Attacking the Remote Desktop Protocol
A Hands-On Workshop

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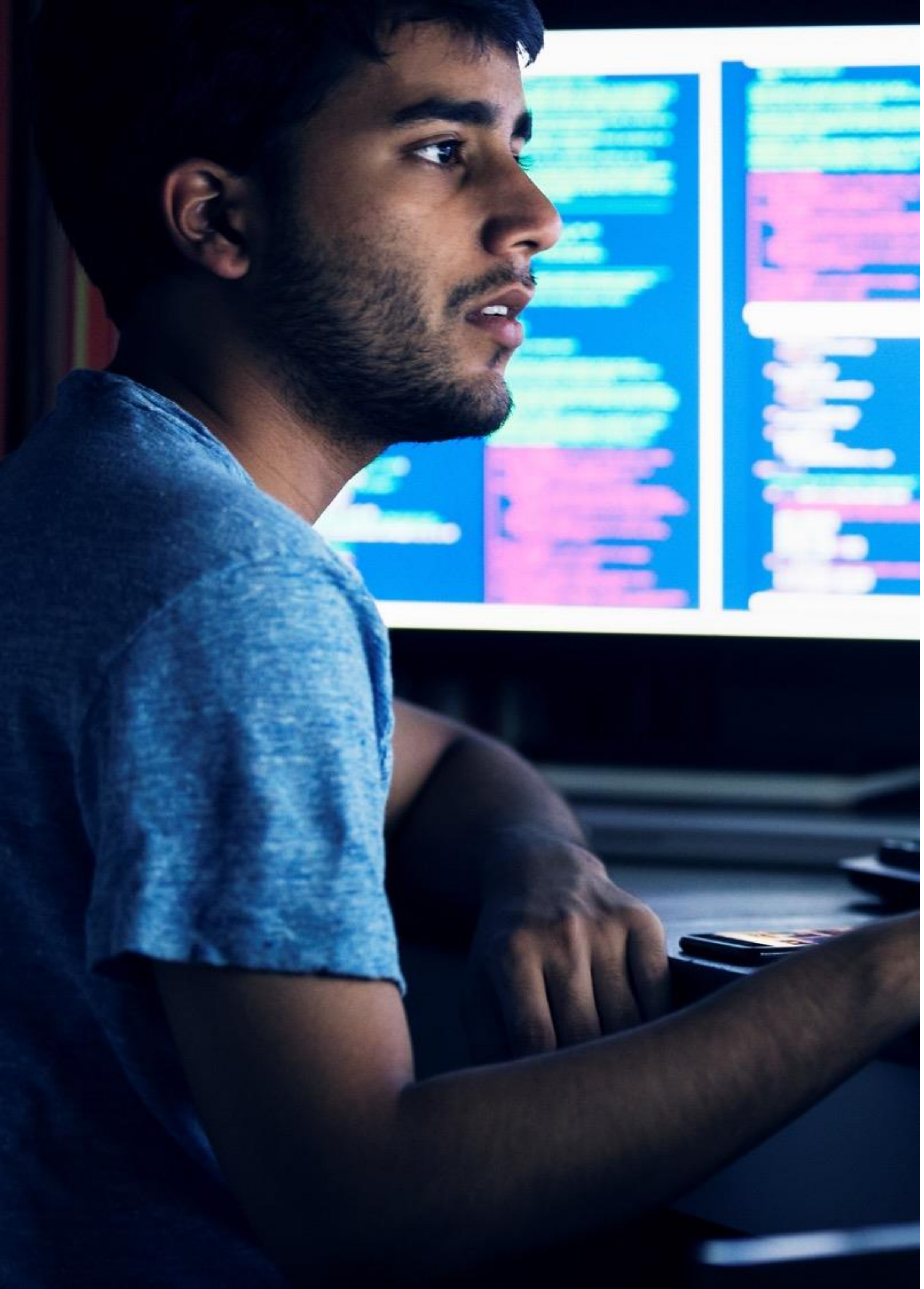
- Jack of all trades, master of none
- Co-founder MontréHack (hands-on security workshops)
- NorthSec Hacker Jeopardy



