**#3GPP TSG RAN WG1 #104-e R1-210xxxx**

**e-Meeting, January 25th – February 5th, 2021**

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**Source:** Moderator (LG Electronics)

**Title:** Feature lead summary for AI 8.11.1.2 Feasibility and benefits for mode 2 enhancements

**Document for:** Discussion and information

1. **Summary of evaluation results**

In RAN1#103-e meeting, RAN1 listed up three types of “A set of resources” for inter-UE coordination in Mode 2:

* Type A: UE-A sends to UE-B the set of resources preferred for UE-B’s transmission
	+ e.g., based on its sensing result
* Type B: UE-A sends to UE-B the set of resources not preferred for UE-B’s transmission
	+ e.g., based on its sensing result and/or expected/potential resource conflict
* Type C: UE-A sends to UE-B the set of resource where the resource conflict is detected

The summary of evaluation results is as follows:

* For Type A without sensing at UE-B,
	+ When a UE-A transmits multiple Type A information to multiple UE-B(s),
		- It is assumed that R16 Mode 2 RA is used to determine resources for inter-UE coordination signalling.
			* 5.4% PRR gain is observed in highway scenario for periodic unicast traffic at 320m [Huawei, R1-2100206].
				+ Coverage of 200m is extended in highway scenario at PRR=0.95.
	+ When a UE-A is the intended RX UE of UE-B,
		- Assumptions on latency and signalling overhead of transmitting and processing coordination information
			* R16 Mode 2 RA is used to determine resources for inter-UE coordination signalling,
				+ PRR loss is observed in highway and urban scenario for aperiodic unicast traffic at 320m [Intel, R1-2100673].
			* No latency and signalling of transmitting and processing coordination information
				+ 3.4% PRR gain is observed in highway scenario for aperiodic unicast traffic at 300m [Samsung, R1-2101232].

Coverage of 5m is extended in highway scenario at PRR=0.95.

* For Type A and/or Type B with sensing at UE-B,
	+ When a UE-A is the intended RX UE of UE-B,
		- Assumptions on latency and signalling overhead of transmitting and processing coordination information
			* R16 Mode 2 RA is used to determine resources for inter-UE coordination signalling,
				+ [1-4.3]% PRR gain is observed in highway scenario for periodic unicast traffic at 320m [Huawei, R1-2100206].

Coverage of [10-100]m is extended in highway scenario at PRR=0.95.

* + - * + No PRR gain is observed in highway scenario for periodic and aperiodic unicast traffic [Intel, R1-2100673].
			* No signalling overhead and latency of 3ms+2 slots,
				+ 7.6% PRR gain is observed in urban scenario for periodic unicast traffic at 150m [OPPO, R1-2100142].

Coverage of 20m is extended in highway scenario at PRR=0.95.

* + - * No signalling overhead and latency of 2ms,
				+ 20% PRR gain is observed in highway scenario for periodic unicast traffic at 320m [CATT, R1-2100352].

Coverage of 20m is extended in highway scenario at PRR=0.95.

* + - * + No PRR gain is observed in highway scenario for aperiodic unicast traffic [CATT, R1-2100352].
			* No latency and 1 sub-channel in a slot for signalling overhead of transmitting and processing coordination information
				+ 3% PRR gain is observed in urban scenario for aperiodic unicast traffic at 150m [vivo, R1-2101791].

No coverage is extended in highway scenario at PRR=0.95.

* + - * + 4.3% PRR gain is observed in urban scenario for periodic unicast traffic at 150m [vivo, R1-2101791].

Coverage of 15m is extended in highway scenario at PRR=0.95.

* + - * + If 20% of slots are used for UL TX of UE-A,

9% PRR gain is observed in urban scenario for periodic unicast traffic at 150m [vivo, R1-2101791].

Coverage of 40m is extended in highway scenario at PRR=0.95.

* + - * + If 50% of slots are UL TX of UE-A,

46% PRR gain is observed in urban scenario for periodic unicast traffic at 150m [vivo, R1-2101791].

* + - * 10% of resources are used for signalling related to coordination and latency of 10 slots,
				+ PRR loss is observed in highway scenario for periodic groupcast traffic at 320m [Fujitsu, R1-2100746].
			* No latency and signalling of transmitting and processing coordination information
				+ 6% PRR gain is observed in highway scenario for periodic unicast traffic at 320m [Mitsubishi, R1-2100828].

Coverage of 50m is extended in highway scenario at PRR=0.95.

* + - * + 3.2% PRR gain is observed in highway scenario for periodic groupcast traffic at 320m [Mitsubishi, R1-2100828].

Coverage of 50m is extended in highway scenario at PRR=0.95.

