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OMG DDS SIG Co-Chair
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PRESS Release

Coflight Consortium Selects PrismTech's OpenSplice DDS Middleware for Next Generation European Flight Data Processor

ATC Global 2010, Amsterdam, The Netherlands, — March 09, 2010 — PrismTech™, a world leader in high-performance software platform and integration solutions, today announced that the Coflight Consortium headed by THALES and SELEX-SI has selected its OMG™ Data Distribution Service implementation, OpenSplice™ DDS, to power its next generation European Flight Data Processor (FDP).

CHANNELS
- Architecture & Design
- C/C++
- Database
- Development Tools
- > Embedded Systems
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EMBEDDED SYSTEMS

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The Data Distribution Service for Real-Time Systems: Part 1

By Angelo Corsaro, February 12, 2010

0 Comments

DDS is the standard for real-time data distribution

Angelo Corsaro is CTO at PrismTech. Angelo also leads strategic standardization at the Object Management Group (OMG), where he co-chairs the Data Distribution Service (DDS) Special Interest Group.

This is the first installment of a series covering the Object Management Group (OMG) Data Distribution Service for Real-Time Systems (DDS). In this first installment I focus on what DDS is, why it represents an important technology you should learn about, and how it is being used today. I also make sure that those of you that can't spend too much time away from a keyboard will get started coding their first DDS application.

What Is DDS?

Whether you are an experienced programmer or a newbie, it is highly likely that you have already experienced some form of Publish/Subscribe (Pub/Sub). Pub/Sub is an abstraction for one-to-many communication that provides anonymous, decoupled, and

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The Challenge

Episode 1

Flight Data Processor

Controller
Working
Positions

OpenSplice|DDS

Radar

Flight Data Processor

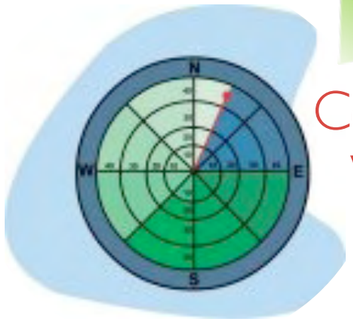
Controller
Working
Positions

Radar

OpenSplice|DDS

OpenSplice|DDS

Radar



Controller
Working
Positions

Multi-Radar
Tracker

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The Challenge

Episode II

Flight Data Processor

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Multi-Radar
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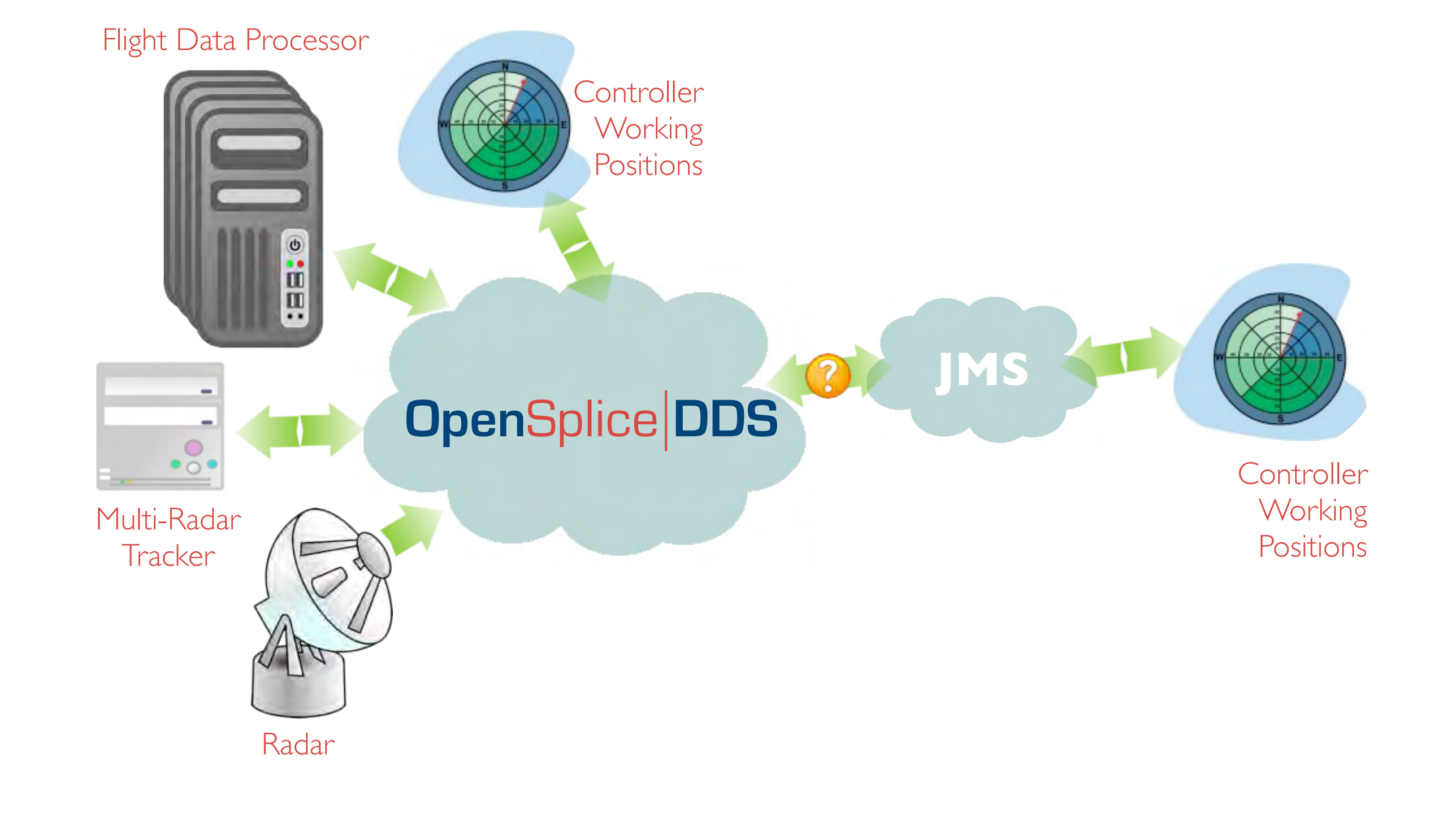
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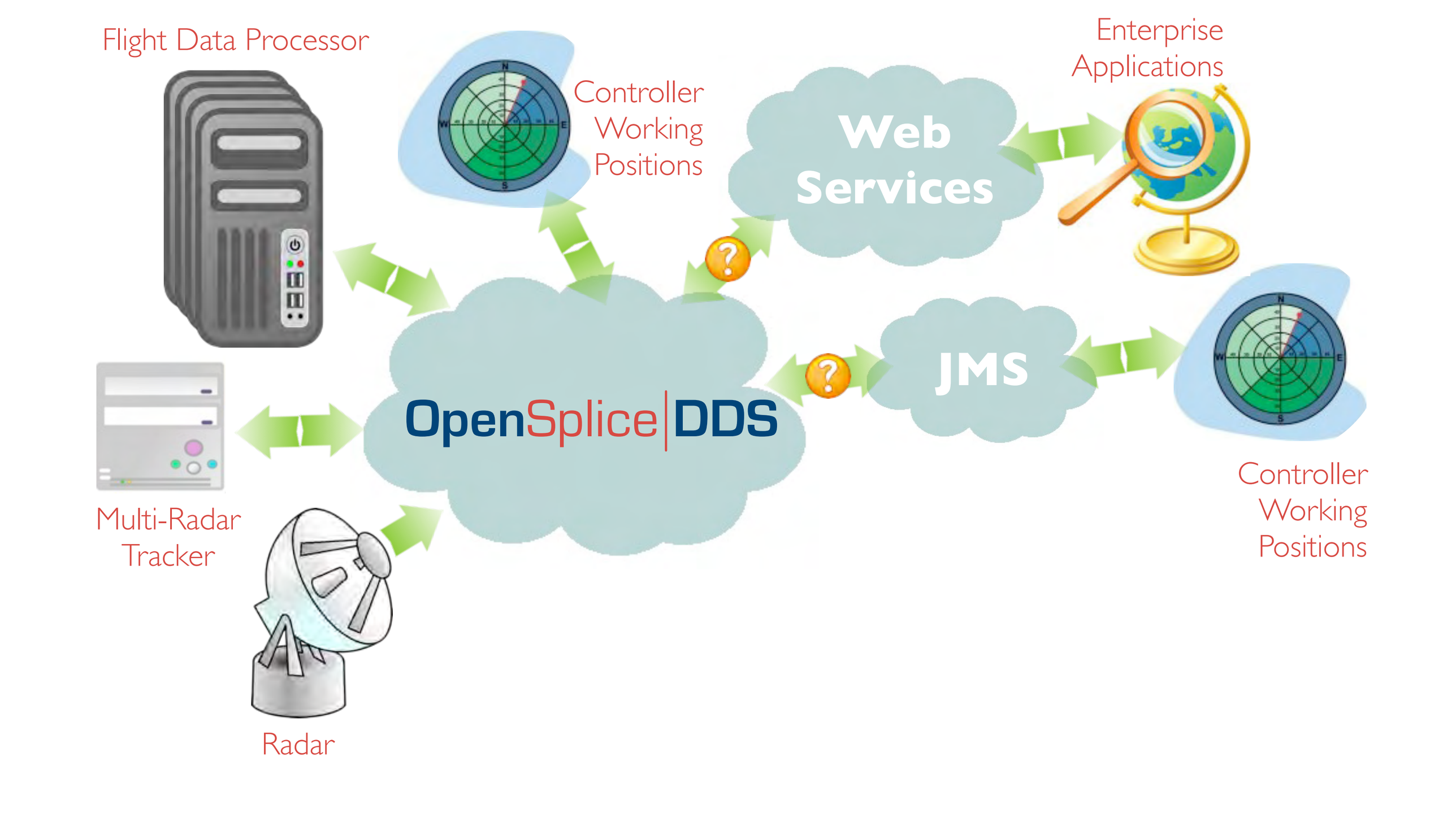
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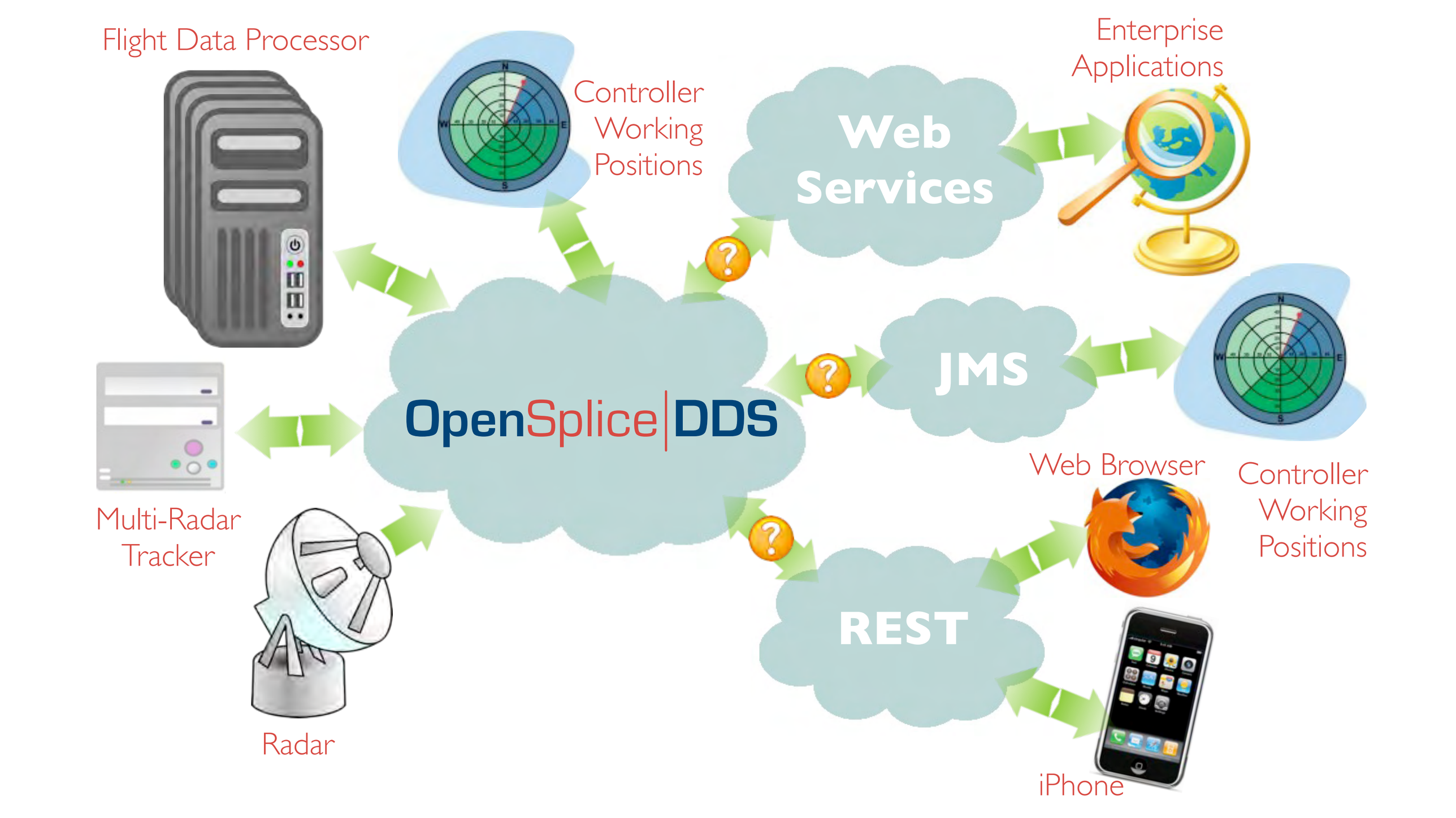
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Web Browser
Controller Working Positions
REST
iPhone

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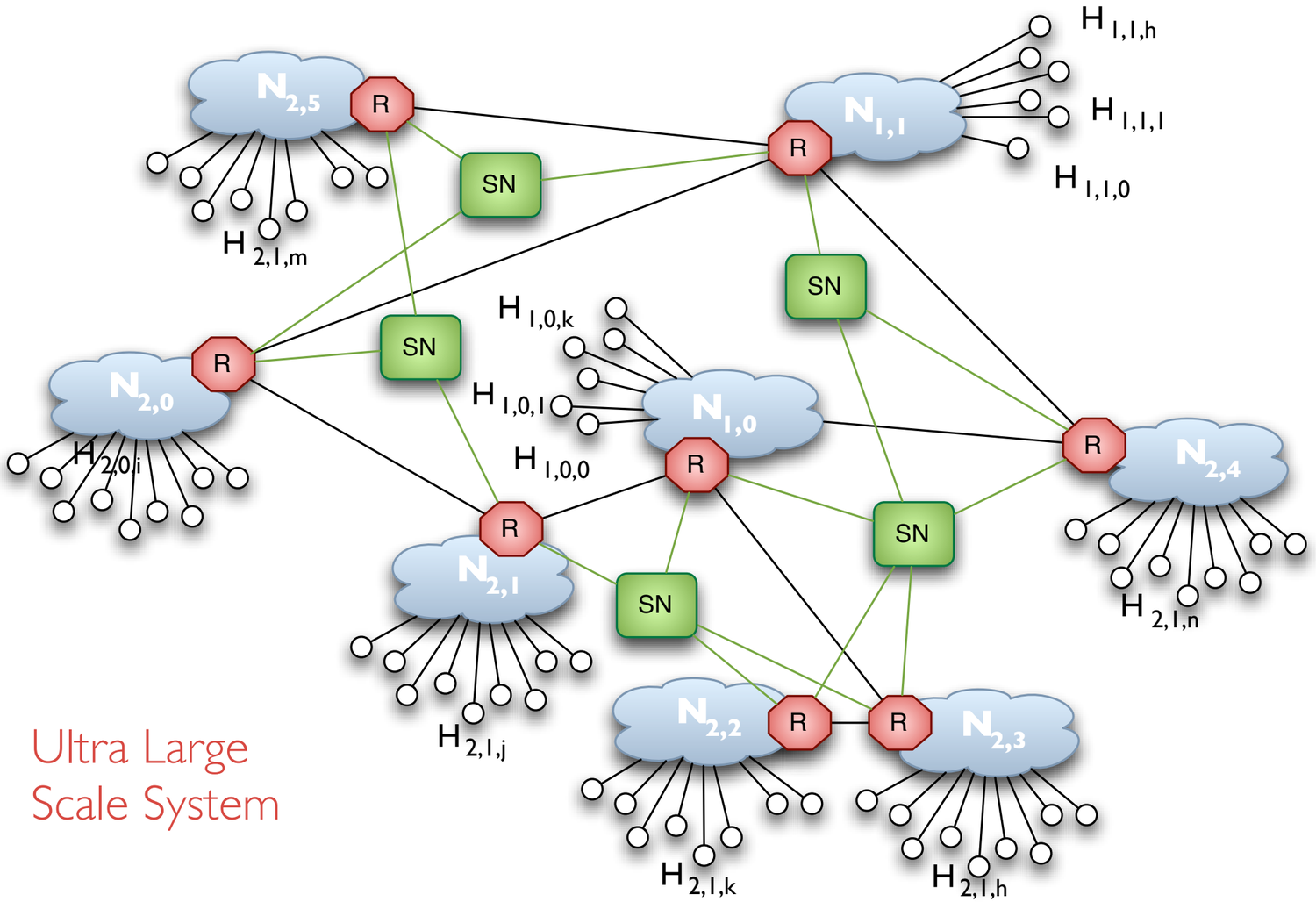
Episode III

