Spring 2017 Seminar Series

Towards Efficient Architecture Design in IoT Big Data Era: Integrating Intelligence into the Communication Path

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The proliferation of Internet of Things (IoT) intensifies the connections between the physical world and cyber spaces. IoT establishes intelligent information interactions base on billions of devices, sensors, and communication infrastructures. However, existing IoT infrastructure still faces many open problems such as the manageability of the data that is generated by a large amount of distributed devices, the complexity of handling the huge data flows, and the communication and computation challenge to the data center infrastructures.

The pervasive decoupled computation and communication in modern cloud computing and mobile computing exacerbates the data movement challenges caused by the enormous amount of data generation from distributed sources. This decoupling could result in the inferior quality of service and lose the real-time intelligence in the context of IoT big data. In this talk, I will present my work that tackles this issue as a hierarchical solution. In the first part, I will present the architecture and framework designs for IoT big data processing at data center infrastructure level. I will introduce a new self-powered in-situ data center InSURE, which is optimized for pre-processing IoT data at rural area and demonstrate our real system prototype. In the second part, I will present how I manage to bridge the decoupled computation and communication in the network system at server architecture level. I focus on the Network Function Virtualization (NFV) technique, a killer app that enables the intelligence-adding communication in future IoT network infrastructure by deploying virtualized network functions on COTS servers. I will present my work towards building efficient architectural and system framework support for high-performance NFV deployment on hypervisor-based and container-based virtualization platforms.

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Yang Hu is a sixth-year PhD candidate in the Department of Electrical and Computer Engineering at the University of Florida, USA. He is a recipient of the prestigious Graduate Alumni Fellowship at the University of Florida. Yang's research interests include data center scale computing, sustainable computing, power/energy management, architectural support for network function virtualization, and heterogeneous architectural support for deep learning. He has published over ten papers at top-tier conferences including ISCA, MICRO, HPCA, ASPLOS, PACT, DSN, ICS, etc. His research has been recognized with best paper awards at IEEE CAL 2015 and best paper nominee at HPCA 2017. Yang received a BS degree from Tianjin University in 2007 and a MS degree from Tsinghua University in 2011. He is expected to get his doctoral degree in August 2017.