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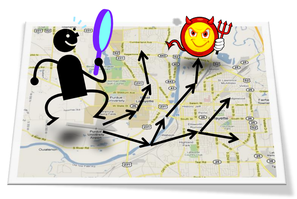
the center for education and research in information assurance and security

LiveDM: Kernel Malware Analysis with Un-tampered and Temporal Views of Dynamic Kernel Memory



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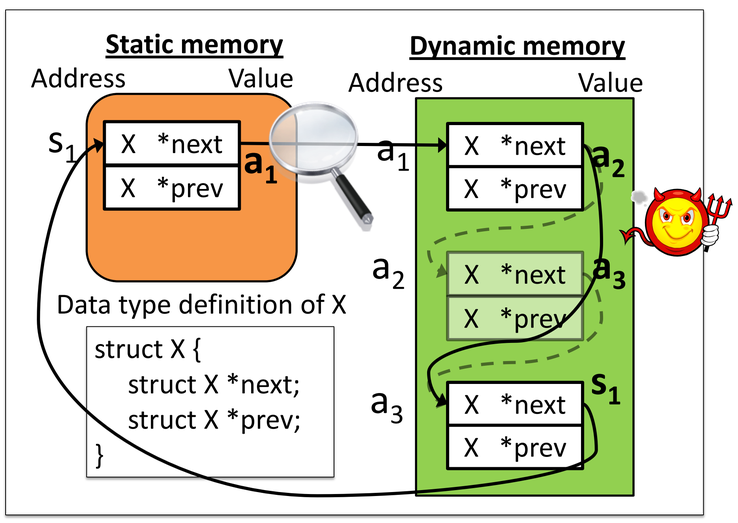
State-of-the-art Memory Mapping

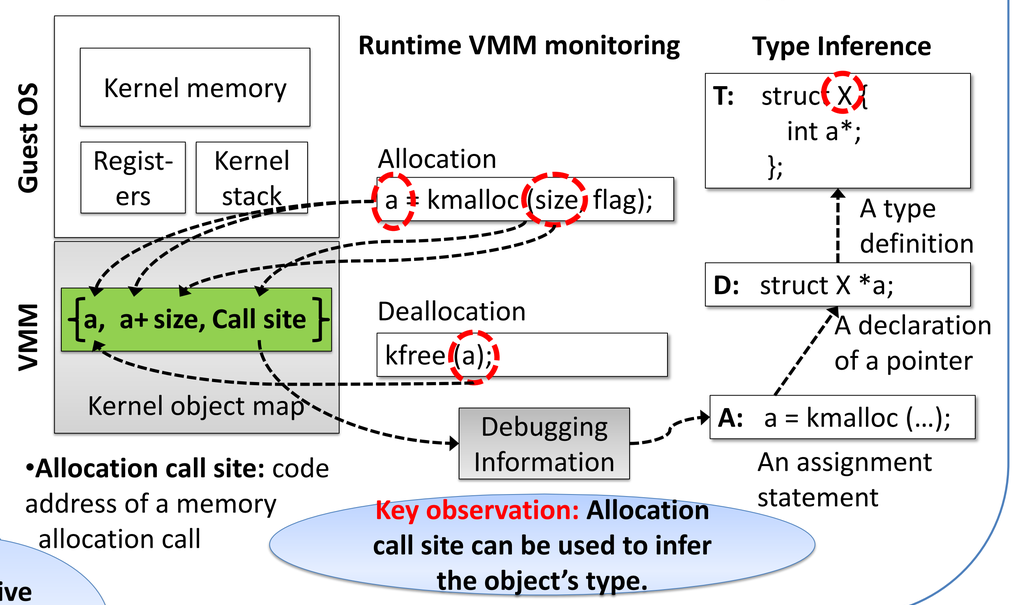
- Kernel object maps are built by recursively traversing pointer connections starting from static objects. (Type-projection Mapping)
- Maps are subject to pointer manipulation.
- Asynchronous due to its base on memory snapshots



Kernel memory view is subject to malware manipulation.

Allocation-driven Mapping Approach

- Kernel objects are identified by transparently capturing kernel memory function calls.
- Memory ranges are extracted from function arguments and return values.
- Call stack information is used to derive data types.



