

ASSESSMENT REPORT

Report on the assessment of

Master of System and Network Engineering Universiteit van Amsterdam

Croho-registration number: 60227

with regard to the NVAO Accreditation framework

The assessment has taken place on 8 and 9 March 2007

Contents of the report

| | |
|--|----|
| Identification | 2 |
| Management summary | 3 |
| Findings | 5 |
| Appendix 1: Programme of visits by assessment team | 31 |
| Appendix 2: Documents | 33 |
| Appendix 3: Domain-specific framework of reference | 34 |
| Appendix 4: Assessment team | 36 |
| Appendix 5: Statements of independence | 37 |

Chairman of the assessment team, responsible for the report: ir R.S. Kloosterman
On behalf of him,

M.I. van de Velde
Certiked
Juni 2007

Identification

Programme Master of Science in System and Network Engineering
Universiteit van Amsterdam
Nieuwe Achtergracht 166
1018 WV Amsterdam
Telephone: +31 20 5257100
Website: <http://www.studeren.uva.nl/ma-syst/>

Responsibility for the quality of the Programme: prof.dr. J.A. Bergstra, Director Educational Institute
Director of Programme Master of Science in System and Network Engineering: dr C.P.J. Koymans

Scope and aim of the assessment

The assessment concerns:

- Universiteit van Amsterdam
- Master of Science in System and Network Engineering
- Full-time and part-time programme
- Location: gebouw de Leeuwenburg, Weesperzijde 190; 1097 DZ Amsterdam.

The aim of this assessment has been to verify whether and to what extent the degree course is in accordance with the accreditation framework of NVAO of February 2003.

Composition of the assessment team

Chairman: ir. R.S. Kloosterman
External experts: prof.dr. M. Burgess, dr. H. Bos
Secretary: drs. C.J. de Monchy
Student member: J. van der Mandele BSc

Method of assessment

The programme Master of Science in System and Network Engineering has written a self-assessment report and has sent this report to the assessment team. The first visit of the assessment was on 8 March 2007 and the second visit was on March 9 2007. The draft report has been sent to the management of the programme on May 25 2007. On June 4 the management of the programme has reacted in writing to the draft report. This has led to this final version of the report.

The assessment team was pleased with the actions for improvement based on the findings in the report, that the management included in their writing.

Before the visits members of the assessment team and representatives of the Universiteit van Amsterdam have met twice. These meetings were meant to exchange information and to plan the dates and the programme of the visits by the assessment team.

Management summary

On 8 and 9 March 2007 the assessment team of Certiked has performed an assessment of the programme Master of Science in System and Network Engineering of the Universiteit van Amsterdam. The aim of the assessment has been to verify the quality of the programme with regard to the accreditation framework of the NVAO.

General remarks

The programme MSc in System and Network Engineering (SNE) collaborates closely with the System and Network Engineering (SNE) research group of the Computing, System Architecture and Programming (CSP) Laboratory in the Informatics Institute of the Universiteit van Amsterdam (UvA).

The programme is being offered by the Educational Institute for Information Sciences, which is part of the Faculty of Science of the Universiteit van Amsterdam. The Faculty of Science comprises three educational institutes and eleven research institutes. The educational institutes offer programmes in exact sciences, in information sciences and in life & earth sciences. Each of the educational institutes is headed by a director who is responsible for the quality of the programmes with regard to the content and the teaching methods, the coherence between the various programmes and the operational management of the educational institute. For each programme, a programme director has been appointed who is responsible for the development, execution and quality of the programme at an operational level.

The Educational Institute for Information Sciences offers nine programmes. Apart from the tasks already mentioned, the institute also carries out tasks directly related to the students, like study progress monitoring, administration of study results and also student counselling. Administrative tasks are performed by the Education Office. General and technical support is offered by the Universiteit van Amsterdam.

In the near future all of the bachelor programmes of the Faculty of Science will belong to one educational institute which will include all of these programmes. The Faculty of Science will have four master institutes for master programmes: the school of computer science, the school of science, the school of life sciences and the professional school.

Conclusions

The assessment team of Certiked has reviewed and assessed the programme. The assessment team is truly impressed by the didactical concept of the programme. In a 'pressure-cook' setting students (that frequently enroll with a professional bachelor degree in computer sciences) are very intensively taught during one year in a dedicated room with necessary facilities. And not only is the assessment team impressed by this concept, most of all it was impressed to see the elaborated way it is worked out (e.g. with appropriate intake assessments) and most of all that it indeed leads to students that have obtained a scientific master's level. Therefore, this facet is awarded with an excellent evaluation.

In general, the assessment team is quite satisfied about the content of the programme, which therefore leads to several facets being evaluated as 'good'.

There is consequently some room for improvement. During the programme the 'scientific values' (like dealing with uncertainties, presentation of data, formulating hypotheses) can be a more explicitly dealt with.

Moreover, the supervision of students during the two research projects, can be more elaborated.

In addition to this point, the assessment team recommends the programme to consider whether a more independent position and more reflection can be created during or after the research projects.

All in total the assessment team has evaluated this one year MSc programme as very positive, with minor points for improvement.

The assessment team of Certiked concludes on the basis of the findings that the programme Master of Science in System and Network Engineering meets the requirements of all of the subjects and facets of the accreditation framework of the NVAO.

Findings

Below the assessment team will give their findings with regard to the subjects and facets of the accreditation framework of the NVAO. The assessment team states each of these findings under the heading of each of the subjects and the facets of the accreditation framework of the NVAO.

Overview of the assessments of the degree course

| <i>Subject and aspect</i> | |
|--|--|
| Aims and objectives of the degree course <ul style="list-style-type: none"> ▪ Domain-specific requirements ▪ Level: Master ▪ Orientation: University (WO) | <p style="text-align: center;">Positive</p> <p style="text-align: center;">Good Satisfactory Satisfactory</p> |
| Programme <ul style="list-style-type: none"> ▪ Requirements University ▪ Relationship between aims & objectives and contents of the programme ▪ Coherence of the programme ▪ Study load ▪ Intake ▪ Duration ▪ Coordination of structure and contents of the degree ▪ Assessments and examinations | <p style="text-align: center;">Positive</p> <p style="text-align: center;">Satisfactory Satisfactory Good Good Good Satisfactory Excellent Satisfactory</p> |
| Deployment of staff <ul style="list-style-type: none"> ▪ Requirements for University ▪ Quantity of staff ▪ Quality of staff | <p style="text-align: center;">Positive</p> <p style="text-align: center;">Satisfactory Good Satisfactory</p> |
| Facilities and provisions <ul style="list-style-type: none"> ▪ Material Facilities ▪ Student support and guidance | <p style="text-align: center;">Positive</p> <p style="text-align: center;">Satisfactory Good</p> |
| Internal quality assurance <ul style="list-style-type: none"> ▪ Evaluation or results ▪ Measures to effect improvement ▪ Involvement of staff, students, alumni and the professional field | <p style="text-align: center;">Positive</p> <p style="text-align: center;">Good Satisfactory Good</p> |
| Results <ul style="list-style-type: none"> ▪ Level that has been achieved ▪ Results of teaching | <p style="text-align: center;">Positive</p> <p style="text-align: center;">Satisfactory Good</p> |

1. Aims and objectives of the degree course

1.1 Domain-specific requirements

The final qualifications of the degree course correspond to the requirements made to a degree course in the relevant domain (field of study/discipline and/or professional practice) by colleagues in the Netherlands and abroad and the professional practice.

