

Natural User Interaction

with

AaltoWindow

Jari Kleimola

Researcher

Dept. of Signal Processing and Acoustics / Media Technology

Multitouch Interaction (25114) / 9.12.2011

Outline

- Natural User Interaction
- AaltoWindow
- Content

Natural User Interaction (NUI)

- **Natural = using existing skillset** (Buxton 2010)
 - innate abilities (acquired automatically by just being human)
 - simple skills (learned by observation, transfer to other tasks)
 - composite skills (collection of simple skills)
 - once skills are learned, they become natural
- **Learning is an innate ability**
 - learning while using
 - ease-of-use is not a primary design goal
 - a) obvious enough to do simple tasks straight away
 - b) paths to unfold "hidden" functionality

Natural User Interaction (NUIs)

- **Direct Manipulation** (Schneiderman 1982)
 - transparent user interface : interact in problem domain
 - a) define a real-world metaphor for the interface
 - b) bind gestures directly to the metaphor objects and semantics
 - c) nuke complicated syntax !
- **Natural but super-realistic environment**
 - familiar metaphor, physics
 - with magic, cool
 - engaging user experience
- **Flow**
 - gestural phrases : start, manipulate, stop
 - do many things simultaneously
 - translate – scale – rotate
 - peek inside by scaling larger then back to normal

Example : photo browser



Metaphor : photos on a table

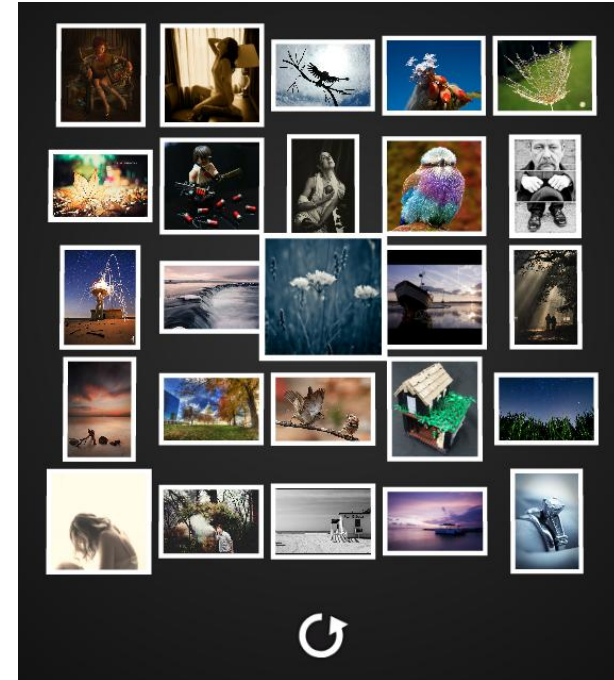
- natural : drag + rotate (simple skills)
- magic : scale
- direct manipulation (simple syntax)
 - compare with "scale exe c:/photos/img1.jpg 0.8", or a modal dialog
- flow : drag, rotate and scale simultaneously
- learning paths ?

Example : photo browser



red carpet zoom

<http://movies.msn.com/wonderwall/red-carpet-zoom/>



tiltviewer

<http://simpleviewer.net/tiltviewer/app/>

(these are mouse-based, but illustrate some NUI concepts, as well as differences between mouse and multitouch interaction)

Outline

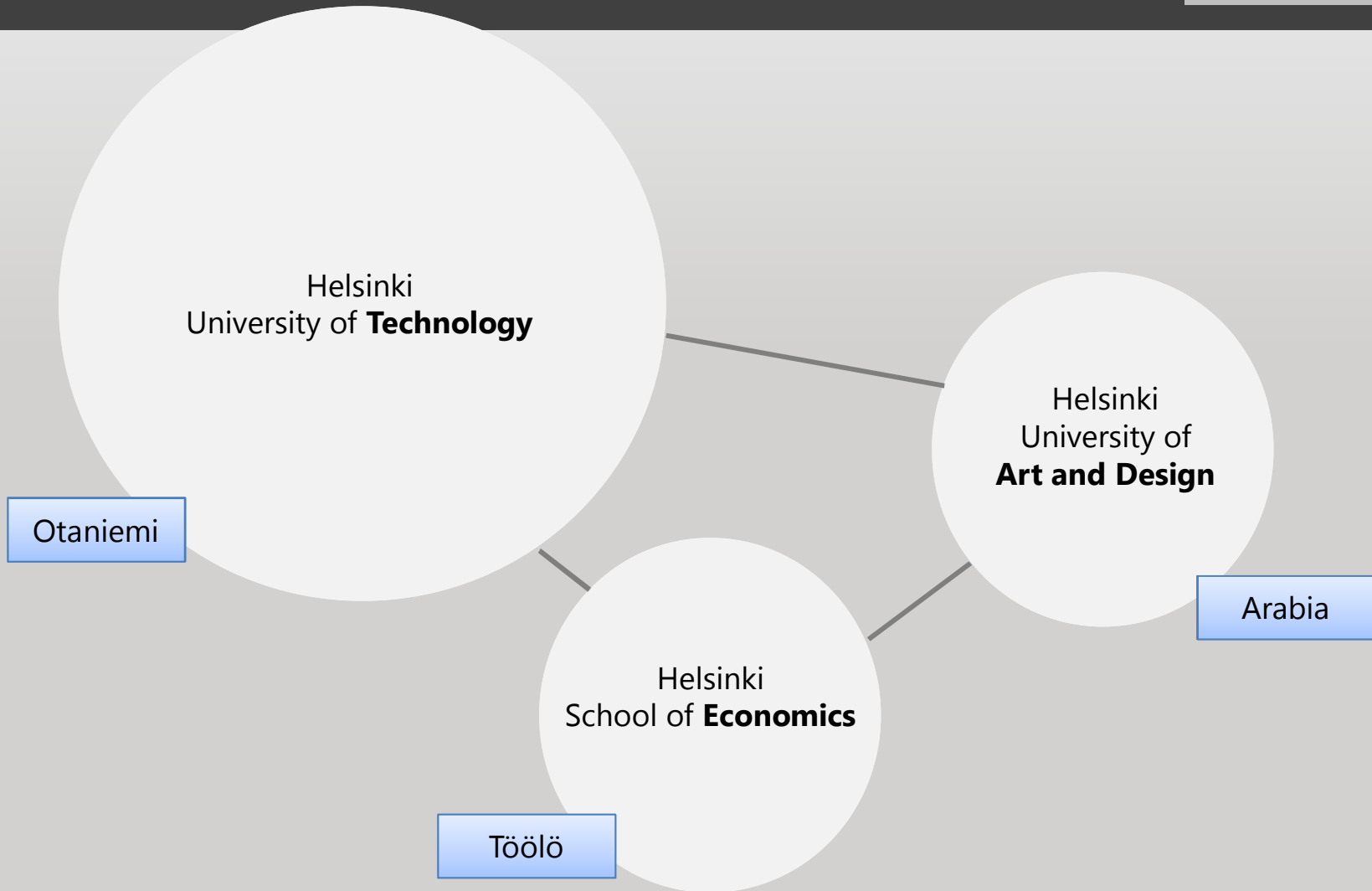
- Natural User Interaction
- AaltoWindow
- Content



