

DCGI

DEPARTMENT OF COMPUTER GRAPHICS AND INTERACTION

SMART SOLUTIONS FOR AGEING SOCIETY

Czech Technical University in Prague
Faculty of Electrical Engineering

MOTIVATION

- ▶ Seniors have problems with text entry
 - too complex
 - low dexterity of hands
 - ICT devices (phones, smart TV, tablets)
- ▶ Seniors can have problems with navigation and orientation
 - Accessibility of public places
 - Cognitive aspects of orientation
- ▶ Effects of ageing progress over the time

OBJECTIVES

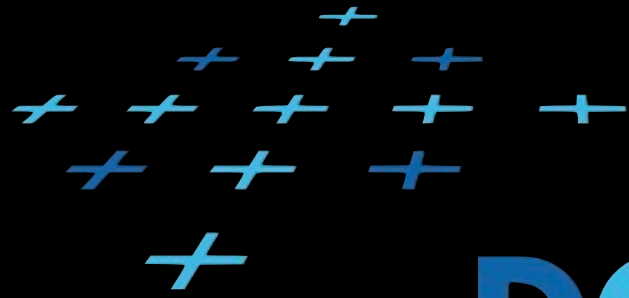
- ▶ Senior navigation and orientation in unknown environment
- ▶ Comfortable text entry methods for seniors with reduced dexterity of hands

MAIN ACTIVITIES

- ▶ Research of effective contextual-dependent text entry methods
- ▶ Immediate usability of text-entry methods
- ▶ Navigation and orientation methods of seniors in unknown environment
- ▶ Scalable solution to above mentioned problems that adapts to dynamics of effects of ageing
- ▶ New methods for usability and accessibility

OUTCOMES AND BUDGET

- ▶ Model of adaptive text-entry methods for seniors
- ▶ Contribution to standardisation effort in the field of text-entry methods
- ▶ Methodology for improvement of usability of text-entry methods
- ▶ Methodology for design of systems for adaptive navigation and orientation of seniors
- ▶ Publications in international journals and proceedings of international conferences
- ▶ Verification using pilot implementation
- ▶ Budget: 154 000 EUR



DCGI

DEPARTMENT OF COMPUTER GRAPHICS AND INTERACTION

HCI at DCGI CTU

CTU in Prague

CTU | DEPARTMENT OF COMPUTER GRAPHICS AND INTERACTION

- ▶ Main research areas:
 - Computer Graphics
 - virtual reality, visualization, multimedia
 - HCI (Human Computer Interaction)
 - usability, accessibility, mobile computing

PROJECTS

- ▶ In last 10 years - 10 EC funded projects in the field of HCI, Virtual reality, and Multimedia.
- ▶ Several projects funded by various Czech foundations and companies

MAIN STREAM IN HCI RESEARCH

- ▶ Accessibility and usability
- ▶ Target applications: elderly people (aging population in Europe)
- ▶ Independent living for elderly people (i2home project)
- ▶ Use of iDTV to support mental and physical fitness of elderly people (Vital Mind project)
- ▶ Use of iDTV for t-learning (ELU project)

i2home PROJECT

- ▶ FP6, EU Project, 9 partners, 3 years
- ▶ intuitive intelligent household for people with disabilities
- ▶ based on UCH
- ▶ UIP developed as a side effects
- ▶ **U**ser **C**entred **D**esign
- ▶ target groups: visually impaired, cognitively impaired, seniors

