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Voxilla Phone

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Contents

- introduction
- Voice-over-IP protocols: H.323 & SIP
- HW architecture
- SW architecture
- lessons learned
- future activities

The VoIP Story (199x)

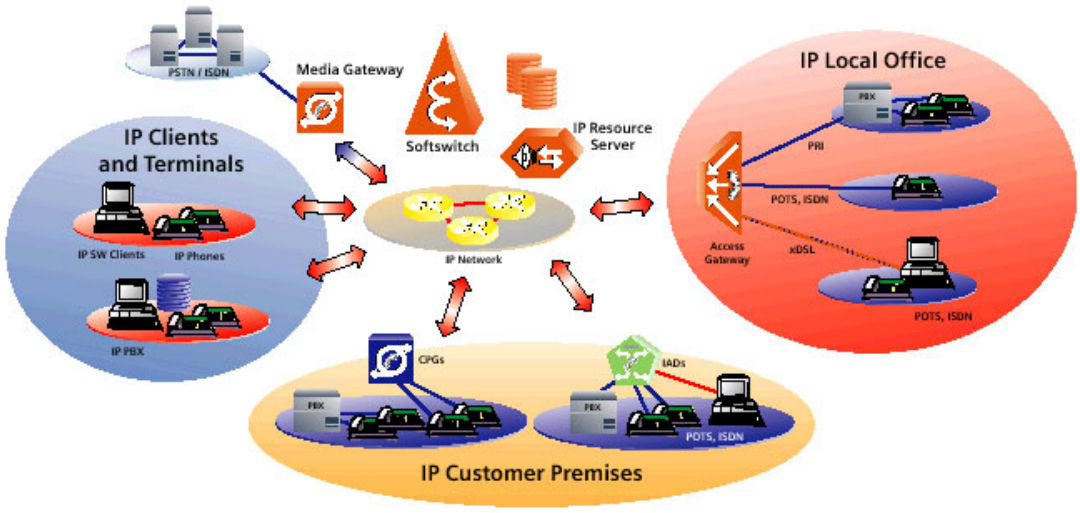
- VoIP hype in 1995 - 2001
- CAPEX reduction
  - one infrastructure for voice and data
  - routers + LAN switches cheaper than TDM switches
- OPEX reduction
  - auto configuration
  - simplified operation
- new business opportunities
  - unified messaging, integration

VoIP Now (2002)

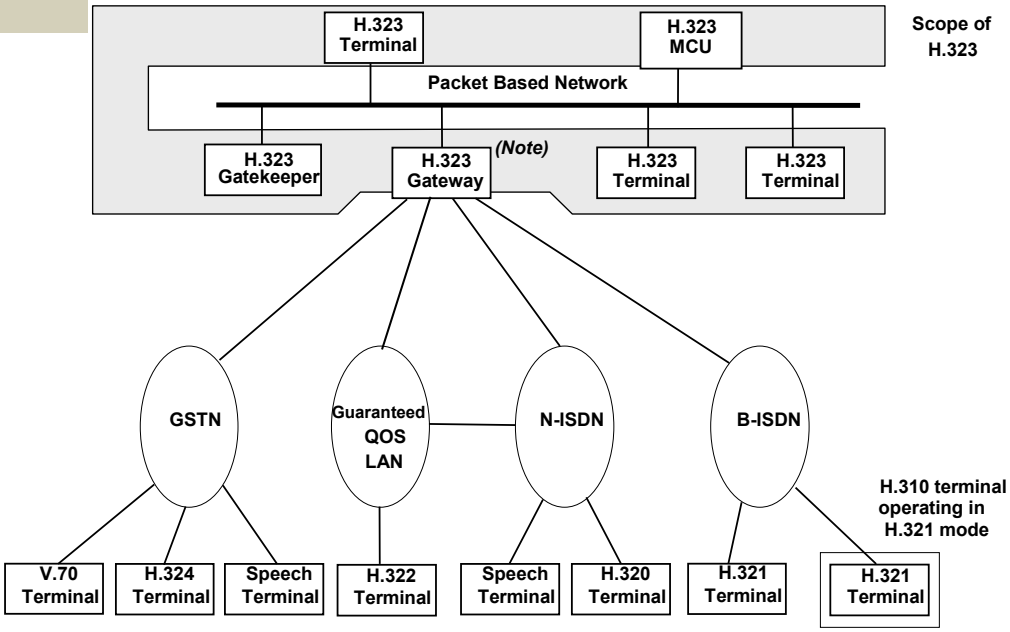
- CAPEX reduction difficult:
  - TDM equipment cheap
  - LAN infrastructure re-use only in new buildings
  - QoS: VoIP requires managed IP NWs
- traditional Telcos: OPEX not only influenced by technology
- new Telcos: tight financial situation
- new apps delayed: acceptance problems

