

Integrating Warfighting Experimentation with Dynamic Modelling – A Practical Approach

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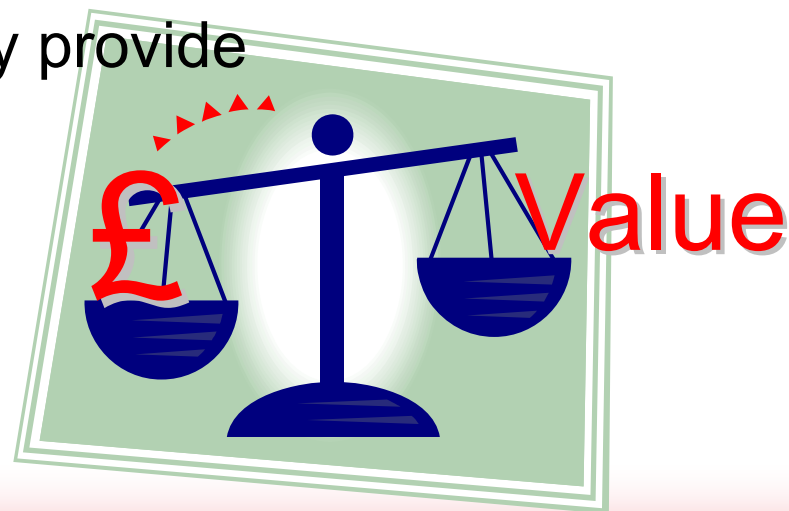
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Aims for the work

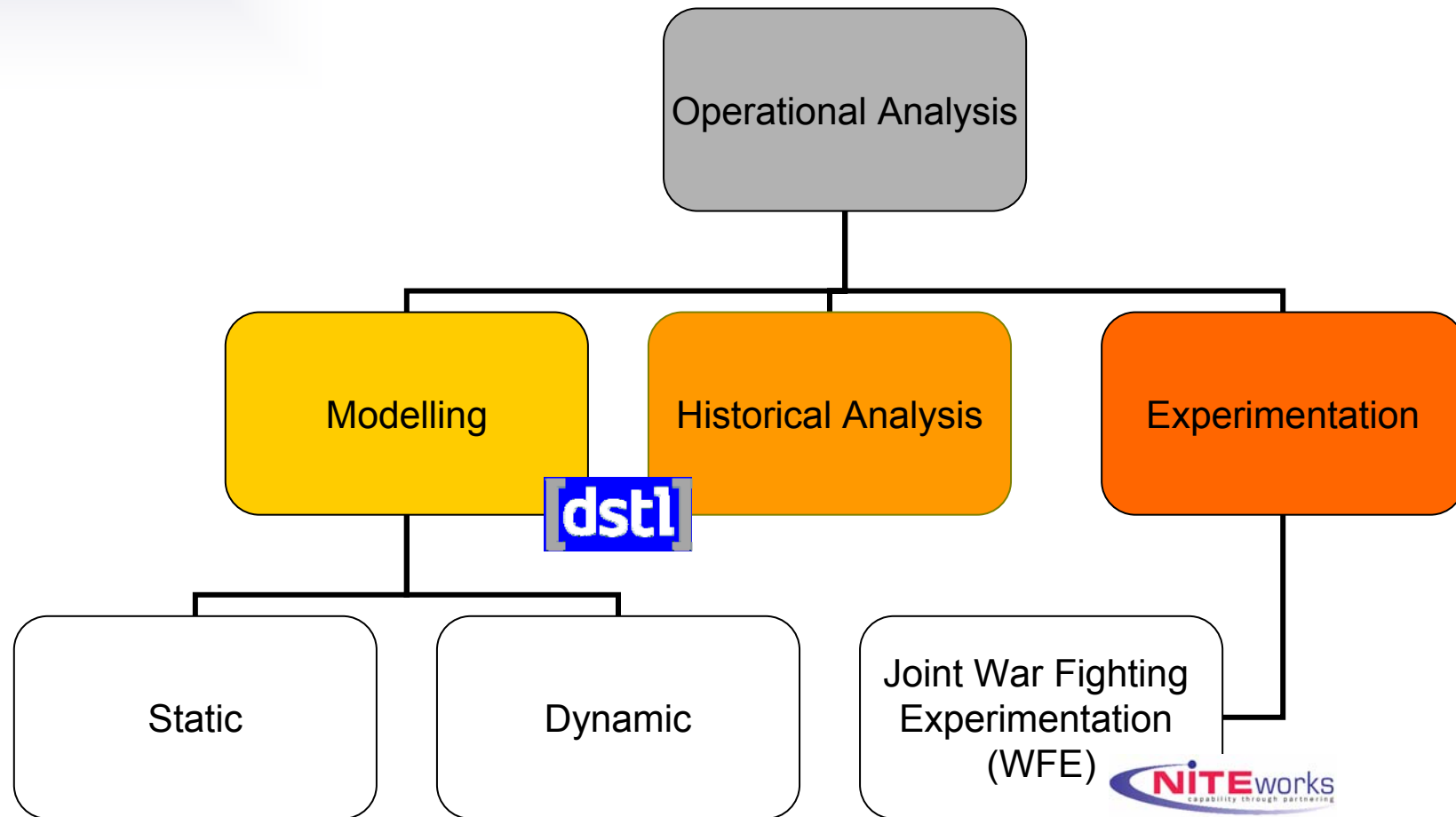
- Add value to WFE using dynamic modelling
- De-risk critical areas of the experiment
- Provide a 'dynamic data repository'
- Aspiration: Assess in advance the benefits that modelling may provide



