

GUI

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Web server/client communication: REST

- Uniform interface:** Any device connecting to the URL should get the same reply. No matter if a web page or mobile phone requests the temperature of a sensor the returned format must always be the same.
- Client-server decoupling:** The only information the client needs to know is the URL of the server to request data or send data.
- Statelessness:** Each request needs to include all the information necessary and must not depend on previous requests. For example a request to a buffer must not alter the buffer but just read from it so that another user reading the buffer shortly after receives the same data.

See <https://www.ibm.com/cloud/learn/rest-apis>

Data format: JSON

```
{  
  temperature: [20, 21, 20, 19, 17],  
  steps: 100,  
  comment: "all good!"  
}
```

Web servers

- ▶ NGINX: Easy to configure but very flexible web server.
Pronounced “Engine-X”.
- ▶ Apache: Hard to configure but safe option
- ▶ lighttpd: Smaller web server with a small memory footprint.
Pronounced “lighty”.

Fast CGI

A fast CGI program is a UNIX commandline program which communicates with the web server (nginx, Apache, ...) via a UNIX socket which in turn is a pseudo file located in a temporary directory for example /tmp/sensorsocket.

The web server then maps certain http/https requests to this socket. An example configuration for nginx looks like this:

```
location /sensor/ {  
    include          fastcgi_params;  
    fastcgi_pass      unix:/tmp/sensorsocket;  
}
```

via the URL `www.mywebpage.com/sensor/`

JSON C++ encoding with jsoncpp

```
virtual std::string getJSONString() {  
    Json::Value root;  
    root["epoch"] = (long)time(NULL);  
    Json::Value values;  
    for(int i = 0; i < datasink->values.size(); i++) {  
        values[i] = datasink->values[i];  
    }  
    root["values"] = values;  
    Json::StreamWriterBuilder builder;  
    const std::string json_file = Json::writeString(builder, root);  
    return json_file;  
};
```

JSON C++ decoding with jsoncpp

```
virtual void postString(std::string postArg) {  
    const auto rawJsonLength = postArg.length();  
    JSONCPP_STRING err;  
    Json::Value root;  
    Json::CharReaderBuilder builder;  
    const std::unique_ptr<Json::CharReader>  
        reader(builder.newCharReader());  
    reader->parse(postArg.c_str(), postArg.c_str() + rawJsonLength,  
        // do something with root  
    }
```

where root is a std::map.

Web browser: javascript

```
function getterCallback(result) {  
    var temperatureArray = result.temperatures;  
}  
  
function getTemperature() {  
    $.getJSON("/sensor/:80",getterCallback);  
}  
  
function documentReady() {  
    window.intervalId = setInterval(getTemperature , 1000);  
}  
  
$(document).ready( documentReady );
```