A Coordinated Matrix of RFID Readers as Interactions Input

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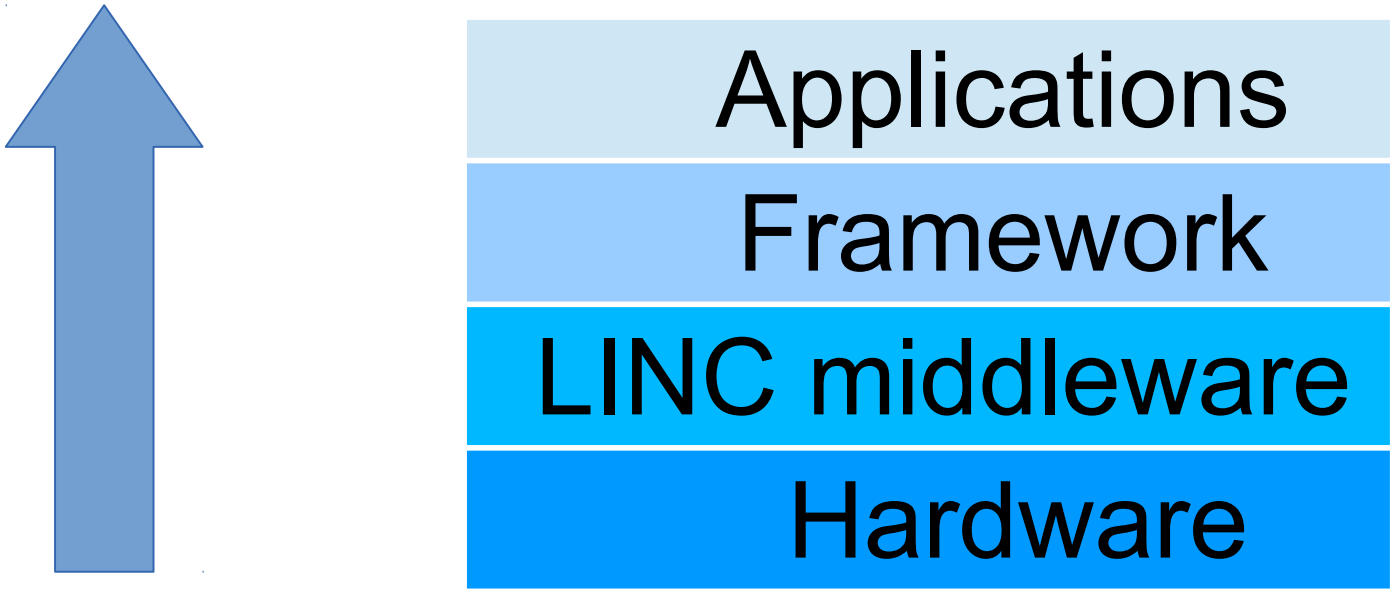
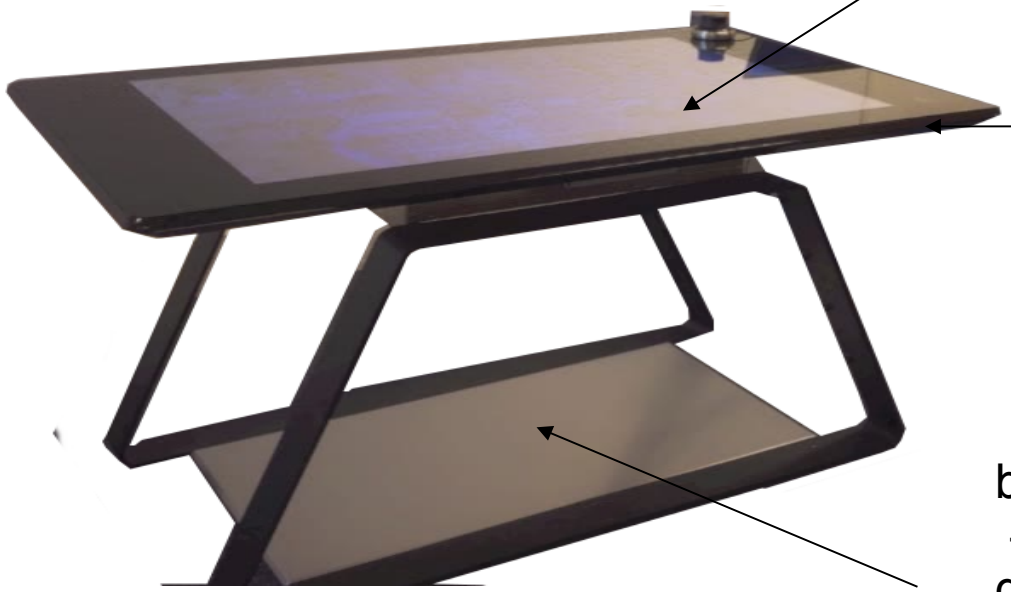
Outline

