

Doing More with Less: The Aging Population Challenge

By Steven Dean, Healthcare Market Lead, Freescale, and Patrice Bertrand, Systems Architect for the Consumer and Industrial Segments, Freescale

In the near future, the number of elderly people living alone in industrialized countries is expected to increase substantially¹. At the same time, and due to the recent economic downturn, health funding in most developed countries will most likely remain under pressure, and will not be able to grow significantly in the foreseeable future.

As a consequence, and in order to limit overall human and financial cost burden for the society, healthcare systems will have to find innovative ways to provide cost effective, but high quality care to an increasing number of elderly patients who are most likely to suffer from chronic disease or other disabilities.

Incidentally, because face-to-face services are being put under significant pressure, less resource intensive ways to deliver chronic disease care have to be deployed.

That's where smart connected homes and personal tele-health systems enter the game; they are recognized as key enablers to address the above mentioned challenges, provided remote patient monitoring reimbursement gets resolved over the coming years.

Smart connected homes and personal tele-health systems

Smart connected homes, with wireless home networks and wireless sensor networks allow home environments to be connected to the internet, and to be securely monitored and controlled both internally and externally using pervasive (mobile) devices.

Furthermore, a smart connected home equipped with networked devices and tele-health systems – such as a reference design which is currently being developed with Freescale Semiconductor's i.MX28 – can act in pre-programmed ways, should a medical problem occur within the home of an elderly patient. Tele-health systems can give the patient the assurance that the appropriate caregiver will automatically be alerted should the situation deserve it (that caregiver could be a family member, a close relative or the care center, depending on pre-set policies or pre-set automatic alert levels).

Personal tele-health systems consisting of a central health hub managing multiple biometrics data measurement devices, as well as security and assisted living sensors, will allow the elderly or people with illnesses or disabilities, to live within the comforts of home while retaining a high quality of life; the "always-on" nature of those connected health hubs will bring care from the hospital to the home.

As a consequence, personal tele-health systems allow for optimization of patient medication and treatment by geographically distant care providers: unobtrusive remote patient monitoring and remote patient management becomes possible!

This geographic separation between care givers and the patient, enabled by smart connected homes and personal tele-health systems, is expected to allow for more efficient management of larger groups of diseased patients by care givers. It is also expected to provide an appropriate answer to the anticipated demographic challenge among the elderly and chronically ill population.

There is compelling evidence to support the value of remote monitoring for individuals with chronic conditions, including:

- 35-56% reduction in mortality
- 47% reduction in risk of hospitalization
- 6 days reduction in length of hospital admission
- 65% reduction in office visits
- 40-64% reduction in physician time for checks
- 63% reduction in transport costs

(Cleland et al 2005; Lee R, Goldberg et al, 2003; Scalvini S et al., 2001; Elsner et al, 2006; Van Ginneken et al 2006)

As a consequence, to help address those burgeoning but flourishing markets of people suffering from chronic condition or elderly people willing to age-well at home, Freescale is expected to introduce a cost effective and modular development platform targeted at the independent living market in 2011.

¹ United Nations, World Population Prospects: The 2008 Revision (medium scenario), 2009.

The upcoming Freescale Home Health Hub: An answer to assisted living challenges?

To be successful with patients suffering from chronic disease, and to be able to address their independent living challenges, ambient assisted living devices should focus on users and services, not on technologies; a key factor to help patients take more responsibility for their care is device personalization.

The aforementioned need for personalization means that the underlying electronic platform at the heart of those patient centered devices should embed appropriate technology to allow for various chronic disease and patient-led requirements.

Freescale's upcoming tele-health development platform addresses those technology requirements and allows for the development of cost effective devices aimed at tackling the demographic change, where individuals are living longer and families are increasingly dispersed.

