Exploring IoT with RTI DDS

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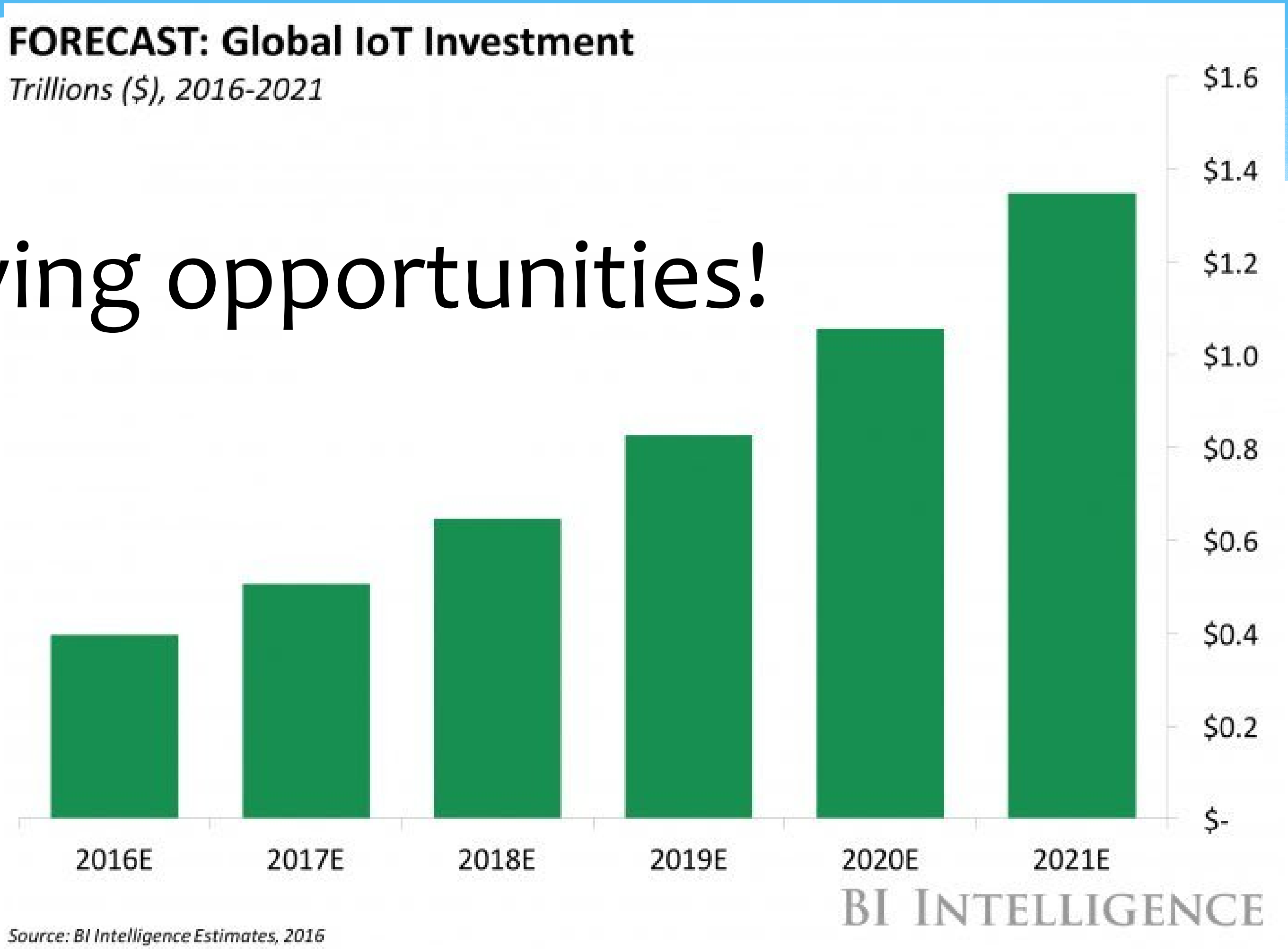
Global Business in IoT

Growing opportunities!



FORECAST: Global IoT Investment

Trillions ($), 2016-2021

Source: BI Intelligence Estimates, 2016

Industial IoT: All about system

Consumer Internet of Things (CIoT)

