DELAY STATUS REPORTING IN PRESENCE OF SKIPPABLE RADIO RESOURCE MANAGEMENT (RRM) MEASUREMENT PERIOD

PRIORITY CLAIM

[0001] The present application claims priority to U.S. provisional application No. 63/633,658, filed on April 12, 2024, the entire contents of which are incorporated herein.

TECHNICAL FIELD

[0002] The present disclosure relates to wireless communications, and more specifically scheduling delay-critical uplink data for wireless communications.

BACKGROUND

[0003] A wireless communications system may include one or multiple network communication devices, such as base stations, that may support wireless communications for one or multiple user communication devices, which are also called user equipment (UE) or other suitable terminology. The wireless communications system may support wireless communications with one or multiple user communication devices by utilizing resources of the wireless communications system, including time resources (e.g., symbols, slots, subframes, frames, or the like) or frequency resources (e.g., subcarriers, carriers, or the like). Additionally, the wireless communications system may support wireless communications across various radio access technologies, such as including third generation (3G) radio access technology, fourth generation (4G) radio access technology, fifth generation (5G) radio access technology, and other suitable radio access technologies beyond 5G (e.g., sixth generation (6G)).

SUMMARY

[0004] Some implementations of the method and apparatuses described herein may include performing wireless communications between a user equipment (UE) and a base station that reduces discarding of delay-critical uplink data, thereby improving a user experience for applications such as eXtended Reality (XR) applications. In some

implementations of the method and apparatuses described herein, a UE for wireless communication provides improved delay status reporting for flexible measurement period cancellation. In one or more embodiments, the UE includes a transceiver, at least one memory, and at least one processor coupled with the transceiver and the at least one memory. The at least one processor is configured to cause the UE to receive, from a base station, one or more configuration. The one or more configuration includes an indication of a dynamic delay status reporting parameter and an indication of a first uplink grant preceding a measurement period. The at least one processor is configured to cause the UE to determine, based on the dynamic delay status reporting parameter, a first time distance ("Ta") and a second time distance ("Tb") to the measurement period. The first time distance Ta is greater than the second time distance Tb. In response to determining time distance ("Td") to the measurement period is within a dynamic reporting time window between first time distance Ta and second time distance Tb, the at least one processor is configured to cause the UE to trigger and subsequently transmit delay status reporting in an uplink transmission to the base station, in response to the UE determining that at least one data unit of the delay-critical data is not accommodated by the first uplink grant and has an assigned discard time to occur during the measurement period. In an example, the UL resources assigned by the first uplink grant carry the delay status reporting (DSR).

[0005] In some implementations of the method and apparatuses described herein, a base station for wireless communication provides increased flexibility in prioritizing data communication and control channel monitoring over radio resource management measurements. In one or more embodiments, the base station includes at least one memory and at least one processor coupled with the at least one memory. The at least one processor is configured to cause the base station to transmit one or more configurations to the UE. The one or more configurations include an indication of a dynamic delay status reporting parameter and an indication of a first uplink grant preceding a measurement period. The one or more configurations prompt the UE to determine, based on the dynamic delay status reporting parameter, a first time distance ("Ta") and a second time distance ("Tb") to the measurement period that define a dynamic reporting time window. At a time distance ("Td") to the measurement period that is within the dynamic reporting time window, the base station receives delay status reporting from the UE. The UE sends the delay status reporting based

on determining that at least one data unit of delay-critical data is not accommodated by the first uplink grant and has an assigned discard time to occur during the measurement period.

[0006] As utilized herein, an article "a" before an element is unrestricted and understood to refer to "at least one" of those elements or "one or more" of those elements. The terms "a," "at least one," "one or more," and "at least one of one or more" may be interchangeable. As used herein, including in the claims, "or" as used in a list of items (e.g., a list of items prefaced by a phrase such as "at least one of" or "one or more of" or "one or both of") indicates an inclusive list such that, for example, a list of at least one of A, B, or C means A or B or C or AB or AC or BC or ABC (i.e., A and B and C). Also, as used herein, the phrase "based on" shall not be construed as a reference to a closed set of conditions. For example, an example step that is described as "based on condition A" may be based on both a condition A and a condition B without departing from the scope of the present disclosure. In other words, as used herein, the phrase "based on" shall be construed in the same manner as the phrase "based at least in part on. Further, as used herein, including in the claims, a "set" may include one or more elements.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 illustrates an example of a wireless communications system in accordance with aspects of the present disclosure.

[0008] FIG. 2 is an example timing diagram illustrating delay status reporting (DSR) triggering by a user equipment (UE) according to a dynamic threshold when a current time distance is in proximity of a measuring gap (MG), in accordance with aspects of the present disclosure.

[0009] FIG. 3 is an example timing diagram illustrating DSR triggering according to a configured threshold when current time distance is far from a MG, in accordance with aspects of the present disclosure.

[0010] FIG. 4 is an example communication diagram illustrating signaling exchange between a UE and a new radio base node (gNB) for DSR procedure in proximity of a MG, in accordance with aspects of the present disclosure.

[0011] FIG. 5 is a flow chart of a method of dynamic and fixed DSR triggering by a UE in accordance with aspects of the present disclosure.

[0012] FIG. 6 is an example timing diagram illustrating overlapping MGs with a DSR being triggered for the later MG, in accordance with aspects of the present disclosure.

[0013] FIG. 7 is an example timing diagram illustrating advancing DSR triggering due to proximity to a cancellable radio resource management (RRM) measurement period, in accordance with aspects of the present disclosure.

[0014] FIG. 8 is an example timing diagram illustrating DSR triggered at time (T0) preceding RDB expiration during a measurement gap and a DSR cancellation window, in accordance with aspects of the present disclosure.

[0015] FIG. 9 is an example timing diagram illustrating DSR not being triggered or a triggered DSR being canceled if there is less than a minimum processing time left from the transmission occasion of the DSR prior to an active MG, in accordance with aspects of the present disclosure.

[0016] FIG. 10 is an example timing diagram illustrating the UE cancelling a MG when the UE triggers a DSR, in accordance with aspects of the present disclosure.

[0017] FIG. 11 is an example timing diagram illustrating advancing DSR triggering due to proximity to a cancellable RRM measurement period, in accordance with aspects of the present disclosure.

[0018] FIG. 12 is an example communication diagram illustrating signaling exchange including not acknowledged/acknowledged signals between UE and a new radio base node (gNB), in accordance with aspects of the present disclosure.

[0019] FIG. 13 illustrates an example of a UE in accordance with aspects of the present disclosure.

[0020] FIG. 14 illustrates an example of a processor in accordance with aspects of the present disclosure.

[0021] FIG. 15 illustrates an example of a network entity (NE) such as a base station in accordance with aspects of the present disclosure.

[0022] FIG. 16 illustrates a flowchart of a method for wireless communication at a user equipment (UE) in accordance with aspects of the present disclosure.

[0023] FIG. 17 illustrates a flowchart of a method for wireless communication at a base station in accordance with aspects of the present disclosure.

DETAILED DESCRIPTION

[0024] Aspects of the present disclosure address delay status reporting in the presence of a skippable radio resource management (RRM) measurement period. As conventionally specified, during measurement gaps or periods, a user equipment (UE) is not required to conduct reception/transmission from/to a corresponding new radio (NR) serving cell for standalone (SA) mode with single carrier or carrier aggregation (CA) configured. As an exception, reception of signals used for RRM measurement(s), position reference signal (PRS) measurement(s), and the signals used for random access procedure may still occur during a measurement gap.

[0025] A UE can communicate with a gNB to support eXtended Reality (XR) features. XR refers to all real-and-virtual combined environments and human-machine interactions generated by computer technology and wearables. XR is an umbrella term for different types of realities including Virtual reality (VR), Augmented reality (AR), and Mixed reality (MR), and the areas interpolated among them. The levels of virtuality range from partially sensory inputs to fully immersive VR. A key aspect of XR is the extension of human experiences, especially relating to the senses of existence (represented by VR) and the acquisition of cognition (represented by AR). To achieve an effective user experience, XR data uploaded by the UE to the gNB may be delay critical.

[0026] Conventionally, during measurement periods of specific measurement types (e.g., intra-frequency RRM measurements (FR2), or measurement gaps, certain scheduling

restrictions are applicable that could degrade the system throughput (e.g., depending on the periodicity and length of the measurement gap). In case of eXtended Reality (XR) traffic, the number of satisfied UEs (i.e., UEs with most of their packet data unit (PDU) sets being delivered within the PDU-Set Delay Budget) has been shown to drop to no more than 50% for some measurement configurations due to scheduling restrictions during measurement periods. The general concept of using DCI or MAC-CE signaling has been suggested to de-activate or skip the scheduling restrictions during a next measurement period to improve the number of satisfied UEs in case of XR traffic. However, the conventional indication (DCI or MAC-CE) needs to be sent a certain time (e.g., ~ 5ms) earlier than the beginning of the next measurement period.

[0027] For an XR application, a data stream (e.g., video, sensor, etc.) should be delivered within its latency budget. For a new radio base node (gNB) to timely decide if an RRM measurement gap is to be de-activated to provide extra resources for communicating undelivered data approaching its maximum allowable delay, the gNB should know if an uplink (UL) PDU-set is approaching its delay budget with enough time in advance so that gNB can de-active the upcoming RRM measurement period and schedule the PDU-set in an UL transmission overlapping with the measurement period, if needed.