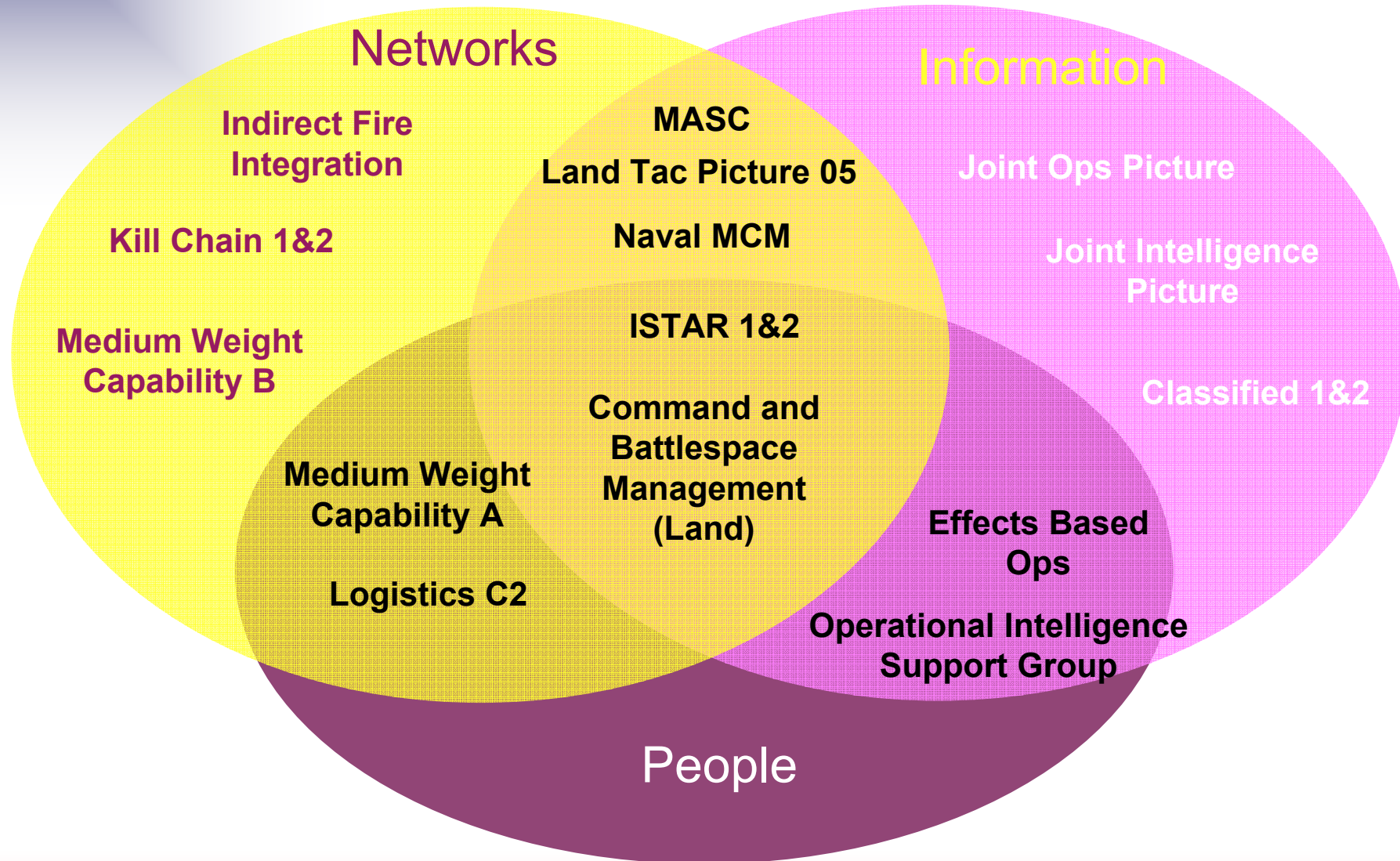
Cultural issues

What the analyst/modeller said	What the experiment manager thought
‘ ’	‘What <u>is</u> that chap in the corner doing?’
‘This is completely straightforward ...’	‘ ...it is completely what ...??’
‘...mmm... are lots of unknowns here’	‘This is completely straightforward’
‘Don’t worry – we are close to getting a solution’	‘He said that last week’

