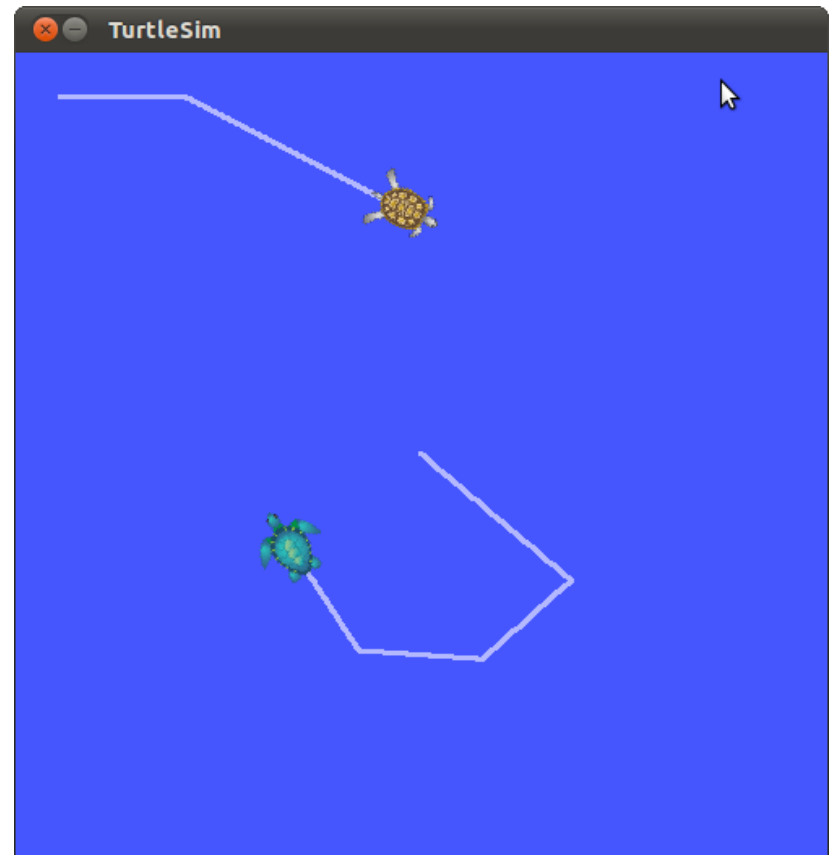# Handle Project Meeting
Shadow Robot

ROS

7 February 2012
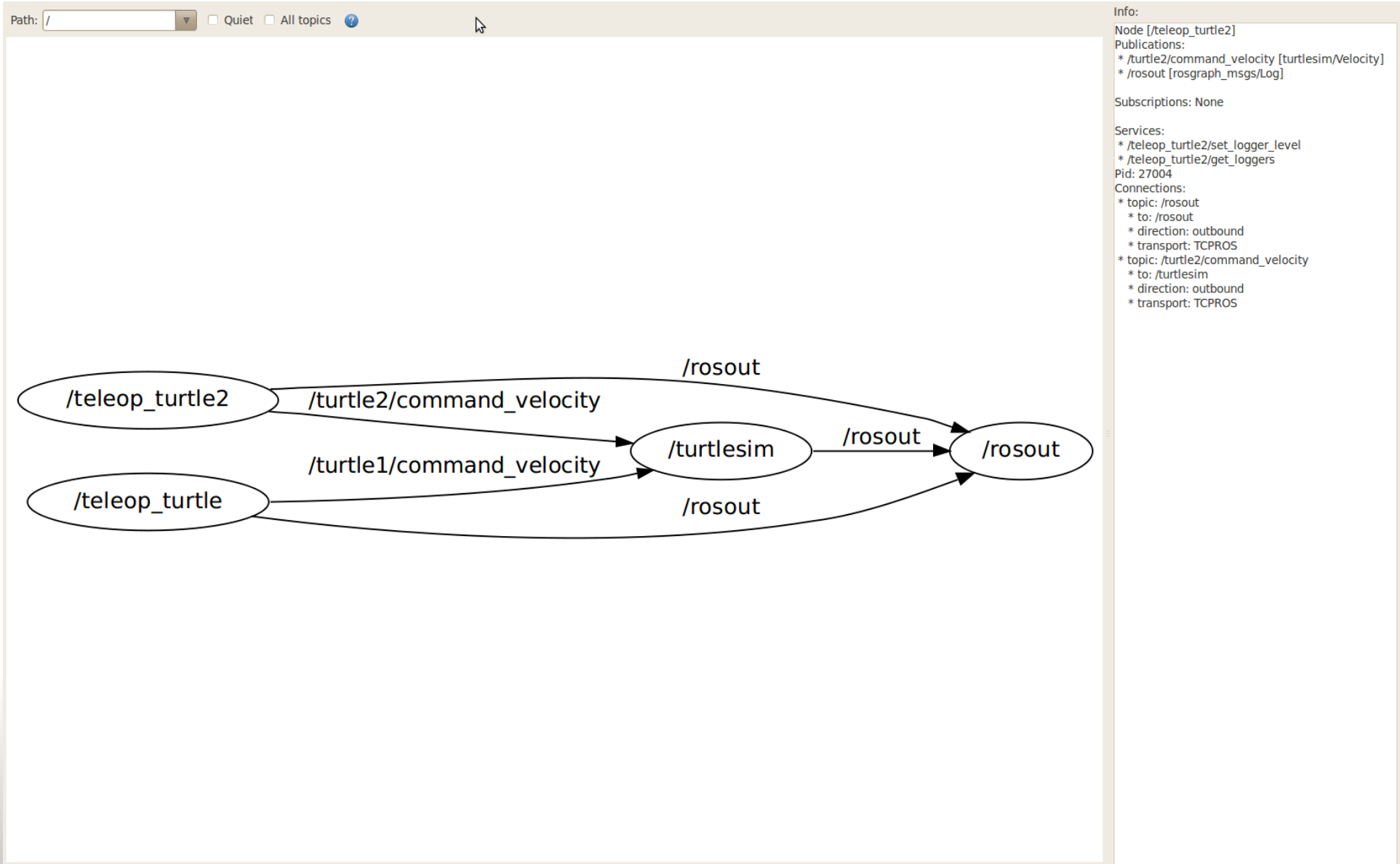Toni Oliver

What is ROS?

A meta-operating system for robotics:

- Provides the services you would expect from an OS

- ROS runtime "graph" is a peer-to-peer network of processes that are loosely coupled using the ROS communication infrastructure

TurtleSim

ROS Graph

