IEEE802.11ah Use case

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802.11ah Promotion Council

Summary

- [Home]
  - Home security network
  - Contents synchronization between home server and cars
- [Office]
  - Power management
- [Industry]
  - Wireless sensor network backbone in process automation industry
  - Efficient field work and inspection at factories
  - Remote monitoring of wildlife to prevent damages of agricultural crops
- [Infrastructure]
  - Surveillance camera system using edge computing
  - Advanced water pipe management
  - Backup network for cellular drone
  - Detecting deterioration of infrastructure by wireless vibration sensors
- [Mobility]
  - Push notification customer support
  - Advanced management in public transportation

[Home] Home security network

Summary

Use case

- Home security service may be expanded using HaLow to integrate the multiple home security devices which are using multiple radio frequency bands.

Background

- Existing home security devices such as magnetic motion sensors are using 426MHz band (in some countries). On the other hand, outdoor surveillance cameras, alarming speakers are using Wi-Fi (2.4GHz and/or 5GHz) network. Wi-Fi HaLow is able to integrate multiple home security devices to utilize the wireless infrastructure for home security service. It may be expected to reduce a cost and provide variety of sensors in the network.

Why Wi-Fi HaLow? (features)

- IP based wireless sensor network enables to integrate existing Wi-Fi infrastructure.

- Wi-Fi base network enables the DIY (Do It Yourself) home security. (Some wireless security sensors such as 426MHz band are required professionals for its installation.)

- Longer range compared to existing Wi-Fi standards enables to cover wide area of monitoring including garages and gardens.

Images

Low-power wireless sensors (426MHz)

❶ Magnetic sensor

❷ Area motion detection sensor

❸ Smoke detection sensor

+

Home security devices (Wi-Fi based)

❹ Surveillance camera w/ lighting function

❺ Network video recorder (NVR) system

❻ Outdoor speaker

Covering both HaLow

Surveillance camera w/ lighting function image

[Home] Contents synchronization between home server and cars

Summary

Use case

- Synchronization of contents between home server and cards using HaLow supports fun to drive .

Background

- To enjoy multimedia contents during drive, general way is to use digital media players or memory cards to carry out from home network attached servers (NAS). Longer range of HaLow enables to send those data to outdoors and synchronization with car media library.

- In addition, HaLow is able to upload and provide variety of information from the cars including drive records, diagnostics, notification of vandalism, route navigation for safety drive.

Why Wi-Fi HaLow? (features)

- Longer range and better penetration enables to communicate between house and car in garage.

- IP base enables easy integration existing Wi-Fi devices.

- Tri-band Wi-Fi access point (2.4 GHz, 5 GHz, 900 MHz) may be utilized an existing Wi-Fi infrastructure at home.

Images

Synchronization of home server contents and car media library, uploading of car status info and remote setting (e.g. route navigation) via HaLow.

HaLow

[Office] Power management

Summary

Use case

- Remote monitoring and control of devices in the building using HaLow integrated with BMES enables to save a energy .

Background

- BEMS (Building Energy Management System) is being expected for cost saving based on the demand of ISO14001 and rising electricity charge.

- Furthermore, individual energy management per tenants in the building will be needed additional cost saving and ISO certification.

- By monitoring and controlling with HaLow compatible devices (e.g. computers, MFP(Multifunction Peripheral)s, air-conditioners, ceiling lighting units), companies can optimize usage of electricity.

Why Wi-Fi HaLow? (features)

- Tri-band Wi-Fi access point (2.4 GHz, 5 GHz, 900 MHz) may be utilized an existing Wi-Fi infrastructure in the tenants.
- IP based network enables easy integration with power management system for monitoring and controlling.

