A Study on the Use of Wireless Sensor Networks in a Retail Store

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Table of Contents

- **Introduction**
- **Trial Setup**
- **Requirements Analysis**
- **Results**
- **Conclusion**
- **Work in Progress**
- **Question and Answer**

Introduction

- **Evaluate WSNs in retail enviroment**
- **Authors**
  - Dawud Gordon
  - Masayuki Iwai
  - Michael Beigl
- **Trial implementation in Akihabara town, Tokyo**
  - Created by Masayuki Iwai
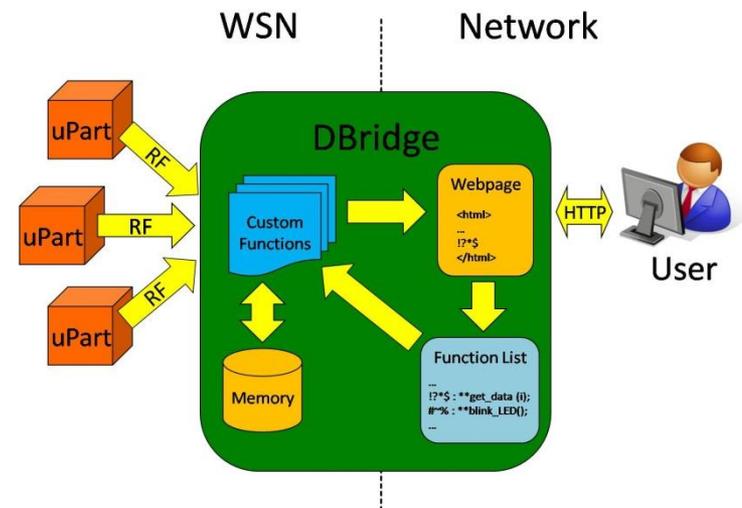
Introduction (cont.)

- **Goals of study**
  - Gather experience
  - Reduce development effort
  - Open market for high-level developers
- **Methods: Requirements analysis**
  - Improve requirement definition
  - Specify weak spots

Trial Setup

- **In-store front-end**
  - Network
    - Objects + nodes
    - Sink nodes/bridges
  - Display
    - Monitor
    - Countertop
- **Central back-end**
  - Server-based client analysis
  - Feedback to in-store system
- **Output**
  - To owner
  - To client

