

### Raspberry Pi vs. Desktop:

Raspberry Pi: Quad 64 Bit 1.2Ghz cpu 1GB SDRAM 1.4Ghz ARM core; Gigabit ethernet "Over USB." Desktop might have 8+ cores, about twice as fast, but a lot more RAM. Plus faster graphics. I've used raspberry pi as a general purpose computer. It runs Libre Office and many applications (including rails web applications) fine. Graphics are a bit slow. When I use it as a desktop machine, I usually put a HDD on USB, as the EMMC memory isn't high speed.

### Nvidia:

Jetson TX2: 32G memory Quad ARM (doesn't say speed) but 256 CUDA/Vector cores Much more memory than Raspberry Pi, especially for anything using the graphics/vector operations. (I applied for the student discount; haven't heard yet if I'm approved).

### MQTT:

MQTT is a high-performance (low overhead) machine to machine connectivity protocol. It implements a publish/subscribe message protocol (but runs over TCP; it is apparently not tied to UDP datagrams). Three major classes of service are:

Qos 0: "Messages delivered at most once" This is a best-efforts type of reliability. (Applications may build their own degree of reliability/retry mechanisms on top of it, of course).

Qos 1 "Messages delivered at least once" This guarantees delivery, but there might be a duplication of messages.

Qos 2 "Messages delivered exactly once" This is a reliable transport mechanism. Applications needn't build their own reliability/retry mechanism on top of it.

### Why block chains are relevant for the Internet of Things:

A key element of blockchains is that it has a distributed mechanism for admitting new entrants to the "voting system." The internet-of-things might have a huge number of nodes; having to manage them as they enter (or leave and re-enter) even through a hierarchically

arranged system would involve a huge administrative effort. With blockchain's distributed system, they can be admitted as "voters." But as small systems, the individual nodes will have relatively little "voting power."

What do + and # mean when specifying MQTT topics?

Topics are organized into a hierarchical namespace which looks superficially like a Unix file system namespace. Within the hierarchy, a "+" may be used as a wildcard at any level of the hierarchy, while a "#" at the end will match as a wildcard for anything at or below that level of the hierarchy.

Min mosquitto\_sup, the -t arg specifies message topic

Sample run of mosquitto\_sub:

Here are the first few outputs; there seem to be two formats and they are coming about one per second. At least one of them appears to be sending a position (including altitude, which looks like it's somewhere in Peasanton California. Not clear if this is some type of device transmitting it's position, or some type of regular differential-GPS correction message). There are also other messages that look like they're some type of "elevation/azimuth" with an item called PRN; which might be related to the GPS Pseudo Random Noise code of GPS. I'm suspecting that this "topic" is somehow related to satellite navigation. It looks like this feed is sending satellite reception information about once per second, then calculating a position once every 15 seconds or so.

Here is partial output.

```
root@17e94a3f3c15:/# mosquitto_sub -t /applications/in/+ /public/# -h 169.44.201.108
{"t":1526876790,"r":{"lat":37.659482896,"lon":-121.85896457,"alt":146.914}}
{"t":1526876791,"d":{"PRN":4,"el":31,"az":241,"ss":18,"used":false},
{"PRN":10,"el":32,"az":231,"ss":0,"used":false},{PRN":13,"el":24,"az":57,"ss":29,"used":true},
{"PRN":15,"el":43,"az":92,"ss":35,"used":true},{PRN":16,"el":29,"az":292,"ss":0,"used":false},
{"PRN":20,"el":80,"az":261,"ss":29,"used":true},{PRN":21,"el":67,"az":342,"ss":21,"used":true},
{"PRN":26,"el":30,"az":259,"ss":14,"used":true},{PRN":27,"el":12,"az":318,"ss":24,"used":true},
{"PRN":29,"el":45,"az":141,"ss":26,"used":false},
{"PRN":131,"el":46,"az":172,"ss":0,"used":false},
{"PRN":135,"el":45,"az":198,"ss":0,"used":false},
{"PRN":138,"el":44,"az":157,"ss":0,"used":false}}}
{"t":1526876792,"d":{"PRN":4,"el":31,"az":241,"ss":18,"used":false},
{"PRN":10,"el":32,"az":231,"ss":19,"used":false},{PRN":13,"el":24,"az":57,"ss":29,"used":true},
{"PRN":15,"el":43,"az":92,"ss":35,"used":true},{PRN":16,"el":29,"az":292,"ss":0,"used":false},
```

```
{"PRN":20,"el":80,"az":261,"ss":29,"used":true},{ "PRN":21,"el":67,"az":342,"ss":21,"used":true},
{"PRN":26,"el":30,"az":259,"ss":11,"used":true},{ "PRN":27,"el":12,"az":318,"ss":24,"used":true},
{"PRN":29,"el":45,"az":141,"ss":25,"used":false},
{"PRN":131,"el":46,"az":172,"ss":0,"used":false},
{"PRN":135,"el":45,"az":198,"ss":0,"used":false},
{"PRN":138,"el":44,"az":157,"ss":0,"used":false}}
{"t":1526876793,"d":[{"PRN":4,"el":31,"az":241,"ss":18,"used":false},
{"PRN":10,"el":32,"az":231,"ss":18,"used":false},{ "PRN":13,"el":24,"az":57,"ss":29,"used":true},
{"PRN":15,"el":43,"az":92,"ss":34,"used":true},{ "PRN":16,"el":29,"az":292,"ss":0,"used":false},
{"PRN":20,"el":80,"az":261,"ss":29,"used":true},{ "PRN":21,"el":67,"az":342,"ss":21,"used":true},
{"PRN":26,"el":30,"az":259,"ss":11,"used":true},{ "PRN":27,"el":12,"az":318,"ss":23,"used":true},
{"PRN":29,"el":45,"az":141,"ss":23,"used":true},{ "PRN":131,"el":46,"az":172,"ss":0,"used":false},
{"PRN":135,"el":45,"az":198,"ss":0,"used":false},
{"PRN":138,"el":44,"az":157,"ss":0,"used":false}]}
```