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- System and Network Engineering should be seen as a specialisation within the area of computer sciences. In the scientific world, the field of system and network administration is relatively new and underdeveloped as an independent discipline. Although Internet, security, parallel and distributed calculation, system architecture, hardware development and other components obviously have long-established traditions, they have never before been integrated into a single discipline with an emphasis on manageability and management.
- The degree course SNE is aimed at an academic, professional oriented programme of study. The combination of scientific and practical knowledge is comparable with an education in medicine or law, both disciplines with a strong connection to the professional practise. The requirements set by the professional practice have been derived from the System Administrators Guild (SAGE) who established job descriptions of senior system administrators.
- The master's degree programme in System and Network Engineering is associated with a research group of the Informatics Institute, which has chosen the SNE areas as its research field. The aims and objectives of the SNE programme have been based on the scientific traditions from the field of System and Network Engineering (SNE). The research area integrates a number of traditional subject areas, including computer science, the natural sciences and mathematics.
- The domain specific requirements of the programme derive from the practical needs within the field of system and network engineering. The programme has strong connections to the professional field through an informal network of external guest lecturers and colleagues in different research institutes, who participate in the supervision of students research projects.
- The final qualifications have been discussed in January 2006 with several representatives in the field. The programme committee has learned from the proposed additions to clarify certain wordings of the final qualifications. For a number of skills were indeed concluded in the programme, although they are not identified explicitly as final qualifications. The programme committee will institute a regular (once a year) meeting with relevant representatives to evaluate the requirements.

Assessment by the Certiked assessment team:

In terms of the domain-specific requirements the assessment team regards the strong relation to the professional field as a valuable element in maintaining up to date final qualifications. The involvement of the research group SNE assures the requirements of an academic discipline in the final qualifications. The assessment team assesses the final qualifications as **good** in terms of the accreditation framework of the NVAO.

1.2 Level: Master

The final qualifications of the degree course correspond to general, internationally accepted descriptions of the qualifications of a Master.

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- The general, internationally accepted descriptions of the qualifications of a master have been stated by the NVAO in the so-called Dublin descriptors. The assessment team has taken the Dublin descriptors to verify whether and to what extent the final qualifications of the programme meet these general, internationally accepted descriptions of a master.
- The final qualifications G2, G3 and S6 meet the requirements with regard to knowledge and understanding, as the ability to make an original contribution is implied. Final qualification G1 states that graduates should have knowledge and understanding of the most important technological developments and related scientific results. A comparison between the university-level bachelor's degree programmes in computer science and the master's degree programme in System and Network Engineering shows that the knowledge that is offered in the master's degree programme builds upon the final qualifications of the bachelor's degree programme; it is therefore new and can be seen as more in-depth.
- Related international scientific disciplines include the branches of 'computer science' and 'information science', which address the following:
 - Development of network technology: development of new architectures, network protocols, interfaces.
 - Development of security methods for systems and networks, including the development of systems for defining user roles and access control.
- The final qualifications (G2), (G3) and (S2), (S3) and (S4) relate to the ability of the graduates to apply their knowledge and understanding in new and unfamiliar situations. In the qualification (G3) is stated that graduates should have the capacity to address system and network problems using abstraction and model formation based on the knowledge (G2), and they should be capable of formulating solutions in both general and mathematical and technical terms. In the qualifications (S2), (S3), and (S4) the application of knowledge and understanding is specified regarding the complex problem solving in the professional field.. These final qualifications correspond to the Dublin descriptors with regard to the application of knowledge and understanding.
- The ability to arrive at a professional judgement under conditions of uncertain or incomplete information is implied in the learning objectives (G2), (G3) and (G6), as well as (S5) and (S6). The programme committee points out correctly that this should be stated more explicitly.
- The final qualifications (G4) and (G5) are related to the ability of graduates to communicate. These qualifications say that the graduates are able to collaborate with others in teams and to deliver and defend presentations of their own work, both orally and in writing. These qualifications meet the requirements of the Dublin descriptors with regard to the communication skills.

- The final qualification (S1) indicates the ability of the graduates concerning their learning skills. In this qualification is stated that the graduates are able in exploring (searching, reading and evaluating) the many forms of documentation and literature concerning system and network engineering, with regard to both content and medium. This qualification meets the graduate's ability to study in a manner that may be largely self-directed or autonomous.

Table 1.3: Dublin descriptors and the qualifications associated with them.

| Dublin descriptors | Final qualifications | | | | | | | | | | | |
|--------------------------------------|----------------------|---|---|---|---|---|---|---|---|---|---|---|
| | G | | | | | | S | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 |
| Knowledge and understanding | • | • | • | | | | | | | | | • |
| Applying knowledge and understanding | | | | | | | | • | • | • | | |
| Making judgements | | • | • | | | • | | | | | • | • |
| Communication | | | | • | • | | | | | | | |
| Learning skills | | | | | | | • | | | | | |

Assessment by the Certiked assessment team:

On the basis of these findings the assessment team evaluates the final qualifications of the programme to be in accordance with the general, internationally accepted descriptions of the level of the master. Therefore the assessment team assesses this facet as **satisfactory** in the terms of the accreditation framework of the NVAO.

1.3 Orientation: University (WO)

The final qualifications of the degree course correspond to the following descriptions of a Master at universities (WO):

The final qualifications are based on requirements made by the academic discipline, the international academic practice and, if applicable to the course, the relevant practice in the prospective professional field. A University (WO) master possesses the qualifications to conduct independent academic research or to solve multidisciplinary and interdisciplinary questions in a professional practice for which a University (WO) degree is required or useful.

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- System and network engineering should be seen as a specialisation within the area of computer science. During the study programme, originality can be demonstrated in a research context, but it can be demonstrated just as well in design or advice situations. The latter types of situations involve the production of knowledge that is new to both advisor and client, but this does not necessarily have to be globally new knowledge.
- The master's degree programme in System and Network Engineering is associated with a research group of the Informatics Institute, which has chosen the SNE areas as its research field. Final qualification (G1) specifies that students must be aware of 'the most important technological developments and the associated scientific results'. As the institute is performing academic research in the areas of SNE the programme benefits from this research.
- The programme has formulated the final qualifications in the document 'Programma van de opleiding'. The core of the final qualifications have been defined as follows: graduates of the master's degree programme in System and Network Engineering (SNE) should have the capacity to address system and network problems using abstraction and model formation, and they should be capable of formulating solutions in both general and mathematical end technical terms (G3). They base their knowledge on insight into the most important technological developments and related scientific results (G1) and have the capacity to apply this insight (G2) in the professional field. The acquired general skills lie in the area of communication (G4), teamwork (G5) and awareness of societal, ethical and social aspects of system and network administration (G6). (See also appendix 3).
- The specific final qualifications (S1 – S6) specify in depth the knowledge with which the graduates of the degree's programme should be familiar and the skills in which they should be competent in order to make an contribution to the evolution and innovation in concrete system environments.
- The general final qualification (G1) is specified further in final qualifications (S3) and (S4) for network technology and security. These final qualifications require knowledge of usual systems and procedures, corresponding to the professional oriented nature of the programme. The assessment team points out that the final qualifications to conduct independent academic research could be more explicit.
- There are no programmes in the Netherlands which offer similar contents as the programme in Amsterdam. The only other degree programme that has similar ambitions is the two-year master's degree programme in Network and System Administration at the University of Oslo and Oslo University College. The implication is that the programme master of science in SNE is rather unique in training students in attaining an academic perspective on the practical complexities of the professional field of system and network administration.