[0028] The present disclosure provides enhancements to the DSR mechanism to ensure that the gNB can de-activate an RRM measurement period in time for scheduling such a delay-critical UL transmission in that period. As used herein, skipping/deactivating/relaxing scheduling restrictions and skipping/cancelling RRM measurements/measurement periods/MGs are used interchangeably unless clearly stated otherwise. These techniques essentially mean data communication and control channel monitoring are enabled during the measurement periods. Measurement gap and RRM measurement period are used interchangeably unless clearly stated otherwise. Remaining time/Remining Delay Budget is the smallest remaining value of the Packet Data Convergence Protocol (PDCP) discard timers ("PDCP discardTimers") among service data units (SDUs) buffered for the logical channel group (LCG) as specified.

[0029] Various aspects of the present disclosure relate to a user equipment (UE), base station, method, and processor for wireless communication that reduces discarding of delay-

critical uplink data. The UE receives, from the base station, one or more configurations including an indication of a dynamic delay status reporting parameter and an indication of a first uplink grant preceding a measurement period. In one or more embodiments, the one or more configurations configure the UE to decide between performing with a dynamic DSR threshold or fixed ("configured") DSR threshold. In one or more embodiments, the one or more configurations are received at different times to configure the UE with one of dynamic and fixed DSR thresholds. In one or more embodiments, the indication of the first uplink grant is received in a different, later configuration signal from the indication of the dynamic DSR. In response to determining a time distance to the measurement period is within a dynamic reporting time window, based on the configuration, the UE determines whether at least one data unit of delay-critical data is not accommodated by the first uplink grant and has an assigned discard time to occur during the measurement period. To avoid discarding the delay-critical data, the UE transmits delay status reporting to prompt the base station to cancel the measurement period and to schedule an additional uplink resource for the delay-critical data.

[0030] Figure 1 illustrates an example of a wireless communications system 100 in accordance with aspects of the present disclosure. The wireless communications system 100 may include one or more network entity (NE) 102, one or more user equipment (UE) 104, and a core network (CN) 106. The wireless communications system 100 may support various radio access technologies. In some implementations, the wireless communications system 100 may be a fourth generation (4G) network, such as an LTE network or an LTE-Advanced (LTE-A) network. In some other implementations, the wireless communications system 100 may be a new radio (NR) network, such as a fifth generation (5G) network, a 5G-Advanced (5G-A) network, or a 5G ultrawideband (5G-UWB) network. In other implementations, the wireless communications system 100 may be a combination of a 4G network and a 5G network, or other suitable radio access technology including Institute of Electrical and Electronics Engineers (IEEE) 802.11 (Wi-Fi), IEEE 802.16 (WiMAX), and IEEE 802.20. The wireless communications system 100 may support radio access technologies beyond 5G, for example, 6G. Additionally, the wireless communications system 100 may support different technologies, such as time division multiple access (TDMA), frequency division multiple access (FDMA), or code division multiple access (CDMA), etc.

[0031] The one or more NE 102 may be dispersed throughout a geographic region to form the wireless communications system 100. One or more of the NE 102 described herein may be, or may include, or may be referred to as a network node, a base station, a network element, a network function, a network equipment, a network entity, a radio access network (RAN), a NodeB, an eNodeB (eNB), a next-generation NodeB (gNB), or other suitable terminology. An NE 102 and a UE 104 may communicate via a communication link, which may be a wireless or wired connection. For example, an NE 102 and a UE 104 may perform wireless communication (e.g., receive signaling, transmit signaling) over a Uu interface.

[0032] An NE 102 may provide a geographic coverage area for which the NE 102 may support services for one or more UEs 104 within the geographic coverage area. For example, an NE 102 and a UE 104 may support wireless communication of signals related to services (e.g., voice, video, packet data, messaging, broadcast, etc.) according to one or multiple radio access technologies. In some implementations, an NE 102 may be moveable, for example, a satellite associated with a non-terrestrial network (NTN). In some implementations, different geographic coverage areas associated with the same or different radio access technologies may overlap, but the different geographic coverage areas may be associated with different NE 102.

[0033] The one or more UE 104 may be dispersed throughout a geographic region of the wireless communications system 100. A UE 104 may include or may be referred to as a remote unit, a mobile device, a wireless device, a remote device, a subscriber device, a transmitter device, a receiver device, or some other suitable terminology. In some implementations, the UE 104 may be referred to as a unit, a station, a terminal, or a client, among other examples. Additionally, or alternatively, the UE 104 may be referred to as an Internet-of-Things (IoT) device, an Internet-of-Everything (IoE) device, or machine-type communication (MTC) device, among other examples.

[0034] A UE 104 may be able to support wireless communication directly with other UEs 104 over a communication link. For example, a UE 104 may support wireless communication directly with another UE 104 over a device-to-device (D2D) communication link. In some implementations, such as vehicle-to-vehicle (V2V) deployments, vehicle-to-everything (V2X) deployments, or cellular-V2X deployments, the communication link may be referred

to as a sidelink. For example, a UE 104 may support wireless communication directly with another UE 104 over a PC5 interface.

[0035] An NE 102 may support communications with the CN 106, or with another NE 102, or both. For example, an NE 102 may interface with other NE 102 or the CN 106 through one or more backhaul links (e.g., S1, N2, N2, or network interface). In some implementations, the NE 102 may communicate with each other directly. In some other implementations, the NE 102 may communicate with each other or indirectly (e.g., via the CN 106). In some implementations, one or more NE 102 may include subcomponents, such as an access network entity, which may be an example of an access node controller (ANC). An ANC may communicate with the one or more UEs 104 through one or more other access network transmission entities, which may be referred to as radio heads, smart radio heads, or transmission-reception points (TRPs).

[0036] The CN 106 may support user authentication, access authorization, tracking, connectivity, and other access, routing, or mobility functions. The CN 106 may be an evolved packet core (EPC), or a 5G core (5GC), which may include a control plane entity that manages access and mobility (e.g., a mobility management entity (MME) and/or an access and mobility management functions (AMF)) and a user plane entity that routes packets or interconnects to external networks (e.g., a serving gateway (S-GW), a Packet Data Network (PDN) gateway (P-GW), or a user plane function (UPF)). In some implementations, the control plane entity may manage non-access stratum (NAS) functions, such as mobility, authentication, and bearer management (e.g., data bearers, signal bearers, etc.) for the one or more UEs 104 served by the one or more NE 102 associated with the CN 106.

[0037] The CN 106 may communicate with a packet data network over one or more backhaul links (e.g., via an S1, N2, N2, or another network interface). The packet data network may include an application server. In some implementations, one or more UEs 104 may communicate with the application server. A UE 104 may establish a session (e.g., a protocol data unit (PDU) session, or the like) with the CN 106 via an NE 102. The CN 106 may route traffic (e.g., control information, data, and the like) between the UE 104 and the application server using the established session (e.g., the established PDU session). The PDU

session may be an example of a logical connection between the UE 104 and the CN 106 (e.g., one or more network functions of the CN 106).

[0038] In the wireless communications system 100, the NEs 102 and the UEs 104 may use resources of the wireless communications system 100, including time resources (e.g., symbols, slots, subframes, frames, or the like) or frequency resources (e.g., subcarriers, carriers) to perform various operations (e.g., wireless communications). In some implementations, the NEs 102 and the UEs 104 may support different resource structures. For example, the NEs 102 and the UEs 104 may support different frame structures. In some implementations, such as in 4G, the NEs 102 and the UEs 104 may support a single frame structure. In some other implementations, such as in 5G and among other suitable radio access technologies, the NEs 102 and the UEs 104 may support various frame structures (i.e., multiple frame structures). The NEs 102 and the UEs 104 may support various frame structures based on one or more numerologies.

[0039] One or more numerologies may be supported in the wireless communications system 100, and a numerology may include a subcarrier spacing and a cyclic prefix. A first numerology (e.g., μ=0) may be associated with a first subcarrier spacing (e.g., 15 kHz) and a normal cyclic prefix. In some implementations, the first numerology (e.g., μ=0) associated with the first subcarrier spacing (e.g., 15 kHz) may utilize one slot per subframe. A second numerology (e.g., μ=1) may be associated with a second subcarrier spacing (e.g., 30 kHz) and a normal cyclic prefix. A third numerology (e.g., μ=2) may be associated with a third subcarrier spacing (e.g., 60 kHz) and a normal cyclic prefix or an extended cyclic prefix. A fourth numerology (e.g., μ=3) may be associated with a fourth subcarrier spacing (e.g., 120 kHz) and a normal cyclic prefix. A fifth numerology (e.g., μ=4) may be associated with a fifth subcarrier spacing (e.g., 240 kHz) and a normal cyclic prefix.

[0040] A time interval of a resource (e.g., a communication resource) may be organized according to frames (also referred to as radio frames). Each frame may have a duration, for example, a 10 millisecond (ms) duration. In some implementations, each frame may include multiple subframes. For example, each frame may include 10 subframes, and each subframe may have a duration, for example, a 1 ms duration. In some implementations, each frame

may have the same duration. In some implementations, each subframe of a frame may have the same duration.

