COMMUNICATION METHOD AND RELATED APPARATUS

[0001] This application claims priority to Chinese Patent Application No. 202410318222.1, filed with the China National Intellectual Property Administration on March 15, 2024 and entitled "COMMUNICATION METHOD AND RELATED APPARATUS", which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] This application relates to the communication field, and in particular, to a communication method and a related apparatus.

BACKGROUND

[0003] Wireless communication may be transmission communication performed between two or more communication nodes without propagation relying on conductors or cables, and the communication nodes generally include a network device and a terminal device.

[0004] Currently, in a wireless communication system, a communication node usually has signal receiving and sending capabilities and a computational capability. A network device having a computational capability is used as an example. The computational capability of the network device is mainly used to provide computational power support for signal receiving and sending capabilities (for example, sending and receiving a signal), to implement communication between the network device and another communication node.

[0005] However, in a communication network, in addition to providing computational power support for the foregoing communication task based on the computational capability of the communication node, the communication node may further have spare computational capabilities. Therefore, how to use these computational capabilities is a technical problem.

SUMMARY

[0006] This application provides a communication method and a related device, enabling a communication apparatus in a communication system to function as a data collection node, thereby implementing data collection.

[0007] A first aspect of this application provides a communication method. The method is

performed by a first communication apparatus. The first communication apparatus may be a communication device (for example, a terminal device or a network device), or the first communication apparatus may be some components (for example, a processor, a chip, or a system on chip) in the communication device, or the first communication apparatus may be a logic module or software that can implement all or some functions of the communication device. In the method, the first communication apparatus receives first information, where the first information indicates collection of data of P categories, P is a positive integer, and a first collection state of the data of the P categories is incomplete; and the first communication apparatus sends second information, where the second information includes data of Q categories among the P categories, and Q is a positive integer less than or equal to P.

[0008] Based on the foregoing solution, the first information received by the first communication apparatus indicates data collection of the data of the P categories. In addition, the first communication apparatus may obtain the data of the Q categories among the P categories (namely, data of some or all categories among the P categories) based on the first information, and send the second information including the data of the Q categories. In other words, the first communication apparatus can perform data collection based on an indication of the first information to obtain the data of the Q categories, and feed back the data of the Q categories via the second information. Therefore, a communication apparatus in a communication system can function as a data collection node, to implement collection of specific categories of data.

[0009] In addition, in the foregoing technical solution, the first collection state of the data of the P categories is incomplete, that is, the data of the Q categories fed back by the first communication apparatus via the second information is data that is currently not completely collected. In this manner, the first communication apparatus can collect data whose current collection state is incomplete, so that a receiver of the second information (for example, a second communication apparatus) can obtain the data of the Q categories, thereby enabling efficient data collection.

[0010] In this application, data collection may be replaced by another term, for example, data acquisition, data gathering, data obtaining, or data capture.

[0011] In this application, "incomplete" may be replaced by another term, for example, "not completely collected", "partially completed", "not collected", "not started to be collected", or "to be completed".

[0012] It should be noted that, after the first communication apparatus receives the first information, the first communication apparatus can determine, based on the first information, to collect the data of the P categories. The first communication apparatus may collect the data of the P categories based on the first information, or the first communication apparatus may collect data

of some categories among the P categories due to some factors (for example, limited power consumption or insufficient computational power resources). Correspondingly, the second information sent by the first communication apparatus may include the data of some or all categories (for example, the Q categories) among the P categories.

[0013] Optionally, the data of the P categories includes at least one of the following: data of one or more collection areas, data of one or more signal strength intervals, or data of one or more tasks.

[0014] In a possible implementation of the first aspect, the first information includes first indication information, and the first indication information indicates the first collection state.

[0015] Based on the foregoing solution, the first information received by the first communication apparatus indicates data collection of the data of the P categories. In addition, the first communication apparatus may determine to indicate, based on the first indication information included in the first information, the first collection state of the data of the P categories. In this manner, a sender of the first information (for example, the second communication apparatus) may maintain a data collection state of data of one or more categories, and indicate, to a data collector (namely, the first communication apparatus) via the maintained data collection state, a collection state of data of a corresponding category, to implement a data collection process of the data that is currently not completely collected.

[0016] In a possible implementation of the first aspect, the first indication information includes at least one of the following: an amount of collected data of the P categories, a proportion of the collected data of the P categories, an amount of uncollected data of the P categories, a proportion of the uncollected data of the P categories, a total target collection amount of the data of the P categories, or an identifier indicating that a collection state of the data of the P categories is incomplete.

[0017] Based on the foregoing solution, the first indication information indicating the first collection state may be implemented in the foregoing plurality of manners, to improve flexibility of implementing the solution.

[0018] In a possible implementation of the first aspect, the first collection state is determined based on first data collection status information, the first data collection status information indicates a collection state of data of N categories, the N categories include the P categories, and N is a positive integer.

[0019] Based on the foregoing solution, the first communication apparatus may locally maintain the first data collection status information, and the first data collection status information indicates the collection state of the data of the N categories. In this manner, the first communication apparatus may locally determine a collection state of the data of the Q categories, so that signaling

overheads can be reduced.

[0020] Optionally, the first communication apparatus may update the first data collection status information based on periodically exchanged information, so that the first communication apparatus can determine a current collection state of data of each category based on the update process.

[0021] Optionally, the first data collection status information maintained by the first communication apparatus may indicate the collection state of the data of the N categories. For example, the first data collection status information may indicate a mapping relationship between the N categories and a collection state of data of each category. The mapping relationship may be implemented in a form of table, formula, matrix, or the like.

[0022] In a possible implementation of the first aspect, the second information is used to update the first data collection status information.

[0023] Based on the foregoing solution, the second information sent by the first communication apparatus may be used to update the first data collection status information locally maintained by the first communication apparatus. In this manner, the first communication apparatus can update data collection status information based on a data collection process.

[0024] In a possible implementation of the first aspect, the first information includes second indication information, and the second indication information indicates the P categories.

[0025] Based on the foregoing solution, the first information received by the first communication apparatus may further include the second indication information, so that the first communication apparatus can determine, based on the second indication information, a category of data to be collected.

[0026] In a possible implementation of the first aspect, the first information further indicates collection of data of at least one category, and a collection state of the data of the at least one category is complete.

[0027] Based on the foregoing solution, the first information received by the first communication apparatus may further include an indication of data of another category whose data collection state is complete, that is, the first communication apparatus determines that the collection state of the data of the at least one category is complete. In this manner, the first communication apparatus can be prevented from continuing to collect, based on the first information, data of a category that has been currently collected, to avoid a repeated (or redundant or invalid) data collection process, thereby reducing overheads.

[0028] In this application, "complete" may be replaced by another term, for example, "collection completed", "all completed", or "collection terminated".

[0029] In a possible implementation of the first aspect, the second information further includes

third indication information, the third indication information indicates a second collection state of the data of the Q categories, and the second collection state is determined based on the data of the Q categories.

[0030] Based on the foregoing solution, after the first communication apparatus collects and feeds back the data of the Q categories based on the first information, the first communication apparatus may update the collection state of the data of the Q categories to the second collection state based on the collection process. Correspondingly, the second information sent by the first communication apparatus may further include the third indication information, so that the receiver of the second information (for example, the second communication apparatus) can determine the second collection state of the data of the Q categories based on the third indication information, to update the data collection state.

[0031] Optionally, because the second information may include the data of the Q categories and the third indication information, in a process of updating the first data collection status information based on the second information, the first communication apparatus may update the first data collection status information based on the data of the Q categories, or may update the first data collection status information based on the third indication information, or may update the first data collection status information based on the data of the Q categories and the third indication information.

[0032] In a possible implementation of the first aspect, before the first communication apparatus receives the first information, the method further includes: The first communication apparatus sends request information for requesting to collect the data of the P categories, where the request information is used to determine the first information.

[0033] Based on the foregoing solution, the first communication apparatus and the second communication apparatus may further exchange the request information, to determine and deliver a data collection instruction (namely, the first information).

[0034] Optionally, the request information includes one or more of position information, channel information, or computational power resource information.

[0035] In a possible implementation of the first aspect, before the first communication apparatus receives the first information, the method further includes: The first communication apparatus receives indication information indicating a data collection task, where the data collection task is to collect data of M categories, the M categories include the P categories, and M is a positive integer; and the first communication apparatus sends indication information indicating to join the data collection task.

[0036] Based on the foregoing solution, the first communication apparatus and the second communication apparatus may further exchange the indication information, so that the first

communication apparatus and the second communication apparatus determine that the first communication apparatus participates in the data collection task, and subsequently, the second communication apparatus may send the data collection instruction (namely, the first information) to the first communication apparatus, to implement the data collection process.

[0037] A second aspect of this application provides a communication method. The method is performed by a second communication apparatus. The second communication apparatus may be a communication device (for example, a terminal device or a network device), or the second communication apparatus may be some components (for example, a processor, a chip, or a system on chip) in the communication device, or the second communication apparatus may be a logic module or software that can implement all or some functions of the communication device. In the method, the second communication apparatus sends first information, where the first information indicates collection of data of P categories, P is a positive integer, and a first collection state of the data of the P categories is incomplete; and the second communication apparatus receives second information, where the second information includes data of Q categories among the P categories, and Q is a positive integer less than or equal to P.

[0038] Based on the foregoing solution, the first information sent by the second communication apparatus to a first communication apparatus indicates collection of the data of the P categories, so that the first communication apparatus may obtain the data of the Q categories among the P categories (namely, data of some or all categories among the P categories) based on the first information, and send the second information including the data of the Q categories to the second communication apparatus. In other words, the first communication apparatus can perform data collection based on an indication of the first information to obtain the data of the Q categories, and feed back the data of the Q categories via the second information. Therefore, a communication apparatus in a communication system can function as a data collection node, to implement collection of specific categories of data.

[0039] In addition, in the foregoing technical solution, the first collection state of the data of the P categories is incomplete, that is, the data of the Q categories fed back by the first communication apparatus via the second information is data that is currently not completely collected. In this manner, the first communication apparatus can collect data whose current collection state is incomplete, so that the second communication apparatus can obtain the data of some or all categories among the P categories, thereby enabling efficient data collection.

[0040] In a possible implementation of the second aspect, the first information includes first indication information, and the first indication information indicates the first collection state.

[0041] Based on the foregoing solution, the first information sent by the second communication apparatus indicates collection of the data of the P categories. In addition, the first

communication apparatus may determine to indicate, based on the first indication information included in the first information, the first collection state of the data of the P categories. In this manner, a sender of the first information (for example, the second communication apparatus) may maintain a data collection state of data of one or more categories, and indicate, to a data collector (namely, the first communication apparatus) via the maintained data collection state, a collection state of data of a corresponding category, to implement a data collection process of the data that is currently not completely collected.

[0042] In a possible implementation of the second aspect, the first indication information includes at least one of the following: an amount of collected data of the P categories, a proportion of the collected data of the P categories, an amount of uncollected data of the P categories, a proportion of the uncollected data of the P categories, a total target collection amount of the data of the P categories, or an identifier indicating that a collection state of the data of the P categories is incomplete.

[0043] Based on the foregoing solution, the first indication information indicating the first collection state may be implemented in the foregoing plurality of manners, to improve flexibility of implementing the solution.

[0044] In a possible implementation of the second aspect, the first collection state is determined based on second data collection status information, the second data collection status information indicates a collection state of data of K categories, the K categories include the P categories, and K is a positive integer.

[0045] Based on the foregoing solution, the second communication apparatus may locally maintain the second data collection status information, and the second data collection status information indicates the collection state of the data of the K categories. In this manner, the second communication apparatus may locally determine a collection state of the data of the Q categories, and indicate a determining result via the first information, to implement a data collection process of the data that is currently not completely collected.

