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ALERT NOTIFICATION SERVICE

Abstract:

Alert Notification service exposes

- The different types of alerts with the short text messages,
- The count of new alert messages,
- The count of unread alerts.

Revision History

Revision	Date (yyyy-mm-dd)	Comments
D09r01	2010-11-14	The first draft
D09r02	2011-03-08	Texts and figures are updated.
D09r03	2011-05-27	Deleted Supported Alert Subcategory
D09r04	2011-06-01	Removed last traces of old architecture
D09r05	2011-06-12	Several edits in F2F. Most notably refine and future proof categories
D09r06	2011-06-24	Update the characteristic usage.
D09r07	2011-07-05	Updated to answer comments
D09r08	2011-07-20	Delete “Both” command for Alert Notification Control Point. Add the explanation to Notify immediately command.
D09r10	2011-07-28	Clean version before final WG review
D09r11	2011-08-01	Lots of editorial/document readability edits. Moved behavior from characteristics to service.
D09r12	2011-08-10	Final cleanup of drawing in appendix. Fixed UUID of service
D09r13	2011-08-18	Responded to Barb and GPA reviewers
D09r14	2011-08-18	Fixed figure 4-1 and section 1.3 as requested by Len.
D09r15	2011-08-20	Responded to some additional comments from Terry
D09r16	2011-08-24	Responded to comments from Tim during vote.
V09r00	2011-08-29	Adopted prototype specification
D10r01	2011-09-02	First Draft D10, one typo fixed
V10r00	2011-09-15	Adopted by the Bluetooth SIG Board of Directors

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The Bluetooth SIG has adopted Section 13.1 of the IEEE Standards Style Manual, which dictates use of the words ``shall'', ``should'', ``may'', and ``can'' in the development of documentation, as follows:

The word *shall* is used to indicate mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals *is required to*).

The use of the word *must* is deprecated and shall not be used when stating mandatory requirements; *must* is used only to describe unavoidable situations.

The use of the word *will* is deprecated and shall not be used when stating mandatory requirements; *will* is only used in statements of fact.

The word *should* is used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain course of action is deprecated but not prohibited (*should* equals *is recommended that*).

The word *may* is used to indicate a course of action permissible within the limits of the standard (*may* equals *is permitted*).

The word *can* is used for statements of possibility and capability, whether material, physical, or causal (*can* equals *is able to*).

Table of Contents

1 Introduction

The Alert Notification service exposes alert information in a device. This information includes the following:

- Type of alert occurring in a device
- Additional text information such as caller ID or sender ID
- Count of new alerts
- Count of unread alert items.

1.1 Conformance

If a server claims conformance to this service, all capabilities indicated as mandatory for this service shall be supported in the specified manner (process-mandatory). This also applies for all optional and conditional capabilities for which support is indicated. All mandatory capabilities, and optional and conditional capabilities for which support is indicated, are subject to verification as part of the Bluetooth qualification program.

1.2 Service Dependency

This service has no dependencies on other GATT-based services.

1.3 *Bluetooth* Specification Release Compatibility

This is compatible with any Bluetooth core specification host [1] that includes the Generic Attribute Profile (GATT) and the *Bluetooth* Low Energy Controller specification.

1.4 GATT Sub-Procedure Requirements

Additional GATT sub-procedures requirements beyond those required by GATT are indicated in Table 1.1.

GATT Sub-Procedure	Requirements
Write Characteristic Value	M
Notification	M
Read Characteristic Descriptors	M
Write Characteristic Descriptors	M

Table 1.1: GATT Sub-Procedure Requirement

1.5 Transport Dependencies

The service shall only operate over an LE transport.

1.6 Error Codes

The following error code is defined in this service:

Error Code	Descriptions
0xA0	Command not supported.

Table 1.2: Error code

1.7 Concepts

1.7.1 Category ID

In the Alert Notification service, the concept of Category ID is used to identify the type of alert information.

The category ID is represented as a one-octet unsigned integer in commands and notifications that relate to one category or it is represented as a bit map for characteristics that expose capabilities for multiple categories.

