Petroleum Experts

IPM and DOF Enhancements

IPM 10 / IFM 4.1 / IVM 7

GAP

MULTIPHASE NETWORK MODELLING AND OPTIMISATION

INTEGRATED PRODUCTION AND INJECTION NETWORKS

EQUATIONS BASED SOLVER

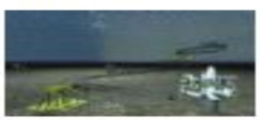
$$\begin{bmatrix} a_{1,1} & a_{1,2} & a_{1,3} & \cdots & a_{1,n} \\ a_{2,1} & a_{2,2} & a_{2,3} & \cdots & a_{2,n} \\ \cdots & \cdots & \cdots & & \cdots \\ a_{m,1} & a_{m,2} & a_{m,3} & \cdots & a_{m,n} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \end{bmatrix}$$

NON-LINEAR OPTIMISATION

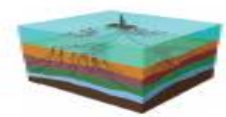
UNCONVENTIONALS

RULE BASED CONSTRAINTS

FLOW ASSURANCE

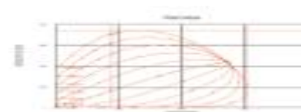


WELL PERFORMANCE



SURFACE EQUIPMENT MODELLING

ADVANCED PVT HANDLING



IPM 10 Development for GAP

Developments for GAP can be split into 3 categories:

- **Calculation enhancements – related to the solver, optimiser and pressure/rate response options**
- **Engineering Enhancements – new engineering calculations and features (e.g. new items)**
- **GAP structure and data handling enhancements – user input/output**

IPM 10 Development for GAP

Calculation enhancements:

- **Parallelization**
- **In many cases we see a 2x to 4x gain in calculation time.**
- **Gains will be model specific and will still require sound models.**
- **External DLLs are not being parallelized**

IPM 10 Development for GAP

Calculation enhancements:

- Rule Based Method extension for injection systems with tank constraints
- Rule Based Method impurity constraints
- Rule Based Method min API (max. oil density) constraint
- New constraints added to wells
- VLP generation will continue if an error is encountered during batch generation. An error will be flagged to the user upon completion
- MWA enhanced to match on gas composition

IPM 10 Development for GAP

Engineering enhancements:

- New GAP items:
  - Heat Exchanger
  - User Defined Element
- New Fluid property options:
  - New PVT correlation (inline with rest of IPM)
  - Pressure corrected water viscosity
- Choke Calculation options in GAP
  - IPM 10 will allow the user to output choke size calculations from the calculated ΔP
- Flow Assurance Enhancements (accessible from main screen)
- Gas Coning Model Enhancements

IPM 10 Development for GAP

Data handling – input/output enhancements:

- Compressor curves entered as ratio or energy
- New Equipment results ‘tool-tip’ options: custom results
- Pipe results reported using pipeline terminology
- Transfer IPR data and rel. perms from MBAL
- Decline curve or production layer data: User can add more rows to table
- Number of pipe segments allowed increased to 500
- Edit Equipment Controls validation flags added to alert user to issues
- Number of active wells in a system reported

IPM 10 Development for GAP

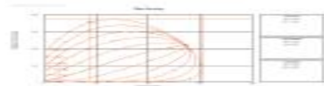
Data handling – input/output enhancements:

- Layer and tank cumulative rates for fractional flow table supported
- Power fluid rate for jet pump wells reported as result
- Tank name provided to user if issue during validation
- Prediction start and end times reported
- GAR file size support extended

PROSPER

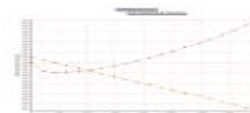
MULTIPHASE WELL AND PIPELINE NODAL ANALYSIS

FULLY COMPOSITIONAL

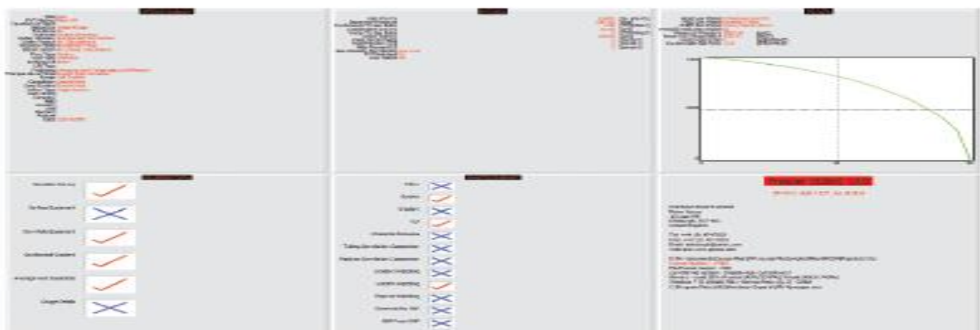


WELL AND PIPELINE MODELS

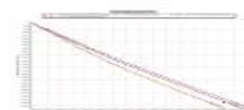
INFLOW/OUTFLOW RESPONSE



STEAM WELLS



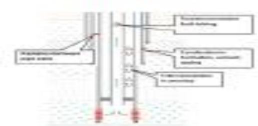
OUTFLOW (VLPs) MODELS



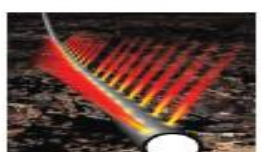
FLOW ASSURANCE

ARTIFICAL LIFT SYSTEMS

THERMAL MODELLING

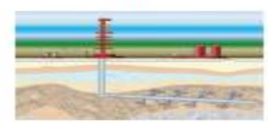


PERFORATION DESIGN AND PERFORMANCE



MULTILATERAL COMPLETIONS

INFLOW (IPRs) MODELS



IPM 10 Development for Prosper

- Flow Assurance Developments
- Artificial Lift Developments
- CBM Well Type Developments
- Other

IPM 10 Development for Prosper

– Flow Assurance Developments

- DNV Erosion Model
- NORSOK CO2 Corrosion Model
- New Slug Model PE5
- Slugcatcher (two phase separator) model
- Severe slugging/stability criteria
- Pipeline thermal gradient option
- Flow assurance warning plotting(Hydrate, wax etc.)
- Flow assurance for any rate in VLP or system calculation (Sensitivity PvD extension)
- Pipeline Only Nomenclature option

IPM 10 Development for Prosper

- Artificial Lift Developments
  - Transient Gas Lift Simulator
  - Gas lift adjustments with Thornhill-Craver de-rating.
  - Modeling of venturi type valves (Design/Quicklook/Adjustment).
  - Publishing of the GVF for HSP and ESP wells.