2 « mediation based » applications using an RFID based « interactive » table

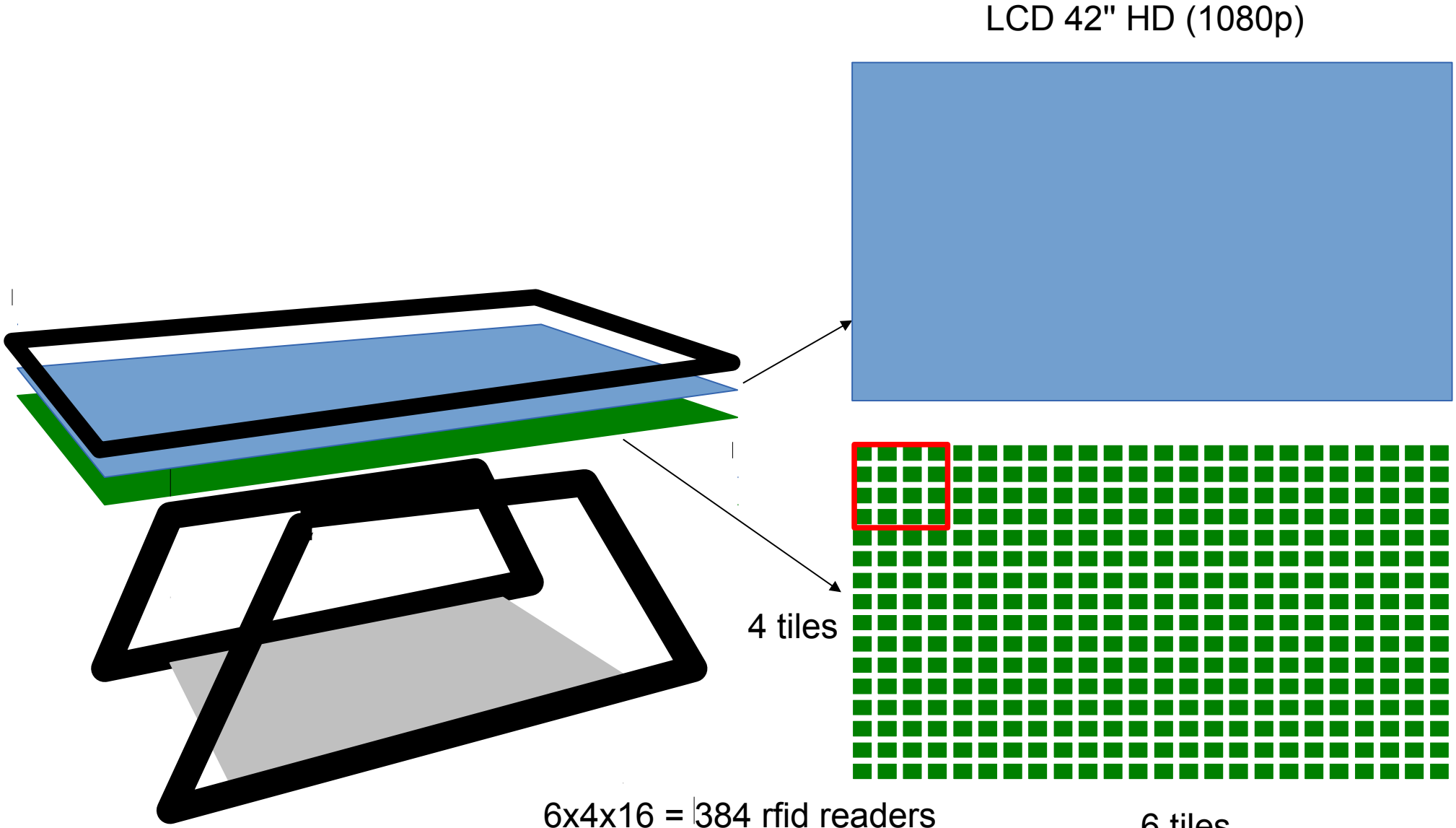


Hardware

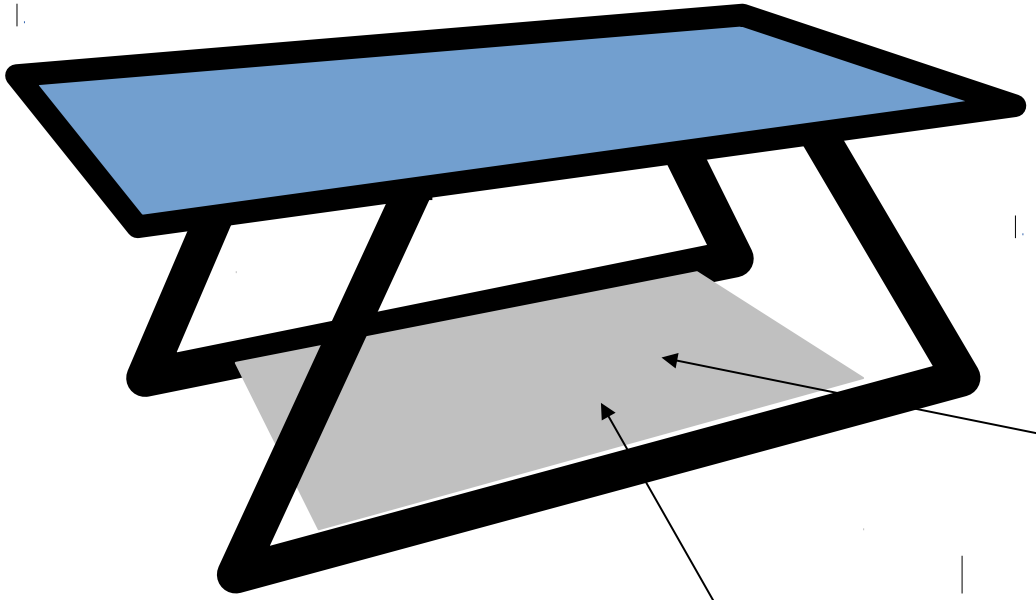
Interactive Table



Interactive Table



Interactive Table



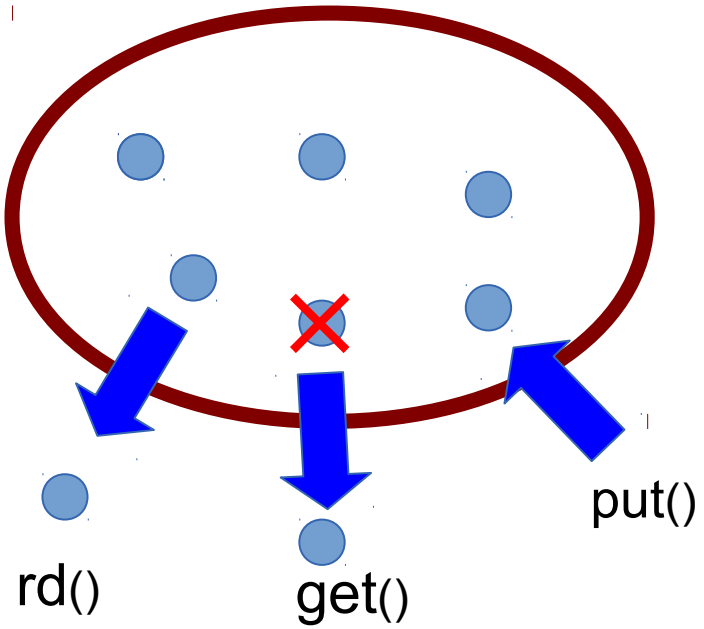
A laptop
- External display (LCD or video projector)
- Application objects

Raspberry Pi
- Table LCD
- Application objects

Coordination Middleware
LINC

Coordination Middleware

Bag paradigm



Abstraction Layer

External services

Sensors / actuators

OS launcher (standalone application)

Database

Tuplespace

Event system

...

Coordination rule

Production rules

precondition

::

performance

Based only on the 3 primitives

precondition → rd() for inference engine

performance → rd(), get(), put()

Coordination rule

Production rules

precondition

::

performance

Based only on the 3 primitives

precondition → rd() for inference engine

performance → rd(), get(), put()

Transaction

Performance is a sequence of transactions

