

TaraxNode: An IPv6 Wireless Sensor Network Node

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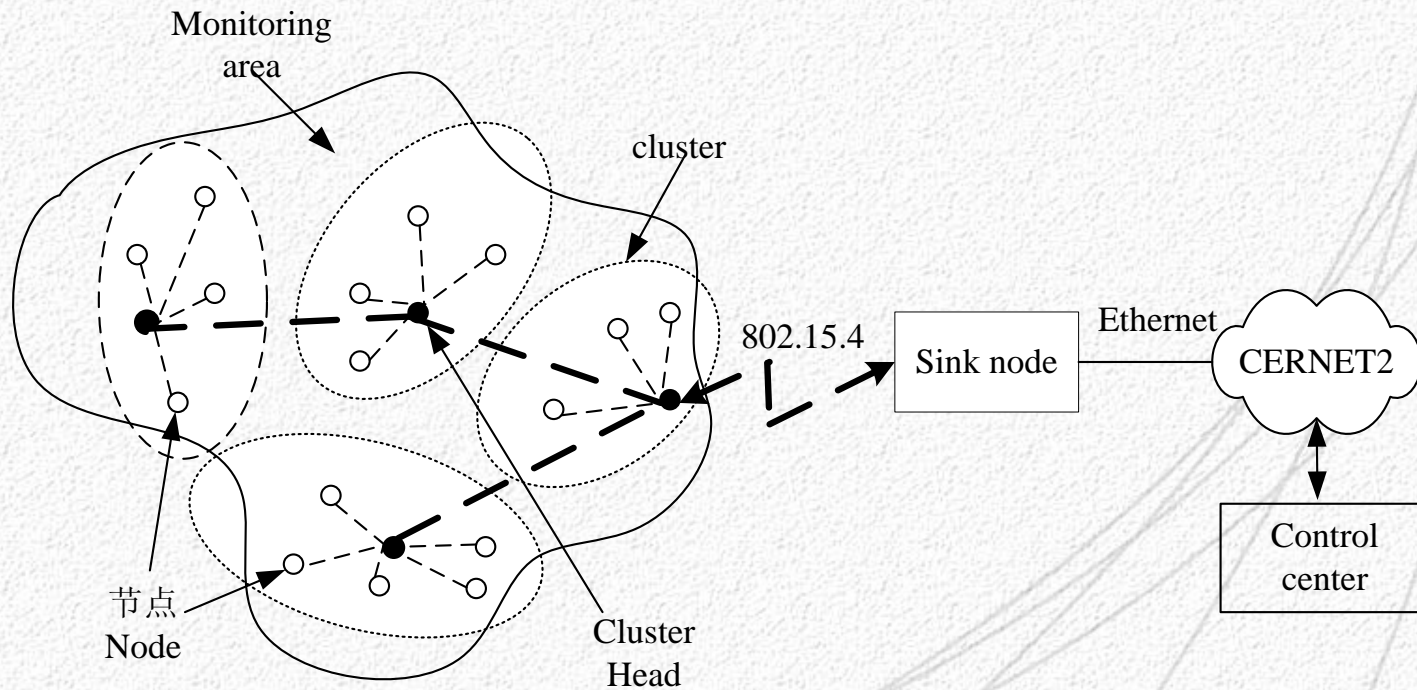
Research Goals

- **Research WSN's architecture**
- **Establish industry standard of WSN node**
- **Develop hardware and software technology on WSN and WSN node**
- **Products, protocols and corresponding technologies with independent intellectual property**

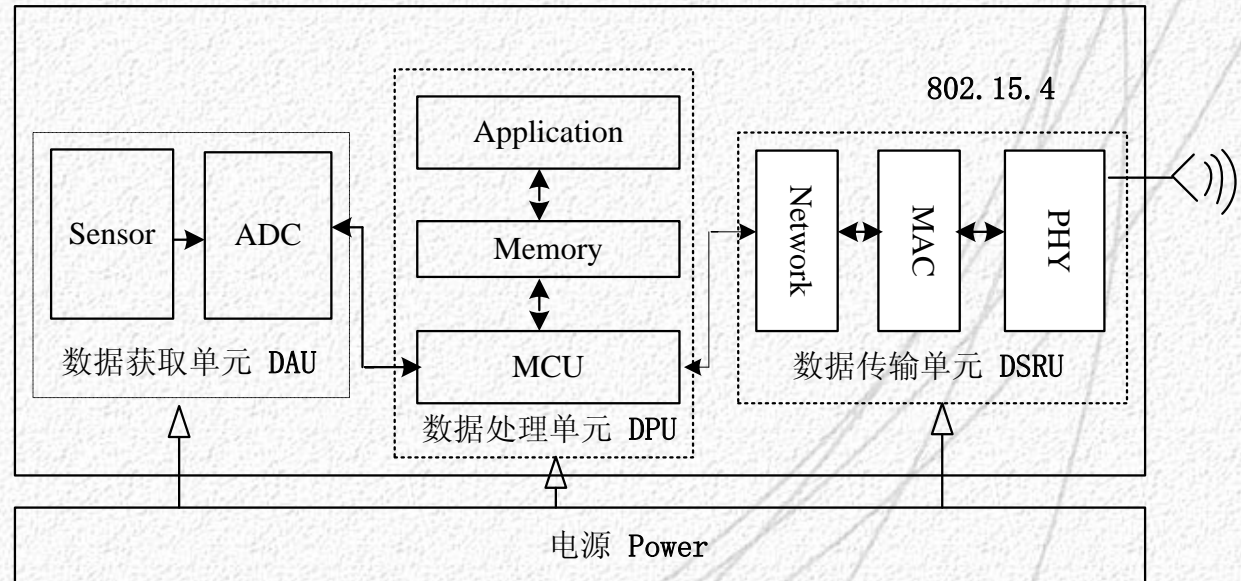
- 1. System architecture of IPv6 Wireless Sensor Network**
- 2. Node's Data Acquire Unit (DAU)**
- 3. Node's Data Process Unit (DPU)**
 - Embedded MCU**
 - Embedded OS、Data base system**
 - IPv6 protocol and self-organized routing protocol**
- 4. Node's Data Send/Receive Unit (DSRU)**
- 5. Embedded data base on local and data control center**
- 6. Applications**

