CERN

PM Storage Issues

On behalf of BE-CO admins and MPE PM experts
LPM-933 and LPM-934

GPM With Incomplete Event Data

Dump context

Event timestamp:	2016.06.16 04:24:39 CEST
Fill number:	5021
Filling pattern:	
Acc / Beam mode:	PROTON PHYSICS / STABLE BEAMS
Energy:	6499440 MeV
Intensity B1:	18748 e^10 charges
Intensity B2:	19515 e^10 charges
SMP flags:	PRESENT, STABLE, MOVEABLE / PRESENT, STABLE, MOVEABLE
BSTAR 1/2/5/8:	0.4 / 10.03 / 0.4 / 3.0 m

Event sequen

Event category:	TIMING_EVENT
Event classification:	PM1_EVENT
Event sequence:	No input change detected
Triggered BIC inputs:	
SCEvents:	No power converter events found

Machine protection features

Event description	BIC_ES finished with warnings.
Highest beam losses:	
Magnet quenches:	No magnet quenches found
nQPS triggers:	No nQPS events found

BIC IPOC: ✗ FMCM ISA: ✓ PIC IPOC: ✓

XPOC B1: ✗ XPOC B2: ✗

Safe for injection ?: ✗ PM Overall: ✗

Comments

User: lponce

Adviced actions:

Beam Losses: Lo

Orbit Changes: Classi

UFO in 5L1, but no PM event triggered

standard_viewer >> Version: 2.0.0 Responsible: Roman Gorbonosov

Event time stamp

16/06/16 04:24:39.499+98

HEADER

System	LHC
Class	DATA_COMPL
Source	GA
Event stamp	04:24:39.499 16/06/16
Version	1.1
Encoding	PMData
Qualifier	
Analysis flags	11000