a virtual window into our university

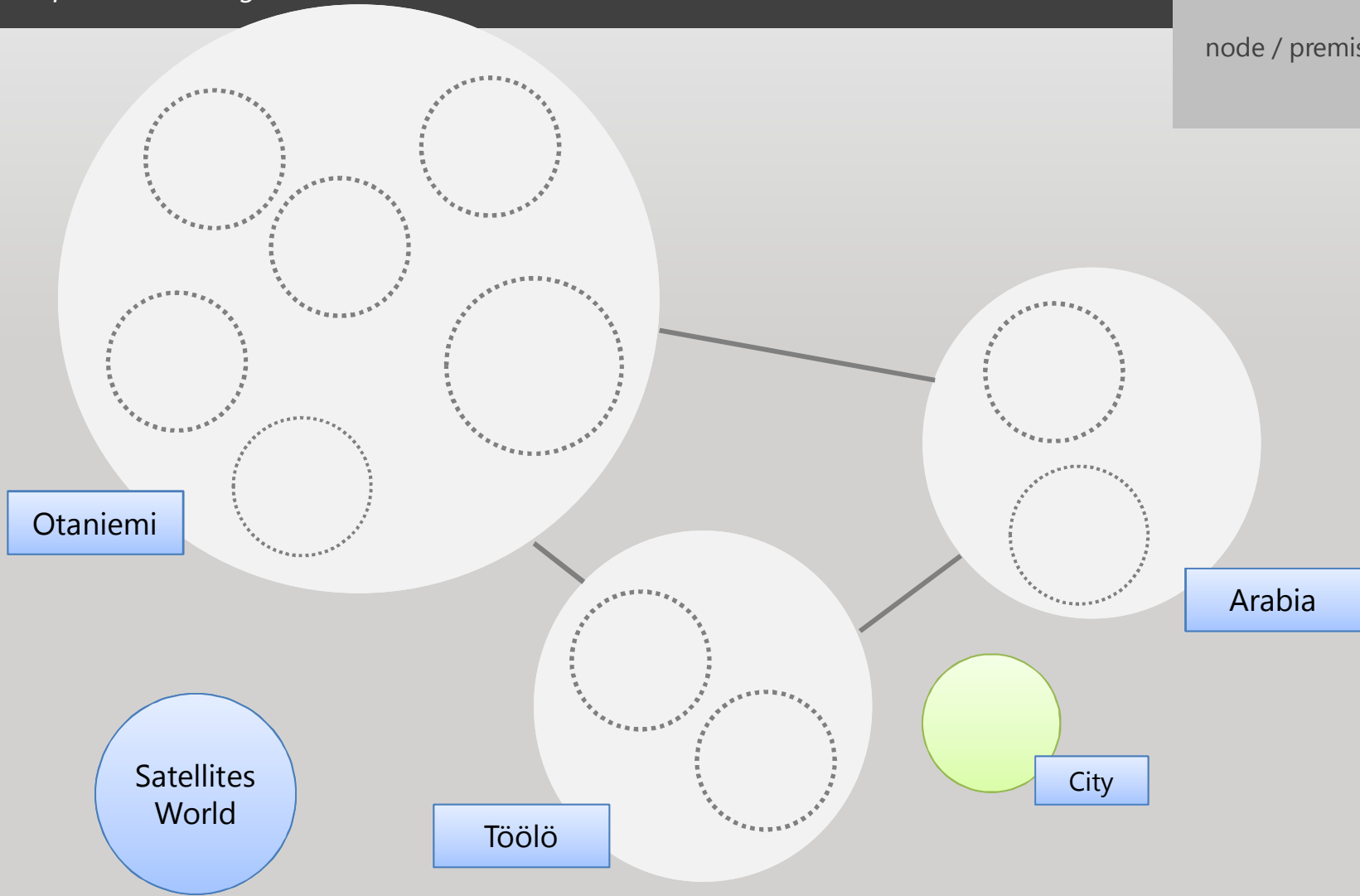
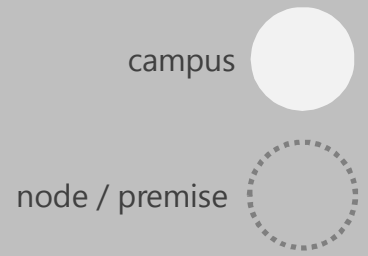
Aalto University merger (2010)

