Oracle Database Consolidation
It's not all about Oracle database 12c!

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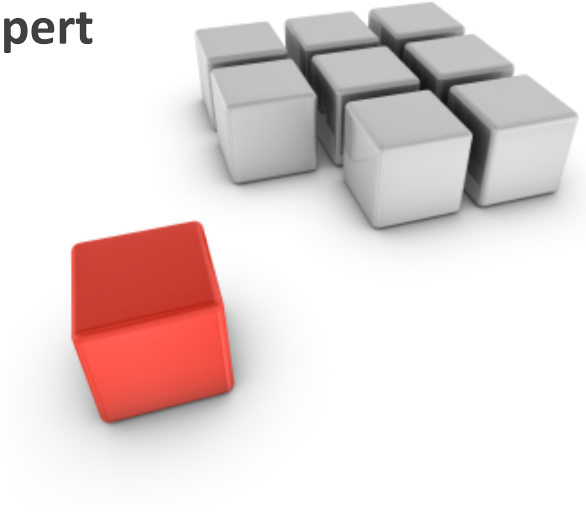

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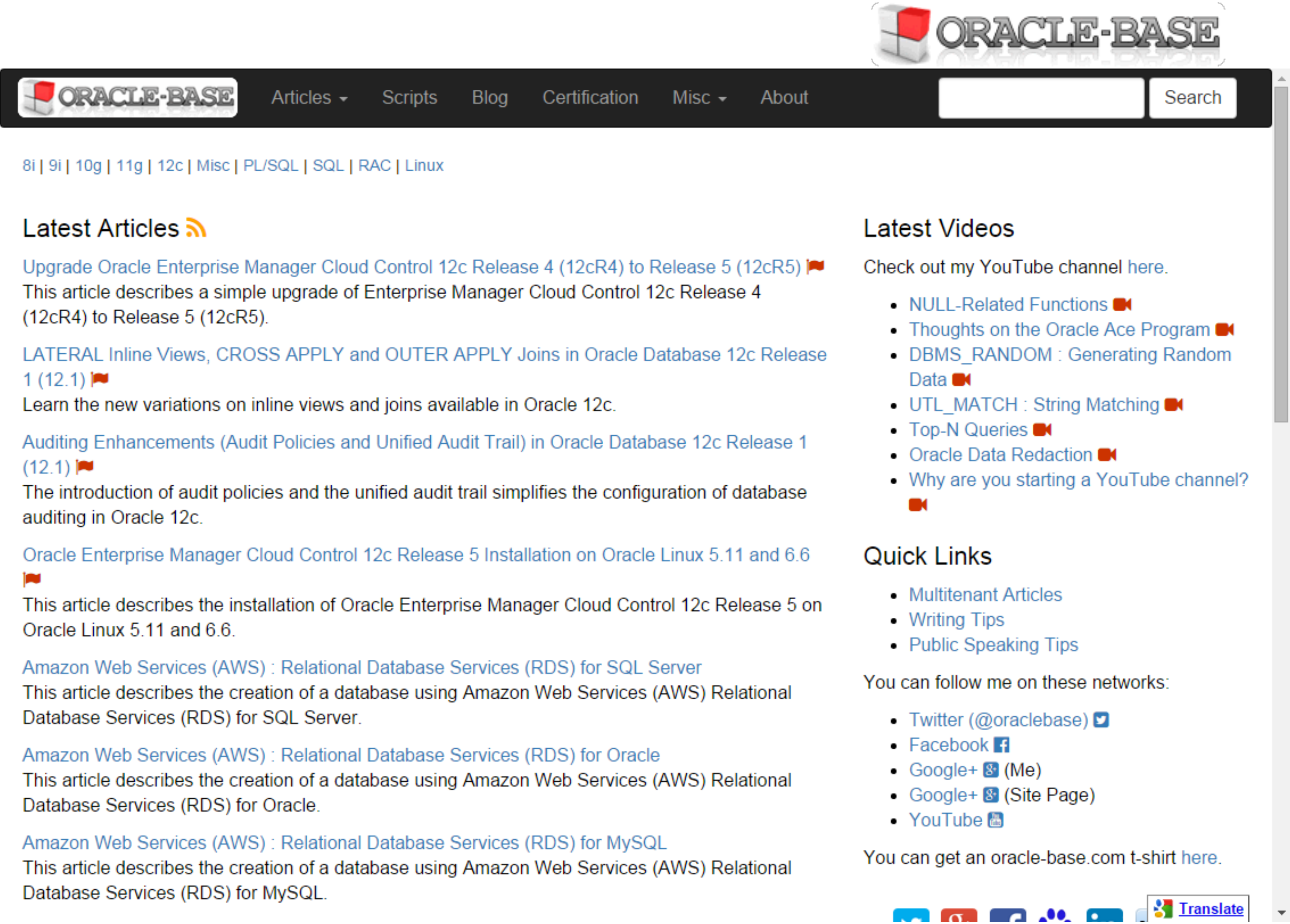

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Learn the new variations on inline views and joins available in Oracle 12c.

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This article describes the creation of a database using Amazon Web Services (AWS) Relational Database Services (RDS) for Oracle.

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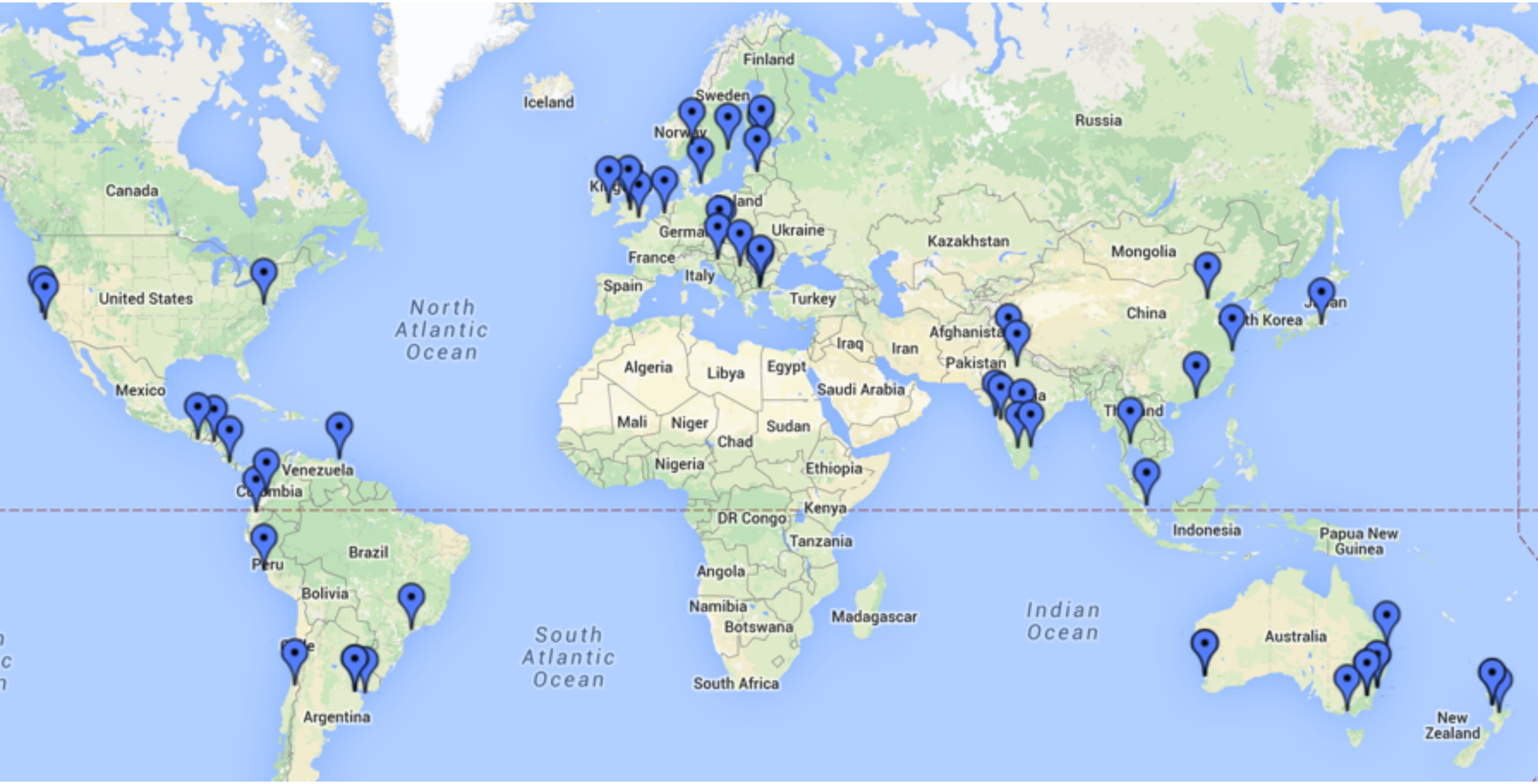
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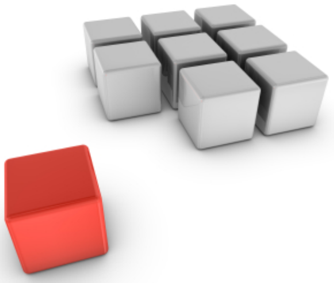
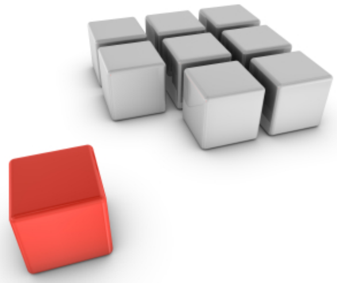
Agenda

