(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
09 January 2025 (09.01.2025)

WIPO | PCT

(10) International Publication Number
WO 2025/008932 A1

(51) International Patent Classification:
H04W 16/18 (2009.01) *H04L 41/04* (2022.01)
H04W 24/02 (2009.01) *H04L 41/149* (2022.01)

(21) International Application Number:
PCT/IN2024/050862

(22) International Filing Date:
19 June 2024 (19.06.2024)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
202321044266 02 July 2023 (02.07.2023) IN

(71) Applicant: **JIO PLATFORMS LIMITED** [IN/IN]; Office-101, Saffron, Nr. Centre Point, Panchwati 5 Rasta, Ambawadi, Ahmedabad - 380006, Gujarat (IN).

(72) Inventors: **BHATNAGAR, Aayush**; Tower-7, 15B, Beverly Park, Sector-14, Koper Khairane, Navi Mumbai - 400701, Maharashtra (IN). **BHATNAGAR, Pradeep Kumar**; Tower-7, 15B, Beverly Park, Sector-14, Koper Khairane, Navi Mumbai - 400701, Maharashtra (IN). **SHANBHAG, Uday**; A/10, Tridal Society, Mithaghar Road, Mulund East, Mumbai - 400081, Maharashtra (IN). **KOUL, Rishi**; B-903, NPSC, Plot-5, Sector-2, Dwarka, New Delhi - 110075 (IN). **PATEL, Vivek**; 1259, Happy Homes, Omaxe City-1, Indore - 453771, Madhya Pradesh (IN). **POLSONI, Chaitanya Reddy**; Reliance Corporate Park, Thane-Belapur Road, Ghansoli, Navi Mumbai 400701, Maharashtra (IN).

(74) Agent: **D J, Solomon** et al.; De Penning & De Penning, 120 Velachery Main Road, Guindy, Chennai - 600032 (IN).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ,

(54) Title: SYSTEM AND METHOD FOR MANAGING DEPLOYMENT OF NETWORK ELEMENTS IN A WIRELESS NETWORK

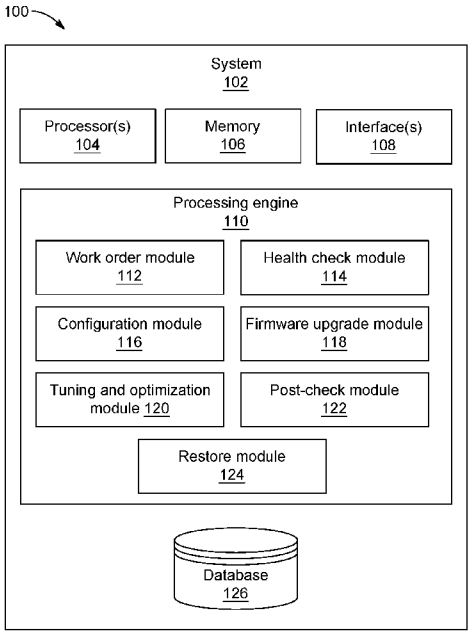


FIG. 1

(57) Abstract: The present disclosure provides a system (102) and a method (700) for managing deployment of network elements in a wireless network. The system (102) includes one or more modules such as a work order module (112), a health check module (114), a configuration module (116), a firmware upgrade module (118), a tuning and optimization module (120), a post-check module (122), and a restore module (124) for automated deployment of new nodes or new cells in the wireless network. The system (102) automates a process of creating and operationalizing a new node or a new cell, eliminating the need for manual input of a large number of configuration parameters. The system (102) and the method provide a centralized platform for managing and monitoring nodes and cells in the wireless network.

WO 2025/008932 A1

[Continued on next page]

DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

SYSTEM AND METHOD FOR MANAGING DEPLOYMENT OF NETWORK ELEMENTS IN A WIRELESS NETWORK

RESERVATION OF RIGHTS

[0001] A portion of the disclosure of this patent document contains material, which is subject to intellectual property rights such as, but are not limited to, copyright, design, trademark, Integrated Circuit (IC) layout design, and/or trade dress protection, belonging to Jio Platforms Limited (JPL) or its affiliates (hereinafter referred as owner). The owner has no objection to the facsimile reproduction by anyone of the patent document or the patent disclosure, as it appears in the Patent and Trademark Office patent files or records, but otherwise reserves all rights whatsoever. All rights to such intellectual property are fully reserved by the owner.

FIELD OF INVENTION

[0002] The present disclosure relates generally to a field of data automation for network deployment and expansion. In particular, the present disclosure pertains to a system and a method for managing deployment of network elements in a wireless network.

BACKGROUND

[0003] The following description of related art is intended to provide background information pertaining to the field of the disclosure. This section may include certain aspects of the art that may be related to various features of the present disclosure. However, it should be appreciated that this section be used only to enhance the understanding of the reader with respect to the present disclosure, and not as admissions of prior art.

[0004] An introduction of wireless network technologies such as a 4^{th} Generation (4G) network technology, a 5^{th} Generation (5G) network technology,

and potentially a 6th Generation (6G) network technology, has revolutionized a world of telecommunications, providing faster speeds, lower latency, and higher capacity. Currently, with an increase in demand for the 5G network technology, network providers are struggling to keep up with the demand. As a result, there is a need for quick expansion of the 5G network technology through the deployment of network elements, such as new nodes or cells, in different geographies.

[0005] However, a high-scale deployment of the new nodes or cells requires automation to ensure efficiency and error-free deployment. This is because the introduction of a new cell requires configuring numerous parameters onto the existing node or deploying a completely new node. While some of these parameters are determined at runtime, other parameters are configured based on data in other nodes or systems.

[0006] Currently, the process used for deploying new nodes is manual, time-consuming, and prone to errors. Network providers have to rely on human intervention to configure these parameters, which can result in inconsistencies and errors. This manual approach lacks scalability and may lead to delays, downtimes, and customer dissatisfaction.

[0007] Moreover, the deployment of the new nodes necessitates rigorous testing and validation to ensure proper functionality and service provision to customers. However, the current manual approach lacks comprehensive testing and validation. This is because, the current manual approach for testing and validation is time-consuming and prone to errors, which may result in network failures and customer dissatisfaction.

[0008] There is, therefore, a need for a system and a method for managing deployment of network elements that is scalable, efficient, and error-free.

SUMMARY

[0009] The present disclosure discloses a method for managing deployment of network elements in a wireless network. The method includes receiving, by a processing engine, at least one input from a user corresponding to a new network

element. The method includes dynamically computing, by the processing engine, at least one configuration parameter corresponding to the new network element based on the at least one input and a preloaded data in a wireless network using a machine learning technique. The method includes creating, by the processing engine, an Optimum Deployment Data (ODD) for the new network element based on the at least one configuration parameter. The method includes transmitting, by the processing engine, the ODD to an Element Management System (EMS) for deploying the new network element in the wireless network based on each of the at least one configuration parameter.

[0010] In an embodiment, the method includes a step of executing, by the EMS, the ODD on a repository to create the new network element based on an associated set of attributes. The associated set of attributes includes at least one of a network connectivity, a software version, a firmware version, a hardware configuration, and an availability of resources. The method includes integrating, by the EMS, the new network element within the wireless network by tuning and optimizing each of the at least one configuration parameter in response to executing.

[0011] In an embodiment, the method includes a step of monitoring in real-time, the new network element for improved network operation over a period of time by validating a status and a health of the wireless network in which the new network element is deployed.

[0012] In an embodiment, the method includes a step of determining, configurations and functioning of the new network element based on the real-time monitoring of the new network element.

[0013] In an embodiment, the at least one input includes a network element name, a band, a network element number, and geography details of the new network element, and the at least one configuration parameter includes an antenna tilt, a power, and a frequency allocation corresponding to the new network element.

[0014] The present disclosure discloses a system for managing deployment of network elements in a wireless network. The system includes a memory and a processing engine communicatively coupled with the memory. The processing engine is configured to receive at least one input from a user corresponding to a

new network element. The processing engine is configured to dynamically compute at least one configuration parameter corresponding to the new network element based on the at least one input and a preloaded data in a wireless network using a machine learning technique. The processing engine is configured to create an Optimum Deployment Data (ODD) for the new network element based on the at least one configuration parameter. The processing engine is configured to transmit the ODD to an Element Management System (EMS) for adding the new network element to the wireless network based on each of the at least one configuration parameter.

[0015] In an embodiment, the system is configured to execute the ODD on a repository via the EMS, to create the new network element based on an associated set of attributes. The associated set of attributes includes at least one of a network connectivity, a software version, a firmware version, a hardware configuration, and an availability of resources. The system is configured to integrate the new network element within the wireless network via the EMS by tuning and optimizing each of the at least one configuration parameter in response to executing.

[0016] In an embodiment, the system is configured to monitor in real-time, the new network element for improved network operation over a period of time by validating a status and a health of the wireless network in which the new network element is added.

[0017] In an embodiment, the system is configured to determine configurations and functioning of the new network element based on the real-time monitoring of the new network element.

[0018] In an embodiment, the at least one input includes a network element name, a band, a network element number, and geography details of the new network element, and the at least one configuration parameter includes an antenna tilt, a power, and a frequency allocation corresponding to the new network element.

[0019] The present disclosure discloses a user equipment (UE) coupled to a system. The UE is configured to send at least one input corresponding to a new network element to the system, for deploying the new network element in a wireless

network. The UE is configured to receive an acknowledgement from the system in response to deploying the new network element.

[0020] The foregoing general description of the illustrative embodiments and the following detailed description thereof are merely exemplary aspects of the teachings of this disclosure and are not restrictive.

OBJECTS OF THE PRESENT DISCLOSURE

[0021] Some of the objects of the present disclosure, which at least one embodiment herein satisfies are as listed herein below.

[0022] An object of the present disclosure is to provide a method and a system to manage deployment of network elements in a wireless network in a way that achieves high-scale and error-free deployment.

[0023] An object of the present disclosure is to dynamically generate configuration parameters corresponding to a new network element for adding the new network element to the wireless network based on minimum inputs from users (e.g., network administrators).

[0024] An object of the present disclosure is to reduce time and effort required by the network administrators to configure the configuration parameters for adding new network elements in the wireless network.

[0025] An object of the present disclosure is to integrate the new network elements within the wireless network in an optimal manner to improve network performance and capacity.

[0026] An object of the present disclosure is to provide a centralized platform for managing and monitoring the new network elements within the wireless network for improved network operations.

[0027] An object of the present disclosure is to enable on-demand deployment of the new network elements based on required capacity of the wireless network to maintain optimal network performance.

[0028] An object of the present disclosure is to reduce a cost of adding the new network elements by minimizing the need for manual configuration and optimizing resource utilization.

[0029] An object of the present disclosure is to improve network scalability by enabling rapid expansion of the wireless network through quick deployment of the new network elements in different geographies.

[0030] An object of the present disclosure is to enhance a quality of service (QoS) for end-users by improving network coverage, capacity, and performance.

[0031] An object of the present disclosure is to provide real-time monitoring and reporting of the new network elements to ensure that the new network elements are configured correctly and functioning optimally.

[0032] An object of the present disclosure is to leverage machine learning techniques to analyze network data and optimize the configuration parameters for deploying the new network element.

BRIEF DESCRIPTION OF DRAWINGS

[0033] The accompanying drawings, which are incorporated herein, and constitute a part of this disclosure, illustrate exemplary embodiments of the disclosed methods and systems in which like reference numerals refer to the same parts throughout the different drawings. Components in the drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the present disclosure. Some drawings may indicate the components using block diagrams and may not represent the internal circuitry of each component. It will be appreciated by those skilled in the art that disclosure of such drawings includes the disclosure of electrical components, electronic components or circuitry commonly used to implement such components.

