

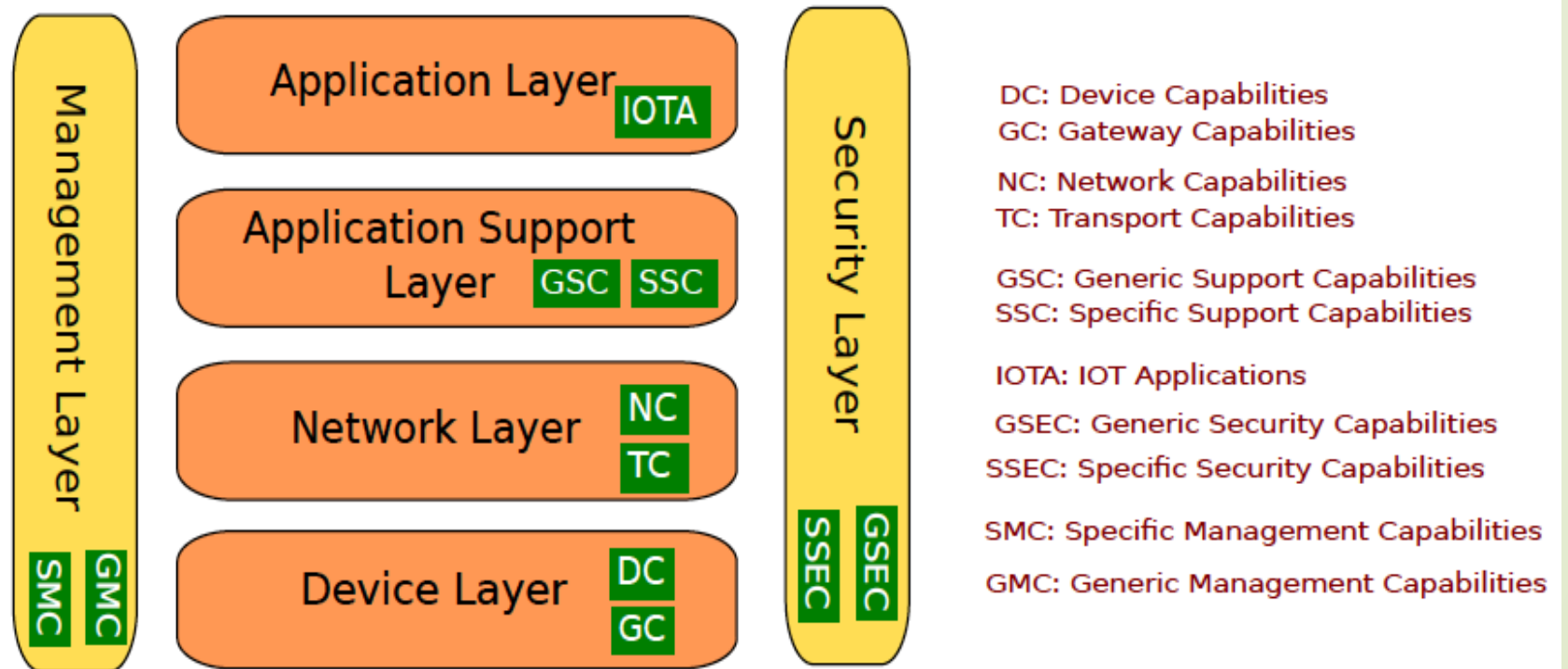
# SWE-425 Security of Internet of Things (IoT) and Privacy

