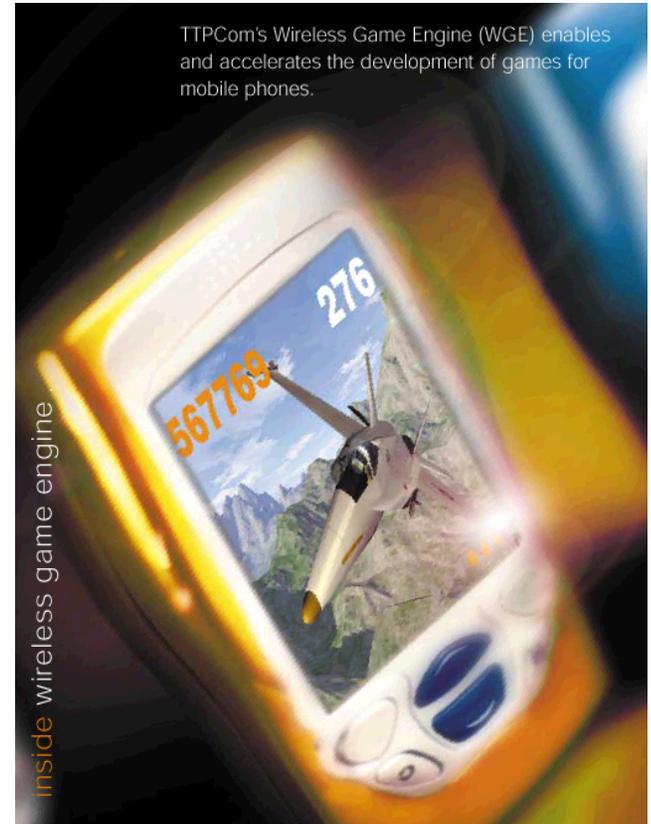




Wireless Game Engine

Gaël Rosset
TTPCom Danmark ApS
Gael.rosset@tppcom.com



TTPCom's Wireless Game Engine (WGE) enables and accelerates the development of games for mobile phones.

Agenda

- Let's start by playing !
 - Traditional gaming technologies
 - 2 Games developed by TTPCom
- Mobile Gaming Market overview
- Technical challenges when developing games for mobile phones
- Wireless Game Engine - a real end to end solution
- Overview of the different games
- Summary and Questions

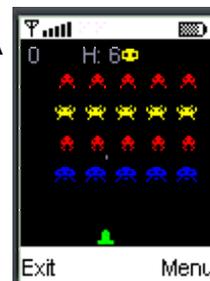
Let's play !

- SMS (text based)

- WAP

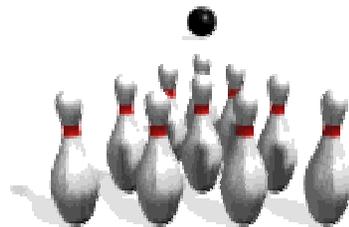


- Virtual Machines (VM) like JAVA

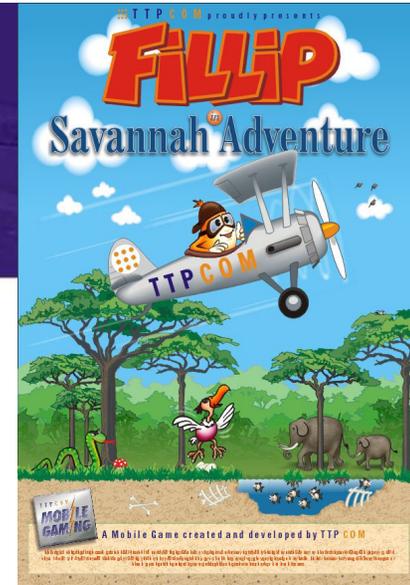


Goal

- February 2001: "Our goal is to offer in 2002 a handheld console equivalent gaming experience on mass market mobiles phones while using standard hardware"
- November 2001



Fillip in Savannah Adventures by TTPCom



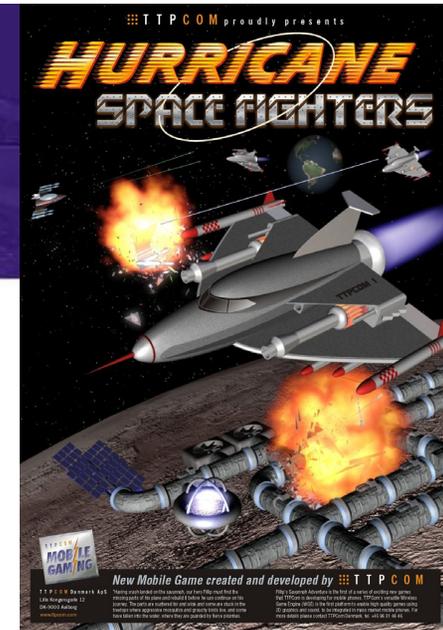
- Features

- Branded character – Fillip crashlands on the Savannah and gets his airplane scattered all over the Savannah
- Start sequence
- Filip has to find airplane parts and assemble to escape the Savannah
- Various animals/bugs to avoid
- Different levels of difficulty
- High scores
- Trembler effect when colliding with objects
- Sound effects and melody playing

- [DEMO !](#)



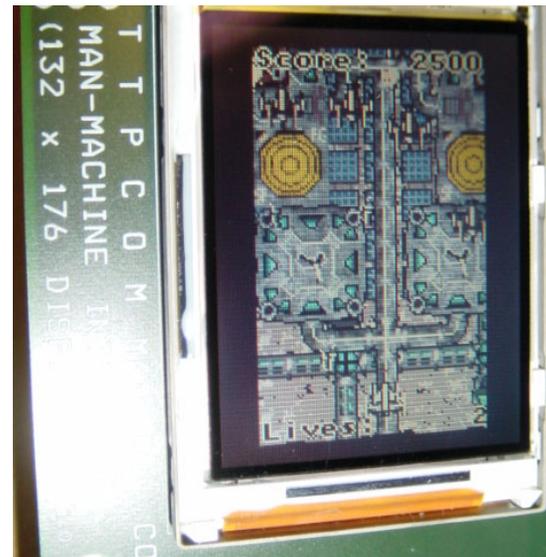
Hurricane Space Fighters by TTPCom



- Main features

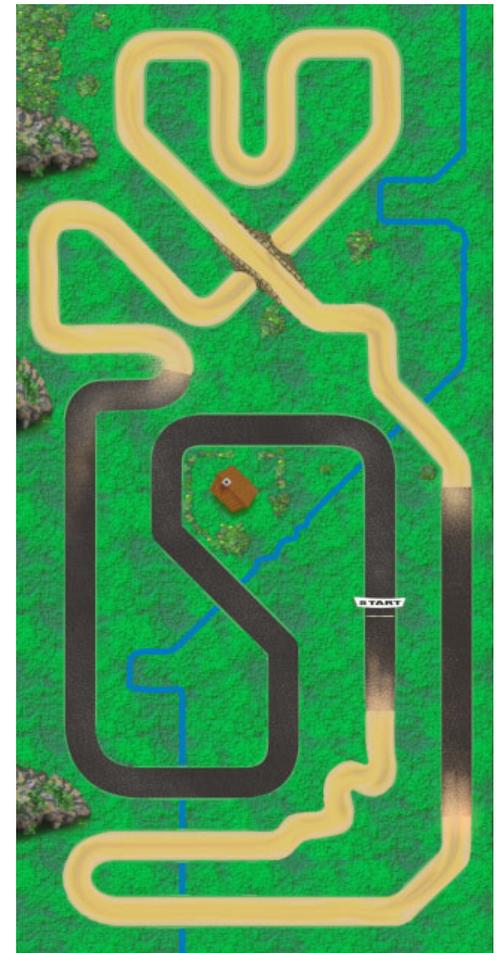
- You are on a mission to save the earth from the dark forces
- Different levels with varying scenary
- Highscore list, local and global
- Two different weapons: Lasergun and Missils
- Enemy ships attacking
- Different difficulties

