NETSIA

Dynamic LAG Application (DLA) for VOLTHA Whitebox OLTs

ONF Broadband Community Meetup 2023

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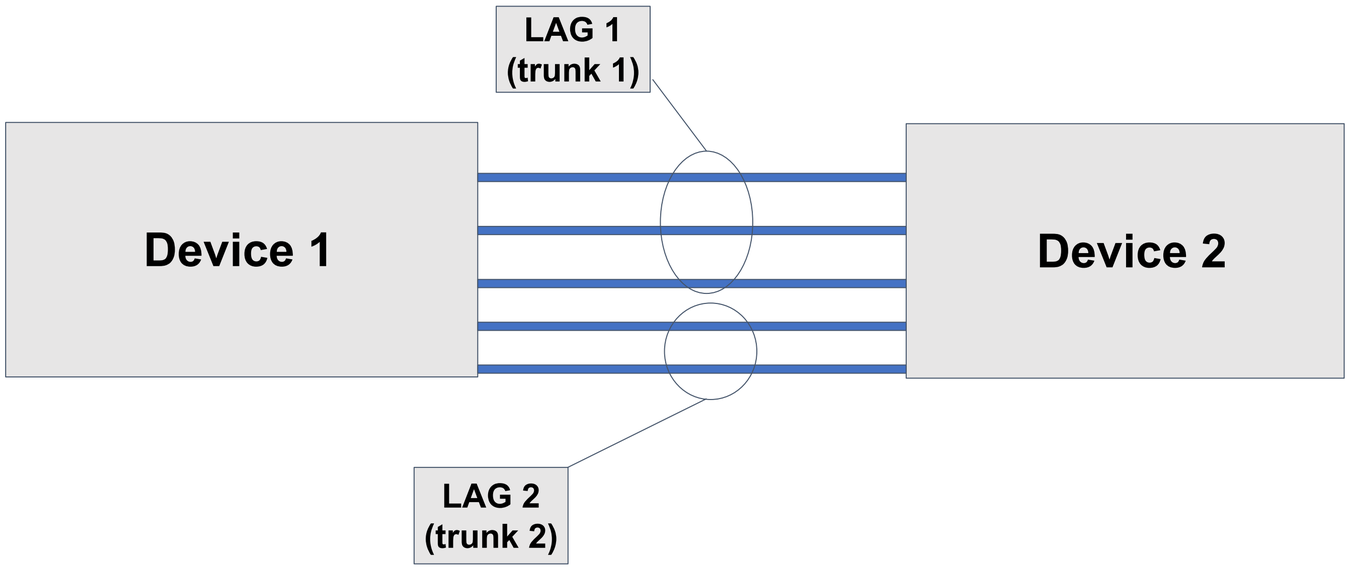
OUTLINE

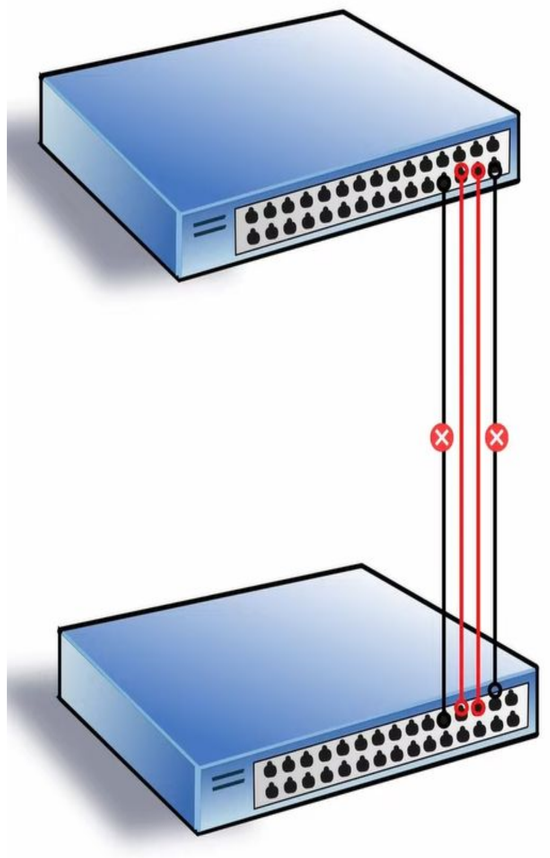
- ❏ Motivation
- ❏ LACP Protocol Overview
- ❏ Previous Work
- ❏ DLA Design Overview
- ❏ DLA Components
- ❏ Development Phases
- ❏ Items to be Discussed
- ❏ Q&A

WHAT IS LINK AGGREGATION? WHY DO WE NEED IT?



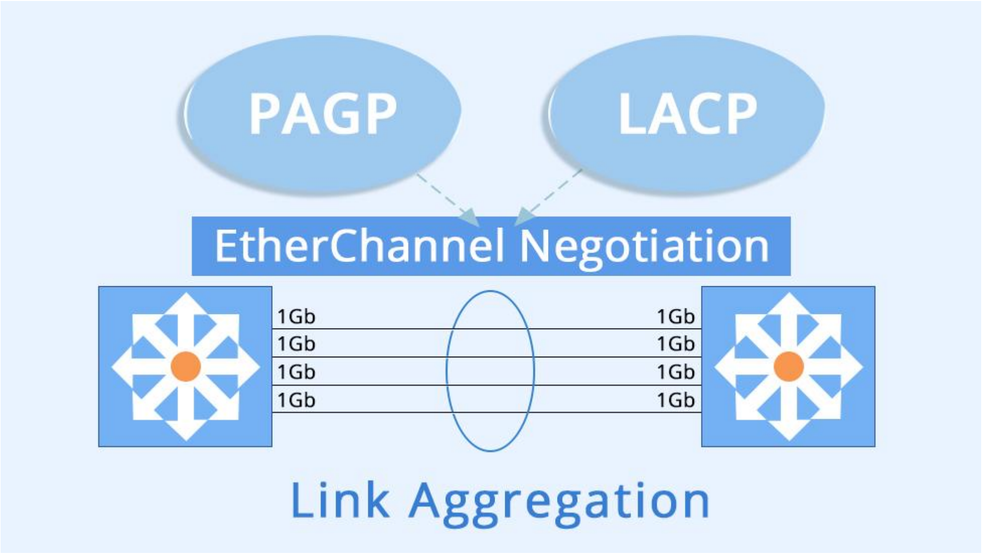
Link Aggregation is the combination of multiple network connections in parallel.

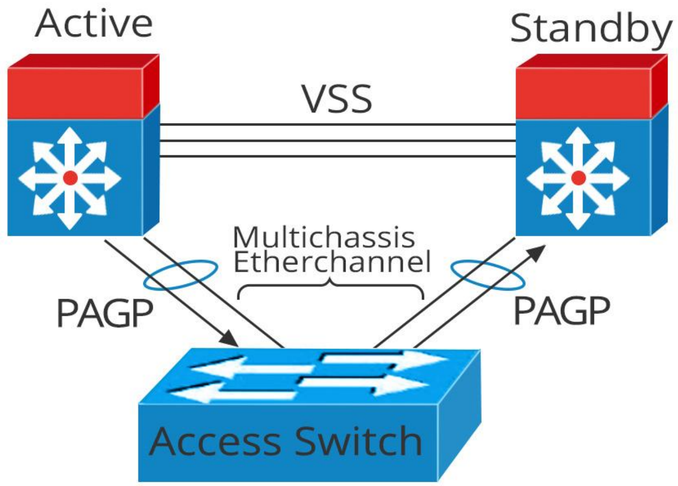
- IEEE 802.3ad standard. Invented in 2000.
- Connects routers, switches, hosts, firewalls etc…
- We called this combination of physical ports as a **link aggregation group** (**LAG**).



- It increases total throughput.
- Provides redundancy. If a port fails, the other port will resume as a primary link and continue to operate
- Divides traffic between links via various hashing mechanisms.
- Implementation followed vendor-independent standards such as Link Aggregation Control Protocol (LACP). In that way it works with multiple vendors.

LINK AGGREGATION CONTROL PROTOCOL (LACP)





Two protocols:

- LACP
- PAGP

LACP is a Open Standard protocol

➔ Defined in 802.3ad specification.

➔ Control the bundling of several physical ports together to form a single logical link

➔ Automatic bundling of links by sending LACP packets

PAGP is a Cisco-proprietary protocol

➔ Can be used only on Cisco switches

➔ Invented in early 1990s

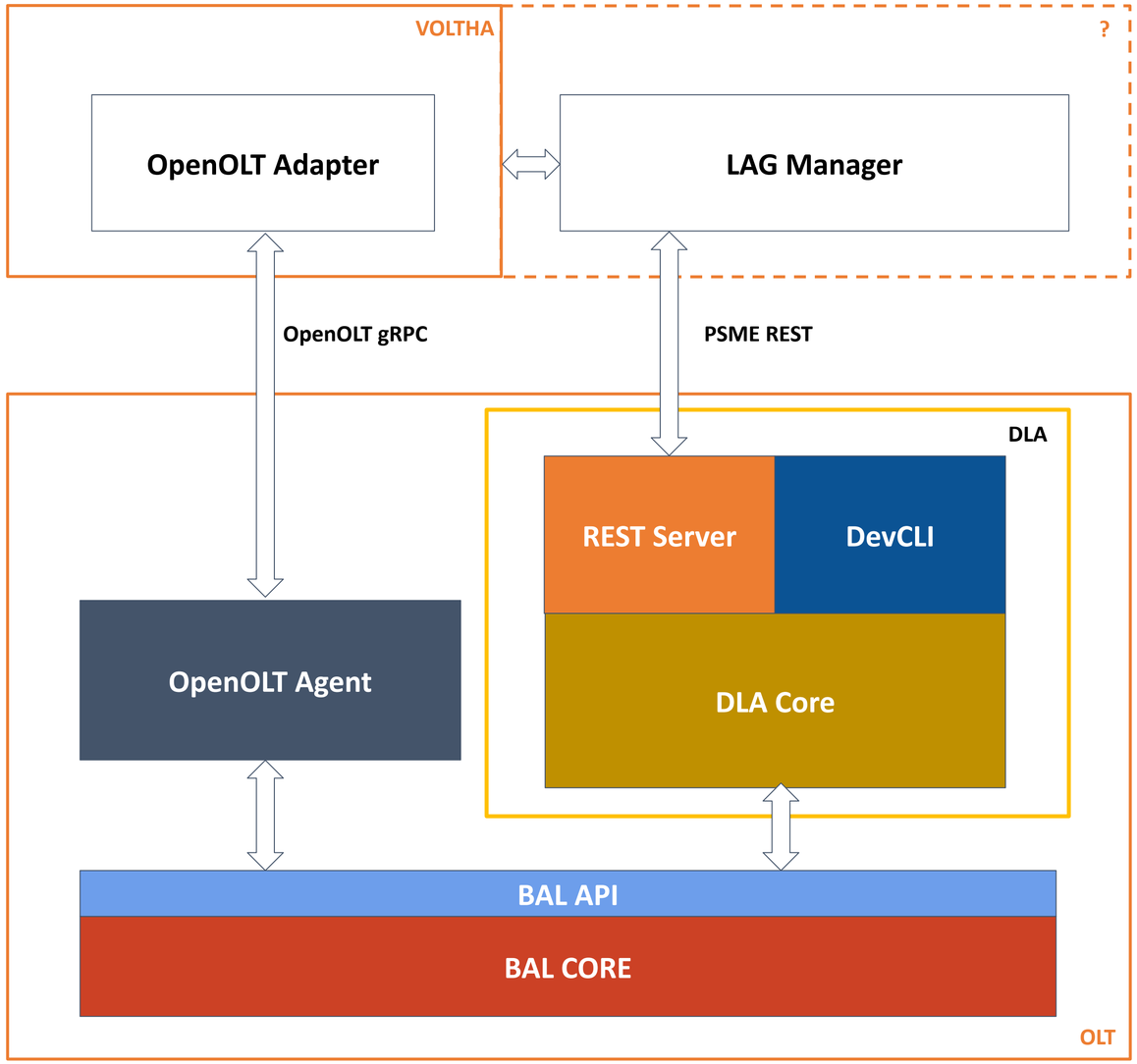
➔ Dynamically group similarly configured ports

PREVIOUS WORK IN SEBA

- Static LAG support on the OpenOLT Agent level
  - OLT level (i.e. not visible to VOLTHA)
  - Developed as a PoC
  - Not upstreamed to the community
    - Dynamic LAG was required
      - Added to the wishlist

- LAG work on the community side
  - Discussions in the brigade meetings
  - LAG folder under ONF Drive
  - Notes of the “Multi-NNI/LAG Discussion” Meeting with ONF

DESIGN OVERVIEW



- **DLA Core:** DLA daemon starts its execution from here. It holds LACP stack as well.
- **DevCLI:** CLI of DLA for testing/debugging
- **REST Server:** NBI of DLA
- **LAG Manager:** LAG Management Entity in the control plane (position is TBD)
- **BAL**: Broadband Abstraction Layer (BAL) for PON and switch subsystems.
- **OpenOLT Agent**: VOLTHA driver for whitebox OLTs
- **OpenOLT Adapter**: VOLTHA adapter for whitebox OLTs

DLA CORE

Components:

- LACP Daemon (i.e. LACP Stack)
  - Based on LibreSwitch LACP Daemon
- Customized OVSDB Interface Implementation for Dynamic LAG
- BAL Wrapper for LAG management
  - Based on BAL 3.10.4.4

BAL WRAPPER

- BAL API calls gathered in bal_wrapper lib
  - DLA Core initialized as a BAL Host Application (like OpenOLT Agent)

- It connects the DLA process (LACPd) to the BAL Core Service and configure the corresponding BAL objects:
  - ACL to trap incoming PDUs
  - Flow to packet out outgoing PDUs
  - LAG Interfaces

DEV CLI

- CLI for debugging and testing DLA
- Connected via telnet
- Functionalities:
  - Create/Delete LAG
  - Add/Remove LAG Members
  - Dump/Write LAG Config
  - Dump LAG states

REST SERVER

- Northbound Interface of DLA
- Based on Edgecore Public PSME REST Server Implementation
  - PSME REST API
- API Functionalities:
  - Create/Delete/Modify LAG Interfaces
  - Get LAG Status
  - Get LAG Statistics
  - Subscribe to LAG-related Events
    - LAG UP/DOWN/DEGRADED
    - NNI Member Events

DLA CORE - LACP STACK

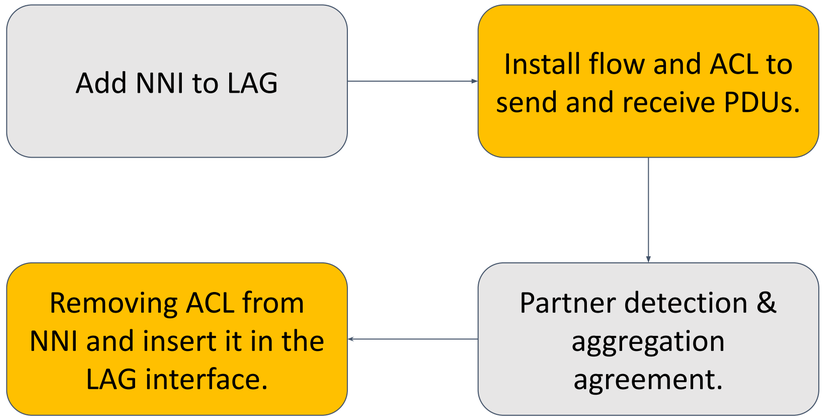
LACP Stack Initialization:

- LACP Stack (protocol queues and event listeners)
- Rest Server
- DevCLI
- LACPd as the host application attached to the BAL Core

Stack Initialization

- Initializes all interfaces & all LAGs lists
- Configures the OLT switch with the LAG global parameters.
- Install ACL to trap LACP PDU packets to the host.
- Configures the System ID and priority.
- Creates all LAG groups from the config.yaml file.
- Configures all NNI from the config.yaml file as LAG members.

Adding member



DEVELOPMENT PHASES

- Phase 1
  - LAG Configuration based on DLA config file
    - Control plane is not LAG-aware
  - Tested on
    - Zyxel SDA3016SS
    - Edgecore ASGvOLT64
  - Completed

- Phase 2
  - LAG Configuration through NBI
  - LAG Manager and its placement should be clarified
    - Level of LAG-awareness in the control plane should be determined

ITEMS TO BE DISCUSSED (IN TST MEETINGS?)

- VOLTHA assumes single OLT uplink: NNI-0
  - Should SEBA/VOLTHA be LAG-aware?
- Who will be the LAG Manager?
  - Device Manager?
  - A new entity?
- Issues with BAL 3.10.4.4

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Thank You

Q&A

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