Leurré.com: a worldwide distributed honeynet, lessons learned after 4 years of existence

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Foreword

- **M. Dacier joined Symantec on the first of April 2008 as the director of Symantec Research Labs Europe.**
  - » These slides present work done with partners while he was at the Eurecom Institute.
  - » The views expressed here are the ones of the author and are not necessarily shared by Symantec

Overview

- **Introduction**
  - » Leurré.com V1.0 set up and lessons learned
  - » Leurré.com V2.0 set up
  - » WOMBAT
- **Conclusions**

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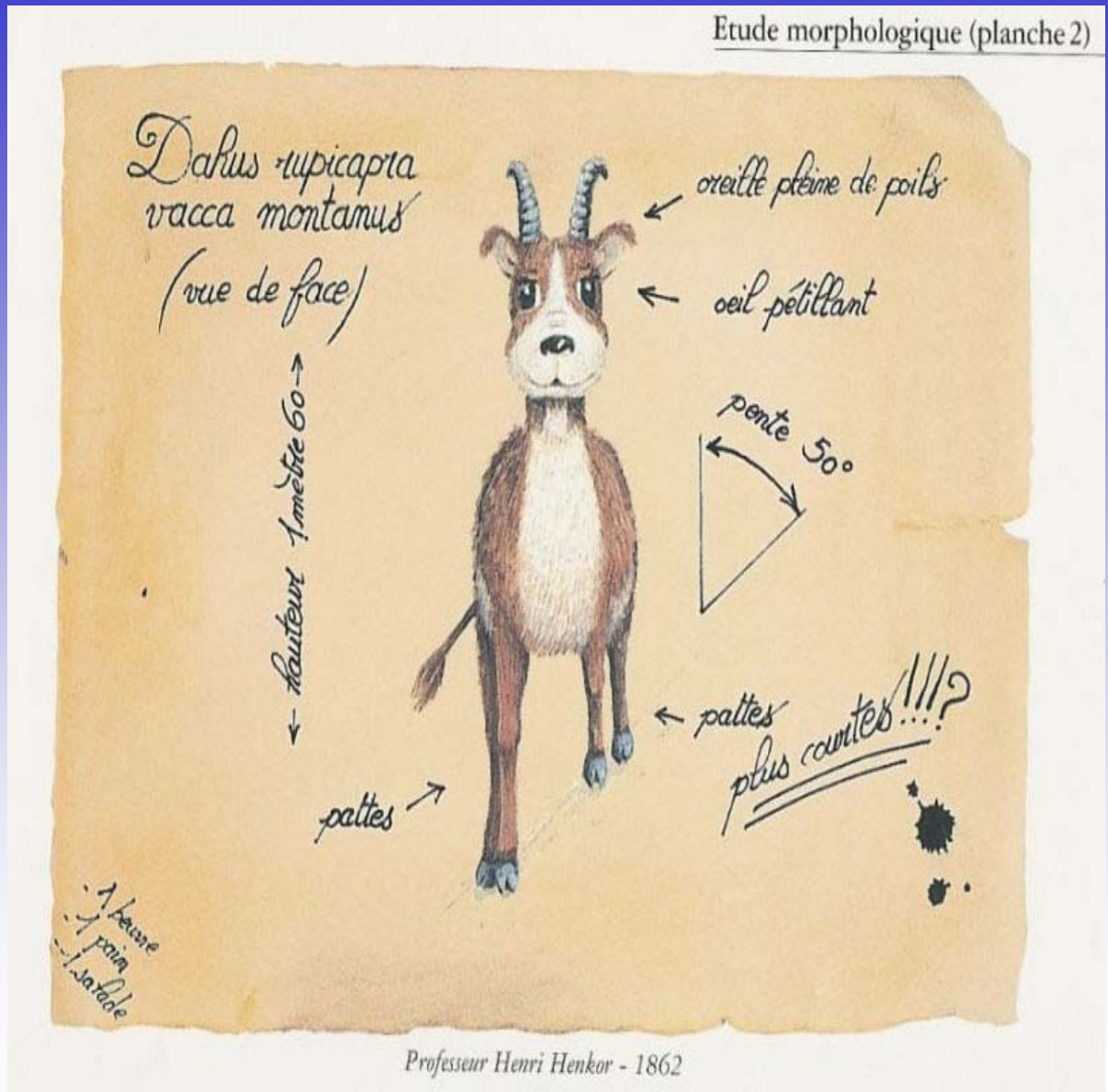
Dahu: definition

- **“The Dahu is an extremely shy animal living in the Alps of France and Switzerland.[…] It has adapted to its steep environment by having legs shorter on the uphill side and longer on the downhill side […] “**
  - “The Dahu, An endangered Alpine species”, Science, 2568, November 1996, pp.112:
  - http://www.vidonne.com/html/dahu-reignier.htm



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Food for thoughts …

- **Dahus are rare, bizarre, stimulating from an intellectual point of view but ...**
  - » Does it justify the existence of *Dahusian research*?
  - » How can we make sure we are not building tools against *Dahusian hackers*?
  - » How can we avoid inventing *Dahusian solutions*?

Data, data and more data

- **Experimental validation is at the core of every scientific discipline.**
  - » Computer security should not be different
  - » Data collected in a rigorous way may reveal interesting actionable knowledge

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Leurré.com V1.0

- **Ongoing effort since 2003**
  - » Almost 50 platforms in 30 countries today
  - » Uses low interaction honeypot (based on honeyd)
  - » Stores all enriched tcpdump (os fingerprinting, geographical location, etc.) in an Oracle DB open to all partners.
  - » Collection of tools, interfaces (java, matlab, python, etc.) and documentation available for free to all partners.