ROS computation graph level

**Nodes** are processes that performs computation

They can run on different machines

ROS implements several different styles of communication:

- synchronous RPC-style communication over **Services**

- asynchronous streaming of data over **Topics**

- storage of data on a **Parameter Server**

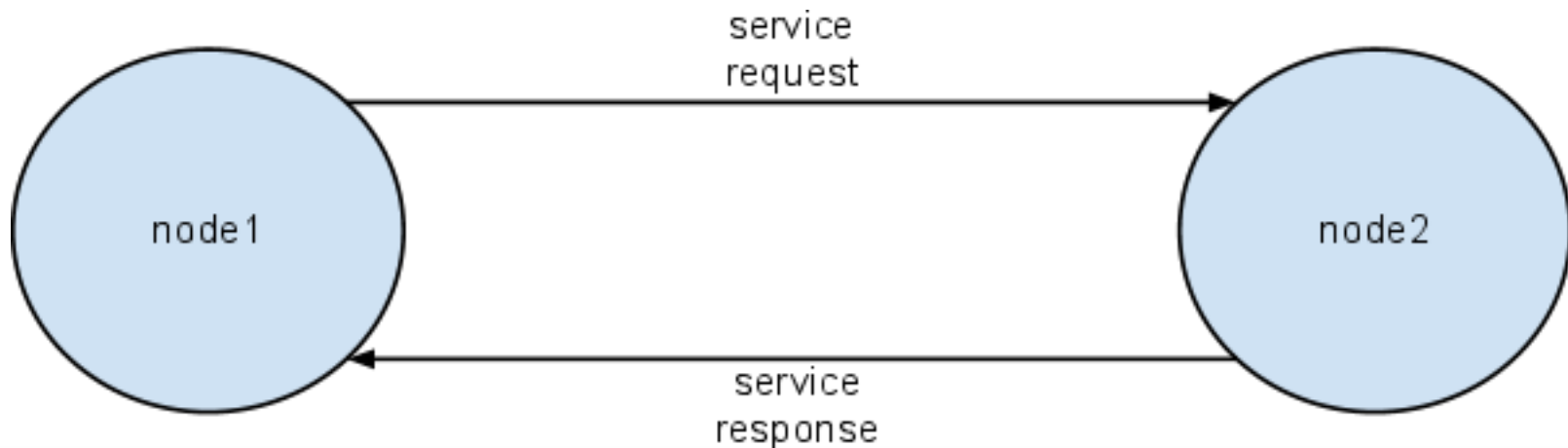- more advanced mechanisms as actionlib services, nodelets, etc