•**Allocation call site:** code address of a memory allocation call

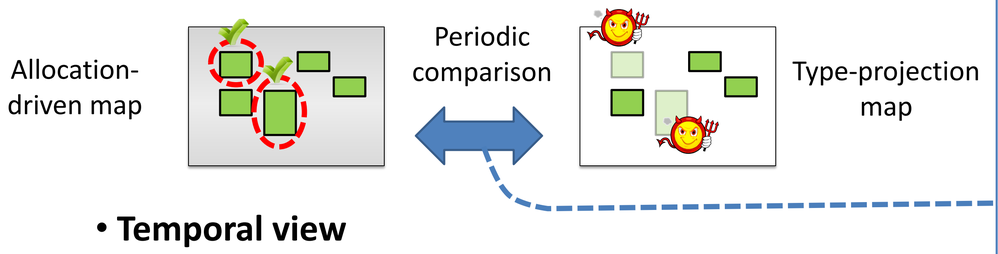
Key observation: Allocation call site can be used to infer the object's type.

LiveDM: **Live** **D**ynamic Kernel Memory **M**ap

Applications of Allocation-driven Mapping

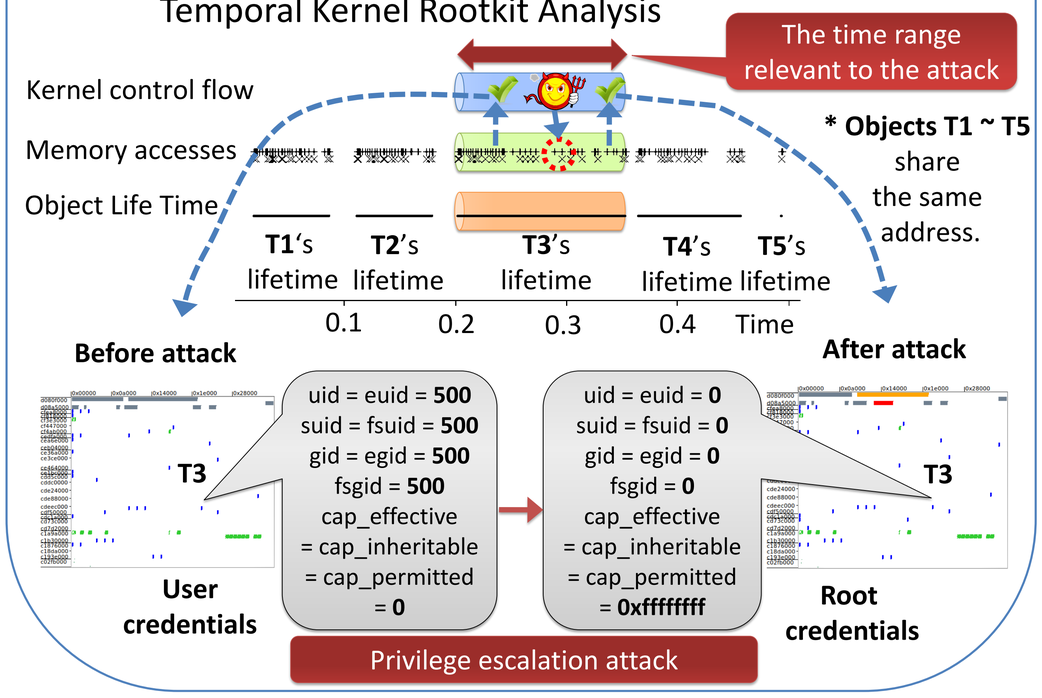
- **Un-tampered view**

  Systematic detection of kernel data hiding attacks



- **Temporal view**

  Temporal Kernel Rootkit Analysis



Privilege escalation attack

Detection of Rootkit Attacks Hiding Kernel Objects

Rootkit Name	# of Hidden Objects	Manipulated Data		Attack Vector
		Type	Field	
hide_lkm	# of hidden drivers	module	next	/dev/kmem
fuuld	# of hidden processes	task_struct	next_task, prev_task	/dev/kmem
cleaner	# of hidden drivers	module	next	LKM
modhide	# of hidden drivers	module	next	LKM
hp	# of hidden processes	task_struct	next_task, prev_task	LKM
linuxfu	# of hidden processes	task_struct	next_task, prev_task	LKM
modhide1	1	module	next	LKM
kis 0.9	1	module	next	LKM
adore-ng 2.6	1	module	list.next, list.prev	LKM
ENYELKM	1	module	list.next, list.prev	LKM

Demo Slides Paper Author

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