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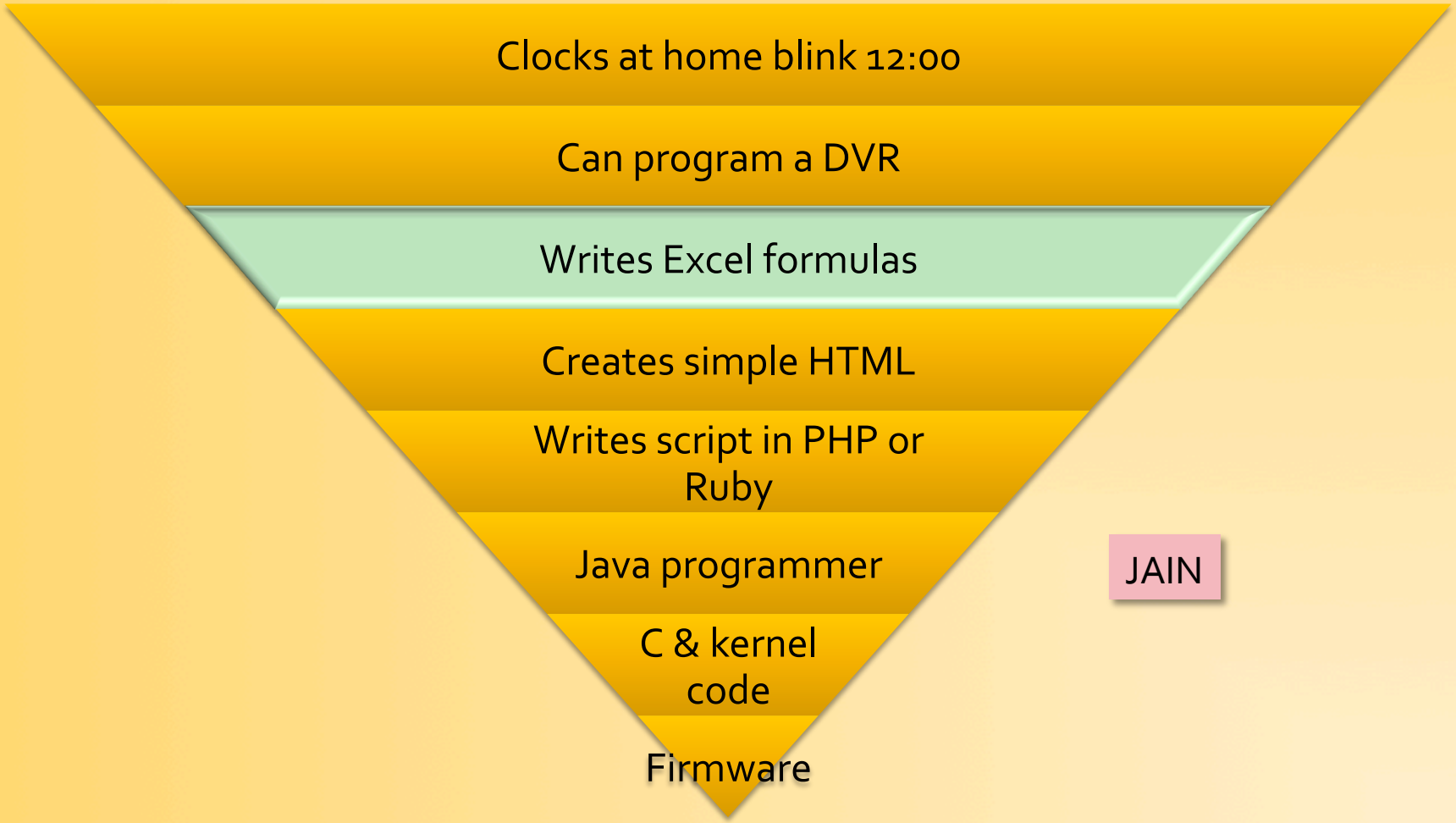
SECE: Making Services Programmable (Again)