Topics

A node sends out a message by publishing it to a given topic
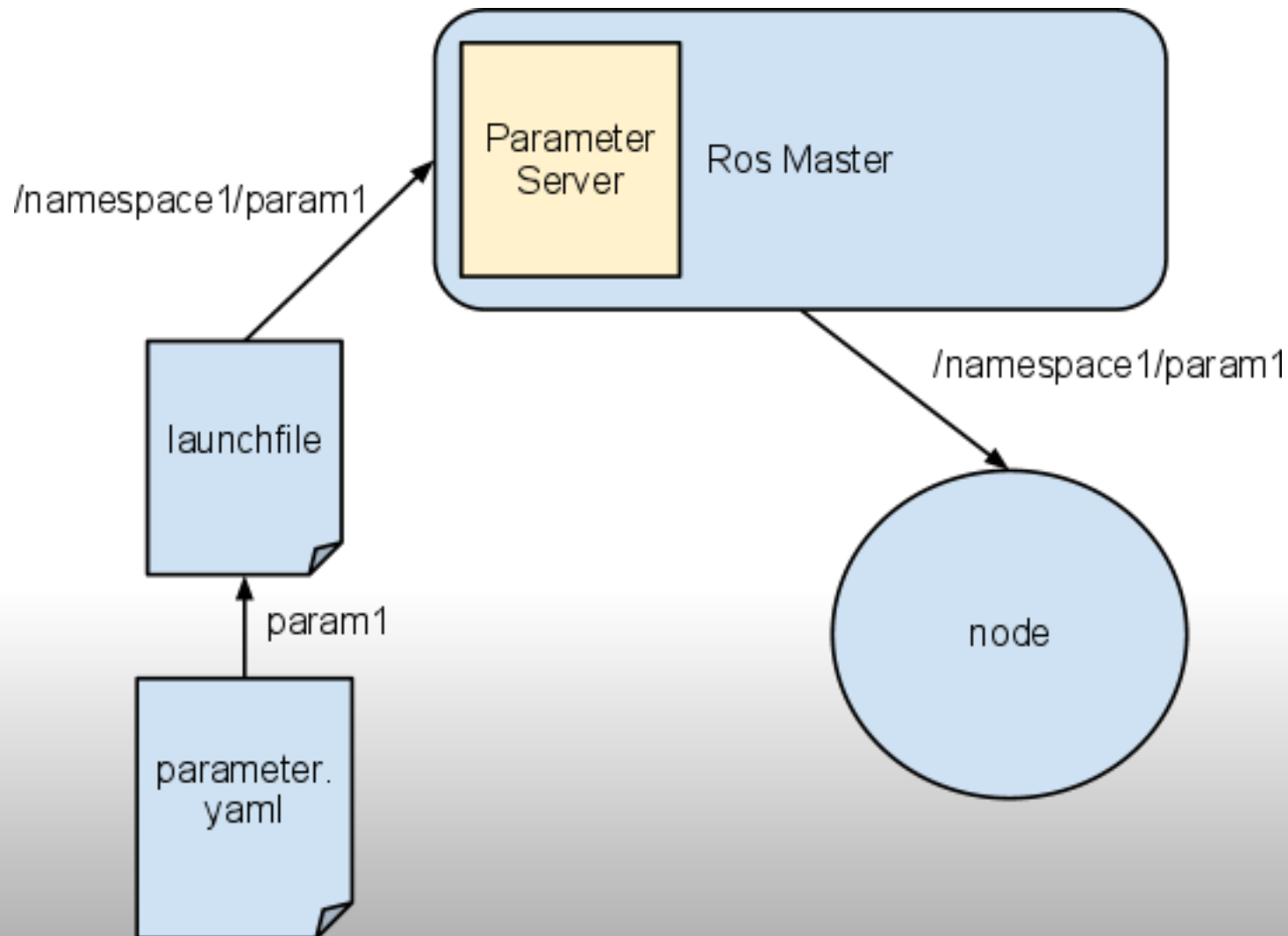A **message** is simply a data structure, comprising typed fields
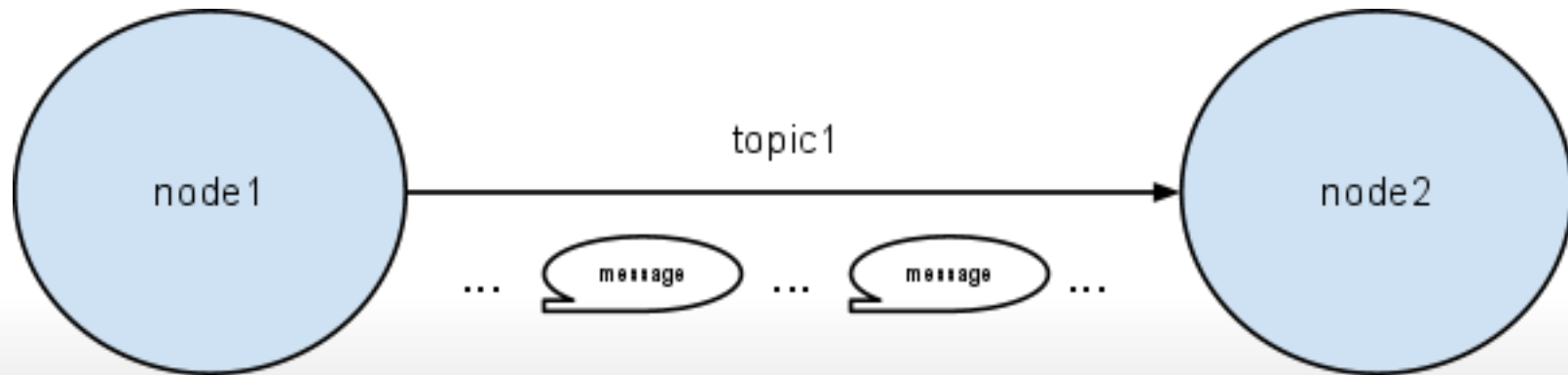
Services

