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Integrated Cognitive-neuroscience Architectures for Understanding Sensemaking (ICArUS):

Phase 1 Test and Evaluation Development Guide

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1 Overview

The Integrated Cognitive-neuroscience Architectures for Understanding Sensemaking (ICArUS) Program aimed to build computational cognitive-neuroscience models to explain, predict, and emulate the process of human sensemaking – the process of generating hypotheses to explain data that is sparse, noisy, and uncertain. Phase 1 lasted from December, 2010 to December, 2012. In Phase 1, the program employed a challenge problem, based on *geospatial data*, to compare the models' performance to human performance. Here, the term geospatial data includes multiple types of intelligence data, any of which may be represented in a georeferenced framework – for instance, a layer within a GIS-like display. The challenge problem was focused on scientific rigor as opposed to operational relevance; all examples were fictitious in nature and represented in a neutral manner.

This document's primary purpose is to specify the format of the ICArUS Phase 1 Challenge Problem. It was written for software developers, contains development code, and is not meant to stand alone. The document, *ICArUS: Overview of Test and Evaluation (T&E) Materials*, available at http://www.mitre.org/publications, provides a broad overview of MITRE's T&E effort, including a list of all T&E documents and materials produced in Phase 1.

All content following this page is copied verbatim from the original report prepared in May, 2012.

2 Introduction

Consistent with the ICArUS Broad Agency Announcement (BAA), all tasks of the Phase 1 Challenge Problem involve spatial context frames with underlying probabilities that are constant in time. Tables 1 and 2 outline the 7 tasks that comprise the Challenge Problem and the probabilistic if-then rules (PROBS) that govern each task respectively. The primary distinctions among the tasks are as follows: Tasks 1-3 require statistical learning of spatial frames – i.e., evidence is accumulated over time from reports of individual attacks; Tasks 4-6 require rule-based sensemaking and integration of evidence (INTs) over layers – i.e., evidence about single attacks are provided by multiple independent sources coincident in time. Task 7 combines aspects of earlier tasks while introducing self-initiated sensemaking.

This document focuses on 5 types of intelligence data (INT), including:

HUMINT (Human Intelligence): intelligence derived from information collected by human sources.

IMINT (Image Intelligence): intelligence derived from buildings, roads, terrain elements, or other objects or physical features of the environment.

MOVINT (Movement Intelligence): intelligence derived from moving things, e.g., traffic density.

SIGINT (Signals Intelligence): intelligence gathered by the interception of signals, e.g., a phone call.

SOCINT (Sociocultural Intelligence): intelligence based on people and their communities, including customs, moral attitudes, and culture.

Since the ICArUS model will not be required to process raw imagery or perform low-level feature extraction, all geospatial data (scene objects) are represented as a *multidimensional feature vector*. This document specifies the format of that vector as well as the format of the ICArUS models' output.

Table 1: Description of 7 Tasks

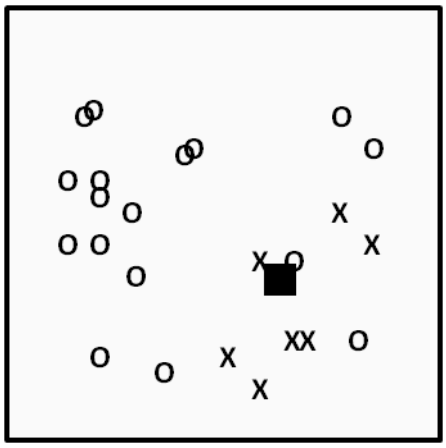
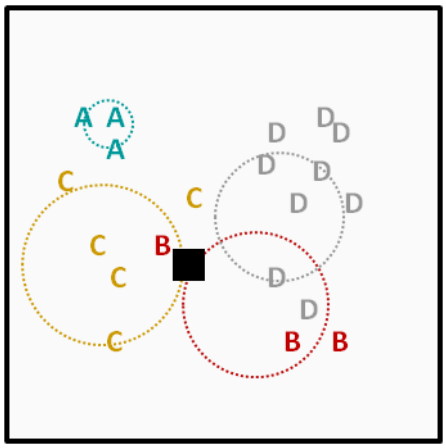
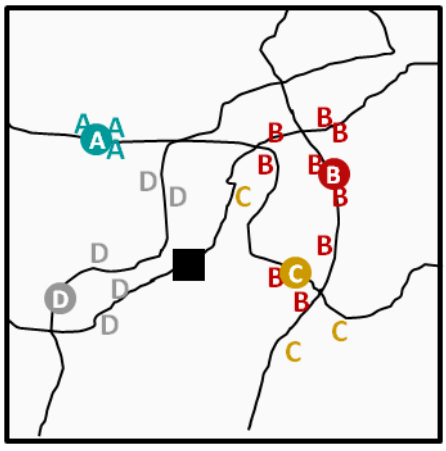
Task	Stimuli	Description
1		**Learning two groups.** [10 blocks of 10 trials.] Attacks by two groups (X, O) are generated, one on each trial, by two normal distributions – each with a different center location and dispersion. On the last trial of each block the subject is shown an attack location and asked to predict the probability of attack by each group, {X%, O%}. The subject then makes a forced choice (X or O). At the end of the trial the subject sees ground truth (X or O) at the attack location and he reports surprise (on 7-point Likert scale).
2		**Learning four groups.** [10 blocks of 20 trials] Unlike Task 1, there are four different groups (A, B, C, D). Also, after reporting {A%, B%, C%, D%}, the subject is required to draw four circles – each representing the "two-to-one boundary" for a group (i.e., attack by a group is twice as likely inside the circle compared to outside the circle). At the end of the trial the subject is shown ground truth (A, B, C, or D) at the attack location and he reports surprise.
3		**Finding centers.** [10 blocks of 20 trials] Unlike Task 2, the task is to find group centers along roads "as the cow walks" (not as the crow flies). After each block of trials, the subject reports {A%, B%, C%, D%} at the attack location. The subject then clicks four points A, B, C, and D on the roads – each representing the "center of gravity" for a group (i.e., maximum likelihood location for a group's center, given the group's attacks). At the end of the trial the subject is shown ground truth (A, B, C, or D) at the attack location and he reports surprise.

Table 1 (Continued): Description of 7 Tasks

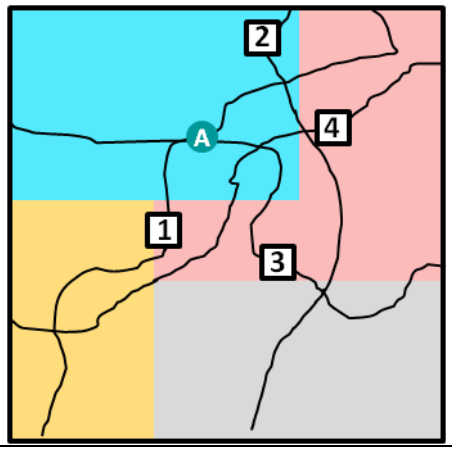
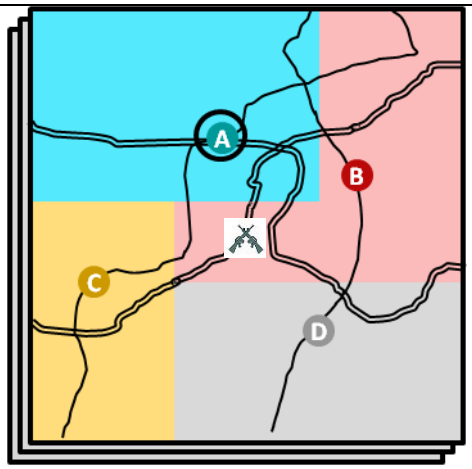
Task	Stimuli	Description
4		**Scoping attacks.** [10 trials] Unlike Task 3, the subject is given the center (from HUMINT) for one group A, along with four possible locations 1, 2, 3, and 4 of attack by that group. The subject is required to estimate the probability of attack at each location based on a normal distance decay function along roads. The subject is then given the regional boundaries for groups (SOCINT), along with the inside/outside region attack likelihoods. The subject is required to update the prior (HUMINT) probabilities. The subject then allocates resources in % across the sites. At the end of the trial the subject is shown ground truth (1, 2, 3, or 4). The subject reports surprise after each datum.
5		**Fusing layers.** [10 trials with 4 stages] Unlike Task 4, the subject is given an attack location (SIGACT) along with group centers (HUMINT) A, B, C, and D for four groups. The subject reports probabilities of attack by each group {A%, B%, C%, D%}. The subject is then given four more INTS (IMINT, MOVINT, SIGINT, SOCINT) in four stages, along with likelihoods of these data for each group. At each stage the subject reports surprise and updates probabilities {A%, B%, C%, D%}. After the last stage the subject allocates resources in percentages {A%, B%, C%, D%} against the groups. At the end of the trial the subject is shown ground truth and he reports surprise.
6		**Choosing layers.** [20 trials with 6* stages] Much like Task 5, except the subject decides which layer of INT (IMINT, MOVINT, SIGINT, SOCINT) to receive at each stage of each trial. The subject chooses a total of three layers in any order. The criterion for each choice is to maximize the amount of information gain expected from the INT. *Each INT is counted as two stages of the task because it requires a decision (choosing a layer) and an inference (of group probabilities).

Table 1 (Continued): Description of 7 Tasks

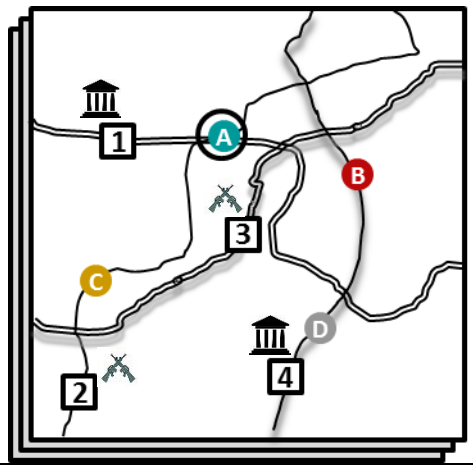
Task	Stimuli	Description
7		***Self-initiated sensemaking.*** [15 trials]. Task 7 is a combination, in part, of Tasks 4 and 6, but with a focus on *self-initiated* sensemaking. Participants will be given the centers of four groups (A-D) and four possible attack sites (1-4). As in Task 4, the primary task is to predict the location of attack and to allocate resources to each location {@1%, @2%, @3%, @4%}. But unlike Task 4, participants will decide *if and when* to seek additional data, as well as which data (INT) to seek. See the Phase 1 Challenge Problem Design and Test Specification for a more detailed description of Task 7, including a summary of the major structural differences between Task 7 and Tasks 1-6.

Table 2: Probabilistic If-then Rules (PROBS) for each INT Type

INTS	PROBS
HUMINT	**If** a group attacks, **then** the likelihood of attack is a Gaussian function (σ = 10 miles) of distance along road(s) from the group's center.
IMINT	**If** the attack is near a *government* building, **then** attack by A or B is four times as likely as attack by C or D. **If** the attack is near a *military* building, **then** attack by C or D is four times as likely as attack by A or B.
MOVINT	**If** the attack is in *dense* traffic, **then** attack by A or C is four times as likely as attack by B or D. **If** the attack is in *sparse* traffic, **then** attack by B or D is four times as likely as attack by A or C.
SIGINT	**If** SIGINT on a group reports *chatter*, **then** attack by that group is seven times as likely as attack by each other group. **If** SIGINT on a group reports *silence*, **then** attack by that group is one-third as likely as attack by each other group.
SOCINT	**If** the attack is in a group's region, **then** attack by that group is twice as likely as attack by each other group.

3 Input Format

The Phase 1 Challenge Problem is implemented in 7 tasks. Each task is specified by an ExamPhase element in a XML input file, and each phase is comprised of one or more trials (see Figures 1 and 2). For a primer on XML, see http://www.w3schools.com/web/web_xml.asp. An XML schema defining all XML elements described in this guide is packaged with the challenge problem software, available at http://www.mitre.org/research/technology-transfer.

Each exam begins with an IcarusEvaluation_CPD1 tag; an *id* attribute provides a unique identifier for the exam, and an *examTimeStamp* attribute (optional) indicates when the exam file was last modified. A GridSize element specifies the size, scale, and geographic location (latitude and longitude) of the scene. Attributes include *gridWidth*, *gridHeight*, *milesPerGridUnit*, *bottomLeftLat*, and *bottomLeftLon*. This information is used to convert between a geographic (latitude and longitude) and scene-based coordinate system. Coordinate translation and specification are described in more detail in Sections 3.8 – 3.10.

Next, one or more ExamPhase elements specify the tasks contained in the exam. Each ExamPhase element has both an *examId* attribute (that specifies the exam it is part of) and an *id* attribute (that provides a unique identifier for the exam phase). Appendix A provides an entire sample exam.

```
<?xml version="1.1" encoding="UTF-8" standalone="yes"?>
<ns3:IcarusEvaluation_CPD1 xmlns:ns2="IcarusCPD_Base"
      xmlns:ns3="IcarusCPD_1" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance"
      examTimeStamp="2011-07-27T12:31:54.989-04:00" name="Sample Exam"
      id="Sample Exam">

    <!--  Grid size, scale, and location information -->
    <GridSize gridWidth="100" gridHeight="100" milesPerGridUnit="0.2"
     bottomLeftLat="0.0" bottomLeftLon="0.0"/>

    <!-- Task 1 -->
    <ExamPhase xsi:type="ns3:Task_1_Phase" examId="Sample Exam"
     name="Mission 1" id="Task1"> …
    </ExamPhase>

    <!-- Task 2 -->
    <ExamPhase xsi:type="ns3:Task_2_Phase" examId="Sample Exam"
      name=" Mission 2" id="Task2"> …
    </ExamPhase>

    <!-- Task 3 -->
    <ExamPhase xsi:type="ns3:Task_3_Phase" examId="Sample Exam"
     name=" Mission 3" id="Task3"> …
    </ExamPhase>

    <!-- Task 4 -->
    <ExamPhase xsi:type="ns3:Task_4_Phase" examId="Sample Exam"
     name=" Mission 4" id="Task4"> …
    </ExamPhase>
```

```
    <!-- Task 5 -->
    <ExamPhase xsi:type="ns3:Task_5_Phase" examId="Sample Exam"
     name=" Mission 5" id="Task5"> …
    </ExamPhase>

    <!-- Task 6 -->
    <ExamPhase xsi:type="ns3:Task_6_Phase" examId="Sample Exam"
     name=" Mission 6" id="Task6"> …
    </ExamPhase>

    <!-- Task 7 -->
    <ExamPhase xsi:type="ns3:Task_7_Phase" examId="Sample Exam"
     name=" Mission 7" id="Task7"> …
    </ExamPhase>
</ns3:IcarusEvaluation_CPD1>
```

Figure 1: Overview of an exam document

3.1 Task 1: Learning two groups

For convenience, the following task summary is reproduced here from Table 1.

Task summary: **Learning two groups.** [10 blocks of 10 trials] Attacks by two groups (A, B) are generated, one on each trial, by two normal distributions – each with a different base rate, center location, and dispersion. On the last trial of each block the subject is shown an attack location and asked to predict the probability of attack by each group, {A%, B%}. The subject then makes a forced choice (A or B), to allocate resources against the attack. At the end of the trial the subject sees ground truth (A or B) at the attack location and reports surprise (on 7-point Likert scale).

Task 1 is defined by an ExamPhase element of type Task_1_Phase. The task is divided into 10 blocks, each defined by a TrialBlock element of type Task_1_TrialBlock; each block contains 10 trials. Each TrialBlock element also contains a *trialBlockNum* attribute that specifies the block number, and a *numPresentationTrials* attribute that specifies the number of training trials during which attacks are shown. Note: no response is expected during these trials.

```
<!-- Task 1 -->
    <ExamPhase xsi:type="ns3:Task_1_Phase" examId="Sample Exam"
        name="Mission 1" id="Task1">
        <TrialBlock xsi:type="ns3:Task_1_TrialBlock" trialBlockNum="1"
          numPresentationTrials="9">
            <FeatureVectorFile featureVectorUrl_CSV="task1_1.csv"
              featureVectorUrl_KML="task1_1.kml"/>
            <ProbeTrial trialNum="10">
                <GroupProbe>
                    <AttackLocation locationId="1" x="25" y="18"
                     lat="0.13025057227020484" lon="0.1809035725975067"/>
                    <Groups>A B</Groups>
                </GroupProbe>
                <TroopSelectionProbe>
```

```
                <Groups>A B</Groups>
            </TroopSelectionProbe>
            <GroundTruth responsibleGroup="A"/>
            <GroundTruthSurpriseProbe minSurprise="0" maxSurprise="6"
             increment="1"/>
        </ProbeTrial>
    </TrialBlock>
    …
</ExamPhase>
```

Figure 2: Task 1 <ExamPhase> element

The location (URL) of each feature vector is contained in a FeatureVectorFile element; the location of both CSV and KML version of the feature vector is contained in the *featureVectorURL_CSV* and *featureVectorURL_KML* attributes respectively. A URL may point to a local file (as shown), or to a remote file on a server.

