Service sessions as concurrent parts

Version 091023

ICU 5

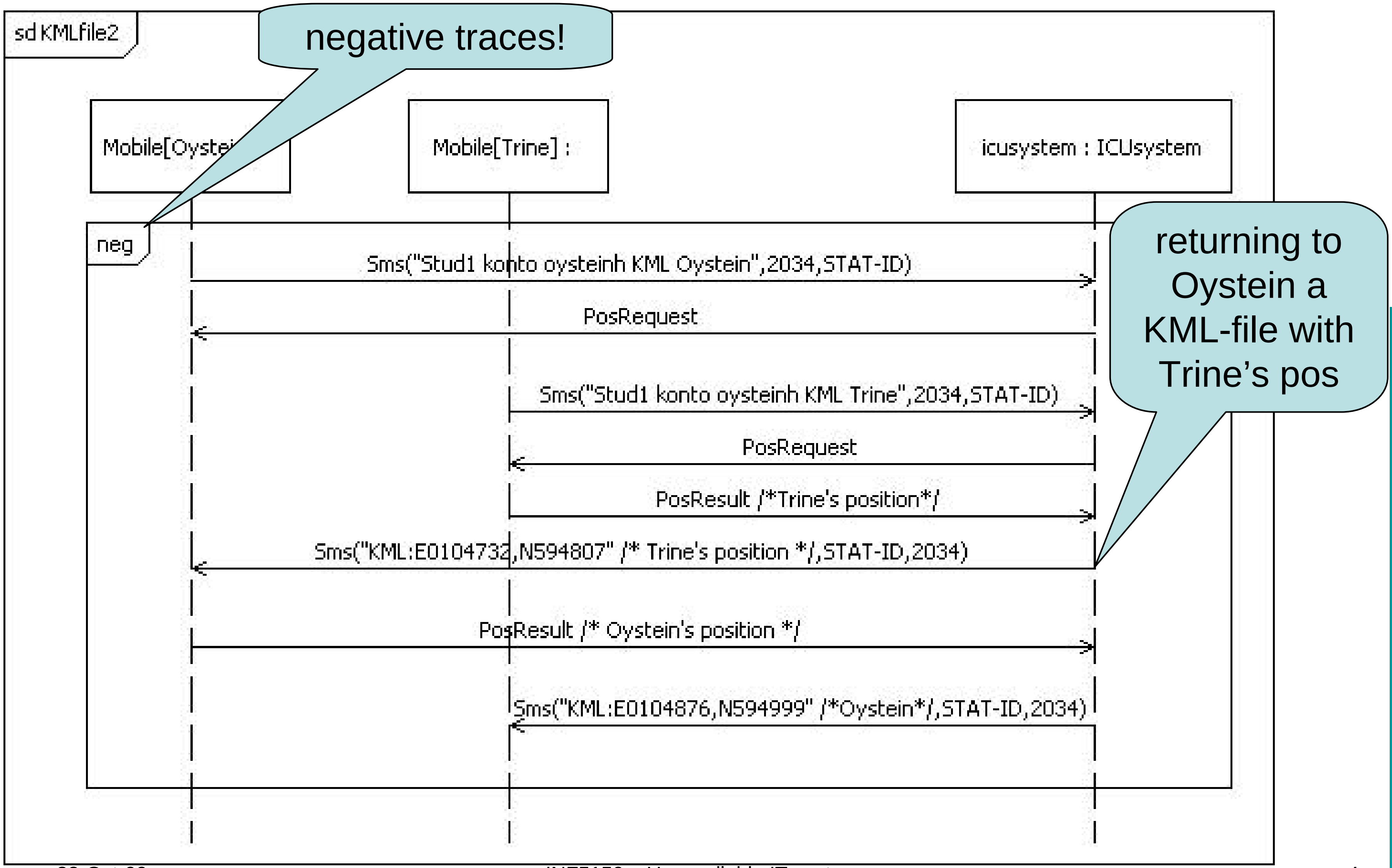
Motivation

- Assume having several users using ICU concurrently
  - The system could try and handle one user at the time
  - The system could try and handle everybody at the same time, but keep their data apart
- Some things take real time outside the ICU system
  - Users thinking
  - Positioning
  - SMS forwarding
- Potentially
  - Handling all users ”at the same time” may gain overall throughput

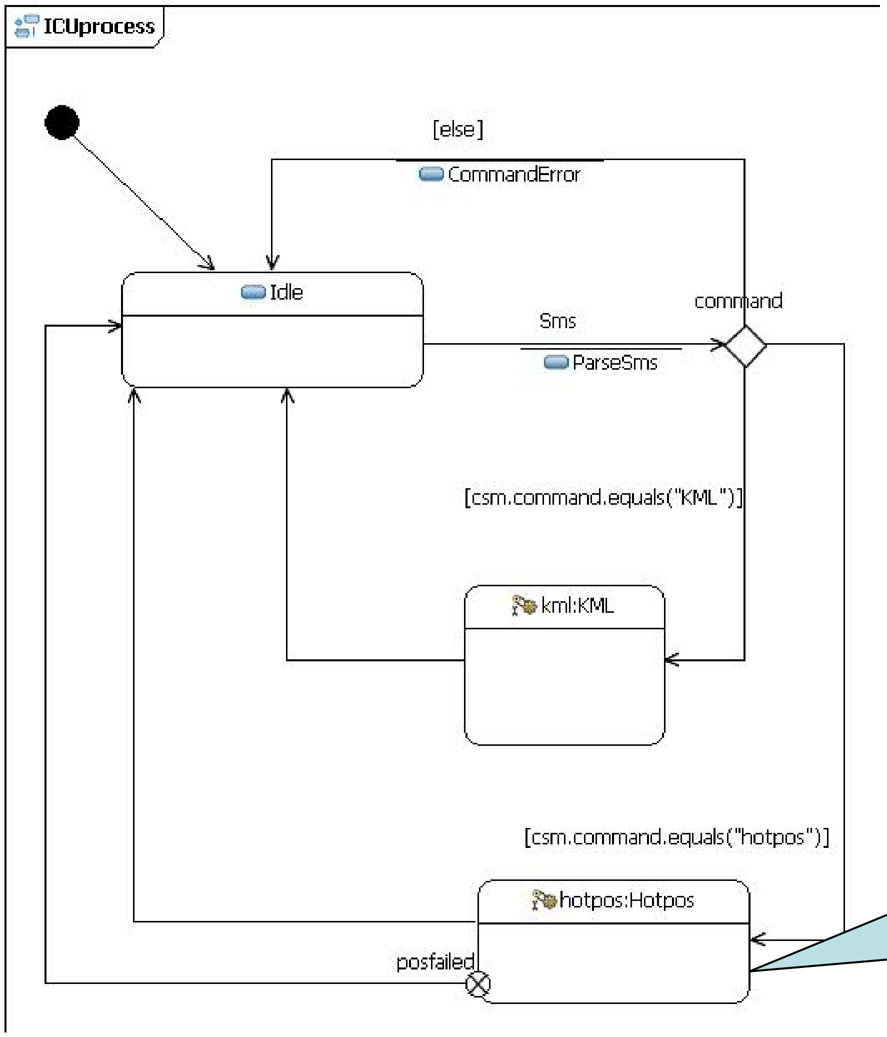
Risks

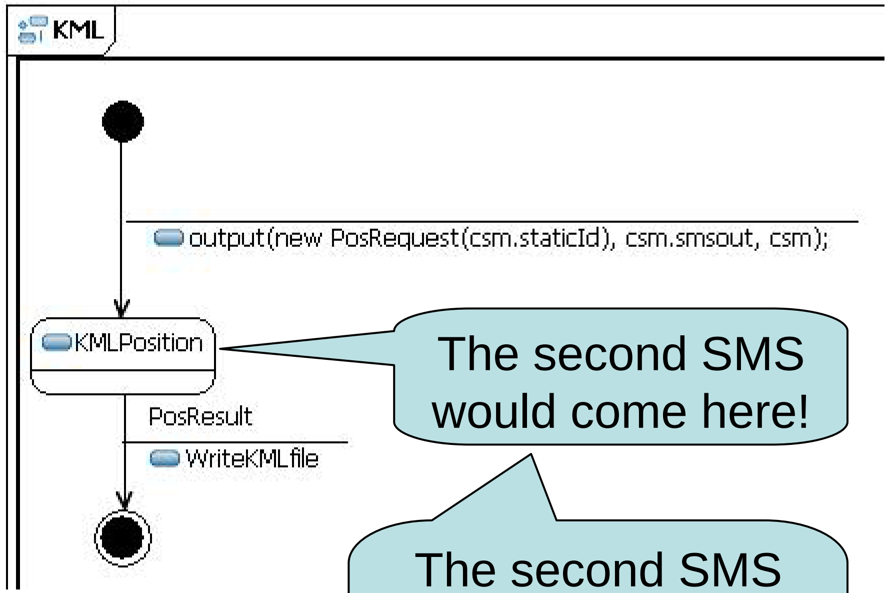
- The ICU system confuses which user has which position
- The ICU system returns SMS'es to the wrong user
- Coordinates are garbled
  - x-coordinate from one user and y-coordinate from another

This should not happen ....


sd KMLfile2
negative traces!
Mobile[Oystei
Mobile[Trine] :
icusystem : ICUsystem
neg
Sms("Stud1 konto oysteinh KML Oystein",2034,STAT-ID)
PosRequest
Sms("Stud1 konto oysteinh KML Trine",2034,STAT-ID)
PosRequest
PosResult /*Trine's position*/
Sms("KML:E0104732,N594807" /* Trine's position */,STAT-ID,2034)
PosResult /* Oystein's position */
Sms("KML:E0104876,N594999" /*Oystein*/,STAT-ID,2034)
returning to Oystein a KML-file with Trine's pos

What would our current design do?



