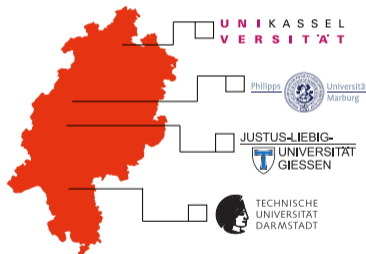


Debugging & Totalview

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Introduction to debugging and Totalview Part III

Topics

- ▶ Core-file,
- ▶ Local variables,
- ▶ Data inspection by data-view,
- ▶ Data transformation.



We will discuss more features of Totalview using the program found in the **demo02** folder:
Demo 2 implements a two-way connected list with a payload data field.

- ▶ Makefile
- ▶ demo02.cc
- ▶ demo02B.cc - demo02F.cc
- ▶ readme.md

Original sourcefile for *Part III*
Incremental fixes.

The makefile has 7 targets: *demo02.exe*, *demo02B.exe* to *demo02F.exe* and *clean*.
The program has no input.
Please consult *readme.md* for more details.

shell

```
>$ ./demo02.exe
```

Causes for abnormal program termination, next to *exit* or *abort*:

- ▶ unhandled system signal, e.g. no signalhandler
- ▶ unhandled C++ exception
- ▶ external signal trigger, e.g. kill

Noteworthy signals:

- ▶ **SIGSEGV - Segmentation fault:** the program accessed an uninitialized memory page, tried to execute non-executable labeled memory addresses, tried to write to read-only memory, attempted to access read-protected memory (kernel space).
- ▶ **SIGILL - Illegal Instruction fault:** the program used an assembly instruction, not supported by the CPU-architecture, or not allowed for the user.
- ▶ **SIGFPE - Floating Point exception:** the program performed an illegal floatingpoint OR integer operation, e.g. division by zero.

More <https://pubs.opengroup.org/onlinepubs/009695399/basedefs/signal.h.html>



- ▶ Programs memory content at the time of the abnormal abort.
- ▶ Contents:
 - ▶ Last executed statement,
 - ▶ Stack,
 - ▶ Heap, and
 - ▶ CPU-registers.
- ▶ Can be large >size of the systems memory
- ▶ Governed by OS policy.

shell

```
ulimit -c $CORESIZE
```

- ▶ Core-dumps are controlled by system configuration:

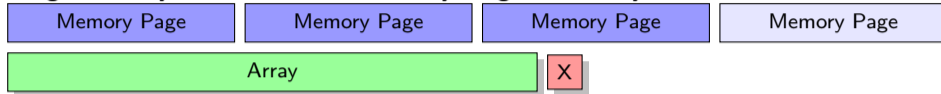
configuration file

```
/proc/sys/kernel/core_pattern
```

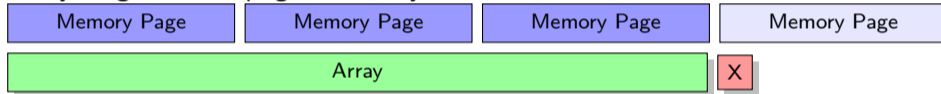
- ▶ Core-dump file configuration: `core.%e.%p.%h.%t`
Direct creation of core-dump file.
Example configuration components: `%p`: process id, `%h` hostname, `%e` executable filename, ...
- ▶ Program redirection: `|/usr/lib/systemd/systemd-coredump %P %u %g`
Note the "pipe" redirection to the systemd-coredump application. Redirection of the core to a program. System can be configured independently of the kernel. Example configuration components: `%P`: initial PID of namespace, `%u` user ID, `%g` group ID, ...



Original array ends inside of Memory Page boundary:



Array Aligned with page boundary:



This segments contents:

- ▶ Core-file, ulimits,
- ▶ Local variables,
- ▶ Data inspection by data-view,
- ▶ Data transformation.

