



**Technical Document**

**GSM PROTOCOL STACK**

**GPF**

**xPANEL – MMI TEST APPLICATION (PC)**

**DEVELOPER DESCRIPTION**

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|                     |                                |
|---------------------|--------------------------------|
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## 0 Document Control

### 0.1 Change History

| Date        | Changed by | Approved by | Version | Status | Notes |
|-------------|------------|-------------|---------|--------|-------|
| 2000-Oct-26 | RK et al.  |             | 0.1     |        | 1     |
| 2003-May-21 | XINTE GRA  |             | 0.2     | Draft  |       |
| 2003-Aug-18 | RK         |             | 0.3     | Draft  | 2     |

**Notes:**

1. Initial version
2. New Document ID introduced

### 0.2 List of Figures and Tables

### 0.3 List of References

|                        |   |
|------------------------|---|
| <b>[ISO 9000:2000]</b> | International Organization for Standardization. Quality management systems - Fundamentals and vocabulary. December 2000 |
| <b>[GSM 2.30]</b>      | ETS 300 511: July 1995 (GSM 02.30 version 4.13.0)<br>Man-Machine Interface (MMI) of the Mobile Station (MS), ETSI       |
| <b>[PANEL]</b>         | 8415.014.00.105, February 7, 2000, Panel – PC Test Application  |
| <b>[XPAN_UG]</b>       | 06-03-36-UDO, xPanel – MMI Test Application (PC)<br>(xpan_userguide.doc)  |
| <b>[XPAN_MC]</b>       | xpan_mainconcept.ppt  |
| <b>[XPAN+]</b>         | xPanel_plus_design_spec.doc   |
| <b>[MOAN]</b>          | 06-03-53-UDO, MoanBtn – Instant GUI-problem Informer<br>(mbtn_userguide.doc)  |
| <b>[PCO2]</b>          | 06-03-35-UDO, PCO2 – Tracing Environment (pco_userguide.doc)  |

## 0.4 Abbreviations

|                   |   |
|-------------------|---|
| ACI               | Application Control Interface (AT Commands)                           |
| G23               | The Condat implementation of Layers 2 and 3 of the GSM Protocol Stack |
| G23 Target System | Hardware which executes G23   |
| LCD               | Liquid Crystal Display  |
| MM                | Mobility Management   |
| MMI               | Man Machine Interface   |
| MOC               | Mobile Originated Call  |
| MTC               | Mobile Terminated Call  |
| PC                | Personal Computer   |
| PCO               | Point of Control and Observation                                      |
| PIN               | Personal Identification Number  |
| RS232             | Serial Communication Standard   |
| Target System     | Shortened form of 'G23 Target System'                                 |

## 0.5 Terms

|                      |  |
|----------------------|--|
| Entity               | Program which executes the functions of a layer  |
| Message              | A message is a data unit which is transferred between the entities of the same layer (peer-to-peer) of the mobile and infrastructure side. Message is used as a synonym to protocol data unit (PDU). A message may contain several information elements. |
| Primitive            | A primitive is a data unit which is transferred between layers on one component (mobile station or infrastructure). The primitive has an operation code which identifies the primitive and its parameters.   |
| Service Access Point | A Service Access Point is a data interface between two layers on one component (mobile station or infrastructure).   |

## 1 Introduction:

LGIC would like to have their own customer specific PANEL solution. They have provided the keyboard layout and the LCD display size and expect a panel with that design and corresponding functionality: Key-Code connection and graphical display response.

To avoid another proprietary „isolated solution“ only one new panel will be implemented with the functionality of the former „Panel“ and the „Gameboy“ insight. This merged and extended „xPanel“ will have a configurable layout as well. The customer himself should be able to do configuration and creation of new layouts.

At the same time the two existing mechanisms for transmission of graphical display data (MMITAP, Gameboy) will be merged into one solution.

