

Signal Path Scheduling for Reconfigurable SDR RF Hardware

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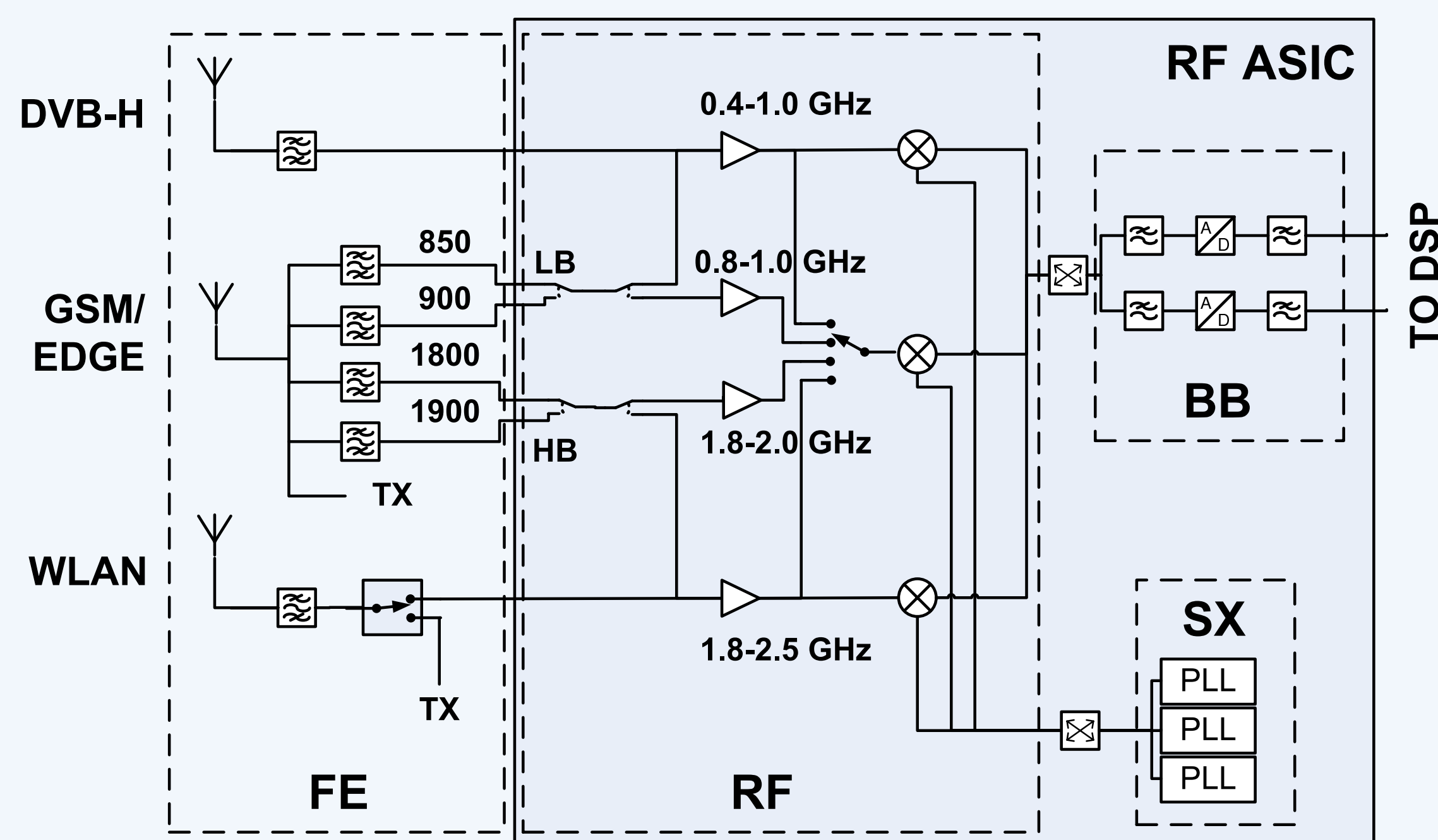
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Hardware

- RF blocks and switches
- Switches are used to dynamically activate *RF pipes*
- Some blocks can be concurrently shared by multiple jobs



