Graduation assignments & Internships
Thales Nederland

2016

www.thalesgroup.com/nl
Thales Nederland operates within the Defence, Security and Public Transportation sectors. With almost 2,000 employees, Thales is a leading provider of high-tech jobs. Safety and Security is our main business area and product innovation and swift anticipation of the newest technological possibilities are the driving force behind our business. Examples are radar, communication and command & control systems for Defence. Furthermore we deliver communication, security and payment systems for trade and industry.

Thales Nederland is part of the Thales Group, which has a workforce of 68,000 in more than 50 countries, of whom 22,000 are working in the Research and Development sector. This makes Thales one of Europe’s largest electronic companies.
LOCATIONS

HENGELO
In the Netherlands our Corporate head office is located in Hengelo (+/- 1500 employees). Since 1922 the plant in Hengelo has been a worldwide leader in the latest and most innovative radar technologies and radar systems for naval ships.

Besides our plant and Corporate head office in Hengelo, Thales Nederland is located and specialises in:

HUIZEN
Thales Land Defence, Cyber Security and Thales Transportation Systems (+/- 300 employees). The core business in Huizen consists of communication systems/networks, optronic systems, solutions for cyber security and installation and maintenance of electronic fare systems for public transport.

EINDHOVEN
Thales Cryogenics (+/- 100 employees). We develop and fabricate cooling systems for cameras which are used for military and civil applications.

DELFt
This R&D lab is built near the TU Delft and specialises in the research of radar technology and radar systems (+/- 25 employees).

ENSCHeDe
T-Xchange (+/- 20 employees). This R&D lab runs in collaboration with the University of Twente and specialises in ‘Serious Gaming’.

FIND OUT MORE

Within Thales Nederland there are numerous possibilities for engineers to expand on their knowledge within a technical as well as in an international environment.

If you’re looking for an internship, graduation assignment or a job within the field of cutting edge technologies, Defence and Civil solutions, or looking to become a generalist in an international environment where you can combine your technical and commercial skills then we have a range of opportunities on offer for the brightest talent. Join us and together we can explore a world of possibilities.

Go to www.thalesgroup.com/nl
Overview of graduation assignments & internships for Master and Bachelor students
(Overzicht van afstudeeropdrachten & stageplaatsen voor Universitaire en HBO studenten)

Contents

Thales Nederland ................................................................................................................................. 2
Overview of graduation assignments & internships for Master and Bachelor students ...................... 4

Computer Science ................................................................................................................................. 7

Visualisation of emerging software systems ....................................................................................... 7
Develop Sensor Management Test Tool ............................................................................................... 8
Service Oriented RADAR interface ...................................................................................................... 9
Android rules! ........................................................................................................................................ 10
Advanced Code Compression for Deployments .................................................................................. 11
Toepassen NFC sloten ......................................................................................................................... 12
Attribute Based Encryption in IoT ....................................................................................................... 13
Intent-Based coordination using a Belief-Desire-Intention agent ...................................................... 14
Deployment calculation for dynamic environments .............................................................................. 15
Distributed service tracing ................................................................................................................. 16
Add authentication system to Radars .................................................................................................. 17
Automatic Network Provisioning ......................................................................................................... 18
Establish Chain of Trust ..................................................................................................................... 19
Automated cyber security testing ........................................................................................................ 20
Remote communication between zones ............................................................................................... 21
3D Augmented Reality Maintenance Support ..................................................................................... 22
Investigate and develop an interface library for EtherCAT ................................................................. 23
3D Augmented Reality Operational Display ......................................................................................... 24
Investigate and Develop an Interface Translation Methodology ...................................................... 25
Gamification of graphical fault finding ............................................................................................... 26
Attribute based access control ........................................................................................................... 27
Request-based Dynamic Cloud Architectures ..................................................................................... 28
Big Data Storage for Sensor System ................................................................................................... 29
Simulate Run-Time Deployments of Distributed Systems .................................................................... 30
Radar aansturing via een tablet ............................................................................................................ 31
Visualisatie van meteorologische data in een radar control tool ...................................................... 32
Visualisatie van open source statische data in een radar control tool ............................................. 33
Improving Video Encoding/Decoding using GPU ............................................................................ 34
Server Virtualization Control .............................................................................................................. 35
Orchestration of Docker containers (Applications) ............................................ 35
Network configuration in a (near) Real Time system ......................................... 36
HTML5 applications in Real time environment .................................................. 37
Secure hypervisors ....................................................................................... 38
Thin client hardware ..................................................................................... 39
Maritime Intrusion Detection System .............................................................. 40
Drone Swarming and Combat Management ..................................................... 41

IT service management.......................................................................................... 42
Linux on thin-clients for software engineering .................................................. 42
Continuous deployment of IT services to end users .......................................... 43
Automated Asset Management ....................................................................... 44
SW@T 2.0 – A Laptop for Everyone ................................................................. 45

Electronics ........................................................................................................... 46
Cloaking ............................................................................................................. 46
OFDM for data transport within distributed sensing systems .............................. 47
Design, build and test a compact state of the art High Power Amplifier .......... 48
Filtenna ............................................................................................................. 49
In-System ASIC Emulation Environment .......................................................... 50
Near-field antenna measurements ................................................................... 51
Influence of g-forces on 2-phase cooling of radar systems................................. 51
Modeling of thermomechanical stresses in electronic assemblies .................... 53
Array Scan Matching Techniques .................................................................... 54
Linearized power amplifier techniques for radar transmitters ........................... 55
RF design based on model library .................................................................... 56
Evaluation of GaN in frontend SMPS ............................................................... 57
Matlab to LibreOffice ..................................................................................... 58

Volonta ............................................................................................................... 59
For Thales Netherlands an important change in the strategy of **software development** for advanced radar systems was to select, use and contribute to open source software. We have initiated the C implementation of OSGi and contributed this to the Apache Software Foundation (ASF) as Apache Celix. Apache Celix is graduated as Apache Top Level project in July 2014. Pepijn Noltes is Apache Member (since 2015) and Björn Petri and Gabriele Ricciardi are Apache contributors. Apache Celix (and OSGi) is one of the fundamentals in our near future open software architecture, described in the INAETICS project ([www.inaetics.org](http://www.inaetics.org)).

We share our vision and contributions to open source in various platforms. Since most of our software assignments are more or less related to this vision, a selection of these presentations, articles and demonstrations are listed in this document (in the blue boxes) to give you some background information of our work.

---

### For generic questions please contact:
recruitment@nl.thalesgroup.com

Postal address:

**Recruitment**, Thales Nederland B.V., Postbus 42
7550 GD Hengelo. Tel. + 31 (0)6 13254498

---

**NOTE:**

Assignments can be tailored in order to fit more the skills or interests of the student. Also sufficient knowledge is available within Thales of the technologies mentioned in the assignments. Please contact us for specific details.

---

If you want to apply for an assignment

- send an email with your C.V. and the reference number(s) of the assignment(s) including a motivation why you choose this specific assignment to the department coordinator directly.
- or respond on our website: [https://www.thalesgroup.com/nl](https://www.thalesgroup.com/nl) (follow link: Stage- & Afstudeeropdrachten). **This booklet shows a subset of all assignments; the website contains all available assignments.**

---

[Info box on presentations, demonstrations of our work](#)
Title

Visualisation of emerging software systems

Level

Bachelor / Master of Science Study

Education

Computer Science

Affinity

Linux, UI

Background

The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems. The work is performed in multi-disciplinary teams with specialists in system engineering, functional sensor design and design and realization of real-time embedded systems.

Overview

Assignment

Thales is one of the partners in the INAETICS research project. The goal of this research project is to define and demonstrate a dynamic service architecture that addresses the requirements of time critical systems in a broad range of domains.

INAETICS systems are based on an emerging functionality. This means that the middleware runtime detects (discover) changes within the systems and dynamically “wires” functionality between distributed components. One of downsides of a fully dynamically reconfigurable system is that it can become very complex to analyze the actual deployment configuration; Especially when searching for bugs. Tooling to visualize and explore the emerged deployment configurations can greatly help in overcoming this downside.

The assignment consists of researching how to visualize an emerging complex systems based on wired functionality in an intuitive manner and designing & developing a prototype visualization tool based on the current INAETICS reference architecture.

Links: http://www.github.com/inaetics

Location

Hengelo

Department

Naval – Application Engineering

Internship coordinator

René van Hees (rene.vanhees@nl.thalesgroup.com)

Internship attendant

Pepijn Noltes / Gerrit Binnenmars
Develop Sensor Management Test Tool

Internship  Refnr: 1504311

<table>
<thead>
<tr>
<th>Title</th>
<th>Develop Sensor Management Test Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Bachelor study</td>
</tr>
<tr>
<td>Education</td>
<td>Computer Science</td>
</tr>
<tr>
<td>Affinity</td>
<td>Embedded / Real-time systems, 3D graphics, OpenGL, Java, C.</td>
</tr>
</tbody>
</table>

**Background**

The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems. The used real-time processing systems are implemented with state-of-the-art hardware and software.

Within these systems there is the Sensor Management subsystem. This subsystem is responsible for all control aspects of the various Sensors. This includes control of transmissions, motion control, climate and power control etc.

The Sensor Management subsystem provides a test tool with which various parts of the subsystem can be visualized.

**Overview**

**Assignment:**

There is a wish to use the Sensor Management test tool beyond the Sensor Management development team. For this internship the test tool should be extended and productized so that it can be used by other departments (for example: the integration and verification department). The test tool is written in Java.

The following tasks are identified:
- Investigate the wishes from the (Thales internal) customers.
- Rewrite the current visualization so that it is able to use OpenGL / hardware acceleration
- Add the required functionality to the tool
- Provide a user manual for the customers.

**Hengelo**

Naval – Application Engineering

René van Hees  (rene.vanhees@nl.thalesgroup.com)

Brian Postma
Service Oriented RADAR interface

Graduation Refnr: 1400475

<table>
<thead>
<tr>
<th>Title</th>
<th>Service Oriented RADAR interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Bachelor study</td>
</tr>
<tr>
<td>Education</td>
<td>Computer Science</td>
</tr>
<tr>
<td>Affinity</td>
<td>C- programming, UML, Linux, OSGi</td>
</tr>
</tbody>
</table>

**Background**
The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems.

![Diagram of OSGi and Celix/Felix architecture]

**Overview**
Realize a Proof of Concept implementation of the Open Architecture RADAR Interface Standard (OARIS) using remote services between and C and Java platform (based on Celix resp. Felix).

**Location**
Hengelo
Naval – Application Engineering

**Department**
This assignment is in cooperation with Luminis ([www.luminis.eu](http://www.luminis.eu)). Luminis is a preferred supplier of Thales that, amongst others, focuses on modular software architecture and development using OSGi. As software house, Luminis not only uses, but also actively contributes to Open Source OSGi based projects. For example, Apache Felix, Apache ACE and the Incubator project Apache Celix.

**Internship coordinator**
René van Hees ([rene.vanhees@nl.thalesgroup.com](mailto:rene.vanhees@nl.thalesgroup.com))

**Internship attendant**
Niels van Breederoode
Android rules!

**Graduation / Internship**  Refnr: 1504315

**Android rules!**

**Bachelor study**

**Computer Science**

Java, Android, GUI

The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems.

---

**Assignment**

We have diverse assignments on the Android platform; either in SmartWatch, Smartphone, Tablet or maybe even in embedded devices. Please contact us if you want more information.

**Location**

**Hengelo**

**Department**

Naval – Application Engineering

**Internship coordinator**

René van Hees (rene.vanhees@nl.thalesgroup.com)

**Internship attendant**

Jasper Gielen

---

**On April 23, 2015 Pepijn Noltes co-presented on the Luminis DevCon**

**Modularizing C software with Apache Celix**

Join the world of service oriented programming with all its benefits but without its usually found shortcomings with Apache Celix. Apache Celix is a framework for service oriented programming in C, with a focus on a low overhead, and a small footprint. Service oriented programming brings a lot to table. It enables the design and development of software applications in small cohesive modules, which interact based on loosely coupled services. In this presentation the history and concepts behind Apache Celix and OSGi will be explained and several use cases will be used to explain where and how it can help with the development of complex distributed systems (e.g. INEATICS research project).
# Advanced Code Compression for Deployments

## Graduation assignment

<table>
<thead>
<tr>
<th>Title</th>
<th>Advanced Code Compression for Deployments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Master</td>
</tr>
<tr>
<td>Education</td>
<td>Software Technology</td>
</tr>
<tr>
<td>Affinity</td>
<td>Software Modularity</td>
</tr>
</tbody>
</table>

**Background**

The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems. The work is performed in multi-disciplinary teams with specialists in system engineering, functional sensor design and design and realization of real-time embedded systems.

