BSA and TSE field

Kukhee Kim

Controls Department

Mar 24, 2011

Contents

- TSE and General Time
  - Compare between LCLS custom and Bundled General Time in R3.14.11
- BSA and BSA scheme
- BSA check point
- BSA and TSE issue
- Success / Fail Scenario on BSA
- Examples for some BSA Scenario
- Exceptional consideration (Wavefrom with BSA aware timestamp)
- BSA Check Points AGAIN!

Timestamp Event Issue: TSE

- Base-R3.14.8.2
  - Standalone generalTime/Customized for LCLS
- Base-R3.14.11
  - generalTime has been bundled into base
  - Different behavior compare to the standalone version
- Different Behavior between standalone and bundled

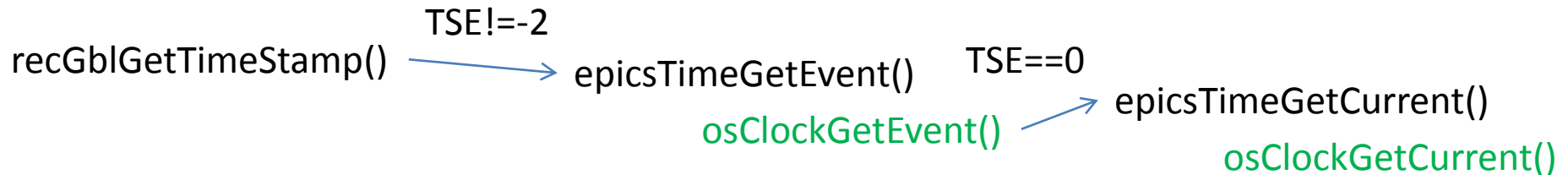|	Standalone (R3.14.8.2)	Bundled (R3.14.11)
TSE>0	TSE is event number (if IOC has EVR and TSE=1 : fiducial event, 360Hz EVR timestamp with Pulse_ID)	TimeStamp for Event number
TSE=0	If, IOC has EVR 120Hz EVR timestamp with Pulse_ID (because, TSE=0, beam pulse)	Always System Clock
TSE=-1	Best choice in the time/event source table generalTimeGetEventPriority() Choose between evrTimeGet() and evrTimeGetSystem()	Best choice in the time/event source table generalTimeGetEventPriority()
TSE=-2	Record support does not care about timestamp. Device developer has to provide timestamp with own code.	Record support does not care about the timestamp. Device developer has to provide timestamp with own code.

OSI calling chain for timestamp (1)

