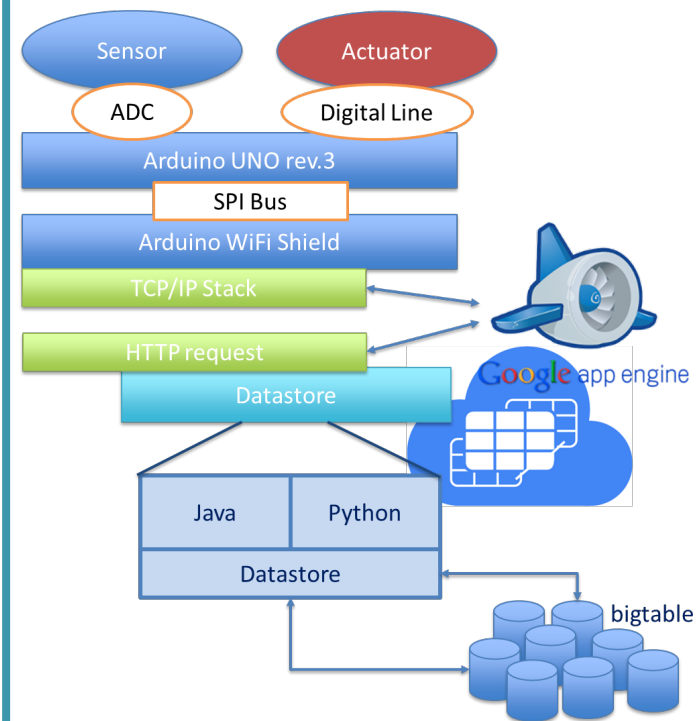
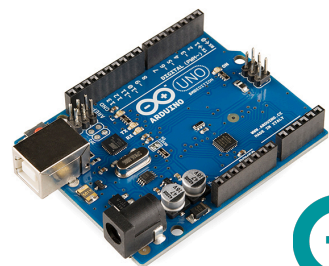


- A sensor or an actuator can be connected to an Arduino platform equipped with a WIFI shield.
- The acquired information can be saved in the datastore in Google Cloud, by sending simple HTTP requests.
- Information can be received by different clients (PCs, smartphones and others). Commands can be also sent to Google for controlling actuators.



Hardware modules



Arduino UNO rev.3



Arduino WiFi Shield



Sensors and actuators
for controlling devices



HOW TO

1. Download the Arduino IDE and Install the Google App Engine API and Eclipse (Luna).
2. Select a sensor that will be used to register information, and which data will be stored (for example, a value and a timestamp).
3. Write a Google Web Application by using the Google App Engine API with the Eclipse plugin.
4. Implement two Java Servlets for respectively storing and retrieving data using the low level Datastore API.
5. Debug the program using the localhost; then, deploy the app.
6. Connect a sensor to Arduino, write a program to acquire data and send them to Google Cloud by using http requests.
7. Implement a client (in a smartphone) that sends http requests to test the full example.

commercial example



Nest Thermostat, a smart thermostat that saves energy by learning the user's schedule, automatically detects user's absence through Auto-away mode, and comes with Wi-Fi connectivity so it can be remotely regulated by a mobile app.

EXTENSIONS

- Additional sensors and/or actuators can be connected to the same device.
- The Arduino WiFi Shield can be easily replaced by the Arduino Ethernet Shield.
- Data format can be easily modified and extended if needed.
- Apps for different devices can be easily written, if an API for managing http clients is available.

Security

Google Cloud Engine allows apps to be extended with several features that ensure a secure data exchange.

Scalability

Designers can easily decide the data format. This format can be properly extended and modified if needed. New sensors and actuators can easily included in the system.

Portability

Google App Engine provides an extended collection of tools that allow developers to implement any kind of application in the Software as a Service (SaaS) layer. Data are easily exchanged and stored by using the HTTP protocol.