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### ► To cite this version:

Manuel Poisson, Sébastien Kilian, Valérie Viet Triem Tong, Jean-François Lalande, Gilles Guette, et al.. Digital twin for security evaluation using an attack agent. USENIX 2024 - 33rd USENIX Security Symposium, Aug 2024, Philadelphia, United States. , pp.1-1, 2024. hal-04708718

**HAL Id: hal-04708718**

**<https://inria.hal.science/hal-04708718v1>**

Submitted on 25 Sep 2024

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# Digital twin for security evaluation using an attack agent

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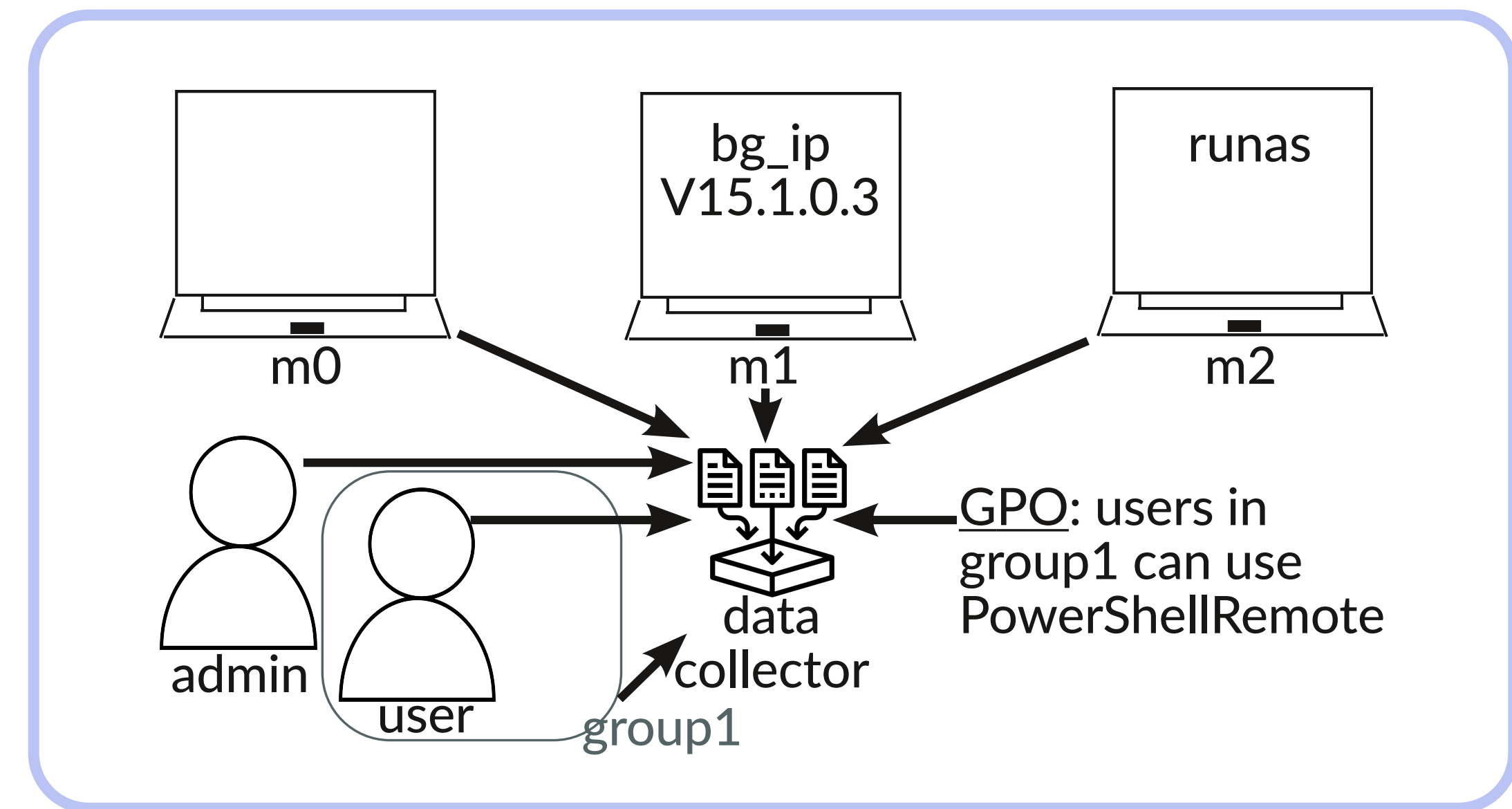
V. VIET TRIEM TONG, J-F LALANDE, G. GUETTE, F. GUIHÉRY, D. CRÉMILLEUX

Discover attack paths in an information system without affecting the services in production.