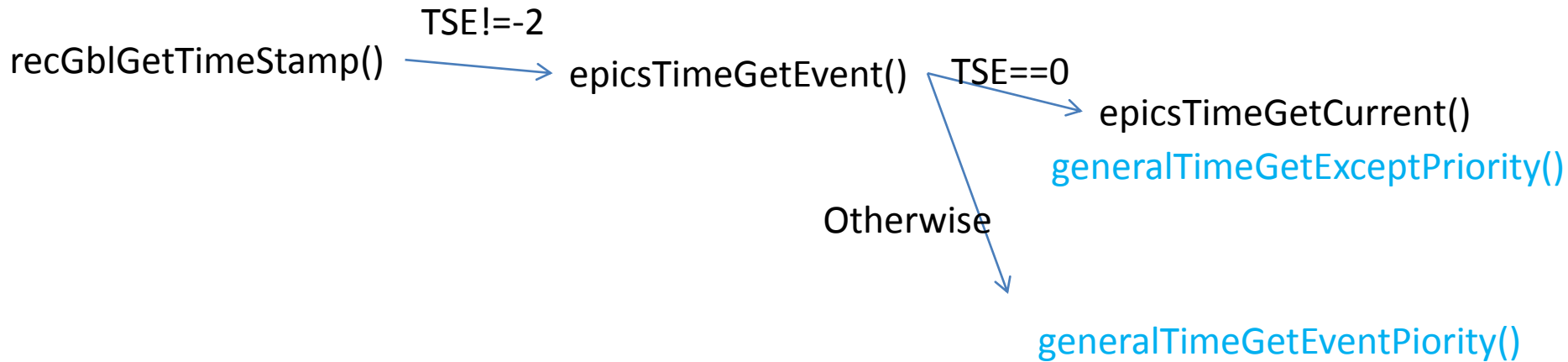Record Time Stamping: base-R3.14.8.2

Default OSD:
getCurrent = oscIocClockGetCurrent;
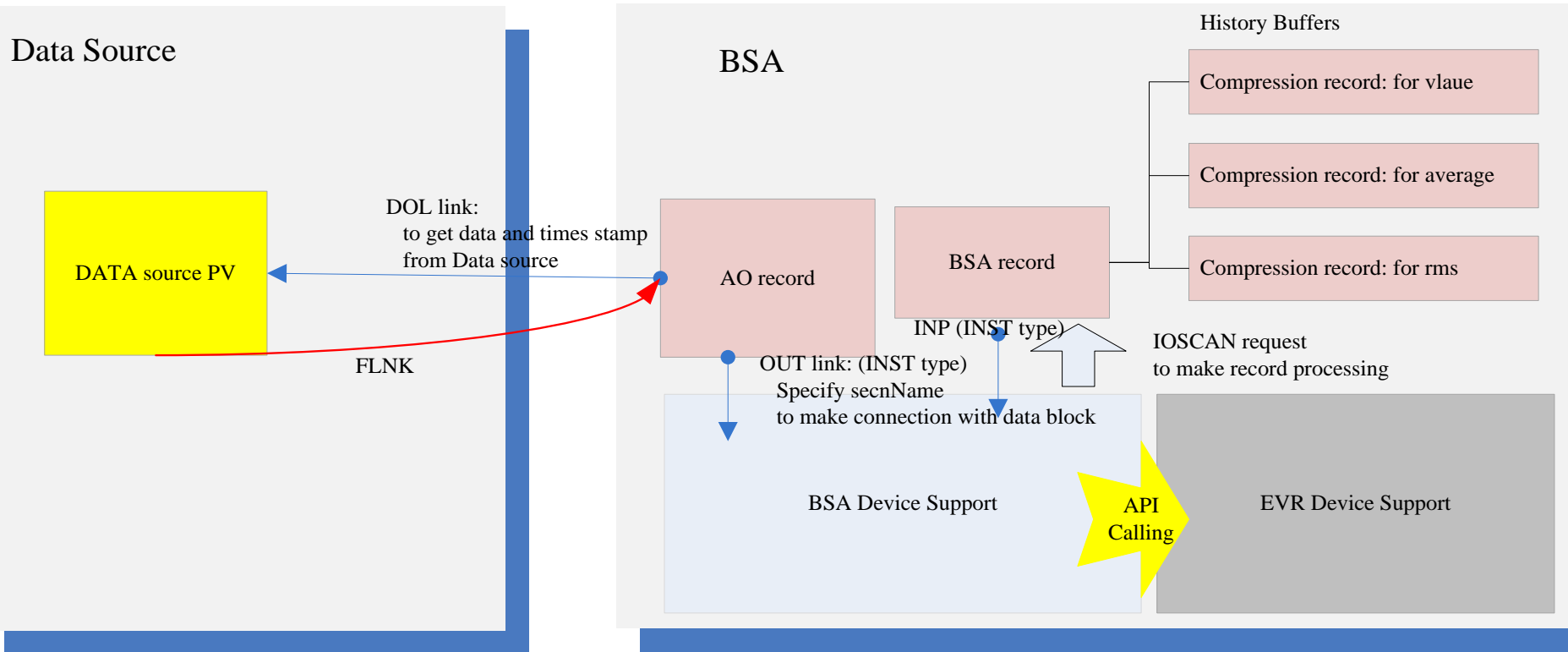getEvent = oscIocClockGetEvent

recGblGetTimeStamp() ——TSE!=-2——→ epicsTimeGetEvent() ——TSE==0——→ epicsTimeGetCurrent()

osClockGetEvent() ——→ osClockGetCurrent()

OSI calling chain for timestamp (2)

Record Time Stamping: base-R3.14.11

BSA Scheme

Data Source

DATA source PV

BSA

History Buffers

Compression record: for vlaue

Compression record: for average

Compression record: for rms

DOL link:
  to get data and times stamp
  from Data source

FLNK

AO record

BSA record

INP (INST type)

