WOMBAT: a Worldwide Observatory of Malicious Behaviors and Attack Threats

Corrado Leita

Symantec Research Labs

A Worldwide Observatory of Malicious Behaviors and Attack Threats

EURECOM
Sophia Antipolis

Hispasec Sistemas
Seguridad y Tecnologías de la Información

NASK

symantec.

A*STAR
Institute for Infocomm Research

orange™

WOMBAT

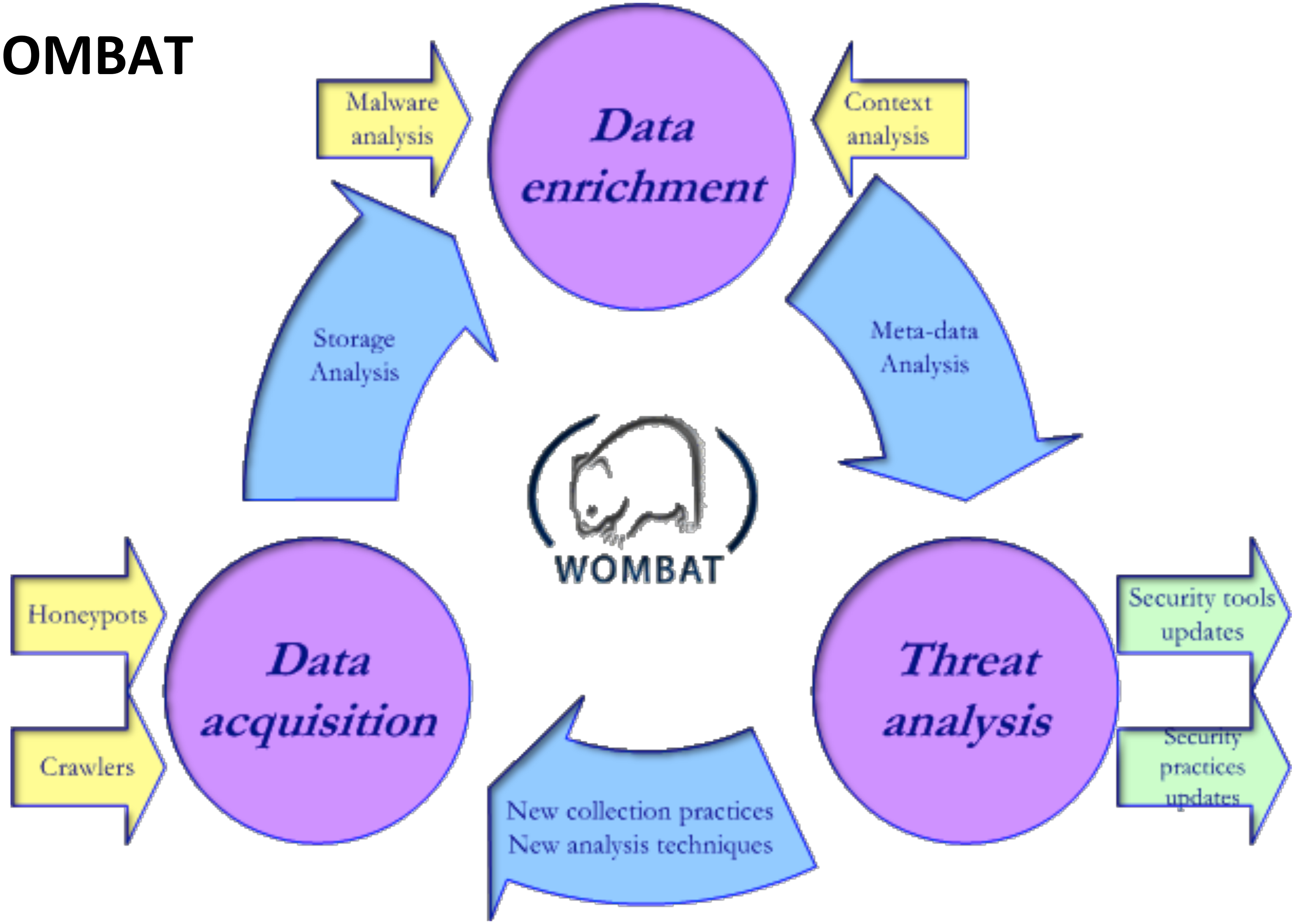
TU VIENNA
Technische Universität Wien
Vienna University of Technology