IPM 10 Development for Prosper

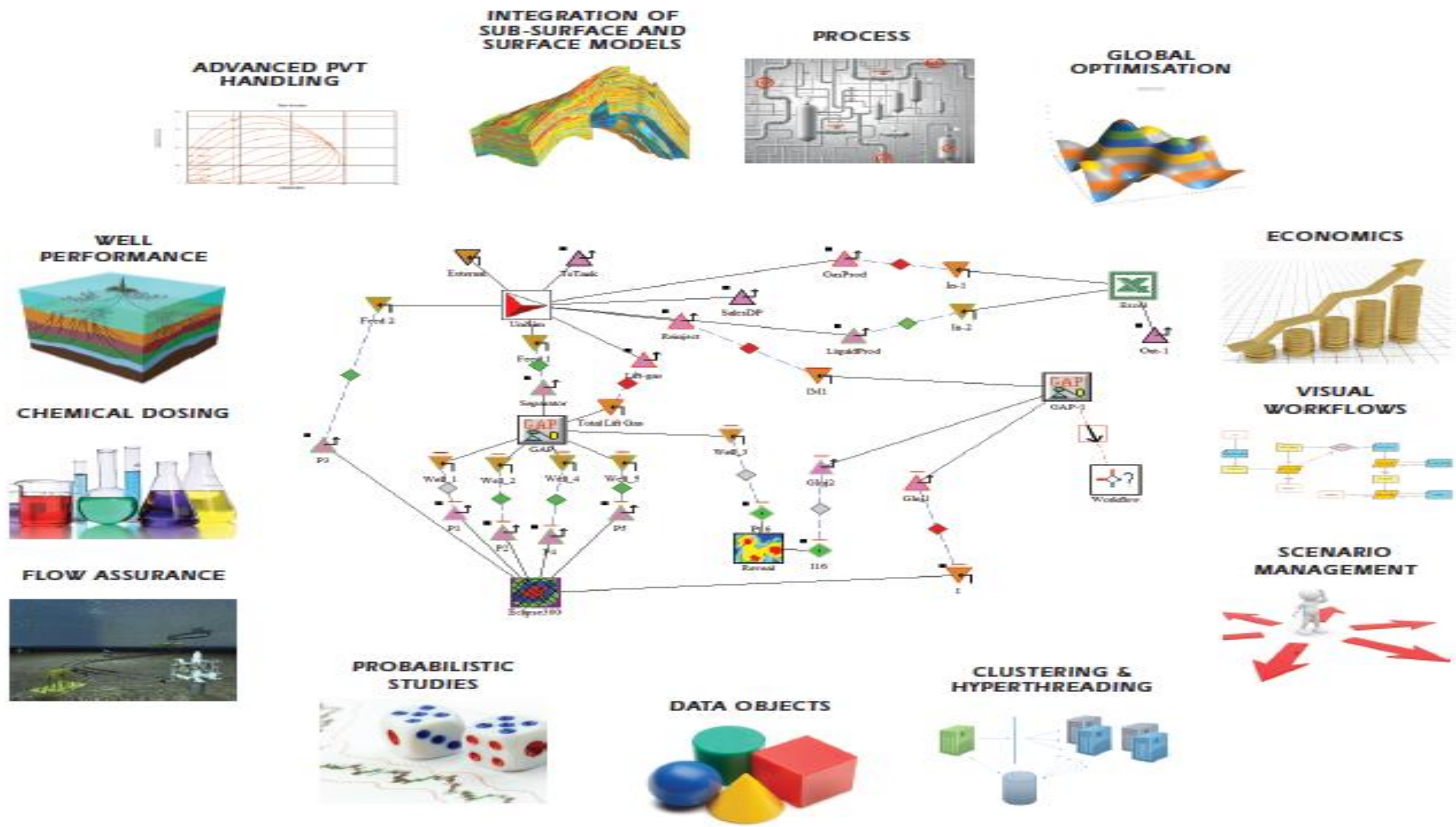
- CBM Well Type Developments
  - PCP wells with sucker rod drive for CBM wells
  - Naturally flowing CBM well
  - Improvements to visualization of the pump performance plots

IPM 10 Development for Prosper

– **Other**
  - **New Heavy oil PVT correlation (Ghetto *et al*) for Pb, Rs, FVF and Viscosity**
  - **Improvements to plotting**
  - **Added an emulsion match command**
  - **Added the gauge pressure to the reporting of the system calculation**
  - **Improved file name display in task and title bar**
  - **Button to transfer the viscosity coefficients from gas to oil for EoS (LBC with coefficients)**
  - **Improvements to the cases and sensitivity interface**
  - **Clarification of multilateral inputs**
  - **Changes to gravel pack model (Perf Interval)**

RESOLVE

ADVANCED INTEGRATION
A VENDOR NEUTRAL SOLUTION FORMULATION PLATFORM



IPM 10 Development for RESOLVE

- **Most features can be made commercial relatively quickly**
  - **Functionality added through implementation of data objects**
  - **Highly modular architecture**

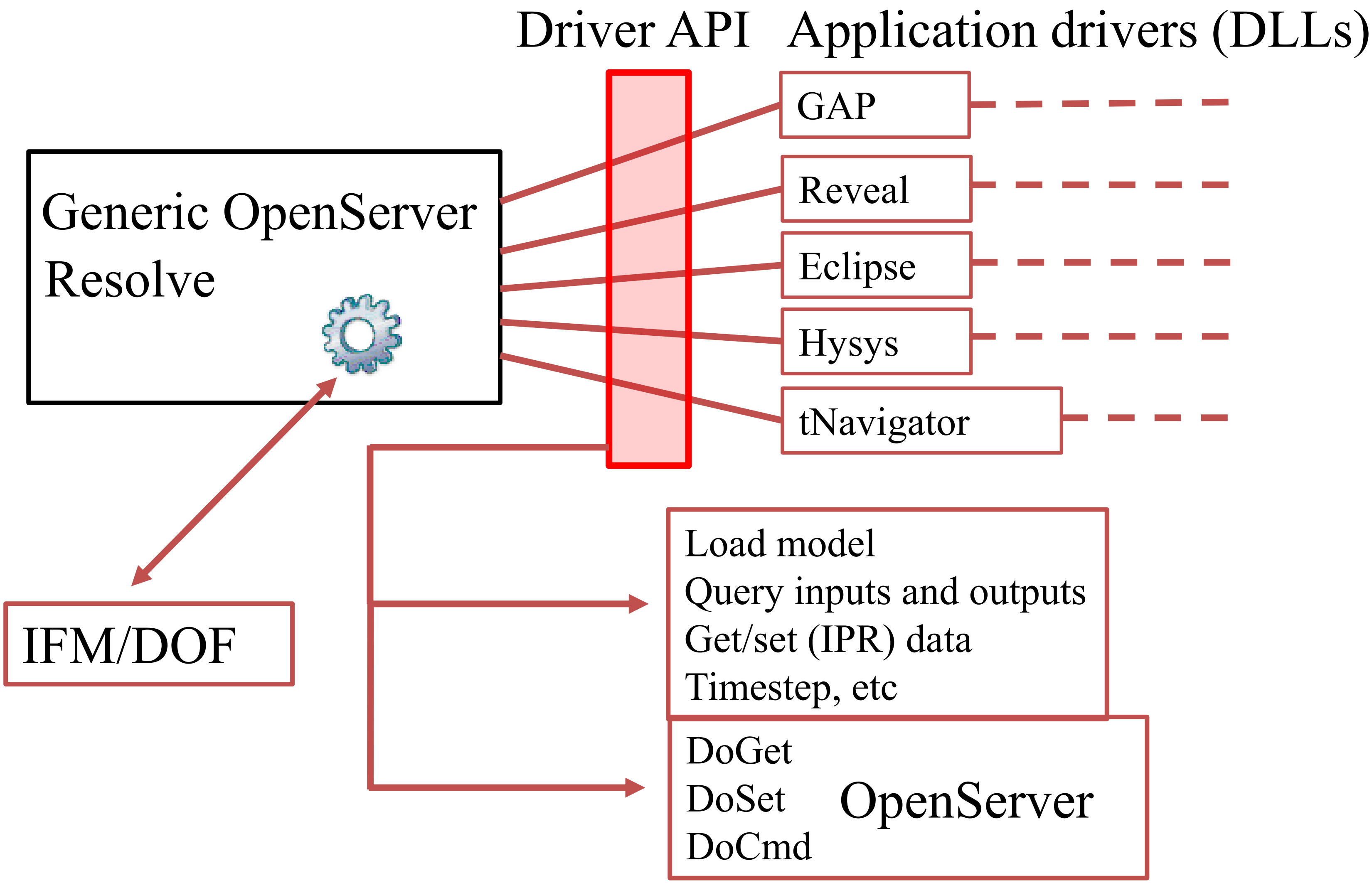
- **Most of the developments discussed today have been added to the IPM9 commercial release**