[0046] Optionally, the second communication apparatus may update the second data collection status information based on periodically exchanged information, so that the second communication apparatus can determine a current collection state of data of each category based on the update process.

[0047] Optionally, the second data collection status information maintained by the second communication apparatus may indicate the collection state of the data of the K categories. For example, the first data collection status information may indicate a mapping relationship between the K categories and a collection state of data of each category. The mapping relationship may be implemented in a form of table, formula, matrix, or the like.

[0048] In a possible implementation of the second aspect, the second information is from the first communication apparatus, and the method further includes: The second communication apparatus sends third information to a third communication apparatus, where the third information indicates collection of data of X categories, X is a positive integer, and a collection state of the data of the X categories is incomplete; and the second communication apparatus receives fourth information from the third communication apparatus, where the fourth information includes data of Y categories among the X categories, and Y is a positive integer less than or equal to X. The second information and the fourth information are used to update the second data collection status information.

[0049] Based on the foregoing solution, the second communication apparatus may serve as a central node in a distributed scenario, and implement a data collection process by interacting with another distributed node (for example, the first communication apparatus or the third communication apparatus). In addition, the second information and the fourth information that are received by the second communication apparatus may be used to update the second data collection status information locally maintained by the second communication apparatus. In this manner, the second communication apparatus can update data collection status information based on a data collection process.

[0050] It should be noted that, for an implementation of the third information, refer to an implementation process of the first information, and for an implementation of the fourth information, refer to an implementation process of the second information.

[0051] Optionally, the third information and the first information may be same information. In other words, the X categories may be the same as the P categories, so that the second communication apparatus can indicate data collection of a plurality of distributed nodes via same information, to reduce overheads.

[0052] In a possible implementation of the second aspect, the first information includes second indication information, and the second indication information indicates the P categories.

[0053] Based on the foregoing solution, the first information sent by the second communication apparatus to the first communication apparatus may further include the second indication information, so that the first communication apparatus can determine, based on the second indication information, a category of data to be collected.

[0054] In a possible implementation of the second aspect, the first information further indicates collection of data of at least one category, and a collection state of the data of the at least one category is complete.

[0055] Based on the foregoing solution, the first information sent by the second communication apparatus to the first communication apparatus may further include an indication

of data of another category whose data collection state is complete, that is, the first communication apparatus determines that the collection state of the data of the at least one category is complete. In this manner, the first communication apparatus can be prevented from continuing to collect, based on the first information, data of a category that has been currently collected, to avoid a repeated (or redundant or invalid) data collection process, thereby reducing overheads.

[0056] Optionally, the data of the P categories includes at least one of the following: data of one or more collection areas, data of one or more signal strength intervals, or data of one or more tasks.

[0057] In a possible implementation of the second aspect, the second information further includes third indication information, the third indication information indicates a second collection state of the data of the Q categories, and the second collection state is determined based on the data of the Q categories.

[0058] Based on the foregoing solution, after the first communication apparatus collects and feeds back the data of the Q categories based on the first information, the second communication apparatus may update the collection state of the data of the Q categories to the second collection state based on the collection process. Correspondingly, the second information sent by the first communication apparatus to the second communication apparatus may further include the third indication information, so that the second communication apparatus can determine the second collection state of the data of the Q categories based on the third indication information, to update the data collection state.

[0059] Optionally, because the second information may include the data of the Q categories and the third indication information, in a process of updating the second data collection status information based on the second information, the second communication apparatus may update the second data collection status information based on the data of the Q categories, or may update the second data collection status information based on the third indication information, or may update the second data collection status information based on the data of the Q categories and the third indication information.

[0060] In a possible implementation of the second aspect, before the second communication apparatus sends the first information, the method further includes: The second communication apparatus receives request information for requesting to collect the data of the P categories, where the request information is used to determine the first information.

[0061] Based on the foregoing solution, the first communication apparatus and the second communication apparatus may further exchange the request information, to determine and deliver a data collection instruction (namely, the first information).

[0062] Optionally, the request information includes one or more of position information,

channel information, or computational power resource information.

[0063] In a possible implementation of the second aspect, before the second communication apparatus sends the first information, the method further includes: The second communication apparatus sends indication information indicating a data collection task, where the data collection task is to collect data of M categories, the M categories include the P categories, and M is a positive integer; and the second communication apparatus receives indication information indicating to join the data collection task.

[0064] Based on the foregoing solution, the first communication apparatus and the second communication apparatus may further exchange the indication information, so that the first communication apparatus and the second communication apparatus determine that the first communication apparatus participates in the data collection task, and subsequently, the second communication apparatus may send the data collection instruction (namely, the first information) to the first communication apparatus, to implement the data collection process.

[0065] A third aspect of this application provides a communication apparatus. The communication apparatus is a first communication apparatus, and the communication apparatus includes a transceiver unit and a processing unit. The transceiver unit is configured to receive first information, where the first information indicates collection of data of P categories, and a first collection state of the data of the P categories is incomplete; the processing unit is configured to determine second information; and the transceiver unit is further configured to send the second information, where the second information includes data of Q categories among the P categories, and Q is a positive integer less than or equal to P.

[0066] In the third aspect of this application, a composition module of the communication apparatus may be further configured to: perform the steps performed in the possible implementations of the first aspect, and achieve corresponding technical effects. For details, refer to the first aspect. Details are not described herein again.

[0067] A fourth aspect of this application provides a communication apparatus. The communication apparatus is a second communication apparatus, and the communication apparatus includes a transceiver unit and a processing unit. The processing unit is configured to determine first information; the transceiver unit is configured to send the first information, where the first information indicates collection of data of P categories, and a first collection state of the data of the P categories is incomplete; and the transceiver unit is further configured to receive second information, where the second information includes data of Q categories among the P categories, and Q is a positive integer less than or equal to P.

[0068] In the fourth aspect of this application, a composition module of the communication apparatus may be further configured to: perform the steps performed in the possible

implementations of the second aspect, and achieve corresponding technical effects. For details, refer to the second aspect. Details are not described herein again.

[0069] A fifth aspect of this application provides a communication apparatus, including at least one processor. The at least one processor is coupled to a memory. The memory is configured to store a program or instructions. The at least one processor is configured to execute the program or the instructions, so that the communication apparatus implements the method in any possible implementation in either of the first aspect and the second aspect. Optionally, the communication apparatus may include the memory.

[0070] A sixth aspect of this application provides a communication apparatus, including at least one logic circuit and an input/output interface. The logic circuit is configured to perform the method in any possible implementation in either of the first aspect and the second aspect.

[0071] A seventh aspect of this application provides a communication system. The communication system includes the first communication apparatus and the second communication apparatus described above.

[0072] An eighth aspect of this application provides a computer-readable storage medium. The storage medium is configured to store one or more computer-executable instructions. When the computer-executable instructions are executed by a processor, the processor performs the method in any possible implementation in either of the first aspect and the second aspect.

[0073] A ninth aspect of this application provides a computer program product (or referred to as a computer program). When the computer program in the computer program product is executed by a processor, the processor performs the method in any possible implementation in either of the first aspect and the second aspect.

[0074] A tenth aspect of this application provides a system on chip. The system on chip includes at least one processor, configured to support a communication apparatus in implementing the method in any possible implementation in either of the first aspect and the second aspect.

[0075] In a possible design, the system on chip may further include a memory, and the memory is configured to store program instructions and data that are necessary for the communication apparatus. The system on chip may include a chip, or may include a chip and another discrete component. Optionally, the system on chip further includes an interface circuit, and the interface circuit provides program instructions and/or data for the at least one processor.

[0076] For technical effects brought by any design in the third aspect to the tenth aspect, refer to the technical effects brought by different designs in the first aspect and the second aspect. Details are not described herein again.

BRIEF DESCRIPTION OF DRAWINGS

[0077] FIG. 1a to FIG. 1c are diagrams of communication systems according to this application;

[0078] FIG. 2a to FIG. 2e are diagrams of AI processing processes according to this application;

[0079] FIG. 3 is a diagram of interaction in a communication method according to this application;

[0080] FIG. 4 is another diagram of interaction in a communication method according to this application; and

[0081] FIG. 5 to FIG. 9 are diagrams of communication apparatuses according to this application.

DESCRIPTION OF EMBODIMENTS

[0082] Some terms in embodiments of this application are first described, to help a person skilled in the art have a better understanding.

[0083] (1) A terminal device may be a wireless terminal device that can receive scheduling and indication information of a network device. The wireless terminal device may be a device providing voice and/or data connectivity for a user, a handheld device having a wireless connection function, or another processing device connected to a wireless modem.

[0084] The terminal device may communicate with one or more core networks or the internet through a radio access network (radio access network, RAN). The terminal device may be a mobile terminal device like a mobile phone (or referred to as a "cellular" phone or a mobile phone (mobile phone)), a computer, and a data card. For example, the terminal device may be a portable, pocket-sized, handheld, computer built-in, or vehicle-mounted mobile apparatus that exchanges voices and/or data with the radio access network. For example, the terminal device may be a device like a personal communication service (personal communication service, PCS) phone, a cordless phone, a session initiation protocol (session initiation protocol, SIP) phone, a wireless local loop (wireless local loop, WLL) station, a personal digital assistant (personal digital assistant, PDA), a tablet computer (tablet or pad), or a computer having a wireless transceiver function. The wireless terminal device may also be referred to as a system, a subscriber unit (subscriber unit), a subscriber station (subscriber station), a mobile station/mobile console (mobile station, MS), a remote station (remote station), an access point (access point, AP), a remote terminal (remote terminal), an access terminal (access terminal), a user terminal (user terminal), a user agent (user agent), a subscriber station (subscriber station, SS), customer premises equipment (customer premises equipment, CPE), a terminal (terminal), user equipment (user equipment, UE), a mobile terminal (mobile

terminal, MT), or the like.

[0085] By way of example, but not limitation, in embodiments of this application, the terminal device may alternatively be a wearable device. The wearable device may also be referred to as a wearable intelligent device, an intelligent wearable device, or the like, and is a general term of wearable devices that are intelligently designed and developed for daily wear by using a wearable technology, for example, glasses, gloves, watches, clothes, and shoes. The wearable device is a portable device that can be directly worn on the body or integrated into clothes or an accessory of a user. The wearable device is not only a hardware device, but also implements a powerful function through software support, data exchange, and cloud interaction. In a broad sense, wearable intelligent devices include full-featured and large-sized devices that can implement all or some functions without depending on smartphones, for example, smart watches or smart glasses, and include devices that dedicated to only one type of application function and need to collaboratively work with other devices such as smartphones, for example, various smart bands, smart helmets, or smart jewelry for monitoring physical signs.

[0086] The terminal may alternatively be an uncrewed aerial vehicle, a robot, a terminal in device-to-device (device-to-device, D2D) communication, a terminal in vehicle-to-everything (vehicle-to-everything, V2X), a virtual reality (virtual reality, VR) terminal device, an augmented reality (augmented reality, AR) terminal device, a wireless terminal in industrial control (industrial control), a wireless terminal in self driving (self driving), a wireless terminal in telemedicine (telemedicine or telehealth services), a wireless terminal in smart grid (smart grid), a wireless terminal in transportation safety (transportation safety), a wireless terminal in smart city (smart city), a wireless terminal in smart home (smart home), or the like.

[0087] In addition, the terminal device may alternatively be a terminal device in a communication system (for example, a 5G Advanced or 6th generation (6th generation, 6G) communication system) evolved after a 5th generation (5th generation, 5G) communication system, a terminal device in a future evolved public land mobile network (public land mobile network, PLMN), or the like. For example, a 5G Advanced or 6G network may further extend a form and a function of a 5G communication terminal, and a 6G terminal includes but is not limited to a vehicle, a cellular network terminal (integrating a function of a satellite terminal), an uncrewed aerial vehicle, and an internet of things (internet of things, IoT) device.

