CWMP BOF

February 7, 2012

Irvine, CA

PWG F2F Meeting

Agenda

- CWMP BOF Overview
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- Next Steps
- Supplement
  - CWMP Overview
  - CWMP Overview – more details
  - Why use CWMP for Printers/MFDs?
  - Benefits of CWMP for Printers/MFDs
  - Collaboration Approach
  - CWMP Functionality
  - Celstream's Print Service Attribute Table

CWMP BOF Overview

- CWMP is a standard internet application protocol developed by Broadband Forum (BBF) that allows all IT devices in a customer premise be remotely managed by a central Auto-Configuration Server.

- CWMP BOF is providing guidance for developing the standard CWMP data model for MFD services based on PWG Semantic Model, so that MFDs of all brands can be remotely deployed, installed, and managed through entire life cycle like all other IT devices (routers, PCs, servers, smart phones, SetTops, ..., etc.).

- Once the recommended CWMP data model for MFD services have been developed, BBF members from PWG will propose it to BBF as a standard.

Current Activities

- Working on PWG white paper on CWMP data model for printers and MFDs -
    - Rationale for developing the standard model
    - Guidance for remote management of Printers and MFDs via CWMP
    - Guidance for CWMP Proxy implementations that communicate with Printers and MFDs using their native IPP, SNMP, web services, etc.
    - Data model for Printers in first phase, based on the BBF Data Model Template for CWMP-Enabled-Devices (TR-106)
    - Data model for MFDs in second phase.

- Working on the translation tool for mapping PWG SM to CWMP data model for MFDs – first phase: Print Service.

Status

- The first Machine translation of PWG Print Service XML Schema to TR-106 based CWMP Print Service XML Schema is complete. Thanks for Celstream engineering team's impressive speed.

    - Data model translation document, XML schema, and code (to be reviewed) –

    1) Document: "Translation of PWG Semantic Model to CWMP Data Model"
    ftp://ftp.pwg.org/pub/pwg/BOFs/cwmp/cwmp-pwgsm-to-cwmpdm-20120204.docx
    2) Presentation slides of 1)
    ftp://ftp.pwg.org/pub/pwg/BOFs/cwmp/cwmp-pwgsm-to-cwmpdm-20120204.pdf
    3) Translated XML file of CWMP Data Model
    ftp://ftp.pwg.org/pub/pwg/BOFs/cwmp/cwmp-data-model-20120130.xml
    4) Translator code:
    ftp://ftp.pwg.org/pub/pwg/BOFs/cwmp/cwmp-translation-dm-20120204.zip

Status

- Review issues of the first Machine translation

  - How to fill "Access" attribute of parameters and objects?
  - How to fill activeNotify, forcedInform and requirement attributes for translated objects and parameters?
  - How to fill description text of objects? manually? Skip?
  - Naming optimization needed
  - How to translate "choice" in complex type?
  - How to translate "union" member types – either NMTOKEN or string => all string?
  - How to take advantage of object-oriented structure for CWMP data models used in BBF CWMP namespace

Status

- Guidance whitepaper in progress – "Broadband Forum CWMP Multifunction Device Data Model"
  ftp://ftp.pwg.org/pub/pwg/BOFs/cwmp/white-cwmpmfdmodel10-20111205.pdf

  - Considering the following changes in CWMP data model –

    - Power Management elements:
      - Read-only Power Log to be added to Processor subunit
      - All other power management elements already in all subunits

    - Support of Capabilities but not CapabilitiesReady

    - Add CapabilitiesFactory:
      - "as-shipped" capabilities of the device, before any site admin configuration
      - For recovery of factory defaults when necessary
      - Read-Only

    - No MediaColDatabase: just Media and MediaType

    - Exclude ActiveJobs (but keep JobHistory):
      - Focus on Service and Device management (instead of full MPS)

Status

- Celstream has provided a top-level list of management elements for printers implemented in a CWMP proxy.

- Received a list of Printer management elements generated in the WIMS WG to be considered in PWG SM –

  ftp://ftp.pwg.org/pub/pwg/wims/white/Management_elements-20120116.pdf

  - Observed that printers and MFDs have more network configuration elements than what are included in the common device data model of BBF CWMP.

  - Will consider including additional printer network and font configuration elements added to PWG SM when that occurs.