This is a shared assignment of Thales and Luminis. Luminis is a software house with a clear focus on research and innovation. Luminis is involved in several Open Source projects related to OSGi, such as Apache Celix, Apache Felix and Apache ACE.

**Overview**

The OSGi standard provides powerful support for modular development in the Java space. In OSGi these modules (called bundles) are the single form of resource deployment into a running system and therefore carry everything from code to supporting artifacts.

**Assignment**

Assembling bundles is supported by existing tooling, but these tools are not very good at minimizing the size of bundles and unnecessary large bundles can become a bottleneck in wide scale systems where bundles need to be distributed across large numbers of systems and/or onto resource constraint systems.

Research and provide an implementation of optimized tooling that is capable of minimizing bundles through generic or specialized compression techniques as well as specific strategies based on static analysis. Additional topics such as signing and delta calculations may also be explored.

**Location**

Arnhem / Hengelo (optional)

Luminis / Naval – Application Engineering

**Department**

Internship coordinator

Rene van Hees (rene.vanhees@nl.thalesgroup.com)

Internship attendant

Marcel Offermans (Luminis) / Pepijn Noltes (Thales)

---

**November 2013, René van Hees co-wrote the whitepaper**

**Software Architecture evolution in an Open World**

The INAETICS architecture is based on the assumption that it is possible to identify one architecture style that abstracts from all underlying computing-paradigms. This results in a single design and implementation space with the a number of architecturally relevant patterns and mechanisms.
Toepassen NFC sloten

Titel Opdracht

Toepassen NFC sloten

Niveau

Hogeschool

Studierichting

(Technische) Informatica

Affiniteit

Java, Android

Achtergrond

De Application Engineering cluster van THALES-NAVAL-NEDERLAND is producent van geavanceerde Radar- en besturingssystemen. T.b.v. verificatie en systeem testen wordt gebruik gemaakt van simulatoren en training systemen waarin de operationele werking van (delen van) de systemen gesimuleerd wordt. De hiervoor benodigde apparatuur wordt ontwikkeld en geproduceerd binnen de groep SITE (System Integration & Training Equipment).

Overzicht

Onze kabinetten gaan op slot – geen onbevoegden mogen de deur openen. Wanneer de deur geopend wordt geven wij daarvoor toestemming, is dit persoonlijk en wordt dit gelogd.

1. Er is een hardware fout waarbij een reparatie (of check) uitgevoerd moet worden in het kabinet.
2. Er is een overrule (burn through mode); omdat het een crisissituatie betreft wordt het slot gedisabled, de deur kan door iedereen geopend worden (zonder NFC oid)
3. Master key; er wordt een masterkey uitgegeven door het MC (kan alleen door inloggen met master rechten, nog steeds persoonsgebonden, er kunnen dus meerdere masterkeys zijn). Deze key is altijd geldig en hiermee kan altijd het slot geopend worden.

Voor alle gevallen geldt dat geregistreerd wordt wie wanneer de deur geopend heeft en hoelang (wanneer ging de deur dicht). De registratie wordt op het systeem zelf bijgehouden. Tevens worden mutaties in de hardware bijgehouden en defecten in de hardware. Dit om te checken of er een verband is.

Naast een slotwerking zou NFC ook gebruikt kunnen worden voor gegevensoverdracht naar een Android app. Hiermee kan dan snel – door de telefoon bij het slot van het kabinet te houden – de status van het systeem opgevraagd worden zonder dat hierbij de deur geopend hoeft te worden.

Vestiging

Hengelo

Afdeling

Naval – Application Engineering

Afdelings stage-coordinator

René van Hees (rene.vanhees@nl.thalesgroup.com)

Stagebegeleider

Jasper Gielen
Attribute Based Encryption in IoT

Graduation assignment

**Title**
Attribute Based Encryption in IoT

**Level**
Master

**Education**
Software Technology

**Affinity**
Software Modularity, distributed Systems, Software Security

**Background**
The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems.

This is a shared assignment of Thales and Luminis. Luminis is a software house with a clear focus on research and innovation. Luminis is involved in several Open Source projects related to OSGi, such as Apache Celix, Apache Felix and Apache ACE.

With the advent of IoT-based solutions, it is becoming clear that it introduces a number of deep challenges for the security aspect of these solutions. Because of the sheer volume, the heterogeneous character and the inherent geographical dispersion, the classical security strategies, which are based on a secure perimeter with a centralised identity strategy, fail to deliver sufficient security.

**Assignment**
One of the principles for new resilient security strategies is that they need to be risk-adaptive and highly automatable (Stronger: anything that is not automated is not going to scale sufficiently). One decision than can be automated is to grant access to data based on an attribute-based encryption approach (ABE). In ABE, a user has a set of attributes in addition to its unique ID. Based on a given policy, it grant parties access to specific parts of the data if it has the correct combination of ID and attributes.

This research is expected to design and implement an ABE solution that is capable of using different policies and attribute-schemes in order to increase the risk-adaptive aspect of a security strategy by granting access to parts of data.

**Location**
Arnhem / Hengelo (optional)

**Department**
Luminis / Naval – Application Engineering

**Internship coordinator**
Rene van Hees (rene.vanhees@nl.thalesgroup.com)

**Internship attendant**
Marcel Offermans (Luminis) / Pepijn Noltes (Thales)

---

**On November 16, 2011 René van Hees presented**

**Innovation, Services and Open source**

During a knowledge session on services in distributed and/or embedded environments Thales presented their vision on the future of software and how services can help to improve the flexibility of existing systems.
**Intent-Based Coordination using a BDI agent**

<table>
<thead>
<tr>
<th>Title</th>
<th>Intent-Based Coordination using a BDI agent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Master</td>
</tr>
<tr>
<td>Education</td>
<td>Computer Science</td>
</tr>
<tr>
<td>Affinity</td>
<td>Software Modularity, Dynamic Reconfiguration, Artificial Intelligence, Intelligent Agent</td>
</tr>
<tr>
<td>Background</td>
<td>The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems.</td>
</tr>
<tr>
<td>Overview</td>
<td>Distributed systems are more and more running in a dynamic context. Different modes of operation are requested dependent of the ships mission. New functionality is regularly added during the lifetime of systems. System have to cope with failing hardware resources or have to share hardware resources with other systems. To be able to built these systems a dynamic architecture is required.</td>
</tr>
<tr>
<td>Assignment</td>
<td>Within research projects we developed a reference architecture using real-time resource monitoring in combination with constraint-based dynamic deployment to ensure an adaptable system capable of handling resource, environmental and/or functional usages changes.</td>
</tr>
<tr>
<td>Assignment</td>
<td>The assignment is to research and prototype a Belief-Desire-Intention (BDI) agent to coordinate the desired end-user functionality in terms of high level (invariant) intents. The BDI agent should use the existing resource and application monitoring to create a belief set and should instruct the existing constraint-based resolver to actualize the requested intent in a coordinated manner.</td>
</tr>
<tr>
<td>Assignment</td>
<td>The BDI agent must – at least - consider software redundancy for time critical parts, distributed and redundant data storage requirements including delay constraints, expected and/or measured jitter and the variability in the input data.</td>
</tr>
<tr>
<td>Location</td>
<td>Hengelo / Arnhem (optional)</td>
</tr>
<tr>
<td>Department</td>
<td>Naval – Application Engineering</td>
</tr>
<tr>
<td>Internship coordinator</td>
<td>Rene van Hees (<a href="mailto:rene.vanhees@nl.thalesgroup.com">rene.vanhees@nl.thalesgroup.com</a>)</td>
</tr>
<tr>
<td>Internship attendant</td>
<td>Marcel Offermans (Luminis) / Pepijn Noltes (Thales)</td>
</tr>
</tbody>
</table>
Deployment calculation for dynamic environments

Graduation assignment

<table>
<thead>
<tr>
<th>Title</th>
<th>Deployment calculation for dynamic environments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Master</td>
</tr>
<tr>
<td>Education</td>
<td>Computer Science</td>
</tr>
<tr>
<td>Affinity</td>
<td>C / Distributed systems</td>
</tr>
<tr>
<td>Background</td>
<td>The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems. This is a shared assignment of Thales and Luminis. Luminis is a software house with a clear focus on research and innovation. Luminis is involved in several Open Source projects related to OSGi, such as Apache Celix, Apache Felix and Apache ACE.</td>
</tr>
<tr>
<td>Overview</td>
<td>Distributed systems are more and more running in a dynamic context. New functionality is regularly added during the lifetime of systems. System have to cope with failing hardware resources or have to share hardware resources with other systems. To be able to built these systems a dynamic architecture is required.</td>
</tr>
<tr>
<td>Assignment</td>
<td>One of the hurdles with the adoption of a modular software in dynamic environments is the runtime deployment of the modules. The problem is a typical NP problem. At the moment, Thales uses OSGi as modular technology. In the OSGi world various strategies and implementations exist to handle and solve dependencies between modules at runtime. The built-in resolver, also available as a stand-alone component, uses an extensible model that can match capabilities and requirements that can be used to express all kinds of dependencies. TNO and Thales together realized a demonstrator showing the concept of a constraint based solution resolver using the OSGi requirement/capability model. The resolver takes into account different combination of modules and the needed CPU and Memory resources per module. At this moment, research is on going to extend this with Hardware capabilities (e.g. GPU resources) and Network capabilities. Thales was also involved in a research project called INAETICS (<a href="http://www.inaetic.org">www.inaetic.org</a>) in which a demonstrator is realized where the open-source container orchestration solution Kubernetes (from Google) was used for deployment. At this moment, Kubernetes only support CPU and Memory resources as deployment parameters. This research aims to design an alternative solution resolver and compare it with the constraint based solution resolver. The solutions shall be implemented using the Kubernetes framework and be tested in the INAETICS demonstrator.</td>
</tr>
<tr>
<td>Location</td>
<td>Hengelo</td>
</tr>
<tr>
<td>Department</td>
<td>Naval – Application Engineering</td>
</tr>
<tr>
<td>Internship coordinator</td>
<td>Rene van Hees (<a href="mailto:rene.vanhees@nl.thalesgroup.com">rene.vanhees@nl.thalesgroup.com</a>)</td>
</tr>
<tr>
<td>Internship attendant</td>
<td>Gerrit Binnenmars / Pepijn Noltes / Marcel Offermans (Luminis)</td>
</tr>
</tbody>
</table>
Distributed service tracing

Graduation assignment

<table>
<thead>
<tr>
<th>Title</th>
<th>Distributed service tracing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Master</td>
</tr>
<tr>
<td>Education</td>
<td>Computer Science</td>
</tr>
<tr>
<td>Affinity</td>
<td>C / Distributed systems</td>
</tr>
</tbody>
</table>

Background
The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems.

This is a shared assignment of Thales and Luminis. Luminis is a software house with a clear focus on research and innovation. Luminis is involved in several Open Source projects related to OSGi, such as Apache Celix, Apache Felix and Apache ACE.

Overview
Distributed systems are more and more running in a dynamic context. New functionality is regularly added during the lifetime of systems. System have to cope with failing hardware resources or have to share hardware resources with other systems. To be able to built these systems a dynamic architecture is required.

Assignment
At the moment, Thales is adopting a service oriented architecture for their Radar systems. Thales was involved in a research project called INAETICS (www.inaetic.org) in which an architecture for modular, dynamic infallible systems was developed together with a reference architecture. One of the difficulties with dynamic distributed systems is the question “what is going on”. Understanding system behavior in distributed dynamic systems requires observing related activities across many different modules and machines.