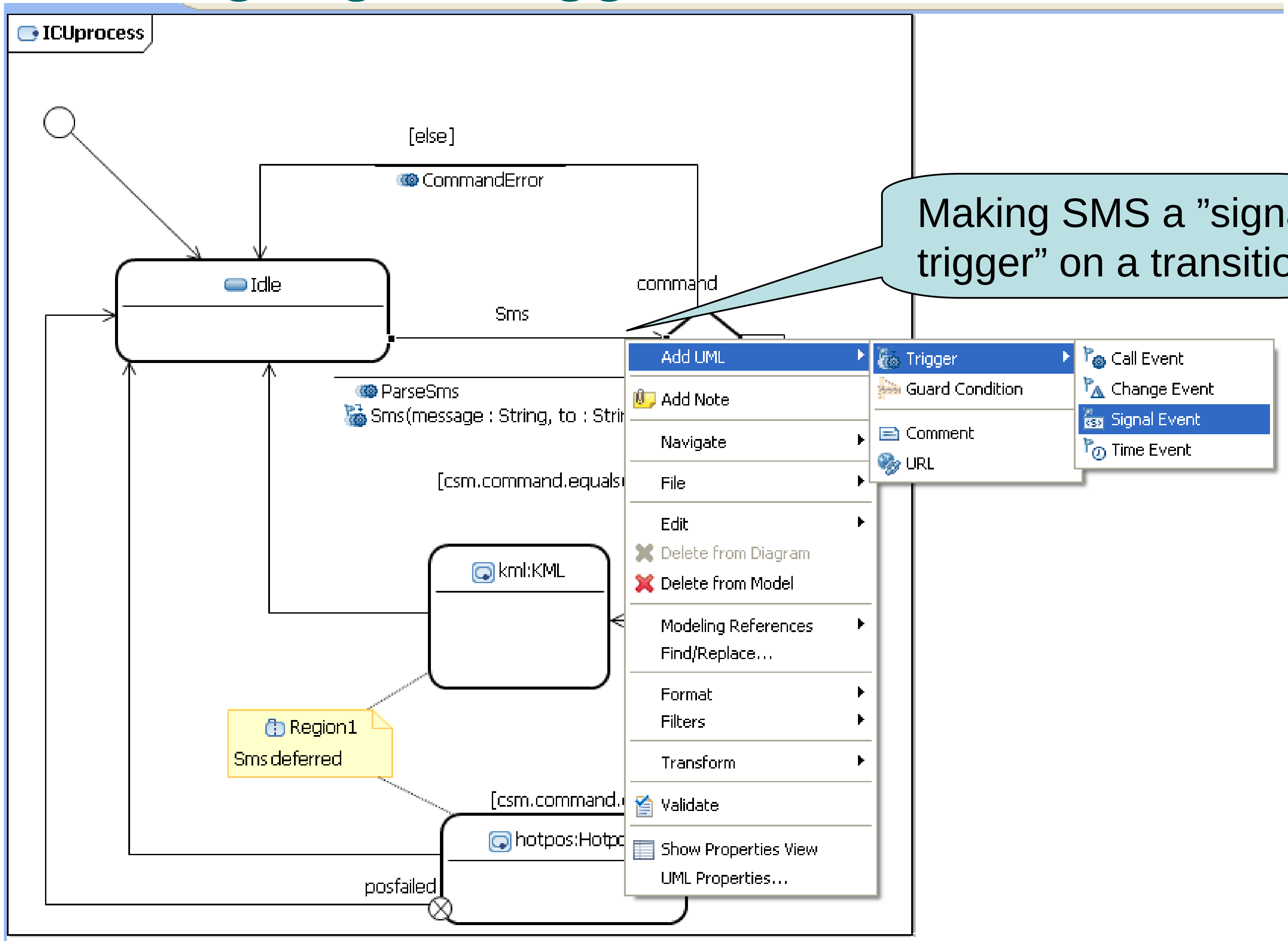


The second SMS would come here!

The second SMS would simply be discarded as a ”default transition”

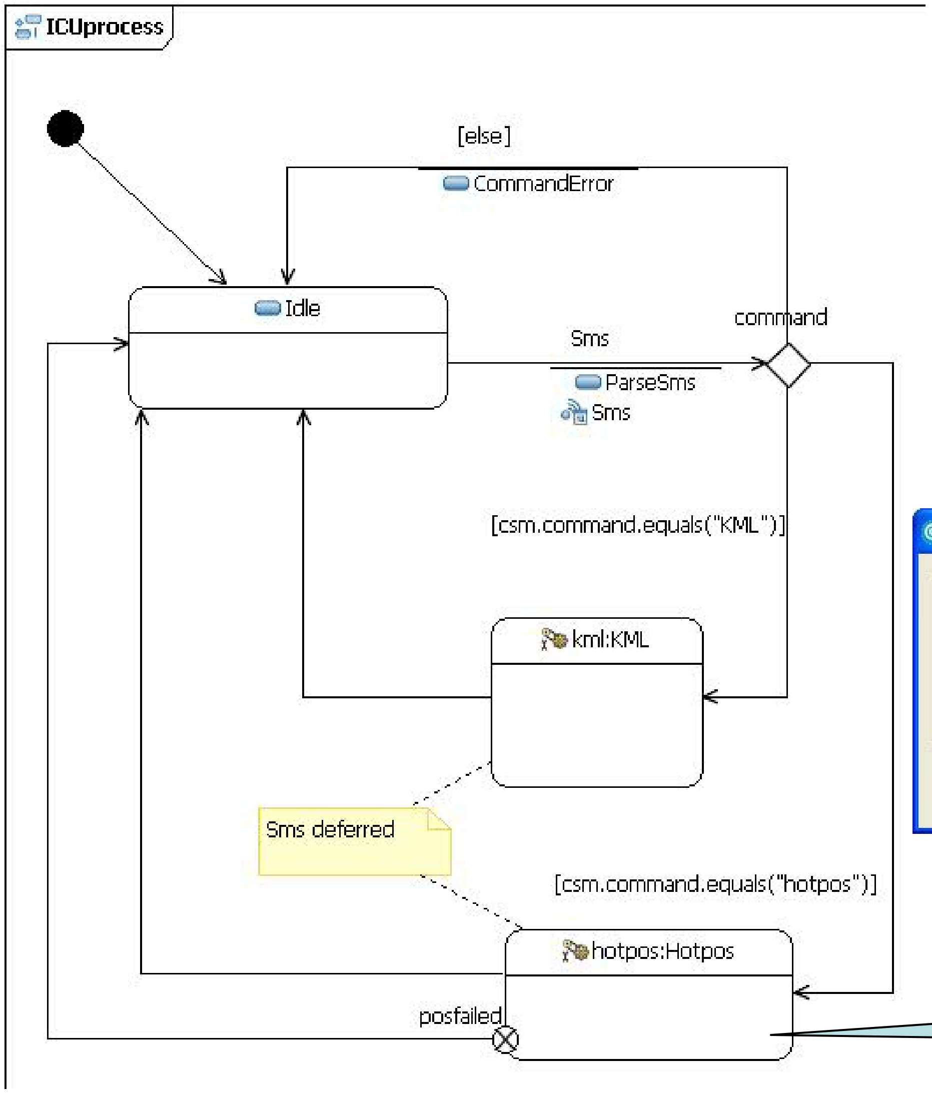
Introducing *defer* for *Sms* on every state but Idle, will cause services to be performed in sequence

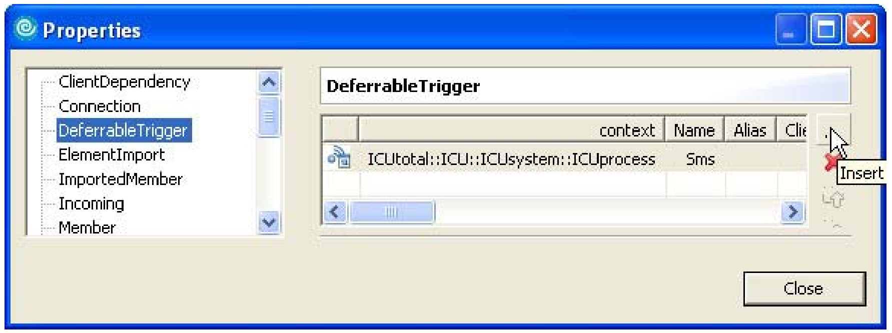
Defining Signal trigger Sms



Making SMS a "signal trigger" on a transition

Defer on the service submachine states



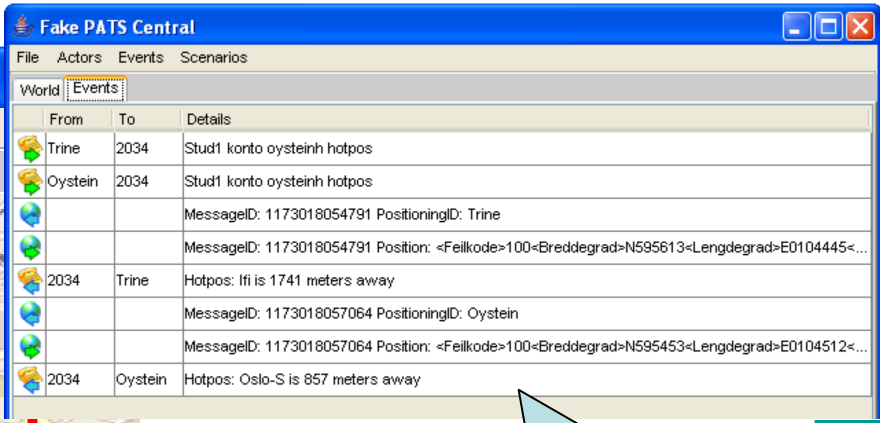


DeferrableTrigger

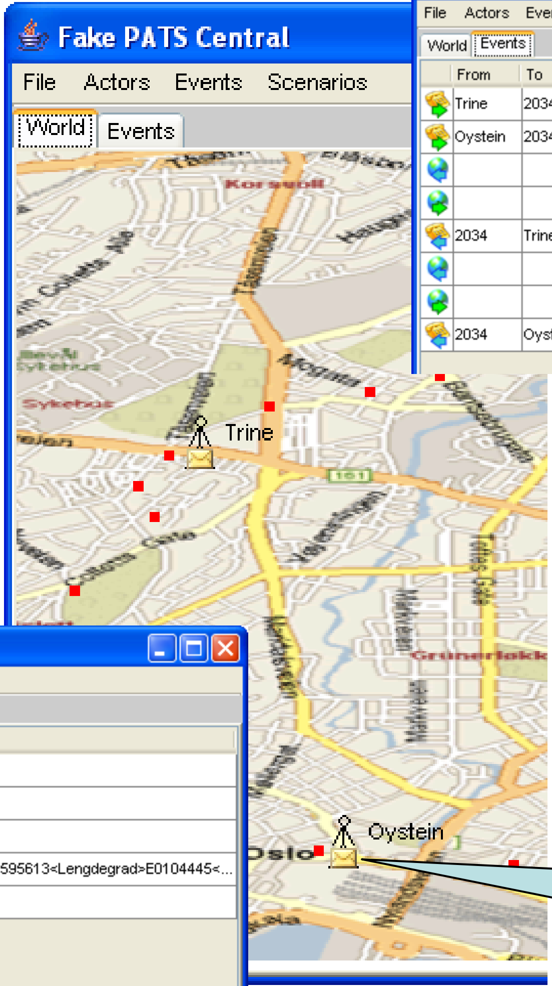
	context	Name	Alias	Clie
	ICUtotal::ICU::ICUsystem::ICUprocess	Sms		

