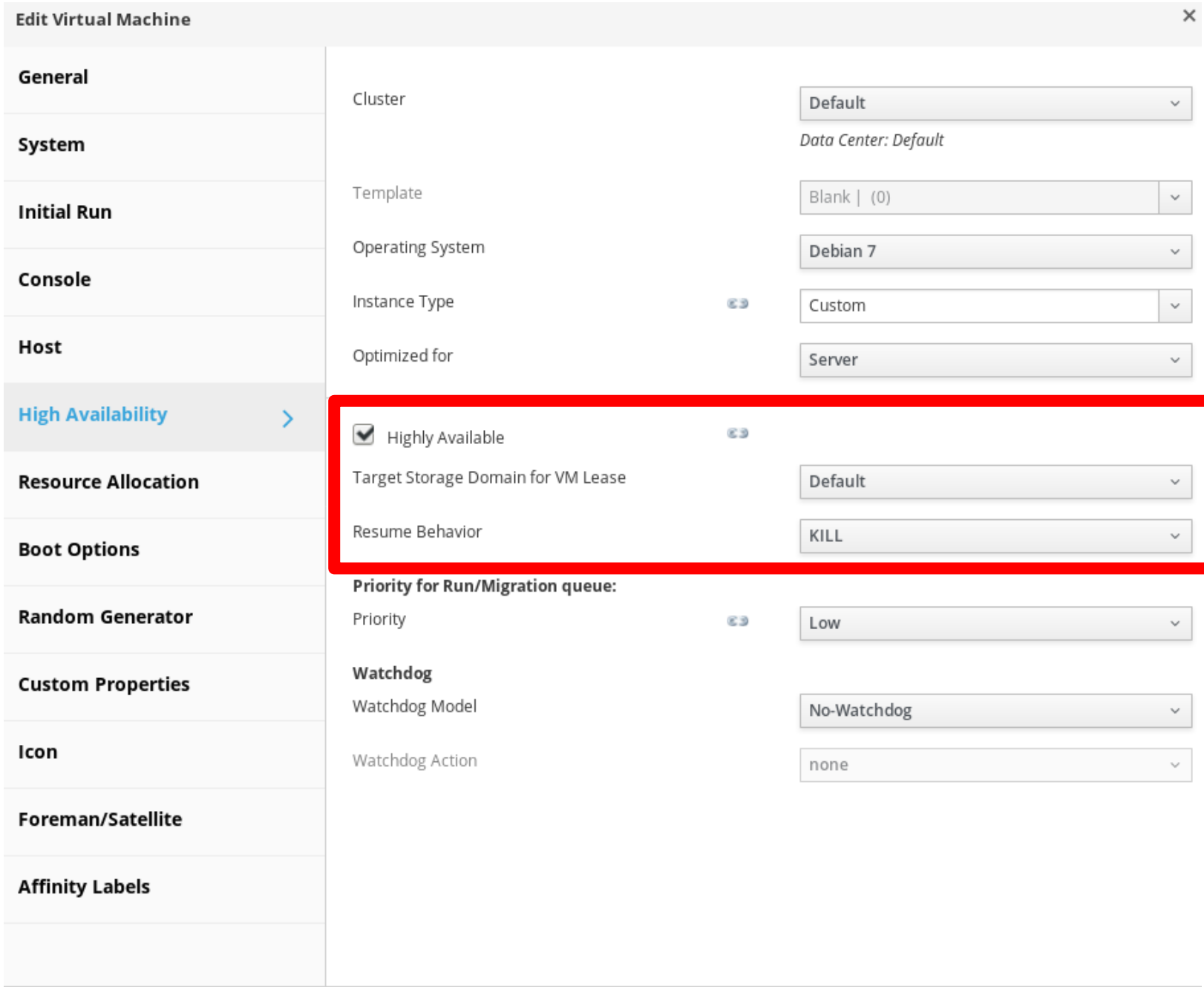


VM will not start while its lease exists

VM Lease Creation



VM Lease Creation

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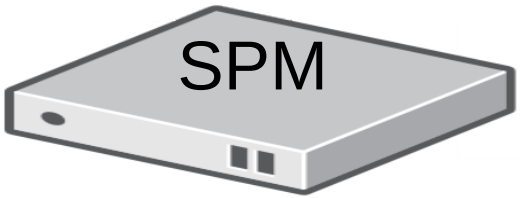
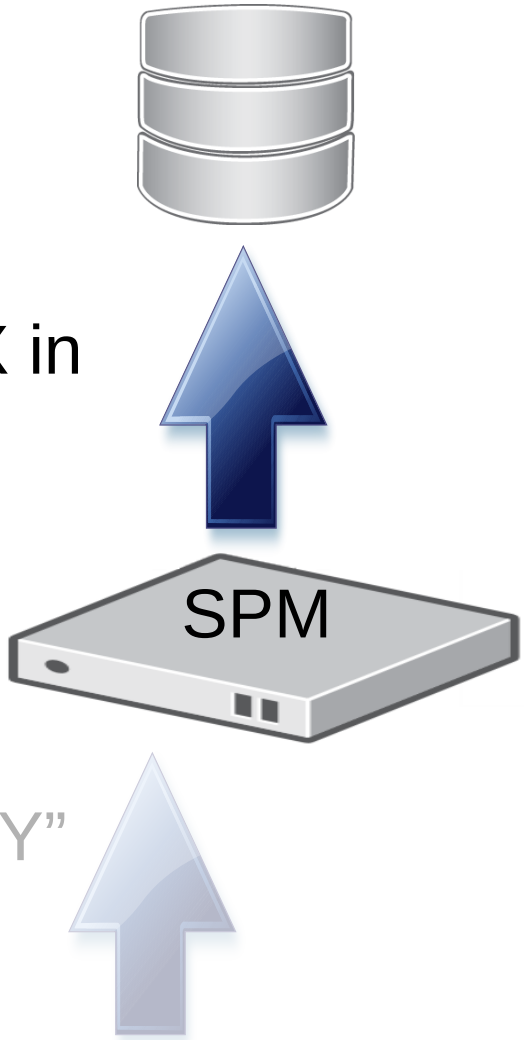