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# Outline

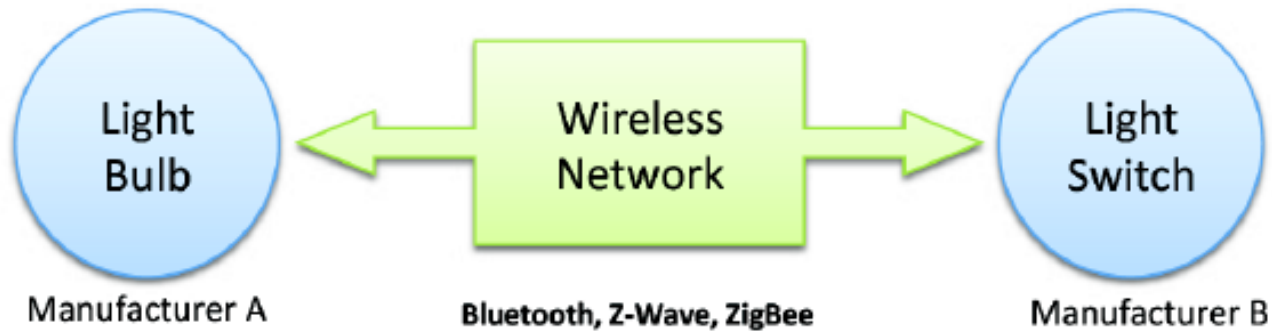
- ❑ Review - IoT Architecture
- ❑ Review - Communication models
- ❑ IoT and Transportation

# Review - IoT Architecture



# Review IoT Architecture communication models

## 1-Device to Device Model

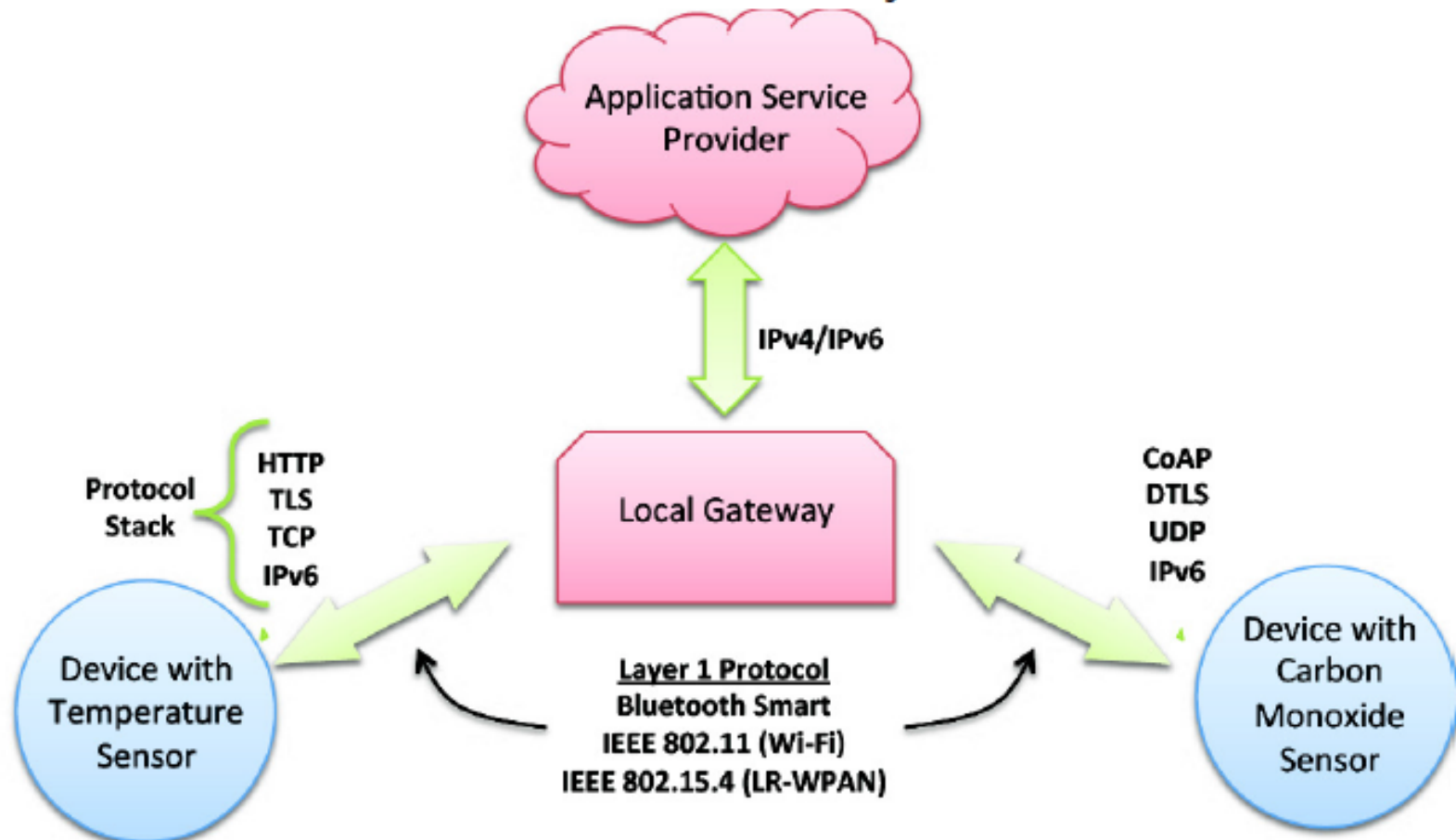


## 2-Device to Cloud Model



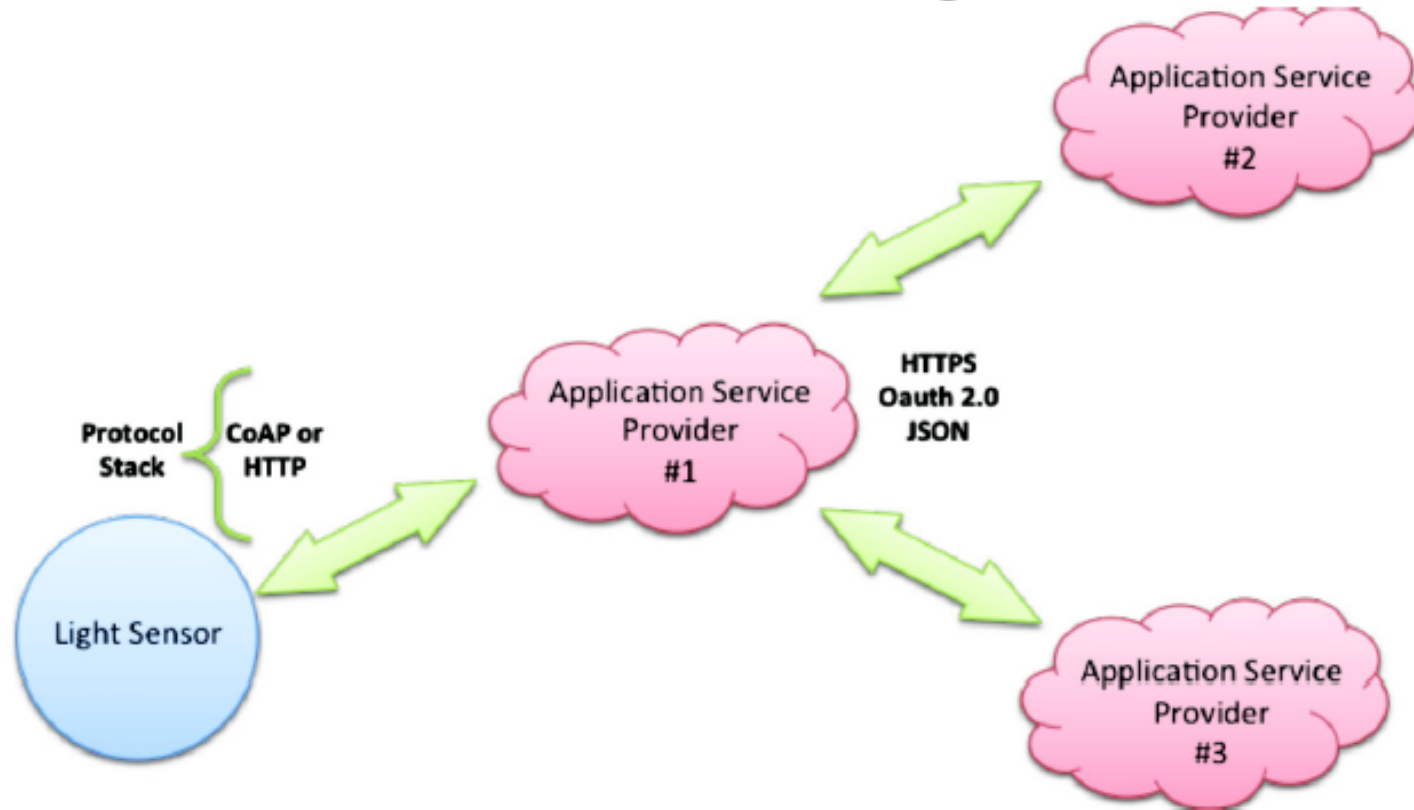
# Review - IoT Architecture communication models

