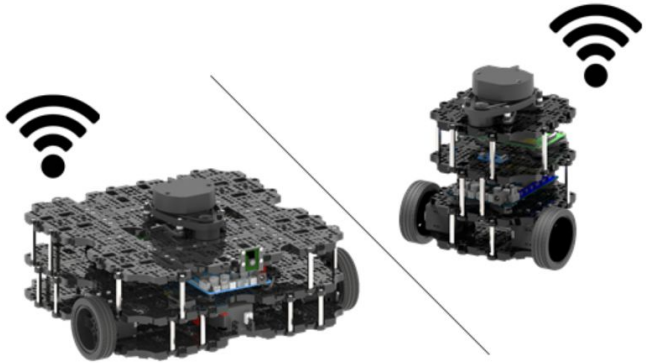
Connection to physical robot using ROS

Connect the remote PC and Turtlebot3

TurtleBot



ROS_MASTER_URI = http://IP_OF_REMOTE_PC:11311
ROS_HOSTNAME = IP_OF_TURTLEBOT

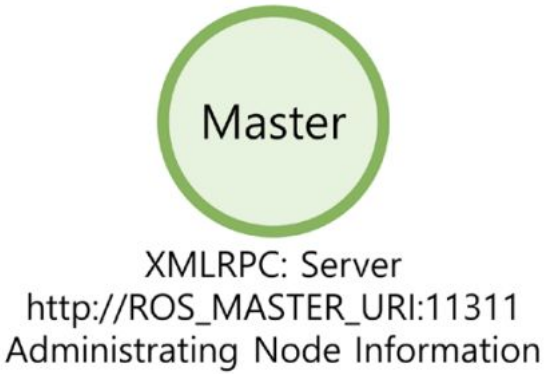
Remote PC

ROS_MASTER_URI = http://IP_OF_REMOTE_PC:11311
ROS_HOSTNAME = IP_OF_REMOTE_PC

* Example when ROS Master is running on the Remote PC

Running the master

```
$ roscore
```



XMLRPC

What is XML-RPC?

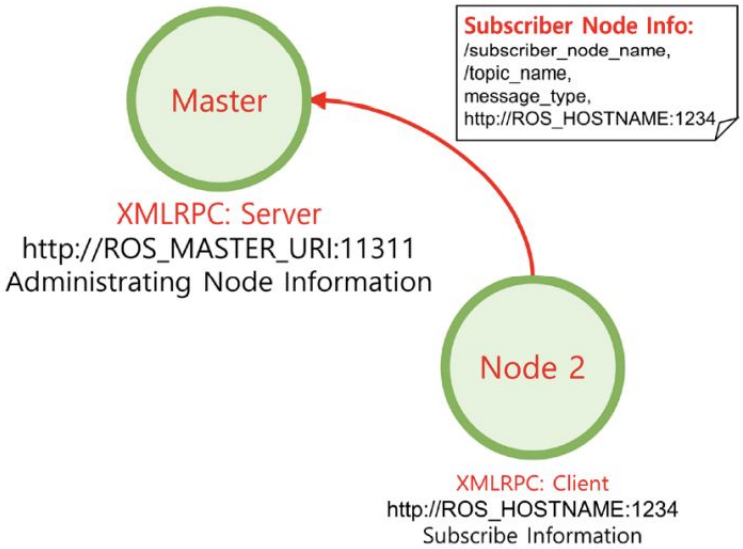
It's a spec and a set of implementations that allow software running on disparate operating systems, running in different environments to make procedure calls over the Internet.

It's remote procedure calling using HTTP as the transport and XML as the encoding. XML-RPC is designed to be as simple as possible, while allowing complex data structures to be transmitted, processed and returned.