■ Network Architecture

Multi-hop self-organized wireless network

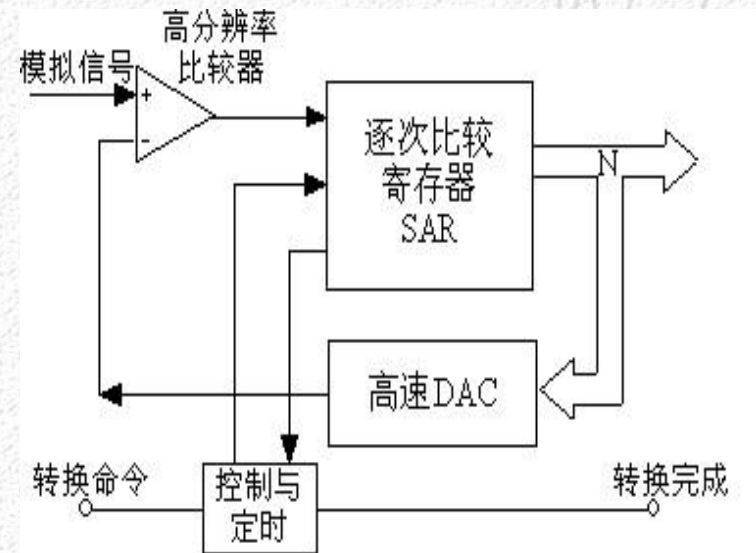


■ Node Architecture



■ Data Acquire Unit (DAU)

- 8bit ADC with Successive Approximation Register(SAR)