Images

Office

Conference Room

Stairs

Elevator hall

Conference Room

W.C.
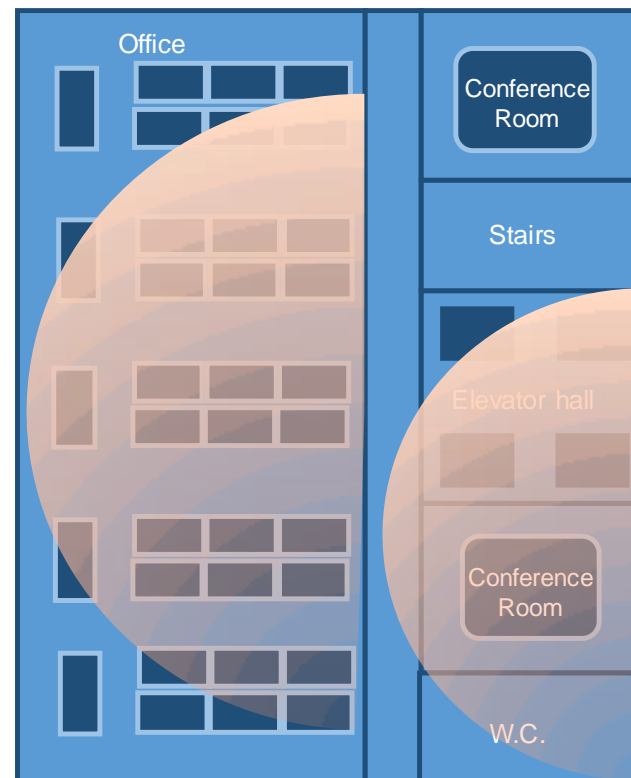
BEMS (Building Energy Management System): Systems that controlling building facilities, environment and power supplies aiming for electricity power saving.

[Industry] Wireless sensor network backbone in process automation industry

Summary

Use case

- Wireless backbone for industrial wireless sensor network using HaLow enables to provide low cost, flexible wireless infrastructure, coexistence management in production site.
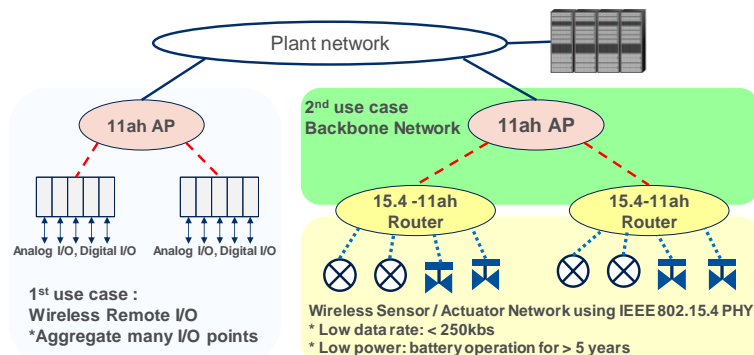
Background

- Industrial wireless sensor network such as ISA100 Wireless (IEEE 802.15.4 - 2.4GHz band) are operating in the production site for process monitoring and control. And Wi-Fi networks are running (on 2.4GHz and/or 5GHz) at same plant area for mobile workforce and other purposes   Although some applications are required a wireless backhaul network to transfer the sensing data from remote I/O units in the field to a central control room, it is difficult to deploy another Wi-Fi network solution for wireless backhaul due to the coexistence issues on 2.4GHz band. Also wireless backhaul requires a long distance communication with higher bandwidth.
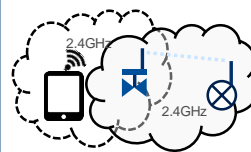
Why Wi-Fi HaLow? (features)

- IP base wireless network enables seamless integration with existing IP base automation systems.
- Longer range + high bandwidth for wireless backhaul
- Robust communication under multi-path environment
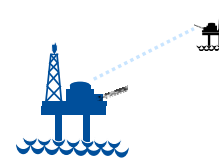- Coexistence with another wireless system in 2.4GHz Band

Images

1) Interface for remote I/O: Communicate with central control room
2) Wireless back bone network: Interface for WSN
3) Wireless sensor network(WSN)

Plant network

11ah AP

2nd use case
Backbone Network

11ah AP

Analog I/O, Digital I/O   Analog I/O, Digital I/O

15.4 -11ah
Router

15.4-11ah
Router

1st use case :
Wireless Remote I/O
*Aggregate many I/O points

Wireless Sensor / Actuator Network using IEEE 802.15.4 PHY
* Low data rate: < 250kbs
* Low power: battery operation for > 5 years

Coexistence

Long distance

Robust Comm.