OUT link: (INST type)
  Specify secnName
  to make connection with data block

IOSCAN request
to make record processing

BSA Device Support

API Calling

EVR Device Support

BSA Check Point

- DOL field in data receptor
  - AO record in BSA facility
  - The data receptor gets data, timestamp, and severity from the DOL LINK.
  - DOL should be pointed your data source
- Data Source PV
  - Timestamp (BSA aware)
  - FLNK to the data receptor
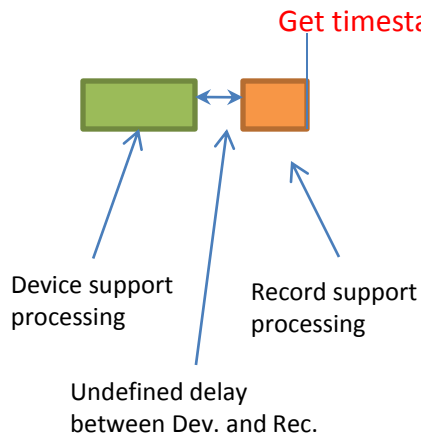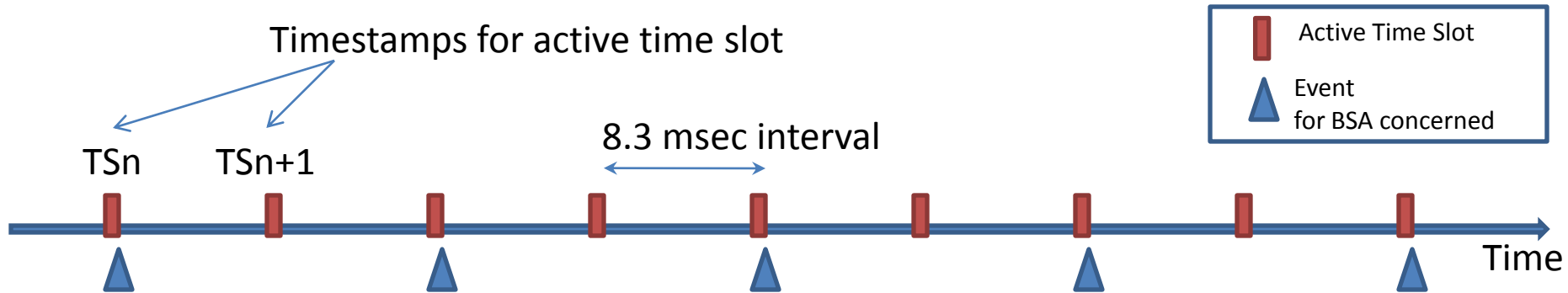
BSA aware Timestamp

- Basically, BSA facility compares the timestamp from data source and BSA event definition
- Assume, the timestamp from data source reflects ACTIVE_TIMESLOT and Pulse ID
  - ACTIVE_TIMESLOT: TS1 and TS4, event#0 in LCLS Event system
  - Pulse ID: lower 17 bits in nano-sec in timestamp
- TSE=-2 for your data source PV
  - if, our device support for data source PV, takes care the timestamp
  - Somewhere in device support should call the following function evrTimeGet(&pMyRec->timestamp, 0)
- TSE=0 (default or no description on TSE) for your data source PV
  - If we can guarantee that record processing must be finished within 8.33 msec (time interval between active timeslot 1/120).
- TSE>1 for your data source PV
  - If we can not guarantee, the record processing can be finished within 8.33 msec (time interval between active time slot 1/120)
  - Or, data gettering is not synchronized with beam or event system. Ex, motor position

