

Kingfisher: A MOOS-Enabled USV for Marine Sensing



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Vessel Introduction



Mechanical

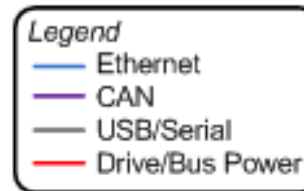
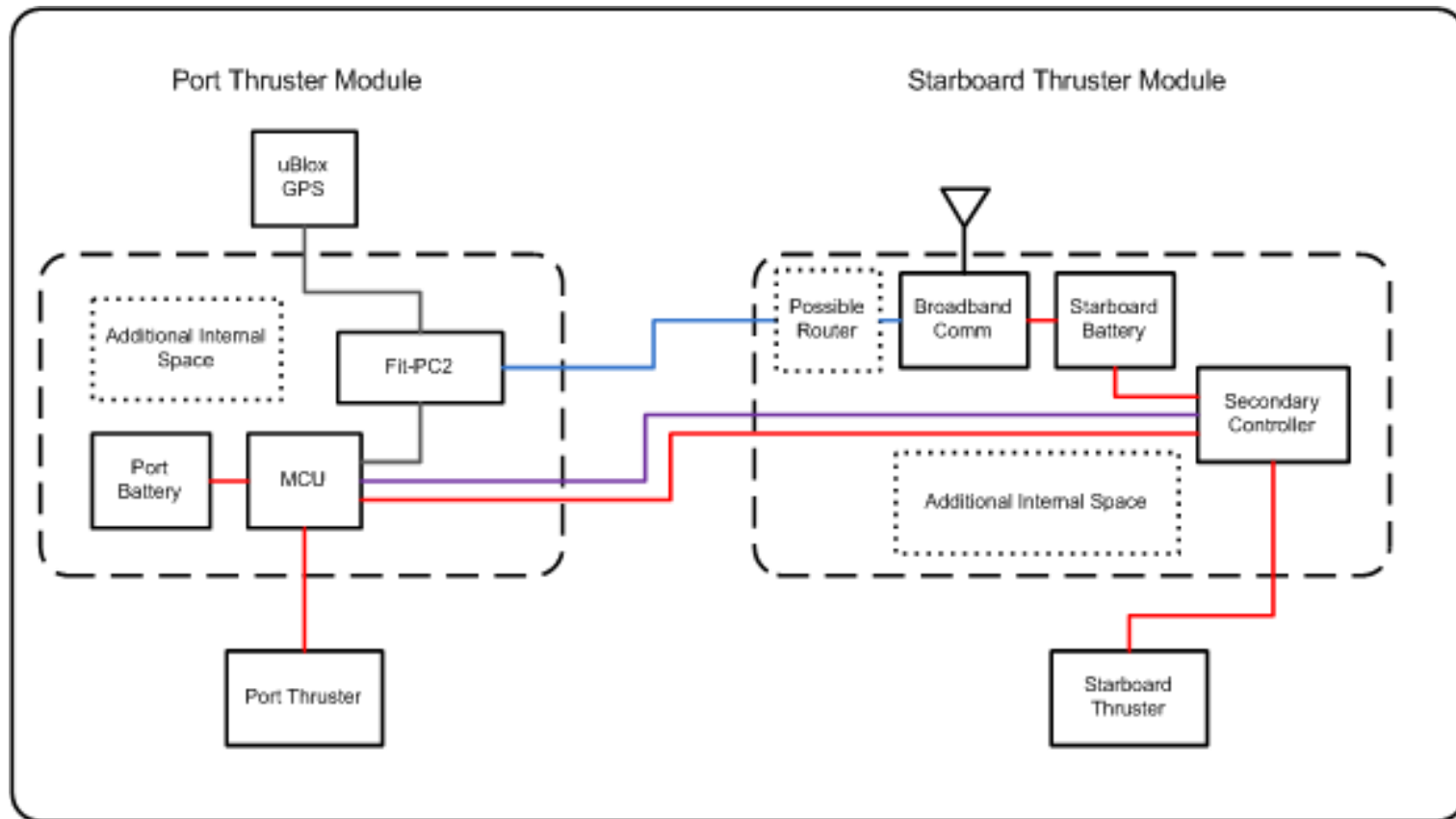
- Dimensions: 1.3 x 1.3 x 0.5 m (assembled)
- Weight: 30 kg
- Payload: 6 kg
- Max speed: 3 kn forward, 1.5 kn reverse
- Draught: 0.3 m
- Thrust: 270 N
- Steering: Differential Thrust

