

# Digital Fault Recorder in Information System

Wang Xurui\*, Yun Wang\* Xiaolong Sun

LEM China/Beijing Dianyan Electronic Instruments Co. Ltd. No. 1 Standard Factory Building,  
Section B, Airport Industrial Area, Beijing 101300, China

Tel: 0086-1080490470

Fax: 0086-1080490473

E-mail: [bdy@bjlem.com.cn](mailto:bdy@bjlem.com.cn)

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## 1. Introduction

That is a tendency to manage the DFR by Control and Management System at a substation or power plan in China. Modern digital fault recorder has several different communication ports. Normally they are series direct communication port (RS232, 485), Dialing net communication port (MODEM), TCP/IP communication port (Ethernet). DFRs transfer the information report and record data to any concerned system by different nets.

To transfer and manage the information of DFR and the record data, two difficulties must be overcome: 1) the recorded data of DFR has very huge capacity. Once a fault in power system happened, digital fault recorder triggered and began to transfer huge amount of information to any concerned Control and Management System. It will interfere the communication of other important process, for example the protection relay's report or control command. 2) The DFRs in a substation are not from monopolistic manufacture usually. The communication protocol and the data form are not standard in the time. This fact causes

confusion to Control and Management System often.

To solve the mentioned problem DFR's sub net in different manufacture is to build. The task of the sub-net is to convert the data format in a specified form and manage the communication procedure under the rule of Control and management system.

## 2. A real DFR information management system

In this system there are "m" different types DFR. Their data format is different and work under the different communication protocol. In china "m" is 1 ~ 4 at the 500kV substation. Total number of DFRS in the substation is "n". "n" is 1 ~ 12 normally. The remote dispatch center is located in several hundred kilometers far away from substations. The main connection medium between it and substation is phone line in china currently. C&M net is located in substation and built with optical fiber. Sub net are located also in substation and built with optical fiber and cable.

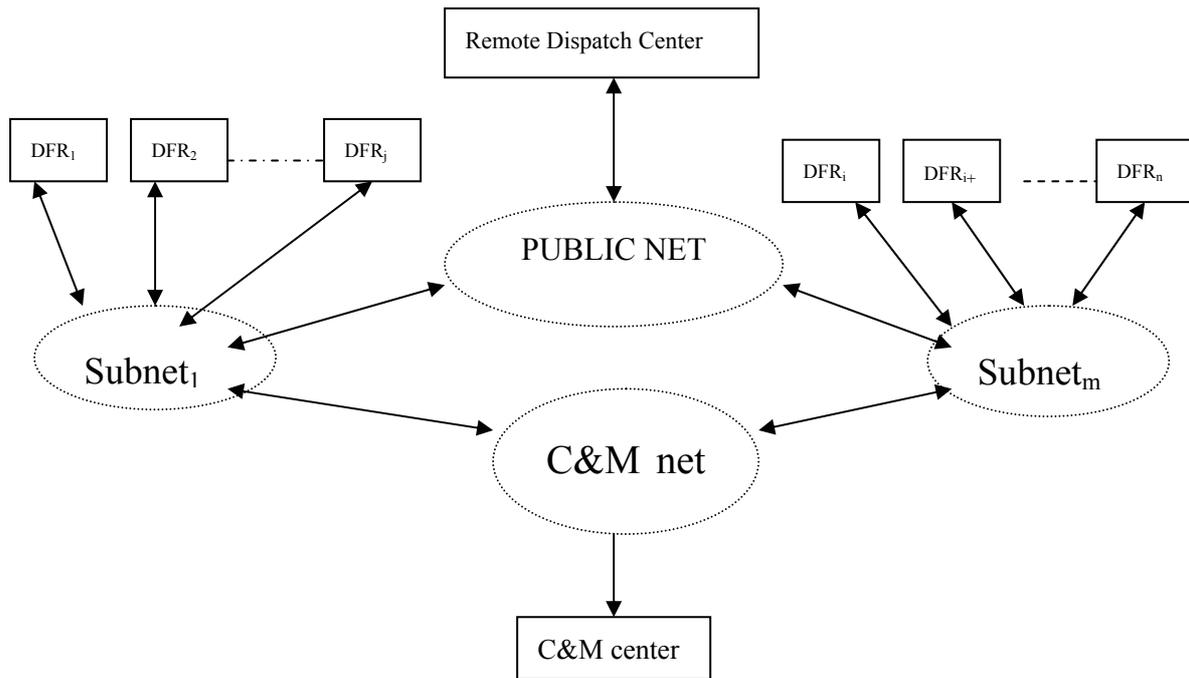


Fig. 1 Structure of a DFR's Information Management system

The main role to control and manage the DFRS is played by C&M center in substation. DFRs must report its situation to C&M center regularly. If DFR triggered or some situation changed, new situation must be reported immediately. Once the trigger condition has higher weight factor than set threshold, record data transfer to the C&M center. C&M center has another task by means DFR: setting and modifying the parameter of DFR, test the equipment regularly.

