
3.6 Groups

3.6.1 Overview

Please see Chapter 2 for a general cluster overview defining cluster architecture, revision, classification, identification, etc.

The stack specification provides the capability for group addressing. That is, any endpoint on any device MAY be assigned to one or more groups, each labeled with a 16-bit identifier (0x0001 to 0xfff7), which acts for all intents and purposes like a network address. Once a group is established, frames, sent using the APSDE-DATA.request primitive and having a DstAddrMode of 0x01, denoting group addressing, will be delivered to every endpoint assigned to the group address named in the DstAddr parameter of the outgoing APSDE-DATA.request primitive on every device in the network for which there are such endpoints.

Management of group membership on each device and endpoint is implemented by the APS, but the over-the-air messages that allow for remote management and commissioning of groups are defined here in the cluster library on the theory that, while the basic group addressing facilities are integral to the operation of the stack, not every device will need or want to implement this management cluster. Furthermore, the placement of the management commands here allows developers of proprietary profiles to avoid implementing the library cluster but still exploit group addressing.

Commands are defined here for discovering the group membership of a device, adding a group, removing a group and removing all groups.

Finally, the group cluster allows application entities to store a name string for each group to which they are assigned and to report that name string in response to a client request.

Note that configuration of group addresses for outgoing commands is achieved using the APS binding mechanisms, and is not part of this cluster.

As Groupcasts are made on a broadcast to all devices for which macRxOnWhenIdle = TRUE, sleeping end devices will not be able to benefit from the features of the Groups and Scenes server Cluster. For example, a door lock which would typically be a sleeping end device would not be able to receive the datagrams required to commission a scene or change for example, to a night scene. It is therefore not Mandatory but only optional to support the Groups and Scenes Server cluster if the device is a Sleeping end device (even when listed as Mandatory).

3.6.1.1 Revision History

The global *ClusterRevision* attribute value SHALL be the highest revision number in the table below.

Rev	Description
1	global mandatory *Cluster Revision* attribute added; CCB 1745 2100
2	CCB 2289
3	CCB 2310 2704

3.6.1.2 Classification

Hierarchy	Role	PICS Code
Base	Utility	G

3.6.1.3 Cluster Identifiers

Identifier	Name
0x0004	Groups

3.6.2 Server

Each device that implements this cluster MAY be thought of as a group management server in the sense that it responds to information requests and configuration commands regarding the contents of its group table.

Note that, since these commands are simply data frames sent using the APSDE_SAP, they must be addressed with respect to device and endpoint. In particular, the destination device and endpoint of a group management command must be unambiguous at the time of the issuance of the primitive either because:

1. They are explicitly spelled out in the DstAddr and DstEndpoint parameters of the primitive.
2. They are not explicitly spelled out but MAY be derived from the binding table in the APS of the sending device.
3. Broadcast addressing is being employed, either with respect to the device address or the endpoint identifier.

4. Group addressing is being employed.

On receipt of a group cluster command, the APS will, at least conceptually, deliver the frame to each destination endpoint spelled out in the addressing portion of the APS header and, again conceptually speaking, the application entity resident at that endpoint will process the command and respond as necessary. From an implementation standpoint, of course, this MAY be done in a more economical way that does not involve duplication and separate processing, e.g., by providing a hook in the APS whereby group cluster commands could be delivered to a special application entity without duplication.

3.6.2.1 Dependencies

For correct operation of the 'Add group if identifying' command, any endpoint that implements the Groups server cluster SHALL also implement the Identify server cluster.

3.6.2.2 Attributes

The server supports the attribute shown in Table 3-36.

Table 3-36. Attributes of the Groups Server Cluster

Identifier	Name	Type	Range	Acc	Def	M/O
0x0000	*NameSupport*	map8	desc	R	0	M

3.6.2.2.1 NameSupport Attribute

The most significant bit of the *NameSupport* attribute indicates whether or not group names are supported. A value of 1 indicates that they are supported, and a value of 0 indicates that they are not supported.

3.6.2.2.2 Group Names

Group names are between 0 and 16 characters long. Support of group names is optional, and is indicated by the *NameSupport* attribute. Group names, if supported, must be stored in a separate data structure managed by the application in which the entries correspond to group table entries.