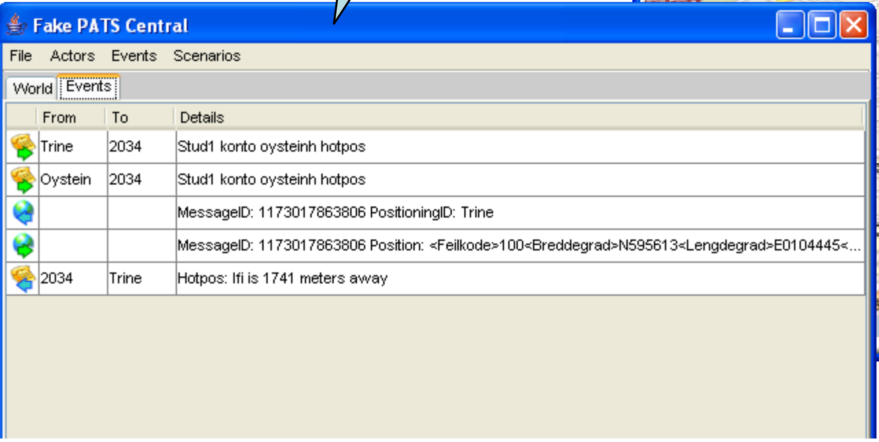
Defining a "deferrable trigger"

Comparing ICU4 and ICU4-DEFER



From	To	Details
Trine	2034	Stud1 konto oysteinh hotpos
Oystein	2034	Stud1 konto oysteinh hotpos
		MessageID: 1173018054791 PositioningID: Trine
		MessageID: 1173018054791 Position: <Feilkode>100<Breddegrad>N595613<Lengdegrad>E0104445<...
2034	Trine	Hotpos: Ifi is 1741 meters away
		MessageID: 1173018057064 PositioningID: Oystein
		MessageID: 1173018057064 Position: <Feilkode>100<Breddegrad>N595453<Lengdegrad>E0104512<...
2034	Oystein	Hotpos: Oslo-S is 857 meters away





From	To	Details
Trine	2034	Stud1 konto oysteinh hotpos
Oystein	2034	Stud1 konto oysteinh hotpos
		MessageID: 1173017863806 PositioningID: Trine
		MessageID: 1173017863806 Position: <Feilkode>100<Breddegrad>N595613<Lengdegrad>E0104445<...
2034	Trine	Hotpos: Ifi is 1741 meters away

ICU4 ignored the second service request

ICU4-DEFER sequences the requests

queued ”Stud1 konto oysteinh hotpos”

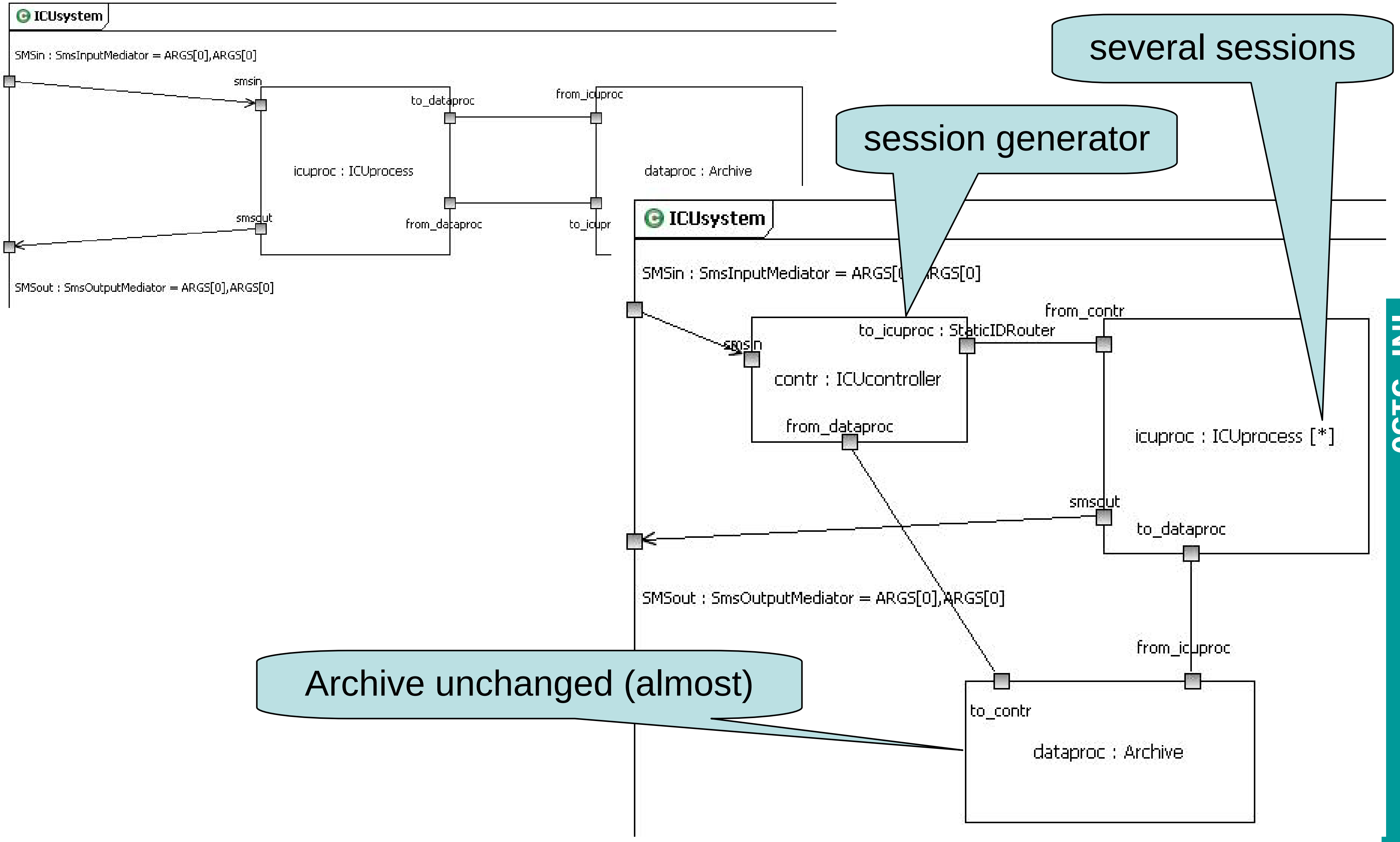
The ”session” solution

- Each initiative by a user is represented by an instantiation of a state machine (a session)
  - with all the temporary data associated with that user
  - taking care of all the communication related to that user
- The session is generated when the user initiates a service
- The session is terminated when the service is finished

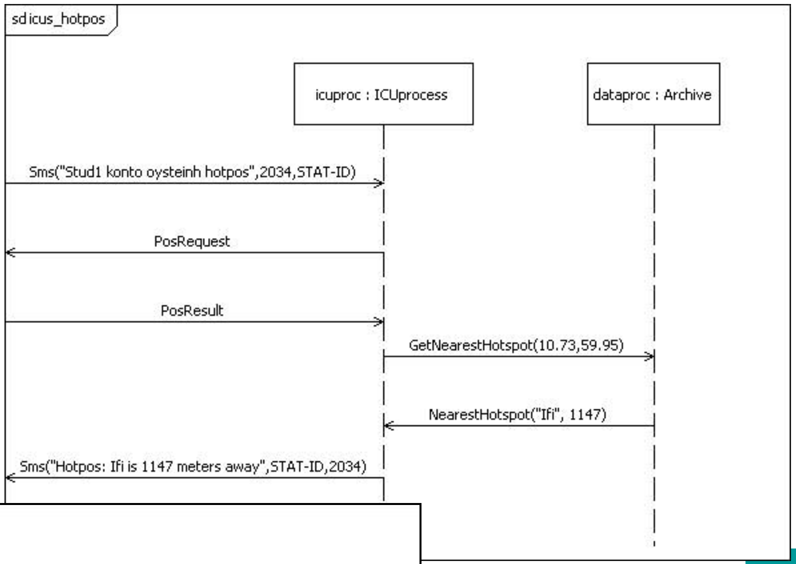
Buzzzzz Groups (5 minutes)

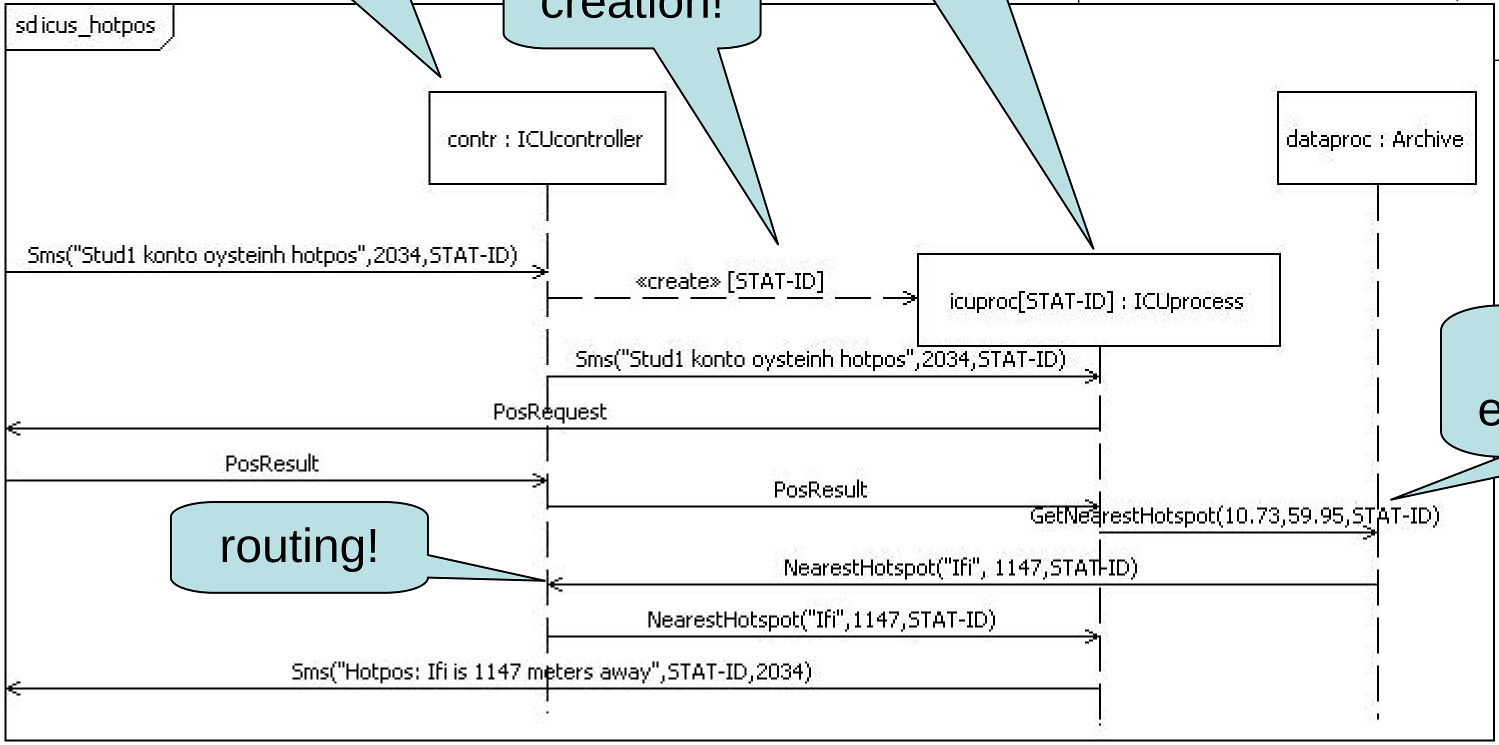
- Discuss what represents sessions in the ICU systems
- Discuss what could represent sessions in ”Tourist Guide”
- Determine what should identify a session of the ICU system
- Determine what could identify a session in ”Tourist Guide”
- What would we need to make sessions come alive starting from ICU4?

