

# Extended Glucose Monitoring Through The Use Of Group-Based Internet Of Things Mini Displays

Martin Haugen Mikalsen<sup>1</sup>, Miroslav Muzny<sup>1,4</sup>, Eirik Årsand<sup>2,3</sup>, Gunnar Hartvigsen<sup>1,2</sup>

<sup>1</sup>UiT The Arctic University of Norway, Department of Computer Science, Tromsø, Norway

<sup>2</sup>Norwegian Centre for E-health research (NSE), University hospital of North Norway (UNN)

<sup>3</sup>UiT The Arctic University of Norway, Department of Clinical Medicine, Tromsø, Norway

<sup>4</sup>Charles University in Prague, 1st Faculty of Medicine, Prague, Czech Republic

## / ABSTRACT

Social media, mobile technology and Internet of Things (IoT) have enabled new ways of interacting between people with diabetes. However, there are still empty spots on the map that should be explored. One of these is motivational technology (persuasive technology) that can be used by different groups of people with diabetes to motivate each other to be optimal regulated or to simply get continues status updates and reminders on diabetes-related health parameters.

## / METHODS

We are developing a system for group-based IoT-enabled mini displays that will enable extended glucose monitoring of people with diabetes. In this way, users or their sensors can communicate through sending messages and images to mini displays that might be located anywhere.

However, we expect that most of them will be located in people's homes or in their professional surroundings. CGM data used by the system is gathered by users sensors, and uploaded to their own NightScout[1] Database. This database exposes an API which is in turn used by a server application to pull the data periodically and push it to the IoT device which show it on the display.

An mobile application is also developed for interaction and mananging the different aspects of the system, sending new text-messages, creating new groups, accepting new members, managing group settings and so on.

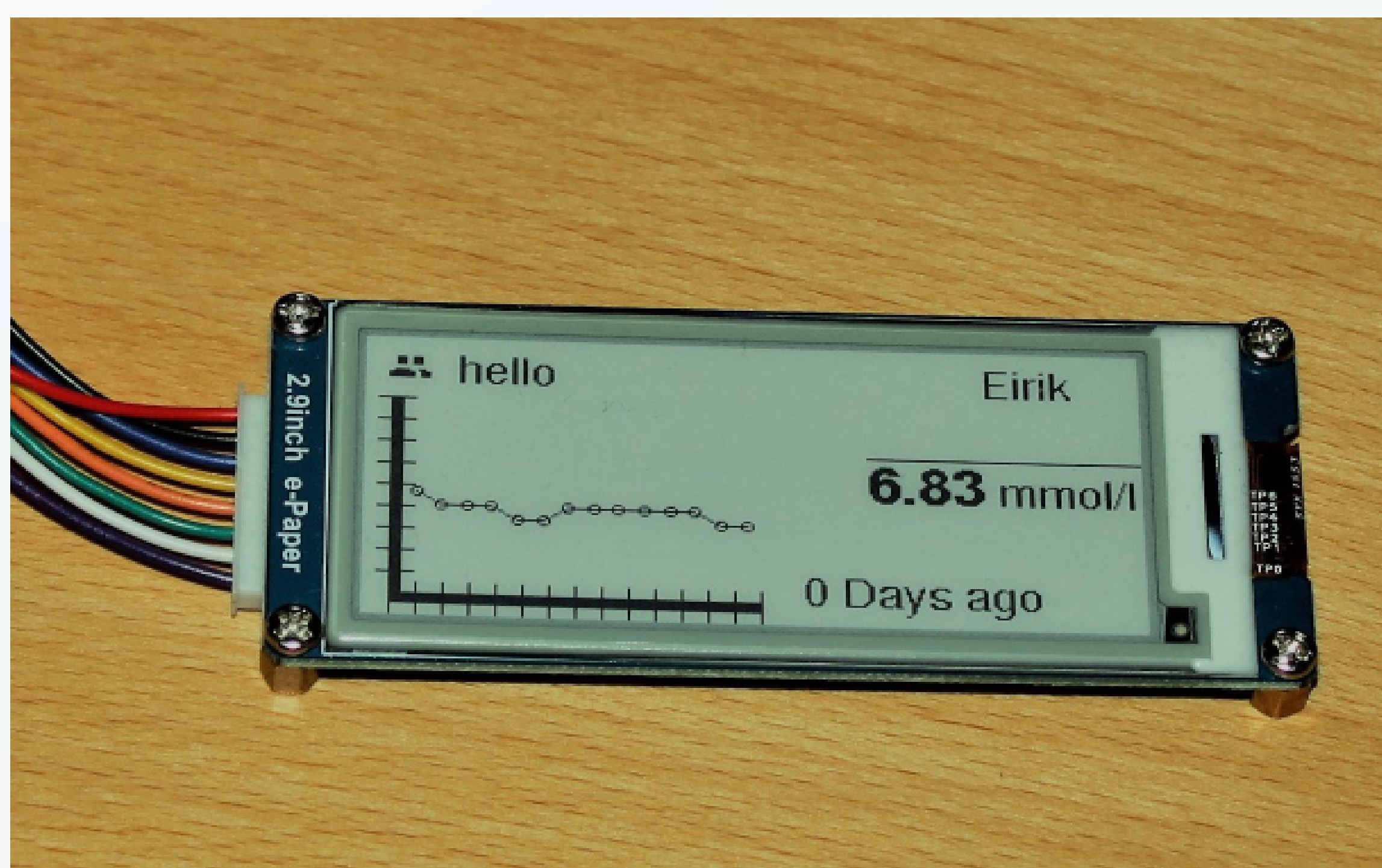


Figure 1: blood glucose levels from a CGM device with a graph over previous measurements

## / MATERIALS

IoT devices often are small, low-cost, and low-energy devices that can run for a long time without the need of changing or recharging batteries. For this project we have chosen the WiFi enabled microcontroller ESP8266[2] and a Electronic Paper Display (EPD) display[3].

