Satellite TV & Linux
Geostationary Satellites

- We want the satellite to stand still
- But the earth is rotating at 1 revolution per 24H
- So we want the satellite to move with us

- Some physics: \( GmM/r^2 = mw^2r \) → \( r = 36,000 \) Km
  (earth radius is only 6,000 Km)

- All satellites are located above the equator, which is South of Israel
- Positions are longitude e.g. 13E, 4W, 7W etc ...
Satellites Dish

• A dish, is a hyperbolic shaped reflector (mirror), concentrating incoming radio waves at it's focus

• This is similar to taking a magnifying glass and focusing the Sun's light at a spot

• An LNB (low noise block) is located at the dish's focus

• Prime vs. offset dish
The LNB is comprised of:

- Dipole antenna – The actual antenna
- Low Noise Amplifier – Amplify the signal before “catching” noise is from the electronics.
- Frequency Down conversion – Convert to Frequencies that can be transferred via coax without being attenuated too much
- Quad LNB. Monoblock LNB, multiple LNBS
Diseqc –
Digital Satellite Equipment Control

- **Diseqc 1.0** – connects to 4 LNBs
- **Diseqc 1.1** – connects to 4 Diseqc 1.0
- **Diseqc 1.2 & 1.3** – mobile dish
- **Diseqc 2.x** – same as 1.x but bidirectional
Transponder

- Required information:
  - Frequency
  - Symbol Rate (SR)
  - Polarization
  - FEC (can be set to auto)
- May have many channels
- Statistical Multiplexing
- Feeds
Encryption / Conditional access

- CSA (Common Scrambling Algorithm)
- CAM (Conditional access module)
- FTA (Free To Air)
- Smart Card
DVB-S Vs. DVB-S2

• DVB-S: QPSK (4PSK), TRELLIS, MPEG2
• DVB-S2: 8PSK, LDPC, H-264. introduced to support HD. (though HD is possible via DVB-S)
• DVB-T, DVB-H, ATSC etc ...

Due to "political issue" DVB-S2 development was forked and stalled. There were many half baked branches.

• About 6 months ago, there was a decision to create a new API: S2API. It was merged into kernel 2.6.28
Israel's Upcoming DVB-T

• AFAIK:
  • H264 – not supported by regular DVBT STB
  • Channels: 1,2,10,33,99
  • Channels 9 & 23 not included (politics ?)
  • Will indoor antenna suffice ?
  • Probably commence on July 2009
Software

- Drivers – depends on adapter, may be built in into kernel. There is also a loopback device.
  - VDR – as close as can be to a real STB.
  - MYTHTV – full blown HTPC. Distributed.
  - Kaffeine – KDE app
  - Cmdline – use your favorite media player via /dev/dvb
THE LAST SIGN

Kathy is tormented by the ghost of her abusive, alcoholic husband she must come to terms with her past if she is to find peace and love. Drama - Andie MacDowell / Samuel Le Bihan
A young man leaves Ireland with his landlord's daughter after some trouble with her father, and they dream of owning land at the big giveaway in Oklahoma ca. 1893. Adventure—Tom Cruise/Nicole Kidman
Myth – Watch TV
Myth – Weather

Three Day Forecast

Tel Aviv, Israel

Tuesday
High 17°C
Low 8°C

Wednesday
High 19°C
Low 10°C

Thursday
High 24°C
Low 13°C

Updated Tue Feb 17 17:42:39 2009
**MBC2 SHATTERED GLASS**

The true story of journalist Stephen Glass who quickly rose from a minor writing post in Washington, to a freelance feature wri...
<table>
<thead>
<tr>
<th>Time</th>
<th>Channel</th>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>06:15 PM</td>
<td>1 CH 1</td>
<td>فيد روستا</td>
</tr>
<tr>
<td>06:30 PM</td>
<td>2 CH 2</td>
<td>=current_time=</td>
</tr>
<tr>
<td>06:45 PM</td>
<td>3 CH 10</td>
<td>לודג מאיו פאראוגווס</td>
</tr>
<tr>
<td>07:00 PM</td>
<td>4 MBC2</td>
<td>SHATTERED GLASS</td>
</tr>
<tr>
<td>07:15 PM</td>
<td>5 MBC4</td>
<td>THE DOCTORS</td>
</tr>
<tr>
<td>07:30 PM</td>
<td>6 MBC Action</td>
<td>LAW &amp; ORDER</td>
</tr>
<tr>
<td>07:45 PM</td>
<td></td>
<td>TNA XPLOSION</td>
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<tr>
<td>08:00 PM</td>
<td></td>
<td>THE UNIT</td>
</tr>
<tr>
<td>08:15 PM</td>
<td></td>
<td>UNDERCOVER BROTHER</td>
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<td>08:30 PM</td>
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<td>08:45 PM</td>
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<tr>
<td>09:00 PM</td>
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</tbody>
</table>
### Mythweb - Schedule