Introduction - OA - WFE and NITEworks



NITEworks AP Themes

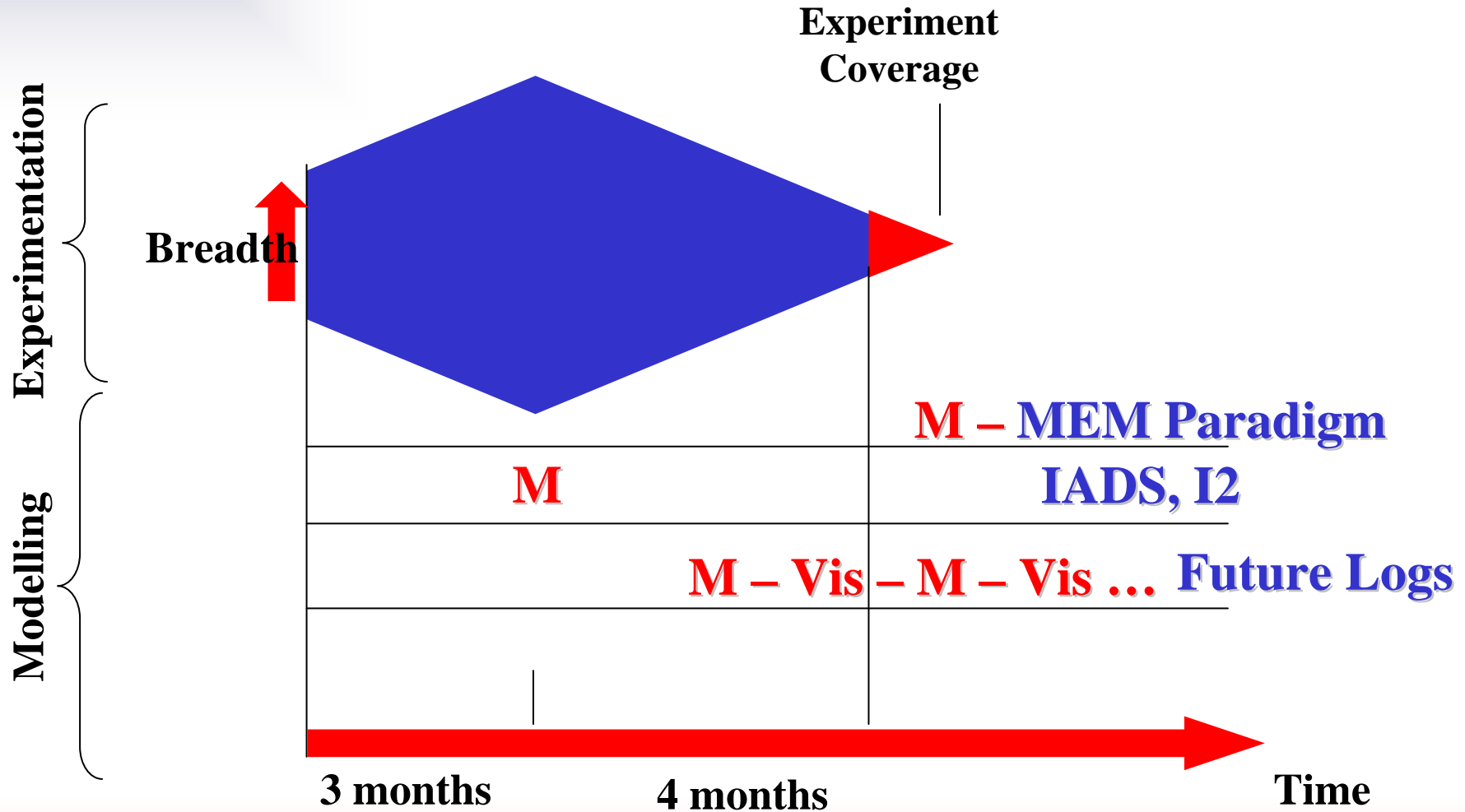


Introduction (2) - Analysis Environments

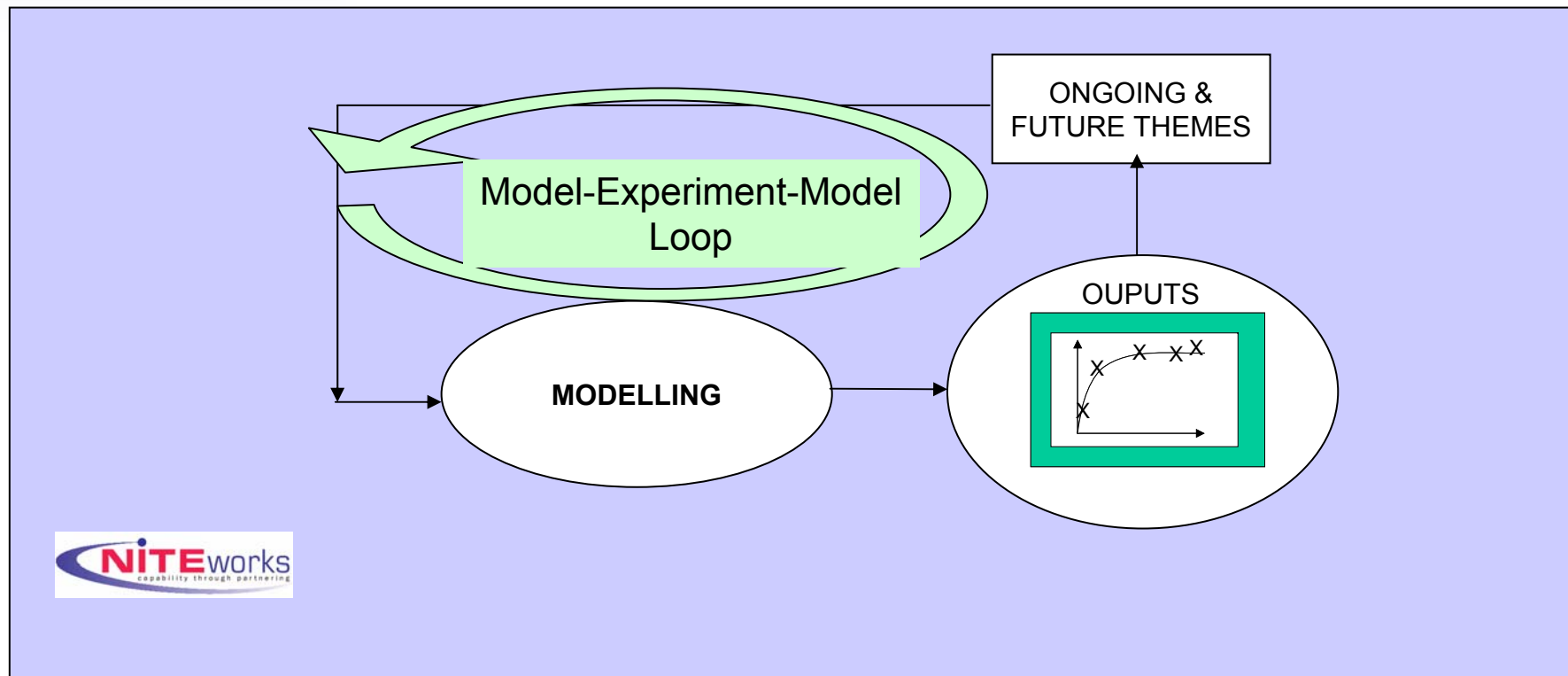
	Constructive Simulation or (OA) modelling	Wargaming	Virtual Simulation	Live Simulation	Analysis of Current Ops	Analysis of Historical Ops
Weapon Effects	Simulated	Simulated	Simulated	Simulated	Real	Real
Equipment	Simulated	Simulated	Real and Simulated	Real	Real	Real
People	Simulated	Simulated	Real and Simulated	Real	Real	Real