[0088] In embodiments of this application, the terminal device may further obtain an artificial intelligence (artificial intelligence, AI) service provided by the network device. Optionally, the terminal device may further have an AI processing capability.

[0089] (2) A network device may be a device in a wireless network. For example, the network device may be a RAN node (or device) connecting a terminal device to the wireless network, and

may also be referred to as a base station. Currently, some examples of the RAN device are a base station (base station), an evolved NodeB (evolved NodeB, eNodeB), a base station gNB (gNodeB) in a 5G communication system, a transmission reception point (transmission reception point, TRP), an evolved NodeB (evolved NodeB, eNB), a radio network controller (radio network controller, RNC), a NodeB (NodeB, NB), a home base station (for example, a home evolved NodeB, or a home NodeB, HNB), a baseband unit (baseband unit, BBU), a wireless fidelity (wireless fidelity, Wi-Fi) access point (AP), and the like. In addition, in a network structure, the network device may include a central unit (central unit, CU) node, a distributed unit (distributed unit, DU) node, or a RAN device including a CU node and a DU node.

[0090] Optionally, the RAN node may alternatively be a macro base station, a micro base station, an indoor base station, a relay node, or a donor node, or may be a radio controller in a cloud radio access network (cloud radio access network, CRAN) scenario. The RAN node may alternatively be a server, a wearable device, a vehicle, a vehicle-mounted device, or the like. For example, an access network device in a vehicle-to-everything (V2X) technology may be a road side unit (road side unit, RSU).

[0091] In another possible scenario, a plurality of RAN nodes coordinate to assist the terminal in implementing radio access, and different RAN nodes separately implement some functions of a base station. For example, the RAN node may be a CU, a DU, a CU-control plane (control plane, CP), a CU-user plane (user plane, UP), or a radio unit (radio unit, RU). The CU and the DU may be separately disposed, or may be included in a same network element, for example, a baseband unit (BBU). The RU may be included in a radio frequency device or a radio frequency unit, for example, included in a remote radio unit (remote radio unit, RRU), an active antenna unit (active antenna unit, AAU), a radio head (radio head, RH), or a remote radio head (remote radio head, RRH).

[0092] In different systems, the CU (or the CU-CP and the CU-UP), the DU, or the RU may alternatively have different names, but a person skilled in the art may understand meanings thereof. For example, in an open access network (open RAN, O-RAN or ORAN) system, the CU may also be referred to as an O-CU (open CU), the DU may also be referred to as an O-DU, the CU-CP may also be referred to as an O-CU-CP, the CU-UP may also be referred to as an O-CU-UP, and the RU may also be referred to as an O-RU. For ease of description, the CU, the CU-CP, the CU-UP, the DU, and the RU are used as examples for description in this application. Any one of the CU (or the CU-CP or the CU-UP), the DU, or the RU in this application may be implemented by using a software module, a hardware module, or a combination of a software module and a hardware module.

[0093] Communication between the access network device and the terminal device complies

with a specific protocol layer structure. Protocol layers may include a control plane protocol layer and a user plane protocol layer. The control plane protocol layer may include at least one of the following: a radio resource control (radio resource control, RRC) layer, a packet data convergence protocol (packet data convergence protocol, PDCP) layer, a radio link control (radio link control, RLC) layer, a media access control (media access control, MAC) layer, a physical (physical, PHY) layer, or the like. The user plane protocol layer may include at least one of the following: a service data adaptation protocol (service data adaptation protocol, SDAP) layer, a PDCP layer, an RLC layer, a MAC layer, a physical layer, or the like.

[0094] For a correspondence between network elements in the ORAN system and protocol layer functions that may be implemented by the network elements, refer to Table 1.

Table 1

ORAN network element	3GPP protocol layer function
O-CU-CP	RRC+PCDP-control plane (PDCP-C)
O-CU-UP	SDAP+PCDP-user plane (PDCP-U)
O-DU	RLC+MAC+PHY-high
O-RU	PHY-low

[0095] The network device may be another apparatus that provides a wireless communication function for the terminal device. A specific technology and a specific device form that are used by the network device are not limited in embodiments of this application. For ease of description, this is not limited in embodiments of this application.

[0096] The network device may further include a core network device. For example, the core network device includes network elements such as a mobility management entity (mobility management entity, MME), a home subscriber server (home subscriber server, HSS), a serving gateway (serving gateway, S-GW), a policy and charging rules function (policy and charging rules function, PCRF), and a public data network gateway (public data network gateway, PDN gateway or P-GW) in a 4th generation (4th generation, 4G) network, and an access and mobility management function (access and mobility management function, AMF), a user plane function (user plane function, UPF), and a session management function (session management function, SMF) in a 5G network. In addition, the core network device may further include another core network device in the 5G network and a next-generation network of the 5G network.

[0097] In embodiments of this application, the network device may alternatively be a network node having an AI capability, and may provide an AI service for a terminal or another network device, for example, may be an AI node, a computational power node, a RAN node having an AI

capability, or a core network element having an AI capability on a network side (an access network or a core network).

[0098] In embodiments of this application, an apparatus configured to implement a function of the network device may be a network device, or may be an apparatus, for example, a system on chip, that can support the network device in implementing the function. The apparatus may be disposed in the network device. In the technical solutions provided in embodiments of this application, description is made by using an example in which the apparatus configured to implement the function of the network device is the network device.

[0099] (3) Configuration and preconfiguration: In this application, both the configuration and the preconfiguration are used. The configuration means that a network device/a server sends configuration information of some parameters or values of the parameters to a terminal via a message or signaling, so that the terminal determines, based on the values or the information, a communication parameter or a resource used during transmission. Similar to the configuration, the preconfiguration may be parameter information or a parameter value negotiated by a network device/a server with a terminal device in advance, or may be parameter information or a parameter value used by a base station/a network device or a terminal device as specified in a standard protocol, or may be parameter information or a parameter value pre-stored in a base station/a server or a terminal device. This is not limited in this application.

[00100] Further, these values and parameters may be changed or updated.

[00101] (4) Terms "system" and "network" in embodiments of this application may be used interchangeably. "A plurality of" means two or more. The term "and/or" describes an association relationship between associated objects, and indicates that three relationships may exist. For example, A and/or B may indicate the following cases: Only A exists, both A and B exist, and only B exists, where A and B may be singular or plural. The character "/" generally indicates an "or" relationship between the associated objects. "At least one of the following items (pieces)" or a similar expression thereof indicates any combination of these items, including a single item (piece) or any combination of a plurality of items (pieces). For example, "at least one of A, B, and C" includes A, B, C, AB, AC, BC, or ABC. In addition, unless otherwise specified, ordinal numbers such as "first" and "second" in embodiments of this application are used to distinguish between a plurality of objects, and are not used to limit a sequence, a time sequence, priorities, or importance of the plurality of objects.

[00102] (5) "Sending" and "receiving" in embodiments of this application indicate signal transmission directions. For example, "sending information to XX" may be understood as that a destination of the information is XX, and may include direct sending through an air interface, or include indirect sending by another unit or module through an air interface. "Receiving information

from YY" may be understood as that a source of the information is YY, and may include direct receiving from YY through an air interface, or may include indirect receiving from YY via another unit or module through an air interface. "Sending" may also be understood as "outputting" of a chip interface, and "receiving" may also be understood as "inputting" of the chip interface.

[00103] In other words, sending and receiving may be performed between devices, for example, between a network device and a terminal device; or may be performed inside a device, for example, sending or receiving between components, modules, chips, software modules, or hardware modules inside the device through a bus, a trace, or an interface.

[00104] It may be understood that, necessary processing, such as encoding and modulation, may be performed on information between a source and a destination of information sending, but the destination may understand valid information from the source. A similar expression in this application may be understood similarly. Details are not described again.

[00105] (6) In embodiments of this application, "indication" may include a direct indication and an indirect indication, or may include an explicit indication and an implicit indication. Information indicated by specific information (for example, indication information in the following descriptions) is referred to as to-be-indicated information. In this case, during specific implementation, the to-be-indicated information may be indicated in a plurality of manners, for example, but not limited to: The to-be-indicated information may be directly indicated, for example, the to-be-indicated information or an index of the to-be-indicated information is indicated. Alternatively, the to-be-indicated information may be indirectly indicated by indicating other information, where there is an association relationship between the other information and the to-be-indicated information. Alternatively, only a part of the to-be-indicated information may be indicated, and a remaining part of the to-be-indicated information is known or pre-agreed upon. For example, specific information may be indicated by an arrangement sequence of a plurality of pieces of information that is pre-agreed upon (for example, predefined in a protocol), to reduce indication overheads to a specific extent. A specific indication manner is not limited in this application. It may be understood that, for a sender of the indication information, the indication information may indicate the to-be-indicated information, and for a receiver of the indication information, the indication information may be used to determine the to-be-indicated information.

[00106] In this application, unless otherwise stated, mutual reference may be made between same or similar parts of various embodiments. In embodiments of this application and methods/designs/implementations in embodiments, unless otherwise specified or logic conflicts occur, terms and/or descriptions between different embodiments and between the methods/designs/implementations in embodiments are consistent and may be mutually referenced, and different embodiments and technical features in the methods/designs/implementations in

embodiments may be combined to form a new embodiment, method, or implementation based on an internal logic relationship thereof. The following implementations of this application do not constitute a limitation on the protection scope of this application.

[00107] This application may be applied to a long term evolution (long term evolution, LTE) system, a new radio (new radio, NR) system, or a communication system (for example, 6G) evolved after 5G. The communication system includes at least one network device and/or at least one terminal device.

[00108] FIG. 1a is a diagram of a communication system according to this application. FIG. 1a illustrates one network device and six terminal devices. The six terminal devices are a terminal device 1, a terminal device 2, a terminal device 3, a terminal device 4, a terminal device 5, a terminal device 6, and the like. In the example shown in FIG. 1a, an example in which the terminal device 1 is a smart teacup, the terminal device 2 is a smart air conditioner, the terminal device 3 is a smart fuel dispenser, the terminal device 4 is a vehicle, the terminal device 5 is a mobile phone, and the terminal device 6 is a printer is used for description.

[00109] As shown in FIG. 1a, an AI configuration information sending entity may be the network device. AI configuration information receiving entities may be the terminal device 1 to the terminal device 6. In this case, the network device and the terminal device 1 to the terminal device 6 form a communication system. In the communication system, the terminal device 1 to the terminal device 6 may send data to the network device, and the network device needs to receive the data sent by the terminal device 1 to the terminal device 6. In addition, the network device may send configuration information to the terminal device 1 to the terminal device 6.

[00110] For example, in FIG. 1a, the terminal device 4 to the terminal device 6 may also form a communication system. The terminal device 5 serves as a network device, namely, an AI configuration information sending entity. The terminal device 4 and the terminal device 6 serve as terminal devices, namely, AI configuration information receiving entities. For example, in an internet of vehicles system, the terminal device 5 sends AI configuration information separately to the terminal device 4 and the terminal device 6, and receives data sent by the terminal device 4 and the terminal device 6; and correspondingly, the terminal device 4 and the terminal device 6 receive the AI configuration information sent by the terminal device 5, and send the data to the terminal device 5.

[00111] The communication system shown in FIG. 1a is used as an example. In addition to a communication-related service, an AI-related service may be performed between different devices (including between network devices, between a network device and a terminal device, and/or between terminal devices).

[00112] As shown in FIG. 1b, an example in which the network device is a base station is used.

A communication-related service and an AI-related service may be performed between the base station and one or more terminal devices, and a communication-related service and an AI-related service may also be performed between different terminal devices.

