Privacy and security in older adults independent living assistance platform

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Structure of presentation

- Overview of Mobiserv
- Importance of security and privacy
- Security goals
- Information evaluation
- Vulnerable points
- Information flow analysis

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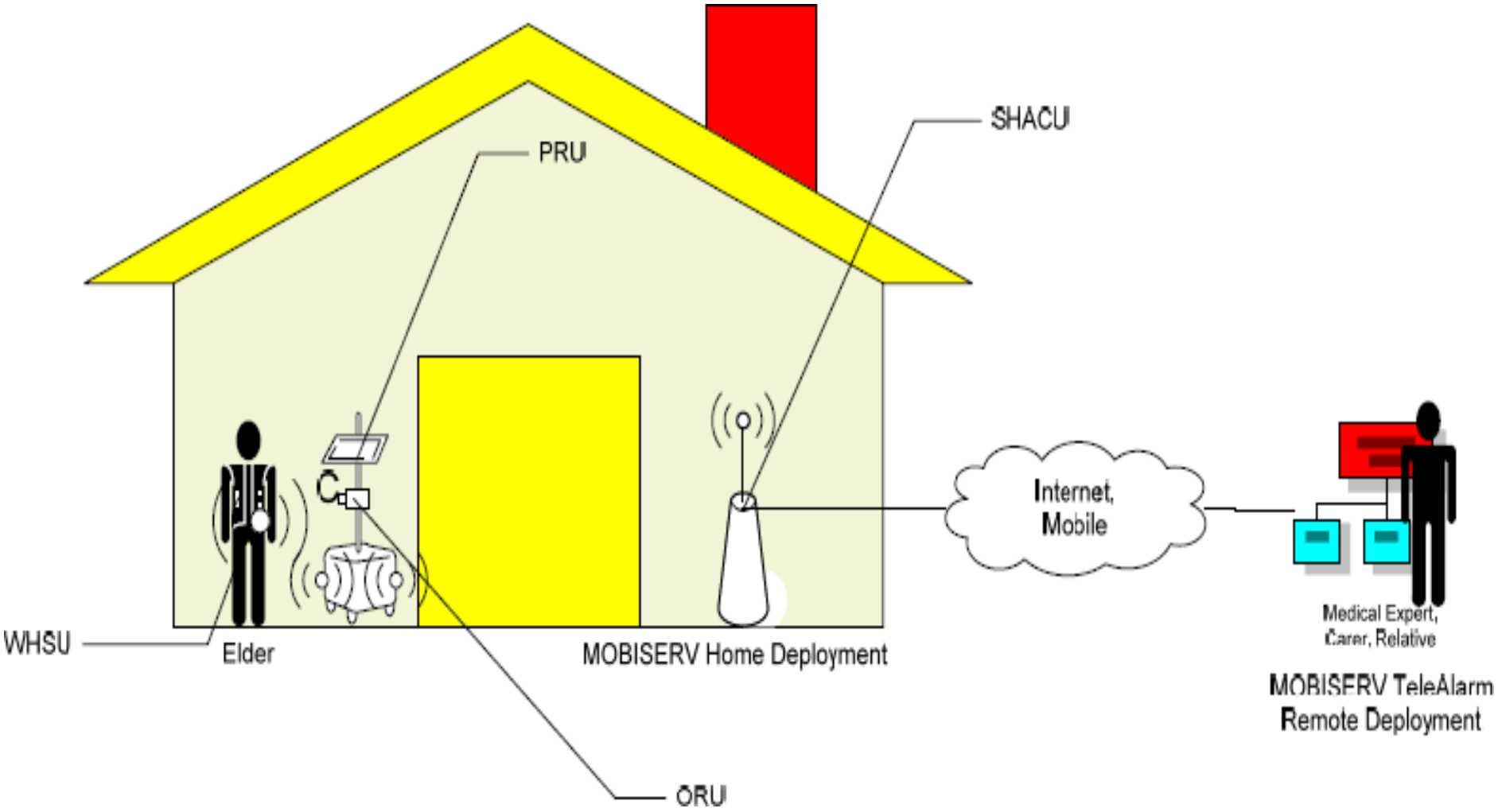
Mobiserv