Ability to Manipulate and Control

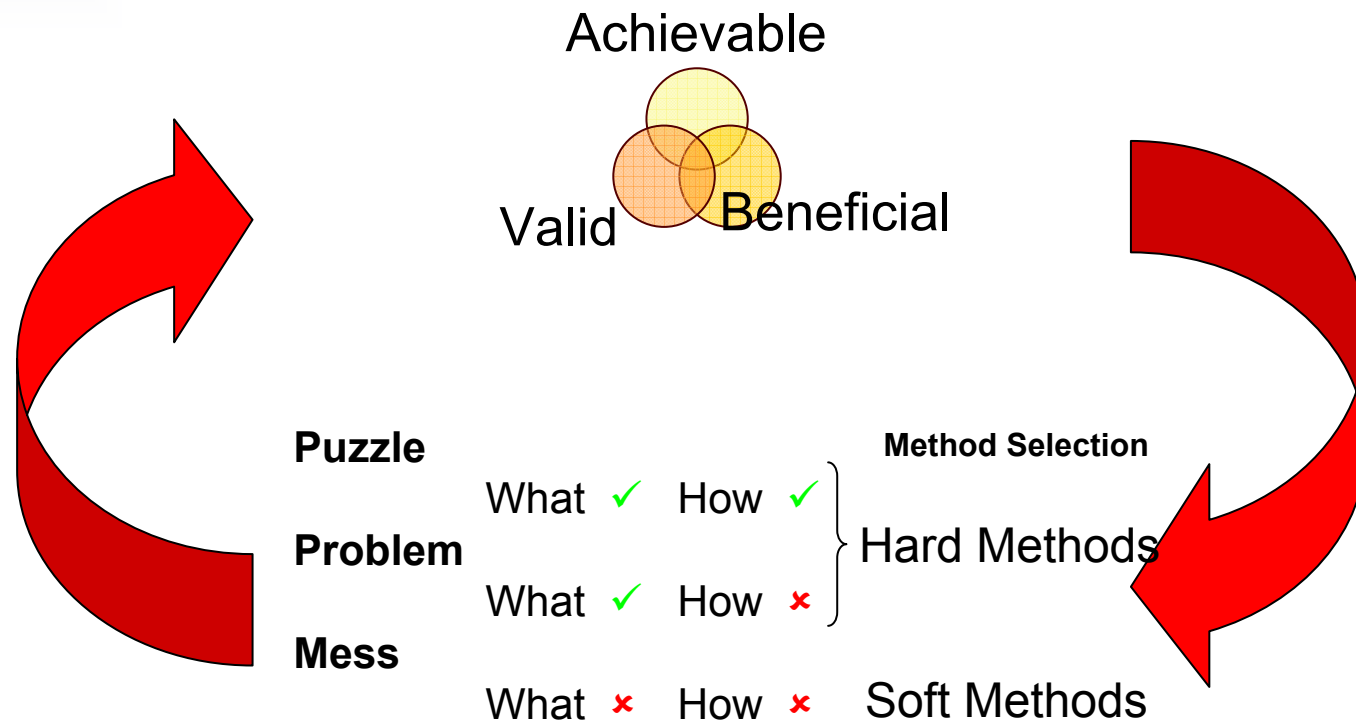
Modelling and Experimentation



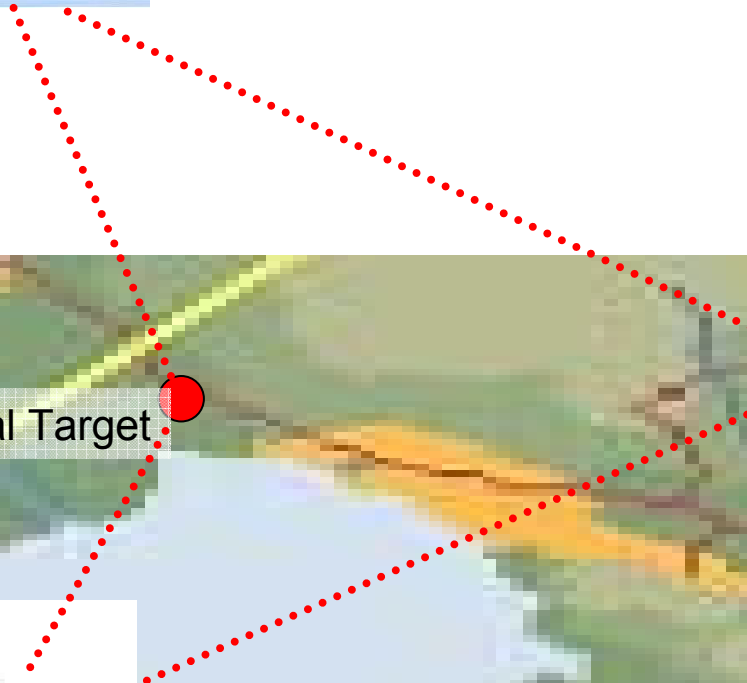
Model-Experiment-Model (M-E-M) Paradigm



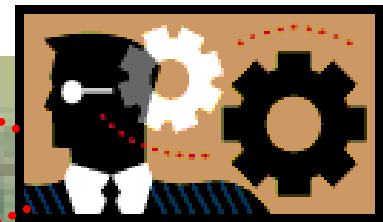
Modelling Criteria



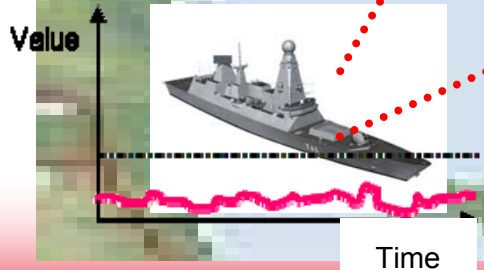
IADS Theme (1)