[00113] As shown in FIG. 1c, an example in which terminal devices include a television and a mobile phone is used. A communication-related service and an AI-related service may also be performed between the television and the mobile phone.

[00114] The technical solutions provided in this application may be applied to a wireless communication system (for example, the system shown in FIG. 1a, FIG. 1b, or FIG. 1c). For example, an AI network element may be introduced to the communication system provided in this application to implement a part or all of AI-related operations. The AI network element may also be referred to as an AI node, an AI device, an AI entity, an AI module, an AI model, an AI unit, or the like. The AI network element may be built in a network element in a communication system. For example, the AI network element may be an AI module built in the access network device, the core network device, a cloud server, or an operation, administration and maintenance (operation, administration and maintenance, OAM), to implement an AI-related function. The OAM may serve as a network manager of the core network device and/or a network manager of the access network device. Alternatively, the AI network element may be an independently disposed network element in a communication system. Optionally, the terminal or the chip built in the terminal may alternatively include the AI entity, configured to implement the AI-related function.

[00115] The following briefly describes AI that may be used in this application.

[00116] AI enables machines to have human intelligence, for example, enables machines to use computer software and hardware to simulate some intelligent human behaviors. To implement the artificial intelligence, a machine learning method may be used. In the machine learning method, a machine obtains a model through learning (or training) by using training data. The model represents mapping from an input to an output. The model obtained through learning may be used for inference (or prediction). To be specific, the model may be used to predict an output corresponding to a given input. The output may also be referred to as an inference result (or a prediction result).

[00117] Machine learning may include supervised learning, unsupervised learning, and reinforcement learning. The unsupervised learning may also be referred to as non-supervised learning.

[00118] In terms of supervised learning, based on collected sample values and sample labels, a mapping relationship between the sample values and the sample labels is learned by using a machine learning algorithm, and the learned mapping relationship is expressed by using an AI model. A process of training a machine learning model is a process of learning the mapping

relationship. In the training process, a sample value is input into the model to obtain a predicted value of the model, and a model parameter is optimized by calculating an error between the predicted value of the model and a sample label (ideal value). After the mapping relationship is learned, a new sample label may be predicted by using the learned mapping. The mapping relationship learned through the supervised learning may include linear mapping or non-linear mapping. Learning tasks may be classified into a classification task and a regression task based on a type of a label.

[00119] In terms of unsupervised learning, an algorithm autonomously explores the internal pattern of samples based on collected sample values. For a specific type of algorithm of the unsupervised learning, a sample is used as a supervised signal. In other words, a model learns a mapping relationship between samples, which is referred to as self-supervised learning. During training, a model parameter is optimized by calculating an error between a predicted value of the model and the sample. The self-supervised learning may be used for signal compression and decompression restoration. Common algorithms include an autoencoder, a generative adversarial network, and the like.

[00120] The reinforcement learning is different from the supervised learning, and is an algorithm that learns a policy of resolving problems by interacting with an environment. Different from the supervised learning and the unsupervised learning, the reinforcement learning does not have clear "correct" action label data. The algorithm needs to interact with the environment to obtain a reward signal fed back by the environment and adjust a decision action to obtain a larger reward signal value. For example, in downlink power control, a reinforcement learning model adjusts a downlink transmit power of each user based on a total system throughput fed back by a wireless network, to obtain a higher system throughput. An objective of the reinforcement learning is also to learn a mapping relationship between an environment status and a better (for example, an optimal) decision action. However, a label of "correct action" cannot be obtained in advance. Therefore, a network cannot be optimized by calculating an error between an action and the "correct action". Reinforcement learning training is implemented through iterative interaction with the environment.

[00121] A neural network (neural network, NN) is a specific model in a machine learning technology. According to a universal approximation theorem, the neural network can theoretically approximate any continuous function, so that the neural network has a capability of learning any mapping. In a conventional communication system, rich expertise is required to design a communication module. However, in a neural network-based deep learning communication system, an implicit pattern structure may be automatically discovered from a large quantity of datasets and a mapping relationship between data may be established, to obtain performance better

than that of a conventional modeling method.

[00122] An idea of the neural network comes from a neuron structure of brain tissue. For example, each neuron performs a weighted summation operation on input values of the neuron, and outputs an operation result through an activation function.

[00123] FIG. 2a is a diagram of a neuron structure. It is assumed that inputs of a neuron are $x = [x_0, x_1, \dots, x_n]$, and weights corresponding to the inputs are respectively $w = [w_0, w_1, \dots, w_n]$, where n is a positive integer, and w_i and x_i may be values of any possible type, for example, a decimal, an integer (for example, 0, a positive integer, or a negative integer), or a complex number. w_i is used as a weight of x_i, and is used to weight x_i. A bias for performing weighted summation on the input values based on the weights is, for example, b. There may be a plurality of forms of activation function. It is assumed that an activation function of a neuron is $y = f(z) = \max(0, z)$. In this case, an output of the neuron is $y = f\left(\sum_{i=0}^{i=n} w_i * x_i + b\right) = \max(0, \sum_{i=0}^{i=n} w_i * x_i + b)$. For another example, if an activation function of a neuron is $y = f(z) = z$, an output of the neuron is $y = f\left(\sum_{i=0}^{i=n} w_i * x_i + b\right) = \sum_{i=0}^{i=n} w_i * x_i + b$. Herein, b may be a value of any possible type, for example, a decimal, an integer (for example, 0, a positive integer, or a negative integer), or a complex number. Activation functions of different neurons in the neural network may be the same or different.

[00124] In addition, the neural network usually includes a plurality of layers, and each layer may include one or more neurons. A depth and/or a width of the neural network is increased, so that an expression capability of the neural network can be improved, and a more powerful information extraction and abstraction modeling capability can be provided for a complex system. The depth of the neural network may be a quantity of layers included in the neural network, and a quantity of neurons included at each layer may be referred to as a width of the layer. In an implementation, the neural network includes an input layer and an output layer. The input layer of the neural network performs neuron processing on received input information, and transfers a processing result to the output layer. The output layer obtains an output result of the neural network. In another implementation, the neural network includes an input layer, a hidden layer, and an output layer. The input layer of the neural network performs neuron processing on received input information, and transfers a processing result to an intermediate hidden layer. The hidden layer performs calculation on the received processing result to obtain a calculation result. The hidden layer transfers the calculation result to the output layer or a next adjacent hidden layer. Finally, the output layer obtains an output result of the neural network. One neural network may include one hidden layer, or include a plurality of hidden layers that are sequentially connected. This is not limited.

[00125] The neural network is, for example, a deep neural network (deep neural network, DNN).

According to a network construction manner, the DNN may include a feedforward neural network (feedforward neural network, FNN), a convolutional neural network (convolutional neural network, CNN), and a recurrent neural network (recurrent neural network, RNN).

[00126] FIG. 2b is a diagram of an FNN network. A feature of the FNN network is that neurons at adjacent layers are fully connected to each other. Due to this feature, the FNN usually needs a large amount of storage space, resulting in high computational complexity.

[00127] The CNN is a neural network dedicated to processing data of a grid-like structure. For example, both time series data (for example, timeline discrete sampling) and image data (for example, two-dimensional discrete sampling) may be considered as data of a grid-like structure. The CNN performs a convolution operation by extracting partial information through a window with a fixed size, instead of performing an operation based on all input information at one time. This greatly reduces a computation workload of model parameters. In addition, based on different types of information extracted through the window (for example, a person and an object in a same image are information of different types), a different convolution kernel operation may be used for each window, so that the CNN can better extract a feature of input data.

[00128] The RNN is a neural network using feedback time series information. Inputs of the RNN include a new input value at a current moment and an output value of the RNN at a previous moment. The RNN is suitable for obtaining sequence features having a time correlation, for example, is used for applications such as speech recognition and channel encoding and decoding.

[00129] In the foregoing model training process of machine learning, a loss function (loss function) may be defined. The loss function describes a gap or a difference between an output value of the model and an ideal target value. The loss function may be expressed in a plurality of forms, and a specific form of the loss function is not limited. The model training process may be considered as the following process: A part or all of parameters of the model are adjusted, so that a value of the loss function is less than a threshold or meets a target requirement.

[00130] The model may also be referred to as an AI model, a rule, another name, or the like. The AI model may be considered as a specific method for implementing an AI function. The AI model represents a mapping relationship or a function between an input and an output of the model. The AI function may include one or more of the following: data collection, model training (or model learning), model information release, model inference (or referred to as model inference, inference, prediction, or the like), model monitoring or model verification, inference result release, or the like. The AI function may also be referred to as an AI (AI-related) operation or an AI-related function.

[00131] The following describes an example of an implementation process of a fully connected neural network with reference to the accompanying drawings. The fully connected neural network

is also referred to as a multilayer perceptron (multilayer perceptron, MLP).

[00132] As shown in FIG. 2c, one MLP includes one input layer (left side), one output layer (right side), and a plurality of hidden layers (middle). Each layer of the MLP includes several nodes, which are referred to as neurons. Neurons at two adjacent layers are connected to each other in pairs.

[00133] Optionally, in consideration of neurons at two adjacent layers, an output h of a neuron at a lower layer is a weighted sum of all neurons x at an upper layer connected to the neuron at the lower layer, and may be expressed, by using an activation function, as:

$$h = f(wx + b).$$

[00134] Herein, w is a weight matrix, b is a bias vector, and f is the activation function.

[00135] Further, optionally, the output of the neural network may be recursively expressed as:

$$y = f_z(w_z f_{z-1}(\dots) + b_z).$$

[00136] Herein, z is an index of a neural network layer, z is greater than or equal to 1, z is less than or equal to Z, and Z is a total quantity of layers of the neural network.

[00137] In other words, the neural network may be understood as a mapping relationship between an input dataset and an output dataset. The neural network is usually initialized randomly, and a process of obtaining the mapping relationship from random w and b based on existing data is referred to as training of the neural network.

[00138] Optionally, a specific training manner is evaluating an output result of the neural network by using a loss function.

[00139] As shown in FIG. 2d, an error may be backpropagated, and neural network parameters (including w and b) can be iteratively optimized by using a gradient descent method until a loss function reaches a minimum value, namely, "a better point (for example, the optimal point)" in FIG. 2d. It may be understood that a neural network parameter corresponding to "the better point (for example, the optimal point)" in FIG. 2d may be used as a neural network parameter in trained AI model information.

[00140] Further, optionally, a gradient descent process may be expressed as:

$$\boldsymbol{\theta} \leftarrow \boldsymbol{\theta} - \eta \frac{\partial L}{\partial \boldsymbol{\theta}}.$$

[00141] Herein, $\boldsymbol{\theta}$ is a to-be-optimized parameter (including **w** and **b**), L is a loss function, η is a learning rate for controlling a gradient descent step, ∂ represents differentiation, and $\frac{\partial L}{\partial \boldsymbol{\theta}}$ represents taking a derivative of $\boldsymbol{\theta}$ with respect to L.

[00142] Further, optionally, a chain rule for obtaining a partial derivative is used in a backpropagation process.

[00143] As shown in FIG. 2e, a gradient of a parameter at a given layer may be obtained by

recursive calculation of a gradient of a parameter at an immediately subsequent layer, and may be expressed as:

$$\frac{\partial L}{\partial w_{ij}} = \frac{\partial L}{\partial s_i}\frac{\partial s_i}{\partial w_{ij}}.$$

[00144] Herein, w_{ij} is a weight of a connection between a node j and a node i, and s_i is a weighted sum of inputs on the node i.

[00145] The technical solutions provided in this application may be applied to a wireless communication system (for example, the system shown in FIG. 1a or FIG. 1b). In the wireless communication system, a communication node usually has a signal receiving and sending capability and a computational capability. A network device having a computational capability is used as an example. The computational capability of the network device is mainly used to provide computational power support for signal receiving and sending capabilities (for example, sending and receiving a signal), to implement a communication task between the network device and another communication node. In addition, in addition to processing a communication signal in a communication network, a communication device may further process another communication task (for example, channel prediction, beam management, and resource scheduling).

