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System Design & Dev.

## BioStar 2 API Quick Start Guide

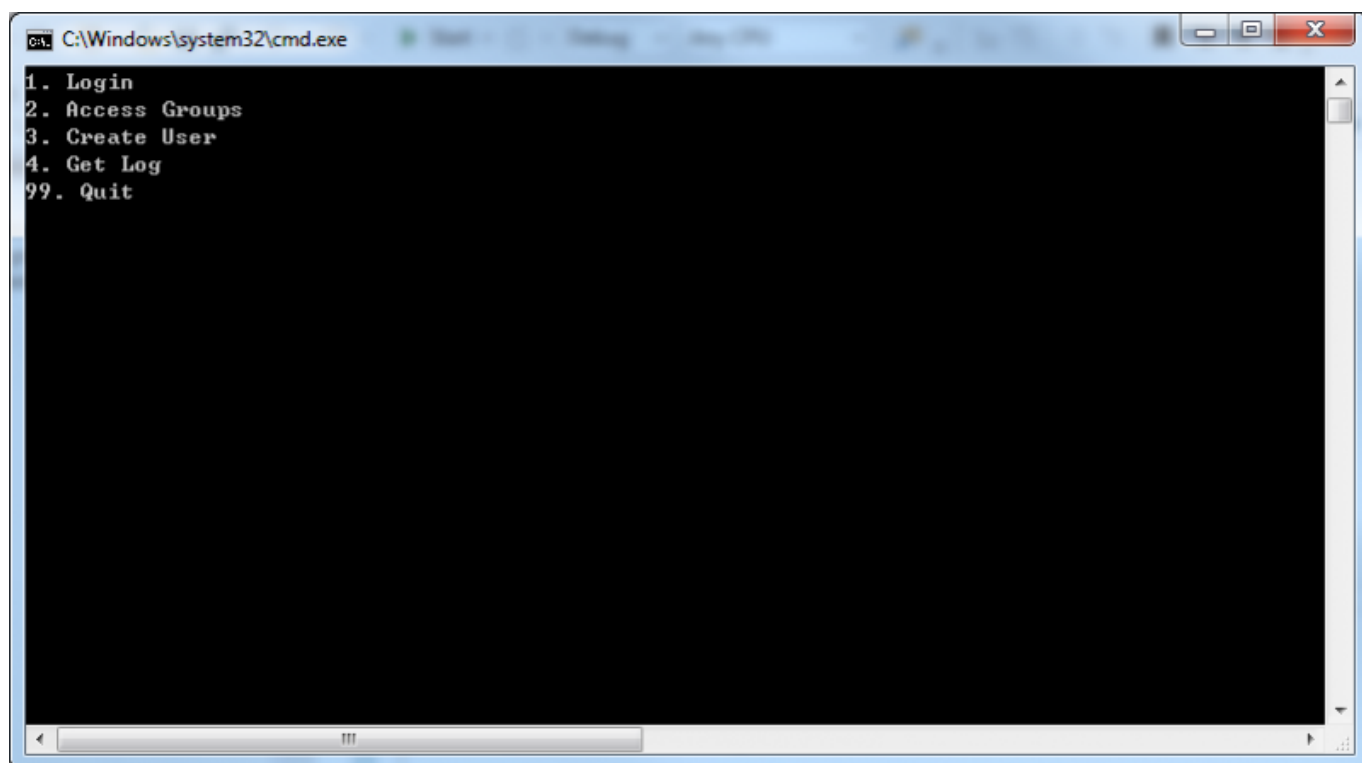
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### Introduction

The official BioStar API developer website is <https://api.biostar2.com>. So, you can visit the official website and get more detailed information on how to use BioStar API. In this article, I'm going to take a closer look at a sample application that I made for those who are familiar with C# or standalone Windows application. Since BioStar API is RESTful API, those who are not familiar with RESTful API might have difficulties implementing their own applications with BioStar API. Therefore, I'd like to guide them to kick-start their development with the sample application in this article.