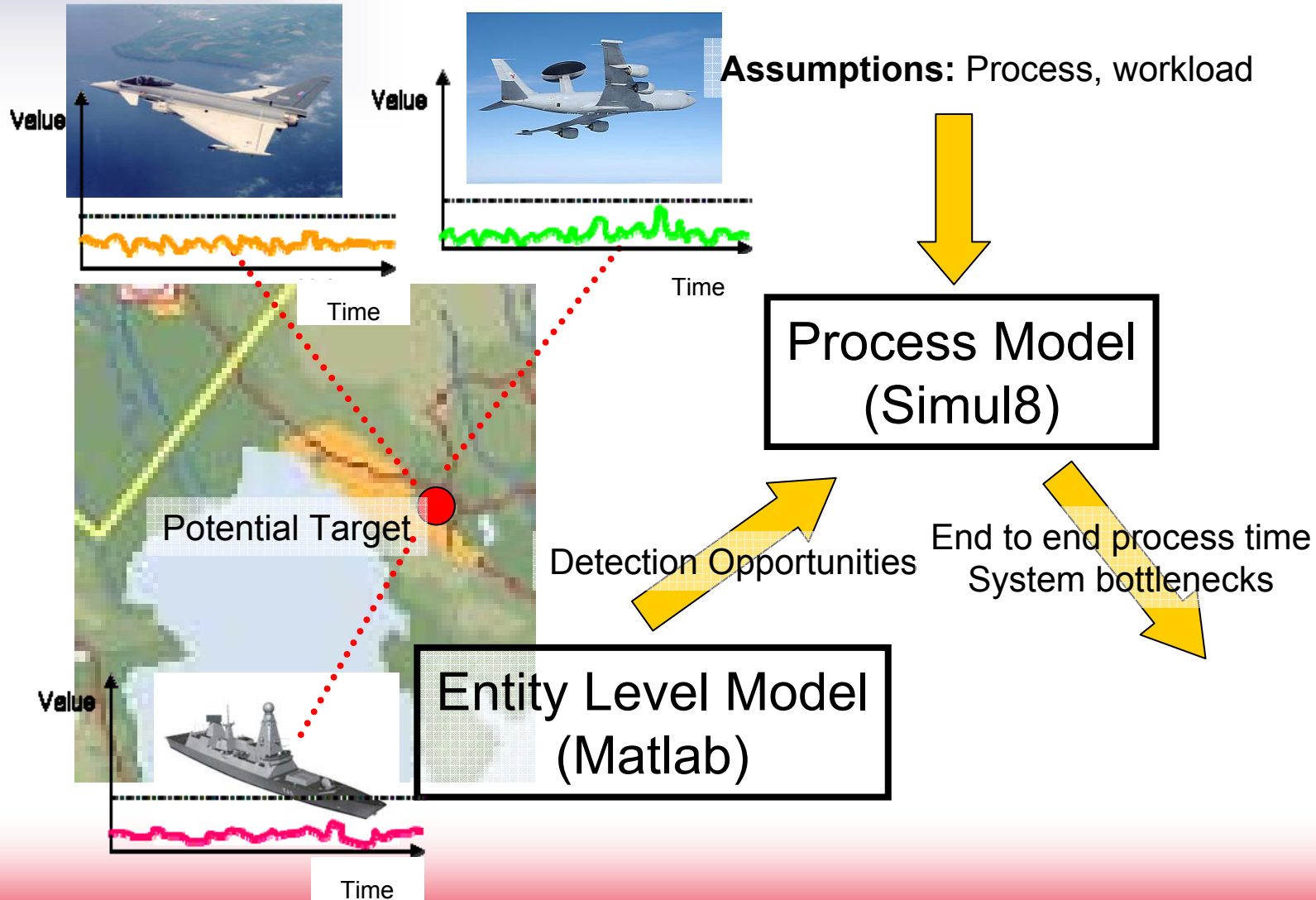
Potential Target



$\Delta t ??$

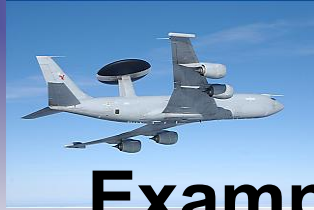


IADS Theme (2)



IADS Theme - Summary

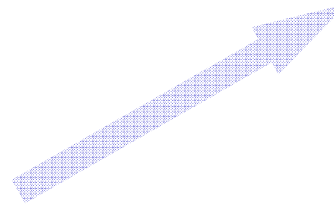
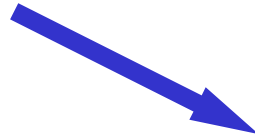
- Results
 - Full automatic tracking of all targets within the chosen scenario
 - Given a less bright target: Link 16 bandwidth assessment showed little additional loading when a manual intervention was needed