Assessment by the Certiked assessment team:

On the basis of these findings the assessment team assesses the final qualifications of the programme to meet the requirements made by the international academic discipline. The programme holds a unique position in the area of System and Network Administration. The intense relationship with the SNE research group at the Informatics Institute assures that the level of the final qualifications is adequate for the level of academic research. Even so the programme is advised to be more specific in stating the academic orientation in the final qualifications.

The assessment team assesses this facet as being **satisfactory** in the terms of the accreditation framework of the NVAO.

Evaluation of the subject Aims and objectives of the programme

The domain-specific requirements are appropriately translated into the final qualifications of the programme. The final qualifications meet the general, internationally validated descriptions of the level of the master, as these are indicated by the Dublin descriptors. The programme has an intense relationship with the SNE Research Group at the Informatics Institute. Most of the lecturers in the programme conduct research in this research group. Among other things, this gives the programme the opportunity to meet the requirements concerning the level of academic research in the teaching. However the recommendation is to be more explicit in the academic orientation of the programme. The assessment team of Certiked assesses the aims and objectives of the programme as positive and as being in accordance with the requirements of the accreditation framework of the NVAO.

2. Programme

2.1 Requirements University (WO)

The programme meets the following criteria applicable to a degree programme at a University (WO): The students acquire knowledge on the interface between teaching and academic research within the relevant disciplines.

The programme follows the developments in the relevant academic discipline(s), as it is demonstrated that it incorporates current academic theories.

The programme ensures the developments of skills in the field of academic research.

For those courses for which this is applicable, the course programme has clear links with the current professional practice in the relevant professions.

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- As stated the programme is associated with the SNE Research Group at the Informatics Institute. Many of the lecturers of the programme are active researchers of this institute. Their involvement in the delivery of the programme assures that new and experimental systems and procedures are regularly addressed, in addition to the customary systems and procedures. The courses are therefore in accordance with the recent developments in the academic discipline.
- Apart from courses the programme offers guest lecturers, who bring in actual questions in the professional field and related new system approaches.
- The lecturers bring into the courses their scientific approach to system and network topics. When asked the alumni concur that the most important result of the teaching is the competency to stand back, think about the roots of problems and then come up with an answer.
- The programme committee and the research group SNE maintain regular contacts with and collaborate with a research group at the University of Oslo.
- The students are also trained in their research capabilities in the research projects. The two research projects are conducted in an external environment, industry or research institutes, for example SARA, KPMG, CERN, SURFnet, few students work on a project from the SNE research group. The research projects are assignments from project leaders in these external organizations, who are familiar with the SNE programme. All potential assignments are evaluated by the group leader of the SNE Research Group, dr. ir. C. de Laat.
- The assessment team looks favourable upon the focus on applying knowledge and problem oriented teaching. However, the programme is advised to make sure that the balance between theory and practice is adequate. Meaning to say that the theory in the course should be presented in the usual scientific form, using clear definitions and relating the concepts together in a robust structure.
- The programme teaches the students an open approach by addressing the origin and development of current customary methods (e.g. Internet, security) and focusing explicitly at open-source solutions without losing sight of legacy systems. This enables the students to be critical and capable of weighing a number of solutions to the problems with which they are presented.
- The students when asked claim that the programme teaches them academic skills, especially the art of 'critical thinking', looking very closely at the detail and not taking what they read or hear for granted. The students from a HBO (polytechnic) background emphasise the difference with their former education which was much more oriented at making things work, not in analysing why some thing works.

Assessment by the Certiked assessment team:

The assessment team assesses the extent to which the programme meets the university requirements as **satisfactory**. The programme contains courses on the relevant subject areas. The programme succeeds in integrating the current trends in the academic research in the courses. The students are in close contact with complex practical issues in various areas. The courses are given by lecturers who themselves are active researchers and who bring their own research work into the courses. The students are required to participate actively in the courses and in the research projects.

2.2 Relationship between aims and objectives and contents of the programme.

The course contents adequately reflect the final qualifications, both with respect to the level and orientation, and with respect to domain-specific requirements.

The final qualifications have been translated adequately into learning targets for the programme or its components.

The contents of the programme offer students the opportunity to obtain the final qualifications that have been formulated.

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- Each semester consists of three theoretical courses, a practical course and a research project. The practical course (DIA in Semester 1, IDS in Semester 2) consists largely of practical assignments, culminating in a major assignment to tackle an open ended problem without given solutions. Six courses are on theoretical subjects, for example, Large Internet Administration (LIA) or Security of Systems and Networks (SSN). Each semester ends with a month-long research project.
- For each course testable specific learning objectives have been established. One of the practical courses – Intrusion Detection Systems (IDS) – and two of the theoretical courses (LIA, SSN) are directed toward the integrated achievement of all of the final qualifications. The other theoretical courses vary from focusing on a few specific final qualifications to having a relatively broad focus.
- The assessment team has been satisfied that the course contents adequately reflect the final qualifications concerning the domain specific requirements. However, the programme committee is advised to pay attention to transport layers in networking (TCP, UDP, etc.) as this topic is somewhat lacking in the courses.
- The acquisition of general academic skills emerges as a secondary objective in various theoretical courses, and it figures prominently in all of the practical courses and projects. These skills are not only tested; students receive guidance in carrying out their literature searches, developing a well-defined research question and establishing a timetable for their work. When asked the alumni told stories how they learned the academic approach by understanding and following the patterns of questions the lecturers asked when discussing practical assignments and research projects.
- The research projects RP1 and RP2 each take one month at the end of each semester. Both projects follow the same structure: the students work in duo's, the students get acquainted with the assignment, reformulate their research question, conduct the research and write a report. Alumni explain that the two times one month experience was great, it gives them some flavour of doing research. And for those who are interested in research, they know how to improve themselves.

- The strong point of the design on two projects is the steep learning curve: the quality of the second project is superior to the first one.
The potentially weak point is the risk of superficiality: the students hardly have time for thorough data collection, for example to take repeated measurements. Generally the students need more time for reflection on the research question, to develop a more independent position and can obtain more depth in the research. The assessment team recommends the programme committee to consider the possibility of joining the two projects into one or to consider the differentiation between the two research projects.

Assessment by the Certiked assessment team:

On the basis of the findings the assessment team assesses the relationship between the aims and objectives of the programme and the contents of the programme as **satisfactory**. The assessment team has been able to verify that the final qualifications are appropriately translated into the contents of the programme. The contents of the programme have the same standards as the final qualifications. The assessment team recommends to reconsider the structure of the two research projects, so that the students get more time for reflection on the research question, to develop a more independent position and can obtain more depth in the research.

2.3 Coherence of the programme

Students follow a programme of study that is coherent in its contents

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- The degree programme has chosen a clear focus on two main topics to serve as a unifying theme for the entire study programme. These topics relate to current and important themes within the profession. The first topic is Open Technology. This involves the importance of open standards (e.g., RFCs), open software (including open source) and open security (the antithesis of security through obscurity). The second topic is Security, both technical and non-technical.
The assessment team considers this clear focus a strong point of the curriculum.
- The first semester concentrates on the basic course: Essential Skills for Administrators (ESA); two technical theoretical courses: Classical Internet Applications (CIA) and Security of Systems and Network (SNN); a practical course: Distributed Internet Applications (DIA) and the first research project (RP1).
The second semester holds two technical theoretical courses: InterNetworking and Routing (INR) and Large Internet Administration (LIA); one non-technical course: ICT and Company Practice (ICP); one practical course: Intrusion Detection Systems (IDS) and the second research project (RP2).
To succeed in courses later in the curriculum the students need the content of the earlier courses. This structure shows coherence in the curriculum.

