DBA (Dynamic Bandwidth Allocation) Overview
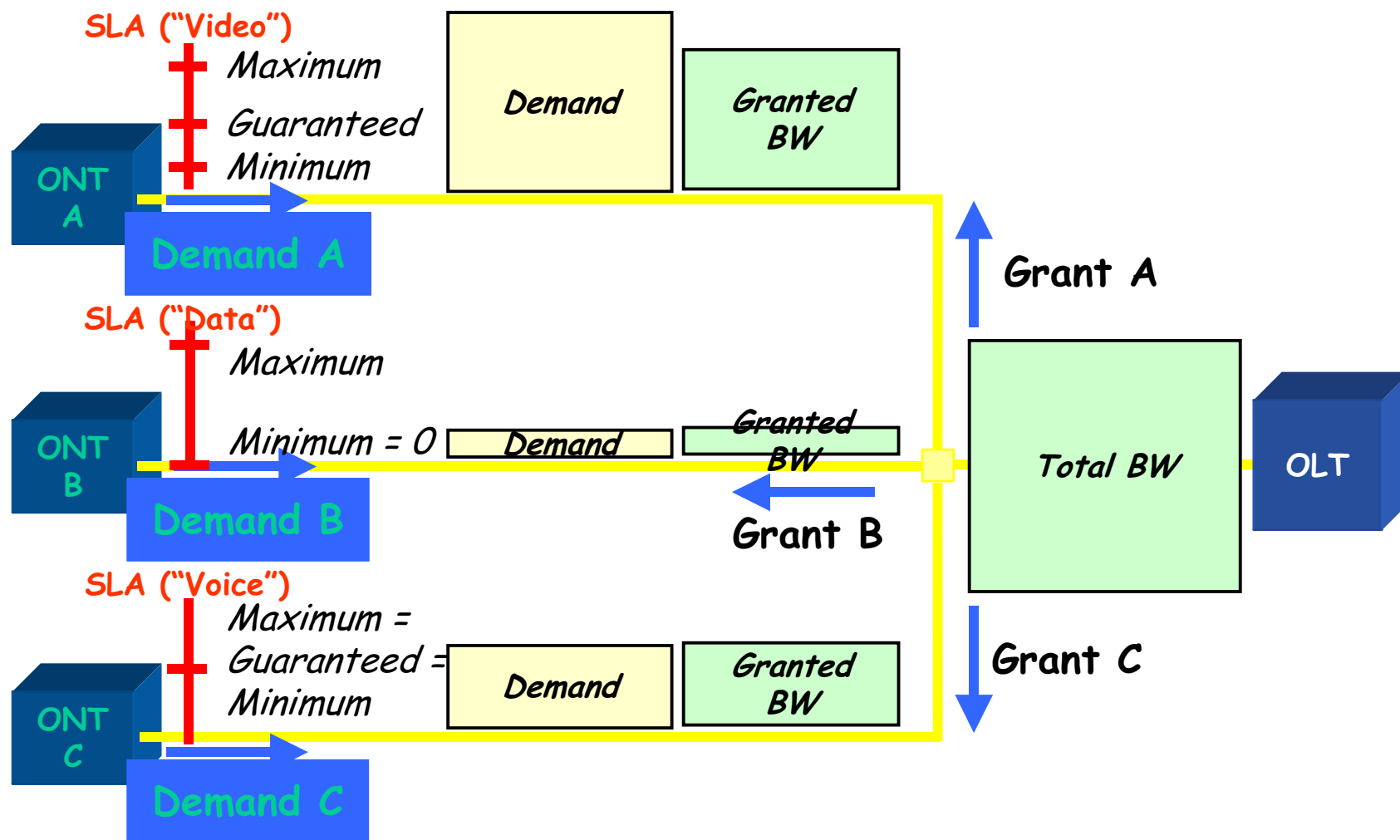
Outline

- What is DBA?

- Benefit of DBA

- DBA Service Requirements

- DBA Performance Requirements

- DBA Signaling Requirements

What is DBA

- ## What is DBA?

  - Mechanisms in place to dynamically change upstream BW on a millisecond/microsecond timescale

- ## Why we need DBA?

