Luleå University of Technology

Third year project

Sensor data aggregation through CoAP

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March 4, 2012

Project Description

Background

Luleå University of Technology conducts research on lowpower wireless microprocessors called "Mulle". These microprocessors can be used for various things depending on which type of sensors you connect to it, everything from measuring temperature or vibrations in a car to analyzing the quality of the road that you drive on.

Every year northern parts of Sweden are used for testing cars during winter conditions. To test a car you first decide what you want to test, then you test with local sensors logging within the car. When enough data is collected you return back home. At the testing facility the data is now available for analysis. Depending on the results from the previous runs you might want to test some parts in more detail so you re-configure all sensors and go out for another test run.

This process is time consuming when you need to return to testing facility to be able to analyze and re-configure all sensors. In todays society most computers are connected to internet and/or other private networks, most of these computers have the ability to be remotely configured and maintained. The goal with this project is to be able to analyze data from sensors in realtime and re-configure them on the fly while testing is in progress.

Project Targets

1. Be able to send live sensor data from multiple "Mulles" to an online logging server/service.

2. Be able to read sensor data on the web with both a PC (web browser) and through an Android mobile device.

3. Be able to re-configure the sensors through a web interface and through an Android mobile device.

Technical dilimiations

TODO: Vad har explicit uteslutits från arbetet?

Execution of the project

Scrum and how it has been used

It was decided back in november that the entire project would be divded into three sprints. The exact dates were to be decided in the beginning of each sprint. In cooperation with the client the scope of the project and the scope of the first sprint was decided upon in november. During the first projectmeeting the first sprint goal was divided into eight sprint stories. It soon became clear that those eight stories were way to big, at the end of the sprint none of the stories had been finished.

Lesson learnt, the second sprint was divided into smaller stories which gave immidiate result when the first 69 sprint story points finished during the second sprint.

To decide upon size for each sprint story, for the second and third sprint, "planning poker" [1, p. 42] was used. For every sprint story each project member everyone wrote down an estimate on the scope for each story. With planning poker it became clear that each project member had a different vision for each story. A short discussion after each estimate made it more clear on how big the scope was, an agreement was usually made within a few minutes.

One project, three sprint goals

TODO: Vi delade in oss i tre olika grupper, mulle, server och android under ett skype-möte. TODO: Efter sprint planning första två gångerna var det upp till varje "grupp" att fördela uppgifter. TODO: Under andra sprinten flyttade vi resurser från server-delen då den var långt före de andra delarna. TODO: Flyttade tillbaka en resurs i början av tredje sprinten eftersom det fortfarande var svåra flaskhalsar vi satt fast med på Mullen...onödigt att tre sitter fast på samma ställe. TODO: Sista sprinten tog var och en direkt en uppgift från sprint backlog och satte den mer tydlig som "sin". Detta ledde till viss förbättring men eftersom vi inte har dagliga scrum möten så ger det inte en daglig uppdatering/reflektion över hur det faktiskt går...sprint backloggen blir inte en del av vardagen.

Individual time monitoring and speed

Sophia Bergendahl

Edvin Bruun

Throughout the project I, as well as my fellow group members, have been gradually learning to work with the Scrum project-model. This work-model includes a tactic for distributing work called "stories". These stories are given a time estimate and a actual time when they are done, and following this I will explain three stories that I've encountered in this project. For convenience I've chosen one story from each iteration to roughly show how the work-model was more and more used. As a quick reminder, my stories have revolved around getting the Mulle-communication to work.

To start things off, I chose the first story that I had, which was titled "CoAP communication over bluetooth from Mulle to server". This story was estimated to take the entire first sprint which was roughly eight weeks long. In this story there was a pretty hefty start-up time included, as most of us were clueless as to how much time we would spend on learning the new technologies in each of our assignment-fields(Mulle, Server, Android). When the eight weeks were up, the progress on the story was horrible, to say the least. During our first sprint we struggled with issues that were very much out of the scope of what we should have been doing. The reason for this was mainly because we needed to get these things working before we could start progressing on the actual story. However when the time was up we agreed that we'd have to take a different route to achieve the communication so the actual time for this story was pretty accurate.

Moving on to the next story, this story took place in the second iteration and revolved around sending UDP packets from the Mulle to the server. The point of this story was to check if we could achieve the simplest of communication(with our new approach) and then build from there. This story was scheduled to run over a week which also was our estimate. The actual time for this story was however a few days over the estimate. The reason for this was that at this point we were working on multiple stories as well as some issues with our testing methods. However looking back now on the things that caused the delay I don't see now how we could have avoided them.

The third story to be explained in this documentation will be a story that was very small and which took place in the third iteration. The task in the story was to get the Mulle to run a certain function every time it received a UDP package. This was estimated at roughly ten hours, were as the actual time it took was closer to five. The reason for the shorter time than anticipated was that I had gained knowledge how to do this indirectly through

another story which I'd worked on earlier.

William Gustafsson

Christoffer Holmstedt

Exempelvis kan lista användas om man vill. Jag, christoffer, kommer inte använda det tror jag.

1. TODO: Hur man citerar till specifik sida i kurslitteraturen. [1, p. 42]
2. TODO: Hur man citerar utan sidhänvisning [1]
3. Third sprint story

Marcus Rådman

Kristoffer Svensson

Ludwig Thurfjell

Reflection about Scrum usage during this project

Results

Deliverables

TODO: Vad levererar vi med respekt till ursprungliga krav?

Testing

Lessons learnt

Suggested improvements

Conclusions

References

[1] Henrik Kniberg, *Scrum and XP from the Trenches*. C4Media Inc, Publisher of InfoQ.com, 978-1-4303-2264-1, http://infoq.com/minibooks/scrum-xp-from-the-trenches, 2007.

Appendix A - How to build upon our codebase

This appendix include information on how to build upon our codebase for the Mulle (C), server code (Python, PHP/HTML5 and C) and Android Mobile phone (Java).

Mulle

Server

Coapy server

TODO: Python parts such as the python coapy server and how we use EXIP c-code parts.

Webpages and database

Android Mobile Phone application