



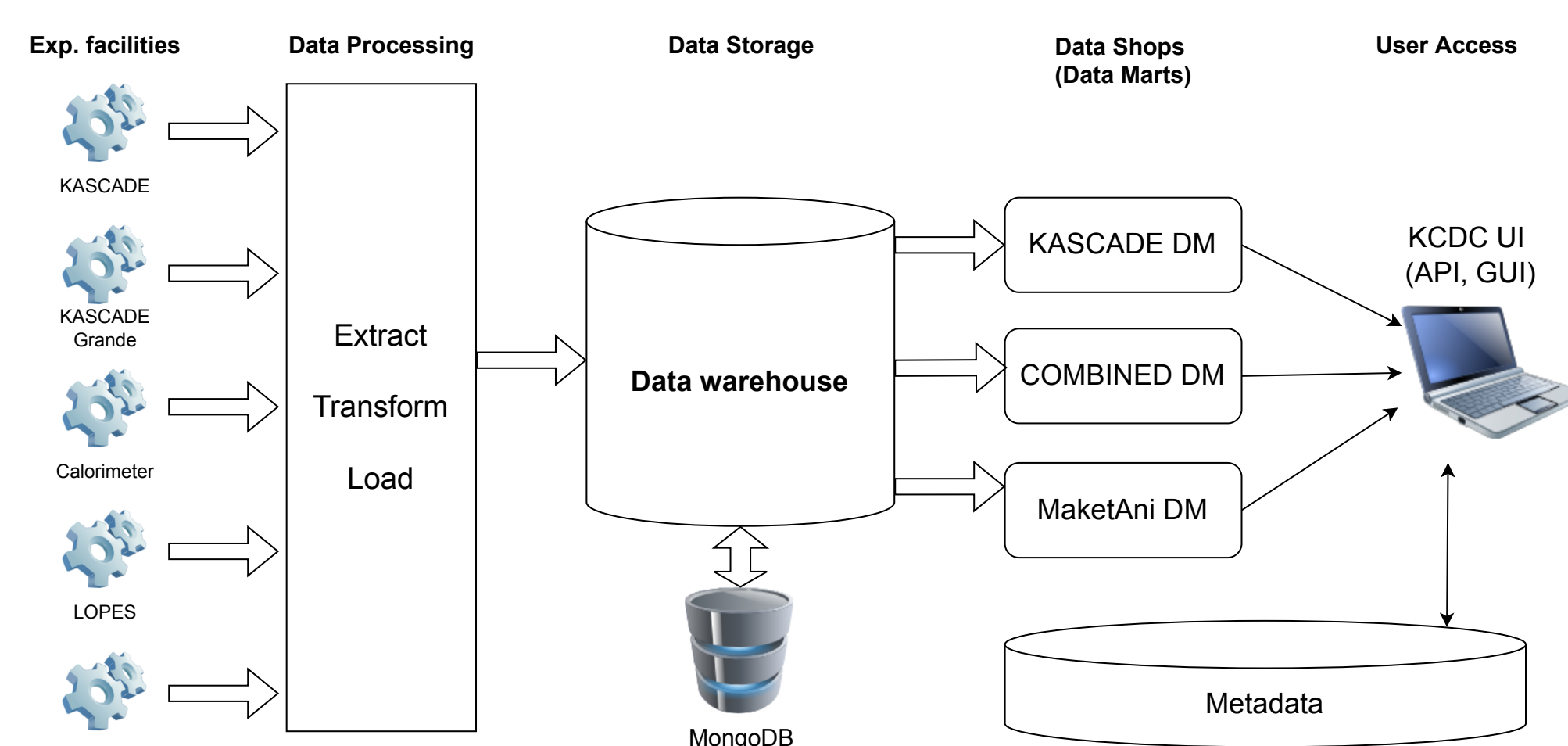
KCDC and GRADLCI data centers



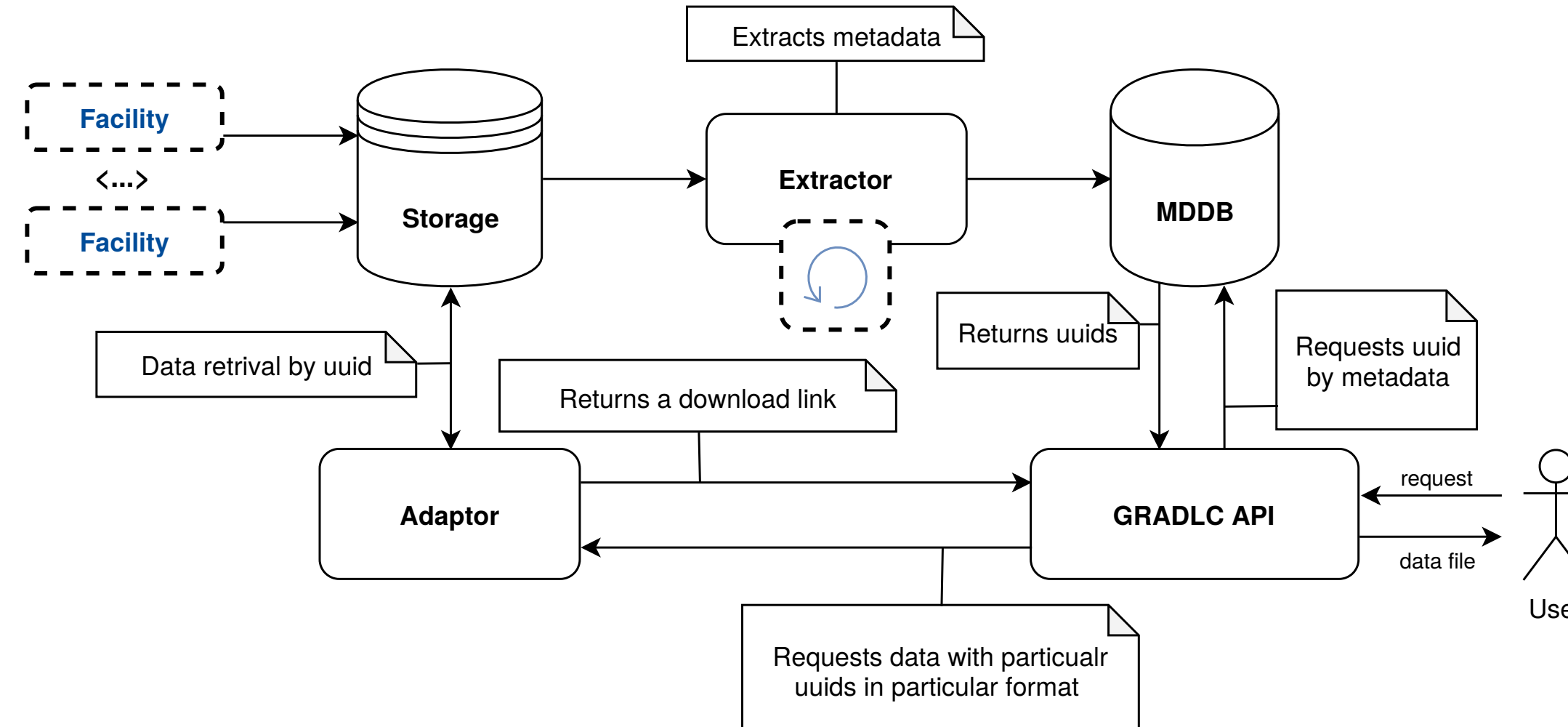
-
- The diagram illustrates the process of deriving deliverables from use cases and classes. On the left, a vertical list of use cases (Use case 1, Use case 2, Use case 3, ..., Use case 99) is shown. On the right, a vertical list of classes (Class 1, Class 2, Class 3, Class 4, Class 5, Class 6) is shown. A large yellow arrow points from the use cases to the classes, labeled "Aggregation Abstraction". Below this arrow, the text "Derivation of deliverables" is written. On the far right, a vertical list of deliverables (Deliverable, Deliverable, Deliverable, ..., Deliverable, Deliverable) is shown. A large yellow arrow points from the classes to the deliverables, labeled "Derivation of deliverables". To the right of the deliverables, a vertical list of terms (TA, TA, TA, ..., TA, TA) is shown, with curly braces grouping the deliverables to these terms.



