
3.8 On/Off

3.8.1 Overview

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

Attributes and commands for switching devices between ‘On’ and ‘Off’ states.

[49] CCB 2310 clarify command process and response

3.8.1.1 Revision History

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

Rev	Description
1	global mandatory *ClusterRevision* attribute added; CCB 1555
2	ZLO 1.0: *StartUpOnOff*

3.8.1.2 Classification

Hierarchy	Role	PICS Code	Primary Transaction
Base	Application	OO	Type 1 (client to server)

3.8.1.3 Cluster Identifiers

Identifier	PICS Code	Name
0x0006	OO	On/Off

3.8.2 Server

3.8.2.1 Dependencies

None

3.8.2.1.1 Effect on Receipt of Level Control Cluster Commands

On receipt of a *Level Control* cluster command that causes the *OnOff* attribute to be set to 0x00, the *OnTime* attribute SHALL be set to 0x0000.

On receipt of a *Level Control* cluster command that causes the *OnOff* attribute to be set to 0x01, if the value of the *OnTime* attribute is equal to 0x0000, the device SHALL set the *OffWaitTime* attribute to 0x0000.

3.8.2.2 Attributes

The server supports the attributes shown in Table 3-45.

Table 3-45. Attributes of the On/Off Server Cluster

Identifier	Name	Type	Range	Acc	Def	M
0x0000	*OnOff*	bool	value	RPS	0	M
0x4000	*GlobalSceneControl*	bool	value	R	1	O
0x4001	*OnTime*	uint16	full-non	RW	0	O
0x4002	*OffWaitTime*	uint16	full	RW	0	O

Identifier	Name	Type	Range	Acc	Def	M
0x4003	*StartUpOnOff*	enum8	desc	RW	*MS*	O

3.8.2.2.1 *OnOff* Attribute

The *OnOff* attribute has the following values: 0 = Off, 1 = On.

3.8.2.2.2 GlobalSceneControl Attribute

In order to support the use case where the user gets back the last setting of the devices (e.g. level settings for lamps), a global scene is introduced which is stored when the devices are turned off and recalled when the devices are turned on. The global scene is defined as the scene that is stored with group identifier 0 and scene identifier 0.

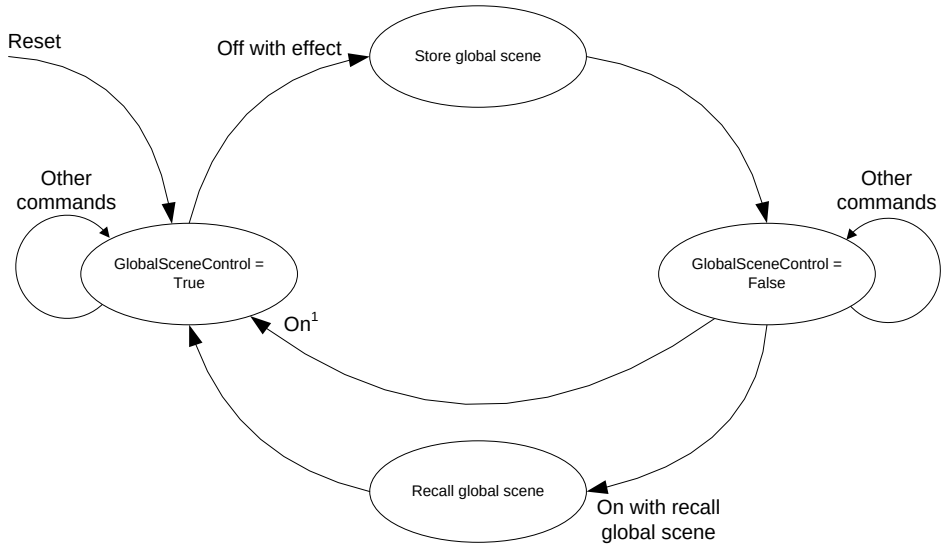
The *GlobalSceneControl* attribute is defined in order to prevent a second *off* command storing the all-devices-off situation as a global scene, and to prevent a second *on* command destroying the current settings by going back to the global scene.

The *GlobalSceneControl* attribute SHALL be set to TRUE after the reception of a command which causes the *OnOff* attribute to be set to TRUE, such as a standard *On* command, a *Move to level (with on/off)* command, a *Recall scene* command or a *On with recall global scene* command (see Section 3.8.2.3.5).

The *GlobalSceneControl* attribute is set to FALSE after reception of a *Off with effect* command.

These concepts are illustrated in Figure 3-35.