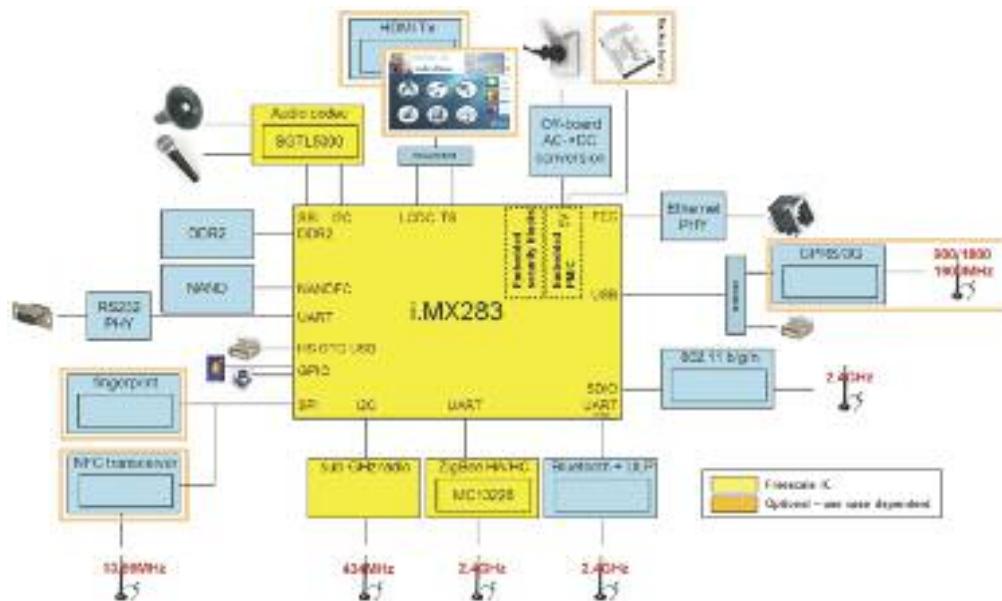


Figure 1: Tele-health hardware platform (planned availability by the end of 2011).

The Freescale tele-health reference design, expected to be released later this year, is based on the i.MX28 applications processor which integrates security, power management, and connectivity features and has been designed to reduce system cost and complexity.

The i.MX28 is the corner stone upon which ODM and OEM device manufacturers can build systems to restore confidence to both the chronically ill and the elderly who want to continue living independently, and to their families and relatives.

To address concerns this population may have about personal security and safety, the always-on platform, powered by mains or backup battery for increased reliability, provides tools and connectivity options to monitor cost effective wireless sensors, as well as mechanisms to report alerts to monitoring centers when potential risks are detected (through an existing broadband router or an integrated, redundant, 3G/GPRS backup modem in the event of a network failure).

Through unobtrusive and simple to install technology, wireless sensors provide an innovative approach to patient wellness and security. They do not require active user participation, but enable patients to be monitored and cared for while maintaining their independence.

As such, the upcoming tele-health platform, embedding Freescale's MC13226V ARM7™-based ZigBee System-on-chip, will help ODM, OEM and other forward thinking houses, implement innovative use cases like:

- temperature-sensors driven shutters and heaters regulating over all house temperature and preventing temperature from getting too hot or too cold
- flood-, smoke- or fall-sensors driven emergency alarms
- motion detectors driven patient movement logging

The tele-health platform, with its modular design and rich integration, allows for services to be added at any time, as required.

The positive impact of social engagement

Research has shown that social engagement is better than isolation and helps people live longer and healthier lives.

Acknowledging that communities and social-links are the primary requirement of those who have decided to live independently, the tele-health platform developed by Freescale will provide tools and frameworks streamlining the development of rich media services like educational video players, mail readers, digital pictures viewers, or community-related services.

Furthermore, to avoid costly, time consuming, stressful and frequent visits to doctors' offices or hospitals, the platform has been designed to support tele-health extensions.

Connection of weight-scale, blood pressure monitor, blood glucose monitor, and many other devices the user is already familiar with can easily be supported on the platform thanks to various pre-validated wired and wireless connectivity interfaces.