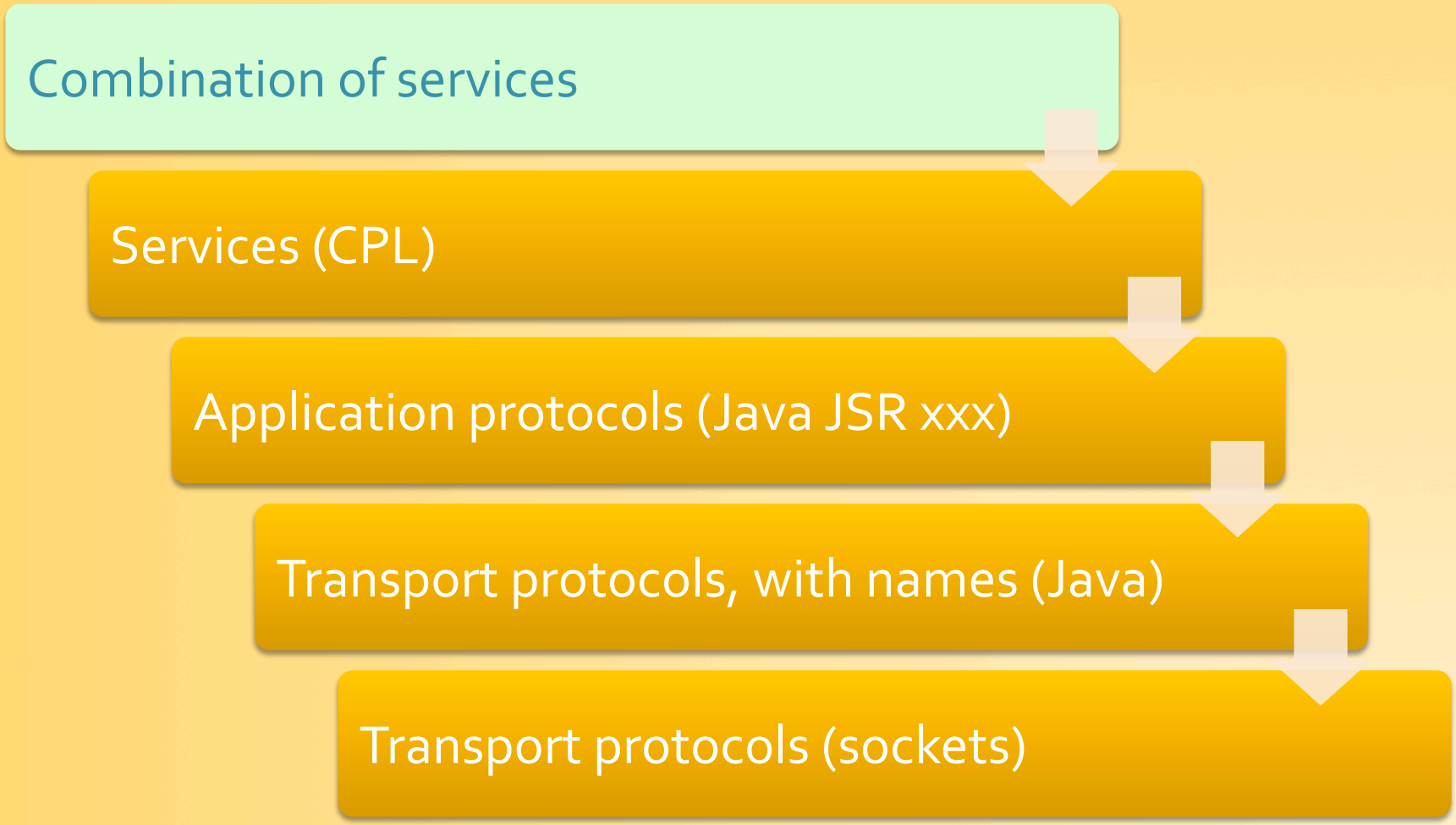
Overview

- Motivation and (brief) history
- Programming in-network services → NetServ
- Combining web and telecom services → SECE

A Pyramid of programmers



Levels of programming



SECE: Sense Everything, Control Everything

Omer Boyaci, Victoria Beltran and Henning Schulzrinne

Overview

- SECE allows *non-technical* users to create services that combine
  - communication
  - calendaring
  - location
  - devices in the physical world
- SECE: *event-driven* system
  - uses high-level *event languages*
  - to trigger action scripts, written in Tcl

Events & actions

Events

- Presence updates
- Incoming calls
- Email
- Calendar entries
- Sensor inputs
- Location updates

Actions

- Control the delivery of email
- Route phone calls
- Update social network status
- Control actuators such as lights
- Reminders (email, voice call, SMS)
- Interact with Internet services

Event language syntax

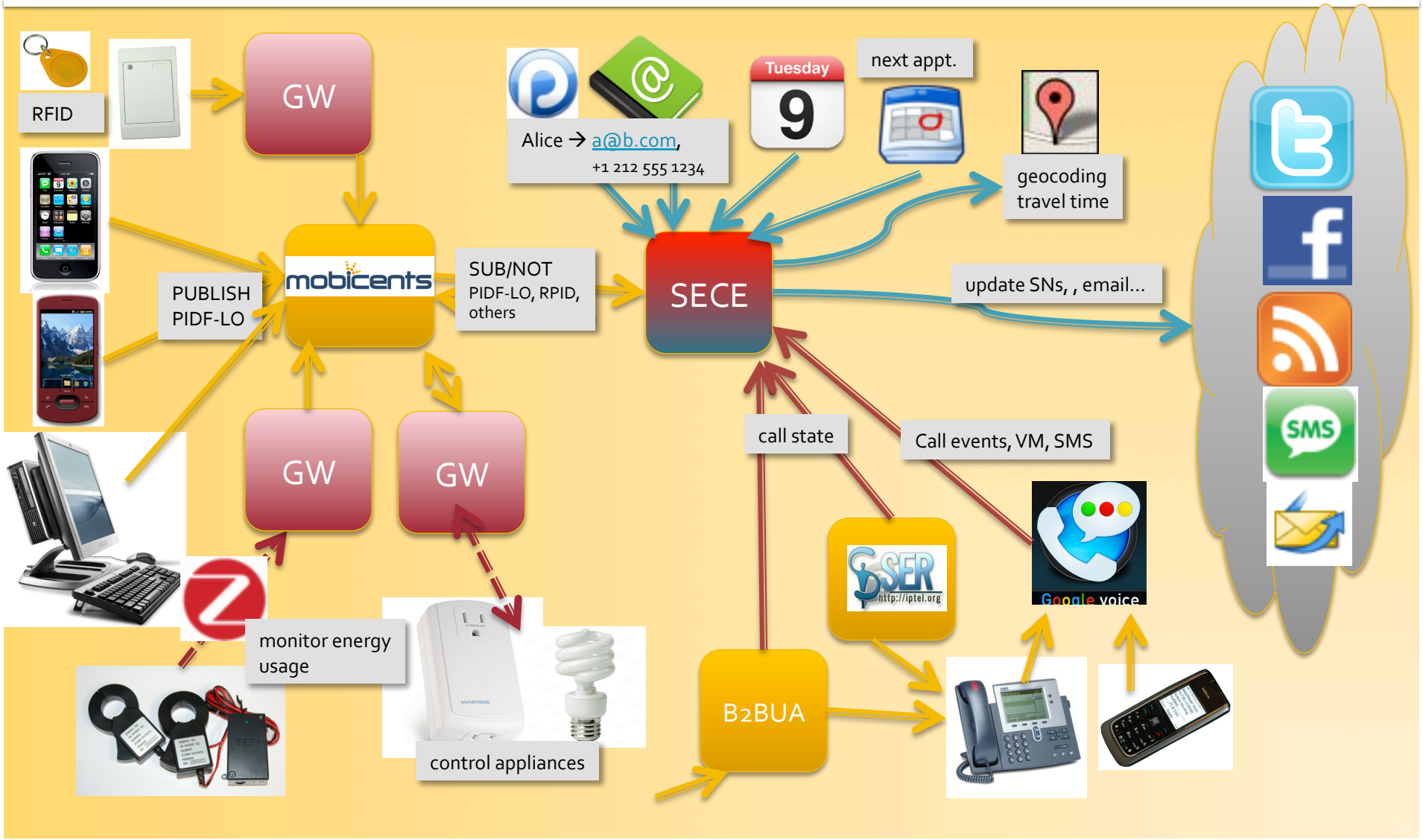
```
every sunset {
   homelights on;
}

every week on WE at 6:00 PM{
   email irt_list “Pizza talk at 6:00 PM today.”;
}

if my stock.google > 14 {
   sms me "google stock:"+[stock google];
}
```

