AMG 19

RTI Performance Result Example

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Test Objective

- Use framework to characterize test for one slice of RTI performance
- Assess utility of framework in describing and planning a test federation
  - Is information in the framework sufficient to characterize external factors in performance testing (e.g. tick rate, etc.)

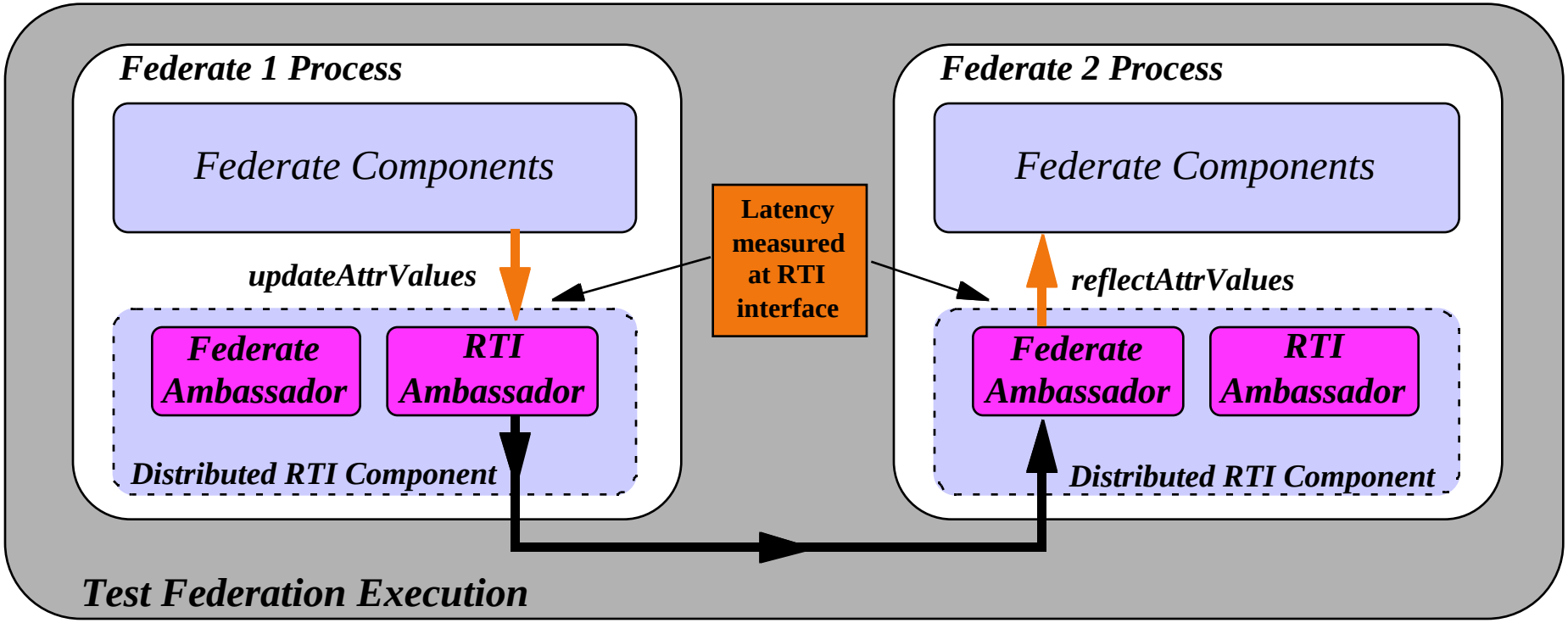
RTI Performance Test Matrix

- Focus of test is measuring latency for updateAttributeValues - reflectAttributeValues service pair
- Ran 4 test federation executions

Federation Execution Name	No. of Federates	Total Objects in Federation	Transport (Best Effort or Reliable)
Jager test BE2	2	20	Best Effort
Jager test R2	2	20	Reliable
Jager test BE4	4	40	Best Effort
Jager test R4	4	40	Reliable

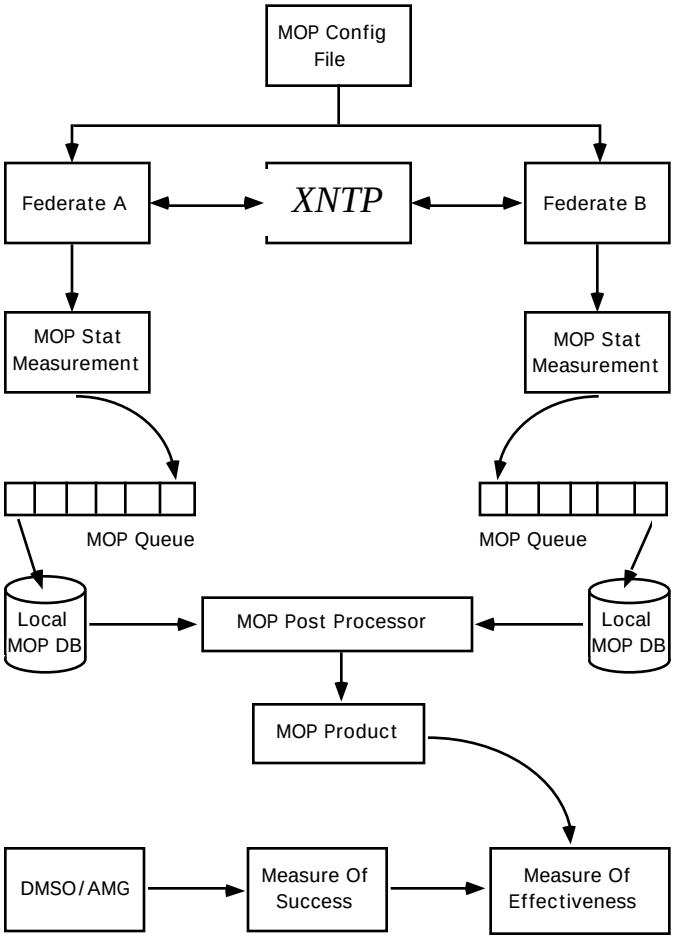
Latency Measurement Definition

- Latency is measured at the RTI interface on each federate
  - RTI ambassador for updateAttributeValues
  - FederateAmbassador for reflectAttributeValues



Test Environment

- Instrumentation Approach
  - Goal: Measure & collect with as little intrusion as possible
  - Log relevant RTI invocations for latency post-processing
  - Use separate thread for I/O to local DB to reduce intrusion
- Performance measurement & collection
  - Instrument at RTI interface
  - Time synch each host on network with XNTP time daemons
  - Collect MOP in persistent store



Federation Planning Workbook

- Federation Execution Summary Table
- Host Table
- LAN Table
- RTI Services Table
- Object/Interaction Table

Federation Execution Summary Table

(Jager test BE2)

Federation Execution Summary Table

Federation Execution Name	**Jager test BE2**
Number of Concurrent Federation Executions (tot this Federation Execution)	**1**
RTI Software Used (Version)	**1.0**

Federate Summary Information

	Name	API (C++,Ada, IDL, Java)	Time Management Switches: Regulating (y or n)	Time Management Switches: Constraining (y or n)	Host (assign # to each host) [List data on Host Table]	LAN (assign # to each LAN) [List data on LAN Table]
Fed_1	Jager	C++	N	N	1	1
Fed_2	Jager	C++	N	N	2	1

Host Table
(Jager test BE2)

Host Table

	Hardware	Operating System	Memory available RTI (MB)	% CPU Availab to RTI
Host$_1$	Sun Ultra2, 2x 200Mhz UltraSPARC, 256M RAM	Solaris 2.5.5	54% of 256M actual measures	95 % CPU availab nominal load
Host$_2$	Sun Ultra2, 2x 200Mhz UltraSPARC, 256M RAM	Solaris 2.5.5	59% of 256M actual measures	97 % CPU availab nominal load

LAN Table
(Jager test BE2)

LAN Tables

LAN Table 1: LAN Descriptions

	Physical Type (Ethernet, ATM,etc.)	Throughtput Available to FEDEX
LAN_1	Ethernet	Clean LAN 10Mbits/sec * 80

LAN Table 2: LAN to LAN Connectivity

	LAN_1
LAN_1	

RTI Service Table

(Jager test BE2)

RTI Services Table

(Check if service to be used at least once during this Federation execution)

Service	IF Ref	Service Used?
Create Federation Execution	2.1	✓
Destroy Federation Execution	2.2	✓
Join Federation Execution	2.3	✓
Resign Federation Execution	2.4	✓
Request **Pause**	2.5	
Initiate **Pause**	2.6	
Pause Achieved	2.7	
Request **Resume**	2.8	
Initiate **Resume**	2.9	
Resume Achieved	2.10	
Request **Federation Save**	2.11	
Initiate **Federation Save**	2.12	
Federation Save Begun	2.13	
Federation Save Achieved	2.14	
Request **Restore**	2.15	
Initiate **Restore**	2.16	
Restore Achieved	2.17	
Publish Object Class	3.1	✓
Subscribe Object Class **Attributes**	3.2	✓
Publish Interaction	3.3	✓
Subscribe Interaction	3.4	✓
Control Updates	3.5	✓
Control Interactions	3.6	✓
Request ID	4.1	✓
Register Object	4.2	✓
Update Attribute Values	4.3	✓
Delete Object	4.8	✓
Remove Object	4.9	✓
Change Attribute Transportation Type	4.10	
Change Attribute Order Type	4.11	
Change Interaction Transportation Type	4.12	
Change Interaction Order Type	4.13	
Request Attribute Value Update	4.14	
Provide Attribute Value Update	4.15	
Retract	4.16	
Reflect Retract	4.17	
Request Attribute **Ownership Divestiture**	5.1	
Request Attribute **Ownership Assumption**	5.2	
Attribute Ownership **Divestiture Notification**	5.3	
Attribute Ownership **Acquisition Notification**	5.4	
Request Attribute **Ownership Acquisition**	5.5	
Request Attribute **Ownership Release**	5.6	
Query Attribute Ownership	5.7	
Inform Attribute Ownership	5.8	
Is **Attribute Owned by Federate?**	5.9	
Request **Federation Time**	6.1	
Request **LBTS**	6.2	
Request **Federate Time**	6.3	✓
Request **Min Next Event Time**	6.4	
Set **Lookahead**	6.5	
Request **Lookahead**	6.6	
Time Advance Request	6.7	✓

Federate 1 Object/Interaction Table

(Jager test BE2)

Object/Interaction Table

Federate # 1

Enter Name Jager 1

					If Update =" y"					If Subscribe = y	Ownership	
Object/ Interaction Class	**Attribute/ Parameter**	**Count**	**Size**	**Update ? (y or n)**	**Update Rate # updates/unit time**	**Update Grouping** (Assign same letter to attributes which will all be updated at the same time)	**Transport** R= Reliable B= Best Effort	**Ordering** TSO or FIFO	**Subscribe? (y or n)**	**Maximum tolerable latency from any source (milliseconds)**	**Attribute Ownership Transfer Rate # times/unit time**	**Ownership Transfer Grouping** (Assign same letter to attributes which will all be transferred together)
Model		10										
	Durability		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Damage		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Location		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Mass		4 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Orientation		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Shape		4 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Velocity		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A

Table entries are for illustration only

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Federate 2 Object/Interaction Table

(Jager test BE2)

