

UNDER THE HOOD OF IOCEANSERVERCOMMS

A Look at the Challenges of
Implementing the Backseat Driver
on the OceanServer Iver2 AUV

Scott R. Sideleau, Donald P. Eickstedt
Naval Undersea Warfare Center (NUWC)
Newport, RI



Overview

- Backseat Driver Architecture
- Brief History of iOceanServerComms
- Current Capabilities
- Configuration & Setup
- Lessons Learned & Results
- Future Capabilities
- Getting Source & Support

Overview

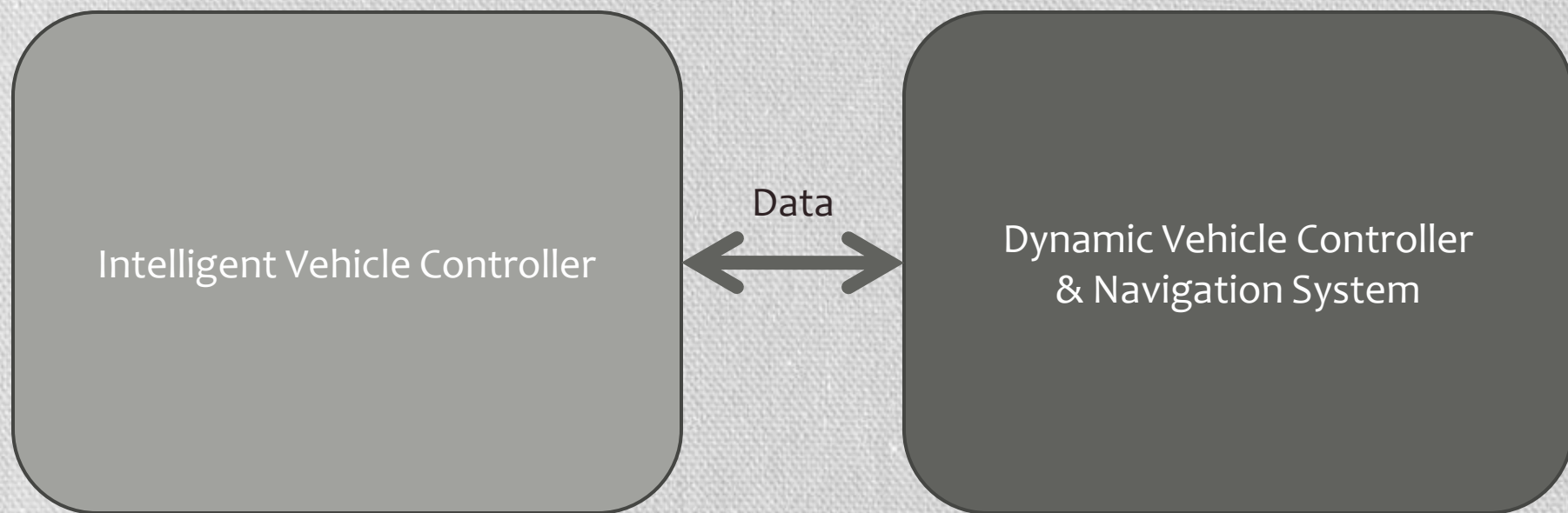
- **Backseat Driver Architecture**
- Brief History of iOceanServerComms
- Current Capabilities
- Configuration & Setup
- Lessons Learned & Results
- Future Capabilities
- Getting Source & Support

What is the Backseat Driver?

