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2007

## Joint Battle Management Language (JBML) - Phase 1 Development and Demonstration Results

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J.; Kearley, J.; Blais, Curtis

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# Joint Battle Management Language (JBML) - Phase 1 Development and Demonstration Results

Fall 2007 Simulation Interoperability Workshop  
Paper 07F-SIW-051

*September 18, 2007*

# Outline

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- Purpose
- BML Background
- JBML Phase 1 Description
- Demonstration Results
- Summary/Conclusions

# Purpose

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The purpose of this briefing is to present the results of **Phase 1** of the Joint Battle Management Language Program  
**(JBML)**

# Outline

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- Purpose
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# The Problem

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- Our current “BML” is a language tailored to interpersonal communication
- It is riddled with ambiguity and overlapping definitions
- It will not support the integration of advanced modeling and simulation with “digitized” command and control

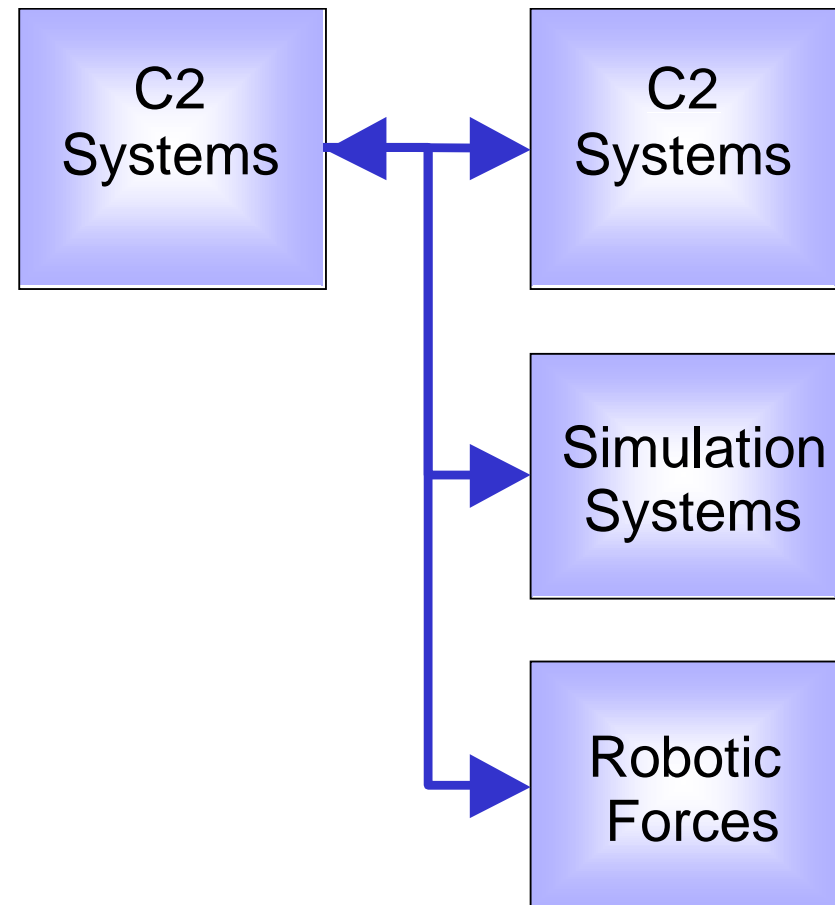


# Battle Management Language (BML)

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BML is being developed as a **standard representation** of digitized C2 information for executable **plans, orders, requests and reports** for:

- military units,
- simulated forces, and
- future robotic forces.



## Benefits of Adopting BML

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- Supports better integration of simulations with C2 systems
- Reduces time and cost to accomplish training / operations
- Reduces number of workstation controllers, unique interfaces, and interpreters
- Improves Service, Joint, Coalition interoperability

**Key enabler for battle staff training capability**



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# Phase 1 Project Definition

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- **Build and demonstrate** an initial **Joint BML** capability to transmit digital **orders**:
  - to Joint and Combined Forces
  - using a Battle Management Language specification
  - for Proof of Principle

# JBML Phase 1 Products

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- Proof of Principle Demo for Joint Capability
  - Representative **Land, Sea, Air**
- Input to a draft SISO standard
  - Including Web Service infrastructure
- Integrated into NATO MSG-048 planning

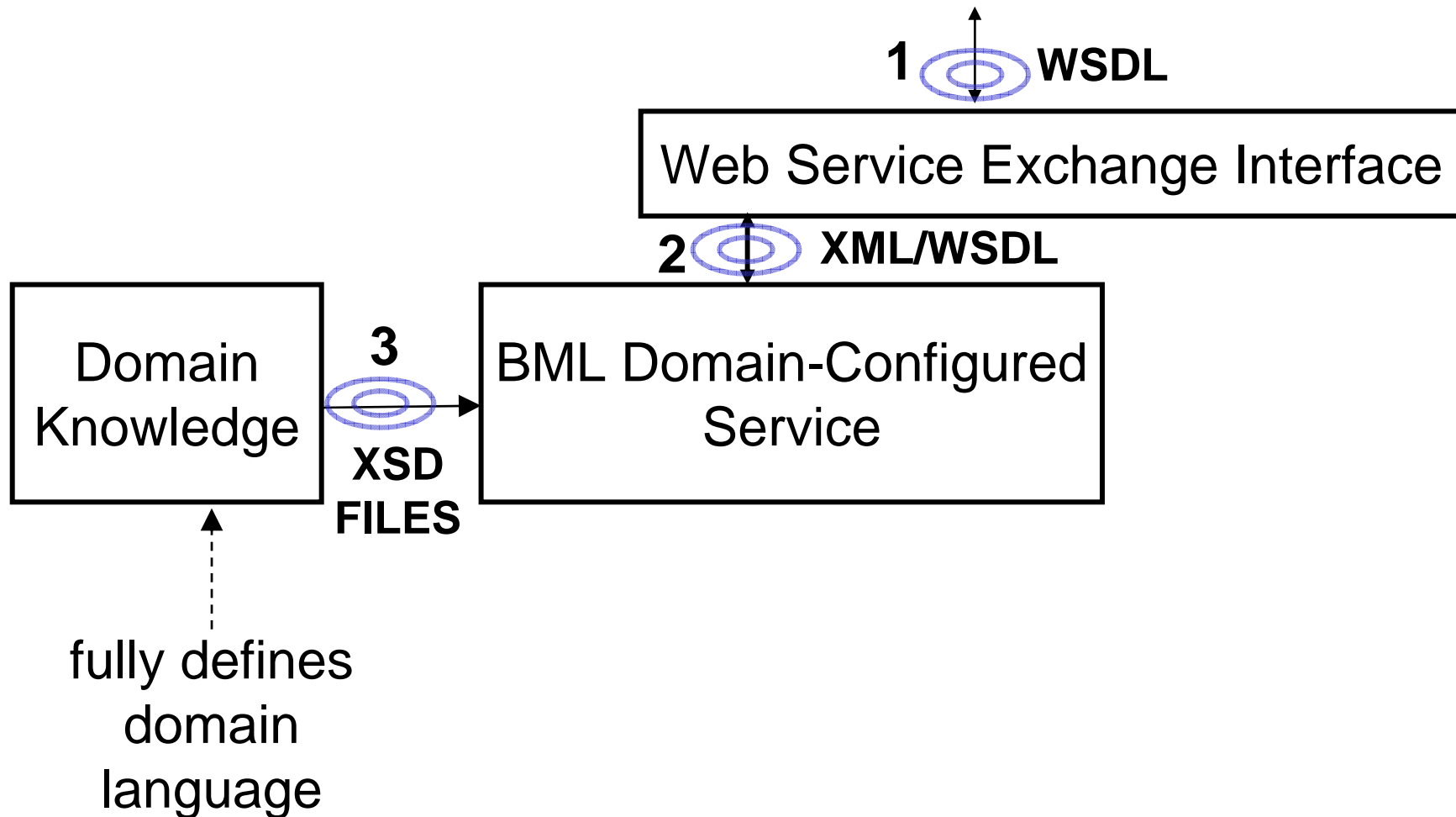
# JBML Phase 1 Team Leads

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- Mr. Michael Powers, TEC, Program Manager
- Dr. Mark Pullen, GMU, Project Lead
- Dr. Michael Hieb, GMU, Technical Lead
- Dr. Stan Levine, GMU, Project Manager
- Mr. John Roberts, ACS, Ground Lead
- Mr. Curtis Blais, NPS, Maritime Lead
- Mr. David Perme, Gestalt, Air Lead
- Dr. Andreas Tolk, ODU, Standards Lead
- Ms. Shea Smith, JATTTL, JFCOM Coordinator
- Mr. John Kearley, DRC, Scenario Lead
- Dr. Harry Keeling, HU, Testbed Lead

