

**J AUS Interface Design Document
For
International Aerial Robotics Competition
2007**

Version 1.1

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RECORD OF REVISIONS			
Revision	Date	Pages Involved	Change Number
Initial	12 Mar 2007	Initial Release	
1.1	18 May 2007	Updated Section 2 to include JCTS distribution restrictions and non-US team award structure.	

1 EXECUTIVE SUMMARY

INTERNATIONAL AERIAL ROBOTICS COMPETITION 2007 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). IARC officials and sponsors believe that it is valuable for student teams to be exposed to and familiar with JAUS. The intent is to start at a very simple level and incrementally increase the complexity at successive IARCs.

1.2 Voluntary Participation

Student team participation in the JAUS portion of IARC is voluntary. No negative implications will be assigned or implied to teams that do not participate.

1.3 The Challenge

There are two aspects to IARC JAUS Challenge: (1) a written/oral presentation and, (2) a practical demonstration.

1.3.1 Written/Oral Presentation

Teams will be allotted a five minute oral presentation slot immediately after their Static Judging time to brief a special JAUS Judge orally. A design report of 1 to 5 pages describing their JAUS implementation will also be due at that time. Topics addressed in the design report and presentation shall include:

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

1.3.2 Practical Demonstration

The practical demonstration will consist of the control station being connected to an IARC developed operator control unit (OCU) via an Ethernet data link. The OCU will send a message to request the vehicle's current position and the control station responding with the vehicle's position. This will be concurrent with any of the team runs during the Performance Competition period. The control station will also be tested to ensure it only accepts messages intended for it. The technical requirement details are in section 2.

1.4 Judging

IARC JAUS Challenge judging will be on a pass-fail basis. Judgment will be based on satisfactory completion of the practical demonstration and an evaluation of the JAUS implementation description in the team's paper. The JAUS judges will determine if the oral presentation and paper have sufficient detail to address the areas listed in section 1.3.

1.5 Award

Schools that successfully complete the IARC JAUS Challenge shall receive an award of \$750.00. There will only be one monetary prize per school.

All schools and teams participating in the JAUS Challenge will be individually recognized on the IARC website.

2 TECHNICAL APPROACH

Student teams are required to implement the messages defined in this section as defined the JAUS Reference Architecture version 3.2 Part 3 and the JAUS Header as described in the JAUS RA V3.2 Part 2. All other messages within the JAUS Reference Architecture document may be ignored for this competition. The IARC OCU will not transmit JAUS messages that are not defined within this section. Teams are not required to develop an OCU for this competition, but are free to develop one that may help in testing. The JAVA based JAUS Compliance Tool Suite (JCTS) that will be used for testing during the competition is available to participants from the United States. A copy of JCTS can be requested from Mr. Dan Gehring (daniel.g.gehring@us.army.mil). A testing station will be available for all teams in the evenings prior to the JAUS Challenge day. Since the tool is not available prior to the IARC for non-US teams, they will be given priority during the evening testing. All non-US teams that successfully accomplish the Oral/Written Presentation will be given half the challenge award (\$375.00). Upon successful completion of the Practical Demonstration, the non-US teams will receive the final half of the challenge award. US teams are only eligible to receive the full JAUS Challenge award upon successful completion of both the Oral/Written Presentation and Practical Demonstration, no partial award will be granted to a US team.

The current JAUS RA documents can be found at:

<http://www.jauswg.org/baseline/refarch.html>.

2.1 Network Based

The network connection between the team's control station and the IARC OCU shall be Ethernet (802.3). A JAUS judge will provide an Ethernet switch and cables needed to connect between it, the IARC OCU, and the team control station.

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.

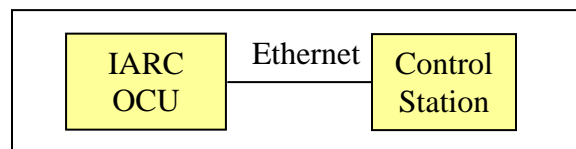


Figure 1 – Network Setup

2.2 UDP Port Allocation

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

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

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 control station will be the Global Pose Sensor (ID 38).

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

The Instance ID will always be 1.

2.5 JAUS Challenge

2.5.1 JAUS Header Fields

The control station shall not respond to messages that have an improperly formed JAUS Header. A properly formed JAUS Header consists of 16 bytes and contains the following information:

1. JAUS Message Properties
 - a. Version must be set for 3.2
 - b. User Defined Message bit must be set to JAUS
 - c. Service Connection bit must be set to Not
 - d. Ack/Nak must be set to None
 - e. Priority must be set to Default
2. Command Code
3. JAUS Destination ID (as specified above for the control station)
4. JAUS Source ID (as specified above for the OCU)
5. JAUS Data Control (bytes)
6. Sequence Number set to zero

To pass this part of the challenge, the control station shall not respond to any JAUS message that has an improperly formed Header.

2.5.2 Position Report

The control station shall accept and respond to properly formed queries for position using the JAUS Query Global Pose (Command Code = 2402h). The queries will be sent at 0.5 Hertz. The control station shall respond by returning the JAUS Report Global Pose (Command Code = 4402h).

To pass this part of the challenge the position reported must be within a reasonable distance from the control station's displayed position.