Politecnico Milano

FORTH
Foundation for Research & Technology - Hellas

vrije Universiteit

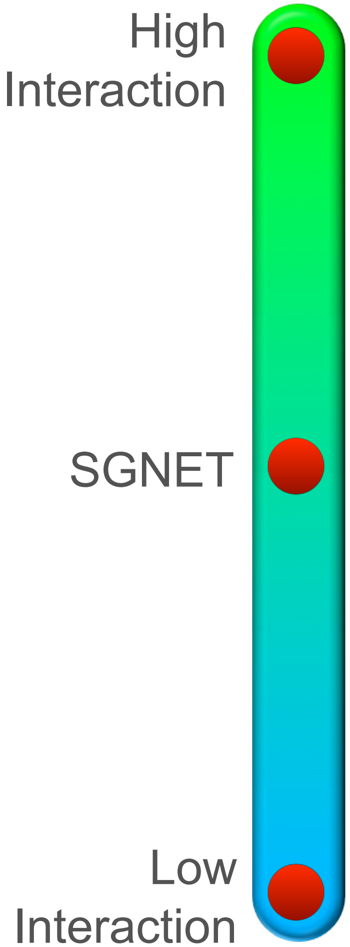
WOMBAT


Malware analysis
Data enrichment
Context analysis
Storage Analysis
Meta-data Analysis
WOMBAT
Honeypots
Crawlers
Data acquisition
Threat analysis
Security tools updates
Security practices updates
New collection practices
New analysis techniques

WOMBAT datasets

- Data sources
  - SGNET *(Symantec)*: server side threats
  - HARMUR *(Symantec)*: client side threats
  - HoneySpider *(NASK/CERT Polska)*: hybrid crawler
  - Shelia *(VU Amsterdam)*: memory tainting-based analysis of exploits against Internet Explorer
  - NoAh *(FORTH)*: honeypot deployment
  - Bluebat *(Politecnico di Milano)*: Bluetooth honeypots
- Data enrichment
  - Anubis Sandbox *(iseclab.org)*: malware behavioral analysis
  - VirusTotal *(Hispasec Sistemas)*: malware detection rates/static analysis
- Aggregators
  - www.maliciousnetworks.org : AS reputation based on the output of the different datasets