- Future – BBF CWMP Data Model for Printers (TR-xxx)

  - BBF members (from PWG) should propose a new BBF project

Status

- Current approach for BBF data model for Printers
  1) Define translation rules for PWG complex datatypes and element groups
  2) Machine-translate all PWG SM XML schema well known values and datatypes into control files for the tool
  3) Machine-translate the PrintService subtree of the PWG SM XML schema into the equivalent BBF model/object/sub-object/parameter statements, with BBF parameters mapped one-to-one from PWG SM simple XML elements.
     - **Thinxtream software team has developed the first version of machine-translation tool**
  4) Hand-edit machine-translated CWMP data model to fix artifacts and add XML documentation (e.g., PWG SM mapping notes)
     - **Ira, Nancy, Bill, Pete (?) and perhaps others to ensure the closest mapping from the PWG semantic model XML schema**

Next Steps

- Review and update the whitepaper

- Update and enhance the machine translator to cover changes needed in the CWMP model

- Next teleconference: Friday 24 Feb 10am EST?

Supplements

CWMP Overview

- CWMP (CPE WAN Management Protocol) is a Broadband Forum standard (TR-069) that defines a set of WAN management interfaces between an Auto-Configuration Server (ACS) and a set of CWMP-enabled CPEs (Customer Premise Equipments)

- CWMP supports service contract based **remote** and **secure** management and provisioning of CPEs *throughout their entire lifecycle* – **deployment, installation, management, and support**

- CWMP supports all of the following functionality via an ACS:

  - Auto-configuration and dynamic provisioning of CPEs and services

  - Software/Firmware image management of CPEs

  - Software module management of services

  - Status and performance monitoring of CPEs and services

  - Diagnostics execution and reporting of CPEs

  - Standard interfaces to policy servers, call centers, and business applications (e.g. OSS/BSS/CRM)

  - Strong security – transaction confidentiality and data integrity

CWMP Overview– cont'd

The following figure places TR-069 in the end-to-end management architecture:
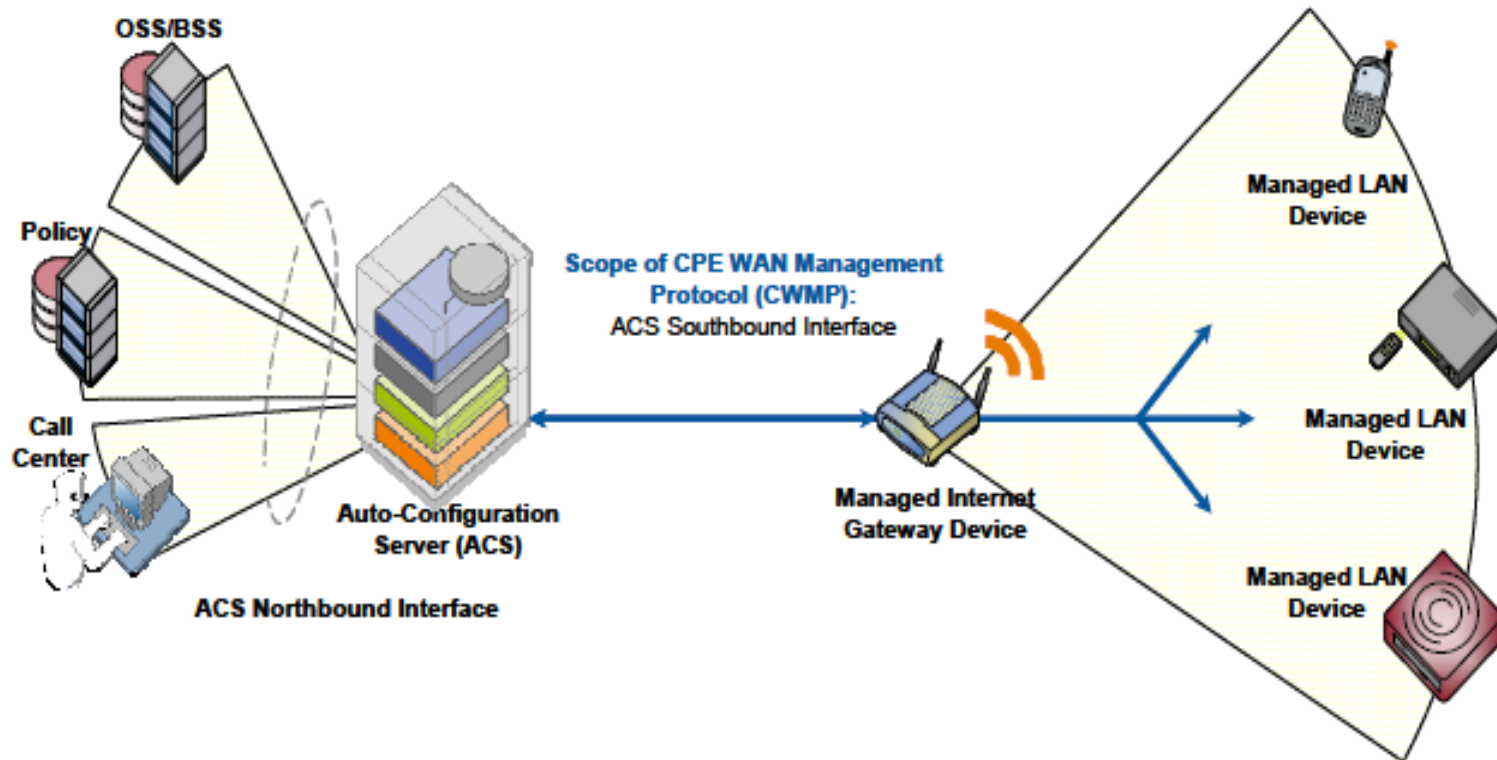
Figure 1 – Positioning in the End-to-End Architecture