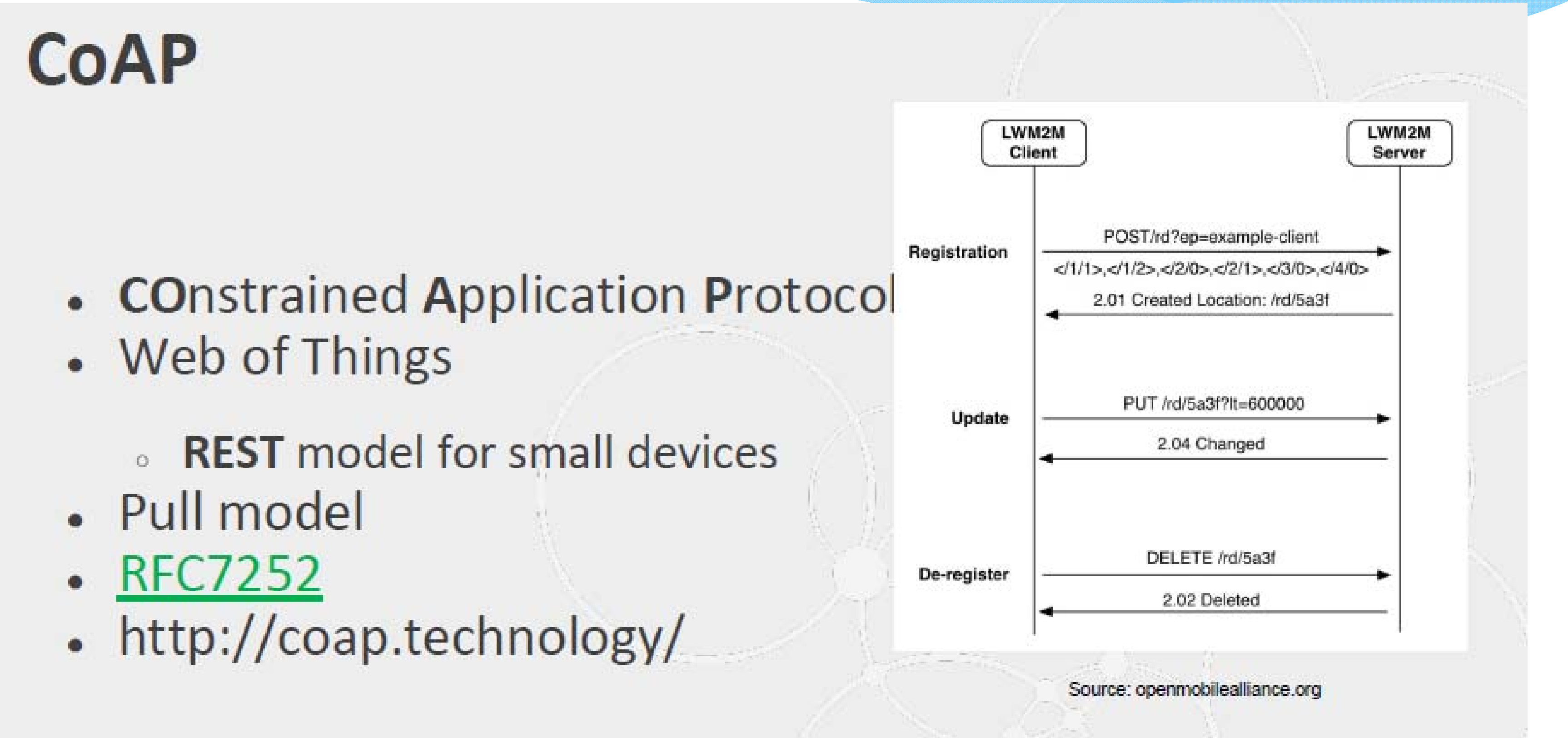
Industrial Internet of Things (IIoT)

80% of hype

80% of value

Cyber-Physical Systems (CPS)