2.4GHz

2.4GHz

[Industry] Efficient field work and inspections at factories

Summary

Use case

- Remote visual inspections are expected using HaLow for efficient and safe plant maintenances. It requires the large data transfer such as still images and videos for the asset condition monitoring and predictive maintenance.
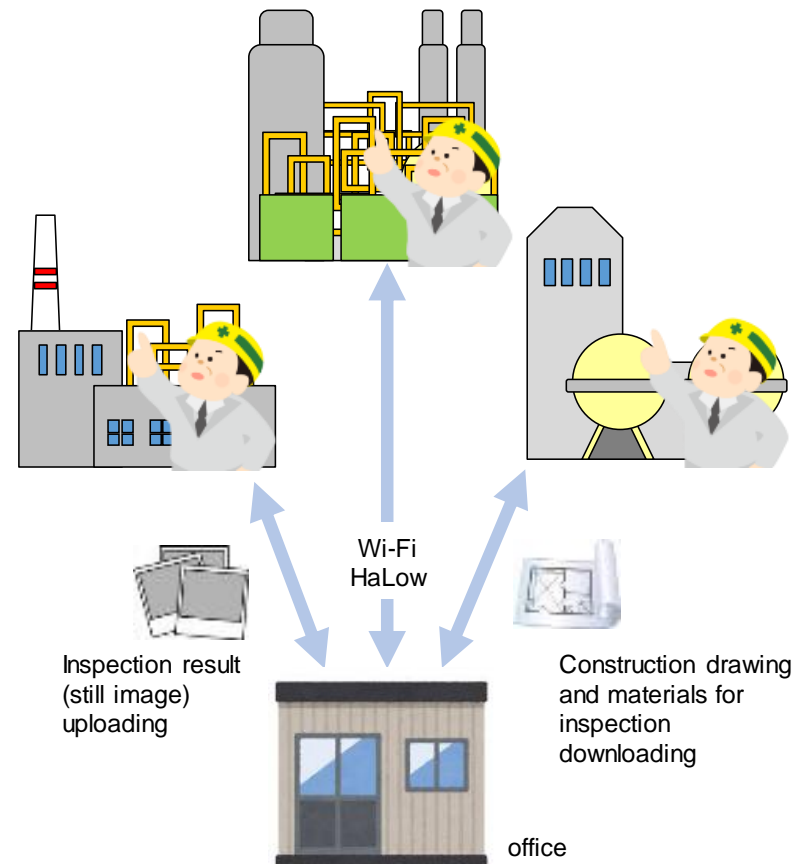
Background

- Mobile workforce is a important to keep a safe plant operation and improve productivity.

- The Augmented Reality (AR) may become a one of the key technology for the smart manufacturing and maintenance using IP base wireless technology such as Wi-Fi.

Why Wi-Fi HaLow? (features)

- Longer range and better penetration enable plant wide monitoring even non-line of sight condition at the pipe jungle environment in oil & gas plants.

- Higher throughput wireless communication enables to transfer the clear images for inspections.

- Tri-band Wi-Fi access point (2.4 GHz, 5 GHz, 900 MHz) may be utilized an existing Wi-Fi infrastructure in the manufacturing site.

Images

Wi-Fi HaLow

Inspection result (still image) uploading

Construction drawing and materials for inspection downloading

office

[Industry] Remote monitoring of wildlife to prevent damages of agricultural crops

Summary

Use case

- Remote monitoring and alarming system using HaLow to prevent damages of agricultural crops by the wild life. Existing system notices only events when animals were trapped, but HaLow enables to identify trapped animals by visual monitoring for saving a time to find appropriate tools for catching by hunters.

Background

- Crop damages by number of wildlife such as boars or deers are being increased.

- In order to reduce the economic losses of agriculture business, traps and patrolling are needed.

