D1 - project outline for the entire lab

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1 Project Goal

1.1 Basic Idea

The basic idea of our project is to evaluate different distributed clock synchronisation algorithms over an asynchronous bus communication. Therefore we are going to implement a csma/ca protocol providing basic fault tolerancy methods and an easy way to estimate message round trip time and message priorising. Upon the protocol, detailed described in [**?**, NESD2], we settle the algorithms for the clock synchronisation.

Each node has divers hardware such as buttons, leds, a bulp, a lcd and some other things as its periferial. We want to display drift rates of clocks on the lcd and trigger faults in the nodes internal clock or cause bus overloads with the connected buttons.

The outcome of this project should be the experience in the field of asynchronous real time bus engineering and to be able to estimate influences of overloads and faults to applications upon them. We try to give a link between theoretical and practical aspects and how they relate.

1.2 Requirements

The requirements outlined below are only a very abstract view valid for the global project idea.

1.2.1 ULFTRTP

Req 1 ***analyzeable:*** *the protocol has to be relatively easy to analyze with respect to worst case timing.*

Req 2 ***interfacing:*** *the protocol design has to follow strictly interface guidelines. This means:*

1. *lower levels of the protocol can only be accessed by higher levels through the defined layer interfaces.*
2. *higher levels of the protocol cannot be accessed by lower levels. Data to higher layers can only be propagated using callback mechanisms.*

Req 3 ***migration:*** *the protocol has to be migratable in arbitrary applications with minimal effort.*

Req 4 ***resource consumption:*** *the protocol has to be adaptable to minimal hardware constraints.*

1.2.2 Clock Synchronization

Req 5 ***analyzeable:*** *the clock synchronisation has to be relatively easy to analyze.*

Req 6 ***exchangeable:*** *the specific clock synchronisation algorithms have to be easily interchangeable with other clock synchronisation algorithms, as we want to try out different algorithms.*
This Requirement correlates with Requirement 2.

2 Project Management

2.1 Roles

2.1.1 Chief Executive Officer - CEO

The duty of the CEO (or Projectmanager) is to monitor and adapt the tasks progresses and the timeplan, to justify deadlinemisses or delays in the development process.

The projectmanager also has to formulate a contract specification declaring certain requirements, claims, need to haves and nice to haves as well as to construct testcases in cooperation with the project team and the project partners.

Beside the depicted duties of the CEO, he/she is also responsible for project internal coordination, needed appointments and the assignment and monitoring of certain tasks.

2.1.2 Chief Technical Officer - CTO

The CTO is responsible to evaluate existing algorithms and protocols relating to the certain tasks as well as the design of the protocol and algorithms used in the application.

Another important task of the technical manager is to check the technically feasibility of the application or parts of it and to provide plannings and adaptions to technical contents.

By providing the outlined responsibilities the CTO has to be the last instance with respect to technical decisions.

2.1.3 Chief Documentation Officer - CDO

The CDO is responsible for the documentation process all over the project. His/Her aim is to provide a well structured documentation to monitor the documentation progress during coding, the compliance of the code with predetermined coding-guidelines.

Besides this he/she is responsible for codereviews, meeting protocols, and test protocols.

collective responsibilities
All project members are in charge to hand in their duties and responsibilities in time and as defined (as possible), to recheck decisions taken and to review, document and test their implementations on their own before handing in.

Reviews of documents, design decisions and implementations have to be rechecked by other project members as far as necessary. The final tests on certain implementations before assuming these valid have to be done by project members not involved in the implementation.

2.2 Role allocation

Description	Allocation
CEO (Project Manager)	Robert Annessi
CTO (Technical Manager)	Alexander Heinisch
CDO (Documentation Manager)	Nick Mayerhofer

3 Project time schedule

We elected eGroupware for our project management matters that provides:

- time management
- issue tracking
- todo management and
- cost tracking

key explanation for this chapter:

Start	...	Planned starting date of the concerning task
End	...	Planned finishing date of the concerning task
resources	...	Expected resource consumption in percent

3.1 Project presentaiton

Project presentation for the first workshop day.

Start	kw43
End	kw46
Resources[%]	5

3.2 Documentation

Documentation is one of the main parts of project and referes to the entire project processflow and therefore lives over the entire project.
One of the main parts in this project is project management and we attach much importance to it and thus also on the documentation.

Documentation consists of: the documents [1, NESD1] - [?, NESD5] as well as in code documentation via doxygen documentation language.

Start	kw43
End	kw3
Resources[%]	40

3.3 Dilate testcases

The matter of dialating testcases is to provide apropriate sets of conditions or variables under wich a tester is able to determine wheter the application is working correctly or not.

Start	kw43
End	kw3
Resources [%]	10

Our test cases will include a description of the functionality to be tested and the preparation required to ensure that the test can be conducted.
A test will be, that we will test our system in case of bus load and clock drifts so that we are able to get significant test result to ensure our clocks can be synchronised in case of a high bus load.

3.4 Gantt Charts & Milestones

Start	kw44
End	kw45
Resources [%]	5

We are providing a Gantt Chart - that is a task dependent timeline - in form of a image output of our project management tool eGroupware. That includes milestones which are points in time bound to the timelines in the Gantt Chart.

3.5 Bus protocol specification

Start	kw44
End	kw45
Resources [%]	10

Our bus protocol specification regards layer two and can be found in the documents [?, NESD2].
It describes the operational purpose and the qualities of our bus protocol.

3.6 Testing Implementations

Over the real process of implementation the hole team has to take care that their implementations are tested with the concerning testcase or with a miniature subset of a testcase.

Start	kw46
End	kw52
Resources [%]	5

Testing each implementation is an important part of the implementation an takes place while implementing.

3.7 Hardware Abstraction

Hardware abstraction includes the particular parts of concrete hardwar APIs needed through the project.
That means that the hardware abstraction layer (HAL) makes high lvl programming interfaces available to higher abstraction layers.

We broke down our main hardware parts to:

Start	kw46
End	kw48
Resources [%]	5

- Timer driver
  Which allows to initialize, set and get hardware timer concerning values that are needed for further use regarding our bus communication, clock, clock synchronisation and measurements concerning drift rates

- USART driver
  Wich allows to arbitrate via the bus, send and receive data including automatic message pre filtering

- LCD driver
  Wich allows to initialize and draw text to the LCD display.

3.8 Bus Protokoll Implementation

The bus protocol is the second main part of this project which includes the correct communication between multiple nodes over the available bus connection. The bus itselfe is specified in [?, NESD2] and deviations should stay small depending the protocol specification.

Start	kw48
End	kw51
Resources [%]	10

3.9 Clocksync Implementation

The clock synchronisation and clocksync application is the third and last main part of this project where all conceived parts have

Start	kw50
End	kw2
Resources [%]	10

3.9.1 Clocksync Application

The application is ment to:

- measure drift rates through the clock sync processflow

- applying measurements in case of heavy bus load

References

[1] Mayerhofer Annessi, Heinisch. Nes 2011/12 - d1 project outline for the entire lab. 2011.