



# **Next Generation Range Control and Data Distribution**

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## **19<sup>th</sup> Test Instrumentation Workshop**





# Next Generation Range Control and Data Distribution - Project Background



- Sponsored by Test Resource Management Center (TRMC), Central Test and Evaluation Investment Program (CTEIP)
- Objective is to modernize and enhance range control and data distribution architecture at PMRF
- Project scope to include
  - Data distribution architecture and mechanisms
  - Data processing applications
  - Source Integration Server (SIS)/Sensor interfaces



# Next Generation Range Control and Data Distribution - Project Scope



- Focus is on configuration, control, and monitoring of range systems
- Adds configuration and control domain on top of test data domain
- Development of mechanisms through which system configuration information is distributed throughout the range as data so that range systems can auto-configure themselves to meet different mission requirements more efficiently.



# Benefits



- Rapid range reconfiguration
- Reduced cost
- Increased reliability
- Increased awareness during operations
- Increased troubleshooting capabilities



# Legacy data distribution methods



- The current state of data distribution at PMRF is a legacy network with no connection broker or message syntax enforcement.
- No connection broker makes it difficult to:
  - Know what applications are on the network
  - Measure performance of those applications
  - Troubleshoot if there is a problem



# Legacy data distribution methods (continued)



- Mountains of data get repeatedly transmitted from producers to consumers that may or may not be connected, compounding the problem inherent in troubleshooting
- Because connections are not well characterized (or in some cases even known) it complicates migration planning as any effort becomes difficult to scope.



## Our migration plan to TENA middleware



- Our approach to modernization at PMRF is to add control, configuration, and monitoring management layer on top of existing test data domain
- Implementation consists of integration of code components into existing as well as new applications that leverage the features of TENA middleware so that we can gain better oversight of our processing streams.
- Much of the traditional range data will still be distributed via legacy methods



# Case Study 1: Instrumentation Plan



- The Instrumentation Plan (IP) at PMRF defines much of the relevant range data for a mission - it exists as an Excel spread sheet that gets emailed to mission personnel. As such, no applications can directly ingest the plan but range personnel either type in information from the Plan into their configurations or have scripts that process the Plan into a format that their applications can utilize.
- We developed an application called the IP Tasker that uses TENA to distribute entries in the Plan as tasks directly to applications which auto-configure themselves for specific mission



# Instrumentation Plan Tasker



**IP Tasker**

Configuration

Join Execution | IP Loader

IP File:

Current Tasks

Publish Task	IP VID/SID	Type	Task VID	TASK SID	Units	Host Alias	Assigned Time
<input checked="" type="checkbox"/>	124/122	IIP	3001	142	ARAV-B(1) ORIOLE RDR TRK (Q1 BCN)	ATIIP-PRIMARY1	263 02:40:48.719
<input type="checkbox"/>	124/122	ITB	3401	147	ARAV-B(1) ORIOLE RDR TRK (Q1 BCN)		
<input type="checkbox"/>	125/128	IIP	3109	142	ARAV-B(1) NOSE-TIP RDR TRK (Q9 SKN)		
<input type="checkbox"/>	125/128	ITB	3509	147	ARAV-B(1) NOSE-TIP RDR TRK (Q9 SKN)		
<input type="checkbox"/>	144/152	IIP	3050	142	ARAV-B(1) ORIOLE TM GPS TRK (BSS/PRI)		
<input type="checkbox"/>	144/152	ITB	3450	147	ARAV-B(1) ORIOLE TM GPS TRK (BSS/PRI)		



## Case Study 2: Monitoring status of a configuration



- Testers face a number of obstacles in monitoring and troubleshooting configurations at PMRF due to the nature of data distribution design and implementation.
- Nevertheless, we can augment existing applications to utilize the functionality provided by the TENA middleware to overcome many of those obstacles.