Why Wi-Fi HaLow (features)

- Longer range enables to identify status of traps in forest and mountains from remote location.

- Higher throughput enables to transfer image data.

- Tri-band Wi-Fi access point (2.4 GHz, 5 GHz, 900 MHz) may be utilized an existing Wi-Fi infrastructure at home .

Images

Not only detecting trapped or not, but also capable to define species of animal.
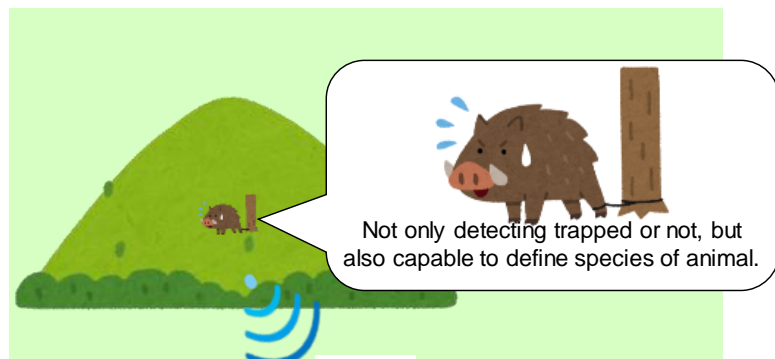
HaLow

hmm, looks like I captured boar. It is better bring that item for this.

[Infrastructure] Surveillance camera system using edge computing
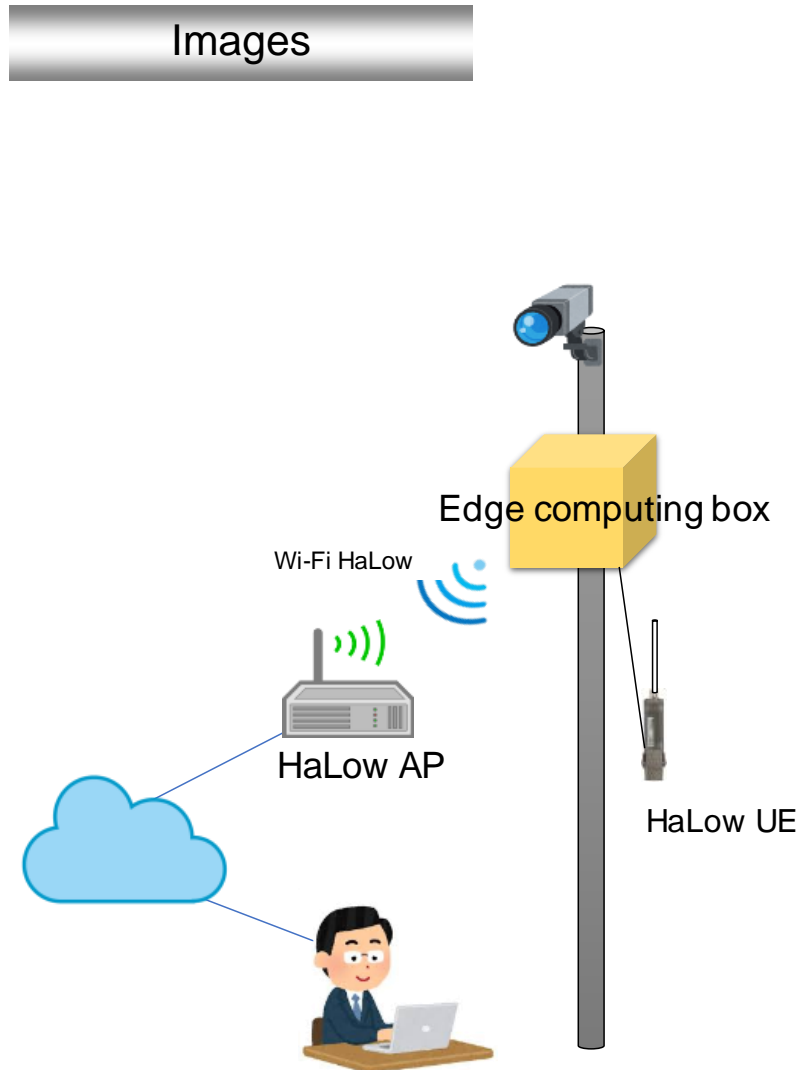
Summary

Use case

- HaLow enables not only wider area of video surveillance but also sending alert and pictures when some events or system fault happened. It may be a lower investment cost against existing system.