3.6.2.3 Commands Received

The groups cluster is concerned with management of the group table on a device. In practice, the group table is managed by the APS and the table itself is available to the next higher layer as an AIB attribute. A command set is defined here and the implementation details of that command set in terms of the facilities provided by the APS is left up to the implementer of the cluster library itself.

The server side of the groups cluster is capable of receiving the commands listed in Table 3-37.

Table 3-37. Received Command IDs for the Groups Cluster

Command Identifier	Description	M/O
0x00	Add group	M
0x01	View group	M

Command Identifier	Description	M/O
0x02	Get group membership	M
0x03	Remove group	M
0x04	Remove all groups	M
0x05	Add group if identifying	M

3.6.2.3.1 Generic Usage Notes

On receipt of the *Add Group*, *View Group*, or *Remove Group* command frames via the groupcast or broadcast transmission service, no response SHALL be given.

3.6.2.3.2 Add Group Command

The Add Group command allows the sending device to add group membership in a particular group for one or more endpoints on the receiving device.

3.6.2.3.2.1 Payload Format

The Add Group command payload SHALL be formatted as illustrated in Figure 3-10.

Figure 3-10. Format of the Add Group Command Payload

Octets	2	Variable
Data Type	uint16	string
Field Name	Group ID	Group Name

3.6.2.3.2.2 Effect on Receipt[23]

If the device is unable to store the contents of the Group Name field, the Group Name field can be ignored.

On receipt of the Add Group command, the device SHALL perform the following procedure:

1. The device verifies that the Group ID field contains a valid group identifier in the range 0x0001 – 0xfff7. If the Group ID field contains a group identifier outside this range, the status SHALL be INVALID_VALUE and the device continues from step 5.
2. The device verifies that it does not already have an entry in its Group Table that corresponds to the value of the Group ID field. If it already has the requested entry in its Group Table, the Group Name SHALL be updated (if supported), the status SHALL be SUCCESS, and the device continues from step 5.
3. The device verifies that it has free entries in its Group Table. If the device has no free entries in its Group Table, the status SHALL be INSUFFICIENT_SPACE and the device continues from step 5.
4. The device adds the values of the Group ID and Group Name (if supported) fields to its Group Table and the status SHALL be SUCCESS.

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5. If the Add Group command was received as a unicast, the device SHALL generate an Add Group Response command with the Status field set to the evaluated status and SHALL transmit it back to the originator of the Add Group command.

See 3.6.2.4.1 for a description of the Add Group Response command.

3.6.2.3.3 View Group Command

The view group command allows the sending device to request that the receiving entity or entities respond with a view group response command containing the application name string for a particular group.

3.6.2.3.3.1 Payload Format

The View Group command payload SHALL be formatted as illustrated in Figure 3-11:

Figure 3-11. Format of the View Group Command Payload

Octets	2
Data Type	uint16
Field Name	Group ID

3.6.2.3.3.2 Effect on Receipt[24]

On receipt of the View Group command, the device SHALL perform the following procedure:

1. The device verifies that the Group ID field contains a valid group identifier in the range 0x0001 – 0xfff7. If the Group ID field contains a group identifier outside this range, the status SHALL be INVALID_VALUE and the device continues from step 4.
2. The device attempts to retrieve the entry in its Group Table corresponding to the group identifier contained in the Group ID field. If no such entry exists in the Group Table, the status SHALL be NOT_FOUND and the device continues from step 4.
3. The device retrieves the requested entry from its Group Table and the status SHALL be SUCCESS.
4. If the View Group command was received as a unicast, the device SHALL generate a View Group Response command with the retrieved group entry and the Status field set to the evaluated status and SHALL transmit it back to the originator of the View Group command.

See 3.6.2.4.2 for a description of the View Group Response command.

3.6.2.3.4 Get Group Membership Command

The get group membership command allows the sending device to inquire about the group membership of the receiving device and endpoint in a number of ways.

3.6.2.3.4.1 Payload Format

The get group membership command payload SHALL be formatted as illustrated in Figure 3-12.

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Figure 3-12. Format of Get Group Membership Command Payload

Octets	1	Variable
Data Type	uint8	List of 16-bit integers
Field Name	Group count	Group list

3.6.2.3.4.2 Effect on Receipt

On receipt of the get group membership command, each receiving entity SHALL respond with group membership information using the get group membership response frame as follows:

If the group count field of the command frame has a value of 0 indicating that the group list field is empty, the entity SHALL respond with all group identifiers of which the entity is a member.