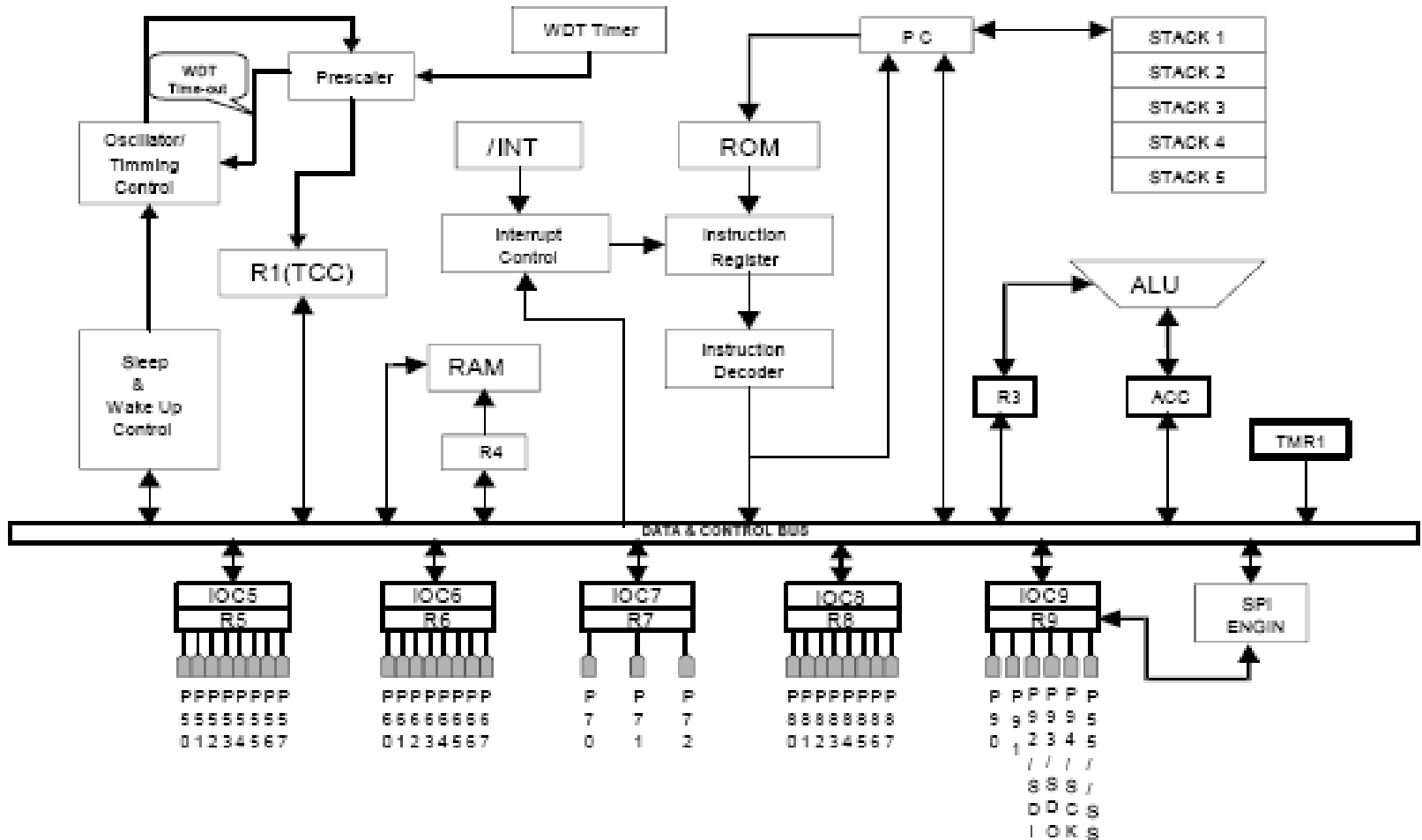


- Support temperature, humidity and O₂ sensors

■ TaraxCore--Embedded low-energy cost processor chip with independent intellectual property

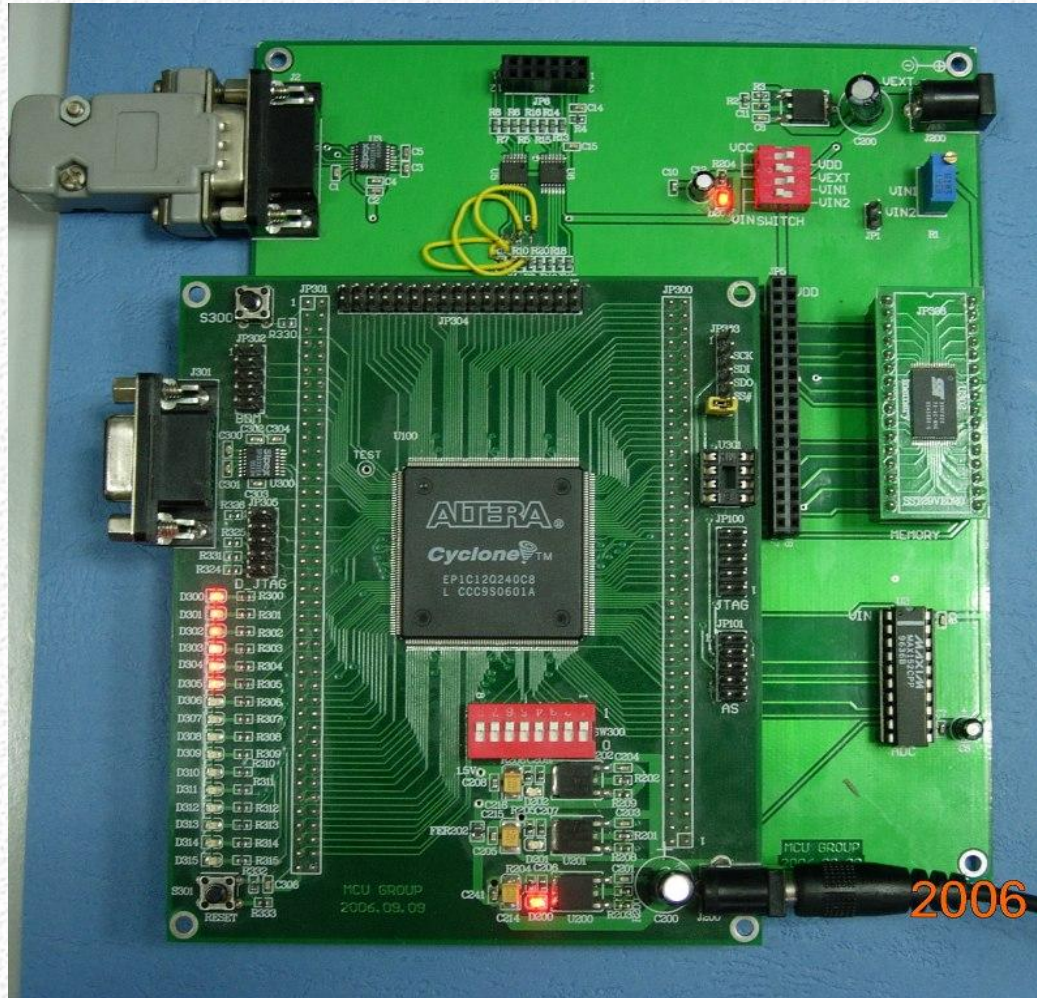
- 8bit RISC processor, with frequency 4MHz
- RAM: on chip $4K \times 8\text{bits}$
- ROM: on chip $64K \times 13\text{bits}$ 、 $64K \times 13\text{bits}$ extended
- Voltage: $2.0V \sim 3.6V$
- Port: 56 bidirectional 3-state I/O ports
- $P_{\text{work}} \leq 10\text{mW}$, $P_{\text{sleep}} \leq 2\text{mW}$
- Instruction set: 58
- Independent clock source with watchdog

