



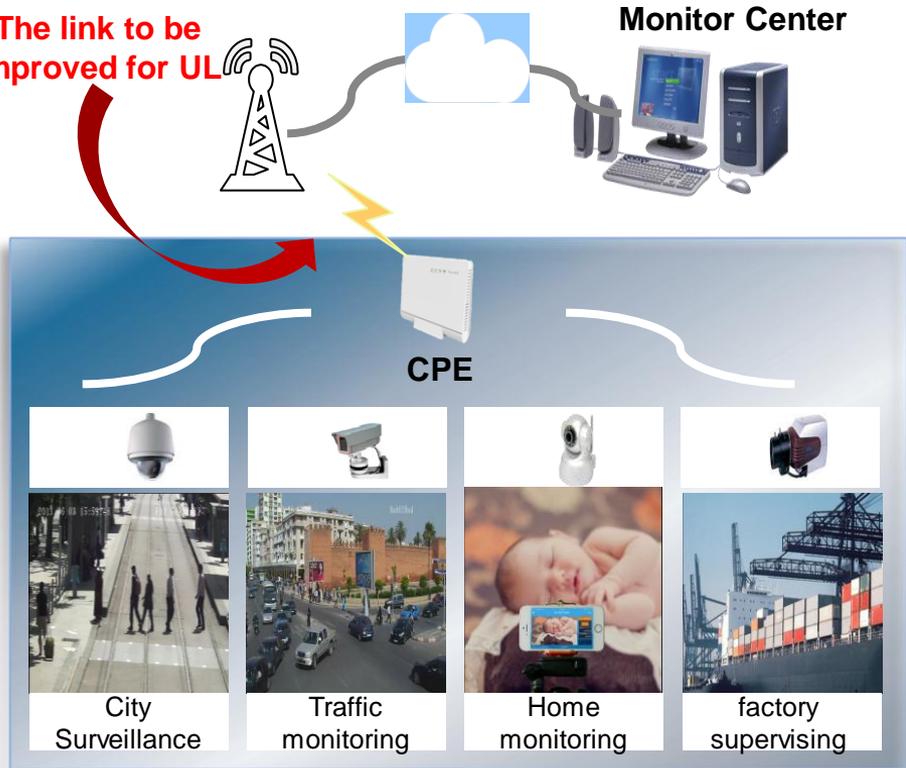
Motivation for new WI proposal on LTE uplink enhancements for WTTc

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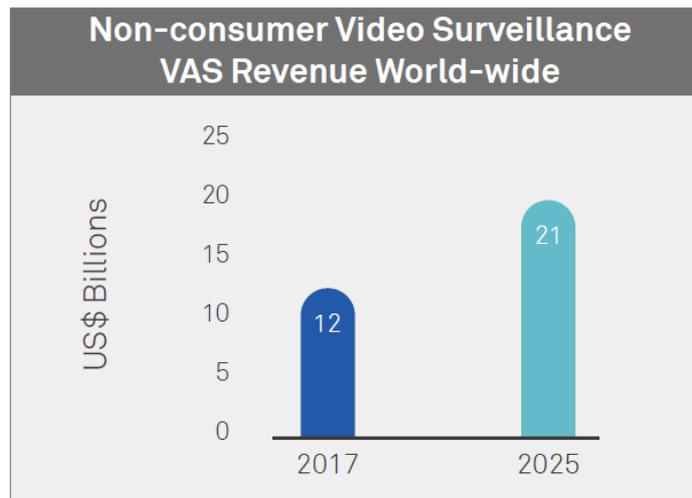


Video monitoring services boost

The link to be improved for UL



Video monitoring has rapidly been developed nowadays. Target markets for wireless operators are diverse.

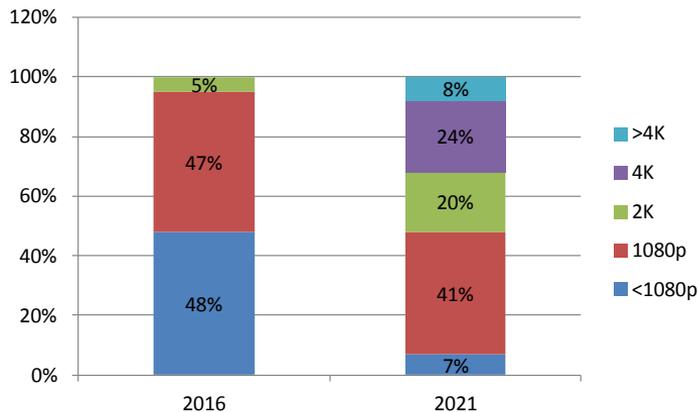


Video monitoring over wireless

- Benefits to carry video services over wireless:
 - For the areas hard to dig trenches, lay fiber, such as protected districts, rural areas, special road surface, etc.
 - Much less costs (up to 60% cost reduction) than fiber, esp. when the camera is far from the collector.
 - Many areas can reuse the existing eNB equipments with software updating
 - Easy to expand
 - Quick to deploy



Requirements of video capacity



	720P	1080P	2K	4K
H.264	2Mbps	4Mbps	8Mbps	16Mbps
H.265	1.5Mbps	2Mbps	4Mbps	8Mbps

Spectrum resources with 1.5~2 times of data rate are needed to guarantee the real-time video quality.

Reference: LTE R10 UL 4x4: Cell average~ 50Mbps @20MHz; Cell edge ~ 1.6Mbps@20MHz

UL capacity improvement is necessary and beneficial for supporting video monitoring services

With LTE R10 4x4 design @20MHz BW

- The performance at cell-edge cannot support even a single camera with 720P
- The maximum number of videos with 720P that can be supported simultaneously in a cell is around 15
- The maximum number of videos with 4K that can be supported simultaneously in a cell is around 2

Opportunities of uplink enhancements

- For safe city and smart home monitoring, the application and environment characteristics should and need to be utilized for uplink enhancements

- Less limitation on device cost, power, size, and processing capabilities

UEs in such scenarios are typically new type of devices. so it is feasible to introduce more advanced features in LTE uplink

- Stationary UEs with slow-varying channels between UEs and eNBs

The channels would vary quite slowly for typical deployment scenarios. This characteristic can be utilized to further improve the spectral efficiency by e.g., more accurate channel measurement/scheduling/retransmission, RS overhead reduction and so on

- Continuous traffic with large packet size and usually small inter-packet interval

This characteristic can be utilized for better link adaptation

Objectives

- Specify enhancements for stationary UEs in uplink (RAN1, RAN2, RAN4)
 - Enhanced uplink SU/MU MIMO schemes for the high capacity UEs such as codebook extension, and non-codebook-based precoding. Other enhancement on UL MIMO is not precluded.
 - More accurate channel measurement/scheduling/retransmission
 - Overhead reduction of uplink reference signals for slow-varying channels
 - Overhead reduction of control channels
 - Special improvement for the users with poor link quality
- Define the specific requirements for each band for HPUE. (RAN4)
 - These include but are not limited to associated regulatory requirements on transmit power levels, unwanted emissions, radiation requirements, etc.



Thank you !

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