- The curriculum is build on a gradually increasing level of difficulty and over the year increasing independent work of the students.
- In the meeting with the assessment team the students explained that they felt the level of complexity gradually increasing, but they felt equal to it.
- At the (bi) weekly conference with the students all aspects of the courses are evaluated, including study load.

Assessment by the Certiked assessment team:

On the basis of these findings the assessment team assesses the coherence of the programme as being **good**. The components of the programme show a clear focus on relevant topics in the profession. The components relate to each other in a logical way, the students recognize the logic.

2.4 Study load

The programme can be successfully completed within the set time, as certain programme-related factors that may be impediment to study progress are removed as much as possible.

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- The students follow all the same courses of the curriculum. Students can follow individual learning paths during both projects (RP1 and RP2).
- A full time instructor is available for supervising the practical training for the students. If necessary, the instructor offers additional support for practical assignments and provides advice to students with regard to learning problems. Individual student progress is monitored by regularly reviewing the individual study logbooks that students are required to keep.
- In addition to the full-time practical instructor, a (part-time) system administrator is involved in the programme. The system administrator is selected on the basis of extensive experience and serves also as a ‘resonance board’ for experimenting students and as a help desk for the available infrastructure.
- Information facilities for students are provided primarily through the Web and by email. Schedules, instructions for practical trainings, examination dates and similar matters are available in ‘Wiki environments’. This information is updated daily by the lecturers who are involved in the programme.
- When asked the students say to be content with the support by the system administrator and the lab instructor. None of the respondents to the alumni survey mentioned ‘supervision’ as a point of improvement.
- For each course, surveys from the educational institutes are used to ask students what they think of the study load and the number of credits that can be gained and how much time they spent on the course. The reported number of hours spent on each course (6 EC) per week varied from 11 (DIA) to 16 (INR) in 2004-2005, with students spending between 13 and 14 hours each week for most courses.
- Nearly all students complete the programme within the period of one year. This can be regarded as a proof of the fact that the study load is fair.

Assessment by the Certiked assessment team:

On the basis of these findings the assessment team assesses the study load as **good** in the terms of the accreditation framework of the NVAO. The programme has created several procedures and instruments to be able to monitor the study load of the students. Also a full time instructor and a half time network administrator are available. These staffing and procedures are effective, as can be seen from the study period of most of the students

2.5 Intake

The structure and contents of the programme are in line with the qualifications of the students that embark on the degree course.

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- Students with a university Bachelor degree (WO) are accepted without conditions. Relatively few students with a university Bachelor enter the degree course, roughly 15%.
- Students with a professional Bachelor degree (HBO) are admitted, on condition that they pass an extensive intake examination or assessment. The assessment is specified in the OER.
- The majority of the students in the degree programme do have a professional Bachelor. Students with a university Bachelor are invited to join the examination voluntarily, just to check their entrance level. All of them do so.
- The intake assessment procedure consists of two parts. Part one contains tests. The applicants are tested on general academic skills, like reading and summarising a technical document, presenting a previously written thesis and analytical skills. And they are tested on specific knowledge of computer science, like basic knowledge of UNIX; basic network knowledge (TCP/IP) and basic knowledge of scripting (shell).
The second part of the assessment procedure is an individual interview with the applicants about their test-results and their motivation. Only truly motivated students are admitted, since the master programme is intense and the students need to put in a real effort.
When asked the students concur that the tests concentrate on the basic knowledge of computer science and on the academic study skills. The tests prepare the students what to expect in the courses.
- Truly motivated applicants with a low score on some items of the entrance test are given the opportunity to follow pre-master courses in the summer to study the missing subjects more thoroughly.
- The degree course has no exemption policy. Even students with for example a thorough training in routers as provided by certain suppliers follow the course InterNetworking and Routers (INR).
When asked the students agree that the programme course INR covers new material and add value to the programme.
- The rejection rates of the admission tests are high, an average of 35% - 45% of the applicants are rejected. The students who are admitted have a good chance to pass the programme.
- Intensive contact with the students creates the possibility to spot throughout the year possible problems regarding intake and matching of previous qualifications.

Assessment by the Certiked assessment team:

On the basis of these findings the assessment team assesses the intake of students as **good** in terms of the accreditation framework of the NVAO. The assessment team evaluates the intake procedure as thorough and complete and aims to find the most suitable students. The programme looks carefully at the motivation and the qualities of the students to be able to assure that the students can successfully follow the programme. The intensive contacts with the students allow early warning of possible problems.

2.6 Duration

*The degree course complies with formal requirements regarding the size of the curriculum:
Master of a University (WO): a minimum of 60 credits, dependent on the relevant degree course.*

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- The programme takes one year and the students have to obtain 60 credits points (ECTS). The programme is divided into ten courses, each worth six ECTS. There are six theoretical courses, two practical team courses and two research projects (RP1, RP2).
- The theoretical courses consist of seventy contact hours, seventy independent learning hours and twenty-eight hours for examination preparation. The practical team courses consist of eighty contact hours and eighty-eight team hours. The research projects consist of eighteen contact hours and 150 research hours. The assessment team considers the relatively large number of contact hours to be positive to enhance the feasibility for students.
- Lecturers for the theoretical courses estimate that contact hours and the time scheduled for independent learning are divided evenly in these courses. Students begin their practical assignments during the contact hours, in which assistance is available, and they complete them later through independent study.
- (Bi-)weekly, lecturers and students discuss the ins and outs of the degree programme, including the study load. Information gathered from these discussions and from separate questionnaires suggests that the study load is evenly distributed across the semesters. On average, the number of hours that students actually spend on their studies tends to remain within the standard of a forty-hour working week.

Assessment by the Certiked assessment team:

On the basis of these findings the assessment team assesses the duration of the programme as **satisfactory** in terms of the accreditation framework of the NVAO. The assessment team evaluates that the programme complies with the formal requirements of the size of the programme.

2.7 Coordination of structure and contents of the degree course

The didactic concepts are in line with the aims and objectives of the degree course.

The teaching methods correspond to the didactic concept.

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- The master's degree programme in System and Network Engineering strives to be an academic, vocationally oriented training programme. Practice oriented projects play a major role in the programme. During these projects, students are presented with problems for which trivial solutions do not suffice and which require academic research skills. The various theoretical courses that have been included in the programme are designed to impart knowledge and understanding to students that is useful in such projects.
- The curriculum consists of roughly 60% theoretical courses and 40% project work. Each of the theoretical courses involves a practical assignment in addition to lectures. The practical assignments vary from closed to open, according to the theoretical course. The projects in the practical courses focus on predetermined themes and correspond closely to previous theoretical courses. The activities in these assignments are designed to allow students to assimilate the theory that has been offered and learn to use it.
- The majority of the courses are provided by three core lecturers, thus facilitating the process of reaching a consensus concerning a didactic concept.
- The group consist of maximum 20 students, which allows lectures to be interactive. When asked the students report that discussions in classroom are interesting and challenging. Guest lecturers notice the team spirit and commitment of the students and comment favourable on this.
- All teaching is offered at the laboratory (see 4.2 Material Facilities), attendance is required. The students are expected to come in for a full time work schedule. This approach strengthens the coherence of the group of students, as they work together on projects, help each other with assignments, discuss together tough theoretical concepts. They get to know each other real well as they work together in duos or small groups. It encourages students to attend and participate in the curriculum components.
- The master's degree programme SNE is a one-year curriculum. In this relatively short time the students have to put in a lot of effort to meet all the requirements. In course evaluations the students report that the programme asks considerably more work than the programmes they previously followed and asks a considerable personal initiative. In the meeting with the assessment team the students told to feel committed to their team mates, like they have to show up and play their part in the group. They dare to share weaknesses and are often able to help each other. This has a positive effect on academic achievement.
- The effectiveness of the chosen methods is evaluated each year per course through discussions with the students and through the lecturers' assessment of test results.