[0034] FIG. 1 illustrates a block diagram of an exemplary system configured for managing deployment of network elements in a wireless network, in accordance with an embodiment of the present disclosure.

[0035] FIG. 2 illustrates a flow diagram of an exemplary process overview for managing deployment of network elements in a wireless network, in accordance with an embodiment of the present disclosure.

[0036] FIG. 3A illustrates an exemplary control logic for managing deployment of network elements in a wireless network, in accordance with an embodiment of the present disclosure.

[0037] FIG. 3B illustrates a flow diagram of a method depicting interaction of a user with a system for managing deployment of network elements in a wireless network, in accordance with an embodiment of the present disclosure.

[0038] FIG. 4 illustrates an exemplary block diagram of an architecture of a system configured for managing deployment of network elements in a wireless network, in accordance with an embodiment of the present disclosure.

[0039] FIG. 5A illustrates an exemplary Graphical User Interface (GUI) depiction uploading of an Optimum Deployment Data (ODD) for executing the ODD on a Logical System Module Repository (LSMR), in accordance with an embodiment of the present disclosure.

[0040] FIG. 5B illustrates another exemplary GUI depicting at least one input received from a user, in accordance with an embodiment of the present disclosure.

[0041] FIG. 6 illustrates an exemplary GUI depicting a deployment progress status of new network elements in real-time, in accordance with an embodiment of the present disclosure.

[0042] FIG. 7 illustrates a flow chart of a method for managing deployment of network elements in the wireless network, in accordance with an embodiment of the present disclosure.

[0043] FIG. 8 illustrates an exemplary computer system in which or with which embodiments of the present invention can be utilized, in accordance with embodiments of the present disclosure.

[0044] The foregoing shall be more apparent from the following more detailed description of the disclosure.

LIST OF REFERENCE NUMERALS

102 – System

104 - Processor(s)

106 – Memory

108 – Interface(s)

110 – Processing engine

112 – Work order module

114 – Health check module

116 – Configuration module

118 – Firmware upgrade module

120 – Tuning and optimization module

122 – Post-check module

124 – Restore module

126 – Database

404 – User plane

406 – Abstraction layer

408 – Applications and tools unit

410 – Scheduler

412 – Analytics engine

414 – Client change management engine

416 – Query engine and reporting engine

418 – Recipe – Microservices

420 – Biz rules setting

422 – Vendor/equipment library

424 – Configuration Management Database (CMDB)

426 – History Unit

428 – Configuration unit

430 – Multi-version/multi-vendor support

432 – Integration and load balancing plane

810 – External Storage Device

820 – Bus

830 – Main Memory

840 – Read Only Memory

850 – Mass Storage Device

860 – Communication Port

870 – Processor

DETAILED DESCRIPTION OF DISCLOSURE

[0045] In the following description, for the purposes of explanation, various specific details are set forth in order to provide a thorough understanding of embodiments of the present disclosure. It will be apparent, however, that embodiments of the present disclosure may be practiced without these specific details. Several features described hereafter can each be used independently of one another or with any combination of other features. An individual feature may not address all of the problems discussed above or might address only some of the problems discussed above. Some of the problems discussed above might not be fully addressed by any of the features described herein.

[0046] The ensuing description provides exemplary embodiments only, and is not intended to limit the scope, applicability, or configuration of the disclosure. Rather, the ensuing description of the exemplary embodiments will provide those skilled in the art with an enabling description for implementing an exemplary embodiment. It should be understood that various changes may be made in the function and arrangement of elements without departing from the spirit and scope of the disclosure as set forth.

[0047] Specific details are given in the following description to provide a thorough understanding of the embodiments. However, it will be understood by one of ordinary skill in the art that the embodiments may be practiced without these specific details. For example, circuits, systems, networks, processes, and other components may be shown as components in block diagram form in order not to obscure the embodiments in unnecessary detail. In other instances, well-known circuits, processes, algorithms, structures, and techniques may be shown without unnecessary detail in order to avoid obscuring the embodiments.

[0048] Also, it is noted that individual embodiments may be described as a process which is depicted as a flowchart, a flow diagram, a data flow diagram, a

structure diagram, or a block diagram. Although a flowchart may describe the operations as a sequential process, many of the operations can be performed in parallel or concurrently. In addition, the order of the operations may be re-arranged. A process is terminated when its operations are completed but could have additional steps not included in a figure. A process may correspond to a method, a function, a procedure, a subroutine, a subprogram, etc. When a process corresponds to a function, its termination can correspond to a return of the function to the calling function or the main function.

[0049] The word "exemplary" and/or "demonstrative" is used herein to mean serving as an example, instance, or illustration. For the avoidance of doubt, the subject matter disclosed herein is not limited by such examples. In addition, any aspect or design described herein as "exemplary" and/or "demonstrative" is not necessarily to be construed as preferred or advantageous over other aspects or designs, nor is it meant to preclude equivalent exemplary structures and techniques known to those of ordinary skill in the art. Furthermore, to the extent that the terms "includes," "has," "contains," and other similar words are used in either the detailed description or the claims, such terms are intended to be inclusive—in a manner similar to the term "comprising" as an open transition word—without precluding any additional or other elements.

[0050] Reference throughout this specification to "one embodiment" or "an embodiment" or "an instance" or "one instance" means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present disclosure. Thus, the appearances of the phrases "in one embodiment" or "in an embodiment" in various places throughout this specification are not necessarily all referring to the same embodiment. Furthermore, the particular features, structures, or characteristics may be combined in any suitable manner in one or more embodiments.

[0051] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the disclosure. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further

understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

[0052] The present disclosure relates generally to data automation for wireless network deployment and expansion. In particular, the present disclosure pertains to a system and a method for managing the deployment of network elements in a wireless network. The system can automate a deployment process, configure configuration parameters accurately, and test and validate the new network elements to ensure that they are functioning correctly. Such a solution can help network providers meet the growing demand for network services and improve customer satisfaction.

[0053] The various embodiments throughout the disclosure will be explained in more detail with reference to FIGS. 1-8.

[0054] FIG. 1 illustrates a block diagram 100 of an exemplary system 102 for managing deployment of network elements in a wireless network, in accordance with an embodiment of the present disclosure. The system 102 may include one or more processor 104, a memory 106, one or more interface(s) 108, and a processing engine 110. The one or more processor(s) 104, amongst other capabilities, may be configured to fetch and execute computer-readable instructions stored in the memory 106. The one or more processor(s) 104 may be implemented as one or more microprocessors, microcomputers, microcontrollers, digital signal processors, central processing units, state machines, logic circuitries, and/or any devices that manipulate signals based on operational instructions. The functions of the various elements shown in the figure, including any functional blocks labeled as "processor(s)", may be provided through the use of dedicated hardware as well as hardware capable of executing software in association with the appropriate software. The memory 106 may be coupled to the one or more processor(s) 104 and

may, among other capabilities, provide data and instructions for generating different requests.

[0055] Further, the system 102 may include the interface(s) 108. The interface(s) 108 may comprise a variety of interfaces, for example, interfaces for data input and output devices, referred to as Input/Output devices, storage devices, and the like. The interface(s) 108 may facilitate communication to/from the system 102. The interface(s) 108 may also provide a communication pathway for one or more components of the system 102. Examples of such components include, but are not limited to, the processing engine 110 and a database 126.

[0056] In an embodiment, the processing engine 110 may receive an input from a user corresponding to a new network element. The user may be a network administrator, a network operator, and the like. In other words, the user may send the input corresponding to the new network element through a user equipment (UE). The UE may be communicatively coupled to the system 102. Examples of the UE may include, but are not limited to, a desktop, a laptop, a smartphone, a tablet, and the like. Further, the UE may interact with the system 102 via a network. The network, for example may be a wide area network (WAN), a local area network (LAN), a wireless network, a mobile network, a Virtual Private Network (VPN), the Internet, the Public Switched Telephone Network (PSTN), or the like.

[0057] The new network element may be a new network element that needs to be deployed in a wireless network. In an embodiment, the new network element may be one of a new cell that needs to be added to an existing node or a new node that needs to be created in the wireless network. The wireless network may be one of an existing wireless network or a new wireless network. Examples of the wireless network may be the 4G network, the 5G network, the 6G network, and the like.

[0058] Further, the processing engine 110 may dynamically compute at least one configuration parameter based on the at least one input and a preloaded data (i.e., a pre-fed data) in the wireless network. The at least one configuration parameter may be computer using a machine learning technique. The at least one input may include a network element name, a band, a network element number, and geography details associated with the new network element. The at least one

configuration parameter may correspond to configuration parameters required for deploying the new network element. The at least one configuration parameter may include, but are not limited to, an antenna tilt, a power, and a frequency allocation corresponding to the new network element.

[0059] The processing engine 110 may create an Optimum Deployment Data (ODD) for the new network element based on each of the at least one configuration parameter. The ODD may be a minimum most suitable configuration required to deploy the new network element on an Element Management System (EMS). Further, the processing engine 110 transmit the ODD to the EMS for deploying the new network element in the wireless network based on each of the at least one configuration parameter. The processing engine 110 may execute the ODD on a repository (e.g., a Logical System Module Repository (LSMR)) via the EMS to deploy the new network element based on an associated set of attributes. The set of attributes may include, but are not limited to, a network connectivity, a software version, a firmware version, a hardware configuration, and an availability of resources on the new cell. The processing engine 110 may further integrate the new network element within the wireless network by tuning and optimizing each of at least one configuration parameter in response to execution. Further, after deployment of the new network element, the system 102 may be configured to send an acknowledgement depicting a successful deployment of the new network element to the UE via the network.

[0060] Also, the processing engine 110 may manage and monitor in real-time the new network element for improved network operation over a period of time by validating a status and a health of the wireless network on which the new network element is deployed. The period of time may be defined by the network administrator. For example, the period of time may be 30 minutes, 60 minutes, or the like. Further, the processing engine 110 may determine configuration and functioning of the new network element. The configurations and functioning may be determined to check if the new network element is functioning optimally. Further, information determined related to the configurations and the functioning of the new network element may be reported to the network administrator after the

pre-defined time interval. The pre-defined time interval may be defined by the network administrator. For example, the pre-defined time interval may be 30 minutes, 60 minutes, and the like.

[0061] In an embodiment, the processing engine 110 may include a work order module 112 for capturing inputs, i.e., the at least one input from the network administrator, including the network element name, the band, the network element number, and geography details; a health check module 114 for executing commands on the EMS to validate a status and a health of the wireless network (e.g., the existing wireless network or the existing node) on which the new network element is to be deployed; a configuration module 116 for computing the at least one configuration parameters based on the at least one input captured and performing logical operations on the preloaded data in the system 102 to create a minimum configuration for deploying the new network element; a firmware upgrade module 118 for upgrading node's hardware to a latest software and firmware versions, if necessary; a tuning and optimization module 120 for generating tuning and optimizing each of the at least one configuration parameter using different logics and executing them on the new network element; a post-check module 122 for validating that all commands have been executed correctly and all Key Performance Indicators (KPI) of the new network element are normal; and a restore module 124 for restoring any node-level settings if required.

[0062] In an embodiment, the work order module 112 may capture various inputs (i.e., the at least one input), such as the network element name, the band, the network element number, and geography details, from the network administrator. The network administrator is a person designated in an organization whose responsibility includes maintaining one or more network operations (e.g., allocating resource, managing power, or the like). These inputs are used by the system 102 to compute the configuration parameters required for the new network element. The network administrator inputs these details through a user-friendly and intuitive interface provided by the system 102. The network element name is a name of the existing node on which the new cell is to be deployed or a name of the new node that needs to be deployed in the wireless network. The band is a frequency band on

which the new network element may operate. The network element number may be a unique identifier of the new network element. The geography details include a latitude and a longitude of a location of the new network element.