Already in 2010, Google proposed “Dapper, a large scale distributed system tracing infrastructure”. It proposes a common set of building blocks for instrumentation where the traces can be annotated via an annotation model to put application specific information in the trace logs.

At the moment, two students are investigating if time series databases provide the needed functionality to make traces visible in an understandable/observable way.

The aim of this research is to research distributed service tracking and visualization solutions. Develop a design for distributed service tracing taking into account instrumentation, storage and visualization. Implement at least the instrumentation building blocks as a component with a set of services in the INAETICS architecture.

Location
Hengelo

Department
Naval – Application Engineering

Internship coordinator
Rene van Hees (rene.vanhees@nl.thalesgroup.com)

Internship attendant
Gerrit Binnenmars / Pepijn Noltes / Marcel Offermans (Luminis)
**Add authentication system to Radars**

<table>
<thead>
<tr>
<th>Title</th>
<th>Add authentication system to Radars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Bachelor</td>
</tr>
<tr>
<td>Education</td>
<td>Computer Science</td>
</tr>
<tr>
<td>Affinity</td>
<td>Linux, Operating Systems</td>
</tr>
<tr>
<td>Background</td>
<td>The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems.</td>
</tr>
<tr>
<td>Overview</td>
<td>The amount of machines in a radar increases and the risk of a system getting hacked increases. For that reason, focus on cyber security is essential. One of the principals is a authentication of users</td>
</tr>
<tr>
<td>Assignment</td>
<td>Investigate what is needed to establish an authentication system in Radars. Investigate what is needed to couple it with external authentication systems (e.g. the authentication system of the Combat Management System)</td>
</tr>
<tr>
<td></td>
<td>Design and implement a proof-of-concept for a Radar System. The future Radar Systems will use CoreOs as operating system. So preferably CoreOs and their DEX solution are taken into account.</td>
</tr>
<tr>
<td>Location</td>
<td>Hengelo</td>
</tr>
<tr>
<td>Department</td>
<td>Naval – Application Engineering</td>
</tr>
<tr>
<td>Internship coordinator</td>
<td>René van Hees (<a href="mailto:renee.vanhees@nl.thalesgroup.com">renee.vanhees@nl.thalesgroup.com</a>)</td>
</tr>
<tr>
<td>Internship attendant</td>
<td>Gerrit Binnenmars</td>
</tr>
</tbody>
</table>

December, 2012 Jasper Gielen en Pepijn Noltes in de Bits&Chips

**Servicegeoriënteerd programmeren in radarsystemen**

Bij Service-Oriented Architecture denken velen vrijwel direct aan een enterprise-gerichte, trage Soap-oplossing waarbij meerdere systemen XML uitwisselen over het internet. Het is echter ook toepasbaar op kleinere schaal en zelfs voor realtime embedded systemen. In dit artikel laten Jasper Gielen en Pepijn Noltes zien hoe Thales dit aanpakt.
Automatic Network Provisioning

Graduation

<table>
<thead>
<tr>
<th>Title</th>
<th>Automatic Network Provisioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Bachelor</td>
</tr>
<tr>
<td>Education</td>
<td>Computer Science</td>
</tr>
<tr>
<td>Affinity</td>
<td>Linux, Operating Systems</td>
</tr>
<tr>
<td>Background</td>
<td>The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems. The amount of machines in a radar increases. Further, the time needed to configure test-machines needs to be declined. Also development is done in a continuous integration environment which ideally would be extended with a continuous deployment solution.</td>
</tr>
</tbody>
</table>

Overview

| Assignment | A lot of different solutions for automated booting of bare metal machines are available. Make an overview of the available solutions and the differences between these solutions. Possible solutions known are: • CoreOS bootcfg tool • GiantSwarm, Mayu and Yoghu tools • Github, the gPanel tooling with iPXE and Facter from PuppetLabs • DC/OS solution • Others Establish criteria to select a solution for a Radar System Implement at least one solution for a Radar System It is possible to do this assignment with multiple students |

Location

| Location | Hengelo |

Department

| Department          | Naval – Application Engineering |

Department Internship coordinator

| René van Hees (rene.vanhees@nl.thalesgroup.com) |

Internship attendant

| Gerrit Binnenmars |
# Establish Chain of Trust

## Internship/Graduation

<table>
<thead>
<tr>
<th>Title</th>
<th>Establish Chain of Trust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Bachelor</td>
</tr>
</tbody>
</table>

## Education

<table>
<thead>
<tr>
<th>Affinity</th>
<th>Linux, Operating Systems</th>
</tr>
</thead>
</table>

## Background

The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems.

## Overview

The amount of machines in a radar increases and the risk of a system getting hacked increases. For that reason, focus on cyber security is essential. One of the principals is a trusted computing platform.

## Assignment

- Investigate what is needed to establish a chain of trust for computing equipment in Radar Systems.
- Investigate if it is possible to establish a chain of trust when network booting (PXE booting) is used.
- Design and implement a proof-of-concept for a Radar System.
- Optionally: show how a Certificate Authority can use this Chain of Trust

## Location

Hengelo

## Department

Naval – Application Engineering

## Internship coordinator

René van Hees ([rene.vanhees@nl.thalesgroup.com](mailto:rene.vanhees@nl.thalesgroup.com))

## Internship attendant

Gerrit Binnenmars / Marco ten Thije

---

**October 1, 2015 Pepijn Noltes and Björn Petri on ApacheCon**

**Self Healing Systems using Distributed OSGi**

Taking advantage of polyglot OSGi allows us already to bridge the gap between the world of Virtual machines and the native layer allowing to run distributed services virtually everywhere: from embedded devices to high end workstations. Combining the described portability with dynamical deployed software modules allows not only the composition of re-configurable systems in heterogeneous environments. It also eases the automatic replacement of failing components resulting in self-healable systems. Using this, reliable systems can be built in an unreliable environments
# Automated cyber security testing

<table>
<thead>
<tr>
<th>Internship/Graduation</th>
<th>Automated cyber security testing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
<td>Automated cyber security testing</td>
</tr>
<tr>
<td><strong>Level</strong></td>
<td>Bachelor</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td>Computer Science</td>
</tr>
<tr>
<td><strong>Affinity</strong></td>
<td>Linux, Operating Systems</td>
</tr>
<tr>
<td><strong>Background</strong></td>
<td>The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems.</td>
</tr>
<tr>
<td><strong>Overview</strong></td>
<td>The amount of machines in a radar increases and the risk of a system getting hacked increases. For that reason, focus on cyber security is essential.</td>
</tr>
</tbody>
</table>
| **Assignment**        | The assignment consists of two parts:  
1. Investigate the radar systems and establish scenarios that show how the system can be possibly compromised.  
2. Investigate if there are frameworks available to automate these test scenarios and implement such a solution. With this tool, the scenarios can be included in nightly regression tests of the radar systems. |
| **Location**          | Hengelo                          |
| **Department**        | Naval – Application Engineering  |
| **Internship coordinator** | René van Hees (rene.vanhees@nl.thalesgroup.com) |
| **Internship attendant** | Gerrit Binnenmars / Marco ten Thije |

---

June 2015, Ferenc Schopbarteld and Jeroen Kouwer present

**Lessons learned in 10 years of MDSE**

Since 2004 Thales Nederland is generating more than 40 percent of their code base in modern radar systems from XML models. In 2009 a shift was made to apply model-driven architecture (MDA) using UML. Also the structural modeling was extended with behavioural modeling for algorithm design (using Simulink) in which case over 90 percent of the code was generated from models. Another major challenge was the introduction of the Agile practices (in 2012) and being able to support short development iterations while maintaining a consistent model. Over the years this approach is successfully used in almost twenty international radar systems (both legacy and new). The architectures applied vary from single boards to highly distributed platforms based on heterogeneous technologies.
## Title
Remote communication between zones

## Level
Bachelor

## Education
Computer Science

## Affinity
Linux, Operating Systems

## Background
The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems.

## Overview

### Assignment
At the moment, Thales is adopting a service oriented architecture for their Radar systems. Thales was involved in a research project called INAETICS (www.inaetic.org) in which an architecture for modular, dynamic infallible systems was developed together with a reference architecture. In this architecture the concept of zones is introduced to realize grouping of Nodes based on e.g. geographical location, business domain or security domain.

At the moment, Thales uses OSGi as modular technology. In the OSGi world the concept of remote services is supported.

This research aims to design and implement a zone bridge that provides service accessibility between zones and message routing between zones. In the design concepts like security (access to services), dynamic leader election (who becomes the zone bridge) and no single point of failure have to be taken into account. Also the access to non OSGi services has to be taken into account (e.g. REST services or gRPC based services). All concepts need to be pluggable.

## Location
Hengelo

## Department
Naval – Application Engineering

## Internship coordinator
René van Hees (rene.vanhees@nl.thalesgroup.com)

## Internship attendant
Gerrit Binnenmars / Pepijn Noltes
3D Augmented Reality Maintenance Support

**Title**
3D Augmented Reality Maintenance Support

**Level**
Bachelor

**Education**
Computer Science

**Affinity**
AR, Java

**Background**
The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems.

**Overview**
Offer a enhanced operation display using state of the art technology like augmented reality and speech recognition. The idea is to use an AR device to support system maintenance and repair. The maintainer is supported remotely by an expert with live chat, voice and video connection allowing graphical feedback (like drawing). Speech recognition is used for handsfree control of the system. Optionally sessions can be recorded for (future) offline assistance and educational purposes.

**Assignment**
The assignment consists of two parts:
1. Investigate the current radar maintenance solution.
2. Determine the systems architecture taken into account the relevant solutions that are available today.
3. Develop a proof of concept

Since this is a large assignment the final result of internship period is unknown upfront.

**Location**
Hengelo

**Department**
Naval – Application Engineering

**Internship coordinator**
René van Hees (rene.vanhees@nl.thalesgroup.com)

**Internship attendant**
Jasper Gielen, Jeroen van der Wel
Investigate and develop an interface library for EtherCAT

**Internship**

**Location:** Hengelo  
**Department:** Naval – Application Engineering  
**Education:** Computer Science  
**Level:** Bachelor / HBO  
**Title:** Investigate and develop an interface library for EtherCAT

**Background:**
The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems. The used real-time processing systems are implemented with state-of-the-art hardware and software.

Within these systems there is the Sensor Management subsystem. This subsystem is responsible for all control aspects of the various Sensors. This includes control of transmissions, motion control, climate and power control etc.

To do so Sensor Management interfaces with external interfaces through an Ethernet connection using Modbus or through direct point-to-point connections.

**Assignment:**
Within our Radar Systems much of the external equipment is controlled through a physical "discrete" line or through a Modbus interface. Thales has the ambition to change this to EtherCAT. The goal is to use EtherCAT in the following situations:

- As a replacement of our I/O control board
- As an I/O test board in our test setup
- To control external third party equipment

Goals of this assignment are:

- Implement a library to control EtherCAT devices. This library should be built on top of the Thales middleware, using an existing open-source EtherCAT stack.
- Integrate this library into our Mockito based Test Environment.
- Control external equipment, for example Siemens S7 PLC’s.
- Demonstrate working system using available EtherCAT and Siemens devices.

**Affinity:**  
Embedded / Real-time systems, Fieldbus protocols.

**Required:**  
Knowledge of C, C++ and Java.

**Department Internship - coordinator:** Reinier Kleefman (reinier.kleefman@nl.thalesgroup.com)

**Internship attendant:** Brian Postma
3D Augmented Reality Operational Display

Internship/Graduation

Title
3D Augmented Reality Operational Display

Level
Bachelor

Education
Computer Science

Affinity
AR, Java

Background
The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems.

Overview
Offer a enhanced operation display using state of the art technology like augmented reality and speech recognition. The idea is to use an AR device to show relevant radar information (vessels, relevant detections, splash predictions, etc.) and to combine this with 360 degrees sphere camera recordings to enable (3D) replay of the recorded scenario’s.

Assignment

1. Investigate the radar systems and determine the relevant information to be taken into account.
2. Determine the systems architecture taken into account the relevant solutions that are available today.
3. Develop a proof of concept

Since this is a large assignment the final result of internship period is unknown upfront.