The format of the Category ID is defined in [2] as Alert Category ID characteristic (unsigned octet representation) and Alert Category ID Bit Mask characteristic (bit map representation).

1.7.2 New Alert

When a server device has new messages or an alarm is set off, it will normally alert the user via its UI. If more messages or alarms happen before the user interacts with the server device, the UI normally keeps a count of these events. The count shall be decremented when the user acknowledges the alert(s) through a UI function on the server device. This count is referenced in this service specification as ‘count of new alerts’.

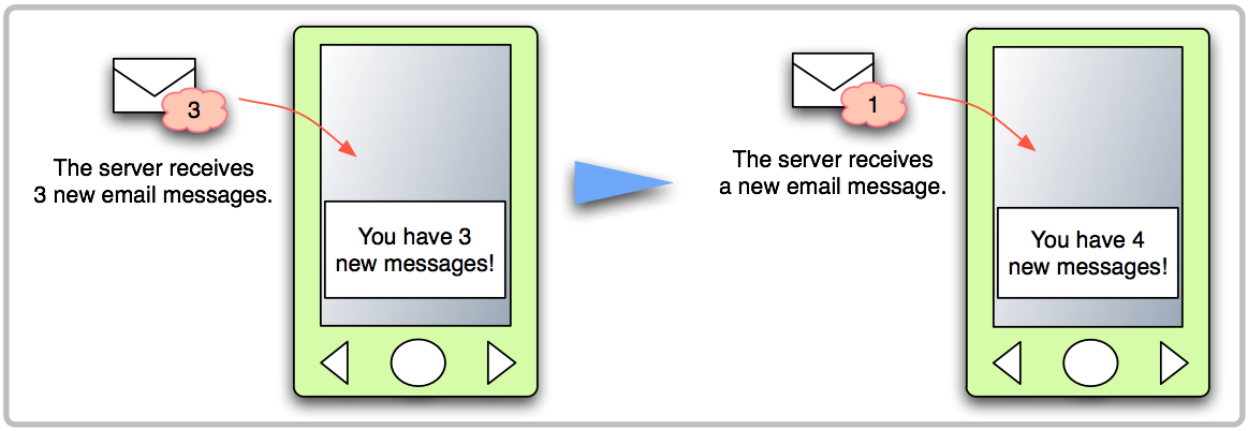

Figure 1.1: Count of New Message concept

1.7.3 Unread Alert

For messages like email and SMS the server device normally keeps a count of how many messages have not been read by the user. The count of the messages that have not been read by the user is referenced in this service specification as ‘count of unread alerts’.

2 Service Declaration

The Alert Notification service shall be instantiated as a «Primary Service». The service UUID shall be set to «Alert Notification Service».

The UUID value assigned to «Alert Notification Service» is defined in [2].

There shall be one instance of the Alert Notification Service on a device.

3 Service Characteristics

The Alert Notification service shall expose the following characteristics:

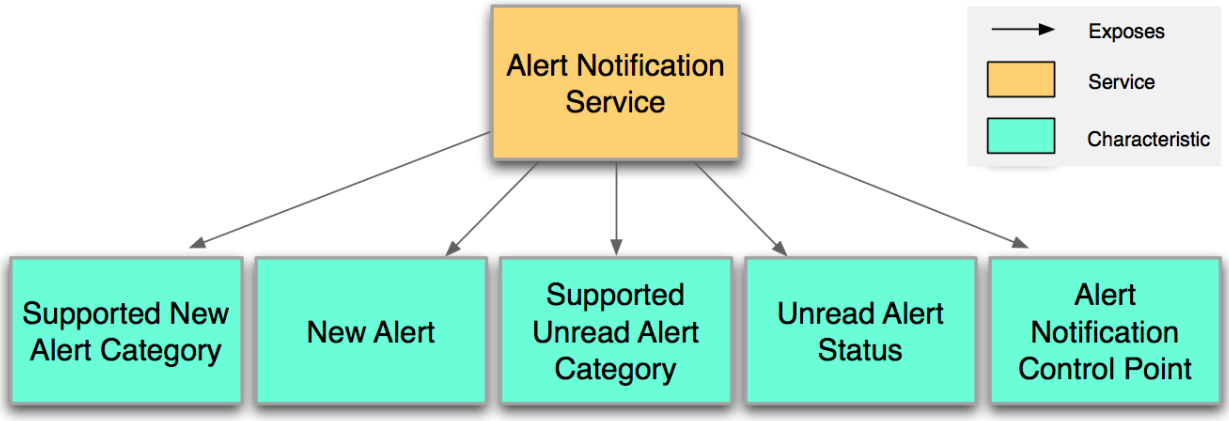

Figure 3.1: Diagram of the Alert Notification service

Characteristic	Ref.	Mandatory / Optional
Supported New Alert Category	3.1	M
New Alert	3.2	M
Supported Unread Alert Category	3.3	M
Unread Alert Status	3.4	M
Alert Notification Control Point	3.5	M

Table 3.1: Service Characteristics

In Table 3.1, the characteristics shall comply with the properties in Table 3.2:

	Broadcast	Read	Write without Response	Write	Notify	Indicate	Signed Write	Reliable Write	Writable Auxiliaries
Supported New Alert Category	X	M	X	X	X	X	X	X	X
New Alert	X	X	X	X	M	X	X	X	X
Supported Unread Alert Category	X	M	X	X	X	X	X	X	X
Unread Alert Status	X	X	X	X	M	X	X	X	X
Alert Notification Control Point	X	X	X	M	X	X	X	X	X

Table 3.2: Characteristic Properties

Requirements marked with ‘M’ are mandatory, ‘O’ are optional and ‘X’ are excluded (not permitted).

There shall be one instance of the Supported New Alert Category characteristic in an Alert Notification service.

There shall be one instance of the New Alert characteristic in an Alert Notification service.

There shall be one instance of the Supported Unread Alert Category characteristic in an Alert Notification service.

There shall be one instance of the Unread Alert Status characteristic in an Alert Notification service.

There shall be one instance of the Alert Notification Control Point characteristic in an Alert Notification service.

3.1 Supported New Alert Category

This characteristic is a bit map showing which categories of new alert are supported and which are not.

3.1.1 Characteristic Behavior

This characteristic can be read using the GATT Read Characteristic Value sub-procedure.

The characteristic is a bit mask with one bit for each category. For each category the server device supports, it shall set the corresponding bit in the bit mask.

The server shall support at least one category.

The value of this characteristic shall not change while in a connection. An example is shown in Appendix A.

3.2 New Alert

This characteristic provides the count of new alerts (for a given category) in the server.

3.2.1 Characteristic Behavior

This characteristic can be configured for notification using the GATT *Write Characteristic Descriptors* sub-procedure on the *Client Characteristic Configuration* descriptor. When configured for notification, this characteristic can be notified while in a connection; see Section 4.1.2.

3.2.2 Characteristic Descriptors

3.2.2.1 Client Characteristic Descriptor

The *Client Characteristic Configuration* descriptor shall be included in this characteristic.

This descriptor shall be readable and writable.

This descriptor can be read using the GATT Read Characteristic Descriptors sub-procedure.

This descriptor can be written using the GATT Write Characteristic Descriptors sub-procedure.

3.3 Supported Unread Alert Category

This characteristic is a bit map showing which categories of unread alert events are supported and which are not.

3.3.1 Characteristic Behavior

This characteristic can be read using the GATT Read Characteristic Value sub-procedure.

The characteristic is a bit mask with one bit for each category. For each alert category that the server supports an unread message count, it shall set the corresponding bit in the bit mask.

The value of this characteristic shall not change while in a connection. An example is shown in Appendix A.

3.4 Unread Alert Status

This characteristic exposes the count of unread alert events existing in the server. The count of unread alert events is provided with the Category ID.

3.4.1 Characteristic Behavior

This characteristic can be configured for notification using the GATT *Write Characteristic Descriptors* sub-procedure on the *Client Characteristic Configuration* descriptor. When configured for notification, this characteristic can be notified while in a connection. See Section 4.1.3.