- [DEMO!](#)



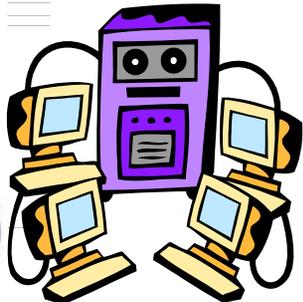
TTPCom Classic Rally

- Classic racing game
- 3 circuits
- Best time recording
- 3 to 5 oponents
- Realistic car physics engine
- B&W, Greyscale, colour version

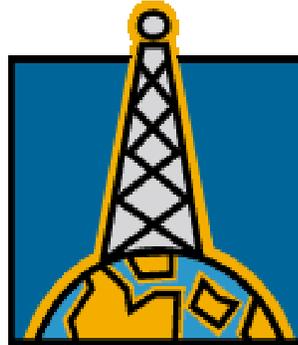


A real end-to-end solution

Dedicated Servers
Apps and games
TTPCom Portal



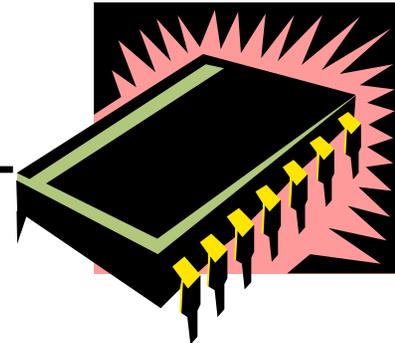
Content Provision
(Rankings, contests...)
Network Operators