A new composite structure



Enhancing the behavior


sd icus_hotpos
icuproc : ICUprocess
dataproc : Archive
Sms("Stud1 konto oysteinh hotpos",2034,STAT-ID)
PosRequest
PosResult
GetNearestHotspot(10.73,59.95)
NearestHotspot("Ifi", 1147)
Sms("Hotpos: Ifi is 1147 meters away",STAT-ID,2034)


sd icus_hotpos
contr : ICUcontroller
dataproc : Archive
Sms("Stud1 konto oysteinh hotpos",2034,STAT-ID)
«create» [STAT-ID]
icuproc[STAT-ID] : ICUprocess
Sms("Stud1 konto oysteinh hotpos",2034,STAT-ID)
PosRequest
PosResult
PosResult
GetNearestHotspot(10.73,59.95,STAT-ID)
NearestHotspot("Ifi", 1147,STAT-ID)
NearestHotspot("Ifi",1147,STAT-ID)
Sms("Hotpos: Ifi is 1147 meters away",STAT-ID,2034)

The receptionist: handling all input signals

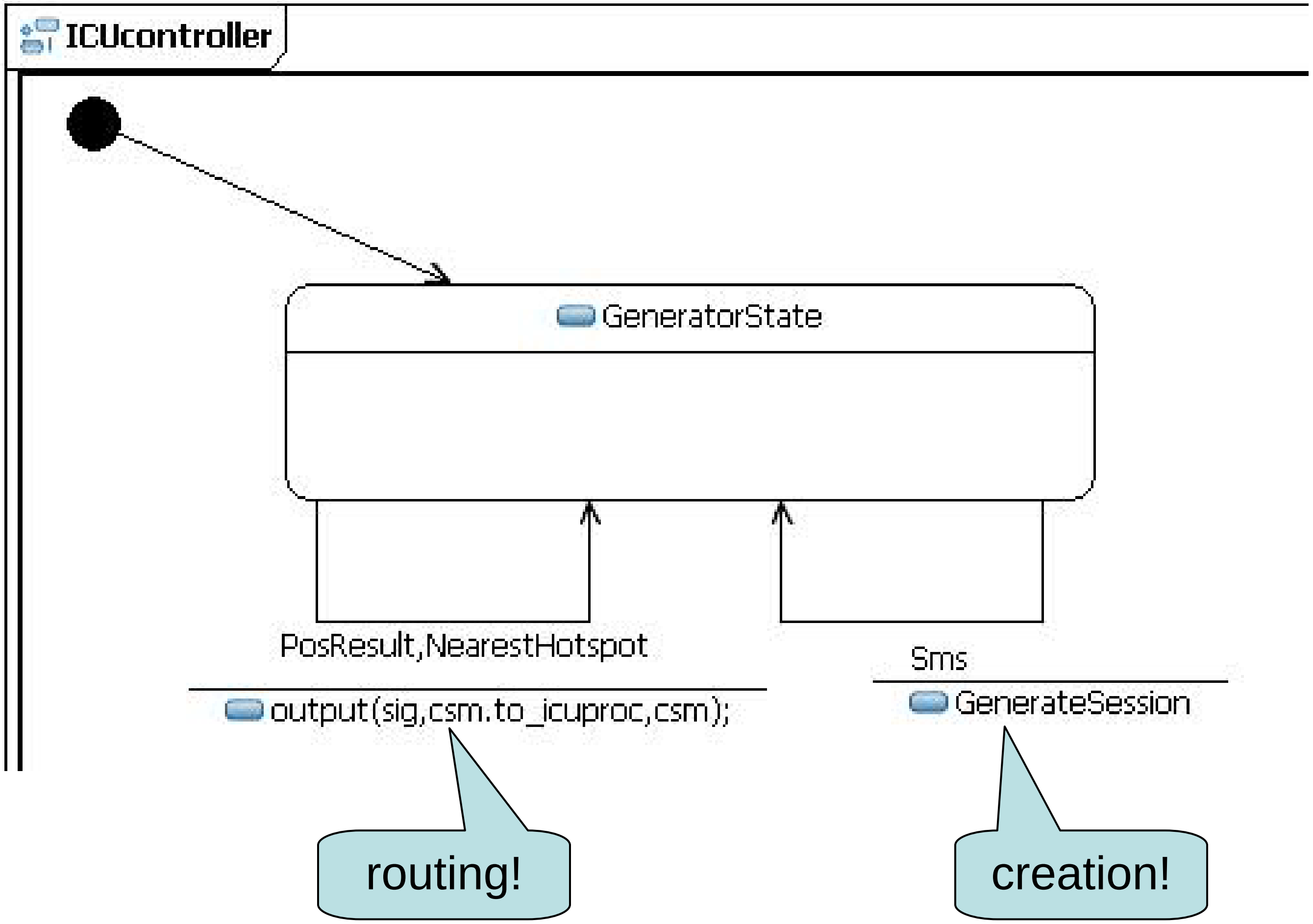
ICUprocess: very similar to before

creation!

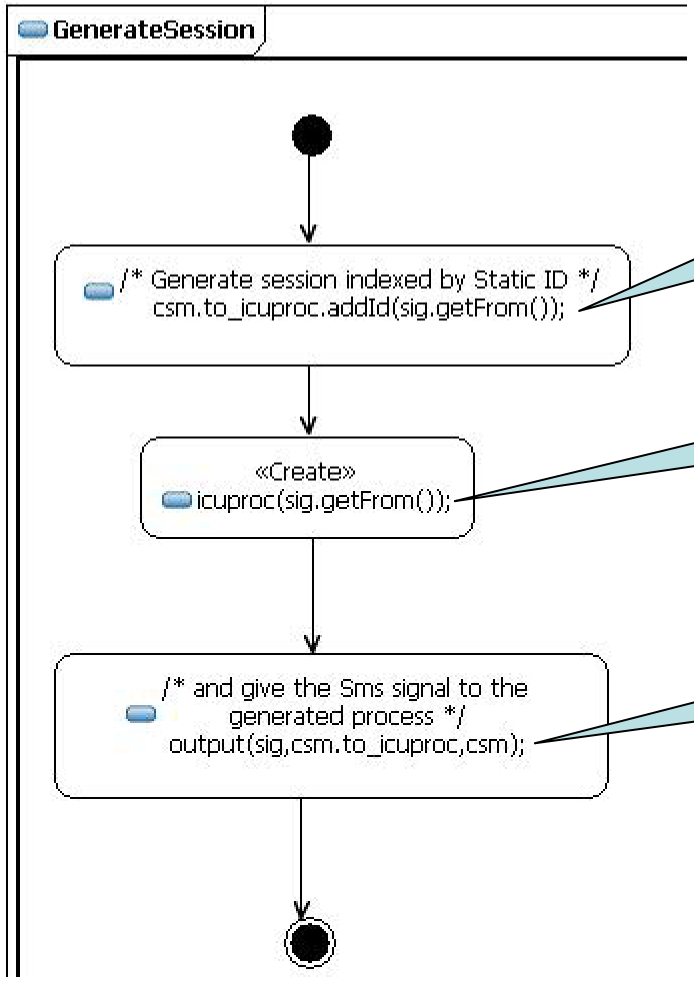
signal enhancement

routing!

ICUcontroller



Creating a session

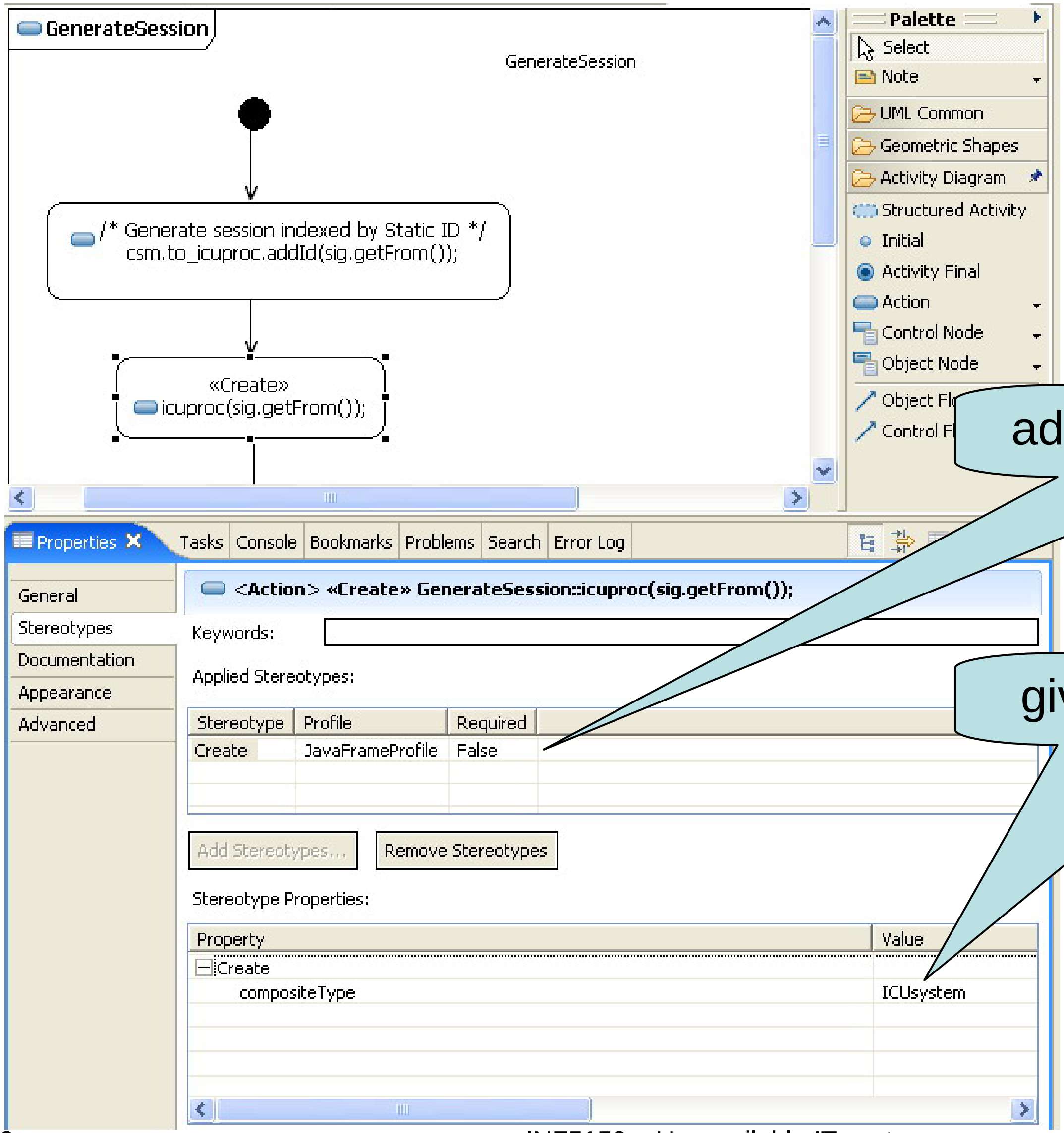

GenerateSession
/* Generate session indexed by Static ID */
csm.to_icuproc.addId(sig.getFrom());
«Create»
icuproc(sig.getFrom());
/* and give the Sms signal to the
generated process */
output(sig,csm.to_icuproc,csm);

routing information so that the new member to come will ever be found

create a new member of the *icuproc* set of parts

sending a message to the generated process

Technicalities of the Create-stereotype



```
/* Generate session indexed by Static ID */
csm.to_icuproc.addId(sig.getFrom());
```

