

## C3-TREK NUMAC Interface (NI) – RWM Data Services

### INTRODUCTION

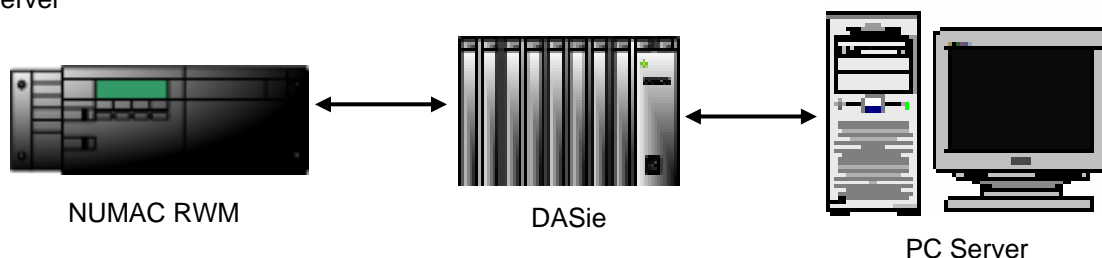
For Nuclear Utilities using General Electric NUMAC devices, C3-ilex has developed replacement software for legacy Core Monitoring System (CMS) data interface applications. The C3-TREK-NI functions consist of Windows Services and Windows Client user-interface applications. The NUMAC Interface (NI) Services will usually run on the Plant Process Computer (PPC) or alternatively on a separate PC. Operators will communicate with the NI Services across the network using one or more NI Client applications. Replacement applications are available for plants using NUMAC RWM, ATIP and/or PRNM devices. The specific NUMAC Services accessible via the C3-TREK NI replacement software are independent of each other, and a customer can implement any combination of RWM, ATIP and/or PRNM Services.

This Product Description discusses the RWM Services application, which supports the following basic functionality:

- Display control rod positions and support position substitutions
- Perform rod sequence enforcement
- Capture control rod scram timing information

The design approach for the replacement software was to:

- Design the software to run under Microsoft Windows using C-based code developed under Visual Studio .NET
- Retain the same RWM service actions and reports, thereby minimizing user retraining
- Provide a data acquisition interface to the Plant Process Computer and/or Core Monitoring System Computer for RWM data messaging
- Modernize the user interfaces to standard Windows look and feel
- Implement the serial data interface to the NUMAC RWM using a C3-ilex DASie (Data Acquisition System importer/exporter) device as the data interface between the NUMAC RWM and the host computer running the C3-TREK-NI RWM software application
- Run on standard servers and PCs that support the Microsoft XP Professional or 2003 server



### DASie/NUMAC DATA INTERFACE

The DASie provides the data interface between NUMAC devices and the C3-TREK Servers performing the NUMAC data processing and application services. The DASie consists of one or more Serial Input/Output (SIO) cards installed in a rack-mountable chassis. Each card is capable of handling several fiber optic data streams from the NUMAC devices. The DASie provides the output (i.e., message downloads) and data retrieval communication paths between the C3-TREK NI software applications (e.g., RWM, ATIP, and/or PRNM) and the NUMAC devices. The DASie translates the NUMAC proprietary protocol data streams into ones that can be accessed by network addressable computers using TCP/IP protocols.

## RWM SERVICES

The RWM Service communicates with the NUMAC RWM hardware via the DASie, which handles the protocol translation. The messages sent and received by RWM Service are TCP/IP versions of the messages defined in the GE NUMAC protocol documents. RWM Service actions include the following:

- Validation and upload/download of control rod sequence definitions (e.g., default, SPCL, SMTS, user named)
- Upload of RWM data reports & files (e.g., substituted rods, sequence alignment data, bypass rod lists, rapid power reduction rod lists, rod scram timing data, bank position withdrawal sequence)
- Upload of non-periodic message requests (e.g., error & diagnostic messages, RWM rod motion categories)
- Save and create printable files of uploaded and downloaded data
- Capture Control Rod Position data
- Data Acquisition Interface (DAI) with the PPC for RWM error message and alarm monitoring

Figure 1 provides a functional overview of the C3-TREK NI RWM data services application

## RWM CLIENT

The RWM Client is a user interface that shows RWM Service status and provides a way for the user to issue a variety of commands to the RWM Service. RWM Client is a Windows application providing a single screen view of actions, options and interfaces with the NUMAC RWM via the DASie. The RWM Client runs on a PC workstation. One or more client interfaces may run simultaneously with the RWM Service.

The user interface provides feedback on validation, upload, and download requests to the RWM Service that are initiated from that client. Various error messages are also displayed in the client window such as when communication errors occur between the RWM Service and the NUMAC.

Figure 2 represents a screen shot of the RWM Client Window that is displayed following launch of the RWM Function from the C3-ilex Core Monitor Client application.

