A study on Requirements of Data Base Translator for APR1400 Computerized Procedure System at Shin-Hanul unit 1&2

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1. Introduction

The computerized-based procedures are being developed to overcome the drawbacks of paper-based procedures in many nuclear power plants [1]. For this reason, Computerized Procedure System (CPS) has been developed and applied to Shin-Kori unit 3&4 and is being applied to Shin-Hanul unit 1&2 [2-3]. The CPS is one of the Man Machine Interface (MMI) resources and the CPS can directly display plant graphic objects which are in the Digital Control System (DCS). And the CPS can send a request to DCS to provide DCS screen which is called step support display through DCS link button on a computerized procedure.

The procedure writers can insert DCS graphic information to computerized procedure through data base which is provided by CPS Editing System (CPSES). The data base which is provided by CPSES conforms to the naming rule of DCS graphic objects. The naming rule of DCS graphic objects is defined by vendor thus status of DCS graphic objects which are in computerized procedure at Shin-Kori plant cannot be displayed on CPS at Shin-Hanul plant. To use computerized procedure which is written by other plant procedure writer, DCS graphic objects shall be translated by its plant data base. This paper introduces requirements of data base translator to reduce translation and re-inserting graphic objects burden [2-4].

2. Tables of Data Base of CPS

The CPS has connection functions between CPS and DCS to support operator with MMI resources. To use connection functions there are tables of data base as follows:
- DCS graphic objects (valve, pumps, fans, etc.)
- DCS variables (analog, digital)
- DCS screen links (RCS, SIFC, etc.)
- Alarm tag ID

2.1 DCS Graphic Objects

CPS can directly displays plant graphic objects which are in the DCS to allow operators to perform computerized procedure quickly. The data base which is provided by CPSES conforms to the naming rule of DCS graphic objects at each plant.
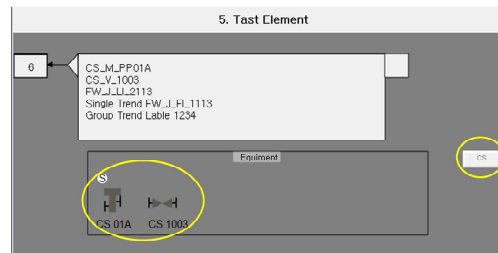

Fig. 1. Typical DCS graphic objects in CPSES.

2.2 DCS variables

CPS monitors procedure entry condition, re-performing condition of continuously applied step and flashing condition of caution instruction which are created by the logic editor of CPS ES. DCS variables are needed for input of logic equations.
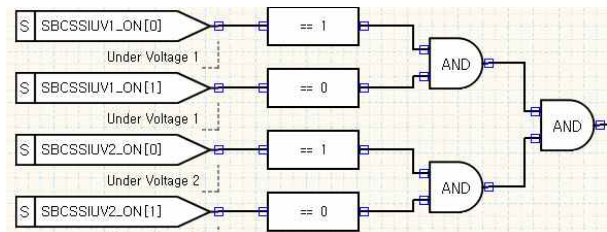

Fig. 2. Typical logic equation in CPSES logic editor.

2.3 DCS screen links

The CPS sends a request to DCS to provide DCS screen through DCS link (procedure support display, step support display, trend) button on computerized procedure. NUMBER which is one of attributes of DCS link is an identifier in plant DCS at Shin-Kori unit 3&4 but NUMBER shall be used as primary key of screen mapping table at Shin-Hanul unit 1&2.

2.4 Alarm ID

The MCR operators can access to computerized procedure through alarm list directly. Each alarm has a unique alarm ID. In Shin-Kori unit 3&4 DCS, procedure writers insert the alarm ID into an attribute of

computerized procedure. On the other hand in Shin-Hanul 1&2 DCS, maintainer inserts alarm procedure number into each field of alarm data base of DCS.

3. Requirements of Data Base Translator

3.1 DCS Graphic Objects and DCS variables

The translator analyzes DB files of IPS of Shin-Hanul 1&2 and extracts unit information, system code (number, abbreviation), equipment type (instrument type) and equipment number. The translator inserts extracted information into data base in CPSES using by comparing existed data base. The translator shall show the results of translation that are success, fail, duplication or not. And the comparing algorithm of translator can be added by CPS maintainer.

3.2 DCS Screen Link

The translator analyzes DB files of IPS of Shin-Hanul 1&2 and checks the title attribute of DCS link. And it compares checked title information with previous title information. The translator changes the number attribute of DCS link in DB of CPSES by compared result. If translator cannot find the previous title, this DCS screen link shall be added to DB of CPSES.

3.3 Alarm ID

The translator extracts alarm IDs and computerized procedure number of Alarm Response Procedure (ARP) and finds the alarm ID in data base of Shin-Hanul. If translator finds alarm ID in the data base, it inserts the computerized procedure number which is extracted from ARP into field of procedure of database.

3. Conclusions

This paper introduces the requirements of data base translator of CPSES for APR1400 CPS at Shin-Hanul unit 1&2. The translator algorithms shall be tested to update data base of CPSES effectively. The prototype of translator is implemented and is being tested using real plant DB. This translator can be applied to Shin-Hanul unit1&2 through software V&V. It can reduce procedure writer's burden effectively.

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