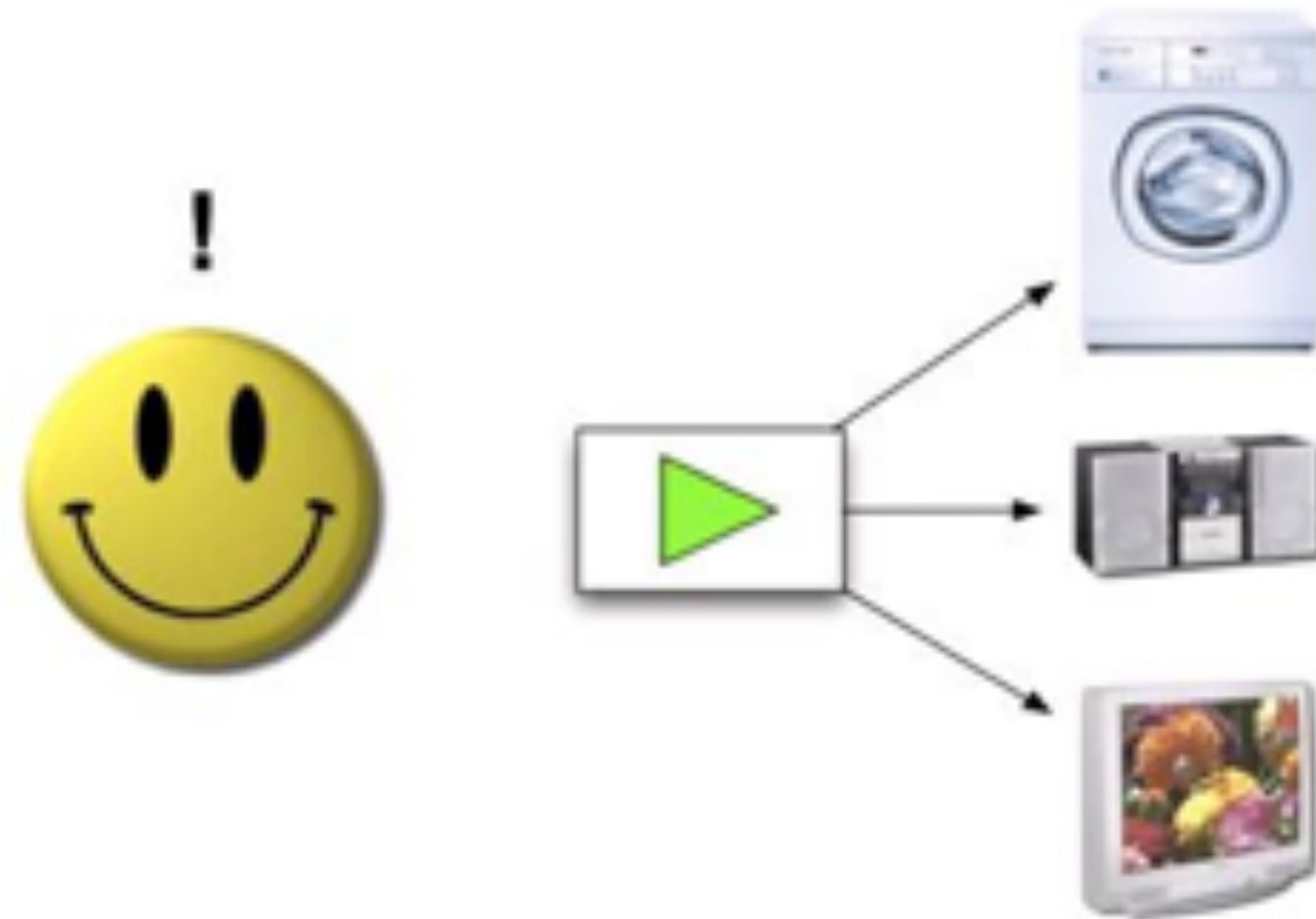


Model training Household

i2home | MOTIVATION



i2home | MOTIVATION



i2home | ARCHITECTURE

i2home | ARCHITECTURE

WebClient

.NET Client

Smartphone

Clients

i2home | ARCHITECTURE

WebClient

.NET Client

Smartphone

Clients

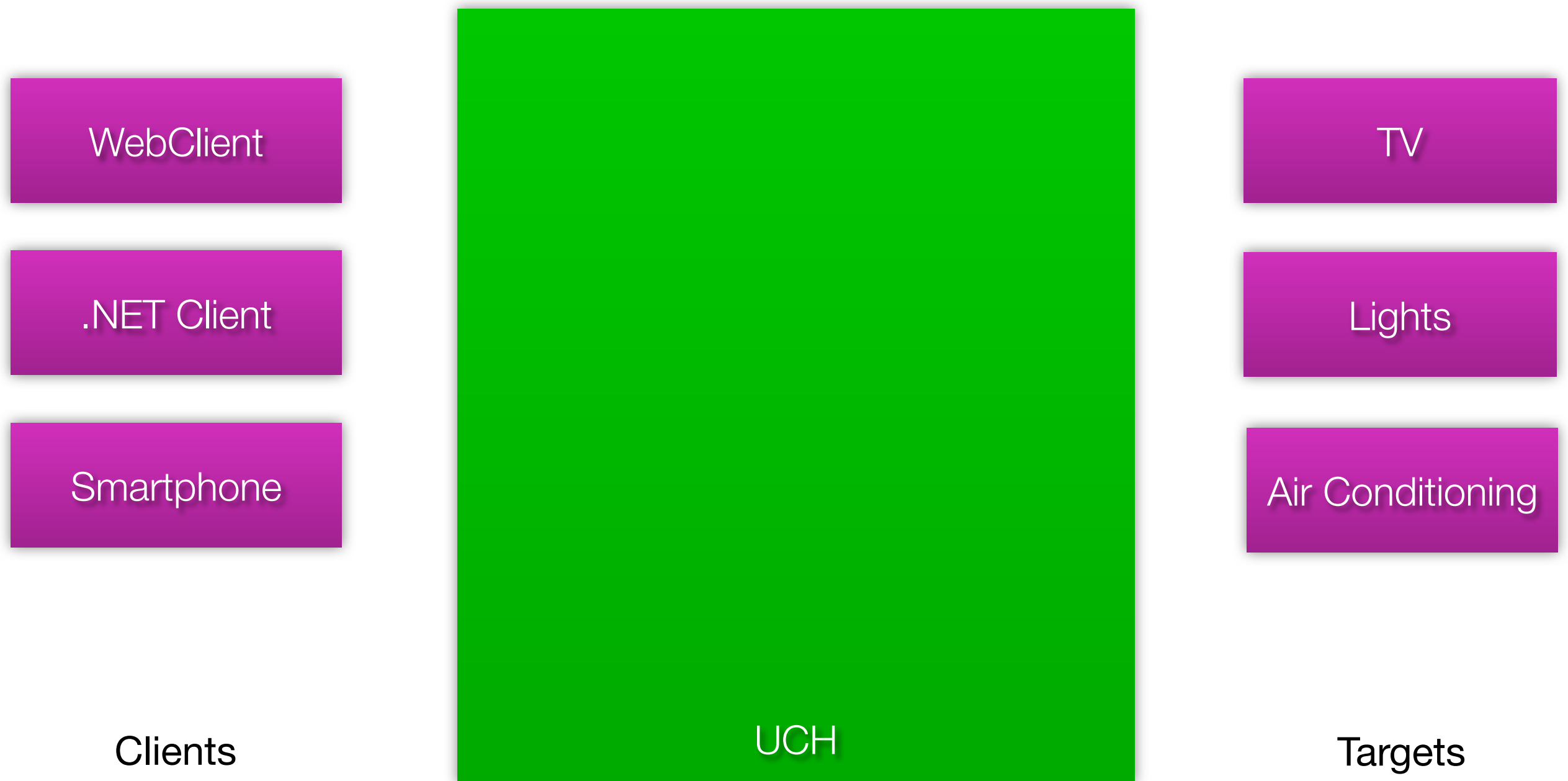
TV

Lights

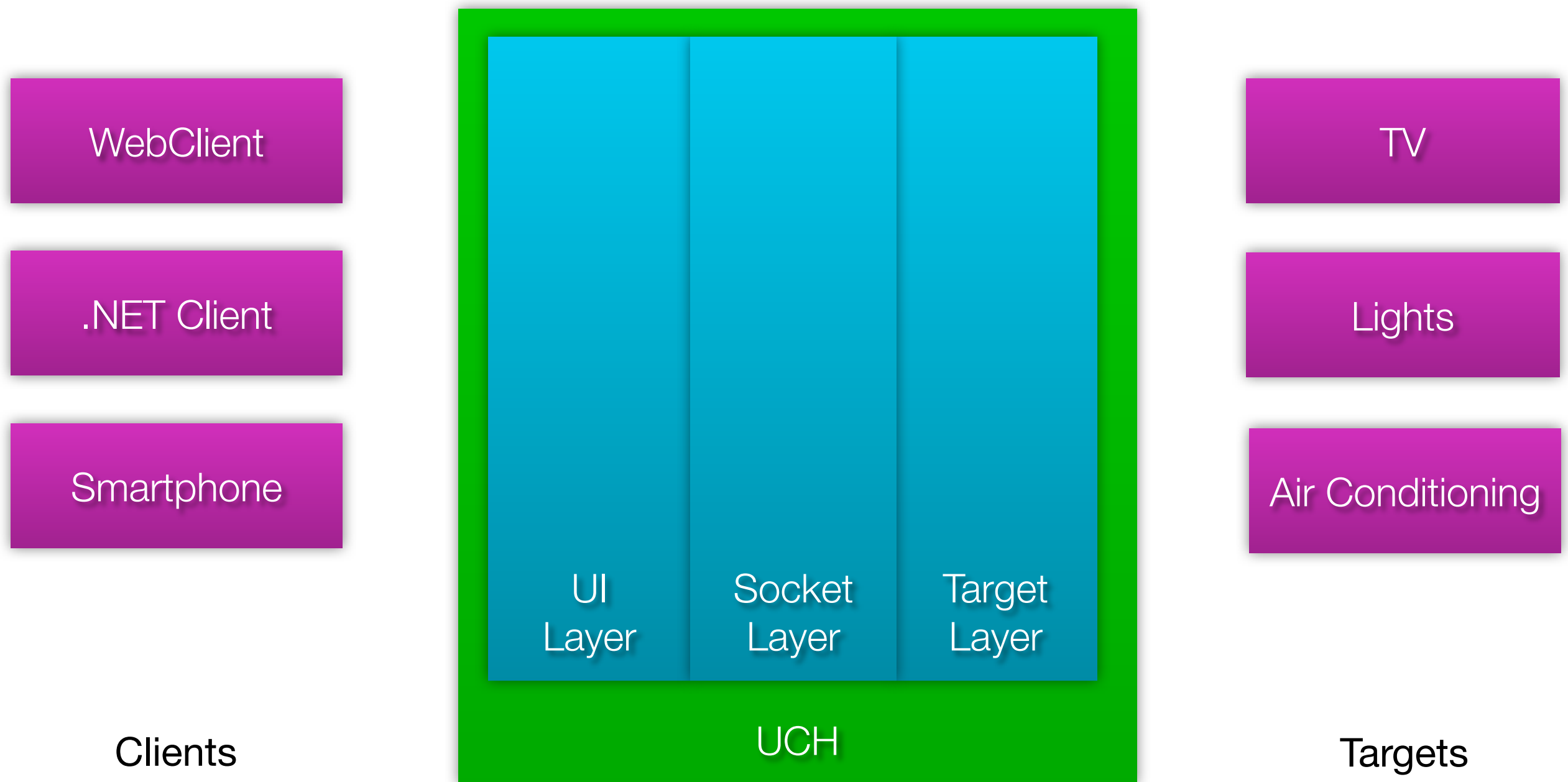
Air Conditioning

Targets

