APPLICATION NOTE

Encrypted Reads and Writes

Atmel CryptoAuthentication

Introduction

The Atmel® CryptoAuthentication™ product line offers an exceptionally clean way of keeping traffic between the CryptoAuthentication device and microcontroller encrypted to prevent snooping on the bus during personalization or system operation. The encrypted read and encrypted write are configurations of the `Read` and `Write` commands and provide a mechanism for limiting access, enabling features, or updating a key value.

Features

- Securely Store Passwords or Keys without transferring the values in the clear
- Check Password or Keys without revealing expected value

1 Overview

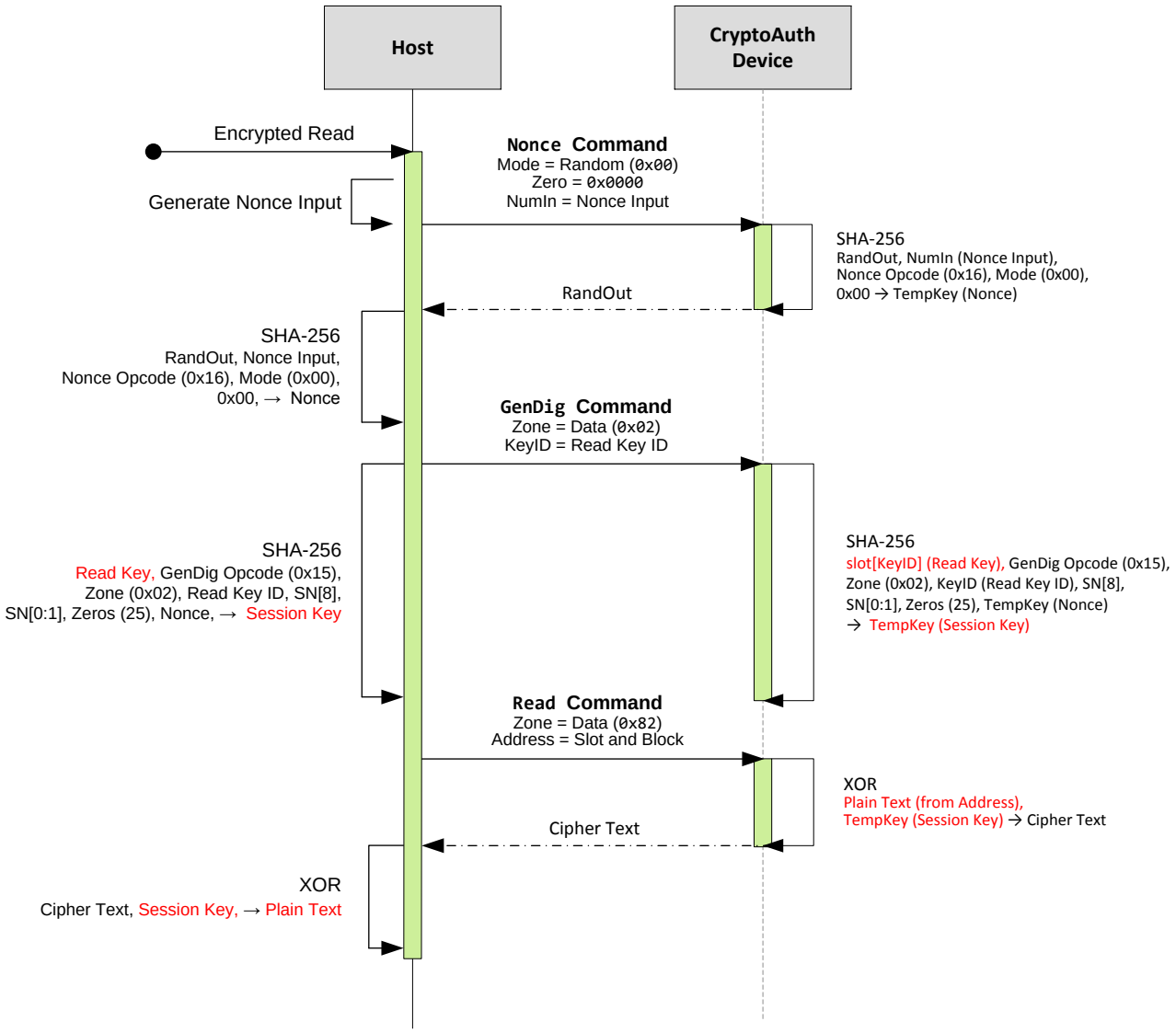
Secure hardware devices can provide mechanisms to hide the clear value of the password, prevent offline exhaustive attacks, and greatly increase the difficulty of local physical attacks. The Atmel® CryptoAuthentication™ devices (crypto devices) provide such a capability in a very small package and at a low cost which is easy to integrate into any digital system.

There are a couple of ways to implement the encrypted read or encrypted write commands.

2 Encrypted Read

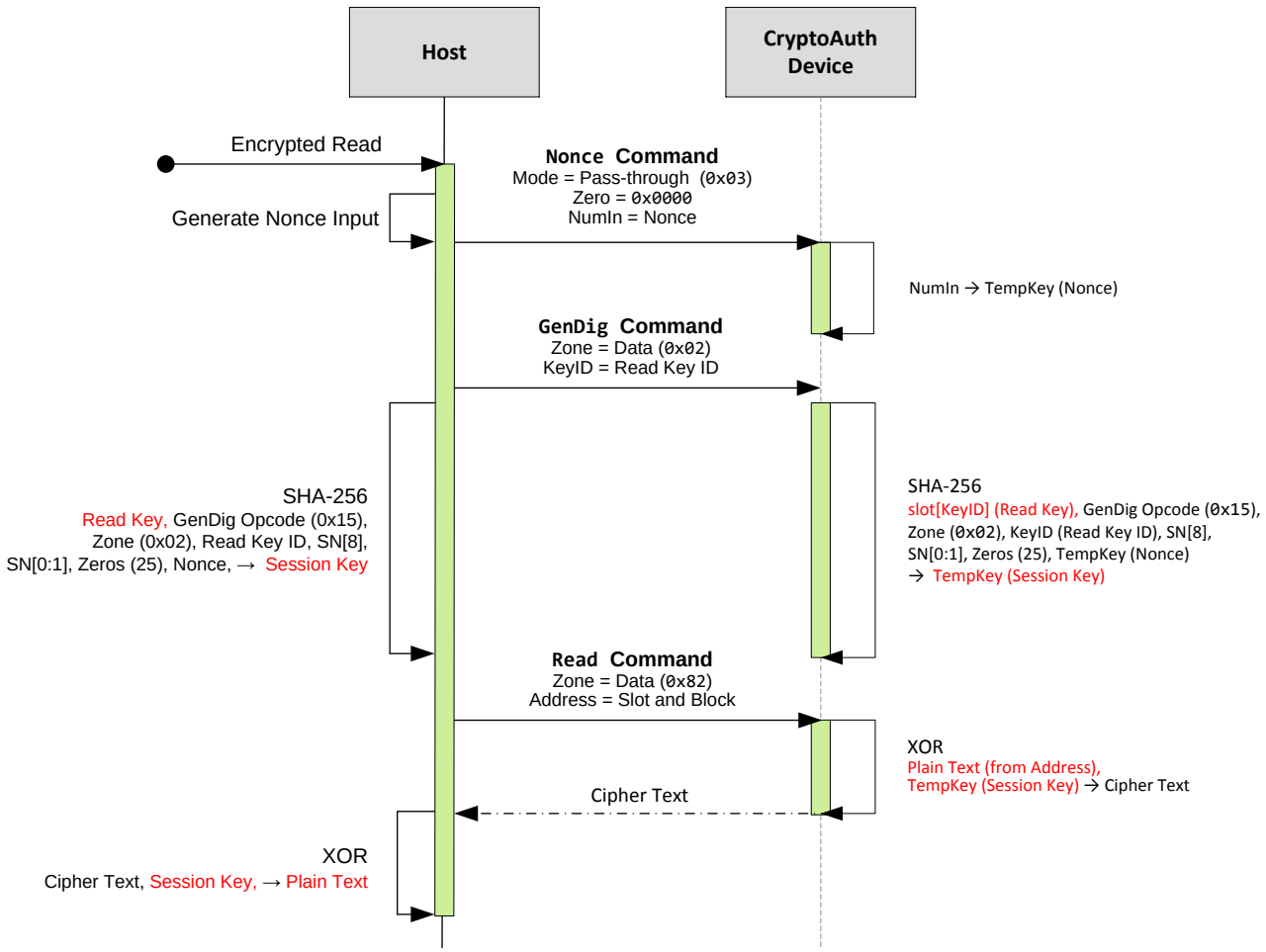
2.1 Standard Encrypted Read