Event rules: more examples

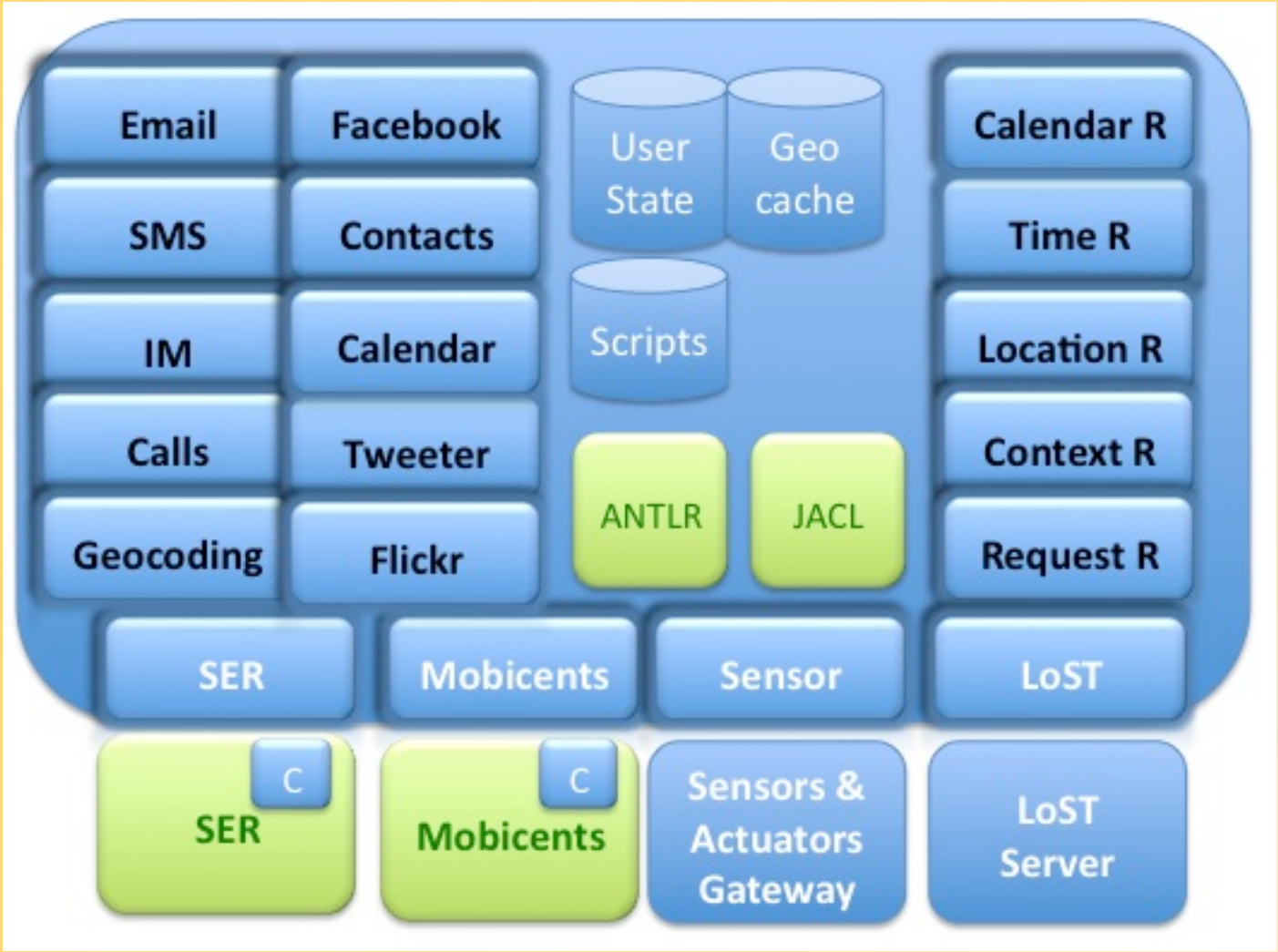
Extensible set of small languages

- Time
  - Single `on February 16, 2010 at 6:00 PM`
  - Recurring `every day at 12:00 until April`
- Location
  - `Tom within 5 miles of me`
- Context
  - `if my office.temperature > 80`
- Communication requests
  - `incoming call`

