

ComMA

Component Modeling & Analysis

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Problem Statement



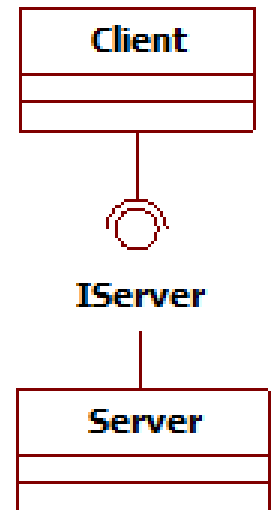
Challenges with interfaces

- Integration problems
 - When two separate groups develop a side of an interface
- 3rd party components
 - When suppliers change timing behavior of their side of an interface

Problem Statement

Before the introduction of ComMA, we described

- The signature of an interface -> often
 - For example: method name, parameters, return values
- The (state) behavior of an interface -> sometimes
 - For example: allowed order of method calls
- The timing behavior of an interface -> rarely
 - For example: time a method call might take



Approach

We created a horizontal DSL called: Component Modeling & Analysis (ComMA)

Signature

```
interface ICamera {
  Types:
  enum Status {OnOk OnFailed}
  commands
  Status PowerOn()
  void PowerOff()
  void Click()
  int GetPictureNumber()
  notifications
  CameraStatus(Status)
  LowBattery()
  EmptyBattery()
  PictureTaken()
}
```

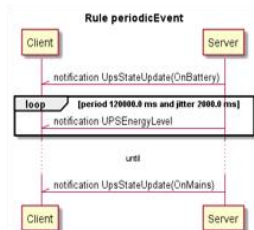
Behavior

```
in all states {
  transition trigger: ICamera::PowerOff do: reply next state: Off
  transition guard: emptyBattery next state: Off
}
initial state Off {
  transition trigger: ICamera::PowerOn
  do: reply(Status::OnOk) next state: SwitchingOn
  OR
  do: reply(Status::OnFailed) next state: Off
}
```

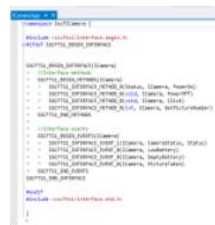
Constraints

```
TR1 in state SwitchingOn call ICamera::PowerOff - [ .. 32 ms ]
-> reply
TR2 in state On call ICamera::Click - [ 10 ms .. 100 ms ]
-> notification ICamera::PictureTaken
```

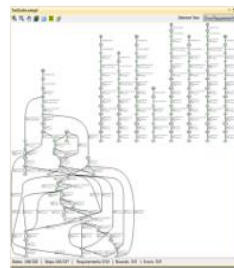
Generate



Visualization & Documentation



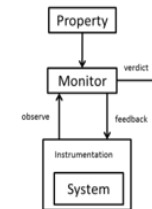
Interface Proxy Code



Model-based Testing Suite



Executable Model for Simulation



Runtime Monitoring

Demo

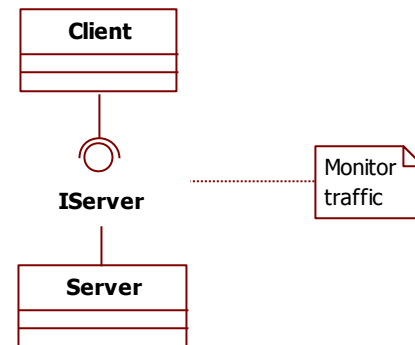
We describe interfaces to prevent integration problems and problems with 3rd party components

Part 1

- Demo interface descriptions language
 - Camera project
 - Signatures
 - Behavior
 - Constraints

Part 2

- Example monitor trace
 - Power Distribution Component project
 - Demo error trace
 - Demo statistical data



