prpl Working Groups roundtable

- Certification Technical WG
  - Timothy Winters

- prplOS WG
  - Olaf Wachendorf

- prplMesh WG
  - Frederik Van Bogaert

- Low Level API WG
  - Wouter Cloetens

- LCM Life-Cycle Mgmt WG
  - João Freitas

- prplSecurity WG
  - Brendan Black & Evgeni Tzvetanov

- High Level API WG
  - David Cluytens

Moderator: Dave Barr
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prpl CERTIFIED Working Group Updates

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2023 Achievements

- Program Guide for Certification Tests (on prpl public website)
- High-Level API Test Plan (published on prpl public website)
- prpl Data Model (initial version published on Confluence site)
Work Items for 2023

● Test devices for High-Level API
  ○ Initial devices certified
  ○ Finalize Data Model profiles

● prplOS Certification - early 2024
  ○ Focus on High-Level API Data Model Functionality
  ○ Develop parts of the test plan
Roadmap 2024 and beyond

- **Low-Level API Certification**
  - Focused on Hardware
  - Additional tools necessary

- **prplMesh Certification**

- **LCM Certification**
  - Configuration and testable items to be discussed
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prplOS working group

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prplOS working group achievements

prplOS-3.0 released

- OpenWrt 22.03, Linux 5.15 LTS
- Latest prplWare integrations: prplMesh 4.1.0, pwhm 4.18.4, LCM 1.4
- Wi-Fi 6E (6GHz)
- mod-dhcpv4c (replacing udhcpc client)
- unbound-prpl (replacing dnsmasq as local DNS server)
- Global Time-Of-Day scheduler facility

- Supporting multiple carrier-grade prpl Foundation reference HW platforms
  - MaxLinear’s Open Service Platform (OSP)
  - WNC’s Haze Qualcomm platform

- TR-181i2-v16 (data model updates for Firewall and SSH)
- TR-181 Logical Interface Manager
- IPDiagnostics UploadDiagnostics and DownloadDiagnostics methods
- LCM network management and host object
prplOS CI ready for XGSPON

Congrats to first the XGSPON platform successfully integrated into prplOS CI:

MaxLinear’s AnyWAN™ URX
prplOS Working Group 2024 Roadmap Wish-List

- First deployments
- Updates to OpenWrt & Kernel
- Evolution on the Application Development Framework
- Wi-Fi 7, WiFi Sensing extensions
- prplOS profile for Wi-Fi extenders
- Power Management
- Matter IoT (Thread)
- Fixed Wireless Access
- Enhance resource- and process-monitoring
- Additional carrier-grade reference platforms
- Touchscreen support
- DHCPv6, UPnP-IGD carrier enhancements
- LCM hardening
- Your ideas?...
prplMesh 2023 Successes

- EasyMesh R4 and R5 support - verification in-progress
  - BSS Coloring (spatial re-use)
  - Service Prioritization (QoS)
  - R5 now in development

- "Virtual BSS" steering (collaboration with CableLabs on Mobile Wi-Fi. See their demo.)

- Continued collaboration with BBF and their sister-project OB-MAP for Multi-APs

- Wireless Hardware Manager adoption
  - Harmonized platform-independent framework
  - Replaces vendor-specific and inflexible nl80211 backends
  - Unified implementation of TR-181 Device.WiFi Objects

- Platform-independent persistent storage of configuration settings

- Backhaul Optimization refinements
  - Capability to enable/disable multi-hop backhaul "daisy-chain"

- Wi-Fi Sensing basics: CSI stream delivery to containerized sensing apps
prplMesh wishlist for 2024

- HW support
  - More next-gen Wi-Fi 7 SoC vendors (beyond MaxLinear and Qualcomm)
  - New carrier-grade HW platforms into prplMesh CI/CD
- Wi-Fi 7 support (e.g., MLO Backhaul)
  - EasyMesh 2024 release compliance
  - Including Early AP capability
- Wi-Fi Puncturing (to avoid interferers)
- Wi-Fi AFC (to enable 6GHz at standard power)
- DPP support
  - DPP Cloud Provisioning
  - Enables backhaul link security over IEEE 1905
- Wi-Fi Sensing enhancements
  - Coordination of multiple participating stations
  - Multicast streaming of CSI data to multiple sensing application containers
Testing and Certification

- Wi-Fi Alliance EasyMesh Testbeds used for weekly, daily and CI/CD
  - some testing of WFA Data Elements

- prpl Certifications
  - Pivoting to CDRouter-based testing (away from Boardfarm)
  - Certify prpl’s superset additions beyond EasyMesh (i.e., prpl Data Model)
What is the Low-Level API?

Hardware abstraction
Benefit: portability in code and behavior

Policies: align with open source

 Mostly Linux kernel API

 Also user-space projects such as hostap and ModemManager
2023 Accomplishments

- Ethernet port name / Linux interface name modeling
- Cellular
- QoS across Wi-Fi mesh
- Wi-Fi Sensing
- Wi-Fi 7
Challenges

- Wide time zone range (far East to U.S. Pacific)
- Very Limited Resources
- Need to engage open-source communities (Linux, hostap)
- Verifying compliance is not simple. Combination of:
  - code audits -- can reveal gaps in Specification / API
  - blackbox testing -- prplOS components and prplMesh expose low-level functionality through data model, using LL API
  - whitebox testing -- may be hard to automate
Call to Action

● New feature standardization before implementation
  ● Opportunity for SoC vendors to work on new API's together
  ● Current model:
    ● implement proprietary API
    ● be forced to add new standard API
    ● deprecate old proprietary API with ongoing support for deployed projects
2024 Roadmap wishlist

● Definition:
  ○ IoT (802.25.4, BLE)
  ○ Wi-Fi (Wi-Fi 7, gap analysis)
  ○ Wi-Fi Sensing (phase 2, IEEE802.11bf)
  ○ Display / touchscreen
  ○ SFP
  ○ Power consumption
  ○ Multicast

● Certification

● Implementation
  ○ Interface naming, Ethernet WAN interface selection, Wi-Fi Sensing, pushbutton, QoS (.schedulers, mesh), cellular
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prpl LCM (Life-Cycle Management)

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2023 Achievements:

Releases
- LCM 1.5 (October)
- LCM 1.4 (July)

Builds
- Crun (February)
- OCI Runtime Bundles (March)

Features
- “Containers additional rights” (NetworkConfig, HostObject).
- Pre-embedded Containers & Auto-Detection

Platforms
- RDK (rbus)
- prplOS

Bug-Fixes
- Reliability & Stabilization.
- Performance (e.g.: run operations in parallel).

Data-Models
- NetworkConfig (param in InstallDU and displayed in EE).
- HostObject.
- ApplicationData. (standardization).
2024 Wishlist (Highlights)

Data-Model Extensions:
- Close gap with TR-181 standardization.
- Linux Capabilities.
- Constraints Management.

Bug-Fixes
- Stabilization.
- Interoperability Improvements (RDK).

Scope
- mDNS Discovery (for containers).
- Unprivileged Containers (full support).
- ApplicationData (implementation).
Certification

Unit Tests:
- ~50 - 80% Code Coverage.

Integration Tests:

System Tests:
- USP / TR-369
prplSecurity Working Group Update
WG Objectives & Organisation

Your Workgroup Chairs (since 2019):

Brendan ‘I’m Not The Expert’ Black <brendan.black@prplfoundation.org>
Evgueni ‘Joining’ Tzvetanov <evgueni.joining@prplfoundation.org>

Working Group Objectives: (the very short version)

Create security standards for prpl, based on best practices from wider industry.
Drive security practices within prpl ecosystem, based on the those standards.
2023 Successes

- **prpl Packet Intercept API**
  Implementation in gitlab repo since Jan - thanks to Marten et al.
  Testing & Feedback gratefully received from BitDefender → Improvements, including a future Fast-Path approach

- **prpl Secure Manufacturing Data Standard published**
  Standardizes formats & methods of securing sensitive data embedded in CPE devices at time of manufacture

- **prpl Secure Boot Requirements published**
  An extensive process to refine & generalize the original work contributed by Orange

- **prpl Introduction to Secure Boot White Paper published**
  A general introduction to the technology & terminology
Workgroup 2024-2025 challenges

- **prpl Flash Layout Recommendations**
  Currently in final phase of work, that leads into:

- **Secure Firmware Upgrade discussion**
  Compare & contrast existing vs. proposed solutions

- **Software Bill of Materials**
  A key step to introducing:

- **prpl Security Incident Response Process / Team**
  This may require sponsorship (get your checkbooks out...)

- **prpl Standard Crypto API**
  That works whether or not you have a TEE or Security Co-Processor

- **Flow Management API**
  Needed for flow monitoring, distinct from inspection or diagnostics

- **BBF Standardisation of Security-related APIs**

- And lots more...

How many beers do I owe Evgueni now?
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prpl High-Level API Working Group Update

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What happened

- prpl contributions to BBF released as TR-181i2-v16 and TR-369a3
- Official UDS aka “internal” iMTP Specification is now available
- OB-USP-Agent open-source now being updated to latest Specs (co-sponsored by AT&T and BBF)
Contributions to USP and TR-181i2-v16 and -v17
via close collaboration between prpl and:

- Specification enhancements
- Syslog management
- Log Rotation management
- RouterAdvertisement: RDNSS and DNSSL options
- DNS: Zone File concept and tweak cache settings
- DNS: SD Advertisement
- DSL: xTU-C and xTU-R parameters
- PON: Password support added
- WiFi: AssociatedDevice KPIs

Firewall:
- InterfaceSettings: ICMP echo reply, StealthMode, Spoof protection.
- Lease duration for Pinhole and DMZ entries
- Origin parameter for PortTrigger, PortMapping, Pinhole and DMZ
- ALG support
- MaxNumberOfPortMapping/PortTrigger

SoftwareModules:
- ModuleVersion parameter
- NetworkConfig
2024 Roadmap

- USP v1.4 enhancements for Internal Services
- Data Model contributions (expansions & enhancements)
- Enhance the Software Modules Management API
- Enhance the HL-API to support more and better Apps
Thank you

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