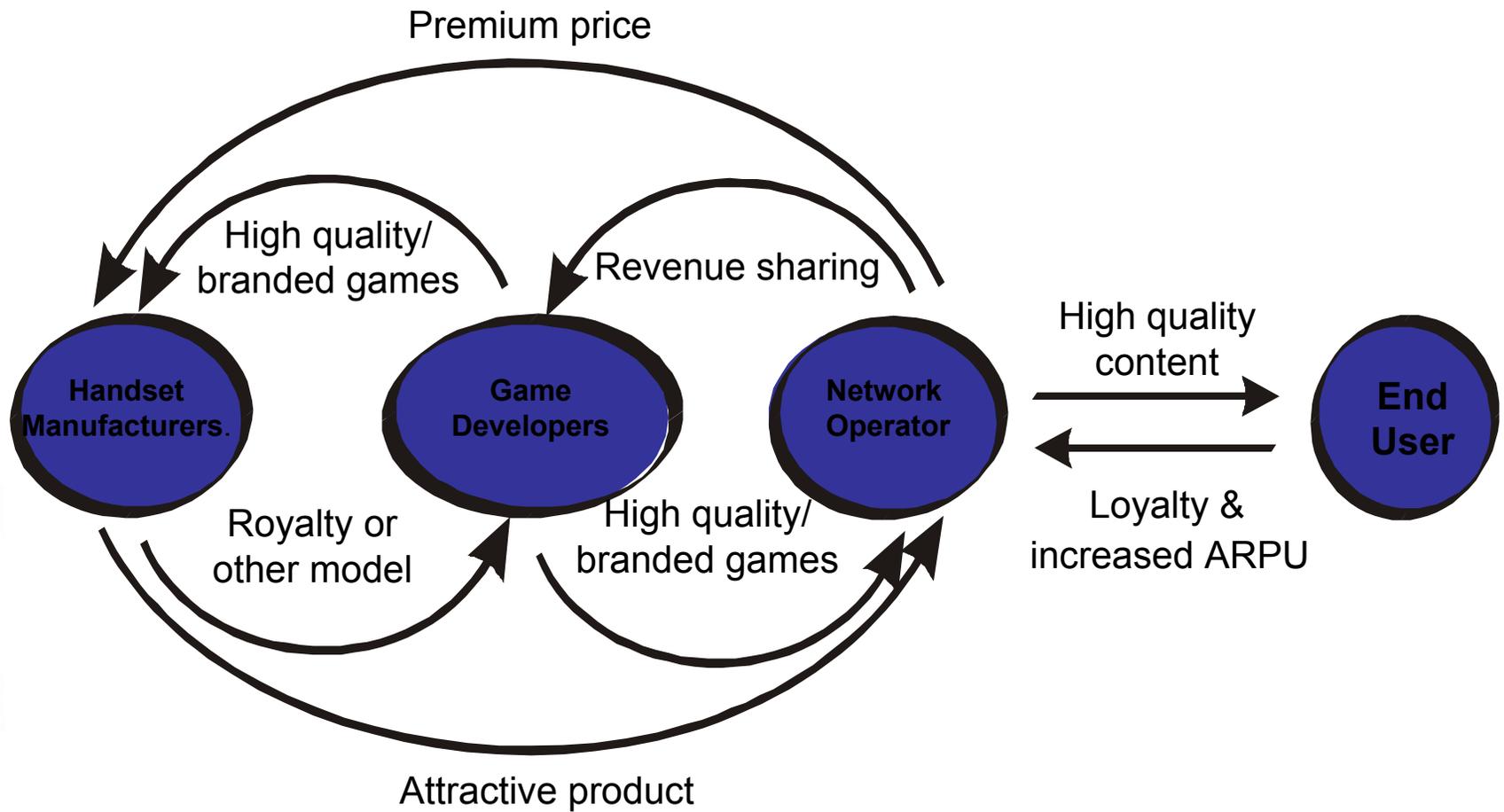
Optimised API
Games, MM apps
Handset



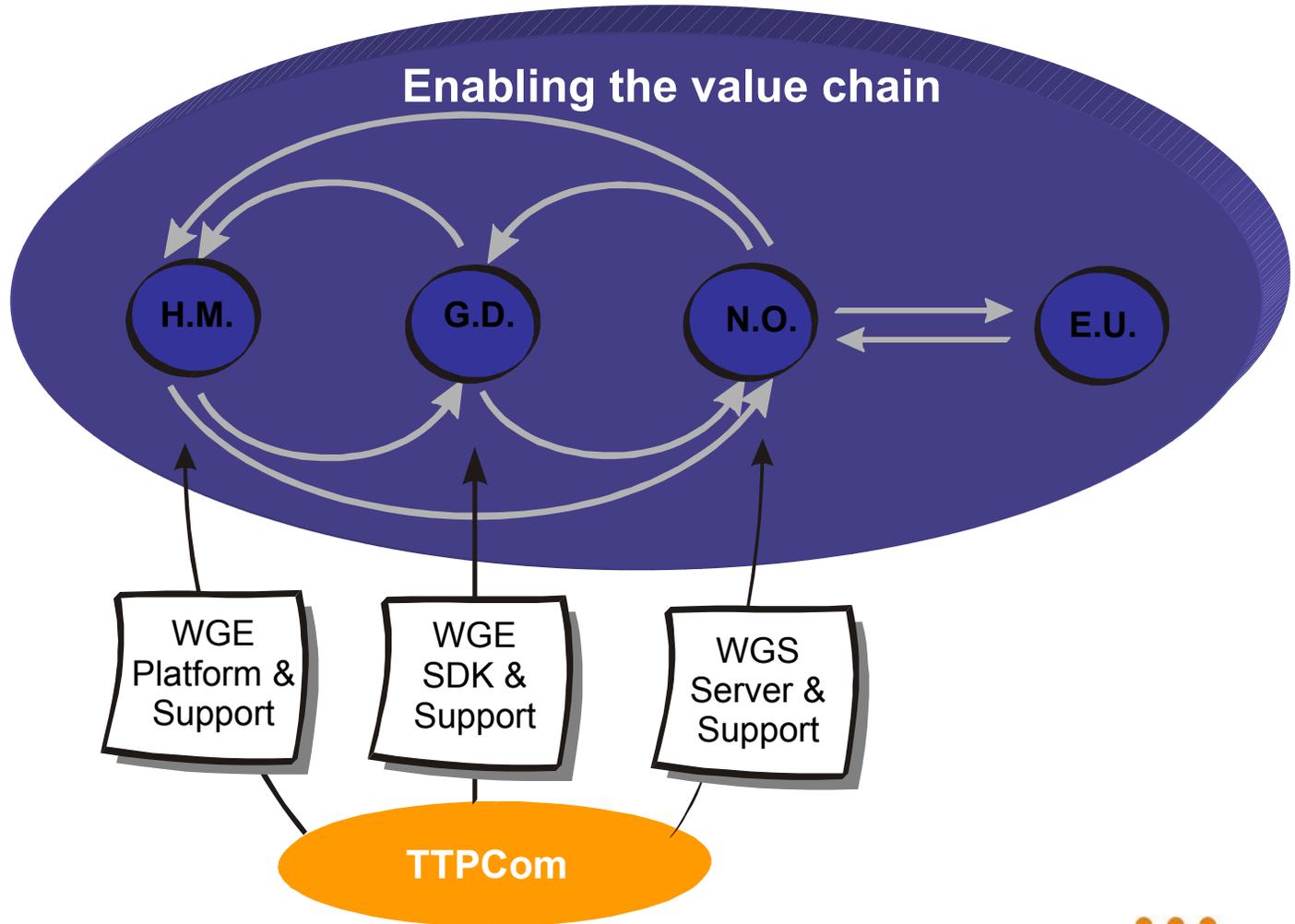
HW Acceleration
2D,3D functions
Chipset



The Business Concept



Enabling the business concept



Target Products

Segments	Subsegments	Mobile type	Market size	Driver	Application Interface
Data	Modules		1	Applications	AT
Data +Voice	Communicator		1	Business	Epoc,pJava,MIDP
	Smart Phone		1	OS	EPOC/Stinger
Voice +Data	High/Prestige		2	Technology	Java VM
	Professional		22	Features	Java VM
	Consumer		25	Design	None
	Entry		40	Price	None

Focus area (circled in blue dashed line)

The Wireless Game Engine is targeting the mass market

Technical challenges / solutions

- **Restricted Environment**
 - Storage Memory
 - Runtime Memory
 - Display performances
 - Closed environment
- **Choice of the programming language**
 - Java ?
 - C vs C++
- **Choice of Platform**
 - TTPCom SW, Brew, Epoc, Merlin, PalmOs, PocketPC, Stinger...

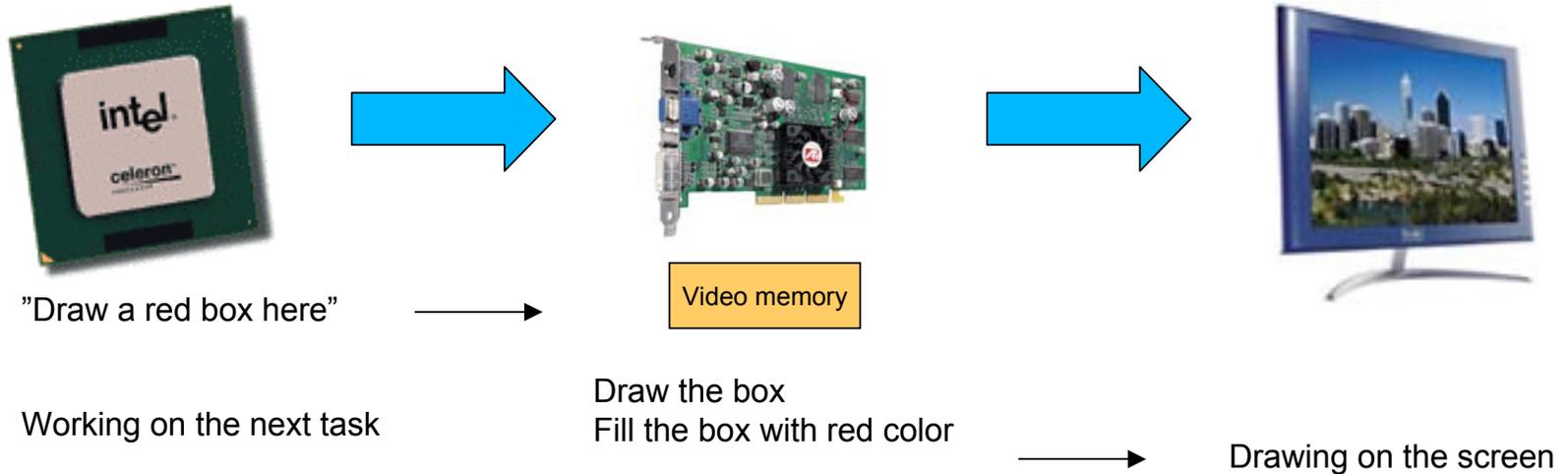
(Very) Restricted hardware environment

- **ALU Power:** Athlon 1.2 (**3886** Dhrystone MIPS ALU) on the ADI msp430 mcu around **30** (=486DX33)
- **Graphical Power:** GeForce 3 (57 M transistors ... 42 M Pentium4) on our HW no graphic card !
- **RAM:** On a PC **128 MB** on ADI msp430 BB chip **0,125 MB** SRAM on chip
- **Storage:** On a PC **10240 MB** HD on a phone **1MB** flash chip

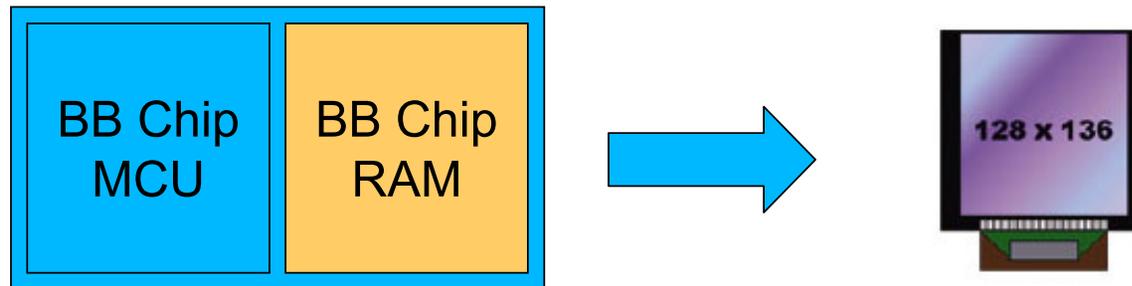
Dhrystone programs are by Reinhold Weicker

Working without graphic card on a smaller CPU

- Graphics processing on PC



- Graphics processing on a mobile phone



Java or C/C++

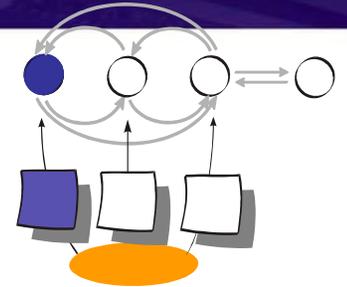
- Java
 - Popular
 - Good marketing
 - Slow for games, big footprint
 - Not too good at graphics
 - Supposedly platform independent
 - Not popular with Game Developers
- C/C++
 - Operators have not heard of it
 - Target compiled code implies high security issues
 - Fast, small, cheap and good for graphics
 - Portable (TTPCom SW, Brew, Epoc, PocketPC, PalmOS, Win32, ...)
 - Popular for Game Developers

C or C++ in the embedded world

- C++ provides object oriented development
- Game developers used to high level APIs (DirectX, OpenGL, Glide...)
- EC++
 - No templates / no exceptions handling / no namespaces
 - `nothrow` new No
 - `wchar_t` type No
 - `mutable` keyword No
 - `explicit` keyword No
 - `static member constants` No
 - `covariant return types` No
 - `Universal character names` No
- Our experience
 - Same footprint as C, no additional RAM usage, same performances and object oriented flexibility !

