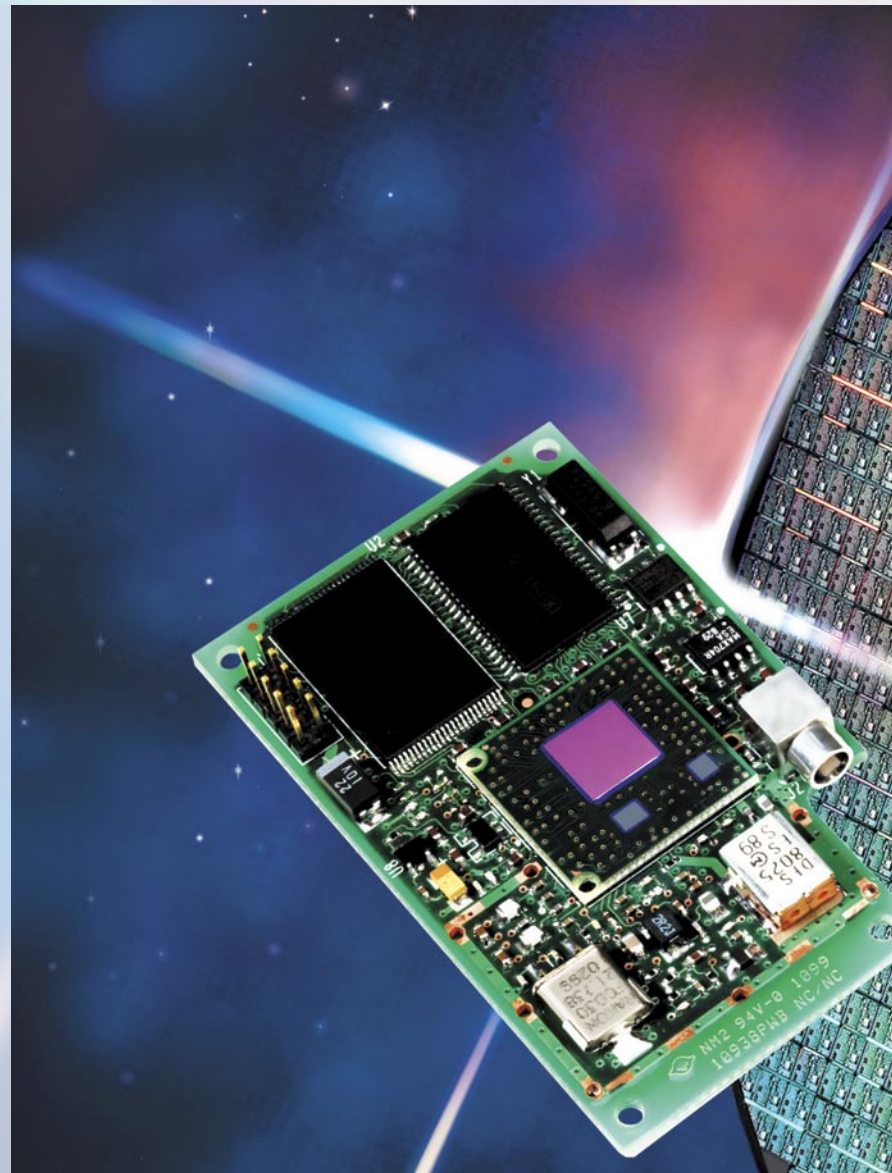


IBM Research's mobile computing vision involves the seamless integration of real-time data from the physical and virtual world into the IT operations infrastructure of organizations for supporting mobile and dynamic information access. IBM's history in mobile computing includes key contributions to both SyncML, a markup language that set the standard in mobile data synchronization, and Bluetooth, the standard for short-range wireless connectivity, as well as the creation of the Linux Watch, the premier example of wearable computing via miniaturization. Future research efforts will continue supporting the development of mobile computing by integrating optimized hardware with a service-oriented computing model that enables on-demand collaboration anytime and anywhere. A goal of this research activity is to provide industry leadership in the development of disconnected clients and in supporting efficient delivery of data streams across intermittently available networks.



PROGRAMMING MODELS AND TOOLS

IBM Research is developing software tools and systems that integrate data flows from disparate sources into business services in support of users. For example, a uniform control application abstraction model is being developed to integrate sensors, actuators, and business processes into a system ubiquitously distributed through an enterprise. Similarly, a novel programming model is being created for networked, distributable applications based on service-oriented concepts. An application is thought of as a document that weaves together local, mobile, and remote services in a mix of procedural and declarative programming styles, making applications easy to share, transport, manage, distribute, and transform. IBM Research is advancing this effort in the wireless domain as well with the development of a platform for studying low power wireless sensor networks that use a variety of networking standards, including IEEE 802.15.4/Zigbee, Bluetooth, and Ultra Wideband.

MOBILE HEALTH MONITORING

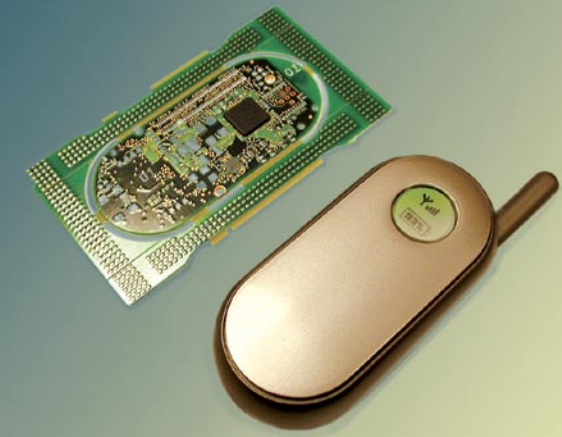
To address the needs of an aging population, IBM Research is developing mobile health solutions for *in situ* monitoring of biometric data. These solutions incorporate wearable computing by using personal mobile hubs that can manage interactions between wearable devices and act as assistant, proxy, and gateway for these devices. IBM's Personal Mobile Hub (PMH) prototype includes a powerful processor, storage, and wireless connectivity. As an example, consider a patient being monitored at home by body-worn medical sensors. The PMH can analyze the data locally looking for abnormal patterns, issuing a wireless notification to the health care provider when necessary.

TELEMATICS

In the automotive domain, IBM researchers are addressing automobile-centric applications, offering an open, services-oriented telematics platform that abstracts out infrastructure-intensive services and, at the same time, creates a safety-oriented user-interface with high-level intelligent spatio-temporal computing services. IBM's platform will enable location-based applications, such as automated navigation, predictive route determination, as well as customized query and response support that dynamically considers geographical parameters.

UBIQUITOUS GRAPHICAL USER INTERFACES

IBM Research pioneered the idea of steering the image of a projector through mirrors and pan/tilt mechanical heads to create virtual displays on any surface of a room. Computer vision is used to detect interaction with the projected image by analyzing imagery from a camera aimed at the projected surface. The combination of technologies enables any surface to be transformed into a virtual touch-screen and allows objects to act as interactive displays.



A prototype of the Personal Mobile Hub (PMH) used for *in situ* monitoring of biometric data.



Everywhere Displays Projector.