SUMMARY

[0005] Embodiments described herein generally relate to a method, apparatus and system for providing end to end solutions for devices of an end to end system, and more specfically, for assisting the provisioning of end to end systems and enabling the ability to automatically generate end to end code, for example, for a complete Internet of Things (IoT) system supporting multiple architecture options, connectivity options, scaling provisions and update capabilities, substantially as shown in and/or described in connection with at least one of the figures, as set forth more completely in the claims.

[0006] According to a first aspect of the present disclosure, there is provided a method for assisted provisioning of an end to end network, including: in response to a user request, providing a first interface menu for enabling an initial user input of at least one of configuration information and application logic information, which defines workflow logic, for the end to end network; in response to the user completing the input of the at least one of the configuration information and application logic information for the end to end network, automatically providing a second interface menu for enabling a subsequent user input of at least one of configuration information and application logic information, which defines workflow logic for applications, for at least one device of the end to end network; continuing to automatically provide subsequent interface menus for receiving at least one of configuration information and application logic information for all devices and interconnections required to establish the end to end network; wherein a subsequent interface menu provided for input can be dependent upon an input made to a previously provided interface menu, and an order of interface menus automatically provided guides a user through a provisioning of the end to end network without the need to enter programming code; automatically generating programming code from the input of the at least one of configuration information and application logic information for each of the devices required to establish the end to end network; analyzing operating data of at least one of the devices of the end to end network; and predicting a future behavior of the at least one of the devices of the end to end network using the analyzed data.

[0007] In some embodiments the method can further include at least one of automatically generating programming code from the input configuration information and application logic information for each of the devices required to establilsh the end to end network and deploying the generated programming code by sending the generated programming code to respective ones of each of the devices for configuring the devices to establish the end to end network.

[0008] In some embodiments the method can further include at least one of analyzing operating data of at least one of the devices of the end to end network and predicting a future behavior of the at least one of the devices of the end to end network using the analyzed data, at least one of monitoring and analyzing operating data of the devices of the end to end network and reprogramming at least one of the devices of the end to end network based on the at least one of the monitored and analyzed data, and providing a scaling function such that the at least one of the configuration information and application logic information does not have to be input for duplicate ones of the at least one of the devices of the end to end network. In some embodiments the method can further include determining at least one of the configuration information and application logic information using at least one of machine learning, linear regression analysis and neural networks.

[0009] According to a second aspect of the present disclosure, there is provided a method for assisted code provisioning of an end to end network, including: receiving at least one of configuration information and application logic information, which defines workflow logic for applications, for devices required to establish the end to end network determined using data analysis methods including at least one of machine learning, linear regression analysis and neural networks; automatically generating programming code from the received configuration information for each of the devices required to establilsh the end to end network; and deploying the generated programming code by communicating the generated programming code to respective ones of each of the devices for configuring the devices to establish the end to end network; and providing an interface to a user for inputting supplemental configuration information and application logic information for each of the devices required to establish the end to end network.

[0010] In some embodiments the method further includes providing an interface to a user for inputting the configuration information and application logic information for each of the devices required to establilsh the end to end network.

[0011] According to a third aspect of the present disclosure, there is provided an apparatus for assisted provisioning of an end to end network, including: a processor; and a memory coupled to the processor, the memory having stored therein at least one of programs or instructions executable by the processor to configure the apparatus to: automatically provide a first interface menu for enabling an initial user input of at least one of configuration information and application logic information, which defines workflow logic, for the end to end network; in response to the user completing the input of the at least one of the configuration information and application logic information for the end to end network, automatically provide a

second interface menu for enabling a subsequent user input of at least one of configuration information and application logic information, which defines workflow logic for applications, for at least one of the devices of the end to end network; continue to automatically provide subsequent interface menus for receiving at least one of configuration information and application logic information for all devices and interconnections required to establish the end to end network; and automatically generate programming code from the received at least one of the configuration information and application logic information for each of the devices required, deploy the generated programming code by sending the generated programming code to respective ones of each of the devices for configuring the devices to establilsh the end to end network; wherein a subsequent interface menu provided for input can be dependent upon an input made to a previously provided interface menu and an order of interface menus automatically provided guides a user through logically ordered provisioning of each of the devices of the end to end network.

[0012] In some embodiments, the apparatus can further include a deployment module to deploy the generated programming code by sending the generated programming code to respective ones of each of the devices for configuring the devices to establish the end to end network.

[0013] In some embodiments the apparatus can further be configured to at least one analyze operating data of at least one of the devices of the end to end network and predict a future behavior of the at least one of the devices of the end to end network using the analyzed data, at least one of monitor and analyze operating data of the devices of the end to end network and reprogram at least one of the devices of the end to end network based on the at least one of the monitored and analyzed data, provide a scaling function such that the at least one of the configuration information and application logic information does not have to be input for duplicate ones of the at least one of the devices of the end to end network and generate a graphical user interface for enabling a user to input the configuration information and the application logic information for the devices required to establish the end to end network.

[0014] In some embodiments of the apparatus, the end to end network can comprise an internet-of-things (IoT) end to end network and at least some of the devices comprise IoT devices. In some embodiments of the apparatus, the devices of the end to end network can comprise multiple architecture options, connectivity options, scaling options and programming languages and the code generator module generates respective code for each of the devices in accordance with how each of the devices is provisioned.

[0015] According to a fourth aspect of the present disclosure, there is provided a non-transitory machine-readable medium having stored thereon at least one program, the at least one program including instructions which, when executed by a processor, cause the processor to perform a method in a processor based system for assisted code provisioning of an end to end network, including: in response to a user request, providing a first interface menu for enabling an initial user input of at least one of configuration information and application logic information, which defines workflow logic, for the end to end network; in response to the user completing the input of the at least one of the configuration information and application logic information for the end to end network, automatically providing a second interface menu for enabling a subsequent user input of at least one of configuration information and application logic information, which defines workflow logic for applications, for at least one device of the end to end network; continuing to automatically provide subsequent interface menus for receiving at least one of configuration information and application logic information for all devices and interconnections required to establish the end to end network; wherein a subsequent interface menu provided for input can be dependent upon an input made to a previously provided interface menu, and an order of interface menus automatically provided guides a user through a logically ordered provisioning of the end to end network without the need to enter programming code; automatically generating programming code from the input at least one of configuration information and application logic information for each of the devices required to establish the end to end network; and deploying the generated programming code by sending the generated programming code to respective ones of each of the devices for configuring the devices to establish the end to end network.

[0016] In some embodiments the method performed by the processor when executing the program can further include at least one of automatically generating programming code from the input configuration information and application logic information for each of the devices required to establilsh the end to end network and deploying the generated programming code by sending the generated programming code to respective ones of each of the devices for configuring the devices to establish the end to end network.

[0017] In some embodiments the method performed by the processor when executing the program can further include at least one of analyzing operating data of at least one of the devices of the end to end network and predicting a future behavior of the at least one of the devices of the end to end network using the analyzed data, at least one of monitoring and analyzing operating data of the devices of the end to end network and reprogramming at least one of the devices of the end to end

network based on the at least one of the monitored and analyzed data, and providing a scaling function such that the at least one of the configuration information and application logic information does not have to be input for duplicate ones of the at least one of the devices of the end to end network. In some embodiments the method can further include determining at least one of the configuration information and application logic information using at least one of machine learning, linear regression analysis and neural networks.

[0018] According to a fifth aspect of the present disclosure, there is provided a non-transitory machine-readable medium having stored thereon at least one program, the at least one program including instructions which, when executed by a processor, cause the processor to perform a method in a processor based system for assisted code provisioning of an end to end network, including: receiving at least one of configuration information and application logic information, which defines workflow logic for applications, for devices required to establish the end to end network determined using data analysis methods including at least one of machine learning, linear regression analysis and neural networks; automatically generating programming code from the received at least one of configuration information and application logic information for each of the devices required to establish the end to end network; deploying the generated programming code by communicating the generated programming code to respective ones of each of the devices for configuring the devices to establish the end to end network; and providing an interface for receiving input of supplemental configuration information and application logic information for each of the devices required to establish the end to end network.

[0019] In some embodiments, the method performed by the processor when executing the program further includes providing an interface to a user for inputting the configuration information and application logic information for each of the devices required to establilsh the end to end network.

[0020] These and other features and advantages of the present disclosure may be appreciated from a review of the following detailed description of the present disclosure, along with the accompanying figures in which like reference numerals refer to like parts throughout.

