

For more information, please visit <http://i3.usc.edu/>

# I3

## University of Southern California

A Consortium Project and Action Cluster

Marshall School of Business

Viterbi School of Engineering

City of Los Angeles

And many others

*Intelligent IoT Integrator*

[i3.usc.edu](http://i3.usc.edu)



# Challenges and Solutions



## IoT R1.0 Approach

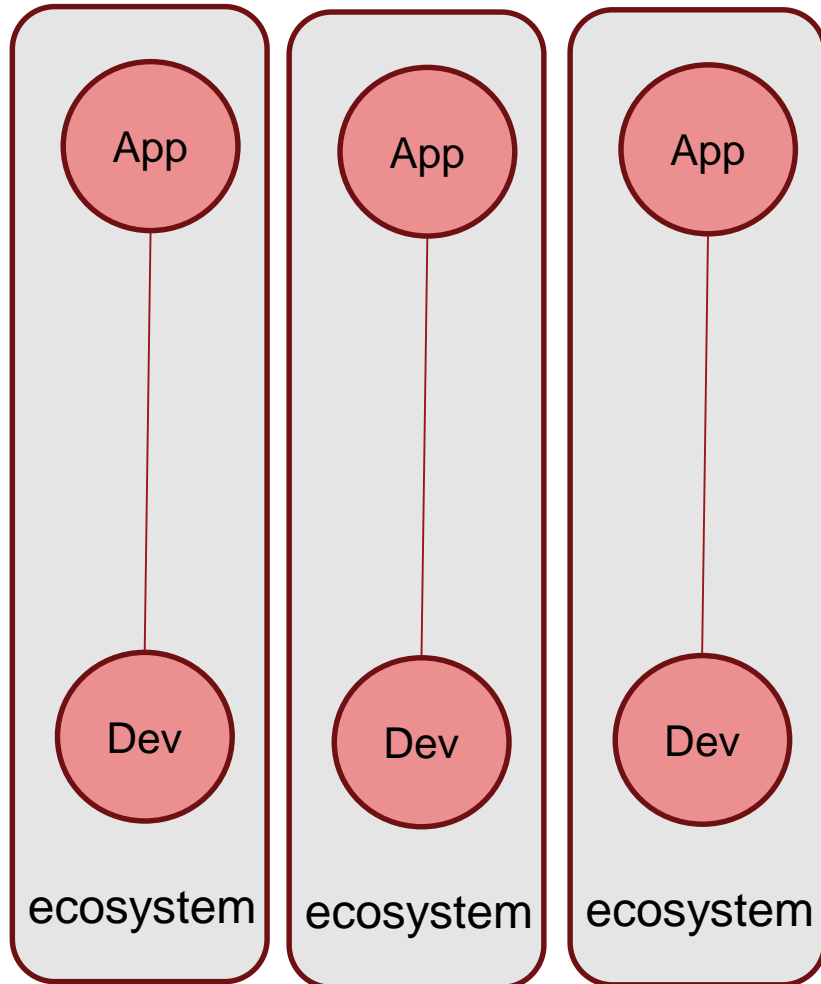
- Each application is developed independently, as a silo.  
Device visibility limited by the application
- Independent agencies/departments adopt applications based on their use cases
- Proprietary systems solutions require commitment to cover costs