3.4.2 Characteristic Descriptors

3.4.2.1 Client Characteristic Descriptor

The *Client Characteristic Configuration* descriptor shall be included in this characteristic.

This descriptor shall be readable and writable.

This descriptor can be read using the GATT Read Characteristic Descriptors sub-procedure.

This descriptor can be written using the GATT Write characteristic Descriptors sub-procedure.

3.5 Alert Notification Control Point

This characteristic allows the client device to enable/disable the alert notification of new alert and unread alert events more selectively than can be done by setting or clearing the notification bit in the Client Characteristic configuration for each alert characteristic.

3.5.1 Characteristic Behavior

This characteristic shall receive the command from the client when written using the GATT Write Characteristic Value sub-procedure. See Section 4.1.1.

3.5.2 Error Handling

If the server receives an invalid command, the server shall respond with the error code defined in Section 1.6 using *ATT Error Response*.

4 Service Behaviors

4.1.1 Alert Notification Control Point Command Behavior

In the following text it is assumed that notifications are enabled by setting the Client Characteristic Configuration notification bit to 1 for the given alert characteristic. Commands to notify a given characteristic immediately have no effect if the corresponding Client Characteristic Configuration has the notification bit set to 0.

The server device shall accept the following commands (See also [2]):

Command	Server action
Enable New Alert Notification	Enable New Alert messages for the category specified in the Category ID field of the command. If the category ID is specified as 0xff, all supported categories shall be enabled.
Enable Unread Alert Status Notification	Enable Unread Alert Status messages for the category specified in the Category ID field of the command. If the category ID is specified as 0xff, all supported categories shall be enabled.
Disable New Alert Notification	Disable New Alert messages for the category specified in the Category ID field of the command. If the category ID is specified as 0xff, all supported categories shall be disabled.
Disable Unread Alert Status Notification	Disable Unread Alert Status messages for the category specified in the Category ID field of the command. If the category ID is specified as 0xff, all supported categories shall be disabled.
Notify New Alert immediately	Notify the New Alert characteristic to the client immediately for the category specified in the Category ID field if that category is enabled. If there are no new alerts for specified category ID on the server, the value for the “Number of New Alert” field shall be set to 0. If the category ID is specified as 0xff, the New Alert characteristics for all currently enabled categories shall be notified.
Notify Unread Alert Status immediately	Notify the Unread Alert Status characteristic to the client immediately for the category specified in the Category ID field if that category is enabled. If there are no unread alerts for specified category ID on the server, the value for the “Unread count” field shall be set to 0. If the category ID is specified as 0xff, the Unread Alert Status characteristic(s) that covers all currently enabled categories shall be notified.

Table 4.1: Alert Notification Control Point commands

4.1.2 New Alert Notification Behavior

If a client has configured notifications on the New Alert characteristic, notifications shall be sent when the count of new alerts changes in the server for an enabled category or the server receives the command "Notify New Alert immediately" for an enabled category via the Alert Notification Control Point.

After connection setup, the notifications for all categories shall be disabled. Control point commands (see 4.1.1) can be used to enable and disable categories.

The Category ID field shall be set to the category of the alert being notified.

The Number of New Alert field shall be set to the number of new alerts in the server.

The Text String Information field may be set to text that is related to the last alert in the category being reported (see [2]).

If the text is longer than the maximum length defined by the characteristic definition [2], the text for the notification shall be truncated.

If multiple alert events occur in the same category, only one notification should be sent.