[0063] In an embodiment, the health check module 114 may be configured for executing a series of commands on the EMS to perform the validation. The EMS is a system that hosts nodes and its associated cells for management and operations. The EMS provides a centralized platform for managing and monitoring the nodes and the associated cells in the wireless network. The health check module 114 may use the EMS to validate the status and the health of the wireless network on which the new node is to be deployed or the existing node on which the new cell is to be deployed. The health check module 114 may execute a series of commands on the EMS to check the status and the health of the node. These commands may include checking the network connectivity, checking the software and firmware versions, and checking the hardware configurations. The health check module 114 may also check the availability of resources on the wireless network or the existing node, such as memory and disk space, to ensure that the wireless network or the existing node can support the new cell.

[0064] In an embodiment, the configuration module 116 may be configured to compute the configuration parameters required for the new network element based on one or more machine-learning techniques. The configuration module 116 may consider various factors, such as a node's capacity, a frequency band, a cell's location, and a number of users in an area to compute the configuration parameters. The configuration module 116 uses logical operations on the pre-fed data in the system 102 to determine the configuration parameters for the new network element. The configuration module 116 considers the pre-fed data, for example, an existing network topology, a number of cells already present in the area, and a network load to determine the configuration parameters for the new network element. The configuration parameters may include, but are not limited to, the antenna tilt, the power, and the frequency allocation.

[0065] In an embodiment, the firmware upgrade module 118 may be designed to ensure that the existing node is running on the latest software and firmware

versions to support the new cell. The firmware upgrade module 118 may execute the series of commands on the EMS to check the latest software and firmware versions running on the existing node. If the existing node is not running on the latest software and firmware versions, the firmware upgrade module 118 may initiate an upgrade process. The upgrade process involves downloading the latest software and firmware versions from a repository and installing them on the existing node.

[0066] In an embodiment, the tuning and optimization module 120 may use various methods to determine tuning and optimization parameters (i.e., the associated set of attributes). The tuning and optimization module 120 may process the associated set of attributes to execute the ODD on the LSMR to deploy the new network element. The tuning and optimization module 120 may monitor the performance of the new cell or the new node and adjust the configuration parameters accordingly to optimize the performance.

[0067] In an embodiment, the post-check module 122 may be configured to ensure that the new cell or the new node is functioning correctly and is meeting required Key Performance Indicators (KPIs). The KPIs can be, for example, but not limited to, an availability, an accessibility, a retainability, a security, and a mobility to achieve a quality of service (QoS). The post-check module 122 may execute the series of commands on the EMS to check the status and the health of the new cell or the new node. The post-check module 122 may compare the KPIs of the new cell or the new node with expected KPIs to ensure that the new cell or the new node is performing as expected. The post-check module 122 may also validate that all commands executed during an installation process have been executed correctly and that the new cell or the new node has been configured correctly. If the post-check module 122 detects any issues or errors during a validation process, it alerts the network administrator and initiates corrective actions to resolve the issues or errors. The post-check module 122 may ensure that the new cell or the new node is functioning correctly and is meeting the expected KPIs.

[0068] In an embodiment, the restore module 124 may be configured to ensure that the wireless network or the existing node is restored to its original state if any

issues or errors occur during the deployment of the new node or the new cell, respectively. The restore module 124 may work by taking a backup of an existing wireless network setting or an existing node-level settings before the new node or the new cell deployment process starts. This backup includes all previous configuration parameters, software and firmware versions, and other critical settings of the wireless network or the existing node. If any issues or errors occur during the new node or the new cell deployment process, the restore module 124 may use this backup to restore the wireless network or the existing node to its original state.

[0069] In an embodiment, the system 102 may also include the one or more machine learning techniques for computing the configuration parameters or the associated set of attributes required for new network elements based on inputs, i.e., the at least one input received from the network administrator and the pre-fed data in the system 102. The system 102 may use the inputs from the network administrator and the pre-fed data in the system 102 to compute the configuration parameters. Further, the one or more machine learning techniques work by analyzing historical data from the network, including performance metrics and the previous configuration parameters, to identify patterns and trends. The one or more machine learning techniques then use this data to compute the configuration parameters for deploying the new network elements. The one or more machine learning techniques may continuously learn and adapt based on new data and feedback from the network administrator.

[0070] In an embodiment, the configuration module 116 may use data from neighbouring cells to compute the configuration parameters for the new network element. The configuration module 116 may analyze the performance metrics and previous configuration parameters of neighbouring cells to identify patterns and trends. The configuration module 116 may then use this data to compute the configuration parameters for the new network element. The configuration module 116 may take inputs from the neighbouring cells, such as cell type, frequency band, and power output, and combines them with other data, such as the network element name, the band, the network element number, and geography details, to compute

the configuration parameters for the new network element. Using data from the neighbouring cells to compute the configuration parameters for the new network element may be beneficial because it ensures that the new network element is optimized for performance and is compatible with the wireless network, i.e., the existing wireless network. The configuration module 116 uses the neighbouring cells as a reference point to ensure that the new network element is configured in a way that is consistent with the existing network and does not cause interference or other issues.

[0071] In an example, the system 102 may automate a process of creating the ODD for the new network element. The novelty of the ODD creation process lies in a fact that with just four inputs, i.e., the at least one input from the network administrator, the system 102 may generate around more than 90 configuration parameters on the fly using the one or more machine learning techniques and the pre-fed data in the system 102. Once the ODD is created, the network administrator can execute the ODD on the LSMR with a single click, which deploys the new network element with all required configuration parameters. This process significantly reduces the time taken to deploy the new network element and eliminates a risk of errors associated with a manual approach. After the new network element is deployed, it needs to be integrated with the existing wireless network by tuning and optimizing the configuration parameters. The system 102 provides a solution for this by automatically generating around 500 commands to tune the configuration parameters of the new network element, based on the data from neighbouring cells and other logics in the system 102. This process ensures that the new network element integrates seamlessly with the existing network and provides required services to customers.

[0072] FIG. 2 illustrates a flow diagram 200 of an exemplary process overview for managing the deployment of network elements in a wireless network in accordance with an embodiment of the present disclosure. FIG. 2 is explained in conjunction with FIG. 1. The system 102 may automate the process of deploying the new network element by creating the ODD for the new network element. The ODD is a minimum most suitable configuration required to create the new network

elements on the EMS. According to the present embodiment, with the at least one input, e.g., a set of four inputs from the network administrator, at step 202, the system 102 may compute configuration parameters, e.g., around 90 configuration parameters on the fly based on the at least one input and the pre-fed data using the machine learning technique. Further, based on the configuration parameters, the system 102 may create the ODD with each of the at least one input parameter.

[0073] Once the ODD is created, at step 204, the ODD may be transmitted on the EMS to execute the ODD of the LSMR via the EMS. In particular, the network administrator may execute the ODD on the LSMR with a single click, which deploys the new network element with all required configuration parameters. This process significantly reduces a time taken to deploy the new network element and eliminates a risk of errors associated with a manual approach. After the new network element is deployed, it needs to be integrated within the existing network by tuning and optimizing the configuration parameters. In some embodiment, the set of attributes may be tuned and optimized for deploying the new network element. For this, at step 206, the series of commands may be generated to tune and optimize the configuration parameters for deploying the new network element. For example, around 500 commands may be automatically generated to tune the configuration parameters of the new network element based on the data from the neighbouring cells and other logic in system 102. This process ensures that the new network element may integrate seamlessly with the existing network and provides all the required services to customers.

[0074] FIG. 3A illustrates an exemplary control logic 300A for managing deployment of network elements in a wireless network, in accordance with an embodiment of the present disclosure. FIG. 3A is explained in conjunction with FIGS. 1 -2. FIG. 3A exhibits the control logic for automated deployment of the new network element in the wireless network. The control logic 300A depicts a system builder recipe 302A. The system builder recipe 302A may include various operations required to be performed to enable a system 304A to manage the deployment of the new network element in the wireless network. The system 304A may correspond to the system 102. The system builder recipe 302A may include

operations such as alarm check commands, a pre-check operation, lock parent sector commands, and the like, as depicted via the control logic 300A. The system 304A may perform various operations including creating a work order (i.e., the at least one input) for the node or cell to be deployed in the wireless network, including node name, band, cell number, and geography details; performing a health check by executing commands on the EMS for the new network element and validating the status and the health of the new network element; creating a minimum most suitable configuration required to deploy the new network element and other logics in the system; upgrading the node's hardware to the latest software and firmware versions, if necessary; checking if the existing node is operational and healthy by executing and validating health check commands; generating tuning and optimizing parameters, i.e., the associated set of attributes using different logics and executing them on the new network element; performing a post-check to validate that all commands have been executed correctly and all KPI of the new network element are normal; and restoring any node-level settings if required.

[0075] In order to deploy the new network element based on the ODD, the system 304A may execute the ODD on an LSMR 306A via the EMS. Further, the system 304A may integrate the new network element in the wireless network by tuning and optimizing each of the at least one configuration parameter. In order to integrate the new network element, the system 304A may access more services 308A corresponding to the LSMR 306A. In an embodiment, the system 304A also includes the one or more machine learning techniques to configure the configuration parameters required for the new network element based on the inputs from the network administrator and the pre-fed data in the system 102. The one or more machine learning techniques works by analyzing historical data from the wireless network, including performance metrics and configuration parameters, to identify patterns and trends.

[0076] In an embodiment, the system 304A may also test and validate the new network element to ensure that it is functioning correctly and providing required services to customers. The testing and validation process involves running the series of commands on the new network element to ensure that it meets required

performance and service level parameters. These commands can include, verifying that the new network element can communicate with neighbouring nodes, that it can handle required amount of traffic, and that it is providing required services to customers. Once the tests have been completed, results are analyzed to ensure that the new network element is functioning correctly and providing required services to the customers. If any issues are identified, they are addressed before the new network element is deployed in the wireless network.

[0077] In an embodiment, the system 304A may also reduce a risk of network failures, downtime, and customer dissatisfaction through an error-free deployment process. The error-free deployment process involves following a set of predefined procedures and best practices to ensure that the new network element is added to the wireless network correctly. This process can include steps, such as verifying that all necessary equipment is available, ensuring that the new network element is configured correctly, and testing and validating the new network element before it is added to the wireless network. This may reduce the risk of network failures, downtime, and customer dissatisfaction is critical in success of the new element deployment process. By ensuring an error-free deployment process, the network administrator may minimize an impact of the new network element on the existing wireless network and ensure that customers receive uninterrupted service.

[0078] FIG. 3B illustrates a flow diagram of a method 300B depicting interaction of a user with a system for managing deployment of network elements in a wireless network, in accordance with an embodiment of the present disclosure. FIG. 3B is explained in conjunction with FIGS. 1 – 3A. Initially, at step 312B, a user 302B may provide the at least one input corresponding to the new network element to a system 304. The system 304 may correspond to the system 102. The at least one input may include the network element name, the band, the network element number, and the geography details of the new network element. Further, at step 314B, the system 304 may computes other required parameters, i.e., each of the at least one configuration parameter. The at least one configuration parameter may include the antenna tilt, the power, and the frequency allocation corresponding to the new network element, and the like.

[0079] Further, the system 304B may transmit the required parameters to an EMS 306B. Further, the EMS 306B may deploy the new network element. In one embodiment, when the new network element is the new cell that needs to be added on the existing node (e.g., a node 308B), then at step 316B, the EMS 306B may create and add the new cell to the node 308B. Further, in another embodiment, when the new network element is the new node (e.g., a new node 310B) that needs to be created, then at step 318B, the EMS 306B may create and add the new node 310B to the wireless network, e.g., the existing network. Once the new network element is deployed, the EMS 306B may send an acknowledgement depicting the deployment to the system 304B as mentioned via step 320B. Upon receiving the acknowledgement, the system 304B may render the acknowledgment to the user 302B. Further, at step 322B, the user 302B may acknowledge the creation and the addition of the new cell or the new node and test results corresponding to the new cell or the new node 310B. In other words, the user 302B may send an acknowledgment depicted reception of the acknowledgement of the deployment.

