



User guide of Google Nest's cloud database

The example guides how to import and get data from Google Nest's cloud database through Ameba and some simple Javascript and Java examples.

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1 Introduce

This document illustrates how to get and insert data to Google Nest's cloud database - Firebase.

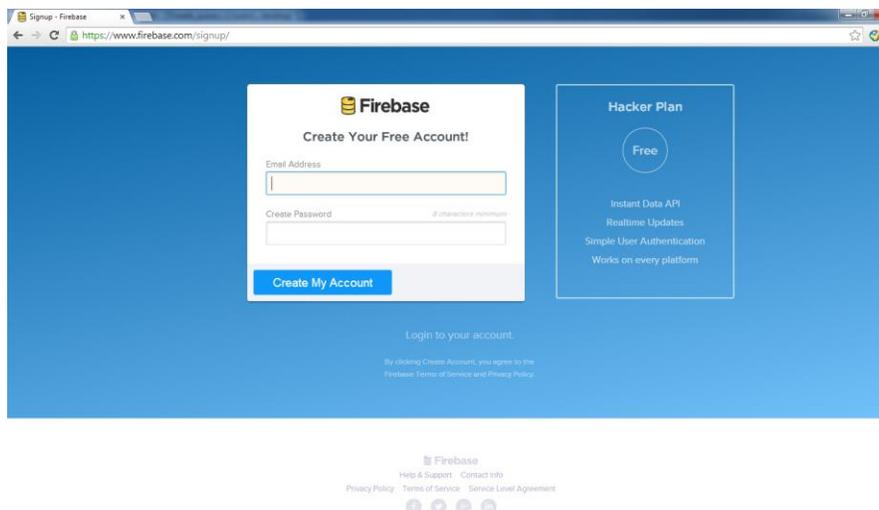
Firebase provides a realtime database and backend as a service. The service provides application developers an API that allows application data to be synchronized across clients and stored on Firebase's cloud. It is very simple and convenient to register an account on Firebase. Then all the data can be stored in your own Firebase and you can also manage the database easily.

Here, the Google Nest API is provided to access to the Google Nest's cloud database – Firebase. In this Google Nest API, PolarSSL is used to support SSL connection. Two examples will be provided to show how to send and retrieve data from database. Besides of that, a sample code named “googlenest.c” shows how to do some simple actions with Firebase using AT Command.

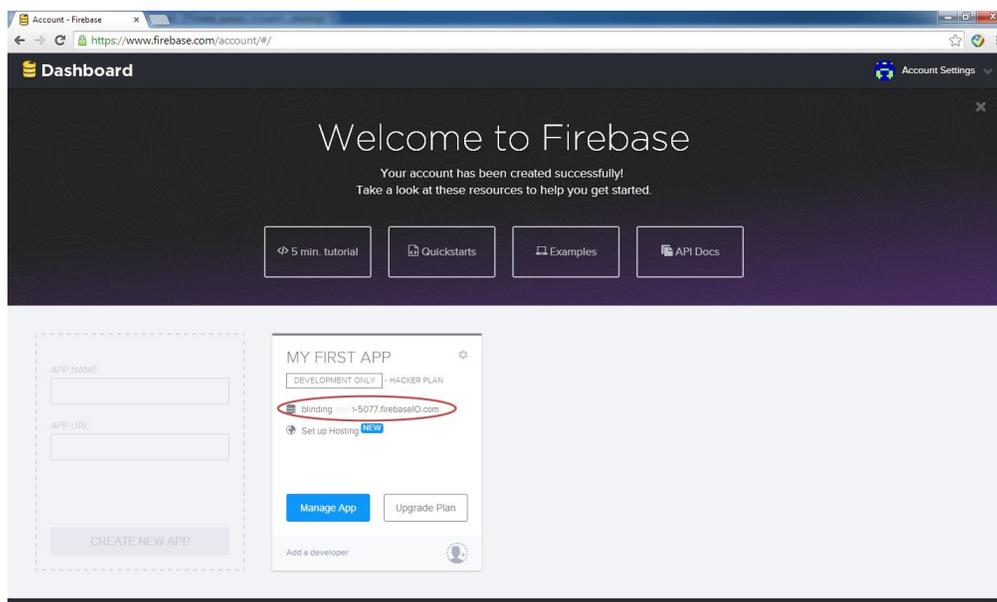
2 Start the REST API

2.1 Sign up a free firebase Account

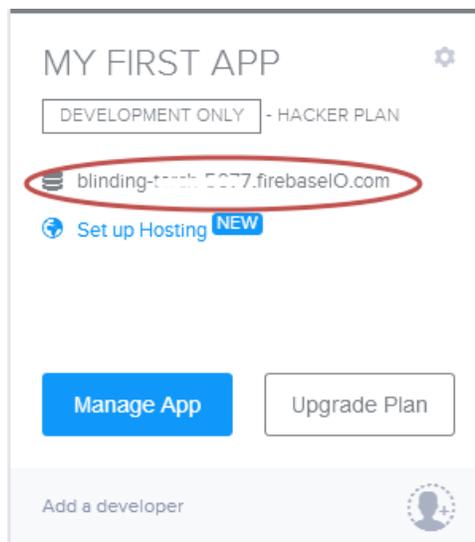
It is very simple to register an account for Firebase. It needs your Email address and then sign up on their website – www.firebase.com/signup/.



