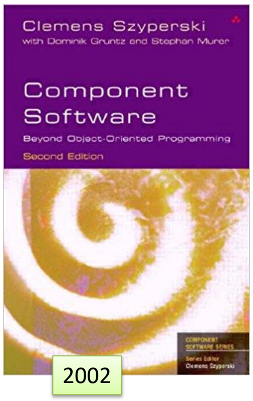
Software components

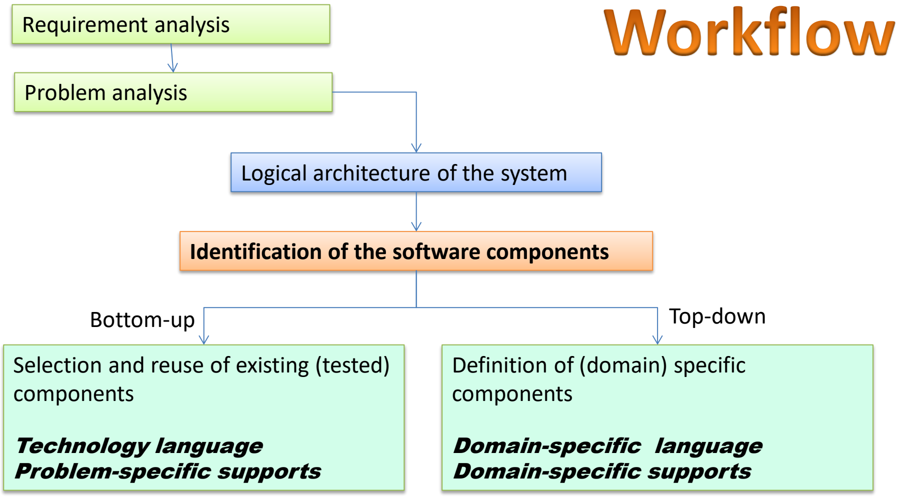

Clemens Szyperski
with Dominik Gruntz and Stephan Murer
Component Software
Beyond Object-Oriented Programming
Second Edition
Component Software Series
Series Editor Clemens Szyperski

2002

The book gives us an objective survey of the component landscape, blended with unique insights into the market forces that influence deployment and in-depth coverage of real problems and their solutions.
Highlights of the Second Edition include:

- A comprehensive update of market-leading technologies including COM+, CORBA, EJB and J2EE
- New sections evaluating the strengths and weaknesses of emerging technologies like .NET, the CORBA Component Model, XML Web Services, showing how they work together with components and XML-related standards
- New examples in C# in addition to Java and Component Pascal

Workflow



Requirement analysis

Problem analysis

Logical architecture of the system

Identification of the software components

Bottom-up

Top-down

Selection and reuse of existing (tested) components

Technology language
Problem-specific supports

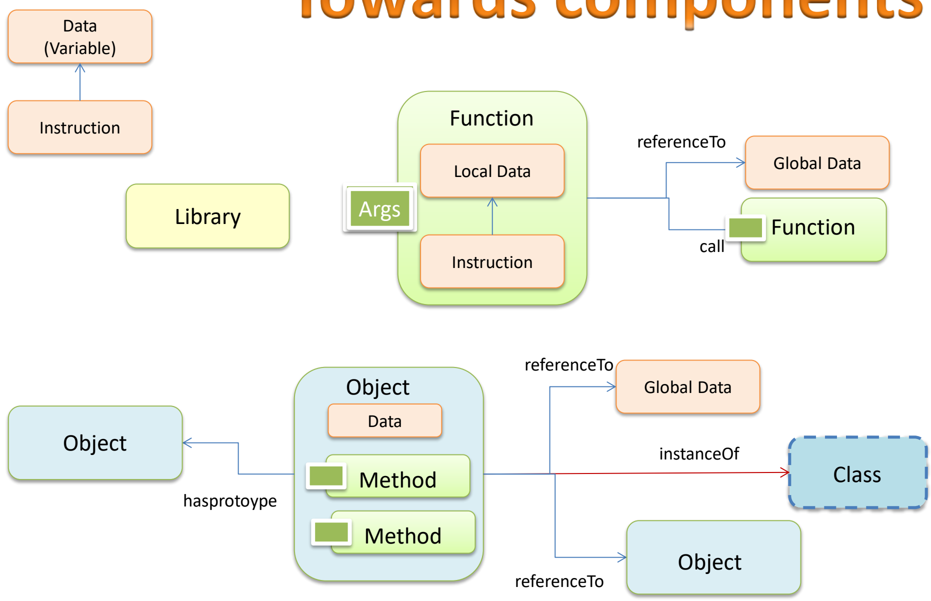
Definition of (domain) specific components

Domain-specific language
Domain-specific supports

In any case:

What is a software component?
How components interact?
Which components embed the ***business logic***?

Towards components



Data (Variable)

Instruction

Library

Function

Local Data

Args

Instruction

referenceTo

Global Data

call

Function

Object

Data

Method

Method

Object

hasprotoype

referenceTo

Global Data

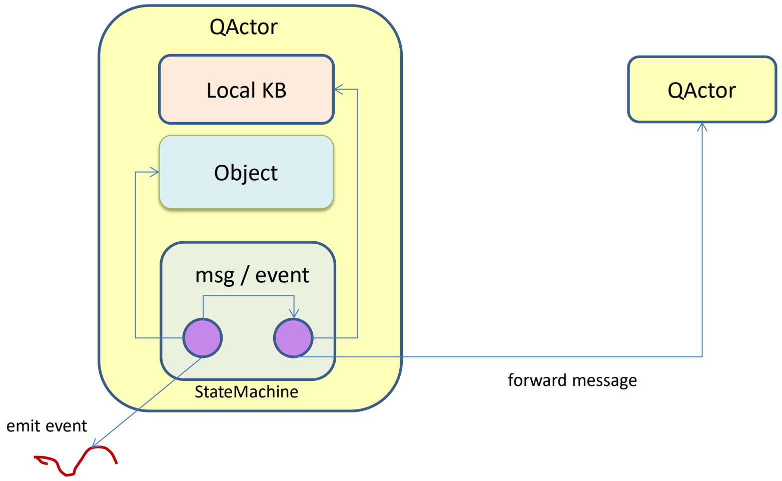
instanceOf

Class

Object

referenceTo

Beyond procedure calls



QActor

Local KB

Object

msg / event

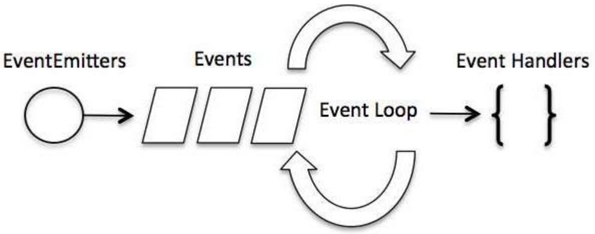
StateMachine

QActor

forward message

emit event

Event loop

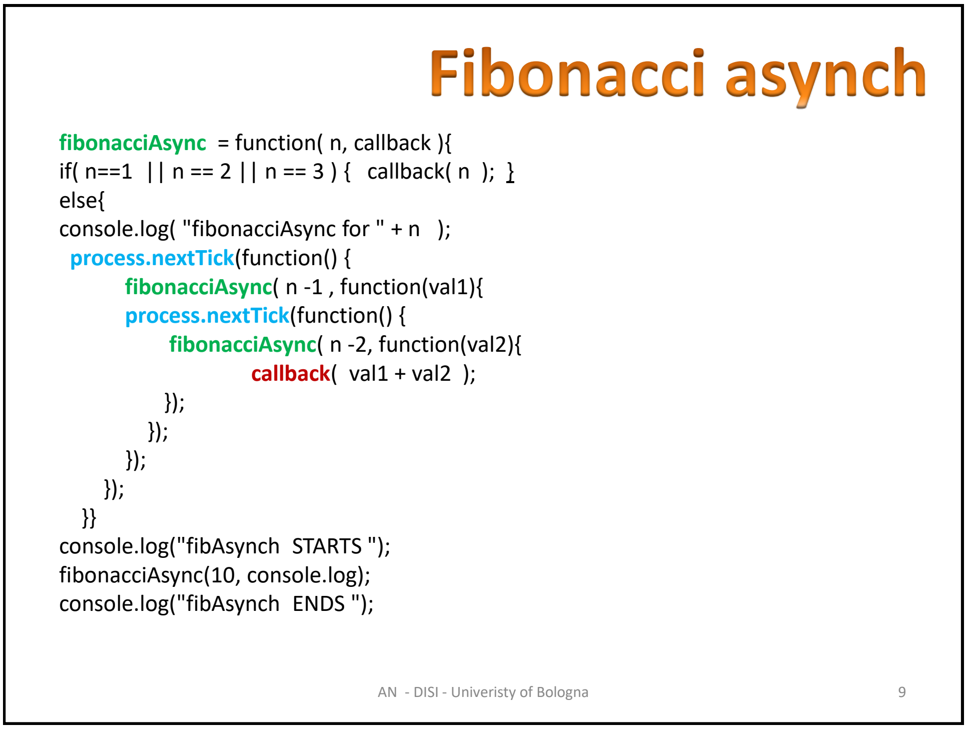


```
setTimeout(  function(){ console.log(“1000a1”); console.log(“1000a2”);  } , 1000 );

setTimeout(  function(){ console.log(“1000b1”); console.log(“1000b2”);  } , 1000 );

setTimeout(  function(){ console.log(“500”);  } , 500);
```