Setup (cont.)
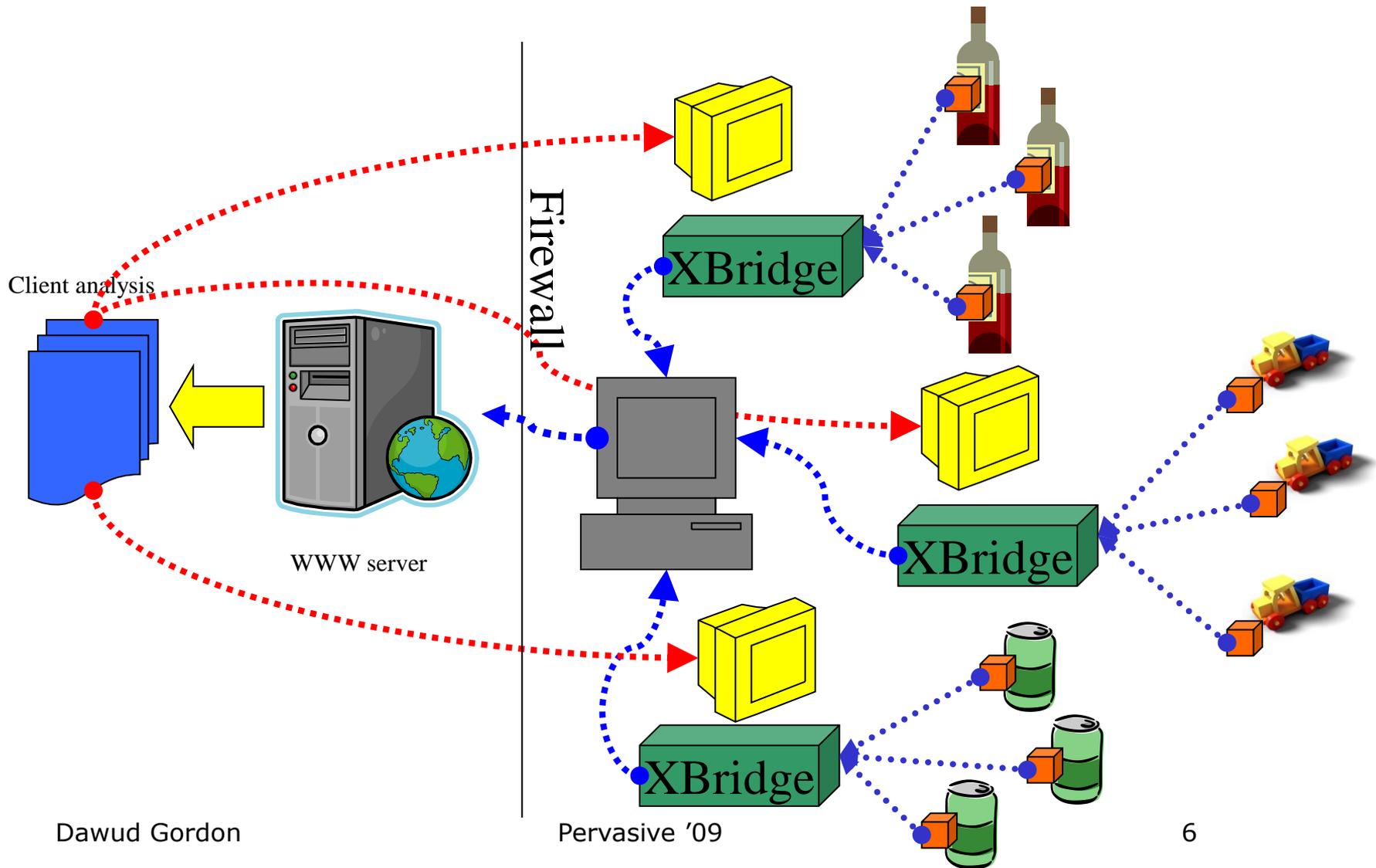
Setup (Cont.)

Requirements

- **Phase 1:**
    - Mr. Iwai – application requirements
    - Eliminates client/user stakeholder from this analysis
- **Phase 2:**
    - After Akihabara trial
    - Document Mr. Iwai's needs

Requirements - Configuration

- **Application needs to adapt**
  - Changing conditions in store
  - Market analysis
- **Dynamic changes during runtime**
- **By developer/SmartStore server**
  - Remote access from WWW (through firewall)
  - OTAC
- **By store owner**
  - Remotely from application within LAN
  - OTAC
- **Multiple nodes at once + acked config**
  - Allows reconfig of entire application
  - Saves time during development

Requirements - Sensors

- **Vibration**
  - Think ballswitch
  - Differentiation:
    - At rest
    - In user's hand
- **Light sensor**
  - Large lux ranges
    - Bottoming out
    - Saturation
  - Differentiation
  - Store interior
  - Store front
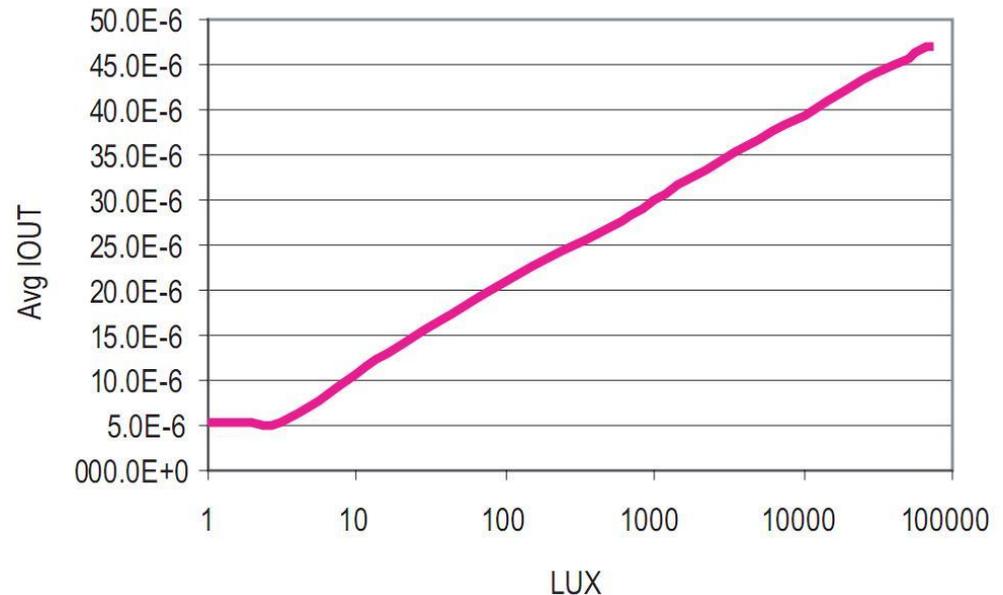
Requirements - Interactivity

- **Realtime input event reporting**
  - Allows systems to have interactive feel
  - Delay detracts from user experience
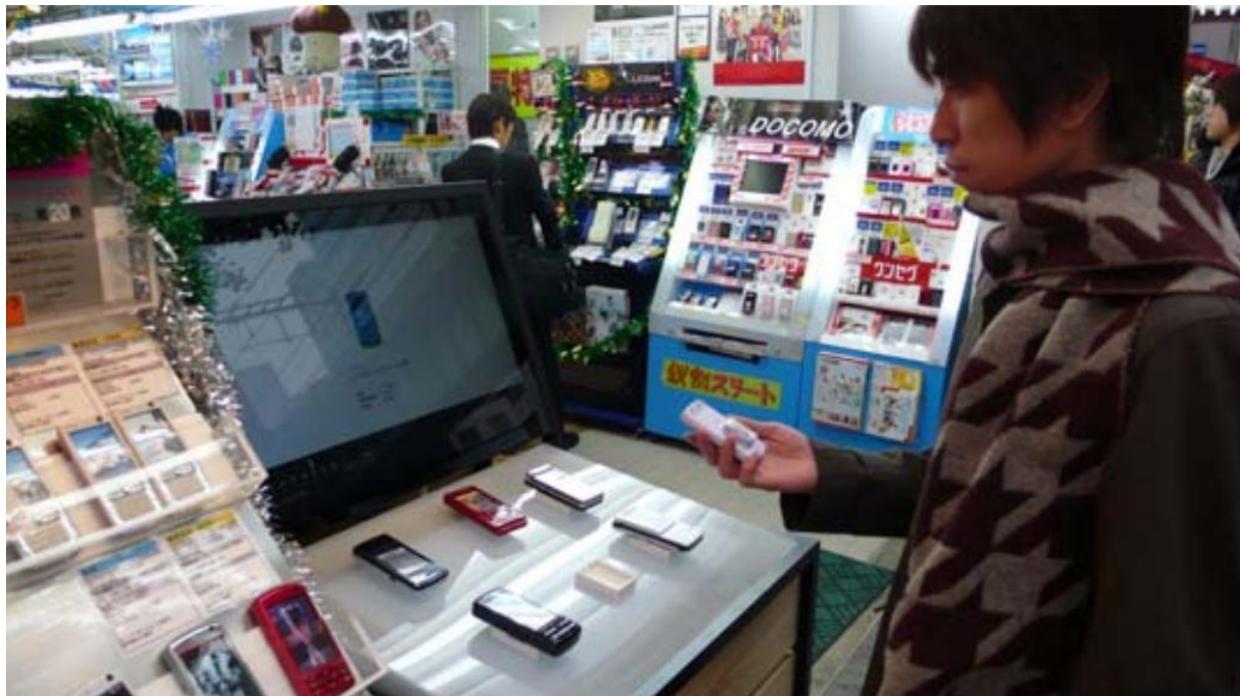
Requirements - Power

- **Battery changes effort-expensive**
- **Store's hours**
  - System not active
  - Sleep mode
    - Save battery
    - Reduce maintenance
    - Manual override higher priority
- **Battery**
  - TTD
  - Alert @ TTD = 24 hrs

Requirements - Range

- **2 scenarios present**
- **High-density**
  - 10m sink-to-node
- **Low-density**
  - 40m sink-to-node
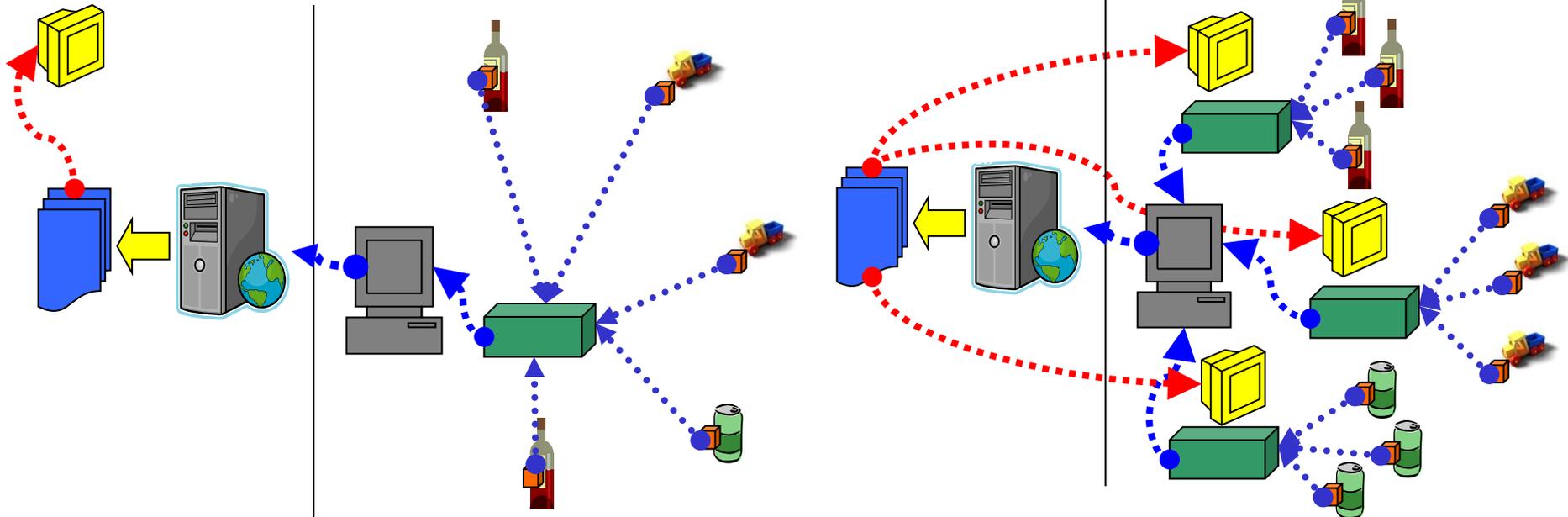
Requirements - Security

- **Problem: Config interference**
    - Broadcast affects all in range
    - multiple apps
    - multiple apps
- **Grouping mechanism**
- **Inclusion**
- **NOT real security**
    - Prevents interference, not attack

Conclusion

- **Trial provided good results**
  - Sensory
  - Interactivity
  - Power
  - Range
- **System still too technical**
  - Programming @ HW
    - Bridge
    - Node
  - Not accessable to high-level developers

Work in Progress

- **Abstraction from HW level**
  - Think: HTML
  - Point + click
- **Akiba Sensor Node**
  - In development
  - Will fulfill requirements
- **D-Bridge**
  - Prototype
  - Embedded application
  - Webserver