A Satellite Data Model for the AFRL Responsive Space Initiative

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Introduction

- 6 day satellite
  - Insufficient time to develops software
  - Insufficient time to develop hardware
- Attribute based publish/subscribe

Example

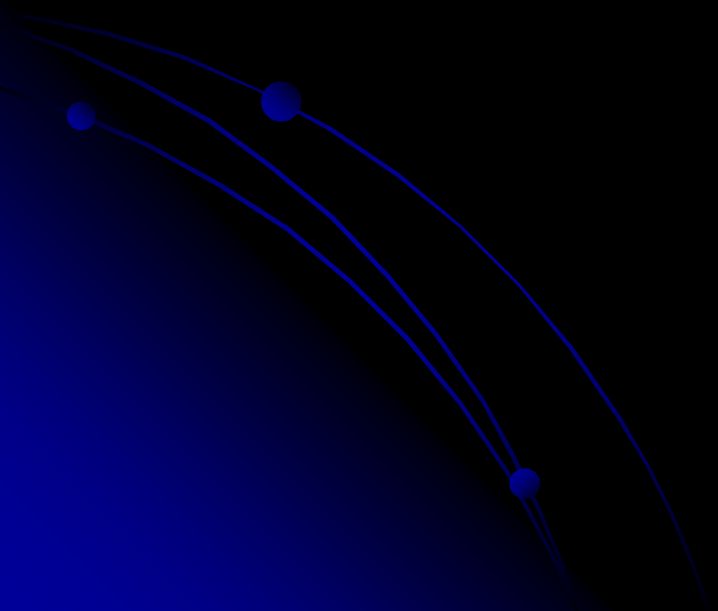
- A thermostat system is to be built
- Requires
  - Heating Element
  - Temperature Sensor
  - Control Program
- One of each is selected and added to the system
- The Control Program queries the SDM for a generic heating element and temperature sensor
- The SDM matches the generic request with the available devices
- Point-to-point communication between devices and the control program is initiated

System Overview

- Core Components
  - Data Manager
  - Task Manager
  - Process Manager
  - Sensor Manager

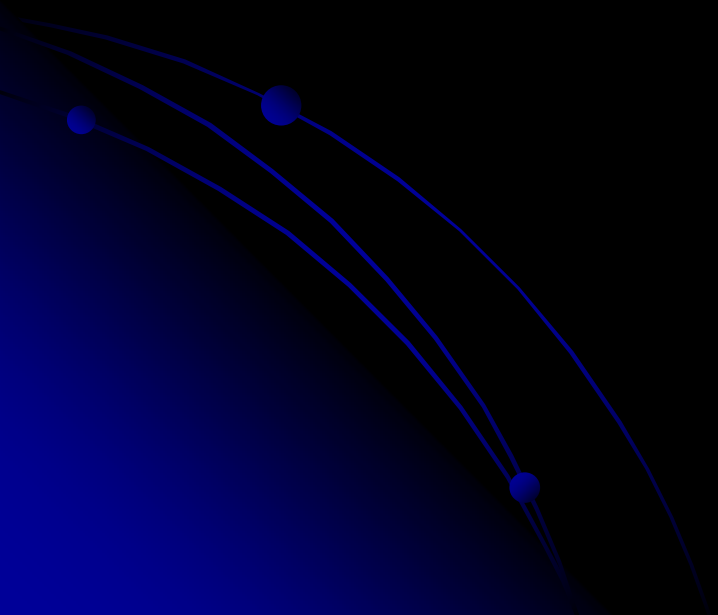
System Overview

- Applications
  - Data/Service Consumers
  - Data/Service Producers



System Overview

- Devices
  - Heavyweight Devices
  - Lightweight Devices
  - Legacy Devices



Auto configuration

- Initialization
- Discovery
- Control
- Failure Recovery

Data Description

- xTEDS
  - IEEE 1451
- Common Data Dictionary
- Physical Location

SDM protocols

- SPA-U
  - Simple protocol used by lightweight devices, run on a modified USB network
- SPA-E
  - Full SDM message protocol designed for ethernet
- SPA-S
  - Future extension of SDM protocol designed for SpaceWire

SDM API

- Message Classes
  - These classes describe the SDM message protocol
- Message Manipulator
  - Aids in the marshalling/unmarshalling of generic messages
- Subscription Manager
  - Handles tasks common to all data publishers

Conclusion

- SDM is a developing standard for rapid satellite deployment
- Attribute based publish/subscribe
- Attribute based auto configuration