

heig-vd

Haute Ecole d'Ingénierie et de Gestion
du Canton de Vaud



People Detection in Video Surveillance

based on Atom development kit

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Date : June 20, 2012

"The value of an idea lies in the using of it." Thomas Edison

Acknowledgements

First of all, I would like to thank those at PES-IT for allowing me to do my internship in Bangalore, India.

I would especially like to thanks professor A.Srinivas for his time, support and making me feel at home in India.

I would also like to thanks professor S.Robert for giving me the opportunity to travel between Switzerland, India, and America for my studies

The following list comprises some of the peoples who helped me in any form during the realization of my work of bachelor. My deepest gratitude to all of the below.

- Ahalya Srinivasan
- Aude Ray
- Kumari Radha
- Michael Haney
- Nitheesh K L
- Sarah Carbonel
- Valentin Delaye
- Valérie C. Fazan

Lastly, I wish to thank my parents Michel Reussner and Mireille Bourquin Reussner for their continuous support.

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Glossary

Advanced Packaging Tool Default package management system for Debian. 9

HeigVD School of Business and Engineering Vaud. 2, 5

Open Source Computer Vision Library Library for computer vision. 5, 11

PES-IT PES School of Engineering is a premiere Technical Education College based in Bengaluru, Karnataka. 2, 5

Yellowdog Updater, Modified Default package management system for RedHat. 9

Acronyms

CCTV Closed-circuit television. 4

CF Compact Flash. 9

DARPA Defense Advanced Research Projects Agency. 11

DNS Domain Name System. 18

NSA National Security Agency (USA). 11

OpenTLD Open Track Learn Detect. 5, 10

PoI Person of Interest. 1

TAR the tape archiver. 16

UDP User Datagram Protocol. 20

VCA Video Content Analysis. 4

1 Scope statement

1.1 Project objective

This project will develop and deliver a new tracking system. The new system will be able to select a person on a video stream then track their movement across a large area covered by multiple movie-quality cameras. The system will be developed to be cost effective and easy to maintain. The project should be able to stop tracking a person for sometime then resume searching.

1.2 Proposed Solution

Project Person of Interest (PoI) will design, develop and deliver a new tracking system which will allow user to stay focus on a specific person across a large area covered by multiple movies camera. This project will involve the use of a video recognition system previously developed and available under license.

1.3 Requirements

The following equipment is required for the project:

Intel® Atom™ Innovation Kit??

Movie camera One or more cameras/webcam that can be connected to the Innovation Kit??

Documentations Documentation will be provided as unfiltered¹ Internet access.

1.4 Deliverables

1.4.1 Proof of concept

Disc Image A digital copy of hard drive (or SD cards) used during the project

Demo A demo board installed and configured.

¹YouTube and Open-source projects repository must not be blocked

1.4.2 Report

A report describing the following part of the project written in English .

- Technical choices
- Configuration
- Deployment
- Tests
- Conclusions

1.4.3 User documentation

If relevant to the project usage, user documentation which states:

- How to track someone interactively
- How to resume searching someone
- How to save a pattern for later search

1.4.4 Presentation documents

All documents, videos, files, and slides used during the presentation must be included.

1.5 Deadline

At the end of the project (20th of June 2012), the following deliverables will be given to Pr. A.Srinivas from PES-IT:

- Proof of concept
- Report
- User documentation
- Presentation documents

Only the report will be given on 20th of June to Pr. S.Robert from HeigVD. The remaining deliverables (except the Proof of concept) will be transmitted to Pr. S.Robert during the week following the return of M.Reussner.

1.6 Owner of Deliverables

This project is developed for two different schools PES-IT(India) and HeigVD (Switzerland). The Deliverables of the project will be owned by the two aforementioned schools.

1.7 Milestones

Every Friday at 8 pm (local time UTC+05:30), a summary of the work done during the week will be sent to Pr. S.Robert (Pr. A.Srinivas can request a copy of these email if needed). On the 20th of April 2012², an intermediate report will be give to Pr. A.Srinivas and Pr. S.Robert for review.

1.8 Approved change requests

Every change on the project has to be discussed and approved by Pr. A.Srinivas and forward to Pr. S.Robert.

1.9 Acceptance criteria

This project evaluation will be based on

- project presentation
- project documentation
- project results

1.10 Signatures

Bengaluru, June 20, 2012

Pr. A.Srinivas (PES-IT)	Pr. S.Robert (HeigVD)	Reussner Matthieu
_____	_____	_____

²The date was later changed to 4th of May

2 Summary

Currently, the rate at which Closed-circuit television (CCTV) are installed across the world is increasing rapidly. From the first use in 1942 in Germany to the surveillance system in London, a lot of progress have been made. They are now used for different purposes ranging from monitoring dangerous industrial processes to traffic monitoring, to the fight against crime.

Since the first use of these cameras, much research has been carried out leading to tremendous development. Steady progress has led to cheaper systems, which has led to mass deployment (particulariy) in public spaces. According to CCTV advocates, these cameras are supposed to deter crime, provide evidence in criminal cases, and allow people to feel safer.

However, opponents of CCTV systems claim that systematic use of monitoring leads to the loss of privacy and has a negative impact on civil liberties such as right of privacy, political meeting, etc...

The objective of this diploma project is to build an affordable Video Content Analysis (VCA) which will be able to follow a moving object across a wide area covered by multiple sensors. An example use case might be that of tracking a specific person in a mall if suspected of theft.

In order to achieve this goal, the specification provides two tasks which are simultaneously distinct and complementary. The first task will be to set up a monitoring system using multiple embedded systems. Secondly, to integrate some intelligence into the monitoring system.

3 Introduction

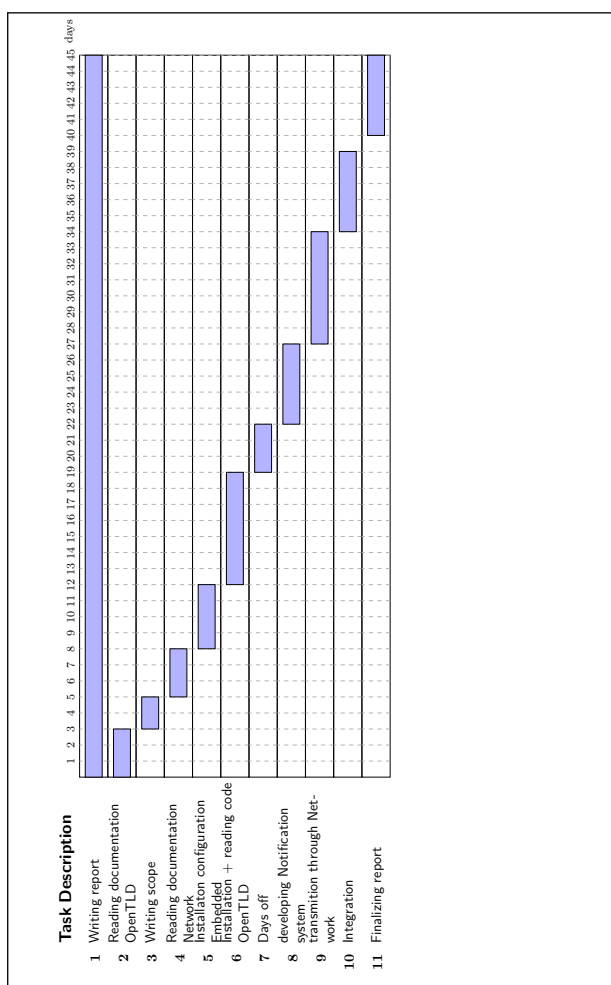
This report describes the objectives and results of a Bachelor's thesis done in collaboration between PES-IT and HeigVD. This project was conducted between February 20, 2012 and June 20, 2012 in Bangalore (Karnataka, India).

The first goal of this project is to study the capability of a tracking software developed by "Zdenek Kalal" during his PhD thesis. This software (called Open Track Learn Detect (OpenTLD) or "Predator"), visually identifies an object and tracks it wherever it moves, regardless of the object's ability to disappear and re-appear in the video stream. The second objective is to develop and implement an algorithm that is demonstrative of a typical use case. Finally the last objective of this project is to distribute the search of an object across a large area using multiple cameras plugged into multiple embedded systems.

For this project, a broad range of technologies and software were used. Among them Open Source Computer Vision Library, OpenTLD, and "The Spread toolkit".

4 Planning

4.1 Part One of the project (45 days)



As detailed in the work log, the project did not follow the schedule for several reason including two weeks of work not related to the project and various problems with OpenTLD.

Figure 4.1: Desired schedule

4.2 Part Two of the project (45 days)

After seeing difference between the desired planning and the real one, during the first part of the project. No real planning has been done for this part. The work done has been recorded in the work log.

5 Materials and software

5.1 Intel® Atom™ Innovation Kit Board 2

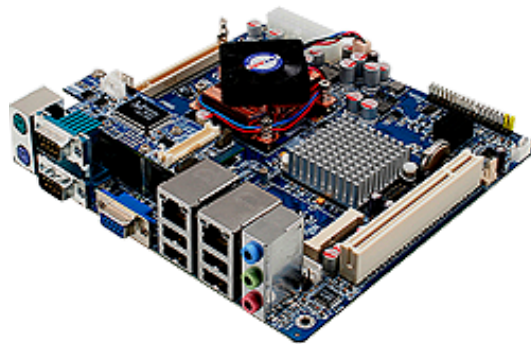


Figure 5.1: Pineview board overview[1]

5.1.1 Overview

The kit5.1 is a fully integrated computer on one card (CPU, RAM, GPU, etc.). It was released on 11 January 2010. According to Intel[2], the kit halves the power of the previous version and is particularly suitable for embedded device.

5.1.2 Specifications[2]

CPU Intel® PNV-M SC N450 1.6GHz; Intel® PNV-D DC D410/D510/ D525

South-bridge Intel® ICH8-M Chip-set

System Memory One 200-pin SODIMM Up to 2GB DDR2 667MHz SDRAM/ One 204-pin SODIMM 4GB DDR3 800MHz SDRAM (EMX-PNV-D525)

Video Output Dual View, VGA, 18-bit LVDS, Optional 48-bit LVDS Output

High Definition Audio Codec Realtek ALC888 Supports 5.1+2-CH HD Audio

Ethernet Dual Intel® 82583V Gigabit Ethernet

Expansion 1 PCI, 1 Mini PCI Express, CompactFlash reader

I/O 2 SATA, 4 COM, 8 USB, 16-bit GPIO

Power Type ATX/ AT Power Mode

Trusted Platform Module Infineon TPM 1.2 SLB9635 (Optional)

5.2 CompactFlash card

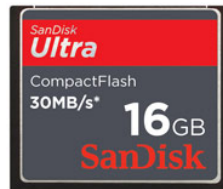


Figure 5.2: SanDisk 16Gb FlashCard[3]

5.2.1 Overview

Compact Flash (CF) is a "Mass storage device" format developed in 1994 by SanDisk. It was later (1995) standardized by the "CompactFlash Association".

According to the the "CompactFlash Association"[4], even though the CompactFlash standards were first developed for cameras, it is now broadly use in embedded systems.

5.3 Gnu/Linux Gentoo



Figure 5.3: Gentoo logo[5]

5.3.1 Overview

Gentoo5.3 Linux is an operating system based on Gnu/Linux kernel. Unlike most of other Gnu/Linux distribution, Gentoo is a rolling release—meaning the system can be updated at any time. As all modern distribution, Gentoo provide a "package management system" called "portage". Portage provides the ability to download, configure, compile, and install software. It may be differentiated from other "package manager" like Advanced Packaging Tool or Yellowdog Updater, Modified by its unique proficiency to enable or disable features of the selected program.

5.3.2 Specifications

Flexibility Gentoo can be customized for just about any need—from supercomputers to embedded systems.

Speed Gentoo can be optimized to match local hardware.

Packages Gentoo provides 19,234¹ packages. This variety ensures that the needed program for any project will be available.

5.4 OpenTLD

5.4.1 Overview

OpenTLD² is an implementation of the Predator algorithm for tracking objects without prior learning.

The object is selected on the first frame of a video³. Predator then tracks it, learning its appearance in order to detect it. OpenTLD is able to improve its detection rate over time as it processes additional frames with the object.

5.4.2 Specifications

Training No off-line training

Time constraint Real-time performance on QVGA video stream

Object tracking TLD tracks only one object

Interoperability Windows, Mac OS X and Linux

Input video stream from a single camera

Licensing GPL version 3.0 and Commercial

5.5 OpenCV



Figure 5.4: OpenCV logo[6]

¹On February 28 2012, multiples versions of the same program are count only once

²The C/Cpp version was choosen

³From a video file or camera

5.5.1 Overview

Open Source Computer Vision Library is a computer library for image processing released under an BSD license.

5.5.2 Specifications

Algorithms Version 2.3.1 include more than 2500 optimized algorithms for image processing and computer vision

Bindings C++, C, Python, Perl

Interoperability Windows, Mac os X, Linux, Android

5.6 The Spread Toolkit

5.6.1 Overview

Spread Toolkit is an open source library that provides messaging services across different computers. It provides a layer of abstraction to most of the communications across different nodes of a network.

5.6.2 Specifications

Broadcast Multi-cast message sending

Group message Messages can be sent to 1 host, 1 group, or anyone

Strength Reliability and ordering can be assured

Wellknown Part of the funding was provided by Defense Advanced Research Projects Agency (DARPA) and National Security Agency (USA) (NSA).

5.7 Microsoft LifeCam VX-1000 Webcam - Black - USB



Figure 5.5: Webcam used for the project[7]

5.7.1 Specifications[7]

Resolution 0.3 mega-pixel - 640 x 480

Drivers GSPCA

Size Width 2.2 in / Depth 2.1 in

5.8 Library Curl



Figure 5.6: libcurl logo[8]

5.8.1 Overview

Libcurl allows the transfer of data using various protocols, from HTTP to Gopher. This library is used to send email through SMTP.

5.8.2 Specifications

Protocols FTP, FTPS, Gopher, HTTP, HTTPS, SCP, SFTP, TFTP, Telnet, DICT, the file URI scheme, LDAP, LDAPS, IMAP, POP3, SMTP and RTSP.

Interoperability Solaris, NetBSD, FreeBSD, OpenBSD, Darwin, HPUX, IRIX, AIX, Tru64, Linux, Unix-Ware, HURD, Windows, Symbian, Amiga, OS/2, BeOS, Mac OS X, Ultrix, QNX, Open-VMS, RISC OS, Novell NetWare, DOS

License Open source license based on MIT/X

5.9 Library Off-The-Record

5.9.1 Overview

Off the Record library provides the base64 encoding function used to encode images inside an email.

6 Schema

6.1 Global

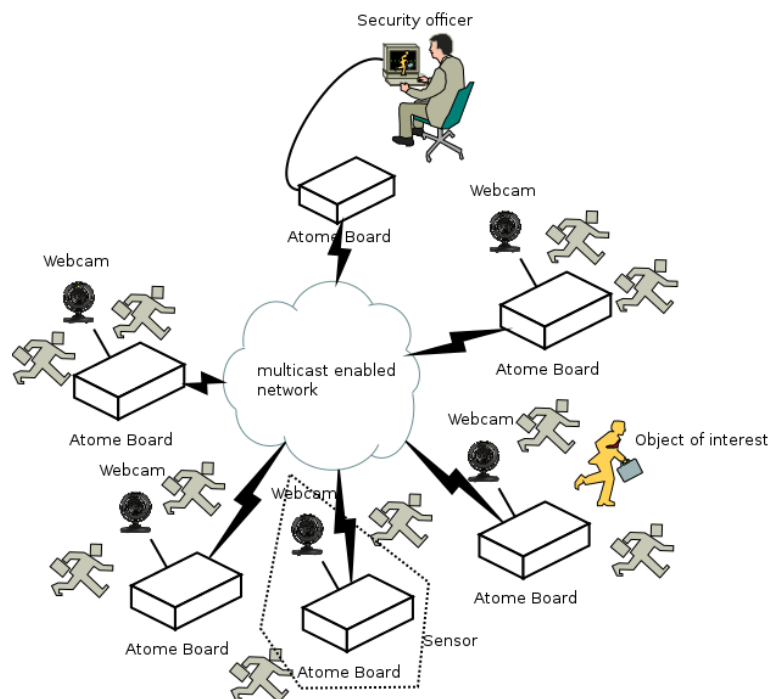


Figure 6.1: Global schema of the project

As shown on figure6.1, the project once deployed is composed of different elements:

Sensor Multiple sensors as described in 6.2

Network A network which allow multi-cast data(without firewall to get best result if possible)

Object of interest An item (person or object) who will be tracked by the sensor network

Security officer Someone who will watch the video stream and report any suspicious activity

6.2 Sensor

Atom Board This is the "brain" of the sensor, all calculations happen here.

Movie camera This is the "eye" of the sensor.

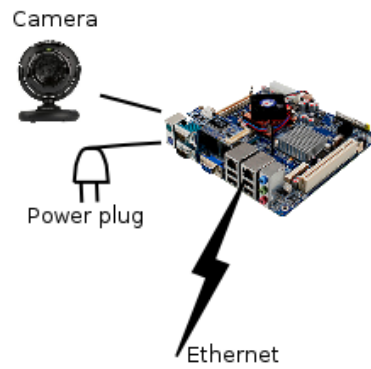


Figure 6.2: Sensor

Power supply To be fully autonomous, the sensor can be plugged into a battery or if the system. needs to stay on for an extended period of time, directly into sector AC.

Network connection This allows the sensor to share pictures to the other sensors and to the Security officer.