Location
Hengelo

Department
Naval – Application Engineering

Department Internship coordinator
René van Hees (rene.vanhees@nl.thalesgroup.com)

Internship attendant
Jasper Gielen, Jeroen van der Wel
# Investigate and Develop an Interface Translation Methodology

## Internship

- **Location:** Hengelo
- **Reference Number:**
- **Department:** Naval – Application Engineering
- **Education:** Computer Science
- **Level:** WO

## Title

**Investigate and Develop an Interface Translation Methodology**

The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems. The used real-time processing systems are implemented with state-of-the-art hardware and software.

Within these systems there is the Sensor Management subsystem. This subsystem is responsible for all control aspects of the various Sensors and the provision of a standardized Open Sensor Interface (OSI). Customers often require an adaptation from this standard interface to their dedicated interface, controlled by themselves. To accommodate this, translation software needs to be manually created which is customer specific and creation is time consuming.

## Assignment

Are you interested in Model Driven Development and code generation and automation? Then this assignment might suit you. The goal is to create an Interface Translation Methodology by using modern practices like Domain Specific Languages (DSL), Model Driven Development (MDD) and XLM/IDL languages. Based on these techniques, you will develop a proven prototype and perform a demonstration to prove consistent interface translations.

## Affinity

- Real-Time Systems
- State Machine Modeling
- Interface Techniques

## Required

- DSL
- MDD
- Java
- IDL

## Department Internship - coordinator

Reinier Kleefman (reinier.kleefman@nl.thalesgroup.com)

## Internship attendant

Brian Postma / Niels van Breederoode / Damiaan van der Kruk
Gamification of graphical fault finding

Internship/Graduation

<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>Gamification of graphical fault finding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level</strong></td>
<td>Bachelor</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td>Computer Science</td>
</tr>
<tr>
<td><strong>Affinity</strong></td>
<td>Java, Gaming</td>
</tr>
<tr>
<td><strong>Background</strong></td>
<td>The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems. Today, the maintainers of the radar systems are directed to the broken part in a stepwise graphical approach. It is relevant for maintainers to know where the parts are located in the radar to allow fast and easy repairs (and less downtime of the system).</td>
</tr>
</tbody>
</table>

**Assignment**

For training (and fun) purposes we would like to use this concept as basis for a game. This game should make the player aware of the parts of the radar and their location. It should be challenging for the player for both the short term and the long term.

The assignment consists of several parts:
1. Investigate the current radar maintenance solution, possible training goals and how to achieve these goals.
2. Design the game (story board, rules, challenges, levels, scoring method, …)
3. Develop a proof of concept

<table>
<thead>
<tr>
<th><strong>Location</strong></th>
<th>Hengelo</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Department</strong></td>
<td>Naval – Application Engineering</td>
</tr>
<tr>
<td><strong>Internship coordinator</strong></td>
<td>René van Hees (<a href="mailto:rene.vanhees@nl.thalesgroup.com">rene.vanhees@nl.thalesgroup.com</a>)</td>
</tr>
<tr>
<td><strong>Internship attendant</strong></td>
<td>Jasper Gielen, Jeroen van der Wel</td>
</tr>
</tbody>
</table>
Attribute based access control

Internship

<table>
<thead>
<tr>
<th>Title</th>
<th>Attribute based access control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Bachelor study</td>
</tr>
<tr>
<td>Education</td>
<td>Computer Science, IT Service management</td>
</tr>
<tr>
<td>Affinity</td>
<td>Linux , Security</td>
</tr>
<tr>
<td>Background</td>
<td>The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems. The work is performed in multi-disciplinary teams with specialists in system engineering, functional sensor design and design and realization of real-time embedded systems.</td>
</tr>
</tbody>
</table>

**Assignment**

To be prepared for the future Thales is researching – for radar development - the benefits of using open source software, shifting to a (micro) service oriented architecture and the feasibility of infallible software systems.

Thales is one if the partners in the INAETICS research project. This goal of this research project is to define and demonstrate a dynamic service architecture that addresses the requirements of time critical systems in a broad range of domains.

One of the aspects of the INAETICS architecture is security of systems.

The assignment consists of making an overview of the available attribute-based access control implementations including pro’s and con’s. Select the preferred implementation and demonstrate how it can be used in a distributed environment.

Note: this assignment can be extended to let multiple students work on it together

| Location | Hengelo |
| Department | Naval – Application Engineering |
| Internship coordinator | René van Hees (rene.vanhees@nl.thalesgroup.com) |
| Internship attendant | Gerrit Binnenmars |
Request-based Dynamic Cloud Architectures

Graduation assignment

<table>
<thead>
<tr>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Request-based Dynamic Cloud Architectures</td>
</tr>
</tbody>
</table>

| Level | Master |
|-------------------|

| Education |
| Software Technology |

| Affinity |
| Software Modularity |

| Background |
| The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems. |

This is a shared assignment of Thales and Luminis. Luminis is a software house with a clear focus on research and innovation. Luminis is involved in several Open Source projects related to OSGi, such as Apache Cellx, Apache Felix and Apache ACE.

| Overview |
| Public clouds offer almost infinite resources at a reasonable cost. At the same time, effectively using such resources remains a challenge as it ultimately determines your margin when offering services yourself. |

| Assignment |
| When such services are used by many customers and their usage patterns are irregular, you often end up with servers that are partially idle because they have to be there in case a customer logs in. Ideally you could start such services “on demand” except for the problem that when a web request comes in, you cannot start everything quickly enough to start and process the request without making the customer wait. |

At the same time, the OSGi based architecture we use for our applications allows you to quickly start such an application (either completely or partially). Can we setup our infrastructure and application architecture in such a way that it is quick enough to start an application when a request comes in and and, after a certain grace period, shut it down again. Or, more fine-grained, have subsystems with life cycles that allow this as it might not be necessary to start everything for every request. |

| Location |
| Arnhem / Hengelo (optional) |

| Department |
| Luminis / Naval – Application Engineering |

| Internship coordinator |
| Rene van Hees (rene.vanhees@nl.thalesgroup.com) |

| Internship attendant |
| Marcel Offermans (Luminis) / Pepijn Noltes (Thales) |

INtelligent robust ArchitecturE for TIime Critical Systems (INAETICS)

The INAETICS goal is to define and demonstrate a dynamic service oriented reference architecture that addresses the requirements of time critical systems in a broad range of domains by providing a single design and implementation space for all subsystems, irrespective of control strategy. By providing system-wide consistency and avoiding architectural impedance intermediaries the architecture will support organizational as well as functional scalability, allowing adopters to streamline and accelerate their entire product lifecycle (www.inaetics.org).
Big Data Storage for Sensor System

Graduation assignment

<table>
<thead>
<tr>
<th>Title</th>
<th>Big Data Storage for Sensor System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Bachelor</td>
</tr>
<tr>
<td>Education</td>
<td>Computer Science, Electronic Engineering, IT management</td>
</tr>
<tr>
<td>Affinity</td>
<td>Big Data, JSON, C &amp; Java</td>
</tr>
</tbody>
</table>

Background

The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems. The work is performed in multi-disciplinary teams with specialists in system engineering, functional sensor design and design and realization of real-time embedded systems.

Overview

Assignment

Big Data and associated technologies brings a lot opportunities to process and analyze data in a offline situation. For Thales Sensors this brings opportunities to enrich our data processing and classification.

In this assignment the student will design, implement and roll-out a big data storage solution which can be used to store sensor data from sensors develop and fabricated at Thales Hengelo.

The solution encompasses the following concern:
- The solution must have different connectors for the currently developed sensors.
- It should be easy to connect/disconnect sensors system to the storage system.
- Data storage format should be decoupled from specific sensor info and technology.
- The solution should be able to approximately storage 3 years of sensors data.
- The solution must have an elaborate query and visualization support.
- The solution must be deployed in the existing Thales IT facilities.

Location

Hengelo

Department

Naval – Application Engineering

Department Internship coordinator

Rene van Hees (rene.vanhees@nl.thalesgroup.com)

Internship attendant

Damiaan van der Kruk / Thom Bennink
# Graduation assignment

**Simulate Run-Time Deployments of Distributed Systems**

<table>
<thead>
<tr>
<th>Title</th>
<th>Simulate Run-Time Deployments of Distributed Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Master</td>
</tr>
<tr>
<td>Education</td>
<td>Computer Science</td>
</tr>
<tr>
<td>Affinity</td>
<td>Distributed Systems, Modeling Tooling</td>
</tr>
<tr>
<td>Background</td>
<td>The software department of the Application Engineering cluster is responsible for the software development in radar- and optical sensors for worldwide navies- and air defense systems.</td>
</tr>
<tr>
<td>Overview</td>
<td>Distributed systems are more and more running in a dynamic context. New functionality is regularly added during the lifetime of systems. System have to cope with failing hardware resources or have to share hardware resources with other systems. To be able to built these systems a dynamic architecture is required.</td>
</tr>
<tr>
<td>Assignment</td>
<td>At the moment, Thales is adopting a service oriented architecture for their Radar systems. Thales was involved in a research project called INAETICS (<a href="http://www.inaetic.org">www.inaetic.org</a>) in which an architecture for modular, dynamic infallible systems was developed together with a reference architecture. One of the difficulties with dynamic distributed systems is the question “what is going on”. Understanding system behavior in distributed dynamic systems requires observing related activities across many different modules and machines.</td>
</tr>
<tr>
<td>Location</td>
<td>Hengelo</td>
</tr>
<tr>
<td>Department</td>
<td>Naval – Application Engineering</td>
</tr>
<tr>
<td>Internship coordinator</td>
<td>Rene van Hees (<a href="mailto:rene.vanhees@nl.thalesgroup.com">rene.vanhees@nl.thalesgroup.com</a>)</td>
</tr>
<tr>
<td>Internship attendant</td>
<td>Damiaan van der Kruk / Pepijn Noltes</td>
</tr>
</tbody>
</table>
Radar aansturing via een tablet

De Application Engineering cluster van THALES-NAVAL-NEDERLAND is producent van geavanceerde Radar- en besturingssystemen. T.b.v. verificatie en systeem testen wordt gebruik gemaakt van simulatoren en training systemen waarin de operationele werking van (delen van) de systemen gesimuleerd wordt. De hiervoor benodigde apparatuur en software wordt ontwikkeld en geproduceerd binnen de groep SITE (System Integration & Training Equipment).

Tevadis is een framework voor het maken van sensor (radar) control applicaties op een PC. Het toont radar data in een grafisch overzicht waar het gecombineerd kan worden met andere data zoals een kaart en hoogte data. Tevadis is geschreven in Java en OpenGL. De opdracht voor de student is het implementeren van de functionaliteit van Tevadis op een android tablet.

On May 25, 2016 Pepijn Noltes demonstrated

A demonstration of a dynamic reconfigurable software architecture

Systems are subject to change over the course of their existence. These changes can be driven by changing requirements, changing technology, changing environment or simply because of obsolescence of hardware. Within the Stars (Sensor Technologies Applied to Reconfigurable Systems for Sustainable Security) research project, Thales and TNO took up the challenge to research and prototype a reference architecture designed to cope with software evolution. Our solution is technology-agnostic and withstands changes in the underlying hardware. Moreover, it recovers from hardware failure and enables users to dynamically request and deploy new/different functionalities. We will demonstrate the reference architecture by interactively changing the requested functionality and ‘break’ the available hardware of the system.
Visualisatie van meteorologische data in een radar control tool

Stageopdracht

Visualisatie van meteorologische data in een radar control tool

Hogeschool

(Technische) Informatica

Java, Swing, OpenGL, JSON, XML

De Application Engineering cluster van THALES-NAVAL-NEDERLAND is producent van geavanceerde Radar- en besturingssystemen. T.b.v. verificatie en systeem testen wordt gebruik gemaakt van simulatoren en training systemen waarin de operationele werking van (delen van) de systemen gesimuleerd wordt. De hiervoor benodigde apparatuur en software wordt ontwikkeld en geproduceerd binnen de groep SITE (System Integration & Training Equipment).

