

DISTRIBUTED VIZUALIZATION IN THE COMMAND AND CONTROL ENVIRONMENT FOR CONSTRUCTIVE SIMULATIONS

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ABSTRACT

GIAC, the Graphical Input Aggregate Control, System is a Distributed Visualization and Command and Control Environment for Constructive Simulations. The GIAC system creates a distributed environment utilizing distributed databases to capture and distribute simulation objects. GIAC provides an interactive visual representation of simulation objects from multiple constructive simulations. GIAC allows Command and Control of the simulation objects from anywhere in the world.

1 INTRODUCTION

GIAC is a component of a distributed, realistic simulation environment at the multi-theater/global level. GIAC interfaces with major wargaming simulation models, distributing the model data to both local and remote locations. An interactive graphical visualization of the air, land and sea simulation scenarios is provided by the GIAC Command and Control workstations. The workstations can be used to monitor and control the simulation model objects during an exercise.

GIAC was developed by Los Alamos National Laboratory. This work is sponsored by the Warrior Preparation Center (WPC), under an agreement with the Department of Energy. WPC is the central computing facility for the largest operational wargame in Europe and Distributed Warfighting System.

2 SIMULATION MODELS

GIAC interfaces with major wargaming simulations including the Air Warfare Simulation Model (AWSIM), the Corps Battle Simulation (CBS), the Joint Theater Level Simulation (JTLS), and the Research and Evaluation System for Analysis (RESA). GIAC also interfaces with the Battlefield Intelligence Collection model (BICM) and the Target Management System (TMS). Other systems interface with the GIAC Data System (GDS), including the Tactical Information Broadcast System (TIBS) and the Synthetic Theater of War for Europe (STOW-E).

3 DESCRIPTION OF THE GIAC SYSTEM

The GIAC Data Distribution System receives data from major wargaming simulation models. The data from the models is filtered and transformed into a format that the clients can accept. The clients receive and display the data, allowing interaction between the client and the simulation. Figure 1 illustrates the GIAC Data Distribution System.

GIAC is made up of several components, including:

- G Data System (GDS)
- GIAC Command and Control Workstations
- Digitized Map Server
- Graphical Analyst Workstation (GAWS)
- Graphical Analyst Workstation (GAWS) Databases

Figure 2 is a simplified diagram showing how these components are structured.

