

Technical requirements for 802.16j

IEEE 802.16 Presentation Submission Template (Rev. 8.3)

Document Number:

IEEE C802.16j-06/049r1.ppt

Date Submitted:

2006-07-02

Source:

Koon Hoo Teo, **Toshiyuki Kuze**, Shigeru Uchida,
Yukimasa Nagai, Kentaro Sawa
Mitsubishi Electric Corp. & MERL
5-1-1 Ofuna Kamakura, Kanagawa 2478501, JAPAN
201 Broadway, Cambridge, MA 02139, USA

voice: +81-467-41-2885

Fax: +81-467-41-2486

E-mail: teo@merl.com

E-mail: Kuze.Toshiyuki@ah.MitsubishiElectric.co.jp

Venue:

IEEE 802.16 Session #44. San Diego, USA

Base Document:

None

Purpose:

To list the technical requirements for 802.16j.

Notice:

This document has been prepared to assist IEEE 802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.

Release:

The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.

IEEE 802.16 Patent Policy:

The contributor is familiar with the IEEE 802.16 Patent Policy and Procedures <<http://ieee802.org/16/ipr/patents/policy.html>>, including the statement "IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard." Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair <<mailto:chair@wirelessman.org>> as early as possible, in written or electronic form, if patented technology (or technology under patent application) might be incorporated into a draft standard being developed within the IEEE 802.16 Working Group. The Chair will disclose this notification via the IEEE 802.16 web site <<http://ieee802.org/16/ipr/patents/notices>>.

Outline

□ Usage Scenario

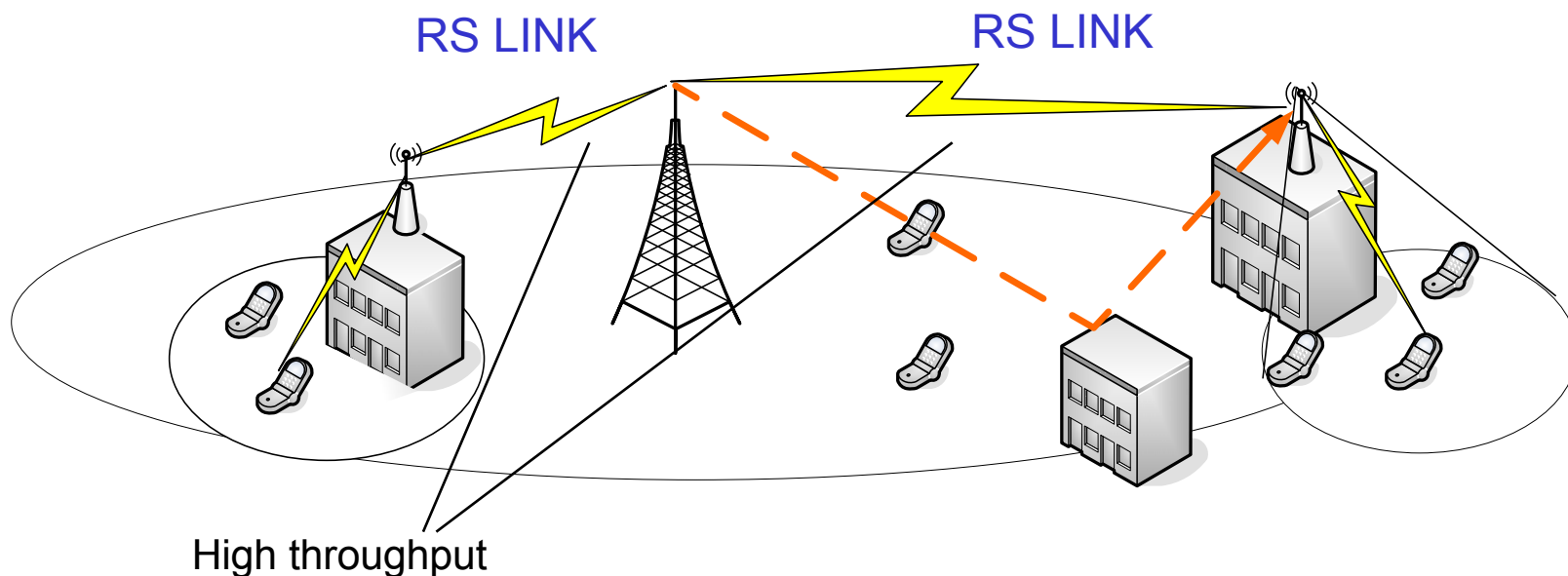
- ✓ Scenario1: Fixed RS (FRS)
- ✓ Scenario2: Nomadic RS (NRS) in the building
- ✓ Scenario3: Nomadic RS (NRS) in the field
- ✓ Scenario4: Mobile RS (MRS)

□ Technical challenges / Requirements in Brief

□ Technical Requirements

Scenario 1: Fixed RS (FRS)

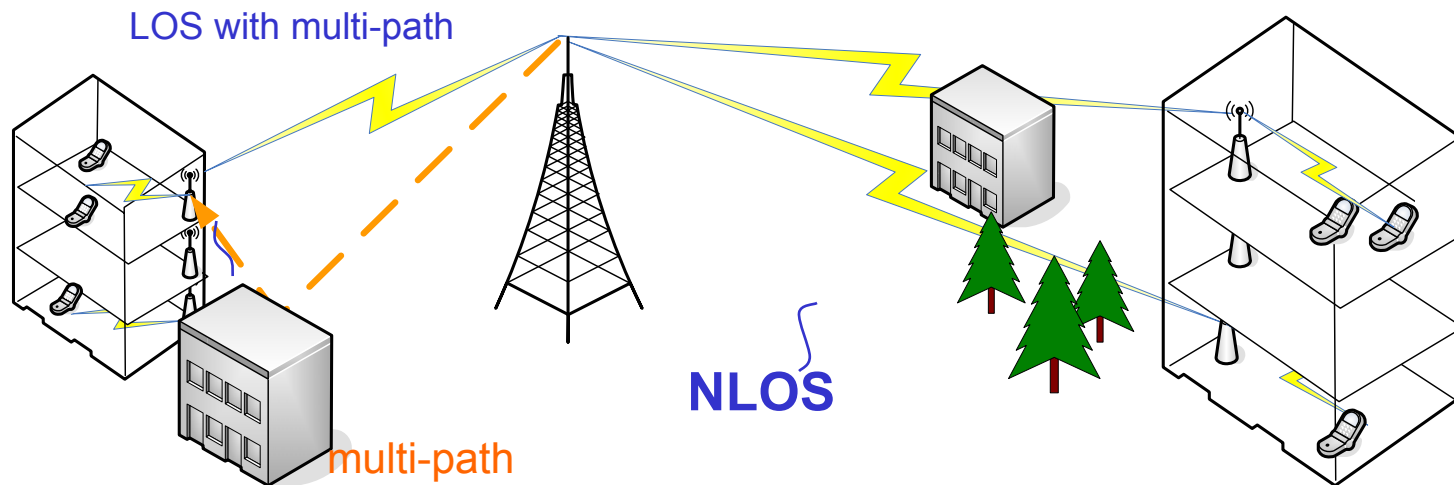
- ❑ FRS are deployed for coverage extension and reducing coverage holes,
 - ✓ The RS link requires high throughput in LOS/NLOS (line of sight/non line of sight) environment
 - ✓ RS link shall provide an efficient and reliable data communication scheme
 - ✓ RS link shall limit added delay and jitter variance especially under heavy traffic



The RS link specification (BS-RS or RS-RS) shall allow scheme that enhances its reliability, efficiency and throughput while minimizing delay and delay jitter in a LOS/NLOS environment for a fixed RS