Just inputting your Email Address and creating your password, and then you will get your Firebase account. You will see the homepage of your account as following, and your Firebase address is the one circled by red color.



The information required for database access is the Firebase address, so keeping this Firebase address for later usage. Then you can read and write data with your Google Nest's database. One user account can have single one Firebase address.



After this, you can also click the “Manage App” to see what information inside.

There are plenty of resources to teach how to use Firebase. Please check <https://www.firebase.com/>, and start from “Start Hacking”, and read documentation in <https://www.firebase.com/docs/>

2.2 Data Types

This sub-section lists the data types used by provided Google Nest API.

2.2.1 googlenest_context

```
typedef struct {  
    int socket;  
    char *host;  
    ssl_context ssl;  
} googlenest_context;
```

This structure is used to store the context of Google Nest SSL connection information.

2.3 Google Nest API

This sub-section lists the provided API for Google Nest operations.

2.3.1 gn_connect

This function triggers to connect to the Google Nest's database.

2.3.1.1 Syntax

```
int gn_connect(  
googlenest_context *googlenest,  
char *host,  
int port  
);
```

2.3.1.2 Parameters

googlenest

SSL connect information to connect the database using SSL

host

The Firebase address to access your Firebase

port

Service port information for the service to connect, normally use 443

2.3.1.3 Return Value

If the function succeeds, the return value is 0.

2.3.1.4 Remarks

This API must be used before using the request API.

2.3.2 gn_close

This function triggers to close the connection to the Google Nest's database.

2.3.2.1 Syntax

```
void gn_close(  
googlenest_context *googlenest  
);
```

2.3.2.2 Parameters

googlenest

SSL connect information to connect the database using SSL

2.3.2.3 Return Value

None

2.3.2.4 Remarks

This API must be used after using the request API.

2.3.3 gn_get

This function triggers to send a GET request to the Google Nest's database.

2.3.3.1 Syntax

```
int gn_get(  
    googlenest_context *googlenest,  
    char *uri,  
    unsigned char *out_buffer,  
    size_t out_len  
);
```

2.3.3.2 Parameters

googlenest

SSL connect information to connect the database using SSL

uri

The path you want to get under the database and must follow ".json" behind

out_buffer

Buffer to store the data you get from the database

out_len

Length of the buffer which store the data getting from database

2.3.3.3 Return Value

If the function succeeds, the return value is 0.

2.3.3.4 Remarks

Used for Reading data from Firebase's defined path. The data retrieved from Firebase is in format of JSON.

2.3.4 gn_put

This function triggers to send a PUT request to write or replace data in the Google Nest's database.

2.3.4.1 Syntax

```
int gn_put(  
googlenest_context *googlenest,  
char *uri,  
char *content  
);
```

2.3.4.2 Parameters

googlenest

SSL connect information to connect the database using SSL

uri

The path defined to write or replace under the database and must follow “.json” behind

content

Data defined to write or replace

2.3.4.3 Return Value

If the function succeeds, the return value is 0.

2.3.4.4 Remarks

The data PUT to Firebase must in format of JSON.

2.3.5 gn_patch

This function triggers to send a PATCH request to update some of the keys for a defined path without replacing all of the data in the Google Nest's database.

2.3.5.1 Syntax

```
int gn_patch(  
googlenest_context *googlenest,  
char *uri,  
char *content  
);
```

2.3.5.2 Parameters

googlenest

SSL connect information to connect the database using SSL

uri

The path defined to update under the database and must follow “.json” behind content

Data defined to update

2.3.5.3 Return Value

If the function succeeds, the return value is 0.

2.3.5.4 Remarks

The data PATCH to Firebase must in format of JSON.

2.3.6 gn_post

This function triggers to send a POST request to add to a list of data in the Google Nest’s database. Every time you send a POST request, a unique ID will be generated.

2.3.6.1 Syntax

```
Int gn_post(  
    googlenest_context *googlenest,  
    char *uri,  
    char *content,  
    unsigned char *out_buffer,  
    size_t out_len  
);
```

2.3.6.2 Parameters

googlenest

SSL connect information to connect the database using SSL

uri

The path defined to get under the database and must follow “.json” behind content

Data defined to insert

out_buffer

Buffer to store the unique ID returned from the database

out_len

Length of the buffer which store the unique ID returned from database

2.3.6.3 Return Value

If the function succeeds, the return value is 0.

2.3.6.4 Remarks

The data POST to Firebase must in format of JSON.

2.3.7 gn_delete

This function triggers to send a DELETE request to remove data the Google Nest's database.

