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Source(s)		
	Hang Zhang, Peiying Zhu, Mo-Han Fong, Wen Tong, David Steer, Gamini Senarath, Derek Yu, Mark Naden, G.Q. Wang	Voice: +1 613 7631315 wentong@nortel.com
	Nortel 3500 Carling Avenue Ottawa, Ontario K2H 8E9	pyzhu@nortel.com
	Kanchei (Ken) Loa, Yi-Hsueh Tsai, Shiann-Tsong Sheu, Hua-Chiang Yin, Chih-Chiang Hsieh, Yung-Ting Lee, Frank C.D. Tsai, Heng-Iang Hsu, Youn-Tai Lee	loa@nmi.iii.org.tw
	Institute for Information Industry 8F, No. 218, Sec. 2, Dunhua S. Rd., Taipei City 106, Taiwan, ROC.	
	Chie Ming Chou Wern-Ho Sheen, Fang-Ching Ren, Jen-Shun Yang, Tzu-Ming Lin, I-Kang Fu, Ching-Tarng Hsieh, Kun-Ying Hsieh	chieming@itri.org.tw
	Industrial Technology Research Institute (ITRI) / National Chiao Tung University (NCTU) 195,Sec. 4, Chung Hsing Rd. Chutung, Hsinchu, Taiwan 310, R.O.C	
		hlee@kw.ac.kr
	Hyukjoon Lee, Hyun Park, Yong-Hoon Choi, Young-uk Chung, Seung Hyong Rhee	netipark@kw.ac.kr
	Kwangwoon University447-1 Wolgye-Dong, Nowon-Gu, Seoul, 139-701, Korea	yhchoi@kw.ac.kr
		yuchung@kw.ac.kr

srhee@kw.ac.kr

Yong Su Lee, Young-il Kim

L7856@etri.re.kr

ETRI
161, Gajeong-dong, Yuseong-Gu, Daejeon, 305-350, Korea

yikim@etri.re.kr

Re:	A response to a Call for Technical Proposal, http://www.ieee802.org/16/relay/docs/80216j-07_007r2.pdf
Abstract	This contribution proposes RS initial network entry procedures.
Purpose	To incorporate the proposed text into the P802.16j Baseline Document (IEEE 802.16j-06/026r2)
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RS Initial Network Entry and Re-entry

1 Introduction

When a relay station initially enters or re-enters a network, most of network operations are the same as MS does. However, some additional operations may be required for a RS, such as path selection operation and operation parameter configuration. Those operations are special to RS and shall be defined in the standard.

2 RS initial network entry and re-entry proposal

2.1 RS initial network entry

We propose the RS initial network entry as shown in Figure 1. The RS initial ranging procedure shall be the same as MS initial ranging procedure as defined in Section 6.3.10. Compared with MS initial network entry, two operation steps are added and four original steps are removed. The new operations are:

- *Access point attachment (path) negotiation*
  This procedure enables a RS and the MRBS to negotiate the access point attachment of this RS. This operation happens after registration and before RS operation parameter configuration. During this operation a relay station is allowed to report to the MRBS the radio environment measurements. The MRBS is allowed to make final decision regarding the access point attachment selection (e.g., serving station selection). In order to support this operation, we suggest either reuse RNG-REQ/RSP message with a new TLV added in RNG-REQ message or introduce a new message called as RS_path request/response.

  To assist access station selection by the RS, an access station or serving MR-BS may optionally broadcast information related its end-to-end path quality. [The detailed definition of the broadcast information related to path quality is TBD]

- *Relay station operation parameter configuration*
  This procedure allows a RS to obtain necessary operation configuration parameters that must be configured over-the-air. One example of such parameters is the frame beginning preamble (802.16e preamble) configuration since the configuration of such parameters usually requires radio environment measurement of a RS. To enable this procedure, we suggest to introduce a new MAC management message – RS configuration request /response message (RS_Config-REQ/RSP).
- *The removed steps from the MS network entry include IP connectivity, establish time of day, transfer operational parameters and establish provision connection.*

The reason for the removal of these steps is that these procedures are used for network layer's application and RS doesn't have its own packets from network.

