DESIGN OF A COMPONENT-ORIENTED DISTRIBUTED DATA INTE-GRATION MODEL

Z. G. Ni, L Li, J. Luo, J. Liu, X. W. Zhou, Institute of Computer Application,
China Academy of Engineering Physics, Mianyang City, China

A. LARGE SCIENTIFIC EXPERIMENTAL FACILITY'S CONTROL SYSTEM

- Heterogeneous control systems
- Two-tier architecture based ethernet structure
- Use EPICS or TANGO as software middleware

B. QUESTION

- Communication between the early and current systems
- Adapt to changes in requirements with zero programming

C. RELATED TECHNOLOGY

- RPC and EDA: Thrift or Tango
- JavaScript Engine: Elk
- Realtime Database: LevelDB

D. COMPONENT-ORIENTED DISTRIBUT-ED DATA INTEGRATION MODEL

- CICADA: the Component of Integrated Control And Data Acquisition
- The Entity of CICADA
- Connection between CICADA Entities

A. LARGE SCIENTIFIC EXPERIMENTAL FACILITY'S CONTROL SYSTEM

- Large scientific experimental devices generally consist of dozens of heterogeneous systems, each of which is also an independent control system.
- a two-tier architecture consisting of a monitoring layer of the network structure and a control layer of the fieldbus structure.
- the integrated control system mainly used by large-scale laboratories and scientific research institutions around the world is EPICS or TANGO.

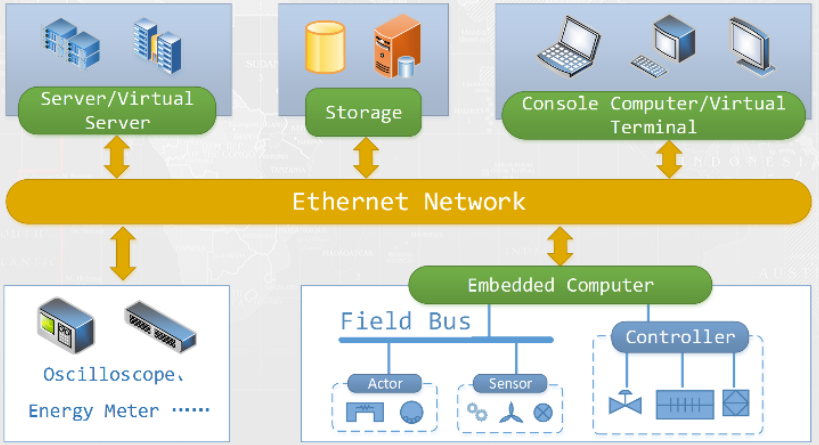

Figure 1: The control system architecture of the typical large scientific facilities

B. QUESTION?

- A few years later, the scientific experimental device will inevitably bring about the continuous upgrading of the system. How to adapt the control system and software to this change is a great challenge. How to realize the communication between the early and current systems is a technical problem, which is a problem that this article needs to solve.
- We have to modify the code, compile, and test run, and the debugging time for software developers is very short, so the skills of software technicians are very high. If you can adapt to changes in requirements with zero programming, this is a great thing.

C. RELATED TECHNOLOGY

- RPC and EDA: Thrift or Tango
  1. an interprocess communication technique
  2. Event-driven architecture makes it possible to exchange information in real time or near real time.
- JavaScript Engine: Elk
  1. implements a small but usable subset of ES6.
- Realtime Database: LevelDB
  1. a fast key-value storage library

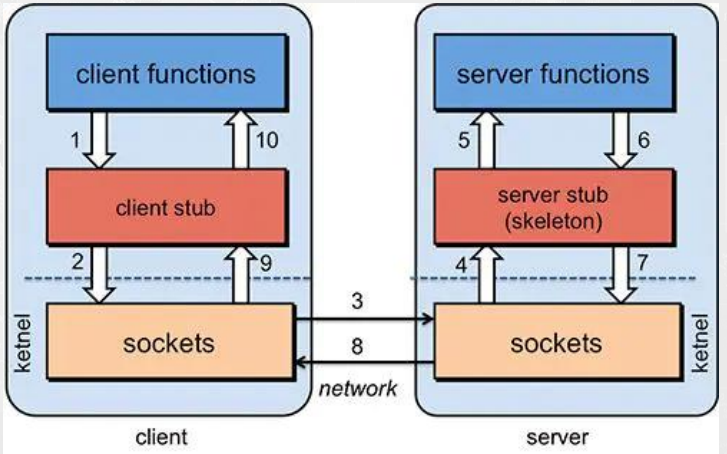

Figure 2: The software architecture of Thrift

D. CICADA: COMPONENT OF INTEGRATED CONTROL AND DATA ACQUISITION

- Data is stored in a real-time database, control logic is stored in JavaScript scripts, and the script engine is used to update data and dispatch commands regularly.