Figure 2-1. Standard Encrypted Read Flow Diagram



2.2 Simple Encrypted Read

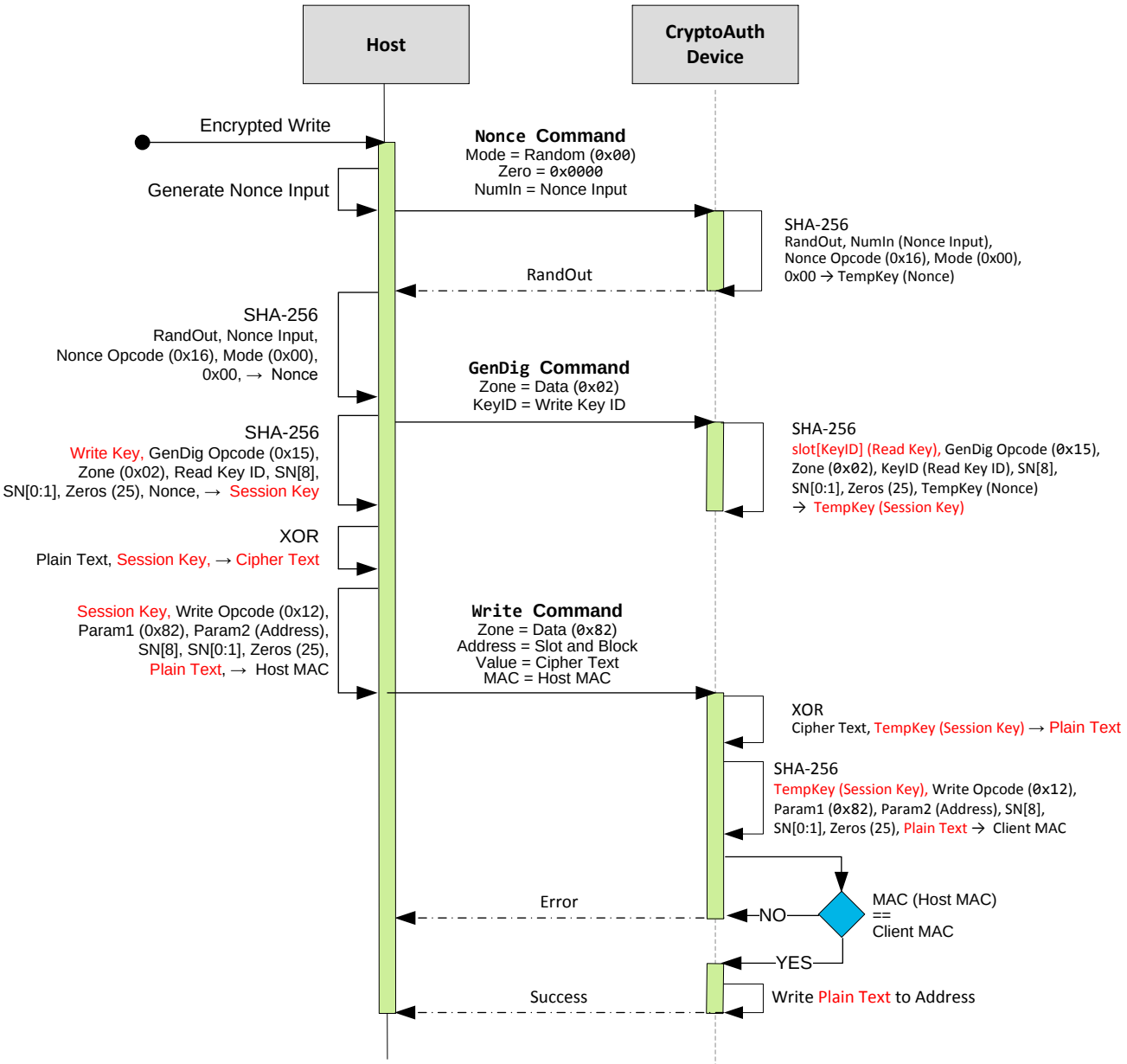
Figure 2-2. Simple Encrypted Read Flow Diagram