7 Installation

7.1 Operating system

This section assumes that the reader has prior knowledge of the Unix command line interface (CLI) and is using a Gnu/Linux distribution. This section covers the basis for installing a Gentoo system—more information can be found in the "Gentoo Handbook"[9]

7.1.1 Downloading and installing the base system

Preparing the Disks

Even though it is possible to use only one partition for the operating system, it's almost never done in practice. The first step is to split the cf card in smaller partitions. This step was done using fdisk from a terminal though it can also be done using a graphical user interface (GUI).

```

1  steelbook ~ # fdisk /dev/sdb
2
3  Command (m for help): p
4
5  Disk /dev/sda: 3997 MB, 3997163520 bytes
6  255 heads, 63 sectors/track, 485 cylinders, total 7806960 sectors
7  Units = sectors of 1 * 512 = 512 bytes
8  Sector size (logical/physical): 512 bytes / 512 bytes
9  I/O size (minimum/optimal): 512 bytes / 512 bytes
10 Disk identifier: 0x00054b7c
11
12      Device Boot      Start         End      Blocks   Id  System
13  /dev/sdb1   *           62        198275       99107    83   Linux
14  /dev/sdb2             198276       2150531       976128    83   Linux
15  /dev/sdb3          2150532       7806959      2828214    83   Linux
16
17 Command (m for help):

```

Listing 7.1: Partition on the CF card

As shown on figure 7.1, 3 partitions were created.

sdb1 Size: 100 Mo, FS Type: ext2, Flags: Boot, Mount Point: /boot

sdb2 Size: 1.0 Go, FS Type: swap

sdb3 Size: 2.8 Go, FS Type: ext3, Mount Point: /

Creating file-systems

The different file systems were created using the following commands

```
1 steelbook ~ # mkfs.ext2 /dev/sdb1
2 [...]
3 steelbook ~ # mkfs.ext3 /dev/sdb3
4 [...]
5 steelbook ~ # mkswap /dev/sdb2
6 [...]
```

Listing 7.2: Creation of the file system on the CF card

Mounting file-system

After splitting the CF and creating a filesystem on the resulting partition, mount the filesystems with the following commands:

```
1 steelbook ~ # mkdir -p /mnt/gentoo
2 steelbook ~ # /dev/sdb3 /mnt/gentoo
3 steelbook ~ # mkdir /mnt/gentoo/boot
4 steelbook ~ # mount /dev/sdb1 /mnt/gentoo/boot
```

Listing 7.3: Mounting partition

Downloading the base system and Portage files

Unlike most of Gnu/Linux distribution, Gentoo's base layout is provided as a simple the tape archiver (TAR) archive. It can be downloaded from various mirrors^[10]¹.

```
1 steelbook ~ # cd /mnt/gentoo/
2 steelbook gentoo # wget http://gentoo.cs.nctu.edu.tw/gentoo/releases/x86/current-
  stage3/stage3-i686-20120221.tar.bz2
3 steelbook gentoo # tar xjpf stage3*.tar.bz2
4 [...]
5 steelbook gentoo # cd
6 steelbook ~ # wget http://gentoo.cs.nctu.edu.tw/gentoo/snapshots/portage-latest.tar
  .bz2
7 steelbook ~ # tar xjpf portage-latest.tar.bz2
8 [...]
```

Listing 7.4: Downloading and extracting Gentoo stage 3 and Portage files

Copying modified configuration files

The following files must be replaced by those provided

- /etc/udev/rules.d/70-persistent-net.rules 19.6
- /env.sh 19.12
- /etc/kernels/kernel-config-x86-3.2.1-gentoo-r219.5
- /etc/make.conf 19.1

¹nctu.edu.tw was chosen for its speed from PES-IT. From Switzerland, the best choice is mirror.switch.ch

- /etc/conf.d/net19.2
- /etc/portage/package.accept_keywords19.3
- /etc/portage/package.use19.4
- /etc/local.d/x.start19.8

7.1.2 Enter the new installation environment

Once all the previous operations have been completed, the next operation is to change the root (/) value:

```
1 steelbook ~ # cp -L /etc/resolv.conf /mnt/gentoo/etc/  
2 steelbook ~ # mount -t proc none /mnt/gentoo/proc  
3 steelbook ~ # mount -o bind /dev /mnt/gentoo/dev  
4 steelbook ~ # chroot /mnt/gentoo /env.sh
```

Listing 7.5: Changing root value

7.1.3 Installing and configuring the Kernel

On Gentoo, the process of configuring, building, and installing a kernel can be done with genkernel. This tool automates the process.

```
1 (chroot) hostname ~ # emerge genkernel =sys-kernel/gentoo-sources-3.2.1-r2  
2 [...]  
3 (chroot) hostname ~ # cd /usr/src/  
4 (chroot) hostname src # rm linux  
5 (chroot) hostname src # ln -s linux-3.2.1-gentoo-r2 linux  
6 (chroot) hostname src # genkernel all & echo "Time to have a nap or dring some tee"  
7 [...]
```

Listing 7.6: Building the kernel

7.1.4 Installing and configuring the Boot-loader

EXTLinux from SysLinux was chosen as the project boot-loader, mainly because of it's size and speed. It can be installed on the CF card with the following commands:

```
1 (chroot) hostname ~ # emerge sys-boot/syslinux  
2 (chroot) hostname ~ # mkdir /boot/extlinux/  
3 (chroot) hostname ~ # cat - > /boot/extlinux/extlinux.conf  
4 DEFAULT gentoo  
5  
6 LABEL gentoo  
7     KERNEL /kernel-genkernel-x86-3.2.1-gentoo-r2  
8     INITRD /initramfs-genkernel-x86-3.2.1-gentoo-r2  
9     APPEND real_root=/dev/sda3  
10  
11 ctrl-d  
12 (chroot) hostname ~ # extlinux --install /boot/extlinux  
13 (chroot) hostname ~ # cd /boot  
14 (chroot) hostname boot #ln -s . boot
```

Listing 7.7: Installing the boot-loader

7.1.5 Configuring the Network

Configuring interface name and IPv4 address

For this project, a trick was used to only have 1 cf card image but different IPv4 address without a DHCP server. The physical interfaces are renamed based on their MAC address. This is done by matching the "ATTRaddress" variable from /etc/udev/rules.d/70-persistent-net.rules with the MAC address, then a unique name must be assigned. Consequently, all init services who require net as a dependency will not be able to start without "-D" option.

Then interface name must match their configuration in /etc/conf.d/net as show on Listing 19.2 The last part of the network configuration is adding the name of the embedded inside hosts file. By doing this, the network will not need a Domain Name System (DNS) server.

Configuring multi-cast address

A new static route must be created to the multi-cast address. The kernel will then be able to receive and dispatch multi-cast data. This is done as shown on Listing19.2.

7.1.6 Installing and configuring of miscellaneous applications and library

The following packages need to be installed on the embedded system

iproute2 command line tool to deal with routing and ip address

awesome Windows manager

xorg-server X servers

opencv A collection of various computer vision algorithms

dhcpcd DHCP client

xterm terminal

mplayer Media Player for Linux

libotr provides functions to send email

net-misc/curl provides functions to send email

```
1 (chroot) hostname ~ # emerge iproute2 net-misc/dhcpcd xterm xorg-server mplayer  
   media-libs/opencv x11-wm/awesome net-misc/curl net-libs/libotr  
2 [...]  
3 (chroot) hostname ~ # useradd -m graphic  
4 (chroot) hostname ~ # echo 'exec /usr/bin/awesome' > /home/graphic/.xinitrc
```

Listing 7.8: Installation and configuration of miscellaneous applications

7.2 Messaging service

As specified on section 5.6, Spread is used as a messaging bus to transmit data across the different embedded systems

7.2.1 Installing the Spread toolkit

The spread toolkit is tagged as `arch`, which means it is considered as not sufficiently tested to be included in the default branch. Since this package is highly specific, it is usually tagged as `unstable`. Before installing this package, the protection needs to be overridden (l1-34).

```

1  (chroot) hostname ~ # emerge net-misc/spread --autounmask-write -av
2
3  These are the packages that would be merged, in order:
4
5  Calculating dependencies... done!
6  [ebuild N    ~] net-misc/spread-4.1.0  0 kB
7
8  Total: 1 package (1 new), Size of downloads: 0 kB
9
10 The following keyword changes are necessary to proceed:
11 #required by net-misc/spread (argument)
12 =net-misc/spread-4.1.0 ~x86
13
14 Would you like to add these changes to your config files? [Yes/No] Yes
15
16 Autounmask changes successfully written. Remember to run etc-update.
17
18 [...]
19 (chroot) hostname ~ # etc-update
20 Scanning Configuration files...
21 The following is the list of files which need updating, each
22 configuration file is followed by a list of possible replacement files.
23 1) /etc/portage/package.keywords (1)
24 Please select a file to edit by entering the corresponding number.
25     (don't use -3, -5, -7 or -9 if you're unsure what to do)
26     (-1 to exit) (-3 to auto merge all remaining files)
27     (-5 to auto-merge AND not use 'mv -i')
28     (-7 to discard all updates)
29     (-9 to discard all updates AND not use 'rm -i'): 1
30 Replacing /etc/portage/package.keywords with /etc/portage/. _cfg0000_package.
    keywords
31 mv: overwrite '/etc/portage/package.keywords'? yes
32
33 Exiting: Nothing left to do; exiting. :)
34
35 (chroot) hostname ~ # emerge net-misc/spread
36 [...]
```

Listing 7.9: Installing the messaging system

7.2.2 Configuring the Spread toolkit

All aspect of the configuration of the Spread toolkit is done by altering the file `/etc/spread.conf` The appropriate file for the project is provided on Listing19.9

8 Transmission of data

8.1 Schema

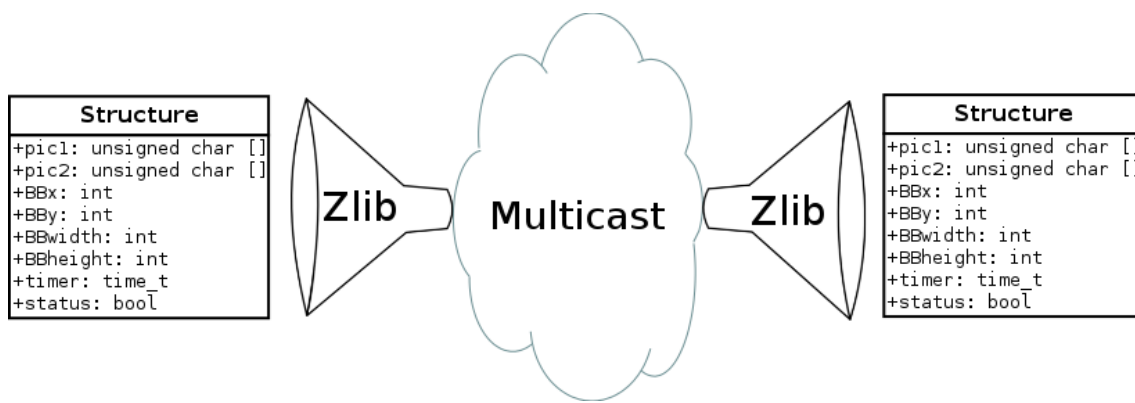


Figure 8.1: Transmission of data across the network

8.2 Overview

As shown on figure9.1, The data is packed and then compressed before being send on the network. On the opposite side, they are uncompressed before being used.

8.3 Technical description

As the the spread toolkit limits the payload size to 100 Kilo Octet and 2 pictures with a resolution of 320x240x1 (width X height X depth) weight about 192 Ko, it was not possible to send this amount of data without compressing it. The z library was chosen as it provides a good trade-off between size and CPU usage. On average, after compression, the data (2 pictures + context) weighs 79.257 Ko. This allows the compressed data to be sent inside 1 packet, which limits the delay between transmitting and receiving the pictures.

As shown on figure 8.2 the data is similar to Matryoshka dolls. They are first compressed with zlib, and then wrapped by the spread toolkit. All the data is then sent to a multi-cast address (224.0.0.1) as User Datagram Protocol (UDP) message. This methodology allows the sender to pass the data in a single transmission to many receivers without overloading the network.

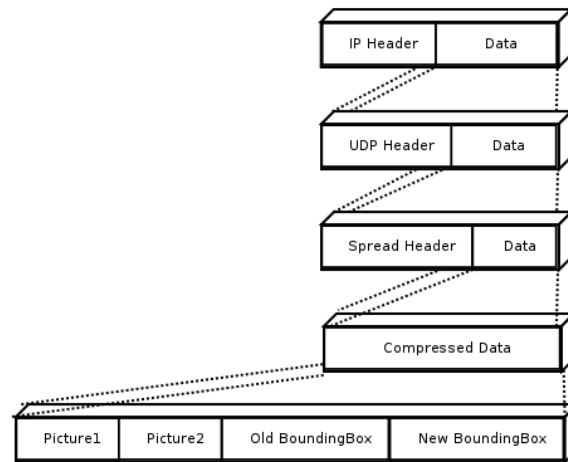


Figure 8.2: Transmission of data across the network

8.4 Implementation

8.4.1 Data

For this project the data that will be transmitted is packed in a structure as shown on Listing19.13. The fields used are described below:

pic1 memory space to store the previous picture (needed by openTLD to track)

pic2 memory space to store the actual picture

LBBx X coordinates of the top-left corner of the box bounding the previous object

LBBy Y coordinates of the top-left corner of the box bounding the previous object

LBBwidth Width of the box bounding the previous object

LBBheight Height of the box bounding the previous object

BBx X coordinates of the top-left corner of the box bounding the object

BBy Y coordinates of the top-left corner of the box bounding the object

BBwidth Width of the box bounding the object

BBheight Height of the box bounding the object

timer Timestamp of the second picture

status Object is present on the actual picture

9 Notifications

9.1 Schema

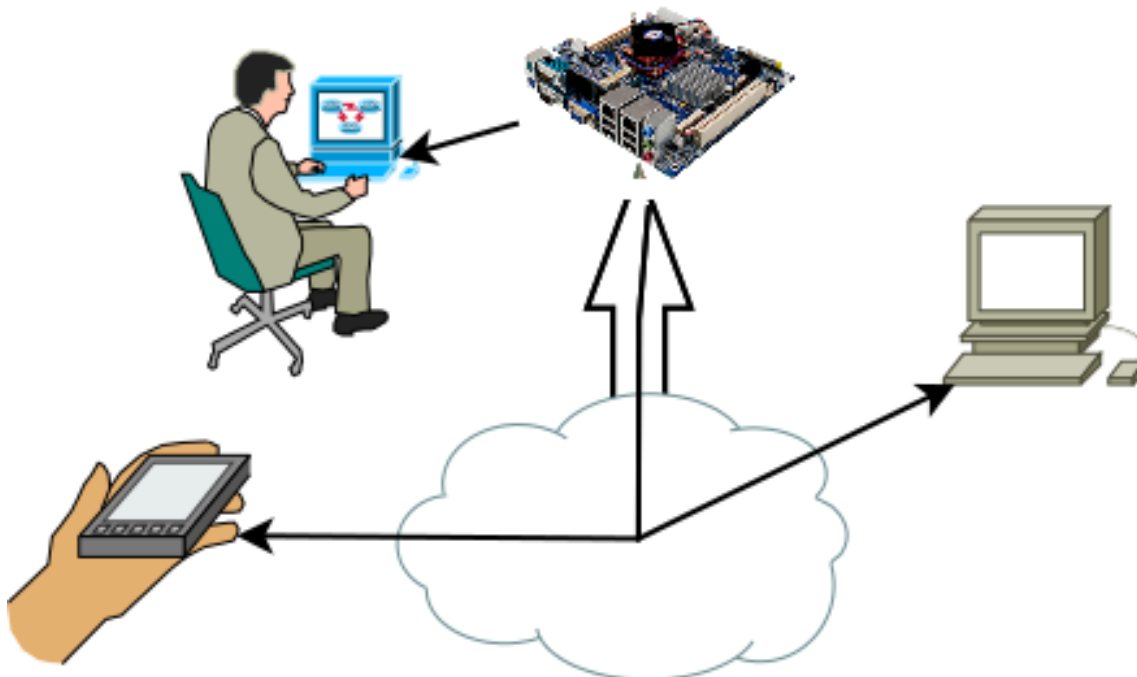


Figure 9.1: Notifications

9.2 Technical description

Every time an alert is triggered, the main embedded board sends an E-mail. As shown in figure 9.2, the E-Mail includes some information about the camera and as attachment, a picture from the detected object.