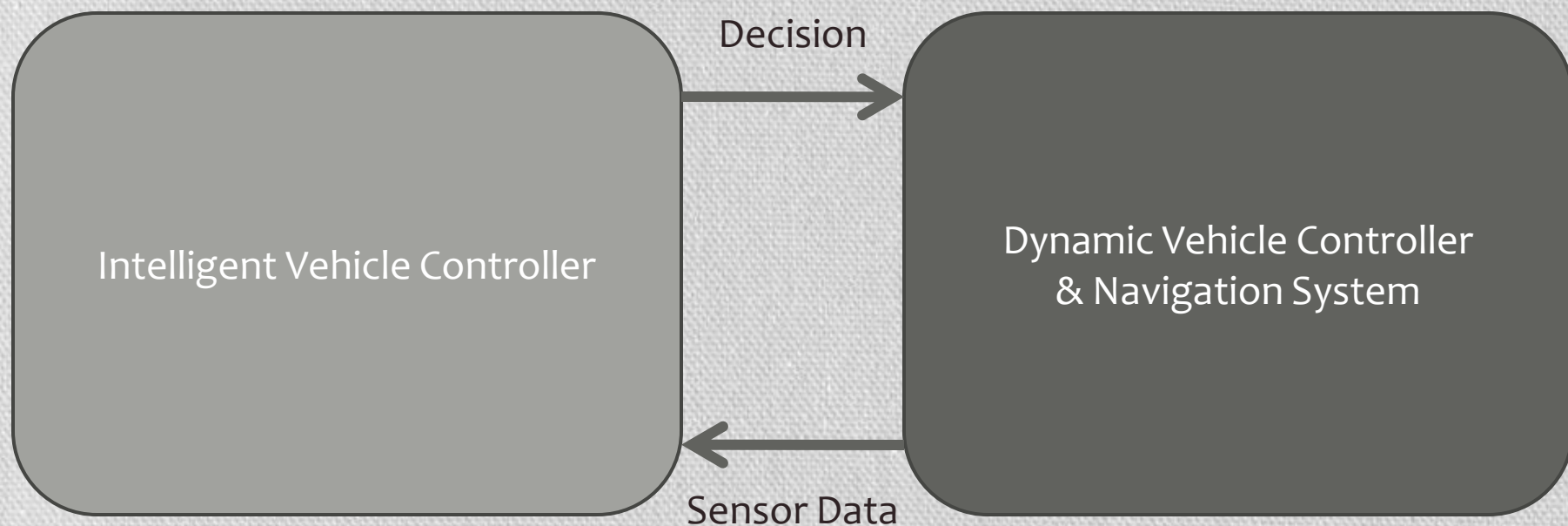
Classical Vehicle Control Architecture

Vehicle Controller & Navigation System

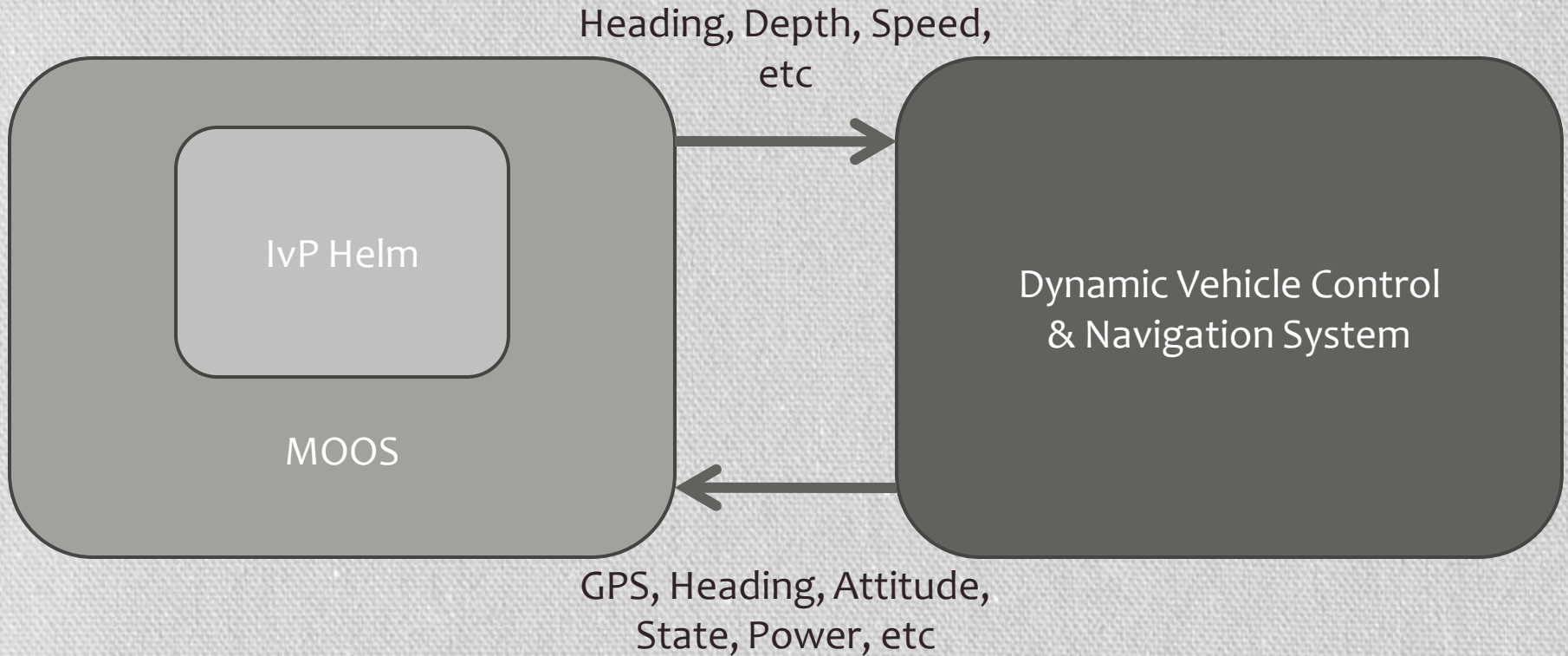
Decoupling of Vehicle Controller



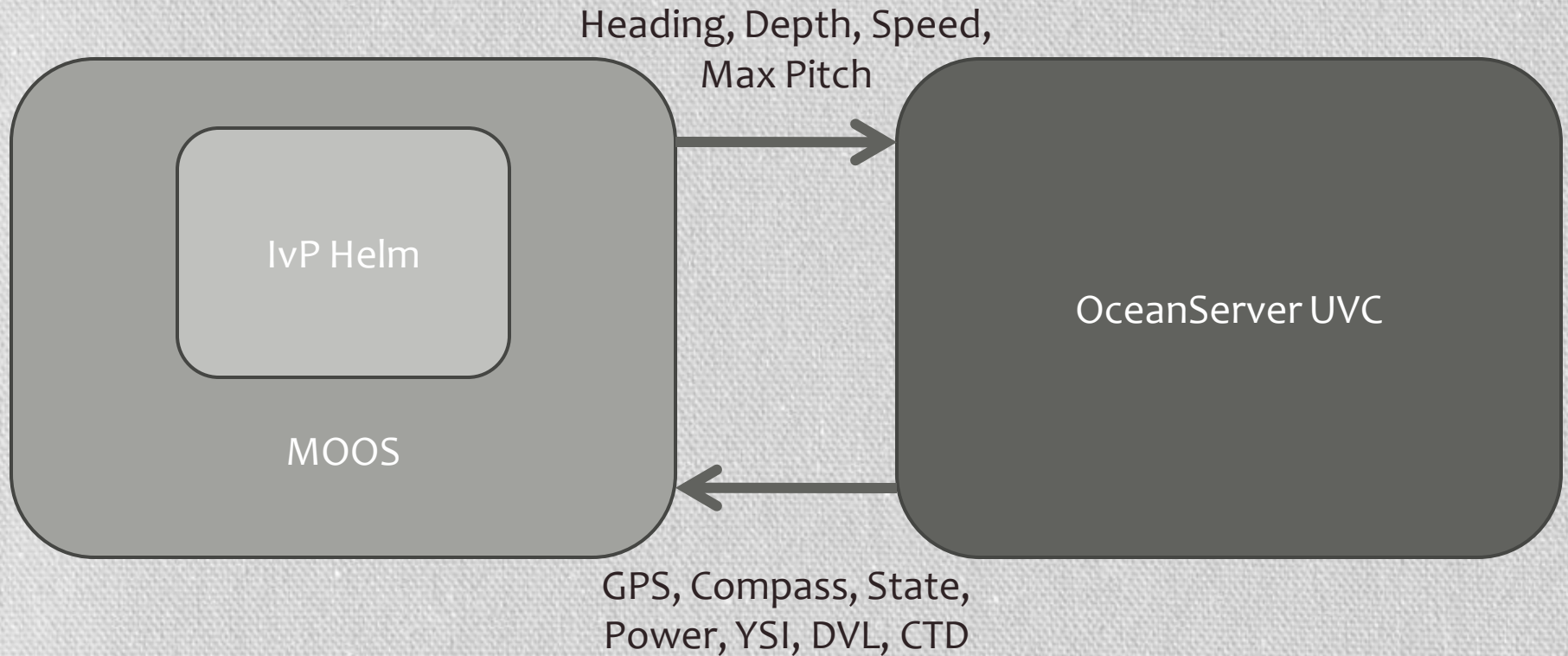
Decoupling of Vehicle Controller



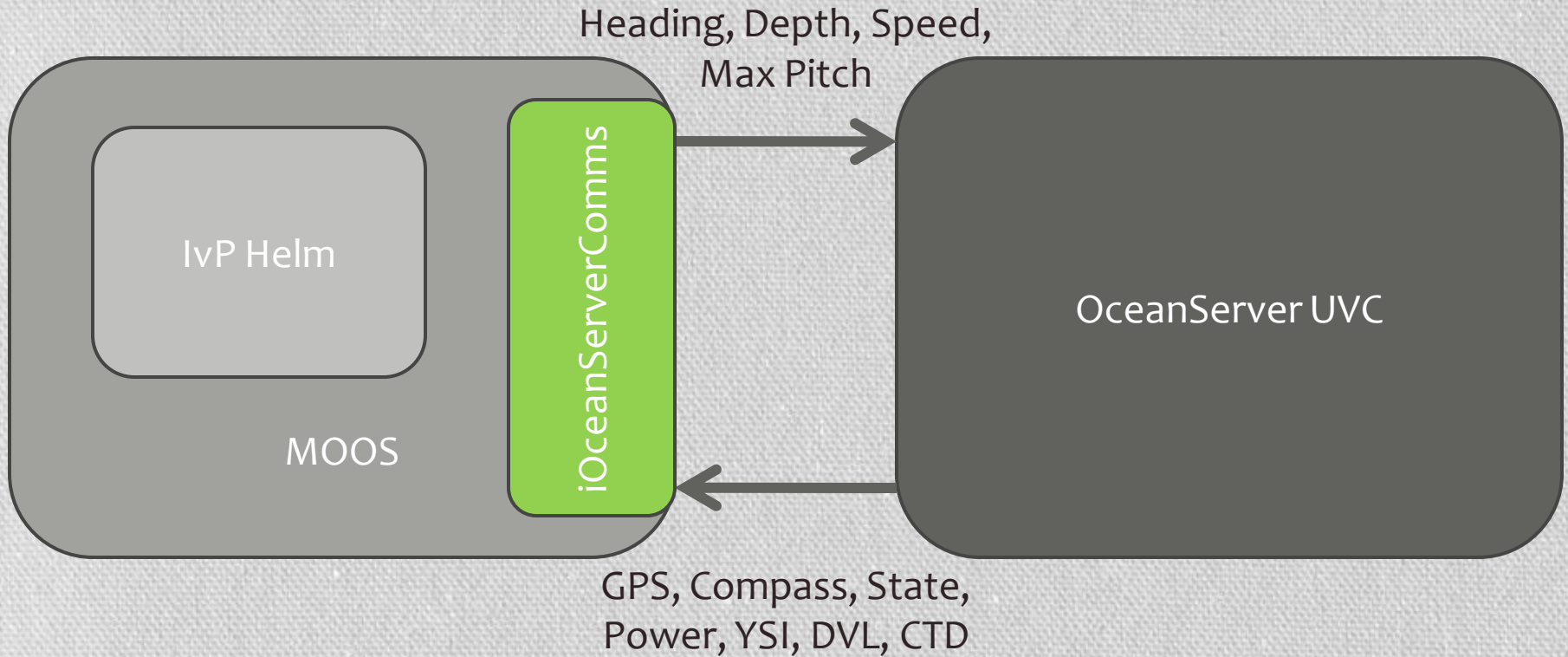
Backseat Driver Architecture



Interface to OceanServer Iver2 AUV



iOceanServerComms



Overview

- Backseat Driver Architecture
- **Brief History of iOceanServerComms**
- Current Capabilities
- Configuration & Setup
- Lessons Learned & Results
- Future Capabilities
- Getting Source & Support

Brief History of iOceanServerComms

- Developed as NUWC/UMass-D partnership pre-2007
- Delivered in late 2007 in semi-functional state
- Made functional in preparation for pre-GLINT '08 trials
- Minor changes through GLINT '09
- Significant refactorization/rewrite post-GLINT '09
- Public release via repository / Mailing list created
- Maintenance and additions on-going

Overview

- Backseat Driver Architecture
- Brief History of iOceanServerComms
- **Current Capabilities**
- Configuration & Setup
- Lessons Learned & Results
- Future Capabilities
- Getting Source & Support

Current Capabilities

- Parses all existing data messages and puts data into MOOSdb
 - \$C Compass Heading, Pitch, Roll, Depth
 - \$GPRMS GPS Latitude/Longitude
 - \$OSI State information, Altitude, Estimated frontseat position
 - \$OPI Battery information
 - \$YSI YSI Oceanographic Sensor Data
 - \$DVL Doppler Velocity Logger (DVL)
 - \$CTD Conductivity, Temperature, Salinity, Sound Speed
- Capable of commanding the vehicle
 - \$OSD Make data requests (see above)
 - \$OMS Send state space command
 - \$OJW Jump to Frontseat Waypoint