[0041] Additionally, or alternatively, a time interval of a resource (e.g., a communication resource) may be organized according to slots. For example, a subframe may include a number (e.g., quantity) of slots. The number of slots in each subframe may also depend on the one or more numerologies supported in the wireless communications system 100. For instance, the first, second, third, fourth, and fifth numerologies (i.e., μ=0, μ=1, μ=2, μ=3, μ=4) associated with respective subcarrier spacings of 15 kHz, 30 kHz, 60 kHz, 120 kHz, and 240 kHz may utilize a single slot per subframe, two slots per subframe, four slots per subframe, eight slots per subframe, and 16 slots per subframe, respectively. Each slot may include a number (e.g., quantity) of symbols (e.g., OFDM symbols). In some implementations, the number (e.g., quantity) of slots for a subframe may depend on a numerology. For a normal cyclic prefix, a slot may include 14 symbols. For an extended cyclic prefix (e.g., applicable for 60 kHz subcarrier spacing), a slot may include 12 symbols. The relationship between the number of symbols per slot, the number of slots per subframe, and the number of slots per frame for a normal cyclic prefix and an extended cyclic prefix may depend on a numerology. It should be understood that reference to a first numerology (e.g., μ =0) associated with a first subcarrier spacing (e.g., 15 kHz) may be used interchangeably between subframes and slots.

[0042] In the wireless communications system 100, an electromagnetic (EM) spectrum may be split, based on frequency or wavelength, into various classes, frequency bands, frequency channels, etc. By way of example, the wireless communications system 100 may support one or multiple operating frequency bands, such as frequency range designations FR1 (410 MHz – 7.125 GHz), FR2 (24.25 GHz – 52.6 GHz), FR3 (7.125 GHz – 24.25 GHz), FR4 (52.6 GHz – 114.25 GHz), FR4a or FR4-1 (52.6 GHz – 71 GHz), and FR5 (114.25 GHz – 300 GHz). In some implementations, the NEs 102 and the UEs 104 may perform wireless communications over one or more of the operating frequency bands. In some implementations, FR1 may be used by the NEs 102 and the UEs 104, among other equipment or devices for cellular communications traffic (e.g., control information, data). In some

implementations, FR2 may be used by the NEs 102 and the UEs 104, among other equipment or devices for short-range, high data rate capabilities.

[0043] FR1 may be associated with one or multiple numerologies (e.g., at least three numerologies). For example, FR1 may be associated with a first numerology (e.g., μ=0), which includes 15 kHz subcarrier spacing, a second numerology (e.g., μ=1), which includes 30 kHz subcarrier spacing, and a third numerology (e.g., μ=2), which includes 60 kHz subcarrier spacing. FR2 may be associated with one or multiple numerologies (e.g., at least 2 numerologies). For example, FR2 may be associated with a third numerology (e.g., μ=2), which includes 60 kHz subcarrier spacing, and a fourth numerology (e.g., μ=3), which includes 120 kHz subcarrier spacing.

[0044] FIG. 2 is an example timing diagram 200 illustrating DSR triggering by the UE according to a dynamic threshold when a current time distance is in proximity of a MG. FIG. 3 is an example timing diagram 300 illustrating DSR triggering according to a configured ("fixed" or non-dynamic) threshold when the current time distance is far from a MG. FIG. 4 is a communication diagram 400 illustrating DSR signaling exchange between a UE 401 and a new radio base node (gNB) 402 in proximity of a MG, according to a one or more embodiments. As shown by the figure at 405, UE 401 triggers DSR. At 410, gNB 402 transmits first uplink grant 410 on the downlink. At 415, the UE 401 transmits the DSR 415 on the UL resources provided by the 1st UL grant 410. At 420, gNB 402 triggers cancellation of the MG on the network side. In one or more embodiments, the gNB 402 explicitly sends an MG cancellation indication 425 on the downlink to the UE 401. The MG cancellation indication to the UE 401 can be an implicit indication (e.g., when gNB sends the 2nd UL grant 430 with UL resources overlapping with the MG) or can be included in the 2nd UL grant. UE 401 transmits delay-critical data 435 using the 2nd UL grant resources.

[0045] As an alternative to the above described embodiments, in another embodiment, the UE triggers a DSR at time "t1" if the remaining delay budget (or RDB-δ) for an LCG (at time "t1") is to be exceeded in an upcoming RRM measurement period, where t_1 is $T_{MG} + \gamma$ prior to the beginning of a MG and where T_{MG}, is the time needed for cancelling the MG by gNB, and where:

$$\gamma_{lb} \leq \gamma \leq \gamma_{ub}$$

[0046] "lb" being lower bound and "ub" being upper bound. Parameters δ and γ in the above embodiments can be determined as follows:

δ is: (i) '0'; (ii) a specified non-zero value; or (iii) configured by the network (e.g., 0 or 1 slot).

γ is: (i) related to a processing time by gNB for the processing of a DSR (and preparation and transmission of the MG cancellation command by gNB, and SR transmission in case no UL resource is available); (ii) configured (e.g., 1 slot); or (iii) determined to be a predefined value from a reference time, which can be the time that is T_{MG} prior to the beginning of a MG (as shown in FIG. 6). γ_{ub} and γ_{lb} can be determined based on configuration.

[0047] In another embodiment, if there is an upcoming cancellable MG, the UE triggers a DSR if $d_{MG} \geq T_{MG} + \gamma$, and $d_{MG} \leq RDB \leq d_{MG} + l_{MG}$. In other words, the dynamic DSR threshold is satisfied when the time distance to the measurement gap is greater than a minimum time for cancellation signaling specified by the base station, which can include a γ factor for processing time required by the base station.

[0048] FIG. 5 presents a flow-chart of a method 500 of dynamic and fixed DSR triggering by a UE. In one or more embodiments, at block 505, UE begins a loop for the next measurement group. The UE expedites DSR triggering, i.e., the UE triggers DSR sooner than the time allotted for a DSR triggering criteria, based on checking, at block 510, if RDB is smaller than a configured threshold, in proximity of an upcoming MG (i.e., dynamic DSR threshold is satisfied). The expedited or earlier DRS triggering ensures that the gNB has at least certain time to cancel the MG to enable data transmission, and reception, as well as control channel monitoring during the MG. In response to determining that the dynamic DSR threshold of block 510 is not satisfied, the UE determines whether a fixed DSR threshold is satisfied ($d_{MG} \geq T_{MG} + \gamma$). In response to the fixed DSR threshold of block 515 not being satisfied, method 500 returns to block 505. In response to the determinations of either block 510 or block 515 being satisfied, method 500 proceeds to block 520 where the UE next determines if an upcoming MG (which is not necessarily the immediate upcoming MG) is

cancellable. The MG is cancellable if the associated MG configuration or any other network indication (e.g., via radio resource control (RRC) signaling) has enabled the upcoming MG to be cancelable/skippable. In response to determining that the upcoming MG is not cancellable in block 520, the method 500 returns to block 505. In response to determining that the MG is cancellable in block 520, in block 525, the UE triggers the DSR. Then the method 500 returns to block 505.

[0049] For clarity, method 500 is for evaluating DSR for one MG. If there are multiple MGs (e.g., FIG. 10) overlapping or close-to-each other, the UE first resolves overlap or performs prioritization amongst the MGs, and then checks DSR triggering criteria (e.g., repeating operation as shown in FIG. 5 for each MG). If there are multiple upcoming MGs (e.g., after resolving overlap between MGs or after prioritization of the MGs), the UE performs the check for DSR triggering (e.g., as shown in FIG. 5) for each upcoming MG, e.g., from the earliest to the latest. Once a DSR is triggered for the LCG, the UE would not check the triggering condition for the rest of the MGs or the UE would start a DSR-prohibit timer for the LCG, and the UE checks again when the DSR-prohibit timer expires. The DSR-prohibit timer associated with MG cancellation can be different than a DSR-prohibit timer associated with RDB being smaller than a threshold. If there is a triggered DSR (e.g., due to RDB<threshold) for the LCG, then there is no need to check the triggering condition related to MG. The upcoming measurement period is determined to be a measurement period selected from a set of overlapping or close-to-each other measurement periods/occasions (i.e., the distance between the two measurement occasions is equal to or smaller than a certain threshold time). The measurement period is selected as a result of a prioritization procedure performed by the UE amongst the set of overlapping or close-to-each other measurement periods (e.g., FIG. 10).

[0050] According to a second embodiment, a new DSR cancellation rule is provided. FIG. 6 is an example timing diagram 600 illustrating advancing DSR triggering due to proximity to a cancellable RRM measurement period. In an embodiment, a previously triggered DSR with dynamic triggering threshold or with configured triggering threshold (i.e., a pending DSR) is cancelled not earlier than "θ" time units prior to the start of an active MG if the RDB is going to be exhausted within the MG. As a motivation, a pending DSR in

general should not be cancelled unless that DSR is not useful if transmitted. Hence, to give as much chance as possible to the UE to send delay-critical UL data, the UE cancels the associated pending DSR if the DSR is too close to the MG, in which case transmitting that DSR would not be useful. The value assigned to "θ" can depend on a physical uplink shared channel (PUSCH) preparation time (e.g., $T_{proc,2}$ as defined), and a DSR processing time, and θ can be configured ($\theta = T_{proc,2} + \beta$), wherein "β" is configured or determined, in an example, such that θ is in unit of integer slots.

[0051] One or more related embodiments to the above-described embodiment are presented in FIGs. 8 - 10. FIG. 8 is an example timing diagram 800 illustrating a DSR triggered time (T0), RDB expiration during a measurement gap, and a DSR cancellation window. The present disclosure provides a process of data in LCG associated with RDB being discarded and the corresponding PDCP discard timer being updated within DSR cancellation window θ. In a related embodiment, the UE does not trigger a DSR or the UE cancels a triggered/pending DSR if four conditions all exist. The first condition is that the time gap between the DSR triggering time (e.g., when RDB < threshold) and the start of the MG is less than the time needed for scheduling a PUSCH transmission (e.g., $T_{proc,2}$. The second condition is that the corresponding RDB becomes zero or negative prior to the end of the MG. The third condition is that there is no configured grant (CG) resource which can be used for transmission of a packet associated with the LCG during the time gap (d_{MG}). The fourth condition is that the MG is not canceled.

