Feasibility of TDD & China Market Demand on EPoC

Yong Yao, Technical Working Committee, China Radio & TV Association
Shusheng Dai, Haier IC
Jiangming Shi, Dao Wang, BGCTV (Beijing Cable)
Yong Guo, ZTE
Li Zhang, Guangsheng Wu, Huawei
Xiaojun Gao, Jiangsu Cable
Jun Xu, Bo Zhang, Guizhou Cable
Mengling Li, Dao Nie, Cable DTV lab, SARFT
Ao Zhang, Xianhong Zhao, FiberHome
Baoming Hu, YOTC
Chengguo Xiong, Lei Xu, Guanmin Xu, Lootom
Wenhao Li, Raisecom
Alex Liu, Qualcomm
Lin Li, Kingtype Group

TDD Demand & Feasibility

- Currently, only few parts of China deployed DOCSIS systems
  - In the places DOCSIS systems deployed, HFC networks have been finished the bidirectional network transformation
  - Under 1GHz, It is easier to handle distraction issue when co-existence with legacy technology via FDD
- Above 1GHz, TDD is simple and flexible
  - Spectrum above 1GHz would be the most proper band for EPoC
  - There is no approved spectrum plan above 1GHz
  - There is no available amplification above 1GHz
- In most EoC deployed places of China, guard band is required for FDD

Static Bandwidth Allocation in TDD

- There is no difference between TDD and FDD when using static US/DS bandwidth allocation (e.g., 1:1 or 1:n) in TDD mode, except the data container in TDD is time and the other is frequency
- The full-duplex MAC operation is maintained
- Both TDD and FDD can be supported in a single PHY
  - Only one more PLL is needed in TDD than FDD
  - The peak data rate of TDD is twice as FDD
  - Transmission in downstream is discontinuous, but it is different from burst mode in upstream
- The upstream allocation would not be consecutive
- Additional delay is inevitable, but controllable
- Multiple carrier FDD requires buffers as well
  - Parallel to serial is needed during frequency to time conversion, and vice versa
  - Framing structures between fiber and coax are also different

