

TSP blackboard

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What is a TSP blackboard

❖ What is a TSP blackboard

- ❖ A typical BB sequence
- ❖ Why use a blackboard?
- ❖ Command line fun
- ❖ In-kernel blackboard module 1/4
- ❖ In-kernel blackboard module 2/4
- ❖ In-kernel blackboard module 3/4
- ❖ In-kernel blackboard module 4/4
- ❖ tspfs: a data exporting filesystem
- ❖ DADI: SNMP for blackboards 1/2
- ❖ DADI: SNMP for blackboards 2/2
- ❖ Future work
- ❖ Q&A

- Shared memory to store shared data (SysV shmem)
 - ❖ program A creates a blackboard
 - ❖ program A publishes data (typed data)
 - ❖ client programs attach to a blackboard
 - ❖ client programs subscribe to the published data

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- Messaging interface (SysV messages) Programs can send/recv lightweight messages to communicate (eg. notification)

What is a TSP blackboard

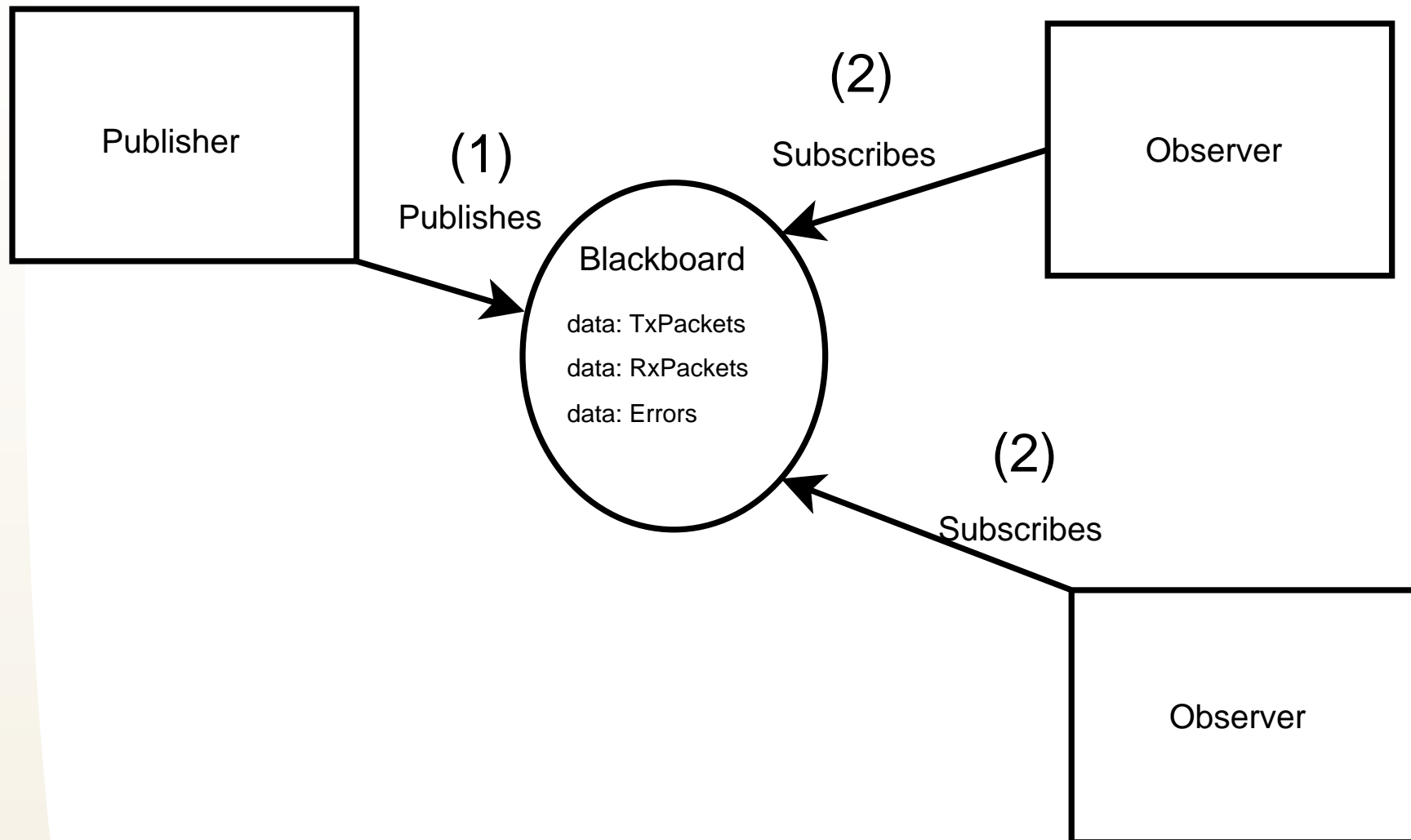
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- Messaging interface (SysV messages) Programs can send/recv lightweight messages to communicate (eg. notification)
- Locking primitives (SysV semaphores) Programs can lock the Blackboard if needed to protect data integrity

A typical BB sequence

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Why use a blackboard?

