

API – Application Program Interface

(#) points for API and Time Zone questions

Navigate to YouTube and watch this video about APIs. Tom Scott will tell you the answer to the first questions in less than 3 ½ minutes. The additional 7 minutes is an excellent perspective on the issues of using an API.

<https://www.youtube.com/watch?v=BxV14h0kFs0>

1. (5) → What is sent via the API from one system to another?

What is sent back from that other system upon receipt of the API?

FYI: You will often see the REST [TLA](#) in relation to Internet [APIs](#). REST is much less complicated than it sounds in this definition: REpresentational State Transfer ([REST](#)) is a software architectural style describing RESTful Web services which provide interoperability between computer systems on the Internet using HTTP protocol and APIs. [REST API](#) concepts and examples in under 9 minutes. Readable [API and REST description](#)

An HTTP URL with a query string is a simple way to activate an API on another system. Every time you Google [something](#), you are generating an API request at Google's back-end.

Here is an example: copy the following line, paste into a new browser tab, and see what it turns into.

http://www.google.ca/search?q=new+students&as_sitesearch=senecacollege.ca

Anatomy of an API query

An API query begins with the usual HTTPS domain or sub-domain name.

<https://somewhere.com/apiName> or <https://apiName.somewhere.com/>
or simply <https://somewhereapiName.com/>

Next, the ? character signals the beginning of the [query string](#) itself within a [URI / URL](#).

The query string is made up of [name=value pairs](#), AKA attribute=value, key=value, or field=value.

The = character joins query string's name and value together.

The + character joins multiple values together.

The & character joins multiple name=value pairs.

No embedded spaces are allowed in URL which is why you often see %20 which is hex 20, decimal 32, in place of the ASCII Space character.

Web search results convert query results to a formatted page for people to use (and be advertised to).

Using Mozilla Firefox is strongly recommended because it can transform JSON responses into a human readable format. (Raw Data > "Pretty Print")

2. (5) → Try a simple API from <https://agify.io/> for predicting the age of a person specifying their given name and ISO [country code](#) of their birth.

https://api.agify.io/?name=abcdefg&country_id=XX

Substitute your name and country code of birth.

The response to an API query is usually returned in a [JSON](#) object. (Older XML may be an option.)

The raw data with name—value pairs looks like this:

```
{"age":68,"count":2670,"country_id":"BR","name":"Maria"}
```

Programmers use language functions to access the raw data in a JSON response by requesting the name to receive the value. E.g. asking for "age" returns 68.

Raw JSON data looks better to humans using the Pretty Print feature in Firefox:

```
{
  "age": 68,
  "count": 2670,
  "country_id": "BR",
  "name": "Maria"
}
```

→ Copy the URL query string with your name and country code of birth and the JSON result from Firefox in Pretty Print to the answer document.

APIs to determine location time

How is a date & time represented in [Unix systems](#)? It is called a timestamp: a 32-bit integer containing the number of seconds since the Unix Epoch began at 1970-01-01T00:00:00Z ([ISO 8601](#) format). "Z" indicates the Zulu ("Z") time zone, previously known as Greenwich Mean Time (GMT), now indicating [Coordinated Universal Time](#) (UTC). This reference point is used by systems all over the world to convert UTC to a location [time zone](#). See this for an entertaining [explanation of time zones](#).

[World Time API](#) receives a request for a location and returns the current UTC timestamp with related data.

This Request URL <http://worldtimeapi.org/api/timezone> returns the various *area/location[/region]* values for the world's major cities. Find the *area/location* for a city that is not Toronto.

Format an API Request URL to [worldtimeapi.org](#) for the current time and related information
<http://worldtimeapi.org/api/timezone/?area?/?location?>

3. (5) → What is the URL of your time zone API request for any city *except* Toronto?

→ Copy the URL and Pretty Print JSON result from your browser to the answer document.

Example: An API request to World Time API for Toronto returns this JSON object...

```
{
    "Name": Value pairs
    "abbreviation": "EDT",
    "client_ip": "142.114.225.188",
    "datetime": "2021-10-15T16:59:28.875629-04:00",
    "day_of_week": 5,
    "day_of_year": 288,
    "dst": true,
    "dst_from": "2021-03-14T07:00:00+00:00",
    "dst_offset": 3600,
```

```

    "dst_until": "2021-11-07T06:00:00+00:00",
    "raw_offset": -18000,
    "timezone": "America/Toronto",
    "unixtime": 1634331568,
    "utc_datetime": "2021-10-15T20:59:28.875629+00:00",
    "utc_offset": "-04:00",
    "week_number": 41
}

```

Use this [Response Schema](#) (data format) to decode the JSON's "name":value pairs.