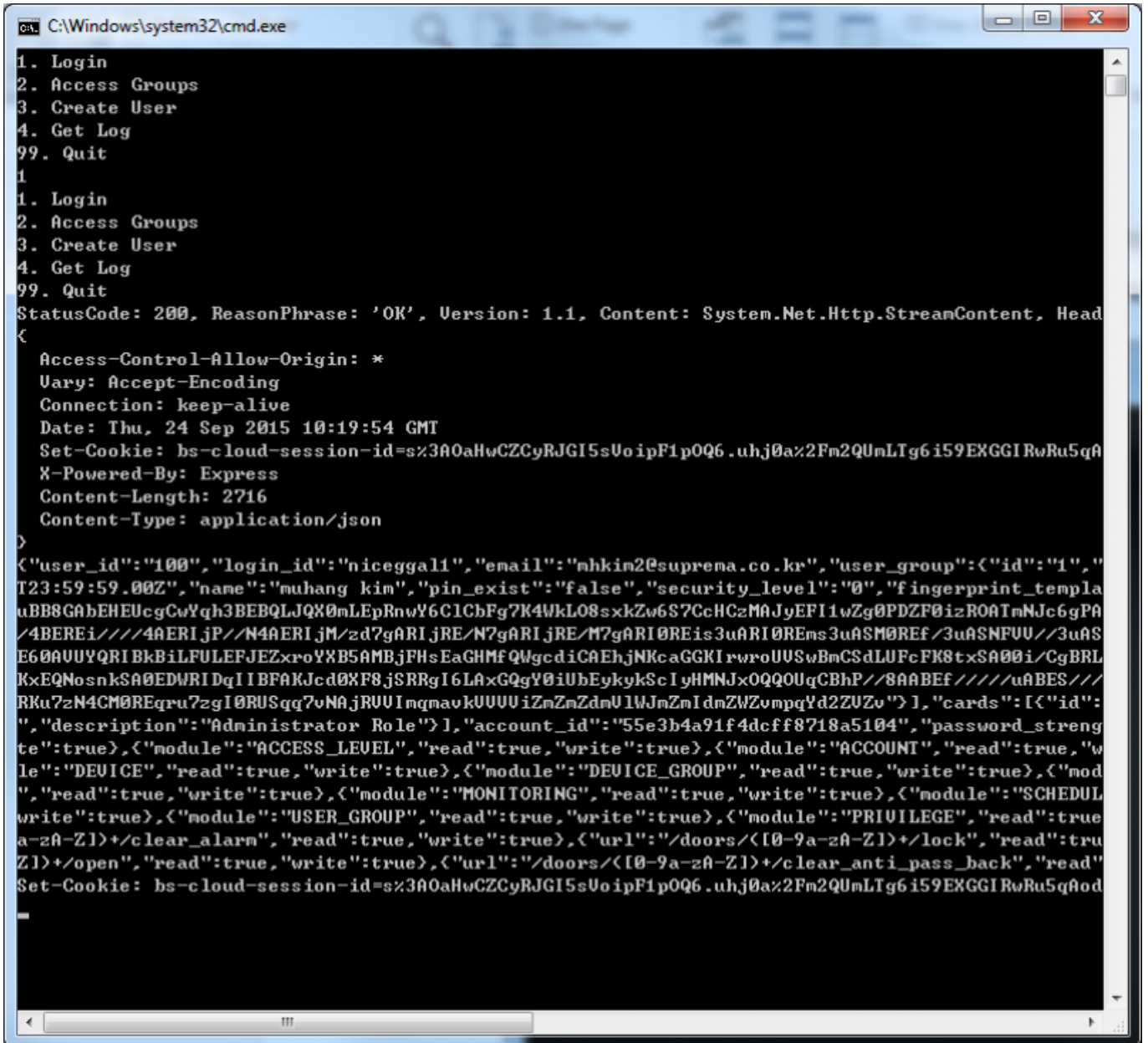
### Features

This sample application is a Visual C# console application and includes four basic functions: login, user creation, access group retrieval and log retrieval.



