

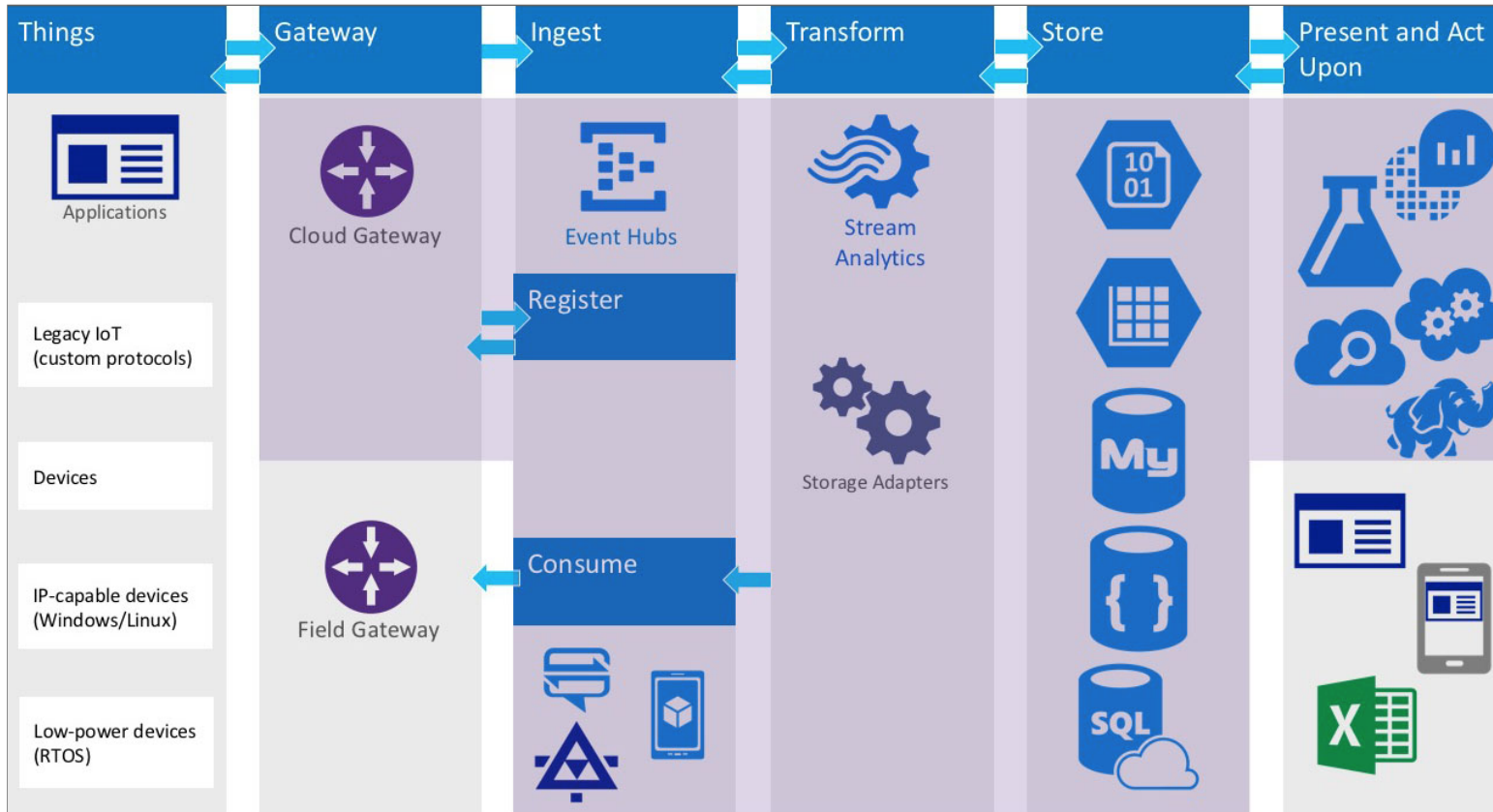
Building Internet of Things Devices with AllJoyn

