

N S 2022

ACCELERATING INNOVATION

The HTTP Client (Developers Edition)

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April 4th 2022



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Niagara HTTP Client

Allows the Niagara station to interact with HTTP web services and API's.

Data can be exchanged both **in** and **out** of Niagara.

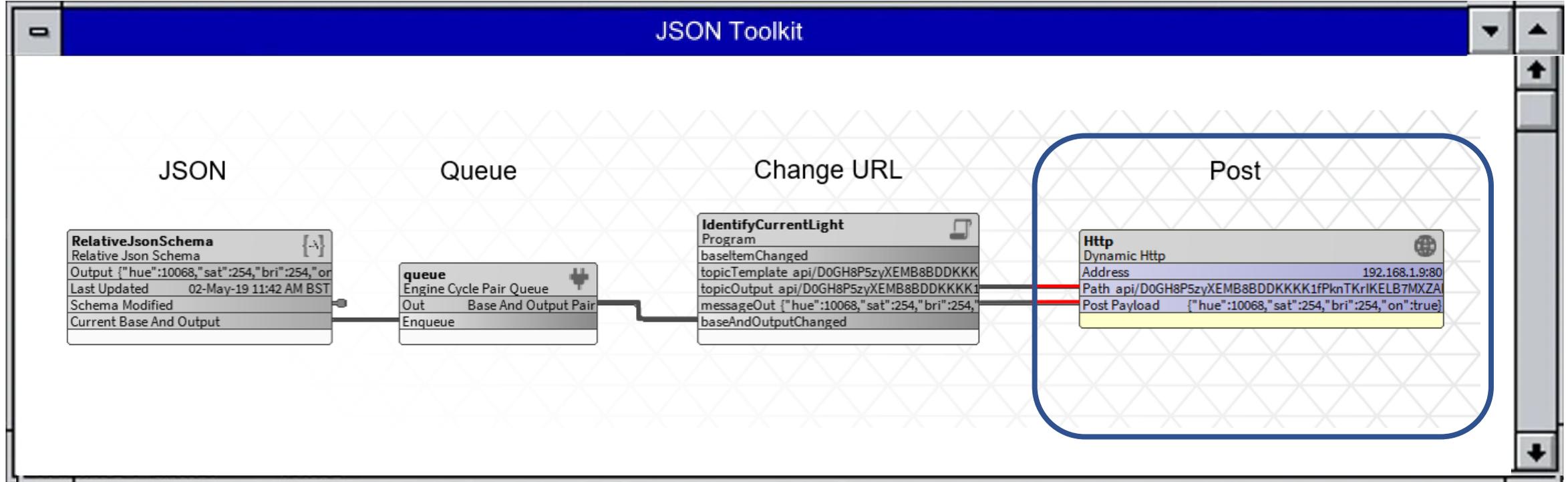
Display Name	Value	Commands
Enabled	true <input checked="" type="checkbox"/>	
Out	<pre>April 4th is the day in 1887 that Argonia, Kansas elects Susanna M. Salter as the first female mayor in the United States.</pre>	
▶ Health	Http Response Health	<input checked="" type="checkbox"/>
▶ Address	http://numbersapi.com/4/4/date	<input checked="" type="checkbox"/>
Method	GET <input type="checkbox"/>	
▶ Headers	Http Headers	<input checked="" type="checkbox"/>
▶ Parameters	Http Parameters	<input checked="" type="checkbox"/>

As many use cases as API's

- Bringing useful data **into** a building
 - Occupancy, Travel, Air Quality, Car Parks
- Exporting station data **out** to an external service / cloud
 - AWS IoT, Azure IoT, Google Cloud offer RESTful services
 - Messaging, Notifications
- Device Control
 - Integrate with IoT Devices / Gateways



Rewind....Niagara Forum 2019



JSON Toolkit lighting control demo

Actually - repeated by us tomorrow @ 4.30

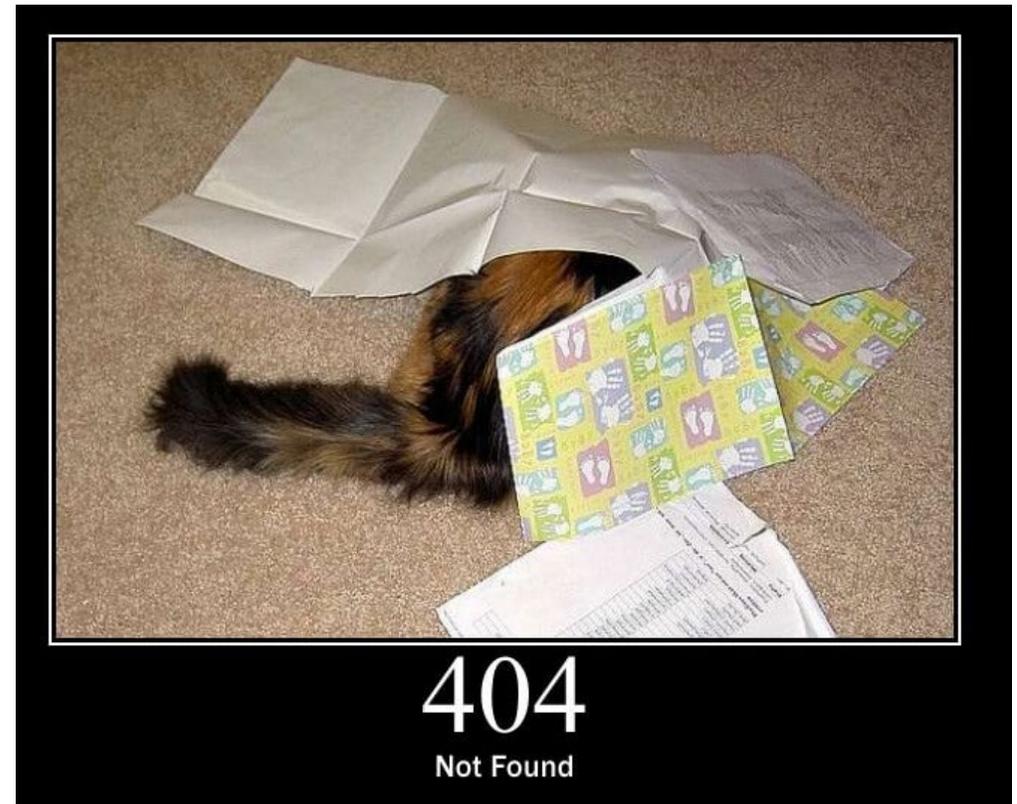
Next 2 years – where is the HTTP component?