■ TaraxCore function framework



Research Contents

■ TaraxCore FPGA version

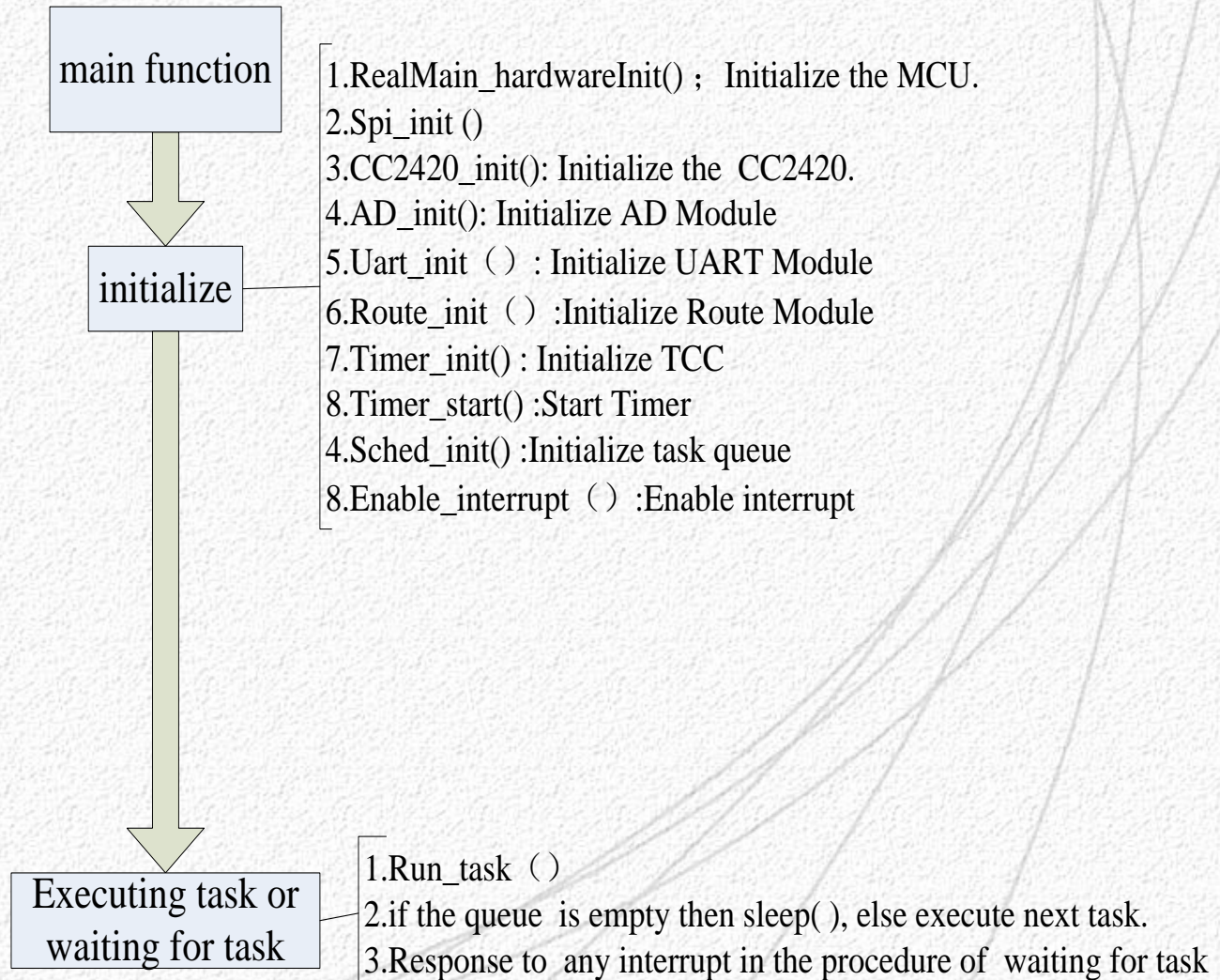


■ **TaraxOS— an Embedded OS based on TaraxCore**

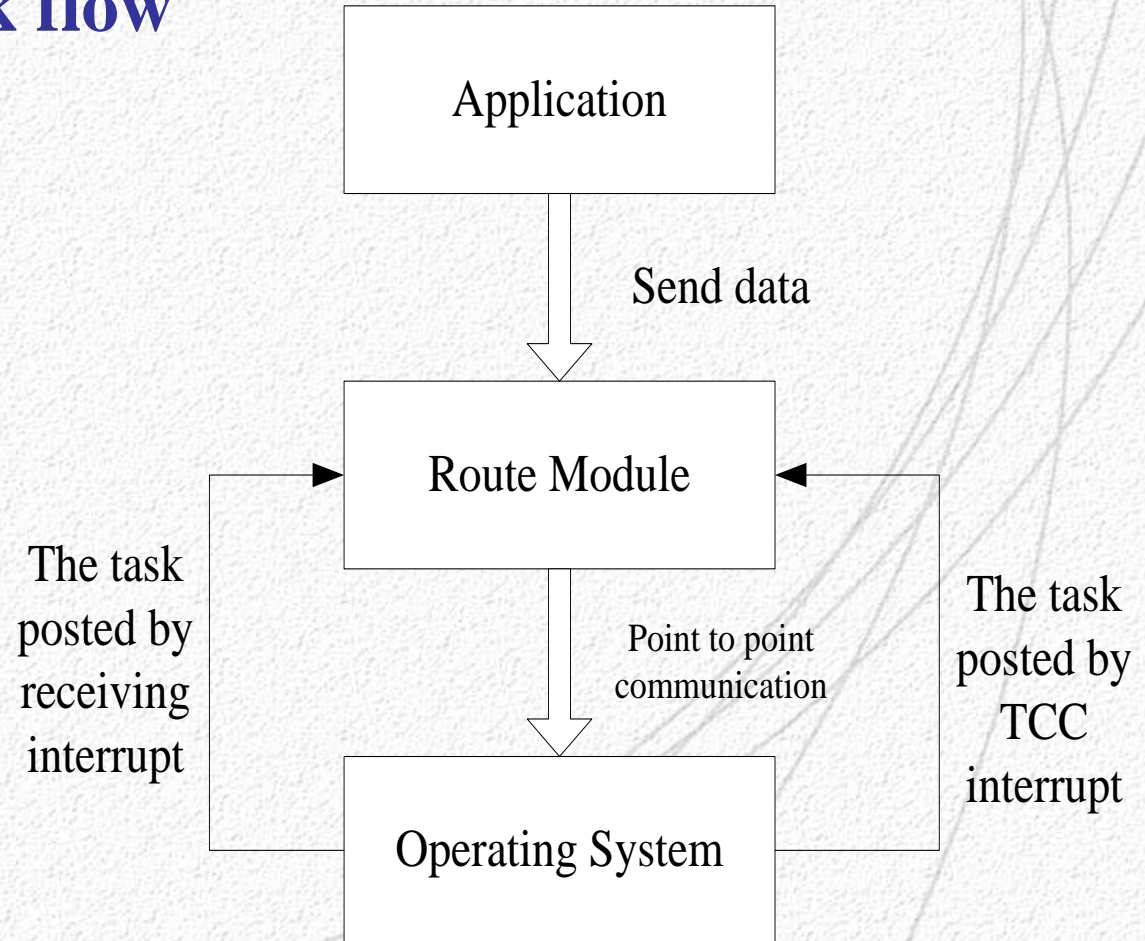
- **Modularity: system is combined with modules**
- **Reusability : modules are connected by configuration files, so modules could be reused**
- **Event-driven: work status change**
- **Schedule: FIFO/Priority**
- **C-like compiler**
- **Core: 15Kbytes**