## Case Study 2: Monitoring status of a configuration (continued)



- Over 80% of range data at PMRF is tracks/TSPI information. From its origin at the sensor to the final consumer/viewer, a track message can get routed through many applications before it gets to its final destination but due to the design of data distribution currently at PMRF, we can't trace those data flows without a major effort.
- As a result, we developed some code components for integration into applications across the range that enable the status reporting of how an application is processing or rejecting individual tracks using tools and functionality offered by the TENA middleware.



## Case Study 2: Monitoring status of a configuration (continued)



- The benefits are numerous: 1) for each application with this capability, we now can determine from anywhere on the network what machine its deployed on and its configuration parameters, 2) if a track is rejected, we can determine the reason WHY the application rejected it, and 3) if an application is performing nominally the status reporting can be turned off, minimizing network traffic.
- As a result we can troubleshoot configurations and determine the data flow from producer to consumer much easier than before.



# TENA Console



ID	App Name	Hostname	IP Address	Port	MW Version	Platform	Joined	Resigned	Status
94	atiip		192.168.1.25	50201	6.0.4	centos6-gcc44...	09/30/14 12:10:...		OK
98	atiip		192.168.1.10	50202	6.0.4	centos6-gcc44...	09/30/14 12:15:...		OK
110	IP_Publisher		192.168.1.15	50360	6.0.4	rhel6-gcc44-6...	10/09/14 10:22:...		OK
112	reversepmrfvariabletrackdatagateway		192.168.1.15	50054	6.0.4	rhel6-gcc44-6...	10/09/14 10:54:...		OK
113	pmrfvariabletrackdatagateway		192.168.1.20	50050	6.0.4	centos6-gcc44...	10/09/14 10:55:...		OK
114	pmrfvariabletrackdatagateway		192.168.1.20	50051	6.0.4	centos6-gcc44...	10/09/14 10:55:...		OK
115	SIMDIS 9.5.0 SR-8 1.15.0		192.168.1.15	50324	6.0.4	rhel6-gcc44-6...	10/09/14 11:09:...		OK

Keep Active Apps Selected   
  Hide Resigned/Terminated Apps

Force Remove    

Application: # 113, pmrfvariabletrackdatagateway

  
   
   

Hide Default Values   
 Filter: \* No Filter \*

ID	Option	Value	Source	Parameter Type
113	listenEndpoints	iiop://192.168.1.20:50050	Command Line	Middleware
113	applicationName	pmrfvariabletrackdatagateway	Command Line	Middleware
113	noErrorLog	true	Command Line	Middleware
113	sessionName	RSDDataTEGateway	Command Line	Application
113	subscriptionTags	None	Command Line	Application
113	publicationTags	2	Command Line	Application
113	transmissionType	Best Effort	Command Line	Application
113	nonIOCommandLine	-25 -vid 100 -vid 124 -vid 125	Command Line	Application
113	iNetCommandLine	-A 225.0.0.1 -i 1999	Command Line	Application



# Range Asset Manager



RAM

Status Configuration

Join Execution TRAM Control TRAM Status

App ID	App Name	Type	Time Joined	Time Resigned	Received	Rejected	Processed	Sent
68	ATIIP1-SECONDARY	IIP	191 01:09:44.0031		N/A	Started	N/A	N/A
76	Gateway	VariableTrackData Gateway	191 01:10:23.0409		N/A	Started	Started	N/A
77	ReverseGWInet	VariableTrackData Reverse Gateway	191 01:10:36.0682		N/A	Started	Started	N/A

Remove All Terminated



# Range Asset Manager (continued)



RAM

Status Configuration

Join Execution TRAM Control All tracks VID 124

Filter

VID	SID	App ID	App Name	IP Address	Type	Status	Reason Rejected	Time
0	31	76	Gateway	192.168.1.30:50...	VariableTrackDat...	Rejected	VID/SID	191 01:53:16.0111
519	209	76	Gateway	192.168.1.30:50...	VariableTrackDat...	Rejected	VID/SID	191 01:53:14.0114
245	153	76	Gateway	192.168.1.30:50...	VariableTrackDat...	Processed	N/A	191 01:53:09.0503
421	185	76	Gateway	192.168.1.30:50...	VariableTrackDat...	Rejected	VID/SID	191 01:53:07.0946
421	37	76	Gateway	192.168.1.30:50...	VariableTrackDat...	Rejected	VID/SID	191 01:53:07.0940
519	185	76	Gateway	192.168.1.30:50...	VariableTrackDat...	Rejected	VID/SID	191 01:53:07.0055
519	34	76	Gateway	192.168.1.30:50...	VariableTrackDat...	Rejected	VID/SID	191 01:53:07.0025
615	182	76	Gateway	192.168.1.30:50...	VariableTrackDat...	Rejected	VID/SID	191 01:53:05.0560
214	185	77	ReverseGWiNet	192.168.1.30:50...	VariableTrackDat...	Processed	N/A	191 01:52:58.0234
214	185	76	Gateway	192.168.1.30:50...	VariableTrackDat...	Processed	N/A	191 01:52:58.0224
215	185	77	ReverseGWiNet	192.168.1.30:50...	VariableTrackDat...	Processed	N/A	191 01:52:58.0211
215	185	76	Gateway	192.168.1.30:50...	VariableTrackDat...	Processed	N/A	191 01:52:58.0198

Remove All Terminated



# Range Asset Manager (continued)

RAM

Status Configuration

Join Execution TRAM Control All tracks VID 124

▼ Filter

VID  -   Rejected

SID  -   Processed

App ID  -   Terminated

Sub Filter  -

Pub Filter  -

App Name

IP Address

App Type

Reason Rejected

vid: n == 124; sid: Any; appld: Any; subFilter: Any; pubFilter: Any; appType: Any; rejected:true; processed:true;

VID	SID	App ID	App Name	IP Address	Type	Status	Reason Rejected	Time
124	122	76	Gateway	192.168.1.30:50...	VariableTrackDat...	Processed	N/A	191 01:52:13.0156
124	124	76	Gateway	192.168.1.30:50...	VariableTrackDat...	Processed	N/A	191 01:52:13.0152
124	163	76	Gateway	192.168.1.30:50...	VariableTrackDat...	Processed	N/A	191 01:52:13.0254
124	165	76	Gateway	192.168.1.30:50...	VariableTrackDat...	Processed	N/A	191 01:52:13.0251
124	185	76	Gateway	192.168.1.30:50...	VariableTrackDat...	Processed	N/A	191 01:52:13.0562
124	209	76	Gateway	192.168.1.30:50...	VariableTrackDat...	Processed	N/A	191 01:52:13.0281
124	122	77	ReverseGWNet	192.168.1.30:50...	VariableTrackDat...	Processed	N/A	191 01:52:13.0166
124	124	77	ReverseGWNet	192.168.1.30:50...	VariableTrackDat...	Processed	N/A	191 01:52:13.0160
124	163	77	ReverseGWNet	192.168.1.30:50...	VariableTrackDat...	Processed	N/A	191 01:52:13.0268
124	165	77	ReverseGWNet	192.168.1.30:50...	VariableTrackDat...	Processed	N/A	191 01:52:13.0259
124	185	77	ReverseGWNet	192.168.1.30:50...	VariableTrackDat...	Processed	N/A	191 01:52:13.0604
124	209	77	ReverseGWNet	192.168.1.30:50...	VariableTrackDat...	Processed	N/A	191 01:52:13.0293



# Summary



- Our upgrade/replacement strategy was designed to leverage the benefits of the TENA middleware by offering new capability **not** currently available but needed at PMRF
- At the same time we sought to minimize the impact on vital processing chains which are protected and difficult to upgrade due to the tight schedule that so many ranges maintain