## I<sup>3</sup>: Intelligent IOT Integrator (I3)

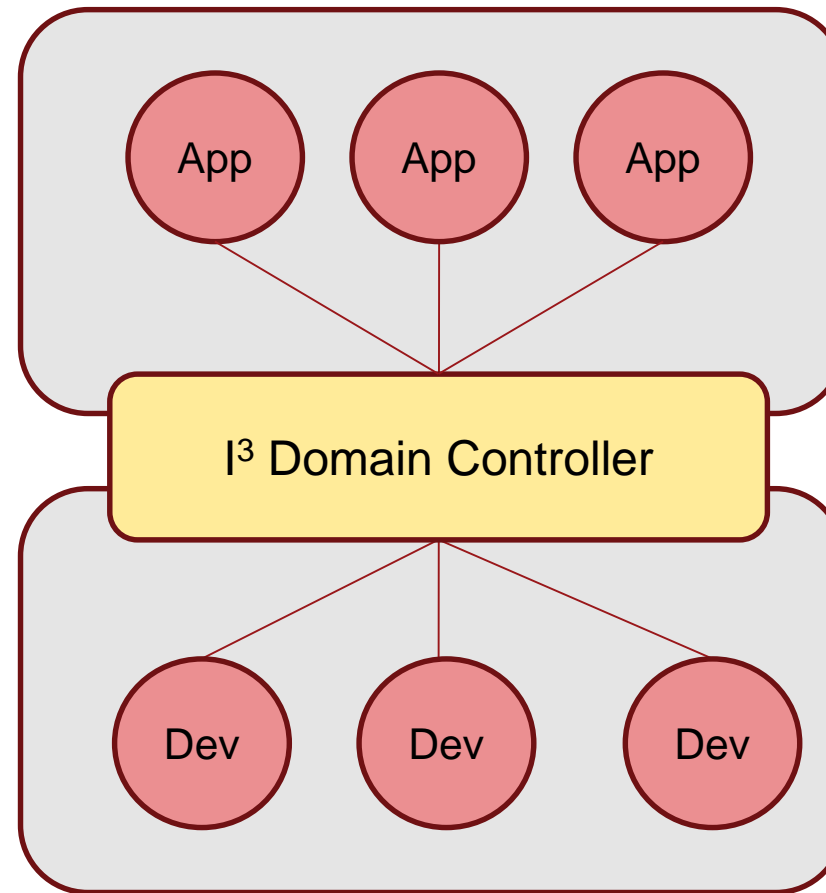
- By increasing the ability to leverage data, we change the economics associated with IOT
- Improved economics drives accelerated adoption (IOT, AI, data-analytics, ..)
- Removes roadblocks that slow data-driven management
  
- I<sup>3</sup> is an IOT R2.0 concept developed at University of Southern California  
A true multidisciplinary effort (Marshall, Viterbi, Los Angeles).  
Creates respectful/involved partnerships between data producers and data consumers
- IOT data rivers transforms the Internet from a connectivity tool to a context awareness tool
- Creates an data marketplace to connect independently owned data devices to applications.
- I<sup>3</sup> is a new public-private, open-source/community driven development effort  
Universities, companies, and individuals all contributing to its realization.

# The I<sup>3</sup> Vision

From:



To:



Apps no longer have to justify themselves to device owners.

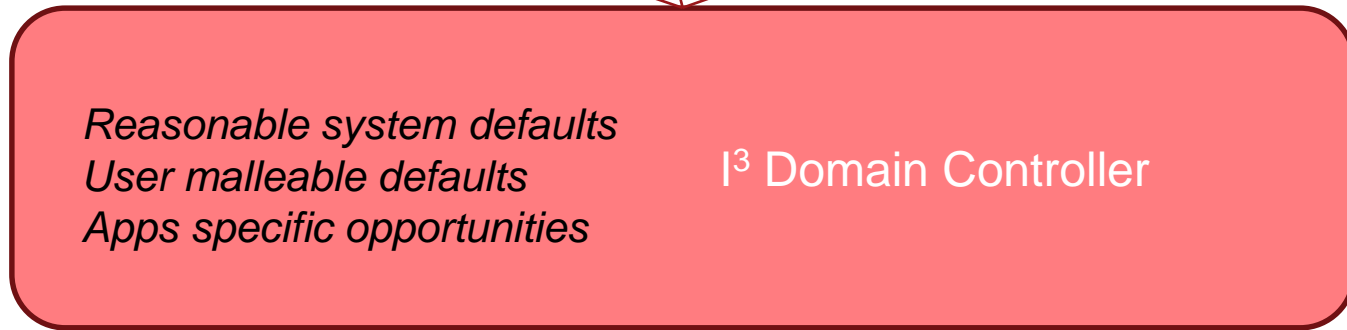
Data can be accessed as needed and in a shared environment

Users no longer have to develop a trust relationship with each app developer. I<sup>3</sup> provides user control of data dissemination and apps are user rated based on trust.