SECE: The glue for Internet applications



Software Modules



Software architecture

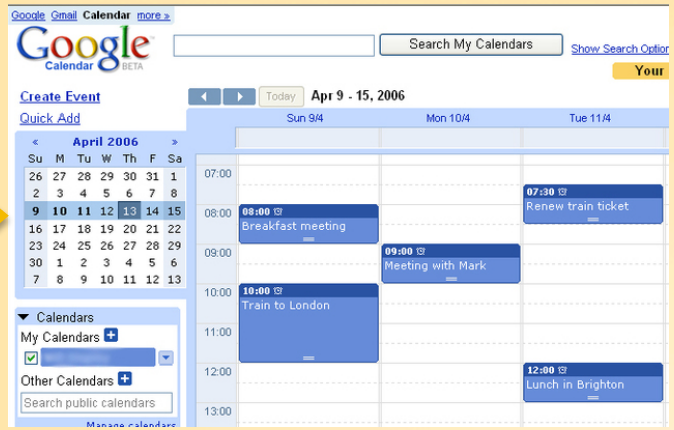
Time-based events

Every day at 12:00 from 01/01/2010 until 04/01/2010 {
email employees "lunch time" "Location: 5th floor Dinning Room, Time: 12:30"
}

```
BEGIN:VCALENDAR
BEGIN:VEVENT
DTSTART;TZID=America/New_York:
20100101T120000 RRULE:FREQ=DAILY;BYHOUR=12;
        UNTIL=20100401T120000
END:VEVENT
END:VCALENDAR
```

SECE

Export / Import



Time: single events

on *dateExpr* (**at** *timeExpr*) (**in** *timezone*) { *body* }

on Anne's birthday at 12:00 am in anne.location{sms anne "Happy Birthday!"}

2011-12-31, 12/31/2011
December 31, 2011
31th day of December, 2011
300th day, 2011
2th MO of May, 2011
May 2th Monday, 2001
Last Sunday in 52th week, 2011
Christmas Day, 2011
Thanksgiving Day, 2011
1 day before Thanksgiving Day, 2011

e.g *Europe/Zurich*

sunrise
sunset
evening twilight
morning twilight
first working hour
last working hour
lunch break

Time: recurrences

every freq (on *dateExpr)* (at *timeExpr*) (in *timezone*) (from *dateExpr*) (until *dateExpr*) (for num times| timeUnits) (during period) (except dateExprList) (including dateExprList) { *body* }

every sunset { homelights on; } → "every day at sunset"

every year on last Friday of January, March, June at last working hour except August { backup; }

every day at 10 minutes before lunch break from September 1, 2010 until Dec 24, 2010 { sms group-list "Lunch time! Let's meet in 5 minutes";}

every last monthly day { email me "Reminder: Check the students' monthly reports";}

every WE at 6:00 PM from 10/1/09 until May 12, 2010 except 3th WE of Feb, including first day of June, 2010 { email irt-list "reminder: weekly meeting today at 6:00 PM"; }

Calendar events

when *meeting-name* begins|finishes { *body* }

when *time time-units* before|after *meeting-name* { *body* }

```
when ”weekly meeting” begins {
        status activity busy;
        sms [event participants] ”Please, switch your cell phone off or set silent mode”;
}
when 30 minutes before ”weekly meeting” {
      email [event participants] “”[event title]" “The event [event title] will start is 30
      minutes and will last [event duration] minutes. Description: [event
      description]. Start time: [event start]."
      if {me not within 3 miles of campus } {
            email [status bob.email] ”I’m away” ”Please, head the conference room and
            prepare everything for the weekly meeting. Not sure if I will be on time.”;
      }
}
```

Location-based events

user operator location { body }

bob near "Columbia University”
me near 40.807,-73.963

tom within 5 miles of me
me within 3 miles of ”2960 Broadway, New York, 10027”

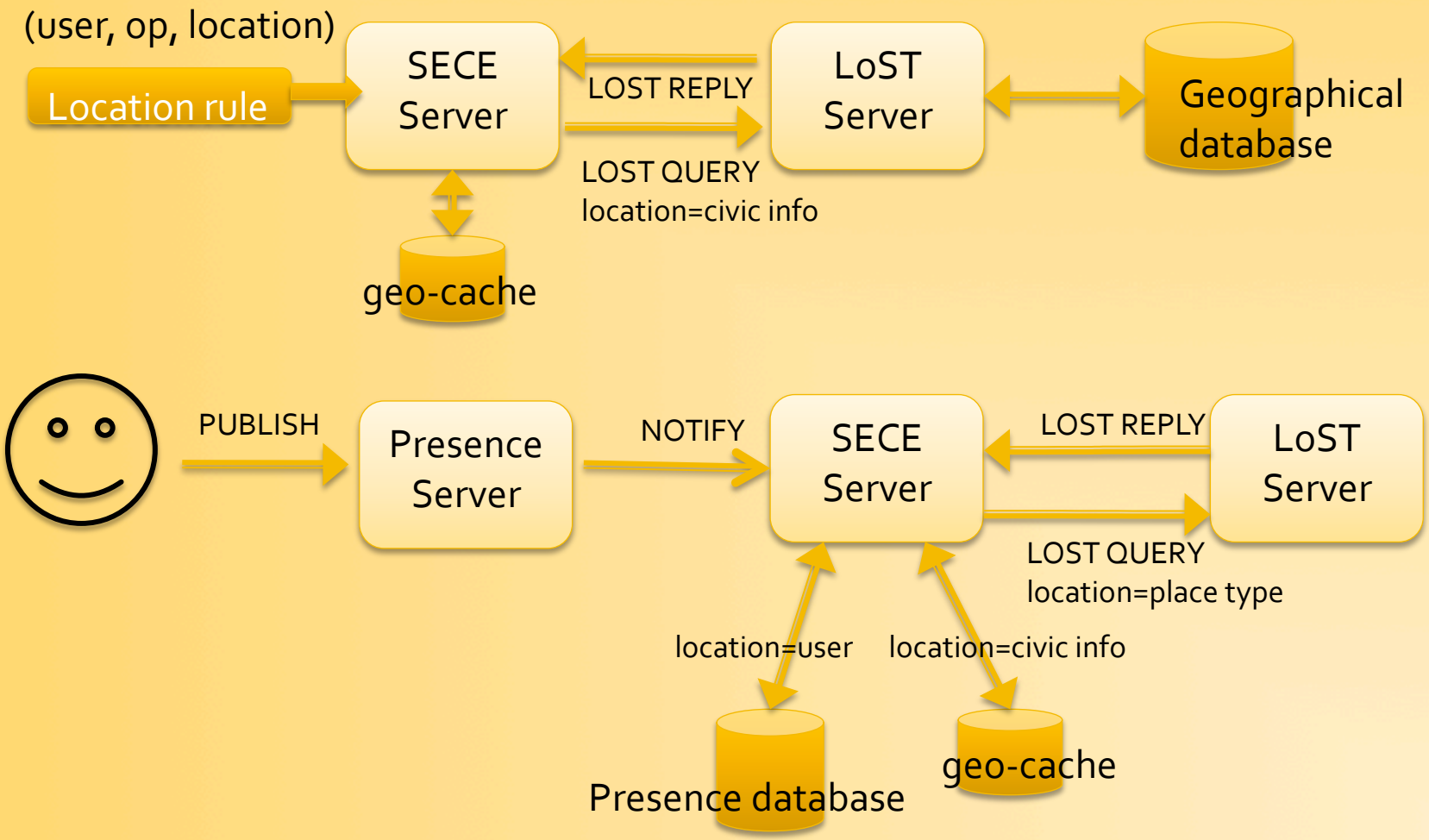
tom in “Rockefeller center”
Me outside of “Manhattan”