[0052] FIG. 9 is an example timing diagram 900 illustrating DSR not being triggered or a triggered DSR being canceled if there is less than a minimum processing time ($\boldsymbol{T_{proc,2}}$) left from the transmission occasion of the DSR prior to an active MG. In an embodiment, the UE triggers/sends a DSR to the network as before (when RDB<threshold). If an MG cancellation timeline is satisfied (e.g., if the time gap between the time the DSR is sent and the starting time of the MG is at least T_{MG}), the UE transmits the associated LCG within the MG. In other words, sending the DSR implies that the UE will cancel the MG, and so the network (gNB) and the UE are on the same page with respect to the MG cancellation status). As an example, in response to receiving the DSR, the gNB assumes that the UE will cancel

the MG if the RDB is going to be expired/exhausted during the MG or within a vicinity of the MG.

[0053] FIG. 10 is an example timing diagram 1000 illustrating the UE cancelling a MG when the UE triggers a DSR if RDB < threshold and the time gap between the DSR triggering time and the start of the MG is larger than time needed for the UE to cancel the MG ($d_{MG} \geq T_{MG}$).

[0054] If the UE has already received an indication which has canceled a set of upcoming MGs, including the MG satisfying $d_{MG} \leq RDB \leq d_{MG} + l_{MG} + \gamma$, the DSR is triggered as before (if RDB<threshold). If the UE cancels an MG (e.g., based on some rules, such as based on L3 measurement reports or L1 CSI reports) without need to receive a subsequent command from the network to cancel the MG, the DSR is triggered as before (if RDB<threshold).

[0055] The UE triggers a DSR (e.g., based on decisions rules considering RDB, and a MG, e.g., as shown in FIG. 5) if the UE has indicated to the network that the MG may/can be skipped (assuming the UE needs to receive a subsequent command from the network to cancel the MG). The indication can be an explicit indication or an implicit indication. For instance, the UE may indicate that the UE is in a low mobility state (e.g., by indicating a low mobility criterion is satisfied).

[0056] FIG. 11 is a diagram 1100 of advancing DSR triggering due to proximity to a cancellable RRM measurement period. If the gNB deactivates the MG via a MAC-CE indication, the applicability of the MAC-CE takes effect 'α' time units (e.g., 3msec) after the MAC-CE is acknowledged, and therefore, the cancellation timeline requirement increases by 'α' as shown in FIG. 11**Error! Reference source not found.**.

[0057] FIG. 12 is a timing diagram 1200 of signaling exchange between UE 104 and gNB 102 following triggering of DSR at the UE.

[0058] FIG. 13 illustrates an example of a UE 1300 in accordance with aspects of the present disclosure. The UE 1300 may include a processor 1302, a memory 1304, a controller 1306, and a transceiver 1308. The processor 1302, the memory 1304, the controller 1306, or the transceiver 1308, or various combinations thereof or various components thereof may be

examples of means for performing various aspects of the present disclosure as described herein. These components may be coupled (e.g., operatively, communicatively, functionally, electronically, electrically) via one or more interfaces.

[0059] The processor 1302, the memory 1304, the controller 1306, or the transceiver 1308, or various combinations or components thereof may be implemented in hardware (e.g., circuitry). The hardware may include a processor, a digital signal processor (DSP), an application-specific integrated circuit (ASIC), or other programmable logic device, or any combination thereof configured as or otherwise supporting a means for performing the functions described in the present disclosure.

[0060] The processor 1302 may include an intelligent hardware device (e.g., a general-purpose processor, a DSP, a CPU, an ASIC, an FPGA, or any combination thereof). In some implementations, the processor 1302 may be configured to operate the memory 1304. In some other implementations, the memory 1304 may be integrated into the processor 1302. The processor 1302 may be configured to execute computer-readable instructions stored in the memory 1304 to configure the UE 1300 to perform various functions of the present disclosure.

[0061] The memory 1304 may include volatile or non-volatile memory. The memory 1304 may store computer-readable, computer-executable code including instructions when executed by the processor 1302, cause the UE 1300 to perform various functions described herein. The code may be stored in a non-transitory computer-readable medium, such as the memory 1304 or another type of memory. Computer-readable media includes both non-transitory computer storage media and communication media including any medium that facilitates transfer of a computer program from one place to another. A non-transitory storage medium may be any available medium that may be accessed by a general-purpose or special-purpose computer.

[0062] In some implementations, the processor 1302 and the memory 1304 coupled with the processor 1302 may be configured to cause the UE 1300 to perform one or more of the functions described herein (e.g., executing, by the processor 1302, instructions stored in the memory 1304). For example, the processor 1302 may support wireless communication at the UE 1300 in accordance with examples as disclosed herein. The UE 1300 may be configured

to support a means for establishing communication session, such as an IMS session, between originating and terminating user equipment. The controller 1306 may manage input and output signals for the UE 1300. The controller 1306 may also manage peripherals not integrated into the UE 1300. In some implementations, the controller 1306 may utilize an operating system such as iOS®, ANDROID®, WINDOWS®, or other operating systems. In some implementations, the controller 1306 may be implemented as part of the processor 1302.

[0063] In some implementations, the UE 1300 may include at least one transceiver 1308. In some other implementations, the UE 1300 may have more than one transceiver 1308. The transceiver 1308 may represent a wireless transceiver. The transceiver 1308 may include one or more receiver chains 1310, one or more transmitter chains 1312, or a combination thereof.

[0064] A receiver chain 1310 may be configured to receive signals (e.g., control information, data, packets) over a wireless medium. For example, the receiver chain 1310 may include one or more antennas for receiving the signal over the air or wireless medium. The receiver chain 1310 may include at least one amplifier (e.g., a low-noise amplifier (LNA)) configured to amplify the received signal. The receiver chain 1310 may include at least one demodulator configured to demodulate the receive signal and obtain the transmitted data by reversing the modulation technique applied during transmission of the signal. The receiver chain 1310 may include at least one decoder for decoding and processing the demodulated signal to receive the transmitted data.

[0065] A transmitter chain 1312 may be configured to generate and transmit signals (e.g., control information, data, packets). The transmitter chain 1312 may include at least one modulator for modulating data onto a carrier signal, preparing the signal for transmission over a wireless medium. The at least one modulator may be configured to support one or more techniques such as amplitude modulation (AM), frequency modulation (FM), or digital modulation schemes like phase-shift keying (PSK) or quadrature amplitude modulation (QAM). The transmitter chain 1312 may also include at least one power amplifier configured to amplify the modulated signal to an appropriate power level suitable for transmission over the wireless medium. The transmitter chain 1312 may also include one or more antennas for transmitting the amplified signal into the air or wireless medium. In one or more aspects of

the present disclosure, the UE 1300 performs wireless communication including improved delay status reporting for flexible measurement period cancellation.

[0066] According to aspects of the present disclosure, at least one processor 1302 is configured to cause the UE to receive, via the transceiver from a base station, one or more configurations comprising an indication of a dynamic delay status reporting parameter and an indication of a first uplink grant preceding a measurement period. The processor 1302 is configured to cause the UE to determine, based on the dynamic delay status reporting parameter, a first time distance ("Ta") and a second time distance ("Tb") to the measurement period, the first time distance Ta being greater than the second time distance Tb. In response to determining time distance ("Td") to the measurement period is within a dynamic reporting time window between first time distance Ta and second time distance Tb, the processor 1302 is configured to cause the UE to transmit delay status reporting to prompt cancelling of the measurement period and scheduling of an additional uplink resource for delay-critical data. Transmitting the delay status reporting is performed in response to (i.e., based on) determining that at least one data unit of the delay-critical data is not accommodated by the first uplink grant and has an assigned discard time to occur during the measurement period.

[0067] In one or more embodiments, the processor 1302 is configured to cause the UE to receive a second uplink grant in response to the delay status reporting; and transmit the at least one unit of the delay-critical data according to the second uplink grant, before the assigned discard time. In one or more particular embodiments, the processor 1302 is configured to cause the UE to receive the one or more configuration further including an indication of a fixed delay status reporting parameter and a third uplink grant preceding a second measurement period. The processor 1302 is configured to cause the UE to determine, based on the fixed delay status reporting parameter, a fixed time distance to a second measurement period. In response to determining time distance ("Td") to the second measurement period is not within a dynamic reporting time window between first time distance Ta and second time distance Tb: the processor 1302 is configured to cause the UE to transmit second delay status reporting at or before the fixed time distance from the second measurement period to prompt scheduling of an additional uplink resource for delay-critical data based on determining that at least one data unit of the delay-critical data is not

accommodated by the third uplink grant and has an assigned second discard time to occur during the second measurement period.

[0068] In one or more embodiments, the processor 1302 is configured to cause the UE to determine a minimum time distance from the measurement period required by the UE to prepare a physical uplink shared channel (PUSCH) transmission. The processor 1302 is configured to cause the UE to transmit second delay status reporting based in part on a time distance to the measurement period being greater than the minimum time distance. In one or more embodiments, the processor 1302 is configured to cause the UE to cancel transmission of a pending delay status reporting that has not been transmitted before a minimum reporting time distance to the measurement period.

[0069] In one or more embodiments, the processor 1302 is configured to cause the UE to transmit an indication of mobility being below a mobility threshold, indicating a stable communication channel condition to prompt the base station to prioritize scheduling additional uplink resources for data communication and control channel monitoring over measurements during the measurement period.