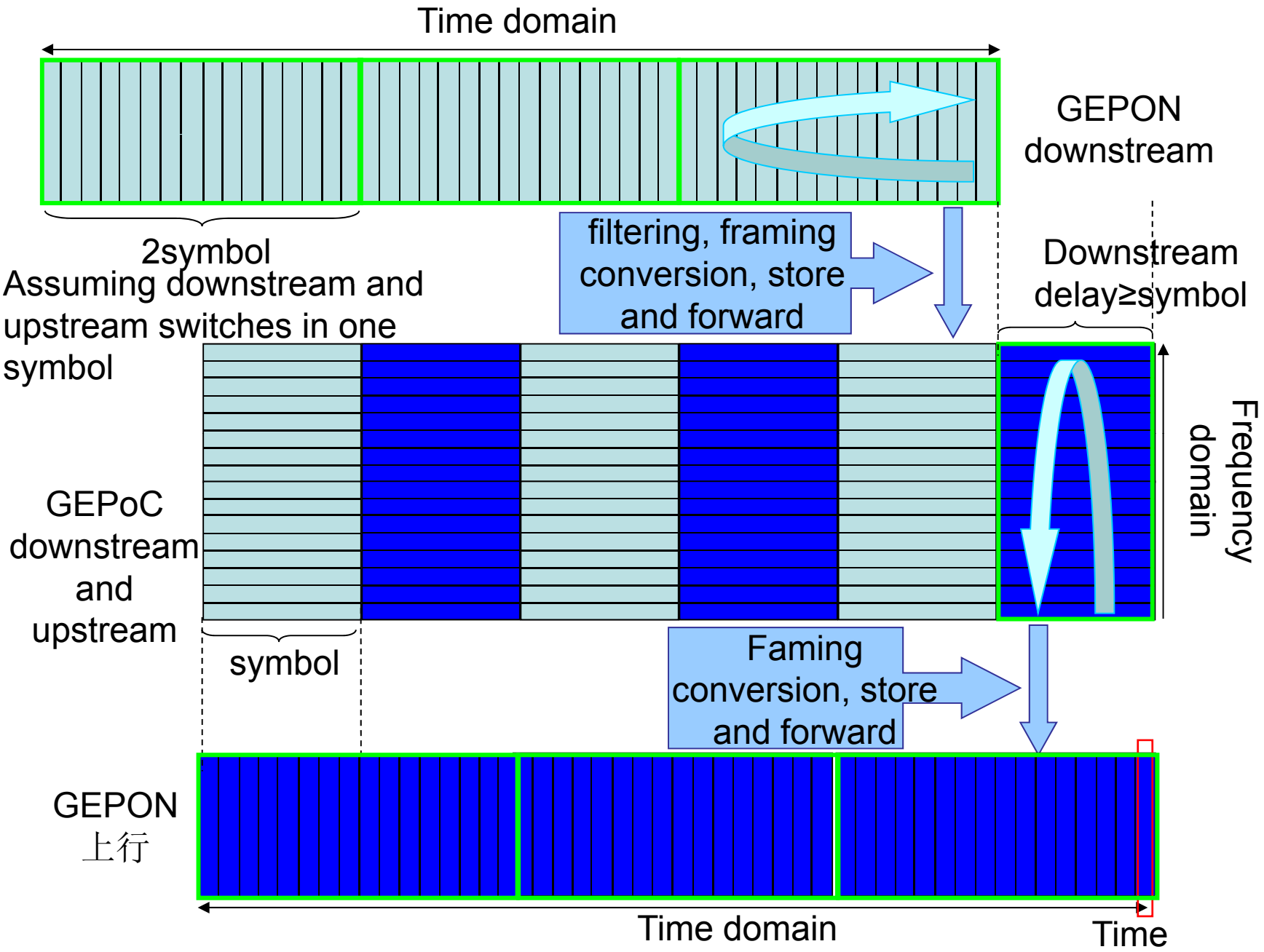
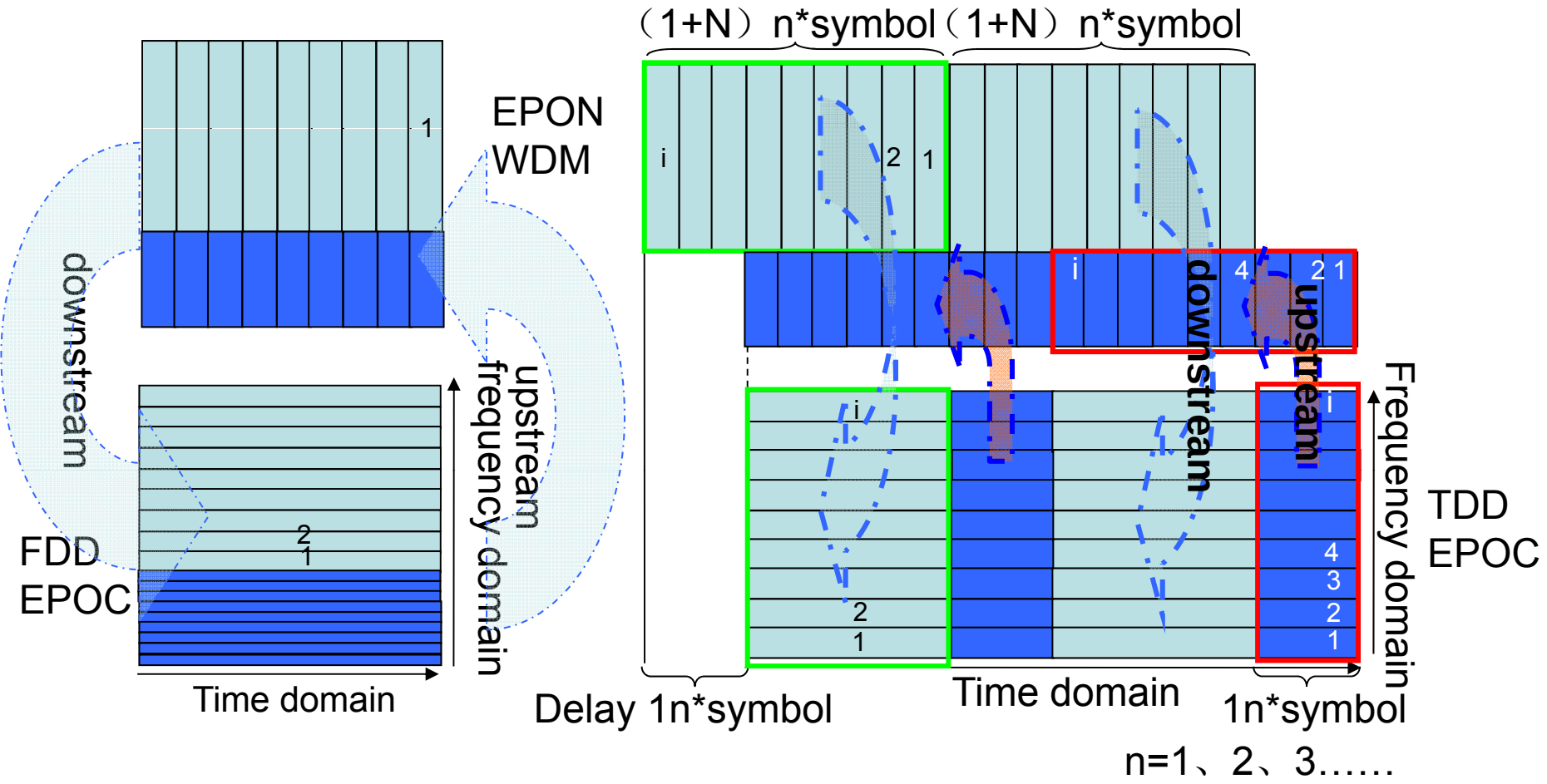