Claims:

1. A method for assisted provisioning of an end to end network, comprising:

in response to a user request, providing a first interface menu for enabling an initial user input of at least one of configuration information and application logic information, which defines workflow logic, for the end to end network;

in response to the user completing the input of the at least one of the configuration information and application logic information for the end to end network, automatically providing a second interface menu for enabling a subsequent user input of at least one of configuration information and application logic information, which defines workflow logic for applications, for at least one device of the end to end network;

continuing to automatically provide subsequent interface menus for receiving at least one of configuration information and application logic information for all devices and interconnections required to establish the end to end network;

wherein a subsequent interface menu provided for input can be dependent upon an input made to a previously provided interface menu, and an order of interface menus automatically provided guides a user through a provisioning of the end to end network without the need to enter programming code;

automatically generating programming code from the input of the at least one of configuration information and application logic information for each of the devices required to establish the end to end network;

analyzing operating data of at least one of the devices of the end to end network; and

predicting a future behavior of the at least one of the devices of the end to end network using the analyzed data.

2. The method of claim 1, further comprising:

deploying the generated programming code by sending the generated programming code to respective ones of each of the devices for configuring the devices to establish the end to end network.

3. The method of claim 1, further comprising:

analyzing operating data of the end to end network; and

predicting a future behavior of the end to end network using the analyzed data.

4. The method of claim 1, further comprising:

at least one of monitoring and analyzing operating data of the devices of the end to end network; and

reprogramming at least one of the devices of the end to end network based on the at least one of the monitored and analyzed data.

5. The method of claim 1, wherein operating data of the end to end network is made available for at least one of download, visual display and sending to another system.

6. The method of claim 1, further comprising:

providing a scaling function such that the at least one of the configuration information and application logic information does not have to be input for duplicate ones of the at least one of the devices of the end to end network.

7. The method of claim 1, wherein the at least one of the configuration information and application logic information is further determined using data analysis methods including at least one of machine learning, linear regression analysis and neural networks.

8. A method for assisted code provisioning of an end to end network, comprising:

receiving at least one of configuration information and application logic information, which defines workflow logic for applications, for devices required to establish the end to end network determined using data analysis methods including at least one of machine learning, linear regression analysis and neural networks;

automatically generating programming code from the received configuration information for each of the devices required to establilsh the end to end network; and

deploying the generated programming code by communicating the generated programming code to respective ones of each of the devices for configuring the devices to establish the end to end network; and

providing an interface to a user for inputting supplemental configuration information and application logic information for each of the devices required to establish the end to end network.

9. The method of claim 8, further comprising:

analyzing operating data of at least one of the devices of the end to end network; and

predicting a future behavior of the at least one of the devices of the end to end network using the analyzed data.

10. The method of claim 8, further comprising:

analyzing operating data of the end to end network; and

predicting a future behavior of the end to end network using the analyzed data.

11. The method of claim 8, further comprising:

at least one of monitoring and analyzing operating data of the devices of the end to end network; and

reprogramming at least one of the devices of the end to end network based on the at least one of the monitored and analyzed data.

12. The method of claim 8, wherein operating data of the end to end network is made available for download.

13. The method of claim 8, further comprising:

providing a scaling function such that the at least one of the configuration information and application logic information does not have to be input for duplicate ones of the at least one of the devices of the end to end network.

14. An apparatus for assisted provisioning of an end to end network, comprising:

a processor; and

a memory coupled to the processor, the memory having stored therein at least one of programs or instructions executable by the processor to configure the apparatus to:

automatically provide a first interface menu for enabling an initial user input of at least one of configuration information and application logic information, which defines workflow logic, for the end to end network;

in response to the user completing the input of the at least one of the configuration information and application logic information for the end to end network, automatically provide a second interface menu for enabling a subsequent user input of at least one of configuration information and application logic information, which defines workflow logic for applications, for at least one of the devices of the end to end network;

continue to automatically provide subsequent interface menus for receiving at least one of configuration information and application logic information for all devices and interconnections required to establish the end to end network; and

automatically generate programming code from the received at least one of the configuration information and application logic information for each of the devices required

deploy the generated programming code by sending the generated programming code to respective ones of each of the devices for configuring the devices to establilsh the end to end network;

wherein a subsequent interface menu provided for input can be dependent upon an input made to a previously provided interface menu and an order of interface menus automatically provided guides a user through logically ordered provisioning of each of the devices of the end to end network.

15. The apparatus of claim 14, wherein the apparatus is further configured to:

analyze operating data of at least one of the devices of the end to end network; and

predict a future behavior of the at least one of the devices of the end to end network using the analyzed data.

16. The apparatus of claim 14, wherein the apparatus is further configured to:

at least one of monitor and analyze operating data of the devices of the end to end network; and

reprogram at least one of the devices of the end to end network based on the at least one of the monitored and analyzed data.

17. The apparatus of claim 14, wherein the apparatus is further configured to:

provide a scaling function such that the at least one of the configuration information and application logic information does not have to be input for duplicate ones of the at least one of the devices of the end to end network.

18. The apparatus of claim 14,wherein the apparatus is further configured to:

generate a graphical user interface for enabling a user to input the at least one of the configuration information and the application logic information for the devices required to establish the end to end network.

19. The apparatus of claim 14, wherein the end to end network comprises an internet-of-things (IoT) end to end network and at least some of the devices comprise IoT devices.

20. The apparatus of claim 14, wherein the devices of the end to end network comprise multiple architecture options, connectivity options, scaling options and programming languages and the code generator module generates respective code for each of the devices in accordance with how each of the devices is provisioned.

21. A non-transitory machine-readable medium having stored thereon at least one program, the at least one program including instructions which, when executed by a processor, cause the processor to perform a method in a processor based system for assisted code provisioning of an end to end network, comprising:

in response to a user request, providing a first interface menu for enabling an initial user input of at least one of configuration information and application logic information, which defines workflow logic, for the end to end network;

in response to the user completing the input of the at least one of the configuration information and application logic information for the end to end network, automatically providing a second interface menu for enabling a subsequent user input of at least one of configuration information and application logic

information, which defines workflow logic for applications, for at least one device of the end to end network;

continuing to automatically provide subsequent interface menus for receiving at least one of configuration information and application logic information for all devices and interconnections required to establish the end to end network;

wherein a subsequent interface menu provided for input can be dependent upon an input made to a previously provided interface menu, and an order of interface menus automatically provided guides a user through a logically ordered provisioning of the end to end network without the need to enter programming code;

automatically generating programming code from the input at least one of configuration information and application logic information for each of the devices required to establish the end to end network; and

deploying the generated programming code by sending the generated programming code to respective ones of each of the devices for configuring the devices to establish the end to end network.

22. The non-transitory machine-readable medium of claim 21, wherein the method performed by the processor further comprises:

analyzing operating data of at least one of the devices of the end to end network; and

predicting a future behavior of the at least one of the devices of the end to end network using the analyzed data.

23. The non-transitory machine-readable medium of claim 21, wherein the method performed by the processor further comprises:

at least one of monitoring and analyzing operating data of the devices of the end to end network; and

reprogramming at least one of the devices of the end to end network based on the at least one of the monitored and analyzed data.

24. The non-transitory machine-readable medium of claim 21, wherein operating data of the end to end network is made available for download.

25. The non-transitory machine-readable medium of claim 21, wherein the method performed by the processor further comprises:

providing a scaling function such that the at least one of the configuration information and application logic information does not have to be input for duplicate ones of the at least one of the devices of the end to end network.

26. The non-transitory machine-readable medium of claim 21, wherein the at least one of the configuration information and application logic information is further determined using at least one of machine learning, linear regression analysis and neural networks.

27. A non-transitory machine-readable medium having stored thereon at least one program, the at least one program including instructions which, when executed by a processor, cause the processor to perform a method in a processor based system for assisted code provisioning of an end to end network, comprising:

receiving at least one of configuration information and application logic information, which defines workflow logic for applications, for devices required to establish the end to end network determined using data analysis methods including at least one of machine learning, linear regression analysis and neural networks;

automatically generating programming code from the received at least one of configuration information and application logic information for each of the devices required to establish the end to end network;

deploying the generated programming code by communicating the generated programming code to respective ones of each of the devices for configuring the devices to establish the end to end network; and

providing an interface for receiving input of supplemental configuration information and application logic information for each of the devices required to establish the end to end network.