Honeypots and protocol emulation: the problem

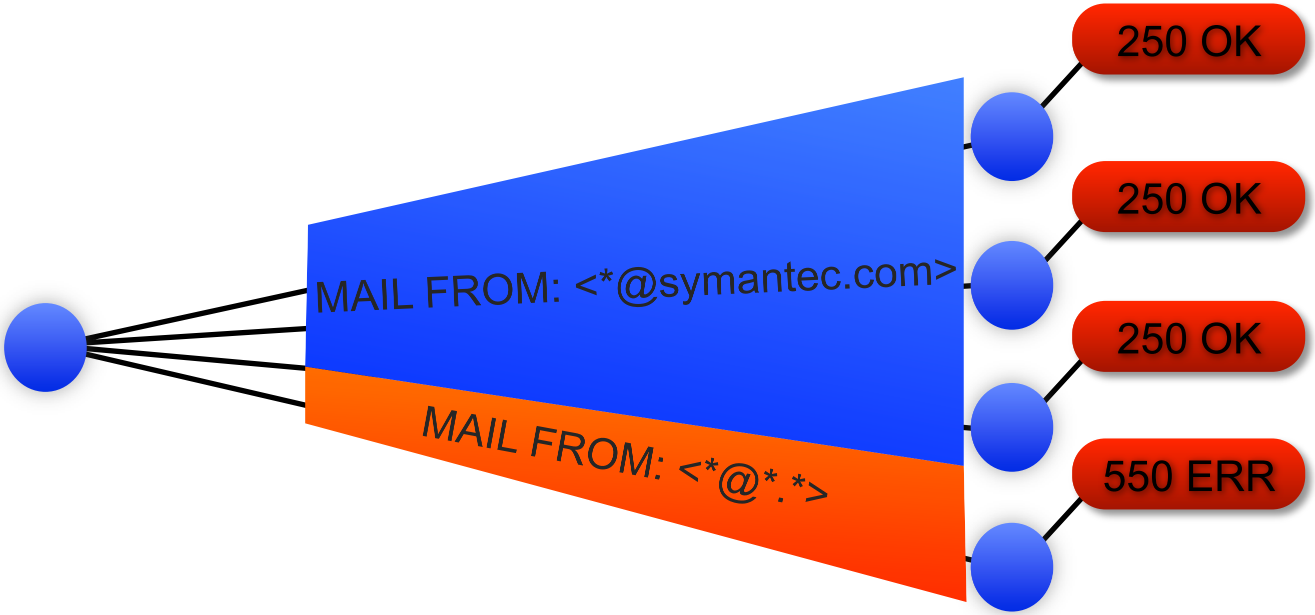


- Need to increase level of interaction
  - Required to retrieve information on the root cause of the observed activities

- Need to minimize the cost of the sensors
  - Implicit requirement of a distributed deployment of sensors hosted by volunteering partners