- **Changes or additions to the underlying engines need to wait for a major release**
  - **These are now relatively rare**

IPM 10 Development for RESOLVE

- **New drivers**
  - **Reservoir simulators**
    - **T-Navigator - RFD**
    - **Tempest - Emerson**
  - **Process models**
    - **Proll – Invensys**
- **All drivers have full 'Generic Open Server' functionality built in from the start**

Generic OpenServer



IPM 10 Development for RESOLVE

- New Drivers
- All drivers have full ‘Generic Open Server’ functionality built in from the start
  - DOF workflows can be built which automate the application in isolation, without needing to go through RESOLVE
  - Where this didn’t exist in the existing drivers, it has been back-fitted
  - The Generic OpenServer is truly ‘generic’

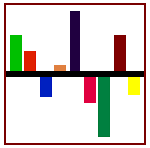
IPM 10 Development for RESOLVE

- **All drivers are fully cluster enabled**
  - **New drivers, and back-fitted to old drivers if necessary**
  - **If a model is run under the cluster, the driver detects this and will take appropriate action, e.g. will copy the data file if required**
  - **Includes Unisim and Hysys**
    - **Hysys will only work in ‘exclusive’ mode**

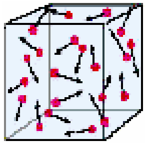
IPM 10 Development for RESOLVE

- New data objects – 'statistical'
  – Case manager

  – Sensitivity tool



  – @Risk (Palisade)
  – Crystal Ball (Oracle)
  – Stochastic optimisation
    - in development, to be reviewed



IPM 10 Development for RESOLVE

- New data objects – ***REVEAL***
  - SAGD

  - ICD analysis

  - Water chemistry
    - Main object

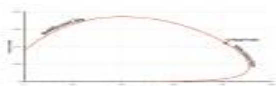
    - Mixer

    - PVT mixer

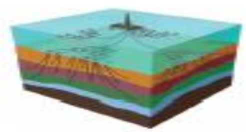
REVEAL

SIMULATOR FOR SPECIALISED RESERVOIR STUDIES

COMPLEX FLUIDS



ADVANCED WELLS

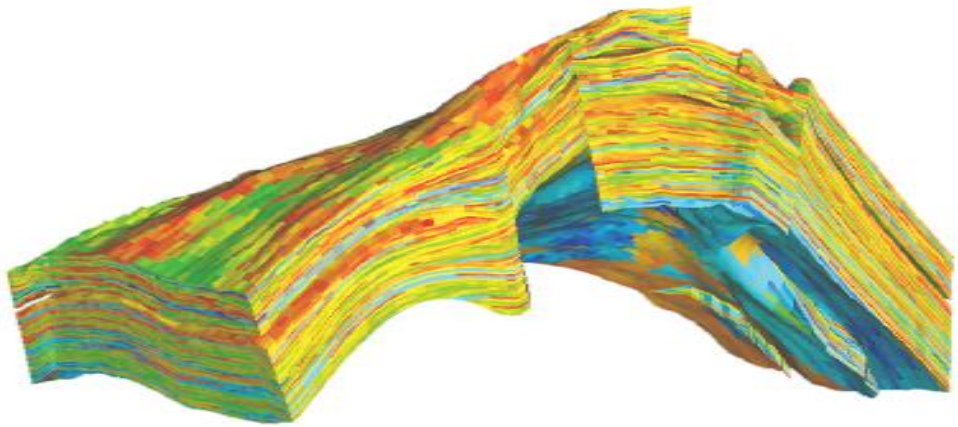


TEMPERATURE

GEO-MECHANICS AND FRACTURES

SCALE

ROCK FAILURE AND SAND GENERATION

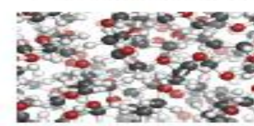


WATER CHEMISTRY

FILTERCAKE

STEAM

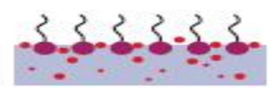
POLYMERS / GELS



ASPHALTENE / WAX

BACTERIAL SOURING

SURFACTANTS



IPM 10 Development for REVEAL

- New Models:
  - Dedicated compositional flash calculations
  - Polymer shear and thermal degradation

IPM 10 Development for REVEAL

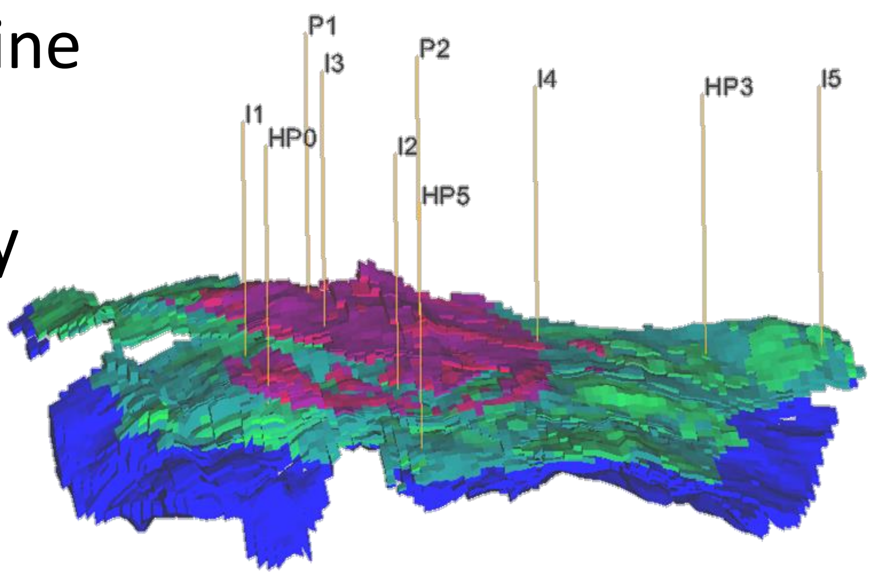
- End point scaling
- Thermal transmissibility control, including NNCs
- Water vapour model
- Well solver options
- Generalised AICD model
- Coupling SAGD models to surface network
- Water chemistry engine updated for new database

IPM 10 Development for REVEAL

- Oil water capillary pressure scaling
  - Maximum capillary pressure scaling
  - Initial water saturation scaling
  - By block, thermal or salinity end point scaling methods
  - Imported using equivalent keywords SWATINIT and PCW from Eclipse

Compositional PVT

- New faster dedicated engine for Reveal
- 3 phase 9 component fully thermal example



Model	Time Steps	Newton Solves	PVT Time (s)	Total Time (s)	PVT/Solve (s)
Black Oil	7	17	1.0	10.9	0.06
Old Flash	9	31	90.4	117.7	2.91
New Flash	9	26	8.6	32.9	0.33