* + - * + 0.2% PRR gain is observed in urban scenario for aperiodic groupcast traffic at 50m [Qualcomm, R1-2101486].

Coverage of 1.2m is extended in highway scenario at PRR=0.95.

Coverage of 5m is extended in highway scenario at PRR=0.99.

* + When UE-A is determined by UE-B via PC5-RRC,
		- It is assumed that no latency and signalling of transmitting and processing coordination information
		- 2.6% PRR gain is observed in highway scenario for periodic broadcast traffic at 320m [ZTE, R1-2100925].
			* Coverage of 40m is extended in highway scenario at PRR=0.95.
		- 5.8% PRR gain is observed in urban scenario for periodic broadcast traffic at 150m [ZTE, R1-2100925].
			* Coverage of 10m is extended in highway scenario at PRR=0.95.
* For Type C,
	+ Evaluation assumptions
		- UE-A is one of the RX UE of UE-B within the communication range requirement from the UE-B, if any.
		- PSFCH format is used for convey resource conflict indication.
	+ When the communication range requirement is smaller than or equal to 200m,
		- For the post-conflict indication,
			* [0.4-1.3]% PRR gain is observed in highway scenario for aperiodic and periodic groupcast traffic at 50m [Intel, R1-2100673] [Fujitsu, R1-2100746].
				+ Coverage of [5-25]m is extended in highway scenario at PRR=0.95.
				+ Coverage of [50-60]m is extended in highway scenario at PRR=0.99.
			* 1.2% PRR gain is observed in highway scenario for aperiodic groupcast traffic at 300m [Intel, R1-2100673].
			* 2% PRR gain is observed in urban scenario for periodic groupcast traffic at 100m [Fujitsu, R1-2100746].
				+ Coverage of 10m is extended in highway scenario at PRR=0.95.
			* 0.5% PRR gain is observed in urban scenario for aperiodic groupcast traffic at 150m [Fujitsu, R1-2100746].
				+ Coverage of 5m is extended in highway scenario at PRR=0.95.
				+ Coverage of 25m is extended in highway scenario at PRR=0.99.
			* 0.5% PRR gain is observed in urban scenario for aperiodic groupcast traffic at 50m [Qualcomm, R1-2101486].
				+ Coverage of 2.5m is extended in highway scenario at PRR=0.95.
				+ Coverage of 10m is extended in highway scenario at PRR=0.99.
			* PRR loss is observed in highway scenario for aperiodic groupcast traffic compared to R16 Mode 2 RA with minimum number of (re)transmissions of 2 [Intel, R1-2100673].
	+ When the communication range requirement is larger than or equal to 240m,
		- For the post-conflict indication,
			* [0.1-0.5]% PRR gain is observed in highway scenario for aperiodic groupcast traffic at 320m [Intel, R1-2100673] [Ericsson, R1-2101804].
				+ Coverage of 25m is extended in highway scenario at PRR=0.95.
				+ Coverage of [10-50]m is extended in highway scenario at PRR=0.99.
			* PRR loss is observed in highway scenario for aperiodic groupcast traffic compared to R16 Mode 2 RA with minimum number of (re)transmissions of 2 [Intel, R1-2100673].
		- For the pre-conflict indication,
			* 0.3% PRR gain is observed in highway scenario for aperiodic groupcast traffic at 320m [Ericsson, R1-2101804].
				+ Coverage of 40m is extended in highway scenario at PRR=0.99.
		- For the mix of pre-conflict and post-conflict indication,
			* 0.6% PRR gain is observed in highway scenario for aperiodic groupcast traffic at 320m [Ericsson, R1-2101804].
				+ Coverage of 70m is extended in highway scenario at PRR=0.99.
	+ When no communication range requirement is configured,
		- For the post-conflict indication,
			* 3% PRR gain is observed in highway scenario for periodic unicast traffic at 50m [MediaTek, R1-2100606].
				+ Coverage of 10m is extended in highway scenario at PRR=0.95.

