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Increased Developer Productivity for IoT

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Agenda

- Why look at developer productivity?
- A use case
- Overcoming developer challenges
- Summary
- Q&A

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WHY?

Would you review your productivity?

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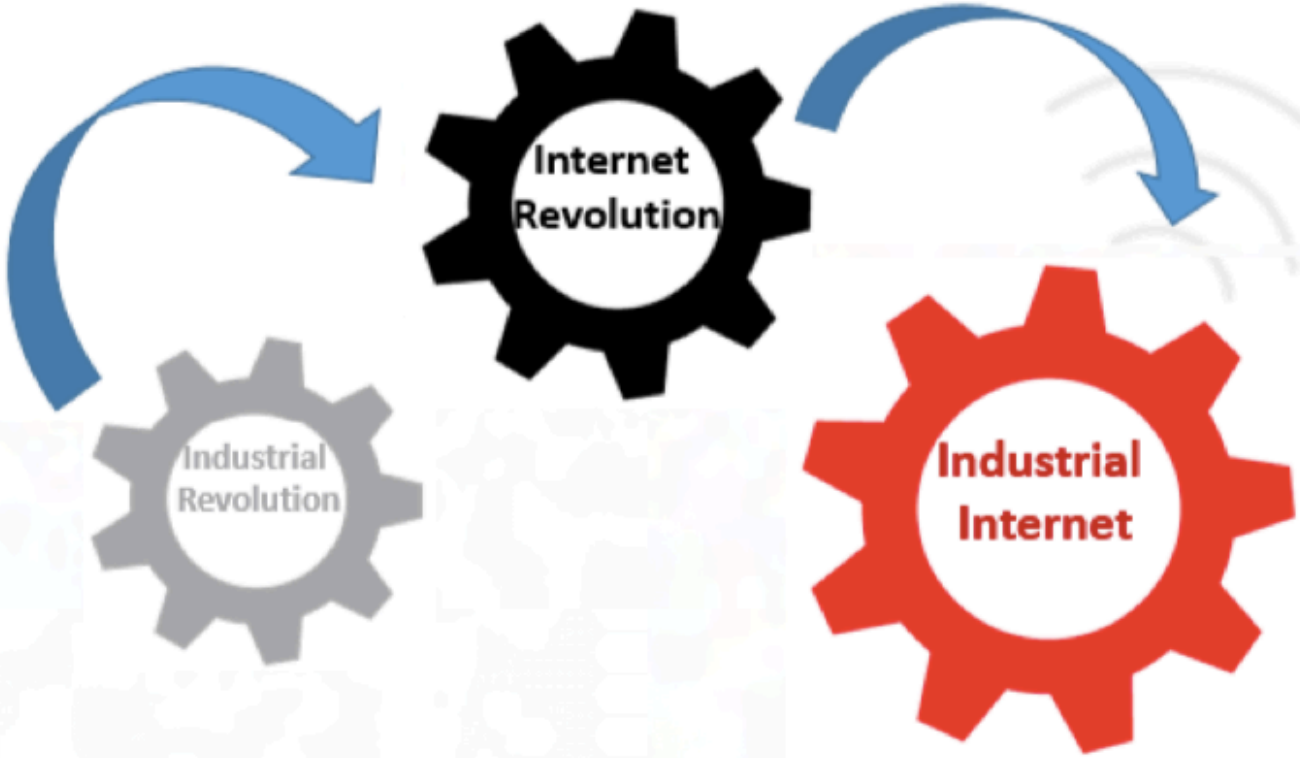
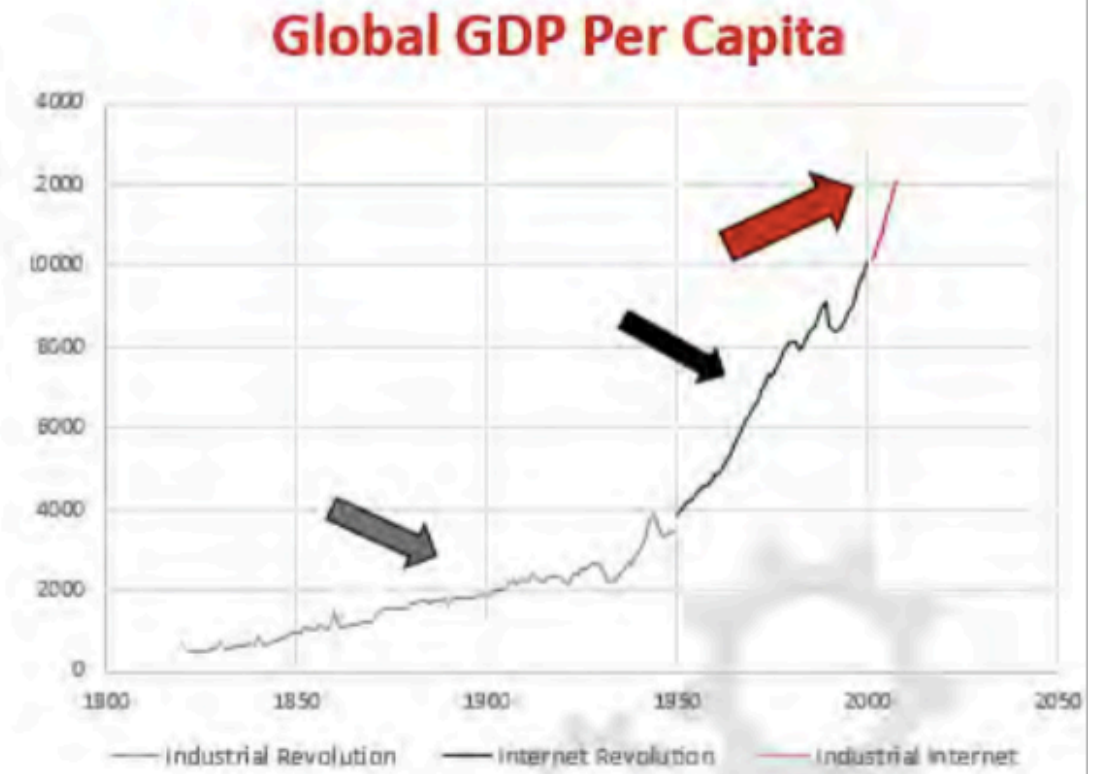
IoT = The Third Revolution
= Embedded Market Transformation





