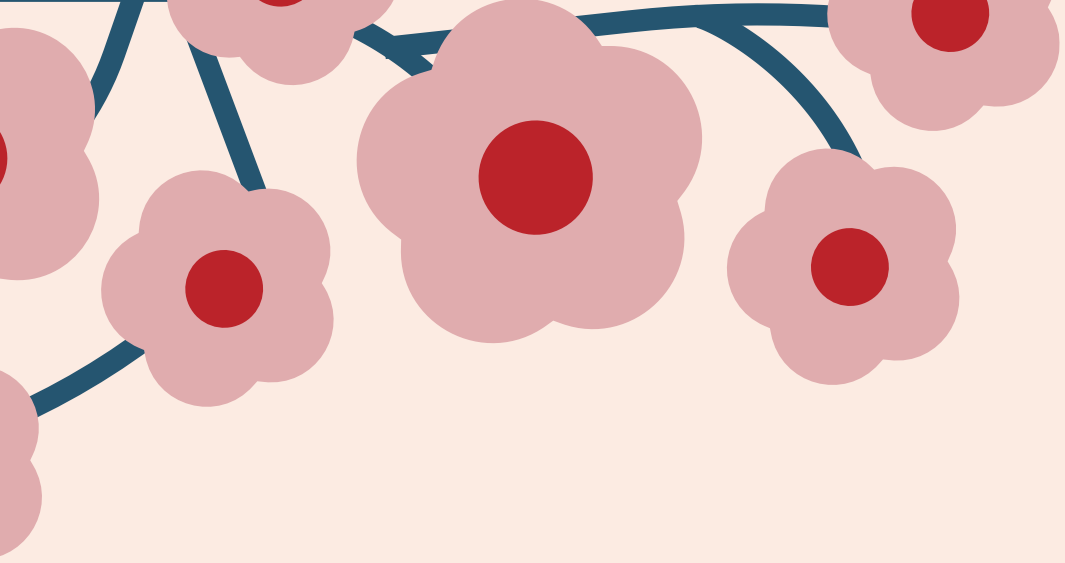
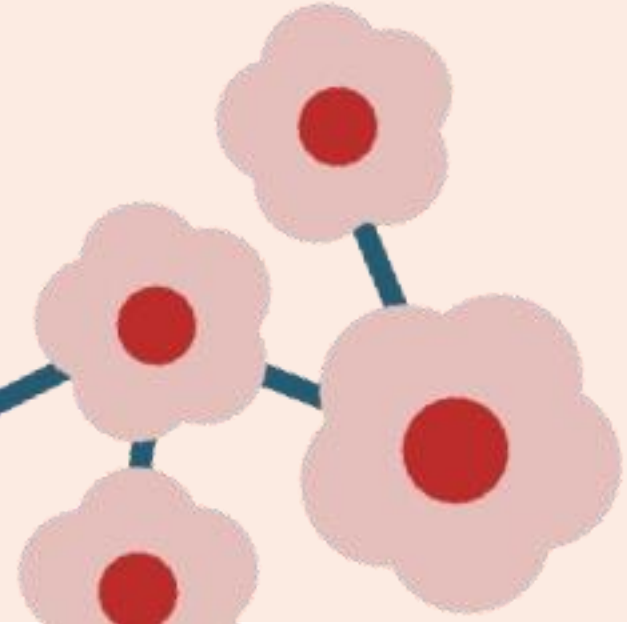
06 April 2026



CHERI

Inside the CHERI in SoC Working Group

Ben Fletcher
IP Engineering Director - Codasip



Agenda

- What we do
- What we've done
- What we are doing next

What we do - mission

To make it easier to successfully build SoCs that include CHERI.

What we do - resources

- To make it easier to successfully build SoCs that include CHERI.
  - We do not:
    - Say how you should build your SoCs or Systems.
    - Tell you how specific problems should be solved.
  - We do:
    - Provide materials to help you ramp up your understanding of CHERI.
      - The basics of what CHERI is and how it works.
      - System level considerations.
    - Provide documents that help you understand what questions need answers.
    - Make sure you know what needs to be done so your system successfully provides the Memory Safety Guarantees CHERI offers.
  - It is hard to know what you don't know…
    - Our documents serve as the go-to starting point to help you ramp up into the world of CHERI.