WGE Platform

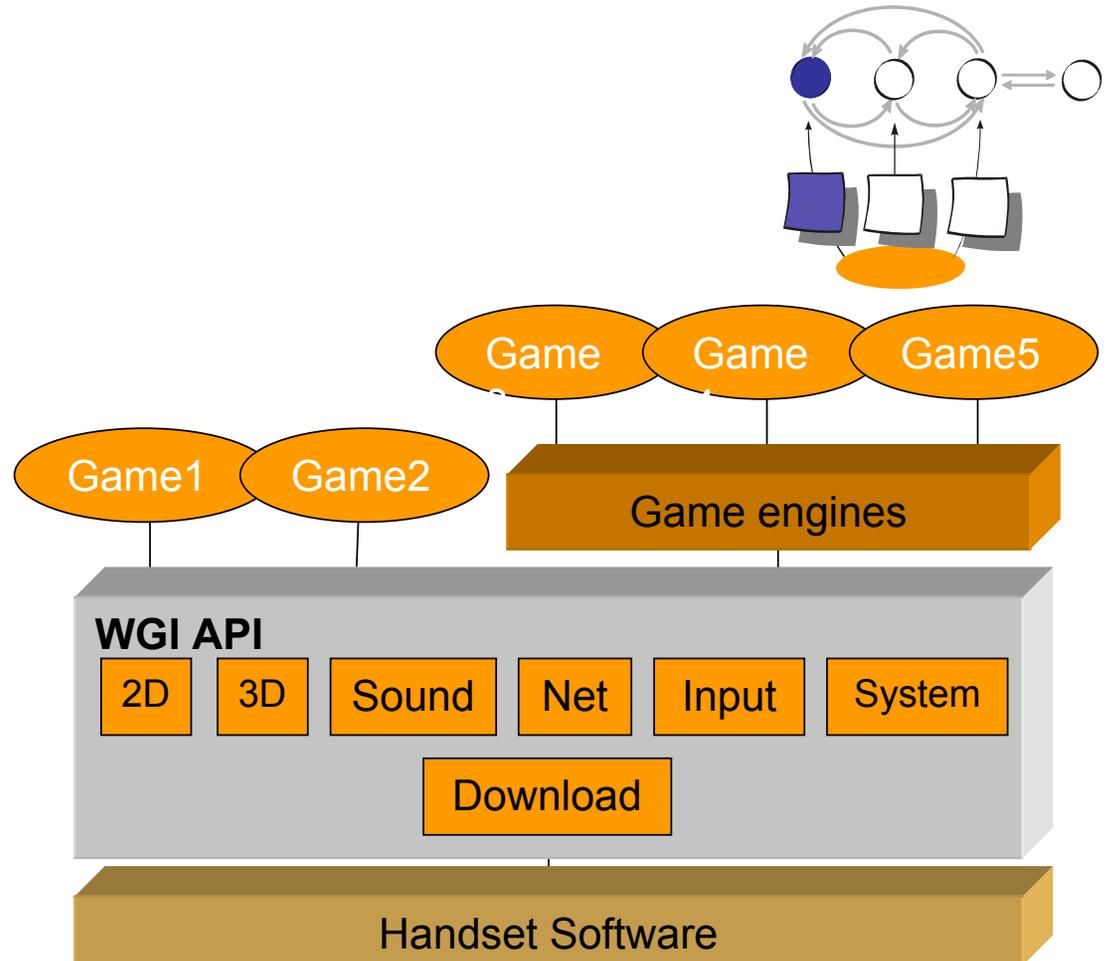
- Optimised for 3rd party developers – easy to develop games
- 2D and 3D engines
- Provides clean interfaces to
 - Network resources
 - System resources
 - Media, input and output resources
- Games are compiled for the native controller and executed faster than interpreted games
- WGE takes the most out of the available hardware
- OTA safe download (MExE compliant)



