Usage scenarios and antenna configurations for 802.16 Relay

IEEE 802.16 Presentation Submission Template (Rev. 8.3)

Document Number:

IEEE C802.16j-06/007

Date Submitted:

2006-05-01

Source:

Kenji Saito, Takashi Inoue	Voice:	+81-46-847-6350
KDDI R&D Laboratories Inc. YRP Research Center	Fax:	+81-46-847-0947
7-1 Hikarinooka, Yokosuka, Kanagawa 239-0847, Japan	E-mail:	saito@kddilabs.jp
Mitsuo Nohara	Voice	+81-3-6678-3599
KDDI Corporation	Fax:	+81-3-6678-0279
10-10, Iidabashi 3-chome, Chiyoda-ku, Tokyo 102-8460, Japan	E-mail:	mi-nohara@kddi.com

Acknowledgments: The authors would like to thank Mr.Asa of Motorola Japan and Dr.Jaeweon Cho of Samsung for their kind support in preparation of this document.

Venue:

IEEE 802.16 Session #43, Tel Aviv, Israel

Base Document:

None

Purpose:

Information

Usage scenarios and antenna configurations for 802.16 Relay

Kenji Saito, Takashi Inoue
KDDI R&D Laboratories Inc. YRP Research Center

Mitsuo Nohara
KDDI Corporation

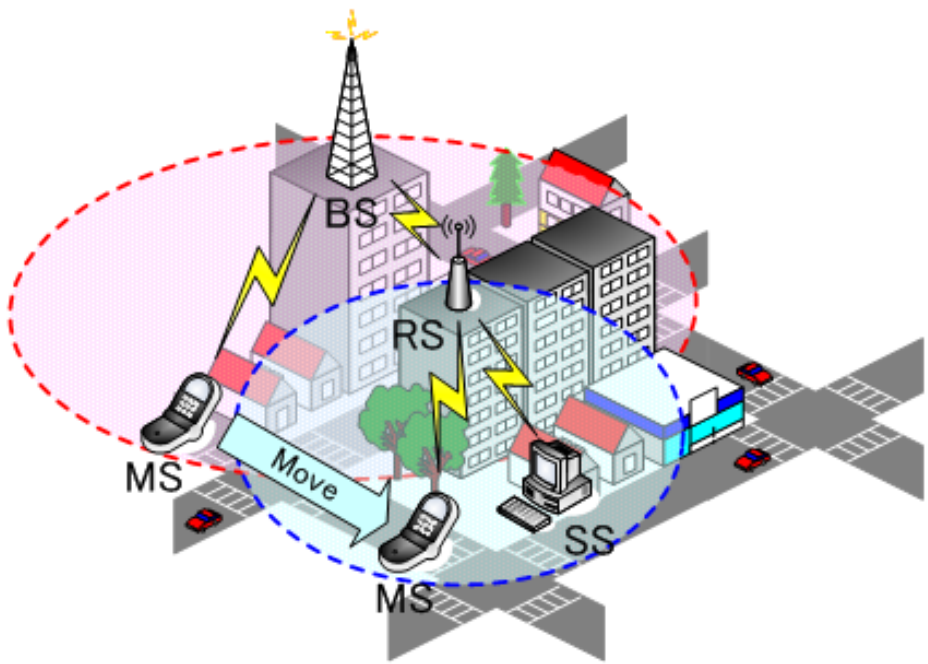
May, 2006

Objectives of this contribution

- To indicate usage scenarios for each RS type
- To consider antenna configuration according to each scenario

