

China Academy of Telecommunication Technology ■

3GPP TSG RAN WG Meeting #74

Vienna, Austria, Dec. 5th -8th, 2016

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Agenda Item: 10.1.2

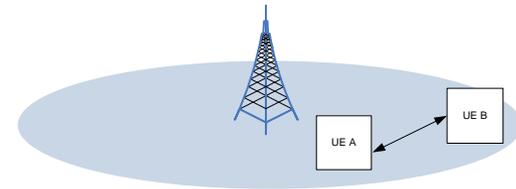
RP-162476

Motivation on introduction of UL data compression in LTE

CATT, CMCC

Motivation (1)

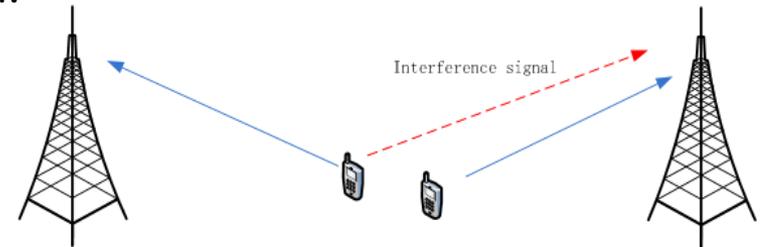
- Shortage of uplink resource becomes more and more concern in the network due to following reasons:
 - More and more mobile internet users are becoming content producers.
 - Increasing of downlink traffic when using CA leads to more uplink traffic. To satisfy requirements on UE battery consumption and reduce UE complexity, few uplink carriers are used, typically only one.
 - Sidelink transmission introduced in D2D consumes uplink resources. This results in reduction of available uplink resources for D2N transmission.
 - Typical UL/DL configuration in TD-LTE network is configuration 2, i.e. 3DL: 1UL. It is quite often that uplink becomes bottleneck in case of, e.g. file uploading.



- **Saving uplink resource is very important for practical networks.**

Motivation (2)

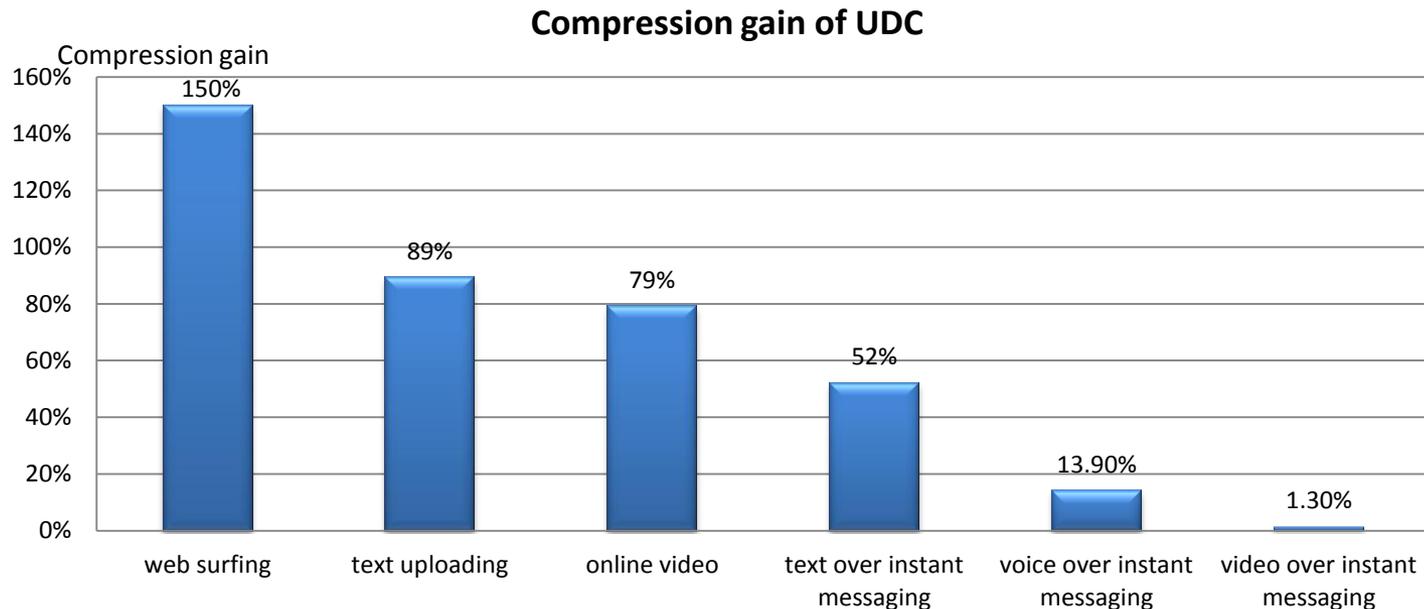
- Another concern on uplink is its coverage vulnerability, namely in following aspects:
 - As the number of LTE subscribers increases, the uplink interference level reaches 5~10 dB in CMCC's network, making uplink transmission in poor radio condition difficult.
 - Due to power limitation, RLC segmentation is a common way to extend uplink coverage. However, it is not a preferred solution in some case, e.g. VoLTE call setup.
 - During VoLTE call setup phase, a SIP message size is about 2KB. When UE is in poor radio condition (e.g. RSRP < -120dBm) and/or high interference (e.g. uplink IoT = 10dB), it has been observed in CMCC's network that a SIP message is segmented into 200 RLC pieces, thus average call setup time and call drop rate are increased. So very large SIP message size becomes a problem.



