

# Application Perspective on Wireless Communication Medium

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# Outline

- Background
- Basic wireless medium challenges
- Reasons behind the problems
- Effects of the problems to applications and their use
- Some ways to handle the problems
- Conclusions



# Background

- Wireless environment has its own challenges yet the applications are developed like they are using reliable communication channel.
- Developers of wireless technologies try to find ways to avoid these problems.
  - The extent of problem depends on the selected lower layer solutions
  - At the end the problems are affecting on the usability of your application.
- Application developer should not just hope that lower layers will handle the problems
  - Problems are not know, understood or they are just plainly ignored.

# • Wireless Communication Medium

- Unreliable
  - Disconnections
  - Packet losses
- Performance issues
  - Latency
    - One-Way
    - Round Trip Time (RTT)
  - Low data transfer rates
- Extent of problems depends on utilised technology

# Disconnections

- Reasons behind disconnections
  - Blocking elements
    - Moving element like bus
    - User moves in Tunnel, Building
    - Different magnetic fields within e.g. factory
  - User moves out from coverage area
    - Gap /void in coverage area
  - Lack of mobility management technologies
    - Vertical & horizontal handoff /roaming
    - Automatic fail over from one medium to another to maintain connectivity

# Problems disconnection causes

- Did all the messages got through
  - What messages were lost?
  - Did the action get through
  - Was the entire transaction successful
  - Is the customer/client aware of it?
- Is the connection going to be re-established
  - When?
  - What happens when the connection is re-established?
- State of interruption stored

# • Packet loss

- Really short term disconnection
- Causes:
  - Interferences
  - Congested medium - E.g. too many users of same frequency in small area
- Problems
  - Similar to disconnected communication to some degree
  - Audio/Video streams heavily affected

# Handling packet loss & disconnected communications

- Non-blocking communications
  - e.g. Threading
  - Prevent application to hang during network problems
    - Loss of network should not interrupt/deter writing of email
- Store the state of interruption
  - Synchronize the state of peer entities once the connection is re-established



# Let the user know what is going on

## - Enlighten

- Allow user to react
  - User can move to area with better coverage
- Not knowing why application has delays causes frustration → Frustration causes extreme measure
  - Repeated push of send button
  - Restart application
  - Reboot the device
- Anticipate already in your application design phase that connection loss may happen at any time.

# Performance

- Small data transfer rate & bandwidth
- Delays between sending & receiving
  - Round trip time (RTT) between sending & getting response
- What affects on RTT and latency
  - Distance Amounts of hops
  - Number of users on same base station (AP)
  - Processing of messages and application latency
- Caused problems due the performance
  - Communication delays
  - Slow start on applications

# Remedies to performance problems

- Say No! to chatty protocols
  - E.g. HTTP 1.0
  - Avoid unnecessary waits for ACKs and other responses
- Use existing open connections
  - e.g. Avoid unnecessary handshakes
- Avoid unnecessary meta-data
  - Predetermined fields vs XML based notations
- Use compression
  - Requires computational power, drains battery.

# Conclusions

- Wireless challenges are not only the problem for the low layer technologies
- Know what challenges are relevant for your target environment
- Take the challenges into account already at design phase.
- Don't forget the application user!