[0080] FIG. 4 illustrates an exemplary block diagram of an architecture 400 of the system 102 configured for managing deployment of network elements in the wireless network, in accordance with an embodiment of the present disclosure. FIG. 4 is explained in conjunction with FIGS. 1 – 3.

[0081] The architecture 400 of the system 102 may include several components that work together seamlessly to automate a process of deploying the new network elements in the wireless network. The components may include a user plane 404, an abstraction layer 406, an applications and tools unit 408, a scheduler 410, biz rule settings 420, a vendor/equipment library 422, a multi-vendor/ multi-version support unit 430, and an integration and load balancing plane 432. The scheduler 410 may further include an analytics engine 412, a change management engine (work order) 414, a query engine and a reporting engine 416, a recipe - microservices unit 418, and a Configuration Management Database (CMDB) 424. The CMDB 424 may further include a history unit 426, and a configuration unit 428.

[0082] A user 402 (same as the user 302B), i.e., the network administrator or the network operator, may interact with system 102 via the user plane 404. Each of these components may function together to provide assistance to the user 402 in managing deployment of the new network element in the wireless network. As depicted via the architecture 400, an EMS-V1 and an EMS- V2 may interact with the system 102 via the integration and load balancing plane 432. Further, the EMS-V1 and EMS-V2 may be associated with various gNodeB (GNB), such as GNB-1, GNB-2, GNB-3, and GNB-4. It should be noted that, an EMS may correspond to a system that hosts various nodes and its associated cell for management and operations. The EMS provides a centralized platform for managing and monitoring nodes and cells in the wireless network. The system 102 may also include servers and database(s) 126 that contain vendor libraries and logic to compute each of at least one configuration parameter required for configuring the new network element, i.e., the new cell or the new node. These libraries and logics may be based on machine learning techniques and the preloaded data in the system 102. They help in computing at least one configuration parameter required for creating and operationalizing the new network element.

[0083] FIG. 5A illustrates an exemplary GUI 500A depiction uploading of the ODD for executing the ODD on the LSMR, in accordance with an embodiment of the present disclosure. FIG. 5A is explained in conjunction with FIGS. 1 – 4. The user, i.e., the network administrator may be able to upload the ODD depicted as an ODD template via the GUI 500A for further execution. In addition, the network administrator may be able to select project type and sub domain from a drop-down list using the GUI 500A.

[0084] FIG. 5B illustrates another exemplary GUI 500B depicting the at least one input received from a user, in accordance with an embodiment of the present disclosure. FIG. 5B is explained in conjunction with FIGS. 1 – 5A. The GUI 500B is designed to be user-friendly and intuitive, allowing the network administrator to input the at least one input required to deploy the new network element. As depicted via the GUI 500B, the network administrator may be able to provide information

such as a circle, Data Unit (DU) type, a band, a Service Access Point Identified (SAP ID), and the like, corresponding to the new network element.

[0085] FIG. 6 illustrates an exemplary GUI 600 depicting a deployment progress status of new network elements in real-time, in accordance with an embodiment of the present disclosure. FIG. 6 is explained in conjunction with FIGS. 1 – 5B. The GUI 600 depicts the deployment progress status of each new network element that is being deployed at various zones and circle. The deployment process status may enable the user to know a progress in the deployment of each new network element along with the time left for the deployment to complete. Further, the GUI 600 depicts the at least one input received from the user.

[0086] The at least one input may correspond to a work order list. The work order list includes information associated with the new network element, such as the network element name, the band, the network element number, and geography details associated with the new network element. Further, each of the at least one configuration parameters required for deploying the new network element may be computed based on the at least one input and the preloaded data associated with the wireless network using the machine learning technique. Once the work order list is created, the system 102 may automatically executes a series of commands to validate the status and the health of the wireless network in which the new network element is to be deployed. For example, in some embodiments, the system 102 may validate the status and the health of an existing node on which the new cell is to be added. The system 102 may also upgrade the existing node's hardware to a latest software and firmware versions, if necessary. The system 102 then creates the ODD based on each of the at least one configuration parameter to add the new cell on the existing node using the at least one input received from the user, e.g., the network administrator, and the preloaded data associated with the wireless network that is present in the system 102.

[0087] FIG. 7 illustrates a flow chart 700 of a method for managing deployment of network elements in the wireless network, in accordance with an embodiment of the present disclosure.

[0088] Initially, at step 702, the at least one input may be received corresponding to the new network element from the user, e.g., the network administrator or the network operator. In an embodiment, the new network element may be one of a new cell that needs to be added to an existing node or a new node that needs to be created in the wireless network. The wireless network may be one of an existing wireless network or a new wireless network. Examples of the wireless network may be the 4G network, the 5G network, the 6G network, and the like. The at least one input may include the network element name (e.g., a name of the new cell or a name of the new node), the band, the network element number (e.g., a number of the new cell or a number of the new node), and the geography details of the new network element.

[0089] Upon receiving the at least one input, at step 704, the at least one configuration parameter corresponding to the new network element may be dynamically computed. The at least one configuration parameter may be dynamically computed based on the at least one input and the preloaded data, i.e., the pre-fed data in the wireless network. The pre-fed data may include, for example, an existing network topology, a number of cells already present in the area, and a network load to determine the configuration parameters for the new network element Further, the at least one configuration parameter may be computed using the machine learning technique. With reference to FIG. 1, the processing engine 110 may be configured to receive the at least one input from the network administrator to compute the at least one configuration parameter dynamically using the machine learning technique and the pre-fed data in the wireless network. The at least one configuration parameter may include, but are not limited to, an antenna tilt, a power, and a frequency allocation corresponding to the new network element. It should be noted that, the at least one configuration parameter are not limited to above listed parameters and may include 90 configuration parameters or more based on the new network element.

[0090] Once each of the at least one configuration parameters are computed, at step 706, the ODD for the new network element may be created based on each of the at least one configuration parameter. The ODD is a minimum most suitable

configuration required to deploy the new network element. With reference to FIG. 1, the processing engine 110 may be configured to create the ODD for the new network element based on each of the at least one configuration parameter.

[0091] Further, at step 708, the ODD may be transmitted to the EMS. In an embodiment, the ODD may be transmitted to the EMS for deploying the new network element in the wireless network based on each of the at least one configuration parameter. With reference to FIG. 1, the processing engine 110 may be configured for transmitting the ODD to the EMS. Upon transmitting, the ODD may be executed on the LSMR to deploy the new network elements based on the associated set of attributes. The associated set of attributes may include, but are not limited to, the network connectivity, the software version, the firmware version, the hardware configuration, and the availability of resources. With reference to FIG. 1, the processing engine 110 may be configured to execute the ODD on the LSMR via the EMS to deploy the new network element.

[0092] In response to executing the ODD, the new network element may be integrated within the wireless network by tuning and optimizing each of the at least one configuration parameter. With reference to FIG. 1, the processing engine 110 may be configured to integrate the new network element with the wireless network via the EMS.

[0093] In order to deploy the new network element, the new network element may be monitored in real-time for improved network operation over the period of time. This is done to validate the status and the health of the wireless network in which the new network element is deployed. In addition, based on the monitoring, the status and the health of the new network element may also be validated. In an embodiment, the period of time may be defined by the network administrator. For example, the period of time may be 30 minutes, 60 minutes or the like. With reference to FIG. 1, the processing engine 110 may be configured for monitoring the new network element.

[0094] Further, based on the real-time monitoring, the configuration and the functioning of the new network element may be determined. The configurations and functioning may be determined to check if the new network element is

functioning optimally. Further, information determined related to the configurations and the functioning of the new network element may be reported to the network administrator after the pre-defined time interval. The pre-defined time interval may be defined by the network administrator. For example, the pre-defined time interval may be 30 minutes, 60 minutes, and the like. With reference to FIG. 1, the processing engine 110 may be configured for determining the configurations or the functioning of the new network element.

[0095] In an exemplary embodiment, a computer system (800) in which or with which embodiments of the present invention can be utilized is disclosed.

[0096] Referring to FIG. 8, a computer system 800 includes an external storage device 810, a bus 820, a main memory 830, a read only memory 840, a mass storage device 850, communication port(s) 860, and a processor 870. A person skilled in the art will appreciate that computer system 800 may include more than one processor and communication ports. Examples of processor 870 include, but are not limited to, an Intel® Itanium® or Itanium 2 processor(s), or AMD® Opteron® or Athlon MP® processor(s), Motorola® lines of processors, FortiSOC™ system on a chip processors or other future processors. The processor 870 may include various modules associated with embodiments of the present invention. The communication port(s) 860 can be any of an RS-232 port for use with a modem-based dialup connection, a 10/100 Ethernet port, a Gigabit or 10 Gigabit port using copper or fiber, a serial port, a parallel port, or other existing or future ports. The communication port(s) 860 may be chosen depending on a network, such a Local Area Network (LAN), Wide Area Network (WAN), or any network to which computer system 800 connects.

[0097] In an embodiment, the main memory 830 may be Random Access Memory (RAM), or any other dynamic storage device commonly known in the art. The read only memory 840 can be any static storage device(s) e.g., but not limited to, a Programmable Read Only Memory (PROM) chips for storing static information e.g., start-up or BIOS instructions for the processor 870. The mass storage 850 may be any current or future mass storage solution, which can be used to store information and/or instructions.

[0098] In an embodiment, the bus 820 communicatively couples the processor 870 with the other memory, storage and communication blocks. The bus 820 can be, e.g. a Peripheral Component Interconnect (PCI) / PCI Extended (PCI-X) bus, Small Computer System Interface (SCSI), USB or the like, for connecting expansion cards, drives and other subsystems as well as other buses, such a front side bus (FSB), which connects the processor 870 to the computer system 800.

[0099] Optionally, operator and administrative interfaces, e.g. a display, keyboard, and a cursor control device, may also be coupled to the bus 820 to support direct operator interaction with the computer system 800. Other operator and administrative interfaces can be provided through network connections connected through the communication port(s) 860. The external storage device 810 can be any kind of external hard-drives, floppy drives, IOMEGA® Zip Drives, Compact Disc - Read Only Memory (CD-ROM), Compact Disc - Re-Writable (CD-RW), Digital Video Disk - Read Only Memory (DVD-ROM). Components described above are meant only to exemplify various possibilities. In no way should the aforementioned exemplary computer system 800 limit the scope of the present disclosure.

[00100] The method and system of the present disclosure may be implemented in a number of ways. For example, the methods and systems of the present disclosure may be implemented by software, hardware, firmware, or any combination of software, hardware, and firmware. The above-described order for the steps of the method is for illustration only, and the steps of the method of the present disclosure are not limited to the order specifically described above unless specifically stated otherwise. Further, in some embodiments, the present disclosure may also be embodied as programs recorded in a recording medium, the programs including machine-readable instructions for implementing the methods according to the present disclosure. Thus, the present disclosure also covers a recording medium storing a program for executing the method according to the present disclosure.

[00101] While considerable emphasis has been placed herein on the preferred embodiments, it will be appreciated that many embodiments can be made and that many changes can be made in the preferred embodiments without departing from

the principles of the disclosure. These and other changes in the preferred embodiments of the disclosure will be apparent to those skilled in the art from the disclosure herein, whereby it is to be distinctly understood that the foregoing descriptive matter to be implemented merely as illustrative of the disclosure and not as limitation.