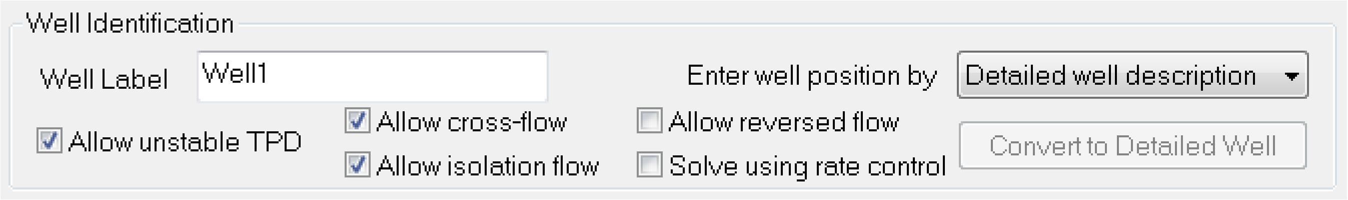
Polymer Degradation

- Track polymer mean molecular weight
- Degrade at perforations (velocity) and reservoir (temperature)
- Modify zero shear thickening factor (TF^0) by reduced molecular weight raised to a power
- $\mu = \frac{\tau}{\dot{\gamma}} = \mu_w \left(1 + \frac{TF^0 \left(\frac{mw}{mw_{ref}} \right)^p - 1}{1 + \left(\frac{\dot{\gamma}}{\dot{\gamma}_h} \right)^{n-1}} \right)$
- TF^0 is a function of concentration, salinity, divalent cations and temperature
- Shear rate
  - $\dot{\gamma} = \gamma_c \frac{|q_w|}{\sqrt{\frac{9}{8}\bar{k}\phi S_w k r_w}}$ $\dot{\gamma} = \frac{8Q}{Ad_h}$ $\dot{\gamma} = \frac{4v}{w}$

Thermal Transmissibility

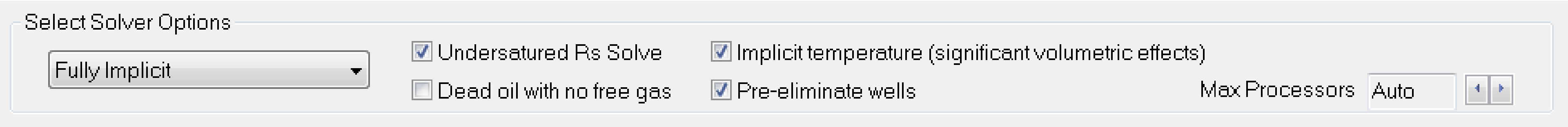
- Conduction diffusivity
  - $\dot{H} = Ak_T \nabla T$
  - $\dot{Q} = \frac{Ak\nabla P}{\mu}$
- Geometrical part ($A\nabla$) calculated from geometry or estimated from transmissibility for NNCs
- Can be modelled independently from flow for inter-grid or NNC thermal conductivity using optional directional thermal transmissibility multipliers

Well Solver Options



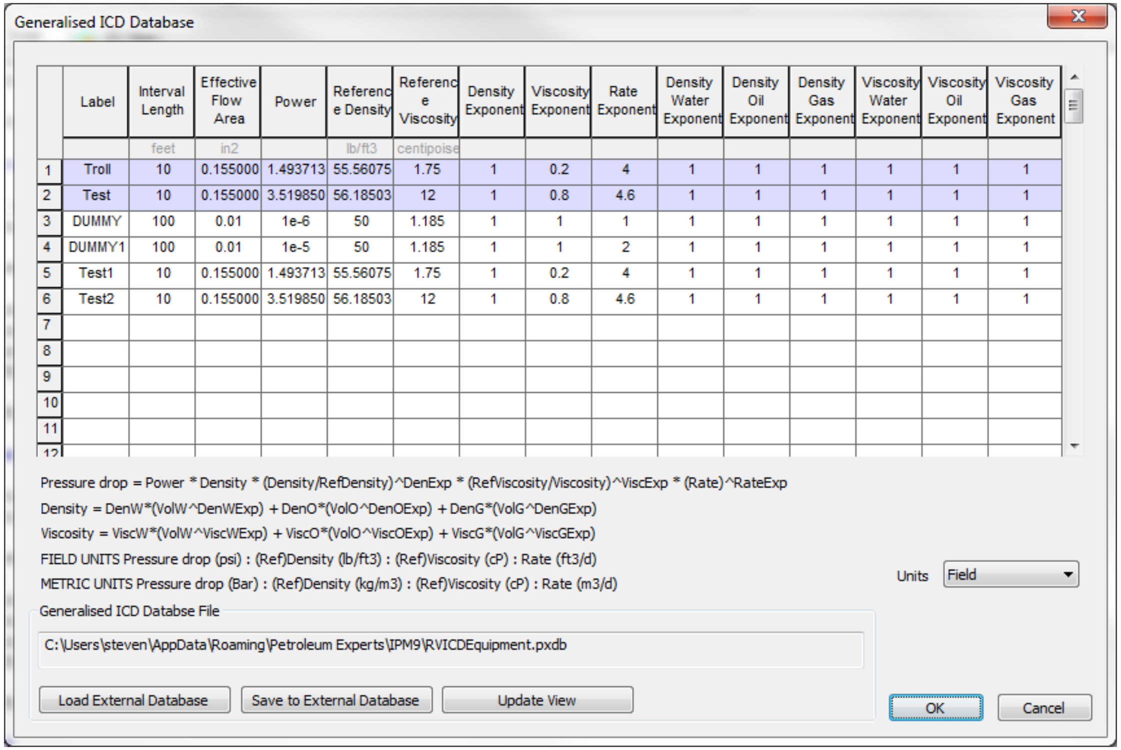
- Allow unstable TPD
  - Allow negative slope solutions
- Allow cross-flow
  - Discontinuous solutions if disabled (not recommended)
- Allow isolation flow
  - Cross flow behind isolated detailed well zones (e.g. closed ICVs coupled with fractures)
- Allow reversed flow
  - Well defined w.r.t. base pipe tubing, but the reservoir flow may be negative (e.g. producing through annulus with base pipe injection)
- Solve using rate control
  - Fixed pressure wells that are very ill-conditioned (e.g. very large IPR with large well friction, fracture with ICDs and controlled with detailed well to surface)

Solver Options



- Undersaturated Rs Solve
  - Primary unknown switched between Sg and Rs if gas phase not present (recommended)
- Dead oil with no free gas
  - Make sure PVT cannot generate free gas (mainly used with steam)
- Implicit temperature
  - Very little overhead (recommended)
- Pre-eliminate wells
  - Can require large memory requirements for implicit rate wells with large number of connected blocks (e.g. fractures with 1000-10000 blocks)

12(+2) Parameter Generalised AICD Model



Generalised ICD Database

	Label	Interval Length	Effective Flow Area	Power	Reference Density	Reference Viscosity	Density Exponent	Viscosity Exponent	Rate Exponent	Density Water Exponent	Density Oil Exponent	Density Gas Exponent	Viscosity Water Exponent	Viscosity Oil Exponent	Viscosity Gas Exponent
		feet	in2		lb/ft3	centipoise									
1	Troll	10	0.155000	1.493713	55.56075	1.75	1	0.2	4	1	1	1	1	1	1
2	Test	10	0.155000	3.519850	56.18503	12	1	0.8	4.6	1	1	1	1	1	1
3	DUMMY	100	0.01	1e-6	50	1.185	1	1	1	1	1	1	1	1	1
4	DUMMY1	100	0.01	1e-5	50	1.185	1	1	2	1	1	1	1	1	1
5	Test1	10	0.155000	1.493713	55.56075	1.75	1	0.2	4	1	1	1	1	1	1
6	Test2	10	0.155000	3.519850	56.18503	12	1	0.8	4.6	1	1	1	1	1	1
7															
8															
9															
10															
11															
12															