- Basic Resource Consolidation
- Virtualization
- Containers
- Multi-Instance
- Schema Consolidation
- Multitenant Option
- Cloud?

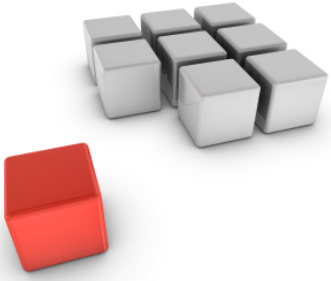


Basic Resource Consolidation

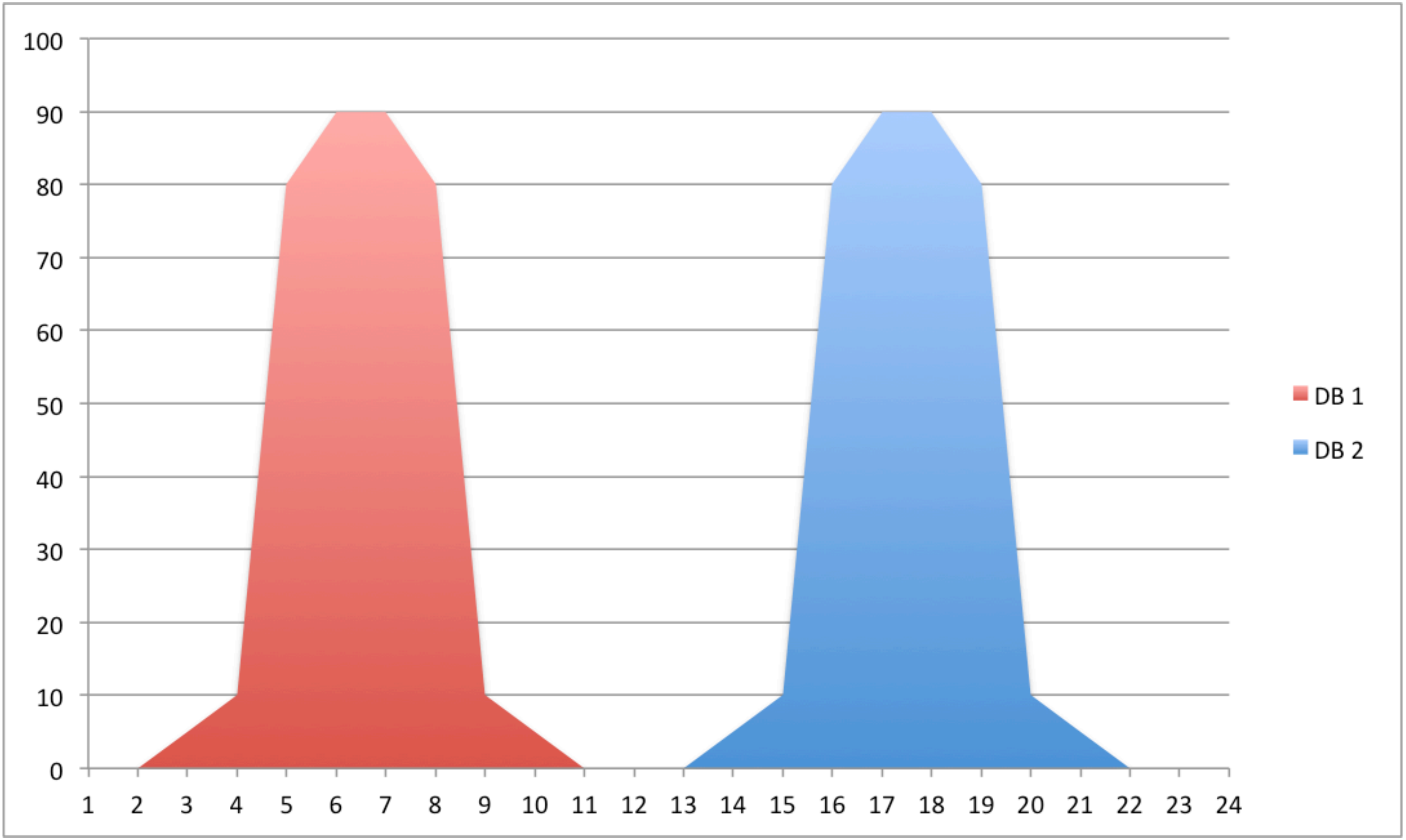


Basic Resource Consolidation

- Is it possible to consolidate your workloads? (CPU, RAM, Disk, Network)
- Do peak loads happen at different times of the day?