Ultra-Large Scale Systems

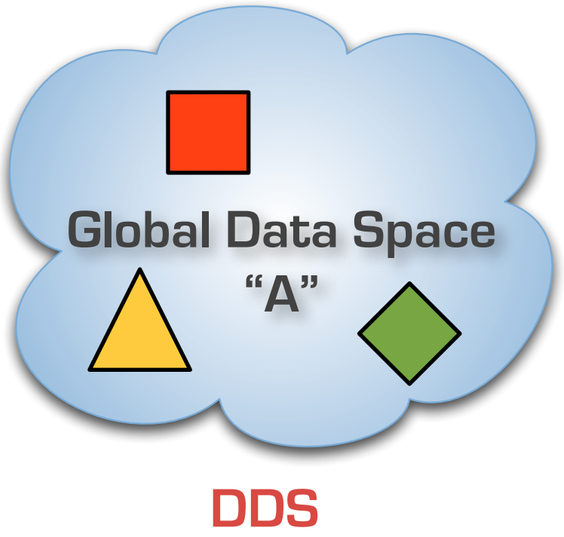


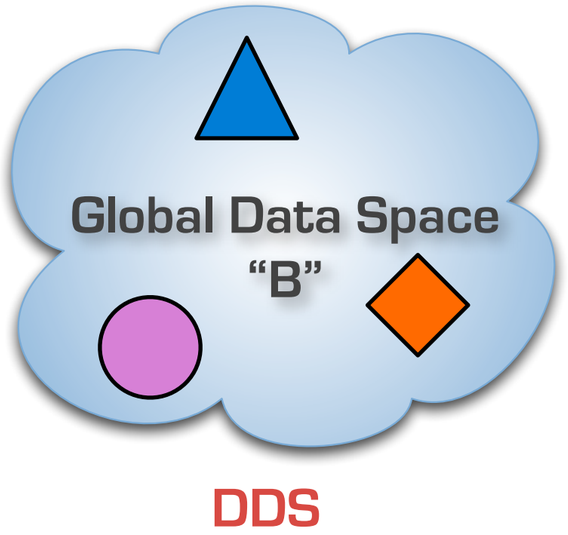
Ultra Large Scale System

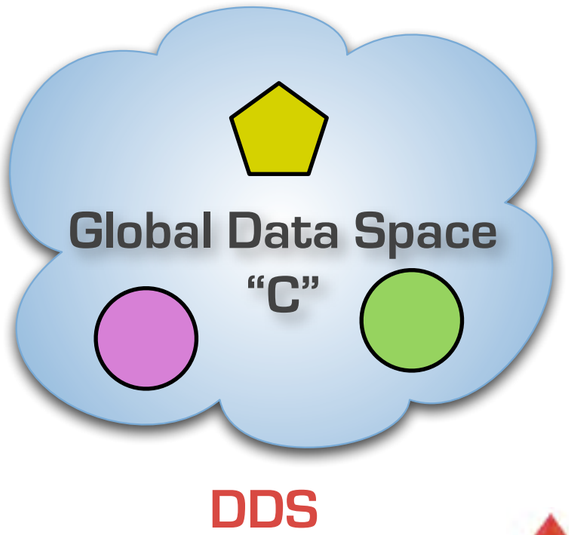
Data Discovery Challenges

Data Discovery

- Standard Discovery Protocol Requires Multicast
- Standard Discovery poses Scalability issues for ULS
- Limited Control over Topics Visibility, e.g., choosing what to expose to the external world







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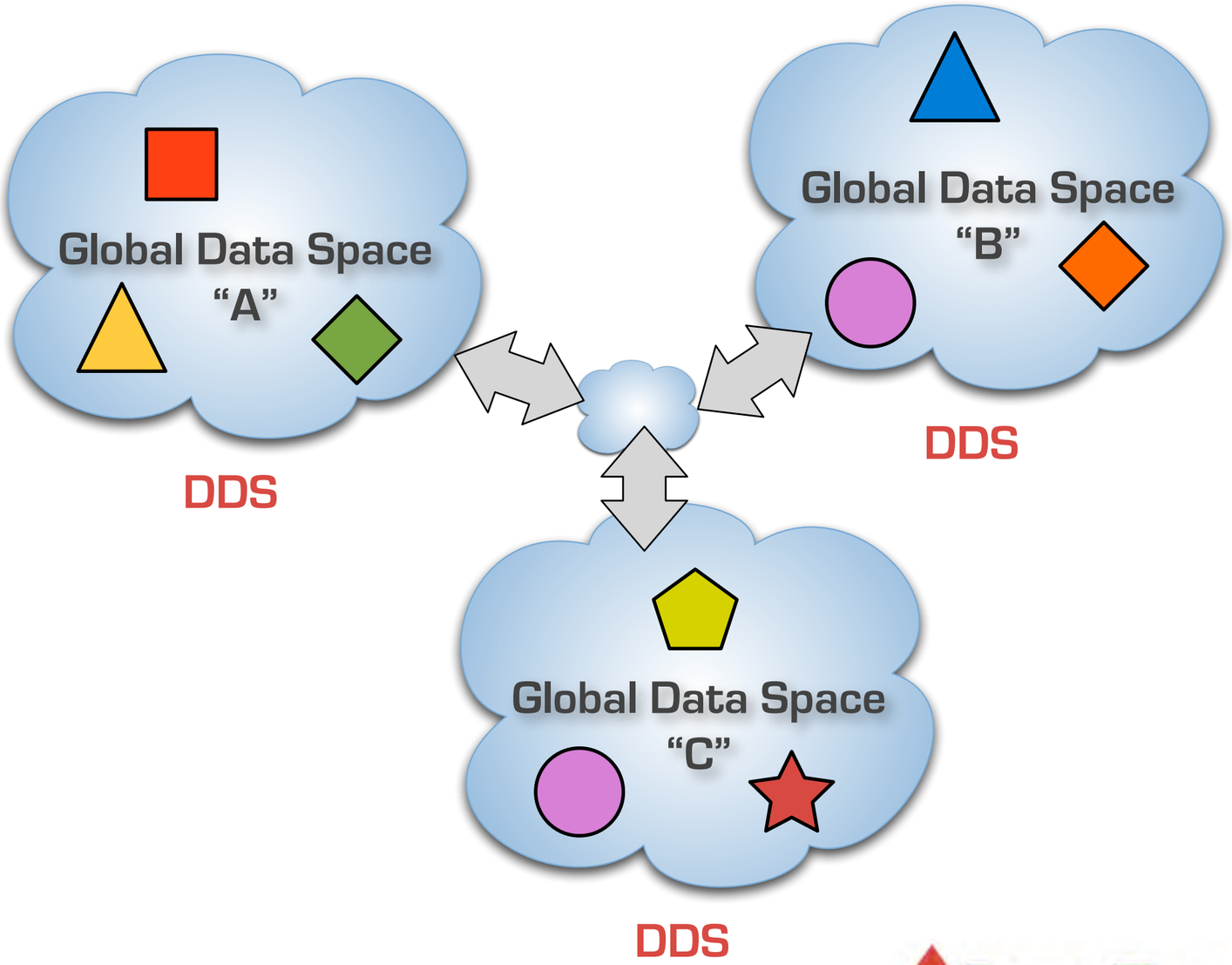

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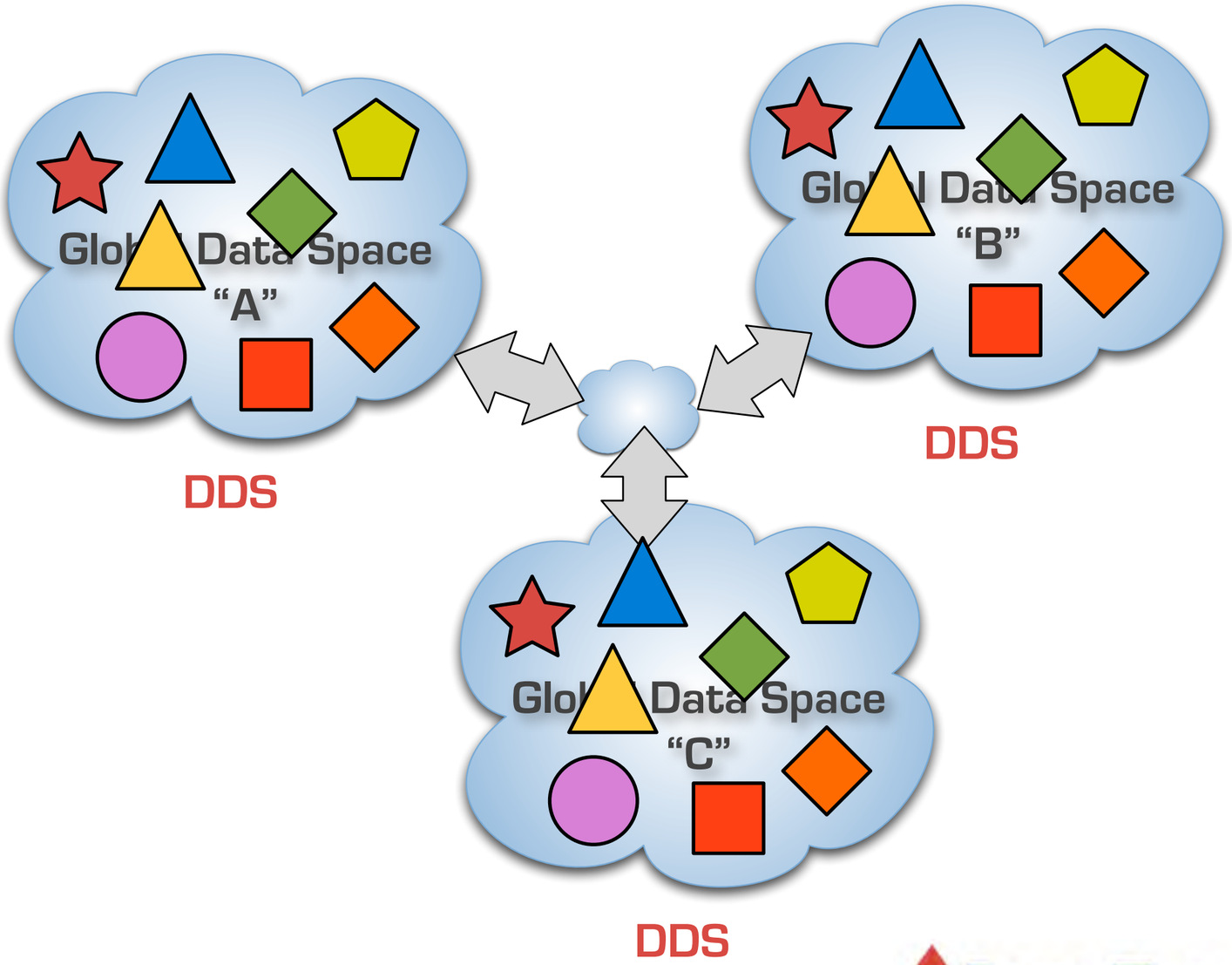
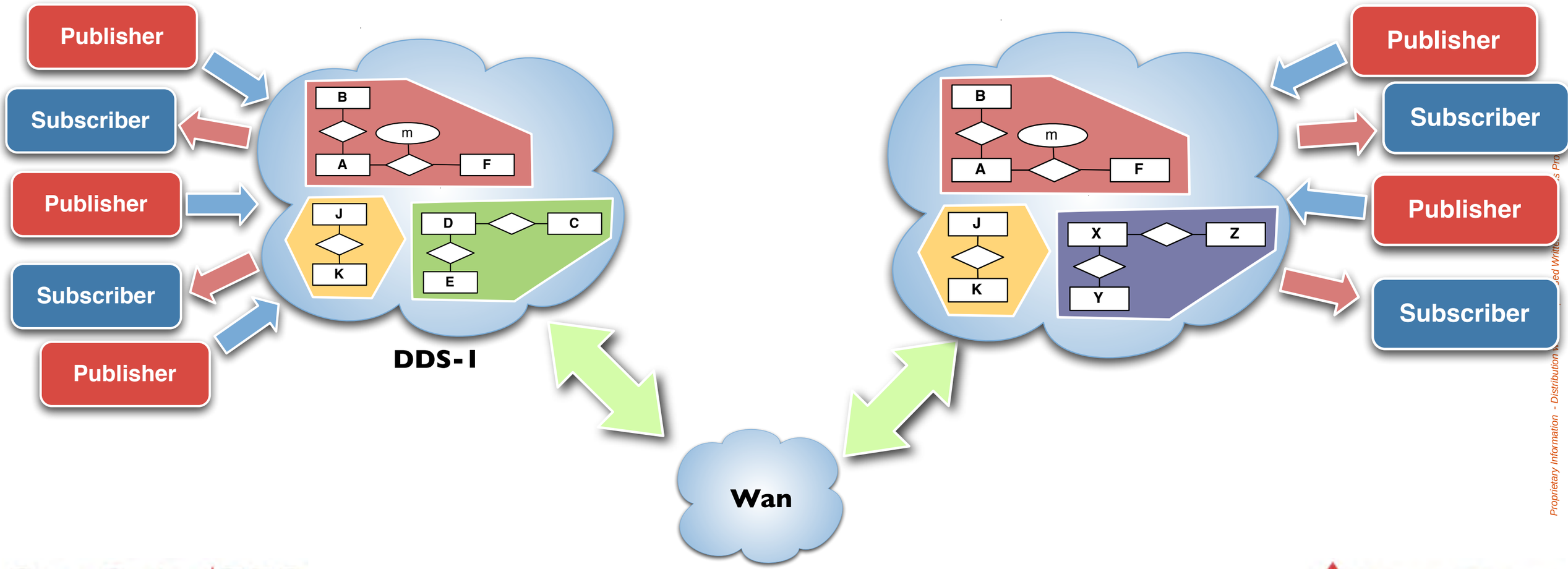


Data Communication Challenges

Data Communication

- Standard Communication Protocol Relies on UDP
- No Support for Compression
- Difficult NAT/Firewall traversal
- Sub-Optimal Data Distribution for WAN Scenario (limited exploitation of multicast)
- Scalability

Data Communication Challenges



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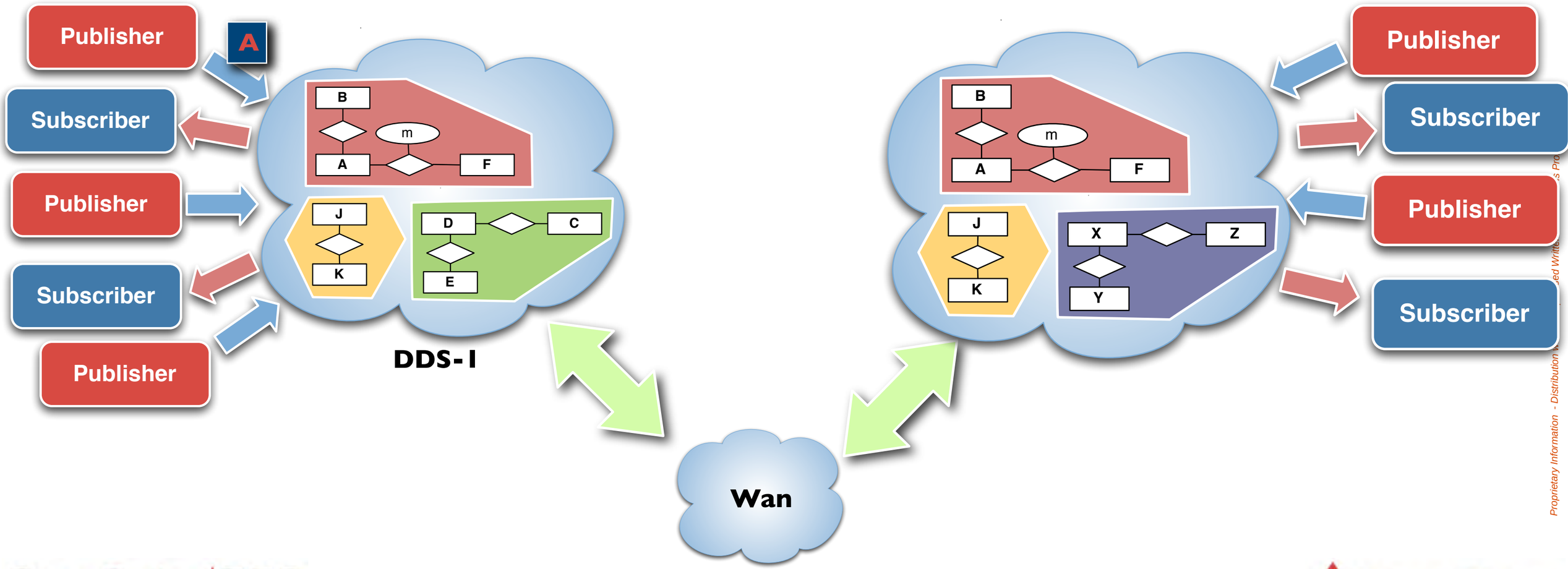

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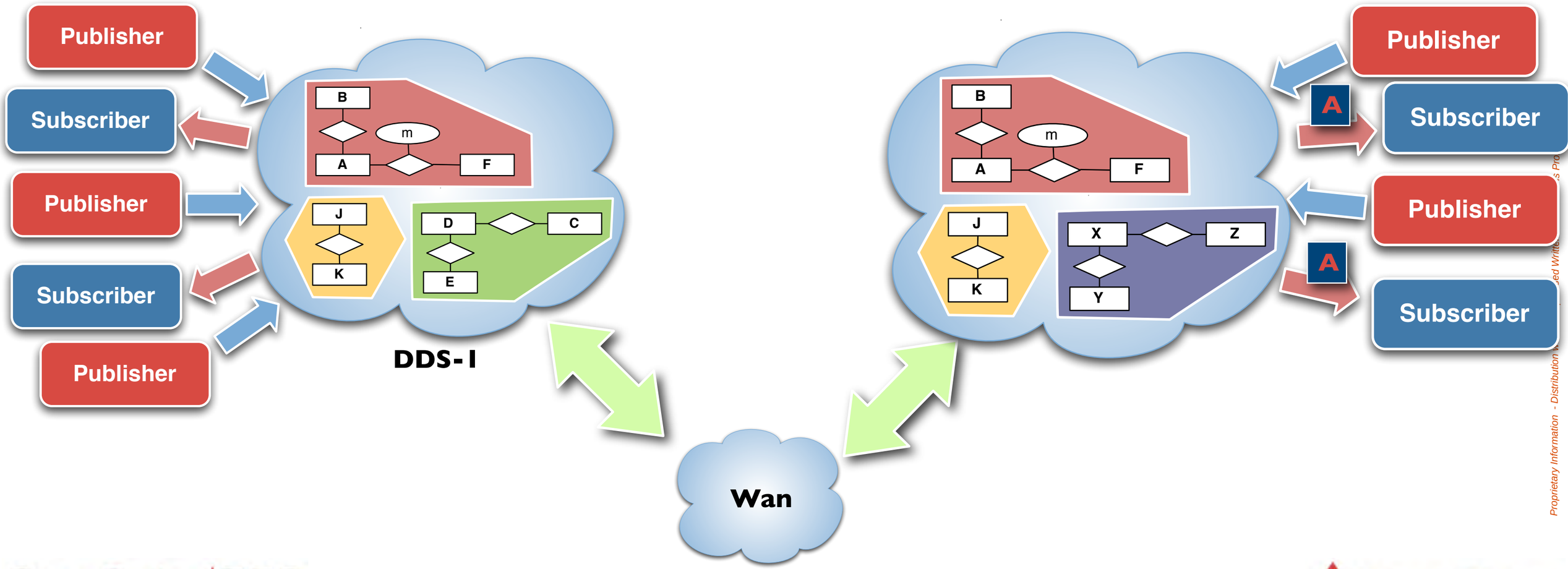

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The Challenge

Episode IV

Flight Data Processor

Controller Working Positions

Enterprise Applications

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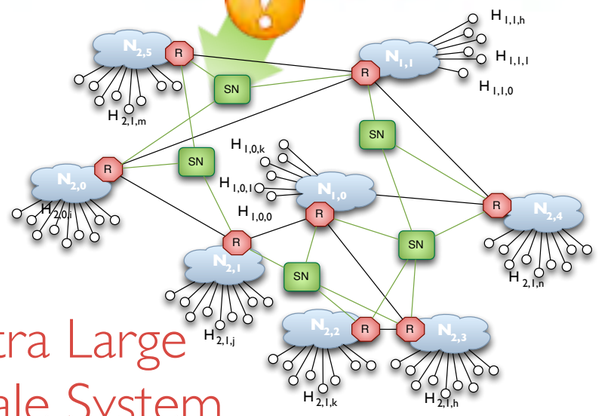
JMS

Controller Working Positions

OpenSplice DDS

Multi-Radar Tracker

Radar



Ultra Large Scale System

REST

Web Browser

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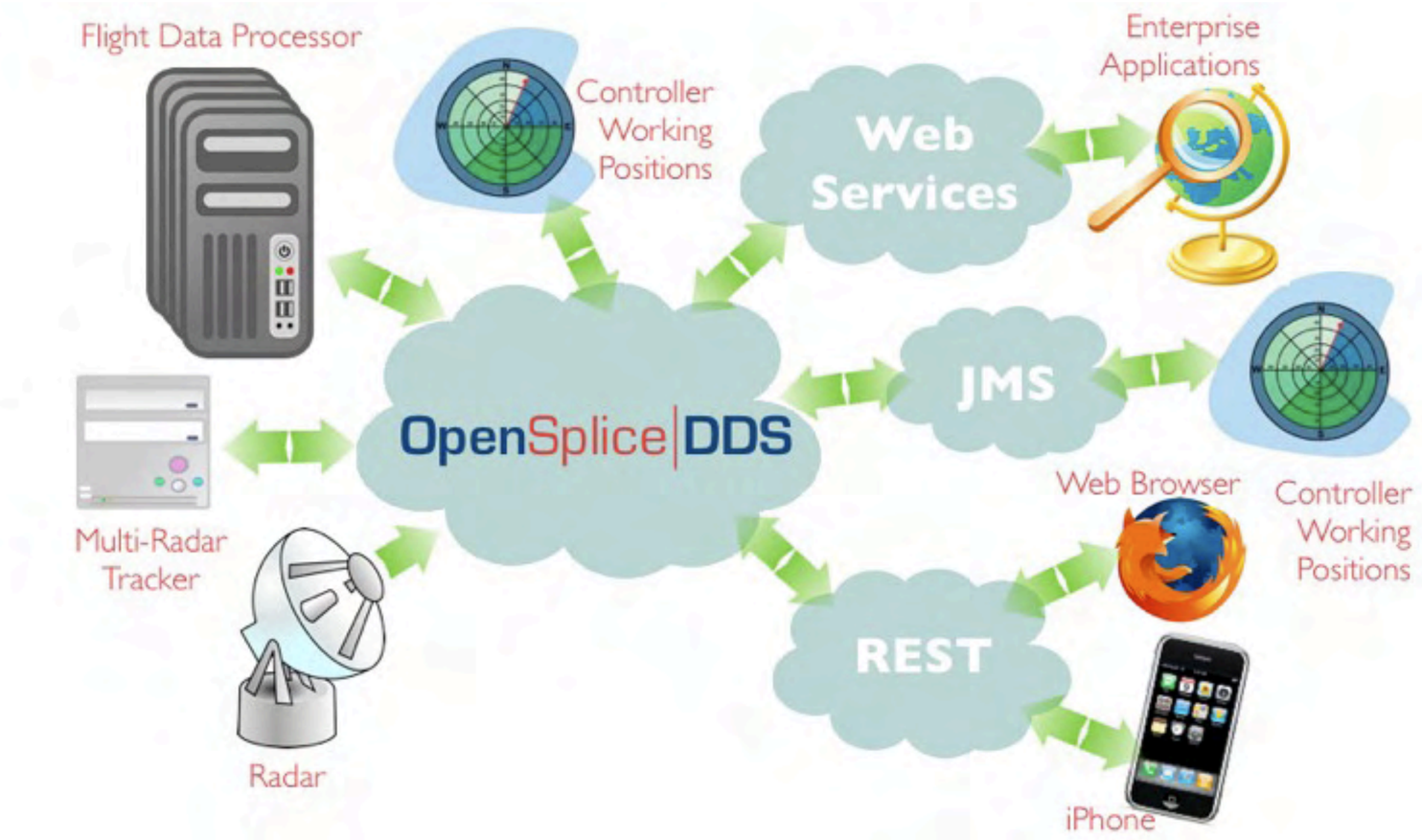
Enterprise Integration vs. Mission Critical

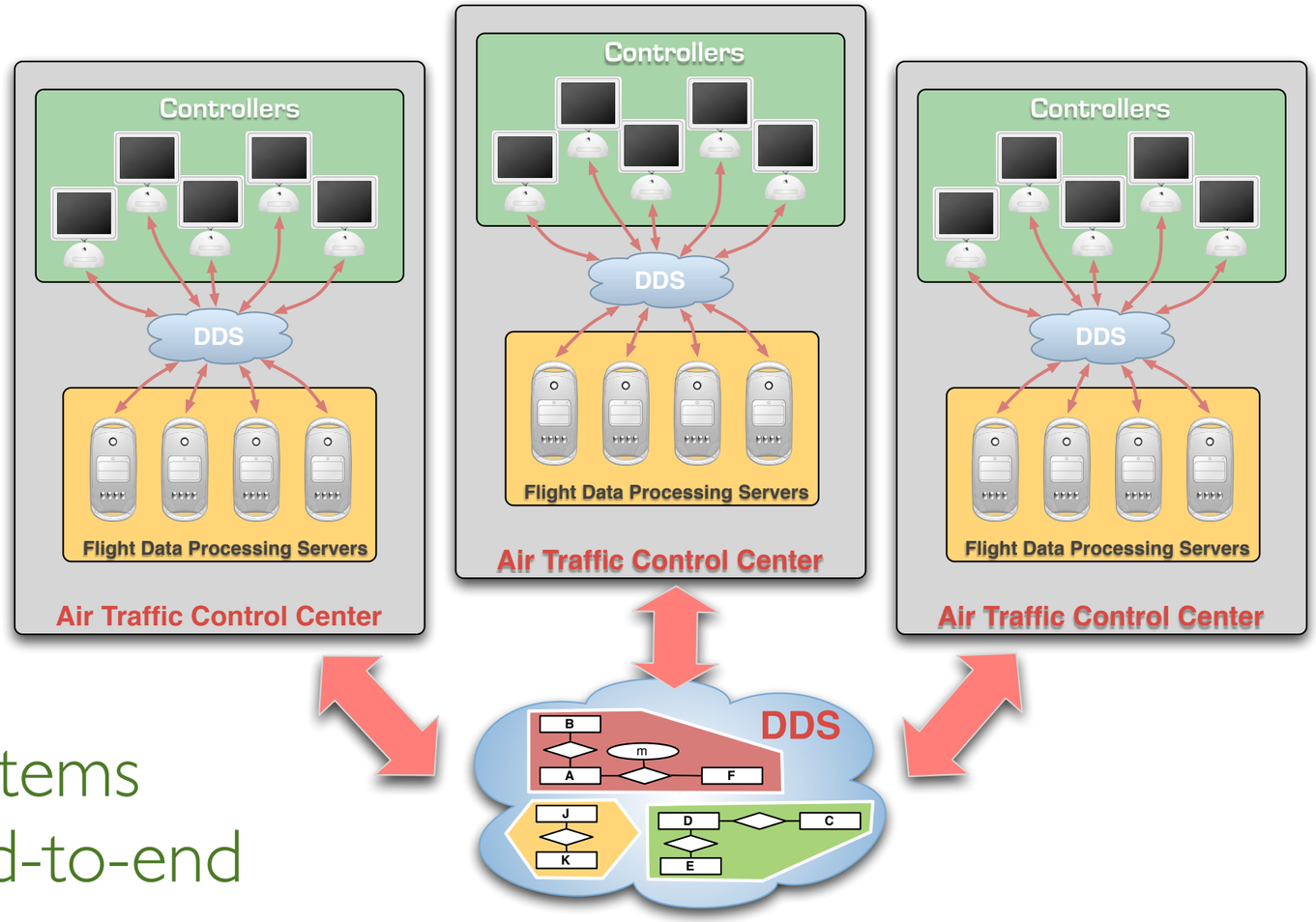
Enterprise Integration

- Business integration focuses on "gluing" systems together
- Content and format transformation are the key aspects of Enterprise Integration



Mission Critical Integration

- Like business integration focuses on "gluing" systems together
- Content, format and **QoS** transformation are the key aspects of Enterprise Integration



Integration of Mission-Critical Systems
Requires that QoS is adapted end-to-end

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Enterprise Integration

CamelOS

What

- Camel Connector for OpenSplice DDS
- Allows to bridge from DDS to any of the Camel-provided connectors, e.g. JMS, HTTP, etc.