Research Contents

■ Main process



■ Data and task flow

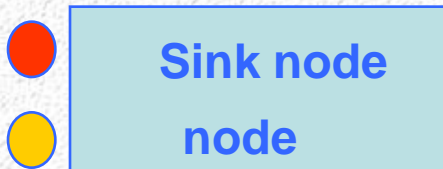
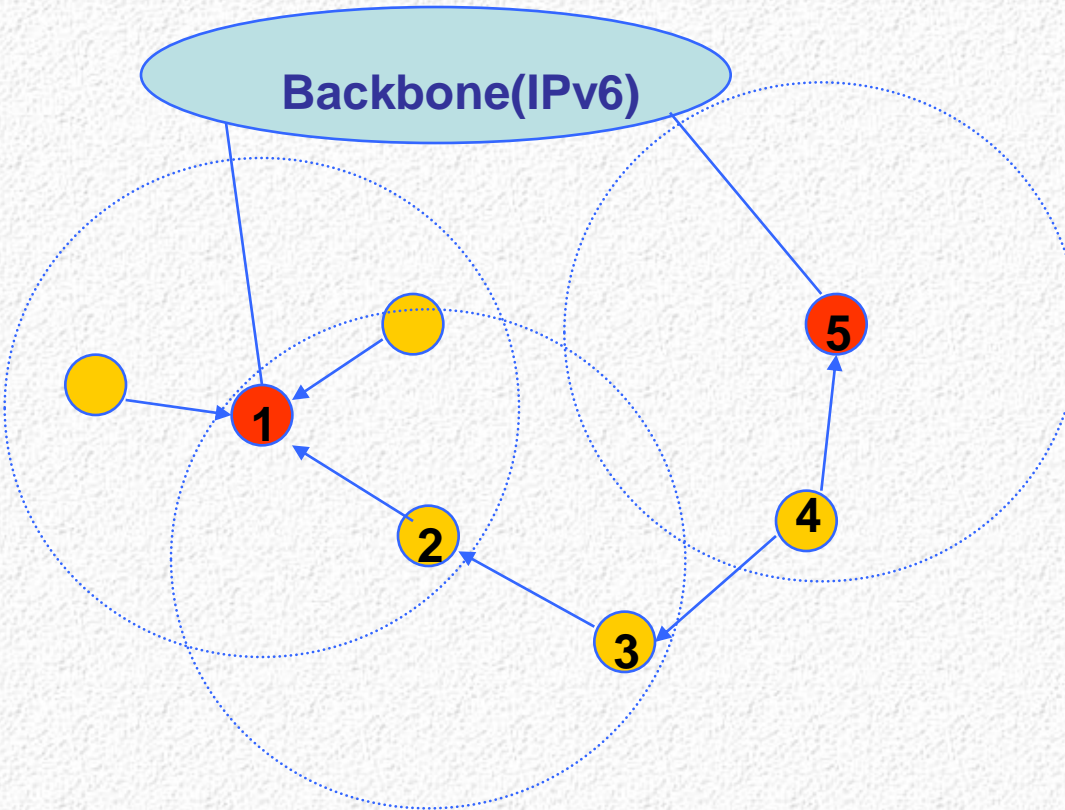


■ Data Send/Receive Unit (DSRU)

- **IEEE 802.15.4**
- **Carrier frequency 2.4GHz**
- **Max distance:125m**
- **Max data transmission rate: 250Kbps**

