CLAIMS

1. A system for tuning a process performed on a substrate in a process module of a substrate processing system, the system comprising:

a first controller connected to the process module of the substrate processing system, wherein the first controller is configured to provide steps to perform the process on the substrate in the process module;

a plurality of devices of the process module connected to a first network associated with the process module, the plurality of devices configured to perform operations associated with the process; and

a second controller connected to the process module, the second controller comprising:

an interface configured to receive selected inputs from the plurality of devices via the first network and to provide selected outputs to the plurality of devices via the first network to tune the process, wherein the selected inputs are indicative of the operations of the plurality of devices; and

a processor configured to execute instructions to define the interface, process the selected inputs received during a step of the process, and generate the selected outputs based on the processed selected inputs to adjust one or more of the operations of one or more of the plurality of devices to tune the process during the step of the process.

2. The system of claim 1 wherein the first controller is configured to provide a graphical user interface to select the inputs and outputs of the interface.

3. The system of claim 1 wherein:

the first controller is configured to execute a first application or a second application to provide the steps to perform the process on the substrate in the process module; and

the instructions executed by the processor of the second controller to tune the process during the step of the process is independent of the first and second applications.

4. The system of claim 1 wherein:

the instructions comprise a first set of instructions and a second set of instructions; and

the processor of the second controller is configured to execute the first and second sets of instructions interchangeably to tune the process during the step of the process.

5. The system of claim 1 wherein:

the first controller is configured to execute an application to provide the steps to perform the process on the substrate in the process module; and

the second controller is configured to swap the instructions with another set of instructions to tune the process during the step of the process while the first controller executes the application unchanged.

6. The system of claim 1 further comprising a master device connected to the first controller and the first network, the master device configured to:

receive the selected inputs via the first network;

receive the selected outputs from the interface; and

transmit the selected outputs to the plurality of devices via the first network.

7. The system of claim 6 wherein:

the master device comprises a physical layer and a data link layer of the Open Systems Interconnection (OSI) model; and

the processor of the second controller is configured to execute the instructions in a network layer of the OSI model.

8. The system of claim 7 wherein:

the first controller is configured to execute an application in an application layer of the OSI model to provide the steps to perform the process; and

the processor of the second controller does not execute the instructions in the application layer.

9. The system of claim 1 wherein:

the plurality of devices comprises sensors and actuators associated with the process module;

the sensors are configured to sense parameters associated with the process; and

the actuators are configured to perform the operations associated with the process.

10. The system of claim 1 wherein the instructions comprise a plurality of models for tuning the process, and when the instructions are executed by the processor of the second controller, the second controller is configured to:

adjust the one or more of the operations of the one or more of the plurality of devices using a first model of the plurality of models during the step of the process;

receive from the plurality of devices, after the adjustment, a second set of the selected inputs via the first network during the step of the process, the second set of the selected inputs is indicative of the operations of the plurality of devices after the adjustment; and

adjust, based on the second set of the selected inputs, the one or more of the operations of the one or more of the plurality of devices using a second model of the plurality of models during the step of the process.

11. The system of claim 1 wherein:

the processor of the second controller is configured to communicate an endpoint of the step of the process to the first controller via the interface; and

the first controller is configured to advance the process to a next step of the process or end the process in response to the communicated endpoint.

12. The system of claim 1 wherein:

the second controller comprises a second interface;

the processor of the second controller is configured to communicate an endpoint of the step of the process to the first controller via the second interface; and

the first controller is configured to advance the process to a next step of the process or end the process in response to the communicated endpoint.

13. The system of claim 12 wherein the second interface comprises a serial interface.

14. The system of claim 12 wherein the second interface comprises a universal serial bus (USB) interface.

15. The system of claim 1 further comprising a second network, wherein:

the second controller and the plurality of devices are connected to the second network; and

the processor of the second controller is configured to receive additional data from the plurality of devices via the second network, process the additional data, and generate the selected outputs based on the processed additional data.

16. The system of claim 15 wherein the processor of the second controller is configured to receive the additional data comprising bursts of compressed data from the plurality of devices via a User Datagram Protocol (UDP) of a transport layer of the Open Systems Interconnection (OSI) model.

17. The system of claim 15 wherein the instructions comprise a plurality of models for tuning the process, and when the instructions are executed by the processor of the second controller, the second controller is configured to:

adjust the one or more of the operations of the one or more of the plurality of devices using a first model of the plurality of models during the step of the process;

receive from the plurality of devices, after the adjustment, a second set of the selected inputs via the first network and a second set of the additional data via the second network during the step of the process, the second sets of the selected inputs and the additional data indicative of the operations of the plurality of devices after the adjustment; and

adjust, based on the second sets of the selected inputs and the additional data, the one or more of the operations of the one or more of the plurality of devices using a second model of the plurality of models during the step of the process.

18. The system of claim 15 wherein the interface comprises a physical layer and a data link layer of the Open Systems Interconnection (OSI) model and wherein the processor of the second controller is configured to execute a first portion of the instructions associated with the first network in a network layer of the OSI model and a second portion of the instructions associated with the second network in a transport layer of the OSI model.

19. The system of claim 15 wherein:

one of the plurality of devices comprises a radio frequency (RF) power source and a matching circuit configured to supply RF power to the process module to generate plasma in the process module during the process; and

one of the selected outputs adjusts a frequency of the RF power source to adjust a profile of the plasma during the step of the process.

20. The system of claim 15 wherein:

one of the plurality of devices comprises a radio frequency (RF) power source and a matching circuit configured to supply RF power to the process module to generate plasma in the process module during the process; and

one of the selected outputs adjusts a frequency of the RF power source to adjust a profile of the plasma during the step of the process and to match the frequency in a second process module of the substrate processing system during the step of the process performed in the second process module.

21. The system of claim 1 wherein:

one of the plurality of devices comprises a temperature control device configured to control a temperature of a component of the process module during the step of the process; and

one of the selected outputs adjusts the temperature of the component during the step of the process.

22. The system of claim 21 wherein:

the temperature control device comprises a temperature controller, one or more heaters disposed in at least one of a substrate support and a showerhead of the process module, and one or more cooling channels disposed in at least one of the substrate support and the showerhead of the process module; and

the component comprises at least one of the substrate support and the showerhead of the process module.

23. The system of claim 1 wherein:

one of the plurality of devices comprises a mass flow controller configured to control a flow rate of a gas supplied to the process module during the process; and

one of the selected outputs adjusts the flow rate of the gas during the step of the process.

24. The system of claim 1 wherein:

one of the plurality of devices comprises a pressure controller configured to control a pressure of a gas supplied to the process module during the process; and

one of the selected outputs adjusts the pressure of the gas during the step of the process.

25. The system of claim 1 wherein:

one of the plurality of devices comprises a tunable edge ring system configured to adjust a shape of plasma around edges of the substrate during the process; and

one of the selected outputs adjusts the tunable edge ring system during the step of the process.

26. The system of claim 25 wherein adjusting the tunable edge ring system comprises adjusting an actuator associated with the tunable edge ring system, adjusting a radio frequency power supplied to the tunable edge ring system, or both.

27. The system of claim 25 wherein adjusting the tunable edge ring system comprises adjusting a radio frequency (RF) power supplied to the tunable edge ring system based on RF power supplied to the process module to generate the plasma in the process module during the process.

28. The system of claim 1 wherein the first and second controllers are implemented by first and second processor cores, respectively.