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On-premises Serverless Container-aware ARchitectures

Changes in the programing paradigms over the last years have pushed Cloud providers, such as Amazon Web Services (AWS), to offer new service solutions to adapt to the user requirements. Cloud serverless computing has arisen to palliate the demand of executing small pieces of code in the Cloud without having to previously provision infrastructure resources. Several benefits from serverless services (such as AWS Lambda) are high scalability, ease of deployment and a fine-grained pay-per-use policy. However, those platforms also impose significant restrictions for the applications and the environment in which they are executed (e.g. runtime, permissions and environment constraints).

To address such issues we developed a framework and a methodology to create Serverless Container-aware ARchitectures (SCAR). SCAR, in combination with udocker (a tool to execute Docker containers in user space), allows to run Docker containers in AWS Lambda, thus enabling the user to execute customized runtime environments and bypass some of the limitations imposed by the provider. The SCAR framework also aims to ease the application deployment process and allows the user to create, in addition to the serverless functions, API endpoints and use function composition to model their applications.

Although SCAR presents increased benefits to the usage of serverless functions on the Cloud, there are some strict limitations imposed by Cloud providers that cannot be bypassed only by software (e.g. storage size limit, execution time limit). This fact, in combination with data restrictions usually present in scientific applications, like private data that cannot be uploaded to the Cloud, encouraged us to create the On-premises Serverless Container-aware ARchitectures (OSCAR) framework. OSCAR will preserve the benefits of SCAR but in an on-premises infrastructure. In combination with curated software such as the IM and EC3, OSCAR offers the users the possibility of deploying an elastic Kubernetes cluster with serverless functions support, together with automated data management from S3-like storage backends.

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