

A Method to Optimize SCN messages

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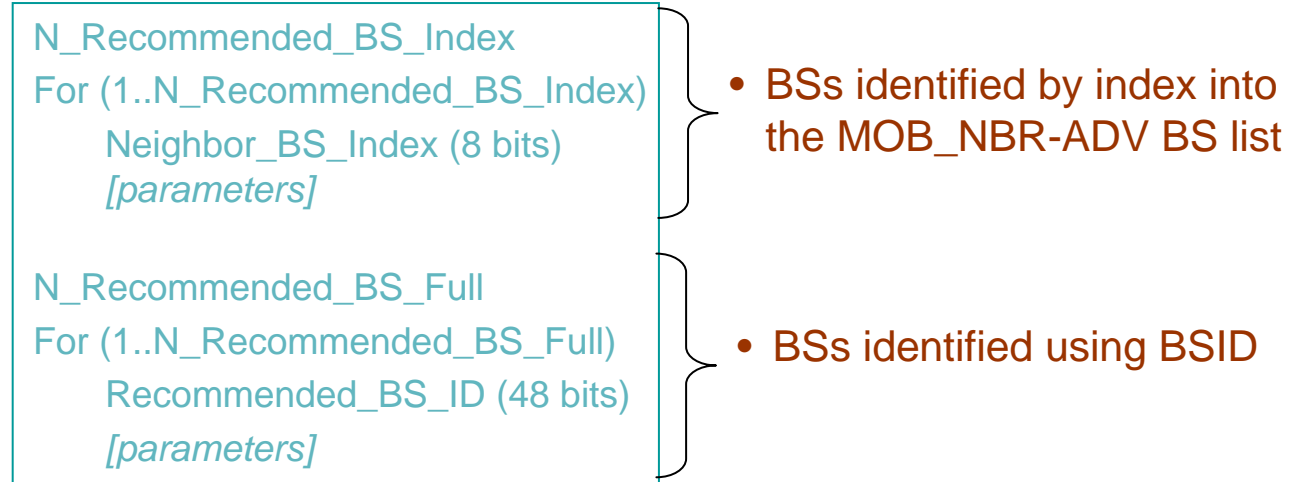
<http://standards.ieee.org/guides/bylaws/sect6-7.html#6>> and <http://standards.ieee.org/guides/opman/sect6.html#6.3>>.

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

Background

In MOB_SCN messages, BSs may be identified in 2 ways

1. If the BS was included in a MOB_NBR-ADV message
 - Use an 8-bit index into the MOB_NBR-ADV's BS list
 - Avoids the use of the 48-bit BSID
 2. Otherwise, the full BSID is used
-



MOB_NBR-ADV bitmap index

Issue

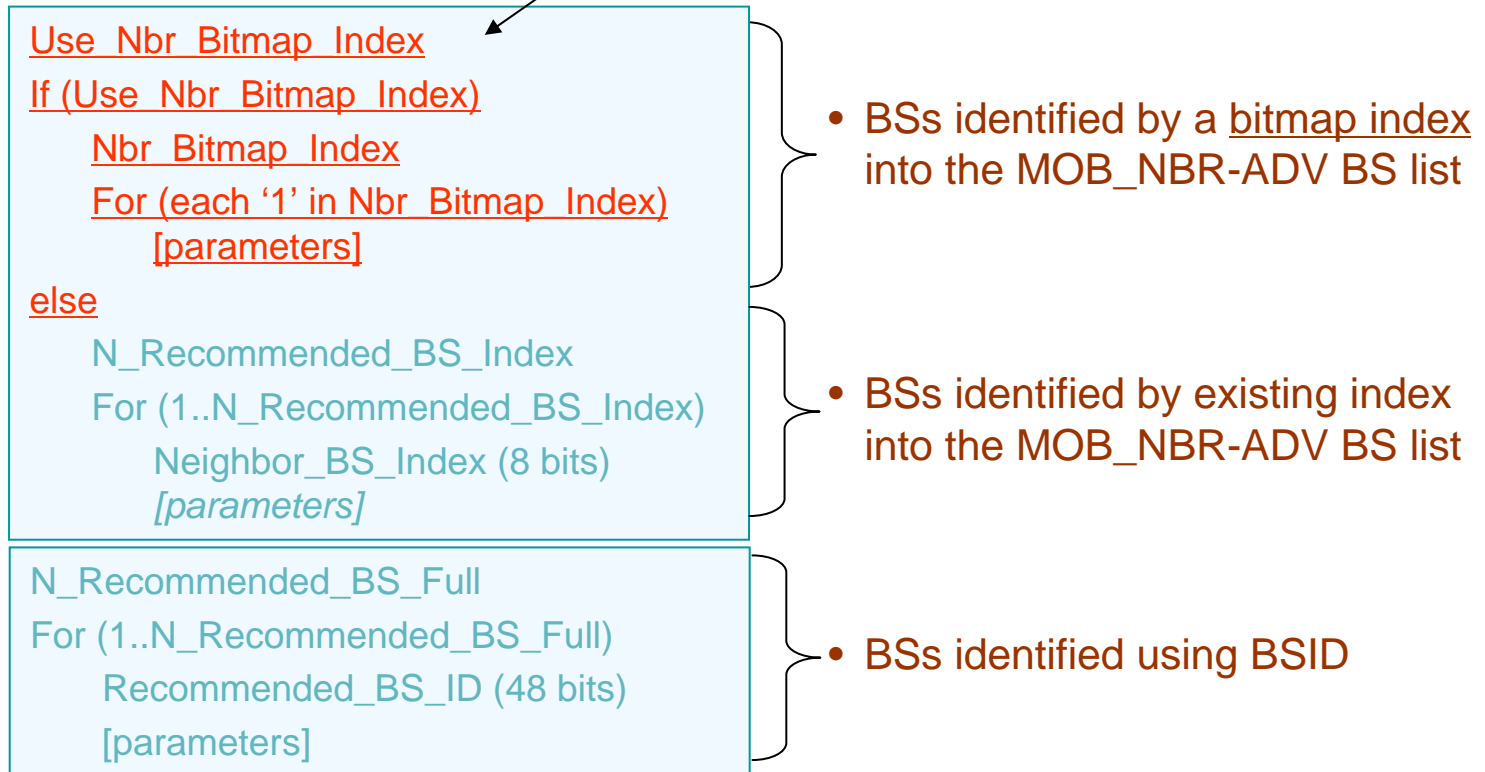
- For MOB_SCN-REQ/RSP/REP
 - The 8-bit MOB_NBR-ADV index
 - Supports 256 BSs in the MOB_SCN messages
 - In most cases, this is many more than needed
-

