HDL Intellectual Property Protection

Encryption, Decryption and License Proxy

based on
IEEE Std 1735™-2023 standard

IP Encrypter

Contents

Introduction

The *ipencrypter* is a suite that supports encryption, decryption and licensing for intellectual property (IP) conforming to IEEE Std 1735™-2023 standard. This standard specifies syntax for HDL IP encryption, rights and license management embedded in HDL. IP author can protect IP source code and its usage by inserting special "protect" directives and encapsulating the block of code. *ipencrypter* supports SystemVerilog and VHDL languages.

Features of *ipencrypter*

ipencrypter provides following features:

- Encrypt IP (*ipecrypt*)
- Decrypt IP modules (*ipeclient*)
- License Proxy (*ipeproxy*)

Encrypt IP

IP author can use *ipecrypt* to encrypt an IP. IP author provides the level of protections through protect directivesblocks. IP author can choose the tools to support and needs public key for each tool.

Process of creating encrypted IP through *ipecrypt*:

- Create IP in plain text
- Add protect directives around the code to encrypt or alternatively specify directives through a separate file
- Run *ipecrypt* application to generate encrypted IP

Encryption Flow:
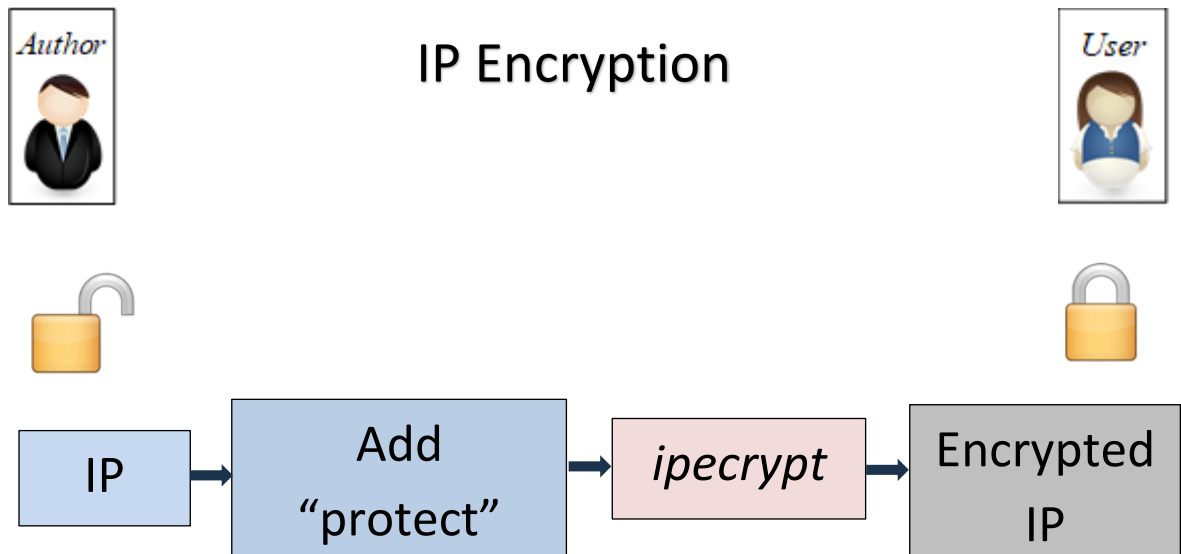
Decrypt IP within EDA Tool

ipencrypter provides a client module, *ipeclient*, that can be used to decrypt IP. It reads the encrypted IP and decrypts it using the tool's private key. The use of IP may require runtime license check. This module is integrated with the EDA tool.

Client Module

ipeclient is embedded in EDA tool. It parses the encrypted IP, validates its integrity. It checks for licensing requirement for decryption. If needed establishes secure communication with license proxy and evaluates license rights. Based on the rights granted the tool will either proceed with decryption of IP or terminate the decryption operation.

Process of handling encrypted IP through embedded *ipeclient*:

- Tool (reads the encrypted IP through *ipeclient* module
- Check license rights for decryption
- *ipeclient* decrypts the IP
- Provides IP in plain text to tool

Decryption Flow:

IP Decryption

User

Encrypted
IP

EDA Tool
IP Processing

ipeclient
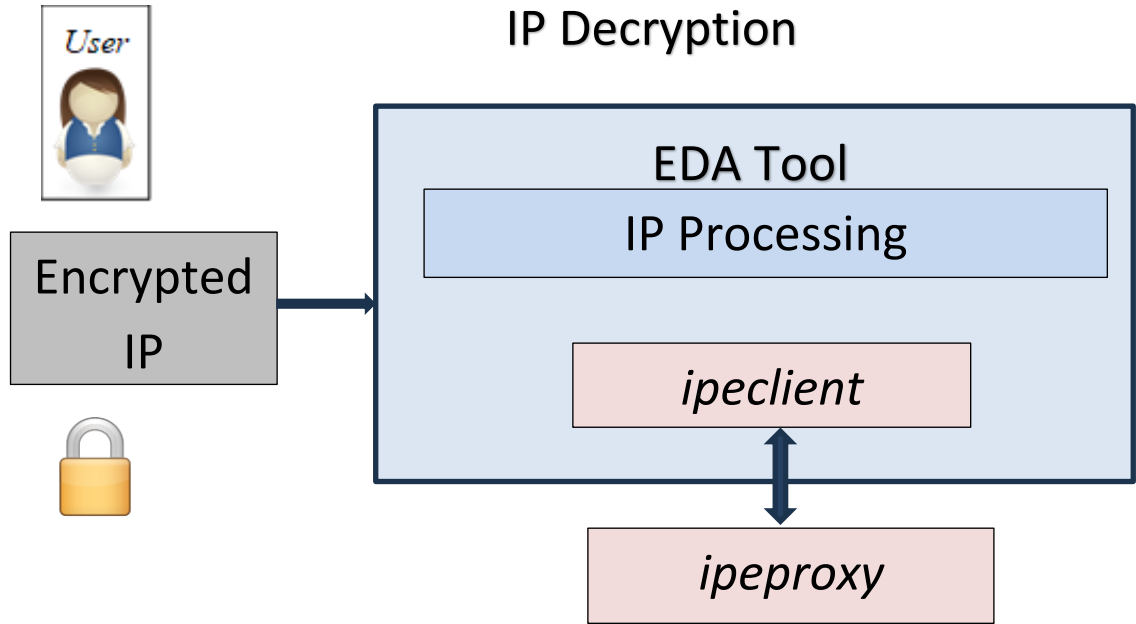
ipeproxy

License Proxy

IP author can grant access of IP to users of a particular tool through rights specified in common and tool blocks. The access can further be controlled through licensing mechanism. IP author can distribute license for IP to some users of the tool. In this way IP author can further restrict the use of IP. A license can grant different rights to different users.

License Check Flow:

License Check

EDA Tool

License Check Request

ipeproxy

License Server

(third party license manager)

ipeclient

License Check Response