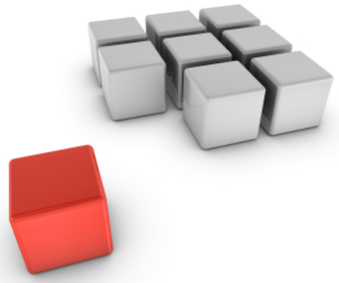


Resource Consolidation

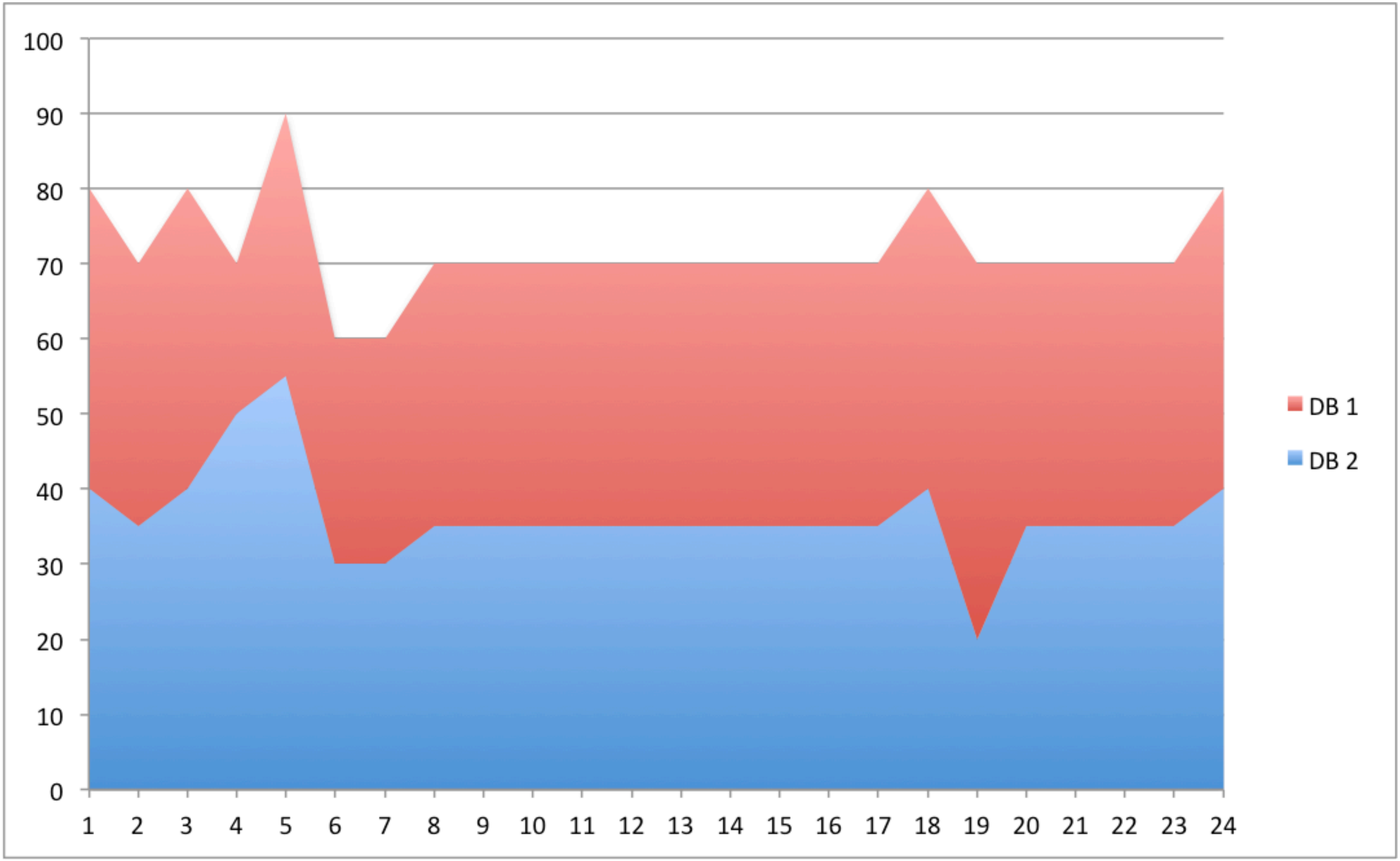


Basic Resource Consolidation

- Is it possible to consolidate your workloads? (CPU, RAM, Disk, Network)
- Do peak loads happen at different times of the day?
- Does combined resource usage stay below 100% during the day?

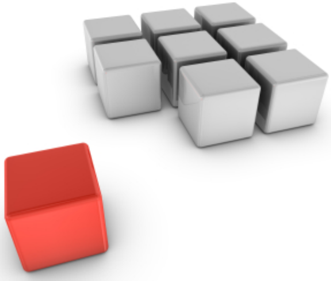


Resource Consolidation

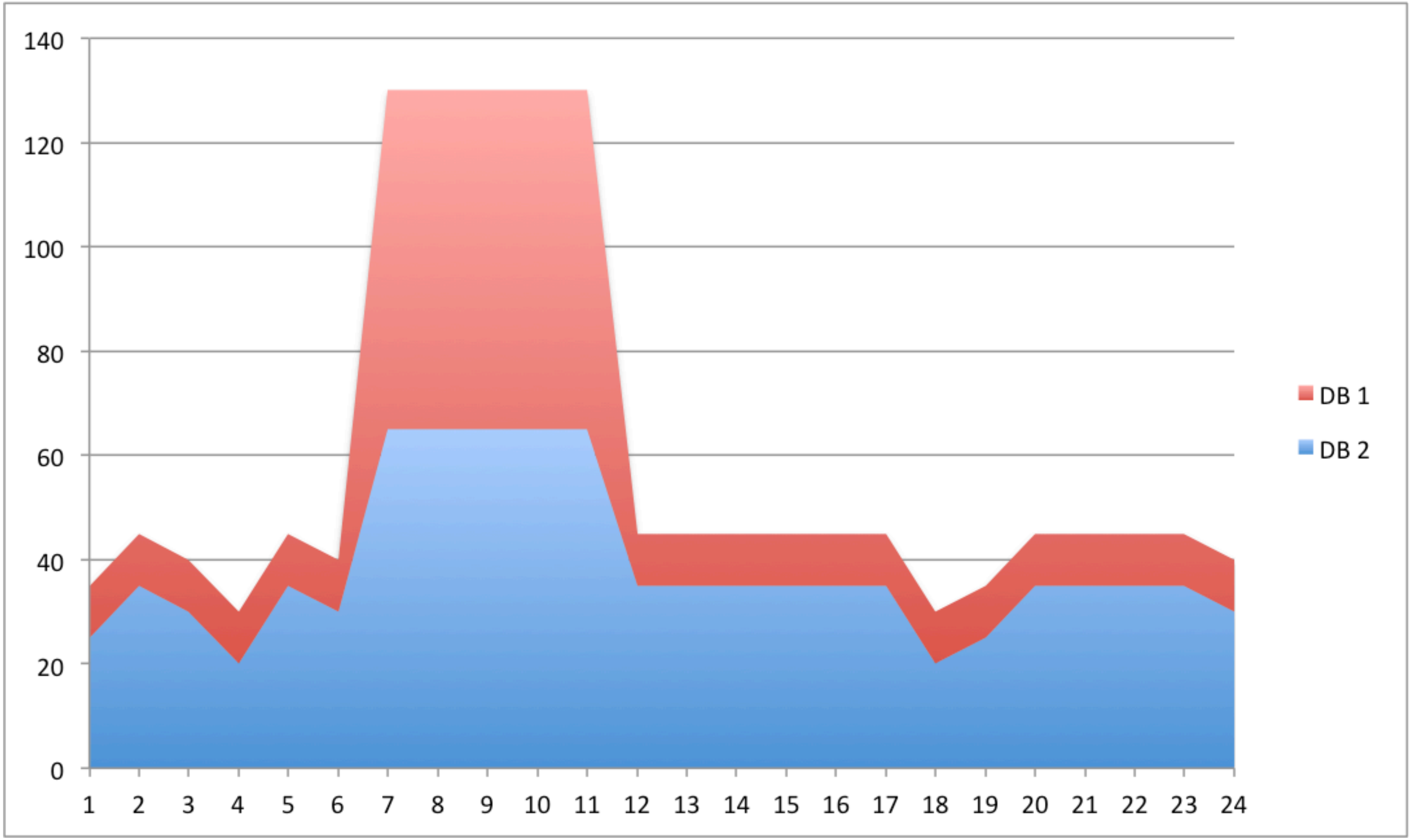


Basic Resource Consolidation

- Is it possible to consolidate your workloads? (CPU, RAM, Disk, Network)
- Do peak loads happen at different times of the day?
- Do continuous loads stay below 100% during the day?
- Do loads combine to take you above 100%?