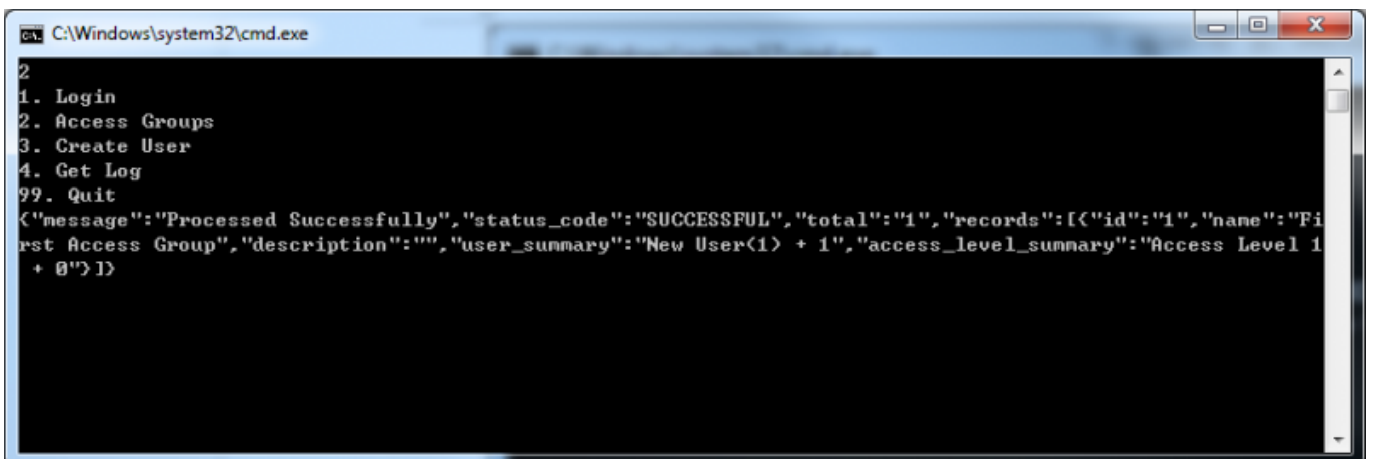
[Figure 1. When you've launched the sample application]

First, you have to log in before using any other functions. If you type '1' and press Enter, the sample application logs into your local BioStar server through BioStar Cloud. For now, you must configure cloud settings in order to use BioStar API since BioStar API works only with BioStar Cloud, and it's not possible to call BioStar API directly from you local BioStar server without using BioStar Cloud. We're planning to release a local BioStar API layer in the near future.




[Figure 2. After logging in]

When successfully logged in, you get the information of the user that you used for logging in. The user data is in the JSON format and includes very detailed data including fingerprint templates as you can see from Figure 2. Now that we've logged in, we can use other functions. In order to retrieve access groups, type "2" and press Enter.



### [Figure 3. Retrieving access groups]

As you can see from the screenshot, there is only one access group in BioStar 2 Server and the name of the access group is "First Access Group" and if you look at the "user\_summary" property, you can notice that it has two users. Now type "3" and press Enter to create a new user. You will be asked to enter the user ID. I entered "98" as user ID and got the success message from the server.



```
C:\Windows\system32\cmd.exe
4. Get Log
99. Quit
<"message": "Processed Successfully", "status_code": "SUCCESSFUL", "total": "1", "records": [{"id": "1", "name": "First Access Group", "description": "", "user_summary": "New User(1) + 1", "access_level_summary": "Access Level 1 + 0"}]>
3
Input User ID:
98
1. Login
2. Access Groups
3. Create User
4. Get Log
99. Quit
User has been created
<"message": "Created successfully", "status_code": "CREATED", "user_id": "98">
```