Pressure drop = Power * Density * (Density/RefDensity)^DenExp * (RefViscosity/Viscosity)^ViscExp * (Rate)^RateExp

Density = DenW*(VolW^DenWExp) + DenO*(VolO^DenOExp) + DenG*(VolG^DenGExp)

Viscosity = ViscW*(VolW^ViscWExp) + ViscO*(VolO^ViscOExp) + ViscG*(VolG^ViscGExp)

FIELD UNITS Pressure drop (psi) : (Ref)Density (lb/ft3) : (Ref)Viscosity (cP) : Rate (ft3/d)

METRIC UNITS Pressure drop (Bar) : (Ref)Density (kg/m3) : (Ref)Viscosity (cP) : Rate (m3/d)

Units: Field

Generalised ICD Databse File

C:\Users\steven\AppData\Roaming\Petroleum Experts\IPM9\RVICDEquipment.pxdb

Load External Database | Save to External Database | Update View | OK | Cancel

$$\rho = \rho_w(V_w)^a + \rho_o(V_o)^b + \rho_g(V_g)^c$$

$$\mu = \mu_w(V_w)^d + \mu_o(V_o)^e + \mu_g(V_g)^f$$

$$\Delta P = F\rho\left(\frac{\rho}{\rho_0}\right)^{\alpha}\left(\frac{\mu_0}{\mu}\right)^{\beta} Q^{\gamma}$$

SAGD Coupling to Surface

- Multiple SAGD well pairs connected through RESOLVE
  - May be scheduled and constrained in production and injection
- Injection and production strongly coupled
  - Cannot over-produce or over-inject
  - Surface constraints will require production and injection reduction
  - Will significantly modify steam chamber SOR efficiency etc
- Constraint passing workflow

Water Chemistry Engine

- Recommended only for advanced features in recent engine databases
  - For example pressure dependent equilibrium constants or additional species pathways
  - The new engine gives very similar results using the current default database, but is a bit slower

Interface and Visualisation

- Import ECLIPSE summary files
- NEXUS model import
- Well reporting variables added
- Fracture node property visualisation

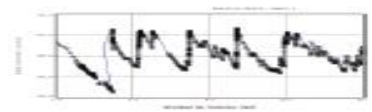
Nexus Model Import

- **Nexus Input**
  - In the Nexus case file (.fcs file), add the keywords EXPORT REVEAL. These should be located prior to the GRID_FILES section of the case file.
- **Output from Standalone**
  - Standalone will output files named *casename*.reveali, *casename*.revealr, and create a directory named *casename*.export