  - Improves the efficiency of the PON upstream bandwidth by dynamically adjusting the bandwidth among the ONUs in response to ONU burst traffic requirement

  - Network operators can add more end subscribers for a given PON due to the more efficient utilization

  - DBA allows more flexible SLAs for PONs with large (i.e. 32) splits

  - The end subscribers can enjoy enhanced services, such as those bandwidth peaks beyond the traditional fixed allocation

How DBA works

SLA ("Video")
- Maximum
- Guaranteed
- Minimum

SLA ("Data")
- Maximum
- Minimum = 0

SLA ("Voice")
- Maximum =
- Guaranteed =
- Minimum

ONT A

ONT B

ONT C

Demand A

Demand B

Demand C

Demand

Granted BW

Demand

Granted BW

Demand

Granted BW
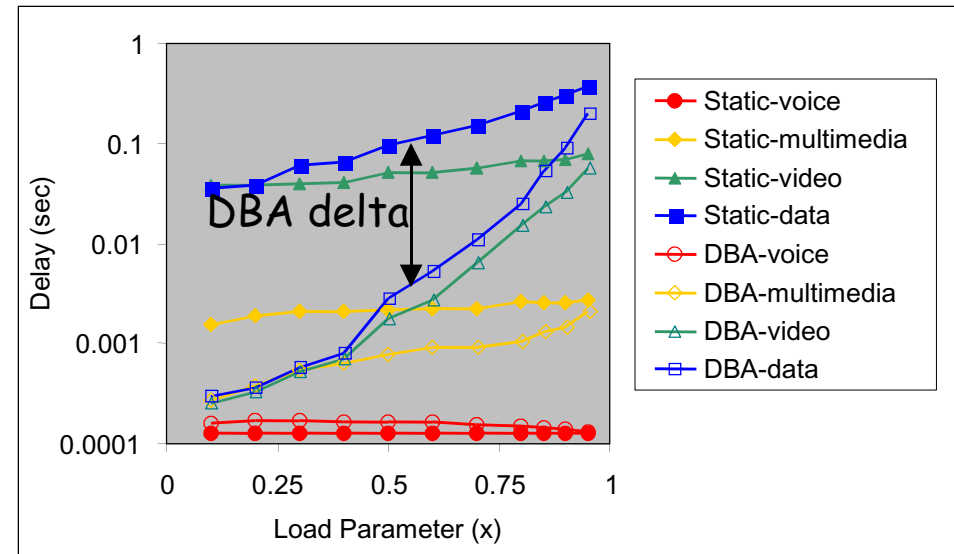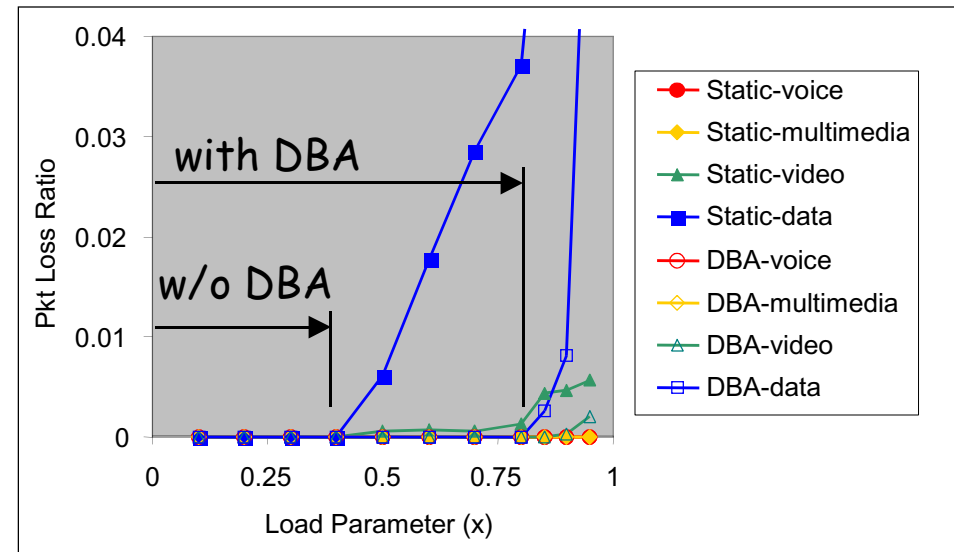
Grant A

Grant B

Grant C

Total BW

OLT

The Value of DBA
Utilization and Delay Impact

Maximum Utilization
- Without DBA: 40%
- With DBA: 80%
- Double capacity
- 3dB more Revenue

Average Transfer Delay
- Without DBA: 100 ms
- With DBA: <10 ms
- >10dB more speed

10/10/2001

DBA Service Requirement - Introducing T-CONT

- **T-CONTs:** "Traffic Containers (T-CONTs)" carry traffic flows / connections and are used for the management of upstream bandwidth allocation in the PON section of the Transmission Convergence layer.