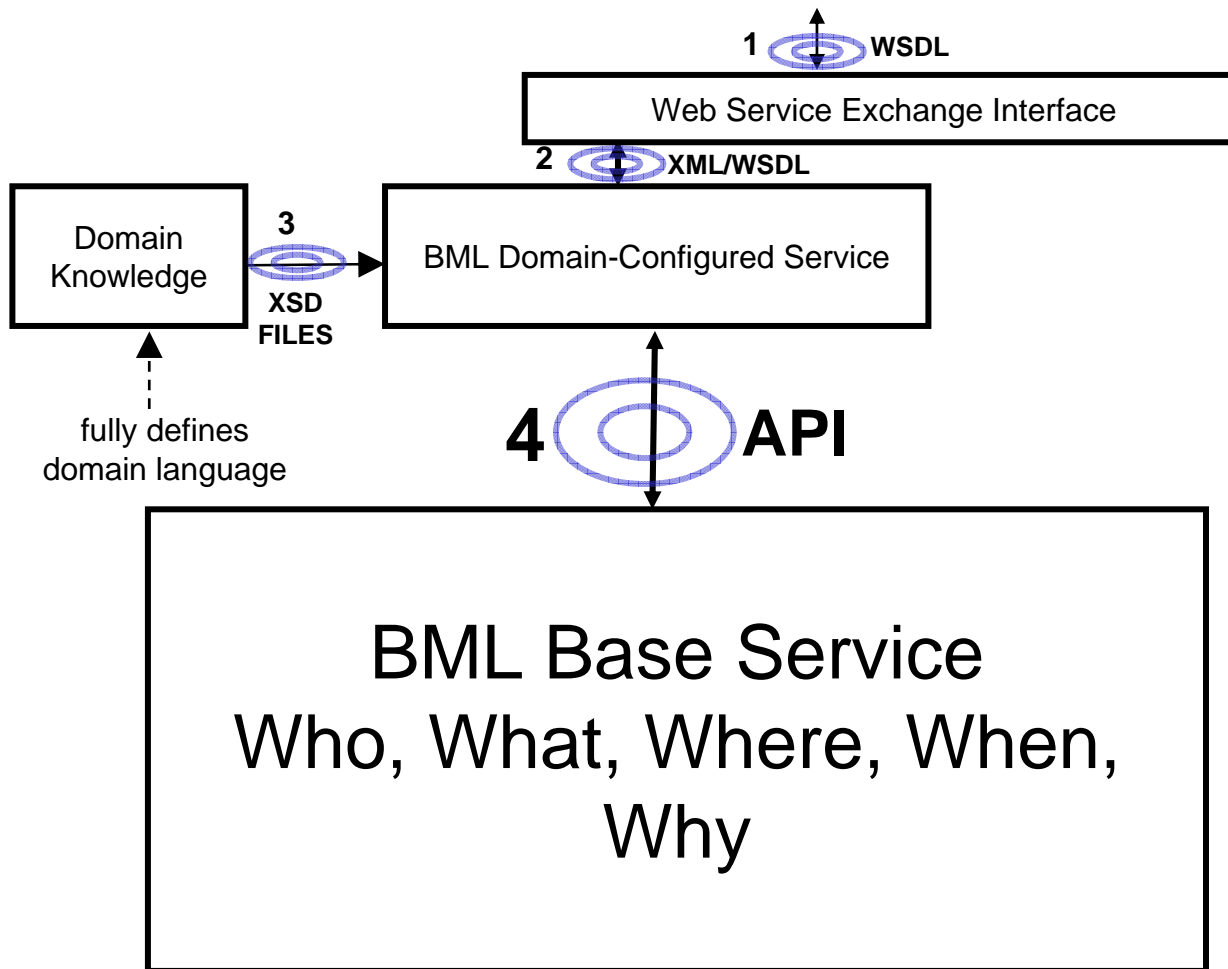
# JBML Web Service Architecture

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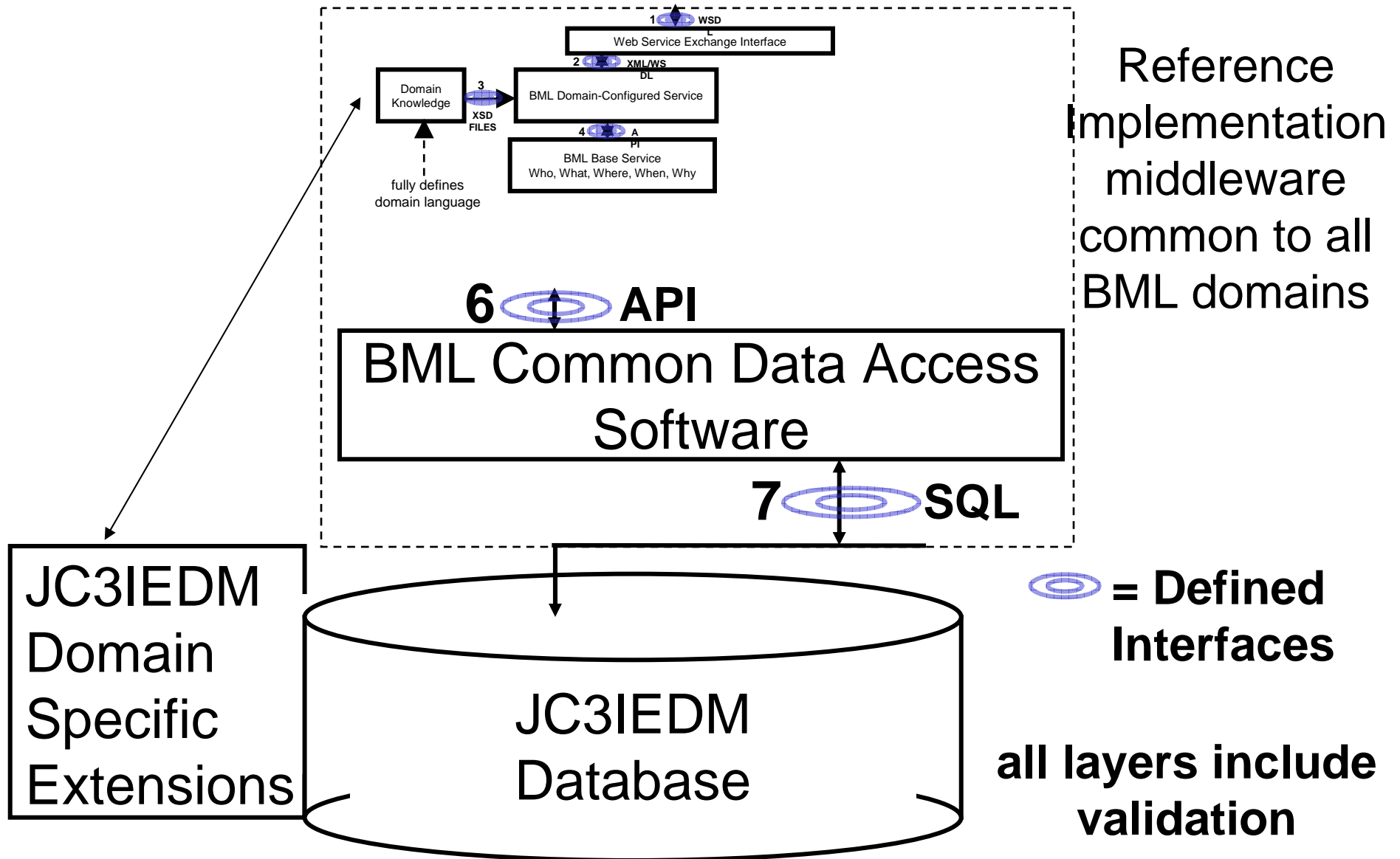