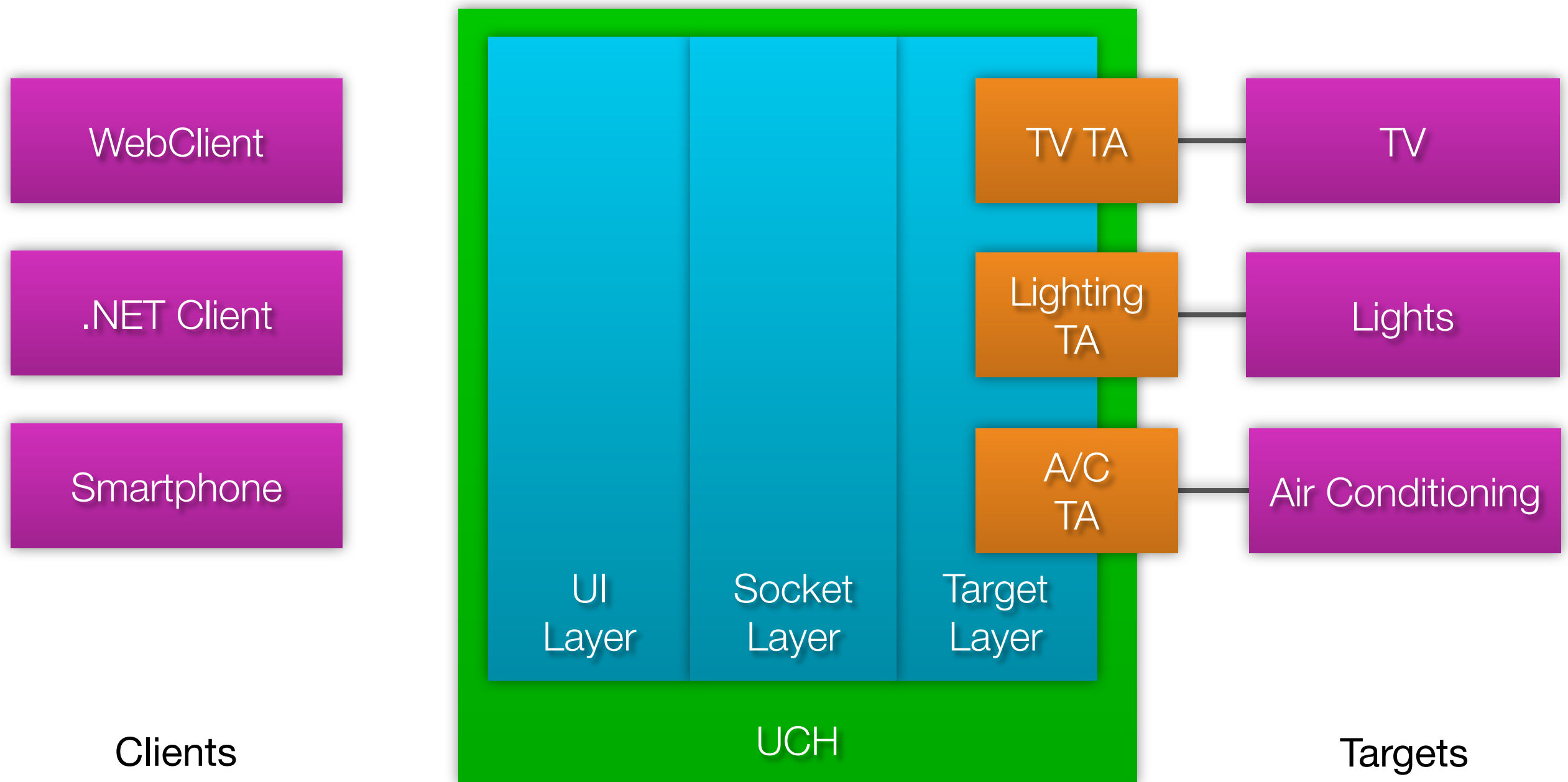
i2home | ARCHITECTURE



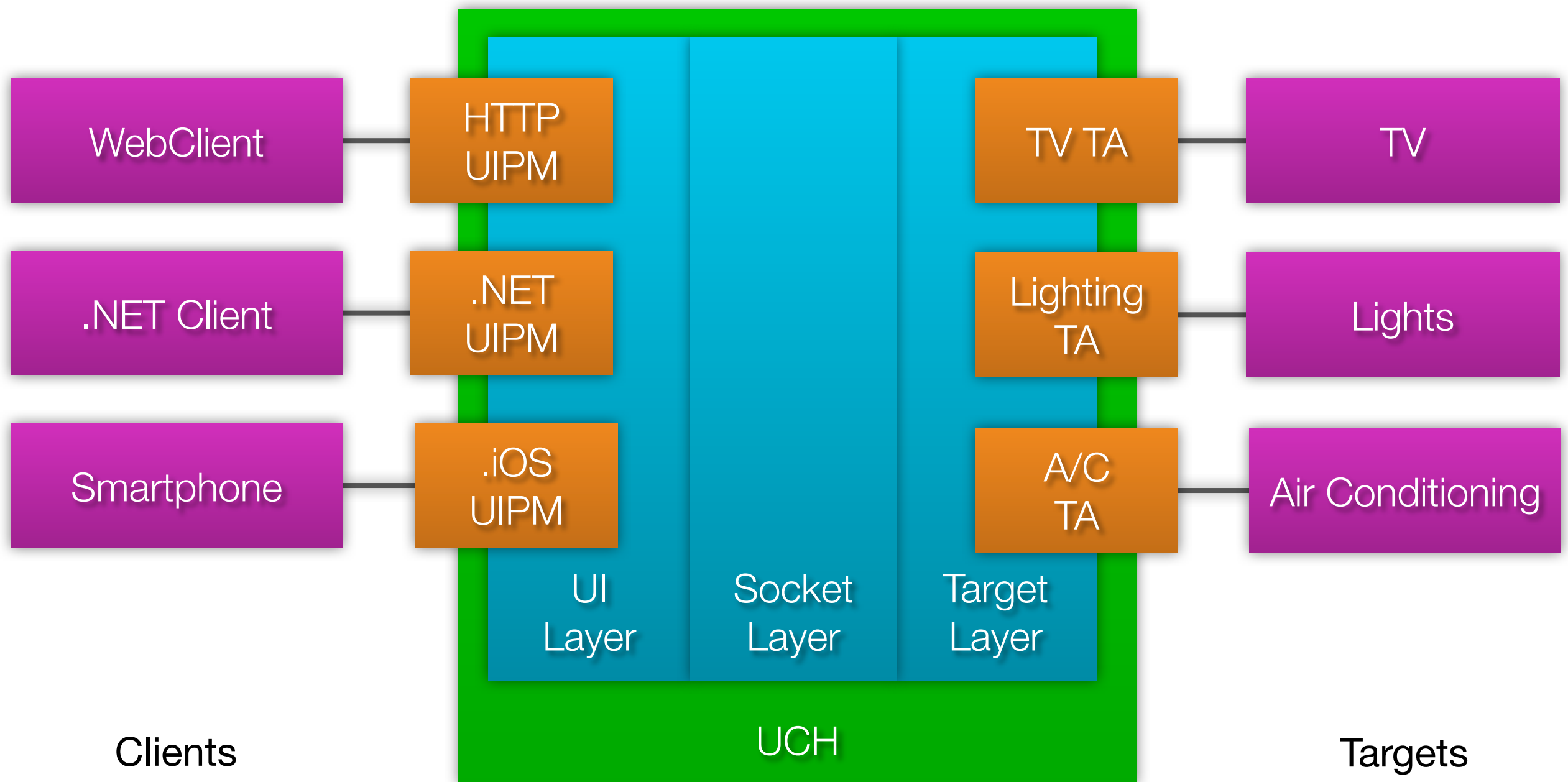
i2home | ARCHITECTURE



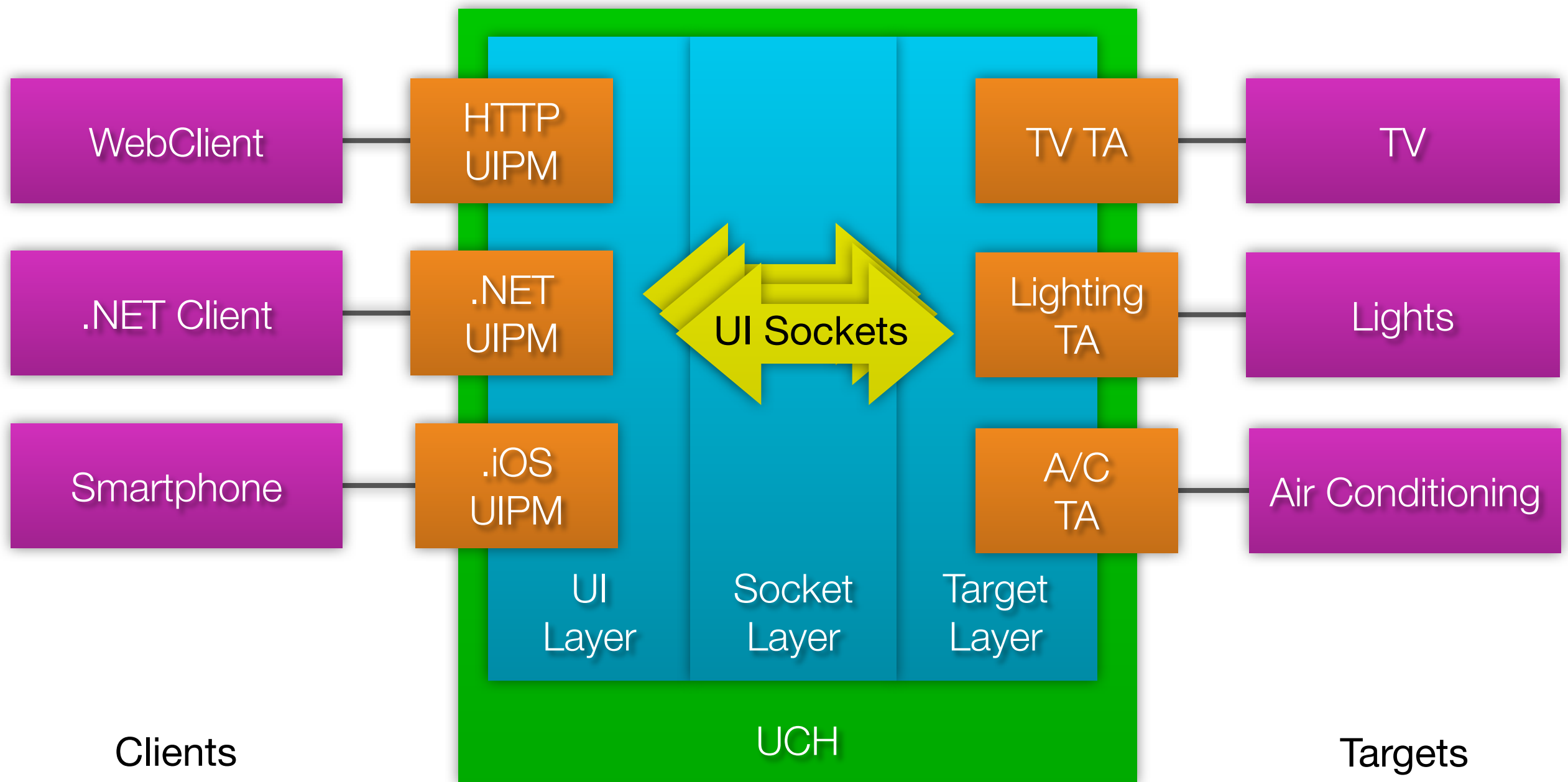
i2home | ARCHITECTURE



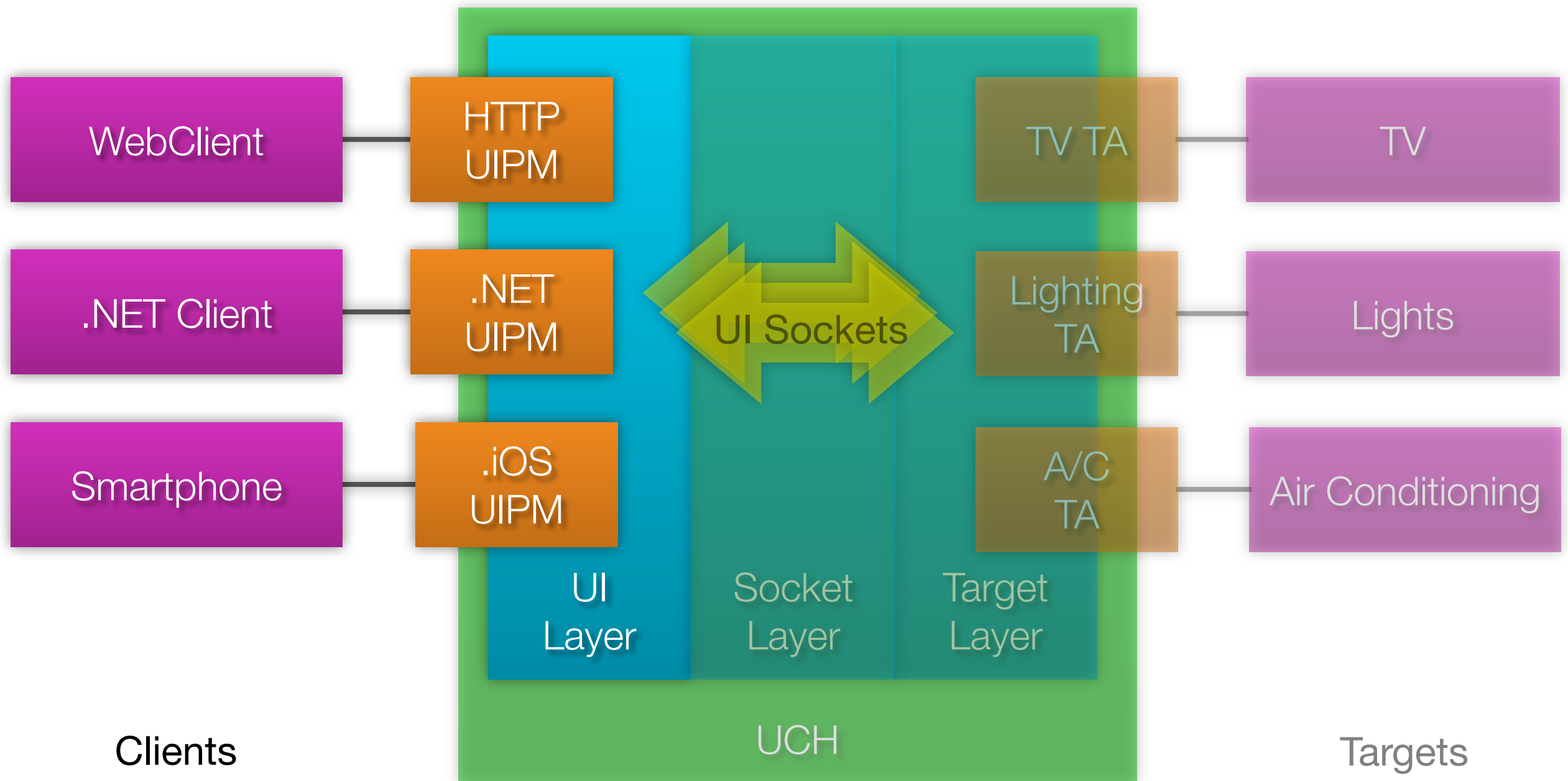
i2home | ARCHITECTURE



i2home | ARCHITECTURE



i2home | ARCHITECTURE



i2home | GOALS



- ▶ User centered design
 - use of Personas
- ▶ Simplicity
- ▶ Accessibility
- ▶ Usability

