"Covering the Bases:" Development of a Framework for Defence Force Planning Scenarios

Brief to 15th ICCRTS

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Outline

- Project Motivation
- Methodology
  - Field Anomaly Relaxation
  - Scenarios – The What
  - Appropriateness
- Application
- Illustrative Screenshots
- Some Observations for Command and Control
- Status and Way Ahead

Project Motivation

- Scenarios are a key inject to Capability Based Planning
  - Original set of 11, 1999
  - Extended to 18, 2005-06
  - Canada First Defence Strategy (CFDS), 2008
- There is a need to address uncertainty of a limited scenario set
  - Full spectrum missions
  - Multiple campaign themes
  - Broad range of operational areas
    - Domestic, Continental, International etc.
- Provide analytical evidence for scenario development
  - Test different military capabilities
  - Design a robust and agile force

Methodology

- A scenario analysis tool has been developed by DRDC CORA
  - Informed by lessons learned
- We are using the tool to characterize the force planning scenarios and assess gaps that may require new scenario development
- Evaluation, through field anomaly relaxation, of plausible scenario combinations
  - Contributes to a systematic and defensible process
- The software tool has been built in cooperation with defence industry partners in Canada

Defining Scenarios – The What

The Force Planning Scenario (FPS) set provides a representative lay down of the situations in which the Canadian Forces anticipates conducting operations and allows, through the study of these scenarios, different approaches to delivering capability to be explored. The scenarios depict a range of indicative domestic, continental and international events and possibilities across the full spectrum of conflict.

- Chief of Force Development Handbook

Field Anomaly Relaxation

- Field Anomaly Relaxation is a version of Morphological Analysis
- Involves the evaluation of a scenario set using a series of filtrations that eliminate inconsistencies to arrive at the final set

Table 1: *Matrix of Pairs*

	A_1	A_2	B_1	B_2	C_1	C_2	D_1	D_2	D_3
A_1 A_2									
B_1 B_2		X							
C_1 C_2			X						
D_1 D_2 D_3	X					X			

Table 2: *Filtering Inconsistent/Implausible Configurations*

No.	Configuration	Inconsistent?	No.	Configuration	Inconsistent?
1	$A_1B_1C_1D_1$		13	$A_2B_1C_1D_1$	Yes
2	$A_1B_1C_1D_2$		14	$A_2B_1C_1D_2$	Yes
3	$A_1B_1C_1D_3$	Yes	15	$A_2B_1C_1D3$	Yes
4	$A_1B_1C_2D_1$	Yes	16	$A_2B_1C_2D_1$	Yes
5	$A_1B_1C_2D_2$	Yes	17	$A_2B_1C_2D_2$	Yes
6	$A_1B_1C_2D_3$	Yes	18	$A_2B_1C_2D_3$	Yes
7	$A_1B_2C_1D_1$		19	$A_2B_2C_1D_1$	
8	$A_1B_2C_1D_2$		20	$A_2B_2C_1D_2$	
9	$A_1B_2C_1D_3$	Yes	21	$A_2B_2C_1D_3$	
10	$A_1B_2C_2D_1$		22	$A_2B_2C_2D_1$	
11	$A_1B_2C_2D_2$		23	$A_2B_2C_2D_2$	
12	$A_1B_2C_2D_3$	Yes	24	$A_2B_2C_2D_3$	Yes

Taken from DSTO, "Some Methods for Scenario Analysis in Defence Strategic Planning", 2009