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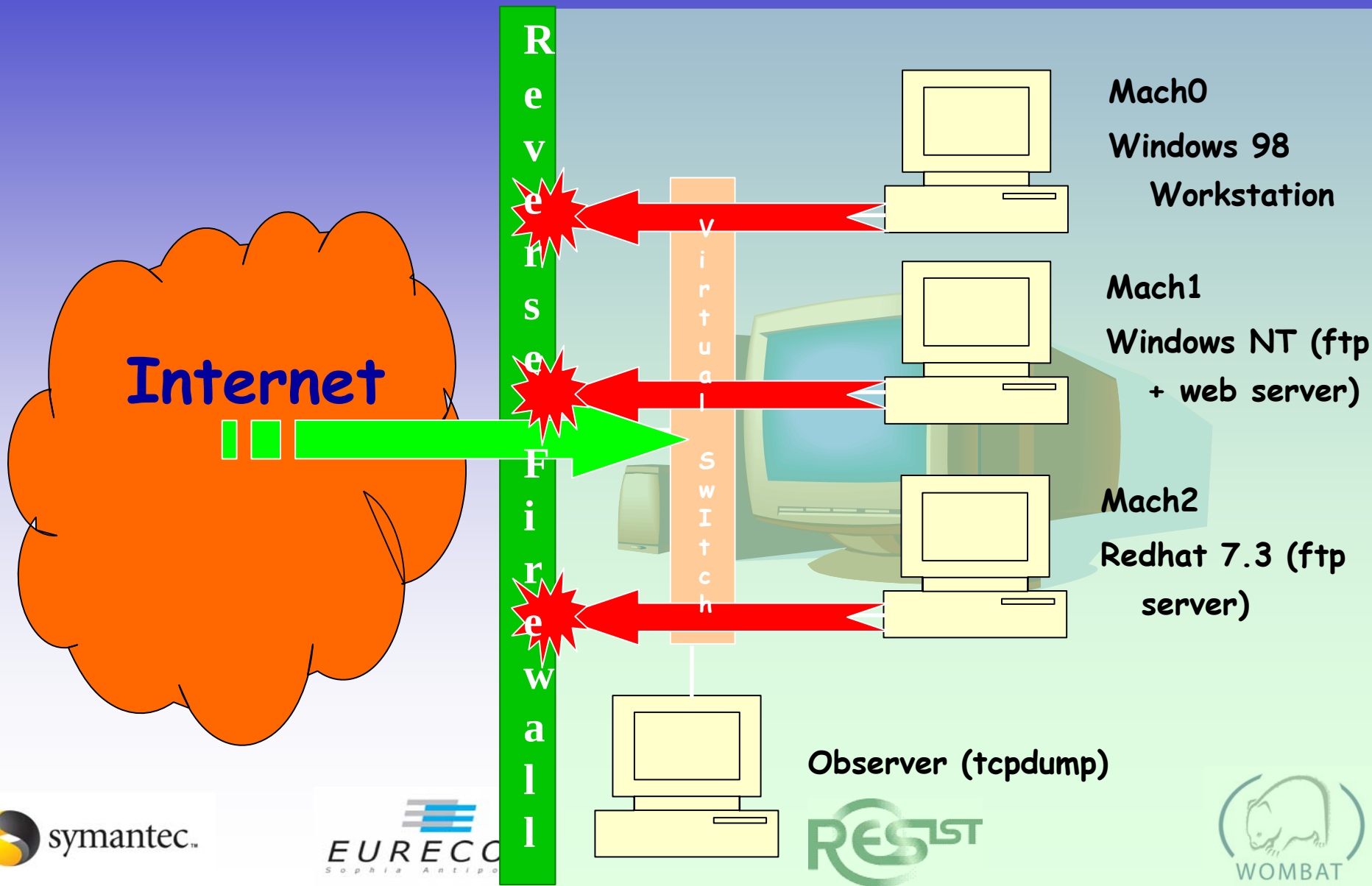
Experimental Set Up (based on honeyd)



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50 sensors in 30 countries (5 continents)

Win-Win Partnership

- **The interested partner provides …**
  - » One old PC (pentiumII, 128M RAM, 233 Mhz…) and 4 routable IP addresses,
- **EURECOM offers …**
  - » Installation CD Rom
  - » Remote logs collection and integrity check.
  - » Access to the whole SQL database by means of a secure GUI and a wiki (over https) + an automated alerting system

Leurré.com V1.0: Lessons learned (1/3)

- **Leurré.com, a collaborative effort:**
  - » Partially funded by the European RESIST NoE (*www.resist-noe.org*)
  - » Key element of the new European WOMBAT Project.. (*www.wombat-project.eu*)
  - » More information is available in the publications listed on the *www.leurrecom.org* web page.

Leurré.com V1.0: lessons learned (2/3)

- **Data used in this presentation:**
  - » Collected between March 14, 2004 and March 14, 2008
  - » Aggregated on a monthly basis.
  - » Names and localizations of the platforms have been anonymized (as imposed by the NDA).
  - » Available by means of dynamic applets at *www.leurrecom.org* after the conference.