"Probes" in the XML are intended to query the participant. A ProbeTrial element specifies the probe trial that comes at the end of a trial block; this *follows* the presentation of each training trial. ProbeTrial contains 4 elements: GroupProbe, TroopSelectionProbe, GroundTruth, and GroundTruthSurpriseProbe. GroupProbe queries the participant to provide the probability of attack by each group {A%, B%} at the location specified by AttackLocation. The TroopSelectionProbe queries the participant to make a forced choice and select which group to allocate troops against. The Groups element provides the possible hypotheses, i.e., the list of groups (A, B). Next, the GroundTruth***** element specifies the group responsible for the attack, and the GroundTruthSurpriseProbe element asks the participant to state their level of "surprise." Surprise is indicated on a scale defined by the *minSurprise*, *maxSurprise*, and *increment* attributes. In the example above, the participant would indicate surprise on a 7-point integer scale.

Note that the GroundTruth element will not be present during the final Phase I evaluation. Instead, ground truth information will be automatically provided – at the end of a trial - by the T&E's Test Harness after receiving a response from the ICArUS model.

3.2 Task 2: Learning four groups

Since each task logically builds on the last, only significant differences with respect to the previous task(s) will be highlighted below (and in future sections).

For convenience, the following task summary is reproduced here from Table 1.

Task summary: **Learning four groups.** [5 blocks of 20 trials] Unlike Task 1, there are four different groups (A, B, C, and D). Also, before reporting {A%, B%, C%, D%}, the subject is required to draw four circles – each representing the "two-to-one boundary" for a group (i.e., attack by the group is twice as likely inside the circle compared to outside the circle). After reporting the probabilities {A%, B%, C%,

D%} and making a forced choice in allocating resources against one group, the subject is shown ground truth (A, B, C, or D) at the attack location and reports surprise.

Major differences: Each ProbeTrial element contains a GroupCirclesProbe element (in addition to the elements described in Task 1). The GroupCirclesProbe is intended to query the participant to provide a circle for each group specified; each circle represents the "two-to-one boundary" for the group (i.e., attack by the group is twice as likely inside the circle as outside the circle).

```
<!-- Task 2 -->
    <ExamPhase xsi:type="ns3:Task_2_Phase" examId="Sample Exam"
        name=" Mission 2" id="Task2>
        <TrialBlock xsi:type="ns3:Task_2_TrialBlock" trialBlockNum="1"
         numPresentationTrials="19">
            <FeatureVectorFile featureVectorUrl_CSV="task2_1.csv"
             featureVectorUrl_KML="task2_1.kml"/>
            <ProbeTrial trialNum="20">
                <GroupCirclesProbe>
                    <Groups>A B C D</Groups>
                </GroupCirclesProbe>
                <GroupProbe>
                    <AttackLocation locationId="1" x="25" y="18"
                     lat="0.13025057227020484" lon="0.1809035725975067"/>
                    <Groups>A B C D</Groups>
                </GroupProbe>
                <TroopSelectionProbe>
                   <Groups>A B C D</Groups>
                </TroopSelectionProbe>
                <GroundTruth responsibleGroup="B"/>
                <GroundTruthSurpriseProbe minSurprise="0" maxSurprise="6"
                 increment="1"/>
            </ProbeTrial>
        </TrialBlock>
        …
    </ExamPhase>
```

Figure 3: Task 2 <ExamPhase> element

3.3 Task 3: Finding centers

For convenience, the following task summary is reproduced here from Table 1.

Task summary: **Finding centers.** [5 blocks of 20 trials] Unlike Task 2, the task is to find group centers along roads "as the cow walks" (rather than "as the crow flies"). After each block of trials, the subject clicks four points A, B, C, and D on the roads – each representing the "center of gravity" for a group (i.e., maximum likelihood location for a group's center, given the group's attacks). The subject then reports {A%, B%, C%, D%} at the attack location. After reporting the probabilities and making a forced choice in allocating resources, the subject is shown ground truth (A, B, C, or D) at the attack location and reports surprise.

Major differences: Task 3 includes the addition of a RoadsFile element that specifies the URL location of the CSV and KML version of the road network vector (see Section 2.10). Each ProbeTrial element contains a GroupCentersProbe element (in addition to the elements described in Task 1). The GroupCentersProbe is intended to query the participant to provide the center of gravity for each group specified.

```
<!-- Task 3 -->
    <ExamPhase xsi:type="ns3:Task_3_Phase" examId="Sample Exam"
        name="Mission 3" id="Task3">
        <RoadsFile featureVectorUrl_CSV="roads.csv"
             featureVectorUrl_KML="roads.kml"/>
        <TrialBlock xsi:type="ns3:Task_3_TrialBlock" trialBlockNum="1"
             numPresentationTrials="19">
            <FeatureVectorFile featureVectorUrl_CSV="task3_1.csv"
             featureVectorUrl_KML="task3_1.kml"/>
            <ProbeTrial trialNum="20">
                <GroupCentersProbe>
                    <Groups>A B C D</Groups>
                </GroupCentersProbe>
                <GroupProbe>
                    <AttackLocation locationId="1" x="13" y="37"
                     lat="0.2677372874443099" lon="0.09406985775070349"/>
                    <Groups>A B C D</Groups>
                </GroupProbe>
                <TroopSelectionProbe>
                   <Groups>A B C D</Groups>
                </TroopSelectionProbe>
                <GroundTruth responsibleGroup="D"/>
                <GroundTruthSurpriseProbe minSurprise="0" maxSurprise="6"
                 increment="1"/>
            </ProbeTrial>
        </TrialBlock>
        …
    </ExamPhase>
```

Figure 4: Task 3 <ExamPhase> element

3.4 Task 4: Scoping attacks

For convenience, the following task summary is reproduced here from Table 1.

Task summary: **Scoping attacks.** [10 trials, 2 stages per trial] Unlike Task 3, the subject is given the center (from HUMINT) for one group, along with four possible locations 1, 2, 3, and 4 of attack by that group. In stage 1, the subject is required to estimate the probability of attack at each location based on a normal distance decay function along roads. In stage 2, the subject is given the regional boundaries for groups (SOCINT), along with the inside/outside region attack likelihoods from PROBS. The subject is required to aggregate the prior (HUMINT) and SOCINT probabilities. The subject allocates resources in % across the sites, and is shown ground truth (1, 2, 3, or 4). The subject reports surprise after receiving SOCINT, and then again after observing ground truth.

Major differences: Unlike Tasks 1 through 3, which rely on statistical learning, Tasks 4 through 6 require rule-based sensemaking. At the beginning of a trial, the participant is asked to estimate the probability of attack at each location via a LocationProbe element. AttackGroup specifies the group being probed, and Locations specify candidate attack locations, labeled by ID. The location IDs specified in the Locations element match the locations given in the feature vector.

Next, an INTLayers element contains the layers (one or more) to be added, in sequence. In Task 4, only SOCINT is available. The INT data for each attack location is specified in the feature vector file for the trial (Section 2.9). SOCINT at each location is specified in the feature vector; a "regions" file specifies SOCINT at all locations. The URL location of the file is specified by a RegionsFile element (Section 2.11). These data are needed to visually render the image and are presented to human participants. After the SOCINT presentation, the participant is asked to update the probability of attack at each location via a LocationProbe element.

```
<!-- Task 4 --
    <ExamPhase xsi:type="ns3:Task_4_Phase" examId="Sample Exam"
        name="Mission 4" id="Task4">
        <Trial trialNum="1">
            <FeatureVectorFile featureVectorUrl_CSV="task4_1.csv"
             featureVectorUrl_KML="task4_1.kml"/>
            <RoadsFile featureVectorUrl_CSV="roads.csv"
             featureVectorUrl_KML="roads.kml"/>
            <RegionsFile featureVectorUrl_CSV="SOCINT_1.csv"
             featureVectorUrl_KML="SOCINT_1.kml"/>
            <LocationProbe >
                <AttackGroup>A</AttackGroup>
                <Locations>1 2 3 4</Locations>
            </LocationProbe>
            <INTLayers>
                <INTLayer>
                    <LayerType xsi:type="ns3:SocintLayer"/>
                    <LocationProbe >
                        <AttackGroup>A</AttackGroup>
                        <Locations>1 2 3 4</Locations>
                    </LocationProbe>
                </INTLayer>
            </INTLayers>
            <TroopAllocationProbe>
                <Locations>1 2 3 4</Locations>
            </TroopAllocationProbe>
            <GroundTruth attackLocationId="3"/>
            <GroundTruthSurpriseProbe minSurprise="0" maxSurprise="6"
             increment="1"/>
        </Trial>
         …
    </ExamPhase>
```

Figure 5: Task 4 <ExamPhase> element

Finally, a TroopAllocationProbe element queries the participant to allocate troops across sites. A GroundTruth element specifies the actual attack location, and the

`GroundTruthSurpriseProbe` element asks the participant/model to report surprise, as in Tasks 1-3.

3.5 Task 5: Fusing layers

For convenience, the following task summary is reproduced here from Table 1.

Task summary: **Fusing layers.** [10 trials, 4 stages per trial] Unlike Task 4, the subject is given an attack location (SIGACT) along with group centers (HUMINT) for four groups (A, B, C, D). The subject is also given the probabilities of attack by each group {A%, B%, C%, D%}, based on the HUMINT distance function. The subject is then given four more INTS (IMINT, MOVINT, SIGINT, SOCINT), one at a time, along with the likelihoods (from PROBS) for features of INTS. At each stage, the subject updates probabilities {A%, B%, C%, D%}. After the last stage the subject allocates resources in percentages {A%, B%, C%, D%} against the groups. At the end of the trial the subject is shown ground truth and reports surprise.

Major differences: Task 5 is similar to Task 4, however, the participant is asked to report the probabilities of attack by each group {A%, B%, C%, D%}, as opposed to the probability of attack at each location. Also, the subject does not report surprise after each INT presentation.

```
<!-- Task 5 -->
    <ExamPhase xsi:type="ns3:Task_5_Phase" examId="Sample Exam"
        name="Mission 5" id="Task5">
        <Trial trialNum="1">
            <FeatureVectorFile featureVectorUrl_CSV="task5_1.csv"
             featureVectorUrl_KML="task5_1.kml"/>
            <RoadsFile featureVectorUrl_CSV="roads.csv"
             featureVectorUrl_KML="roads.kml"/>
            <RegionsFile featureVectorUrl_CSV="SOCINT_1.csv"
                         featureVectorUrl_KML="SOCINT_1.csv"/>
            <InitialHumintReport>
                  <Groups>A B C D</Groups>
                  <Probabilities>25 25 25 25</Probabilities>
            </InitialHumintReport>
            <INTLayers>
                <INTLayer>
                    <LayerType xsi:type="ns3:ImintLayer"/>
                    <GroupProbe>
                        <AttackLocation locationId="1"/>
                        <Groups>A B C D</Groups>
                    </GroupProbe>
                </INTLayer>
                <INTLayer>
                    <LayerType xsi:type="ns3:MovintLayer"/>
                    <GroupProbe>
                        <AttackLocation locationId="1"/>
                        <Groups>A B C D</Groups>
                    </GroupProbe>
                </INTLayer>
```

```
                <INTLayer>
                    <LayerType xsi:type="ns3:SigintLayer">
                        <Group>B</Group>
                    </LayerType>
                    <GroupProbe>
                        <AttackLocation locationId="1"/>
                        <Groups>A B C D</Groups>
                    </GroupProbe>
                </INTLayer>
                <INTLayer>
                    <LayerType xsi:type="ns3:SocintLayer"/>
                    <GroupProbe>
                        <AttackLocation locationId="1"/>
                        <Groups>A B C D</Groups>
                    </GroupProbe>
                </INTLayer>
            </INTLayers>
            <TroopAllocationProbe>
                <Groups>A B C D</Groups>
            </TroopAllocationProbe>
            <GroundTruth responsibleGroup="C"/>
            <GroundTruthSurpriseProbe minSurprise="0" maxSurprise="6"
             increment="1"/>
        </Trial>
        …
    </ExamPhase>
```

Figure 6: Task 5 <ExamPhase> element

Another key difference is that layers are presented sequentially (IMINT, MOVINT, SIGINT, and SOCINT, see Figure 6). All INT data is contained in the feature vector (see Section 2.9). For SIGINT, theparticipant must specify which group s/he would like to collect SIGINT on; only 1 group can be chosen per trial.

After each layer is presented, the participant will be asked to update their probability estimates and report surprise. As in Task 4, after the last layer is presented, the participant will allocate troops, see the ground truth (responsible group), and report surprise.

3.6 Task 6: Choosing layers

For convenience, the following task summary is reproduced here from Table 1.

Task summary: **Choosing layers.** [10 trials, 3 stages per trial] Task 6 is much like Task 5, except the subject decides which layer of INT (IMINT, MOVINT, SIGINT, or SOCINT) to receive on each of three stages, after receiving the initial HUMINT. The criterion for each choice is to maximize the expected amount of useful information to be gained from the choice of an INT.

Major differences: Task 6 is almost identical to Task 5, except that layers are chosen by the model/participant (user choice) instead of being presented sequentially. The total number of layers to select is specified in the *numLayersToShow* attribute within each Trial element.

```
<!-- Task 6 -->
    <ExamPhase xsi:type="ns3:Task_6_Phase" examName="Sample Exam"
        name="Mission 6" id="Task6”>
        <Trial trialNum="1" numLayersToShow="1">
            <FeatureVectorFile featureVectorUrl_CSV="task6_1.csv"
             featureVectorUrl_KML="task6_1.kml"/>
            <RoadsFile featureVectorUrl_CSV="roads.csv"
             featureVectorUrl_KML="roads.kml"/>
            <RegionsFile featureVectorUrl_CSV="SOCINT_1.csv"
                        featureVectorUrl_KML="SOCINT_1.csv"/>
            <InitialHumintReport>
                  <Groups>A B C D</Groups>
                  <Probabilities>25 25 25 25</Probabilities>
            </InitialHumintReport>
            <INTLayers>
                <INTLayer>
                    <LayerType xsi:type="ns3:ImintLayer"/>
                    <GroupProbe>
                        <AttackLocation locationId="3"/>
                        <Groups>A B C D</Groups>
                    </GroupProbe>
                </INTLayer>
                <INTLayer>
                    <LayerType xsi:type="ns3:MovintLayer"/>
                    <GroupProbe>
                        <AttackLocation locationId="3"/>
                        <Groups>A B C D</Groups>
                    </GroupProbe>
                </INTLayer>
                <INTLayer>
                    <LayerType xsi:type="ns3:SigintLayer">
                        <Group>A</Group>
                    </LayerType>
                    <GroupProbe>
                        <AttackLocation locationId="3"/>
                        <Groups>A B C D</Groups>
                    </GroupProbe>
                </INTLayer>
                <INTLayer>
                    <LayerType xsi:type="ns3:SigintLayer">
                        <Group>B</Group>
                    </LayerType>
                    <GroupProbe>
                        <AttackLocation locationId="3"/>
                        <Groups>A B C D</Groups>
                    </GroupProbe>
                </INTLayer>
                <INTLayer>
                    <LayerType xsi:type="ns3:SigintLayer">
                        <Group>C</Group>
```

```
                    </LayerType>
                    <GroupProbe>
                        <AttackLocation locationId="3"/>
                        <Groups>A B C D</Groups>
                    </GroupProbe>
                </INTLayer>
                <INTLayer>
                    <LayerType xsi:type="ns3:SigintLayer">
                        <Group>D</Group>
                    </LayerType>
                    <GroupProbe>
                        <AttackLocation locationId="3"/>
                        <Groups>A B C D</Groups>
                    </GroupProbe>
                </INTLayer>
                <INTLayer>
                    <LayerType xsi:type="ns3:SocintLayer"/>
                    <GroupProbe>
                        <AttackLocation locationId="3"/>
                        <Groups>A B C D</Groups>
                    </GroupProbe>
                </INTLayer>
            </INTLayers>
            <TroopAllocationProbe>
                <Groups>A B C D</Groups>
            </TroopAllocationProbe>
            <GroundTruth responsibleGroup="D"/>
            <GroundTruthSurpriseProbe minSurprise="0" maxSurprise="6"
             increment="1"/>
        </Trial>
          …
    </ExamPhase>
</IcarusEvaluation_CPD1>
```

Figure 7: Task 6 <ExamPhase> element

3.7 Task 7: Self-initiated sensemaking

For convenience, the following task summary is reproduced here from Table 1.