Electrical

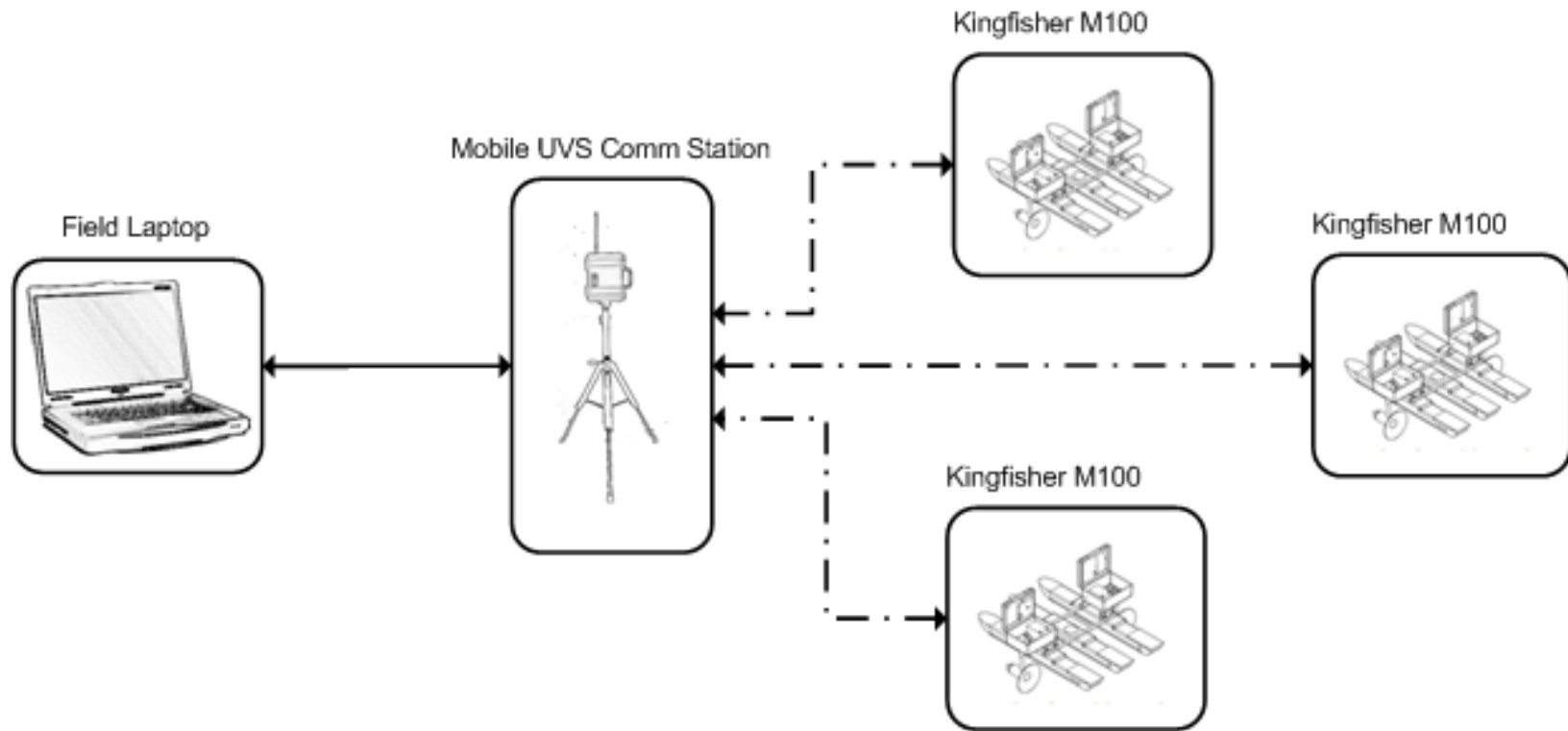
- Runtime: 3 hrs typ. / 10 hrs max
- Drive Power: 200 W peak
- Battery: 2x 12 V 12 Ah NiMH
- Charge Time: 9 hrs