2.3.7.1 Syntax

```
Int gn_delete(  
googlenest_context *googlenest,  
char *uri  
);
```

2.3.7.2 Parameters

googlenest

SSL connect information to connect the database using SSL

uri

The path you want to delete under the database and must follow ".json" behind

2.3.7.3 Return Value

If the function succeeds, the return value is 0.

2.3.7.4 Remarks

None.

NOTE: The usage of cJSON to store the data in format of JSON is provided.

2.3.8 gn_stream

This function triggers to send a Streaming request to get data which changed in the Google Nest's database through Server-Send Event.

2.3.8.1 Syntax

```
Int gn_stream(  
    googlenest_context *googlenest,  
    char *uri  
);
```

2.3.8.2 Parameters

googlenest

SSL connect information to connect the database using SSL

uri

The path you want to delete under the database and must follow “.json” behind

2.3.8.3 Return Value

If the function succeeds, the return value is 0.

2.3.8.4 Remarks

Using the callback function to get the real-time data:

```
void google_data_retrieve_cb(char *response_buf, int buf_size)
```

3 Example

Three examples are provided. The first example shows how a device put state to database every one seconds. The second example shows how to get data from database. And the third example has two threads to show the flow both get data and put data through database.

3.1 Storing data from device

In this example, the Motion Sensor will send the count of person to the Firebase.

The data is as following:

```
{  
    "MotionSensor" : "i"  
}
```

The count "i" will be added once person pass by. This example simulates there is one person pass by every 5 seconds.

3.1.1 How to test

Activate browser and paste the url of the Firebase address in the browser, then it is able to check the status changed overtime.

3.1.2 Access to the Firebase

Making some modifies:

- In platform_opts.h, define CONFIG_EXAMPLE_GOOGLE_NEST to 1
#define CONFIG_EXAMPLE_GOOGLE_NEST 1
- In example_entry.c, choose the type "#define TYPE FromDevice"
"FromDevice" shows how data is transferred from device (Ameba) to database.
- Define your Firebase Account address in "example_google.h"
define HOST_ADDR xxxxxx
- Build project and download it into Ameba

3.1.3 Start to store data

This example shows how to update data to Firebase.

First of all, making sure that Ameba associates to AP and that AP is connecting to Internet. After system reboot, it waits for 2 minutes for user to use AT command to connect Ameba to AP.

```

COM13:38400baud - Tera Term VT
File Edit Setup Control Window Help
=====
Check boot type form eFuse
SPI Initial
Image1 length: 0x338c, Image Addr: 0x10000bc8
Image1 Validate OK, Going jump to Image1
#

<<<<<<Waiting for 2 mins to connect Wi-Fi>>>>>>>>
    
```

```

IP address : 192.168.1.102 (1)Wi-Fi is associated to AP, and get IP address.
Got IP after 4693ms. (2)AP is connecting to Internet

WIFI initialized

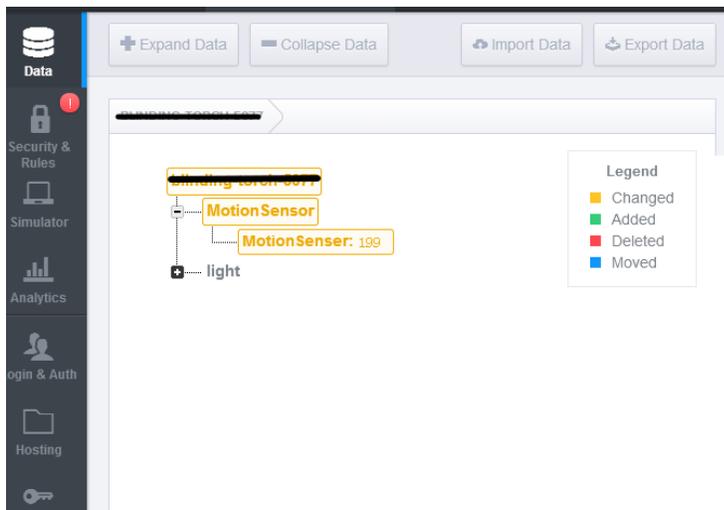
init_thread(50), Available heap 0x5f80
Start connecting to Google Nest Server!
Example code connect to Google Database 2 mins after system reboot
Update the Motion Sensor's data to 0
Start update to Cloud
Update the Motion Sensor's data to 1
    
```

Updating shows on Ameba:

```

COM7:38400baud - Tera Term VT
File Edit Setup Control Window Help
Update the Motion Sensor's data to 183
Update the Motion Sensor's data to 184
Update the Motion Sensor's data to 185
Update the Motion Sensor's data to 186
Update the Motion Sensor's data to 187
Update the Motion Sensor's data to 188
Update the Motion Sensor's data to 189
Update the Motion Sensor's data to 190
Update the Motion Sensor's data to 191
Update the Motion Sensor's data to 192
Update the Motion Sensor's data to 193
Update the Motion Sensor's data to 194
Update the Motion Sensor's data to 195
Update the Motion Sensor's data to 196
Update the Motion Sensor's data to 197
Update the Motion Sensor's data to 198
Update the Motion Sensor's data to 199
    
```

Result shows on browser



3.2 Reading data

In this example, the RGB information of a light will be controlled by a webpage through Firebase.

Note: The webpage cannot access the Firebase for the Internet of Mainland of China. So ameba may show that the data is “null”.

3.2.1 How to test

Editing the Firebase address in the example.html.

```
<script>
var myDataRef = new Firebase("https://your_firebase_address.firebaseio.com");
function submit()
{
```

Note: It is required to fill Firebase address in the Javascript.

After editing the webpage, double click it to open it through a browser (the Chrome is recommended).

3.2.2 Access to the Firebase

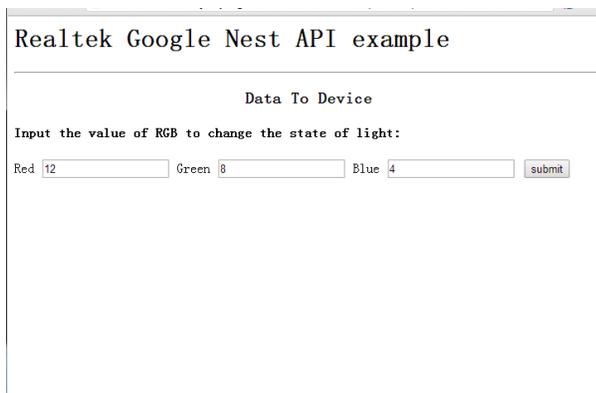
Making some modifies:

- In platform_opts.h, define CONFIG_EXAMPLE_GOOGLE_NEST to 1
`#define CONFIG_EXAMPLE_GOOGLE_NEST 1`
- In example_entry.c, choose the type “#define TYPE ToDevice”
 “ToDevice” example shows how user update data from remote controller (using javascript) to device (Ameba) via database.
- Define your Firebase Account address in “example_google.h” and the html code
`# define HOST_ADDR xxxxxx`

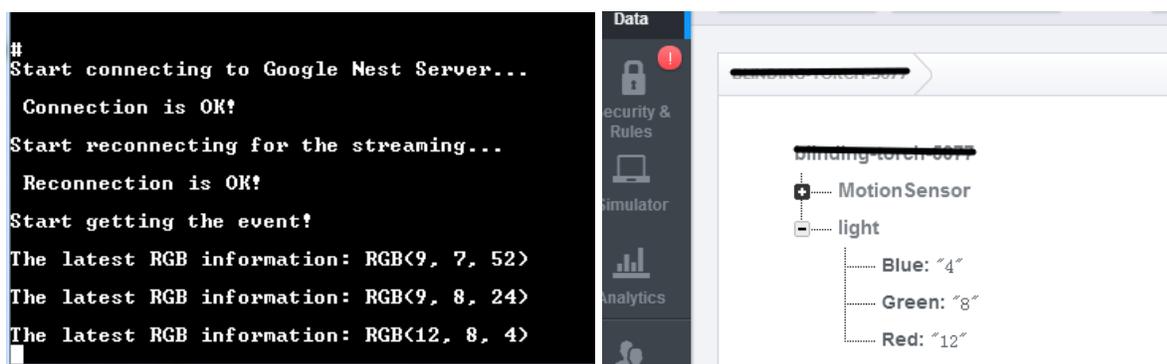
3.2.3 Start to read data

Inserting data to your Firebase using the webpage provided. Then building this code and the data will be retrieved from Firebase. You can control the value of RGB through webpage at any time to test retrieving the latest data.

Test Method 1: Changing RGB through webpage:



Results show on Ameba and the Firebase Account:



Note: Please Allow blocked content temporarily.

Realtek Google Nest API example

Data To Device

Input the value of RGB to change the state of light:

Red Green Blue

Internet Explorer restricted this webpage from running scripts or ActiveX controls. Allow blocked content x

Test Method 2:

Update data directly on Firebase database.



Ameba receives status update notice.

```
COM13:38400baud - Tera Term VT
File Edit Setup Control Window Help
The latest RGB information: RGB(data: {"path":"/Red","data":33}, , GET /light.json?ns=boiling-fire-8665&sse=true HTTP/1.1
Host: s-dal5-nss-18.firebaseio.com
)
```

3.3 Reading and writing data at the same time

In this example, there are two threads running at the same time. One thread is running to update the data of “Motion Sensor” and “light”, and the other thread is getting the latest value of “light” from Firebase.

```
{  
  
    "Motion_Sensor" : "i",  
  
    "Light" : {  
  
        "Red" : "0",  
  
        "Green" : "0",  
  
        "Blue" : "0",  
  
    }  
  
}
```

The value of Motion_Sensor and Light will be changed every 5 seconds.

3.3.1 How to test

Activate browser and paste the url of the Firebase address in the browser, then it is able to check the status changed overtime.