Task summary: **Self-initiated sensemaking.** [15 trials] Task 7 is a combination, in part, of Tasks 4 and 6, but with a focus on *self-initiated* sensemaking. Participants will be given the centers of four groups (A-D) and four possible attack sites (1-4). As in Task 4, the primary task is to predict the location of attack and to allocate resources to each location {@1%, @2%, @3%, @4%}. But unlike Task 4, participants will decide *if and when* to seek additional data, as well as which data (INT) to seek. See the Phase 1 Challenge Problem Design and Test Specification for a more detailed description of Task 7, including a summary of the major structural differences between Task 7 and Tasks 1-6.

Major differences: Task 7 departs from Tasks 4 and 6 in several ways. For one, the group center locations, road network, and SOCINT regions are fixed for the entire task. Thus, the RoadsFile and RegionsFile elements at the ExamPhase element level define the feature vector files for the road

network and SOCINT regions for all trials in the task.

The InitialResponsibleGroup element defines the group responsible for the last attack wave. This group is always shown on the first trial. Initial group attack probabilities are provided to the participant at the start of the task, and it is up to the participant whether to update them in subsequent trials; the participant may not update them on the first trial. The InitialCredits element next defines the starting credits allotted to the participant, and the CorrectPredictionCredits element defines the maximum number of credits awarded for correctly predicting the attack location. The actual number of credits awarded is computed as the troop allocation percent at the actual attack location multiplied by CorrectPredictionCredits.

Each trial first contains a FeatureVectorFile element that specifies the location of the feature vector file defining the attack locations and group center locations (the group center locations will remain fixed for the duration of the task, but SIGINT information on each group may be different for each trial). The GroupProbe element next queries the participant to optionally update the probability of attack by each group (before the attack locations are shown). While a GroupProbe element is present on the first trial, the participant will simply be shown the initial group attack probabilities and will not have an opportunity to update them. Probabilities are initialized based on the initial responsible group; for example, if the initial responsible group is A, the group attack probabilities would be {85%, 5%, 5%, 5%}.

The attack locations are then presented and the LocationProbe element queries the participant to provide the probability of attack at each location. Next, a TroopAllocationProbe element queries the participant to allocate troops at each location.

The ResponsibleGroupShown element indicates whether the group responsible for the attack will be shown (the actual attack location is always shown). In trial 1, the responsible group will always be presented at the start of the trial. Both the responsible group and attack location are specified in the GroundTruth element. Finally, the INTLayers element defines the INT layers that may be purchased provided the participant has enough credits (the cost of each layer is specified in the *costCredits* attribute). The participant may either purchase one or more layers to see or continue to the next trial. The participant will not be given the option to purchase INT layers on the last trial.

```
<!-- Task 7 -->
    <ExamPhase xsi:type="ns3:Task_7_Phase" examId="Sample Exam"
        name="Mission 7" id="Task7">
        <FeatureVectorFile featureVectorUrl_CSV="task7_phase.csv"
         featureVectorUrl_KML="task7_phase.kml"/>
        <RoadsFile featureVectorUrl_CSV="roads.csv"
         featureVectorUrl_KML="roads.kml"/>
        <RegionsFile featureVectorUrl_CSV="SOCINT_1.csv"
                     featureVectorUrl_KML="SOCINT_1.csv"/>
        <InitialResponsibleGroup>A</InitialResponsibleGroup>
        <InitialCredits>10</InitialCredits>
        <CorrectPredictionCredits>1</CorrectPredictionCredits>
        <Trial trialNum="1">
            <FeatureVectorFile featureVectorUrl_CSV="task7_1.csv"
```

```
             featureVectorUrl_KML="task7_1.kml"/>
            <GroupProbe>
                <Groups>A B C D</Groups>
            </GroupProbe>
            <LocationProbe>
                <Locations>1 2 3 4</Locations>
            </LocationProbe>
            <TroopAllocationProbe>
                <Locations>1 2 3 4</Locations>
            </TroopAllocationProbe>
            <ResponsibleGroupShown>true</ResponsibleGroupShown>
            <GroundTruth responsibleGroup="A" attackLocationId="4"/>
            <INTLayers>
                <INTLayer costCredits="1">
                    <LayerType xsi:type="ns3:ImintLayer"/>
                </INTLayer>
                <INTLayer costCredits="1">
                    <LayerType xsi:type="ns3:MovintLayer"/>
                </INTLayer>
                <INTLayer costCredits="2">
                    <LayerType xsi:type="ns3:SigintLayer">
                        <Group>A</Group>
                    </LayerType>
                </INTLayer>
                <INTLayer costCredits="2">
                    <LayerType xsi:type="ns3:SigintLayer">
                        <Group>B</Group>
                    </LayerType>
                </INTLayer>
                <INTLayer costCredits="2">
                    <LayerType xsi:type="ns3:SigintLayer">
                        <Group>C</Group>
                    </LayerType>
                </INTLayer>
                <INTLayer costCredits="2">
                    <LayerType xsi:type="ns3:SigintLayer">
                        <Group>D</Group>
                    </LayerType>
                </INTLayer>
                <INTLayer costCredits="2">
                    <LayerType xsi:type="ns3:SocintLayer"/>
                </INTLayer>
            </INTLayers>
            …
        </Trial>
    </ExamPhase>
```

Figure 8: Task 7 <ExamPhase> element

3.8 Feature Vector Format: Tasks 1 -3

In Tasks 1 – 3, attacks will be defined as Placemarks in a KML document as shown in Figure 8 below (see http://code.google.com/apis/kml/documentation/kmlreference.html for more information on KML). The KML document will contain an ordered series of one or more Placemark elements

corresponding to each attack presentation. Each Placemark element will contain Data elements in the ExtendedData section that specify the *ObjectId* and *ObjectType* values. In the case of Tasks 1-3, the *ObjectID* will indicate the group responsible for the attack, and the *ObjectType* will always be "Location". The Point element will contain the longitude and latitude of the attack location in degrees. Longitudes and latitudes may be converted to grid coordinates using the formulas:

$$x = \frac{\pi r(longitude - bottomLeftLon)}{180 * milesPerGridUnit}, \qquad y = \frac{\pi r(latitude - bottomLeftLat)}{180 * milesPerGridUnit}$$

where *r* is the mean radius of the earth in miles (app. 3,959 miles), and *bottomLeftLat*, *bottomLeftLon*, and *milesPerGridUnit* are specified in the exam's GridSize element.

All distances supplied by an ICArUS model should be provided in grid units.

```
<?xml version="1.1" encoding="UTF-8" standalone="yes"?>
<kml xmlns="http://www.opengis.net/kml/2.2"
     xmlns:gx="http://www.google.com/kml/ext/2.2"
     xmlns:atom="http://www.w3.org/2005/Atom"
     xmlns:xal="urn:oasis:names:tc:ciq:xsdschema:xAL:2.0">
    <Document>
        <name>Task 1</name>
        <Placemark>
            <ExtendedData>
                <Data name="ObjectId">
                    <value>A</value>
                </Data>
                <Data name="ObjectType">
                    <value>Location</value>
                </Data>
            </ExtendedData>
            <Point>
                <coordinates>0.09551708633148355,0.13603948659332504</coordinates>
            </Point>
        </Placemark>
        <Placemark>
            <ExtendedData>
                <Data name="ObjectId">
                    <value>B</value>
                </Data>
                <Data name="ObjectType">
                    <value>Location</value>
                </Data>
            </ExtendedData>
            <Point>
                <coordinates>0.1157782864624043,0.08393925768524312</coordinates>
            </Point>
        </Placemark>
          …
    </Document>
</kml>
```

Figure 9: Sample feature vector for Tasks 1-3 (KML version)

While developers are encouraged to adopt the KML feature vector format, a CSV (comma-separated value) format will also be provided. Each CSV feature vector contains 4 columns as defined below. The example in Figure 10 below contains 9 attack presentations.

ObjectID	ObjectType	X	Y
A	Location	33	47
B	Location	40	29
B	Location	31	27
A	Location	53	38
A	Location	46	22
A	Location	33	17
B	Location	39	38
A	Location	45	15
B	Location	21	17

Figure 10: Sample feature vector for Tasks 1-3 (CSV version)

Name: ObjectID
Description: Object identification; in this case a group.
Format: String
Range: [A, B, C, D]

Name: ObjectType
Description: The type of object being identified.
Format: String
Range: [Location]

Name: X
Description: The X-coordinate of the data.
Format: Scalar
Range: [0 … GridWidth]

Name: Y
Description: The Y-coordinate of the data.
Format: Scalar
Range: [0 … GridHeight]

Note: Refer to Appendix B for guidance to obtain example feature vectors.

3.9 Feature Vector Format: Tasks 4-7

The location data for Tasks 4-7 will also be defined as Placemarks in a KML document as shown in Figure 11 below. The KML document will contain a list of Placemark elements corresponding to either group center locations or attack locations. The Placemark element will always contain at least two

Data elements in the ExtendedData section that specify the *ObjectId* and *ObjectType* values. The *ObjectID* will provide either the group information or a location ID, and the object type will either be "Group" or "Location" respectively. There may be additional Data elements that specify the various INT layers at the group center or attack location. Such Data elements include:

Name: "IMINT"
Values: [Government, Military]

Name: "MOVINT"
Values: [SparseTraffic, DenseTraffic]

Name: "SIGINT"
Values: [Silent, Chatter]

Name: "SOCINT"
Values: [A, B, C, D]

The Point element will contain the longitude and latitude of the group center or attack location in degrees (see Section 2.8 for information on translating longitudes and latitudes to grid coordinates).

```
<?xml version="1.1" encoding="UTF-8" standalone="yes"?>
<kml xmlns="http://www.opengis.net/kml/2.2"
     xmlns:gx="http://www.google.com/kml/ext/2.2"
     xmlns:atom="http://www.w3.org/2005/Atom"
     xmlns:xal="urn:oasis:names:tc:ciq:xsdschema:xAL:2.0">
    <Document>
        <name>Task 5</name>
        <Placemark>
            <ExtendedData>
                <Data name="ObjectId">
                    <value>1</value>
                </Data>
                <Data name="ObjectType">
                    <value>Location</value>
                </Data>
                <Data name="IMINT">
                    <value>Military</value>
                </Data>
                <Data name="MOVINT">
                    <value>SparseTraffic</value>
                </Data>
                <Data name="SOCINT">
                    <value>A</value>
                </Data>
            </ExtendedData>
            <Point>
                <coordinates>0.5716552894081212,0.5427107177925201</coordinates>
            </Point>
        </Placemark>
        <Placemark>
            <ExtendedData>
```

```
                <Data name="ObjectId">
                    <value>A</value>
                </Data>
                <Data name="ObjectType">
                    <value>Group</value>
                </Data>
                <Data name="SIGINT">
                    <value>Silent</value>
                </Data>
            </ExtendedData>
            <Point>
                <coordinates>0.4196962884262156,0.5788914323120214</coordinates>
            </Point>
        </Placemark>
        <Placemark>
            <ExtendedData>
                <Data name="ObjectId">
                    <value>B</value>
                </Data>
                <Data name="ObjectType">
                    <value>Group</value>
                </Data>
                <Data name="SIGINT">
                    <value>Chatter</value>
                </Data>
            </ExtendedData>
            <Point>
                <coordinates>0.10130600065460375,0.6657251471588246</coordinates>
            </Point>
        </Placemark>
        <Placemark>
            <ExtendedData>
                <Data name="ObjectId">
                    <value>C</value>
                </Data>
                <Data name="ObjectType">
                    <value>Group</value>
                </Data>
                <Data name="SIGINT">
                    <value>Silent</value>
                </Data>
            </ExtendedData>
            <Point>
                <coordinates>0.37627943100281397,0.13025057227020484</coordinates>
            </Point>
        </Placemark>
        <Placemark>
            <ExtendedData>
                <Data name="ObjectId">
                    <value>D</value>
                </Data>
                <Data name="ObjectType">
                    <value>Group</value>
                </Data>
                <Data name="SIGINT">
                    <value>Silent</value>
```

```
                </Data>

            </ExtendedData>
            <Point>
                <coordinates>0.16643128678970615,0.19537585840530722</coordinates>
            </Point>
        </Placemark>
    </Document>
</kml>
```

Figure 11: Sample feature vector for Tasks 4-7 (KML version)

While developers are encouraged to adopt the KML feature vector format, a CSV (comma-separated value) format will also be provided. Each CSV feature vector contains 8 columns as defined below. The example in Figure 11 below is for Task 5.

ObjectID	ObjectType	X	Y	SOCINT	IMINT	MOVINT	SIGINT
1	Location	79	75	A	1	1	[]
A	Group	58	80	A	[]	[]	2
B	Group	14	92	B	[]	[]	1
C	Group	52	18	C	[]	[]	1
D	Group	23	27	D	[]	[]	1

Figure 12: Sample feature vector for Tasks 4-7 (CSV version)

Name: ObjectID
Description: Object identification
Format: String
Range: [A, B, C, D] for groups, and [1, 2, 3, 4] for locations.

Name: ObjectType
Description: The type of object being identified.
Format: String
Range: [Location, Group]

Name: X
Description: The X-coordinate of the data.
Format: Scalar
Range: [0 … GridWidth]

Name: Y
Description: The Y-coordinate of the data.
Format: Scalar
Range: [0 … GridHeight]

Name: SOCINT
Description: Sociocultural intelligence.
Format: String

Range: [A, B, C, D], “A” refers to Group A’s ‘territory’, “B” refers to Group B’s territory etc.

Name: IMINT
Description: Image intelligence; facility identity.
Format: Scalar
Range: [1, 2], where “1” denotes a government facility and “2” denotes a military facility.

Name: MOVINT
Description: Movement intelligence; dense vs. sparse traffic.
Format: Scalar
Range: [1, 2], where “1” denotes sparse traffic and “2” denotes dense traffic.

Name: SIGINT
Description: Signals Intelligence.
Format: Scalar
Range: [1, 2], where “1” denotes silence (no intelligence), and “2” denotes chatter (significant intelligence)

3.10 Feature Vector Format: Roads

Roads will also be defined as Placemarks in a KML document as shown in Figure 13 below. The KML document will contain a list of Placemark elements for each road. The Placemark element will always contain two Data elements in the ExtendedData section; one that specifies the *ObjectId* and another that specifies the *ObjectType*. The *ObjectID* provides the ID for the road; the object type will be “Road”.

The LineString element will contain an ordered list of longitudes and latitudes that define the points along the road (see Section 2.8 for information on translating longitudes and latitudes to grid coordinates).

```
<?xml version="1.1" encoding="UTF-8" standalone="yes"?>
<kml xmlns="http://www.opengis.net/kml/2.2"
xmlns:gx="http://www.google.com/kml/ext/2.2"
xmlns:atom="http://www.w3.org/2005/Atom"
xmlns:xal="urn:oasis:names:tc:ciq:xsdschema:xAL:2.0">
    <Document>
        <name>Roads</name>
        <Placemark>
            <ExtendedData>
                <Data name="ObjectId">
                    <value>1</value>
```

```
                </Data>
                <Data name="ObjectType">
                    <value>Road</value>
                </Data>
            </ExtendedData>
            <LineString>
                <coordinates>0.3618071451950134,0.04341685742340161
                 0.3618071451950134,0.05065300032730188
                 0.3618071451950134,0.05788914323120215
                 0.3618071451950134,0.06512528613510242
                 0.3618071451950134,0.07236142903900268
                  …
                </coordinates>
            </LineString>
        </Placemark>
         …
    </Document>
</kml>
```

Figure 13: Sample feature vector for roads (KML version)

While developers are encouraged to adopt the KML feature vector format, a CSV (comma-separated value) format will also be provided as shown in Figure 14 below.

ObjectID	ObjectType	X	Y
1	Road	50	6
1	Road	52	5
1	Road	63	34
1	Road	67	40
1	Road	72	48
1	Road	74	53
1	Road	79	62
1	Road	79	82
1	Road	79	91

Figure 14: Sample feature vector for roads (CSV version)

Name: ObjectID
Description: Object identification
Format: Integer
Range: [0 … 100]
Name: ObjectType
Description: The type of object being identified.
Format: String
Range: [Road]

Name: X
Description: The X-coordinate of the data.
Format: Scalar
Range: [0 … GridWidth]

Name: Y
Description: The Y-coordinate of the data.
Format: Scalar
Range: [0 … GridHeight]

3.11 Feature Vector Format: Regions

Note on regions: While models are not expected to read region files, they will be presented visually to human participants. A description of the format is provided here for completeness.

Regions will also be defined as Placemarks in a KML document as shown in Figure 15 below. The KML document will contain a list of Placemark elements that define a series of polygons for all SOCINT regions in the grid. The Placemark element will always contain one Data element in the ExtendedData section that specifies the group the SOCINT region is for. Multiple polygons may be defined for a single group.