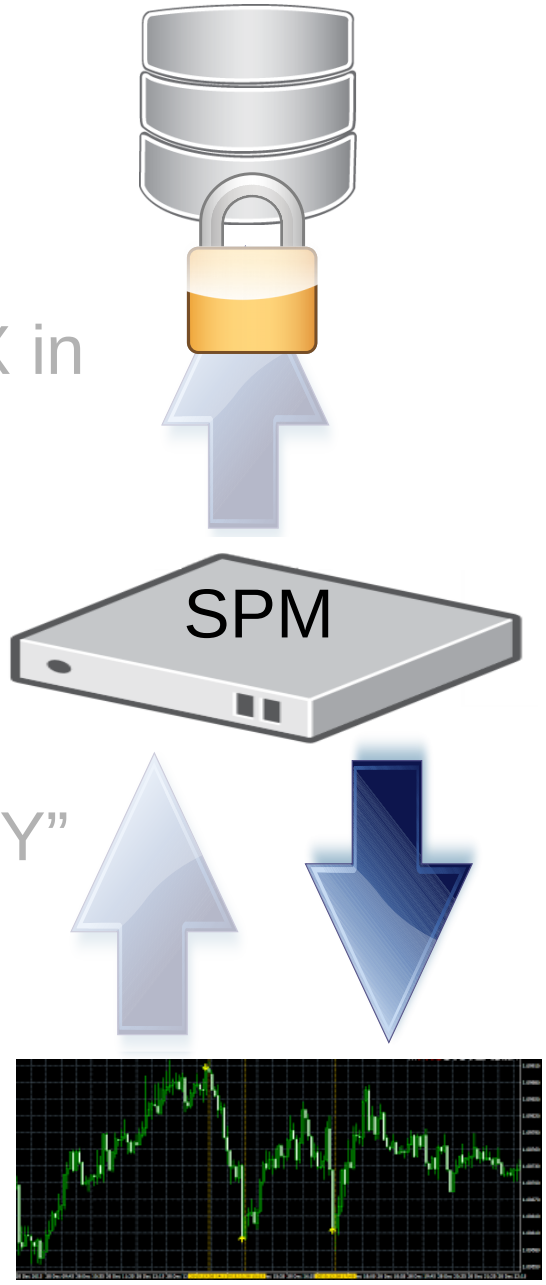


“Create VM Lease for
VM X in storage domain Y”

VM Lease Creation



VM Lease Creation



xleases volume

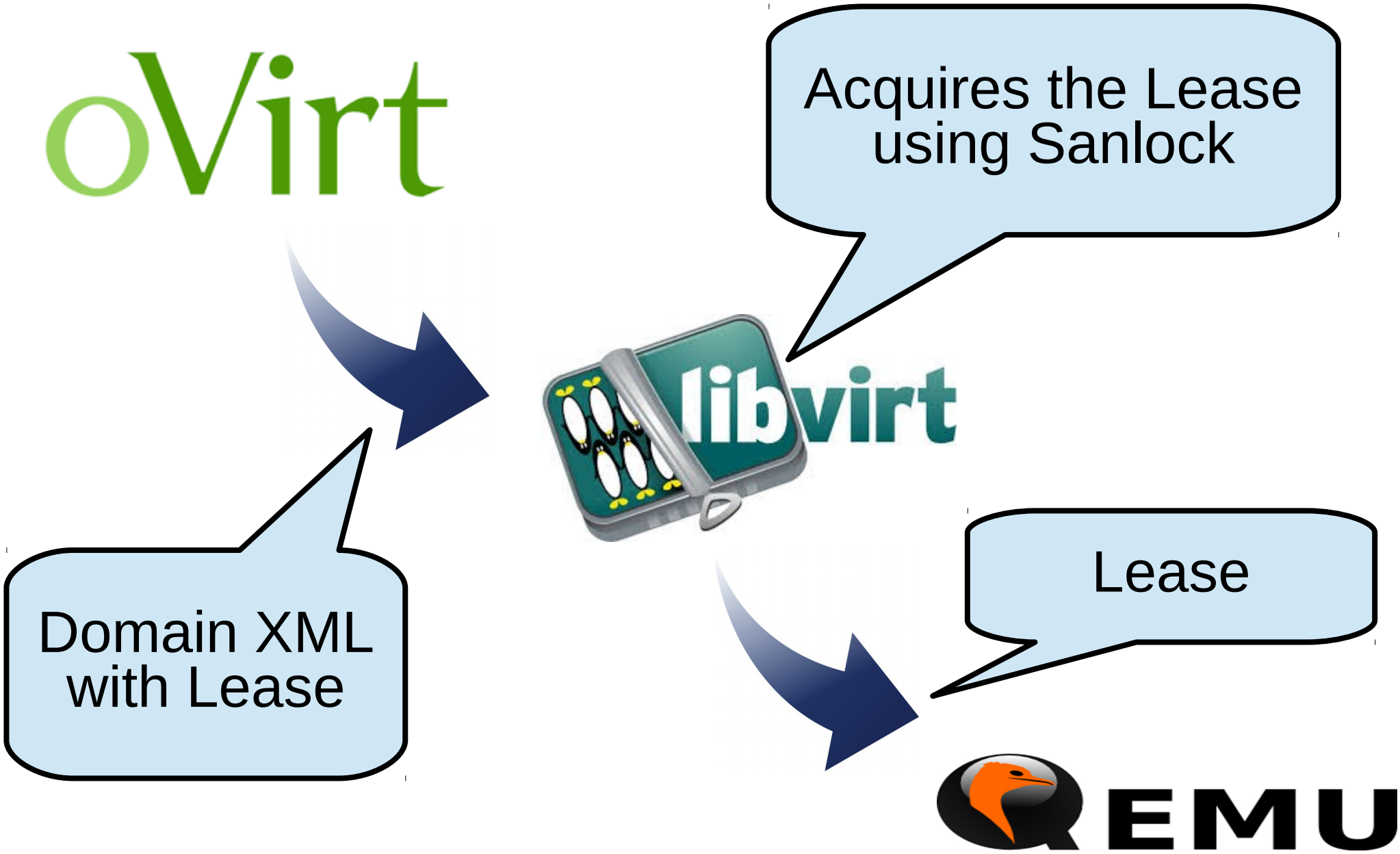
- Sanlock does not manage leases allocation
- Volume layout:

- Same format in block and file storage
- Deep Dive - VM leases (youtube)

Running a VM with a Lease

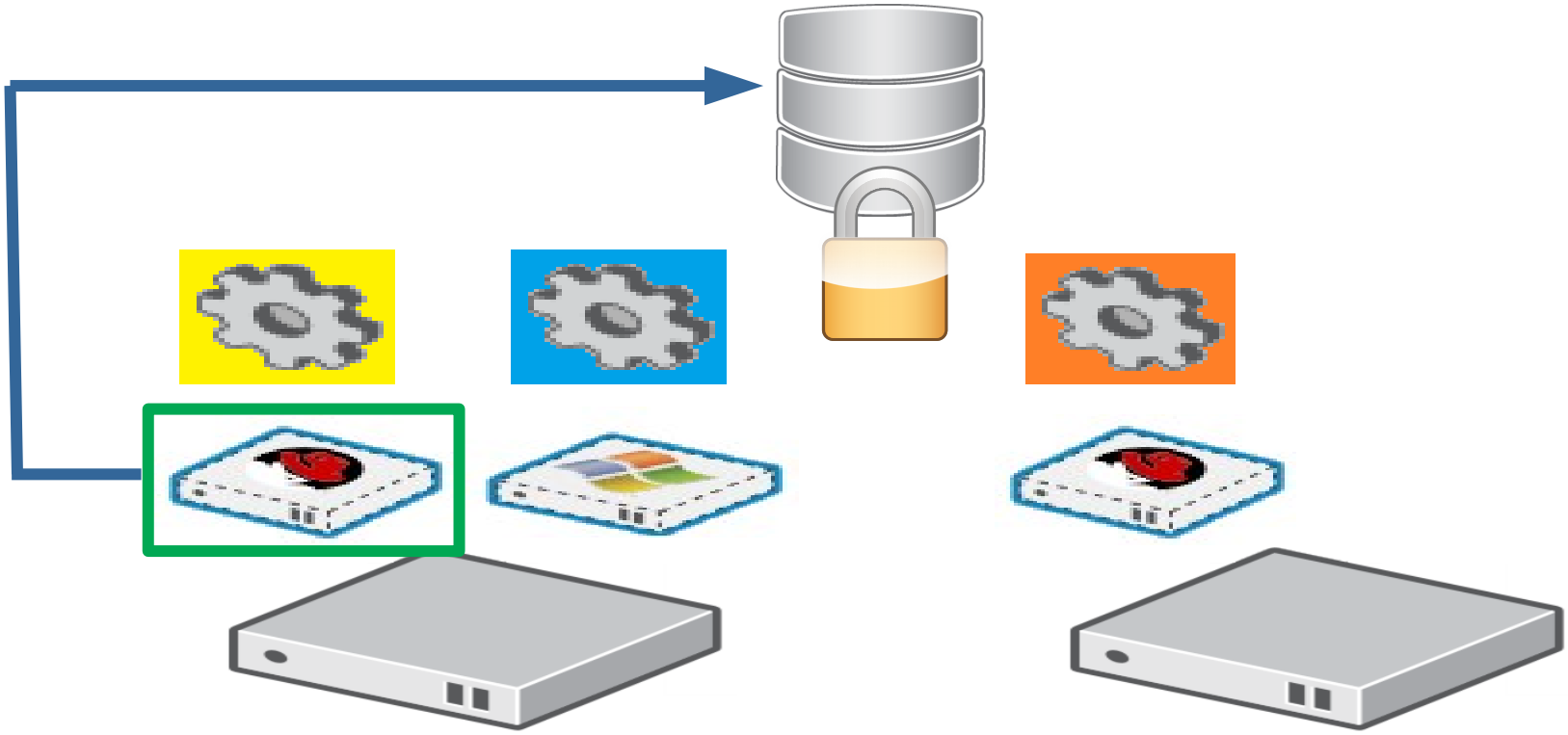
```
<domain type='kvm' id='6'>
  <name>fedora8</name>
    ... skipped ...
  <devices>
    ... skipped ...
    <lease>
      <lockspace>571184ae-79da-41fb-a3fb-c3117991abae</lockspace>
      <key>cbd783e4-45f8-4b51-93ca-4460d4dad772</key>
      <target path='/rhev/data-center/mnt/10.35.1.90:_srv_Default/571184ae-
79da-41fb-a3fb-c3117991abae/dom_md/xleases' offset='3145728'/>
    </lease>
    ... skipped ...
 </domain>
```