Collect data in an information system (IS) in production

## ✓ Dynamic data collection

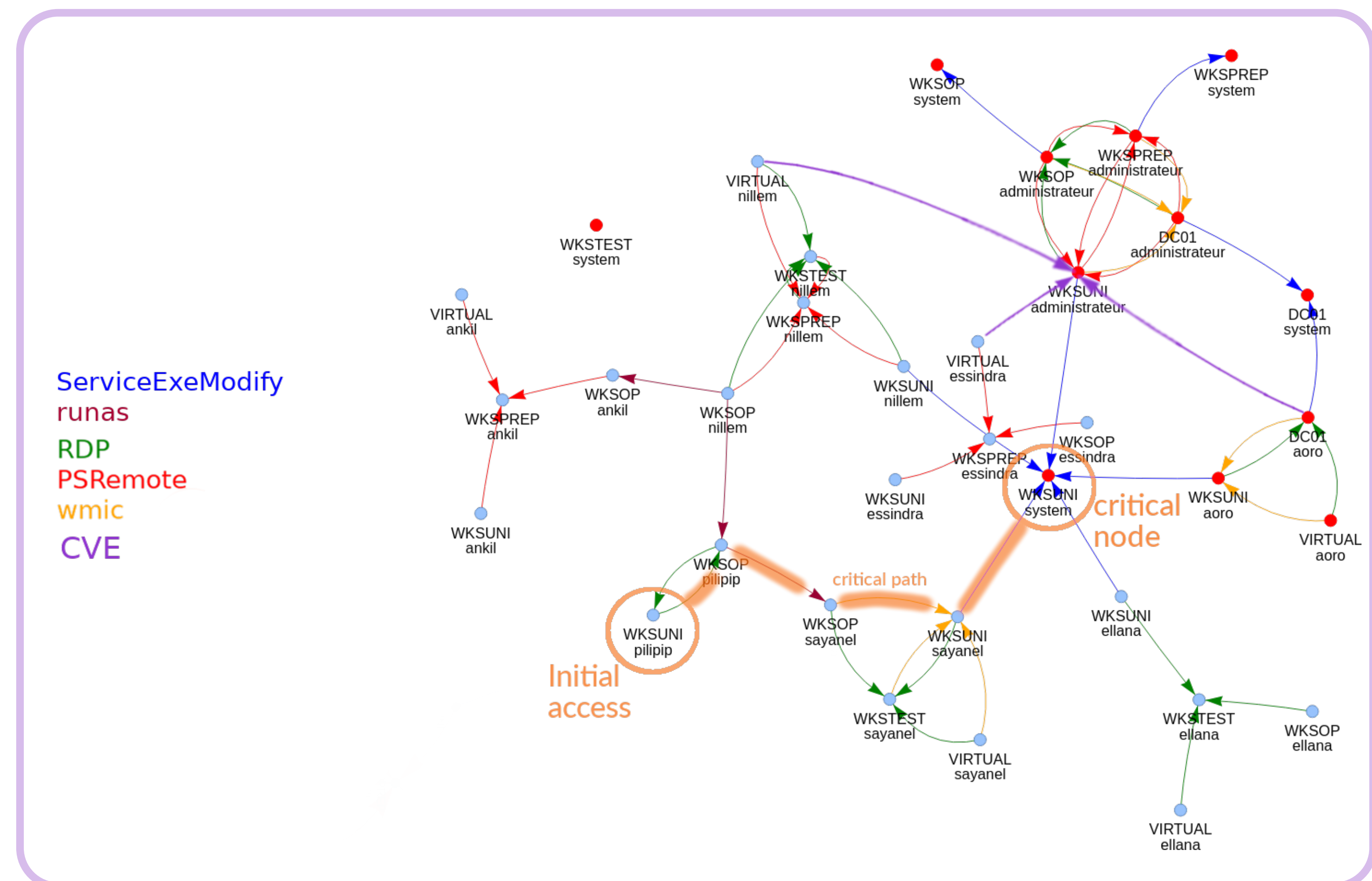
- Machines, users and groups
- GPO (in Active Directory): define settings and permissions for groups in the IS
- Living of the Land (LotL): legitimate tools abused by attackers
- Software and their version



Model all potential attackers' actions

## ✓ Organize data and model potential attack paths [1]

- Discover attack positions and lateral/vertical movements
- Highlight attack path in a graph