Fact asynch

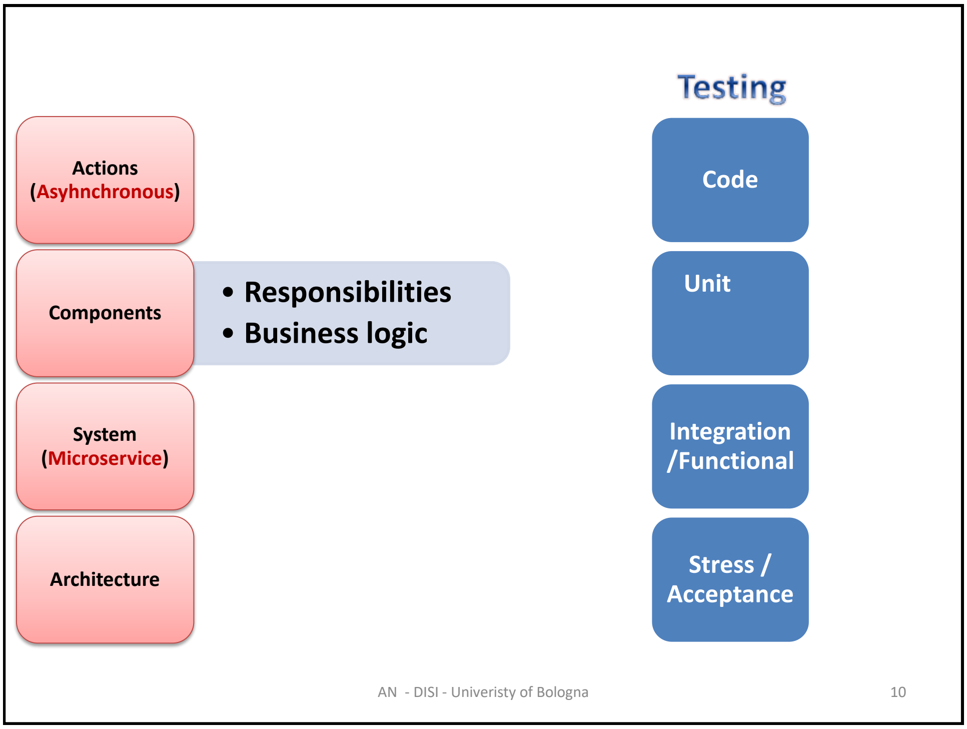
```
factAsynch = function( n,  callback ){ factIterAsynch(n,n,1,callback); }
factIterAsynch = function( n, n0, v, callback ){
var res = n*v;          //ACCUMULATOR
       console.log( "factIterAsynch n0=" + n0 + " n=" + n, " v=" + v + " res=" + res);
       if( n == 1 ) callback( "factIterAsynch(" + n0 + ") RESULT="+res );
       else setTimeout( function(){  factIterAsynch( n-1, n0, res, callback ) ; } , 0 );
 }
console.log("START");
console.log("CALL= ", factAsynch(4, console.log) );
factAsynch(6,console.log);
console.log("END");
```

```
START
factIterAsynch n0=4 n=4  v=1 res=4
CALL=  undefined
factIterAsynch n0=6 n=6  v=1 res=6
END
factIterAsynch n0=4 n=3  v=4 res=12
factIterAsynch n0=6 n=5  v=6 res=30
factIterAsynch n0=4 n=2  v=12 res=24
factIterAsynch n0=6 n=4  v=30 res=120
factIterAsynch n0=4 n=1  v=24 res=24
factIterAsynch(4) RESULT=24
factIterAsynch n0=6 n=3  v=120 res=360
factIterAsynch n0=6 n=2  v=360 res=720
factIterAsynch n0=6 n=1  v=720 res=720
factIterAsynch(6) RESULT=720
```



