**DESCRIPTION**

Resource pool processing method and device and storage medium

**Technical field**

The present invention relates to the field of communications and, in particular, relates to a resource pool processing method and apparatus, and storage medium.

**Background**

The fifth generation (5G) mobile networks will meet diverse service requirements of people in various fields such as living, working, leisure and traffic. Even in scenarios with ultra-high traffic density, ultra-high connection density and an ultra-high mobility characteristic, such as dense residential area, office, stadium, outdoor gathering, subway, express way, high-speed rail and wide-area coverage, the 5G mobile networks may also provide a user with extreme service experience such as ultra-high definition video, virtual reality, augmented reality, cloud desktop and online game. At the same time, the 5G mobile networks will also penetrate into Internet of Things (IoT) and various industries, and deeply integrate with industrial facilities, medical instruments and vehicles. This effectively meets diverse service requirements of vertical industries such as industry, medical treatment and traffic, and truly implements "Internet of everything".

In design of 5G system, forward compatibility is an important principle. This principle requires all resources to be dynamically configured. For example, a Synchronization Channel (SCH), a Channel State Information-Reference Signal (CSI-RS), a Sounding Reference Signal (SRS) and a feedback channel are configured to be dynamic and aperiodic. However, the better the forward compatibility is, the more the control overhead is. This will lead to reduction of spectral efficiency of the system. Due to the scarcity of radio spectrum resources, the design of a wireless communication system without consideration of the control overhead is certainly unreasonable.

Hence, it is required to strike a compromise between the control overhead and the forward compatibility. For example, a common resource pool is configured for transmitting the SCH, the CSI-RS, the SRS, the feedback channel or a transmission resource for a particular service (such as a low-delay high-reliability service). The system uses a resource in the resource pool according to requirements. However, if some resources in the resource pool are not used, there is no existing effective mechanism for allocating these unused resources to other downlink or uplink data channels that require resources (rate matching).

No effective solution has been proposed to solve the problem of poor usage flexibility of the resource pool of the 5G system in the existing art.

In the same endeavour as that of the invention, patent publication EP 2 840 748 A1 discloses receiving indication information from base station according to usage of the resource pool, and adjusting configuration of the first resource pool according to the indication information.

**Summary**

The embodiments of the present invention provide a resource pool processing method and apparatus, and storage medium, to at least solve the problem of poor usage flexibility of a resource pool of a 5G generation mobile communication system in the existing art.

The invention is defined by the independent claims. Preferred embodiments are defined by the dependent claims.

According to an embodiment of the present invention, a resource pool processing method according to claim 1 is provided.

Optionally, before the step in which the state information is sent, the method further includes a following step: a sending manner of the state information is configured.

Optionally, the sending manner of the state information includes one of following manners: the state information is sent through a physical downlink control channel (PDCCH); the state information is sent through a channel or a signal on a resource in the resource pool; the state information is sent through a resource in a time slot of the PDCCH corresponding to a data channel affected by usage of the resource pool; the state information is sent through a resource in a time slot after a time slot of the PDCCH corresponding to the data channel affected by the usage of the resource pool; the state information is sent through a resource in a time slot of the data channel affected by the usage of the resource pool; the state information is sent through a resource in a time slot after a time slot of the data channel affected by the usage of the resource pool.

Optionally, when the state information is sent through the PDCCH, the method further includes a following step: the state information is sent through a number N of PDCCHs. N is an integer greater than or equal to 2.

Optionally, the sending manner of the state information includes a sending manner determined through feedback information from the second communication node.

Optionally, the sending manner of the state information includes one of following manners: if the PDCCH exists in a time-domain resource corresponding to the resource pool, the state information is sent through a resource on a symbol of the PDCCH; the state information is sent through a resource on a symbol after a symbol of the PDCCH.

Optionally, the state information describes resource usage of a partial resource collection in the resource pool.

According to the invention, the state information describes one of the following: whether the first communication node sends data through a resource in the resource pool; whether the second communication node receives data through a resource in the resource pool; whether the second communication node tries to receive data through a resource in the resource pool; whether the second communication node measures, through a resource in the resource pool, at least one of a channel, interference, a sending manner and a receiving manner.