- Standard interfaces to policy servers, call centers, and business applications (e.g. OSS/BSS/CRM)
- Strong security – transaction confidentiality and data integrity
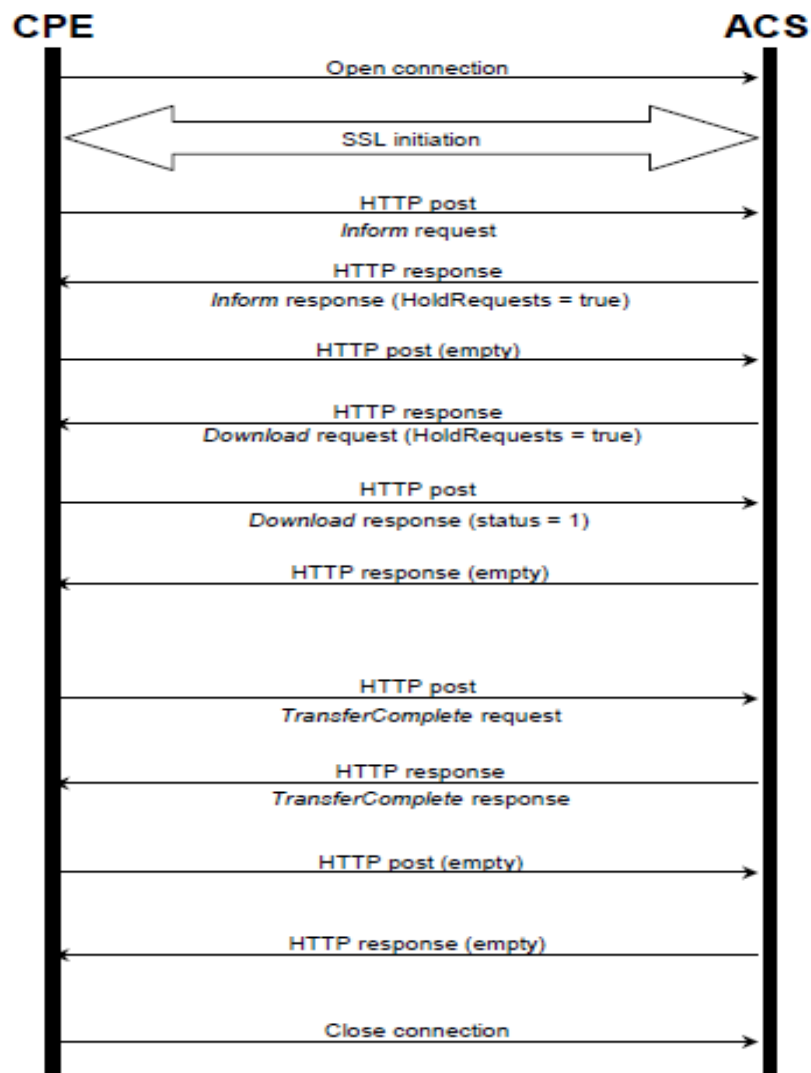
CWMP Overview