Running a VM with a Lease



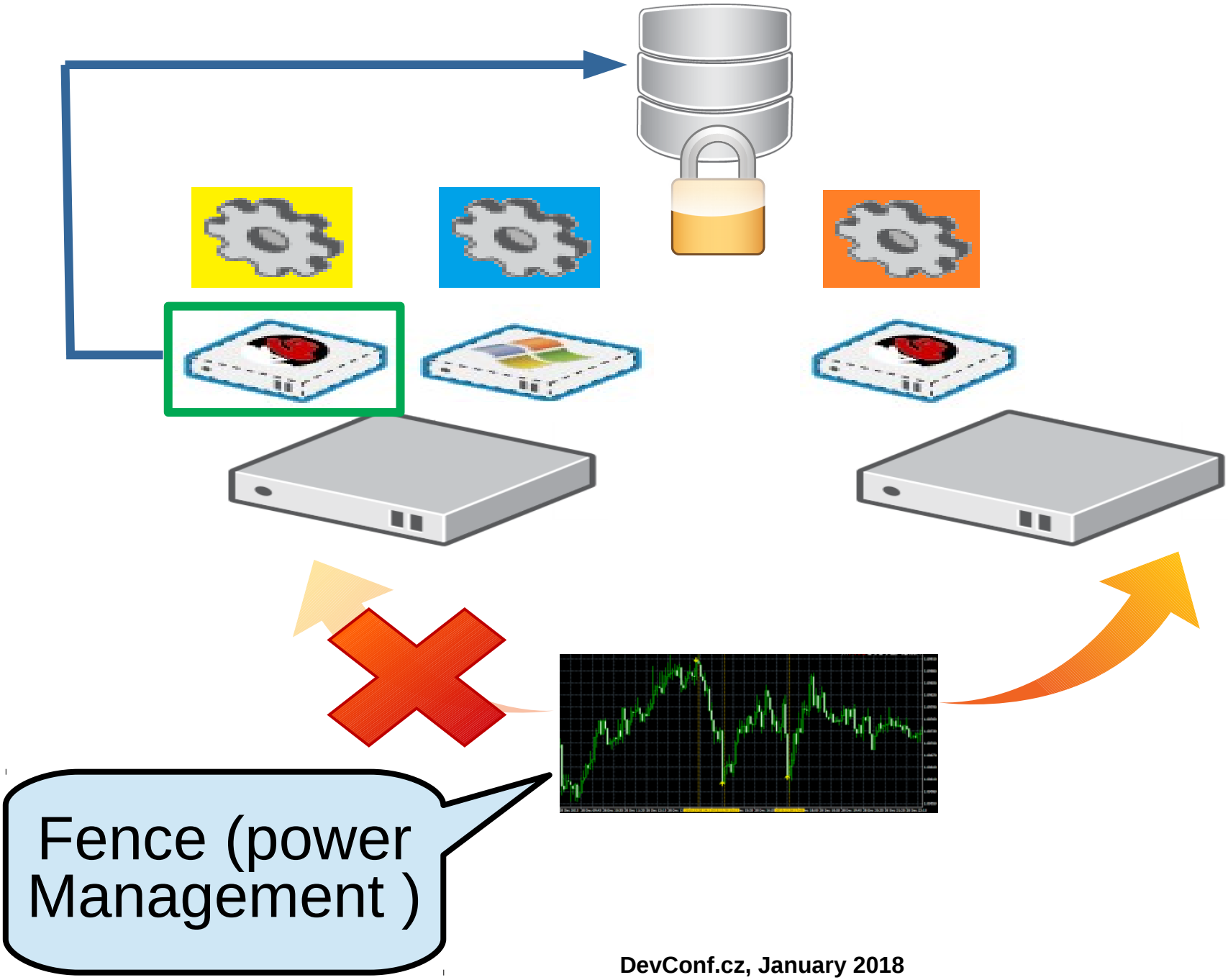
Non-Responsive Host Treatment

Non-Responsive Host Treatment

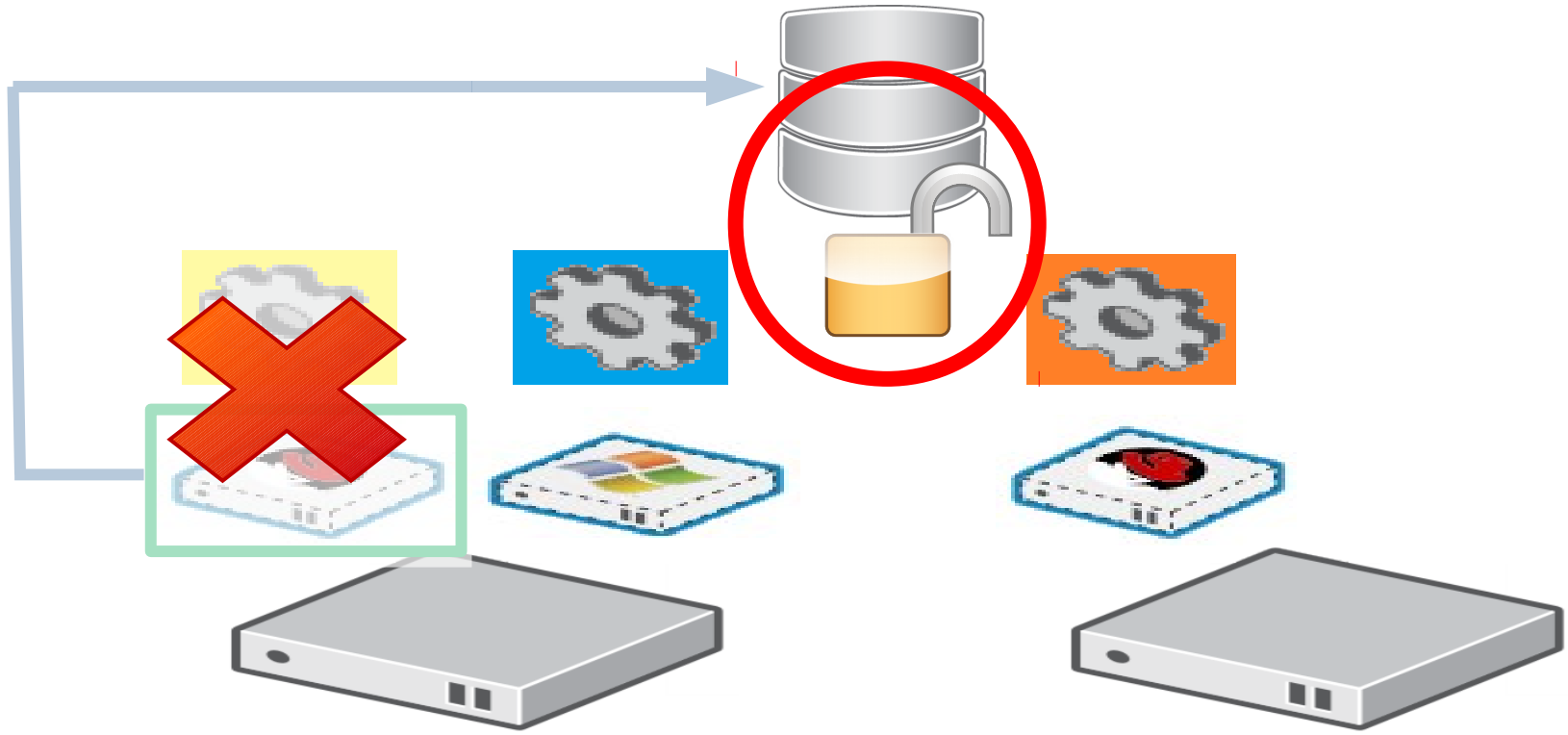


60+ sec of grace period

Non-Responsive Host Treatment

