

Tcl/Tk on Android

<http://www.ch-werner.de/sdltk/AndroWish>

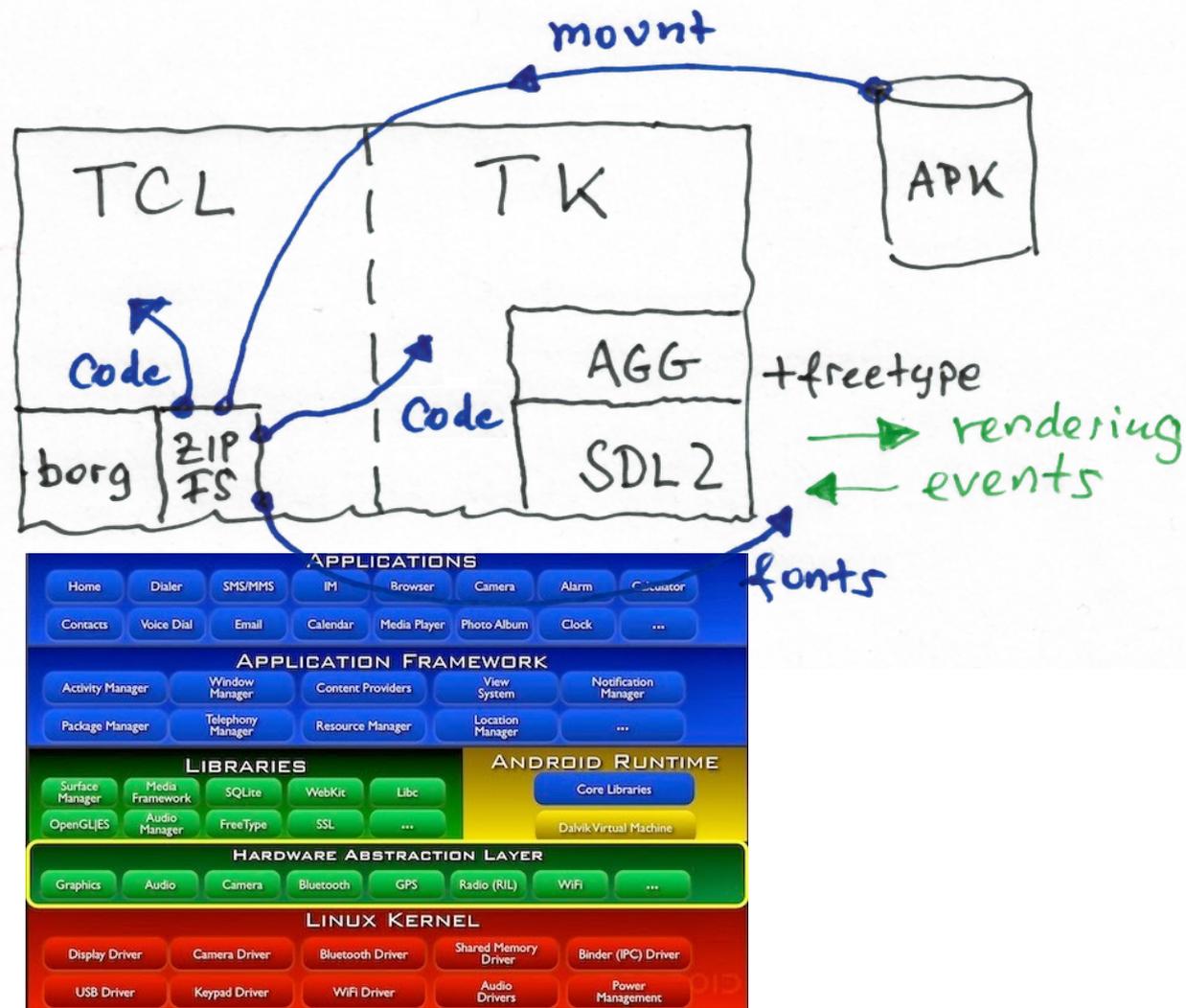


Icon kindly donated by Jorge Raul Moreno

AndroWish

- Native Tcl/Tk port for Android $\geq 2.3.3$ on ARM and x86 processors. Top goal: execute existing Tcl/Tk scripts on Android without modification.
- Uses Tim Baker's SDLTK project for graphics rendering, see <http://members.shaw.ca/tnbaker/SDLTk>
 - X11 emulation based on AGG (Anti-Grain-Geometry, <http://www.antigrain.com>) and SDL 2.0 (<http://libsdl.org>)
 - freetype font engine (<http://www.freetype.org>)
- Mounts its constituting APK (Android Package, i.e. the app) using a built-in ZIP file system based on mmap(2)
- “Batteries included” like TclKits (i.e. many ready-to-use Tcl extensions already bundled)
- Tcl commands available to use specific Android facilities

AndroWish, the big picture



AndroWish, limitations

- X11 emulation is not thread-safe, thus it is impossible to **package require Tk** from another thread. But multiple Tcl **interps** in the main thread work.
- Due to Android process start up with respect to the window system **exec(n)** is limited to non-Tk processes, i.e. you can't **exec wish**.
- The bandwidth of device screen resolutions is broad (140 dpi ... 500 dpi) compared to usual desktop systems. But many elements of Tk widgets are pixel based.

SDLTK

- Partial Xlib replacement to implement rendering of standard Tk widgets using SDL and AGG and to support most features of extensions (treeview, tktable, TIX, BLT).
- Event handling by translating SDL events to X11 events plus additional virtual events
 - App life cycle (<<WillEnterBackground>>, <<WillEnterForeground>>, etc.)
 - Accelerometer is handled by SDL and mapped to an SDL joystick, and translated to Tk virtual event <<Accelerometer>>
 - Multi-touch events <<FingerUp>>, <<FingerDown>>, <<FingerMotion>>, <<PinchToZoom>>
- Other SDL goodies available through `sdltk` command
- Can be built standalone on other platforms (currently tested on Linux x86/Raspberry with X11 and DirectFB), see <http://www.ch-werner.de/sdltk>

SDL_tk command

- Obtain power management information (SDL_tk powerinfo)
