

## 802.16 Enhancements to Support Direct Communications for Proximity-based Applications

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Re:

Unsolicited contribution intended for Project Planning Committee

Base Contribution:

None

Purpose:

To instigate discussion regarding a new project for the IEEE 802.16 Working Group, and to propose a development of study report on direct communications for proximity-based services

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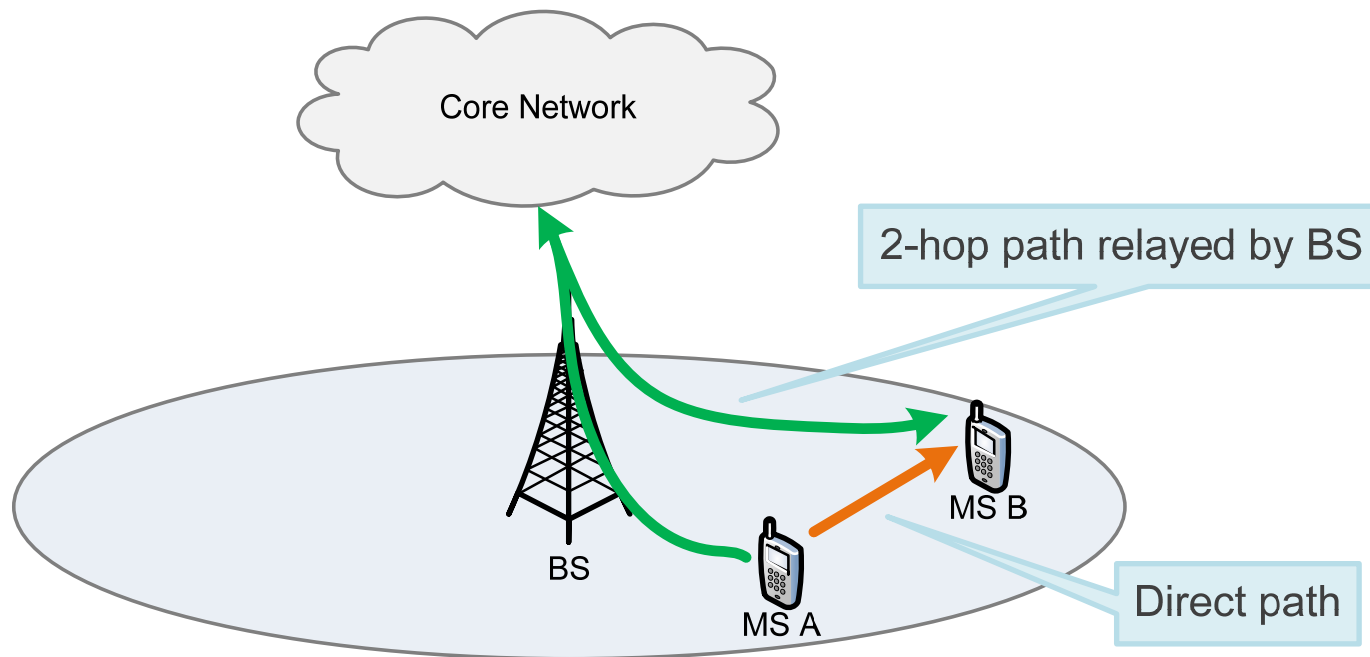
Further information is located at <<http://standards.ieee.org/board/pat/pat-material.html>> and <<http://standards.ieee.org/board/pat>>.

# Introduction

- Trends of Recent Mobile Wireless Networks
  - Almost close to the Shannon limit
  - Studies and proposals on enhancing spectrum utilization
    - Multi-tier networks, multi-RAT networks, D2D, etc
- Trends of Recent Mobile Services
  - Proximity Aware Services
    - Most of mobile users are interested in sharing what they have/think/do with someone being NEAR ME(themselves) NOW.
    - Highly frequent packet deliveries between proximal devices necessitate exploiting direct communications.
    - Social networking services, social commerce and advertisement, etc
  - P2P and Content Distribution Services
    - Packets do not always need to be delivered through CSN.
    - File sharing, local cloud services, personal broadcasting, etc

# Introduction

- What is *Direct Communication*?
  - Transmitting directly from a source device to a destination device without its relay by an intermediate node(s) if they can reach each other (i.e., make a direct link between them)

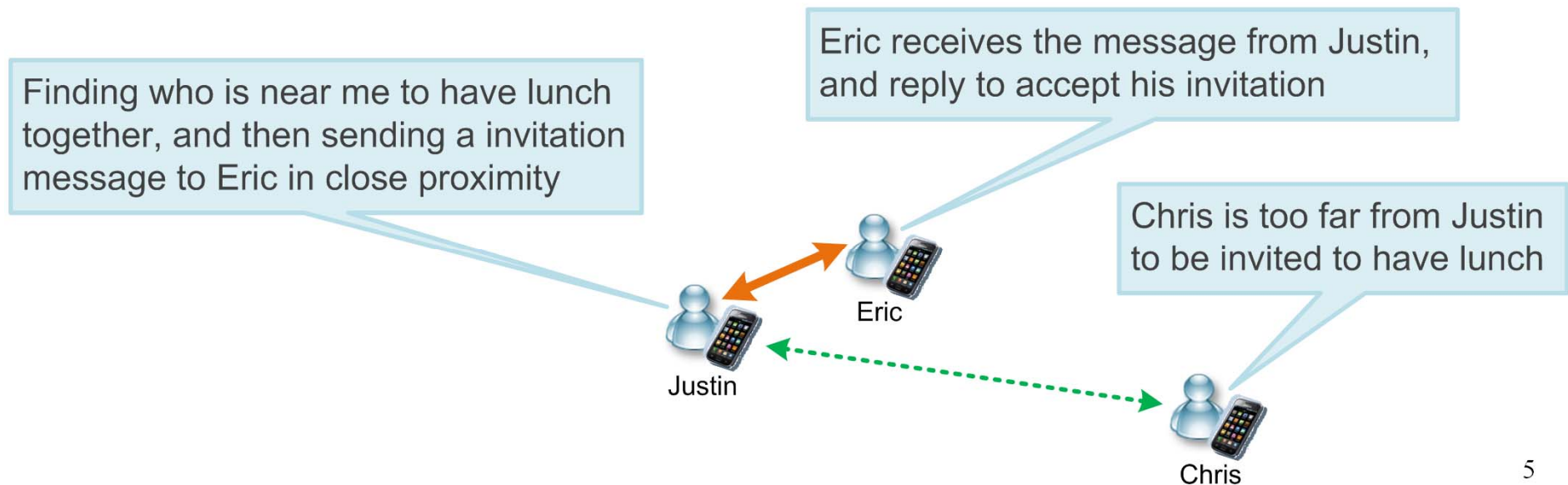


# Introduction

- *Why Direct Communication?*
  - Has been studied and proposed as an efficient communication method b/w proximal devices
  - The followings are introduced as benefits of DC
    - Performance enhancement
      - High data rate, low transmission latency, low power consumption
    - Better utilization of radio resource
      - Resource reuse b/w direct links or b/w a cellular link and a direct link
      - Use of a single link instead of occupying two links (one for uplink and another for downlink) → cellular traffic offloading
    - Efficient direct discovery and relative localization
      - Easing load spurred by location information delivery from/to the server
      - Low discovery/relative-localization latency

# Use Cases

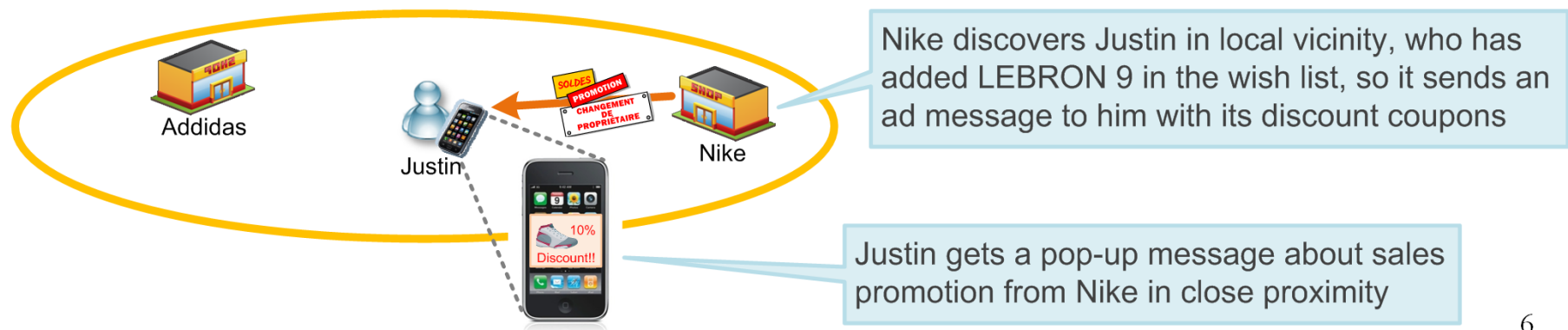
- Social Networking Services
  - Justin wants to find someone around himself to have lunch together in no time.
  - He directly discovers Eric being in close proximity via the SNS application, and directly sends a message to him.



