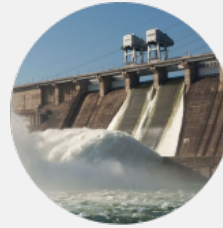




Your systems.
Working as one.



Connex DDS Tools

Ken Brophy
ken@rti.com

Outline



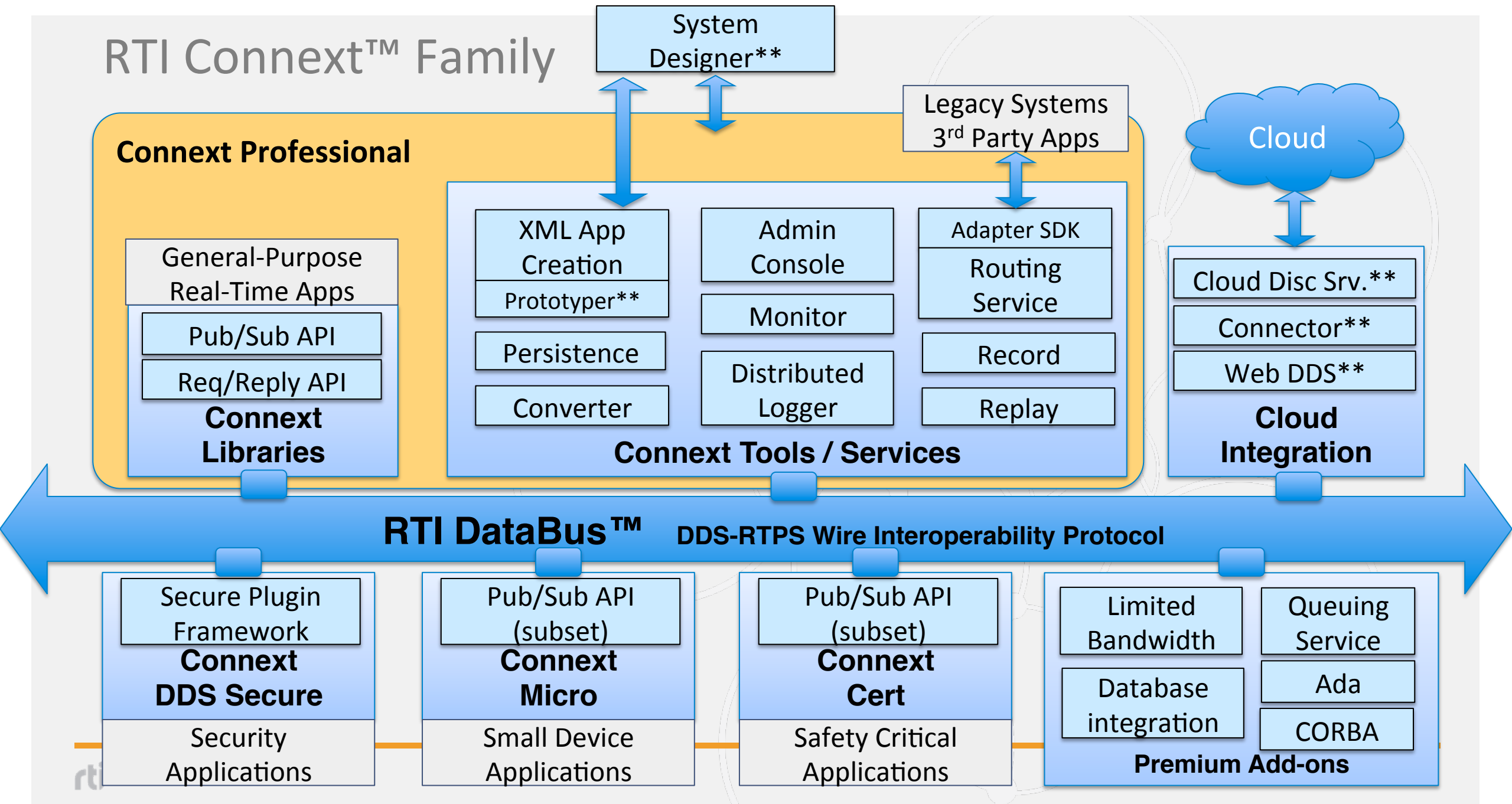
- Very brief biography
- Available tools
- Demonstrations
- Questions & Answers
- Resources

Very brief biography

- Former RTI customer
- Joined RTI 11 years ago as a Services Engineer
- Started developing tools 7+ years ago
- Started the Tools Team 6 years ago which I currently lead