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Reasons to use a blackboard

- Observing or debugging: low impact on the target
 1. small impact on code itself (few LOC)
 2. small/no impact on performances

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 1. Stick a `tsp_bb_provider` to the blackboard
 2. Use any TSP consumer to display the data (targa, gdisp)

Why use a blackboard?

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Reasons NOT to use a blackboard

- Microsoft Windows runs your programs
- Your code has no bugs

Command line fun

Blackboard are persistent creatures, they survive the process end.

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- ❖ **Command line fun**

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Command line fun

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Blackboard are persistent creatures, they survive the process end. We can thus use simple shell scripts to create blackboards and publish data.

```
$ bb_tools create bb_test 2 8 #Two integers
$ bb_tools publish bb_test txpacket UINT32
$ bb_tools publish bb_test rxpacket UINT32
$ bb_tools write bb_test rxpacket 0xca
$ bb_tools write bb_test txpacket 0xfe
echo $(bb_tools read bb_test rxpacket;
      bb_tools read bb_test txpacket)
$ bb_tools destroy bb_test
```

In-kernel blackboard module 1/4

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- What is the In-kernel BB ?
 - ❖ - kernel module: "insmod bb.ko"
 - ❖ - same API as in user space
 - ❖ - reuses a lot of code from userspace BB
 - ❖ - tested on kernels $\geq 2.6.18$

In-kernel blackboard module 1/4

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 - ❖ - same API as in user space
 - ❖ - reuses a lot of code from userspace BB
 - ❖ - tested on kernels $\geq 2.6.18$
- The SysV shmем is replaced by a mmap to userspace
 - ❖ - exports data to userspace tools (bb_tools) through a shared memory mapping exported in `/dev/bbk[0,1,2,...]`
 - ❖ - only reading is allowed at the moment, enabling writing is trivial, but dangerous

In-kernel blackboard module 2/4

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In-kernel BB HOWTO

- - BB creation
- - Publishing a variable
- - Observing data from userspace

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In-kernel BB HOWTO

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In-kernel blackboard module 3/4

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- Creating the blackboard

```
S_BB_T *test_bb1 ;  
bb_create(&test_bb1 , "bb_test1" ,  
          nb_vars , var_size );
```

In-kernel blackboard module 3/4

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- Creating the blackboard

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bb_create (&test_bb1 , "bb_test1" ,  
          nb_vars , var_size );
```

- Declaring the variable

```
int *my_var ;  
my_var = (int *)  
bb_simple_publish (test_bb , "variable" ,  
                  "bb_test" , -1 ,  
                  E_BB_INT32 ,  
                  sizeof (int) , 1);
```

In-kernel blackboard module 3/4

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```

● Obtaining the variable from the blackboard

