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J. Hildebrand  
Cisco Systems, Inc.  
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Erosion of the moral authority of middleboxes  
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Abstract

Many middleboxes on the Internet attempt to add value to the connections that traverse that point on the network. Problems in their implementations erode the moral authority that otherwise might accrue to the legitimate value that they add.

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## 1. Introduction

There are several middlebox use cases that typically stand in the way of better encryption helping to mitigate perpass-style attacks.

- o Local caching
- o Enterprise policy controls, including Data Loss Prevention (DLP) and monitoring for acceptable use
- o Service provider acceleration of mobile data
- o Advertisement insertion for "free" networks

These use cases may cause third parties to an end-to-end conversation to have legitimate legal and moral rights that grant them participation in the conversation. This document discusses several reasons why the legitimacy of these use cases is undermined in the minds of some who build products for the Internet.

## 2. Similarity to attacks

Some middlebox capabilities are currently implemented using the same mechanisms employed by attackers, including passive capturing of plaintext data, active impersonation, and denial of service.

It is difficult to design protocols that simultaneously prevent a given vulnerability and simultaneously selectively allow legitimate access, and arguments that particular attacks cannot therefore be mitigated are greeted by end-users with skepticism - particularly when the benefit added by the middlebox does not accrue directly to those users.

## 3. Unintentional breakage

The experiences of living with a wide variety of middleboxes in the real world lead developers to realize that they all have defects that go years without being addressed. Even when the vendor fixes a given bug, software is updated so infrequently at this layer that often the bug must just be worked around.

Developers that have to add multiple special cases to their products as they discover every new way to incorrectly implement what they previously thought were simple protocols often overreact by using protocols that are harder to manage, have worse security properties, or perform poorly.

#### 4. Support cost appropriation

When a middlebox subtly fails, end users never call the entity that deployed the middlebox, much less the vendor that built that box. Instead, they file a support request with the services that they are trying to access. The team that developed that service typically spends many hours finally tracking down the issue, only to finally find the problem with the middlebox. The original end user never has the authority to fix the middlebox, so they demand the service owner work around the problem.

When the costs associated with broken behavior are not paid by the developers of that behavior, it is easy for those developers to assume that everyone is happy with their product.

#### 5. Other monetary incentives

Developers of new services will often try to make their network traffic as similar as possible to an existing essential service. This approach maximizes the chances that they will be able to develop a user base, however it can stress middleboxes beyond their design constraints causing them to fail in new ways.

When middlebox developers bring about their own downfall by pushing application providers outside of natural design patterns, they do not impress the community with their desire to be trustable elements of the Internet architecture.

#### 6. Conclusions

When the moral authority of middleboxes is eroded, arguments by their developers to allow unfettered access to the plaintext of traffic that traverses those boxes may be called into question.

As an industry, we should look for other mechanisms to provide legitimate third-party value.

#### 7. References

##### Author's Address

Joe Hildebrand  
Cisco Systems, Inc.

Email: [jhildebr@cisco.com](mailto:jhildebr@cisco.com)