Welcome
prpl Summit 2019
Building Apps & Services on OpenWrt/prplWrt Based Platforms w/(o) High Level API

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Prpl Vision of a Software Vendor
What Do ISPs Want?

Vendor Independence
Reduce Time to Market
Differentiate Fixed-Net Offerings
Generate New Revenue Streams

How is it possible?

By keeping application and service development
• quick and cost-effective
• deployable across multiple hardware and software platforms

What Do ISPs Need?

A middleware supporting application environments that work smoothly and consistently across various SoCs and/or software platforms
App & Service Development Environment Checklist

APIs
• To abstract and expose configuration, functions and events covering end-to-end functionality of the gateway

Security Layer
• To secure the interaction between the APIs and the consumers of the APIs by providing access control and session handling

Protocols
• To expose APIs northbound over various protocols in order to give the developers the flexibility to choose from a large selection of tools for building applications and services.

Containerization
• To increase portability and to improve scalability and security
Ticking off the Checklist
on OpenWrt/prplWrt Based Systems

✓ APIs
  • OpenWrt uBus/UCI APIs + Vendor Extensions

✓ Security Layer
  • RPCD+ Granular ACL and Session Handling

✓ Protocols
  • WSS, HTTP(s), MQTT, etc.

✓ Containerization
  • LXCs
Example Architecture Overview

- Value Added Services
- Northbound APIs
  - Protocols Layer (Communications & Messaging)
  - Security Layer (Session & ACL)
- System IPC
- Userspace Applications Controlling Gateway Functions
- Configuration Database
- Linux/BSP
- Hardware

IOPSYS Software Solutions AB
(OpenWrt) Building Blocks for a Service Development Environment

**OB-USPA (obuspa)**
- USP Agent shared by BBF/CommScope and integrated on top of OpenWrt/prplWrt by IOPSYS

**USP Daemon (uspd)**
- A daemon sitting on top of libbbfdm and exposing usp object over uBus

**BBF Data Models Library (libbbfdm)**
- A C library exposing USP/TR-181 API with mappings to OpenWrt uBus/UCI objects with vendor extensions

**WebSockets (owsd)**
- A WebSocket server integrated with OpenWrt’s ubus and rpcd.
- Also extends uBus over network (uBus-X) by creating proxying objects to master uBus on a multi-node network environment

**WebGUI (juci)**
- A fast and modular AngularJS based WebGUI framework
BBF Data Models Library -> USP Daemon -> OB-USPA

**BBF Data Models Library (libbbfdm.so)** maps data model (TR-181, TR-143, TR157, etc.) nodes to UCI configuration parameters and uBus objects/methods, and exposes USP/TR-181 C API

- The mapping is done via a JSON file where the code is generated from. Manual code writing is only needed if direct mapping to uBus/UCI is not possible.
- It also supports dynamic parameter addition by adding a new JSON file with correct mappings which allows exposing new parameters on runtime.

**USP Daemon (uspd)** is responsible for exposing USP/TR-181 API of libbbfdm.so over ubus via an object called usp.

- It creates set,get,add,delete and operate methods.
- USP features such as regular expression matching, alias searching and commands are supported via this ubus object.
- It can also be configured to expose objects more granularly, for ex: usp.Device.IP.Interface, usp.Device.WiFi.Radio.1, etc.

**OB-USP Agent (obuspa)** is the USP agent shared by BBF/CommScope and integrated by IOPSYS on top of uBus usp object. Parameters and commands are registered at vendor file of obuspa and one-to-one mapped to uBus usp object.
IOPSYS Software Solutions AB
FAQ

If you already have a framework allowing consumers to build SoC agnostic apps and services, why do you need a high level API?

You can build applications and services on OpenWrt/prplWrt based platforms and run it across devices based on various SoCs, but:

- End-to-end converage of the gateway functions depends on the vendor providing OpenWrt/prplWrt based software and their API extensions

- If you want to move your services on to another OpenWrt/prplWrt based software:
  - next vendor must follow the APIs defined by the previous vendor
  - or you will have to remap towards the new vendor extensions

- You CANNOT move your services on to non-OpenWrt based software platforms
(OpenWrt) Building Blocks of a Service Development Environment with High Level API

- Northbound API based on well-defined vendor independent object models
- Application and Service development is to be moved on top of High Level API
- How to implement the High Level API is up to the vendor
- ISPs can seamlessly move their applications and services across not only devices based on various SoCs but also devices running different software platforms
Source Code Access to Framework Components

OpenWrt Feed:
• https://git.prpl.dev/prplwrt/feed-prpl

OB-USPA (obuspa):
• Origin: https://github.com/BroadbandForum/obuspa
• Fork with OpenWrt/prplWrt integration: https://dev.iopsys.eu/fork/obuspa

USP Daemon (uspd)
• https://dev.iopsys.eu/iopsys/uspd

BBF Data Models Library (libbbfdm)
• https://dev.iopsys.eu/iopsys/bbf

WebSockets & uBus-X (owsd)
• https://dev.iopsys.eu/iopsys/owsd

WebGUI (juci)
• https://dev.iopsys.eu/iopsys/juci
Questions?

Thank You