Fibonacci asynch

```
fibonacciAsync  = function( n, callback ){
if( n==1  || n == 2 || n == 3 ) {   callback( n  );  }
else{
console.log( "fibonacciAsync for " + n   );
 process.nextTick(function() {
      fibonacciAsync( n -1 , function(val1){
      process.nextTick(function() {
          fibonacciAsync( n -2, function(val2){
                  callback(  val1 + val2  );
          });
        });
      });
    });
  }}
console.log("fibAsynch  STARTS ");
fibonacciAsync(10, console.log);
console.log("fibAsynch  ENDS ");
```



Testing

Actions (Asyhnchronous)

Components

- Responsibilities
- Business logic

System (Microservice)

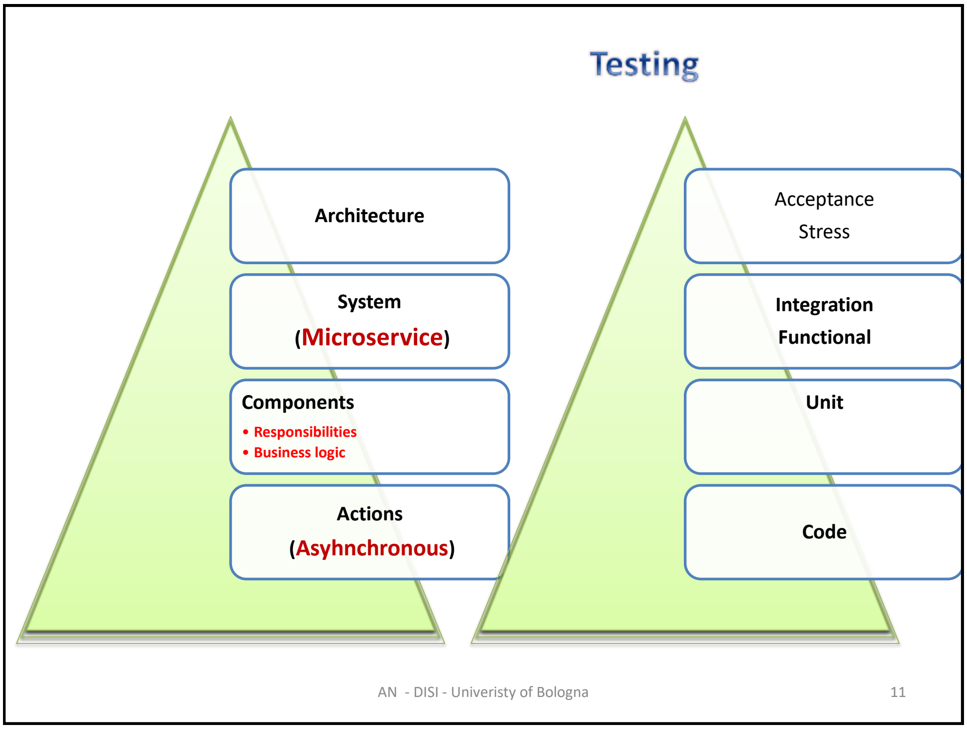
Architecture

Code

Unit

Integration /Functional

Stress / Acceptance



Testing

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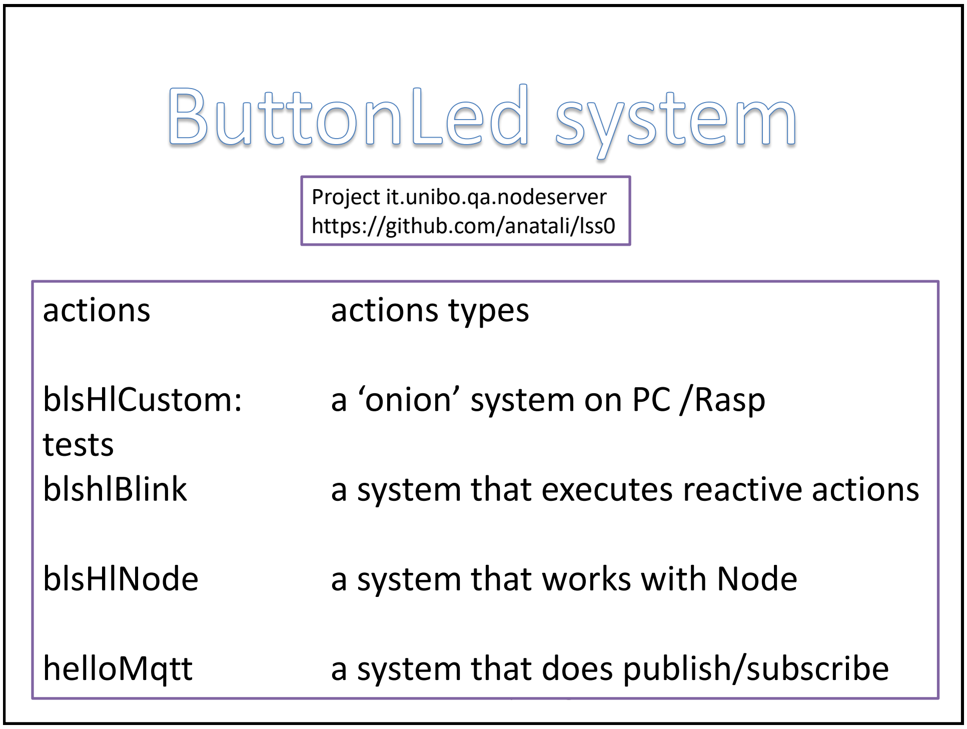
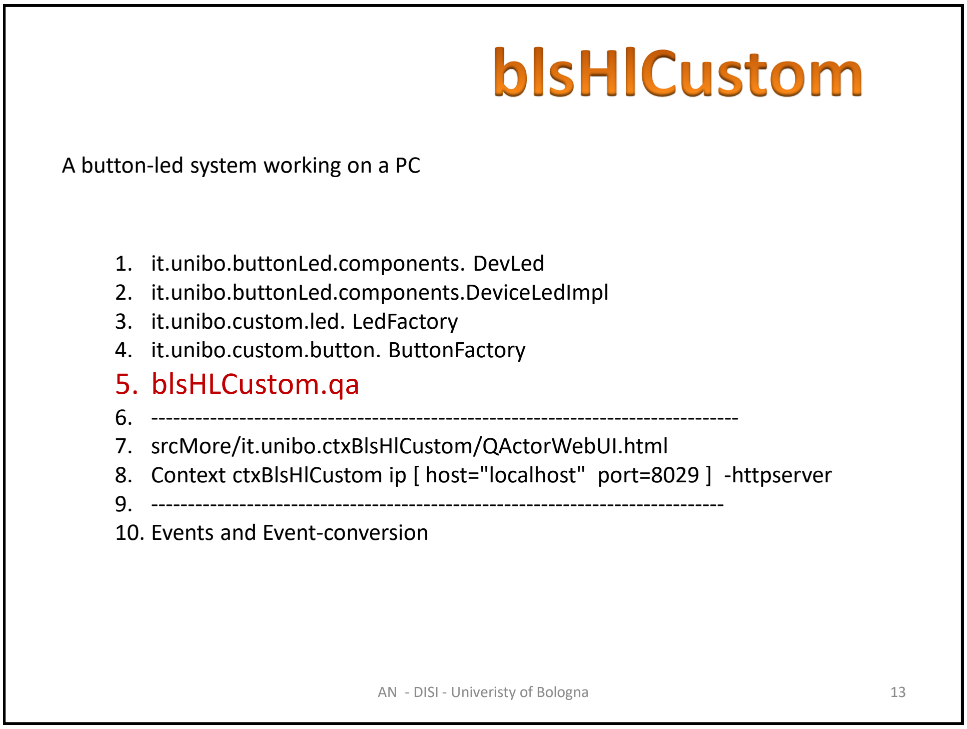