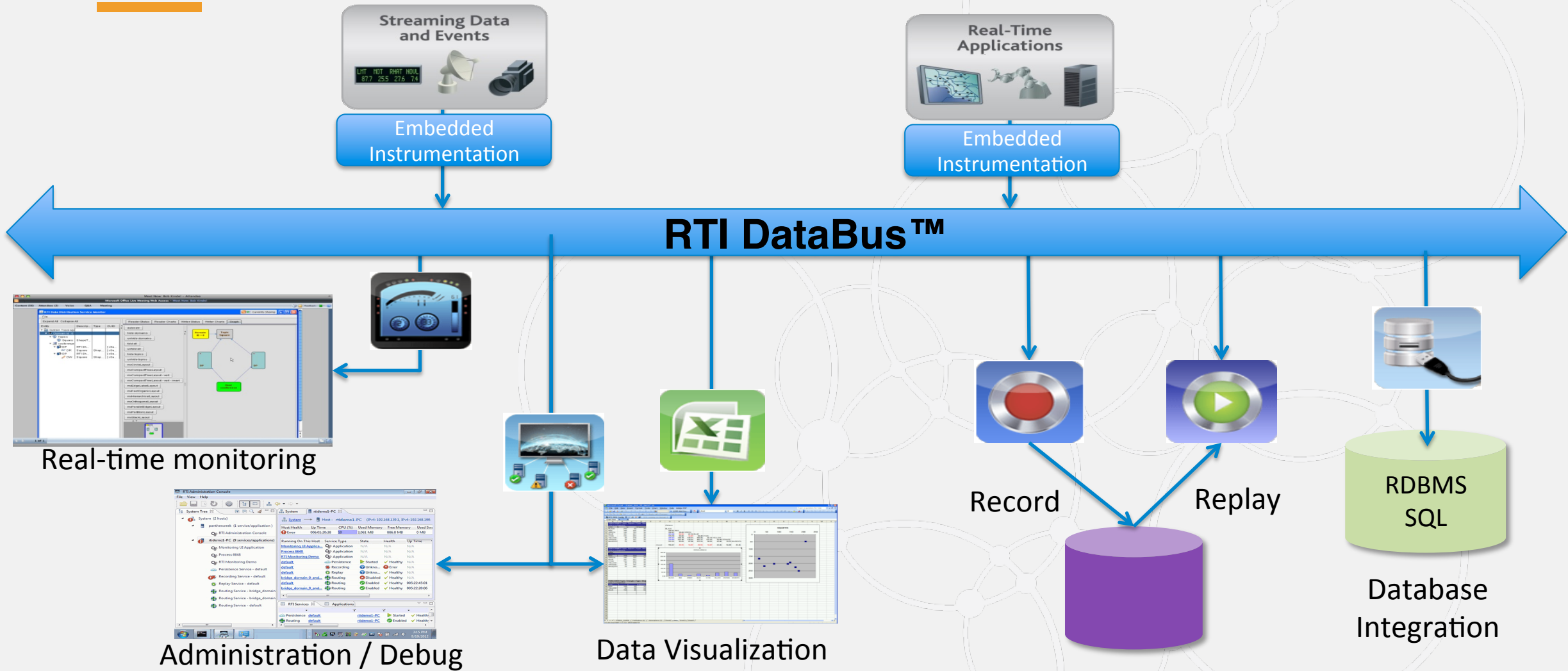


RTI ConnexTM Family



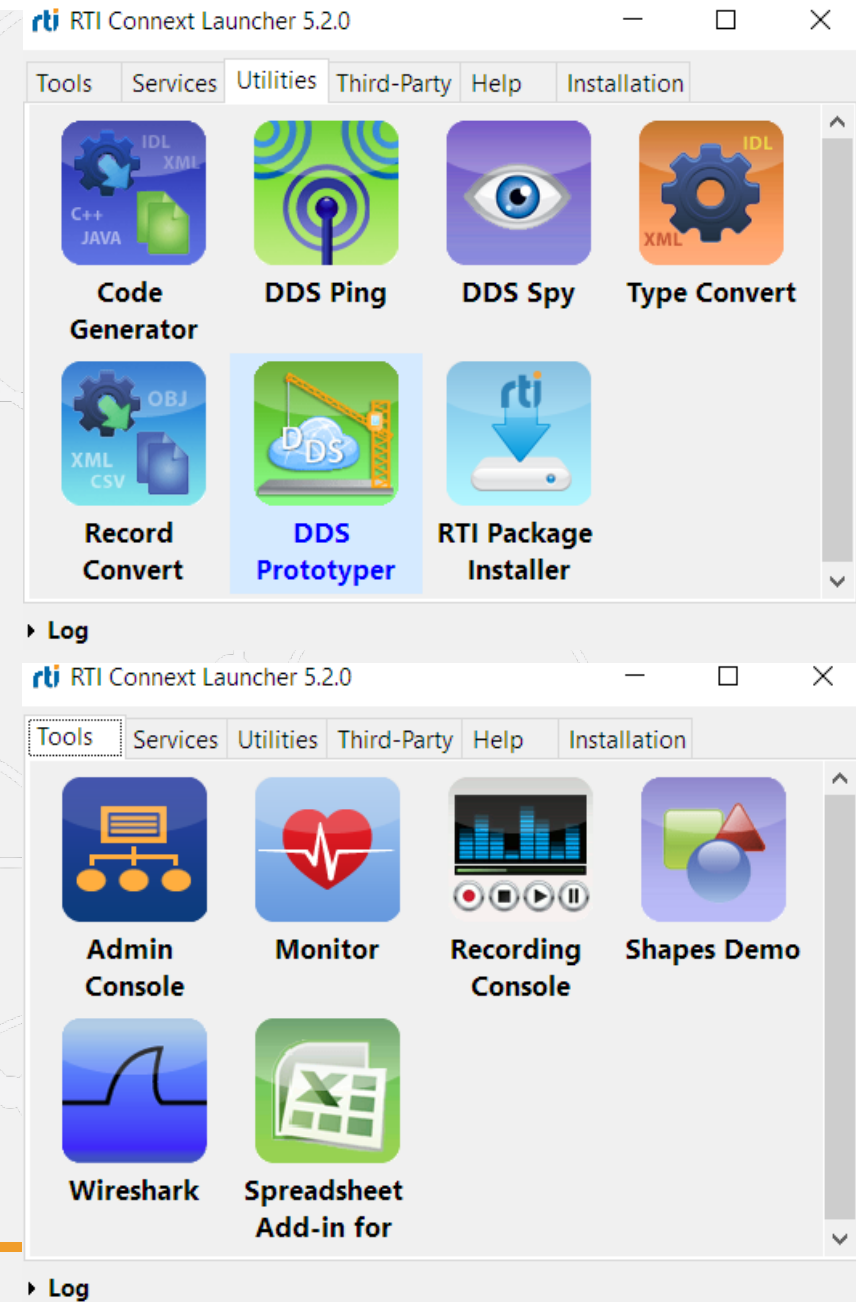
** Experimental feature

Flexible Application Monitoring Solution



Tools

- Design
 - System Designer
- Utilities
 - Launcher, Ping, Spy, & Log Parser
- Visualization & Debugging
 - Admin Console
 - Monitor
 - Distributed Logger
 - Spreadsheet Add-in
 - Wireshark