“Interested in ‘Dynamic HTTP’ component seen in JSON toolkit presentation....?”

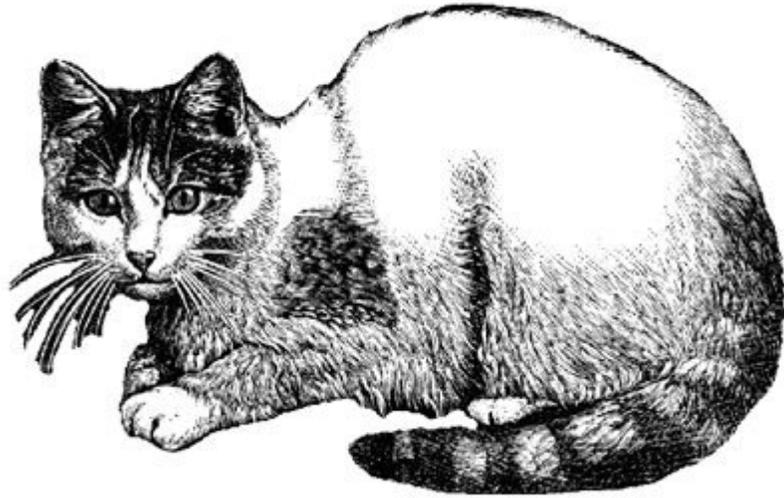
“I recently saw a hint in one of your JSON Toolkit presentations and couldn’t find the module which contains.....”

“Is it possible to receive or send HTTP requests from our Niagara equipment”

“Could you advise whether there is a Rest API module”



<https://http.cat/404>



Essential

HTTP Client in a nutshell

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Standalone Client

CharlottePollenData (Http Client)

Enabled true

```
{ "message": "success", "lat": 35.22, "lng": ... }
```

Out

- Health Http Response Health
- Address https://api.ambeedata.com/latest/poller...
- Method GET
- Headers Http Headers
- Parameters Http Parameters
- Http Tuning Policy Http Standalone Tuning Policy
- Authenticator Http Authenticator
- Transport Http Transport
- Request Body Request Body

Health (Http Response Health)

Status {ok}

Last Update 02-Mar-2022 10:10 AM GMT

Last Response OK

Request Body (Request Body)

Source Type httpClient SlotSource

Source Slot Source

```
{  
  "roomTemp" : 25.2,  
  "occupants" : 209,  
  "eaten" : true,  
  "upNext" : "SECURITY DASHBOARD API"  
}
```

Clear Payload After Neither

Send On Source Cov true

Write Buffer Size 8192 B [1-max]

Duration Avg 2486.20 ms

Request Body Size 0 B

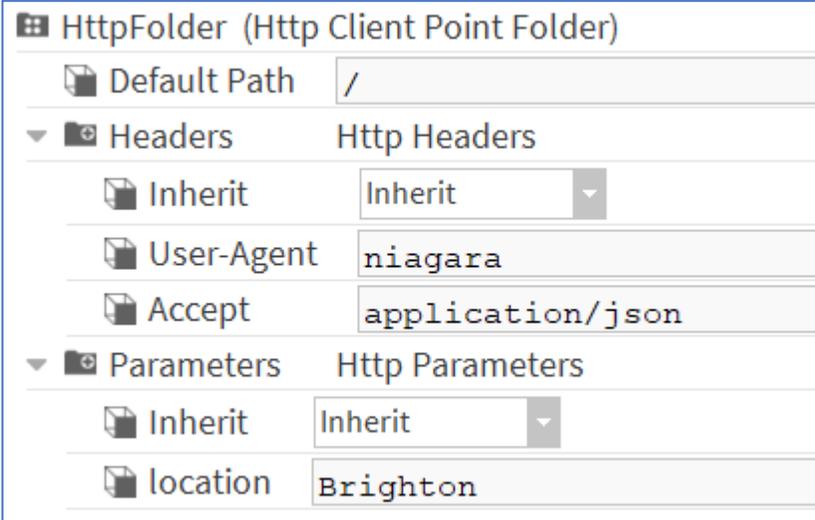
Request Body Bytes Avg 0.00 B

Response Body Size 2175 B

Response Body Size Avg 435.00 B

HTTP Client Driver

- HTTP Client Proxy Points *per resource*
 - Share auth and transport
 - Useful for polling multiple similar endpoints
- Device Ping Address for service status (optional)
- Points Folder defines common Headers or Parameters



The screenshot displays the configuration for an 'HttpFolder (Http Client Point Folder)'. It includes the following settings:

Property	Value
Default Path	/
Headers	Http Headers
Inherit	Inherit
User-Agent	niagara
Accept	application/json
Parameters	Http Parameters
Inherit	Inherit
location	Brighton

WebSocket Client

Persistent Connection

The screenshot shows the configuration for a 'Websocket Client' under the 'WebsocketTennis' application. The 'Enabled' checkbox is checked, and the status is 'true'. The 'Health' section shows a status of '{ok}' with a last update of '02-Mar-2022 02:28 PM GMT'. The 'Last Response' is 'Switching Protocols' with a code of '101'. The 'Address' section shows the URL 'https://localhost/httpClientTest/tennisS...' with a 'Mode' of 'Secure', 'Host Address' of 'localhost', 'Port' of '443', and 'Path' of '/httpClientTest/tennisSocket'.