Optionally, the state information includes a number M of levels of usage state information. M is an integer greater than or equal to 2.

Optionally, at least one of the M levels of usage state information is sent in at least one manner of a group consisting of a PCDDH for broadcast, a PCDDH for multicast and a high-level signaling.

Optionally, mapping exists between a modulation coding scheme used for a channel for sending the state information and a modulation coding scheme of a data channel affected by the resource pool.

Optionally, a beam used for a channel for sending the state information is the same as a beam used for a data channel affected by the resource pool.

Optionally, the resource pool is divided into a number Y of resource collections. Y is an integer greater than or equal to X.

Optionally, the resource pool is configured to the second communication node by the first communication node through a number A of levels of signaling. A is an integer greater than or equal to 1.

Optionally, the A levels of signaling includes at least one of a group consisting of a high-level signaling and a Media Access Control (MAC) signaling.

Optionally, if A is greater than 1, dependency exists among the A levels of signaling. The dependency is used for indicating a relation between a resource pool configured through a first signaling in the A levels of signaling and a resource pool configured through a second signaling in the A levels of signaling.

According to another embodiment of the present invention, a resource pool processing method according to claim 7 is provided.

Optionally, the state information describes resource usage of a partial resource collection in the resource pool.

According to the invention, the state information describes one of the following: whether the first communication node sends data through a resource in the resource pool; whether the second communication node receives data through a resource in the resource pool; whether the second communication node tries to receive data through a resource in the resource pool; whether the second communication node measures, through a resource in the resource pool, at least one of a channel, interference, a sending manner and a receiving manner.

Optionally, the state information includes a number M of levels of usage state information. M is an integer greater than or equal to 2.

Optionally, mapping exists between a modulation coding scheme used for a channel for sending the state information and a modulation coding scheme of a data channel affected by the resource pool.

Optionally, a beam used for a channel for sending the state information is the same as a beam used for a data channel affected by the resource pool.

Optionally, the resource pool is divided into a number Y of resource collections. Y is an integer greater than or equal to X.

Optionally, the resource pool is configured to the second communication node by the first communication node through a number A of levels of signaling. A is an integer greater than or equal to 1.

Optionally, the A levels of signaling includes at least one of a group consisting of a high-level signaling and a MAC signaling.

Optionally, if A is greater than 1, dependency exists among the A levels of signaling. The dependency is used for indicating a relation between a resource pool configured through a first signaling in the A levels of signaling and a resource pool configured through a second signaling in the A levels of signaling.

According to another embodiment of the present invention, a resource pool processing apparatus according to claim 11 is provided.

Optionally, the apparatus further includes a configuration module. The configuration module is configured to configure a sending manner of the state information before the state information is sent.

Optionally, the sending module includes one of a first sending unit, a second sending unit, a third sending unit, a forth sending unit, a fifth sending unit or a sixth sending unit. The first sending unit is configured to send the state information through a physical downlink control channel (PDCCH). The second sending unit is configured to send the state information through a channel or a signal on a resource in the resource pool. The third sending unit is configured to send the state information through a resource in a time slot of the PDCCH corresponding to a data channel affected by usage of the resource pool. The forth sending unit is configured to send the state information through a resource in a time slot after a time slot of the PDCCH corresponding to the data channel affected by the usage of the resource pool. The fifth sending unit is configured to send the state information through a resource in a time slot of the data channel affected by the usage of the resource pool. The sixth sending unit is configured to send the state information through a resource in a time slot after a time slot of the data channel affected by the usage of the resource pool.

Optionally, the first sending unit is further configured to send the state information through a number N of PDCCHs. N is an integer greater than or equal to 2.

Optionally, the sending module is further configured to determine a sending manner of the state information according to feedback information from the second communication node.

Optionally, the sending module includes a seventh sending unit or an eighth module. The seventh sending unit is configured to, if the PDCCH exists in a time-domain resource corresponding to the resource pool, send the state information through a resource on a symbol of the PDCCH. The eighth sending unit is configured to send the state information through a resource on a symbol after a symbol of the PDCCH.