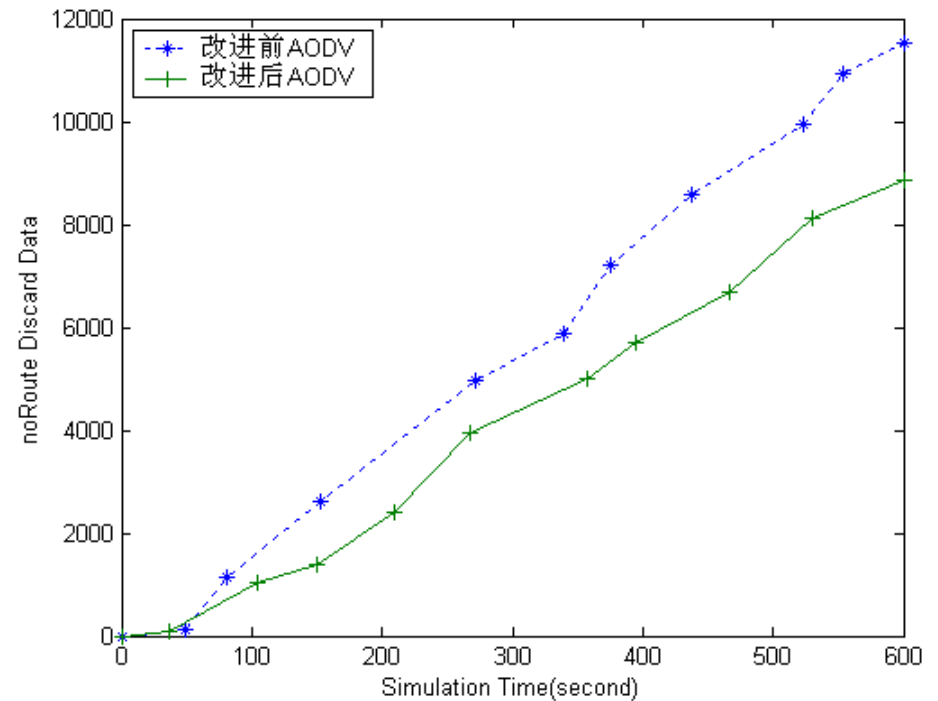
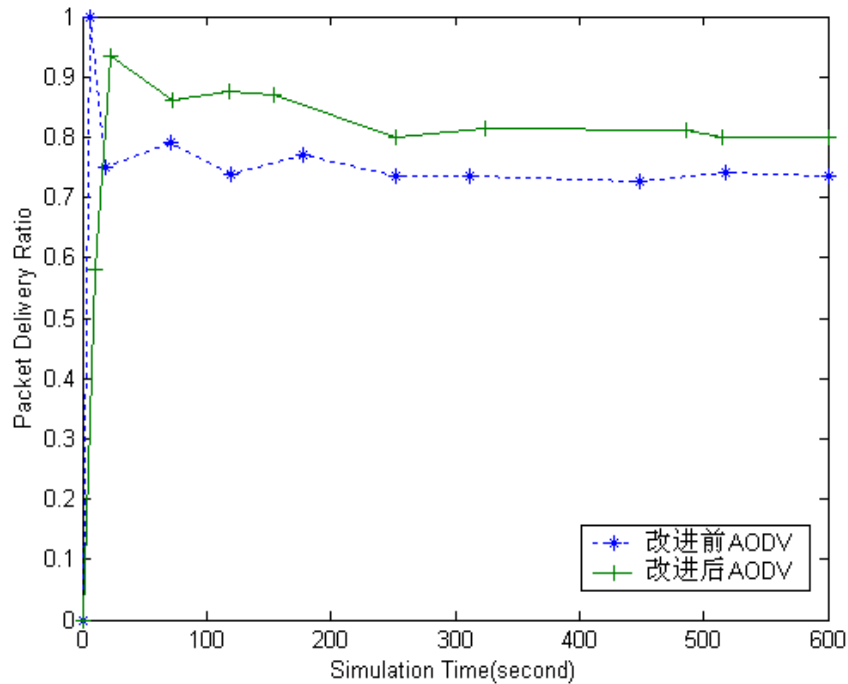
- **Ripple – a routing protocol**
 - **Self-organized**
 - **Load balanced**
 - **High-efficiency and low cost**
 - **Broadcast control**

Research Contents

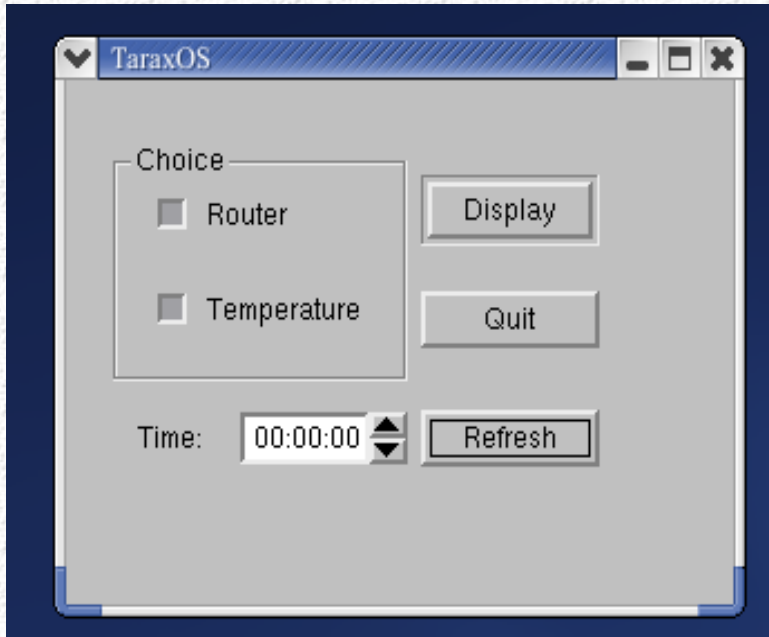


1. Sink node broadcast route-build message to it's one-hop neighbors
2. one-hop neighbors add route to sink
3. one-hop neighbors broadcast route-build message to their one-hop neighbors(i.e. 2 hops to sink)
4. two-hops nodes add route to sink
5. All the nodes add route at the same way
6. More than one sink: find the closest sink

