Cloud Computing

Assignment # 01

Hafiz Muhammad Ahmad
01-134132-048
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Department of Computer Science
BAHRIA UNIVERSITY, ISLAMABAD

The Use of Fog Computing for Internet of Things

Introduction:

Cloud Computing is not usable for many of internet of things(IoT), where Fog Computing is often used. Fog Computing has some distributed approaches which makes many of internet of things to easily accessible and more efficient to use. Let us take an example of smart sensors or many of IoT devices which generate huge amount of data to analyze, compute and reusable. So if we apply fog computing on these kind of IoT devices, cost, bandwidth and back-and-forth communication between sensors and cloud can be reduced. But one more thing to note down here is that use of fog computing can reduce performance of IoT Devices.

Use of Fog Computing:

In this section, we demonstrate the role the Fog plays in two scenarios of interest

- Connected Vehicle
- Wireless Sensor and Actuator Networks

Let's have some detailed discussion on these scenarios

Connected Vehicle

The Connected Vehicle deployment displays a rich scenario of connectivity and interactions: cars to cars, cars to access points (Wi-Fi, 3G, LTE, roadside units [RSUs], smart traffic lights), and access points to access points. The Fog has a number of attributes that make it the ideal platform to deliver a rich menu of SCV services in infotainment, safety, traffic support, and analytics: geo-distribution (throughout cities and along roads), mobility and location awareness, low latency, heterogeneity, and support for real-time interactions.

A smart traffic light system illustrates the latter. The smart traffic light node interacts locally with a number of sensors, which detect the presence of pedestrians and bikers, and measures the distance and speed of approaching vehicles. It also interacts with neighboring lights to coordinate the green traffic wave. Based on this information the smart light sends warning signals to approaching vehicles, and even modifies its own cycle to prevent accidents.

Re-coordinating with neighboring STLs through the orchestration layer of the Fog follows any modification of the cycle. The data collected by the STLs is processed to do real-time analytics (changing, for instance, the timing of the cycles in response to the traffic conditions). The data from clusters of smart traffic lights is sent to the Cloud for global, long-term analytics.

Wireless Sensor and Actuator Networks

Energy constrained WSNs advanced in several directions: multiple sinks, mobile sinks, multiple mobile sinks, and mobile sensors were proposed in successive incarnations to meet the requirements of new applications. These sensors were designed to get facilities which require low bandwidth, low energy, low processing power and small memory motes. Yet, they fall short in applications that go beyond sensing and tracking, but require actuators to exert physical actions (open, close, move, focus, target, even carry and deploy sensors). Actuators, which can control either a system or the measurement process itself, bring new dimensions to sensor networks.

The information flow is not unidirectional (from the sensors to the sink), but bi-directional (sensors to sink, and controller node to actuators). In a subtler, it becomes a closed-loop system, in which the issues of stability and potential oscillatory behavior cannot be ignored. Latency become as issue concern in systems that require rapid response.

S.S. Kashi and M. Sharifi survey the contributions in the coordination of Wireless Sensor and Actuator Networks (WSANs). They point out that in one architectural choice, the WSAN consists of two networks: a wireless sensor network and a mobile ad hoc network (MANET). T. Banka stress that emergent applications demand a higher bandwidth, collaborative sensing environment. Their experience is rooted in the CASA (Collaborative Adaptive Sensing of the Atmosphere) project. CASA, a multi-year, multi-partner initiative led by UMASS, deployed a network of small weather radars, integrated with a distributed processing and storage infrastructure in a closed-loop system to monitor the lower troposphere for atmospheric hazards like tornados, hailstorms, etc. Zink provide technical details of the deployment.

The characteristics of the Fog (proximity and location awareness, geo-distribution, hierarchical organization) make it the suitable platform to support both energy-constrained WSNs and WSANs.

Conclusion:

We have outlined the vision and defined key characteristics of Fog Computing, a platform to deliver a rich portfolio of new services and applications at the edge of the network. The motivating examples peppered throughout the discussion range from conceptual visions to existing point solution prototypes. We welcome collaborations on the substantial body of work ahead architecture of this massive infrastructure of compute, storage, and networking devices.

References:

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[2] P. Tavel. Modeling and simulation design. 2007.