[00146] For example, the communication node may serve as a participating node of an AI learning system, and the computational power of the communication node is applied to a specific phase of the AI learning system (for example, the AI learning system shown in FIG. 2d or FIG. 2e). With advent of the era of large models, deep learning models with massive parameters, such as bidirectional encoder representations from transformers (bidirectional encoder representations from transformers, BERT) and a generative pre-trained transformer (generative pre-trained transformer, GPT), can complete increasingly complex tasks and achieve better performance.

[00147] In the foregoing implementation process, the communication device may need to perform related optimization on data obtained in a data collection process. However, for the communication device, how to implement data collection is a technical problem to be urgently resolved.

[00148] To resolve the foregoing problem, this application provides a communication method and a related apparatus. The following provides detailed descriptions with reference to the accompanying drawings.

[00149] FIG. 3 is a diagram of an implementation of a communication method according to this application. The method includes the following steps.

[00150] It should be noted that in FIG. 3 below, an example in which a first communication apparatus and another communication apparatus (for example, a second communication apparatus) are used as execution bodies of the interaction example is used to illustrate the method. However,

the execution bodies of the interaction example are not limited in this application. For example, the communication apparatus may be a communication device (for example, a terminal device or a network device), or a chip, a baseband (baseband) chip, a modem (modem) chip, a system-on-chip (system-on-chip, SoC) chip including a modem core, a system-in-package (system-in-package, SIP) chip, a communication module, a system on chip, a processor, a logic module, or software in a communication device. The first communication apparatus may be a terminal device, and the second communication apparatus may be a network device. Alternatively, both the first communication apparatus and the second communication apparatus are terminal devices.

[00151] S301: The second communication apparatus sends first information, and correspondingly, the first communication apparatus receives the first information. The first information indicates collection of data of P categories, and a first collection state of the data of the P categories is incomplete.

[00152] S302: The first communication apparatus sends second information, and correspondingly, the second communication apparatus receives the second information. The second information includes data of Q categories among the P categories, and Q is a positive integer less than or equal to P.

[00153] In this application, data collection may be replaced by another term, for example, data acquisition, data gathering, data obtaining, or data capture.

[00154] In this application, "incomplete" may be replaced by another term, for example, "not completely collected", "partially completed", "not collected", "not started to be collected", or "to be completed".

[00155] It should be noted that, after the first communication apparatus receives the first information, the first communication apparatus can determine, based on the first information, to collect the data of the P categories. The first communication apparatus may collect the data of the P categories based on the first information, or the first communication apparatus may collect data of some categories among the P categories due to some factors (for example, limited power consumption or insufficient computational power resources). Correspondingly, the second information sent by the first communication apparatus may include the data of some or all categories (for example, the Q categories) among the P categories.

[00156] It should be noted that, in a data collection process, data of different categories may be implemented in a plurality of manners.

[00157] In an example, data generated in communication processes in different collection areas may be different. Correspondingly, data in different collection areas may be data of different categories. For example, different collection areas may be identified in a plurality of manners, for example, longitude and latitude coordinates of each collection area and coordinates of an

identification point of each collection area (for example, vertex coordinates of a rectangular area and center coordinates of a circular area).

[00158] In another example, data generated in communication processes in different signal strength intervals may be different. Correspondingly, data collected in different signal strength intervals may be data of different categories.

[00159] In another example, data generated in communication processes in different tasks may be different. Correspondingly, data collected in different tasks may be data of different categories. For example, data generated in a channel prediction task may include channel data, data generated in a beam prediction task may include beam information, and data generated in a positioning task may include signal strength information.

[00160] In other words, the P categories may be implemented in the foregoing plurality of manners. For example, the data of the P categories includes at least one of the following: data of one or more collection areas, data of one or more signal strength intervals, or data of one or more tasks.

[00161] In a possible implementation, the first information received by the first communication apparatus in step S301 includes second indication information, and the second indication information indicates the P categories. In this manner, the first communication apparatus can determine, based on the second indication information, a category of data to be collected. For example, the second indication information may include identifiers, indexes, or the like of the P categories.

[00162] In a possible implementation, the first information received by the first communication apparatus in step S301 further indicates collection of data of at least one category, and a collection state of the data of the at least one category is complete. The P categories are different from the at least one category. In other words, the first information received by the first communication apparatus may further include an indication of data of another category whose data collection state is complete, that is, the first communication apparatus determines that the collection state of the data of the at least one category is complete. In this manner, the first communication apparatus can be prevented from continuing to collect, based on the first information, data of a category that has been currently collected, to avoid a repeated (or redundant or invalid) data collection process, thereby reducing overheads.

[00163] Similarly, the at least one category may be implemented in the foregoing plurality of manners. For example, the data of the at least one category includes at least one of the following: data of one or more collection areas, data of one or more signal strength intervals, or data of one or more tasks.

[00164] Optionally, indication information indicating collection of the data of the at least one

category may be implemented by using information other than the first information. In other words, the second communication apparatus may separately indicate, via different information, data collection states (for example, complete or incomplete) of data of different categories.

[00165] In this application, "complete" may be replaced by another term, for example, "collection completed", "all completed", or "collection terminated".

[00166] Based on the solution shown in FIG. 3, the first information received by the first communication apparatus in step S301 indicates collection of the data of the P categories. In addition, the first communication apparatus may obtain the data of the Q categories among the P categories (namely, the data of some or all categories among the P categories) based on the first information, and send, in step S302, the second information including the data of the Q categories. In other words, the first communication apparatus can perform data collection based on an indication of the first information to obtain the data of the Q categories, and feed back the data of the Q categories via the second information. Therefore, a communication apparatus in a communication system can function as a data collection node, to implement collection of specific categories of data.

[00167] In addition, in the foregoing technical solution, the first collection state of the data of the P categories is incomplete, that is, the data of the Q categories fed back by the first communication apparatus via the second information is data that is currently not completely collected. In this manner, the first communication apparatus can collect data whose current collection state is incomplete, so that a receiver of the second information (for example, the second communication apparatus) can obtain the data of the Q categories, thereby enabling efficient data collection.

[00168] It should be noted that the method shown in FIG. 3 may be applied to a distributed scenario. One or more communication apparatuses (including the first communication apparatus, a third communication apparatus below, and the like) may serve as distributed nodes, and the second communication apparatus may serve as a central node. In addition, any one of the one or more communication apparatuses may implement data collection based on an indication of the second communication apparatus, and the second communication apparatus may perform processing (for example, redundancy removal or deduplication) based on data collected by the one or more communication apparatuses.

[00169] In an example, as shown in FIG. 4, the distributed nodes include the first communication apparatus and a third communication apparatus. In the method shown in FIG. 3, step S301 may be represented as S301_1 in FIG. 4, and step S302 may be represented as S302_1 in FIG. 4. In addition, the method further includes the following steps.

[00170] S301_2: The second communication apparatus sends third information, and

correspondingly, the third communication apparatus receives the third information. The third information indicates collection of data of X categories, X is a positive integer, and a collection state of the data of the X categories is incomplete.

[00171] S302_2: The third communication apparatus sends fourth information, and correspondingly, the second communication apparatus receives the fourth information. The fourth information includes data of Y categories among the X categories, and Y is a positive integer less than or equal to X. The second information and the fourth information are used to update second data collection status information.

[00172] Therefore, the second communication apparatus may serve as a central node in the distributed scenario, and implement a data collection process by interacting with another distributed node (for example, the first communication apparatus or the third communication apparatus).

[00173] It should be noted that, for an implementation process of the third communication apparatus, refer to an implementation process of the first communication apparatus. In other words, for an implementation of the third information, refer to an implementation process of the first information, and for an implementation of the fourth information, refer to an implementation process of the second information.

[00174] Optionally, the third information and the first information may be same information. In other words, the X categories may be the same as the P categories, so that the second communication apparatus can indicate data collection of a plurality of distributed nodes via same information, to reduce overheads.

[00175] In the process shown in FIG. 3, the first communication apparatus may determine, in a plurality of manners, that the first collection state of the data of the P categories is incomplete. The following provides descriptions by using some implementation examples.

[00176] Implementation example 1: The first communication apparatus determines, based on an indication of another communication apparatus, that the first collection state of the data of the P categories is incomplete.

[00177] In the implementation example 1, the first information received by the first communication apparatus in step S301 includes first indication information, and the first indication information indicates the first collection state. In other words, the first information received by the first communication apparatus indicates collection of the data of the P categories. In addition, the first communication apparatus may determine to indicate, based on the first indication information included in the first information, the first collection state of the data of the P categories. In this manner, a sender of the first information (for example, the second communication apparatus) may maintain a data collection state of data of one or more categories, and indicate, to a data collector

(namely, the first communication apparatus) via the maintained data collection state, a collection state of data of a corresponding category, to implement a data collection process of the data that is currently not completely collected.

[00178] Optionally, the first indication information includes at least one of the following: an amount of collected data of the P categories, a proportion of the collected data of the P categories, an amount of uncollected data of the P categories, a proportion of the uncollected data of the P categories, a total target collection amount of the data of the P categories, or an identifier indicating that a collection state of the data of the P categories is incomplete. Therefore, the first indication information indicating the first collection state may be implemented in the foregoing plurality of manners, to improve flexibility of implementing the solution.

[00179] Optionally, the first indication information may be included in the first information, or the first indication information may be included in other information sent by the second communication apparatus to the first communication apparatus.

[00180] In a possible implementation of the implementation example 1, for the second communication apparatus, the first collection state is determined based on the second data collection status information, the second data collection status information indicates a collection state of data of K categories, the K categories include the P categories, and K is a positive integer. In other words, the second communication apparatus may locally maintain the second data collection status information, and the second data collection status information indicates the collection state of the data of the K categories. In this manner, the second communication apparatus may locally determine the collection state of the data of the P categories, and indicate a determining result via the first indication information in the first information, to implement the data collection process of the data that is currently not completely collected.

[00181] Optionally, the second communication apparatus may update the second data collection status information based on periodically exchanged information (for example, information exchanged between the second communication apparatus and another distributed node shown in FIG. 4), so that the second communication apparatus can determine a current collection state of data of each category based on the update process.

[00182] Optionally, the second data collection status information maintained by the second communication apparatus may indicate the collection state of the data of the K categories. For example, the first data collection status information may indicate a mapping relationship between the K categories and a collection state of data of each category. The mapping relationship may be implemented in a form of table, formula, matrix, or the like.

[00183] Optionally, the second information received by the second communication apparatus in step S302 may be used to update the second data collection status information locally maintained

by the first communication apparatus. In this manner, the second communication apparatus can update data collection status information based on a data collection process.

[00184] For example, in the distributed scenario shown in FIG. 4, the second information and the fourth information that are received by the second communication apparatus may be used to update the second data collection status information locally maintained by the second communication apparatus. In this manner, the second communication apparatus can update data collection status information based on a data collection process.

[00185] Implementation example 2: The first communication apparatus determines, based on locally stored information, that the first collection state of the data of the P categories is incomplete.

[00186] In the implementation example 2, the first collection state is determined based on first data collection status information, the first data collection status information indicates a collection state of data of N categories, the N categories include the P categories, and N is a positive integer. Specifically, the first communication apparatus may locally maintain the first data collection status information, and the first data collection status information indicates the collection state of the data of the N categories. In this manner, the first communication apparatus may locally determine a collection state of the data of the Q categories, so that signaling overheads can be reduced.