IoT Protocols

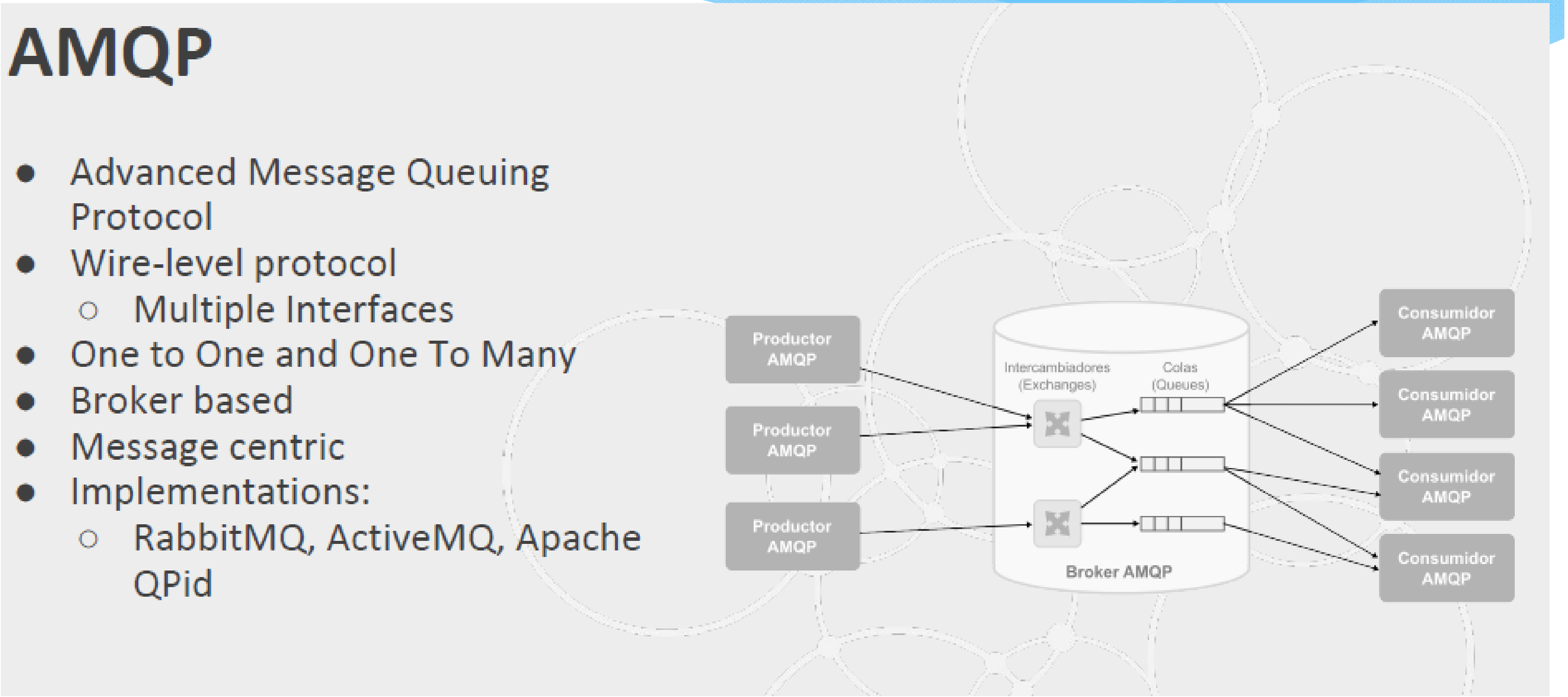


CoAP

- **CO**nstrained **A**pplication **P**rotocol
- Web of Things
    - ○ **REST** model for small devices
- Pull model
- RFC7252
- http://coap.technology/

Source: openmobilealliance.org

IoT Protocols



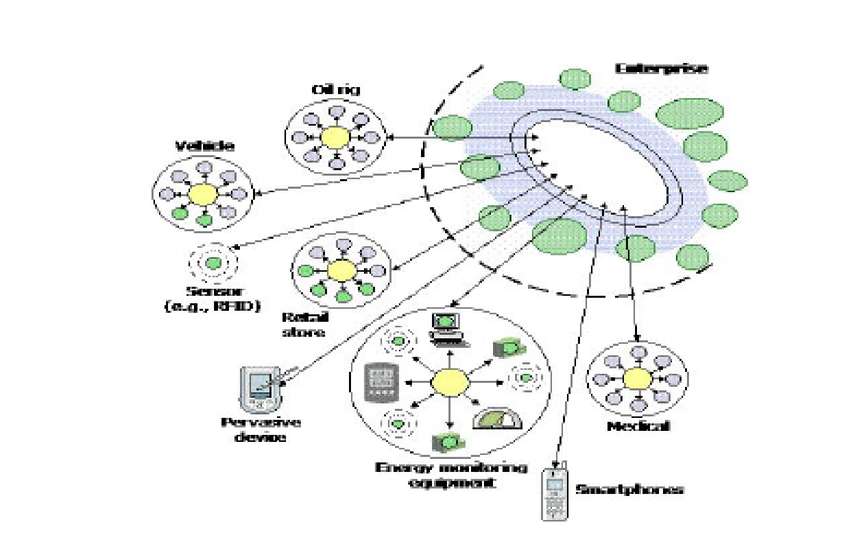
AMQP

- Advanced Message Queuing Protocol
- Wire-level protocol
  - Multiple Interfaces
- One to One and One To Many
- Broker based
- Message centric
- Implementations:
  - RabbitMQ, ActiveMQ, Apache QPid

IoT Protocols

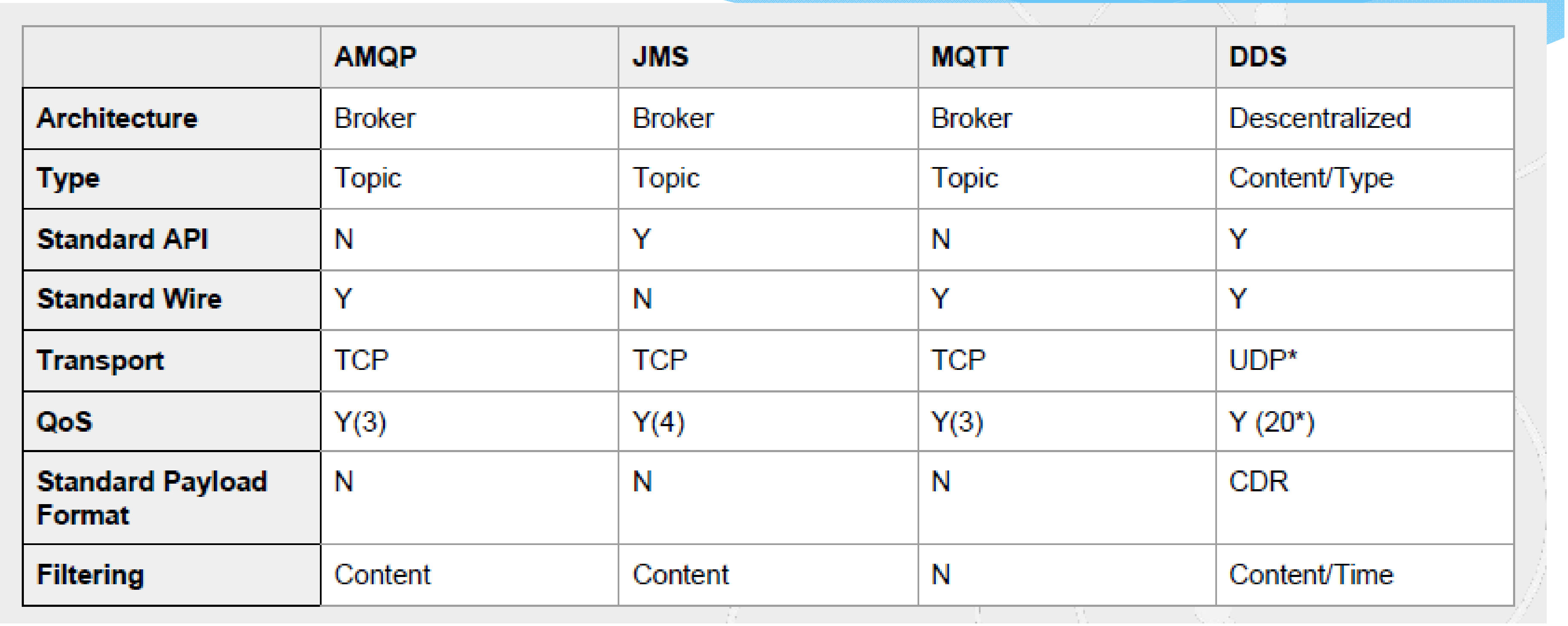
MQTT: Collect Device Data

- Brokered
- Lightweight
- Wire protocol
- Implementations:
  - paho, mosquitto, …