If the group list field of the command frame contains at least one group of which the entity is a member, the entity SHALL respond with each entity group identifier that match a group in the group list field.

If the group count is non-zero, and the group list field of the command frame does not contain any group of which the entity is a member, the entity SHALL only respond if the command is unicast. The response SHALL return a group count of zero.

3.6.2.3.5 Remove Group Command

The remove group command allows the sender to request that the receiving entity or entities remove their membership, if any, in a particular group.

Note that if a group is removed the scenes associated with that group SHOULD be removed.

3.6.2.3.5.1 Payload Format

The Remove Group command payload SHALL be formatted as illustrated in Figure 3-13.

Figure 3-13. Format of the Remove Group Command Payload

Octets	2
Data Type	uint16
Field Name	Group ID

3.6.2.3.5.2 Effect on Receipt[25]

On receipt of the Remove Group command, the device SHALLperform the following procedure:

1. The device verifies that the Group ID field contains a valid group identifier in the range 0x0001 – 0xfff7. If the Group ID field contains a group identifier outside this range, the status SHALL be INVALID_VALUE and the device continues from step 4.
2. The device attempts to remove the entry in its Group Table corresponding to the group identifier contained in the Group Id field. If no such entry exists in the Group Table, the status SHALL be NOT_FOUND and the device continues from step 4.
3. The device removes the requested entry from its Group Table and the status SHALL be SUCCESS.

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4. If the Remove Group command was received as a unicast, the device SHALL generate a Remove Group Response command with the Status field set to the evaluated status and SHALL transmit it back to the originator of the Remove Group command.

See 3.6.2.4.4 for a description of the Remove Group Response command.

3.6.2.3.6 Remove All Groups Command

The remove all groups command allows the sending device to direct the receiving entity or entities to remove all group associations.

Note that removing all groups necessitates the removal of all associated scenes as well. (Note: scenes not associated with a group need not be removed).

3.6.2.3.6.1 Payload Format

The Remove All Groups command has no payload.

3.6.2.3.6.2 Effect on Receipt[26]

On receipt of this command, the device SHALL remove all groups on this endpoint from its Group Table. If the Remove All Groups command was received as unicast and a default response is requested, the device SHALL generate a Default Response command with the Status field set to SUCCESS and SHALL transmit it back to the originator of the Remove All Groups command.

3.6.2.3.7 Add Group If Identifying Command

The add group if identifying command allows the sending device to add group membership in a particular group for one or more endpoints on the receiving device, on condition that it is identifying itself. Identifying functionality is controlled using the identify cluster, (see 3.5).

This command might be used to assist configuring group membership in the absence of a commissioning tool.

3.6.2.3.7.1 Payload Format

The Add Group If Identifying command payload SHALL be formatted as illustrated in Figure 3-14.

Figure 3-14. Add Group If Identifying Command Payload

Octets	2	Variable
Data Type	uint16	string
Field Name	Group ID	Group Name

3.6.2.3.7.2 Effect on Receipt[27]

If the device is unable to store the contents of the Group Name field, the Group Name field MAY be ignored.

On receipt of the Add Group If Identifying command, the device SHALL perform the following procedure:

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1. The device verifies that it is currently identifying itself. If the device it not currently identifying itself, the Add Group If Identifying command was received as unicast and a default response is requested, the device SHALL generate a Default Response command with the Status field set to SUCCESS and SHALL transmit it back to the originator of the Add Group If Identifying command. If the device it not currently identifying itself and the Add Group If Identifying command was not received as unicast, no further processing SHALL be performed.
2. The device verifies that the Group ID field contains a valid group identifier in the range 0x0001 – 0xfff7. If the Group ID field contains a group identifier outside this range, the status SHALL be INVALID_VALUE and the device continues from step 6.
3. The device verifies that it does not already have an entry in its Group Table that corresponds to the value of the Group ID field. If it already has the requested entry in its Group Table, the status SHALL be SUCCESS and the device continues from step 6.
4. The device verifies that it has free entries in its Group Table. If the device has no free entries in its Group Table, the status SHALL be INSUFFICIENT_SPACE and the device continues from step 6.
5. The device adds the values of the Group ID and Group Name (if supported) fields to its Group Table and the status SHALL be SUCCESS.
6. If the Add Group If Identifying command was received as unicast and the evaluated status is not SUCCESS, the device SHALL generate a Default Response command with the Status field set to the evaluated status and SHALL transmit it back to the originator of the Add Group If Identifying command.

