l'Observatoire de Paris | LESIA

Laboratoire d'Études Spatiales et d'Instrumentation en Astrophysique

PLATO kickoff
Nov. 9, 2010, CNES Headquarters

N-DPU software

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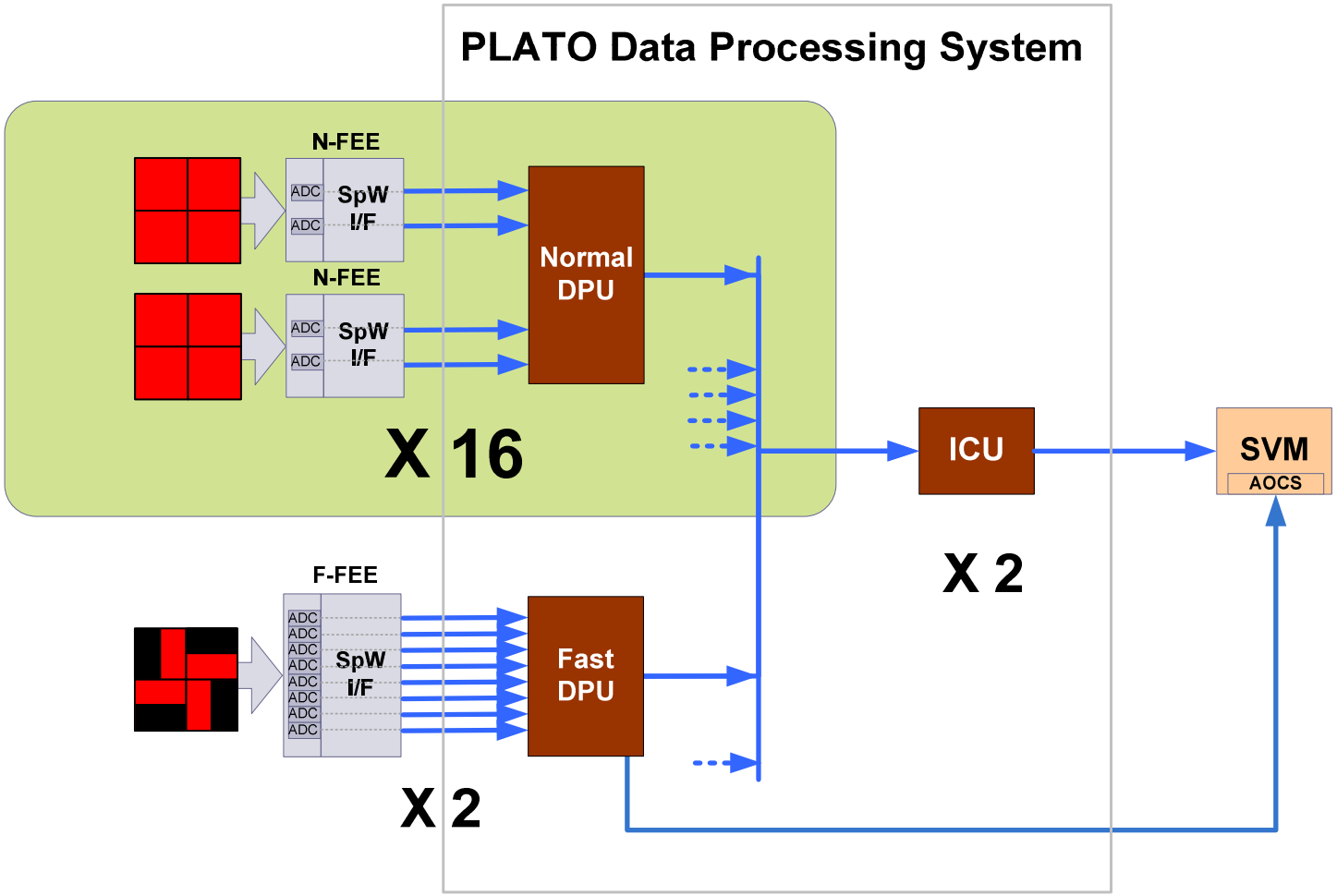
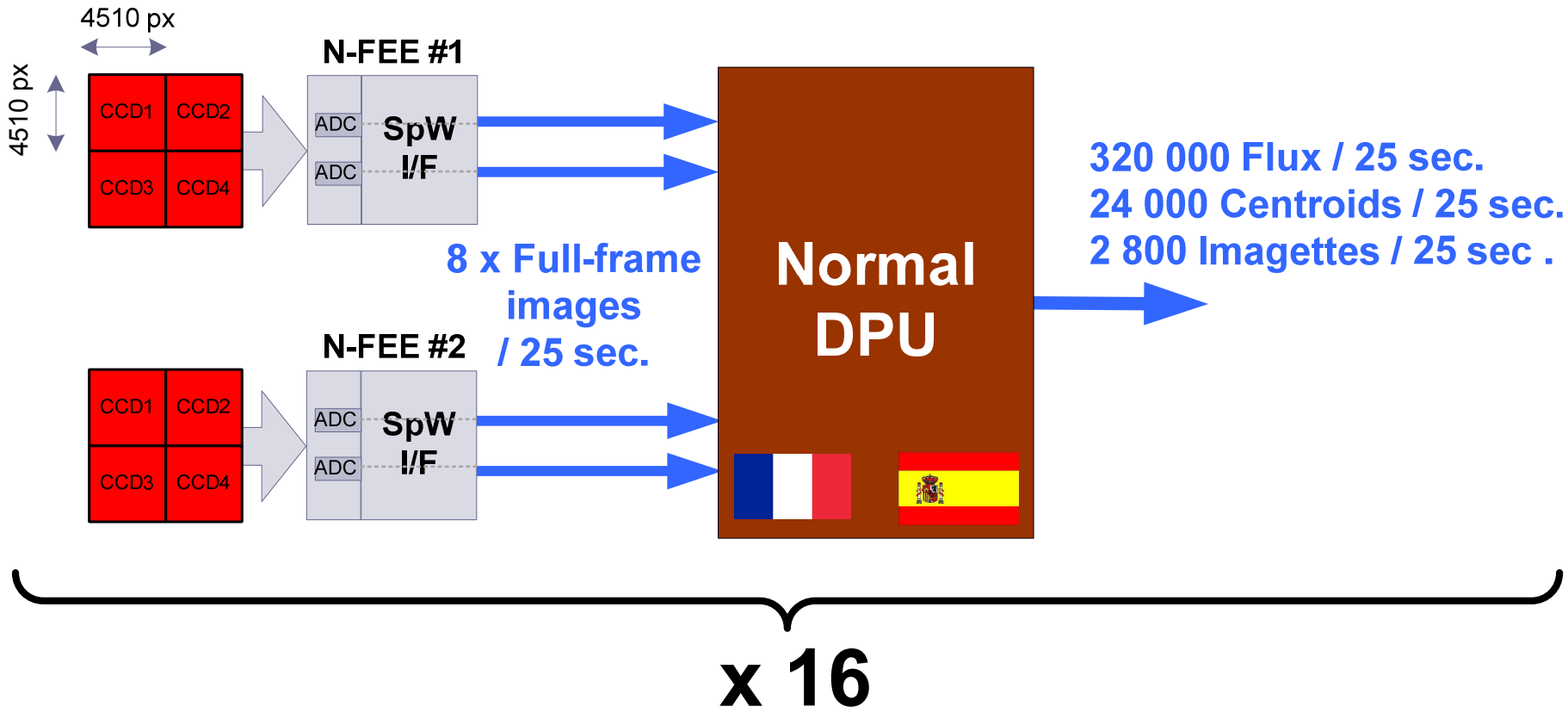
The N-DPU in the DPS architecture