Sniffed network traffic

```

0001 0203 0405 0607 0809 0A0B 0C0D 0E0F 0123456789ABCDEF
00000 D4C3 B2A1 0200 0400 0000 0000 0000 0Ã²;.....
00010 0000 0400 0100 0000 9DFC 7356 B062 0A00 ..... tsv*b..
00020 3600 0000 3600 0000 FFFF FFFF FFFF 90E2 6...6...yyyyy â
00030 BA57 A5EE 0800 4500 0028 5321 0000 8011 *wWi..E..(s!..e.
00040 075F C044 2001 FFFF FFFF C48C C501 0014 . ÅD .yyyyAaÃ...
00050 E06A 0100 0001 0000 0000 0000 0000 9FFC àj.....Yu
00060 7356 0CC3 0200 3600 0000 3600 0000 FFFF sV.A..6...6...yy
00070 FFFF FFFF 90E2 BA57 A5EE 0800 4500 0028 yyyÿ à*wWi..E..(
00080 5322 0000 8011 075E C044 2001 FFFF FFFF s"..e.^ÅD .yyyy
00090 C48C C501 0014 E06A 0100 0001 0000 0000 AaÃ...àj.....
000A0 0000 0000 A0FC 7356 A665 0A00 3600 0000 .... tsv|e..6...
    
```

Generate

```

import "IBossV6.sscf"
server Server on 192.0.0.1 provides ISuSd ITest ILogging
client Client1 on 192.0.0.12 uses ISuSd ITest ILogging
client Client2 on 192.0.0.13 uses ISuSd

Timing: 123.067
Timestamp: 0.0
src address: 192.0.0.12
dest address: 192.0.0.1
Interface: ITest
Command: GetState

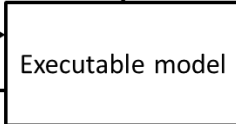
Timing: 142.067
Timestamp: 151000.0
src address: 192.0.0.1
dest address: 192.0.0.12
Interface: ITest
Command: GetState OK
Parameter: ITest::State : ITest::State::SystemOff
    
```



Input

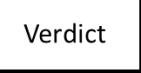


Event



Response

Output

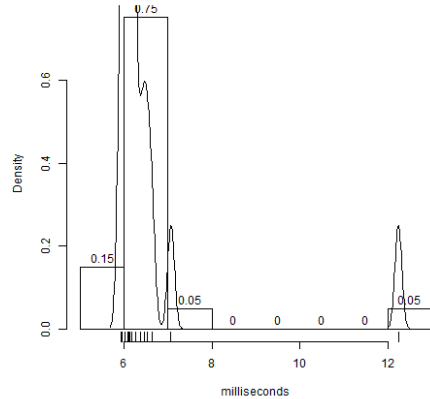
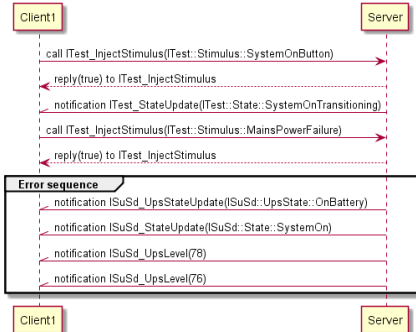


Generate

Generate

Histogram of requestStimulus

Warning (rule periodicEvent):
The expected periodic event is observed outside of the expected time interval [2030 ms .. 2130 ms].
Arrival time: 2300 ms

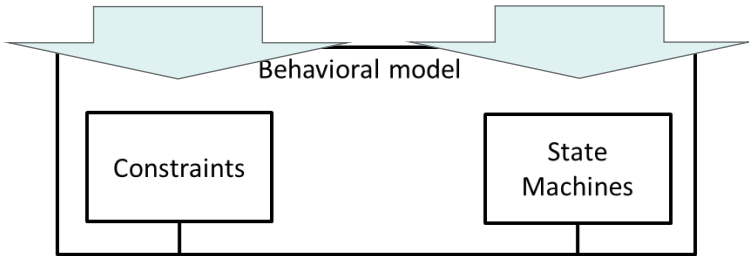


```

in all states {
  transition trigger: ICamera:PowerOff do: reply next state: Off
  transition guard: emptyBattery next state: Off
}
initial state Off {
  transition trigger: ICamera:PowerOn
  do: reply(Status:OnOK) next state: SwitchingOn
  OR
  do: reply(Status:OnFailed) next state: Off
}
    
```

```

TR1 in state SwitchingOn call ICamera:PowerOff - [ .. 32 ms ]
-> reply
TR2 in state On call ICamera:Click - [ 10 ms .. 100 ms ]
-> notification ICamera:PictureTaken
    
```



Transformed to

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Technology independent trace language



