ISAPP symposium

9 & 10 November 2016

Venue:

Art Centre Delft

Wednesday 9 November 2016

09:00	***09:30***	***Registration and coffee/tea***			
09:30	09:40	Braal	Richard	TNO	Welcome and short introduction
09:40	10:10	Brouwer	Jan	TNO	The value of cooperation
10:10	10:55	Hanea	Remus	Statoil	Asset implementation of ISAPP ideas and future outlook
10:55	***11:15***	***Coffee/tea break***			
11:15	11:45	Jansen	Jan Dirk	TUD	Closed loop reservoir management – next steps?
11:45	12:15	Barros	Eduardo	TUD	Value of information assessment for the Egg-model test case
12:15	12:45	Wilschut	Frank	TNO	Keep the fire burning: TNO's perspective on a post-ISAPP smart fields community
12:45	***13:30***	***Lunch***			
13:30	14:20	Kapteijn/ Kruijsdijk, van	Pieter/ Cor	TriGen Energy/ Shell	Smart fields: from a technical concept to a value adding O&G capability
14:20	14:50	Fatemi	Amin	TUD	Discern in situ performance of an EOR agent in the midst of geological uncertainty III: Norne field
14:50	15:20	Evensen	Geir	IRIS	Integrated reservoir modeling using multiple realizations
15:20	***15:40***	***Coffee/tea break***			
15:40	16:10	Meer, van der	Jakolien	TUD	Temporal oscillations in foam enhanced oil recovery simulation
16:10	16:40	Siraj	Mohsen	TUE	Robust online closed-loop approaches for reducing uncertainity in model-based water-flooding optimization
16:40	17:30	Essen, van/ Gelderblom/ Kaleta	Gijs/ Paul/ Gosia	Shell	10 years of quantitative reservoir management R&D in Shell
17:30		***Drinks***			
18:00		***Dinner***			

Thursday 10 November 2016

09:00	***09:30***	***Registration and coffee/tea***			
09:30	10:00	Hof, Van den	Paul	TUE	Systems and control in reservoir engineering: results and challenges
10:00	10:30	Stordal	Andreas	IRIS	Iterative ensemble smoothers in the annealed importance sampling framework
10:30	11:00	Vossepoel	Femke	TUD	Data assimilation for monitoring surface effects over producing hydrocarbon reservoirs
11:00	***11:20***	***Coffee/tea break***			
11:20	11:50	Twerda	Aris	TNO	The ISAPP program looking from a short-term production optimization point of view
11:50	12:15	Hanea	Remus/	Statoil	The adaptive pluri-gaussian simulation model
12:15	12:45	Fonseca	Rahul	TNO	Drill and learn: an efficient decision making workflow to assess value of learning under geological uncercainties
12:45	***13:30***	***Lunch***			
13:30	14:00	Popa	Tudor	TUD	Engineering localization approach for a synthetic field case
14:00	14:25	Shoeibi Omrani	Pejman	TNO	Future topics for research in short-term production optimization
14:25	14:55	Moraes	Rafael	TUD/ Petrobas	Analytical and stochastic multiscale gradient computation for reservoir management studies
14:55		Jansen/ Hegen	Jan Dirk/ Dries	TUD/ TNO	Closing
15:30		***Reception***			

ISAPP Symposium 9 and 10 November 2016

Programme Wednesday 9 November

09:30 - 09:40 **Richard Braal (TNO)**
Welcome and introduction

09:40 - 10:10 **Jan Brouwer (TNO)**
The value of cooperation

In 2004 Shell, TUD, NSM and TNO joined forces in the ISAPP program, a knowledge center focusing on an Integrated System Approach to Petroleum Production. Whereas the joint development of knowledge was typically executed through either bi-lateral cooperation (e.g., Shell and TU Delft in the VALUE project) or multilateral cooperation (e.g., projects as DELPHI) ISAPP was an exponent of a trend to conduct R&D by means of open innovation in knowledge clusters (other examples include the Dutch Polymer Institute (DPI), the Telematics Institute (TI) and the Holst Centre).
At the heart of the ISAPP innovation approach was the observation that E&P industry could no longer compete at the level of individual technologies, but would have to shift towards building a superior integration capability. This led to the adaptation of a networked approach to capability development where the selection of key partners and the effective management of cooperative relationships was seen as crucial to success. This paper will focus on the role of the partners in ISAPP, the individual value proposition of these partners and the value of cooperation.