# JBML Web Service Architecture

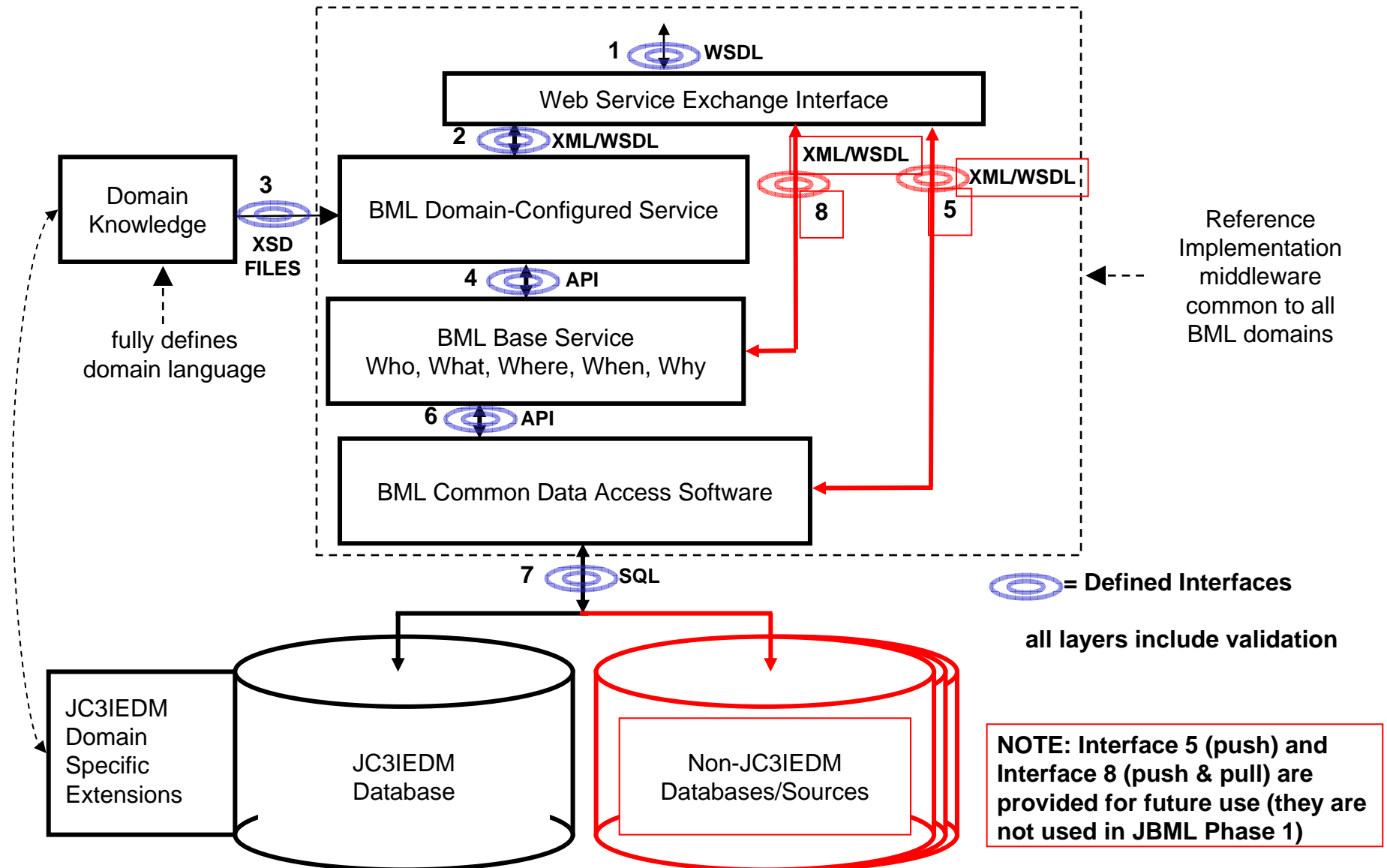
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# JBML Web Service Architecture



