



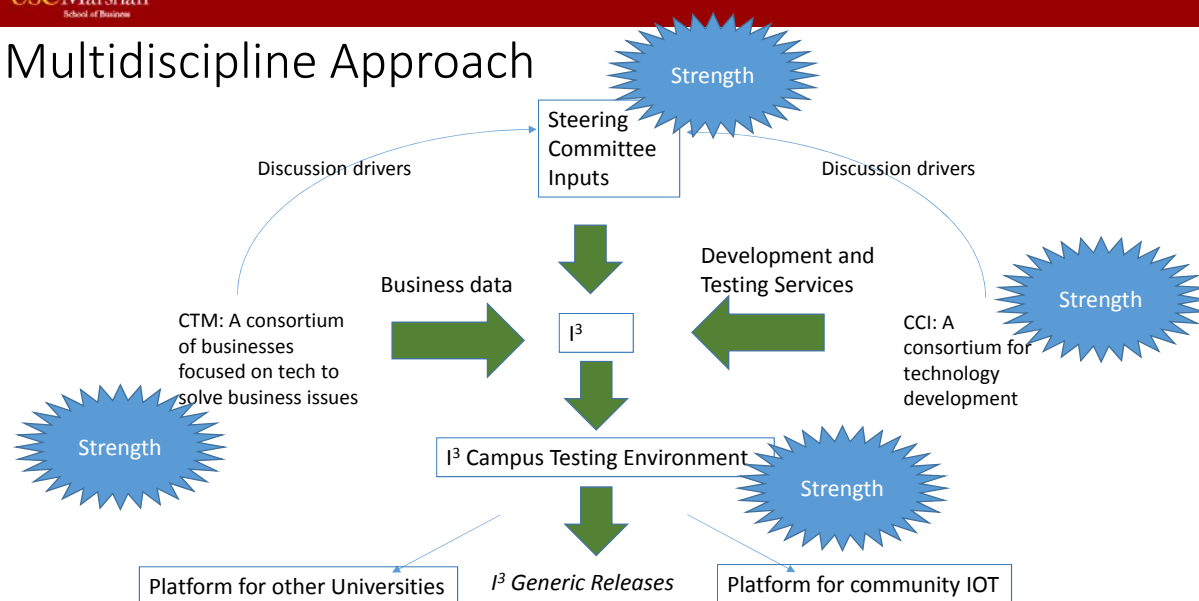
A Business Driven Approach to Technology since 1984

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Multidiscipline Approach



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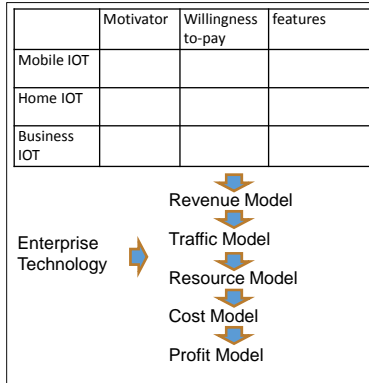
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Institute for Communications Technology Mgmt (CTM)

Research Summary

Key questions:

(1) What market factors impact IOT market development. (2) Where do the lucrative profit pools lie? (3) What are the corporate cultural issues that impact a company's ability to utilize technology and data (privacy, trust, ownership, etc)



Market Value

Relevance:

The IOT market is not homogenous; different parts of the market will evolve at different rates. Sustainable markets are beginning to emerge and behavioral research is needed to understand how demand growth can be encouraged.

Technologies:

Will test business concepts that might accelerate or act as hurdles to IOT adoption.

Further information

CTM is a Center of Excellence within the Marshall School of business. Consortium based research supported by CTM member companies. For further information on this project, please contact Jerry Power at jerry.power@marshall.usc.edu

An Connected Suite of IOT Research Programs

Parallel Independent Projects that can be linked

| Mobile IOT | | | | | | Home IOT | | | | | | Business IOT | | | | | | |
|----------------------------|--|-------|-----------|-----------|--------|-------------------|------|-------|-----------|-----------|--------|-------------------------------------|--------------------|----------|-----------|-----------|--------|------|
| Home IOT Output | | price | feature 1 | feature 2 | demand | Mobile IOT Output | | price | feature 1 | feature 2 | demand | Enterprise IOT Output (if we do it) | | device 5 | feature 1 | feature 2 | demand | |
| | | | | | YR 1 | YR 2 | YR 3 | YR 4 | YR 5 | | | | | YR 1 | YR 2 | YR 3 | YR 4 | YR 5 |
| Smart home security system | | | | | | | | | | | | | Smart Tractor | | | | | |
| Smart water heater | | | | | | | | | | | | | Smart Delivery Car | | | | | |
| Smart thermostat | | | | | | | | | | | | | Tracked Package | | | | | |
| Smart shades/curtains | | | | | | | | | | | | | Tracked Employee | | | | | |
| Smart locks | | | | | | | | | | | | | Gas Leak Detection | | | | | |
| Smart plugs and switches | | | | | | | | | | | | | etc. | | | | | |
| Smart lights | | | | | | | | | | | | | | | | | | |
| Smart toilet | | | | | | | | | | | | | | | | | | |
| Smart trash compactor | | | | | | | | | | | | | | | | | | |
| Smart food freezer | | | | | | | | | | | | | | | | | | |
| Smart wine cooler | | | | | | | | | | | | | | | | | | |
| Smart sewing machine | | | | | | | | | | | | | | | | | | |
| etc. | | | | | | | | | | | | | | | | | | |