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| **Source (tdoc number)** | **Evaluation Scenario** | **What is the relationship between UE-A and UE-B, including additional latency and signaling overhead model** | **How UE-A determines the set of resources, including the form of the information** | **When UE-A sends the set of resources to UE-B** | **How UE-A sends the set of resources to UE-B, including container and signaling overhead model** | **How/when UE-B takes the received set of resources into account in the resource selection for its own transmission, including additional latency model**  | **Gain over Rel.16 Mode-2 RA** |
| OPPO [R1-2100142] | Unicast,Urban,Periodic(UUP) | UE-A is receiver of UE-B.  | Type B. | 2 slots after UE-A receiving the triggering signalling from UE-B | Not modelled | The latency of transmitting and processing coordination information is set to 3ms.UE-B precludes resources overlapping with the indicated set, and selects resource from the remaining. | PRR gain is 1% at the range of 50m.PRR gain is 7.6% in the range at 150m.PIR gain is 5ms in average in the range of [100m,240m].Coverage of 20m is extended at PRR=0.95.Coverage of []m is extended at PRR=0.99. |
| Huawei [R1-2100206] | Unicast,Highway,Periodic(UHP) | **Scheme 1:**UE-A is the UE closest the center of UE group in geographical sense. UE-B(s) are other UEs in the UE group. **Scheme 2&3:**UE-A is receiver of UE-B. | Type A. **Scheme 1:**The set of resources is the resources for UE-B’s transmission.**Scheme 2&3:**The set of resources is the identified candidate resource set obtained by UE-A’s sensing and resource exclusion procedure. | When UE-A receives the trigger information from UE-B.The request signalling occupies one sub-channel in a slot. **Scheme 1:**Resources for the request are (pre)configured by UE-A. **Scheme 2&3:**Resources for the request are obtained by UE-B’s sensing and exclusion procedure.  | The signalling of the set of resources occupies one sub-channel in a slot. Resources for the signalling are obtained by UE-A’s sensing and exclusion procedure. | **Scheme 1:**UE-B uses the transmission resources provided by UE-A.**Scheme 2:**UE-B takes the union of UE-B’s S\_A and UE-A’s S\_A to obtain the final candidate resource set**Scheme 3:**UE-B takes the intersection of UE-B’s S\_A and UE-A’s S\_A to obtain the final candidate resource set. | **Scheme 1:**PRR gain is 5.4% at the range of 320m.Coverage of 200m is extended at PRR=0.95.Coverage of []m is extended at PRR=0.99.**Scheme 2:**PRR gain is 4.3% at the range of 320m.Coverage of 100m is extended at PRR=0.95.Coverage of []m is extended at PRR=0.99.**Scheme 3:**PRR gain is 1% at the range of 320m.Coverage of 10m is extended at PRR=0.95.Coverage of []m is extended at PRR=0.99. |
| CATT [R1-2100352] | Unicast,Highway,Periodic(UHP) | UE-A is receiver of UE-B. | A mix of Type A and Type B.UE-A determines the possible transmission occasions of UE-A as Type B resource set. | When UE-A receives the trigger information from UE-B. | Not modelled | The latency of transmitting and processing coordination information is set to 2ms.UE-B takes the intersection of UE-B’s S\_A and Type A resource set to obtain the final candidate resource set.UE-B will preclude all the resources of Type B resource set.  | **Type A only:**PRR gain is 11% at the range of 300mCoverage of 50m is extended at PRR=0.95.Coverage of []m is extended at PRR=0.99.**Type B only:**PRR gain is 9% at the range of 300mCoverage of 50m is extended at PRR=0.95.Coverage of []m is extended at PRR=0.99.**Mix of Type A and B:**PRR gain is 20% at the range of 300m.Coverage of 100m is extended at PRR=0.95.Coverage of []m is extended at PRR=0.99. |
| CATT [R1-2100352] | Unicast,Highway,Aperiodic(UHA) | UE-A is receiver of UE-B. | A mix of Type A and Type B.UE-A determines the possible transmission occasions of UE-A as Type B resource set. | When UE-A receives the trigger information from UE-B.Resources for the request are obtained by UE-B’s sensing and exclusion procedure. | Not modelled | The latency of transmitting and processing coordination information is set to 2ms.UE-B takes the intersection of UE-B’s S\_A and Type A resource set to obtain the final candidate resource set.UE-B will preclude all the resources of Type B resource set.  | No PRR gain. |
