Towards large-scale IoT network testbed platforms

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## Technologies and Tools

| Security and Privacy | Software Engineering, Interfaces & Visualization | Signal Processing, Data Analytics, Machine Learning, Control | Networking, Middleware, Storage and Cloud Computing | Sensing, Energy-harvesting, and Computational Hardware |

## Application Domains

- Transportation
- Energy
- Environment
- Healthcare
- Smart Buildings
- Manufacturing
- Smart Cities

Find out more at [http://cci.usc.edu](http://cci.usc.edu)
USC Viterbi CCI Activities

- Thought leadership **events**: seminar series, workshops, industry meetups

- Current **focus areas**: IoT platforms, connected and driverless vehicles, cyber-physical security and privacy, and theoretical foundations of cyber-physical systems

- **Research testbeds**: Tutornet, an existing state of the art low power indoor IoT testbed. New sensor-rich campus-wide **CCI IoT testbed** under development.

- **Education**: developing new courses and programs related to IoT and CPS

- **Outreach**: building collaborative partnerships with industry and government
IoT Architecture

Embedded Sensors
Cameras
Actuators, Robots
Wearables, AR devices
Mobile Devices
Human Observers
Edge Computing

IOT APPLICATIONS
DATA ANALYTICS
Signal Processing, Machine Learning, Inference, Contextual Computing
CLOUD COMPUTING
SECURE DATA STORE
The USC Tutornet IoT Testbed

- Established 2006. One of the first-ever low power wireless testbeds in the world. 100+ nodes. Wired for power, programming, data-upload, wireless 802.15.4-based. Has been used for the design and evaluation of many protocols.

- Ongoing: integrate robotic nodes with testbed.

- Has played a key role in industry collaborations with Bosch, GM, design and evaluation of industry standard protocol (RPL).
Software implementation of network protocols for moving sensor data quickly and reliably:

- Scalable Medium Access
- SenZip
- Backpressure Collection Protocol
- Wireless Rate Control Protocol
- Backpressure with Adaptive Redundancy
USC CCI IoT Testbed (in development)

- A new campus-wide testbed
- For evaluating IoT hardware, software, and applications
- **Scale**: 50-100 gateways, up to 50 devices per gateway
- **Heterogeneity**: seeking a wide range of sensing/actuation, compute, and (wired/wireless) communication capabilities. Mix of legacy and innovative systems
- **Interoperability**: between sensor/actuator vendors and analytics / application developers using an application-layer middleware
The I3 project is a collaboration between CTM, CCI, and IMSC.
Scaling to the City

LOS ANGELES OPEN DATA

Information, Insights, and Analysis from the City of Los Angeles
Thanks!

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