9.3 Implementation

The notification system is implemented using 2 libraries

- libcurl
- libotr from cypherpunks

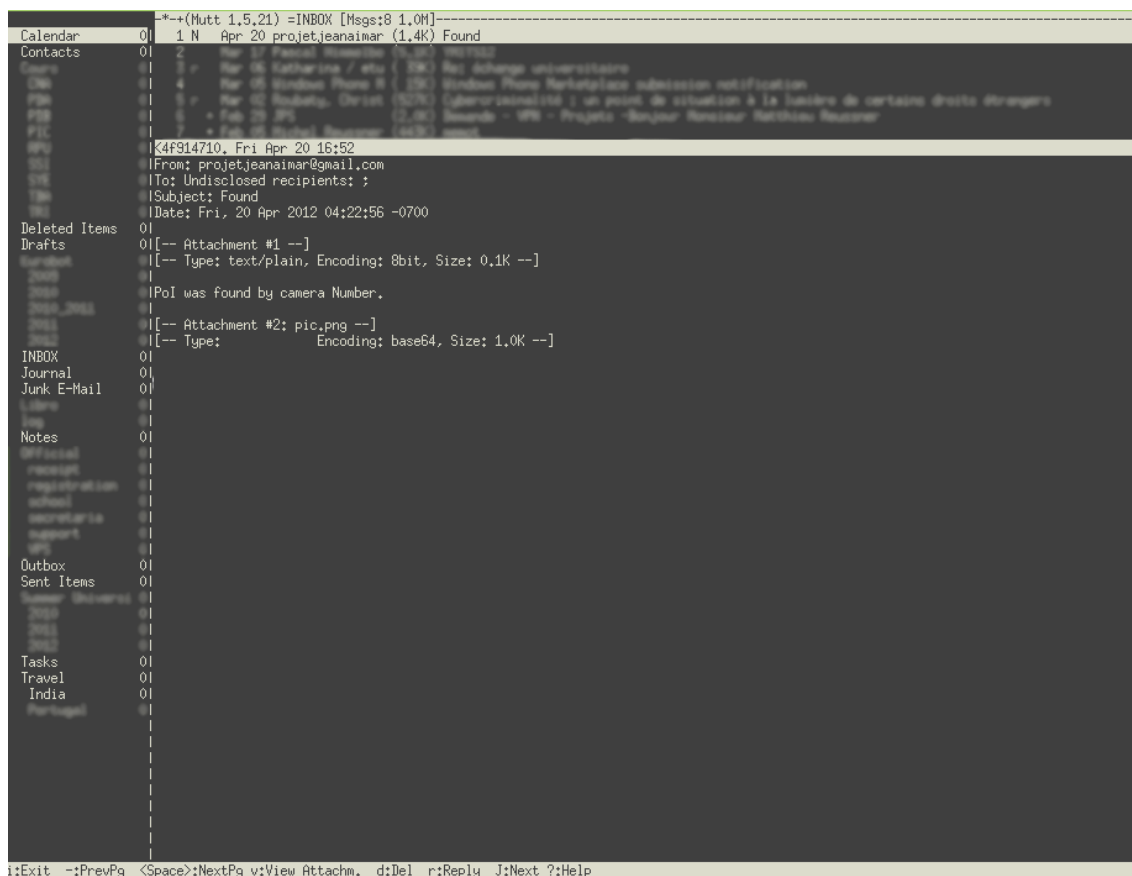


Figure 9.2: Notification display by a email client (mutt)

9.3.1 libcurl

The curl library is used during this project for the following task:

Connection to the smtps server

Verification of the ssl/tls certificate

Generating most of the header

Sending the email

9.3.2 libotr

The Off-The-Record (OTR) library from "Cypherpunks" allows any kind of message to be encrypted. During this project, the library is used not to encrypt data but to encode it as base64.

10 Results

10.1 Definition

To measure the quality of the results, two notions are essential:

Recall is the number of object correctly found divided by the total number of object

Precision is the number of relevant object found divided by the total number of object found.

10.2 Methodology

Two movies of about 30 seconds are recorded then split into frames. Each frame is then labelled as positive or negative. If the frame is labeled as positive, the position of the object is also compared with the real position. The program is then run on each video and the results compared with the manual labelling.

10.3 Raw data

Table 10.1 summarizes the result of the experiments. In the FINAL report, the results will be discussed in greater detail.

	Movie 1	Movie 2
Recall	27%	24%
Precision	97%	89%
# of frames	549	415
# of positives frames	286	251
# of negatives frames	263	164

Table 10.1: Result of the first part (rounded value)

10.4 Interpretation

As shown in table 10.1, Recall is too low for this system to work in real life.

10.4.1 Recall

Within the context of the object detection, the recall is the ratio of object found. Table 10.1 clearly show that most occurrence of the person are not found.

10.4.2 Precision

Within the context of the object detection, the precision is the ratio of real object found versus the false positive. Table 10.1 show that the number of false positive is low.

11 Problems

11.1 Network

The internet connection of PESIT is filtered by a network appliance called "FortiGate". During the realisation of this project, three different compartments of the "box" were observed:

- Block of some website (tcp port 80 and 443) but no alteration of other data
- Man In The Middle for ssl connection
- Block of every thing except tcp port 0,53,80,443

The first blocking techniques can easily be circumvented. The third one required a computer outside the network listing for incoming connection on one of the "free" port.

11.1.1 Block of specific website

Nothing has to be done. smtp.gmail.com was not blocked.

11.1.2 Man In The Middle

As shown on listing11.1, the certificate for Google smtp can't be trusted. The Certificate Authority who sign it is not "Google Internet Authority" but "Fortinet"

```
1 * Server certificate :
2 * subject: C=US; ST=California; L=Mountain View; O=Google Inc; CN=smtp.gmail.com
3 * start date: 2011-11-18 01:57:17 GMT
4 * expire date: 2012-11-18 02:07:17 GMT
5 * issuer: C=US; ST=California; L=Sunnyvale; O=Fortinet; OU=Certificate Authority;
   CN=FortiGate CA; emailAddress=support@fortinet.com
6 * SSL certificate verify result: self signed certificate in certificate chain (19)
   , continuing anyway.
```

Listing 11.1: Certificate informations

The correct certificat can be seen on figure11.2.

```
1 * Server certificate :
2 * subject: C=US; ST=California; L=Mountain View; O=Google Inc; CN=smtp.gmail.com
3 * start date: 2011-11-18 01:57:17 GMT
4 * expire date: 2012-11-18 02:07:17 GMT
5 * issuer: C=US; O=Google Inc; CN=Google Internet Authority
6 * SSL certificate verify ok.
```

Listing 11.2: Certificate informations

This block is more an annoyance than something really efficient. In this case, adding the following line and creating a disposable¹ gmail account is enough.

```
1 curl_easy_setopt(curl, CURLOPT_SSL_VERIFYPEER, 0L);
```

Listing 11.3: Certificate informations

11.1.3 General Block

Presently, all tcp port but 53,80,443 are blocked by the fortigate bastion. The only way around is to use a server listening on one of the "free" port. The server will then retransmit the data to smtp.gmail.com.

As shown in figure 11.4, access is denied to Google smtp.

```
1 $ openssl s_client -showcerts -connect smtp.gmail.com:465 </dev/null
2 connect: Connection timed out
3 connect:errno=110
```

Listing 11.4: Denying access to smtps

As the block will not be present once the system is deployed, an elegant solution based on OpenSSH "localforward" is used. The necessary steps are shown in figure 19.14 and 19.15.

11.1.4 Consequences on the project

About 1.5 day was lost due to the changes of the network policies. The changes don't imply any modification of the project itself.

11.2 Predator

The version of OpenTLD used during this project² is not able to recognize the object under the following circumstances:

- Rapid movement of the object
- Long disappearance of the object
- Partial view of the object if moving

11.2.1 Consequences on the project

The most important part of the project is based on OpenTLD, any change impact the whole work done during the last 2 months.

Following the problems encountered, the project can't be used as defined in the "Scope statement". The risk of missing something important / dangerous is too big.

For instance, a thief trying to leave the premises of PESIT, is likely going to run. In this case, the system will not be able to follow him.

¹The "Proxy" has access to plain text data

²From alantrrs on github

12 Change from the initial objectives

12.1 Reason

Following the disappointing results observed in 10.1, and after a talk with Pr.A.Srinivas, it was decided to change the orientation of the research.

12.2 Conservation of some part of the project

The main subject (object detection) of the project is kept as well as the following parts:

- Embedded system
- Notifications system
- Transmission between the embedded boards

The main change on the project is the algorithm responsible to detect the objects of interest. In the first part, OpenTLD was the chosen algorithm, this part is done using Haar-like features from OpenCV. Also, the part responsible for sending and receiving has to be updated. On the first part, only one object was tracked, during the second, multiple occurrences of an object can be tracked at the same time.

13 Cascade of Boosted Classifiers Based on Haar-like Features

13.1 Description

Haar-like features are heavily used in computer object recognition, mostly for its calculation speed and its adaptability.

A set of pictures of the particular object of interest is processed offline, a file containing all the results is created. Later all the region of interest of the pictures are then compared with the file.

13.2 Theory

Haar-like features work by splitting the picture into squares. For each square the algorithm sums all the pixel, then calculate the difference between these number. The difference is then converted as binary based on a threshold. The thresholded values are then compared to the "database" of value. Figure 13.1 show the different steps needed to detect an eye.

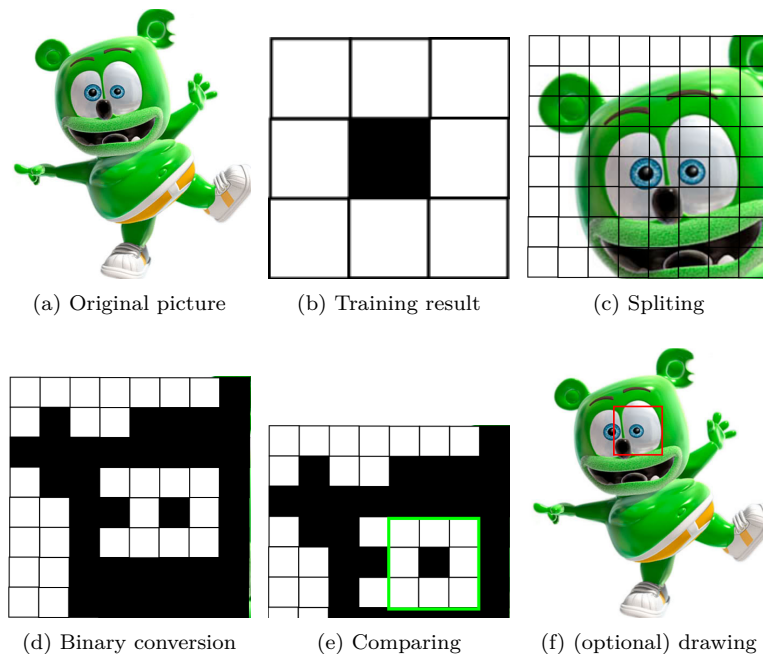


Figure 13.1: Steps of haar-like features detection

13.3 Generation of the Haarcascade with OpenCV

6 steps are required to generate a Haarcascade classifier:

Collecting a large collection of images with and without the object of interest

Cropping all the pictures contening the Object of interest

Packing all the positives images in a single vector file

Training of the classifier

Merging all the trained cascade in a single xml file

Testing the haar-like cascade to detect an object

13.3.1 Installation of the training program

Generating haarcascade is a CPU Intensive process, which can't be done in a timely fashion on the embedded board. For this reason, another computer with an Intel i5 CPU and 4Go of ram was used. The system use Ubuntu 11.10 code name Oneiric Ocelot as an operating system and OpenCV 2.3.

Thanks to M.Gijs Molenaar, the installation is as straightforward as

- add 2 repository
- updating local package cache
- installing a package

The following commands install OpenCV on Ubuntu 11.10 without going through the though process of compiling OpenCV and it's dependencies.

```
1 buildCascade ~ $ sudo su -
2 Password: 1234
3 buildCascade ~ # add-apt-repository ppa:gijzelaar/cuda
4 [...]
5 buildCascade ~ # add-apt-repository ppa:gijzelaar/opencv2.3
6 [...]
7 buildCascade ~ # apt-get update
8 [...]
9 buildCascade ~ # apt-get install libcv-dev
10 [...]
```

Listing 13.1: Installing OpenCV on Ubuntu

13.3.2 Sources images

The Collection of sources images need to be split in 2 different group. One containing all the pictures of car called positive and one with all the remaining pictures called negative.

Positives images

The positive images need to be cropped to contain only one object, then "tagged". During this project, "Gwenview" is use for this task.

Once this task completed, a file containing the following fields need to be written:

- filename
- number of object in the picture
- top left x coordinate of the object
- top left y coordinate of the object
- width of the object
- height of the object

The following listing 13.2 shows the content of a sample file

```
1 #[filename] [# of objects] [[x y width height] [... 2nd object] ...]  
2 positive/image_00000_1.png 1 0 0 310 268
```

Listing 13.2: Sample from positive.txt

The labeling phase can be done with the following script:

```
1 #!/usr/bin/env bash  
2  
3 for foo in $(file positive/* | tr -d ' ' )  
4 do  
5     FILENAME=$(echo $foo | cut -d : -f1)  
6     SIZE=$(echo $foo | cut -d , -f2)  
7     WIDTH=$(echo $SIZE | cut -d x -f1)  
8     HEIGHT=$(echo $SIZE | cut -d x -f2)  
9     echo $FILENAME 1 0 0 $WIDTH $HEIGHT  
10 done
```

Listing 13.3: Labelling

Negative images

The negative pictures don't need to be cropped. Neither did they need to be tagged. The only task is to generate a text file containing the path of all the pictures. The easy way to do it, is to use "find negative/> negative.txt".

13.3.3 Generation of the vector

The vector of positive pictures is generated by the following command:

```
1 opencv-createsamples-info positive.txt -vec vecfile.vec \  
2 -num $(( $(cat positive.txt | wc -l ) -1 ))
```

Listing 13.4: Generation of the vector

The command shown in listing 13.4 counts the number of pictures listed in positive.txt then generate a vector using the opencv-createsamples application.

13.3.4 Training of the classifier

The commands shown in listing 13.5 generate a classifier using 3.6Go of RAM in the haar folder, then convert it to an xml file named haarCascade.xml.

```
1  opencv-haartraining -data haar -vec vecfile.vec -bg negative.txt -nstages 25 -mem  
   3600 -mode all  
2  ./convert_cascade --size="30x33" haar haarCascade.xml
```

Listing 13.5: Training of the classifier

13.4 Test of the classifier

13.4.1 Subjective assessment

Due to time constraints, only subjective tests have been made. The results seem to be promising with no false positive and high detection rate.

14 New notification system

A new notification system was developed and integrated to the project. The notification system is called "The WALL"

14.1 Schema

14.1.1 Schema of the Wall

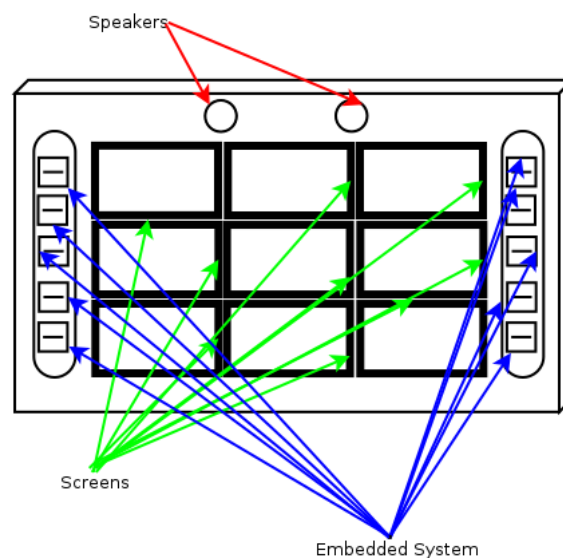


Figure 14.1: The Wall

14.1.2 Logical connection

14.2 Implementation

The implementation of "The WALL" rests on the following software:

- OpenCV
- Gstreamer

The main system board (embedded0) receive information from the sensors through spread. The system generates an image corresponding to 9 screens and forwards it on the internal network of the wall. The

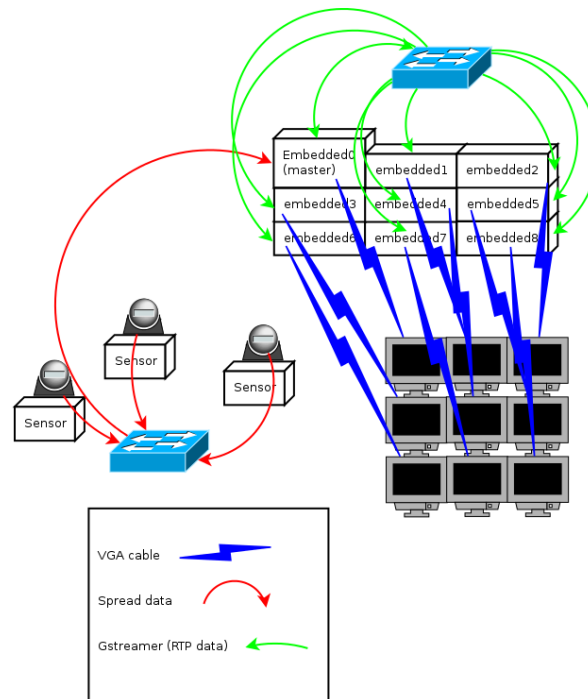


Figure 14.2: The Wall

other embedded systems retrieve the video stream, cut the portion corresponding to their screens and displayed the video.

14.2.1 Technical description

Network

To make the system extensible, images are transmitted in "multicast". This allow the streaming of the video once to a unlimited number of clients. Inside "The Wall", the ip 224.0.0.1 is used.

Multimedia

The pair of framework GStreamer-OpenCV multimedia is used to generate a video, it is then encapsulated and transmitted via the network. A program specifically developed for the occasion generates the image corresponding to the screen wall, writes the contents to a file type "FIFO". The contents of that file is then injected into a gstreamer's pipeline . GStreamer is responsible for preparing the data and then transmitting them via the network using the RTP protocol.

14.3 Making

The fabrication of the notification system has been outsourced to a fabricator in Bangalore suburb. The address is Vaishnavi Controls Acoustics, Kanakapura Road, Bangalore-560062

14.4 Product

The final product weighing several dozen kilograms and measuring several meters, it is therefore not possible to produce a copy for HeigVD. Therefore a gallery photo and video are different available at the following address: <http://vps.reussner.ch/Wall/>. Two representative photos are attached in the annexes.

14.5 Problems

Currently the system is not fully achieved. More than half (5/8) of the Embedded systems in possession of PESIT are defective. To validate the concept, it was decided to use desktop computer temporarily. This change lead to heavy modifications to the operating system and to the project source code of the project.