3.3.2 Access to the Firebase

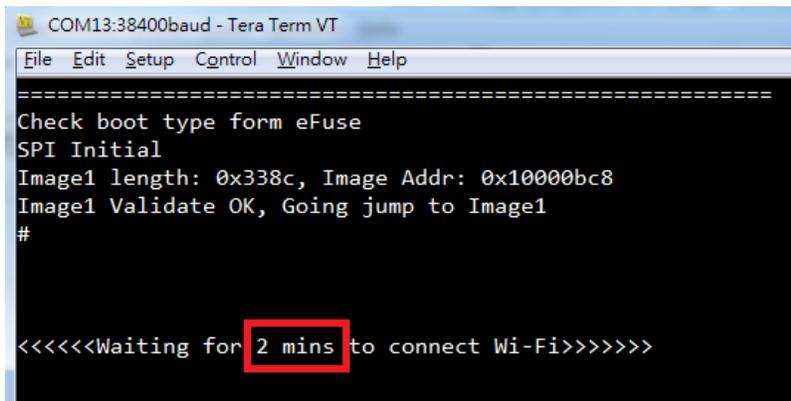
Making some modifies:

- In platform_opts.h, define CONFIG_EXAMPLE_GOOGLE_NEST to 1
#define CONFIG_EXAMPLE_GOOGLE_NEST 1
- In example_entry.c, choose the type “#define TYPE BOTH”
“BOTH” shows how data is read and wrote by device (Ameba) to database.
- In FreeRTOSConfig.h, increasing the value of configTOTAL_HEAP_SIZE to make sure the two threads have enough heap size to run.
#define configTOTAL_HEAP_SIZE ((size_t) (110 * 1024)) // use HEAP5
- Define your Firebase Account address in “example_google.h”
define HOST_ADDR xxxxxx
- Build project and download it into Ameba

3.3.3 Start to store and read data

This example shows how to update data to Firebase and get the latest data from Firebase.

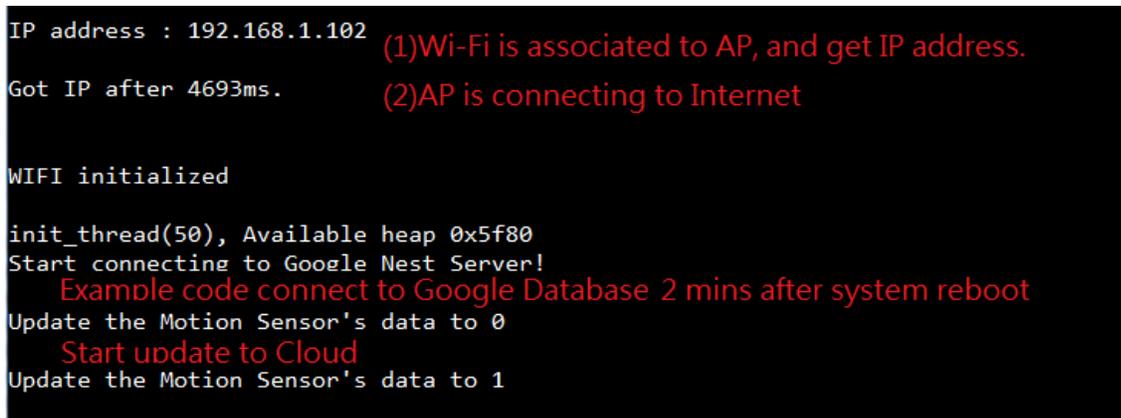
First of all, making sure that Ameba associates to AP and that AP is connecting to Internet. After system reboot, it waits for 2 minutes for user to use AT command to connect Ameba to AP.



```

COM13:38400baud - Tera Term VT
File Edit Setup Control Window Help
=====
Check boot type form eFuse
SPI Initial
Image1 length: 0x338c, Image Addr: 0x10000bc8
Image1 Validate OK, Going jump to Image1
#

<<<<<Waiting for 2 mins to connect Wi-Fi>>>>>
  
```



```

IP address : 192.168.1.102
Got IP after 4693ms.
WIFI initialized
init_thread(50), Available heap 0x5f80
Start connecting to Google Nest Server!
Update the Motion Sensor's data to 0
Update the Motion Sensor's data to 1
  
```

The thread of updating data to Google Nest Server will start first, and after about 20 seconds, the thread of retrieving data from Google Nest Server will start also. And then after each updating data OK, the latest RGB information will be got.

