ATLAS ITK Production Database use & Tools for ITk Pixels community

The ATLAS ITk upgrade

Inner Tracker upgrade for HL-LHC

	∫L	<µ>	Inl		# Modules	Агеа	# Channels		
ID	400 fb ⁻¹	~58*	2.5		4000	63m²	100M		
ITk	3 000 fb ⁻¹	200	4		9 500 (pixels) + 18 000 (strips)	180m²	5000M		
*2024 average									

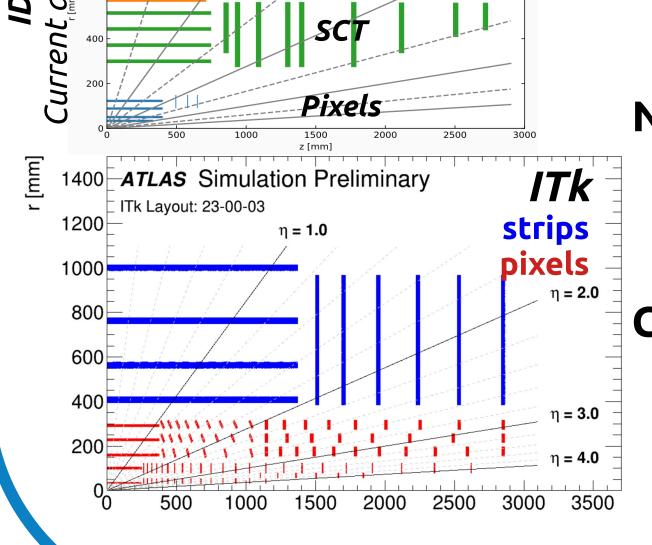
High pile-up – High level of radiations 10 MGy Total Ionising Dose closest to beam pipe

Monitoring the production

Large scale production: ~150 institutes, ~1300 users of the database → Ensure the detector is built **on-time** and **to specifications**:



Three different (interconnected) **objects to store**:



New Inner Tracker

Maintain track reconstruction performances

All registered shipments

– Extend eta coverage

Challenge

- Bigger scale \rightarrow production logistics

- Stricter specifications

(radiation hardness, mechanical envelop,...)

– Same volume!

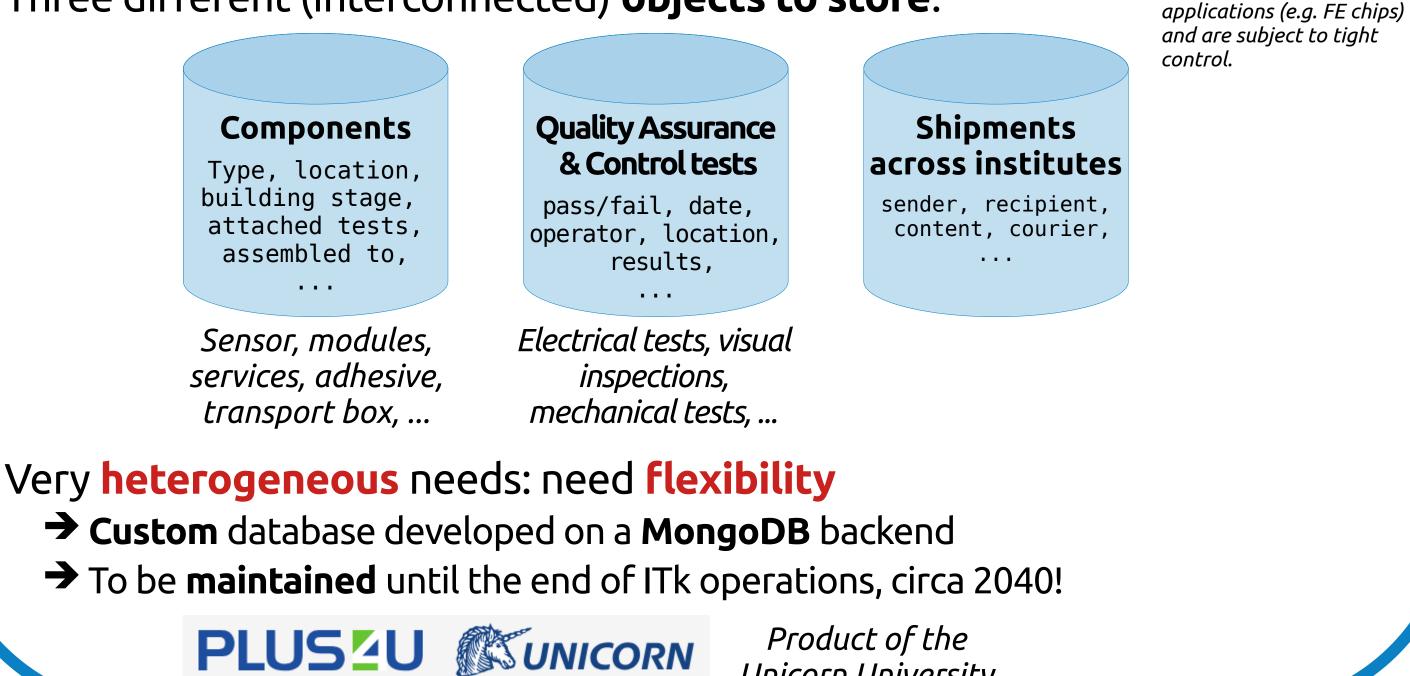
The scale of the ITk Production Database (PDB)