10:10 - 10:55 **Remus Hanea (Statoil)**
Asset implementation of ISAPP ideas and future outlook
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10:55 - 11:15 ***Coffee / tea break***

11:15 - 11:45 **Jan Dirk Jansen (TUD)**
Closed loop reservoir management – next steps?

Established as a concept in 2004 at a workshop here at TU Delft, Closed Loop Reservoir Management (CLRM) has seen 12 years of continuous development. Some elements have developed faster than foreseen and are now state of the art among pioneers and fast followers in the industry; other elements have been a source of fascinating academic research but have failed to make it into practice until now. Also as a whole CLRM has not even come close to the stage of application that we had hoped for a decade ago. Is that a sign to abandon the idea, or to step up our efforts and try harder? I'll address my view on threats and opportunities for research in CLRM for the coming years.

11:45 - 12:15 **Eduardo Barros (TUD), Paul Van den Hof (TUE) and Jan Dirk Jansen (TUD)**
Value of information assessment for the Egg model test case

In the previous ISAPP symposia, we introduced a methodology to assess the value of information (VOI) of future measurements in the context of closed-loop reservoir management (CLRM). After implementing the VOI workflow for simple examples we concluded that large-scale applications would be impossible due to the extremely high computational costs. More recently, we have proposed to make use of clustering techniques to select representative models and drastically reduce the number of reservoir simulations required by the original procedure. In this talk, we present how these latest developments constitute a significant step to make VOI assessment possible for real-field applications, by showing the results obtained for the Egg model test case. To end my final participation (at least as a PhD student) in ISAPP meetings, we look at what is left to be done for VOI assessment to become more practical and I give an update on the preparations for my approaching graduation.

Programme Wednesday 9 November

12:15 - 12:45 **Frank Wilschut (TNO)**
Keep the fire burning: TNO's perspective on a post-ISAPP smart fields community

For more than a decade, research, development and application of smart field technologies have enjoyed the umbrella of the ISAPP consortium. This consortium guaranteed a smart fields community, next to other initiatives employed by ISAPP partners and stakeholders. At times, it has proven difficult for the partners, including TNO, to define their respective roles within the ISAPP community; at the same time, a lot of technological progress has been made through fruitful interactions between the scientists and closer cooperation between their organizations. In this contribution to this last ISAPP symposium, TNO presents a number of activities it is involved with that are aimed at 'keeping the fire burning', also in the post-ISAPP era. These activities, amongst others, include a new benchmark study on field development optimization, cooperation with the current ISAPP partners in 2017 and beyond, and initiatives to explore new market opportunities to further increase the smart fields playing field. Last but not least, new ideas will be presented that may have their relevance for application of smart fields technology for our society aiming to establish an energy transition.

12:45 - 13:30 ***Lunch***

13:30 - 14:20 **Pieter Kapteijn (TriGen Energy) and Cor van Kruijsdijk (Shell)**
Smart fields: from a technical concept to a value adding O&G capability
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14:20 - 14:50 **Amin Fatemi (TUD) and Bill Rossen (TUD)**
Discern in situ performance of an EOR agent in the midst of geological uncertainty III: Norne field

This study focuses on evaluation of effectiveness of a chemical enhanced-oil-recovery (EOR) process for a synthetic complex reservoir model by statistically analysing a number of injection and production well signals. It includes both uncertainty in the EOR process itself and in the reservoir description. Considering the complexity of EOR processes and the inherent uncertainty in the reservoir description, it is a challenge to discern the properties of the EOR agent in situ. We propose a case study to illustrate this challenge: a polymer EOR process designed for the modified "Norne Field". We study different scenarios where a polymer flood process could fail and try to discern this failure by utilizing different signals at injection and production wells. We start with an ensemble of reservoir models to represent the initial geological uncertainties and use the Ensemble Kalman Filter (EnKF) to update the ensemble by integrating 30 years of waterflood production data. We then simulate 30 years of polymer injection on the updated ensemble. We allow different scenarios where the polymer process might fail in situ and test whether the signals of this failure would be statistically significant in the midst of the updated geological uncertainty. Polymer breakthrough time and incremental oil arrival time give reliable indications of whether a polymer viscosity is maintained in situ.