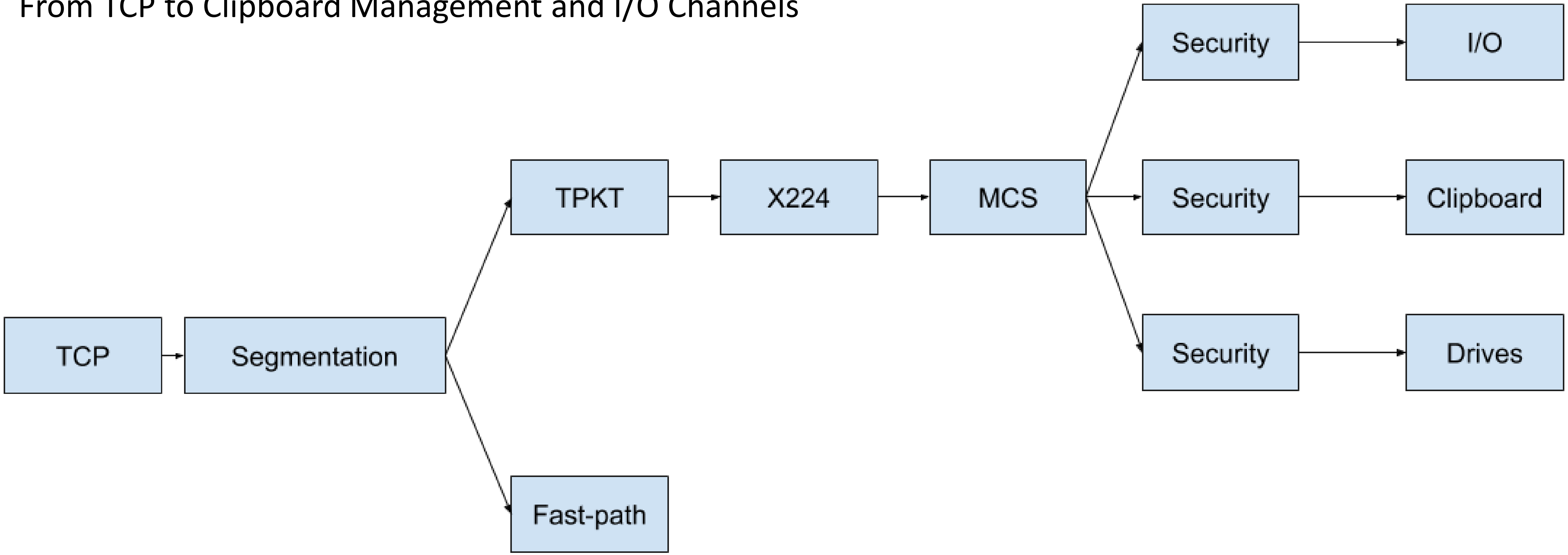
Agenda

- Introduction to RDP
- What is the PyRDP attack tool?
- Interactive Demos
  - Perform an eavesdropping monster-in-the-middle attack
  - Watch previously recorded sessions
  - Use the interactive player to crawl client filesystem
  - Perform a hijacking monster-in-the-middle attack
  - Extract private RDP keys from Windows and use them in PyRDP