# Data Ownership/Permission

Read only access    Only location data    Full read/write access



I own my data  
I determine the rules  
I decide who I trust  
I manage my own privacy

Device owners “own” their data and give it to the I<sup>3</sup> domain controller for safekeeping. Rules in I<sup>3</sup> determine who can see the owners data.

If you can “see” it, you can make a copy that the applications then own.

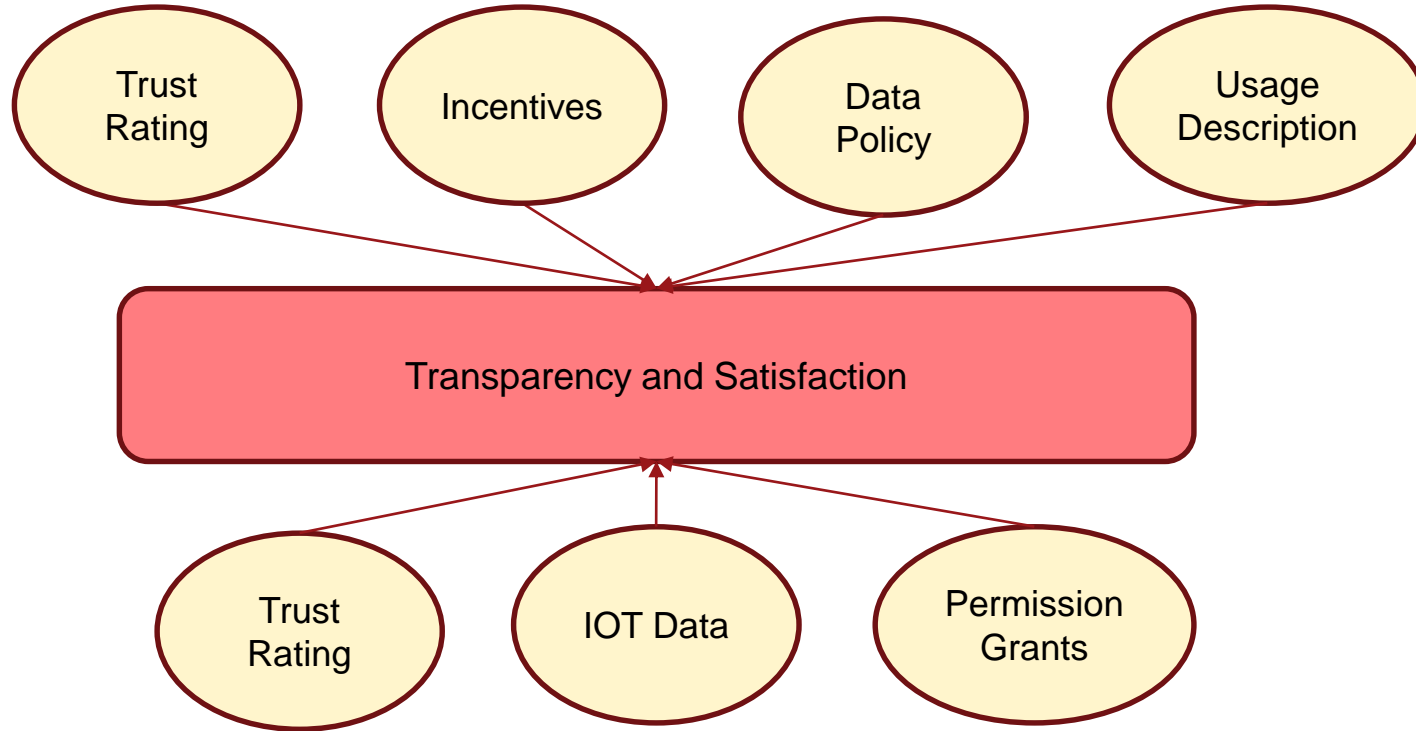
Users can report whether they trust applications to safeguard their data.