System Designer (I)

This feature is in the Prototype stage
Live demo later

The screenshot displays the rti System Designer interface for a project named 'MyProject'. The interface includes a top toolbar with icons for Projects, Properties, Load, Export, Save, and Help. Below this, there are tabs for Types, QoS, Domain, and Participant. The main workspace is divided into several panels:

- Left Panel:** Contains a 'Collapse' button and a tree view of 'Imported Types' and 'Types'. The 'Types' tree shows 'struct ShapeType' and 'struct MyStruct'.
- Top Panel:** Contains tabs for 'Structured', 'XML', and 'IDL'. Below these are 'Types', 'QoS', 'Domain', and 'Participant' tabs. A 'Collapse' button and a 'New library' button are also present.
- Right Panel:** Contains a 'Collapse' button and a tree view of 'Imported Participant Libraries' and 'Participant Libraries'. The 'Participant Libraries' tree shows 'MyLib' with sub-items 'MyParticipant', 'MyPub', 'SquareWriter', 'MySub', and 'SquareReader'.
- Bottom Panel:** Contains a 'Domain participant name' field set to 'MyParticipant', a 'Domain reference' field set to 'MyDomainLib::DoMa', and a 'Participant Qos' field set to 'Default QoS'. Below these are tabs for 'Publications' and 'Subscriptions'. The 'Publications' tab is active, showing a table of publishers.

The 'Publications' table lists the following data:

Publisher Name	Qos
MyPub	Default QoS

Below the 'Publications' table is a section for 'Data Writers' with a table listing the following data:

Data Writer Name	Topic	Qos
SquareWriter	Square	Default QoS

System Designer (II)

This feature is in the Prototype stage
Live demo later

Integration with XML App Creation

```
<?xml version="1.0" encoding="UTF-8"?>
<dds>
  <!-- DDS Types -->
  <types>
    <struct name="ShapeType">
      <member name="x" type="long"/>
      <member name="y" type="long"/>
      <member name="size" type="long"/>
      <member name="color" type="string" stringMaxLength="128" key="true"/>
    </struct>
    <struct name="MyStruct" baseType="ShapeType" extensibility="mutable">
      <member name="NewMember1" type="long"/>
    </struct>
  </types>
  <!-- Qos Libraries -->
  <qos_library name="MyLibrary">
    <qos_profile name="MyProf" is_default_qos="true">
      <participant_qos>
        <participant_name>
          <name>MyParticipant</name>
        </participant_name>
      </participant_qos>
    </qos_profile>
  </qos_library>

  <!-- Domain Libraries -->
  <domain_library name="MyDomainLib">
    <domain name="Domain0" domain_id="0">
      <register_type name="ShapeType" kind="dynamicData" type_ref="ShapeType"/>
      <topic name="Square" register_type_ref="ShapeType"/>
    </domain>
  </domain_library>

  <!-- Participant Libraries -->
  <participant_library name="MyLib">
    <domain_participant name="MyParticipant" domain_ref="MyDomainLib::Domain0">
```

[Copy document](#) to clipboard, or [Download](#) it as a file

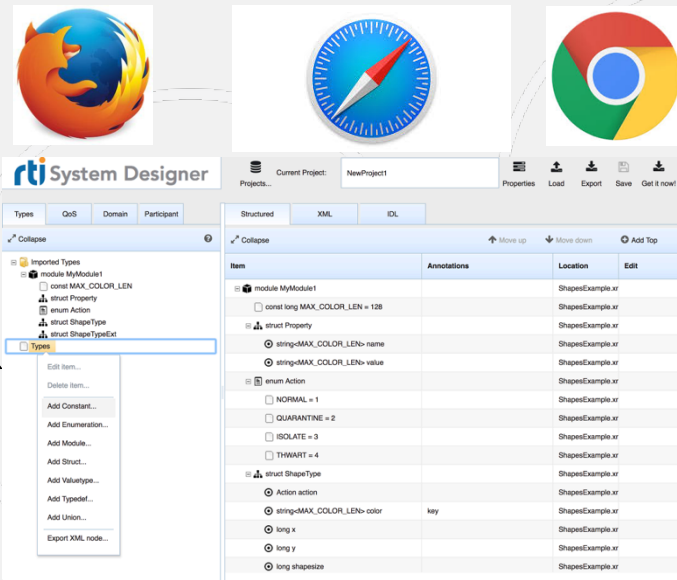
Close

System Designer Architecture

System Designer Server

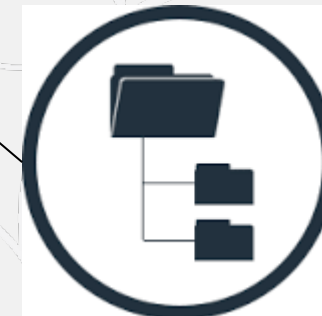


System Designer Client



HTTP

User's file system



Browser Sandbox



Live demo later

DDS Ping

- Command-line tool for connectivity experiments.
- Great for checking if discovery is not working in your configuration.
- Can be run directly on your target machines.



DDS Spy

Live demo later

- Command-line tool to see what's running and can print live data.
- Can be run directly on your target machines.
- Great for smaller systems and relatively low data rates.