Examples – MISTAR – Vessel Classification



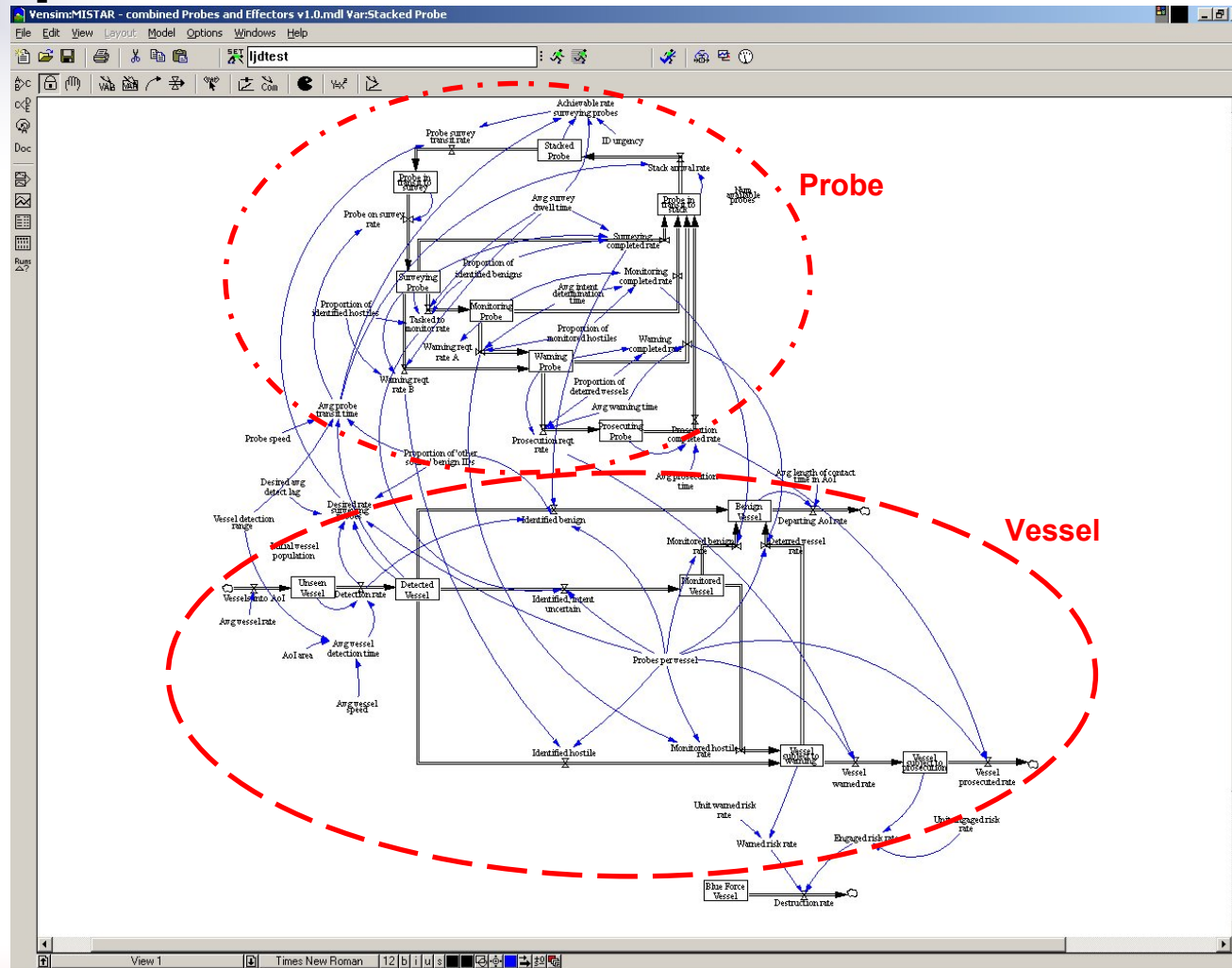
ISTAR Assets



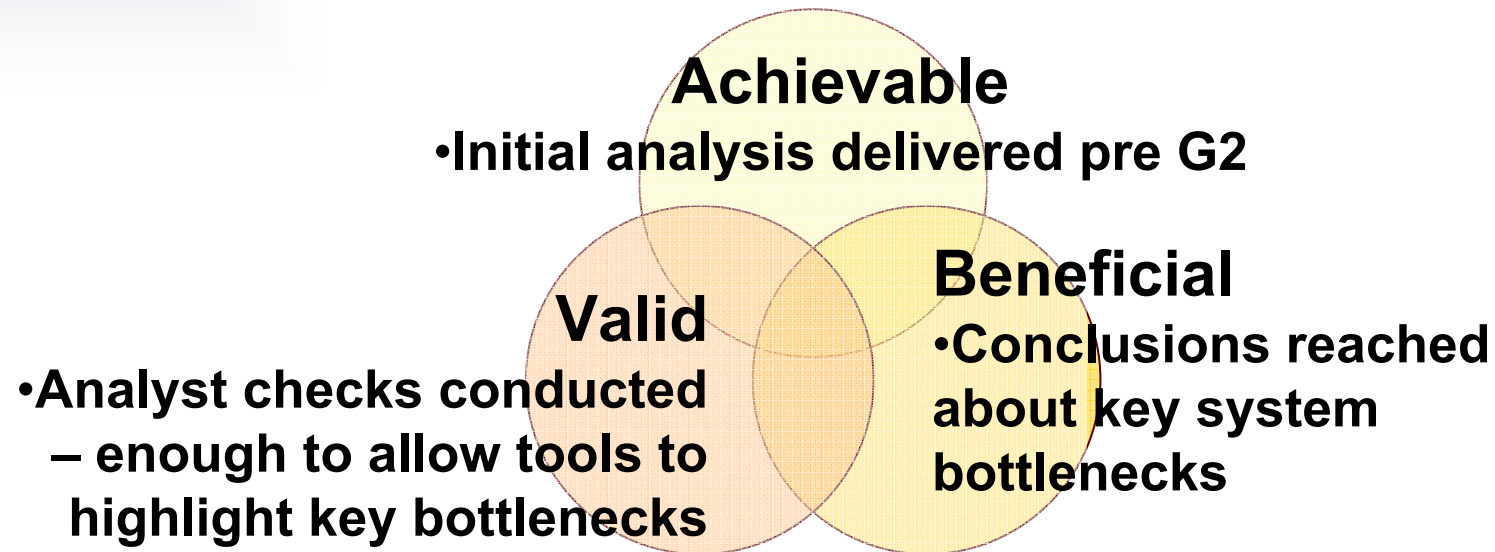
White or Red?



Examples – MISTAR



MISTAR Summary



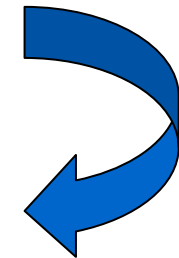
Iraqi Problems:

- Insurgency
- Terrorism
- Civil Unrest
- Ethnic Rivalry
- Criminal Activity

Information and Intelligence (I2) Theme

Operational Landscapes:

- Political
- Economic
- Military
- Social Cultural
- Legal, Ethical & Moral
- Physical
- Technological



Campaign Plan

Adversary Characteristics

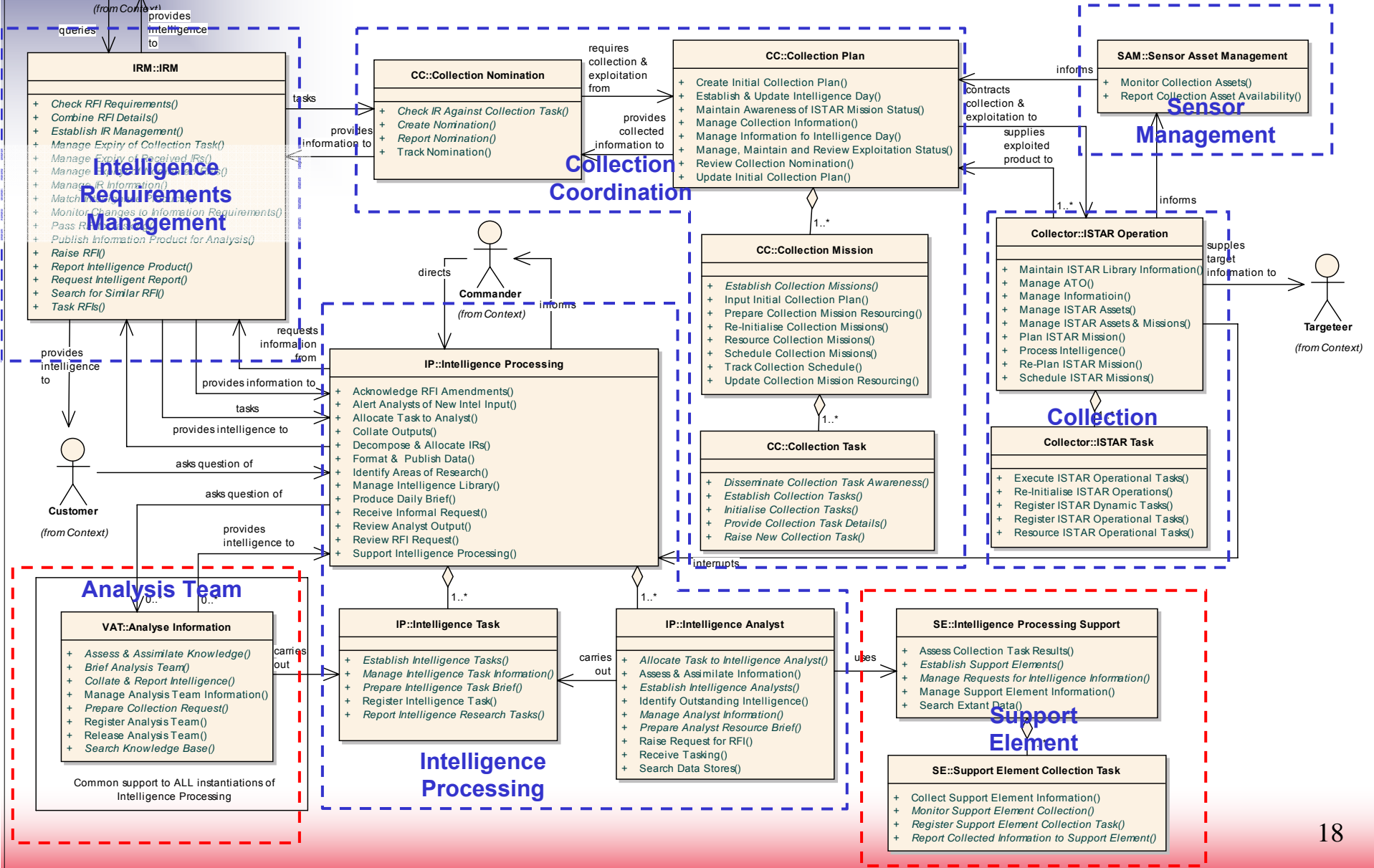
- Asymmetric
- Dynamic
- Uncertain
- Chaos
- Complex
- Novel
- Ambiguous



Enemy Or Friend?