# JBML Web Service Architecture



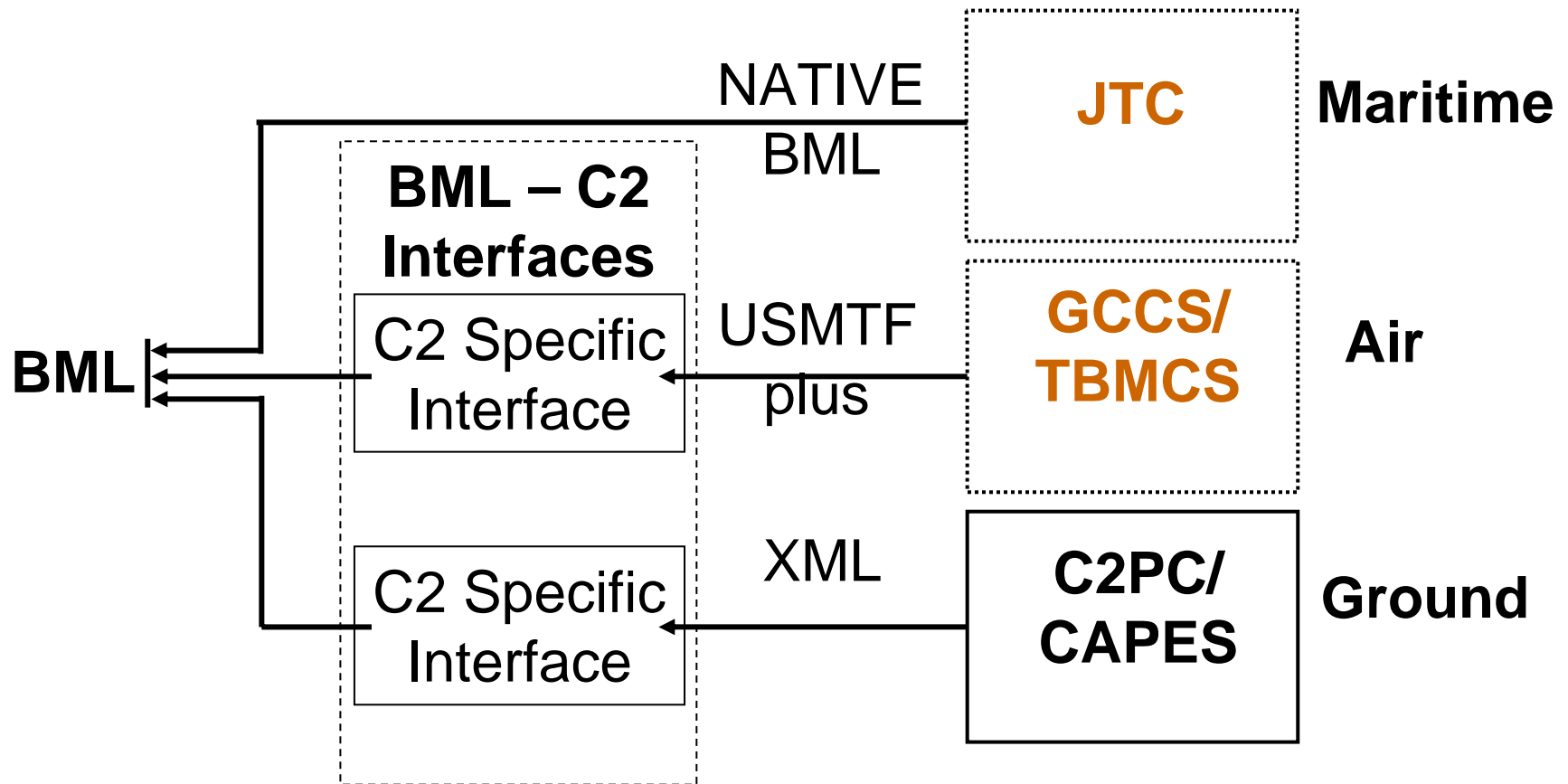


# Outline

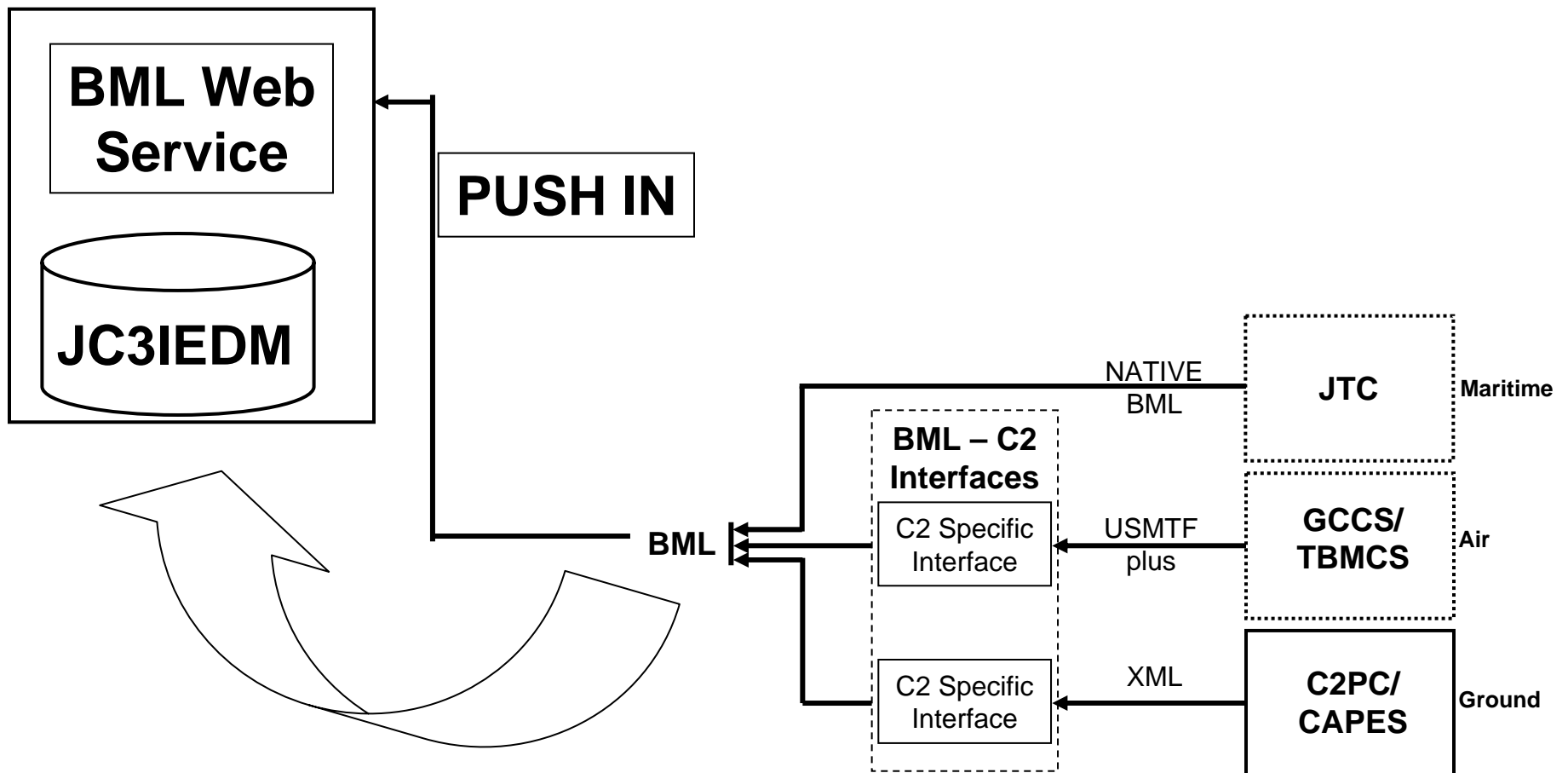
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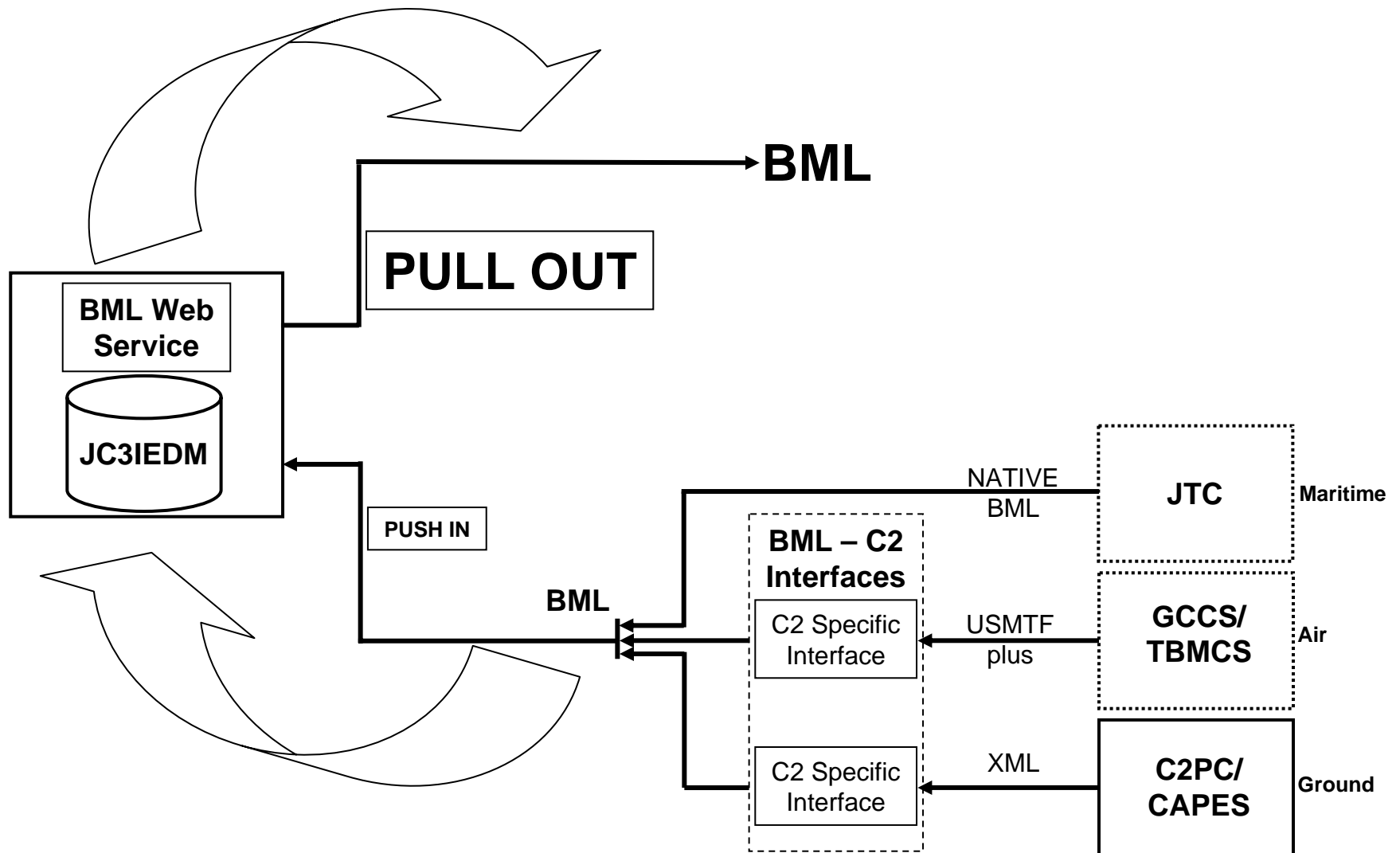
# JBML Demo Environment