According to another embodiment of the present invention, a resource pool processing apparatus according to claim 12 is provided.

Optionally, the state information describes resource usage of a partial resource collection in the resource pool.

According to the invention, the state information describes one of the following: whether the first communication node sends data through a resource in the resource pool; whether the second communication node receives data through a resource in the resource pool; whether the second communication node tries to receive data through a resource in the resource pool; whether the second communication node measures, through a resource in the resource pool, at least one of a channel, interference, a sending manner and a receiving manner.

Optionally, the state information comprises a number M of levels of usage state information. M is an integer greater than or equal to 2.

Optionally, mapping exists between a modulation coding scheme used for a channel for sending the state information and a modulation coding scheme of a data channel affected by the resource pool.

Optionally, a beam used for a channel for sending the state information is the same as a beam used for a data channel affected by the resource pool.

Optionally, the resource pool is divided into a number Y of resource collections. Y is an integer greater than or equal to X.

Optionally, the resource pool is configured to the second communication node by the first communication node through a number A of levels of signaling. A is an integer greater than or equal to 1.

Optionally, the A levels of signaling includes at least one of a group consisting of a high-level signaling and a MAC signaling.

Optionally, if A is greater than 1, dependency exists among the A levels of signaling. The dependency is used for indicating a relation between a resource pool configured through a first signaling in the A levels of signaling and a resource pool configured through a second signaling in the A levels of signaling.

According to another embodiment of the present invention, a storage medium according to claim 13 is further provided.

Optionally, the storage medium is further configured to store program codes used for performing steps described below.

The state information of the resource pool is received, where the state information is identified by the X bits, X is an integer greater than or equal to 1, and the value of X is determined through the negotiation between the first communication node and the second communication node, or determined through the pre-configuration. A resource used for data transmission is determined according to the state information.

Through the present invention, the state information of the resource pool is generated. The state information is identified by X bits. X is an integer greater than or equal to 1, and the value of X is determined through the negotiation between the first communication node and the second communication node, or determined through the pre-configuration. Then the state information is sent. That is, the present invention implements sending of the state information of the resource pool to the second communication node, to enable the second communication node to determine the resource used for data transmission according to received state information. This effectively utilizes a part of the unused resources in the resource pool, and solves the problem of poor usage flexibility of the resource pool of the 5G system in the existing art. The effect of increasing the usage flexibility of the resource pool is achieved.

**Description of drawings**

The drawings described herein are used for providing a further understanding of the present invention and form a part of the application. The exemplary embodiments of the present invention and their description are used for interpreting the present invention and do not constitute improper limitations to the present invention. Among the drawings:

FIG. 1 is a flowchart of a resource pool processing method according to an embodiment of the present invention;

FIG. 2 is a first schematic diagram of a sending manner of usage information of a resource pool according to an embodiment of the present invention;

FIG. 3 is a second schematic diagram of a sending manner of usage information of a resource pool according to an embodiment of the present invention;

FIG. 4 is a third schematic diagram of a sending manner of usage information of a resource pool according to an embodiment of the present invention;

FIG. 5 is a forth schematic diagram of a sending manner of usage information of a resource pool according to an embodiment of the present invention;

FIG. 6 is a fifth schematic diagram of a sending manner of usage information of a resource pool according to an embodiment of the present invention;

FIG. 7 is a sixth schematic diagram of a sending manner of usage information of a resource pool according to an embodiment of the present invention;

FIG. 8 is a seventh schematic diagram of a sending manner of usage information of a resource pool according to an embodiment of the present invention;

FIG. 9 is a structural diagram of a resource pool processing apparatus according to an embodiment of the present invention;

FIG. 10 is a first structural diagram of a resource pool processing apparatus according to an embodiment of the present invention;

FIG. 11 is a second structural diagram of a resource pool processing apparatus according to an embodiment of the present invention;

FIG. 12 is a third structural diagram of a resource pool processing apparatus according to an embodiment of the present invention;

FIG. 13 is a flowchart of another resource pool processing method according to an embodiment of the present invention; and

FIG. 14 is a fourth structural diagram of a resource pool processing apparatus according to an embodiment of the present invention.