The Polygon element will contain vertices defining a polygon that encompasses the region (see Section 2.8 for information on translating longitudes and latitudes to grid coordinates).

```
<?xml version="1.1" encoding="UTF-8" standalone="yes"?>
<kml xmlns="http://www.opengis.net/kml/2.2"
xmlns:gx="http://www.google.com/kml/ext/2.2"
xmlns:atom="http://www.w3.org/2005/Atom"
xmlns:xal="urn:oasis:names:tc:ciq:xsdschema:xAL:2.0">
    <Document>
        <Document>
        <name>Regions</name>
        <Placemark>
            <styleUrl>#3pt</styleUrl>
            <ExtendedData>
                <Data name="SOCINT">
                    <value>C</value>
                </Data>
            </ExtendedData>
            <Polygon>
                <outerBoundaryIs>
                    <LinearRing>
                        <tessellate>1</tessellate>
                        <coordinates>0.24313440157104899,0.004341685742340161
                           0.24747608731338916,0.004341685742340161
                           0.24747608731338916,0.008683371484680322
                           0.24313440157104899,0.008683371484680322
                           0.24313440157104899,0.004341685742340161
                        </coordinates>
                    </LinearRing>
                </outerBoundaryIs>
            </Polygon>
        </Placemark>
    </Document>          …
    </Document>
```

```
</kml>
```

Figure 15: Sample feature vector for regions (KML version)

A CSV (comma-separated value) format is also provided as shown in Figure 16 below. The SOCINT value (group) of each grid coordinate (X, Y) is specified. Note that SOCINT values may be specified as either numbers (1, 2, 3, 4) that correspond to groups (A, B, C, D), or as the groups themselves as shown in Figure 16.

X	Y	SOCINT
1	1	A
1	2	A
1	3	A
1	4	A
1	5	A
1	6	A
1	7	A
1	8	A

Figure 16: Sample feature vector for regions (CSV version)

Name: X
Description: The X-coordinate of the data.
Format: Scalar
Range: [0 … GridWidth]

Name: Y
Description: The Y-coordinate of the data.
Format: Scalar
Range: [0 … GridHeight]

Name: SOCINT
Description: The group
Format: String or Scalar
Range: [A, B, C, D] or [1,2,3,4]

4 Output Format

A participant's or model's responses to an exam will be recorded in the same XML document that defines the exam. A ResponseGenerator element at the beginning of the document provides information about the participant/ICArUS model that generated the responses; a unique SiteId will be provided to each team, and each team may use the ResponseGeneratorId element to specify the model version ID (for example, there may be multiple IDs corresponding to different versions of a model running with different parameters). It is preferable to avoid using an underscore character ('_') in the site ID or response generator ID names as the underscore is used as a field delineator.

The document may also contain StartTime and EndTime elements that indicate when the participant/model started and finished the exam. The ExamPhase elements for each task may also contain StartTime and EndTime elements that indicate when the participant/model started and finished the task. Responses to the trials in each task phase are contained within the phase and are described in Sections 4.1 – 4.6 below. Appendix C contains an entire sample output document. While the example given in Appendix C shows responses for all trials in all tasks in the exam, a model should only send an exam document containing results for a single task at a time.

```
<?xml version="1.1" encoding="UTF-8" standalone="yes"?>
<ns3:IcarusEvaluation_CPD1 xmlns:ns2="IcarusCPD_Base" xmlns:ns3="IcarusCPD_1"
  examTimeStamp="2011-07-27T12:50:45.571-04:00" name="Sample Exam"
      id="Sample Exam"
      startTime="2011-07-27T13:50:45.571-04:00"
      endTime="2011-07-27T16:50:45.571-04:00">

    <!-- ICArUS System information -->
    <ResponseGenerator>
        <HumanSubject>false</HumanSubject>
        <ResponseGeneratorId>Model2</ResponseGeneratorId>
        <SiteId>Team1</SiteId>
    </ResponseGenerator>

    <!-- Task 1 Response -->
    <ExamPhase xsi:type="ns3:Task_1_Phase" examId="Sample Exam"
      name="Mission 1" id="Task3"
      startTime="2011-07-27T13:50:45.571-04:00"
      endTime="2011-07-27T14:20:45.571-04:00">
        …
    <ExamPhase>
     …

</ns3:IcarusEvaluation_CPD1>
```

Figure 17: Overview of an exam document with ICArUS model responses

Note on timing data: The trialTime_ms attribute and trialPartTime_ms attributes capture the amount

of time taken by a participant on the overall trial and each part of the trial. The time_ms attributes in GroupAttackProbability and TroopAllocation elements capture the amount of time spent adjusting input controls when providing probability judgments and troop allocations. The layerSelectionTime_ms attribute in the INTLayerShown element captures the amount of time spent selecting an INT layer in Task 6. While this information is captured for human participants, ICArUS models are not required to report this information.

Note on normative response data and S1 and S1 scores: The normative responses for each stage of each trial and the scores for assessing probabilities (S1) and allocating troops (S2) are also calculated and embedded in the response elements. The ResponseFeedback element for a trial contains the overall S1 and S2 scores for the trial. In this case of trials with multiple probability assessments (such as those in Tasks 4-6), the overall S1 score is the average of each individual S1 score for each probability assessment. ICArUS models are not expected to report this information. The example normative solutions in this document are used only to illustrate XML formats and are not actual normative solutions. Please consult the appendix "Normative Solutions" in the "Sample Human Behavioral Data" document for details on how normative solutions are calcualted and consult the "Phase 1 Challenge Problem Design and Test Specification" document for details on how scores are calculated.

4.1 Task 1 Output

The TrialResponse element, contained within the ProbeTrial element (see Figure 18), contains the participant's response to each probe trial. The TrialResponse element next includes a GroupResponse element, which contains the probability that each group is responsible for the attack. The TroopSelectionProbeResponse element next indicates the group that the participant chose to allocate troops against, and the GroundTruthSurpriseResponse element contains the participant's "surprise" after being shown ground truth.

Normative Response Data and Scores: The ResponsFeedback element contains the participant's overall S1 and S2 scores for the trial. The NormativeProbsCumulative element in the GroupResponse element contains the normative probabilities, and the ProbabilitiesScore_s1 element contains the participant's S1 score for the probability assessment. The TroopAllocationScore_s2 element contains the participant's S2 score for the troop allocation. The AttackDispersionParameters element contains the "dispersion" parameters for each group (e.g., base rates, mean locations) based on the distribution of attacks that have been presented.

```
<!-- Task 1 Response -->
    <ExamPhase xsi:type="ns3:Task_1_Phase" examId="Sample Exam"
     name="Mission 1" id="Task1" startTime="2011-07-27T13:50:45.571-04:00"
      endTime="2011-07-27T14:20:45.571-04:00">
        <TrialBlock xsi:type="ns3:Task_1_TrialBlock" trialBlockNum="1"
          numPresentationTrials="9">
            <FeatureVectorFile featureVectorUrl_CSV="task1_1.csv"
             featureVectorUrl_KML="task1_1.kml"/>
            <ProbeTrial trialNum="10">
```

```
                <AttackDispersionParameters>
                    <Parameters baseRate="0.5" group="A" sigmaX="5.0"
                        sigmaY="5.0" theta="0.0">
                        <CenterLocation locationId="A" x="25.0" y="75.0" />
                    </Parameters>
                    <Parameters baseRate="0.5" group="B" sigmaX="2.5"
                        sigmaY="2.5" theta="0.0">
                        <CenterLocation locationId="B" x="50.0" y="50.0" />
                    </Parameters>
                </AttackDispersionParameters>
                <GroupProbe>
                    <AttackLocation locationId="1" x="25" y="18"
                      lat="0.13025057227020484" lon="0.1809035725975067"/>
                    <Groups>A B</Groups>
                </GroupProbe>
                <TroopSelectionProbe>
                    <Groups>A B</Groups>
                </TroopSelectionProbe>
                <GroundTruth responsibleGroup="A"/>
                <GroundTruthSurpriseProbe minSurprise="0" maxSurprise="6"
                 increment="1"/>
                <TrialResponse trialTime_ms="11903">
                    <ResponseFeedback responseWellFormed="true">
                        <GroundTruth responsibleGroup="A"/>
                        <ProbabilitiesScore_s1>100.0</ProbabilitiesScore_s1>
                        <TroopAllocationScore_s2>100.0</TroopAllocationScore_s2>
                    </ResponseFeedback>
                    <GroupResponse trialPartTime_ms="3229">
                        <NormativeProbsCumulative>
                          50.0 50.0
                        </NormativeProbsCumulative>
                        <ProbabilitiesScore_s1>100.0</ProbabilitiesScore_s1>
                        <GroupAttackProbability group="A" probability="50"
                          time_ms="897"/>
                        <GroupAttackProbability group="B" probability="50"
                          time_ms="455"/>
                    </GroupResponse>
                    <TroopSelectionResponse group="A" trialPartTime_ms="2683">
                       <TroopAllocationScore_s2>100.0</TroopAllocationScore_s2>
                    <TroopSelectionResponse/>
                    <GroundTruthSurpriseResponse surprise="5"
                        trialPartTime_ms="1982"/>
                </TrialResponse>
            </ProbeTrial>
        </TrialBlock>
         …
    </ExamPhase>
```

Figure 18: Task 1 sample response

4.2 Task 2 Output

Major differences: The task 2 TrialResponse element also contains a GroupCirclesResponse element, which contains the center locations and radii of each group circle. Radii distances should be specified in grid units (see Section 2.8 for details).

```
<!-- Task 2 Response -->
    <ExamPhase xsi:type="ns3:Task_2_Phase" examId="Sample Exam"
     name="Mission 2" id="Task2" startTime="2011-07-27T14:20:45.571-04:00"
      endTime="2011-07-27T14:50:45.571-04:00">
        <TrialBlock xsi:type="ns3:Task_2_TrialBlock" trialBlockNum="1"
         numPresentationTrials="19">
            <FeatureVectorFile featureVectorUrl_CSV="task2_1.csv"
             featureVectorUrl_KML="task2_1.kml"/>
            <ProbeTrial trialNum="20">
                <AttackDispersionParameters>
                  <Parameters baseRate="0.25" group="A" sigmaX="5.0"
                        sigmaY="5.0" theta="0.0">
                        <CenterLocation x="25.0" y="50.0" />
                  </Parameters>
                  <Parameters baseRate="0.25" group="B" sigmaX="1.0"
                        sigmaY="1.0" theta="0.0">
                        <CenterLocation x="50.0" y="25.0" />
                  </Parameters>
                  <Parameters baseRate="0.25" group="C" sigmaX="9.0"
                        sigmaY="9.0" theta="0.0">
                        <CenterLocation x="75.0" y="75.0" />
                  </Parameters>
                  <Parameters baseRate="0.25" group="D" sigmaX="2.5"
                        sigmaY="2.5" theta="0.0">
                        <CenterLocation x="10.0" y="10.0" />
                  </Parameters>
                </AttackDispersionParameters>
                <GroupCirclesProbe>
                    <Groups>A B C D</Groups>
                </GroupCirclesProbe>
                <GroupProbe>
                    <AttackLocation locationId="1" x="25" y="18"
                     lat="0.13025057227020484" lon="0.1809035725975067"/>
                    <Groups>A B C D</Groups>
                </GroupProbe>
                <TroopSelectionProbe>
                    <Groups>A B C D</Groups>
                </TroopSelectionProbe>
                <GroundTruth responsibleGroup="B"/>
                <GroundTruthSurpriseProbe minSurprise="0" maxSurprise="6"
                 increment="1"/>
                <TrialResponse trialTime_ms="29606">
                    <ResponseFeedback responseWellFormed="true">
                        <GroundTruth responsibleGroup="B"/>
                        <ProbabilitiesScore_s1>100.0</ProbabilitiesScore_s1>
                        <TroopAllocationScore_s2>100.0</TroopAllocationScore_s2>
                    </ResponseFeedback>
                    <GroupCirclesResponse trialPartTime_ms="5698">
```

```
                        <GroupCircle group="A" radius="5.0">
                            <CenterLocation x="3" y="4" lat="0.028944571615601076"
                             lon="0.021708428711700804"/>
                        </GroupCircle>
                        <GroupCircle group="B" radius="9.0">
                            <CenterLocation x="8" y="5" lat="0.03618071451950134"
                             lon="0.05788914323120215"/>
                        </GroupCircle>
                        <GroupCircle group="C" radius="6.0">
                            <CenterLocation x="8" y="12" lat="0.08683371484680322"
                             lon="0.05788914323120215"/>
                        </GroupCircle>
                        <GroupCircle group="D" radius="3.0">
                            <CenterLocation x="6" y="4" lat="0.028944571615601076"
                             lon="0.04341685742340161"/>
                        </GroupCircle>
                    </GroupCirclesResponse>
                    <GroupResponse trialPartTime_ms="15436">
                        <NormativeProbsCumulative>
                          25.0 25.0 25.0 25.0
                        </NormativeProbsCumulative>
                        <ProbabilitiesScore_s1>100.0</ProbabilitiesScore_s1>
                        <GroupAttackProbability group="A" probability="25"
                           time_ms="4533"/>
                        <GroupAttackProbability group="B" probability="25"
                           time_ms="1344"/>
                        <GroupAttackProbability group="C" probability="25"/
                           time_ms="2200">
                        <GroupAttackProbability group="D" probability="25"
                           time_ms="988"/>
                    </GroupResponse>
                    <TroopSelectionResponse group="B" trialPartTime_ms="1638">
                         <TroopAllocationScore_s2>100.0</TroopAllocationScore_s2>
                    <TroopSelectionResponse/>
                    <GroundTruthSurpriseResponse surprise="5"
                       trialPartTime_ms="3229"/>
                </TrialResponse>
            </ProbeTrial>
        </TrialBlock>
        …
    </ExamPhase>
```

Figure 19: Task 2 sample response

4.3 Task 3 Output

Major differences: A task 3 TrialResponse element contains a GroupCentersResponse element instead of a GroupCirclesResponse element. The GroupCentersResponse element contains the "center of gravity" location for each group.

```
<!-- Task 3 Response -->
    <ExamPhase xsi:type="ns3:Task_3_Phase" examId="Sample Exam"
```

```
    name="Mission 3" id="Task3" startTime="2011-07-27T14:50:45.571-04:00"
    endTime="2011-07-27T15:20:45.571-04:00">
       <RoadsFile featureVectorUrl_CSV="roads.csv"
            featureVectorUrl_KML="roads.kml"/>
       <TrialBlock xsi:type="ns3:Task_3_TrialBlock" trialBlockNum="1"
         numPresentationTrials="19">
           <FeatureVectorFile featureVectorUrl_CSV="task3_1.csv"
            featureVectorUrl_KML="task3_1.kml"/>
           <ProbeTrial trialNum="20">
               <AttackDispersionParameters>
                 <Parameters baseRate="0.25" group="A">
                       <CenterLocation locationId="A" x="10.0" y="30.0" />
                 </Parameters>
                 <Parameters baseRate="0.25" group="B">
                       <CenterLocation locationId="B" x="50.0" y="25.0" />
                 </Parameters>
                 <Parameters baseRate="0.25" group="C">
                       <CenterLocation locationId="C" x="75.0" y="25.0" />
                 </Parameters>
                 <Parameters baseRate="0.25" group="D">
                       <CenterLocation locationId="D" x="25.0" y="50.0" />
                 </Parameters>
               </AttackDispersionParameters>
               <GroupCentersProbe>
                   <Groups>A B C D</Groups>
               </GroupCentersProbe>
               <GroupProbe>
                   <AttackLocation locationId="1" x="13" y="37"
                    lat="0.2677372874443099" lon="0.09406985775070349"/>
                   <Groups>A B C D</Groups>
               </GroupProbe>
               <TroopSelectionProbe>
                   <Groups>A B C D</Groups>
               </TroopSelectionProbe>
               <GroundTruth responsibleGroup="D"/>
               <GroundTruthSurpriseProbe minSurprise="0" maxSurprise="6"
                increment="1"/>
               <TrialResponse trialTime_ms="54439">
                   <ResponseFeedback responseWellFormed="true">
                       <GroundTruth responsibleGroup="D"/>
                       <ProbabilitiesScore_s1>100.0</ProbabilitiesScore_s1>
                       <TroopAllocationScore_s2>100.0</TroopAllocationScore_s2>
                   </ResponseFeedback>
                   <GroupCentersResponse trialPartTime_ms="6894">
                       <GroupCenter group="A">
                           <CenterLocation x="3" y="4" lat="0.028944571615601076"
                            lon="0.021708428711700804"/>
                       </GroupCenter>
                       <GroupCenter group="B">
                           <CenterLocation x="8" y="5" lat="0.03618071451950134"
                            lon="0.05788914323120215"/>
                       </GroupCenter>
                       <GroupCenter group="C">
                           <CenterLocation x="8" y="12" lat="0.08683371484680322"
                            lon="0.05788914323120215"/>
                       </GroupCenter>
```

```
                        <GroupCenter group="D">
                            <CenterLocation x="6" y="4" lat="0.028944571615601076"
                             lon="0.04341685742340161"/>
                        </GroupCenter>
                    </GroupCentersResponse>
                    <GroupResponse trialPartTime_ms="17129">
                        <NormativeProbsCumulative>
                          25.0 25.0 25.0 25.0
                        </NormativeProbsCumulative>
                        <ProbabilitiesScore_s1>100.0</ProbabilitiesScore_s1>
                        <GroupAttackProbability group="A" probability="25"
                          time_ms="2344"/>
                        <GroupAttackProbability group="B" probability="25"
                          time_ms="2353"/>
                        <GroupAttackProbability group="C" probability="25"
                          time_ms="3836"/>
                        <GroupAttackProbability group="D" probability="25"
                          time_ms="1837"/>
                    </GroupResponse>
                    <TroopSelectionResponse group="D" trialPartTime_ms="2418">
                         <TroopAllocationScore_s2>100.0</TroopAllocationScore_s2>
                    <TroopSelectionResponse/>
                    <GroundTruthSurpriseResponse surprise="5"
                        trialPartTime_ms="2106"/>
                </TrialResponse>
            </ProbeTrial>
        </TrialBlock>
        …
    </ExamPhase>
```

Figure 20: Task 3 sample response

4.4 Task 4 Output

Major differences: Like Tasks 1-3, each response in Task 4 is contained within a TrialResponse element. An initial LocationResponse element contains the probability of attack at each location. Next, a LocationResponse_afterINT element contains the updated probability of attack at each location after being shown the SOCINT layer. Finally, a TroopAllocationResponse element contains the participant's troop allocations across locations, and a GroundTruthSurpriseResponse element contains the participant's "surprise" after being shown the actual attack location.