Scenario 2: Nomadic RS (NRS) in the room

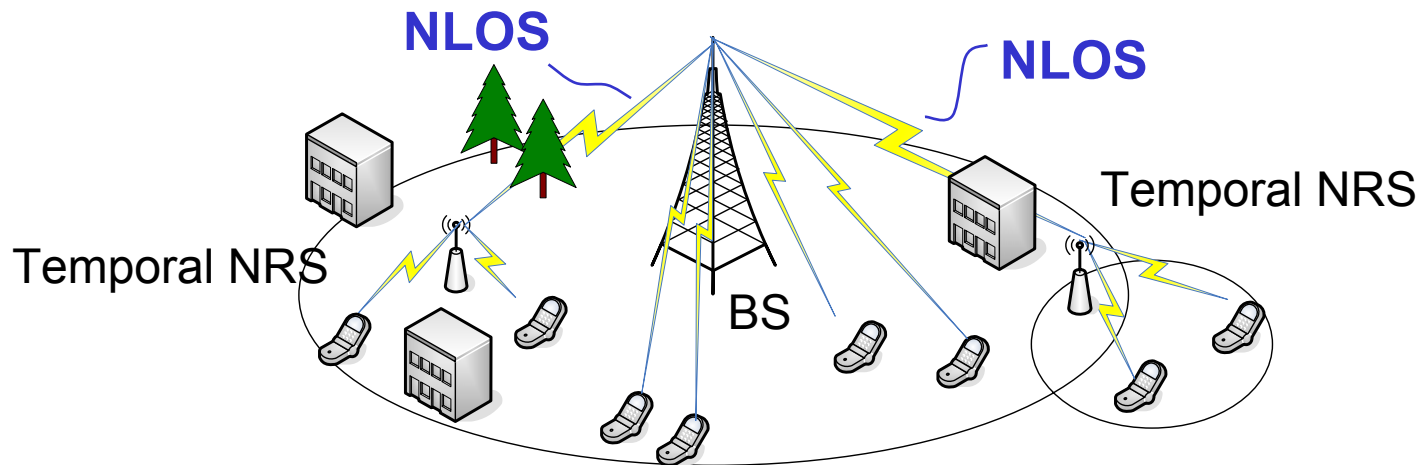
- ❑ NRSs are deployed for coverage extension into the building
 - ✓ The RS link requires high throughput in LOS/NLOS (line of sight/non line of sight) environment
 - ✓ RS link shall provide an efficient and reliable data communication scheme
 - ✓ RS link shall limit added delay and jitter variance especially under heavy traffic
 - ✓ NRS is deployed near the window in the building, and relays packets to the MSs (Mobile stations) in the room.



The RS link specification (BS-RS or RS-RS) shall allow scheme that enhances its reliability, efficiency and throughput while minimizing delay and delay jitter in a LOS/NLOS environment for a nomadic RS

Scenario 3: Nomadic RS (NRS) in the field

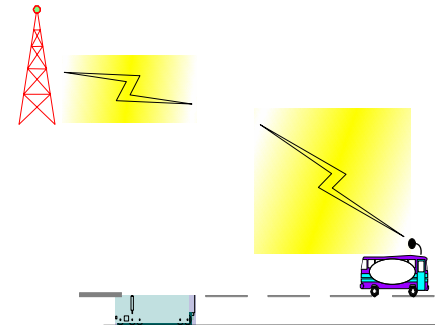
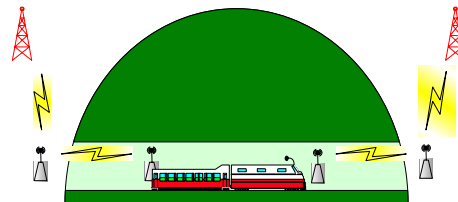
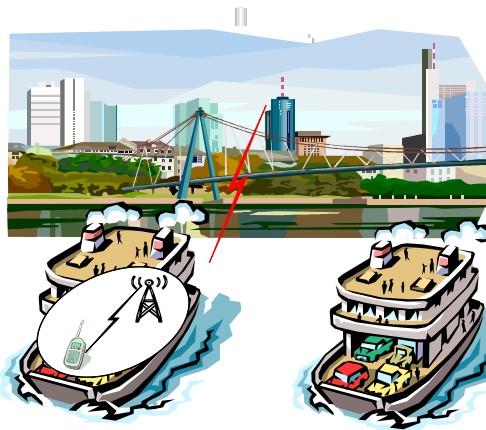
- ❑ NRSs are deployed for tentative coverage extension
 - ✓ The RS link requires moderate to high throughput in NLOS environment
 - ✓ RS link shall provide an efficient and reliable data communication scheme
 - ✓ NRS is nomadic (on the emergency vehicle for example), and relays packets to the MSs around the NRS.
 - ✓ NRS is deployed at a special location temporarily (event spots for example) to fill coverage hole temporary or permanently
 - ✓ Reduce ACK delay under heavy traffic loading



The RS link specification (BS-RS or RS-RS) shall allow scheme that enhances its reliability, efficiency and throughput while minimizing delay and delay jitter in a LOS/NLOS environment for a nomadic RS