[00187] Optionally, the first communication apparatus may update the first data collection status information based on periodically exchanged information, so that the first communication apparatus can determine a current collection state of data of each category based on the update process. For example, the foregoing implementation example 1 and the foregoing implementation example 2 may be combined. To be specific, the first communication apparatus may update the locally stored first data collection status information based on the first indication information.

[00188] Optionally, the first data collection status information maintained by the first communication apparatus may indicate the collection state of the data of the N categories. For example, the first data collection status information may indicate a mapping relationship between the N categories and a collection state of data of each category. The mapping relationship may be implemented in a form of table, formula, matrix, or the like.

[00189] Optionally, the second information sent by the first communication apparatus in step S302 is used to update the first data collection status information. In other words, the second information sent by the first communication apparatus may be used to update the first data collection status information locally maintained by the first communication apparatus. In this manner, the first communication apparatus can update data collection status information based on a data collection process.

[00190] In a possible implementation of the implementation example 1 and the implementation example 2, the second information sent by the first communication apparatus in step S302 further

includes third indication information, the third indication information indicates a second collection state of the data of the Q categories, and the second collection state is determined based on the data of the Q categories. Specifically, after the first communication apparatus collects and feeds back the data of the Q categories based on the first information, the first communication apparatus may update the collection state of the data of the Q categories to the second collection state based on the collection process. Correspondingly, the second information sent by the first communication apparatus may further include the third indication information, so that the receiver of the second information (for example, the second communication apparatus) can determine the second collection state of the data of the Q categories based on the third indication information, to update the data collection state.

[00191] Similarly, the third indication information includes at least one of the following: an amount of collected data of the Q categories, a proportion of the collected data of the Q categories, an amount of uncollected data of the Q categories, a proportion of the uncollected data of the Q categories, a total target collection amount of the data of the Q categories, or an identifier indicating that a collection state of the data of the P categories is incomplete (or complete).

[00192] Optionally, because the second information may include the data of the Q categories and the third indication information, in a process of updating the first data collection status information based on the second information, the first communication apparatus may update the first data collection status information based on the data of the Q categories, or may update the first data collection status information based on the third indication information, or may update the first data collection status information based on the data of the Q categories and the third indication information.

[00193] Similarly, in a process of updating the first data collection status information based on the second information, the second communication apparatus may update the second data collection status information based on the data of the Q categories, or may update the second data collection status information based on the third indication information, or may update the second data collection status information based on the data of the Q categories and the third indication information.

[00194] In a possible implementation of the method shown in FIG. 3, before the first communication apparatus receives the first information in step S301, the method further includes: The first communication apparatus sends request information for requesting to collect the data of the P categories, where the request information is used to determine the first information. Specifically, the first communication apparatus and the second communication apparatus may further exchange the request information, to determine and deliver a data collection instruction (namely, the first information).

[00195] Optionally, the request information includes one or more of position information, channel information, or computational power resource information.

[00196] Optionally, request may be replaced by another term, for example, query, retrieval, or access.

[00197] For example, in the distributed scenario shown in FIG. 4, the second communication apparatus may receive request information of one or more first communication apparatuses, and the second communication apparatus may indicate, based on the received request information, the one or more first communication apparatuses to collect data of different categories. For example, data of different categories includes data in different collection areas, the request information sent by the one or more first communication apparatuses to the second communication apparatus may include position information, and the second communication apparatus may indicate, based on the position information, a first communication apparatus at a corresponding position to collect data in a specific collection area.

[00198] In a possible implementation of the method shown in FIG. 3, before the first communication apparatus receives the first information in step S301, the method further includes: The first communication apparatus receives indication information indicating a data collection task, where the data collection task is to collect data of M categories, the M categories include the P categories, and M is a positive integer; and the first communication apparatus sends indication information indicating to join the data collection task. Specifically, the first communication apparatus and the second communication apparatus may further exchange the indication information, so that the first communication apparatus and the second communication apparatus determine that the first communication apparatus participates in the data collection task, and subsequently, the second communication apparatus may send the data collection instruction (namely, the first information) to the first communication apparatus, to implement the data collection process.

[00199] Refer to FIG. 5. An embodiment of this application provides a communication apparatus 500. The communication apparatus 500 can implement functions of the first communication apparatus (or the second communication apparatus) in the foregoing method embodiment, and therefore can achieve beneficial effects of the foregoing method embodiment. In this embodiment of this application, the communication apparatus 500 may be the first communication apparatus (or the second communication apparatus), or may be an integrated circuit, a component, or the like inside the first communication apparatus (or the second communication apparatus), for example, a chip, a baseband chip, a modem chip, a SoC chip including a modem core, a system-in-package (system-in-package, SIP) chip, a communication module, a system on chip, or a processor.

[00200] It should be noted that a transceiver unit 502 may include a sending unit and a receiving unit that are respectively configured to perform sending and receiving.

[00201] In a possible implementation, when the apparatus 500 is configured to perform the method performed by the first communication apparatus in FIG. 3 and the related embodiment, the apparatus 500 includes a processing unit 501 and the transceiver unit 502. The transceiver unit 502 is configured to receive first information, where the first information indicates collection of data of P categories, and a first collection state of the data of the P categories is incomplete; the processing unit 501 is configured to determine second information; and the transceiver unit 502 is further configured to send the second information, where the second information includes data of Q categories among the P categories, and Q is a positive integer less than or equal to P.

[00202] In a possible implementation, when the apparatus 500 is configured to perform the method performed by the second communication apparatus in FIG. 3 and the related embodiment, the apparatus 500 includes a processing unit 501 and the transceiver unit 502. The processing unit 501 is configured to determine first information; the transceiver unit 502 is configured to send the first information, where the first information indicates collection of data of P categories, and a first collection state of the data of the P categories is incomplete; and the transceiver unit 502 is further configured to receive second information, where the second information includes data of Q categories among the P categories, and Q is a positive integer less than or equal to P.

[00203] In a possible design, when the communication apparatus 500 is a terminal device or a communication module in a terminal, functions of the processing unit 501 may be implemented by one or more processors. Specifically, the processor may include a modem chip, or a SoC chip including a modem core, or a SIP chip. Functions of the transceiver unit 502 may be implemented by a transceiver circuit.

[00204] In a possible design, when the communication apparatus 500 is a circuit or chip for implementing a communication function in a terminal, for example, a modem chip, a SoC chip including a modem core, or a SIP chip, functions of the processing unit 501 may be implemented by a circuit system that includes one or more processors or processor cores in the chip. Functions of the transceiver unit 502 may be implemented by an interface circuit or a data transceiver circuit in the chip.

[00205] It should be noted that for content such as an information execution process of the units of the communication apparatus 500, refer to descriptions in the foregoing method embodiment of this application. Details are not described herein again.

[00206] FIG. 6 is a diagram of another structure of a communication apparatus 600 according to this application. The communication apparatus 600 includes a logic circuit 601 and an input/output interface 602. The communication apparatus 600 may be a chip or an integrated

circuit.

[00207] The transceiver unit 502 shown in FIG. 5 may be a communication interface. The communication interface may be the input/output interface 602 in FIG. 6. The input/output interface 602 may include an input interface and an output interface. Alternatively, the communication interface may be a transceiver circuit, and the transceiver circuit may include an input interface circuit and an output interface circuit.

[00208] In a possible implementation, when the apparatus 600 is configured to perform the method performed by the first communication apparatus in FIG. 3 and the related embodiment, the input/output interface 602 is configured to receive first information, where the first information indicates collection of data of P categories, and a first collection state of the data of the P categories is incomplete; the logic circuit 601 is configured to determine second information; and the input/output interface 602 is further configured to send the second information, where the second information includes data of Q categories among the P categories, and Q is a positive integer less than or equal to P.

[00209] In a possible implementation, when the apparatus 600 is configured to perform the method performed by the second communication apparatus in FIG. 3 and the related embodiment, the logic circuit 601 is configured to determine first information; the input/output interface 602 is configured to send the first information, where the first information indicates collection of data of P categories, and a first collection state of the data of the P categories is incomplete; and the input/output interface 602 is further configured to receive second information, where the second information includes data of Q categories among the P categories, and Q is a positive integer less than or equal to P.

[00210] The logic circuit 601 and the input/output interface 602 may further perform other steps performed by the first communication apparatus or the second communication apparatus in any embodiment, and achieve corresponding beneficial effects. Details are not described herein again.

[00211] In a possible implementation, the processing unit 501 shown in FIG. 5 may be the logic circuit 601 in FIG. 6.

[00212] Optionally, the logic circuit 601 may be a processing apparatus, and some or all functions of the processing apparatus may be implemented by software. Some or all functions of the processing apparatus may be implemented by software.

[00213] Optionally, the processing apparatus may include a memory and a processor. The memory is configured to store a computer program, and the processor reads and executes the computer program stored in the memory, to perform corresponding processing and/or steps in any method embodiment.

[00214] Optionally, the processing apparatus may include only the processor. The memory

configured to store the computer program is located outside the processing apparatus, and the processor is connected to the memory through a circuit/wire, to read and execute the computer program stored in the memory. The memory and the processor may be integrated together, or may be physically independent of each other.

[00215] Optionally, the processing apparatus may be one or more chips or one or more integrated circuits. For example, the processing apparatus may be one or more field-programmable gate arrays (field-programmable gate arrays, FPGAs), an application-specific integrated circuit (application-specific integrated circuit, ASIC), a system on chip (system on chip, SoC), a central processing unit (central processing unit, CPU), a network processor (network processor, NP), a digital signal processor (digital signal processor, DSP), a microcontroller unit (microcontroller unit, MCU), a programmable logic controller (programmable logic device, PLD) or another integrated chip, or any combination of the foregoing chips or processors.

[00216] FIG. 7 shows a communication apparatus 700 in the foregoing embodiment according to an embodiment of this application. The communication apparatus 700 may be specifically a communication apparatus serving as the terminal device in the foregoing embodiment. FIG. 7 shows an example in which the terminal device is implemented through a terminal device (or a component in the terminal device).

[00217] In a possible diagram of a logical structure of the communication apparatus 700, the communication apparatus 700 may include but is not limited to at least one processor 701 and a communication port 702.

[00218] The transceiver unit 502 shown in FIG. 5 may be a communication interface. The communication interface may be the communication port 702 in FIG. 7, and the communication port 702 may include an input interface and an output interface. Alternatively, the communication port 702 may be a transceiver circuit, and the transceiver circuit may include an input interface circuit and an output interface circuit.

[00219] Further, optionally, the apparatus may further include at least one of a memory 703 and a bus 704. In this embodiment of this application, the at least one processor 701 is configured to control an action of the communication apparatus 700.

[00220] In addition, the processor 701 may be a central processing unit, a general-purpose processor, a digital signal processor, an application-specific integrated circuit, a field programmable gate array or another programmable logic device, a transistor logic device, a hardware component, or any combination thereof. The processor may implement or execute various example logical blocks, modules, and circuits described with reference to content disclosed in this application. Alternatively, the processor may be a combination of processors implementing a computational function, for example, a combination of one or more microprocessors, or a

combination of a digital signal processor and a microprocessor. It may be clearly understood by a person skilled in the art that, for the purpose of convenient and brief description, for a detailed working process of the foregoing system, apparatus, and unit, refer to a corresponding process in the foregoing method embodiment, and details are not described herein again.

[00221] It should be noted that the communication apparatus 700 shown in FIG. 7 may be specifically configured to implement steps implemented by the terminal device in the foregoing method embodiment, and achieve technical effects corresponding to the terminal device. For a specific implementation of the communication apparatus shown in FIG. 7, refer to the descriptions in the foregoing method embodiment. Details are not described herein again.

[00222] FIG. 8 is a diagram of a structure of a communication apparatus 800 in the foregoing embodiment according to embodiments of this application. The communication apparatus 800 may be specifically the communication apparatus serving as the network device in the foregoing embodiment. FIG. 8 shows an example in which the network device is implemented through a network device (or a component in the network device). For a structure of the communication apparatus, refer to the structure shown in FIG. 8.