«Create»
icuproc(sig.getFrom());

<Action> «Create» GenerateSession::icuproc(sig.getFrom());

Keywords:

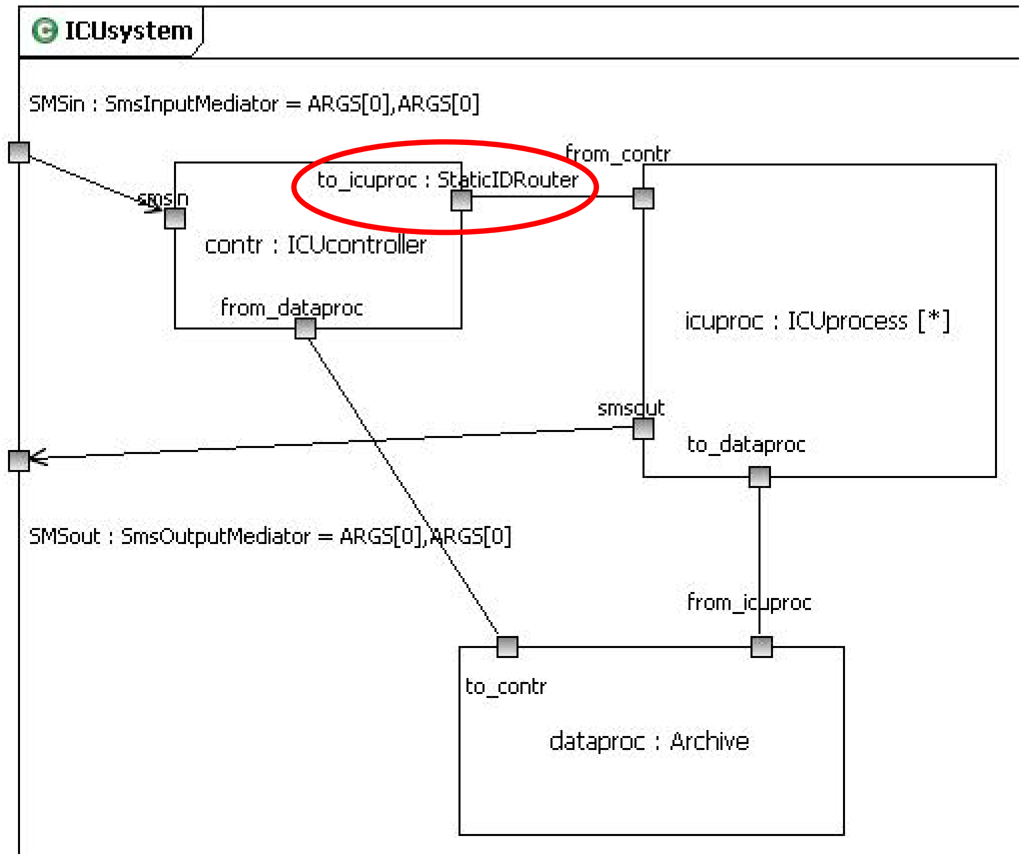
Applied Stereotypes:

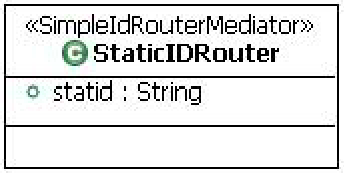
Stereotype	Profile	Required
Create	JavaFrameProfile	False

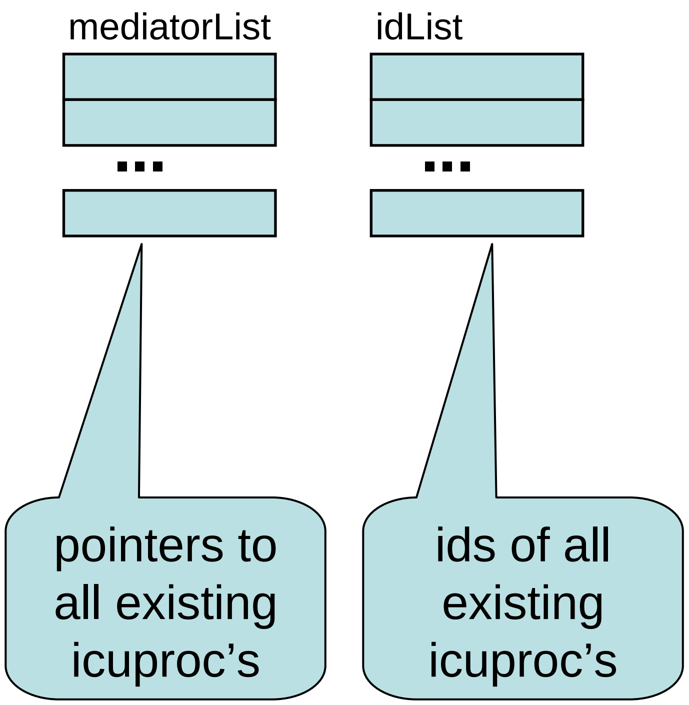
Stereotype Properties:

Property	Value
Create	
compositeType	ICUsystem

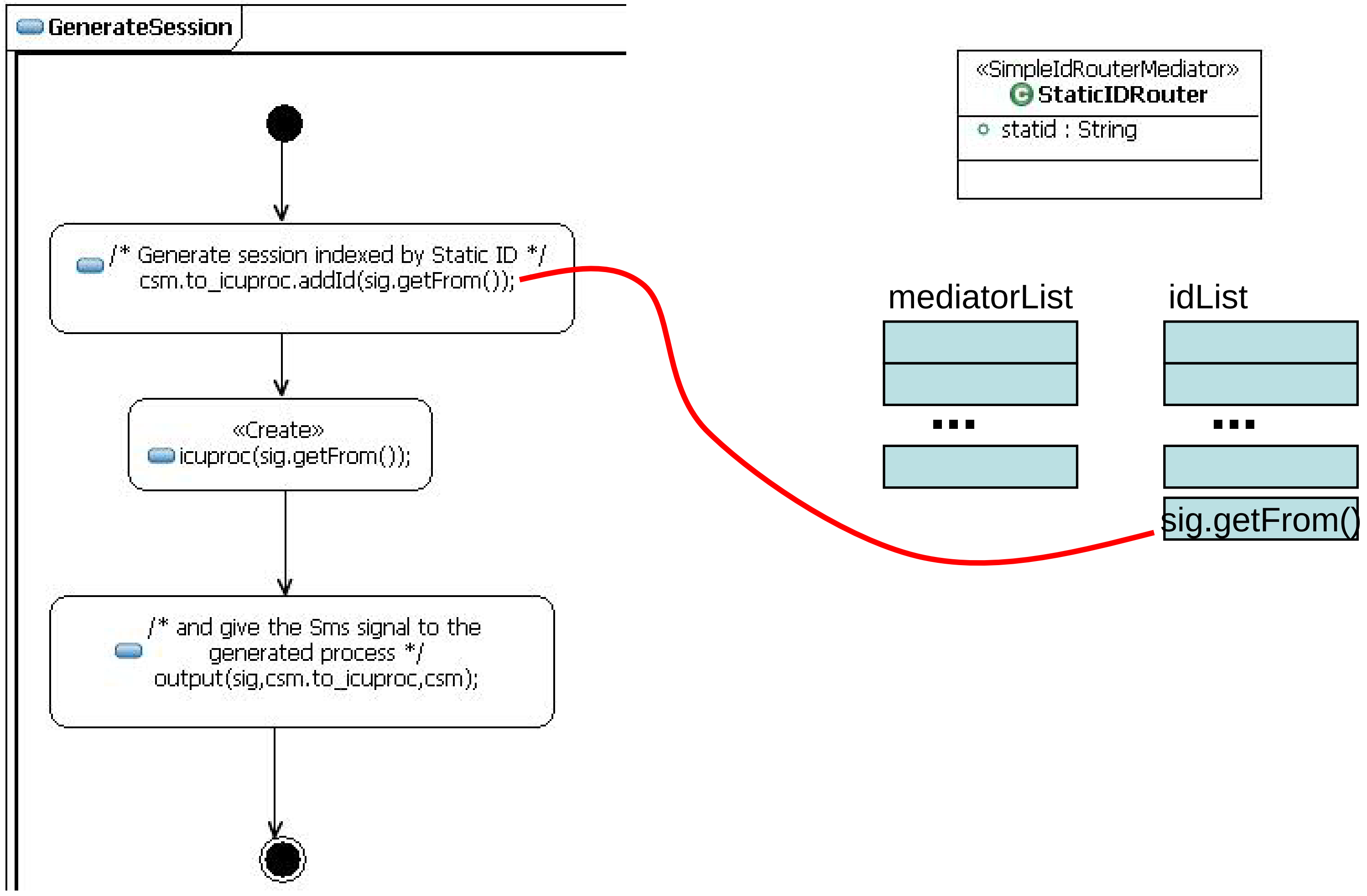
Simple Routing (1) One-to-many Port



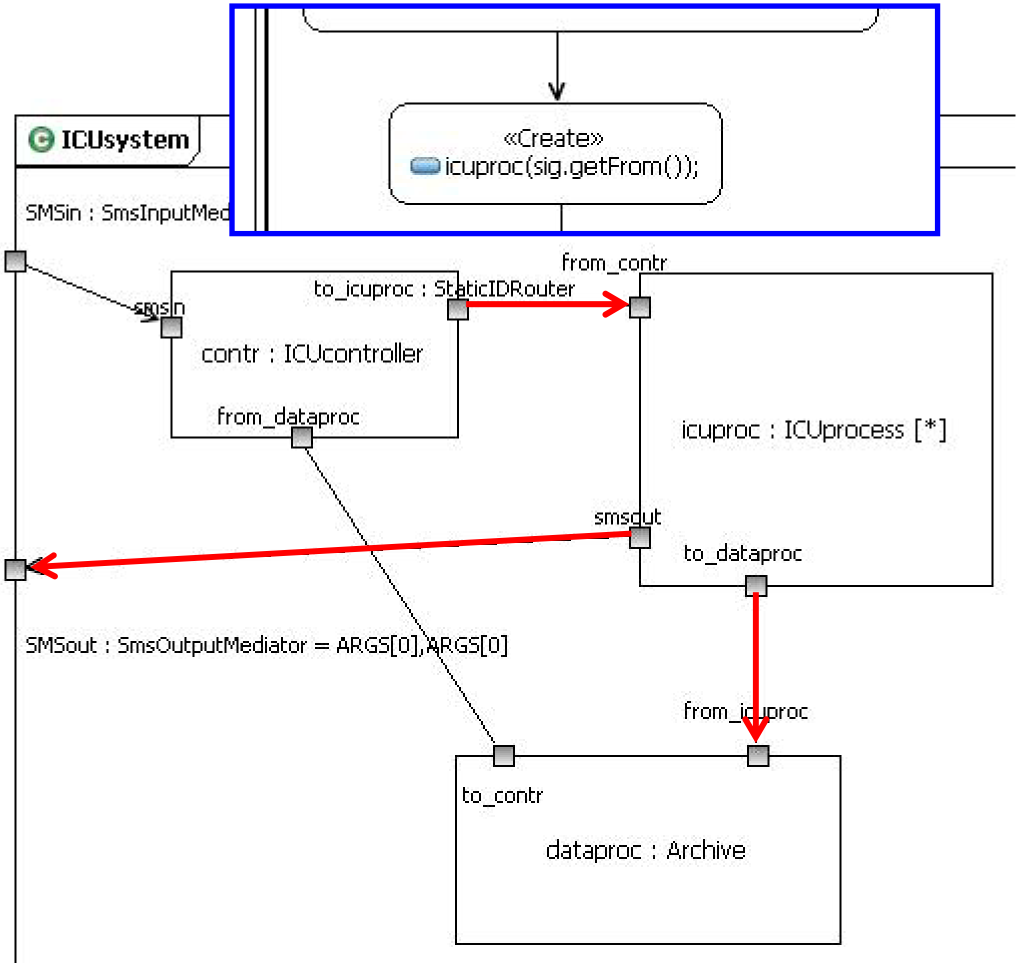


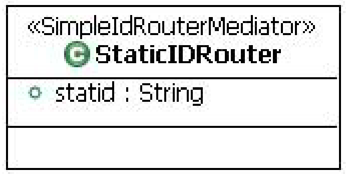

mediatorList
idList
...
...
pointers to all existing icuproc's
ids of all existing icuproc's