Proposal

- Add ***Nbr_Bitmap_Index*** associated with MOB_NBR-ADV
 - May be used instead of the 8-bit index
 - Size (number of bits) is up to the number of BSs included in the MOB_NBR-ADV message
 - A '1' in the bitmap identifies a BS's index in the MOB_NBR-ADV's BS list

MOB_NBR-ADV bitmap index

- Either the bitmap index or the existing index may be used



MOB_SCN-REQ bitmap index for MOB_SCN-RSP

Issue

- For MOB_SCN-RSP
 - A MOB_SCN-REQ message may include BSs that are not in the associated MOB_NBR-ADV message
 - BSID for these BSs must be used in the MOB_SCN-RSP message, which requires 48 bits apiece
-

Proposal

- Add ***Req Bitmap Index*** associated with MOB_SCN-REQ
 - Size (number of bits) is up to the number of BSs included in the MOB_SCN-REQ message
 - A '1' in the bitmap identifies a BS's index in the MOB_SCN-REQ's BS list
- Add ***1-bit sequence number*** to identify the associated MOB_SCN-REQ to resolve the following error scenario:
 - MS retransmits a MOB_SCN-REQ maximum number of times
 - MS transmits a new MOB_SCN-REQ but then receives MOB_SCN-RSP based on the first MOB_SCN-REQ

MOB_SCN-REQ bitmap index for MOB_SCN-RSP

Use Nbr Bitmap Index

If (Use Nbr Bitmap Index)

Nbr Bitmap Index

For (each '1' in Nbr Bitmap Index)

[parameters]

else

N_Recommended_BS_Index

For (1..N_Recommended_BS_Index)

Neighbor_BS_Index (8 bits)

[parameters]

- BSs identified by a bitmap index into the MOB_NBR-ADV BS list

- BSs identified by existing index into the MOB_NBR-ADV BS list

Use Req Bitmap Index

If (Use Req Bitmap Index)

Req Seq Num (1 bit)

Req Bitmap Index

For (each '1' in Req Bitmap Index)

[parameters]

- BSs identified by a bitmap index into the MOB_SCN-REQ BS list

N_Recommended_BS_Full

For (1..N_Recommended_BS_Full)

Recommended_BS_ID (48 bits)

[parameters]

- BSs identified using BSID

MOB_SCN-RSP bitmap index for MOB_SCN-REP

Issue

- For MOB_SCN-REP
 - A MOB_SCN-RSP message may include BSs that are not in the associated MOB_NBR-ADV or MOB_SCN-REQ
 - BSID for these BSs must be used in the MOB_SCN-REP message, which requires 48 bits apiece
-