[00223] The communication apparatus 800 includes at least one processor 811 and at least one network interface 814. Further, optionally, the communication apparatus further includes at least one memory 812, at least one transceiver 813, and one or more antennas 815. The processor 811, the memory 812, and the transceiver 813 are connected to the network interface 814, for example, connected through a bus. In this embodiment of this application, the connection may include various interfaces, transmission lines, buses, or the like. This is not limited in embodiments. The antenna 815 is connected to the transceiver 813. The network interface 814 is configured to cause the communication apparatus to communicate with another communication device through a communication link. For example, the network interface 814 may include a network interface, for example, an S1 interface, between the communication apparatus and a core network device. The network interface may include a network interface, for example, an X2 or Xn interface, between the communication apparatus and another communication apparatus (for example, another network device or a core network device).

[00224] The transceiver unit 502 shown in FIG. 5 may be a communication interface. The communication interface may be the network interface 814 in FIG. 8, and the network interface 814 may include an input interface and an output interface. Alternatively, the network interface 814 may be a transceiver circuit, and the transceiver circuit may include an input interface circuit and an output interface circuit.

[00225] The processor 811 is mainly configured to: process a communication protocol and communication data, control the entire communication apparatus, execute a software program, and

process data of the software program, for example, is configured to support the communication apparatus in performing actions described in embodiments. The communication apparatus may include a baseband processor and a central processing unit. The baseband processor is mainly configured to process the communication protocol and the communication data. The central processing unit is mainly configured to: control an entire terminal device, execute the software program, and process the data of the software program. The processor 811 in FIG. 8 may integrate functions of the baseband processor and the central processing unit. A person skilled in the art may understand that the baseband processor and the central processing unit each may be an independent processor, and are interconnected through a bus or by using another technology. A person skilled in the art may understand that the terminal device may include a plurality of baseband processors to adapt to different network standards, and the terminal device may include a plurality of central processing units to enhance processing capabilities of the terminal device, and components of the terminal device may be connected through various buses. The baseband processor may also be referred to as a baseband processing circuit or a baseband processing chip. The central processing unit may also be referred to as a central processing circuit or a central processing chip. A function of processing the communication protocol and the communication data may be built in the processor, or may be stored in the memory in a form of software program, and the processor executes the software program to implement a baseband processing function.

[00226] The memory is mainly configured to store the software program and data. The memory 812 may exist independently, and is connected to the processor 811. Optionally, the memory 812 may be integrated with the processor 811, for example, integrated into a chip. The memory 812 can store program code for executing the technical solutions in embodiments of this application, and the processor 811 controls the execution. Various types of executed computer program code may also be considered as drivers of the processor 811.

[00227] FIG. 8 shows only one memory and one processor. In an actual terminal device, there may be a plurality of processors and a plurality of memories. The memory may also be referred to as a storage medium, a storage device, or the like. The memory may be a storage element on a same chip as the processor, namely, an on-chip storage element, or may be an independent storage element. This is not limited in embodiments of this application.

[00228] The transceiver 813 may be configured to support receiving or sending of a radio frequency signal between the communication apparatus and a terminal, and the transceiver 813 may be connected to the antenna 815. The transceiver 813 includes a transmitter Tx and a receiver Rx. Specifically, the one or more antennas 815 may receive the radio frequency signal. The receiver Rx of the transceiver 813 is configured to: receive the radio frequency signal from the antenna, convert the radio frequency signal into a digital baseband signal or a digital intermediate

frequency signal, and provide the digital baseband signal or the digital intermediate frequency signal to the processor 811, so that the processor 811 further processes, for example, demodulates or decodes, the digital baseband signal or the digital intermediate frequency signal. In addition, the transmitter Tx of the transceiver 813 is further configured to: receive a modulated digital baseband signal or a modulated digital intermediate frequency signal from the processor 811, convert the modulated digital baseband signal or the modulated digital intermediate frequency signal into a radio frequency signal, and send the radio frequency signal through the one or more antennas 815. Specifically, the receiver Rx may selectively perform one-level or multi-level down-conversion mixing and analog-to-digital conversion on the radio frequency signal, to obtain the digital baseband signal or the digital intermediate frequency signal. A sequence of the down-conversion mixing and the analog-to-digital conversion may be adjusted. The transmitter Tx may selectively perform one-level or multi-level up-conversion mixing and digital-to-analog conversion on the modulated digital baseband signal or digital intermediate frequency signal, to obtain the radio frequency signal. A sequence of the up-conversion mixing and the digital-to-analog conversion may be adjusted. The digital baseband signal and the digital intermediate frequency signal may be collectively referred to as a digital signal.

[00229] The transceiver 813 may also be referred to as a transceiver unit, a transceiver machine, a transceiver apparatus, or the like. Optionally, a component configured to implement a receiving function in the transceiver unit may be considered as a receiving unit, and a component configured to implement a sending function in the transceiver unit may be considered as a sending unit. In other words, the transceiver unit includes a receiving unit and a sending unit. The receiving unit may also be referred to as a receiver, an input port, a receiver circuit, or the like. The sending unit may be referred to as a transmitter, a transmitter machine, a transmitter circuit, or the like.

[00230] It should be noted that the communication apparatus 800 shown in FIG. 8 may be specifically configured to implement steps implemented by the network device in the foregoing method embodiment, and achieve technical effects corresponding to the network device. For a specific implementation of the communication apparatus 800 shown in FIG. 8, refer to the descriptions in the foregoing method embodiment. Details are not described herein again.

[00231] FIG. 9 is a diagram of a structure of a communication apparatus in the foregoing embodiment according to an embodiment of this application.

[00232] It may be understood that the communication apparatus 900 includes, for example, modules, units, elements, circuits, or interfaces, which are appropriately configured together to perform the technical solutions provided in this application. The communication apparatus 900 may be the terminal device or the network device described above, or may be a component (for example, a chip) in these devices, to implement the methods described in the following method

embodiment. The communication apparatus 900 includes one or more processors 901. The processor 901 may be a general-purpose processor, a dedicated processor, or the like. For example, the processor may be a baseband processor or a central processing unit. The baseband processor may be configured to process a communication protocol and communication data. The central processing unit may be configured to: control the communication apparatus (for example, a RAN node, a terminal, or a chip), execute a software program, and process data of the software program.

[00233] Optionally, in a design, the processor 901 may include a program 903 (which may also be referred to as code or instructions sometimes). The program 903 may be run on the processor 901, to cause the communication apparatus 900 to perform the method described in the following embodiment. In another possible design, the communication apparatus 900 includes a circuit (not shown in FIG. 9).

[00234] Optionally, the communication apparatus 900 may include one or more memories 902, storing a program 904 (which may also be referred to as code or instructions sometimes). The program 904 may be run on the processor 901, to cause the communication apparatus 900 to perform the method described in the foregoing method embodiment.

[00235] Optionally, the processor 901 and/or the memory 902 may include AI modules 907 and 908, and the AI modules are configured to implement an AI-related function. The AI module may be implemented by software, hardware, or a combination of software and hardware. For example, the AI module may include a radio intelligence control (radio intelligence control, RIC) module. For example, the AI module may be a near-real-time RIC or a non-real-time RIC.

[00236] Optionally, the processor 901 and/or the memory 902 may further store data. The processor and the memory may be separately disposed, or may be integrated together.

[00237] Optionally, the communication apparatus 900 may further include a transceiver 905 and/or an antenna 906. The processor 901 may also be referred to as a processing unit sometimes, and control the communication apparatus (for example, the RAN node or the terminal). The transceiver 905 may also be referred to as a transceiver unit, a transceiver machine, a transceiver circuit, a transceiver device, or the like sometimes, and is configured to implement a transceiver function of the communication apparatus through the antenna 906.

[00238] The processing unit 501 shown in FIG. 5 may be the processor 901. The transceiver unit 502 shown in FIG. 5 may be a communication interface. The communication interface may be the transceiver 905 in FIG. 9. The transceiver 905 may include an input interface and an output interface. Alternatively, the transceiver 905 may be a transceiver circuit, and the transceiver circuit may include an input interface circuit and an output interface circuit.

[00239] An embodiment of this application further provides a computer-readable storage medium. The storage medium is configured to store one or more computer-executable instructions.

When the computer-executable instructions are executed by a processor, the processor performs the method in the possible implementations of the first communication apparatus or the second communication apparatus in the foregoing embodiment.

[00240] An embodiment of this application further provides a computer program product (or referred to as a computer program). When the computer program product is executed by a processor, the processor performs the method in the possible implementations of the first communication apparatus or the second communication apparatus.

[00241] An embodiment of this application further provides a system on chip. The system on chip includes at least one processor, configured to support a communication apparatus in implementing functions in the possible implementations of the communication apparatus. Optionally, the system on chip further includes an interface circuit, and the interface circuit provides program instructions and/or data for the at least one processor. In a possible design, the system on chip may further include a memory, and the memory is configured to store program instructions and data that are necessary for the communication apparatus. The system on chip may include a chip, or may include a chip and another discrete component. The communication apparatus may be specifically the first communication apparatus or the second communication apparatus in the foregoing method embodiment.

[00242] An embodiment of this application further provides a communication system. An architecture of the network system includes the first communication apparatus and/or the second communication apparatus in any one of the foregoing embodiments.

[00243] In the several embodiments provided in this application, it should be understood that the disclosed system, apparatus, and method may be implemented in other manners. For example, the apparatus embodiments described above are merely examples. For example, the unit division is merely logical function division and may be other division during actual implementation. For example, a plurality of units or components may be combined or integrated into another system, or some features may be ignored or not performed. In addition, the displayed or discussed mutual couplings or direct couplings or communication connections may be implemented through some interfaces. The indirect couplings or communication connections between the apparatuses or units may be implemented in electronic, mechanical, or other forms. Whether a function is performed by hardware or software depends on particular applications and design constraints of the technical solutions. A person skilled in the art may use different methods to implement the described functions for each particular application, but it should not be considered that the implementation goes beyond the scope of this application.

[00244] The units described as separate parts may or may not be physically separate, and parts displayed as units may or may not be physical units, may be located in one position, or may be

distributed on a plurality of network units. Some or all of the units may be selected based on actual requirements to achieve the objectives of the solutions of embodiments.

[00245] In addition, functional units in embodiments of this application may be integrated into one processing unit, each of the units may exist alone physically, or two or more units may be integrated into one unit. The integrated unit may be implemented in a form of hardware, or may be implemented in a form of software functional unit. When the integrated unit is implemented in the form of software functional unit and sold or used as an independent product, it may be stored in a computer-readable storage medium. Based on such understanding, a part of the technical solutions of this application that essentially makes contributions, or all or a part of the technical solutions, may be embodied in the form of software product. The computer software product is stored in a storage medium and includes several instructions for instructing a computer device (which may be a personal computer, a server, a network device, or the like) to perform all or some of the steps of the methods described in embodiments of this application. The foregoing storage medium includes any medium that can store program code, such as a USB flash drive, a removable hard disk, a read-only memory (read-only memory, ROM), a random access memory (random access memory, RAM), a magnetic disk, or an optical disc.

CLAIMS

1. A communication method, comprising:

receiving first information, wherein the first information indicates collection of data of P categories, P is a positive integer, and a first collection state of the data of the P categories is incomplete; and

sending second information, wherein the second information comprises data of Q categories among the P categories, and Q is a positive integer less than or equal to P.

2. The method according to claim 1, wherein the first information comprises first indication information, and the first indication information indicates the first collection state.