Figure 3-35. State Behavior of Store and Recall Global Scene



Note 1: Any command which causes the *OnOff* attribute to be set to 0x01 exept On with recall global scene, e.g. On or Toggle.

3.8.2.2.3 *OnTime* Attribute

The *OnTime* attribute specifies the length of time (in 1/10ths second) that the “on” state SHALL be maintained before automatically transitioning to the “off” state when using the *On with timed off* command. If this attribute is set to 0x0000 or 0xffff, the device SHALL remain in its current state.

3.8.2.2.4 OffWaitTime Attribute

The *OffWaitTime* attribute specifies the length of time (in 1/10ths second) that the "off" state SHALL be guarded to prevent an on command turning the device back to its "on" state (e.g., when leaving a room, the lights are turned off but an occupancy sensor detects the leaving person and attempts to turn the lights back on). If this attribute is set to 0x0000, the device SHALL remain in its current state.

3.8.2.2.5 StartUpOnOff Attribute

The *StartUpOnOff* attribute SHALL define the desired startup behavior of a[50] device when it is supplied with power and this state SHALL be reflected in the *OnOff* attribute. The values of the *StartUpOnOff* attribute are listed below.

Table 3-46. Values of the *StartUpOnOff* Attribute

Value	Action on power up
0x00	Set the *OnOff* attribute to 0 (off).
0x01	Set the *OnOff* attribute to 1 (on).
0x02	If the previous value of the *OnOff* attribute is equal to 0, set the *OnOff* attribute to 1. If the previous value of the *OnOff* attribute is equal to 1, set the *OnOff* attribute to 0 (toggle).
0x03 to 0xfe	These values are reserved. No action.
0xff	Set the *OnOff* attribute to its previous value.

3.8.2.3 Commands Received

The command IDs for the *On/Off* cluster are listed below.

Table 3-47. Command IDs for the On/Off Cluster

ID	Description	M/O
0x00	Off	M
0x01	On	M
0x02	Toggle	M
0x40	Off with effect	O
0x41	On with recall global scene	O
0x42	On with timed off	O

3.8.2.3.1 Off Command

This command does not have a payload.

[50] CCB 2605 remove 'lamp'

3.8.2.3.1.1 Effect on Receipt

On receipt of this command, a device SHALL enter its ‘Off’ state. This state is device dependent, but it is recommended that it is used for power off or similar functions. On receipt of the *Off* command, the *OnTime* attribute SHALL be set to 0x0000.

3.8.2.3.2 On Command

This command does not have a payload.

3.8.2.3.2.1 Effect on Receipt

On receipt of this command, a device SHALL enter its ‘On’ state. This state is device dependent, but it is recommended that it is used for power on or similar functions. On receipt of the *On* command, if the value of the *OnTime* attribute is equal to 0x0000, the device SHALL set the *OffWaitTime* attribute to 0x0000.

3.8.2.3.3 Toggle Command

This command does not have a payload.

3.8.2.3.3.1 Effect on Receipt

On receipt of this command, if a device is in its ‘Off’ state it SHALL enter its ‘On’ state. Otherwise, if it is in its ‘On’ state it SHALL enter its ‘Off’ state. On receipt of the *Toggle* command, if the value of the *OnOff* attribute is equal to 0x00 and if the value of the *OnTime* attribute is equal to 0x0000, the device SHALL set the *OffWaitTime* attribute to 0x0000. If the value of the *OnOff* attribute is equal to 0x01, the *OnTime* attribute SHALL be set to 0x0000.

3.8.2.3.4 Off With Effect Command

The *Off With Effect* command allows devices to be turned off using enhanced ways of fading.

The payload of this command SHALL be formatted as illustrated in Figure 3-36.

Figure 3-36. Format of the Off With Effect Command

Octets	1	1
Data Type	uint8	uint8
Field Name	Effect identifier	Effect variant

3.8.2.3.4.1 Effect Identifier Field

The *Effect Identifier* field is 8-bits in length and specifies the fading effect to use when switching the device off. This field SHALL contain one of the non-reserved values listed in Table 3-48.

Table 3-48. Values of the Effect Identifier Field of the Off With Effect Command

Effect Identifier Field Value	Description
0x00	Delayed All Off
0x01	Dying Light
0x02 to 0xff	Reserved

3.8.2.3.4.2 Effect Variant Field

The *Effect Variant* field is 8-bits in length and is used to indicate which variant of the effect, indicated in the *Effect Identifier* field, SHOULD be triggered. If a device does not support the given variant, it SHALL use the default variant. This field is dependent on the value of the *Effect Identifier* field and SHALL contain one of the nonreserved values listed in Table 3-49.