Assessment by the Certiked assessment team:

On the basis of these findings the assessment team assesses the coordination of structure and contents of the programme as **excellent** in the terms of the accreditation framework of the NVAO.

The didactic concept contains as key factors: problem oriented teaching, close interaction between lecturers and students, the relatively small group of students who work real hard for a limited period, the dependence on small teams to succeed in the projects, the required attendance and the availability of the laboratory. The assessment team is truly impressed by this 'pressure-cook-approach', its implementation and the results that are achieved.

2.8 Assessment and examinations

The system of assessments and examinations provides an effective indication whether the students have reached the learning targets of the course programme or its components..

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- The Education and Examination Regulations (OER) establish the rules and procedures of the examinations, grading of exams, and re-sits.
- Both semesters are divided into three periods (two eight-week periods and one four-week period). Each period ends with an assessment. Students follow two courses simultaneously in each of the eight-week periods. Assessments are therefore distributed over six periods, with a maximum of two courses per period. Each of the research projects incorporates subjects that were covered in the preceding periods.
- Forty percent of the programme is comprised of instruction on a project basis, and sixty percent is comprised of theoretical courses. For practical courses the testing occurs on the basis of project assignments that are closely related to the course content. For the theoretical courses the assessment is based primarily upon examinations.
At the end of each theoretical course, students are asked whether they found the testing appropriate to the contents of the course. In 2003-2004, only one course (ICP) received negative evaluations from a majority of students on this point. This result did not recur in later evaluations.
- The two research projects at the end of each semester incorporate subjects that were covered in the preceding periods. The research projects are mostly conducted at external organisations, for example SARA, KPMG – research, CERN, Surf Net. The projects are assignments from project leaders in these external organizations, who are familiar with the SNE programme.
- The students are required to write a paper on their research project and to give presentations. The students are evaluated on the quality of their problem solving, the written report and on their competence to communicate their findings.
- All research project assignments are to be approved by the leader of the SNE research group, dr ir C. de Laat who is involved in all research projects as final supervisor.

- The supervision during the research projects rests largely on the external supervisors. During the two project periods, one of the lecturers from the programme maintains contact with the internship supervisors. These supervisors are familiar with the SNE programme and usually they have experience in conducting research.
However, the programme can not ascertain their ability to guide the students in the research process and since the research project takes only one month there is little time for the students to learn by trial and error.
The assessment team recommends the programme committee to secure structural internal supervision of the students during the research projects.
- A representative of the Board of Examiners is present at all of the presentations of the theses. In this way the Board contributes to arriving at a fair assessment and a fair grading.

Assessment by the Certiked assessment team:

The assessment team evaluates on the basis of these findings the assessment and examinations of the programme as **satisfactory** in the terms of the accreditation framework of the NVAO. The programme has assessments and examinations which are in accordance with the skills and knowledge of the students that are being assessed. The internal supervising of the students during their external research projects should be developed, however.

Evaluation of the subject Programme

*The assessment team of Certiked assesses the aims and objectives of the programme as **positive** and as being in accordance with the requirements of the accreditation framework of the NVAO.*

The programme satisfies the requirements of a university degree. The contents of the courses reflect the final qualifications and the curriculum has been designed to form a coherent programme.

Several procedures and instruments have been created to monitor the study load of the students.

The intake procedure is thorough and complete. The programme looks carefully at the motivation and the qualities of the applicants to assure that they can successfully follow the programme.

The programme complies with the formal requirements of the size of the programme.

The didactic concept of the programme is excellent. It consists of several dynamics that strengthen each other forming a strong concept that is familiar with staff and students. The programme has assessments and examinations which are in accordance with the skills and knowledge of the students that are being assessed.

3. Deployment of staff

3.1 Requirements for University (WO)

The degree course meets the following criteria for the deployment of staff for a degree course at a University (WO):

Teaching is largely provided by researchers who contribute to the development of the subject area..

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- The core lecturers in the programme are all researchers in the SNE research group. These researchers are actively engaged in research projects which are largely externally funded by national (BSIK, NOW) and international (EU) programmes. The ideas of the group have had a leading role in the approval of funding for several of the research projects.
- The SNE research group collaborates nationally in the ASCI research school. Internationally it maintains extensive contact with the University of Illinois in Chicago, North Western University in Chicago and the University of California in San Diego. The group is the first international partner in the US National Science Foundation-funded OptIPuter project, which involves using optic technology to build an advanced e-Science grid.
- Two of the three regular lecturers in the degree programme hold a PhD degree, as well as the leader of the SNE research group. The director of the Educational Institute, prof. dr. Jan Bergstra, holds a professorship.
- A survey among alumni revealed that most of the respondents state the programme to have been too practice-oriented. They should have valued a higher academic character. In the meeting with the assessment team the students indicated that they would like more time to study some topics more in depth. The programme committee sticks to a broad overview of the professional field, since most of the alumni find positions in the professional field.

Assessment by the Certiked assessment team:

On the basis of these findings the assessment team assesses the university requirements as being **satisfactory** in the terms of the accreditation framework of the NVAO. The lecturers in the programme are researchers at the SNE research group. These lecturers include the results of their research in the teaching.

3.2 Quantity of staff

The staff levels are sufficient to ensure that the course is provided to the required standards.

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- The available personnel in the SNE degree programme can be categorised as three core lecturers and a number of guest lecturers and research-project supervisors. The leader of the SNE research group is involved in all external research projects in the curriculum.
- In addition to the staff members with the ultimate responsibility for the programme, two essential employees are involved in guidance of students: a full time laboratory instructor, for supervising the practical training for the students. and a (part-time) system administrator to support students in their experiments and to act as a help desk regarding the available infrastructure.
- The core lecturers serve as stand-in for each other in case of absence or illness. The current ad-hoc procedure works quite well. The programme points out justly that they better make a general arrangement for replacement.
- The programme has not calculated the total amount of time in terms of full-time equivalents over the lecturers which perform teaching, mentoring and supervising tasks in the programme. In stead the programme director makes sure that the scheduled contact hours in the courses are met by the core lecturers and guest lecturers.
Together with the available laboratory instructor and part time system administrator this turns out to be a more favourable docent / student ratio than the ratio of one to 20 to 25, which is normally found in institutions for higher education.

Assessment by the Certiked assessment team:

On the basis of these findings the assessment team assesses the quantity of staff as **good** in the terms of the accreditation framework of the NVAO. The programme makes sure that the teachers which are needed to meet the demands of the programme and support staff are available. This makes the student-teacher ratio quite favourable.

3.3 Quality of staff

The staff is sufficiently qualified to ensure that the aims regarding contents, didactics and organization of the course programme are achieved.

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- The lecturers of the programme engage actively in the exchange of views on the SNE subjects with the students. The participation of the students in the classroom is seen as important by the lecturers and by the students themselves. Guest lecturers report the commitment of the students to be very high and stimulating for the teachers.