Normative Response Data and Scores: The initial LocationResponse element contains a NormativeProbsCumulative element with the the initial normative probabilities and a ProbabilitiesScore_s1 element that contains the participant's S1 score based on the initial probability assessment. The LocationResponse_afterINT element contains the updated normative probabilities and S1 score. The overall S1 score for the trial in the ResponseFeedback element is the average of these two scores.

```
<!-- Task 4 Response -->
    <ExamPhase xsi:type="ns3:Task_4_Phase" examId="Sample Exam"
```

```
name="Mission 4" id="Task4" startTime="2011-07-27T15:20:45.571-04:00"
endTime="2011-07-27T15:50:45.571-04:00">
   <Trial trialNum="1">
       <FeatureVectorFile featureVectorUrl_CSV="task4_1.csv"
          featureVectorUrl_KML="task4_1.kml"/>
       <RoadsFile featureVectorUrl_CSV="roads.csv"
          featureVectorUrl_KML="roads.kml"/>
       <RegionsFile featureVectorUrl_CSV="SOCINT_1.csv"
          featureVectorUrl_KML="SOCINT_1.kml"/>
       <LocationProbe>
           <AttackGroup>A</AttackGroup>
           <Locations>1 2 3 4</Locations>
       </LocationProbe>
       <INTLayers>
           <INTLayer>
               <LayerType xsi:type="SocintLayer"/>
               <LocationProbe>
                   <AttackGroup>A</AttackGroup>
                   <Locations>1 2 3 4</Locations>
               </LocationProbe>
               <SurpriseProbe minSurprise="0" maxSurprise="6" increment="1" />
           </INTLayer>
       </INTLayers>
       <TroopAllocationProbe>
           <Locations>1 2 3 4</Locations>
       </TroopAllocationProbe>
       <GroundTruth attackLocationId="3"/>
       <GroundTruthSurpriseProbe minSurprise="0" maxSurprise="6"
         increment="1"/>
       <TrialResponse trialTime_ms="13572">
           <ResponseFeedback responseWellFormed="true">
              <GroundTruth attackLocationId="3"/>
              <ProbabilitiesScore_s1>100.0</ProbabilitiesScore_s1>
              <TroopAllocationScore_s2>25.0</TroopAllocationScore_s2>
           </ResponseFeedback>
           <LocationResponse Group="A" trialPartTime_ms="8938">
               <NormativeProbsCumulative>
                     25.0 25.0 25.0 25.0
               </NormativeProbsCumulative>
               <ProbabilitiesScore_s1>100.0</ProbabilitiesScore_s1>
               <GroupAttackProbability locationId="1" probability="25"
                 time_ms="2100"/>
               <GroupAttackProbability locationId="2" probability="25"
                 time_ms="1083"/>
               <GroupAttackProbability locationId="3" probability="25"
                 time_ms="1000"/>
               <GroupAttackProbability locationId="4" probability="25"
                 time_ms="2411"/>
           </LocationResponse>
           <LocationResponse_afterINT>
               <INTLayerShown userSelected="false">
                   <LayerType xsi:type="SocintLayer"/>
               </INTLayerShown>
               <LocationResponse Group="A" trialPartTime_ms="4353">
                   <NormativeProbsCumulative>
                     25.0 25.0 25.0 25.0
```

```
                    </NormativeProbsCumulative>
                    <ProbabilitiesScore_s1>100.0</ProbabilitiesScore_s1>
                    <GroupAttackProbability locationId="1" probability="25"
                      time_ms="1078"/>
                    <GroupAttackProbability locationId="2" probability="25"
                      time_ms="420"/>
                    <GroupAttackProbability locationId="3" probability="25"
                      time_ms="678"/>
                    <GroupAttackProbability locationId="4" probability="25"
                     time_ms="1780"/>
                </LocationResponse>
            </LocationResponse_afterINT>
            <TroopAllocationResponse trialPartTime_ms="5738">
                <TroopAllocationScore_s2>25.0</TroopAllocationScore_s2>
                <TroopAllocation locationId="1" allocation="25"
                  time_ms="899"/>
                <TroopAllocation locationId="2" allocation="25"
                 time_ms="400"/>
                <TroopAllocation locationId="3" allocation="25"
                  time_ms="678"/>
                <TroopAllocation locationId="4" allocation="25"
                  time_ms="1780"/>
            </TroopAllocationResponse>
            <GroundTruthSurpriseResponse surprise="3"
               trialPartTime_ms="1840"/>
        </TrialResponse>
    </Trial>
     …
</ExamPhase>
```

Figure 21: Task 4 sample response

4.5 Tasks 5-6 Output

Major differences: The TrialResponse element first contains an InitialProbabilities element, which contains the probabilities that were provided to the participant in the InitialHumintReport element at the start of the trial. Next, a sequence of one or more GroupResponse_afterINT elements contain the updated probabilities after each INT layer is presented and whether the INT layer was selected by the participant or not (only true for Task 6). Finally, a TroopAllocationResponse element contains the participant's troop allocations across groups, and a GroundTruthSurpriseResponse element contains the participant's "surprise" after being shown the group actually responsible for the attack.

Normative Response Data and Scores: Each GroupResponse_afterINT element contains the normative probabilities based on the INT layers that have been observed and the participant's S1 score based on their probability assessment. The overall S1 score for the trial in the ResponseFeedback element is the average of these scores. For Task 6, the INTLayerExpectedUtilities element contains the expected informatic utility of selecting each INT layer. The normative response is to select the layer with the highest informatic utility.

```
<!-- Task 6 Response -->
      <ExamPhase xsi:type="ns3:Task_6_Phase" examId="Sample Exam"
            name="Mission 6" id="Task6"
            startTime="2011-07-27T16:20:45.571-04:00"
            endTime="2011-07-27T16:50:45.571-04:00">
            <Trial trialNum="1" numLayersToShow="3">
                  <FeatureVectorFile featureVectorUrl_CSV="task6_1.csv"
                        featureVectorUrl_KML="task6_1.kml" />
                  <RoadsFile featureVectorUrl_CSV="roads.csv"
                        featureVectorUrl_KML="roads.kml" />
                  <RegionsFile featureVectorUrl_CSV="SOCINT_1.csv"
                        featureVectorUrl_KML="SOCINT_1.csv" />
                  <InitialHumintReport>
                        <Groups>A B C D</Groups>
                        <Probabilities>25 25 25 25</Probabilities>
                  </InitialHumintReport>
                  <INTLayers>
                        <INTLayer>
                              <LayerType xsi:type="ns3:ImintLayer" />
                              <GroupProbe>
                                    <AttackLocation locationId="3" />
                                    <Groups>A B C D</Groups>
                              </GroupProbe>
                        </INTLayer>
                        <INTLayer>
                              <LayerType xsi:type="ns3:MovintLayer" />
                              <GroupProbe>
                                    <AttackLocation locationId="3" />
                                    <Groups>A B C D</Groups>
                              </GroupProbe>
                        </INTLayer>
                        <INTLayer>
                              <LayerType xsi:type="ns3:SigintLayer">
                                    <Group>A</Group>
                              </LayerType>
                              <GroupProbe>
                                    <AttackLocation locationId="3" />
                                    <Groups>A B C D</Groups>
                              </GroupProbe>
                        </INTLayer>
                        <INTLayer>
                              <LayerType xsi:type="ns3:SigintLayer">
                                    <Group>B</Group>
                              </LayerType>
                              <GroupProbe>
                                    <AttackLocation locationId="3" />
                                    <Groups>A B C D</Groups>
                              </GroupProbe>
                        </INTLayer>
                        <INTLayer>
                              <LayerType xsi:type="ns3:SigintLayer">
                                    <Group>C</Group>
                              </LayerType>
                              <GroupProbe>
                                    <AttackLocation locationId="3" />
                                    <Groups>A B C D</Groups>
```

```
                        </GroupProbe>
                  </INTLayer>
                  <INTLayer>
                        <LayerType xsi:type="ns3:SigintLayer">
                              <Group>D</Group>
                        </LayerType>
                        <GroupProbe>
                              <AttackLocation locationId="3" />
                              <Groups>A B C D</Groups>
                        </GroupProbe>
                  </INTLayer>
                  <INTLayer>
                        <LayerType xsi:type="ns3:SocintLayer" />
                        <GroupProbe>
                              <AttackLocation locationId="3" />
                              <Groups>A B C D</Groups>
                        </GroupProbe>
                  </INTLayer>
            </INTLayers>
            <TroopAllocationProbe>
                  <Groups>A B C D</Groups>
            </TroopAllocationProbe>
            <GroundTruth responsibleGroup="D" />
            <GroundTruthSurpriseProbe minSurprise="0"
                  maxSurprise="6" increment="1" />
            <TrialResponse trialTime_ms="66496">
                  <ResponseFeedback responseWellFormed="true">
                      <GroundTruth responsibleGroup="D" />
                      <ProbabilitiesScore_s1>100.0</ProbabilitiesScore_s1>
                      <TroopAllocationScore_s2>25.0</TroopAllocationScore_s2>
                  </ResponseFeedback>
                  <InitialProbabilities>25 25 25 25</InitialProbabilities>
                  <GroupResponse_afterINT>
                        <INTLayerExpectedUtilities>
                              <ExpectedUtility
                                    expectedUtility_cumulative="0.25">
                                    <LayerType xsi:type="ns3:ImintLayer" />
                              </ExpectedUtility>
                              <ExpectedUtility
                                    expectedUtility_cumulative="0.25">
                                    <LayerType xsi:type="ns3:MovintLayer" />
                              </ExpectedUtility>
                              <ExpectedUtility
                                    expectedUtility_cumulative=".25">
                                    <LayerType xsi:type="ns3:SigintLayer">
                                          <Group>A</Group>
                                    </LayerType>
                              </ExpectedUtility>
                              <ExpectedUtility
                                    expectedUtility_cumulative="0.25">
                                    <LayerType xsi:type="ns3:SigintLayer">
                                          <Group>B</Group>
                                    </LayerType>
                              </ExpectedUtility>
                              <ExpectedUtility
                                    expectedUtility_cumulative="0.25">
```

```
                              <LayerType xsi:type="ns3:SigintLayer">
                                    <Group>C</Group>
                              </LayerType>
                        </ExpectedUtility>
                        <ExpectedUtility
                              expectedUtility_cumulative="0.25">
                              <LayerType xsi:type="ns3:SigintLayer">
                                    <Group>D</Group>
                              </LayerType>
                        </ExpectedUtility>
                        <ExpectedUtility
                              expectedUtility_cumulative="0.25">
                              <LayerType xsi:type="ns3:SocintLayer" />
                        </ExpectedUtility>
                  </INTLayerExpectedUtilities>
                  <INTLayerShown userSelected="true"
                        layerSelectionTime_ms="2372">
                        <LayerType xsi:type="ns3:SigintLayer">
                              <Group>A</Group>
                        </LayerType>
                  </INTLayerShown>
                  <GroupResponse locationId="1"
                        trialPartTime_ms="6030">
                        <NormativeProbsCumulative>
                          25.0 25.0 25.0 25.0
                        </NormativeProbsCumulative>
                   <ProbabilitiesScore_s1>100.0</ProbabilitiesScore_s1>
                        <GroupAttackProbability group="A"
                              probability="25" time_ms="1324" />
                        <GroupAttackProbability group="B"
                              probability="25" time_ms="1123" />
                        <GroupAttackProbability group="C"
                              probability="25" time_ms="1245" />
                        <GroupAttackProbability group="D"
                              probability="25" time_ms="333" />
                  </GroupResponse>
            </GroupResponse_afterINT>
            <GroupResponse_afterINT>
                  <INTLayerExpectedUtilities>
                        <ExpectedUtility
                              expectedUtility_cumulative="0.25">
                              <LayerType xsi:type="ns3:ImintLayer" />
                        </ExpectedUtility>
                        <ExpectedUtility
                              expectedUtility_cumulative="0.25">
                              <LayerType xsi:type="ns3:MovintLayer" />
                        </ExpectedUtility>
                        <ExpectedUtility
                              expectedUtility_cumulative="0.25">
                              <LayerType xsi:type="ns3:SocintLayer" />
                        </ExpectedUtility>
                  </INTLayerExpectedUtilities>
                  <INTLayerShown userSelected="true"
                        layerSelectionTime_ms="1638">
                        <LayerType xsi:type="ns3:MovintLayer" />
                  </INTLayerShown>
```

```
                        <GroupResponse locationId="1"
                              trialPartTime_ms="12075">
                              <NormativeProbsCumulative>
                                 25.0 25.0 25.0 25.0
                              </NormativeProbsCumulative>
                         <ProbabilitiesScore_s1>100.0</ProbabilitiesScore_s1>
                              <GroupAttackProbability group="A"
                                    probability="25" time_ms="3078" />
                              <GroupAttackProbability group="B"
                                    probability="25" time_ms="3434" />
                              <GroupAttackProbability group="C"
                                    probability="25" time_ms="1234" />
                              <GroupAttackProbability group="D"
                                    probability="25" time_ms="4532" />
                        </GroupResponse>
                  </GroupResponse_afterINT>
                  <GroupResponse_afterINT>
                        <INTLayerExpectedUtilities>
                              <ExpectedUtility
                                    expectedUtility_cumulative="0.25">
                                    <LayerType xsi:type="ns3:ImintLayer" />
                              </ExpectedUtility>
                              <ExpectedUtility
                                    expectedUtility_cumulative="0.25">
                                    <LayerType xsi:type="ns3:SocintLayer" />
                              </ExpectedUtility>
                        </INTLayerExpectedUtilities>
                        <INTLayerShown userSelected="true"
                              layerSelectionTime_ms="6084">
                              <LayerType xsi:type="ns3:ImintLayer" />
                        </INTLayerShown>
                        <GroupResponse locationId="1"
                           trialPartTime_ms="4213">
                              <NormativeProbsCumulative>
                                 25.0 25.0 25.0 25.0
                              </NormativeProbsCumulative>
                         <ProbabilitiesScore_s1>100.0</ProbabilitiesScore_s1>
                              <GroupAttackProbability group="A"
                                    probability="25" time_ms="783" />
                              <GroupAttackProbability group="B"
                                    probability="25" time_ms="1323" />
                              <GroupAttackProbability group="C"
                                    probability="25" time_ms="346" />
                              <GroupAttackProbability group="D"
                                    probability="25" time_ms="467" />
                        </GroupResponse>
                  </GroupResponse_afterINT>
                  <TroopAllocationResponse trialPartTime_ms="7854">
                      <TroopAllocationScore_s2>25.0</TroopAllocationScore_s2>
                        <TroopAllocation group="A" allocation="25"
                           time ms="345" />
                        <TroopAllocation group="B" allocation="25"
                           time_ms="687" />
                        <TroopAllocation group="C" allocation="25"
                           time_ms="5677" />
                        <TroopAllocation group="D" allocation="25"
```

```
                                    time_ms="456" />
                            </TroopAllocationResponse>
                            <GroundTruthSurpriseResponse surprise="3" />
                        </TrialResponse>
                    </Trial>
```

Figure 22: Tasks 5-6 sample response

4.6 Task 7 Output

Major differences: Each TrialResponse element contains a GroupProbeResponse element that contains the probability of attack by each group, a LocationProbeResponse element that contains the probability of attack at each location, and the TroopAllocationProbeResponse element that contains the troop allocation at each location. Note that a GroupProbeResponse element should always be present even if the participant does not update group attack probabilities. On the first trial, the GroupProbeResponse element should contain the initial group attack probabilities based on the initial responsible group. Finally, a sequence of zero or more INTLayerPurchase elements contains the INT layers purchased by the participant.