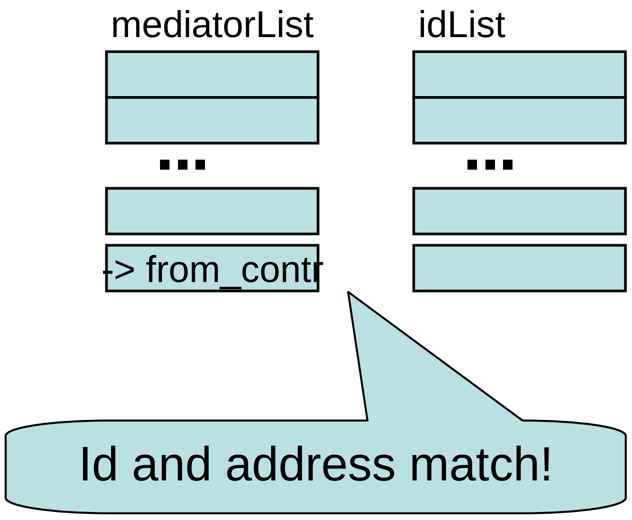
Simple Routing (2) Adding the ID



Simple Routing (3) Connecting connectors

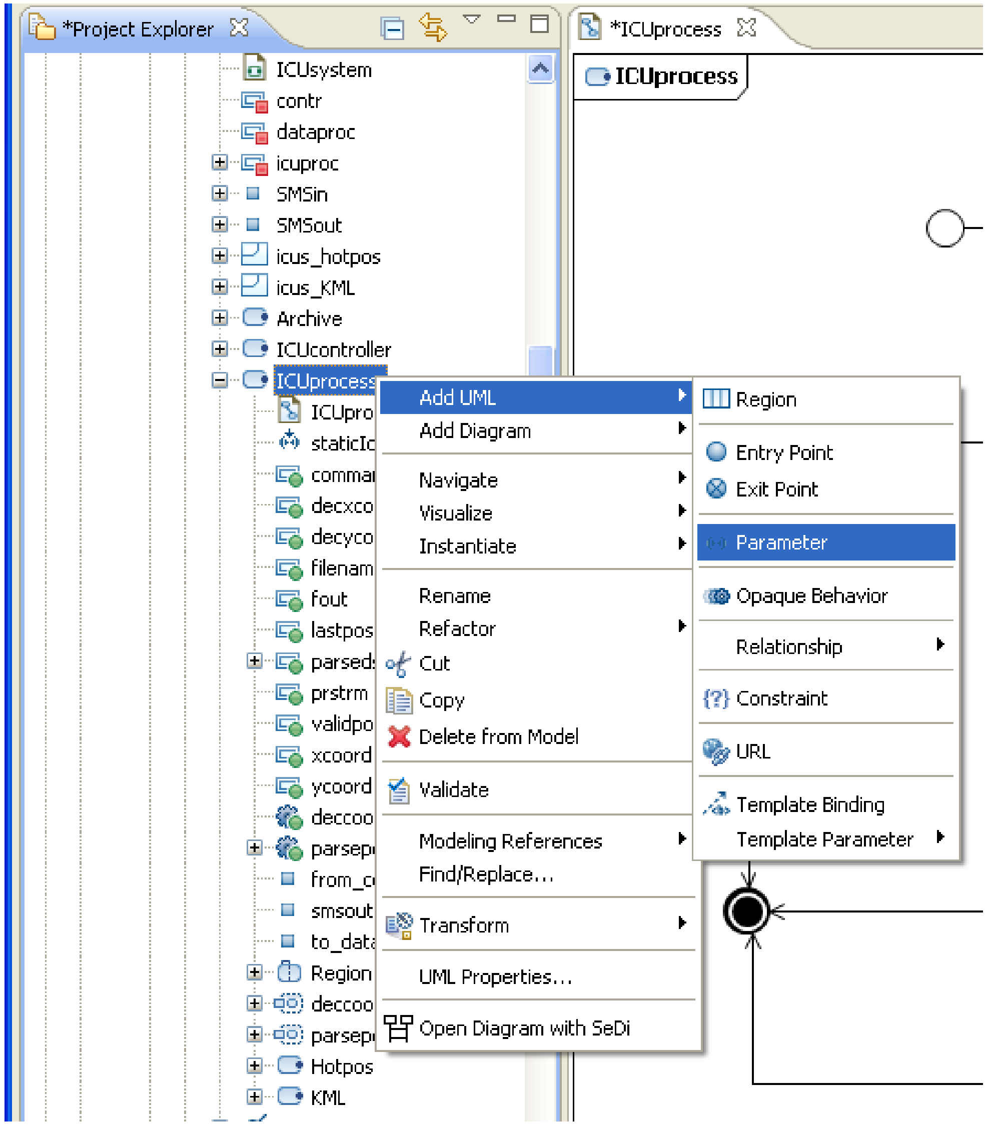




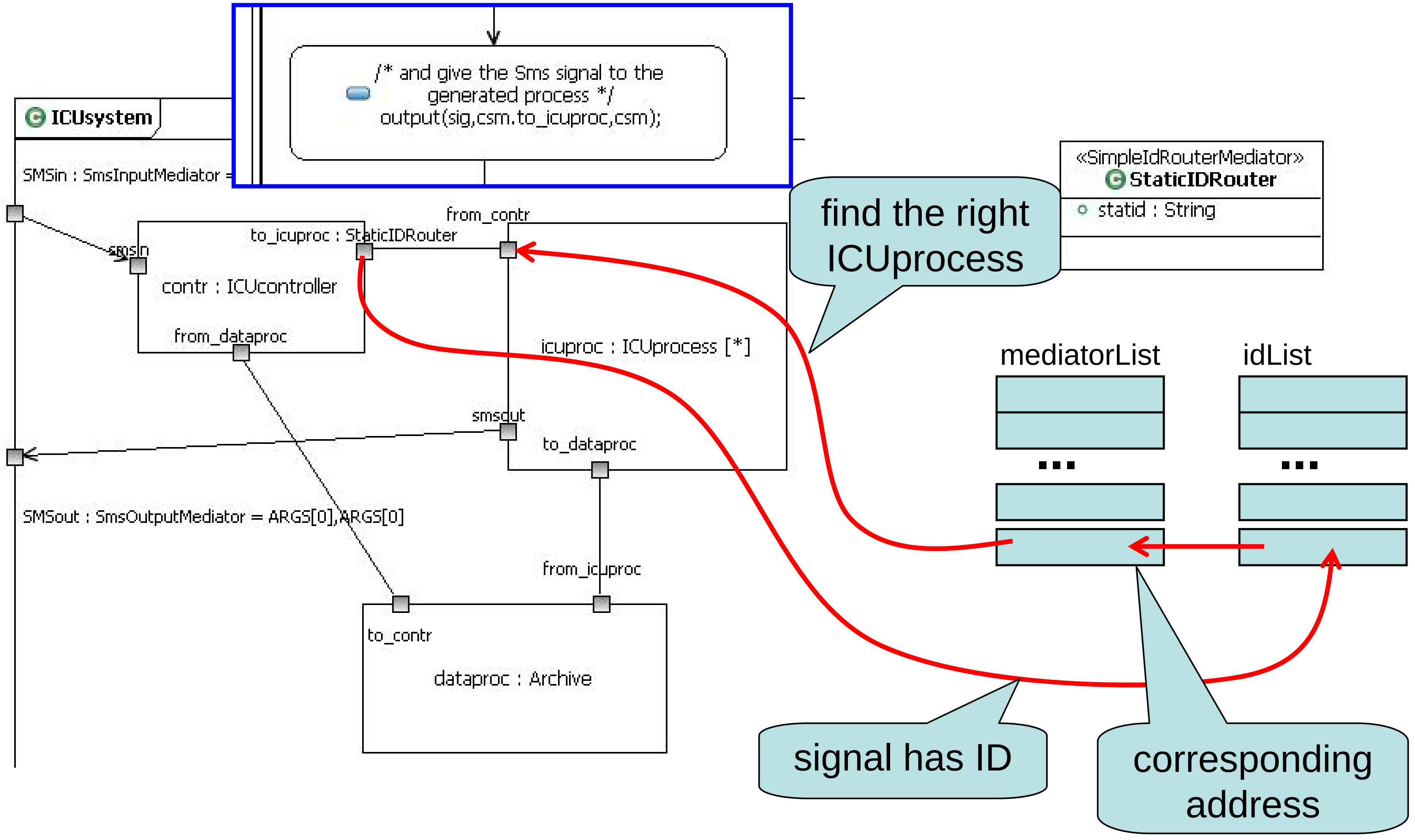


INF 5150

Adding a parameter to the dynamic process



Simple Routing (4) Forwarding from Port



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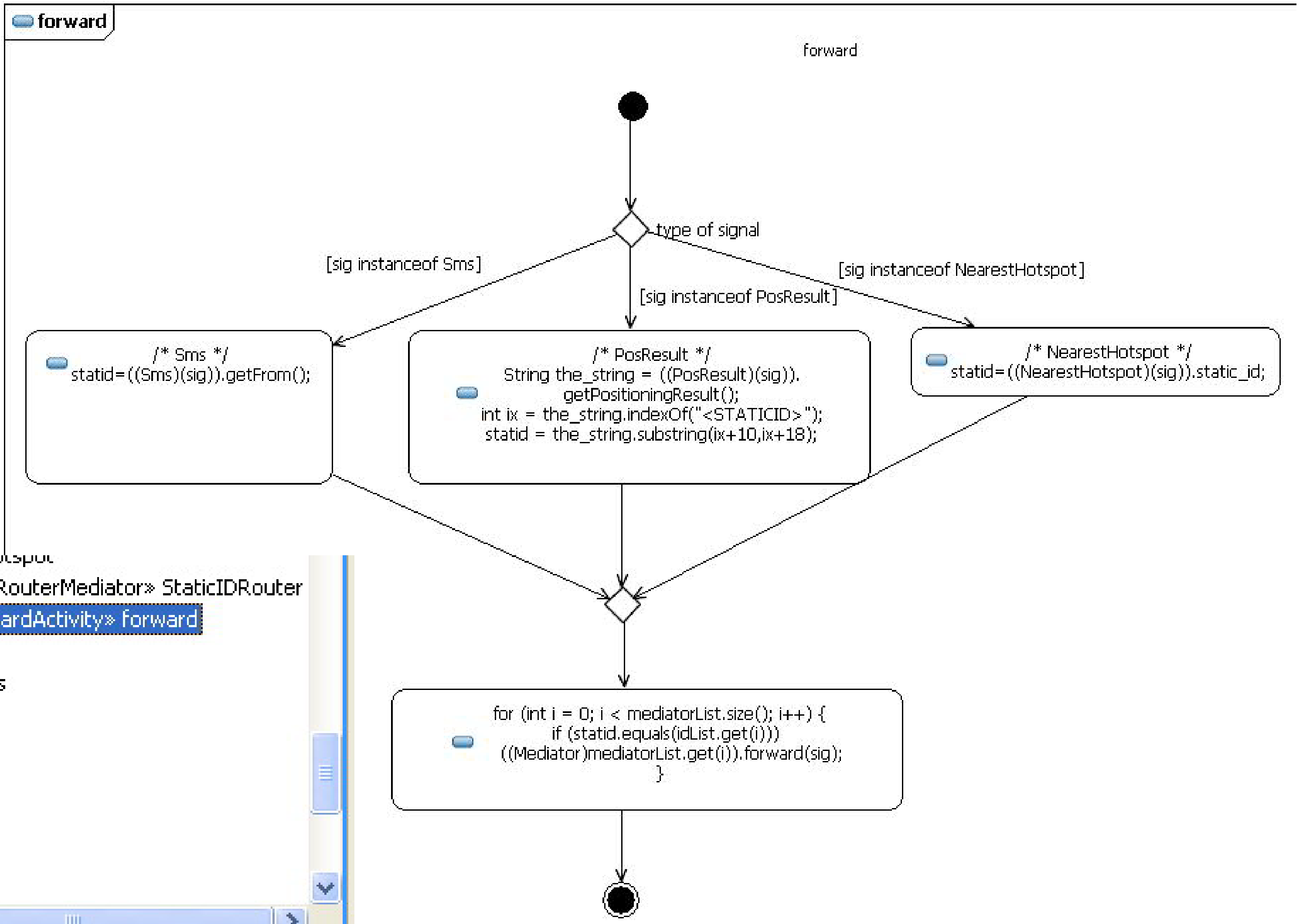
Simple Routing (5) forward() is programmed!

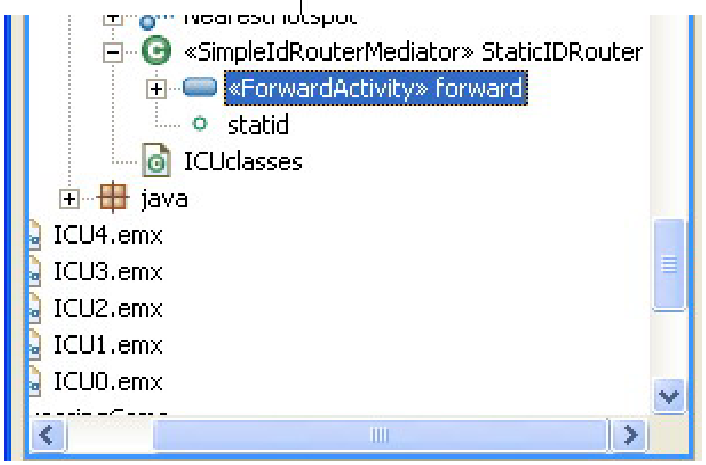


```
/* Sms */
statid=((Sms)(sig)).getFrom();
```

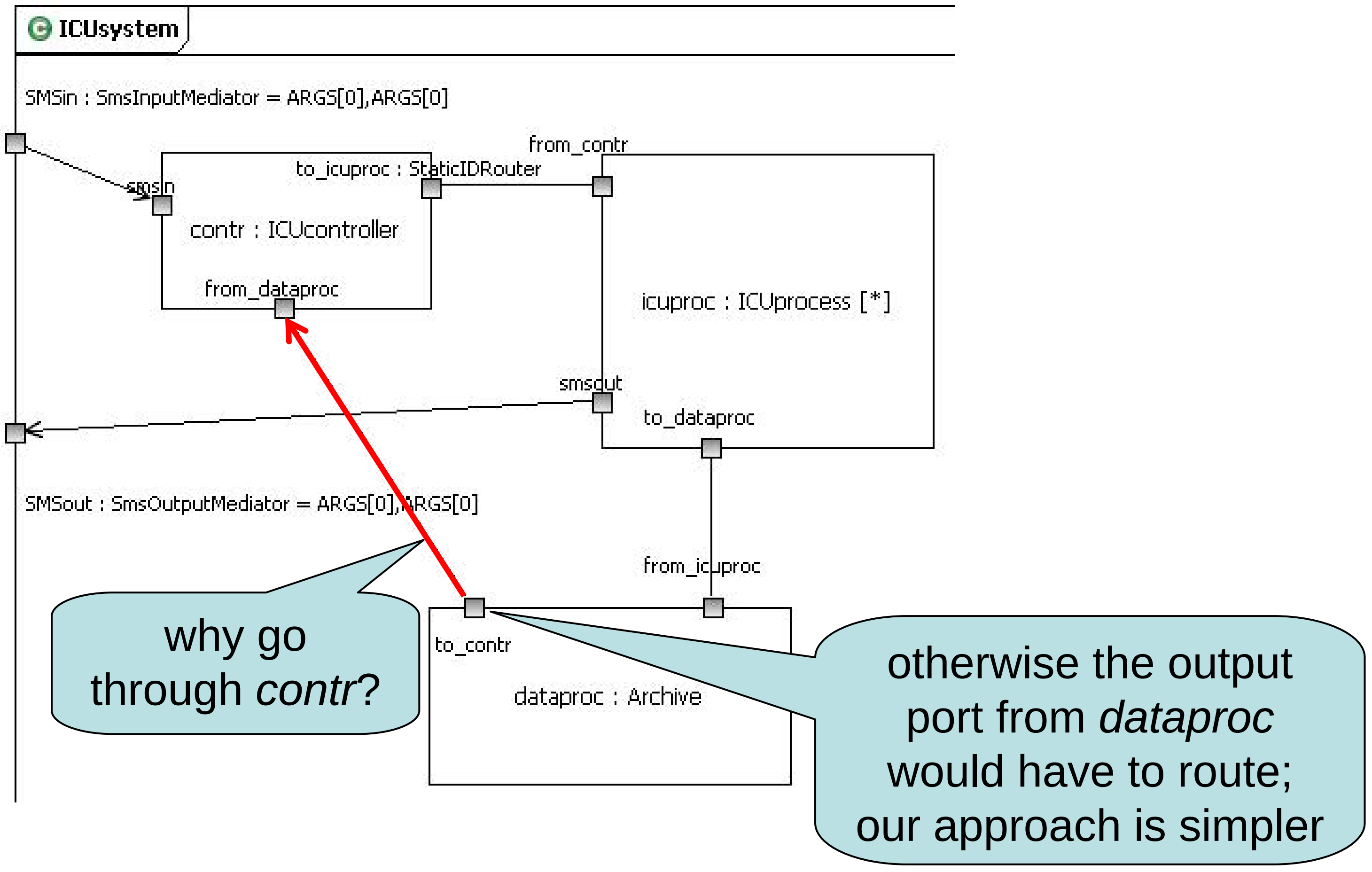
```
/* PosResult */
String the_string = ((PosResult)(sig)).
getPositioningResult();
int ix = the_string.indexOf("<STATICID>");
statid = the_string.substring(ix+10,ix+18);
```

```
/* NearestHotspot */
statid=((NearestHotspot)(sig)).static_id;
```

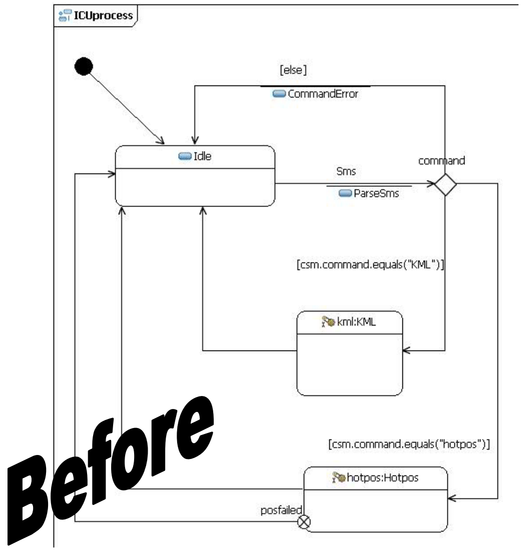
```
for (int i = 0; i < mediatorList.size(); i++) {
  if (statid.equals(idList.get(i)))
  ((Mediator)mediatorList.get(i)).forward(sig);
}
```

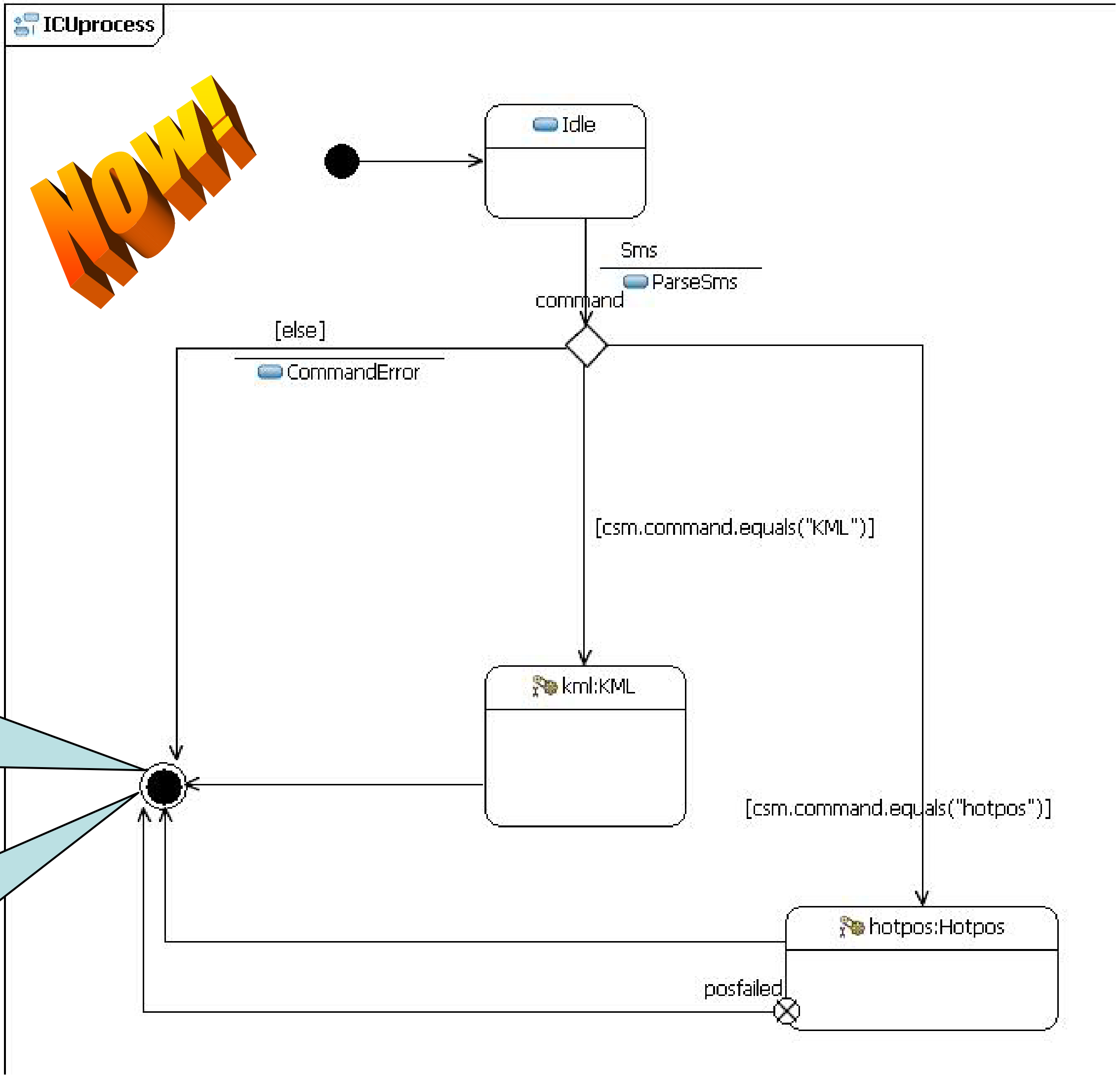


Simple Routing (6) The routing central


ICUsystem
SMSin : SmsInputMediator = ARGS[0],ARGS[0]
smsin
to_icuproc : StaticIDRouter
from_contr
contr : ICUcontroller
from_dataproc
icuproc : ICUprocess [*]
smsout
to_dataproc
SMSout : SmsOutputMediator = ARGS[0],ARGS[0]
from_icuproc
to_contr
dataproc : Archive
why go through *contr*?
otherwise the output port from *dataproc* would have to route; our approach is simpler

Terminating a session



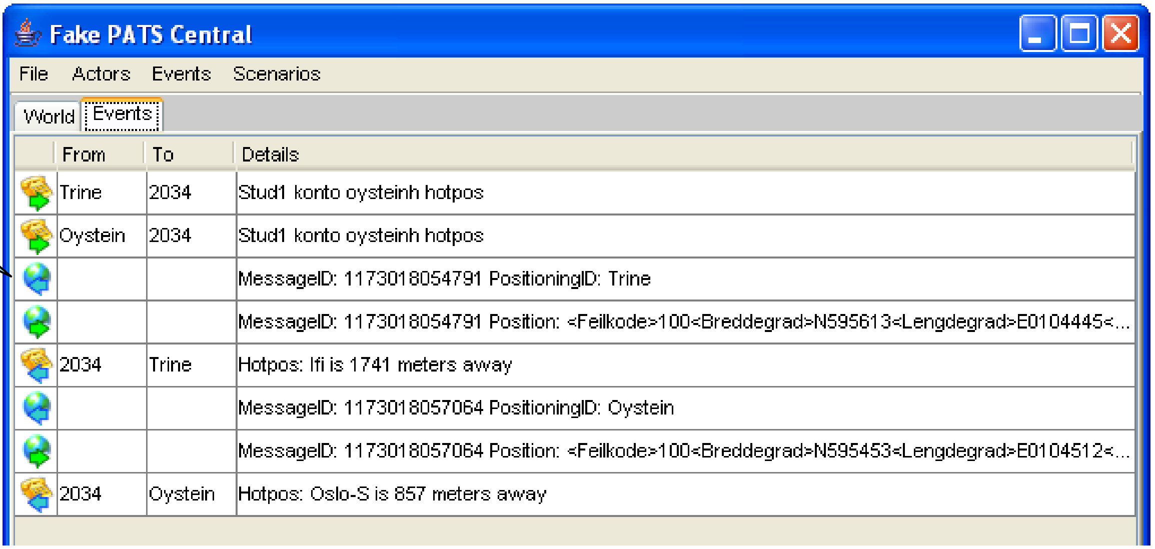


At the final state the *ICUprocess* representing the session will terminate

The compiler and JavaFrame make sure that the implementation gets rid of the session

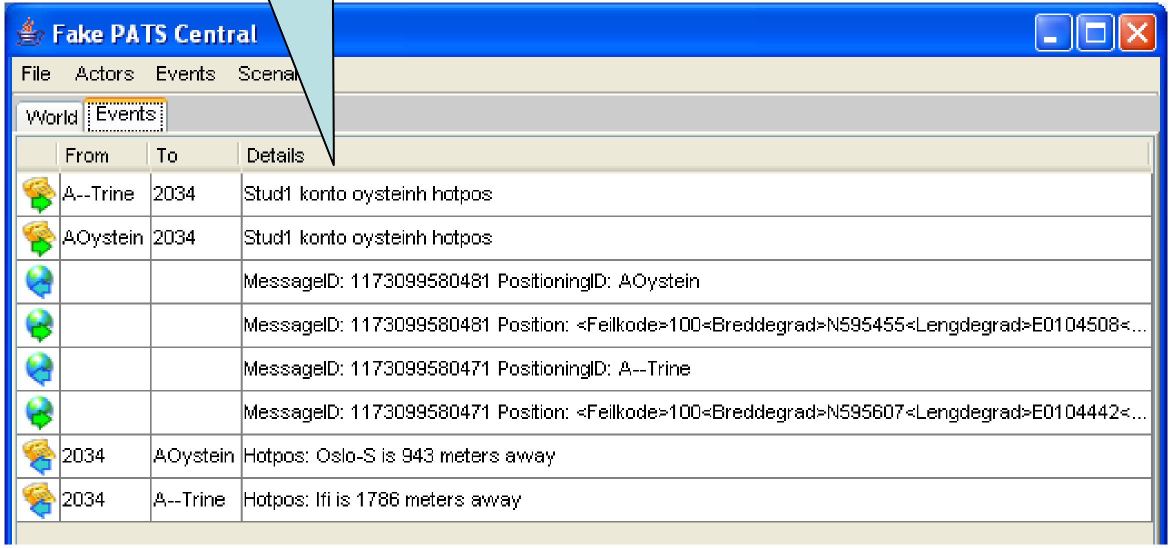
Executing ICU5 (with Sessions)

ICU4-DEFER: sequentialized



From	To	Details
Trine	2034	Stud1 konto oysteinh hotpos
Oystein	2034	Stud1 konto oysteinh hotpos
		MessageID: 1173018054791 PositioningID: Trine
		MessageID: 1173018054791 Position: <Feilkode>100<Breddegrad>N595613<Lengdegrad>E0104445<...
2034	Trine	Hotpos: Ifi is 1741 meters away
		MessageID: 1173018057064 PositioningID: Oystein
		MessageID: 1173018057064 Position: <Feilkode>100<Breddegrad>N595453<Lengdegrad>E0104512<...
2034	Oystein	Hotpos: Oslo-S is 857 meters away

ICU5: more concurrency



From	To	Details
A--Trine	2034	Stud1 konto oysteinh hotpos
AOystein	2034	Stud1 konto oysteinh hotpos
		MessageID: 1173099580481 PositioningID: AOystein
		MessageID: 1173099580481 Position: <Feilkode>100<Breddegrad>N595455<Lengdegrad>E0104508<...
		MessageID: 1173099580471 PositioningID: A--Trine
		MessageID: 1173099580471 Position: <Feilkode>100<Breddegrad>N595607<Lengdegrad>E0104442<...
2034	AOystein	Hotpos: Oslo-S is 943 meters away
2034	A--Trine	Hotpos: Ifi is 1786 meters away

Technicality: StaticID **must** be 8 chars

Summary of Sessions

- One session per concurrent user initiative
  - The state machine type *ICUprocess* describes the session
- One receptionist state machine creates the sessions
  - when the session initiation arrives
  - here: Sms-message
- Centralized routing through the receptionist *contr*
  - one routing port (SimpleIdRouterMediator)
  - all signals aiming for a session are sent through *contr*
- Terminating the session by reaching the final state
  - and the runtime system machinery takes care of the rest