Where

- Available at:
  - http://fusesource.com/forge/projects/CAMELOPENSPLICE

CamelOS in Action

- This simple examples shows how to specify DDS-endpoints
- The uses Camel to receive ExampleStrTopic samples and then print them on the screen

```
ctx = new DefaultCamelContext();
template = ctx.createProducerTemplate();
final String fromURI = "dds:ExampleStrTopic:0/?target=stringTarget";
endpoint = ctx.getEndpoint(fromURI);
ctx.addRoutes(new RouteBuilder() {
   public void configure() {
      from(fromURI).process(new Processor() {
         public void process(Exchange e) {
            displayExchange(e);
         }
      });
   }
});
```

restful-dds

What

- RESTful Connector for OpenSplice DDS
- Driving the standardization of the REST API for the Web-Enabled DDS
- Provides a full REST-based API for reading/writing data over HTTP

Where

- Available at:
  - http://code.google.com/p/restful-dds/

Using the REST API

URI	HTTP Method	Request Body	Replace Body	Description
/ dds/<participantname>/<partition >/<topic>/ <type>/subscribe/<datareadername>/read? sample_state=xx&view_state=xx &instance_state=xx&max_sample s=xx	GET		list of read samples and their state info	Read data from a data-reader
/ dds/<participantname>/<partition > /<topic>/ <type>/publish /<datawritername>/write? time_stamp=xx	POST	sample data		Write a sample

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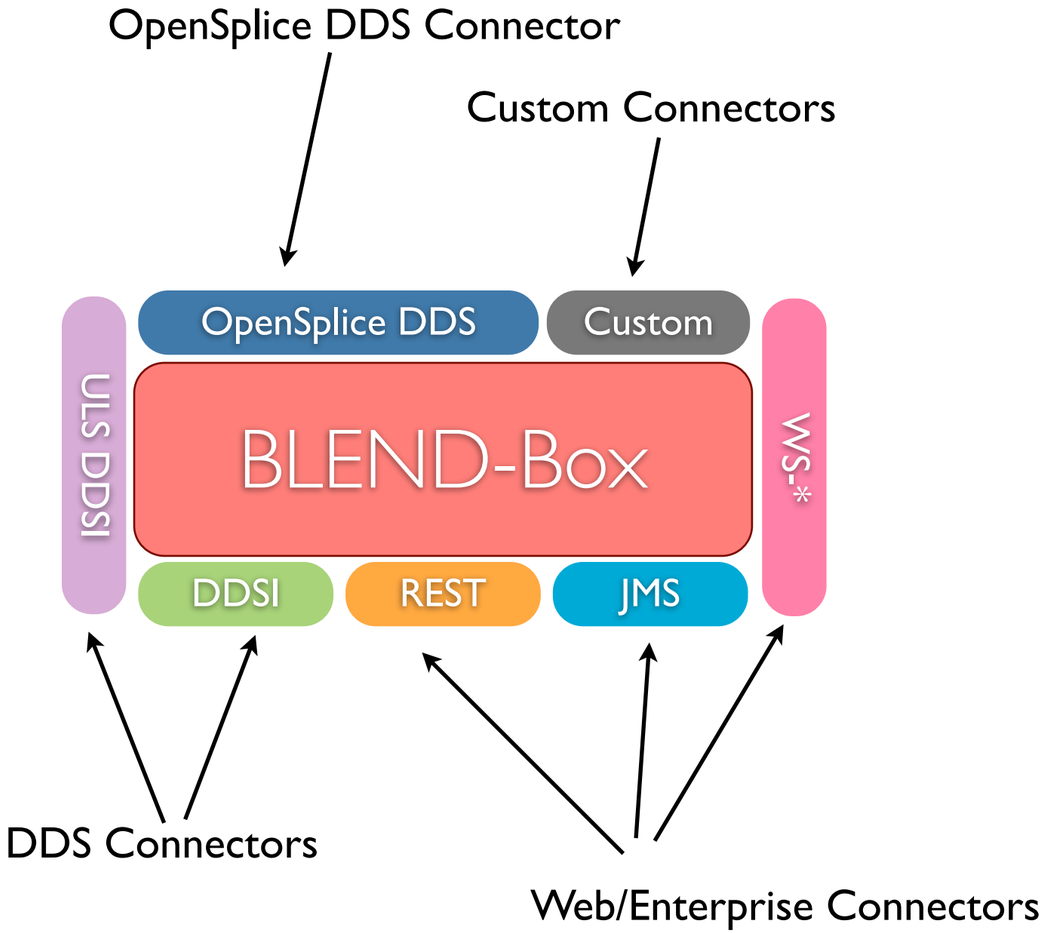
Mission Critical Integration

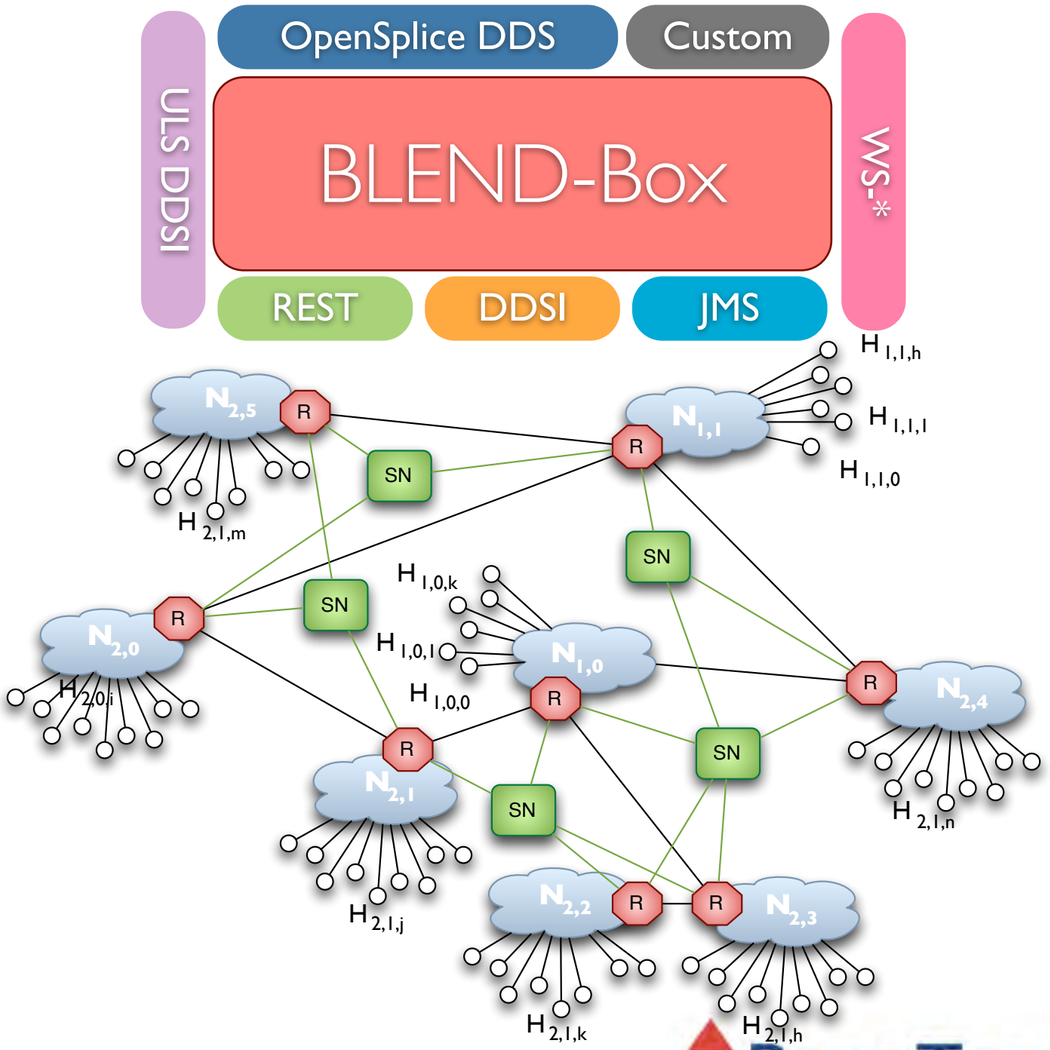
The Blend-Box

- The **BLEND-Box** will provide a very **high performance, qos-enabled, extensible and configurable** protocol gateway framework allowing to automatically bridge from one communication technology to another
- The BLEND-Box will allow to expose relevant data in the required communication protocol, without imposing changes into existing systems



System and SoS Integration

- The BLEND-Box provides an integration infrastructure that allows to:
  - Decide what data has to be exposed to other systems
  - Decide over which transport the data should be exposed
  - Control the Content, format and QoS adaptation
- The BLEND-Box allows to optimally integrate DDS-based systems using:
  - DDSI or the OpenSplice Real-Time Networking over a LAN
  - Ultra-Large-Scale (ULS) DDSI over a WAN



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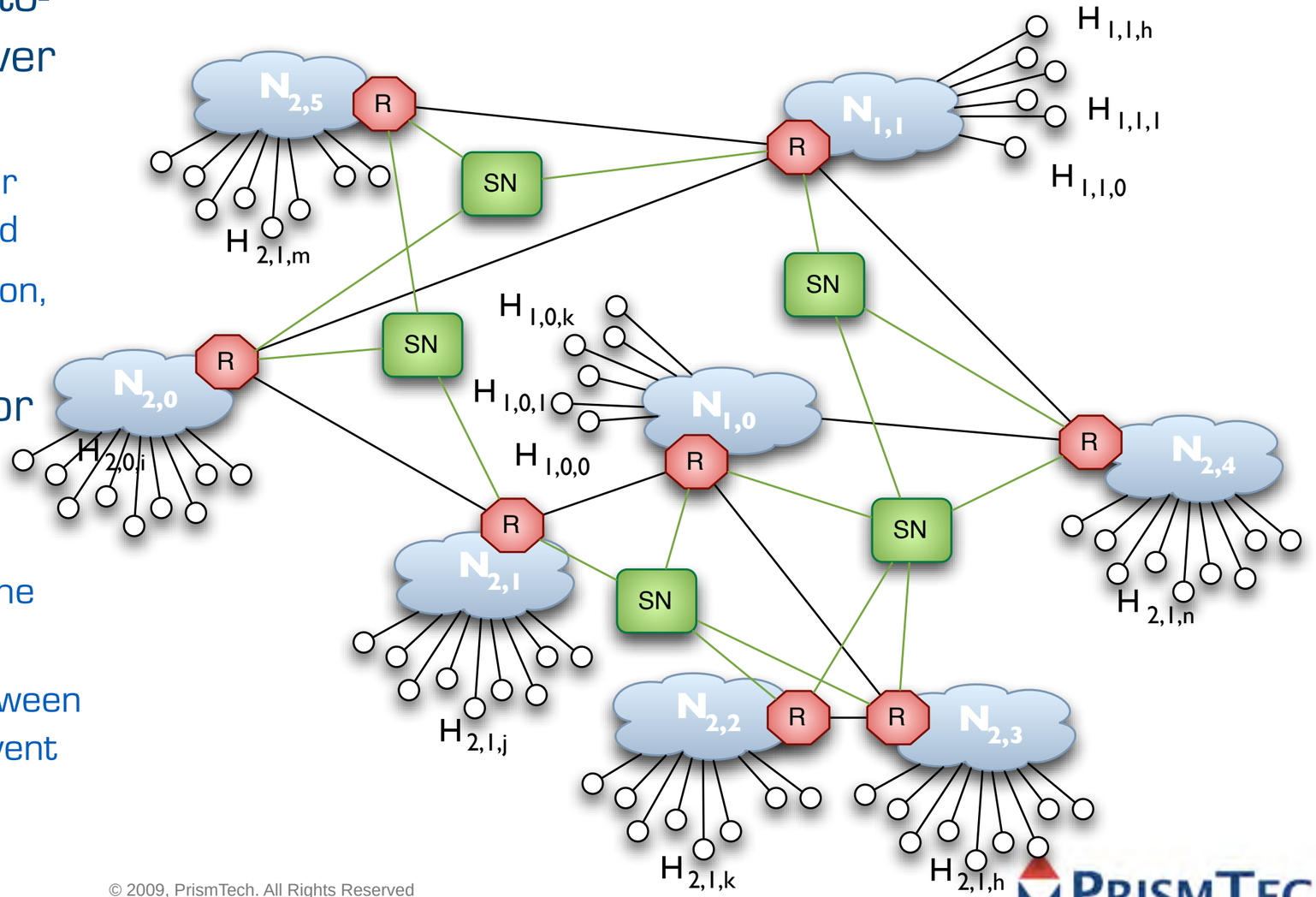
ULS-DDSI

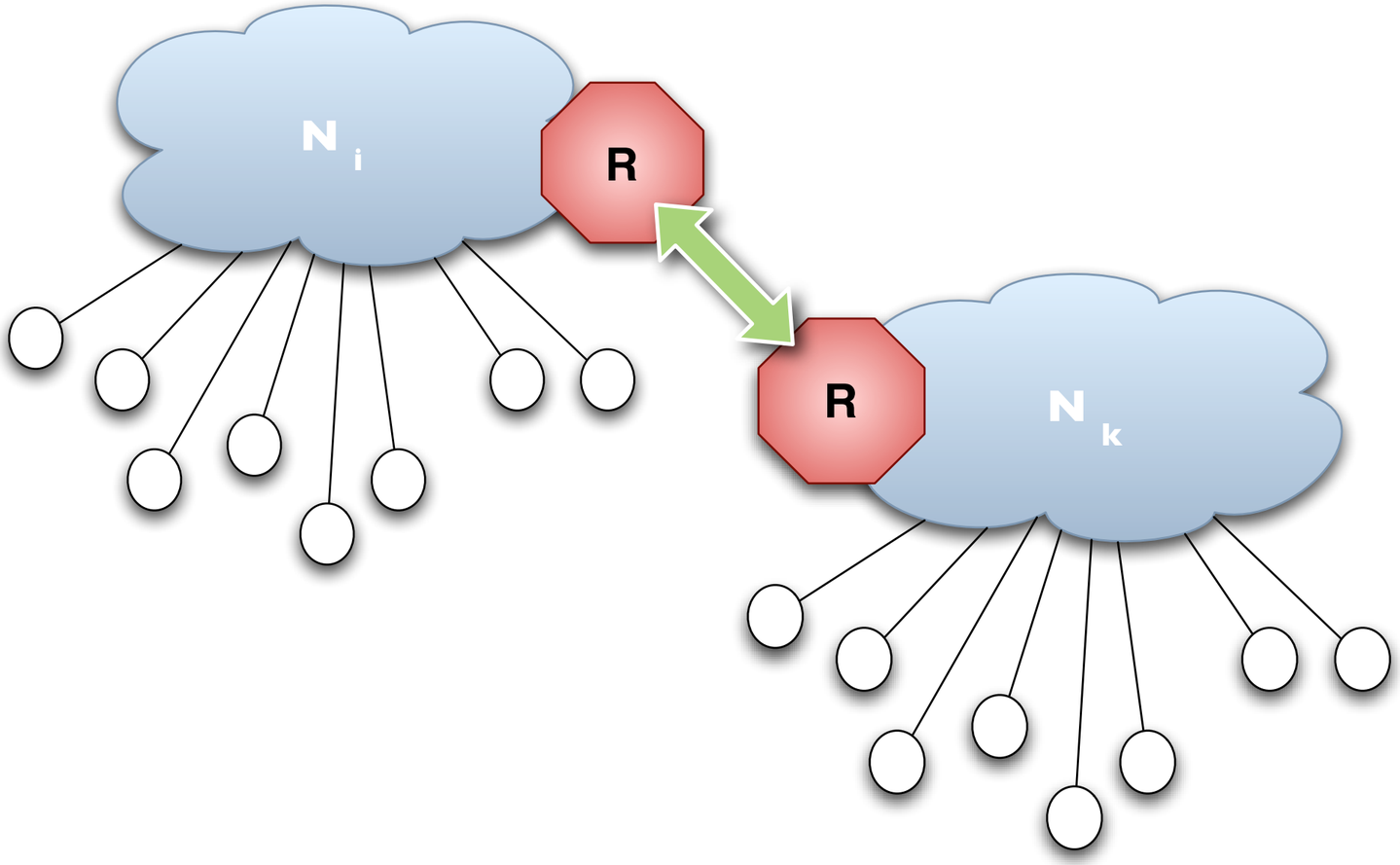
Architecture for Internet Scale DDS

- DDS-Level Routers establish a Peer-to-Peer overlay that relays DDS data over the WAN
  - The Router provides a single access point for deciding what to expose to the external world
  - The Router can perform Topic Transformation, etc.
- A Network of Super-Nodes is used for ensuring:
  - Scalable (Global) Discovery
  - Subscription Management (when crossing the boundaries of a System)
  - Support for establishing communication between Pub and Sub (perhaps via STUNT to circumvent