The more trust the greater the visibility granted by the users.

There is no single definition of privacy that applies to all users and all applications.

Centralized permission management allows fine grain control without burdening IOT devices with extra management overhead

# Integrity and Trust: Critical Components



Application owners rate device owners for data fidelity

Device owners rate applications for trustworthiness

Higher trust reduces need for incentives

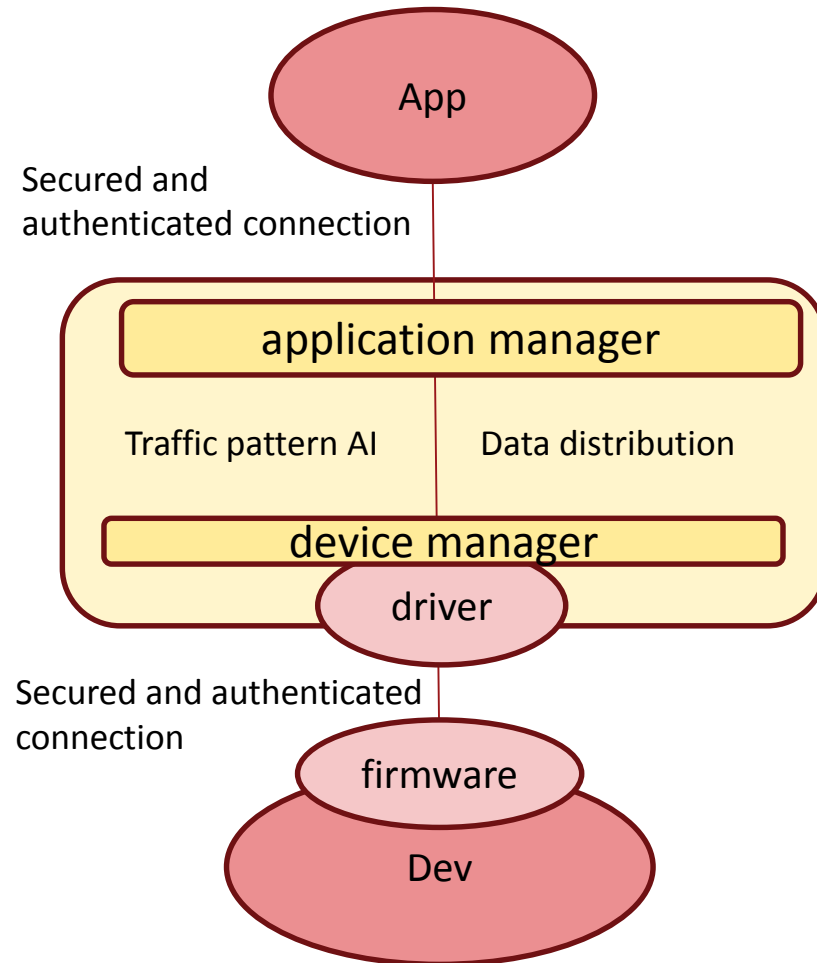
Applications and Device Owners compete to win the trust of the others needed as the market becomes more efficient

I<sup>3</sup> allows departmental exchange of data in a managed fashion.

I<sup>3</sup> allows citizens to provide IOT data to the city while maintaining individual control.

I<sup>3</sup> allows the city to exchange data with neighboring cities and state authorities without losing control.

