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Anonymous-address-resolution model

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Introduction

- Due to the existence of malicious nodes and information leakage, the traditional address resolution protocol is vulnerable.
- In order to prevent information leakage, the destination of address resolution, the IP address and MAC address of source node should be hidden.
- An anonymous address resolution model is proposed in this work.

Packet formats used in this work

Table 1 Format of NS_{AS-AR}

Part	Description	Value
Ethernet header	Dest MAC	3333-0000-0001
	Src MAC	$\text{Left}(E_{IP_X}(MAC_A), 48)$
	Type	0x0806
IPv6 header	Src IP	$E_{IP_X}(IP_A)$
	Dest IP	ff02::1
	Next header	0x3a
ICMPv6	Type	200
	Target address	$H(IP_X)$
	Options	$E_{IP_X}(MAC_A)$

Table 2 Format of NA_{AS-AR}

Part	Description	Value
Ethernet header	Dest MAC	MAC_A
	Src MAC	$\text{Left}(E_{IP_Y}(MAC_B), 48)$
	Type	0x0806
IPv6 header	Src IP	$E_{IP_Y}(IP_Y)$
	Dest IP	IP_A
	Next header	0x3a
ICMPv6	RSO	$S=1$
	Type	201
	Target address	$E_{IP_Y}(IP_Y)$
	Options	$E_{IP_Y}(MAC_B)$