KCDC



GRADLCI



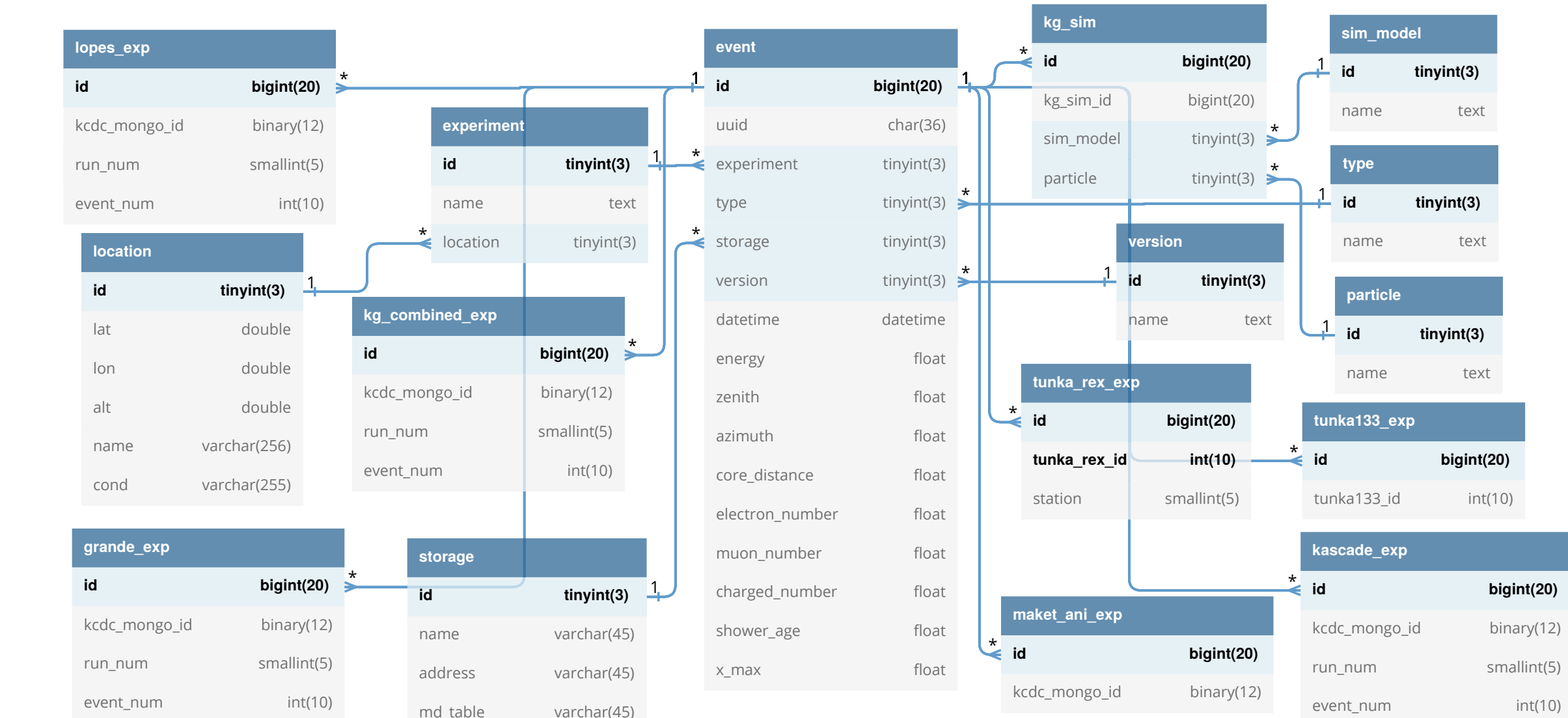
JSON metadata schema, example of a record from [KCDC](#)

```

392 | "model": "kaos_datastop.quantity",
393 |
394 | "fields": {
395 |   "quant_type": "num",
396 |   "allow_cuts": true,
397 |   "read_description": "<p class=dcInfoBoxHeaderDS>Zenith Angle Info</ps>",
398 |   "descr_text": "HTML",
399 |   "composite_data_handler": "",
400 |   "unit": "\\u00B0",
401 | }},
402 | "detector": [
403 |   {
404 |     "quant_sub_type": "rfid",
405 |     "display_format": "default",
406 |     "min_value": "-0.0",
407 |     "display_name": "Zenith Angle",
408 |     "description": "<div/rn\\nspan class=dcInfoBoxDetailsDS>r/nThe reconstructed Zenith Angle of the KASCADE showers is derived from the arrival time distribution of the particles at the detector stations. The range is from <span class=dcMathFunc-0.4ddeg/><span>-<span class=dcMathFunc-0.4ddeg/><span>-<span where <span class=matlath-Bdeg/><span>-<span corresponds to a vertical shower. The angular resolution between <span class=dcMathFunc-0.4ddeg/><span>-<span and <span class=dcMathFunc-0.16deg/><span>-<span depends on energy.</r/n><b>Note:</b> In webUI recommend to use data only up to <ddeg/><b>Dr</b>-dr</span></span></span>"
409 |   },
410 | ],
411 | "name": "Ze",
412 | "max_value": "60.0",
413 | "order": 2,
414 | "desc_head_html": "<p class=dcInfoBoxHeaderDS>Zenith Angle Info"
415 | }