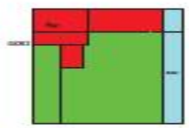
MBAL

ANALYTICAL RESERVOIR ENGINEERING TOOLKIT

HISTORY MATCHING

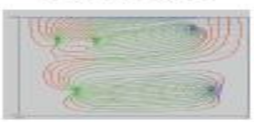


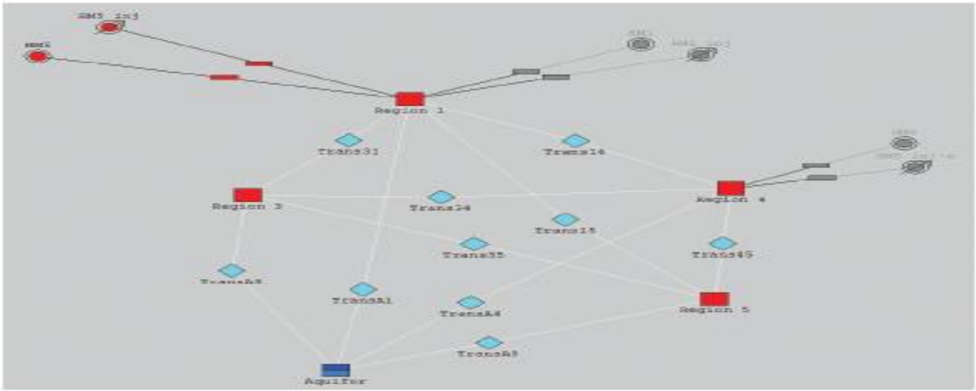
MATERIAL BALANCE



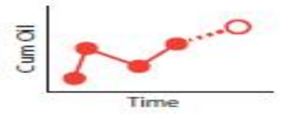
AQUIFER MODELLING

STREAMLINES

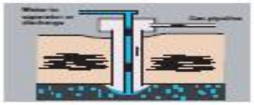




FORECASTS

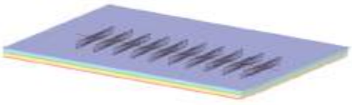


COAL BED METHANE

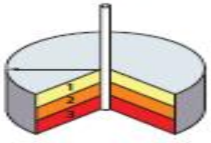


1D MODEL

TIGHT RESERVOIRS



MULTILAYER PRODUCTION



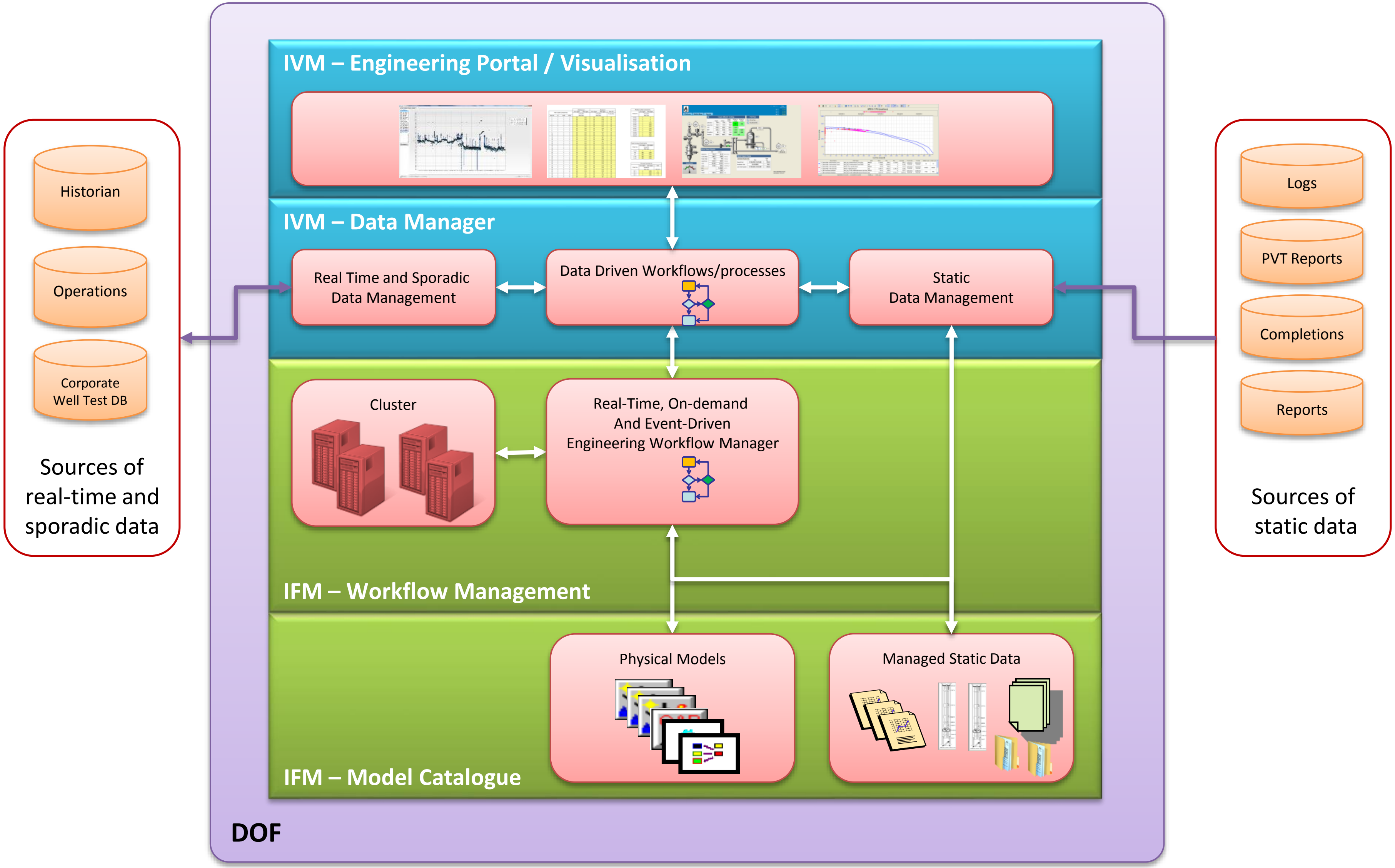
IPM 10 Development for MBAL

- Fractional Flow Tables can be based on layer cumulative instead of tank cumulative
- Gas coning matching extended to allow more than three points and matching algorithm improved
- History Match – fix total hydrocarbon summed for all tanks
- Ghetto et al Heavy Oil PVT correlation added (SPE 30316)
- Fractional Flow Matching Plots – theoretical curve always displayed even if no valid match data

IPM 10 Development for MBAL

- **Open Server behaviour for non-defined variables can be controlled.**
- **New well types added to handle diluent wells with gas lift and ESP**
- **Well deviation added to gravel pack model**

DOF



Historian
Operations
Corporate Well Test DB
Sources of real-time and sporadic data
IVM – Engineering Portal / Visualisation
IVM – Data Manager
Real Time and Sporadic Data Management
Data Driven Workflows/processes
Static Data Management
Cluster
Real-Time, On-demand And Event-Driven Engineering Workflow Manager
IFM – Workflow Management
Physical Models
Managed Static Data
IFM – Model Catalogue
DOF
Logs
PVT Reports
Completions
Reports
Sources of static data

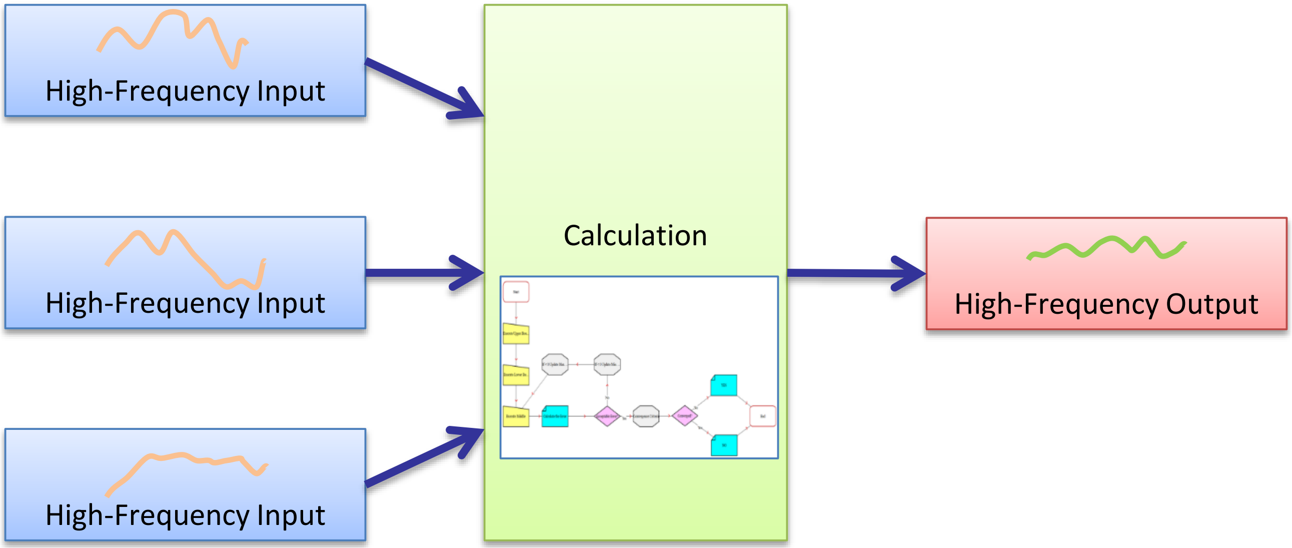
DOF (IFM 4.1 and IVM 7) Developments

- Data-driven workflows (IVM)
  - Workflow management and execution in IVM
- Data Management (IVM)
  - Drivers for data acquisition
- Graphics Screens (IVM)
  - Controls
  - Templates
- Architecture (IVM & IFM)
- Data Exchange (IVM & IFM)
- IT considerations (IVM & IFM)

Calculations

- Data-driven workflows for
  - Preventive maintenance (ESP run-life, Compressor vibration,...)
  - 'Virtual' instrumentation in the high frequency domain (meters, gauges,..)
  - Data Validation
  - Data Filtering
  - Alarming Logic
  - Data-Driven High-Frequency Calculations
    - Performance monitoring
    - Rate estimation
    - …

Calculations – Visual Workflows



Data Management - Drivers

IVM 7.0 has an open architecture to allow drivers to be registered to allow data acquisition from any source and any mechanism:

- Web services
- Custom files
- “Native” communication to data sources (e.g. OsiSoft PI)
- Other communication standards…

Graphic Screens - Controls

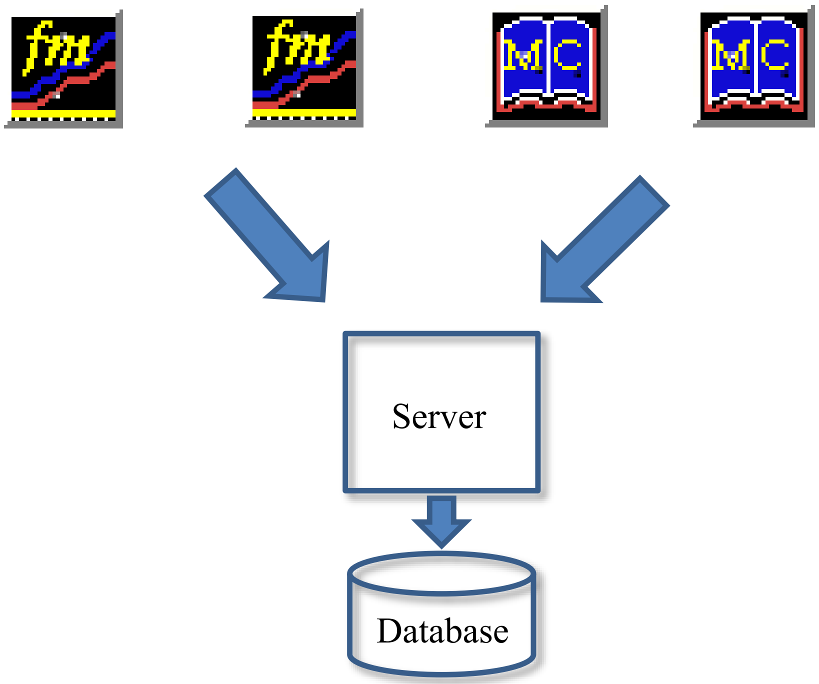
- Graphic screens are built using a series of “controls” to visualise information
  - Text boxes
  - Images
  - Shapes
  - Gauges
  - Time-based and XY Plots (new in IVM 7)