Leurré.com V1.0: lessons learned (3/3)

1. **The observed attack strategy**

2. **Safe havens**

3. **Good and bad neighborhoods**

Reality vs. Representation

"*This is not a pipe*"

René Magritte (1898-1967)

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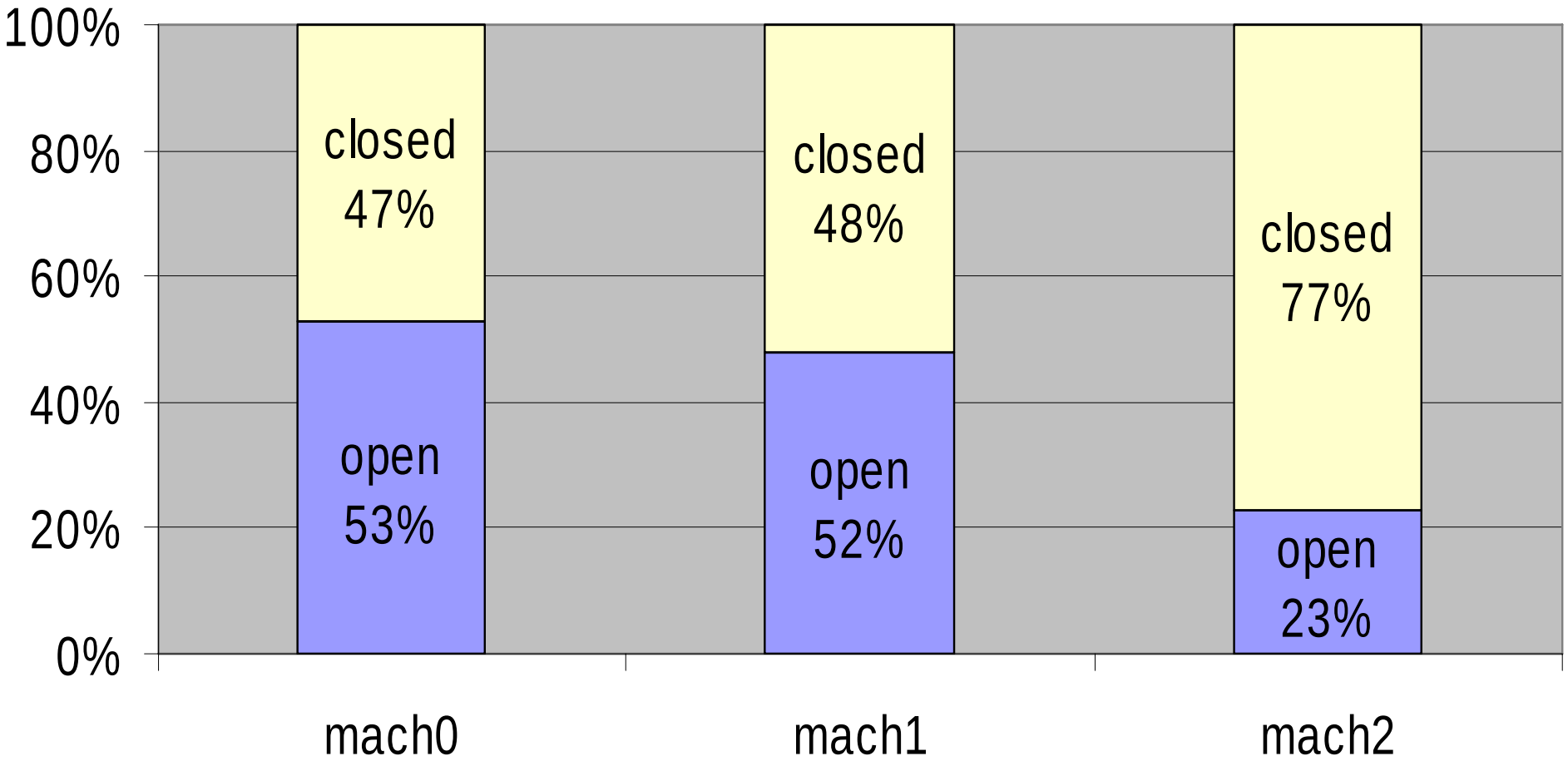
1. The observed Attack Strategy

- **Different groups of compromised machines are used for specific tasks.**
  - » Some do scan the network without attacking anyone
  - » Others do take advantage of this accumulated knowledge to attack vulnerable targets.

1. The observed attack strategy (ctd.)

- **Once a human being eventually logs into a compromised machine, this is achieved from a third, distinct, set of machines.**
  - » In the ssh experimentation carried out with LAAS-CNRS (E. Alata et al.), all of these machines came from a specific country, Romania.

« Scanners »


