ECN versus IPsec?

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What is IPSEC, and Why?

- Network-layer security protocol for the Internet.
- TCP- or UDP application-level retransmissions handle deleted or damaged packets.

- Generally must modify protocol stack, kernel, or hardware; out of reach of application writers or users.

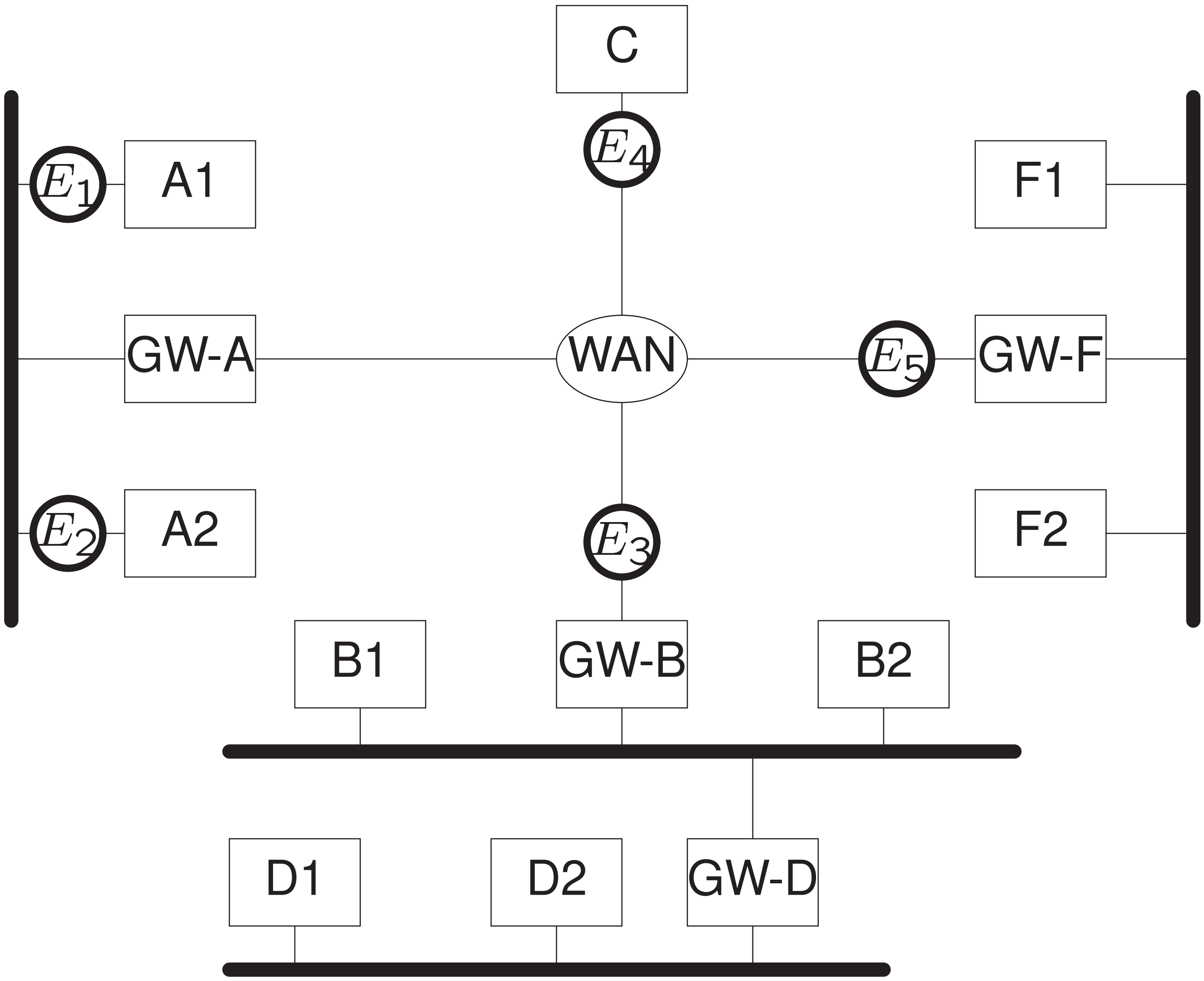
Basic Principles

- Nested headers
- Variable granularity of protection: user, host, network.
- Transparent to applications.

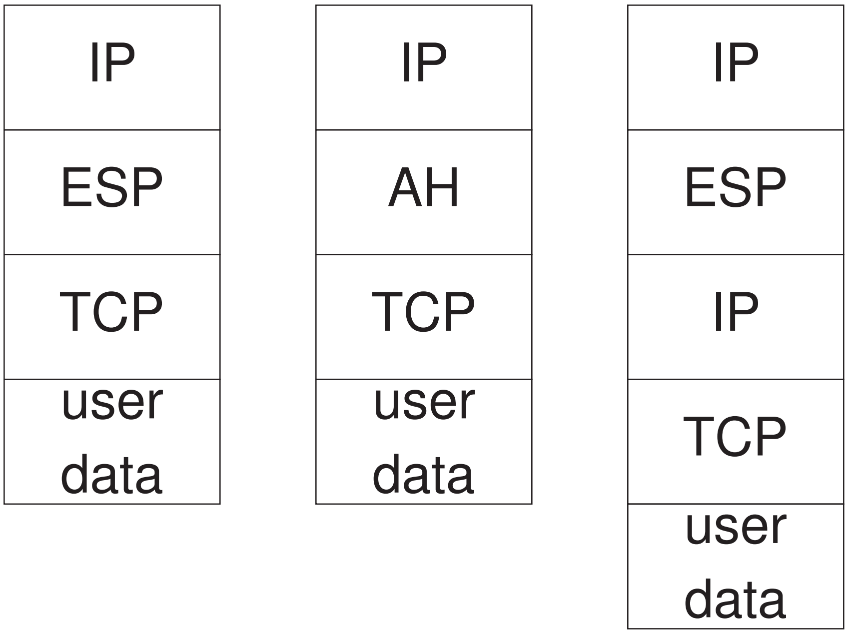
Design Rationale

- “Wasp-waist” protection.
- Maximum security leverage.
- Potential for end-to-end protection, while not requiring new higher-layer mechanisms to deal with corruption or deletion.
- Link-layer encryption doesn’t scale; application-level encryption is vulnerable to active attacks, traffic analysis, etc.

Uses



Packet Layouts



ESP versus AH

- ESP
  - Generally includes encryption, authentication, and replay prevention.
  - Any of the above can be omitted.
  - Strict layering.
- AH
  - Includes authentication and replay prevention.
  - Protects some of the preceeding IP headers.

  ⇒ Mutable IP fields excluded from AH calculation.

ECN Considerations – Transport Mode

- ToS field excluded from AH calculation; not examined for ESP.
- No impact in transport mode.

ECN Considerations – Tunnel Mode

- Original ToS field copied to outer IP header.
- Outer ToS field *not* copied back to inner header at tunnel termination.

Why It's Done This Way

- A tunnel is a virtual wire.
- A goal of VPN-style IPsec is to protect the packet against outside influences.
- If the "wire" has certain properties, should the tunnel handler retain state and deal with it? Congestion control at the tunnel?
- Should we negotiate ToS field handling? Can an enemy exploit this? (That is, can an enemy cause worse behavior by modifying that field than simply dropping the packet?)