3. The method according to claim 2, wherein the first indication information comprises at least one of the following:

an amount of collected data of the P categories, a proportion of the collected data of the P categories, an amount of uncollected data of the P categories, a proportion of the uncollected data of the P categories, a total target collection amount of the data of the P categories, or an identifier indicating that a collection state of the data of the P categories is incomplete.

4. The method according to claim 1, wherein the first collection state is determined based on first data collection status information, the first data collection status information indicates a collection state of data of N categories, the N categories comprise the P categories, and N is a positive integer.

5. The method according to claim 4, wherein the second information is used to update the first data collection status information.

6. The method according to any one of claims 1 to 5, wherein the first information comprises second indication information, and the second indication information indicates the P categories.

7. The method according to any one of claims 1 to 6, wherein the first information further indicates collection of data of at least one category, and a collection state of the data of the at least one category is complete.

8. The method according to any one of claims 1 to 7, wherein the second information further comprises third indication information, the third indication information indicates a second collection state of the data of the Q categories, and the second collection state is determined based on the data of the Q categories.

9. The method according to any one of claims 1 to 8, wherein before receiving the first information, the method further comprises:

sending request information for requesting to collect the data of the P categories, wherein the request information is used to determine the first information.

10. The method according to claim 9, wherein the request information comprises one or more of position information, channel information, or computational power resource information.

11. A communication method, comprising:

sending first information, wherein the first information indicates collection of data of P categories, P is a positive integer, and a first collection state of the data of the P categories is incomplete; and

receiving second information, wherein the second information comprises data of Q categories among the P categories, and Q is a positive integer less than or equal to P.

12. The method according to claim 11, wherein the first information comprises first indication information, and the first indication information indicates the first collection state.

13. The method according to claim 12, wherein the first indication information comprises at least one of the following:

an amount of collected data of the P categories, a proportion of the collected data of the P categories, an amount of uncollected data of the P categories, a proportion of the uncollected data of the P categories, a total target collection amount of the data of the P categories, or an identifier indicating that a collection state of the data of the P categories is incomplete.

14. The method according to any one of claims 11 to 13, wherein the first collection state is determined based on second data collection status information, the second data collection status information indicates a collection state of data of K categories, the K categories comprise the P categories, and K is a positive integer.

15. The method according to claim 14, wherein the method is applied to a second communication apparatus, the second information is from a first communication apparatus, and the method further comprises:

sending third information to a third communication apparatus, wherein the third information indicates collection of data of X categories, X is a positive integer, and a collection state of the data of the X categories is incomplete; and

receiving fourth information from the third communication apparatus, wherein the fourth information comprises data of Y categories among the X categories, and Y is a positive integer less than or equal to X, wherein

the second information and the fourth information are used to update the second data collection status information.

16. The method according to any one of claims 11 to 15, wherein the first information comprises second indication information, and the second indication information indicates the P categories.

17. The method according to any one of claims 11 to 16, wherein the first information further

indicates collection of data of at least one category, and a collection state of the data of the at least one category is complete.

18. The method according to any one of claims 11 to 17, wherein the second information further comprises third indication information, the third indication information indicates a second collection state of the data of the Q categories, and the second collection state is determined based on the data of the Q categories.

19. The method according to any one of claims 11 to 18, wherein before sending the first information, the method further comprises:

receiving request information for requesting to collect the data of the P categories, wherein the request information is used to determine the first information.

20. The method according to claim 19, wherein the request information comprises one or more of position information, channel information, or computational power resource information.

21. A first communication apparatus, comprising a transceiver unit, wherein

the transceiver unit is configured to: receive first information, wherein the first information indicates collection of data of P categories, P is a positive integer, and a first collection state of the data of the P categories is incomplete; and

send second information, wherein the second information comprises data of Q categories among the P categories, and Q is a positive integer less than or equal to P.

22. The apparatus according to claim 21, wherein the first information comprises first indication information, and the first indication information indicates the first collection state.

23. The apparatus according to claim 22, wherein the first indication information comprises at least one of the following:

an amount of collected data of the P categories, a proportion of the collected data of the P categories, an amount of uncollected data of the P categories, a proportion of the uncollected data of the P categories, a total target collection amount of the data of the P categories, or an identifier indicating that a collection state of the data of the P categories is incomplete.

24. The apparatus according to claim 21, wherein the first collection state is determined based on first data collection status information, the first data collection status information indicates a collection state of data of N categories, the N categories comprise the P categories, and N is a positive integer.

25. The apparatus according to claim 24, wherein the second information is used to update the first data collection status information.

26. The apparatus according to any one of claims 21 to 25, wherein the first information comprises second indication information, and the second indication information indicates the P categories.

27. The apparatus according to any one of claims 21 to 26, wherein the first information further indicates collection of data of at least one category, and a collection state of the data of the at least one category is complete.

28. The apparatus according to any one of claims 21 to 27, wherein the second information further comprises third indication information, the third indication information indicates a second collection state of the data of the Q categories, and the second collection state is determined based on the data of the Q categories.

29. The apparatus according to any one of claims 21 to 28, wherein

the transceiver unit is further configured to send request information for requesting to collect the data of the P categories, wherein the request information is used to determine the first information.

30. The apparatus according to claim 29, wherein the request information comprises one or more of position information, channel information, or computational power resource information.

31. A second communication apparatus, comprising a transceiver unit, wherein

the transceiver unit is configured to: send first information, wherein the first information indicates collection of data of P categories, P is a positive integer, and a first collection state of the data of the P categories is incomplete; and

receive second information, wherein the second information comprises data of Q categories among the P categories, and Q is a positive integer less than or equal to P.

32. The apparatus according to claim 31, wherein the first information comprises first indication information, and the first indication information indicates the first collection state.

33. The apparatus according to claim 32, wherein the first indication information comprises at least one of the following:

an amount of collected data of the P categories, a proportion of the collected data of the P categories, an amount of uncollected data of the P categories, a proportion of the uncollected data of the P categories, a total target collection amount of the data of the P categories, or an identifier indicating that a collection state of the data of the P categories is incomplete.

34. The apparatus according to any one of claims 31 to 33, wherein the first collection state is determined based on second data collection status information, the second data collection status information indicates a collection state of data of K categories, the K categories comprise the P categories, and K is a positive integer.

35. The apparatus according to claim 34, wherein the second information is from a first communication apparatus; and

the transceiver unit is further configured to: send third information to a third communication apparatus, wherein the third information indicates collection of data of X categories, X is a positive

integer, and a collection state of the data of the X categories is incomplete; and

receive fourth information from the third communication apparatus, wherein the fourth information comprises data of Y categories among the X categories, and Y is a positive integer less than or equal to X, wherein

the second information and the fourth information are used to update the second data collection status information.

36. The apparatus according to any one of claims 31 to 35, wherein the first information comprises second indication information, and the second indication information indicates the P categories.

37. The apparatus according to any one of claims 31 to 36, wherein the first information further indicates collection of data of at least one category, and a collection state of the data of the at least one category is complete.

38. The apparatus according to any one of claims 31 to 37, wherein the second information further comprises third indication information, the third indication information indicates a second collection state of the data of the Q categories, and the second collection state is determined based on the data of the Q categories.

39. The apparatus according to any one of claims 31 to 38, wherein

the transceiver unit is further configured to receive request information for requesting to collect the data of the P categories, wherein the request information is used to determine the first information.

40. The apparatus according to claim 39, wherein the request information comprises one or more of position information, channel information, or computational power resource information.

41. A first communication apparatus, comprising a communication port, wherein

the communication port is configured to: receive first information, wherein the first information indicates collection of data of P categories, P is a positive integer, and a first collection state of the data of the P categories is incomplete; and

send second information, wherein the second information comprises data of Q categories among the P categories, and Q is a positive integer less than or equal to P.

42. The apparatus according to claim 41, wherein the first information comprises first indication information, and the first indication information indicates the first collection state.

43. The apparatus according to claim 42, wherein the first indication information comprises at least one of the following:

an amount of collected data of the P categories, a proportion of the collected data of the P categories, an amount of uncollected data of the P categories, a proportion of the uncollected data of the P categories, a total target collection amount of the data of the P categories, or an identifier

indicating that a collection state of the data of the P categories is incomplete.

44. The apparatus according to claim 41, wherein the first collection state is determined based on first data collection status information, the first data collection status information indicates a collection state of data of N categories, the N categories comprise the P categories, and N is a positive integer.

45. The apparatus according to claim 44, wherein the second information is used to update the first data collection status information.

46. The apparatus according to any one of claims 41 to 45, wherein the first information comprises second indication information, and the second indication information indicates the P categories.

47. The apparatus according to any one of claims 41 to 46, wherein the first information further indicates collection of data of at least one category, and a collection state of the data of the at least one category is complete.

48. The apparatus according to any one of claims 41 to 47, wherein the second information further comprises third indication information, the third indication information indicates a second collection state of the data of the Q categories, and the second collection state is determined based on the data of the Q categories.

49. The apparatus according to any one of claims 41 to 48, wherein

the communication port is further configured to send request information for requesting to collect the data of the P categories, wherein the request information is used to determine the first information.

50. The apparatus according to claim 49, wherein the request information comprises one or more of position information, channel information, or computational power resource information.

51. The apparatus according to any one of claims 41 to 50, wherein the apparatus is a chip or a system on chip.

52. A second communication apparatus, comprising a communication port, wherein

the communication port is configured to: send first information, wherein the first information indicates collection of data of P categories, P is a positive integer, and a first collection state of the data of the P categories is incomplete; and

receive second information, wherein the second information comprises data of Q categories among the P categories, and Q is a positive integer less than or equal to P.

53. The apparatus according to claim 52, wherein the first information comprises first indication information, and the first indication information indicates the first collection state.

54. The apparatus according to claim 53, wherein the first indication information comprises at least one of the following:

an amount of collected data of the P categories, a proportion of the collected data of the P categories, an amount of uncollected data of the P categories, a proportion of the uncollected data of the P categories, a total target collection amount of the data of the P categories, or an identifier indicating that a collection state of the data of the P categories is incomplete.

55. The apparatus according to any one of claims 52 to 54, wherein the first collection state is determined based on second data collection status information, the second data collection status information indicates a collection state of data of K categories, the K categories comprise the P categories, and K is a positive integer.

56. The apparatus according to claim 55, wherein the second information is from a first communication apparatus; and

the communication port is further configured to: send third information to a third communication apparatus, wherein the third information indicates collection of data of X categories, X is a positive integer, and a collection state of the data of the X categories is incomplete; and

receive fourth information from the third communication apparatus, wherein the fourth information comprises data of Y categories among the X categories, and Y is a positive integer less than or equal to X, wherein

the second information and the fourth information are used to update the second data collection status information.

57. The apparatus according to any one of claims 52 to 56, wherein the first information comprises second indication information, and the second indication information indicates the P categories.

58. The apparatus according to any one of claims 52 to 57, wherein the first information further indicates collection of data of at least one category, and a collection state of the data of the at least one category is complete.

59. The apparatus according to any one of claims 52 to 58, wherein the second information further comprises third indication information, the third indication information indicates a second collection state of the data of the Q categories, and the second collection state is determined based on the data of the Q categories.

60. The apparatus according to any one of claims 52 to 59, wherein

the communication port is further configured to receive request information for requesting to collect the data of the P categories, wherein the request information is used to determine the first information.

61. The apparatus according to claim 60, wherein the request information comprises one or more of position information, channel information, or computational power resource information.

62. The apparatus according to any one of claims 52 to 61, wherein the apparatus is a chip or a system on chip.

63. A readable storage medium, wherein the storage medium stores a computer program or instructions, and when the computer program or the instructions are executed by a computer, the method according to any one of claims 1 to 20 is implemented.

64. A computer program product, comprising instructions, wherein when the instructions run on a computer, the computer is caused to perform the method according to any one of claims 1 to 20.