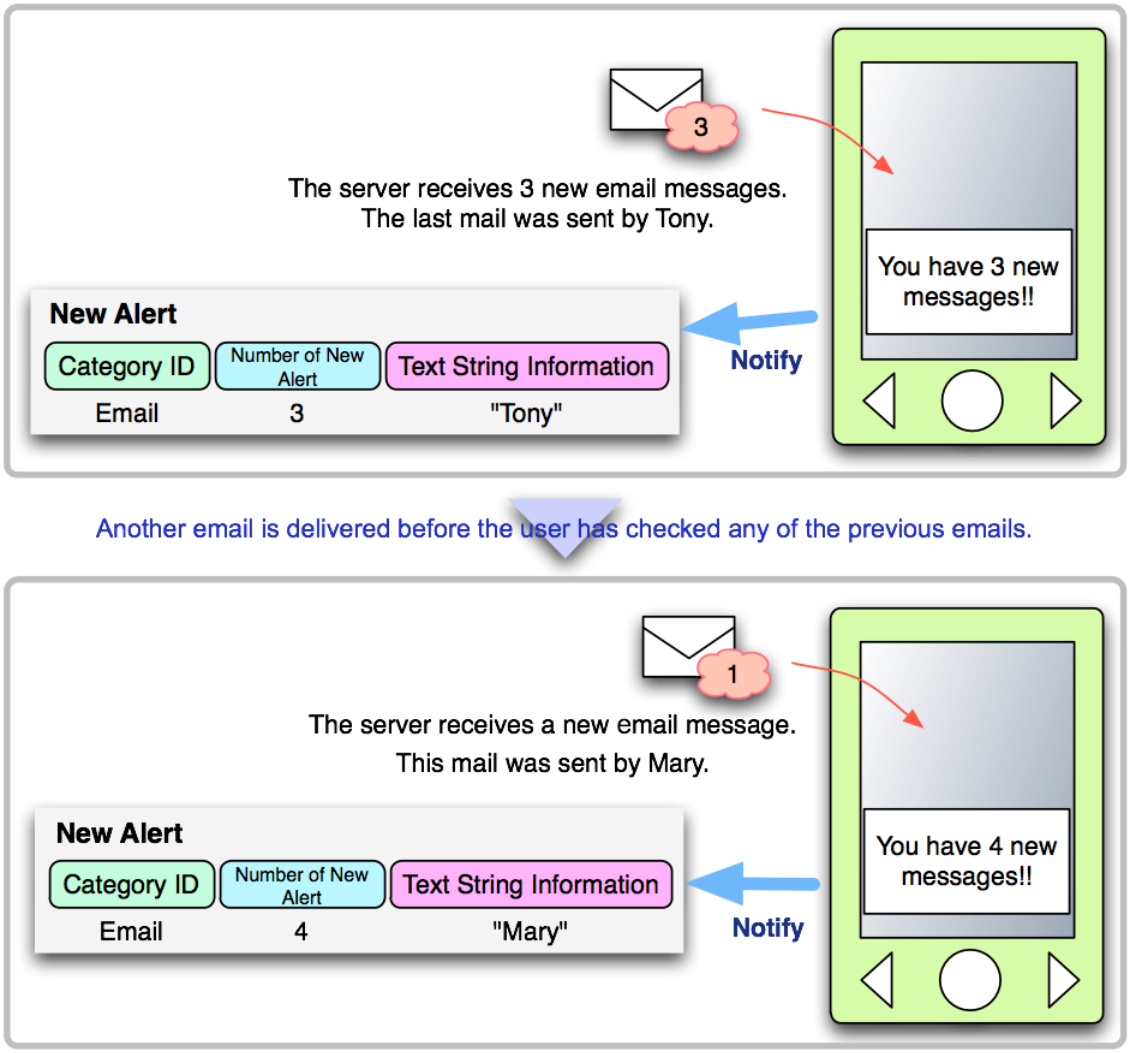

Figure 4.1: Number of new alerts in the New Alert characteristic

4.1.3 Unread Alert Status Notification Behavior

If a client has configured notifications on the Unread Alert Status characteristic, notifications shall be sent when the count of unread alerts changes in the server for an enabled category or the server receives the command "Notify Unread Alert Status immediately" for an enabled category via the Alert Notification Control Point.

After connection setup, the notifications for all categories shall be disabled. Control point commands (see 4.1.1) can be used to enable and disable categories.