Provide a RPC style request/reply interaction between nodes
Two message structures are defined: Request and Response
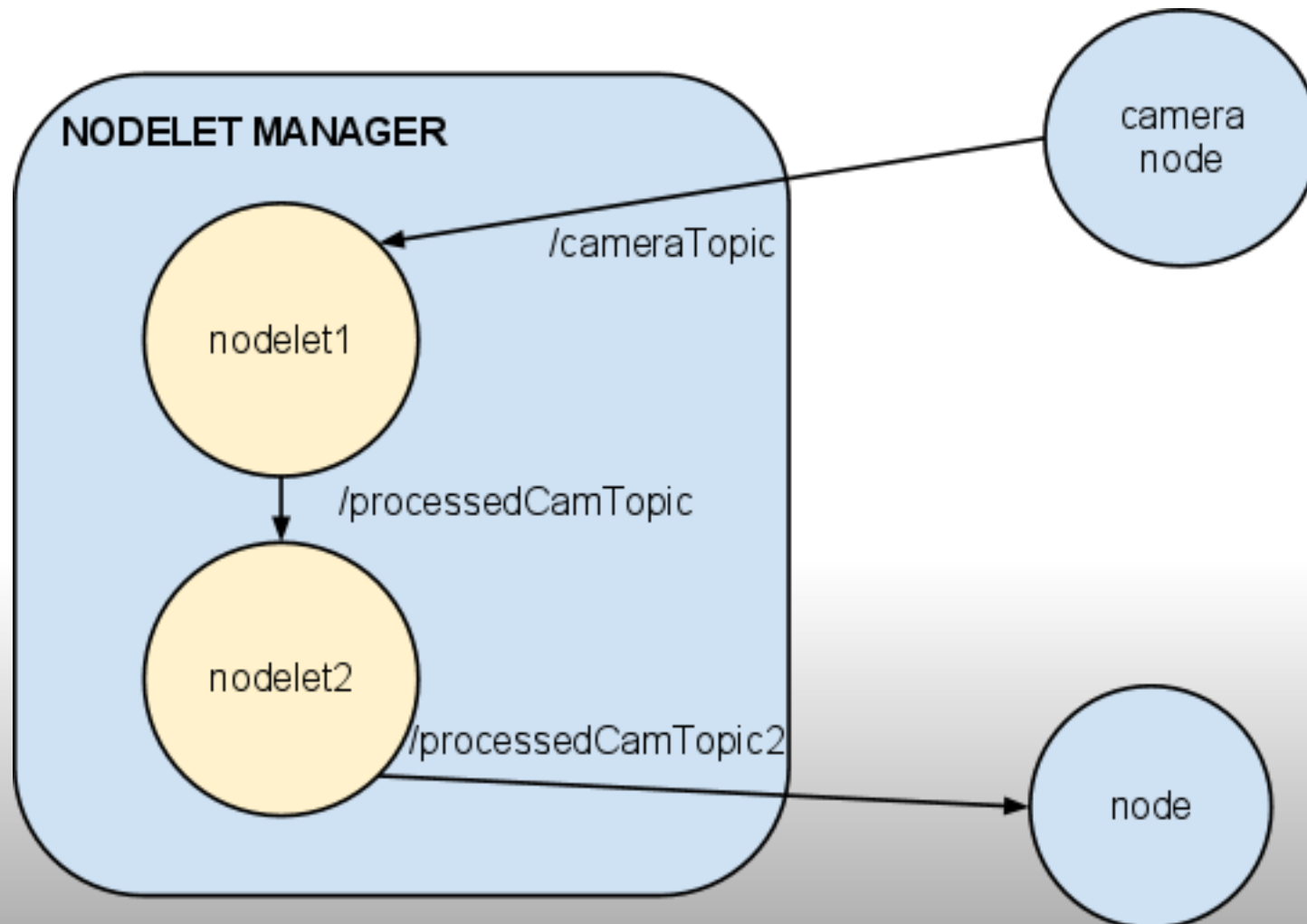Only one provider per service

