Trace of "SubMatrix" algorithm[1]

$$\left(\begin{array}{cc|cc} \mathbf{1} & 2 & 3 & 4 \\ \hline 5 & 6 & 7 & 8 \\ \hline 9 & 10 & 11 & 12 \\ \hline 13 & 14 & 15 & 16 \end{array}\right) \times \left(\begin{array}{cc|cc} \mathbf{a} & \mathbf{b} & c & d \\ \hline e & f & g & h \\ \hline i & j & k & l \\ \hline m & n & o & p \end{array}\right) =$$

$$\left(\begin{array}{cc|cc} \mathbf{1}a + 2e + 3i + 4m & \mathbf{1}b + 2f + 3j + 4n & 1c + 2g + 3k + 4o & 1d + 2h + 3l + 4p \\ \hline 5a + 6e + 7i + 8m & 5b + 6f + 7j + 8n & 5c + 6g + 7k + 8o & 5d + 6h + 7l + 8p \\ \hline 9a + 10e + 11i + 12m & 9b + 10f + 11j + 12n & 9c + 10g + 11k + 12o & 9d + 10h + 11l + 12p \\ \hline 13a + 14e + 15i + 16m & 13b + 14f + 15j + 16n & 13c + 14g + 15k + 16o & 13d + 14h + 15l + 16p \end{array}\right)$$

[1] Note: Two elements by cache line

Trace of "SubMatrix" algorithm[2]

$$\left(\begin{array}{cc|cc} 1 & \mathbf{2} & 3 & 4 \\ 5 & 6 & 7 & 8 \\ \hline 9 & 10 & 11 & 12 \\ 13 & 14 & 15 & 16 \end{array}\right) \times \left(\begin{array}{cc|cc} a & b & c & d \\ \mathbf{e} & \mathbf{f} & g & h \\ \hline i & j & k & l \\ m & n & o & p \end{array}\right) =$$

$$\left(\begin{array}{cc|cc} 1a + \mathbf{2e} + 3i + 4m & 1b + \mathbf{2f} + 3j + 4n & 1c + 2g + 3k + 4o & 1d + 2h + 3l + 4p \\ 5a + 6e + 7i + 8m & 5b + 6f + 7j + 8n & 5c + 6g + 7k + 8o & 5d + 6h + 7l + 8p \\ \hline 9a + 10e + 11i + 12m & 9b + 10f + 11j + 12n & 9c + 10g + 11k + 12o & 9d + 10h + 11l + 12p \\ 13a + 14e + 15i + 16m & 13b + 14f + 15j + 16n & 13c + 14g + 15k + 16o & 13d + 14h + 15l + 16p \end{array}\right)$$

[2]Note: Two elements by cache line

Trace of "SubMatrix" algorithm[3]

$$\left(\begin{array}{cc|cc} 1 & 2 & 3 & 4 \\ \mathbf{5} & 6 & 7 & 8 \\ \hline 9 & 10 & 11 & 12 \\ 13 & 14 & 15 & 16 \end{array}\right) \times \left(\begin{array}{cc|cc} \mathbf{a} & \mathbf{b} & c & d \\ e & f & g & h \\ \hline i & j & k & l \\ m & n & o & p \end{array}\right) =$$

$$\left(\begin{array}{cc|cc} 1a+2e+3i+4m & 1b+2f+3j+4n & 1c+2g+3k+4o & 1d+2h+3l+4p \\ \mathbf{5a}+6e+7i+8m & \mathbf{5b}+6f+7j+8n & 5c+6g+7k+8o & 5d+6h+7l+8p \\ \hline 9a+10e+11i+12m & 9b+10f+11j+12n & 9c+10g+11k+12o & 9d+10h+11l+12p \\ 13a+14e+15i+16m & 13b+14f+15j+16n & 13c+14g+15k+16o & 13d+14h+15l+16p \end{array}\right)$$