Message Queuing Telemetry Transport (MQTT)

IoT Protocols



	AMQP	JMS	MQTT	DDS
Architecture	Broker	Broker	Broker	Descentralized
Type	Topic	Topic	Topic	Content/Type
Standard API	N	Y	N	Y
Standard Wire	Y	N	Y	Y
Transport	TCP	TCP	TCP	UDP*
QoS	Y(3)	Y(4)	Y(3)	Y (20*)
Standard Payload Format	N	N	N	CDR
Filtering	Content	Content	N	Content/Time

So many protocols…

Which should we use?

No Silver Bullet..

Choose AMPQ if:

- Distributing work, not information?
- Just send from A to B?
- Speed & CPU use are not important?
- Can´t loose anything?

3 or 4 Yes, than choose AMPQ.

Choose MTTQ if:

- Think the thing as collection?
- Little device to device communication?
- Large number of devices?
- Very small number of devices?

3 or 4 Yes, than choose MTTQ.

Choose REST if:

- Always connected?
- Few connectivity points in large space?
- Use the word “my”?
- Speed & CPU use not important?

3 or 4 Yes, than choose REST.

Choose DDS if:

- Disaster if offline for 5 minutes (Real time development)?
- Measure performance in ms or us? Or scale >100+

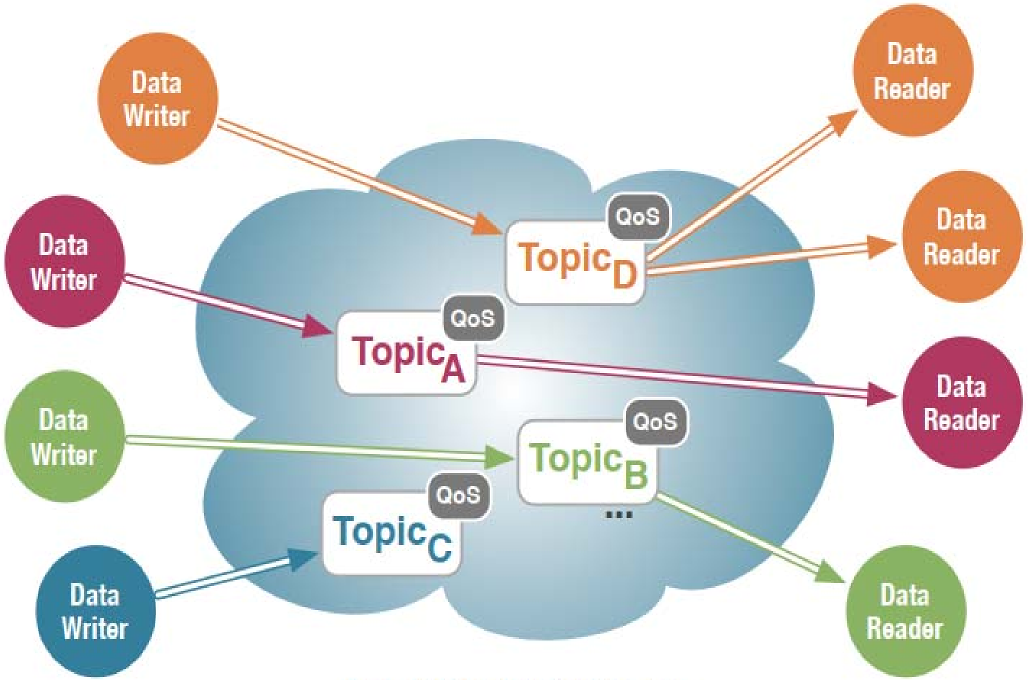
applications? Or 10k+ data values?

1 or 2 choose DDS.

DDS : The main idea

VIRTUALISED DATA SPACE

Applications can **autonomously** and **asynchronously read** and **write** data enjoying **spatial** and **temporal decoupling**