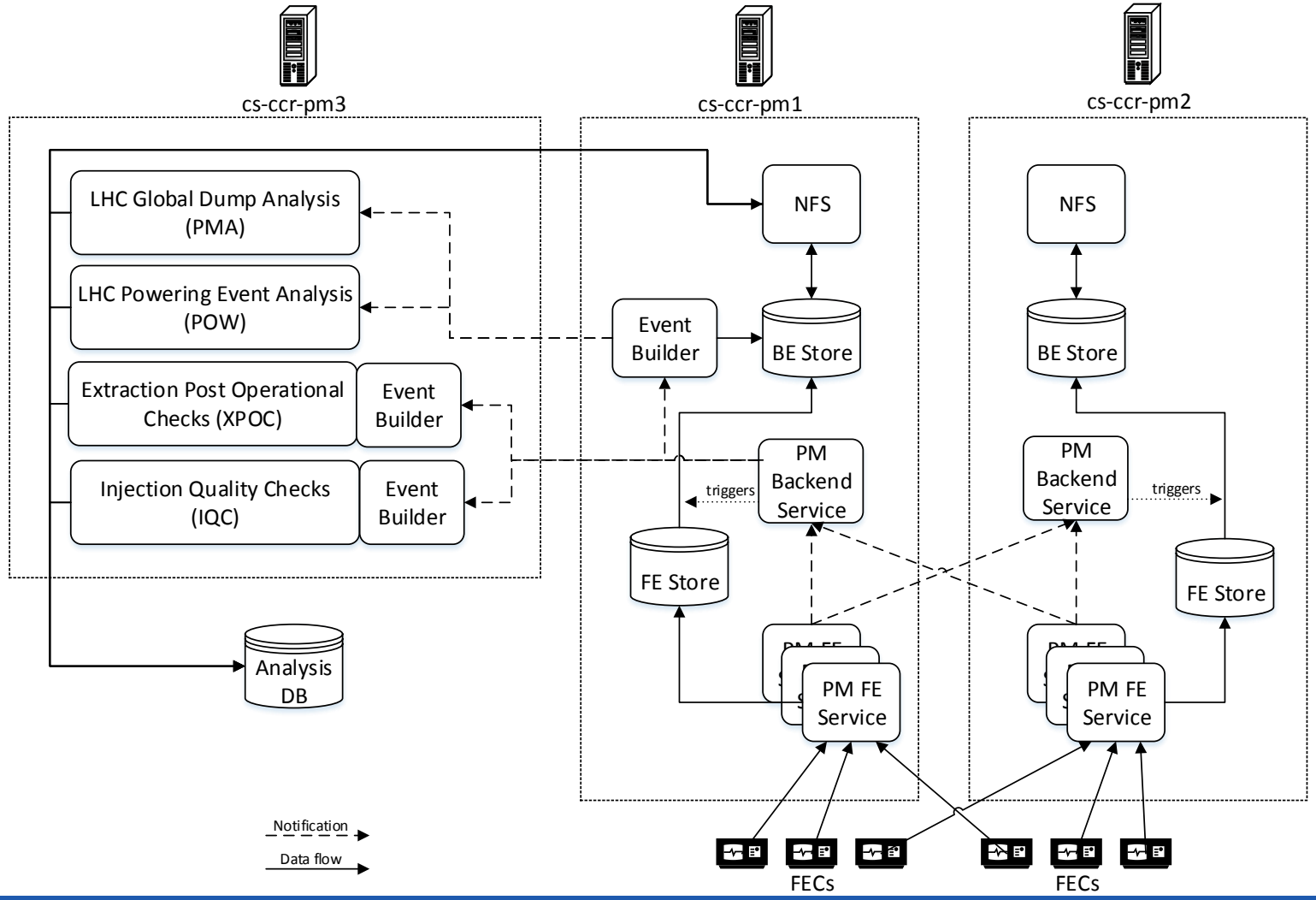
CONTENTS

String[3] – nmExtraTrigDev

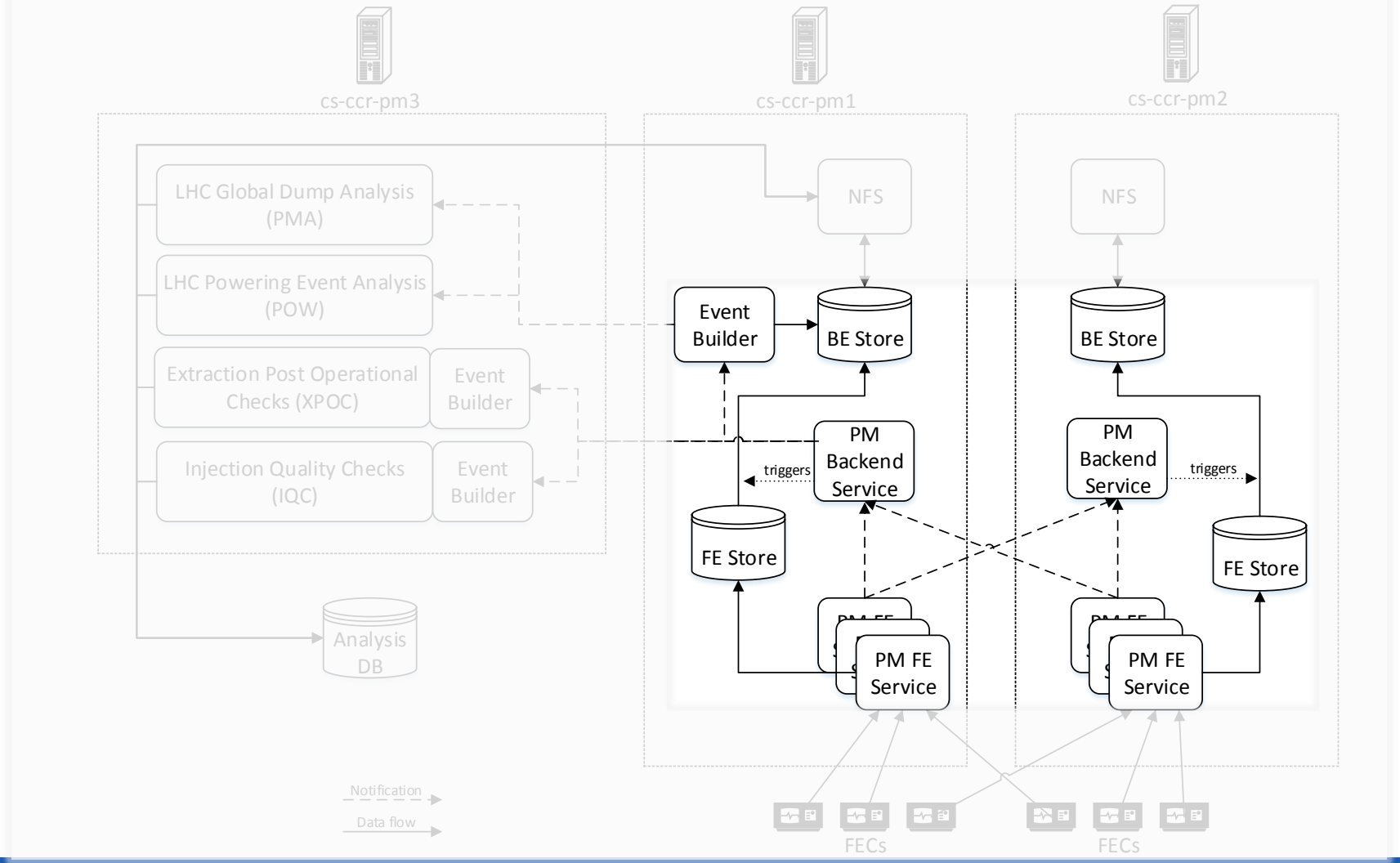
String[5] – nmIgnoredTrigDev

String[3613] – nmNonTrigDev

PM System Architecture



Problem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cs-ccr-pm1
cs-ccr-pm2
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LHC Powering Event Analysis (POW)
Extraction Post Operational Checks (XPOC)
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Injection Quality Checks (IQC)
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Analysis DB
NFS
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PM Backend Service
triggers
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triggers
FE Store
FE Store
PM FE Service
PM FE Service
Notification
Data flow
FECs
FECs