Usage Scenarios for each RS type

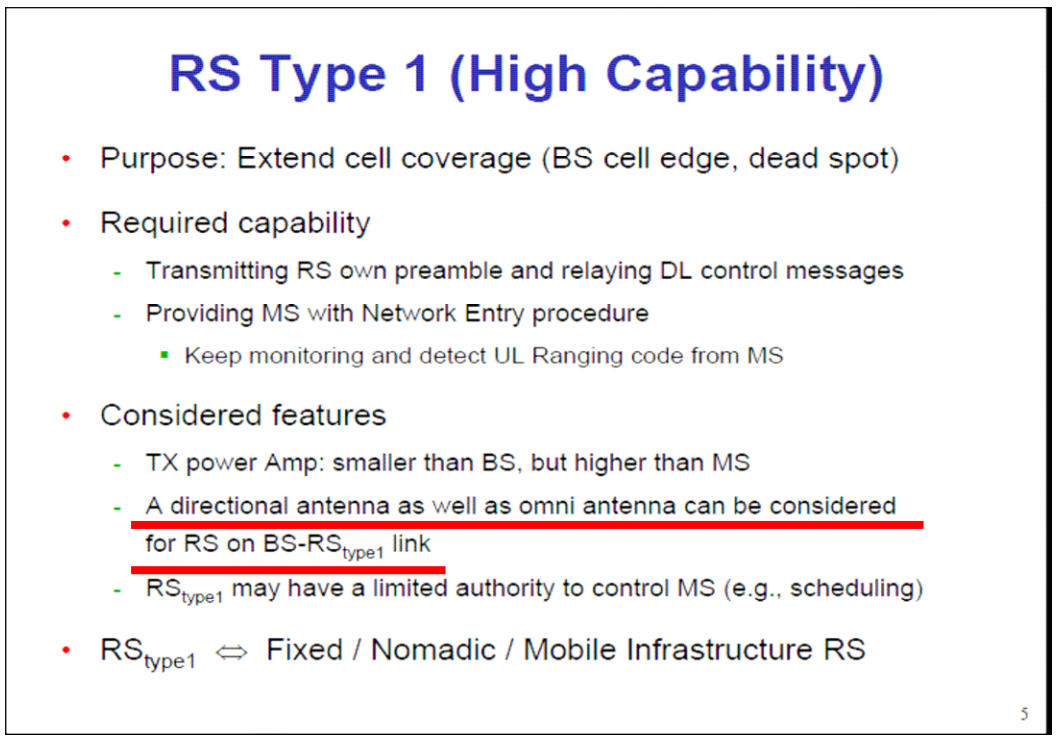
- Fixed RS
  - Open area
    - The service is often not available in shadow area, such as street corner.
  - Underground area
    - The service is not available at underground shopping area or platform of subway.
- Nomadic RS
  - Office / home
    - Some room may be out of service area
- Mobile RS
  - Open area
    - Signal is unstable when on board moving vehicle



Antenna configuration for 802.16 Relay

- We need to consider antenna configuration according to each usage scenario.
- Antenna type is one of the important issues for our common understanding and future system evaluations.

Reference : IEEE C802.16mmr-05/002



RS Type 1 (High Capability)

- Purpose: Extend cell coverage (BS cell edge, dead spot)
- Required capability
  - Transmitting RS own preamble and relaying DL control messages
  - Providing MS with Network Entry procedure
    - Keep monitoring and detect UL Ranging code from MS
- Considered features
  - TX power Amp: smaller than BS, but higher than MS
  - A directional antenna as well as omni antenna can be considered for RS on BS-RS_{type1} link
  - RS_{type1} may have a limited authority to control MS (e.g., scheduling)
- RS_{type1} ⇔ Fixed / Nomadic / Mobile Infrastructure RS

5

Antenna configuration for 802.16 Relay

Table 1

		Case 1 (Fig.1)	Case 2 (Fig.2)	Case 3 (Fig.3)	Case 4 (Fig.3)
BS	(⇔MS)	Omni or Sector	Omni or Sector	Omni or Sector	Omni or Sector
	(⇔RS)			Directional	Array※
RS	(⇔BS)	Omni	Directional	Directional	Directional
	(⇔MS)		Omni or Sector	Omni or Sector	Omni or Sector
MS		Omni	Omni	Omni	Omni