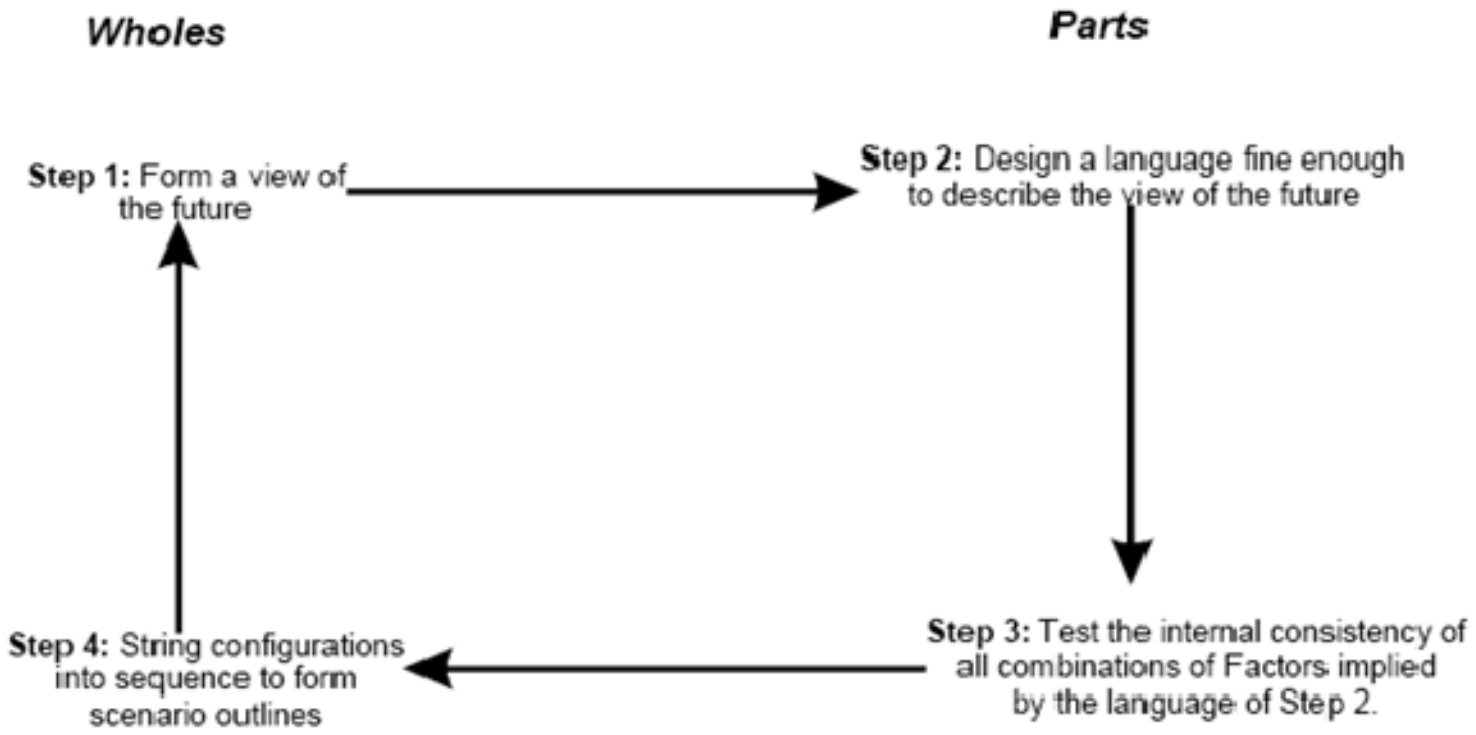
Appropriateness

- Traditional Morphological Analysis not well-suited
  - Too many relationships and combinations to consider
- The goal of the FAR is to develop a manageable number of scenarios to support planning
  - Series of filters to arrive at a scenario set
  - Feasibility rating
  - Averaged value for each scenario

- The final result is a feasibility assessment
  - Inconsistencies are eliminated
  - Refine and prioritize most significant scenarios

Moving from "Possible" to "Plausible"

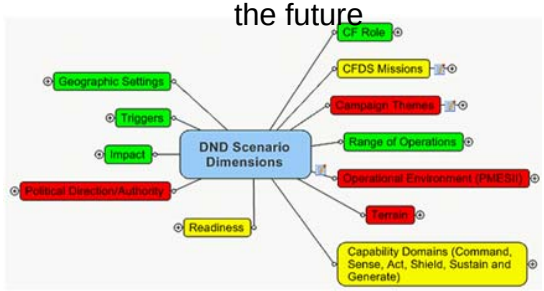
Applying FAR (1/2)



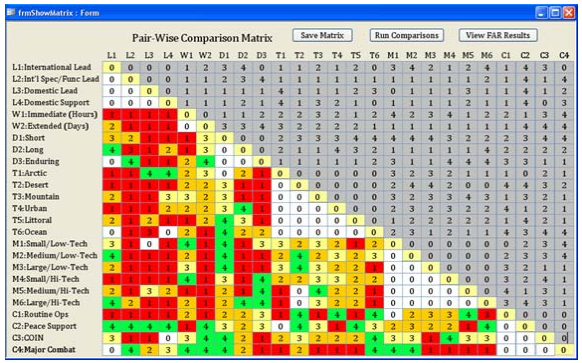
Applying FAR (2/2)