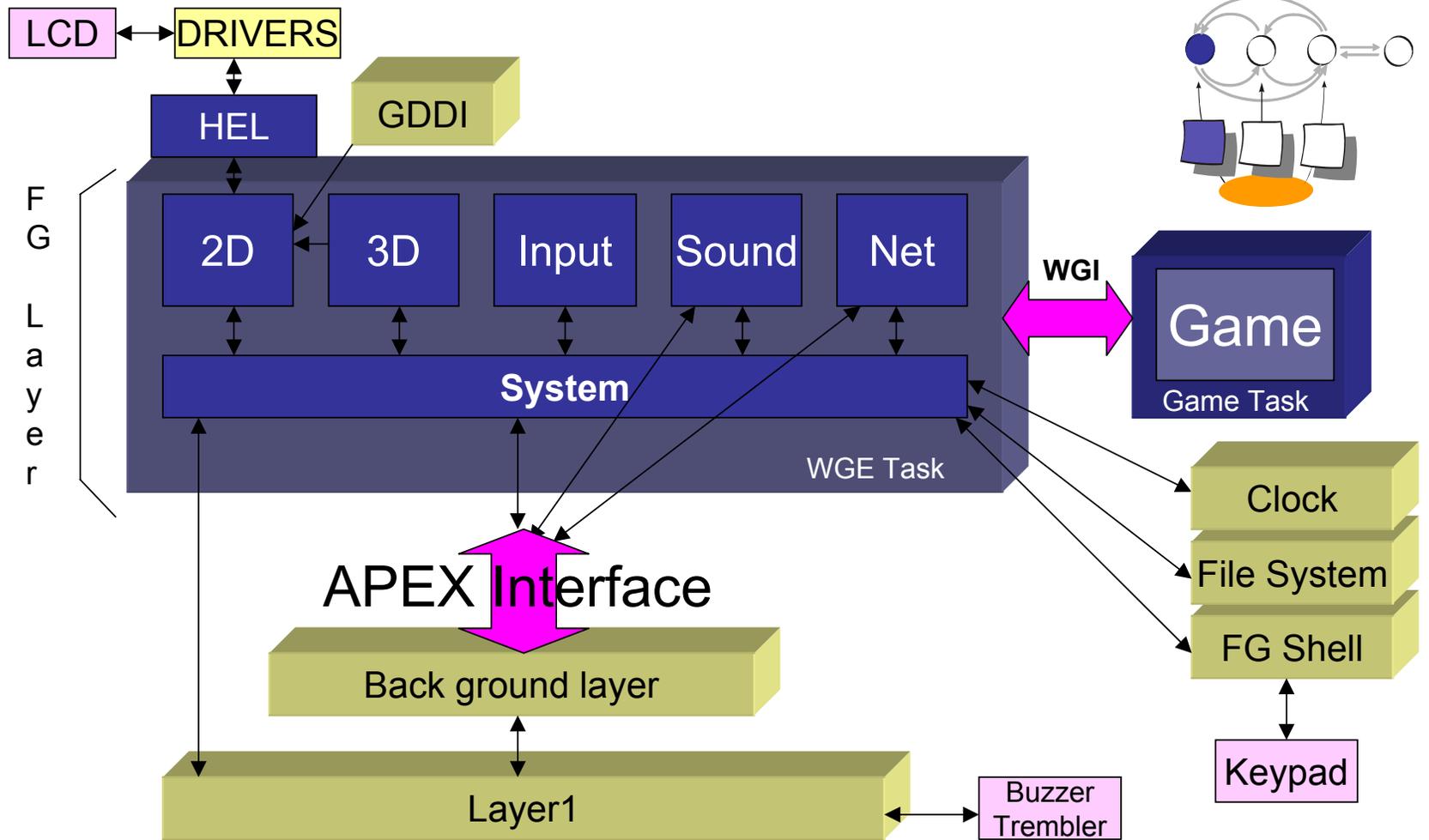
WGE Global Architecture

Modules

- WGE 2D
- WGE 3D
- WGE Sound
- WGE Net
- WGE Input
- WGE System
- WGE Download



WGE Detailed architecture



Technology overview

Handheld Gaming

Nintendo Handhelds 1980



Matrix LCD

Nintendo GameBoy 1990-2001



8 bit Z80
160*140
Bw



32 bit ARM7
240*160
Colour

Wireless Mobile Gaming

Proprietary Games
Since 1993

C code
Single Layer
BW
Low fps
Compact

ML Games
1999

Single layer
Low fps
Multiplayer



VM Games
2000
Single layer
Low fps
Sprites
BW/Colors
Power consuming

Footprint :
**150-
>400kB**

J2ME

Basic 2D gaming

WGE
2001

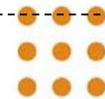
Multiple layer
High fps
Transparency
Tiles/Sprites
BW/Colors
Compact
C++ code
Multiplayer
Footprint :
40kB

WGE
2002-2003

3D
C++ AND Java Interface
MGIF Compliance

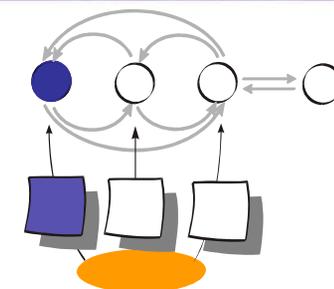


Highly Interactive
2D/3D Gaming



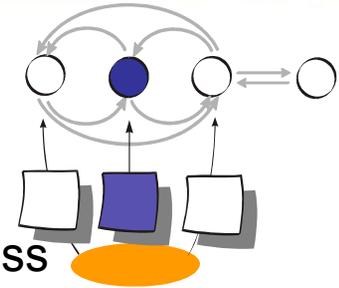
WGE Memory budget

	FLASH	Runtime RAM
WGE 2D,INPUT,SOUND,SYSTEM,NET	42 kB	0,1 kB
Secure Download Module WAP interface+crypto Can be reduced	20 kB	7 kB
Hurricane Space Fighters 4 Greyscale	30kB	1kB
Hurricane Space Fighters 256 colours palette for 16bit display	75kB	1kB



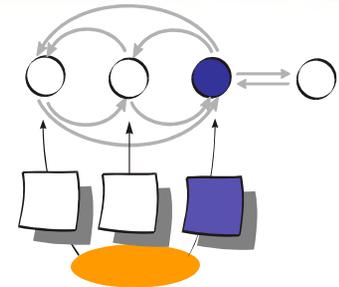
WGE SDK & support

- WGE is programmed using a C++ interface
- Open API to ensure all interested Game Developers have access
- WGE is delivered with a full SDK
 - Documentation
 - Simulator – wrapper WGE->DirectX on Win32 platforms for fast evaluation and development
 - Game Engines
 - Sample games
- Evaluation board are available
- Courses and maintenance programs