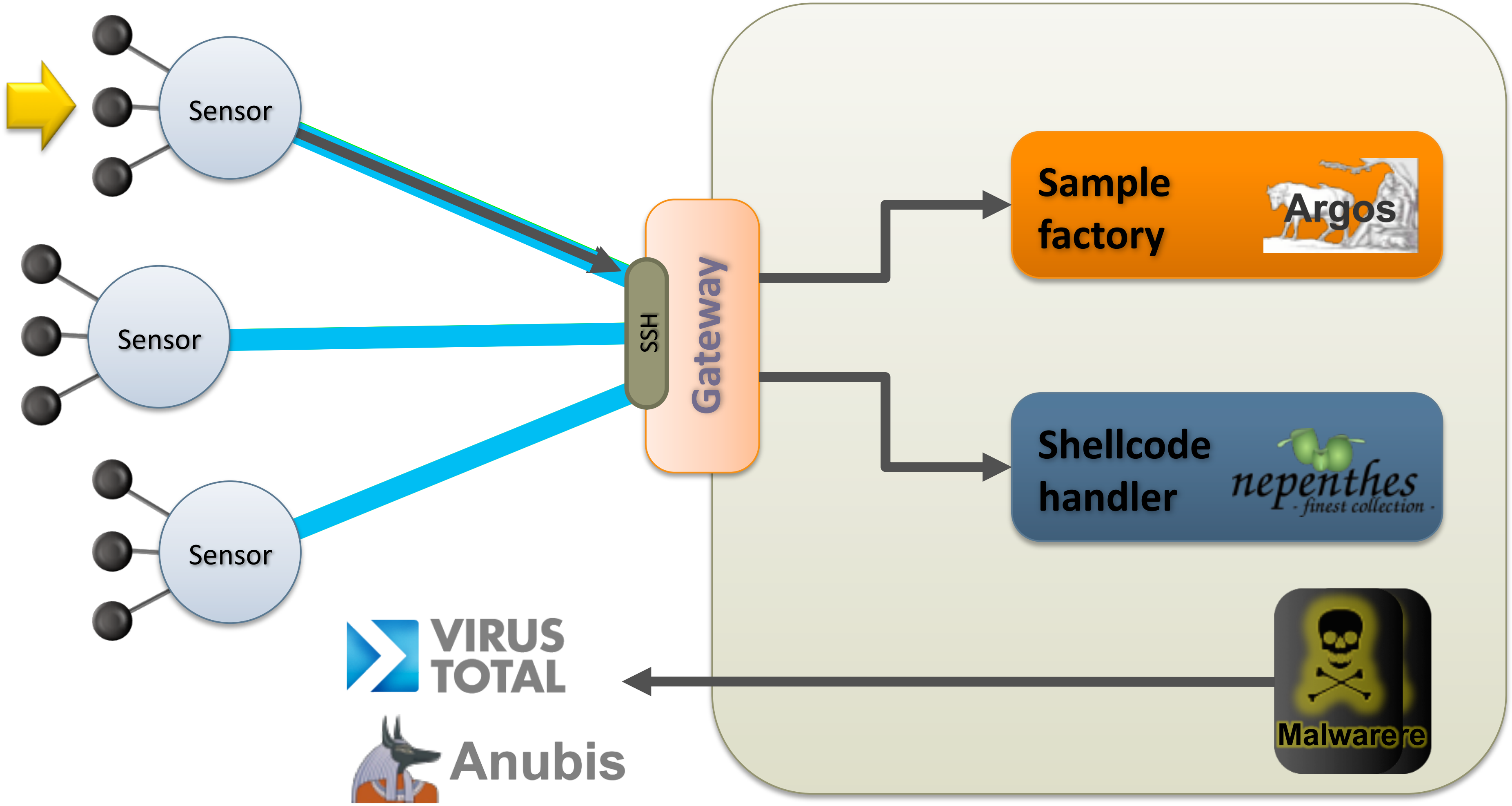
ScriptGen

- Protocol-agnostic algorithm
- Observe conversation samples between a client and a real server
- Infer semantics using bioinformatics algorithms
- Proved good results in handling deterministic exploit scripts