100%
80%
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mach0
mach1
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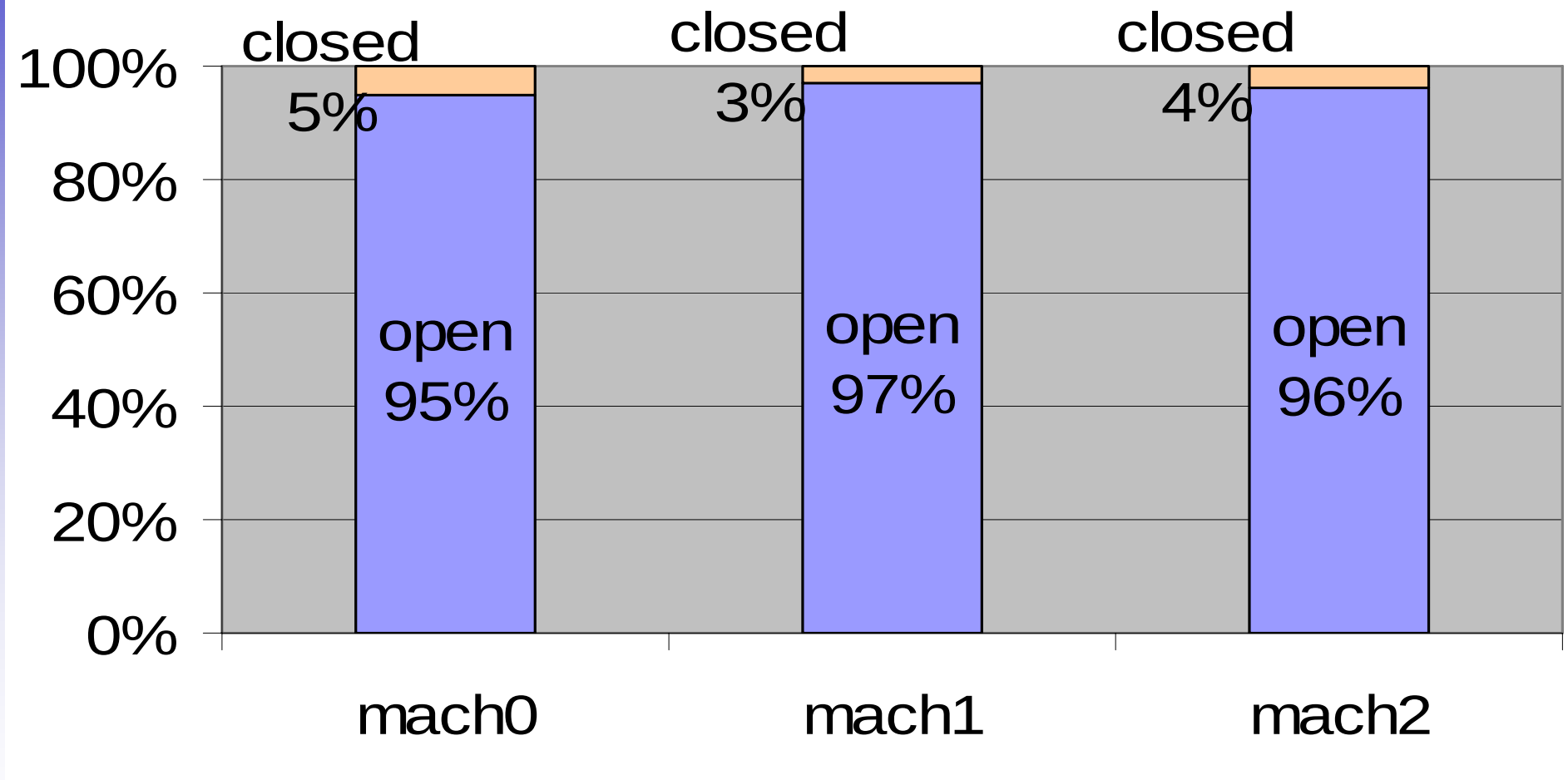
« Attackers »



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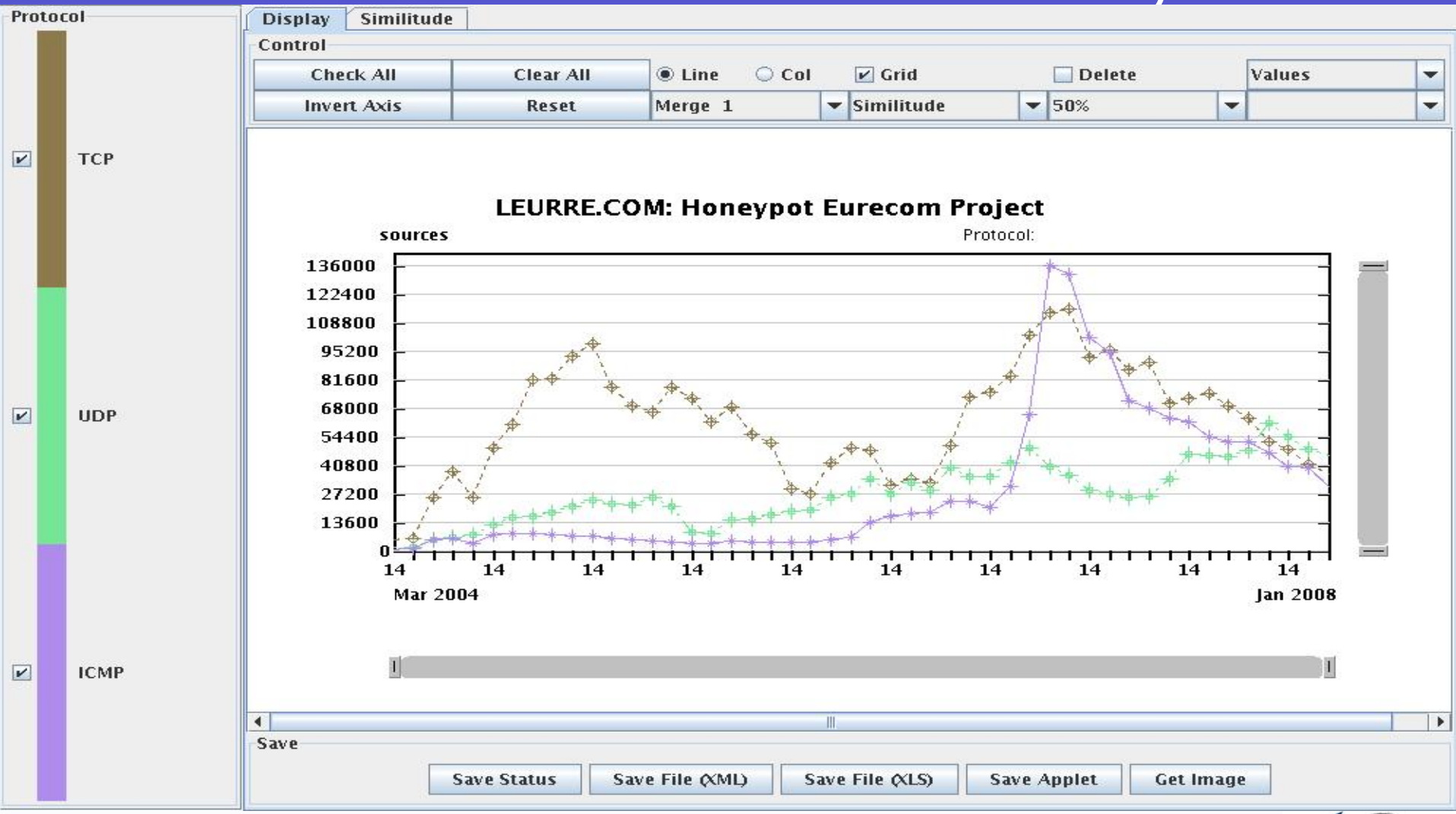
The changing observed attack strategy