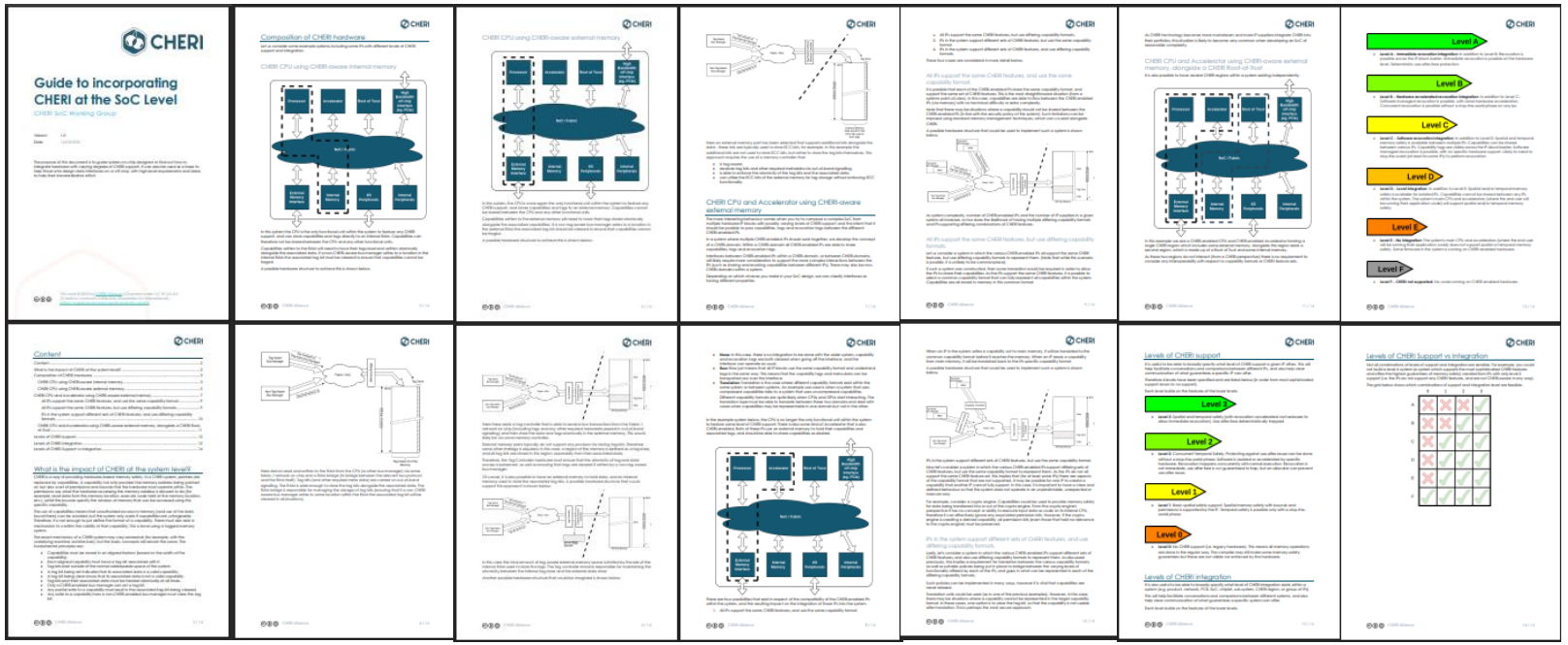
What we do - meetings

- Held every 2 weeks.
- Discuss topics to include in documents and resources.
- Discuss and brainstorm different technical topics to help share understanding.
- Members of the working group from various organizations:

What we have done

- We have released our first document:

[Guide to incorporating CHERI at the SoC level]



CHERI

What we are doing next

- Working on a series of mini-documents.
  - The documents will be shorter and more targeted at specific topics.
  - They will form a family of documents.
    - Each can be read in a stand-alone context.
    - However, they work together to give a good overview of the CHERI landscape.
  - Plan to have a series of regular releases during H2 2026.
    - Working in conjunction with the marketing working group.

