

1. IoT Considerations, Requirements, and Architectures for Smart Buildings-Energy Optimization and Next-Generation Building Management Systems by Daniel Minoli, Kazem Sohraby, and Benedict Occhiogrosso

Tutorial Paper

Findings /conclusions/ contributions of the paper

- Commercial offices consume 20% of electricity generated in USA & spend ~ 10 % of their total operating cost on electricity
- Energy efficiency systems have not seen much growth in medium and smaller buildings as complexity of replacing the older technology outweighs the savings. Also, there is little motivation for owners as tenants pay a fixed monthly power fee
- The computer industry has been the front-runner in using advanced technology to manage power consumption as they have easier access to innovative tools. Usage of Solid state drives and virtualization of servers have decreased energy usage
- Building owners should incorporate the latest technology to save cost & future-proof their investment against regulations
- Lack of universally accepted standards & architectures have hindered IoT deployment & integration of security mechanism

Technology insights from the paper

- The price reduction of the advanced sensors, data storage & data processing along with a continuous decrease in device size will drive the growth of IoT devices in the market during the decade (30 Billion devices worldwide by 2020)
- Power over Ethernet(PoE) can supply both content and power to the IoT device; reducing material & installation costs
- LiFi(light fidelity) technologies are being developed which use LEDs to transmit data by modulating content over light beam
- More than 90% of all the IoT devices available in the market doesn't have appropriate security measures integrated into them
- Bulkier PTZ(pan/tilt/zoom) cameras have lost popularity to smaller & cheaper fixed-view cameras running on PoE

Insights of relevance to scalability computing

- BMS (building management systems) of the future will be scalable allowing easier integration of systems/devices; they will support different sensors and manage all the energy sources (natural gas, renewable energy)
- PoE allows easier integration & deployment of cameras, sensors & networking devices; suited for scaling the IoT network
- The core network carriers' move towards functionality virtualization will lead to better carrying of IoT traffic
- 'Open systems IoT reference model'(OSiRM) architecture enables scalability as it follows a layered building block approach
- Low-voltage dc lightning infrastructure supports scalability; users can add/change devices/systems without turning power off

2. Machine-to-Machine Communications With In-Network Data Aggregation, Processing, and Actuation for Large-Scale Cyber-Physical Systems by Ivan Stojmenovic, Fellow, IEEE

Review Paper

Findings /conclusions/ contributions of the paper

- The authors envisions a new generation of intelligent devices & systems developed across industries from the CPS research
- In today's CPSs, network elements are just communicators; author believes they can be potential actuators & decision makers
- Currently deployed large-scale ad hoc wireless sensor networks don't support coordination & actuation between sensors
- Authors champion the in-network processing approach for large scale CPS in which data recording and processing is done by the sensors nodes and not by a sink computer
- Traditional robot networks were small scaled & centralized. large scale robot networks were envisioned recently & led to the design of localized & decentralized algorithms

Technology insights from the paper

- The "Sensor web" concept aims at utilizing web connectivity for sensors to enable better coordination and distributed sensing
- In fog network, edge nodes serve to users' requirements and also communicate & update with the remote cloud periodically
- Cyber-physical systems (CPS) have direct applications ranging across a wide area; CPS are used in Smart Power Grids, Intelligent transportation systems, smart cities and many other areas
- The expansion of Internet protocol(IP) network worldwide has lead to a decrease in power & time required for communication
- Large-scale surveillance system can utilize the sensor networks in which rotating cameras & autonomous ground/aerial vehicles will be both sensors & actuators. The devices can coordinate data capturing and distribute processing to handle intrusions

Insights of relevance to scalability computing

- Scalability along with security, resource management & design are important issues in cyber-physical networking systems
- Data aggregation based communication architectures supports scalability & allows M2M devices to be cheap & use less power
- The M2M communication research done so far has been on small-scale models & centralised solutions while the existing decentralised solutions are not scalable
- Authors proposed a 'localized cooperative access stabilization algorithm' where M2M devices connect to gateways & have limited collaboration with their local neighbours. An approach based this algorithm can be used to develop scalable solutions
- Nikola Tesla first introduced the concepts of CPS in 1926 and envisioned that the wireless communication has the potential to scale globally & convert the earth into a "huge brain"