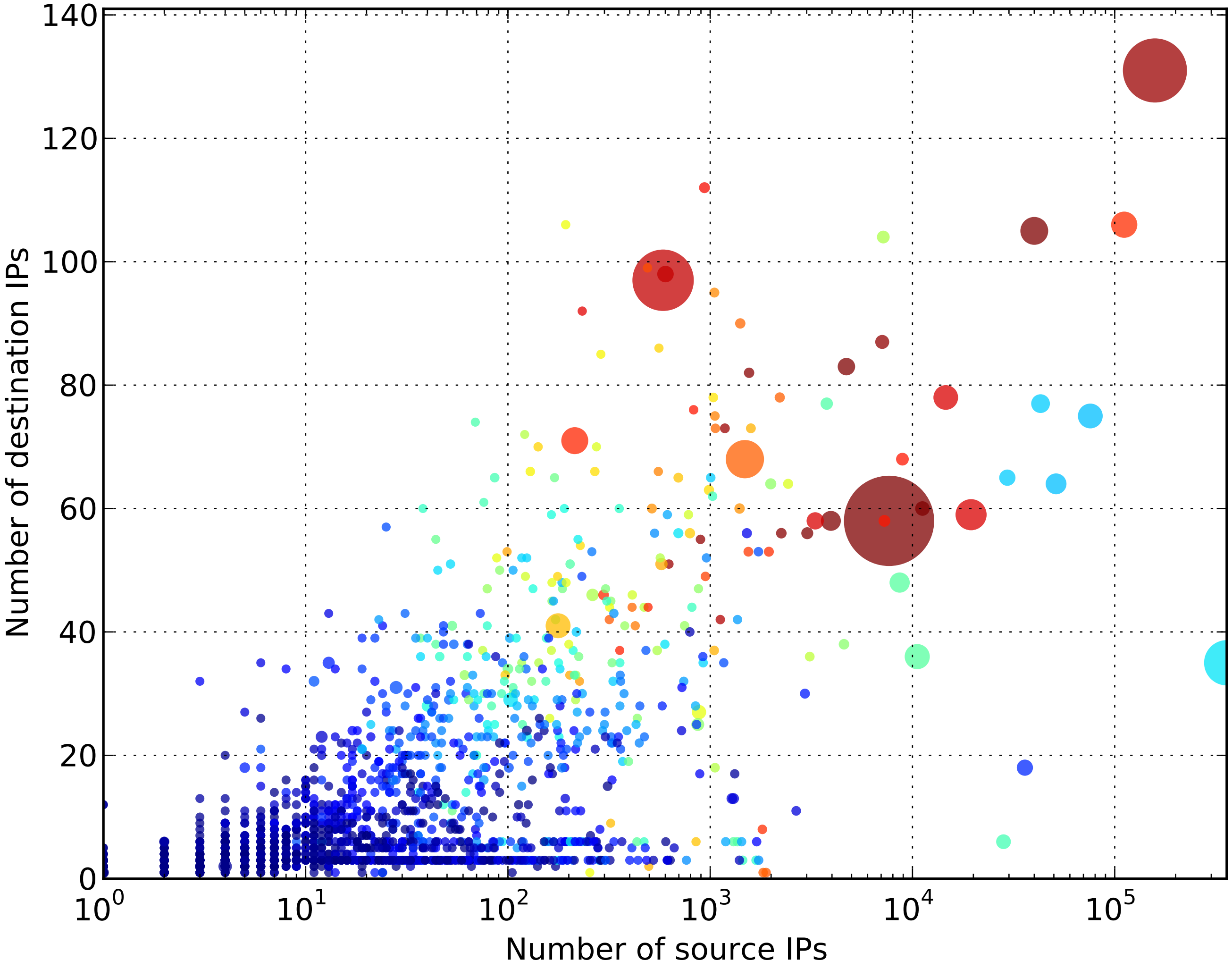


SGNET operation

- Normal operation
- New exploit encountered
- Global update of the FSM knowledge
- Submission of a shellcode sample
- Analyze new malware sample



