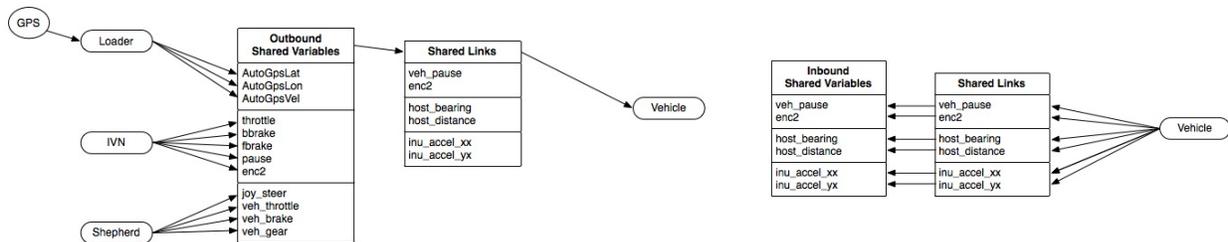


Kairos Autonomi Source Code Examples

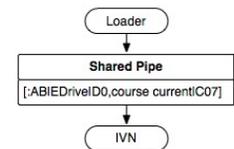
System Overview

The Kairos Autonomi software infrastructure is made up of several discrete executables, each doing very specific tasks. Each of these executables exchange data with each other in two ways: shared variables and named pipes.

The shared variables are stored in a contiguous memory pool and are indexable by referencing a variable name. Each executable can read and write into this memory pool. Additionally, each executable can receive a changed event when a variable of interest has been updated by another application. For example, the application that reads GPS positional data (i.e. dj_ldr.exe or Loader), will write to the shared variables gps3_latitude, gps3_longitude, gps3_velocity, etc. The application that handles autonomous path following (i.e. djDriveWB.exe or Drive) will read the shared variables produced by Loader and use them to command vehicle actuation. Another application (i.e. djSharedLCD.exe or SharedLCD) will also read the GPS position variables produced by Loader and use them to update the text overlay on the video stream. Care is taken to ensure that there is only one executable that writes to each shared variable but any number may read the data in the shared variable.



The second method of inter-process communication is the use of named pipes. Each instantiation of an executable has a distinct name associated with it. Continuing with the previous example, the pipe name for dj_ldr.exe is Loader and the pipe name for djDriveWB.exe is Drive. When Drive wants to command actuation position, it sends pipe commands to the application in charge of communication with the actuators, djJAUS_IVN.exe (IVN) or pipe name ServoPod. IVN receives the pipe message, commands the actuators and then updates shared variables to represent the new position or state.





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Up to this point, all inter-process communication has taken place on the same computer system. If data and commands need to be shared between two or more separate computers, another application is used called SharedLinkF (djSharedLinkF.exe). SharedLinkF encapsulates a user supplied list of shared variables and named pipe commands using a protocol called sharedlink and then sends the data over a UDP or serial data link. The remote side of that link will receive the data and commands, parse them, and then update the corresponding shared variables on the remote system and send the commands to the named pipe of that remote system. This works in both directions. An example of this is what happens during teleoperation of a remote Pronto4. The Operator Control Unit (OCU) will connect to the Pronto4 using SharedLinkF and send a pipe command to command the Pronto4 to enter teleoperation mode. The OCU will then begin updating shared variables that are generated by moving the joystick controls. SharedLinkF on the OCU reads those shared variables and then transmits them to the Pronto4. SharedLinkF on the Pronto4 will then write to the corresponding shared variable on the Pronto4. IVN will then read the shared variable and then command the correct actuators.

A Pronto4 system may have over 100 shared variables in use at a time. To manage these, Shared Element Management (djSVManage.exe or SVManage) was created. With this software tool, all shared variables in the system are exposed for the user to monitor. Additionally, pipe commands can be sent and received to test functionality.

Source Code

In the source code installer, sample code is provided for SharedLinkF, SVManage, and Servopod (precursor to IVN). It also includes an installer for the named pipes (DataSend) and the installer for the shared variables (beWISE). Below is an overview of the directory structure:

```
C:\GC07\Source
  Docs
  Pipes
    -Dataseed Installer
    -Docs
    -Examples
      -Dataseed C
      -UDP C
      -VB6
  Servopod
    -Examples
      -Python
  SharedLink
    -Examples
      -Perl
```



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- Python
- VB6
- djSharedLinkF
- SharedVariables
- Docs
- Examples
- Java
- urban.beWise
- Python
- Install
- SVManagement
- Examples
- VB6