## 3-Device to Gateway Model



# Review - IoT Architecture communication models

## 4-Back End Data Sharing Model



# IoT and sensor networks

## ? Internet connectivity

? In IoT, all devices/sensors are connected to Internet and data can be sent directly from any device to Internet

? In sensor networks, devices/sensors do not have to be directly connected to Internet and sensors send information to a router or a central node

? Sensor networks can be considered a subset of IoT

? IoT are more encompassing than sensor networks

? In IoT, devices are stand-alone internet-connected devices and are independent

# IoT and transportation

- ❑ Experts forecast that transportation industry will make substantial investment in IoT related technologies
- ❑ Important aspects
  - ❑ Context of using IoT technologies
  - ❑ What are these technologies going to look like?
  - ❑ What should we expect from these technologies?
- ❑ We are already seeing limited use of IoT in transportation
  - ❑ Vehicle-to-person – your uber is two minutes away

# IoT and transportation

- ❑ Benefits of IoT in transportation
- ❑ Maintaining vehicle health
  - ❑ Onboard diagnostics port
  - ❑ Maintenance is easy and less expensive
  - ❑ Information is useful for businesses such as fleet management
    - ❑ Performance
    - ❑ Catch issues early
    - ❑ Fuel consumption, idle time
  - ❑ Tracking your car

# IoT and transportation

## ? Traffic

- ? Commuters spend on the average 42 hours per year sitting in traffic (in addition to commute time)
- ? IoT can help:
  - ? Can help smooth the traffic flow than just stop-and-go
  - ? Can suggest better routes
  - ? Traffic Jam Assist – match the speed of the cars ahead

# IoT and transportation

## ? Transforming vehicle ownership

- ? Car ownership is expected to decrease 80% by 2030
- ? Trends are already visible – urban population is already relying on uber, lyft, and public transportation
- ? The trend is expected to expand
- ? IoT helps the trend by tracking and broadcasting
- ? Car2Go program allows users to unlock cars (from a fleet) by phone and drive it anywhere (within limits)
- ? IoT will help in fuel management, battery health, and other aspects

# IoT and transportation

- ❑ Autonomous cars – Countries plan to build infrastructure for autonomous vehicles
- ❑ Benefits
  - ❑ Reduce auto collisions and driving risks
  - ❑ A large number of people die in auto collisions every year
  - ❑ Self-driving cars are expected to reduce these
  - ❑ Autonomous cars can see blind turns, corners, identify pedestrians, cyclists, and other hazards well in advance
  - ❑ They can make judgment calculations, decisions very quickly

# IoT and transportation

## ? Benefits (continued)

- ? Time saving for efficient routing and parking

## ? Benefits to companies

- ? Increase utilizations, lower costs

- ? Real-time data and faster claims by insurance companies

# IoT and transportation





- ❑ Benefits to cities
  - ❑ Information sharing about traffic congestion, hazards to other vehicles
  - ❑ Information sharing with traffic lights
  - ❑ Coordinated rerouting and traffic load balancing
- ❑ Platooning
  - ❑ Set of vehicles
  - ❑ Vehicles coupled together
  - ❑ Maintaining speed and distance
- ❑ Reduce accidents

# IoT and transportation

- ❑ Smart traffic lights
  - ❑ Faster commute
  - ❑ Reduce vehicle wait
  - ❑ Reduce emissions

# IoT and transportation

## Challenges

-  Adopting IoT is expensive
-  Enabling communication infrastructure is a big undertaking
-  Responsibility for liabilities such as accidents
-  Data security

# IoT and transportation

 Video

 <https://www.youtube.com/watch?v=tiwVMrTLUWg>



**Thank you!**