// making computing palpable

PalCom is a four-year integrated project that is funded by the European Union. At the start of the research project in 2004, it was the only project accepted by the EU in the field of "The Disappearing Computer in Future and Emerging Technologies" and the total budget amounts to almost 13 million euros. Over 100 researchers and professional developers take part in PalCom. They come from universities and IT companies all over Europe. The initiative to form the PalCom consortium came from the University of Aarhus, Denmark, where Professor Morten Kyng is the project coordinator. The project develops software architecture and prototypes, where the latter is to a large extent focused on the health care sector.

PalCom partners

Universities
• The University of Aarhus, Denmark
• The Aarhus School of Architecture, Denmark
• Kings College, Great Britain
• Lancaster University, Great Britain
• The Polytechnic Institute of Lausanne, Switzerland
• Lund University, Sweden
• Malmö University, Sweden
• The University of Siena, Italy

Companies
• Siemens, Germany
• Whitestein Technologies, Switzerland
• The Alexandra Institute, Denmark
• 43D, Denmark

www
The PalCom project: www.ist-palcom.org
The Disappearing Computer in Future and Emerging Technologies:
http://cordis.europa.eu/ist/fet/dc.htm

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'Palpable computing' means pervasive and comprehensible IT solutions. The greater the influence IT has on our daily lives, the more apparent becomes our need for compatibility in the functioning of different technologies, whilst at the same time ensuring that such technology is easily understood by users. PalCom's researchers are developing design concepts and a range of software development tools, so that both technicians and general users have easy access to a reliable cross-section of different types of IT.

Information Society Technologies

palcom
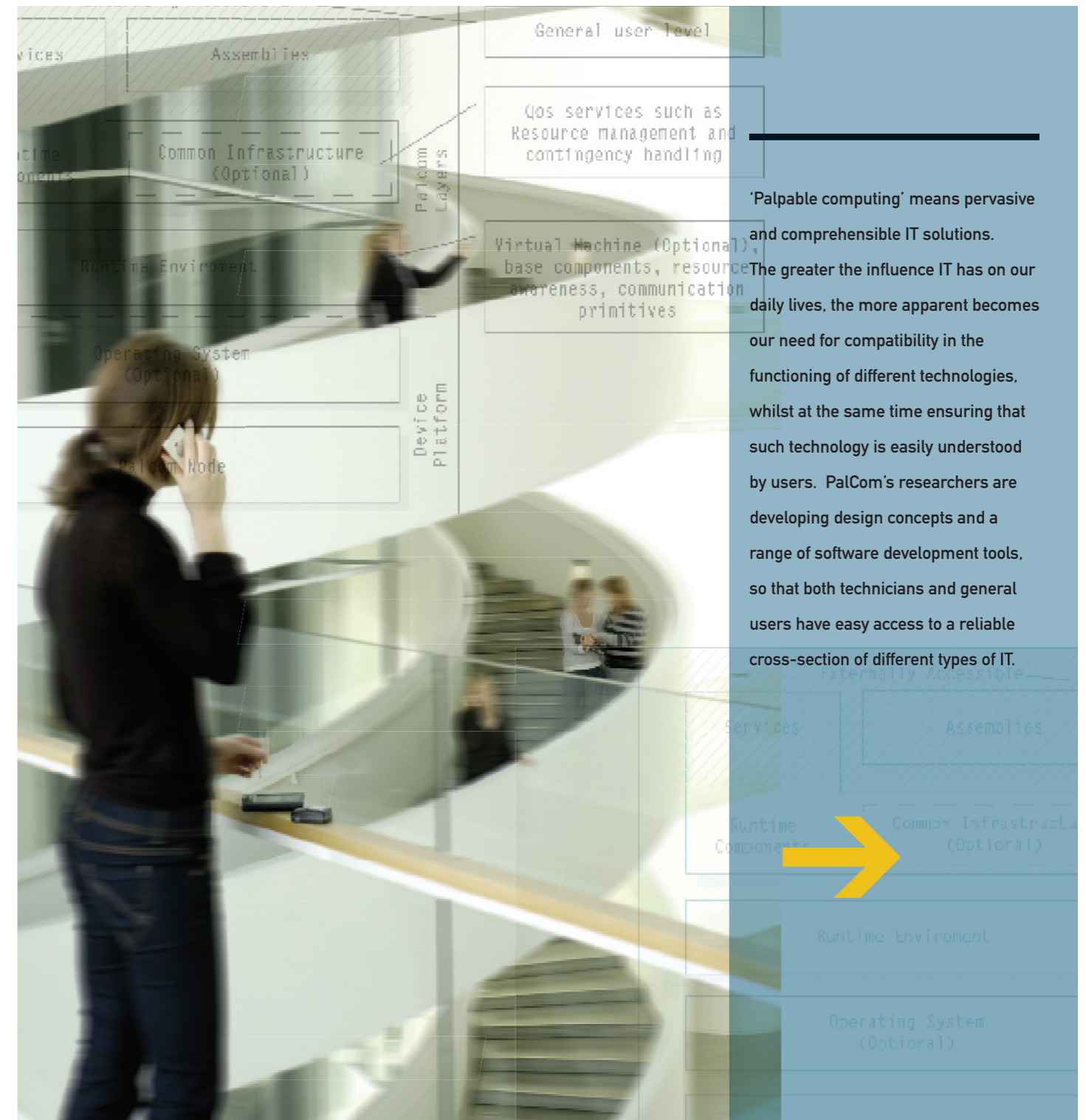
// The future belongs to palpable computing

