XDOP

Whitepaper

XDOP is an attempt to define a universal, simple and lightweight device communication protocol which can be used for controlling devices. As for now there is no standard protocol on the market which can be used to control various devices from very limited microcontrollers to high end devices. Every device manufacturer defines his own protocol which leads to more effort because with every new device a vendor developer must learn and implement a new protocol.

XDOP tries to close this gap by defining a transport independent protocol which main application areas are the Universal Serial Bus (USB), LAN (Ethernet), WLAN, Bluetooth, ZigBee but also older transport layers such as RS-232.

XDOP itself is a very simple and lightweight protocol, which can be implemented for almost every microcontroller (embedded systems). The minimal code size for XDOP will be in the most cases between 2k and 8k, depending on the number of variables, actions and events.

The design of XDOP is based on the following requirements

- XDOP is a universal control protocol for device objects
- The device objects are accessed by numeric indexes (mapping between indexes and names)
- The device delivers a description of its objects
- XDOP is independent of any transport layer
- The communication messages are mostly text-based and therefore human-readable
- XML can easily be embedded into the messages
- The protocol overhead is minimal
- The parsing of the messages is very simple
- The device can send events

XDOP is for devices what the SOAP protocol is for web services. XDOP defines no addressing or discovery mechanism because this is something that depends on the application and can be done by the underlying transport layer.

XDOP is the result of a 10-year evolution, influenced by many customer projects and other technologies like UPnP, DPWS, SOAP, XML, JSON and many others.

XDOP Example

A control point sends a text argument for action 1 to a display service in a device:

```
øA1s1øVHello world!øZ
```

The service s1 displays the message "Hello world!” and replies to the control point:

```
øA1s1øZ
```

Client

Supported client platforms:

- Microsoft Windows
- HTML5 Browser (WebSocket, JavaScript)
- Android / Linux
- iOS

Scales from smartphones and mobile devices to high-end server platforms.

Client Application

XDOP Middleware

Service objects with
Actions
Variables
Events
Callbacks

Transport Abstraction Layer (TAL)

Transport Layer

TCP/IP Sockets

USB Bulk Endpoints

XDOP Serial Transport

Other Interface APIs

Code Generator

Generates source code for the given device description:

.NET, Java, JavaScript (HTML5)

Device Model

Device Description
Type
Identifier
...

Service List
Service 1
...
Service n

Service n

Service 1
Type
Actions
Variables
Events
Callbacks

Designer

XDOP Studio

Integrated Development Environment (IDE)

Contains:

- Designer for creating and managing device descriptions
- Code generators for client and device source code
- Test application and simulator for testing and diagnostic purposes

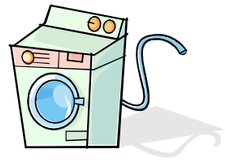
System requirements: Microsoft Windows

Device Test

Test Application,
which plays the role of a client application and enables and visualizes the communication with a device.

Client Test

Device Simulator,
which plays the role of a device and enables and visualizes the communication with a client.



Code Generator

Generates source code for the given device description:

.NET, C/C++

Device

Supported device platforms:

- Microsoft Windows
- Android / Linux
- Other microcontroller environments

Scales from compact 8-bit micro-controllers to high-end embedded platforms.

Device Application

XDOP Middleware

Service objects

TAL | SPI TAL

Transport Layer

See Client

Option:

XDOP Chip

Custom Physical Layer and/or Communication Modules

Physical Communication Layer

LAN, WLAN, WAN, 3GPP (UMTS, LTE), USB, Bluetooth, ZigBee, RS-232, RS-485, Custom ...

Products

XDOP

XDOP is a royalty-free protocol and there are no charges or annual payments for the use of the protocol. The protocol definition can be found in the “XDOP Architecture Document” on the XDOP Website http://www.xdop.info, where it can be downloaded.

XDOP Studio

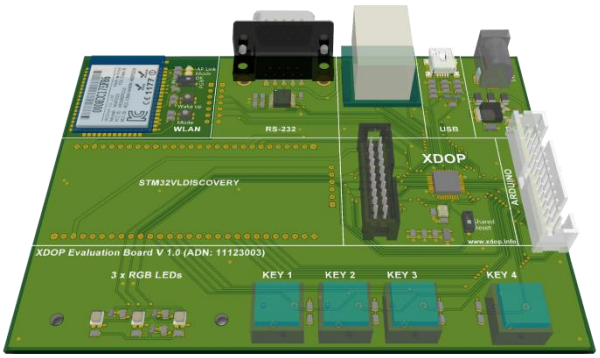
XDOP Studio is an integrated development environment (IDE) for designing XDOP descriptions, generating XDOP middleware source code and Testing XDOP communication. It is currently under development by Altotec and will be available in 2013.

XDOP Chip

The XDOP Chips is an optional microcontroller, which can support a main microcontroller by preprocessing XDOP messages and taking over low-level communications tasks. It is planned to generate source code with the XDOP Studio for some selected microcontroller derivatives.

XDOP Evaluation Board

The XDOP evaluation board models a device service with 3 RGB LEDs and 4 keys. A client (e.g. a .NET test application on Windows) communicates with the device service on the XDOP microcontroller either through WLAN, RS-232, LAN or USB.
Other drop-in device application boards are optional (e.g. STM32VLDISCOVERY, Arduino)



Further XDOP information

Please visit the XDOP website http://www.xdop.info to get more XDOP related information.

Altotec Expertise

Altotec has invented the XDOP protocol with the experience of more than 10 years contract development of many applications in the area of device communication

XDOP is ready for integration into customer projects.
An evaluation board is available for first steps. The final tools are currently under development and are backed up by a ZIM program of the BMWi until the end of 2012.

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