

- 1. Introduction.** This is a test of literate programming with part of the CPU emulation from `perry`, an emulator for a DEC Alpha system. The joke is that AXP stood for "Almost Exactly Prism", referring to a previous CPU architecture, and Perry Simm was the main character in Infocom's "A Mind Forever Voyaging" and turned out fairly early on to be PRISM, an artificial intelligence system.
- 2.** As this is a test of converting just part of `perry`, we need to run in the context of `perry`'s packages.
(in-package `:perry`)

3. Data address translation.

```
(defun mbox-translate-addr (va instruction-bits mode vpte-fetch)
  (declare (ignore mode))
  (flet ((fail (reason)
          (Set mbox fault address and enter PALmode 5)))
    (let ((tag (ldb (byte 30 13) va)))
      ;; Check for matching PTE for address.
      (dotimes (i 4016) (fail (if vpte-fetch :dtbmiss_double :dtbmiss_single)))
        (when (PTE matches tag 4)
          ;; Found matching PTE, check access permissions.))))))
```

4. A page table entry matches a given tag iff the entry tag matches the tag being looked for and either the entry is marked as being a “global” entry or the entry address space number matches the current address space number for the MBox.

```
(PTE matches tag 4) ≡
(and (logbitp i *mbox-dtb-valid*)
     (= (aref *mbox-dtb-tags* i) tag)
     (or (logbitp 0 (aref *mbox-dtb-misc* i))
         (= (aref *mbox-dtb-asns* i) *mbox-dtb-asn*)))
```

This code is used in section 3.

5. Should the memory address being accessed not be in the DTB or be protected against the access being requested then we need to arrange an entry to PALmode.

```
(Set mbox fault address and enter PALmode 5) ≡
(unless *mbox-va-locked*
  (setf *mbox-mm-stat* (dpb instruction-bits (byte 11 6) 1116))
  (setf *mbox-va* va)
  (setf *mbox-va-form* (Calculate MBox faulting VA_FORM 6))
  (setf *mbox-va-locked* t))
(enter-palmode reason)
(return-from mbox-translate-addr (values nil nil))
```

This code is used in section 3.

6. When a fault occurs VA_FORM is set to the DTB lookup key used to address the faulting entry. The actual computation is different if the MBox is in NT compatibility mode.

```
(Calculate MBox faulting VA_FORM 6) ≡
(if (In NT_Mode 7)
    (dpb (ldb (byte 19 13) va) (byte 19 3) *mbox-mvptbr*)
    (dpb (ldb (byte 30 13) va) (byte 30 3) *mbox-mvptbr*))
```

This code is used in section 5.

7. NT_Mode is set via a bit in the MCSR.

```
(In NT_Mode 7) ≡
(logbitp 1 *mbox-mcsr*)
```

This code is used in section 6.