WebsocketTennis	Websocket Client
Enabled	<input checked="" type="checkbox"/> true
Health Websocket Health	
Status	{ok}
Last Update	02-Mar-2022 02:28 PM GMT
Last Response	Switching Protocols
Last Response Code	101
Fault Cause	
Metrics Websocket Metrics	
Address https://localhost/httpClientTest/tennisS...	
Mode	Secure
Host Address	localhost
Port	443 [-1 - 65536]
Path	/httpClientTest/tennisSocket

The screenshot shows the monitoring panel for the 'Websocket Client'. It displays the connection status as 'true', the last connected time as '02-Mar-2022 02:28 PM GMT', and the last sent message as 'Serve'. The last sent time is '02-Mar-2022 02:30 PM GMT', and the last received message is 'Ace! 15-0'.

Connected	<input checked="" type="checkbox"/> true
Last Connected	02-Mar-2022 02:28 PM GMT
Last Sent Message	Serve
Last Sent Time	02-Mar-2022 02:30 PM GMT
Last Received Message	Ace! 15-0

Full duplex comms with queues

Wireshet Tools

Capture response headers/cookies

ResponseHeaderCapture Response Header Capture	
Capture All	<input checked="" type="checkbox"/> true
Concat Duplicates	<input checked="" type="checkbox"/> true
date	Wed, 02 Mar 2022 11:59:15 GMT
vary	Origin
access-control-allow-origin	*
x-download-options	noopen
x-permitted-cross-domain-policies	none
keep-alive	timeout=5
content-type	application/json; charset=utf-8
access-control-allow-headers	Origin, X-Requested-With, Content-Type, ...
x-dns-prefetch-control	off
access-control-allow-credentials	true
x-xss-protection	0
referrer-policy	no-referrer
content-length	437

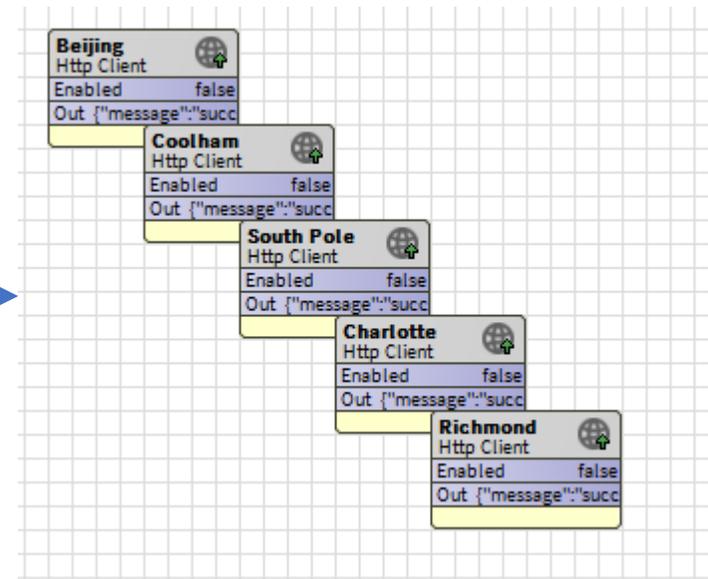
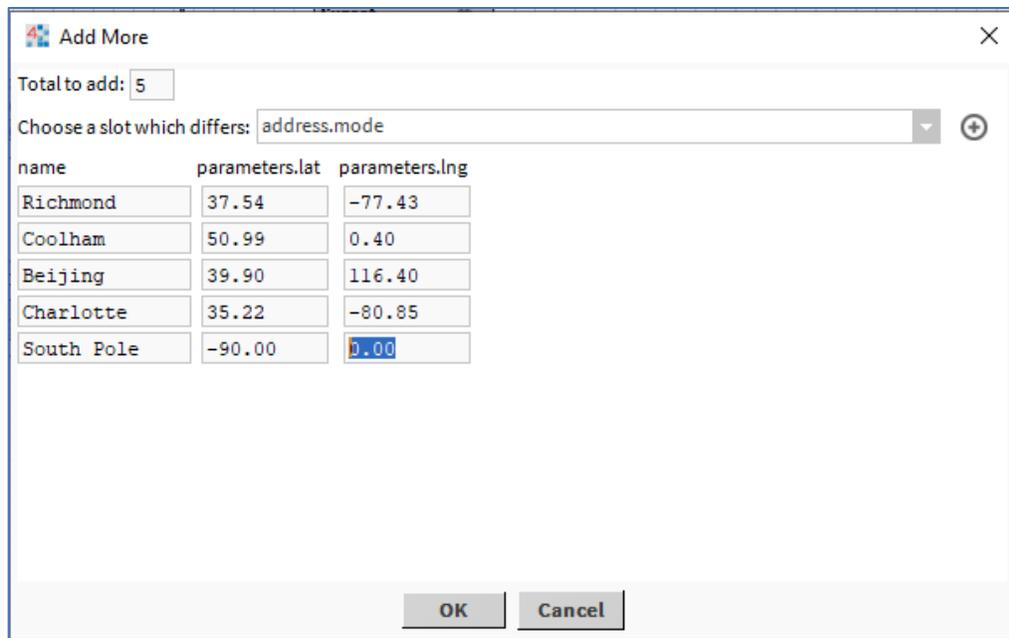
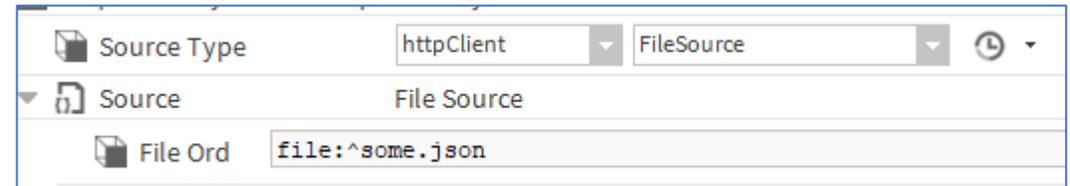
ResponseTrigger Response Trigger	
Enabled	<input checked="" type="checkbox"/> true
Fire On	200 Response
Conditions	Conditions
Triggered	<input checked="" type="checkbox"/> true