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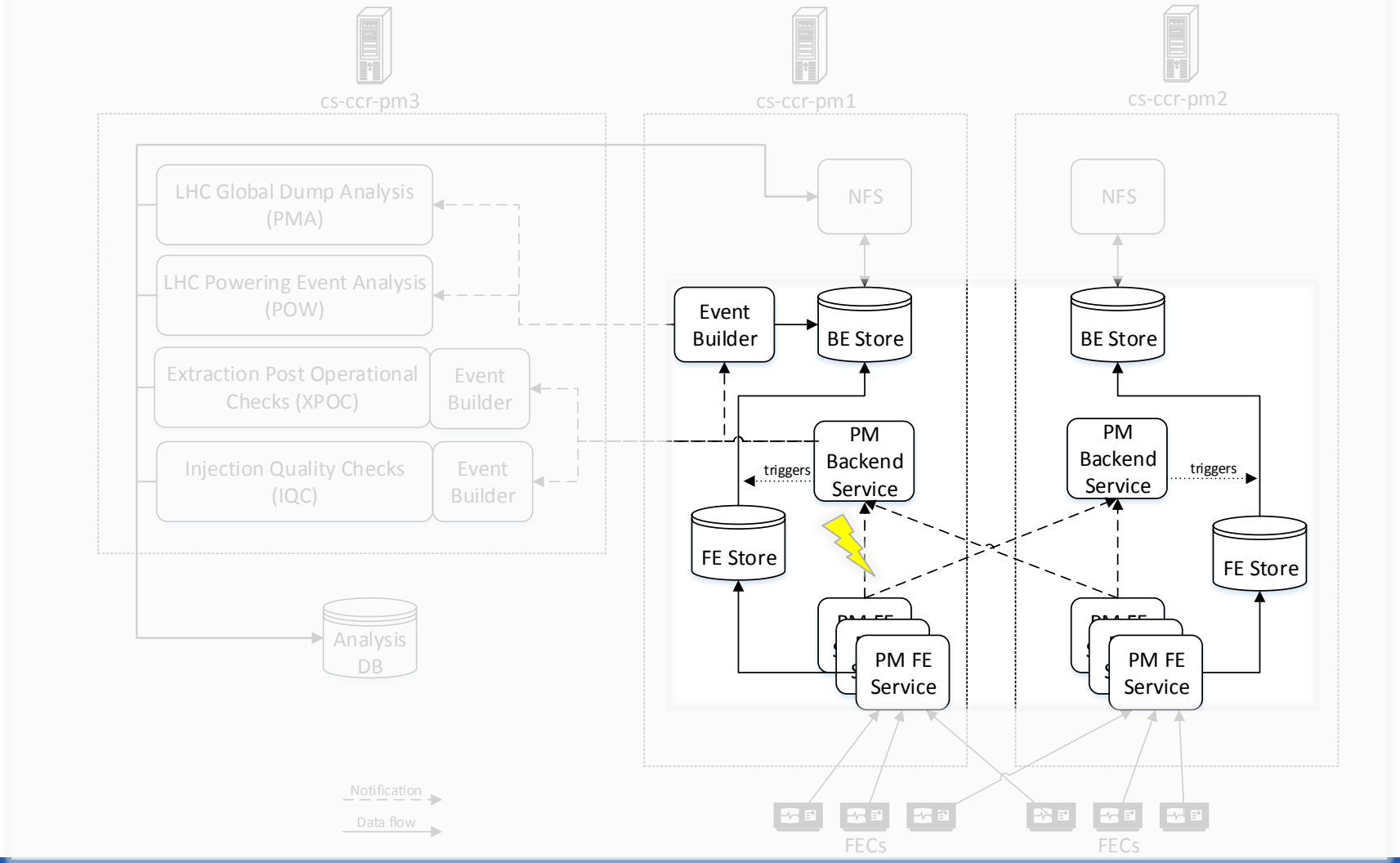
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