Pre production and production starting

Already managing a large amount of data

Component	Components	Test	Test Runs	Shipments
Types	Registered	Types	registered	
> 450	> 900 000	> 2 000	> 9 500 000	> 8000

Complex production flows of each component



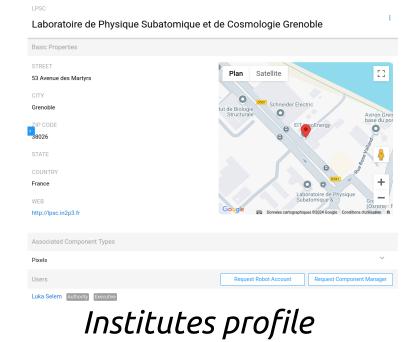
Uploading to the PDB

Unicorn University

Component registrat

Centralised Unicorn web-based app

- Representation of database structure
- → Visualise, navigate



		SN Assigned Later No
Select current location Pixels Select subproject Coffee club component	O Current stage only	SN Component Identifier Not set
Enter batch number O Trashed		Child registration Not available
	Save view Manage views	·
Actions	Search by ATLAS SN Q Q	Flag List @
Filters 🔿 Dummy 🔿 Trashed 🕂 Add filter		Actions Add
Sorting 🕀 Add sorting		No flag
Showing 5 of 5	Select all	Type List @
Component Serial Number Current stage	Current location Registered	Actions Add
🗌 🎲 📕 Coffee club component - Common 20UPGCC0000001 The unused stage	I Glasgow Univer 09/01/2023 11:07	Name Code Subproject SN Component CERN Drawing Version Identifier Number
type Kenny		Common type COMMON Pixel general CC PROTOTY
© Coffee club component - Common 20UPGCC0000002 Drinking Coffee type Kenneth_Wraight	11:55 @Glasgow Univer 09/01/2023	Stage List 🚱
Coffee club component - Common 20UPGCC0000003 The unused stage	1 Glasgow Univer 09/03/2023 10:18	Actions
type Richard_Bates		Name Code Type
Coffee club component - Common 20UPGCC0000004 The unused stage	m SCIPP, UC Sant 28/06/2024 22:21	The unused stage UNUSED_STAGE Tests
type Giordon	TTT Langageter Univ. 01/11/0004.14/ 04	Drinking Coffee COFFEE_DRINKING FINAL Tests 2
	Tancaster Univ 01/11/2024 16:24	
Tunable tables of	registered	Component Type

