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Executable Architecture of Net Enabled Operations: State Machine of Federated Nodes

Mr. Mark Ball (DRDC CORA*) – Presenter

Mr. Ron Funk (DRDC CORA*)

Mr. Rick Sorensen (Vitech Corp.)

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* Defence R&D Canada – Centre for Operational Research and Analysis

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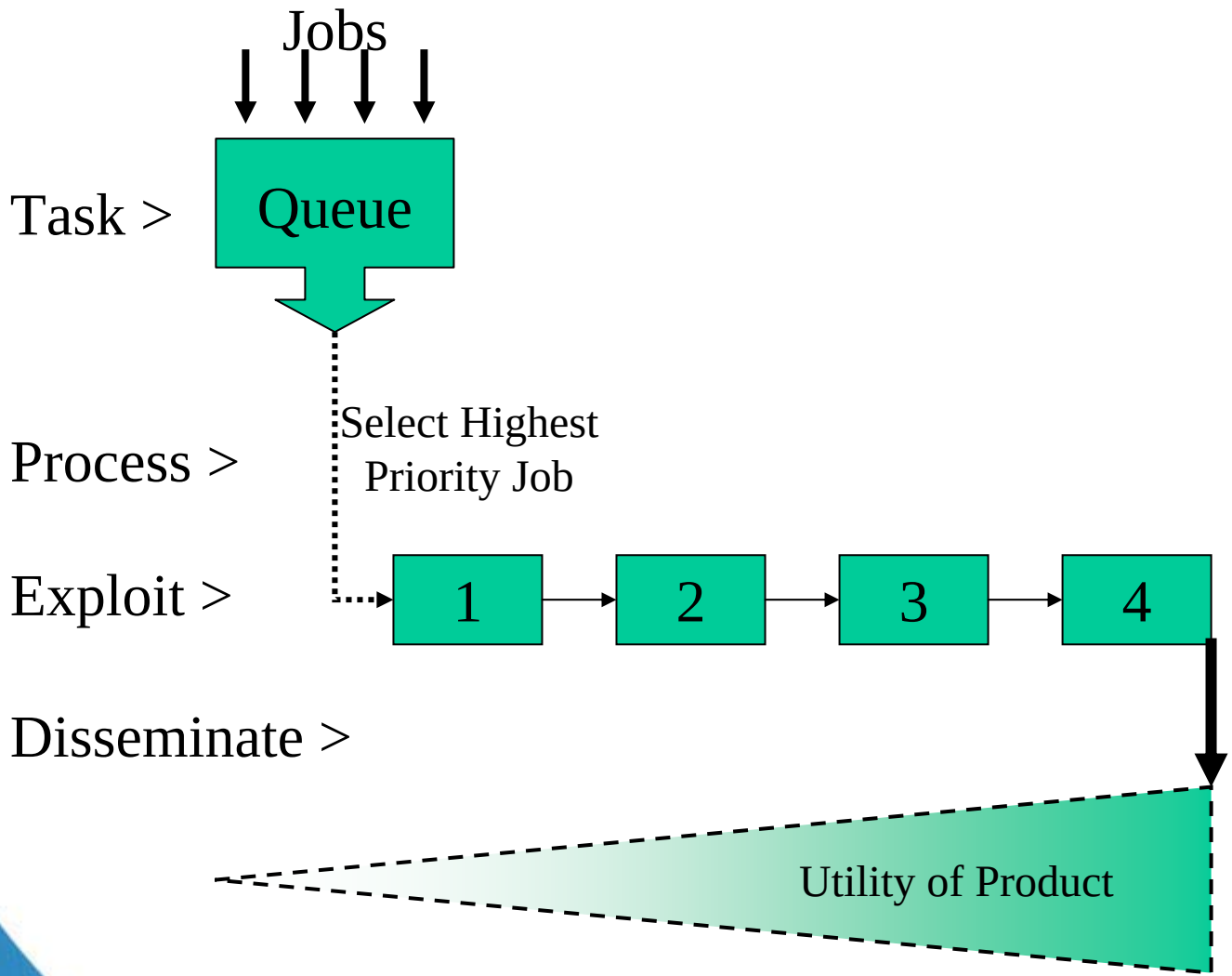
Outline