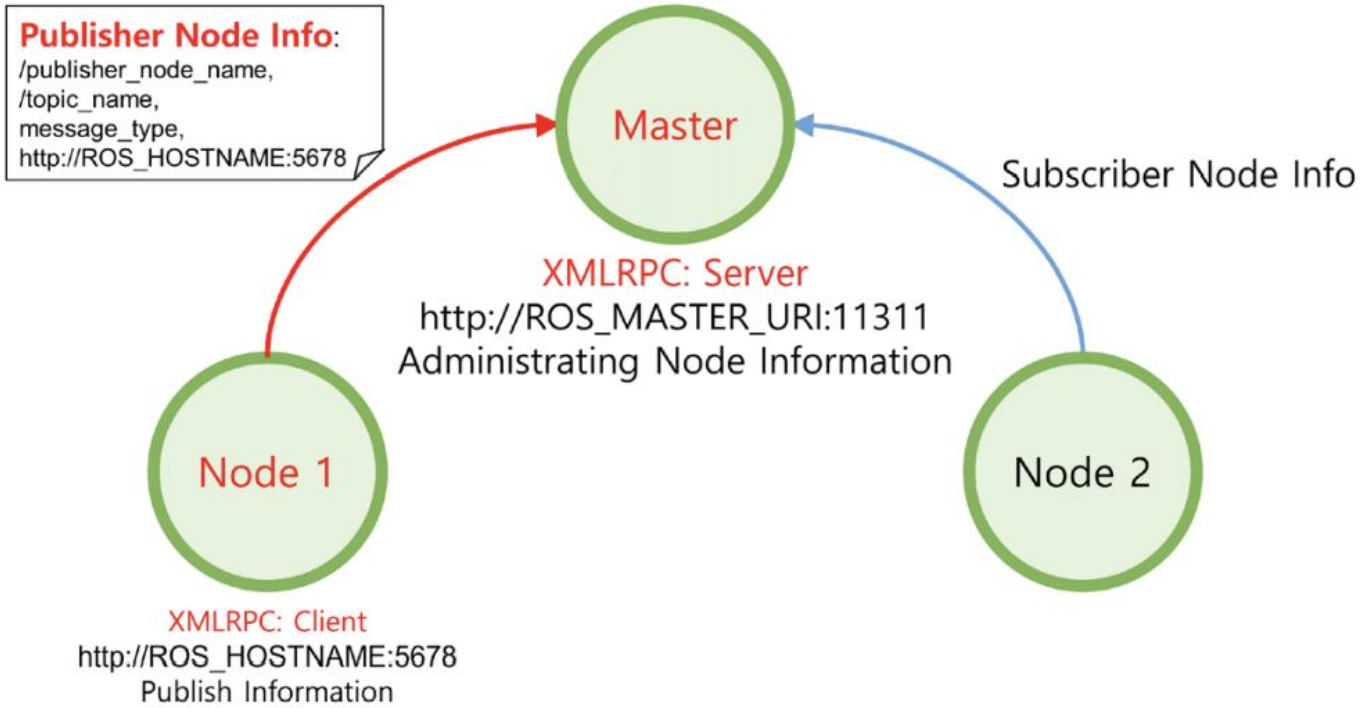
http://xmlrpc.com/

Running the Subscriber Node