Generate a digital Twin

## Virtual topology deployment

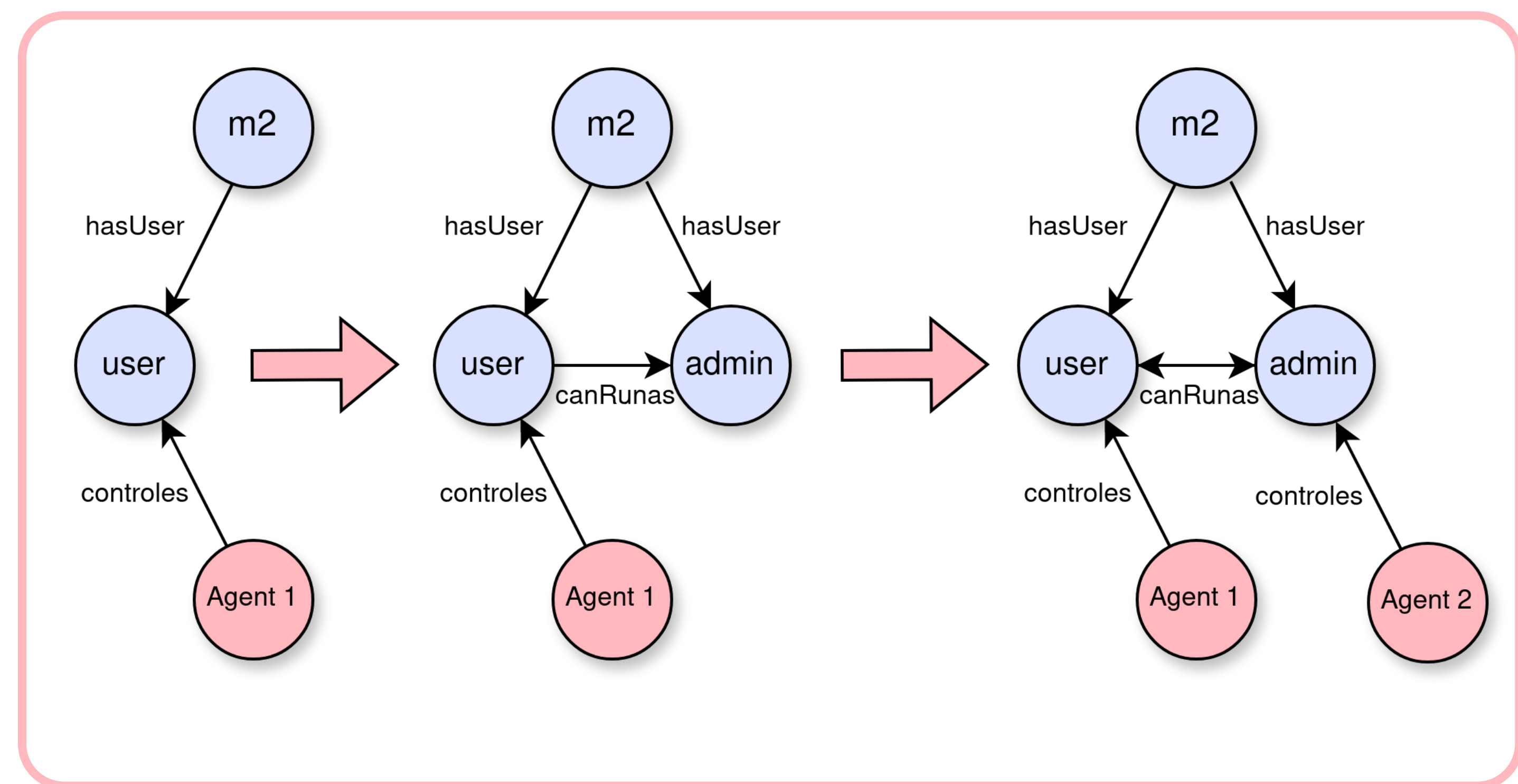
Generate and provision virtual machines in a virtual network

- ✓ URSID [2] <https://gitlab.inria.fr/pirat-public/ursid>
- ✓ M&NTIS <https://mantis-platform.io>

Discover attacker's perception of IS

## Attack agent

- Automated exploits are parameters of the system
- ✓ Attack agent's knowledge is represented as a knowledge graph [3]
- Real exploits reveal the true exploitability of the information system



Assess overall security

## Assess and improve the security level

- Evaluate attack detection: stealthiness of attack paths
- Prevent known attack paths: propose remediations
- Remediations can be tested on the digital twin

## Replicate systems with high fidelity

- Security features are replicated
- Evaluation is done on a digital twin
- Usable attack paths are highlighted by the attack agent

[1] M. Poisson et al. Unveiling stealth attack paths in Windows Environments using AWARE. CSNet 2023 - 7th Cyber Security in Networking Conference, IEEE ComSoc, 2023

[2] P-V Besson et al. URSID: Automatically Refining a Single Attack Scenario into Multiple Cyber Range Architectures. FPS 2023

[3] A. Berady et al. PWNJUTSU: A Dataset and a Semantics-Driven Approach to Retrace Attack Campaigns - IEEE TNSM 2022

This work has benefited from a government grant managed by the National Research Agency under France 2030 with reference "ANR-22-PECY-0007"