

CAPI - Creating A Practical Interface

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When the CAPI (see also box) became a tremendous success in Europe, we here in Germany were all very happy, even more so, when we saw, that the US in 96 started taking up ISDN as an interesting topic as well. But very soon, we found out, that most US vendors, SW-manufacturers and system integrators (and several in European countries and other important places as well) who started working on ISDN, were not really aware of CAPI. So, here's in short, what it's all about:

What is CAPI?

The CAPI is a vendor-independent, internationally standardized, interface specification between ISDN-adapters and application software. In terms of the OSI-reference model it is above layer three. CAPI can very easily be extended for additional functions. Presently it already contains many functions for the control of the ISDN-connection (d-channel functions):

- **basic call control**
- **DTMF detection / generation**
- **handset support**
- **support for multiple applications**
- **support for multiple ISDN-controllers**
- **support for most supplementary services.**

as well as for the data transmitted (through the b-channels and - in certain functions - through the d-channel):

- **HDLC**
- **HDLC inverted**
- **SDLC**
- **LAPD**
- **56kbit with byte-framing**
- **V.110**
- **V.120**
- **T.30**
- **Modem**
- **Bit-transparent (Speech)**
- **X.75**
- **PPP**
- **T.30 (Fax)**
- **X.25 / ISO 8208**
- **X.31**

CAPI is platform independent and can presently be used for implementing applications under the following system platforms:

- **MS-DOS**
- **MS-Windows 3.x**
- **MS-Windows 95**
- **MS-Windows NT**
- **OS/2**
- **Novell Netware**
- **Unix**
- **Realtime OS for embedded systems (e.g. QNX, VRTX etc.)**

The present international version of CAPI is **CAPI 2.0** (ETSI standard pr ETS 300325 edition 2), which supports all ISDN-protocols based on ITU standard Q.931, e.g.:

- **Euro-ISDN (ETS 300 102)**
- **DSS-1 (Q.931)**
- **National ISDN 1 (NI-1/2)**
- **Northern Telekom ISDN (DMS-100)**
- **AT&T ISDN (5ESS)**
- **French ISDN (VN3, 4, ff.)**
- **German ISDN (1TR6)**
- **DSS-2 (Q.2931)**
- **INS-Net (Japan)**

- **GSM**

Besides CAPI 2.0, sometimes CAPI 1.1 is still in use. This sometimes leads to misunderstandings. CAPI 1.1 is a version exclusively for the national German ISDN protocol (1TR6), which is now running out (the service by German Telekom is limited until the year 2000). CAPI 1.1 is only relevant for a segment of the German market and for some exported German PBX built in the years from 1989 to 1993.

As most telecommunication standards do, CAPI contains a number of mandatory functions and a number of optional features. Today, more than 90% of all applications in use are based on only the mandatory CAPI functions, which means that they would run with any CAPI-compatible controller. However, if a CAPI-compatible application should require optional functions of a CAPI-compatible controller, that the controller does not support, it will obviously have a problem. The application can, however, ask a list of the supported features from the CAPI-compatible controller.

Why is CAPI here?

In the beginning, in 1988, three German manufacturers of ISDN-adapters (AVM, Stollmann and Systec) together with the Deutsche Bundespost Telekom (the predecessor of the Deutsche Telekom AG) started with the idea of an independent interface standard for ISDN applications in order to encourage software companies to do more and better applications for the - at that time tiny - ISDN-market. It proved very helpful for the development of the market and so more and more hardware and software companies joined the club. Others just implemented the standard, which was public domain from the very beginning. The idea has remained the same since then. Also from the beginning, the CAPI association was very pragmatic in the sense that all technical issues were always discussed and resolved strictly technically.

Who is using CAPI today and what does the CAPI logo mean?

Today, more than 100 hardware vendors and an even larger number of software manufacturers all over the world use CAPI. CAPI-members are allowed to show the CAPI-logo (an internationally registered trade-mark) on their CAPI-compatible products. Vendors of CAPI-compatible products, who are not members of the CAPI association, are not allowed to use the CAPI-logo, but can, of course, mention the compatibility of their product in written anywhere. Independent certification of specification conformance is planned by the ETSI, but presently not yet available. CAPI association is presently discussing, how this process could be speeded up and encourages any company or institution interested in independent certification, especially in the UK and the US, to make themselves known to the chairman. Today, it is still the vendors' full responsibility to make sure, that their products really complies with the standard. Anybody in doubt about compatibility issues of special products can make use of and give information into the new CAPI internet news-group.

How you can benefit of CAPI

The benefits of CAPI naturally depend on what you are doing:

- **If you are a SW-manufacturer**

When you design CAPI into your software, you make it compatible with a wealth of ISDN-adapters, in fact with the vast majority of all the ISDN-adapters that were ever built in the world (more than 1 million).

- **If you are a HW-manufacturer**

When you design CAPI into your adapter, almost every application in the world, that could principally use the functionality of your adapter can now actually do.

- **If you are an embedded systems developer**

If you develop embedded systems, like TA, least cost router, encryption, or automation boxes use CAPI as your internal interface to combine your strength in application development with the strength of ISDN protocol stack developers. You will find it very simple to develop the whole software on a PC and download it into the target. Additionally it will make your design scalable for a complete product family without redesigning the communications core.

- **If you are a system integrator**

If you want to design ISDN-solutions, using CAPI makes your job it much easier. You can choose between a wide variety of compatible products, both hardware and software and you'll find a lot of integration support, from documentation over SW-libraries and developers packages to seminars.

- **If you are a consultant**

If you are a consultant, you should think of CAPI as one of these cost-saving, risk-reducing international standards which help reduce the complexity of IT-solutions to some extent.

- **If you are a user**

As a user, you should ask for CAPI in your next ISDN-buy, because is free and it gives you the freedom of choice to buy the ISDN-adapter you like from your favourite manufacturer and the application you like from your favourite software vendor and run them together on your system. This can save you a lot of money and give you extra functionality for free. If you are not an expert in the subtleties of ISDN, you should, however, use the product information that both hardware and software vendors give or ask your suppliers, to make sure, that the adapter will have all the functionality options your application may require.

How difficult is it to design CAPI into your product?

First, you have to download (see box), read and understand what the interface specifies and how. The application software side of a simple CAPI interface is then easy to implement (within two man-months by a skilled programmer), the same is true for the device side, if you have all the ISDN protocol stuff already there. Software companies can make use of free CAPI software development kits offered by several adapter vendors (e.g. AVM). Hardware vendors will also find offers of proven portable drivers and ISDN protocol software (from CAPI downwards to practically any ISDN chipset) and integration support by several companies (e.g. Siemens, Stollmann). These are not free, but cheaper than you may think.

How can you make sure your product complies with the standard?

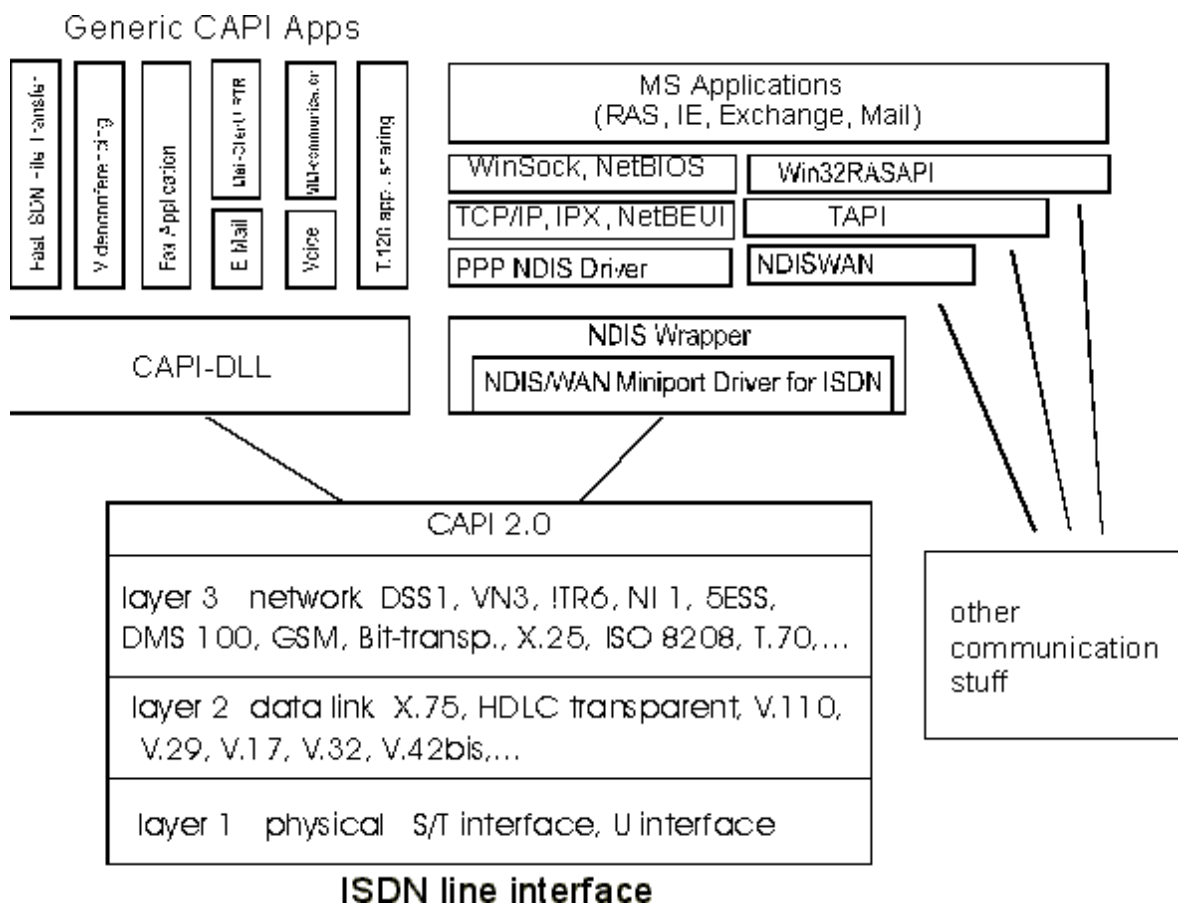
After reading all the public CAPI stuff and doing the implementation, the straightforward way to begin is to simply buy some proven CAPI-compatible products (preferably those, you expect your customers to use) and use them as your private compatibility test suite. During debugging, also use the CAPI Internet news group or join the association, to get personal contact with all the experts and use all the latest information. After that, you normally know enough about CAPI to judge possible difficult points yourself. Independent certification for CAPI 2.0 is not yet available.

What are present issues of the CAPI association ?

CAPI intends to support virtually anything you could possibly want to do with an ISDN-connection. In June, 1997 the CAPI association released the second edition of the CAPI 2.0 specification, after 12 months of work of the technical working group. It will be available to the public over www by the end of July. It added several new functions, e.g. the supplementary services of ISDN, V.42bis compression, V.120 and others, as well as several technical clarifications. Possible cooperation of the CAPI association with the ECTF and other international standardisation bodies will be defined. The aim of these cooperations will be, to position CAPI into the international technology framework (e.g. to make the rich CTI-relevant functionality of CAPI known to the ECTF-members). But we also plan to discuss the issue of independent specification conformance testing and test-tools here.

Better support for international members has to be organised. The marketing circle of the association decided to prepare an information folder, to be present on several international events and to put a product information overview and a new design into the CAPI homepage.

As a very important point, we see the information about the position of CAPI in the Microsoft systems platforms and drivers. Here is the present view:



How can you participate in the development process of the CAPI?

Every comment, question or suggestion concerning the public CAPI documents in the internet (see box, in English language only and preferably by e-mail) or other issues of the CAPI, is appreciated and will be regarded. Personal contact to the chairman or to the technical assembly is possible by e-mail, fax, telephone or snail-mail over the CAPI secretariat (see also box). Any company or institution working on or interested in ISDN, that wants to take part in the process more intensely, is invited to apply for observing membership or principal membership in the CAPI association (for the conditions refer to the CAPI homepage).

All members have access to all of the CAPI working-groups all of their protocols and other information files of the CAPI association and can take part in all working-group meetings and in the general assembly. The only restriction for observing members in comparison to the principal members is, that observing members have no right to formally vote.

Box: CAPI

CAPI : Common ISDN Application Programming Interface

- 1989: Foundation as industry working group in the German ISDN-trial
- 1991: Foundation of the international CAPI association
- Principal members: 19
- Observing Members: 39
- Number of CAPI-compliant products: Over 700
- Certification institution: Wanted!
- More information and document download under <http://www.capi.org>
- CAPI association secretariat: Alexandra Marksteiner
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