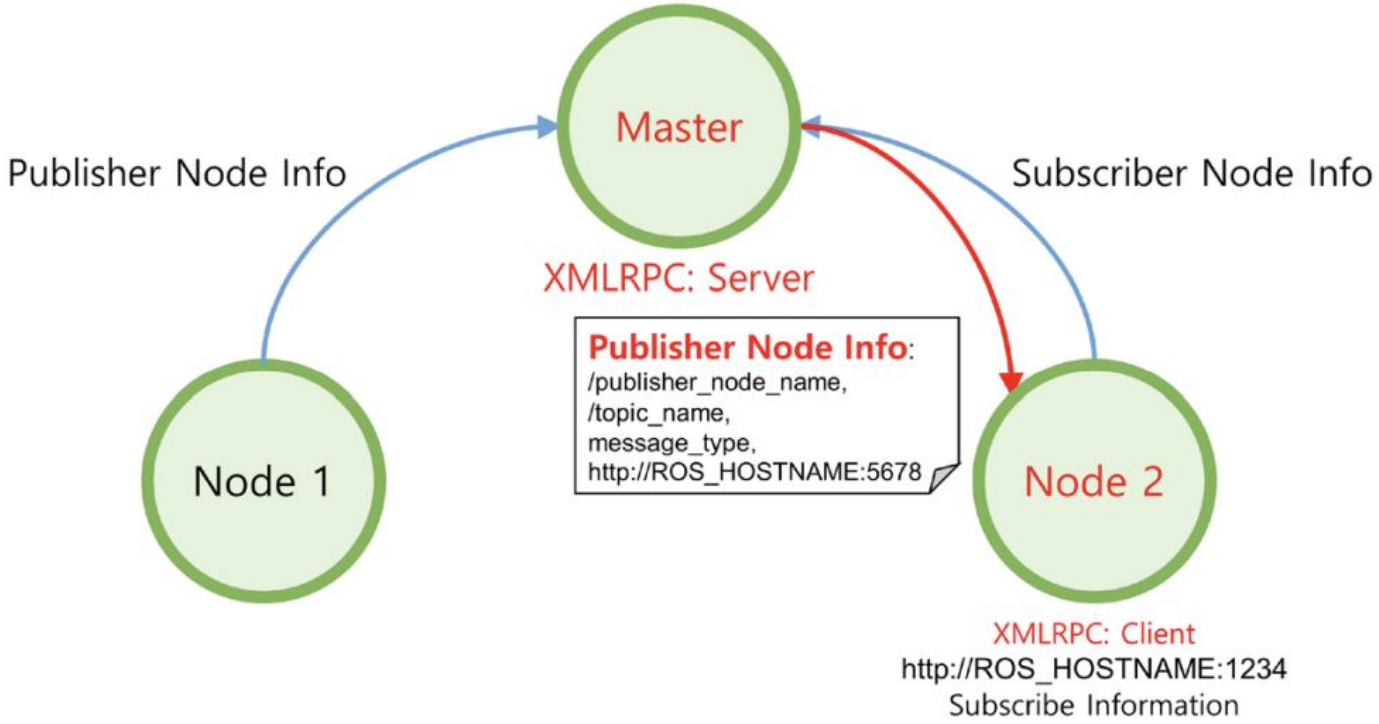
```
$ rosrun PACKAGE_NAME NODE_NAME
$ roslaunch PACKAGE_NAME LAUNCH_NAME
```