Background

- Current regulation in Japan, video surveillance system requires local backup. HaLow device enables easy integration with IP base edge computing devices. Today the edge computing device sends alarms using 60GHz band when malfunction had been detected. It may be a higher costs.

Why Wi-Fi HaLow? (features)

- IP base network device enable easy integration with ICT equipment such as Edge computing device.

- Longer range and higher throughput network enables an enhancing of remote surveillance service.

Images

Edge computing box

Wi-Fi HaLow

HaLow AP

HaLow UE

[Infrastructure] Advanced water pipe management

Summary

Use case

- HaLow enables efficient management of the water pipe lines and to improve predictive maintenance.

Background

- Wireless sensor network is expected to use monitoring of the sewer pipes flow and water level since it enables easy implementation and maintenance.

- Water pipe leakage detection is using acoustic signal. By using high frequency sound, more accurate detection can be expected. Higher bandwidth wireless network enables to transfer such acoustic wave form signal to analyze its leakages. In case of LPWA, it is difficult to send large data efficiently for this purpose.

Why Wi-Fi HaLow? (features)

- Higher bandwidth enables transferring large size of data such as high frequency acoustic wave form

- IP based network enables easy integration with sewer management systems which are generally using IP base devices.
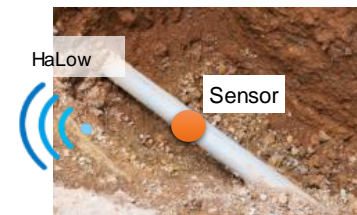
Images

Source: Matsudo City webpage

HaLow

Sensor

Water pipe leakage detection car (HaLow AP inside)

[Infrastructure] Backup network for cellular drone

Summary

Use case

- HaLow enables to enhance drone's usability and capability.

Background

- A cellular drone provided by service providers of mobile phone may have a risk of uncontrollable under network congestion when disasters are happen.
- Some drones have a compatibility with Wi-Fi, thus operator is able to use Wi-Fi network as a backup for drone control. However, existing Wi-Fi has a limitation of communication range for flying area.

Why Wi-Fi HaLow? (features)

- Longer range communication enables the wide area done flight.
- Wi-Fi based HaLow device enables easy adopting to existing Wi-Fi drone.
- Higher bandwidth enables to transfer detail images from disaster area.

Images

Taking photos to get the picture of hazard at dangerous and unapproachable area; shore line, mountain recesses, etc.

Drone

Network congestion caused by disaster

HaLow

Mobile phone base station

Local government office
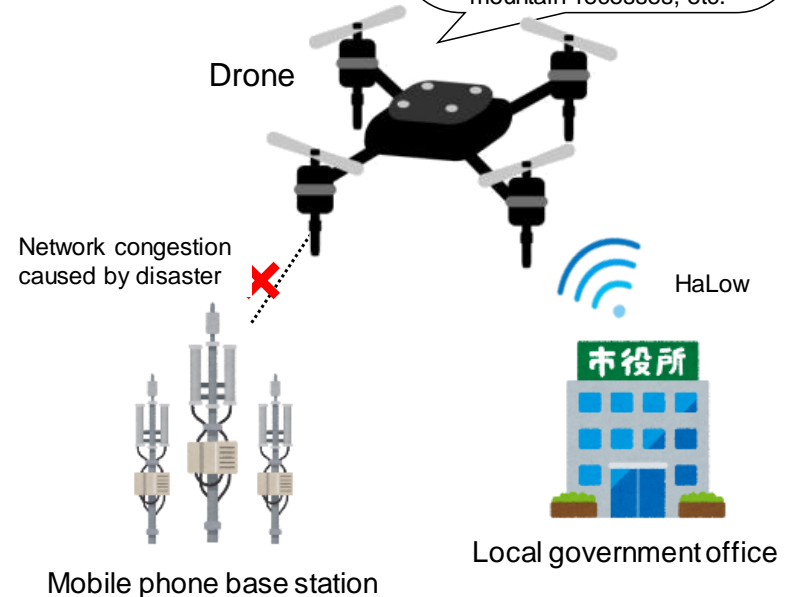
[Infrastructure] Detecting deterioration of infrastructure by wireless vibration sensors