ADVANTAGES OF THE PRESENT DISCLOSURE

[00102] The present disclosure significantly reduces the time taken to deploy a new network element, i.e., a new cell or a new node in a wireless network (e.g., a 5G network).

[00103] The present disclosure automates the process of creating and operationalizing the new cell or the new node, eliminating a need for manual input of a large number of configuration parameters, i.e., each of the at least one configuration parameters.

[00104] The present disclosure reduces a risk of errors associated with a manual approach to configuring the new cell or the new node.

[00105] The present disclosure uses machine learning techniques and pre-fed data, i.e., the preloaded data to compute the large number of configuration parameters required for the new cell or the new node.

[00106] The present disclosure provides a centralized platform for managing and monitoring cells and nodes in the wireless network.

[00107] The present disclosure ensures that the new cell or the new node integrates seamlessly with the wireless network and provides required services to customers.

[00108] The present disclosure reduces a risk of network failures, downtime, and customer dissatisfaction.

[00109] The present disclosure improves an efficiency of the wireless network by automating process of deploying new cells or new nodes in the wireless network.

[00110] The present disclosure provides a user-friendly and an intuitive interface for users, e.g., network administrators to provide minimum inputs (i.e., the at least one input) required for creating the new cell or the new node.

[00111] The present disclosure eliminates a need for manual intervention in the process of creating and operationalizing the new cell or the new node, ensuring a high level of accuracy and consistency in the wireless network.

CLAIMS:

We Claim

1. A method (700) for managing deployment of network elements in a wireless network, the method comprising:

receiving (702), by a processing engine (110), at least one input from a user corresponding to a new network element;

dynamically computing (704), by the processing engine (110), at least one configuration parameter corresponding to the new network element based on the at least one input and a preloaded data in the wireless network using a machine learning technique;

creating (706), by the processing engine (110), an Optimum Deployment Data (ODD) for the new network element based on each of the at least one configuration parameter; and

transmitting (708), by the processing engine (110), the ODD to an Element Management System (EMS) for deploying the new network element in the wireless network based on each of the at least one configuration parameter.

2. The method (700) as claimed in claim 1, wherein deploying the new network element in the wireless network comprises:

executing, via the EMS, the ODD on a repository to create the new network element based on an associated set of attributes, wherein the associated set of attributes comprises at least one of a network connectivity, a software version, a firmware version, a hardware configuration, and an availability of resources; and

integrating, via the EMS, the new network element within the wireless network by tuning and optimizing each of the at least one configuration parameter in response to executing.

3. The method (700) as claimed in claim 1, further comprising monitoring in real-time, by the processing engine (110), the new network element for improved network operation over a period of time by validating a status and a health of the wireless network on which the new network element is deployed.

4. The method (700) as claimed in claim 3, further comprising determining, by the processing engine (110), configurations and functioning of the new network element based on the real-time monitoring of the new network element.

5. The method (700) as claimed in claim 1, wherein the at least one input comprises a network element name, a band, a network element number, and geography details of the new network element, and wherein the at least one configuration parameter comprises an antenna tilt, a power, and a frequency allocation corresponding to the new network element.

6. A system (102) for managing deployment of network elements in a wireless network, the system (102) comprising:

a memory (106); and

a processing engine (110), coupled with the memory (106), configured to:

receive (702) at least one input from a user corresponding to a new network element;

dynamically compute (704) at least one configuration parameter corresponding to the new network element based on the at least one input and a preloaded data in the wireless network using a machine learning technique;

create (706) an Optimum Deployment Data (ODD) for the new network element based on each of the at least one configuration parameter; and

transmit (708) the ODD to an Element Management System (EMS) for deploying the new network element in the wireless network based on each of the at least one configuration parameter.

7. The system (102) as claimed in claim 6, wherein, to deploy the new network element in the wireless network, the processing engine (110) is configured to:

execute, via the EMS, the ODD on a repository to create the new network element based on an associated set of attributes, wherein the associated set of

attributes comprises at least one of a network connectivity, a software version, a firmware version, a hardware configuration, and an availability of resources; and

integrate, via the EMS, the new network element within the wireless network by tuning and optimizing each of the at least one configuration parameter in response to executing.

8. The system (102) as claimed in claim 6, wherein the processing engine (110) is configured to monitor in real-time the new network element for improved network operation over a period of time by validating a status and a health of the wireless network on which the new network element is deployed.

9. The system (102) as claimed in claim 6, wherein the processing engine (110) is configured to determine configurations and functioning of the new network element based on the real-time monitoring of the new network element.

10. The system (102) as claimed in claim 6, wherein the at least one input comprises a network element name, a band, a network element number, and geography details of the new network element, and wherein the at least one configuration parameter comprises an antenna tilt, a power, and a frequency allocation corresponding to the new network element.

11. A user equipment (UE) coupled to a system (102), configured to:

send at least one input corresponding to a new network element to the system (102), for deploying the new network element in a wireless network; and

receive an acknowledgement from the system (102) in response to deploying the new network element.

12. A computer program product comprising a non-transitory computer-readable medium comprising instructions that, when executed by one or more processors, cause the one or more processors to:

receive (702) at least one input from a user corresponding to a new network element;

dynamically compute (704) at least one configuration parameter corresponding to the new network element based on the at least one input and a preloaded data in a wireless network using a machine learning technique;

create (706) an Optimum Deployment Data (ODD) for the new network element based on each of the at least one configuration parameter; and

transmit (708) the ODD to an Element Management System (EMS) for deploying the new network element to the wireless network based on each of the at least one configuration parameter.

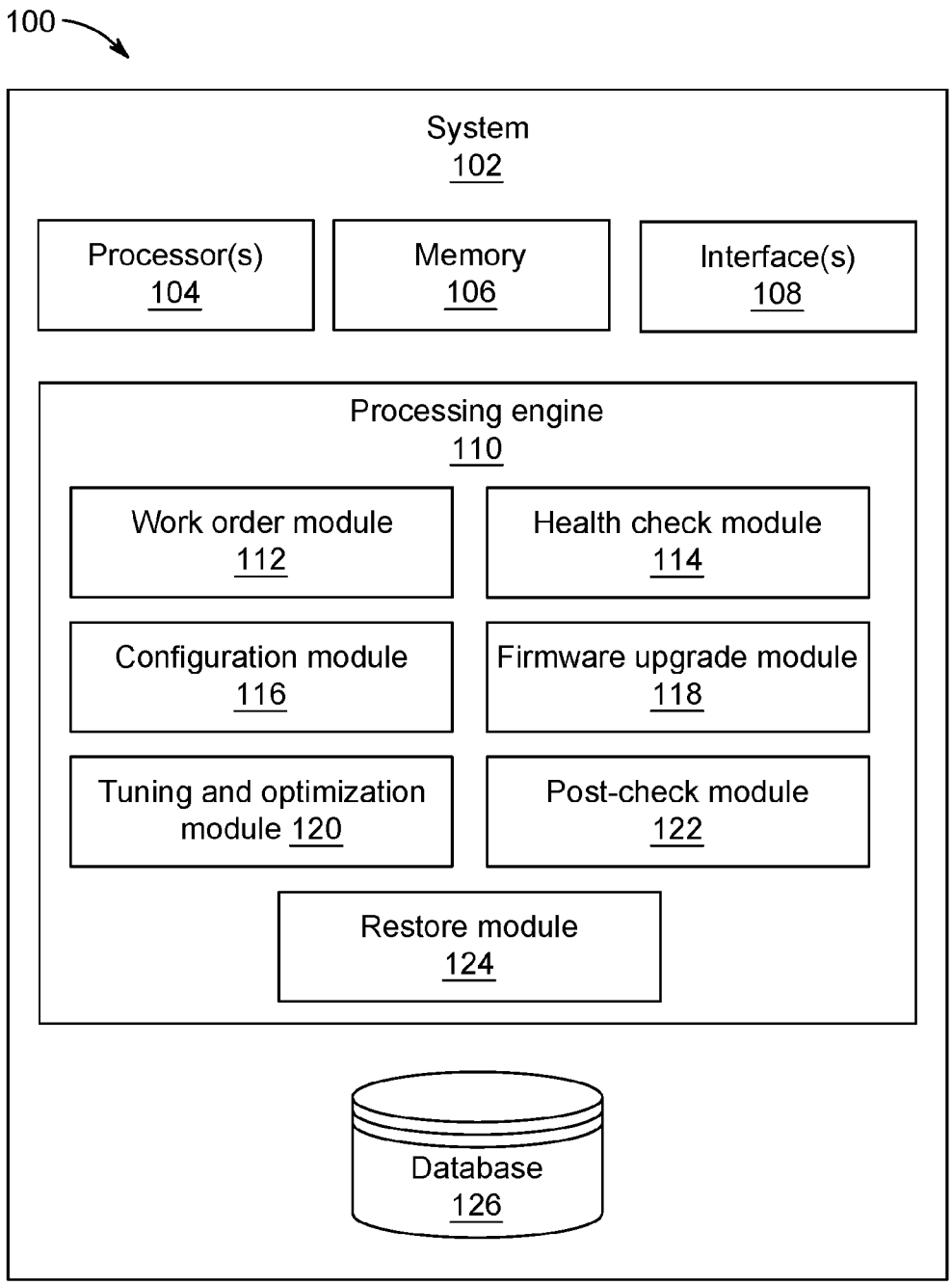

100
System
102
Processor(s)
104
Memory
106
Interface(s)
108
Processing engine
110
Work order module
112
Health check module
114
Configuration module
116
Firmware upgrade module
118
Tuning and optimization module 120
Post-check module
122
Restore module
124
Database
126

FIG. 1

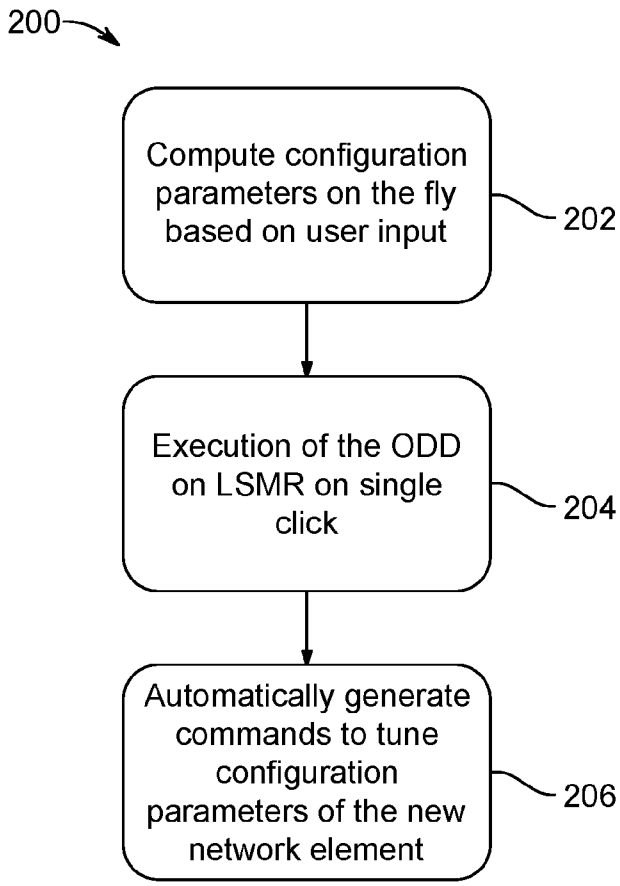

200
Compute configuration parameters on the fly based on user input
202
Execution of the ODD on LSMR on single click
204
Automatically generate commands to tune configuration parameters of the new network element
206

