

Computer Architecture

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Keep in mind there are *two* PDFs available (of which this is the latter):

1. a PDF of examinable material used as lecture slides, and
2. a PDF of non-examinable, extra material:
 - ▶ the associated notes page may be pre-populated with extra, written explanation of material covered in lecture(s), plus
 - ▶ anything with a “grey’ed out” header/footer represents extra material which is useful and/or interesting but out of scope (and hence not covered).

Notes:

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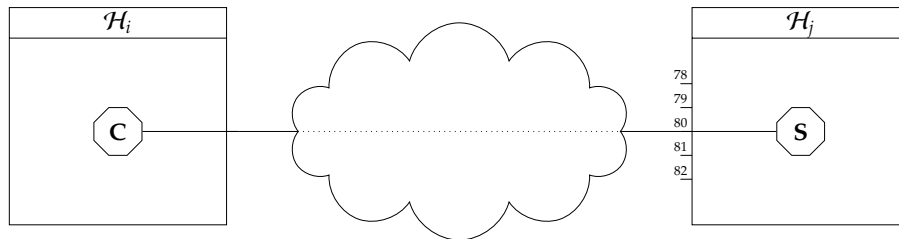
- ▶ **Agenda:** a somewhat technical introduction to the coursework assignment, i.e.,
 - ▶ overview of the assignment motivation and content,
 - ▶ answer any FAQs,
 - ▶ answer any non-FAQs,with the overarching goal of clarity, and enabling early progress.

Notes:

Encrypt (1)

Overview

- ▶ **Problem:** confidential (bulk) communication, per



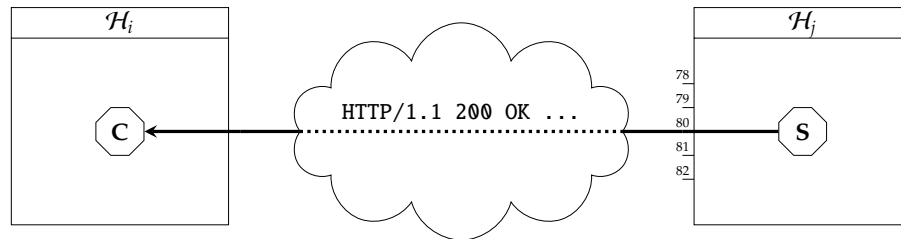
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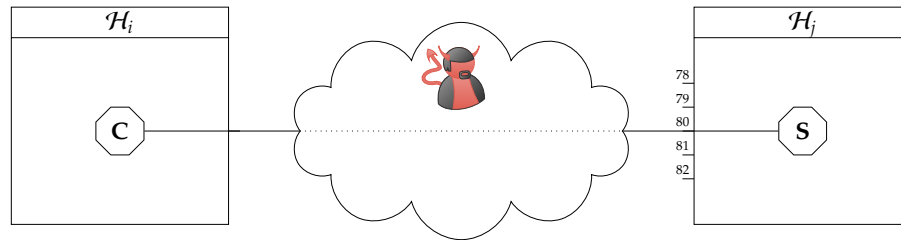


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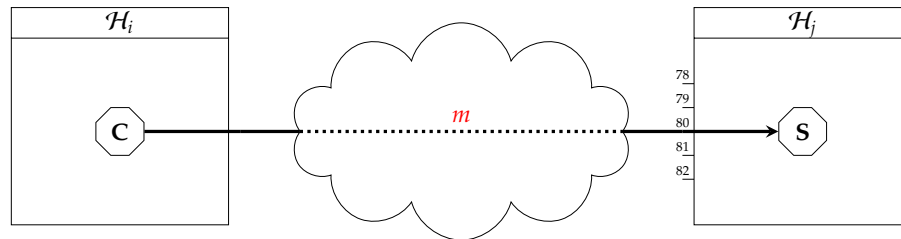


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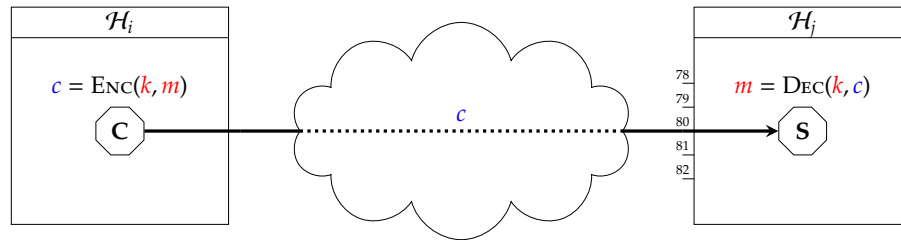


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Encrypt (1)

Overview

- **Problem:** confidential (bulk) communication, per



- **Solution:** encryption using a **block cipher**, i.e.,

$$\begin{aligned} \text{ENC} &: \{0, 1\}^{n_k} \times \{0, 1\}^{n_b} \rightarrow \{0, 1\}^{n_b} \\ \text{DEC} &: \{0, 1\}^{n_k} \times \{0, 1\}^{n_b} \rightarrow \{0, 1\}^{n_b} \end{aligned}$$

such that $\text{DEC}(k, c = \text{ENC}(k, m)) = m$.