- **A supplementary step seems to have emerged:**
  - » ICMP scans precede the two other steps.
  - » New *modus operandi* has appeared rapidly, worldwide.
- **Actionable Knowledge:**
  - » Machines that do not respond to ICMP echo packets will be less attacked than others
  - » Early discovery of “pingers” and/or “scanners” help protecting your network.

ICMP vs TCP vs UDP over the last 4 years



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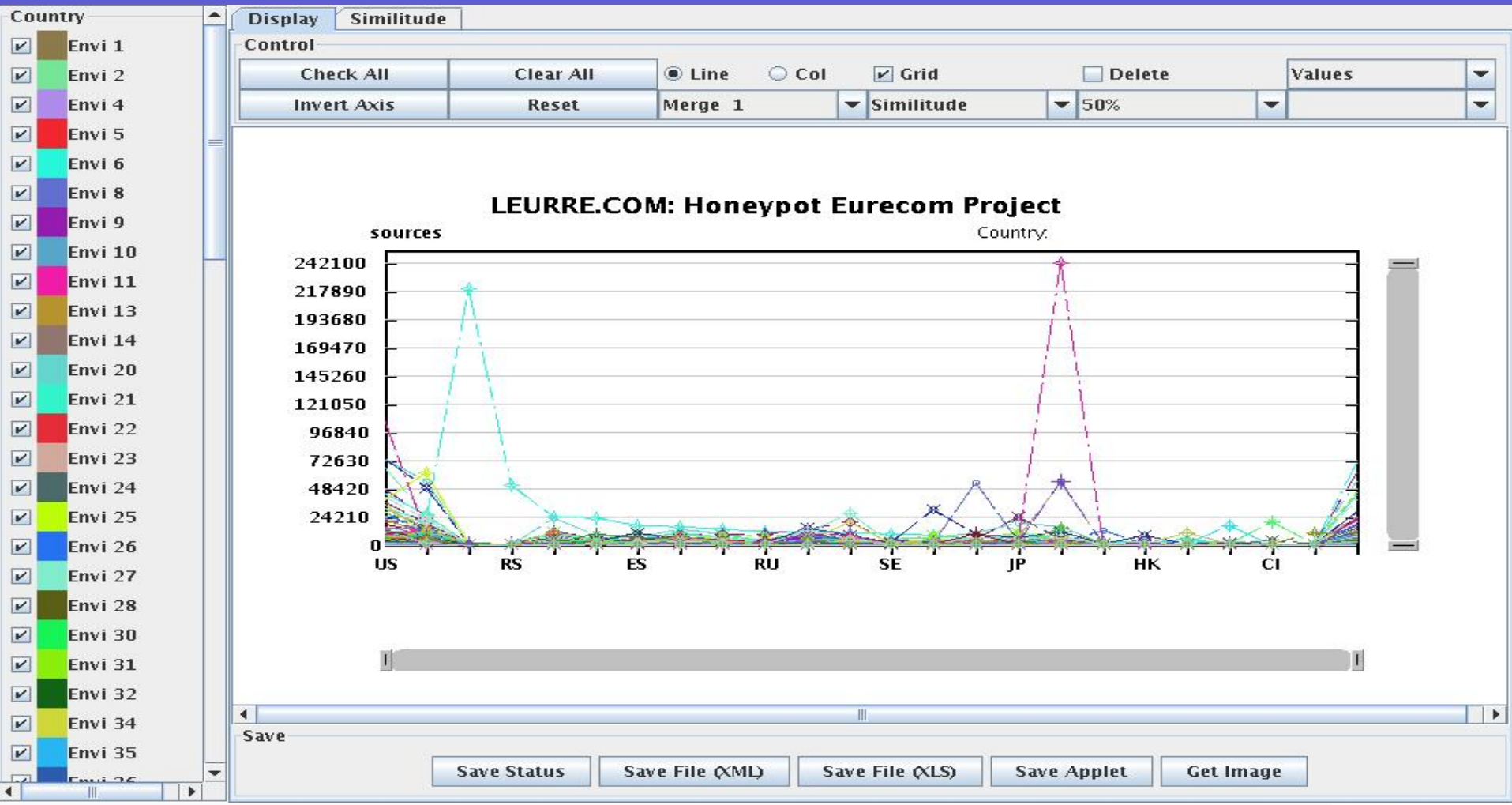
2. Safe Havens

- **Some attacks do come from a very limited number of countries**
  - » sometimes from only one
  - » They target a, sometimes very, small fraction of the Internet
  - » This is not limited to the ssh case explained before.
- **Actionable knowledge:**
  - » Enables “behavior-based” protection paradigms.