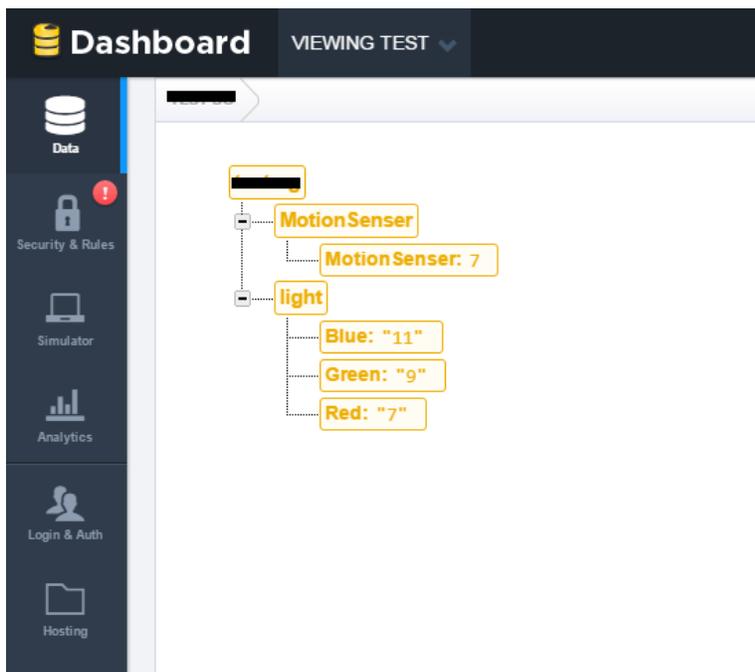
```
COM5 - Tera Term VT
File Edit Setup Control Window Help

Start connecting to Google Nest Server to update data!
Update data OK

<<<<<Starting retrieving data from Google Nest Server>>>>>>>>

Start connecting to Google Nest Server...
Connection is OK!
Update data OK
Start reconnecting for the streaming...
Reconnection is OK!
Start getting the event!
The latest RGB information: RGB<4, 6, 8>
The latest RGB information: RGB<5, 7, 9>
Update data OK
The latest RGB information: RGB<6, 8, 1
U0>
e data OK
The latest RGB information: RGB<7, 9, 11>
Update data OK
```

Result shows on browser



4 AT Command Usage

The googlenest.c is provided to support using the AT Command to do some simple requests. And before sending the Google Nest request, make sure the Wi-Fi is connected.

4.1 AT Command used

4.1.1 Connecting Wi-Fi

4.1.1.1 'ATW0' Wlan Set Network SSID

Description:

Command Format: ATW0=SSID<CR>

Default Value: None

Response: None

4.1.1.2 'ATW1' Wlan set Network Passphrase

Description:

Command Format: ATW1=password<CR>

Default Value: None

Response: None

4.1.1.3 'ATW2' Wlan Set Key ID

Description:

Command Format: ATW2=Key_ID<CR>

Default Value: None

Response: None

4.1.1.4 'ATWC' Wlan Join a Network

Description:

Command Format: ATWC<CR>

Default Value: None

Response: None

4.1.1.5 'ATWD' Wlan Disconnect from Network

Description:

Command Format: ATWD<CR>

Default Value: None

Response: None

4.1.2 Google Nest API

The “ATG0” command can be used to send request to Google Nest’s database.

4.1.2.1 Syntax

```
ATG0=[method,address,path,data]or[method,address,path]
```

4.1.2.2 Parameters

method

provided methods: get, put, patch, post, delete

address

The Firebase address which show how to get in section 2.1

path

The path defined to get under the database and must follow “.json” behind

Data

Only needed when using method of put, patch or post

4.2 Google Nest API AT Command usage

4.2.1 Network Connection

The “ATWC” command can be used to connect to an access point. To process the connection, an SSID should be set first. Meanwhile a password must be set except in open mode, and a key id is also required for WEP mode.

To disconnect AP, type “ATWD”.

WPA2 mode

Command sequence: (refer to 3.2.1)

```
#ATW0=SSID
```

```
#ATW1=passphrase
```

```
#ATWC
```

```
# ATW0=rtk
ATW0 match ATW0, search cnt 2
[ATW0]: _AT_WLAN_SET_SSID_ [rtk]

[MEM] After do cmd, available heap 47264

# ATW1=12345678
ATW1 match ATW1, search cnt 1
[ATW1]: _AT_WLAN_SET_PASSPHRASE_ [12345678]

[MEM] After do cmd, available heap 47264

# ATWC
ATWC match ATWC, search cnt 2
[ATWC]: _AT_WLAN_JOIN_NET_

Joining BSS ...RTL8195A[Driver]: set ssid [rtk]
RTL8195A[Driver]: start auth
RTL8195A[Driver]: auth success, start assoc
RTL8195A[Driver]: association success(res=2)

wifi_handshake_done_hdl 31
CCConnected after 1261ms.
RTL8195A[Driver]: set group key to hw: alg:4(WEP40-1 WEP104-5 TKIP-2 AES-4) keyid:1
RTL8195A[Driver]: set pairwise key to hw: alg:4(WEP40-1 WEP104-5 TKIP-2 AES-4)

IP address : 192.168.1.100

GGGot IP after 2782ms.

[MEM] After do cmd, available heap 46616
```

#ATWD

```
# ATWD
ATWD match ATWD, search cnt 1
[ATWD]: _AT_WLAN_DISC_NET_

Deassociating AP ...
ioctl[SIOCGIWESSID] ssid = NULL, not connected
WIFI disconnected

[MEM] After do cmd, available heap 47376
```

WEP mode

Command sequence: (refer to 3.2.1)

```
#ATW0=SSID
#ATW1=Password
#ATW2=Key id
#ATWC
```