- **T-CONTs** are primarily used to improve the bandwidth utilization in PON section.

T-CONT BW Terminologies
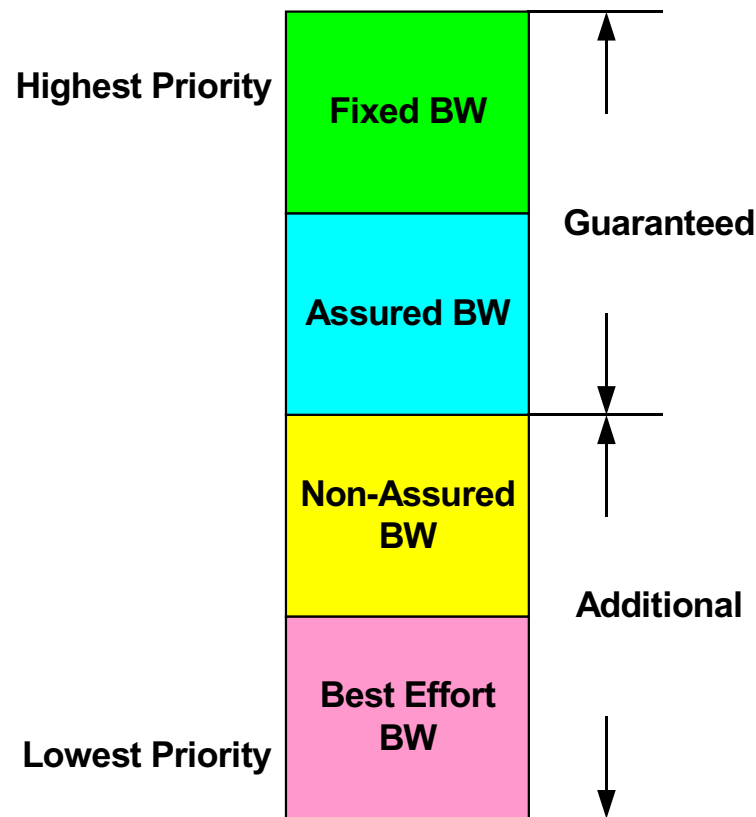
- Fixed BW: reserved upstream BW, cyclically allocated regardless of demand.

- Assured BW- similar to fixed, but BW may not be given without demand.

- Non-Assured - bandwidth only given if BW is available but not guaranteed.

- Best Effort - demand only met if remaining upstream BW is available.

- Maximum BW - max BW that can be allocated to a T-CONT.

T-CONT Types and Relationships with BW terminologies

- Types: 1, 2, 3, 4, 5

- Relationships

BW Type	Delay Sensitive	Applicable T-CONT types				
		Type 1	Type 2	Type 3	Type 4	Type 5
Fixed	Yes	X				X
Assured	No		X	X		X
Non-Assured	No			X		X
Best Effort	No				X	X
Max.	No			X	X	X

DBA Performance Requirement

– Speed of response

- Waiting time for bandwidth allocation

  – Target at least millisecond (~ 1ms)

- Transition time from ONU status change to steady state

  – Target several millisecond (~ 3ms)

– Fairness

- Surplus bandwidth shall be FAIRLY allocated to all relevant T-CONTs, according to the T-CONT parameters

DBA Signaling Requirement

– Downstream bandwidth assignment

- Supporting continuous change

- Once every frame

- Protect from error propagations

– Upstream status reporting

- Implicit ONT status report

  – Idle slot detection: OLT looks for idle slot in transmissions

- Explicit ONT status report

  – ONT transmits reports of buffer status for OLT

Upstream Signaling:
Implicit ONT Status Reporting

- Idle slot detection (real time monitoring) provides
  - Per T-CONT indication of empty buffers
  - No additional function required at ONT
  - First level of DBA support

Upstream Signaling: Explicit ONT Status Report: PSS PCBu embedded Reporting

- Every ONT/T-CONT can report its buffer status in every upstream burst

- Buffer queue length report format (default): 4 Byte / T-CONT

- Buffer queue length coding (default): non-linear

Summary

- DBA improves the PON upstream bandwidth efficiency

- DBA service, performance and signaling requirements need to be satisfied

Thank You