Scenario 4: Mobile RS (MRS) in the field

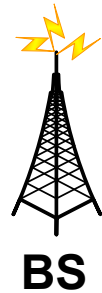
- ❑ NRSs are deployed for tentative coverage extension
 - ✓ The RS link requires moderate to high throughput in NLOS environment
 - ✓ RS link shall provide an efficient and reliable data communication scheme
 - ✓ MRS is a mobile HUB (on the train for example), and relays packets to the MSs around the MRS.
 - ✓ MRS handover is seamless and shall be able to initiate handover for itself
 - ✓ Reduce ACK delay under heavy traffic loading



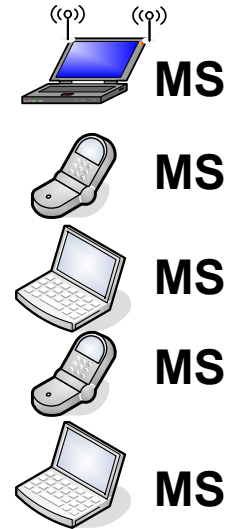
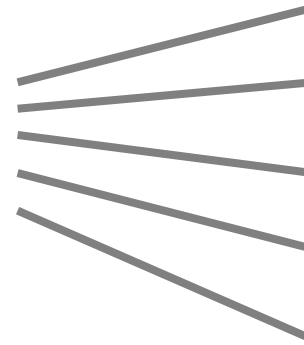
The RS link specification (BS-RS or RS-RS) shall allow scheme that enhances its reliability, efficiency and throughput while minimizing delay and delay jitter in a LOS/NLOS environment for a mobile RS

Technical Challenges/Requirements in Brief

Our Typical Model



Aggregation of traffic



Reliable, High Speed Traffic Link for
FRS, NRS and MRS

The RS LINK

- The RS link specification (BS-RS or RS-RS) shall allow scheme that enhances its reliability, efficiency and throughput while minimizing delay and delay jitter in a LOS/NLOS environment
- The specification shall provide signaling to support MAC scheduling of data and control message transmissions on relay and access links. Scheduling may be centralized, distributed, or a hybrid.
- The RS link shall provide more efficient processing technique (to reduce power and cost) than existing technique given that the throughput pipe of the RS link would be larger
- The aggregation of traffic is supported in the RS for higher efficiency
- RS support ARQ and HARQ of MSs and SSs (stationary stations)
- MRS handover shall be supported and MRS shall be able to initiate handover for itself

Technical Requirements (1)

□ **Architectural Requirements**

- ✓ The 802.16 specification shall support different types of RS based on intended use.
 - It shall support fixed, nomadic and mobile variants of RS.
 - It shall support extending coverage and increasing throughput variants of RS.
 - It shall support client and infrastructure RS. Where, the client RS can be owned and placed by a consumer, and the infrastructure RS can be owned by an operator.
- ✓ RS shall serve both the mobile and stationary users.
- ✓ The specification shall support the hop count greater than or equal to 2. The hop count shall be limited only when a specific performance requirement is necessary.

□ **Functional Requirements**

- ✓ The specifications shall enable relay station MAC PDU and SDU configuration and processing as specified in 802.16-2004/802.16e-2005.
- ✓ The specification shall provide signaling to support MAC scheduling of data and control message transmissions on relay and access links. Scheduling may be centralized, distributed, or a hybrid.
- ✓ RS shall perform better than existing techniques, e.g. MIMO, and AMC, for increasing throughput, limited throughput variation for a given PHY modulation index and packet size, limited added latency and timing jitter.
- ✓ The RS link specification (BS-RS or RS-RS) shall allow scheme that enhances its reliability, efficiency and throughput while minimizing delay and delay jitter in a LOS/NLOS environment
- ✓ The RS link shall provide more efficient processing technique (to reduce power and cost) than existing technique given that the throughput pipe of the RS link would be larger.
- ✓ The RS link shall operate in NLOS and LOS environment.
- ✓ RS shall support mobile and stationary station's ARQ and HARQ operation.

Technical Requirements (2)

□ ***Mobility Requirements***

- ✓ The 802.16 specification shall support mobility of the RS along with the associated SS/MS. For example, an RS attached to a train or bus moves along with the MS/SS in the bus.
- ✓ The specification shall support MS seamless handover via multi-hop and shall not require modification to MS.
- ✓ The specification shall support MRS handover and shall not require any modification to the subordinate MSs
- ✓ The specification shall allow MRS to initiate a handover for itself

□ ***Security Requirements***

- ✓ RS shall not add any new security threats in the existing system as defined in 802.16e-2005
- ✓ RS shall not increase in the number of security procedures for MS.