14.6 Realisation

14.6.1 Installation of the operating system on the embedded board

As specified in the "Problems" section, the GNU/Linux distribution used had to be changed to support PC. Currently a minimal version of ubuntu is used. It was generated using "debootstrap" scripts as shown below:

```

1 root@steelbook # mkdir /mnt/cle
2 root@steelbook # mount /dev/sdb3 /mnt/cle
3 root@steelbook # mkdir /mnt/cle/boot
4 root@steelbook # mount /dev/sdb1 /mnt/cle/boot/
5 root@steelbook # debootstrap --verbose --variant=minbase --arch i386 precise /mnt/
  cle/
6 root@steelbook # mount -o bind /dev /mnt/cle/dev
7 root@steelbook # mount -t proc none /mnt/cle/proc
8 root@steelbook # cp -L /etc/resolv.conf /mnt/cle/etc/
9 root@steelbook # chroot /mnt/cle /bin/bash
10 root@chroot # apt-get update
11 root@chroot # apt-get install libgtk2.0-0 net-tools iproute linux-image \
12 gstreamer-tools gstreamer0.10-plugins-base gstreamer0.10-plugins-good \
13 xinit psmisc gstreamer0.10-ffmpeg awesome x11-xserver-utils
14 root@chroot # cat - > /etc/hostname
15 embedded0
16 ^-D
17 root@chroot # mkdir /boot/extlinux
18 root@chroot # cat - > /boot/extlinux/extlinux.conf
19 DEFAULT ubuntu
20
21 LABEL ubuntu
22     KERNEL /vmlinuz-3.2.0-23-generic-pae
23     INITRD /initrd.img-3.2.0-23-generic-pae
24     APPEND real-root=/dev/sda3 root=/dev/sda3
25 ^-D
26
27
28 root@chroot:/# cat - > /root/.xinitrc
29 xset -dpms
30 xset s noblank
31 xset s off
32 /root/wall `hostname | grep -o [0-9]` &
33 exec /usr/bin/awesome

```

```

34 ^-D
35
36
37 root@chroot:/# cat -> /etc/rc.local
38 #!/bin/sh -e
39 HOST=$(hostname|grep -o [0-9]*)
40 ifconfig eth0 192.168.23.$((HOST+1)) up
41 ip route add 224.0.0.0/4 dev eth0
42
43 if ! fuser /dev/tty7 && /dev/null; then
44     su -c 'startx && ~/.xsession-errors' &
45 fi
46
47 exit 0
48 ^-D
49
50 root@chroot # exit
51 root@steelbook # dd if=/usr/share/syslinux/mbr.bin of=/dev/sdb

```

Listing 14.1: Installation of the embedded system for the wall

Once the first system is configured, the fastest way to deploy other system is to make a deep copy of the memory card using "dd" as presented below. The name of the embedded system must match the following schema:

embedded0 for the screen 0

embedded1 for the screen 1

embedded8 for the screen 8

embedded9 for the full picture in one screen (debug feature)

```

1 root@steelbook # dd if=/dev/sdb of=/dev/sd_X bs=8M
2 root@steelbook # mount /dev/sdc3 /mnt/cle
3 root@steelbook # echo embedded_Y > /mnt/cle/etc/hostname
4 root@steelbook # > /mnt/cle/etc/udev/rules.d/70-persistent-net.rules
5 root@steelbook # umount /mnt/cle

```

Listing 14.2: Deep copy

The system embedded0 need other programs and configurations:

```

1 root@steelbook # mount -o bind /dev /mnt/cle/dev
2 root@steelbook # mount -t proc none /mnt/cle/proc
3 root@steelbook # cp -L /etc/resolv.conf /mnt/cle/etc/
4 root@steelbook # chroot /mnt/cle /bin/bash
5 root@steelbook:/# wget https://launchpad.net/~jrjohansson/+archive/spread/+build
  /2124936/+files/spread_4.1.0-0ubuntu2_i386.deb
6 [...]
7 root@steelbook:/# wget https://launchpad.net/~jrjohansson/+archive/spread/+build
  /2124936/+files/libspread2_4.1.0-0ubuntu2_i386.deb
8 [...]
9 root@steelbook:/# gpg --keyserver keyserver.ubuntu.com --recv CA70E6A9087475A0
10 root@steelbook:/# gpg --export --armor CA70E6A9087475A0 | apt-key add -
11 root@steelbook:/# apt-get update
12 [...]
13 Fetched 8035 kB in 60s (132 kB/s)
14 Reading package lists... Done
15 root@steelbook:/# apt-get install opencv
16 Reading package lists... Done
17 Building dependency tree

```



```
18 Reading state information... Done
19 The following extra packages will be installed:
20   libcudart4 libcufft4 libdc1394-22 libjpeg62 libnpp4 libopencv2.3 libtbb2 libusb
   -1.0-0
21 Recommended packages:
22   libcuda1
23 The following NEW packages will be installed:
24   libcudart4 libcufft4 libdc1394-22 libjpeg62 libnpp4 libopencv2.3 libtbb2 libusb
   -1.0-0 opencv
25 0 upgraded, 9 newly installed, 0 to remove and 0 not upgraded.
26 Need to get 33.7 MB of archives.
27 After this operation, 221 MB of additional disk space will be used.
28 Do you want to continue [Y/n]? Y
29 [...]
30 root@steelbook:~# dpkg -i libspread2_4.1.0-0ubuntu2_i386.deb spread_4.1.0-0
   ubuntu2_i386.deb
31 Selecting previously unselected package libspread2.
32 (Reading database ... 20004 files and directories currently installed.)
33 Unpacking libspread2 (from libspread2_4.1.0-0ubuntu2_i386.deb) ...
34 Selecting previously unselected package spread.
35 Unpacking spread (from spread_4.1.0-0ubuntu2_i386.deb) ...
36 Setting up libspread2 (4.1.0-0ubuntu2) ...
37 Setting up spread (4.1.0-0ubuntu2) ...
38 Adding group 'spread' (GID 105) ...
39 Done.
40 Warning: The home dir /var/run/spread you specified already exists.
41 Adding system user 'spread' (UID 103) ...
42 Adding new user 'spread' (UID 103) with group 'spread' ...
43 The home directory '/var/run/spread' already exists. Not copying from '/etc/skel'.
44 adduser: Warning: The home directory '/var/run/spread' does not belong to the user
   you are currently creating.
45 Processing triggers for libc-bin ...
46 ldconfig deferred processing now taking place
47 root@steelbook:~# rm libspread2_4.1.0-0ubuntu2_i386.deb spread_4.1.0-0ubuntu2_i386.
   deb
```

Listing 14.3: Installation and configuration of miscellaneous applications

15 Source code and cf images

The project is split in 3 different programs. Each program includes a Makefile for an easy compilation.

wall The program used to display the video on the notification system

sensor The program who detects the object and sends the video

master The program who receives all the pictures and video stream, generates the wall picture and streams it

It should be noted that if the computer used for compilation runs on Ubuntu, the program will not compile "as is". Two things need to be changed.

Source code In every source file, the following line needs to be replaced:

```
1 //remove this line
2 #include <opencv2/opencv.hpp>
3 //add the following line
4 #include "opencv2/objdetect/objdetect.hpp"
5 #include "opencv2/highgui/highgui.hpp"
6 #include "opencv2/imgproc/imgproc.hpp"
```

Listing 15.1: Installation and configuration of miscellaneous applications

Makefile Every Makefile related to OpenCV needs to be edited

```
1 #replace this line with
2 LDFLAGS='pkg-config --libs opencv' -lz
3 #this
4 LDFLAGS='pkg-config --libs opencv | sed s/lopencv_contrib//g' -lz
```

Listing 15.2: Installation and configuration of miscellaneous applications

15.1 shared

This folder contains 2 configuration files for the project. The resolution of the webcam can be changed here.

15.2 wall

This program needs to be executed on each embedded system of the wall. It requires the screen ID as argument. For example: ./wall 0 for the screen 0. This program is started by xinit as stated in /root/.xinitrc.

fullscreenRTP.c This source file is the program who display the RTP stream generate by master¹.

15.3 master

This folder contain the following source files and scripts used on embedded0 to receive the tagged frames from the sensor, generate the wall and stream it.

server.sh Stream the picture of the wall from fifo.avi to the other embedded system

master.h configuration file for master program

master.cpp Source code

15.4 sensor

sensor.h configuration file for sensor program

sensor.cpp Source code

15.5 wall.dd

Backup image of the CF card of the embedded system for the wall. It should not be forgotted to change the hostname and clear the MAC address

15.6 sensor.dd

Backup image of the CF card of the embedded system for the the sensor. It should not be forgotted to change the hostname and clear the MAC address

¹Most of the souce code come from the website: https://gitorious.org/blog-examples/blog-examples/trees/master/fullscreen_video_with_gst_gtk no license has been apply

16 Deployment

16.1 Required Material

The following material is needed to deploy the project:

- 9 screens + power supply + cables(VGA or DVI)
- 9 embedded system for "The Wall" + power supply
- 1 switch 9 ports for "The Wall" + cables
- Multiples embedded system + webcam as sensor (up to 20)

16.2 Notification system (The Wall)

The easiest way to deploy "The Wall", is usually to use the application "dd". This can be done using the following commands

```
1 root@steelbook # dd if=/dev/sdb of=/dev/sd__X__ bs=8M
2 root@steelbook # mount /dev/sd__X__3 /mnt/cle
3 root@steelbook # echo embedded__Y__ > /mnt/cle/etc/hostname
4 root@steelbook # > /mnt/cle/etc/udev/rules.d/70-persistent-net.rules
5 root@steelbook # umount /mnt/cle
```

Listing 16.1: Installation and configuration of miscellaneous applications

16.3 Master node

The master node can either be install on any Wall node or alone. If installed in a Wall node, please follow the instruction in 16.1 first. then follow the instructions 14.3 then finally

```
1 root@steelbook # mount /dev/sd__X__3 /mnt/cle
2 root@steelbook # cat - > /mnt/cle/root/.xinitrc
3 /root/wall 'hostname|grep -o [0-9] ' &
4 #Put this in a loop to catch kill by OOK
5 /root/server.sh &
6 sleep 2
7 /root/master &
8 #end of loop
9 exec /usr/bin/awesome
10 ^-D
```

```
11 root@steelbook # umount /mnt/cle
```

Listing 16.2: Installation and configuration of miscellaneous applications

16.4 Sensor

Deployment of the sensor is very similar to deployment of the wall node. The following command can be used:

```
1 root@steelbook # dd if=sensor.dd of=/dev/sd__X__ bs=8M
2 root@steelbook # mount /dev/sd__X__3 /mnt/cle
3 root@steelbook # cat - > /mnt/cle/etc/conf.d/net
4 config_eth0="192.168.19.__SENSOR_ID_PLUS_1__ netmask 255.255.255.0 brd
  192.168.19.255"
5 routes_eth0="239.0.0.0/8 dev eth0"
6 ^-D
7 root@steelbook # > /mnt/cle/etc/udev/rules.d/70-persistent-net.rules
8 root@steelbook # echo "192.168.19.__SENSOR_ID_PLUS_1__ embedded__SENSOR_ID__" \
9 >> /mnt/cle/etc/hosts
10 root@steelbook # cat - > /etc/spread.conf
11 EventLogFile = /var/log/spread.log
12 EventTimeStamp
13
14 Spread_Segment 239.0.0.1:4803 {
15     embedded1 192.168.19.1 {
16         D 192.168.19.1
17         C 192.168.19.1
18     }
19
20     embedded__SENSOR_ID__ 192.168.19.__SENSOR_ID_PLUS_1__ {
21         D 192.168.19.__SENSOR_ID_PLUS_1__
22         C 192.168.19.__SENSOR_ID_PLUS_1__
23     }
24 }
25 ^-D
```

Listing 16.3: Installation and configuration of miscellaneous applications

17 Conclusion

At the end of my internship, and I'm can say that the project developped during the last 4 month has reached a stable and usable state. Currently the status of the project is a woking distributed system of sensor able to recognising an object/person on a video stream and sending alerts to a centralized notification system.

The system developped can be use as a whole or split in differents parts. The current use-case of the full system are: monitoring a very big area, searching for a specific animal in its natural habitat, etc. If not use as a whole, the system can be split in two differents parts: detection system and a Synchronize multiple screen. The use cases ranged from advertisement in public places (train station, airport,...) to display of medical informations through person counting.

The project duration was not enough to explore all the aspect of the topic, therefor the following enhancements remain to be explored:

- Representing a person's position in real time in a building
- Person identification system(can be helpful in prison, colleges, hospitals, etc).
- Extending the display from small screen devices to the Wall.

Having been able to explore the field of inteligent sensor has been very rewarding experience. Having been able to work in the young and dynamic environnement of the "Nokia Lab" of PESIT has certainty contributed to the success of this internship. Having the opportunity of achieving a work of diploma abroad, particulary in Bangalore - which is known as the Silicon Valley of asia - was an immense opportunity.

I would once again thank the following people for the assistance provided during this project: S.Robert, A.Srinivas, Kumari Radha, Nitheesh K L, Vishal Gupta, Ahalya Srinivasan, Greeshma N and any members of the "Lab".

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19 Annexes

19.1 Custom settings for Portage

```
1 # These settings were set by the catalyst build script that automatically
2 # built this stage.
3 # Please consult /usr/share/portage/config/make.conf.example for a more
4 # detailed example.
5 CFLAGS="-O2 -march=i686 -pipe"
6 CXXFLAGS="${CFLAGS}"
7 # WARNING: Changing your CHOST is not something that should be done lightly.
8 # Please consult http://www.gentoo.org/doc/en/change-chost.xml before changing.
9 CHOST="i686-pc-linux-gnu"
10
11
12
13
14 USE="minimal -X -cups opengl -ipv6"
15
16 #GENTOO_MIRRORS="http://mirrors.stuhome.net/gentoo/"
17
18
19 GENTOO_MIRRORS="http://gentoo.cs.nctu.edu.tw/gentoo/ ftp://gentoo.cs.nctu.edu.tw/
20 gentoo/ http://mirrors.sohu.com/gentoo/ http://gentoo.aditsu.net:8000/"
21 VIDEO_CARDS="intel"
```

Listing 19.1: Main gentoo configuration file

19.2 Network configuration

```
1 # This blank configuration will automatically use DHCP for any net.*
2 # scripts in /etc/init.d. To create a more complete configuration,
3 # please review /usr/share/doc/openrc*/net.example* and save your configuration
4 # in /etc/conf.d/net (this file :|!).
5
6
7 config_eth0="192.168.142.1 netmask 255.255.255.0 brd 192.168.142.255"
8 routes_eth0="default via 192.168.142.1"
9
10
11 config_eth2="192.168.142.2 netmask 255.255.255.0 brd 192.168.142.255"
12 routes_eth2="default via 192.168.142.1
13 224.0.0.0/4 dev eth0"
```

Listing 19.2: Network configuration with multicast route

19.3 Packages configurations

```
1 #required by =media-libs/opencv-2.3.1a-r1 (argument)
2 =media-libs/opencv-2.3.1a-r1 ~x86
3 #required by net-misc/spread (argument)
4 =net-misc/spread-4.1.0 ~x86
```

Listing 19.3: Per-package ACCEPT_KEYWORDS for profiles

```
1 #required by x11-libs/gtk+-2.24.8-r1, required by media-libs/opencv-2.3.1a-r1[gtk],
   required by opencv (argument)
2 =x11-libs/cairo-1.10.2-r1 X
3 #required by x11-libs/gtk+-2.24.8-r1, required by media-libs/opencv-2.3.1a-r1[gtk],
   required by opencv (argument)
4 =x11-libs/gdk-pixbuf-2.24.0-r1 X
5 media-libs/opencv opengl sse sse2 ffmpeg gtk python v4l
6 #required by media-libs/mesa-7.11.2, required by x11-base/xorg-server-1.11.2-r2[-
   minimal], required by x11-drivers/xf86-input-evdev-2.6.0, required by x11-base/
   xorg-drivers-1.11[input_devices_evdev]
7 >=dev-libs/libxml2-2.7.8-r4 python
8 #required by x11-drivers/xf86-video-intel-2.17.0-r3[dri], required by x11-base/xorg
   -drivers-1.11[video_cards_intel]
9 =x11-base/xorg-server-1.11.2-r2 -minimal
10 #required by x11-wm/awesome-3.4.9-r1, required by x11-wm/awesome (argument)
11 =x11-libs/cairo-1.10.2-r1 xcb
12 #required by x11-wm/awesome-3.4.9-r1, required by x11-wm/awesome (argument)
13 >=media-gfx/imagemagick-6.7.5.3 png
14 #required by x11-wm/awesome-3.4.9-r1, required by x11-wm/awesome (argument)
15 =media-libs/imlib2-1.4.4 png
16 media-video/mplayer -a52 -cdio -dirac -dts -dv -dvd -dvdnv -enca -faac -faad -
   network -osdmenu -quicktime -rar -real -rtc -schroedinger -speex -theora -
   toolame -tremor -twolame -vorbis -x264 -xscreensaver -xv
17 media-video/mplayer -a52 -cdio -dirac -dts -dv -dvd -dvdnv -enca -faac -faad -
   network -osdmenu -quicktime -rar -real -rtc -schroedinger -speex -theora -
   toolame -tremor -twolame -vorbis -x264 -xscreensaver -xv -ass -live -mp3
18 media-video/mplayer v4l X
```