### [Figure 4. Creating a new user]

Lastly, let's retrieve log events from the server. Type "4" and press Enter and you will get log data from the server as shown in the screenshot below:

```

4
1. Login
2. Access Groups
3. Create User
4. Get Log
99. Quit
Succeeded to retrieve log from 2015-09-21T10:07:27Z to 2015-09-24T10:45:28Z
{"message": "Processed Successfully", "status_code": "SUCCESSFUL", "total": 0, "records": []}
Succeeded to retrieve log from 1970-01-01T00:00:00Z to 2015-09-24T10:45:28Z
{"message": "Processed Successfully", "status_code": "SUCCESSFUL", "total": "3437", "records": [{"device": {"id": "546833022", "name": "BioStation 2 546833022 (192.168.16.158)"}, "datetime": "2015-09-21T10:07:26.00Z", "id": "68002", "index": "341", "server_datetime": "2015-09-21T19:07:26.00Z", "user": {"user_id": "56"}, "event_type": {"code": "9216", "name": "DELETE_SUCCESS", "alertable": "false", "enable_alert": "false", "description": "DELETE_SUCCESS"}, "type": "USER", "level": "GREEN"}, {"device": {"id": "546833022", "name": "BioStation 2 546833022 (192.168.16.158)"}, "datetime": "2015-09-21T10:06:08.00Z", "id": "6801", "index": "340", "server_datetime": "2015-09-21T19:07:08.00Z", "user": {"user_id": "56"}, "event_type": {"code": "8192", "name": "ENROLL_SUCCESS", "alertable": "false", "enable_alert": "false", "description": "ENROLL_SUCCESS"}, "type": "USER", "level": "GREEN"}, {"device": {"id": "546833022", "name": "BioStation 2 546833022 (192.168.16.158)"}, "datetime": 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"2015-09-21T09:46:02.00Z", "id": "6796", "index": "334", "server_datetime": "2015-09-21T18:47:04.00Z", "user": {"user_id": "33"}, "event_type": {"code": "8192", "name": "ENROLL_SUCCESS", "alertable": "false", "enable_alert": "false", "description": "ENROLL_SUCCESS"}, "type": "USER", "level": "GREEN"}, {"device": {"id": "546833022", "name": "BioStation 2 546833022 (192.168.16.158)"}, "datetime": "2015-09-21T09:44:44.00Z", "id": "6793", "index": "333", "server_datetime": "2015-09-21T18:44:46.00Z", "user": {"user_id": "33"}, "event_type": {"code": "9216", "name": "DELETE_SUCCESS", "alertable": "false", "enable_alert": "false", "description": "DELETE_SUCCESS"}, "type": "USER", "level": "GREEN"}, {"device": {"id": "546833022", "name": "BioStation 2 546833022 (192.168.16.158)"}, "datetime": "2015-09-21T09:43:53.00Z", "id": "6794", "index": "332", "server_datetime": "2015-09-21T18:44:54.00Z", "user": {"user_id": "33"}, "event_type": {"code": "8192", "name": "ENROLL_SUCCESS", "alertable": "false", "enable_alert": "false", "description": "ENROLL_SUCCESS"}, "type": "USER", "level": "GREEN"}, {"device": {"id": "546833022", "name": "BioStation 2 546833022 (192.168.16.158)"}, "datetime": "2015-09-21T09:42:11.00Z", "id": "6792", "index": "331", "server_datetime": "2015-09-21T18:42:12.00Z", "user": {"user_id": "33"}, "event_type": {"code": "9216", "name": "DELETE_SUCCESS", "alertable": "false", "enable_alert": "false", "description": "DELETE_SUCCESS"}, "type": "USER", "level": "GREEN"}, {"device": {"id": "546833022", "name": "BioStation 2 546833022 (192.168.16.158)"}, "datetime": "2015-09-21T08:06:53.00Z", "id": "6791", "index": "330", "server_datetime": "2015-09-21T17:07:54.00Z", "user": {"user_id": "33"}, "event_type": {"code": "8704", "name": "UPDATE_SUCCESS", "alertable": "false", "enable_alert": "false", "description": "UPDATE_SUCCESS"}, "type": "USER", "level": "GREEN"}, {"device": {"id": "546833022", "name": "BioStation 2 546833022 (192.168.16.158)"}, "datetime": "2015-09-21T05:57:53.00Z", "id": "6790", "index": "329", "server_datetime": "2015-09-21T14:58:54.00Z", "user": {"user_id": "33"}, "event_type": {"code": "8704", "name": "UPDATE_SUCCESS", "alertable": "fal

```

[Figure 5. Getting log list]

## Analysis of the source code

### 1. Log in

The most important part in this sample application is log-in. Let's take a look at the function below:

```

24     static async void LoginTask()
25     {
26         string resourceAddress = "https://api.biostar2.com/v1/login";
27
28         HttpClient httpClient = new HttpClient();
29
30         JavaScriptSerializer serializer = new JavaScriptSerializer();
31
32         Dictionary<string, string> dicLoginUser = new Dictionary<string, string>();
33         dicLoginUser.Add("name", "ts22");
34         dicLoginUser.Add("password", "rlaangkd!1");
35         dicLoginUser.Add("user_id", "niceggal1");
36
37         string jsonLoginUser = serializer.Serialize(dicLoginUser);
38
39         StringContent sc = new StringContent(jsonLoginUser, Encoding.UTF8, "application/json");
40         HttpResponseMessage httpResponse = await httpClient.PostAsync(resourceAddress, sc);
41
42
43         if(httpResponse.IsSuccessStatusCode == true)
44         {
45             Console.WriteLine(httpResponse.ToString());
46             string httpResponseBody = await httpResponse.Content.ReadAsStringAsync();
47             Console.WriteLine(httpResponseBody);
48
49
50             MemoryStream responseMemoryStream = new MemoryStream();
51             StreamWriter sw = new StreamWriter(responseMemoryStream);
52             sw.Write(httpResponse.ToString());
53             sw.Flush();
54
55             bool isSessionIDContained = httpResponse.Headers.Contains("Set-Cookie");
56             if (isSessionIDContained == true)
57             {
58                 IEnumerable<string> sessionEnum = httpResponse.Headers.GetValues("Set-Cookie");
59                 foreach(string element in sessionEnum)
60                 {
61                     Console.WriteLine("Set-Cookie: " + element);
62                     string[] strCookieArr = element.Split(new string[] { "bs-cloud-session-id=" }, StringSplitOptions.None);
63                     string[] strCookieArr2 = strCookieArr[1].Split(new string[] { ";" }, StringSplitOptions.None);
64                     sessionID = strCookieArr2[0];
65                 }
66             }
67             else
68             {
69                 Console.WriteLine("Session ID not found");
70             }
71         }
72         else
73         {
74             Console.WriteLine("Failed to log in");
75             Console.WriteLine(httpResponse.ToString());
76         }
77     }

