ECE 485/585
Fall 2024
Final Project Report
Group 1

GitHub

All major design specs are found on the team GitHub. The GitHub includes a docs folder with a README that provides all relevant information for design decisions, testing outline, interface information, and assumptions.

GitHub link: https://github.com/stweeks-pdx/ECE585-LLC-GRP1

Address Mapping

To parse a given address into the required tag, index, and byte select portions we must perform the following calculations:

$$byte\ select\ width\ = log2(cache\ line\ size\ in\ bytes)$$
$$index\ width\ = log2(cache\ capacity)\ - log2(associativity)\ - byte\ select\ width$$
$$tag\ width\ = address\ width\ in\ bits\ - index\ width\ - byte\ select\ width$$

For the default specification provided for this project, this gives us the following mapping:

Address																													
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Tag												*Set Index*														*Byte Select*					

Extensibility

Cache specifications are either in global variables or in #defines that can be seen by the modules that need them. #define values can be changed at compilation time through Makefile arguments, while global variables are calculated at runtime based on those #define values.

#define values are:

- *BYTESELECTWIDTH:* Width of byte select in bits; log2(cache line size in bytes)
- *ASSOCIATIVITY:* Set associativity
- *SETS:* Number of sets; must be manually calculated before defining

Global variables are:

- *BYTESELECTMASK:* Bitmask for parsing byte from address
- *INDEXWIDTH:* Width of index in bits; log2(SETS)
- *INDEXMASK:* Bitmask for parsing index from address
- *TAGWIDTH:* Width of tag in bytes
- *TAGMASK:* Bitmask for parsing tag from address

Additionally, an experimental version of our build has run-time extensibility through command line arguments. Global variables above are still calculated in the same manner but, in place of #defines, these variables are now set when parsing argv[].

Values that are newly configurable are:

- *CAPACITY:* Width of cache capacity in bits; log2(capacity of cache)