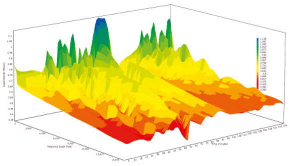
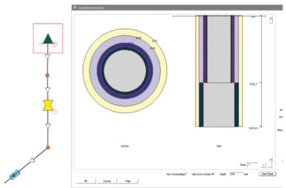
GAP Transient

TRANSIENT MULTIPHASE NETWORK MODELLING

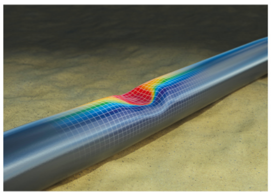
TRANSIENT MULTIPHASE NETWORK FLOW



TRANSIENT THERMAL MODELLING

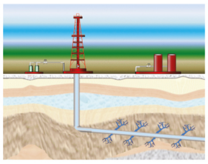


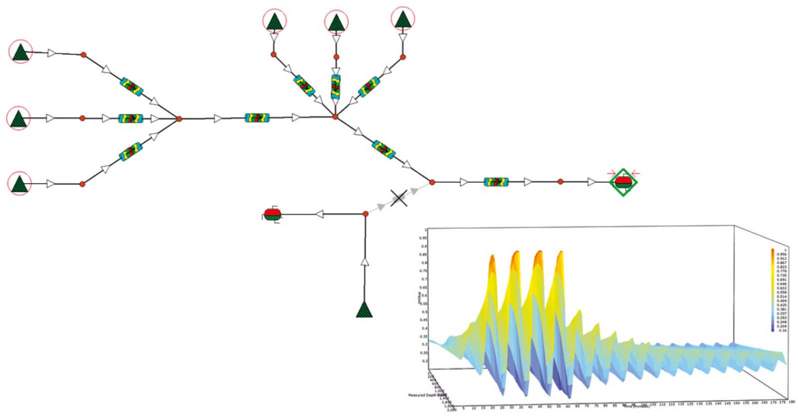
FLOW ASSURANCE STUDIES



VISUAL WORKFLOW INTEGRATION

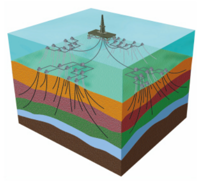
TRANSIENT RESERVOIR PERFORMANCE



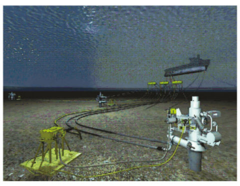


EQUIPMENT INTEGRITY

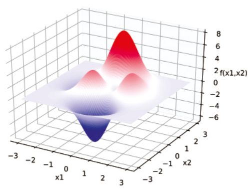
INTEGRATION WITH STEADY-STATE



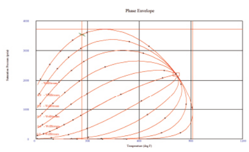
INTIALISATION FROM FIELD CONDITIONS

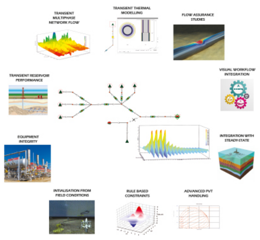


RULE-BASED CONSTRAINTS



ADVANCED PVT HANDLING

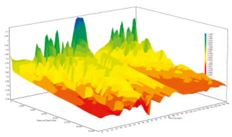




GAP Transient

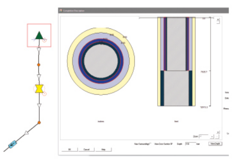
TRANSIENT MULTIPHASE NETWORK MODELLING

TRANSIENT MULTIPHASE NETWORK FLOW



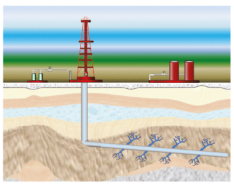
Transient multiphase flow modelling studies are typically performed by specialist teams and software in ad-hoc studies if/when there are specific flow assurance aspects that are suspected. **GAP Transient** extends the production engineering toolkit allowing a seamless integration between the state-of-the-art integrated modelling capabilities of the **IPM tools** and transient multiphase flow models. **GAP Transient** ensures that the relevant boundary conditions and physics are fully captured; integrating the knowledge and experience of the specialist transient modelling studies in one place for field management, optimisation, forecasting and development studies. This allows **GAP Transient** to bring transient modelling into the everyday tasks which are performed in the industry standard **IPM toolkit**.

TRANSIENT THERMAL MODELLING



When working in short timescales (as is required in transient flow calculations), it becomes vital to capture the complex exchange of heat between the fluid and the surroundings in a more detailed manner. **GAP Transient** harnesses all the existing functionality of **PVTp** and **PROSPER** to model complex fluids as well as the ability to model detailed well and pipeline completions. Detailed annuli, insulation, burial and annular fluid descriptions allow the physics critical to the thermal response of the well to be calculated. The results of these calculations, such as pressurisation of the annulus during well start-up, can be captured and included in well integrity calculations.