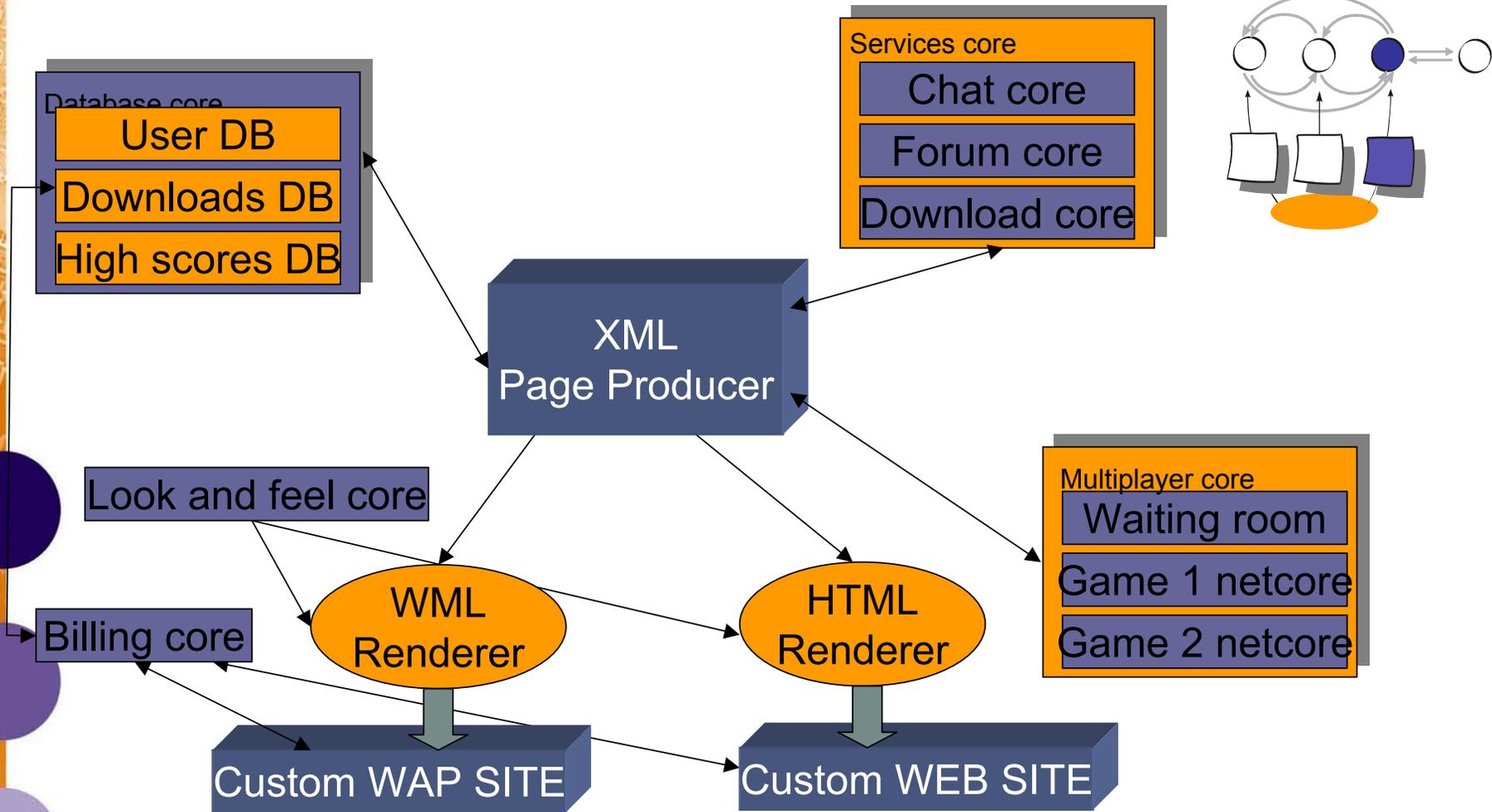


WGE Server & Support

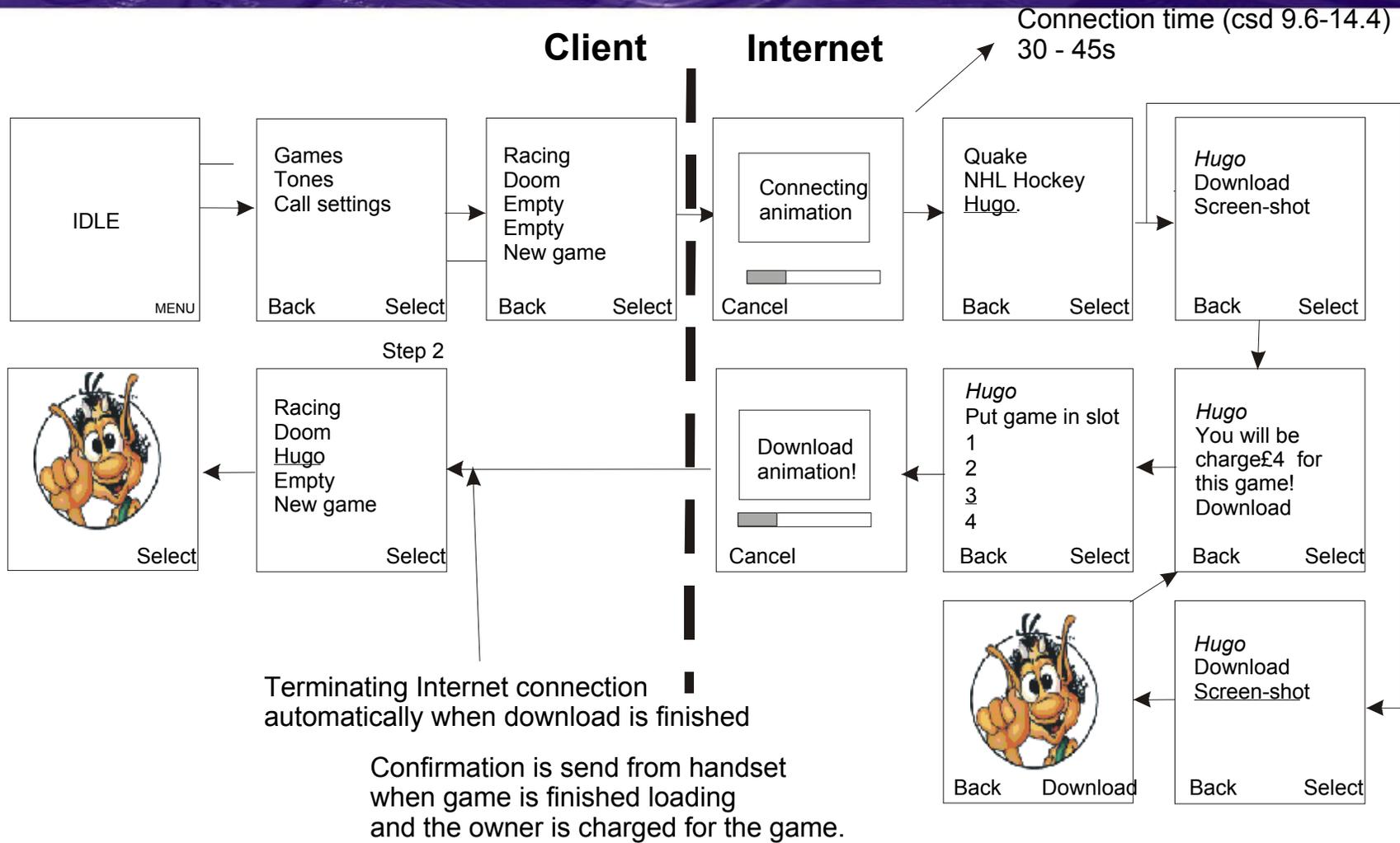
- The WGE server supports WEB, WAP or I-Mode sites providing access to wireless entertainment services and applications
- The Server contains
 - Downloadable games
 - Games related content (high score, tips, ...)
 - Games forum
 - Chat
- The server supports
 - Multiplayer games
 - Multiplatform games
 - Contests and events
 - Branding, sponsoring, commercials