- Introduction
  - Background
  - TPED vs TPPU
- Conceptual basis
  - OV-1
  - PRC
- Implementation in COREsim
- Decision Logic
  - Extensions beyond OPCEN SM
  - Node-specific logic (Producer, Consumer, Discovery, External, Repository)
- Input Data Files
- Way Ahead

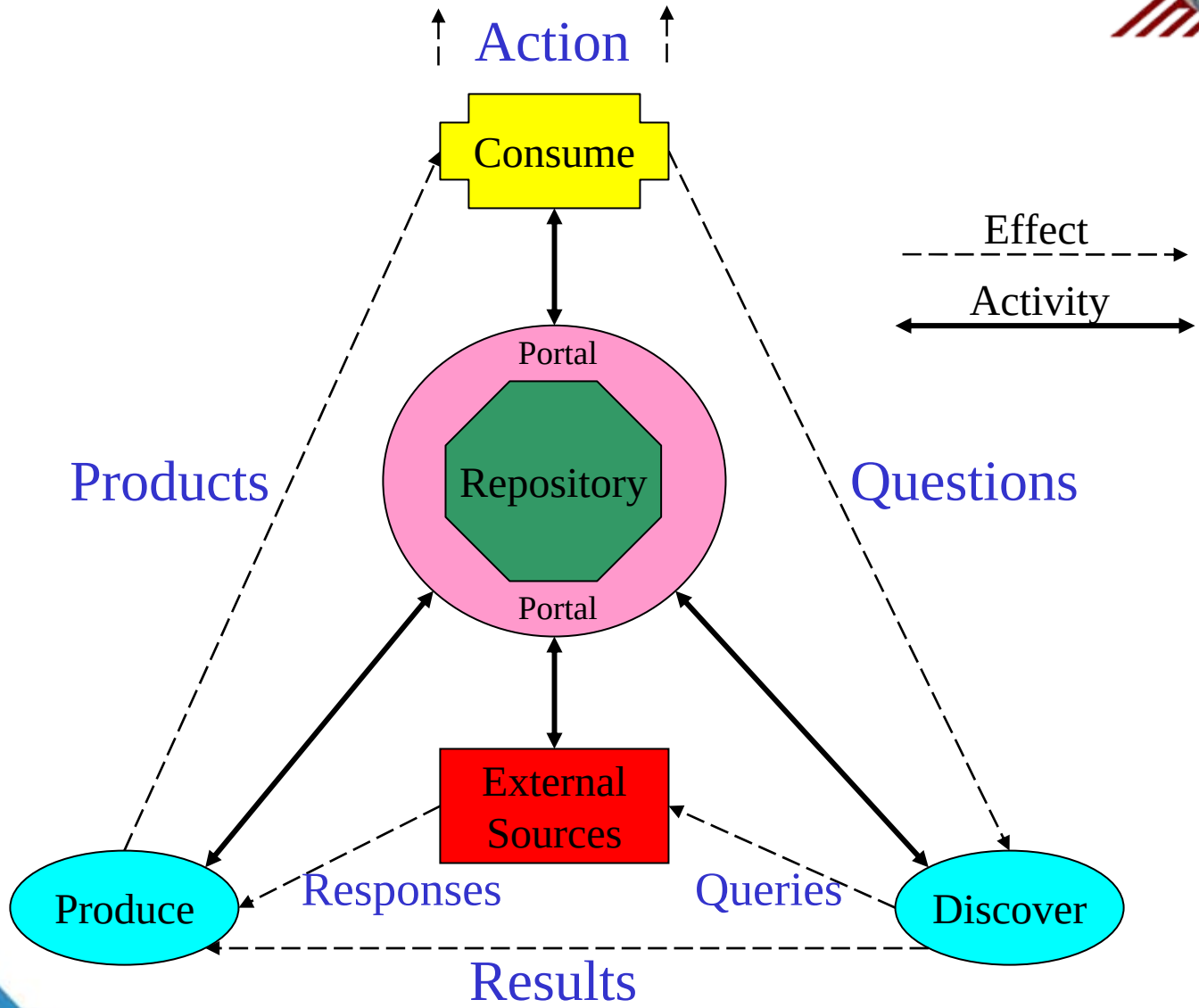
Background

- Goal: develop capability-engineering analysis tools to support the building, demonstration, and analysis of executable architectures.
- OPCEN State Machine

