Unconventional Computer Architecture and Networks

The group is conducting research on the Internet of Things (IoT) and Fog Computing; new simulation techniques based on queue models and statistical information; design and optimization of processor architectures; and optical interconnections. As stated by IBM, each day 2.5 quintillion bytes of data are created, and 90% of the existing data in the world has been created in the last two years.

Working with these massive amounts of data has become the next major computational challenge. When IoT becomes more pervasive, the number of sensors and actuators will increase and the need for latency sensitive applications will explode in the near future. Fog Computing is a distributed and hierarchical computation, storage and communication platform co-located between the core and the edge of the network.

The convergence of Fog and IoT opens a vast research area that includes system architecture, virtualization, mobility, connectivity (wired and wireless), and distributed computing among others.

Objectives

1. Bring to reality the concept of Fog Computing through real deployments
2. Design and evaluate architectural solutions to exploit the potential of IoT. We are focused on system architecture, mobility, end-to-end virtualization and nodes design.
3. Exploit the convergence between Fog Computing and IoT, since Fog is the natural platform to support IoT applications which require real-time characteristics.
4. Consolidate the use of iQ, the queue model-based methodology, to perform design space explorations at any stage of the processor design.
5. Propose new architectural solutions based on novel interconnection techniques
6. Improve the efficiency of the Memory Management Unit (MMU)