ButtonLed system

Project it.unibo.qa.nodeserver
https://github.com/anatali/lss0

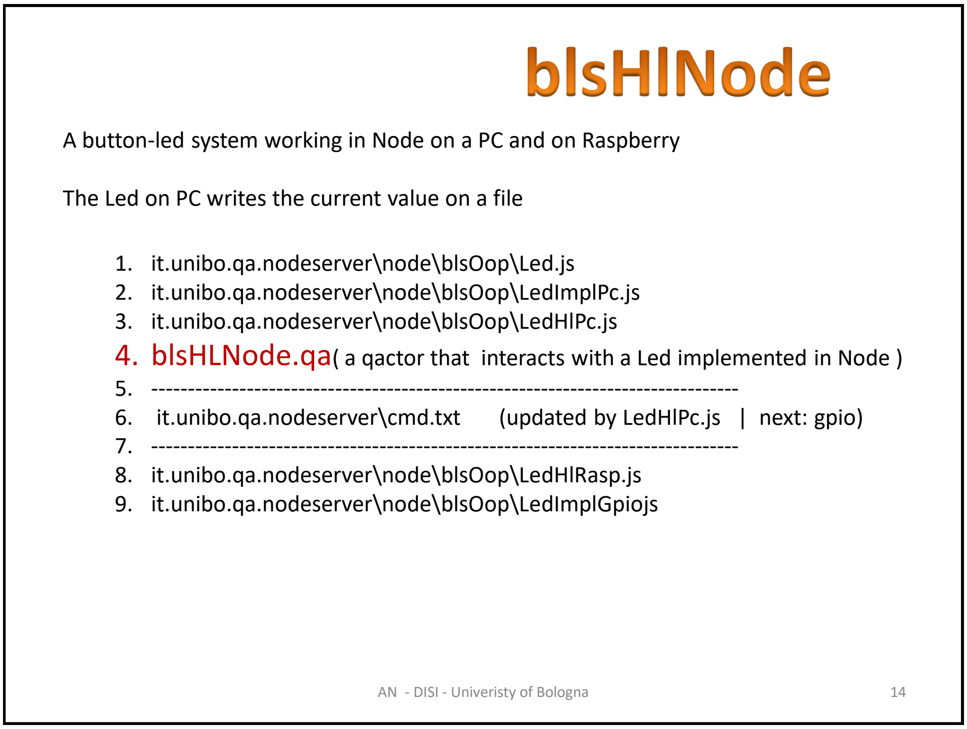
actions	actions types
blsHlCustom: tests	a 'onion' system on PC /Rasp
blshlBlink	a system that executes reactive actions
blsHlNode	a system that works with Node
helloMqtt	a system that does publish/subscribe



blsHlCustom

A button-led system working on a PC

1. it.unibo.buttonLed.components. DevLed
2. it.unibo.buttonLed.components.DeviceLedImpl
3. it.unibo.custom.led. LedFactory
4. it.unibo.custom.button. ButtonFactory
5. blsHLCustom.qa
6. --
7. srcMore/it.unibo.ctxBlsHlCustom/QActorWebUI.html
8. Context ctxBlsHlCustom ip [host="localhost" port=8029] -httpserver
9. --
10. Events and Event-conversion

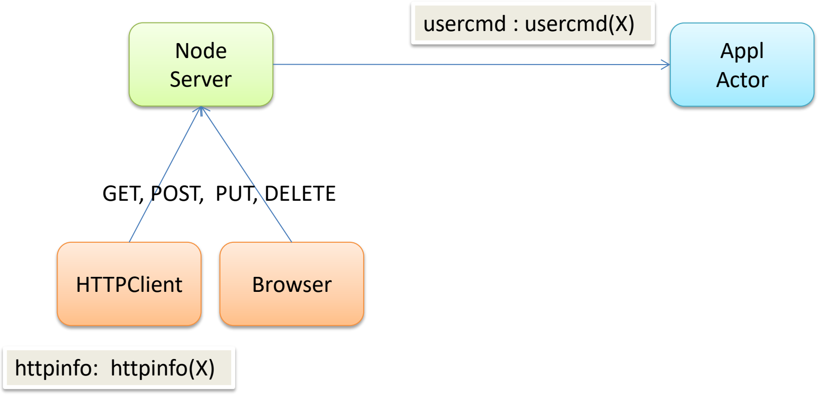


blsHlNode

A button-led system working in Node on a PC and on Raspberry

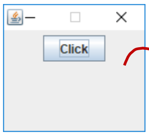
The Led on PC writes the current value on a file