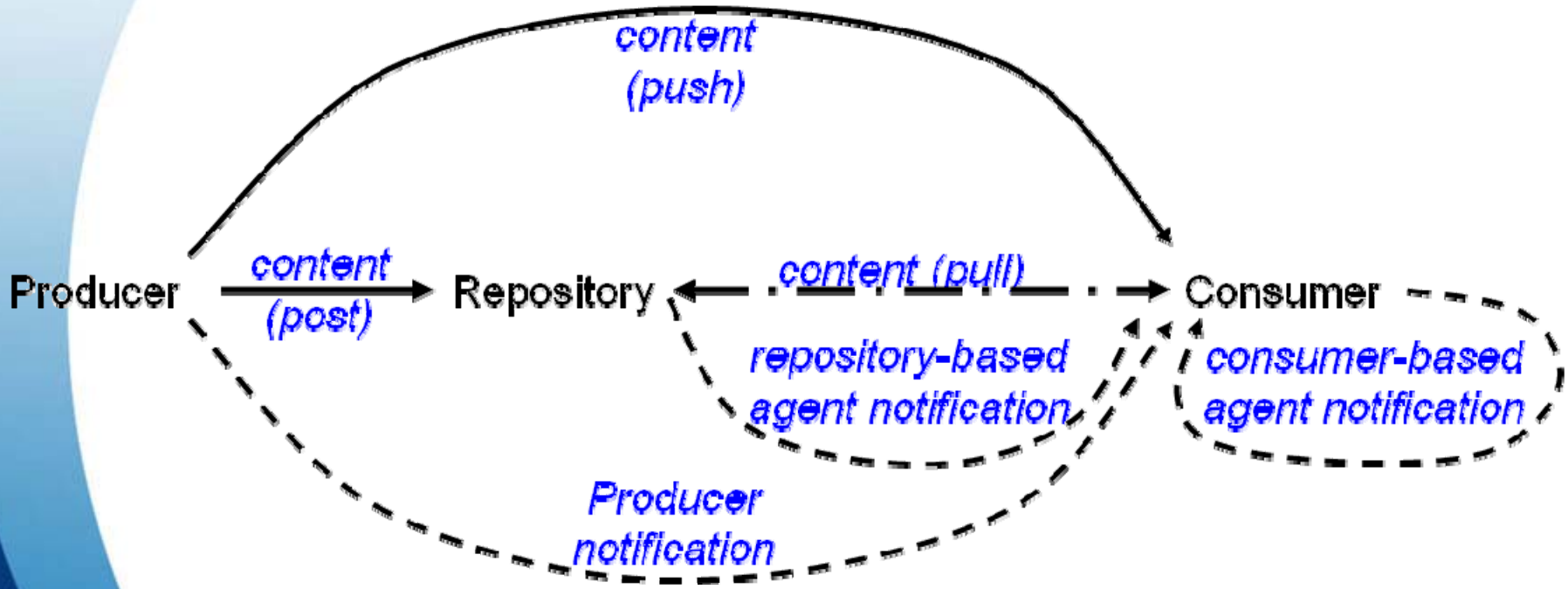
How Task, Process, Exploit and Disseminate (TPED) Handles Jobs