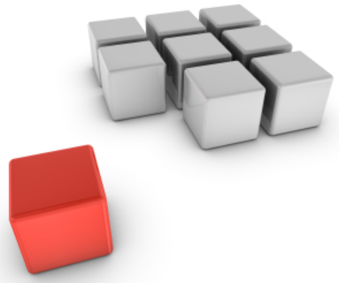


Resource Consolidation

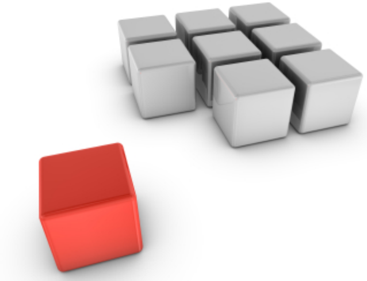


Basic Resource Consolidation

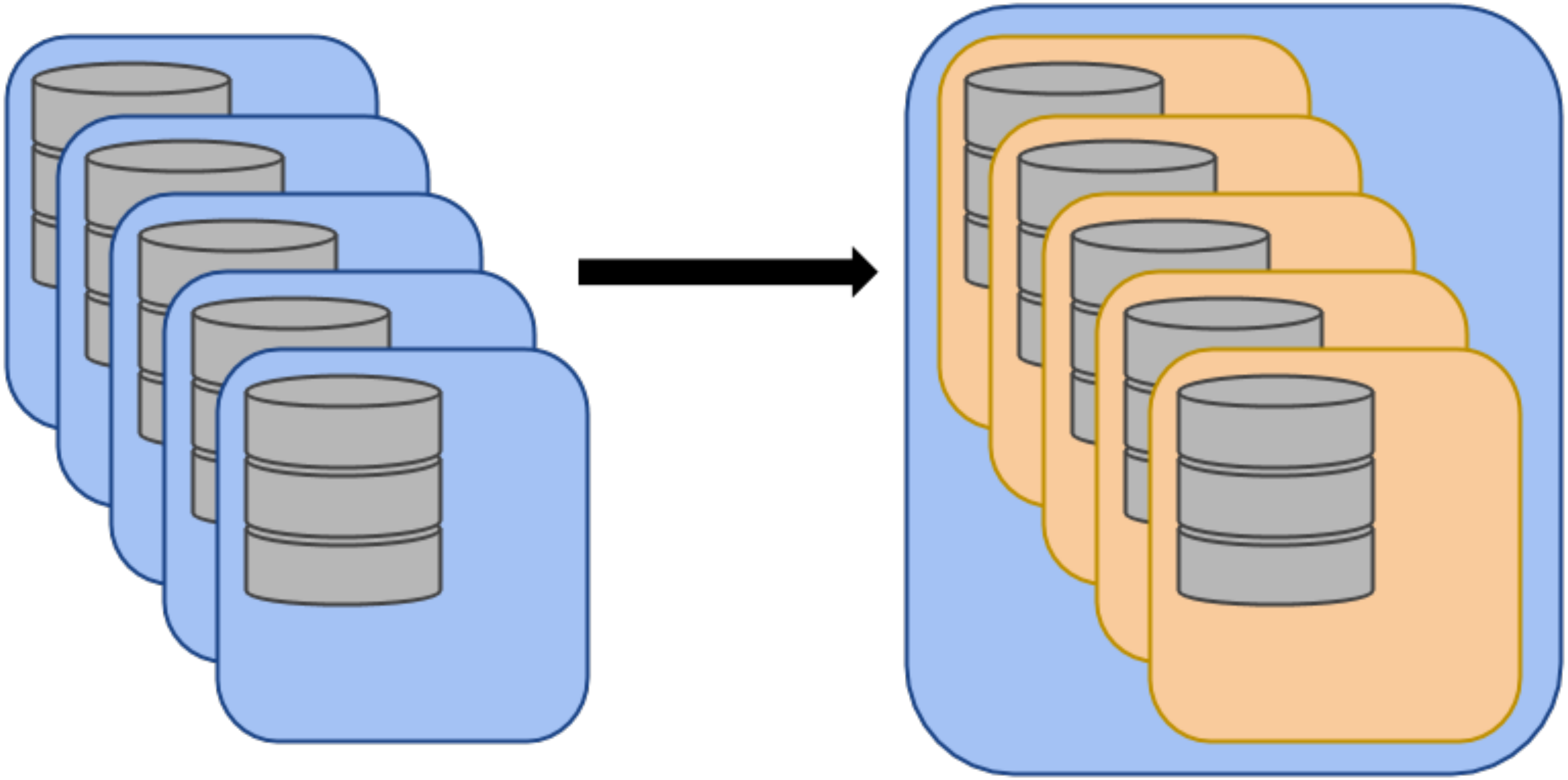
- Is it possible to consolidate your workloads? (CPU, RAM, Disk, Network)
- Do peak loads happen at different times of the day?
- Do continuous loads stay below 100% during the day?
- Do loads combine to take you above 100%?
- Some systems do not consolidate well, so don't try!



Virtualization

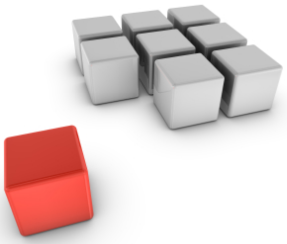


Virtualization



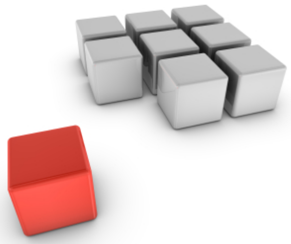
Virtualization : Pros

- Complete separation.
- Allows differing OS versions in each machine.
- Allows differing DB versions in each machine.
- Allows separation of duties if different teams need to control each VM.
- The virtual infrastructure can be used to provide basic high availability (HA) functionality.

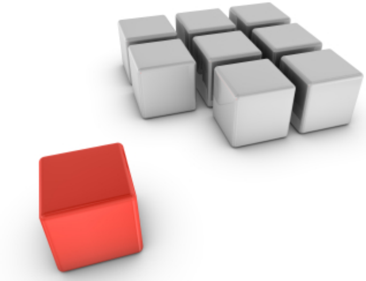


Virtualization : Cons

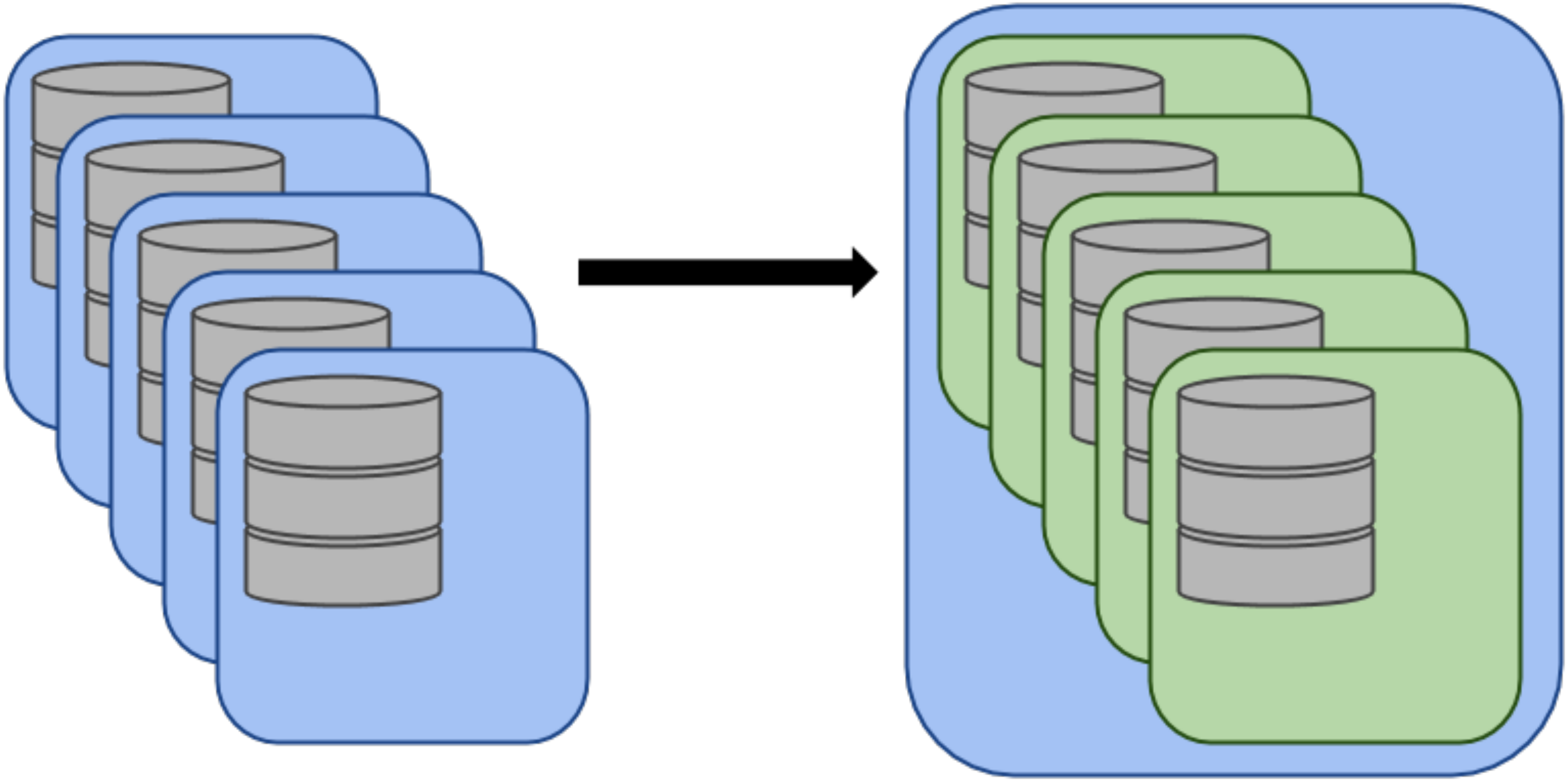
- Overhead associated with running the hypervisor on the hardware.
- Overhead associated with running an entire OS in each VM.
- Each OS has to be patched and monitored separately.
- Overhead of multiple DBs running on a single physical server.
- Each DB has to be patched and monitored separately.
- Who is responsible for learning about and maintaining it?
- Licensing and support of the virtualization infrastructure.



Containers

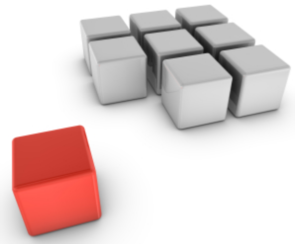


Containers



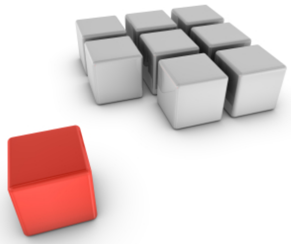
Containers : Pros

- Reduced overhead as only one OS is running on the physical hardware.
- Reduced OS patching as the OS is shared between all the containers.
- Some separation, making each container "feel" like a separate installations.
- With a separate Oracle installation in each container, each database could run at a different database version if required.
- The container functionality can be used to provide basic high availability (HA) functionality.

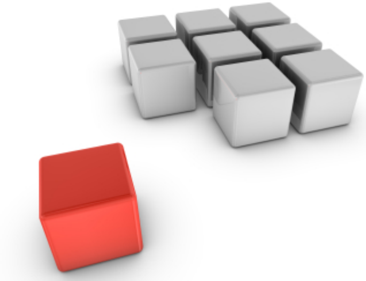


Containers : Cons

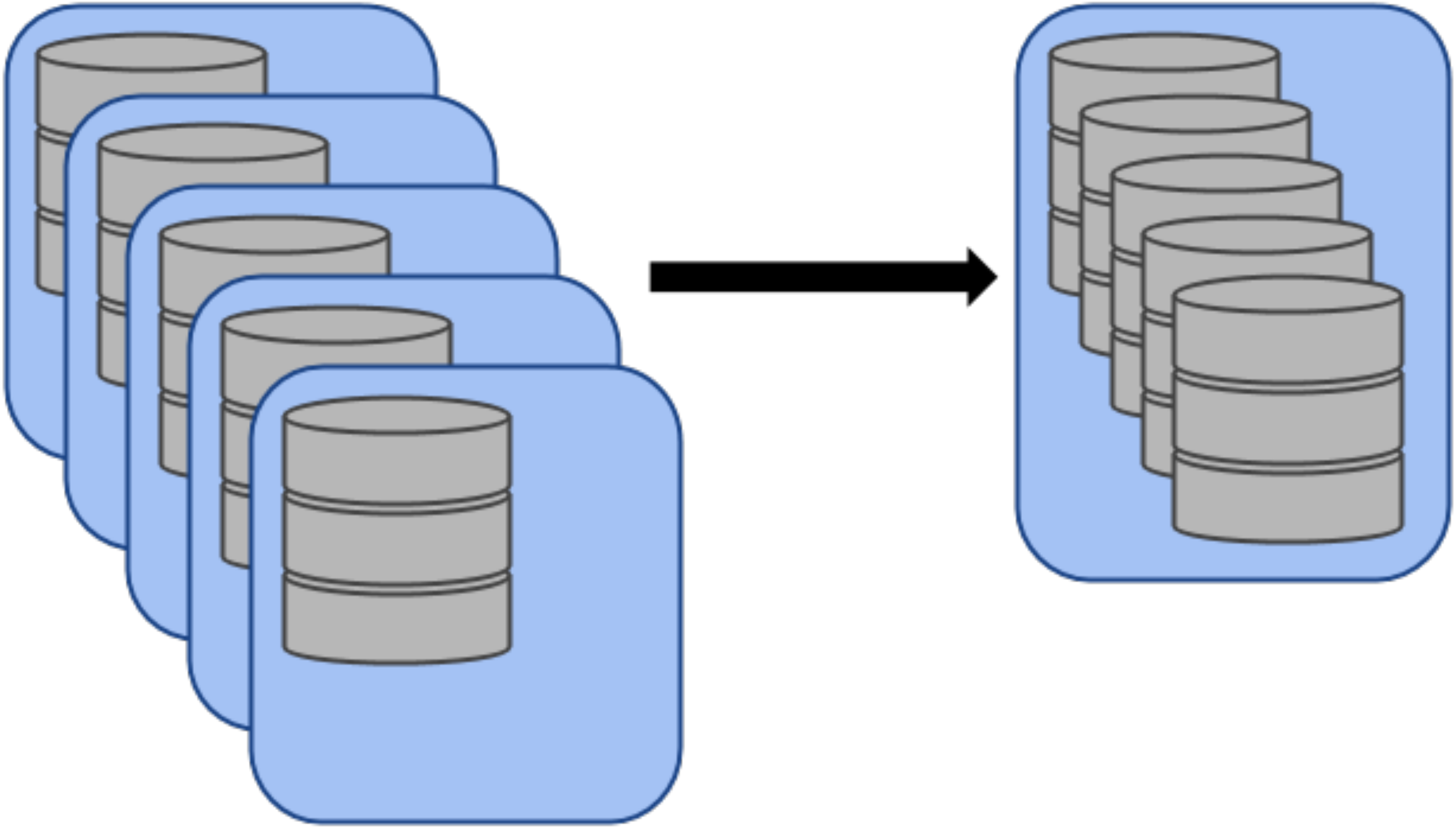
- Containers do not provide complete separation.
- The lack of complete separation means there may be security implications where containers are concerned.
- Operating system patches affect all containers.
- Who is responsible for learning about and maintaining it?
- Overhead of multiple DBs running on a single physical server.
- Each DB has to be patched and monitored separately.
- Licensing and support of the container feature. Not all container solutions are supported to run Oracle products.



Multi-Instance

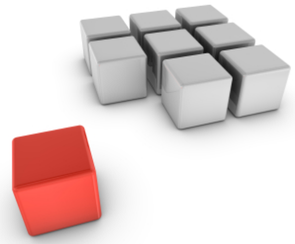


Multi-Instance



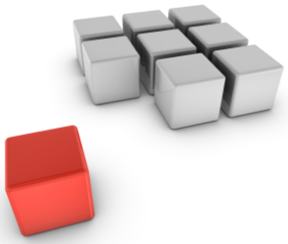
Multi-Instance : Pros

- Reduced overhead as only one OS is running.
- Reduced OS patching as the OS is shared between all the instances.
- Can share a single Oracle installation, or have a separate Oracle installation per database, allowing each database to run at a different database version if required.
- No additional cost or knowledge needed to support a containers or virtualization.
- Depending on the setup, patching and monitoring may be simplified. At a minimum, we may only need a single Oracle installation and a single Cloud Control agent on the server.

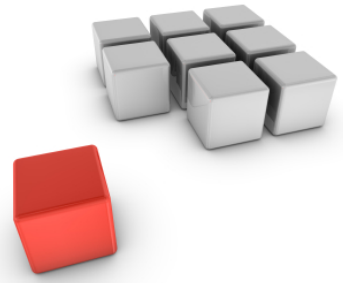


Multi-Instance : Cons

- No separation.
- The lack of complete separation means there may be security implications.
- Operating system patches affect all instances.
- Overhead of multiple DBs running on a single physical server.
- If you are using multiple Oracle installations, they will all have to be patched separately. If you are using a shared installation, all databases must be kept at the same version.
- Does not provide any High Availability (HA) functionality directly, but Data Guard and Real Application Clusters (RAC) can provide this at an extra cost.



Multi-Instance Tips



Multi-Instance : Instance Caging

- Limit CPU for an instance using Instance Caging.

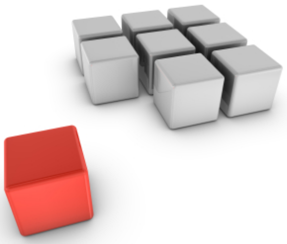
- Set CPU_COUNT for each instance.

```
ALTER SYSTEM SET cpu_count = 2;
```

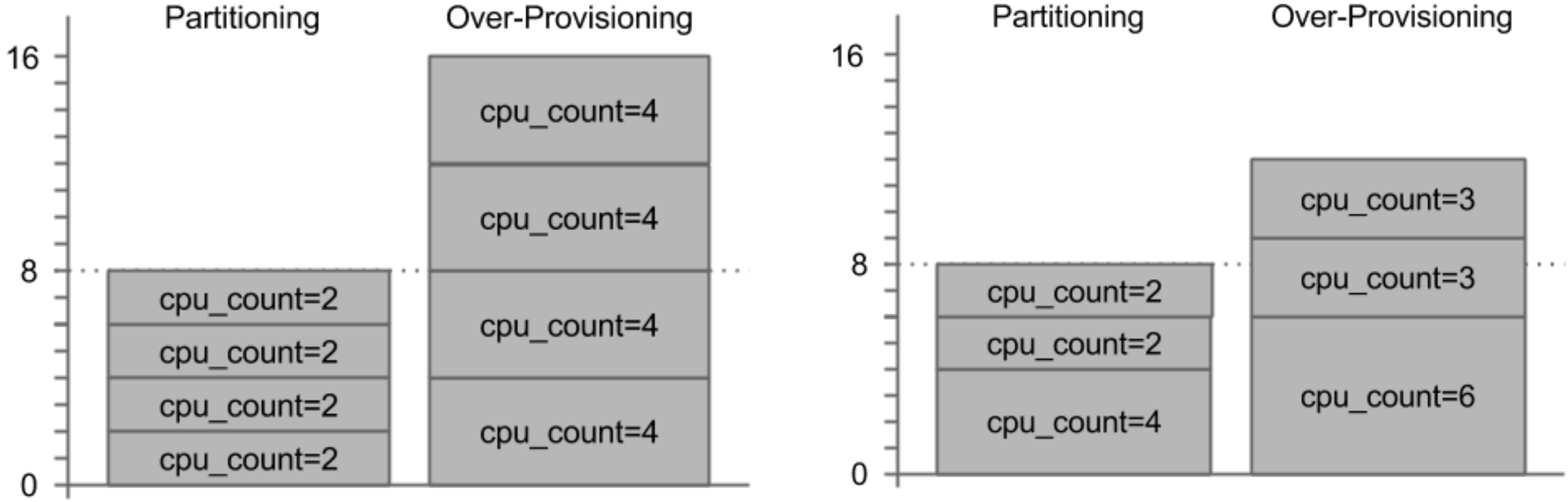
- Must have a Resource Manager resource plan assigned for this to work.

- Using the default plan is fine.

```
ALTER SYSTEM SET RESOURCE_MANAGER_PLAN = default_plan;
```



Instance Caging : Over-Provisioning



Multi-Instance : Multithreaded Model

- Oracle on UNIX/Linux is multi-process by default.

```
$ ps -ef | grep [o]ra_oracle
   15356     1  0 10:53 ?        00:00:00 ora_pmon_db12coracle
   15358     1  0 10:53 ?        00:00:00 ora_psp0_db12coracle
   15360     1  8 10:53 ?        00:01:27 ora_vktm_db12coracle
   15364     1  0 10:53 ?        00:00:00 ora_gen0_db12coracle
   15366     1  0 10:53 ?        00:00:00 ora_mman_db12coracle
   15370     1  0 10:53 ?        00:00:00 ora_diag_db12coracle
   15372     1  0 10:53 ?        00:00:00 ora_dbrm_db12coracle
   15374     1  0 10:53 ?        00:00:00 ora_dia0_db12coracle
   15376     1  0 10:53 ?        00:00:00 ora_dbw0_db12coracle
   15378     1  0 10:53 ?        00:00:00 ora_lgwr_db12coracle
   15380     1  0 10:53 ?        00:00:00 ora_ckpt_db12coracle
   15382     1  0 10:53 ?        00:00:00 ora_smon_db12coracle
   15384     1  0 10:53 ?        00:00:00 ora_reco_db12coracle
   15386     1  0 10:53 ?        00:00:00 ora_lreg_db12coracle
   15388     1  0 10:53 ?        00:00:03 ora_mmon_db12coracle
   15390     1  0 10:53 ?        00:00:00 ora_mmnl_db12coracle
   15392     1  0 10:53 ?        00:00:00 ora_d000_db12coracle
   15394     1  0 10:53 ?        00:00:00 ora_s000_db12coracle
   15407     1  0 10:54 ?        00:00:00 ora_tmon_db12coracle
   15409     1  0 10:54 ?        00:00:00 ora_tt00_db12coracle
   15411     1  0 10:54 ?        00:00:00 ora_smco_db12coracle
   15413     1  0 10:54 ?        00:00:00 ora_fbda_db12coracle
   15415     1  0 10:54 ?        00:00:00 ora_aqpc_db12coracle
...
```

Multi-Instance : Multithreaded Model

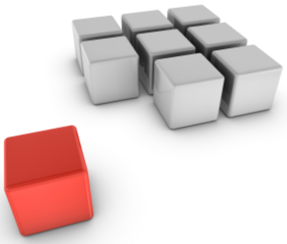
- In 12c you can make it multi-threaded (like Oracle on Windows).

```
CONN sys AS SYSDBA
ALTER SYSTEM SET threaded_execution=TRUE SCOPE=SPFILE;
SHUTDOWN IMMEDIATE;
STARTUP;
```

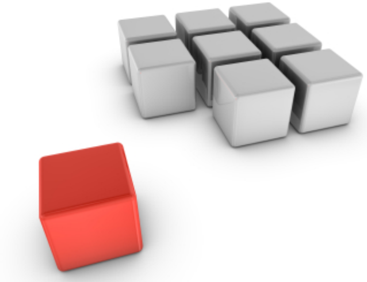
- The number of processes per instance is greatly reduced.

```
$ ps -ef | grep [o]ra_oracle
   15839     1  0 11:26 ?        00:00:00 ora_pmon_db12coracle
   15841     1  0 11:26 ?        00:00:00 ora_psp0_db12coracle
   15843     1  8 11:26 ?        00:00:03 ora_vktm_db12coracle
   15847     1  0 11:26 ?        00:00:00 ora_u004_db12coracle
   15853     1 34 11:26 ?        00:00:13 ora_u005_db12coracle
   15859     1  0 11:26 ?        00:00:00 ora_dbw0_db12c
$
```

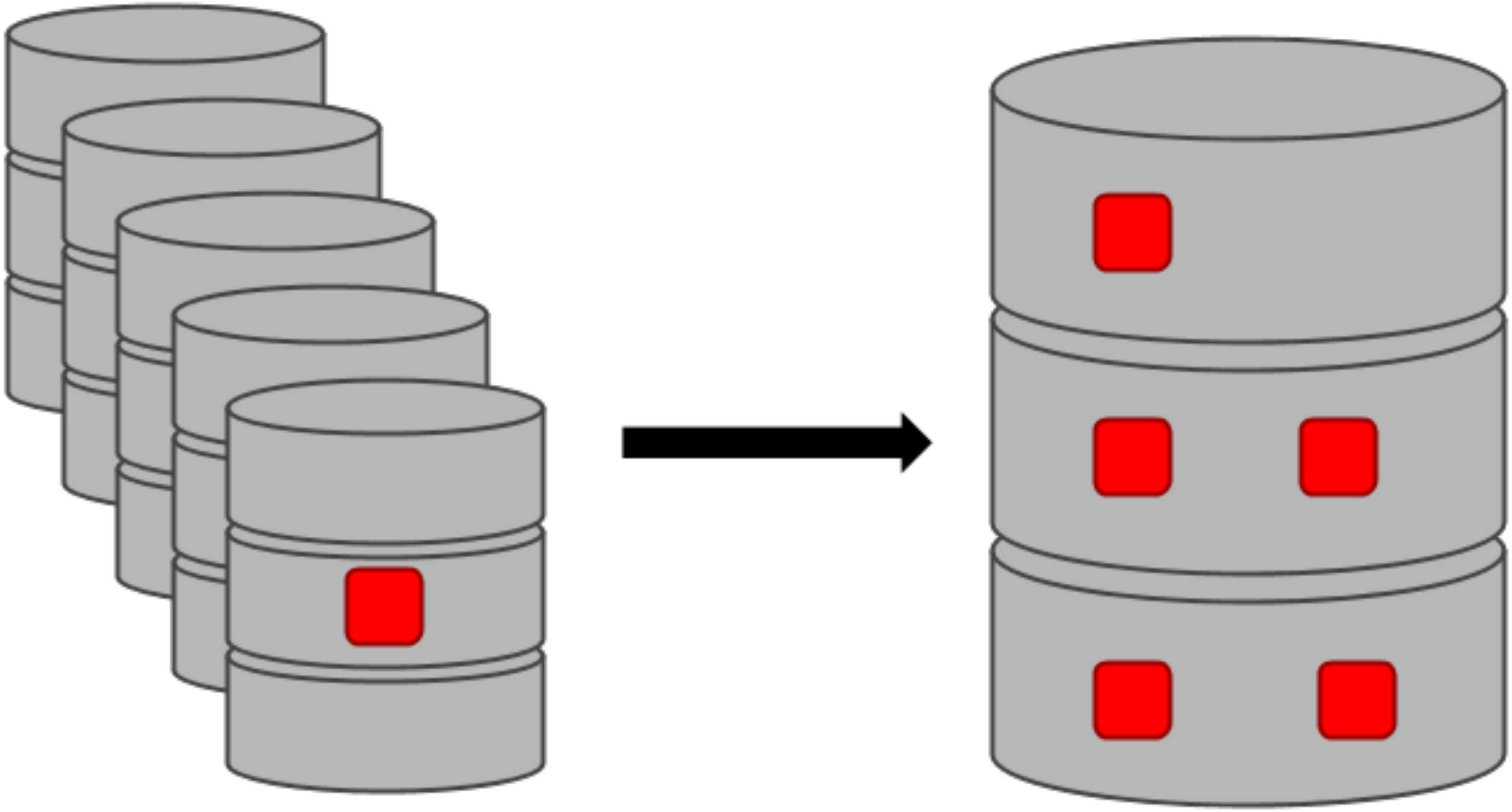
- Oracle can prioritise threads better than the OS can processes.



Schema Consolidation

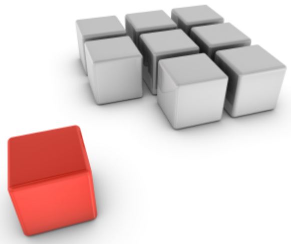


Schema Consolidation



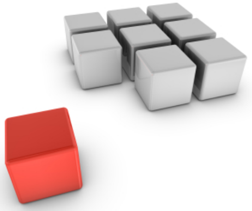
Schema Consolidation : Pros

- Reduced overhead as only one OS is running.
- Reduced overhead as only one DB instance is running.
- Only a single database installation is present.
- No additional cost and knowledge needed to support a containers or virtualization.
- Depending on the setup, patching and monitoring may be simplified. At a minimum, we may only need a single Oracle installation and a single Cloud Control agent on the server.

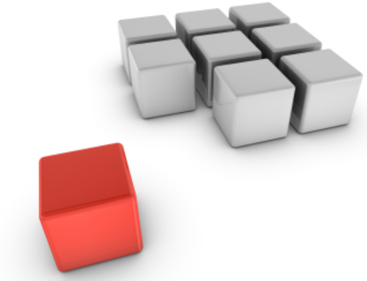


Schema Consolidation : Cons

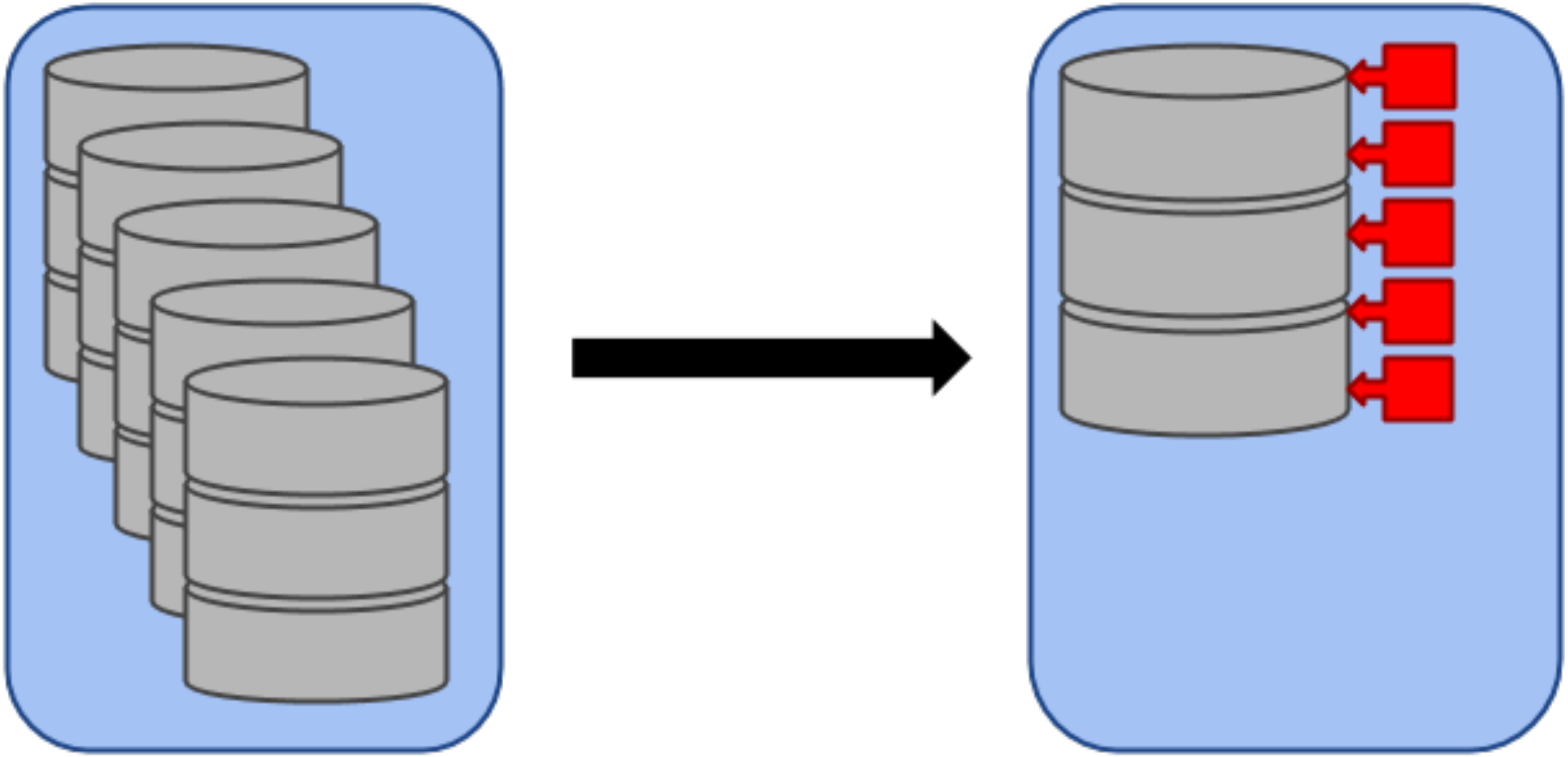
- No separation, making it harder prioritise performance of specific schemas. Resource Manager can't control memory usage.
- The lack of complete separation means there may be security implications.
- Operating system patches affect all applications.
- Database patches affect all applications.
- Instance level changes affect all applications.
- Database recovery and flashback have to be planned carefully as all top-level operations affect all schemas. This can be mitigated using tablespace point in time recovery (PITR).



Multitenant Option



Multitenant Option



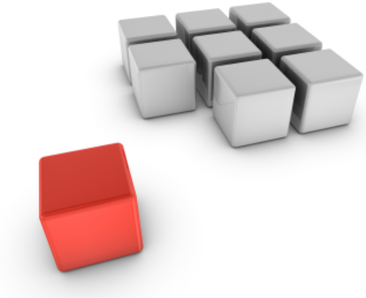
Multitenant Option : Pros

- Reduced overhead as only one OS is running.
- Reduced overhead as only one DB instance is running.
- Only a single database installation is present.
- No additional cost or knowledge needed to support a containers or virtualization.
- Depending on the setup, patching and monitoring may be simplified. At a minimum, we may only need a single Oracle installation and a single Cloud Control agent on the server.

Multitenant Option : Cons

- The multitenant option is a chargeable Enterprise Edition option.
- No separation, making it harder prioritise performance of specific schemas. Resource Manager can not control memory usage.
- The lack of complete separation means there may be security implications.
- Operating system patches affect all applications.
- Database patches affect all applications. This can be mitigated by using the unplug/plugin approach to patches and upgrades.
- Instance level changes affect all applications. Some initialization parameters are PDB-specific.
- Database recovery and flashback have to be planned carefully as all top-level operations affect all pluggable databases. This can be mitigated using PDB point in time recovery (PITR).

Cloud?

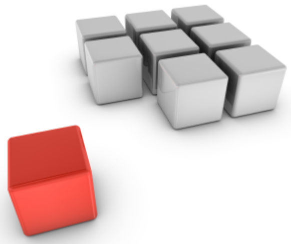


Cloud?

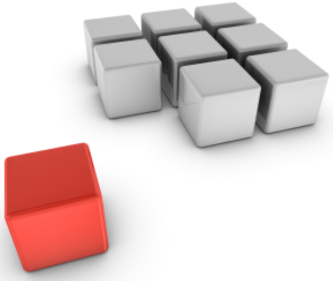
- Do you event care about consolidation?

- Virtual Machine:
  - Multi-instance
  - Schema consolidation
  - Multitenant Option

- Database as a Service (DBaaS):
  - Schema Consolidation
  - Multitenant Option?

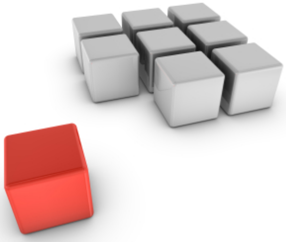


Conclusion



Conclusion

- There is no single “best” solution for consolidation.
- You will probably use a mix-and-match approach.
- Pick what works for you!



The End…

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- **Questions?**