Introduction to RDP

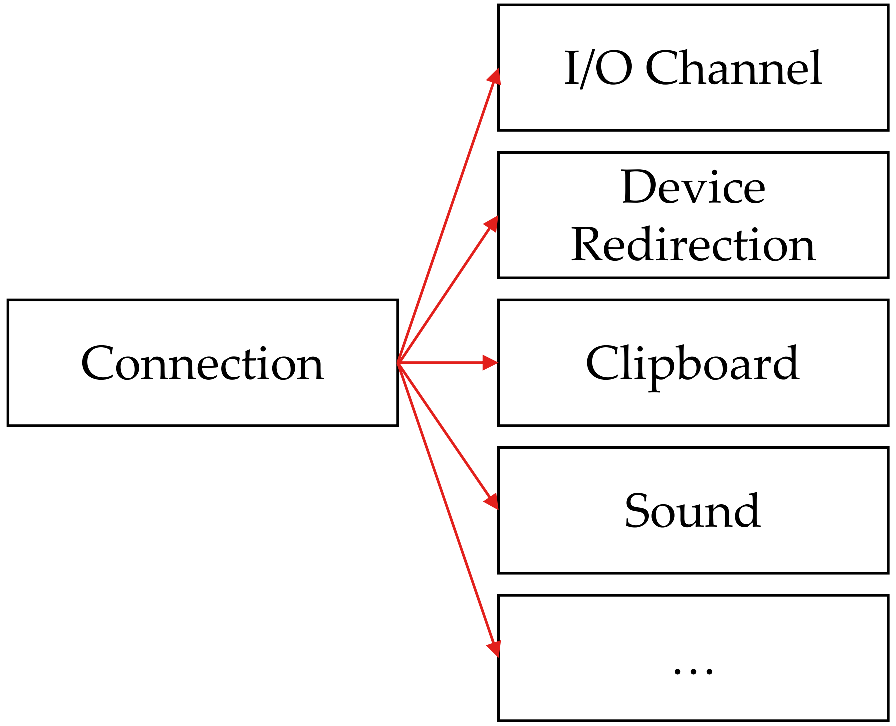
RDP Layers

From TCP to Clipboard Management and I/O Channels

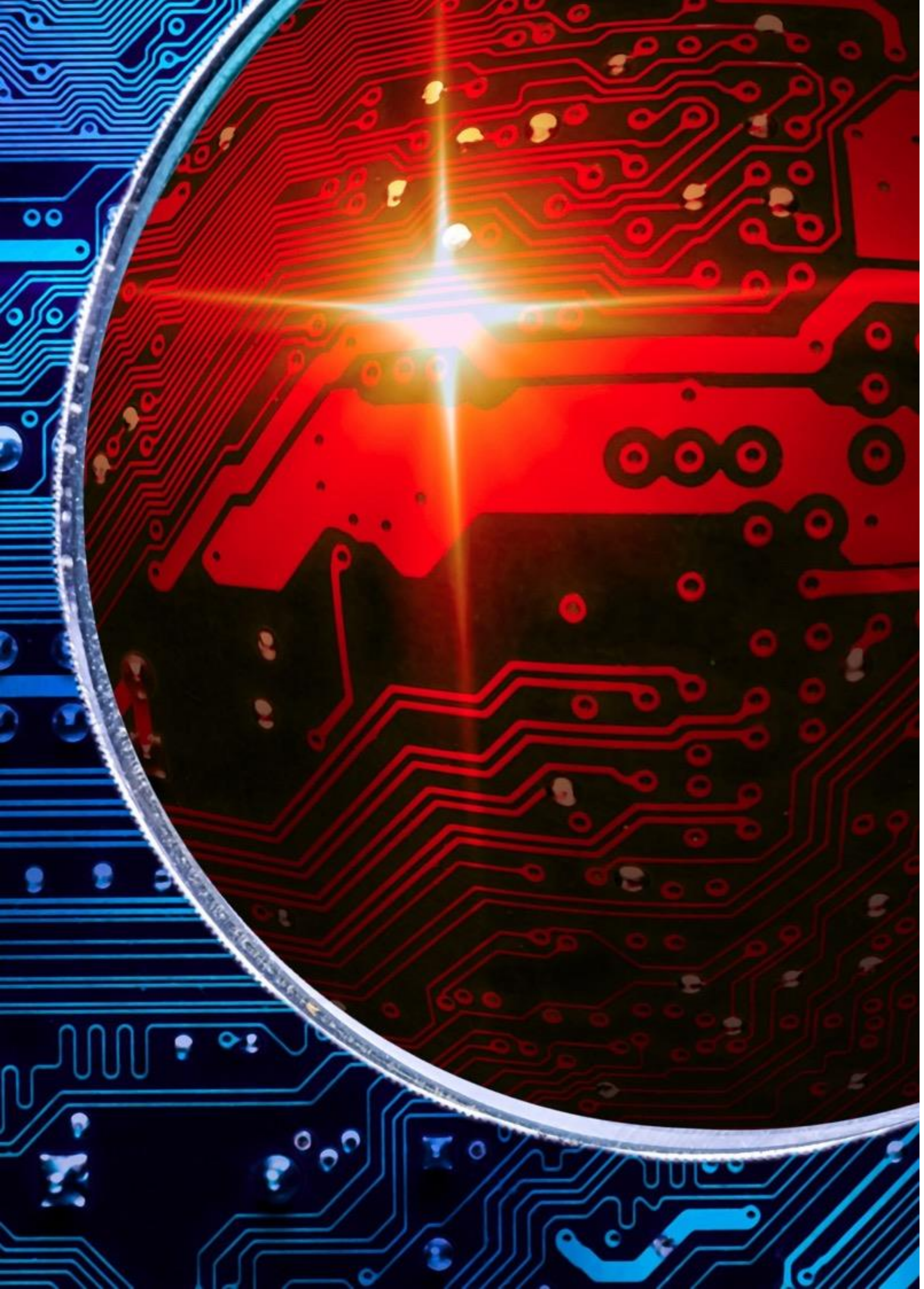


RDP Virtual Channels

Multiplexing data and extensions within a single connection



- Extra RDP features and extensions are implemented in virtual channels
- Server sends a list of available channels during connection phase