- Protocol message exchange: SOAP over HTTP 1.1

- Security Mechanisms
    - TLS 1.2 or higher is RECOMMENDED
    - Alternative authentication using shared secrets via HTTP is also supported for lower security environments

- Data Model
    - Data hierarchy
        - Root object: "Device" – common objects (in TR-181)
                                 – components (in TR-143 & 157)
                                 – single "Services" object
        - Each Service Object – objects
                                 - sub-objects
                                     - parameters
    - Object Versioning – two integers (ObjectName:Major.Minor)
    - Profiles – define conformance requirements for object

CWMP Overview – cont'd

- An example CWMP protocol exchange sequence
    - ACS initiates a short file download, and CPE sends a TransferComplete later in the same session
    - This happens in parallel when CPE still performing on-going CWMP session - hence ACS needs to set HoldRequests to true until it has completed sending all requests to the CPE

*Note: Figure 4 is copied "verbatim" from BBF TR-069.

Figure 4 – Example with the ACS using HoldRequests equal true

CPE — ACS

- Open connection
- SSL initiation
- HTTP post / *Inform* request
- HTTP response / *Inform* response (HoldRequests = true)
- HTTP post (empty)
- HTTP response / *Download* request (HoldRequests = true)
- HTTP post / *Download* response (status = 1)
- HTTP response (empty)
- HTTP post / *TransferComplete* request
- HTTP response / *TransferComplete* response
- HTTP post (empty)
- HTTP response (empty)
- Close connection

Why use CWMP for Printers/MFDs?

- In recent years the telecom industry and IT MSPs have migrated to using CWMP to remotely and securely manage and provision all kinds of devices in home, SOHO, SMB, and enterprise environments based on service contracts

- CWMP is supported in routers, bridges, cable modems, DSL modems, and Internet/residential gateways, set-top boxes, IP phones, cell phones, storage devices, PCs and laptops

- Standard CWMP data models for Printers and MFDs are important – to ensure interoperability of all CWMP-based solutions across all imaging products

- Devices supporting CWMP-based management must implement:

  - A set of standard interfaces between ACS and all CPEs

  - CWMP device data model(s) to expose device/service info to ACS

Benefits of CWMP for Printers/MFDs

- Enables Telecom and IT MSPs (Managed Service Providers) to include Printers/MFDs in their service offerings.

- Enables MPS (Managed Print Service) providers to include mainstream IT devices in their service offerings.

- CWMP serves as a common protocol to simplify remote administration and problem resolution for both customers and service providers.

- Customers benefit since they are no longer locked into one vendor for their IT devices.

- Advanced remote management capabilities help reduce service dispatch and other customer support costs.

Collaboration Approach

- PWG and Thinxtream participants collaborate closely
  - CWMP BOF calls at 8am US PST 11am US EST on Friday roughly bi-weekly (w/ participation of Bangalore engineers)
  - CWMP whitepaper updates to document technical progress
  - Architecture and pseudo-code for machine translation tool
  - New focus – Printer data model for first phase

- Current CWMP BOF participants
  - PWG: Ira McDonald (Samsung), Nancy Chen (Oki Data), Bill Wagner (TIC)
    - **Others are welcome!**
  - Thinxtream: Ranga Raj (CTO), Anil Takkar (Product Manager), Laxman Bhat, Subramanyan Krishnan, Nagaraj Ghatigar

CWMP Functionality

- Auto-configuration and Dynamic Service Provisioning
  - At the time of CPE connection
  - Re-provision and re-configure at subsequent time
  - Asynchronous ACS-initiated re-provisioning
  - Based on the requirements of a specific CPE or on collective criteria, e.g. vendor, model, software version, etc.
  - Straightforward future extensions

- Software/firmware image management
  - ACS initiated and optional CPE initiated download of img file
  - Version identification
  - Notification of download success/failure

CWMP Functionality – cont'd

- Software module management
  - Install, update, uninstall software modules in CPE
  - Notify ACS of success/failure
  - Start and stop applications
  - Enable/disable execution environment
  - Inventory software modules available