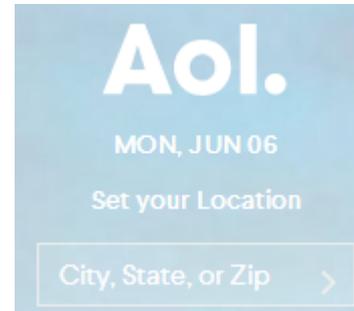
- **Reducing the message size is helpful for uplink coverage vulnerability case.**

Benefits from UDC

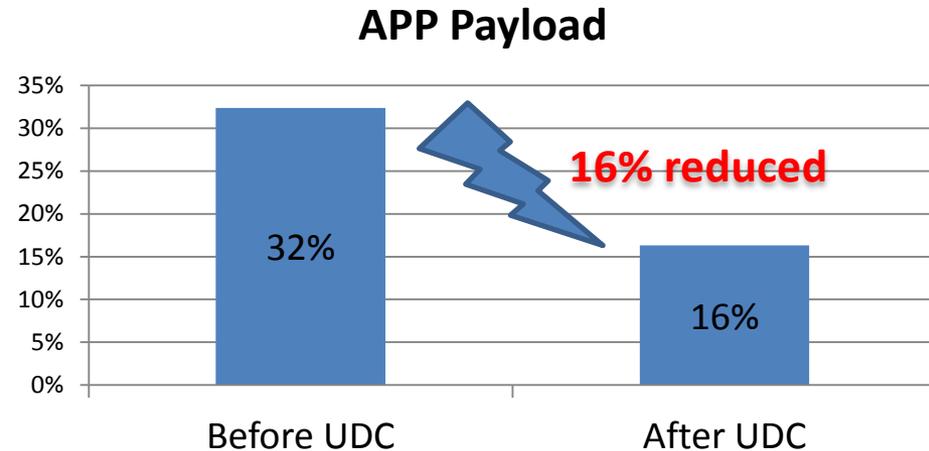
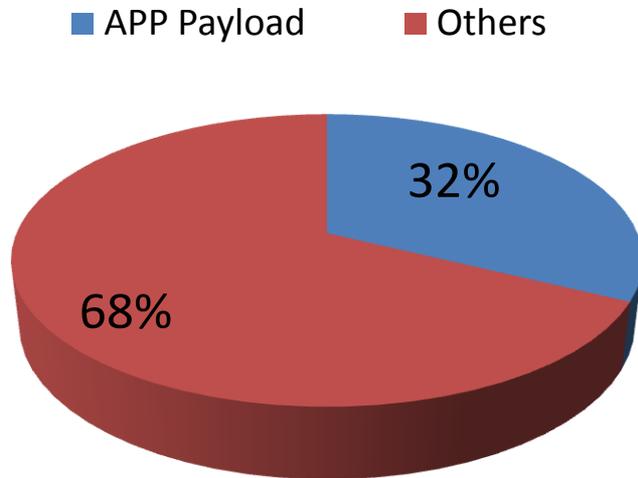
- Gains from CMCC practice test in RP-160042:
 - UDC can achieve over 50% compression gain for web surfing, text uploading, online video and text over instant message.
 - UDC can achieve high compression gain and increase uplink capacity in practical network deployment.



Popular APPs without application layer encryption



Benefits from UDC (BBC News)