1. Form a view of the future

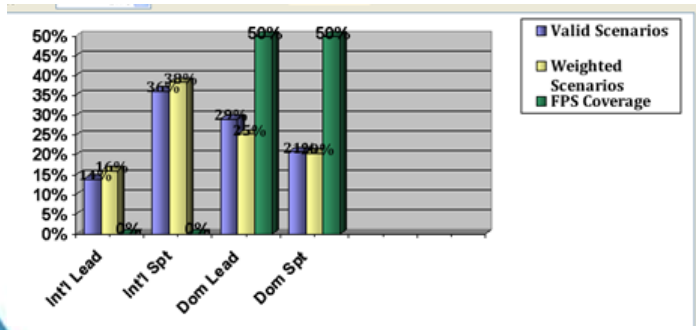
2. Define a language to describe the future



3. Evaluate combinations of Factors/Variables



4. Apply results to create scenario outlines



Step 1: Form a View of the Future

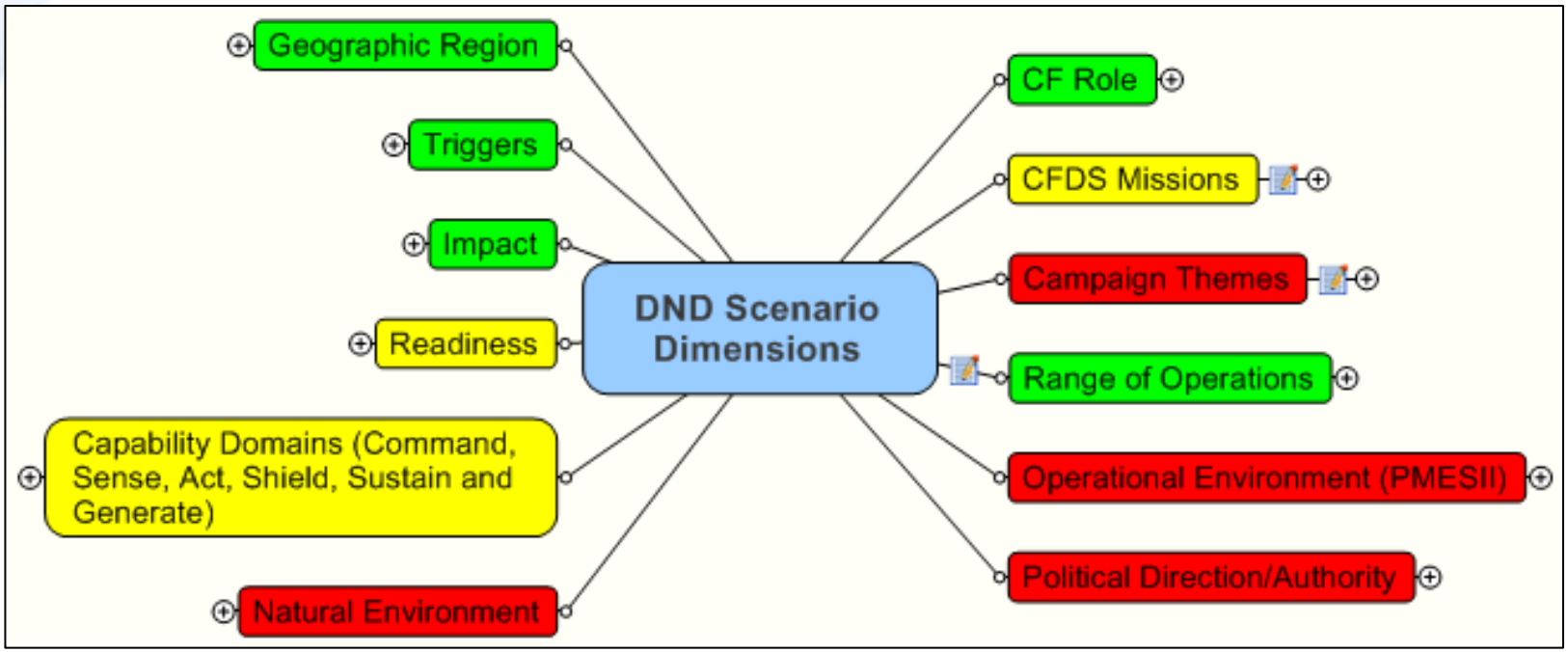
- Canada First Defence Strategy outlines the vision of the CF capabilities through six core missions that address the future security environment:

1. Conduct daily domestic and continental operations, including in the Arctic and through NORAD;
2. Support a major international event in Canada, such as the 2010 Olympics;
3. Respond to a major terrorist attack;
4. Support civilian authorities during a crisis in Canada such as a natural disaster;
5. Lead and/or conduct a major international operation for an extended period; and
6. Deploy forces in response to crises elsewhere in the world for shorter periods.

Step 2: Develop a Language to Describe the Future

- Framework dimensions are designed to capture all relevant aspects of the Future Security Environment
  - Build on previous scenario development efforts
  - Capable of expansion to accommodate different perspectives and classes of users (e.g., policy, capability manager)
  - Broken into three categories:
    - Drivers: Includes the core elements of future scenarios. These driver dimensions are used to evaluate the range of plausible scenarios in evaluating the set as a whole
    - Descriptors: Used to characterize the important details within a scenario. Descriptors are necessary for developing individual scenarios to ensure they are suitable for mission analysis and Capability Based Planning
    - Derivatives: Includes all dimensions that are invoked by a particular scenario

Scenario Framework Dimensions: Drivers, Descriptors and Derivatives



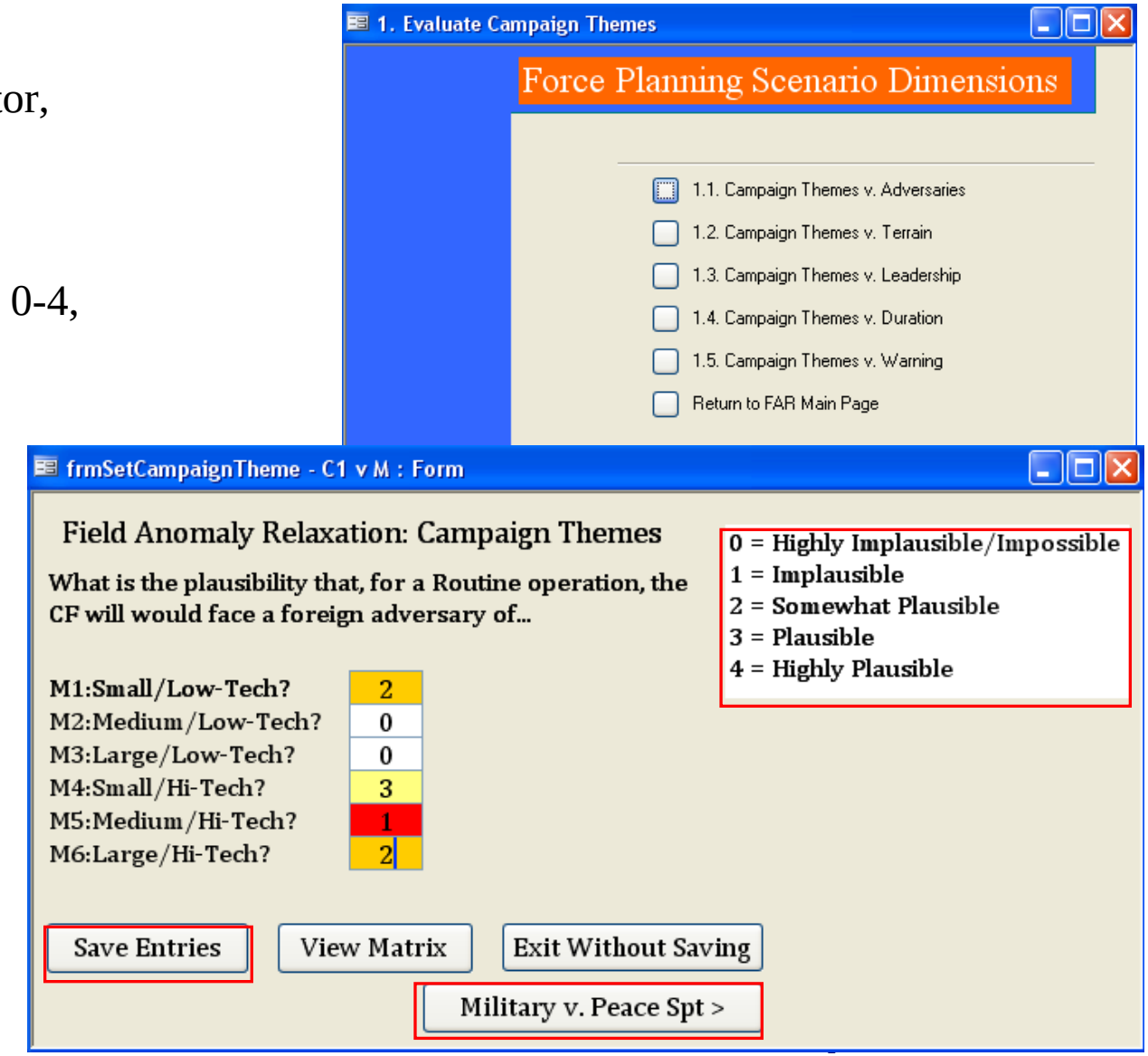
Only Drivers were applied in developing plausible scenario combinations

