**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.

**Section 2, Content**

The primary content of this document are the details of the tests and the test results. The Test Description Section is preceded by the Characterization Summary so the reader can quickly view the documented performance.

**Section 3, 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 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.

**Section 4, 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 |
|  |  |

**Section 5, Characterization Summary**

**Characterization Listing**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Metric | UDP | 232 | TCP | 1 Hop | 2 Hop | Mixed |
| Standard |  |  |  |  |  |  |  |
| Sent | Count |  |  |  |  |  |  |
| Received | Count |  |  |  |  |  |  |
| Dropped | Count |  |  |  |  |  |  |
| Garbled | Count |  |  |  |  |  |  |
| Latency | Average Time |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| Broadcast |  |  |  |  |  |  |  |
| Sent | Count |  |  |  |  |  |  |
| Received | Count |  |  |  |  |  |  |
| Dropped | Count |  |  |  |  |  |  |
| Garbled | Count |  |  |  |  |  |  |
| Latency | Average Time |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| Multi-Packet |  |  |  |  |  |  |  |
| Size | Bytes |  |  |  |  |  |  |
| Sent | Count |  |  |  |  |  |  |
| Received | Count |  |  |  |  |  |  |
| Dropped | Count |  |  |  |  |  |  |
| Garbled | Count |  |  |  |  |  |  |
| Latency | Average Time |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

**Section 6, Test Descriptions**

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

**Test 1: Baseline Evaluation Test**

Transmit 1,000,000 statically sized “JAUS Messages” from a SOURCE to a DESTINATION using the UDP protocol where SOURCE and DESTINATION are physically disparate and connected on a hardwire 100 Mbps Ethernet backbone.

Conduct the test for data sizes (JAUS Message Sizes) of 0, 1, 8, 54, 64, 128, 256, 512, 1024, 1280, 1518, 2048, and 4472 bytes not including the size of the JAUS header.

Include a delay between each transmission. Vary the delay between tests to show the expected latency as opposed to the empirical data.

Collect the metrics as listed in the table below and complete the summary table in Section 5 above with the average of each of the marked scores.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Metric |  |  |  |  |  | Averages |
| Time | Total Time |  |  |  |  |  | N/A |
| Delay | Time |  |  |  |  |  |  |
| Size | Bytes |  |  |  |  |  | N/A |
| Sent | Count |  |  |  |  |  |  |
| Received | Count |  |  |  |  |  |  |
| Dropped | Count |  |  |  |  |  |  |
| Latency | Average Time |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

**Test 2: Ethernet Topology Test**

Transmit 1,000,000 statically sized “JAUS Messages” from a SOURCE to a DESTINATION using the UDP protocol where SOURCE and DESTINATION are physically disparate and connected on a hardwire 100 Mbps Ethernet backbone.

Conduct the test for data sizes (JAUS Message Sizes) of 0, 1, 8, 54, 64, 128, 256, 512, 1024, 1280, 1518, 2048, and 4472 bytes not including the size of the JAUS header.

Vary the topology of the network to include an optional 1 to 3 Ethernet routers and execute the tests for each configuration.

Include a delay between each transmission. Vary the delay between tests to show the expected latency as opposed to the empirical data.

Collect the metrics as listed in the table below and complete the summary table in Section 5 above with the average of each of the marked scores.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Metric |  |  |  |  |  | Averages |
| Time | Total Time |  |  |  |  |  | N/A |
| Size | Bytes |  |  |  |  |  | N/A |
| Sent | Count |  |  |  |  |  |  |
| Received | Count |  |  |  |  |  |  |
| Dropped | Count |  |  |  |  |  |  |
| Latency | Average Time |  |  |  |  |  |  |
| Hops | Count |  |  |  |  |  | N/A |
|  |  |  |  |  |  |  |  |

**Test 3: Variable Size Data Test**

Transmit 1,000,000 variably sized “JAUS Messages” from a SOURCE to a DESTINATION using the UDP protocol where SOURCE and DESTINATION are physically disparate and connected on a hardwire 100 Mbps Ethernet backbone.

Conduct the test for data sizes (JAUS Message Sizes) between 0 and 4088 bytes not including the size of the JAUS header. Each sent message shall be 1 byte larger than the last message until the size of 4088 bytes is reached at which point the size rolls back to 0 and the increasing begins again.

Vary the topology of the network to include an optional 1 to 3 Ethernet routers and execute the tests for each configuration.

Include a delay between each transmission. Vary the delay between tests to show the expected latency as opposed to the empirical data.

Collect the metrics as listed in the table below and complete the summary table in Section 5 above with the average of each of the marked scores.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Metric |  |  |  |  |  | Averages |
| Time | Total Time |  |  |  |  |  | N/A |
| Sent | Count |  |  |  |  |  |  |
| Received | Count |  |  |  |  |  |  |
| Dropped | Count |  |  |  |  |  |  |
| Latency | Average Time |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

**Test 4: Multi-Packet Variable Size Data Test**

Transmit 1,000,000 variably sized “JAUS Messages” from a SOURCE to a DESTINATION using the UDP protocol where SOURCE and DESTINATION are physically disparate and connected on a hardwire 100 Mbps Ethernet backbone.

Conduct the test for data sizes (JAUS Message Sizes) of 11,568, 48,093, and 178,975 bytes not including the size of the JAUS header. The test will cycle through one of each message of the prescribed size until the total number of messages is reached.

Include a delay between each transmission. Vary the delay between tests to show the expected latency as opposed to the empirical data.

Collect the metrics as listed in the table below and complete the summary table in Section 5 above with the average of each of the marked scores.

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Metric |  |  |  |  |  | Averages |
| Time | Total Time |  |  |  |  |  | N/A |
| Max Size | 1,000,000 | N/A | N/A | N/A | N/A | N/A | N/A |
| Sent | Count |  |  |  |  |  |  |
| Received | Count |  |  |  |  |  |  |
| Dropped | Count |  |  |  |  |  |  |
| Latency | Average Time |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

**Test 5: Burst Data Test**

Transmit 1,000,000 statically sized “JAUS Messages” from a SOURCE to a DESTINATION using the UDP protocol where SOURCE and DESTINATION are physically disparate and connected on a hardwire 100 Mbps Ethernet backbone.

Conduct the test for data sizes (JAUS Message Sizes) of 0, 1, 8, 54, 64, 128, 256, 512, 1024, 1280, 1518, 2048, and 4472 bytes not including the size of the JAUS header.

Include a delay between each transmission. Vary the delay between tests to show the expected latency as opposed to the empirical data.

After every 475 messages include a burst of 25 messages with 0 delay between each message.

Collect the metrics as listed in the table below and complete the summary table in Section 5 above with the average of each of the marked scores.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Metric |  |  |  |  |  | Averages |
| Time | Total Time |  |  |  |  |  | N/A |
| Size | Bytes |  |  |  |  |  |  |
| Sent | Count |  |  |  |  |  |  |
| Received | Count |  |  |  |  |  |  |
| Dropped | Count |  |  |  |  |  |  |
| Latency | Average Time |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

**Test 6: Serial (RS-232) Data Link**

Conduct tests 1 through 5 above replacing the UDP over Ethernet with the JAUS Serial Protocol over RS-232.

**Test 7: TCP Data Transfer**

Conduct tests 1 through 5 above replacing the UDP with TCP.