```
$ bb_tools read /dev/bbk0 bb_test1_variable  
8
```

In-kernel blackboard module 4/4

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Comparing the BB to other userspace exporting methods

- Pros
 - ❖ Easy to setup (compared to sysfs/debugfs or netlink)
 - ❖ Extremely low overhead

In-kernel blackboard module 4/4

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Comparing the BB to other userspace exporting methods

● Pros

- ❖ Easy to setup (compared to sysfs/debugfs or netlink)
- ❖ Extremely low overhead

● Cons

- ❖ Needs more testing
- ❖ Lacks synchronization methods (this is worked on)

tspfs: a data exporting filesystem

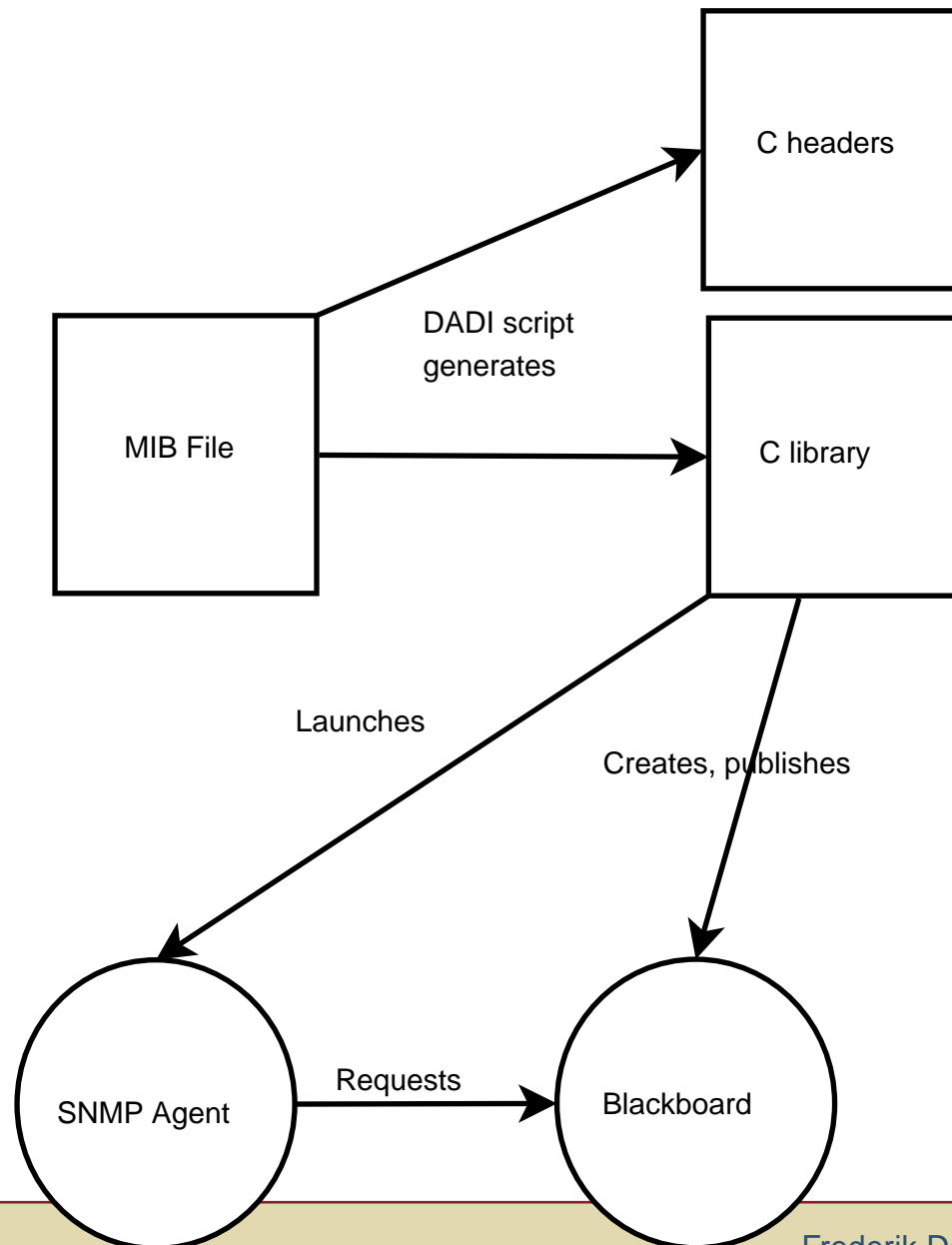
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- TSP consumer sync/async
- exposes data as a filesystem

```
$ ls
DYN_0_d_qsar POSA_0_d_DirSol bb_simu_1_Toto
$ cat bb_simu_MyType_t_var.d
time=0 value=1.00000
$ echo 5 > bb_simu_MyType_t_var.d
$ cat bb_simu_MyType_t_var.d
time=0 value=5.00000
```

DADI: SNMP for blackboards 1/2

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DADI: SNMP for blackboards 2/2

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- Generates blackboards from MIBs
- Generates SNMP Agents from MIBs
- Puggable front-ends / backends
 - ❖ Frontends: parse a blackboard, parse SMI files
 - ❖ Backends: generate Perl code, Javascript code, C code

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- Puggable front-ends / backends
 - ❖ Frontends: parse a blackboard, parse SMI files
 - ❖ Backends: generate Perl code, Javascript code, C code
- Easy to extend (templates)

```
static inline int get_${var name}() {  
    return ${var bbname}->${var name};  
}  
bb_simple_alias_publish(bb_${var bbname},  
                        "${var name}" ...)
```

Future work

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- - open source the DADI framework
- - propose the BB kernel module for inclusion in mainline Linux
- - automatically generate blackboards for given symbols in the executable

Q&A

Q&A

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