- IVM 7 has a Custom Control Plugin Framework allowing custom visualisation embedded in graphic screen

Architecture - Objectives

- Consistency
- Scalability
- Security
- Performance
- Future Proof

IFM 4.1 Architecture

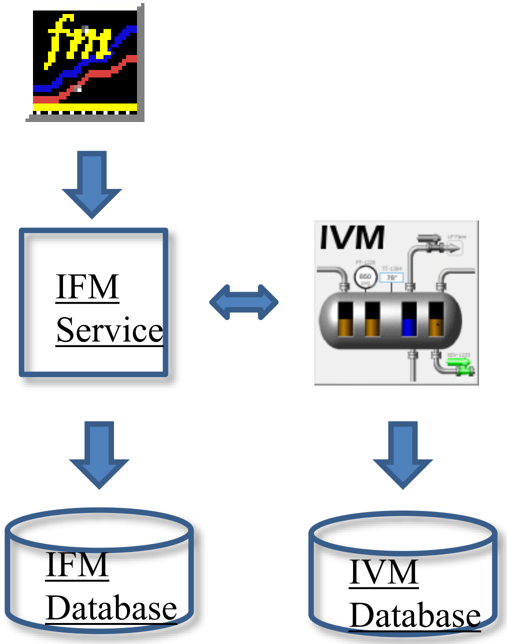


- Service component runs as a windows service
- Cache data on service
- Offload processing onto service
- Supports multiple services
- Services can be geographically distributed
- Data Transfer Objects to transfer data - use less memory, are encrypted and compressed

IFM 4.1 Architecture - Summary

- Consistency
  - IFM and IVM share common architecture
- Scalability
  - additional services can be deployed for failover or load balancing
- Security
  - data encrypted between client and service
- Performance
  - transferring smaller packets of compressed data
  - Server side caching for frequently requested data
- Future Proof
  - client/services architecture
  - built with ability to swap out components as technology changes

IFM 4.1 with IVM 7



Enhanced capabilities with IVM 7.0 installed

- **Minimal setup to pass data between systems**
- **Transfer time series data**
- **Transfer data types other than doubles**
- **Make use of IVM Data Sources for reading/writing data into IVM**

Other IT considerations

- IVM Server and Client available as 64 bit
- IVM Server runs as a Windows service
- All configuration of IVM Server are configured in the IVM Client (drivers, data source connections, IVM security, etc.)
- Single IVM Client can simultaneously connect to multiple IVM Servers

Time-zone/Culture Changes

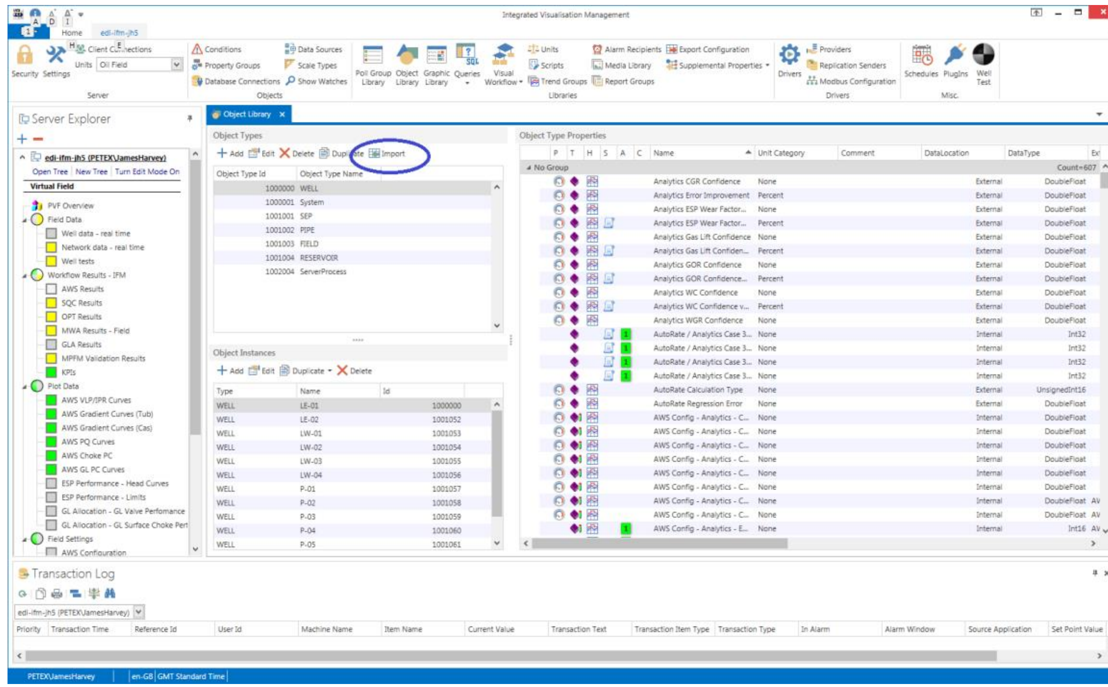
- What is it?
  - The ability to change time-zone used within the application
  - The ability to change how dates/numerical data is formatted.
- Why use it?
  - Allows the user to view dates and numerical data in a familiar format and time-zone
  - Previous method was changing windows time-zone/culture

DOF Enhancements - Summary

- Software Versions
- Background
  - Model Management
  - Engineering Workflows
  - Data Models
- DOF Enhancement Discussion

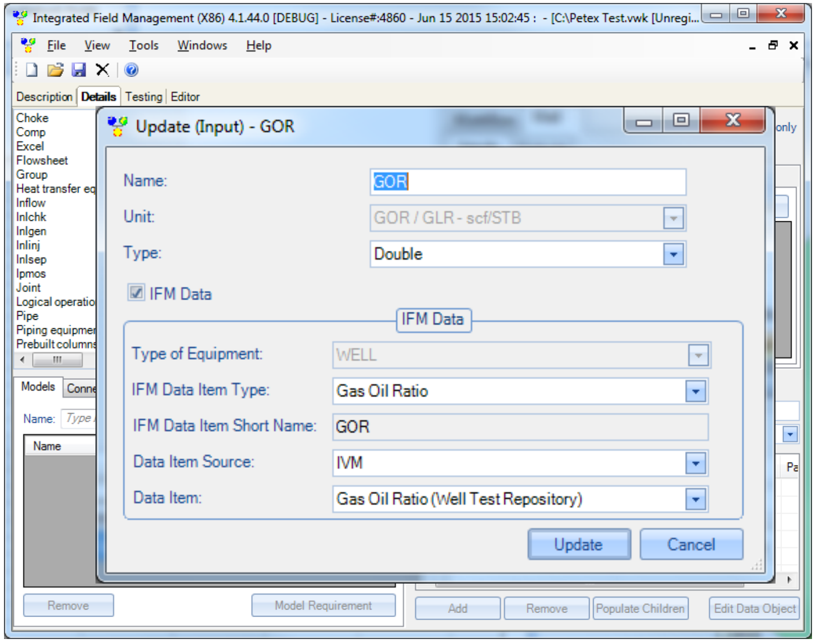
IFM & IVM Data Exchange

- Configuring IVM
  - Run IFM Provider
  - Import field + visual workflow data



IFM & IVM Data Exchange

- **Configuring IFM**
  - **Build visual workflow**
  - **Use new IVM data source item**