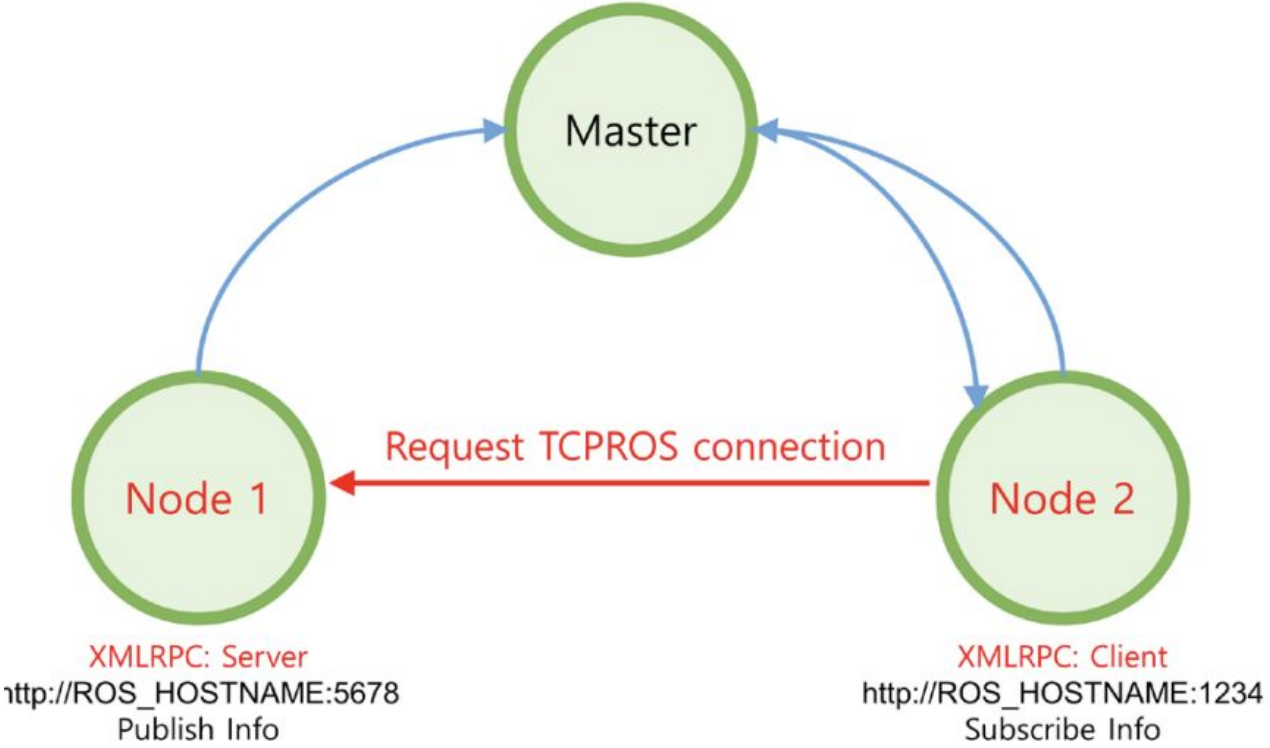
Running the Publisher Node



Providing Publisher Information



Connection Request from the Subscriber Node



TCPROS

ROS/ TCPROS

TCPROS

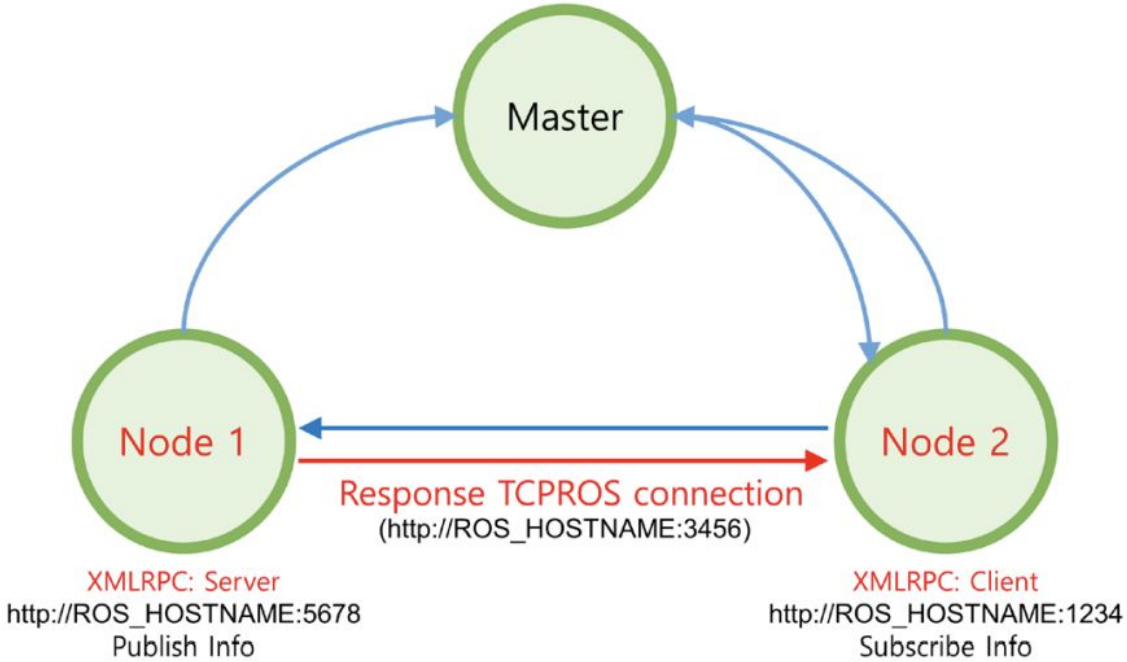
TCPROS is a transport layer for ROS Messages and Services. It uses standard TCP/IP sockets for transporting message data. Inbound connections are received via a TCP Server Socket with a header containing message data type and routing information. For more information about this header format, see Connection Header.

