

controller devices, ability to accommodate dynamic inputs and/or generate dynamic output may be desirable. Configuring and programming controller devices to accommodate dynamic inputs or outputs requires writing or rewriting the code for all controller devices, and is very challenging for average users because one needs to understand hierarchies of the peripherals and suitable controller devices for the peripherals, memorize coding commands, utilize proper calling syntaxes, and the like. In the absence of accurate code, a program will fail to run or produce errors. Further, rewriting programs every time a modification in input or output is required, can be cumbersome and excessively time consuming.

[0005] As the “Internet of Things (IoT)” grows, more and more such controller devices are connected to one another and/or to the Internet. Groups of such devices may communicate with one another and/or to a gateway such that the gateway becomes a proxy for the Internet communications for the so-called edge devices. The edge devices may communicate through one or more gateways, or directly as independent devices. Within a group, all the devices (gateway and edge) must be programmed in a compatible manner to facilitate interoperability. Managing compatibility every time customization is required may also be excessively time consuming.

[0006] Thus, there is a need in the art for creating and managing controller based remote solutions.

SUMMARY OF THE INVENTION

[0007] Embodiments of the present invention generally relate to a method and apparatus for creating and managing controller based remote solutions, substantially as shown in and/or described in connection with at least one of the figures, as set forth more completely in the claims.

[0007a] According to a first aspect of the present invention, there is provided a computer-implemented method for creating a controller based remote solution, including: receiving, at a code virtualization server (CVS), via a graphical user interface (GUI) of a user device remote to the CVS, at least one of a selection of a blank template in which a controller device is selected, and a solution corresponding to a conventional system is built via the GUI, or a selection of a pre-defined solution including a controller device installed in a conventional system, the controller device operable to monitor and control the conventional system, wherein the controller device and the conventional system are remote to the user device and the CVS; receiving, via the GUI, at the CVS, at least one parameter of the selected solution, the at least one parameter including at least one of a monitored parameter of the conventional system, a condition for the monitored parameter, or a remote program parameter for executing a remote program, wherein the remote program is executed remote to the user device and the controller device; generating, on the CVS, an automatically generated controller program (AGCP) for execution by the controller device based on the selected solution, the AGCP including a call for executing the

remote program based on the condition being met; sending the AGCP for installation on the controller device; comparing the selected solution and the at least one parameter with at least one of a solutions library, a hardware library, or a process library; determining, at the CVS, based on the comparing, if modification of at least one of the selected solution, the at least one parameter, the solutions library, the hardware library, or the process library is required; and sending the required modification for presentation via the GUI on the user device.

[0007b] According to a second aspect of the present invention, there is provided an apparatus for a controller based remote solution, including: at least one processor; and a memory including executable instructions, which when executed using the at least one processor, cause execution of a method including: receiving, at a code virtualization server (CVS), via a graphical user interface (GUI) of a user device remote to the CVS, at least one of a selection of a blank template in which a controller device is selected, and a solution corresponding to a conventional system is built via the GUI, or a selection of a pre-defined solution including a controller device installed in a conventional system, the controller device operable to monitor and control the conventional system, wherein the controller device and the conventional system are remote to the user device and the CVS, receiving, via the GUI, at the CVS, at least one parameter of the selected solution, the at least one parameter including at least one of a monitored parameter of the conventional system, a condition for the monitored parameter, or a remote program parameter for executing a remote program, wherein the remote program is executed remote to the user device and the controller device, generating, on the CVS, an automatically generated controller program (AGCP) for execution by the controller device based on the selected solution, the AGCP including a call for executing the remote program based on the condition being met, sending the AGCP for installation on the controller device; comparing the selected solution and the at least one parameter with at least one of a solutions library, a hardware library, or a process library; determining, at the CVS, based on the comparing, if modification of at least one of the selected solution, the at least one parameter, the solutions library, the hardware library, or the process library is required; and sending the required modification for presentation via the GUI on the user device.

[0008] These and other features and advantages of the present disclosure may be appreciated from a review of the following detailed description of the present

CLAIMS:

1. A computer-implemented method for creating a controller based remote solution, comprising:

receiving, at a code virtualization server (CVS), via a graphical user interface (GUI) of a user device remote to the CVS, at least one of

a selection of a blank template in which a controller device is selected, and a solution corresponding to a conventional system is built via the GUI, or

a selection of a pre-defined solution comprising a controller device installed in a conventional system,

the controller device operable to monitor and control the conventional system, wherein the controller device and the conventional system are remote to the user device and the CVS;

receiving, via the GUI, at the CVS, at least one parameter of the selected solution, the at least one parameter comprising at least one of a monitored parameter of the conventional system, a condition for the monitored parameter, or a remote program parameter for executing a remote program, wherein the remote program is executed remote to the user device and the controller device;

generating, on the CVS, an automatically generated controller program (AGCP) for execution by the controller device based on the selected solution, the AGCP comprising a call for executing the remote program based on the condition being met;

sending the AGCP for installation on the controller device;

comparing the selected solution and the at least one parameter with at least one of a solutions library, a hardware library, or a process library;

determining, at the CVS, based on the comparing, if modification of at least one of the selected solution, the at least one parameter, the solutions library, the hardware library, or the process library is required; and

sending the required modification for presentation via the GUI on the user device.