Object/Interaction Table

Federate # 2

Enter Name Jager 2

					If Update =" y"					If Subscribe = y	Ownership	
Object/ Interaction Class	**Attribute/ Parameter**	**Count**	**Size**	**Update ? (y or n)**	**Update Rate # updates/unit time**	**Update Grouping** (Assign same letter to attributes which will all be updated at the same time)	**Transport R= Reliable B= Best Effort**	**Ordering TSO or FIFO**	**Subscribe? (y or n)**	**Maximum tolerable latency from any source (milliseconds)**	**Attribute Ownership Transfer Rate # times/unit time**	**Ownership Transfer Grouping** (Assign same letter to attributes which will all be transferred together)
Model		10										
	Durability		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Damage		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Location		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Mass		4 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Orientation		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Shape		4 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Velocity		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A

Table entries are for illustration only

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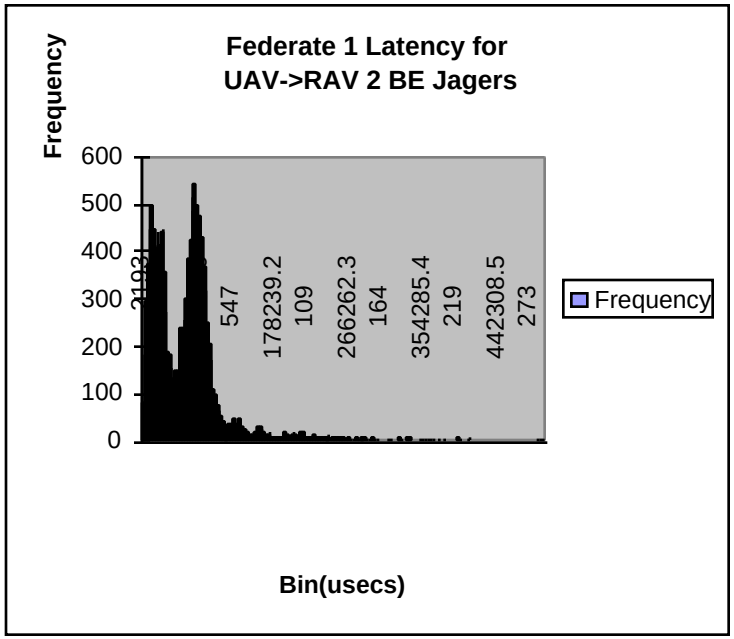
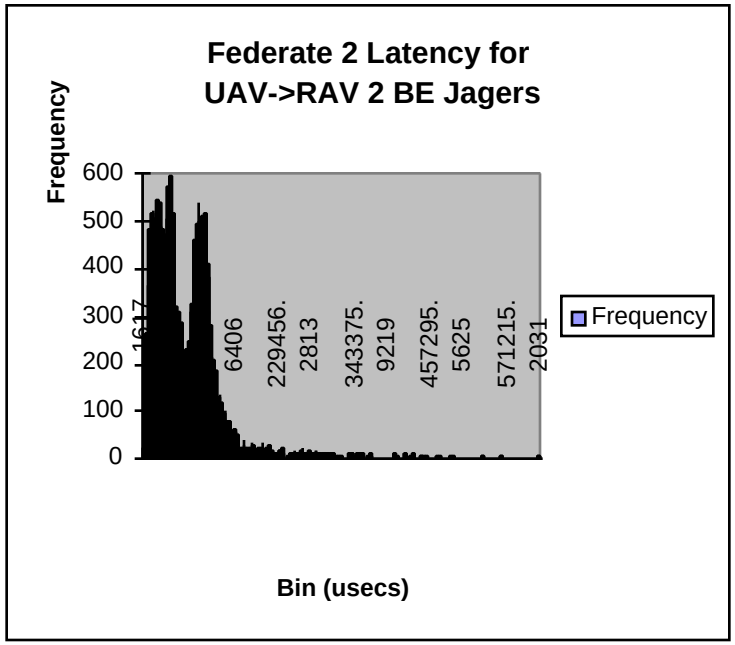
Performance Results

(Jager test BE2)

Federate	Service	Rate of Invocations (per sec)	Execution Duration	Number of Invocations	Latency (milliseconds) min	max	average
1	update -> reflect	92.141	241	16975	2	482	57
2	update -> reflect	104.799	199	20877	2	597	67
All	update -> reflect	98.47	220	37852	2	597	63





Federation Execution Summary Table

(Jager test R2)

Federation Execution Summary Table

Federation Execution Name	Jager test R2
Number of Concurrent Federation Executions (tota this Federation Execution)	1
RTI Software Used (Version)	1.0

Federate Summary Information

	Name	API (C++,Ada, IDL, Java)	Time Management Switches		Host (assign # to each host) [List data on Host Table]	LAN (assign # to each LAN [List data on LAN Table
			Regulating (y or n)	Constraining (y or n)		
Fed_1	Jager	C++	N	N	1	1
Fed_2	Jager	C++	N	N	2	1

Host Table
(Jager test R2)

Host Table

	Hardware	Operating System	Memory available RTI (MB)	% CPU Availab to RTI
Host$_1$	Sun Ultra2, 2x 200Mhz UltraSPARC, 256M RAM	Solaris 2.5.5	54% of 256M actual measures	95 % CPU availab nominal load
Host$_2$	Sun Ultra2, 2x 200Mhz UltraSPARC, 256M RAM	Solaris 2.5.5	59% of 256M actual measures	97 % CPU availab nominal load

LAN Table
(Jager test R2)

LAN Tables

LAN Table 1: LAN Descriptions

	Physical Type (Ethernet, ATM,etc.)	Throughtput Available to FEDEX
LAN_1	Ethernet	Clean LAN 10Mbits/sec * 80

LAN Table 2: LAN to LAN Connectivity

	LAN_1
LAN_1	

RTI Service Table

(Jager test R2)

RTI Services Table

(Check if service to be used at least once during this Federation execution)