- The lecturers achieve active involvement of the students. This is among other things to be seen from the enthusiasm with which the students shoulder the assignments in the courses and the effort they put into the work on the assignments. And from the spontaneous forming of ‘power learning meetings’, in which students discuss among themselves topics of the course. Sometimes the students invite a lecturer to the meeting to bring in expert knowledge.
- The nature of the programme demands special skills of the instructional personnel. The lecturers are able to connect their scientific insights with the practical side of their subject, as it arises in projects or practical training. The lecturers mostly formulate appealing assignments for the students and guide the students in carrying out such projects without providing ready made answers.
- The quality of the lecturers is evaluated by the students using surveys from the educational institute. The students grade the lecturers, the practical training, the literature used and the syllabus. They are also asked to state whether they feel that the supervision for the seminars and practical training is sufficient. In case of unfavourable or negative evaluations of the students, appropriate measures are made. On the whole student ratings are quite positive.

Assessment by the Certiked assessment team:

On the basis of these findings the assessment team assesses the facet of the quality of staff as **satisfactory** in the terms of the accreditation framework of the NVAO. The lecturers take care that the students actively engage in the courses and they achieve the interaction between the students and the staff in practical assignments.

Evaluation of the subject Deployment of staff

*The assessment team assesses the deployment of staff as **positive** and as being in accordance with the requirements of the accreditation framework of the NVAO.*

The core lecturers in the programme are part time researchers at the SNE research group.

These lecturers include the results of their research in the teaching. The suggestion is made to involve more university professors in the degree programme.

The programme director makes sure that the teachers which are needed to meet the demands of the programme are available. The student-teacher ratio is favourable. The lecturers take care that the students actively engage in the courses succeed in formulating interesting practical assignments for the students.

4. Facilities and provisions

4.1 Material facilities

The accommodation and material facilities are sufficient to implement the programme.

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- For the programme a room has been leased within a building of the Hogeschool van Amsterdam. This accommodation – the laboratory – is managed entirely by staff of the SNE programme. It is used for both lectures and practical training (the two overlap for many components of the programme). The laboratory holds space for 22 work places.
- The SNE research group, where the core lecturers hold their offices, is located in a building of the Informatics Institute UvA, at approximately 3 km distance. This is a workable arrangement, both for students and staff.
- The programme's orientation towards practice requires that students have the opportunity to organise their own servers and set up experiments. For these purposes, each student is provided with at least one workstation, a freely adaptable system and the opportunity to experiment with other equipment (in consultation). The 'open' philosophy of the programme led to the choice to base the production environment on the UNIX-based Linux. The programme has its own supply of equipment that can be used for experiments.
- A (part-time) system administrator is available (see section 3.2) for the administration of the infrastructure and to provide support for the students during experiments.
- When asked the alumni and the students refer to the laboratory as a great place to work concerning the colleagues and material facilities. During the day the atmosphere tends to become stuffy, more ventilation might improve this. The students and staff notice that the workstations are rather obsolete, the students network and the production network require frequent maintenance.
- However, each facility (both personnel and/or material) must be negotiated separately with either the director of the research institute, the director of the educational institute or de the directors of central services. The assessment team considers this situation not suitable, a well designed degree programme deserves to be sure of a structural funding based on a sound procedure.

Assessment by the Certiked assessment team:

The assessment team assesses the material facilities as **satisfactory** in the terms of the accreditation framework of the NVAO. In the opinion of the assessment team notably the laboratory has an important function for the students of the programme. Attention to improvement of the ICT facilities is highly recommended.

4.2 Student support and guidance

The student support and guidance, as well as the information given to students are adequate for the purpose of students' progress.

The student support and guidance, as well as the information given to students meet the requirements of the students.

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- A practical instructor is available throughout the day for students who have questions or problems. This instructor can be found in either the laboratory or the adjoining room. He monitors the progress of students and, if necessary, intervenes by providing assistance to those students who need it.
- Twice a year each student has an individual appointment with some of the staff members to talk for half an hour or so about the progress in the study, the motivation and other relevant topics.
- All students following the programme are assigned their own email address, through which information about the programme and grades is provided. Information concerning courses and schedules is offered on the programme's website. A wiki is also available on the website, in which students are free to exchange information. Within this environment, appointments are made and information about projects regarding content is posted.
- In addition to email and the programme's website, students are required to maintain logbooks on their own websites, which can be reached through the programme's main website. Students can use these logbooks to document their own progress, both for their personal use and that of the laboratory instructor, who uses this information as a means of determining whether intervention is necessary. The process of maintaining a logbook also trains students in the appropriate documentation of ongoing projects.
- The programme does not have its own budget. The general policy of UvA calls for allocating personnel and materials to research institutes. Arranging a good degree programme requires separate budgeting facilities, which are not provided.
- Each facility (personnel or material) must be negotiated separately with either the director of the research institute, the director of the educational institute or the directors of central services, and the distribution of responsibilities is not clear in this regard.

Assessment by the Certiked assessment team:

The assessment team assesses the student support and guidance as being **good**.

The students are well informed about their progress, about the programme and there are adequate facilities to exchange information and work together on projects. The programme has effective means to assist the students. These are the programme administration and the procedure of the individual appointments with a member of the teaching staff. The assessment team looks favourably upon the availability of the full time laboratory instructor.

Evaluation of the subject Facilities and provisions

*The assessment team assesses the facilities and provisions of the programme as **positive** and as being in accordance with the requirements of the accreditation framework of the NVAO.*

The programme has adequate material facilities. In the opinion of the assessment team notably the laboratory room has a vital function for the students that follow the programme. The programme has effective means for student support and guidance.

5. Internal quality assurance

5.1 Evaluation of results

The degree course is subject to a periodic review, which is partly based on verifiable targets.

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- The master programme employs four quality assurance cycles: yearly evaluation of the programme, the teaching staff, courses and (bi-)weekly evaluation of running courses. These quality assurance cycles fit into the quality assurance plan of the 'Faculteit Natuurkunde, Wiskunde en Informatica'. The tasks and responsibilities have been defined in this plan, which is subsequently carried out.
- The director of the Educational Institute of Information Sciences, prof. dr. Jan Bergsta, is responsible for the content and didactic quality of the existing programmes as well as for developing new programmes. The Programme Committee advises the director on educational matters.
- The Programme Committee of the SNE master's degree programme exists of a lecturer and a student representative. This Programme Committee meets jointly with the Programme Committee of System Engineering (SE), also consisting of a lecturer and a student representative. SNE and SE are both relatively small, one year master degree programmes in the Educational Institute. Both the Programme Committees benefit from meeting jointly, as is to be expected.
- All courses are evaluated by students as well as teachers in writing on topics as content, didactic quality of lecturer and the course connection to the other courses. All course evaluations are discussed in the Programme Committee. In case of unfavourable evaluations the feedback is discussed with the teacher and amendments in writing are presented to the Programme Committee.
- One year after graduation the alumni are asked to complete a survey to evaluate the usefulness of the programme in relation to the demands of their current job and give suggestions for improvement.
- (Bi-) weekly the core lecturers plus the laboratory instructor meet with all of the students to evaluate the running course. This meeting proves to be very valuable in addressing issues of the 'small quality', matters in which immediate action can be taken for example logistics, and exchanging information about the purpose and objections of the running course. The assessment teams looks favourably on the establishment of this evaluation procedure.
- The master's degree programme has not explicitly formulated goals to be attained. The programme is quite small, the goals and objectives are implicitly known to the core lecturers and the programme committee and acted upon.

Assessment by the Certiked assessment team:

On the basis of these findings the assessment team assesses the evaluation of results of the programme as **good** in the terms of the accreditation framework of the NVAO. The programme has several committees in place to gather information, to evaluate the programme and to assure improvements in the programme, whenever necessary. Especially the (bi-) weekly meetings with students are appreciated highly.