TODO: more information about wire protocol

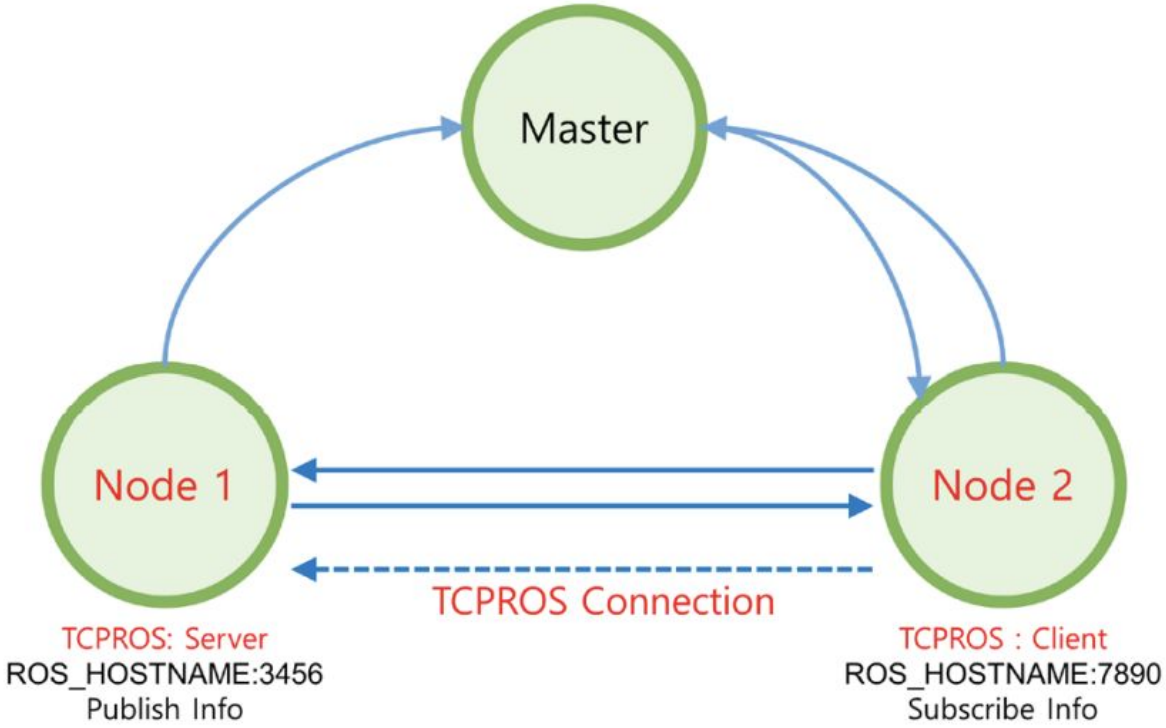
https://www.fortinet.com/resources/cyberglossary/tcp-ip