# Increased Security in Uncertain Environments



## TRUST Requires more than encryption

Platform Security

User Privacy

Operations Transparency

Operational Code of Conduct

Attack pattern detection

Policy Audits

Isolation/protection cut-offs

# Vision: Los Angeles - A Platform for its Citizens - A Platform for Leadership



4,000,000 people • 1,400,000 housing units • 470 square miles • 6,000 miles of sewer  
22,000 miles of paved streets • 50,000 City connected street lights • 4,500 intersections  
2,000,000 Google/Waze connected sensors • 25,000 connected parking meters • 7,000 body cams

## The I<sup>3</sup> Direction Forward

- I<sup>3</sup> can be used as a platform that corporations can build commercial products upon. The platform is opensource but corporate value-added may be licensed.
- Anyone (corporations, individuals, universities..) can contribute to the I<sup>3</sup> development process
- I<sup>3</sup> systems are rigorously tested before software is released; dependable software must be quality assured and supported.

**Actively seeking corporate partners to participate in the process.**

***Partner value can be derived from:***

- use of opensource platform as basis for value-add,
- from new research the platform allows,
- from business research behind the program,
- from hiring IOT savvy students
- from interactions with others in the I<sup>3</sup> community

[www.I3-IOT.net](http://www.I3-IOT.net)



Join I3 Today



[Manager@I3-IOT.net](mailto:Manager@I3-IOT.net)



## Backup/Reference Slides

# Communications Technology Management (CTM)

## CTM Mission Summary

### Key questions:

*How does rapidly changing technology impact business issues?*

- 1. How does tech impact consumer and business markets?*
- 2. How does tech impact commercial operations and business practices?*
- 3. How does tech impact corporate culture; can performance be optimized?*
- 4. How can a company provide shareholder value in a world where change has become the norm?*
- 5. What are the opportunities and risks that await over the horizon?*

### Welcome to CTM!

- A consortium funded Center of Excellence at the Marshall School of Business
- Founded in 1985 when the world was a very different place
- A unique group that looks at technology driven disruption as an opportunity enablers and threat indicators that must be understood.

### Business Processes and Culture

- People and environments need to be managed for max potential in an evolving workplace

### Business Disruption

- Consumers have redefined how they entertain themselves and how they interact with businesses and with each other

### Internet of Things, Automation, and Big

### Data

- Tech is making big-data a real-time asset that allows firms to be customer context sensitive.

## Value

**CTM Members:** *CTM attracts companies that consider technology as a strategic weapon that can be used to create a competitive business advantage. CTM influences these companies and the companies influence Marshall..*



## The Process

"What people think of as the moment of discovery is really the discovery of the question." - Jonas Salk

"We thought that we had the answers, it was the questions we had wrong." - Bono

CTM paramount objective is to create a collaborative environment that includes industry, academia, or other interested parties that provide a means to focus on the issues that serve to shape our future (opportunities and threats) from a business perspective. The rapid rate of technological evolution creates a growing number of disruptors that continually need to be assessed, considered, and responded to. The CTM members work together to develop an understanding and to find pathways for forward action.

For Further Information: [Jerry.power@marshall.usc.edu](mailto:Jerry.power@marshall.usc.edu) or [www.marshall.usc.edu/ctm](http://www.marshall.usc.edu/ctm)

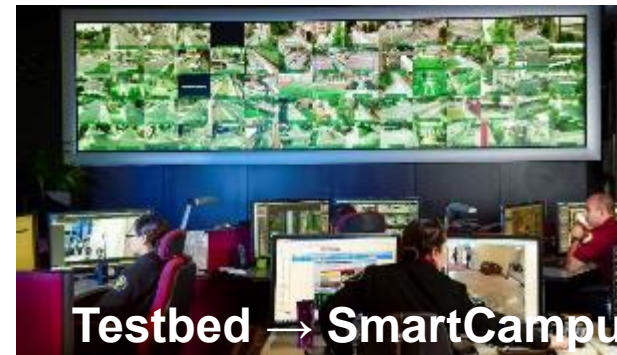
# Campus IoT Testbed (CCI)

## CCI Mission Summary

The USC Center for Cyber-Physical Systems (CCI) and the Internet of Things is building a campus-wide IoT testbed at USC.

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



## 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 CCI, please contact Bhaskar Krishnamachari at [bkrishna@usc.edu](mailto: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>





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Thank You!

**I3**

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A Joint Project: Marshall and Viterbi

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