```
precondition
::
{
  op1
  op2
}
{
  op3
  op4
}.
```

op1 AND op2 are done or none of them

op3 AND op4 are done or none of them

if op1 or op2 consumes (get) a resource required by op3 or op4 the second transaction will abort

if op1 or op2 are known to normally consume a resource required by op3 or op4 the second transaction commit only if the first aborted

if op1, op2, op3 and op4 do not compete for any ressource then both transactions are independent

Basics

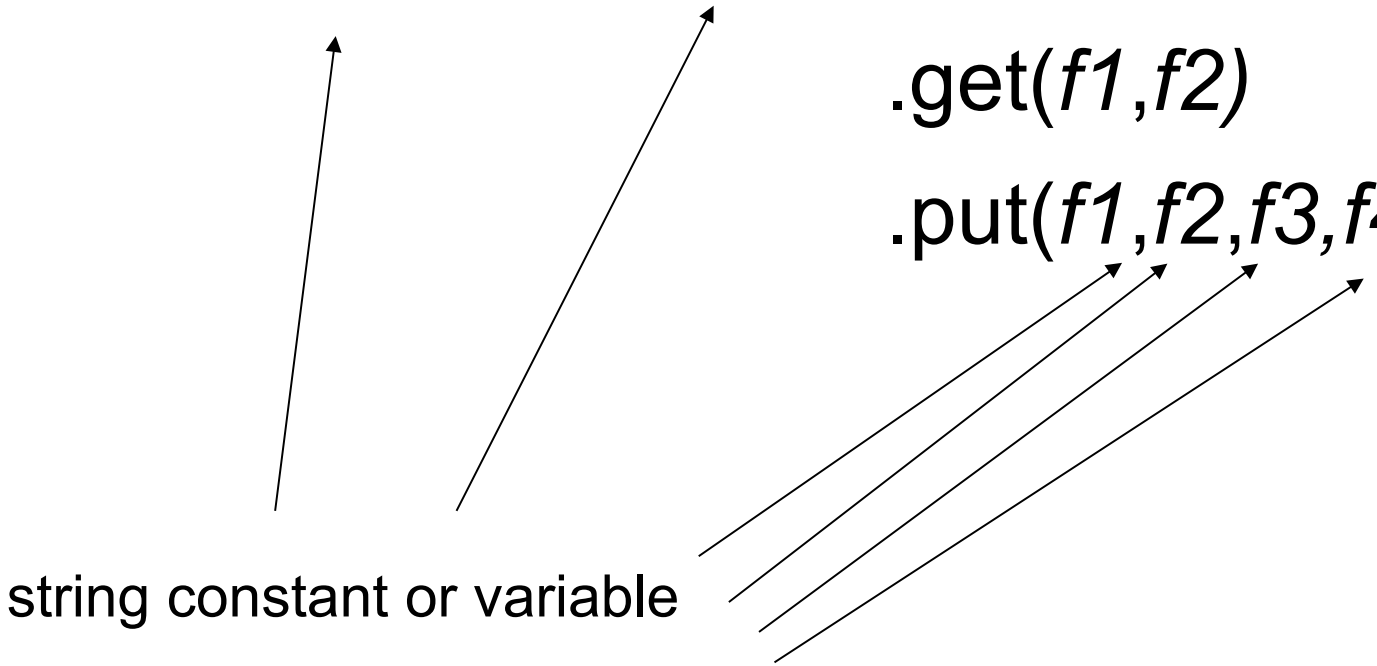
Bags are grouped into objects

Operation

[*objectname*, *bagname*].rd(*f1*,*f2*,*f3*)

.get(*f1*,*f2)*

.put(*f1*,*f2*,*f3*,*f4*)



Framework

Framework

4 Objects

RFID
encapsulates the matrix of rfid readers

2D_Engine
encapsulates an HTML5 renderer (svg, js, bitmap, …)
manages what is displayed on the table

Display
encapsulates video reader

3D_Engine
encapsulates a 3D renderer (2 versions Ogre and OSG)
manages what is displayed on an external screen