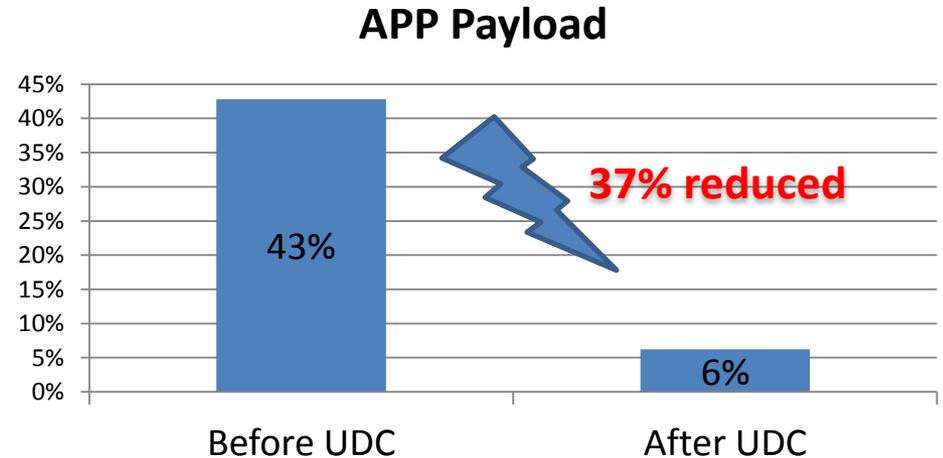
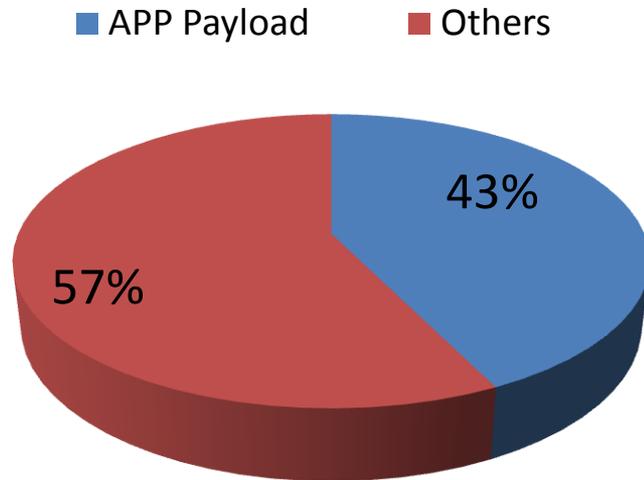


- Gains from CATT simulations:

- Gzip and DEFLATE like compression method with cross-packet pattern matching
- 16% uplink resource is saved in case UDC is only applied for APP Payload

Note: APP Payload is the application layer packets without IP/TCP header.

Benefits from UDC (Sina News)



- Gains from CATT simulations:
 - 37% uplink resource is saved in case UDC is only applied for APP Payload
- It can save average over 25% uplink resource if only payload is compressed by UDC.

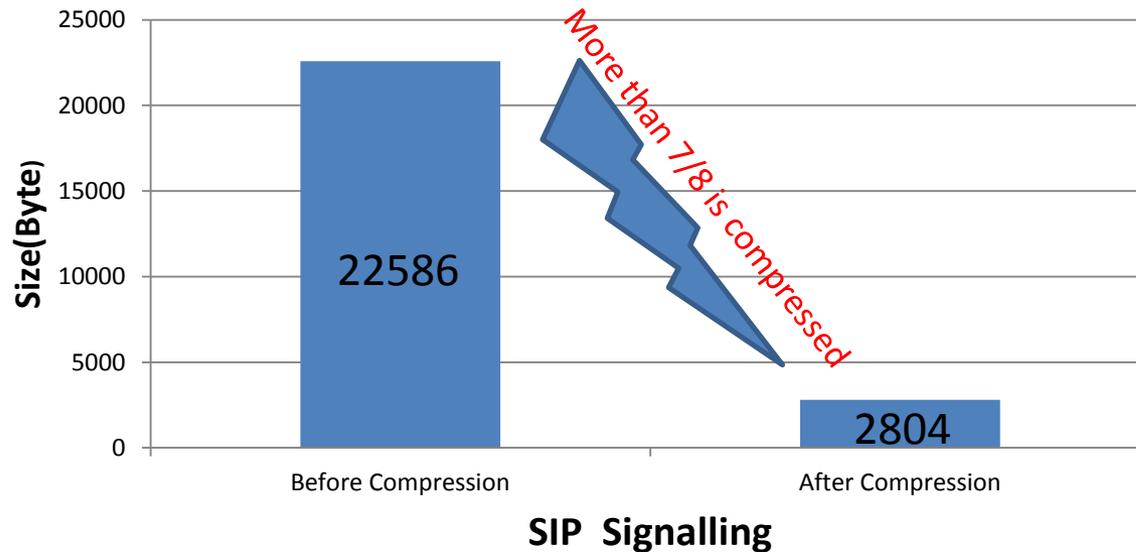
Benefits from UDC

- Gains to use UDC on video by using Zlib (RFC1950) with cross-packet pattern matching from MediaTek
 - 45594 UL packets are collected.
 - TCP/IP header, HTTP header and contents are included in the compression operation.

Window size(byte)	Compressed gain (bytes before compression/bytes after compression -1) *100 %
256/512	102%
1K	119%
2K	113%
4K	114%
8K	107%
16K	109%
32K	102%

Benefits from UDC (SIP Signalling 1/2)

- The UL SIP signalling messages are collected from one UE during successive SIP based service procedures.