GDP data extracted from the Futurist 2007

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IoT success requires rethinking developer productivity

Project Characteristics

- Many smaller projects, each unique
- Custom hardware, OS
- Deployments relatively small

Edge Device Characterics

- Explosion of hardware/devices
- Explosion of operating systems
- Demand for intelligence at edge

Business Characteristics

- Time To Market, Time To Revenue
- Longevity of deployments
- Cost of maintaining remote devices
- Cost of connectivity

Developer Characteristics

- Shortage in embedded specialists
- Field Application Engineers, Enterprise Developers, Process Engineers struggle to become embedded programmers
- Multi-disciplinary engineering teams

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IoT success requires rethinking developer productivity

Project Characteristics

- Many projects each unique
- Custom hardware, OS
- Deployments relatively small

Standardize on re-usable IoT components, Automate the plumbing

Edge Device Characterics

- Explosion of hardware/devices
- Explosion of operating systems
- Demand for intelligence at edge

Abstract from hardware+OS with embedded Java

Business Characteristics

- Time To Market/Time To Revenue
- Longevity of deployments
- Cost of maintaining remote devices
- Cost of connectivity

Offer high productivity tooling, Enabling resource-efficient, maintainable, edge intelligence.

Developer Characteristics

- Shortage in embedded specialists
- Embedded Application Engineers, Enterprise Developers, Process Engineers struggle to become embedded programmers
- Multi-disciplinary engineering teams

Visual modeling to abstract from low level coding

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Java Embedded

Making Devices Smarter
(since 20 years)

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Java's Unique Market Position

9+ million developers

Billions of Devices already run Java

The majority of enterprise & business Apps run on Java (On Premise and Cloud)

Java provides one common platform – End to End

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A Use case

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An Industry Customer Example

How To Make a PLC ready for Industry 4.0

- How can I make my PLC ready for IoT/ Industry 4.0 ?
  - Which functionality do I need ?
  - How do I expose the data?
  - Which software do I use ?
  - How do I maximize the productivity of my customers ?

Local Real Time Connectivity

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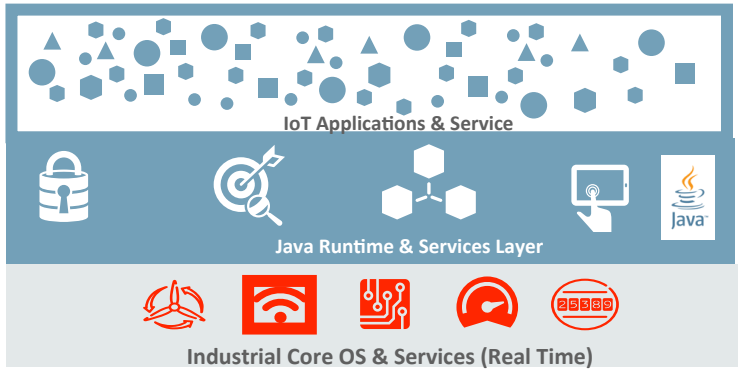
An Industry Customer Example

How To Make An PLC ready for Industry $.0

- How can I make my PLC ready for IoT/ Industry 4.0 ?

-> Add an IoT software gateway



IoT Network Connectivity

Local Real Time Connectivity

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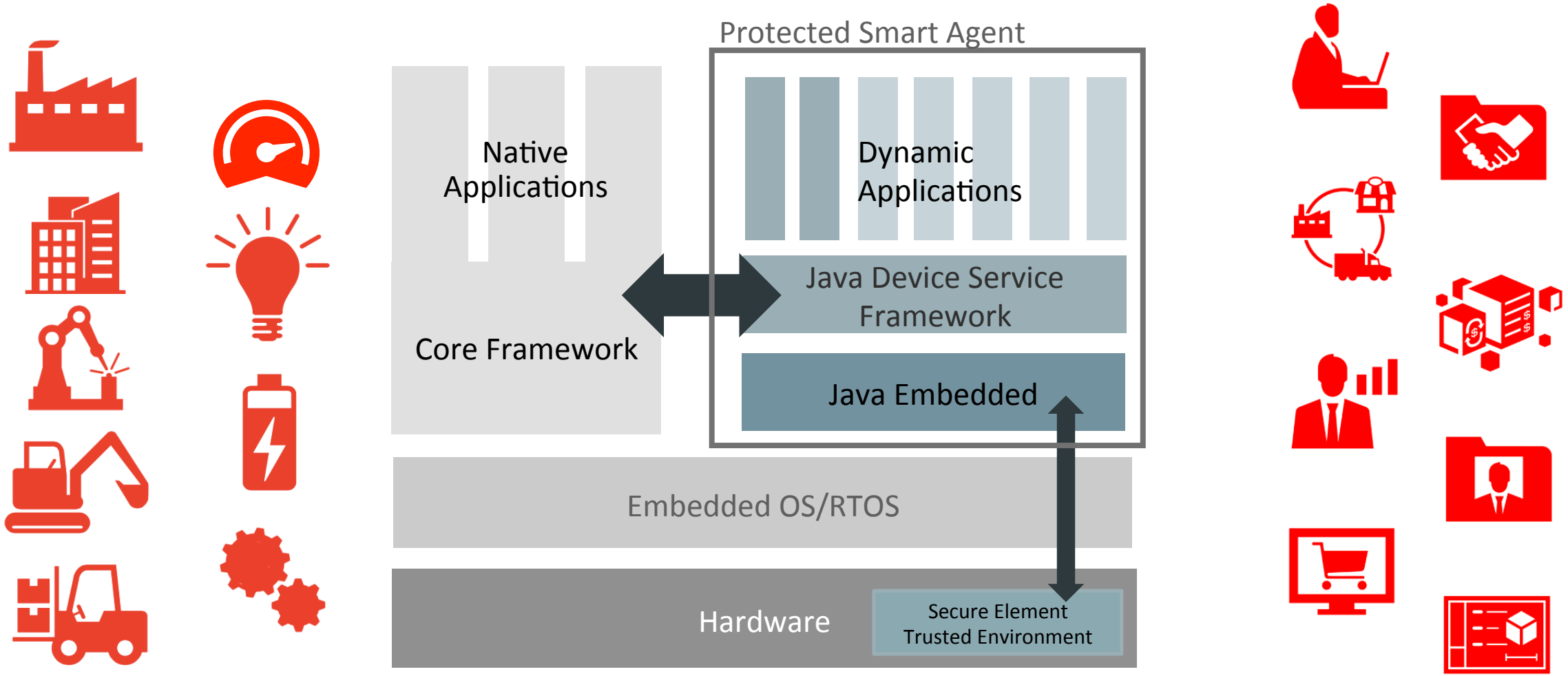
Smart Things/Gateways With Java