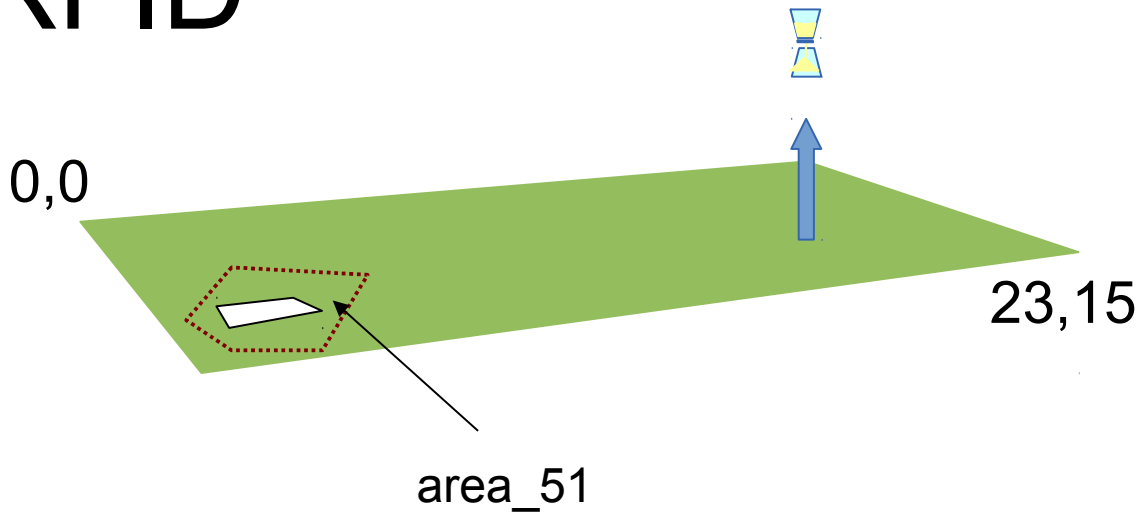
RFID

LogicalTag
(physicalTagId, tagId)
e.g. (”030209348393”, ”tag_1”) ; (”030839320934”, ”tag_f_pacull”)

Type
(tagId, type)
e.g. (”tag_1”, ”tangible_object”) ; (”tag_f_pacull”, ”badge”)

Mapping
(tagId, objectId)
e.g. (”tag_1”, ”hourglass”) ; (”tag_f_pacull”, ”francois_pacull_id_badge”)

RFID



Position
(tagId, posX, posY)
e.g. (”tag_f_pacull”, ”3”, ”12”)

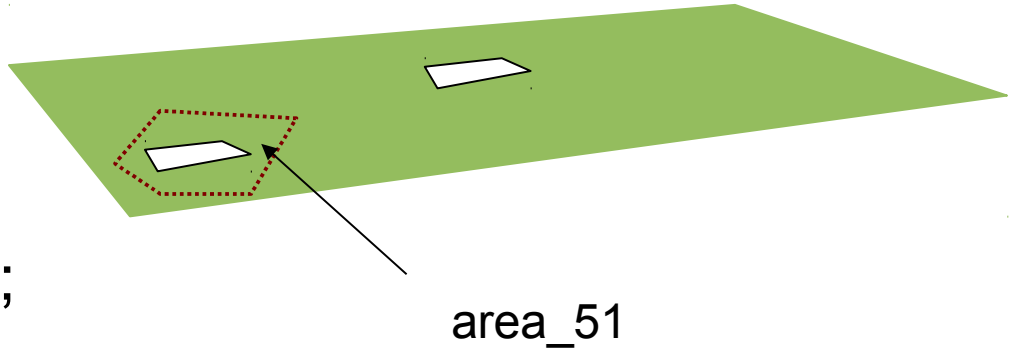
TagStatus
(tagId, status)
status : "in" or "out"
e.g. (”tag_1”, ”out”) ; (”tag_f_pacull”, ”in”)

Area
(areaId, areaDefinition)
areas on the table are defined as a set of points defining a polygon
e.g. (”area_51”, ”4,7 ; 3,5 ; 4,8 ; 2,14 ; 1,10”)

PositionArea
(tagId, areaId)
e.g. (”tag_f_pacull”, ”area_51”)

Rule example

```
["Rfid","TagStatus"].rd(tagId,"in") &
["Rfid","Type"].rd(tagId,"badge") &
["Rfid","PositionArea"].rd(tagId,"area_51")
::
{
   ["Rfid","TagStatus"].rd(tagId,"in");
   ["Rfid","PositionArea"].rd(tagId,"area_51");
   #some actions
}.
```

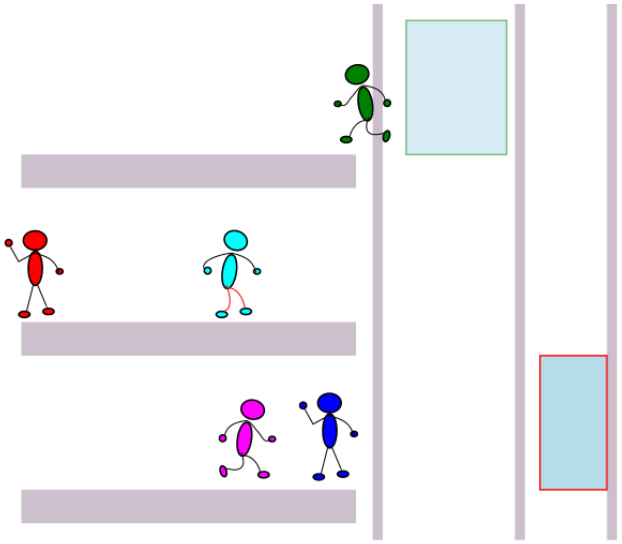


2D Engine

Sprites
(spriteId,x,y, svgfile):
display a sprite (svg image) at the position x,y