Service	IF Ref	Service Used?
Create Federation Execution	2.1	✓
Destroy Federation Execution	2.2	✓
Join Federation Execution	2.3	✓
Resign Federation Execution	2.4	✓
Request **Pause**	2.5	
Initiate **Pause**	2.6	
Pause Achieved	2.7	
Request **Resume**	2.8	
Initiate **Resume**	2.9	
Resume Achieved	2.10	
Request **Federation Save**	2.11	
Initiate **Federation Save**	2.12	
Federation Save Begun	2.13	
Federation Save Achieved	2.14	
Request **Restore**	2.15	
Initiate **Restore**	2.16	
Restore Achieved	2.17	
Publish Object Class	3.1	✓
Subscribe Object Class **Attributes**	3.2	✓
Publish Interaction	3.3	✓
Subscribe Interaction	3.4	✓
Control Updates	3.5	✓
Control Interactions	3.6	✓
Request ID	4.1	✓
Register Object	4.2	✓
Update Attribute Values	4.3	✓
Delete Object	4.8	✓
Remove Object	4.9	✓
Change Attribute Transportation Type	4.10	
Change Attribute Order Type	4.11	
Change Interaction Transportation Type	4.12	
Change Interaction Order Type	4.13	
Request Attribute Value Update	4.14	
Provide Attribute Value Update	4.15	
Retract	4.16	
Reflect Retract	4.17	
Request Attribute **Ownership Divestiture**	5.1	
Request Attribute **Ownership Assumption**	5.2	
Attribute Ownership **Divestiture Notification**	5.3	
Attribute Ownership **Acquisition Notification**	5.4	
Request Attribute **Ownership Acquisition**	5.5	
Request Attribute **Ownership Release**	5.6	
Query Attribute Ownership	5.7	
Inform Attribute Ownership	5.8	
Is **Attribute Owned by Federate?**	5.9	
Request **Federation Time**	6.1	
Request **LBTS**	6.2	
Request **Federate Time**	6.3	✓
Request **Min Next Event Time**	6.4	
Set **Lookahead**	6.5	
Request **Lookahead**	6.6	
Time Advance Request	6.7	✓

Federate 1 Object/Interaction Table

(Jager test R2)

Object/Interaction Table

Federate # 1

Enter Name Jager 1

					If Update =" y"				If Subscribe = y		Ownership	
Object/ Interaction Class	**Attribute/ Parameter**	**Count**	**Size**	**Update ?** (y or n)	**Update Rate** # updates/unit time	**Update Grouping** (Assign same letter to attributes which will all be updated at the same time)	**Transport** R= Reliable B= Best Effort	**Ordering** TSO or FIFO	**Subscribe?** (y or n)	**Maximum tolerable latency from any source** (milliseconds)	**Attribute Ownership Transfer Rate** # times/unit time	**Ownership Transfer Grouping** (Assign same letter to attributes which will all be transferred together)
Model		10										
	Durability		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Damage		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Location		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Mass		4 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Orientation		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Shape		4 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Velocity		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A

Table entries are for illustration only

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Federate 2 Object/Interaction Table

(Jager test R2)

Object/Interaction Table

Federate # 2

Enter Name Jager 2

Object/ Interaction Class	Attribute/ Parameter	Count	Size	Update ? (y or n)	If Update =" y" Update Rate # updates/unit time	Update Grouping (Assign same letter to attributes which will all be updated at the same time)	Transport R= Reliable B= Best Effort	Ordering TSO or FIFO	Subscribe? (y or n)	If Subscribe = y Maximum tolerable latency from any source (milliseconds)	Ownership Attribute Ownership Transfer Rate # times/unit time	Ownership Transfer Grouping (Assign same letter to attributes which will all be transferred together)
Model		10										
	Durability		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Damage		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Location		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Mass		4 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Orientation		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Shape		4 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Velocity		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A

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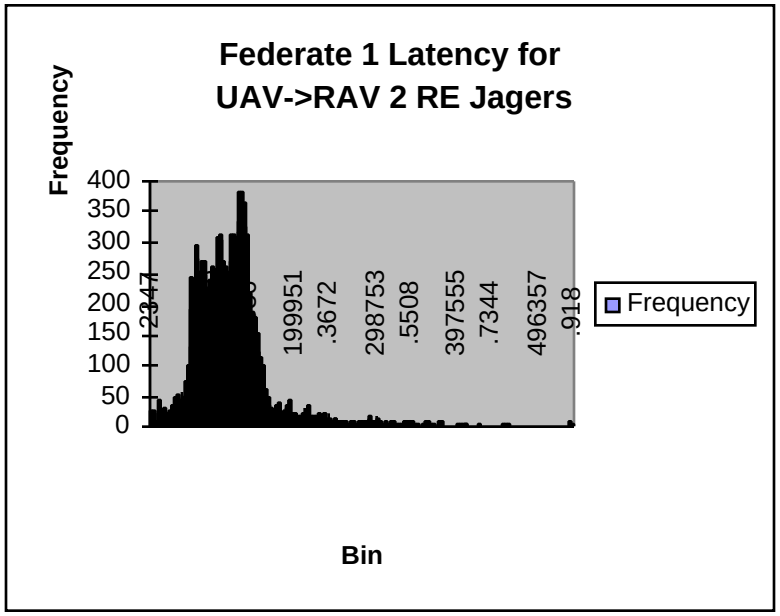
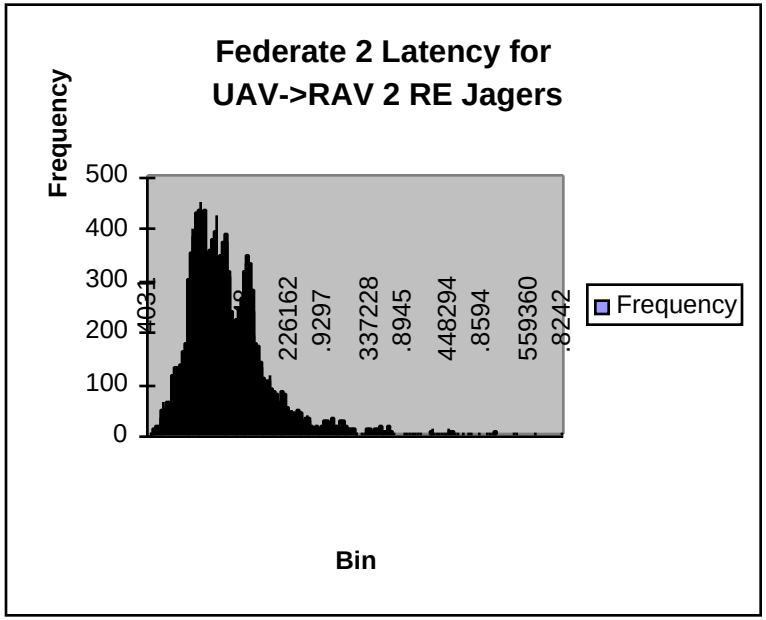
Denotes an invalid cell for entry of data