Log parser

Remote Address	In/Out	Local Entity	Message
H1.A1.P1	--->	R-K_800000	Received DATA [1
			*Warning: Missing
H1.A1.P1	--->	R-K_800000	Received DATA [1
H1.A1.P1	--->	R-K_800000	Received HB [347
H1.A1.P1	<---	R-K_800000	Sent NACK [353]
H1.A1.P1	--->	R-K_800000	Received DATA [1

Config:

```
0. 14x File NDDSCOVERY_PEERS not found
1. 14x Environment variable NDDSCOVERY_PEERS not found
2. 1x Version of NDDSCORE is 5.2.0.0
3. 1x Version of NDDSC is 5.2.0.0
4. 1x Version of NDDSCPP is 5.2.0.0
5. 1x Valid interface: enp0s25
6. 1x Environment variable NDDSHOME not found
7. 1x Environment variable NDDSQOS_PROFILES not found
8. 1x Enabled interface: lo (with multicast)
9. 1x Enabled interface: enp0s25 (with multicast)
10. 1x Enabled interface: wlp3s0 (with multicast)
11. 1x Enabled interface: virbr0 (with multicast)
12. 1x Enabled interface: tun0 (with multicast)
13. 1x Initial peers: builtin.udpv4://H1, builtin.udpv4://H2, builtin.shmem://
14. 1x Local address: 10.70.1.247 21988
```

Warnings:

```
0. 447x [LP-11] DataReader exceeded resource limits
1. 428x [LP-10] DataWriter exceeded resource limits
2. 1x 3 discovery samples lost for subscription SED_SUB_READER (3 in total)
3. 1x 2 discovery samples lost for publication SED_PUB_READER (2 in total)
4. 1x 14 discovery samples lost for subscription SED_SUB_READER (17 in total)
```

Errors:

```
0. 236x [LP-8] Cannot serialize sample
1. 10x [LP-5] Try to get key from unkeyed type.
2. 64x [LP-13] Write maximum blocking time expired
3. 2x [LP-14] Cannot write because DataWriter has been deleted
4. 2x [LP-15] Cannot delete 2 FlowControllers from delete_contained_entities
5. 1x [LP-3] Cannot write unregistered instance
```

```
01347), dataRcvd.lead(0,1347), next
```

```
der oid 0x80000004 received HB for
0000003
der oid 0x80000004 sent ACK of bitm
```

```
* Participant H3.A2.P1: 1
* App H3.A1: 21988
* Participant H3.A1.P1: 1
* Host H2: 127.0.0.1
```

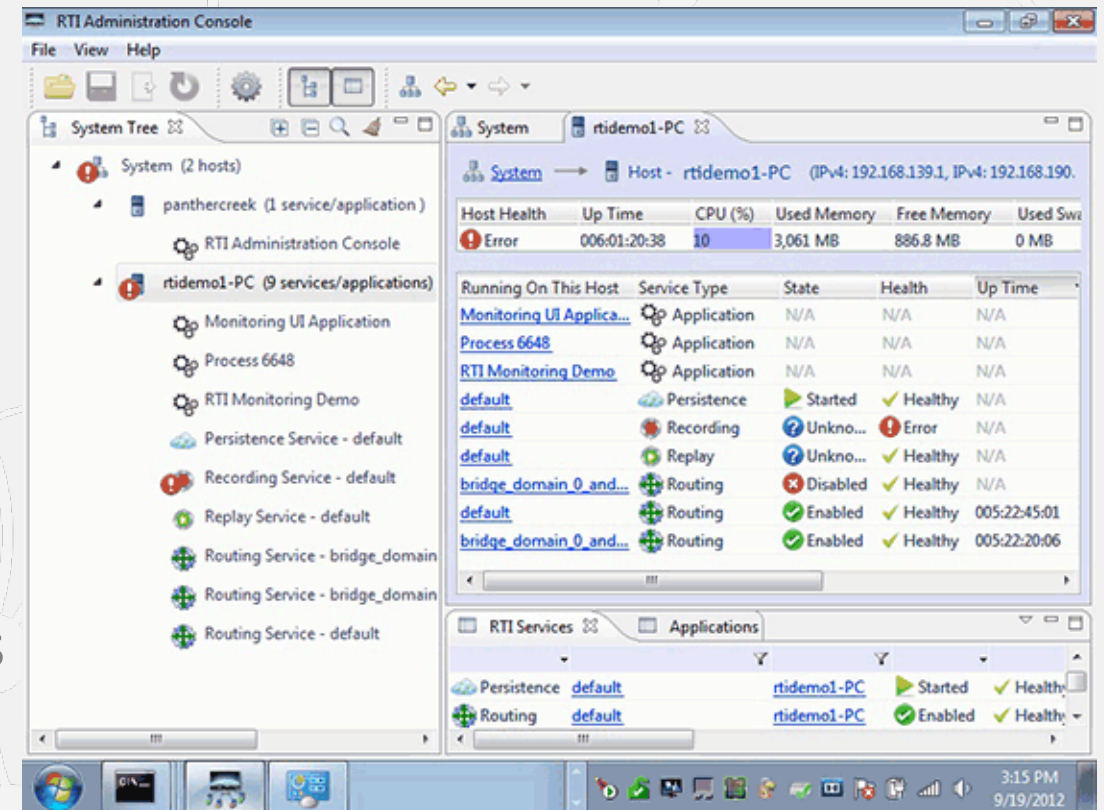
```
Number of hosts: 6
Number of apps: 2
Number of participants: 2
```



Live demo later

Admin Console

- System Awareness
 - Who/What/How?
 - Exactly data types published/subscribed?
 - System performance*
- Debugging
 - QoSes and/or types mismatches.
 - View/administer the log messages
- Administration
 - Control RTI Services remotely.
- Data Visualization





Admin Console: Data Visualization

Live demo later

- Subscribe to topics
- See live data
 - Customize fields
- Compare data
- Store data

