

## Motivation and Objectives

### Motivation

- Provisioning of multi-cloud resources for scientific workflows
- Loosely coupled integration with cloud management platforms
- Leverage cloud elasticity for autoscaling of scientific workflows driven by workflow execution stage

### Objectives

- Integrate the HyperFlow workflow runtime environment with the PaaSAGE cloud platform
- Application-agnostic interplay of application-specific workflow scheduler with generic provisioning and autoscaling components of PaaSAGE

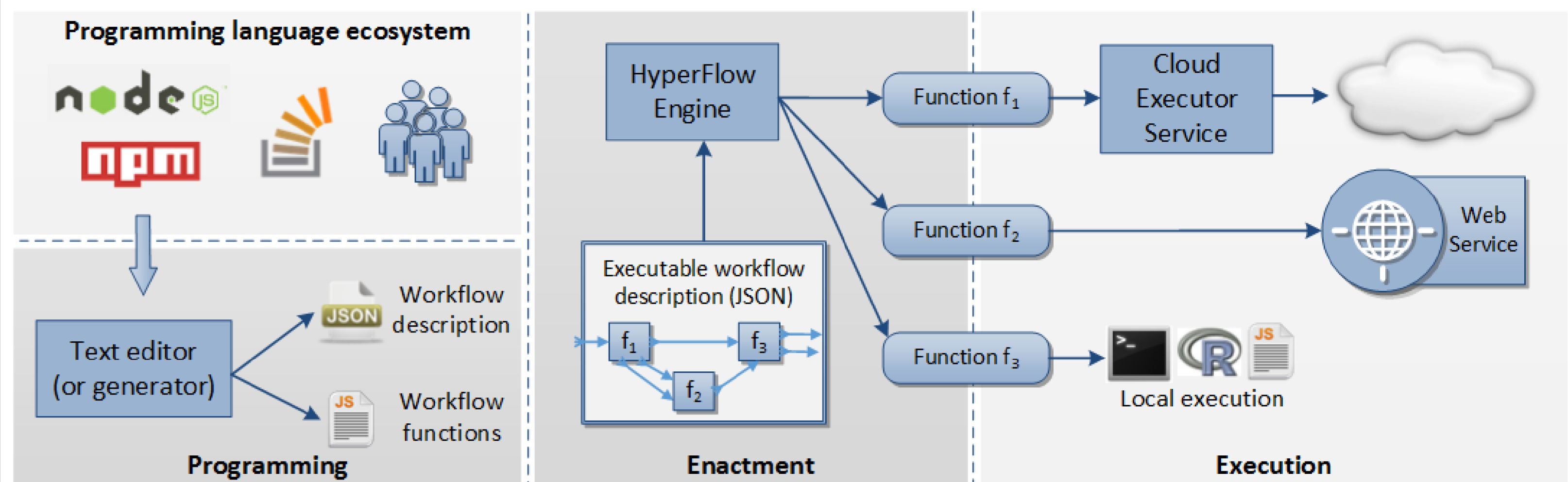
## PaaSAGE platform

Open and integrated platform to support model-driven development, deployment and adaptive execution of multi-cloud applications.

*Define your application once — deploy it at the full spectrum of the Clouds*

## HyperFlow workflow engine

- Model of computation, programming and enactment engine for scientific workflows
- Combines concise, declarative description of workflow graph with low-level programming of workflow activities
- Designed for experienced programmers in order to maximize workflow programming productivity



- Lightweight enactment engine based on platform node.js, easy to deploy in the cloud
- Abstracts details of the execution environment enabling loosely-coupled integration with various execution, scheduling and resource provisioning services

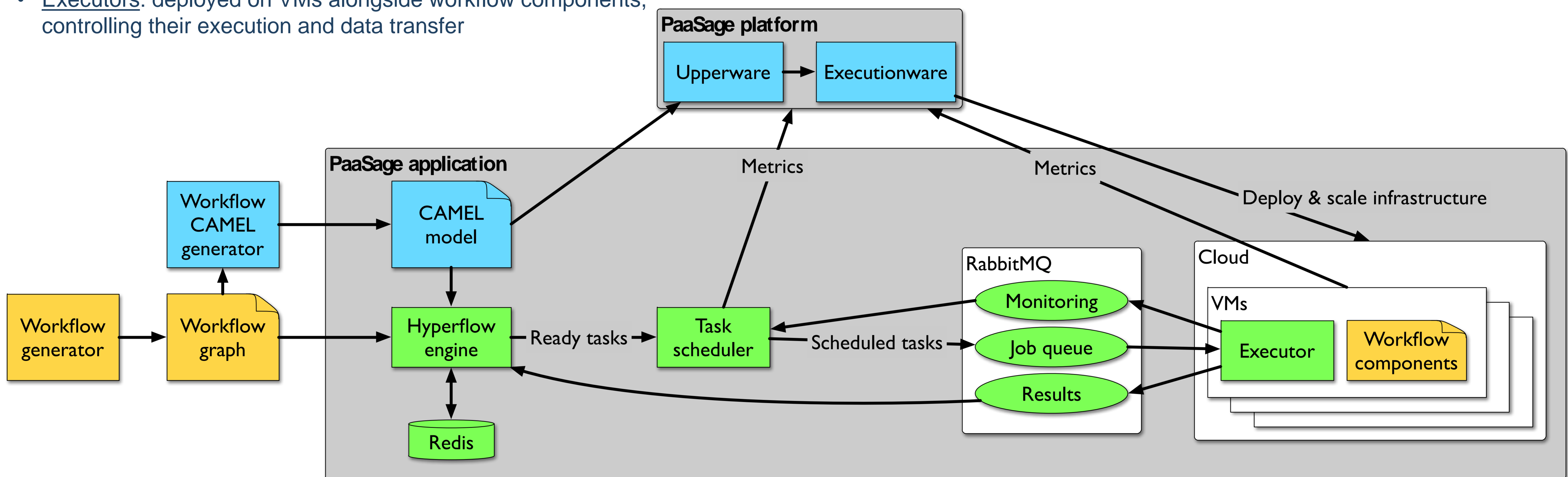
## Solution Architecture

### Main components

- HyperFlow workflow engine: workflow enactment
- Job queue: submission of task requests, fetching results, and execution monitoring
- Task scheduler: computes a workflow execution plan taking into account constraints such as cost and deadline
- Executors: deployed on VMs alongside workflow components, controlling their execution and data transfer

### Novelty

- On-demand deployment of the workflow runtime environment as part of the workflow application
- Workflow engine as another app component driving the execution of other components
- Avoidance of tight coupling to a particular cloud infrastructure and middleware



### Integration with PaaSAGE

- CAMEL application model automatically generated based on the HyperFlow workflow description. Includes initial deployment plan and scalability rules which control autoscaling behavior
- Monitoring information sent from the Task scheduler and VM workers to the PaaSAGE Executionware; Triggers the scalability rules and automatic scaling of the workflow application

### Conclusion

- A solution for deployment, execution and autoscaling of scientific workflows
- Workflow runtime environment deployed in the cloud on-demand as part of the workflow application
- Loosely-coupled integration with the PaaSAGE cloud platform

## References

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PaaSAGE: Model-Based Cloud Platform Upperware – <http://www.paasage.eu> <http://paasage.icsr.agh.edu.pl>

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