- Control accelerometer (SDL_tk accelerometer)
- Control screensaver (SDL_tk screensaver)
- Show/hide virtual keyboard (SDL_tk textinput)
 - built into standard bindings of entry and text widgets
- Control emulation of middle and right mouse buttons for context menus and panning/scrolling (SDL_tk touchtranslate)

borg ['bɔʊk]

- German imperative of “borgen” (to borrow)
- Inspired by Scripting Layer for Android (SL4A) and PhoneGap (now Apache Cordova)
- Junction to connect the (native) Tcl/Tk with the (Java) Android universe
- Use Android facilities from Tcl scripts
 - Information about device
 - Activities (Android apps)
 - Alarms, Notifications
 - Content (Android databases)
 - Location (GPS)
- Report device events using Tk virtual events (network status, location updates, sensor events)

borg command examples

Obtain information about the display

```
borg displaymetrics
```

```
density 1.33125 densitydpi 213 \  
width 800 height 1216 \  
xdpi 216.17021 ydpi 215.31126 \  
scaleddensity 1.33125
```

borg command examples

Use Android's text-to-speech facility for speech output

```
borg speak "resistance is futile" \  
en_US
```

borg command examples

Add an icon to Android's desktop which launches a Tcl script contained in AndroWish's ZIP mounted /assets directory

```
borg shortcut add \  
file:///assets/sdl2tk8.6/demos/widget
```

borg command examples

Use other Android activities (parts of other apps). Example: read a bar code using the <http://code.google.com/p/zxing> bar code scanner app.

```
proc barcode_read {code action uri type cat data} {
    array set result $data
    if {[info exists result(SCAN_RESULT)]} {
        # that is the barcode
        # result(SCAN_RESULT_FORMAT) is the barcode format
    }
}
```

```
borg activity com.google.zxing.client.android.SCAN \
    {} {} {} {} {} barcode_read
```

borg virtual events

- <<LocationUpdate>>: location information is available and can be read using
borg location get
- <<SensorUpdate>>: a sensor can be read using
borg sensor get ...
- <<NetworkInfo>>: network status was updated and can be read using
borg networkinfo
- <<Bluetooth>>: Bluetooth status was updated and can be read using
borg bluetooth state