Calculations - Classification

Intelligence Category		Methods	Who
• Data driven	**Data**	• Neural Networks • Fuzzy Logic • Data Mining • FFTs • Pattern Recognition • Correlations • Performance Curves	• Operators • Engineers
• Knowledge driven	**Knowledge and Physics**	• Models • Knowledge Base • Expert System	• Engineers

IVM 7.0 Direction

Platform	**Extensibility**	Visual workflows Open driver architecture Extended visualisation templatability Custom graphic controls
	Scalability **Maintainability**	Provider framework Data model enhancements IT considerations

Graphic Screens - Templates

- Can embed one graphic screen directly into a portion of another screen
- Extends to embedding a template as well
  - Increases maintainability of the system
  - Promotes consistency across the system

Graphic Screens – Templates

AWS Results Template

	Measured / Base Values	Well-Based: VLPIPR	VLP	IPR	Choke	CHP	AutoRate
Calc Method		VLPIPR	VLP	IPR	Choke	CHP	AutoRate
Sensitivity to Input		2.059	7.744	3.177	69.746	9.702	0.000
Preferred Method		●	○	○	○	○	○
PRODUCTION RATES							
Oil Rate		3,481	3,490	3,479	6,087	3,453	3,402
Water Rate		870	872	870	1,522	863	851
Liquid Rate		4,351	4,362	4,348	7,609	4,316	4,253
Gas Rate		3.31	3.32	3.31	5.78	3.28	3.19
PRESSURES and TEMPERATURES	Measured	Grad	Grad	Grad	Grad	Grad	Grad
FLP	455	453	453	453	449	453	453
FLT	116	115	116	115	142	115	114
FWHP	455	454	454	455	453	454	454
FWHT	118	116	116	115	142	115	114
DHGP	2,714	2,729	2,836	2,836	3,254	2,831	2,836
DHGT	206	205	205	205	205	205	205
FBHP		2,870	2,871	2,871	3,293	2,866	2,871
FBHT		205	205	205	205	205	205
CHP	1,440	1,440	1,440	1,441	1,672	1,438	1,438
IPR SENSITIVITY CALCULATIONS	Base Values						
Res Pres	4,944	4,944	4,951	4,944	6,592	4,922	4,892
PI	2.50	2.50	2.51	2.50	5.27	2.48	2.45

VLP/IPR Curves

Graphic Screens – Templates

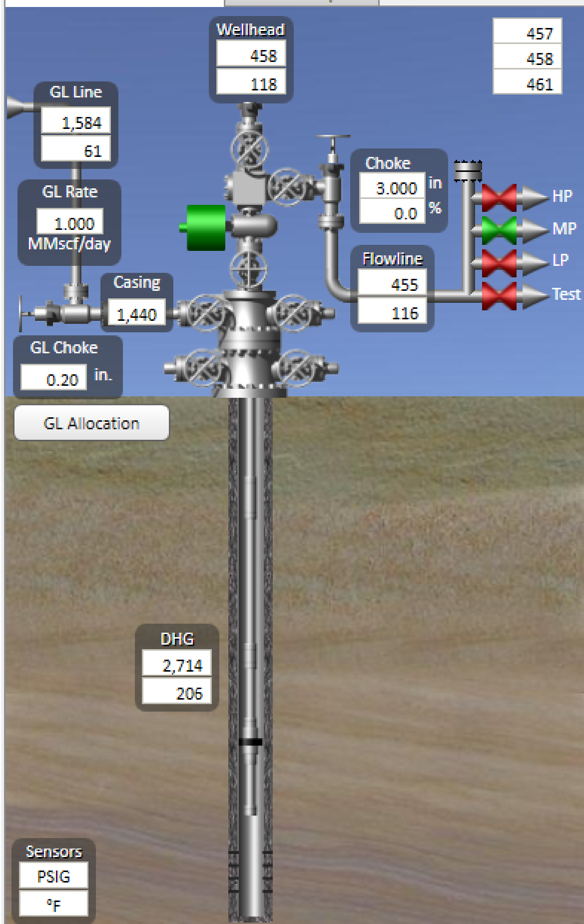
Petex Virtual Field

Well P-01

Overviews | Reports | Wells

TOTAL FIELD RATES	Measured	Preferred	SQC	MWA	OPT	
Oil Rate	30,070	27,670	28,282	29,907	26,765	STB/day
Water Rate	10,988	10,387	10,356	10,947	9,947	STB/day
Liquid Rate	41,058	38,057	38,638	40,853	36,712	STB/day
Gas Rate	26.9	24.8	25.3	40.5	24.1	MMscf/day

Real Time Measurements | Workflow Inputs



Summary | Well Surveillance | Model-based Analytics | Tests

	Well-Based					VLP/IPR Curves	Network-Based		
Calc Method	VLPIPR	VLP	IPR	Choke	CHP	AutoRate	SQC	MWA	Preferred
Sensitivity to Input	2.059	7.744	3.177	69.746	9.702	0.000			
Preferred Method									VLP/IPR

PRODUCTION RATES

	VLPIPR	VLP	IPR	Choke	CHP	AutoRate	SQC	MWA	Preferred
Oil Rate	3,481	3,490	3,479	6,087	3,453	3,402	3,486	3,700	3,481
Water Rate	870	872	870	1,522	863	851	871	925	870
Liquid Rate	4,351	4,362	4,348	7,609	4,316	4,253	4,356	4,625	4,351
Gas Rate	3.31	3.32	3.31	5.78	3.28	3.19	3.31	3.57	3.31

PRESSURES and TEMPERATURES (Deviations with respect to Measured values)

	Measured	Grad	Grad	Grad	Grad	Grad	Grad	Grad	Grad	Grad
FLP	455	453	453	453	449	453	453	451	459	453
FLT	116	115	116	115	142	115	114	116	115	115
FWHP	455	454	454	455	453	454	454	453	461	454
FWHT	118	116	116	115	142	115	114	116	117	0
DHGP	2,714	2,729	2,836	2,836	3,254	2,831	2,836	2,833	2,726	2,729
DHGT	206	205	205	205	205	205	205	205	205	205
FBHP		2,870	2,871	2,871	3,293	2,866	2,871	2,868	2,759	2,870
FBHT		205	205	205	205	205	205	205	205	205
CHP	1,440	1,440	1,440	1,441	1,672	1,438	1,438	1,439	1,336	1,440

IPR SENSITIVITY CALCULATIONS (Deviations with respect to Base values)

	Base Values									
Res Pres	4,944	4,944	4,951	4,944	6,592	4,922	4,892	4,944	4,995	4,944
PI	2.50	2.50	2.51	2.50	5.27	2.48	2.45	2.50	2.55	2.50

Fundamentals – Data Model

The two data models are brought together during the deployment:

- ‘Engineering’ Data Model
  - Knows what is required
- ‘Data’ Data Model
  - Knows what is provided

The structure afforded by the Data Model means that the system can scale easily from 10’s of equipments to 1,000’s of equipments

Engineering Workflows

- With a model added to Model Catalogue, IFM is able to execute engineering workflows against that model

- The same components that were shown in Resolve on Monday are available in IFM
  - Visual Workflows
  - Data Objects
  - Application Co-ordination