SAFE RIVER
Safety & Security Forge

Software Un-Security Exploitation Evaluation
CadRiver project

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Project objectives

- **Static tool development**
  - Security audit help
  - Input:
    - Audit objective (security policy)
    - Piece of software (source code)
  - Output:
    - Elements that contribute to the audit objective
    - Facts on these elements
  - Arguments to show
    - Insecurity: problems found
    - Security w.r.t. the security objective
- **Extension of vulnerability detection tools**
  - RATS, ITS4, Fortify
  - PolySpace, Astrée
  - Database of known vulnerabilities

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Use cases *(1)*

- **Objective: Attack surface**
- **Input:**
  - Source code
  - Specification of the attack surface
- **Output:**
  - List of entry/output points (I/O): actual attack surface
  - To be compared with expected ones

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Use case *(2)*

- **Objective: Accesses to assets**
- **Input:**
  - Source code
  - List of assets (cryptographic key, password, bank account)
- **Output:**
  - List of entry/output points
  - Accesses to assets (read / write)
  - Rights and access modes

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Use case *(3)*

- **Objective: Information leak**
- **Input:**
  - Source code
  - List of assets
- **Output:**
  - List of entry/output points
  - Impact of assets on output (O ports)
  - Influence of inputs (I ports) on assets

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Use case *(4)*

- **Objective: Correctness of protections**
- **Input:**
  - Source code
  - List of assets
  - List of protections
- **Output:**
  - List of sensible flows w.r.t. assets
  - Location of protections on the source code
  - Presence/miss of protections on sensible flows
  - List of unprotected assets

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Use case *(5)*

- **Objective: Vulnerability instruction**
- **Input:**
  - Source code
  - List of vulnerabilities
    - Present in the target software
    - Computed by other tools
- **Output:**
  - List of entry/output points
  - Influence of entries on the vulnerabilities
  - Impact of the vulnerabilities on the output
  - Simulation of the vulnerability effect ?
    - In terms of execution flow
    - In terms of memory

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Example Input

Inputs:

- **Vulnerability (2, non verified line)**
- **Asset (precious)**
- **Source code:**

```
0: x=getc(fic1);
1: gets(line);
2: system(line);
3: fscanf(fic2,precious);
4: y=compute(precious,x);
5: z=makefullcomputation(x,y);
6: printf(z);
```

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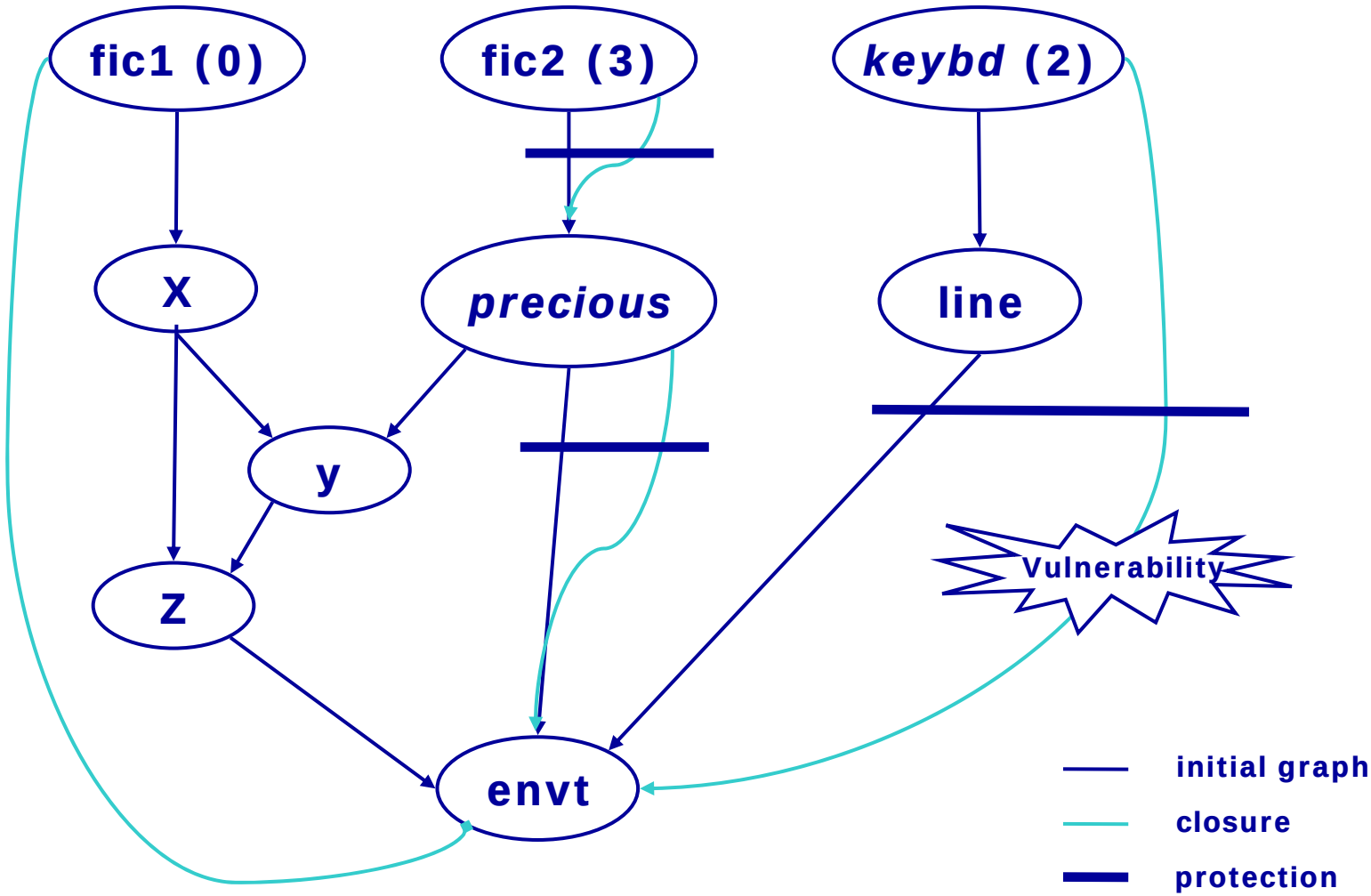
Exemple Output (1)