Humans use world time zones that have offsets in hours:minutes from UTC to location time, e.g. Eastern Standard is UTC minus 5 hours. Humans can do the +/- HH:MM UTC offset in their heads.

UNIX timestamp is the UTC time, in seconds since 1970. The offsets to a location's time are given in seconds which are added to the UNIX timestamp resulting in a location timestamp. The location timestamp is then converted to a human date format.

[THIS](#) is an excellent [Introduction to Date and Time](#) in the Unix world. You can stop reading at "Using Calendars from the shell command line" for now. The entire article will be useful in the future.

4. (16) ➔ Using the above location's JSON data from [worldtimeapi.org](#), fill in the JSON key / value pairs related to the descriptions in the table below. The only key / value not found is the *location's timestamp*. Convert the Unix UTC timestamp to a location timestamp showing the calculations. The location timestamp is same as a UTC timestamp with different seconds +/- adjusted for the location's time zone.

See Response Schema	JSON key	JSON value
UTC date/time in ISO8601 format		
Unix UTC timestamp		
Unix UTC to location difference		
Location's daylight saving time difference		
Location date/time in ISO8601 format		
How do you calculate the <i>location's timestamp</i> from the UTC timestamp using JSON keys?	<i>put your calculation here</i>	<i>Calculated location timestamp value is: 0000000000</i>

5. (5) ➔ How did you confirm that your location timestamp when converted to data/time was the same as the Location date/time in ISO8601 format in the JSON schema? Show your test and the result.

A Unix **timestamp** can be passed to software functions which return the equivalent human date/time. (Calculating the difference between two dates means accounting for leap years and knowing whether 2000 was a leap year or not. Nobody wants to [deal with this](#).)

On the web, use <https://www.epochconverter.com/> which will translate a timestamp to ISO format as GMT (UTC). (It also does automagical adjustment of the timestamp – assumed to be UTC / Unix Epoch – to local ISO format. There are features there to help check your explanation of the magic.)

In Excel, use this formula where 0000000000 is a Unix timestamp or a cell reference to it.

= (0000000000/86400) + DATE(1970,1,1)

Format the cell's Number with Custom Type "yyyy-mm-dd hh:mm:ss"

(In [Unix time](#), every day is treated as if it contains exactly 86400 seconds and is relative to the beginning of 1970.)

In [PowerShell Code 7](#) (Windows | macOS X | Linux), run this command with a Unix timestamp to get the human date and time.

```
Get-Date -UnixTimeSeconds 0000000000 -Format "o" -AsUTC # returns UTC time  
returns 1970-01-01T00:00:00Z where Z is equivalent to +00:00 offset
```

```
Get-Date -UnixTimeSeconds 0000000000 -Format "o"      # adjusts UTC to location time
```

In PowerShell 5 (legacy Windows), run this command with a Unix timestamp.

```
(Get-Date -Date "1970-01-01
```

```
00:00:00Z").toUniversalTime().addSeconds(0000000000).ToString("o")
```

SDLC – Software Development Life Cycle (AKA Systems Development Life Cycle)

You can apply the SDLC process to anything that requires investigation, planning, and execution. e.g. your decision to come to Seneca, moving residences, or just getting a cup of coffee.

If you are in IPC144, apply the SDLC to the work you do for workshops in that course. How will you use the steps of software development to do your assignments more efficiently and effectively? Illustrate with an example from a recent workshop or assignment.

If you are *not* in IPC144, apply the SDLC to one of the general cases mentioned or an assignment in another course.

(54 points = 9 points × 6 steps below, 75+ words each. Note that the minimum word count gets more or less average marks depending on the quality of content. To go above average, see the rubric in Announcements.)

What is the problem?

→ **Determine:** This is largely given by the assignment specs but how do you become comfortable with the scope of the assignment? How do you create a plan to complete it?

→ **Define** the detailed requirements. What do you do to fully understand the problem? How do you ensure you have a firm grasp of all inputs, processing, and outputs?

What is the solution?

→ **Design:** Please, don't jump into coding yet. How will you design a solution? Do you know the technical skills the solution requires? What about creating pseudocode or a flowchart to document the algorithm? Is there value in writing all the coding comments first? (The answer is yes.) How will the process of design help the development process?

→ Develop: Programming & Testing

How do you implement the design into programming source code? What is your process of writing comments and code? (*Please do not send any source code...just describe your development process.*)

What is your process to test and debug code? How do you know the output is correct?

→ **Deliver:** How do you manage the delivery and deployment of your project? There are required steps on the matrix server, but it is more than just that. How do you resolve issues when things do not work as expected? What do you do and how do you make changes to achieve a successful test? How do you conceive of what to write for the reflection text?

→ **D'oh:** The last stage in industry is ongoing system maintenance and user support. Your use case is not that different. You support yourself as the user who keeps track of source code files, ensures the version on matrix is up to date with your own system's version, and keeps the source code maintainable, i.e. easily understandable the next time you look at it. The in-lab workshop is *Maintained* to become the at-home version. Your C assignment project will proceed in stages which means maintenance and version control.

- **How do you ensure that the in-lab work is maintainable when the at-home work is done?**
- **How do you ensure that the first version of an assignment project's code is maintainable when later requirements are added?**

Software Version, 5 × 2 points

Research the **version of a software application** you use, such as a game, photo editor, browser, or IDE. Usually, the version can be found under the Help menu, About...

- A. What is the name of the software and its current version?
- B. What do the components of the version number mean?
- C. In what way would that software be forward compatible?
- D. In what way would that software be backward compatible?
- E. Find the release notes (AKA changelog) for that software and include the URL, release date, a description of one of the latest changes. Programmers wrote those notes. It is time someone read them, for example:

<https://support.office.com/en-us/article/release-notes-for-office-2016-for-mac-ed2da564-6d53-4542-9954-7e3209681a41>

Release Date: February 13, 2018

Excel – Precision selecting: Ever selected too many cells or the wrong ones? You can now deselect extraneous cells without having to start over.

F Y I

Your operating system probably keeps its version up to date as does your anti-virus and malware protection utility. It is a good idea to check your other software and firmware to ensure you are at the most current, i.e. **secure**, level. **Have you checked that your router's firmware is up to date? Your router can be a firewall against intrusion from the Internet but only if its firmware has been patched to plug security holes.**

API – Weather

[OpenWeather](#) provides weather and satellite data worldwide through free and paid [APIs](#).

This API key **fe781e059e25c50f460f226e052aaa0d** works for their free service; it is limited to 60 calls/minute and 1,000,000 calls/month – more than enough for our purposes. Many APIs require a key to prevent abuse of their free services and/or to charge for billable services. The API key code is passed in the query string *without {braces}*.

Details of their [Current weather data API call](#) are documented at their website.

As a programmer, it is your job to use that documentation to create your API call.

It is a two-step process to get the weather. Use their...

- [Geocoding API](#) to get the geographical coordinates (lat, lon) for a city
- [Current weather data API](#) to get the weather at those geographical coordinates (lat, lon)
- [API at openweathermap.org](#) to get the weather for a city

If your request is unsuccessful, there is a problem with syntax. {Curly braces are NOT used in API requests, they merely indicate a value to be substituted.} Ensure there are no embedded spaces in the request string.

APIs – FYI

Check out the Geolocation API at <http://ip-api.com> to see what they know about Seneca's servers.

(Sometimes an API is so simple that it does not need a query string.)

<http://ip-api.com/json/matrix.senecacollege.ca>

– returns what you might expect about matrix

<http://ip-api.com/json/learn.senecacollege.ca>

– returns information revealing the sub-domain's cloud hosting.

Refresh the browser page after a few seconds and see the query: IP address change!

Even more interesting is the Seneca domain:

<http://ip-api.com/json/senecacollege.ca>

– Refresh the browser page after a few seconds and see almost all the information change!

N.B. An encrypted https:// SSL connection is not available from ip-api.com without a billable account. Instead use just their domain or the basic http://

There are free APIs, [Open APIs](#), and [Open Data sources](#) which can be used in your future applications. E.g. <https://myttc.ca/developers>; <https://www.themealdb.com/api.php> might be fun and useful.

People Data Labs is one of many companies offering "THE SOURCE OF TRUTH FOR PERSON DATA", known as Data Enrichment in the industry. They came to notoriety in this story: <https://www.wired.com/story/billion-records-exposed-online/>.

See what the surveillance economy knows about Seneca's president, David Agnew. Submit this API

https://api.peopledatalabs.com/v4/person?pretty=true&api_key=c33da995d69e7a09c5f75bea202bc6dbda2db41cf2a3fb08bbbdfee25d37b86&email=david.agnew@senecacollege.ca

What does the surveillance economy know about you? Try the above API with your personal email address. People Data Labs is limiting usage to 1,000 free matches TOTAL rather than 1000 free per month as of February 1, 2020. If the above API_KEY stops working and you are interested, sign up for your own API.

[Data Enrichment APIs](#), [Data Enrichment Tools](#), [Google search](#).

For more information on the surveillance economy, see [this](#) and [this](#) and [this](#).

FYI: IoT – Internet of Things

What follows is purely For Your Information (FYI).

An IoT is an object with embedded microcontrollers, sensors, actuators, *and network connectivity* that works without human interaction.

Many devices exist in the Internet of Things – [Google](#), see [IEEE](#).