The Unread Alert information shall be formatted in two octets for one category as follows:

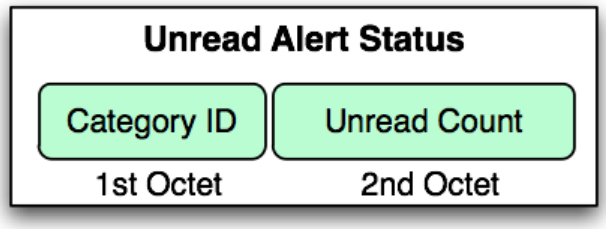

Figure 4.2: Format of the Unread Alert Status

5 Acronyms and Abbreviations

Acronyms and Abbreviations	Meaning
GATT	Generic Attribute Profile
LE	Low Energy
ATT	Attribute Protocol

Table 5.1: Acronyms and Abbreviations

6 References

[1] Bluetooth Core Specification v4.0
[2] Characteristic and Descriptor descriptions are accessible via the Bluetooth SIG Assigned Numbers.

Appendix A Example Implementation

Figure 6.1 shows an example of exposing the characteristics of a device that is capable of SMS, Email and Incoming Call categories.

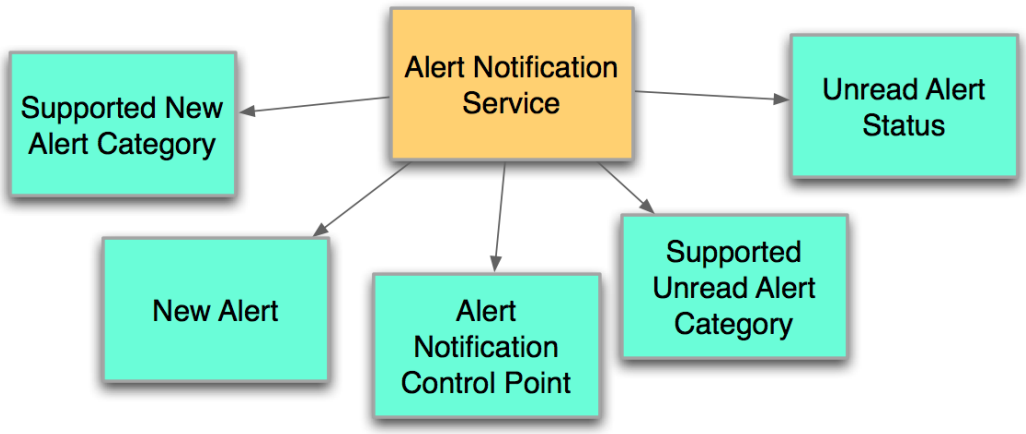

Figure 6.1: Example of Alert Notification Service

Table 6.1 is the attribute database for Alert Notification service shown in Figure 6.1.

UUID	Permission	Value (Default)
<<Primary Service>>	Read	<<Alert Notification Service>>
<<Characteristic>>	Read	Properties = 0x02 (Read) Handle = Handle of Supported New Alert Category UUID = <<Support New Alert Category>>
<<Supported New Alert Category>>	Read	0x2c (SMS, Email, Call)
<<Characteristic>>	Read	Properties = 0x02 (Read) Handle = Handle of Supported Unread Alert Category UUID = << Supported Unread Alert Category >>
<<Supported Unread Alert Category>>	Read	0x2c (SMS, Email, Call)
<<Characteristic>>	Read	Properties = 0x10 (Notify) Handle = Handle of New Alert UUID = <<New Alert >>
<<New Alert>>	Notify	See 3.2, [2]
<<Client Characteristic Configuration>>	Read, Write	0x0000 (as default value)
<<Characteristic>>	Read	Properties = 0x10 (Notify) Handle = Unread Alert Status UUID = <<Unread Alert Status>>
<<Unread Alert Status>>	Notify	See 3.3, [2]
<<Client Characteristic Configuration>>	Read, Write	0x0000 (as default value)
<<Characteristic>>	Read	Properties = 0x08 (Write) Handle = Alert Notification Control Point UUID = <<Alert Notification Control Point>>
<<Alert Notification Control Point>>	Write	See 3.5, [2]

Table 6.1: Example attribute database for Alert Notification Service

Appendix B Controlling Notifications with the Client Characteristic Configuration and Control Point Commands

Figure 6.2 shows an overview of the relationship between the Client Characteristic Configuration descriptor and the configuration via the command from the Alert Notification Control Point characteristic. This relationship is common for the New Alert characteristic and the Unread Alert Status characteristic.