	Map	Definition	Use
0	IN(getc)	X	fic1
1	IN(gets)	line	*keyboard*
2	OUT(system) Vuln(non verified line)	*envt*	line
3	IN(fscanf) Access(precious)	precious	fic2
4	Access(precious)	y	precious, x
5		z	x,y
6	OUT(printf)	*envt*	z

Example output (2)



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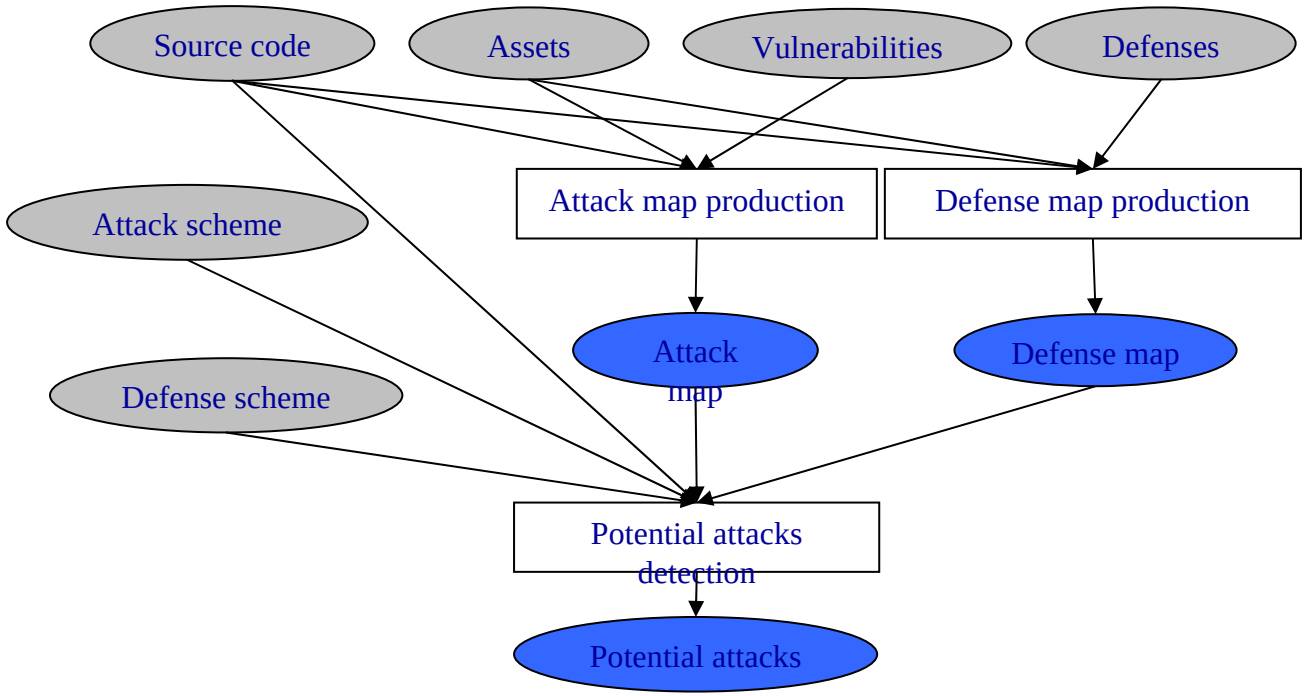
Source code
Assets
Vulnerabilities
Defenses
Attack map production
Defense map production
Attack scheme
Attack map
Defense map
Defense scheme
Potential attacks detection
Potential attacks

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Underlying technologies

- **Data-flow, control-flow, semantic analysis**
- **Exploration of the source code**
  - Computation of interfaces
  - Search for occurrences of declared assets
  - Search for present vulnerabilities
  - Search for protections
- **Dependencies computation**
  - Inter-procedural
  - Aliasing
  - Projected on target paths
  - Closed by target variables
- **Conformance with objective**

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Development in progress

- **Internal development**
- **Related studies:**
  - Airbus, Aréva: extension of the development process
  - Thales RSS: robustness proved by PolySpace
  - Lafosec: security for functional languages (ANSSI, LIP6, INRIA …)
- **Tool development projects:**
  - Baccarat: LIP6, Magillem, Oppida
  - Autostat (Systematic/Aerospace valley)?: CEA, SERMA, Continental, IRIT, Actia, ATOS …
  - ITEA?: CEA, Verimag, EADS IW, Onera, IMDEA
  - Célar?: