

Eco4Cloud - VMware DRS/DPM Comparison



AT A GLANCE

Eco4Cloud is an innovative and very effective solution to optimize the consolidation of virtual machines and cut 30-60% (measured!) the energy bill of highly-virtualized/large-scale data centers. Eco4Cloud computes residual capacity estimation, additional capacity requirements, optimal resources relocation, disposal and refresh.

What is Eco4Cloud?

It's an innovative platform which consolidates the max number of virtual machines on the min number of physical servers in a data center, enabling the switch-off/hibernation of those freed-up, making them dynamically available as additional capacity for incremental workloads. Based on the insights and real-time monitoring analytics of critical system parameters (e.g. CPU load, memory usage, bandwidth saturation, temperature, storage occupancy), DC Managers can proactively/predictively prevent SLA violations. Eco4Cloud is fully aware of high availability needs, in fact it interacts with load balancing systems offered by virtualization layer, e.g. inheriting affinity and anti-affinity rules set in the virtualization platforms.

How Does Eco4Cloud Work?

Eco4Cloud adopts a distributed and self-organizing algorithm to consolidate VMs on the minimum number of servers in real time, so as to achieve energy and cost savings. The consolidation problem is very complex (NP) when approached in a centralized fashion and the solutions/techniques commonly available today are semi-manual, extremely complex, poorly adaptive and not scalable. Eco4Cloud is scalable because it adopts a self-organizing/probabilistic approach, which decentralizes most of the intelligence to single servers. Furthermore, its behavior is transparent and users can dynamically select among manual/semi-automatic/automatic modes.



VMware DRS/DPM

AT A GLANCE

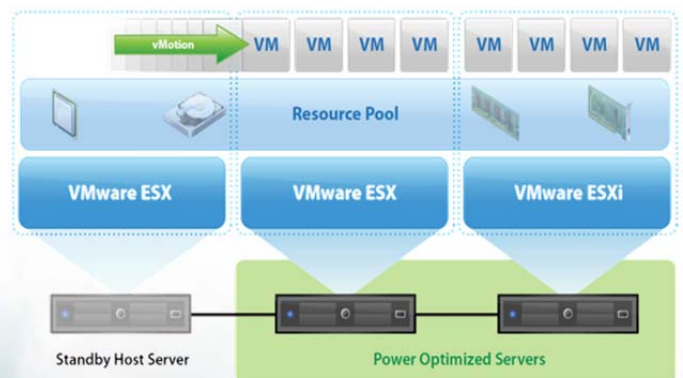
VMware® Distributed Resource Scheduler (DRS) aggregates computing capacity across a set of servers into logical resource pools and intelligently allocates available resources among the VMs based on pre-defined rules. VMware Distributed Power Management (DPM), included with VMware DRS, automates power management and minimizes power consumption across the collection of servers in a VMware DRS cluster.

What is VMware DRS/DPM?

VMware DRS dynamically balances computing capacity across a collection of hardware resources aggregated into logical resource pools, continuously monitoring utilization across resource pools and intelligently allocating available resources among the virtual machines based on pre-defined rules that reflect business needs and changing priorities. VMware DPM monitors resource requirements in a VMware DRS cluster and consolidates workloads during periods of low usage to reduce power consumption. When resource requirements increase, VMware DPM brings powered-down hosts back online.

How Does VMware DRS/DPM Work?

VMware® DRS aggregates computing capacity across a collection of servers into logical resource pools and intelligently allocates available resources among the virtual machines based on pre-defined rules that reflect business needs and changing priorities. VMware DPM makes recommendations or decisions to power off or power on hosts to save energy. These recommendations are based on a comparison of the available capacity in a DRS cluster against resource requirements of virtual machines plus some administrator defined buffer capacity requirements.




Key points

The objective of **VMware DRS** (Distributed Resource Scheduler) is load balancing, i.e. spread the workload across a number of servers, and prevent situations in which some servers are underutilized and others are overloaded. Load balancing is a desired characteristics of classical parallel/distributed systems. However, in a **data center** scenario, load balancing is not well combined with energy saving, which is obtained through **consolidation**, i.e., assign the workload – the virtual machines – to the minimum number of servers. After consolidation, unloaded and unutilized servers can be switched off after consolidation (which enables energy saving), or devoted to accommodate additional workload (which increases the system efficiency and indirectly saves energy as well). Energy saving is not obtained through load balancing, but with consolidation. Energy saving is not the purpose of DRS.

The objective of **VMware DPM** (Distributed Power Management) is workload consolidation. DPM “makes recommendations or decisions to power off hosts to save energy”. DPM is an optional tool included in DRS. Unfortunately, the goals of DRS and DPM are opposite (spread workload vs. consolidate workload), and DPM actually works by forcing DRS to revert its normal operation. In actual facts, the decisions taken by DPM are not transparent and are not well understood by data center administrators, most probably due to the non natural combination of DPM and DRS objectives. As far as we know, adoption of DPM in data centers is scarce, which leaves room to the adoption of high level tools that operate on top of VMware (and on top of other virtualization platforms as well) and ensure energy saving through workload consolidation.

Here comes **Eco4Cloud!**

😊	☹️		VMware DPM
Energy Saving	Eco4Cloud reduces energy consumption (among 30% and 60%) by improving computational efficiency and consolidating the workload.	VMware DPM reduces energy consumption by switching off servers in accordance to a predefined order.	
Virtual Machines Consolidation	Eco4Cloud adopts a distributed and self-organizing algorithm to consolidate VMs on the minimum number of servers in real time, so as to achieve energy and cost savings.	DPM is a tool included in the VMware DRS package. The DPM objective is workload consolidation, but the inclusion within DRS is troublesome, as the objective of DRS, load balancing, is opposed to consolidation.	
Scalability	The consolidation problem is very complex (NP) when approached in a centralized fashion. Eco4Cloud is scalable because it adopts a self-organizing/probabilistic approach, which decentralizes most of the intelligence to single servers.	DPM is poorly scalable because it adopts a classical centralized approach. Servers are ordered according to a number of parameters and they are switched off according to that order. This procedure is not efficient in data centers with a large number of servers.	
Controlled behavior	Eco4Cloud behavior is transparent and users can dynamically select among manual/semi-automatic/automatic modes.	DPM does not allow the user to control and monitor the distribution of the workload. It is our evidence that VMware users generally prefer not to activate DPM at all because its behavior is not clear and it is not controllable/configurable.	
Heterogeneous hypervisors support	Eco4Cloud works on top of any virtualization platform: VMware, Microsoft HyperV, KVM etc.	DPM only works in top of the VMware platform.	
Inter-Cloud Management	Eco4Cloud has patented an algorithm for the efficient management of workload in geographical data centers. The inter-cloud algorithm combines intra-cloud consolidation with optimal distribution of workload among remote data centers. Objectives may be specialized for specific deployments: inter-cloud load balancing, reduction of costs, consumed energy and carbon emissions, etc.	DPM consolidates the workload only within a single data center.	