FIG. 2

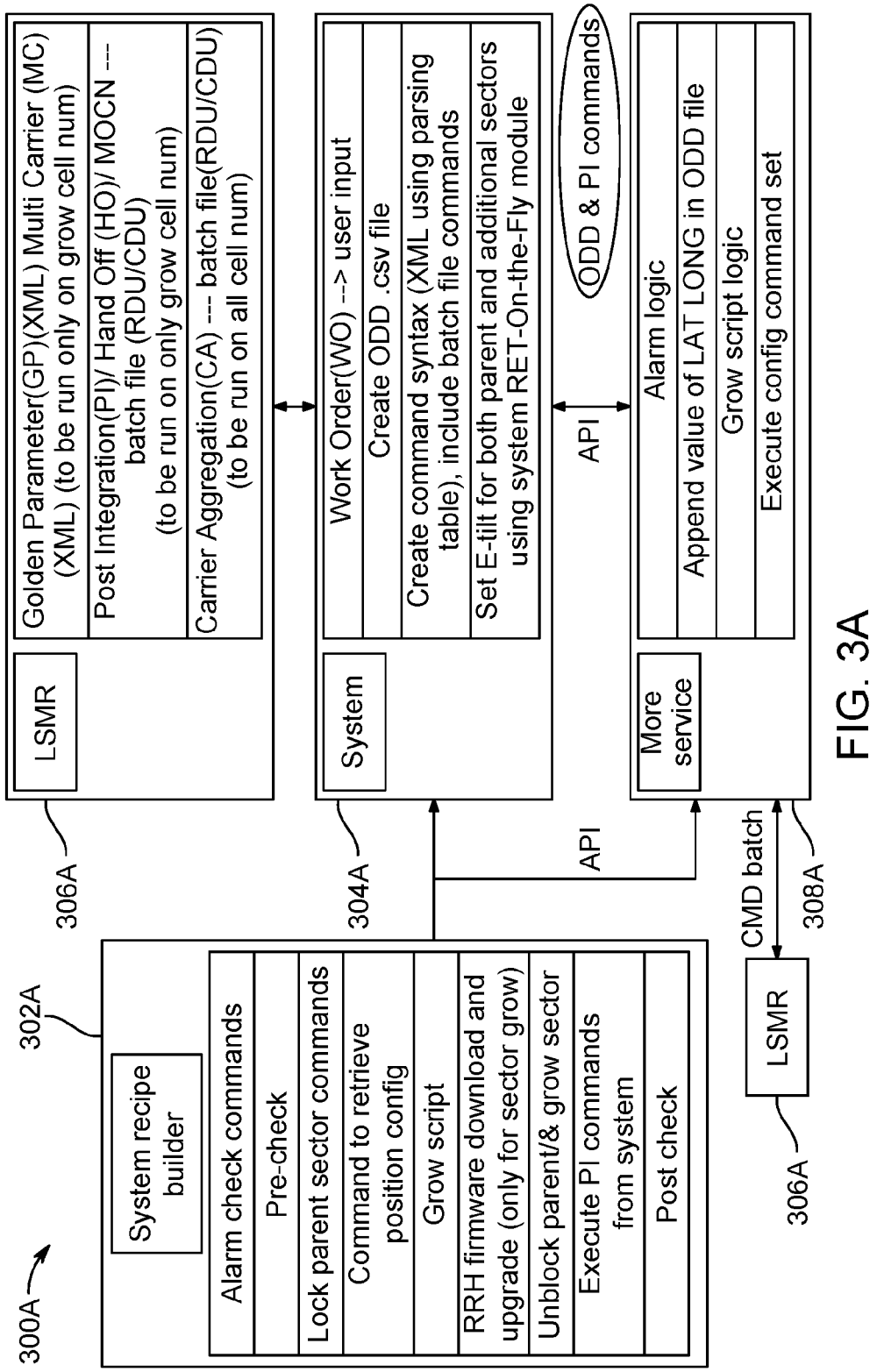

300A
System recipe builder
Alarm check commands
Pre-check
Lock parent sector commands
Command to retrieve position config
Grow script
RRH firmware download and upgrade (only for sector grow)
Unblock parent/& grow sector
Execute PI commands from system
Post check
302A
LSMR
306A
Golden Parameter(GP)(XML) Multi Carrier (MC) (XML) (to be run only on grow cell num)
Post Integration(PI)/ Hand Off (HO)/ MOCN --- batch file (RDU/CDU) (to be run on only grow cell num)
Carrier Aggregation(CA) --- batch file(RDU/CDU) (to be run on all cell num)
System
304A
Work Order(WO) --> user input
Create ODD .csv file
Create command syntax (XML using parsing table), include batch file commands
Set E-tilt for both parent and additional sectors using system RET-On-the-Fly module
API
ODD & PI commands
More service
Alarm logic
Append value of LAT LONG in ODD file
Grow script logic
Execute config command set
API
CMD batch
LSMR
306A
308A

FIG. 3A

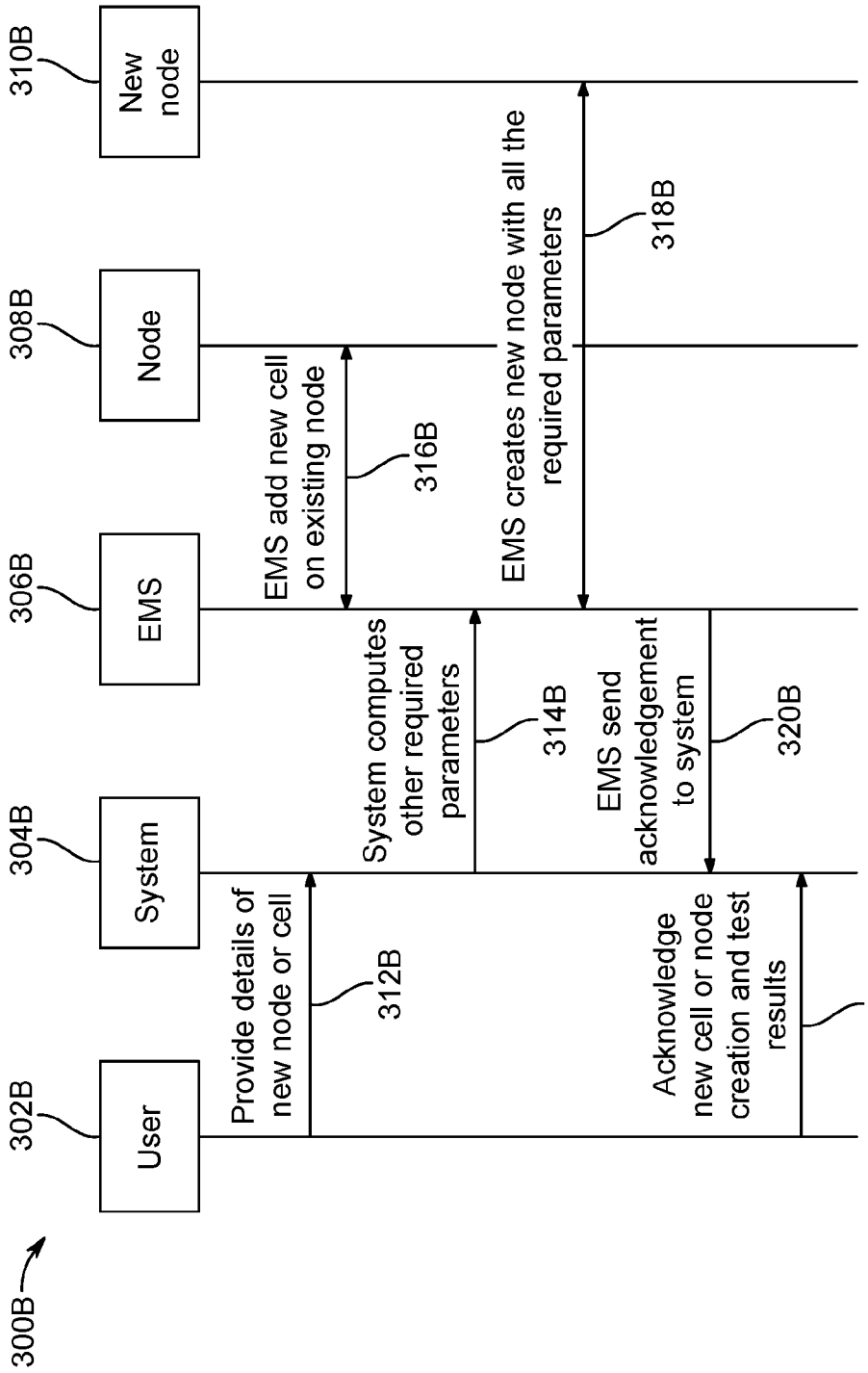

300B
302B
User
304B
System
306B
EMS
308B
Node
310B
New node
Provide details of new node or cell
312B
System computes other required parameters
314B
EMS add new cell on existing node
316B
EMS creates new node with all the required parameters
318B
EMS send acknowledgement to system
320B
Acknowledge new cell or node creation and test results
322B

FIG. 3B

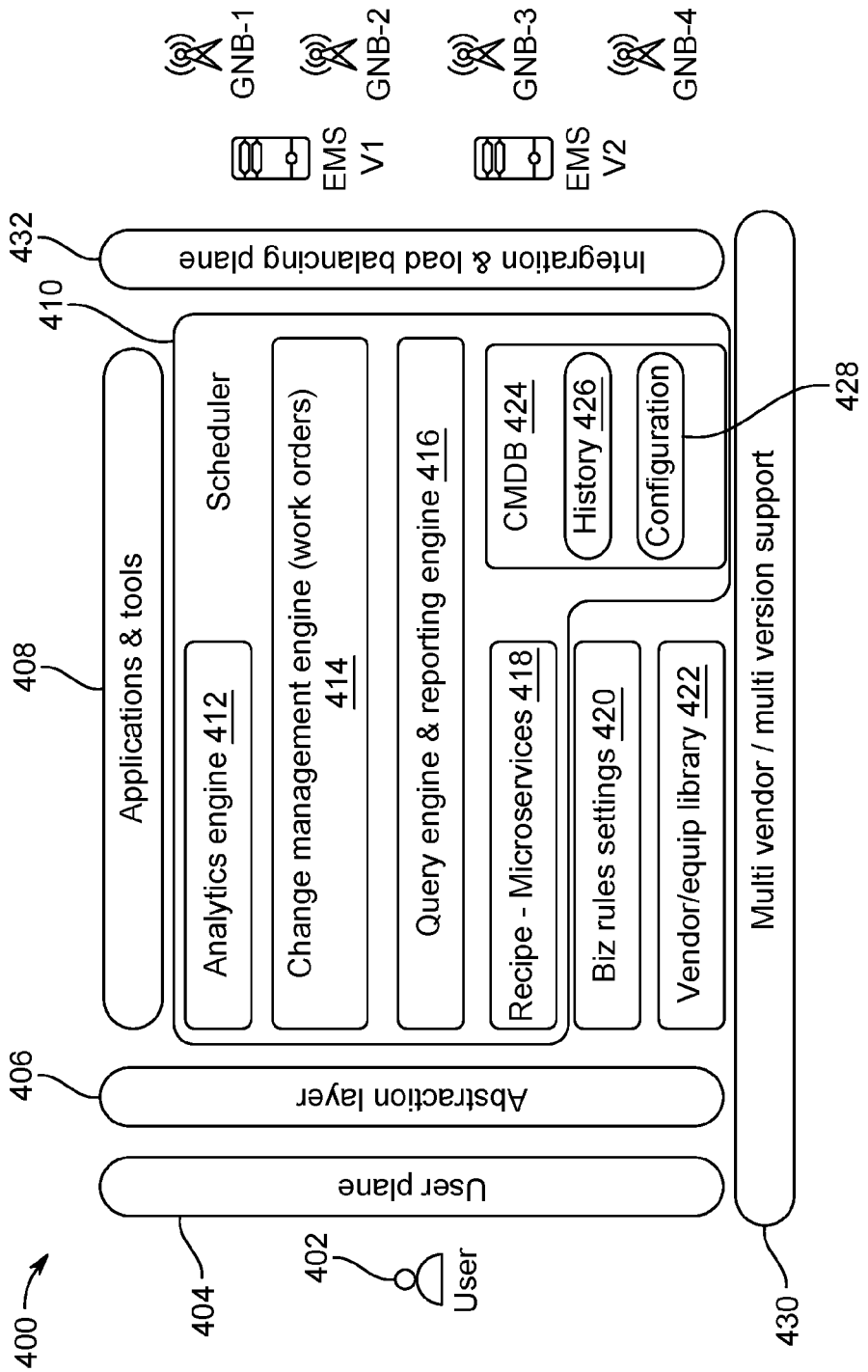

GNB-1
GNB-2
GNB-3
GNB-4
EMS V1
EMS V2
Integration & load balancing plane
Scheduler
Analytics engine 412
Change management engine (work orders) 414
Query engine & reporting engine 416
Recipe - Microservices 418
Biz rules settings 420
Vendor/equip library 422
CMDB 424
History 426
Configuration
Applications & tools
Abstraction layer
User plane
Multi vendor / multi version support
User
400
402
404
406
408
410
428
430
432

