Your systems.
Working as one.

Connext DDS Professional 5.1 Overview

February 2014

Agenda

- Connext DDS Professional 5.1
- New Features and Enhancements
- Summary

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RTI Connext DDS Professional 5.1

- 60+ new features and enhancements to improve
  - Scalability
  - Performance
  - Usability
  - Product Capability
- New experimental features
- 20+ new platforms

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New Features and Enhancements

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XTypes - Mutable Types

- Motivation for XTypes
  - Support customer product life cycle
    - Dynamic upgrades for large and mission-critical systems
    - Allow types to evolve without breaking interoperability with applications using different versions
- Mutable Types
  - Supported in C, C++, Java and .NET/C#
  - Supported in Dynamic Data

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Extensible Types

Connext DDS 5.0

```
@Extensibility(Extensible_EXTENSIBILITY)
struct TrackData {
   long id; //@ID 1
   long x;  //@ID 2
   long y;  //@ID 3
};
```

```
@Extensibility(Extensible_EXTENSIBILITY)
struct TrackData {
   long id; //@ID 1
   long x; //@ID 2
   long y; //@ID 3
   long z; //@ID 4
};
```

```
@Extensibility(Extenisble_EXTENSIBILITY)
struct TrackData {
   long id; //@ID 1
   long x;  //@ID 2
   long y;  //@ID 3
};
```

```
@Extensibility(Extensible_EXTENSIBILITY)
struct TrackData {
   long id; //@ID 1
   long x; //@ID 2
   long z; //@ID 4
   long y; //@ID 3
};
```


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Mutable Types

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```
@Extensibility(Mutable_EXTENSIBILITY)
struct TrackData {
   long id; //@ID 1
   long x;  //@ID 2
   long y;  //@ID 3
};
```

```
@Extensibility(Mutable_EXTENSIBILITY)
struct TrackData {
   long id; //@ID 1
   long x; //@ID 2
   long y; //@ID 3
   long z; //@ID 4
};
```

```
@Extensibility(Mutable_EXTENSIBILITY)
struct TrackData {
   long id; //@ID 1
   long x;  //@ID 2
   long y;  //@ID 3
};
```

```
@Extensibility(Mutable_EXTENSIBILITY)
struct TrackData {
   long id; //@ID 1
   long x; //@ID 2
   long z; //@ID 4
   long y; //@ID 3
};
```

4-byte or 12-byte per member **extra overhead** on the wire.

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XTypes - Optional Members

- Motivation
  - Support scenarios in which data type member value is not known or does not exist
- Specific
  - Supported in C, C++ and Java
  - Supported in Dynamic Data

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Optional Members

```
@Extensibility(MUTABLE_EXTENSIBILITY)
struct TrackData {
    long id;
    long x;
    long y;
    long z;  //@Optional
};
```

C/C++

