

Wireless Health Monitoring Based on Biomedical System on a Chip

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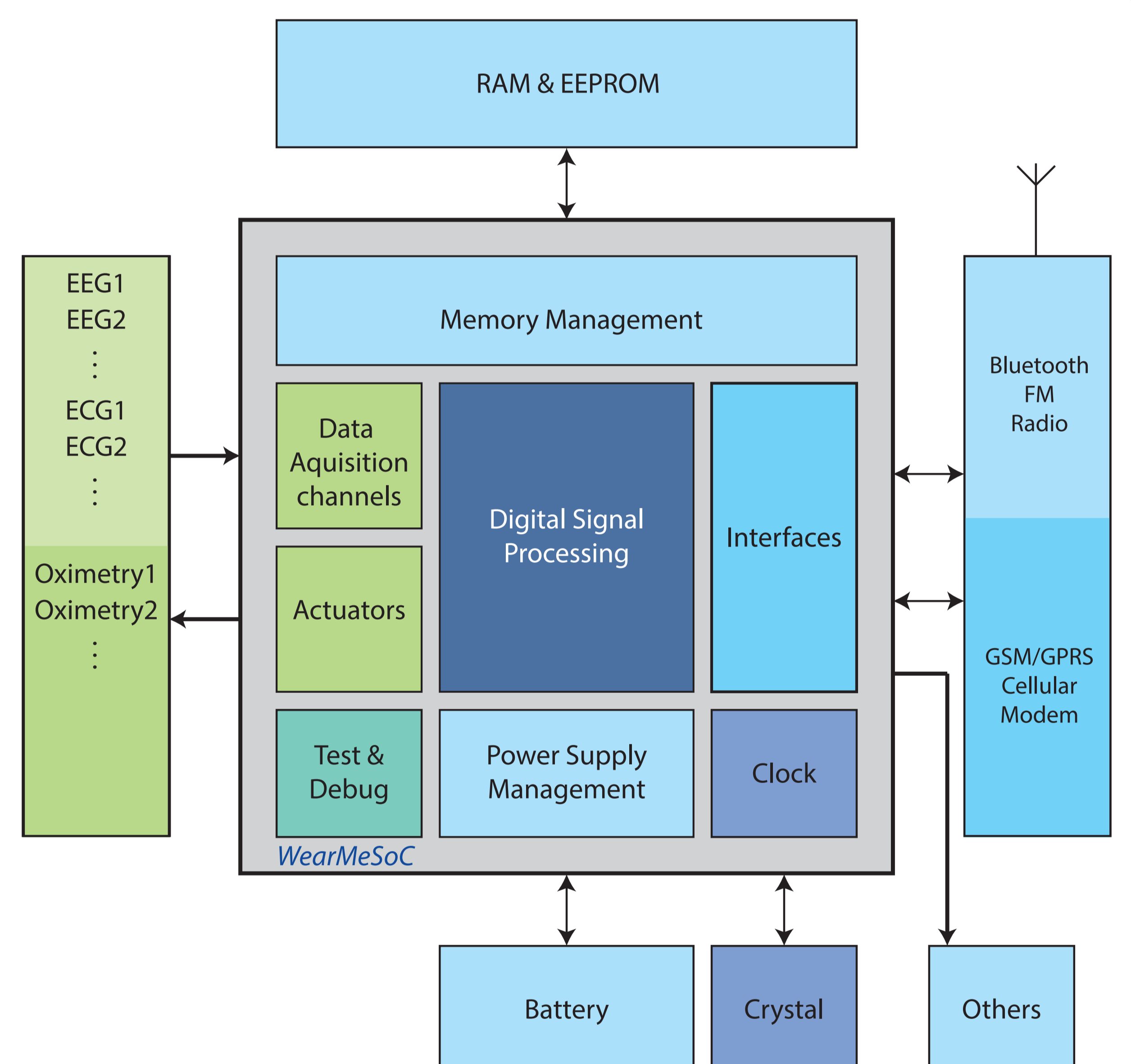
Abstract – Aging population and increasing medical costs in industrialized nations require the development of novel miniaturized healthcare devices for use in ambulatory environments and outpatient monitoring applications. The prevalence of Machine-to-Machine Communication (M2M) together with the increasing availability of inexpensive handheld computers offer a new way of meeting this demand. WearMeSoC plans to develop a matchbox-sized healthcare device based on a biomedical System on a Chip (SoC) with wireless connectivity. Real-world medical scenarios including post-operative patient monitoring, treatment of sleep disorders, assessment of driving capability and study of altitude-related disorders will be used to demonstrate the effectiveness of the system.

SoC-Based Healthcare Device

- Miniature size is inevitable for developing new approaches for non-intrusive patient monitoring: no more need for bulky devices which limit a patient's mobility.
- Low-power operation maximizes recording time. Efficient power management of the SoC is used to adapt RF duty cycle to specific application needs.
- Multi-purpose sensor and actuator circuitry covering the most common medical tests: ECG, EEG, pulse oximetry.
- High-sensitivity analog front-end guarantees low-noise recording.
- Flexible digital signal processing blocks implemented in hardware. Control via state-of-the-art embedded processor.
- Several SoCs are cascadable in order to serve applications that require a higher number of input channels.