campus

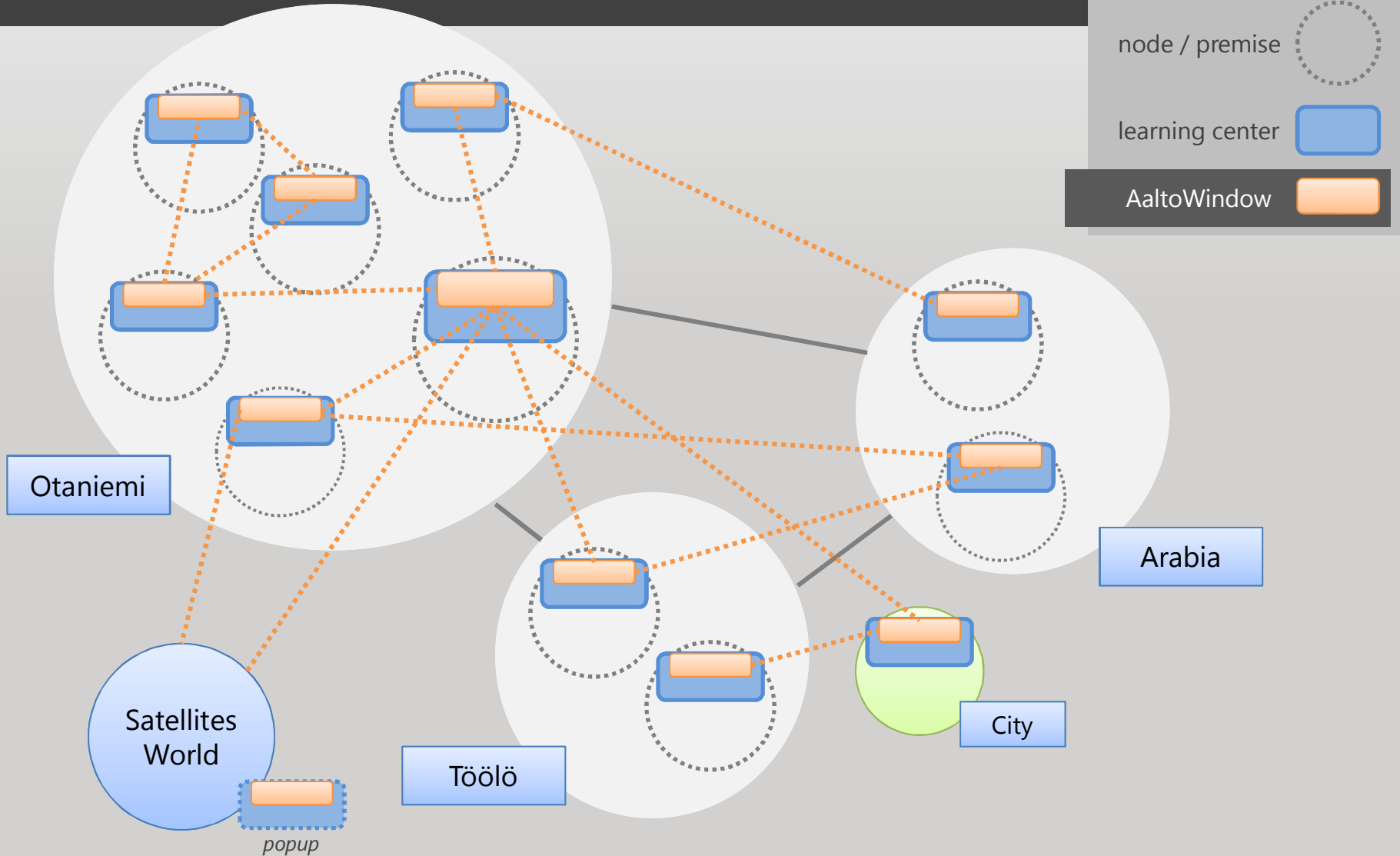


6 schools, 38 departments, institutes, units...