※ Array antenna with multiple beams

Antenna configuration for 802.16 Relay

- Distance between BS and RS
  - Case 1 < Case 2 < Case 3, 4

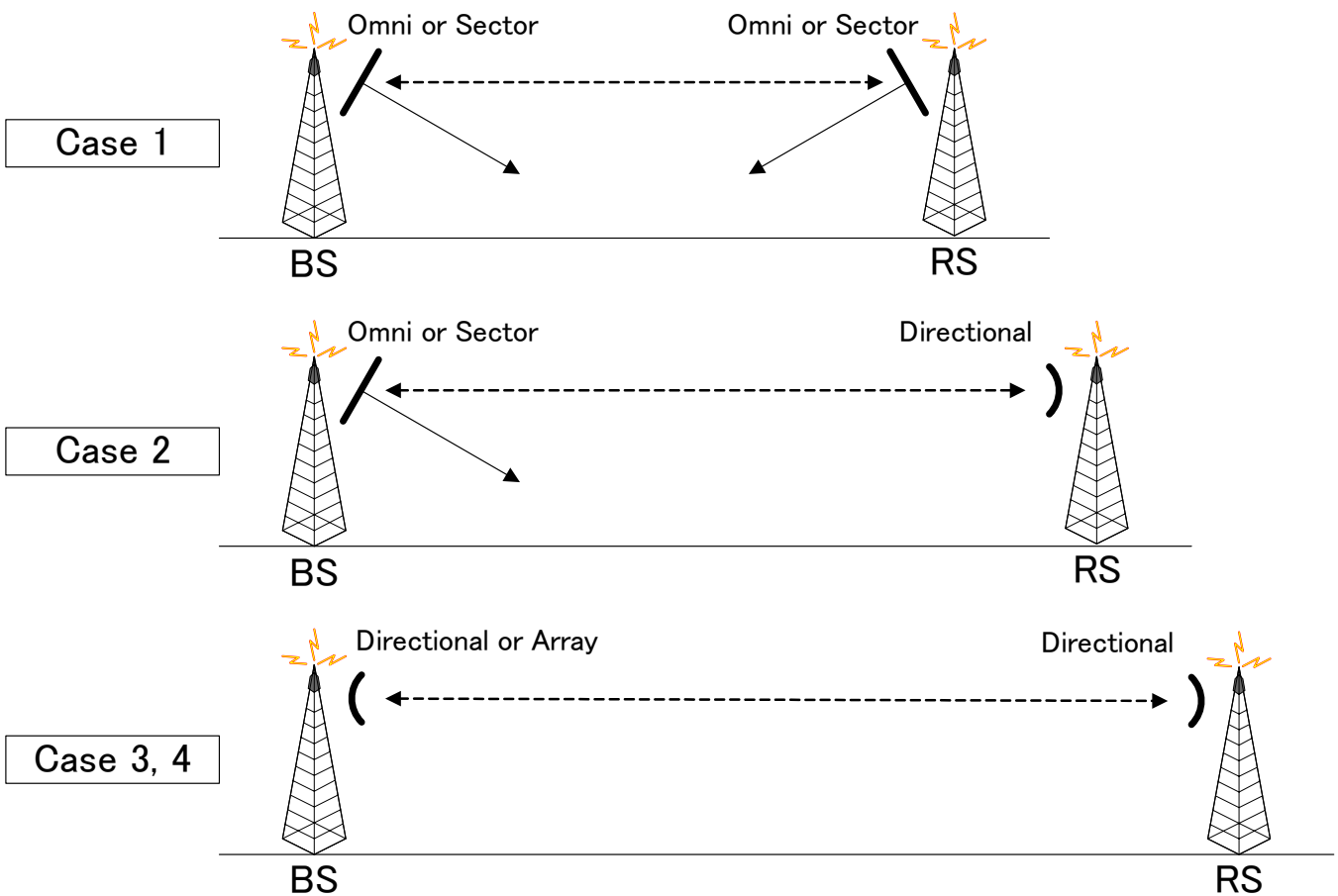


Fig.1

Antenna configuration for 802.16 Relay

Case 1

- Open area and office / home scenarios
- Increase of excessive interference to neighbors