Other AndroWish goodies

- `bluetooth` command allows to create Bluetooth client and server sockets providing the serial port profile (SPP). Those sockets are normal Tcl channels.
- `usbserial` command allows to use certain USB to serial converters (FTDI, Prolific) similar to normal Tcl serial channels, i.e. `fconfigure` can be used to control the baud rate etc.

Anatomy of AndroWish's APK

Directory within APK	Description	Size uncompressed
assets/	Application auxiliary files, Tcl libraries	36 MByte
tcl8.6/		
sdltk8.6/		
fonts/	Default fonts, Deja Vu	
...	"Batteries included" (SQLite, tcllib, tls, treectrl, ...)	
app/		
lib/	Native code, shared libraries	
armeabi/	... for ARM processors	10 MByte
x86/	... for x86 processors	15 MByte
res/	Android Resources	few kByte
drawable/	... icons	
layout/	... layout, styles	
resources.asrc	Application resources	few kByte
AndroidManifest.xml	Application descriptor	few kByte
classes.dex	Compiled Java code for Android's Dalvik VM	< 1 MByte
META-INF/	JAR Manifest, signatures of all files in APK	< 1 MByte

Batteries included

BLT BWidget Img Itcl Iwidgets Memchan Mentry Mentry_tile Plotchart S3 SASL SASL::NTLM
SASL::SCRAM SASL::XGoogleToken Tablelist Tablelist_tile Tcl TclCurl TclMixer TclOO Tclx Thread
Tix Tk Tktable Tif Ttk Ttrace Wcb XOTcl aes ascii85 asn autoproxy autoscroll base32
base32::core base32::hex base64 bee bench bench::in bibtex bindDown blowfish cache::async
canvas::drag canvas::gradient canvas::highlight canvas::mvg canvas::snap canvas::sqmap
canvas::tag canvas::zoom char chatwidget cksum clock::iso8601 clock::rfc2822 cmdline comm
configuration control controlwidget coroutine coroutine::auto counter crc16 crc32 crosshair csv
cxtex cursor datefield debug debug::caller debug::heartbeat debug::timestamp des diagram
diagram::application diagram::attribute diagram::basic diagram::core diagram::direction
diagram::element diagram::navigation diagram::point dns docstrip docstrip::util doctools
doctools::changelog doctools::config doctools::cvs doctools::html doctools::idx
doctools::msgcat doctools::paths doctools::text doctools::toc dtplite fileutil fileutil::decode
fileutil::globfind fileutil::multi fileutil::traverse ftp ftp::geturl ftpd generator getstring gpx
grammar::aycock grammar::fa grammar::peg gridplus history hook html htmlparse http huddle
ico icons ident imap4 img::base img::bmp img::dtd img::gif img::ico img::jpeg img::pcx
img::pixmap img::png img::ppm img::raw img::sgi img::sun img::tga img::tiff img::window
img::xbm img::xpm inifile interp ip ipentry irc itcl itk iwidgets javascript jpeg json json::write
keynav khim lambda ldap ldapx led log logger appender logger::utils map::slippy mapproj
math math::bigfloat math::bignum math::calculus math::complexnumbers math::constants
math::decimal math::fourier math::fuzzy math::geometry math::interpolate math::linearalgebra
math::machineparameters math::numtheory math::optimize math::polynomials
math::rationalfunctions math::roman math::special math::statistics md4 md5 md5crypt
mentry mentry::common mentry_tile menubar menubar::debug menubar::node menubar::tree