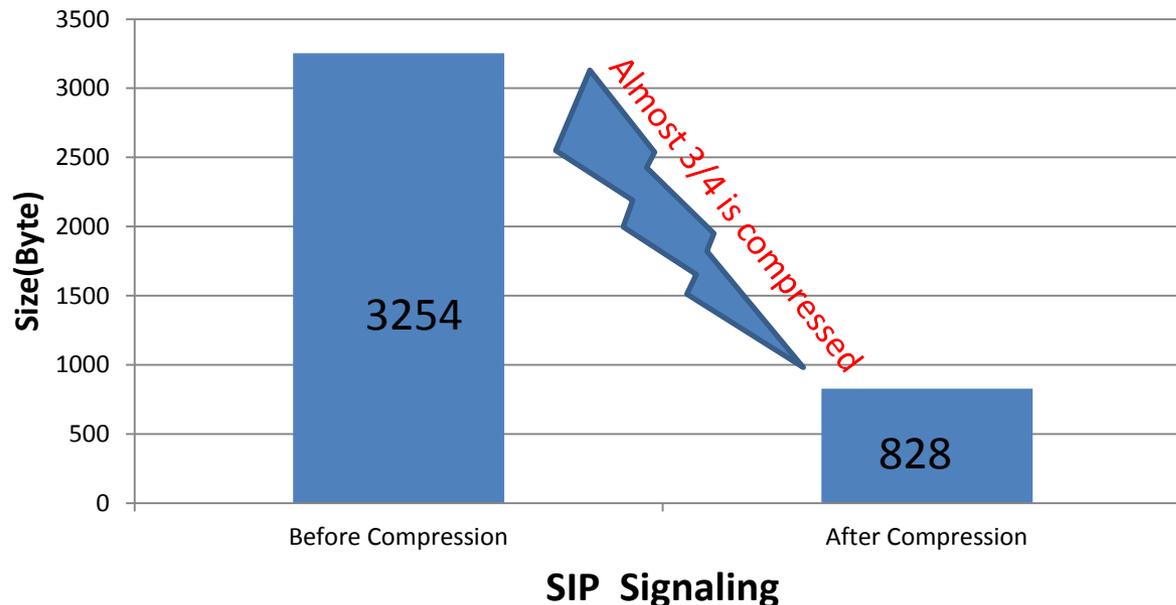


	Original size (Byte)	Size after compression (Byte)	Compressed Gain
SIP signalling	22586	2804	705%

- Only 1/8 of the original size is remained after compression.**

Benefits from UDC (SIP Signalling 2/2)

- The UL SIP signalling messages are collected from one UE during one SIP based service procedure.



	Original size (Byte)	Size after compression (Byte)	Compressed Gain
SIP signalling	3254	828	293%

- Only 1/4 of the original size is remained after compression.**

Observations and Proposal

- Observation 1: UDC could compress both header and payload.
- Observation 2: UDC could save over 50% UL resources if both header and payload are compressed
- Observation 3: UDC could save over 25% UL resources if only payload is compressed
- **Observation 4: UDC could save over 75% UL resources if SIP signalling is compressed**
- Observation 5: with UDC, the compressed data can be transmitted with less uplink resource and lower latency than of uncompressed data.
- Real network requirement:
 - Not only for future usage, but also the current network deployment in practice urgently requires this enhancement.
 - Operators have strong requirements to specify UDC in Rel-14.
- Considering above observations and real network requirement, it is proposed:
- **Proposal: Support UDC as soon as possible for LTE**

טכניקה אלה



Q&A

- Q: why not use ROHC?
- A: ROHC only compresses header part. But UDC also could be used for payload part besides header part.

- Q: whether the UDC could bring more benefit if application layer used the encryption?
- A: Yes, UDC still could bring benefit on header compression. And according to the simulations, there are gains. But it is true that UDC can bring much more benefit if application layer does not use encryption.

- Q: if all applications use application layer encryption, the benefit brought by UDC is very limited.
- A: But according to our checking, many popular applications do not use application layer encryption not only in China but also abroad.

Potential specification impact

- Potential specification impact analysis assuming the new PDU format is defined in PDCP layer:
 - 36.331:
 - Signalling on UE capability and UDC configuration
 - 36.323:
 - New PDCP PDU types are defined for UDCed PDU

Work plan and TU allocation

- Work plan

meetings	destinations	TU requirement
Feb.	Work plan and skeleton of TR. Propose algorithms/compression formats of UDC by interested companies. Provide some common data for simulation by operators.	1
Apr.	Provide simulation results. Start an email discussion to compare these simulation results and try to make down selection. Initiate procedure discussion.	2
May	Decide solutions to be specified in WI and continue on the procedure discussion and other issues, complete the TR.	2