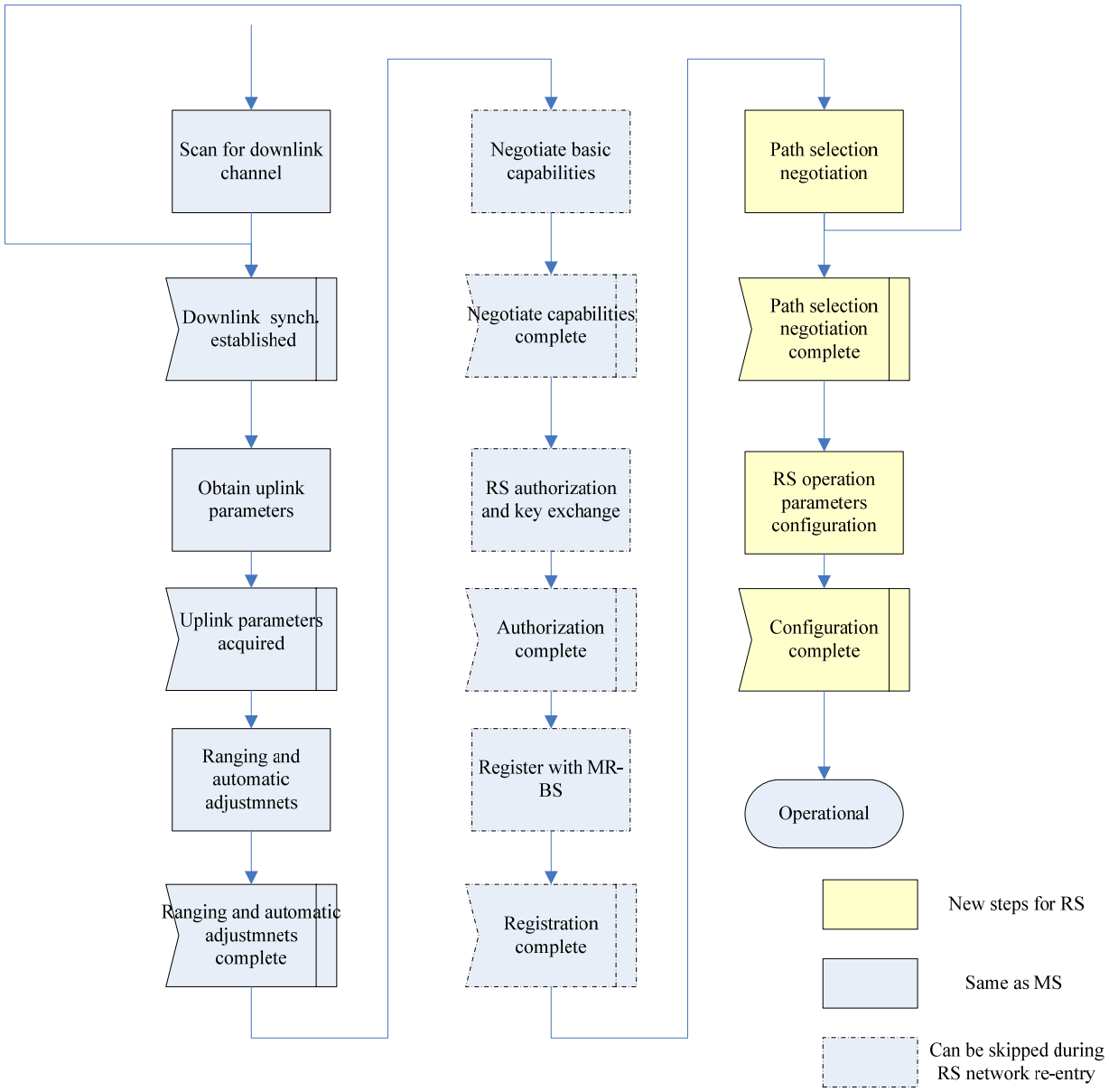

Figure 1. Proposed RS network entry.

In addition, the existing basic capability negotiation procedure needs to be enhanced to include negotiation of RS specific capabilities, e.g. transparent RS, non-transparent RS etc. As part of the basic capabilities negotiation, BS is notified that the station performing network entry is an RS.

2.2 RS network re-entry

The usage of RS network re-entry is when the network or an operating RS wants to perform path optimization for improving the path and/or network performance. Compared with the RS initial network entry, some of the steps can be skipped in the RS network re-entry as shown in Fig. 1 in order to speed up the process. In our design, this can be achieved by checking the RS network re-entry optimization parameters which are indicated in the RS_Path response message.

3 Proposed text change

We propose the following modifications to 802.16e standard

3.1 RS initial network entry and re-entry description

++++++++++++++++ Start Text ++++++++++++++++++++++++++++

[Add section 6.3.9.16.3 after section 6.3.9.16.2 in page 27]

[Insert new subclause 6.3.9.16.3]

6.3.9.16.3 RS network (re)-entry and initialization

RS network (re)-entry procedure is shown in Figure xxx.