ResponseChain Response Chain	
Enabled	<input checked="" type="checkbox"/> true
Fire On	200 Response
Conditions	Conditions
Triggered	<input type="checkbox"/> false
	Twilio
Targets	Room1 ✕ Room2 ✕ Room3 ✕
Delay Between Each Request	00000h 00m 00.050s [0 ms - +inf]

Trigger actions / other clients to send

Other timesavers

- Use Files or Niagara Reports as payload
- Utility to duplicate clients with different settings



String Servlet

Send messages into the station

- trigger some logic
- inject into a px view
- append to a history

The screenshot shows the configuration for the 'PxPageBanner' String Servlet. The 'Status' is set to '{ok}'. The 'Enabled' checkbox is checked (true). The 'Servlet Name' is 'pxBanner'. The 'Out' field contains the text 'Car Park Status: Full'. The 'Last Received' timestamp is '02-Mar-2022 01:59 PM GMT'. The 'Csrf Protection' and 'Clear Between Duplicate Requests' checkboxes are unchecked (false). The 'Response Body' section is expanded to show a 'Response Folder'.

The screenshot shows the conditional response configuration. The 'Response Body' section is expanded to show a 'Response Folder'. The 'Default Response' is 'Response'. The 'JsonResponse' is 'Conditional Response'. The 'Enabled' checkbox is checked (true). The 'Conditions' section is expanded to show an 'And' condition. The 'And' condition is checked (true). The 'HasToken' condition is 'Header Contains'. The 'WantsJson' condition is 'Header Contains'. The 'Not' checkbox is unchecked (false). The 'Header Name' is 'Accept'. The 'Contains' field is 'application/json'. The 'Response' section is expanded to show 'Response', 'XmlResponse', and 'ErrorResponse'.

Setup conditional response based on headers / content

But hang on...why are you telling me all this?

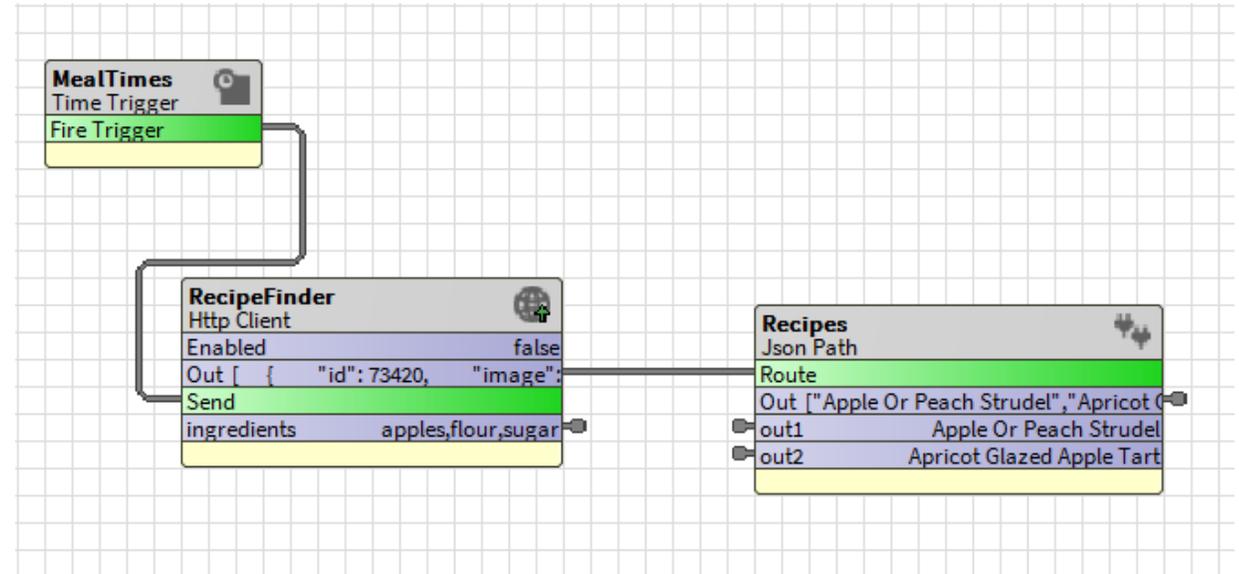


“I am at a developer day, I can do all this myself with a simple Java class?”

