The Art of Necromancy - Bringing Back a Dead Onlineservice

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The Cept Family

Bildschirmtext

- Cept standard
  - 24/20 content lines with 40 (or more) columns each
  - serial or parallel attributes
  - optional geometric and photographic layers (pre JPEG!)
- interactive terminal via the telephone network
  - V.23 1200 bps with 75 bps secondary channel (with optional data link layer)
  - X.75 over ISDN
  - hints of higher than 64k speeds
  - not limited to static pages
  - could be implemented without CPUs

Simple, isn't it?

- Modem
  - V.23 1200/75bps answer mode is rare and hard to get
  - Terminals usually don't support V.8 negotiation
- Connection
  - ANIS/ISDN lines are expensive
  - ISDN lines require hardware to connect modems (PBX, Terminaladapter, etc)
  - severely limited number of channels

Let's write a modem in software!

Asterisk may have its severe flaws, but this is something it can do.

- Start with Echo Application
- Exchange Data of Packets before sending out again
- Send the data off via a normal TCP/IP connection
- Modulation is trivial
- Demodulation is not to hard
  - "Downmix" to IQ
  - Filter
  - Demodulate
  - Find Bits
- `https://github.com/Casandro/btx_modem` (527 lines in total)

What could possibly go wrong?

- weird Codecs (not in Germany, as it's G.711 only)
- echo cancellers in the network (insane, but Fax machines know how to turn them off)
- broken echo chancellers which mix in other channels (I'm looking at you, Vodafone)
- cheap ATAs have extremely wrong sampling rates generates sample/packet slips (irrelevant here as we send one frame for every one we get)
- packet loss (rare, but forces us to use link layer protocol)

How to get content

- use what's already out there
  - `http://btx.runningserver.com/`
  - `https://git.imzadi.de/acn/rtx`
  - `https://github.com/proquar/asterisk-Softmodem`
  - `https://github.com/Casandro/cas_btx`
- connect to other servers (Rechnerverbund)
- write a termcap definition

Structure

Videotex Presentation Data Element			
Videotex Presentation Control Element		Videotex Service Control Element	
$1F	$20	Terminal Facility Identifier request	
$1F	$21	Terminal Facility Identifier request	
$1F	$23	Define DCRS (user defined characters)	
$1F	$26	Define Colour	
$1F	$2D	Define Format	
$1F	$2E	Timing Control	
$1F	$2F	Reset (also sets screen size)	
$1F	$31	Geometric Data 3D	
$1F	$32	Geometric Data 2D	
$1F	$34	Photographic Pixel Data	
$1F	$35	Photographic Table Data	
$1F	$3B	Sound (1980s codecs)	
$1F	$3E	Telesoftware	
$1F	$3F	length	Transparent Data
$1F	X	Y	Alphamosaic Spalte X, Zeile Y (both $41...)

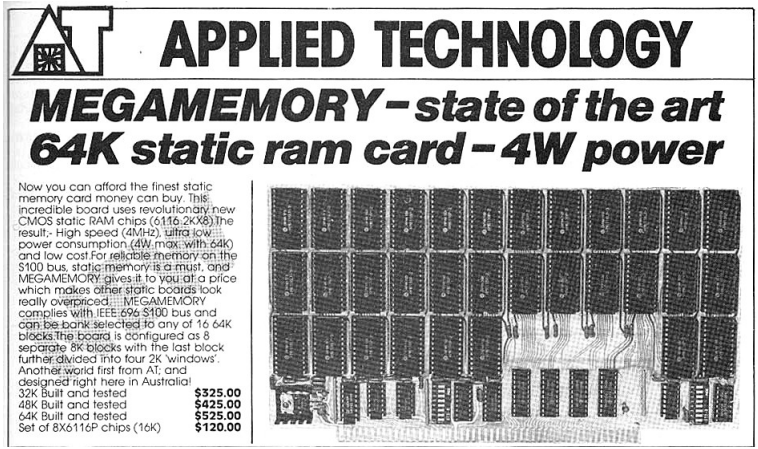
Parallel Attributes

Just like on the PC. Every character cell has both the character code and the attributes in memory.

- roughly 1024 characters $\Rightarrow$ 10 Bit
- 32 foreground colours $\Rightarrow$ 5 Bit
- 32 background colors $\Rightarrow$ 5 Bit
- 5 blink modes $\Rightarrow$ 3 Bit
- 4 character sizes $\Rightarrow$ 2 Bit
- underline, hidden, box, marked, protected $\Rightarrow$ 5 Bit

$\Rightarrow$ 4 octets needed per character. At 40x24 characters that's 30720 bits!

RAM in December 1981, 15 AUD for 16kbit of RAM



APPLIED TECHNOLOGY

MEGAMEMORY – state of the art 64K static ram card – 4W power

Now you can afford the finest static memory card money can buy. This incredible board uses revolutionary new CMOS static RAM chips (6116 2KX8).The result:- High speed (4MHz), ultra low power consumption (4W max. with 64K) and low cost.For reliable memory on the S100 bus, static memory is a must, and MEGAMEMORY gives it to you at a price which makes other static boards look really overpriced. MEGAMEMORY complies with IEEE 696 S100 bus and can be bank selected to any of 16 64K blocks.The board is configured as 8 separate 8K blocks with the last block further divided into four 2K 'windows'. Another world first from AT; and designed right here in Australia!

32K Built and tested	**$325.00**
48K Built and tested	**$425.00**
64K Built and tested	**$525.00**
Set of 8X6116P chips (16K)	**$120.00**

Serial Attributes

RAM is expensive, so let's cheat!

⇒ Only 1 byte needed per character. So only 7680 bits!
TV Teletext uses this to have pages of fixed size.

Character sets

G0:

G1:

G2:

G3:

Additional sets for other languages in extensions. $40-$4f in G2 are special accent characters which combine with the next character.

Shift

We only have 256 (8 Bit) or 128 (7 Bit) input codepoints, but many more characters.
Solution: We split up the range into several parts.

- $00-$1f: control characters (mostly cursor control)
- $20-$7f: left character set
- $80-$9f: more control characters (mostly attributes)
- $A0-$ff: right character set

There are control sequences to shift each character set either to the left or the right position. See ETS 300 072 3.8.2. Some control sequences are accessed by ESC $1b.

Todo:
Parallel und Serial Attributes mischbar?

Audio

References

ETS 300 072 Overview
ETS 300 073 Geometric Display
ETS 300 074 Transparent Data
ETS 300 075 File Transfer
ETS 300 076 Terminal Facility Idenfifier

Why?

- Because we can!
- it fits nicely onto badge-sized computers
  - 40x24 characters can work on 320x240 TFTs
  - accessing pages works via a ITU-T E.161 keypad
- far less complex than modern websites so you can run it on classes of SoCs which will *never* get any kind of ME
- easy to reverse engineer, even without specs
- amount of data small enough for low bandwidth connections. (shortwave radio? cubesats?)