Mini-Documents

CHERI Basics

CHERI Rules

Memory Safety

Integration of CHERI and non-CHERI IP in the same System

Transport of Capabilties within a System

CHERI and Spatial Safety

CHERI and Temporal Safety

Compartmentalisation

Example: Simple CHERI DMA Engine

Example: Descriptor Based CHERI DMA Engine

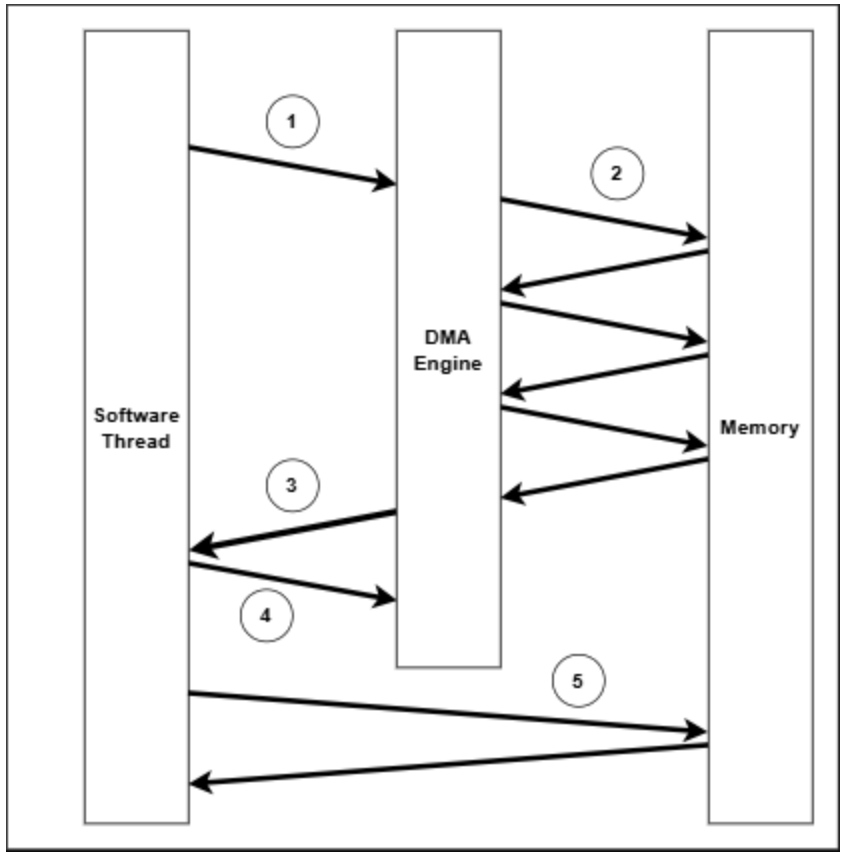
Revocation

References and Resource

Mini-Documents

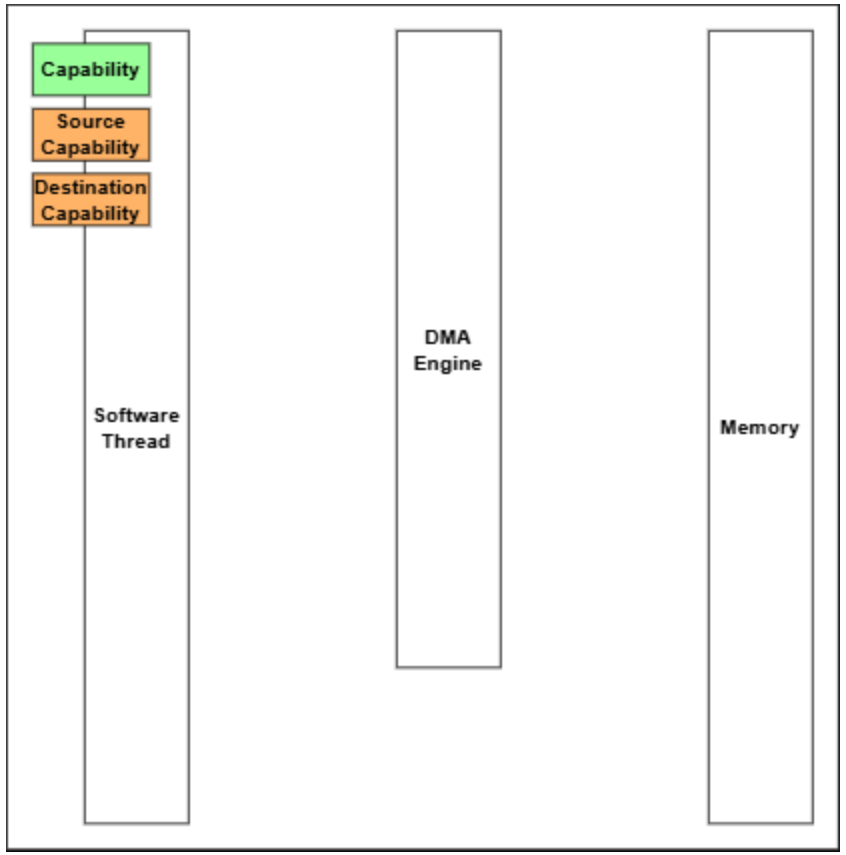
EXAMPLE: Simple CHERI DMA Engine

- In a traditional DMA engine:
  - (1) Software delegates a memory transfer to the DMA engine via memory mapped configuration.