**Detailed description**

The present invention will be described in detail in conjunction with the drawings and embodiments. It should be noted that the embodiments of the present invention and features of the embodiments may be arbitrarily combined with each other in case of no conflict.

It should be noted that the terms "first", "second" and so on in the specification, the claims and the above drawings of the present invention are used for distinguishing similar objects, rather than for describing a specific order or a sequence.

Embodiment 1:

In this embodiment, a resource pool processing method is provided. FIG. 1 is a flowchart of the resource pool processing method according to the embodiment of the present invention. As shown in FIG. 1, the method includes steps described below.

In S102, state information of a resource pool is generated.

Optionally, the state information is used for describing usage information of the resource pool, such as used resources in the resource pool and unused resources in the resource pool.

It should be noted that the state information is identified by a number X of bits. X is an integer greater than or equal to 1, and the value of X is determined through negotiation between a first communication node and a second communication node, or determined through pre-configuration.

The first communication node includes, but is not limited to, a base station. The second communication node includes, but is not limited to, a terminal.

In S104, the state information is sent.

Optionally, in the embodiment, an application scenario of the above resource pool processing method includes, but is not limited to, the design of 5G system. In this application scenario, the state information of the resource pool is generated. The state information is identified by the X bits. X is an integer greater than or equal to 1, and the value of X is determined through the negotiation between the first communication node and the second communication node, or determined through the pre-configuration. Then the state information is sent. That is, the present invention implements sending of the state information of the resource pool to the second communication node, to enable the second communication node to determine a resource used for data transmission according to received state information. This effectively utilizes a part of the unused resources in the resource pool, and solves a problem of poor usage flexibility of a resource pool of a 5G system in the existing art. An effect of increasing the usage flexibility of the resource pool is achieved.

A specific example will be presented hereinafter to describe the embodiment.

A network-side equipment (including the base station) generates the usage information of the resource pool. Preferably, the usage information of the resource pool includes X bits. X is an integer greater than or equal to 1, and the value of X is determined through negotiation between the base station and the terminal, or determined through a standard pre-configuration. This is advantageous to increase flexibility of signaling and better meet a design requirement of "forward compatibility" of the 5G system.

The base station sends the usage information of the resource pool to the terminal.

In an optional implementation, before the step in which the state information is sent, the method further includes a following step: a sending manner of the state information is configured. Through the above method, the flexibility of signaling is increased and the design requirement of "forward compatibility" of the 5G system is better met.

A specific example will be presented hereinafter to describe the embodiment.

The network-side equipment (including the base station) generates the usage information of the resource pool. Preferably, the usage information of the resource pool includes X bits. X is an integer greater than or equal to 1, and the value of X is determined through the negotiation between the base station and the terminal, or determined through the standard pre-configuration. This is advantageous to increase the flexibility of signaling and better meet the design requirement of "forward compatibility" of the 5G system.

The base station sends the usage information of the resource pool to the terminal. Preferably, a sending manner of the usage information of the resource pool is configured to the terminal by the base station. In this way, the base station may select an appropriate sending manner, such as sending the usage information of the resource pool through a high-level signaling or a physical layer signaling, according to load of the system and capacity of the terminal.

In an optional implementation, the sending manner of the state information includes, but is not limited to, any one of manners described below.

The state information is sent through a physical downlink control channel (PDCCH). The state information is sent through a channel or signal on a resource in the resource pool. The state information is sent through a resource in a time slot of the PDCCH corresponding to a data channel affected by usage of the resource pool. The state information is sent through a resource in a time slot after the time slot of the PDCCH corresponding to the data channel affected by the usage of the resource pool. The state information is sent through a resource in a time slot of the data channel affected by the usage of the resource pool. The state information is sent through a resource in a time slot after the time slot of the data channel affected by the usage of the resource pool.