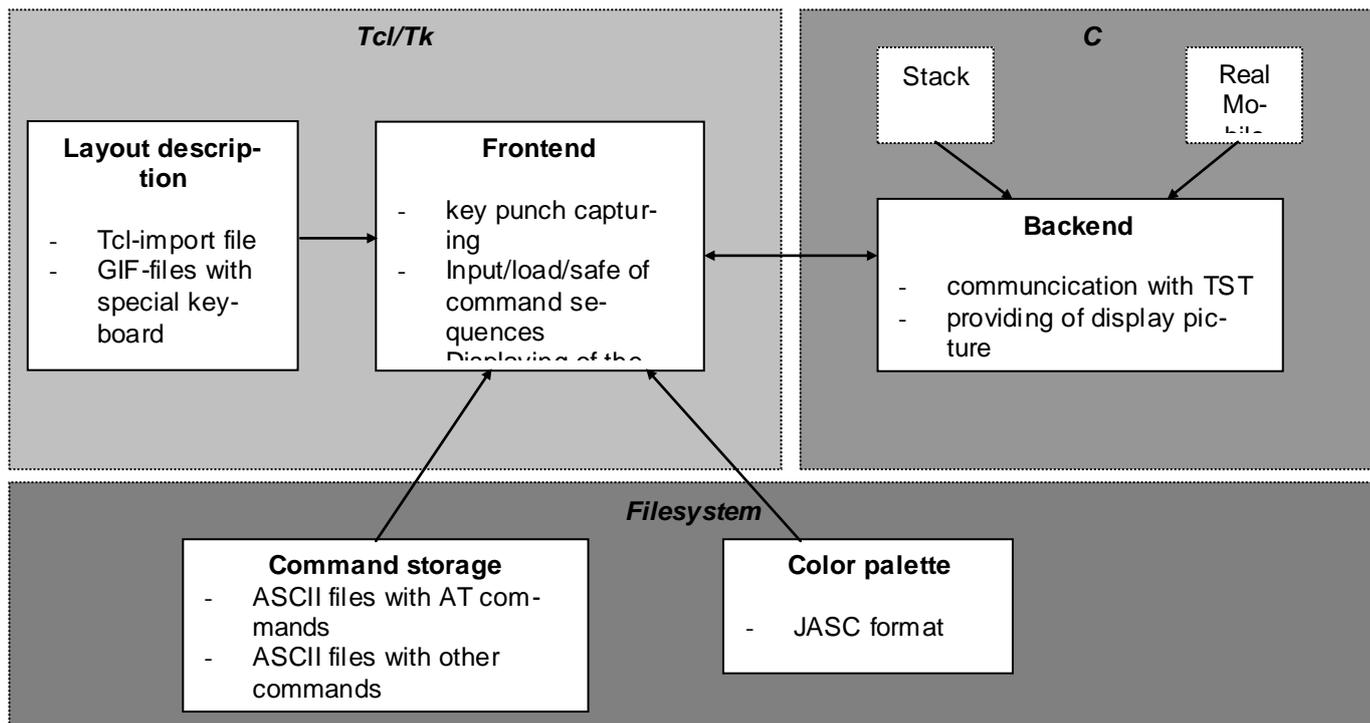
This documentation is dedicated to interested developers. For user/customer specific documentation see [XPAN\_UG].

## 2 Solution

### 2.1 General Procedure

There are two main parts of the documented software: the TCL/Tk-Frontend and the C-Entity-Backend. While the first will provide the user interface and will handle in- and output the latter communicates with real mobile hardware or a dedicated stack program.

The following picture shows the dependencies between the components:



#### 2.1.1 Environment

To use xPanel some environmental constraints have to be taken into account.

*For use under Windows:*

At first you'll have to make sure that several DLL-files are available to the system. In the Condat development directory structure you can find them in „<View>/GPF/Bin” and „<View>/GPF/tools/bin”:

- Frame-DLLs (frame.dll, tif.dll, misc.dll)
- cms.dll, ipc.dll
- tk84.dll, tcl84.dll

So just make sure „<View>/GPF/Bin” and “<View>/GPF/gnu/bin” are in your PATH-variable. (use e.g. the “initvars.bat” in „<View>/GPF”)

From the MS-Explorer you can directly double click on the “<View>/GPF/bin/xpan.bat”, which will solve the PATH-problem for you.