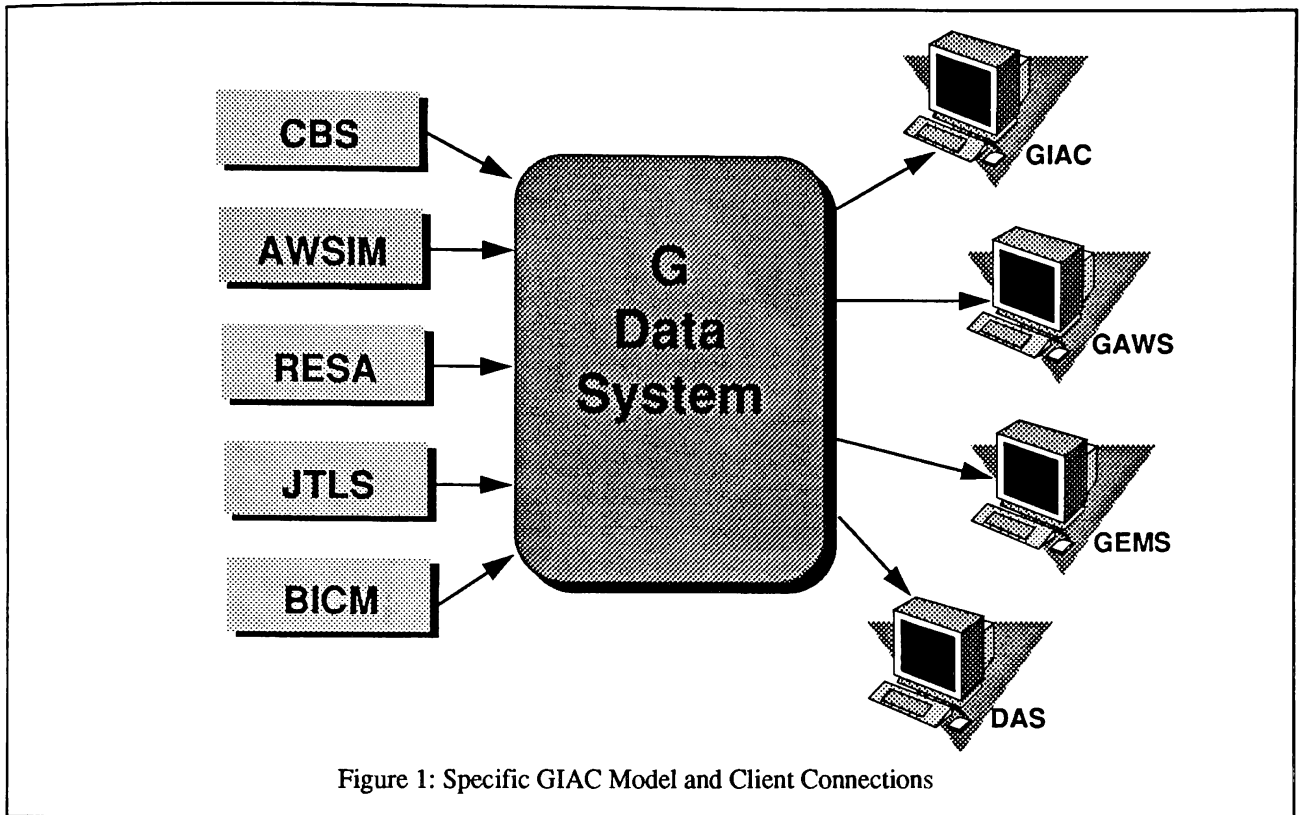


Figure 1: Specific GIAC Model and Client Connections

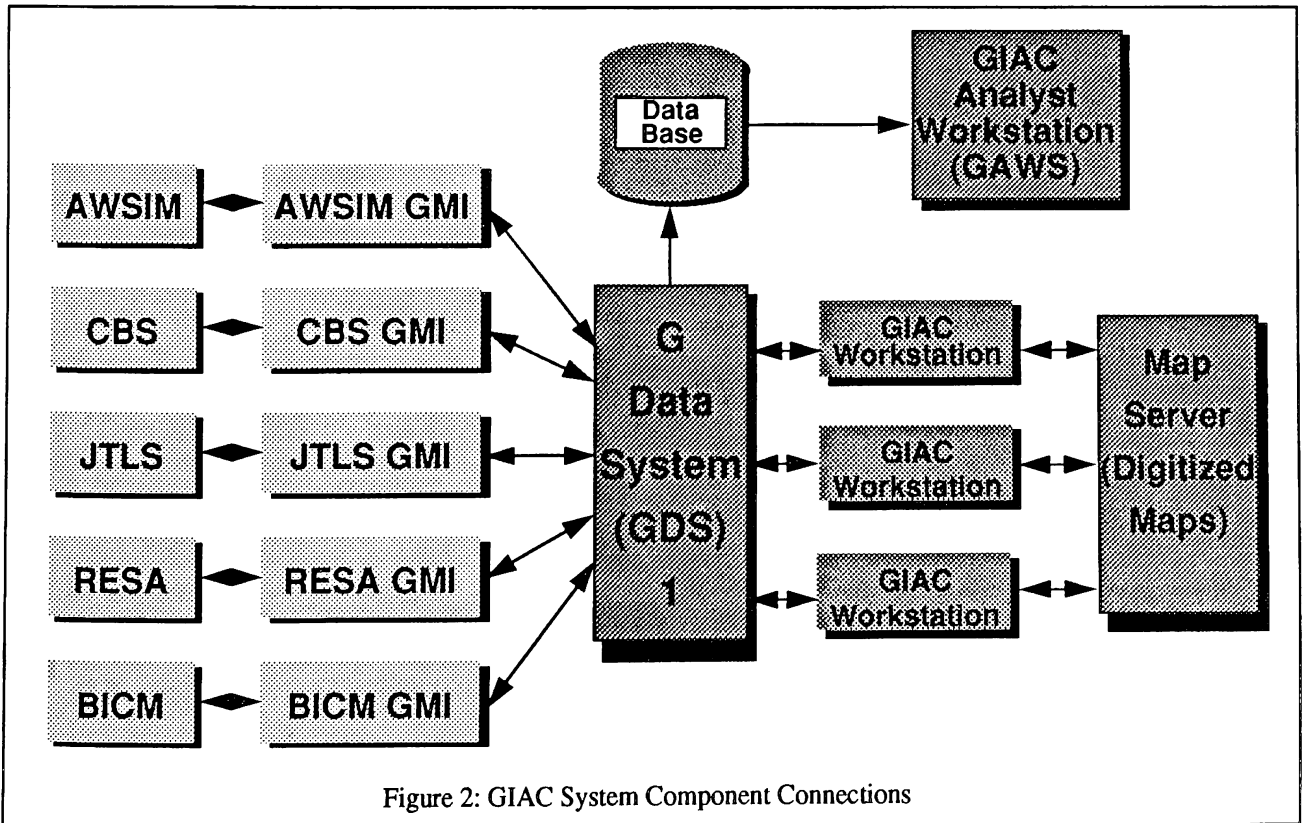


Figure 2: GIAC System Component Connections

4 G DATA SYSTEM (GDS)

The G Data System, or GDS, is a data distribution system designed to provide information from the simulation environments to clients located worldwide. The G Data System allows clients anywhere in the world to visualize and control the simulation objects as if they were attached directly to the simulation model. The G Data System implements a distributed computing environment utilizing distributed databases to make simulation data available to clients.

The GDS model independent Data Distribution System provides recovery mechanisms as well as a common interface to models. GDS supports multiple data types (air, land, sea, intel, terrain, weapon, and targets), supports multiple models and multiple clients.

The G Data System is made up of the following components:

- G Protocol
- G Data Server
- G Model Interface

The G protocol is the language in which various components of the G Data System communicate. The G protocol can be used over any reliable network. The network protocols currently supported are TCP/IP and DECnet.

The G Protocol defines communication protocol between the G Data Server and clients and provides data filtering mechanism for clients.

Each individual Data Server component of the G Data System is called GENIS. GENIS acts as repository for the simulation data and forms a distribution system for the simulation data. GENIS receives data in G protocol format from a model interface or another data server, stores the data in a local database and then distributes the data to other data servers or client interfaces. Each data server filters the data sent out to its clients. The data server allows filtering data on the following:

- Model
- Side
- Data Type
- View
- Latitude/Longitude

