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Source: [Chihong Cho, Noh-Gyoung Kang, Seung-Hoon Park, and Eun Tae Won]

Company: [[Samsung Electronics Co. Ltd.]

Address: [416, Maetan-3dong, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742, Korea]

Voice: [+82-31-279-7325], **FAX:** [+82-31-279-5130], **E-Mail:**[Chihong316.cho@samsung.com]

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Abstract: [This document presents the brief information about power consumption for BAN applications]

Purpose: [To discuss the power consumption for BAN applications]

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Low power consumption considerations for BAN

Chihong Cho, Noh-Gyoung Kang, Seung-Hoon Park
and Eun Tae Won

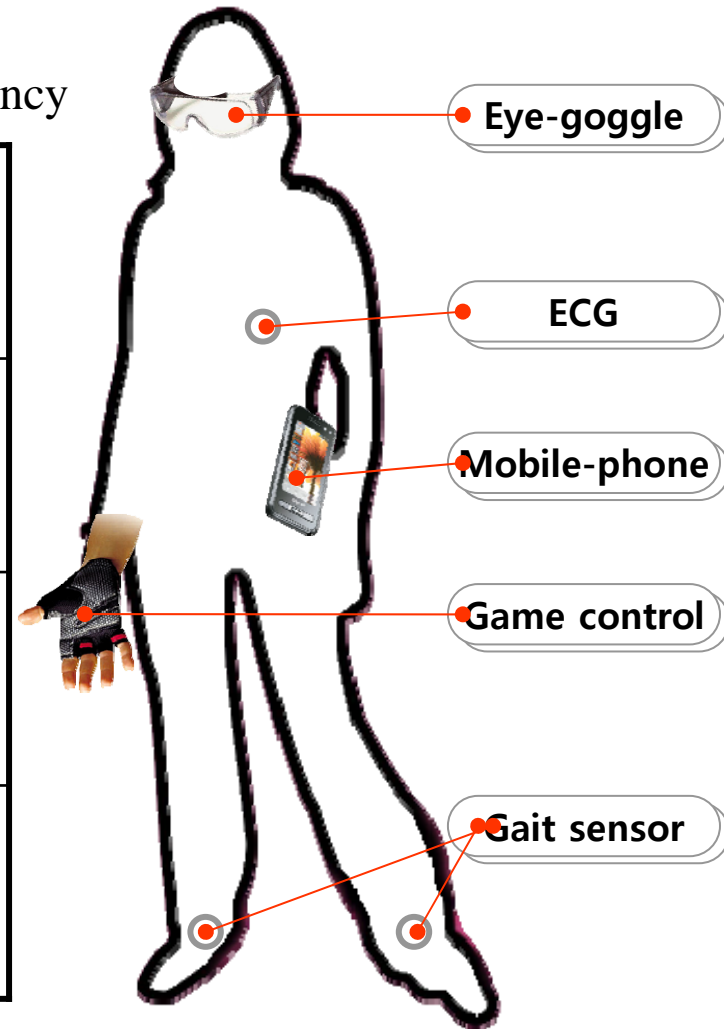
Introduction

- Low power consumption is a key issue for BAN applications
- Battery life is a critical point for BAN sensors.
- Energy-efficient transmission scheme is needed
 - Band plan for low power consumption transmission
 - Dynamic power control according to traffic change