#### Schedule Options:
- Don't record this program.
- Record only this showing.
- Record this program in this timeslot every day.
- Record this program in this timeslot every week.
- Find and record one showing of this title.
- Find and record one showing of this title each day.
- Find and record one showing of this title each week.
- Record at any time on channel ch 10.
- Record at any time on any channel.

#### Advanced Options: (Hide)
- Recording Profile: Default
- Transcoder: Autodeect
- Recording Group: Default
- Storage Group: Default
- Playback Group: Default
- Recording Priority: 0
- Time Stretch Default: 1.00
- Duplicate Check method: Subtitle and Description
- Check for duplicates in: All recordings

#### History:
- Current Recording
- Earlier Showing
- Previous Recording
- Will Record
- Conflicts

#### Filters:
- 10 תויוד

#### MythTV Status:
- Never Record

#### Listing details:
- **Channel:** ch 10
- **Date:** Tue, Feb 17, 07:00 PM to 08:00 PM (60 mins)
- **Category:** Unknown
- **Type:** Unknown (66239791)
- **Original Airdate:** 2009
- **Length:** 1 hr
- **Playback Group:** Default

#### Possible conflicts:
- Search IMDB
- Search TV.com
- Search Google
- Find other showings of this program
- What else is on at this time?
VDR – as close as can be to a real STB. can be used with soft-device. Has many plug-ins. (but no Hebrew subtitles AFAIK).

MYTHTV – full blown HTPC. Distributed, Harder to install...

Kaffeine – KDE app

Cmdline – use your favorite media player

Both myth/vdr can record multiple channels on same transponder
There are a few Linux Based receivers on the market.

Dreambox is the popular choice – popular enough to be a target for copies ...

Features like time shifting. (modules without a hard-drive requires an external NFS server)

Some software images supports only original Dreamboxes (there are rumors about bricking the non originals).

Original and alternate firmwares
Some channels have On-line EPG

TV_GRAB_* : Perl based scripts, which downloads EPG from different Internet sites, and converts them to an XMLTV format.

tv_grab_dvb – may be used for cross source eit.
Websites

- **www.lyngsat.com** - info: sat, freq, chans, etc...
- **www.dvbsupport.net/freetv.html** - free TV
- **www.sat-israel.com** - פורום הלווינים הישראלי
- **www.mythtv.org** - mythtv
- **www.cadsoft.de/vdr** - vdr
- **http://dvbn.happysat.org/viewforum.php?f=17** - Linux specific sat forum, discussions on many issues, HD (VDPAU), patches to vdr/myth/kaffeine, etc ...
Hardware Issues

- NVIDIA Vs. ATI
- NVIDIA's VDPAU (Video Decode and Presentation API for Unix) offload portions of the video decoding/post-processing to the GPU.
- SS2 (DVB-S), S2-3600 (USB. Problems ?),
- FULL HD
- interlaced
Before you buy

- PC Hardware: GPU (VDPAU, 8400gs vs. newer, vc1), DVB-Card (Budget/FF), display, lirc.
- STB (FTA only ?)
- Which satellites (num, size, and mobility of dishes. Num LNBs).
- Is South (SE/SW) blocked ?
- How many TVs
Modulation: PSK
(Just for general knowledge)

- A Sine wave is transmitted, its phase holds the information

- 4PSK (QPSK) – 4 options (2 bits/sym): 45, 135, 225, 315

- 8PSK – 8 options (3 bits/sym): 0, 45, 90, 135, 180, 225, 270, 315
• Convolution code. Aka Trellis: Not all sequences of data are valid, choose the "path" that is most probable.

• LDPC – low density parity check. For Each group of data bits, a sum is calculate. Each bit is a member of more than one group. In case of contradiction between bits and sum, the error can be corrected using other sums.
Satellite TV & Linux
The End