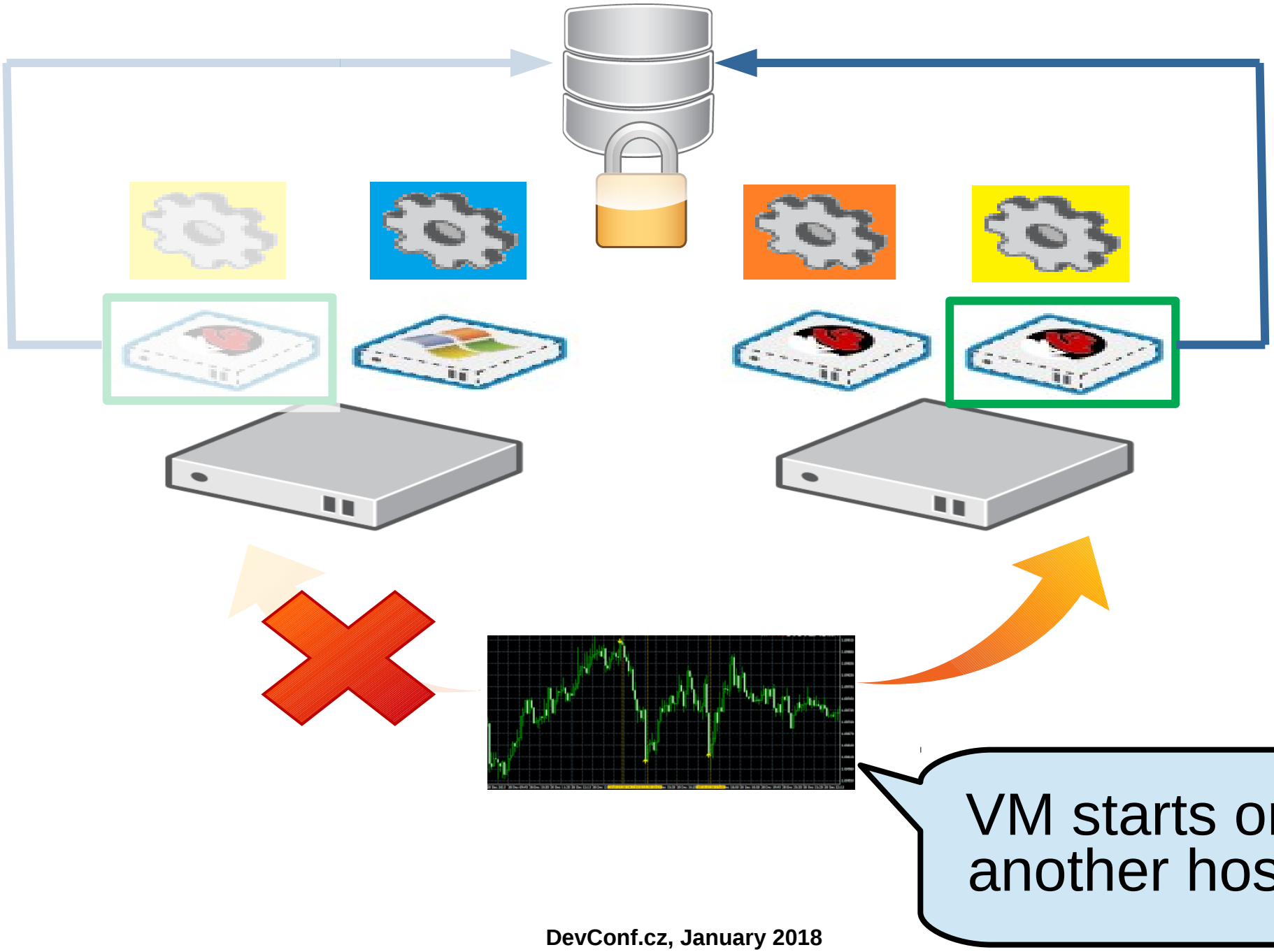


oVirt Non-Responsive Host + VM is Down

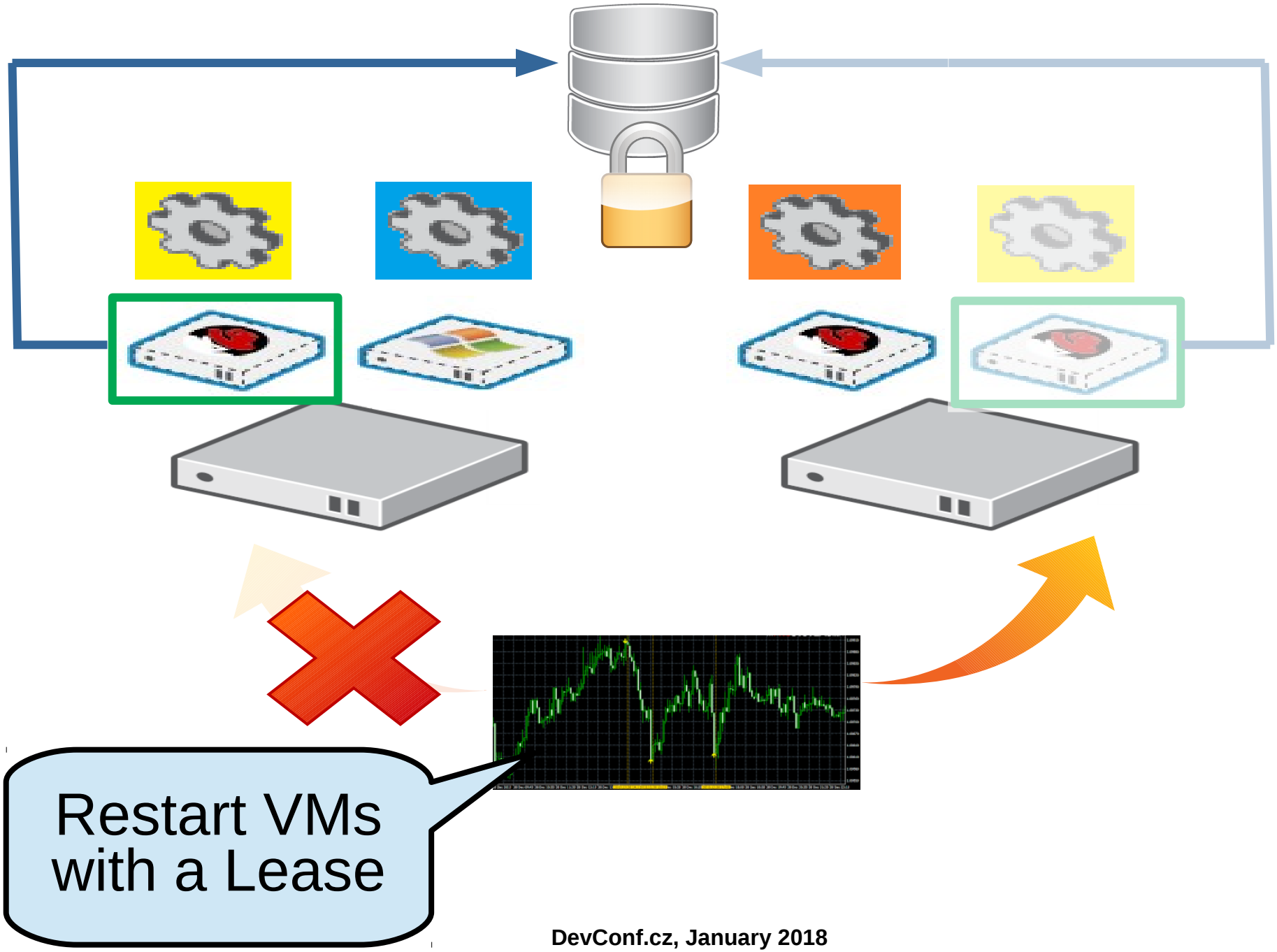


Restart VMs with a Lease

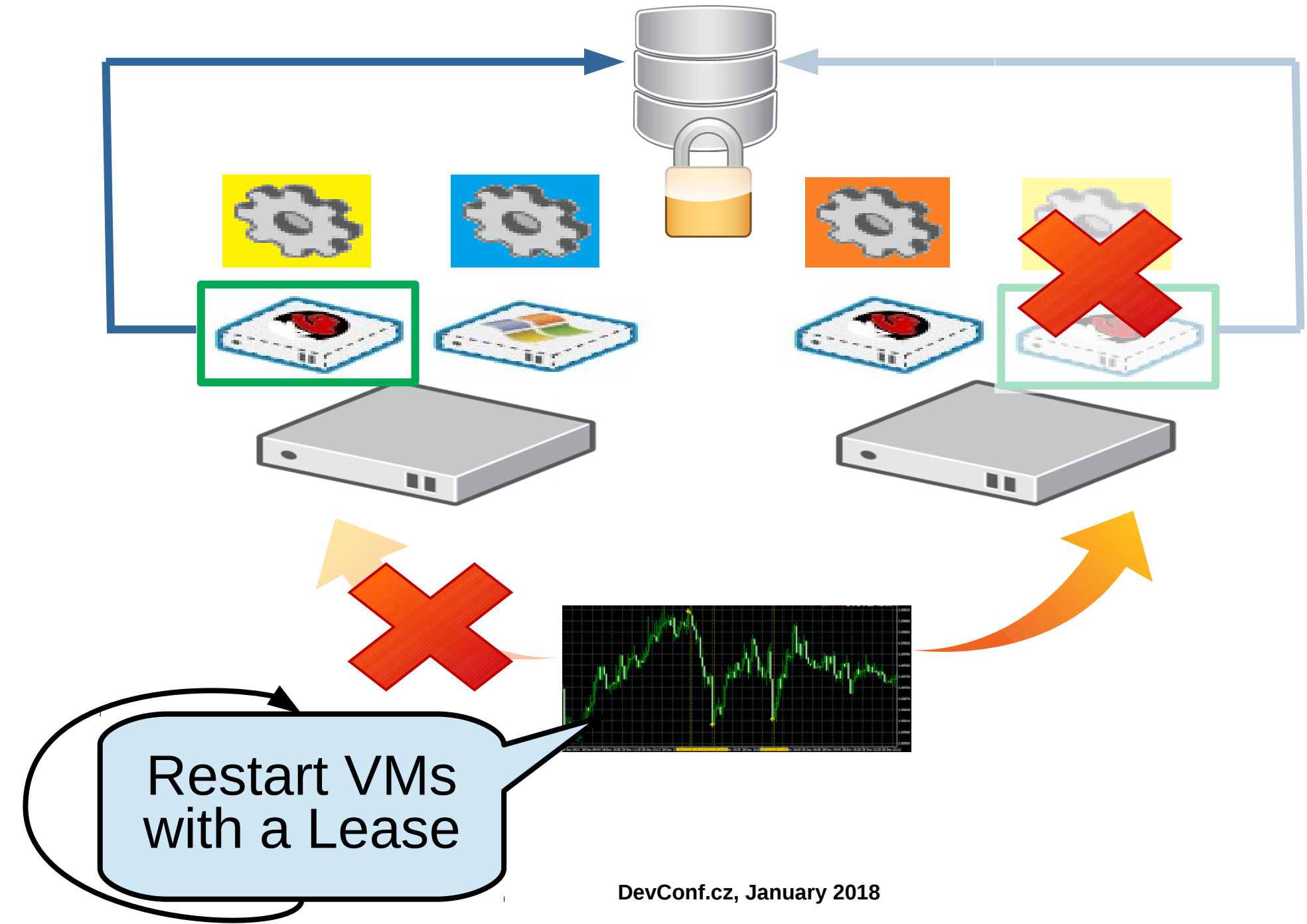