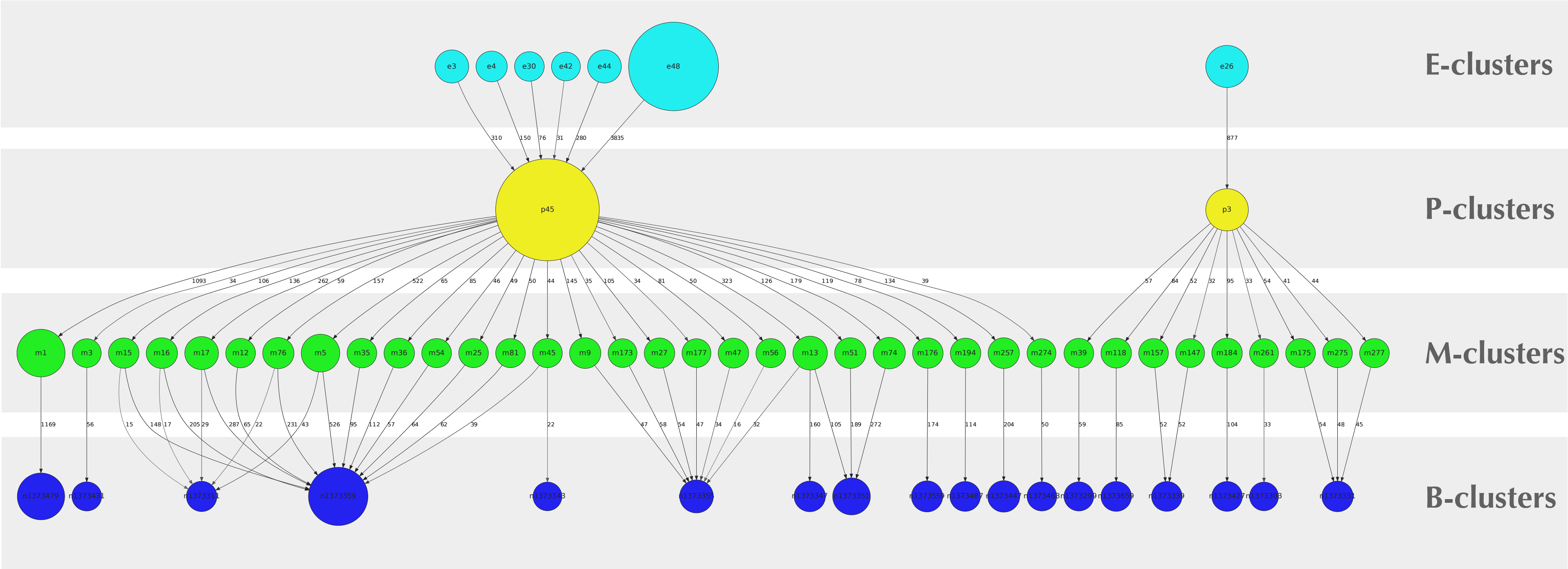
Seeing "things"…



Corrado Leita, Ulrich Bayer, Engin Kirda, “Exploiting diverse observation perspectives to get insights on the malware landscape”, DSN PDS 2010

…and dissecting them

- High visibility activities
  - Few exploits/payload combinations for a large number of M-clusters
  - Same shellcode reused across lots of different variants
  - M-clusters are more than B-clusters