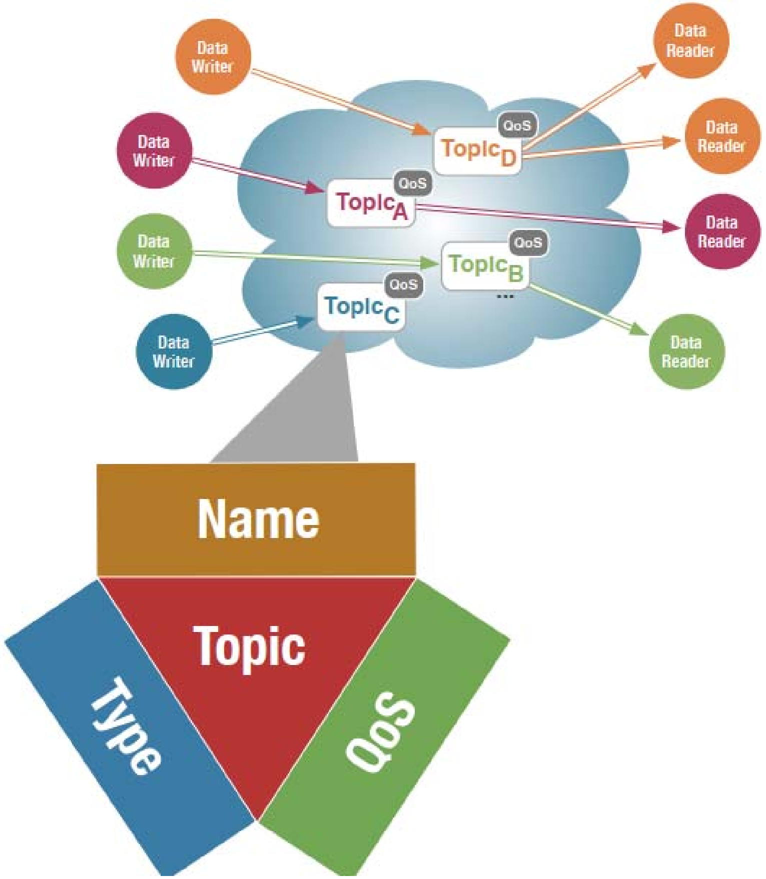


DDS Global Data Space

DDS Ideas

TOPIC

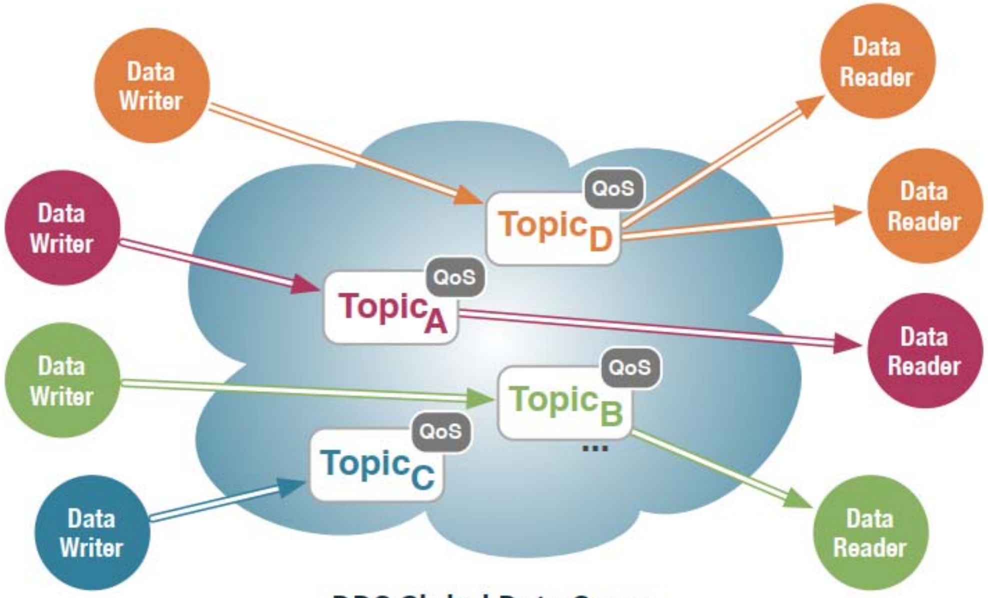
A domain-wide information's class A **Topic** defined by means of a <name, type, qos>



DDS Ideas

DYNAMIC DISCOVERY

Built-in dynamic discovery **isolates applications from network topology** and **connectivity** details