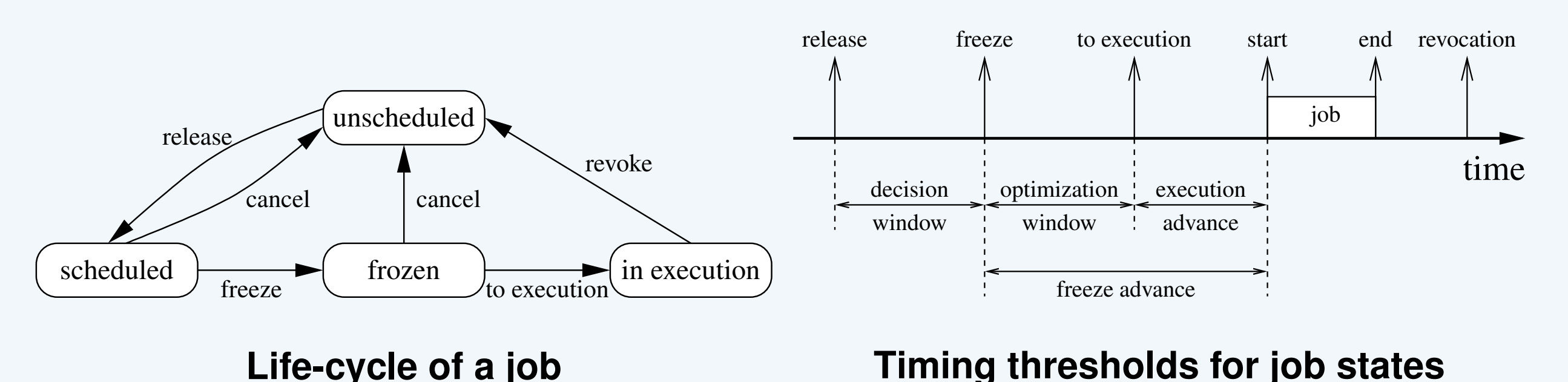
A multi-radio receiver for GSM, DVB, and WLAN

Signal Path Scheduling Problem

- Multiple concurrent radios on shared analog RF hardware
- *Time-path* problem: Find HW configurations for radio ops
- Most radio operations are uninterruptible and *rigid*
- Scheduling freedom comes from configuration alternatives
- Classical scheduling algorithms do not apply

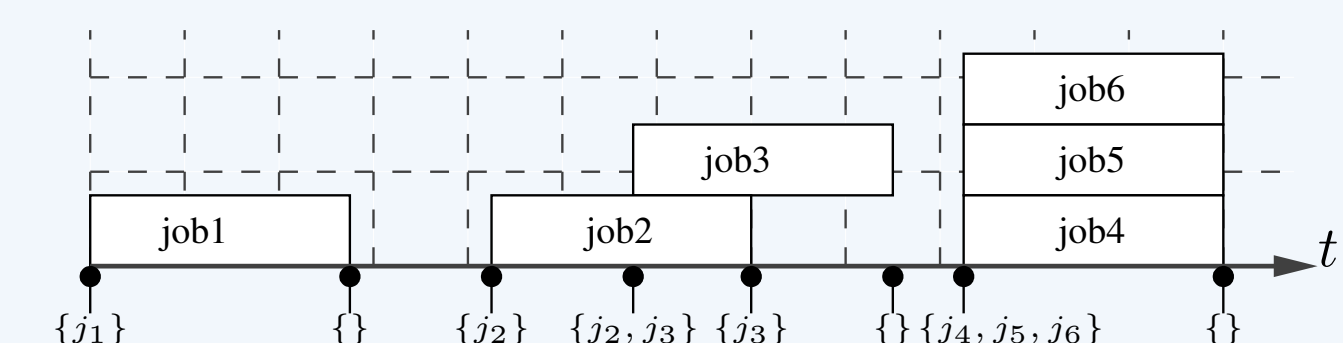
Fixed-Job Path Scheduler

- Job life-cycle management and path resolution
- Path resolution is cost-based greedy algorithm
- Eager/Lazy allocation strategy
- Decision tree partitioning
- Global optimization window



