**NAME**
   **le** - AMD Am7900 LANCE and Am79C9xx ILACC/PCnet Ethernet interface driver

**SYNOPSIS**
   To compile this driver into the kernel, place the following line in your kernel configuration file:

   **device le**

   Alternatively, to load the driver as a module at boot time, place the following line in loader.conf(5):

   if_le_load="YES"

   For ISA non-PnP adapters, the port address as well as the IRQ and the DRQ numbers have to be specified in */boot/device.hints*:
   **hint.le.0.at="isa"**
   **hint.le.0.port="0x280"**
   **hint.le.0.irq="10"**
   **hint.le.0.drq="0"**

**DEPRECATION NOTICE**
   The **le** driver may not be present in FreeBSD 15.0 and later.

**DESCRIPTION**
   The **le** driver provides support for Ethernet adapters based on the AMD Am7990 and Am79C90 (CMOS, pin-compatible) Local Area Network Controller for Ethernet (LANCE) chips.

   The **le** driver also supports Ethernet adapters based on the AMD Am79C900 Integrated Local Area Communications Controller (ILACC) as well as the Am79C9xx PCnet family of chips, which are single-chip implementations of a LANCE chip and a DMA engine.  The **le** driver treats all of these PCI bus Ethernet chips as an AMD Am79C970 PCnet-PCI and does not support the additional features like the MII bus and burst mode of AMD Am79C971 PCnet-FAST and greater chips.

   Generally, the **le** driver aims at supporting as many different chips on as many different platforms as possible, partially at the cost of the best performance with some of these.

   The **le** driver supports reception and transmission of extended frames for vlan(4).  Selective reception of multicast Ethernet frames is provided by a 64-bit mask; multicast destination addresses are hashed to a bit entry using the Ethernet CRC function.

**HARDWARE**

## ISA

The **le** driver supports ISA bus Ethernet adapters which are based on the following chips:

- AMD Am7990 and Am79C90 LANCE
- AMD Am79C960 PCnet-ISA
- AMD Am79C961 PCnet-ISA+
- AMD Am79C961A PCnet-ISA II

This includes support for the following Ethernet adapters:

ISA non-PnP:

- BICC Isolan
- Novell NE2100

ISA PnP:

- AMD AM1500T/AM2100
- AMD PCnet-32
- AMD PCnet-ISA
- Allied Telesyn AT-1500
- Boca LANCard Combo
- Cabletron E2100 Series DNI
- Cabletron E2200 Single Chip
- Melco Inc. LGY-IV
- Novell NE2100
- Racal InterLan EtherBlaster

The **le** driver does not support the selection of media types and options via ifconfig(8) with ISA bus Ethernet adapters.

## PCI

The PCI bus Ethernet chips supported by the **le** driver are:

- AMD Am53C974/Am79C970/Am79C974 PCnet-PCI
- AMD Am79C970A PCnet-PCI II
- AMD Am79C971 PCnet-FAST
- AMD Am79C972 PCnet-FAST+
- AMD Am79C973/Am79C975 PCnet-FAST III
- AMD Am79C976 PCnet-PRO

⊕   AMD Am79C978 PCnet-Home

This includes support for the following Ethernet adapters:

⊕   AcerLAN NIC P20
⊕   Allied Telesyn AT-2450 and AT-2700 series
⊕   VMware emulated AMD Am79C970A PCnet-PCI II interface

The **le** driver supports the selection of the following media types via ifconfig(8) with PCI bus Ethernet adapters:

**autoselect**      Enable autoselection of the media type.

**10baseT/UTP**
                Select UTP media.

**10base5/AUI**  Select AUI/BNC media.

The following media option is supported with these media types:

**full-duplex**  Select full duplex operation.

Note that the **le** driver does not support selecting 100Mbps (Fast Ethernet) media types.

**DIAGNOSTICS**
**le%d: overflow**  More packets came in from the Ethernet than there was space in the LANCE receive buffers.  Packets were missed.

**le%d: receive buffer error**  The LANCE ran out of buffer space, packet dropped.

**le%d: lost carrier**  The Ethernet carrier disappeared during an attempt to transmit.  The LANCE will finish transmitting the current packet, but will not automatically retry transmission if there is a collision.

**le%d: excessive collisions, tdr %d**  The Ethernet was extremely busy or jammed, outbound packets were dropped after 16 attempts to retransmit.

TDR is the abbreviation of "Time Domain Reflectometry".  The optionally reported TDR value is an internal counter of the interval between the start of a transmission and the occurrence of a collision.  This value can be used to determine the distance from the Ethernet tap to the point on the Ethernet cable that is shorted or open (unterminated).

**le%d: dropping chained buffer**  A packet did not fit into a single receive buffer and was dropped.  Since the **le** driver allocates buffers large enough to receive maximum sized Ethernet packets, this means some other station on the LAN transmitted a packet larger than allowed by the Ethernet standard.

**le%d: transmit buffer error**  The LANCE ran out of buffer space before finishing the transmission of a packet.  If this error occurs, the driver software has a bug.

**le%d: underflow**  The LANCE ran out of buffer space before finishing the transmission of a packet.  If this error occurs, the driver software has a bug.

**le%d: controller failed to initialize**  Driver failed to start the LANCE.  This is potentially a hardware failure.

**le%d: memory error**  RAM failed to respond within the timeout when the LANCE wanted to read or write it.  This is potentially a hardware failure.

**le%d: receiver disabled**  The receiver of the LANCE was turned off due to an error.

**le%d: transmitter disabled**  The transmitter of the LANCE was turned off due to an error.

## SEE ALSO
altq(4), arp(4), intro(4), netintro(4), vlan(4), ifconfig(8)

## HISTORY
The **le** driver was ported from NetBSD and first appeared in FreeBSD 6.1.  The NetBSD version in turn was derived from the **le** driver which first appeared in 4.4BSD.

## AUTHORS
The **le** driver was ported by Marius Strobl <*marius@FreeBSD.org*>.