Chain analysis Hosting

ICT stands for green!

History

Version	Date	Author	Description
0.5	08-AUG-2012	David Eken (ICT)	Record adjustments based on feedback Sander Hegger.
0.6	10-AUG-2012	David Eken (ICT) Sander Hegger (BECO)	Record adjustments based on feedback Sander Hegger and adjusted chain partners scheme.
0.7	14-AUG-2012	David Eken (ICT) Sander Hegger (BECO)	Processed feedback Sander Heggen
0.8	17-AUG-2012	David Eken (ICT) Sander Hegger (BECO)	Sharpen aim of the chain, extended source list, improved index, added BECO logo.
0.9	21-AUG-2012	Frits Wuts (ICT)	Added responsible
1.0	23-AUG-2012	Frank de Groot (ICT	Final version
1.1	17-NOV-2015	Frits Wuts (ICT)	Adjusted number of projects for the coming years
2.0	17-MAY-2017	Frits Wuts (ICT)	Extension with regard to on/off project
3.0	22-MAY-2018	Mark van Eesteren (ICT)	Update 2017 hosting projects and translation into English

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1 Chain analyses for Software Hosting

1.1 Introduction

ICT Automatisering Nederland B.V., which is a subsidiary of ICT Group N.V. ("ICT"), executes an active sustainability policy related to corporate social responsibility. Part of the sustainability policy is that ICT participates in the CO_2 performance ladder in which ICT Automatisering Nederland B.V. is certificated on level 4.

Part of this certification is that the execution of a chain analysis for scope 3 emissions. The chosen chains has to be material for ICT Group N.V. The materiality of the different chain is recorded in the 'Scope 3 chain analyses document'. In this document is recorded that one of the chains which is analysed is the "Cloud sourcing" proposition which is CO_2 friendly manner for the hosting of software.

Under the name 'Cloud Sourcing' ICT offers knowledge and experience with respect to Cloud Computing over the whole spectrum from IaaS ("Infrastructure as a Service), PaaS ("Platform as a Server") to SaaS ("Software as a Service) among other things the Windows Azure Cloud Platform. This software hosting technology is already used in a number of projects and the solution will be applied more in the future. Additionally, the service will be extended with managing services to be able to unburden clients.

An important part of the Cloud Sourcing proposition is the ability to offer a "green" total solution to our customers. The energy reduction compared to a traditional on-premise solutions is considerably (refer to Appendix for literature references.

The chain analysis for this proposition is recorded in this document and written together with the knowledge institute BECO (http://www.beco.nl).

1.2 Aim

The aim of this analysis is to record the chain emission effects of our advising and implementation solutions related to software hosting. Based on this analysis CO_2 reduction targets for the future can be formulated.

1.3 Reading guide

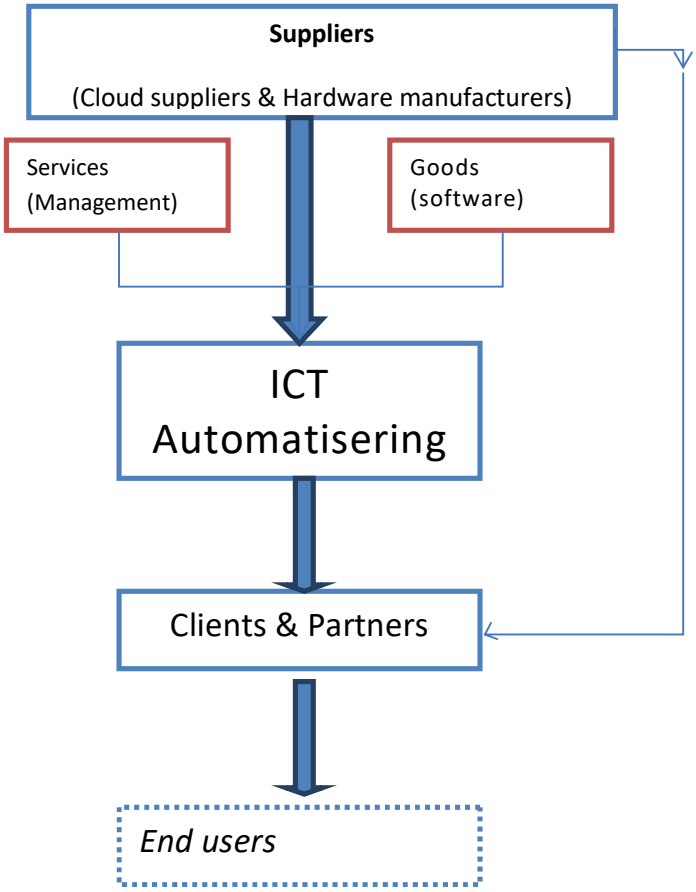
This document is structured as following:

1. Description of the value chain;
2. Quantification of CO_2 scope 3 emissions;
3. CO_2-reduction targets; and
4. Roadmap.

2 Value chain software hosting

In the following diagram the most important chain partners are recorded. Software hosting is the offer of a system solution on a hardware environment which accessible for the end users.

The hardware can be established in different ways for a on-premise solutions to a solution which is based on the cloud.



ICT develops together with clients and partners new cloud based systems for the different markets in which they are active.

The services of ICT can be dividend a number of areas:

- Consultancy, among other things an impact analysis for the suitability and applicability of a cloud solution.
- Development, the whole development spectrum from architecture design to the acceptance of a solution.
- Management, from operational IT management of the solution to IT management including the backup- and recovery, fall-back location and a service desk.

2.1 Chain partners

The following list is an overview of the possible chain partners which are able to help within the emission inventory and reaching the reduction measures:
:

- Clients & Partners
- Cloud suppliers
- Hardware manufacturers.

In the following sections the various chain partners are further disclosed and recorded in which way they play a role in the emission inventory and the possible reduction measures.

2.1.1 Clients & Partners

For clients ICT provides solutions for the demanded system functionality by advising, designing the IT architecture and software development. During this process steps ICT is able to inform their clients about the possibilities and initiatives which are the most CO_2 efficient.

Currently, no concrete usage data is available.

2.1.2 Cloud suppliers

For the development of cloud environment there are multiple cloud suppliers. This are:

- Microsoft – Azure platform
- Mendix – App Platform
- Amazon - Elastic Compute Cloud
- Google – App Engine platform

These cloud suppliers can offer their software hosting on a large scale resulting in efficiency and possibilities to reduce CO_2. If possible insights in the CO_2 emission of their solutions can be provided..

2.1.3 Hardware manufacturers

The hardware manufacturers supply their hardware to clients which choose for an on-premise solutions and cloud suppliers. For example these are Dell, IBM and HP. Based on specific machines the emissions can be calculated.

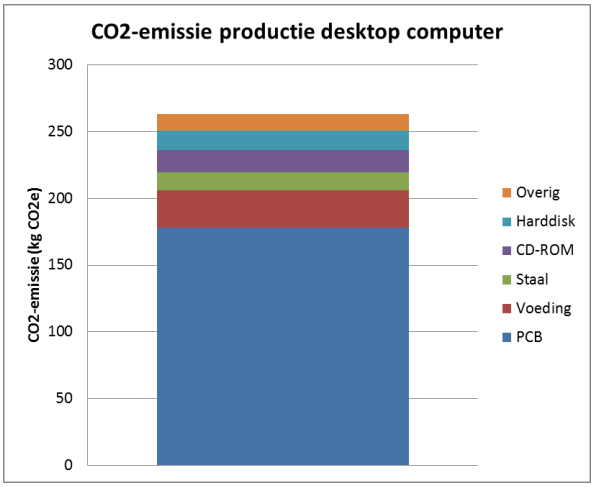
3 CO_2 emission quantification

The quantification of the CO_2 emission strongly depends on the client. There are clients with 1 server and 10 users, but there are also clients with 10 servers and thousands users. This makes it a challenge to quantify the CO_2 emission of ICT related to the hosting of servers.

3.1 Case study

To make it is possible to prepare a calculation a typical client of ICT is taken as example. This example is a simplified example of a real case of one of our customers. A client uses 10 servers with an average energy use of 250 Watt per server. The servers are on for 24 hours each day. The user time is estimated on 5 years. The CO_2 emission for hosting products based on the ICT perspective can be described as follows for each of the following life stages.

- Production, for this phase, the emissions of the necessary PC's and servers are the largest emission component. The LCA software SimaPro with Ecoinvent database gives a CO_2 emission of 263 kilogram for the production of a desktop computer. Assuming that a server has a comparable size as a desktop computer we consider the mission is also comparable. For the cloud also servers are needed. The CO_2 emission of these servers is expected to be slightly lower as the size of server parks increased the efficiency related to side devices.



- User phase, as the described client has an electricity consumption of 2,2 MWh on a yearly basis per server. This results in an electricity consumption of 110 MWh for the client for the lifetime of 10 servers. This results into a CO_2 emission of 50 ton CO_2. There are different sources which reduce the CO_2 by using the cloud as alternative for on-premise hosting. Microsoft gives a range from 30 to 90 %, depending on the situation. If this had chosen for the cloud the CO_2 emission reduced with 20 ton CO_2, assuming a 60% reduction (which is the average between 30% and 90%).

Azure Cloud oplossing: "Voor de Cloud Computing initiatieven van Microsoft worden bestaande datacenters zo efficiënt en duurzaam mogelijk gemaakt of klimaatvriendelijke datacenters gebouwd. Een recent onderzoek toont aan dat door de efficiency van de Microsoft datacenters bedrijven tussen 30% en meer dan 90% CO2 per user kunnen besparen als ze bijvoorbeeld mail, sharepoint of CRM niet on premises maar in de Microsoft cloud laten draaien.", bron http://www.be-init.nl/article/1481/co2-reductie-met-stichting-10-10-en-azure

The most important pillars for the energy efficiency of a cloud solutions are the following:

- Energy efficient data centres: needed scale size, favourable location and energy efficient supply these belong to the top of the most energy efficient data centres..

  See also:
  http://www.greenpeace.org/international/en/publications/Campaign-reports/Climate-Reports/How-Clean-is-Your-Cloud/

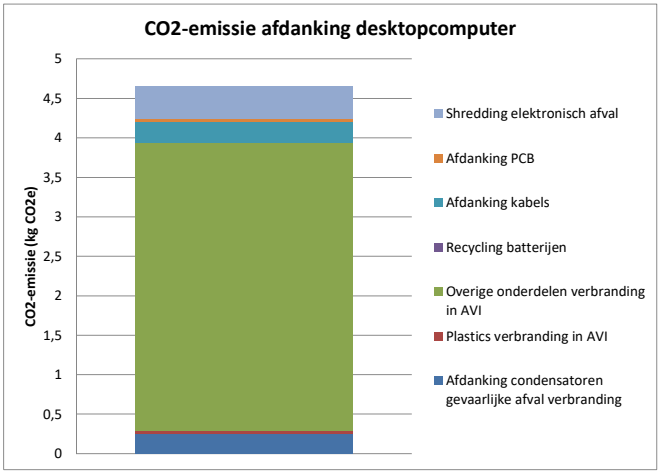
  https://www.cdproject.net/Documents/Cloud-Computing-The-IT-Solution-for-the-21st-Century.pdf

  http://www.google.com/green/

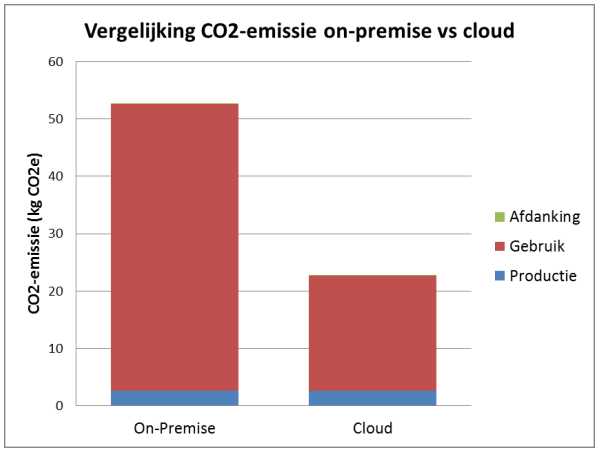
- Shared hard ware: every machine is maximally utilized by different clients;

- Scale: a server park for one organisation does not have to build for the required peak load.
- Elasticity: the scale of the required capacity can be adjusted every moment.