Life-cycle of a job

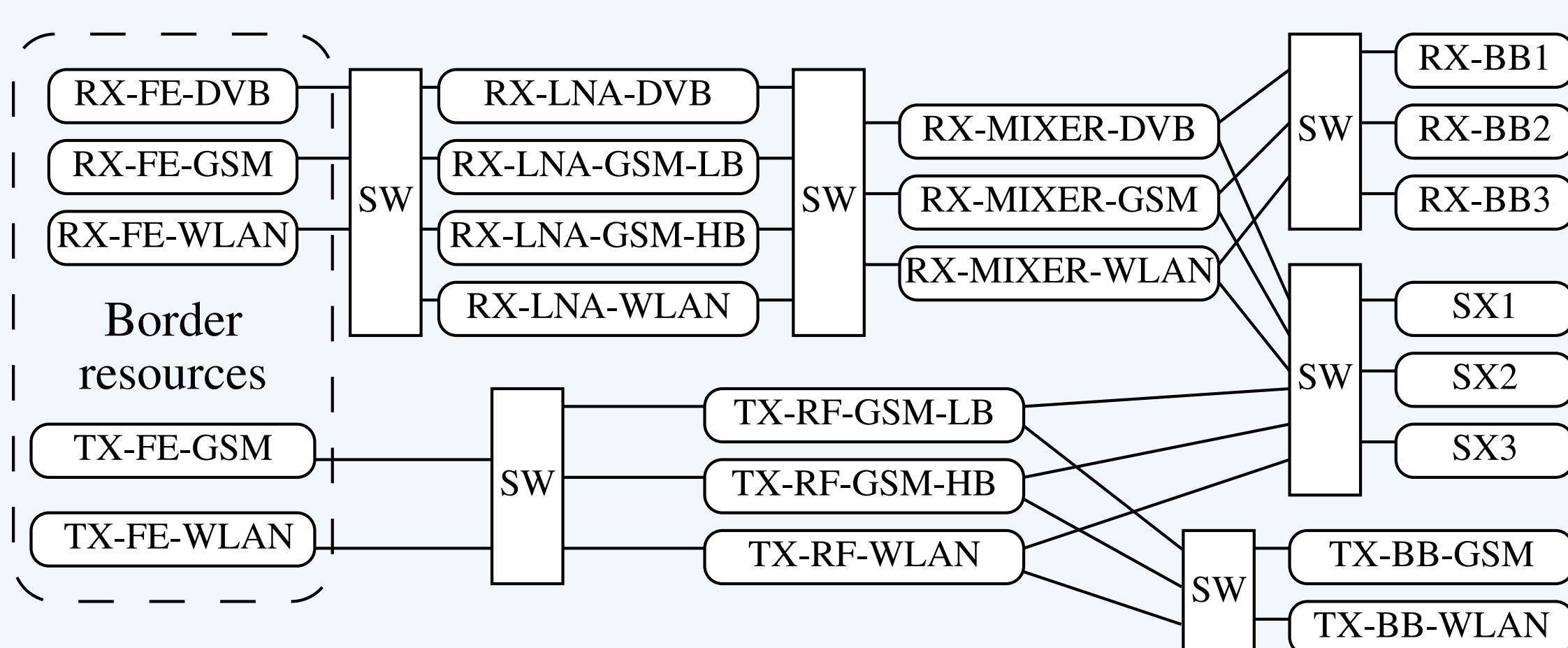
Timing thresholds for job states



Resource allocation table implementation

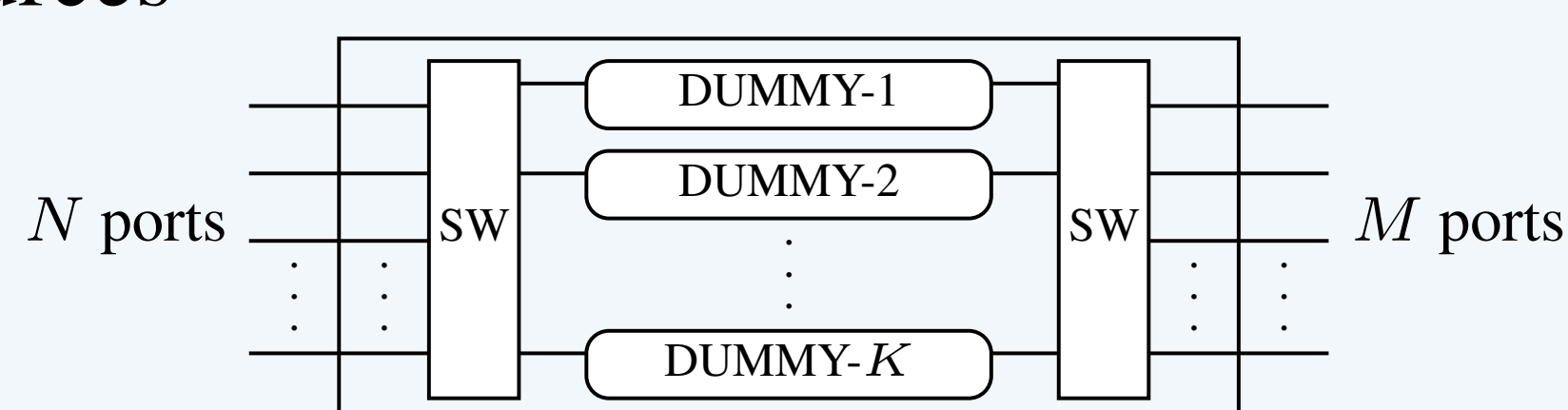
Hardware Modeling

- Network of resources and unrestricted switches
- *Border resources* start RF pipes



