Internet of Things (IoT):
A Vision, architectural elements,
and future directions
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• Cloud Centric Internet of Things
  – Two perspective:
    • *Internet* centric: internet service being the main focus
    • *Thing* centric: smart object take the center stage

• Cloud computing
  – Use as a viable framework to combined with ubiquitous computing

• Sensing service provider
  – Using storage cloud for their sensor data collection
    • Give benefit for analytic tool S/W developer
    • Give benefit for AI, Machine Learning, or Data Mining Expert
    • Give benefit for visualization computer graphics designer
Network of Things
- sensing data
- collect data
(data = sensor data)

Cloud computing
- store the data
- get the insight/pattern of data
  (analytics - computation)
- illustrate the insight
  (visualize the data)
- archiving data
  (just store)

Applications
- developer create interactive UI
  with useful information
- without worry where the data
  come from
- developer monetizing data
  sensor

Conceptual framework – IoT layer
- Applications
  - Surveillance
  - Critical infrastructure monitoring
  - Environment Monitoring
  - Health Monitoring
  - Smart Transportation
- Cloud Computing
  - Visualization
  - SaaS
  - PaaS
  - IaaS
  - Computation
  - Analytics
  - Storage
- Wireless Sensor Networks
  - Network of Things
  - Security, Re-configurability, Quality of Service, Communication protocols, Location Awareness, Compressive Sensing
Implementation Cloud Centric Model – End to end interaction
What the implementation models offered?

- Reading data streams either from sensor directly
- Easier logic expression data analysis
  - Transparent
  - Scalable manner
- Detect specific event and passed to output streams
- Reducing time and cost develop IoT applications
• Aneka Cloud Computing Platform
  - .NET based PaaS (Platform as Service)
    • Utilize storage and compute resource
      - Public cloud
      - Private cloud
• Application Scheduler
  – Responsible for assigning each resource to a task in an application for execution

• Dynamic Resource Provisioning
  – Implements the logic for provisioning and managing virtualized resources
- IoT Sensor Data Analytic SaaS using Aneka and Microsoft Azure
  - Microsoft Azure = cloud platform, includes:
    - Microsoft Azure
    - SQL Azure
    - AppFabric
    - Azure Marketplace
- Ubicomp related implementation:
  - Seamless operation within specific deadline by utilizing public and private cloud services
  - Support huge computation task for data analytic and AI (sensor data analytic)
- Aneka Master container deployed in the on-premises private cloud
- Aneka Worker container will be run as instances Microsoft Azure Role
- **Management Extensibility Framework (MEF)**
  - Solution for updating analytic tools by several client
  - Third party plugin
  - Improves flexibility, maintainability and testability of large applications in IoT platform
  - Standard way for the host application to expose itself and consume external extensions