- Status and performance monitoring
  - CPEs make information available to ACS for monitoring
  - ACS monitors CPE's status and performance statistics
  - CPE actively notifies ACS of change to CPE state
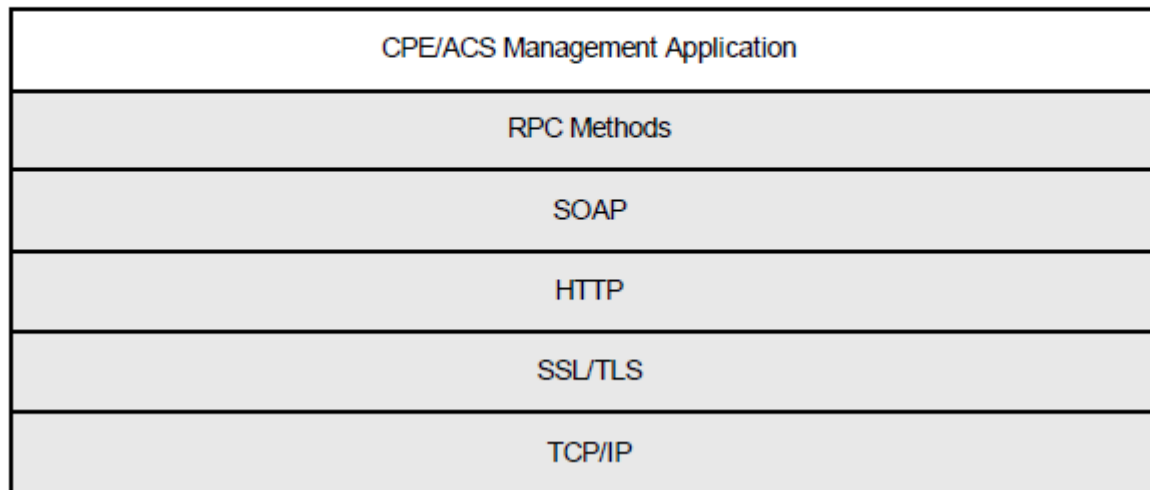
CWMP Functionality – cont'd

- Diagnostics reporting
  - CPEs make information available to ACS for diagnostics
  - ACS diagnoses and resolves CPE's connectivity/service issues
  - ACS instructs CPEs to execute defined diagnostic tests

- Standard interfaces to operational/business support systems, policy servers, and call centers for:
  - Order fulfillment
  - Billing
  - Subscriber management
  - Change management
  - Manufacturer management
  - Service level agreement management
  - Performance analysis

CWMP Functionality – cont'd

- Protocol Stack Requirements

Figure 2 – Protocol stack

CPE/ACS Management Application
RPC Methods
SOAP
HTTP
SSL/TLS
TCP/IP

*Note: Figure 2 above is copied "verbatim" from BBF CWMP (TR-069)

CWMP Functionality – cont'd

- **Security Mechanisms**
  - Use TLS/1.2 for secure transport between CPE and ACS (RECOMMENDED)
    - Provides transaction confidentiality, data integrity
    - Supports certificate-based authentication of CPE and ACS

  - Alternative authentication in HTTP layer between the CPE and ACS – based on shared secrets

Celstream's Print Service Attribute Table

Celstream's Print Service Attribute Table				
Information	**SNMP**	**EWS**	**Access**	**Comments**
Network configuration				
DNS and WINS Configuration	No	Yes	Read-write	
SMTP configuration	No	Yes	Read-write	
FTP configuration	No	Yes	Read-write	
HTTP configuration	No	Yes	Read-write	
LPD and Port 9100	No	Yes	Read-write	
SNMP configuration	No	Yes	Read-write	
Time	No	Yes	Read-write	
TCP/IP	Yes	No	Read-write	
Printing Settings				
Email alerts configuration	No	Yes	Read-write	
Finishing configuration	No	Yes	Read-write	This includes configuration of banner & separator sheets, Resource save, collation, blank pages etc
Scan, print, fax settings	No	Yes	Read-write	Darkness, Resolution Error and toner alarm switches, fax phone number etc
PCL settings	No	Yes	Read-write	Font, Duplex, paper size, orientation, draft mode, color mode etc
PS settings	No	Yes	Read-write	Error report flag, Timeout, paper select
Printer information				
Printer general, identification and asset information	Mostly Yes	Mostly No	Few are read-write	Asset info, identification info, printing speed, memory size, language
Consumables and paper usage				
Consumable status and estimates	Yes	No	Read	
Service	Yes	No	Read	Drum, fuser, roller information
Paper – Metering	Yes	No	Read	
Tray status	Yes	No	Read	Printer interaction
SNMP and EWS connection settings	No	Yes	Read-write	