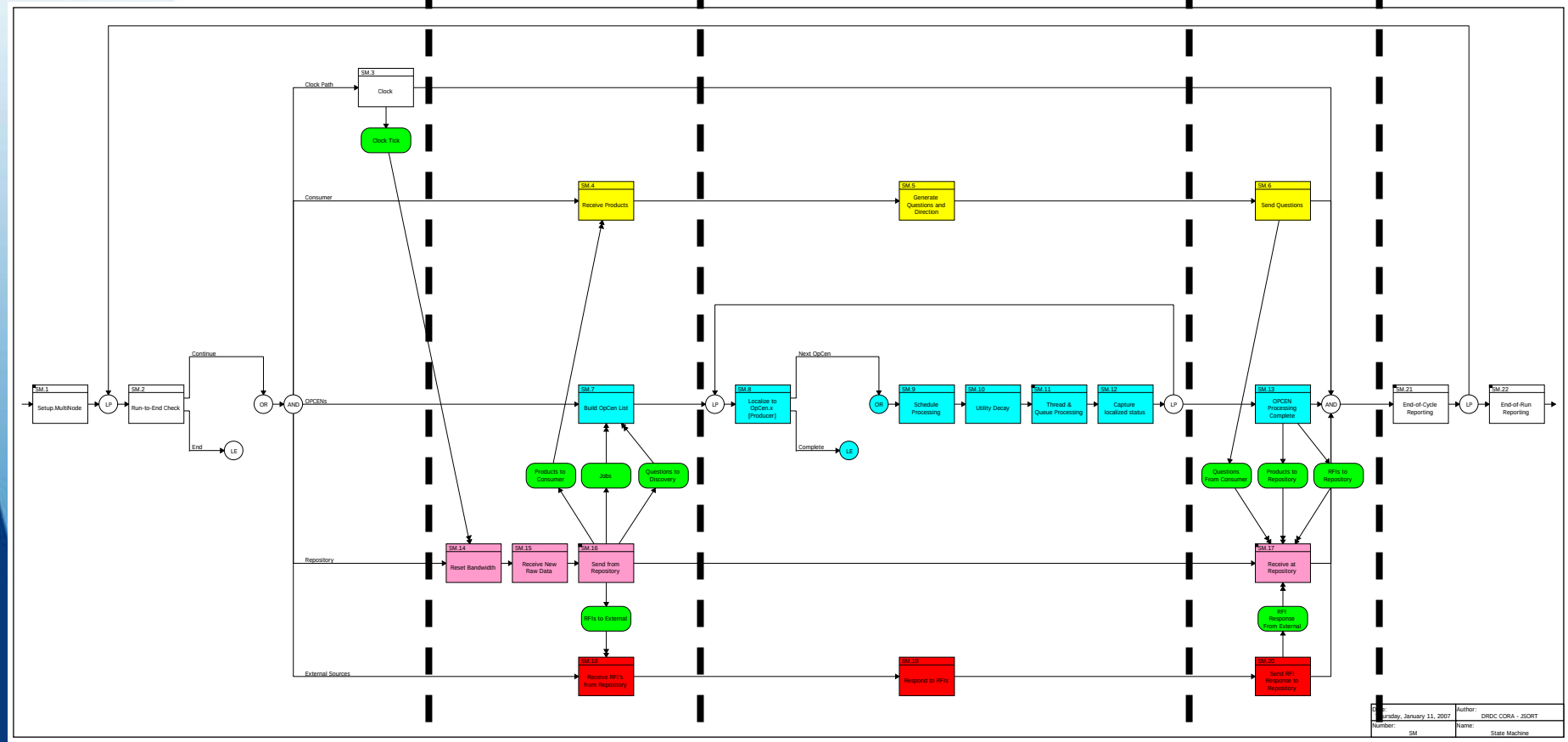
Scale Free OV-1 for SMOFN

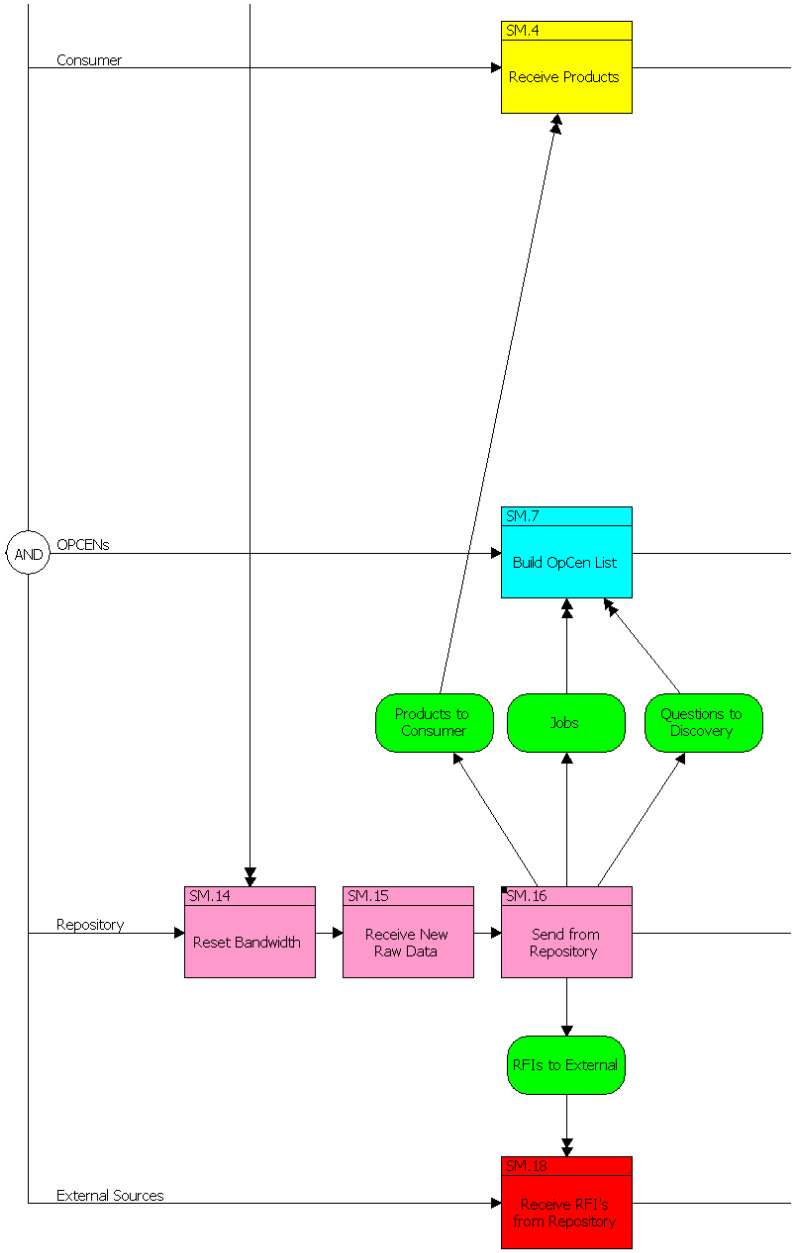