Table 3-49. Values of the Effect Variant Field of the Off With Effect Command

Effect Identifier Field Value	Effect Variant Field Value	Description
0x00	0x00 (default)	Fade to off in 0.8 seconds
	0x01	No fade
	0x02	50% dim down in 0.8 seconds then fade to off in 12 seconds
	0x03 to 0xff	Reserved
0x01	0x00 (default)	20% dim up in 0.5s then fade to off in 1 second
	0x01 to 0xff	Reserved
0x02 to 0xff	0x00 to 0xff	Reserved

3.8.2.3.4.3 Effect on Receipt

On receipt of the *Off With Effect* command and if the *GlobalSceneControl* attribute is equal to TRUE, the application on the associated endpoint SHALL store its settings in its global scene then set the *GlobalSceneControl* attribute to FALSE. The application SHALL then enter its “off” state, update the *OnOff* attribute accordingly and set the *OnTime* attribute to 0x0000.

In all other cases, the application on the associated endpoint SHALL enter its “off” state and update the *OnOff* attribute accordingly.

3.8.2.3.5 On With Recall Global Scene Command

The *On With Recall Global Scene* command allows the recall of the settings when the device was turned off.

The *On With Recall Global Scene* command SHALL have no parameters.

3.8.2.3.5.1 Effect on Receipt

On receipt of the *On With Recall Global Scene* command, if the *GlobalSceneControl* attribute is equal to TRUE, the application on the associated endpoint SHALL discard the command.

If the *GlobalSceneControl* attribute is equal to FALSE, the application on the associated endpoint SHALL recall its global scene, entering the appropriate state and updating the *OnOff* attribute accordingly. It SHALL then set the *GlobalSceneControl* attribute to TRUE. In Addition, if the value of the *OnTime* attribute is equal to 0x0000, the device SHALL then set the *OffWaitTime* attribute to 0x0000.

3.8.2.3.6 On With Timed Off Command

The *On With Timed Off* command allows devices to be turned on for a specific duration with a guarded off duration so that SHOULD the device be subsequently switched off, further *On With Timed Off* commands, received during this time, are prevented from turning the devices back on. Note that the device can be periodically re-kicked by subsequent *On With Timed Off* commands, e.g., from an on/off sensor.

The payload of this command SHALL be formatted as illustrated in Figure 3-37.

Figure 3-37. Format of the On With Timed Off Command

Octets	1	2	2
Data Type	uint8	uint16	uint16
Field Name	On/off Control	On Time	Off Wait Time

3.8.2.3.6.1 On/Off Control Field

The *On/Off Control* field is 8-bits in length and contains information on how the device is to be operated. This field SHALL be formatted as illustrated in Figure 3-38.

Figure 3-38. Format of the On/Off Control Field of the On With Timed Off Command

Bits: 0	1-7
Accept Only When On	Reserved

The *Accept Only When On* sub-field is 1 bit in length and specifies whether the *On With Timed Off* command is to be processed unconditionally or only when the *OnOff* attribute is equal to 0x01. If this sub-field is set to 1, the *On With Timed Off* command SHALL only be accepted if the *OnOff* attribute is equal to 0x01. If this sub-field is set to 0, the *On With Timed Off* command SHALL be processed unconditionally.

3.8.2.3.6.2 On Time Field

The *On Time* field is 16 bits in length and specifies the length of time (in 1/10ths second) that the device is to remain “on”, i.e., with its *OnOff* attribute equal to 0x01, before automatically turning “off”. This field SHALL be specified in the range 0x0000 to 0xfffe.

3.8.2.3.6.3 Off Wait Time Field

The *Off Wait Time* field is 16 bits in length and specifies the length of time (in 1/10ths second) that the device SHALL remain “off”, i.e., with its *OnOff* attribute equal to 0x00, and guarded to prevent an on command turning the device back “on”. This field SHALL be specified in the range 0x0000 to 0xfffe.

3.8.2.3.6.4 Effect on Receipt

On receipt of this command, if the *accept only when on* sub-field of the on/off control field is set to 1and the value of the *OnOff* attribute is equal to 0x00 (off), the command SHALL be discarded.

If the value of the *OffWaitTime* attribute is greater than zero and the value of the *OnOff* attribute is equal to 0x00, then the device SHALL set the *OffWaitTime* attribute to the minimum of the *OffWaitTime* attribute and the value specified in the off wait time field.