MoveSpriteGrid
(spriteid,x,y,duration, nbsteps,renderlist)

Visibility
(spriteId,percent)
opacity

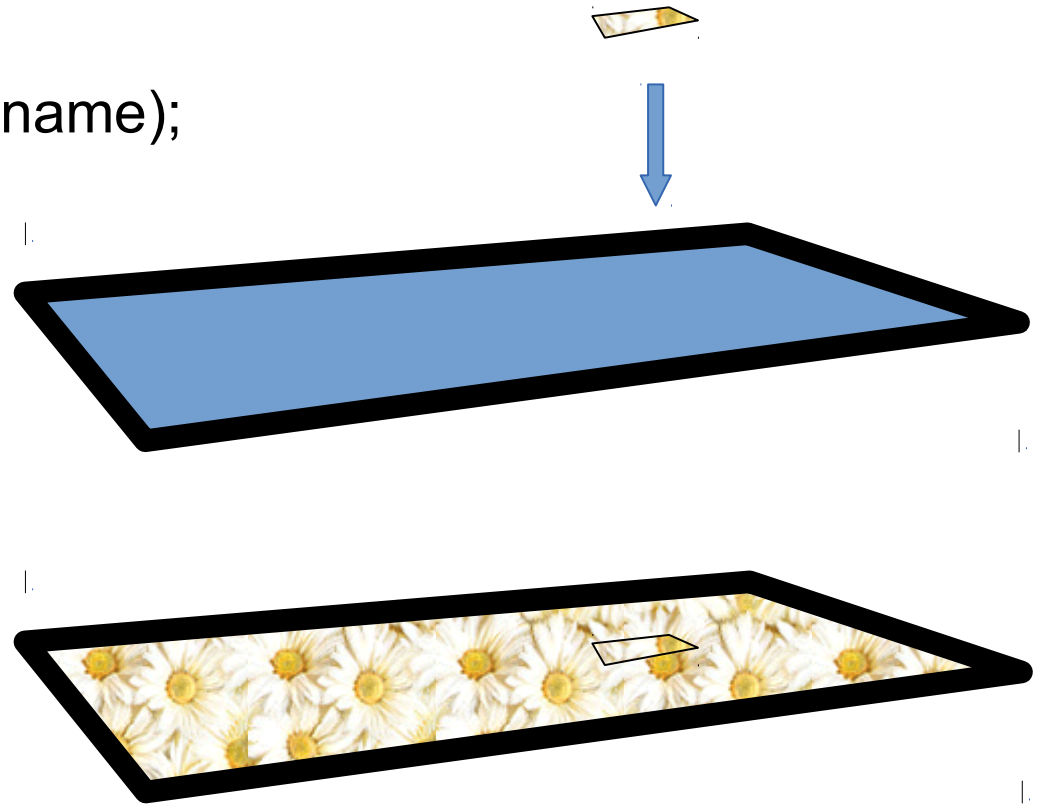


Media
(tagId, filename)

Background
(filename)

Exemple of interaction

```
[”Rfid”,”TagStatus”].rd(tagId,”in”) &
[”Rfid”,”Type”].rd(tagId,”background”) &
[”2DEngine”,”Media”].rd(tagId,filename)
::
{
  [”2DEngine”,”background”].put(filename);
}.
```

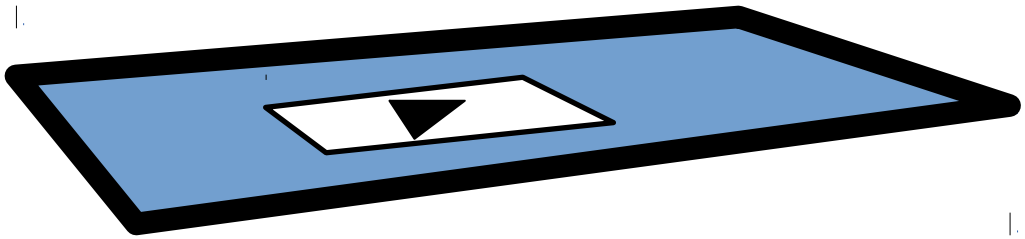


Display

videoPlayer
(playerId, videoname, posX, posY, width, height,orientation, soundTrack)
e.g. (”vlc”, ”video_grenoble”, ”5”, ”4”, ”400”, ”300”,”up”,”no”)

videoPlayerCommand
(videoname, command):
commands → "stop", "pause", "resume", "fs_on", "fs_off"
e.g. (”video_grenoble”, ”pause”)

video
(videoname, status)
status → started, finished,paused
e.g. (”video_grenoble”, ”paused”)



RFID + Display

Rfid

Position
(tagId, posX, posY)
e.g. (”tag_video_1”, ”5”, ”4”)

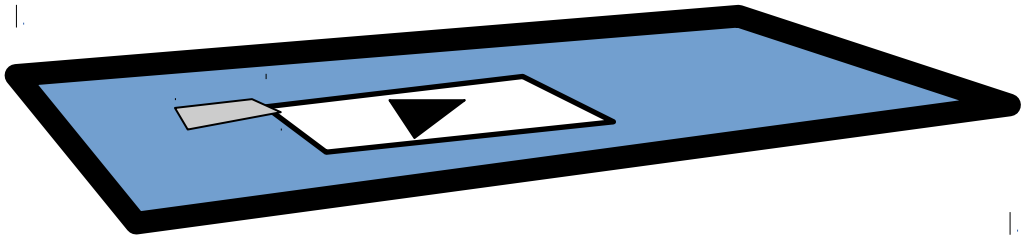
Display

videoPlayer
(playerId, videoname, posX, posY, width, height,orientation, soundTrack)
e.g. (”vlc”, ”grenoble.avi”, ”5”, ”4”, ”400”, ”300”,”up”,”no”)

videoPlayerCommand
(videoname, command):
commands → "stop", "pause", "resume", "fs_on", "fs_off"
e.g. (”vlc”, ”pause”)

Rule example (2)

```
[”Rfid”,”Status”].rd(tagId,”in”) &
[”Rfid”,”Type”].rd(tagId,”video”) &
[”Rfid”,”Position”].rd(tagId,x,y) &
INLINE :x2=x+3 &
INLINE :y2=y+2 &
[”2DEngine”,”Filename”].rd(tagId,filename) &
::
{
  [”Rfid”,”Status”].rd(tagId,”in”) ;
  [”Rfid”,”Position”].rd(tagId,x,y) ;
  [”Display”,”videoPlayer”].rd(”vlc”,filename,x2,y2, ”400”,”300”,”up”,”no”)
}.
```



Application (1)

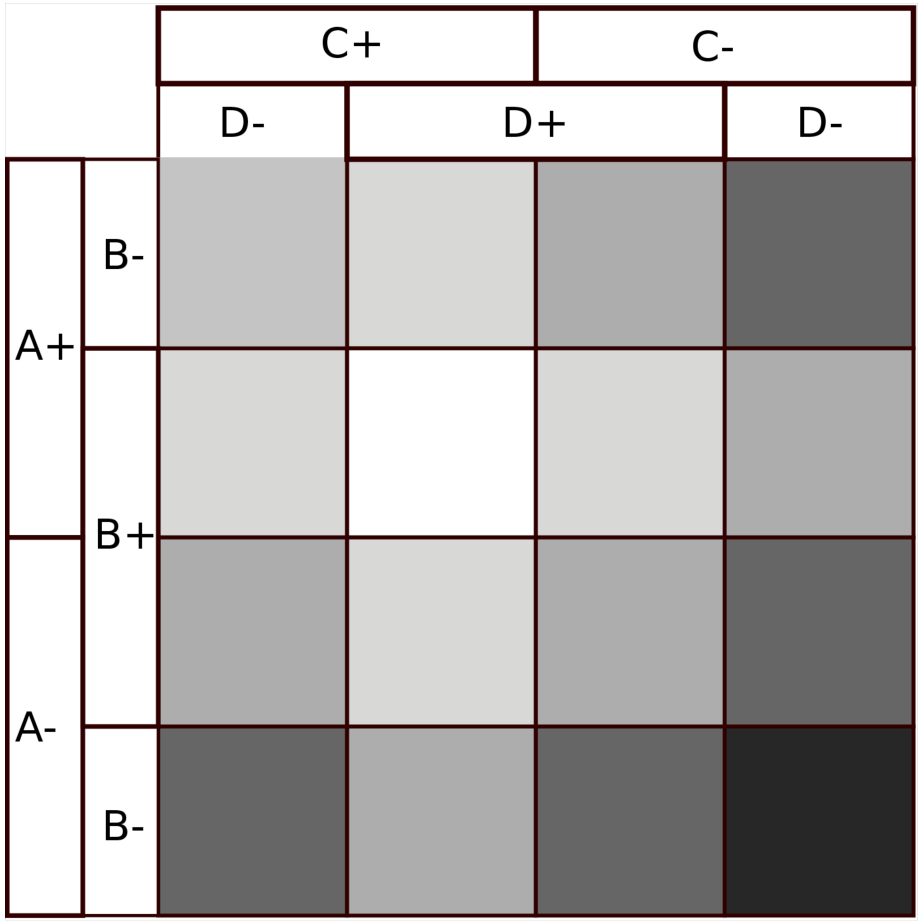
User Panel

n products

4 properties

m users

Each user gives her advice
(positive / negative)
for each of the n products
according to the properties



The lighter the better

Example

Smartphones : …

4 properties

- Autonomy
- Price
- Impact (feeling, brand)
- # of usefull applications

Scenario

- User registration
- Video explaining the process
- n rounds
  - Video of smartphone (opt)
  - 4 rounds
    - Video or data illustrating property for this smartphone (opt)
    - vote collection
- display result

Tagged objects

badge for user id (m)

registration card (start the registration phase)

smartphone pictures (n)

property cards (4)

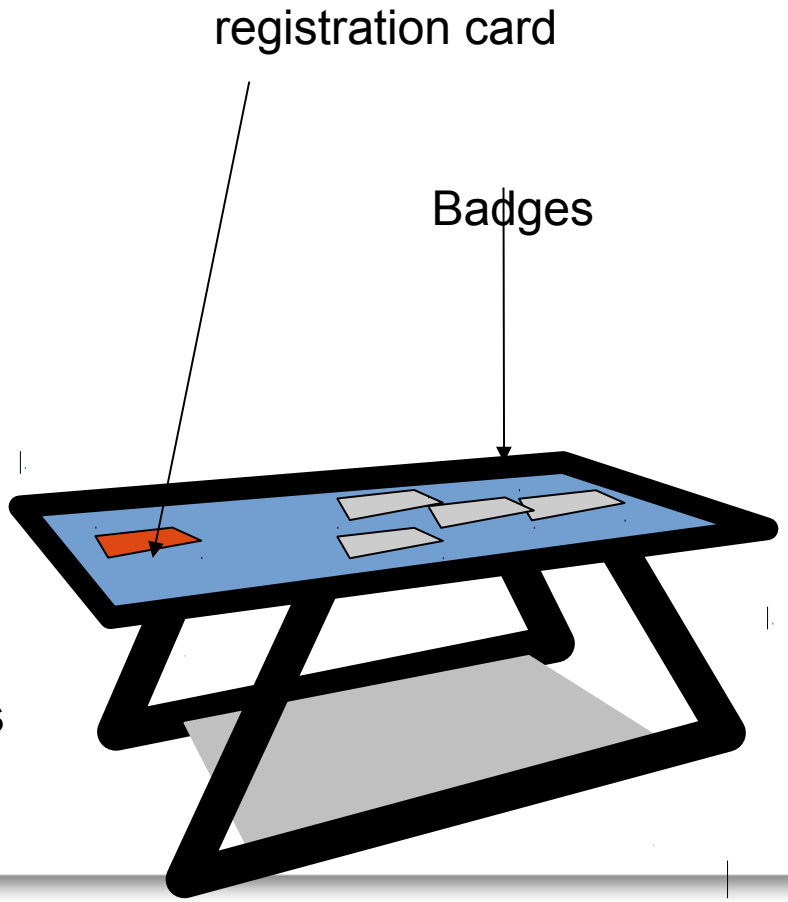
hourglass (start the timer for the vote)