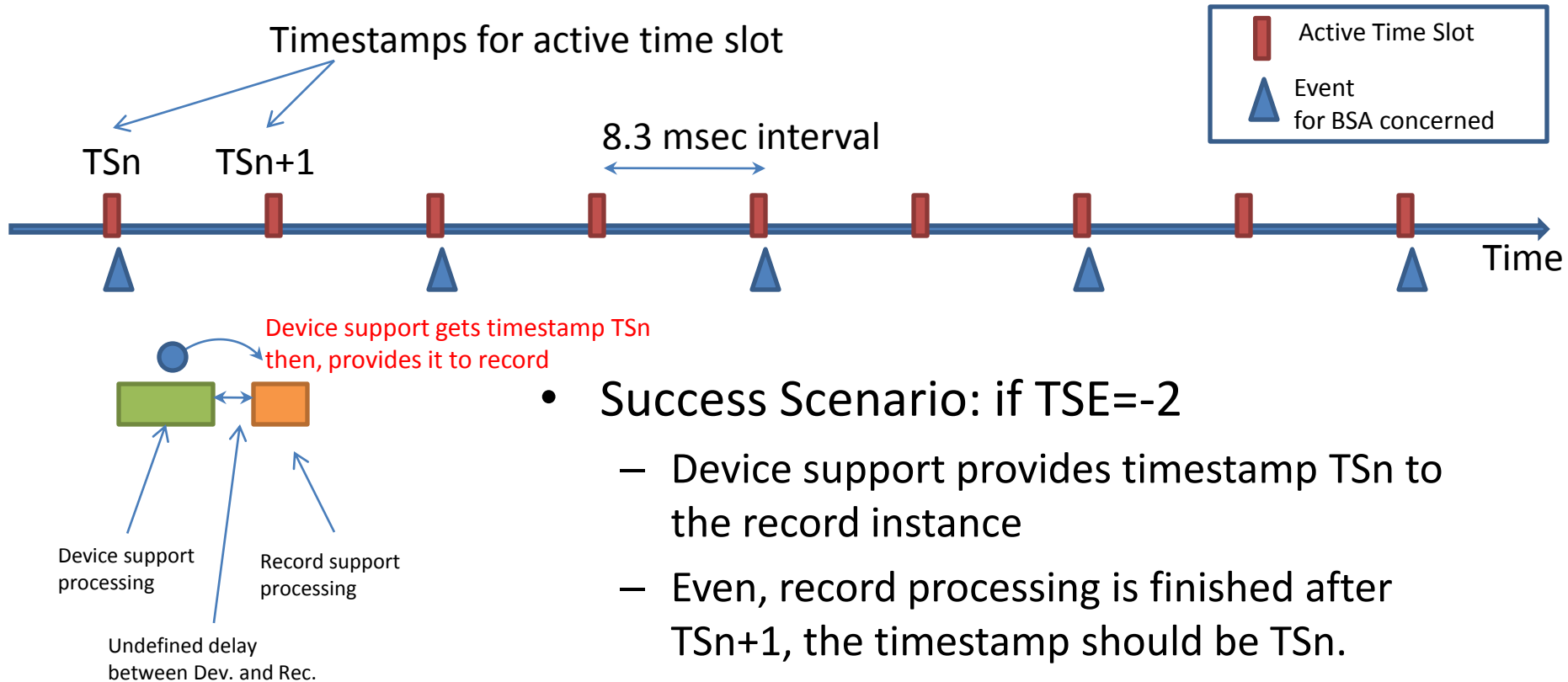# BSA aware timestamp
and BSA Success/Fail scenario (1)
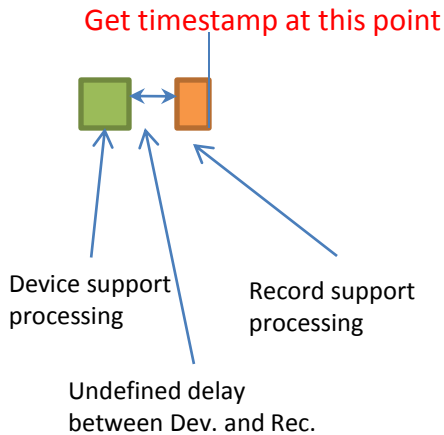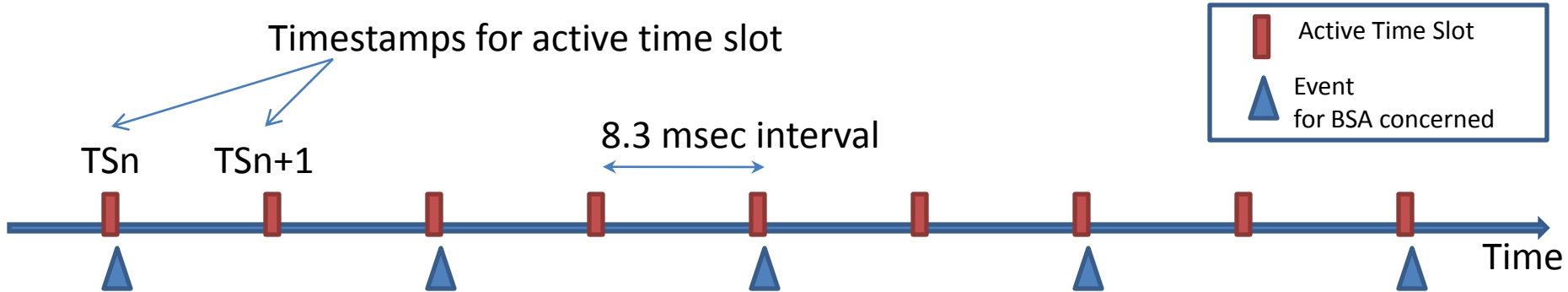
- Success Scenario: if TSE=0, and Guaranteed everything can be finished before next active time slot (within 8.3 msec)
  - Device support gets data for TSn
  - When the record instance gets timestamp, it should be still TSn

BSA aware timestamp and BSA fail/success scenario (2)