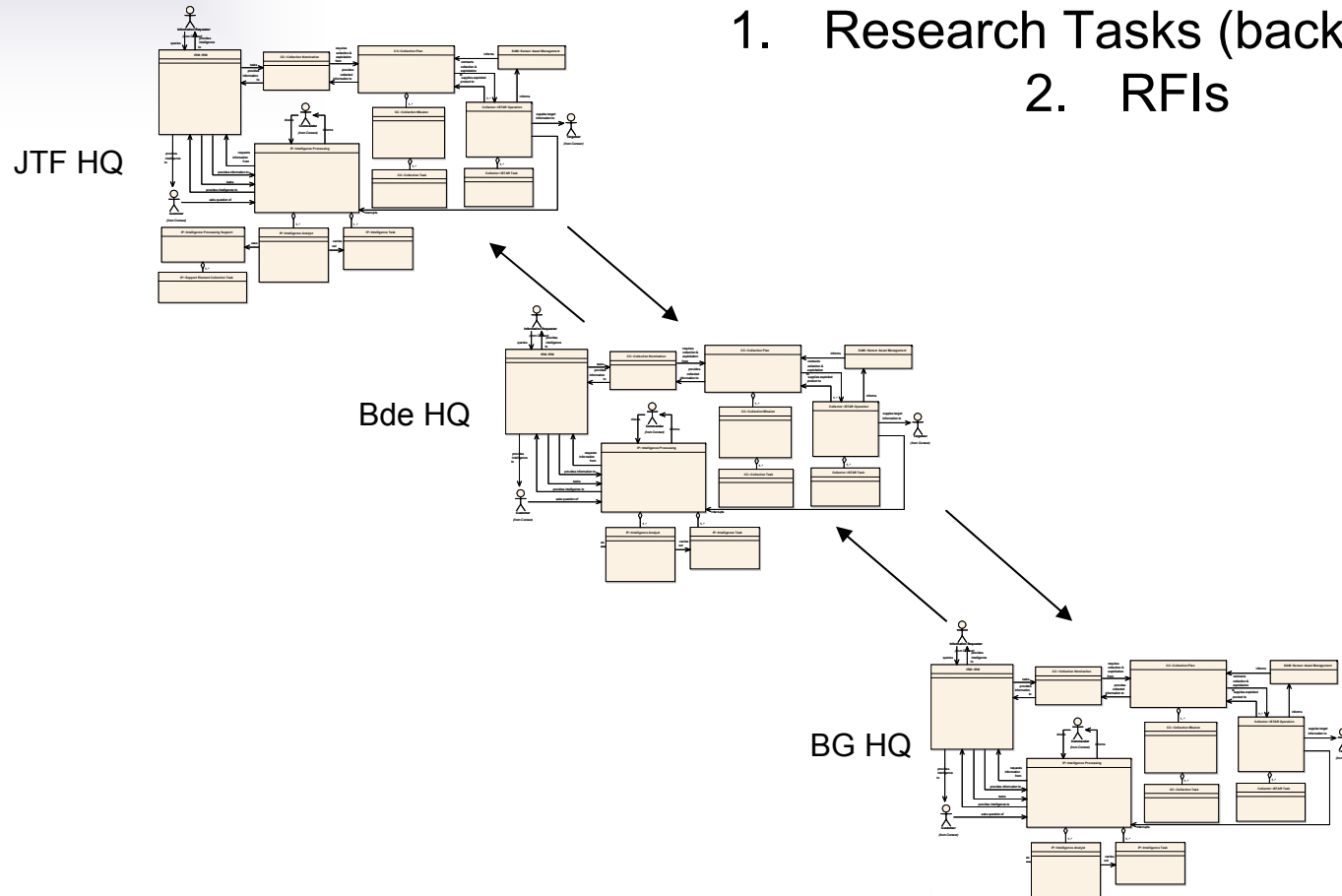
The process modelled by the I2 Theme



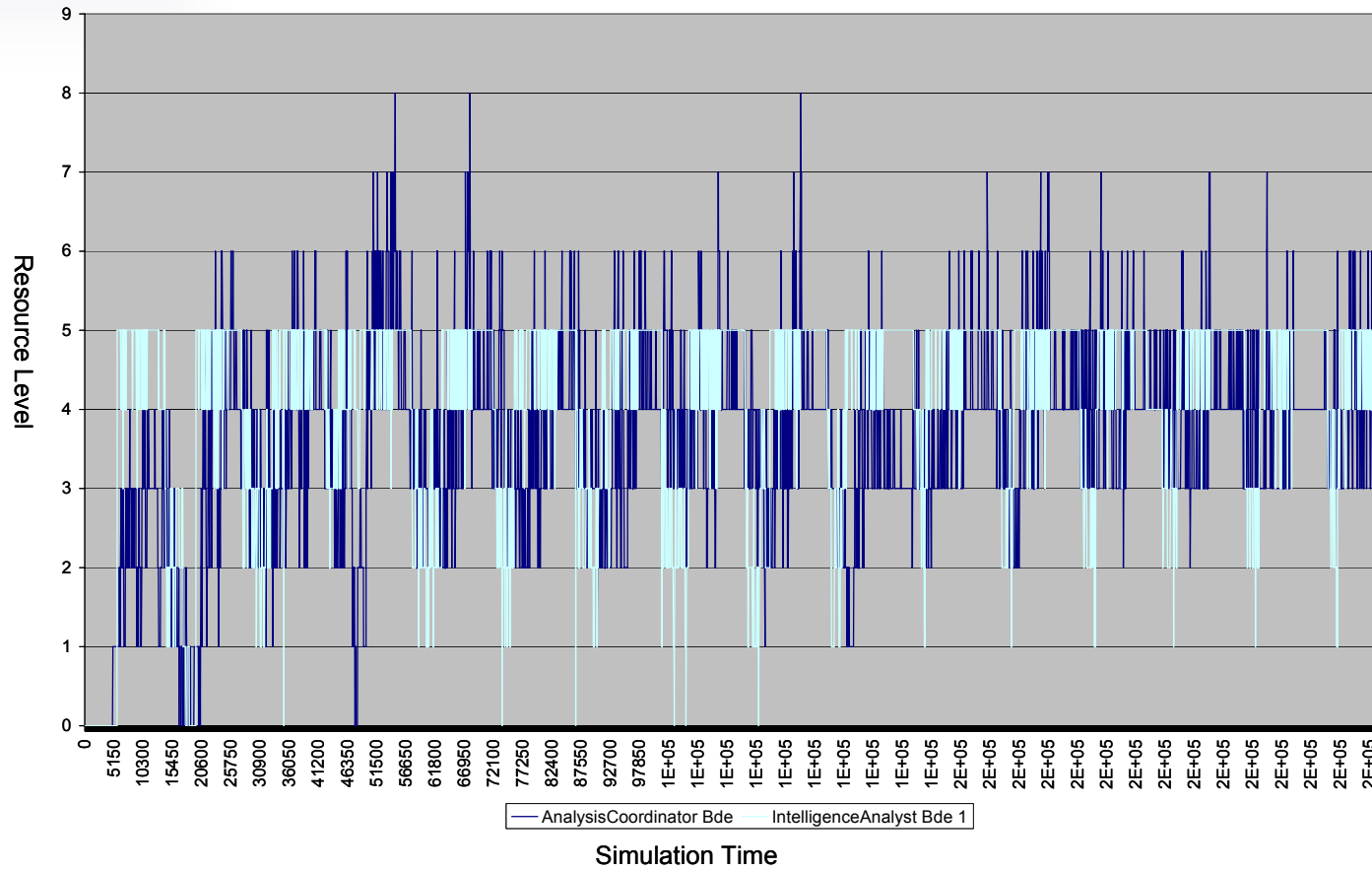
Instantiating the I2 Model at Organisational Levels

