Container adoption is growing, and Kubernetes is becoming the de facto standard of container management platforms. Whether container adoption occurs on-premises, in public clouds, or both, the operational overhead is enormous. IT administrators cannot foresee computing resource demands of applications, so they must reserve more computing resources for a workload than needed. Managing computing resources and optimizing costs on multiple clouds is a daunting task. Federator.ai, ProphetStor’s Artificial Intelligence for IT Operations (AIOps) platform, provides intelligence to orchestrate container resources on top of VMs (virtual machines) or bare metal, allowing users to operate applications without the need to manage the underlying computing resources.

**Challenges**

Over-provisioned computing resources and the deployment of the incorrect number and/or size of VMs and/or pods are two common issues in a cloud-native environment. Federator.ai addresses these problems by orchestrating resources in multi-cloud environments. As shown in the figure below, Federator.ai optimizes costs for both Day-1 deployment and Day-2 operations. Utilizing metrics from monitoring systems, such as Datadog, Sysdig, and Prometheus, Federator.ai predicts resource consumption dynamically and recommends the right amount of resources for pods, providing a 20 – 70% reduction of wasted resources for a typical workload, as well as preventing under-provisioning of resources for mission-critical workloads. Users can stack up the predicted pod resources to determine the right number and size of VMs to deploy and enable the automatic execution of these recommendations.

With Federator.ai, users no longer need to specify the CPU and memory requests and limits for each container. Federator.ai recommends optimal pod configurations. The direct effect is that the configured resources will accurately and dynamically match the workload. It also effectively reduces occurrences of under-provisioned issues, such as running out of memory.

**The Solution - Federator.ai**

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Federator.ai aims to provide optimal resource planning recommendations that will help enterprises make better decisions. The benefits of Federator.ai include:

### Benefits

**Up to 70% resource savings**

Federator.ai mainly serves to reduce unnecessary spending and increase application service quality for both enterprises and cloud providers. ProphetStor data scientists and engineering teams work together to build the most advanced AIOps solution to reduce resource wastage at different infrastructure layers. With the help of patented prediction technologies, Federator.ai simultaneously reduces spending and delivers necessary performance.

**Increased operational efficiency**

Federator.ai frees users from continuously monitoring Kubernetes / OpenShift cluster or VM cluster utilization and cloud spending. Users also do not need to manually record usage data, calculate optimal configurations, and change configurations based on the calculations. These tasks are routinely accomplished when using Federator.ai.

**Reduced manual configuration time with digital intelligence**

Federator.ai allows users to turn on the optimization engine at any time and let the system do the heavy lifting, automatically provisioning resources when needed. Using the Federator.ai open API, users can re-configure pods with the right values at the right time.

**Fully integrated with leading cloud-monitoring services**

Federator.ai provides analysis and system recommendations based on the correlation between microservices of an application, providing insights about how individual microservices are impacted by external factors that affect the primary workload. This correlation is crucial for preventing over- or under-provisioning of resources.

### Key Features

**Multi-layer workload prediction**

Federator.ai applies multiple analytics tools, such as machine learning and signal processing, to predict resource usage for Kubernetes objects at different levels: clusters, nodes, namespaces, applications, and controllers. The usage predictions are the basis for resource recommendations for these objects. Federator.ai supports both physical and virtual CPU and memory.

**Application-aware recommendations and autoscaling/auto provisioning**

The predicted application resource demand determines the number and size of containers. Federator.ai utilizes resource usage prediction based on workload patterns to recommend the right size and/or the right number of containers, automatically scaling the containers to handle the demands.

**Application correlation and impact analysis**

Federator.ai provides analysis and system recommendations based on the correlation between microservices of an application, providing insights about how individual microservices are impacted by external factors that affect the primary workload. This correlation is crucial for preventing over- or under-provisioning of resources.

**Intelligent cost management**

Federator.ai provides analysis of cost efficiency and cost trends for clusters, cluster nodes, namespaces, and applications based on expected workload. Using this information, Federator.ai makes predictions and recommendations for planning and cost optimization.

**Policy-driven planning of CPU and memory**

Federator.ai plans cluster-wide CPU and memory allocation for different types of applications according to the user-defined policy.

**Continuous recommendations for optimal resource planning**

Federator.ai continuously generates recommendations and learns better with more accumulated metrics data.

**Enterprise-ready**

Federator.ai works seamlessly with any Kubernetes or Red Hat OpenShift-operated environment, providing application lifecycle management based on the operator framework.
### Feature Details and Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
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| **AI-based multi-layer workload predictions** | - Workload predictions for multi-layer Kubernetes resources: clusters, nodes, namespaces, applications, and controllers  
  - Workload predictions for individual VMs and VM clusters  
  - Generate daily, weekly, and monthly workload predictions  
  - Obtain near-immediate prediction results with historical metric data collection |
| **Intelligent recommendations for resource planning** | - Rightsize CPU/memory resource recommendations for Kubernetes clusters, nodes, namespaces, applications, and controllers to reduce waste without compromising performance  
  - Extend resource usage predictions and recommendations for VM nodes and VM clusters  
  - Support application-specific metrics for controllers of Kubernetes applications, such as MongoDB, MySQL, NGINX, RabbitMQ, and Redis |
| **Application correlation and impact analysis** | - Analysis of operational metrics correlation between microservices of an application  
  - Provide insights about how individual microservices are impacted by external factors that affect the primary workload  
  - Intelligent system recommendations based on application workload and the impact to each microservice  
  - Full-stack visibility of application resource utilization and performance |
| **Proactive and application-aware autoscaling** | - Intelligent autoscaling of containers based on workload predictions  
  - Autoscale containers based on application-specific workload metrics and KPIs  
  - Autoscale NGINX ingress upstream services  
  - Autoscale Kafka consumers |
| **Auto provisioning application resources** | - User-defined provisioning policy for automatic adjusting resources allocation for application container and namespaces  
  - Additional headroom adjustments and min/max resource allocation settings  
  - Flexible scheduling options  
  - Downloadable resource provisioning scripts for easy customization and 3rd party integration |
| **CI/CD integration** | - Simple integration to CI/CD pipeline for right-sized container deployment  
  - Sample script for easy Terraform deployment integration |
| **Intelligent cost management** | - Machine-learning-based cost optimization and recommendations for clusters, nodes, namespaces, and applications  
  - Predictive analytics for cost trends of clusters, cluster nodes, namespaces, and applications based on expected workload  
  - Analysis of cost efficiency for better planning and optimization |
| **Multicloud cost analysis** | - Recommend most cost-effective cluster configuration for AWS, Google, Azure, and on-premises  
  - Recommendations based on on-demand, reserved, Spot, and Spot+Reserved instances  
  - Workload prediction-based recommendations for individual VM instances  
  - Custom price book for cost calculation of on-premises deployments  
  - Automatic update of price books from public cloud service |
### Multiple metrics data sources
- Support metrics collected from Prometheus, Datadog, and Sysdig monitoring services for Kubernetes clusters, as well as VMware/vCenter, and AWS CloudWatch for VM clusters

### Open REST API
- Open REST API for resource predictions and recommendations
- Open REST API for cost management and cluster configuration recommendations

### Setup wizard for easy Installation
- Easy installation through Operator framework on Kubernetes and OpenShift
- Support Ansible Playbook installation
- Support installation by Helm charts

### Usage based licensing
- License based on number of resource objects monitored (cluster nodes, namespaces, controllers)
- Free software usage for monitoring up to 10 resource objects

### Easy-to-use UI
- Visualization of resource usages and predictions for multi-layer of Kubernetes resources
- Support monitoring for multiple clusters
- User defined application with controllers from multiple namespaces

### Integration with third party monitoring services
- Single pane of glass management from Datadog, Sysdig monitoring portal with custom dashboards
- Preconfigured Datadog Monitor for under-provisioned resource alerts

### Supported platforms
- Kubernetes v1.11x – v1.22x
- Red Hat OpenShift v4.6-v4.9
- Amazon AWS/EKS
- Google GCP/GKE
- MicroSoft Azure/AKS
- Rancher v2.4.8, v2.5.8, v2.5.9,v2.6.3
- VMware vCenter 5.5, 6.0, 6.5, 6.7, 7.0

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