<https://http.cat/417>

'I want to save some time'

- Public API
 - Create working clients in a few lines of code
 - Forward compatibility
- Wiresheet Ready
 - Drag from the palette and go
- Ready to use driver
 - Attracts usual driver benefits
 - Poll Scheduler
 - Point Extensions
 - Consistent UI



'I guess I need to do the Security thing'

- Certificate Management
 - Approval of SSL certificates in familiar tool
- Security Dashboard
 - Already integrated with warnings for various settings
- Security Logging
 - Dedicated audit log for all outgoing requests

HTTP/WebSocket clients

3

Warning 2

OK 1

MORE

- ⚠ HTTP Basic Authentication is being used for clients: TestTheServlet, WebsocketBasic, basic, getDefaultRespons...
- ⚠ Non driver HTTP clients enabled: 200 Trigger, 302, 401, 404, 405, BadCertificate, BodyContainsTrigger, BrightonSunDat...
- ✅ Software Maintenance Agreement active.

httpTesting/HttpClientRequestHistory						
Timestamp	Operation	Target	Slot Name	Old Value	Value	User Name
24-Feb-22 12:12:55 PM GMT	GET	/api/CharlottePollenData	CharlottePollenData		https://api.ambeedata.com:443/latest/pollen/by-lat-lng	Dave Lister
24-Feb-22 12:12:53 PM GMT	GET	/api/BrightonSunData	BrightonSunData		https://api.sunrise-sunset.org:443/json	Dave Lister
24-Feb-22 12:12:45 PM GMT	GET	/Drivers/HttpClientNetwork/HttpClientDevi	Ping Address		https://localhost:443/ord/station:%7Cslot:/	system
24-Feb-22 12:12:32 PM GMT	POST	/httpClients/ReportSource	ReportSource		https://httpbin.org:443/post	system

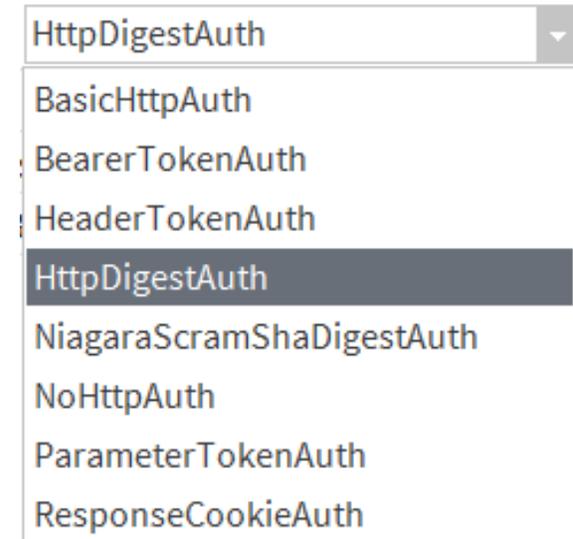
'Sometimes you need more than 1 class....'

- Authentication

- Basic / Digest / Niagara / Token / Response Cookie
- Extensible / pluggable authenticator model *

- Avoid bottlenecks

- Randomization of send on startup
- Don't DDOS your endpoint!

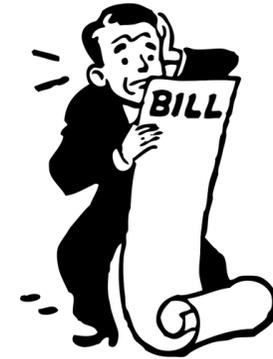


* not public API yet

'Sometimes you need more than 1 class....'

- Request Throttling

- Per Client + Global
- Ensure you do not exceed API limits, avoiding unexpected bills.



- Concurrency challenges

- Managed Thread pool

- Trigger and Response Chain

- Trigger events or secondary requests.

Request Throttle (Request Throttle)	
Enabled	<input checked="" type="checkbox"/> true
Period	+00001h 00m 00s
Max Requests	60 [2 - max]
Snap To Hour	<input checked="" type="checkbox"/> true
Next Threshold Time	02-Mar-2022 03:00 PM GMT
Current Count	3

Public API

Time to build something



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1. Building a simple client

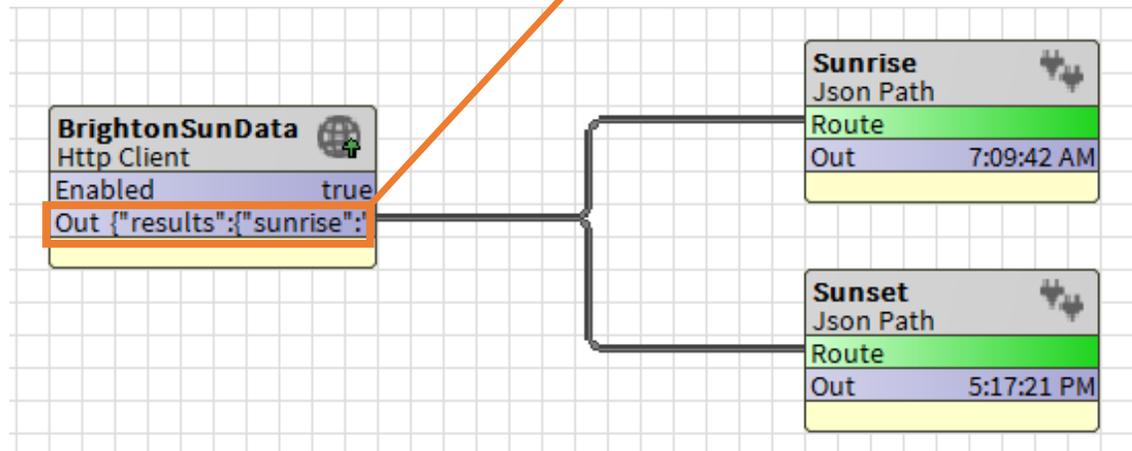
‘I want to bring the lights on at sunset’

```
IHttpClient client = HttpClientBuilder.instance()
    .withAddress("https://api.sunrise-sunset.org/json")
    .withParameter("lat", BDouble.make(50.822))
    .withParameter("lng", BDouble.make(0.137))
    .mountAtOrd("slot:/api", "BrightonSunData")
    .build();

client.send();
```