In an era of ubiquitous IT, it is crucial that an increasing number of devices are able to function and communicate interactively and that users are able to understand how the systems surrounding them work. The EU-sponsored project 'PalCom' has taken up the challenge

Since the late eighties, ubiquitous computing has been the design concept to attract many professional developers. For more than 20 years, concepts such as 'invisibility' and 'automation' have guided how IT-systems are designed. The EU-sponsored research project 'PalCom' challenges the traditional notion of ubiquitous computing with a more

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Palpable computing will make technology a much more integrated and dynamic part of our lives. It has the potential to change technology from something rather static to something flexible that we can change and adjust on an everyday basis, just as we do with the contents of our pockets or the shelves in the kitchen"

- Professor Morten Kyng, project leader

up-to-date concept; palpable computing. According to PalCom's researchers we need new developmental tools and a new approach to designing information systems in order to meet the demands of a future with ubiquitous IT.

   - Palpable computing is really about doing ubiquitous computing right. In its original sense, ubiquitous computing is centered round making technology invisible whilst using it. But if your tools do not fit the job you are trying to do, or if there is a system breakdown, then you need to be able to see the tools, to experiment with them or even to repair them, says the project leader, Professor Morten Kyng from the University of Aarhus.

Putting the user in control
One of the biggest problems that ubiquitous computing will face in the future is that people will not want to use the systems because they feel they have lost control – for example, people may become concerned about interacting with invisible systems where unknown companies or government agencies can

snatch personal information and use it to their own benefit.

   - Today, we are already beginning to see the first signs of such anxiety. The vision of palpable computing is to put comprehensibility and control over your own information on the agenda of system developers and into the hands of users, says project leader Morten Kyng.

Designing together with users
In PalCom, end-users are deeply involved in the design. PalCom's researchers develop technologies for a number of application areas, many connected to healthcare and emergency services. Fire-fighters and doctors give advice and feedback in workshops, and host researchers as participant observers, e.g. in the drills of the local fire department. Designing in collaboration with users is an important starting point for the project. Professor Morten Kyng explains:

   - If we are to do pervasive computing the right way, by ensuring comprehensibility and user control, then we need to carry out our design work together with the people who are going to use the systems.

PalCom's researchers develop prototypes for a number of application areas. They are all characterized by the use of a growing number of digital devices and a need for technologies that work better together and are easier to comprehend.

PalCom provides overview for Major Incidents

If a lorry crashes, or a fire breaks out, it is a challenging task for rescue professionals to get an overview of the accident scene and the number of injured. One of PalCom's prototypes, Major Incidents Overview, is an application that enables fire fighters, police men and doctors to keep track of wounded, vehicles and equipment at the scene of accident. An electronic map within a 3D environment displays the relevant

locations to the fire chief and managing police officer who coordinate the rescue effort. The managers can also use the map to draw security boundaries, exit gates and meeting points. Further, the system allows for patient monitoring and remote controlled cameras providing live video and pictures. The information is accessible for the professionals via a variety of devices; e.g. laptops, PDA's and mobile phones.

PalCom is about software; software that enables the age of pervasive and ubiquitous computing.

PalCom open Software Architecture

The architecture is developed through real life settings:
- to meet the vision of palpable computing,
- while answering the challenges presented by the real-world, and
- evolving a reference infrastructure as the architecture is iteratively refined.
The objective, in short, is to make computing palpable.

Service Oriented Architecture
The nature of the software in PalCom is that it consists of multiple small, self-contained subsystems that communicate with one another to solve user tasks.
- The choice of architectural style lends itself to the SOA paradigm.
- SOA is defined as a distributed collection of services communicating with one another.

- Services can form aggregated groups that may provide additional functionality beyond the sum of their individual parts.

As an example, *The PalCom Geotagger software application* consists of an aggregated assembly of a GPS-service, a camera service, a digital compass service, a geoconverter service and others.
   This granularity allows services to be distributed across different devices in several locations, and yet belong, and contribute to the operation of, multiple assemblies. Assemblies include service aggregations, devices, connectors and actors.

The notion of PalCom Assemblies
Assemblies support understandability, flexibility and inspection.

The assembly mechanism allows:
- the user to (de)construct an assembly in a sensible manner,
- flexible, real-time application construction responsive to foreseen events and requirements,
- inspection at multiple levels through explicit representation of behaviour in the software.

A way to handle contingencies
The PalCom Architecture offers the means to handle contingencies, which represent actions to take in response to detected events – a necessary fact of life in a pervasive era.
- A primary reason for addressing contingencies is to help unite the user and the system.
- It comes down to coping with a world where change is often the norm.