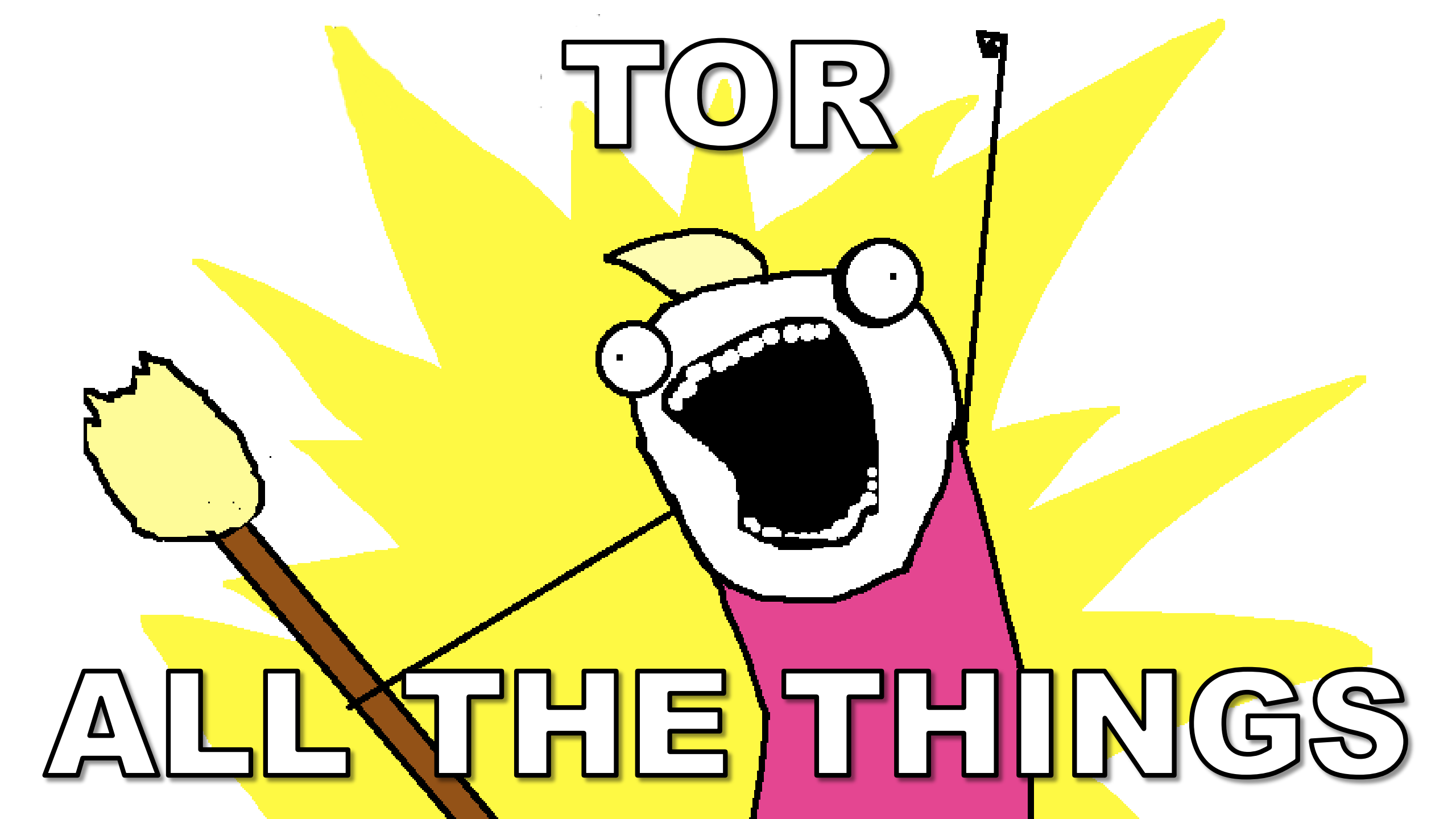

TOR
ALL THE THINGS

TOR… ALL THE THINGS!

Jason Geffner

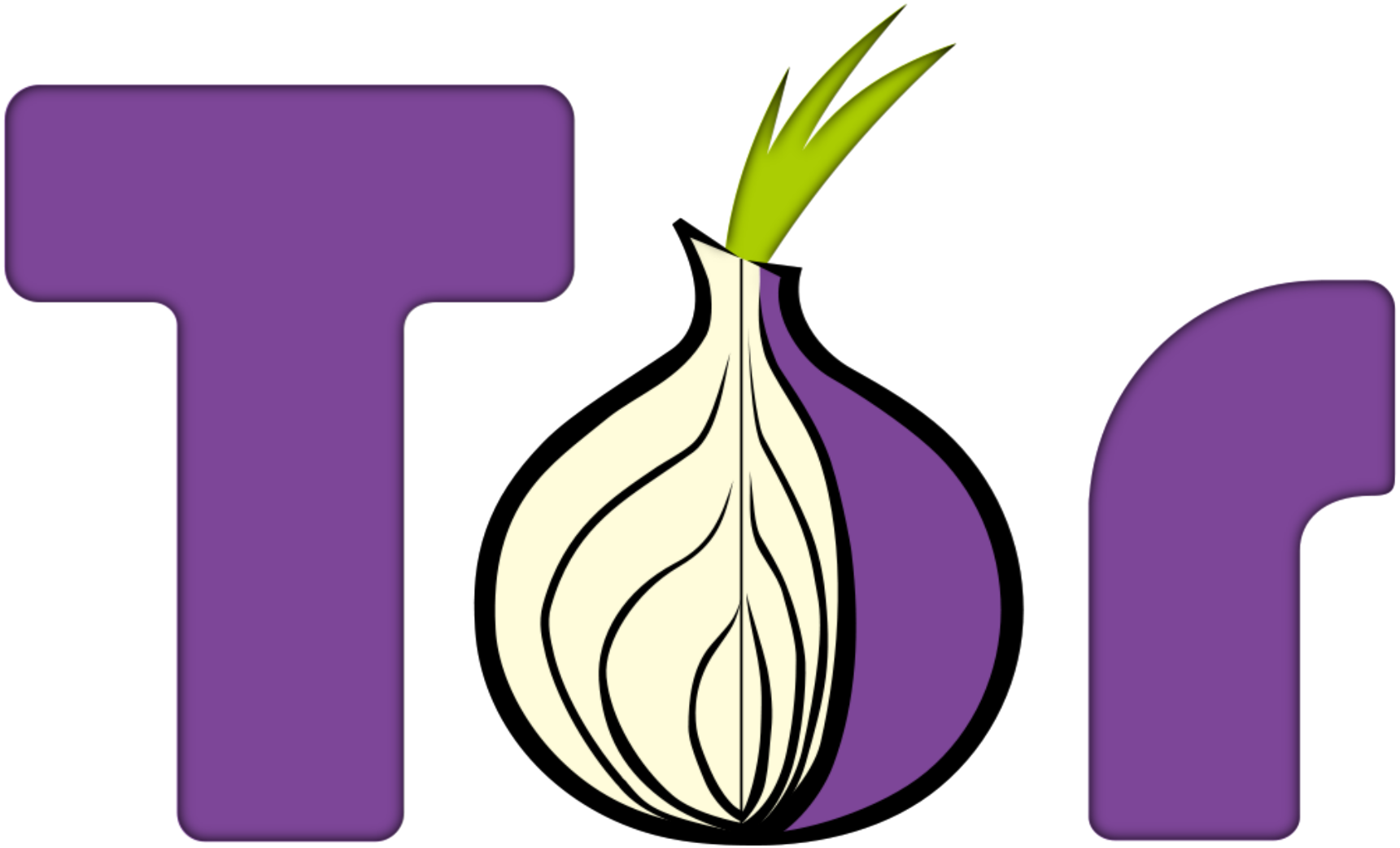
Sr. Security Researcher

CrowdStrike, Inc.