Parameters

A parameter can be loaded on the Parameter Server by a node or a launchfile. Any node can read any parameter from there.
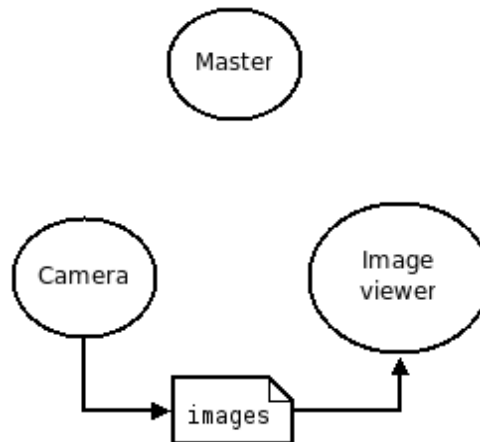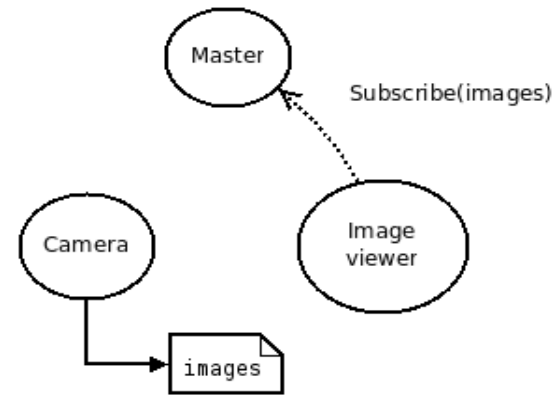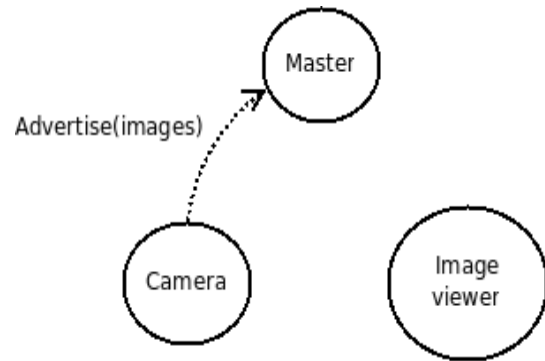
Nodelets