```

- Line 26: This is the URL that we are using to log in to your local BioStar server. We only allow HTTPS protocol and "api.biostar2.com/v1/" is prefix. "login" after the prefix indicates a behavior or action we want to take.
- Line 27: In this sample code, we use class HttpClient to send a request and receive a response from the BioStar Cloud.
- Line 30: Class JavaScriptSerializer is needed to convert the data into JSON formatted data or parse the JSON formatted data into any format you want.
- Line 32-35: These lines creates a dictionary which consists of a string key and a string value. Three parameters are essential: your subdomain name, ID and password. The "name" field is for the subdomain name, so set this field to your subdomain name.
- Line 37: This line converts the dictionary to a JSON formatted string.
- Line 39: This line sets the JSON formatted string as the HTTP request content, UTF8 as encoding option, and JSON as media type.
- Line 40: We use HTTP POST method to make a HTTP request for login.
- Line 45-53: We output the content of the HTTP response for debugging purposes.
- Line 55-65: If the login information is valid, we receive the session information from the server. Every time we make an API call, we have to put that session information in the HTTP header. So, line

55 to 65 extracts the session information from the HTTP response header for later use.

## 2. Retrieving access groups

```
203 static async void AccessGroupsTask()
204 {
205     if (sessionID == null)
206     {
207         Console.WriteLine("You must log in first!");
208         return;
209     }
210
211     CookieContainer cookieContainer = new CookieContainer();
212
213     HttpClientHandler handler = new HttpClientHandler();
214     handler.CookieContainer = cookieContainer;
215
216     HttpClient client = new HttpClient(handler);
217
218
219     cookieContainer.Add(new Uri("https://api.biostar2.com"), new Cookie("bs-cloud-session-id", sessionID));
220     HttpResponseMessage httpResponse = await client.GetAsync("https://api.biostar2.com/v1/access_groups");
221
222     if (httpResponse.IsSuccessStatusCode == true)
223     {
224         string httpResponseBody = await httpResponse.Content.ReadAsStringAsync();
225         Console.WriteLine(httpResponseBody);
226     }
227     else
228     {
229         Console.WriteLine("Retrieving Access Groups Failed");
230         Console.WriteLine(httpResponse.ToString());
231     }
232 }
```

- Line 205-209: We first need to check if the login was successfully made and the session ID was stored.
- Line 211: We use class CookieContainer to send the session ID information to the BioStar server.
- Line 219: When putting the session ID in the cookie, we have to specify the URI.
- Line 220: Retrieving access groups should be done via HTTP GET method.