- Removing: To have an indication of the CO_2 emission related to the removing of a server we used the removing of a desktop computer as a basis. The data used is based on the LCA software SimaPro database Ecoinvent. The total CO_2 emission is 4,7 kilogram for each desktop computer. Assumming that a server and a desktop are comparable we also use this CO_2 emission for a server. This emission is very small compared to the production and user phases. We expect that the hosting in the cloud instead of on-premise hosting will give a lower CO_2 emission.



In the alongside figure a comparison between the different phases of the lifecycle of a hosting solution in the cloud and on-premise is recorded. Cloud hosting will give a reduction of 30 ton CO_2.



3.2 General considerations

Besides the individual case these are also various cases described in literature, see Appendix A. These cases provide a broad view on the possible reduction by choosing a cloud solution instead of an on-premise solution.
.

In the below table the most important figures are summarized. This aim of this table is provide a general view with respect to the possible reduction. For details the referenced document must be read.

Reference	Reduction
[2] Cloud computing: Grijs of Groen?	4.1.4: Virtualisation: 63%
[3] Carbon Disclosure Project Study 2011	P17: 13% .. 50% (2012 – 2020)
[4] Energy-Efficient Cloud Computing	P2: 20%
[6] CO2 reductie met Stichting 10:10 en Azure	30% - 90% CO2 reduction per user
[11] Report to Congress on Server and Data Center Energy Efficiency	P8: 20%
[12] Can Cloud Computing enable Carbon Abatement?	P19: >80% - 90% depending on the solution and company

4 CO_2 – Reduction targets

The influence of ICT on the CO_2 emission in the chain is mainly related to the possibility to convince customers during the advising projects to choose for our Cloud Sourcing proposition. For more information, refer to our website https://ict.eu/digital-transformation/cloud/.

4.1 CO_2 reduction target

Concrete CO_2 reduction targets are based on our role in the chain and related to our sphere of influence.

The use of a new software highly depends on the client and their end users. The projects ICT executes for the clients does have a heterogenous character. This means that every client has their unique character traits related to the needed hardware, functionality, the user intensity and the useful life.

The emission effect of our product in the chain and the possibilities to work out CO_2 reduction highly depend on the situation. Calculating a CO_2 reduction targets based on percentage CO_2 emission on a yearly basis is therefore not possible.

To concrete the reduction target and measure the CO_2 reduction we choose for activities by which ICT can influence the most. This is in the advising projects and the architecture design for clients and own initiatives to support this process.

Although a substantial reduction target in the chain cannot be calculated is further investment and expansion of the Cloud Sourcing proposition a target by which Target can contribute in CO_2 reductions.

The reduction targets for the coming years are based on the expectations with regard to new started commercial projects on a yearly basis based on our Cloud Sourcing proposition. In the below tablet he targets based on the expected number of project for the next 3 years are recorded.

Year	Number of projects	Potention reduction
2012	5	150 ton CO_2
2013	10	300 ton CO_2
2014	10	300 ton CO_2
2015-2020	5 every year	150 ton CO_2

For the realisation of this ambitious target ICT works on the following concrete investment projects to expand our Cloud Sourcing proposition.

4.2 Cloud Sourcing investments

ICT continues their investments in the Cloud Sourcing proposition. This investments has resulted in the following concrete products::

- GreenFlux – Portal
- On/off project
- Cloud Sourcing - Backup module
- Training in the Cloud
- Knowledge sharing

4.2.1 Greenflux - Portal

ICT invests in various 'green solutions', a good example is the partnership with GreenFlux.

GreenFlux is an operator and service provider for electric transport. They offer a country covered network of loading poles to make it possible to drive electric in the Netherlands.

As supplier of high quality technological solutions ICT can contribute in the area of information- and communication technology to develop systems for electric driving. ICT has a lot of experience in the development of products for the automotive industry and large scale information systems.

For the roll-out of electric vehicles a whole chain is needed, from the production of electric energy, the distribution of electricity to the electricity consumption in a car. ICT invests and cooperates in the development of systems for electric driving and under takes initiatives to develop the systems in a sustainable manner.

The cooperation includes the design, building and operational management of the GreenFlux Service and Operations Platform by which the loading pole network for electric driving is set up and managed.

Additionally, ICT realises the MyGreenFlux portal for the mobile electric driver. The Operations Platform takes care for the authentication and settlement with respect to the electricity delivery. The MyGreenFlux provides the possibility to give the user insight in the contribution in the reduction of fine dust emission and CO_2 emissions.

