

**J AUS Interface Control Document
For
Intelligent Ground Vehicle Competition
2006**

Version 1.0

October 24, 2005

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1 EXECUTIVE SUMMARY

INTELLIGENT GROUND VEHICLE COMPETITION 2006 JOINT ARCHITECTURE FOR UNMANNED SYSTEMS (JAUS) IMPLEMENTATION

1.1 Objective

JAUS is a set of standardized messages suitable for controlling all types of unmanned systems, and is soon to become an Aerospace Standard of the Society of Automotive Engineers (SAE). IGVC officials and sponsors believe that it would be valuable for student teams to become exposed to and familiar with JAUS. The intent is to start at a very simple level and increase the complexity in an incremental manner at successive IGVCs.

1.2 Voluntary Participation

Participation in the JAUS portion of IGVC by a student team is voluntary.

1.3 Implementation

There are two aspects to IGVC JAUS Implementation if a student team opts to participate. First, there will be a practical demonstration during the qualification certification phase of the Autonomous Challenge. The demonstration will consist of the vehicle being given JAUS message commands from an IGVC developed operator control unit (OCU) via an RF data link. The messages will be to start the vehicle moving forward in the autonomous mode, stop the vehicle from moving in the autonomous mode, and activate a warning device (horn/light). Student teams will be given the specific JAUS messages to implement and data link requirements by October 31, 2005 in an Interface Control Document (ICD). In order to give student teams as much advance warning as possible, the ICD will specify that the JAUS messages will be sent over an 802.11g link.

The second aspect of the IGVC JAUS Implementation is a description of the student team's implementation in the design competition. If a student team participates in the IGVC JAUS Implementation, they will be allotted one extra page in their report and two extra minutes during their oral presentation. The items to be addressed in the design report and presentation are:

1. Student team's process for learning about JAUS.
2. How the JAUS messages were integrated into the design.
3. Challenges to implementation that were encountered.

URL for the JAUS message set is <http://www.jauswg.org/baseline/refarch.html>.

1.4 Judging

Because IGVC JAUS Implementation is voluntary, there shall be no negative implications assigned or implied if a student team does not participate. Successful IGVC JAUS Implementation will on a pass-fail basis and consists of the vehicle performing the JAUS commands on the course during qualification and the student team's JAUS Implementation in the Design Competition.

1.5 Award

Student teams that pass the IGVC JAUS Implementation shall receive an award of \$500 (limit one award per school).

2 TECHNICAL APPROACH

The student teams are only required to implement the messages defined in this section as defined the JAUS Reference Architecture version 3.2 Part 3. Any required messages within the JAUS Reference Architecture document can be ignored for this competition. The IGCV developed OCU will only transmit the messages defined within this section and will not expect any status messages from the unmanned systems. Teams are not required to develop an OCU for this competition, but are free to develop one that may help in testing.

2.1 Network Based

The Radio Frequency will adhere to the 802.11g specification. The protocol will be carried using a Direct Sequence Spread Spectrum (DSSS) carrier that is prevalent in commercially available wireless Ethernet systems.

JAUS communication will be accomplished using UDP (User Datagram Protocol) over Ethernet. The UDP header, in addition to the JAUS header information and the standard UDP header information will include eight bytes containing the ASCII equivalent of "JAUS01.0". Only one JAUS message per UDP packet is allowed.

2.2 UDP Port Allocation

The following TCP/UDP ports shall be used for data transfer via Ethernet during the experiment:

Command and Control	3794
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2.3 IP Address Assignment

Communications: Internal (subsystem) traffic shall not leave the subsystem.

The IP address for the OCU shall be: 192.168.128.1

The IP addresses for the student unmanned vehicles shall be selected from the following range: 192.168.128.2-254

The unmanned vehicle must be developed such that the 802.11g radio is powered off while the unmanned system is not performing in the JAUS competition.

2.4 JAUS IDs

The following values will be used for the JAUS IDs:

The last octet of the IP address will be the Subsystem ID.

The Node ID will always be 1.

The Component ID for the unmanned system will be the Primitive Driver ID (33).

The Component ID for the OCU will be the System Commander ID (40).

The Instance ID will always be 1.

2.5 Mobility

The vehicle will start moving in its autonomous mode upon receipt of the JAUS Resume message (Cmd Code = 0004h).

The vehicle will stop moving upon receipt of the JAUS Standby message (Cmd Code = 0003h)

2.6 Warning Device Activation

A horn or light will be activated using the JAUS Set Discrete Devices message (Cmd Code = 0406h) using bit 1 of field #3 (Horn On/Off bit).