video cards (up to n * 5)

modality cards for video (fs, sound, ...)

Registration

```
[”Rfid”,”Status”].rd(”tag_registration”,”in”) &
[”Rfid”,”Status”].rd(tagId,”in”) &
[”Rfid”,”Type”].rd(tagId,”badge”) &
::
{
   [”Rfid”,”Status”].rd(”tag_registration”,”in”) &
   [”Rfid”,”Status”].rd(tagId,”in”) &
   [”Application”,”Users”].put(tagId)
}.
```



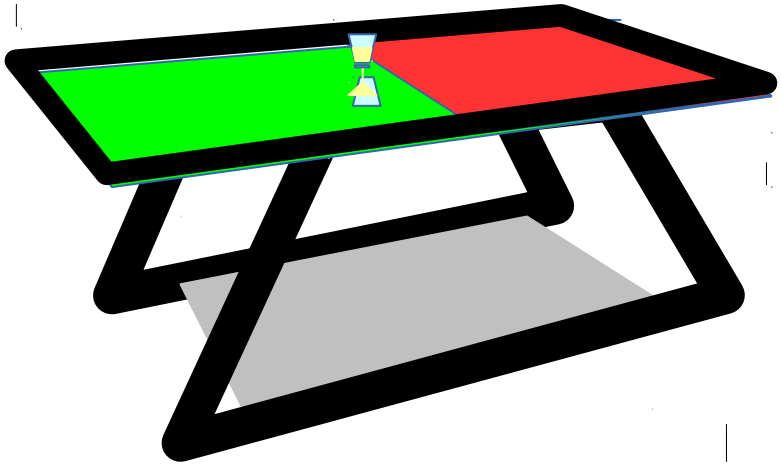
start when registration card is placed on the table

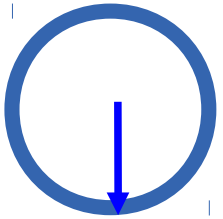
stop immediately when registration card is removed

as result all the registered users are in the bag **Users**

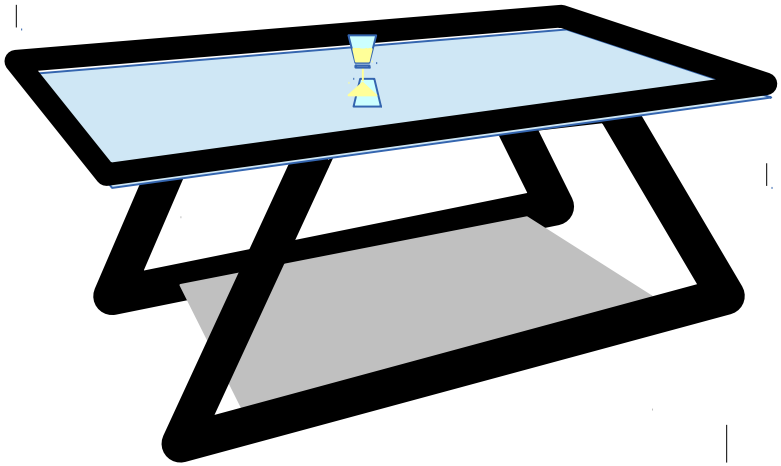
Vote

```
["Rfid","Status"].rd("tag_vote","in") &
::
{
   ["Application","Step"].put("vote_started")
   ["2D_Engine","Background"].put("vote_bg")
}.

_____

["Application","Step"].rd("vote_started") &
SLEEP: 30
::
{
   ["Application","Step"].get("vote_started")
   ["2D_Engine","Background"].put("end_vote_bg")
}.

_____

["Application","Step"].rd("vote_started") &
["Rfid","Status"].rd("tag_vote","out") &
::
{
   ["Application","Step"].get("vote_started")
   ["Rfid","Status"].rd("tag_vote","out") &
   ["2D_Engine","Background"].put("end_vote_bg")
}.
```