  - (2) DMA engine does the transfer.
  - (3) DMA engine lets the software know the transfer is done.
  - (4) Software acknowledges the DMA engine has completed the task.
  - (5) Software can then access the relocated data in memory.



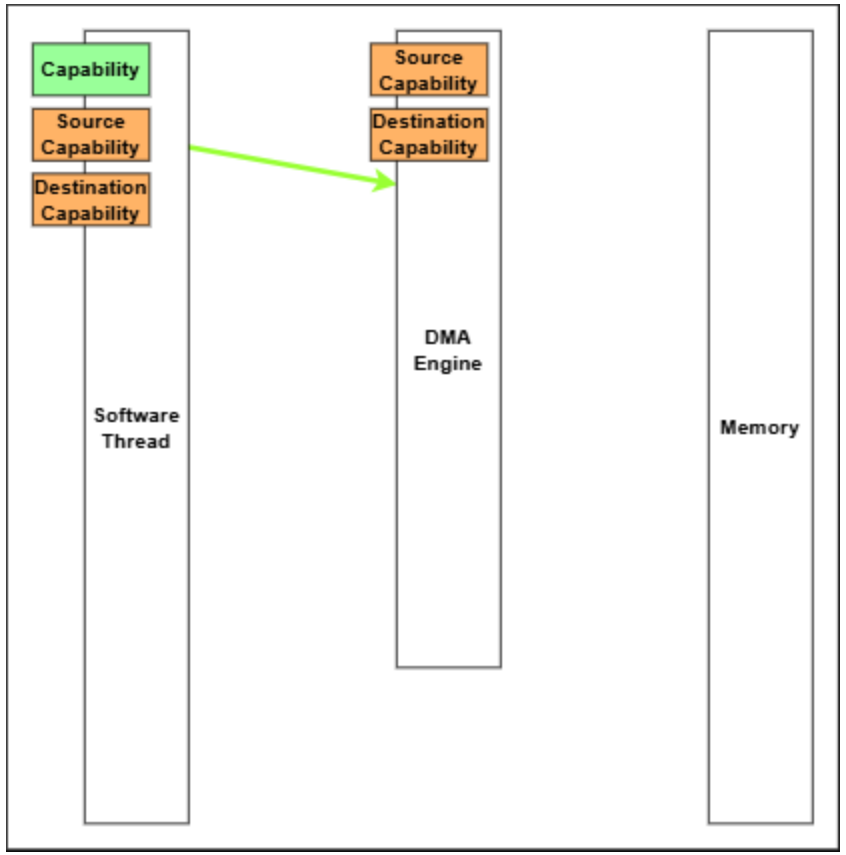
EXAMPLE: Simple CHERI DMA Engine

- Software must have capabilities to allow it to access:
  - The Memory mapped registers of the DMA engine.
  - The data being moved (source address space).
  - The location the data will be moved to (destination address space).