| vivo [R1-2101791] | Unicast,Urban,Aperiodic(UUA) | UE-A is receiver of UE-B. | Type A. | Once resource (re)-selection is triggered at UE-B, the assistance info is provided by UE-A | 1 sub-channel and 1 slot signalling overhead is assumed; 0ms latency is assumed | Based on mixed candidate resource set derived by TX UE and RX UE | 3% PRR gain at the range of 150m.Coverage of 10m is extended at PRR=0.95.No coverage is extended at PRR=0.99. |
| vivo [R1-2101791] | Unicast,Urban,Periodic(UUP)UL/SL coexistence | UE-A is receiver of UE-B. | Type A.UE-A determines Type A resource set to further consider half-duplex problem.  | When UE-A change transmission occasion  | 1 sub-channel and 1 slot signalling overhead is assumed; 0ms latency is assumed | Based on mixed candidate resource set derived by TX UE and RX UE Further precluding on UE-A’s transmission occasion | **No UL slot:**4.3% PRR gain at the range of 150m.Coverage of 15m is extended at PRR=0.95.Coverage of []m is extended at PRR=0.99.**20% UL slot:**5.4% PRR gain at the range of 50m.9% PRR gain at the range of 150m.Coverage of 40m is extended at PRR=0.95.Coverage of []m is extended at PRR=0.99.**50% UL slot:**46% PRR gain in 150m. |
| MediaTek [R1-2100606] | Unicast,Highway,Periodic(UHP) | UE-A is receiver of UE-B.UE-B can include TX UEs other than the intended TX UE of UE-A.  | Type C and Type B.When UE-A determines the resources reserved by UE-B as non-preferred resources, then the UE-A transmits non-preferred resource indication to UE-B. Otherwise, the UE-A will transmit the resource reserved by UE-B as non-preferred resource for other TX UE’s transmission.  | Upon receiving a new reservation. | PSFCH format is used for non-preferred resource indication. | Upon receiving an inter-UE coordination message, a UE drops the concerned reservation and reselects resources | 3% PRR gain in 50m.[]% PRR gain in 320m.Coverage of 10m is extended at PRR=0.95.Coverage of []m is extended at PRR=0.99. |
| Intel [R1-2100673] | Groupcast (Option 1 with target range of 200m),Highway,Aperiodic(GHA) | UE-A is another receiver of UE-B within the target range. | Type C. | When UE-A observes half-duplex restriction for the same UE group. (Post-conflict indication) | PSFCH resource for groupcast HARQ-ACK feedback is reused.  | Upon receiving NACK from UE-A, UE-B performs retransmission.  | **Reference is R16 Mode 2:**0.4% PRR gain in 50m.1.2% PRR gain in 300m.Coverage of 25m is extended at PRR=0.95.Coverage of 60m is extended at PRR=0.99.**Reference is Mode 2 RA with minimum (re)transmissions of 2:**0.1% PRR loss in 50m.2% PRR loss in 300m.Coverage of 20m is reduced at PRR=0.95.No coverage is extended at PRR=0.99. |
| Intel [R1-2100673] | Groupcast (Option 1 with target range of 400m),Highway,Aperiodic(GHA) | UE-A is another receiver of UE-B within the target range. | Type C. | When UE-A observes half-duplex restriction for the same UE group. (Post-conflict indication) | PSFCH resource for groupcast HARQ-ACK feedback is reused.  | Upon receiving NACK from UE-A, UE-B performs retransmission.  | **Reference is R16 Mode 2:**0.5% PRR gain in 320m.0% PRR gain in 400.Coverage of 25m is extended at PRR=0.95.Coverage of 50m is extended at PRR=0.99.**Reference is Mode 2 RA with minimum (re)transmissions of 2:**0.5% PRR loss in 320m.1% PRR loss in 400m.No coverage is extended at PRR=0.95.No coverage is extended at PRR=0.99. |
| Intel [R1-2100673] | Unicast (AN disabled),Highway,Periodic(UHP) | UE-A is receiver of UE-B. | Type A. | When UE-A receives the trigger information from UE-B.Signalling for the request is not modelled.  | Resources for the signalling are obtained by UE-A’s sensing and exclusion procedure. | UE-B takes the intersection of UE-B’s S\_A and UE-A’s S\_A to obtain the final candidate resource set. | 0% PRR gain. |