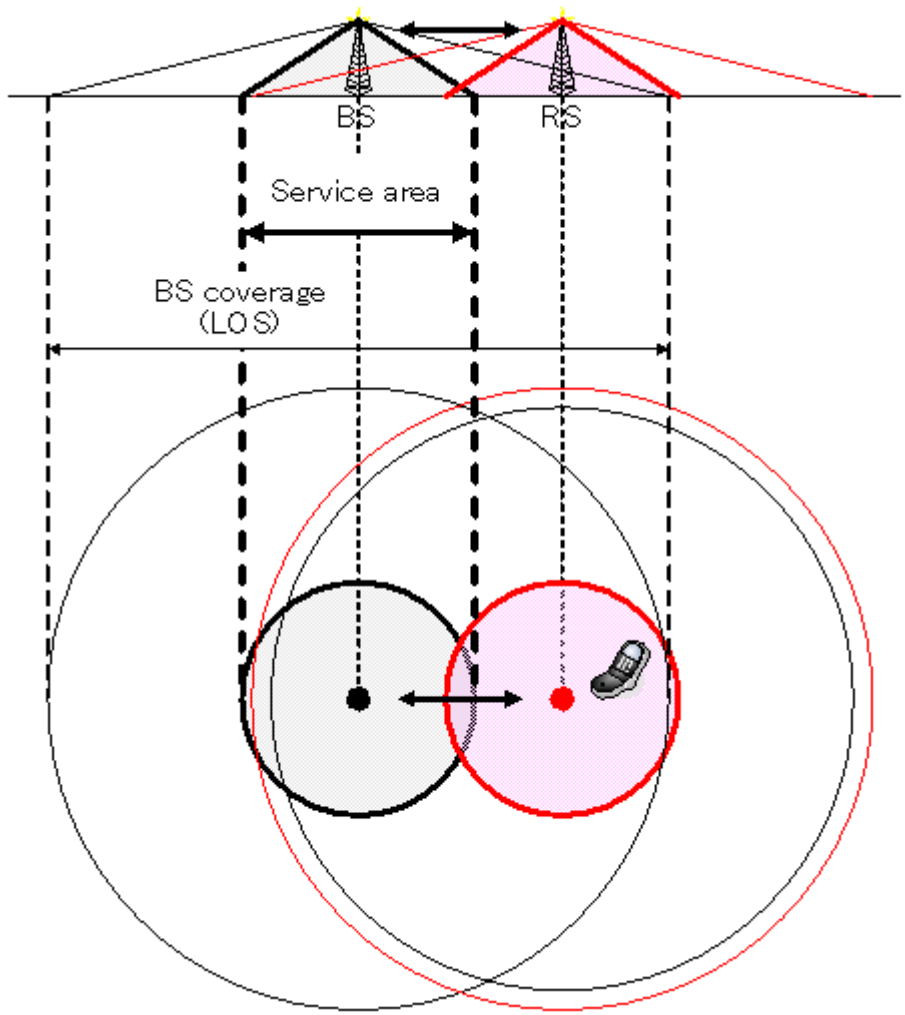


Fig.2

Antenna configuration for 802.16 Relay

Case 2 (RS : Omni + Directional antenna)

- Open area, underground area and office / home scenarios
- Excessive interference to neighbors is limited