- Client chooses which channels to join



RDP Security

- RC4 + Graphical login (dead)
- TLS + Graphical login (legacy)
- TLS + Network Level Authentication (NLA) which relies on CredSSP

What is PyRDP?

Core Features

MITM

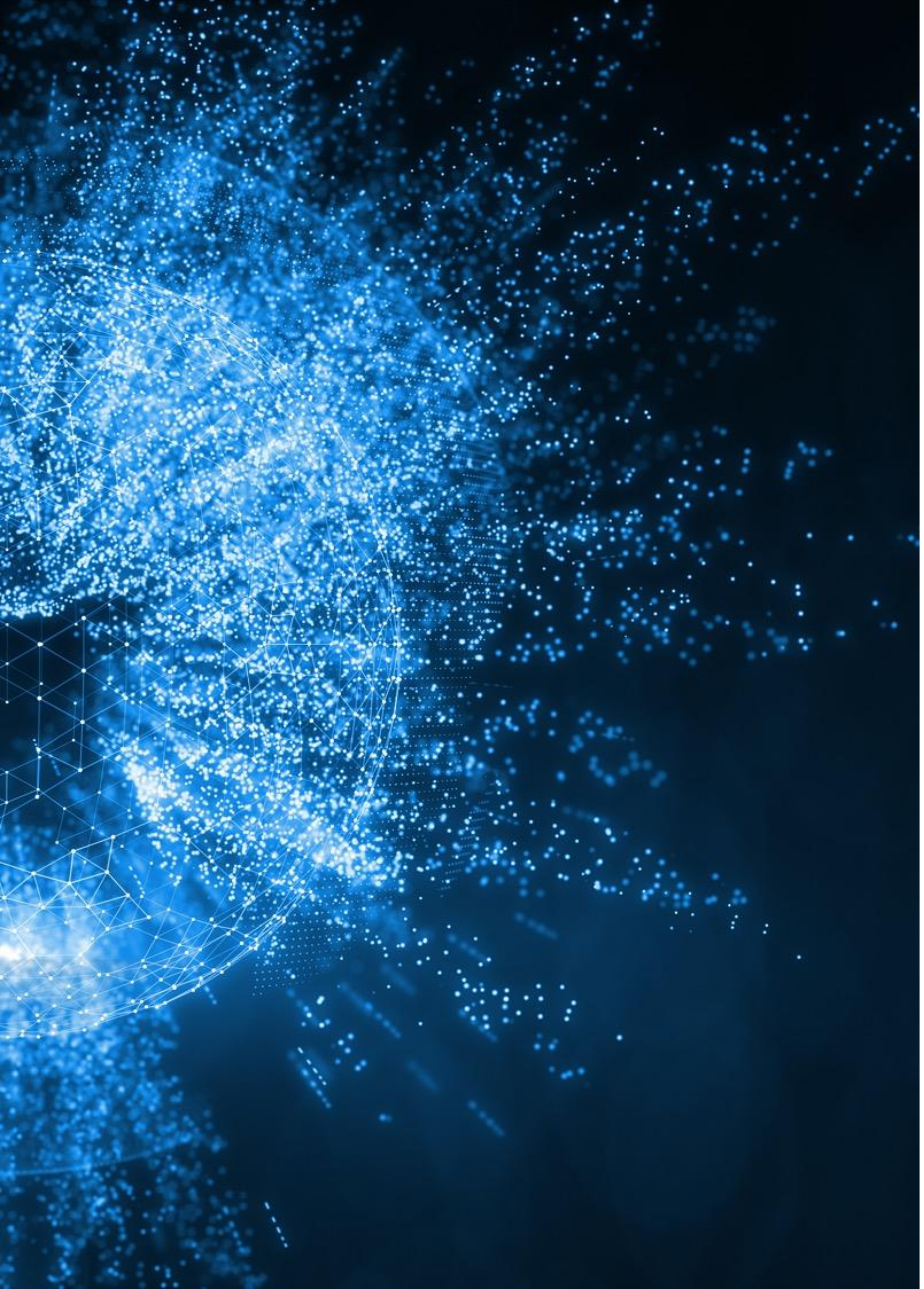
- Credentials collected
- Clipboard actively stolen
- File collector
- Extensive recording and logging

Player

- Live replay of exact keystrokes and mouse movement
- Decoupled from MITM: sessions can be sent over the network
- After the fact replay of sessions recorded by the MITM

Convert

- Recorded sessions can be converted to MP4
- Pcaps can also be converted to MP4 or PyRDP session files



Lab 1

Install the tool

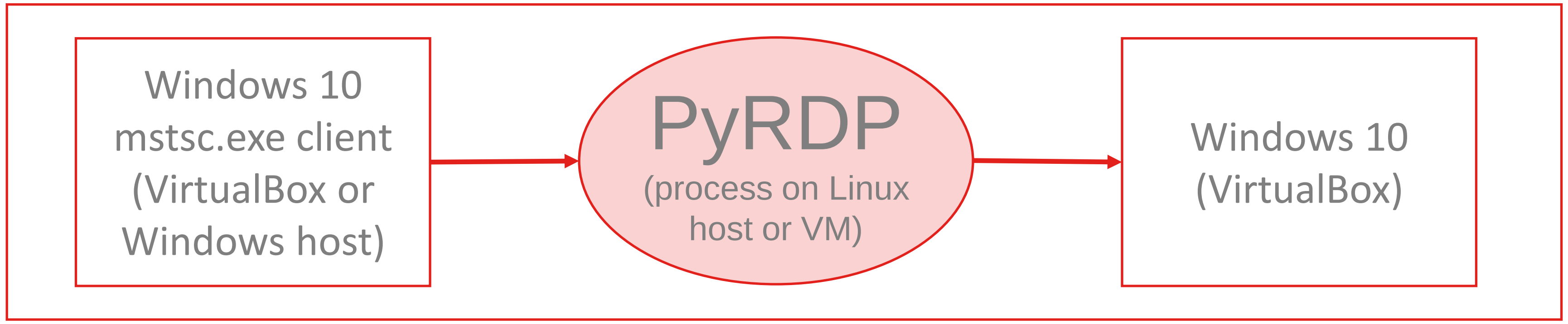
Follow instructions here:

https://github.com/GoSecure/pyrdp#from-git-source

Lab 2

Perform an Eavesdropping MITM Attack

- Credentials, keystrokes and clipboard interception
- Take a look at the logs

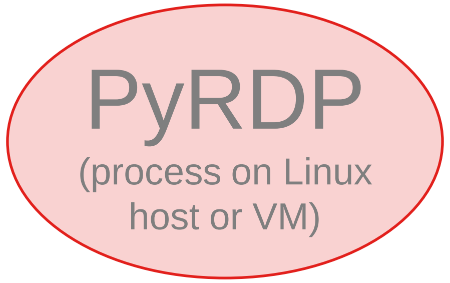

Windows 10 mstsc.exe client (VirtualBox or Windows host)
PyRDP
(process on Linux host or VM)
Windows 10 (VirtualBox)

My laptop (Linux)