14:50 - 15:20 **Geir Evensen (IRIS)**
Integrated reservoir modeling using multiple realizations

A major advantage of using Ensemble methods for data assimilation is that the assimilation system becomes completely independent of the model. The model can be defined as any set of actions or operations on a set of input parameters that result in an output, and the model can thus be treated as a black box. This property has been exploited in the ResX software by Resoptima as well as the Fast Model Update (FMU) reservoir modelling workflow that is being implemented in Statoil.

Given an automated modelling workflow, an ensemble framework provides an efficient mean for sensitivity and uncertainty studies, for assisted history matching, robust reservoir management and well planning, and for ensemble based optimization. The ensemble concept is applicable within many disciplines and the conditioning methods range from sequential ensemble-filtering methods to ensemble smoothers. Within reservoir applications the ensemble smoothers have proven to be extremely useful, since they provide additional flexibility with respect to the model used. In FMU and ResX the use of smoothers have supported big-loop model conditioning where geological model parameters are updated based on dynamical data.
Typically three different ensemble smoothers are currently used, including Ensemble Smoother (ES), the multiple data assimilation ES (MDAES), and ensemble random maximum likelihood EnRML. The current presentation will explain properties, similarities, and differences, between these three methods.

15:20 - 15:40 ***Coffee / tea break***

15:40 - 16:10 **Jakolien van der Meer (TUD), Matthias Möller (TUD) & Jan Dirk Jansen (TUD)**
Temporal oscillations in foam enhanced oil recovery simulation

Many enhanced oil recovery (EOR) processes can be described using partial differential equations with parameters that are strongly nonlinear functions of one or more of the state variables. Typically these non-linearities result in solution components changing several orders of magnitude over small spatial or temporal distances. The numerical simulation of such processes with the aid of finite volume or finite element techniques poses challenges. In particular, temporally oscillating state variable values are observed for realistic grid sizes when conventional discretization schemes are used. These oscillations, which do not represent a physical process but are discretization artifacts, hamper the use of the forward simulation model for optimization purposes. To analyze these problems, we study the dynamics of a simple foam model describing the interaction of water, gas and surfactants in a porous medium. It contains sharp gradients due to the formation of foam. The simplicity of the model allows us to gain a better understanding of the underlying processes and difficulties of the problem. The foam equations are discretized by a second-order finite volume method. Instead of using a standard interpolation procedure, we apply a tailor made finite volume method that incorporates the influence of the discontinuity caused by the foam generation. We introduce this method by applying it to a parabolic diffusion equation with a discontinuous coefficient. This technique is then extended to the foam model, reducing the oscillations drastically, but not removing them. We analyze this difference in behavior by performing a convergence study of the numerical scheme for each model.

16:10 - 16:40 **Mohsen Siraj (TUE)**
Robust online closed-loop approaches for reducing uncertainty in model-based water-flooding optimization

Model-based economic optimization of the water-flooding process suffers from high levels of uncertainty arising from the limited knowledge of model parameters and from strongly varying economic conditions. In this presentation, I will briefly summarize my PhD research, which focuses on developing novel robust optimization strategies to improve the performance of model-based decision making under both geological and economic uncertainty. We have considered two distinct solution trajectories to achieve our research objective. The first set of approaches aim at mitigating the negative effect of uncertainty aim at mitigating the negative effect of uncertainty in an open-loop situation. In the second solution direction, the main focus is to reduce uncertainty by using available information (production data in our case) in a closed-loop setting. A robust online closed-loop scheme is developed using the concept of residual analysis. The basic idea of residual analysis is to confront models in an ensemble with data and models are invalidated if they do not sufficiently agree with the observed data. A deterministic metric, i.e., Best-Fit Ratio (BFR) is used to define the invalidation test. An adapted ensemble is formed with only those models that are not invalidated thus providing a less conservative description of uncertainty with a reduced number of models in an ensemble. The adapted ensemble is used in a robust optimization in an online fashion.