The Client Characteristic Configuration (CCC) works as a “Master switch” for the notification. Even if the client writes the *Notify Immediately* command or the count of new/unread alerts changes in the server, notifications shall not be sent to the client when the CCC is set to 0x0000.

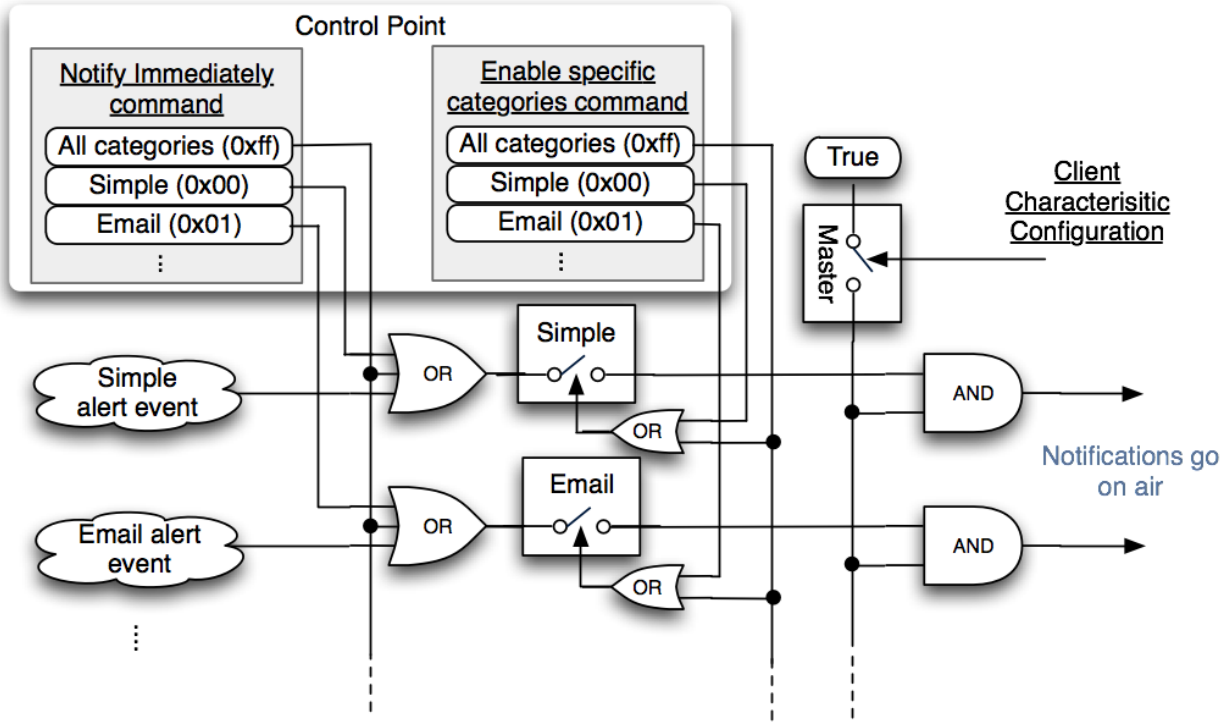

Figure 6.2: Conceptual illustration of how notifications are controlled in the server.

The server also has a switch for each category like “Simple Alert,” “Email Alert,” and “Incoming Alert,” if the server is capable of these categories. The clients can set those switches by writing the *Enable New Alert Notification* command to the Alert Notification Control Point if the client wants to receive notifications of them.

If the client writes the *Notify Immediately* command with the value of ‘0xff’ to the Alert Notification Control Point, notifications of categories that have been enabled by sending the Enable specific categories command are sent to the client (when the CCC is set to 0x0001 “Notify”).

Even if the client writes the *Notify Immediately* command to the Alert Notification Control Point for some specific categories, the server shall not send the notifications when the value of the CCC is 0x0000.

If the target category that is set by the client via the Alert Notification Control Point is not configured “Enable”, the server shall not send the notification for the category even if the CCC is set to 0x0001 “Notify”.