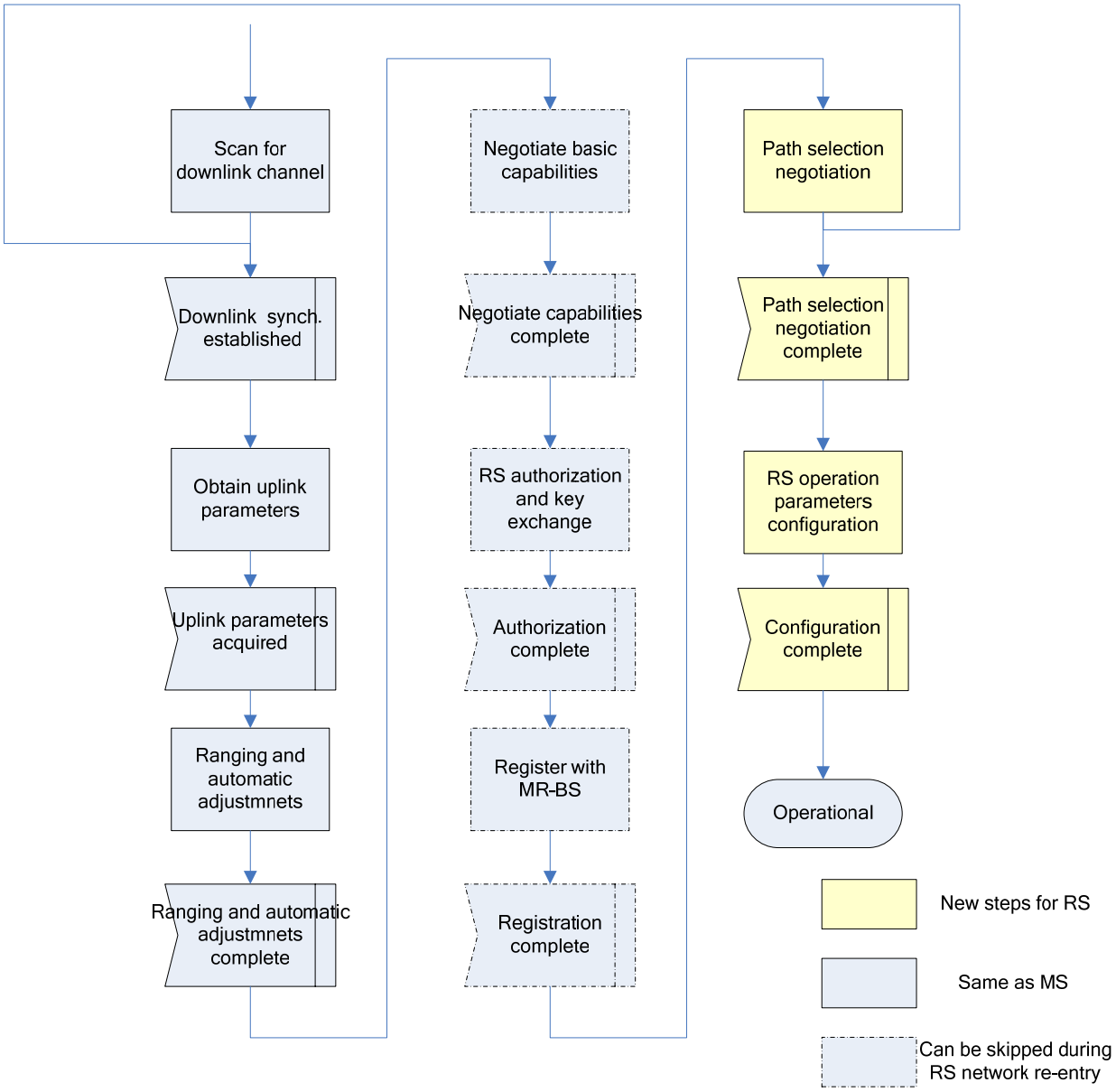

Figure XXX RS network (re)-entry

From this figure, two new procedures are added to RS network (re)-entry procedure. They are path selection negotiation, relay station operational parameters configuration.

The RS initial ranging procedure shall be the same as MS initial ranging procedure as defined in Section 6.3.10 .