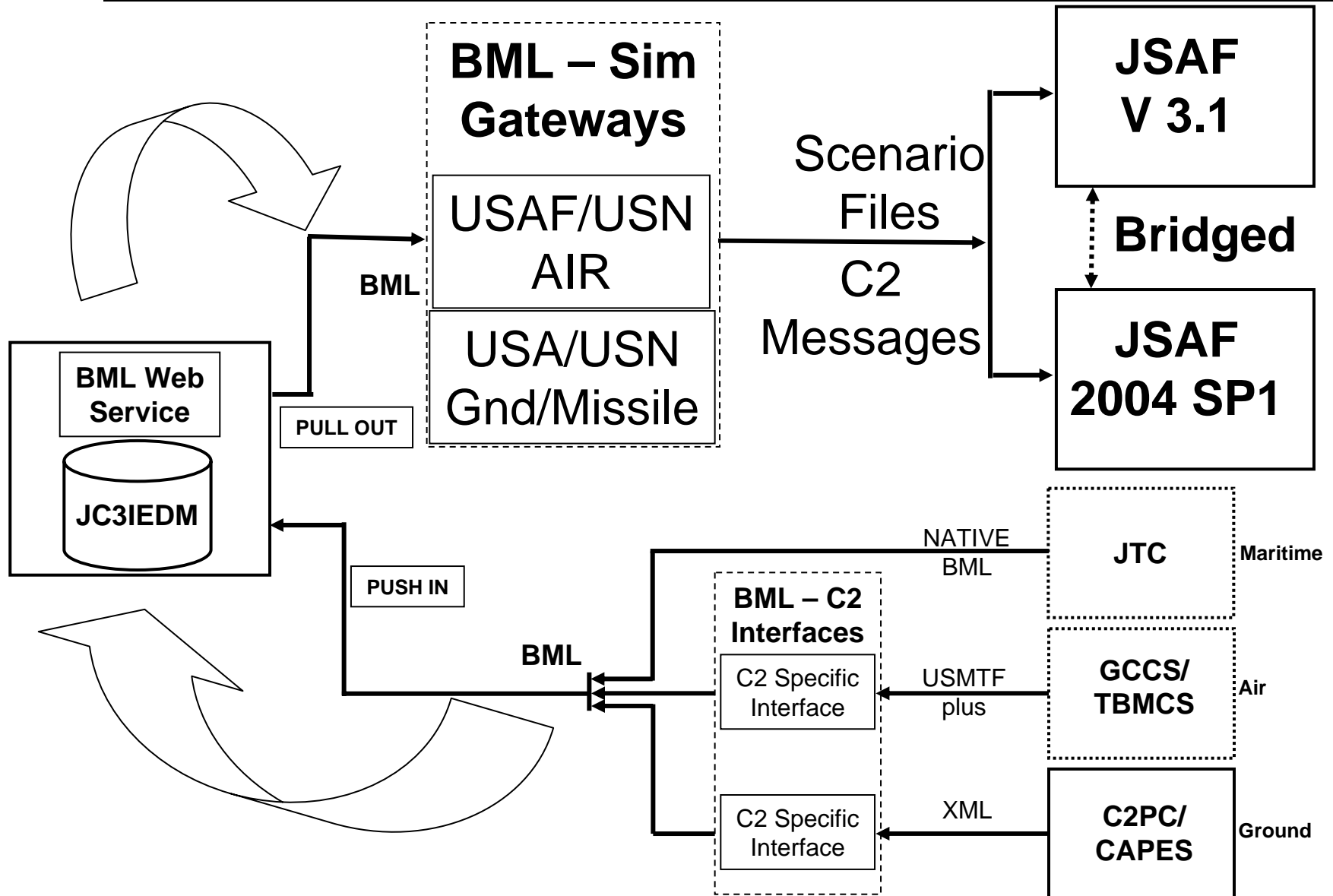
# JBML Demo Environment



# JBML Demo Environment



# JBML Demo Environment

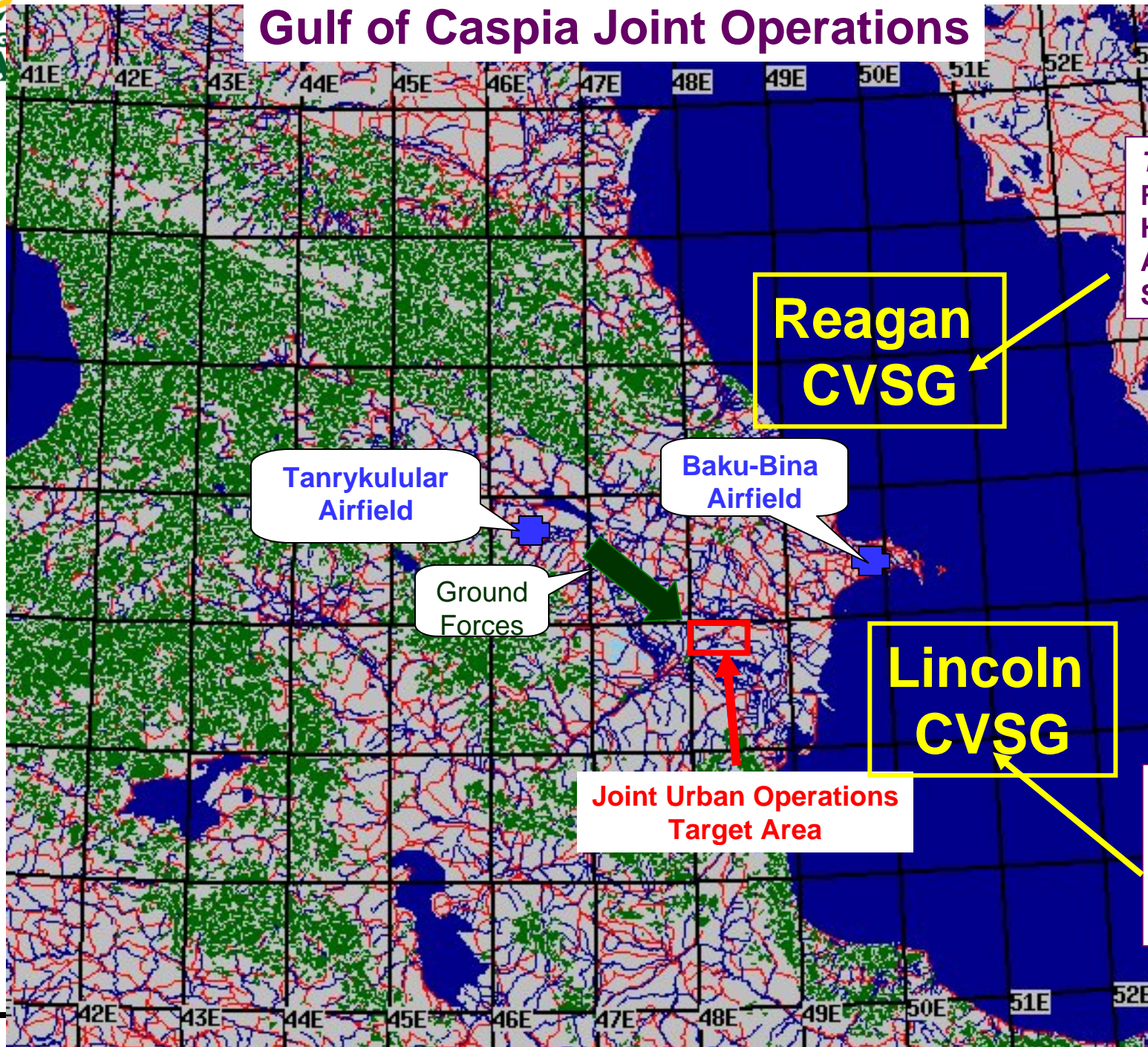


# Demo Concept of the Operation

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- Army units proceed through Urban Areas, seizing designated objectives and destroying enemy forces, in order to reestablish an international border.
- They are preceded by:
  - Navy and Air Force strikes on key C2 and communication nodes
  - Close Air Support strikes
  - Pre-planned Navy Tomahawk strikes

# Gulf of Caspia Joint Operations



Tomahawk  
Russell  
Hamilton  
Antietam  
Santa Fe

Reagan  
CVSG

Tanrykulular  
Airfield

Baku-Bina  
Airfield

Ground  
Forces

Joint Urban Operations  
Target Area

Lincoln  
CVSG

Tomahawk  
Mobile Bay  
Shoup  
Momsen  
Chicago

41N

# Outline

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# JBML Information

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**Available at <http://netlab.gmu.edu/JBML>**

(under password control)

- Descriptive documents
  - Architecture overview
  - Code documentation (narrative & Javadoc)
  - XSD Web service schema
  - SQL database schema
- Open source code
  - Latest version of all Web services
  - GUI to inspect JC3IEDM database

## Summary

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- Phase 1 has been successful in developing a basic Joint integrated capability:
  - ATO, Ground OPORD, TLAM INDIGO
  - **TBMCS, JTC**, C2PC, multiple JSAF
- Basis for Coalition BML Standard
- Basis for follow-on MSG-048 Demo

# Questions?

# BACKUPS

## JBML Demonstration

# Joint Combat Operations

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### CJTF-CS Joint orders to component commanders

- **JFLCC as supported commander directs:**

- **2nd ID to conduct major ground operations:**

- 1-66 CAB to re-take strategic towns, airfields, railheads, and restore border

- **JFACC will conduct offensive operations:**

- Deep strike
    - Close air support

- **JFMCC will conduct offensive operations:**

- Provide forces (air and cruise missile) to JFACC for deep strike, close air support

# JBML Products

# JBML Support to C-BML

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- The C-BML Standard will include:
  1. a data model in a subset of JC3IEDM
  2. an Information Exchange content and structure specification in the form of an XML schema
  3. and an Information Exchange mechanism specification embedded into a WSDL document
  4. Guidelines
- The JBML effort will provide:
  1. JC3IEDM subset and extensions
  2. Domain Specific Interface and Functionality
  3. Composite/Atomic interfaces and functionality
  4. Embedded information that can be used to develop a C-BML guideline document.

# JBML Domain-Configured Service (DCS)

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- Purpose:
  - Provide a high-level, semantically consistent, XML-based language definition
  - Modular and readily extensible
  - Structure based on C2 Lexical grammar of Hieb & Schade
    - Gives high confidence the language will meet BML needs
    - No actual grammar processing; just a way to structure JBML

<task> (verb)

<tasker-who>

<taskee-who>

<affected-who>

<what> (action)

