

DAHDI Overview for Asterisk Developers

Presented by

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What is DAHDI?

- **Digium Asterisk Hardware Device Interface**
- It is...
 - A high density kernel telephony interface for PSTN hardware
 - Abstracts the hardware interface.
 - A collection of kernel modules to implement this interfaces.
- It was...
 - Formerly known as Zaptel.

Presentation Goals

- We hope to...
 - Give an overview of directory and code structure for DAHDI
 - Point out differences between DAHDI and Zaptel
 - Provide an overview of some of the internals of DAHDI, including an overview of the main data path to and from a card.

Code Structure

- Two Packages
 - dahdi-tools
 - Userland programs and utilities
 - <http://svn.digium.com/svn/dahdi/tools/trunk>
 - dahdi-linux
 - Kernel modules
 - <http://svn.digium.com/svn/dahdi/linux/trunk>
 - Divided into two parts to ease binary distribution.

dahdi-linux organization

- System header files
 - include/dahdi/user.h
 - include/dahdi/kernel.h
 - include/dahdi/wctdm_user.h
 - include/dahdi/fasthdlc.h
- Kernel modules
 - drivers/dahdi/
- Changed to allow building of DAHDI in the kernel tree (mostly for distributions)
 - No more menuselect

dahdi-tools organization

- /doc/
 - contains man pages for tools
- /build_tools/
 - Contains tools used by build system (version information, generate udev rules, deprecated module removal)
- /ppp/
 - Contains pppd plugin for DAHDI data mode
- /
 - Contains all utilities, system scripts, and sample configuration files

Installed Scripts and Config Files

- /etc/init.d/dahdi
- /etc/modprobe.d/dahdi
- /etc/modprobe.d/dahdi.blacklist
- /etc/dahdi/modules
- /etc/udev/rules.d/dahdi.rules

/etc/dahdi/system.conf

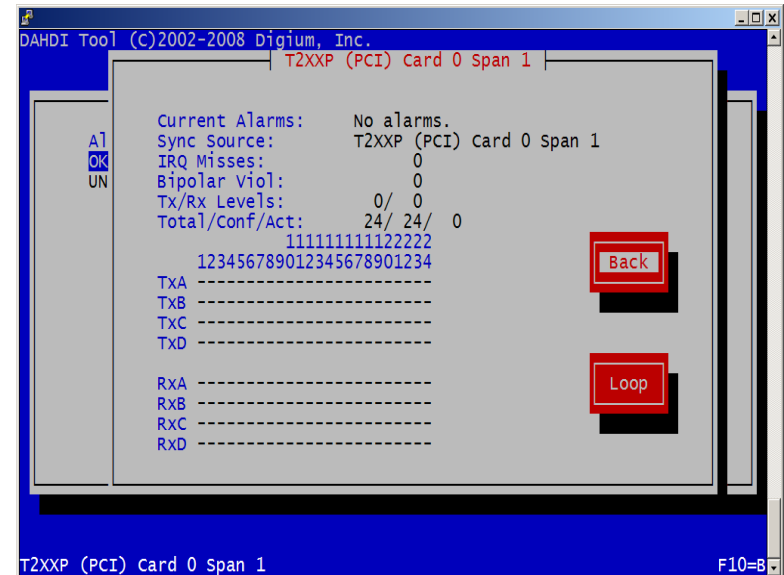
- Why do we have /etc/dahdi/system.conf and /etc/asterisk/chan_dahdi.conf?
- Syntax compatible with existing zaptel.conf (just copy old zaptel.conf to /etc/dahdi/system.conf)
- NOTE!! Must now explicitly set echocanceller for channels in this file.
- dahdi_cfg activates configuration

Useful DAHDI tools and utilities

- dahdi_tool
- dahdi_test
- dahdi_monitor
- fxotune

dahdi_tool

- Graphical front end for viewing spans on a system.
- Can activate loop up and loop down of spans.
- Can display signalling bits (ABCD) of span.
- And other span related information (Bipolar violations, IRQ misses)
- Requires libnewt to compile



dahdi_test

- Used for troubleshooting and qualifying platforms.
- Measures the amount of bytes generated by DAHDI each second
- If operating properly (no system or system latency problems) should be very close to 100% (99.99, 99.98, 99.97).