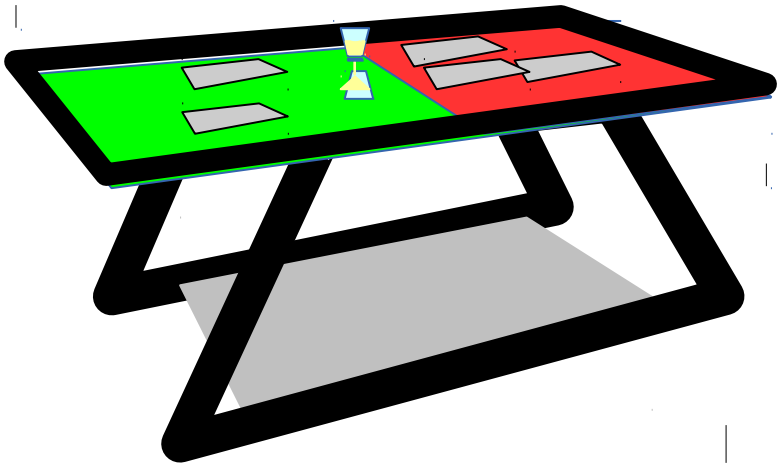


30 secs



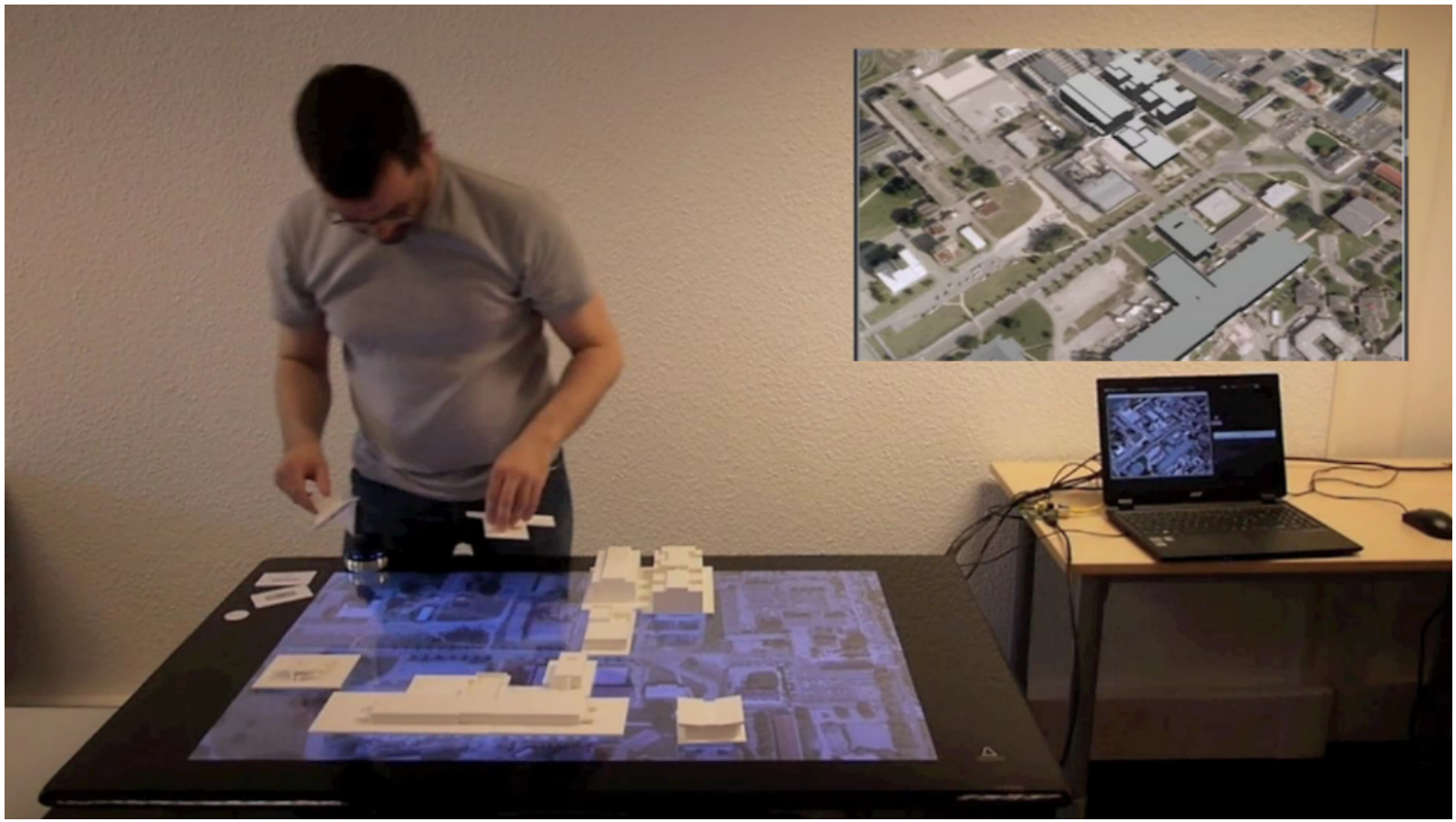
Vote

```
["Application","Step"].rd("vote_started") &
["Rfid","Status"].rd(tag_product,"in") &
["Rfid","Type"].rd(tag_product,"product") &
["Rfid","Status"].rd(tag_property,"in") &
["Rfid","Type"].rd(tag_property,"property") &
["Application","Users"].rd(user_tagId) &
["Rfid","Status"].rd(user_tagId,"in") &
::
{
   ["Application","Step"].rd("vote_started")
   ["Rfid","Status"].rd(tag_product,"in")
   ["Rfid","Status"].rd(tag_property,"in")
   ["Rfid","Status"].rd(user_tagId,"in")
   ["Rfid","Area"].rd("positive",user_tagId)
   ["Application","Vote"].put(tag_product, tag_property,user_tagId, "+")
}
{
   ["Application","Step"].rd("vote_started")
   ["Rfid","Status"].rd(tag_product,"in")
   ["Rfid","Status"].rd(tag_property,"in")
   ["Rfid","Status"].rd(user_tagId,"in")
   ["Rfid","Area"].rd("negative",user_tagId)
   ["Application","Vote"].put(tag_product, tag_property,user_tagId, "-")
}.
```



Application (2)

Urban Mediation



dasein interactions

Conclusion

* Reusability of framework
  - Rfid, 2D_Engine, Display are the same in the 2 applications
  - 3D_Engine has been added for the second application
* Linc Middleware can accomodate of light CPU
  - 2D_Engine runs on a Raspberry Pi
* Hardware
  - Promising innovation area in term of usage and mediation
* Future work
  - Extend Urban Mediation Application