Epothecary: Cost-effective Drug Pedigree Tracking and Authentication Using Mobile Phones

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Abstract—Counterfeit and expired drugs are a significant problem in the developing world, constituting up to 80% of stock on pharmacy shelves. This is due both to poor existing controls and to lack of supporting infrastructure to build upon.

In this demonstration we present Epothecary, a system which uses built-in functionality in cellphones including cameras, SMS, and optionally GPS to construct a robust system for tracking and verifying the pedigrees of pharmaceuticals at every point in the distribution chain, particularly in the developing world.

Index Terms—Pedigree, Counterfeit, SMS, Barcode, Track & Trace Mobile Phones, ICT

I. INTRODUCTION

According to estimates from the International Chamber of Commerce[1], counterfeit goods constituted 5-7% of the multi-billion dollar pharmaceutical trade in 1997. While this is a problem in the developed world, it is endemic in the developing world, with the counterfeit rate of certain high-volume drugs reaching up to 80%[2], [3], [4], which poses a clear and present danger to lives and livelihoods.

Existing strategies to fight counterfeiting include holograms, special packaging, and paper invoice tracing, but each of these have been proven ineffectual in the face of increasingly sophisticated counterfeiting rings, which inject fake drugs into the market for profit and/or sell off genuine medications on the black market or in adjacent countries at marked up prices.

Track & trace systems are essentially nonexistent in the developing world, as the network infrastructure present is not adequate to run systems used in the developed world. As such, the typical methodology relies heavily on paper invoices and signatures, both of which are easily falsifiable.

To fill this gap, we demonstrate Epothecary, a system which uses 2D barcodes affixed to pharmaceuticals to provide tracking and pedigree authentication. Epothecary uses commodity cameraphones and existing cellular infrastructure, and is deployable in most developing contexts.

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II. DEMONSTRATION

Epothecary’s 2D barcodes, or 'tags,' are printed on or affixed to pharmaceuticals at each level of aggregation: each retail package, carton, crate, pallet, etc. Each tag contains a unique, random 20-digit serial number, lot code, and expiration date, and back-end servers track the hierarchy of these serial numbers, e.g. which cartons are contained in which crate, as well as who is in possession of any given unit at any given time all the way down the supply chain. Each participant in the supply chain also receives a unique tag to identify him as a transacting party.

In this demonstration, we will present the overall operation of the Epothecary system including the software which runs on the mobile handsets, centralized Track & Trace mechanisms, tag printing, scanning, and various transaction types within a typical developing world supply chain.

The demonstration will use inexpensive Nokia 3110c cameraphones as client devices, which will be used to scan the 2D barcodes of merchandise and Epothecary users and convey compressed, encrypted transaction information over SMS to a central server. The server’s ability to trace any product’s movement and provenance will also be demonstrated.

III. CONCLUSION

Epothecary presents a usable, lightweight system which provides highly secure and auditable transaction traces for pharmaceuticals.

The Epothecary proof-of-concept is nearing its first pilot deployment pending external funding, and we look forward to garnering real-world data about reductions in counterfeiting rates as a result.

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REFERENCES