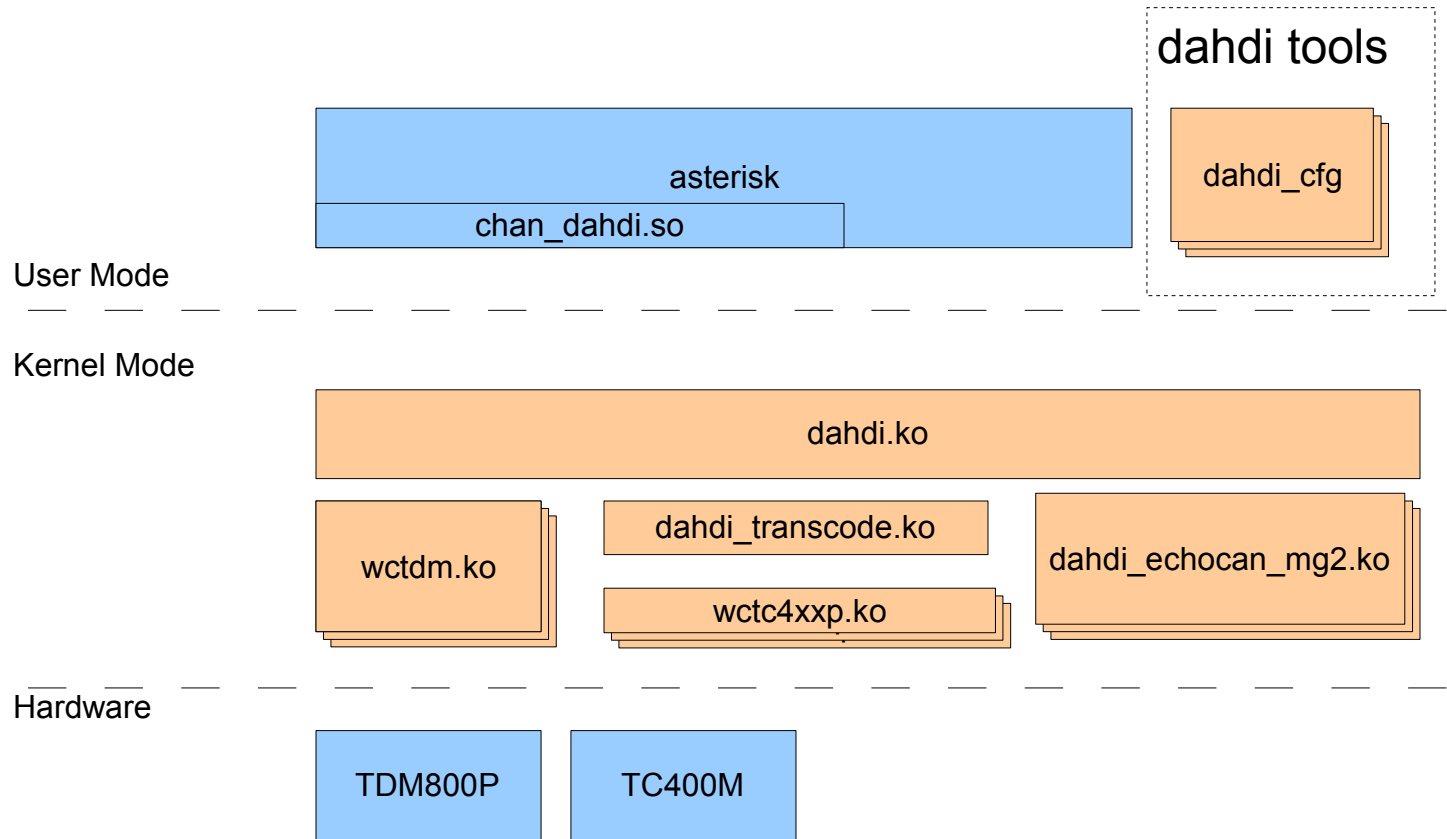
dahdi_monitor

- Used to record pre and post echo cancelled data on tx and rx directions of a DAHDI channel
- Can be run while Asterisk is running to monitor data through a channel
- Can also provide a visual indication of tx and rx signal levels on a line (good for doing gain normalization).