```
typedef struct TrackData {
    DDS_Long id;
    DDS_Long x;
    DDS_Long y;
    DDS_Long * z;
};
```

NULL value means there is no value because logically the value is not there

Bandwidth overhead per member

	FINAL/EXTENSIBLE	MUTABLE
SET	4/12-byte HEADER + VALUE	4/12-byte HEADER + VALUE
NOT SET	4/12-byte HEADER	0-byte

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Builtin QoS Profile

- Motivation
  - Facilitate configuration of the product for common scenario and use cases
  - Reduce configuration effort for setting individual QoS parameters
  - Communicate how to use new features or QoS in a use case
  - Increase accessibility of new capabilities and features

- Specific
  - Total of 34 QoS Profiles as part of the core library
  - Can be extended and expanded as new features developed and new use cases identified

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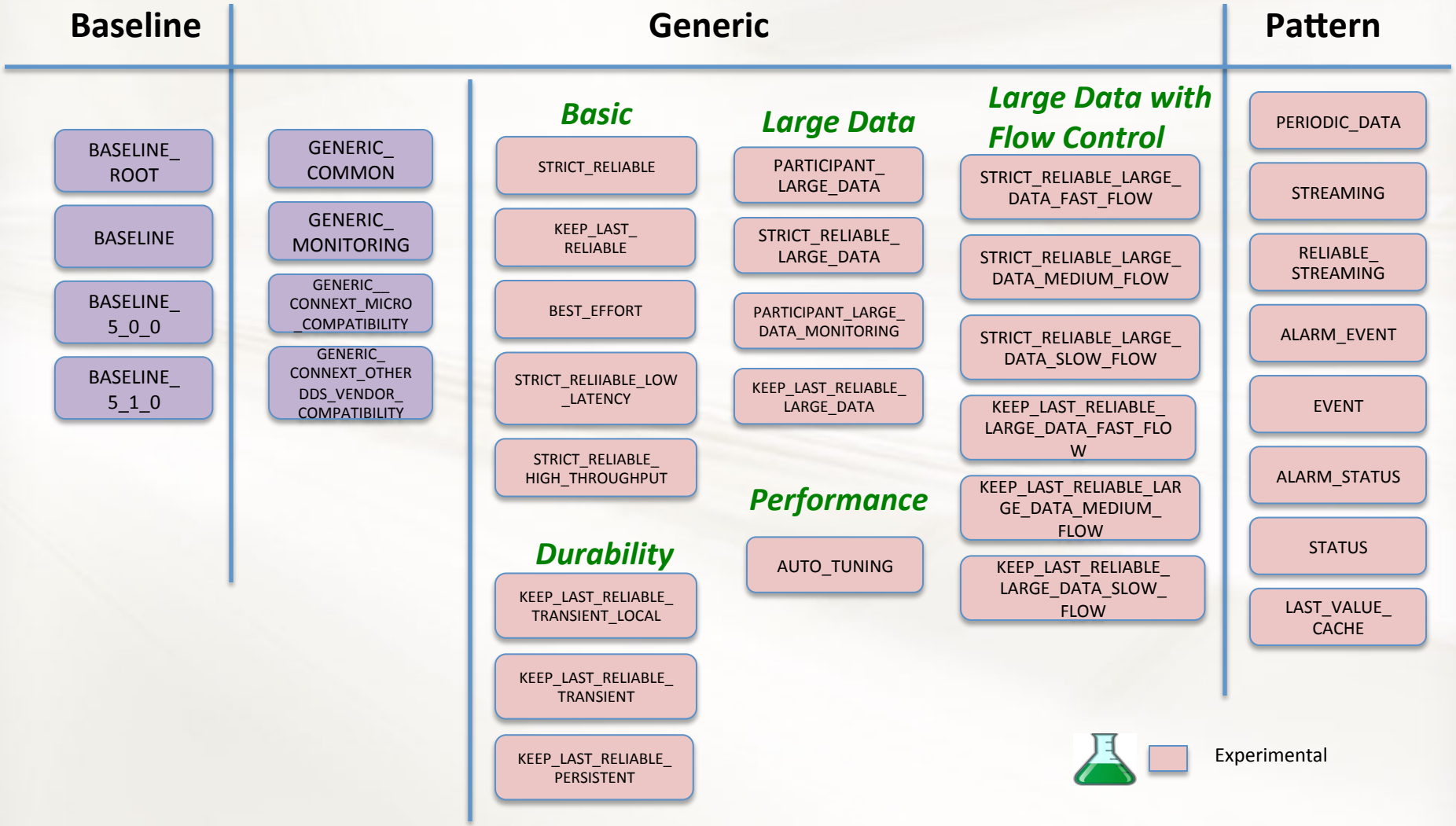
Builtin QoS Profiles



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Improved Default Transport Settings

- Motivation
  - Improve out-of-box performance
  - Minimize need for tuning
- Specific
  - Increased MTU size, Send Buffer size and Receive Buffer size
  - Default QoS profile available to enable backward compatible with 5.0.0

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Enhanced TCP Transport using I/O Completion Port (IOCP)

- Motivation
  - Increase the scalability of TCP transport by supporting more TCP connections in Windows-based deployments

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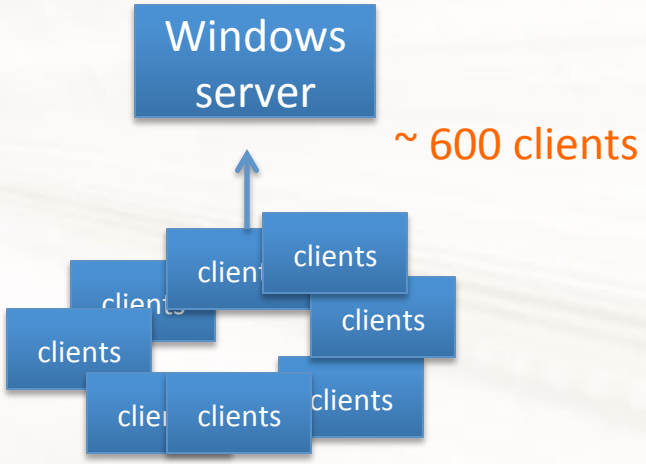
I/O Completion Port (IOCP)

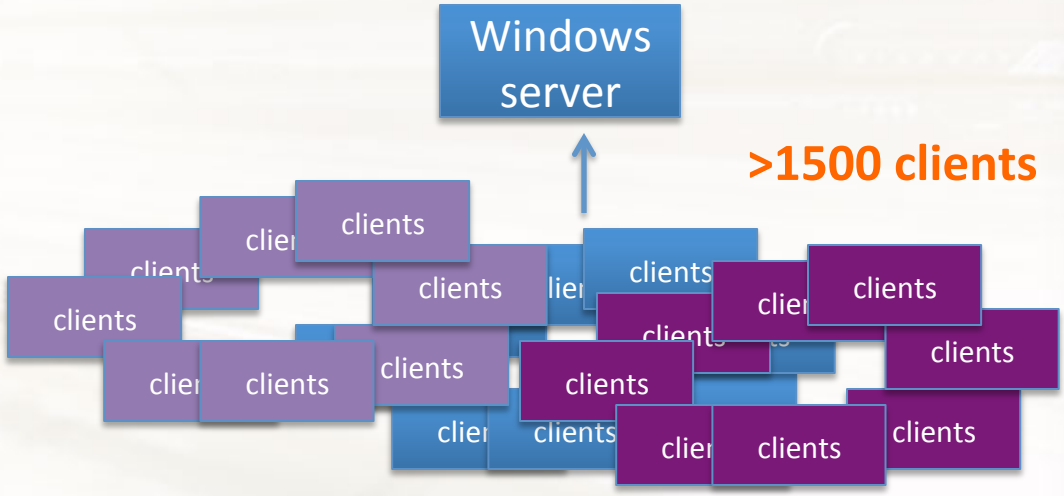
Synchronous I/O operation using Select () API

Connext DDS 5.0



Asynchronous I/O operation using IOCP API

Connext DDS 5.1



- To enable IOCP simply set the property **socket_monitoring_kind** in TCP plugin to **WINDOWS_IOCP**

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UDPv4 NAT Support

- Motivation
  - In 5.0 WAN transport requires running a rendezvous server when crossing NAT
  - Allow applications running outside the NAT to continue using UDPv4 transport without changes

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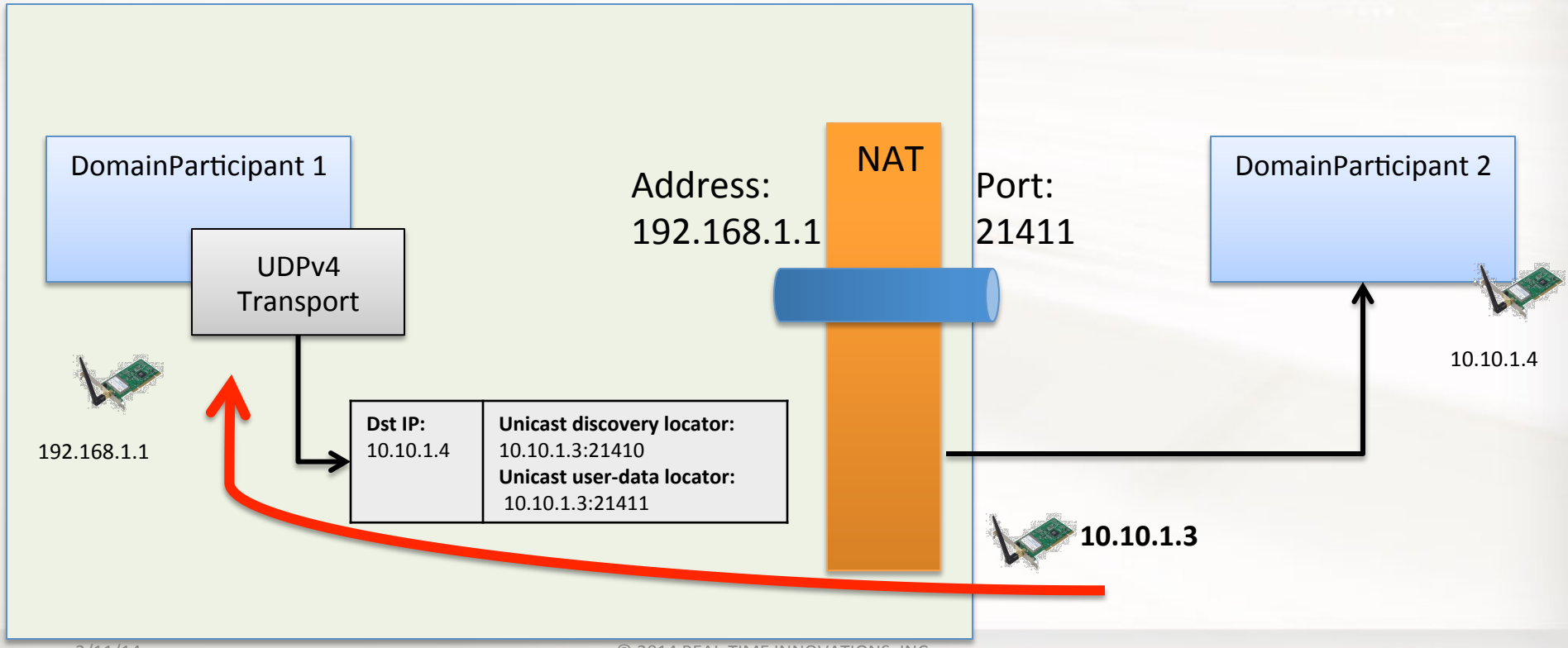
UDPv4 NAT Support

- New way to traverse WAN
- New UDPv4 transport property **dds.transport.UDPv4.builtin.public_address** to provide IP address to be announced to other DomainParticipants



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Routing Service Content Filter Propagation

- Motivation
  - Reduce bandwidth and CPU utilization in a Routing Service hierarchical system where DataReaders subscribe to only a subset of the data
  - DataWriter and Routing Service only publish data that is subscribed

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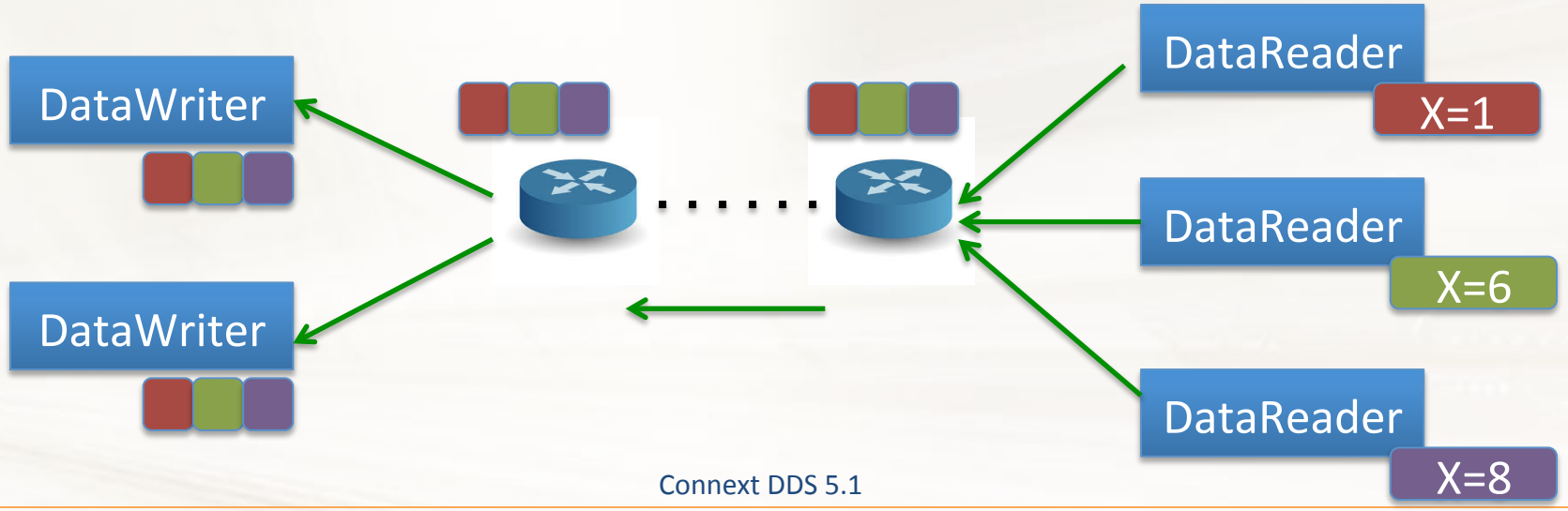
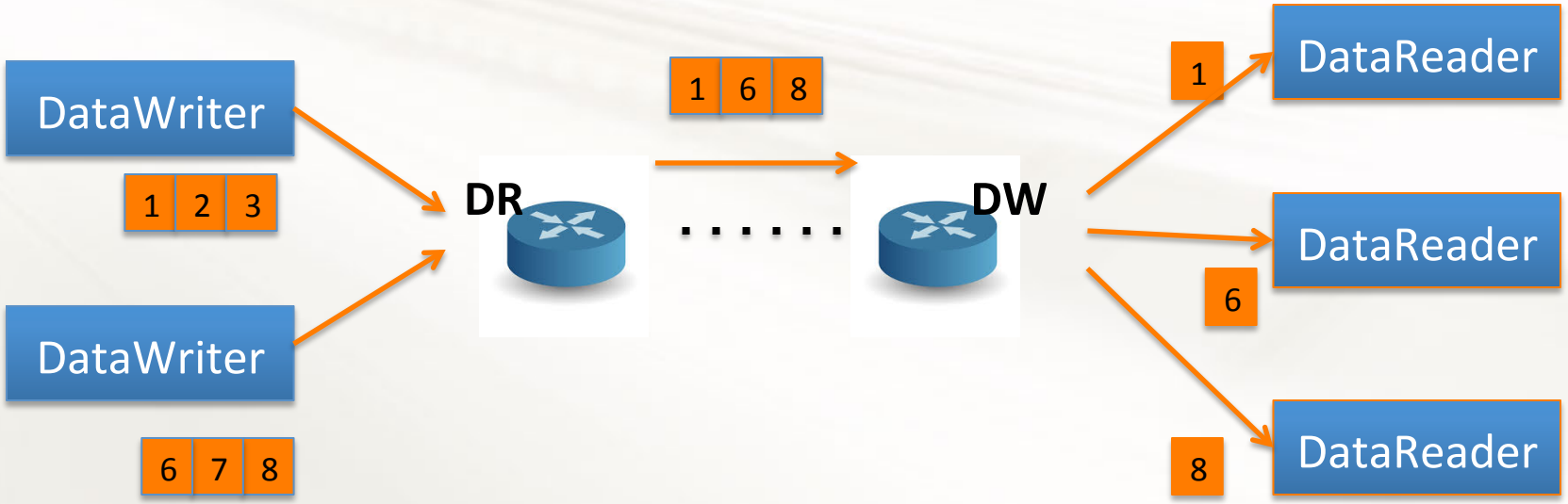
Routing Service – Content Filter Propagation



Connext DDS 5.1



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Turbo Mode (Experimental)

- Motivation
  - When system condition changes, automatically adjust QoS to maintain optimal performance
  - Improve performance in burst traffic scenario
    - high throughput at high sending rate
    - low latency at slow sending rate

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Auto Throttle (Experimental)

- Motivation
  - When system condition changes, automatically adjust QoS to maintain optimal performance
  - Improves latency average and jitter in high throughput conditions

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CodeGen 2.0 (Experimental)

- Motivation
  - Reduce code generation time especially when dealing with large IDL files and large number of IDL files.
  - Ease customizations and extensions to code generation
- Usability
  - Apache Velocity (VLT) templates are used in place of XSL
- Performance
  - With small IDL files, performance is **6x faster** (server mode)
  - With a large IDL file (2,000 structs) CodeGen 2.0 is **>10x faster**

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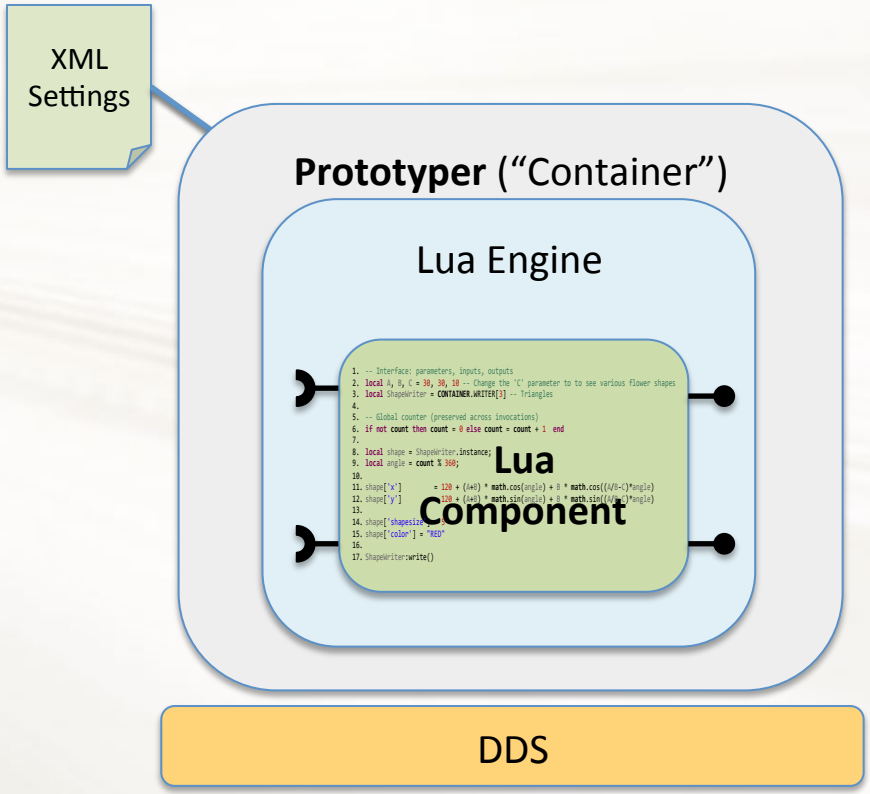
Prototyper with LUA (Experimental)



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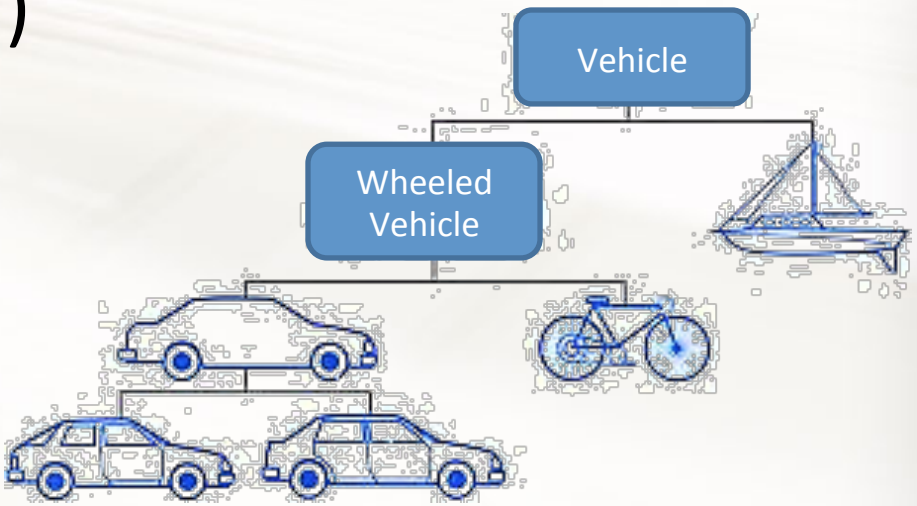
Spreadsheet Add-in Enhancements

- Spreadsheet Add-in adds support for visualizing **extensible**, **mutable** and **optional members**
- Added support for Excel 2013 (we now support 2010 and 2013)



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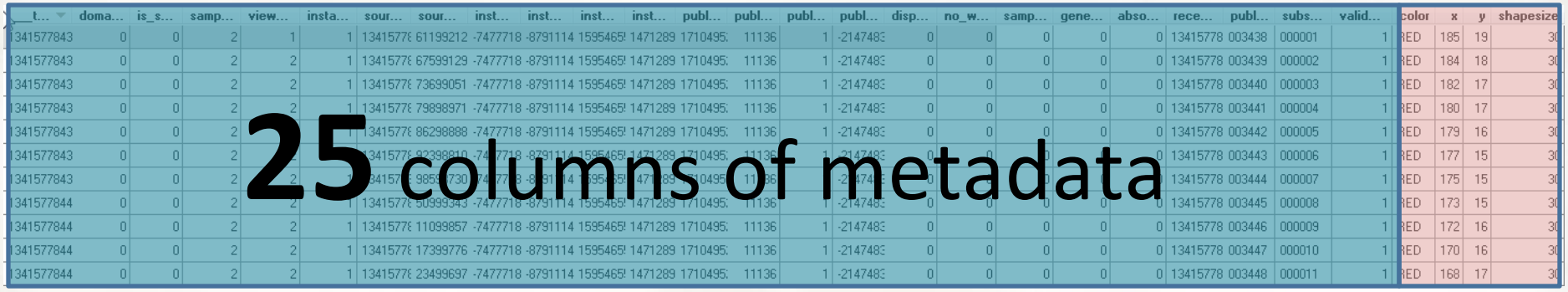
Recording Service: Flexible Field Selection

Pre 5.1.0 …



t...	doma...	is_s...	samp...	view...	insta...	sour...	sour...	inst...	inst...	inst...	inst...	publ...	publ...	publ...	publ...	disp...	no_w...	samp...	gene...	abso...	rece...	publ...	subs...	valid...	color	x	y	shapesize
1341577843	0	0	2	1	1	13415778	61199212	-7477718	-8791114	1595465!	1471289	1710495:	11136	1	-214748:	0	0	0	0	0	13415778	003438	000001	1	RED	185	19	30
1341577843	0	0	2	2	1	13415778	67599129	-7477718	-8791114	1595465!	1471289	1710495:	11136	1	-214748:	0	0	0	0	0	13415778	003439	000002	1	RED	184	18	30
1341577843	0	0	2	2	1	13415778	73699051	-7477718	-8791114	1595465!	1471289	1710495:	11136	1	-214748:	0	0	0	0	0	13415778	003440	000003	1	RED	182	17	30
1341577843	0	0	2	2	1	13415778	79898971	-7477718	-8791114	1595465!	1471289	1710495:	11136	1	-214748:	0	0	0	0	0	13415778	003441	000004	1	RED	180	17	30
1341577843	0	0	2	2	1	13415778	86298888	-7477718	-8791114	1595465!	1471289	1710495:	11136	1	-214748:	0	0	0	0	0	13415778	003442	000005	1	RED	179	16	30
1341577843	0	0	2	2	1	13415778	92398810	-7477718	-8791114	1595465!	1471289	1710495:	11136	1	-214748:	0	0	0	0	0	13415778	003443	000006	1	RED	177	15	30
1341577843	0	0	2	2	1	13415778	98597730	-7477718	-8791114	1595465!	1471289	1710495:	11136	1	-214748:	0	0	0	0	0	13415778	003444	000007	1	RED	175	15	30
1341577844	0	0	2	2	1	13415778	50999343	-7477718	-8791114	1595465!	1471289	1710495:	11136	1	-214748:	0	0	0	0	0	13415778	003445	000008	1	RED	173	15	30
1341577844	0	0	2	2	1	13415778	11099857	-7477718	-8791114	1595465!	1471289	1710495:	11136	1	-214748:	0	0	0	0	0	13415778	003446	000009	1	RED	172	16	30
1341577844	0	0	2	2	1	13415778	17399776	-7477718	-8791114	1595465!	1471289	1710495:	11136	1	-214748:	0	0	0	0	0	13415778	003447	000010	1	RED	170	16	30
1341577844	0	0	2	2	1	13415778	23499697	-7477718	-8791114	1595465!	1471289	1710495:	11136	1	-214748:	0	0	0	0	0	13415778	003448	000011	1	RED	168	17	30

- What the user **really cares about**
- What we store **by default**, apart from user-data

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Recording Service: Flexible Field Selection

Now (5.1.0) …

Samp...	Samp...	color	x	y	shapesize
138201651	1	CYAN	133	58	30
138201651	1	MAGENTA	204	23	25
138201651	1	CYAN	131	53	30
138201651	1	MAGENTA	203	26	25
138201651	1	CYAN	129	48	30
138201651	1	MAGENTA	202	28	25
138201651	1	CYAN	127	43	30
138201651	1	MAGENTA	202	30	25
138201651	1	CYAN	125	39	30
138201651	1	MAGENTA	201	32	25
138201651	1	CYAN	124	34	30

2 columns of metadata

What the user **really cares about**

What we also store in the DB **by default**

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Recording Service: Flexible Field Selection

Users can now **select** what SampleInfo fields to store with their recorded data

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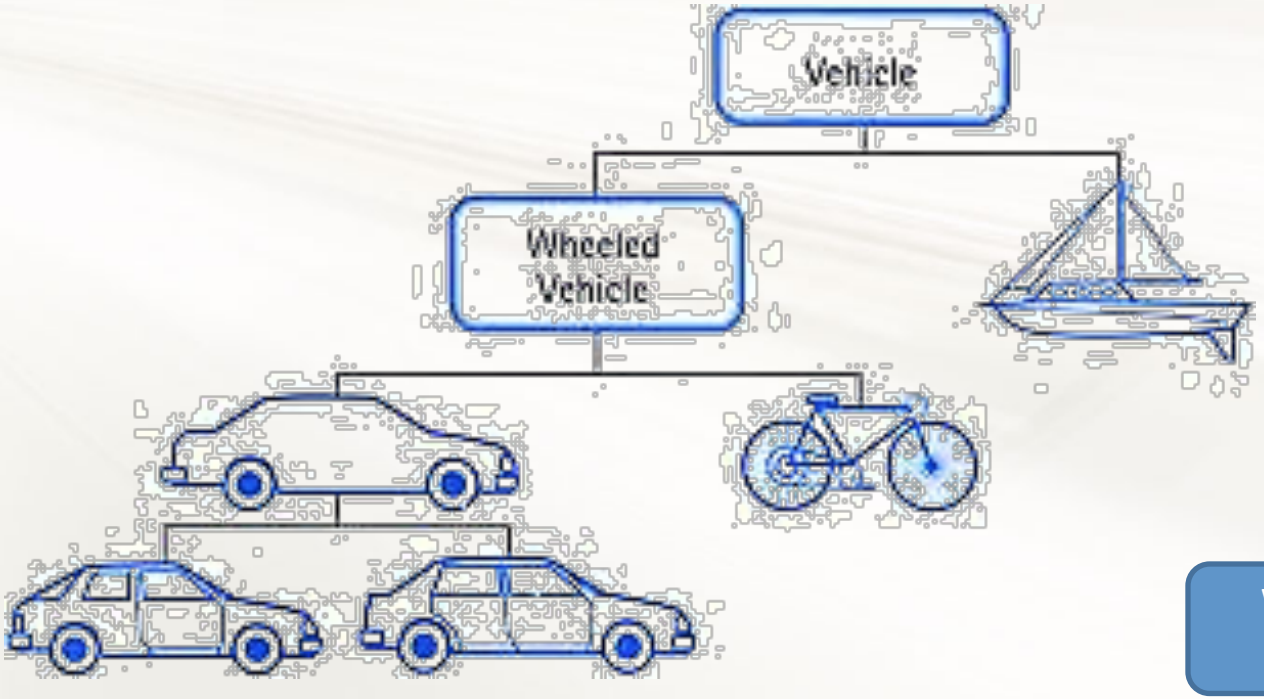
Recording Service: Integration with X-Types

- Recorder, Replay and Converter can now work with **extensible**, **mutable** types and **optional members**



Vehicle

Wheeled Vehicle

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Recording Service: Online Indexing

- Enable access the DB while recording
  - Efficient queries based on the source timestamp and some user defined fields

- **New in 5.1.0**: flexible, user-defined, DB indexing while recording

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Recording Service: Other Features

- SQLite version upgraded from 3.3.13 to **3.7.17**
  - New DB journal mode: WAL (Write-Ahead Log) provides improved concurrency
- **New in 5.1.0**: ability to specify SQLite pragmas
  - Useful for fine-tuning performance or other aspects, like concurrency
  - E.g. page size on Windows systems
  - WAL journal mode for concurrency

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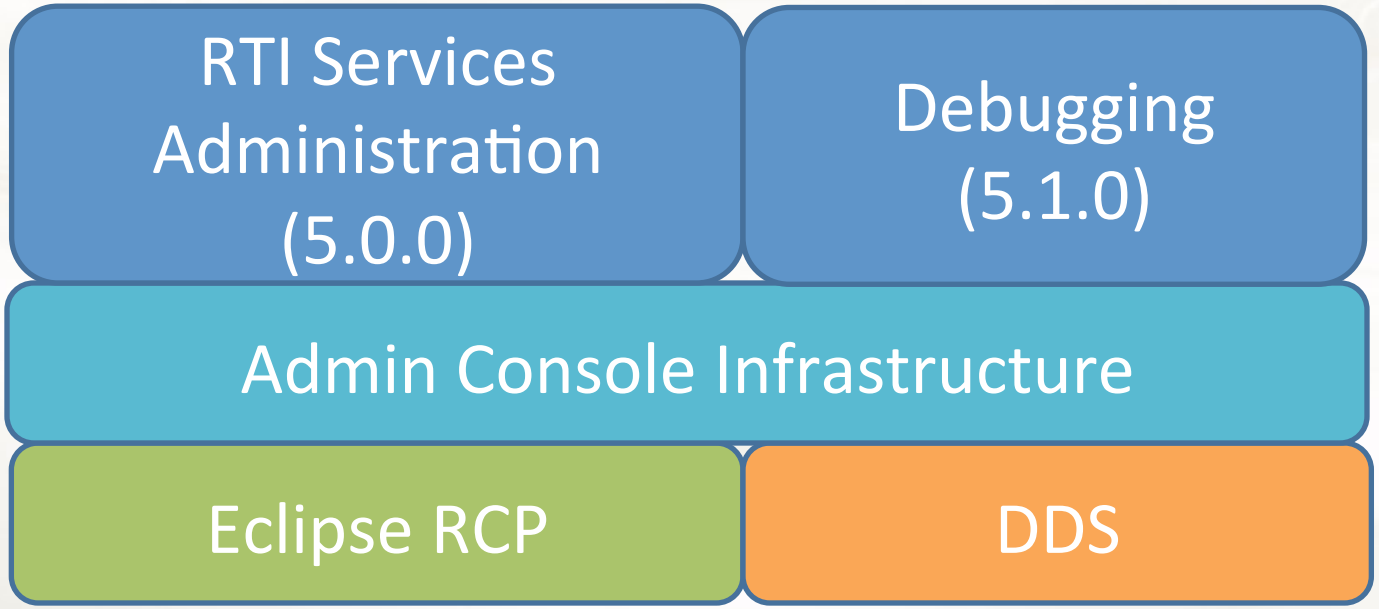
Admin Console



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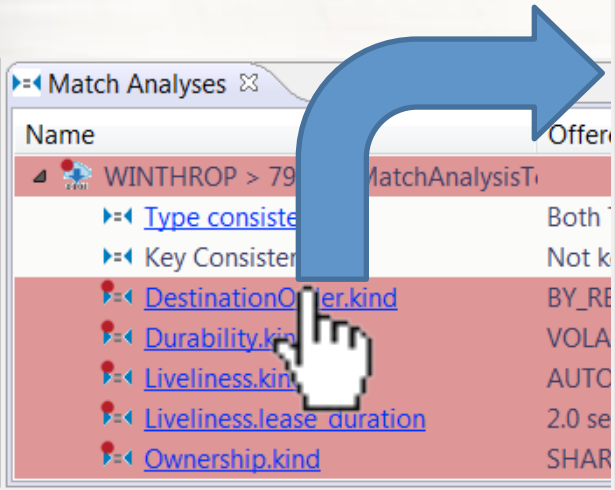
Real-time Match Analyses



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Health View

Health

Health	Reason	Description
Error	Error log entry	One or more error log entries have been received
Error	Requested/offered QoS	QoS offered by DataWriter(s) is not compatible with the QoS requested by DataReader(s)
Warning	Warning log entry	One or more warning log entries have been received
Warning	No matching partitions	Associated DataWriter(s) and DataReader(s) do not contain mismatching partitions

9 conditions are evaluated to determine health.

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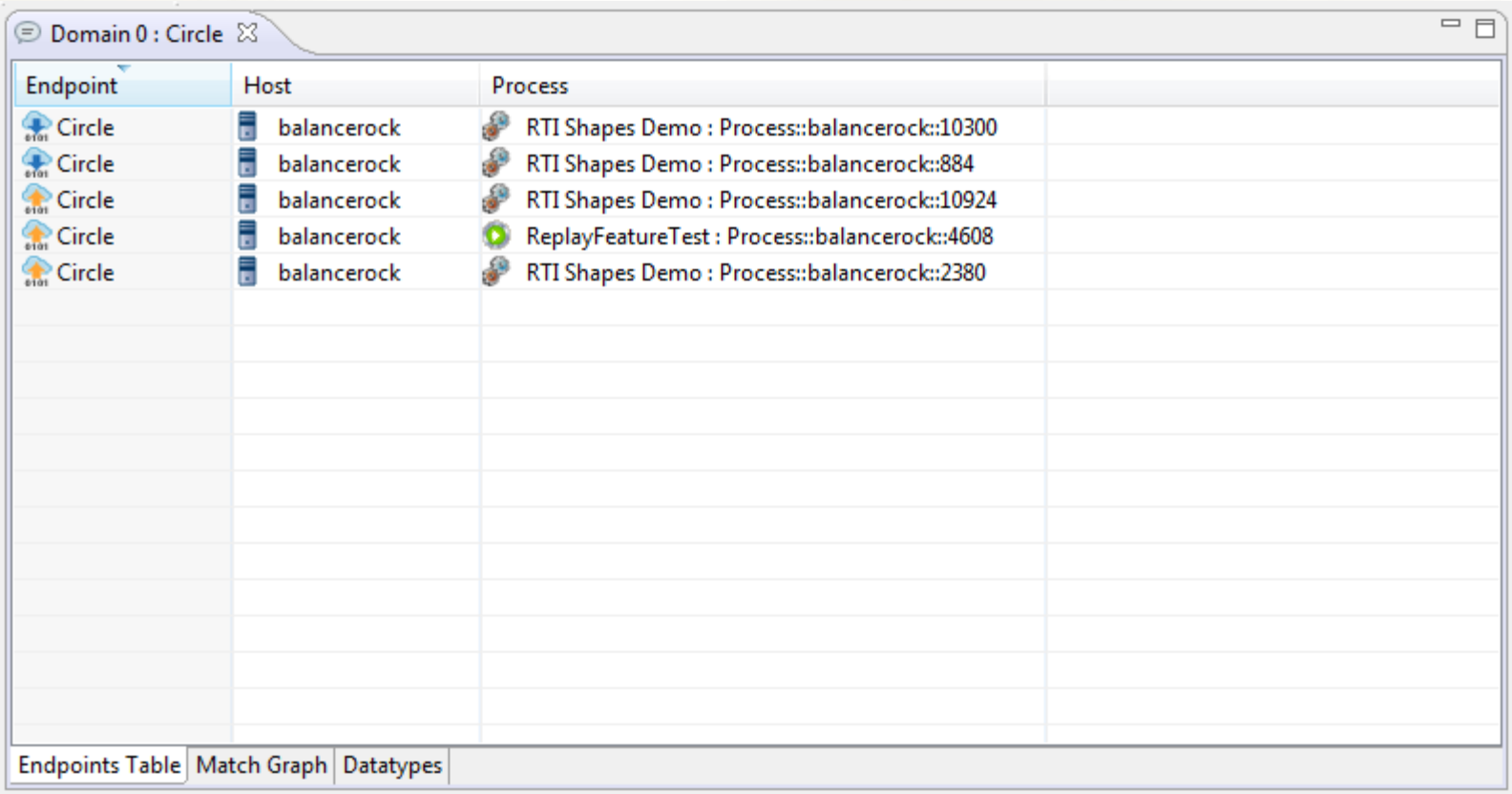
Topic



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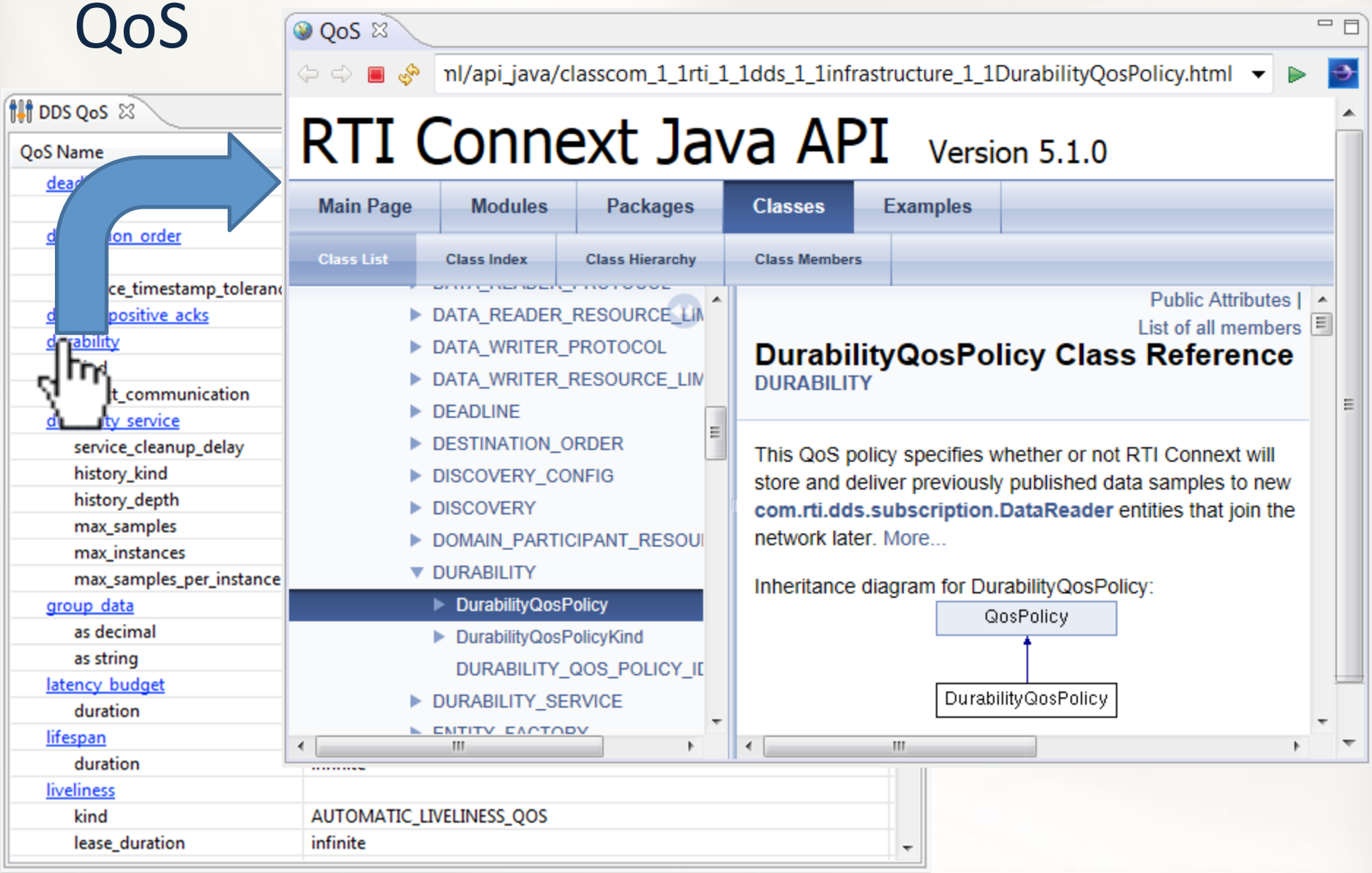
QoS



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DDS Data Type

DDS Data Type

```
struct RTI::DL::HostAndAppId{
   long rtps_host_id; //@key
   //@ID 0
   long rtps_app_id; //@key
   //@ID 1
};
//@Extensibility EXTENSIBLE_EXTENSIBILITY

enum RTI::DL::ADMIN::CommandResult {
   RTI_DL_COMMAND_RESULT_OK = 0,
   RTI_DL_COMMAND_RESULT_NOT_SUPPORTED = 1,
   RTI_DL_COMMAND_RESULT_ERROR = 2
};
//@Extensibility EXTENSIBLE_EXTENSIBILITY

struct RTI::DL::ADMIN::CommandResponse{
```

Type tree | Equivalent IDL

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System Log

Hosts | System Log

Host	Process	Time	Level	Category	Message
WINTHROP	DistributedLoggerTestApplication	04:48:19.876 PM Thu 01/...	Warning		This is a warning message @ time : Thu Jan 16 16:48:19 P...
WINTHROP	DistributedLoggerTestApplication	04:48:14.877 PM Thu 01/...	Error		This is an error message @ time : Thu Jan 16 16:48:14 PST...
WINTHROP	DistributedLoggerTestApplication	04:48:09.876 PM Thu 01/...	Warning		This is a warning message @ time : Thu Jan 16 16:48:09 P...
WINTHROP	DistributedLoggerTestApplication	04:48:04.877 PM Thu 01/...	Error		This is an error message @ time : Thu Jan 16 16:48:04 PST...
WINTHROP	DistributedLoggerTestApplication	04:47:59.876 PM Thu 01/...	Warning		This is a warning message @ time : Thu Jan 16 16:47:59 P...
WINTHROP	DistributedLoggerTestApplication	04:47:54.877 PM Thu 01/...	Error		This is an error message @ time : Thu Jan 16 16:47:54 PST...
WINTHROP	DistributedLoggerTestApplication	04:47:49.876 PM Thu 01/...	Warning		This is a warning message @ time : Thu Jan 16 16:47:49 P...
WINTHROP	DistributedLoggerTestApplication	04:47:44.877 PM Thu 01/...	Error		This is an error message @ time : Thu Jan 16 16:47:44 PST...
WINTHROP	DistributedLoggerTestApplication	04:47:39.876 PM Thu 01/...	Warning		This is a warning message @ time : Thu Jan 16 16:47:39 P...

Combined log from all applications using Distributed Logger.

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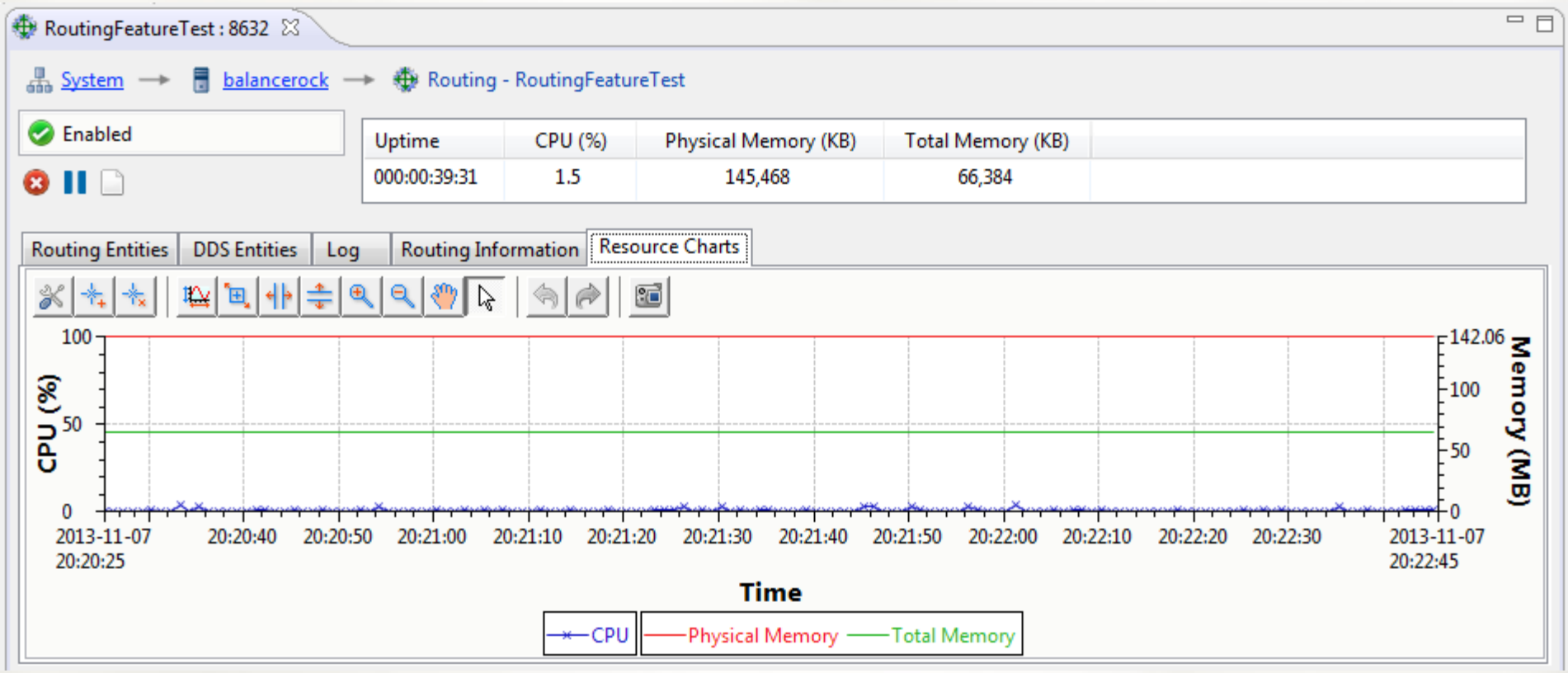
Routing Service : Resources Chart



Similar view for Host

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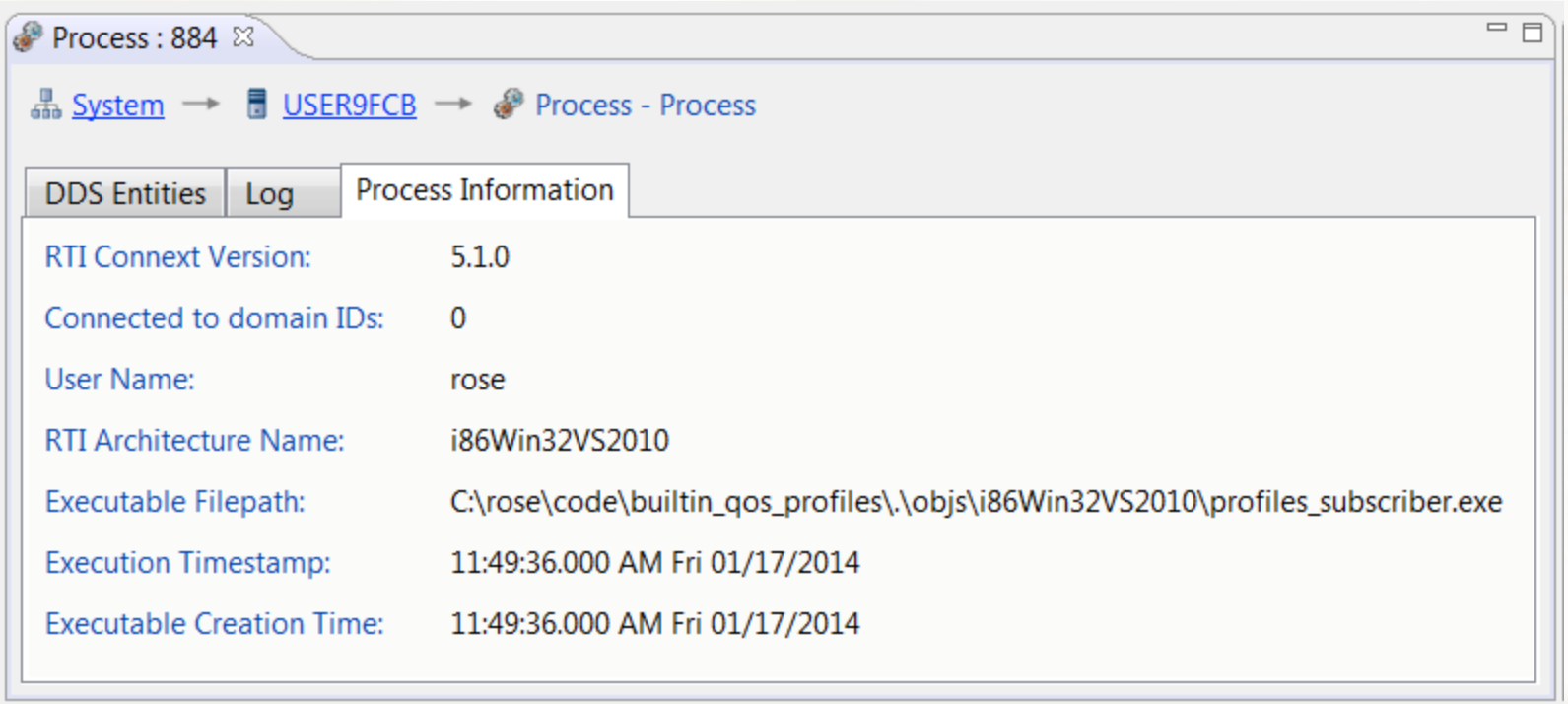
Extended Process Information



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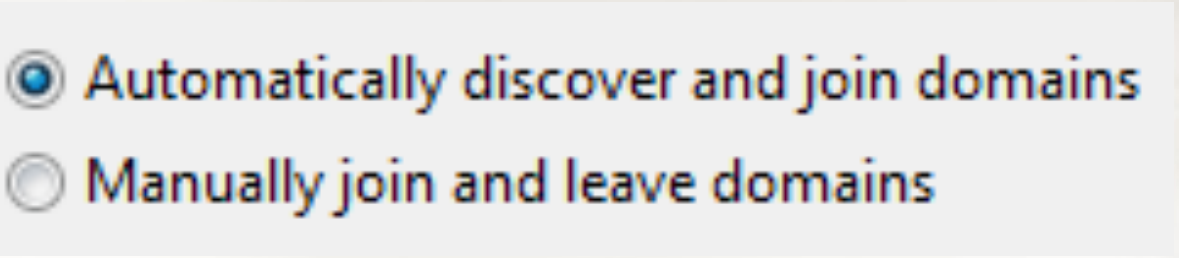
Auto Join



6

8

Domains Joined:

0, 6, 8

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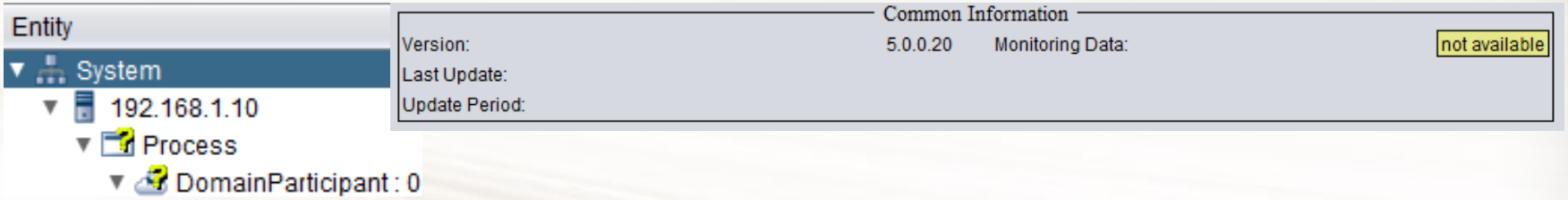
Monitor UI

- Auto join active DDS domains.
- No monitoring information indicators.



- Displays DataReaders and DataWriters even if monitoring library is ***not*** enabled.
- System Overview usability improvements

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Many More …

- Prioritized Samples Supported in Java and C# APIs
  - Enable prioritization of traffic when in competition for transmission resources
- Ability to Change Expression in ContentFilterTopic
  - More flexible for a subscriber to change its interest on the data contents
- Ability to Zero Out Padding Bytes in Message on the Wire
  - To provide better security
- XML-Based Application Creation is now GAR
  - Simplifies development and programming effort of RTI Connext application
- New APIs to Get ParticipantBuiltinTopicData of Matched Publication or Subscription using Publication and Subscription Handles
  - Easier way to retrieve information about remote application that publish and subscribe data

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Summary

- Connext DDS Professional 5.1 greatly improves
  - Scalability
  - Usability
  - Performance
  - Robustness
- Rich set of Tools
- Most standards compliant DDS middleware in the market
- Runs on all mainstream platforms
- Available NOW!

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Thank You!

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