Tevadis is een framework voor het maken van sensor (radar) control applicaties op een PC. Het toont radar data in een grafisch overzicht waar het gecombineerd kan worden met andere data zoals een kaart en hoogte data. De opdracht voor de student is aan dit overzicht meteorologische (weer) informatie toe te voegen. De meteorologische informatie wordt verkregen middels de API (JSON of XML) van OpenWeatherMap, Weather Underground, Yahoo Weather, Forecast.io of een andere open source weather API. In Tevadis moet geconfigureerd kunnen worden welke data getoond moet worden. De opdracht zal geïmplementeerd worden in Java, Swing en OpenGL.

De opdracht kan naar wens worden uitgebreid met support van additionele APIs en/of visualisatie van andere open source data die van belang kan zijn voor een radar operator, bijvoorbeeld het World Magnetic Model (WMM).

Vestiging

Hengelo

Afdeling

Naval – Application Engineering – System Integration & Training Equipment

Afdelings stage-coordinator

Miklós Donders (mikos.donders@nl.thalesgroup.com)

Stagebegeleider

Sebastian Hogenbirk
Stageopdracht

**Visualisatie van open source statische data in een radar control tool**

Hogeschool

*(Technische) Informatica*

Java, Swing, OpenGL, JSON, XML

Achtergrond

De Application Engineering cluster van THALES-NAVAL-NEDERLAND is producent van geavanceerde Radar- en besturingssystemen. T.b.v. verificatie en systeem testen wordt gebruik gemaakt van simulatoren en training systemen waarin de operationele werking van (delen van) de systemen gesimuleerd wordt. De hiervoor benodigde apparatuur en software wordt ontwikkeld en geproduceerd binnen de groep SITE (System Integration & Training Equipment).

**Overzicht**

Tevadis is een framework voor het maken van sensor (radar) control applicaties op een PC. Het toont radar data in een grafisch overzicht waar het gecombineerd kan worden met andere data zoals een kaart en hoogte data. De opdracht voor de student is aan dit overzicht statische data toe te voegen zoals vliegvelden en havens uit een open source database. De student zal de data moeten inlezen middels een API of uit een specifiek file format en deze weer moeten geven in Tevadis middels de hiervoor beschikbare code.

De opdracht kan naar wens worden uitgebreid met support van additionele APIs en/of visualisatie van andere open source data die van belang kan zijn voor een radar operator, bijvoorbeeld het World Magnetic Model (WMM).

**Vestiging**

Hengelo

**Afdeling**

Naval – Application Engineering – System Integration & Training Equipment

**Afdelings stage-coordinator**

Miklós Donders *(miklos.donders@nl.thalesgroup.com)*

**Stagebegeleider**

Sebastian Hogenbirk
## Improving Video Encoding/Decoding using GPU

### Stage-/Afstudeeropdracht

<table>
<thead>
<tr>
<th><strong>Titel Opdracht</strong></th>
<th>Improving Video Encoding/Decoding using GPU</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Niveau</strong></td>
<td>HBO/ WO</td>
</tr>
<tr>
<td><strong>Studierichting</strong></td>
<td>(Technische) Informatica</td>
</tr>
<tr>
<td><strong>Affiniteit</strong></td>
<td>GPU programming, Linux</td>
</tr>
<tr>
<td><strong>Achtergrond</strong></td>
<td>De Business Unit Naval van Thales ontwikkelt en integreert high-tech command &amp; control systemen radars voor met name inzet in de marine markt. Binnen deze Business Unit is de afdeling Application Engineering onder andere verantwoordelijk voor het ontwikkelen van de middleware en andere infrastructuur software.</td>
</tr>
<tr>
<td><strong>Omschrijving</strong></td>
<td>De opdracht bestaat uit een onderzoek naar de mogelijkheden wat de mogelijkheden van hardware ondersteunde video encoding en decoding (e.g. H.264, H.265), door beter gebruik te maken van de GPU (NVIDIA CUDA). Een onderdeel van de opdracht is om een aantal demonstrators te maken. Afhankelijk van de studierichting en persoonlijke interesses kan het zwaartepunt van de opdracht verlegd worden.</td>
</tr>
<tr>
<td><strong>Vestiging</strong></td>
<td>Hengelo</td>
</tr>
<tr>
<td><strong>Afdeling</strong></td>
<td>Naval – Application Engineering</td>
</tr>
<tr>
<td><strong>Afdelings stage-coordinator</strong></td>
<td>Willy Boenink (<a href="mailto:willy.boenink@nl.thalesgroup.com">willy.boenink@nl.thalesgroup.com</a>)</td>
</tr>
<tr>
<td><strong>Stagebegeleider</strong></td>
<td>Willy Boenink</td>
</tr>
</tbody>
</table>

---

**Stage-/Afstudeeropdracht**

<table>
<thead>
<tr>
<th><strong>Titel Opdracht</strong></th>
<th>Improving Video Encoding/Decoding using GPU</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Niveau</strong></td>
<td>HBO/ WO</td>
</tr>
<tr>
<td><strong>Studierichting</strong></td>
<td>(Technische) Informatica</td>
</tr>
<tr>
<td><strong>Affiniteit</strong></td>
<td>GPU programming, Linux</td>
</tr>
<tr>
<td><strong>Achtergrond</strong></td>
<td>De Business Unit Naval van Thales ontwikkelt en integreert high-tech command &amp; control systemen radars voor met name inzet in de marine markt. Binnen deze Business Unit is de afdeling Application Engineering onder andere verantwoordelijk voor het ontwikkelen van de middleware en andere infrastructuur software.</td>
</tr>
<tr>
<td><strong>Omschrijving</strong></td>
<td>De opdracht bestaat uit een onderzoek naar de mogelijkheden wat de mogelijkheden van hardware ondersteunde video encoding en decoding (e.g. H.264, H.265), door beter gebruik te maken van de GPU (NVIDIA CUDA). Een onderdeel van de opdracht is om een aantal demonstrators te maken. Afhankelijk van de studierichting en persoonlijke interesses kan het zwaartepunt van de opdracht verlegd worden.</td>
</tr>
<tr>
<td><strong>Vestiging</strong></td>
<td>Hengelo</td>
</tr>
<tr>
<td><strong>Afdeling</strong></td>
<td>Naval – Application Engineering</td>
</tr>
<tr>
<td><strong>Afdelings stage-coordinator</strong></td>
<td>Willy Boenink (<a href="mailto:willy.boenink@nl.thalesgroup.com">willy.boenink@nl.thalesgroup.com</a>)</td>
</tr>
<tr>
<td><strong>Stagebegeleider</strong></td>
<td>Willy Boenink</td>
</tr>
</tbody>
</table>
### Server Virtualization Control

**Stage-/Afstudeeropdracht**

<table>
<thead>
<tr>
<th>Niveau</th>
<th>HBO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studierichting</td>
<td><em>(Technische) Informatica / IT Management</em></td>
</tr>
<tr>
<td>Affiniteit</td>
<td>Linux, Virtualization</td>
</tr>
<tr>
<td>Achtergrond</td>
<td>De Business Unit Naval van Thales ontwikkelt en integreert hightech command &amp; control systemen voor met name inzet in de marine markt. Binnen deze Business Unit is de afdeling Application Engineering onder andere verantwoordelijk voor het ontwikkelen van de middleware en andere infrastructuur software.</td>
</tr>
<tr>
<td>Omschrijving</td>
<td>De opdracht bestaat uit een onderzoek naar de mogelijkheden wat het beste tool is om monitoring and control uit te voeren op onze gevirtualiseerde (test)systemen. Dit geld naast de server virtualisatie ook voor het network virtualisatie. Een onderdeel van de opdracht is om een aantal demonstrators te maken. Afhankelijk van de studierichting en persoonlijke interesses kan het zwaartepunt van de opdracht verlegd worden.</td>
</tr>
<tr>
<td>Vestiging</td>
<td>Hengelo</td>
</tr>
<tr>
<td>Afdeling</td>
<td>Naval – Application Engineering</td>
</tr>
<tr>
<td>Afdelings stage-coordinator</td>
<td>Willy Boenink (<a href="mailto:willy.boenink@nl.thalesgroup.com">willy.boenink@nl.thalesgroup.com</a>)</td>
</tr>
<tr>
<td>Stagebegeleider</td>
<td>Willy Boenink</td>
</tr>
</tbody>
</table>

### Orchestration of Docker containers (Applications)

**Stage-/Afstudeeropdracht**

<table>
<thead>
<tr>
<th>Niveau</th>
<th>HBO / WO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studierichting</td>
<td><em>(Technische) Informatica / IT Management</em></td>
</tr>
<tr>
<td>Affiniteit</td>
<td>Linux, Cloud computing</td>
</tr>
<tr>
<td>Achtergrond</td>
<td>De Business Unit Naval van Thales ontwikkelt en integreert hightech command &amp; control systemen voor met name inzet in de marine markt. Binnen deze Business Unit is de afdeling Application Engineering onder andere verantwoordelijk voor het ontwikkelen van de middleware en andere infrastructuur software.</td>
</tr>
<tr>
<td>Omschrijving</td>
<td>De opdracht bestaat uit een onderzoek welke oplossing het best kan worden om te regelen welke Docker containers op welke nodes moeten draaien, binnen onze toekomstige Cloud omgevingen. Een onderdeel van de opdracht is om een aantal demonstrators te maken. Afhankelijk van de studierichting en persoonlijke interesses kan het zwaartepunt van de opdracht verlegd worden.</td>
</tr>
<tr>
<td>Vestiging</td>
<td>Hengelo</td>
</tr>
<tr>
<td>Afdeling</td>
<td>Naval – Application Engineering</td>
</tr>
<tr>
<td>Afdelings stage-coordinator</td>
<td>Willy Boenink (<a href="mailto:willy.boenink@nl.thalesgroup.com">willy.boenink@nl.thalesgroup.com</a>)</td>
</tr>
<tr>
<td>Stagebegeleider</td>
<td>Willy Boenink</td>
</tr>
<tr>
<td>Titel Opdracht</td>
<td>Network configuration in a (near) Real Time system</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Niveau</td>
<td>HBO / WO</td>
</tr>
<tr>
<td>Studierichting</td>
<td>(Technische) Informatica / IT Management</td>
</tr>
<tr>
<td>Affiniteit</td>
<td>Networkink, Virtualization</td>
</tr>
<tr>
<td>Achtergrond</td>
<td>De Business Unit Naval van Thales ontwikkelt en integreert hightech command &amp; control systemen voor met name inzet in de marine markt. Binnen deze Business Unit is de afdeling Application Engineering onder andere verantwoordelijk voor het ontwikkelen van de middleware en andere infrastructuur software.</td>
</tr>
<tr>
<td>Omschrijving</td>
<td>De opdracht bestaat uit een onderzoek naar de (on)mogelijkheden m.b.t. network configuratie mogelijkheden m.b.t. redundantie en voor welke toepassing ze gebruikt kunnen worden. Daarbij kan er gedacht worden aan een aantal standaard protocollen, maar ook dit i.c.m. Netwerk Virtualisatie en Software Defined Networking. Een onderdeel van de opdracht is om een aantal demonstrators te maken. Afhankelijk van de studierichting en persoonlijke interesses kan het zwaartepunt van de opdracht verlegd worden.</td>
</tr>
<tr>
<td>Vestiging</td>
<td>Hengelo</td>
</tr>
<tr>
<td>Afdeling</td>
<td>Naval – Application Engineering</td>
</tr>
<tr>
<td>Afdelings stage-coordinator</td>
<td>Willy Boenink (<a href="mailto:willy.boenink@nl.thalesgroup.com">willy.boenink@nl.thalesgroup.com</a>)</td>
</tr>
<tr>
<td>Stagebegeleider</td>
<td>Willy Boenink</td>
</tr>
</tbody>
</table>
## HTML5 applications in Real time environment

### Stage-/Afstudeeropdracht

<table>
<thead>
<tr>
<th>Titel Opdracht</th>
<th>HTML5 applications in Real time environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niveau</td>
<td>HBO / WO</td>
</tr>
<tr>
<td>Studierichting</td>
<td>(Technische) Informatica / IT Management</td>
</tr>
<tr>
<td>Affiniteit</td>
<td>Networkink, Virtualization</td>
</tr>
</tbody>
</table>

### Achtergrond

De Business Unit Naval van Thales ontwikkelt en integreert hightech command & control systemen voor met name inzet in de marine markt. Binnen deze Business Unit is de afdeling Application Engineering onder andere verantwoordelijk voor het ontwikkelen van de middleware en andere infrastructuur software.

