TLBIP RVALE3OS, TLBIP RVALE3OSNXS, TLB Range Invalidate by VA, Last level, EL3, Outer Shareable

The TLBIP RVALE3OS, TLBIP RVALE3OSNXS characteristics are:

Purpose

If EL3 is implemented, invalidates cached copies of translation table entries from TLBs that meet all the following requirements:

- The entry is a 128-bit stage 1 translation table entry, from the final level of the translation table walk up to the level indicated in the TTL hint.

  Or the entry is 64-bit a stage 1 translation table entry, from the final level of the translation table walk, if TTL is `0b00`.

- The entry would be used to translate any of the VAs in the specified address range using the EL3 translation regime.

- The entry is within the address range determined by the formula [BaseADDR <= VA < BaseADDR + ((NUM +1)*$2^{(5*SCALE +1)}$ * Translation_Granule_Size)].

The invalidation applies to all PEs in the same Outer Shareable shareability domain as the PE that executes this System instruction.

For 128-bit translation table entry, the range of addresses invalidated is unpredictable when Block or Page size corresponding to TTL and TG, for the translation system is not aligned.

If FEAT_XS is implemented, the nXS variant of this System instruction is defined.

Both variants perform the same invalidation, but the TLBI System instruction without the nXS qualifier waits for all memory accesses using in-scope old translation information to complete before it is considered complete.

The TLBI System instruction with the nXS qualifier is considered complete when the subset of these memory accesses with XS attribute set to 0 are complete.

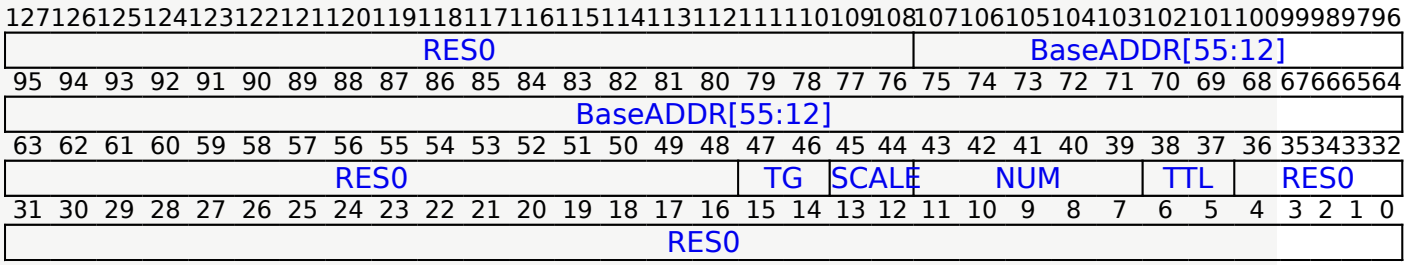
Configuration

This instruction is present only when FEAT_D128 is implemented. Otherwise, direct accesses to TLBIP RVALE3OS, TLBIP RVALE3OSNXS are undefined.

Attributes

TLBIP RVALE3OS, TLBIP RVALE3OSNXS is a 128-bit System instruction.

Field descriptions



Bits [127:108]

Reserved, res0.

BaseADDR[55:12], bits [107:64]

The starting address for the range of the maintenance instructions. This field is BaseADDR[55:12] for all translation granules.

Bits [63:48]

Reserved, res0.

TG, bits [47:46]

Translation granule size.

TG	Meaning
0b00	Reserved.
0b01	4K translation granule.
0b10	16K translation granule.
0b11	64K translation granule.

The instruction takes a translation granule size for the translations that are being invalidated. If the translations used a different translation granule size than the one being specified, then the architecture does not require that the instruction invalidates any entries.

SCALE, bits [45:44]

The exponent element of the calculation that is used to produce the upper range.

NUM, bits [43:39]

The base element of the calculation that is used to produce the upper range.

TTL, bits [38:37]

TTL Level hint. The TTL hint is only guaranteed to invalidate:

- Non-leaf-level entries in the range up to but not including the level described by the TTL hint.
- Leaf-level entries in the range that match the level described by the TTL hint.

TTL	Meaning
`0b00`	The entries in the range can be using any level for the translation table entries.
`0b01`	The TTL hint indicates level 1. If FEAT_LPA2 is not implemented, when using a 16KB translation granule, this value is reserved and hardware should treat this field as `0b00`.
`0b10`	The TTL hint indicates level 2.
`0b11`	The TTL hint indicates level 3.

Bits [36:0]

Reserved, res0.

Executing TLBIP RVALE3OS, TLBIP RVALE3OSNXS

Accesses to this instruction use the following encodings in the System instruction encoding space:

```
TLBIP RVALE3OS{, <Xt>, <Xt2>}
```

op0	op1	CRn	CRm	op2
0b01	0b110	0b1000	0b0101	0b101

```
if PSTATE.EL == EL0 then
    UNDEFINED;
elsif PSTATE.EL == EL1 then
    UNDEFINED;
elsif PSTATE.EL == EL2 then
    UNDEFINED;
elsif PSTATE.EL == EL3 then
    AArch64.TLBIP_RVA(SecurityStateAtEL(EL3),
Regime_EL3, VMID[], Shareability_OSH,
TLBILevel_Last, TLBI_AllAttr, X[t2, 64]:X[t, 64]);
```

TLBIP RVALE3OSNXS{, <Xt>, <Xt2>}

op0	op1	CRn	CRm	op2
0b01	0b110	0b1001	0b0101	0b101

```
if !IsFeatureImplemented(FEAT_XS) then
    UNDEFINED;
elsif PSTATE.EL == EL0 then
    UNDEFINED;
elsif PSTATE.EL == EL1 then
    UNDEFINED;
elsif PSTATE.EL == EL2 then
    UNDEFINED;
elsif PSTATE.EL == EL3 then
    AArch64.TLBIP_RVA(SecurityStateAtEL(EL3),
Regime_EL3, VMID[], Shareability_OSH,
TLBILevel_Last, TLBI_ExcludeXS, X[t2, 64]:X[t, 64]);
```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