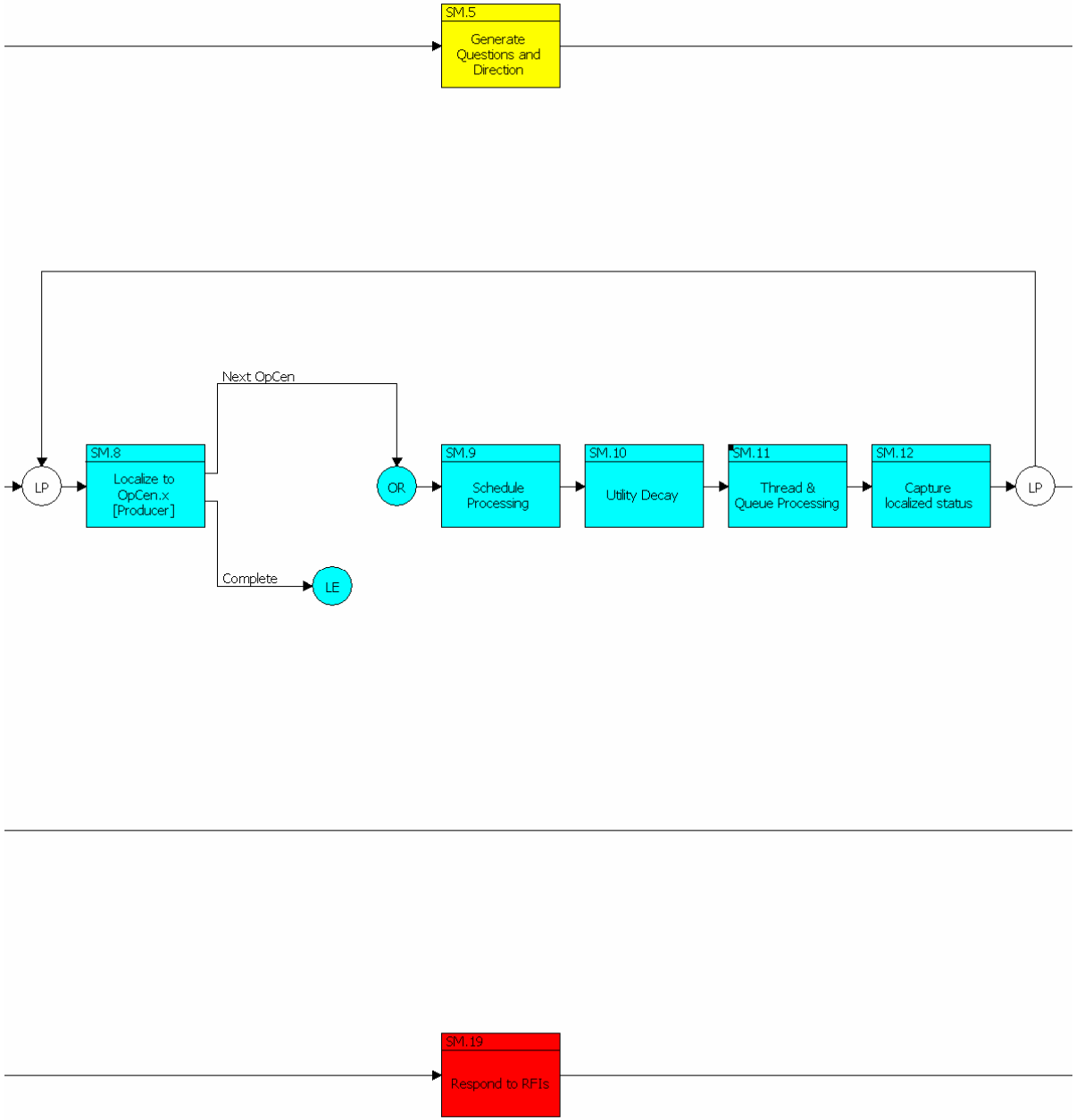
Producer-Repository-Consumer (PRC) Model