<where>

<start-when>

<end-when>

<why>

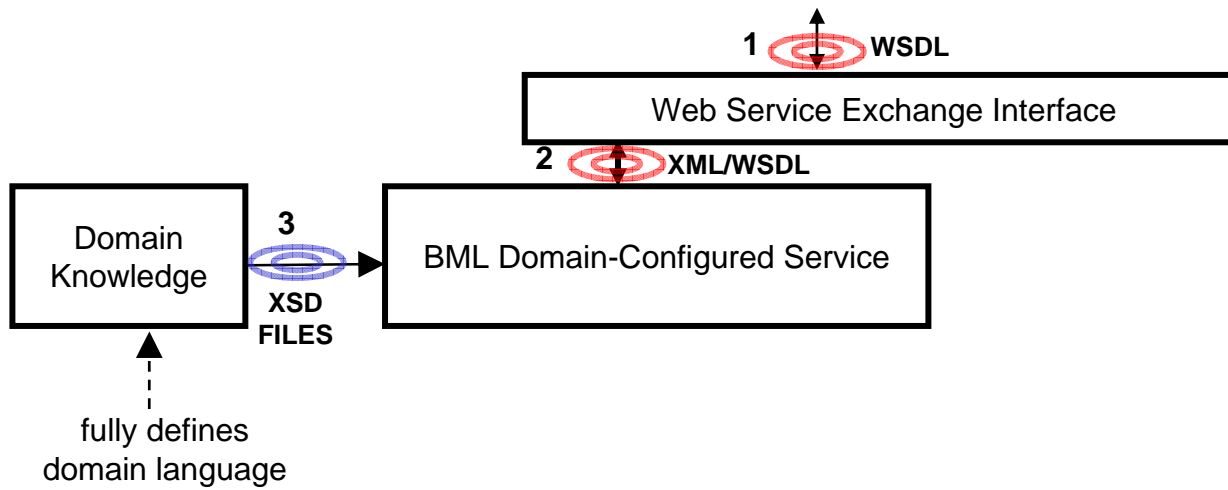
<label>

<modifier>



# JBML Service Architecture

---



# JBML DCS OrderType

---

```
<xsd:annotation>
  <xsd:documentation>Provides basic information that applies to all Tasks in the order
  </xsd:documentation>
</xsd:annotation>
<xsd:complexType name="OrderType">
  <xsd:sequence>
    <xsd:element name="OrderMode" type="OrderModeType"
      default="SINGLE" minOccurs="0"/>
    <xsd:element name="TaskersIntent" type="FreeTextType" minOccurs="0"/>
    <xsd:element name="Task" type="TaskType" maxOccurs="unbounded"/>
    <xsd:element name="OrderIssuedWhen" type="WhenType"/>
    <xsd:element name="OrderID" type="OrderIDType"/>
    <xsd:element name="TaskerWho" type="WhoType"/>
    <xsd:element name="TaskOrganization" type="msdl:TaskOrgType"
      minOccurs="0"/>
    <xsd:element name="EnemyTaskOrg" type="msdl:TaskOrgType"
      minOccurs="0"/>
    <xsd:element name="ControlMeasures" type="MultipleControlMeasuresType"
      minOccurs="0"/>
    <xsd:element name="TargetList" type="TargetListType" minOccurs="0"/>
  </xsd:sequence>
</xsd:complexType>
```

# JBML DCS Joint TaskType

---

```
<xsd:annotation>
```

```
  <xsd:documentation>
```

```
    Defines the domain of warfare associated with the task
```

```
  </xsd:documentation>
```

```
</xsd:annotation>
```

```
<xsd:complexType name="TaskType">
```

```
  <xsd:choice>
```

```
    <xsd:element name="GroundTask" type="GroundTaskType"  
      minOccurs="0" maxOccurs="unbounded"/>
```

```
    <xsd:element name="AirTask" type="AirTaskType"  
      minOccurs="0" maxOccurs="unbounded"/>
```

```
    <xsd:element name="MaritimeTask" type="MaritimeTaskType"  
      minOccurs="0" maxOccurs="unbounded"/>
```

```
  </xsd:choice>
```

```
</xsd:complexType>
```

# JBML DCS GroundTaskType

---

```
<xsd:complexType name="GroundTaskType">
  <xsd:sequence>
    <xsd:element name="TaskeeWho" type="WhoType"/>
    <xsd:element name="What" type="GroundWhatType"/>
    <xsd:element name="Where" type="WhereType"/>
    <xsd:element name="StartWhen" type="WhenType"/>
    <xsd:element name="EndWhen" type="WhenType"
      minOccurs="0"/>
    <xsd:element name="AffectedWho" type="WhoType"
      minOccurs="0"/>
    <xsd:element name="Why" type="GroundWhyType"
      minOccurs="0"/>
    <xsd:element name="Label" type="LabelType"/>
  </xsd:sequence>
</xsd:complexType>
```

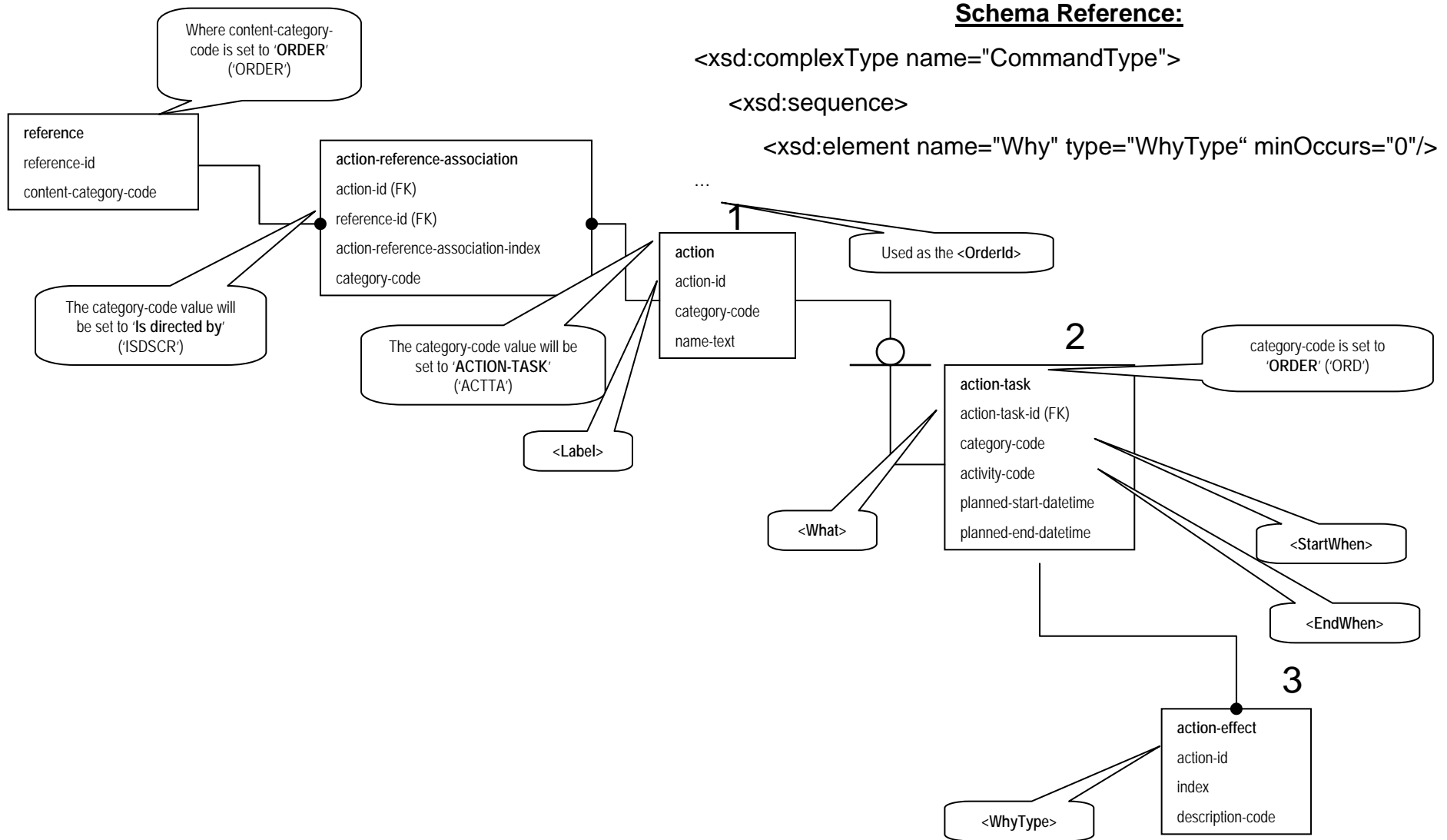
# JBML BML Base Service (BBS)