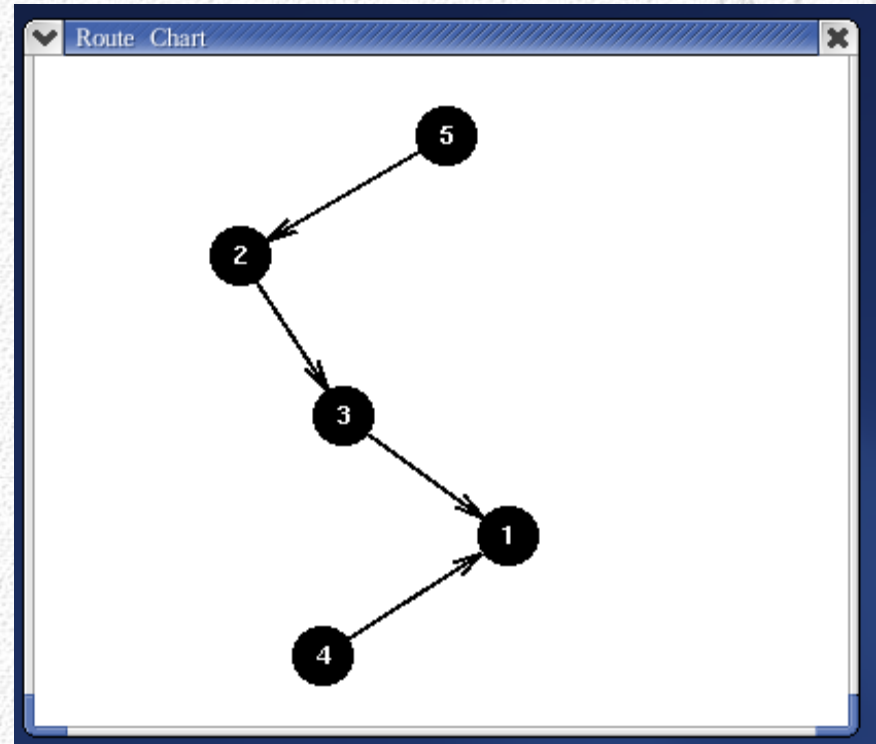
■ Comparison to AODV



■ Display interface

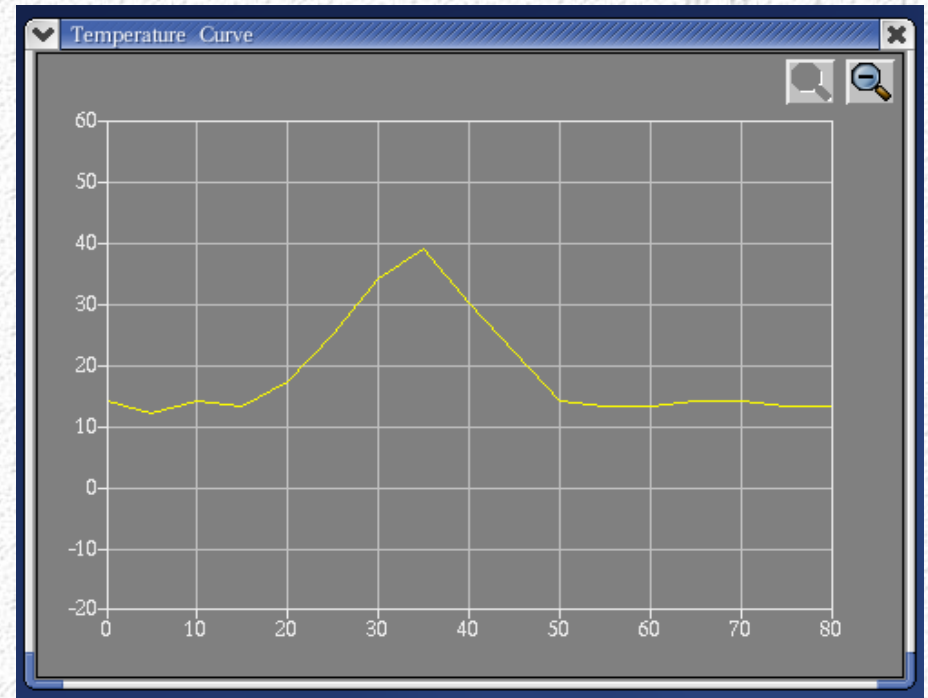
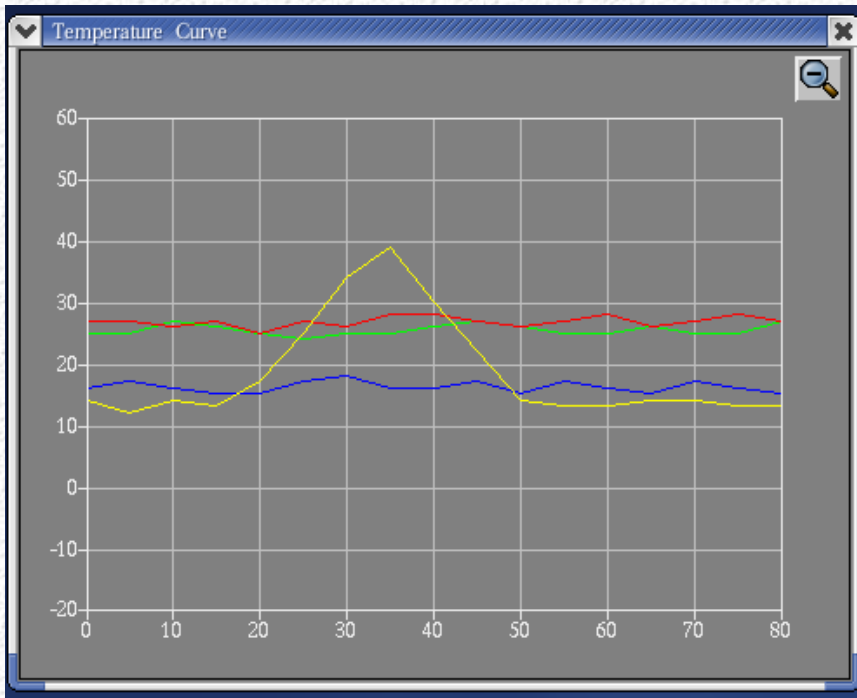