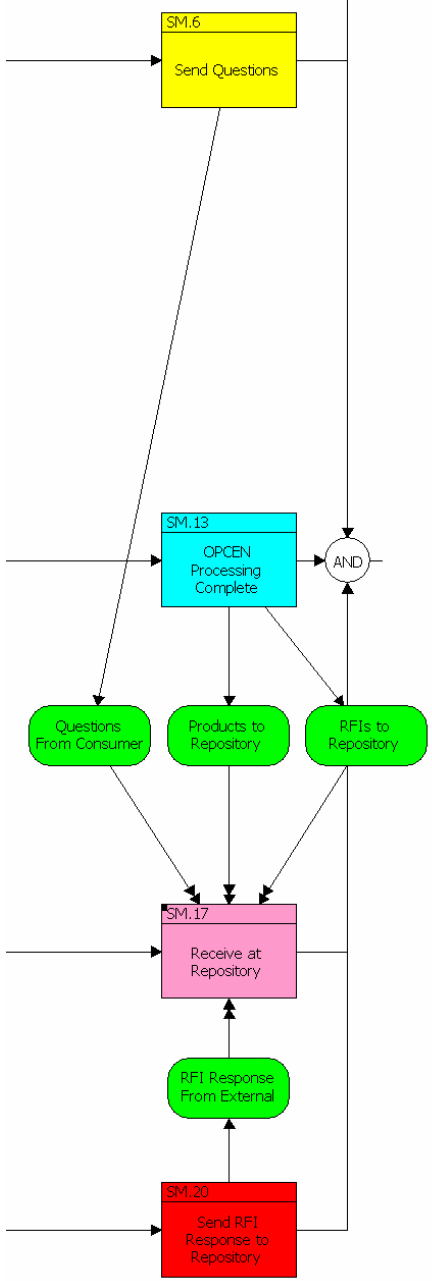


SMOFN Top Level




SM.4
Receive Products
Consumer
SM.7
Build OpCen List
AND
OPCENs
Products to Consumer
Jobs
Questions to Discovery
SM.14
Reset Bandwidth
SM.15
Receive New Raw Data
SM.16
Send from Repository
Repository
RFIs to External
SM.18
Receive RFI's from Repository
External Sources


SM.5
Generate Questions and Direction
Next OpCen
LP
SM.8
Localize to OpCen.x [Producer]
Complete
LE
OR
SM.9
Schedule Processing
SM.10
Utility Decay
SM.11
Thread & Queue Processing
SM.12
Capture localized status
LP
SM.19
Respond to RFIs