meter mime mklite msgcat multiplexer nameserv nameserv::auto nameserv::common
nameserv::server namespaceex ncgi nmea nntp nsf ntext nx nx::class-method nx::doc
nx::plain-object-method nx::pp nx::serializer nx::test nx::trait nx::zip oo::util opt otp
page::pluginmgr paths pdf4tcl pdf4tcl::glyph2unicode pdf4tcl::stdmetrics picoirc pki platform
platform::shell plotanim pluginmgr png pop3 pop3d pop3d::dbx pop3d::udb profiler pt::ast pt::pe
pt::peg pt::pgen pt::rde radioMatrix ral ratcl rc4 rcs rdial report resolv rest ripemd128 ripemd160
sha1 sha256 simulation::annealing simulation::montecarlo simulation::random smtp smtpd snit
soundex spf sqlite3 starkit stooop string::token stringprep stringprep::data struct
struct::disjointset struct::graph struct::list struct::matrix struct::pool struct::prioqueue
struct::queue struct::record struct::set struct::skiplist struct::stack struct::tree style style::as
style::lobster sum swaplist switched tablelist tablelist::common tablelist_tile tachometer tar
tbcloud tcl::randomseed tcl::tommath tclIDES tclIDESjr tcltest tdbc tdbc::sqlite3 tdom tepam
tepam::doc_gen term term::receive term::send text::write textutil textutil::adjust
textutil::expander textutil::repeat textutil::split textutil::string textutil::tabify textutil::trim tie
tiff tile time tipstack tkcon tkconclnt tkpiechart tls tootip transfer::connect transfer::copy
transfer::receiver transfer::transmitter treectrl treeql trofs trsync try ttk::dialog ttk::icons udp
uevent uevent::onidle unicode unicode::data units uri uri::urn uuencode uuid valtype::common
valtype::iban valtype::imei valtype::isbn valtype::luhn valtype::luhn5 valtype::usnpi
valtype::verhoeff vfs vfs::ftp vfs::http vfs::m2m vfs::mk4 vfs::mkcl vfs::ns vfs::tar vfs::template
vfs::test vfs::tk vfs::urltype vfs::webdav vfs::zip vlerq voltmeter wcb websocket widget
widget::all widget::arrowbutton widget::calendar widget::dateentry widget::dialog widget::listentry
widget::listsimple widget::menuentry widget::panelframe widget::ruler widget::screenruler
widget::scrolledtext widget::scrolledwindow widget::statusbar widget::superframe widget::toolbar
widget::validator wip xotcl::htmlib xotcl::metadataAnalyzer xotcl::mixinStrategy xotcl::package
xotcl::script xotcl::serializer xotcl::staticMetadataAnalyzer xotcl::trace xotcl::upvar-compat
xotcl::wafecompat xotcl::xodoc xosp xyplot yaml yencode zipfile::decode zipfile::encode zlib zlibtcl

How to roll your own app

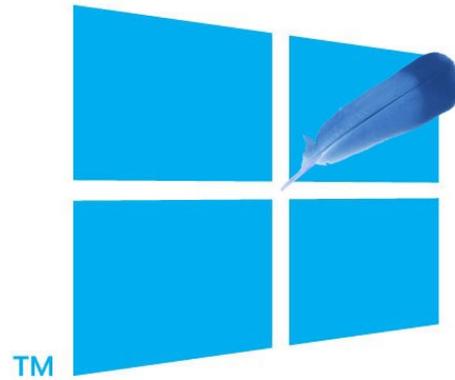
- It is possible to re-use AndroWish's infrastructure (/assets directory with Tcl runtime, native shared libraries) from other apps.
- A slightly modified Java glue is required (about 300 kByte compressed, compared to ≥ 22 MByte of the complete AndroWish APK).
- Due to APK building (various Android tools and Java jarsigner needed) this must be done using Android's SDK and optionally Eclipse.
- A demo project is available on <http://www.ch-werner.de/sdltk/AndroWish/HelloTclTk>

20 minutes into the future

Tcl/Tk is quite portable and SDL already runs on many platforms. So let's think of ...



... throwing the feather at



Thank you.

Questions?