Lab 3

Use PyRDP Player to View Past Sessions

- Things that were collected



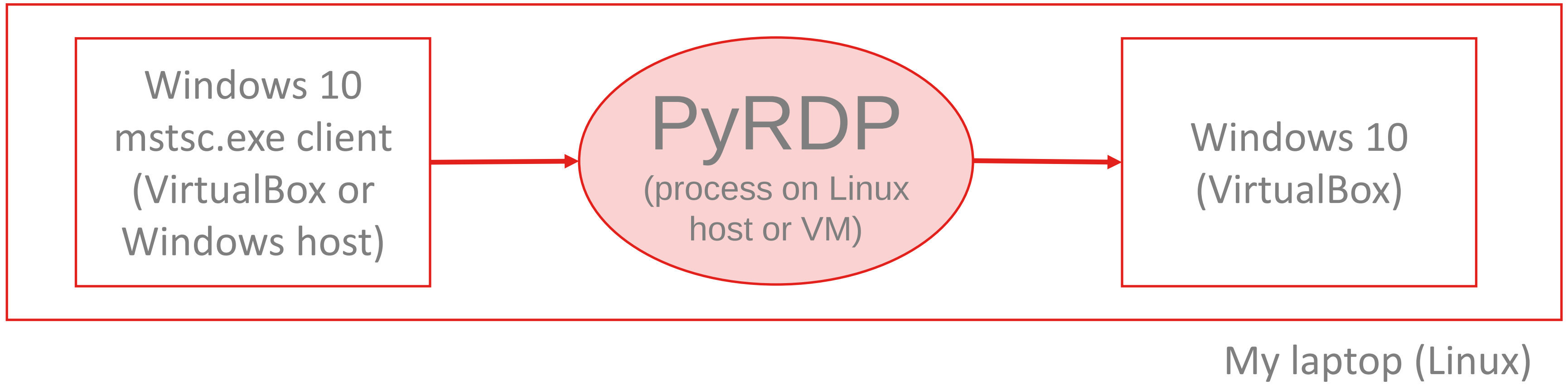
PyRDP

(process on Linux host or VM)

Lab 4

Use the Interactive Player

- Crawl client-side filesystem
- See screen, keystrokes, clipboard stealer in real-time



Windows 10 mstsc.exe client (VirtualBox or Windows host)

PyRDP (process on Linux host or VM)

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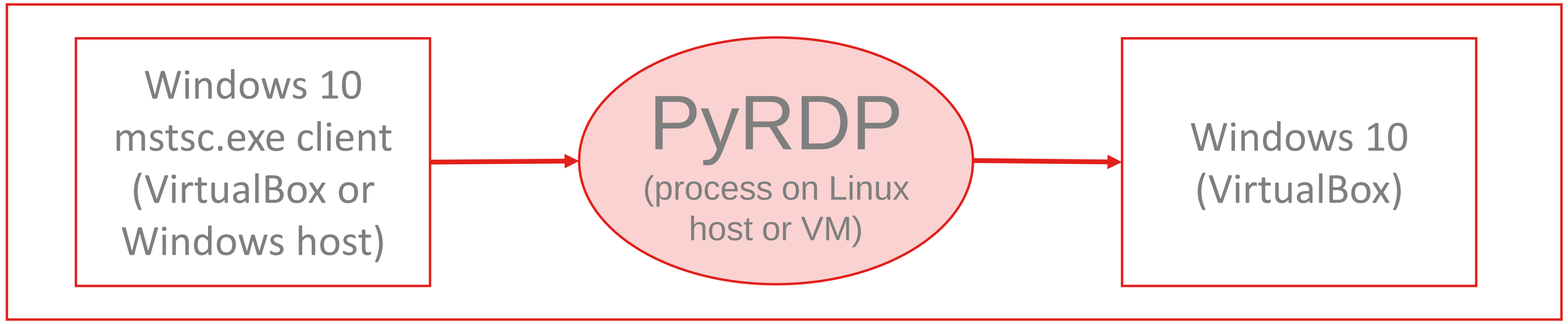
My laptop (Linux)

Lab 5

Use the Interactive Player

- Hijack the client's connection
- Run a payload



Windows 10 mstsc.exe client (VirtualBox or Windows host)

PyRDP (process on Linux host or VM)

