



BPM software and longest acquisitions

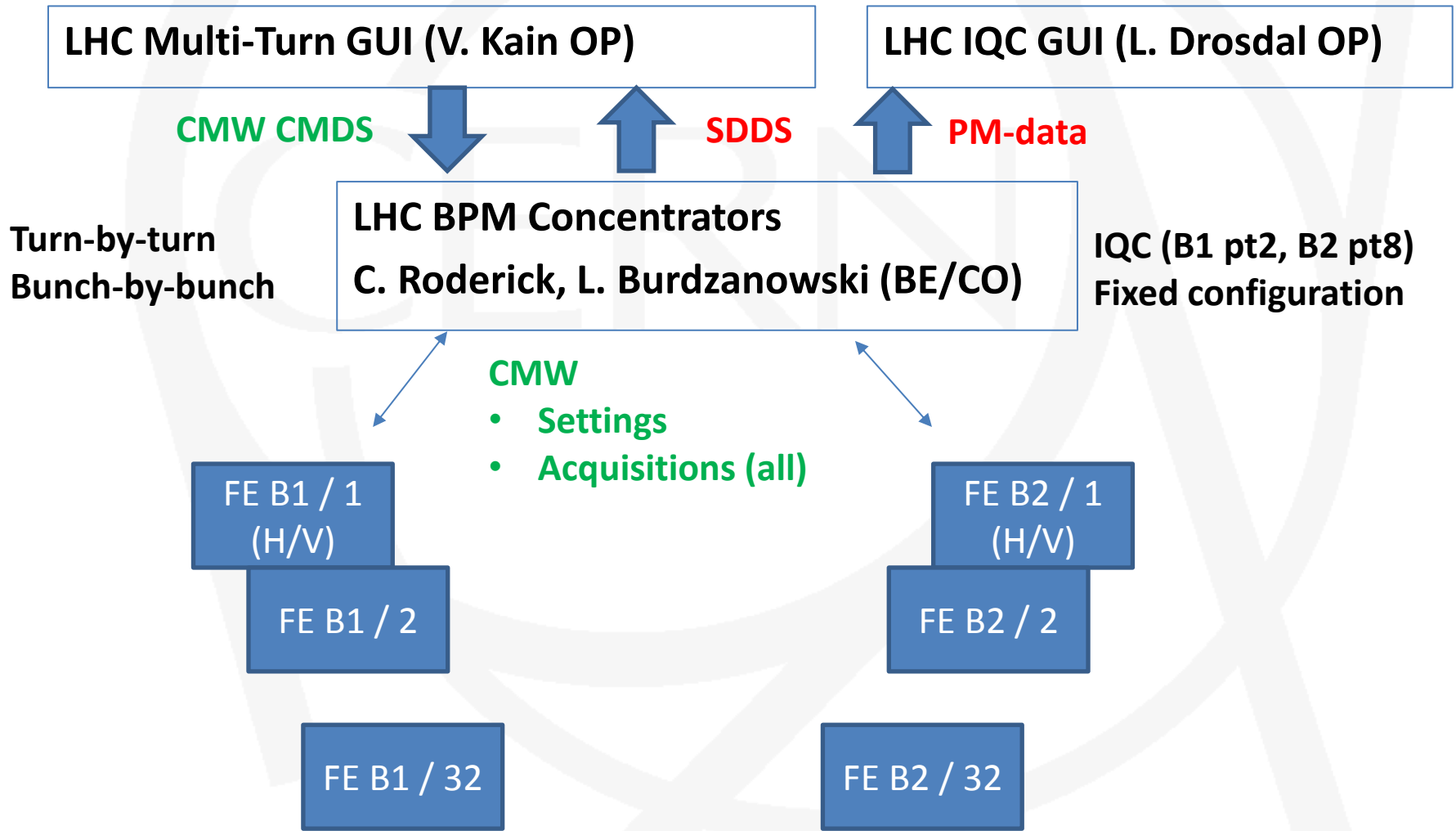
L. Jensen BE/BI/SW

Outline

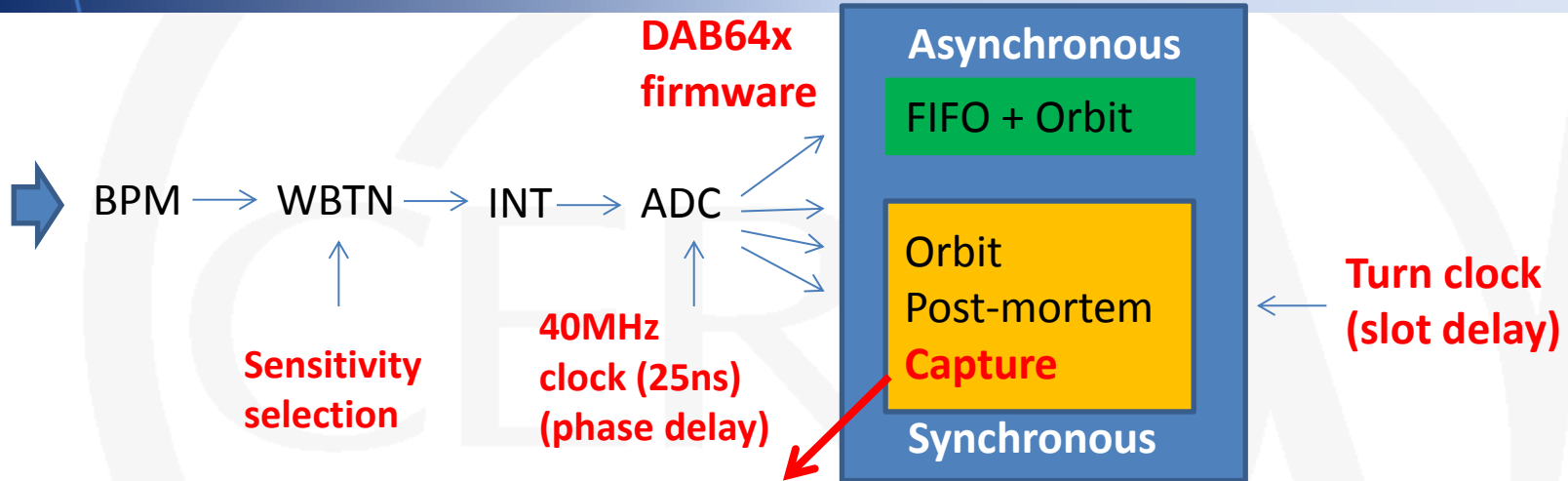
- **Simplified control system layouts**
- **BPM Electronics and front-end software**
- **LS1 objectives**
- **Answers to specific questions**
- **Conclusions**



Control system overview



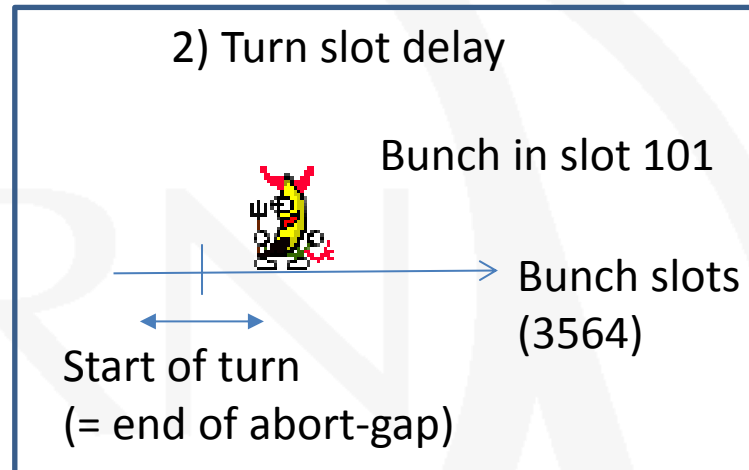
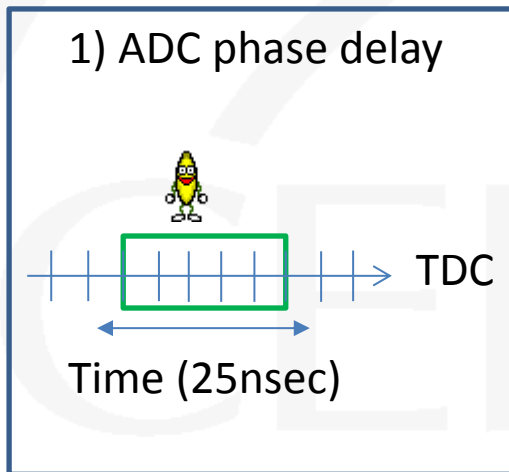
LHC BPM electronics



Synchronous capture (bunch-by-bunch):

- Bunch selection B (N slots selected)
- Consecutive turn selection T
- Hard limit: $N * T \leq 128k \Rightarrow$ (data/BPM \rightarrow never used)
- **Single hardware** (buffer) implementation (IQC/:
 - Distributed trigger selection via BST:
 - 1) Injection (warning) \Rightarrow pre-pulse from RF for IQC
 - 2) Other (elsewhere in cycle) \Rightarrow MTG timing event per beam (1msec frame)

LHC BPM synchronous modes



- **Beam synchronous setting-up “phase-in”**
- **Some problems seen in the past (calibration sequence) now believed to be resolved (delays should not move)**
 - Now work without automatic TDC corrections
 - Special cases still causing problems (phase/slot)?
- **Values in LSA settings DB (reload possible)**

LHC BPM procedure

- **Bunch and Turn selection**
 - Data size = $10\text{kB} + (B \cdot T) \cdot 0.4\text{kB}$ (per front-end)
 - Normal: single bunch ($B=1$), $T = 3000 \Rightarrow 1\text{Mbytes}$ (per front-end)
 - 32 front-ends $\Rightarrow 32\text{ Mbytes}$ total data size / beam (**files**)
 - Desired (Rogelio): 10000 turns \rightarrow **~100 Mbytes / beam**
 - Maximum (128k bunches) \Rightarrow **1.3 Gbytes / beam**
- **External BST trigger to all acquisition cards (a few turns delay from MTG event to start)**
- **Acquisition finish:**
 - Data read-out
 - Raw to position normalisation (see Eva's presentation)
 - Calculation of **turn-by-turn** data (from bunch-by-bunch)
- **Data published to concentrators**

LS1 objectives (software)

- **Upgrade front-end systems to Linux**
 - 4 * gain in available memory
 - 5 * gain in Ethernet speed (new Gbit switches)
- **Redesign software layers (FE->GUIs)**
 - Take into account what we've learnt since 2008
 - Closer look at use-cases (specifications)

Answers to specific questions

1) DOROS electronics

2) Current BBQ and/or ADT BPMs

See Marek's talk later this afternoon

3) Additional data corrections for turn-by-turn data (X/Y)

– See Eva's talk

4) Shift of data in bunch-by-bunch mode

– To be looked into with BE/CO – likely difficult to test without beam

Conclusions

- **Trying to cover injection oscillation and optics with same mode -> complications**
 - Firmware solutions?
- **Updated CPUs with compatible firmware expected to relieve some limitations**
- **LHC turn-by-turn data mechanism to be studied**
 - Understand usage
 - Identify limits to safe operation
- **Larger-scale tests to be planned during LS1 and following beam restart**