[0070] In one or more embodiments, the processor 1302 is configured to cause the UE to receive, via medium access control (MAC) control element (CE), an indication of cancellation of the measurement period at a third time distance after acknowledgement by the UE to the MAC-CE. The processor 1302 is configured to cause the UE to transmit, before a minimum time distance to the measurement period, the acknowledgement to the indication, the acknowledgement enabling the base station to cancel the measurement period. The processor 1302 is configured to cause the UE to cancel measurements during the measurement period that occurs after the third time distance from the acknowledgement.

[0071] In one or more embodiments, the measurement period comprises a first and a second measurement period that overlap or are spaced less than a certain time distance apart. In response to receiving a measurement period configuration of two or more measurement periods, the processor 1302 is configured to cause the UE to determine whether each of the first and the second measurement period are individually cancellable to enable scheduling of the additional uplink resources to transmit the at least one unit before the discard time. The

processor 1302 is configured to cause the UE to transmit, based on the determination, the delay status reporting for one of the first and the second measurement period.

[0072] FIG. 14 illustrates an example of a processor 1400 in accordance with aspects of the present disclosure. The processor 1400 may be an example of a processor configured to perform various operations in accordance with examples as described herein. The processor 1400 may include a controller 1402 configured to perform various operations in accordance with examples as described herein. The processor 1400 may optionally include at least one memory 1404, which may be, for example, an L1/L2/L3 cache. Additionally, or alternatively, the processor 1400 may optionally include one or more arithmetic-logic units (ALUs) 1406. One or more of these components may be in electronic communication or otherwise coupled (e.g., operatively, communicatively, functionally, electronically, electrically) via one or more interfaces (e.g., buses).

[0073] The processor 1400 may be a processor chipset and include a protocol stack (e.g., a software stack) executed by the processor chipset to perform various operations (e.g., receiving, obtaining, retrieving, transmitting, outputting, forwarding, storing, determining, identifying, accessing, writing, reading) in accordance with examples as described herein. The processor chipset may include one or more cores, one or more caches (e.g., memory local to or included in the processor chipset (e.g., the processor 1400) or other memory (e.g., random access memory (RAM), read-only memory (ROM), dynamic RAM (DRAM), synchronous dynamic RAM (SDRAM), static RAM (SRAM), ferroelectric RAM (FeRAM), magnetic RAM (MRAM), resistive RAM (RRAM), flash memory, phase change memory (PCM), and others).

[0074] The controller 1402 may be configured to manage and coordinate various operations (e.g., signaling, receiving, obtaining, retrieving, transmitting, outputting, forwarding, storing, determining, identifying, accessing, writing, reading) of the processor 1400 to cause the processor 1400 to support various operations in accordance with examples as described herein. For example, the controller 1402 may operate as a control unit of the processor 1400, generating control signals that manage the operation of various components of the processor 1400. These control signals include enabling or disabling functional units, selecting data paths, initiating memory access, and coordinating timing of operations.

[0075] The controller 1402 may be configured to fetch (e.g., obtain, retrieve, receive) instructions from the memory 1404 and determine subsequent instruction(s) to be executed to cause the processor 1400 to support various operations in accordance with examples as described herein. The controller 1402 may be configured to track memory address of instructions associated with the memory 1404. The controller 1402 may be configured to decode instructions to determine the operation to be performed and the operands involved. For example, the controller 1402 may be configured to interpret the instruction and determine control signals to be output to other components of the processor 1400 to cause the processor 1400 to support various operations in accordance with examples as described herein. Additionally, or alternatively, the controller 1402 may be configured to manage flow of data within the processor 1400. The controller 1402 may be configured to control transfer of data between registers, arithmetic logic units (ALUs), and other functional units of the processor 1400.

[0076] The memory 1404 may include one or more caches (e.g., memory local to or included in the processor 1400 or other memory, such RAM, ROM, DRAM, SDRAM, SRAM, MRAM, flash memory, etc. In some implementations, the memory 1404 may reside within or on a processor chipset (e.g., local to the processor 1400). In some other implementations, the memory 1404 may reside external to the processor chipset (e.g., remote to the processor 1400).

[0077] The memory 1404 may store computer-readable, computer-executable code including instructions that, when executed by the (at least one) controller 1402, cause the processor 1400 to perform various functions described herein. The code may be stored in a non-transitory computer-readable medium such as system memory or another type of memory. The controller 1402 and/or the processor 1400 may be configured to execute computer-readable instructions stored in the memory 1404 to cause the processor 1400 to perform various functions. For example, the controller 1402 may be coupled with or to the memory 1404, and the processor 1400, the controller 1402, and the memory 1404 may be configured to perform various functions described herein. In some examples, the processor 1400 may include multiple controllers 1402 and the memory 1404 may include multiple memories. One or more of the multiple controllers 1402 may be coupled with one or more of

the multiple memories, which may, individually or collectively, be configured to perform various functions herein.

[0078] The one or more ALUs 1406 may be configured to support various operations in accordance with examples as described herein. In some implementations, the one or more ALUs 1406 may reside within or on a processor chipset (e.g., the processor 1400). In some other implementations, the one or more ALUs 1406 may reside external to the processor chipset (e.g., the processor 1400). One or more ALUs 1406 may perform one or more computations such as addition, subtraction, multiplication, and division on data. For example, one or more ALUs 1406 may receive input operands and an operation code, which determines an operation to be executed. One or more ALUs 1406 be configured with a variety of logical and arithmetic circuits, including adders, subtractors, shifters, and logic gates, to process and manipulate the data according to the operation. Additionally, or alternatively, the one or more ALUs 1406 may support logical operations such as AND, OR, exclusive-OR (XOR), not-OR (NOR), and not-AND (NAND), enabling the one or more ALUs 1406 to handle conditional operations, comparisons, and bitwise operations.

[0079] The processor 1400 may support wireless communication in accordance with examples as disclosed herein. The processor 1400 may be configured to or operable for wireless communication including improved delay status reporting for flexible measurement period cancellation. The UE 1300 provides the processor 1302, memory 1304, controller 1306 and transceiver 1308 that performs the functionality described herein.

[0080] According to aspects of the present disclosure, at least one controller 1402 is configured to cause the processor 1400 to receive, via the transceiver of a UE from a base station, one or more configurations comprising an indication of a dynamic delay status reporting parameter and an indication of a first uplink grant preceding a measurement period. The at least one controller 1402 is configured to cause the processor 1400 to determine, based on the dynamic delay status reporting parameter, a first time distance ("Ta") and a second time distance ("Tb") to the measurement period, the first time distance Ta being greater than the second time distance Tb. In response to determining time distance ("Td") to the measurement period is within a dynamic reporting time window between first time distance Ta and second time distance Tb, the at least one controller 1402 is configured to cause the

processor 1400 to transmit delay status reporting to prompt cancelling of the measurement period and scheduling of an additional uplink resource for delay-critical data. Transmitting the delay status reporting is performed in response to (or based on) determining that at least one data unit of the delay-critical data is not accommodated by the first uplink grant and has an assigned discard time to occur during the measurement period.

[0081] In one or more embodiments, the at least one controller 1402 is configured to cause the processor 1400 to receive a second uplink grant in response to the delay status reporting; and transmit the at least one unit of the delay-critical data according to the second uplink grant, before the assigned discard time. In one or more particular embodiments, the at least one controller 1402 is configured to cause the processor 1400 to receive the one or more configuration further including an indication of a fixed delay status reporting parameter and a third uplink grant preceding a second measurement period. The at least one controller 1402 is configured to cause the processor 1400 to determine, based on the fixed delay status reporting parameter, a fixed time distance to a second measurement period. In response to determining time distance ("Td") to the second measurement period is not within a dynamic reporting time window between first time distance Ta and second time distance Tb: the at least one controller 1402 is configured to cause the processor 1400 to transmit second delay status reporting at or before the fixed time distance from the second measurement period to prompt scheduling of an additional uplink resource for delay-critical data in response to determining that at least one data unit of the delay-critical data is not accommodated by the third uplink grant and has an assigned second discard time to occur during the second measurement period.

[0082] In one or more embodiments, the at least one controller 1402 is configured to cause the processor 1400 to determine a minimum time distance from the measurement period required by the processor 1400 to prepare a physical uplink shared channel (PUSCH) transmission. The at least one controller 1402 is configured to cause the processor 1400 to transmit second delay status reporting based in part on a time distance to the measurement period being greater than the minimum time distance. In one or more embodiments, the at least one controller 1402 is configured to cause the processor 1400 to cancel transmission of

a pending delay status reporting that has not been transmitted before a minimum reporting time distance to the measurement period.

[0083] In one or more embodiments, the at least one controller 1402 is configured to cause the processor 1400 to transmit an indication of mobility being below a mobility threshold, indicating a stable communication channel condition to prompt the base station to prioritize scheduling additional uplink resources for data communication and control channel monitoring over measurements during the measurement period.

[0084] In one or more embodiments, the at least one controller 1402 is configured to cause the processor 1400 to receive, via medium access control (MAC) control element (CE), an indication of cancellation of the measurement period at a third time distance after acknowledgement by the processor 1400 to the MAC-CE. The at least one controller 1402 is configured to cause the processor 1400 to transmit, before a minimum time distance to the measurement period, the acknowledgement to the indication, the acknowledgement enabling the base station to cancel the measurement period. The at least one controller 1402 is configured to cause the processor 1400 to cancel measurements during the measurement period that occurs after the third time distance from the acknowledgement.

[0085] In one or more embodiments, the measurement period comprises a first and a second measurement period that overlap or are spaced less than a certain time distance apart. In response to receiving a measurement period configuration of two or more measurement periods, the at least one controller 1402 is configured to cause the processor 1400 to determine whether each of the first and the second measurement period are individually cancellable to enable scheduling of the additional uplink resources to transmit the at least one unit before the discard time. The at least one controller 1402 is configured to cause the processor 1400 to transmit, based on the determination, the delay status reporting for one of the first and the second measurement period.

[0086] FIG. 15 illustrates an example of a NE 1500 such as a base station in accordance with aspects of the present disclosure. The NE 1500 may include a processor 1502, a memory 1504, a controller 1506, and a transceiver 1508. The processor 1502, the memory 1504, the controller 1506, or the transceiver 1508, or various combinations thereof or various components thereof may be examples of means for performing various aspects of the present

disclosure as described herein. These components may be coupled (e.g., operatively, communicatively, functionally, electronically, electrically) via one or more interfaces.

[0087] The processor 1502, the memory 1504, the controller 1506, or the transceiver 1508, or various combinations or components thereof may be implemented in hardware (e.g., circuitry). The hardware may include a processor, a digital signal processor (DSP), an application-specific integrated circuit (ASIC), or other programmable logic device, or any combination thereof configured as or otherwise supporting a means for performing the functions described in the present disclosure.

[0088] The processor 1502 may include an intelligent hardware device (e.g., a general-purpose processor, a DSP, a CPU, an ASIC, an FPGA, or any combination thereof). In some implementations, the processor 1502 may be configured to operate the memory 1504. In some other implementations, the memory 1504 may be integrated into the processor 1502. The processor 1502 may be configured to execute computer-readable instructions stored in the memory 1504 to cause the NE 1500 to perform various functions of the present disclosure.

[0089] The memory 1504 may include volatile or non-volatile memory. The memory 1504 may store computer-readable, computer-executable code including instructions when executed by the processor 1502, cause the NE 1500 to perform various functions described herein. The code may be stored in a non-transitory computer-readable medium such the memory 1504 or another type of memory. Computer-readable media includes both non-transitory computer storage media and communication media including any medium that facilitates transfer of a computer program from one place to another. A non-transitory storage medium may be any available medium that may be accessed by a general-purpose or special-purpose computer.

[0090] In some implementations, the processor 1502 and the memory 1504 coupled with the processor 1502 may be configured to cause the NE 1500 to perform one or more of the functions described herein (e.g., executing, by the processor 1502, instructions stored in the memory 1504). For example, the processor 1502 may support wireless communication at the NE 1500 in accordance with examples as disclosed herein.

[0091] The controller 1506 may manage input and output signals for the NE 1500. The controller 1506 may also manage peripherals not integrated into the NE 1500. In some implementations, the controller 1506 may utilize an operating system such as iOS®, ANDROID®, WINDOWS®, or other operating systems. In some implementations, the controller 1506 may be implemented as part of the processor 1502.

[0092] In some implementations, the NE 1500 may include at least one transceiver 1508. In some other implementations, the NE 1500 may have more than one transceiver 1508. The transceiver 1508 may represent a wireless transceiver. The transceiver 1508 may include one or more receiver chains 1510, one or more transmitter chains 1512, or a combination thereof.

[0093] A receiver chain 1510 may be configured to receive signals (e.g., control information, data, packets) over a wireless medium. For example, the receiver chain 1510 may include one or more antennas for receiving the signal over the air or wireless medium. The receiver chain 1510 may include at least one amplifier (e.g., a low-noise amplifier (LNA)) configured to amplify the received signal. The receiver chain 1510 may include at least one demodulator configured to demodulate the receive signal and obtain the transmitted data by reversing the modulation technique applied during transmission of the signal. The receiver chain 1510 may include at least one decoder for decoding and processing the demodulated signal to receive the transmitted data.

[0094] A transmitter chain 1512 may be configured to generate and transmit signals (e.g., control information, data, packets). The transmitter chain 1512 may include at least one modulator for modulating data onto a carrier signal, preparing the signal for transmission over a wireless medium. The at least one modulator may be configured to support one or more techniques such as amplitude modulation (AM), frequency modulation (FM), or digital modulation schemes like phase-shift keying (PSK) or quadrature amplitude modulation (QAM).

[0095] According to one or more aspects of the present disclosure, the processor 1502 configures NE 1500 to transmit, to a user equipment (UE), one or more configurations including an indication of a dynamic delay status reporting parameter and an indication of a first uplink grant preceding a measurement period. The configuration prompts the UE to determine, based on the dynamic delay status reporting parameter, a first time distance ("Ta")

and a second time distance ("Tb") to the measurement period, the first time distance Ta being greater than the second time distance Tb. During a dynamic reporting time window of time distance ("Td") to the measurement period that is between first time distance Ta and second time distance Tb, the processor 1502 configures NE 1500 to receive delay status reporting to prompt cancelling of the measurement period and scheduling of an additional uplink resource for delay-critical data in response to determining by the UE that at least one data unit of the delay-critical data is not accommodated by the first uplink grant and has an assigned discard time to occur during the measurement period.

[0096] In one or more embodiments, the processor 1502 configures NE 1500 to base the second time distance at least in part on a network time distance ("δ") required by a network to cancel the measurement period. In one or more embodiments, the processor 1502 configures NE 1500 to transmit a second uplink grant in response to receiving the delay status reporting by the UE; and receive the at least one unit of delay-critical data according to the second uplink grant.

[0097] In one or more embodiments, in response to determining that data communication and control channel monitoring prioritization over measurements is not available, the processor 1502 configures NE 1500 to transmit, to the UE, the one or more configuration further including an indication of a fixed delay status reporting parameter and a third uplink grant preceding a second measurement period. The configuration prompts the UE to determine, based on the fixed delay status reporting parameter, a fixed time distance to a second measurement period. In response to the UE determining time distance ("Td") to the second measurement period is not within a dynamic reporting time window between first time distance Ta and second time distance Tb, the processor 1502 configures NE 1500 to receive second delay status reporting at or before the fixed time distance from the second measurement period. The UE transmits the second delay status reporting to prompt scheduling of an additional uplink resource for delay-critical data in response to determining that at least one data unit of the delay-critical data is not accommodated by the third uplink grant and has an assigned second discard time to occur during the second measurement period.

[0098] In one or more embodiments, the processor 1502 configures NE 1500 to receive, from the UE, an indication of mobility being below a mobility threshold, indicating a stable communication channel condition. The processor 1502 configures NE 1500 to prioritize scheduling additional uplink resources for data communication and control channel monitoring over measurements during the measurement period based on the indication of mobility being below the mobility threshold.

[0099] In one or more embodiments, the processor 1502 configures NE 1500 to transmit, via medium access control (MAC) control element (CE), an indication of cancellation of the measurement period at a third time distance after acknowledgement by the UE to the MAC-CE. In response to receiving, before a minimum time distance to the measurement period, an acknowledgement to the indication of cancellation, the processor 1502 configures NE 1500 to cancel measurements during the measurement period.

[0100] In one or more embodiments, the processor 1502 configures NE 1500 to transmit, to the UE, a measurement period configuration comprising a first and a second measurement period that overlap or are spaced less than a certain time distance apart. In one or more embodiments, the processor 1502 configures NE 1500 to receive the delay status reporting for one of the first and second measurement period, based on a determination by the UE whether each of the first and the second measurement period are individually cancellable to enable scheduling the additional uplink resources to transmit the at least one unit before the discard time.

[0101] FIG. 16 illustrates a flowchart of a method for wireless communication at a user equipment (UE) in accordance with aspects of the present disclosure. The operations of the method may be implemented by a UE as described herein. In some implementations, the UE may execute a set of instructions to control the function elements of the UE to perform the described functions.

[0102] At 1605, the method may include receiving, via a transceiver from a base station, one or more configurations comprising an indication of a dynamic delay status reporting parameter and an indication of a first uplink grant preceding a measurement period. The operations of 1605 may be performed in accordance with examples as described herein. In

some implementations, aspects of the operations of 1605 may be performed by a UE as described with reference to FIG. 13.

[0103] At 1610, the method may include determining, based on the dynamic delay status reporting parameter, a first time distance ("Ta") and a second time distance ("Tb") to the measurement period, the first time distance Ta being greater than the second time distance Tb. The operations of 1610 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 1610 may be performed by a UE as described with reference to FIG. 13.

[0104] At 1615, the method may include determining whether a first condition exists that time distance ("Td") to the measurement period is within a dynamic reporting time window between first time distance Ta and second time distance Tb. The operations of 1615 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 1615 may be performed by a UE as described with reference to FIG. 13.

[0105] At 1620, the method may include determining whether a second condition exists that at least one data unit of the delay-critical data is not accommodated by the first uplink grant and has an assigned discard time to occur during the measurement period. The operations of 1620 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 1620 may be performed by a UE as described with reference to FIG. 13.

[0106] At 1625, the method may include transmitting delay status reporting in response to determining that both the first condition and the second condition exists. The operations of 1625 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 1625 may be performed by a UE as described with reference to FIG. 13.

[0107] According to aspects of the present disclosure, the method may further include receiving a second uplink grant in response to the delay status reporting. The method may further include transmitting the at least one unit of the delay-critical data according to the second uplink grant, before the assigned discard time.

