Université de Rennes

Direction de la Recherche et de l'Innovation

Appel à projets - Année 2024

Contrats doctoraux «Ordinaires»

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Sujet

Titre : Latency-Driven resources placement in Fog-based IoT systems

Mots clés : Fog, Routing, Performance Evaluation, Latency-based optimization.

Cotutelle internationale (oui/non) : non **Si oui, préciser l'établissement et le pays de rattachement** :

Descriptif (15-30 lignes) :
Contexte socioéconomique et scientifique ; Les hypothèses et questions posées ; Les grandes étapes de la thèse et démarche ; Approches méthodologiques et techniques envisagées

Cloud computing and its three facets (IaaS, PaaS and SaaS) have become essential in today Internet Applications, offering many advantages such as scalability, elasticity or flexibility. With its different service models, the cloud still faces many issues prone to impact either the end-user (QoS), the provider (Cost) and the environment (Sustainability).

In the context of IoT applications (i.e. critical response time environments such as Smart City sensing or Vehicular networks) latency is at the center of a tremendous number of studies to optimize the placement of resources in distributed architectures. To ensure that the quality of service is guaranteed, several solutions exist to reconfigure the components placement (migration) and can reduce the overall latency by changing the components and routes. However, knowing precisely which component is the source of the problematical latency remains scarcely addressed. When taking a decision for a reconfiguration or a migration, which can be triggered due to latency issue, it can be beneficial to check if the source of the latency can be solved before instantiating a migration or a full reconfiguration. Some studies exist where a comparison of response time is done between the major cloud actors depending on the load. Proper measurement protocols exist but always refer to specific case studies and would not allow to be integrated in fog systems.

The objective of this thesis is to study the optimization of resource placement in Fog-based IoT systems based on latency measurement, by evaluating the control plane cost of a change in the architecture. It will particularly address the problem of how to identify the origin of a latency issue, and based on this finding, propose an optimization that take into account the cost and elasticity of the control plane.

➢ **Ce document est à renvoyer par la direction de l'unité de Recherche aux animateurs du Pole Recherche et à l'école Doctorale pour le 9 février 2024 au plus tard**