Listing 19.4: Feature selection

19.4 Kernel Configuration

```
1 CONFIG_X86_32=y
2 CONFIG_X86=y
3 CONFIG_INSTRUCTION_DECODER=y
4 CONFIG_OUTPUT_FORMAT="elf32-i386"
5 CONFIG_ARCHDEFCONFIG="arch/x86/configs/i386_defconfig"
6 CONFIG_GENERIC_CMOS_UPDATE=y
7 CONFIG_CLOCKSOURCE_WATCHDOG=y
8 CONFIG_GENERIC_CLOCKEVENTS=y
9 CONFIG_GENERIC_CLOCKEVENTS_BROADCAST=y
10 CONFIG_LOCKDEP_SUPPORT=y
11 CONFIG_STACKTRACE_SUPPORT=y
12 CONFIG_HAVE_LATENCYTOP_SUPPORT=y
13 CONFIG_MMU=y
14 CONFIG_ZONE_DMA=y
15 CONFIG_NEED_SG_DMA_LENGTH=y
16 CONFIG_GENERIC_ISA_DMA=y
17 CONFIG_GENERIC_IOMAP=y
18 CONFIG_GENERIC_BUG=y
19 CONFIG_GENERIC_HWEIGHT=y
```

```

20 CONFIG_ARCH_MAY_HAVE_PC_FDC=y
21 CONFIG_RWSEM_XCHGADD_ALGORITHM=y
22 CONFIG_ARCH_HAS_CPU_IDLE_WAIT=y
23 CONFIG_GENERIC_CALIBRATE_DELAY=y
24 CONFIG_ARCH_HAS_CPU_RELAX=y
25 CONFIG_ARCH_HAS_DEFAULT_IDLE=y
26 CONFIG_ARCH_HAS_CACHE_LINE_SIZE=y
27 CONFIG_HAVE_SETUP_PER_CPU_AREA=y
28 CONFIG_NEED_PER_CPU_EMBED_FIRST_CHUNK=y
29 CONFIG_NEED_PER_CPU_PAGE_FIRST_CHUNK=y
30 CONFIG_ARCH_HIBERNATION_POSSIBLE=y
31 CONFIG_ARCH_SUSPEND_POSSIBLE=y
32 CONFIG_ARCH_POPULATES_NODE_MAP=y
33 CONFIG_ARCH_SUPPORTS_OPTIMIZED_INLINING=y
34 CONFIG_ARCH_SUPPORTS_DEBUG_PAGEALLOC=y
35 CONFIG_X86_32_SMP=y
36 CONFIG_X86_HT=y
37 CONFIG_X86_32_LAZY_GS=y
38 CONFIG_ARCH_HWEIGHT_CFLAGS="-fcall-saved-ecx -fcall-saved-edx"
39 CONFIG_KTIME_SCALAR=y
40 CONFIG_ARCH_CPU_PROBE_RELEASE=y
41 CONFIG_DEFCONFIG_LIST="/lib/modules/$UNAME_RELEASE/.config"
42 CONFIG_HAVE_IRQ_WORK=y
43 CONFIG_IRQ_WORK=y
44 CONFIG_EXPERIMENTAL=y
45 CONFIG_INIT_ENV_ARG_LIMIT=32
46 CONFIG_CROSS_COMPILE=""
47 CONFIG_LOCALVERSION=""
48 CONFIG_HAVE_KERNEL_GZIP=y
49 CONFIG_HAVE_KERNEL_BZIP2=y
50 CONFIG_HAVE_KERNEL_LZMA=y
51 CONFIG_HAVE_KERNEL_XZ=y
52 CONFIG_HAVE_KERNEL_LZO=y
53 CONFIG_KERNEL_GZIP=y
54 CONFIG_DEFAULT_HOSTNAME="(none)"
55 CONFIG_SWAP=y
56 CONFIG_SYSVIPC=y
57 CONFIG_SYSVIPC_SYSCTL=y
58 CONFIG_POSIX_QUEUE=y
59 CONFIG_POSIX_QUEUE_SYSCTL=y
60 CONFIG_BSD_PROCESS_ACCT=y
61 CONFIG_BSD_PROCESS_ACCT_V3=y
62 CONFIG_TASKSTATS=y
63 CONFIG_TASK_DELAY_ACCT=y
64 CONFIG_TASK_XACCT=y
65 CONFIG_TASK_IO_ACCOUNTING=y
66 CONFIG_AUDIT=y
67 CONFIG_AUDITSYSCALL=y
68 CONFIG_AUDIT_WATCH=y
69 CONFIG_AUDIT_TREE=y
70 CONFIG_HAVE_GENERIC_HARDIRQS=y
71 CONFIG_GENERIC_HARDIRQS=y
72 CONFIG_HAVE_SPARSE_IRQ=y
73 CONFIG_GENERIC_IRQ_PROBE=y
74 CONFIG_GENERIC_IRQ_SHOW=y
75 CONFIG_GENERIC_PENDING_IRQ=y
76 CONFIG_IRQ_FORCED_THREADING=y
77 CONFIG_SPARSE_IRQ=y
78 CONFIG_TREE_RCU=y
79 CONFIG_RCU_FANOUT=32
80 CONFIG_IKCONFIG=y
81 CONFIG_IKCONFIG_PROC=y
82 CONFIG_LOG_BUF_SHIFT=15
83 CONFIG_HAVE_UNSTABLE_SCHED_CLOCK=y

```

```
84 CONFIG_CGROUPS=y
85 CONFIG_CPUSETS=y
86 CONFIG_PROC_PID_CPUSET=y
87 CONFIG_CGROUP_CPUACCT=y
88 CONFIG_NAMESPACES=y
89 CONFIG_UTS_NS=y
90 CONFIG_IPC_NS=y
91 CONFIG_USER_NS=y
92 CONFIG_PID_NS=y
93 CONFIG_NET_NS=y
94 CONFIG_SYSFS_DEPRECATED=y
95 CONFIG_RELAY=y
96 CONFIG_BLK_DEV_INITRD=y
97 CONFIG_INITRAMFS_SOURCE=""
98 CONFIG_RD_GZIP=y
99 CONFIG_RD_BZIP2=y
100 CONFIG_RD_LZMA=y
101 CONFIG_RD_XZ=y
102 CONFIG_RD_LZO=y
103 CONFIG_CC_OPTIMIZE_FOR_SIZE=y
104 CONFIG_SYSCTL=y
105 CONFIG_ANON_INODES=y
106 CONFIG_UID16=y
107 CONFIG_KALLSYMS=y
108 CONFIG_HOTPLUG=y
109 CONFIG_PRINTK=y
110 CONFIG_BUG=y
111 CONFIG_ELF_CORE=y
112 CONFIG_PCSPKR_PLATFORM=y
113 CONFIG_HAVE_PCSPKR_PLATFORM=y
114 CONFIG_BASE_FULL=y
115 CONFIG_FUTEX=y
116 CONFIG_EPOLL=y
117 CONFIG_SIGNALFD=y
118 CONFIG_TIMERFD=y
119 CONFIG_EVENTFD=y
120 CONFIG_SHMEM=y
121 CONFIG_AIO=y
122 CONFIG_HAVE_PERF_EVENTS=y
123 CONFIG_PERF_EVENTS=y
124 CONFIG_VM_EVENT_COUNTERS=y
125 CONFIG_PCI_QUIRKS=y
126 CONFIG_COMPAT_BRK=y
127 CONFIG_SLAB=y
128 CONFIG_PROFILING=y
129 CONFIG_TRACEPOINTS=y
130 CONFIG_OPROFILE=m
131 CONFIG_HAVE_OPROFILE=y
132 CONFIG_KPROBES=y
133 CONFIG_OPTPROBES=y
134 CONFIG_HAVE_EFFICIENT_UNALIGNED_ACCESS=y
135 CONFIG_KRETPROBES=y
136 CONFIG_HAVE_IOREMAP_PROT=y
137 CONFIG_HAVE_KPROBES=y
138 CONFIG_HAVE_KRETPROBES=y
139 CONFIG_HAVE_OPTPROBES=y
140 CONFIG_HAVE_ARCH_TRACEHOOK=y
141 CONFIG_HAVE_DMA_ATTRS=y
142 CONFIG_USE_GENERIC_SMP_HELPERS=y
143 CONFIG_HAVE_REGS_AND_STACK_ACCESS_API=y
144 CONFIG_HAVE_DMA_API_DEBUG=y
145 CONFIG_HAVE_HW_BREAKPOINT=y
146 CONFIG_HAVE_MIXED_BREAKPOINTS_REGS=y
147 CONFIG_HAVE_USER_RETURN_NOTIFIER=y
```

```
148 CONFIG_HAVE_PERF_EVENTS_NMI=y
149 CONFIG_HAVE_ARCH_JUMP_LABEL=y
150 CONFIG_ARCH_HAVE_NMLSAFE_CMPXCHG=y
151 CONFIG_HAVE_GENERIC_DMA_COHERENT=y
152 CONFIG_SLABINFO=y
153 CONFIG_RT_MUTEXES=y
154 CONFIG_BASE_SMALL=0
155 CONFIG_MODULES=y
156 CONFIG_MODULE_UNLOAD=y
157 CONFIG_MODULE_FORCE_UNLOAD=y
158 CONFIG_MODVERSIONS=y
159 CONFIG_STOP_MACHINE=y
160 CONFIG_BLOCK=y
161 CONFIG_LBDAB=y
162 CONFIG_BLK_DEV_BSG=y
163 CONFIG_BLK_DEV_BSGLIB=y
164 CONFIG_IOSCHED_NOOP=y
165 CONFIG_IOSCHED_DEADLINE=y
166 CONFIG_IOSCHED_CFQ=y
167 CONFIG_DEFAULT_CFQ=y
168 CONFIG_DEFAULT_IOSCHED="cfq"
169 CONFIG_INLINE_SPIN_UNLOCK=y
170 CONFIG_INLINE_SPIN_UNLOCK_IRQ=y
171 CONFIG_INLINE_READ_UNLOCK=y
172 CONFIG_INLINE_READ_UNLOCK_IRQ=y
173 CONFIG_INLINE_WRITE_UNLOCK=y
174 CONFIG_INLINE_WRITE_UNLOCK_IRQ=y
175 CONFIG_TICK_ONESHOT=y
176 CONFIG_HIGH_RES_TIMERS=y
177 CONFIG_GENERIC_CLOCKEVENTS_BUILD=y
178 CONFIG_GENERIC_CLOCKEVENTS_MIN_ADJUST=y
179 CONFIG_SMP=y
180 CONFIG_X86_MPPARSE=y
181 CONFIG_X86_EXTENDED_PLATFORM=y
182 CONFIG_X86_SUPPORTS_MEMORY_FAILURE=y
183 CONFIG_SCHED_OMIT_FRAME_POINTER=y
184 CONFIG_NO_BOOTMEM=y
185 CONFIG_MATOM=y
186 CONFIG_X86_GENERIC=y
187 CONFIG_X86_INTERNODE_CACHE_SHIFT=6
188 CONFIG_X86_CMPXCHG=y
189 CONFIG_CMPXCHG_LOCAL=y
190 CONFIG_CMPXCHG_DOUBLE=y
191 CONFIG_X86_L1_CACHE_SHIFT=6
192 CONFIG_X86_XADD=y
193 CONFIG_X86_WP_WORKS_OK=y
194 CONFIG_X86_INVLPG=y
195 CONFIG_X86_BSWAP=y
196 CONFIG_X86_POPAD_OK=y
197 CONFIG_X86_INTEL_USERCOPY=y
198 CONFIG_X86_USE_PPRO_CHECKSUM=y
199 CONFIG_X86_TSC=y
200 CONFIG_X86_CMPXCHG64=y
201 CONFIG_X86_CMOV=y
202 CONFIG_X86_MINIMUM_CPU_FAMILY=5
203 CONFIG_X86_DEBUGCTLMSR=y
204 CONFIG_CPU_SUP_INTEL=y
205 CONFIG_CPU_SUP_CYRIX_32=y
206 CONFIG_CPU_SUP_AMD=y
207 CONFIG_CPU_SUP_CENTAUR=y
208 CONFIG_CPU_SUP_TRANSMETA_32=y
209 CONFIG_CPU_SUP_UMC_32=y
210 CONFIG_HPET_TIMER=y
211 CONFIG_DMI=y
```

```
212 CONFIG_NR_CPUS=8
213 CONFIG_SCHED_SMT=y
214 CONFIG_SCHED_MC=y
215 CONFIG_PREEMPT_NONE=y
216 CONFIG_X86_LOCAL_APIC=y
217 CONFIG_X86_IO_APIC=y
218 CONFIG_X86_MCE=y
219 CONFIG_X86_MCE_INTEL=y
220 CONFIG_X86_MCE_THRESHOLD=y
221 CONFIG_X86_THERMAL_VECTOR=y
222 CONFIG_VM86=y
223 CONFIG_X86_REBOOTFIXUPS=y
224 CONFIG_MICROCODE=m
225 CONFIG_MICROCODE_INTEL=y
226 CONFIG_MICROCODE_OLD_INTERFACE=y
227 CONFIG_X86_MSR=m
228 CONFIG_X86_CPUID=m
229 CONFIG_HIGHMEM4G=y
230 CONFIG_PAGE_OFFSET=0xC0000000
231 CONFIG_HIGHMEM=y
232 CONFIG_ARCH_FLATMEM_ENABLE=y
233 CONFIG_ARCH_SPARSEMEM_ENABLE=y
234 CONFIG_ARCH_SELECT_MEMORY_MODEL=y
235 CONFIG_ILLEGAL_POINTER_VALUE=0
236 CONFIG_SELECT_MEMORY_MODEL=y
237 CONFIG_FLATMEM_MANUAL=y
238 CONFIG_FLATMEM=y
239 CONFIG_FLAT_NODE_MEM_MAP=y
240 CONFIG_SPARSEMEM_STATIC=y
241 CONFIG_HAVE_MEMBLOCK=y
242 CONFIG_PAGEFLAGS_EXTENDED=y
243 CONFIG_SPLIT_PTLOCK_CPUS=4
244 CONFIG_ZONE_DMA_FLAG=1
245 CONFIG_BOUNCE=y
246 CONFIG_VIRT_TO_BUS=y
247 CONFIG_DEFAULT_MMAP_MIN_ADDR=4096
248 CONFIG_ARCH_SUPPORTS_MEMORY_FAILURE=y
249 CONFIG_HIGHPTES=y
250 CONFIG_X86_RESERVE_LOW=64
251 CONFIG_MTRR=y
252 CONFIG_MTRR_SANITIZER=y
253 CONFIG_MTRR_SANITIZER_ENABLE_DEFAULT=0
254 CONFIG_MTRR_SANITIZER_SPARE_REG_NR_DEFAULT=1
255 CONFIG_X86_PAT=y
256 CONFIG_ARCH_USES_PG_UNCACHED=y
257 CONFIG_ARCH_RANDOM=y
258 CONFIG_SECCOMP=y
259 CONFIG_HZ_100=y
260 CONFIG_HZ=100
261 CONFIG_SCHED_HRTICK=y
262 CONFIG_KEXEC=y
263 CONFIG_CRASHDUMP=y
264 CONFIG_PHYSICAL_START=0x100000
265 CONFIG_RELOCATABLE=y
266 CONFIG_X86_NEED_RELOCS=y
267 CONFIG_PHYSICAL_ALIGN=0x100000
268 CONFIG_HOTPLUG_CPU=y
269 CONFIG_COMPAT_VDSO=y
270 CONFIG_ARCH_ENABLE_MEMORY_HOTPLUG=y
271 CONFIG_CPU_FREQ=y
272 CONFIG_CPU_FREQ_TABLE=m
273 CONFIG_CPU_FREQ_STAT=m
274 CONFIG_CPU_FREQ_STAT_DETAILS=y
275 CONFIG_CPU_FREQ_DEFAULT_GOV_PERFORMANCE=y
```

```

276 CONFIG_CPU_FREQ_GOV_PERFORMANCE=y
277 CONFIG_CPU_FREQ_GOV_POWERSAVE=m
278 CONFIG_CPU_FREQ_GOV_USERSPACE=m
279 CONFIG_CPU_FREQ_GOV_ONDEMAND=m
280 CONFIG_CPU_FREQ_GOV_CONSERVATIVE=m
281 CONFIG_X86_POWERNOW_K6=m
282 CONFIG_X86_POWERNOW_K7=m
283 CONFIG_X86_GX_SUSPMOD=m
284 CONFIG_X86_SPEEDSTEP_CENTRINO=m
285 CONFIG_X86_SPEEDSTEP_CENTRINO_TABLE=y
286 CONFIG_X86_SPEEDSTEP_ICH=m
287 CONFIG_X86_SPEEDSTEP_SMI=m
288 CONFIG_X86_P4_CLOCKMOD=m
289 CONFIG_X86_CPUFREQ_NFORCE2=m
290 CONFIG_X86_LONGRUN=m
291 CONFIG_X86_E_POWERSAVER=m
292 CONFIG_X86_SPEEDSTEP_LIB=m
293 CONFIG_CPU_IDLE=y
294 CONFIG_CPU_IDLE_GOV_LADDER=y
295 CONFIG_PCI=y
296 CONFIG_PCI_GOANY=y
297 CONFIG_PCI_BIOS=y
298 CONFIG_PCI_DIRECT=y
299 CONFIG_PCI_DOMAINS=y
300 CONFIG_ARCH_SUPPORTS_MSI=y
301 CONFIG_PCI_MSI=y
302 CONFIG_HT_IRQ=y
303 CONFIG_PCI_LABEL=y
304 CONFIG_ISA_DMA_API=y
305 CONFIG_AMD_NB=y
306 CONFIG_PCCARD=m
307 CONFIG_PCMCIA=m
308 CONFIG_PCMCIA_LOAD_CIS=y
309 CONFIG_CARDBUS=y
310 CONFIG_YENTA=m
311 CONFIG_YENTA_O2=y
312 CONFIG_YENTA_RICOH=y
313 CONFIG_YENTA_TI=y
314 CONFIG_YENTA_ENE_TUNE=y
315 CONFIG_YENTA_TOSHIBA=y
316 CONFIG_PD6729=m
317 CONFIG_I82092=m
318 CONFIG_PCCARD_NONSTATIC=y
319 CONFIG_HOTPLUG_PCI=m
320 CONFIG_HOTPLUG_PCI_COMPAQ=m
321 CONFIG_HOTPLUG_PCI_LIBM=m
322 CONFIG_HOTPLUG_PCI_CPCI=y
323 CONFIG_HOTPLUG_PCI_CPCI_ZT5550=m
324 CONFIG_HOTPLUG_PCI_CPCI_GENERIC=m
325 CONFIG_HOTPLUG_PCI_SHPC=m
326 CONFIG_BINFORMAT_ELF=y
327 CONFIG_CORE_DUMP_DEFAULT_ELF_HEADERS=y
328 CONFIG_HAVE_AOUT=y
329 CONFIG_BINFORMAT_AOUT=m
330 CONFIG_BINFORMAT_MISC=m
331 CONFIG_HAVE_ATOMIC_IOMAP=y
332 CONFIG_HAVE_TEXT_POKE_SMP=y
333 CONFIG_NET=y
334 CONFIG_PACKET=y
335 CONFIG_UNIX=y
336 CONFIG_XFRM=y
337 CONFIG_XFRM_USER=m
338 CONFIG_NET_KEY=m
339 CONFIG_INET=y