fxotune

- Used to balance hybrid on most DAHDI FXO hardware (SI3050 based)
- Can dramatically reduce echo on analog lines.
- First thing to use when debugging echo problems on FXOs
- `/etc/fxotune.conf`
- `fxotune -s`

High Level Overview



Kernel Interfaces

- User mode
 - Device Files `/dev/dahdi/`
 - `ioctl()`, `read()`, `write()`, `poll()`
 - `/usr/include/dahdi/user.h`
- Kernel mode
 - `struct file_operations`
 - `request_irq()`
 - Interrupt handlers (bottom half)

DAHDI Main Modules

- dahdi-base.c (dahdi.ko)
 - This file contains the dahdi core, including all core telephony functionality and userspace interface.
 - All telephony related ioctls are handled here.
 - Board driver interface is also located here (dahdi_transmit/dahdi_receive, dahdi_ec_chunk)

DAHDI Main Modules

- dahdi_echocan_*
 - Echo canceller modules
 - MG2 is the latest and greatest
 - echocanceller=mg2,1-8
 - /etc/dahdi/system.conf syntax

struct dahdi_chan

- Read Buffers
 - u_char * readbuf[DAHDI_MAX_NUM_BUFS];
 - int inreadbuf;
 - int outreadbuf;
 - u_char * readchunk;
- Write Buffers
 - u_char * writebuf[ZT_MAX_NUM_BUFS];
 - int inwritebuf;
 - int outwritebuf;
 - u_char * writechunk;