SM.6
Send Questions
SM.13
OPCEN Processing Complete
AND
Questions From Consumer
Products to Repository
RFIs to Repository
SM.17
Receive at Repository
RFI Response From External
SM.20
Send RFI Response to Repository

SMOFN Execution

- Flowchart represents a moment in time
- Decision logic executes entirely for one time step
- Time steps forward, logic repeats, accounts for changes in job states

What SMOFN Accounts For

- Data-driven simulation:
  - Uses files to build customized job workflows and configure any combination of nodes without affecting the business logic.
- Accounts for the following overhead activities:
  - Tracking consumer perception of product utility as it accrues and decays;
  - Consolidation of products into higher-level aggregated products; and
  - Triggering new jobs where needed whenever relevant data becomes available.

What SMOFN Does That OPCEN SM Couldn't Do

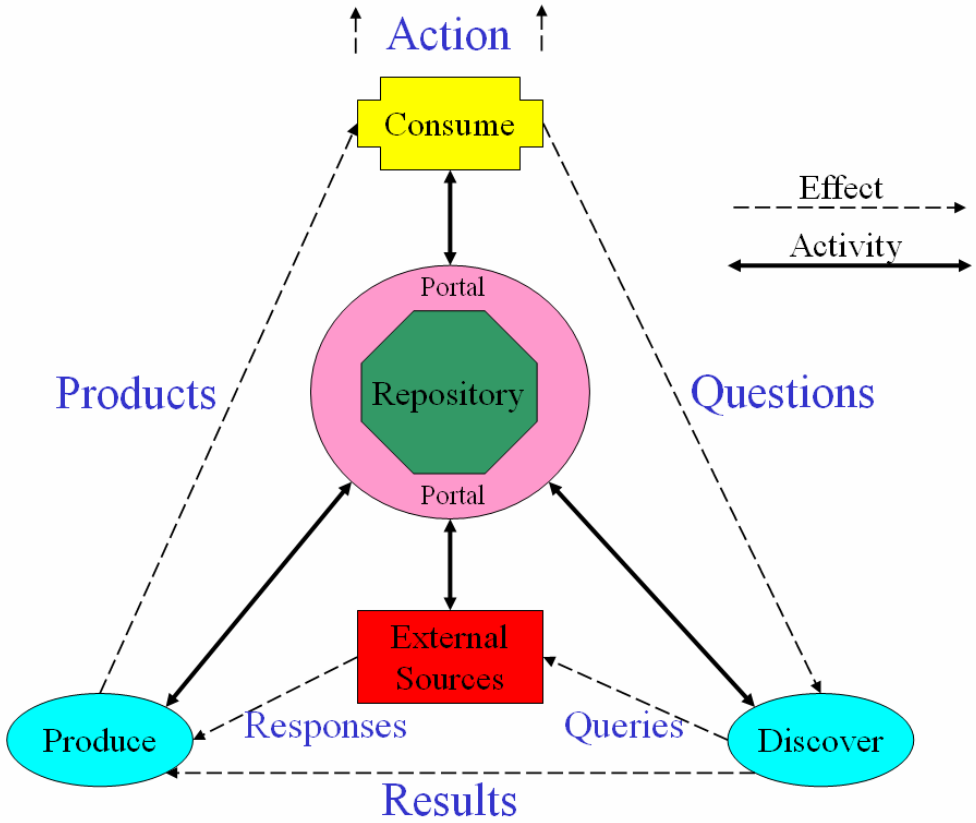
- Nodes other than Producer
  - Discovery threads
  - Interaction between nodes
- More flexibility in job steps
  - Unlimited number
  - Step names

What the Producer Does

- Only node in OPCEN SM
- Converts raw data into analyzed products
- Progress is tracked step by step
- Job state accounts for
  - Utility accrued / decayed
  - Operators involved
  - Time spent / left

What the Repository Does

- Transfers information between nodes according to OV-1



What the Consumer Does

- Receives Products from Repository
- May generate Questions some time after receiving each Product

What the Discoverer Does

- Jobs defined similar to Producer
- Jobs start when Questions received
- Three possible results
  - All required data found
  - Some required data found
  - No required data found
- Found data triggers new analysis job at Producer
- Missing data triggers Query to External Sources