oVirt Non-Responsive Host + VM is Down



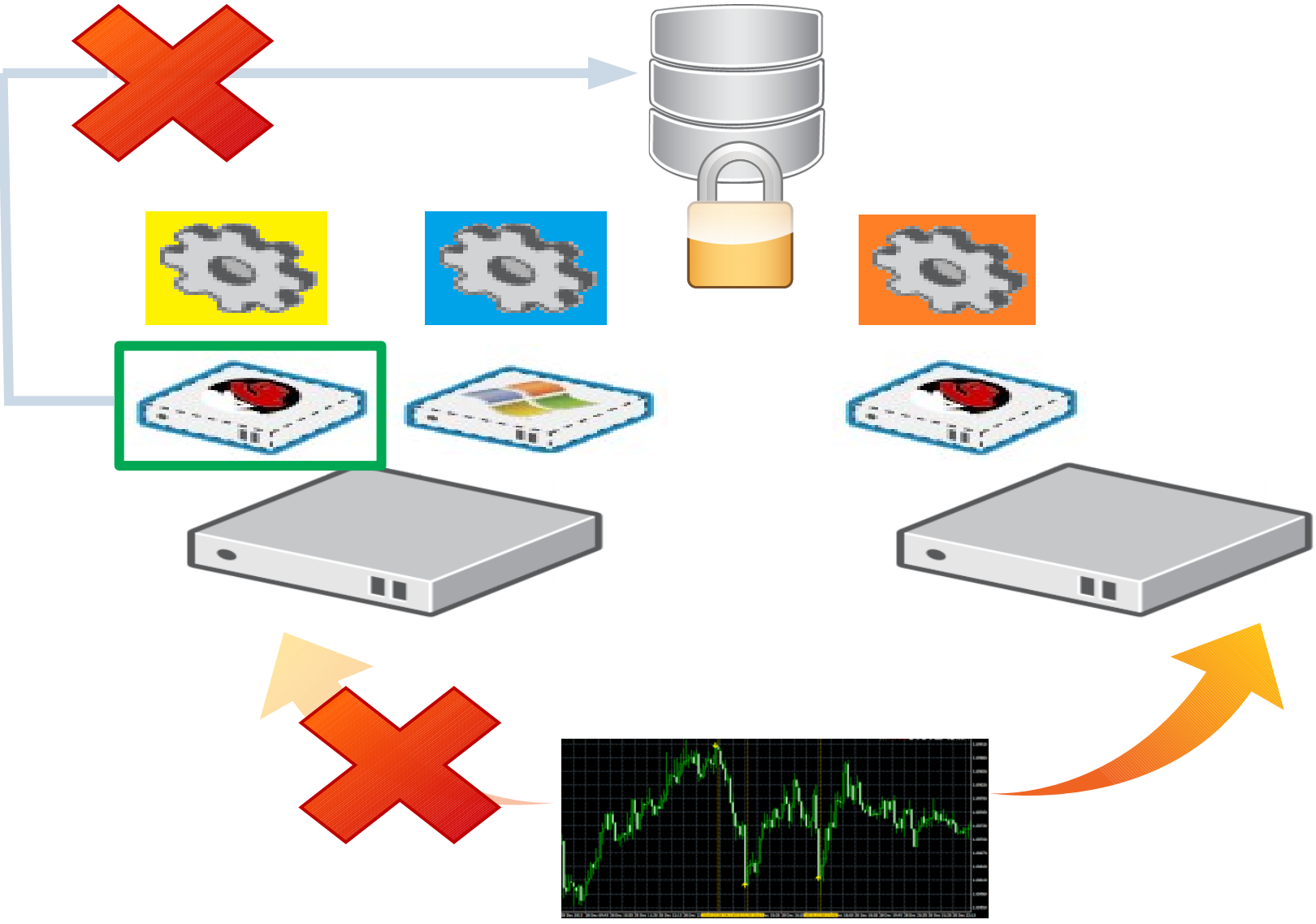
Non-Responsive Host + VM is UP



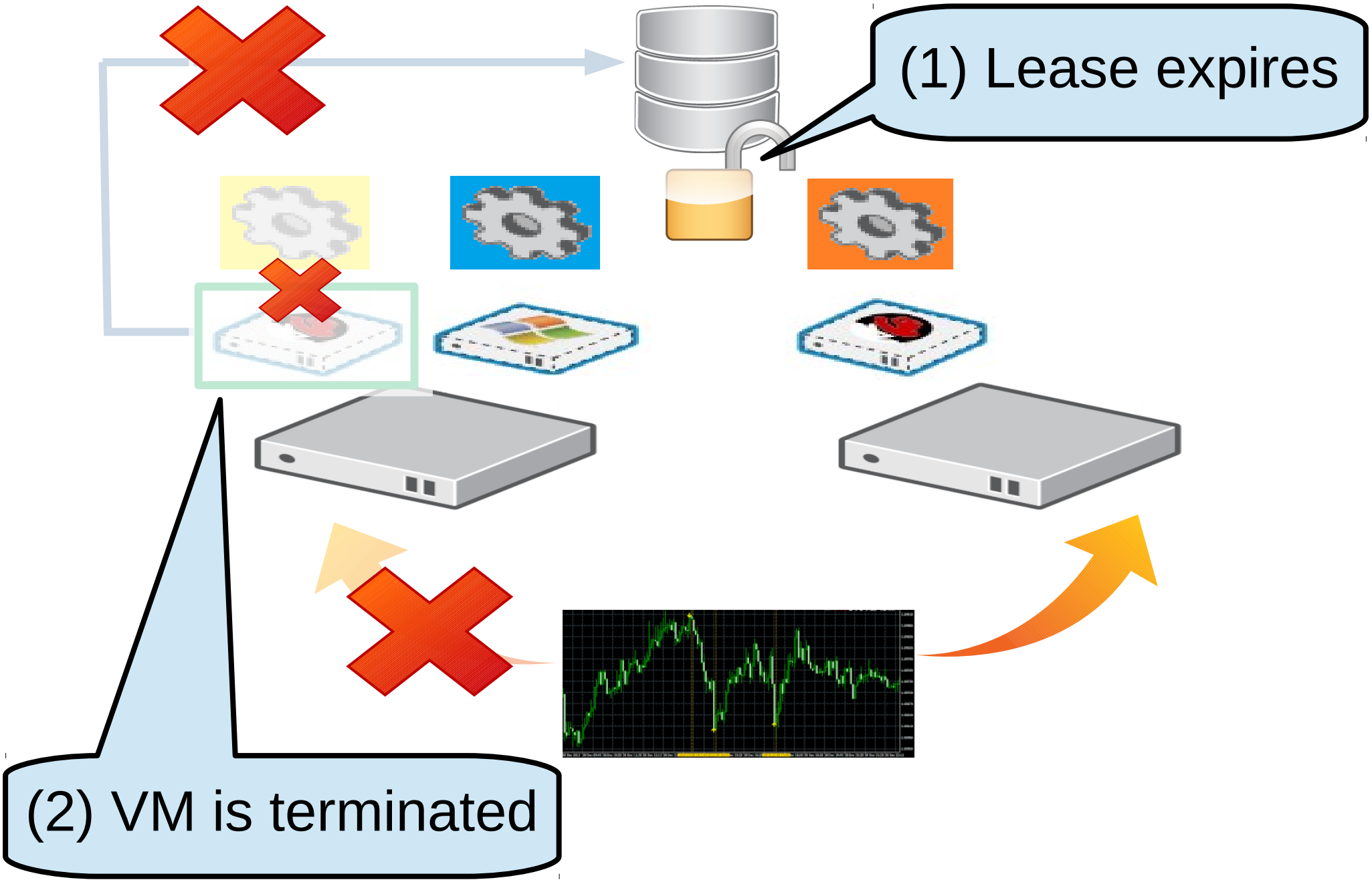
oVirt Non-Responsive Host + VM is UP



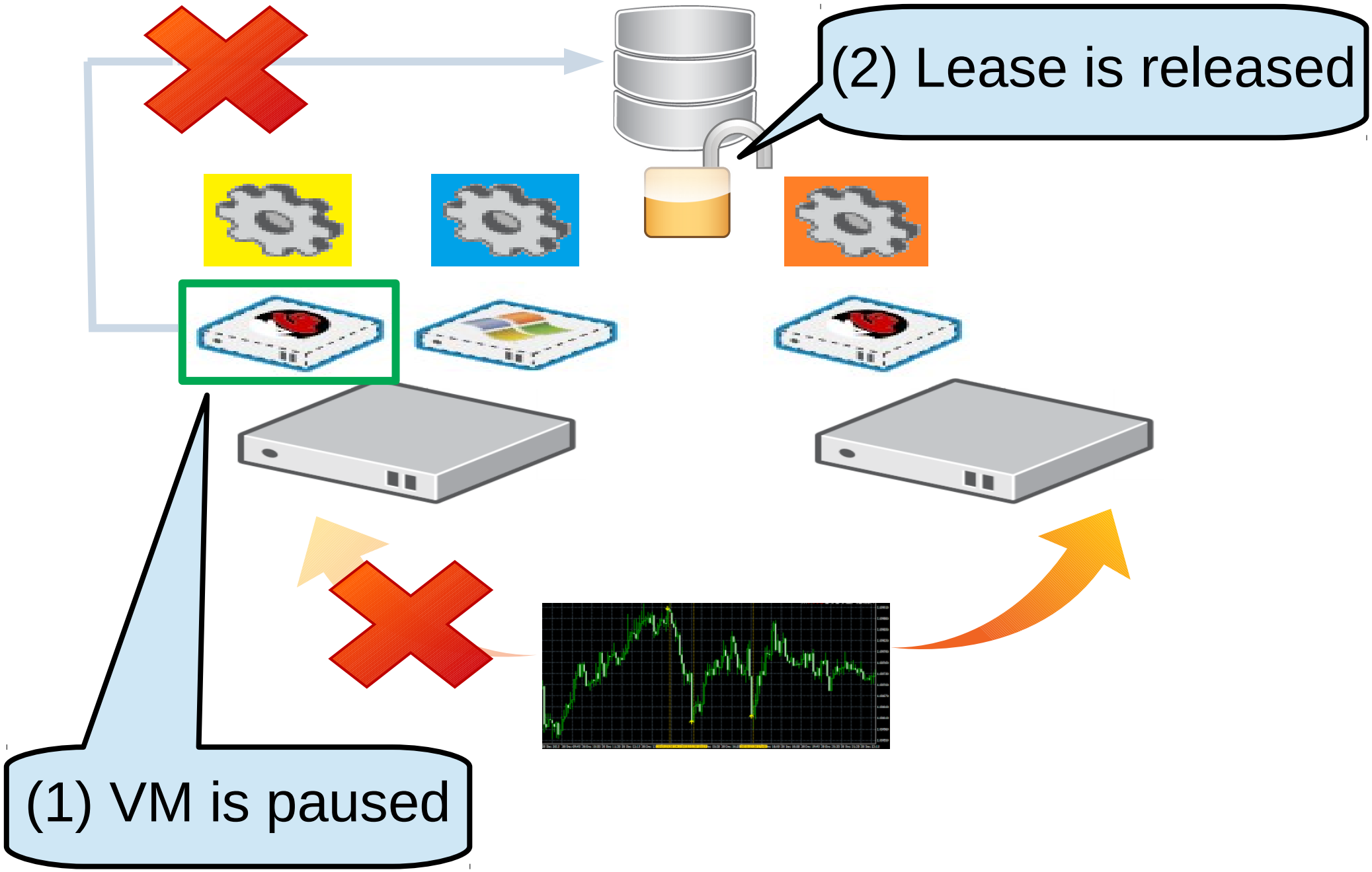
oVirt Disconnected Host + VM is UP



oVirt Disconnected Host + VM is UP (1)



oVirt Disconnected Host + VM is UP (2)



Summary

- VM Lease – an important new element
  - Prevents split-brains
  - Enables automatic restart of unreported VMs
- Available since oVirt 4.1
  - Polished in oVirt 4.2
- Future: may be used to restart paused VMs

THANK YOU!

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ahadas@irc.oftc.net#ovirt