The work of DFR's sub net is in tree sides: 1) In this section the record data must be converted into propose format according to the requirement of C&M center. That is COMTRADE usually. 2) The required communication protocol must be used to control the communication procedure between sub net and C&M center. The communication protocol IEC 60870-5-103 is asked in the most situations. 3) Arrange the priority of data transfer. We know very well that the information and the record date from the Digital Fault Recorder is not so emergence as

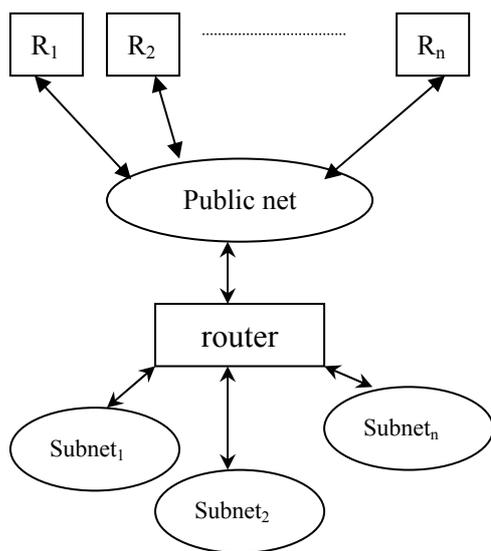
the protection relay's information and the control command. That means set data transfer priority from DFR as secondary or data from DFR transferred only if the Control and management system asked is reasonable. Let the C&M center processes the procedure that can influence the security of power system. Wait until it has free is the strategy of DFR's sub net.

The remote dispatch center need record data in DFR after fault mainly. Normally the dispatch retrieve the record dates only if they have received a fault report from C&M center. The record data can be analyzed to locate the fault point and fest the fault type.

### 3. Implementation

Communication between remote dispatch centers to substation by public phone line in the time in china. In the practice there are not sufficient phone number for every DFR. An exchanger is needed to give every DFR an extension number. In fact we have used IP

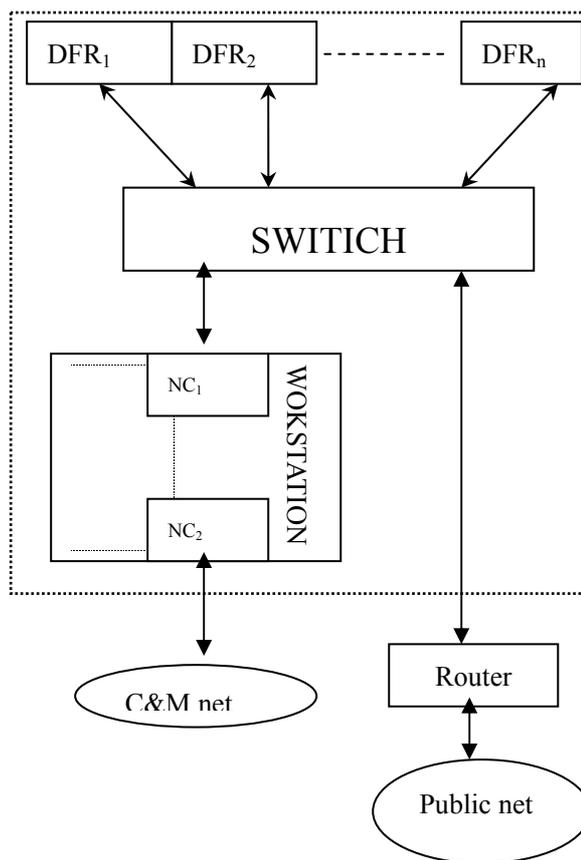
address to identify the DFRs. A router is needed to dispatch the sub net. According to the different situation in substation virtual server or router are used. The dispatcher in remote center can reach the DFR by Internet or dialing net with IP address or phone number.



R: Remote dispatch center

Fig. 2 Structure of remote communication

Building a DFR's sub net is our most important task. Main equipment in it is a workstation. Two net cards are equipped to separate the sub net IP address. One works at same sub net as DFRs. Another works at the same sub net as control and management system. At least three different programs must be worked in the workstation. The program to tread the native communication process of DFR and retrieve the record data in native format is needed. Further more, the program for data format convert is necessary and the program to control communication procedure must be available. The third one is the program to monitor the requirement of C&M center and decide when and what will be transferred to C&M center.



NC1: Net card 1 NC2: Net card 2

Fig. 3 Hardware detail of DFR's sub net

#### 4. Conclusions

DFR is a very important equipment to judge power system situation and the behavior of the protection relays. The dispatcher and controller in dispatch and control center wand have a facility way to get the information from DFR. This structure is used in several substations. Generally to say it is sufficient. With the development of the technique of communication network in power system and the improvement of the DFR's standardization this object can be much more briefly reached than what is in the paper discussed.