The GIAC Model Interface (GMI) provides an interface between the simulation model and the G Data System data server or client. The GMI transforms the model specific data from the simulation model into a common format called the G protocol and can be implemented on any platform that provides TCP/IP or DECnet connection to the G Data Server. The GIAC Model Interface is normally provided by the simulation model developers.

5 GIAC GRAPHICAL USER INTERFACE

GIAC provides an Interactive Graphical User Interface for Visualization and Command and Control of the air, land and sea simulation objects. The GIAC Command and Control workstations support view filtering, data filtering by model and data filtering by data type. Both outline and DMA digitized maps are displayed, as are hex terrain features and barriers. The GIAC workstations support multiple instantiations of the same model and simultaneous input of air, land, sea, and target data from multiple simulation models. The workstations provide visualization of multi-sided perceptions of the battlefield.

The Map Server component of the GIAC system retrieves DMA digitized map data from a CDrom, then stores the data on disk for efficient and responsive retrieval. The digitized map data is formatted and can then be sent to the GIAC workstations for display.

The GIAC Analyst Workstation (GAWS) displays archived data collected and stored in a database created by GDS. The archived data is retrieved and displayed on the GAWS, allowing for After Action Review (AAR) of the simulation. GAWS allows a graphical display of the archived data, enabling a "Snapshot" of the battle from a previous time or "Movie" of designated time slices. A graphical annotation capability can be used to annotate viewgraphs and hardcopy prints for further analysis.

GAWS allows a trainer or analyst to easily ascertain key factors influencing success or failure in the training environment. It is used to support scenario development, mission planning and rehearsal, and the requirements for new or improved weapon systems development. GAWS supports Joint, Combined Arms, and Coalition Forces operational performance assessment.

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