LEGEND

- Driver
- Descriptor
- Derivative

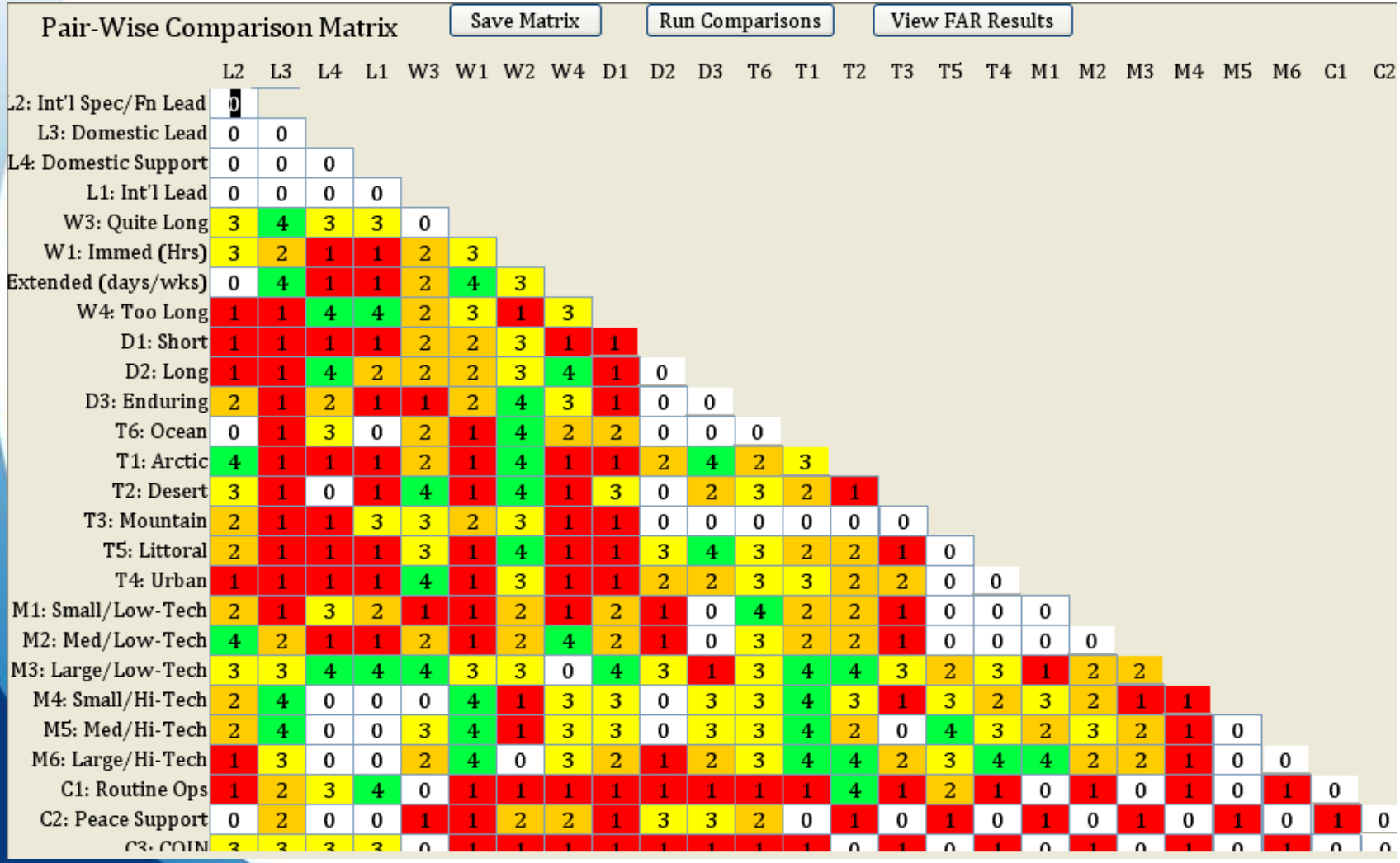
Step 3: Evaluate combinations of variables