Black Hat USA 2013

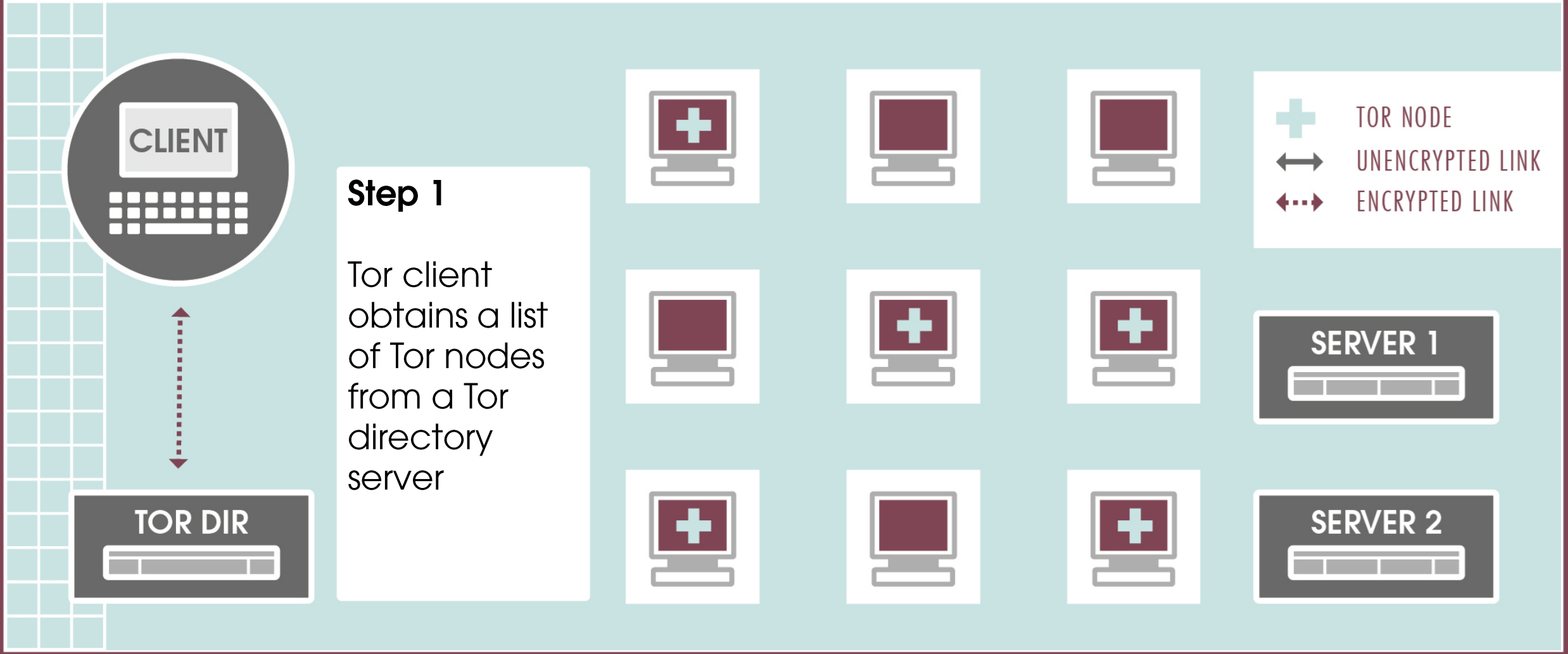
TORTILLA

CROWDTORTILLA



TORTILLA

HOW **TOR** WORKS



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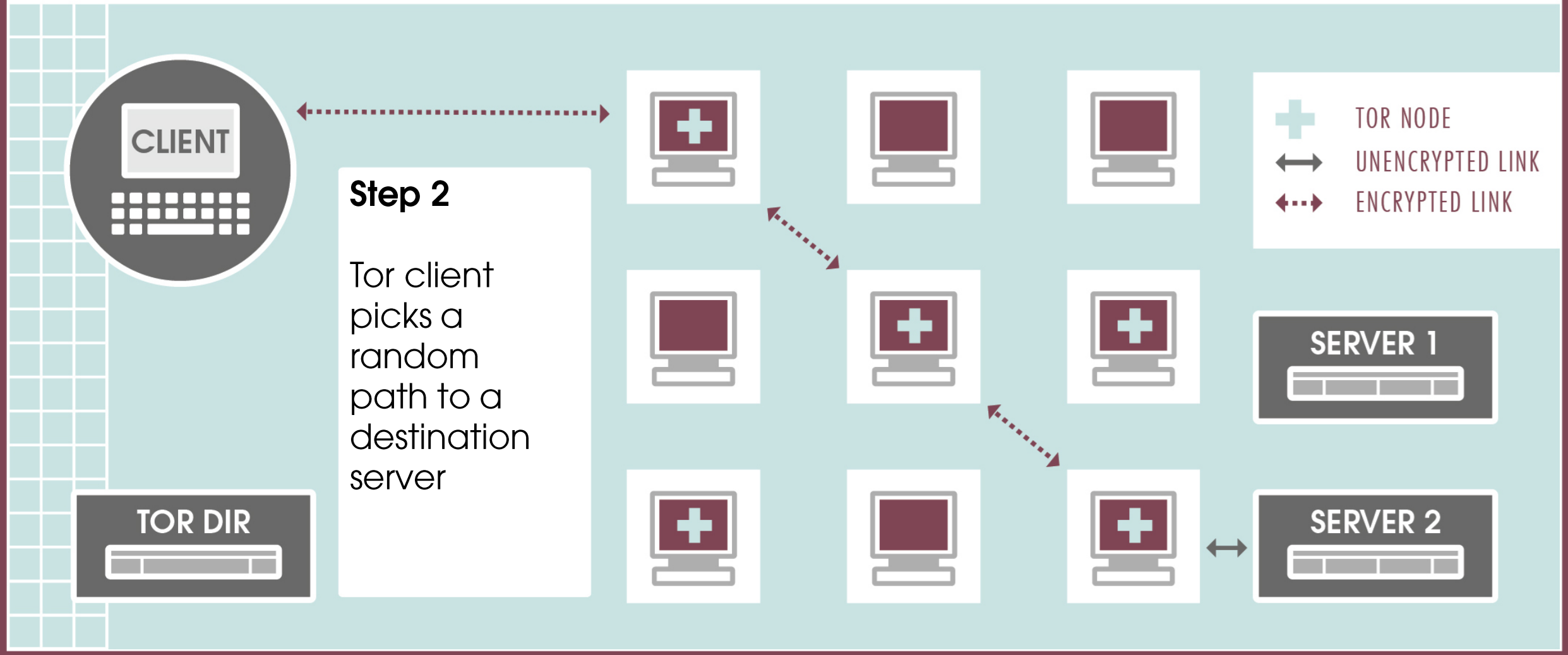