TRANSIENT RESERVOIR PERFORMANCE



Transient wellbore and flowline models require accurate boundary conditions to capture the physics and changes which will happen in the field. Using the Transient Inflow Performance Relationship models which are used throughout the **IPM suite**, the transient multiphase flow models in **GAP Transient** can be integrated directly to the transient reservoir response.

This integration allows the early-time response of the reservoir to be modelled more accurately providing more accurate results in transient flow models as this early-time response can dominate the timescales of the transient model.

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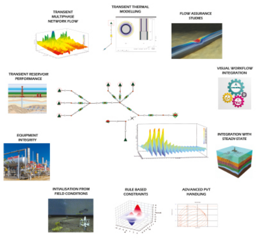
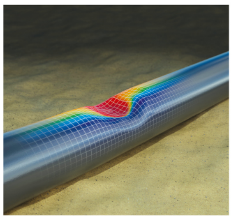


GAP Transient

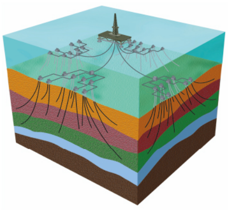
TRANSIENT MULTIPHASE NETWORK MODELLING

FLOW ASSURANCE STUDIES



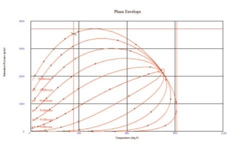
Flow assurance studies centre on the detection of specific phenomena that are a function of the fluid PVT or pipeline hydraulics (e.g. terrain induced or hydro-dynamic slugging, liquid loading, wax or hydrate formation etc.). **GAP** utilises the existing functionality of the IPM suite to detect these phenomena across the entire surface network and provide information that will address flow assurance challenges over time. **GAP** (using steady-state) can very quickly and easily be converted into transient models to be run using **GAP Transient** which extends this functionality into the realm of dynamic multi-phase flow modelling; seamlessly switching between steady-state and transient modelling to allow the engineer to optimise and forecast using the state-of-the-art integrated modelling capabilities of **GAP** and then evaluate the dynamic response of any optimisation strategies that are determined or flow assurance aspects that are predicted.

INTEGRATION WITH STEADY-STATE

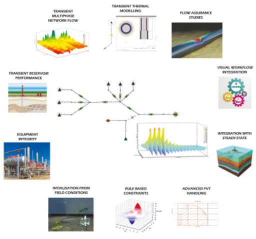


The different time-scales used in transient (minutes/hours/days) and steady-state (weeks/months/years) modelling tools mean that the two approaches can be complementary when used correctly. Models in **GAP** (using steady-state) can very quickly and easily be converted into transient models to be run using **GAP Transient**. This allows transient flow calculations to be triggered at different points within a longer scale steady-state run and use the conditions calculated by the steady-state model (such as fluid and reservoir conditions) to be used as the conditions of the transient model. Late life flow assurance studies (such as riser stability) can therefore be more accurately modelled due to the complementary use of the two approaches.

ADVANCED PVT HANDLING



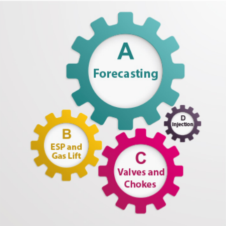
GAP Transient has been designed to handle different PVT descriptions that are used in the reservoir, wells and surface network. In addition to both Black Oil and Equation of State models, **GAP Transient** can utilise the Black Oil Compositional Lumping/Delumping PVT model to exploit the advantages of both the EOS and black oil models without their inherit weaknesses.



GAP Transient

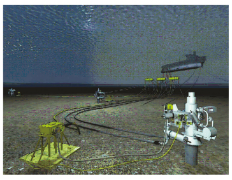
TRANSIENT MULTIPHASE NETWORK MODELLING

VISUAL WORKFLOW INTEGRATION



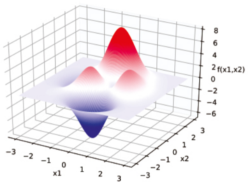
GAP Transient can be integrated with **RESOLVE** and the **Digital Oilfield** to add field management logic to models and real-time systems. Using the cutting edge **Visual Workflow** platform, field logic can be added to control the model without the need for any programming or coding by the engineer. Actions (such as opening of new well or rerouting of a pipeline) can be performed based upon the results of the dynamic calculations. This allows, for example, for a new well to be unloaded into a test separator before a **Visual Workflow** will re-route it to the main flowline when the kill fluid has been fully removed.

INTIALISATION FROM FIELD CONDITIONS



GAP Transient calculations can be initialized from both steady-state or static conditions depending upon the scenario being run. Different parts of the model can be initialised from different states if required. For example, if the start-up of a new well is being evaluated, then the current network (of both wells and pipelines) can be initialized from steady-state while the new well can be initialized from static conditions.

RULE BASED CONSTRAINTS



GAP Transient has access to the Rule Based Network Solver (RBNS) which is used extensively within **GAP** to control models to meet certain constraints applied to the system. This allows the engineer to place constraints on the model and have **GAP Transient** find the controls required to meet these targets for the duration of the transient simulation.