Proposal

- Add ***Rsp_Bitmap_Index*** associated with MOB_SCN-RSP
 - Size (number of bits) is up to the number of BSs included in the MOB_SCN-RSP message
 - A '1' in the bitmap identifies a BS's index in the MOB_SCN-RSP's BS list
- Add ***1-bit sequence number*** to identify the associated MOB_SCN-RSP in to resolve the following error scenario:
 - BS retransmits a MOB_SCN-RSP maximum number of times
 - BS transmits a new MOB_SCN-RSP but then receives MOB_SCN-REP based on the first MOB_SCN-RSP

MOB_SCN-RSP bitmap index for MOB_SCN-REP

```
Use Nbr Bitmap Index  
If (Use Nbr Bitmap Index)  
  Nbr Bitmap Index  
  For (each '1' in Nbr Bitmap Index)  
    [parameters]  
else  
  N_Recommended_BS_Index  
  For (1..N_Recommended_BS_Index)  
    Neighbor_BS_Index (8 bits)  
    [parameters]
```

- BSs identified by a bitmap index into the MOB_NBR-ADV BS list

- BSs identified by existing index into the MOB_NBR-ADV BS list

```
Use Rsp Bitmap Index  
If (Use Rsp Bitmap Index)  
  Rsp Seq Num (1 bit)  
  Rsp Bitmap Index  
  For (each '1' in Rsp Bitmap Index)  
    [parameters]
```

- BSs identified by a bitmap index into the MOB_SCN-RSP BS list

```
N_Recommended_BS_Full  
For (1..N_Recommended_BS_Full)  
  Recommended_BS_ID (48 bits)  
  [parameters]
```

- BSs identified using BSID

MOB_SCN-REQ message

Syntax	Size (bit)
MOB_SCN-REQ_Message_format() {	—
Management Message Type = 54	8
Scan duration	
Interleaving interval	
Scan Iteration	
N_Recommended_BS_Index	8
If(N_Recommended_BS_Index != 0){	
Configuration change count for MOB_NBR-ADV	8
}	
For(j = 0; j < N_Recommended_BS_Index; j++){	
Neighbor_BS_Index	8
Reserved	1
Scanning type	3
}	
N_Recommended_BS_Full	8
For(j = 0; j < N_Recommended_BS_Full; j++){	
Recommended BS ID	48
Reserved	1
Scanning type	3
}	
Padding	variable
TLV encoded information	variable
}	—

Recommended BSs included in MOB_NBR-ADV message can be referenced according to their position in the MOB_NBR-ADV message

Number of recommended BSs that were included in MOB_NBR-ADV message

Position of this BS in MOB_NBR-ADV based on index

Recommended BSs not included in MOB_NBR-ADV message

Full BS ID used to identify BS

Yellow: MOB_NBR-ADV part
Blue: Full BS ID part

Syntax	
MOB_SCN-RSP_Message_format() {	
Management Message Type = 55	
Scan duration	
Report mode	
Reserved	
Report period	
Report metric	
if (Scan Duration != 0) {	
Start frame	
Interleaving interval	
Scan iteration	
}	
N_Recommended_BS_Index	
If(N_Recommended_BS_Index != 0){	
Configuration change count for MOB_NBR-ADV	
}	
For(j = 0; j < N_Recommended_BS_Index; j++){	
Neighbor_BS_Index	
Reserved	
Scanning type	
If (Scanning type == 0b010) OR (Scanning type == 0b011) {	
Rendezvous time	
CDMA_code	
Transmission_opportunity offset	
}	
}	
Padding	
}	
TLV encoded information	
}	

MOB_SCN-RSP message

N_Recommended_BS_Index	N_Recommended_BS_Full
If(N_Recommended_BS_Index != 0){	
Configuration change count for MOB_NBR-ADV	
}	
For(j = 0; j < N_Recommended_BS_Index; j++){	For(j = 0; j < N_Recommended_BS_Full; j++){
Neighbor_BS_Index	Recommended BS ID
Reserved	Reserved
Scanning type	Scanning type
If (Scanning type == 0b010) OR (Scanning type == 0b011) {	If (Scanning type == 0b010) OR (Scanning type == 0b011) {
Rendezvous time	Rendezvous time
CDMA_code	CDMA code
Transmission_opportunity offset	Transmission_opportunity offset
}	}
}	}

Yellow: MOB_NBR-ADV part
Blue: Full BS ID part

Syntax	Size (bit)
MOB_SCN-REQ_Message_format() {	
Management Message Type = 54	
Scan duration	8
Interleaving interval	8
Scan Iteration	
N_Recommended_BS_Index	
If(N_Recommended_BS_Index != 0){	
Configuration change count for MOB_NBR-ADV	
}	
<u>If(N_Recommended_BS_Index == 0xFF){</u>	
<u>Req_Seq_Num</u>	<u>1</u>
<u>Nbr_Bitmap_Index</u>	<u>Up to the Number BSs in MOB_NBR-ADV</u>
<u>For(each '1' in Nbr_Bitmap_Index)</u>	—
<u>Scanning type</u>	<u>3</u>
}	—
<u>} else {</u>	—
For(j = 0; j < N_Recommended_BS_Index; j++){	—
Neighbor_BS_Index	8
<u>Req_Seq_Num [delete Reserved]</u>	<u>1</u>
Scanning type	3
}	—
}	—
N_Recommended_BS_Full	8
[...]	