Ivan R. Judson

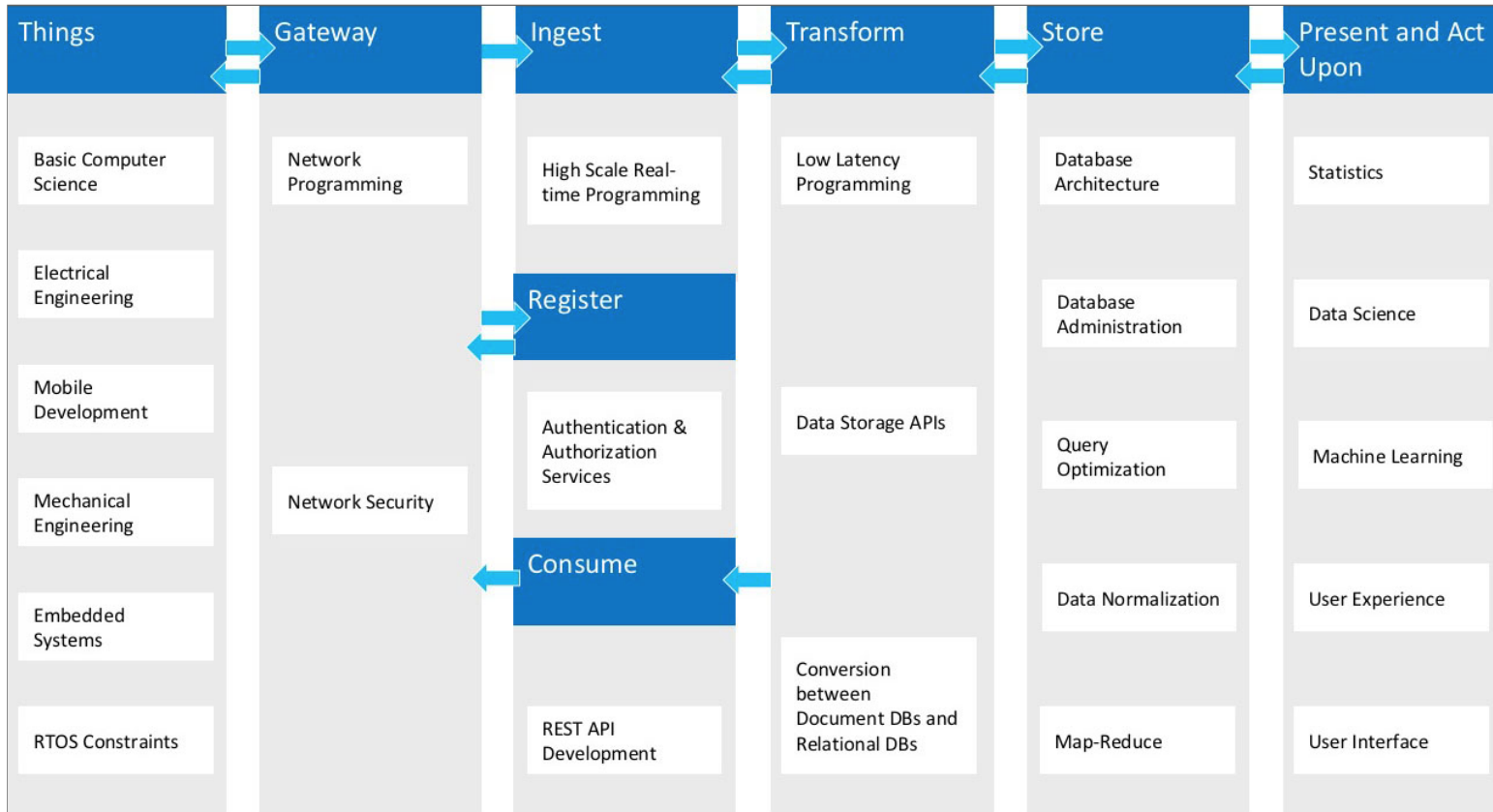
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