Timestamps for active time slot

8.3 msec interval

TSn   TSn+1

Time

Active Time Slot

Event for BSA concerned

Get timestamp at this point

Device support processing

Record support processing

Undefined delay between Dev. and Rec.
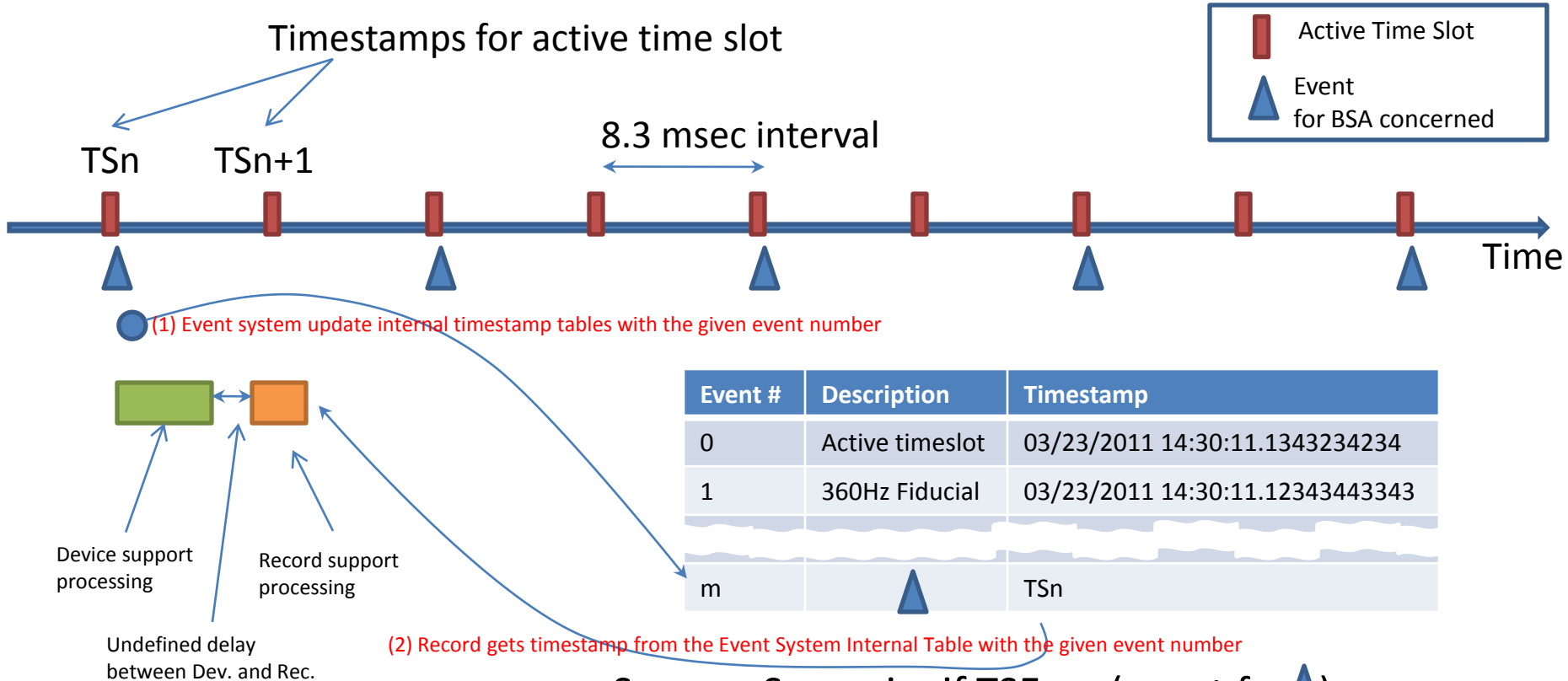
- Fail Scenario: if TSE=0
  - Device support successfully get data for TSn
  - But, need to assume, there should be undefined delay before start record processing
  - And, record processing might be not finished until next active timeslot
  - The record (the data source PV) time stamp gets TSn+1
  - Then, BSA could be failed.
    BSA assumed TSn timestamp for the data source PV

BSA aware timestamp and BSA fail/success scenario (3)

Timestamps for active time slot

TSn   TSn+1

8.3 msec interval

Active Time Slot

Event for BSA concerned

Time

Device support gets timestamp TSn then, provides it to record

Device support processing

Record support processing

Undefined delay between Dev. and Rec.

- Success Scenario: if TSE=-2
  - Device support provides timestamp TSn to the record instance
  - Even, record processing is finished after TSn+1, the timestamp should be TSn.
  - BSA is succeeded

BSA aware timestamp
and BSA fail/success scenario (4)

Timestamps for active time slot

TSn   TSn+1

8.3 msec interval

	Active Time Slot
	Event for BSA concerned

Time

(1) Event system update internal timestamp tables with the given event number

Device support processing

Record support processing

Undefined delay between Dev. and Rec.

