**Diagnosis Integrated Control and Intelligent Operation in Inertial Confinement Fusion**

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For Inertial Confinement Fusion experiments, different kinds of diagnosis with hundreds of channels are used to inspect the target area. The whole fusion process and abundant of physics information would be measured by these diagnoses which are important to understand the physics phenomenon and to achieve the ignition. The application of the integrated computer control system (ICCS) will enhance the experiment efficiency, safety, and reliability, especially for the huge laser facility. Compare to the laser facility, the diagnostic configurations are more flexible and will be adjusted for different experimental design, which is a big challenge for the design of the diagnosis integrated control system. A novel diagnosis integrated control system has been designed for ShenGuang laser facility. The system adopts BS architecture, and the novel micro-service framework is used to improve the scalability, maintainability, and reliability of the system. For system service layer, a visual drag-and-drop programming tool has been developed. The diagnostic operation process can be quickly edited and packaged according to the experimental requirements. The system runs in a process-driven way. Coupling to the operation nodes of the laser facility, the sub-processes of each diagnosis are automatically implemented. Tango-controls middleware is used in the device service layer. The diagnosis units are abstracted and secondary developed according to the process control requirements. Except the hardware of the diagnosis, the image recognition and data statistics modules, as virtual units, are developed under the tango-controls framework and coupled to the corresponding device. These AI techniques are used for the diagnosis aiming, parameters setup and data pre-analysis. In the future, the 3D visualized virtual diagnosis will also be coupled to the control system, like ‘digital twiner’, to show the real-time status of the diagnosis and to improve the safety of the experiments. At present, the system V1.0 has been released and applied to the experiments.