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Resource-Aware Serverless Computing: Leveraging Stateless Paradigms for Cost-Optimized Cloud Applications

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Resource-Aware Serverless Computing: Leveraging Stateless Paradigms for Cost-Optimized Cloud Applications. As cloud adoption continues to grow, so does the need for cost-effective and scalable application design. This talk explores how stateless paradigms, including serverless computing, stateless databases, and event-driven architectures, are being increasingly adopted to address performance, scalability, and cost challenges in modern cloud environments.

We discuss how resource-aware design helps match application components to the appropriate compute, memory, and bandwidth resources. The focus is on stateless application design, which avoids persistent state within compute components, enabling seamless scaling and distributed execution.

While stateless services offer many advantages, they also introduce challenges such as cold starts, repeated dependency uploads, and limited runtime control. To address these issues, we explore several optimization strategies, including code refactoring, reducing unnecessary complexity, and batch processing to minimize invocation overhead. We also examine how to orchestrate services efficiently in stateless environments using workflows and state coordination.

The talk concludes with a case study on distributed machine learning training using serverless computing, illustrating how stateless, resource-aware strategies can significantly reduce infrastructure costs while maintaining performance.