6.3.9.16.3.1. Path selection negotiation

This procedure enables a RS and the MR-BS to negotiate the path selection of this RS. This operation happens after registration and before RS operation parameter configuration. During this operation a relay station shall report to the MR-BS the radio environment measurements. The MR-BS shall make final decision regarding the path selection, i.e., access station selection. Access station can be an RS or an MR-BS RS-path-REQ/RSP message shall be used for this operation. A RS shall send RS_path-REQ message to report its radio environment measurements to its associated MR-BS. The MR-BS shall determine the path of this RS based on the reported radio measurements and other information such as path loading and indicates the path selection for this RS using RS_path-RSP message. In the RS_path-RSP message, the selected access station ID and RS network re-entry optimization parameters will be given to assist the network (re)-entry process.

To assist access station selection by the RS, an access station or serving MR-BS may optionally broadcast information related its end-to-end path quality. [The detailed definition of the broadcast information related to path quality is TBD]

6.3.9.16.3.2. Relay station operational parameter configuration

This procedure allows a RS to obtain necessary operational configuration parameters that must be configured over-the-air. One example of such parameters is the frame start beginning preamble index (802.16e preamble) configuration since the configuration of such parameters usually requires radio environment measurement of a RS. During this procedure, RS and MMR-BS shall use RS configuration request /response message (RS_Config-REQ/RSP) to negotiate the configuration. A RS shall send RS_Config-REQ message to suggest parameter configuration(s) to its associated MMR-BS. The MMR-BS shall determine the parameter configurations and indicate to the RS using RS_Config-RSP message.. The parameters configured during this procedure include:

- 802.16e frame start preamble index for a relay station which is configured to transmit 802.16e frame start preamble

3.2 Introduction of RS configuration message (RS_Config-REQ/RSP)

[Modify the last row in Table 14 in page 4 as follows]

Type	Message name	Message description	Connection
~~68-255~~ 68	RS_Config-REQ	RS configuration request message sent by RS	Basic
69	RS_Config-RSP	RS configuration response message sent by MMR-BS	Basic
70-255		Reserved	

[Add the following text after section 6.3.2.3.64 in page 13]

[Insert new subclause 6.3.2.3.65 and 6.3.2.3.66]

6.3.2.3.65 RS configuration request message

This message may be transmitted by a RS to request some physical layer operation parameters. A RS may use this message to report information to facilitate the determination of a MMR-BS on configuration of RS operation parameters.

Table XXX. RS_Config-REQ message format.

Syntax	Size	Notes
RS_Config-REQ format {		
_Management message type = 67	8 bits	
_Configured_para_type	8 bits	b0 = 1: preamble configuration is included; b1 – b7: reserved
_If (b0 of Configured_para_type == 1) {	8 bits	
__Preamble_index }	7 bits	Preamble index
_TLV	Variable	
}		

Configuration_para_type
The first bit is used as preamble index indicator to indicate the preamble_index field appearance in this message
Preamble_index
This field is used to indicate the preamble index

6.3.2.3.66 MR-BS configuration response message

This message shall be transmitted by a MMRBS for the purpose of RS configuration. A MMR-BS shall use this message to set operation parameters for a RS. MMR-BS can transmit this message as a response to RS_Config-REQ or as a unsolicited message.

Syntax	Size	Notes
RS_Config-RSP format {		
_Management message type = 68	8 bits	
_Configured_para_type	8 bits	b0 = 1: preamble configuration is included; b1 – b7: reserved
_If (b0 of Configured_para_type == 1) {	8 bits	
__Preamble_index }	7 bits	Preamble index
_TLV		
}		

Configuration_para_type
The first bit is used as preamble index indicator to indicate the preamble_index field appearance in this message
Preamble_index
This field is used to indicate the preamble index assigned by MMR-BS

3.3 Introduction of RS path selection message (RS_path-REQ/RSP)

[Modify the last row in Table 14 in page 4 as follows]

Type	Message name	Message description	Connection
~~68-255~~ 68	RS_path-REQ	RS path selection request message sent by RS	Basic
69	RS_path-RSP	RS path selection response message sent by MMRBS	Basic
70-255		Reserved	

[Add the following text after section 6.3.2.3.64 in page 13]

[Insert new subclause 6.3.2.3.67 and 6.3.2.3.68]

6.3.2.3.67 RS path selection request message

This message may be transmitted by a RS to report its radio environment measurement.

Table XXX. RS_path-REQ message format.

Syntax	Size	Notes
RS_path request format {		
Management message type = 67	8 bits	
Number of reports	2 bits	
For (i=0;i< Number of reports; i++) {		
Station ID	24 bits	LSB 24 bits of Station ID present in DL-MAP
CINR mean	8 bits	
}		
}		

Number of reports
This field indicates the number of measurement reports in this message
Station ID

This field indicates identity of the station (MR-BS or RS) to which a RS may access. The Station ID includes the 24 LSB of Station ID present in DL-MAP of this station.

