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From the Cloud to the Cosmos

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Computing R&D Micro-Retreat

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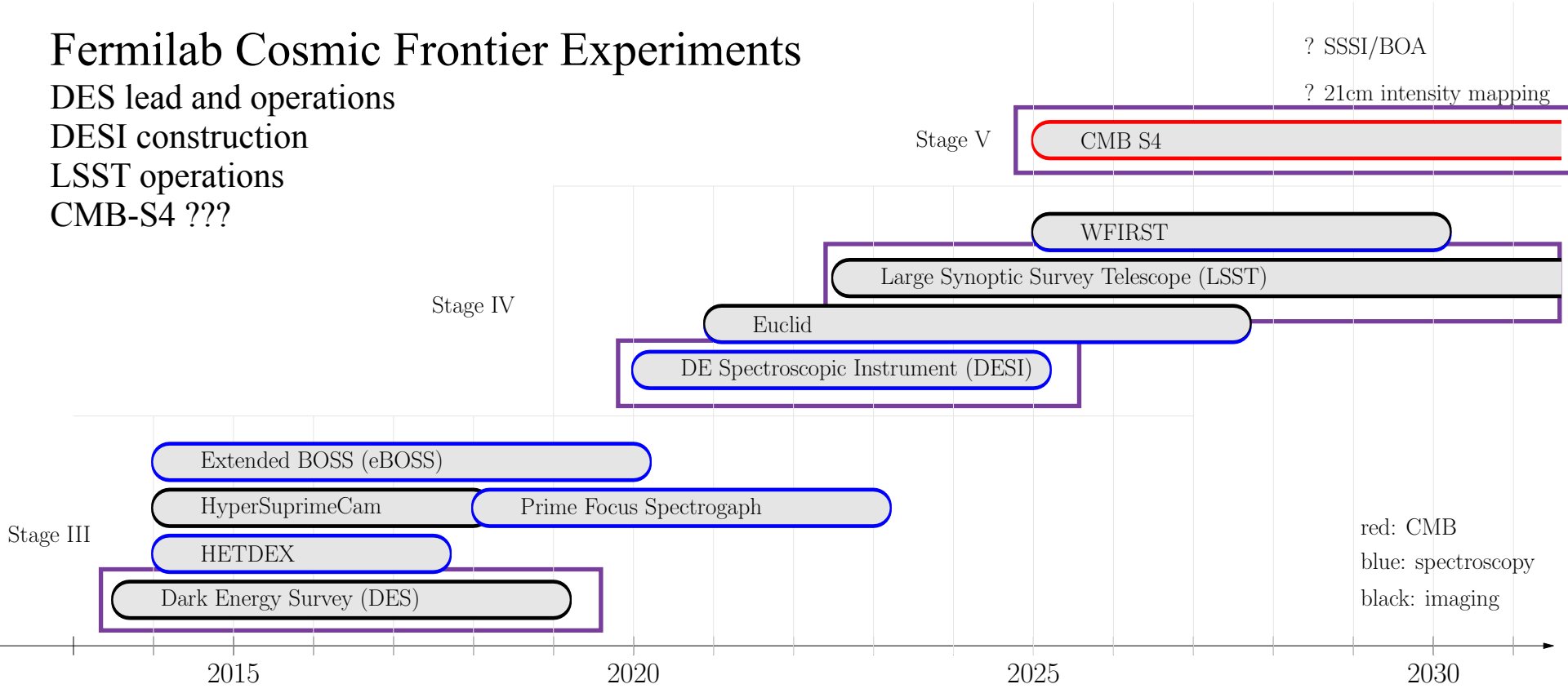
Cosmic Frontier: Dark Energy

Fermilab Cosmic Frontier Experiments

DES lead and operations
DESI construction
LSST operations
CMB-S4 ???