Furthermore the Tcl-interpreter expects some files in subdirectories of a lib-folder relative to the start-directory -> “./lib”. At Condat all the necessary files can be found in “<View>/GPF/Lib” :

- “tk8.4”-directory
- “tcl8.4”-directory

At least you need to have xpanel.tcl in the same directory as the executable.

For your special needs you may have to change the default ini-file of xPanel (“<view>/GPF/cfg/xpan.ini”). An explanation of the options is given in **Error! Reference source not found.**

In “<view>/GPF/cfg” you can find some example ini-s like one for the usage with the TI-Multiplexer (“<view>/GPF/cfg/xpan.ini.ti\_mux”).

To start meaningful work you additionally need a layout-file –adapted to your needs (see 4 for details). You should use PCO (see [PCO2]) together with xPanel, to watch traces and redirected primitives.

## 2.1.2 Build process

MS Developer Studio 5.0 must be installed and it's bin-directory has to be in the PATH. (CONDAT internal you should use /GPF/initvars.bat)

ClearCase : make sure all project dependencies are solved by your config spec (see /GPF/assist/readme\_xpan.txt)

no ClearCase : make sure that you get all files on which xPanel depends (see /GPF/assist/readme\_xpan.txt)

Change to xpanel directory and call 'gnumake' (or 'gnumake help' for more options).

Hint: remove error.log before running make if you want to track current ClearCase errors.

## 2.2 Detailed Descriptions - under construction -

### 2.2.1 Tcl/Tk-Frontend

#### 2.2.1.1 Framework

The implementation of the so called frontend “framework” resides in the source file “xpanel.tcl”. The realised functions are:

- General layout construction
- Panel screen update
- Graphical mode: PPM-image file, modified by C-Entity - reread and displayed by this framework (in function “displ\_img”)
- Text mode: a multi lined label string is updated in function “displ\_text” which will be called by C-Entity

```
set KEY_0      0
set KEY_1      1
set KEY_2      2
set KEY_3      3
set KEY_4      4
set KEY_5      5
set KEY_6      6
set KEY_7      7
set KEY_8      8
set KEY_9      9
set KEY_STAR   10
set KEY_HASH   11
set KEY_VOLUP  12
set KEY_VOLDOWN 13
set KEY_MNUUP  14
set KEY_MNUDOWN 15
set KEY_LEFT   16
```

```
set KEY_RIGHT 17
set KEY_CALL 18
set KEY_HUP 19
set KEY_OK 20
set KEY_CLEAR 21
set KEY_ABC 22
set KEY_POWER 23
set KEY_F1 24
set KEY_F2 25
set KEY_F3 26
set KEY_F4 27
set KEY_MAX 28
```

### 2.2.1.2 Layout Template

### 2.2.1.3 Layout For LGIC

The Layout for LGIC is a specially modified version of the layout template -> „LGIC\_lo.tcl“

## 2.2.2 C-Entity-Backend

### 2.2.3 Display update method

This is how the display updating works:

The Tcl/Tk-frontend periodically calls a procedure *displ\_update* which gets the current display information via a C-function call and updates the display window.

For text mode this C-function is *c\_get\_displtext(xpan\_tcl\_get\_displtext)* which returns the current text to be displayed.

In the graphical mode the C-function is *c\_get\_displimg(xpan\_tcl\_get\_displimg)* which returns the name of the image file to use.

## 2.3 Test

- Tcl/Tk-layout generation test
- C-Entity test
- integration test

### 3 Interface specifications

The next paragraphs contain specific informations about used and provided interfaces.