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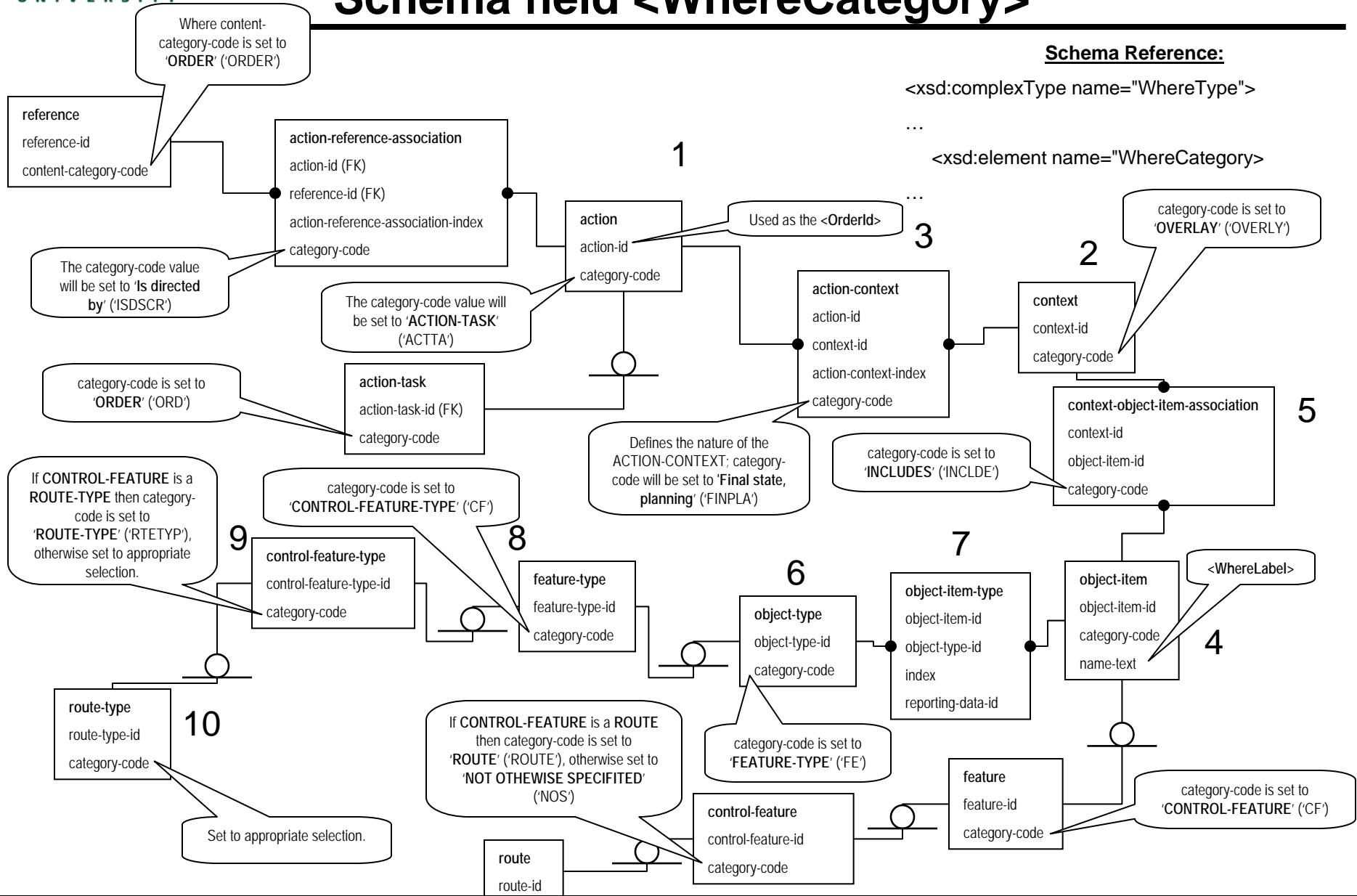
- Purpose:
  - Provide basic building blocks that can be used by multiple domains
    - push/pull API and push/pull Web service
  - who/what-when/where/why/controlMeasures etc.
  - Logical transactions that are “atomic” in the Computer Science sense
    - Must be committed to database all-or-nothing
  - Avoids need to recode the building blocks for every new domain
    - “Where” touches up to 14 tables
    - And requires 373 lines of code, including comments/whitespace
    - To be interoperable, this must be done right – why do it over for every system that is interfaced?

# JBML mapping to JC3I EDM

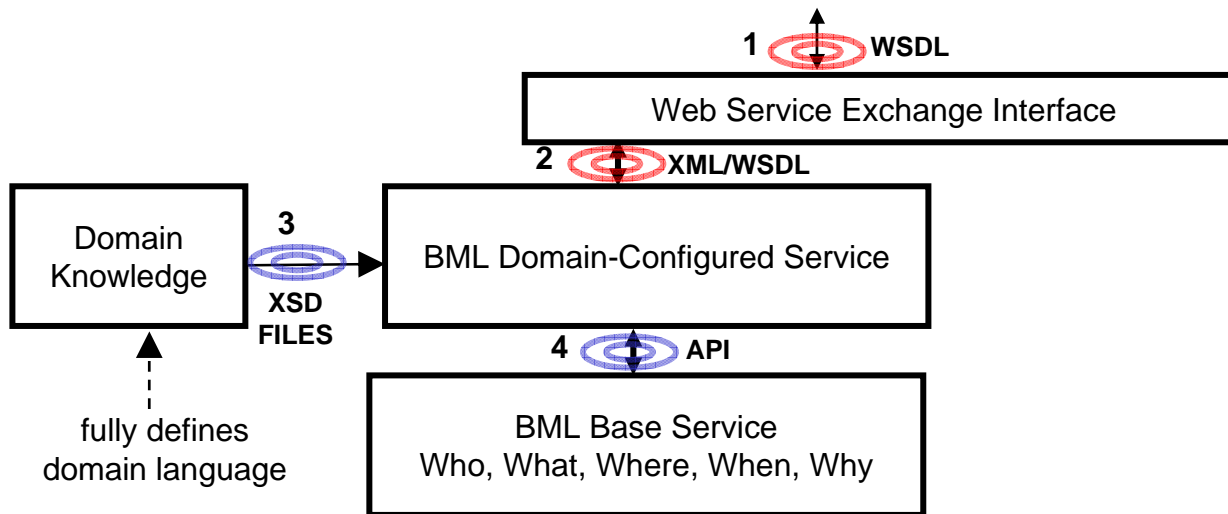
## Schema field <Why>



# JBML mapping to JC3IEDM Schema field <WhereCategory>



# JBML Service Architecture





# JBML BBS WhyType

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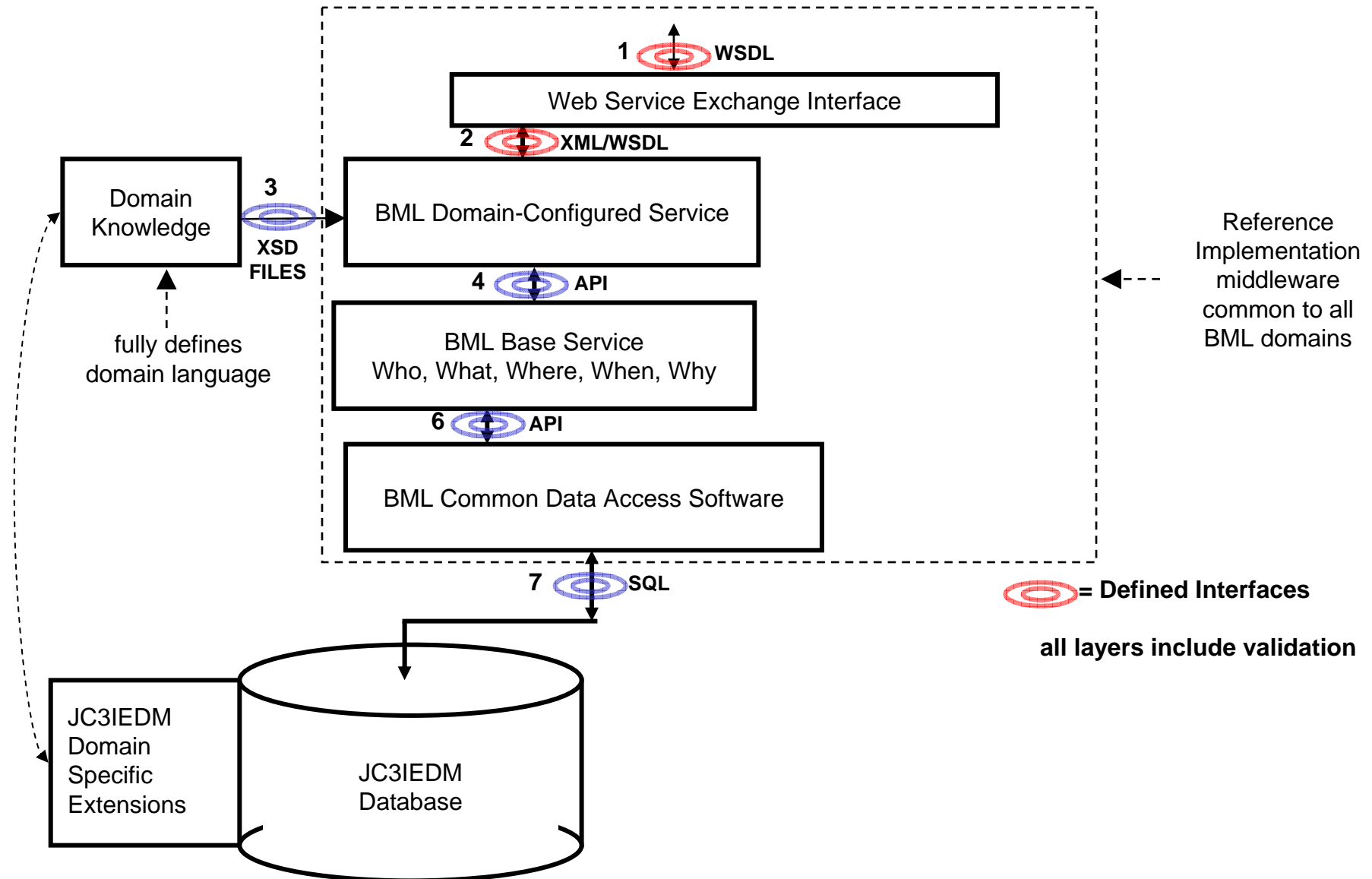
```
<xsd:annotation>
  <xsd:documentation>Defines Why a Task is undertaken</xsd:documentation>
</xsd:annotation>
<xsd:simpleType name="WhyTypeEffectDescriptionCode">
  <xsd:restriction base="xsd:string">
    <xsd:enumeration value="DSTRYK"/>
    <xsd:enumeration value="FKIL"/>
    <xsd:enumeration value="IDNT"/>
    <xsd:enumeration value="ILLUMN"/>
    <xsd:enumeration value="INTREC"/>
    <xsd:enumeration value="KILL"/>
    <xsd:enumeration value="LDAM"/>
    <xsd:enumeration value="LGTRST"/>
    <xsd:enumeration value="MKIL"/>
    <xsd:enumeration value="MODDAM"/>
    <xsd:enumeration value="NORSTN"/>
    <xsd:enumeration value="NOS"/>
    <xsd:enumeration value="SDAM"/>
    <xsd:enumeration value="SUPRSD"/>
  </xsd:restriction>
</xsd:simpleType>
```