# Use Cases

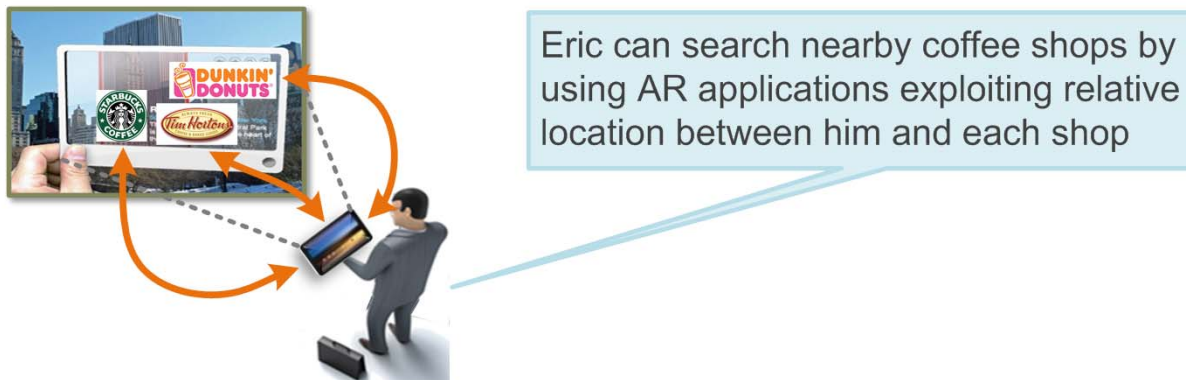
- Social Commerce and Advertisement

- Justin watched an ad on brand-new basketball shoes, Nike LEBRON 9, and he has added it into his wish list.
- Justin passes by shopping mall, and Nike store directly discovers Justin interested in the goods sold there.
- The store directly sends an ad message to him.
- He gets the ad message popped up, and stops by Nike store.



# Use Cases

- Augmented Reality (AR) Services
  - Eric would like to find nearby coffee shops to take a rest.
  - He turns on an AR application providing coffee shop information in local vicinity.
  - He can be aware Starbucks, Tim Hortons, and Dunkin Donuts are being proximal to himself by the AR application employing direct relative localizations to them.



# Use Cases

- P2P and Content Distribution Services
  - Local Cloud Services
    - The data synchronization or backup autonomously works among paired devices via the direct communication links between them if they are proximal to each other.
  - Personal Broadcasting
    - A user can directly stream audio or video to friends in local vicinity so as to share his/her interests with them.
  - Concert Guide Services
    - Programme or further information related to music played now can be directly provided to audiences participating in the concert.



# Are there any similar standards in IEEE 802?

- YES, some WG/TGs are developing standards which support DC technologies.
  - IEEE 802.15.8 TG
    - Peer Aware Communications (PAC) in WPAN
    - Infrastructure-less communications
    - Target data rate is 10 Mbps
    - Unlicensed/licensed bands below 11 GHz
  - IEEE 802.16 GRIDMAN TG
    - BS-controlled/infrastructure-less direct communications in WMAN
    - Voice service for public safety & data service for Smart Grid
    - Licensed bands for WirelessMAN radio interface

# What are Required More?

- Potential requirements to support BS-controlled DC for proximity-based applications
  - Wide coverage
  - Scalability for many devices
  - Efficient link/resource/interference management by BS
  - High data rate
  - Coexistence with cellular air interface
- Key technical features
  - Direct discovery and identification
  - Direct relative localization
  - Direct communication via a direct link
  - Security for direct communication
  - Multicast transmission via direct links

# Proposals

- To start study on BS-controlled direct communication for proximity-based applications in PPC as a new study item of IEEE 802.16 WG
  - Necessities & Feasibilities
  - Differences from DC being developed in other WG/TGs
  - Technical challenges for supporting DC
  - Requirements & Standard impacts
  - If possible, issuing Call for Contributions on these items in Session #80 is preferred.