Model of the GSM/DVB/WLAN platform

- Restricted switches can be modeled with dummy switches and resources

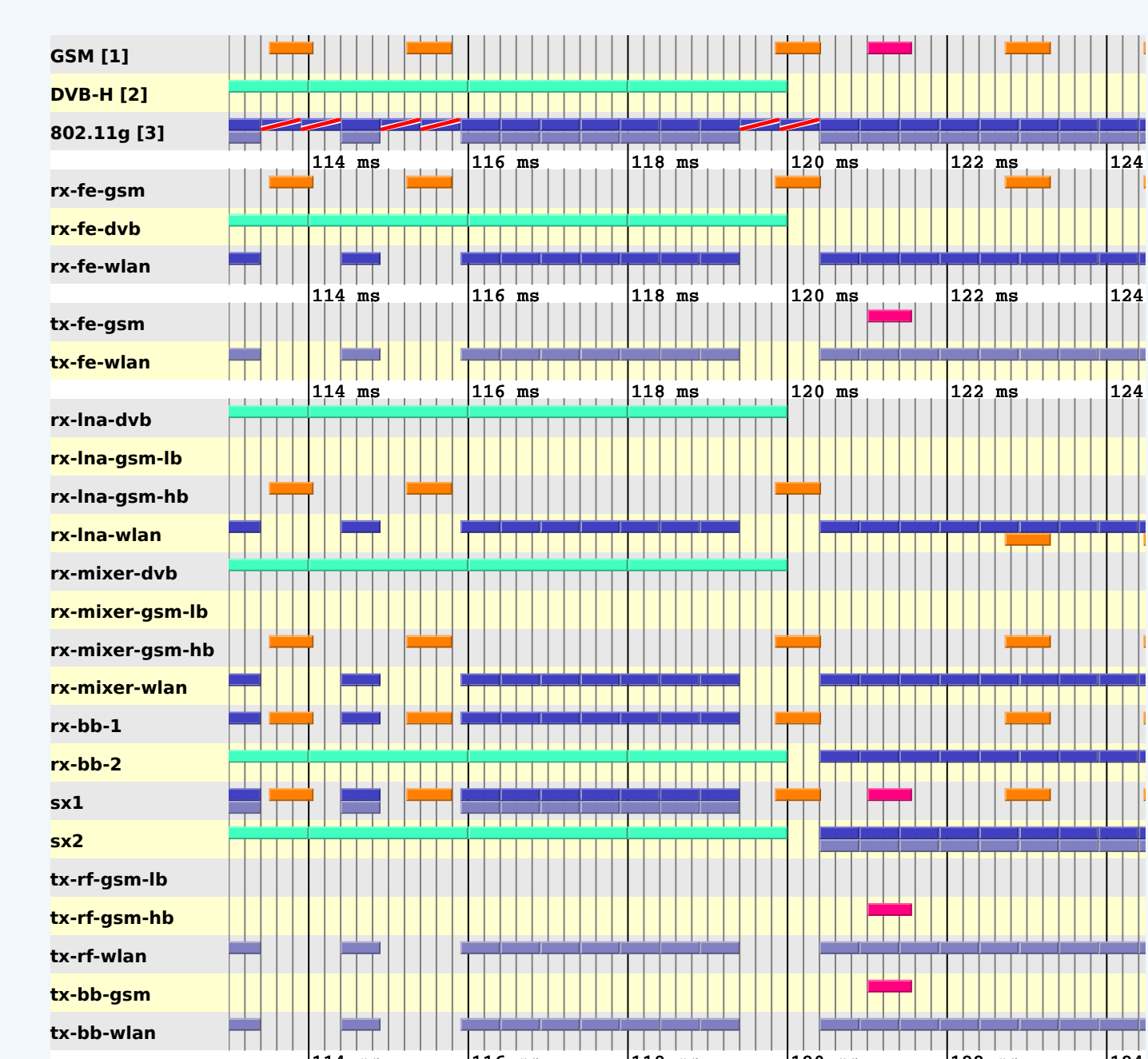


An $N : M$ switch with K connectivity

- Cost and shareability functions are assigned to each resource:
 $C_r : j \rightarrow [0, \infty]$ $S_r : j_1 \times j_2 \rightarrow [\text{true}, \text{false}]$

Application Interface

- The protocols request RF pipes on-the-fly
- Conflict resolution by priorities
- Callback channel for changes in allocations



A resource allocation schedule