Event #	Description	Timestamp
0	Active timeslot	03/23/2011 14:30:11.1343234234
1	360Hz Fiducial	03/23/2011 14:30:11.12343443343
m		TSn

(2) Record gets timestamp from the Event System Internal Table with the given event number
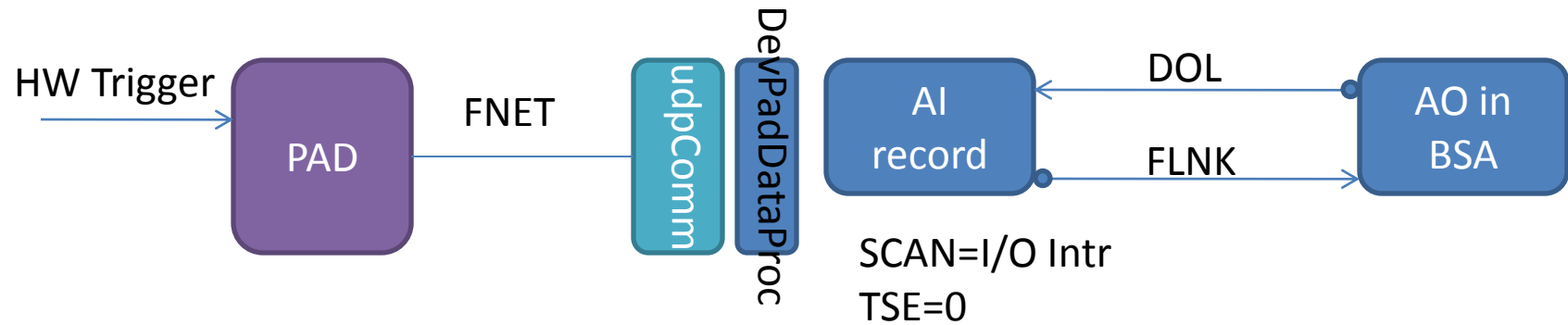
- Success Scenario: if TSE=m (event for △)
  - Need to Enable VME IRQ for event m
  - Event System maintain internal timestamp table for the events (including event m)
  - Record gets latest timestamp from table for event number m
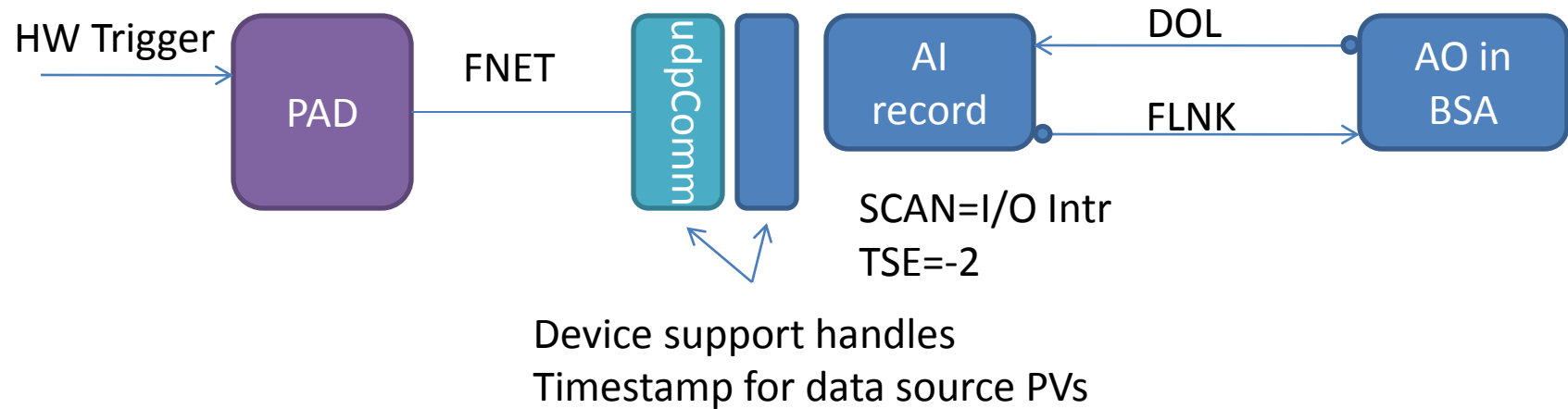
Example for Scenario (1)