A resolution example

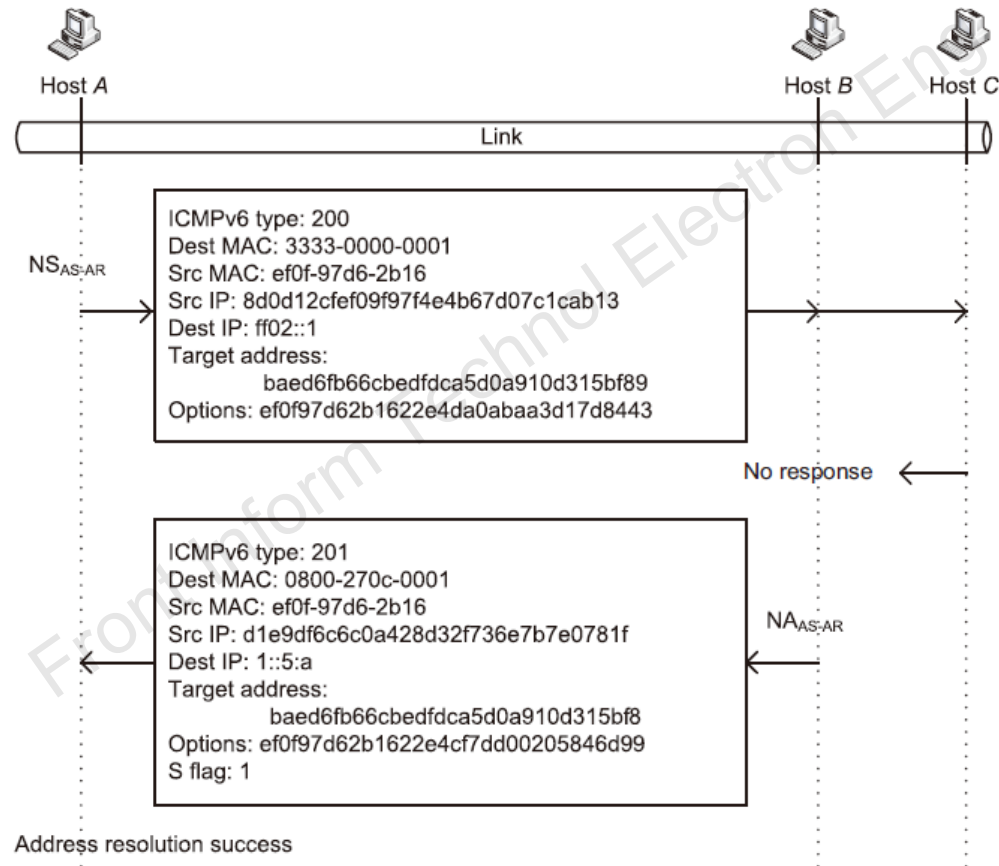


Fig. 3 Example of AS-AR

Experiment results

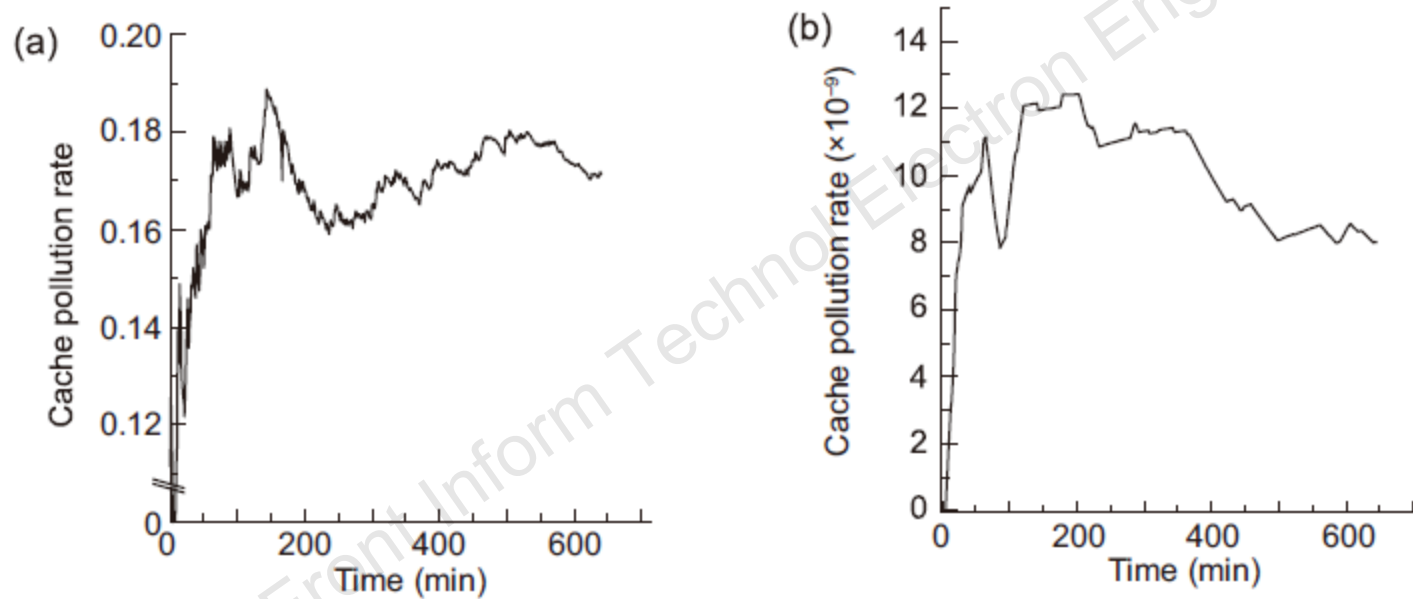


Fig. 5 Pollution rate comparison for SEND (a) and AS-AR (b)

Performance comparison

Table 4 Comparisons between AS-AR and other solutions

Existing solution	Cryptography used	Third-party used	Traffic monitor	Performance degradation	Communication overhead
AS-AR	Yes	Yes	No	Middle	$O(n + 1)$
ES-ARP	No	No	No	Low	$O(2n)$
S-ARP	Yes	Yes (authoritative key distributor)	No	High	$O(n + 1)$
Active DES	No	Yes (intrusion detection system)	Yes	Very low	$O(2n + 2)$
Gouda	Yes	Yes (secure server)	No	Low	$O(2)$
S-UARP	Yes	Yes (DHCP+secure server)	No	High	$O(3)$

ES-ARP: Ataullah and Chauhan (2012); S-ARP: Bruschi *et al.* (2003); Active DES: Barbhuiya *et al.* (2011); Gouda: Gouda and Huang (2003); S-UARP: Issac and Mohammed (2005)

Conclusions

- In experiment, the anonymous resolution mode shows good performance in terms of communication overhead, encryption and traffic monitor overhead.
- The proposed resolution mode achieves a higher security level compared to those proposed in the recent literature.