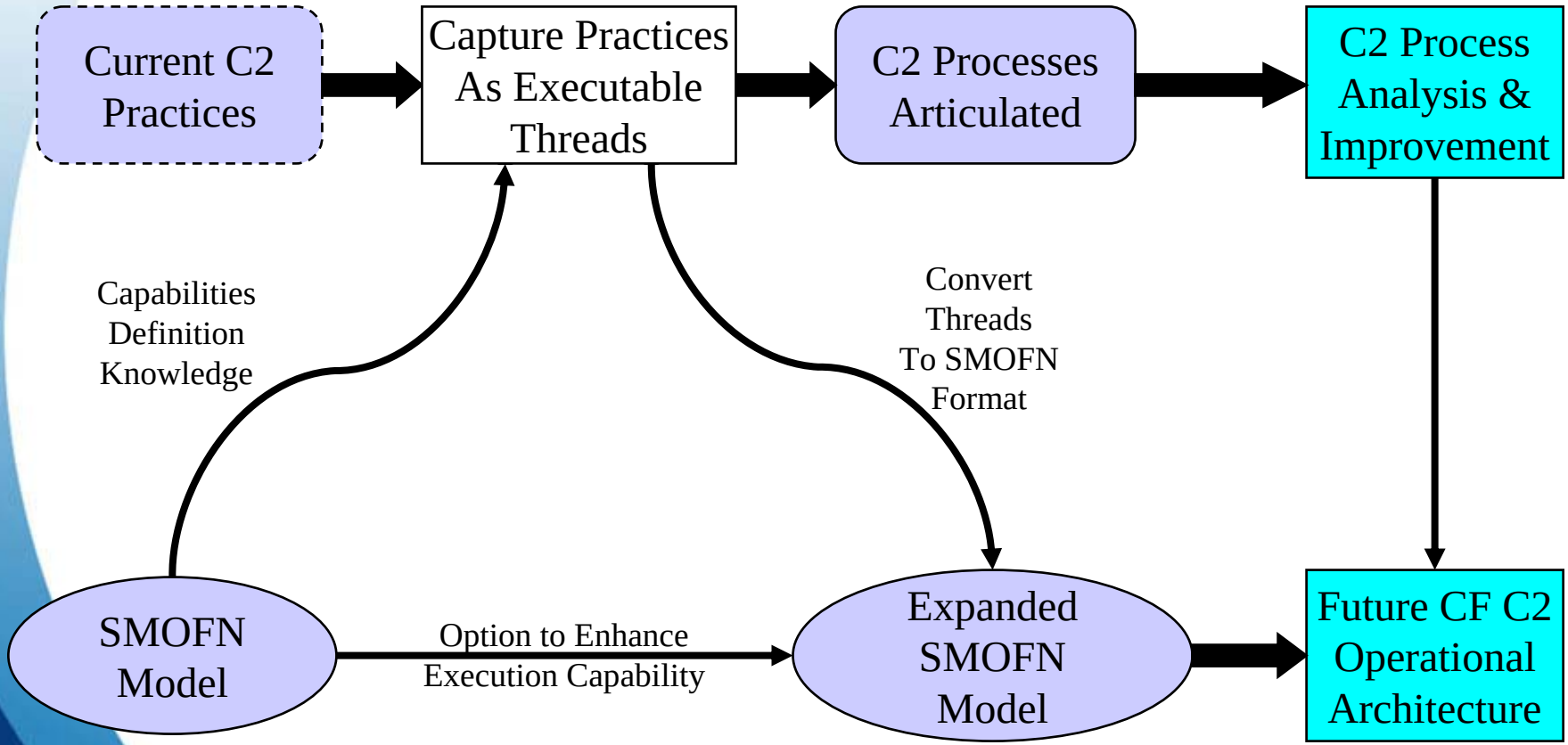
What the External Sources Do

- Logic similar to Consumer
- Receives Queries from Repository
- Generates Responses some time after receiving each Query

Data Files

- Describe general characteristics of each thread
- Describe each step within thread
- Describe OPCEN configuration
- Describe product delivery

C2 Modeling Path



Work in progress

- Customization of SMOFN is underway to make data files representative of new Canadian Forces Command structure
  - OPCEN config
  - Job threads (reporting & response process, daily brief)
- Data remains outside model until runtime – model itself remains unclassified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