|  | Unicast (AN disabled),Highway,Aperiodic(UHA) | UE-A is receiver of UE-B. | Type A. | When UE-A receives the trigger information from UE-B.Signalling for the request is not modelled. | Resources for the signalling are obtained by UE-A’s sensing and exclusion procedure. | **Scheme 1:**UE-B takes the intersection of UE-B’s S\_A and UE-A’s S\_A to obtain the final candidate resource set.**Scheme 2:**UE-B uses the transmission resources provided by UE-A. | **Scheme 1:**0% PRR gain.**Scheme 2:**15% PRR loss in 300m. |
|  | Unicast (AN disabled),Urban,Periodic(UUP) | UE-A is receiver of UE-B. | Type A. | When UE-A receives the trigger information from UE-B.Signalling for the request is not modelled. | Resources for the signalling are obtained by UE-A’s sensing and exclusion procedure. | UE-B takes the intersection of UE-B’s S\_A and UE-A’s S\_A to obtain the final candidate resource set. | 0% PRR gain. |
|  | Unicast (AN disabled),Urban,Aperiodic(UUA) | UE-A is receiver of UE-B. | Type A. | When UE-A receives the trigger information from UE-B.Signalling for the request is not modelled. | Resources for the signalling are obtained by UE-A’s sensing and exclusion procedure. | **Scheme 1:**UE-B takes the intersection of UE-B’s S\_A and UE-A’s S\_A to obtain the final candidate resource set.**Scheme 2:**UE-B uses the transmission resources provided by UE-A. | **Scheme 1:**0% PRR gain.**Scheme 2:**11% PRR loss in 150m. |
| Ericsson [R1-2101804] | Groupcast (Option 1 with target range of 500m)Highway,Aperiodic | Any UE. | Type C.**Scheme 1:**A UE detects that a collision has taken place on a sub-channel or it detects that two UEs from the same group are in a half-duplex situation **Scheme 2:**A UE checks if the reservation overlaps some other reservation received earlier. If there is an overlap and the RSRP associated new reservation exceeds a certain threshold, the UE sends one bit.**Scheme 3:**Combination of Scheme 1 and 2. | **Scheme 1:**When UE-A observes a collision on a sub-channel or a half-duplex restriction for the same UE group.**Scheme 2:**Upon receiving a new (overlapping) reservation.**Scheme 3:**Combination of Scheme 1 and 2. | PSFCH format is used, and it can be shared with multiple UE-A(s) for the same problematic resources. | **Scheme 1:**Upon receiving NACK from UE-A, UE-B performs retransmission.**Scheme 2:**Upon receiving an inter-UE coordination message, a UE drops the concerned reservation and reselects resources**Scheme 3:**Combination of Scheme 1 and 2. | **R16 Mode 2 RA:****Scheme 1:**0.1% PRR gain in 320m.Coverage of 20m is extended at PRR=0.975.Coverage of 10m is extended at PRR=0.99.**Scheme 2:**0.3% PRR gain in 320m.Coverage of 50m is extended at PRR=0.975.Coverage of 40m is extended at PRR=0.99.**Scheme 3:**0.6% PRR gain in 320m.Coverage of 100m is extended at PRR=0.975.Coverage of 70m is extended at PRR=0.99.**Gain over Random RA (Scheme 2):** 1% PRR gain in 320m.Coverage of 100m is extended at PRR=0.975.Coverage of 70m is extended at PRR=0.99. |
| Fujitsu [R1-2100746] | Groupcast (Option with target range of 100m)Highway,Periodic(GHP) | UE-A is another receiver of UE-B. | Type C. | When UE-A observes half-duplex restriction for the same UE group. (Post-conflict indication) | PSFCH resource for groupcast HARQ-ACK feedback is reused.  | Upon receiving NACK from UE-A, UE-B performs retransmission.  | 1% PRR gain in 50m.[]% PRR gain in 320m.Coverage of 5m is extended at PRR=0.95.Coverage of []m is extended at PRR=0.99. |
| Fujitsu [R1-210746] | Groupcast (Option with target range of 100m)Urban,Periodic(GUP) | UE-A is another receiver of UE-B. | Type C. | When UE-A observes half-duplex restriction for the same UE group. (Post-conflict indication) | PSFCH resource for groupcast HARQ-ACK feedback is reused.  | Upon receiving NACK from UE-A, UE-B performs retransmission.  | 1% PRR gain in 50m.2% PRR loss in 100m.Coverage of 10m is extended at PRR=0.95.Coverage of []m is extended at PRR=0.99. |
| Fujitsu [R1-210746] | Groupcast (Option with target range of 100m)Highway,Aperiodic(GHA) | UE-A is another receiver of UE-B. | Type C. | When UE-A observes half-duplex restriction for the same UE group. (Post-conflict indication) | PSFCH resource for groupcast HARQ-ACK feedback is reused.  | Upon receiving NACK from UE-A, UE-B performs retransmission.  | 1.3% PRR gain in 50m.[]% PRR gain in 320m.Coverage of 10m is extended at PRR=0.95.Coverage of 50m is extended at PRR=0.99. |
| Fujitsu [R1-210746] | Groupcast (Option with target range of 100m)Urban,Aperiodic(GUA) | UE-A is another receiver of UE-B. | Type C. | When UE-A observes half-duplex restriction for the same UE group. (Post-conflict indication) | PSFCH resource for groupcast HARQ-ACK feedback is reused.  | Upon receiving NACK from UE-A, UE-B performs retransmission.  | 0.7% PRR gain in 50m.0.5% PRR loss in 150m.Coverage of 5m is reduced at PRR=0.95.Coverage of 25m is extended at PRR=0.99. |
| Fujitsu [R1-210746] | Groupcat (Option 1 with target range of 320m)Highway,Periodic(GHP) | UE-A is receiver of UE-B. | Type A and B. | When UE-A receives the trigger information from UE-B. | 10% of PRBs in a RP is always reserved for the signalling of the inter-UE coordination and the request. | The latency of transmitting and processing coordination information is set to 10 slots in average.UE-B takes the intersection of UE-B’s S\_A and UE-A’s S\_A to obtain the final candidate resource set. | 0.1% PRR loss in 320m.Coverage of 50m is reduced at PRR=0.95.Coverage of []m is extended at PRR=0.99. |
| Mitsubishi [R1-2100828] | Unicast (AN disabled),Highway,Periodic(UHP) | UE-A is receiver of UE-B. | Type B.  | Once resource (re)-selection is triggered at UE-B, the assistance info is provided by UE-A | Not modelled.  | UE-B will preclude all the resources of Type B resource set. | 6% PRR gain in 320m.Coverage of 50m is extended at PRR=0.95.Coverage of []m is extended at PRR=0.99. |
| Mitsubishi [R1-2100828] | Groupcast,Highway,Periodic(GHP) | UE-A is receiver of UE-B. | Type B. | When UE-A is within a certain range from UE-B. | Not modelled.  | UE-B will preclude all the resources of Type B resource set. | 3.2% PRR gain in 320m.Coverage of 50m is extended at PRR=0.95.Coverage of []m is extended at PRR=0.99. |
| ZTE [R1-2100925] | Broadcast,Highway,Periodic(BHP) | UE-A is selected by UE-B via PC5-RRC. | Type A. |  | Not modelled. | UE-B takes the intersection of UE-B’s S\_A and UE-A’s S\_A to obtain the final candidate resource set. | 2.6% PRR gain in 320m.Coverage of 40m is extended at PRR=0.95.Coverage of []m is extended at PRR=0.99. |
| ZTE [R1-2100925] | Broadcast,Urban,Periodic(BUP) | UE-A is selected by UE-B via PC5-RRC. | Type A. |  | Not modelled. | UE-B takes the intersection of UE-B’s S\_A and UE-A’s S\_A to obtain the final candidate resource set. | 5.8% PRR gain in 150m.Coverage of 10m is extended at PRR=0.95.Coverage of []m is extended at PRR=0.99. |
| Samsung [R1-2101232] | Unicast,[Highway],Periodic(UHP) | UE-A is receiver of UE-B. | Type A. | When UE-A receives the trigger information from UE-B. | Not modelled. | UE-B uses the transmission resources provided by UE-A. | 60% PRR gain in 300m.No coverage is extended at PRR=0.95.No coverage is extended at PRR=0.99. |
| Samsung [R1-2101232] | Unicast,Highway,Aperiodic(UHA) | UE-A is receiver of UE-B. | Type A. | When UE-A receives the trigger information from UE-B. | Not modelled. | UE-B uses the transmission resources provided by UE-A. | 3.4% PRR gain in 300m.Coverage of 5m is extended at PRR=0.95.Coverage of []m is extended at PRR=0.99. |
| Qualcomm [R1-2101486] | Groupcat (Option 1 with target range of 60m)UrbanAperiodic(GHA) | UE-A is another receiver of UE-B. | Type C. | When UE-A observes resource conflict for the same UE group.(Post-conflict indication)  | PSFCH resource for groupcast HARQ-ACK feedback is reused.  | Upon receiving NACK from UE-A, UE-B performs retransmission.  | 0.5% PRR gain in 50m.[]% PRR gain in 150m.Coverage of 2.5m is extended at PRR=0.95.Coverage of 10m is extended at PRR=0.99. |
| Qualcomm [R1-2101486] | Groupcat (Option 1 with target range of 60m)UrbanAperiodic(GHA) | UE-A is receiver of UE-B. | Type B. | Whenever forwarding UEs have data to transmit | Not modelled.  | UE-B will preclude all the resources of Type B resource set. | 0.2% PRR gain in 50m.[]% PRR gain in 150m.Coverage of 1.2m is extended at PRR=0.95.Coverage of 5m is extended at PRR=0.99. |