Performance Results

(Jager test R2)

Federate	Service	Rate of Invocations (per sec)	Execution Duration	Number of Invocations	Latency (milliseconds) min	max	average
1	update -> reflect	93.175	211	13759	2	519	102
2	update -> reflect	92.141	171	19093	4	584	116
All	update -> reflect	92.658	191	32852	2	584	110





Federation Execution Summary Table

(Jager test BE4)

Federation Execution Summary Table

Federation Execution Name	**Jager test BE4**
Number of Concurrent Federation Executions (tot this Federation Execution)	**1**
RTI Software Used (Version)	**1.0**

Federate Summary Information

	Name	API (C++,Ada, IDL, Java)	Time Management Switches: Regulating (y or n)	Time Management Switches: Constraining (y or n)	Host (assign # to each host) [List data on Host Table]	LAN (assign # to each LA [List data on LAN Table
Fed_1	Jager	C++	N	N	1	1
Fed_2	Jager	C++	N	N	2	1
Fed 3	Jager	C++	N	N	3	1
Fed 4	Jager	C++	N	N	4	1

Host Table
(Jager test BE4)

Host Table

	Hardware	Operating System	Memory available RTI (MB)	% CPU Availab to RTI
Host 1	Sun Ultra2, 2x 200Mhz UltraSPARC, 256M RAM	Solaris 2.5.5	54% of 256M actual measures	95 % CPU availab nominal load
Host 2	Sun Ultra2, 2x 200Mhz UltraSPARC, 256M RAM	Solaris 2.5.5	59% of 256M actual measures	97 % CPU availab nominal load
Host 3	Sun Ultra1, 167 UltraSI 132M RAM	Solaris 2.5.5	53% of 132M actual measures	95 % CPU availab nominal load
Host 4	Sun Ultra1, 167 UltraSI 132M RAM	Solaris 2.5.5	53% of 132M actual measures	95 % CPU availab nominal load

LAN Table
(Jager test BE4)

LAN Tables

LAN Table 1: LAN Descriptions

	Physical Type (Ethernet, ATM,etc.)	Throughtput Available to FEDEX
LAN_1	Ethernet	Clean LAN 10Mbits/sec * 80

LAN Table 2: LAN to LAN Connectivity

	LAN_1
LAN_1	

RTI Service Table

(Jager test BE4)

RTI Services Table

(Check if service to be used at least once during this Federation execution)

Service	IF Ref	Service Used?
Create Federation Execution	2.1	✓
Destroy Federation Execution	2.2	✓
Join Federation Execution	2.3	✓
Resign Federation Execution	2.4	✓
Request **Pause**	2.5	
Initiate **Pause**	2.6	
Pause Achieved	2.7	
Request **Resume**	2.8	
Initiate **Resume**	2.9	
Resume Achieved	2.10	
Request **Federation Save**	2.11	
Initiate **Federation Save**	2.12	
Federation Save Begun	2.13	
Federation Save Achieved	2.14	
Request **Restore**	2.15	
Initiate **Restore**	2.16	
Restore Achieved	2.17	
Publish Object Class	3.1	✓
Subscribe Object Class **Attributes**	3.2	✓
Publish Interaction	3.3	✓
Subscribe Interaction	3.4	✓
Control Updates	3.5	✓
Control Interactions	3.6	✓
Request ID	4.1	✓
Register Object	4.2	✓
Update Attribute Values	4.3	✓
Delete Object	4.8	✓
Remove Object	4.9	✓
Change Attribute Transportation Type	4.10	
Change Attribute Order Type	4.11	
Change Interaction Transportation Type	4.12	
Change Interaction Order Type	4.13	
Request Attribute Value Update	4.14	
Provide Attribute Value Update	4.15	
Retract	4.16	
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Request Attribute **Ownership Assumption**	5.2	
Attribute Ownership **Divestiture Notification**	5.3	
Attribute Ownership **Acquisition Notification**	5.4	
Request Attribute **Ownership Acquisition**	5.5	
Request Attribute **Ownership Release**	5.6	
Query Attribute Ownership	5.7	
Inform Attribute Ownership	5.8	
Is **Attribute Owned by Federate?**	5.9	
Request **Federation Time**	6.1	
Request **LBTS**	6.2	
Request **Federate Time**	6.3	✓
Request **Min Next Event Time**	6.4	
Set **Lookahead**	6.5	
Request **Lookahead**	6.6	
Time Advance Request	6.7	✓

Federate 1 Object/Interaction Table

(Jager test BE4)

Object/Interaction Table

Federate # 1

Enter Name Jager 1

					If Update =" y"					If Subscribe = y	Ownership	
Object/ Interaction Class	**Attribute/ Parameter**	**Count**	**Size**	**Update ?** (y or n)	**Update Rate** # updates/unit time	**Update Grouping** (Assign same letter to attributes which will all be updated at the same time)	**Transport** R= Reliable B= Best Effort	**Ordering** TSO or FIFO	**Subscribe?** (y or n)	**Maximum tolerable latency from any source** (milliseconds)	**Attribute Ownership Transfer Rate** # times/unit time	**Ownership Transfer Grouping** (Assign same letter to attributes which will all be transferred together)
Model		10										
	Durability		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Damage		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Location		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Mass		4 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Orientation		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Shape		4 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Velocity		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A