```

Metadata data base schema for GRADLCI



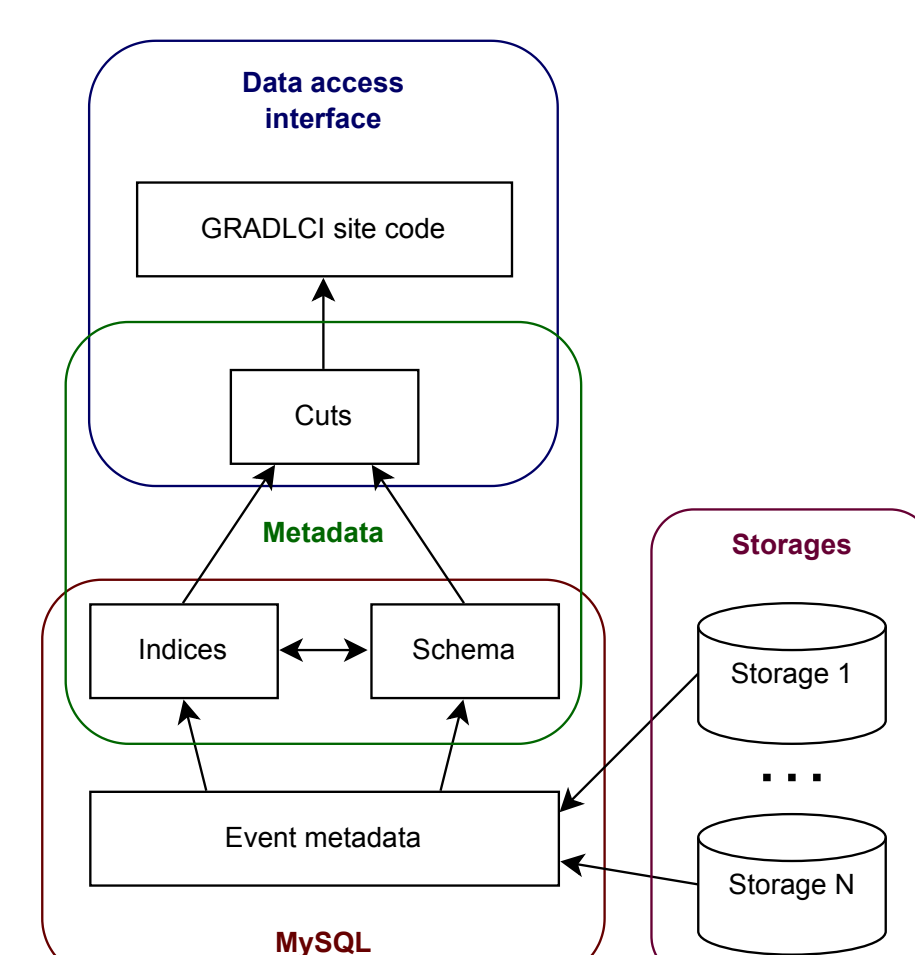