Simple JSON Toolkit integration

```
{  
  "results": {  
    "sunrise": "6:20:11 AM",  
    "sunset": "6:20:11 PM",  
    "solar_noon": ...  
  }  
},
```



The screenshot shows the configuration for a "Sunset (Json Path)" node. The "Enabled" checkbox is checked. The "Last Result" is "Routed" and the "Last Result Time" is "15-Feb-2022 02:49 PM GMT". The "Last Input" field displays a partial JSON object: `{"results":{"sunrise":"7:09:42 AM", "sun:`. The "Status" is `{ok}`. The "Out" field shows "5:17:21 PM". The "Path" field is set to `$.results.sunset`, which is highlighted with an orange box.

2. Adding authentication



<https://http.cat/401>



<https://http.cat/403>

Adding authentication

‘My strategy needs to know the tree pollen index’

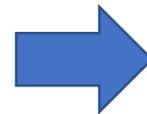
```
IHttpClient client = HttpClientBuilder.instance()
    .withAddress("https://api.ambeedata.com/latest/pollen/by-lat-lng")
    .withParameter("lat", BDouble.make(35.222))
    .withParameter("lng", BDouble.make(-80.847))
    .withHeaderTokenAuthenticator("x-api-key", "895e63e57a1.....")
    .mountAtOrd("slot:/api", "CharlottePollenData")
    .build();
```

Reading the response – Synchronous Send

```
String responseBody = client.sendSync();  
  
System.out.println("Received: " + client.getLastResponseCode() +  
    " : " + responseBody);
```

Received: 200 :

```
{"message":"success","lat":35.22,"  
lng":80.85,"data":[{"Count":{"gra  
ss_pollen":0,"tree_pollen":157...
```



```
{ "message": "success",  
  "lat": 35.22,  
  "lng": 80.85,  
  "data": [  
    { "Count":  
      {  
        "grass_pollen": 0,  
        "tree_pollen": 157,  
        ...
```

Reading the response – Asynchronous Send

```
Future<IHttpResponse> future = client.sendAsync();
IHttpResponse response = future.get(2, TimeUnit.SECONDS);

System.out.println(response.getResponseCode());
System.out.println(response.getBody());
System.out.println(response.getHeader("content-length"));

IHttpResponse responseObject = client.getLastResponse();
```

Received: 200 :

```
{"message":"success","lat":35.22,"lng":-
80.85,"data":[{"Count":{"grass_pollen":0,"tree_pollen":218..... Optional[437]}
```

Polling for Pollen

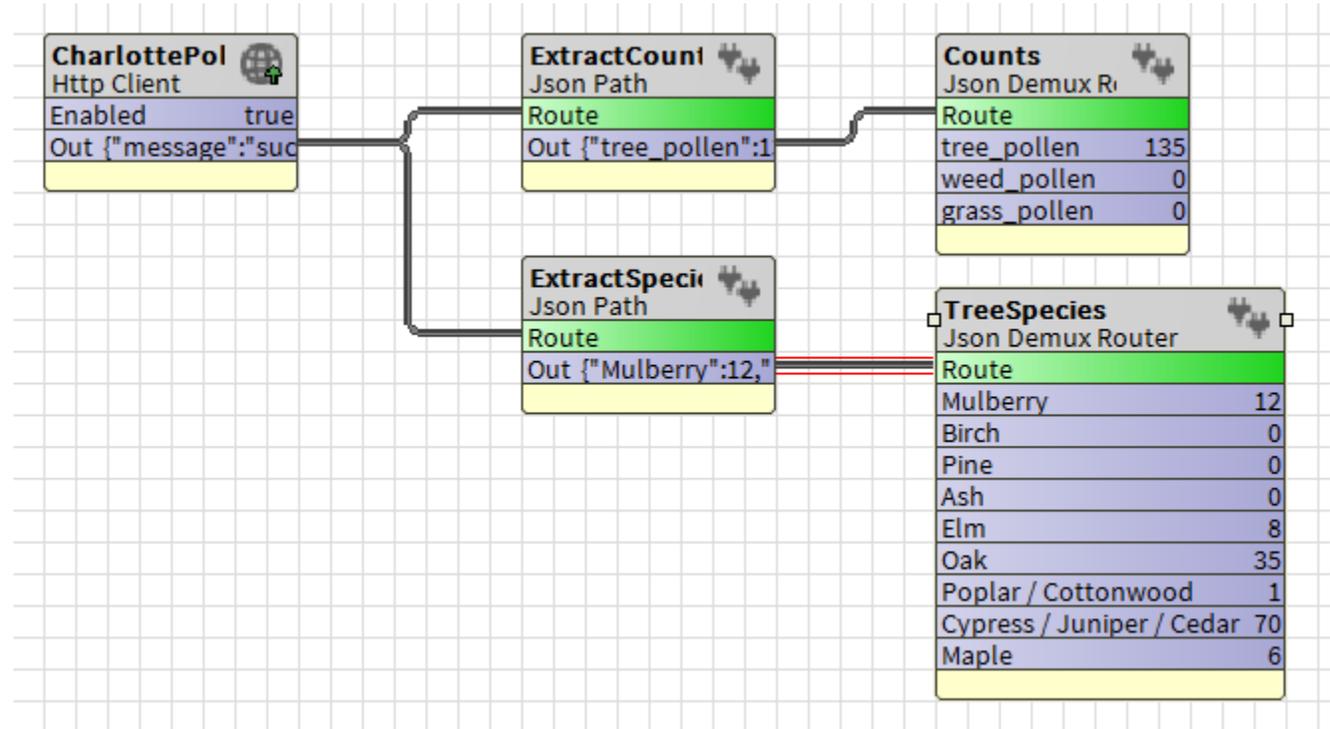
CharlottePollenData (Http Client)