FIG. 4

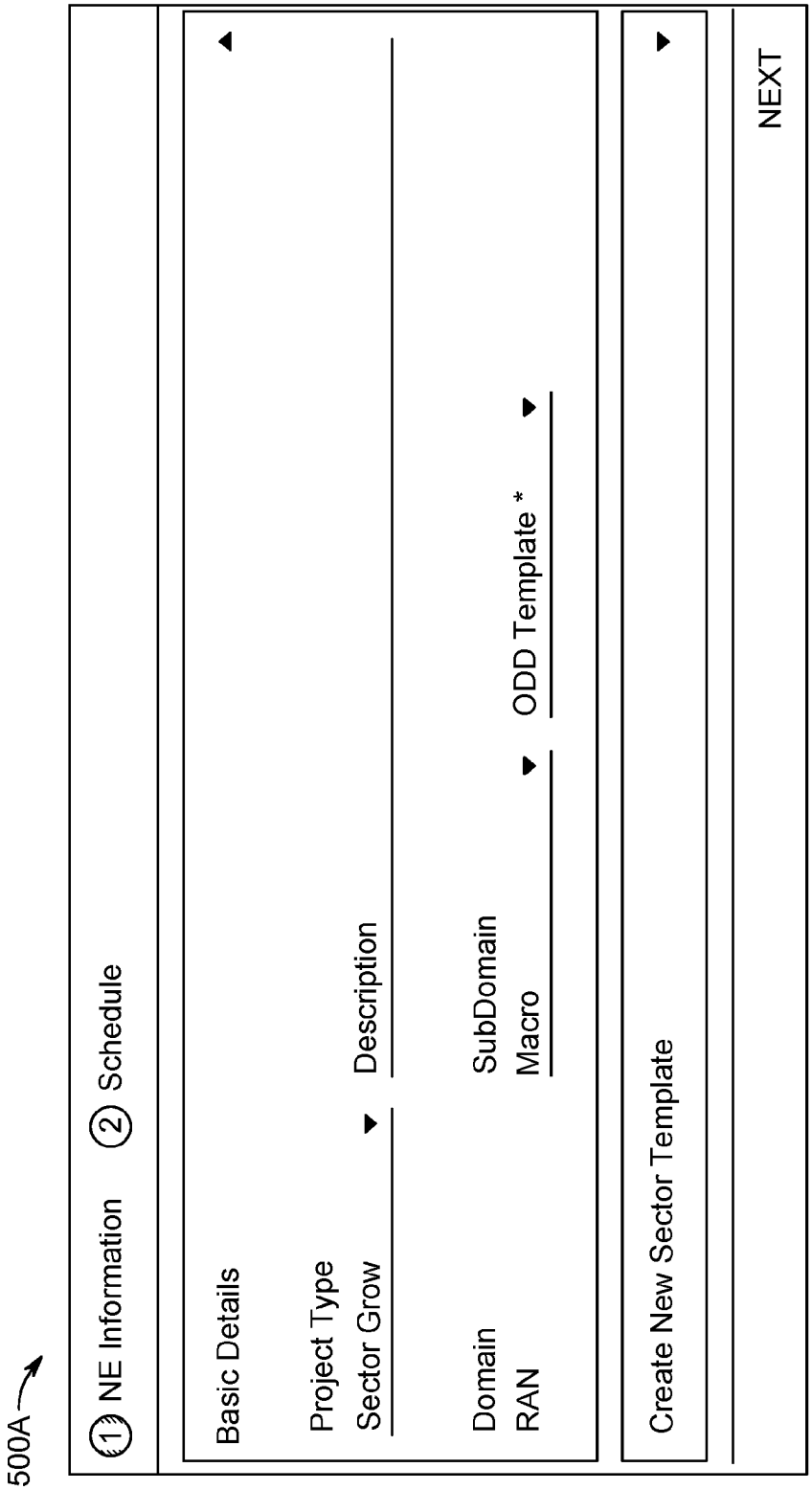

500A
1 NE Information
2 Schedule
Basic Details
Project Type
Sector Grow
Description
Domain
RAN
SubDomain
Macro
ODD Template *
Create New Sector Template
NEXT

FIG. 5A

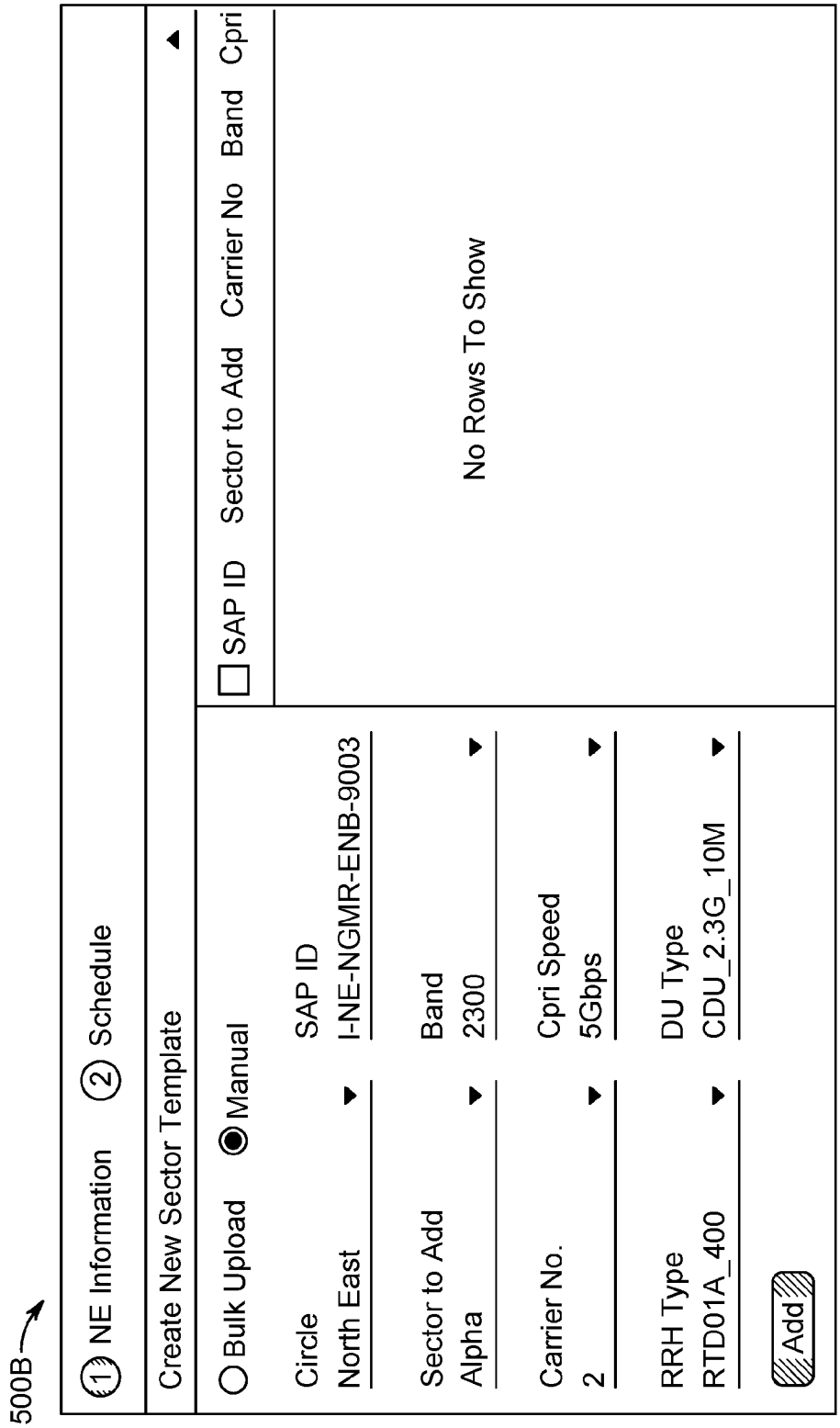

500B
1 NE Information
2 Schedule
Create New Sector Template
Bulk Upload
Manual
Circle
North East
SAP ID
I-NE-NGMR-ENB-9003
Sector to Add
Alpha
Band
2300
Carrier No.
2
Cpri Speed
5Gbps
RRH Type
RTD01A_400
DU Type
CDU_2.3G_10M
Add
SAP ID
Sector to Add
Carrier No
Band
Cpri
No Rows To Show

FIG. 5B

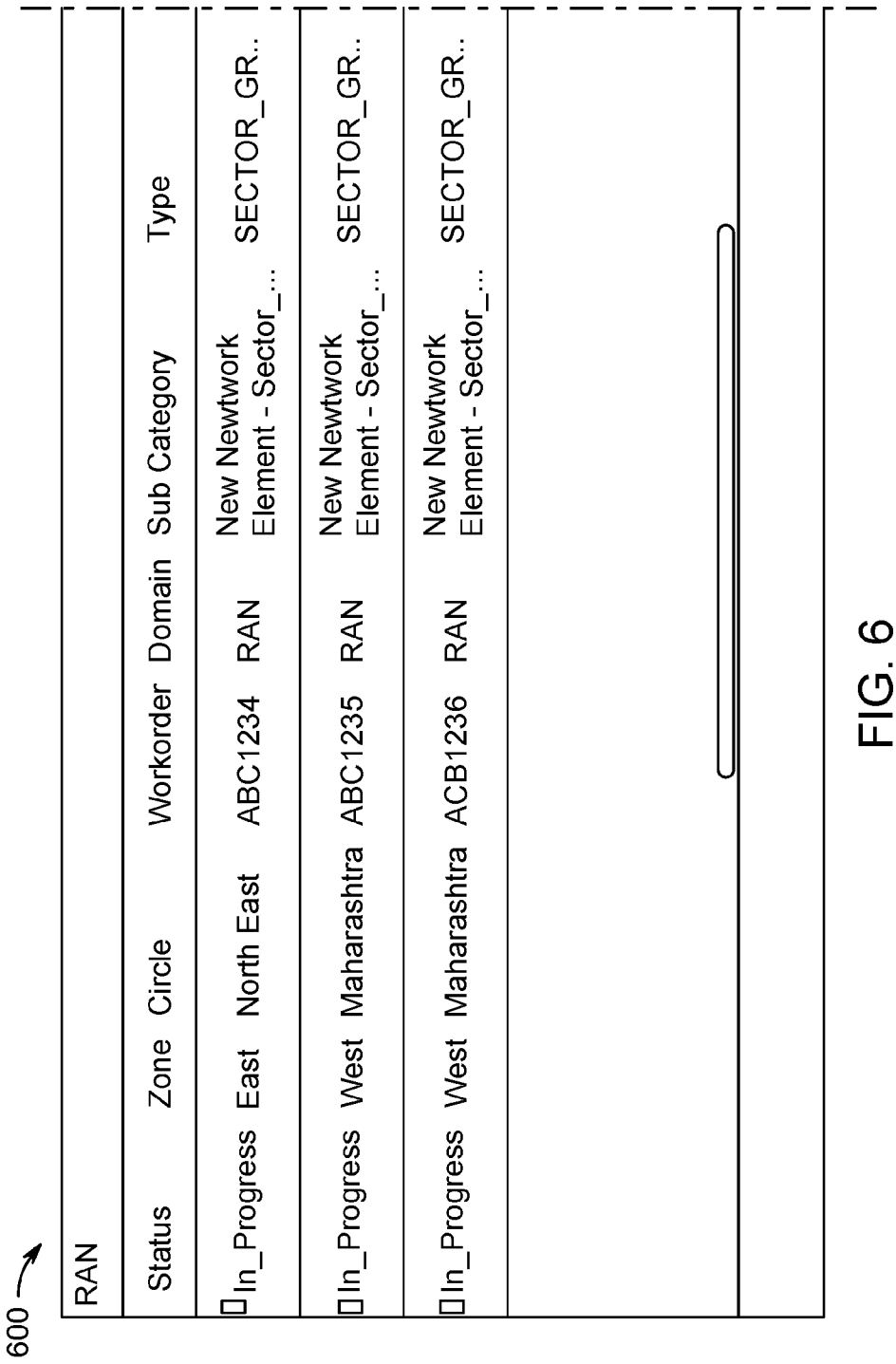

600
RAN
Status
Zone
Circle
Workorder
Domain
Sub Category
Type
In_Progress
East
North East
ABC1234
RAN
New Newtwork Element - Sector_...
SECTOR_GR..
In_Progress
West
Maharashtra
ABC1235
RAN
New Newtwork Element - Sector_...
SECTOR_GR..
In_Progress
West
Maharashtra
ACB1236
RAN
New Newtwork Element - Sector_...
SECTOR_GR..

FIG. 6

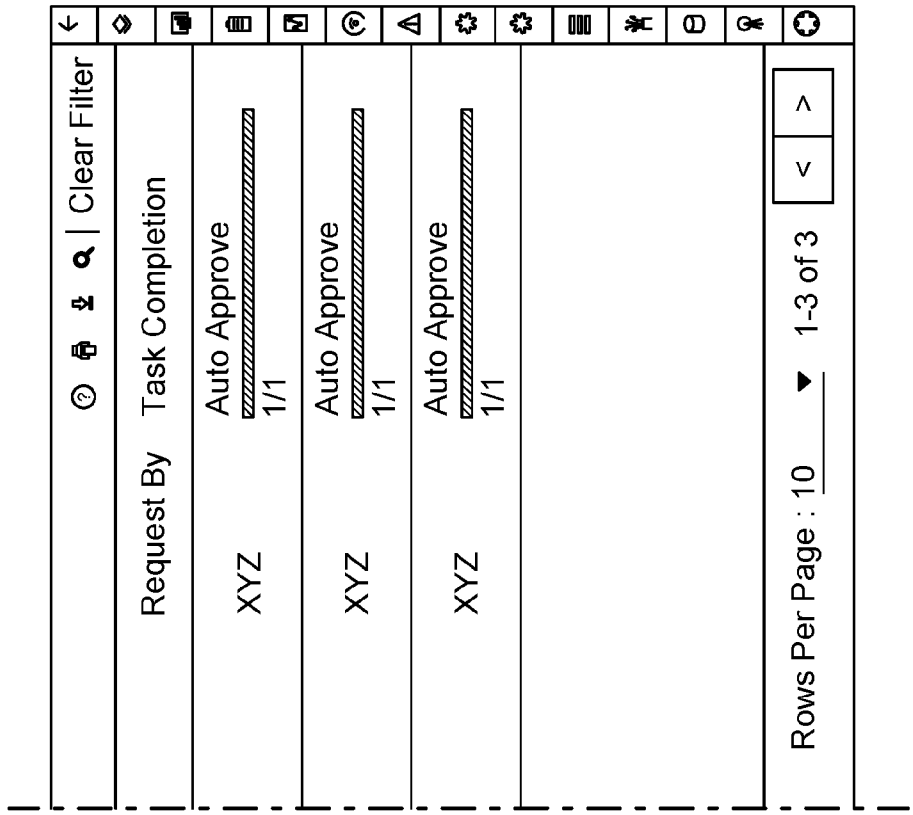

Clear Filter
Request By
Task Completion
Auto Approve
XYZ
1/1
Auto Approve
XYZ
1/1
Auto Approve
XYZ
1/1
Rows Per Page : 10
1-3 of 3
<
>

FIG. 6 (Cont'd)

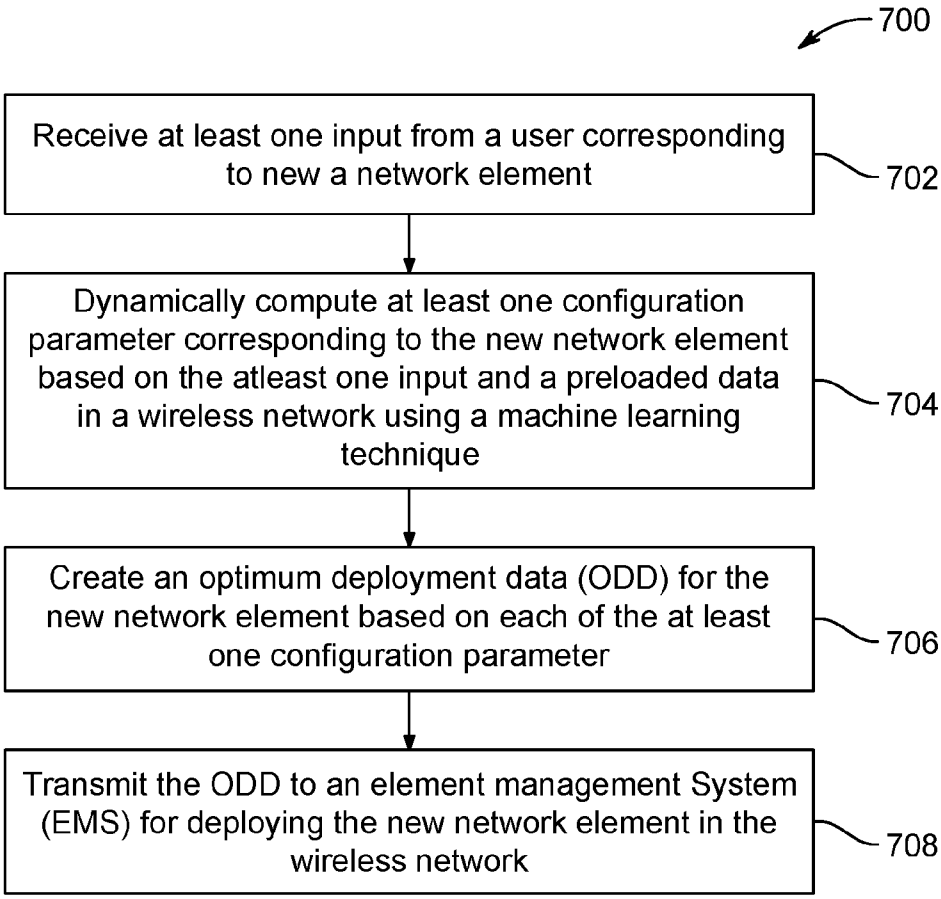

700
Receive at least one input from a user corresponding to new a network element
702
Dynamically compute at least one configuration parameter corresponding to the new network element based on the atleast one input and a preloaded data in a wireless network using a machine learning technique
704
Create an optimum deployment data (ODD) for the new network element based on each of the at least one configuration parameter
706
Transmit the ODD to an element management System (EMS) for deploying the new network element in the wireless network
708

FIG. 7

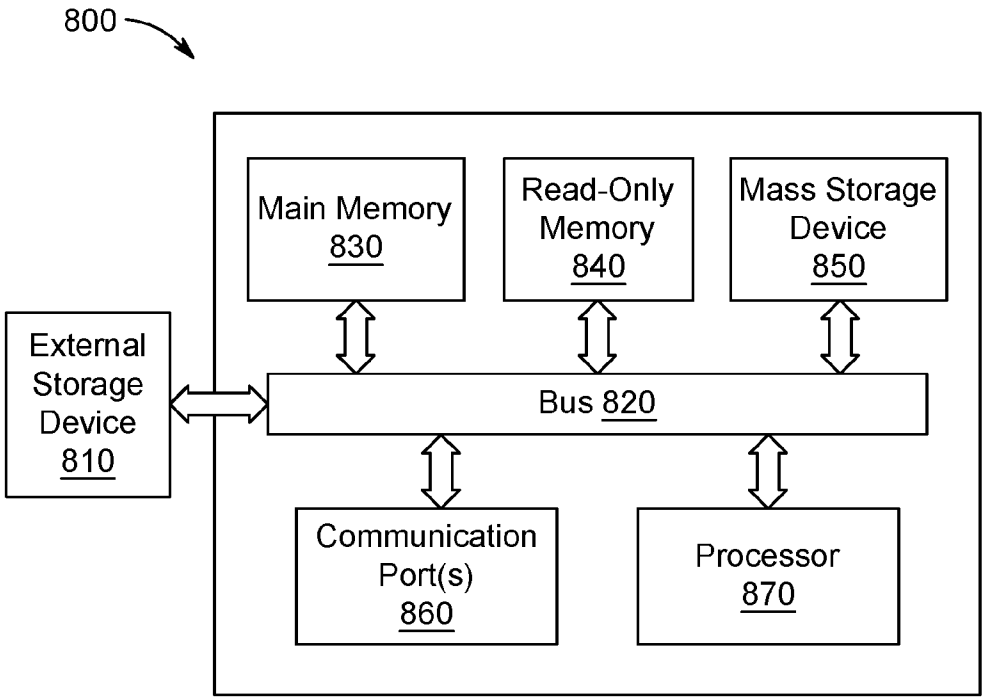

800
Main Memory
830
Read-Only
Memory
840
Mass Storage
Device
850
External
Storage
Device
810
Bus 820
Communication
Port(s)
860
Processor
870

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IN2024/050862

A. CLASSIFICATION OF SUBJECT MATTER
H04W16/18,H04W24/02,H04L41/04,H04L41/149 Version=2024.01

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04W, H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of database and, where practicable, search terms used)

PatSeer, IPO Internal Database

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US9380639B2 (AIRHOP COMMUNICATIONS INC) 28 June, 2016 (28-06-2016) Abstract and Columns 2 & 4	1-12
Y	US9585031B2 (DEUTSCHE TELEKOM AG) 28 February, 2017 (28-02-2017) Abstract and Column 7	1-12

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25-09-2024	25-09-2024

Name and mailing address of the ISA/	Authorized officer
Indian Patent Office Plot No.32, Sector 14,Dwarka,New Delhi-110075 Facsimile No.	Mohammad Shoaib Telephone No. +91-1125300200

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IN2024/050862

Citation	Pub.Date	Family	Pub.Date
US 9380639 B2	28-06-2016	US 8983453 B1	17-03-2015
US 9585031 B2	28-02-2017	EP 2741535 B1	15-02-2017
		ES 2625279 T3	19-07-2016
		PL 2741535 T3	31-08-2017
		WO 2014086586 A1	12-06-2014
		CN 104854901 B	27-11-2018
		CA 2888434 C	08-09-2020
		HR P20170683 T1	08-09-2017