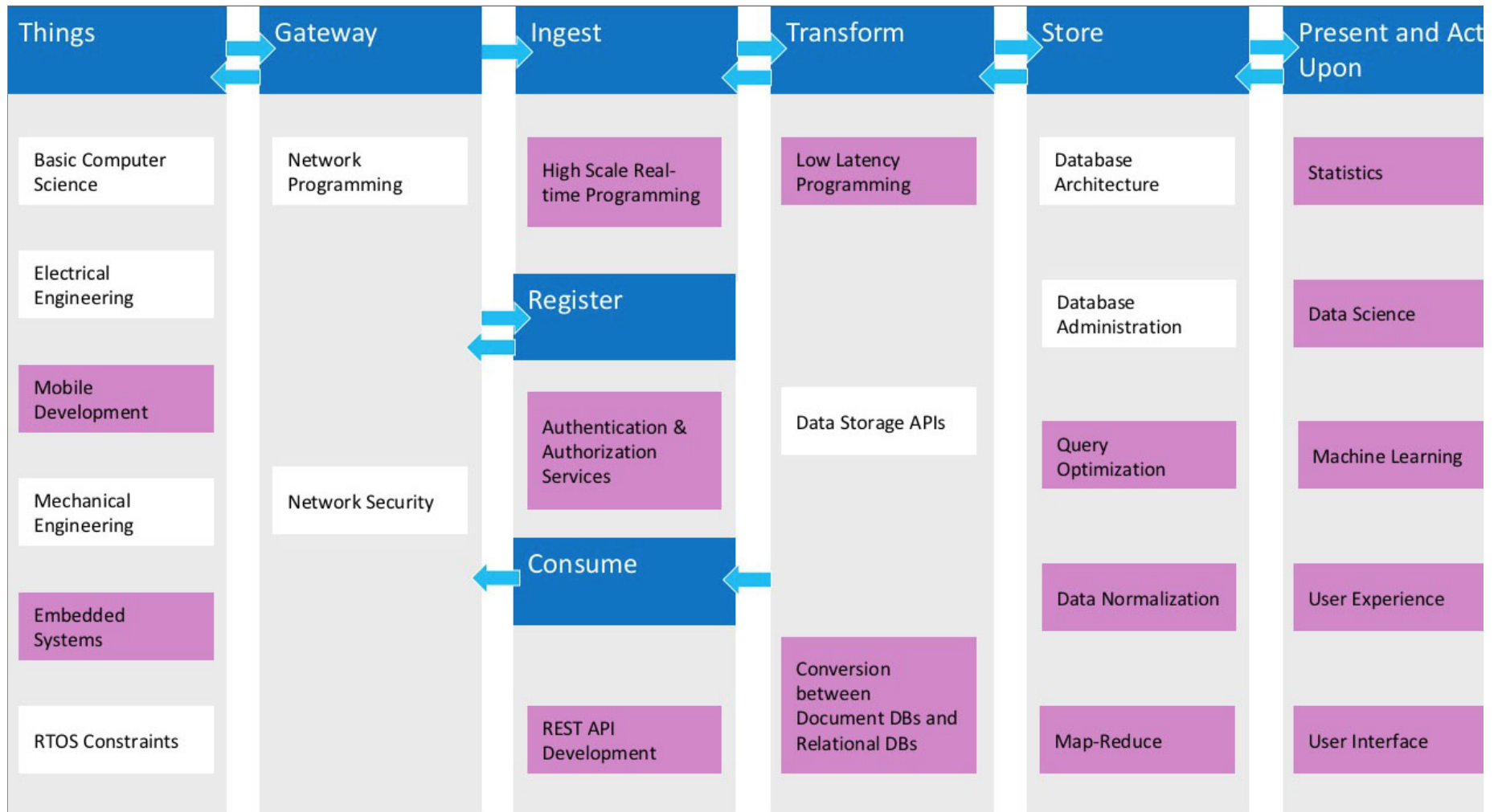
IoT Service Architecture