Normative Response Data and Scores: Normative probabilities are not computed for Task 7. The ResponseFeedback element contains the participant's S2 score based on their troop allocation, the number of credits awarded based on the S2 score, the number of credits used purchasing INT layers, and the number of credits remaining.

```
<!-- Task 7 -->
    <ExamPhase xsi:type="ns3:Task_7_Phase" examId="Sample Exam"
         name="Mission 7" id="Task7" startTime="2011-08-11T12:37:51.054-04:00"
         endTime="2011-08-11T13:07:51.054-04:00">
        <RoadsFile featureVectorUrl_CSV="roads.csv"
         featureVectorUrl_KML="roads.kml"/>
        <RegionsFile featureVectorUrl_CSV="SOCINT_1.csv"
           featureVectorUrl_KML="SOCINT_1.csv"/>
        <InitialResponsibleGroup>A</InitialResponsibleGroup>
        <InitialCredits>10</InitialCredits>
        <CorrectPredictionCredits>1</CorrectPredictionCredits>
        <Trial trialNum="1">
            <FeatureVectorFile featureVectorUrl_CSV="task7_1.csv"
             featureVectorUrl_KML="task7_1.kml"/>
            <GroupProbe>
                <Groups>A B C D</Groups>
            </GroupProbe>
            <LocationProbe>
                <Locations>1 2 3 4</Locations>
            </LocationProbe>
            <TroopAllocationProbe>
                <Locations>1 2 3 4</Locations>
            </TroopAllocationProbe>
            <ResponsibleGroupShown>true</ResponsibleGroupShown>
            <GroundTruth responsibleGroup="A" attackLocationId="4"/>
            <INTLayers>
```

```
                <INTLayer costCredits="1">
                    <LayerType xsi:type="ns3:ImintLayer"/>
                </INTLayer>
                <INTLayer costCredits="1">
                    <LayerType xsi:type="ns3:MovintLayer"/>
                </INTLayer>
                <INTLayer costCredits="2">
                    <LayerType xsi:type="ns3:SigintLayer">
                        <Group>A</Group>
                    </LayerType>
                </INTLayer>
                <INTLayer costCredits="2">
                    <LayerType xsi:type="ns3:SigintLayer">
                        <Group>B</Group>
                    </LayerType>
                </INTLayer>
                <INTLayer costCredits="2">
                    <LayerType xsi:type="ns3:SigintLayer">
                        <Group>C</Group>
                    </LayerType>
                </INTLayer>
                <INTLayer costCredits="2">
                    <LayerType xsi:type="ns3:SigintLayer">
                        <Group>D</Group>
                    </LayerType>
                </INTLayer>
                <INTLayer costCredits="2">
                    <LayerType xsi:type="ns3:SocintLayer"/>
                </INTLayer>
            </INTLayers>
            <TrialResponse trialTime_ms="45187">
                <ResponseFeedback responseWellFormed="true">
                    <GroundTruth responsibleGroup="B"
                       attackLocationId="4" />
                    <NumCreditsAwarded>0.25</NumCreditsAwarded>
                    <NumCreditsRemaining>7.25</NumCreditsRemaining>
                    <NumCreditsUsed>3.0</NumCreditsUsed>
                    <TroopAllocationScore_s2>
                       25.0
                    </TroopAllocationScore_s2>
                </ResponseFeedback>
                <GroupResponse trialPartTime_ms="33542">
                    <GroupAttackProbability group="A" probability="85"/>
                    <GroupAttackProbability group="B" probability="5"/>
                    <GroupAttackProbability group="C" probability="5"/>
                    <GroupAttackProbability group="D" probability="5"/>
                </GroupResponse>
                <LocationResponse trialPartTime_ms="6243">
                    <GroupAttackProbability locationId="1" probability="25"
                     time_ms="456"/>
                    <GroupAttackProbability locationId="2" probability="25"
                     time_ms="864"/>
                    <GroupAttackProbability locationId="3" probability="25"
                     time_ms="1783"/>
                    <GroupAttackProbability locationId="4" probability="25"
                     time_ms="2456"/>
```

```
            </LocationResponse>
            <TroopAllocationResponse trialPartTime_ms="3433">
                <TroopAllocation locationId="1" allocation="25"
                 time_ms="325"/>
                <TroopAllocation locationId="2" allocation="25"
                 time_ms="673"/>
                <TroopAllocation locationId="3" allocation="25"
                 time_ms="437"/>
                <TroopAllocation locationId="4" allocation="25"
                 time_ms="855"/>
            </TroopAllocationResponse>
            <LayerPurchaseTime_ms>5718</LayerPurchaseTime_ms>
            <INTLayerPurchase costCredits="1">
                <INTLayer xsi:type="ns3:ImintLayer"/>
            </INTLayerPurchase>
            <INTLayerPurchase costCredits="2">
                <INTLayer xsi:type="ns3:SigintLayer">
                    <Group>C</Group>
                </INTLayer>
            </INTLayerPurchase>
        </TrialResponse>
    </Trial>
     …
</ExamPhase>
```

Figure 23: Task 7 sample response

5 Appendices

5.1 Appendix A: Example Exam File

```
<?xml version="1.1" encoding="UTF-8" standalone="yes"?>
<ns3:IcarusEvaluation_CPD1 examTimeStamp="2011-07-27T12:31:54.989-04:00"
   name="Sample Exam" id="Sample Exam" xmlns:ns2="IcarusCPD_Base"
   xmlns:ns3="IcarusCPD_1"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

      <!-- Grid size, scale, and location information -->
      <GridSize gridWidth="100" gridHeight="100" milesPerGridUnit="0.2"
            bottomLeftLat="0.0" bottomLeftLon="0.0" />

      <!-- Task 1 -->
      <ExamPhase xsi:type="ns3:Task_1_Phase" examId="Sample Exam"
            name="Mission 1" id="Task1”>
            <TrialBlock xsi:type="ns3:Task_1_TrialBlock" trialBlockNum="1"
                  numPresentationTrials="9">
                  <FeatureVectorFile featureVectorUrl_CSV="task1_1.csv"
                        featureVectorUrl_KML="task1_1.kml" />
                  <ProbeTrial trialNum="10">
                        <GroupProbe>
                              <AttackLocation locationId="1" x="25" y="18"
                                    lat="0.13025057227020484"
                                    lon="0.1809035725975067" />
                              <Groups>A B</Groups>
                        </GroupProbe>
                        <TroopSelectionProbe>
                              <Groups>A B</Groups>
                        </TroopSelectionProbe>
                        <GroundTruth responsibleGroup="A" />
                        <GroundTruthSurpriseProbe minSurprise="0"
                              maxSurprise="6" increment="1" />
                  </ProbeTrial>
            </TrialBlock>
      </ExamPhase>

      <!-- Task 2 -->
      <ExamPhase xsi:type="ns3:Task_2_Phase" examId="Sample Exam"
            name="Mission 2" id="Task2”>
            <TrialBlock xsi:type="ns3:Task_2_TrialBlock" trialBlockNum="1"
                  numPresentationTrials="19">
                  <FeatureVectorFile featureVectorUrl_CSV="task2_1.csv"
                        featureVectorUrl_KML="task2_1.kml" />
                  <ProbeTrial trialNum="20">
                        <GroupCirclesProbe>
                              <Groups>A B C D</Groups>
                        </GroupCirclesProbe>
                        <GroupProbe>
                              <AttackLocation locationId="1" x="25" y="18"
                                    lat="0.13025057227020484"
                                    lon="0.1809035725975067" />
                              <Groups>A B C D</Groups>
                        </GroupProbe>
```

```
                        <TroopSelectionProbe>
                              <Groups>A B C D</Groups>
                        </TroopSelectionProbe>
                        <GroundTruth responsibleGroup="B" />
                        <GroundTruthSurpriseProbe minSurprise="0"
                              maxSurprise="6" increment="1" />
                  </ProbeTrial>
            </TrialBlock>
      </ExamPhase>

      <!-- Task 3 -->
      <ExamPhase xsi:type="ns3:Task_3_Phase" examId="Sample Exam"
            name="Mission 3" id="Task3">
            <RoadsFile featureVectorUrl_CSV="roads.csv"
                  featureVectorUrl_KML="roads.kml" />
            <TrialBlock xsi:type="ns3:Task_3_TrialBlock" trialBlockNum="1"
                  numPresentationTrials="19">
                  <FeatureVectorFile featureVectorUrl_CSV="task3_1.csv"
                        featureVectorUrl_KML="task3_1.kml" />
                  <ProbeTrial trialNum="20">
                        <GroupCentersProbe>
                              <Groups>A B C D</Groups>
                        </GroupCentersProbe>
                        <GroupProbe>
                              <AttackLocation locationId="1" x="13" y="37"
                                    lat="0.2677372874443099"
                                    lon="0.09406985775070349" />
                              <Groups>A B C D</Groups>
                        </GroupProbe>
                        <TroopSelectionProbe>
                              <Groups>A B C D</Groups>
                        </TroopSelectionProbe>
                        <GroundTruth responsibleGroup="D" />
                        <GroundTruthSurpriseProbe minSurprise="0"
                              maxSurprise="6" increment="1" />
                  </ProbeTrial>
            </TrialBlock>
      </ExamPhase>

      <!-- Task 4 -->
      <ExamPhase xsi:type="ns3:Task_4_Phase" examId="Sample Exam"
            name="Mission 4" id="Task4">
            <Trial trialNum="1">
                  <FeatureVectorFile featureVectorUrl_CSV="task4_1.csv"
                        featureVectorUrl_KML="task4_1.kml" />
                  <RoadsFile featureVectorUrl_CSV="roads.csv"
                        featureVectorUrl_KML="roads.kml" />
                  <RegionsFile featureVectorUrl_CSV="SOCINT_1.csv"
                        featureVectorUrl_KML="SOCINT_1.kml"/>
                  <LocationProbe>
                        <AttackGroup>A</AttackGroup>
                        <Locations>1 2 3 4</Locations>
                  </LocationProbe>
                  <INTLayers>
                        <INTLayer>
                              <LayerType xsi:type="ns3:SocintLayer" />
```

```
                        <LocationProbe>
                              <AttackGroup>A</AttackGroup>
                              <Locations>1 2 3 4</Locations>
                        </LocationProbe>
                  </INTLayer>
            </INTLayers>
            <TroopAllocationProbe>
                  <Locations>1 2 3 4</Locations>
            </TroopAllocationProbe>
            <GroundTruth attackLocationId="3" />
            <GroundTruthSurpriseProbe minSurprise="0"
                  maxSurprise="6" increment="1" />
      </Trial>
</ExamPhase>

<!-- Task 5 -->
<ExamPhase xsi:type="ns3:Task_5_Phase" examId="Sample Exam"
      name="Mission 5" id="Task5”>
      <Trial trialNum="1">
            <FeatureVectorFile featureVectorUrl_CSV="task5_1.csv"
                  featureVectorUrl_KML="task5_1.kml" />
            <RoadsFile featureVectorUrl_CSV="roads.csv"
                  featureVectorUrl_KML="roads.kml" />
            <RegionsFile featureVectorUrl_CSV="SOCINT_1.csv"
                  featureVectorUrl_KML="SOCINT_1.kml"/>
            <InitialHumintReport>
                 <Groups>A B C D</Groups>
                 <Probabilities>25 25 25 25</Probabilities>
            </InitialHumintReport>
            <INTLayers>
                  <INTLayer>
                        <LayerType xsi:type="ns3:ImintLayer" />
                        <GroupProbe>
                              <AttackLocation locationId="1" />
                              <Groups>A B C D</Groups>
                        </GroupProbe>
                  </INTLayer>
                  <INTLayer>
                        <LayerType xsi:type="ns3:MovintLayer" />
                        <GroupProbe>
                              <AttackLocation locationId="1" />
                              <Groups>A B C D</Groups>
                        </GroupProbe>
                  </INTLayer>
                  <INTLayer>
                        <LayerType xsi:type="ns3:SigintLayer">
                              <Group>B</Group>
                        </LayerType>
                        <GroupProbe>
                              <AttackLocation locationId="1" />
                              <Groups>A B C D</Groups>
                        </GroupProbe>
                  </INTLayer>
                  <INTLayer>
                        <LayerType xsi:type="ns3:SocintLayer" />
                        <GroupProbe>
```

```
                              <AttackLocation locationId="1" />
                              <Groups>A B C D</Groups>
                        </GroupProbe>
                  </INTLayer>
            </INTLayers>
            <TroopAllocationProbe>
                  <Groups>A B C D</Groups>
            </TroopAllocationProbe>
            <GroundTruth responsibleGroup="C" />
            <GroundTruthSurpriseProbe minSurprise="0"
                  maxSurprise="6" increment="1" />
      </Trial>
</ExamPhase>

<!-- Task 6 -->
<ExamPhase xsi:type="ns3:Task_6_Phase" examId="Sample Exam"
      name="Mission 6" id="Task6”>
      <Trial trialNum="1" numLayersToShow="3">
            <FeatureVectorFile featureVectorUrl_CSV="task6_1.csv"
                  featureVectorUrl_KML="task6_1.kml" />
            <RoadsFile featureVectorUrl_CSV="roads.csv"
                  featureVectorUrl_KML="roads.kml" />
            <RegionsFile featureVectorUrl_CSV="SOCINT_1.csv"
                  featureVectorUrl_KML="SOCINT_1.kml"/>
            <InitialHumintReport>
                 <Groups>A B C D</Groups>
                 <Probabilities>25 25 25 25</Probabilities>
            </InitialHumintReport>
            <INTLayers>
                  <INTLayer>
                        <LayerType xsi:type="ns3:ImintLayer" />
                        <GroupProbe>
                              <AttackLocation locationId="3" />
                              <Groups>A B C D</Groups>
                        </GroupProbe>
                  </INTLayer>
                  <INTLayer>
                        <LayerType xsi:type="ns3:MovintLayer" />
                        <GroupProbe>
                              <AttackLocation locationId="3" />
                              <Groups>A B C D</Groups>
                        </GroupProbe>
                  </INTLayer>
                  <INTLayer>
                        <LayerType xsi:type="ns3:SigintLayer">
                              <Group>A</Group>
                        </LayerType>
                        <GroupProbe>
                              <AttackLocation locationId="3" />
                              <Groups>A B C D</Groups>
                        </GroupProbe>
                  </INTLayer>
                  <INTLayer>
                        <LayerType xsi:type="ns3:SigintLayer">
                              <Group>B</Group>
                        </LayerType>
```

```
                              <GroupProbe>
                                    <AttackLocation locationId="3" />
                                    <Groups>A B C D</Groups>
                              </GroupProbe>
                        </INTLayer>
                        <INTLayer>
                              <LayerType xsi:type="ns3:SigintLayer">
                                    <Group>C</Group>
                              </LayerType>
                              <GroupProbe>
                                    <AttackLocation locationId="3" />
                                    <Groups>A B C D</Groups>
                              </GroupProbe>
                        </INTLayer>
                        <INTLayer>
                              <LayerType xsi:type="ns3:SigintLayer">
                                    <Group>D</Group>
                              </LayerType>
                              <GroupProbe>
                                    <AttackLocation locationId="3" />
                                    <Groups>A B C D</Groups>
                              </GroupProbe>
                              <SurpriseProbe minSurprise="0" maxSurprise="6"
                                    increment="1" />
                        </INTLayer>
                        <INTLayer>
                              <LayerType xsi:type="ns3:SocintLayer" />
                              <GroupProbe>
                                    <AttackLocation locationId="3" />
                                    <Groups>A B C D</Groups>
                              </GroupProbe>
                        </INTLayer>
                  </INTLayers>
                  <TroopAllocationProbe>
                        <Groups>A B C D</Groups>
                  </TroopAllocationProbe>
                  <GroundTruth responsibleGroup="D" />
                  <GroundTruthSurpriseProbe minSurprise="0"
                        maxSurprise="6" increment="1" />
            </Trial>
      </ExamPhase>

      <!-- Task 7 -->
    <ExamPhase xsi:type="ns3:Task_7_Phase" examId="Sample Exam"
        name="Mission 7" id="Task7">
        <RoadsFile featureVectorUrl_CSV="roads.csv"
            featureVectorUrl_KML="roads.kml"/>
        <RegionsFile featureVectorUrl_CSV="SOCINT_1.csv"
            featureVectorUrl_KML="SOCINT_1.csv"/>
        <InitialResponsibleGroup>A</InitialResponsibleGroup>
        <InitialCredits>10</InitialCredits>
        <CorrectPredictionCredits>1</CorrectPredictionCredits>
        <Trial trialNum="1">
            <FeatureVectorFile featureVectorUrl_CSV="task7_1.csv"
             featureVectorUrl_KML="task7_1.kml"/>
            <GroupProbe>
```

```
            <Groups>A B C D</Groups>
        </GroupProbe>
        <LocationProbe>
            <Locations>1 2 3 4</Locations>
        </LocationProbe>
        <TroopAllocationProbe>
            <Locations>1 2 3 4</Locations>
        </TroopAllocationProbe>
        <ResponsibleGroupShown>true</ResponsibleGroupShown>
        <GroundTruth responsibleGroup="A" attackLocationId="4"/>
        <INTLayers>
            <INTLayer costCredits="1">
                <LayerType xsi:type="ns3:ImintLayer"/>
            </INTLayer>
            <INTLayer costCredits="1">
                <LayerType xsi:type="ns3:MovintLayer"/>
            </INTLayer>
            <INTLayer costCredits="2">
                <LayerType xsi:type="ns3:SigintLayer">
                    <Group>A</Group>
                </LayerType>
            </INTLayer>
            <INTLayer costCredits="2">
                <LayerType xsi:type="ns3:SigintLayer">
                    <Group>B</Group>
                </LayerType>
            </INTLayer>
            <INTLayer costCredits="2">
                <LayerType xsi:type="ns3:SigintLayer">
                    <Group>C</Group>
                </LayerType>
            </INTLayer>
            <INTLayer costCredits="2">
                <LayerType xsi:type="ns3:SigintLayer">
                    <Group>D</Group>
                </LayerType>
            </INTLayer>
            <INTLayer costCredits="2">
                <LayerType xsi:type="ns3:SocintLayer"/>
            </INTLayer>
        </INTLayers>
    </Trial>
     <Trial trialNum="2">
        <FeatureVectorFile featureVectorUrl_CSV="task7_2.csv"
          featureVectorUrl_KML="task7_2.kml" />
        <GroupProbe>
              <Groups>A B C D</Groups>
        </GroupProbe>
        <LocationProbe>
              <Locations>1 2 3 4</Locations>
        </LocationProbe>
        <TroopAllocationProbe>
              <Locations>1 2 3 4</Locations>
        </TroopAllocationProbe>
        <ResponsibleGroupShown>true</ResponsibleGroupShown>
        <GroundTruth responsibleGroup="A" attackLocationId="3" />
```

```
        </Trial>
    </ExamPhase>
</ns3:IcarusEvaluation_CPD1>
```