i2home | USER INTERFACES



User Selection

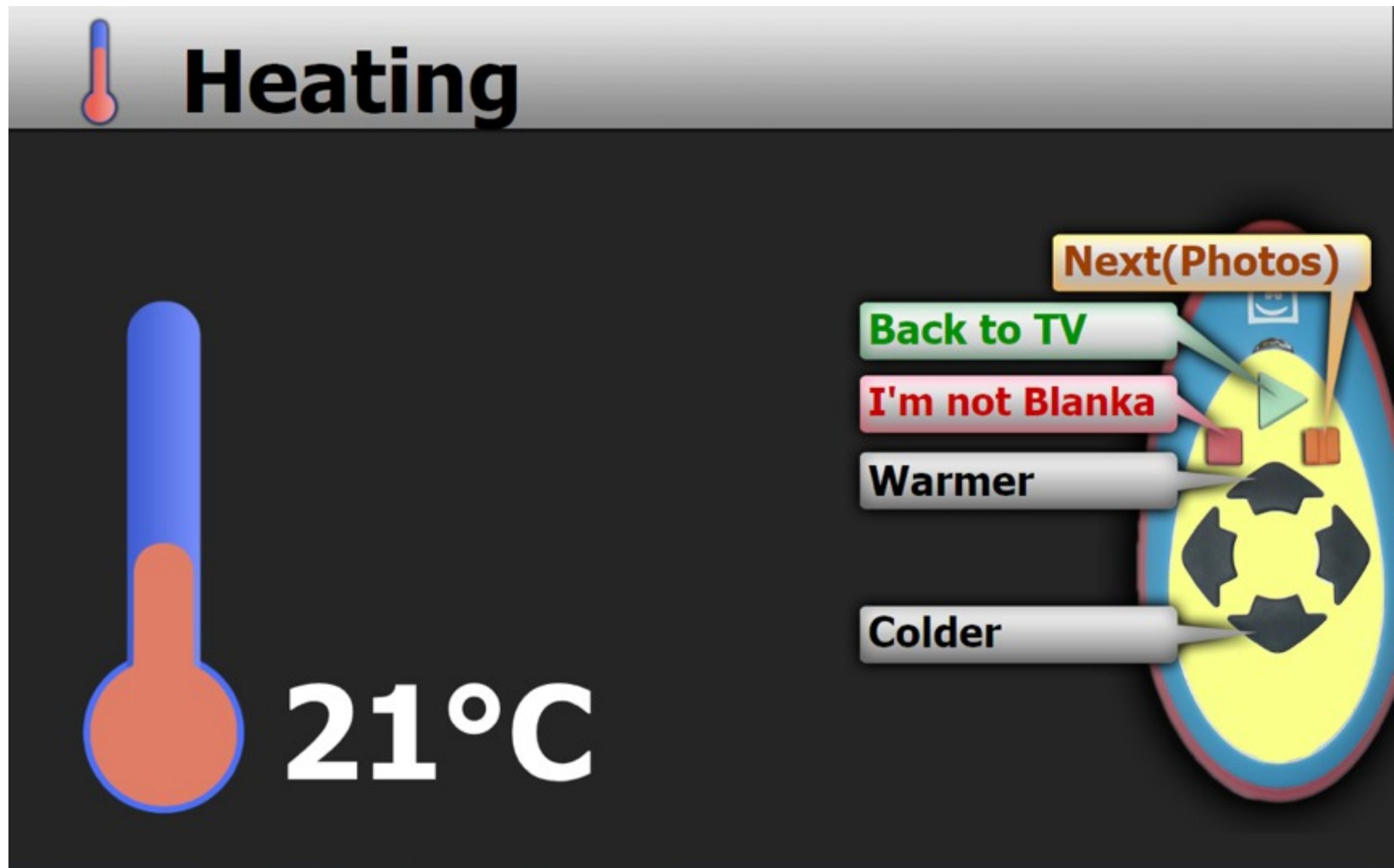


Back to TV

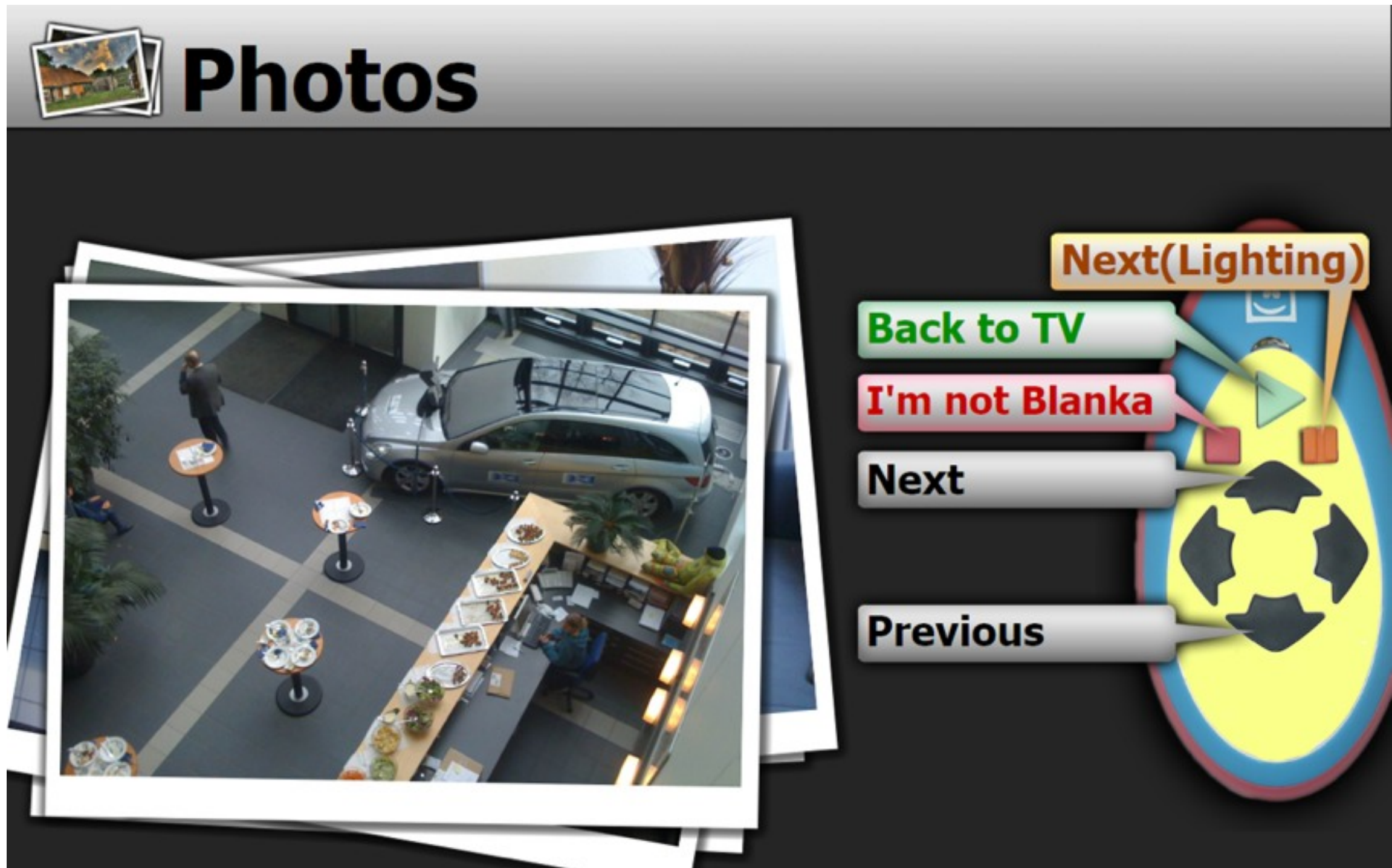
Blanka

Arnošt

i2home | USER INTERFACES



i2home | USER INTERFACES



i2home | USER INTERFACES

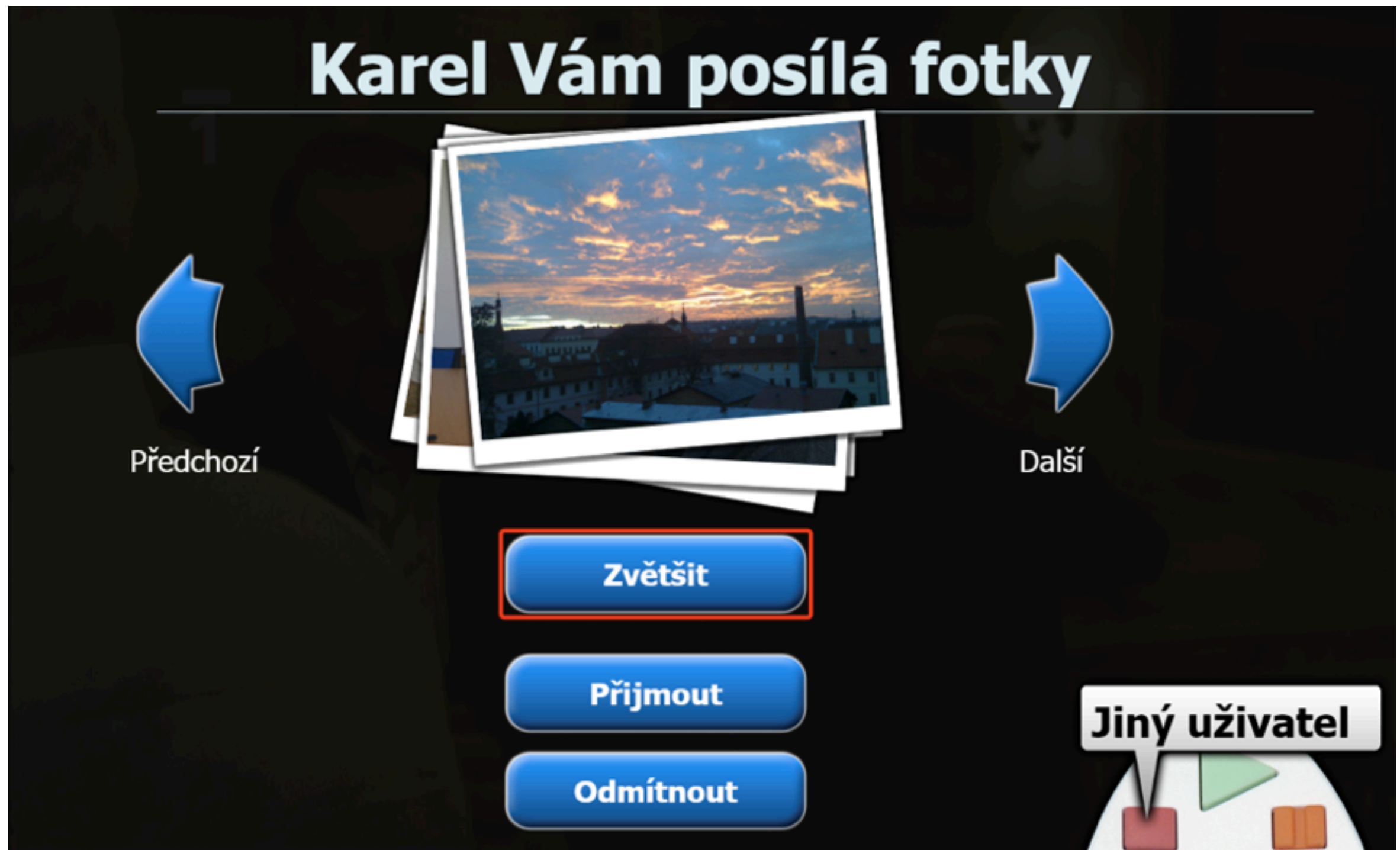
Now you can talk



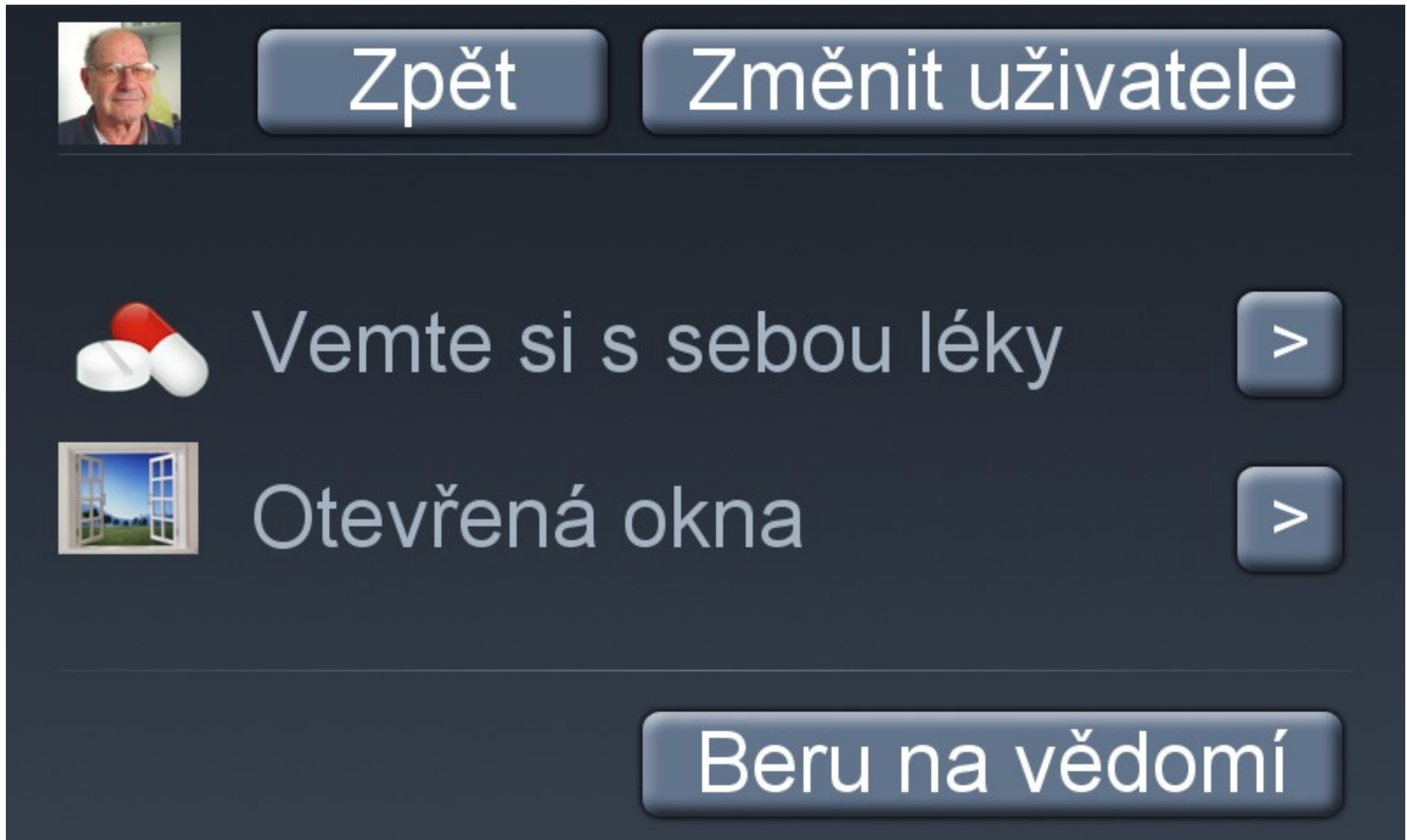
i2home | USER INTERFACES



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i2home | USER INTERFACES

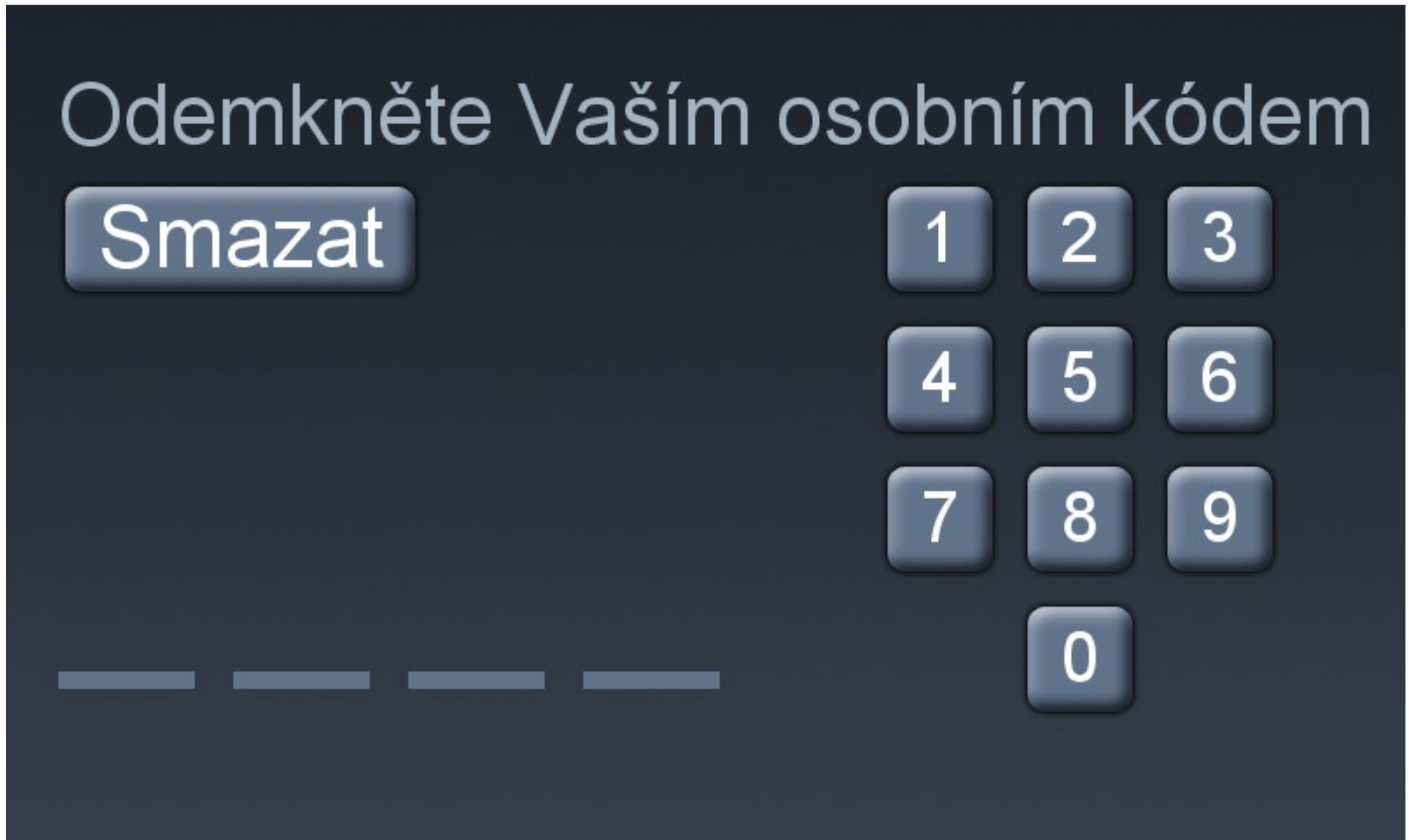


Arnošt



Blanka

i2home | USER INTERFACES



i2home | USER INTERFACES

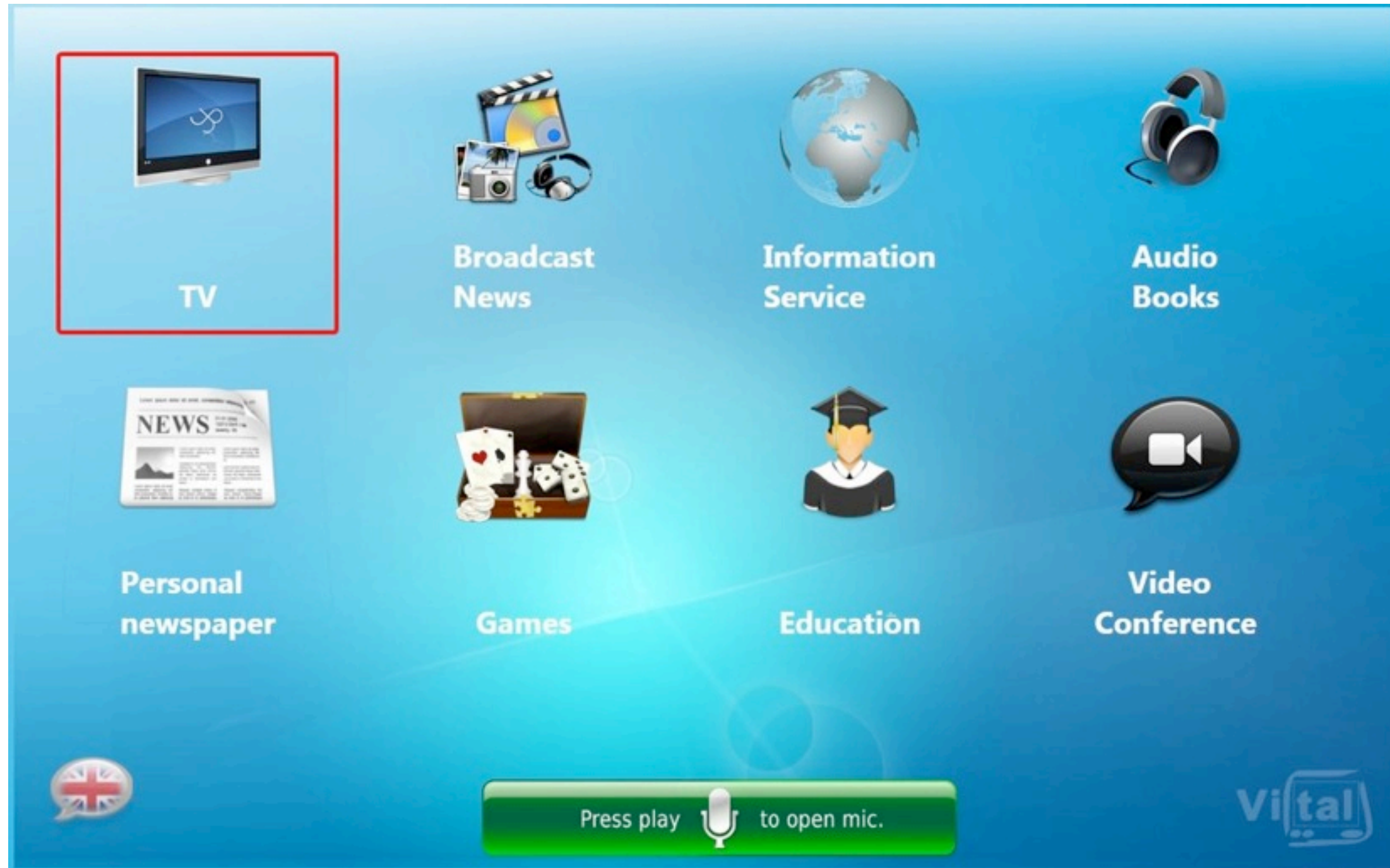
Vybírejte neznáme obličeje



VITAL PROJECT

- ▶ FP6, EU Project, 11 partners, 3(2) years
- ▶ Vital Assistance For The Elderly
 - Entertainment
 - Education
 - Communication
- ▶ based on UCH, UIP
- ▶ Smart TV
- ▶ voice integration