Table entries are for illustration only

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Federate 2 Object/Interaction Table

(Jager test BE4)

Object/Interaction Table

Federate # 2

Enter Name Jager 2

Object/ Interaction Class	Attribute/ Parameter	Count	Size	Update ? (y or n)	Update Rate # updates/unit time	Update Grouping (Assign same letter to attributes which will all be updated at the same time)	Transport R= Reliable B= Best Effort	Ordering TSO or FIFO	Subscribe? (y or n)	Maximum tolerable latency from any source (milliseconds)	Attribute Ownership Transfer Rate # times/unit time	Ownership Transfer Grouping (Assign same letter to attributes which will all be transferred together)
					If Update =" y"				If Subscribe = y		Ownership	
Model		10										
	Durability		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Damage		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Location		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Mass		4 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Orientation		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Shape		4 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Velocity		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A

Table entries are for illustration only

Denotes an invalid cell for entry of data

Federate 3 Object/Interaction Table

(Jager test BE4)

Object/Interaction Table

Federate # 3

Enter Name Jager 3

					If Update =" y"					If Subscribe = y	Ownership	
Object/ Interaction Class	**Attribute/ Parameter**	**Count**	**Size**	**Update ? (y or n)**	**Update Rate # updates/unit time**	**Update Grouping** (Assign same letter to attributes which will all be updated at the same time)	**Transport R= Reliable B= Best Effort**	**Ordering TSO or FIFO**	**Subscribe? (y or n)**	**Maximum tolerable latency from any source (milliseconds)**	**Attribute Ownership Transfer Rate # times/unit time**	**Ownership Transfer Grouping** (Assign same letter to attributes which will all be transferred together)
Model		10										
	Durability		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Damage		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Location		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Mass		4 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Orientation		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Shape		4 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Velocity		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A

Table entries are for illustration only

Denotes an invalid cell for entry of data

Federate 4 Object/Interaction Table

(Jager test BE4)

Object/Interaction Table

Federate # 4

Enter Name Jager 4

					If Update =" y"					If Subscribe = y	Ownership	
Object/ Interaction Class	**Attribute/ Parameter**	**Count**	**Size**	**Update ? (y or n)**	**Update Rate # updates/unit time**	**Update Grouping** (Assign same letter to attributes which will all be updated at the same time)	**Transport R= Reliable B= Best Effort**	**Ordering TSO or FIFO**	**Subscribe? (y or n)**	**Maximum tolerable latency from any source (milliseconds)**	**Attribute Ownership Transfer Rate # times/unit time**	**Ownership Transfer Grouping** (Assign same letter to attributes which will all be transferred together)
Model		10										
	Durability		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Damage		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Location		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Mass		4 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Orientation		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Shape		4 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A
	Velocity		8 bytes	y	14/sec	A	B	FIFO	y	200	N/A	N/A

Table entries are for illustration only

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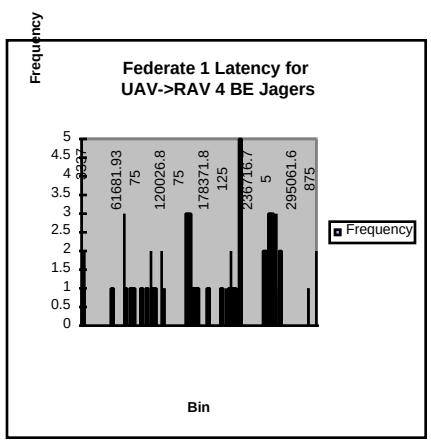
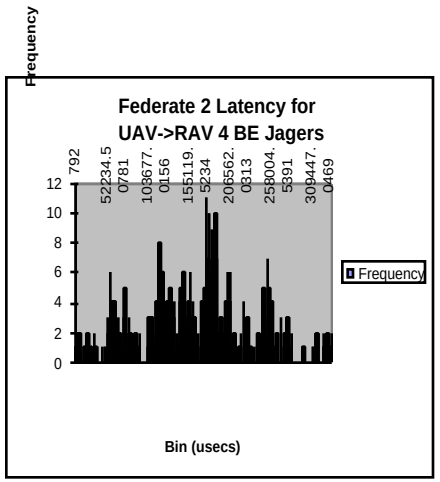
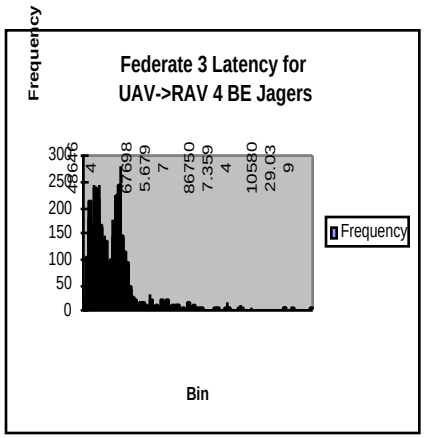
Performance Results

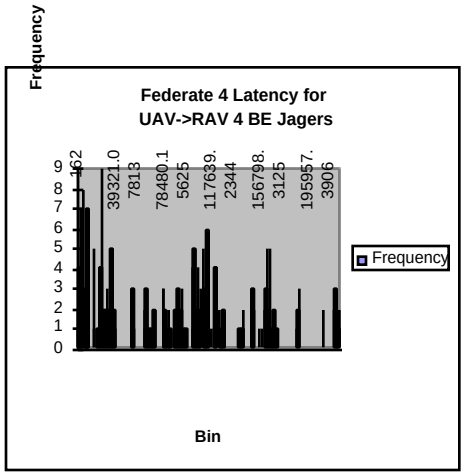
(Jager test BE4)