5.2 Appendix B: Example Output

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns3:IcarusEvaluation_CPD1 xmlns:ns2="IcarusCPD_Base"
      xmlns:ns3="IcarusCPD_1"
      xsi:schemaLocation="IcarusCPD_Base IcarusBaseSchema.xsd IcarusCPD_1
      IcarusCPD_1_Schema.xsd"
      xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
      examTimeStamp="2011-07-27T12:50:45.571-04:00"
      name="Sample Exam" id="Sample Exam"
      startTime="2011-07-27T13:50:45.571-04:00"
      endTime="2011-07-27T16:50:45.571-04:00">

      <!-- ICArUS System information -->
      <ResponseGenerator>
            <HumanSubject>false</HumanSubject>
            <ResponseGeneratorId>Model2</ResponseGeneratorId>
            <SiteId>Team1</SiteId>
      </ResponseGenerator>

      <!-- Grid size, scale, and location information -->
      <GridSize gridWidth="100" gridHeight="100" milesPerGridUnit="0.2"
            bottomLeftLat="0.0" bottomLeftLon="0.0" />

      <!-- Task 1 Response -->
      <ExamPhase xsi:type="ns3:Task_1_Phase" examId="Sample Exam"
            name="Mission 1" id="Task1"
            startTime="2011-07-27T13:50:45.571-04:00"
            endTime="2011-07-27T14:20:45.571-04:00">
            <TrialBlock xsi:type="ns3:Task_1_TrialBlock" trialBlockNum="1"
                  numPresentationTrials="9">
                  <FeatureVectorFile featureVectorUrl_CSV="task1_1.csv"
                        featureVectorUrl_KML="task1_1.kml" />
                  <ProbeTrial trialNum="10">
                        <AttackDispersionParameters>
                              <Parameters baseRate="0.5" group="A" sigmaX="5.0"
                                    sigmaY="5.0" theta="0.0">
                                    <CenterLocation locationId="A" x="25.0"
                                     y="75.0" />
                              </Parameters>
                              <Parameters baseRate="0.5" group="B" sigmaX="2.5"
                                    sigmaY="2.5" theta="0.0">
                                    <CenterLocation locationId="B" x="50.0"
                                     y="50.0" />
                              </Parameters>
                        </AttackDispersionParameters>
                        <GroupProbe>
                              <AttackLocation locationId="1" x="25" y="18"
                                    lat="0.13025057227020484"
                                    lon="0.1809035725975067" />
                              <Groups>A B</Groups>
                        </GroupProbe>
                        <TroopSelectionProbe>
                              <Groups>A B</Groups>
                        </TroopSelectionProbe>
```

```
                        <GroundTruth responsibleGroup="A" />
                        <GroundTruthSurpriseProbe minSurprise="0"
                              maxSurprise="6" increment="1" />
                        <TrialResponse trialTime_ms="11903">
                              <ResponseFeedback responseWellFormed="true">
                                    <GroundTruth responsibleGroup="A" />
                        <ProbabilitiesScore_s1>100.0</ProbabilitiesScore_s1>
                        <TroopAllocationScore_s2>100.0</TroopAllocationScore_s2>
                              </ResponseFeedback>
                              <GroupResponse trialPartTime_ms="3229">
                                    <NormativeProbsCumulative>50.0
                                       50.0</NormativeProbsCumulative>
                                    <ProbabilitiesScore_s1>100.0
                                    </ProbabilitiesScore_s1>
                                    <GroupAttackProbability group="A"
                                          probability="50" time_ms="897" />
                                    <GroupAttackProbability group="B"
                                          probability="50" time_ms="455" />
                              </GroupResponse>
                              <TroopSelectionResponse group="A"
                                    trialPartTime_ms="2683">
                                    <TroopAllocationScore_s2>
                                       100.0</TroopAllocationScore_s2>
                              </TroopSelectionResponse>
                              <GroundTruthSurpriseResponse surprise="5"
                                    trialPartTime_ms="1982" />
                        </TrialResponse>
                  </ProbeTrial>
            </TrialBlock>
      </ExamPhase>

      <!-- Task 2 Response -->
      <ExamPhase xsi:type="ns3:Task_2_Phase" examId="Sample Exam"
            name="Mission 2" id="Task2"
            startTime="2011-07-27T14:20:45.571-04:00"
            endTime="2011-07-27T14:50:45.571-04:00">
            <TrialBlock xsi:type="ns3:Task_2_TrialBlock" trialBlockNum="1"
                  numPresentationTrials="19">
                  <FeatureVectorFile featureVectorUrl_CSV="task2_1.csv"
                        featureVectorUrl_KML="task2_1.kml" />
                  <ProbeTrial trialNum="20">
                        <AttackDispersionParameters>
                              <Parameters baseRate="0.25" group="A" sigmaX="5.0"
                                    sigmaY="5.0" theta="0.0">
                                    <CenterLocation x="25.0" y="50.0" />
                              </Parameters>
                              <Parameters baseRate="0.25" group="B" sigmaX="1.0"
                                    sigmaY="1.0" theta="0.0">
                                    <CenterLocation x="50.0" y="25.0" />
                              </Parameters>
                              <Parameters baseRate="0.25" group="C" sigmaX="9.0"
                                    sigmaY="9.0" theta="0.0">
                                    <CenterLocation x="75.0" y="75.0" />
                              </Parameters>
                              <Parameters baseRate="0.25" group="D" sigmaX="2.5"
                                    sigmaY="2.5" theta="0.0">
```

```
                        <CenterLocation x="10.0" y="10.0" />
                  </Parameters>
            </AttackDispersionParameters>
            <GroupCirclesProbe>
                  <Groups>A B C D</Groups>
            </GroupCirclesProbe>
            <GroupProbe>
                  <AttackLocation locationId="1" x="25" y="18"
                        lat="0.13025057227020484"
                        lon="0.1809035725975067" />
                  <Groups>A B C D</Groups>
            </GroupProbe>
            <TroopSelectionProbe>
                  <Groups>A B C D</Groups>
            </TroopSelectionProbe>
            <GroundTruth responsibleGroup="B" />
            <GroundTruthSurpriseProbe minSurprise="0"
                  maxSurprise="6" increment="1" />
            <TrialResponse trialTime_ms="29606">
                  <ResponseFeedback responseWellFormed="true">
                        <GroundTruth responsibleGroup="B" />
                        <ProbabilitiesScore_s1>
                           100.0</ProbabilitiesScore_s1>
                        <TroopAllocationScore_s2>
                           100.0</TroopAllocationScore_s2>
                  </ResponseFeedback>
                  <GroupCirclesResponse trialPartTime_ms="5698">
                        <GroupCircle group="A" radius="5.0"
                              time_ms="1255">
                              <CenterLocation x="3" y="4"
                                    lat="0.028944571615601076"
                                    lon="0.021708428711700804" />
                        </GroupCircle>
                        <GroupCircle group="B" radius="9.0"
                              time_ms="985">
                              <CenterLocation x="8" y="5"
                                    lat="0.03618071451950134"
                                    lon="0.05788914323120215" />
                        </GroupCircle>
                        <GroupCircle group="C" radius="6.0"
                              time_ms="1356">
                              <CenterLocation x="8" y="12"
                                    lat="0.08683371484680322"
                                    lon="0.05788914323120215" />
                        </GroupCircle>
                        <GroupCircle group="D" radius="3.0"
                                time_ms="2201">
                              <CenterLocation x="6" y="4"
                                    lat="0.028944571615601076"
                                    lon="0.04341685742340161" />
                        </GroupCircle>
                  </GroupCirclesResponse>
                  <GroupResponse trialPartTime_ms="15436">
                        <NormativeProbsCumulative>
                            25.0 25.0 25.0 25.0
                        </NormativeProbsCumulative>
```

```
                                    <ProbabilitiesScore_s1>
                                        100.0</ProbabilitiesScore_s1>
                                    <GroupAttackProbability group="A"
                                          probability="25" time_ms="4533" />
                                    <GroupAttackProbability group="B"
                                          probability="25" time_ms="1344" />
                                    <GroupAttackProbability group="C"
                                          probability="25" time_ms="2200" />
                                    <GroupAttackProbability group="D"
                                          probability="25" time_ms="988" />
                              </GroupResponse>
                              <TroopSelectionResponse group="B"
                                    trialPartTime_ms="1638">
                                    <TroopAllocationScore_s2>
                                      100.0</TroopAllocationScore_s2>
                              </TroopSelectionResponse>
                              <GroundTruthSurpriseResponse surprise="5"
                                    trialPartTime_ms="3229" />
                        </TrialResponse>
                  </ProbeTrial>
            </TrialBlock>
      </ExamPhase>

      <!-- Task 3 Response -->
      <ExamPhase xsi:type="ns3:Task_3_Phase" examId="Sample Exam"
            name="Mission 3" id="Task3"
            startTime="2011-07-27T14:50:45.571-04:00"
            endTime="2011-07-27T15:20:45.571-04:00">
            <RoadsFile featureVectorUrl_CSV="roads.csv"
                  featureVectorUrl_KML="roads.kml" />
            <TrialBlock xsi:type="ns3:Task_3_TrialBlock" trialBlockNum="1"
                  numPresentationTrials="19">
                  <FeatureVectorFile featureVectorUrl_CSV="task3_1.csv"
                        featureVectorUrl_KML="task3_1.kml" />
                  <ProbeTrial trialNum="20">
                        <AttackDispersionParameters>
                              <Parameters baseRate="0.25" group="A">
                                    <CenterLocation locationId="A" x="10.0"
                                      y="30.0" />
                              </Parameters>
                              <Parameters baseRate="0.25" group="B">
                                    <CenterLocation locationId="B" x="50.0"
                                       y="25.0" />
                              </Parameters>
                              <Parameters baseRate="0.25" group="C">
                                    <CenterLocation locationId="C" x="75.0"
                                       y="25.0" />
                              </Parameters>
                              <Parameters baseRate="0.25" group="D">
                                    <CenterLocation locationId="D" x="25.0"
                                      y="50.0" />
                              </Parameters>
                        </AttackDispersionParameters>
                        <GroupCentersProbe>
                              <Groups>A B C D</Groups>
                        </GroupCentersProbe>
```

```
                        <GroupProbe>
                              <AttackLocation locationId="1" x="13" y="37"
                                    lat="0.2677372874443099"
                                    lon="0.09406985775070349" />
                              <Groups>A B C D</Groups>
                        </GroupProbe>
                        <TroopSelectionProbe>
                              <Groups>A B C D</Groups>
                        </TroopSelectionProbe>
                        <GroundTruth responsibleGroup="D" />
                        <GroundTruthSurpriseProbe minSurprise="0"
                              maxSurprise="6" increment="1" />
                        <TrialResponse trialTime_ms="54439">
                              <ResponseFeedback responseWellFormed="true">
                                    <GroundTruth responsibleGroup="D" />
                                    <ProbabilitiesScore_s1>
                                      100.0</ProbabilitiesScore_s1>
                                    <TroopAllocationScore_s2>
                                      100.0</TroopAllocationScore_s2>
                              </ResponseFeedback>
                              <GroupCentersResponse trialPartTime_ms="6894">
                                    <GroupCenter group="A" time_ms="987">
                                          <CenterLocation x="3" y="4"
                                                lat="0.028944571615601076"
                                                lon="0.021708428711700804" />
                                    </GroupCenter>
                                    <GroupCenter group="B" time_ms="2256">
                                          <CenterLocation x="8" y="5"
                                                lat="0.03618071451950134"
                                                lon="0.05788914323120215" />
                                    </GroupCenter>
                                    <GroupCenter group="C" time_ms="597">
                                          <CenterLocation x="8" y="12"
                                                lat="0.08683371484680322"
                                                lon="0.05788914323120215" />
                                    </GroupCenter>
                                    <GroupCenter group="D" time_ms="1493">
                                          <CenterLocation x="6" y="4"
                                                lat="0.028944571615601076"
                                                lon="0.04341685742340161" />
                                    </GroupCenter>
                              </GroupCentersResponse>
                              <GroupResponse trialPartTime_ms="17129">
                                    <NormativeProbsCumulative>
                                       25.0 25.0 25.0 25.0
                                    </NormativeProbsCumulative>
                                    <ProbabilitiesScore_s1>
                                       100.0</ProbabilitiesScore_s1>
                                    <GroupAttackProbability group="A"
                                          probability="25" time_ms="2344" />
                                    <GroupAttackProbability group="B"
                                          probability="25" time_ms="2353" />
                                    <GroupAttackProbability group="C"
                                          probability="25" time_ms="3836" />
                                    <GroupAttackProbability group="D"
                                          probability="25" time_ms="1837" />
```

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                        </GroupResponse>
                        <TroopSelectionResponse group="D"
                              trialPartTime_ms="2418">
                              <TroopAllocationScore_s2>
                                    100.0</TroopAllocationScore_s2>
                        </TroopSelectionResponse>
                        <GroundTruthSurpriseResponse surprise="5"
                              trialPartTime_ms="2106" />
                  </TrialResponse>
            </ProbeTrial>
      </TrialBlock>
</ExamPhase>

<!-- Task 4 Response -->
<ExamPhase xsi:type="ns3:Task_4_Phase" examId="Sample Exam"
      name="Mission 4" id="Task4"
      startTime="2011-07-27T15:20:45.571-04:00"
      endTime="2011-07-27T15:50:45.571-04:00">
      <Trial trialNum="1">
            <FeatureVectorFile featureVectorUrl_CSV="task4_1.csv"
                  featureVectorUrl_KML="task4_1.kml" />
            <RoadsFile featureVectorUrl_CSV="roads.csv"
                  featureVectorUrl_KML="roads.kml" />
            <RegionsFile featureVectorUrl_CSV="SOCINT_1.csv"
                  featureVectorUrl_KML="SOCINT_1.kml" />
            <LocationProbe>
                  <AttackGroup>A</AttackGroup>
                  <Locations>1 2 3 4</Locations>
            </LocationProbe>
            <INTLayers>
                  <INTLayer>
                        <LayerType xsi:type="ns3:SocintLayer" />
                        <LocationProbe>
                              <AttackGroup>A</AttackGroup>
                              <Locations>1 2 3 4</Locations>
                        </LocationProbe>
                  </INTLayer>
            </INTLayers>
            <TroopAllocationProbe>
                  <Locations>1 2 3 4</Locations>
            </TroopAllocationProbe>
            <GroundTruth attackLocationId="3" />
            <GroundTruthSurpriseProbe minSurprise="0"
                  maxSurprise="6" increment="1" />
            <TrialResponse trialTime_ms="13572">
                  <ResponseFeedback responseWellFormed="true">
                        <GroundTruth attackLocationId="3" />
                        <ProbabilitiesScore_s1>100.0</ProbabilitiesScore_s1>
                        <TroopAllocationScore_s2>
                           25.0</TroopAllocationScore_s2>
                  </ResponseFeedback>
                  <LocationResponse Group="A" trialPartTime_ms="8938">
                        <NormativeProbsCumulative>
                           25.0 25.0 25.0 25.0
                        </NormativeProbsCumulative>
                        <ProbabilitiesScore_s1>100.0</ProbabilitiesScore_s1>
```