# JBML Common Data Access Software (CDAS)

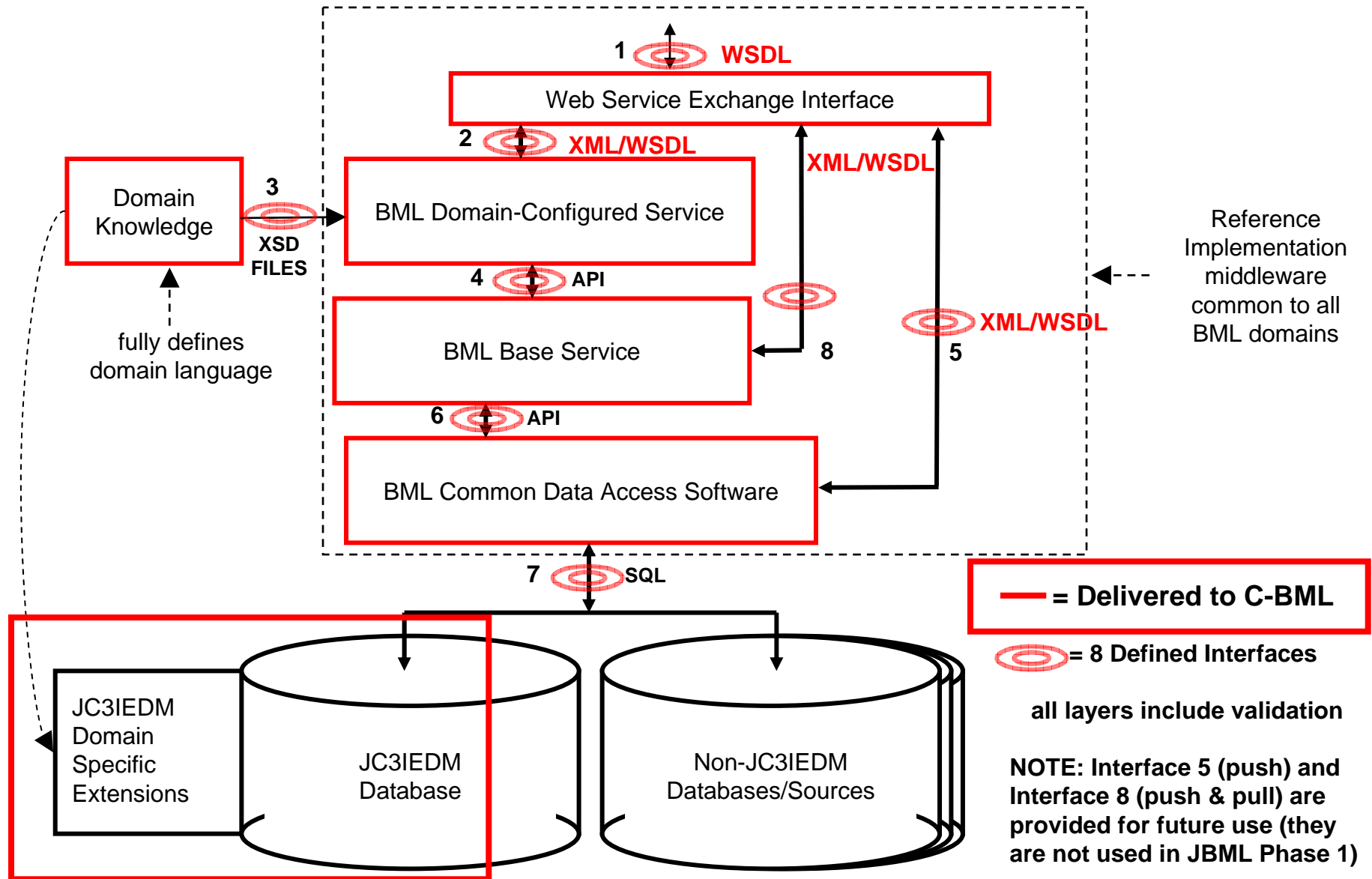
---

- Purpose:
  - Access the JC3IEDM database (push/pull API and WS)
  - Since the database is SQL-based, this only needs to be a wrapper
    - With validation that only the intended tables are accessed
  - We run this in pull-only mode
  - If it is intended to push BML input directly through JC3IEDM, the CDAS push service needs much better validation of data values
  - We didn't build that sort of service because it lacks the control needed for multiple users to update
    - All tables for a transaction must be updated together with no intervening access by other users
    - We keep this turned off

# JBML Service Architecture



# JBML Service Architecture



# JBML Web Services

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Available at <http://netlab.gmu.edu/JBML>:

- Descriptive documents
  - Architecture overview
    - Domain Configured Service (DCS); BML Base Service (BBS); Common Data Access Service (CDAS)
  - Code documentation (narrative & Javadoc)
  - XSD Web service schema
  - Supporting JC3IEDM mappings
  - SQL database schema
- Open source code
  - Latest version of all Web services
    - CDAS and BBS made possible by open source bootstrap of VMASC Atomic and Composite services
  - GUI to inspect JCDIEDM database using CDAS

## JBML XML Schema Definition (xsd) on JBML website

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- DCSOrderPush, DCSOrderPull
  - Top-level definition of Joint order C2 and Simulation services
- OrderTypes
  - Defines Joint operations order consisting of multiple Air, Ground, and Maritime commands
- AirTypes, GroundTypes, MaritimeTypes
  - Define domain-specific information
- FiveWTypes
  - Defines common Who / What-When / Where / Why etc.
- msdlTypes
  - Describes reusable MSDL schema from their webpage
  - This approach implements SISO guidance to make MSDL and C-BML interoperable

# JBML Inputs to SISO C-BML

<https://netlab.gmu.edu/JBML>

---

- JBML had a successful demonstration on 3 May 07
  - Ground/Air/Maritime C2
  - Two versions of JSAF
  - Proved in principle that JBML can work
- But, realistically, there has not been enough experience with the DCS layer to propose standardization
  - NATO MSG-048 will provide more experience by Dec 07
- The component that is ready to consider for standardization is the BBS mappings
  - We have five years experiences with who/what/when/where/why
  - And JC3IEDM provides a stable model for the database
  - C-BML should vet the mappings, revise if needed, and adopt
- Open Source JBML reference implementation Web Service also should be useful

# Major Issues

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- Serious issue surfaced working with USMTF
  - BML carries more semantics than JC3IEDM
  - The aggregate schema reached FOUO level
  - How to deal with sensitive information in an open standard?
- In the future, we recommend that SISO develop a set of rules for top-level (DCS) BML and a reference plain-vanilla example schema
  - Similar to the HLA: the standard is in the rules
- And also a standardized set of mid-level (BBS) mappings who/what/when/where/why etc to JC3IEDM
  - Avoids multiple interpretations of JC3IEDM
  - And allows re-use of composite-level code