Federate	Service	Rate of Invocations (per sec)	Execution Duration	Number of Invocations	Latency (milliseconds) min	max	average
1	update -> reflect	73.707	191	28784	1	1075	75
2	update -> reflect	82.924	197	41002	1	1129	80
3	update -> reflect	58.378	172	25592	0	348	7
4	update -> reflect	51.815	184	26977	381	1183	446
All	update -> reflect	66.706	186	122355	0	1183	146









Federation Execution Summary Table

(Jager test R4)

Federation Execution Summary Table

Federation Execution Name	Jager test R4
Number of Concurrent Federation Executions (tot this Federation Execution)	1
RTI Software Used (Version)	1.0

Federate Summary Information

	Name	API (C++,Ada, IDL, Java)	Time Management Switches: Regulating (y or n)	Time Management Switches: Constraining (y or n)	Host (assign # to each host) [List data on Host Table]	LAN (assign # to each LAN [List data on LAN Table
Fed_1	Jager	C++	N	N	1	1
Fed_2	Jager	C++	N	N	2	1
Fed 3	Jager	C++	N	N	3	1
Fed 4	Jager	C++	N	N	4	1

Host Table
(Jager test R4)

Host Table

	Hardware	Operating System	Memory available RTI (MB)	% CPU Availab to RTI
Host$_1$	Sun Ultra2, 2x 200Mhz UltraSPARC, 256M RAM	Solaris 2.5.5	54% of 256M actual measures	95 % CPU availab nominal load
Host$_2$	Sun Ultra2, 2x 200Mhz UltraSPARC, 256M RAM	Solaris 2.5.5	59% of 256M actual measures	97 % CPU availab nominal load
Host 3	Sun Ultra1, 167 UltraSI 132M RAM	Solaris 2.5.5	53% of 132M actual measures	95 % CPU availab nominal load
Host 4	Sun Ultra1, 167 UltraSI 132M RAM	Solaris 2.5.5	53% of 132M actual measures	95 % CPU availab nominal load

LAN Table
(Jager test R4)

LAN Tables

LAN Table 1: LAN Descriptions

	Physical Type (Ethernet, ATM,etc.)	Throughtput Available to FEDEX
LAN_1	Ethernet	Clean LAN 10Mbits/sec * 80

LAN Table 2: LAN to LAN Connectivity

	LAN_1
LAN_1	

RTI Service Table

(Jager test R4)

RTI Services Table

(Check if service to be used at least once during this Federation execution)

Service	IF Ref	Service Used?
Create Federation Execution	2.1	✓
Destroy Federation Execution	2.2	✓
Join Federation Execution	2.3	✓
Resign Federation Execution	2.4	✓
Request **Pause**	2.5	
Initiate **Pause**	2.6	
Pause Achieved	2.7	
Request **Resume**	2.8	
Initiate **Resume**	2.9	
Resume Achieved	2.10	
Request **Federation Save**	2.11	
Initiate **Federation Save**	2.12	
Federation Save Begun	2.13	
Federation Save Achieved	2.14	
Request **Restore**	2.15	
Initiate **Restore**	2.16	
Restore Achieved	2.17	
Publish Object Class	3.1	✓
Subscribe Object Class **Attributes**	3.2	✓
Publish Interaction	3.3	✓
Subscribe Interaction	3.4	✓
Control Updates	3.5	✓
Control Interactions	3.6	✓
Request ID	4.1	✓
Register Object	4.2	✓
Update Attribute Values	4.3	✓
Delete Object	4.8	✓
Remove Object	4.9	✓
Change Attribute Transportation Type	4.10	
Change Attribute Order Type	4.11	
Change Interaction Transportation Type	4.12	
Change Interaction Order Type	4.13	
Request Attribute Value Update	4.14	
Provide Attribute Value Update	4.15	
Retract	4.16	
Reflect Retract	4.17	
Request Attribute **Ownership Divestiture**	5.1	
Request Attribute **Ownership Assumption**	5.2	
Attribute Ownership **Divestiture Notification**	5.3	
Attribute Ownership **Acquisition Notification**	5.4	
Request Attribute **Ownership Acquisition**	5.5	
Request Attribute **Ownership Release**	5.6	
Query Attribute Ownership	5.7	
Inform Attribute Ownership	5.8	
Is **Attribute Owned by Federate?**	5.9	
Request **Federation Time**	6.1	
Request **LBTS**	6.2	
Request **Federate Time**	6.3	✓
Request **Min Next Event Time**	6.4	
Set **Lookahead**	6.5	
Request **Lookahead**	6.6	
Time Advance Request	6.7	✓

Federate 1 Object/Interaction Table

(Jager test R4)

Object/Interaction Table

Federate # 1

Enter Name Jager 1

					If Update =" y"					If Subscribe = y"	Ownership	
Object/ Interaction Class	**Attribute/ Parameter**	**Count**	**Size**	**Update ?** (y or n)	**Update Rate** # updates/unit time	**Update Grouping** (Assign same letter to attributes which will all be updated at the same time)	**Transport** R= Reliable B= Best Effort	**Ordering** TSO or FIFO	**Subscribe?** (y or n)	**Maximum tolerable latency from any source** (milliseconds)	**Attribute Ownership Transfer Rate** # times/unit time	**Ownership Transfer Grouping** (Assign same letter to attributes which will all be transferred together)
Model		10										
	Durability		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Damage		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Location		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Mass		4 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Orientation		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Shape		4 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Velocity		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A

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Federate 2 Object/Interaction Table

(Jager test R4)

Object/Interaction Table

Federate # 2

Enter Name Jager 2

Object/ Interaction Class	Attribute/ Parameter	Count	Size	Update ? (y or n)	If Update =" y" Update Rate # updates/unit time	Update Grouping (Assign same letter to attributes which will all be updated at the same time)	Transport R= Reliable B= Best Effort	Ordering TSO or FIFO	Subscribe? (y or n)	If Subscribe = y Maximum tolerable latency from any source (milliseconds)	Ownership Attribute Ownership Transfer Rate # times/unit time	Ownership Transfer Grouping (Assign same letter to attributes which will all be transferred together)
Model		10										
	Durability		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Damage		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Location		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Mass		4 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Orientation		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Shape		4 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Velocity		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A

Table entries are for illustration only

Denotes an invalid cell for entry of data

Federate 3 Object/Interaction Table

(Jager test R4)

Object/Interaction Table

Federate # 3

Enter Name Jager 3

Object/ Interaction Class	Attribute/ Parameter	Count	Size	Update ? (y or n)	If Update =" y" Update Rate # updates/unit time	Update Grouping (Assign same letter to attributes which will all be updated at the same time)	Transport R= Reliable B= Best Effort	Ordering TSO or FIFO	Subscribe? (y or n)	If Subscribe = y Maximum tolerable latency from any source (milliseconds)	Ownership Attribute Ownership Transfer Rate # times/unit time	Ownership Transfer Grouping (Assign same letter to attributes which will all be transferred together)
Model		10										
	Durability		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Damage		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Location		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Mass		4 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Orientation		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Shape		4 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Velocity		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A

Table entries are for illustration only

Denotes an invalid cell for entry of data

Federate 4 Object/Interaction Table

(Jager test R4)

Object / Interaction Table

Federate # 4

Enter Name Jager 4

Object/ Interaction Class	Attribute/ Parameter	Count	Size	Update ? (y or n)	If Update =" y" Update Rate # updates/unit time	Update Grouping (Assign same letter to attributes which will all be updated at the same time)	Transport R= Reliable B= Best Effort	Ordering TSO or FIFO	Subscribe? (y or n)	If Subscribe = y' Maximum tolerable latency from any source (milliseconds)	Ownership Attribute Ownership Transfer Rate # times/unit time	Ownership Transfer Grouping (Assign same letter to attributes which will all be transferred together)
Model		10										
	Durability		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Damage		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Location		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Mass		4 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Orientation		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Shape		4 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A
	Velocity		8 bytes	y	14/sec	A	R	FIFO	y	200	N/A	N/A

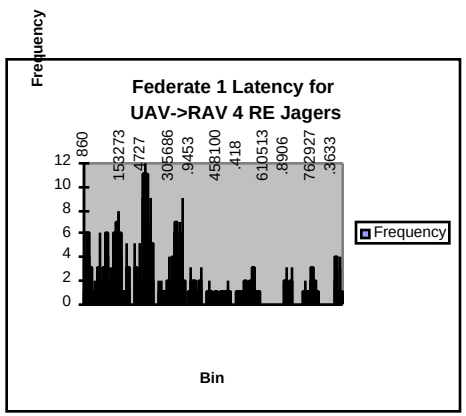
Table entries are for illustration only

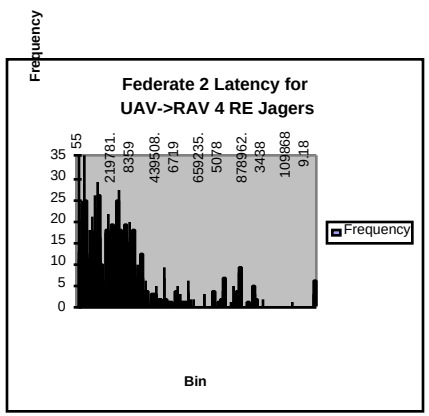
Denotes an invalid cell for entry of data

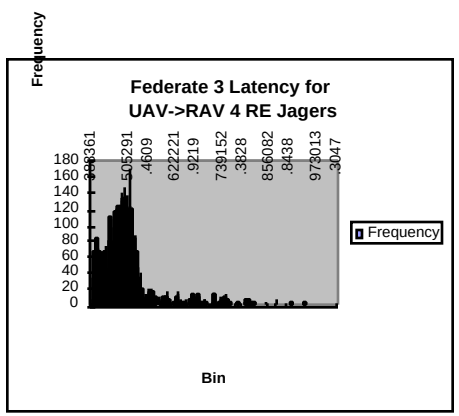
Performance Results

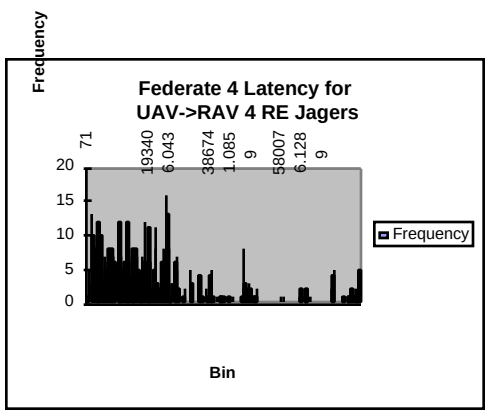
(Jager test R4)

Federate	Service	Rate of Invocations (per sec)	Execution Duration	Number of Invocations	Latency (milliseconds)		
					min	max	average
1	update -> reflect	87.01	198	15802	1	831	123
2	update -> reflect	102.913	195	38380	0	1197	115
3	update -> reflect	51.829	105	21705	0	739	30
4	update -> reflect	62.393	163	11781	312	999	431
All	update -> reflect	76.03625	165.25	75887	0	1197	145









Summary

Summary of latency for Best Effort Federations

Federation	Service	Rate of Invocations (per sec)	Execution Duration	Number of Invocations	Latency (milliseconds)		
					min	max	average
Jager test BE2	update -> reflect	98.47	220	37852	0	596	62
Jager test BE4	update -> reflect	66.706	186	122355	0	1183	146
All	update -> reflect						

Summary of latency for Reliable Federations

Federation	Service	Rate of Invocations (per sec)	Execution Duration	Number of Invocations	Latency (milliseconds)		
					min	max	average
Jager test R2	update -> reflect	92.658	191	32852	2	584	110
Jager test R4	update -> reflect	76.03625	165	75887	0	1197	145
All	update -> reflect						