SPA: Single Packet Authorization

We needed a protocol that allowed us to tell a server that we are who we say we are, have it work across NAT, use TCP, UDP, or ICMP as the transport mechanism, act as an extra layer of security, and be secure itself. Oh, and do so with a single packet. Sound crazy? It’s actually very useful. We’ve come up with a Single Packet Authorization (SPA). This is a protocol for a remote user to send in a request to a server which I cannot be replayed and which uniquely identifies the user. The proof-of-concept code alone is worthy of a presentation itself, but SPA is so much more. This is not port-knowcking (although SPA can easily replace port-knowcking with something much more secure).
SPA: Single Packet Authentication

Who We Are

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What Be It?

What is SPA?

• SPA is Single Packet Authentication, a single packet that can authenticate a user to a system for simple remote administration

• It is a protocol for allowing a remote user to authenticate securely on a “closed” system (limited or no open services) and make changes to or run applications on the “closed” system
What SPA is Not

- It is not a replacement for authentication, just another layer
- It is not port knocking, although it can easily replace it with something more secure
- It is not immunity from attacker threats, but it can help immensely by allowing ports to only be opened when necessary

Design Goals

- Free
- Encrypted and signed payload (using GPG/PGP)
- Fairly painless for end user
- Works across NAT
- Uses TCP, UDP, and/or ICMP
- Utilize the PGP Ring of Trust model
How It Works

The SPA Protocol – Client Side

- Clients have Server’s GPG public key on their ring
- Clients build a data chunk which includes identity, session keys, timestamp, and command/control data for application using the SPA protocol
- Clients encrypt and sign data chunks with Server’s key
- Chunk is sent as data portion of a packet
The SPA Protocol – Server Side

- Server has Client’s GPG public key on its ring
- Server sniffs all packets looking for those with its GPG key in data portion
- Strips off data chunk, decrypts and verifies signature
- Signature verification is the “auth”
- Session keys and timestamp are verified
- Command/control is carried out by application using SPA

K-Rad Implementation Stuff
Challenges (and Resolutions)

- NAT
- Replay
- Client out of “sync” with Server

Sample Implementations

- Port access (replacing port knocking)
- Remote administration
- Reverse shell, aka “dial-back” VPN
Neato Code to Start Playing With

- Remote firewall administration
- Remote script execution and/or commands

A Quick Pseudo Demo….
FIN

• Thanks!
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• Photo session by Dui Nguyen and Amy Lee Muir
• NMRC Fetish Model – Bethany
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Bad packet, naughty packet…

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