bob moved 1.5 miles

- Place types and user-defined locations:

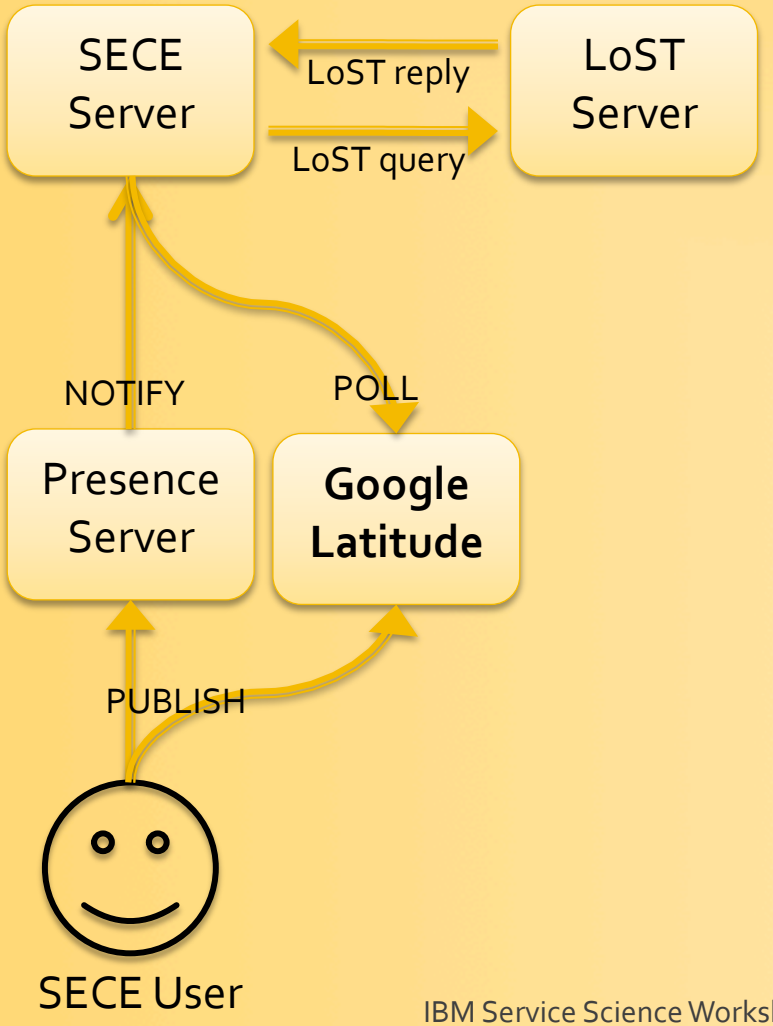
me near a post office
Anne in a museum
me near my tennis club