Please check whether the above evaluation methodology and gain are correctly captured or not, and provide input, if any, **by January 26th, 4:59pm UTC**. You can also make correction directly in the above summary of evaluation results.

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| Company | Comment |
| Ericsson | See corrections above. Given that our scenario has PRR>0.95 for almost every simulated case, we have included results at PRR=0.975 instead |
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1. **FL’s observation on evaluation results**

In this RAN1 meeting, it needs to make conclusion on the feasibility/benefit of inter-UE coordination and send an LS to RAN plenary meeting. In this sense, FL made the following observation after reviewing the submitted evaluation results.

***FL’s observation on evaluation results****:*

* *Type A and/or B*
	+ *For the case when one UE-A indicates the preferred resource set to each of multiple UE-Bs,*
		- *one company claimed that the inter-UE coordination is beneficial compared to Rel-16 Mode 2 RA.*
	+ *For the case when UE-A is the intended receiver of UE-B,*
		- *eight companies claimed that the inter-UE coordination is beneficial compared to Rel-16 Mode 2 RA*
			* *One company claimed that the gain of this solution becomes larger under the scenario where UL transmission can overlap with SL transmission/reception.*
		- *three companies claimed that the inter-UE coordination has no gain under certain scenarios (e.g., highway and/or urban scenario for aperiodic unicast traffic, highway scenario for periodic groupcast traffic)*
* *Type C*
	+ *For the case when UE-A indicates the resource conflict in previous transmission (i.e., post conflict),*
		- *five companies claimed that the inter-UE coordination is beneficial compared to Rel-16 Mode 2 RA*
			* *one company claimed that the inter-UE coordination has a lower gain with Rel-16 Mode 2 RA with ensuring the minimum number of (re)transmissions.*
	+ *For the case when UE-A indicates the resource conflict in future (i.e., pre-conflict),*
		- *one company claimed that the inter-UE coordination is beneficial compared to Rel-16 Mode 2 RA and the gain is higher than the case when UE-A indicates the resource conflict in previous transmission*

Please provide comment, if any, on the above FL’s observation **by January 26th, 4:59pm UTC**. Note that after finishing checking this observation, FL has a plan to provide/discuss potential conclusions on the feasibility/benefit of inter-UE coordination.