5.2 Measures to effect improvement

The results of this evaluation form the basis for measures that can be demonstrated to improve the course and that will contribute to reaching the targets.

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- The lecturers and programme director take action based on the information from the (bi)-weekly meetings. Students report that they really feel to be listened to, that action is taken based on their comments.
- The staff of the MSc programme meets once a year to discuss on basis of all evaluations the programme as a whole and decides on improvements. For example: in 2005 a new course ESA (Essential Skills for Administrators) has been added to the programme, as it became apparent that incoming students lacked the knowledge of these topics.
- The (bi)weekly meeting with the students has been organized by the programme management and proves to be valuable addition to the quality assurance system. Other programmes of the Informatics Institute learn from this initiative and consider to implement this in their own quality assurance system.

Assessment by the Certiked assessment team:

On the basis of these findings the assessment team assesses this facet as **satisfactory** in the terms of the accreditation framework of the NVAO. The programme has given prove of the ability to improve the contents of the courses as well as of the ability to improve the system of quality assurance itself.

5.3 Involvement of staff, students, alumni and the professional field

Staff, students, alumni and the professional field in which graduates of the course are to be employed are actively involved in the internal quality assurance.

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- Staff and students are involved in the quality assurance system. The students have ample opportunity to give feedback to the staff on courses and the programme. The members of staff are very closely related to the quality of the programme and play an active part in looking for improvements.
- The programme has a good relation with alumni. Six months after graduating the alumni are invited to a meeting with the staff. On these meetings most of the alumni show up, eager to catch up with their old pals. The feedback of alumni shows that the courses on which initially they complained like Distributed Internet Applications (DIA) or INR proved be very useful. Several alumni have been invited for guest lectures. The response to annual alumni survey is good, approximately 60% of the forms are returned.

- The programme invites representatives from leading firms in the professional field to be involved with the master's degree programme: to give guest lectures, to offer assignments for the research projects and to give feedback upon the achieved level of the final qualifications.

Assessment by the Certiked assessment team:

On the basis of these findings the assessment team assesses this facet as **good** in the terms of the accreditation framework of the NVAO. The students and the members of staff programme play an active role in the quality assurance of the programme. The programme maintains contacts with the alumni and representatives of the professional field to receive feedback on the programme.

Evaluation of the subject Internal quality assurance

*The assessment team assesses the internal quality assurance as **positive** and as being in accordance with the requirements of the accreditation framework of the NVAO.*

The programme has committees in place to evaluate the programme and to assure improvements in the programme. The committees gather information on the basis of which they can verify whether the goals of the programme are met. The programme has shown the ability to improve the contents of courses and the system of quality assurance. The students and the members of staff play an active role in the quality assurance of the programme. The programme maintains contacts with the alumni and with representatives of the professional field.

6. Results

6.1 Level that has been achieved

The final qualifications that have been achieved correspond to the targets set for the final qualifications in level, orientation and domain-specific requirements.

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- The master's degree programme consists of 8 courses and 2 research projects, on which the students write a paper. The achieved level of most final qualifications is evident in the papers on the second project. The final project does not cover all specific requirements as students are free to choose the topic of this project and as it involves an actual problem. To determine the extent to which these final qualifications have been achieved, it is therefore necessary to consider also examination results and assessments from the two practical courses.
- The assessment has ascertained that the realised final qualifications correspond with the intended qualifications, regarding level (master), orientation and domain specific requirements (research topics). The assessment team noted that in some research papers the presentation of the data and the dealing with uncertainty had not been as convincing as might be expected from a scientific master.
- Students and alumni when asked report to have got enough guidance and support during their research projects and in the various courses.
- Most of the graduated students opt for a position in the professional field: 74% of the graduates had found a job within three months of graduation and 83% after six months. A few students opt for an PhD study, average 1 prer year.
- In the meeting with the assessment team the alumni report that they value the academic approach of the master's degree programme, in that they know to come up with critical evaluations, ask the right questions to dig into problems and solutions. And they value how the programme is up to date in recent or coming trends and issues, good to be prepared for the professional field.
- The programme presents papers and practical tests to representatives from the professional field to evaluate the achieved level. This results in interesting comments. The programme committee reconsiders possibilities to involve the representatives from the professional field.

Assessment by the Certiked assessment team:

On the basis of these findings the assessment team assesses the level that has been achieved as **satisfactory** in the terms of the accreditation framework of the NVAO.

The assessment team has been satisfied that the evaluated papers and examinations is adequate and that the graduates are appreciated candidates for the professional field.

6.2 Results of teaching

To measure the results of teaching, target figures have been set in comparison with relevant other degree courses.

The results of teaching meet these targets.

Findings:

On the basis of the meetings during the visits and the documents that have been reviewed the assessment team has come to the following findings:

- The high graduation rate stems from the strict admission procedure, the strong group coherence and the guidance and support of the students. Only one or two students drop out during the course. The reasons for leaving the programme are known to the staff, because of the frequent contact between staff and students.
- The optimal number of incoming students is twenty, given the organization of the curriculum and the facilities that the laboratory at the Hogeschool Amsterdam has to offer. In 2003 (the first year) 25 students were accepted, in the following years 16 – 19 students have been admitted. Nearly all students (circa 90%) complete the course within one year.
- Given the current funding structure, a class size of thirty students would provide a more stable financial base. However, classes of about twenty students fit better to the didactical concept and the facilities. The Board of Examiners allows the current smaller number of students, therefore tipping the balance between quality and quantity towards quality.

Assessment by the Certiked assessment team:

On the basis of these findings the assessment team assesses the results of the teaching as **good** in the terms of the accreditation framework of the NVAO. About 90 % of the students that enrol, finish the programme, most of them within the year. These are both good figures.

Evaluation of the subject Results

*The assessment team assesses the results of the programme as **positive** and as being in accordance with the requirements of the accreditation framework of the NVAO.*

The level that the programme achieves is satisfactory. Most of the graduates of the programme obtain positions in the professional field. The number of students that finish the programme is high and most of the students finish the programme within the nominal study period.

Appendix 1: Programme of visits by assessment team

Thursday, March 8

- 10.30 -13.00 *Internal deliberations of the committee*
- 13.00 -13.30 *Management of the Programme*
 Introduction, explanation of goals
- Dr. Karst Koymans (Programme Director)
 - Jaap van Ginkel (Programme Coordinator)
 - Dr. ir. Cees de Laat (research coordinator)
 - Prof. dr. Jan Bergstra (Director Educational Institute)
 - Drs. Kees van Wensen (Policy Officer Educational Institute)
- 13.30 -15.00 *Management and staff of the Programme*
 Aims and objectives, structure and contents of the programme, master-level, academic orientation, domain-specific requirements, didactic concepts, theses
- Dr. Peter van Emde Boas (chair Board of Examiners)
 - Dr. Wolter Kaper
 - Jaap van Ginkel
 - Dr. Karst Koymans
 - Dr.ir. Cees de Laat
- 15.00 - 16.00 *Document review*
- 16.00 -16.45 *Management and supporting staff*
 Staff, facilities and quality assurance
- Dr. Karst Koymans
 - Jaap van Ginkel (chair Programme Committee)
 - Maurits van der Schee (student member Programme Committee)
 - Drs. Eelco Schatborn (Teaching Assistant)
 - Jan-Philip Velders (System Administrator)
- 16.45 - 17.15 *Internal deliberations*
- 17.15 - 17.30 *Management of the Programme*
 Short feedback of findings
- Dr. Karst Koymans (Programme Director)
 - Jaap van Ginkel (Programme Coordinator)