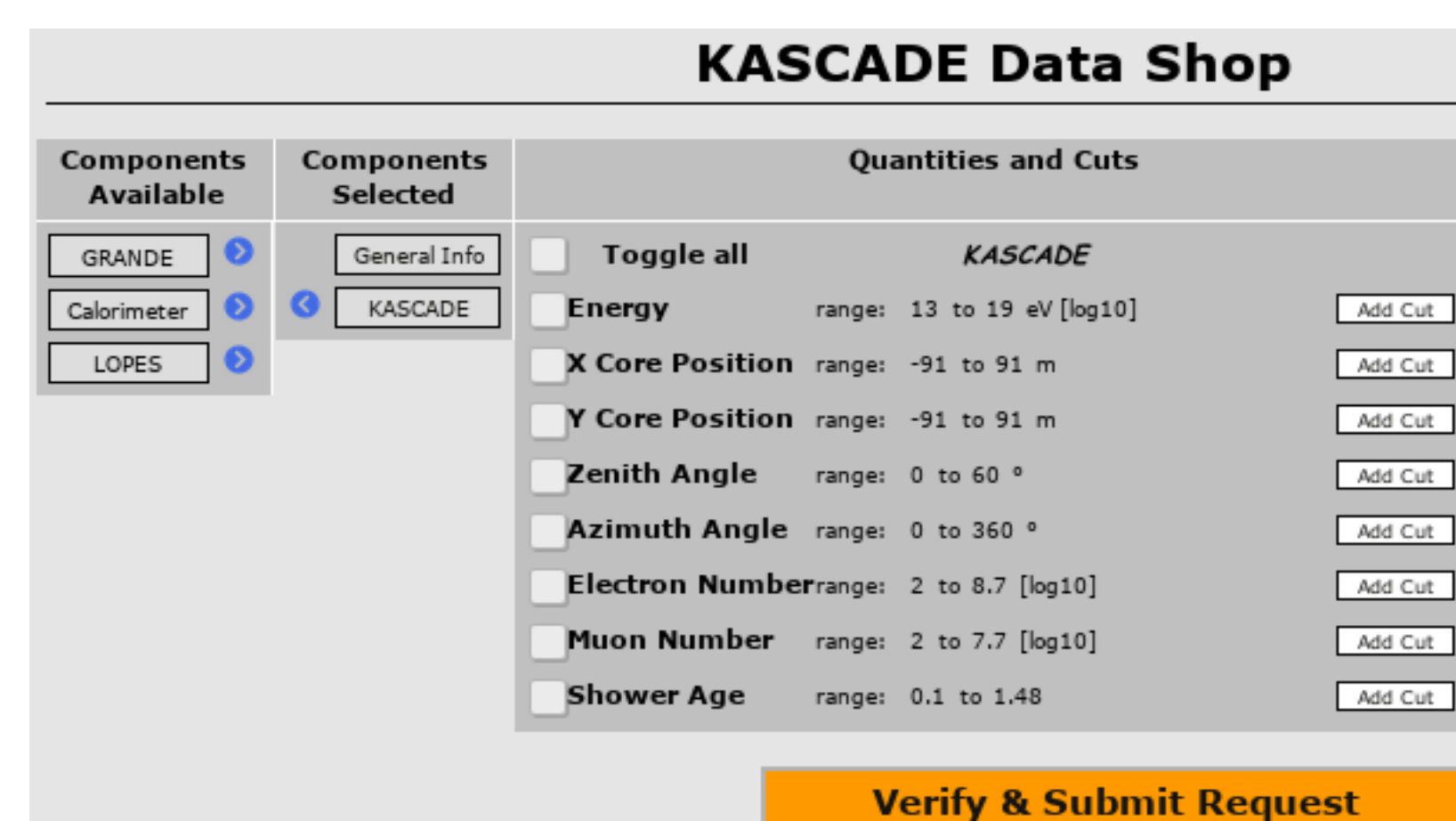
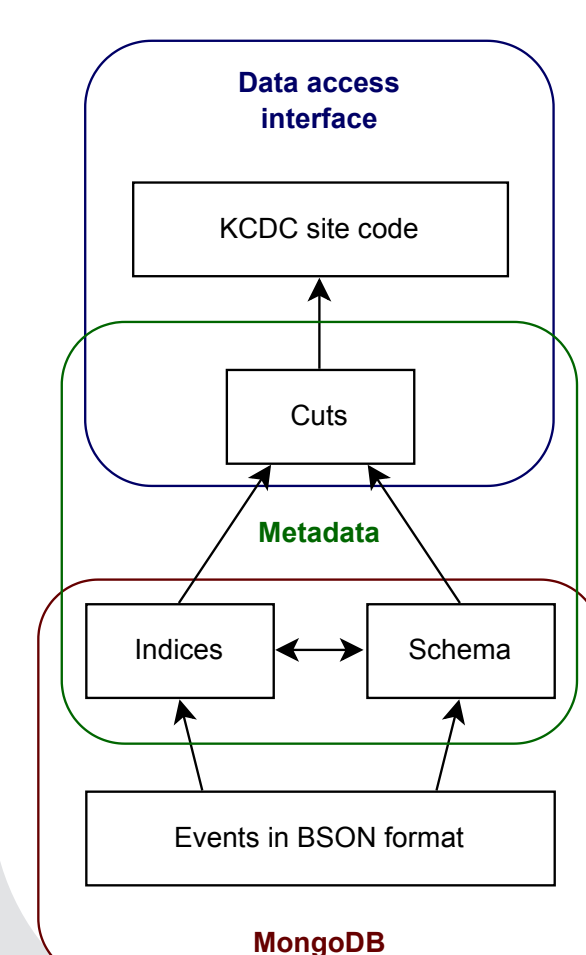
Comparative analysis of the usecases