In all other cases, the device SHALL set the *OnTime* attribute to the maximum of the *OnTime* attribute and the value specified in the on time field, set the *OffWaitTime* attribute to the value specified in the off wait time field and set the *OnOff* attribute to 0x01 (on).

If the values of the *OnTime* and *OffWaitTime* attributes are both less than 0xffff, the device SHALL then update the device every 1/10th second until both the *OnTime* and *OffWaitTime* attributes are equal to 0x0000, as follows:

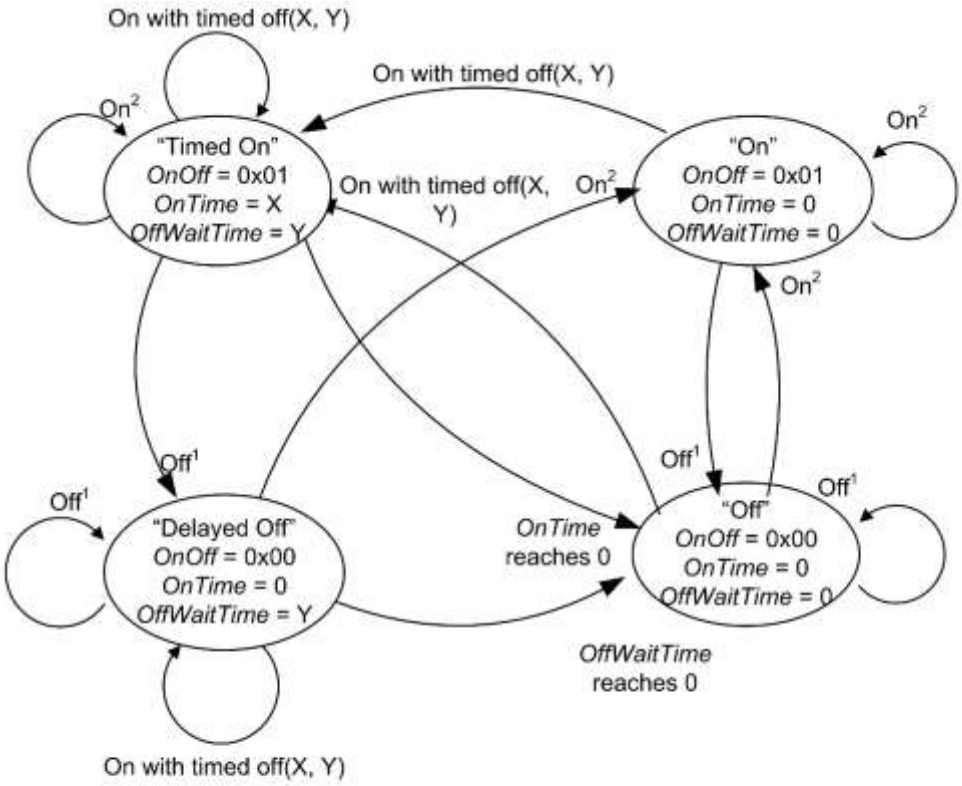
- If the value of the *OnOff* attribute is equal to 0x01 (on) and the value of the *OnTime* attribute is greater than zero, the device SHALL decrement the value of the *OnTime* attribute. If the value of the *OnTime* attribute reaches 0x0000, the device SHALL set the *OffWaitTime* and *OnOff* attributes to 0x0000 and 0x00, respectively.

- If the value of the *OnOff* attribute is equal to 0x00 (off) and the value of the *OffWaitTime* attribute is greater than zero, the device SHALL decrement the value of the *OffWaitTime* attribute. If the value of the *OffWaitTime* attribute reaches 0x0000, the device SHALL terminate the update.

3.8.2.4 State Description

The operation of the on/off cluster with respect to the on, off, and on with timed off commands is illustrated in Figure 3-39. In this diagram, the values X and Y correspond to the on time and off wait time fields, respectively, of the on with timed off command. In the "Timed On" state, the *OnTime* attribute is decremented every 1/10th second. Similarly, in the "Delayed Off" state, the *OffWaitTime* attribute is decremented every 1/10th second.

Figure 3-39. On/Off Cluster Operation State Machine



Note 1: Any command which causes the *OnOff* attribute to be set to 0x00, e.g. Off, Toggle or Off with effect.
Note 2: Any command which causes the *OnOff* attribute to be set to 0x01, e.g. On, Toogle or On with recall global scene.

3.8.2.5 Commands Generated

The server generates no commands.

3.8.2.6 Scene Table Extensions

If the Scenes server cluster (11) is implemented, the following extension field is added to the Scenes table:

OnOff