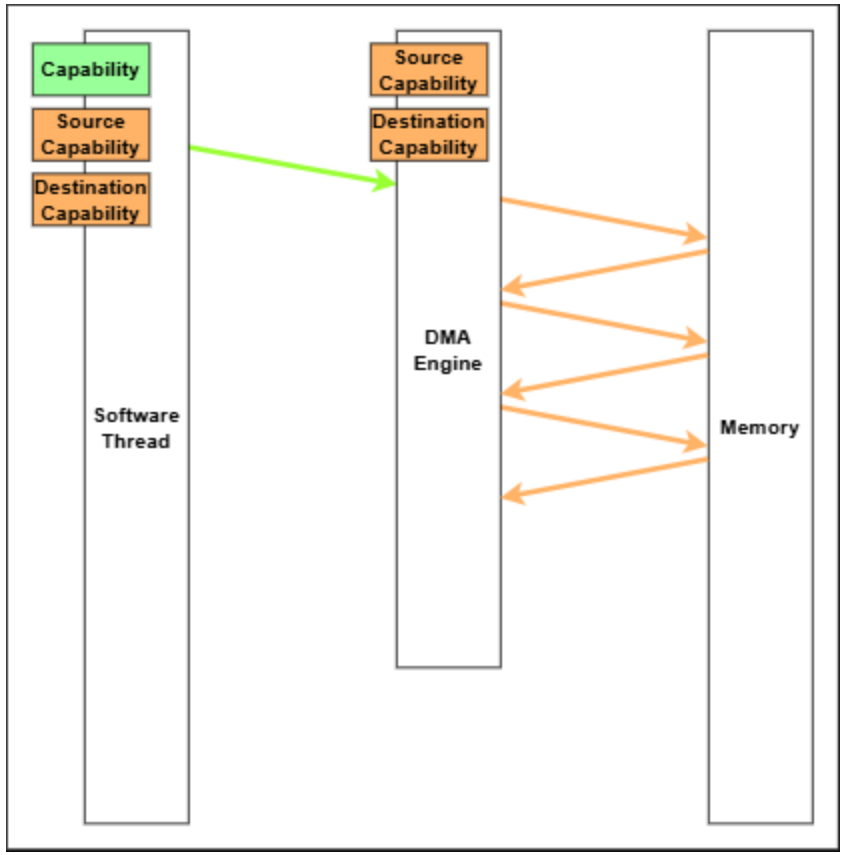
EXAMPLE: Simple CHERI DMA Engine

- Software uses the green capability to pass the orange capabilities to the DMA engine.
- Passing the capabilities to the DMA engine is passing the authority to the DMA engine to complete the task.