	Basic Info 🕐					
plication	Name	Coffee club component COFFEE_COMP				1
Jucacivii	Description					
	Id	63b7e40fd1ecc00036371135				
	Category	Item				
: flexible \rightarrow permissive	Project	Pixels				/
	Subproject	PIXEL GENERAL				
	State	ACTIVE				1
	ATLAS Serial Number	Automatic				/
	SN Assigned Later SN Component Identifier	No Not set				
Vixels Select subproject Coffee club component O Current stage only	Child registration	Not available				
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onent - Common 20UPGCC0000001 The unused stage 🕮 Glasgow Univer 09/01/2023 11:07	Common type	COMMON	Pixel general	Identifier CC	Number	PROTO
nent - Common 20UPGCC0000002 Drinking Coffee III Glasgow Univer 09/01/2023 11:55			. mor general			
	Stage List 🕼					
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	Name	Code		Туре		<u> </u>
onent - Common 20UPGCC0000004 The unused stage 🏾 🏛 SCIPP, UC Sant 28/06/2024 22:21	The unused stage	UNUSED_STAGE		INITIAL	Tests	
	Drinking Coffee	COFFEE_DRINKING		FINAL	Tests 2	

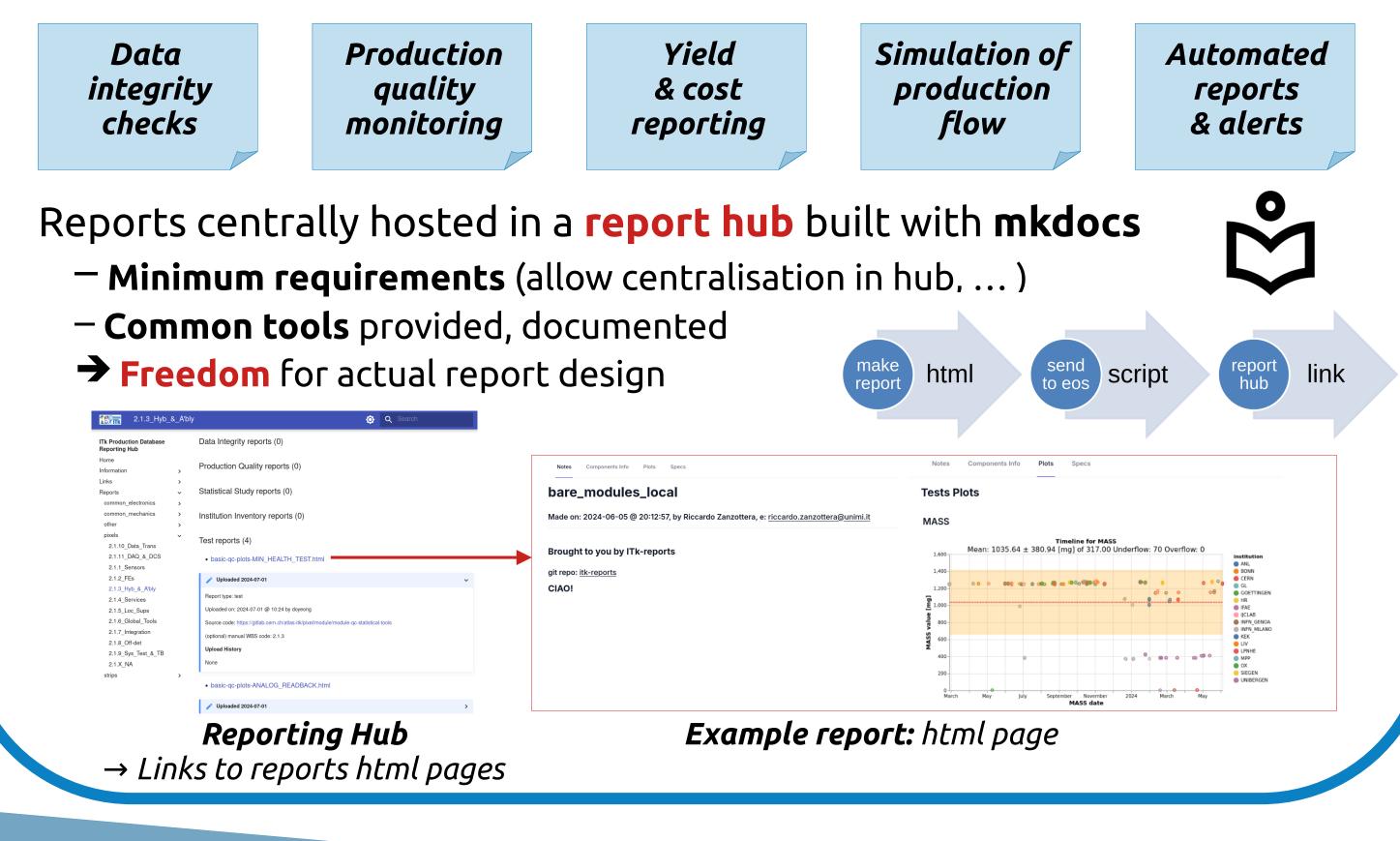
- Building stages per components
- **Tests** attached to building stages
- **Parent/Children** relations in assemblies