Guarantee that everything can be finished within 8.3 msec
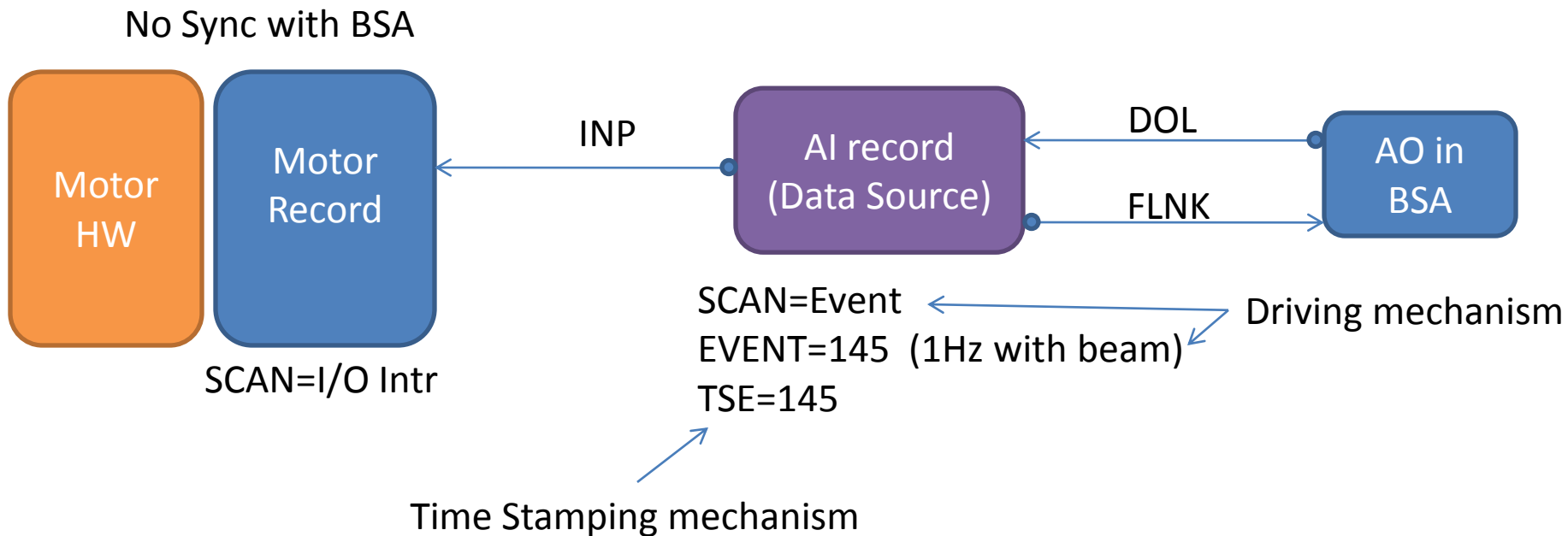
LLRF PAD reading
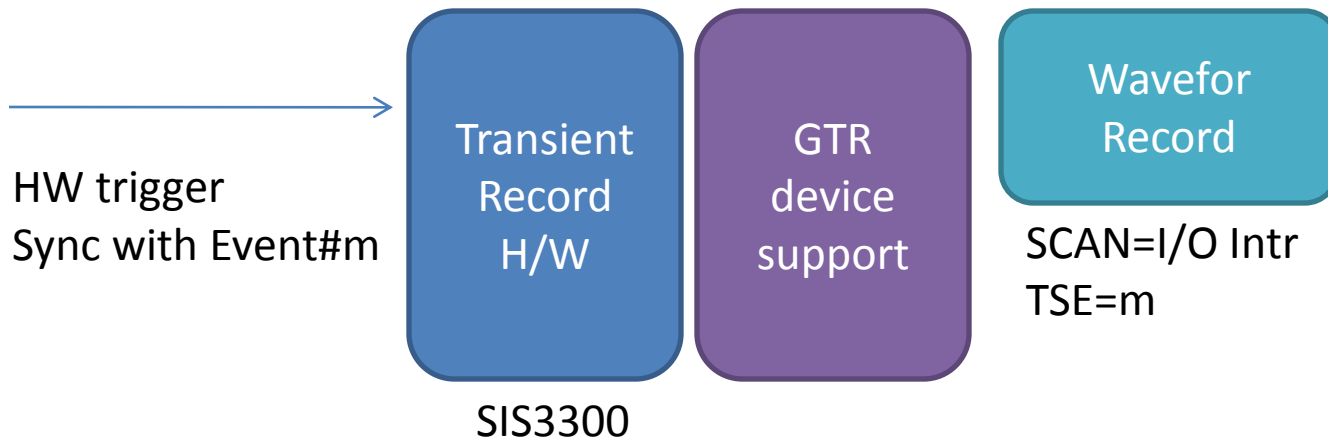
Example for Scenario (3)

BPM PAD reading

HW Trigger → **PAD** → FNET → **udpComm** → **AI record** ← DOL ← **AO in BSA**

AI record → FLNK → **AO in BSA**

SCAN=I/O Intr
TSE=-2

Device support handles
Timestamp for data source PVs

Example of Scenario (4) Asynchronous BSA?