- Backward compatible
- 1.x MS must work with 16e BS

- Assume won't have 256 BSs in MOB_NBR-ADV,
- 1.x BS will use 0xFF value to signal to 1.x MS that bitmap is used.
- 16e BS will use old format

Proposed
MOB_SCN-REQ

MOB_SCN-REQ message solution

FULL BS ID Part:

N_Recommended_BS_Full	8
For(j = 0; j < N_Recommended_BS_Full; j++){	—
Recommended BS ID	48
Req_Seq_Num [delete Reserved]	1
Scanning type	3
}	
Padding	variable
TLV encoded information	variable
}	—

Proposed
MOB_SCN-REQ

Proposed MOB_SCN-RSP message solution

MOB_SCN-RSP_Message_format() {
Management Message Type = 55
Scan duration
Report mode
Reserved <u>3 (delete 6)</u>
<u>Rsp_Seq_Num 1</u>
<u>Use_Nbr_Bitmap_Index 1</u>
<u>Use_Req_Bitmap_Index 1</u>
Report period
Report metric
if (Scan Duration != 0) {
Start frame
Interleaving interval
Scan iteration
<u>If(Use_Nbr_Bitmap_Index == 1){</u>
<u>Configuration change count for</u> <u>MOB_NBR-ADV</u>
<u>Nbr_Bitmap_Index</u>
<u>For(each '1' in Nbr_Bitmap_Index){</u>
<u>Scanning type</u>
<u>If (Scanning type == 0b010) OR</u> <u>(Scanning type == 0b011) {</u>
<u>Rendezvous time</u>
<u>CDMA_code</u>
<u>Transmission_opportunity_offset</u>
<u>}</u>
<u>}</u>
}

<u>} else {</u>
N_Recommended_BS_Index
If(N_Recommended_BS_Index != 0){
Configuration change count for MOB_NBR-ADV
}
For(j = 0; j < N_Recommended_BS_Index; j++){
Neighbor_BS_Index
Reserved
Scanning type
If (Scanning type == 0b010) OR (Scanning type == 0b011) {
Rendezvous time
CDMA_code
Transmission_opportunity_offset
}
}
}

Proposed MOB_SCN-RSP message solution

	<u>If(Use_Req_Bitmap_Index == 1){</u>
	<u> Reg_Seq_Num</u>
	<u> Req_Bitmap_Index</u>
	<u> For(each '1' in Req_Bitmap_Index){</u>
	<u> Scanning_type</u>
	<u> If (Scanning_type == 0b010) OR (Scanning_type == 0b011) {</u>
	<u> Rendezvous_time</u>
	<u> CDMA_code</u>
	<u> Transmission_opportunity_offset</u>
	<u> }</u>
	<u> }</u>
	<u>}</u>
	N_Recommended_BS_Full
	[...] No change
	[...]
	Padding
	}
	TLV encoded information
	}

Proposed MOB_SCN-REP

MOB_SCN-REP_Message_format() {
Management Message Type = 60
Report Mode
N_current_BSs
<u>Use Nbr Bitmap Index</u>
<u>Use Rsp Bitmap Index</u>
Reserved
Report metric
For (j = 0; j < N_current_BSs; j++) {
Temp BSID
Reserved
If (Report metric Bit 0] == 1)
[...]
<u>If(Use Nbr Bitmap Index == 1){</u>
<u>Configuration change count for MOB_NBR-ADV</u>
<u>Nbr Bitmap Index</u>
<u>For(each '1' in Nbr Bitmap Index){</u>
<u>If(Report metric[Bit 0] == 1)</u>
[...]
<u>}else {</u>
N_Neighbor_BS_Index
If (N_Neighbor_BS_Index != 0){
Configuration change count for MOB_NBR-ADV
For(j = 0; j < N_Neighbor_BS_Index; j++) {
Neighbor_BS_Index
If(Report metric[Bit 0] == 1)
[...]

<u>If(Use Rsp Bitmap Index == 1){</u>
<u>Rsp Seq Num</u>
<u>Rsp Bitmap Index</u>
<u>For(each '1' in Rsp Bitmap Index){</u>
<u>If(Report metric[Bit 0] == 1)</u>
[...]
N_Neighbor_BS_Full
For(j = 0; j < N_Neighbor_BS_Full; j++) {
Neighbor BSID
If(Report metric[Bit 0] == 1)
[...]
}