KCDC

Setup / Detector component	Experimental data		Simulations	
	Events	Size	Events	Size
KASCADE	433 209 340	3 200 GB	22 490 883	26.8 GB
GRANDE	35 310 393	260 GB	4 149 416	4.2 GB
COMBINED	15 635 550	120 GB	2 030 227	2.6 GB
LOPES	3 058	25 MB	—	—
MAKET-ANI	2 682 264	1 GB	—	—

GRADLCI

Setup / Detector component	Experimental data		Simulations	
	Events	Size	Events	Size
KCDC datasets	See KCDC table			
Tunka-133	7 421 630	0.5 GB	—	—
Tunka-Rex	107 360 524	3 TB	—	—
TAIGA-IACT	2 700 000 000	605 GB	—	—



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New task

GRANDE	KASCADE combined	KASCADE	Simulations	LOPES	Tunka-133	Tunka-REX
<input checked="" type="checkbox"/> Tunka-133						
Date/time		<input type="text" value="25.10.2010"/> <small>from</small>		<input type="text" value="10.12.2012"/> <small>to</small>		
Energy [eV (log 10)]		<input type="text" value="14"/> <small>from</small>		<input type="text" value="19"/> <small>to</small>		
Zenith [°]		<input type="text" value="0"/> <small>from</small>		<input type="text" value="20"/> <small>to</small>		

Data centers	Characteristics				
	Aim	Task areas / Functions	Datasets	Architectures	Technologies
KCDC	Provision of the free, unlimited, reliable open access to the data of various experiments measuring cosmic radiation by different methods and techniques both for scientists and the broad public	<ul style="list-style-type: none"> ○ Data archive ○ Data analysis platform ○ Information center ○ Outreach platform 	KASCADE, KASCADE-GRANDE, COMBINED, Lopes, MaketAni	Data marts	NoSQL (MongoDB) Django Celery, RabbitMQ, Docker/ Singularity, REST API
GRADLICI	Development of the automatisisation the maintenance of astroparticle-physics data throughout their entire life cycle	<ul style="list-style-type: none"> ○ KCDC extension ○ Prototype analysis and data center for multimessenger astronomy ○ Analysis platform for machine learning for astroparticle physics ○ Outreach and education initiative 	KASCADE, KASCADE-GRANDE, COMBINED, Lopes, MaketAni, Tunka-133, Tunka-GRANDE, Tunka-IACT (restricted), Tunka-Rex	Data virtualisation platform	File-based, SQL for metadata DB, Flask, Custom task queueing, Docker/ Singularity, JSON-RPC