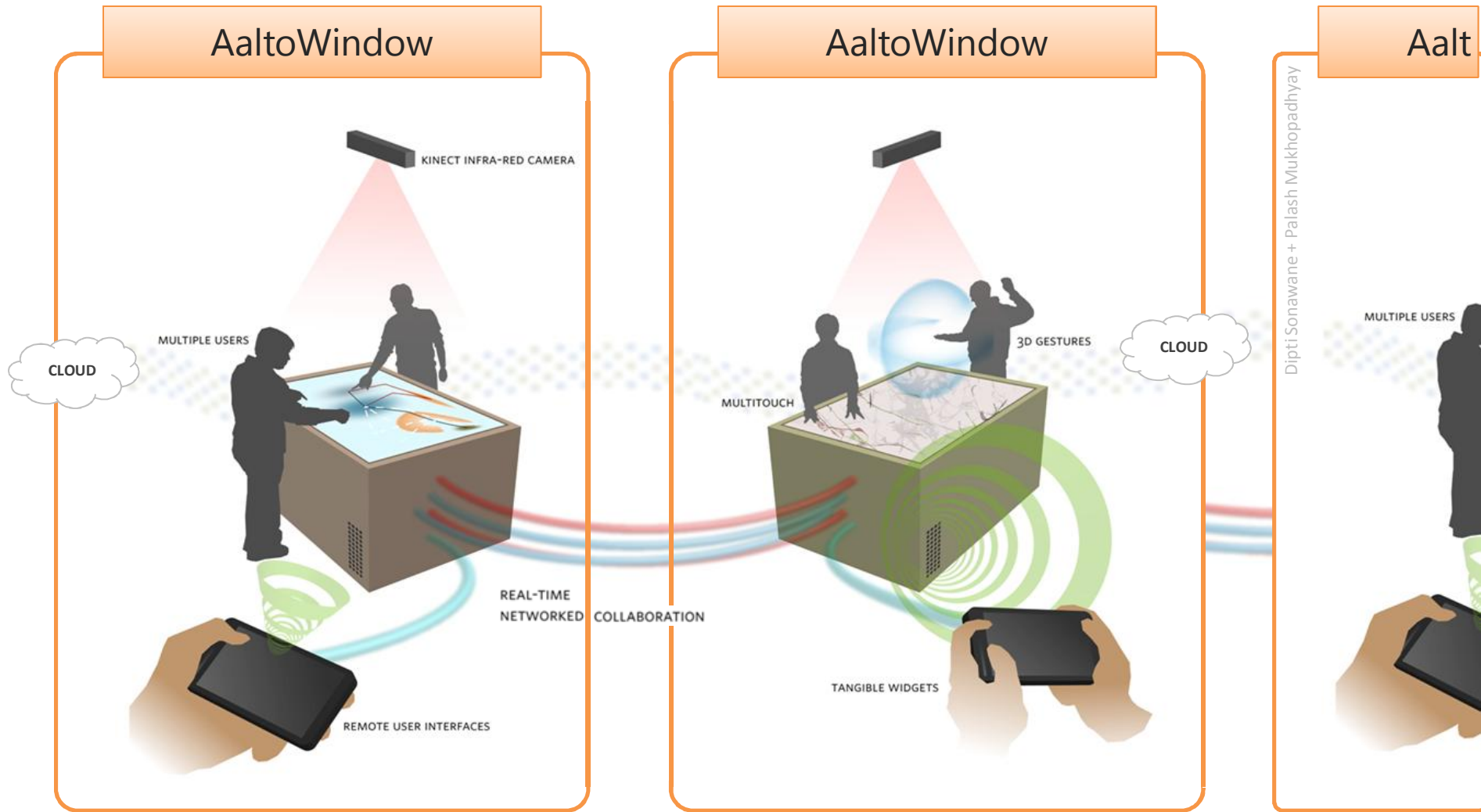
in separate buildings



AaltoWindow project



AaltoWindow stations



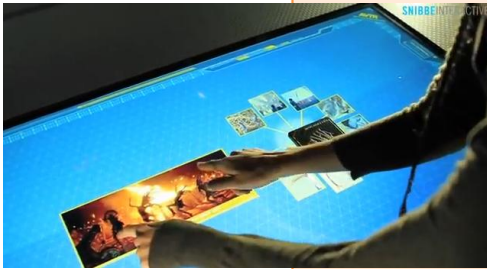
Arabia (kipsari / Media Factory)

Otaniemi (main lobby / Design Factory)

Töölö

1. AaltoWindow hardware

each station consists of



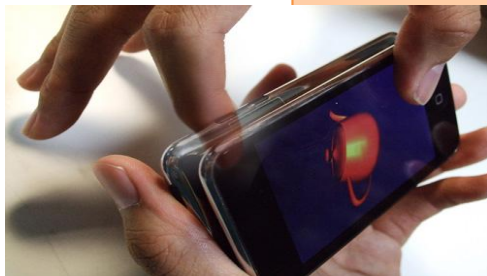
46" multitouch table

- unlimited touch points
- marker tracking
- full HD display
- speakers



Kinect

- people tracking : two active skeletons, fingers
- object tracking : color/shape recognition
- sound source localization
- speech recognition



access point for mobiles, pads + internet

- mobile sensors : touch screen, accelerometers, keypad etc.
- user identity
- internet media + services
- low latency (4 ms) connection between the stations

2. AaltoWindow software platform

supported frameworks:



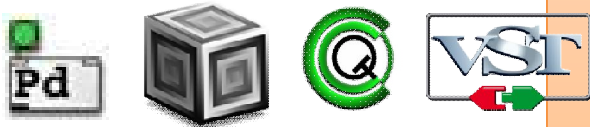
HTML5 + JS : browsers, Silverlight, *Flash*
webkit + mozilla touch events



Java : Processing, MT4J
C# : WPF, WinForms
C++ : SDL/OpenGL, *openFrameworks*, cinder, cornerstone, Win32



python : pyMT, kivy
others : vvvv, *Unity*
mobile : *WP7, Android, Qt*



audio : Pd, SuperCollider, Csound, VST plugins



networking : tuio/osc, midi, ØMQ, XMPP, HTTP

3. support for content creation

community website (soon)

<http://aaltowindow.aalto.fi>

- documentation
- sample code, libraries, mouse simulators
- blog, forum + helpdesk, booking

resources, multitouch table booking

<https://noppa.aalto.fi/noppa/kurssi/t-111.5350>

blog

<http://blogs.aalto.fi/aaltowindow>

contact

jari.kleimola [at] aalto.fi

- Natural User Interaction
- AaltoWindow
 1. hardware
 2. software
 3. support for content creation
- 4. Content

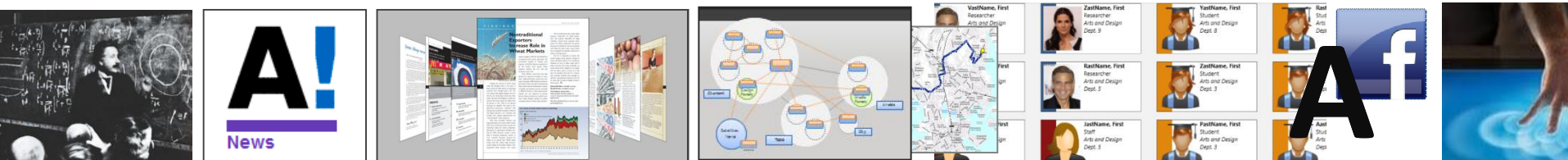
4. Content is produced by the Aalto community



A) students --- target platform for study courses, design competitions, installations, portfolios

