**Executive Summary**

The DeVivo AST, Inc. JAUS Router, or “jr” (pronounced “junior”) is a software package designed to expedite the development of software systems using the standard protocol set referred to as JAUS, the Joint Architecture for Unmanned Systems.

**Section 1, Purpose**

This document provides a mechanism to design, execute and capture the results of the DeVivo software characterization tests for “jr”, the JAUS Router. It is intended to be a living document with the current version being representative of the most recent release of the “jr” software package.

The tests and results listing are based on the assumed most common usage and configuration of the software. No tests or results are tied to applications or their data but some latencies, jitter, and simulated application behaviors are introduced as part of the tests to emulate realistic environments.

The objective of the tests described herein is to provide solid data points for use in marketing and sales as well as for regression analysis. The primary data points are Throughput, Latency, Jitter, Frame Loss Rate and Back-to-back Frames. The initial set of tests will produce the following marketing data and provide regression analysis input as listed below.

**Characterization & Marketing Points:**

What is average latency for a 64 byte Frame?

What is the drop rate for large data sets over a 24 hour period?

**Regression Analysis**

Performance with all variations of priority

Performance with Ack Vs Nak

**Content**

The primary content of this document are the high level descriptions of the tests. The specifics and test results are contained in an accompanying Excel Spreadsheet. The accompanying Excel Spreadsheet document will also contain a summary table that is automatically filled in.

**Definitions**

**Throughput** is the maximum rate in frames/sec at which data can be transported from source to destination with zero errors or lost frames.

**Latency** is the total time taken for a frame to travel from source to destination.

**Jitter** represents the differences in the latency measure (maximum latency, minimum latency and average latency).

**Frame** is a specific packet of data as defined by the JAUS transport standard AS5669 including the JAUS header. Frame sizes are variable.

**Frame Loss Rate** is the percentage of frames that were transmitted successfully from the source but were never received at the destination.

**Back-to-back Frames** determines the maximum number of frames with minimum inter-frame gap (i.e. at full rate or in a burst) that can be sent across the link with no frame loss.

**Document Summary**

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| **JAUS Router Performance Evaluation & Characterization Document History** | |
| **Version** | **1.0, May 2008** |
| **Change Notes** | Initial release of “jr” the JAUS Router PE&C Document |
| **References** | |
|  | Internet Engineering Task Force Request for Comment (RFC) 2544 |
|  | AS5669 revision 0 |
|  | JAUS Reference Architecture, Version 3.3, Part II |
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**Section 2, Characterization Test Descriptions**

A collection of tests are designed to provide performance information to customers, potential customers, and for internal regression analysis. Each test is designed to show reliability in one or more functional areas.

**Characterization Test 1: Baseline Evaluation Test**

Transmit the prescribed “JAUS Messages” from a SOURCE to a DESTINATION using the UDP protocol where SOURCE and DESTINATION are physically disparate and directly connected without network switches, hubs, routers, or other intermediary devices, on a hardwire 100 Mbps Ethernet backbone. The test requires an echo from the DESTINATION back to the SOURCE to complete a ROUND\_TRIP for each message. A successful transmission is one in which the message is returned to the sender exactly as originally sent with the exception of the SOURCE and DESTINATION fields in the message header. This includes both the addresses and the identifiers as applicable.

Conduct the test for data sizes (JAUS Message Sizes) of the number of bytes shown in the Size column of the table below not including the size of the JAUS header. Include a delay between each transmission. The delay between transmissions will be in accordance with the baseline message table below.

Collect the metrics as listed in Test 1 of the characterization spreadsheet. The summary table in the file will be automatically completed. Versioning of this test document and the spreadsheet must be performed together.

**Characterization Test 2: Ethernet Topology Test**

Collect the metrics as listed in Test 2 of the characterization spreadsheet. The summary table in the file will be automatically completed. Versioning of this test document and the spreadsheet must be performed together.

Perform this test as described above with variations in the topology including routers, bridges, switches and hubs. Record the configuration and results.

**Characterization Test 3: Multi-Packet Variable Size Data Test**

Collect the metrics as listed in Test 3 of the characterization spreadsheet. The summary table in the file will be automatically completed. Versioning of this test document and the spreadsheet must be performed together.

**Characterization Test 4: Serial (RS-232) Data Link**

Collect the metrics as listed in Test 4 of the characterization spreadsheet. The summary table in the file will be automatically completed. Versioning of this test document and the spreadsheet must be performed together. This test replaces the Ethernet UDP protocol with the JAUS Serial Protocol over RS-232 at 19,200 baud.

**Characterization Test 5: Serial (RS-232) Multi-Packet**

Collect the metrics as listed in Test 5 of the characterization spreadsheet. The summary table in the file will be automatically completed. Versioning of this test document and the spreadsheet must be performed together. This test replaces the Ethernet UDP protocol with the JAUS Serial Protocol over RS-232 at 115,000 baud.

**Characterization Test 6: TCP Data Transfer**

Perform Test 1 as described above using TCP rather than UDP.

**Characterization Test 7: TCP Multi-Packet**

Perform Test 3 as described above using TCP rather than UDP.

**Section 3, Regression Analysis Test Descriptions**

This collection of tests is designed to provide performance information for internal regression analysis. Each test is designed to show reliability in one or more functional areas.

**Regression Test 1: Priority Test**

Transmit the messages prescribed in the regression test algorithm below for each of JUDP, JSerial and JTCP. JSerial evaluation should use the RS-232 protocol at 115,000 baud.

**Originator**

for ( int i = 0; i < 100; i++ )

{

for ( int j = 0; j < 4; j++ )

send(message with time stamp as data and the current value of i)

delay( 50ms ) while reading the incoming message buffer

}

**Echo / Responder**

while (true) //exit with system control

{

receive(message)

echo message to sender

}

Log all responses with sequence number, time and priority by printing to a file or the screen. Evaluate the log for percentage of high priority messages that precede low priority.

**Regression Test 2: Ack/Nak Test**

Transmit the messages prescribed in the regression test algorithm below for each of JUDP, JSerial and JTCP. JSerial evaluation should use the RS-232 protocol at 115,000 baud.

**Originator**

for ( int i = 0; i < 100; i++ )

{

send(0 length message with Ack flag set)

delay( 5ms )

Log all responses with sequence number

**Echo / Responder** (We will turn it off for testing)

while (true) //exit with system control

{

receive(message)

echo message to sender

}

Log all responses with sequence number, time and priority by printing to a file or the screen. Evaluate the log for acknowledgements.