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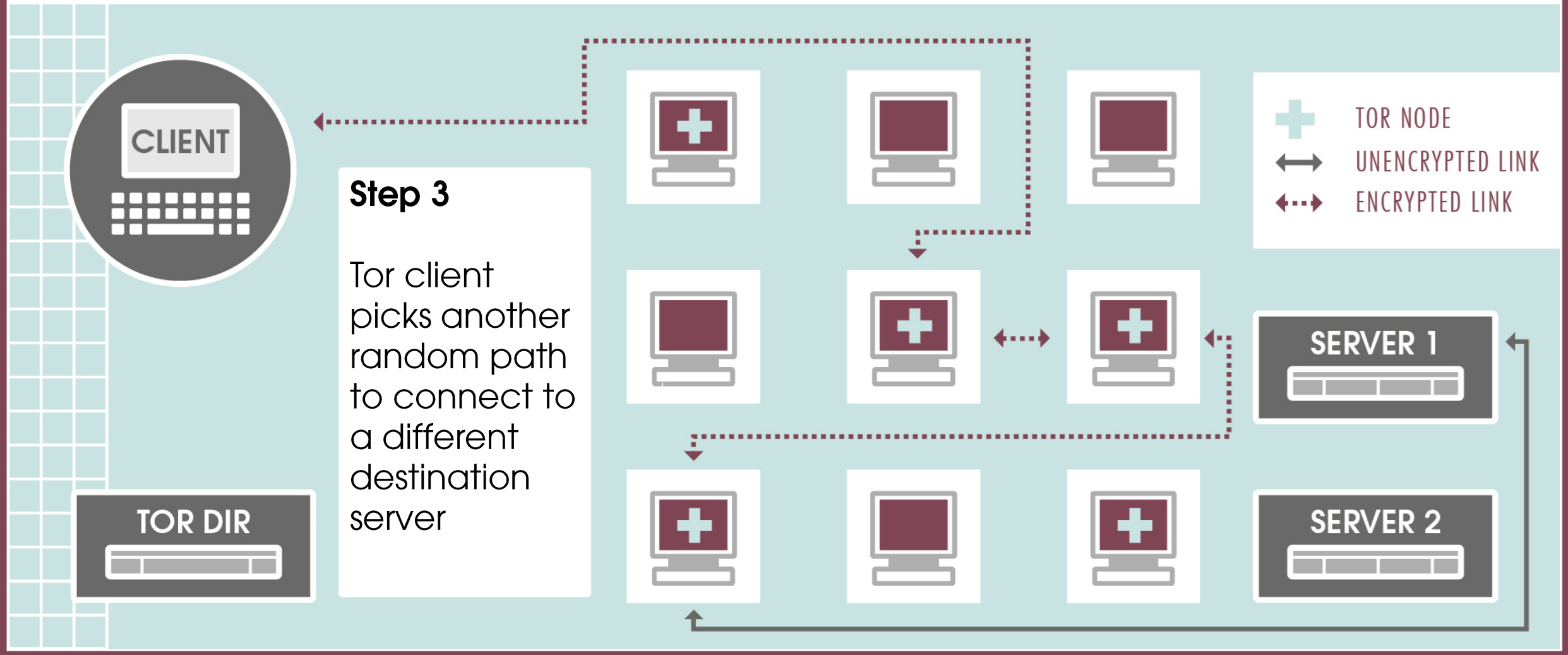
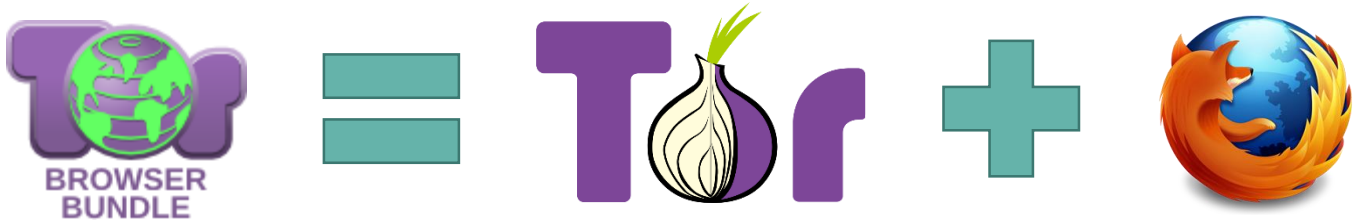


TORTILLA

Tor Browser Bundle



- Tor
  - Runs a SOCKS server listening on TCP port 9050
  - SOCKS server routes traffic through global Tor network

- Modified Firefox ESR
  - Routes all web traffic through Tor's local SOCKS server
  - Disables Flash and all other plugins to deter identity leakage

Problems with Tor Browser Bundle

- Firefox only
  - No other browsers natively supported
  - No plugins allowed

- SOCKS server
  - Most software does not support TCP proxying via SOCKS
  - Even software that does support TCP proxying via SOCKS usually doesn't support DNS proxying via SOCKS