IoT Mapping Skills



What's Missing?



What is AllJoyn?

AllJoyn is...

a **system** that allows devices to advertise and share their abilities with other devices around them.

a **protocol** that your devices can use to interact intelligently.

a **library** you can include in your software to make smarter devices.

AllJoyn System Architecture

Gateways. Routers. Services. Clients.

AllJoyn Gateway

Remote access and management

Interoperability

Supports open standards:

REST, XMPP, MQTT and TR-069.

AllJoyn Router

Connect Services and Clients.

Cache transient information.

Allow for arbitrary topology.

AllJoyn Service

Discoverable.

Expose interfaces.

Interfaces are exposed in detail.

AllJoyn Client

Connect to Services

Expose Services to other Services

Expose Services to Users

AllJoyn Standard vs Thin Library

Standard	Thin
Mobile, Laptop	RTOS
C++, C, Java, JavaScript, Objective-C	C
Router optional	No Router

Microsoft & AllJoyn

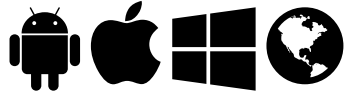
AllJoyn inside Windows 10!

Support in Visual Studio

AllJoyn Studio plugin

AllJoyn Cordova Plugin & Apps

The Open Source Cordova Plugin

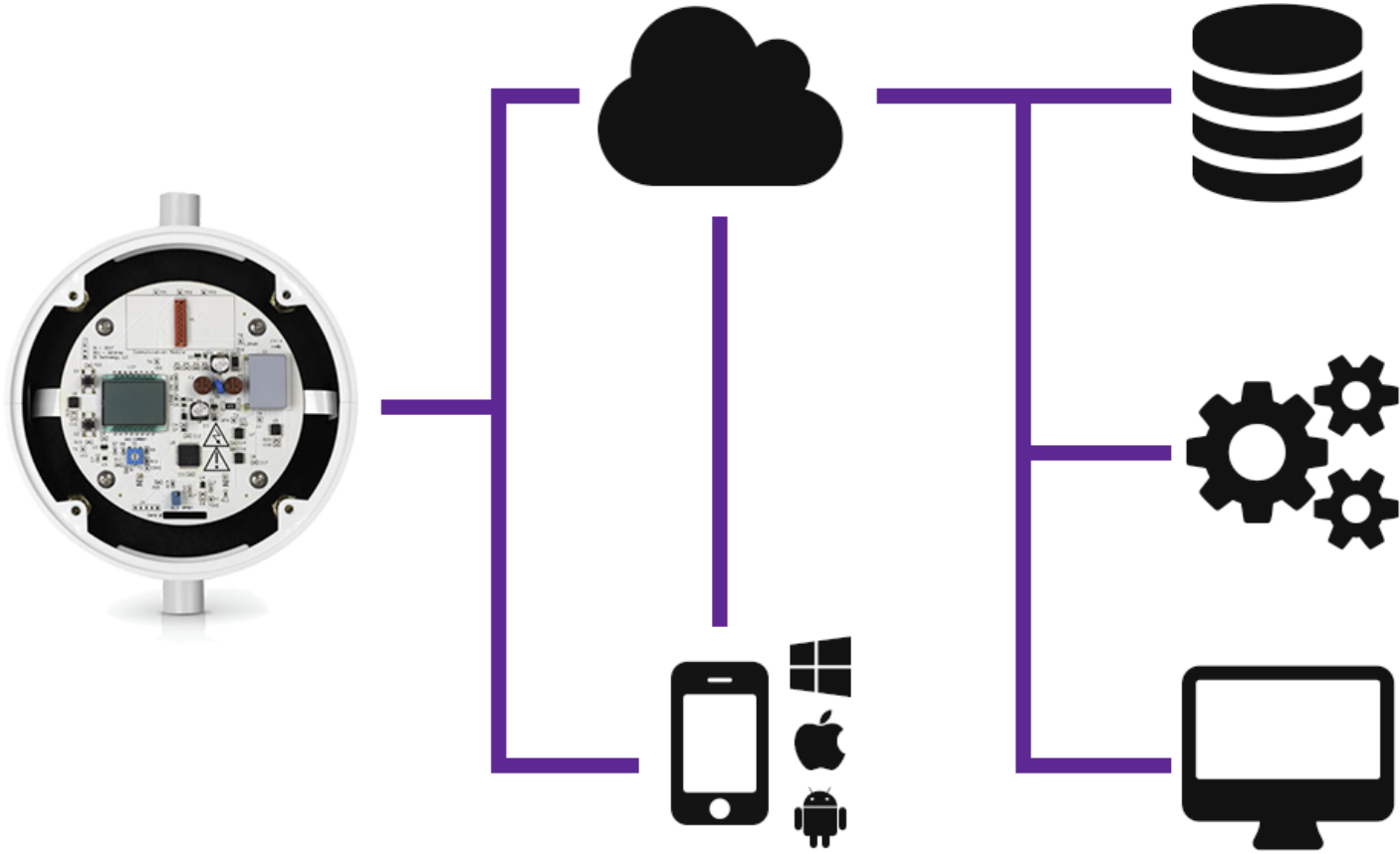


Example

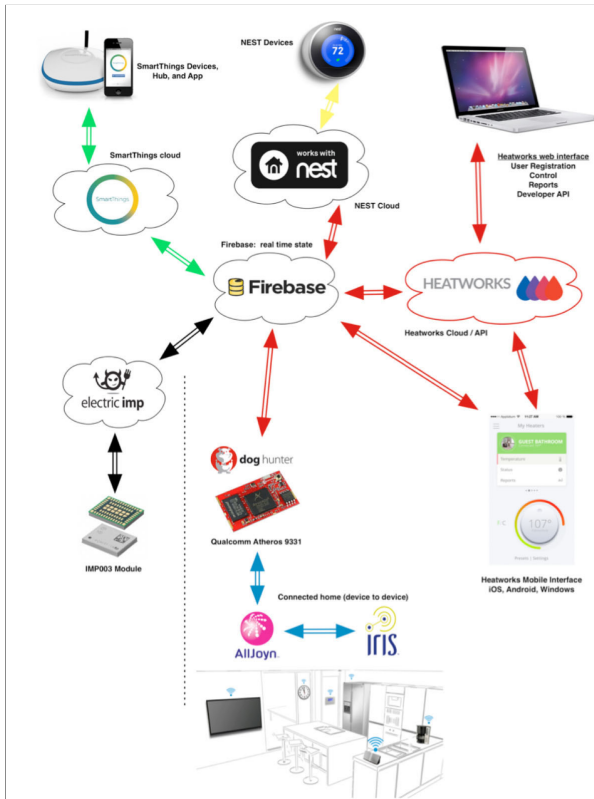
Heatworks



Heatworks Architecture



Heatworks Implementation



Control Interface

Control	Range	Units
Set Point	75-130	Degrees F
Current Temperature	40-160	Degrees F
Current Amps	0-50	Amps
Total Time	0-MAXINT	Seconds
Total Amps	0-MAXINT	Amps
Special Modes	0-255	Bitmask
Presets	Undefined	Undefined

AllJoyn Interface

```
<node name="/control">
  <interface name="com.myheatworks.model1">
    <method name="setPoint">
      <arg name="temp" type="y" direction="in">
    </arg></method>
    <method name="currentTemp">
      <arg name="temp" type="y" direction="out">
    </arg></method>
    <method name="softCurrentLimit">
      <arg name="current" type="y" direction="in">
    </arg></method>
    <method name="currentDrawInstant">
      <arg name="current" type="y" direction="out">
    </arg></method>
    <method name="timeOdometerValue">
      <arg name="time" type="i" direction="out">
    </arg></method>
    <method name="currentOdometerValue">
      <arg name="current" type="i" direction="out">
    </arg></method>
  </interface>
</node>
```