2. The method of claim 1 further comprising:
 - generating, at the CVS, GUI information for displaying graphically, the at least one parameter, and a monitored data of the monitored parameter;
 - sending the GUI information for display via the GUI on the user device;
 - receiving at the CVS, in response to the GUI information displayed via the GUI on the user device, an input to modify the at least one parameter;
 - modifying the AGCP according to the input to modify the at least one parameter; and
 - sending the modified AGCP for installation on the controller device,wherein the GUI information is sent for display via the GUI upon at least one of the monitored data being received from the electronic device, or upon a request received via the GUI of the user device.
3. The method of claim 2, further comprising:
 - receiving, at the CVS, the call from the controller device to execute the remote program, the call comprising the remote program parameter;
 - executing the remote program on the CVS; and
 - if the data is generated as a result of executing the remote program, sending the data to the controller device, wherein the call further comprises instructions to execute a remote service on a device remote to the CVS, the user device, and the controller device, and wherein the remote program parameters comprise parameters to execute the remote service.
4. The method of claim 1, wherein the GUI of the user device is generated by a GUI generation module on the CVS.
5. The method of claim 4, further comprising:
 - generating a modification GUI for display on the user device, the modification GUI comprising a first option for displaying at least one of parameter data from a sensor or an actuator, the condition, the remote program parameter, or the remote program,

receiving input for changing any one or more of the condition, and a second option for receiving input for changing at least one of the parameter, the condition, the remote program parameter, the remote program; and

sending the modification GUI to the user device for display on the user device,

wherein the controller device monitors the conventional system using the sensor coupled thereto, and controls the conventional system using the actuator coupled thereto.

6. The method of claim 5, further comprising:

generating, on the GUI generation module, a modified AGCP for execution by the controller device, the modified AGCP comprising a call for executing the remote program based on the condition being met; and

sending the modified AGCP for installation on the controller device,

wherein either the GUI generation module is implemented on the CVS, or the GUI generation module is implemented on a GUI generation device remote to the CVS, the user device, and the controller device, and

wherein the GUI generation device is communicably coupled to at least one of the CVS, the user device, or the controller device.

7. The method of claim 1, wherein the at least one parameter comprises a boundary related to the monitored parameter, wherein the monitored parameter is monitored by an electronic device communicably coupled to the controller device, wherein the electronic device is configured to actuate the monitored parameter, and wherein the AGCP further comprises code for actuating the monitored parameter of the conventional system based on the condition being met.

8. An apparatus for a controller based remote solution, comprising:

at least one processor; and

a memory comprising executable instructions, which when executed using the at least one processor, cause execution of a method comprising:

receiving, at a code virtualization server (CVS), via a graphical user interface (GUI) of a user device remote to the CVS, at least one of a selection of

a blank template in which a controller device is selected, and a solution corresponding to a conventional system is built via the GUI, or

a selection of a pre-defined solution comprising a controller device installed in a conventional system,

the controller device operable to monitor and control the conventional system, wherein the controller device and the conventional system are remote to the user device and the CVS,

receiving, via the GUI, at the CVS, at least one parameter of the selected solution, the at least one parameter comprising at least one of a monitored parameter of the conventional system, a condition for the monitored parameter, or a remote program parameter for executing a remote program, wherein the remote program is executed remote to the user device and the controller device,

generating, on the CVS, an automatically generated controller program (AGCP) for execution by the controller device based on the selected solution, the AGCP comprising a call for executing the remote program based on the condition being met,

sending the AGCP for installation on the controller device,

comparing the selected solution and the at least one parameter with at least one of a solutions library, a hardware library, or a process library,

determining, at the CVS, based on the comparing, if modification of at least one of the selected solution, the at least one parameter, the solutions library, the hardware library, or the process library is required, and

sending the required modification for presentation via the GUI on the user device.

9. The apparatus of claim 8, wherein the method further comprises:

generating, at the CVS, GUI information for displaying graphically, the at least one parameter, and a monitored data of the monitored parameter,

sending the GUI information for display via the GUI on the user device,

receiving at the CVS, in response to the GUI information displayed via the GUI on the user device, an input to modify the at least one parameter,
modifying the AGCP according to the input to modify the at least one parameter, and
sending the modified AGCP for installation on the controller device,
wherein the GUI information is sent for display via the GUI upon at least one of the monitored data being received from the electronic device, or upon a request received via the GUI of the user device.

10. The apparatus of claim 9, wherein the method further comprises:

receiving, at the CVS, the call from the controller device to execute the remote program, the call comprising the remote program parameter,
executing the remote program on the CVS, and

if the data is generated as a result of executing the remote program, sending the data to the controller device, wherein the call further comprises instructions to execute a remote service on a device remote to the CVS, the user device, and the controller device, and wherein the remote program parameters comprise parameters to execute the remote service.

11. The apparatus of claim 8, wherein the GUI of the user device is generated by a GUI generation module.

12. The apparatus of claim 11, wherein method further comprises:

generating a modification GUI for display on the user device, the modification GUI comprising a first option for displaying at least one of parameter data from a sensor or an actuator, the condition, the remote program parameter, or the remote program,

receiving input for changing any one or more of the condition, and a second option for receiving input for changing at least one of the parameter, the condition, the remote program parameter, the remote program; and

sending the modification GUI to the user device for display on the user device,

wherein the controller device monitors the conventional system using the sensor coupled thereto, and controls the conventional system using the actuator coupled thereto.

13. The apparatus of claim 12, wherein the method further comprises:

generating, on the GUI generation module, a modified AGCP for execution by the controller device, the modified AGCP comprising a call for executing the remote program based on the condition being met; and

sending the modified AGCP for installation on the controller device,

wherein either the GUI generation module is implemented on the CVS, or the GUI generation module is implemented on a GUI generation device remote to the CVS, the user device, and the controller device, and wherein the GUI generation device is communicably coupled to at least one of the CVS, the user device, or the controller device.