Summary

Use case

- HaLow enables to enhance a wireless sensing for social infrastructure. It is able to collect large data such as vibrations from wide area.

Background

- There are many old infrastructures and simultaneously its deterioration is becoming a serious problem. Economic and efficient maintenance works are being required.

- Some sensing and monitoring solutions have been implemented, however large size of data has not been collected enough due to a limitation of bandwidth.

Why Wi-Fi HaLow? (features)

- Longer range communication enables wide area of monitoring for social infrastructure.

- Higher bandwidth enables to transfer large data with shorter time.

- Large number of devices per AP enables to cover large amount of wireless sensor nodes.

Images

HaLow

tunnels

HaLow

quays

HaLow

bridges

[Mobility] Push notification for customer support

Summary

Use case

- HaLow enables to provide new type of advertisement solution from shops to cars. Car dealers send an advertisement messages to moving cars nearby using Wi-Fi HaLow. Those information may be provided maintenance services based on the actual condition of cars.

Background

- In general, breakdown maintenance or time based maintenance are popular for cars. It may not be related to an actual condition of cars or how often use cars.

- In order to improve a maintenance service for safety car driving, HaLow network enables to send a notice for maintenance and/or sales promotion from car dealers.

Why Wi-Fi HaLow? (features)

- Longer range communication enables to transfer the messages from car shop to moving cars on the road.

- Higher throughput enables to send the data with shorter time to moving cars.

- Tri-band Wi-Fi access point (2.4 GHz, 5 GHz, 900 MHz) may be utilized an existing Wi-Fi infrastructure at shops.

Images

Collecting information from moving cars near dealers and providing push notification/recommendation (e.g. exchanging oil).

Car Dealer

802.11ah

[Mobility] Advanced management in public transportation

Summary

Use case

- HaLow enables remote condition monitoring of pubic trains/buses and its drivers to prevent traffic accidents.

Background

- HaLow enables to collect driving record data from the bus/train at garage from remote office.

- Some time, traffic accidents have been happen at public transportation service caused by driver's healthy condition. However, the only periodic medical check may be missed actual condition for safety driving.

- By analyzing driving record may detect rough driving which are potential risk of accident. In addition, driving record could apply to improve an education program for drivers.

Why Wi-Fi HaLow? (features)

- Longer range communication enables data transfer from garage to office without any repeaters.

- Tri-band Wi-Fi access point (2.4 GHz, 5 GHz, 900 MHz) may be utilized an existing Wi-Fi infrastructure in the office.

- Higher bandwidth enables to collect large size of driving recording data from many trains/buses until next business hours.
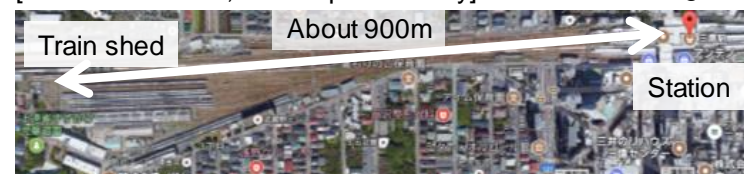
Images

Source: Google Map
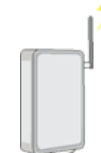
[Tokyo branch office, Japan Railway Bus Kanto]

Office

Bus garage

[Mitaka train shed, East Japan Railway]　　Source: Google Map

Train shed　　About 900m

Station

Sending sensor data to office after business hours

HaLow

HaLow AP in office