- ▶ target group: seniors

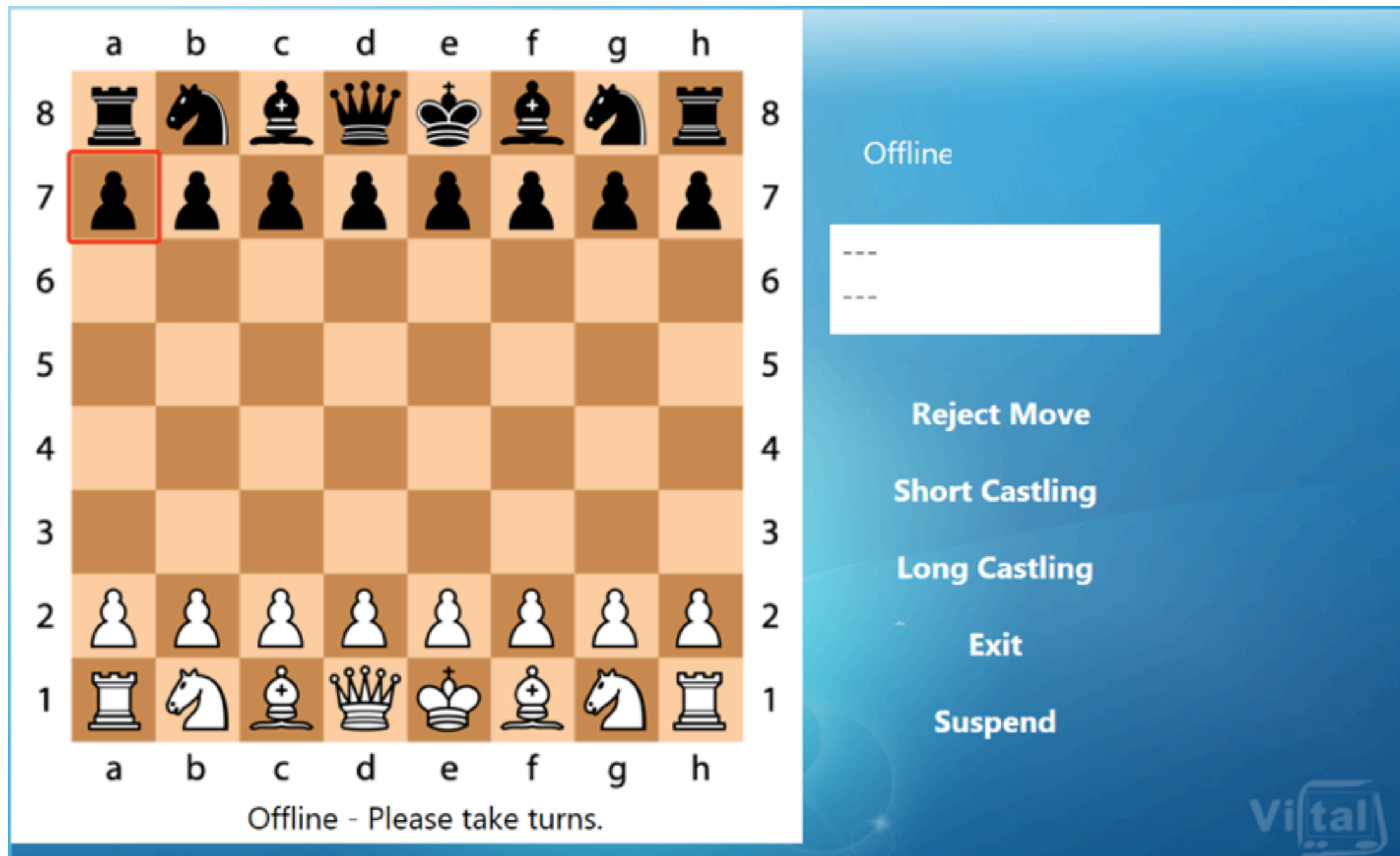
VITAL | USER INTERFACES



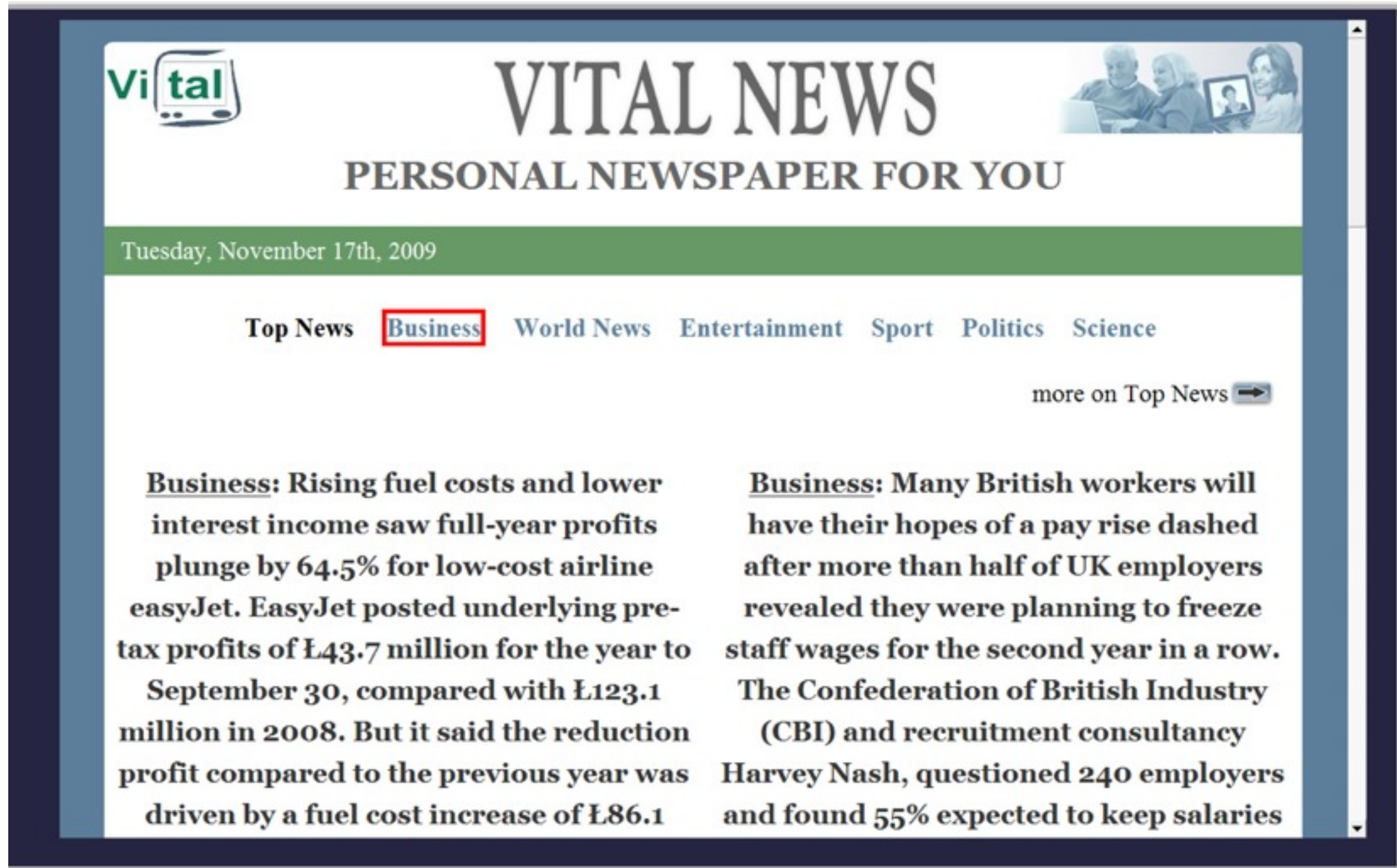
VITAL | USER INTERFACES



VITAL | USER INTERFACES



VITAL | USER INTERFACES



ELU PROJECT

ENHANCED LEARNING UNLIMITED

- ▶ 6th Framework Program (IST EU)
- ▶ Spread the benefits of e-learning to broader audience
- ▶ Barriers
 - availability of the technology
 - usability
 - personalization

ELU | MOTIVATION 1/2

TV

- ▶ 98% households in EU
- ▶ Easy to use
- ▶ Suitable for informal learning
- ▶ Synchronous environment
- ▶ Limited interaction
- ▶ User is passive

iDTV



Computer & Internet

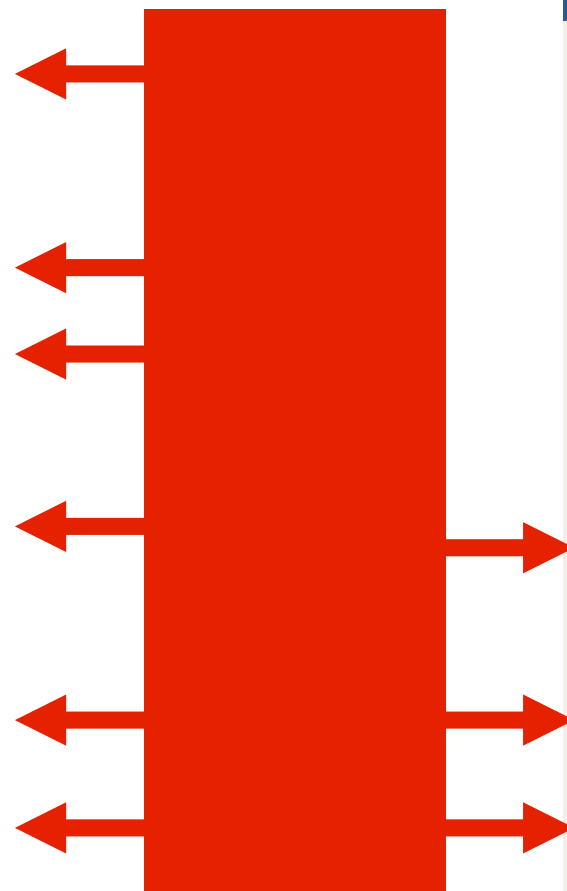
- ▶ 49% households in EU
- ▶ Not so easy to use
- ▶ Suitable for formal and informal learning
- ▶ Asynchronous environment
- ▶ Heavy interaction
- ▶ User is active