Main interface



Topology

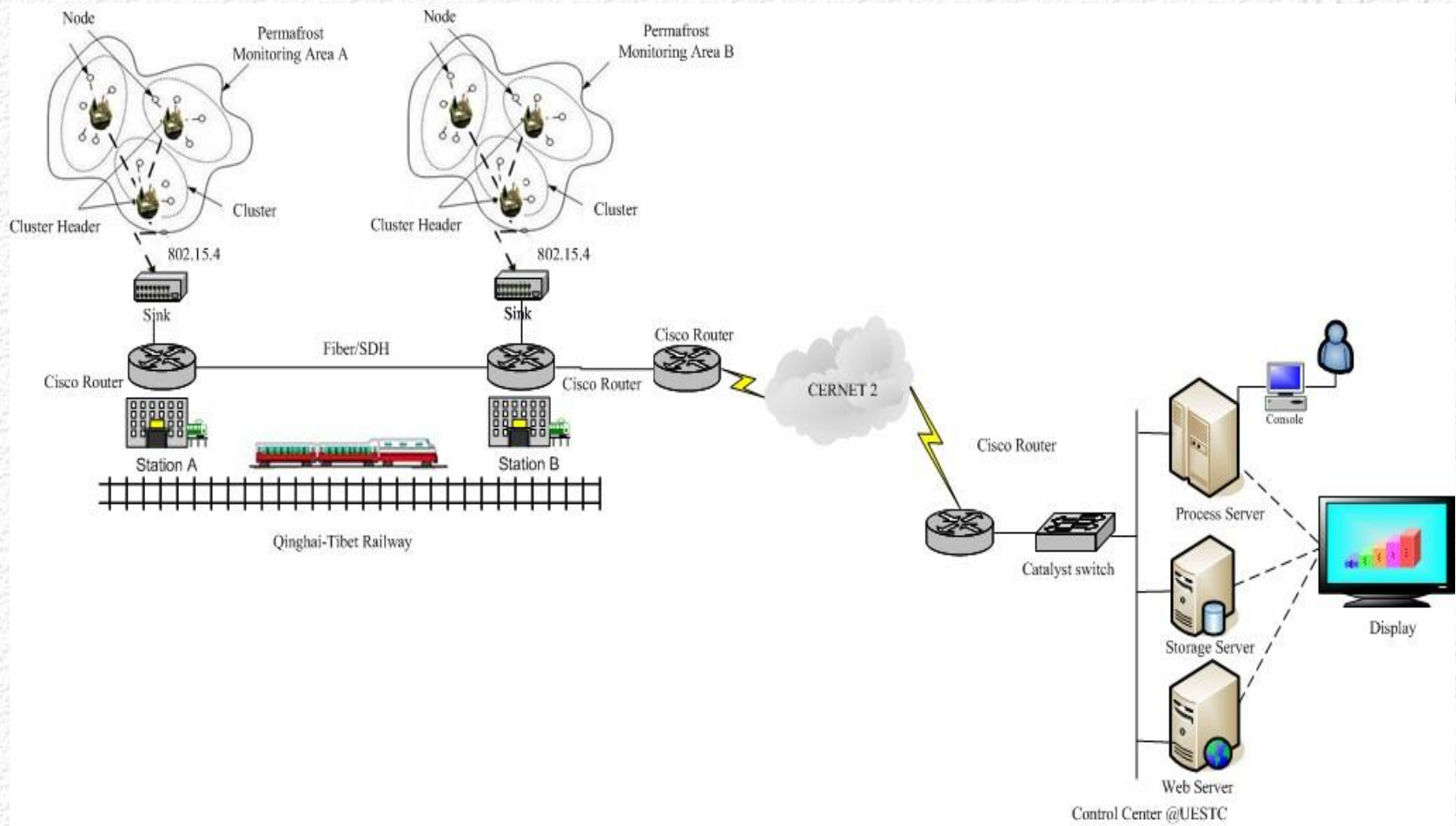
■ Data display



Our Lab



■ Permafrost monitoring of Tibet-Qinghai railway



Next generation WSN processor and it's development kit.

- **TaraxCore2 (including MAC instructions)**
- **TaraxCore2 Simulator**
- **TaraxC Compiler**
- **TaraxC Debugger**



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Thank You