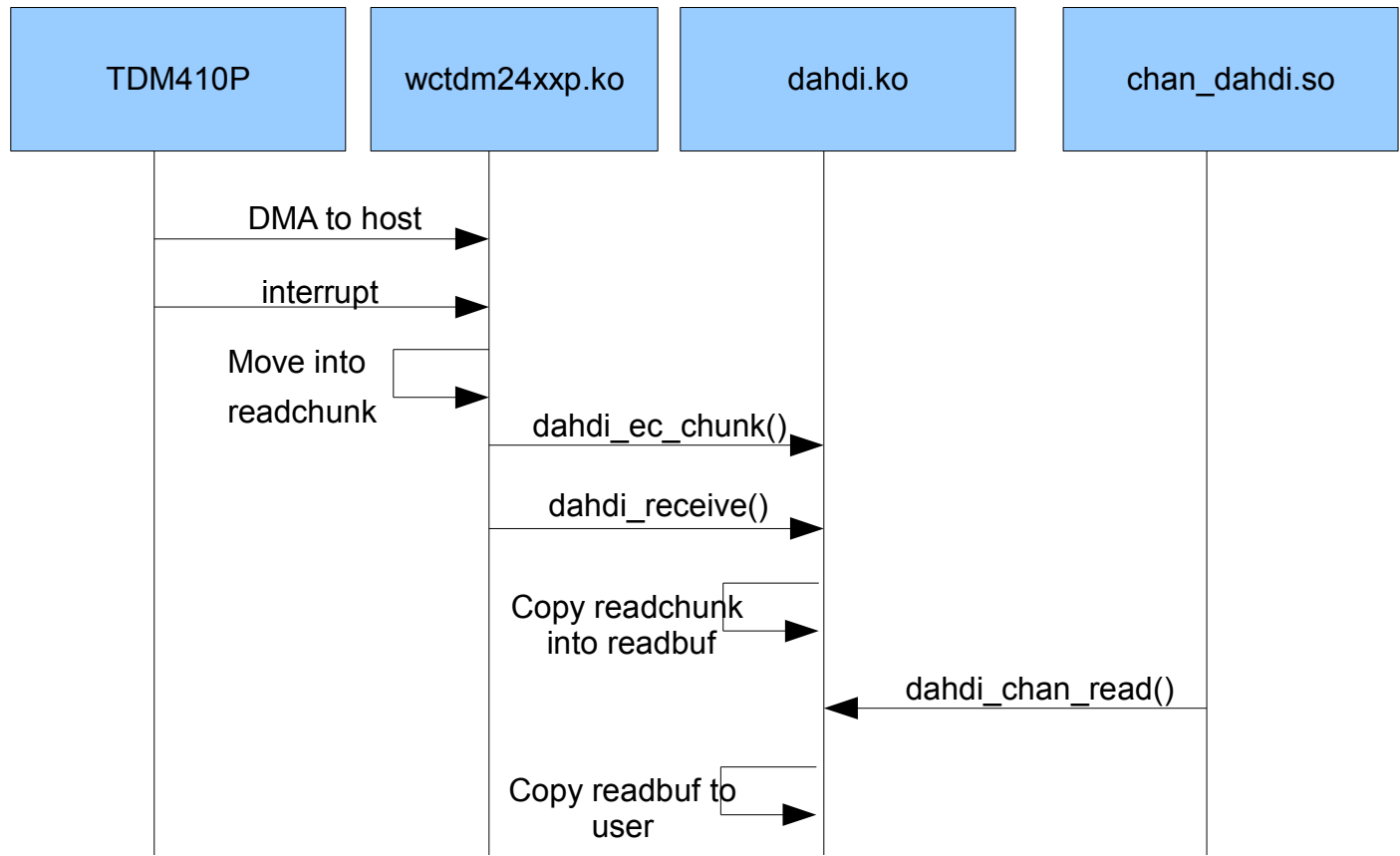
User mode interface of dahdi-base.c

- dahdi_chan_read()
 - Data is copied from channel buffers and placed into user buffers in chan_dahdi
- dahdi_chan_write()
 - Data is copied from buffers in chan_dahdi and placed into channel buffers for preparation to be transmitted to the card.

Device interface of dahdi-base.c

- dahdi_register()
- dahdi_transmit()
 - Passes TDM data from dahdi_chan buffers to hardware driver for transmission out on the line.
- dahdi_receive()
 - Takes TDM data from hardware driver and places it in dahdi_chan buffers.
- dahdi_ec_span()
 - Allows echo cancellers to run (if enabled and active)

Read example

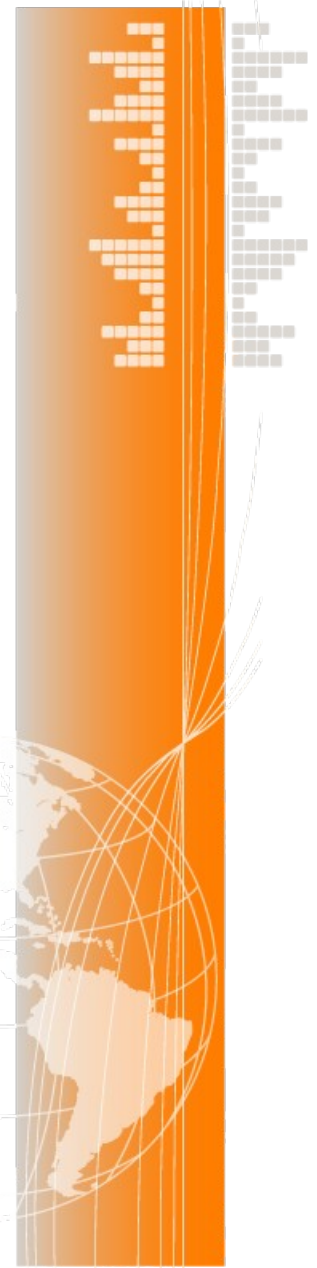


One Last Important Thing

- Master Span
 - One span is the master span
 - Triggered by `dahdi_receive()` on master span
- Master Span Processing
 - Conferencing Engine
 - DAHDI Timer Processing
 - Span Synchronization Functions

chan_dahdi debugging

- core set verbose 100 :-)
- enable all messages in logger.conf
console=warning,error,notice,
verbose,debug
- core set debug 1
- pri debug span x
- ss7 debug linkset x



Questions?