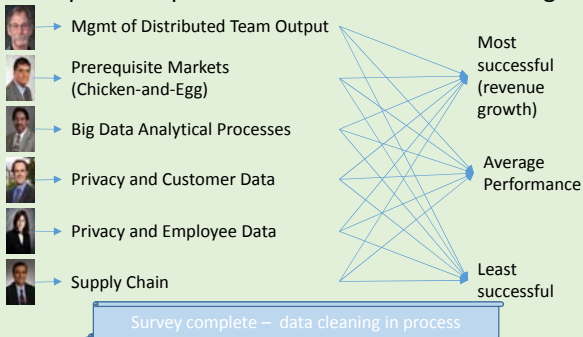
Application specific demand levels

IOT Economics

IOT-Economics: Examination of Costs associated with IOT application to allow identification of profit pools that serve to support price reductions that stimulate increased demand

Understand the Business Issue that Impact Tech

Enterprise Adoption of Tech for Business Advantage



Future of Media: Evolving Revenue Models

PROGRAM DESCRIPTION: The Future of Media Research Program analyzes evolving media consumption and the transformation of media business models. In this fourth year of the program, we look at the evolving revenue models for media monetization from advertising to subscription and transactions and study the impact of new and emerging business models including AR/VR.



Other CTM Activities

- Paramount Challenge for USC Data Analytics Club (60 students participated in total)
- Chicken and Egg Problem Student Analysis
- Digitopolis Opportunities for CTM members
- USC-wide IOT Discussion Group Opportunities for CTM members

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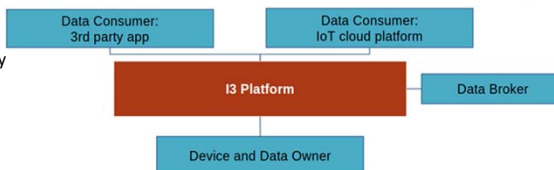
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Intelligent IoT Integrator (I³)

Active Research

Key questions:

- (1) How should Data Owners be incentivized to share their information?
- (2) How to enable seamless, trusted, sharing of data with different third party applications and consumers (trusted privacy).
- (3) How to scale and operate a system that supports both research and operational needs



Market Value

Market Relevance:

This platform development and research effort will address key issues of data ownership, incentives, trust, interoperability arising in IoT systems.

Relevant Technologies:

Physical Web, mobile and IoT operating systems, protocols and other software; enterprise and consumer IOT devices, cloud computing solutions

Further information

For further information on this project, please contact Bhaskar Krishnamachari and Jerry Power at bkrishna@usc.edu, jerry.power@marshall.usc.edu

I³ Project Goal (Big Picture)

Accelerate IOT market evolution, at the application and device level, by making device owners participants in the IOT ecosystem

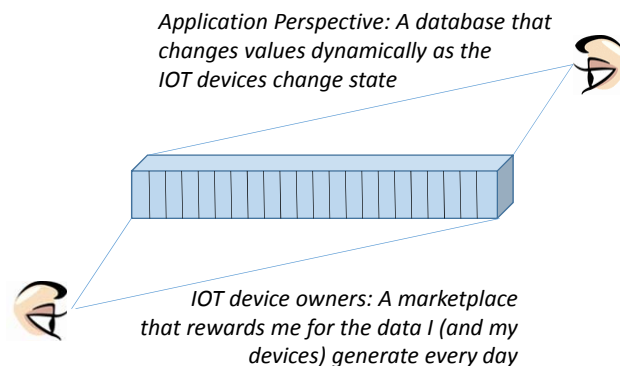
- Develop a platform that allows the device owners to participation
 - Device Owners control distribution of their data (and the resulting rewards)
- Trust of platform operations is critical
 - Security AND Operational trust are both important components
- Distributed/Scalable System Architecture
 - Expect multiple operational entities which will need to interact to exchange data and incentives

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I³ Allows a Different Perspective on IOT