Stimulation:

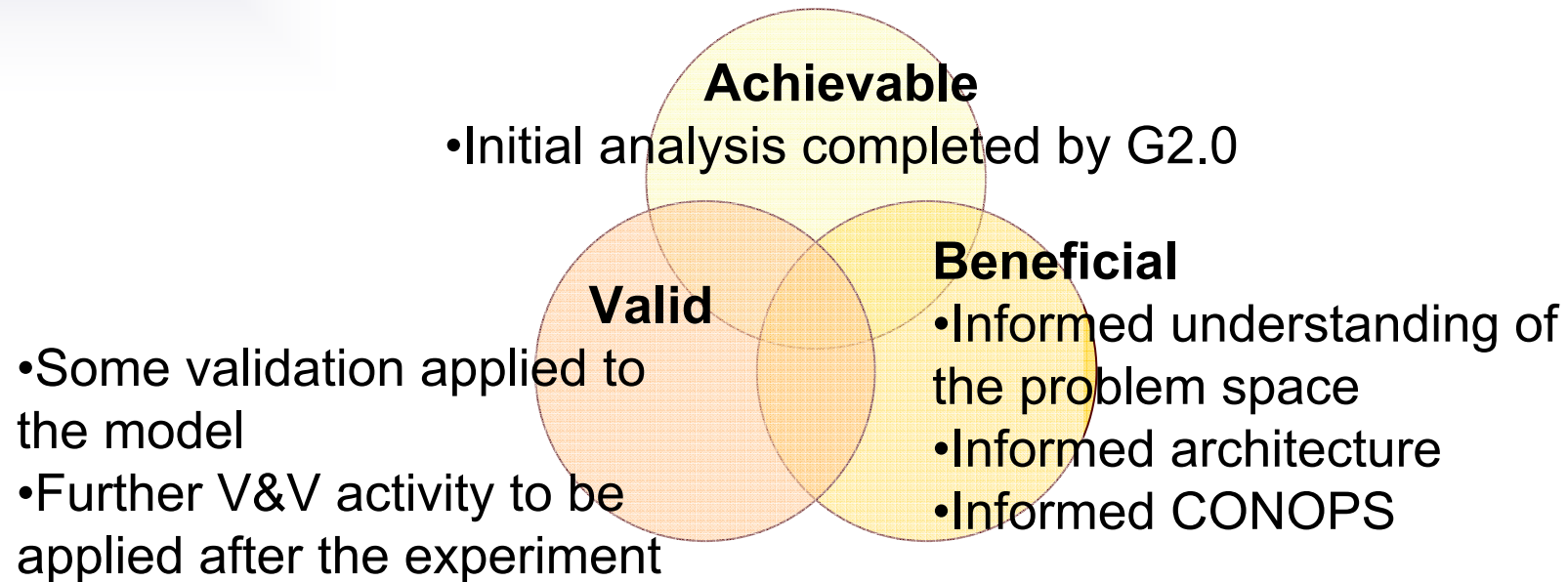
1. Research Tasks (background)
2. RFIs



Results (1) – Resource Usage over time



I2 Summary



Theme Modelling Evaluation (1)

- Add value to a WFE using dynamic modelling
 - IADS – scenario assessment
 - IADS – bandwidth assessment
 - I2 – utility of new ways of working
- De-risk critical areas of the experiment
 - IADS – key architecture questions exposed early in lifecycle
 - IADS – key scenario issue understood early on
- Provide a ‘dynamic data repository’
 - Dynamic models shared with broader OA community – problems in commonality of tools

Theme Modelling Evaluation (2)

- Aspiration: Assess in advance what benefit modelling may provide

Theme	Anticipated purpose (Pre-Modelling)	Key outputs (Post Activity)
IADS	Equipment vrs process Link 16 bandwidth analysis, assessment of Δt for Human in-the-loop	Scenario Bandwidth not major problem
I2	‘integrated understanding’ of problem space, dynamic assessment of system loading	Effect of new ways of working Dynamic effects on system loading

Theme Modelling Evaluation (3)

- What not to model
 - Very simple problems – few parameters, limited problem space
 - Problems with insufficient data
 - Modelling humans
- When to proceed with caution
 - Where there is insufficient knowledge of problem space – modelling can become an activity in its own right rather than a support to WFE

Conclusions

- Pre experiment modelling must be done rapidly
- Essential components for rapid development of dynamic models:
 - Relevant Model Repository
 - Pool of skilled analysts/developers
 - Regular review
- Can we realistically assess benefit before the modelling takes place?
 - No – but we know about some of the things we should not do

Questions