### Omschrijving

De opdracht bestaat uit een onderzoek naar de mogelijkheden om web applicaties te bouwen gebruik te maken HTML5, die gebruik maken van de data uit de gedistribueerde database in onze systemen.

Een onderdeel van de opdracht is om een aantal demonstrators te maken.

Afhankelijk van de studierichting en persoonlijke interesses kan het zwaartepunt van de opdracht verlegd worden.

### Vestiging

Hengelo

### Afdeling

Naval – Application Engineering

### Afdelings stage-coordinator

Willy Boenink ([willy.boenink@nl.thalesgroup.com](mailto:willy.boenink@nl.thalesgroup.com))

### Stagebegeleider

Willy Boenink

---

### October 1, 2015 Smart Systems Conference

**High Availability Systems**

&

**How to build an architecture that is robust, scalable, secure and dynamic**

Luminis’ Hans Bossenbroek and René van Hees of Thales talk about a software architecture for high-availability systems. In this presentation, they present their vision: evolution can be designed into systems. The INAETICS architecture introduces one overall architectural style and is designed for systems that require high-availability, often translated into time-critical and safety demands. The INAETICS project also delivers a reference implementation for both the radar and the smart grid domains.

Moreover, Luminis’ Jan Willem Janssen and Thales’ Gerrit Binnenmars present their experiences on how to implement an INAETICS-like robust software architecture using Open Source solutions. Questions that are addressed are: "How to build an architecture that is robust, scalable, secure and dynamic, which Open Source projects and components are fit for purpose here and how to design an architecture that is not outdated right away. During these presentations the INAETICS architecture will be used as a demonstrator and show case."
The Business Unit Naval of Thales Netherlands develops and integrates high-tech command & control systems for naval vessels. Within the Business Unit, the department of Standard Solution Management is responsible for investigation of new technologies in products and services of Thales.

In the area of virtualization, many hypervisors exist in the commercial area (e.g. Hyper-V, XenServer, Vmware ESXi) and in open-source area (Xen, KVM). For these hypervisors, extensions are being developed which allow secure separation of virtual machines. Separately, specialized hypervisors are being developed (e.g. Sysgo PikeOS and Lynuxworks LynxSecure) which are called separation kernels, which have been built from the ground up to provide security separation. Thales is interested in investigating the current state of those fast-moving technologies, and evaluating whether they are applicable to the current Tacticos product and its future generation. The assignment will include development of one or more prototypes to support the evaluation.

Hengelo
Naval – Standard Solution Management
Jacek Skowronek (jacek.skowronek@nl.thalesgroup.com)

Jacek Skowronek
Thin client hardware

Tacticos is a large and complex software-intensive system, and has been under continuous development for approximately 20 years. During that time, several evolutions of hardware and software infrastructure have been updated, while preserving the original application source code. The current generation of Tacticos applies a distributed thick client architecture.

In the IT and consumer world, there is increasing interest in the use of thin client technologies, combined with virtualisation techniques, such as Virtual Desktop Infrastructure (VDI), remote rendering, VGX etc etc.

Thales is interested in evaluating the use of thin client technologies in the Tacticos product. In the assignment, the evaluation of available technologies is required, based on Tacticos requirements, followed by building a prototype showing the integration of thin client hardware technology in Tacticos architecture.
The Business Unit Naval of Thales Netherlands develops and integrates high-tech command & control systems for naval vessels. Within the Business Unit, the department of Standard Solution Management is responsible for investigation of new technologies in products and services of Thales.

The current situation in IT management is such that there is proliferation of different security threats and tools. The tools include firewalls, intrusion detection systems, vulnerability scanners, penetration testing tools, etc. The user interfaces of those tools are currently very technical in nature and require expert knowledge to operate and to understand the results. These tools are increasingly relevant on maritime vessels, as these are getting more connected and thus experience more and more IT security threats.

In a previous student assignment, an interface (HMI) has been designed that allows the maritime crew to manage the IT. The result of the assignment was an interactive prototype.

This assignment is intended to build upon the results of the previous assignment and is focused on further development of the HMI and extension of the prototype with backend processing components (data collection and analysis, Intrusion Detection Systems, network mapping tools). The extended prototype should achieve a maturity level such that it can be used for an operational evaluation. The assignment will include design of software architecture for the prototype, selection of components based on available open source tools (e.g. OSSIM, Snort), integration of components, and testing. After this assignment, the prototype will be likely used in an operational evaluation, in which operational users will work with the system and evaluate its functionality.

Hengelo

Naval – Standard Solution Management

Jacek Skowronek (jacek.skowronek@nl.thalesgroup.com)

Jacek Skowronek
## Drone Swarming and Combat Management

<table>
<thead>
<tr>
<th>Title</th>
<th>Drone Swarming and Combat Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Bachelor / Master of Science Study</td>
</tr>
<tr>
<td>Education</td>
<td>Computer Science</td>
</tr>
<tr>
<td>Affinity</td>
<td>Linux, Java, User Interface</td>
</tr>
<tr>
<td>Background</td>
<td>The software department of the Application Engineering cluster is responsible for the software development in Combat Management and Radar- and Optical sensors for worldwide navies- and defense systems. The work is performed in multi-disciplinary agile teams with specialists in software/system/test engineering and functional design.</td>
</tr>
</tbody>
</table>

### Overview

**Assignment**

Swarming is hot. Using swarming tactics to attack targets has been used and demonstrated by some organisations in the world. Thales has already researched and developed means to deal with these kinds of Swarm attacks.

Now is the time to use Swarming tactics in our Combat Management System (CMS). We are working together with TNO and our own Research facility to research what swarming can do and how to incorporate this in our current CMS.

Within this assignment you will develop a first prototype of a CMS module to research the best way to incorporate (autonomous) swarms into our CMS.

You will get input from experts from TNO and Thales and use rapid prototyping (using Kanban) to create working software for us to ‘play’ with.

Interested? Have ideas? Want to know more? Contact us!

### Location

**Hengelo**

### Department

**Naval – Application Engineering**

### Department Internship coordinator

Jan-Egbert Hamming (janegbert.hamming@nl.thalesgroup.com)

### Internship attendant

Jan-Egbert Hamming
IT service management

Linux on thin-clients for software engineering

Internship

<table>
<thead>
<tr>
<th>Title</th>
<th>Linux on thin-clients for software engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Bachelor / Master of Science Study</td>
</tr>
<tr>
<td>Education</td>
<td>IT service management</td>
</tr>
<tr>
<td>Affinity</td>
<td>Linux, virtualization, networking</td>
</tr>
</tbody>
</table>

**Background**

Thales Corporate Engineering (TCE) is part of the Information Systems (IS/IT) department. TCE-NL is part of the Thales group TCE department. Within the Netherlands, we act as the point of contact for all IT solutions required by the engineering disciplines within Thales. The team consists of system, software and IT architects, application and infrastructure specialists with ages ranging from 26 to 60.

Influenced heavily by LEAN, DevOps and continuous delivery methodologies, we strive to deliver efficient tooling and process to drive competitiveness across the full product lifecycle. We gather requirements, test them against security procedures, design solutions and implement them with the end-user and IT department. We're self-organizing, manage our own projects and are involved with the latest IT developments within the Thales group.

**Overview**

The Thales IT environment currently offers thin-clients to its office users. The bulk of software engineering activities take place on the Linux platform. We would like to offer the same flexibility to our software engineers, allowing them to run the Linux OS and their applications on thin-clients and through our remote working solution.

The assignment is to establish the requirements, analyse the market and recommend a solution supported by a proof of concept.

**Hengelo**

Corporate – Information Systems Department / Corporate Engineering

<table>
<thead>
<tr>
<th>Department Internship coordinator</th>
<th>Thijs Tijhaar (<a href="mailto:thijs.tijhaar@nl.thalesgroup.com">thijs.tijhaar@nl.thalesgroup.com</a>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internship attendant</td>
<td>Reinier Blesing / Wesley Pronk</td>
</tr>
</tbody>
</table>
Continuous deployment of IT services to end users

Graduation / Internship

Title
Continuous deployment of IT services to end users

Level
Bachelor / Master of Science Study

Education
Computer Science, Business Information Science

Affinity
Linux, virtualization, Puppet, Microsoft Windows, IT-business alignment

Background
The Information Systems Department (ISD) designs, provides, secures and manages the IT services for all Thales Netherlands sites and departments. The team consist of 65 people with a variety of skillsets in infrastructure, cyber security, application management and service delivery with ages ranging from 21 to 60.

Following up on our mission statement “Be leading in offering modern IT solutions to help Thales be most attractive”, our goal is to enable all users of the IT environment to excel at doing their job using the best possible high-secure IT solution.

Overview

Assignment
We want to provide the latest versions and upgrades of tools and applications to the end-users as fast as possible. Several strategies and complimenting tools have emerged in the market.

The assignment is to interview key stakeholders to determine requirements and wishes, investigate the market for existing strategies, investigate potential technical solutions and determine a viable strategy and it’s added value for delivering IT solutions to the Thales community. Depending on the student/university, building a proof of concept can be part of the assignment.

Location
Hengelo

Department
Corporate – Information Systems Department

Thijs Tijhaar (thijs.tijhaar@nl.thalesgroup.com)

Internship attendant
Reinier Blesing / Bert Beltman
# Automated Asset Management

## Internship

<table>
<thead>
<tr>
<th>Title</th>
<th>Automated Asset Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Bachelor / Master of Science Study</td>
</tr>
<tr>
<td>Education</td>
<td>IT service management</td>
</tr>
<tr>
<td>Affinity</td>
<td>Asset management, networking</td>
</tr>
</tbody>
</table>

**Background**

The Information Systems Department (ISD) designs, provides, secures and manages the IT services for all Thales Netherlands sites and departments. The team consist of 65 people with a variety of skillsets in infrastructure, cyber security, application management and service delivery with ages ranging from 21 to 60.

Following up on our mission statement “Be leading in offering modern IT solutions to help Thales be most attractive”, our goal is to enable all users of the IT environment to excel at doing their job using the best possible high-secure IT solution.

**Overview**

The heart of the IT department is its assets; hardware, software and licenses, the building blocks of all of the services offered. IT solutions are rapidly evolving in complexity; a solid overview of the components and their usage are crucial to keep costs under control, reduce delivery time and improve security.

The goal of this assignment is to investigate the possibilities to automate discovery, registration and availability monitoring of all types of assets, physically located in secured locations in highly secured computer networks. Part of the deliverables is a proposal for implementation at Thales.

## Assignment

**Location**

Hengelo

**Department**

Corporate – Information Systems Department

**Internship coordinator**

Thijs Tijhaar ([thijs.tijhaar@nl.thalesgroup.com](mailto:thijs.tijhaar@nl.thalesgroup.com))

**Internship attendant**

Chris Pennings / Thijs Tijhaar
**SW@T 2.0 – A Laptop for Everyone**

**Graduation / Internship**

<table>
<thead>
<tr>
<th>Title</th>
<th>SW@T 2.0 – A Laptop for Everyone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Bachelor / Master of Science Study</td>
</tr>
<tr>
<td>Education</td>
<td>IT service management</td>
</tr>
<tr>
<td>Affinity</td>
<td>Linux, virtualization, networking</td>
</tr>
</tbody>
</table>

**Background**

Thales Corporate Engineering is part of the Information Systems (IS/IT) department. TCE-NL is part of the Thales group TCE department. Within the Netherlands, we act as the point of contact for all IT solutions required by the engineering disciplines within Thales. The team consists of system, software and IT architects, application and infrastructure specialists with ages ranging from 26 to 60.