The WEP key can be 5 ASCII characters for WEP 40 or 13 ASCII characters for WEP 104. The key ID should be 0, 1, 2 or 3. The following is an example to connect network by using WEP 40 with key ID 0.

```

# ATW0=rtk
ATW0 match ATW0, search cnt 2
[ATW0]: _AT_WLAN_SET_SSID_ [rtk]

[MEM] After do cmd, available heap 47480

# ATW1=12345
ATW1 match ATW1, search cnt 1
[ATW1]: _AT_WLAN_SET_PASSPHRASE_ [12345]

[MEM] After do cmd, available heap 47480

# ATW2=0
ATW2 match ATW2, search cnt 2
[ATW2]: _AT_WLAN_SET_KEY_ID_ [0]

[MEM] After do cmd, available heap 47480

# ATWC
ATWC match ATWC, search cnt 2
[ATWC]: _AT_WLAN_JOIN_NET_

Joining BSS ...RTL8195A[Driver]: set ssid [rtk]
RTL8195A[Driver]: set group key to hw: alg:1<WEP40-1 WEP104-5 TKIP-2 AES-4> keyid:0
RTL8195A[Driver]: start auth
RTL8195A[Driver]: auth success, start assoc
RTL8195A[Driver]: association success(res=1)

wifi_connected_hdl 31
CCConnected after 1286ms.

IP address : 192.168.1.100
GGGot IP after 1801ms.

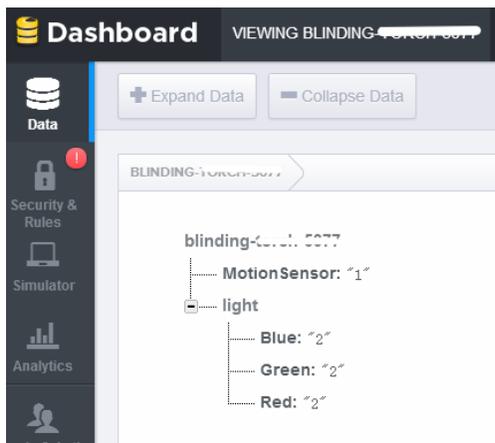
[MEM] After do cmd, available heap 46616

```

4.2.2 Use Google Nest API

4.2.2.1 Get data from database

- The database:



- Command:

```
ATG0=[get,xxxxxxx.firebaseio.com,path.json]
```

- Result:

```
# ATG0=[get,blinding_torch_5077.firebaseio.com,light.json]
[ATG0]: _AT_WLAN_GOOGLENEST_

Get data from googlenest: {"Blue":"2","Green":"2","Red":"2"}
[MEM] After do cmd, available heap 29448

#
```

4.2.2.2 Put or patch data to database

- Command:

```
ATG0=[put,xxxxxxx.firebaseio.com,path.json,data]
```

- Result:

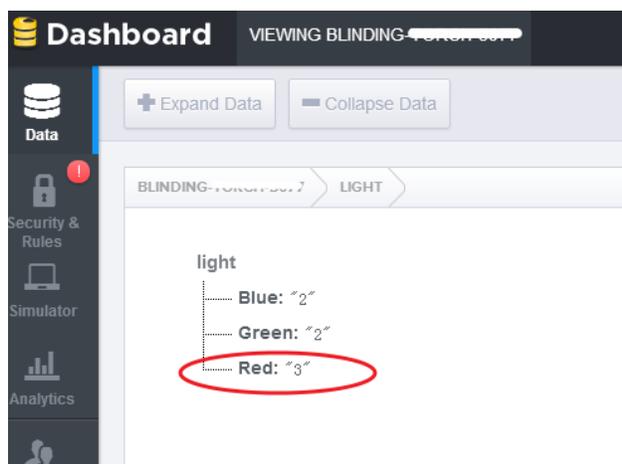
```
# ATG0=[put,blinding_torch_5077.firebaseio.com,light/Red.json,"3"]
[ATG0]: _AT_WLAN_GOOGLENEST_

Saving data in firebase is successful!
[MEM] After do cmd, available heap 29448

#
```

-

The database:



4.2.2.3 Post a list of data to database

- Command:

```
ATG0=[post,xxxxxxx.firebaseio.com,path.json,data]
```

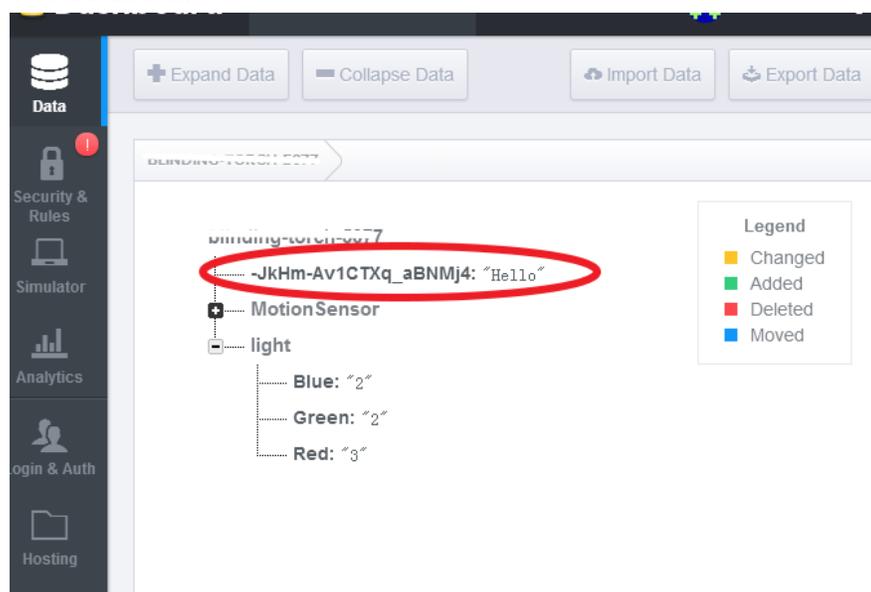
➤ Result:

```
# ATG0=[post,blinding-torch-5077.firebaseio.com,.json,"Hello"]
[ATG0]: _AT_WLAN_GOOGLENEST_

Inserting data to firebase is successful!
The unique name for this list of data is: <"name":"-JkHm-Av1CTXq_aBNMj4">
[MEM] After do cmd, available heap 29448

#
```

➤ The database:



4.2.2.4 Delete data in database

➤ Command:

```
ATG0=[delete,xxxxxxx.firebaseio.com,path.json]
```

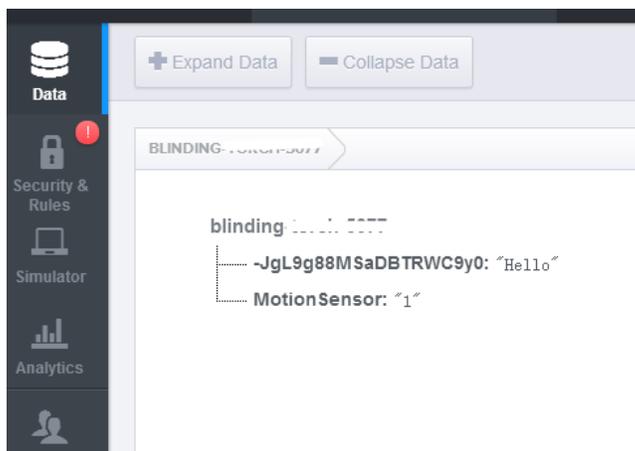
➤ Result:

```
# ATG0=[delete,blinding-torch-5077.firebaseio.com,light.json]
[ATG0]: _AT_WLAN_GOOGLENEST_

Delete the data is successful!
[MEM] After do cmd, available heap 29448

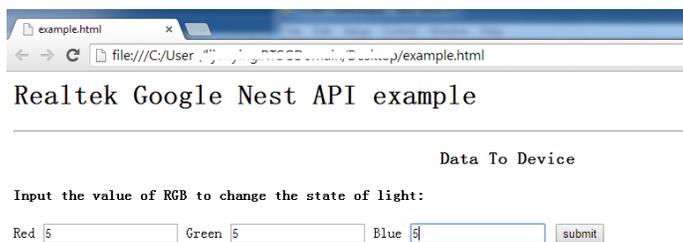
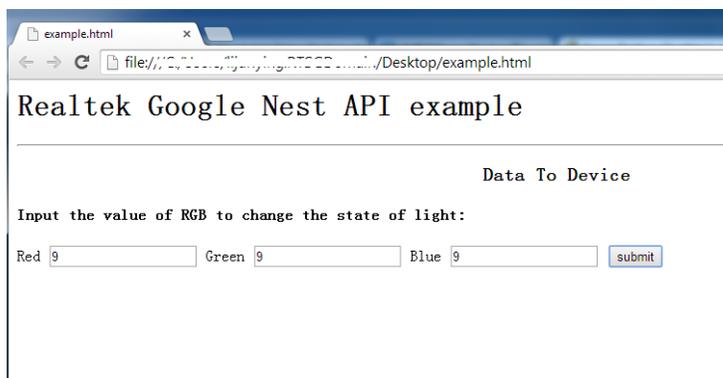
#
```

➤ The database:



4.2.2.5 Get real-time data in database

- Command:
`ATG0=[stream,xxxxxxx.firebaseio.com,path.json]`
- Control by webpage:



- The database:



- Result:

```
# ATG0=[stream, Binding token 5077.firebaseio.com,light.json]
[ATG0]: _AT_WLAN_GOOGLENEST_

Start reconnecting for the streaming...

Reconnection is OK!

Start getting the event!

Response_buf:
event: put
data: <"path":"/", "data":<"Blue": "2", "Green": "2", "Red": "2">>

Response_buf:
event: put
data: <"path":"/", "data":<"Blue": "9", "Green": "9", "Red": "9">>

Response_buf:
event: put
data: <"path":"/", "data":<"Blue": "5", "Green": "5", "Red": "5">>
```