The Smart Agent in The Cyber Physical Environment



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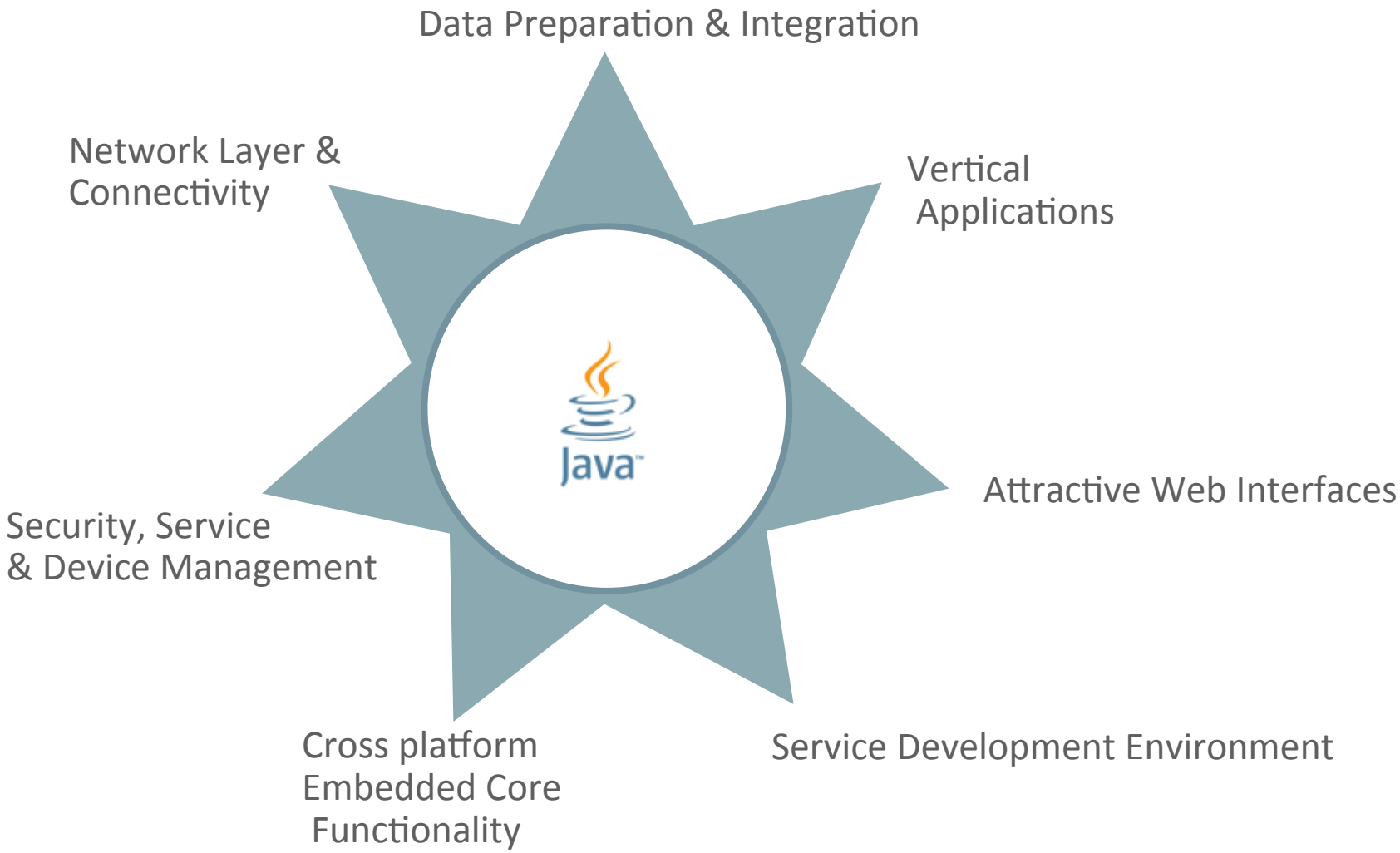
The Java Software Gateway Opens Up New Possibilities



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Overcoming developer challenges

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Concurrent event driven programming is difficult