16:40 - 17:30 **Gijs van Essen (Shell), Paul Gelderblom (Shell) and Gosia Kaleta (Shell)**
10 years of quantitative reservoir management R&D in Shell

In this talk we will look back at 10 years of Quantitative Reservoir Management research in Shell and its effect on the business. The collaborations with Delft (ISAPP1 and Recovery Factory) have been important for the R&D executed in Shell in this field. Assisted History Matching and Well Location Optimization are successfully being deployed in Shell as they can easily be fitted in existing workflows and value gained can be demonstrated. These can be considered point solutions: they improve one step of an existing workflow. More pervasive methods like Big Loop or Closed Loop reservoir management are harder to get broadly accepted. They require integration between different disciplines and significant time investments from already overloaded staff. Also, the idea of frequent model updates does not fit easily with the existing technical assurance process.
Our current work is focused on delivering to the business now: contributing to cost reductions and improvements in capital efficiency are paramount in the current low oil price climate. For the longer term, we are working on extending the optimization technology towards pattern optimization, applying Machine Learning technology in our field, and improving uncertainty quantification to support operational decisions.

17:30 ***Drinks***

18:00 ***Dinner***

Programme Thursday 10 November

09:30 - 10:00

Paul Van den Hof (TUE), Jan Dirk Jansen (TUD), Siep Weiland (TUE), Edwin Insuasty (TUE) and Mohsin Siraj (TUE)
Systems and control in reservoir engineering: results and challenges

The development of systems and control techniques for application in model-based operations of hydrocarbon reservoirs, has led to interesting contributions to the reservoir engineering field. The underlying problem of decision making under uncertainty while considering a dynamic process that is large-scale, highly complex, nonlinear, batch and with limited measurements and highly uncertain models, constitutes a tremendous challenge. As a result only partly solutions and contributions are achievable. In this presentation we will highlight a couple of our recent contributions, in particular related to the use of spatio-temporal (tensor) modelling tools for reduced-complexity modelling in reservoir optimization problems. By focussing on the spatial-temporal flow-relevant behaviour of the models, attractive clustering methods become available for clustering models with related behaviour. It will be shown how these tools can be effectively used, both in robust optimization and in parameter estimation (history-matching) problems. Additionally some open challenges will be discussed.

10:00 - 10:30

Andreas Stordal (IRIS)
Iterative ensemble smoothers in the annealed importance sampling framework

Iterative ensemble techniques for solving inverse problems has recently gained a lot of interest in many geophysical communities. This popularity is attributed to the simplicity of implementation, general reliability and the ability to deal with the forward model as a black box without requiring the implementation of analytical gradients. Although several variants exist, the focus is on the ensemble smoother with multiple data assimilation. This study highlights the similarity between the ensemble smoother and other existing techniques such as particle flow and annealed importance sampling. It is shown how a sequential Monte Carlo sampler can be used in combination with an annealing process to weight-correct the sampling procedure used in the ensemble smoother. Two different approximations in high dimensions, where the curse of dimensionality is unavoidable, are also presented. The methods proposed are compared with an MCMC run on a synthetic reservoir model.

10:30 - 11:00

Femke Vossepoel (TUD)
Data assimilation for monitoring surface effects over producing hydrocarbon reservoirs

With increased usage of enhanced oil recovery techniques such as steam injection and fracking, and rising concerns about the impacts of hydrocarbon production on our environment, there is a growing need for surveillance of producing reservoirs. This paper discusses how data assimilation of surface and subsurface data can optimize production and at the same time minimize environmental risks. Two examples will be presented from a recent ISAPP project in which gravity data have been assimilated into operational reservoir models. In one case, a focusing inversion methodology is applied to monitor the steam front of a thermally-assisted gas-oil gravity drainage. Special attention is paid to the separation of the production signal from shallower ground-water fluctuations. The second case discusses the use of the Ensemble Smoother to estimate aquifer support in a gas-producing reservoir offshore [Glegola et al, 2013]. Both examples emphasize the complimentary nature of the surface gravity data to the subsurface production data, and how they help to separate the effects of different subsurface processes. Taking the work of Glegola et al one step further, ongoing research focuses on the use of geodetic satellite observations and subsurface data to monitor production processes that lead to surface motion. Applications include the monitoring of 'heave' or surface uplift in steam injection, preserving cap-rock integrity, and monitoring of subsidence and induced seismicity over gas-producing reservoirs. The use of particle methods is being studied to assimilate data in the coupled dynamical and geomechanical system. Again, the separation of shallow and deeper causes of surface motion will be addressed.