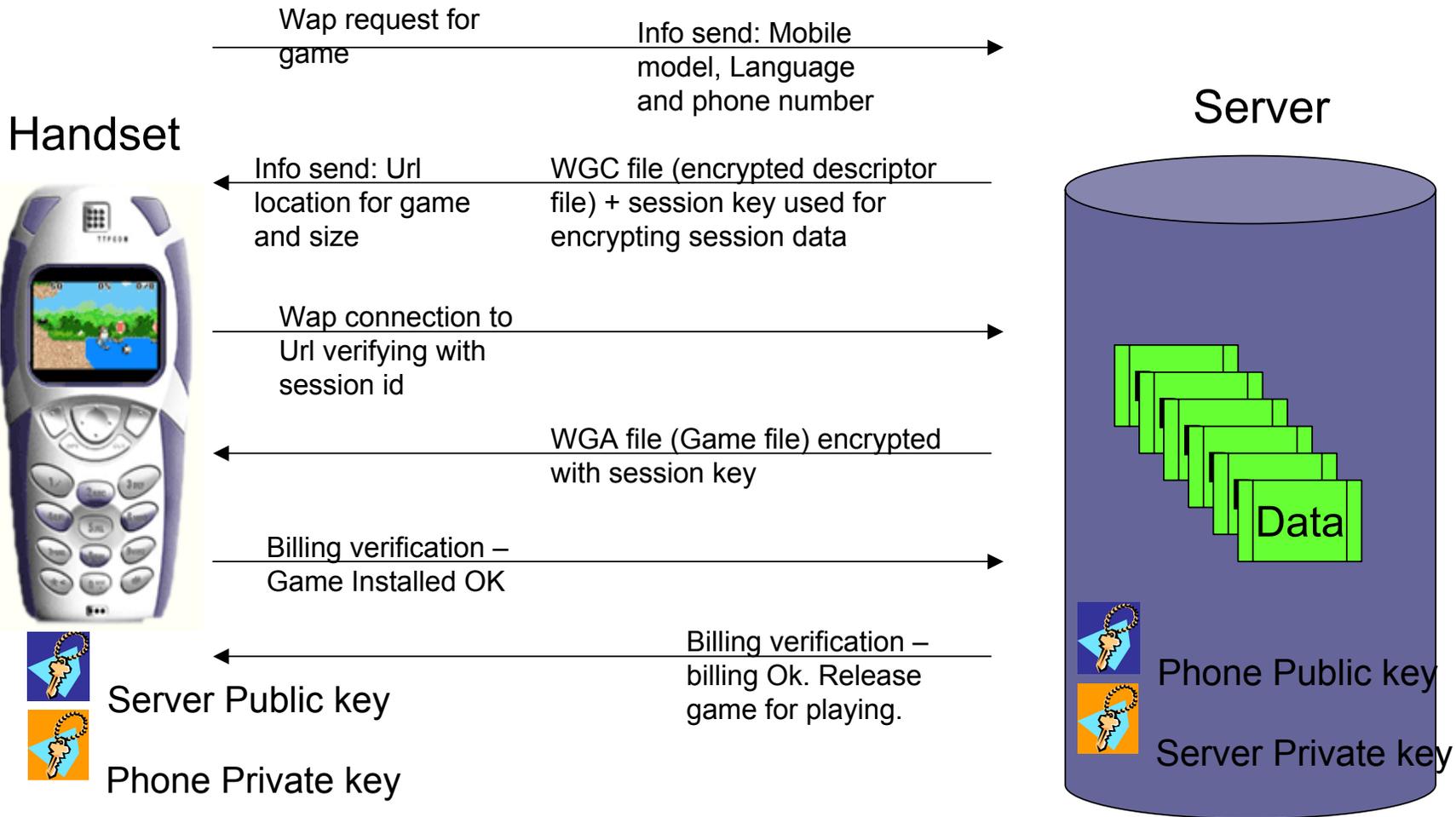
Architecture



MMI EXAMPLE ON HANDSET

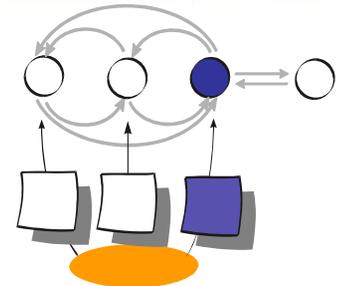


SAFE DOWNLOAD SYSTEM

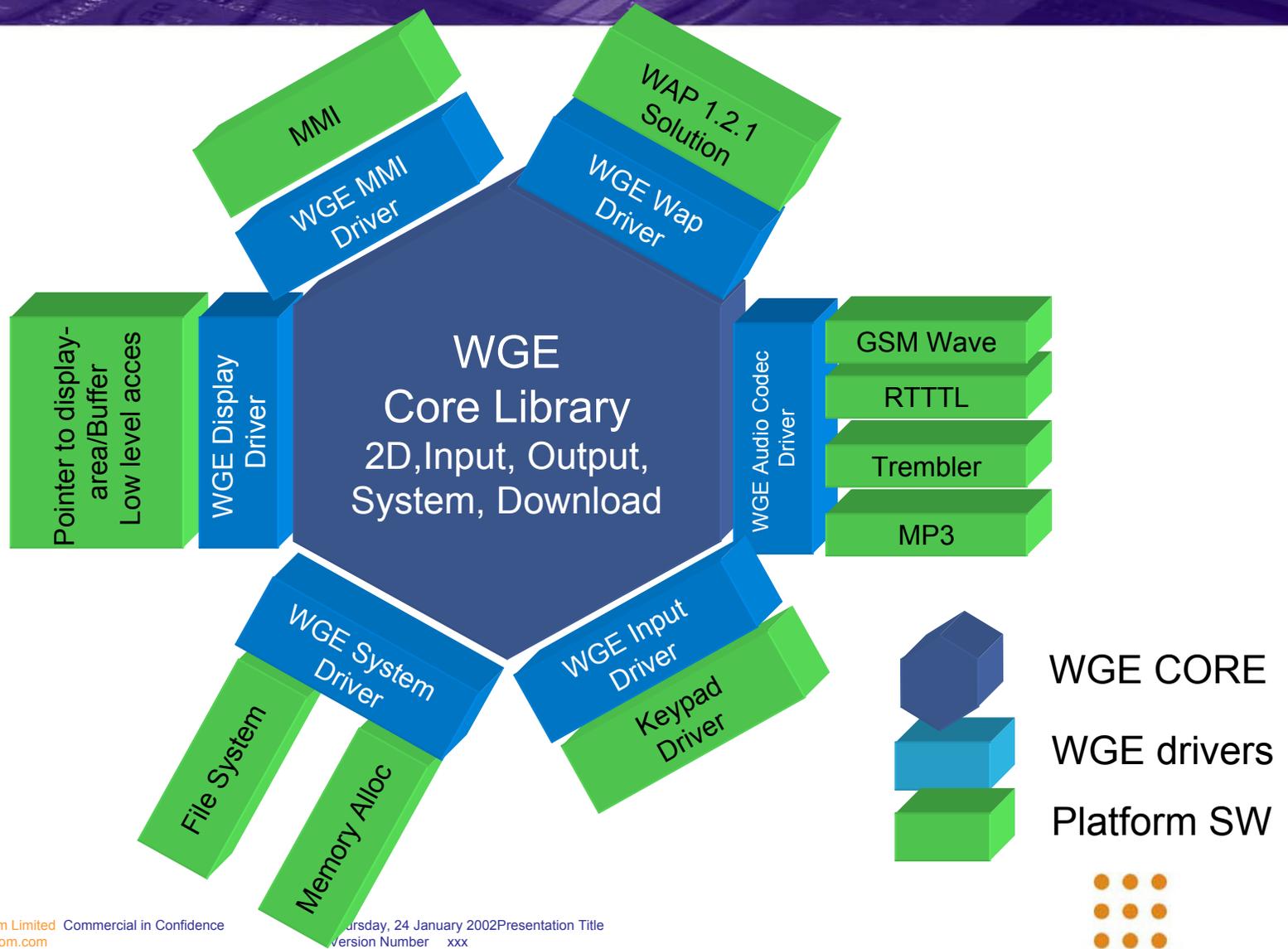


Admin features

- WWW-based admin tools for Game Handling, Tech Support, and Management Info
- Game Handling
 - Technical handling (new, edit, delete) of games, game information incl. Screen shots, categories, technical platforms and game producers
- Tech Support
 - A tool for (over the phone) supporters, which recall user information, transaction logs, and error tracing
- Management info
 - Allows executives to extract usage and revenue information about gameplay, downloads, producers, etc. for statistical analysis



Easy Porting



Porting Details - Deliverables

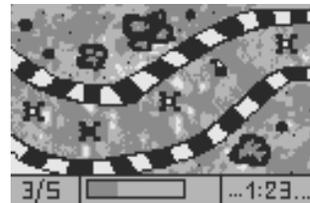
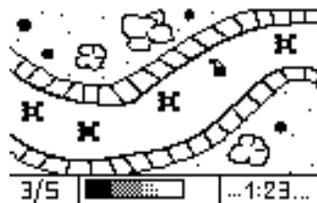
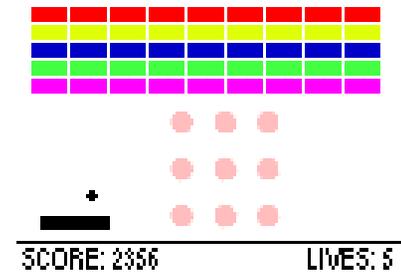
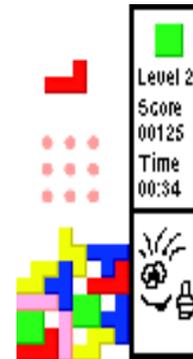
- **Compatibility**
 - Straight forward port to ALL ARM enabled handset (72% of the handsets)
 - Also possible with other technologies (SH, Infineon...) but requires more porting time
- **WGE Core**
 - ARM7/ARM9 Core library compiled for SDT or ADS ARM compilers
 - WGI API provided as h files
- **WGE Drivers**
 - Sample code provided as c/c++/h files

Porting Details

- **WGE MMI Driver**
 - WGE needs to be started from a menu item, and get focus from the MMI. WGE requires certain methods to be called. How the methods are called will depend on the platform SW system.
- **WGE WAP Driver**
 - Provides a set of signals that configures WAP for download of large files, and closes the session again. Needs to match the WAP implementation on the platform. We currently use the AU-WAP stack 1.2.1
- **WGE Audio Codec Driver**
 - Serves as a pilot for the platform codecs. Glue layer between platform HW and WGE SW
- **WGE Input Driver**
 - Handles all kinds of input devices, and needs to be linked with the existing platform input drivers
- **WGE System Driver**
 - Filesystem interface to existing platform filesystem. If none exist on the platform, the WGE internal filesystem can be used.
 - Memory malloc connection for C++ objects instantiation needs to be connected to the memory allocation mechanism of the platform
- **WGE Display Driver**
 - Needs a pointer to the display area/buffer, e.g. low level access.