#### 3.1 XPanel – Display-Driver Communication - under construction -

To redirect a text display output to xpanel a “CONFIG MMI\_MODEL=<1,1,1>” primitive is send to PL. Now primitives of the following type reach xpan\_pei :

##### MMI\_DISPLAY\_REQ ...

Elements:

| long name         | short name | Type   |
|-------------------|------------|--|
| Attributes        | Attrib     | STRUCT:<br>- content<br>- control                  |
| y-coordinate      | c_y        | USHORT   |
| x-coordinate      | c_x        | USHORT   |
| service data unit | Sdu        | STRUCT<br>elements:<br>- l_buf<br>- u_buf<br>- buf |

Description:

MMI\_DISPLAY\_REQ requests the output of a given string or a whole bitmap into the display of, e.g. the xPanel. (see 3.1)  
 The receiver has to know the type of data (in xpan\_pei.c controlled by xpan\_displytp):

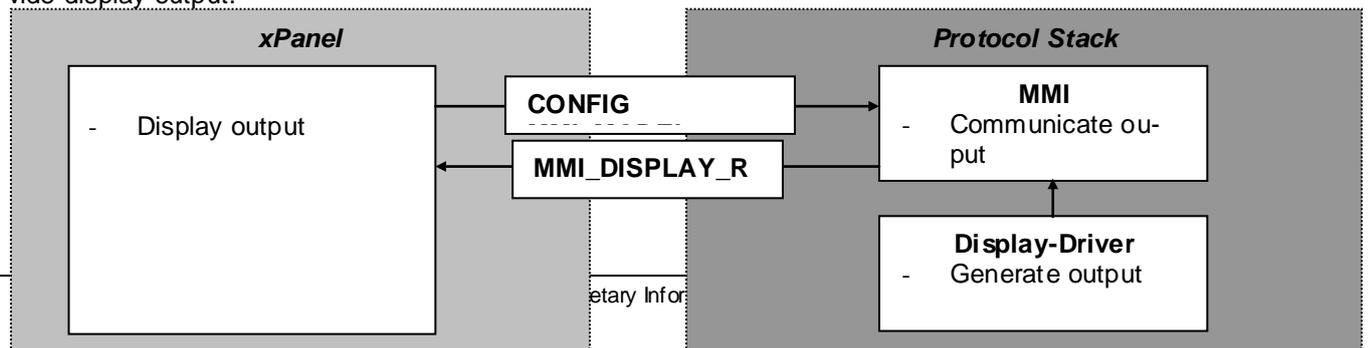
Text-Display: The appearance of the Text is controlled by attributes. The Text is stored in the SDU structure to avoid the exchange of fixed size primitives. The attributes can contain the following values:

| Name    | value | c-macro        | Comment                                   |
|---------|-------|----------------|---|
| Content | 1     | CON_TEXT       | Sdu contains text                         |
|         | 2     | CON_CURSO<br>R | Positioning the cursor                    |
| Control | 0     | CTL_NORMA<br>L | Normal operation                          |
|         | 1     | CTL_HIDDEN     | Hidden attribut (used for cursor control) |

| Name     | Comment                |
|----------|------------------------|
| C_x. c_y | position of the cursor |

| Name    | value | c-macro        | Comment                                   |
|---------|-------|----------------|---|
| Content | 1     | CON_TEXT       | Sdu contains text                         |
|         | 2     | CON_CURSO<br>R | Positioning the cursor                    |
| Control | 0     | CTL_NORMA<br>L | Normal operation                          |
|         | 1     | CTL_HIDDEN     | Hidden attribut (used for cursor control) |

The following picture gives an overview about the communication process which takes place to provide display output.



To receive graphical display the new external display interface is used. See [XPAN+] for detailed information.

### **3.2 Test-Interface Usage - under construction -**

To communicate with the protocol stack the so called test interface of the Condat-FRAME is used (see [XPAN\_MC]).

send\_syscmd

## 4 Layout Development

### 4.1 Basics

To develop a special mobile layout you have to get detailed informations about all the keys – their location, the text/graphic on them and the associated function.