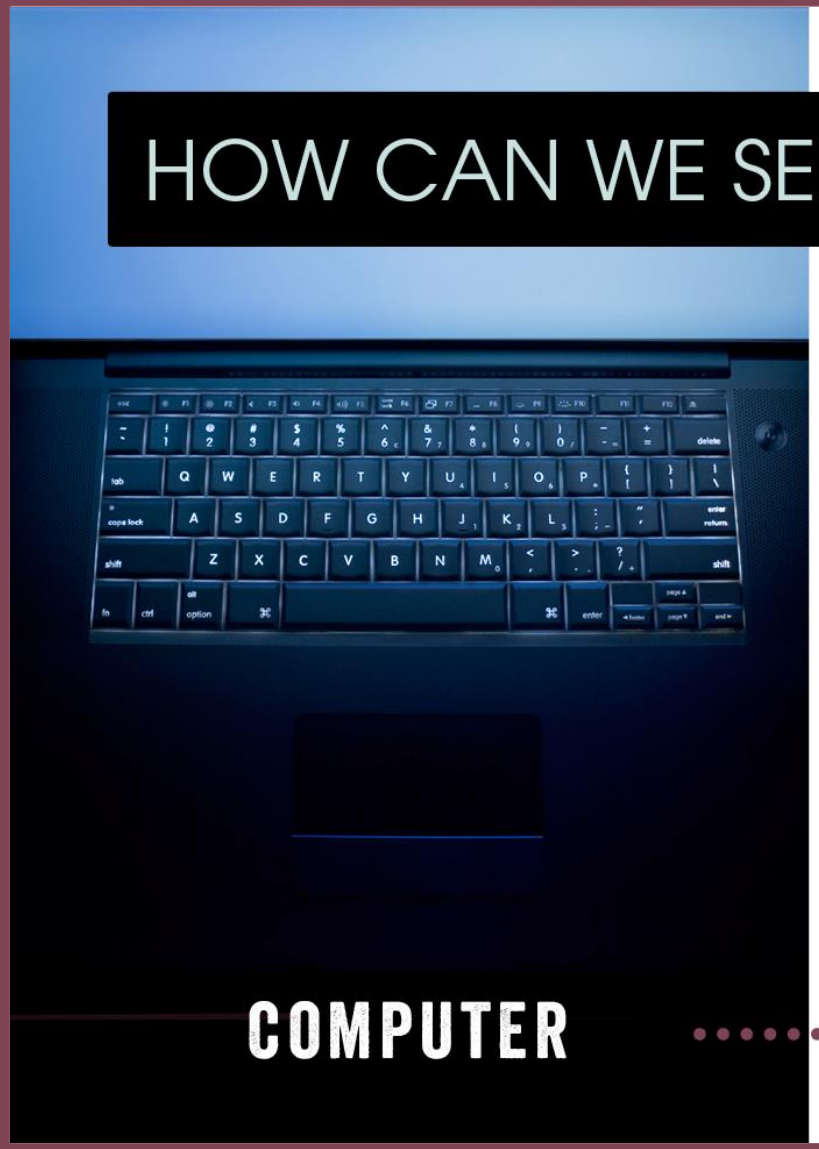
Ideal Tor Solution

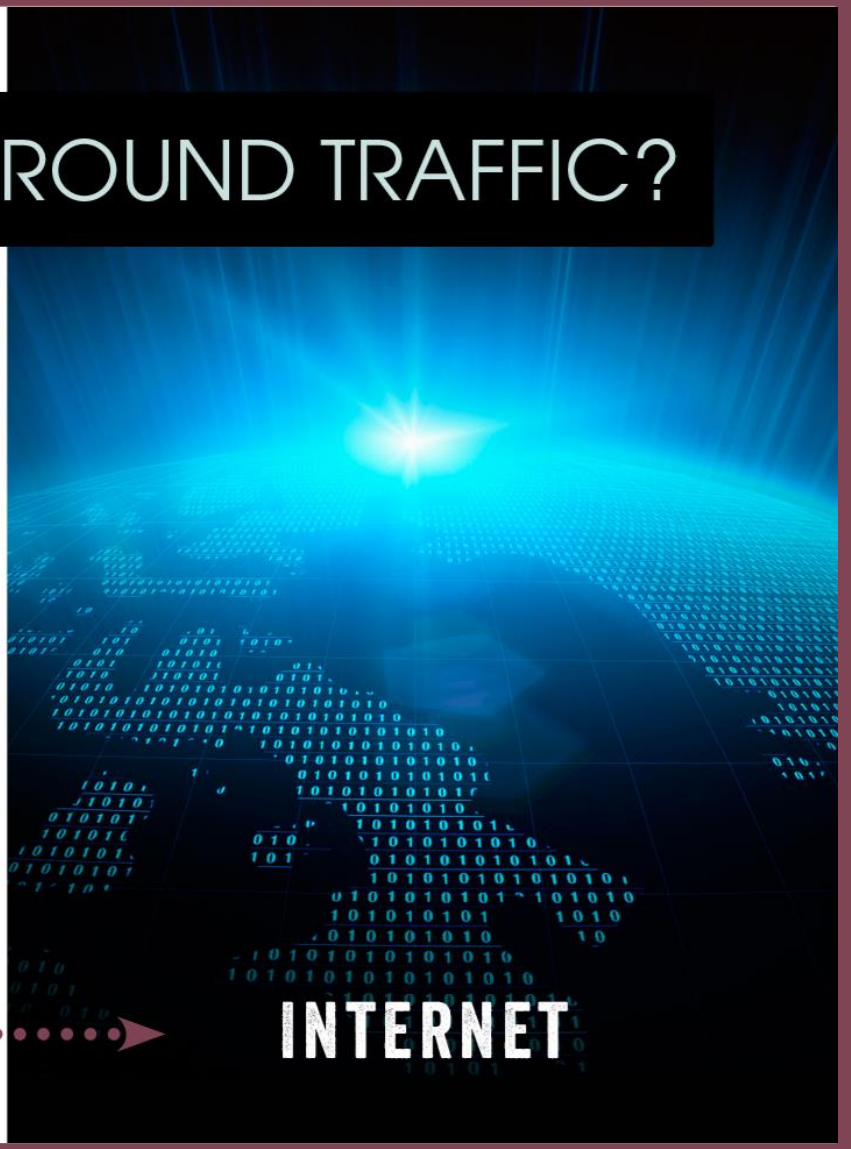
1. Transparently route all TCP and DNS traffic through Tor
2. Do not allow any network traffic onto the Internet unless it goes through Tor
3. Do not require typical user to install an unfamiliar OS
4. Do not allow malware to circumvent Tor tunnel and communicate directly with the Internet
5. Do not require extra hardware or extra VMs

Existing Non-Ideal Solutions

- Hardware-Based Transparent Proxy
  - Solutions such as Onion Pi and P.O.R.T.A.L. require additional hardware
  - Malware could connect to a different WiFi network and circumvent Tor tunnel
- Software-Based Transparent Proxy
  - Tor does not support transparent proxying on Windows since it's implemented via `/dev/pf`
  - Requires non-Windows OS on a host system or additional VM such as Whonix
- Tails - Debian-based non-Windows OS
- Torcap - Malware can circumvent Winsock hooks

HOW CAN WE SECURELY WRAP TOR AROUND TRAFFIC?