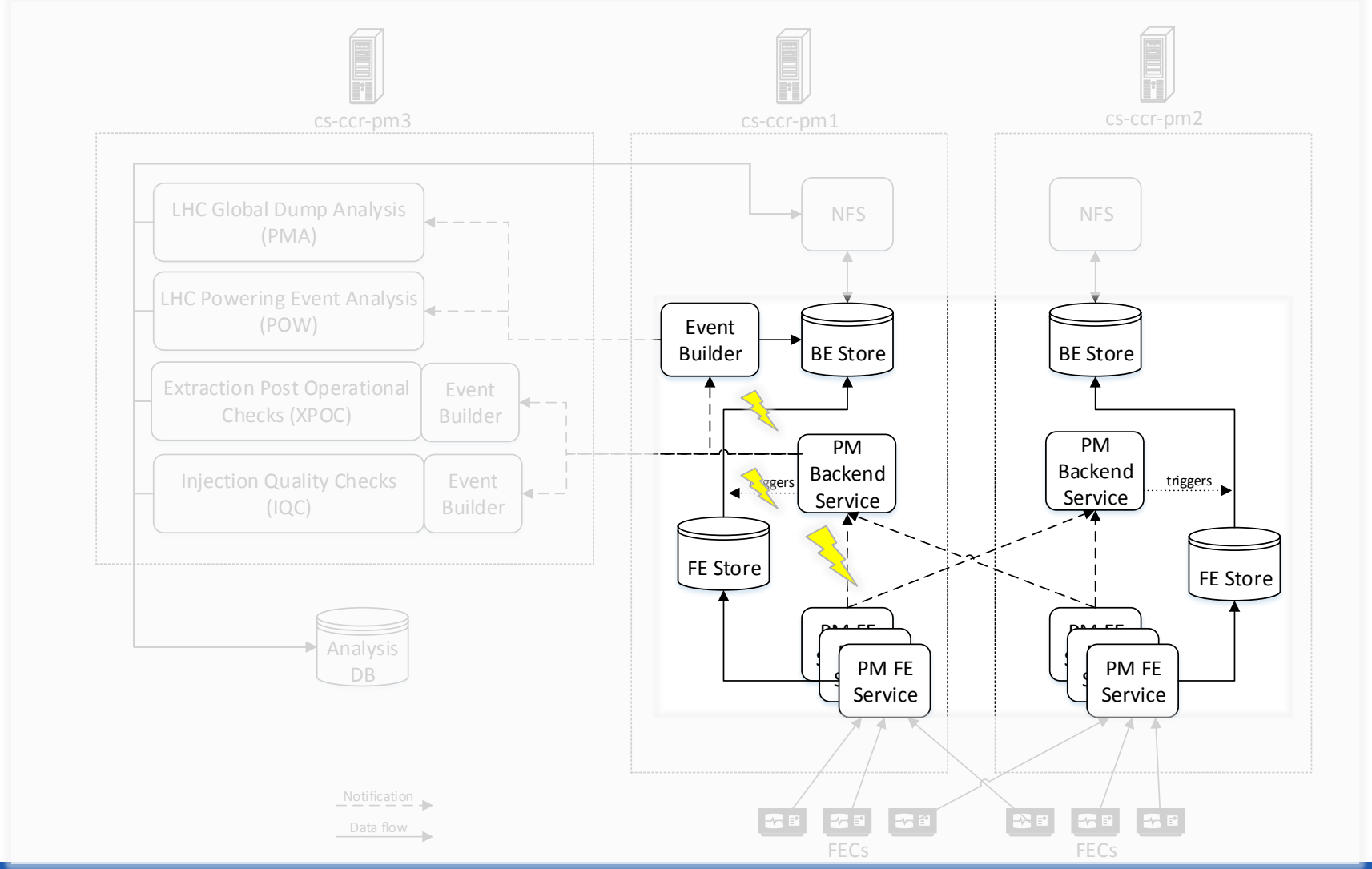
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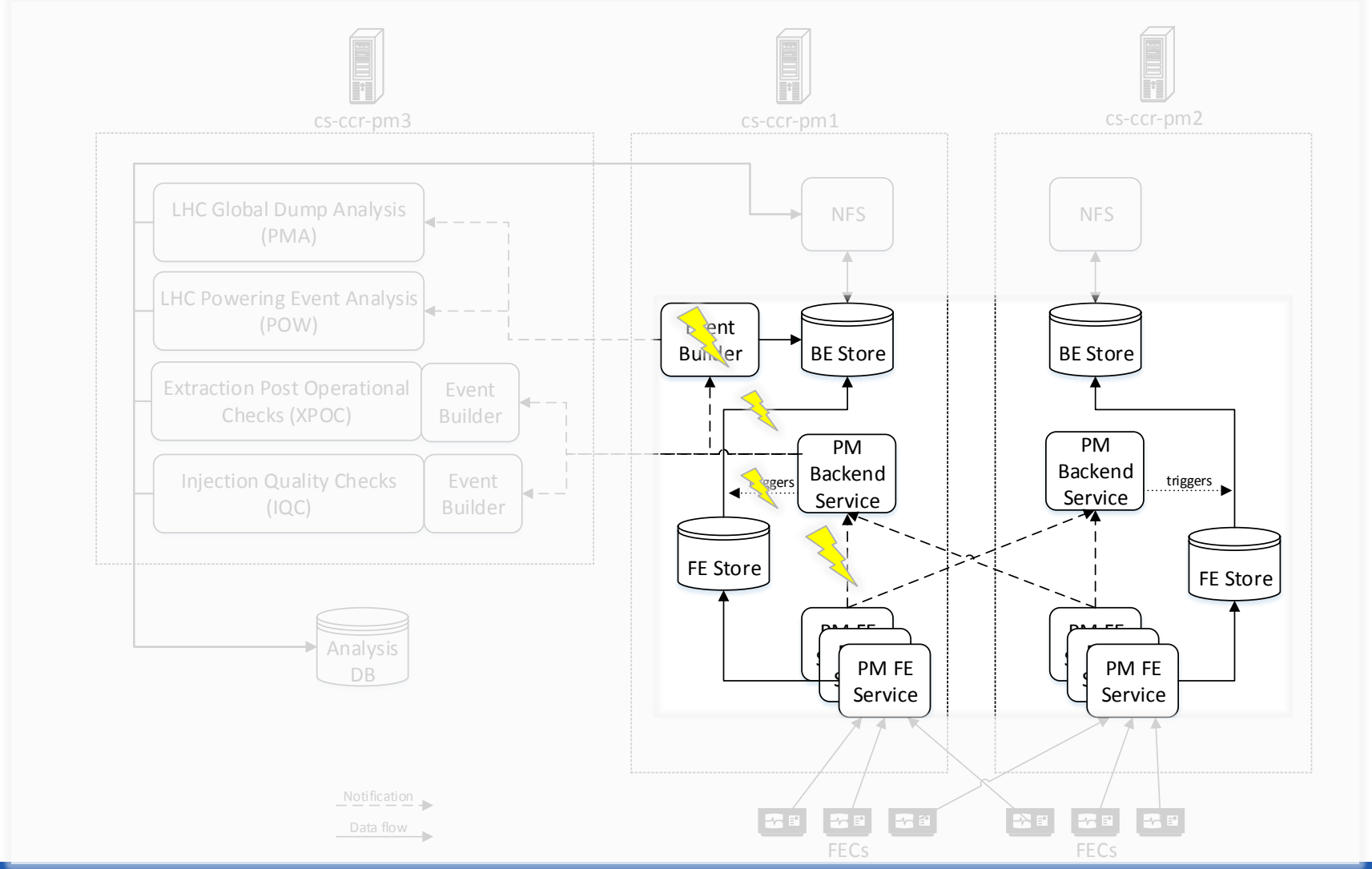