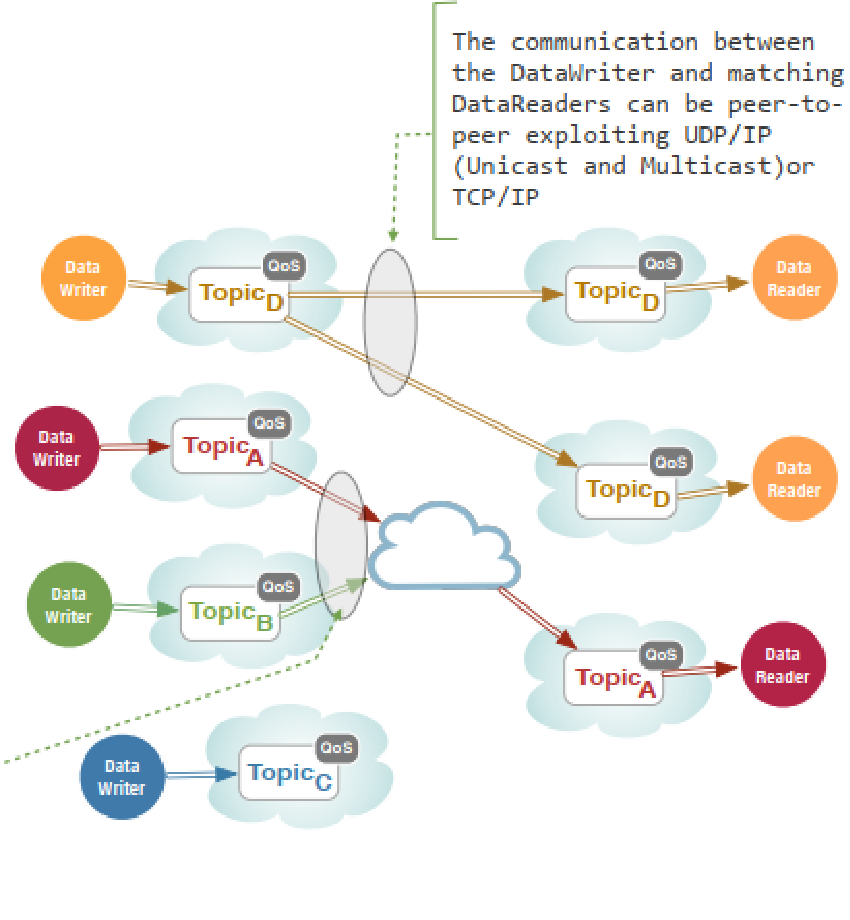


DDS Global Data Space

DDS Ideas

ADAPTIVE CONNECTIVITY

Connectivity is **dynamically adapted** to chose the most effective way of sharing data



The communication between the DataWriter and matching DataReaders can be peer-to-peer exploiting UDP/IP (Unicast and Multicast)or TCP/IP

The communication between the DataWriter and matching DataReaders can be "brokered" but still exploiting UDP/IP (Unicast and Multicast)or TCP/IP

RTI DDS Hands on

- Quick example generation in Modern CPP:

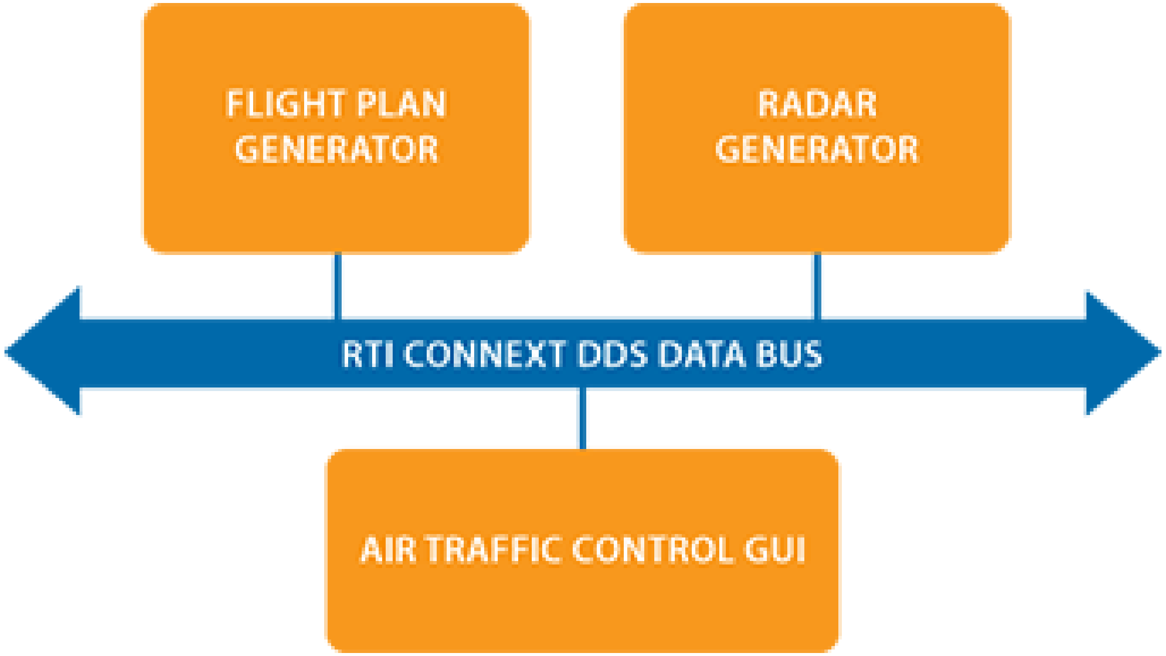
```
rtiddsgen -language C++11 -example universal Foo.idl
```