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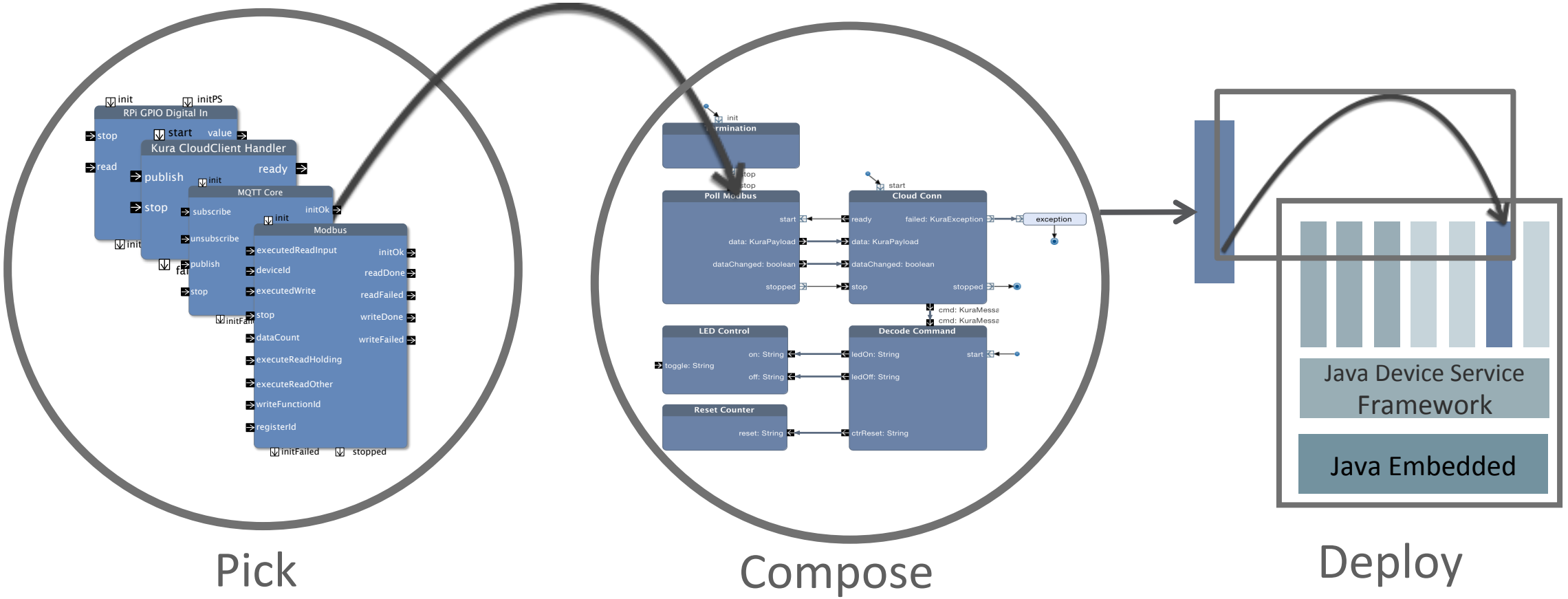
Reactive Blocks to the Rescue!



Pick

Compose

Deploy

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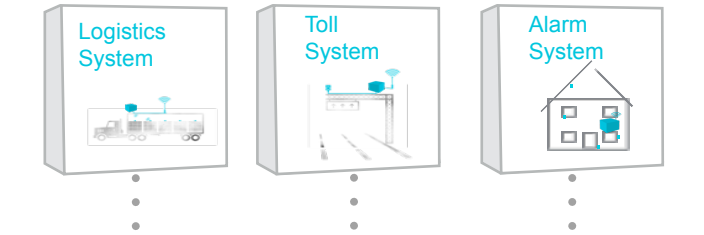
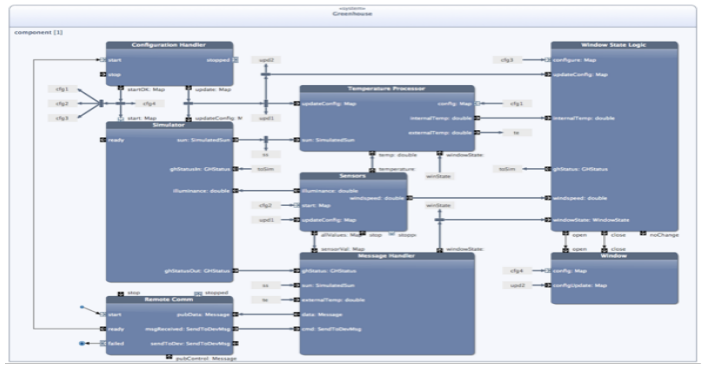
Reactive Blocks

Libraries of building blocks

- **ModBus** 1.3.0 (1) com.bitreactive.library.modbus
  - ModBus Simple
- **KML** 1.0.2 (2) com.bitreactive.library.kml
  - KML Parser
  - KMZ Parser
- **GSON** 1.2.0 (2) com.bitreactive.library.gson
  - Json Deserializer
  - Json Serializer
- **OSGi** 1.1.0 (2) com.bitreactive.library.osgi
  - Simple Service Tracker
  - Termination
- **Buffering** 2.4.0 (14) com.bitreactive.library.buffering
  - Reactive Buffer
  - Timed Cache
- **Serial I/O (rxtxSerial)** 1.1.3 (2) com.bitreactive.library.serial
  - Enumeration
  - Reader and Writer
- **Timers** 1.2.0 (13) com.bitreactive.library.timers
  - Measure Time
  - Timeout
  - Timer
  - Timer Periodic
  - Timer Random
- **MQTT** 1.3.0 (1) com.bitreactive.library.mqtt
  - MQTT
- **Session Utils** 1.5.1 (4) no.ntnu.item.arctis.library.sessions
  - Allocator
  - Allocator 2
  - Constructor
  - Constructor 2
- **Geofence** 1.1.0 (6) com.bitreactive.library.geofence
  - CircleToFence
  - Contained
  - Geofence
  - Geofence for Fleet