Figure 1 TDD 2 dimension mapping(U/D 1:1)

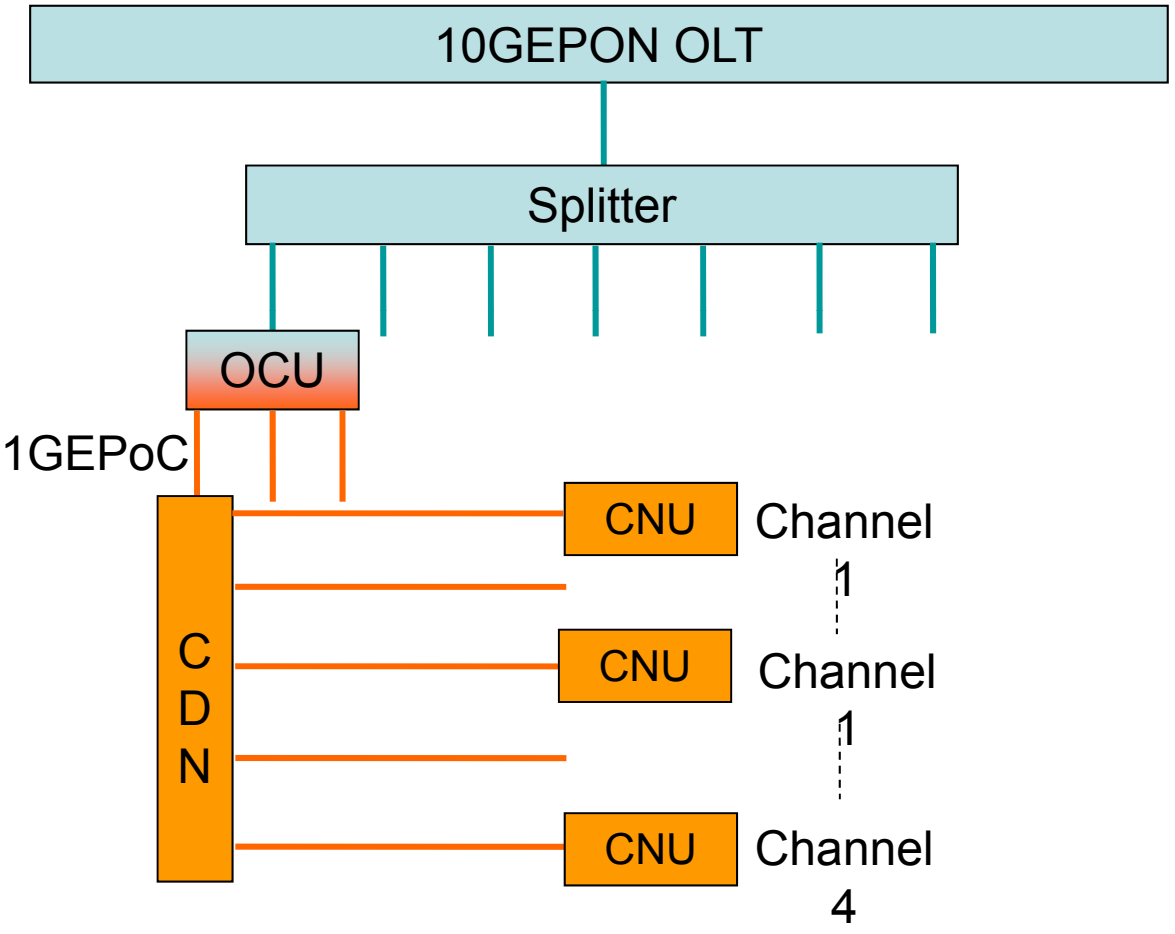


In case of static Us/Ds allocation, upstream allocation is guaranteed. Downstream delay of TDD is 1n*symbol longer than FDD (i.e., the interval of upstream allocation configuration). The upstream delay is almost the same as FDD. However, this generally requires the total upstream and downstream processing time of TDD is not more than that of FDD. For example, when the proportion of time allocation between upstream and downstream is 1:N, the processing time of TDD would then be 1/N more than FDD, where N=2, and the upstream and downstream switches at intervals of n(symbol):Nn(symbol).

Figure 2 EPON-EPoC time domain to time and frequency domains conversion

EPoC Deployment Architecture

- The total rate of all CNU interfaces is greater than the rate of OLT interface
- The link rate of ODN is greater than the rate of CDN
- It is expected that OCU rate could increase as more spectrum becomes available while preserving CNU compatibility



Thanks