Location-based events



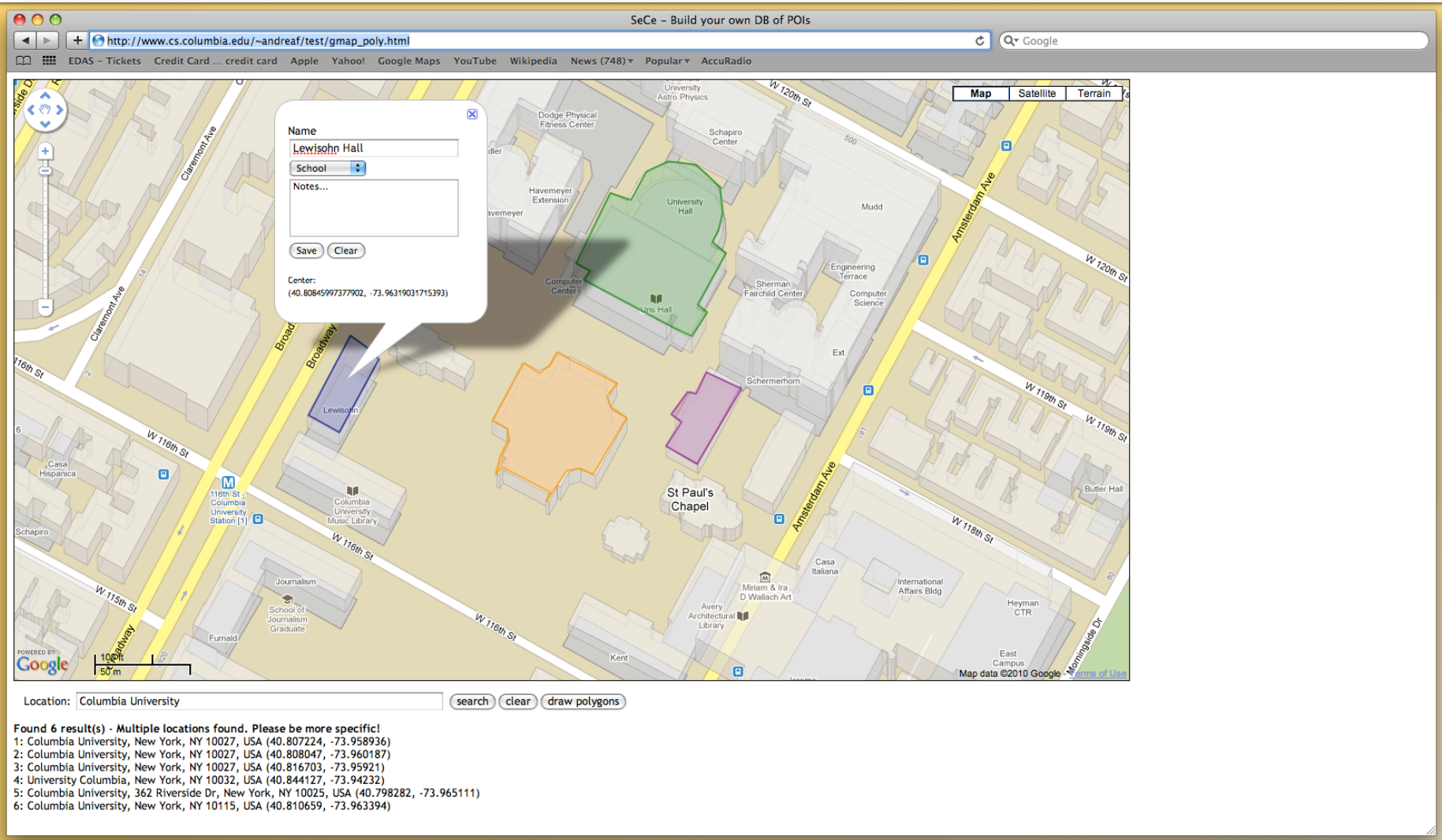
SECE User

Handling location updates



- User
  - publishes his/her location periodically (e.g., every 5 min) to a presence server or to a location service such as Google Latitude
- Presence server
  - notifies changes in location to SECE server
- Google Latitude (or similar service)
  - SECE retrieves user's location periodically
- SECE server
  - depending on user's defined rules, queries LoST server
- LoST server
  - replies with current information on user's surroundings
- SECE server
  - Takes action based on rules and contextual location information

Location-based rules (Geographical database)



Social network events

Incoming *social_network* *message_type*

facebook	wallmesssage
twitter	newsmessage
linkedin	direct

social_network *status_update*

facebook
twitter
linkedin

Context-based rules

if ***context*** *operator* ***(value) { body }***

- What's context?
  - Presence information → IETF SIMPLE specifications
  - Sensor information

if bob's activity is idle { call bob }

If bob@domain.com's status equals working { alarm me }

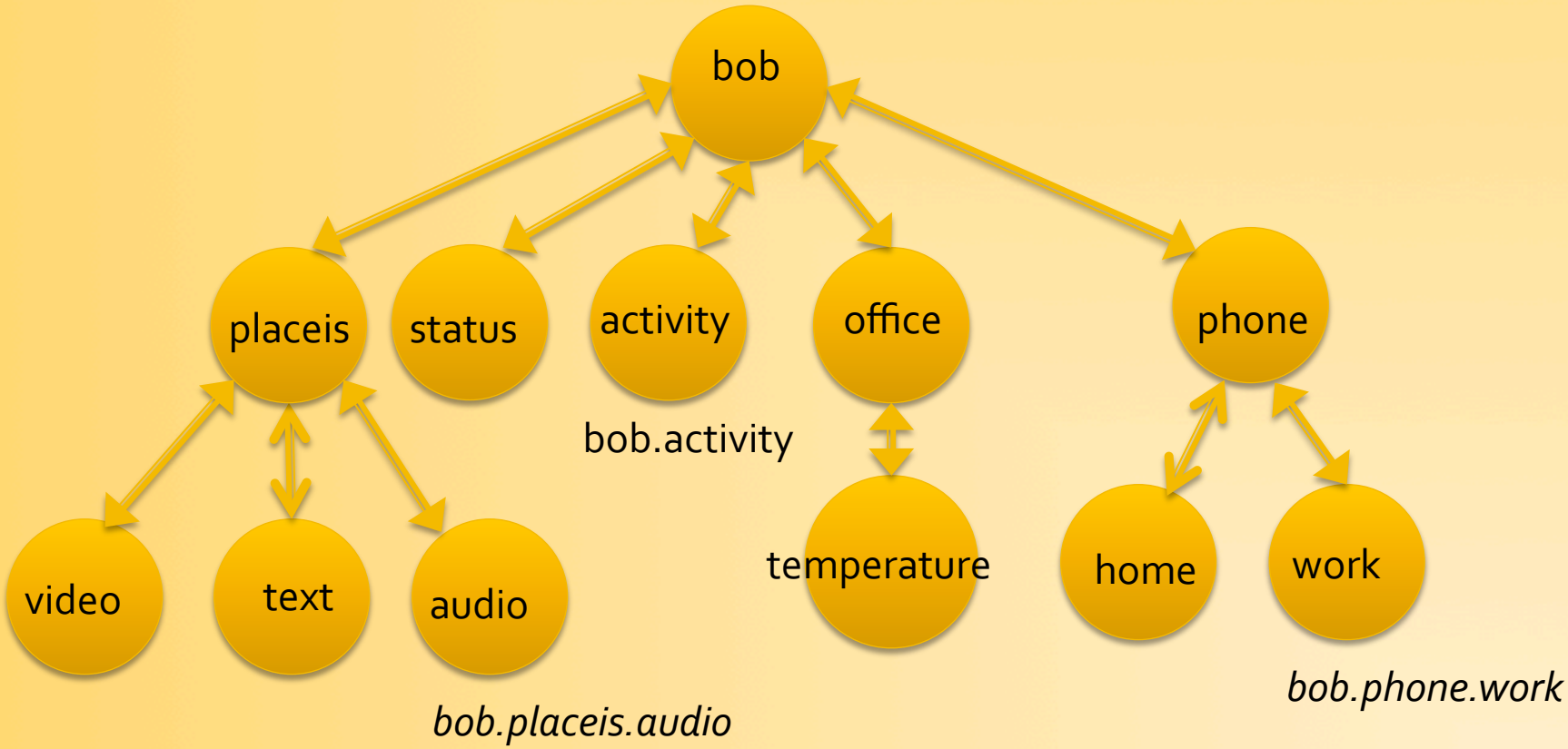
If bob.placetype is home { sms bob "water the plants"; }

if my stock.google > 14 {sms me "google stock:"+[stock google] }

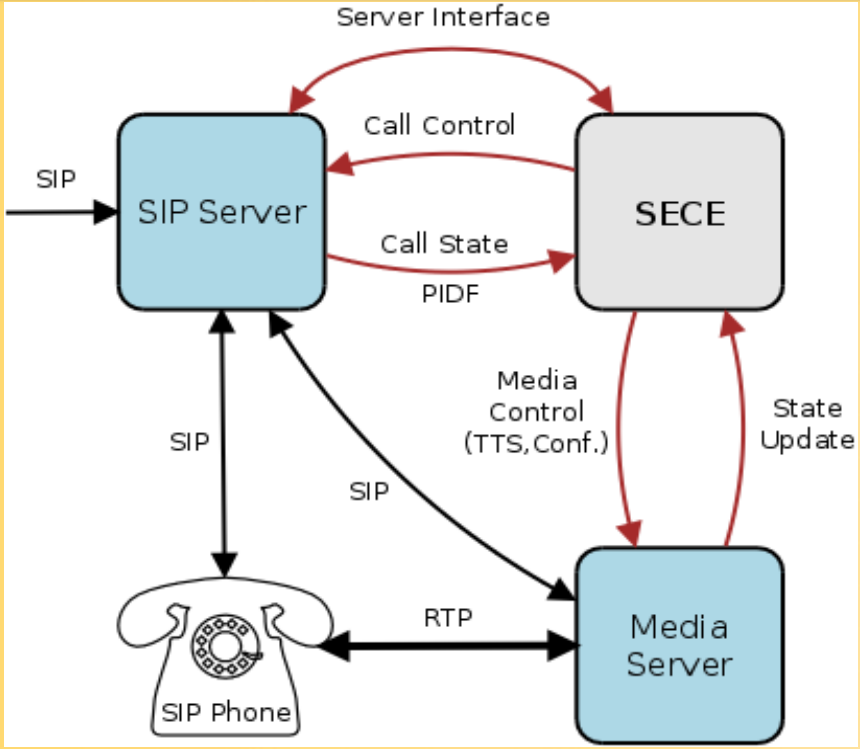
If me.office.temperature < 50 { ac off; }

If anne.location.civic changed { email me "Anne's civic location:"+ [status anne location.civic]

Context as a tree



Automated Call Handling



- **Control**: Accept, reject, redirect, forward calls based on variety of SECE signals
- **Integration**: Calendar, address book, PSTN, Google Voice, SMS, location, Text-to-speech, voicemail)
- **Simplicity**: Natural, easy to learn scripting language
- **Flexibility:** Input from a variety of SECE components involved in call handling
- **Automation**: Scripts for recurring tasks (setup a conf. call based on calendar)

"On mom's birthday, call mom when I am home and near phone."
"Setup a conference call, enter password, invite people, ring desk phone."
"If driving and incoming call, play "user driving" and redirect to voicemail."
"If desk phone ringing and not in room, send SMS with caller's number."