Sample Inspector

type filter text on field names

Field	Value	Type
SampleData		ShapeTypeExtended
color (Key)	ORANGE	string<128>
x	87	long
y	214	long
shapsize	30	long
fillKind	SOLID_FILL (0)	ShapeFillKind
angle	0.0	float
SampleInfo		SampleInfo
valid_data	true	boolean
source_timestamp	2015-02-26 18:43:47.883988619 EST	Timestamp
reception_timestamp	2015-02-26 18:43:47.883988619 EST	Timestamp
instance_handle	f7633de5.9c2ab884.64ba6718.232d3921	InstanceHandle
publication_handle	c0a80110.00001cd8.00000001.80000002	InstanceHandle
instance_state	ALIVE	InstanceStateKind
sample_rank	0	int
generation_rank	0	int

0 : Triangle

Unsubscribe Pause Subscription Select Fields...

type filter text

color	x	y	shapsize	instance_state	publication_handle
ORANGE	155	43	30	ALIVE	c0a80110.00001cd8.00000001.80000002
PURPLE	94	71	30	ALIVE	c0a80110.00001cd8.00000001.80002002
BLUE	84	220	30	ALIVE	c0a80110.00001cd8.00000001.80004002
RED	90	186	30	ALIVE	c0a80110.00001cd8.00000001.80006002
GREEN	43	187	30	ALIVE	c0a80110.00001cd8.00000001.80008002

Total Instances: 5. Throughput: 80.02 samples/second. Lost samples: 0

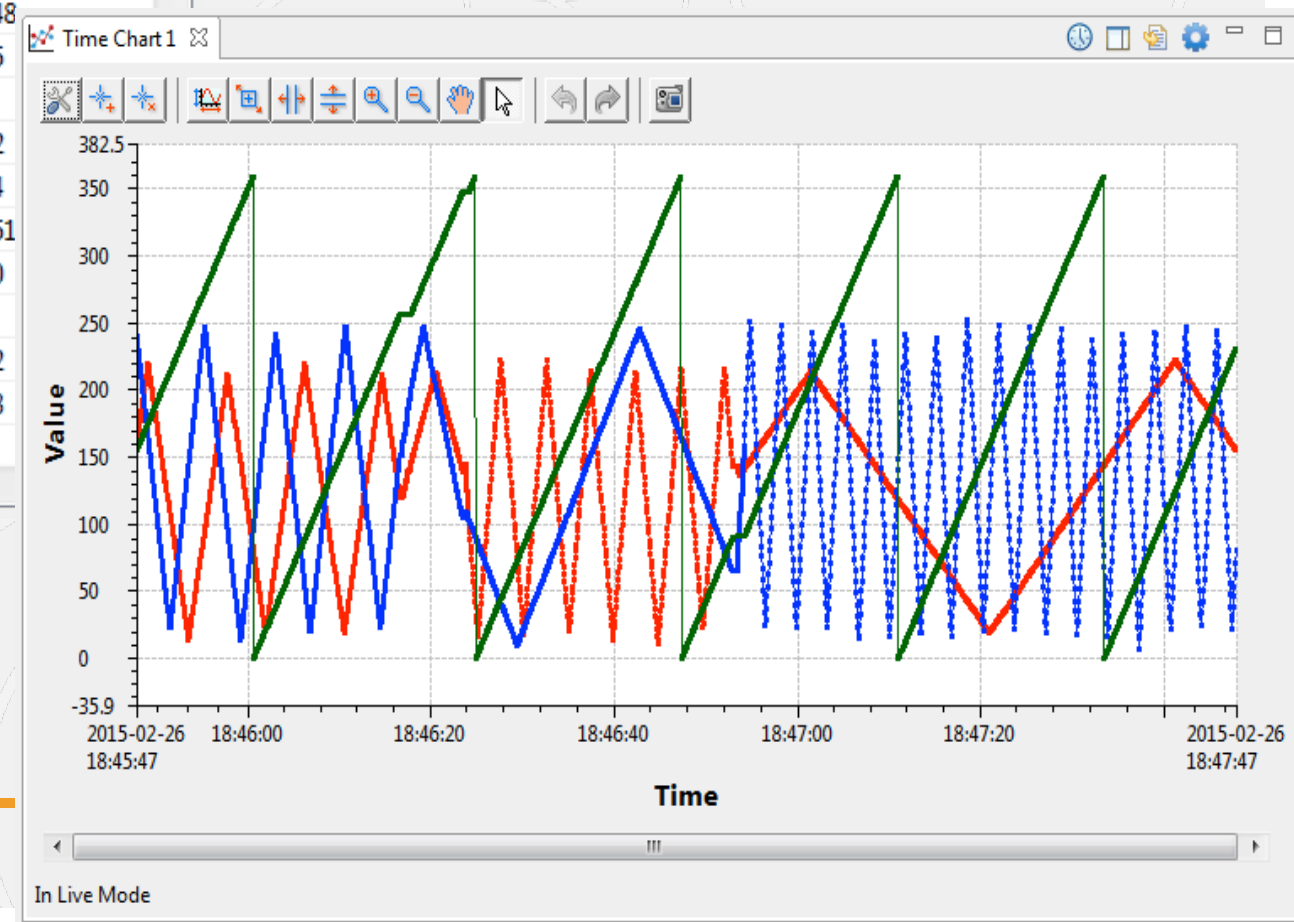
Match Graph Topic Data Endpoints Table Datatypes