DDS Router

- DDS Router communicates with the local DDS Domain by Multicast
- DDS Router are configured with the set of topics to be exposed along with potential transformations
- Router2Router communication is carried on by RTPS over TCP (since TCP has been tuned over years to work fine in WAN
- If required the Router takes care of compressing Data
- DDS Router Runs a “variation” or DDSI/RTPS

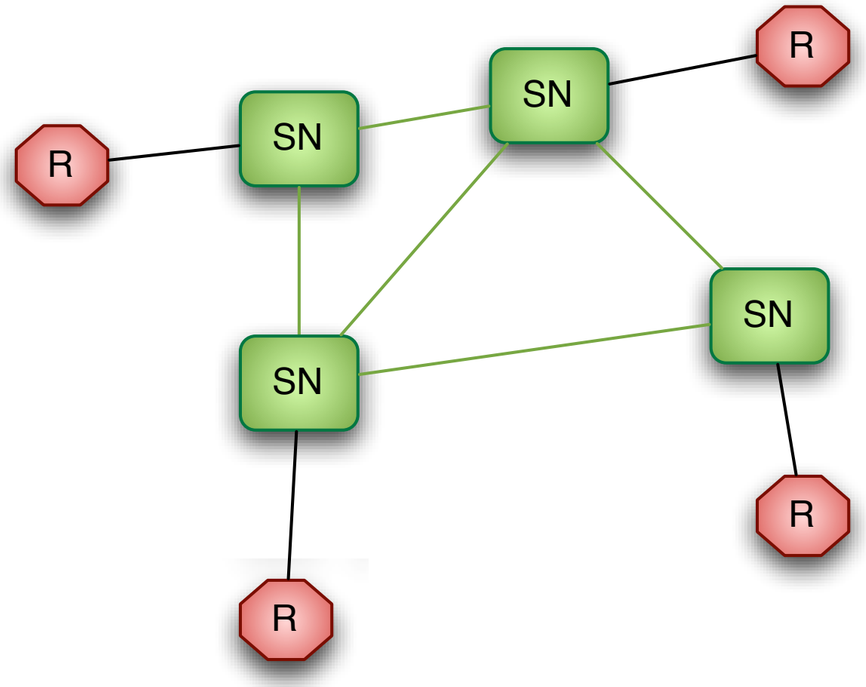


- Topic, Subscription and Publication are propagated to Super Nodes
- Information available into super nodes ensure that local reader/writer will be properly matched

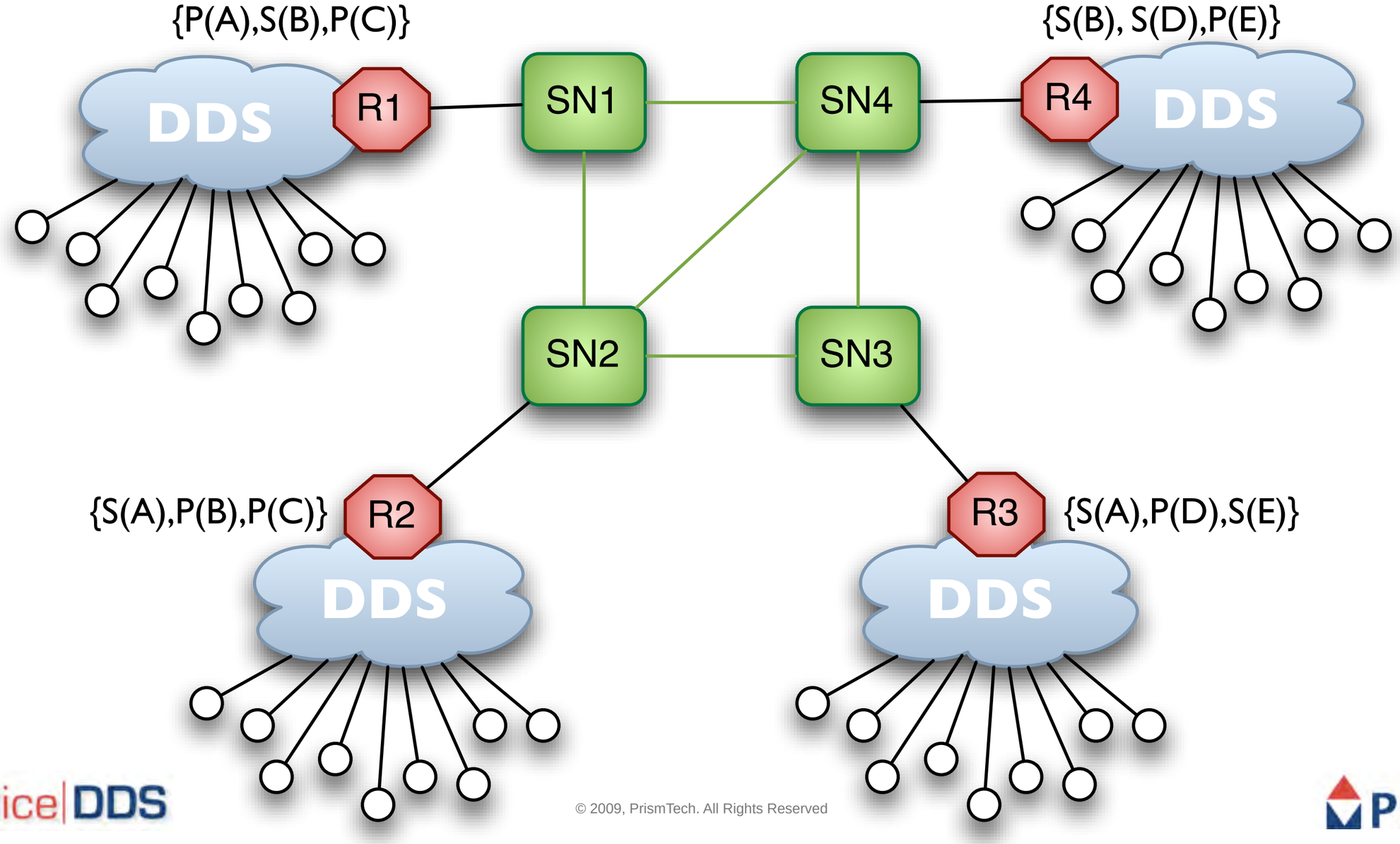
DDS Super-Nodes (SN)

- Super-Nodes store all the “discovery information”
  - List of Topics available in the system
  - Associations between Topics and Router role (e.g. Pub or Sub)
- A distributed protocol is used to replicated data, eventually, on all replicas
- Router keep a list of well-known Super-Nodes to bootstrap discovery

- **NOTE:** Super-Nodes can also be used to support the implementation of STUNT-like protocols to facilitate NAT/Firewall trespassing



How it Works



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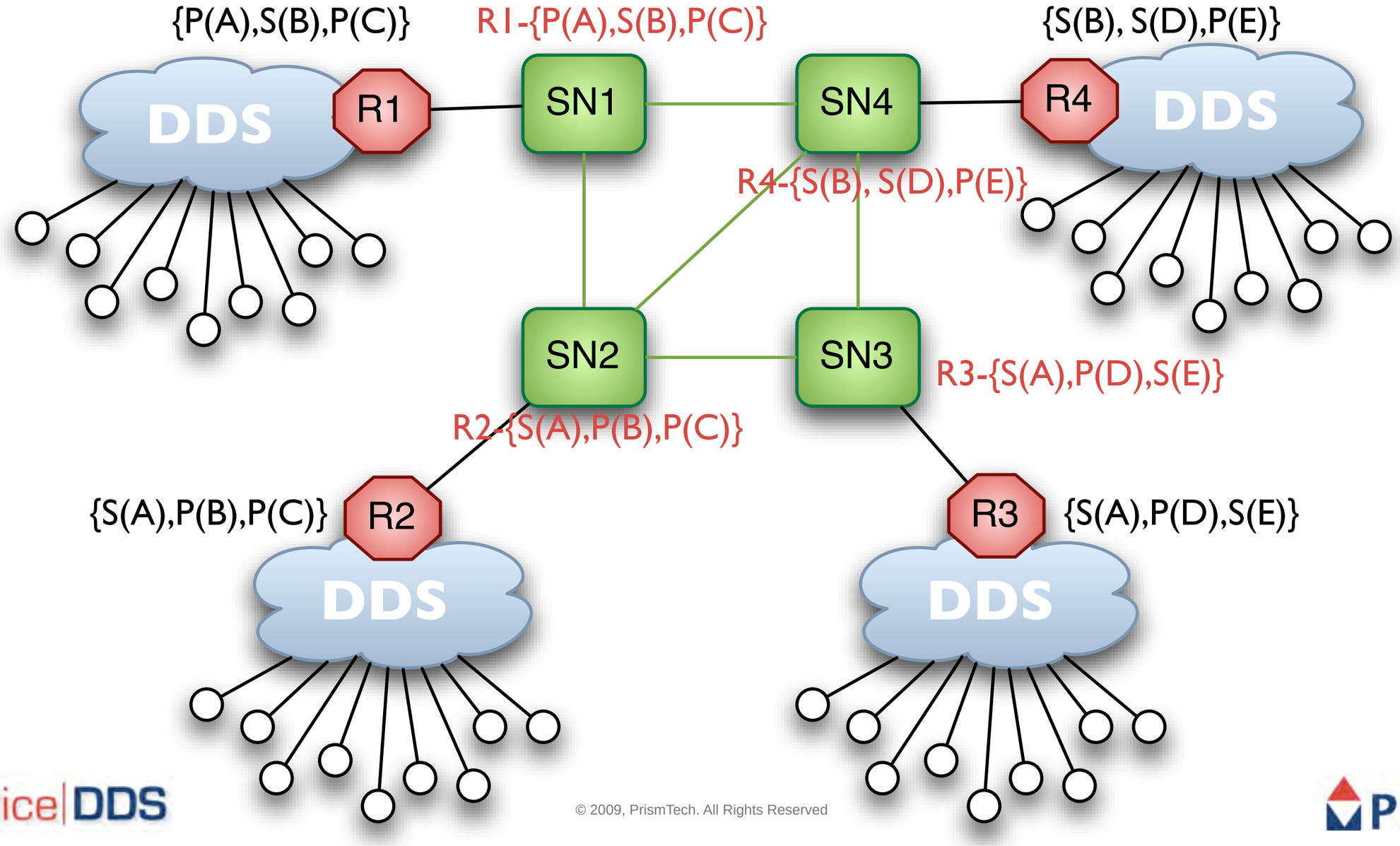

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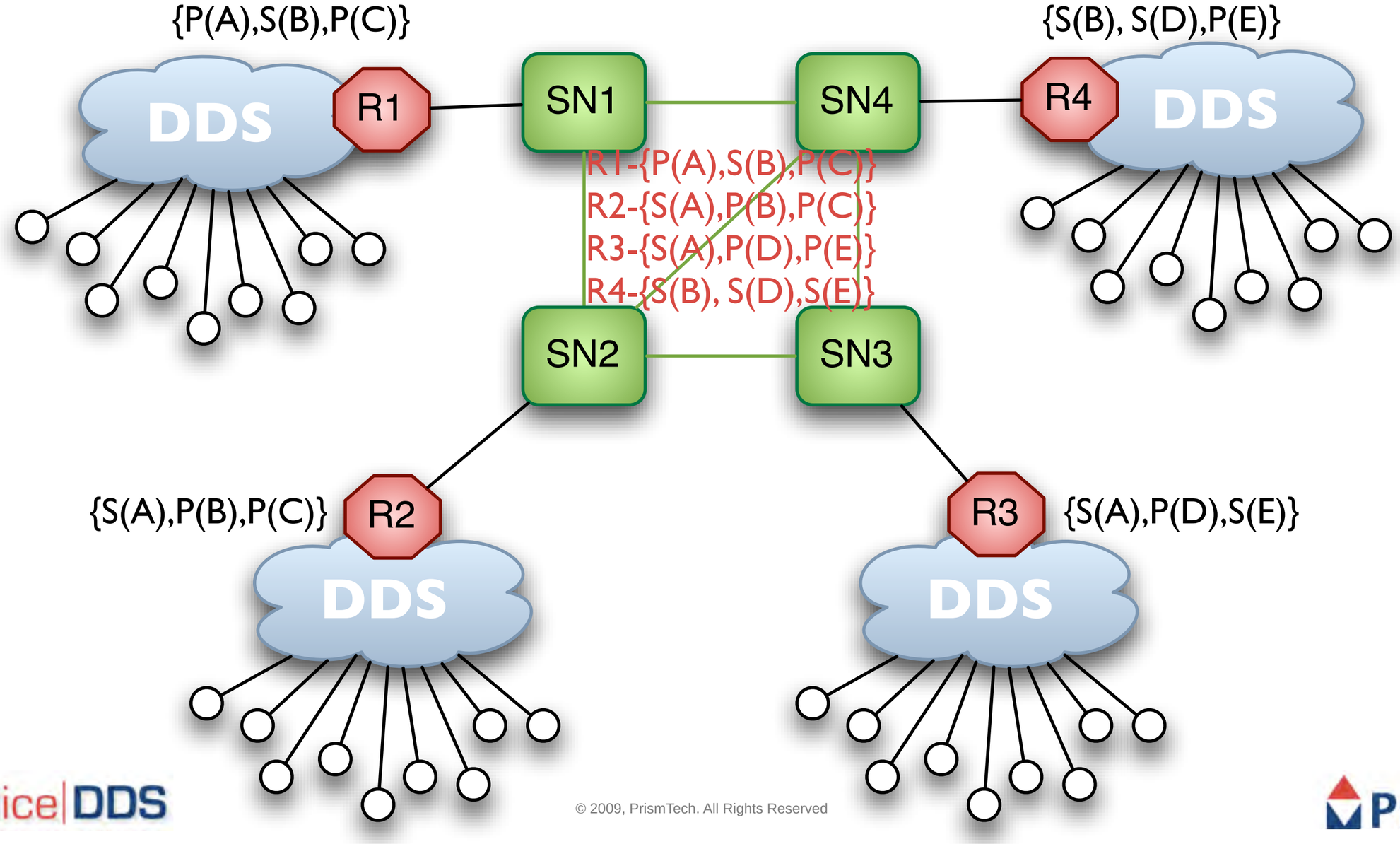

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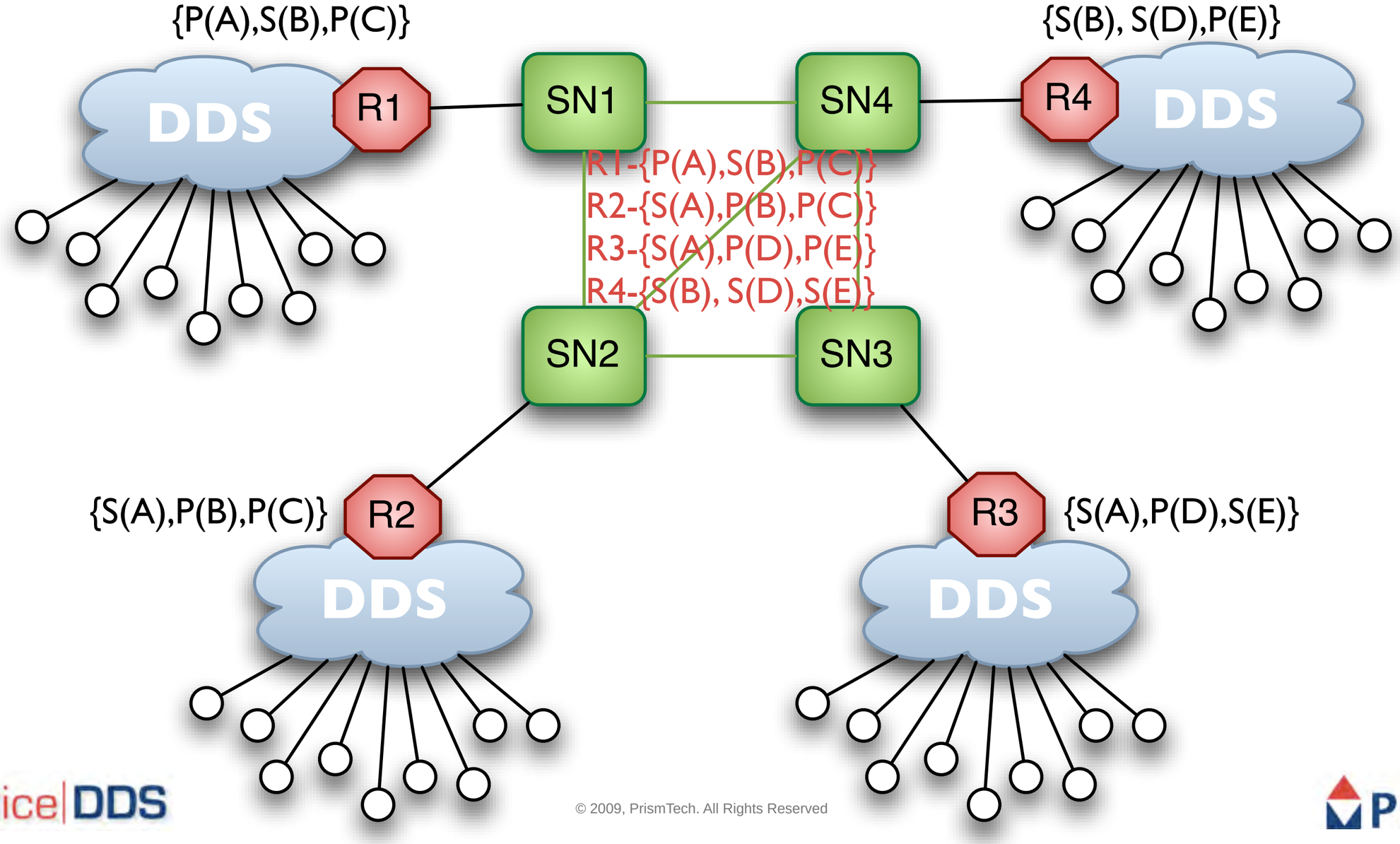

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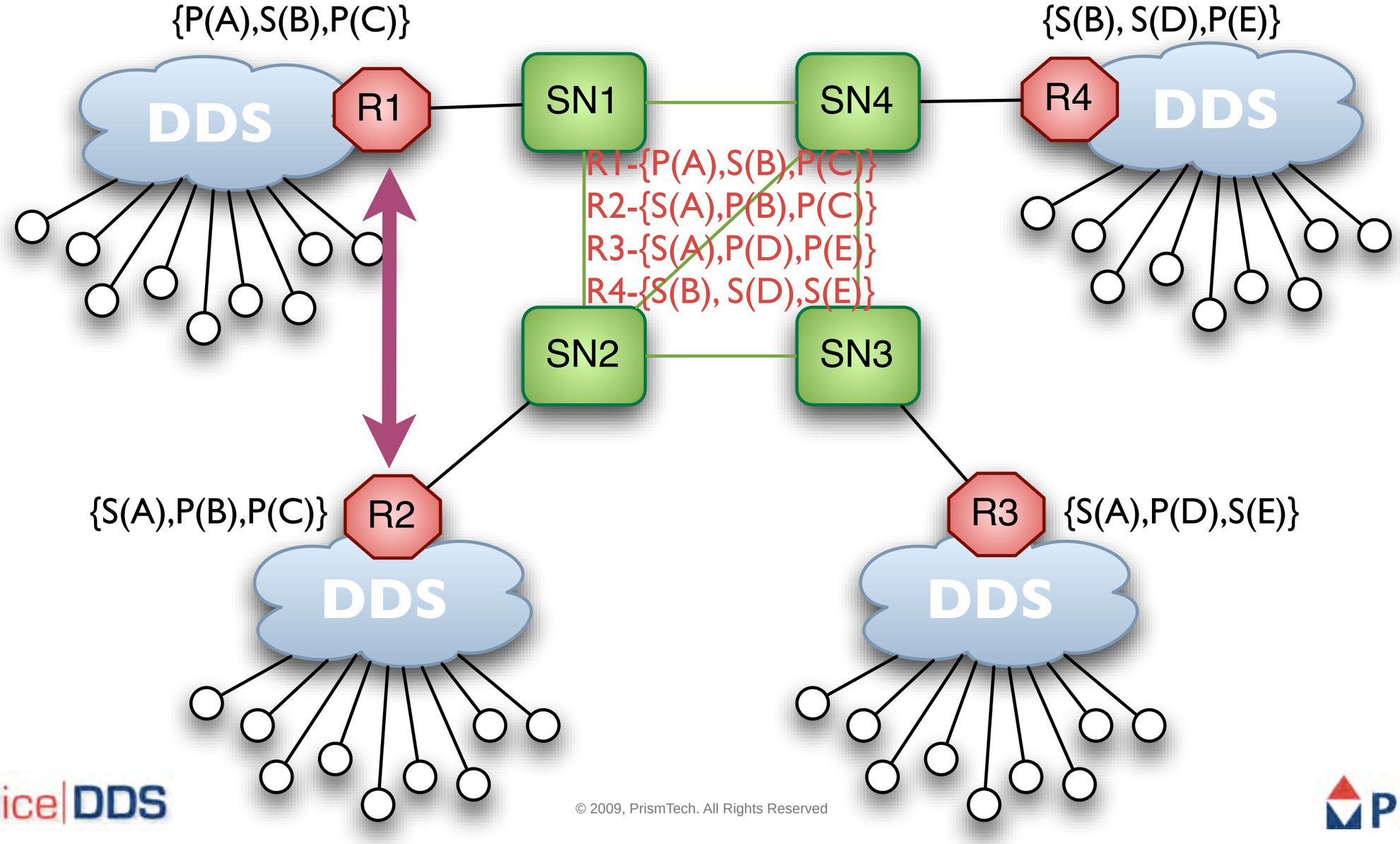

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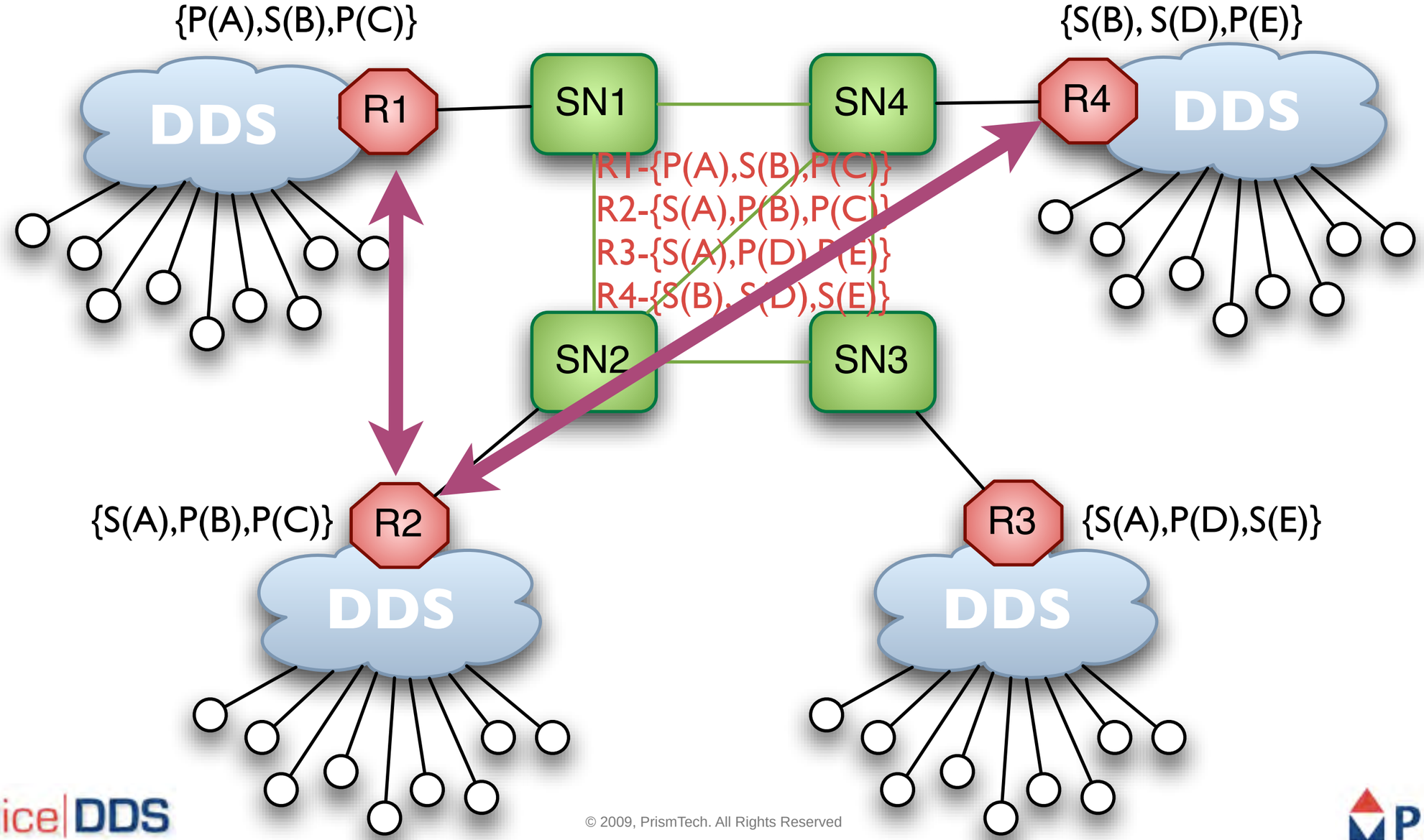

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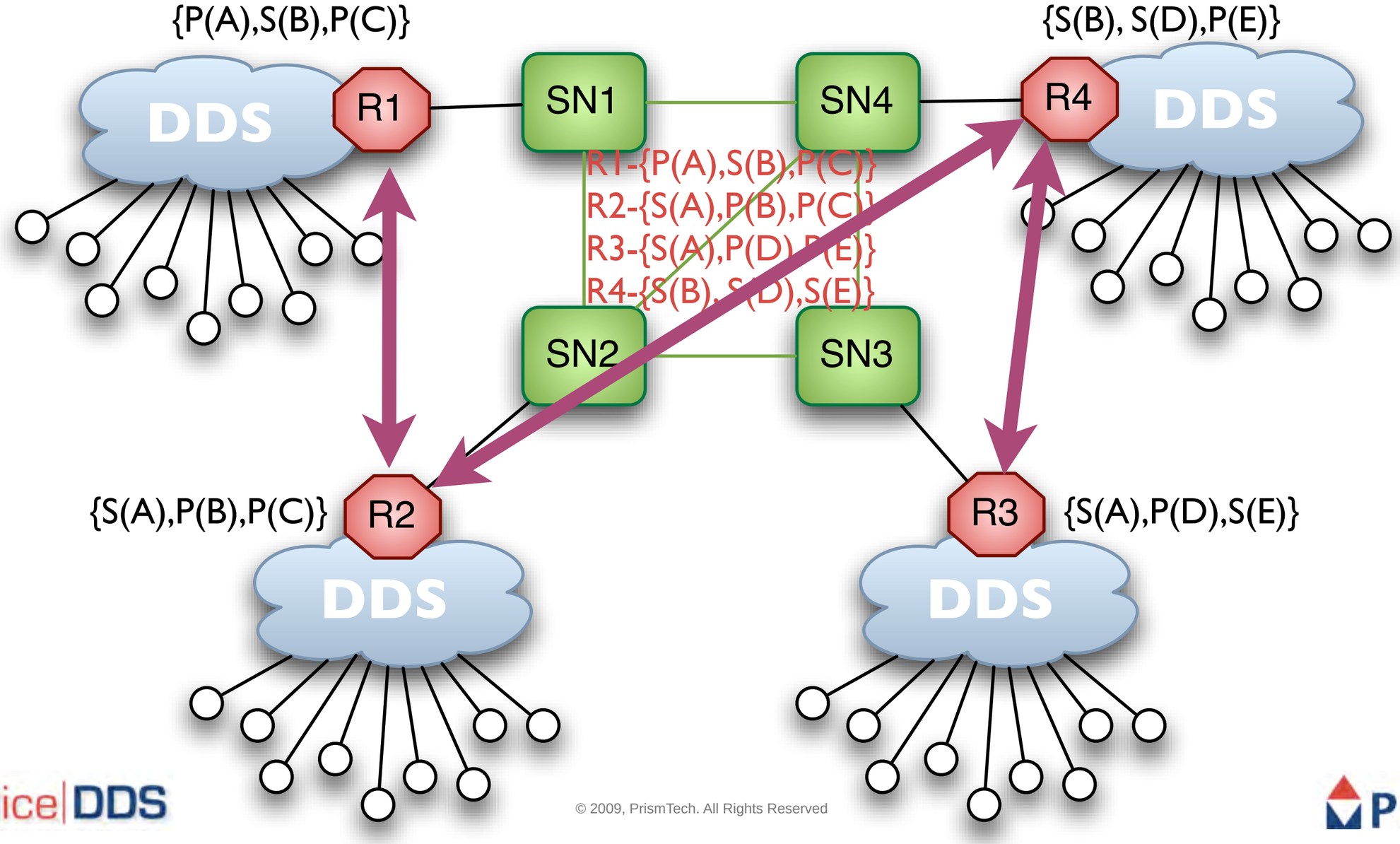

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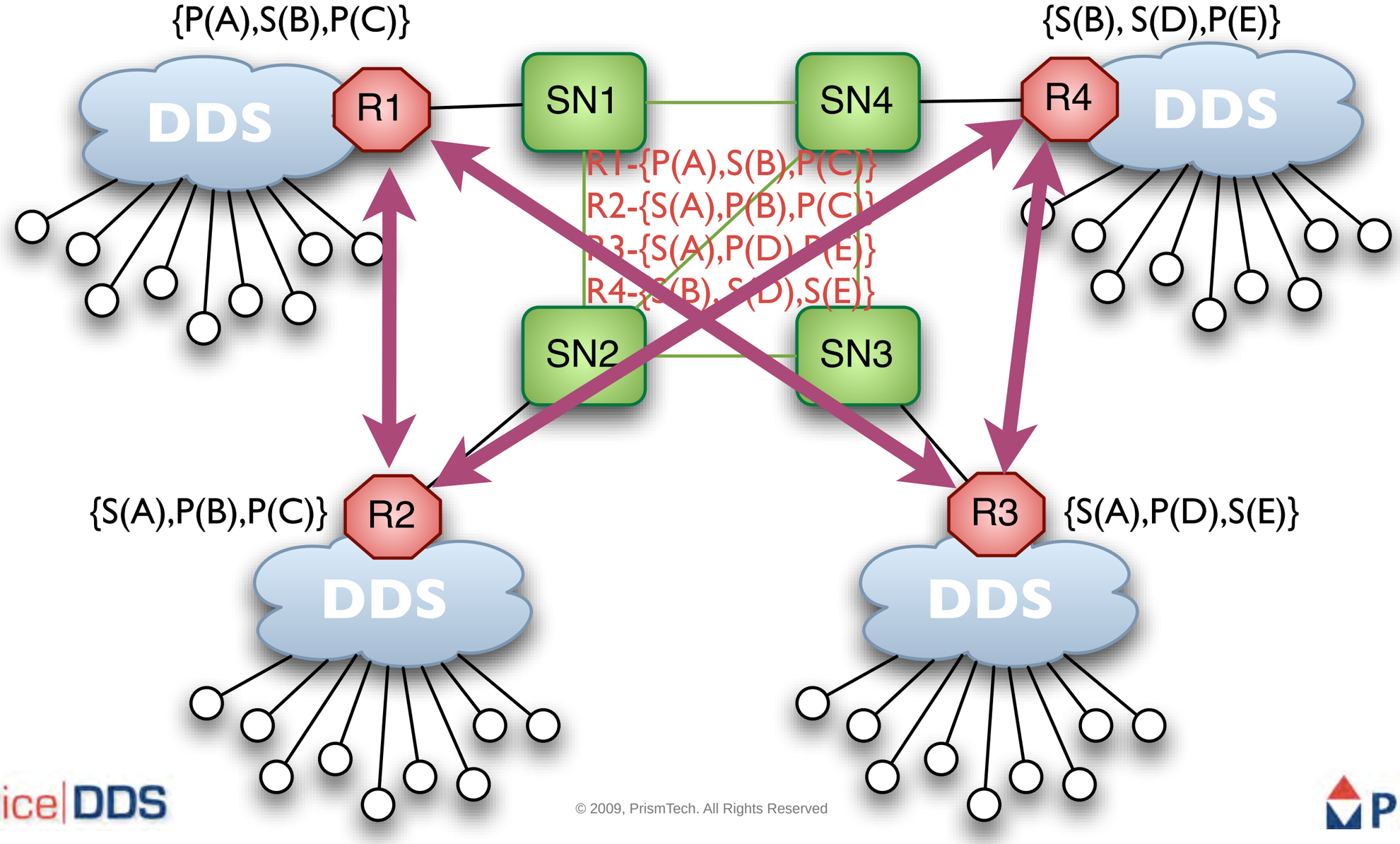