IoT Notes:

- Although smartphones can control IoT devices, smartphones are not single purpose, autonomous IoT devices which send their sensor's data to a controlling system. Smartphones are general purpose ICT devices needing a human to work. (Humans themselves can act like IoT devices gathering data on their thought and behaviour and sending it to AI systems under the control of social media.)
- Modems, routers, switches, bridges, etc. are part of networking infrastructure that connect the Internet to Things; they are not IoT devices themselves although they are all examples of embedded devices. They do not have sensors or transmit data about their environment. Their function is to run network protocols; they are the data transmitters for other devices.
- Has IoT already jumped the shark? [IoT hairbrush](#)
- [Government of Canada API Store](#)
- [IoT for Smart Cities](#), [IEEE IoT Journal](#), [IEEE Access](#), [IoT news](#)
- [Considerations When Developing a Connected Device](#)
- [considerations for IoT solutions](#) e.g. "device monitoring, firmware and software updates, diagnostics, crash analysis and reporting, physical management, and security management"
- [Bilal Javed. \(2017\). Internet of things \(IoT\) design considerations for developers and manufacturers. 2017 IEEE International Conference on Communications.](#)

- [Microsoft IoT Hub](#)
- [IBM Watson IoT Platform Canada](#)

Be the Boss of your OS

Use [Windows Task Manager](#) or macOS [Activity Monitor](#) to take control of software that does not play well with others. *Accessing Windows Task Manager may not be possible on Seneca lab PCs.*

Windows Task Manager is accessed either by Ctrl+Alt+Del (the infamous [three finger salute](#)), right-clicking on the Taskbar, Windows-Key+X, or directly by Ctrl+Shift+Esc.

This utility will give you the name and location of a running process: info you will need for configuring Windows Defender Security (or other malware protection) to give your own applications permission to run and allow them write access to protected folders and files.

1. Open Windows Security by searching the start menu for **Defender**.
2. Select the **Virus & threat protection** tile (or the shield icon on the left menu bar), then select **Manage ransomware protection**.
3. Under the **Controlled folder access** section, select **Allow an app through Controlled folder access** (if prompted by User Account Control, click Yes)
4. Select **Add an allowed app** and follow the prompts to add apps.

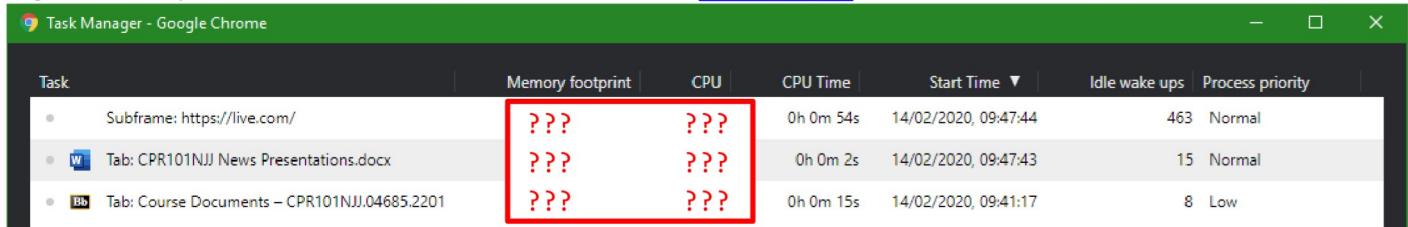
Be the Boss of your Browser

Be the Boss of your Browser when things go wrong. This is becoming especially true of web apps and pages with animated GIFs or videos. Don't close your browser just because of one runaway tab. Use the browser's Task Manager (see below) to see tabs and their sub-processes. Sort by clicking on any column heading. CPU/Energy Impact will usually help you find the misbehaving tab; select it and end/close it.

Chrome Task Manager

Use **Shift+Esc** to open its task manager (or menu / More Tools / Task Manager).

Right-click anywhere to select / deselect columns. See [How to Use](#).



Task	Memory footprint	CPU	CPU Time	Start Time ▾	Idle wake ups	Process priority
Subframe: https://live.com/	???	???	0h 0m 54s	14/02/2020, 09:47:44	463	Normal
Tab: CPR101NJJ News Presentations.docx	???	???	0h 0m 2s	14/02/2020, 09:47:43	15	Normal
Tab: Course Documents – CPR101NJJ.04685.2201	???	???	0h 0m 15s	14/02/2020, 09:41:17	8	Low

Firefox

Open a new tab and enter `about:performance` in the address bar.

or Application 'hamburger' menu (top right corner) > More tools > Task Manager

Details are at [Task Manager - see what tabs or extensions are slowing down Firefox](#)

MS Edge

Click ellipsis (three dots) button in the upper-right > "More tools" > "Browser task manager" [DETAILS](#)