Programme Thursday 10 November

11:00 - 11:20 ***Coffee / tea break***

11:20 - 11:50 **Aris Twerda (TNO)**
The ISAPP program looking from a short-term production optimisation point of view

The work that TNO has done in ISAPP production optimisation was not only focused on the long term but also contained coupling to short term production issues, looking at particular well in conjunction with long term production strategies. Specific issues that were addressed were, o.a. gas coning , wax and asphaltene deposition. The usage and operation of smart wells which are equipped with ICVs and/or ICDs was also addressed as a topic of research. This talk will give an overview of the work performed and lessons learned.

In order to address coupled short term and long term issues which interact at a given length and time scale, a dynamic coupling between a reservoir model and a well flow model was developed. Coupled simulations were then setup for a number of problems such as for example gas coning to see how short term actions (ex. shutting down the well intermittently) can affect long term recovery. The result of these activities provided valuable insight in –the physical effects and provided a tool to assess different productions strategies such as intermittent, gas flow controlled or the placement of ICDs, enabling not only to compare them on short term gains but also on long term compatibility. Also flow assurance issues relating to wax and asphaltene were investigated.

One important lesson learned is that field data needs to be carefully treated to be used for such modeling activities, opening the door for new development for automated data assimilation and processing techniques. Getting the results from the study to the fields also requires commitment from operators which is not always available. Also, the developed approach is only relevant for problems where time and length scales of both reservoir and well flows interact. However, this is becoming more and more the case, for example with tertiary recoveries of oil reservoirs, where (polymer or CO_2) flooding of the reservoirs are accompanied with near well bore effects such as asphaltene precipitation and deposition within the wellbore itself, all of which occurring within a similar time scale.

11:50 - 12:15 **Remus Hanea (Statoil) and Bogdan Sebacher (TUD)**
The adaptive pluri-gaussian simulation model

In the reservoir exploration phase, different types of information are gathered and used for a reliable geological description. Combining seismic data, well log analysis, statistical rock physics or even paleobathymetry ranges, several methods have been proposed to estimate a probability field for each facies type in the reservoir model. However, these probability fields are typically not conditioned to the reservoir production history. Once the reservoir starts production new information becomes available, and an update of the probability fields is needed. The work presented here introduces a new framework for simulation of facies fields in the context of pluri-gaussian simulation where the facies fields are conditioned to the prior probability fields provided. The methodology is based on the probability integral transform, and the topological characteristics of the facies types (number of the facies type and relative position among faqcies types). The new method generates an ensemble of facies fields that honor the facies distribution as described by a probability field. The new proposed method can easily condition the facies field to hard data and preserve the facies field during history matching in an ensemble based framework.

Programme Thursday 10 November

12:15 - 12:45 **Remus Hanea (Statoil), Pierrick Casanova (Statoil), Lars Hustoft (Statoil), Rohith Nair (TNO), Chris Hewson (TNO) and Rahul-Mark Fonseca (TNO)**
Drill and learn: An efficient decision making workflow to assess value of learning under geological uncertainties

The goal of reservoir management is to make decisions with the objective of maximizing the value creation from the oil or gas production. In order to do this models that preserve geological realism and have predictive power are being developed and used. These models are commonly calibrated by using Assisted History Matching (AHM) which, in general, will lead to reduced uncertainty in the predicted production compared with the no-history matching case. However, although uncertainty assessment and reduction is often an element of high-quality decision making, it is not, in itself, value-creating. Value can only be created through our decisions and any decision changes resulting from AHM should be modeled explicitly. Recently there has been a spurt in the application and understanding of Value of Information workflows for reservoir management. In this talk we present a comparison of existing workflows and point out the differences between them. Following this we introduce Drill and Learn, a practically driven approach with elements and concepts from existing workflows to quantify the Value of Learning. The difference and definitions of Value of Information and Value of Learning are also presented. Ensemble methods (ES-MDA and StoSAG) are used for the history matching and optimization loops. The results presented are obtained by applying our proposed Drill and Learn workflow on a realistic synthetic case. Sensitivities to the amount of information obtained before a closed loop exercise is performed is also investigated. We show the benefit of performing the closed loop approach to quantify the value of learning (VoL) to modify field development decisions which leads to a mature robust decision making framework.