3 Encrypted Write

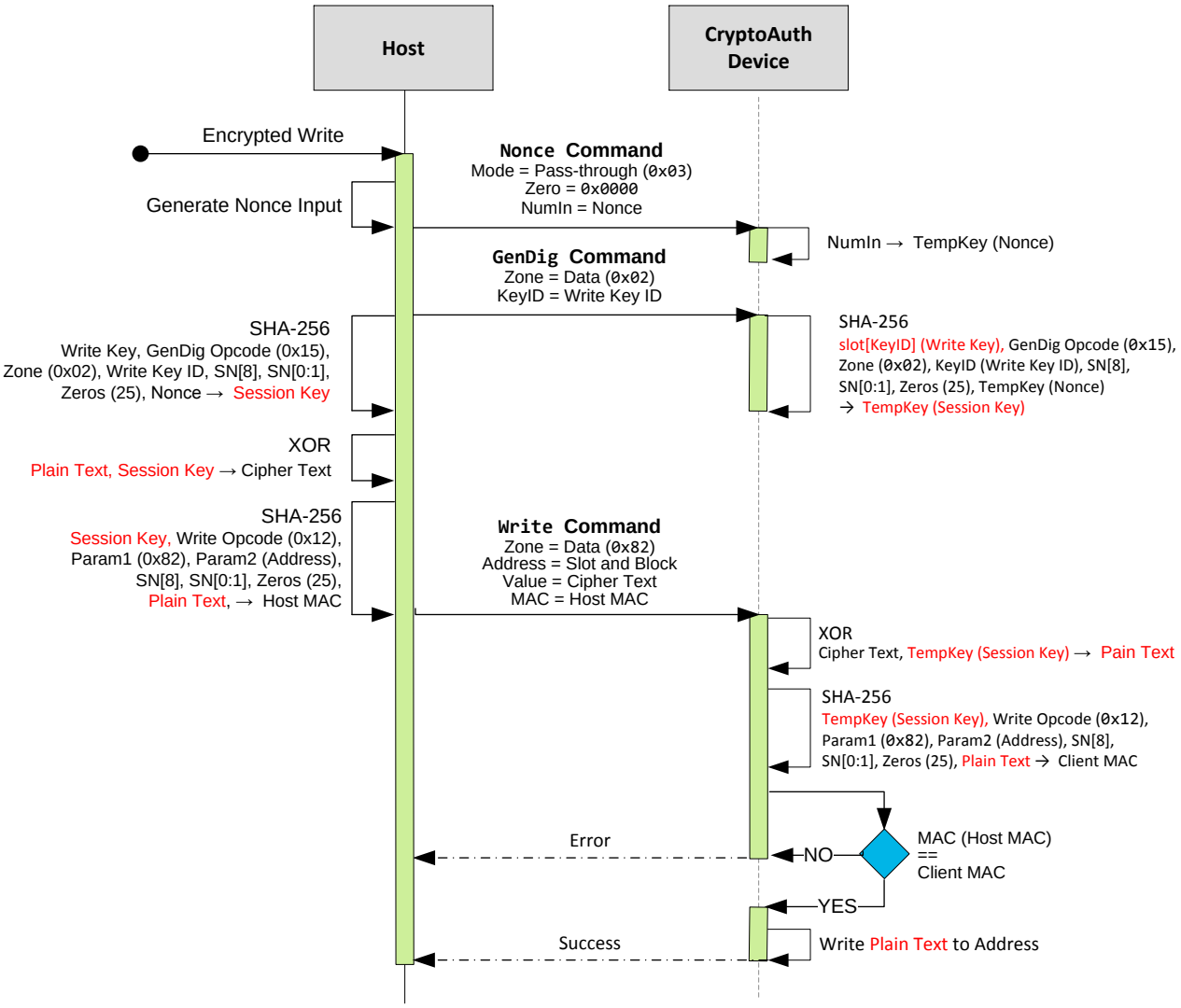
3.1 Standard Encrypted Write

Figure 3-1. Standard Encrypted Write Flow Diagram



3.2 Simple Encrypted Writes

Figure 3-2. Simple Encrypted Writes Flow Diagram



4 Configuration

Before using the Atmel ATSHA204A device for encryption, there are initialization processes that are required to be performed. The initialization processes consist of personalizing and then locking the device. In the personalization step, the device behavior, the data slot behavior, and the data itself is configured as desired. After the personalization process is performed, the device is locked for the configuration to take effect and to prevent any further modification to the data. This section describes ways to configure the device for each specific encryption scheme.

4.1 Standard Encrypted Read and Simple Encrypted Read

Table 4-1. Standard Encrypted Read and Simple Encrypted Read

Host	ATSHA204A
1. Generate Nonce Input (NumIn). 2. Save ReadKeyID and ReadKey.	1. Set: • SlotConfig.ReadKey (ReadKeyID) • SlotConfig.EncryptRead • SlotConfig.IsSecret 2. Lock Config Zone 3. Load ReadKey into Slot[ReadKeyID] 4. Lock Data Zone

Notes:
1. Encrypted Read only applies to 32-Bytes Read.
2. For Standard Encrypted Read, ReadKeyID can be either odd or even. If ReadKeyID is odd, CheckMacConfig bit corresponding to the Slot to Read must be zero.