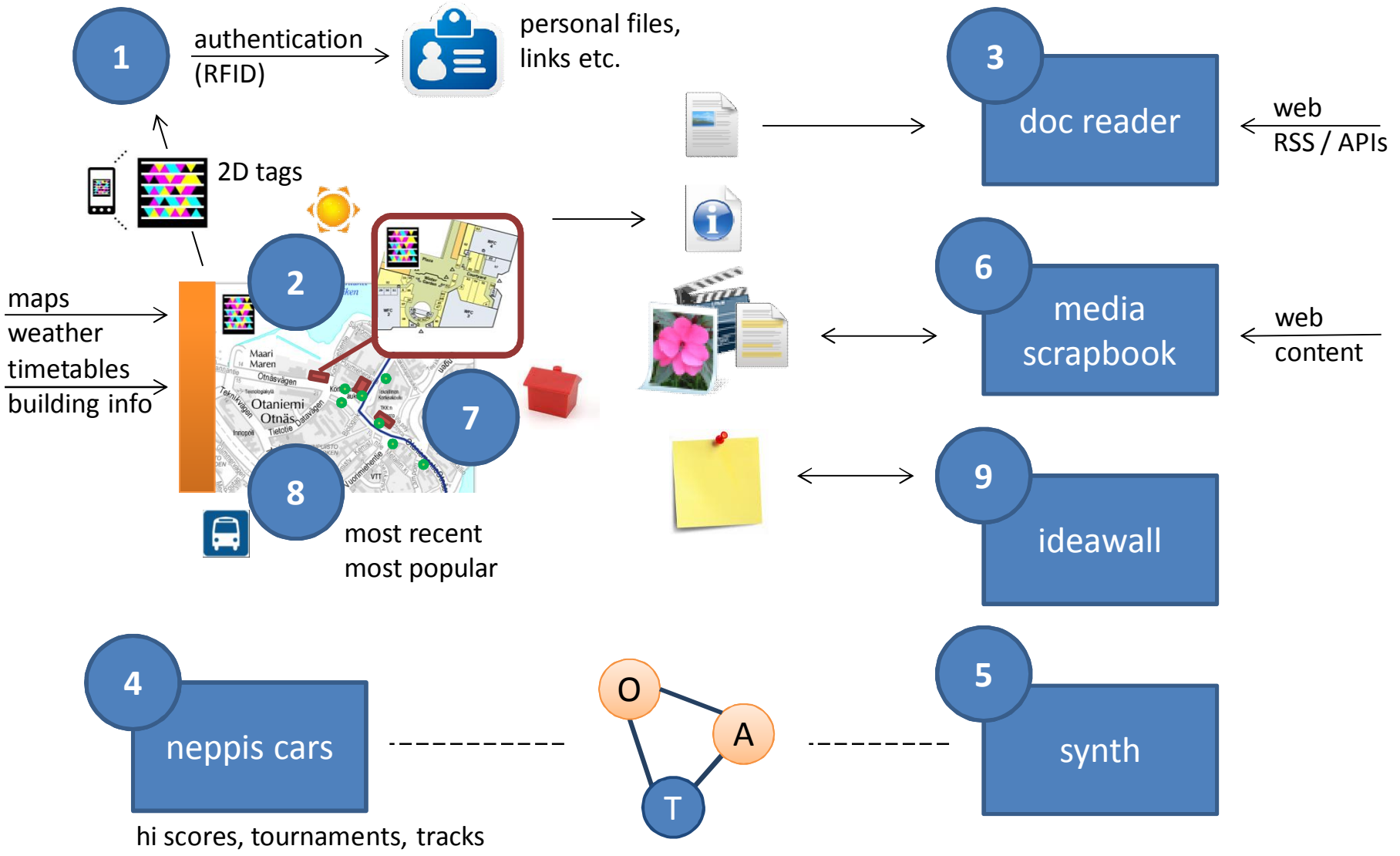


B) researchers --- novel research themes, collaboration, extended visibility, demos, pitching for funding



C) aalto services --- lecture streams, Aalto info, library, campus maps, cloud services, social media

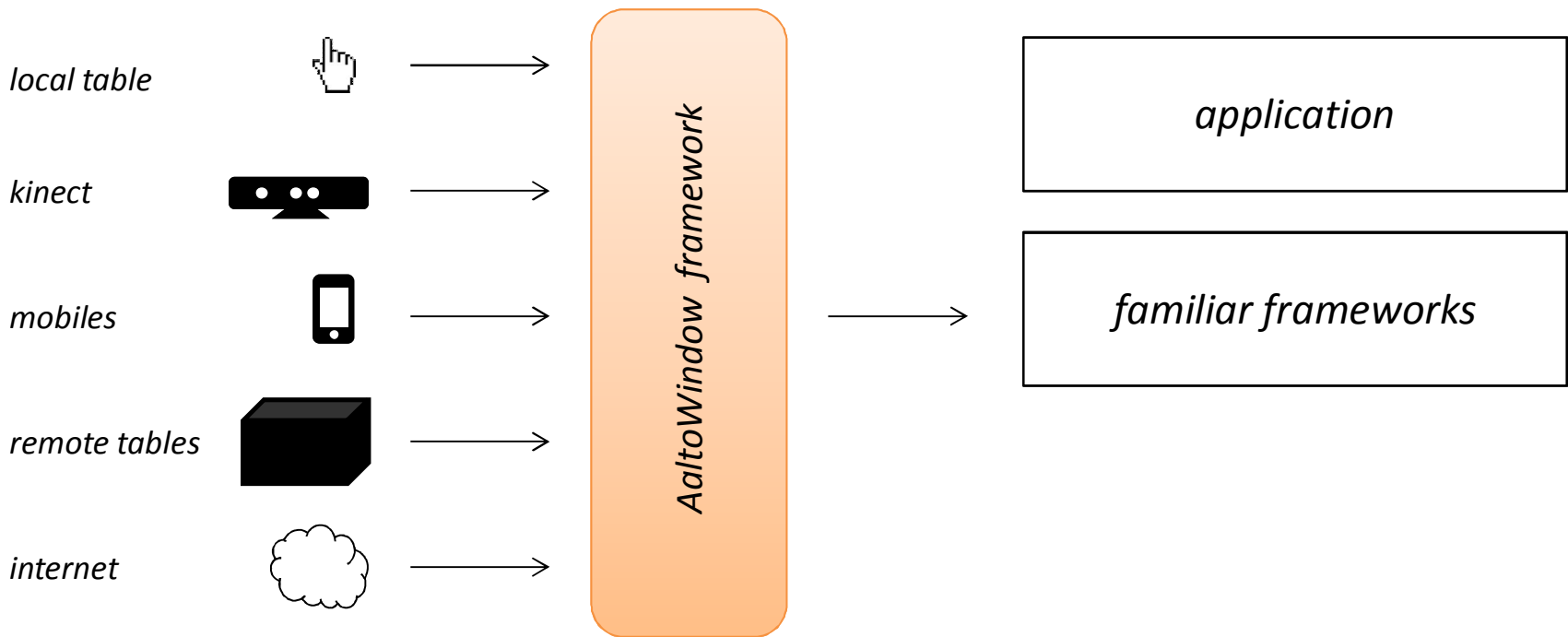
Pilot content from Multimedia Programming course (9 groups, 21 students)



Development with AaltoWindow

Idea : augment familiar frameworks with

- multimodal interaction
- realtime networked interaction (between tables)
- media and service access (internet + local)





```
AWInputStream istream;
```

```
void setup() {
```

```
...
```

```
    istream = new AWInputStream(this);
```

```
    istream.subscribe("/surface/touch");
```

```
    istream.subscribe("/kinect/skeleton");
```

```
    istream.start();
```

```
}
```

```
void onOsc(OscMessage msg) { ... }
```

```
void onTuioCursor(int msg, TuioCursor tcur) { ... }
```

eg. Processing (higher level, with gestures/postures)