No response is defined as this command is EXPECTED to be multicast or broadcast.

If the command is unicast, with the Disable Default Response bit not set, and there is no error (or the endpoint is not identifying), then there SHALL be a Default Response with a Status of SUCCESS.[28]

3.6.2.4 Commands Generated

The commands generated by the server side of the group cluster, as listed in Table 3-38, are responses to the received commands listed in sub-clause 3.6.2.3.

Table 3-38. Generated Command IDs for the Groups Cluster

Command Identifier	Description	M/O
0x00	Add group response	M
0x01	View group response	M
0x02	Get group membership response	M
0x03	Remove group response	M

Note: There is no need for a response to the Remove all Groups command, as, at an application level, this command always succeeds.

[28] CCB 2704

3.6.2.4.1 Add Group Response Command

The add group response is sent by the groups cluster server in response to an add group command.

3.6.2.4.1.1 Payload Format

The Add Group Response command payload SHALL be formatted as illustrated in Figure 3-15.

Figure 3-15. Format of the Add Group Response Command Payload

Octets	1	2
Data Type	enum8	uint16
Field Name	Status	Group ID

3.6.2.4.1.2 When Generated

This command is generated in response to a received Add Group command. The Status field is set according to the Effect on Receipt section of the Add Group command[29]. The Group ID field is set to the Group ID field of the received Add Group command.

3.6.2.4.2 View Group Response Command

The view group response command is sent by the groups cluster server in response to a view group command.

3.6.2.4.2.1 Payload Format

The View Group Response command payload SHALL be formatted as illustrated in Figure 3-16.

Figure 3-16. Format of the View Group Response Command Payload

Octets	1	2	Variable
Data Type	enum8	uint16	string
Field Name	Status	Group ID	Group Name

3.6.2.4.2.2 When Generated

This command is generated in response to a received View Group command. The Status field is according to the Effect on Receipt section of the View Group command[30]. The Group ID field is set to the Group ID field of the received View Group command. If the status is SUCCESS, and group names are supported, the Group Name field is set to the Group Name associated with that Group ID in the Group Table; otherwise it is set to the null (empty) string, i.e., a single octet of value 0.

3.6.2.4.3 Get Group Membership Response Command

The get group membership response command is sent by the groups cluster server in response to a get group membership command.

3.6.2.4.3.1 Payload Format

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The payload of the get group membership response command is formatted as shown in Figure 3-17.

Figure 3-17. Format of the Get Group Membership Response Command Payload

Octets	1	1	Variable
Data Type	uint8	uint8	List of 16-bit group ID
Field Name	Capacity	Group count	Group list

The fields of the get group membership response command have the following semantics:

The Capacity field SHALL contain the remaining capacity of the group table of the device. The following values apply:

0	No further groups MAY be added.
0 < Capacity < 0xfe	Capacity holds the number of groups that MAY be added
0xfe	At least 1 further group MAY be added (exact number is unknown)
0xff	It is unknown if any further groups MAY be added

The Group count field SHALL contain the number of groups contained in the group list field.

The Group list field SHALL contain the identifiers either of all the groups in the group table (in the case where the group list field of the received get group membership command was empty) or all the groups from the group list field of the received get group membership command which are in the group table. If the total number of groups will cause the maximum payload length of a frame to be exceeded, then the Group list field shall contain only as many groups as will fit.

3.6.2.4.3.2 When Generated

See Get Group Membership Command 3.6.2.3.4.2 Effect on Receipt.

3.6.2.4.4 Remove Group Response Command

The remove group response command is generated by an application entity in response to the receipt of a remove group command.

3.6.2.4.4.1 Payload Format

The Remove Group Response command payload SHALL be formatted as illustrated in Figure 3-18.

Figure 3-18. Format of Remove Group Response Command Payload

Octets	1	2
Data Type	enum8	uint16
Field Name	Status	Group ID

3.6.2.4.4.2 When Generated

This command is generated in response to a received Remove Group command. The Status field is according to the Effect on Receipt section of the Remove Group command[31]. The Group ID field is set to the Group ID field of the received Remove Group command.

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