```

```
340 CONFIG_IP_MULTICAST=y
341 CONFIG_IP_ADVANCED_ROUTER=y
342 CONFIG_IP_MULTIPLE_TABLES=y
343 CONFIG_IP_ROUTE_MULTIPATH=y
344 CONFIG_IP_PNP=y
345 CONFIG_IP_PNP_DHCP=y
346 CONFIG_INET_LRO=m
347 CONFIG_INET_DIAG=y
348 CONFIG_INET_TCP_DIAG=y
349 CONFIG_TCP_CONG_ADVANCED=y
350 CONFIG_TCP_CONG_BIC=m
351 CONFIG_TCP_CONG_CUBIC=y
352 CONFIG_TCP_CONG_WESTWOOD=m
353 CONFIG_TCP_CONG_HTCP=m
354 CONFIG_TCP_CONG_HSTCP=m
355 CONFIG_TCP_CONG_HYBLA=m
356 CONFIG_TCP_CONG_VEGAS=m
357 CONFIG_TCP_CONG_SCALABLE=m
358 CONFIG_TCP_CONG_LP=m
359 CONFIG_TCP_CONG_VENO=m
360 CONFIG_TCP_CONG_YEAH=m
361 CONFIG_TCP_CONG_ILLINOIS=m
362 CONFIG_DEFAULT_CUBIC=y
363 CONFIG_DEFAULT_TCP_CONG="cubic"
364 CONFIG_TCP_MD5SIG=y
365 CONFIG_NETWORK_SECMARK=y
366 CONFIG_IP_SCTP=y
367 CONFIG_SCTP_HMAC_MD5=y
368 CONFIG_ATM=m
369 CONFIG_ATM_CLIP=m
370 CONFIG_STP=m
371 CONFIG_BRIDGE=m
372 CONFIG_BRIDGE_IGMP_SNOOPING=y
373 CONFIG_LLC=m
374 CONFIG_DNS_RESOLVER=y
375 CONFIG_RPS=y
376 CONFIG_RFS_ACCEL=y
377 CONFIG_XPS=y
378 CONFIG_NET_PKTGEN=m
379 CONFIG_AF_RXRPC=m
380 CONFIG_RXKAD=m
381 CONFIG_FIB_RULES=y
382 CONFIG_WIRELESS=y
383 CONFIG_LIB80211=y
384 CONFIG_RFKILL=m
385 CONFIG_RFKILL_INPUT=y
386 CONFIG_UEVENT_HELPER_PATH="/sbin/hotplug"
387 CONFIG_STANDALONE=y
388 CONFIG_PREVENT_FIRMWARE_BUILD=y
389 CONFIG_FW_LOADER=y
390 CONFIG_FIRMWARE_IN_KERNEL=y
391 CONFIG_EXTRA_FIRMWARE=""
392 CONFIG_CONNECTOR=m
393 CONFIG_BLK_DEV=y
394 CONFIG_BLK_DEV_LOOP=y
395 CONFIG_BLK_DEV_LOOP_MIN_COUNT=8
396 CONFIG_BLK_DEV_RAM=y
397 CONFIG_BLK_DEV_RAM_COUNT=16
398 CONFIG_BLK_DEV_RAM_SIZE=8192
399 CONFIG_HAVE_IDE=y
400 CONFIG SCSI_MOD=y
401 CONFIG_RAID_ATTRS=m
402 CONFIG SCSI=y
403 CONFIG SCSI_DMA=y
```

```
404 CONFIG_SCSI_TGT=m
405 CONFIG_SCSI_NETLINK=y
406 CONFIG_SCSI_PROC_FS=y
407 CONFIG_BLK_DEV_SD=y
408 CONFIG_CHR_DEV_ST=m
409 CONFIG_CHR_DEV_OSST=m
410 CONFIG_BLK_DEV_SR=y
411 CONFIG_BLK_DEV_SR_VENDOR=y
412 CONFIG_CHR_DEV_SG=m
413 CONFIG_CHR_DEV_SCH=m
414 CONFIG_SCSI_MULTILUN=y
415 CONFIG_SCSI_CONSTANTS=y
416 CONFIG_SCSI_LOGGING=y
417 CONFIG_SCSI_SCAN_ASYNC=y
418 CONFIG_SCSI_WAIT_SCAN=m
419 CONFIG_SCSI_SPL_ATTRS=m
420 CONFIG_SCSI_FC_ATTRS=m
421 CONFIG_SCSI_FC_TGT_ATTRS=y
422 CONFIG_SCSI_ISCSI_ATTRS=y
423 CONFIG_SCSI_SAS_ATTRS=m
424 CONFIG_SCSI_SAS_LIBSAS=m
425 CONFIG_SCSI_SAS_ATA=y
426 CONFIG_SCSI_SAS_HOST_SMP=y
427 CONFIG_SCSI_SRP_ATTRS=m
428 CONFIG_SCSI_SRP_TGT_ATTRS=y
429 CONFIG_SCSILOWLEVEL=y
430 CONFIG_ISCSI_TCP=y
431 CONFIG_ISCSI_BOOT_SYSFS=m
432 CONFIG_BLK_DEV_3W_XXXX_RAID=m
433 CONFIG_SCSI_3W_9XXX=m
434 CONFIG_SCSI_ACARD=m
435 CONFIG_SCSI_AACRAID=m
436 CONFIG_SCSI_AIC7XXX=m
437 CONFIG_AIC7XXX_CMDS_PER_DEVICE=32
438 CONFIG_AIC7XXX_RESET_DELAY_MS=15000
439 CONFIG_AIC7XXX_DEBUG_MASK=0
440 CONFIG_AIC7XXX_REG_PRETTY_PRINT=y
441 CONFIG_SCSI_AIC79XX=m
442 CONFIG_AIC79XX_CMDS_PER_DEVICE=32
443 CONFIG_AIC79XX_RESET_DELAY_MS=15000
444 CONFIG_AIC79XX_DEBUG_MASK=0
445 CONFIG_SCSI_AIC94XX=m
446 CONFIG_SCSI_DPT_I2O=m
447 CONFIG_SCSILADVANSYS=m
448 CONFIG_SCSILARCMSR=m
449 CONFIG_MEGARAID_NEWGEN=y
450 CONFIG_MEGARAID_MM=m
451 CONFIG_MEGARAID_MAILBOX=m
452 CONFIG_MEGARAID_LEGACY=m
453 CONFIG_MEGARAID_SAS=m
454 CONFIG_SCSI_HPTIOP=m
455 CONFIG_SCSI_BUSLOGIC=m
456 CONFIG_SCSIDMX3191D=m
457 CONFIG_SCSIEATA=m
458 CONFIG_SCSLEATA_TAGGED_QUEUE=y
459 CONFIG_SCSLEATA_LINKED_COMMANDS=y
460 CONFIG_SCSLEATA_MAX_TAGS=16
461 CONFIG_SCSIFUTURE_DOMAIN=m
462 CONFIG_SCSIGDTH=m
463 CONFIG_SCSILPS=m
464 CONFIG_SCSI_INITIO=m
465 CONFIG_SCSILINIA100=m
466 CONFIG_SCSISTEX=m
467 CONFIG_SCSISYM53C8XX_2=m
```



```
468 CONFIG_SCSLSYM53C8XX_DMA_ADDRESSING_MODE=1
469 CONFIG_SCSLSYM53C8XX_DEFAULT_TAGS=16
470 CONFIG_SCSLSYM53C8XX_MAX_TAGS=64
471 CONFIG_SCSLSYM53C8XX_MMIO=y
472 CONFIG_SCSLIPR=m
473 CONFIG_SCSLIPR_TRACE=y
474 CONFIG_SCSLIPR_DUMP=y
475 CONFIG_SCSLQLOGIC_1280=m
476 CONFIG_SCSLQLA_FC=m
477 CONFIG_SCSLQLA_ISCSI=m
478 CONFIG_SCSLLPFC=m
479 CONFIG_SCSLDC395x=m
480 CONFIG_SCSLDC390T=m
481 CONFIG_SCSLNSP32=m
482 CONFIG_SCSLSRP=m
483 CONFIG_SCSLOWLEVEL_PCMCIA=y
484 CONFIG_PCMCIA_AHA152X=m
485 CONFIG_PCMCIA_FDOMAIN=m
486 CONFIG_PCMCIA_NINJA_SCSI=m
487 CONFIG_PCMCIA_QLOGIC=m
488 CONFIG_PCMCIA_SYM53C500=m
489 CONFIG_ATA=y
490 CONFIG_ATA_SFF=y
491 CONFIG_ATA_BMDMA=y
492 CONFIG_ATA_PIIX=y
493 CONFIG_PATA_MPIIX=y
494 CONFIG_PATA_PCMCIA=m
495 CONFIG_ATA_GENERIC=y
496 CONFIG_I2O=m
497 CONFIG_I2O_LCT_NOTIFY_ON_CHANGES=y
498 CONFIG_I2O_EXT_ADAPTEC=y
499 CONFIG_I2O_CONFIG=m
500 CONFIG_I2O_CONFIG_OLD_IOCTL=y
501 CONFIG_I2O_BUS=m
502 CONFIG_I2O_BLOCK=m
503 CONFIG_I2O_SCSI=m
504 CONFIG_I2O_PROC=m
505 CONFIG_NETDEVICES=y
506 CONFIG_NET_CORE=y
507 CONFIG_MII=y
508 CONFIG_ETHERNET=y
509 CONFIG_NET_VENDOR_3COM=y
510 CONFIG_NET_VENDOR_INTEL=y
511 CONFIG_E100=m
512 CONFIG_E1000=m
513 CONFIG_E1000E=m
514 CONFIG_JGB=m
515 CONFIG_JGB_DCA=y
516 CONFIG_IXGBEVF=m
517 CONFIG_NET_VENDOR_I825XX=y
518 CONFIG_NET_VENDOR_REALTEK=y
519 CONFIG_8139CP=y
520 CONFIG_8139TOO=y
521 CONFIG_8139TOO_TUNE_TWISTER=y
522 CONFIG_8139TOO_8129=y
523 CONFIG_R8169=y
524 CONFIG_INPUT=y
525 CONFIG_INPUT_POLLDEV=m
526 CONFIG_INPUT_SPARSEKMAP=m
527 CONFIG_INPUT_MOUSEDEV=y
528 CONFIG_INPUT_MOUSEDEV_PSAUX=y
529 CONFIG_INPUT_MOUSEDEV_SCREEN_X=1366
530 CONFIG_INPUT_MOUSEDEV_SCREEN_Y=768
531 CONFIG_INPUT_EVDEV=y
```

```
532 CONFIG.INPUT_KEYBOARD=y
533 CONFIG.KEYBOARD_ATKBD=y
534 CONFIG.KEYBOARD_LKKBD=m
535 CONFIG.KEYBOARD_NEWTON=m
536 CONFIG.KEYBOARD_STOWAWAY=m
537 CONFIG.KEYBOARD_SUNKBD=m
538 CONFIG.KEYBOARD_XTKBD=m
539 CONFIG.INPUT_MOUSE=y
540 CONFIG.MOUSE_PS2=y
541 CONFIG_MOUSE_PS2_ALPS=y
542 CONFIG_MOUSE_PS2_LOGIPS2PP=y
543 CONFIG_MOUSE_PS2_SYNAPTICS=y
544 CONFIG_MOUSE_PS2_LIFEBLOCK=y
545 CONFIG_MOUSE_PS2_TRACKPOINT=y
546 CONFIG_MOUSE_PS2_TOUCHKIT=y
547 CONFIG_MOUSE_SERIAL=m
548 CONFIG_MOUSE_VSXXXAA=m
549 CONFIG_SERIO=y
550 CONFIG_SERIO_I8042=y
551 CONFIG_SERIO_SERPORT=m
552 CONFIG_SERIO_CT82C710=m
553 CONFIG_SERIO_PCIPS2=m
554 CONFIG_SERIO_LIBPS2=y
555 CONFIG_SERIO_RAW=m
556 CONFIG_VT=y
557 CONFIG_CONSOLE_TRANSLATIONS=y
558 CONFIG_VT_CONSOLE=y
559 CONFIG_HW_CONSOLE=y
560 CONFIG_VT_HW_CONSOLE_BINDING=y
561 CONFIG_UNIX98_PTYS=y
562 CONFIG_DEVKMEM=y
563 CONFIG_SERIAL_8250=y
564 CONFIG_SERIAL_8250_CONSOLE=y
565 CONFIG_FIX_EARLYCON_MEM=y
566 CONFIG_SERIAL_8250_PCI=y
567 CONFIG_SERIAL_8250_CS=m
568 CONFIG_SERIAL_8250_NR_UARTS=4
569 CONFIG_SERIAL_8250_RUNTIME_UARTS=4
570 CONFIG_SERIAL_8250_EXTENDED=y
571 CONFIG_SERIAL_8250_MANY_PORTS=y
572 CONFIG_SERIAL_8250_SHARE_IRQ=y
573 CONFIG_SERIAL_8250_RSA=y
574 CONFIG_SERIAL_CORE=y
575 CONFIG_SERIAL_CORE_CONSOLE=y
576 CONFIG_SERIAL_JSM=m
577 CONFIG_IPMI_HANDLER=m
578 CONFIG_IPMI_PANIC_EVENT=y
579 CONFIG_IPMI_PANIC_STRING=y
580 CONFIG_IPMI_DEVICE_INTERFACE=m
581 CONFIG_IPMI_SI=m
582 CONFIG_IPMI_WATCHDOG=m
583 CONFIG_IPMI_POWEROFF=m
584 CONFIG_HW_RANDOM=y
585 CONFIG_HW_RANDOM_INTEL=y
586 CONFIG_NVRAM=m
587 CONFIG_GEN_RTC=y
588 CONFIG_GEN_RTC_X=y
589 CONFIG_SYNCLINK_CS=m
590 CONFIG_CARDMAN_4000=m
591 CONFIG_CARDMAN_4040=m
592 CONFIG_DEVPORT=y
593 CONFIG_I2C=y
594 CONFIG_I2C_BOARDINFO=y
595 CONFIG_I2C_COMPAT=y
```

```

596 CONFIG_I2C_CHARDEV=m
597 CONFIG_I2C_HELPER_AUTO=y
598 CONFIG_I2C_ALGOBIT=y
599 CONFIG_I2C_ALI1535=m
600 CONFIG_I2C_ALI1563=m
601 CONFIG_I2C_ALI15X3=m
602 CONFIG_I2C_AMD756=m
603 CONFIG_I2C_AMD756_S4882=m
604 CONFIG_I2C_AMD8111=m
605 CONFIG_I2C_I801=m
606 CONFIG_I2C_PIIX4=m
607 CONFIG_I2C_NFORCE2=m
608 CONFIG_I2C_SIS5595=m
609 CONFIG_I2C_SIS630=m
610 CONFIG_I2C_SIS96X=m
611 CONFIG_I2C_VIA=m
612 CONFIG_I2C_VIAPRO=m
613 CONFIG_I2C_OCORES=m
614 CONFIG_I2C_SIMTEC=m
615 CONFIG_SCx200_ACB=m
616 CONFIG_SPI=y
617 CONFIG_SPI_MASTER=y
618 CONFIG_SPI_BITBANG=m
619 CONFIG_SPI_SPIDEV=m
620 CONFIG_SPI_TLE62X0=m
621 CONFIG_ARCH_WANT_OPTIONAL_GPIOLIB=y
622 CONFIG_SSB_POSSIBLE=y
623 CONFIG_SSB=m
624 CONFIG_SSB_SPROM=y
625 CONFIG_SSB_PCIHOST_POSSIBLE=y
626 CONFIG_SSB_PCIHOST=y
627 CONFIG_SSB_PCMCIAHOST_POSSIBLE=y
628 CONFIG_SSB_PCMCIAHOST=y
629 CONFIG_SSB_SDIOHOST_POSSIBLE=y
630 CONFIG_SSB_DRIVER_PCICORE_POSSIBLE=y
631 CONFIG_SSB_DRIVER_PCICORE=y
632 CONFIG_BCMA_POSSIBLE=y
633 CONFIG_MFD_SM501=m
634 CONFIG_MEDIA_SUPPORT=y
635 CONFIG_VIDEO_DEV=y
636 CONFIG_VIDEO_V4L2_COMMON=y
637 CONFIG_VIDEO_MEDIA=y
638 CONFIG_MEDIA_ATTACH=y
639 CONFIG_MEDIA_TUNER=y
640 CONFIG_MEDIA_TUNER_SIMPLE=y
641 CONFIG_MEDIA_TUNER_TDA8290=y
642 CONFIG_MEDIA_TUNER_TDA827X=y
643 CONFIG_MEDIA_TUNER_TDA18271=y
644 CONFIG_MEDIA_TUNER_TDA9887=y
645 CONFIG_MEDIA_TUNER_TEA5761=y
646 CONFIG_MEDIA_TUNER_TEA5767=y
647 CONFIG_MEDIA_TUNER_MT20XX=y
648 CONFIG_MEDIA_TUNER_XC2028=y
649 CONFIG_MEDIA_TUNER_XC5000=y
650 CONFIG_MEDIA_TUNER_XC4000=y
651 CONFIG_MEDIA_TUNER_MC44S803=y
652 CONFIG_VIDEO_V4L2=y
653 CONFIG_VIDEOBUF_GEN=y
654 CONFIG_VIDEOBUF_VMALLOC=y
655 CONFIG_VIDEO_TVEEPROM=y
656 CONFIG_VIDEO_TUNER=y
657 CONFIG_VIDEOBUF2_CORE=y
658 CONFIG_VIDEOBUF2_MEMOPS=y
659 CONFIG_VIDEOBUF2_VMALLOC=y