Admin Console: Data Visualization (2) Live demo later

Sample Log 1

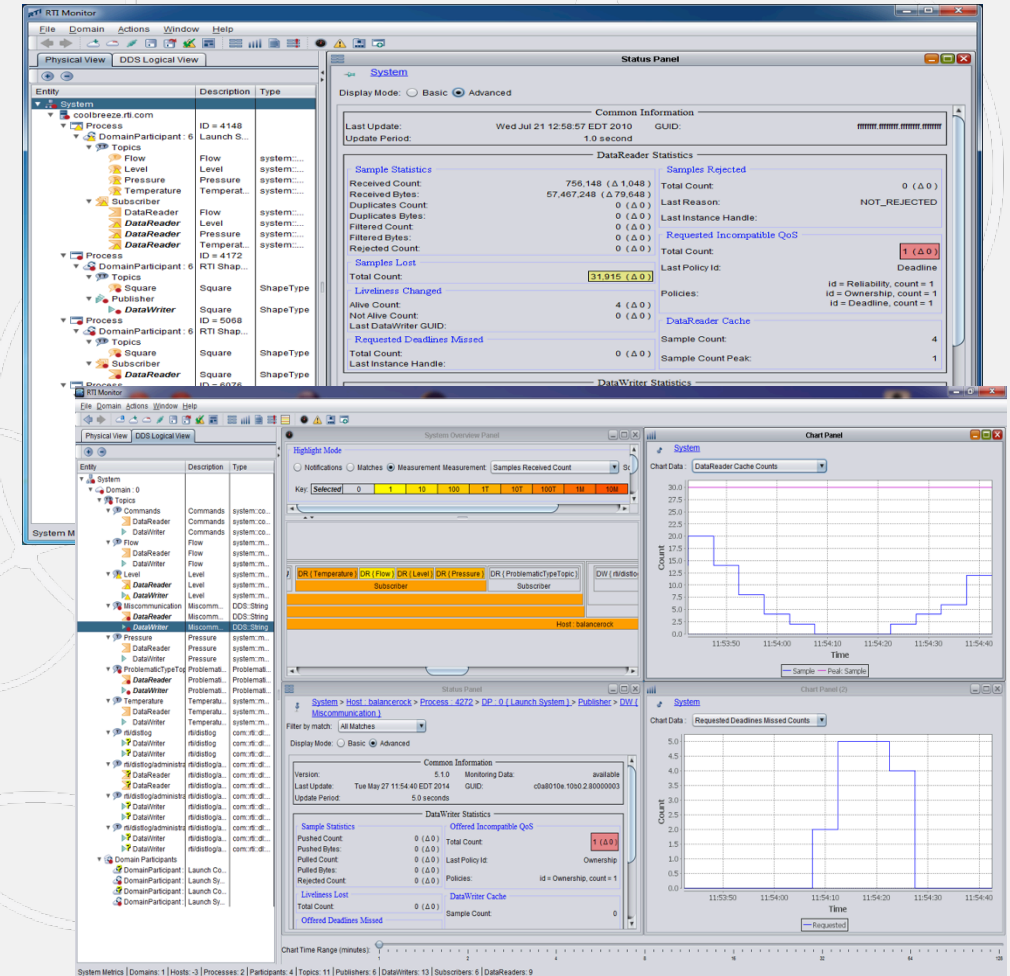
Index	Topic	Instance	Source Time	Value of selected fields
1540	Triangle	ORANGE	2015-02-26 18:44:45.478993834 EST	x=104, y=148
1541	Triangle	PURPLE	2015-02-26 18:44:45.478993834 EST	x=197, y=55
1542	Triangle	BLUE	2015-02-26 18:44:45.478993834 EST	x=53, y=15
1543	Triangle	RED	2015-02-26 18:44:45.478993834 EST	x=43, y=142
1544	Triangle	GREEN	2015-02-26 18:44:45.478993834 EST	x=56, y=214
1545	Triangle	ORANGE	2015-02-26 18:44:45.541993023 EST	x=103, y=151
1546	Triangle	PURPLE	2015-02-26 18:44:45.541993023 EST	x=200, y=50
1547	Triangle	BLUE	2015-02-26 18:44:45.541993023 EST	x=51, y=15
1548	Triangle	RED	2015-02-26 18:44:45.541993023 EST	x=46, y=142
1549	Triangle	GREEN	2015-02-26 18:44:45.542993010 EST	x=54, y=218





Monitor

- Detailed statistics on:
 - QoS
 - Traffic
 - Errors
 - resource usage
- Detailed system topology display
- Diagnose and resolve performance issues
- Understand what's running across the entire system



Distributed Logger

- Not *exactly* a tool...
- Enhance remote debugging from
 - Admin Console & Monitor
- Integrated with RTI services
- Includes an API so you can send your own application messages!

The screenshot shows the RTI Monitor interface with the Distributed Logger window open. The window displays a list of messages with columns for Seq #, Time, Level, Category, and Message. The messages show various states like 'going to warning state due to level' and 'going to error state due to level'.

Seq #	Time	Level	Category	Message
1	05/02/2011 05:38:40 PM	Debug	app SampleCount	strategy: RASBP, baseline: 1, new value: 0
2	05/02/2011 05:38:50 PM	Debug	app SampleCount	strategy: RASBP, baseline: 1, new value: 1
3	05/02/2011 05:38:59 PM	Warning	app LaunchNode	going to warning state due to level: 199.9506560
4	05/02/2011 05:39:09 PM	Error	app LaunchNode	going to error state due to level: 200.0
5	05/02/2011 05:39:19 PM	Warning	app LaunchNode	going to warning state due to level: 199.9506560
6	05/02/2011 05:39:29 PM	Info	app LaunchNode	going to normal state due to level: 199.9506560
7	05/02/2011 05:39:39 PM	Debug	app SampleCount	strategy: RASBP, baseline: 1, new value: 0
8	05/02/2011 05:39:49 PM	Warning	app LaunchNode	going to warning state due to level: 199.9506560
9	05/02/2011 05:39:59 PM	Error	app LaunchNode	going to error state due to level: 200.0
10	05/02/2011 05:40:09 PM	Info	app LaunchNode	going to normal state due to level: 199.9506560
11	05/02/2011 05:39:09 PM	Info	app LaunchNode	going to normal state due to level: 199.9506560
12	05/02/2011 05:39:19 PM	Warning	app LaunchNode	going to warning state due to level: 199.9506560
13	05/02/2011 05:39:29 PM	Error	app LaunchNode	going to error state due to level: 200.0
14	05/02/2011 05:39:39 PM	Warning	app LaunchNode	going to warning state due to level: 199.9506560
15	05/02/2011 05:39:49 PM	Info	app LaunchNode	going to normal state due to level: 199.9506560
16	05/02/2011 05:39:59 PM	Warning	app LaunchNode	going to warning state due to level: 199.9506560
17	05/02/2011 05:40:09 PM	Error	app LaunchNode	going to error state due to level: 200.0
18	05/02/2011 05:40:19 PM	Warning	app LaunchNode	going to warning state due to level: 199.9506560
19	05/02/2011 05:40:29 PM	Info	app LaunchNode	going to normal state due to level: 199.9506560
20	05/02/2011 05:40:39 PM	Warning	app LaunchNode	going to warning state due to level: 199.9506560
21	05/02/2011 05:40:49 PM	Error	app LaunchNode	going to error state due to level: 200.0
22	05/02/2011 05:40:59 PM	Warning	app LaunchNode	going to warning state due to level: 199.9506560
23	05/02/2011 05:41:09 PM	Info	app LaunchNode	going to normal state due to level: 199.9506560
24	05/02/2011 05:41:19 PM	Debug	app SampleCount	strategy: RASBP, baseline: 1, new value: 1