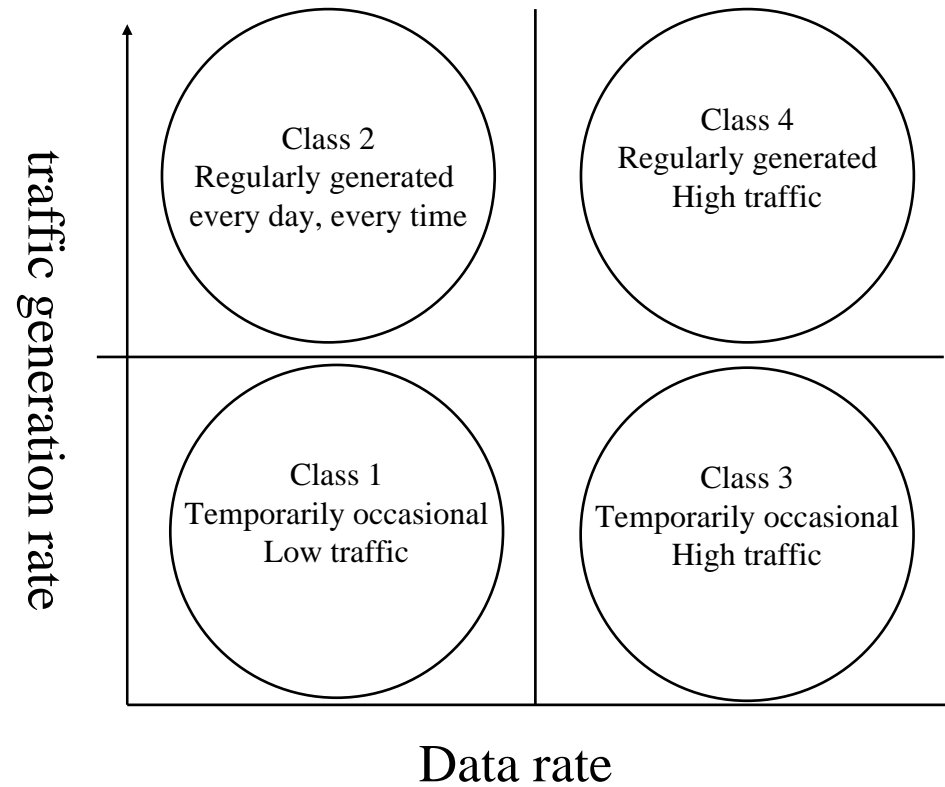
Categorized Classes

- Considering data rate and traffic generation frequency

Class 1	Low data rate / Temporarily occasional Low traffic	CE control Game control
Class 2	Low data rate/ Regularly generated every day, every time	Implant devices Periodic monitoring Periodic health check
Class 3	High data rate/ Temporarily occasional High traffic	Multimedia services Video streaming Gaming services
Class 4	High data rate/ Regularly generated High traffic	Life video recording



BAN Traffic Characteristics



Band plan due to traffic generation condition

- Everyday monitoring and checking sensors as usual
 - Lower band frequency is used for low data rate and low power consumption
 - Medical applications
 - Low data rate and low power
 - e.g. 400MHz as lower frequency band
- When only high speed and robust traffic occurs
 - Higher band frequency is used for high data rate
 - Entertainment applications
 - High data rate and relatively high power
 - e.g. 2.4GHz, UWB as higher frequency band

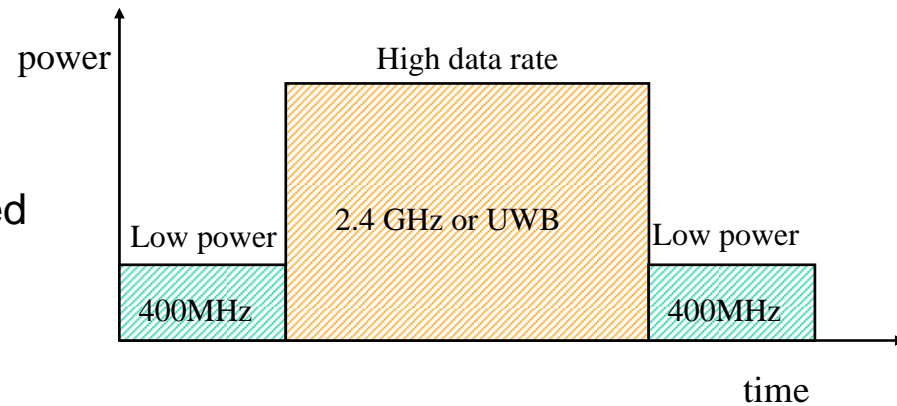
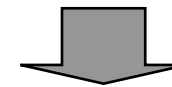
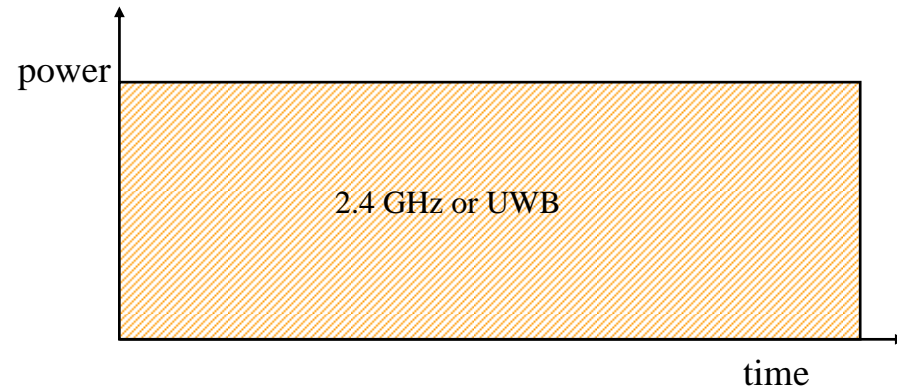
Frequency Band Characteristics

- Lower frequency bands (MICS/MEDS, 400 MHz)
 - Suitable for implanted devices
 - Better propagation characteristics
 - Limited throughput
 - Suitable for low data and low power consumption
 - Not suitable for high data rate applications
- Higher frequency bands (2.4GHz, UWB)
 - Suitable for wearable devices
 - Suitable for high data rate applications
 - Not suitable for implanted devices due to heavy path loss

Band selection for low power consumption

- Using a single band
 - Consumption power is large
 - Adaptive power management is not available

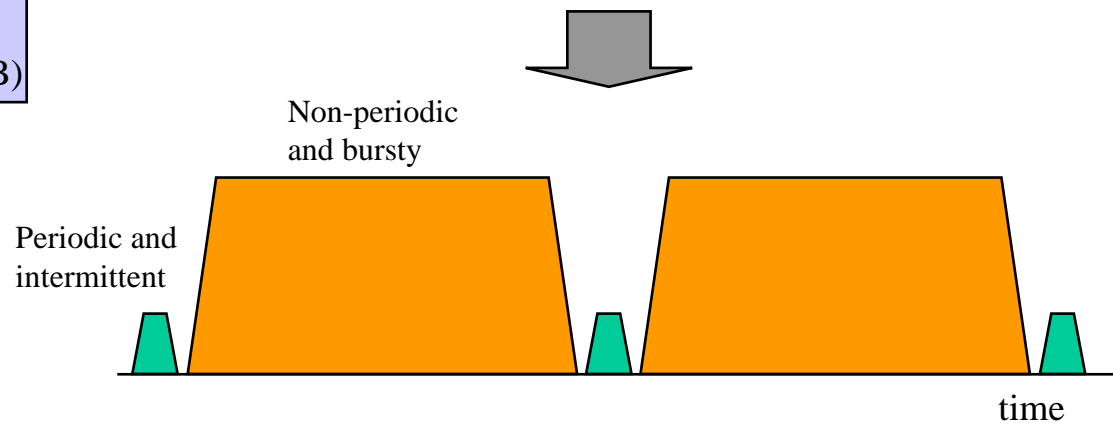
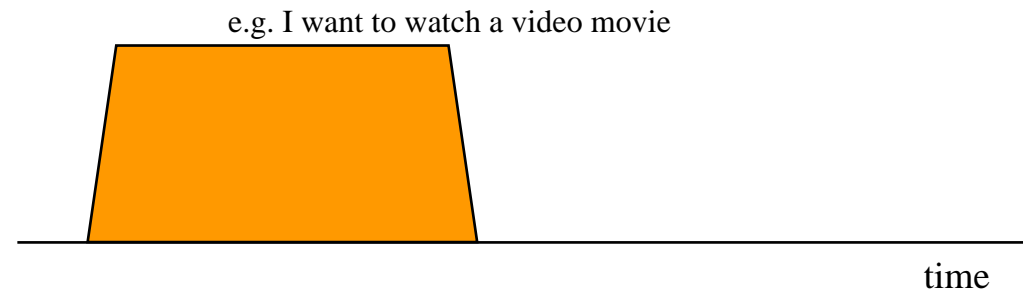
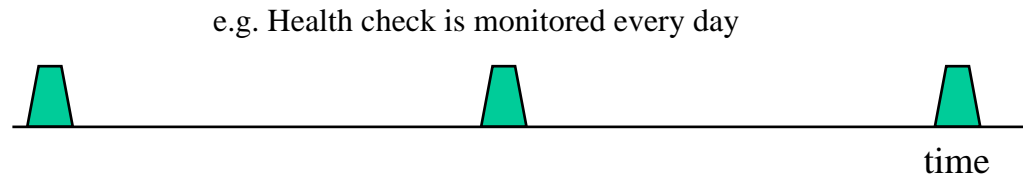
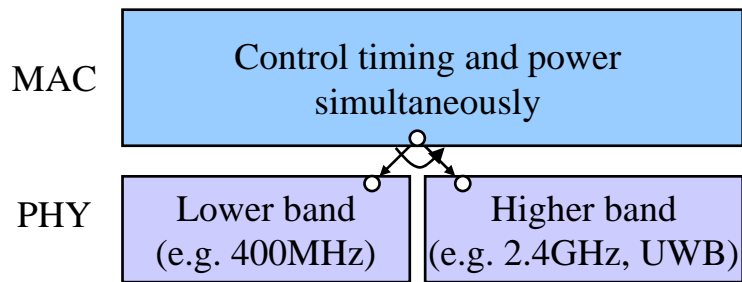
- Using two usage classified bands
 - Consumption power can be decreased



Band Switching

Low power consumption can be achieved by

- Basically, operated at lower band
- Only when needed, operated at higher band



Negative Effects of changing the bandwidth

- Additional scalability factor can be achieved by changing the bandwidth
 - Increase in MAC complexity due to channel sensing in different frequency bands
 - Use of different type of receiver algorithms
 - Design Challenges will be different at different data rates
 - Increase in form factor and cost

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Conclusion

- Low power consumption is a key issues for sensors and mobile devices.
- Switching band scheme may provide a energy-efficient transmission for BAN applications.
- Efficient transmission is decided by observing traffic conditions.

Thank you !
Q & A