ELU | MOTIVATION 2/2

TV

- ▶ 98% households in EU
- ▶ Easy to use
- ▶ Suitable for informal learning
- ▶ Synchronous environment
- ▶ Limited interaction
- ▶ User is passive

iDTV



Computer & Internet

- ▶ 49% households in EU
- ▶ Not so easy to use
- ▶ Suitable for formal and informal learning
- ▶ Asynchronous environment
- ▶ Heavy interaction
- ▶ User is active

1. Challenges of TV environment

Room Set-up:

- GUI is much more visual demanding than telecast
- room set-ups don't have to be suitable for using GUI



2. Characteristics of Remote Controllers

Use of Remote Controller:



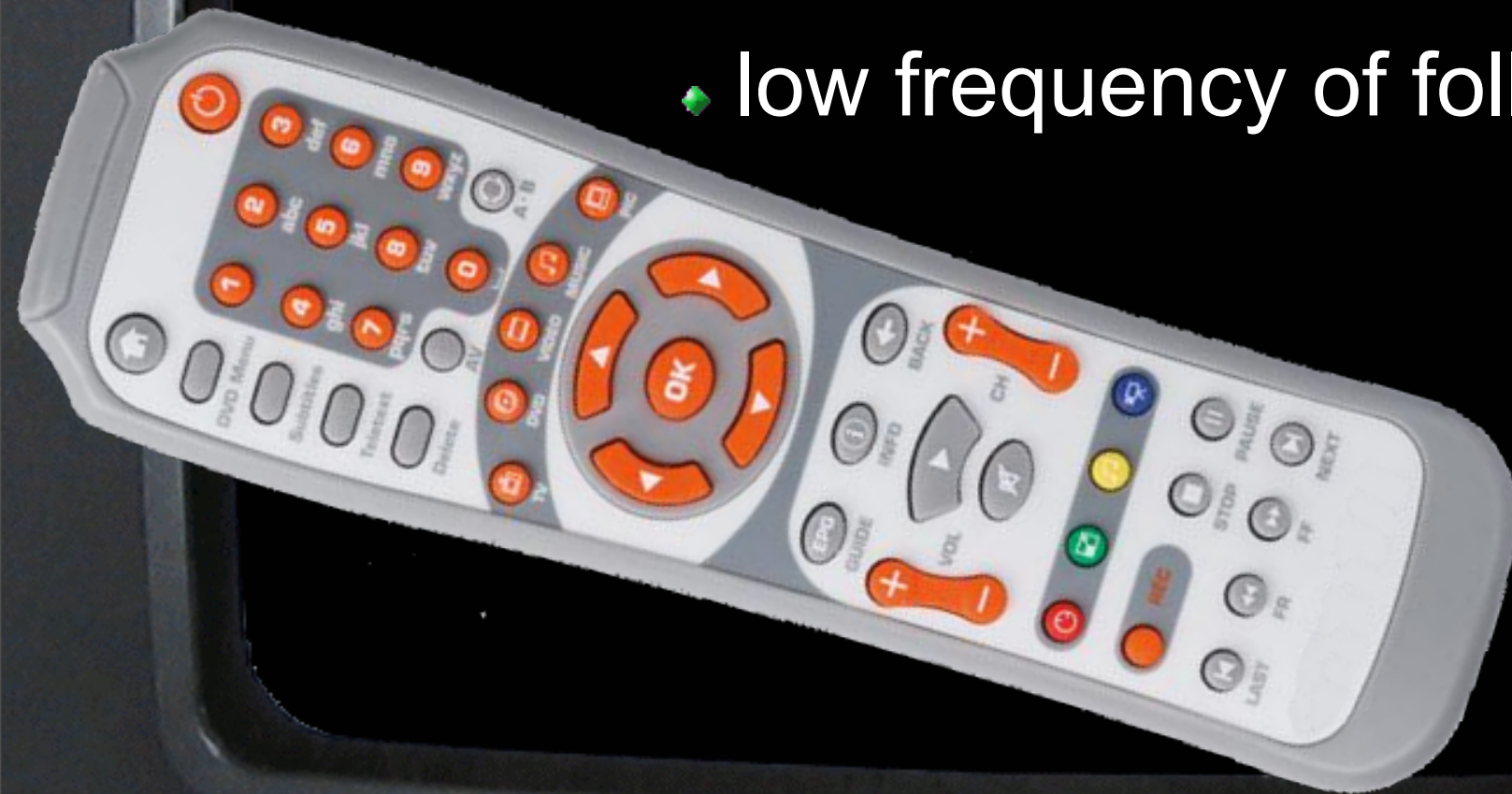
- senior usually holds RC in one hand and presses button with index finger of the other hand
- during tricky operations senior switches his/her attention between GUI and remote controller



2. Characteristics of Remote Controllers

Remote Controller:

- ♦ typical way of controlling GUI
- ♦ aiming at IR receiver on television
- ♦ slow response to actions
- ♦ low frequency of following actions

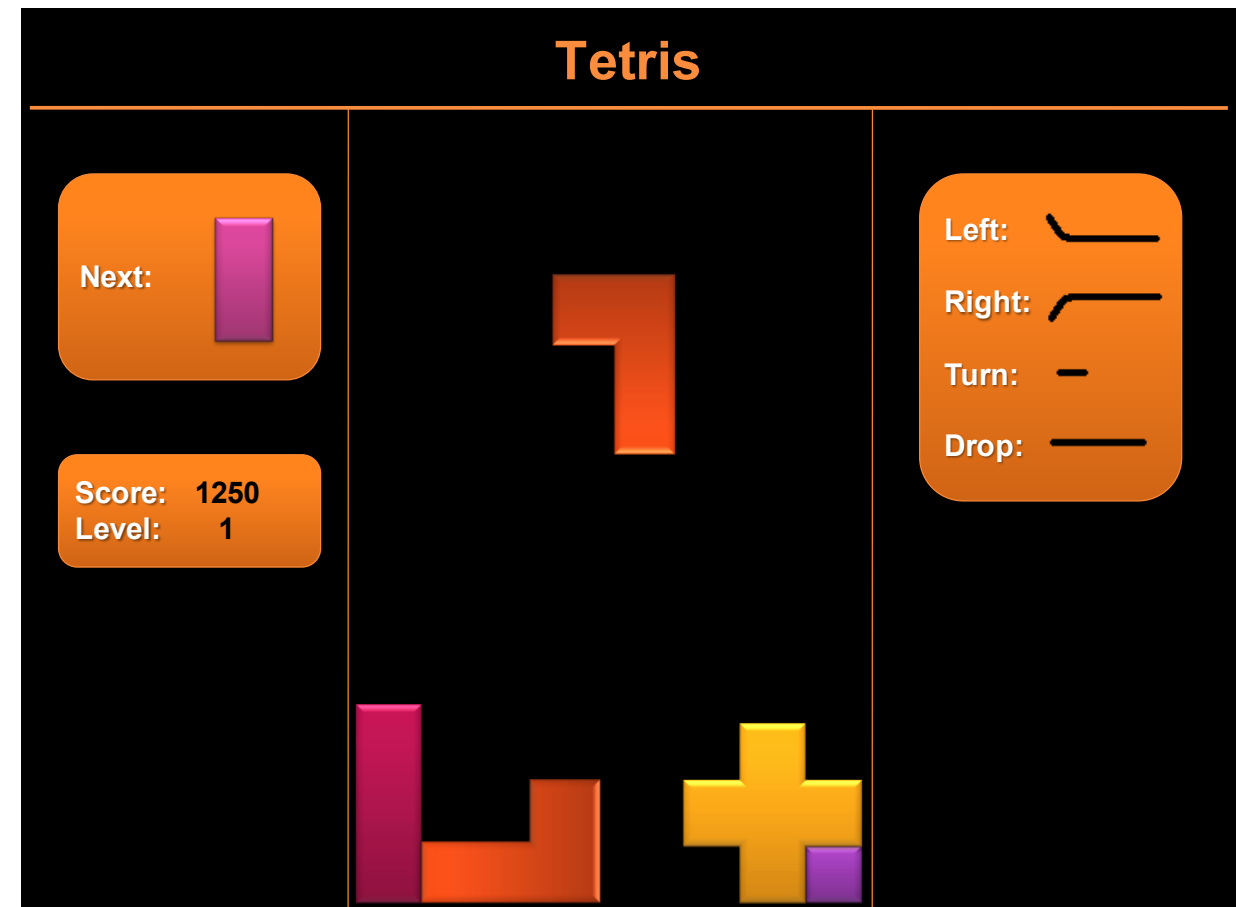


VITAL MIND PROJECT

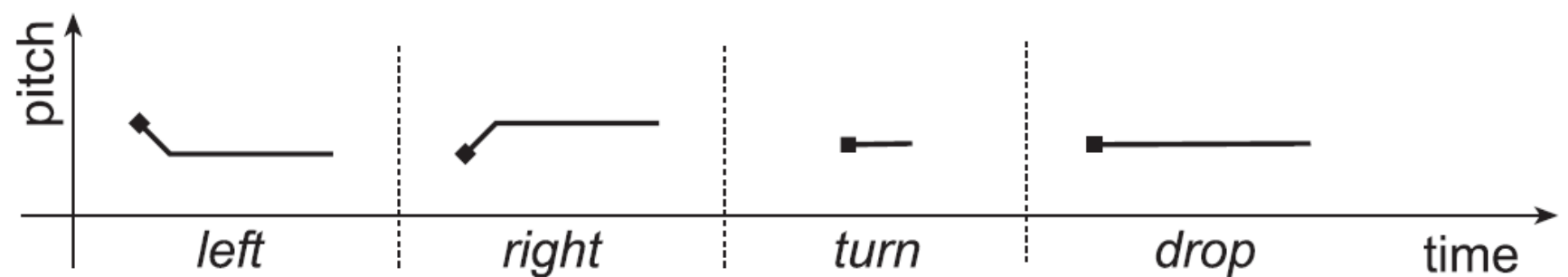
- ▶ The project deals with problems of elderly people
- ▶ These people will get possibility to perform mental and physical training (to improve their mental and physical capabilities)
- ▶ Platform: iDTV
- ▶ New methods of interaction (gyro, non-verbal)

VM | NVVI EXAMPLE

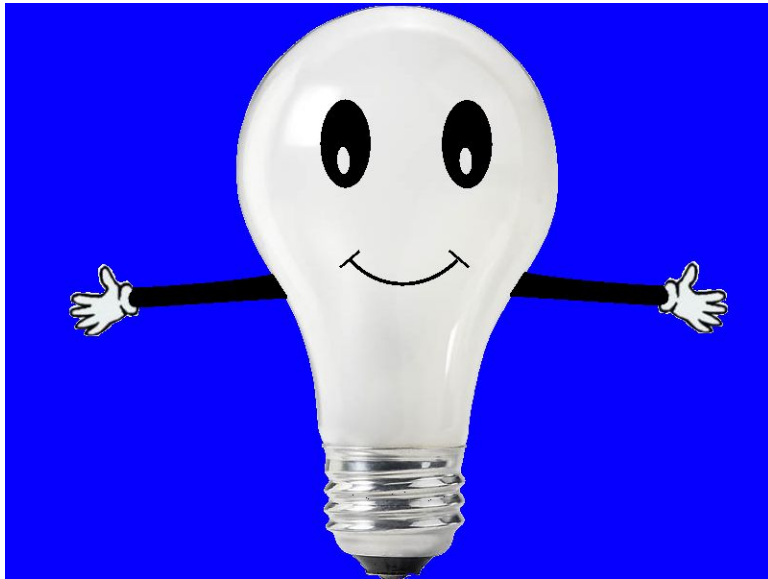
- ▶ Non-Verbal Voice Interaction
- ▶ Tetris
- ▶ Blocks are randomly selected
- ▶ The falling block can be rotated or shifted to the sides
- ▶ When a row is completed, it is removed
- ▶ Controlled by humming and hissing



- ▶ Gestures:



VM | PHYSICAL EXERCISES



AEGIS

- ▶ Open-source accessibility support for ICT-products
- ▶ Reducing development costs of 3rd party accessible applications
- ▶ Innovative approaches to enable interaction for people with severe cognitive impairments
- ▶ Developing new methods for eye-tracking
- ▶ Accessibility for “Web 2.0” applications

ACCESSIBLE

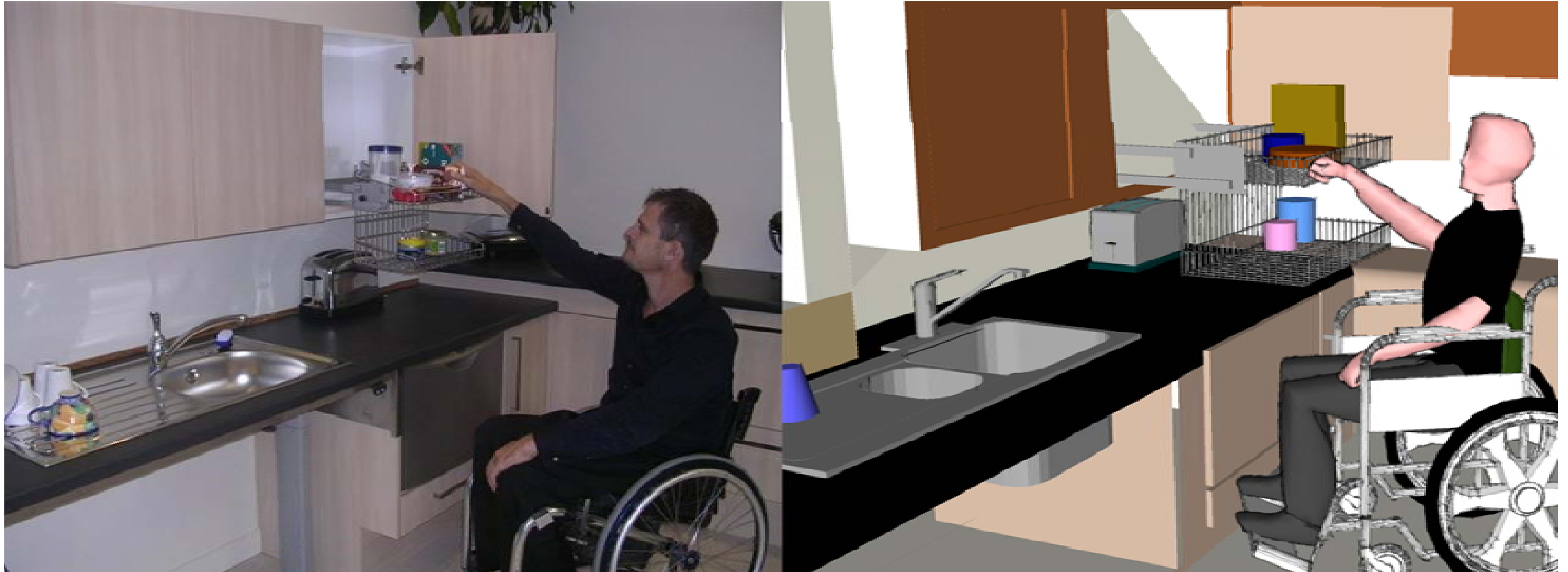
- ▶ Accessibility Assessment Simulation Environment for New Application Design and Development
- ▶ New tools for development and testing of accessible applications
- ▶ Developed tools
 - Disability Impairment Approximation Tool (DIAS)
 - Web Accessibility Assessment Tool (WaaT)
 - Web Service Accessibility Assessment Tool (WebSaaT)
 - Mobile Web Accessibility Assessment Tool (MobileWaaT)
 - Description Language Accessibility Assessment Tool (DLaaT)
 - Mobile Impairment Simulation Tool (MIS tool)
 - Development and Evaluation web portal

VERITAS PROJECT

► Goals

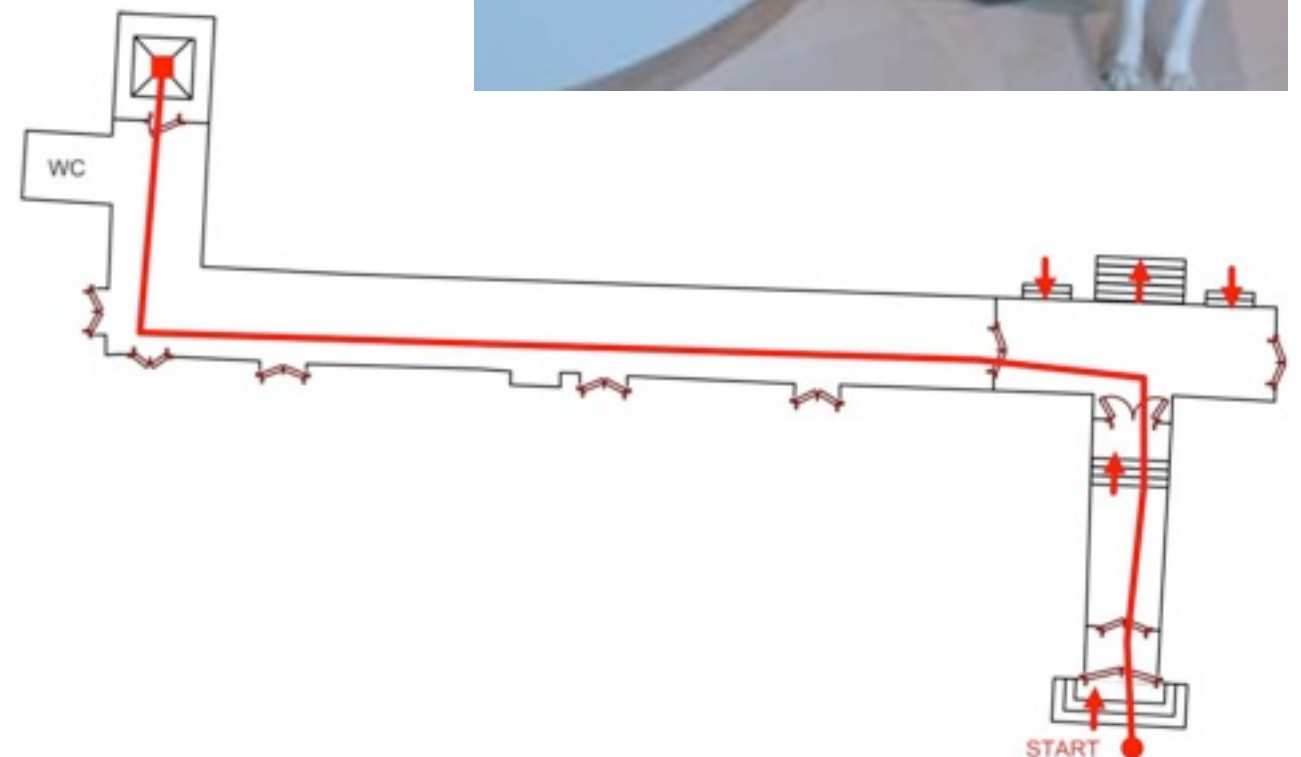
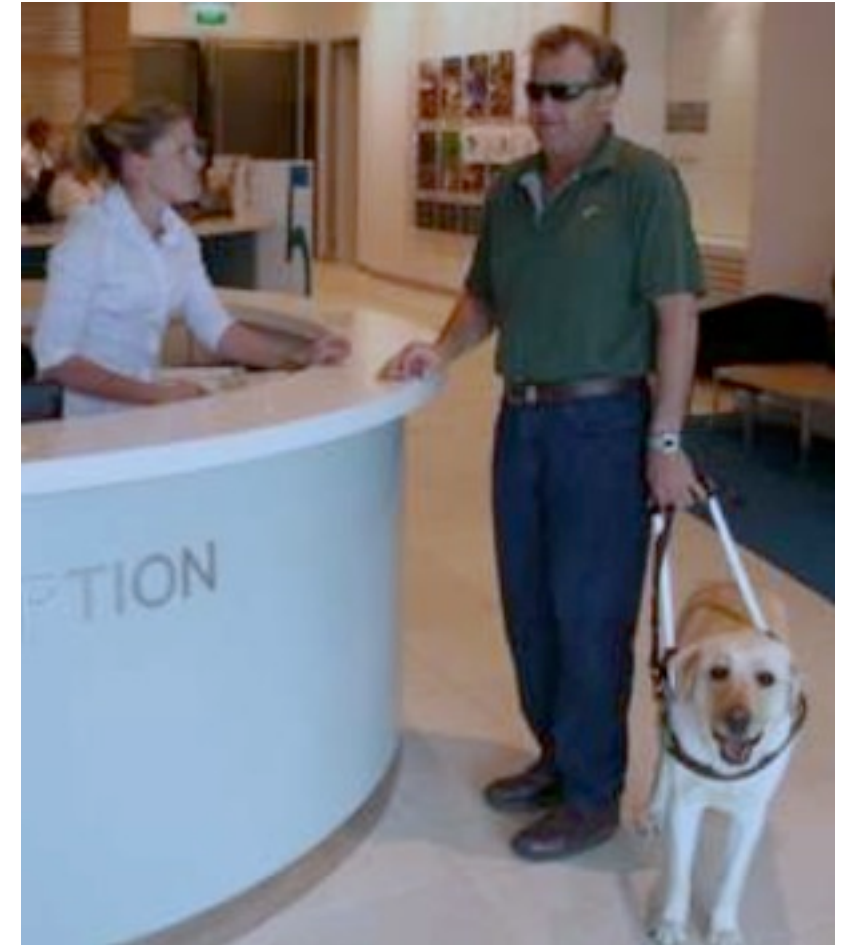
- translate the accumulated knowledge on ICT accessibility to parameters of the virtual user models
- test the validity and applicability of these virtual user models in real accessibility testing scenarios
- create a set of simulation models building on the experience already gathered via testing accessibility in various applications domains
- integrate all the above into VERITAS knowledge, which will serve as a reference to the existing ICT accessibility know how.

VERITAS | EXAMPLE



NAVITERIER | NAVIGATION OF VISUALLY IMPAIRED

- ▶ System for independent interior navigation of visually impaired people
- ▶ Fits for universities, administrative, buildings, libraries, etc.
- ▶ Step-by-step describing of route between two points in building
- ▶ No additional costs for user
 - mobile phone
 - navigation application
- ▶ Low implementation costs
 - description of building



NAVITERIER | FUNCTION

- ▶ Consists of 3 main parts

Navigation system

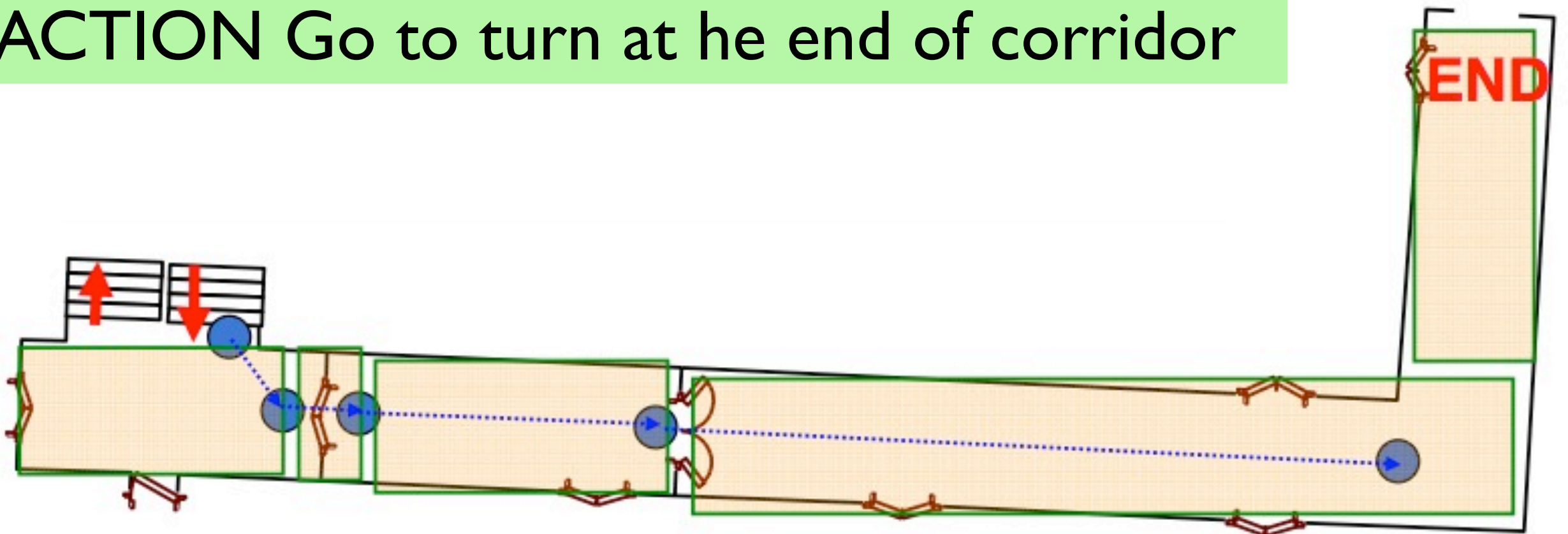


- ▶ Navigation device:
 - Mobile phone
 - TTS system (voice output)
 - Navigating application
- ▶ „Passive“ navigation
- ▶ System describes requested route in segments
- ▶ User gives feedback to system continuously