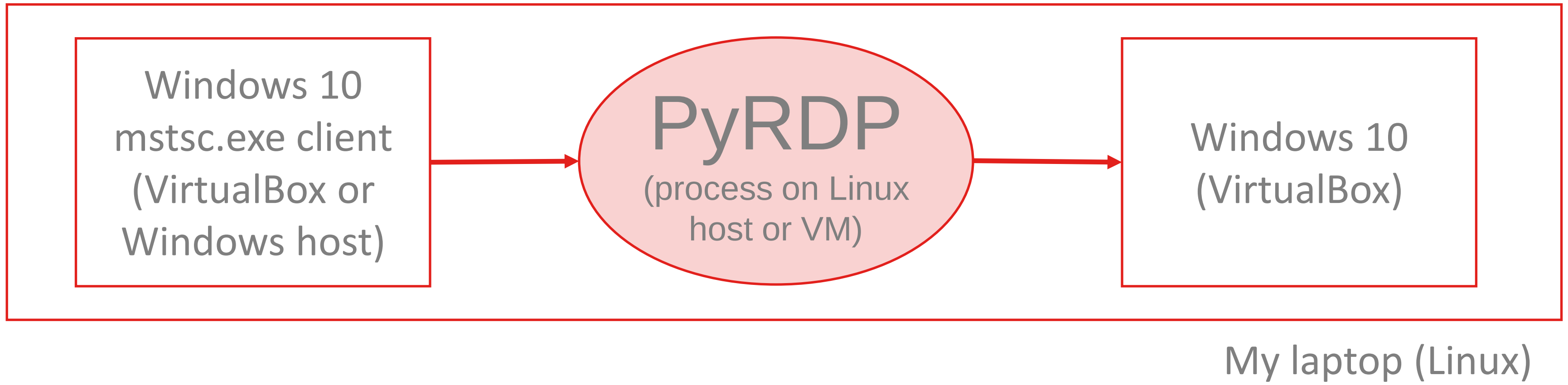
Windows 10 (VirtualBox)

My laptop (Linux)

Lab 6

Attacks on Network Level Authentication

- Extract the private certificate
- Install it on host
- Perform MITM with CredSSP and certificate and private key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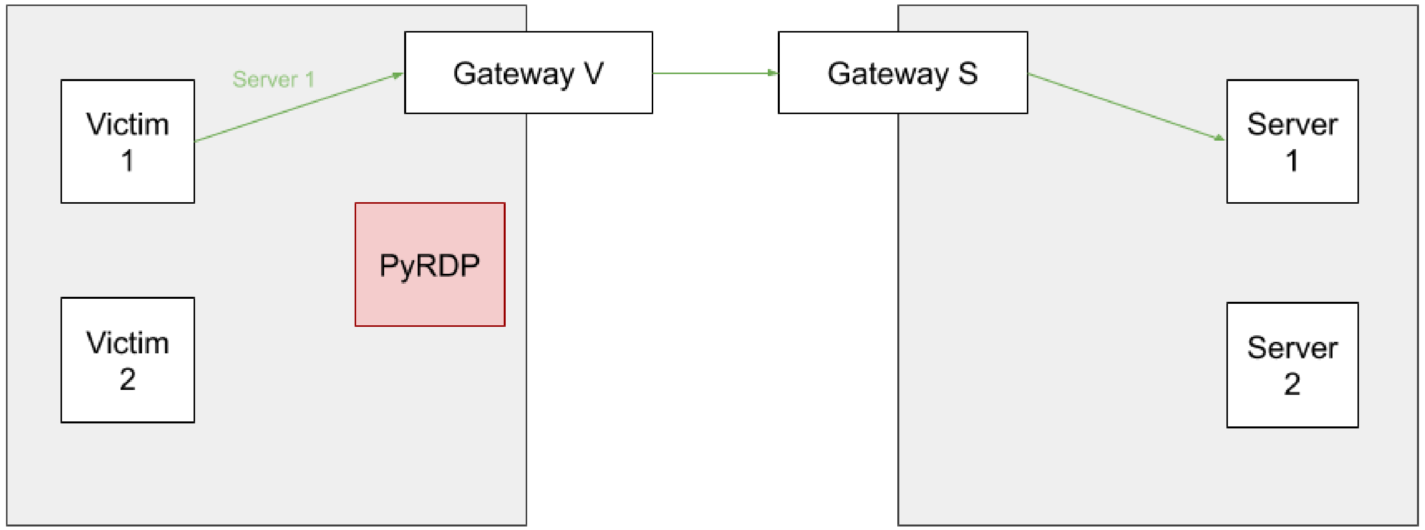
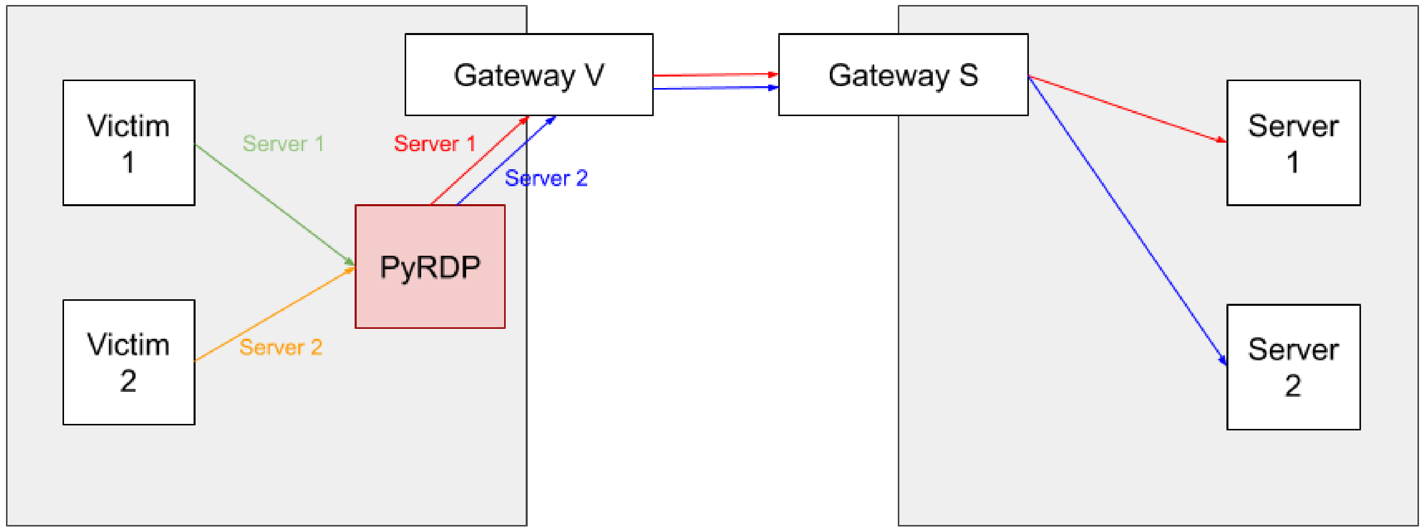
Transparent Proxying

Transparently intercept subnets at scale with ARP spoofing



No ARP Spoofing / TPROXY

Clients must directly connect to PyRDP



ARP Spoofing + TPROXY

Clients are intercepted and redirected to their intended server*

*Clients will fail to connect if the intended server enforces NLA or requires CredSSP

Wrapping Up

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Attack Limitations

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- Certificate error upon connection
  - Certs are not CA signed
- Mapped drives cause an additional warning dialog since Windows 10
- Non-NLA connections cause an additional warning dialog since Windows 10
- ARP poisoning is risky

Learn More about PyRDP

Try it out, contribute, give us your feedback!

Source Code / Documentation

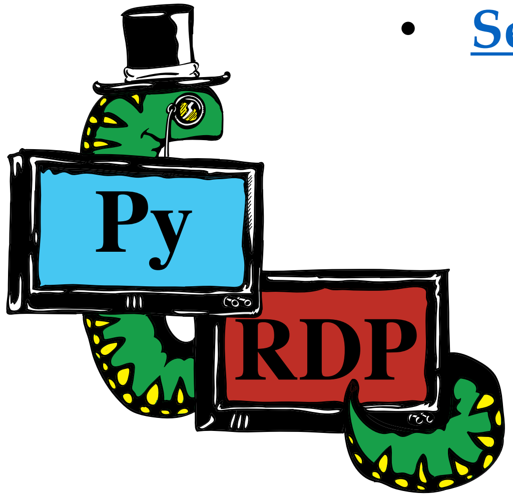
- https://github.com/GoSecure/pyrdp
- PyRDP Transparent Proxying Guide
- RDP Connection Sequence
- RDP Basic Protocol Specification
- Certificate Extraction for NLA

Past Presentations & Blogs

- Introduction Blog Post
- NorthSec 2019 Talk
- BlackHat Arsenal 2019
- Blog: PyRDP on Autopilot
- DerbyCon 2019 (Video)
- Defcon DemoLabs 2020
- Blog: Announcing PyRDP 1.0
- SecTor 2020 Presentation

Thanks to all PyRDP contributors!

- Alexandre Beaulieu, Francis Labelle, Émilio Gonzalez, Maxime Carbonneau, Sylvain Peyrefitte, @coolacid and more…



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