Notes:

Encrypt (2)

Overview

- **Structure:** using Verilog,
 - stage 1 $\Rightarrow$ implement support for ENC
 - stage 2 $\Rightarrow$ implement ENC using combinatorial approach
 - stage 3 $\Rightarrow$ implement ENC using iterative approach
 - stage 4 $\Rightarrow$ implement ENC using pipelined approach

noting that, crucially,

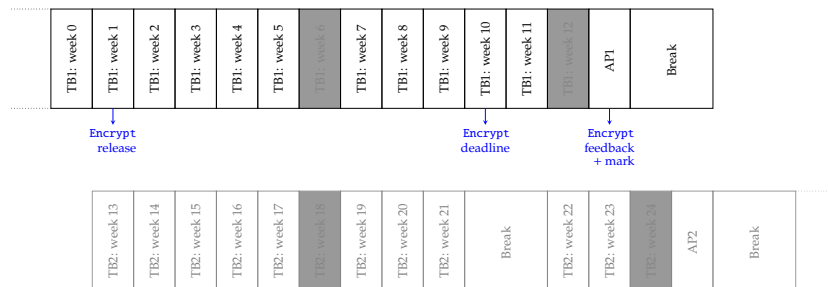
1. a detailed design for ENC,
 2. test vectors for ENC, i.e., sample inputs and outputs, and
 3. a skeleton implementation plus build system,
- are *all* provided.

Notes:

- **Question:** “*when* should I start; *when* should I invest effort”?

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- **Answer:** basically, recall that



and so *could* start $\approx$ week 5, whereas *should* start $\approx$ week 7.

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- **Question:** “*how* should I start; *how* should I invest effort”?
- **Answer:** basically,
 - attempt to complete relevant lab. worksheet(s),
 - work step-by-step through stages, e.g.,
 1. invest in understanding problem and, e.g., tools, workflow, etc.,
 2. produce an on-paper design,
 3. implement the design,
 4. test the implementation,
 - note that said stages are only *somewhat* dependent, e.g.,

stage 1 $\rightsquigarrow$ stage 2

but

stage 2 $\nrightarrow$ stage 3, 4

Notes:

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► Answer:

1. **theory:** [1, Point 5.4] says

“[o]ne credit point represents approximately 10 notional hours of student input”,

so, given 30% of 20CP is 6CP, the notional expectation is

$$6 \times 10 = 60$$

hours.

2. **practice:** some representative data collected from previous years reads

Cohort	Average time	Average mark
2024/5	26.77	63.56
2025/6	25.66	74.61

Notes:

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- ▶ **Answer:**

1. automatically $\Rightarrow$ functional correctness
2. manually $\Rightarrow$ wider quality metrics

noting that

- ▶ the marksheet details
 - ▶ for 1., a per-stage break down of marks, and
 - ▶ for 2., a non-exhaustive set of quality metrics (e.g., style, efficiency, robustness, generality, etc.),
- ▶ for selected submissions (either at random, or based on the marking process) we *may* validate the mark using a viva during week 12.

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- **Question:** “I’m concerned about academic integrity, and, e.g., plagiarism”?!
- **Answer:**
 1. an accessible overview can be found at
<https://www.bristol.ac.uk/students/support/academic-advice/academic-integrity>
 2. the more detailed policy can be found, e.g., via Sec. 3 of
<https://www.bristol.ac.uk/academic-quality/assessment/codeonline.html>
 3. we do apply (semi-)automatic tools to identify potential transgression.

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- ▶ **Question:** “the assignment description is *how* many pages”?!
- ▶ **Answer:** keep in mind that the bulk of those pages capture
 1. various diagrams,
 2. various appendices (which offer additional detail and, e.g., a fully-worked example),meaning the central content is *much* shorter (i.e., ~ 4 pages)!

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- **Question:** “there are lab. worksheets at the same time, i.e., should I do *both*”?
- **Answer:** no, not necessarily, in the sense each such worksheet says

During the period of time aligned with this lab. worksheet, there is an active (or open) coursework assignment for the unit. You could address this fact by dividing your time between them. However, our (strong) suggestion is to view the former as of secondary importance (or optional, basically), and instead focus on the latter: since it is credit bearing, the coursework assignment should be viewed as of primary importance. Put another way, focus exclusively on completing the latter before you invest any time at all in the former.

Notes:

Conclusions (1)

► **Take away points:** the assignment is designed to (ideally) balance

1. short-term challenge:

intellectual	:	demands <i>thinking</i> versus simply <i>doing</i>
technical	:	stresses formative understanding of some concepts, resources, etc.
definitional	:	some aspects are partially defined, or go beyond taught content
logistical	:	demands effective planning and time management
	:	

2. long-term outcome:

rewarding	:	simulate (limited) experience of <i>real</i> versus explanatory task
useful	:	hands-on vehicle for exploring (and understanding) taught content
	:	

in the sense that the former aren't negative, *provided* the latter are true.

Notes:

Conclusions (2)

Questions?

Notes:

References

- [1] *Regulations And Code Of Practice For Taught Programmes*. <https://www.bristol.ac.uk/media-library/sites/academic-quality/documents/taught-code/taught-code-25-26.pdf>. 2025 (see pp. 29, 31).

Notes: