LD1 (single structure)

Load one single-element structure to one lane of one register. This instruction loads a single-element structure from memory and writes the result to the specified lane of the SIMD&FP register without affecting the other bits of the register.

Depending on the settings in the *CPACR_EL1*, *CPTR_EL2*, and *CPTR_EL3* registers, and the current Security state and Exception level, an attempt to execute the instruction might be trapped.

It has encodings from 2 classes: [No offset](#) and [Post-index](#)

No offset

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
0	Q	0	0	1	1	0	1	0	1	0	0	0	0	0	0	x	x	0	S	size		Rn					Rt				
						L	R						o2	opcode																	

8-bit (opcode == 000)

        LD1 { <Vt>.B }[<index>], [<Xn|SP>]

16-bit (opcode == 010 && size == x0)

        LD1 { <Vt>.H }[<index>], [<Xn|SP>]

32-bit (opcode == 100 && size == 00)

        LD1 { <Vt>.S }[<index>], [<Xn|SP>]

64-bit (opcode == 100 && S == 0 && size == 01)

        LD1 { <Vt>.D }[<index>], [<Xn|SP>]

```
integer t = UInt(Rt);
integer n = UInt(Rn);
integer m = integer UNKNOWN;
boolean wback = FALSE;
boolean nontemporal = FALSE;
boolean tagchecked = wback || n != 31;
```

Post-index

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
0	Q	0	0	1	1	0	1	1	1	0			Rm			x	x	0	S	size		Rn					Rt				
						L	R										opcode														

8-bit, immediate offset (Rm == 11111 && opcode == 000)

```
        LD1 { <Vt>.B }[<index>], [<Xn|SP>], #1
```

8-bit, register offset (Rm != 11111 && opcode == 000)

```
        LD1 { <Vt>.B }[<index>], [<Xn|SP>], <Xm>
```

16-bit, immediate offset (Rm == 11111 && opcode == 010 && size == x0)

```
        LD1 { <Vt>.H }[<index>], [<Xn|SP>], #2
```

16-bit, register offset (Rm != 11111 && opcode == 010 && size == x0)

```
        LD1 { <Vt>.H }[<index>], [<Xn|SP>], <Xm>
```

32-bit, immediate offset (Rm == 11111 && opcode == 100 && size == 00)

```
        LD1 { <Vt>.S }[<index>], [<Xn|SP>], #4
```

32-bit, register offset (Rm != 11111 && opcode == 100 && size == 00)

```
        LD1 { <Vt>.S }[<index>], [<Xn|SP>], <Xm>
```

64-bit, immediate offset (Rm == 11111 && opcode == 100 && S == 0 && size == 01)

```
        LD1 { <Vt>.D }[<index>], [<Xn|SP>], #8
```

64-bit, register offset (Rm != 11111 && opcode == 100 && S == 0 && size == 01)

```
        LD1 { <Vt>.D }[<index>], [<Xn|SP>], <Xm>
```

```
integer t = UInt(Rt);
integer n = UInt(Rn);
integer m = UInt(Rm);
boolean wback = TRUE;
boolean nontemporal = FALSE;
boolean tagchecked = wback || n != 31;
```

Assembler Symbols

\<Vt\>	Is the name of the first or only SIMD&FP register to be transferred, encoded in the "Rt" field.
\<index\>	For the 8-bit variant: is the element index, encoded in "Q:S:size".
	For the 16-bit variant: is the element index, encoded in "Q:S:size<1>".

For the 32-bit variant: is the element index, encoded in "Q:S".

For the 64-bit variant: is the element index, encoded in "Q".

<Xn|SP>   Is the 64-bit name of the general-purpose base register or stack pointer, encoded in the "Rn" field.

<Xm>   Is the 64-bit name of the general-purpose post-index register, excluding XZR, encoded in the "Rm" field.

Shared Decode

```
bits(2) scale = opcode<2:1>;
integer selem = UInt(opcode<0>:R) + 1;
boolean replicate = FALSE;
integer index;

case scale of
    when '11'
        // load and replicate
        if L == '0' || S == '1' then UNDEFINED;
        scale = size;
        replicate = TRUE;
    when '00'
        index = UInt(Q:S:size);    // B[0-15]
    when '01'
        if size<0> == '1' then UNDEFINED;
        index = UInt(Q:S:size<1>);    // H[0-7]
    when '10'
        if size<1> == '1' then UNDEFINED;
        if size<0> == '0' then
            index = UInt(Q:S);    // S[0-3]
        else
            if S == '1' then UNDEFINED;
            index = UInt(Q);    // D[0-1]
            scale = '11';

MemOp memop = if L == '1' then MemOp_LOAD else MemOp_STORE;
constant integer datasize = 64 << UInt(Q);
constant integer esize = 8 << UInt(scale);
```

Operation

```
CheckFPAdvSIMDEnabled64();

bits(64) address;
bits(64) offs;
bits(128) rval;
bits(esize) element;
constant integer ebytes = esize DIV 8;

AccessDescriptor accdesc = CreateAccDescASIMD(memop, nontemporal, tagch

if n == 31 then
    CheckSPAlignment();
    address = SP[];
```

```
else
    address = X[n, 64];

offs = Zeros(64);
if replicate then
    // load and replicate to all elements
    for s = 0 to selem-1
        element = Mem[address+offs, ebytes, accdesc];
        // replicate to fill 128- or 64-bit register
        V[t, datasize] = Replicate(element, datasize DIV esize);
        offs = offs + ebytes;
        t = (t + 1) MOD 32;
else
    // load/store one element per register
    for s = 0 to selem-1
        rval = V[t, 128];
        if memop == MemOp_LOAD then
            // insert into one lane of 128-bit register
            Elem[rval, index, esize] = Mem[address+offs, ebytes, accdesc
            V[t, 128] = rval;
        else // memop == MemOp_STORE
            // extract from one lane of 128-bit register
            Mem[address+offs, ebytes, accdesc] = Elem[rval, index, esize
        offs = offs + ebytes;
        t = (t + 1) MOD 32;

if wback then
    if m != 31 then
        offs = X[m, 64];
    if n == 31 then
        SP[] = address + offs;
    else
        X[n, 64] = address + offs;
```

Operational information

If PSTATE.DIT is 1, the timing of this instruction is insensitive to the value of
the data being loaded or stored.