A Scalable Framework for Provisioning Large-scale IoT Deployments

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Abstract:
Internet of Things (IoT) devices are usually considered as external application dependencies that only provide data, or process and execute simple instructions. The recent emergence of IoT devices with embedded execution environments allows practitioners to deploy and execute custom application logic directly on the device. This approach fundamentally changes the overall process of designing, developing, deploying, and managing IoT systems. However, these devices exhibit significant differences in available execution environments, processing, and storage capabilities. To accommodate this diversity, a structured approach is needed to uniformly and transparently deploy application components onto a large number of heterogeneous devices. This is especially important in the context of large-scale IoT systems, such as in the smart city domain. In this paper, we present LEONORE, an infrastructure toolset that provides elastic provisioning of application components on resource-constrained and heterogeneous edge devices in large-scale IoT deployments. LEONORE supports push-based as well as pull-based deployments. To improve scalability and reduce generated network traffic between cloud and edge infrastructure, we present a distributed provisioning approach that deploys LEONORE local nodes within the deployment infrastructure close to the actual edge devices. We show that our solution is able to elastically provision large numbers of devices using a testbed based on a real-world industry scenario.

CCS Concepts: Computing methodologies ! Distributed computing methodologies; Computing systems organization ! Distributed architectures;

Additional KeyWords and Phrases: IoT, framework, provisioning, large-scale, resource-constrained, gateway

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