Enabled true

```
Out {"message": "success", "lat": 35.22, "lng": ...}
```

Health: Http Response Health

Status	{ok}
Last Update	23-Feb-2022 02:42 PM GMT
Last Response	OK
Last Response Code	200
Fault Cause	



(Tree pollen is Nick's kryptonite)

3. Adding POST Payload



<https://http.cat/413>

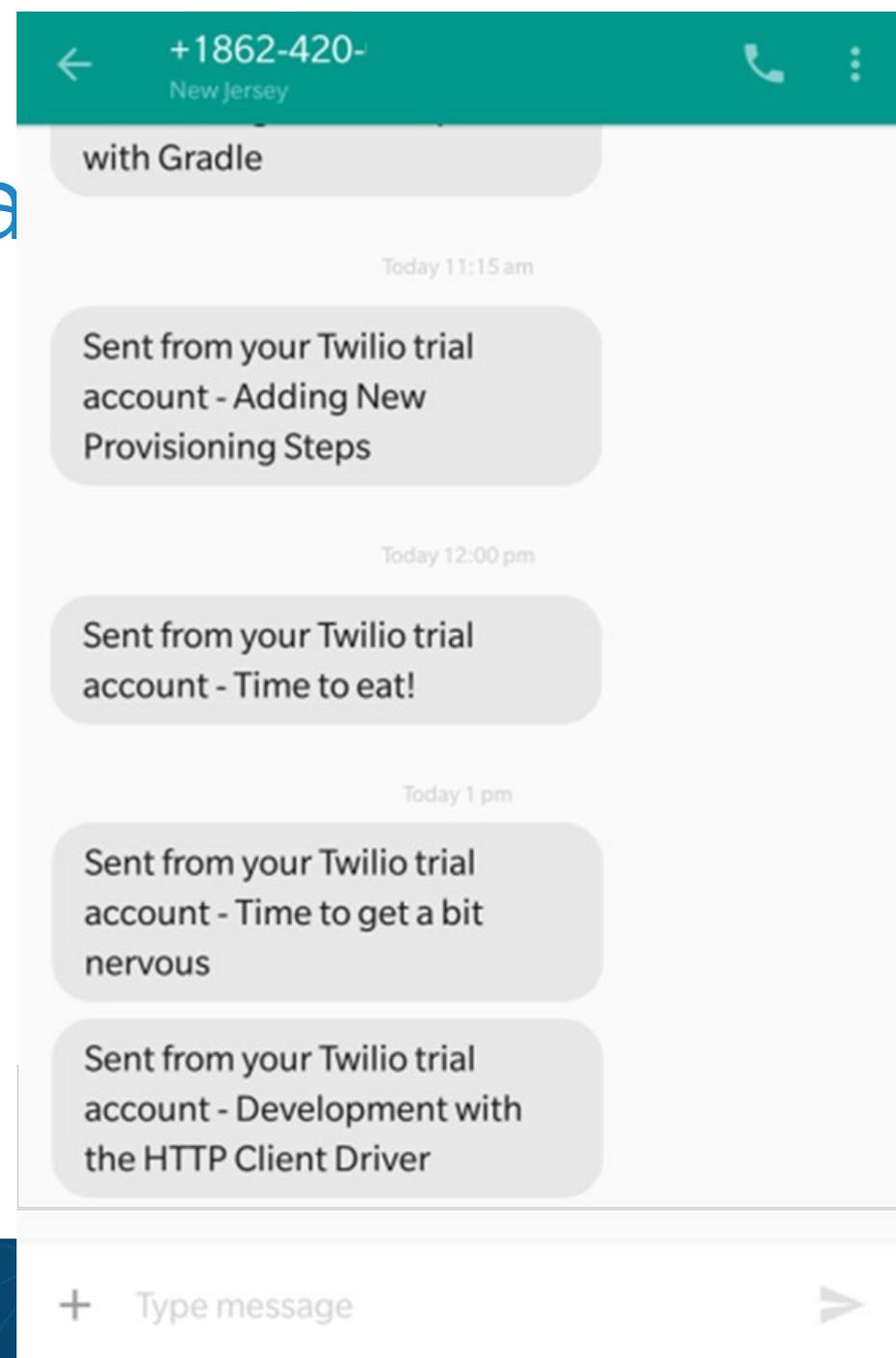
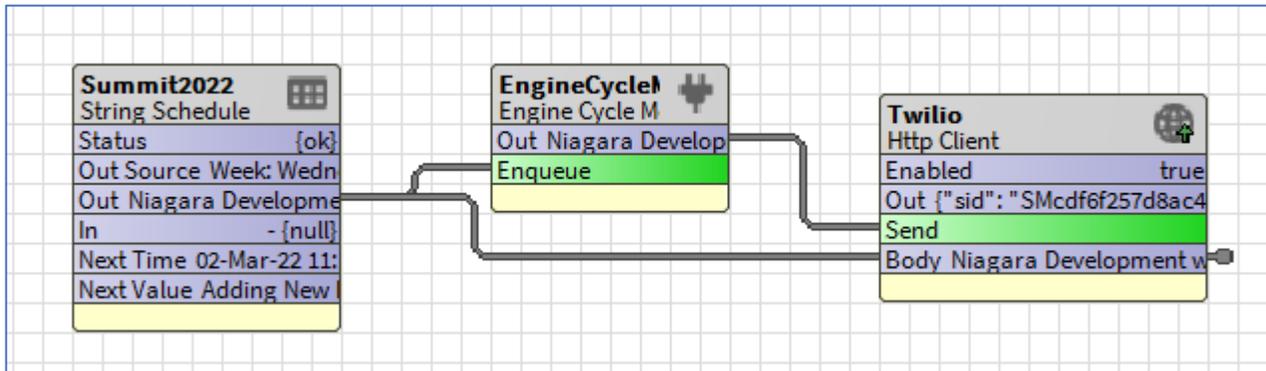
Adding POST Payload

```
IHttpClient client = HttpClientBuilder.instance()
    .withAddress("https://api.twilio.com/2010-04-01/Accounts/AC57e...../Messages.json")
    .withMethod("POST")
    .withFormPayload() // or withStringPayload("...")
    .withParameter("Body", BString.make("Hello Charlotte"))
    .withParameter("From", BString.make("+1862420....."))
    .withParameter("To", BString.make("+44792157....."))
    .withBasicAuthenticator("AC57e96db.....", "cc19b1f.....")
    .mountAtOrd("slot:/api", "TwilioSMS")
    .build();

client.send();
```

```
To=%2B44792157.....&From=%2B1862420.....&Body=Hello+Charlotte
```