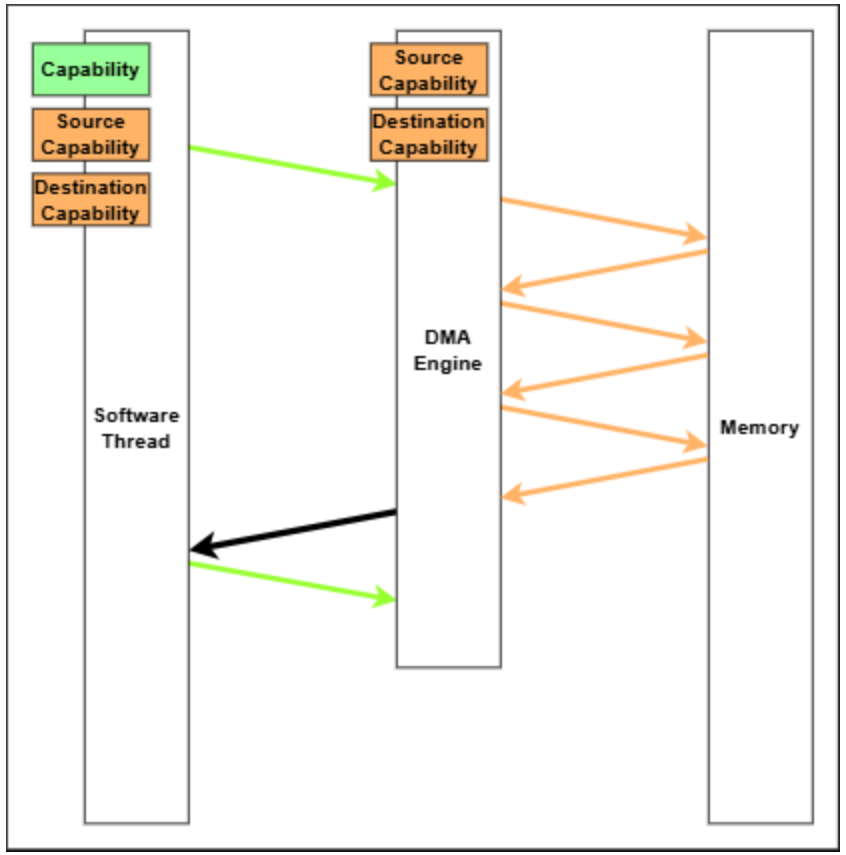
EXAMPLE: Simple CHERI DMA Engine

- The DMA engine will use the orange capabilities to carry out the data transfer.



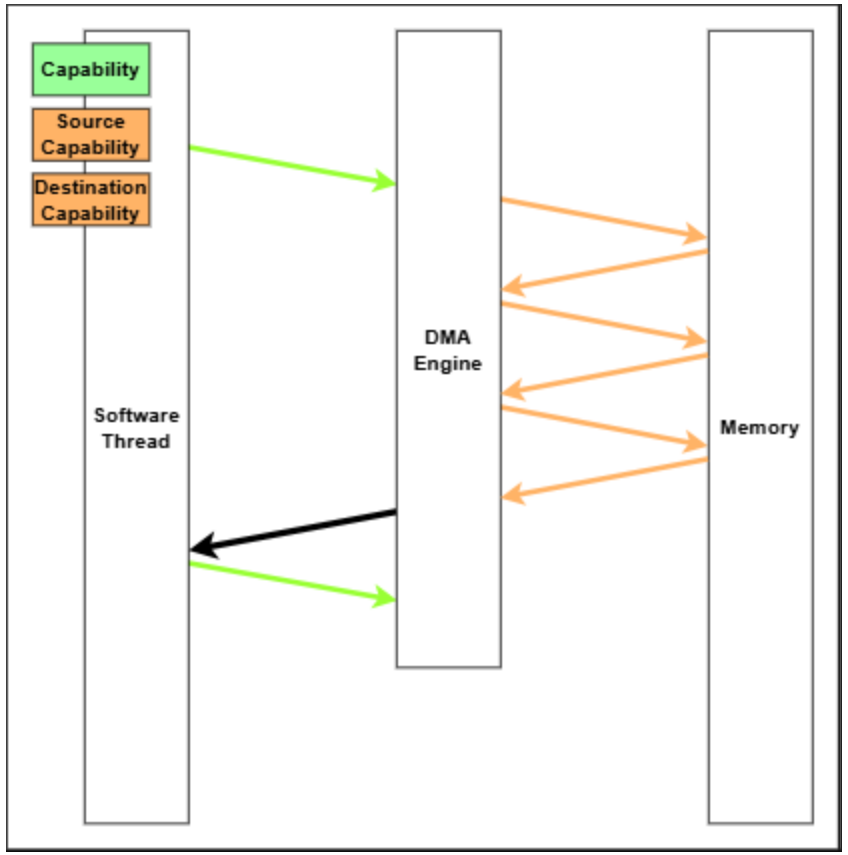
EXAMPLE: Simple CHERI DMA Engine

- The DMA engine will alert the software that the task has been completed (most likely via an interrupt).
- The software will then use the green capability to access the DMA registers to handle that interrupt.



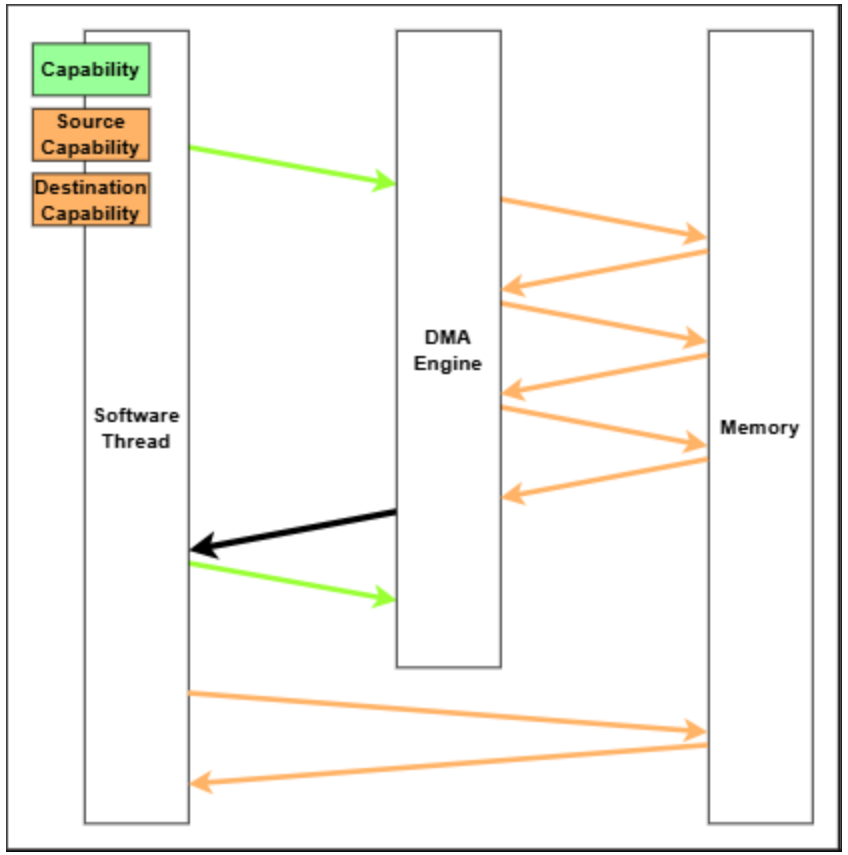
EXAMPLE: Simple CHERI DMA Engine

- As part of handling the interrupt, the software will revoke the orange capabilities.
- By revoking the orange capabilities the authority of the DMA engine to access the source and destination locations in memory is also revoked.

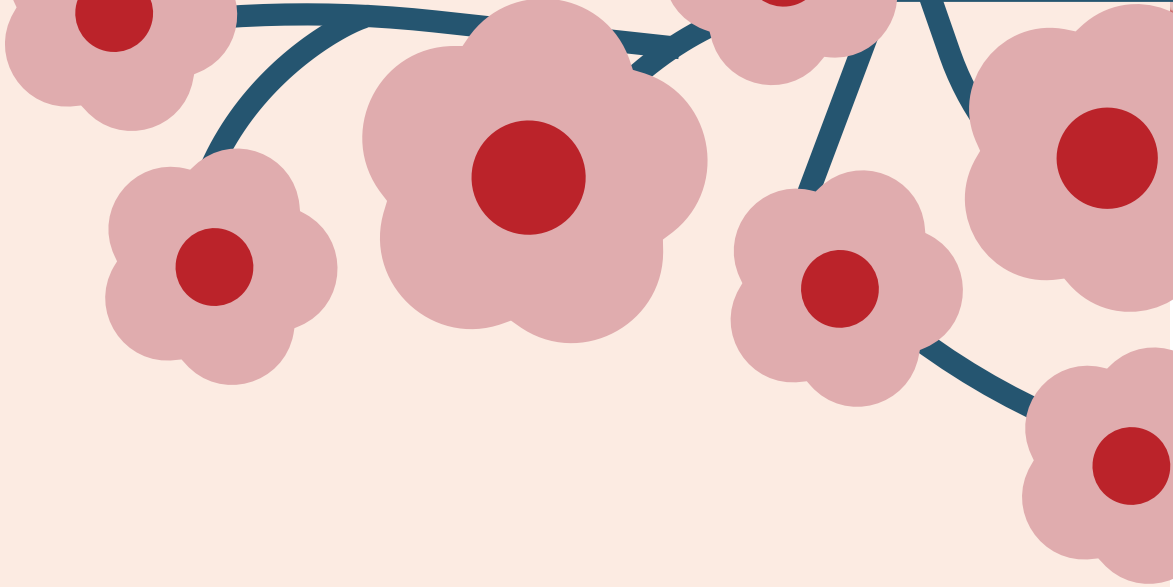


EXAMPLE: Simple CHERI DMA Engine

- The data has now been moved.
- The software can access it from its new location.



Questions



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THANK YOU

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Web www.cheri-alliance.org