Message Details

Publication Sequence Number: 10
Time: 05/02/2011 05:39:09 PM
Level: Warning
Category: app LaunchSystemController
Message: going to warning state due to level: 199.9506560657

Chart Time Range (minutes):

System Metrics | Containers: 1 | Hosts: 1 | Processes: 2 | Participants: 2 | Topics: 11 | Publishers: 4 | DataInterf: 13 | Subscribers: 2 | C



Spreadsheet Add-in

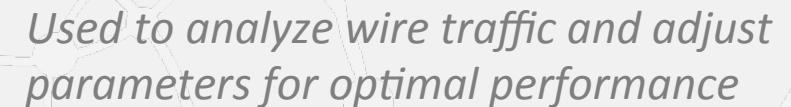
- Easy Integration with Microsoft Excel®
- Real-time updates
 - Spreadsheets
 - Charts
 - Formulas
- Dynamic type detection
 - Discovery
 - XML
- Configurable simplified usage

The screenshot shows the RTI Add-in interface within the Microsoft Excel ribbon. The ribbon includes tabs for FILE, HOME, INSERT, PAGE LAYOUT, FORMULAS, and DATA. The RTI Add-in section contains several command buttons: RTI Config, RTI Monitor Topic, RTI Add Subscription, RTI Add Publication, RTI Publish Now, RTI Update Now, RTI Monitor Domain, and Stop RTI Add-in. A status bar indicates 'Running on domain 38'. Below the ribbon, a data table is displayed in the spreadsheet, showing subscription details for a 'Square' shape type.

	A	B	C	D	E	F
1	SUBSCRIPTION Topic: Square Type: ShapeType					
2	color,x,y,shapsize					
3	color	x	y	shapsize		
4	GREEN	63	134	30		
5	YELLOW	139	174	40		
6	MAGENTA	28	106	30		
7	CYAN	60	135	30		



- RTPS2 dissector for Wireshark
 - Traps RTPS2 packets
 - Dissect discovery & user data
 - Heartbeats, acknowledgements,...
 - Destination & source check
- Totally non-invasive
 - No additional subscribers
- Customized filtering
- Debugging:
 - Capture & share your dissected traffic.
 - Including RTI TCP Control messages
- Supports most platforms





Prototyper with LUA

This feature is in the Experimental stage

- Quick application creation:
 - Demo
 - Simulation
 - Integration/Testing
- Easy
 - XML description
 - Lua integration

XML
Settings

Prototyper ("Container")

Lua Engine

```
1. -- Interface: parameters, inputs, outputs
2. local A, B, C = 30, 30, 10 -- Change the 'C' parameter to see various flower shapes
3. local Shapewriter = CONTAINER.WRITER[3] -- Triangles
4.
5. -- Global counter (preserved across invocations)
6. if not count then count = 0 else count = count + 1 end
7.
8. local shape = Shapewriter.Instance;
9. local angle = count % 360;
10.
11. shape['x'] = 120 + ((A+B) * math.cos(angle) + B * math.cos((A/B-C)*angle)
12. shape['y'] = 120 + ((A+B) * math.sin(angle) + B * math.sin((A/B-C)*angle)
13.
14. shape['shapetype'] = 3
15. shape['color'] = "RED"
16.
17. Shapewriter:write()
```

Lua Component

Connex

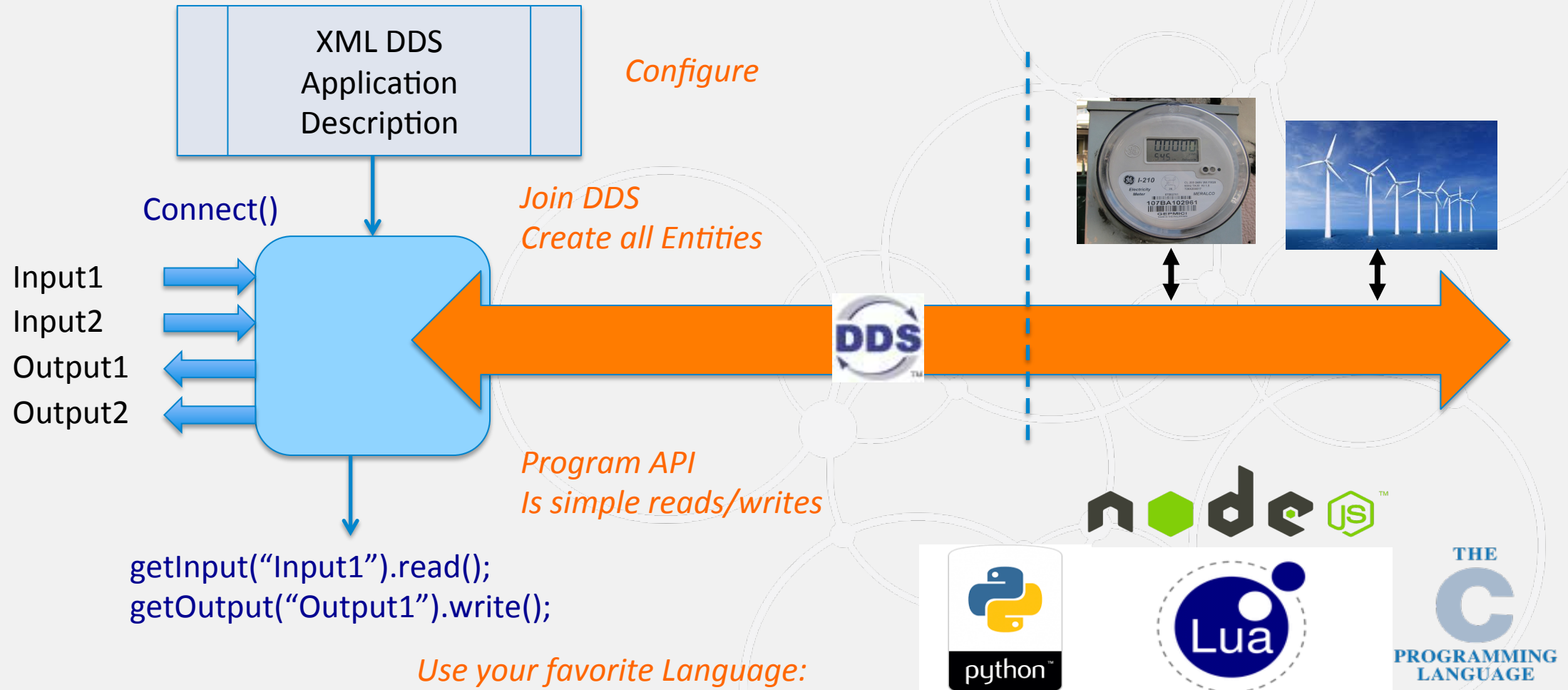
RTI DDS Connector

- Fast Development and Integration
- Support scripting
 - ... and popular scripting languages (Python, Lua, ...)
 - ... Node.js (JavaScript)
- Minimalistic “declarative” API for testing, prototyping...
- Technology Foundation:
 - XML DDS Application Creation
 - DDS-XTYPES
- Available in our GitHub repository:
 - <https://github.com/rticomunity/rticonnextdds-connector>

RTI DDS Connector Concept

App Definition is Simple XML

This feature is in the Experimental stage



Connector Example

This feature is in the Experimental stage



```
conn =
rti.Connector("MyParticipantLib::Zero",
              "./ShapeExample.xml");

out1 = connector.getOutput("Pub::SqWriter")

for i in range(1,500):
    out1.instance.setNumber("x", i);
    out1.instance.setNumber("y", i*2);
    out1.instance.setNumber("shapsize", 30);
    out1.instance.setString("color", "BLUE");
    out1.write();
    time.sleep(2)
```



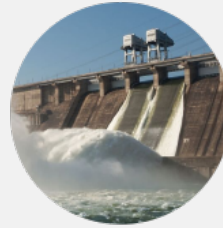
```
var connector = new
rti.Connector("MyParticipantLib::Zero",
              "./ShapeExample.xml");

var out1 =
connector.getOutput("Pub::SqWriter");

var i;
for (i=0; i<500; i++) {
    out1.instance.setNumber("x",i);
    out1.instance.setNumber("y",i*2);
    out1.instance.setNumber("shapsize",30);
    out1.instance.setString("color", "BLUE");
    out1.write();
    sleep.usleep(1000);
}
```



Your systems.
Working as one.

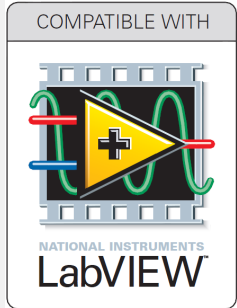


Third Party Integration



Integration with 3rd Party Software

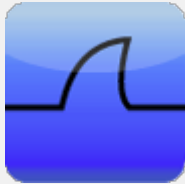
- Maintained by RTI



National Instruments
LabVIEW toolkit

- Windows and NI Linux (RT Targets)

Wireshark



Microsoft® Excel®

- Provided with Professional

IDL Generator for Enterprise Architect

-Experimental tool



- Maintained externally
Mathworks Simulink and Matlab

InformeDDS by Simventions.

- From Launcher

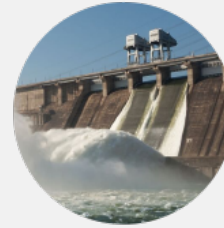


Rational Rhapsody





Your systems.
Working as one.



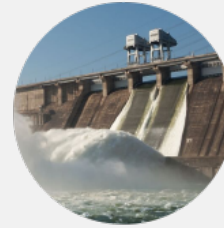
Demonstrations

Resources

- Webinar:
[Accelerate Distributed Systems Development with Connex Tools](#)
- [RTI Community Downloads page](#)
 - You can get Connector, Performance Test, Prototyper with Lua and a lot more there.
- [Log Parser](#)



Your systems.
Working as one.

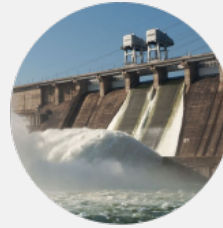


Q&A

Email: ken@rti.com



Your systems.
Working as one.



Thank you!

Email: ken@rti.com