Use Case: Vehicle Tracking

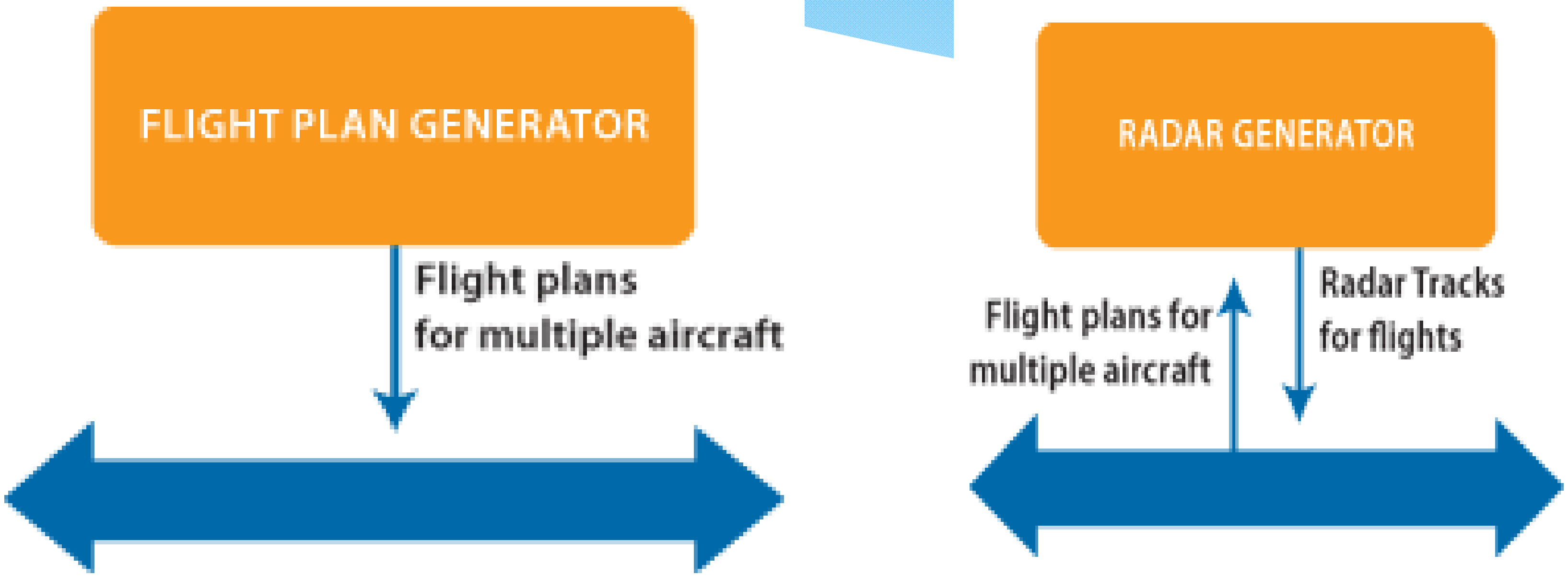
RTI Connext DDS is the core communication infrastructure in a variety of vehicle tracking and radar systems – from air traffic management to area defense systems.

We want minimize the latency in those case.

