A Cloudlet-Based Approach to Tackle Network Challenges in Mobile Cloud Applications

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Advancement in mobile broadband communication enables to effectively communicate anywhere at any time. More specifically, for people who live in rural areas of developing countries it is the best means to communicate with the rest of the world. This has prodigious potential of enabling new opportunities in their live. The appearance of cloud computing, the recent improvements in communication networks, and the mobile phone market penetration allow a large number of users to access remote computing systems using their mobile devices.

Financial and infrastructure challenges in developing countries impose certain limitations to this scenario as they have very limited reliable fixed-line network for internet access. Nowadays wireless mobile networks are quite widely accessible and let end-users access services running in cloud providers' premises. However, a very limited number of cloud providers exist in developing countries thus mobile cloud computing users have to access cloud providers located at far distances. This wide-area communication along with inherent challenges of mobile network introduces long response times and latency problems which lead to unacceptable user experience for mobile users.

As a user scenario, let us assume a group of coffee farmers in a developing country who own hundreds and thousands hectares of coffee plants. Those farmers want to record their plant's historical data on daily basis and then get some calculated scientific recommendation. Each farmer upload data of their respective farm flied, then receive recommendation of some activities each farmer should have to do on their respective farm field in order to improve their production. For instance some regions of the country become drought for a couple of month so that they have to water plants at least once per week. In addition to this it helps to find best place to sale their product.

Within this scenario we assumed as the farmers can use cloud as collaborative storage and computation, and the cloudlets as middleware providing some pre-computed results for a group of mobile devices in specific regions and then contribute to improve to overall performance. Our aim is to develop a platform that supports the development of mobile cloud applications in general and specifically which help those formers to access services in cloud environment in wireless network with low bandwidth and high latency.

Research challenges

The overall end-to-end communication between this cloud computing services and mobile device within bottleneck of wireless mobile network is affected by the processing time on mobile device, the processing time at cloud provider and the time it takes the entire data move across the network including over all latency and propagation delay. Todays' mobile devices and cloud providers processing power is high. Their contribution to the overall delay is very small compared to the network-induced delays in developing countries. To use this limited bandwidth effectively, using of cloudlets that will provide per-computed information closer to mobile user can minimize response time that mobile device expect from the cloud. *Figure 1* depicts the high level architecture of our approach.

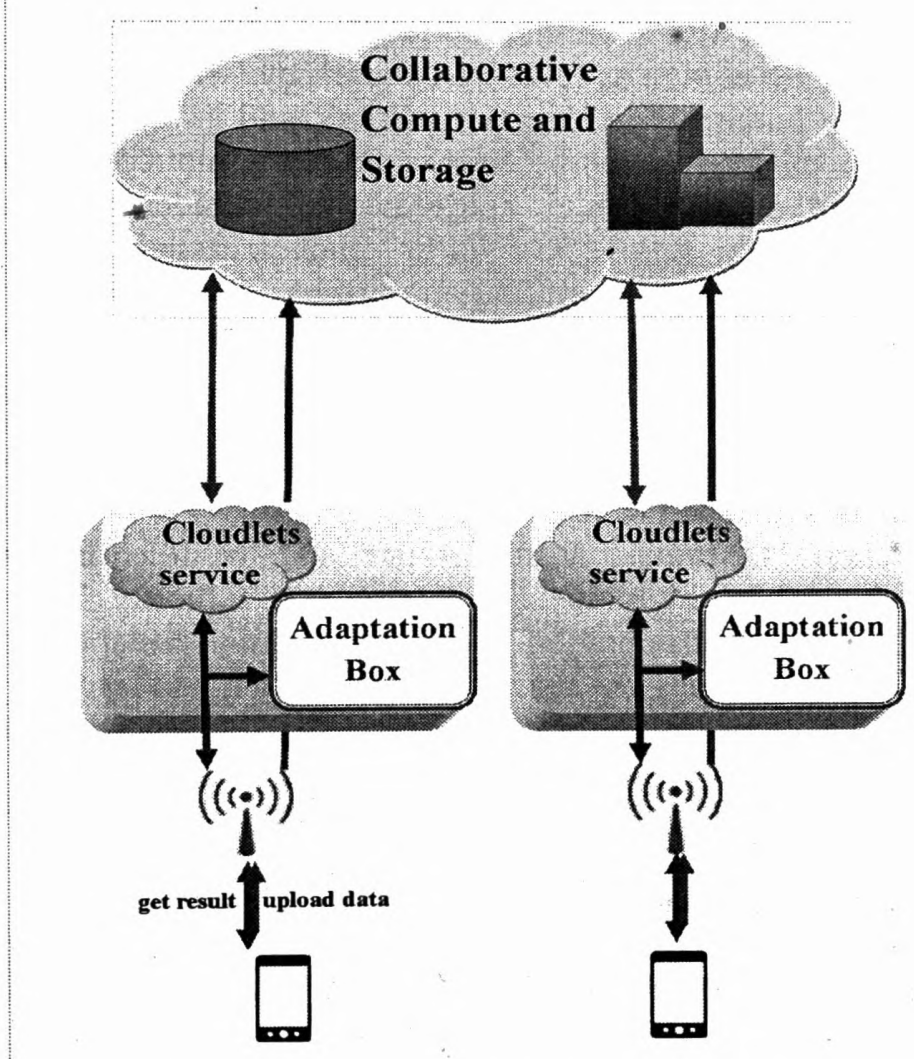

Figure 1: The high level architecture of the system

Related work

Offloading computing tasks from resource-constrained mobile devices to closer computing devices with more resources has been proposed by Satyanarayanan, Flinn Jason, and Tim Verbelen.