```

```
660 CONFIG_VIDEO_CAPTURE_DRIVERS=y
661 CONFIG_VIDEO_HELPER_CHIPS_AUTO=y
662 CONFIG_VIDEO_MSP3400=y
663 CONFIG_VIDEO_CS53L32A=y
664 CONFIG_VIDEO_WM8775=y
665 CONFIG_VIDEO_SAA711X=y
666 CONFIG_VIDEO_TVP5150=y
667 CONFIG_VIDEO_CX25840=y
668 CONFIG_VIDEO_CX2341X=y
669 CONFIG_VIDEO_MT9V011=y
670 CONFIG_V4L_USB_DRIVERS=y
671 CONFIG_USB_VIDEO_CLASS=y
672 CONFIG_USB_VIDEO_CLASS_INPUT_EVDEV=y
673 CONFIG_USB_GSPCA=y
674 CONFIG_USB_M5602=y
675 CONFIG_USB_STV06XX=y
676 CONFIG_USB_GL860=y
677 CONFIG_USB_GSPCA_BENQ=y
678 CONFIG_USB_GSPCA_CONEX=y
679 CONFIG_USB_GSPCA_CPIA1=y
680 CONFIG_USB_GSPCA_ETOMS=y
681 CONFIG_USB_GSPCA_FINEPIX=y
682 CONFIG_USB_GSPCA_JEILINJ=y
683 CONFIG_USB_GSPCA_KINECT=y
684 CONFIG_USB_GSPCA_KONICA=y
685 CONFIG_USB_GSPCA_MARS=y
686 CONFIG_USB_GSPCA_MR97310A=y
687 CONFIG_USB_GSPCA_NW80X=y
688 CONFIG_USB_GSPCA_OV519=y
689 CONFIG_USB_GSPCA_OV534=y
690 CONFIG_USB_GSPCA_OV534_9=y
691 CONFIG_USB_GSPCA_PAC207=y
692 CONFIG_USB_GSPCA_PAC7302=y
693 CONFIG_USB_GSPCA_PAC7311=y
694 CONFIG_USB_GSPCA_SE401=y
695 CONFIG_USB_GSPCA_SN9C2028=y
696 CONFIG_USB_GSPCA_SN9C20X=y
697 CONFIG_USB_GSPCA_SONIXB=y
698 CONFIG_USB_GSPCA_SONIXJ=y
699 CONFIG_USB_GSPCA_SPCA500=y
700 CONFIG_USB_GSPCA_SPCA501=y
701 CONFIG_USB_GSPCA_SPCA505=y
702 CONFIG_USB_GSPCA_SPCA506=y
703 CONFIG_USB_GSPCA_SPCA508=y
704 CONFIG_USB_GSPCA_SPCA561=y
705 CONFIG_USB_GSPCA_SPCA1528=y
706 CONFIG_USB_GSPCA_SQ905=y
707 CONFIG_USB_GSPCA_SQ905C=y
708 CONFIG_USB_GSPCA_SQ930X=y
709 CONFIG_USB_GSPCA_STK014=y
710 CONFIG_USB_GSPCA_STV0680=y
711 CONFIG_USB_GSPCA_SUNPLUS=y
712 CONFIG_USB_GSPCA_T613=y
713 CONFIG_USB_GSPCA_TOPRO=y
714 CONFIG_USB_GSPCA_TV8532=y
715 CONFIG_USB_GSPCA_VC032X=y
716 CONFIG_USB_GSPCA_VICAM=y
717 CONFIG_USB_GSPCA_XIRLINK_CIT=y
718 CONFIG_USB_GSPCA_ZC3XX=y
719 CONFIG_VIDEO_PVRUSB2=y
720 CONFIG_VIDEO_PVRUSB2_SYSFS=y
721 CONFIG_VIDEO_PVRUSB2_DEBUGIFC=y
722 CONFIG_VIDEO_HDPVR=y
723 CONFIG_VIDEO_EM28XX=y
```

```
724 CONFIG_VIDEO_USBVISION=y
725 CONFIG_USB_ET61X251=y
726 CONFIG_USB_SN9C102=y
727 CONFIG_USB_PWC=y
728 CONFIG_USB_PWC_DEBUG=y
729 CONFIG_USB_PWC_INPUT_EVDEV=y
730 CONFIG_USB_ZR364XX=y
731 CONFIG_USB_STKWEBCAM=y
732 CONFIG_USB_S2255=y
733 CONFIG_AGP=y
734 CONFIG_AGP_INTEL=y
735 CONFIG_VGA_ARB=y
736 CONFIG_VGA_ARB_MAX_GPUS=16
737 CONFIG_DRM=y
738 CONFIG_DRM_KMS_HELPER=y
739 CONFIG_DRM_I810=y
740 CONFIG_DRM_I915=y
741 CONFIG_DRM_I915_KMS=y
742 CONFIG_STUB_POULSBO=y
743 CONFIG_VIDEO_OUTPUT_CONTROL=m
744 CONFIG_FB=y
745 CONFIG_FIRMWARE_EDID=y
746 CONFIG_FB_BOOT_VESA_SUPPORT=y
747 CONFIG_FB_CFB_FILLRECT=y
748 CONFIG_FB_CFB_COPYAREA=y
749 CONFIG_FB_CFB_IMAGEBLIT=y
750 CONFIG_FB_VESA=y
751 CONFIG_BACKLIGHT_LCD_SUPPORT=y
752 CONFIG_LCD_CLASS_DEVICE=y
753 CONFIG_LCD_LTV350QV=y
754 CONFIG_BACKLIGHT_CLASS_DEVICE=m
755 CONFIG_BACKLIGHT_GENERIC=m
756 CONFIG_BACKLIGHT_PROGEAR=m
757 CONFIG_DISPLAY_SUPPORT=m
758 CONFIG_VGA_CONSOLE=y
759 CONFIG_DUMMY_CONSOLE=y
760 CONFIG_FRAMEBUFFER_CONSOLE=y
761 CONFIG_FRAMEBUFFER_CONSOLE_DETECT_PRIMARY=y
762 CONFIG_FB_CON_DECOR=y
763 CONFIG_FONT_8x8=y
764 CONFIG_FONT_8x16=y
765 CONFIG_HID_SUPPORT=y
766 CONFIG_HID=y
767 CONFIG_HIDRAW=y
768 CONFIG_USB_HID=m
769 CONFIG_HID_PID=y
770 CONFIG_USB_HIDDEV=y
771 CONFIG_HID_A4TECH=m
772 CONFIG_HID_APPLE=m
773 CONFIG_HID_BELKIN=m
774 CONFIG_HID_CHERRY=m
775 CONFIG_HID_CHICONY=m
776 CONFIG_HID_CYPRESS=m
777 CONFIG_HID_EZKEY=m
778 CONFIG_HID_KYE=m
779 CONFIG_HID_KENSINGTON=m
780 CONFIG_HID_LOGITECH=m
781 CONFIG_HID_MICROSOFT=m
782 CONFIG_HID_MONTEREY=m
783 CONFIG_USB_SUPPORT=y
784 CONFIG_USB_COMMON=y
785 CONFIG_USB_ARCH_HAS_HCD=y
786 CONFIG_USB_ARCH_HAS_OHCI=y
787 CONFIG_USB_ARCH_HAS_EHCI=y
```

```

788 CONFIG_USB_ARCH_HAS_XHCI=y
789 CONFIG_USB=y
790 CONFIG_USB_ANNOUNCE_NEW_DEVICES=y
791 CONFIG_USB_EHCI_HCD=m
792 CONFIG_USB_EHCI_ROOT_HUB_TT=y
793 CONFIG_USB_EHCI_TT_NEWSCHED=y
794 CONFIG_USB_OHCI_HCD=m
795 CONFIG_USB_OHCI_HCD_SSB=y
796 CONFIG_USB_OHCI_LITTLE_ENDIAN=y
797 CONFIG_USB_UHCI_HCD=y
798 CONFIG_USB_STORAGE=m
799 CONFIG_USB_STORAGE_REALTEK=m
800 CONFIG_MMC=m
801 CONFIG_MMC_BLOCK=m
802 CONFIG_MMC_BLOCK_MINORS=8
803 CONFIG_MMC_BLOCK_BOUNCE=y
804 CONFIG_SDIO_UART=m
805 CONFIG_MMC_SDHCI=m
806 CONFIG_DMA_DEVICES=y
807 CONFIG_INTEL_IOATDMA=y
808 CONFIG_DMA_ENGINE=y
809 CONFIG_NET_DMA=y
810 CONFIG_DCA=y
811 CONFIG_CLKSRC_I8253=y
812 CONFIG_CLKEVT_I8253=y
813 CONFIG_I8253_LOCK=y
814 CONFIG_CLKBLD_I8253=y
815 CONFIG_FIRMWARE_MEMMAP=y
816 CONFIG_EXT2_FS=y
817 CONFIG_EXT2_FS_XATTR=y
818 CONFIG_EXT2_FS_POSIX_ACL=y
819 CONFIG_EXT2_FS_SECURITY=y
820 CONFIG_EXT3_FS=y
821 CONFIG_EXT3_DEFAULTS_TO_ORDERED=y
822 CONFIG_EXT3_FS_XATTR=y
823 CONFIG_EXT3_FS_POSIX_ACL=y
824 CONFIG_EXT3_FS_SECURITY=y
825 CONFIG_JBD=y
826 CONFIG_FS_MBCACHE=y
827 CONFIG_FS_POSIX_ACL=y
828 CONFIG_FILE_LOCKING=y
829 CONFIG_FSNOTIFY=y
830 CONFIG_DNOTIFY=y
831 CONFIG_INOTIFY_USER=y
832 CONFIG_GENERIC_ACL=y
833 CONFIG_FAT_FS=y
834 CONFIG_MSDOS_FS=m
835 CONFIG_VFAT_FS=y
836 CONFIG_FAT_DEFAULT_CODEPAGE=437
837 CONFIG_FAT_DEFAULT_IOCHARSET="iso8859-1"
838 CONFIG_NTFS_FS=m
839 CONFIG_PROC_FS=y
840 CONFIG_PROC_KCORE=y
841 CONFIG_PROC_VMCORE=y
842 CONFIG_PROC_SYSCTL=y
843 CONFIG_PROC_PAGE_MONITOR=y
844 CONFIG_SYSFS=y
845 CONFIG_TMPFS=y
846 CONFIG_TMPFS_POSIX_ACL=y
847 CONFIG_TMPFS_XATTR=y
848 CONFIG_CONFIGFS_FS=y
849 CONFIG_PARTITION_ADVANCED=y
850 CONFIG_MAC_PARTITION=y
851 CONFIG_MSDOS_PARTITION=y

```

```
852 CONFIG_BSD_DISKLABEL=y
853 CONFIG_MINIX_SUBPARTITION=y
854 CONFIG_SOLARIS_X86_PARTITION=y
855 CONFIG_UNIXWARE_DISKLABEL=y
856 CONFIG_LDM_PARTITION=y
857 CONFIG_KARMA_PARTITION=y
858 CONFIG_EFI_PARTITION=y
859 CONFIG_NLS=y
860 CONFIG_NLS_DEFAULT="iso8859-1"
861 CONFIG_NLS_CODEPAGE_437=y
862 CONFIG_NLS_ISO8859_1=y
863 CONFIG_NLS_ISO8859_15=y
864 CONFIG_NLS_UTF8=y
865 CONFIG_TRACE_IRQFLAGS_SUPPORT=y
866 CONFIG_DEFAULT_MESSAGE_LOGLEVEL=4
867 CONFIG_ENABLE_WARN_DEPRECATED=y
868 CONFIG_ENABLE_MUST_CHECK=y
869 CONFIG_FRAME_WARN=1024
870 CONFIG_MAGIC_SYSRQ=y
871 CONFIG_DEBUG_FS=y
872 CONFIG_DEBUG_KERNEL=y
873 CONFIG_DEBUG_SHIRQ=y
874 CONFIG_SCHED_DEBUG=y
875 CONFIG_DEBUG_RT_MUTEXES=y
876 CONFIG_DEBUG_PLLIST=y
877 CONFIG_DEBUG_MUTEXES=y
878 CONFIG_STACKTRACE=y
879 CONFIG_DEBUG_BUGVERBOSE=y
880 CONFIG_DEBUG_MEMORY_INIT=y
881 CONFIG_ARCH_WANT_FRAME_POINTERS=y
882 CONFIG_FRAME_POINTER=y
883 CONFIG_RCU_CPU_STALL_TIMEOUT=60
884 CONFIG_USER_STACKTRACE_SUPPORT=y
885 CONFIG_NOP_TRACER=y
886 CONFIG_HAVE_FUNCTION_TRACER=y
887 CONFIG_HAVE_FUNCTION_GRAPH_TRACER=y
888 CONFIG_HAVE_FUNCTION_GRAPH_FP_TEST=y
889 CONFIG_HAVE_FUNCTION_TRACE_MCOUNT_TEST=y
890 CONFIG_HAVE_DYNAMIC_FTRACE=y
891 CONFIG_HAVE_FTRACE_MCOUNT_RECORD=y
892 CONFIG_HAVE_SYSCALL_TRACEPOINTS=y
893 CONFIG_HAVE_C_RECORDMCOUNT=y
894 CONFIG_RING_BUFFER=y
895 CONFIG_EVENT_TRACING=y
896 CONFIG_EVENT_POWER_TRACING_DEPRECATED=y
897 CONFIG_CONTEXT_SWITCH_TRACER=y
898 CONFIG_RING_BUFFER_ALLOW_SWAP=y
899 CONFIG_TRACING=y
900 CONFIG_GENERIC_TRACER=y
901 CONFIG_TRACING_SUPPORT=y
902 CONFIG_FTRACE=y
903 CONFIG_BRANCH_PROFILE_NONE=y
904 CONFIG_BLK_DEV_IO_TRACE=y
905 CONFIG_KPROBE_EVENT=y
906 CONFIG_HAVE_ARCH_KGDB=y
907 CONFIG_HAVE_ARCH_KMEMCHECK=y
908 CONFIG_X86_VERBOSE_BOOTUP=y
909 CONFIG_EARLY_PRINTK=y
910 CONFIG_DOUBLEFAULT=y
911 CONFIG_HAVE_MMIOTRACE_SUPPORT=y
912 CONFIG_IO_DELAY_TYPE_0X80=0
913 CONFIG_IO_DELAY_TYPE_0XED=1
914 CONFIG_IO_DELAY_TYPE_UDELAY=2
915 CONFIG_IO_DELAY_TYPE_NONE=3
```

```
916 CONFIG.IO_DELAY_0X80=y
917 CONFIG.DEFAULT_IO_DELAY_TYPE=0
918 CONFIG.KEYS=y
919 CONFIG.SECURITYFS=y
920 CONFIG.DEFAULT_SECURITY_DAC=y
921 CONFIG.DEFAULT_SECURITY=""
922 CONFIG.ASYNC_TX_DISABLE_PQ_VAL_DMA=y
923 CONFIG.ASYNC_TX_DISABLE_XOR_VAL_DMA=y
924 CONFIG.CRYPTO=y
925 CONFIG.CRYPTO_ALGAPI=y
926 CONFIG.CRYPTO_ALGAPI2=y
927 CONFIG.CRYPTO_AEAD=m
928 CONFIG.CRYPTO_AEAD2=y
929 CONFIG.CRYPTO_BLK_CIPHER=m
930 CONFIG.CRYPTO_BLK_CIPHER2=y
931 CONFIG.CRYPTO_HASH=y
932 CONFIG.CRYPTO_HASH2=y
933 CONFIG.CRYPTO_RNG=m
934 CONFIG.CRYPTO_RNG2=y
935 CONFIG.CRYPTO_PCOMP2=y
936 CONFIG.CRYPTO_MANAGER=y
937 CONFIG.CRYPTO_MANAGER2=y
938 CONFIG.CRYPTO_MANAGER_DISABLE_TESTS=y
939 CONFIG.CRYPTO_GF128MUL=m
940 CONFIG.CRYPTO_NULL=m
941 CONFIG.CRYPTO_WORKQUEUE=y
942 CONFIG.CRYPTO_CRYPTD=m
943 CONFIG.CRYPTO_AUTHENC=m
944 CONFIG.CRYPTO_CBC=m
945 CONFIG.CRYPTO_ECB=m
946 CONFIG.CRYPTO_LRW=m
947 CONFIG.CRYPTO_PCBC=m
948 CONFIG.CRYPTO_XTS=m
949 CONFIG.CRYPTO_HMAC=y
950 CONFIG.CRYPTO_XCBC=m
951 CONFIG.CRYPTO_CRC32C=y
952 CONFIG.CRYPTO_MD4=m
953 CONFIG.CRYPTO_MD5=y
954 CONFIG.CRYPTO_MICHAEL_MIC=m
955 CONFIG.CRYPTO_SHA1=y
956 CONFIG.CRYPTO_SHA256=m
957 CONFIG.CRYPTO_SHA512=m
958 CONFIG.CRYPTO_TGR192=m
959 CONFIG.CRYPTO_WP512=m
960 CONFIG.CRYPTO_AES=m
961 CONFIG.CRYPTO_AES_586=m
962 CONFIG.CRYPTO_ANUBIS=m
963 CONFIG.CRYPTO_ARC4=m
964 CONFIG.CRYPTO_BLOWFISH=m
965 CONFIG.CRYPTO_BLOWFISH_COMMON=m
966 CONFIG.CRYPTO_CAMELLIA=m
967 CONFIG.CRYPTO_CAST5=m
968 CONFIG.CRYPTO_CAST6=m
969 CONFIG.CRYPTO_DES=y
970 CONFIG.CRYPTO_FCRYPT=m
971 CONFIG.CRYPTO_KHAZAD=m
972 CONFIG.CRYPTO_SEED=m
973 CONFIG.CRYPTO_SERPENT=m
974 CONFIG.CRYPTO_TEA=m
975 CONFIG.CRYPTO_TWOFISH=m
976 CONFIG.CRYPTO_TWOFISH_COMMON=m
977 CONFIG.CRYPTO_TWOFISH_586=m
978 CONFIG.CRYPTO_DEFLATE=m
979 CONFIG.CRYPTO_ANSI_CPRNG=m
```



```

980 CONFIG.CRYPTO.HW=y
981 CONFIG.HAVE_KVM=y
982 CONFIG.BINARY_PRINTF=y
983 CONFIG.BITREVERSE=y
984 CONFIG.GENERIC_FIND_FIRST_BIT=y
985 CONFIG.CRC_CCITT=m
986 CONFIG.CRC16=y
987 CONFIG.CRC_ITU_T=y
988 CONFIG.CRC32=y
989 CONFIG.CRC7=m
990 CONFIG.LIBCRC32C=y
991 CONFIG.AUDIT.GENERIC=y
992 CONFIG.ZLIB.INFLATE=y
993 CONFIG.ZLIB.DEFLATE=m
994 CONFIG.LZO.DECOMPRESS=y
995 CONFIG.XZ.DEC=y
996 CONFIG.XZ.DEC.X86=y
997 CONFIG.XZ.DEC.POWERPC=y
998 CONFIG.XZ.DEC.IA64=y
999 CONFIG.XZ.DEC.ARM=y
1000 CONFIG.XZ.DEC.ARMTHUMB=y
1001 CONFIG.XZ.DEC.SPARC=y
1002 CONFIG.XZ.DEC.BCJ=y
1003 CONFIG.DECOMPRESS.GZIP=y
1004 CONFIG.DECOMPRESS.BZIP2=y
1005 CONFIG.DECOMPRESS.LZMA=y
1006 CONFIG.DECOMPRESS.XZ=y
1007 CONFIG.DECOMPRESS.LZO=y
1008 CONFIG.HAS_IOMEM=y
1009 CONFIG.HAS_IOPORT=y
1010 CONFIG.HAS_DMA=y
1011 CONFIG.CHECK_SIGNATURE=y
1012 CONFIG.CPU_RMAP=y
1013 CONFIG.NLATR=y
1014 CONFIG.AVERAGE=y

```

Listing 19.5: Kernel .config

19.5 Persistent net rules

```

1 #card 1
2 # PCI device 0x8086:0x1501 (e1000e)
3 SUBSYSTEM=="net", ACTION=="add", DRIVERS=="*", ATTR{address}=="00:0b:ab:2b:5b:54",
  ATTR{dev_id}=="0x0", ATTR{type}=="1", KERNEL=="eth*", NAME="eth0"
4 SUBSYSTEM=="net", ACTION=="add", DRIVERS=="*", ATTR{address}=="00:0b:ab:2b:5b:55",
  ATTR{dev_id}=="0x0", ATTR{type}=="1", KERNEL=="eth*", NAME="eth1"
5
6
7 # card 2
8 # PCI device 0x10ec:0x8136 (r8169)
9 SUBSYSTEM=="net", ACTION=="add", DRIVERS=="*", ATTR{address}=="00:50:c2:c5:10:ab",
  ATTR{dev_id}=="0x0", ATTR{type}=="1", KERNEL=="eth*", NAME="eth2"

```

Listing 19.6: Persistent configuration for network interface

19.6 Network name resolution

```
1 # /etc/hosts: Local Host Database
2 #
3 # This file describes a number of aliases—to-address mappings for the for
4 # local hosts that share this file.
5 #
6 # In the presence of the domain name service or NIS, this file may not be
7 # consulted at all; see /etc/host.conf for the resolution order.
8 #
9
10
11 192.168.142.1 embedded01
12 192.168.142.2 embedded02
13 #...
14
15 # IPv4 and IPv6 localhost aliases
16 127.0.0.1      localhost
17 ::1           localhost
```

Listing 19.7: file hosts

19.7 Autologin

```
1 /etc/init.d/spread -D start
2 /etc/init.d/sshd -D start
3
4 if ! fuser /dev/tty7 &> /dev/null; then
5   su - graphic -l -c 'exec startx &> ~/.xsession-errors' &
6 fi
```

Listing 19.8: Auto-login service

19.8 Spread toolkit configuration

```
1 EventLogFile = /var/log/spread.log
2 EventTimeStamp
3
4
5 Spread_Segment 224.0.0.1:4803 {
6   embedded01 192.168.142.1 {
7     D 192.168.142.1
8     C 192.168.142.1
9   }
10
11   embedded02 192.168.142.2 {
12     D 192.168.142.2
13     C 192.168.142.2
14   }
15 }
```

Listing 19.9: Spread main configuration file

19.9 Record video from Webcam

```

1  steelido@steelbook ~ $ mencoder tv:// -tv driver=v4l2:width=640:height=480:device
    =/dev/video0 -nosound -ovc lavc -o Downloads/training.avi
2  MEncoder SVN-r33094-4.5.3 (C) 2000-2011 MPlayer Team
3  succes : format : 9  data : 0x0 - 0x0
4  Fichier de type TV detecte.
5  Driver selectionne: v4l2
6  nom : Video 4 Linux 2 input
7  auteur : Martin Olschewski <olschewski@zpr.uni-koeln.de>
8  commentaire : first try, more to come ;- )
9  v4l2: your device driver does not support VIDIOC_G_STD ioctl, VIDIOC_G_PARM was
    used instead.
10 Selected device: USB camera
11 Capabilities: video capture read/write streaming
12 supported norms:
13 inputs: 0 = sonixj;
14 Current input: 0
15 Current format: unknown (0x4745504a)
16 tv.c: norm_from_string(pal) : parametre de norme bogue. Ajuste a default.
17 v4l2: ioctl enum norm failed: Inappropriate ioctl for device
18 Erreur : La norme ne peut pas etre appliquee !
19 L'entree selectionnee n'a pas de tuner !
20 v4l2: ioctl set mute failed: Invalid argument
21 v4l2: ioctl query control failed: Invalid argument
22 [V] filefmt:9 fourcc:0x4745504A taille:640x480 fps:25.000 ftime:=0.0400
23 Ouverture du filtre video : [expand osd=1]
24 Expand: -1 x -1, -1 ; -1, osd: 1, aspect: 0.000000, round: 1
25
26 Ouverture du decodeur video : [ffmpeg] FFmpeg's libavcodec codec family
27 Codec video choisi : [ffmjpeg] vfm : ffmpeg (FFmpeg MJPEG)
28
29 Forcage du pre-chargement audio a 0 et de la correction max des pts a 0
30
31 Image sautee !
32 Pos: 0.0s 1f ( 0%) 0.95fps Trem: 0min 0mb A-V:0.000 [0:0]
33
34 Image sautee !
35 Pos: 0.0s 2f ( 0%) 1.28fps Trem: 0min 0mb A-V:0.000 [0:0]
36 N'a pas pu trouver espace colorimetrique correspondant - nouvel essai avec -vf
    scale...
37 Ouverture du filtre video : [scale]
38 L'aspect du film est indefini - pas de pre-dimensionnement applique.
39 [swscaler @ 0xb0f740]BICUBIC scaler, from yuv422p to yuv420p using MMX2
40 videocodec: libavcodec (640x480 fourcc=34504d46 [FMP4])
41 Ecriture de l'entete...
42 ODML: Aspect information not (yet?) available or unspecified, not writing vprp
    header.
43 Ecriture de l'entete...
44 ODML: Aspect information not (yet?) available or unspecified, not writing vprp
    header.
45 Pos: 0.0s 3f ( 0%) 1.79fps Trem: 0min 0mb A-V:0.000 [0:0]
46
47 [...]
48
49 1 image(s) repetee(s) !
50 Pos: 0.2s 5f ( 0%) 2.73fps Trem: 0min 0mb A-V:0.000 [0:0]
51
52
53 Abandonne des trames video.
54 Ecriture de l'index...
55 Ecriture de l'entete...
56 ODML: Aspect information not (yet?) available or unspecified, not writing vprp
    header.
57

```

```
58 Flux video : 406.971 kbit/s (50871 B/s)  taille : 1347075 octets  26.480 secs
    320 images
59 v4l2: ioctl set mute failed: Invalid argument
60 v4l2: 320 frames successfully processed, 345 frames dropped.
61 steelido@steelbook ~ $
```

Listing 19.10: Webcam recorder

19.10 mount Compact flash

```
1  #!/usr/bin/env bash
2
3  mount /dev/sdb3 /mnt/gentoo
4  mount /dev/sdb1 /mnt/gentoo/boot
5  mount -t proc none /mnt/gentoo/proc
6  mount -o bind /dev /mnt/gentoo/dev
7  mount -o bind /usr/portage /mnt/gentoo/usr/portage
8  mount -o bind /var/tmp/ /mnt/gentoo/var/tmp
9  chroot /mnt/gentoo /env.sh
10 umount /mnt/gentoo/{dev,proc,usr/portage,var/tmp,boot,}
```

Listing 19.11: Mount then chroot inside cf card

19.11 updating environment settings

```
1  #!/bin/bash
2
3  env-update
4  source /etc/profile
5  export TERM=xterm
6  export PS1="(chroot) $PS1"
7  cd
8  bash
```

Listing 19.12: updating environment settings on CF card

19.12 Structure of transmitted data

```
1  typedef struct myParam { //read param from network
2      unsigned char pic1[(CV_FRAME_WIDTH*CV_FRAME_HEIGHT)/sizeof(unsigned char)];
3      unsigned char pic2[(CV_FRAME_WIDTH*CV_FRAME_HEIGHT)/sizeof(unsigned char)];
4      int LBBx;
5      int LBBY;
6      int LBBwidth;
7      int LBBheight;
8      int BBx;
9      int BBy;
10     int BBwidth;
11     int BBheight;
12     time_t timer;
13     bool status;
14 } myParam;
```

Listing 19.13: Structure hosting data

19.13 Getting around the PESIT internet block

```
1 embedded01 $ cat ~/.ssh/config
2 Host mail
3   HostName 176.9.180.154
4   User tunnel
5   port 443
6   IdentityFile ~/.ssh/id_rsa
7   LocalForward 2525 smtp.gmail.com:465
8
9 embedded01 ~ $ ssh-keygen
10 Generating public/private rsa key pair.
11 Enter file in which to save the key (/home/USERNAME/.ssh/id_rsa): <enter>
12 Enter passphrase (empty for no passphrase): <enter>
13 Enter same passphrase again: <enter>
14 Your identification has been saved in /home/USERNAME/.ssh/id_rsa.
15 Your public key has been saved in /home/USERNAME/.ssh/id_rsa_r.pub.
16 The key fingerprint is:
17 34:ce:2c:cf:94:e7:e0:b5:2b:d7:28:be:73:9b:e7:50 USERNAME@embedded01
18 The key's randomart image is:
19 +--[ RSA 2048]-----+
20 |
21 |
22 |      o
23 |     = o
24 |    . S o E
25 |     * = o
26 |     + +o
27 |     + ++o
28 |    .oB+++.
29 +-----+
30
31
32 embedded01 $
```

Listing 19.14: Configuring ssh connection

```
1 permitopen="smtp.gmail.com:465",no-pty,no-X11-forwarding,no-agent-forwarding ssh-
  rsa AAAAB3[...] USERNAME@embedded01
```

Listing 19.15: Content of authorizedkeys on vps server

20 Work log

20.1 Week 1

February 20, 2012

Maha Shivaratri is a national holiday in India, in honor of Lord Shiva. No work was done this day

February 21, 2012

- First working day at school. Discovering of the university.
- Talk with Pr A.Srinivas about the orientations of the project
- Registering on Intel website

February 22, 2012

- Writing specifications of the project

February 23, 2012

- Writing specifications of the project
- Talk with pr. A.Srinivas and Nitheesh Kl about the embedded system

February 24, 2012

- OS deployment on the target board
- Configuration of the kernel to boot in less than 15 sec

February 25, 2012

- Test of OpenTLD on the embedded board

20.2 Week 2

February 27, 2012

- Modification of OpenTLD source code to make it working with two webcam

February 28, 2012

- setup of the messaging system

February 29, 2012

- setup of the messaging system

March 01, 2012

- writing the documentation about the OS + spread installation

March 02, 2012

- writing the documentation about the OS + spread installation

20.3 Week 3

March 05, 2012

- writing the part responsible of sending the data

March 06, 2012

- writing the part responsible of sending the data+receiving

March 07, 2012

- Bug-fix

March 08, 2012

- Writing a viewer+sender application

March 09, 2012

- Splitting code into 3 Application (viewer,sender,sensor)

March 10, 2012

- Drawing schema, updating report

20.4 Week 4

March 12, 2012

- Writing Introduction, Summary, updating planning

March 13, 2012

- writing function to send an email

March 14, 2012

- writing function to send an email

March 15, 2012

- updating report, demo, bug-fix, fighting again Fortinet proxy

March 16, 2012

- updating report, demo, bug-fix, fighting again Fortinet proxy

20.5 Week 5,6

March 19, 2012 to March 29, 2012

- No work for the internship was done.
- Writing presentation for the Hackaton
- Helping students to install OpenCV for one of their lesson

March 30, 2012

- Talking with Pr A.Srinivas about some change in the project

20.6 Week 7

April 02, 2012

- Recode movie
- Split movie in frames (15'000)

April 03, 2012

- Cropping of the frames

April 04, 2012

- Cropping of the frames

April 05, 2012

- Cropping of the frames

April 06, 2012

- Cropping of the frames

20.7 Week 8

April 09, 2012 to April 11, 2012

- Days off in Chennai, Mahabalipuram, Kanchipuram,...

April 12, 2012

- Updating the report

April 13, 2012

- Install of the computer who will be use to train the haarcascade

20.8 Week 9

April 16, 2012

- Downloading 2000 pictures without a car from google image index

April 17, 2012

- Generating all the needed samples for the training

April 18, 2012

- Interview for Intel Embedded on the project
- Updating the report

April 19, 2012

- Updating the report

April 20, 2012

- Updating the report

20.9 Week 10

April 23, 2012

- Test of the classifier

April 24, 2012

- Removing some picture of car

April 25, 2012

- Training of the new classifier

April 26 and 27, 2012

- Working on my Pet project for the Hackaton at PESIT

20.10 Week 11

April 30, 2012

- Cleaning the Nokia lab

May 01, 2012

- Day off
- Helping students from the "Lab"

May 02,03,04, 2012

- Updating the report
- Helping students from the "Lab"
- Teaching

20.11 Week 12

May 07, 2012

- Writing a proposal to include a better notification system on the project

May 08-09-10, 2012

- Helping students from the nokia lab

May 11, 2012

- No work

20.12 Week 13

May 14-18, 2012

- No work has been done this week, I was ill

20.13 Week 14

May 21-23, 2012

- writing the glue code between the notification system and the detection system

May 24-25, 2012

- Helping students from the lab

20.14 Week 15

May 28-29, 2012

- moving the code to the embedded system

May 30, 2012

- generating the mosaic

May 31, 2012

- streaming the mosaic

June 01, 2012

- displaying the wall (mosaic)

20.15 Week 16

June 04, 2012

- reading documentation about gstreamer+gtk

June 05, 2012

- writing the code for the wall

June 06, 2012

- merge of the different part of the code

June 07, 2012

- bug fix

June 08, 2012

- clean up of code

20.16 Week 17

June 11, 2012

- Changing operating system for the wall

June 12, 2012

- Changing operating system for the wall
- writing a demo for the wall

June 13, 2012

- Reconfiguring the wall

June 14, 2012

- Testing the project

June 15, 2012

- Updating the report
- Testing the project
- Helping students

20.17 Week 18

June 18-20, 2012

- Updating the report
- Writing the presentation
- Packing