Some of the old games

- Classical WGE Games



Display considerations

<u>Game Type</u>	<u>Minimum frame rate</u>	<u>Minimum pixels</u>
• Action	12 FPS	6 K pixels
• Adventure and RPG	1 FPS	6 K pixels
• Arcade	12 FPS	10 K pixels
• Board games	1 FPS	5 K pixels
• Cards, Casino, Lottery	1 FPS	5 K pixels
• Kids	1 FPS	5 K pixels
• Puzzles	1 FPS	5 K pixels
• Simulation	12 FPS	6 K pixels
• Sports	12 FPS	10 K pixels
• Strategy & War	1 FPS	6 K pixels

A wide range of games are available for WGE for different displays

Game studios



ITE Games

- Hugo on TV in 25 countries
- ITE is developing games for WGE as well as GameBoy/Playstation
- ITE Games targets all customer segments
- Examples (<http://test.ite.dk/Games/defaultDK.htm>)



ITE Games 1/4

HUGO BALLOON LANDER



You have to help Hugo to land his balloon on safe ground.

HUGO FROG FIGHTER



Hugo has to jump around save the frogs from Don Kroko and his soldiers.

HUGO HUGOCOPTER

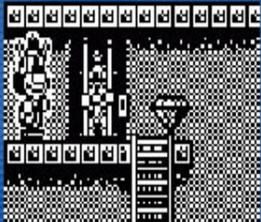


Use you Hugocopter to collect the pieces of you plane that is spread around the Island. Will you get away alive?



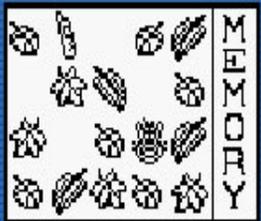
ITE Games 2/4

HUGO BLACK DIAMOND FEVER



Hugo in his first mobile game platform adventures. This is an adaptation of the original Nintendo Gameboy Color game.

HUGO MEMORY MADNESS



This is a traditional memory game with a twist. Will you remember?



ITE Games 3/4

HUGO BEETLE BATTLE



Will your set up of bugs win against Hugo's friend Jean-Paul in this challenging memory fighting game?

HUGO ON THE VULCANO ISLAND



This challenging Hugo graphic adventure takes place on the Jungle Island. Will Hugo get to the top of the volcano and free your family?

THE GLADIATORS BAR GAMES



This multiplayer games lets a party of up to 10 people play traditional card and dice bar games against each other.



ITE Games 4/4

THE GLADIATORS GRENADE FIGHT



Through grenades and stuff and avoid what's coming your way in this explosive game.

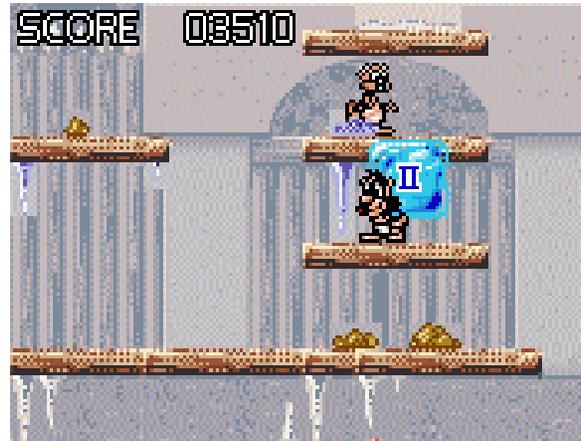
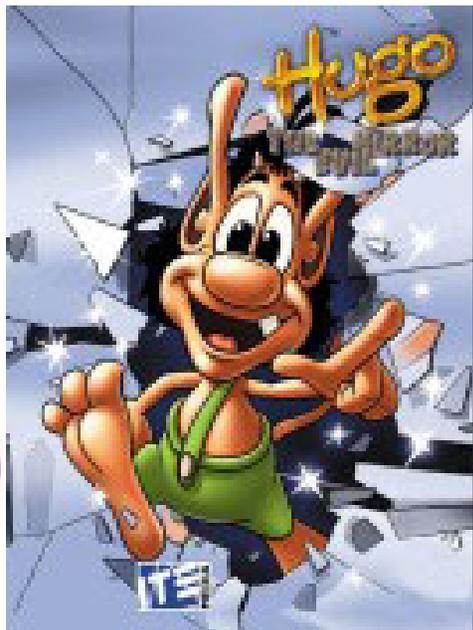
THE GLADIATORS MAIL BOMB



This 2 player fighting game let you challenge friends around the world.

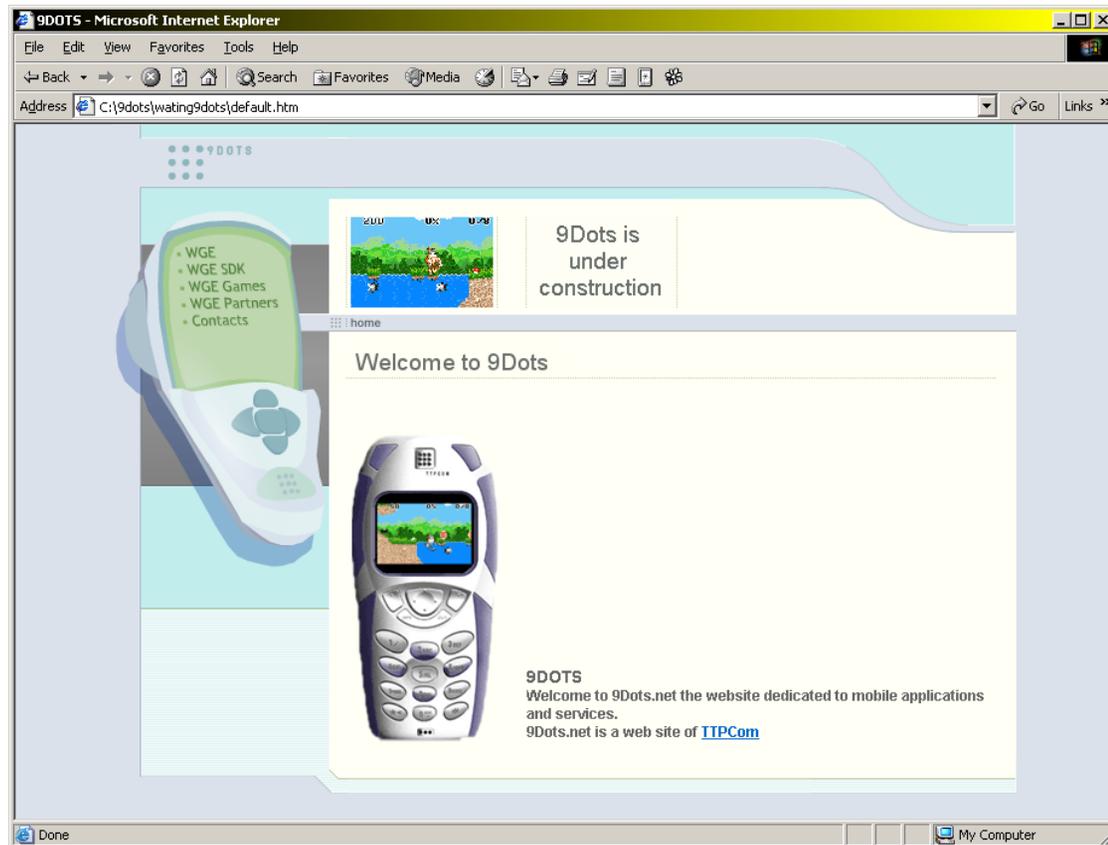


ITE Games (Port from GameBoy Advance)

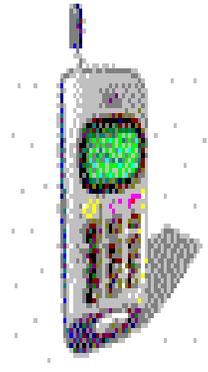


More information

www.9dots.net



Questions



Thank you Questions?