## 3. Retrieving events

```

125     static async void GetLogTask()
126     {
127         if(sessionID == null)
128         {
129             Console.WriteLine("You must log in first!");
130             return;
131         }
132
133         CookieContainer cookieContainer = new CookieContainer();
134
135         HttpClientHandler handler = new HttpClientHandler();
136         handler.CookieContainer = cookieContainer;
137
138         HttpClient httpClient = new HttpClient(handler);
139
140         HttpClient client = new HttpClient(handler);
141         cookieContainer.Add(new Uri("https://api.biostar2.com"), new Cookie("bs-cloud-session-id", sessionID));
142
143         string resourceAddress = "https://api.biostar2.com/v1/monitoring/event_log/search";
144
145         string startTime = "1970-01-01T00:00:00Z";
146         string endTime = DateTime.UtcNow.ToString("yyyy-MM-ddTHH:mm:ssZ");
147
148         DateTime dtLatestLogTime = new DateTime(1970, 1, 1);
149
150         JavaScriptSerializer serializer = new JavaScriptSerializer();
151
152         for (int logCallIndex = 0; logCallIndex < 1000; logCallIndex++)
153         {
154             endTime = DateTime.UtcNow.ToString("yyyy-MM-ddTHH:mm:ssZ");
155
156             string payload = "{ \"datetime\": [\"" + startTime + "\", \"" + endTime + "\"] }";
157
158             StringContent sc = new StringContent(payload, Encoding.UTF8, "application/json");
159             HttpResponseMessage httpResponse = await httpClient.PostAsync(resourceAddress, sc);
160
161             if (httpResponse.IsSuccessStatusCode == true)
162             {
163                 Console.WriteLine("Succeeded to retrieve log from " + startTime + " to " + endTime);
164                 string httpResponseBody = await httpResponse.Content.ReadAsStringAsync();
165                 Console.WriteLine(httpResponseBody);
166
167                 endTime = startTime;
168
169                 Dictionary<string, dynamic> logValues = serializer.Deserialize<Dictionary<string, dynamic>>(httpResponseBody);
170                 foreach(KeyValuePair<string, dynamic> logElement in logValues)
171                 {
172                     if (logElement.Key == "records")
173                     {
174                         foreach (Dictionary<string, dynamic> recordElement in logElement.Value)
175                         {
176                             if(recordElement.ContainsKey("datetime"))
177                             {
178                                 Console.WriteLine(recordElement["datetime"]);
179                                 DateTime dtLogTime = DateTime.Parse(recordElement["datetime"]);
180
181                                 if(dtLogTime > dtLatestLogTime)
182                                 {
183                                     dtLatestLogTime = dtLogTime;
184                                     startTime = dtLatestLogTime.ToUniversalTime().AddSeconds(1).ToString("yyyy-MM-ddTHH:mm:ssZ");
185                                 }
186                             }
187                         }
188                     }
189                 }
190
191                 System.Threading.Thread.Sleep(1000);
192             }
193             else
194             {
195                 Console.WriteLine("Log Retrieval Failed from " + startTime + " to " + endTime);
196                 Console.WriteLine(httpResponse.ToString());
197                 break;
198             }
199         }

```

- Line 152: We use the For loop to repeatedly retrieve the events from the server at an interval.
- Line 154-156: When retrieving the events from the server, we have to specify the start time and end time. This time, rather than using class Dictionary, we build a JSON formatted string manually for demonstration purposes.
- Line 170-188: We use class Dictionary with a string key and a dynamic value to parse the JSON



formatted data into a dictionary data structure. Since the events are in the form of an array, we have to use dynamic type of value in the dictionary.

#### 4. Creating a user

```
79 static async void CreateUserTask()
80 {
81     if (sessionID == null)
82     {
83         Console.WriteLine("You must log in first!");
84         return;
85     }
86
87     CookieContainer cookieContainer = new CookieContainer();
88
89     HttpClientHandler handler = new HttpClientHandler();
90     handler.CookieContainer = cookieContainer;
91
92     HttpClient httpClient = new HttpClient(handler);
93
94     HttpClient client = new HttpClient(handler);
95     cookieContainer.Add(new Uri("https://api.biostar2.com"), new Cookie("bs-cloud-session-id", sessionID));
96
97     string resourceAddress = "https://api.biostar2.com/v1/users";
98
99     Console.WriteLine("Input User ID: ");
100    string userInputID = Console.ReadLine();
101
102    JavaScriptSerializer serializer = new JavaScriptSerializer();
103
104    Dictionary<string, string> dicNewUser = new Dictionary<string, string>();
105    dicNewUser.Add("user_id", userInputID);
106
107    string payload = serializer.Serialize(dicNewUser);
108
109    StringContent sc = new StringContent(payload, Encoding.UTF8, "application/json");
110    HttpResponseMessage httpResponse = await httpClient.PostAsync(resourceAddress, sc);
```

- Line 99-100: We receive a user input for the ID of a new user.
- Line 104-105: The only mandatory property that we have to provide when creating a new user is user ID.

## Conclusion

So far, we have taken a brief look at how we can utilize BioStar API. Much of this article is not BioStar API specific. Rather, it's about basic usage of class HttpClient and what to do to use Web API. Therefore, even if you're not familiar with using Web API, I believe you can kick start on how to use BioStar API with this article. For more detailed information on BioStar API, visit our BioStar API website: <https://api.biostar2.com>

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Last update: **2015/10/15 17:03**