The portal solution is completely cloud based. For example for the website of the MyGreenFlux Portal a PaaS solutions is implemented on Windows Azure. The administrative functionality will be realised as a SaaS solution with SharePoint Online.

Together with GreenFlux ICT invests in the realisation of the portal. The details of the cooperation are confidential.

4.2.2 Cloud Sourcing – Backup module

Part of the Cloud Sourcing proposition will be a certain standard services as making a backup of application data and storage of data. This backup function makes it possible to recover functional errors. Therefore, ICT invests in the development of the Cloud Sourcing Backup module, which besides the functionality also records best practices and architecture policies for future modules.

4.2.3 On/off project

ICT delivers and develops various solutions by which companies which work via the cloud the costs of their machine park and/or services portfolio can significantly reduce. In this domain they can work with so-called virtual machines, cloud services and web apps which are completely accessible via the cloud. A disadvantage of the current available solutions is that these Cloud Services are permanently connected to the Internet and therefore a 24/7 connection must be maintained which is expensive. Therefore, ICT focuses on the following solutions:

- Automatic and/or adjustable turn on/off of cloud service without losing functionality;
- Remote on/off of applications in the cloud;
- Configurability of applications.

4.2.4 Training in the Cloud

Based on the Windows Embedded expertise ICT offers courses which enable the trainees to practice before and after the courses. By hosting the training environments in the cloud no physical machines like servers and laptops. Therefore, it is easier to provide courses on-site by the client so that trainees does not need to travel to a separate course location. ICT invests in the investigation and realisation to make this technical possible.

Based on the experience ICT is building up by developing the cloud based infrastructure for courses this can be scaled to client questions.

4.2.5 Knowledge sharing

By sharing internal publications, concepts, advantages and underlying technical principles are propagate to the ICT organisation.

5 Authorisation

	paraaf	datum
Frits Wuts – CO_2 Manager ICT Automatisering		17-11-2015
Femmy de Rijk – Marketing Manager ICT Automatisering		24-8-2012
Roy Jansen – Directeur ICT Automatisering		24-8-2012
Maxim Luttmer – Adviseur BECO		24-8-2012

Appendix A External sources and reports

To collect insights with regard to the CO_2 emission of cloud solutions and how these can be compared to on-premise solutions a sector broad look must be taken as individual cases are too limited.

Various sources are available, among others:

- [1] THE ENABLING TECHNOLOGIES OF A LOW CARBON ECONOMY
- [2] Cloud computing: Grijs of Groen? Over energie-efficiëntie en duurzaamheid van Infrastructure as a Service
- [3] Carbon Disclosure Project Study 2011, Cloud Computing – The IT Solution for the 21st Century
- [4] Energy-Efficient Cloud Computing
- [5] How Clean is Your Cloud? + Annex
- [6] CO2 reductie met Stichting 10:10 en Azure, zie http://www.be-init.nl/article/1481/co2-reductie-met-stichting-10-10-en-azure
- [7] http://www.greenpeace.org/international/en/publications/Campaign-reports/Climate-Reports/How-Clean-is-Your-Cloud/
- [8] https://www.cdproject.net/Documents/Cloud-Computing-The-IT-Solution-for-the-21st-Century.pdf
- [9] http://www.google.com/green/
- [10] GHG Protocol Product Life Cycle Accounting and Reporting Standard, ICT Sector Guidance, Chapter 5:Guide for assessing GHG emissions of Cloud Computing and Data Center Services Services
- [11] Report to Congress on Server and Data Center Energy Efficiency, Public Law 109-431
- [12] THE ENABLING TECHNOLOGIES OF A LOW CARBON ECONOMY. From Information Technology to Enabling Technology: A Scenario Analysis: Can Cloud Computing enable Carbon Abatement?
- [13] http://ict.eu/nl/pers/nieuws/artikel/ict-automatisering-en-greenflux-werken-samen-aan-elektrisch-vervoer-oplossing/
- [14] http://ict.eu/nl/pers/nieuws/artikel/ict-automatisering-versterkt-haar-focus-op-cloud-computing/
- [15] http://www.microsoft.com/environment/
- [16] http://www.globalfoundationservices.com/