Clusters associated to 50+ injection attacks throughout the observation period

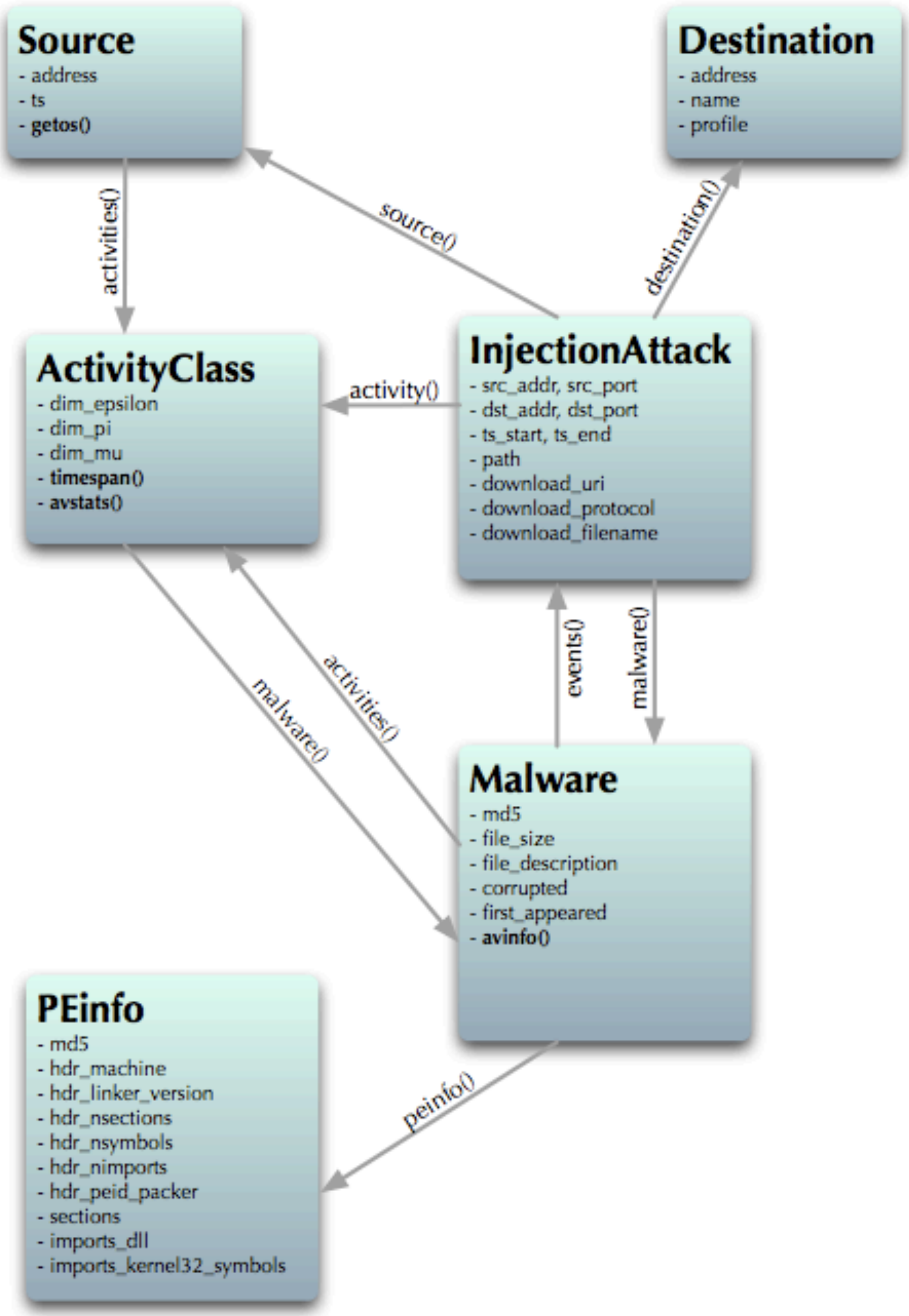
Getting the data: WAPI, the WOMBAT API

- For the **data provider**
  - Control which content to present to the clients, and how
  - Provide the most optimized way
  - Enrich or modify the dataset without needing to modify all the clients

- For the **user**
  - Need for a common "language" to request data from the datasets
    - HTTP submission + XML reports for ANUBIS
    - Email submission + email reports for VirusTotal
    - …
  - Need for programming primitives to easily retrieve information on the fly while performing analysis tasks

WAPI datasets

- Dataset exporable by means of:
  - **Objects:** a specific instance of a given class, e.g. a certain Malware MD5 or a Source IP
  - **Attributes:** basic information on each object, e.g. Malware.file_size
  - **Methods:** more expensive computations on each object, e.g. Malware.avinfo
  - **References:** pointers to related objects
- Reflective API: the client asks at runtime through SOAP primitives what a dataset is currently implementing



Source
- address
- ts
- **getos()**

Destination
- address
- name
- profile

ActivityClass
- dim_epsilon
- dim_pi
- dim_mu
- **timespan()**
- **avstats()**

InjectionAttack
- src_addr, src_port
- dst_addr, dst_port
- ts_start, ts_end
- path
- download_uri
- download_protocol
- download_filename

Malware
- md5
- file_size
- file_description
- corrupted
- first_appeared
- **avinfo()**

PEinfo
- md5
- hdr_machine
- hdr_linker_version
- hdr_nsections
- hdr_nsymbols
- hdr_nimports
- hdr_peid_packer
- sections
- imports_dll
- imports_kernel32_symbols

More info

- WAPI interface implemented on most WOMBAT datasets
  - SGNET, HARMUR, Anubis, VirusTotal, Shelia, …
  - Access managed by dataset maintainers through SSL certificates

- WAPI demo on vimeo:
  - http://www.vimeo.com/15734828 (password: wombat)

- Everybody can join SGNET at low cost
  - Contribute by installing a honeypot (4 routable IPs, old PC is enough)
  - Sign NDA (protect participants identity as well as observed IP addresses)

Thank you!

Corrado Leita

corrado_leita@symantec.com

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