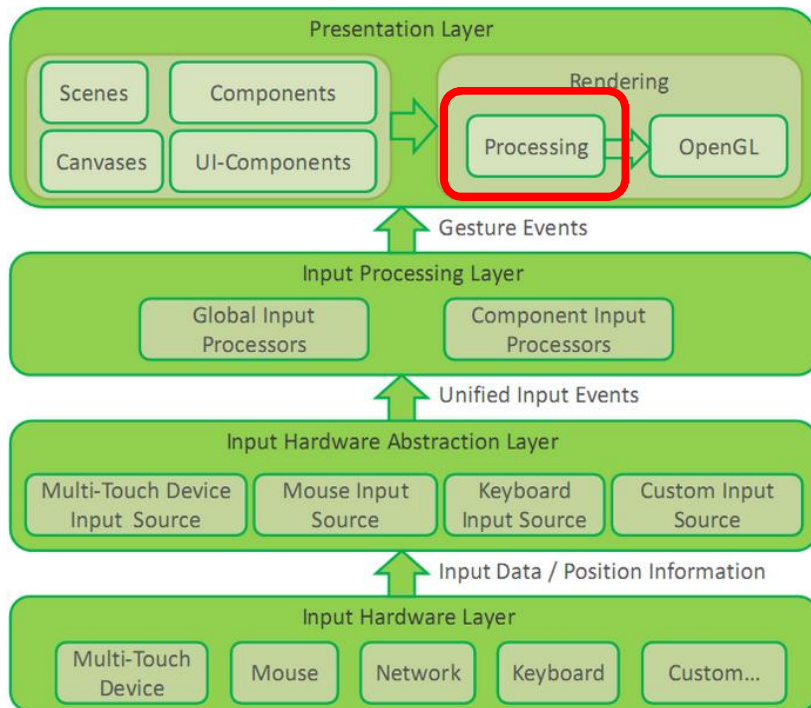


```
AWInputStream istream;
AWScene scene;

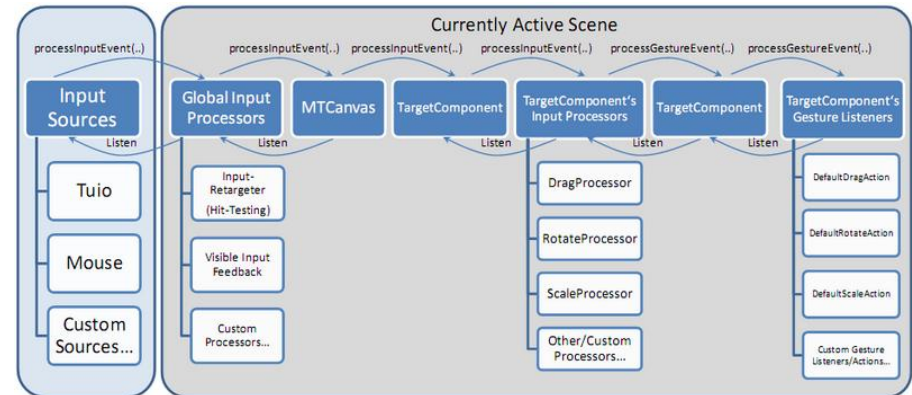
void setup() {
    ...
    istream = new AWInputStream(this);
    istream.subscribe("/surface/touch/gesture/tsr");
    istream.subscribe("/kinect/skeleton/posture/rightHello");
    istream.start();
    ...
    scene = new AWScene(this);
    SimpleTouchObject sto = new SimpleTouchObject(...);
    scene.addObject(sto);
}

void onOsc(OscMessage msg) { ... }
```

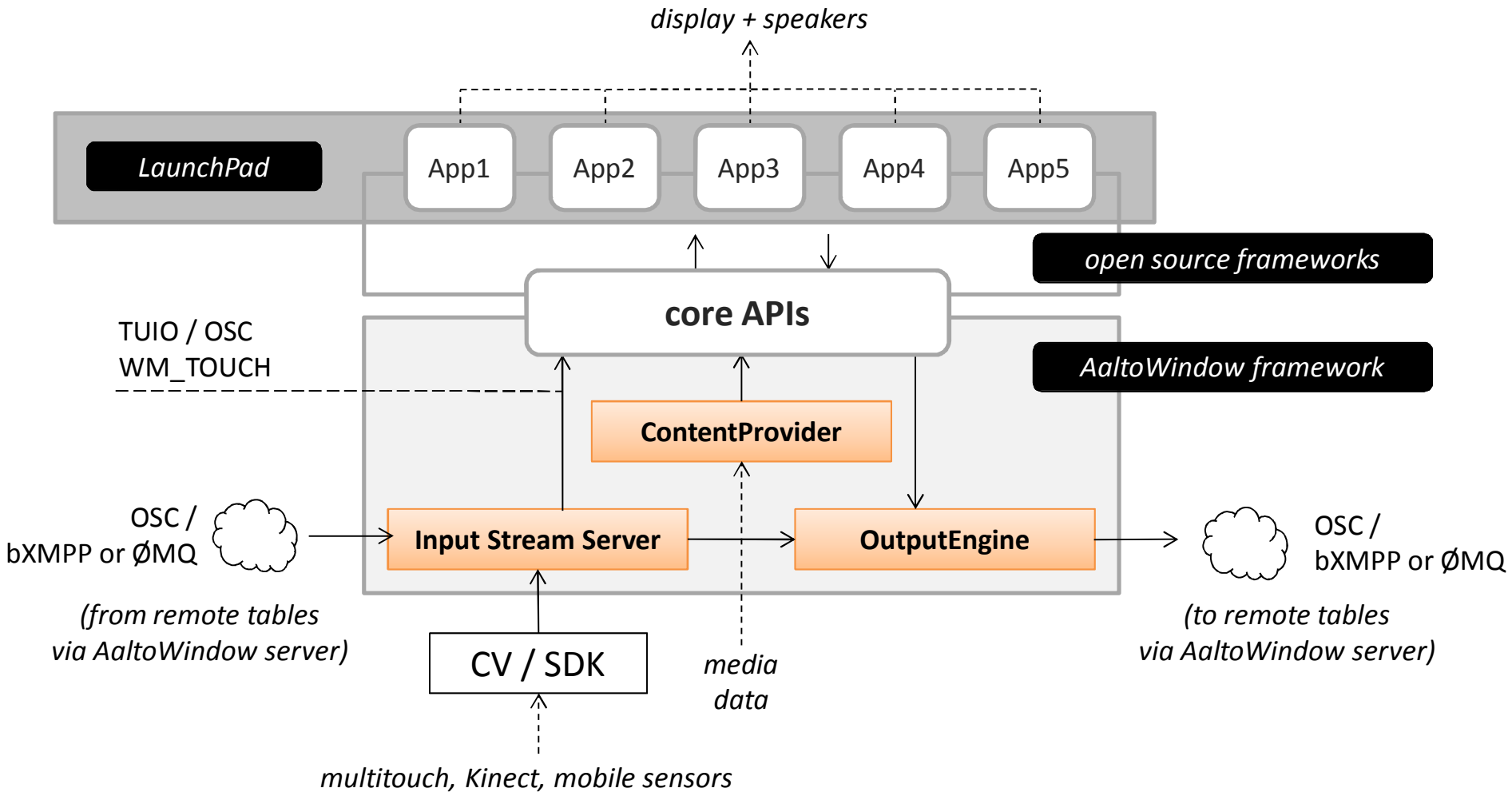
architecture



event flow



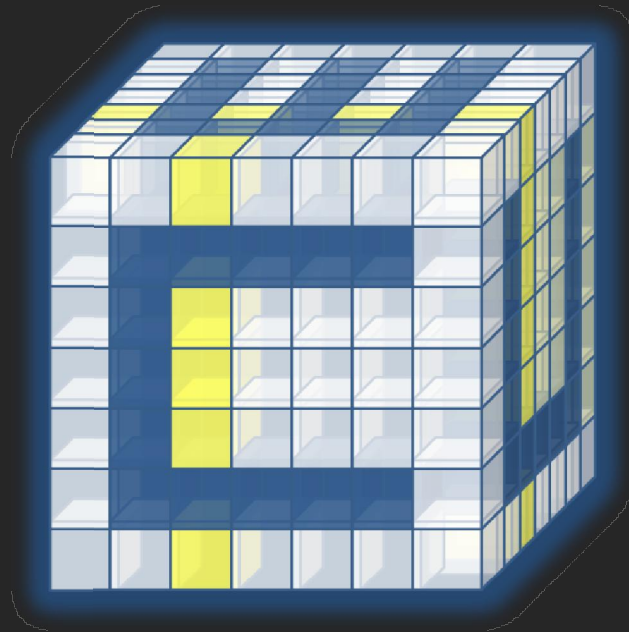
Software architecture



- Natural User Interaction
- AaltoWindow
 1. hardware
 2. software
 3. support for content creation
- 4. Content
 - idea : build on top of augmented familiar frameworks
 - The Cube
 - virtual graffiti

The Cube

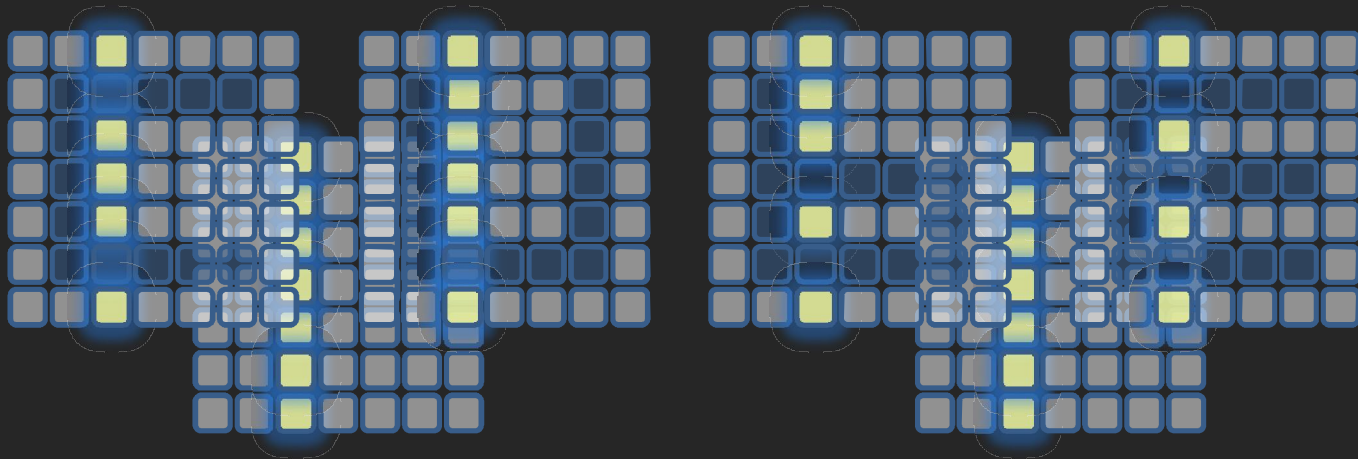
interactive social music box



*Music making is an interactive experience
that is even more engaging and fun when playing together*