'We want to become the most attractive high-tech safety and security company'. In the light of this mission statement Thales Nederland has developed SW@T, Smart Working at Thales. This is a vision on work that is realised by focussing on the employee and to enable him/her – within boundaries – to work where, when, with what and with whom they want.

As a means to remove the constraint on time and place ISD offers different solutions. In the office the desks are fitted with thin clients that allow employees to log in to a virtual work environment. This removes the requirement of a fixed workplace within the office. Another solution that is offered is the use of a telestick. With this USB device a secured connection with the virtual work environment is set-up, allowing the employee to work from any place in which they have access to a (supported) computing device.

This assignment involves the investigation of the feasibility to unify these two solutions.

**Assignment**

Investigate the feasibility of replacing the thin client and the telestick with a “google chrome” like solution: one laptop that can be used both in the office and anywhere where a (wireless) network is available that encompasses the following:

- A requirements investigation: What requirements apply to such a device (Government issued / ABDO, Corporate / IP, usability, performance, etc.)
- A technical investigation: can a device be constructed that meets the requirements.
- A cost Investigation: What is the total cost of ownership (TCO) of the thin client / telestick solution vs. the TCO of the SW@T 2.0 device.

The investigation concludes with a recommendation, based on the above described investigations, supported by a proof of concept.

**Location**

**Hengelo**

**Department**

Corporate – Information Systems Department

**Department Internship coordinator**

Thijs Tijhaar (thijs.tijhaar@nl.thalesgroup.com)

**Internship attendant**

Jeroen Kouwer / Daan te Bokkel
# Electronics

## Cloaking

**Graduation assignment**  
Refnr: 1404449

### Title

**Cloaking**

**Master study**

**Electronics (Analogue, RF, telecom), Physics, Mathematics**

### Affinity

Antennas, Electromagnetics, RF/Microwave electronics, High frequency

### Background

Thales Nederland BV (TNL) develops and produces radar systems. Within the Technical Unit RF radar front-ends are developed. This includes antennas, transmitters, signal generators and receivers. Besides product development, innovative technology studies are carried out in this field.

Radar antennas are factory tested in obstacle free test environments to measure their performance. However, when the antennas are mounted on ships, the environment may not be free from obstacles. These obstacles are at close range and they reflect transmitted RF signals from the radar. This can result in reduced radar performance in the direction of the obstacles.

### Overview

In recent years, RF cloaking methods have been developed by which the disturbance on an RF wave caused by an object can be reduced (see for example the publications by Pendry et al.).

In this thesis project techniques will be investigated to make obstacles less visible for the radar system (cloaking). In particular, if a rotating radar is placed under a fixed radome with other equipment on top of it, there will be some cable runs going up along the radome which reflect some RF energy.

Foreseen activities are:
- Literature research;
- Simulation of suitable structures and materials;
- Assessment of the radar performance improvement;
- Reporting of the activities.

### Assignment

- Location: Hengelo
- Department: Sensors – Development RF
- Internship coordinator: Simon van den Berg (simon.vandenberg@nl.thalesgroup.com)
- Internship attendant: Gertjan van Werkhoven
OFDM for data transport within distributed sensing systems

Title
OFDM for data transport within distributed sensing systems

Level
Master study

Education
Electrical Engineering (specialization in Telecommunications)

Affinity
Analogue and digital electronics, communication signals, data transmission techniques, DSP

Background
Thales Nederland BV (TNL) develops and produces radar systems. Within the Technical Unit RF radar front-ends are developed. This includes antennas, transmitters, signal generators and receivers. Besides product development, innovative technology studies are carried out in this field.

Sensing systems can consist of a network of sensors. Within such a network, there is a need for high speed data transport between the sensors and a central ‘base station’. The network can be wired as well as wireless, and per sensor the amount of data that has to be transported via the network can be different.

Overview
A concept for such a data transport network using RF signals modulated with OFDM (Orthogonal Frequency Division Multiplex) has been developed and proven in experiments using actual hardware.

The goal of this assignment is to investigate different network configurations. In particular, to adapt the already proven concept from one-to-multipoint to multipoint-to-one and from a wired medium to a wireless one.

Assignment
Foreseen activities are:
• Study of the developed concept and literature on data transmission using OFDM;
• Extension of the concept to multipoint-to-one data transmission;
• Investigation of the necessary changes for a wireless implementation of the extended concept (one-to-multipoint and multipoint-to-one data transmission using OFDM);
• Design of a general OFDM system enclosing all functionalities;
• Report the activities and results in a detailed report.

Location
Delft

Department
Sensors – Advanced Development Group, Delft

Department Internship coordinator
Wim de Heij (wim.deheij@nl.thalesgroup.com)

Internship attendant
Sara Pena Barros
Design, build and test a compact state of the art High Power Amplifier

Graduation assignment

RefNr: 1502175

Title
Design, build and test a compact state of the art High Power Amplifier

Level
Master study

Education
Electrical Engineering

Affinity
Analog electronics, RF/microwave, telecommunication

Background
Thales Nederland BV (TNL) develops and produces world-leading radar systems. Within the Technical Unit RF radar front-ends are developed. This includes antennas, transmitters, signal generators and receivers. Besides product development, innovative technology studies are carried out in this field.

For the transmitters designed and built within TNL it’s always a challenge to make the transmitter smaller and increase the output power. Helped by technological progress in the transistor technology, a continuing effort is made to improve the design of High Power Amplifiers (HPA) for our transmitters.

Overview
Since the introduction of Gallium Nitride (GaN) transistor technology, new transistors with higher power density for higher frequencies are becoming available on the market. Today these amplifiers are also available in SMT technology and can be used on a PCB.

The complete design process from component selection to measuring prototype hardware will be conducted, combining theoretical and practical work. Novel solutions will be required to meet the challenging specifications.

Assignment
The assignment is to investigate if discrete transistor HPAs can be integrated into the Thales RADAR transmitters. A complete amplifier design has to be made for a state of the art GaN transistor. This design will involve the selection of a bias point, loadpull simulations, stability considerations and impedance matching. A prototype PCB will be developed and measured and you will finally document your work in a report.

Location
Hengelo

Department
Sensors – Development RF

Department Internship coordinator
Wim de Heij (wim.deheij@nl.thalesgroup.com)

Internship attendant
Robert Smith, Marco Beltman
# Filtenna

**Graduation assignment**  
Refnr: 1312021

<table>
<thead>
<tr>
<th>Title</th>
<th>Filtenna</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Master study</td>
</tr>
<tr>
<td>Education</td>
<td>Electronics (Analogue, RF, telecom), Physics</td>
</tr>
<tr>
<td>Affinity</td>
<td>Antennas, Electromagnetics, RF/Microwave electronics, High frequency</td>
</tr>
</tbody>
</table>

**Background**

Thales Nederland BV (TNL) develops and produces radar systems. Within the Technical Unit RF radar front-ends are developed. This includes antennas, transmitters, signal generators and receivers. Besides product development, innovative technology studies are carried out in this field.

Modern radar systems are mostly based on phased array antennas. A phased array antenna consists of a large number of small antennas (often called radiators) that transmit and receive RF signals with an adjustable phase in order to create antenna beams in different directions without moving the antenna. The radiators in the antenna are the interface with the outside world, and this is the first place where a selection between wanted and unwanted signals can be made. Nowadays the frequency selectivity of such an antenna element is limited. New technologies offer the possibility to increase this selectivity.

**Overview**

The goal is to improve the frequency selectivity of an antenna element by integrating filters into the antenna element. The assignment encompasses the evaluation of different filter concepts in combination with a (array) antenna in the microwave frequency range (1-15GHz). An overview of new concepts and their performance is expected.

**Assignment**

Foreseen activities are:

- Literature search on filters combined with antennas,
- Compare various concepts for feasibility, integration, reproducibility (tolerance study), power handling, etc.,
- Design of a prototype filtenna to verify the chosen concept using advanced modelling software,
- Report the activities, design procedure and results in a detailed report.

**Location**

Hengelo

**Department**

Sensors – Development RF

**Department Internship coordinator**

Wim de Heij ([wim.deheij@nl.thalesgroup.com](mailto:wim.deheij@nl.thalesgroup.com))

**Department Internship attendant**

Robert Oude Velthuis
In-System ASIC Emulation Environment

Graduation assignment

Refnr: 1406764

In-System ASIC Emulation Environment

Bachelor study

Electronics Design

Digital Electronics Design, Board/PCB/FPGA Design, Test/Measurement

The Sensors - Development RF department develops high-end electronics for radar front-ends, involving multiple electronics design disciplines, such as RF/microwave-, power conversion-, mixed-signal-, digital- and PCB design. The developed Printed Circuit Assemblies (PCAs) find their way in a broad range of surveillance- and tracking radars, at relatively low manufacturing volumes and -high complexity. Within legacy radar systems, up to 50 digital ASIC designs have been applied, who have gradually been made end-of-life (EOL) by their manufacturers, these parts have been declared obsolete. Often, Form-Fit-Function replacement PCAs are designed, replacing the obsolete ASIC parts by up-to-date FPGA devices. Depending on the design, the original ASIC designs and -test-vectors can be converted (semi-)automatically towards VHDL representations, which in turn can be fitted into the FPGA device of choice. Since this conversion process heavily depends on the completeness of the input ASIC design files, in most cases based on legacy CAD file formats, and the test-vectors in general having limited test-coverage, a solution is proposed to emulate the converted ASIC within the original system (PCA). Having such emulation system would confirm proper operation within the existing system, in advance of re-designing of original board/PCA. The objective of the assignment is to develop/implement an ASIC emulation environment, consisting of a small PCA acting as "measurement pod", and a larger PCA hosting an FPGA device and supporting electronics (power supply, PLL, USB, SODIMM, JTAG, LSA).

Example ASIC (PGA package/test socket), Logic State Analyzer (LSA), FPGA (BGA package)

Assignment

The assignment objective is to develop/implement an ASIC emulation environment. This is done by:

1. Investigate global ASIC conversion design flow and possible ASIC test socket options
2. Develop/implement/test the required electronics (PCAs) for the ASIC emulation environment
3. Demonstrate the environment using a representative ASIC (or MSI/LSI) design

Create a report, documenting approach, solution, recommendations, etc.

Location

Hengelo

Department

Sensors – Development - RF

Department Internship coordinator

Wim de Heij (wim.deheij@nl.thalesgroup.com) / Bernie Sportel

Internship attendant

Henny van Bodegom / Jaap Mol
**Title**

Near-field antenna measurements

**Level**

Master study

**Education**

Electronics (Analogue, RF, telecom), Physics, Mathematics

**Affinity**

Antennas, Electromagnetics, RF/Microwave electronics, High frequency

**Background**

Thales Nederland BV (TNL) develops and produces radar systems. Within the Technical Unit RF radar front-ends are developed. This includes antennas, transmitters, signal generators and receivers. Besides product development, innovative technology studies are carried out in this field.

Each radar system that is produced has to be qualified using electromagnetic measurements in a dedicated measurement range. The distance between a measurement probe and the antenna has to be large enough to measure the true beam patterns of the antenna system. New antenna systems are currently being developed that are considered too large to measure in such conventional antenna range.

Large antenna systems are measured in a so-called Near Field range where the measurement probe is very close to the antenna. This probe measures the antenna near-field. A special near-field transformation is required to derive the true antenna pattern from antenna near-field. New developments are available in literature with very promising techniques to significantly improve the accuracy of near-field transformations.

**Overview**

The aim of this thesis project is to investigate the accuracy of state of the art developments in near-field transformations for antenna measurements to significantly improve the measurement accuracy on radar systems. The assignment includes a survey in the potential of available modern transformation techniques. The most interesting approaches will be further developed in detail, implemented and investigated using Matlab. The accuracy of the proposed technique will be validated using real antenna measurement data.

**Assignment**

Foreseen activities are:
- Literature research on Near Field measurement methods
- Analysis of Near-to-Far Field transformation accuracy
- Development of a Matlab model and benchmarking this with measured datasets
- Reporting of the activities

**Location**

Hengelo

**Department**

Sensors – Development RF

**Internship coordinator**

Simon van den Berg (simon.vandenberg@nl.thalesgroup.com)

**Internship attendant**

Frank van de Water
Influence of g-forces on 2-phase cooling of radar systems

Graduation/Internship assignment

Title
Influence of g-forces on 2-phase cooling of radar systems

Level
Bachelor (BSc), Master (MSc.)

Education
Mechanical Engineering, Physics

Affinity
Mechanical Engineering, Design, Physics, Thermal Engineering, Heatpipes

Background
Thales Nederland BV (TNL) develops and produces radar systems. Within the Technical Unit RF radar front-ends are developed. This includes antennas, transmitters, signal generators and receivers. Besides product development, innovative technology studies are carried out in this field.

Cooling is an important aspect in the design of a radar. Currently, a lot of systems are cooled with a closed liquid loop, coupled to a heat-exchanger connected to ship’s water.

An alternative cooling concept has been proposed and tested. In the concept, 2-phase heatpipe technology is used to transport heat to the external (air) environment. The system concept has been tested and meets expectations. Next step is to gather more information on the performance of the concept in different environments. This includes g-forces induced by antenna rotation, and start-up effects.

Overview
The main task will be to conduct testing on a demonstrator that has been built. The testing will be done in our environmental test center. At the same time, some analysis and modeling is to be done. Further actions could include improving or further detailing the concept.

Assignment
Foreseen activities are:
- Testing of 2-phase cooling demonstrator in environmental test center
- Applying g-forces on the system by rotation, in different direction and magnitude.
- Analysis of startup effect of the system
- Modelling the system for limitations
- Make a design iteration

Location
Hengelo

Department
Sensors – Development RF

Internship coordinator
Simon van den Berg (simon.vandenberg@nl.thalesgroup.com)

Internship attendant
Gert Jan te Riele
### Modeling of thermomechanical stresses in electronic assemblies

<table>
<thead>
<tr>
<th>Title</th>
<th>Graduation/Internship assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Modeling of thermomechanical stresses in electronic assemblies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ref Nr</th>
<th>1512071</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Level</th>
<th>Master (MSc.)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Education</th>
<th>Mechanics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mechanics, finite element analysis, material science, classical laminate theory</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Affinity</th>
<th>Mechanics, finite element analysis, material science, classical laminate theory</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Background</th>
<th>Thales Nederland BV (TNL) develops and produces radar systems. Within the Technical Unit RF radar front-ends are developed. This includes antennas, transmitters, signal generators and receivers. Besides product development, innovative technology studies are carried out in this field.</th>
</tr>
</thead>
</table>

A typical electronic component consists of a chip and an electronics package (carrier) soldered on a PCB. Bonding of these parts together induces thermomechanical stresses. The required lifetime for military application is 20 years.

Modern electronic assembly techniques use adhesive bonding or sintering techniques, where traditional techniques use solder. Also, different semiconductor materials are applied. These techniques have a better performance, however have limitations in terms of chip size and choice of material combinations. Understanding and predicting thermomechanical stress and lifetime is of critical importance for design.

The main task will be to build knowledge about thermomechanical stresses in electronics assemblies, and making the knowledge available to the design department for future projects. Some work has already been done both internally and with subcontractors and partners, both in modeling and testing. The goal is to better predict the effect of design choices on reliability of electronics assemblies.

**Assignment**

- Literature search on stress and fatigue models with a focus on solders and semiconductors
- Build analytical model based on classical laminate theory or more dedicated models
- Analysis of test samples and test results
- Building of a finite element model, with options to vary all important parameters (material, dimensions, production technology)
- Compare to test data

<table>
<thead>
<tr>
<th>Location</th>
<th>Hengelo</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Department</th>
<th>Sensors – Development RF</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Internship coordinator</th>
<th>Simon van den Berg (<a href="mailto:simon.vandenberg@nl.thalesgroup.com">simon.vandenberg@nl.thalesgroup.com</a>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internship attendant</td>
<td>Gert Jan te Riele</td>
</tr>
</tbody>
</table>
Overview

To scan the array to large angles requires to consider the antenna impedance in the presence of other array elements. Array antenna elements influence each other through the antenna near-fields. The effect of the mutual coupling is that the antenna input reflection coefficient becomes a strong function of the applied scan angle. As a result scan matching techniques need to be applied in order to limit the reflection coefficient to acceptable proportions.

Scan matching can be achieved using various methods. Intrinsic coupling reduction aims to reduce the coupling by influencing the direct near-fields from one element to another. Coupling cancellation method work by creating an additional reflection that interferes with the coupled signal. The reflection can either be on the outside or on the inside of the radiator.

The objective in this assignment is to investigate scan matching techniques, with emphasis on cancellation methods.

Activities include:
- Literature overview of coupling reduction methods
- Investigation of coupling reduction methods
- Feasability study on an array antenna including a selected matching method
- Reporting

Location
Hengelo

Department
Sensors – Development RF

Internship coordinator
Wim de Heij (wim.deheij@nl.thalesgroup.com)

Internship attendant
Gert-Jan van Werkhoven
# Linearized power amplifier techniques for radar transmitters

## Graduation assignment

<table>
<thead>
<tr>
<th>Title</th>
<th>Linearized power amplifier techniques for radar transmitters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Master (MSc.)</td>
</tr>
<tr>
<td>Education</td>
<td>Electronics (Analogue, RF, telecom)</td>
</tr>
<tr>
<td>Affinity</td>
<td>Analogue electronics, RF/Microwave electronics</td>
</tr>
</tbody>
</table>

### Background

Thales Nederland BV (TNL) develops and produces radar systems. Within the Technical Unit RF radar front-ends are developed. This includes antennas, transmitters, signal generators and receivers. Besides product development, innovative technology studies are carried out in this field.

Linearized amplifiers are frequently used in base station applications. These amplifiers have a linear region below their compression point in which they maintain their efficiency, which is advantageous in communication applications using complex modulations. This category of amplifiers may also provide advantages when used in radar transmitters.

### Overview

In this assignment the possible application of linearized amplifiers in radar transmitters will be investigated. The radar waveforms are different from the communication signals, with different modulations, and the consequences of these differences have to be investigated to assess the possible advantages of linearized amplifiers for radar applications. An amplifier design shall be prototyped as a proof of concept.

### Assignment

Foreseen activities are:
- Literature search on commonly used linearized amplifiers;
- Compare various concepts for feasibility and capabilities in a radar application;
- Design of a prototype;
- Verification of the design;
- Report the activities, design procedure and results in a detailed report.

### Location

Hengelo

### Department

Sensors – Development RF

### Internship coordinator

Wim de Heij (wim.deheij@nl.thalesgroup.com)

### Internship attendant

Marijn Ufkes, Wim de Heij
RF design based on model library

Graduation/Internship assignment

RF design based on model library

Bachelor (BSc.)

Electrical Engineering (Analogue, RF, Telecom Engineering)

Analogue electronics, RF/Microwave electronics

Thales Nederland BV (TNL) develops and produces radar systems. Within the Technical Unit RF radar front-ends are developed. This includes antennas, transmitters, signal generators and receivers. Besides product development, innovative technology studies are carried out in this field.

Modeling and simulation are an important part of modern RF/microwave design methods. The probability of a first-time-right design is an aspect that receives continuous attention, because of the money that can be saved by avoiding unnecessary design iterations. As part of continuing innovation and process improvement, significant investments are made in tooling and model libraries.

Overview

In this assignment a newly acquired model library shall be evaluated. The focus of this assignment is on passive components, such as resistors, capacitors, inductors and transformers, which do not behave in an ideal way at microwave frequencies. The quality of the model library depends on how the non-ideal behavior is included in the models, and determines the reliability of the simulations.

As part of the assignment several passive circuits will be designed and simulated using the new model library.

Also, the designs will be converted into printed circuit board layout, adding parasitic effects of the layout to the simulation. The final design will be fabricated and tested to assess the similarity between simulation and reality.

Assignment

Foreseen activities are:
- Selection of suitable passive test circuits;
- Design of circuits for frequencies around 5 GHz;
- Verification of the circuits;
- Writing a report on the activities, design procedure and results.

Location

Hengelo

Department

Sensors – Development RF

Department Internship coordinator

Wim de Heij (wim.deheij@nl.thalesgroup.com)

Internship attendant

Marc van der Sluis
# Evaluation of GaN in frontend SMPS

**Title**
Evaluation of GaN in frontend SMPS

**Level**
Bachelor (BSc.)

**Education**
Electronics, Electrical Engineering

**Affinity**
Analogue electronics, Power conversion

**Background**
Thales Nederland BV (TNL) develops and produces radar systems. Within the Technical Unit RF radar front-ends are developed. This includes antennas, transmitters, signal generators and receivers. Besides product development, innovative technology studies are carried out in this field.

Switched Mode Power Supplies (SMPS) are used to power the receiver and transmitter electronics in the RF front ends of radar systems. Legacy Si technology is used in the SMPS semiconductor components (MosFET’s, diodes). Now GaN technology has become available with improved properties, which enables higher switching frequencies. By increasing the switching frequency of the SMPS the overall size of the SMPS can be reduced and/or efficiency can be improved.

**Overview**
The goal of the assignment is to evaluate the GaN technology for the SMPS in the radar front end. In the evaluation, most suitable topologies to be used with GaN have to be investigated. Also the improvement in efficiency and volume needs to be investigated and the cost has to be taken into account. Using evaluation boards these questions can be answered.

**Assignment**
Foreseen activities are:
- Overview of available GaN components
- Investigation in SMPS topologies with GaN
- Supporting measurements on GaN evaluation boards
- Report the activities and results in a detailed report.

**Location**
Hengelo

**Department**
Sensors – Development RF

**Department Internship coordinator**
Wim de Heij (wim.deheij@nl.thalesgroup.com)

**Internship attendant**
Sander Geurts
# Matlab to LibreOffice

**Internship project**

<table>
<thead>
<tr>
<th>Title</th>
<th>Matlab to LibreOffice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Bachelor, Traineeship</td>
</tr>
<tr>
<td>Education</td>
<td>Computer Science</td>
</tr>
</tbody>
</table>

**Affinity**

Matlab

**Background**

Thales Nederland BV (TNL) develops and produces radar systems. Within the Technical Unit RF radar front-ends are developed. This includes antennas, transmitters, signal generators and receivers. Besides product development, innovative technology studies are carried out in this field.

The tool for simulating and analyzing is Matlab / Simulink. To generate reports from Matlab / Simulink a connection exists to microsoft Word and Excel. But the high performance simulations are processed on Linux computers. On Linux there are several ways to control LibreOffice available. But none of them are controllable by Matlab or Simulink.

**Overview**

The goal is to have a link from Matlab / Simulink to LibreOffice. In such way it is easy to copy Matlab figures or text to the LibreOffice documents.

**Assignment**

The assignment objective is to have a link from Matlab / Simulink towards LibreOffice. This is done in the following steps:

1. Become familiar with the available techniques
2. Choose a technique
3. Write the interface
4. Write a detailed report, documenting results, recommendations, etc.

**Location**

Hengelo

**Department**

Sensors-Development-RF

**Internship coordinator**

Bernie Sportel ([bernie.sportel@nl.thalesgroup.com](mailto:bernie.sportel@nl.thalesgroup.com))

**Internship attendant**

Wim de Boer, Klaas Holwerda
Volonta

Every year a group of approximately 150 students find their way to Thales. Thales offers great internships where the students can develop their skills, but Thales also focusses on the social aspect. That is where Volonta comes into play. Founded several years ago, Volonta offers students a home for fun and educational activities. Did you ever want to visit the Dutch Navy in Den Helder and get on board of a frigate? Want to get to know your fellow students during our mixers? Volonta offers these opportunities and more!

Don’t hesitate to join!
Contact details

If you want to apply for an assignment
- send an email with your C.V. and the reference number(s) of the assignment(s) including a motivation why you choose this specific assignment to the department coordinator directly.
- or respond on our website: [https://www.thalesgroup.com/nl](https://www.thalesgroup.com/nl) (follow link: Stage- & Afstudeeropdrachten)

For generic questions please contact: recruitment@nl.thalesgroup.com