The next step is to modify the template tcl-file (xpan\_lo\_tmpl.tcl) and rename it to <name>\_lo.tcl where <name> stands e.g. for the name of the company you develop the layout for.

Now this name can just be passed to xPanel as a parameter (e.g. xpan -l <name>) or specified in your ini-file (see **Error! Reference source not found.**) and the new layout will be used. Another option is to load the layout from the menu of xPanel (file/load layout ...).

### 4.2 Editing the template

After copying the „xpan\_lo\_tmpl.tcl” to “<name>\_lo.tcl” you can modify the constants in the so called part of the layout file:

- Display colors

Here you can specify the fore-and background colors of the text display.

- Key count

Here you can specify the count of keys in a row/column of your mobile.

- Key IDs

Here you can specify the mapping of key names to IDs. Usually no changes are necessary.

- key distribution

Here you can specify how the key are distributed on your mobile. Where no key exists use \$KEY\_NOKEY.

- Key labels

Here you can specify strings as labels of your keys. Where no key exists or where you want to provide an image use an empty string.

- Optional Key images

Here you can specify names of image files (Bitmaps) which will be uses instead of a string as labels of your keys. Where no key exists or where you want use a label string specify an empty string.

- Key sizes

Here you can specify the sizes of your keys. Just look at the given examples and “trial and error” until you are satisfied. Where no key exists use “0” (it will be ignored anyway).

- Key positions

Here you can specify the relative positions of your keys using sticky-strings. You can choose from “w” (west), “e” (east), “n” (north) and “s” (south) to indicate that a key should stick at a side, or you can center it by using “”. Where no key exists use an empty string (it will be ignored anyway).

- Key reliefs

Here you can specify the relief type of the keys. One of the following constants may be used: raised, sunken, flat, ridge, solid, groove. Just try and decide what you like.

## 5 Command execution

It is possible to execute several commands from the xPanel application. Either by directly input them or by loading them from properly formatted ASCII-files.

Description for all supported formats will be provided in the following sections:

### 5.1 AT-Commands

An AT-command is just a string like "AT+...".

You can input such a line directly by choosing the Menu entry „Cmd/Input AT command ...“.

Under „Cmd/Load AT commands ...“ it is possible to load AT-lines from an ASCII-file formatted like this:

```
<at-string>
<at-string>
<at-string>
:
```

For example:

```
AT+CSCA=491710760000*145
AT+CMGS=491712002400*145*Test__das_ist_MO_SMS
```

### 5.2 CONFIG-Primitives

A CONFIG-primitive consists of a receiver and a primitive body. You can input both directly by choosing the Menu entry „Command/Input primitive ...“.

Under „Command/Load primitive ...“ it is possible to load primitives from an ASCII-file formatted like this:

```
<receiver>
<prim body>
<receiver>
<prim body>
:
```

For example:

```
MMI
CONFIG KEY_SEQUENCE= LEFT
MMI
CONFIG KEY_SEQUENCE= DOWN
```

## 6 Known problems and future tasks

This paragraph is meant to show which bugs are already found (but not removed yet) and to provide an impression of future plans concerning this product.

### 6.1 Known bugs

- XPanel does not remember its position/size correctly sometimes

### 6.2 „Soon implemented“

- the file dialogs should „remember“ the last chosen path
- a recording of button-presses will be possible
- Online-Help

### 6.3 „Nice to have “

- more extensive possibilities of command execution – more automatization

## Appendices

### A. Acronyms

**DS-WCDMA** Direct Sequence/Spread Wideband Code Division Multiple Access

### B. Glossary

**International Mobile Telecommunication 2000 (IMT-2000/ITU-2000)** Formerly referred to as FPLMTS (Future Public Land-Mobile Telephone System), this is the ITU's specification/family of standards for 3G. This initiative provides a global infrastructure through both satellite and terrestrial systems, for fixed and mobile phone users. The family of standards is a framework comprising a mix/blend of systems providing global roaming. <URL: <http://www.imt-2000.org/>>