NAVITERIER | FUNCTION

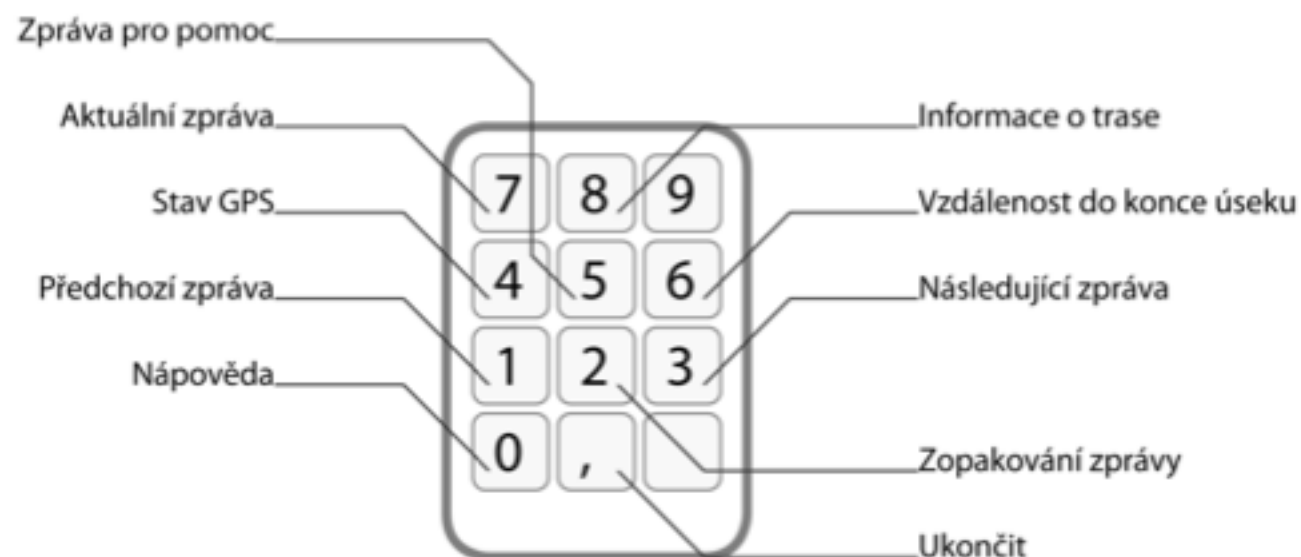
DESCRIPTION: Corridor continues just about 20 meters. Windows are on the left side, office doors are on the right. Corridor turns left at the end of the corridor.

ACTION Go to turn at the end of corridor



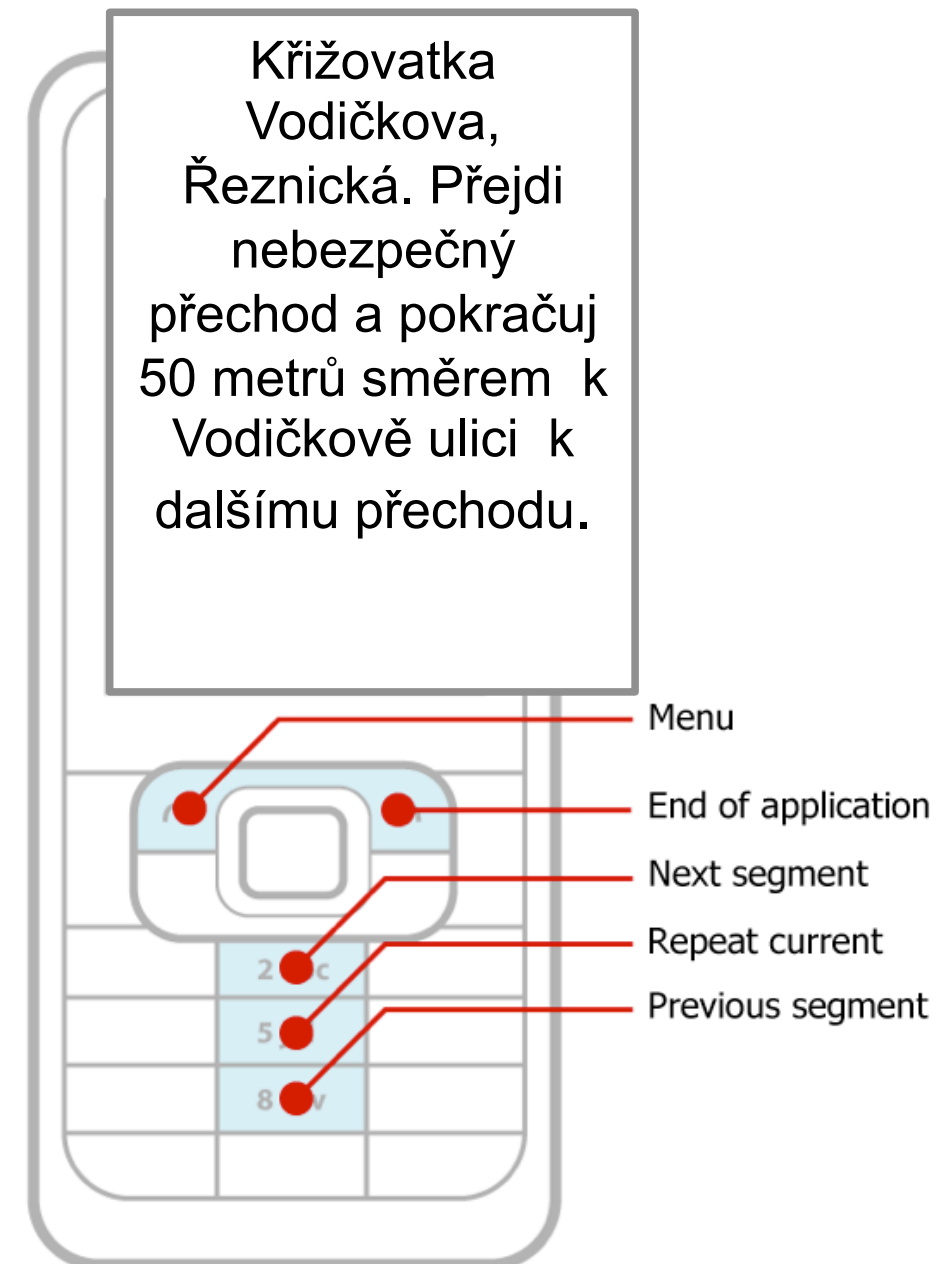
NAVITERIER | OUTDOOR NAVIGATION

- ▶ Tourism - unpaved roads, weather
- ▶ City
 - variable environment
 - more dangerous (e.g. road traffic)
- ▶ GPS for rough navigation, problem with accuracy
- ▶ Control using external numerical keyboard



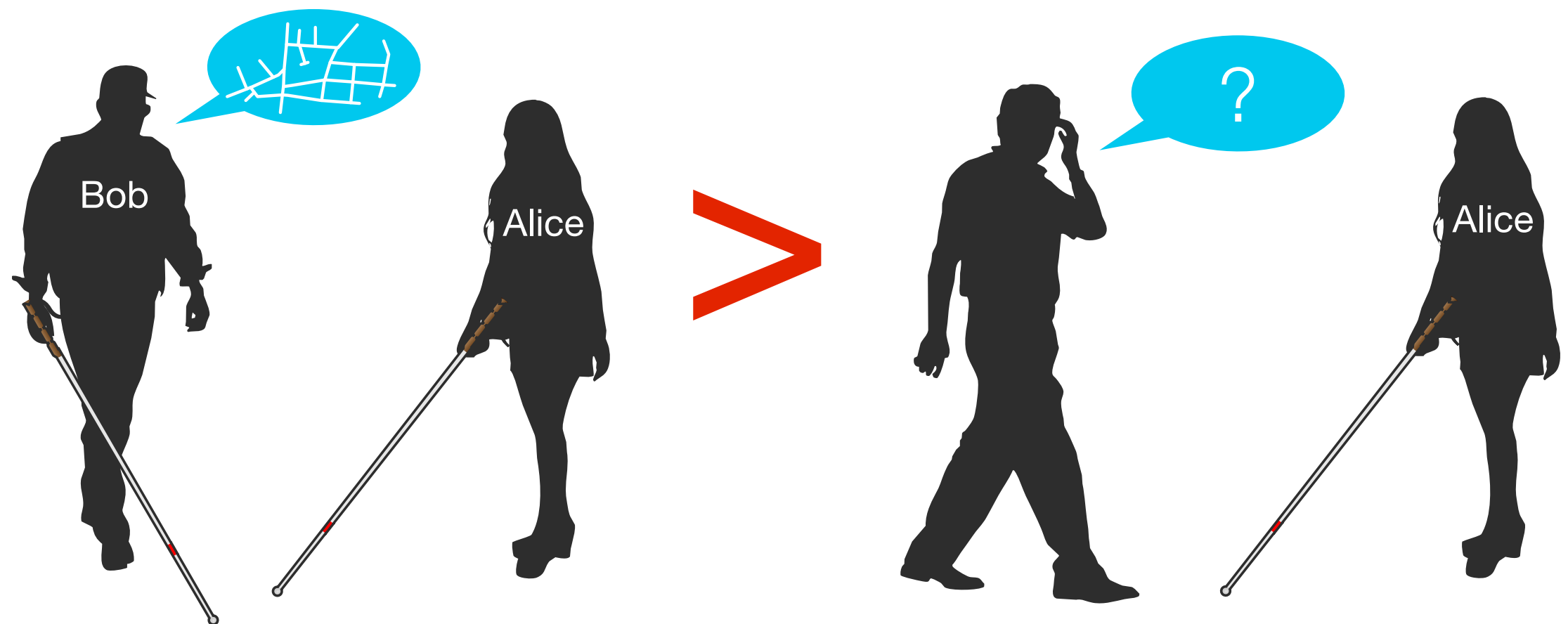
NAVITERIER | OUTDOOR NAVIGATION

- ▶ Route segmentation according important points of interest (crossroads, road crossings, road turnings ...)



NAVITERIER | ONGOING WORK

- ▶ Mutual navigation of visually impaired
- ▶ Visually impaired perform better with navigation from other visually impaired than from sighted



USABILITY LAB



VIRTUAL-REALITY LAB



SUMMARY

- ▶ Department of Computer Graphics and Interaction (CTU Prague)
- ▶ Research activities
- ▶ Project activities
- ▶ Education at bachelor, master, and PhD level

Responsible partner for projects
from CG & HCI areas

RECENT PUBLICATIONS

- ▶ Klima, Martin, et al. "User interfaces for the digital home on the basis of open industrial standards." Ambient intelligence perspectives. Selected papers from the first international ambient intelligence forum. 2008.
- ▶ Klima et al.: "User Interfaces for the Digital Home on the basis of Open Industrial Standards." Ambient Intelligence Perspectives: Selected Papers from the First International Ambient Intelligence Forum, 2008. Vol. 1. Ios Press Inc, 2009.
- ▶ Maly, I. - Mikovec, Z. - Vystřcil, J. - Interactive Analytical Tool for Usability Analysis of Mobile Indoor Navigation Application In: 3rd International Conference on Human System Interaction (HSI2010). Warsaw: IEEE, 2010, p. 259-266. ISBN 978-1-4244-7561-2.
- ▶ Maly, I. - Mikovec, Z. - Vystřcil, J. - Franc, J. - Slavík, P. An evaluation tool for research of user behavior in a realistic mobile environment In: Personal and Ubiquitous Computing. 2013, vol. 17, no. 1, p. 3-14. ISSN 1617-4909.
- ▶ Sporka, A. - Felzer, Torsten - Kurniawan, Sri H. - Polacek, O. - Haiduk, Paul - et al. CHANTI: predictive text entry using non-verbal vocal input, In: CHI '11 Proceedings of the 2011 annual conference on Human factors in computing systems. New York: ACM, 2011, p. 2463-2472. ISBN 978-1-4503-0228-9.
- ▶ Sporka, A. - Polacek, O. - Slavík, P. - Comparison of two text entry methods on interactive TV, In: Proceedings of the 10th European conference on Interactive tv and video. New York: ACM, 2012, p. 49-52. ISBN 978-1-4503-1107-6.
- ▶ Macík, Miroslav, Adam J. Sporka, and Pavel Slavík. "An initial study of effects of temporary disabilities." ACM SIGACCESS Accessibility and Computing 103 (2012): 3-13.
- ▶ Polacek, Ondřej, Adam J. Sporka, and Pavel Slavík. "A Comparative Study of Pitch-Based Gestures in Nonverbal Vocal Interaction." Systems, Man and Cybernetics, Part A: Systems and Humans, IEEE Transactions on 42.6 (2012): 1567-1571.
- ▶ Čmolík, Ladislav, and Jiří Bittner. "Layout-aware optimization for interactive labeling of 3D models." Computers & Graphics 34.4 (2010): 378-387.
- ▶ And more at <http://dcgi.felk.cvut.cz/publications>

THANK YOU FOR YOUR ATTENTION

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