Directions

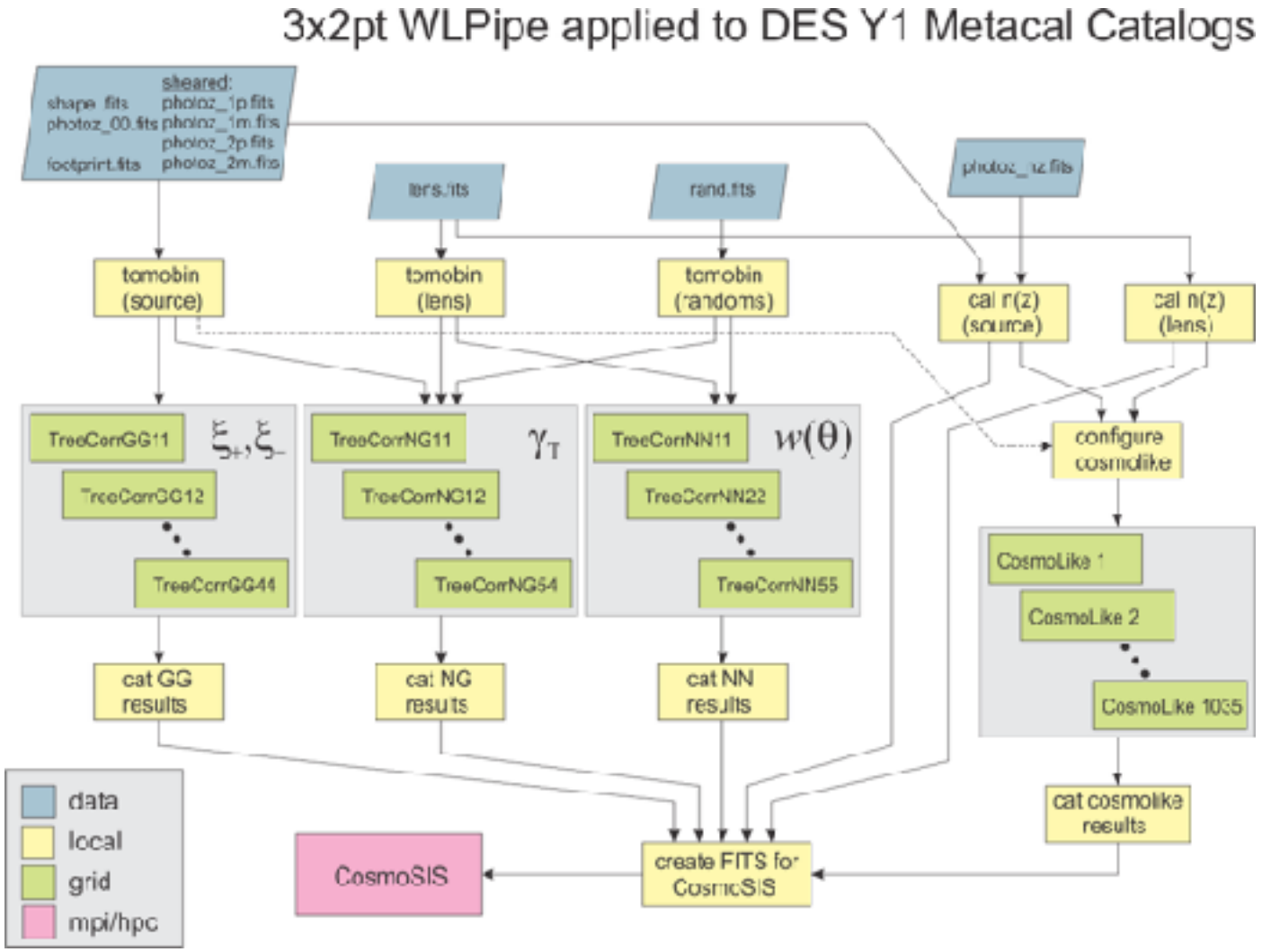
- DES Operations is image processing
- DES science is a complicated spatial catalog processing & cosmological parameter estimation

- Image processing & catalog processing = high throughput & large memory
- Cosmological parameter estimation (MCMC) = high performance
- Always need better database infrastructure

- LSST Operations will be primarily image processing
  - At the exascale- 0.5 exabytes of data
- LSST/DESC science will be complicated spatial processing etc.

- Fermilab centered researchers use Fermigrid, but both collaborations are being asked to use NERSC

WLPipe: From Catalogs to Cosmology



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Bringing WLPipe to the Cloud to Explore the Cosmos

- This system developed for LSST/DESC, currently developing 2nd generation
  - used to re-analyze the results from 4 weak lensing surveys:
- This system adopted by DES for the Year-3 weak lensing & LSS analysis.
  - Other DES collaborators expressed interest in pipelining analyses in this way.
- Suggests a need to explore ways to make this infrastructure more accessible to the DES collaboration to produce more science results.

- HEPCloud seems like a good candidate for this:
  - WLPipe has a mix of HTC and HPC requirements.
  - Develop a way to allow cosmologists to describe complex pipelines using a higher-level abstraction (e.g. CWL).
  - Submit descriptions to a portal/gateway and let HEPCloud take care of the rest.

- Extrapolate to 2026:
  - LSST/DESC model is to take the computations to the data
  - We want to jointly analyze LSST catalogs & CMB-S4 maps