[3]Note: Two elements by cache line

Trace of "SubMatrix" algorithm[4]

$$\left(\begin{array}{cc|cc} 1 & 2 & 3 & 4 \\ \hline 5 & \mathbf{6} & 7 & 8 \\ \hline 9 & 10 & 11 & 12 \\ \hline 13 & 14 & 15 & 16 \end{array}\right) \times \left(\begin{array}{cc|cc} a & b & c & d \\ \hline \mathbf{e} & \mathbf{f} & g & h \\ \hline i & j & k & l \\ \hline m & n & o & p \end{array}\right) =$$

$$\left(\begin{array}{cc|cc} 1a+2e+3i+4m & 1b+2f+3j+4n & 1c+2g+3k+4o & 1d+2h+3l+4p \\ \hline 5a+\mathbf{6e}+7i+8m & 5b+\mathbf{6f}+7j+8n & 5c+6g+7k+8o & 5d+6h+7l+8p \\ \hline 9a+10e+11i+12m & 9b+10f+11j+12n & 9c+10g+11k+12o & 9d+10h+11l+12p \\ \hline 13a+14e+15i+16m & 13b+14f+15j+16n & 13c+14g+15k+16o & 13d+14h+15l+16p \end{array}\right)$$

[4]Note: Two elements by cache line

Trace of "SubMatrix" algorithm[5]

$$\left(\begin{array}{cc|cc} 1 & 2 & \mathbf{3} & 4 \\ \hline 5 & 6 & 7 & 8 \\ \hline 9 & 10 & 11 & 12 \\ \hline 13 & 14 & 15 & 16 \end{array}\right) \times \left(\begin{array}{cc|cc} a & b & c & d \\ \hline e & f & g & h \\ \hline \mathbf{i} & \mathbf{j} & k & l \\ \hline m & n & o & p \end{array}\right) =$$

$$\left(\begin{array}{cc|cc} 1a + 2e + \mathbf{3i} + 4m & 1b + 2f + \mathbf{3j} + 4n & 1c + 2g + 3k + 4o & 1d + 2h + 3l + 4p \\ \hline 5a + 6e + 7i + 8m & 5b + 6f + 7j + 8n & 5c + 6g + 7k + 8o & 5d + 6h + 7l + 8p \\ \hline 9a + 10e + 11i + 12m & 9b + 10f + 11j + 12n & 9c + 10g + 11k + 12o & 9d + 10h + 11l + 12p \\ \hline 13a + 14e + 15i + 16m & 13b + 14f + 15j + 16n & 13c + 14g + 15k + 16o & 13d + 14h + 15l + 16p \end{array}\right)$$

[5] Note: Two elements by cache line

Trace of "SubMatrix" algorithm[6]

$$\left(\begin{array}{cc|cc} 1 & 2 & 3 & \mathbf{4} \\ \hline 5 & 6 & 7 & 8 \\ \hline 9 & 10 & 11 & 12 \\ \hline 13 & 14 & 15 & 16 \end{array}\right) \times \left(\begin{array}{cc|cc} a & b & c & d \\ \hline e & f & g & h \\ \hline i & j & k & l \\ \hline \mathbf{m} & \mathbf{n} & o & p \end{array}\right) =$$

$$\left(\begin{array}{cc|cc} 1a+2e+3i+\mathbf{4m} & 1b+2f+3j+\mathbf{4n} & 1c+2g+3k+4o & 1d+2h+3l+4p \\ \hline 5a+6e+7i+8m & 5b+6f+7j+8n & 5c+6g+7k+8o & 5d+6h+7l+8p \\ \hline 9a+10e+11i+12m & 9b+10f+11j+12n & 9c+10g+11k+12o & 9d+10h+11l+12p \\ \hline 13a+14e+15i+16m & 13b+14f+15j+16n & 13c+14g+15k+16o & 13d+14h+15l+16p \end{array}\right)$$

[6] Note: Two elements by cache line

Trace of "SubMatrix" algorithm[7]

$$\left(\begin{array}{cc|cc} 1 & 2 & 3 & 4 \\ \hline 5 & 6 & \mathbf{7} & 8 \\ \hline 9 & 10 & 11 & 12 \\ \hline 13 & 14 & 15 & 16 \end{array}\right) \times \left(\begin{array}{cc|cc} a & b & c & d \\ \hline e & f & g & h \\ \hline \mathbf{i} & \mathbf{j} & k & l \\ \hline m & n & o & p \end{array}\right) =$$

$$\left(\begin{array}{cc|cc} 1a+2e+3i+4m & 1b+2f+3j+4n & 1c+2g+3k+4o & 1d+2h+3l+4p \\ \hline 5a+6e+\mathbf{7i}+8m & 5b+6f+\mathbf{7j}+8n & 5c+6g+7k+8o & 5d+6h+7l+8p \\ \hline 9a+10e+11i+12m & 9b+10f+11j+12n & 9c+10g+11k+12o & 9d+10h+11l+12p \\ \hline 13a+14e+15i+16m & 13b+14f+15j+16n & 13c+14g+15k+16o & 13d+14h+15l+16p \end{array}\right)$$

[7] Note: Two elements by cache line

Trace of "SubMatrix" algorithm[8]

$$\left(\begin{array}{cc|cc} 1 & 2 & 3 & 4 \\ \hline 5 & 6 & 7 & \mathbf{8} \\ \hline 9 & 10 & 11 & 12 \\ \hline 13 & 14 & 15 & 16 \end{array}\right) \times \left(\begin{array}{cc|cc} a & b & c & d \\ \hline e & f & g & h \\ \hline i & j & k & l \\ \hline \mathbf{m} & \mathbf{n} & o & p \end{array}\right) =$$

$$\left(\begin{array}{cc|cc} 1a+2e+3i+4m & 1b+2f+3j+4n & 1c+2g+3k+4o & 1d+2h+3l+4p \\ \hline 5a+6e+7i+\mathbf{8m} & 5b+6f+7j+\mathbf{8n} & 5c+6g+7k+8o & 5d+6h+7l+8p \\ \hline 9a+10e+11i+12m & 9b+10f+11j+12n & 9c+10g+11k+12o & 9d+10h+11l+12p \\ \hline 13a+14e+15i+16m & 13b+14f+15j+16n & 13c+14g+15k+16o & 13d+14h+15l+16p \end{array}\right)$$

[8] Note: Two elements by cache line

Trace of "SubMatrix" algorithm[9]

$$\left(\begin{array}{cc|cc} \mathbf{1} & 2 & 3 & 4 \\ \hline 5 & 6 & 7 & 8 \\ \hline 9 & 10 & 11 & 12 \\ \hline 13 & 14 & 15 & 16 \end{array}\right) \times \left(\begin{array}{cc|cc} a & b & \mathbf{c} & \mathbf{d} \\ \hline e & f & g & h \\ \hline i & j & k & l \\ \hline m & n & o & p \end{array}\right) =$$

$$\left(\begin{array}{cc|cc} 1a+2e+3i+4m & 1b+2f+3j+4n & \mathbf{1c}+2g+3k+4o & \mathbf{1d}+2h+3l+4p \\ \hline 5a+6e+7i+8m & 5b+6f+7j+8n & 5c+6g+7k+8o & 5d+6h+7l+8p \\ \hline 9a+10e+11i+12m & 9b+10f+11j+12n & 9c+10g+11k+12o & 9d+10h+11l+12p \\ \hline 13a+14e+15i+16m & 13b+14f+15j+16n & 13c+14g+15k+16o & 13d+14h+15l+16p \end{array}\right)$$

[9] Note: Two elements by cache line

Trace of "SubMatrix" algorithm[10]

$$\left(\begin{array}{cc|cc} 1 & \mathbf{2} & 3 & 4 \\ \hline 5 & 6 & 7 & 8 \\ \hline 9 & 10 & 11 & 12 \\ \hline 13 & 14 & 15 & 16 \end{array}\right) \times \left(\begin{array}{cc|cc} a & b & c & d \\ \hline e & f & \mathbf{g} & \mathbf{h} \\ \hline i & j & k & l \\ \hline m & n & o & p \end{array}\right) =$$

$$\left(\begin{array}{cc|cc} 1a+2e+3i+4m & 1b+2f+3j+4n & 1c+\mathbf{2g}+3k+4o & 1d+\mathbf{2h}+3l+4p \\ \hline 5a+6e+7i+8m & 5b+6f+7j+8n & 5c+6g+7k+8o & 5d+6h+7l+8p \\ \hline 9a+10e+11i+12m & 9b+10f+11j+12n & 9c+10g+11k+12o & 9d+10h+11l+12p \\ \hline 13a+14e+15i+16m & 13b+14f+15j+16n & 13c+14g+15k+16o & 13d+14h+15l+16p \end{array}\right)$$

[10] Note: Two elements by cache line

Trace of "SubMatrix" algorithm[11]

$$\left(\begin{array}{cc|cc} 1 & 2 & 3 & 4 \\ \hline \mathbf{5} & 6 & 7 & 8 \\ \hline 9 & 10 & 11 & 12 \\ \hline 13 & 14 & 15 & 16 \end{array}\right) \times \left(\begin{array}{cc|cc} a & b & \mathbf{c} & \mathbf{d} \\ \hline e & f & g & h \\ \hline i & j & k & l \\ \hline m & n & o & p \end{array}\right) =$$

$$\left(\begin{array}{cc|cc} 1a+2e+3i+4m & 1b+2f+3j+4n & 1c+2g+3k+4o & 1d+2h+3l+4p \\ \hline 5a+6e+7i+8m & 5b+6f+7j+8n & \mathbf{5c}+6g+7k+8o & \mathbf{5d}+6h+7l+8p \\ \hline 9a+10e+11i+12m & 9b+10f+11j+12n & 9c+10g+11k+12o & 9d+10h+11l+12p \\ \hline 13a+14e+15i+16m & 13b+14f+15j+16n & 13c+14g+15k+16o & 13d+14h+15l+16p \end{array}\right)$$

[11] Note: Two elements by cache line

Trace of "SubMatrix" algorithm[12]

$$\left(\begin{array}{cc|cc} 1 & 2 & 3 & 4 \\ \hline 5 & \mathbf{6} & 7 & 8 \\ \hline 9 & 10 & 11 & 12 \\ \hline 13 & 14 & 15 & 16 \end{array}\right) \times \left(\begin{array}{cc|cc} a & b & c & d \\ \hline e & f & \mathbf{g} & \mathbf{h} \\ \hline i & j & k & l \\ \hline m & n & o & p \end{array}\right) =$$

$$\left(\begin{array}{cc|cc} 1a+2e+3i+4m & 1b+2f+3j+4n & 1c+2g+3k+4o & 1d+2h+3l+4p \\ \hline 5a+6e+7i+8m & 5b+6f+7j+8n & 5c+\mathbf{6g}+7k+8o & 5d+\mathbf{6h}+7l+8p \\ \hline 9a+10e+11i+12m & 9b+10f+11j+12n & 9c+10g+11k+12o & 9d+10h+11l+12p \\ \hline 13a+14e+15i+16m & 13b+14f+15j+16n & 13c+14g+15k+16o & 13d+14h+15l+16p \end{array}\right)$$

[12] Note: Two elements by cache line

Trace of "SubMatrix" algorithm[13]

$$\left(\begin{array}{cc|cc} 1 & 2 & \mathbf{3} & 4 \\ \hline 5 & 6 & 7 & 8 \\ \hline 9 & 10 & 11 & 12 \\ \hline 13 & 14 & 15 & 16 \end{array}\right) \times \left(\begin{array}{cc|cc} a & b & c & d \\ \hline e & f & g & h \\ \hline i & j & \mathbf{k} & \mathbf{l} \\ \hline m & n & o & p \end{array}\right) =$$

$$\left(\begin{array}{cc|cc} 1a+2e+3i+4m & 1b+2f+3j+4n & 1c+2g+\mathbf{3k}+4o & 1d+2h+\mathbf{3l}+4p \\ \hline 5a+6e+7i+8m & 5b+6f+7j+8n & 5c+6g+7k+8o & 5d+6h+7l+8p \\ \hline 9a+10e+11i+12m & 9b+10f+11j+12n & 9c+10g+11k+12o & 9d+10h+11l+12p \\ \hline 13a+14e+15i+16m & 13b+14f+15j+16n & 13c+14g+15k+16o & 13d+14h+15l+16p \end{array}\right)$$