Platforms targeted by country of origin



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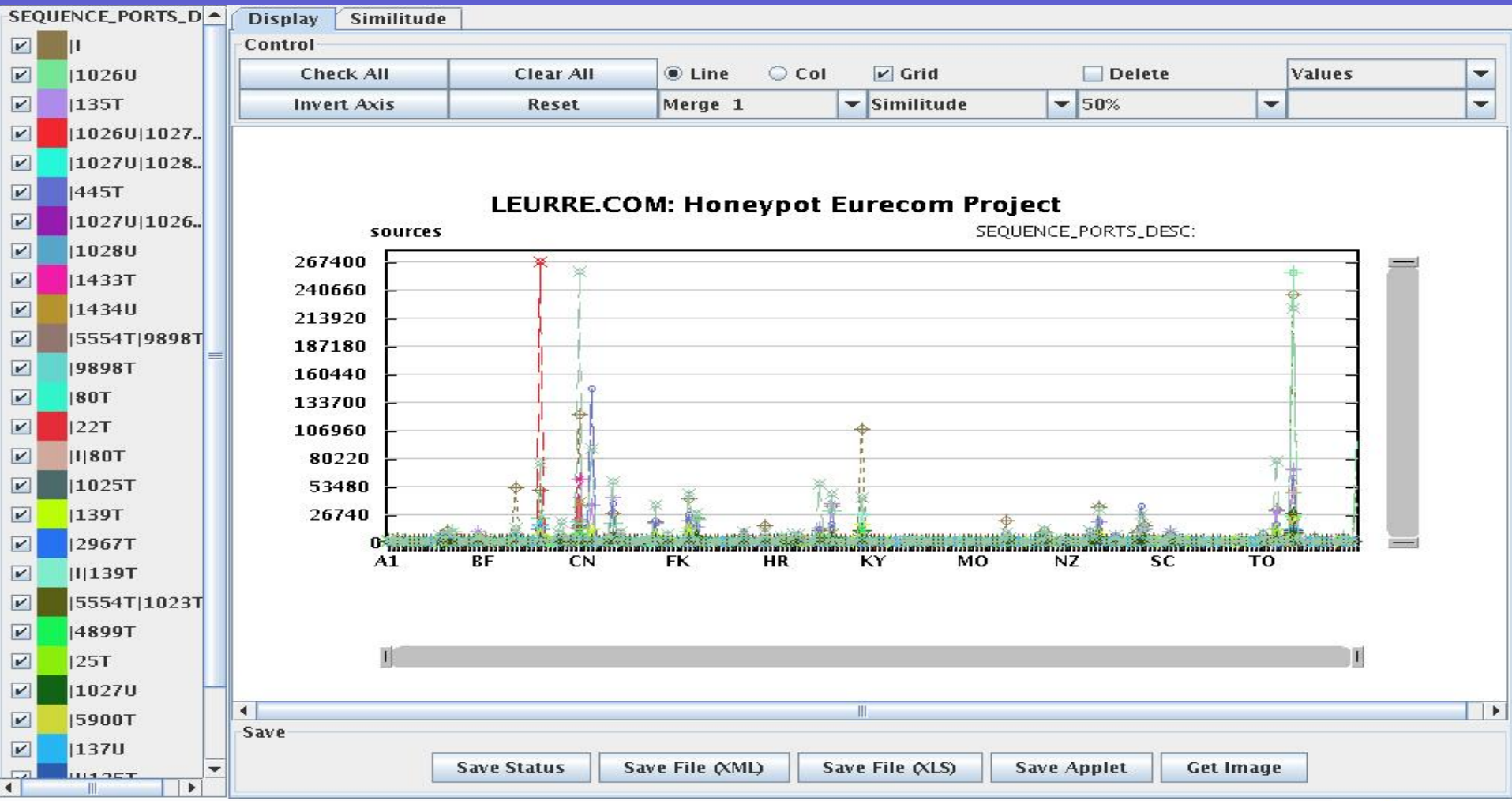
Ports sequence targeted by country of origin



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3. Good and bad neighborhoods

- **Your IP matters:**
  - » The amount of attacks is more a function of *where* you are than of *who* you are.
  - » Other sites in the same environment exhibit similar attack profiles as yours
- **Actionable knowledge:**
  - » Pick the quieter places for your servers
  - » Others can tell you if you are subject to a targeted attack

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Leurrécom V2.0, SGNET: Goals

- **Continue the conversation with the attacker up to the point where a malware is downloaded (resp. uploaded).**
- **Avoid using high interaction honeypots**
- **Data collected with V2.0 enrich the ones obtained with V1.0**

Means

- **Scriptgen: a novel 'medium-interaction' honeypot**
- **SGNET =**
  - Scriptgen (Eurecom) +
    Argos (VU Amsterdam) +
    Nepenthes (TU Manheim) +
    Anubis (TU Wien) +
    Virustotal (Hispasec).