Advanced security features provided by the i.MX28 applications processor, like authenticated boot, hardware-based encryption and hashing, will allow ODM or OEM customers to implement data privacy schemes and governed levels of medical data access, but also allow for an easy integration of i.MX28-based tele-health platforms into medical health backbones.

Authentic and encrypted do-it-yourself medical measurement results can be fed into highly secure healthcare network monitored by a



Figure 2: Tele-health and safety/security reference design.

triage center that would be alerted in real-time if a declining trend or vital statistic outside previously set limits is suspected.

Finally, the i.MX28-based development platform developed by Freescale will allow ODM and OEM customers to develop rich and intuitive user interfaces, either local to the platform, or running on remote platforms (e.g tablets like the Freescale i.MX51 or i.MX53 ARM Cortex™-A8 based tablets, or the upcoming i.MX6x multicore ARM Cortex™-A9 based tablets) and wirelessly connected to the tele-health platform.

Those user interfaces running on either the platform or on a remote device, could be based on standard web technologies, or popular graphics frameworks like Microsoft® Silverlight™ framework, Adobe® Flash framework or Android™ framework.

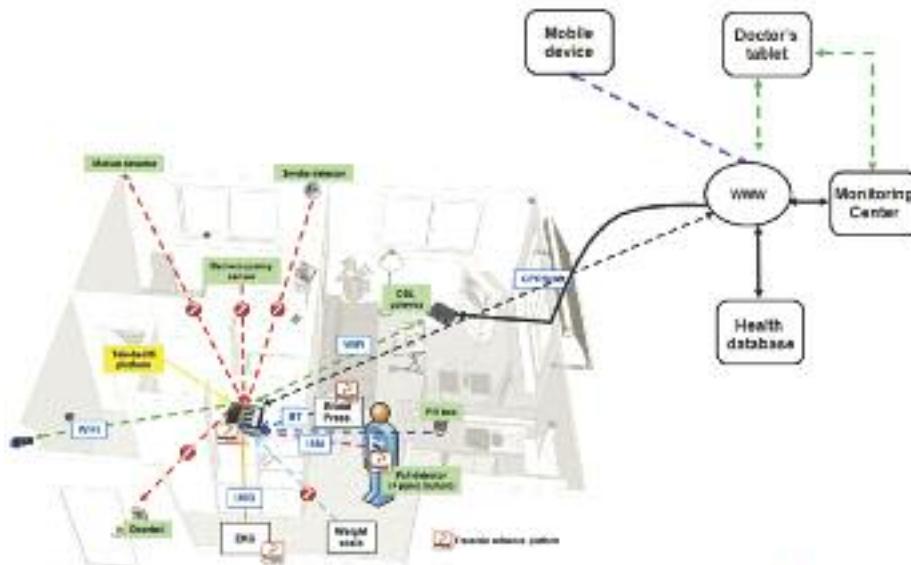


Figure 3: Integration in a global tele-health infrastructure.



Figure 4: User interface based on Android. (courtesy Ulcentric)

Two such example user interfaces, running on remote devices (Freescale i.MX53-based tablets in this particular case) connected to the tele-health platform through RESTful web services are highlighted in Figure 4 and Figure 5.

Easy-to-understand and easy-to-operate user interfaces are expected to drive customer adoption of tele-health hubs and help those become part of our everyday lives.



Figure 5: Silverlight-based user interface. (courtesy Bewise)

Furthermore, tele-health hubs, coupled with personalized data based on biometrics gathered through health devices and tapping into networks of people comprising

family members, friends and care givers, are expected to lead to better health and peace of mind for elderly at home.

Better care for less

The question for tele-health or independent living is not whether, but how and at what pace; as such, Freescale's upcoming and cost effective development platform has the potential to help ODM and OEM manufacturers design tele-health enabled devices and services and make a dramatic impact in the management of patient suffering from chronic disease or elderly patient willing to age well at home.

The platform and its associated ecosystem of partners is expected to help address the need for "better care for less".

Platform-based devices are designed to help patients develop the skills, the knowledge and the confidence to care effectively for both their condition and themselves.

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