1. it.unibo.qa.nodeserver\node\blsOop\Led.js
2. it.unibo.qa.nodeserver\node\blsOop\LedImplPc.js
3. it.unibo.qa.nodeserver\node\blsOop\LedHlPc.js
4. blsHLNode.qa(a qactor that interacts with a Led implemented in Node)
5. --
6. it.unibo.qa.nodeserver\cmd.txt   (updated by LedHlPc.js | next: gpio)
7. --
8. it.unibo.qa.nodeserver\node\blsOop\LedHlRasp.js
9. it.unibo.qa.nodeserver\node\blsOop\LedImplGpiojs



Project it.unibo.qa.nodeserver

CustomBlsGui.*createCustomButtonGui(*QActor qa)



local_click : click(N)

AD HOC

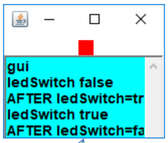
createLedObjecGui

Logical

Concrete

DevLed → DeviceLedGui

DeviceLedRasp

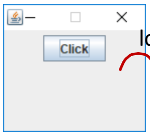


```
gui
ledSwitch false
AFTER ledSwitch=tr
ledSwitch true
AFTER ledSwitch=fa
```

DEIVICE ONTOLOGY

showOntology

blsHl.qa



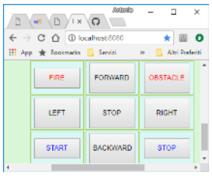
local_click

qacontrolhl → turn : switch → qaledhl

INTEGRATION

DISTRIBUTION

HETEROGENEITY



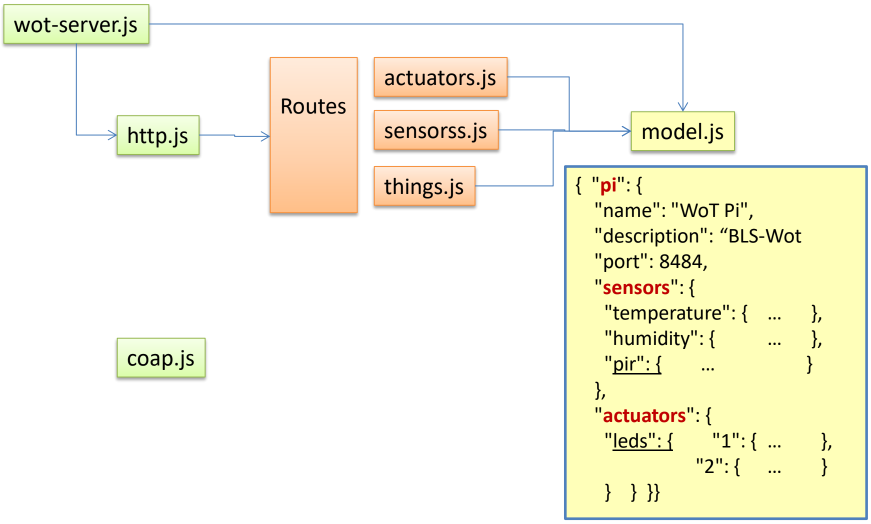
EventHandler as event converter

usercmd : usercmd(N)

A ButtonLed system working as a Wot system

blsWot

1. it.unibo.wot\nodeServerRest\servers\http.js
   - it.unibo.wot\nodeServerRest\resources\model.js
   - it.unibo.wot\nodeServerRest\resources\resources.json
   - --
   - it.unibo.wot\nodeServerRest\routes\actuators.js
   - it.unibo.wot\nodeServerRest\routes\sensors.js
   - it.unibo.wot\nodeServerRest\routes\things.js
2. it.unibo.wot\nodeServerRest\servers\coap.js
3. it.unibo.wot\nodeServerRest\plugins\internal\ledsPlugin.js
   - it.unibo.wot\nodeServerRest\nat\observableFactory.js
   - it.unibo.wot\nodeServerRest\nat\TcpClientToQaNode.js
4. it.unibo.wot\nodeServerRest\plugins\external\coapPlugin.js
5. it.unibo.wot\nodeServerRest\wot-server.js
6. wotRestServerNode.qa ( )
7. --
8. it.unibo.wot\src\it\unibo\rest\clienthttp\RestClientHttp.java
9. --



```
{ "pi": {
   "name": "WoT Pi",
   "description": “BLS-Wot
   "port": 8484,
   "sensors": {
     "temperature": {   ...    },
     "humidity": {        ...    },
     "pir": {      ...            }
   },
   "actuators": {
     "leds": {     "1": {  ...      },
                 "2": {     ...      }
     }   } }}
```