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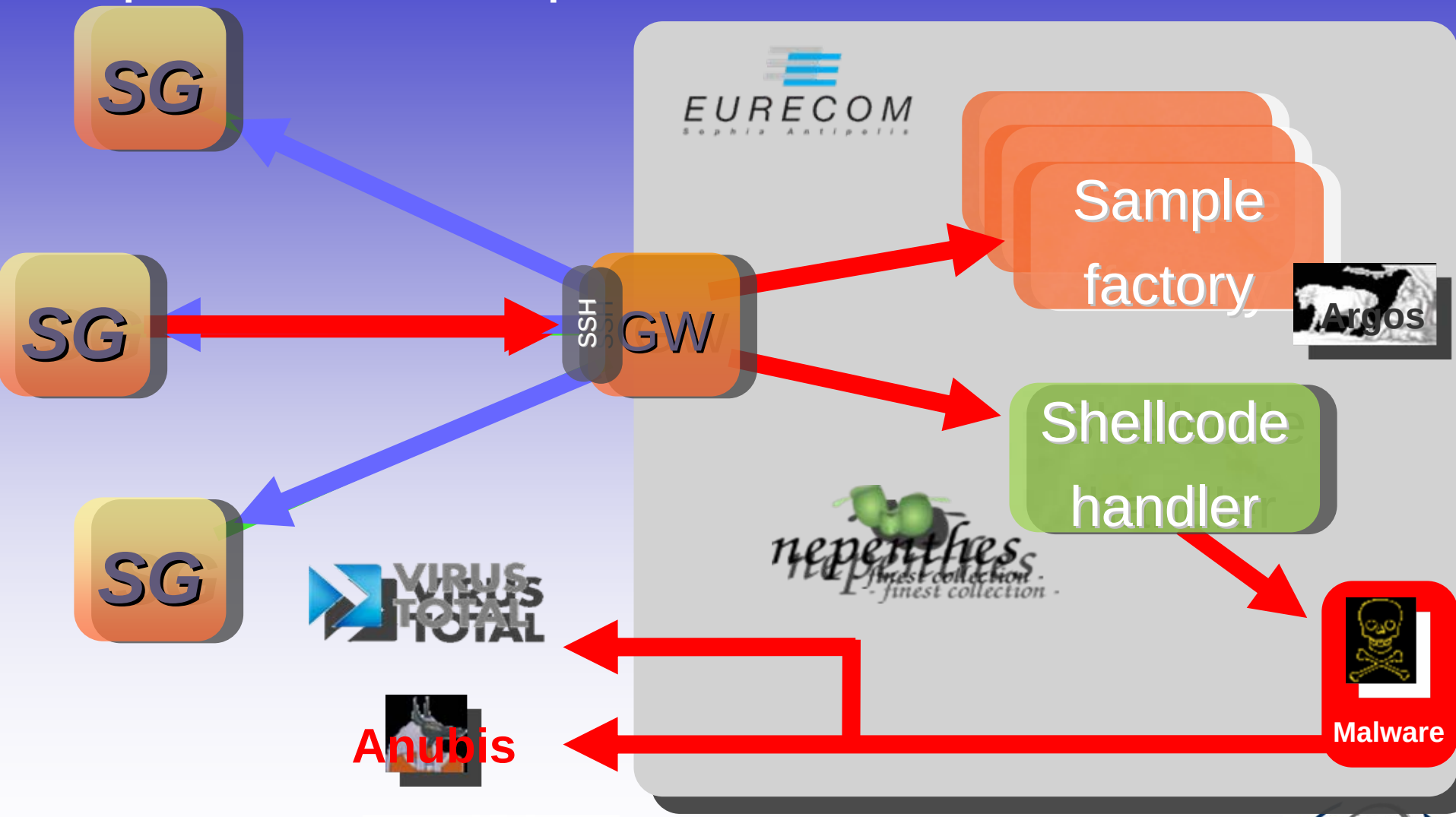
Scriptgen

- **Basic idea** (see ACSAC05, RAID06, NOMS08, EDDC08)**:**
  - » Learn protocol semantics from the interactions with a real server
    - – Represent learnt behavior in a state machine
  - » Protocol agnostic approach
    - – No assumption is done neither on protocol structure, nor on its semantics.

Operational setup



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Current status

- **A couple of SG sensors deployed to study the feasibility of the approach.**

- **Important contribution to the newly funded WOMBAT European project.**

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IST-216026-WOMBAT

- **Worldwide Observatory of Malicious Behaviors and Attack Threats**
- **3 Years research project**
- **See *www.wombat-project.eu* for more information**

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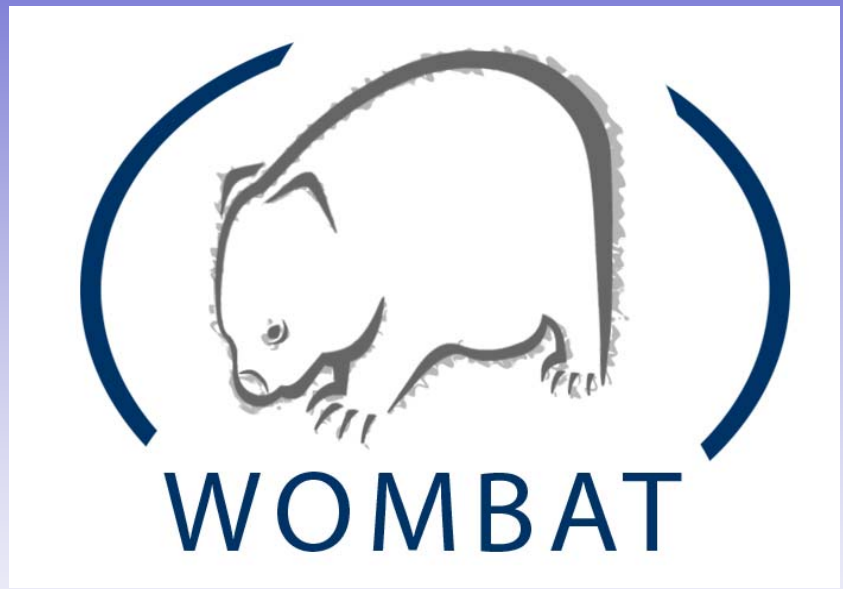
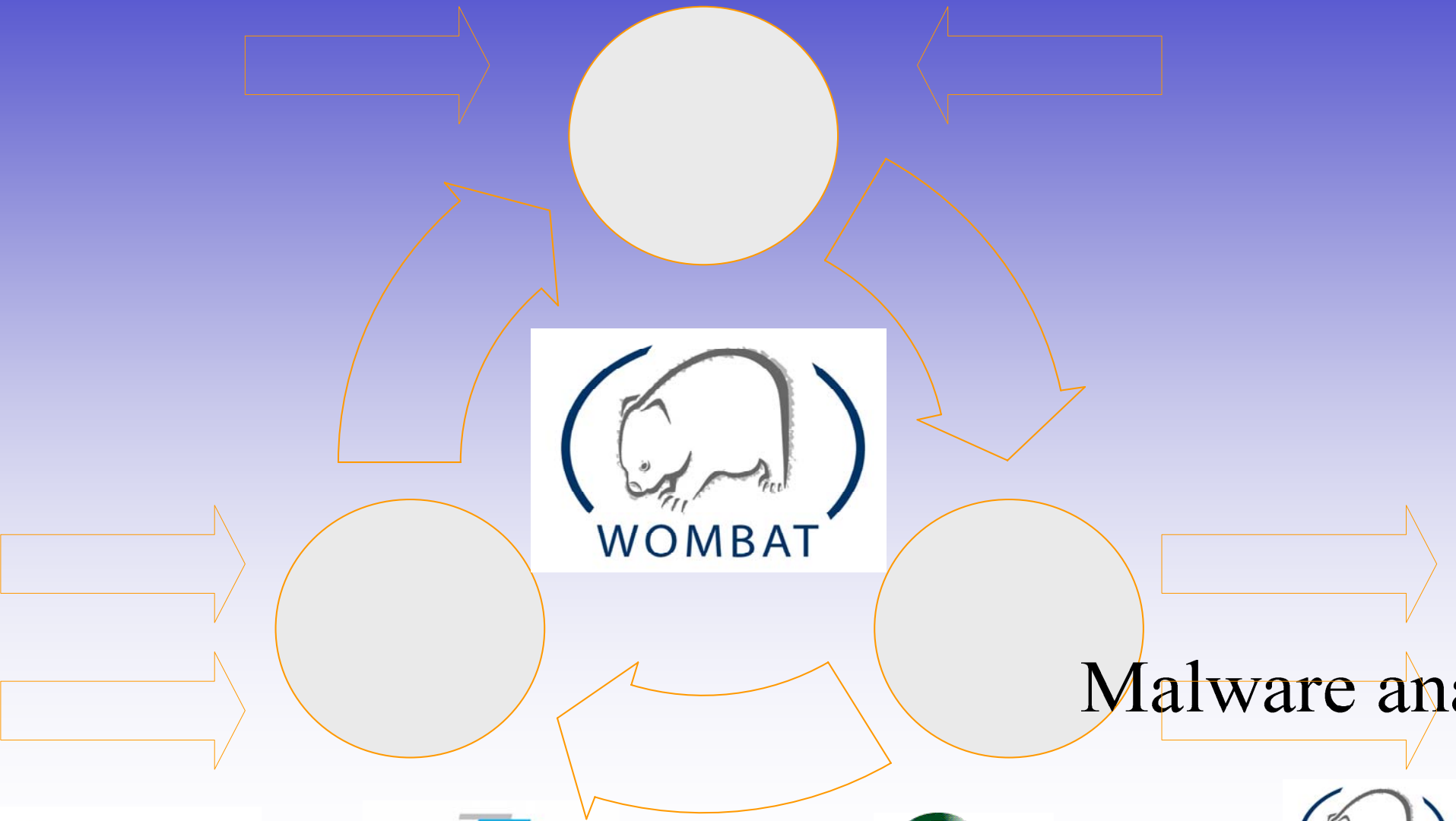
The WOMBAT Consortium



Main objectives and principles



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Project results and innovation

- **New data gathering tools**
  - » Advanced features (high interaction, real-time analysis)
  - » New targets (wireless, bluetooth, RFID, …)
- **Tools and techniques for characterization of malware**
  - » Malware-based analysis AND Contextual analysis
- **Framework and tools for qualitative threat analysis**
  - » Early warning systems

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The WOMBAT is welcoming you

- **The philosophy of the WOMBAT project is to join forces to address the current and future threats**
- **If you are interested in being involved in this effort or in learning more about it, feel free to contact me:**
  - marc_dacier@symantec.com

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Data, data and more data

- **Collecting threats-related data all over the world in such a way that a systematic and rigorous analysis can be carried out is a key element to help us all fight cybercrime as it leads to the discovery of actionable knowledge.**

Data, data and more data (ctd.)

- **The Leurrécom dataset has contributed to this task over the last four years.**
- **Trends are changing and highlight the need for novel sources of data**
- **The WOMBAT project is looking forward to address these issues. Feel free to be part of it.**

Questions ?