① It can exist as a distributed service in the local area network and be called by other component instances;

② It can also be used as a service access module of the client software to access other component instances;

③ It can also be used as a server and implemented as an IO device control server;

④ Replacing different RPC modules can be used as a bridge between different middleware software.

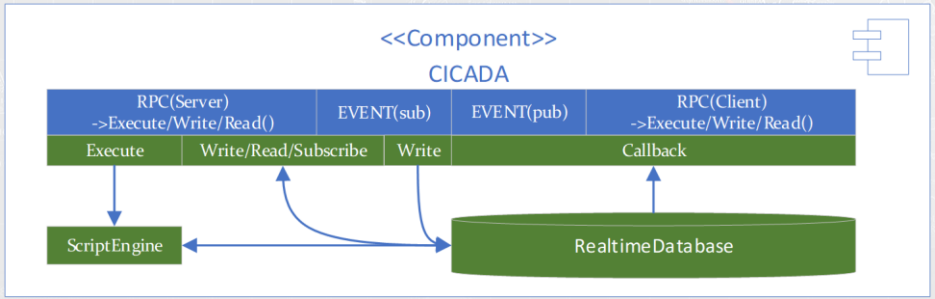

Figure 3: The composition structure of Component of Integrated Control And Data Acquisition.

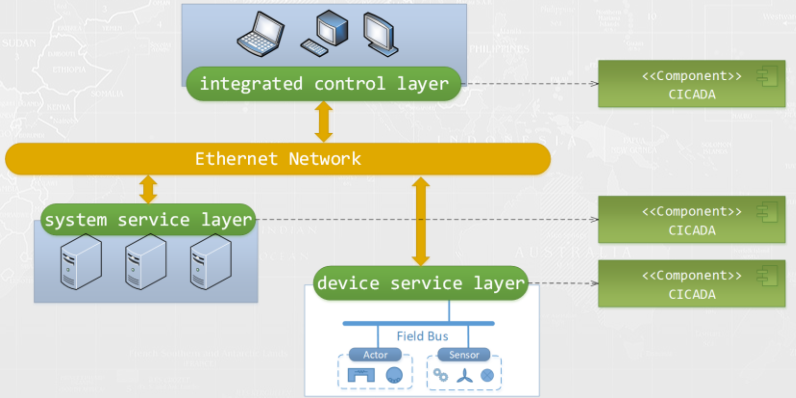

Figure 4: Use CICADA in the three-tier control software architecture.

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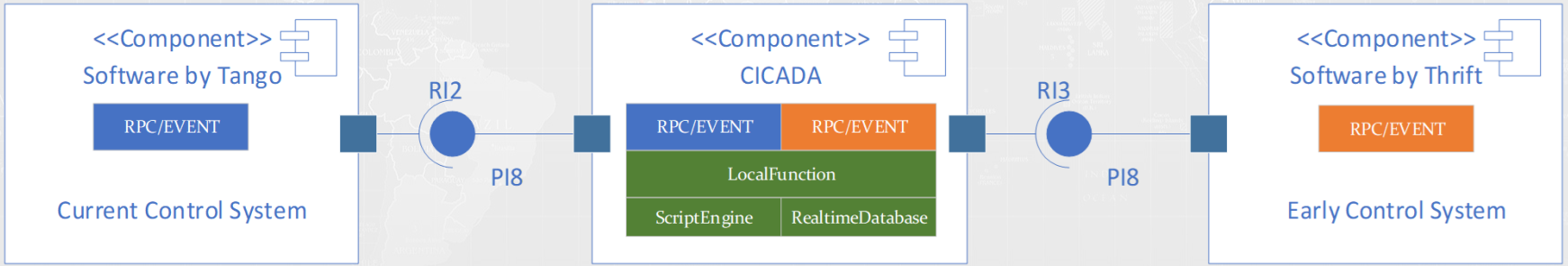

Figure 5: Use CICADA as a bridge between early and current control systems.