EPD are designed to provide a similar appearance of an ordinary ink on paper. Unlike most display technologies, EPD screens do not require any power to maintain a static image, which means that they only consume power on updates of the picture.[4]

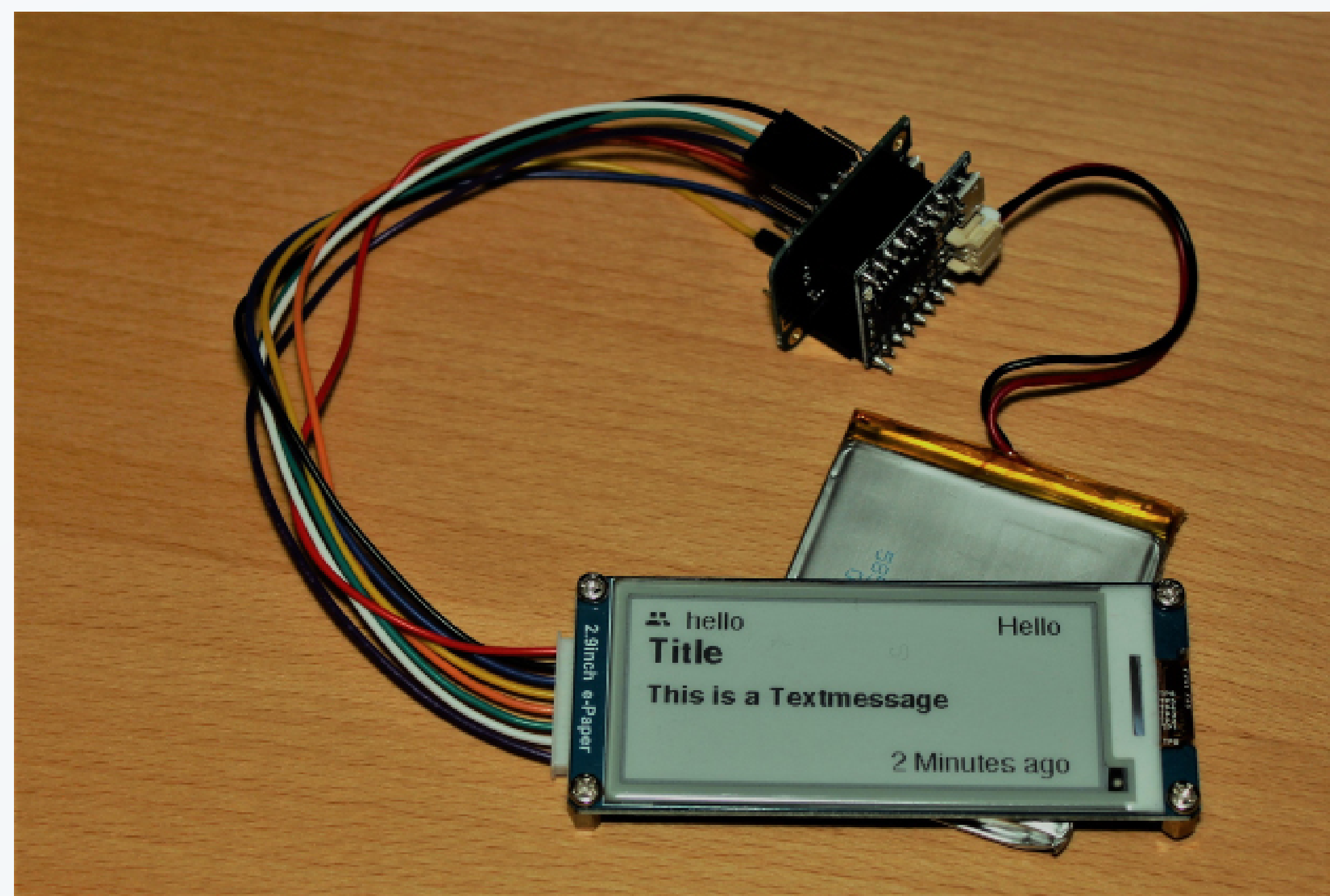


Figure 2: The IoT device with a text message sent from the mobile application, and pushed to the IoT device

## / RESULTS

A Working Prototype has been developed with the ability to show text/messages from multiple users on the IoT device, in addition to the transfer of CGM data status with current and past values. In addition a backend server has been developed to support the storage and communication from the mobile application and to the IoT device.

### References:

- [1] NightScout Project. NightScout - We are not waiting. url: <http://www.nightscout.info/>  
 [2] Espressif Systems. ESP8266 overview. url: <http://espressif.com/en/products/hardware/esp8266ex/overview>  
 [3] R.Jayalakshmi Adithya. Potu and Dr.K.Umpathy. "Smart Paper Technology a Review Based On Concepts of E-Paper Technology". In: IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) 1 (Jan. 2017). issn: 2278-8735. url: <http://www.iosrjournals.org/iosr-jece/papers/Vol.%2011%20Issue%201/Version-1/G011114246.pdf>.  
 [4] Peng Fei Bai et al. "Review of paper-like display technologies (invited review)". In: Progress In Electro magnetics Research 147(2014), pp.95– 116.

For more information, please contact:

Martin Haugen Mikalsen, e-mail: [martin.mikalsen@outlook.com](mailto:martin.mikalsen@outlook.com)  
 Gunnar Hartvigsen, e-mail: [gunnar.hartvigsen@uit.no](mailto:gunnar.hartvigsen@uit.no)