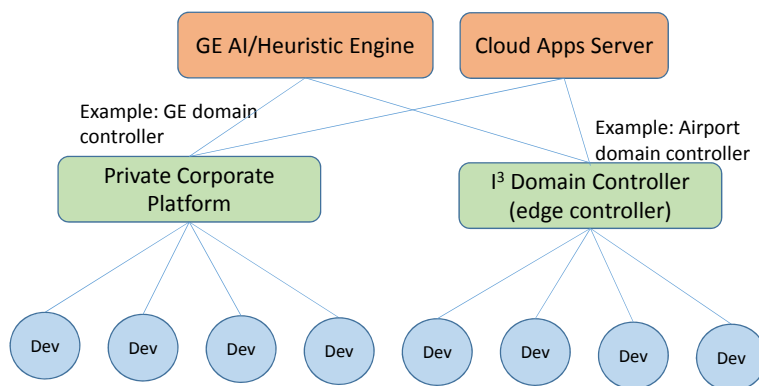


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Example Deployment: Industrial

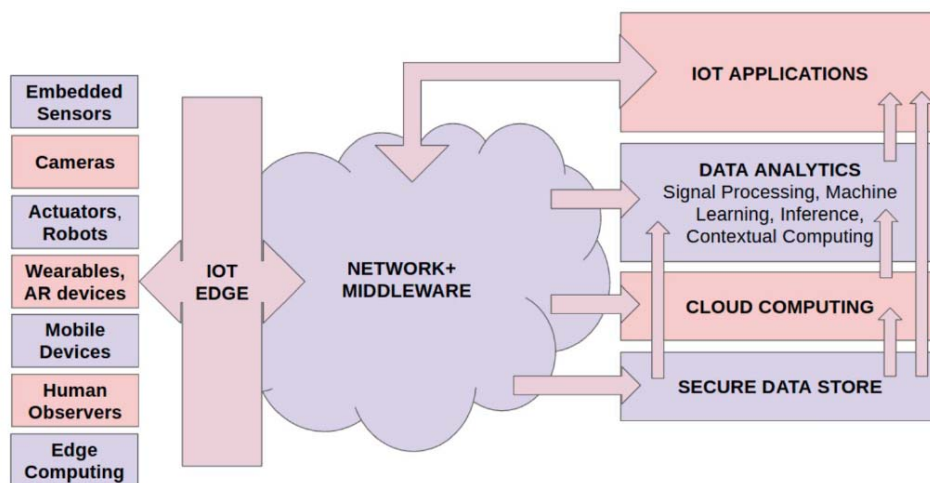


The Private Platform manages an IOT domain as a closed entity that can provide and use data from the more public IOT data lake.

The private platform 'may' expose some private data to the I³ managed IOT environment (e.g. plane schedules)

Affiliated companies may feed their IOT data to the I³ controller and expose that data to GE (e.g. fuel truck locations within the airport).

I3 Architecture



Center for Cyber-Physical Systems and IoT (CCI)

Summary

This newly established center consists of 30+ faculty at USC Viterbi School of Engineering spanning many key areas in EE/CS such as networks, software engineering, machine learning, data management, electronics hardware, and applications across engineering including transportation, manufacturing, robotics and biomedical systems.



Value

Relevance

Coordinated access to engineering faculty experts spanning a wide range of relevant research areas. Opportunities to test out IoT products in classrooms and research.

Technologies:

Cloud computing frameworks, IoT operating systems and protocols, Physical Web, Machine learning and data analytics platforms

Multiple Participation Tiers. Includes seat on advisory board. Includes meetings/conferences/events. Funding used to support students/faculty that work on development projects at the direction of CCI members.

Further information

For further information on this project, please contact Bhaskar Krishnamachari at bkrishna@usc.edu, or visit us online at <http://cci.usc.edu>

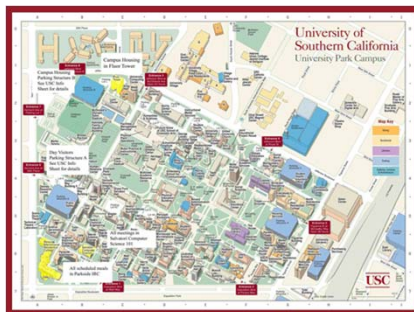
Campus IoT Testbed

Research Summary

The newly formed USC Center for Cyber-Physical Systems and the Internet of Things is building a campus-wide IoT testbed at USC, building on our prior experience hosting Tutornet.

Testbed will include hundreds (eventually thousands) of beacons, sensors, actuators and smartphones including sensors that count people, cars, measure air quality, noise levels, energy usage.

Testbed will include students, faculty, and operational staff



Market Value

Market Relevance:

Researchers can use the testbed to test out IoT products in a networked context
University Operations can use the test bed to support campus operational needs

Relevant Technologies:

Physical Web, mobile and IoT operating systems, protocols and other software; enterprise and consumer IOT devices, cloud computing solutions

Further information

For further information on this project, please contact Bhaskar Krishnamachari at bkrishna@usc.edu, or visit us online at <http://cci.usc.edu>
Back in 2006 we created one of the first IoT low power wireless sensor network testbeds in the world: Tutornet. See <http://testbed.usc.edu/dashboard>