- For each driver factor, conduct pair-wise comparison
- Apply a value from 0-4, then save values
- Progress to next variable



Step 3: Pair-wise Comparison Matrix

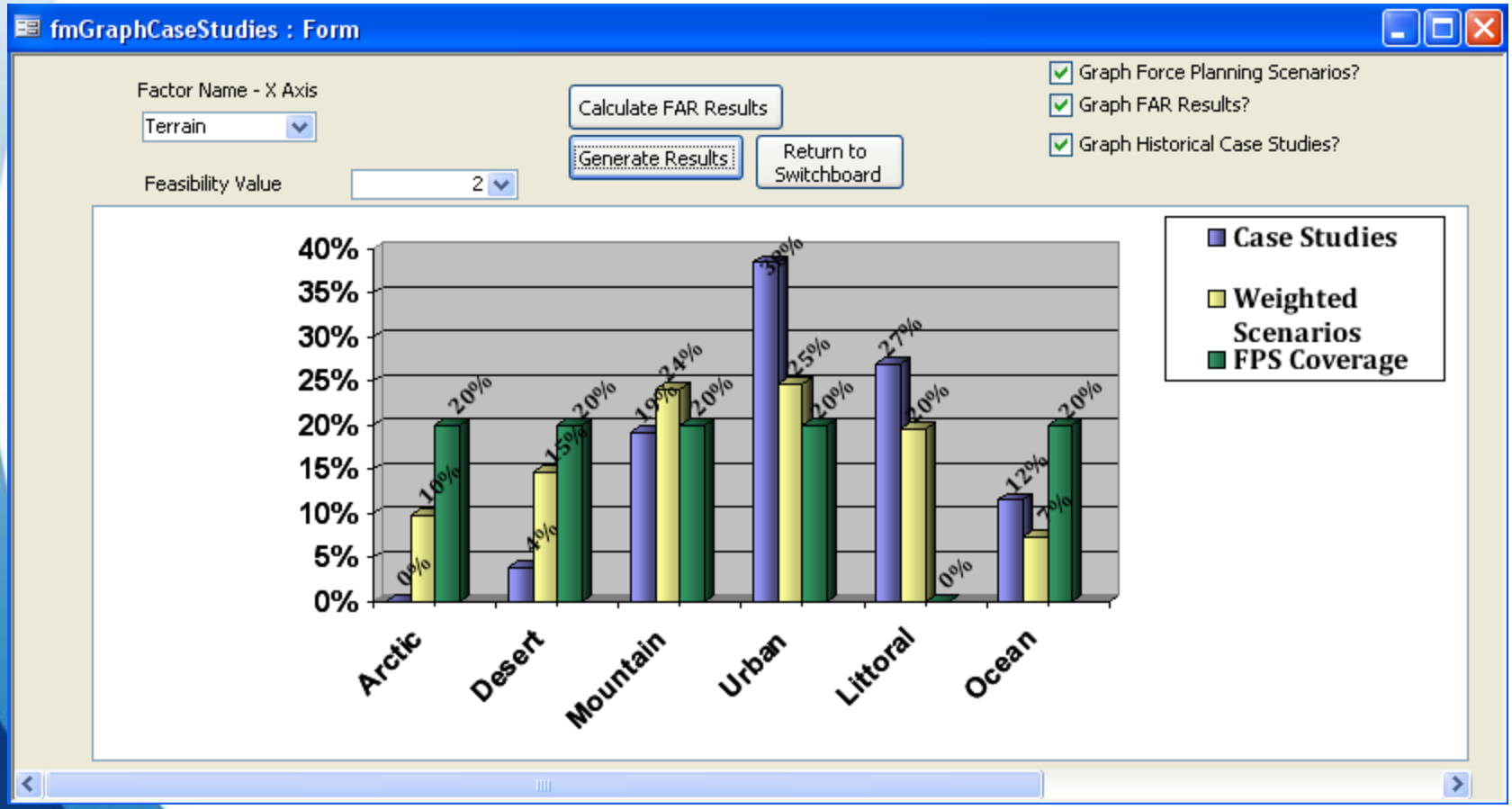
- The pair-wise comparison matrix provides a mechanism to review data



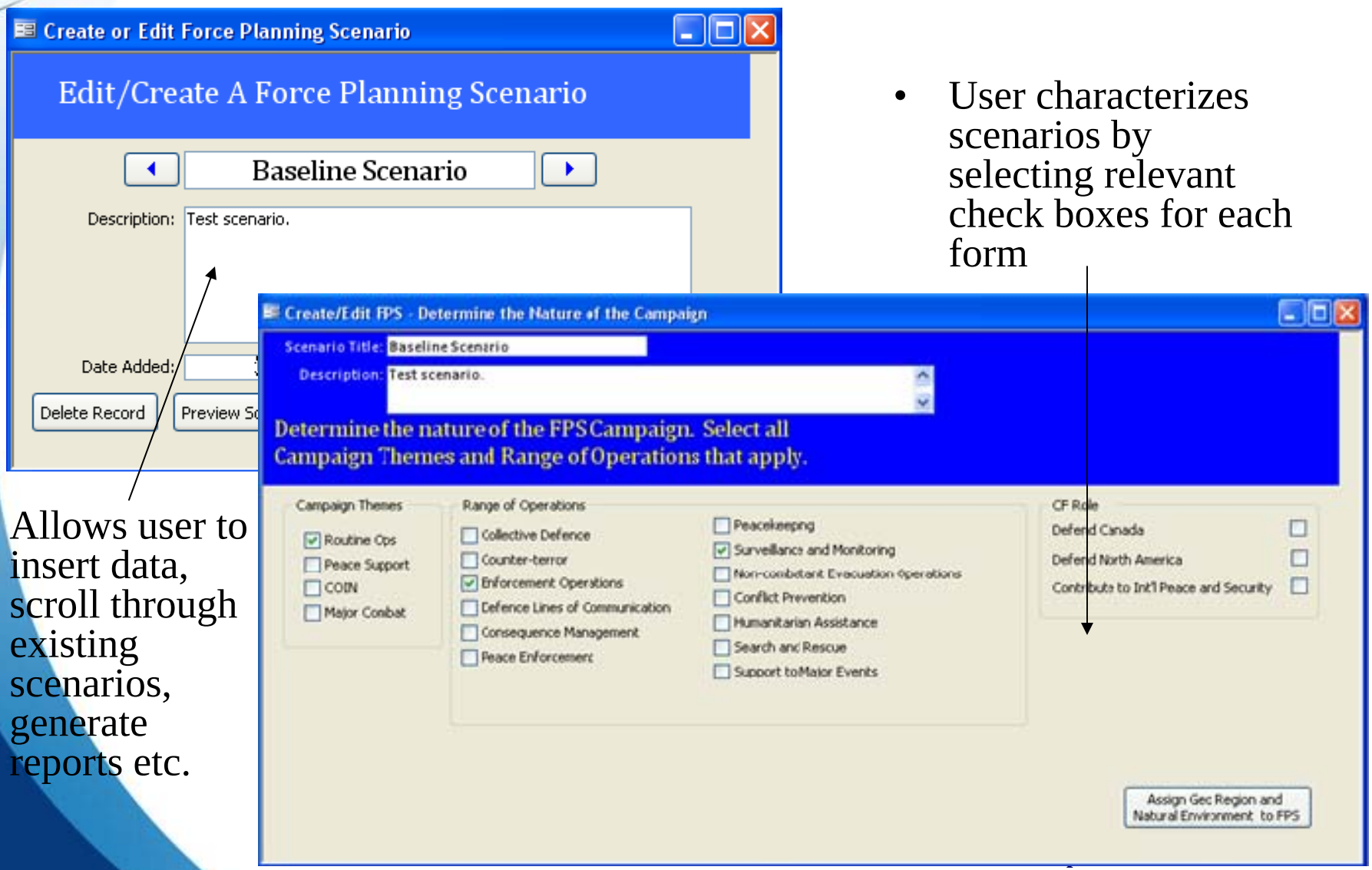
	L2	L3	L4	L1	W3	W1	W2	W4	D1	D2	D3	T6	T1	T2	T3	T5	T4	M1	M2	M3	M4	M5	M6	C1	C2
L2: Int'l Spec/Fn Lead	0																								
L3: Domestic Lead	0	0																							
L4: Domestic Support	0	0	0																						
L1: Int'l Lead	0	0	0	0																					
W3: Quite Long	3	4	3	3	0																				
W1: Immed (Hrs)	3	2	1	1	2	3																			
Extended (days/wks)	0	4	1	1	2	4	3																		
W4: Too Long	1	1	4	4	2	3	1	3																	
D1: Short	1	1	1	1	2	2	3	1	1																
D2: Long	1	1	4	2	2	2	3	4	1	0															
D3: Enduring	2	1	2	1	1	2	4	3	1	0	0														
T6: Ocean	0	1	3	0	2	1	4	2	2	0	0	0													
T1: Arctic	4	1	1	1	2	1	4	1	1	2	4	2	3												
T2: Desert	3	1	0	1	4	1	4	1	3	0	2	3	2	1											
T3: Mountain	2	1	1	3	3	2	3	1	1	0	0	0	0	0	0										
T5: Littoral	2	1	1	1	3	1	4	1	1	3	4	3	2	2	1	0									
T4: Urban	1	1	1	1	4	1	3	1	1	2	2	3	3	2	2	0	0								
M1: Small/Low-Tech	2	1	3	2	1	1	2	1	2	1	0	4	2	2	1	0	0	0							
M2: Med/Low-Tech	4	2	1	1	2	1	2	4	2	1	0	3	2	2	1	0	0	0	0						
M3: Large/Low-Tech	3	3	4	4	4	3	3	0	4	3	1	3	4	4	3	2	3	1	2	2					
M4: Small/Hi-Tech	2	4	0	0	0	4	1	3	3	0	3	3	4	3	1	3	2	3	2	1	1				
M5: Med/Hi-Tech	2	4	0	0	3	4	1	3	3	0	3	3	4	2	0	4	3	2	3	2	1	0			
M6: Large/Hi-Tech	1	3	0	0	2	4	0	3	2	1	2	3	4	4	2	3	4	4	2	2	1	0	0		
C1: Routine Ops	1	2	3	4	0	1	1	1	1	1	1	1	1	4	1	2	1	0	1	0	1	0	1	0	
C2: Peace Support	0	2	0	0	1	1	2	2	1	3	3	2	0	1	0	1	0	1	0	1	0	1	0	1	0
C3: COIN	3	3	3	3	0	1	1	1	1	1	1	1	1	0	1	0	1	0	1	0	1	0	1	0	0

Step 4: View Results for Analysis

- Histogram shows plausibility values for each variable



Create or Modify Scenario Set



- Allows user to insert data, scroll through existing scenarios, generate reports etc.
- User characterizes scenarios by selecting relevant check boxes for each form

Some Observations for Command and Control

- What works well
  - Broad, comprehensive and tailorable approach
  - A tangible “leave behind” decision support capability
  - Structure for capturing current knowledge based on diverse range of inputs
  - Common set of terms and language
- What doesn’t work well
  - Satisfying the concerns of all stakeholders
  - Using the scenario tool to justify expensive capability investment decisions, or solve all acquisition concerns
  - Framework dimensions and values are subjective
  - Challenge to contain the number of variables and scenarios

Summary and Way Ahead

- We are evolving this tool as a web-based platform
  - Enable comparative analysis of multiple frameworks
- Validation
  - Populated with historical case studies
- “Fit For, but not With”
  - Support to ongoing capability assessments

Questions?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