CINR mean

The CINR mean parameter indicates the CINR in dB measured at the RS on the downlink signal of a particular station with BSID in BSID field. The value shall be interpreted as a signed byte with the resolution of 0.5dB. The measurement shall be performed on subcarriers of the frame preamble that are active in the particular station's segment and averaged over the measurement period.

6.3.2.3.68 RS path selection response message

This message shall be transmitted by a MMR-BS to a RS as a response to the RS_path request message. MMR-BS use this message to indicate the serving station the RS shall access to.

Table XXX. RS_path-RSP message format.

Syntax	Size	Notes
RS_path response format {		
_Management message type = 67	8 bits	
Station ID	24 bits	LSB 24 bits of Station ID present in DL-MAP
RS network re-entry optimization	8 bits	For each bit location, a value of '0' indicates the associated reentry management messages is required, a value of '1' indicates the reentry management message is omitted. Bit #0: Omit SBC-REQ/RSP management messages if set to '1' Bit #1: Omit PKM Authentication phase except TEK phase if set to '1'. Bit #2: Omit PKM TEK creation phase if set to '1'. Bit #3: Omit REG-REQ/RSP management if set to '1'. Bit #4: Omit path selection phase if set to '1' Bit #5~7: Reserved
}		

Station ID

This field indicates identity of the station to which a RS shall access. The Station ID includes the 24 LSB of Station ID present in DL-MAP of this station.

RS network re-entry optimization
For each bit location, a value of '0' indicates the associated reentry management messages is required, a value of '1' indicates the reentry management message is omitted.
Bit #0: Omit SBC-REQ/RSP management messages if set to '1'.
Bit #1: Omit PKM Authentication phase except TEK phase if set to '1'.
Bit #2: Omit PKM TEK creation phase if set to '1'.
Bit #3: Omit REG-REQ/RSP management if set to '1'.
Bit #4: Omit path selection phase if set to '1'.
Bit #5~7: Reserved

3.4 RS Basic Capabilities Negotiation

[Modify 6.3.2.3.23 as follows]

6.3.2.3.23 SS and RS Basic Capability Request (SBC-REQ) message

[Change the text in the first paragraph as indicated:]

The SS SBC-REQ shall be transmitted by the SS or RS during initialization. An SS or RS shall generate SBC-REQ messages in the form shown in Table 51.

[Insert the following text at the end of 6.3.2.3.23:]
An RS shall generate SBC-REQs including the following parameter:

Basic CID (in the MAC Header)
The CID in the MAC Header is the Basic CID for this RS, as assigned in the RNG-RSP message.

All other parameters are coded as TLV tuples.

Basic Capability Requests contain those RS Capabilities Encodings (11.8) that are necessary for effective communication with the RS during the remainder of the initialization protocols. Only the following parameters shall be included in the Basic Capabilities Request:

Physical Parameters Supported (see 11.8.3)
Bandwidth Allocation Support (see 11.8.1)

[Modify 6.3.2.3.24 as follows]

6.3.2.3.24 SS or RS Basic Capability Response (SBC-RSP) message

[Insert the following text before the last sentence:]

An MR-BS shall generate SBC-RSPs in the form shown in Table 52, including both of the following parameters:

CID (in the MAC Header)
The CID in the MAC Header is the Basic CID for this RS, as appears in the RNG-REQ message.

The following parameters shall be included in the SBC-RSP if found in the SS SBC-REQ:

Physical Parameters Supported (see 11.8.3)
Bandwidth Allocation Support (see 11.8.1)

The MR-BS responses to the subset of RS capabilities present in the SBC-REQ message. The MR-BS responds to the RS capabilities to indicate whether they may be used. If the MR-BS does not recognize an RS capability, it may return this as “off” in the SBC-RSP. Only capabilities set to “on” in the SBC-REQ may be set “on” in the SBC-RSP, as this is the handshake indicating that they have been successfully negotiated.

[Insert new subclause 11.8.3.7.20]

11.8.3.7.20 MR PHY feature support

This TLV indicates the MR PHY features supported by the RS and the MR-BS.

Type	Length	Value	Scope
xx	1	Bit #0: Transparent relaying Bit #1: Non-transparent relaying Bits #2-7: *Reserved*	SBC-REQ SBC-RSP

++++++++++++++++ End Text ++++++++++++++++++++++++++++