Use Case: Vehicle Tracking



Vehicle Tracking



FLIGHT PLAN GENERATOR

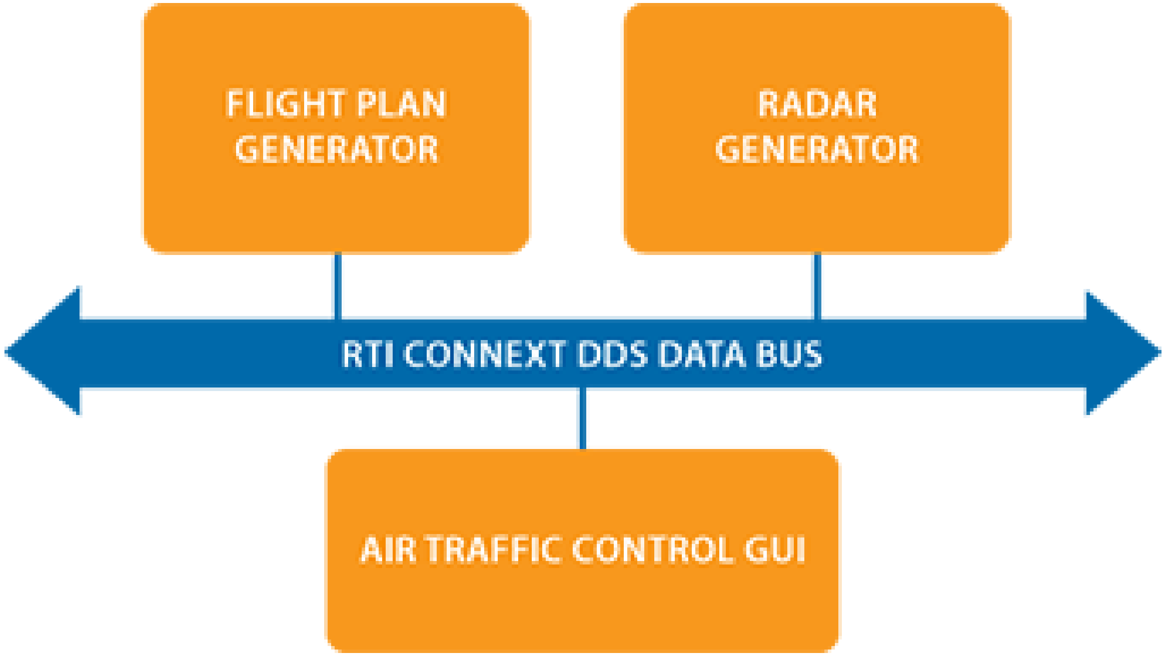
Flight plans
for multiple aircraft

RADAR GENERATOR

Flight plans for
multiple aircraft

Radar Tracks
for flights

Vehicle Tracking

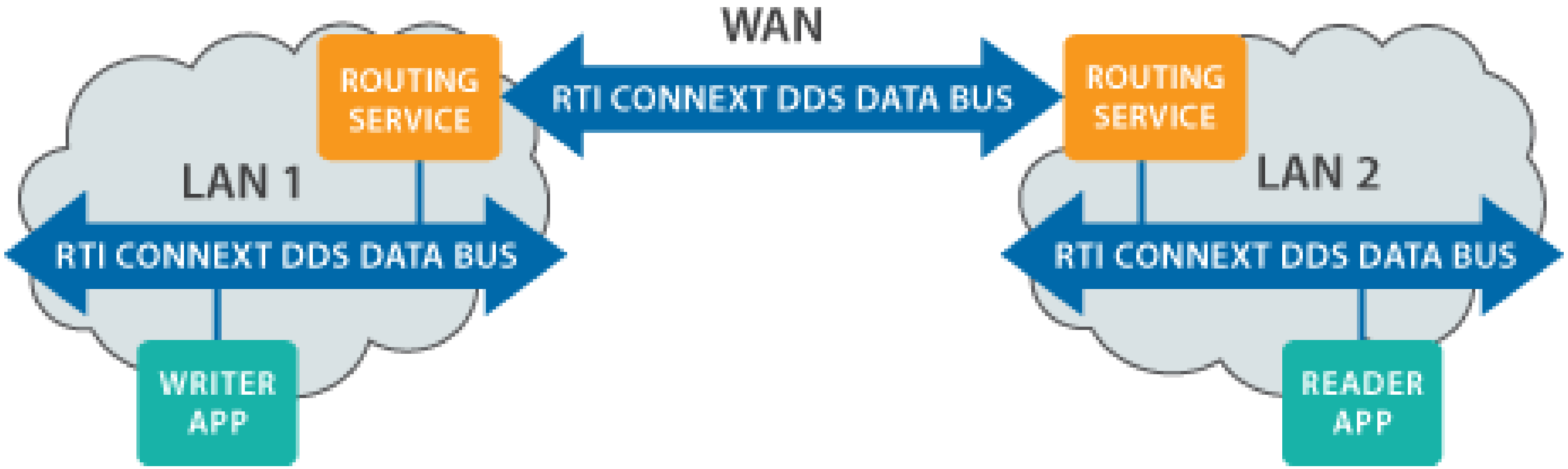

FLIGHT PLAN GENERATOR

RADAR GENERATOR

RTI CONNEXT DDS DATA BUS

AIR TRAFFIC CONTROL GUI

Scale to the WAN



Scale to the Cloud.

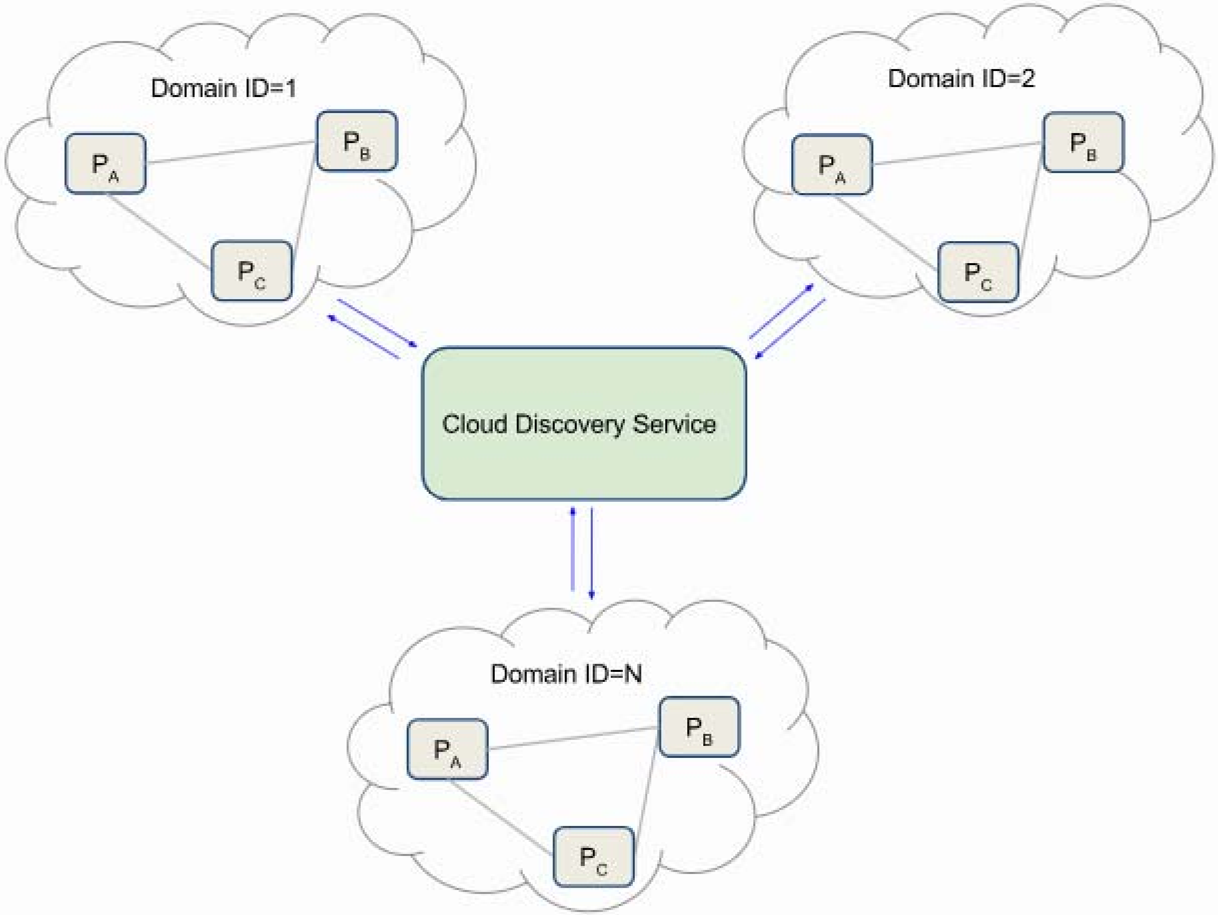


Figure 3.1 Cloud Discovery Service for Multi Domain