	Stages	average / component	max / component	Test Types	average / component	max / component
Strips	~600	~3	11	~1250	~13	260 (AMAC Chip)
Pixels	~770	~5	58	~850	~9	161 (FE Chip)

Reporting

"The Hanseatic League model"

Monitoring of the production evolution using the database:



components

description

Upload of data: must be **constrained**

- Ensure **data integrity**
- User friendly → avoid mistakes
- Treatment of (well motivated) **attachments**: size constraints, inode use
 - \rightarrow Large ones sent to CERN EOS, should be kept at a low level

Some **components** or **building stage** = specific DB interaction needs Unicorn PDB API for custom PDB interactions, Python API wrapper

Variety of custom solutions using modern dev tools - Code forge **GitLab**, documentation generator **MkDocs**

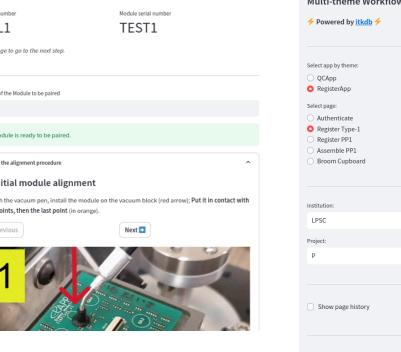
- Streamlit, Flask python packages for web applications → Deployed in **Docker** containers
 - → Hosted at CERN in **OpenShift** containers
- **Locally installed** tools (e.g. LocalDB)

LocalDB

Streamlit based multi-purpose web applications

Define and Upload Type-1

→ C () C ~ localhost.5000/localdb/	E ☆ ♡ ± ≡	Cell preparation		🚺 CELL-MODU	JLE ALIGNMENT
ntos 🕀 Wiki 🕀 Documentation 🕀 Forums		Cell-Module alignement		Cell serial number	Module serial number
LORAL MRS TOP COMPONENTS SCANS	\varTheta Asia/Tokyo 👻 💄 itkqc 👻	🖳 Glue deposit		CELL1	TEST1
Top Page of LocalDB		Load ITk ProdDB Environmental conditions Operator		Fill this page to go to the next step.	
Browse LocalDB Browse Components Browse Scans		Charly Humidity [%]	×	Reference of the Module to be paired Test1	
Customize LocalDB <pre> Create a new tag Change components attached to scans Re-arrange scans to other stages Manage module serial numbers </pre>		0 Temperature ["C] 20 10 Update conditions	100	the 2 points, then the last point (in or	odule on the vacuum block (red arrow); Put it in c ange).
Cenerate a new Serial Number for a newly assembled module ▲ Pull all module Serial Numbers from ITKPD For Pixel modules (election tests realisation and r	• •			Previous	Next
upload		То	cont	rol a buila process	ling stage



components toggle debug for det Select Institutio Select Subproje For DB registrations and test results uploads





Luka SELEM (luka.selem@cern.ch) On behalf of the ATLAS ITk Collaboration PIXEL, Strasbourg, November 2024