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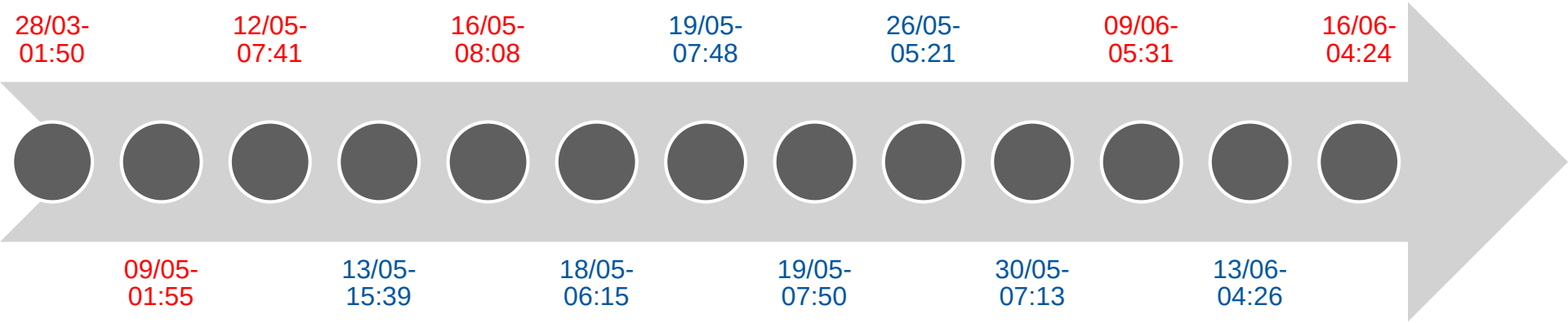
Timeline Of Problem Occurrence