Ready-Made Reference Applications





Reactive Blocks

code ready to deploy

kura

OSGi Alliance

Java

1 Pick existing blocks from the libraries

2 Build by combining blocks and Java code

3 Automatically generate code ready to deploy

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What Reactive Blocks does for you

- Off-the-shelf visual building blocks remove need for deep expertise
- Reuse of building blocks done right
- Abstraction from multithreading + proven correctness of thread synchronisation
- Generate Java JAR files or OSGi bundles + documentation
- Freedom to code manually, do JNI/JNA calls to legacy code, C code etc.
- Design, Code, Documentation always in sync
- High overall productivity gain
- All while using your trusted Eclipse IDE

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Ready-to-use Building Blocks

Generic Functionality
- Buffering
- Counters
- Flow Logic
- Session Utils
- Iterator

Timers
- Timers
- Periodic Timers
- Watchdogs

Application Prototyping
- Java Swing Components
- Java FX
- Speech
- Properties

Hardware Connections
- Modbus
- Serial I/O
- Raspberry Pi GPIO
- Berryclip for Raspberry Pi
- Gertboard for Raspberry Pi
- USB Camera

Files
- File Utilities
- File I/O
- Properties

End-User Communication
- SMS: Twilio, Keyteq, Clickatell
- Email
- XMPP Client

Communication
- HTTP/HTTPS
- MQTT
- CoAP
- JSON-RPC
- AMQP
- Network Monitoring
- OPC-UA
- LoRA

Data Collection Services
- Sierra Wireless AirVantage
- IBM IoT Foundation
- Eurotech ESF
- Xively
- Solair

Security
- Cryptography
- Oauth 2.0

Transformation
- GSON
- XML Parsing
- XLS Transformation

Eclipse Kura and OSGi
- Configuration Listener
- Cloud Client Handler
- Event Admin
- Service Tracker
- Termination
- Service Register

Location
- Geofence
- KML

Data Processing
- Geofence
- KML

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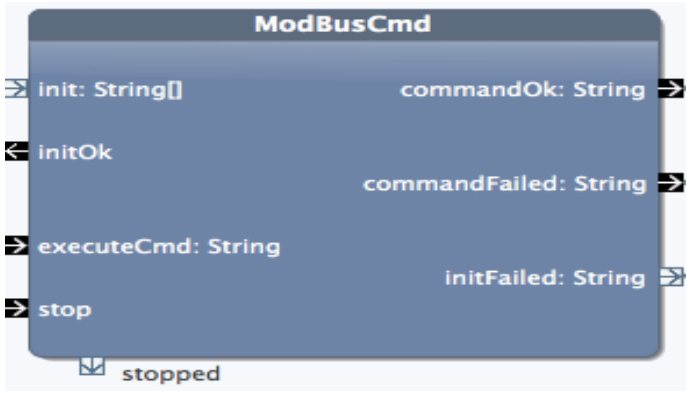
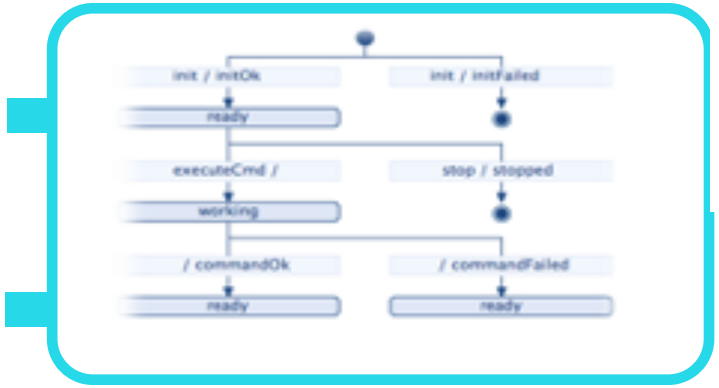
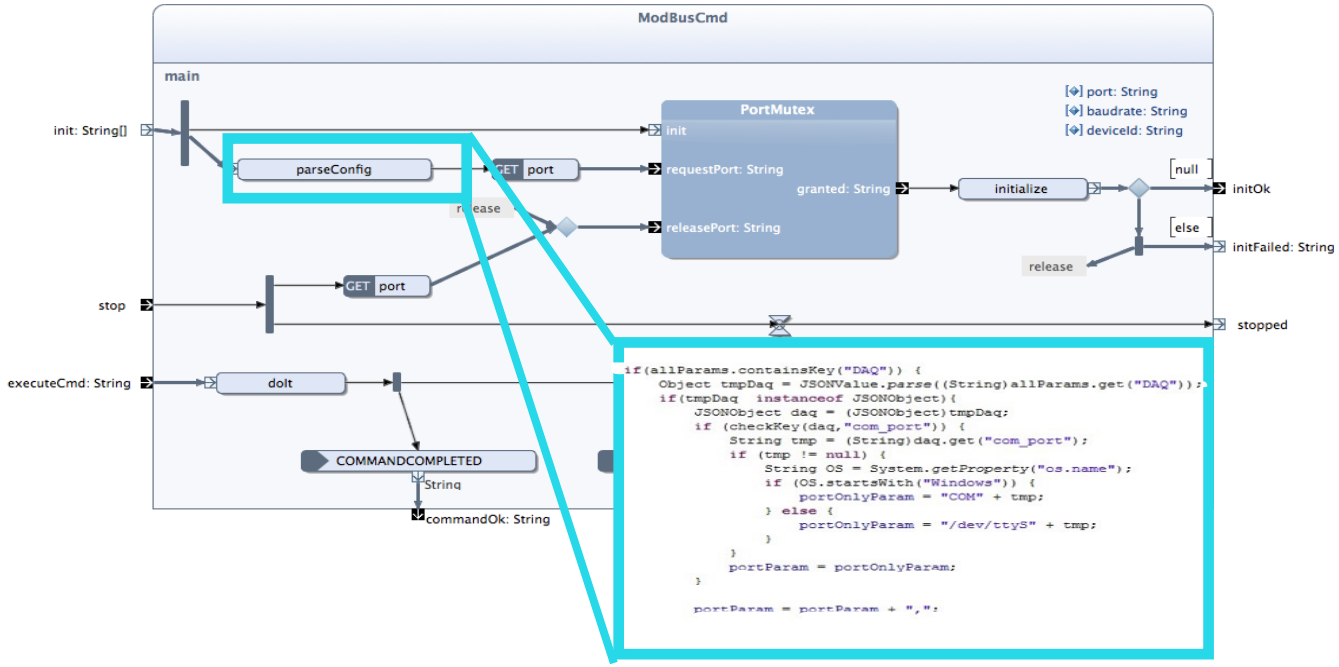
Building Blocks