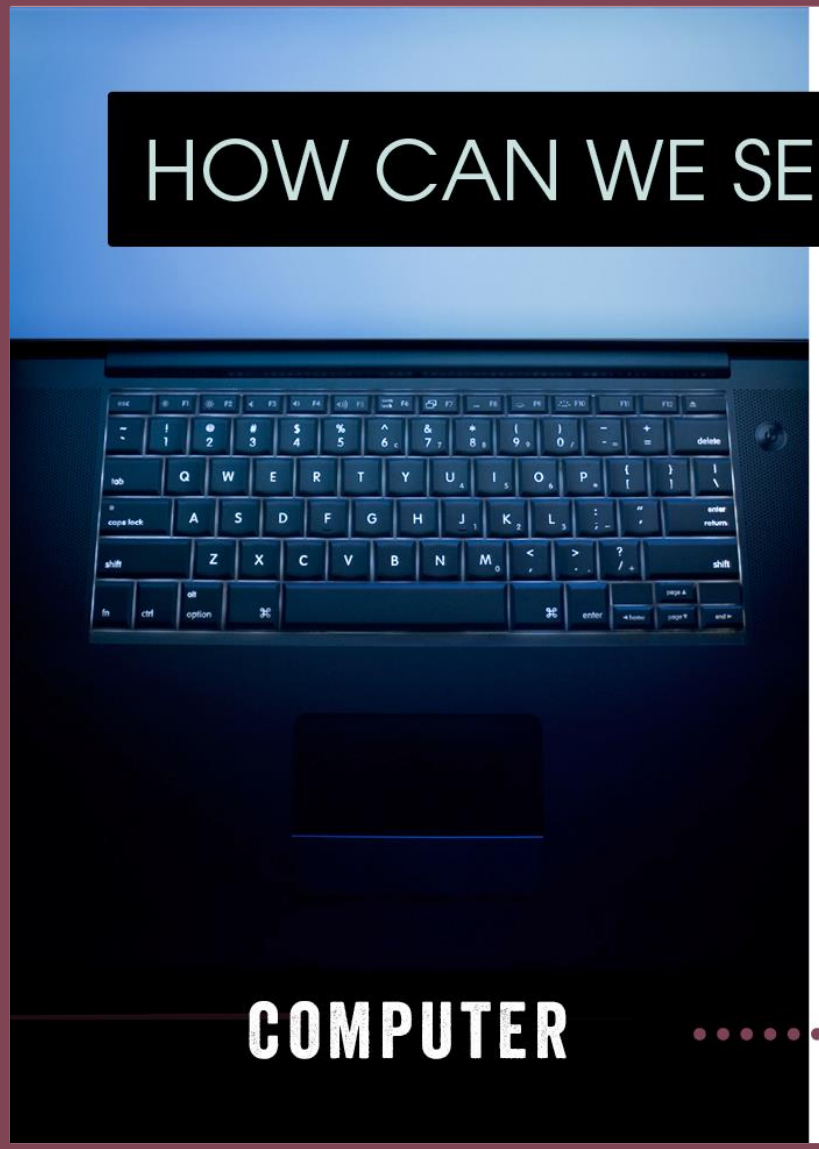


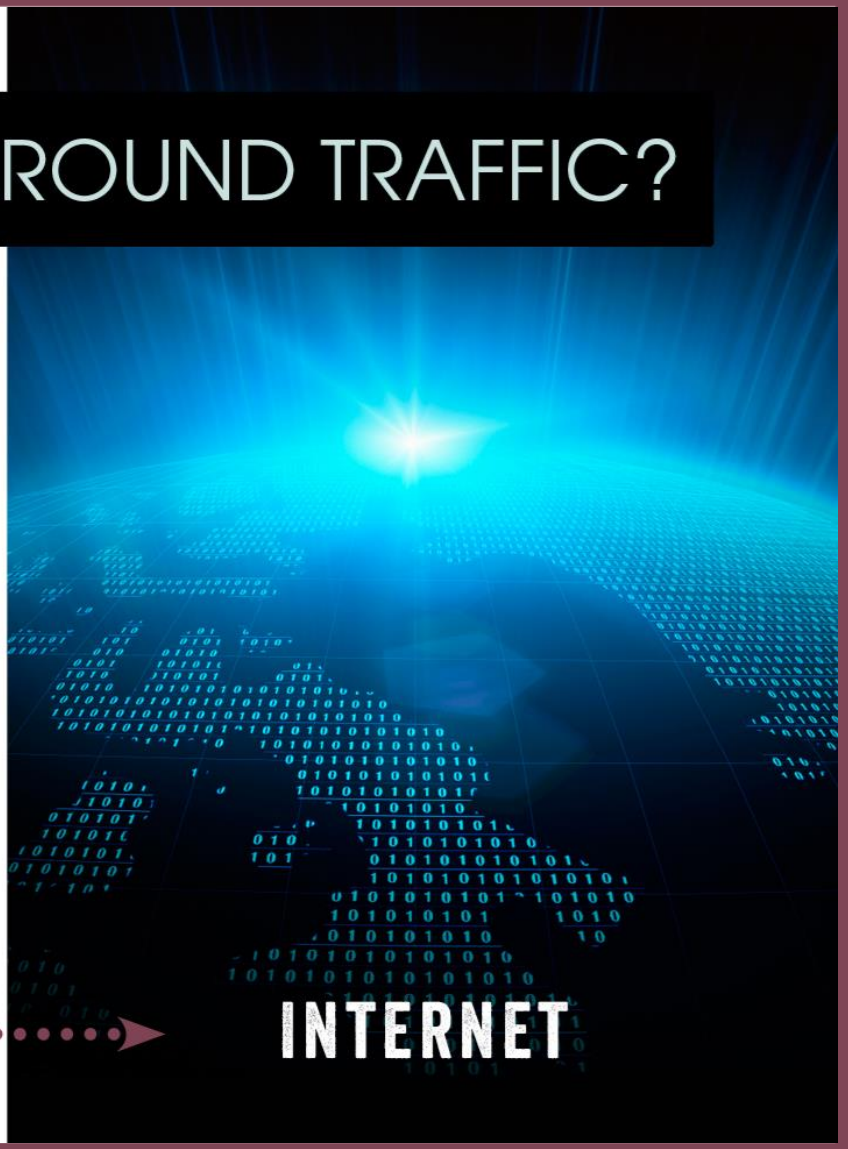
COMPUTER

INTERNET

TORTILLA

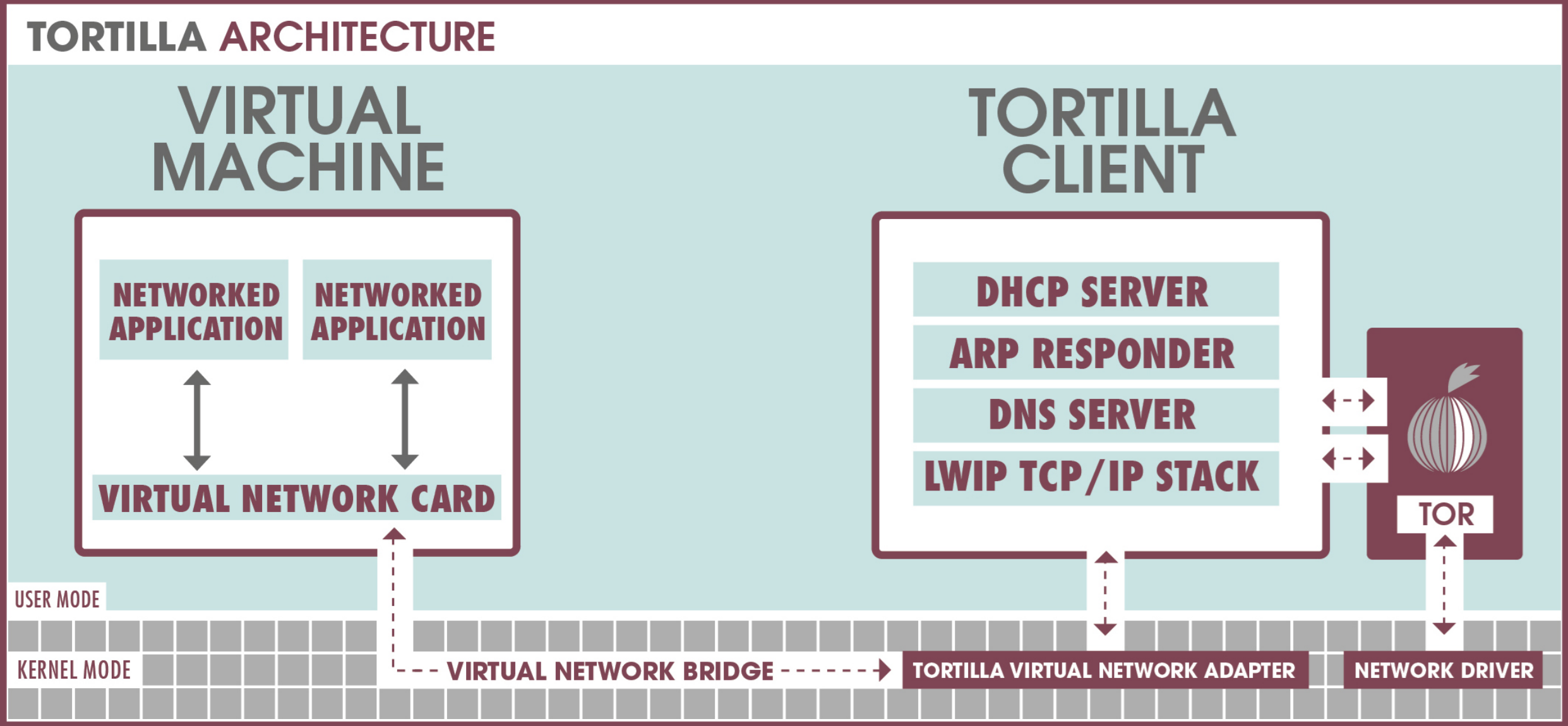
HOW CAN WE SECURELY WRAP TOR AROUND TRAFFIC?





COMPUTER → TORTILLA → INTERNET

TORTILLA ARCHITECTURE



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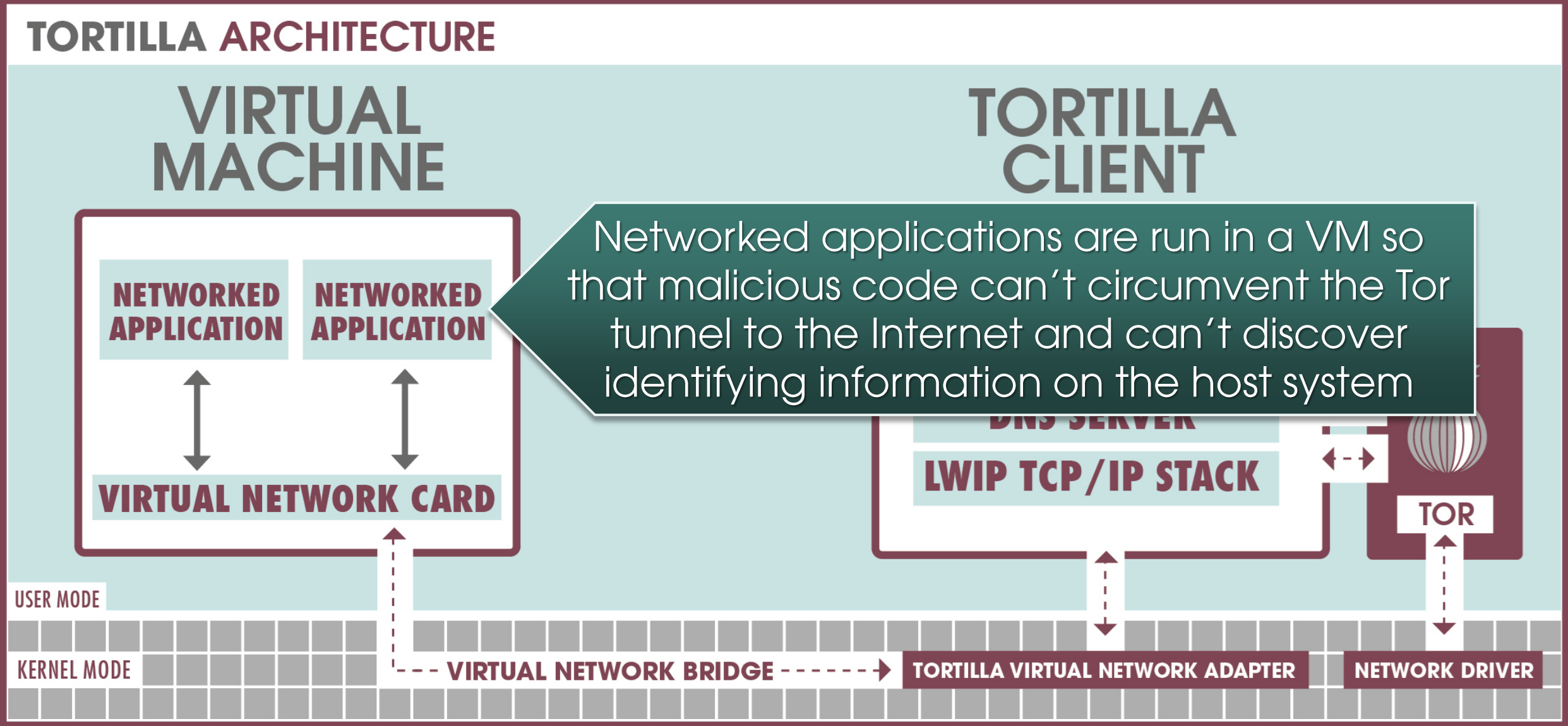

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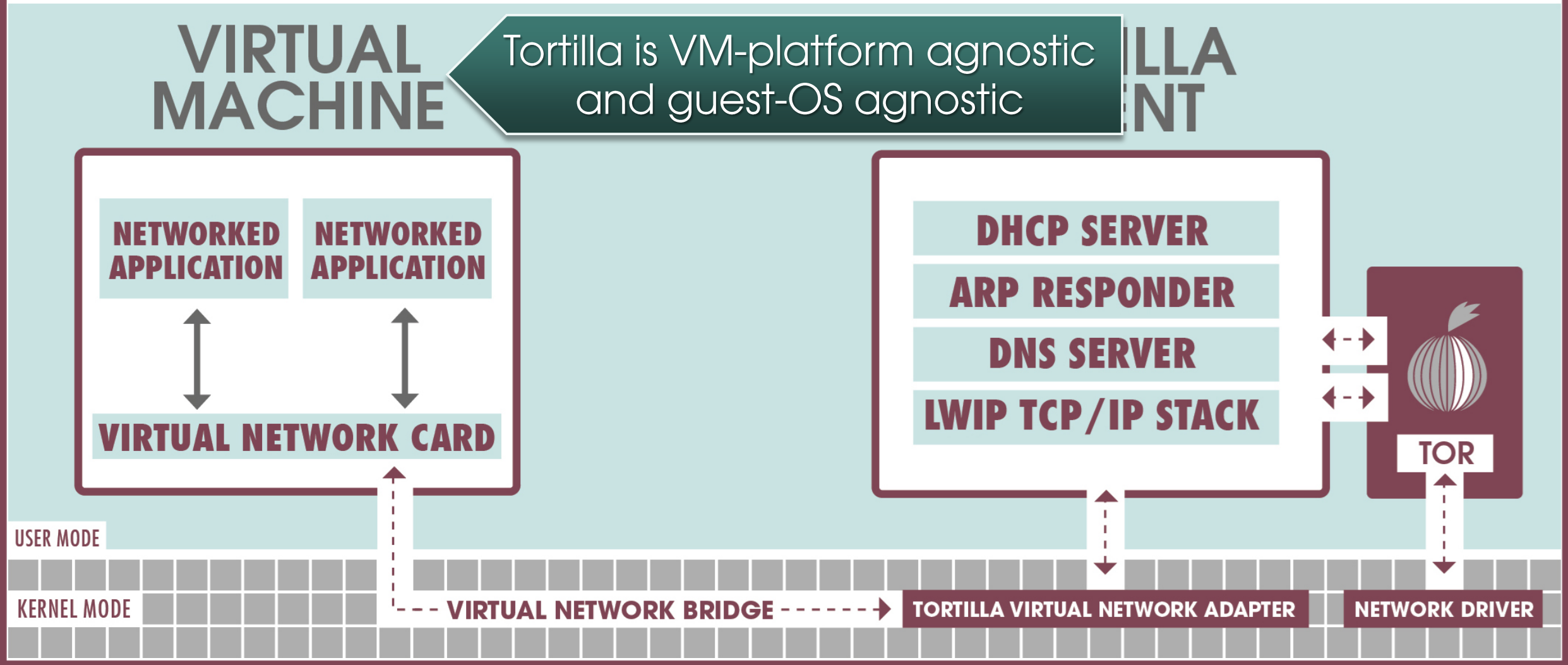

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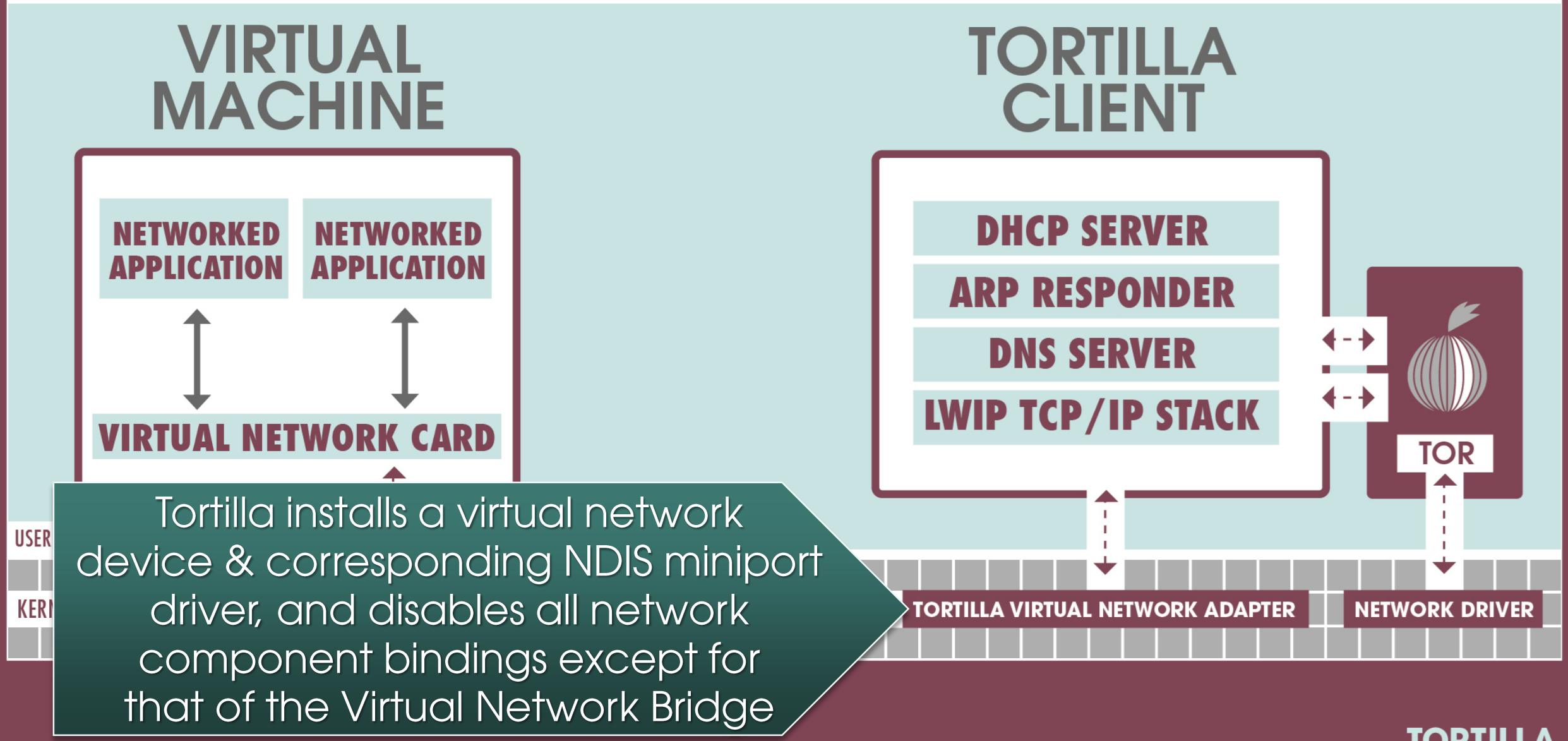

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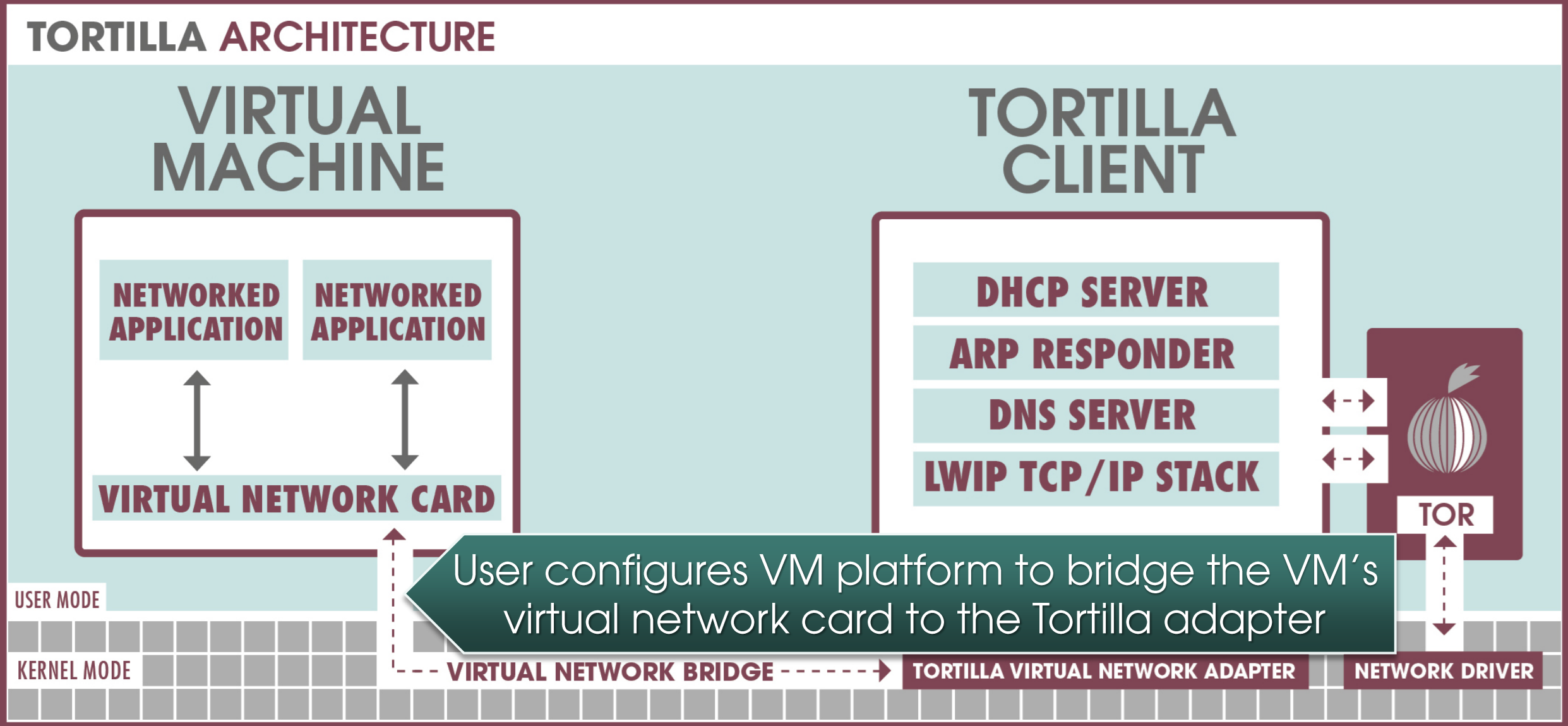

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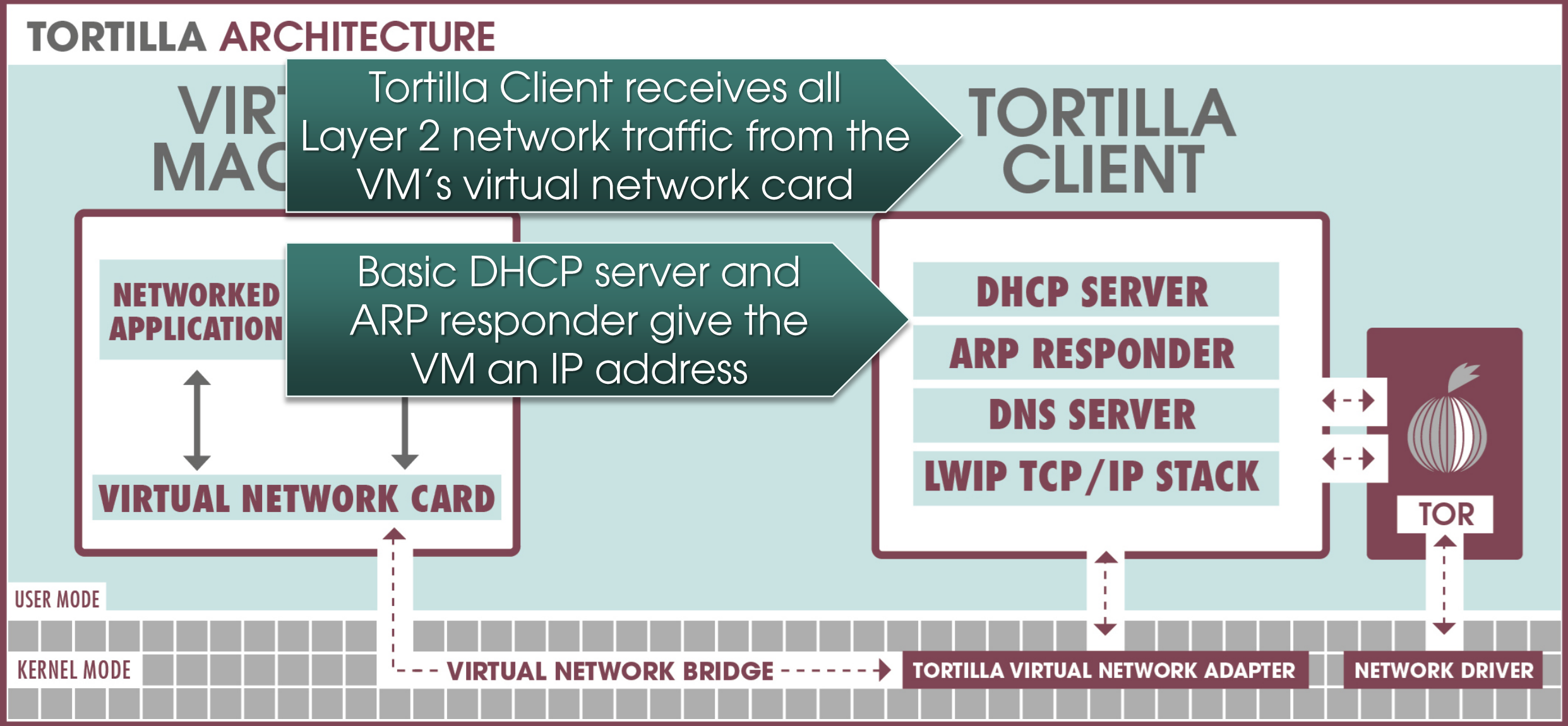