No Sync with BSA

Motor HW

Motor Record

INP

AI record (Data Source)

DOL

FLNK

AO in BSA

SCAN=I/O Intr

SCAN=Event
EVENT=145 (1Hz with beam)
TSE=145

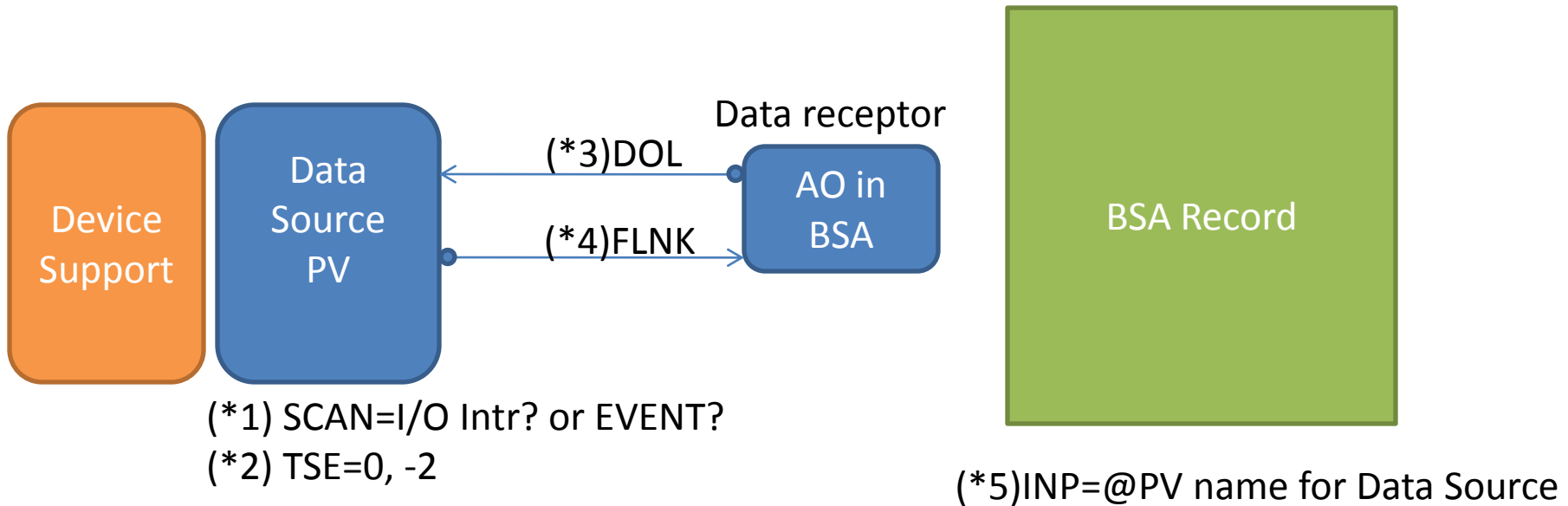Driving mechanism

Time Stamping mechanism

Exceptional Consideration

- BAS does not support waveform data
  - If, waveform can get the BSA aware timestamp: sync with 120Hz active timeslot & Pulse ID
  - Then, High level application can make correlation with other data: even BSA data
- How to get the BSA aware timestamp?
  - Suppose, device support does not handle the timestamp: general device support
  - EVR configuration: Enable VME IRQ for event#m

HW trigger
Sync with Event#m

Transient Record H/W

GTR device support

Wavefor Record

SCAN=I/O Intr
TSE=m

SIS3300

BSA Check Point AGAIN!

Device Support

Data Source PV

Data receptor

(*3)DOL

(*4)FLNK

AO in BSA

BSA Record

(*1) SCAN=I/O Intr? or EVENT?
(*2) TSE=0, -2

(*5)INP=@PV name for Data Source

(*1) check up your data source driving mechanism
(*2) check up TSE in your data source, Please remind the success/fail scenario
(*3) (*5) check up if the PV name matched, DOL in data receptor and INP in BSA
(*4) check up the FLNK, your data source should drive the data receptor