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                        <GroupAttackProbability locationId="1"
                              probability="25" time_ms="2100" />
                        <GroupAttackProbability locationId="2"
                              probability="25" time_ms="1083" />
                        <GroupAttackProbability locationId="3"
                              probability="25" time_ms="1000" />
                        <GroupAttackProbability locationId="4"
                              probability="25" time_ms="2411" />
                  </LocationResponse>
                  <LocationResponse_afterINT>
                        <INTLayerShown userSelected="false">
                              <LayerType xsi:type="ns3:SocintLayer" />
                        </INTLayerShown>
                        <LocationResponse Group="A" trialPartTime_ms="4353">
                              <NormativeProbsCumulative>
                                 25.0 25.0 25.0 25.0
                              </NormativeProbsCumulative>
                              <ProbabilitiesScore_s1>
                                 100.0</ProbabilitiesScore_s1>
                              <GroupAttackProbability locationId="1"
                                    probability="25" time_ms="1078" />
                              <GroupAttackProbability locationId="2"
                                    probability="25" time_ms="420" />
                              <GroupAttackProbability locationId="3"
                                    probability="25" time_ms="334" />
                              <GroupAttackProbability locationId="4"
                                    probability="25" time_ms="678" />
                        </LocationResponse>
                  </LocationResponse_afterINT>
                  <TroopAllocationResponse trialPartTime_ms="5738">
                        <TroopAllocationScore_s2>
                            25.0</TroopAllocationScore_s2>
                        <TroopAllocation locationId="1" allocation="25"
                              time_ms="899" />
                        <TroopAllocation locationId="2" allocation="25"
                              time_ms="400" />
                        <TroopAllocation locationId="3" allocation="25"
                              time_ms="678" />
                        <TroopAllocation locationId="4" allocation="25"
                              time_ms="1780" />
                  </TroopAllocationResponse>
                  <GroundTruthSurpriseResponse surprise="3"
                        trialPartTime_ms="1840" />
            </TrialResponse>
      </Trial>
</ExamPhase>

<!-- Task 5 Response -->
<ExamPhase xsi:type="ns3:Task_5_Phase" examId="Sample Exam"
      name="Mission 5" id="Task5"
      startTime="2011-07-27T15:50:45.571-04:00"
      endTime="2011-07-27T16:20:45.571-04:00">
      <Trial trialNum="1">
            <FeatureVectorFile featureVectorUrl_CSV="task5_1.csv"
                  featureVectorUrl_KML="task5_1.kml" />
            <RoadsFile featureVectorUrl_CSV="roads.csv"
```

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                featureVectorUrl_KML="roads.kml" />
            <RegionsFile featureVectorUrl_CSV="SOCINT_1.csv"
                featureVectorUrl_KML="SOCINT_1.csv" />
            <InitialHumintReport>
                <Groups>A B C D</Groups>
                <Probabilities>25 25 25 25</Probabilities>
            </InitialHumintReport>
            <INTLayers>
                <INTLayer>
                    <LayerType xsi:type="ns3:ImintLayer" />
                    <GroupProbe>
                        <AttackLocation locationId="1" />
                        <Groups>A B C D</Groups>
                    </GroupProbe>
                </INTLayer>
                <INTLayer>
                    <LayerType xsi:type="ns3:MovintLayer" />
                    <GroupProbe>
                        <AttackLocation locationId="1" />
                        <Groups>A B C D</Groups>
                    </GroupProbe>
                </INTLayer>
                <INTLayer>
                    <LayerType xsi:type="ns3:SigintLayer">
                        <Group>B</Group>
                    </LayerType>
                    <GroupProbe>
                        <AttackLocation locationId="1" />
                        <Groups>A B C D</Groups>
                    </GroupProbe>
                </INTLayer>
                <INTLayer>
                    <LayerType xsi:type="ns3:SocintLayer" />
                    <GroupProbe>
                        <AttackLocation locationId="1" />
                        <Groups>A B C D</Groups>
                    </GroupProbe>
                </INTLayer>
            </INTLayers>
            <TroopAllocationProbe>
                <Groups>A B C D</Groups>
            </TroopAllocationProbe>
            <GroundTruth responsibleGroup="C" />
            <GroundTruthSurpriseProbe minSurprise="0"
                maxSurprise="6" increment="1" />
            <TrialResponse trialTime_ms="15382">
                <ResponseFeedback responseWellFormed="true">
                    <GroundTruth responsibleGroup="C" />
                    <ProbabilitiesScore_s1>100.0</ProbabilitiesScore_s1>

<TroopAllocationScore_s2>25.0</TroopAllocationScore_s2>
                </ResponseFeedback>
                <InitialProbabilities>25 25 25 25</InitialProbabilities>
                <GroupResponse_afterINT>
                    <INTLayerShown userSelected="false">
                        <LayerType xsi:type="ns3:ImintLayer" />
```

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                        </INTLayerShown>
                        <GroupResponse locationId="1"
                                trialPartTime_ms="3783">
                              <NormativeProbsCumulative>
                                 25.0 25.0 25.0 25.0
                              </NormativeProbsCumulative>
                              <ProbabilitiesScore_s1>
                                 100.0</ProbabilitiesScore_s1>
                              <GroupAttackProbability group="A"
                                    probability="25" time_ms="333" />
                              <GroupAttackProbability group="B"
                                    probability="25" time_ms="899" />
                              <GroupAttackProbability group="C"
                                    probability="25" time_ms="722" />
                              <GroupAttackProbability group="D"
                                    probability="25" time_ms="455" />
                        </GroupResponse>
                  </GroupResponse_afterINT>
                  <GroupResponse_afterINT>
                        <INTLayerShown userSelected="false">
                              <LayerType xsi:type="ns3:MovintLayer" />
                        </INTLayerShown>
                        <GroupResponse locationId="1"
                             trialPartTime_ms="3678">
                              <NormativeProbsCumulative>
                                   25.0 25.0 25.0 25.0
                              </NormativeProbsCumulative>
                              <ProbabilitiesScore_s1>
                                   100.0</ProbabilitiesScore_s1>
                              <GroupAttackProbability group="A"
                                    probability="25" time_ms="278" />
                              <GroupAttackProbability group="B"
                                    probability="25" time_ms="1928" />
                              <GroupAttackProbability group="C"
                                    probability="25" time_ms="703" />
                              <GroupAttackProbability group="D"
                                    probability="25" time_ms="1078" />
                        </GroupResponse>
                  </GroupResponse_afterINT>
                  <GroupResponse_afterINT>
                        <INTLayerShown userSelected="false">
                              <LayerType xsi:type="ns3:SigintLayer">
                                    <Group>B</Group>
                              </LayerType>
                        </INTLayerShown>
                        <GroupResponse locationId="1"
                              trialPartTime_ms="5788">
                              <NormativeProbsCumulative>
                                  25.0 25.0 25.0 25.0
                              </NormativeProbsCumulative>
                              <ProbabilitiesScore s1>
                                  100.0</ProbabilitiesScore_s1>
                              <GroupAttackProbability group="A"
                                    probability="25" time_ms="1078" />
                              <GroupAttackProbability group="B"
                                    probability="25" time_ms="1899" />
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                              <GroupAttackProbability group="C"
                                    probability="25" time_ms="762" />
                              <GroupAttackProbability group="D"
                                    probability="25" time_ms="563" />
                        </GroupResponse>
                  </GroupResponse_afterINT>
                  <GroupResponse_afterINT>
                        <INTLayerShown userSelected="false">
                              <LayerType xsi:type="ns3:SocintLayer" />
                        </INTLayerShown>
                        <GroupResponse locationId="1"
                              trialPartTime_ms="4598">
                              <NormativeProbsCumulative>
                                  25.0 25.0 25.0 25.0
                              </NormativeProbsCumulative>
                              <ProbabilitiesScore_s1>
                                  100.0</ProbabilitiesScore_s1>
                              <GroupAttackProbability group="A"
                                    probability="25" time_ms="1078" />
                              <GroupAttackProbability group="B"
                                    probability="25" time_ms="344" />
                              <GroupAttackProbability group="C"
                                    probability="25" time_ms="987" />
                              <GroupAttackProbability group="D"
                                    probability="25" time_ms="432" />
                        </GroupResponse>
                  </GroupResponse_afterINT>
                  <TroopAllocationResponse trialPartTime_ms="8937">
                        <TroopAllocationScore_s2>
                            25.0</TroopAllocationScore_s2>
                        <TroopAllocation group="A" allocation="25"
                            time_ms="453" />
                        <TroopAllocation group="B" allocation="25"
                            time_ms="2384" />
                        <TroopAllocation group="C" allocation="25"
                            time_ms="1438" />
                        <TroopAllocation group="D" allocation=”25"
                              time_ms="1211" />
                  </TroopAllocationResponse>
                  <GroundTruthSurpriseResponse surprise="3"
                        trialPartTime_ms="2013" />
            </TrialResponse>
      </Trial>
</ExamPhase>

<!-- Task 6 Response -->
<ExamPhase xsi:type="ns3:Task_6_Phase" examId="Sample Exam"
      name="Mission 6" id="Task6"
      startTime="2011-07-27T16:20:45.571-04:00"
      endTime="2011-07-27T16:50:45.571-04:00">
      <Trial trialNum="1" numLayersToShow="3">
            <FeatureVectorFile featureVectorUrl_CSV="task6_1.csv"
                  featureVectorUrl_KML="task6_1.kml" />
            <RoadsFile featureVectorUrl_CSV="roads.csv"
                  featureVectorUrl_KML="roads.kml" />
            <RegionsFile featureVectorUrl_CSV="SOCINT_1.csv"
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            featureVectorUrl_KML="SOCINT_1.csv" />
      <InitialHumintReport>
            <Groups>A B C D</Groups>
            <Probabilities>25 25 25 25</Probabilities>
      </InitialHumintReport>
      <INTLayers>
            <INTLayer>
                  <LayerType xsi:type="ns3:ImintLayer" />
                  <GroupProbe>
                        <AttackLocation locationId="3" />
                        <Groups>A B C D</Groups>
                  </GroupProbe>
            </INTLayer>
            <INTLayer>
                  <LayerType xsi:type="ns3:MovintLayer" />
                  <GroupProbe>
                        <AttackLocation locationId="3" />
                        <Groups>A B C D</Groups>
                  </GroupProbe>
            </INTLayer>
            <INTLayer>
                  <LayerType xsi:type="ns3:SigintLayer">
                        <Group>A</Group>
                  </LayerType>
                  <GroupProbe>
                        <AttackLocation locationId="3" />
                        <Groups>A B C D</Groups>
                  </GroupProbe>
            </INTLayer>
            <INTLayer>
                  <LayerType xsi:type="ns3:SigintLayer">
                        <Group>B</Group>
                  </LayerType>
                  <GroupProbe>
                        <AttackLocation locationId="3" />
                        <Groups>A B C D</Groups>
                  </GroupProbe>
            </INTLayer>
            <INTLayer>
                  <LayerType xsi:type="ns3:SigintLayer">
                        <Group>C</Group>
                  </LayerType>
                  <GroupProbe>
                        <AttackLocation locationId="3" />
                        <Groups>A B C D</Groups>
                  </GroupProbe>
            </INTLayer>
            <INTLayer>
                  <LayerType xsi:type="ns3:SigintLayer">
                        <Group>D</Group>
                  </LayerType>
                  <GroupProbe>
                        <AttackLocation locationId="3" />
                        <Groups>A B C D</Groups>
                  </GroupProbe>
            </INTLayer>
```

```
                        <INTLayer>
                              <LayerType xsi:type="ns3:SocintLayer" />
                              <GroupProbe>
                                    <AttackLocation locationId="3" />
                                    <Groups>A B C D</Groups>
                              </GroupProbe>
                        </INTLayer>
                  </INTLayers>
                  <TroopAllocationProbe>
                        <Groups>A B C D</Groups>
                  </TroopAllocationProbe>
                  <GroundTruth responsibleGroup="D" />
                  <GroundTruthSurpriseProbe minSurprise="0"
                        maxSurprise="6" increment="1" />
                  <TrialResponse trialTime_ms="66496">
                        <ResponseFeedback responseWellFormed="true">
                              <GroundTruth responsibleGroup="D" />
                              <ProbabilitiesScore_s1>
                                  100.0</ProbabilitiesScore_s1>
                              <TroopAllocationScore_s2>
                                  25.0</TroopAllocationScore_s2>
                        </ResponseFeedback>
                        <InitialProbabilities>25 25 25 25</InitialProbabilities>
                        <GroupResponse_afterINT>
                              <INTLayerExpectedUtilities>
                                    <ExpectedUtility
                                          expectedUtility_cumulative="0.25">
                                          <LayerType xsi:type="ns3:ImintLayer" />
                                    </ExpectedUtility>
                                    <ExpectedUtility
                                          expectedUtility_cumulative="0.25">
                                          <LayerType xsi:type="ns3:MovintLayer" />
                                    </ExpectedUtility>
                                    <ExpectedUtility
                                          expectedUtility_cumulative=".25">
                                          <LayerType xsi:type="ns3:SigintLayer">
                                                <Group>A</Group>
                                          </LayerType>
                                    </ExpectedUtility>
                                    <ExpectedUtility
                                          expectedUtility_cumulative="0.25">
                                          <LayerType xsi:type="ns3:SigintLayer">
                                                <Group>B</Group>
                                          </LayerType>
                                    </ExpectedUtility>
                                    <ExpectedUtility
                                          expectedUtility_cumulative="0.25">
                                          <LayerType xsi:type="ns3:SigintLayer">
                                                <Group>C</Group>
                                          </LayerType>
                                    </ExpectedUtility>
                                    <ExpectedUtility
                                         expectedUtility_cumulative="0.25">
                                          <LayerType xsi:type="ns3:SigintLayer">
                                                <Group>D</Group>
                                          </LayerType>
```

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                        </ExpectedUtility>
                        <ExpectedUtility
                              expectedUtility_cumulative="0.25">
                              <LayerType xsi:type="ns3:SocintLayer" />
                        </ExpectedUtility>
                  </INTLayerExpectedUtilities>
                  <INTLayerShown userSelected="true"
                        layerSelectionTime_ms="2372">
                        <LayerType xsi:type="ns3:SigintLayer">
                              <Group>A</Group>
                        </LayerType>
                  </INTLayerShown>
                  <GroupResponse locationId="1"
                          trialPartTime_ms="6030">
                        <NormativeProbsCumulative>
                             25.0 25.0 25.0 25.0
                        </NormativeProbsCumulative>
                        <ProbabilitiesScore_s1>
                             100.0</ProbabilitiesScore_s1>
                        <GroupAttackProbability group="A"
                              probability="25" time_ms="1324" />
                        <GroupAttackProbability group="B"
                              probability="25" time_ms="1123" />
                        <GroupAttackProbability group="C"
                              probability="25" time_ms="1245" />
                        <GroupAttackProbability group="D"
                              probability="25" time_ms="333" />
                  </GroupResponse>
            </GroupResponse_afterINT>
            <GroupResponse_afterINT>
                  <INTLayerExpectedUtilities>
                        <ExpectedUtility
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                        <TroopAllocation group="C" allocation="25"
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		endTime="2011-08-11T13:07:51.054-04:00">
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			featureVectorUrl_KML="roads.kml" />
		<RegionsFile featureVectorUrl_CSV="SOCINT_1.csv"
			featureVectorUrl_KML="SOCINT_1.csv" />
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		<InitialCredits>10</InitialCredits>
		<CorrectPredictionCredits>1</CorrectPredictionCredits>
		<Trial trialNum="1">
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			<GroundTruth responsibleGroup="B" attackLocationId="4" />
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					</LayerType>
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