12:45 - 13:30 ***Lunch***

13:30 - 14:00 **Tudor Popa (TUD) and Remus Hanea (Statoil)**
Engineering localization approach for a synthetic fields case

In reservoir characterization, modern reservoir modelling and history matching aim at delivering integrated models with quantified uncertainty, constrained on all available data. In this work the quantification and propagation of the uncertainties is done by using an ensemble based algorithm: the Ensemble Kalman Smoother (ES).
Ensemble size is critical to the efficiency and performance of the ensemble based methods. A consequence of the finite dimension of the ensemble is sampling errors. These can severely degrade the reliability of estimates of conditional means and uncertainty quantification obtained by the ES.
The two most common solutions are localization and inflation. The localization approach solves the problem of spurious correlation by reducing the influence of the observations on the parameters of interest. This can be achieved by either directly influence the error covariance matrix (covariance localization) or by influencing locally the update equation of the ES (local analysis).
The work presented here introduces a new localization scheme derived from region based localization (engineering approach), implemented as a local analysis, with the scope of ensuring that the dynamics, the physical process and the influence of the structure of the reservoir are preserved throughout the process. The model is broken down into regions based on the different parameters, e.g geology(layers), structure(fault blocks), uids(oil vs gas). Within each region the relevant observations and parameters are selected. All other correlations are neglected (treated as spurious). The new methodology is implemented in the Ensemble Reservoir Tool (ERT) from Statoil and it is applied to the synthetic Reek field case. The localization is applied over the faulted region of the E sector of the field.

Programme Thursday 10 November

14:00 - 14:25 **Pejman Shoeibi Omrani (TNO)**
Future topics for research in short-term production optimization with the focus on "Better use of data to accurately predict, monitor and optimize production from mature assets"

Most operators (at the North Sea) are dealing with oil and gas wells at the tail-end of production life. Problems such as liquid loading or well and reservoir fouling (e.g. salt precipitation) are serious issues that the industry is facing, as the gains in production and reductions in costs that can results from proper detection, prevention and mitigation of these issues is significant. However, current detection and mitigation measures are not as timely as they could be, resulting in non-optimal production and sometimes cessation of operation. Traditionally, physics-based and data-driven models were developed for short term production prediction and optimization. However, the prediction of production instabilities and upsets remains challenging. One of the challenging features corresponding to mature assets is the production transients, e.g. during intermittent production. Currently, most of the models fail to predict the production trends during the well restart or intermittent production which makes it a topic for future research. Additionally, modelling the chemical treatment of downhole liquids to enhance the production, such as foamer or corrosion inhibitors injection or acid jobs are listed as relevant topics from the physical modelling point of view. Besides, large amount of data is generated during E&P activities and is not always fully used. It could potentially be used to (1) improve the quality of modelling and prediction and (2) understanding or deriving new correlations. New developments are therefore foreseen in better usage of data to predict the production performance, in other words, utilizing historical and real-time data to better predict the performance of the asset and maintenance cycles. These approaches could be employed either in using data to generate black-box models or combine the data with physical models (grey-box approach). Currently, several solutions are being offered to market for big data analytics by IT and consultancy companies of which the pros and cons need to be thoroughly explored. Another challenge in employing data for physical or data-driven models is the veracity of the data used. Risk management and analysis for short term production is crucial and is strongly dependent on the quality of data. The main research question is: how the uncertainty in process conditions (aleatory) or choice of model (epistemic) could affect the simulation outputs and consequently the operational decisions. Since, the number of uncertain parameters could be significantly large, there is a need to develop methods to efficiently propagate uncertainties without compromising the accuracy in uncertainty analysis.

14:25 - 14:55 **Rafael Moraes (TUD), Jan Dirk Jansen (TUD) and Hadi Hajibeygi (TUD)**
Analytical and stochastic multiscale gradient computation for eeservoir management studies

Closed-loop Reservoir Management (CLRM) relies on computationally demanding optimization algorithms. More specifically, the data assimilation and life-cycle optimization steps require multiple simulations of the reservoir model. Multiscale (MS) reservoir simulation is a technique that solves a coarser simulation model, thus increasing the computational speed up, while still utilizing the fine scale representation of the reservoir. In this presentation we address the MS gradient computation utilizing both analytical and stochastic approaches. Numerical experiments illustrate the promising speed up obtained by the MS gradient computation strategies. The challenges on both approaches are discussed, as well as the direction of future developments.

14:55 **Jan Dirk Jansen (TUD) and Dries Hegen (TNO)**
Closing

15:30 ***Reception***