Behavioral contract



Diagram




```
if(allParams.containsKey("DAQ")) {
    Object tmpDaq = JSONValue.parse((String)allParams.get("DAQ"));
    if(tmpDaq  instanceof JSONObject){
        JSONObject daq = (JSONObject)tmpDaq;
        if (checkKey(daq,"com_port")) {
            String tmp = (String)daq.get("com_port");
            if (tmp != null) {
                String OS = System.getProperty("os.name");
                if (OS.startsWith("Windows")) {
                    portOnlyParam = "COM" + tmp;
                } else {
                    portOnlyParam = "/dev/ttyS" + tmp;
                }
            }
            portParam = portOnlyParam;
        }

        portParam = portParam + ",";
```

Java code

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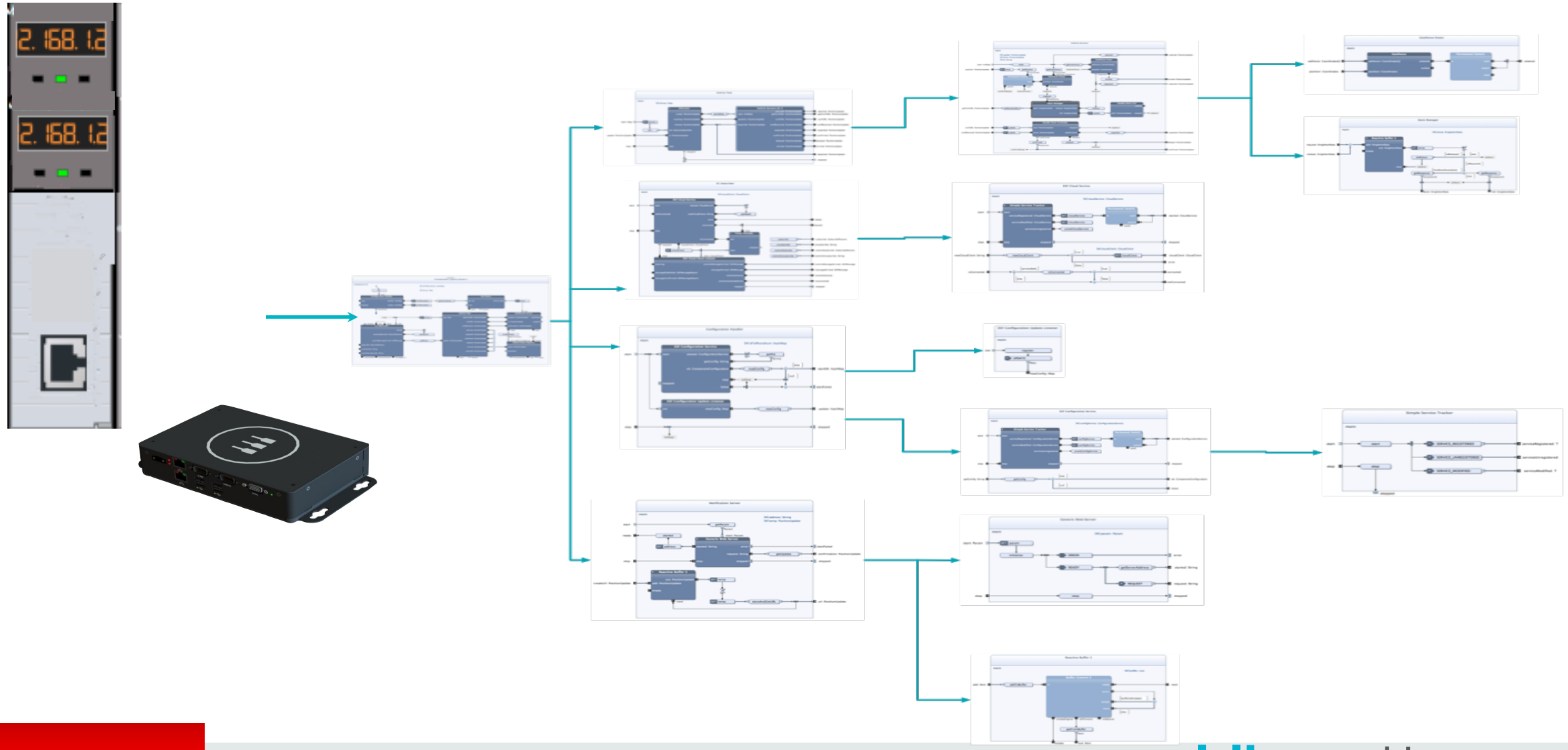
System Structure



