



# Application and Research of FPGA for Nuclear I & C Products



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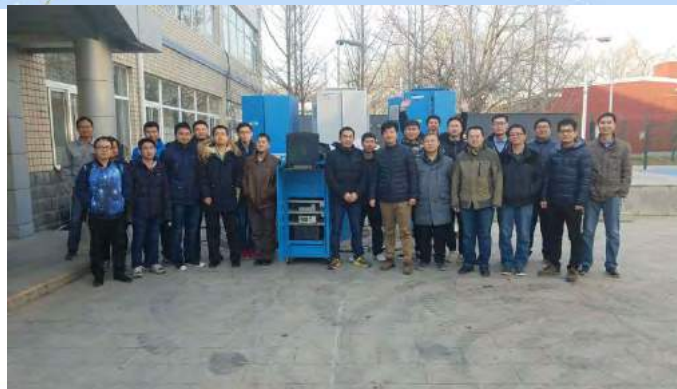


# 一、Introduction

- 胡义武 Hu Yiwu (Tom)
- China Nuclear Control System Engineering (CNCS)



- Team R&D  
100.



# 一、Introduction

## ■ CNCS

### ■ NC

**NicSys1000**

### ■ NC

**NicSys2000**

### ■ 1E

**NicSys8000N**

**DCS**



**DCS**



**DCS**



## 二、 Application of FPGA technology

- Controller IRIG-B protocol analysis
- I/O channel selection

NC DCS

RPC

1E DCS  
NicSys8000N

- Controller Processor -  
Microsemi FPGA
- IO Processor -  
Microsemi FPGA
- IGLOO2

RPN

- 1E DCS  
NicSys8000N
- Special algorithm

- Current output  
Control
- Read back  
adjustment

## 二、 Application of FPGA technology

### NC DCS

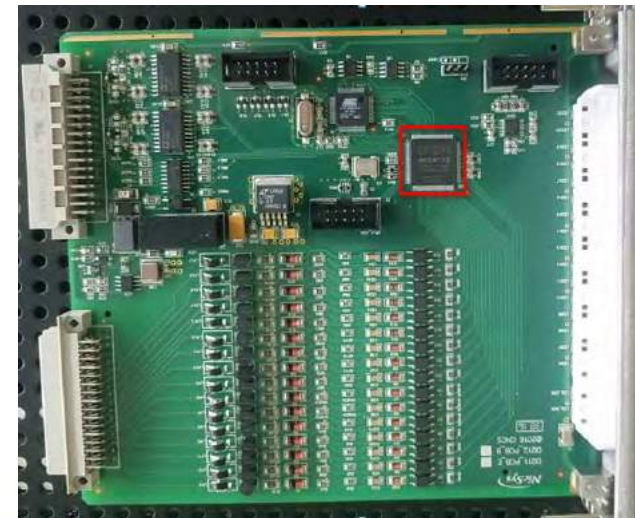
- **Controller - IRIG-B Protocol**

**Second pulse source of SOE module**

**LATTICE Diamond**

- **IO module decoder to select channel**

- **ALTERA MAX II Quartus**



## 二、 Application of FPGA technology

### 1E DCS

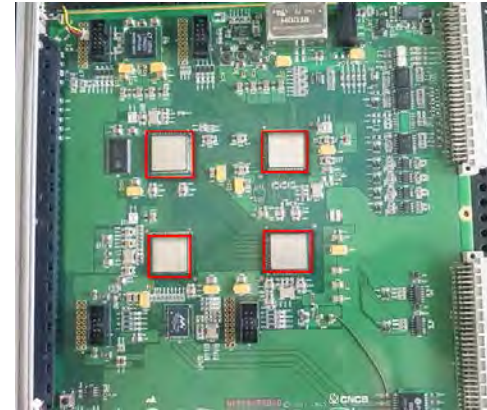
- Main Processor Totally FPGA – controller, I/O, communication

Microsemi IGLOO2 090 ,050,  
Libero

### Security and Reliability

- Controller process algorithm  
Diagnosis
- IO Function Diagnosis

**Whole FPGA DCS Platform!**



## 二、 Application of FPGA technology

### RPN

- Processing unit based on 1E DCS NicSys8000N
- Special algorithm multiplication period calculation algorithm the least squares method Kalman filter

Power Range

Intermediate Range

Source Range





## 二、 Application of FPGA technology

### RGL

- **Current Controller**

**Cyclone IV Quartus**

**Current output control  
Read back adjustment**



- **FPGA technology has been widely used in nuclear instrumentation and control products**
- **The application of FPGA technology ensures the high reliability and security of the system**
- **FPGA technology transplant has high efficiency**



- **FPGA technology,**
- **highly reliable and secure,**
- **high cost, long supply cycles, inefficient compiler tools and other problems**
- **require more support from device manufacturers**
- **or designers to do a good job of preliminary research.**



## 四、Activity

1. The purpose of attending the conference?

- A. Acquire new technology
- B. Seeking technical assistance or cooperation on FPGA
- C. other purpose you can writ on paper.

2. What aspects do you want to know more about this presentation ?

- A. NC DCS Controller IRIG-B protocol Decode
- B. IE DCS processing and communication mode
- C. RPN multiplication period calculation algorithm and Kalman filter
- D. RPC current output control and read back adjustment mode

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Thank you for your  
attention!

And hope we can have a  
good cooperation!