Overview

- Backseat Driver Architecture
- Brief History of iOceanServerComms
- Current Capabilities
- **Configuration & Setup**
- Lessons Learned & Results
- Future Capabilities
- Getting Source & Support

Configuration & Setup

- Free nsplug-based system available from Subversion repository
- Sample static files also available
- Requires two MOOS Configuration Blocks:
 - iOceanServerComms
 - pEchoVar
- Three items to be launched by ANTLER:
 - MOOSdb
 - iOceanServerComms
 - pEchoVar

Configuration: iOceanServerComms

```
//-----  
ProcessConfig = iOceanServerComms  
{  
    AppTick    = 1  
    CommTick   = 1  
  
    //Frontseat Serial Port Configuration  
    port       = /dev/ttyS0  
    BaudRate   = 19200  
    handshaking = false  
    streaming  = false  
  
    //Use Local UTM coordinate system?  
    UTM = false  
  
    //Request data from DVL?  
    DVL = false  
  
    //Request general CTD data?  
    CTD = false  
  
    //Request data string from YSI sonde?  
    YSI = true  
  
    //Are we in salt water? (Used for YSI sound velocity calculation.)  
    SaltWater = false  
  
    //Constraints  
    CommTimeout = 2 //seconds  
    ServoFilter = 0 //ticks  
}
```

Configuration: pEchoVar

```
//-----  
ProcessConfig = pEchoVar  
{  
    AppTick    = 2    //Run twice as fast as iOceanServerComms, for safety.  
    CommsTick = 2  
  
    ECHO = COMPASS_HEADING    -> NAV_HEADING  
    ECHO = COMPASS_DEPTH     -> NAV_DEPTH  
    ECHO = COMPASS_PITCH     -> NAV_PITCH  
    ECHO = COMPASS_ROLL      -> NAV_ROLL  
    ECHO = FRONTSEAT_ALTITUDE -> NAV_ALTITUDE  
    ECHO = FRONTSEAT_X       -> NAV_X  
    ECHO = FRONTSEAT_Y       -> NAV_Y  
    ECHO = FRONTSEAT_LAT     -> NAV_LAT  
    ECHO = FRONTSEAT_LONG    -> NAV_LONG  
    ECHO = FRONTSEAT_SPEED   -> NAV_SPEED  
}
```

Overview

- Backseat Driver Architecture
- Brief History of iOceanServerComms
- Current Capabilities
- Configuration & Setup
- **Lessons Learned & Results**
- Future Capabilities
- Getting Source & Support

Lessons Learned & Results

This section has been modified from its original version. It has been edited for content that will be exposed in future publications.

Please consult our journal article for more information...

Marine Technology Society (MTS) Journal

Volume 44, Number 4, July/August 2010

*“The Backseat Control Architecture for Autonomous Robotic Vehicles:
A Case Study with the Iver2 AUV”*

Donald P. Eickstedt, Scott R. Sideleau

Overview

- Backseat Driver Architecture
- Brief History of iOceanServerComms
- Current Capabilities
- Configuration & Setup
- Lessons Learned & Results
- **Future Capabilities**
- Getting Source & Support

Future Capabilities

- Continue to support changes to OceanServer's existing API
- Add support for new commands
 - \$OPOS – Update vehicle's internal predicted position
 - \$OLOGL, \$OLOGD – Insert data into frontseat vehicle log
 - \$OMSTOP, \$OMLOAD, \$OMSTART – Stop, load, and start existing missions
 - \$ORWSET – Change default frontseat settings
 - \$OPK – Park vehicle at lat/long for duration
 - \$ODVL – Update vehicle's internal predicted speed
 - \$OMW – Plan frontseat waypoints

Overview

- Backseat Driver Architecture
- Brief History of iOceanServerComms
- Current Capabilities
- Configuration & Setup
- Lessons Learned & Results
- Future Capabilities
- **Getting Source & Support**

Getting the Source & Support

To check out the source code...

svn co <https://oceanai.mit.edu/svn/backseat-iver-aro> backseat-iver

To sign-up to the mailing list...

<https://lists.csail.mit.edu/mailman/listinfo/moosiver>

Thanks!

Any questions?

Scott R. Sideleau

Naval Undersea Warfare Center (NUWC)

scott.sideleau@navy.mil