3. For Simple Encrypted Read, ReadKeyID must be odd and CheckMacConfig bit corresponding to the Slot to Read must not be zero.

4.2 Standard Encrypted Write and Simple Encrypted Write

Table 4-2. Standard Encrypted Write and Simple Encrypted Write

Host	ATSHA204A
1. Generate Nonce Input (NumIn). 2. Save WriteKeyID and WriteKey.	1. Set: • SlotConfig.WriteKey (WriteKeyID) • SlotConfig.IsSecret • Bit 14 of SlotConfig 2. Lock Config Zone 3. Load WriteKey into Slot[WriteKeyID] 4. Lock Data Zone

Notes:
1. Encrypted Write only applies to 32-Bytes Write.
2. If the Data Zone is unlocked, Param1 of Write Command is used to indicate whether or not the input data is encrypted.
3. For Standard Encrypted Write, WriteKeyID can be either odd or even. If WriteKeyID is odd, CheckMacConfig bit corresponding to the Slot to Write must be zero.
4. For Simple Encrypted Write, WriteKeyID must be odd and CheckMacConfig bit corresponding to the Slot to Write must not be zero.

5 Revision History

Doc Rev.	Date	Comments
8981B	10/2015	Corrected the standard encrypted write flow diagram.
8981A	09/2015	Initial document release.

Atmel Corporation 1600 Technology Drive, San Jose, CA 95110 USA **T:** (+1)(408) 441.0311 **F:** (+1)(408) 436.4200 | **www.atmel.com**