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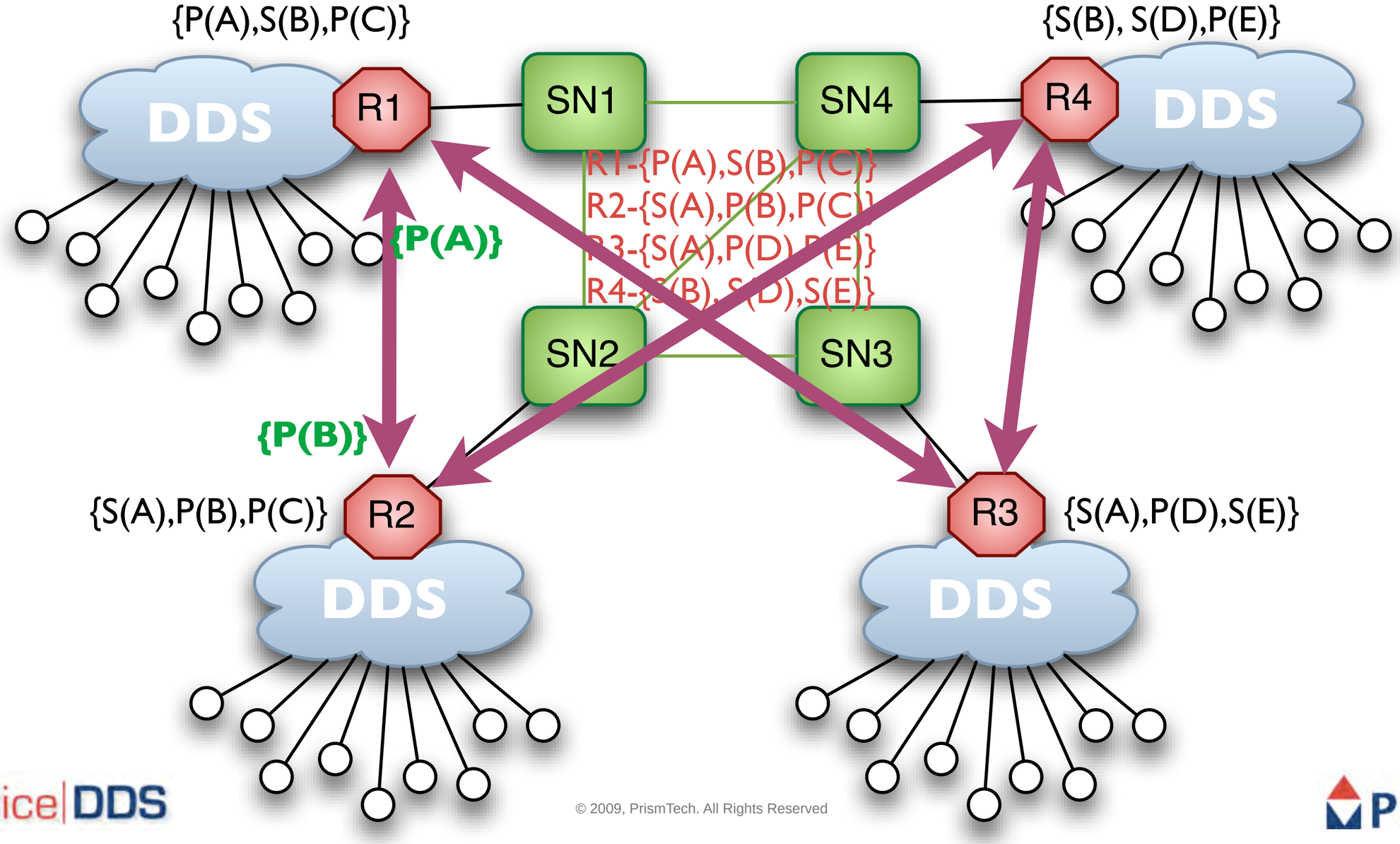

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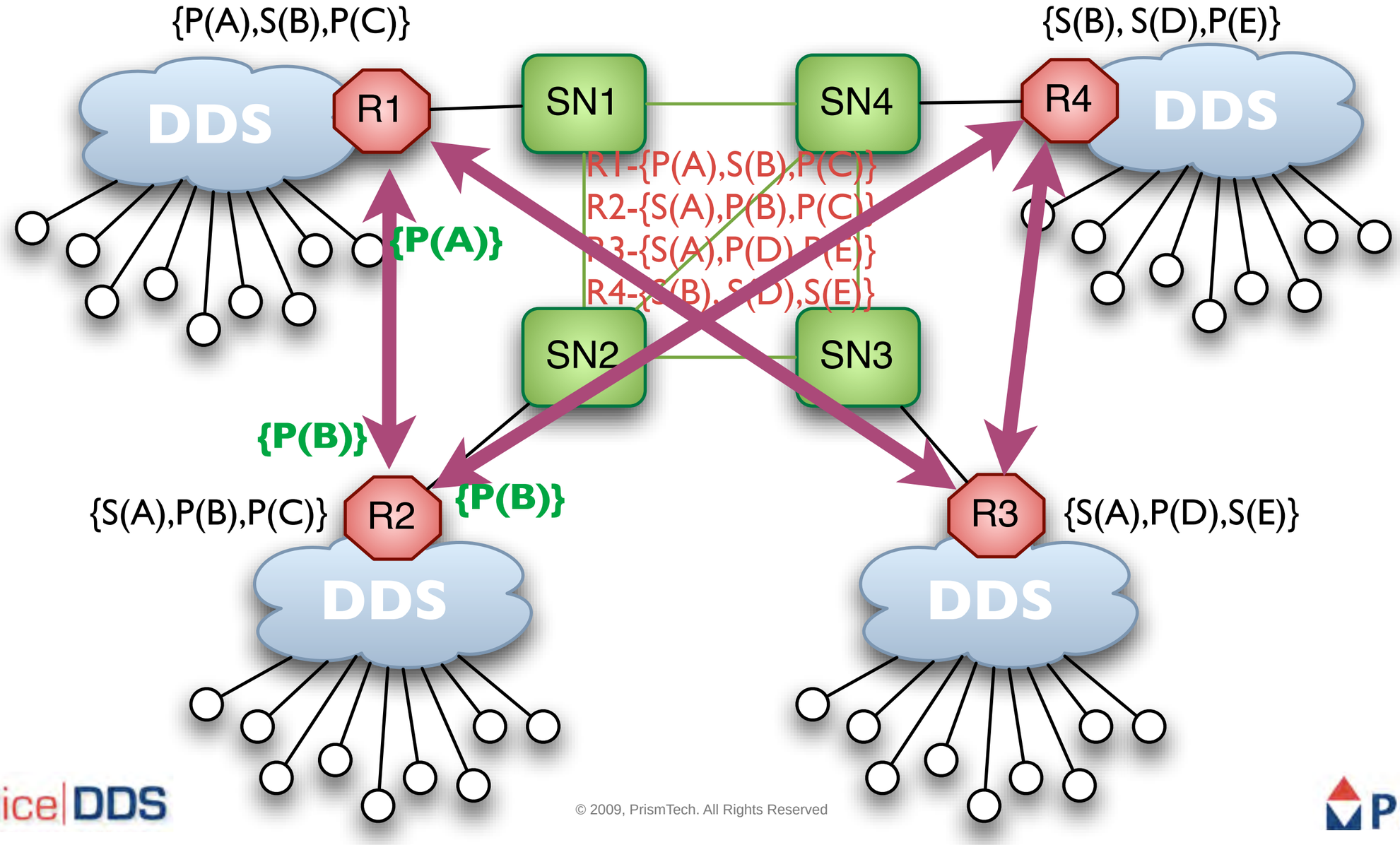

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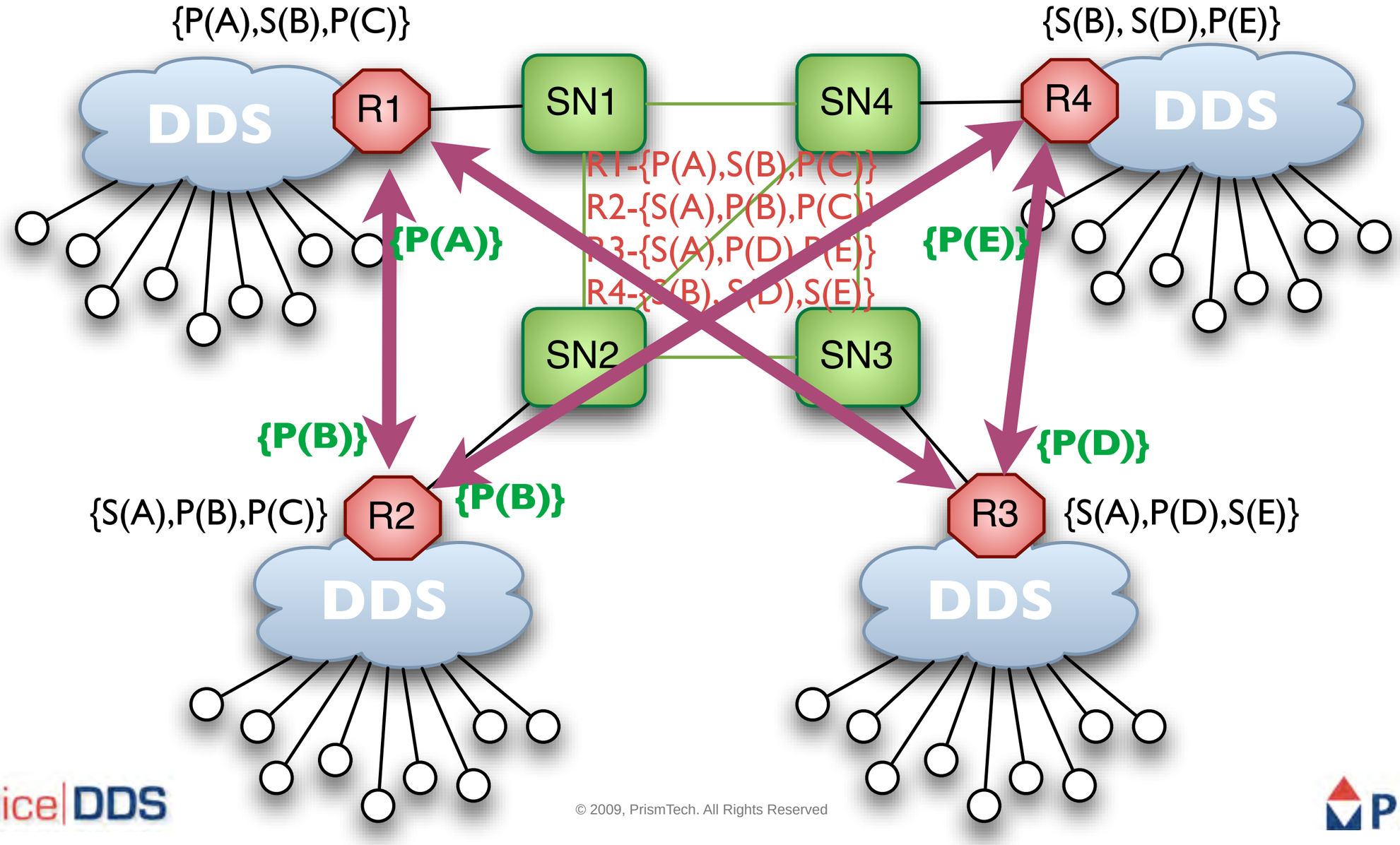

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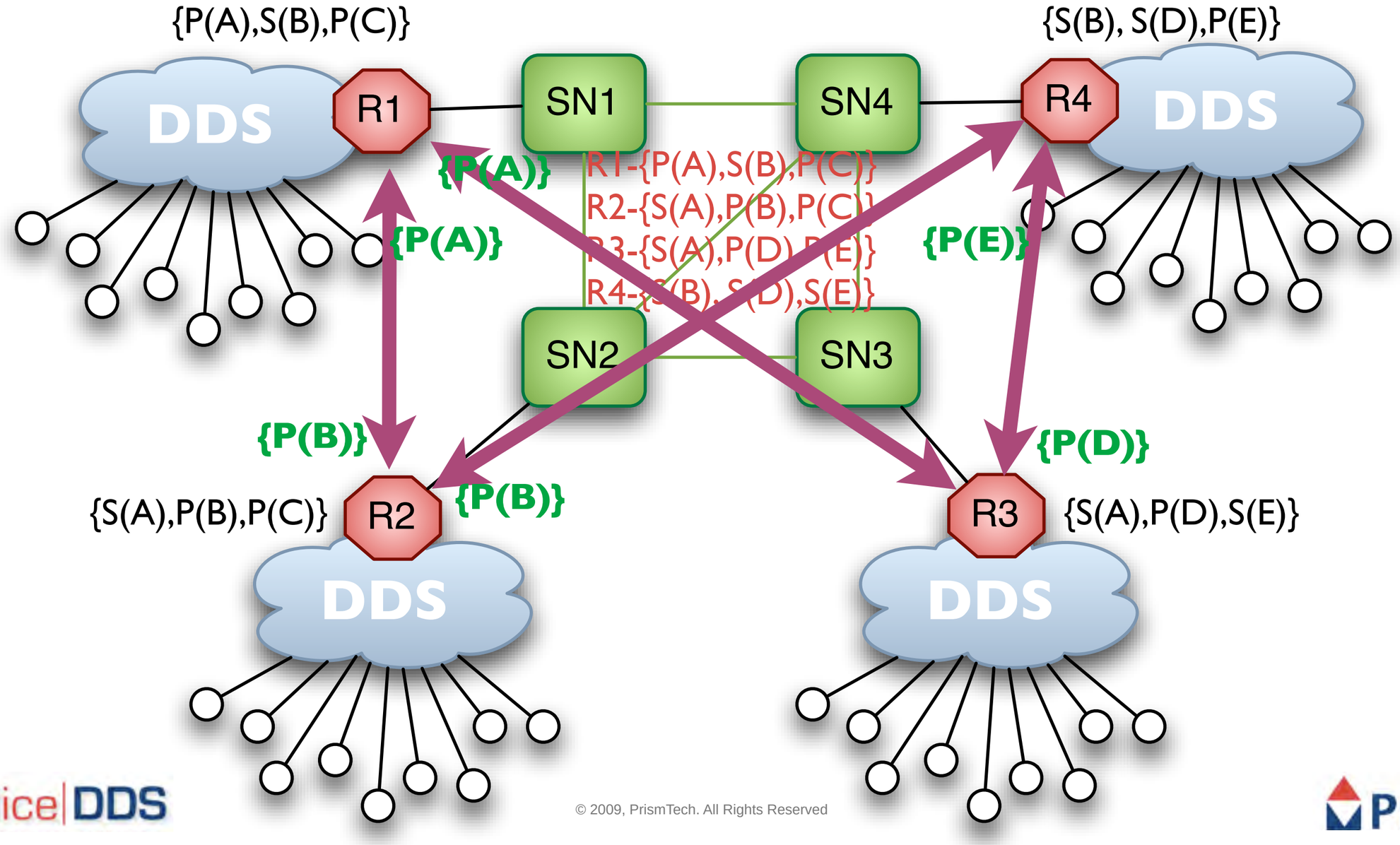

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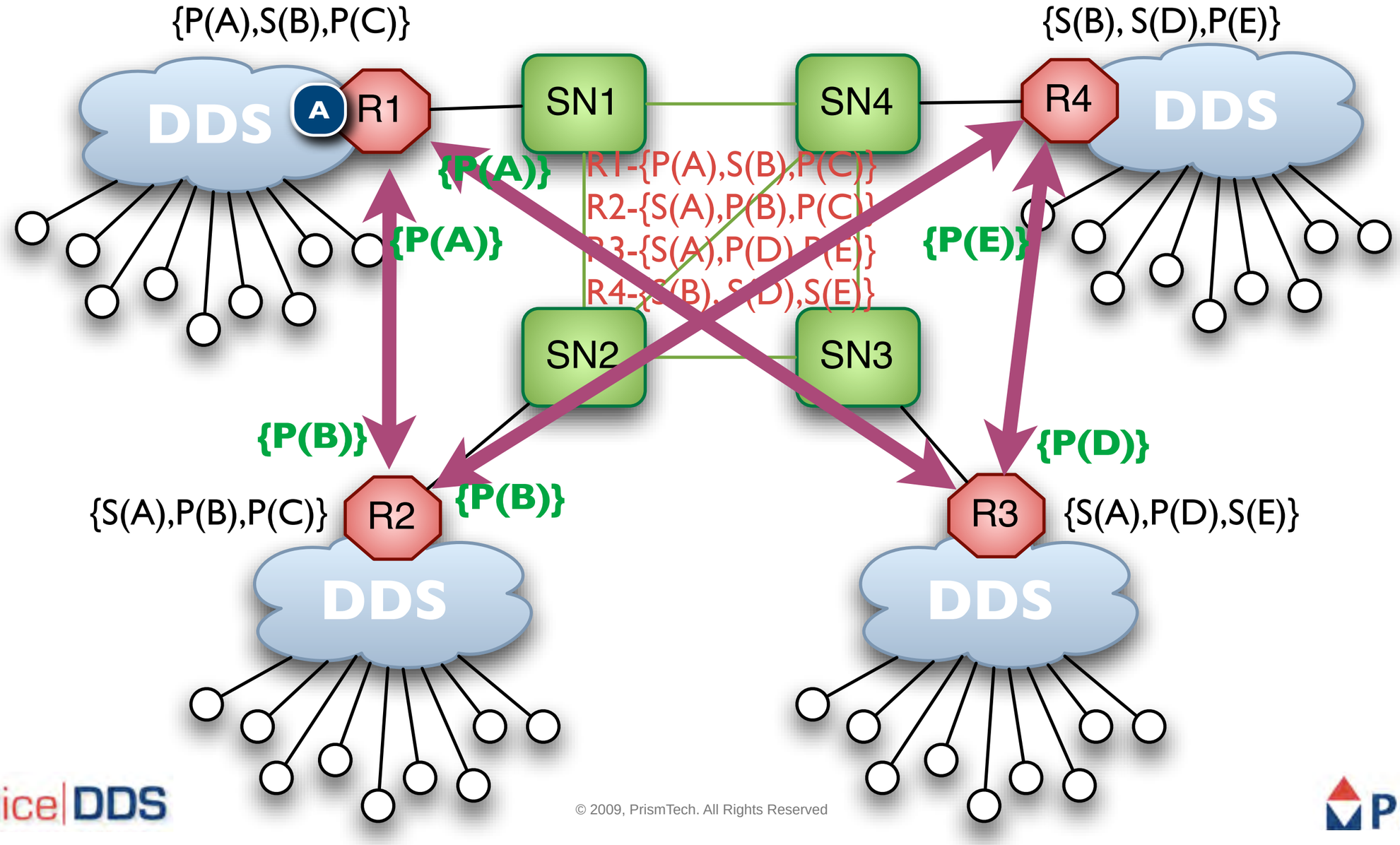

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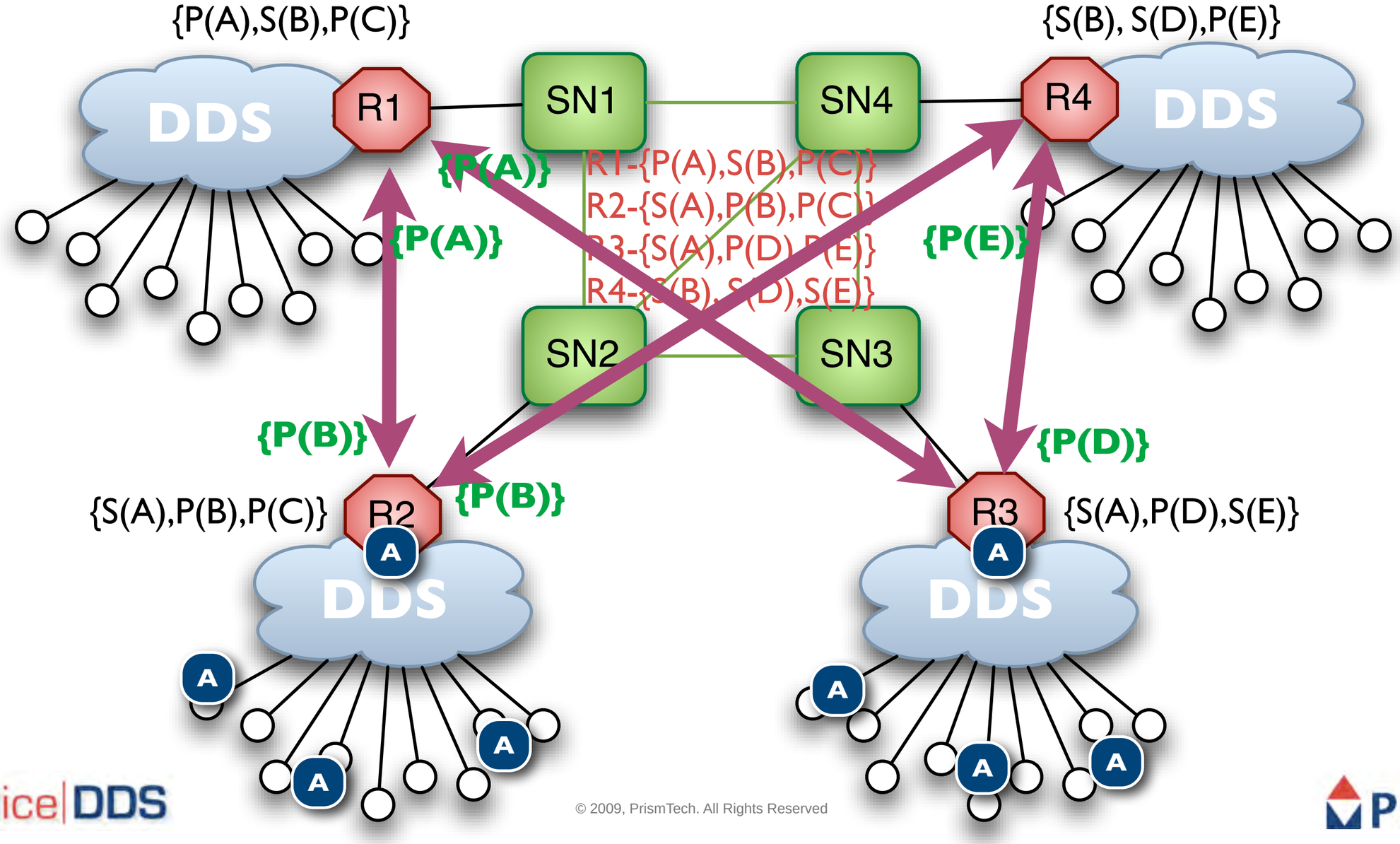

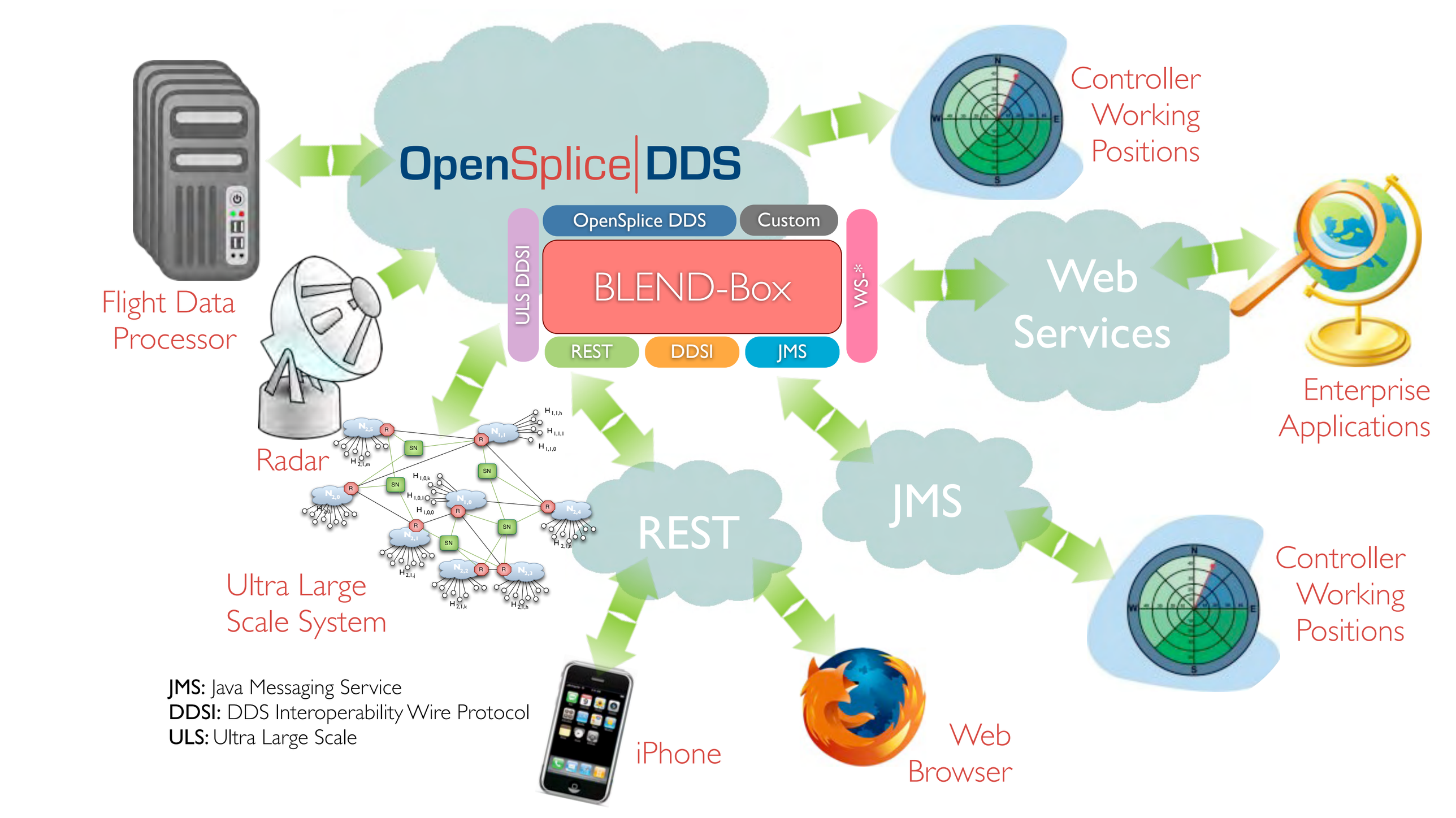
OpenSplice DDS
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Custom
ULS DDSI
BLEND-Box
WS-*
REST
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iPhone
Web Browser
JMS: Java Messaging Service
DDSI: DDS Interoperability Wire Protocol
ULS: Ultra Large Scale

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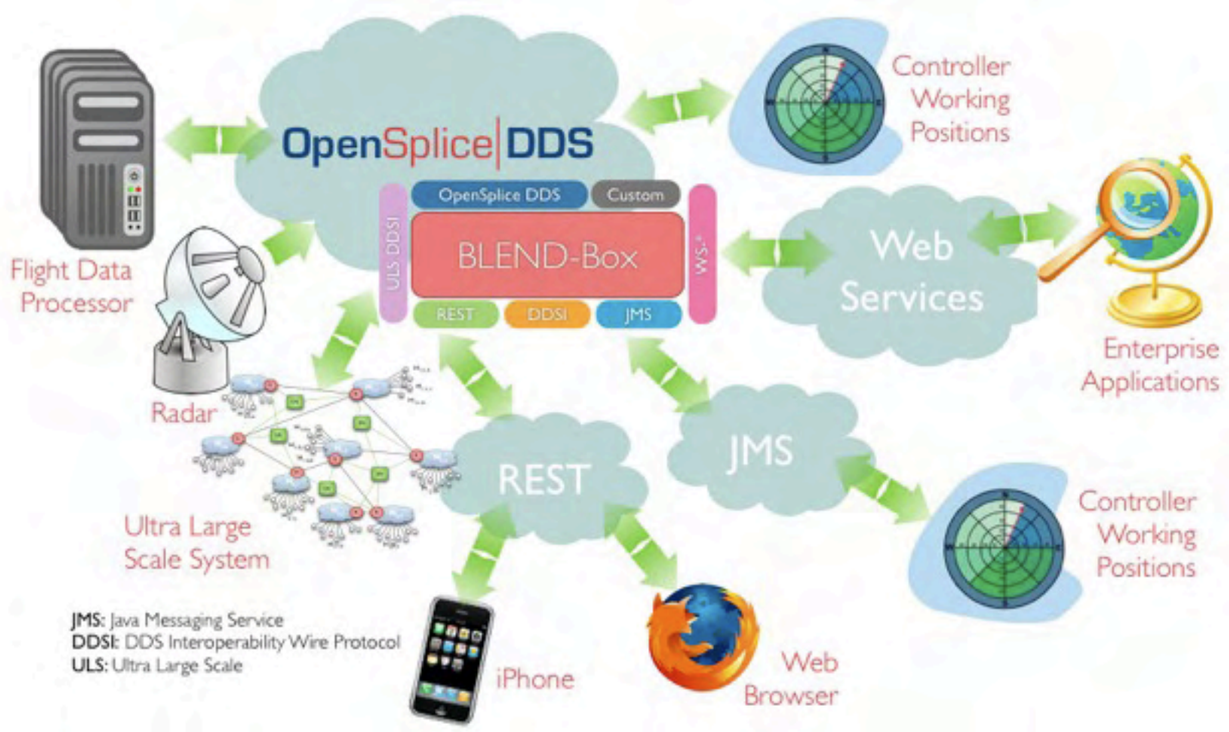
Demo!

Concluding Remarks

- The integration of Mission- and Business-Critical systems is more complex than that of Enterprise Systems because of the additional complexity introduced by the end-to-end QoS requirements
- The OpenSplice DDS ecosystem provides already solutions for integrating DDS-based system with Enterprise or Web Applications
- The BLEND-Box will enable a holistic approach to integration for mission- and business-critical systems and system-of-systems



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