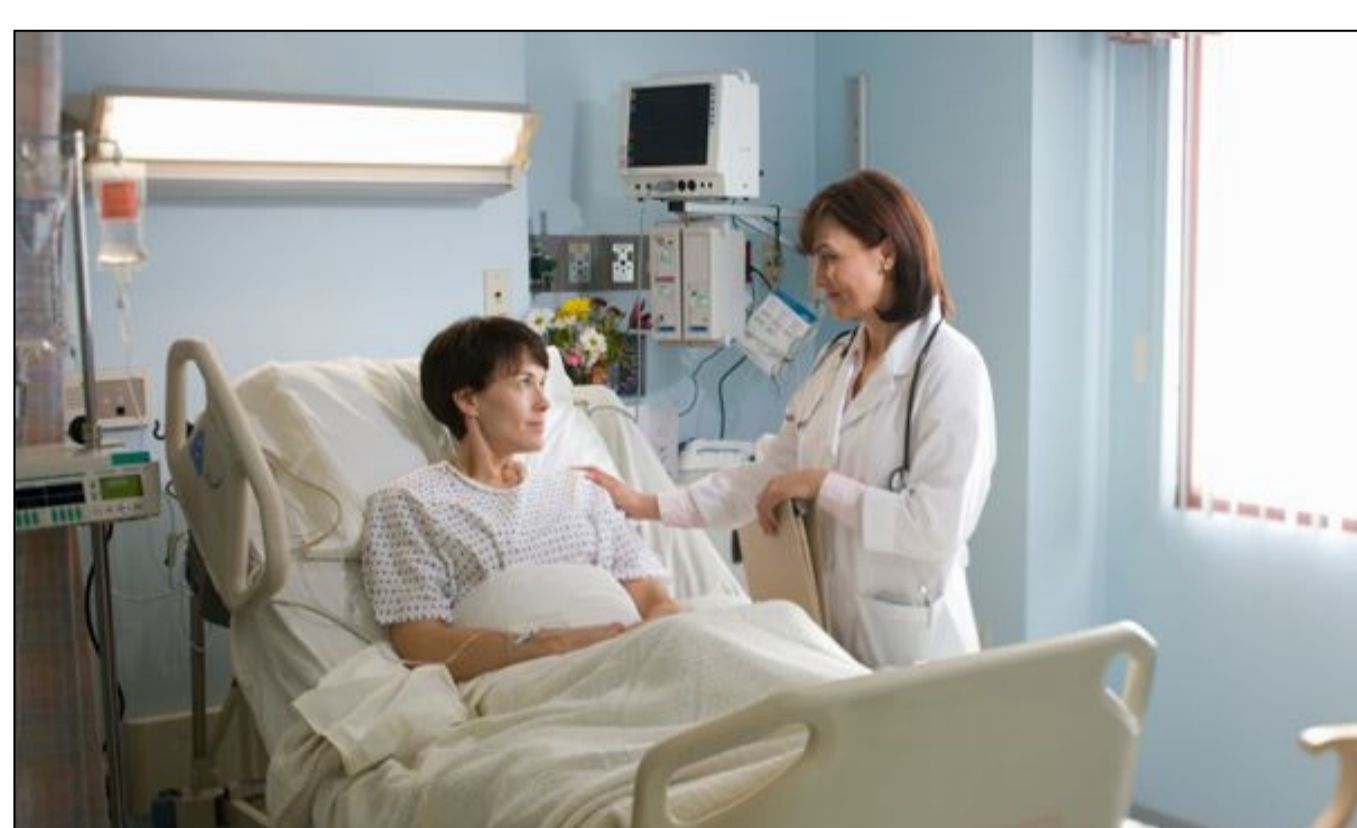


Visualization of matchbox-sized healthcare device.



Functional overview of the planned SoC together with external peripherals.

Post-Operative Patient Monitoring



- Prompt relocation of patients from ICU to normal ward lowers healthcare costs.
- Most important tests are monitored: ECG and pulse oximetry.
- Integration of system into IT infrastructure of hospital for alerting.

Treatment of Sleep Disorders



- Usage of miniature device with SoC to record EEG during sleep non-intrusively, possibly even at home.
- Off-line signal analysis is conducted in the sleep laboratory.
- Possibility to automate diagnosis or alerting.

Assessment of Driving Capability



- Eye and head movement can be captured with skin electrodes.
- Records where people look when driving.
- Planned system meets demand for a way to objectively assess driving capability of elderly people.

Study of Altitude-Related Disorders



- Conduct field studies in order to analyze respiratory system in high-altitude areas.
- Assess workplace safety in some areas.
- Portable device without wires does not encumber subject during usual activities.