Friday, March 9

- 09.00 – 09.45 Preparation by the evaluation committee
- 09.45 – 11.00 *Teaching staff*
Didactic concepts, academic orientation, theses
- Dr. Karst Koymans
 - Jaap van Ginkel
 - Dr.ir. Cees de Laat
 - Dr. Geleyn Meijer
 - MSc. Matthijs Koot
- 11.00 – 12.15 *Students MSc*
Student support and guidance, study-load, facilities, results
- All students, in SNE-lab (room B6.04)
- 12.15 – 14.15 *Document review and lunch*
- 14.15– 15.15 *Alumni*
Results of the programme
- MSc Jeroen van der Ham
 - MSc Andree Toonk
 - MSc Jeffrey Barendse
 - MSc Fangbin Liu
 - MSc Matthijs Koot
- 15.15 – 16.30 *Additional information, internal deliberation*
- 16.30 – 17.00 *Management of the Programme*
Feedback of findings
- Dr. Karst Koymans (Programme Director)
 - Jaap van Ginkel (Programme Coordinator)
- 17.00 – 17.30 Feedback of findings in public (Auditorium, room D0118)
Drinks.

Appendix 2: Documents

Documentation

- Self assessment 'Master System and Network Administration' may 2006
- *Master System- en Netwerk Beheer, Programma van de opleiding*, Koymans, versie 4.6, 13 april 2004
- Several research papers year 2005 – 2006 and 2004 – 2005
- Lists of literature and learning objectives of all curriculum components
- Minutes of meetings with students and staff
- Student evaluations 2004, 2005, 2006

Appendix 3: Domain-specific framework of reference

General and specific final qualifications

| | |
|----|---|
| G1 | In the field of system and network administration, graduates of the master's degree programme in System and Network Engineering should have insight into the most important technological developments and related scientific results. |
| G2 | In the interests of the innovation and modernisation of system and network configurations graduates of the master's degree programme in System and Network Engineering should have the capacity to apply this insight . |
| G3 | Graduates of the master's degree programme in System and Network Engineering should have the capacity to address system and network problems using abstraction and model formation, and they should be capable of formulating solutions in both general and mathematical and technical terms. |
| G4 | Graduates of the master's degree programme in System and Network Engineering should have the capacity to communicate clearly, both orally and in writing; they should be skilled in giving presentations to groups and should know how to explain problems and solutions at the appropriate level of abstraction. |
| G5 | Graduates of the master's degree programme in System and Network Engineering should be able to function well in teams. They should be capable of discussing technical topics in both small and large groups, and they should be well equipped to divide and coordinate technical tasks among group members. |
| G6 | Graduates of the master's degree programme in System and Network Engineering should be aware of the societal, ethical and social aspects of system and network engineering. |

Table 1: General final qualifications

| | |
|----|--|
| S1 | <p>Graduates of the master's degree programme in System and Network Engineering should be skilled in exploring (searching, reading and evaluating) the many forms of documentation and literature concerning system and network engineering, with regard to both content and medium. They should be familiar with the Internet Society (ISOC), the World Wide Web Consortium (W3C), Institute of Electrical and Electronics Engineers (IEEE) and other international bodies that develop standards and publish in the area of computer systems and networks.</p> |
| S2 | <p>Graduates of the master's degree programme in System and Network Engineering should be very familiar with the usual configurations and procedures for the normal and crisis Engineering of a variety of current systems and networks, middleware and applications. They should therefore be quickly employable in the usual multi-vendor systems and network contexts.</p> |
| S3 | <p>Graduates of the master's degree programme in System and Network Engineering should be very familiar with the security functions of systems and networks, and they should be capable of contributing actively to the architecture and configuration of systems and networks that conform to current security standards. Graduates should also be able to determine whether systems or networks conform to particular security standards.</p> |
| S4 | <p>Graduates of the master's degree programme in System and Network Engineering should have the technical knowledge of communication protocols, network components and business systems that they will need to accurately justify choices and steps relating to administration and security, including those regarding configuration, procedures and security architecture.</p> |
| S5 | <p>Graduates of the master's degree programme in System and Network Engineering should have sufficient insight into the organisational contexts within which systems and networks function to channel the needs of organisations and users, and to translate them into appropriate technical support.</p> |
| S6 | <p>Graduates of the master's degree programme in System and Network Engineering should have sufficient technical knowledge and intellectual capacity to assume positions of leadership in the field of system and network administration within a few years. They should have the capacity to develop their own vision of the field of system and network engineering, thus contributing to evolution and innovation in concrete system environments.</p> |

Table 2: Specific final qualifications

Appendix 4: Assessment team

ir R.S. Kloosterman, Chairman

René Kloosterman obtained his MSc in Industrial Engineering at the Technical University of Eindhoven. After that he joined the worldwide consulting firm of KPMG. In the subsequent years he was involved in running projects in Central Europe and the former Soviet Union. In 1994 he joined Certiked as a freelance auditor, and in the period 1998 – 2007 he was director of the company. In this period he developed the system of assessments for bachelor and master programmes. He is involved in carrying out these assessments very frequently. At present, he works as an incubator for starting small and medium size enterprises.

prof.dr. M. Burgess,. External expert

Mark Burgess is professor of Network and System Administration at Oslo University College. Mark obtained a PhD in Theoretical Physics in Newcastle (1990), for which he received the Runcorn Prize. His current research interests include the behaviour of computers as dynamic systems and applying ideas from physics to describe computer behaviour. Mark is the author of the popular configuration management software package cfengine. He made important contributions to the theory of the field of automation and policy based management, including the idea of operator convergence and promise theory. He is the author of numerous books and papers on Network and System Administration and has won several prizes for his work.

dr. H. Bos, External expert

Herbert Bos is tenured assistant professor at the Vrije Universiteit Amsterdam. He obtained his PhD from Cambridge University, (UK) on the topic of controlling high-speed networks. Before joining Vrije Universiteit, he worked as a researcher at KPN Research (now TNO ICT) and as an assistant professor at Leiden Universiteit (Netherlands). For his work on the network side of new thin client systems at Sun Microsystems Laboratories (Mountain View, California), a patent was filed. Herbert is the author of over 40 peer-reviewed publications and regularly serves on the program committees of international conferences. He is known for his work on high-speed networking (FFPF/Streamline), Intrusion Detection Systems (Argos, SafeGuard), and Operating Systems (the Open Kernel Environment, Minix3). In his research group, he supervises 7 PhD students, a postdoc and a full-time programmer. He has obtained funding well exceeding 1M Euro for several national research projects and three European projects.

drs C.J. de Monchy, Secretary

Carolien de Monchy is secretary at Certiked since 2006.

She got her master's degree in organizational psychology in 1981. The next ten years she held various positions with insurance companies. In 1991 she formed a network of independent management consultants. They work together on projects in leadership training, group facilitation, coaching and team coaching in The Netherlands. Since 1992 Carolien is involved in teaching at Erasmus University and the Haagse Hogeschool in courses on Management & Organization.

J. van der Mandele BSc, Student member

Joost van der Mandele is a Bachelor of Science currently doing a Masters Degree Artificial Intelligence at the Vrije Universiteit Amsterdam. He has been secretary at the National Board of Students Guilds (Landelijke Kamer van Verenigingen, LKvV) and is head of the Faculty Students Council Exact Sciences at the VU. Up until now, Joost der Mandele has been member in more than six visitation committees for Certiked.

Appendix 5: Statements of independence