- Each N-DPU is responsible for processing the data of 2 normal cameras.
- There are a total of 16 N-DPU which handle a daily amount of raw data which is around 143 TBits/day

Overview of the N-DPU software role



- Each N-DPU receives 8 CCD full-frame images every 25 seconds (~160 millions of pixels).
- The main role of N-DPU SW in observation mode is to reduce the data flow by:
  - extracting up to 320 000 star windows from the full-frame images every 25 s.
  - computing star flux and centroids
  - transmitting imagettes

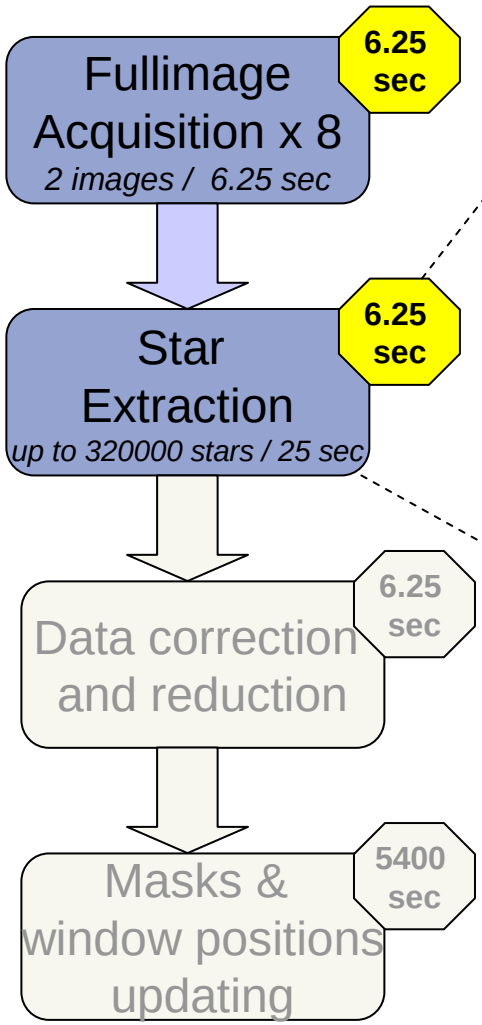
N-DPU tasks

1. Over a period of 25 seconds corresponding to the CCD readout period, each normal DPU receives 2x4 CDD full-frame images: two 20-million pixel images / 6.25 sec

2. Each CCD full-frame image is entirely stored in the DPU memory before processing

Done by HW

N-DPU tasks



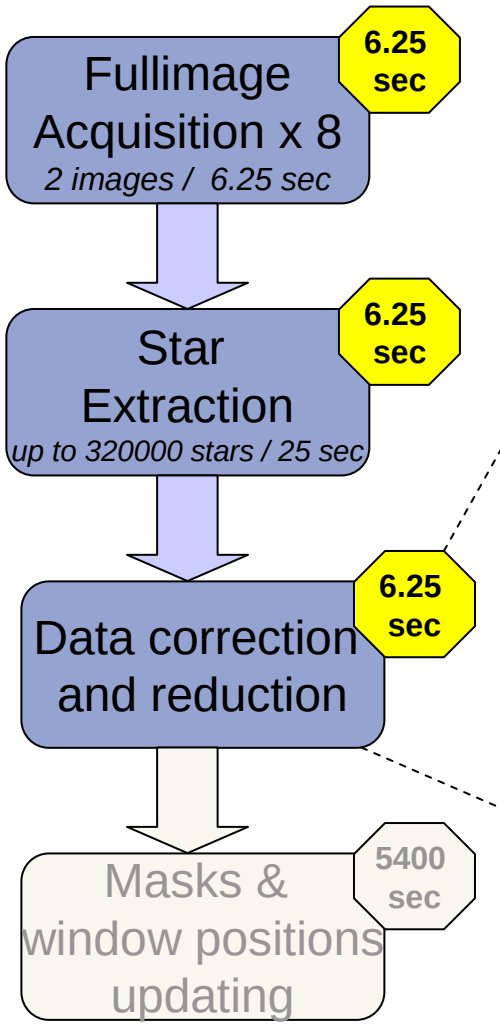
1. Triggered as soon as a CCD full-frame image is available in the DPU memory (8x over a period of 25 seconds)
2. Performed using a set of windows descriptors computed in configuration mode (**6x6-pixel windows**)

Sample P1	2x6720, with margin 50% = 2x10080
Sample P4	2x102200, with margin 50% = 2x153300
Imagettes	up to 2 x 2000

Target count for 2 x 4 CCD (to be processed every 25 sec.)

Done by SW

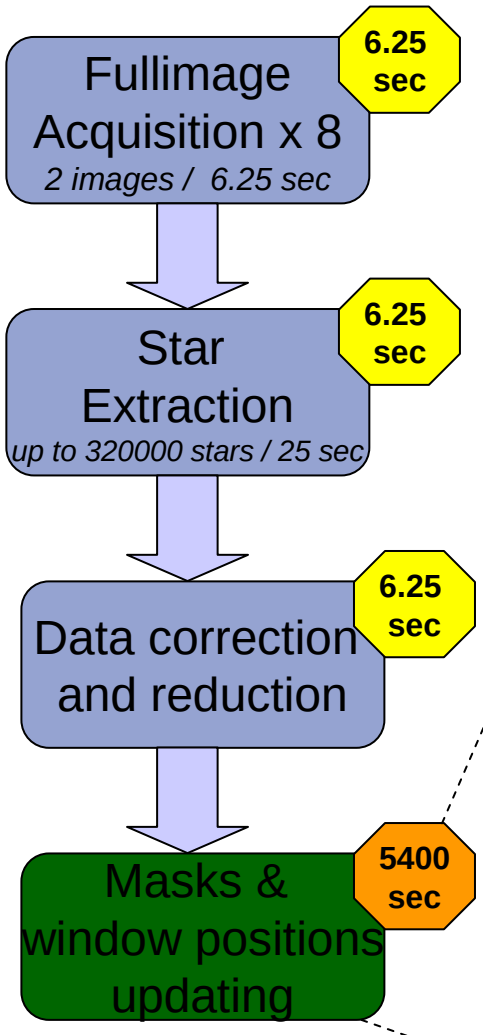
N-DPU tasks



1. Offset value computation
2. Smearing value computation
3. Smearing and offset correction
4. Background correction using an analytical model of the background
5. Flux computation : i) **weighted mask photometry** (baseline) ii) LSF fitting photometry.
6. Gain correction
7. Computation of centroid for each star belonging to the Sample P1 and for a fraction (1%) of the stars of the Sample P4
8. Transmission to ICU of the 6x6-imagette windows, the star flux and the centroids.

Done by SW

N-DPU tasks



Done by SW

1. Updating the mask position.
   - The objective is to anticipate the star displacement by computing the position the star will have at the middle of the time interval between two successive updates.
2. Updating the mask itself by using a Gaussian analytic model of the PSF.
3. Updating the normalization of the mask using a numerical model of the PSF.

N-DPU Software - Conclusion

- The evaluation of the computational resources required to implement the N-DPU software is a critical activity for the dimensioning of the whole DPS and of the PLATO payload itself.
- These dimensioning studies based on prototyping and simulations have been started two years ago by LESIA.
- They have resulted in the production of a very detailed and accurate CPU budget which helped to reduce by half the total number of N-DPU boards (16 N-DPU boards versus 32 N-DPU boards).
- One of the important job of the definition phase will be to consolidate this budget in order to definitively confirm the current DPS design.