The Cube

interactive social music box

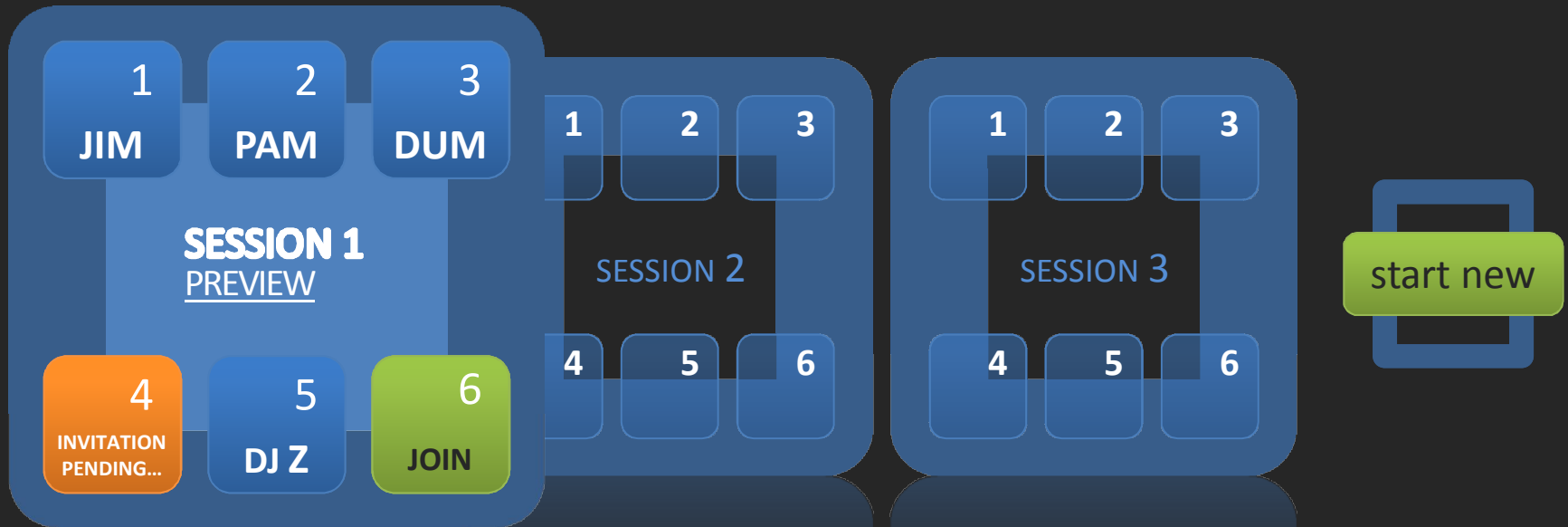


- six step sequencers ————— up to six users, anywhere in the world
- synced together in realtime ————— with multi-touch based interaction
- triggering on-board sounds ————— create contemporary and vintage grooves



The Cube

interactive social music box



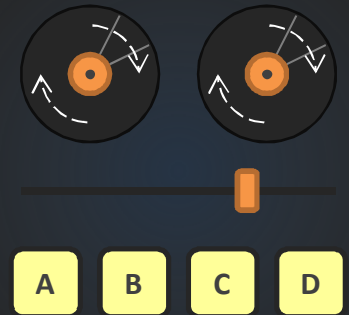
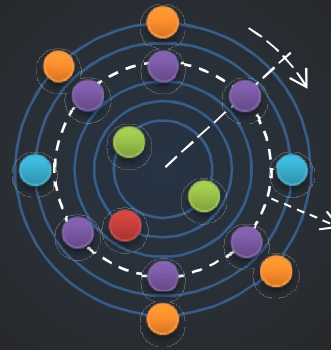
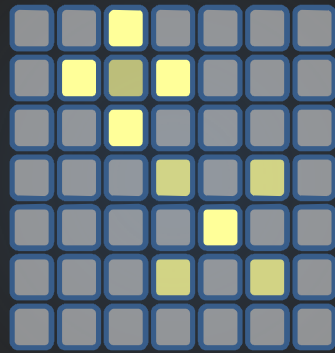
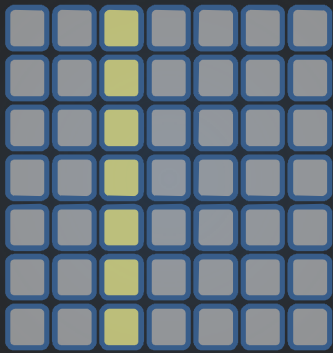
community site

- hosts real-time sequencing sessions
- downloads
 - synths, sounds, patterns, songs
 - controller UIs

The Cube

interactive social music box

sequencer / controller plugins



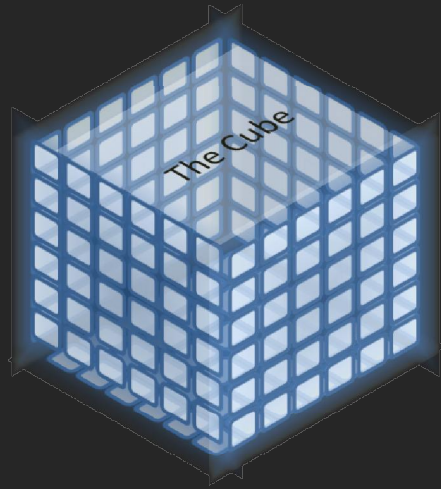
virtual synth and fx plugins

- DX7, analog, soundfonts
- TB-303, TR-909
- sampler, external audio
- reverb, chorus, delay
- ...

The Cube

interactive social music box

Roadmap



1. start simple

- 16x16 step sequencer grid
- add soundfont synth (VST or miniBAE)
- add ØMQ library
- implement plugin-based framework

2. build community site

- session hosting + CMS (wordpress)
- hosted by Aalto IT services (aaltowindow.aalto.fi/cube)

3. add plugins

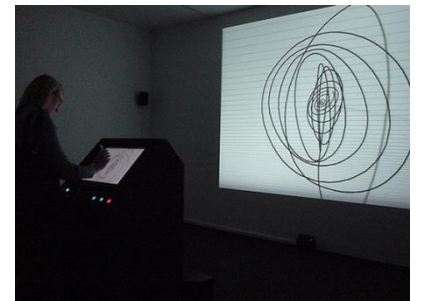
- UIs : radial, DJ, tenori-on scenes, rubik's cube, gestural control etc.
- synths : port and build new ones, add samples and short patterns

Virtual Graffiti

- mobile phone = spray can
 - touch : activate spray, select colors, brushes
 - accelerometers, gyros
- kinect : 3D painting
- table = painting surface
 - touch : zoom for details, rotate in 3D, erase
 - backgrounds : figs, google maps/earth
- collaborative painting
- geotagging
 - augmented reality (via phone screen, projectors, lasers)
- animation, audio

Virtual Graffiti – related work

- `<gml/>`
 - www.graffitimarkuplanguage.com
- Jürgen Scheible
 - www.mobispray.com
- audio
 - Sonic Wire Sculptor (Amit Pitaru)
 - Sonic Graffiti (Lee)



- available for
 - students + teachers
 - researchers
 - service providers
- installed in public spaces around campuses
 - spring 2012
 - Arabia, Otaniemi, Töölö (near cafeterias / restaurants)
 - Media Factory + Design Factory
- contact
 - jari.kleimola [at] aalto.fi