The RWM Client Window contains the following regions of interest:

- Operational Parameters Region (Core Map) – displays the following information:
  - CRD Position & Core Location Coordinates
  - NUMAC Connection Status
- Demandable Functions Region - provides user interface for initiation of the following user actions:
  - Upload/Download Sequences (Figure 3 illustrates the dialog box for uploading or downloading sequences)
  - Validate/Edit/Save sequences (Figure 4 illustrates the dialog box for user interaction with sequences)
  - Upload RWM Reports (e.g., Substituted Rod Lists, Sequence Alignment Data, Bypass Rod Lists, Rapid Power Reduction Rod Lists, Rod SCRAM Timing Data, Bank Position Withdrawal Sequence), reports are saved and formatted as ASCII files so they can be printed offline
- Information/Status Region - provides responses back to the user of errors detected and displays information related to RWM actions and results.

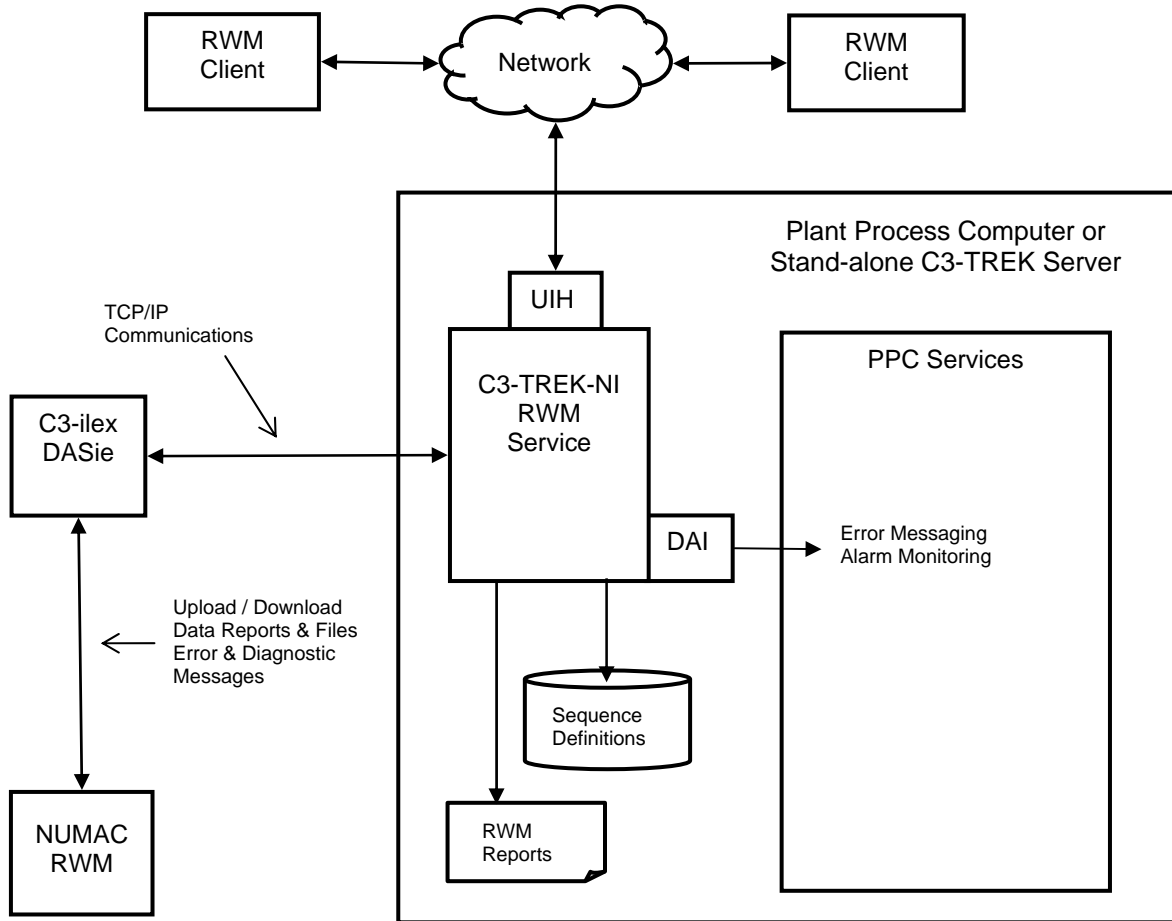


Figure 1. Rod Worth Minimizer Data Services Overview Diagram

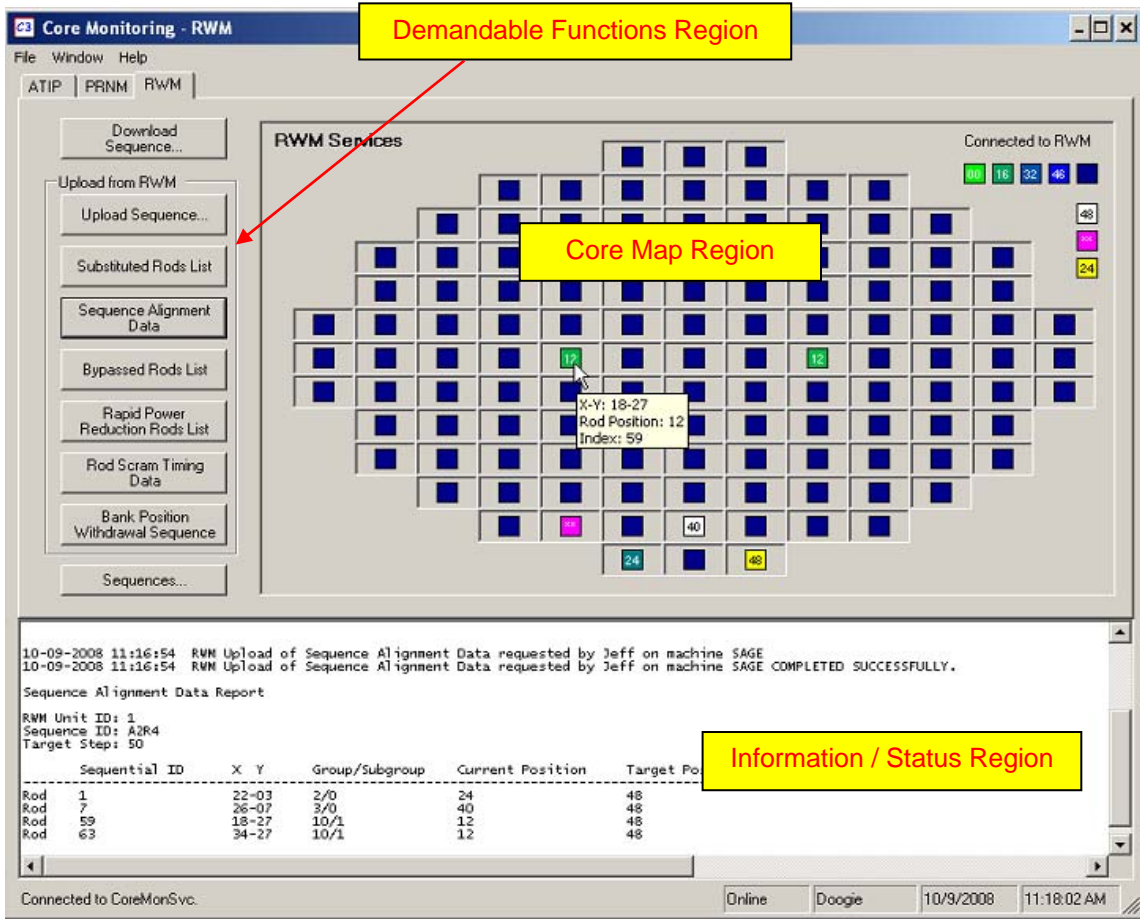


Figure 1. Rod Worth Minimizer Client Window

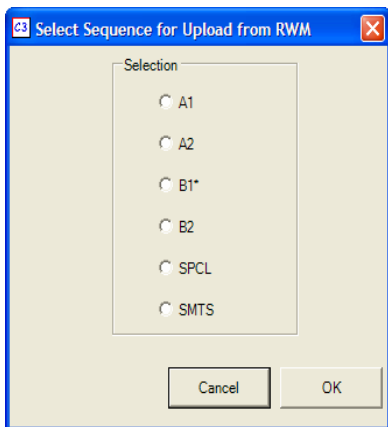


Figure 2. Sequence Upload/Download

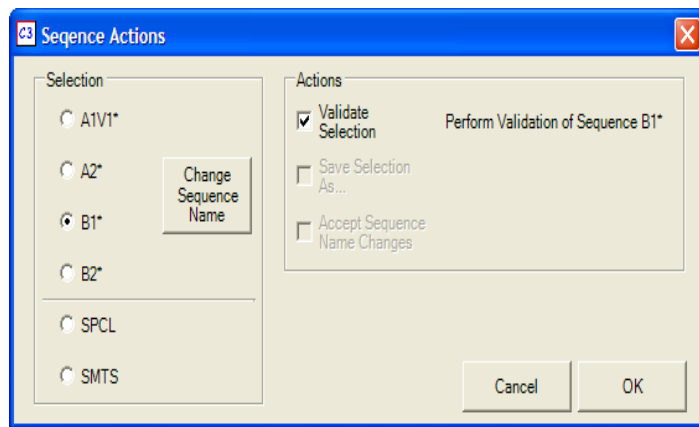


Figure 3. Sequence Actions