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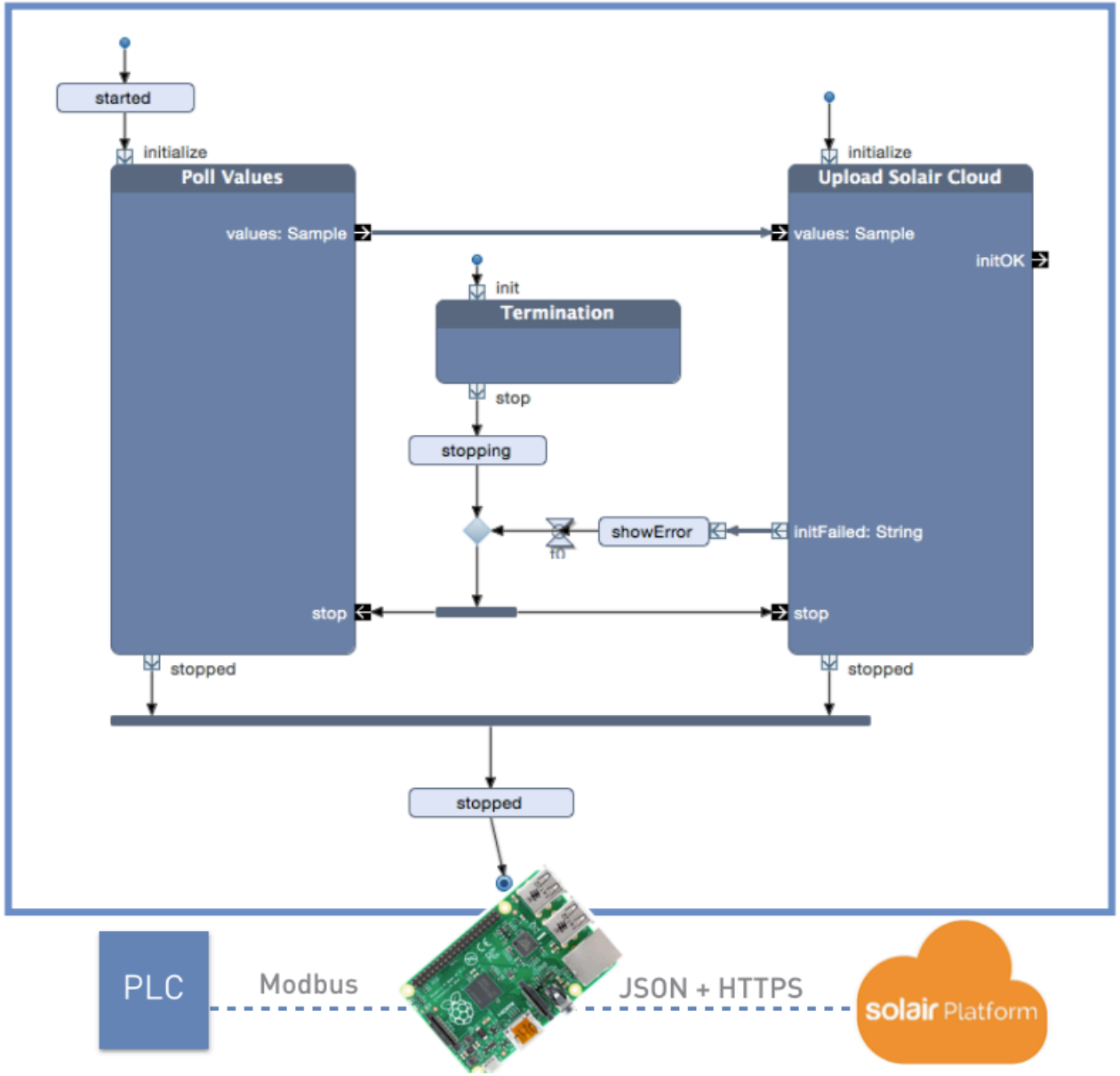
Example 1