http://wiki.ros.org/ROS/TCPROS

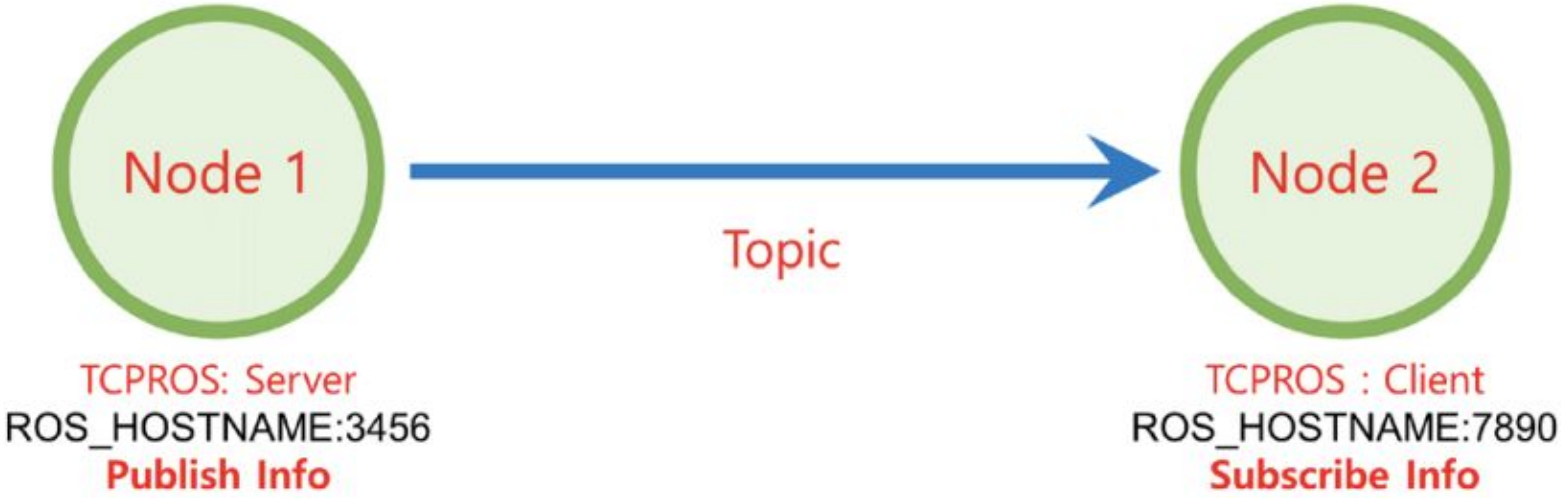
Connection Response from the Publisher Node



TCPROS Connection



Message Transmission By topic



Connection to physical robot

```
ironman@ironman-VirtualBox:~$ ssh ubuntu@10.155.234.16
The authenticity of host '10.155.234.16 (10.155.234.16)' can't be established.
ECDSA key fingerprint is SHA256:TABQuIJz9YsA/HESiewza2ozMjqVfnakWg3QIBNRjgA.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.155.234.16' (ECDSA) to the list of known hosts.
ubuntu@10.155.234.16's password:
Welcome to Ubuntu 18.04.5 LTS (GNU/Linux 5.4.0-1025-raspi aarch64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

  System information as of Thu Jan 27 21:05:55 UTC 2022
```

Connection to physical robot

```
431 packages can be updated.
170 updates are security updates.

New release '20.04.3 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

Your Hardware Enablement Stack (HWE) is supported until April 2023.

Last login: Thu Jan 27 21:05:32 2022
ubuntu@ubuntu:~$
```

Check the wifi of turtlebot3

robot1234
quickboat917

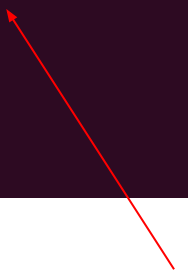
```
ubuntu@ubuntu:~$ ifconfig
eth0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        ether b8:27:eb:11:81:45  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 38  bytes 4310 (4.3 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 38  bytes 4310 (4.3 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

wlan0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 10.155.234.16  netmask 255.255.254.0  broadcast 10.155.235.255
        inet6 fe80::ba27:ebff:fe44:d410  prefixlen 64  scopeid 0x20<link>
        ether b8:27:eb:44:d4:10  txqueuelen 1000  (Ethernet)
        RX packets 93120  bytes 6802831 (6.8 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 432  bytes 54918 (54.9 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

Editing the ~/.bashrc of turtlebot 3

```
#export ROS_MASTER_URI=http://localhost:11311
#export ROS_HOSTNAME=localhost
export ROS_MASTER_URI=http://10.0.0.28:11311
export ROS_HOSTNAME=localhost
export TURTLEBOT3_MODEL=burger
"~/.bashrc" 132L, 4219C
```



Should be the master machine IP!

How to find the master IP (your laptop) -virtual machine