[0108] In one or more particular embodiments, the method may further include receiving the one or more configuration further including an indication of a fixed delay status reporting parameter and a third uplink grant preceding a second measurement period. In response to determining time distance ("Td") to the second measurement period is not within a dynamic reporting time window between first time distance Ta and second time distance Tb, the method may further include determining, based on the fixed delay status reporting parameter, a fixed time distance to a second measurement period. The method may further include transmitting a second delay status report at or before the fixed time distance from the second measurement period. The second delay status report prompts scheduling of an additional uplink resource for delay-critical data in response to (or based on) determining that at least one data unit of the delay-critical data that is not accommodated by the third uplink grant and has an assigned second discard time to occur during the second measurement period.

[0109] In one or more embodiments, the method may further include determining a minimum time distance from the measurement period required by the UE to prepare a physical uplink shared channel (PUSCH) transmission. The method may further include transmitting the delay status reporting based in part on a time distance to the measurement period being greater than the minimum time distance.

[0110] In one or more embodiments, the method may further include cancelling transmission of a pending delay status reporting that has not been transmitted before a minimum reporting time distance to the measurement period. In one or more embodiments, the method may further include transmitting an indication of mobility being below a mobility threshold, indicating a stable communication channel condition to prompt the base station to prioritize scheduling additional uplink resources for data communication and control channel monitoring over measurements during the measurement period.

[0111] In one or more embodiments, the method may further include receiving, via medium access control (MAC) control element (CE), an indication of cancellation of the measurement period at a third time distance after acknowledgement by the UE to the MAC-CE. The method may further include transmitting, before a minimum time distance to the measurement period, the acknowledgement to the indication. The acknowledgement enables the base station to cancel the measurement period. The method may further include cancelling

measurements during the measurement period that occurs after the third time distance from the acknowledgement.

[0112] In one or more embodiments, the measurement period may include a first and a second measurement period that overlap or are spaced less than a certain time distance apart. In response to receiving a measurement period configuration of two or more measurement periods, the method may further include determining whether each of the first and the second measurement period are individually cancellable to enable scheduling of the additional uplink resources to transmit the at least one unit before the discard time. The method may further include transmitting, based on the determination, the delay status reporting for one of the first and the second measurement period.

[0113] FIG. 17 illustrates a flowchart of a method for wireless communication at a network in accordance with aspects of the present disclosure. The operations of the method may be implemented by a network entity (NE) such as a base station as described herein. In some implementations, the NE may execute a set of instructions to control the function elements of the NE to perform the described functions.

[0114] At 1705, the method may include transmitting, to a user equipment (UE), one or more configurations comprising an indication of a dynamic delay status reporting parameter and an indication of a first uplink grant preceding a measurement period, prompting the UE to determine, based on the dynamic delay status reporting parameter, a first time distance ("Ta") and a second time distance ("Tb") to the measurement period, the first time distance Ta being greater than the second time distance Tb. The operations of 1705 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 1705 may be performed by a NE as described with reference to Figure 15.

[0115] At 1710, the method may include, during a dynamic reporting time window of time distance ("Td") to the measurement period that is between first time distance Ta and second time distance Tb, receiving delay status reporting in response to determining by the UE that at least one data unit of the delay-critical data is not accommodated by the first uplink grant and has an assigned discard time to occur during the measurement period. The operations of 1710 may be performed in accordance with examples as described herein. In

some implementations, aspects of the operations of 1710 may be performed by a NE as described with reference to Figure 15.

[0116] At 1715, the method may include transmitting a second uplink grant in response to receiving the delay status reporting by the UE. The operations of 1715 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 1715 may be performed by a NE as described with reference to Figure 15.

[0117] At 1720, the method may include receiving the at least one unit of delay-critical data according to the second uplink grant. The operations of 1720 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 1720 may be performed by a NE as described with reference to Figure 15.

[0118] In accordance with aspects of the present disclosure, the method may include basing the second time distance at least in part on a network time distance ("δ") required by a network to cancel the measurement period. In one or more embodiments, the method may further include receiving, from the UE, an indication of mobility being below a mobility threshold, indicating a stable communication channel condition. The method may further include prioritizing scheduling additional uplink resources for data communication and control channel monitoring over measurements during the measurement period based on the indication of mobility being below the mobility threshold.

[0119] In one or more embodiments, the method may further include transmitting, to the UE, the one or more configuration further including an indication of a fixed delay status reporting parameter and a third uplink grant preceding a second measurement period. The method may further include determining, based on the fixed delay status reporting parameter, a fixed time distance to a second measurement period. In response to determining time distance ("Td") to the second measurement period is not within a dynamic reporting time window between first time distance Ta and second time distance Tb, the method may further include transmitting a second delay status reporting at or before the fixed time distance from the second measurement period. The UE transmits the second delay status reporting to prompt scheduling of an additional uplink resource for delay-critical data in response to (or based on) determining that at least one data unit of the delay-critical data that is not

accommodated by the third uplink grant and has an assigned second discard time to occur during the second measurement period.

[0120] In one or more embodiments, the method may further include transmitting, via medium access control (MAC) control element (CE), an indication of cancellation of the measurement period at a third time distance after acknowledgement by the UE to the MAC-CE. In response to receiving, before a minimum time distance to the measurement period, an acknowledgement to the indication of cancellation, the method may further include cancelling measurements during the measurement period.

[0121] In one or more embodiments, the method may further include transmitting, to the UE, a measurement period configuration comprising a first and a second measurement period that overlap or are spaced less than a certain time distance apart. The method may further include receiving the delay status reporting for one of the first and second measurement period, based on a determination by the UE whether each of the first and the second measurement period are individually cancellable to enable scheduling the additional uplink resources to transmit the at least one unit before the discard time.

[0122] According to other aspects of the present disclosure, a method for wireless communication at a UE is provided. In one or more embodiments, the method includes receiving a configuration; wherein the configuration provides a first threshold value for delay status report (DSR) triggering ('Th1'). The method includes determining time distance ('Td') to an upcoming measurement gap (MG). The method includes determining if 'Td' is smaller than a first number ('Ta'), and larger than a second number ('Tb'). In response to determining Ta<Td<Tb, the method includes determining a second threshold value for dynamic status reporting (DSR) triggering. The method includes determining if a remaining delay budget (RDB) for a logical channel group (LCG) is smaller than a DSR triggering threshold 'T_DSR', wherein (i) T_DSR= Th2 if Ta<Td<Tb, and (ii) T_DSR= Th1, otherwise. The method includes triggering a DSR if the RDB is smaller than T_DSR.

[0123] In one or more embodiments, the method may further include determining if a function of a RDB of an LCG is going to be exhausted during an upcoming measurement period of a measurement type. The method may further include determining if data communication and control channel monitoring can be potentially prioritized over

measurements in the upcoming measurement period. The method may further include determining if a time gap from the current time until the start of the upcoming measurement period is greater than a threshold. In response to determining that the time gap is greater than the threshold, the method may further include triggering a DSR for the LCG. The threshold may be termed "dynamic". The function of the remaining delay budget is RDB-δ, wherein δ is configured by the network. In one or more embodiments, the upcoming measurement period starts not later than the time the RDB is going to be exhausted. In one or more embodiments, the UE determines if data communication and control channel monitoring can be potentially prioritized over measurements in the upcoming measurement period based on a configuration provided by the network. In one or more embodiments, the threshold is determined based on a first parameter (T_MG), and a second parameter (γ); wherein: (i) T_MG is the time needed to determine if data communication and control channel monitoring can be actually prioritized over measurements in the upcoming measurement period, and (ii) γ is a specified value or configured by the network. In one or more particular embodiments, the method further includes transmitting the DSR to the network. In one or more particular embodiments, the method further includes receiving, in response to the transmitted DSR, an indication from the network, wherein the indication prioritizes data communication and control channel monitoring over measurements in the upcoming measurement period. In one or more specific embodiments, the indication is a MAC-CE indication. The method further includes transmitting a positive acknowledgment in response to the reception of the MAC-CE, where the indication is applicable to the UE a certain time after the transmission of the acknowledgment, and wherein the threshold includes the certain time.

[0124] According to aspects of the present disclosure, the upcoming measurement period is determined to be a measurement period selected from a set of overlapping or close-to-each other measurement periods/occasions. The distance between the two measurement occasions is equal to or smaller than a certain threshold time. The measurement period is selected as a result of a prioritization procedure performed by the UE amongst the set of overlapping or close-to-each other measurement periods. According to aspects of the present disclosure a DSR is pending for the LCG. In response to determining the time gap is less than the threshold, the UE cancels the pending DSR if the pending DSR is not transmitted earlier than a certain time from the beginning of the measurement period. In one or more embodiments,

the UE is not expected to trigger a DSR for the LCG if the time gap is smaller than a minimum of the threshold and a certain time needed for preparing a PUSCH transmission.

[0125] According to aspects of the present disclosure, a method for wireless communication at a network node includes receiving a DSR for an LCG from a UE. The DSR indicates that a function of the remaining delay budget of the LCG is going to be exhausted in an upcoming measurement period. The method includes determining if data communication and control channel monitoring should be prioritized over measurements in the upcoming measurement period. In response to the determination, the method includes sending an indication to the UE to enable data communication and control channel monitoring in the upcoming measurement period.

[0126] It should be noted that the method described herein describes a possible implementation, and that the operations and the steps may be rearranged or otherwise modified and that other implementations are possible.

[0127] The description herein is provided to enable a person having ordinary skill in the art to make or use the disclosure. Various modifications to the disclosure will be apparent to a person having ordinary skill in the art, and the generic principles defined herein may be applied to other variations without departing from the scope of the disclosure. Thus, the disclosure is not limited to the examples and designs described herein but is to be accorded the broadest scope consistent with the principles and novel features disclosed herein.

CLAIMS

What is claimed is:

1. A user equipment (UE) for wireless communication, the UE comprising:

at least one memory; and

at least one processor coupled with the at least one memory and configured to cause the UE to:

receive, from a base station, one or more configuration comprising an indication of a dynamic delay status reporting parameter and an indication of a first uplink grant preceding a measurement period;

determine, based on the dynamic delay status reporting parameter, a first time distance ("Ta") and a second time distance ("Tb") to the measurement period, the first time distance Ta being greater than the second time distance Tb; and

in response to determining time distance ("Td") to the measurement period is within a dynamic reporting time window between first time distance Ta and second time distance Tb, transmit delay status reporting based on determining that at least one data unit of the delay-critical data is not accommodated by the first uplink grant and has an assigned discard time to occur during the measurement period.

2. The UE of claim 1, wherein the at least one processor is configured to cause the UE to:

receive a second uplink grant in response to the delay status reporting, the delay status reporting prompting the base station to cancel the measurement period and to schedule an additional uplink resource for delay-critical data; and

transmit the at least one unit of the delay-critical data according to the second uplink grant, before the assigned discard time.

3. The UE of claim 1, wherein the at least one processor is configured to cause the UE to:

receive within the one or more configuration an indication of a fixed delay status reporting parameter and a third uplink grant preceding a second measurement period;

determine, based on the fixed delay status reporting parameter, a fixed time distance to a second measurement period; and

in response to determining time distance ("Td") to the second measurement period is not within a dynamic reporting time window between first time distance Ta and second time distance Tb, transmit second delay status reporting at or before the fixed time distance from the second measurement period to prompt scheduling of an additional uplink resource for delay-critical data based on determining that at least one data unit of the delay-critical data is not accommodated by the third uplink grant and has an assigned second discard time to occur during the second measurement period.

4. The UE of claim 1, wherein the at least one processor is configured to cause the UE to:

determine a minimum time distance from the measurement period required by the UE to prepare a physical uplink shared channel (PUSCH) transmission; and

transmit the delay status reporting based in part on a time distance to the measurement period being greater than the minimum time distance.

5. The UE of claim 1, wherein the at least one processor is configured to cause the UE to cancel transmission of a pending delay status reporting that has not been transmitted before a minimum reporting time distance to the measurement period.

6. The UE of claim 1, wherein the at least one processor is configured to cause the UE to:

transmit an indication of mobility being below a mobility threshold, indicating a stable communication channel condition to prompt the base station to prioritize scheduling additional uplink resources for data communication and control channel monitoring over measurements during the measurement period.

7. The UE of claim 1, wherein the at least one processor is configured to cause the UE to:

receive, via a medium access control (MAC) control element (CE), an indication of cancellation of the measurement period at a third time distance after acknowledgement by the UE to the MAC-CE;

transmit, before a minimum time distance to the measurement period, the acknowledgement to the indication, the acknowledgement enabling the base station to cancel the measurement period; and

cancel measurements during the measurement period that occurs after the third time distance from the acknowledgement.

8. The UE of claim 1, wherein the measurement period comprises a first and a second measurement period that overlap or are spaced less than a certain time distance apart, and the at least one processor is configured to cause the UE to:

in response to receiving a measurement period configuration of two or more measurement periods:

determine whether each of the first and the second measurement period are individually cancellable to enable scheduling of the additional uplink resources to transmit the at least one unit before the discard time; and

transmit, based on the determination, the delay status reporting for one of the first and the second measurement period.

9. A processor for wireless communication at a user equipment (UE), the processor comprising:

at least one controller coupled with at least one memory and configured to cause the processor to:

receive, from a base station, one or more configuration comprising an indication of a dynamic delay status reporting parameter and an indication of a first uplink grant preceding a measurement period;

determine, based on the dynamic delay status reporting parameter, a first time distance ("Ta") and a second time distance ("Tb") to the measurement period, the first time distance Ta being greater than the second time distance Tb; and

in response to determining time distance ("Td") to the measurement period is within a dynamic reporting time window between first time distance Ta and second time distance Tb:

transmit delay status reporting based on determining that at least one data unit of the delay-critical data is not accommodated by the first uplink grant and has an assigned discard time to occur during the measurement period.

10. The processor of claim 9, wherein the controller is configured to cause the processor to:

receive a second uplink grant in response to the delay status reporting, the delay status reporting prompting the base station to cancel the measurement period and to schedule an additional uplink resource for delay-critical data; and

transmit the at least one unit of the delay-critical data according to the second uplink grant, before the assigned discard time.

11. The processor of claim 9, wherein the controller is configured to cause the processor to:

receive within the one or more configuration an indication of a fixed delay status reporting parameter and a third uplink grant preceding a second measurement period;

determine, based on the fixed delay status reporting parameter, a fixed time distance to a second measurement period; and

in response to determining time distance ("Td") to the second measurement period is not within a dynamic reporting time window between first time distance Ta and second time distance Tb:

transmit second delay status reporting at or before the fixed time distance from the second measurement period to prompt scheduling of an additional uplink resource for delay-critical data based on determining that at least one data unit of the delay-

critical data is not accommodated by the third uplink grant and has an assigned second discard time to occur during the second measurement period.

12. The processor of claim 9, wherein the controller is configured to cause the processor to:

receive, via medium access control (MAC) control element (CE), an indication of cancellation of the measurement period at a third time distance after acknowledgement by the UE to the MAC-CE;

transmit, before a minimum time distance to the measurement period, the acknowledgement to the indication, the acknowledgement to enable the base station to cancel the measurement period; and

cancel measurements during the measurement period that occurs after the third time distance from the acknowledgement.

13. A method for wireless communication at a user equipment (UE), the method comprising:

receiving, from a base station, one or more configuration comprising an indication of a dynamic delay status reporting parameter and an indication of a first uplink grant preceding a measurement period;

determining, based on the dynamic delay status reporting parameter, a first time distance ("Ta") and a second time distance ("Tb") to the measurement period, the first time distance Ta being greater than the second time distance Tb; and

in response to determining time distance ("Td") to the measurement period is within a dynamic reporting time window between first time distance Ta and second time distance Tb:

transmitting delay status reporting based on determining that at least one data unit of the delay-critical data is not accommodated by the first uplink grant and has an assigned discard time to occur during the measurement period.

14. The method of claim 13, further comprising:

receiving a second uplink grant in response to the delay status reporting, the delay status reporting prompting the base station to cancel the measurement period and to schedule an additional uplink resource for delay-critical data; and

transmitting the at least one unit of the delay-critical data according to the second uplink grant, before the assigned discard time.

15. The method of claim 13, further comprising:

receiving the one or more configuration further comprising an indication of a fixed delay status reporting parameter and a third uplink grant preceding a second measurement period;

determining, based on the fixed delay status reporting parameter, a fixed time distance to a second measurement period; and

in response to determining time distance ("Td") to the second measurement period is not within a dynamic reporting time window between first time distance Ta and second time distance Tb:

transmitting second delay status reporting at or before the fixed time distance from the second measurement period to prompt scheduling of an additional uplink resource for delay-critical data in response to determining that at least one data unit of the delay-critical data that is not accommodated by the third uplink grant and has an assigned second discard time to occur during the second measurement period.

16. The method of claim 13, further comprising:

determining a minimum time distance from the measurement period required by the UE to prepare a physical uplink shared channel (PUSCH) transmission;

transmitting the delay status reporting based in part on a time distance to the measurement period being greater than the minimum time distance; and

cancelling transmission of a pending delay status reporting that has not been transmitted before a minimum reporting time distance to the measurement period.

17. A base station for wireless communication, the base station comprising:

at least one memory; and

at least one processor coupled with the at least one memory and configured to cause the base station to:

transmit, to a user equipment (UE), one or more configuration comprising an indication of a dynamic delay status reporting parameter and an indication of a first uplink grant preceding a measurement period, to prompt the UE to determine, based on the dynamic delay status reporting parameter, a first time distance ("Ta") and a second time distance ("Tb") to the measurement period, the first time distance Ta being greater than the second time distance Tb; and

during a dynamic reporting time window of time distance ("Td") to the measurement period that is between first time distance Ta and second time distance Tb, receive delay status reporting in response to the UE determining that at least one data unit of the delay-critical data is not accommodated by the first uplink grant and has an assigned discard time to occur during the measurement period.

18. The base station of claim 17, wherein the at least one processor is configured to cause the base station to:

transmit a second uplink grant in response to receiving the delay status reporting by the UE; and

receive the at least one unit of delay-critical data according to the second uplink grant.

19. The base station of claim 17, wherein the at least one processor is configured to cause the base station to:

transmit within the one or more configuration an indication of a fixed delay status reporting parameter and a third uplink grant preceding a second measurement period, prompting the UE to determine, based on the fixed delay status reporting parameter, a fixed time distance to a second measurement period; and

receive second delay status reporting at or before the fixed time distance from the second measurement period to prompt scheduling of an additional uplink resource for delay-critical data in response to the UE determining that at least one data unit of the delay-critical

data is not accommodated by the third uplink grant and has an assigned second discard time to occur during the second measurement period.

20. The base station of claim 17, wherein the at least one processor is configured to cause the base station to:

transmit, via medium access control (MAC) control element (CE), an indication of cancellation of the measurement period at a third time distance after acknowledgement by the UE to the MAC-CE; and

in response to receiving, before a minimum time distance to the measurement period, an acknowledgement to the indication of cancellation, cancel measurements during the measurement period.