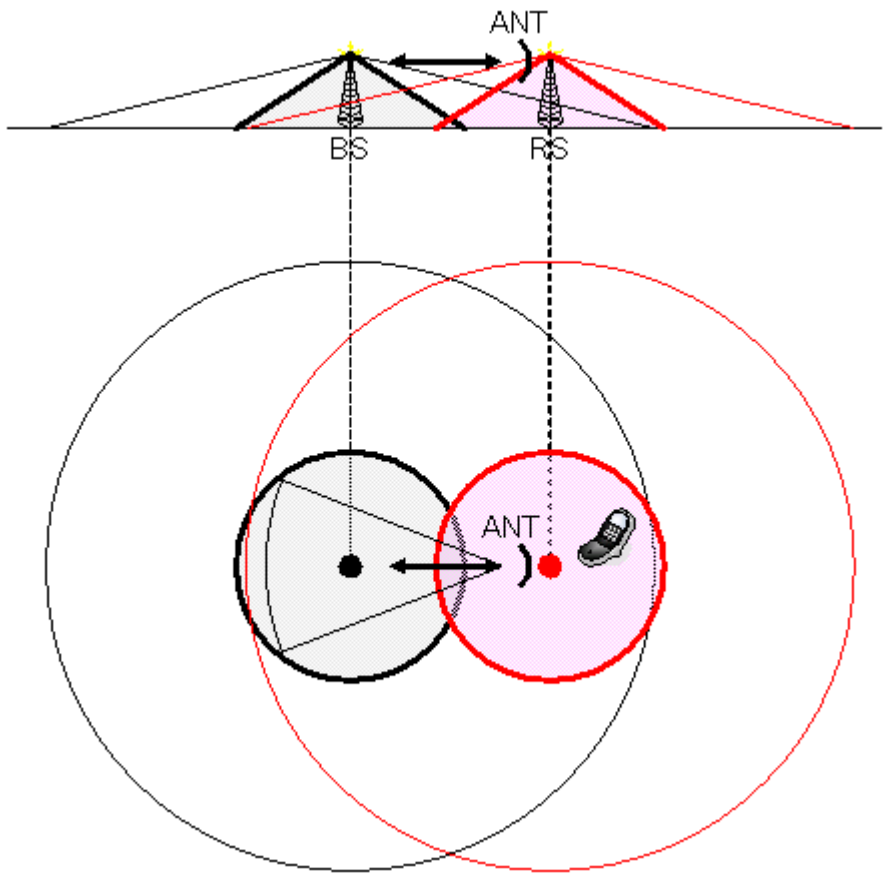


Fig.3

Antenna configuration for 802.16 Relay

Case 3, 4

- Open area scenario only
- Excessive interference to neighbors is limited

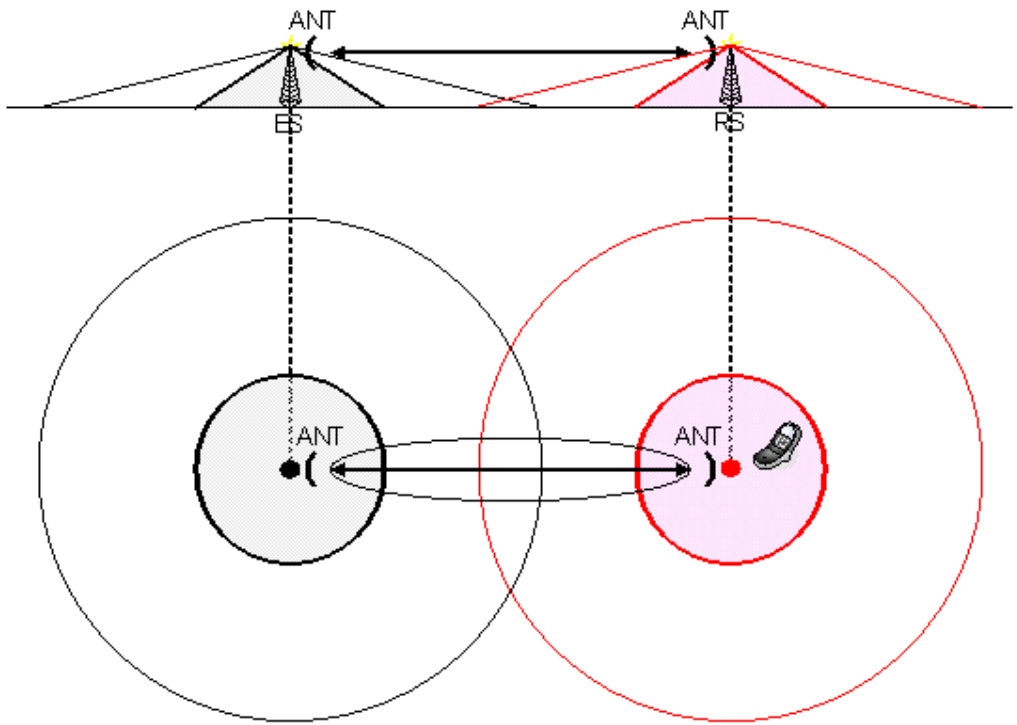


Fig.4

Antenna configuration for 802.16 Relay

Table 2

		Case 1	Case 2	Case 3	Case 4
Fixed RS	Open area	✔	✔	✔	✔
	Underground area	–	✔	–	–
Nomadic RS	Office / Home	✔	✔	–	–
Mobile RS	Open area	✔	–	–	–

Table 3

		Case 1	Case 2	Case 3	Case 4
Distance between BS and RS			<	<	≒
# of ANT	BS	1	1	1+N	1+1
	RS	1	1+1	1+1	1+1
Additional antenna to conventional BS		No		Yes	
Interference to neighbors		Large	be limited		
Priority	Fixed RS		1st	2nd	
	Nomadic RS	1st	2nd	–	–
	Mobile RS	※	–	–	–

※ In case of mobile RS, avoidance of interference would be a critical issue.

Conclusions

We discussed:

- Usage scenarios for IEEE802.16 relay:
  - Fixed RS
  - Nomadic RS
  - Mobile RS
- Antenna configuration
  - Different according to each usage scenario
    - Fixed RS with a directional antenna towards BS can be a good choice.
    - For Nomadic RS, omni antenna can be a practical choice.