Common Definitions

```
#define CONNECT_ATTEMPTS    10

/* All times are expressed in milliseconds. */
#define CONNECT_TIMEOUT    (1000 * 60)
#define UNMARSHAL_TIMEOUT  (1000 * 5)
#define SLEEP_TIME         (1000 * 2)
#define METHOD_TIMEOUT      (100 * 10)

static const char ServiceName[] = "com.myheatworks.modell";
static const char ServicePath[] = "/control";
static const uint16_t ServicePort = 25;

/*
 * Buffer to hold the full service name. This buffer must be big enough to
 * a possible 255 characters plus a null terminator (256 bytes)
 */
static char fullServiceName[AJ_MAX_SERVICE_NAME_SIZE];

/**
 * The interface name followed by the method signatures.
 *
 * See also aj_introspect.h
 */
static const char* const sampleInterface[] = {
    "com.myheatworks.modell",          /* The first entry is the interface */
    "?setPoint temp<y",                /* Set the water temperature */
    "?currentTemp temp>y",             /* Get the water temperature setting */
    "?softCurrentLimit current<y",    /* Set the soft current limit */
    "?currentDrawInstant current>y",  /* Get the current draw at this inst */
    "?timeOdometerValue time>i",      /* Get the number of seconds the uni */
    "?currentOdometerValue current>i", /* Get the integral of amps where dt */
    NULL
}
```

Service Implementation

```
#define AJ_MODULE MODEL1_SERVICE

#include <stdio.h>
#include <aj_debug.h>
#include "alljoyn.h"

#include "modell1.h"

uint8_t dbgMODEL1_SERVICE = 0;

/*
 * The value of the arguments are the indices of the
 * object path in AppObjects (above), interface in sampleInterfaces (above)
 * member indices in the interface.
 * The first index is 1 because the first entry in sampleInterface is the i
 * This makes the first index (index 0 of the methods) the second string in
 * sampleInterface[].
 *
 * See also aj_introspect.h
 */
#define BASIC_SERVICE_SETPOINT AJ_APP_MESSAGE_ID(0, 0, 0)
#define BASIC_SERVICE_CURRENT_TEMP AJ_APP_MESSAGE_ID(0, 0, 1)
#define BASIC_SERVICE_SOFT_CURRENT_LIMIT AJ_APP_MESSAGE_ID(0, 0, 2)
#define BASIC_SERVICE_CURRENT_DRAW_INSTANT AJ_APP_MESSAGE_ID(0, 0, 3)
#define BASIC_SERVICE_TIME_ODOMETER AJ_APP_MESSAGE_ID(0, 0, 4)
#define BASIC_SERVICE_CURRENT_ODOMETER AJ_APP_MESSAGE_ID(0, 0, 5)

int main(int argc, char **argv)
{
    AJ_Status status = AJ_OK;
    AJ_BusAttachment bus;
```

Client Implementation

```
#define AJ_MODULE MODEL1_CLIENT

#include <stdio.h>
#include <stdlib.h>
#include <aj_debug.h>
#include <alljoyn.h>

#include "model1.h"

uint8_t dbgMODEL1_CLIENT = 0;

/*
 * The value of the arguments are the indices of the
 * object path in AppObjects (above), interface in sampleInterfaces (above)
 * member indices in the interface.
 * The first index is 1 because the first entry in sampleInterface is the i
 * This makes the first index (index 0 of the methods) the second string in
 * sampleInterface[].
 *
 * See also aj_introspect.h
 */
#define BASIC_CLIENT_SETPOINT AJ_PRX_MESSAGE_ID(0, 0, 0)
#define BASIC_CLIENT_CURRENT_TEMP AJ_PRX_MESSAGE_ID(0, 0, 1)
#define BASIC_CLIENT_SOFT_CURRENT_LIMIT AJ_PRX_MESSAGE_ID(0, 0, 2)
#define BASIC_CLIENT_CURRENT_DRAW_INSTANT AJ_PRX_MESSAGE_ID(0, 0, 3)
#define BASIC_CLIENT_TIME_ODOMETER AJ_PRX_MESSAGE_ID(0, 0, 4)
#define BASIC_CLIENT_CURRENT_ODOMETER AJ_PRX_MESSAGE_ID(0, 0, 5)

void SetPoint(AJ_BusAttachment *bus, uint32_t sessionId, uint8_t setPoint)
{
    AJ_Status status = AJ_OK;
```

Bringing the Peer to Peer Web to all your Devices with Node.js



Wednesday, April 6th, 2016, 11:05am - 11:55am, in Harbor F


In other news...


- **Bash on windows...**
- **Toyota Connected...**


Thanks!



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