[13] Note: Two elements by cache line

Trace of "SubMatrix" algorithm[14]

$$\left(\begin{array}{cc|c} 1 & 2 & 3 \\ 5 & 6 & 7 \\ \hline 9 & 10 & 11 \\ 13 & 14 & 15 \end{array}\right.\left.\begin{array}{c} \mathbf{4} \\ 8 \\ \\ 12 \\ 16 \end{array}\right) \times \left(\begin{array}{cc|c} a & b & c \\ e & f & g \\ \hline i & j & k \\ m & n & \mathbf{o} \end{array}\right.\left.\begin{array}{c} d \\ h \\ \\ \mathbf{p} \end{array}\right) =$$

$$\left(\begin{array}{cc|c} 1a+2e+3i+4m & 1b+2f+3j+4n & 1c+2g+3k+\mathbf{4o} \\ 5a+6e+7i+8m & 5b+6f+7j+8n & 5c+6g+7k+8o \\ \hline 9a+10e+11i+12m & 9b+10f+11j+12n & 9c+10g+11k+12o \\ 13a+14e+15i+16m & 13b+14f+15j+16n & 13c+14g+15k+16o \end{array}\right.\left.\begin{array}{c} 1d+2h+3l+\mathbf{4p} \\ 5d+6h+7l+8p \\ \\ 9d+10h+11l+12p \\ 13d+14h+15l+16p \end{array}\right)$$

[14] Note: Two elements by cache line

Trace of "SubMatrix" algorithm[15]

$$\left(\begin{array}{cc|cc} 1 & 2 & 3 & 4 \\ \hline 5 & 6 & \mathbf{7} & 8 \\ \hline 9 & 10 & 11 & 12 \\ \hline 13 & 14 & 15 & 16 \end{array}\right) \times \left(\begin{array}{cc|cc} a & b & c & d \\ \hline e & f & g & h \\ \hline i & j & \mathbf{k} & \mathbf{l} \\ \hline m & n & o & p \end{array}\right) =$$

$$\left(\begin{array}{cc|cc} 1a+2e+3i+4m & 1b+2f+3j+4n & 1c+2g+3k+4o & 1d+2h+3l+4p \\ \hline 5a+6e+7i+8m & 5b+6f+7j+8n & 5c+6g+\mathbf{7k}+8o & 5d+6h+\mathbf{7l}+8p \\ \hline 9a+10e+11i+12m & 9b+10f+11j+12n & 9c+10g+11k+12o & 9d+10h+11l+12p \\ \hline 13a+14e+15i+16m & 13b+14f+15j+16n & 13c+14g+15k+16o & 13d+14h+15l+16p \end{array}\right)$$

[15] Note: Two elements by cache line

Trace of "SubMatrix" algorithm[16]

$$\left(\begin{array}{cc|cc} 1 & 2 & 3 & 4 \\ \hline 5 & 6 & 7 & \mathbf{8} \\ \hline 9 & 10 & 11 & 12 \\ \hline 13 & 14 & 15 & 16 \end{array}\right) \times \left(\begin{array}{cc|cc} a & b & c & d \\ \hline e & f & g & h \\ \hline i & j & k & l \\ \hline m & n & \mathbf{o} & \mathbf{p} \end{array}\right) =$$

$$\left(\begin{array}{cc|cc} 1a+2e+3i+4m & 1b+2f+3j+4n & 1c+2g+3k+4o & 1d+2h+3l+4p \\ \hline 5a+6e+7i+8m & 5b+6f+7j+8n & 5c+6g+7k+\mathbf{8o} & 5d+6h+7l+\mathbf{8p} \\ \hline 9a+10e+11i+12m & 9b+10f+11j+12n & 9c+10g+11k+12o & 9d+10h+11l+12p \\ \hline 13a+14e+15i+16m & 13b+14f+15j+16n & 13c+14g+15k+16o & 13d+14h+15l+16p \end{array}\right)$$

[16] Note: Two elements by cache line

Trace of “SubMatrix” algorithm

and so on ...