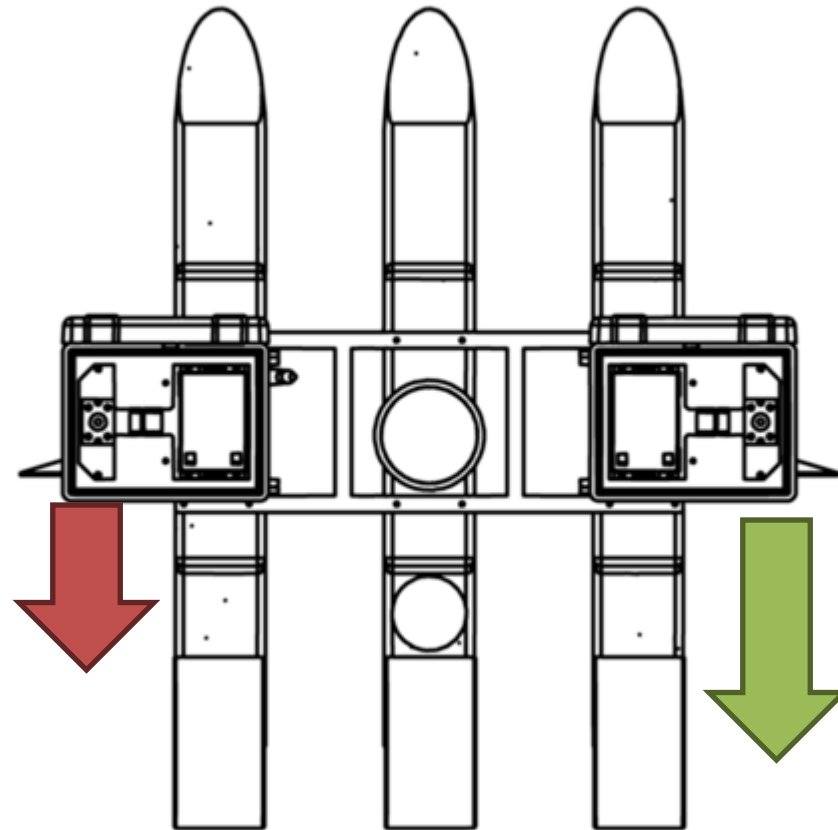
Interfacing

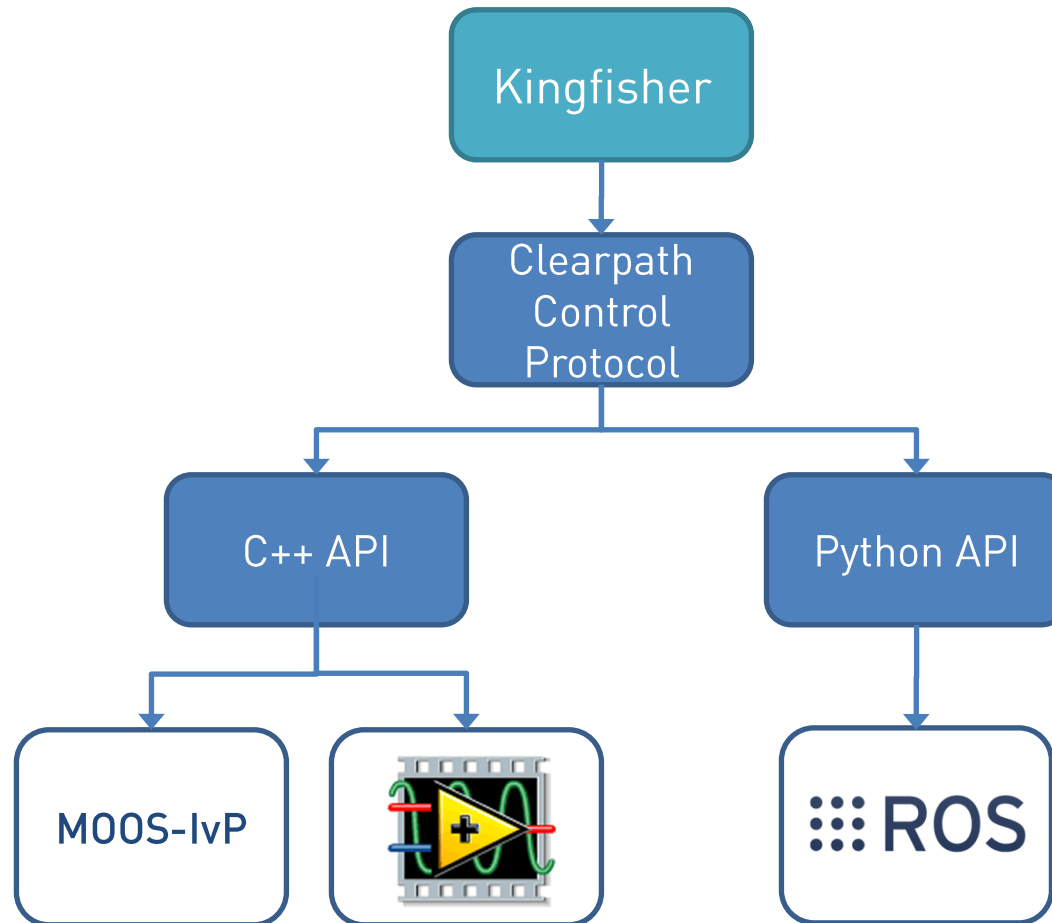
- Comm: 2.4 GHz/54 MBps broadband multi-topology network
- Override: 2.4 GHz DSS R/C
- Feedback: Current, voltage