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Mandatory Functionalities

1. F02 Reminder and encouragement to drink
2. F01 Reminder and encouragement to eat
3. F19 Reporting and communicating to health professionals
4. F17 A tele-medicine/self-check platform
5. F18 Games for Social and Cognitive Stimulation
6. F11 Voice/Video/SMS via Robot communication with friends and relatives
7. F14 A mobile screen connected to the front door
8. F06 Response to call for help from the user
9. F08 Encouragement for exercising

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Importance of security

- Mobiserv applications use information about user that may be sensitive
  - e.g. health status, medication etc.
  - Loss of privacy affects acceptability of solution
- Many features rely on accurate information
  - Corrupted data may cause unexpected behaviour on the system
- Denial of Service
  - Reduces the trust and acceptability of system

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Information Security Goals

- Confidentiality
  - Only those who have right to access the data may do so.
- Integrity
  - The data has not been changed
    - during transmission
    - in storage
- Availability
  - Those who have right to access the data may access it
    - Easily
    - Quickly

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Analysis for data

- Evaluation of the data handled and stored in the system from security goals perspective
- What happens if
  - Data is eavesdropped
  - Data is manipulated
  - Data is unavailable
  - Data is lost
- How important it is to prevent those happening
  - Security is not black and white.
  - Focus on relevant problems

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Example

- Video feed to detect eating activity
  - Integrity loss may cause false positive or false negative on detection.
    - Problem is not very severe
    - Minimal benefits for outsider to do such attack
  - Availability loss to video feed will cause the loss of functionality
    - Minor nuisance
  - Loss of confidentiality can cause loss of privacy
    - Enables possibility for monitoring of older person
    - Severe problem for acceptability

Potential vulnerable points

- Storage points
  - Where the data is held
  - Analysis can be done in different detail levels
    - Laptop, Robot, Monitor ...
    - Calendar, Log ...
    - Hard drives, Memories ...
- Handling points
  - Where the data is read and written (created and deleted)
    - Laptop, smart garment … Screens, keyboards, cameras...
- Transmission point
  - Where the data is transferred between
    - Physical objects: Smart garment → robot
    - Components:

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Storage points

- Internal points
  - Points within the system
    - Datalogger, robot, shacu
  - Security is in developers hand
- External points
  - Points outside the system
    - google calendar, relative, caretaker
  - Security cannot be affected by the system developers.
  - What information and to who will be given
    - Depends who we trust

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Data input and output

- Where the information comes from
  - Write (create/delete) operation
  - Sensors, Robot UI (touchscreen, microphone), cameras, Internet
  - Integrity and availability of system can be compromised from here
- Where the information goes to
  - Read operation
  - ScreenMonitor, speaker (relative, doctor, elder)
  - May affect on confidentiality

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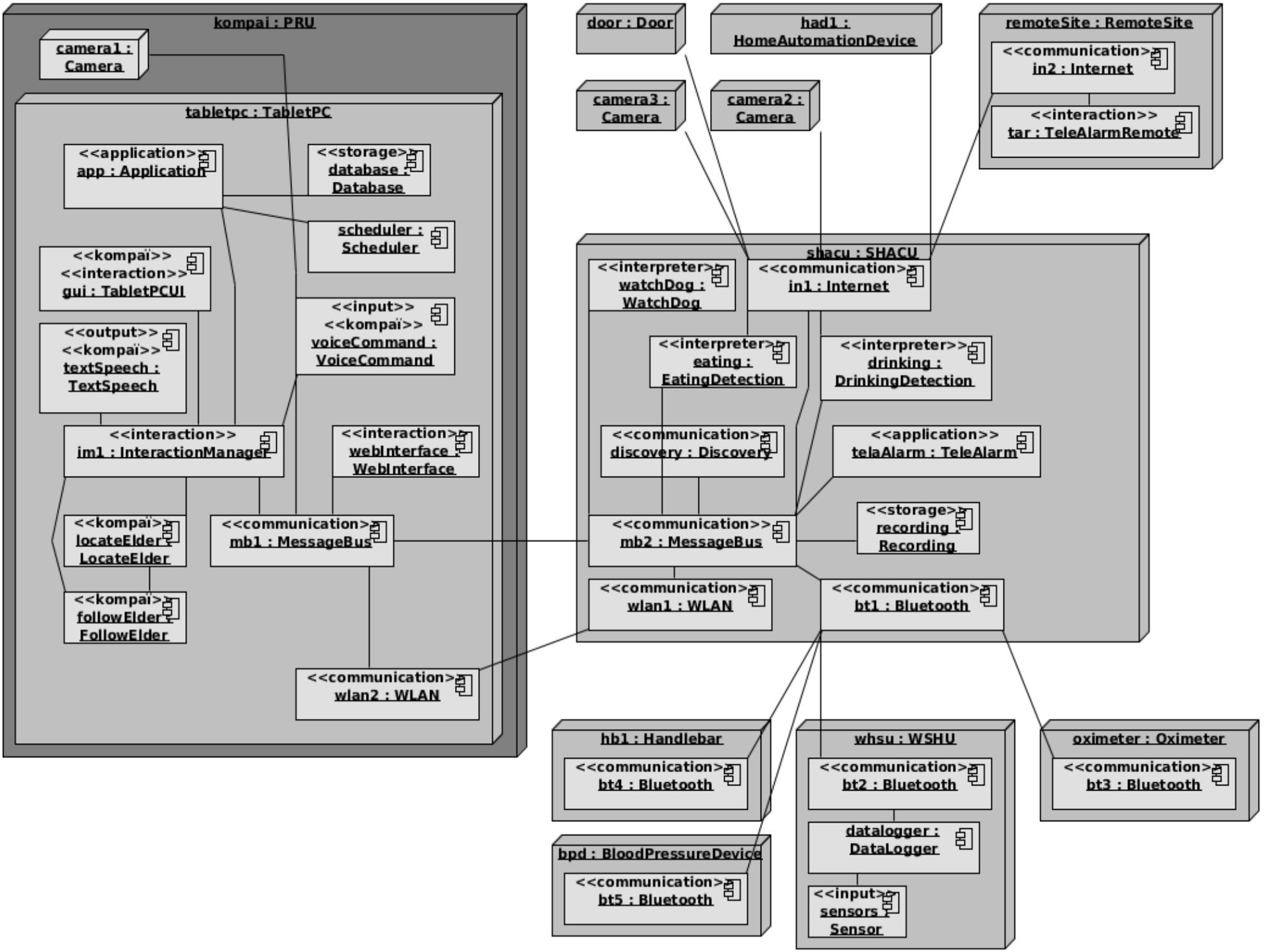
Data transmission

- Within System
  - Smart garment - data logger - robot - SHACU
  - Security measures can be defined in system specification
- System-outside
  - Connections to Internet services
  - Interoperability challenges
- Communication between components outside the system.
  - e.g. caretaker- google calendar
  - No control
  - Explicit Trust to service provider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door : Door
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hb1 : Handlebar
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bt4 : Bluetooth
whsu : WSHU
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bt2 : Bluetooth
datalogger : DataLogger
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sensors : Sensor
oximeter : Oximeter
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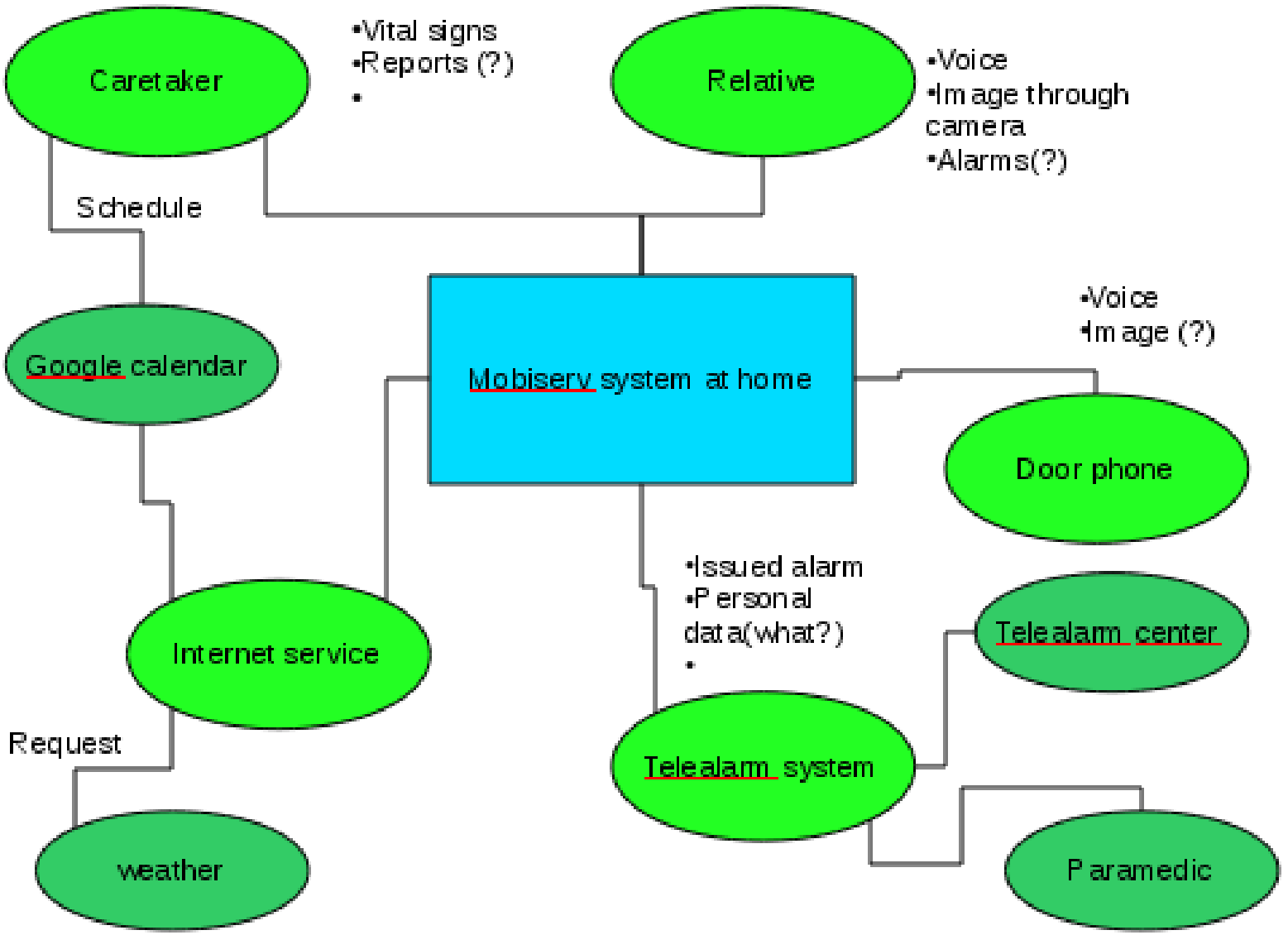
bt3 : Bluetooth
bpd : BloodPressureDevice
<<communication>>
bt5 : Bluetooth

Combining data and system



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Data analysis example

- Door ring
  - Door ring signal is activated by the press of door bell. It activates a ringing sound effect in the house.
- Source: Door bell outside of house
- Source Access: Not access control
- Transmitted between: door bell->shacu->robot
- Stored at: Buffers on Shacu and robot
- Storage length: only for duration of handling the signal
- output: ring tone at Robot or Shacu speaker

- Disclosure of data: Not meaningful. However lack of response can be interpreted as empty house. Insignificant threat
- Denial of service: Older adult will not know someone is at door. Insignificant threat
- Corrupted data: No ringing. Insignificant threat
- Fabricated data: May be used to cause repeated door bell ringing. Insignificant threat. Hard to execute, no real use.

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Privacy

- Privacy is not only about encrypting personal data
  - Before storing personal data, consider if it is really necessary
  - Differentiate Identity from the data when possible
- Camera recording people eating and drinking is intrusive
  - Store and handle only essential information
  - Only hand movements and mouth location stored and analysed
    - Person cannot be identified from image (nor what if anything he/she is wearing)

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Conclusions

- Securing your system is important for its acceptability, especially when handling personal information.
- Privacy can be best protected by carefully considering what is actually needed
  - Identifying data is not always necessary.
- Security is always a compromise.
  - Know what are the main vulnerable points
  - Focus your resources on the important points
    - Man power, processing power, batteries...
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