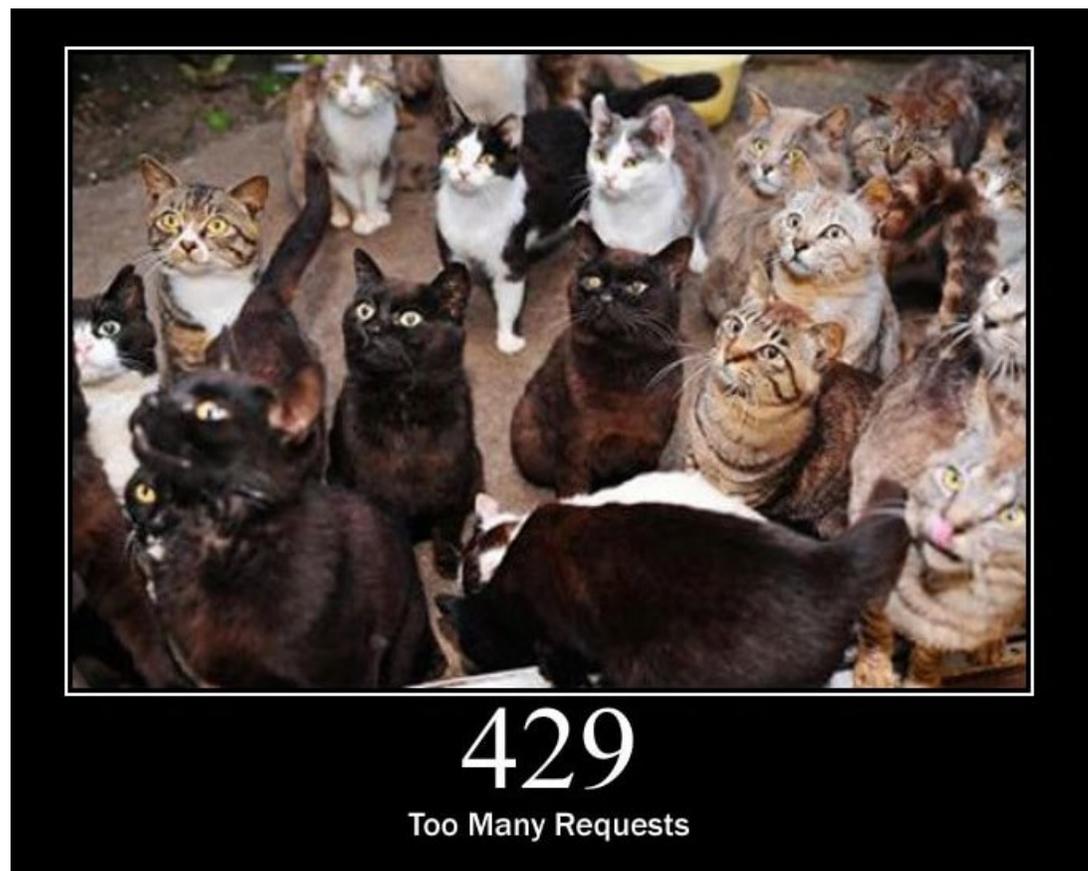

A slide with an agenda



302 Redirect, to more information

- Applications Track **Wednesday!**
 - 10.45 AM with **Curtis McKerlie**
- <https://docs.niagara-community.com/bundle/HttpClientDriver>
- **Bajadoc** for `javax.baja.httpClient.HttpClientBuilder`

Questions?



<https://http.cat/429>



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Niagara Summit 2022

Monday, April 4 – Wednesday, April 6
Charlotte Convention Center & Westin

www.tridium.com/niagarasummit