Article Review on "Cryptographic 'tag of everything' could protect the supply chain"

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On February 20, 2020, MIT news released an article[1], describing an invention announced at IEEE International Solid-State Circuit Conference (ISSCC) by Terahertz Integrated Electronics Group in Microsystems Technology Laboratories—"the tag of everything." This tag is an improved RFID chips, a huge milestone in RFID development since the first use of passive RFID during World War 2, when the refracted radar waves were used to interpret whether a fighter jet belonged to Germany or the Allies[2].

This tag corrected for 4 main problems.

1) The bulk that previously existed in RFID chips made tagging small product infeasible. The tag, being a mere 1.6 millimeters squared in size due to the geometric advantage of monolithic designs[3], allowed for tagging even the smallest tooth implants.
2) The high power demand of RFID chips has been replaced with photovoltaic cells[1] capable of providing operating power to the chip at the presence of a scanner's infrared light.
3) The low transmission range of old RFID chips (relative to its size) has made transmission of data a nuisance. The tag, using longer wavelength (infrared and microwaves), can provide proper transmission up to 5cm. This is enhanced by implementing beam steering technology[4] alongside with conventional RFID backscattering technology, which allowed for a highly concentrated beam of signal to be produced.
4) Poor encryption, or highly energy inefficient encryption, on old RFID chips has been improved with the inclusion of an imbedded ECC high efficiency cryptographic processor. By the means of an improved matrix inversion algorithm (less registers calls), a coordinate swapping method utilizing the Montgomery ladder[5] in computing scalar multiples of elliptical curves in a López-Dahab projective coordinate system[6], and clock gating along with asynchronous counters, the ECC processor performs extremely fast, highly secure encryptions with minimal power consumption[1].

With current upgrades, the tags of everything will be able to prevent the sales of more than $2 Trillion worth of counterfeit goods estimated during 2020. For reference, the entirety of Africa accumulates a GDP of approximately $2.19 Trillion[7].

Future expectations are high as the tag continues to be improved. Planned upgrades includes farther signal ranges (up to meters) and even lower build costs and power consumption. The team describes their product to be a future game changer. As one of the members Wasiq Khan exclaim, "Our chips cost a few cents each, but [protecting] technology is priceless."

References

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