Incomplete Event Data
FE-BE Connection Loss

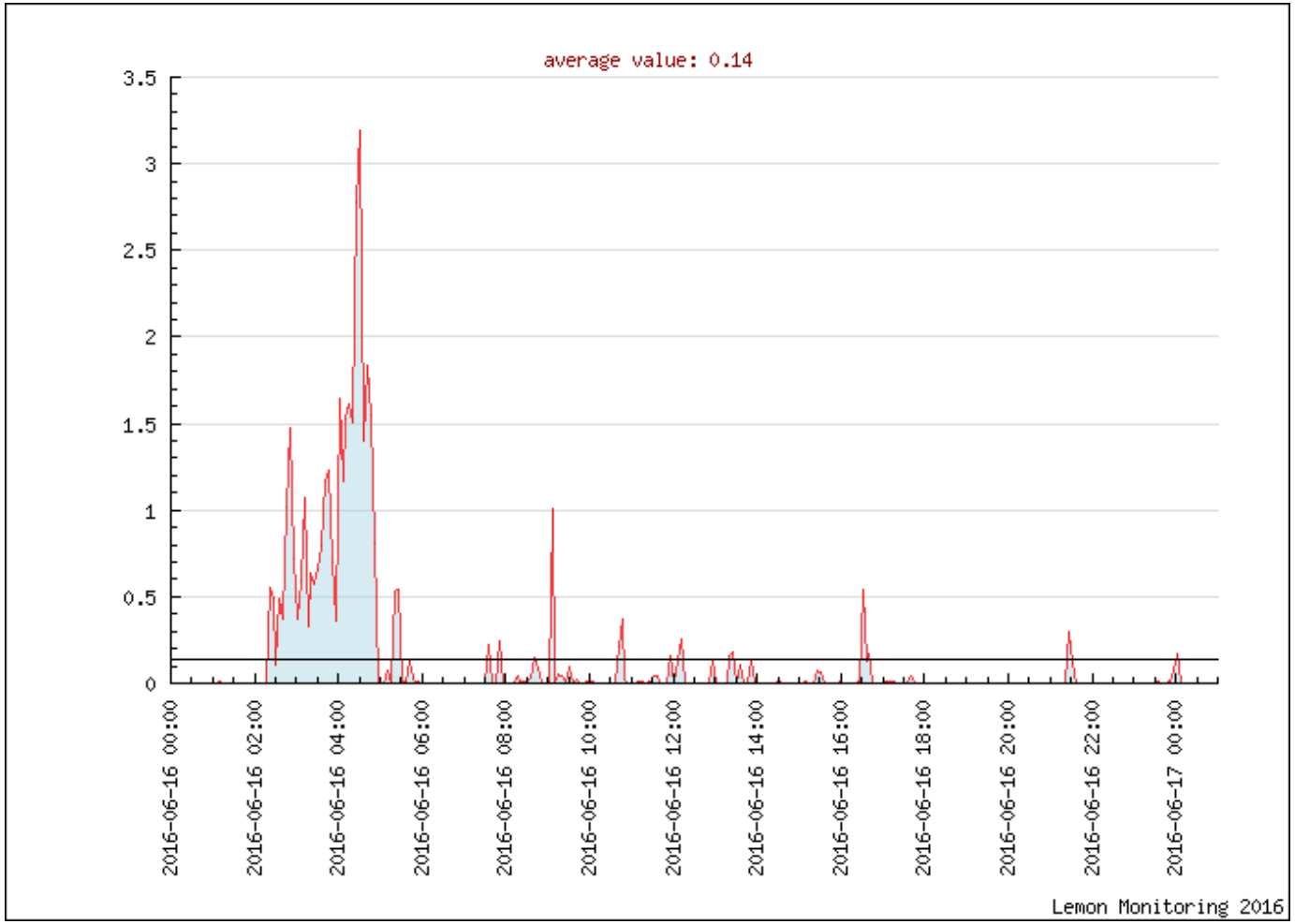
Investigation

- High load on disk observed at the time of the problematic beam dumps, leading to increased latency (I/O wait) and subsequently incomplete events being built

LVM	vg01-lvol1		busy	100%		read	10947		write	2932	
DSK	sdf		busy	100%		read	10947		write	0	
DSK	sda		busy	0%		read	0		write	246	
DSK	sdc		busy	0%		read	0		write	179	
DSK	sdb		busy	0%		read	0		write	54	

KiB/w	4		MBr/s	0.71		MBw/s	0.19		avq	1.02		avio 4.31 ms
KiB/w	0		MBr/s	0.71		MBw/s	0.00		avq	1.00		avio 5.46 ms
KiB/w	9		MBr/s	0.00		MBw/s	0.04		avq	3.90		avio 0.08 ms
KiB/w	65		MBr/s	0.00		MBw/s	0.19		avq	4.82		avio 0.06 ms
KiB/w	15		MBr/s	0.00		MBw/s	0.01		avq	2.60		avio 0.09 ms

Investigation



Metric graph for cs-ccr-pm1 of metric: CPUutil field: PercIOWait

Investigation

1. Data always arrived at the FE Server process (no PM data loss)
2. Other processes read/write to the disks at the same time
   a) I/O wait increases drastically
   b) BE server loses connection to FE server due to timeout
3. Once other processes are completed, BE-FE connection is re-established

Planned Actions

- Update firmware of HDDs (possible bug)
- Consolidate HDD types in RAID (currently a mix of SAS+SATA)
- Remove unnecessary backup processes
- Modify PowerSaver-Settings
- Reprioritize the server processes
  a) FE and BE server: higher
  b) Other processes: lower

Actions Taken

- ❑ Update firmware of HDDs (possible bug)
- ✓ Consolidate HDD types in RAID (currently a mix of SAS+SATA)
- ✓ Remove unnecessary backup processes
- ❑ Modify PowerSaver-Settings
- ✓ Reprioritize the server processes
  a) FE and BE server: higher
  b) Other processes: lower

Current Status

- No incomplete events observed since, but still experienced FE-BE connection losses

- On the 15th of July, one drive in a RAID failed on PM1
  - Drive was assigned to FE data store
  - Drive was replaced and data rebuilt without impact on operations

- Since then, no more FE-BE connection losses

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