=> investments in VoIP behind initial expectations

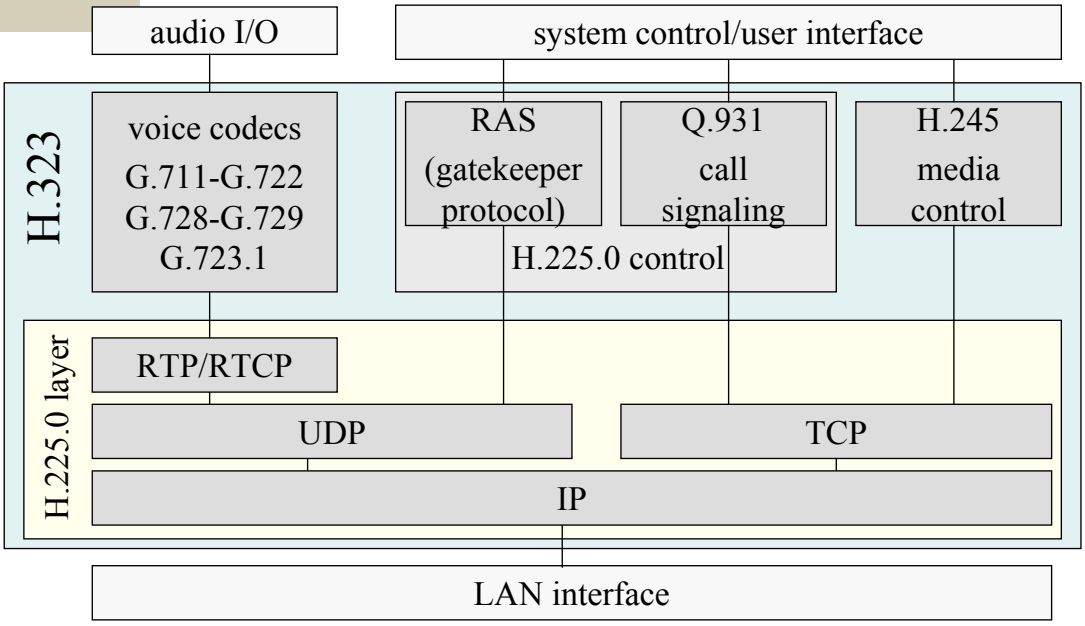
Siemens VoIP Activities



H.323 Protocol Components



H.323 Stack



H.323 vs. SIP – Overview

	H.323	SIP
Architecture	monolithic	modular
Complexity	high	low
Functionality	everything included (signaling, codec ..)	signaling and control
Transport Protocol	UDP and TCP together	UDP or TCP
Expandability	ITU like	IETF like

The OpenH323 Project

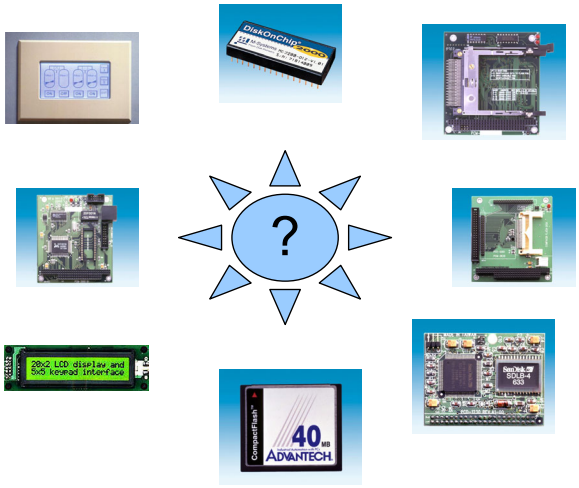
- Open Source (MPL)
- pushed by *Equivalence* and *Vovida*
  - *Equivalence Pty Limited* was acquired by *Quicknet* 09/2000
  - *Vovida Networks, Inc* was acquired by *CISCO* 09/2000
- libraries and clients for Linux and Windows
  - e.g. graphical / CLI based voip clients
  - OpenH323: class library for H.323 protocol
  - OPAL: OpenH323v2 library
  - H.323 Gatekeeper and MCU software
- support for Linux kernel telephony driver

Motivation for a LAN Phone

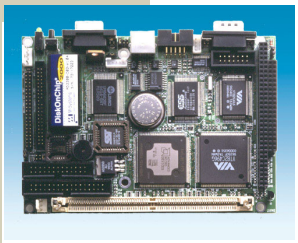
- gain experiences in rapid prototyping
- HW platform
  - for evaluation, development and presentations
  - look-and feel of standard-phone
  - modular and extensible hardware
  - off-the-shelf PC like hardware
- SW platform
  - build knowledge on “embedded” Linux
  - gain experience with OpenH323 and VoIP in general

VIP – Voxilla Internet Phone

- CPU 486/66 Mhz
- 16 MB RAM
- 16 MB Flash ROM
- duplex audio
- network interface
- serial interface/LCD



Hardware Architecture



PCMCIA module

network IF | flash memory

PC/104

AMD 486 with sound onboard (133 Mhz, 32 MB)

RS-232

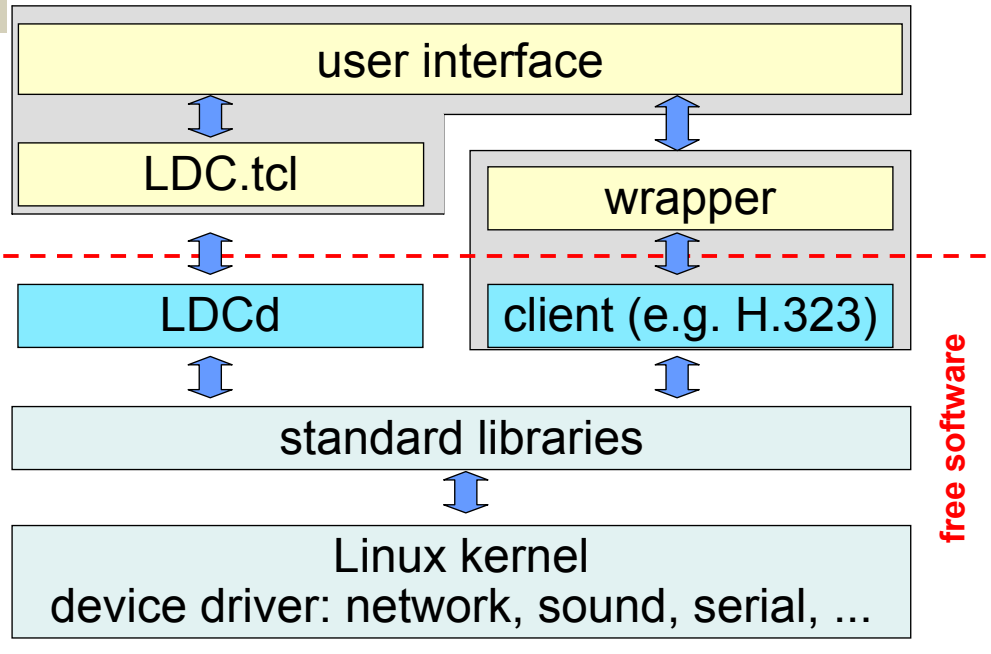
four wire

controller

audio I/O | display | keyboard

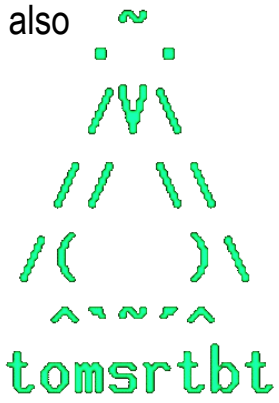
HW Development Environment

Software Architecture



Linux OS - tomsrtbt

- tomsrtbt stands for:
  - "Tom's floppy which has a root filesystem and is also bootable."
- Linux-On-A-Disc with:
  - 2.0.36 kernel, libc5, bunch of rescue tools
- modified for VIP
  - 2.2.10 kernel, libc6, pthreads …
  - full-duplex ALSA audio, new PCMCIA pack
  - tclsh 8.0



SIP Extension

- SIP signaling with *sipc*
  - communication with SIP redirect, proxy and registration servers
  - available for Windows, Linux and Solaris
- robust Audio Tool (RAT) as audio application
  - used without GUI
- additional development
  - wrapper for *sipc* for adaptation to VIP user interface
  - minor modifications to use RAT without GUI
- phone can now operate in H.323 and SIP mode

Lessons Learned (I)

- experiences
  - getting the system to boot is half the work
  - having the system on PCMCIA flash is a good idea
  - trouble with the sound system: use ALSA instead of OSS!
- project data
  - manpower: diploma thesis + internship
  - timeframe: 7 months diploma thesis + 2 months internship
- advantages of Linux-based approach
  - community support: tomsrtbt, bootstrap, ALSA
  - tons of archived discussions and private web pages

Lessons Learned (II)

- Linux OS
  - boot and init process, system layout
  - pcmcia package: tools, drivers, configuration
  - problem analysis
- modular design paid off
  - TCL script wrapper allowed quick design/testing
  - during internship extension with SIP and RAT
- user interface design is really hard work
  - limited by two line LCD and 12 button keyboard
  - be prepared for all different cases of user intervention

Voxilla Internet Phone

Future Activities

- extend to video phone, voice controlled phone …
- deployment in QoS testbed
- deployment in IPv6 testbed
- deployment in Ad-Hoc testbed
- build a commercial product ☺
  - estimated costs about 200 USD