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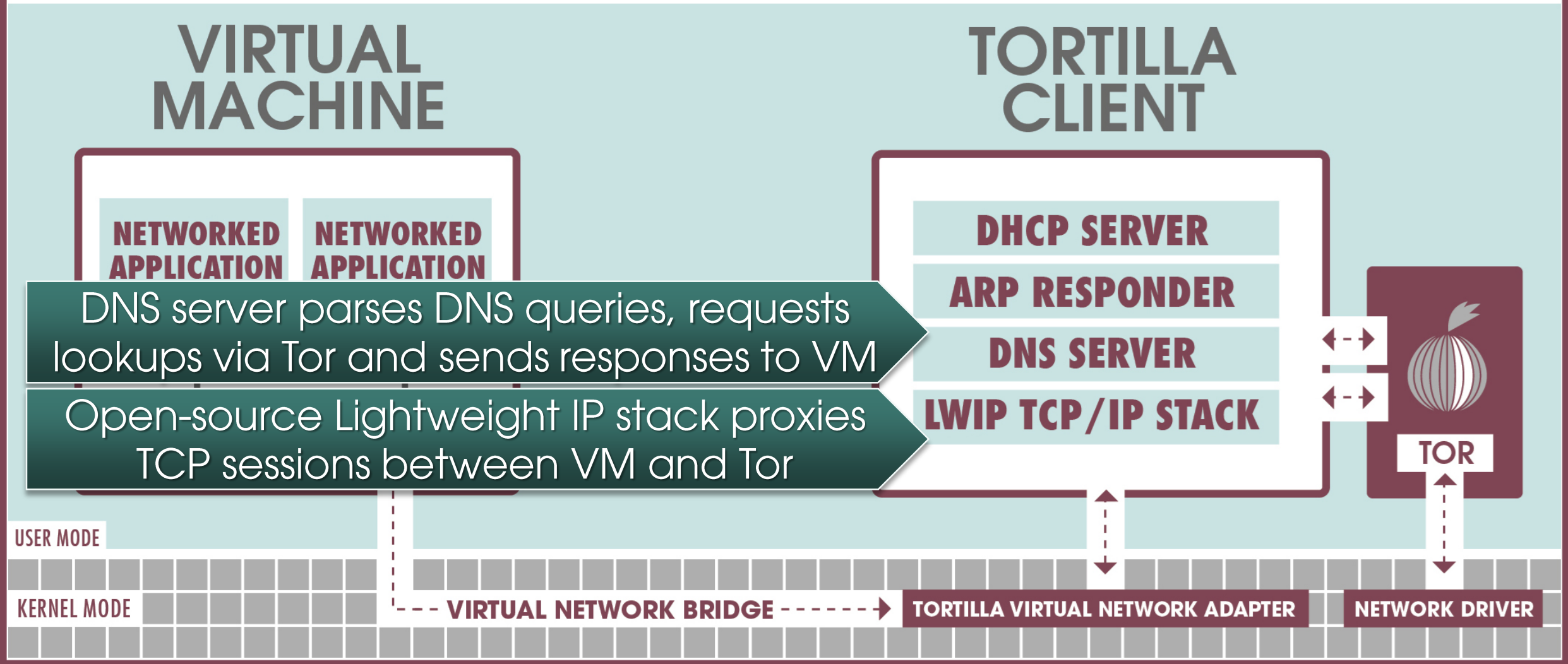

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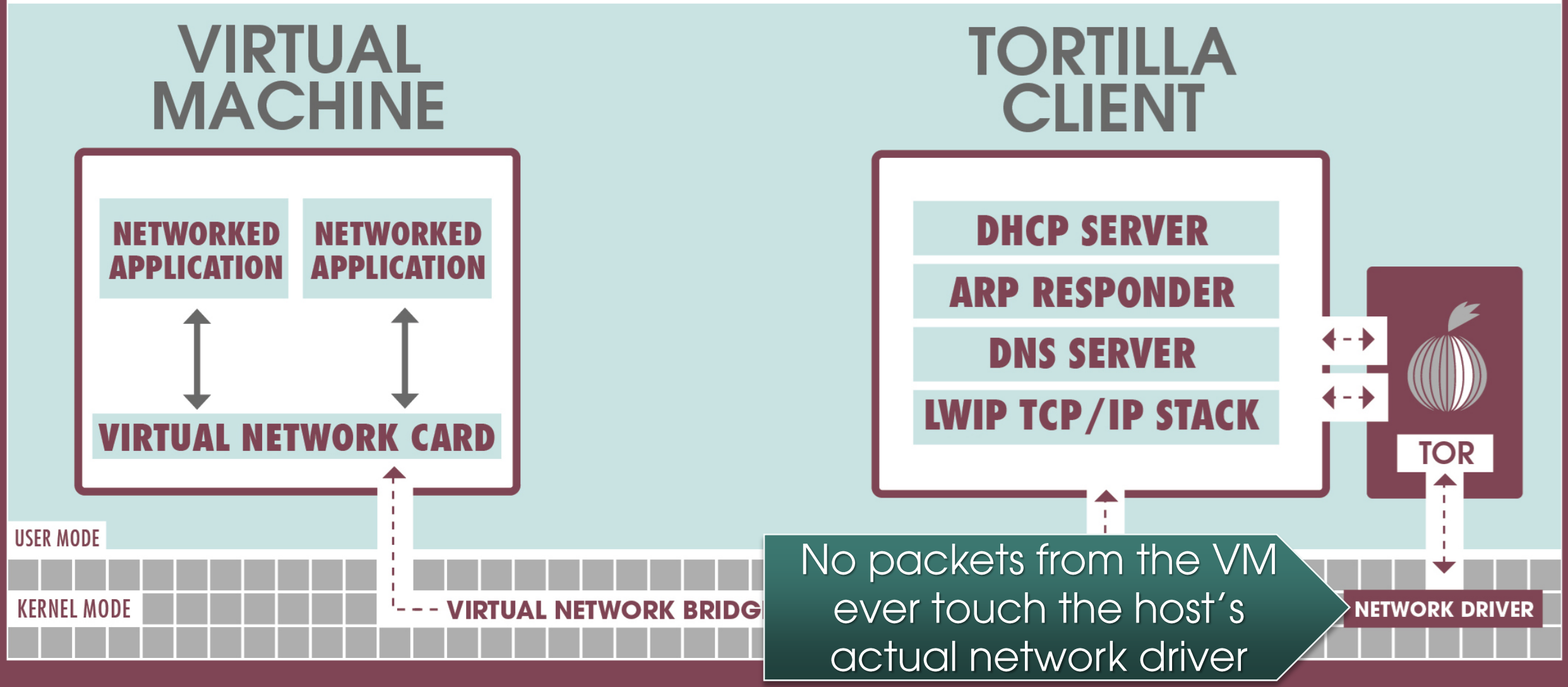

Tortilla is open-source and supports 32-bit and 64-bit Windows host systems

Installation and Usage

- Tortilla ships as a single executable – Tortilla.exe

- When Tortilla.exe is executed on host system:
  - Extracts default Tortilla.ini file if not already on disk
  - Extracts 32-bit or 64-bit driver, depending on host OS
  - Extracts and executes driver installer
    - Installs Tortilla device and driver if not already installed
    - Disables all of the device's network component bindings except for that of the Virtual Network Bridge

Installation and Usage

- When Tortilla.exe is executed on host system:
  - Establishes secure communication channel between Tortilla client and driver
  - Begins listening for Layer 2 packets from VM
  - Acts on DHCP, ARP, DNS, and TCP packets, and drops everything else
  - Optionally stores all traffic to and from VM in a PCAP file on host

Complete Failsafe Functionality

- User can run Tor before or after starting Tortilla.exe
- User can run VM before or after starting Tortilla.exe
- User can configure VM platform's Virtual Network Bridge before or after starting Tortilla.exe (though Tortilla device must already be installed)

Minimal System Footprint

- No registry modifications (aside from Tortilla device and driver installation)
- No file system modifications (aside from Tortilla.ini and installed Tortilla driver)

- Can be uninstalled by just deleting Tortilla.exe and Tortilla.ini, and uninstalling Tortilla Adapter from Device Manager

Demo

Free and Open-Source

You can download Tortilla right now!

http://www.crowdstrike.com/community-tools

Summary

- Tortilla is a free and open-source solution for Windows that transparently routes all TCP and DNS traffic through Tor
- Tortilla does not allow any network traffic onto the Internet unless it goes through Tor
- Tortilla does not require extra hardware or extra VMs
- The Tortilla platform does not allow malware to circumvent the Tor tunnel to communicate directly with the Internet

Q & A

Special Thanks

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- Aaron Putnam

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