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| --- | --- |
| Company | Comment |
| NTT DOCOMO | Firstly, thank you so much for your efforts on evaluations.Then, three comments from our side.- In our understanding, pre-collision indication is a part of type B, and post-collision indication is intended as type C. However, the above FL’s observation seems to include pre-collision indication in both type-B (UL vs SL) and type C (second bullet). Correct categorizing is preferred.- In the above FL’s observation, type A and type B are treated in the same bullet. However, as abovementioned, type B includes pre-collision indication. This implies that achievable gain is different among type A and type B. Separate analysis is preferable.- Regarding type A, many companies show some gain under periodic traffic, not aperiodic. As presented in QC’s contribution, sharing latency is a key aspect for discussion on ‘beneficial or not’. From this perspective, type A is good scheme only for periodic transmission. As you know, NR-SL supports aperiodic transmission, which is one of the important features. For aperiodic transmissions, pre/post collision indication achieves performance gain as some companies kindly evaluated. This point should be included in the above observation and corresponding conclusion should consider it. |
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1. **Summary of contributions**
* How UE-A and UE-B are determined
	+ Option 1: UE-B is a PSCCH/PSSCH TX UE for data transmission, and UE-A is the intended receiver of UE-B [1] [2] [4] [5] [6] [10] [16] [19] [27]
	+ Option 2: UE-A and UE-B is determined via higher layer (e.g. application layer) [3] [5] [7]
	+ Option 3: UE-A is pre-defined, and UE-B is UEs that can receive inter-UE coordination information from other UE [7]
	+ Further consideration on the case when a leading-UE to suggest transmission resources to other UE(s) in a UE group [3] [5] [7] [18] [22] [33]
* How/when UE-A determines the contents of “A set of resources”, including consideration of UL scheduling?
	+ Type of “A set of resources”
		- Type A: UE-A sends to UE-B the set of resources preferred for UE-B’s transmission
			* e.g., based on its sensing result
		- Type B: UE-A sends to UE-B the set of resources not preferred for UE-B’s transmission
			* e.g., based on its sensing result and/or expected/potential resource conflict
		- Type C: UE-A sends to UE-B the set of resource where the resource conflict is detected
		- Companies views
			* Option 1: Support Type A only [3] [5] [27]
			* Option 2: Support both Type A and Type B [2] [4] [6] [7] [10] [13] [14] [15] [17] [18] [19] [24] [25] [28] [29] [36]
			* Option 3: Support Type C [10] [14] [22] [28] [32]
			* Option 4: Support Type B only [35]
			* Option 5: Type B + Type C [12]
	+ Other information in the inter-UE coordination information
		- Type indicator for a set of resources [6] [7] [13] [28]
		- Indication about the intended recipient UE [13]
		- Resource pool index [13] [23]
		- Source ID of UE-B [14] [21]
		- Destination ID associated with UE-B [14] [21]
		- Associated RSRP [21] [28] [34]
		- Associated RX priority [28] [34]
		- Common DRX configuration [29]
		- Recommended TX parameters [29]
	+ Further consideration on the assumption of the behavior of UE-A to determine the inter-UE coordination information [8]
* When UE-A sends ”A set of resources” to UE-B, including which UE(s) sends it
	+ Explicit Trigger-based based coordination procedures [2] [3] [4] [5] [6] [13] [14] [15] [16] [17] [20] [22] [24] [25] [26] [27] [28] [30] [33]
		- Condition that UE-B transmit the triggering
			* When UE-B triggers resource selection procedure [2] [5] [7]
			* When UE-B fails TB reception [20]
			* Upon receiving scheduling request [20]
		- Information carried by the explicit triggering
			* the parameters related to the sensing procedure of UE-B [3] [4] [14] [22] [28]
			* the parameters related to TX packet of UE-B [7]
		- Container of the explicit triggering
			* 2nd SCI format [3] [14]
			* MAC CE [14]
			* PSFCH format [7] [28]
	+ Event-trigger based coordination procedures [3] [5] [6] [7] [12] [13] [14] [16] [17] [20] [24] [25] [26] [29] [30] [32] [33] [35]
		- Based on (pre)configured periodicity [3] [7] [29] [30]
		- Based on detection of resource conflict [5] [12] [13] [16] [20] [26] [29] [32] [35]
		- When the coordination information is updated for UE-B [7]
		- Based on decision in higher layer [7] [20]
		- Based on congestion status [13]
		- Based on distance between UE-A and UE-B [17] [24] [26] [29]
		- Based on RSRP measurement [24]
* How UE-A sends ”A set of resources” to UE-B, including container used for carrying it, implicitly or explicitly or both
	+ Container
		- SCI format 1-A [1] [24] [26] [29]
		- 2nd SCI format [1] [2] [3] [13] [14] [18] [24] [26] [27] [29] [33] [36]
		- MAC CE [7] [14] [20] [29] [33] [36]
		- PC5-RRC [2] [19] [20] [33] [36]
		- PSFCH format [2] [12] [14] [18] [20] [28] [32]
	+ Retransmission of the inter-UE coordination information
	+ Further consideration on whether shared or dedicated resource is used for inter-UE coordination signaling [8] [32]
* How/when/whether UE-B receives “A set of resources” and takes it into account in the resource selection for its own transmission
	+ Whether UE-B can skip sensing operation
		- UE-B does not perform its own sensing operation
		- UE-B performs its own sensing operation [7] [24]
	+ How UE-B performs resource (re)selection procedure upon receiving the inter-UE coordination information
		- Combine UE-B’s sensing results and resource set provided from UE-A [2] [3] [7] [13] [14] [20] [21] [22] [24] [25] [26] [28] [31]
		- Use resource set provided from UE-A without a consideration of UE-B’s sensing results [2] [3] [13] [21] [22] [25] [28] [31]
		- UE-B performs retransmission on the already selected resource(s) [32]
		- UE-B reselect all or a subset of its own selected resource(s) [2] [7] [10] [12] [20] [28] [31] [32] [35]
		- It is up to UE-B how to use it [6] [27]
	+ Cast type of UE-B that can use inter-UE coordination information
		- Unicast [2] [3] [5] [6] [7] [12] [13] [14] [16] [17] [25] [26] [27] [31] [33] [36]
		- Groupcast with HARQ-ACK feedback Option 1 [5] [6] [7] [12] [13] [14] [16] [17] [22] [27] [31] [32] [33] [36]
		- Groupcast with HARQ-ACK feedback Option 2 [2] [3] [5] [6] [7] [12] [13] [14] [16] [17] [22] [25] [27] [31] [33] [36]
		- Broadcast [6] [7] [12] [14] [16] [17] [22] [31] [33]
		- Cast type used in UE-B which is PC5-RRC connected to UE-A [19]
	+ Validity check of the received inter-UE coordination information at UE-B side
		- Based on distance between UE-A and UE-B [7] [13] [14]
		- Based on RSRP from UE-A to UE-B [7] [13] [14]
		- Based on information about target UE of the inter-UE coordination information [7]
		- Based on whether the indicated resource set is inside UE-B’s selection window [7] [13]
* Others
	+ Further consideration of using a single signaling to transmit one or multiple “set of resources” to multiple of UEs [2] [14] [22]
	+ Further consideration on the case when UE-B receives multiple inter-UE coordination information from one or multiple UE-A(s) [6] [7] [13] [33]
	+ Further consideration of congestion control for inter-UE coordination signaling [7] [29]
	+ Further consideration on the unmonitored slot at UE-B side [7] [14]
	+ Additional inter-UE coordination schemes do not show noticeable gain when practical evaluation assumptions are considered [11]
	+ Further consideration of using inter-UE coordination for UE with limited RX capability [12]
	+ Further consideration on the impact on Rel-16 UE sharing the same resource pool with UEs using inter-UE coordination operation [23] [29]
	+ Further consideration of retransmission of inter-UE coordination signaling [29]
	+ Further consideration on SL DRX to determine “A set of resources” at UE-A side [34]
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