MIT System Architecture









Use at MIT for Research and Education



- 2004 – MIT purchased 6 autonomous kayaks (Navy collaborators purchased 4 more)
Robotic Marine Systems – www.maribotics.com
- Most of the initial field-testing of MOOS-IvP was done on these kayaks.



- Low-Cost platforms allows less risk aversion to non-scripted (adaptive and collaborative autonomy).
- Lower cost means a single organization can own multiple vehicles.
- The small size means they won't hurt people or damage property in worst-case scenarios (Tolerated on the Charles River around students and sailboats).
- By low-cost and lightweight, we mean not:



MOOS-DAWG 2011

Made by Sea Robotics
NATO Undersea Research Centre

Cambridge, MA



Made by H-Scientific
NATO Undersea Research Centre

19 July – 20 July

- Feb 2011 – MIT purchased 2 Kingfisher USVs from Clearpath Robotics
- Initial purchase motivated by use in the Spring 2011 course at MIT – 2.017 - “Design of Electrical Mechanical Robotic Systems” Prof. John Leonard.

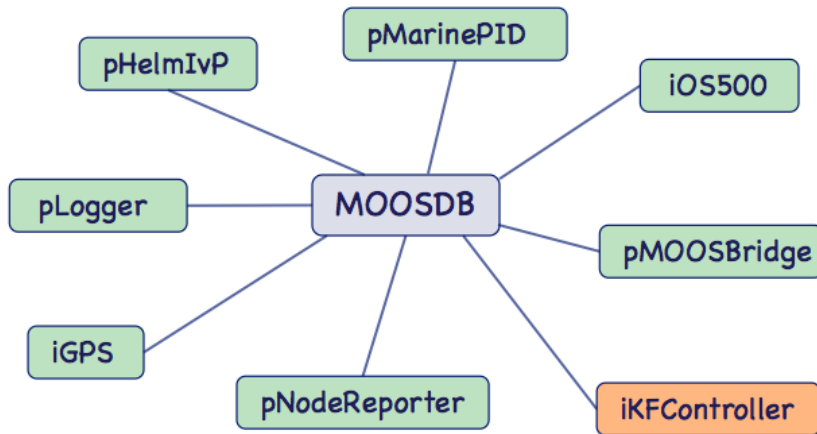


A team of students

- Integrated MOOS-IvP
- Integrated a WHOI acoustic modem and the Goby Acomms software
- Developed their own autonomy behaviors to find beacons at unknown locations using range-only information from the acoustic modem or uSimBeaconRange.

Recap: Kingfishers are very capable, lightweight vehicles for multi-vehicle autonomy research.

They are the likely platform to be used in a new course in Marine Autonomy at MIT in the Spring of 2012.



Existing MOOS Modules

- | | |
|---------------|--|
| pHelmIvP | - The IvP Helm |
| pMarinePID | - PID actuator control |
| iOS500 | - Interface to the OS5000 compass |
| iGPS | - Interface to the ublox LEA-6 GPS module |
| pLogger | - Logs MOOS transactions for post-analysis |
| pNodeReporter | - Produces a node summary for export |
| pMOOSBridge | - Bridges data to off-board communities |

iKFController

- The iKFController MOOS module accesses (links against) the Clearpath Robotics API.
- It converts DESIRED_THRUST postings to the appropriate level of output to the thrusters.
- It converts DESIRED_RUDDER postings to the appropriate differential level of output to the thrusters to provide the equivalent of a rudder angle.

Software: The “moos-ivp-kfish” tree on SVN

- The moos-ivp-kfish tree contains the iKFController MOOS module and the Clearpath Robotics API libraries.
- Available for public download:

svn co <https://oceanai.mit.edu/svn/moos-ivp-kfish>



Wiki Page: MOOS-IvP on the Kingfisher

- The wiki page contains information about the two MIT Kingfisher platforms, but could be made more general to any Kingfisher owner using MOOS-IvP
- Access at:

<http://oceanai.mit.edu/kfisher/pmwiki/pmwiki.php?n=Main.HomePage>