Multiple algorithms (nodelets) in the same process
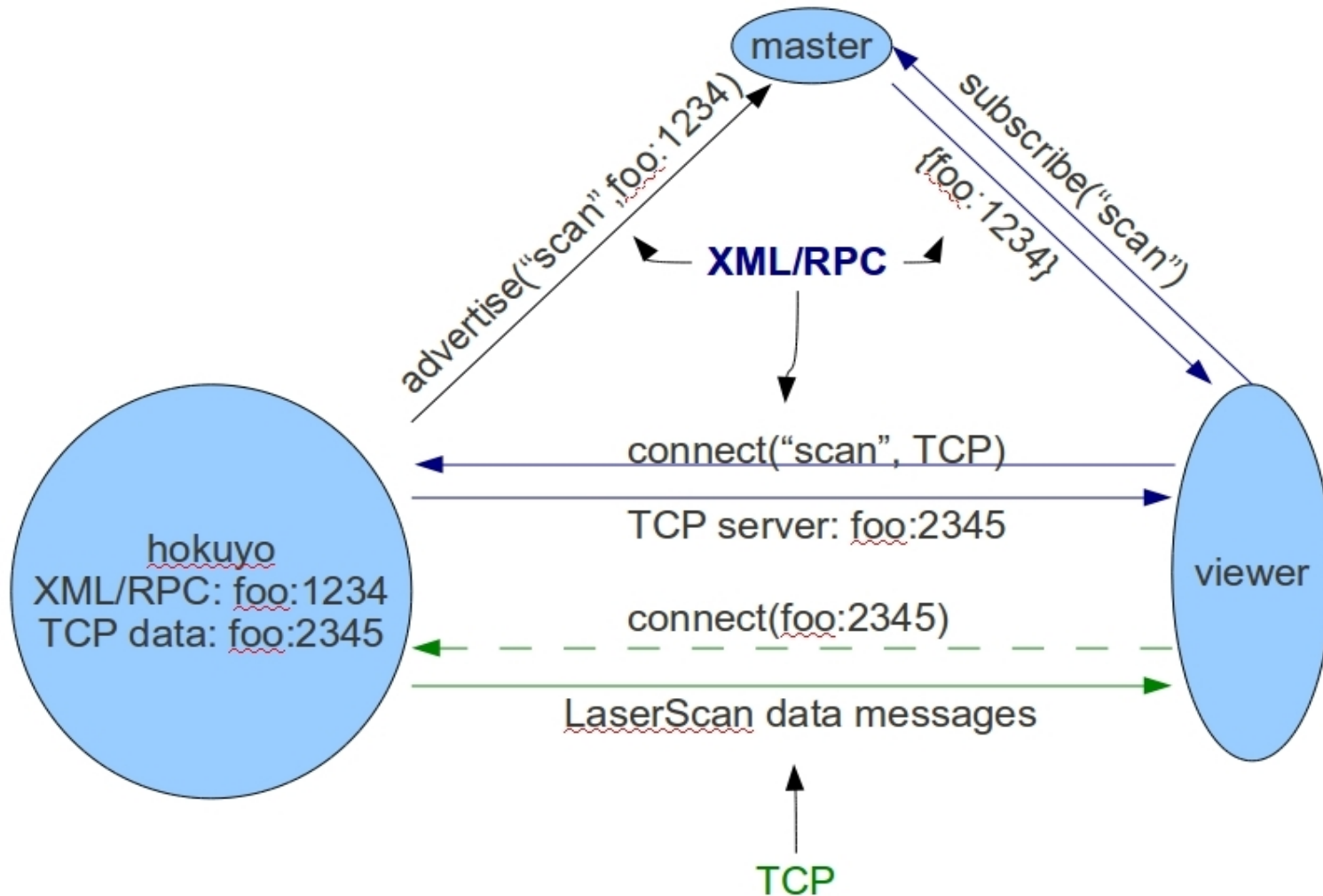Zero copy cost and no network traffic

ROS Master

The ROS Master provides naming and registration services to the rest of the nodes in the ROS system

ROS Master

Underlying mechanism to publish, subscribe and transmit messages over a topic.

ROS filesystem level

- Package (manifest.xml) : main unit for organizing software.
  Can contain:
  - nodes
  - message definitions
  - service definitions
  - parameters
  - libraries

  Can depend on other ROS packages or external packages
- Stack (stack.xml): collection of packages

ROS filesystem level: Tools

- roscd

- rospack (find, list)

- rosinstall

- rosdep (install)

ROS_PACKAGE_PATH determines package search order,
which allows overlays

Some considerations on ROS

- Easy to use
- Lots of available tools:
  - rosgraph
  - rostopic
  - rosservice
  - rosnode
  - rosbag
- Lots of existing packages to use
  - gazebo
  - tf
- Active community: Ros Wiki, Ros Answers
- It's open source (BSD license)