Communication-based events

incoming|outgoing **event** *from* **user|address** *to* **address { body }**

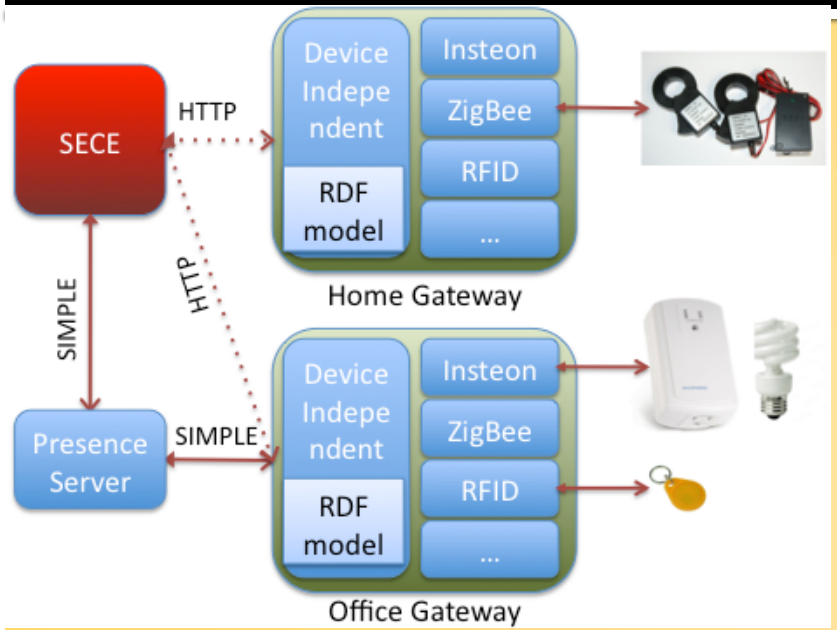
missed call from **user|address** *to* **address { body }**

received call from **user|address** *to* **address { body }**

Event: *call, im, sms*, voicemail*, email (*only incoming)*

```
incoming call {
      if { [my activity] == "on-the-phone"} forward sip:bob@example.com
}
outgoing call {
    if {[outgoing destination] == "18003456789"} modify_call destination 12129397054
}
incoming call from Anne {
       if {[my location] != "office"} auto_answer audio no_office.au –record
}
incoming im {
     sms me [incoming from]+" sent an im:"+[incoming content]
}
incoming call {
    schedule "call received from [incoming origin]"
}
```

Sensors and actuators



Sensors : smoke, light, humidity, motion, temperature and RFID Readers
Actuators: networked devices and actuators such as lights, cameras, sprinklers, heaters, and air conditioners.

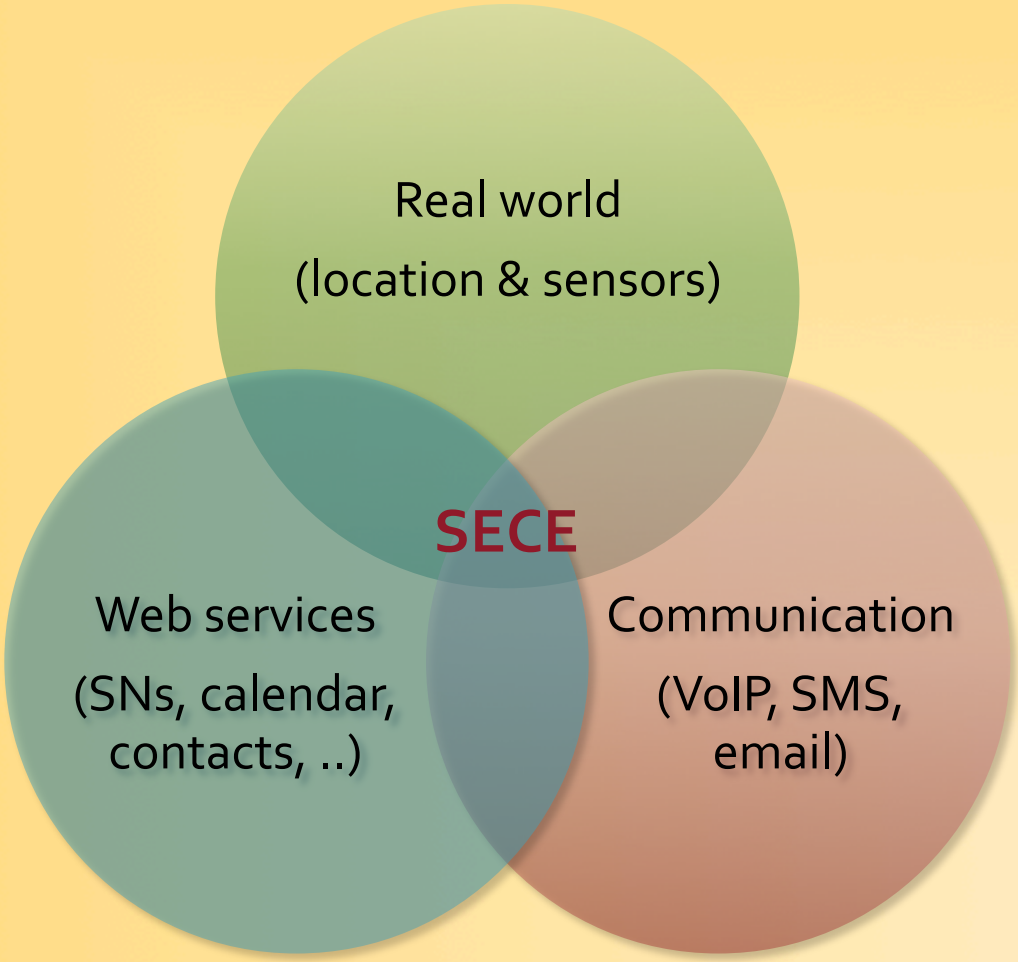
Sensor description: basic RDF ontology (Resource Description Framework)

```
if my warehouse.motion equals true {
      sms me "person in the warehouse."
}
if my office.smoke equals true {
      sprinklers on;
      sms me "fire in the office";
      call_tts fire-department "fire in the "+[get me.office.address];
      electrical-appliances off;
}
```

Next steps

- Functionality:
  - Integrate SER server
  - Integrate LoST server and geo database
  - Finish address book functionality
  - Finish request-based incoming rules
  - Implement request-based outgoing rules
- Usability:
  - guided & graphical interface
  - evaluation: can “normal” users create services?

Conclusion


Real world
(location & sensors)
SECE
Web services
(SNs, calendar, contacts, ..)
Communication
(VoIP, SMS, email)