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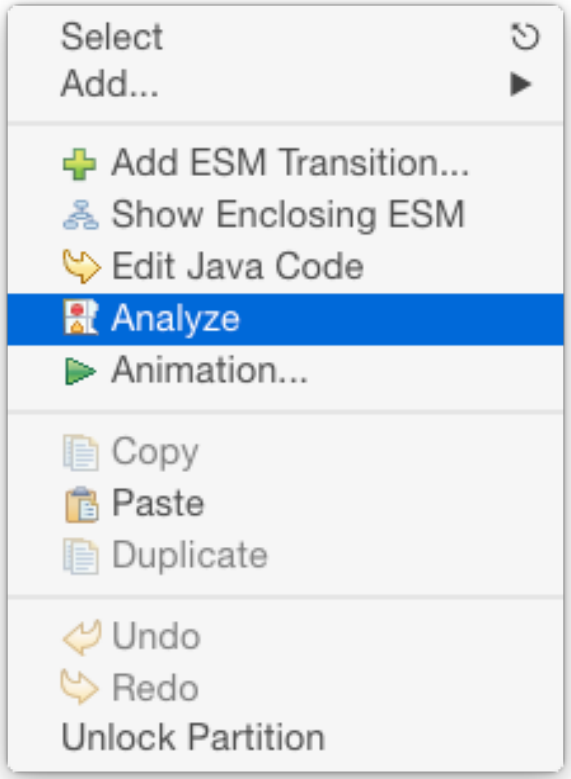
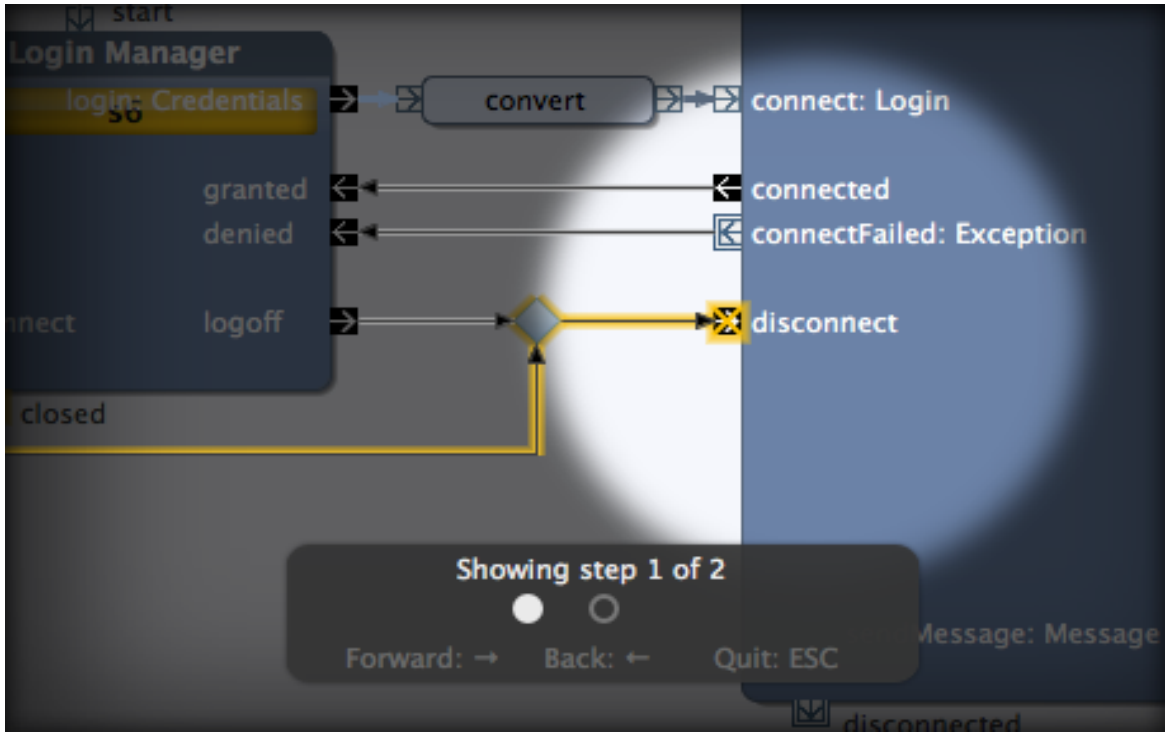
Automatic Analysis





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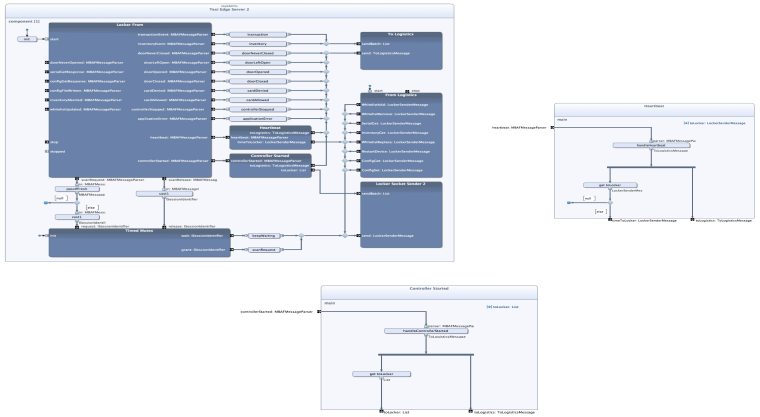
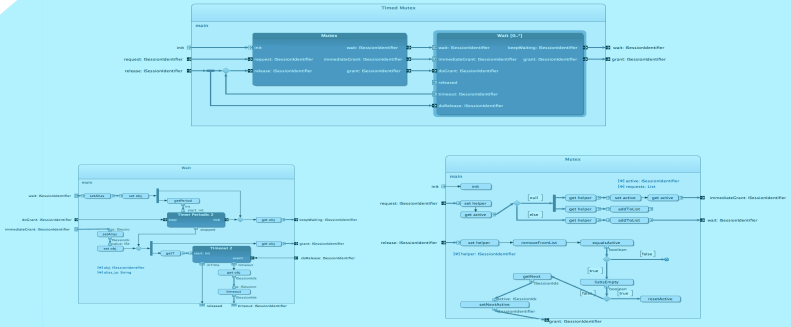
Reuse

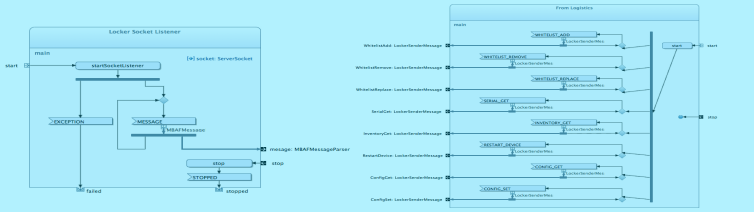


Application-Specific



Reusable from Libraries

Communication



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Summary and Call to Action

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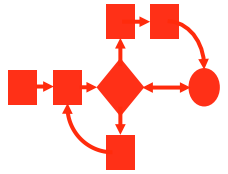
Summary

- IoT and smart embedded is all about the services: transforming data from disparate devices into valued insights and better actions and device applications
- The rapid and productive development of these services is key to IoT projects ongoing success
- Oracle Java Embedded Technology together with Bitreactive building blocks will enable fast, secure and efficient IoT projects


Scale


Integration


Distribution


Lifecycle


Security


Customer Experience

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Get Started

Jumpstart your IoT edge skills!

- Embedded Java
  - https://www.oracle.com/java/technologies/embedded.html
  - http://www.oracle.com/technetwork/java/embedded/overview/javaembedded-community-1981554.html
- Reactive Blocks
  - Download at: http://www.bitreactive.com/installation/
  - Tutorials, Whitepapers, Example apps: http://reference.bitreactive.com

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Q & A

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