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Theory VO: SNAP DM Validation

P. Manzato
and theory WG

INAF-Trieste Astronomical Observatory

DBs for cosmological simulations

List of the databases on which is based the data model :

- ITVO@Trieste database;
- ITVO@Catania database;
- Horizon database;
- GalICS database;
- OWLS-GIMIC result files;
- GAVO hydrosims web application;
- Millennium database;

ITVO@Trieste and ITVO@Catania

They are multi-level databases:

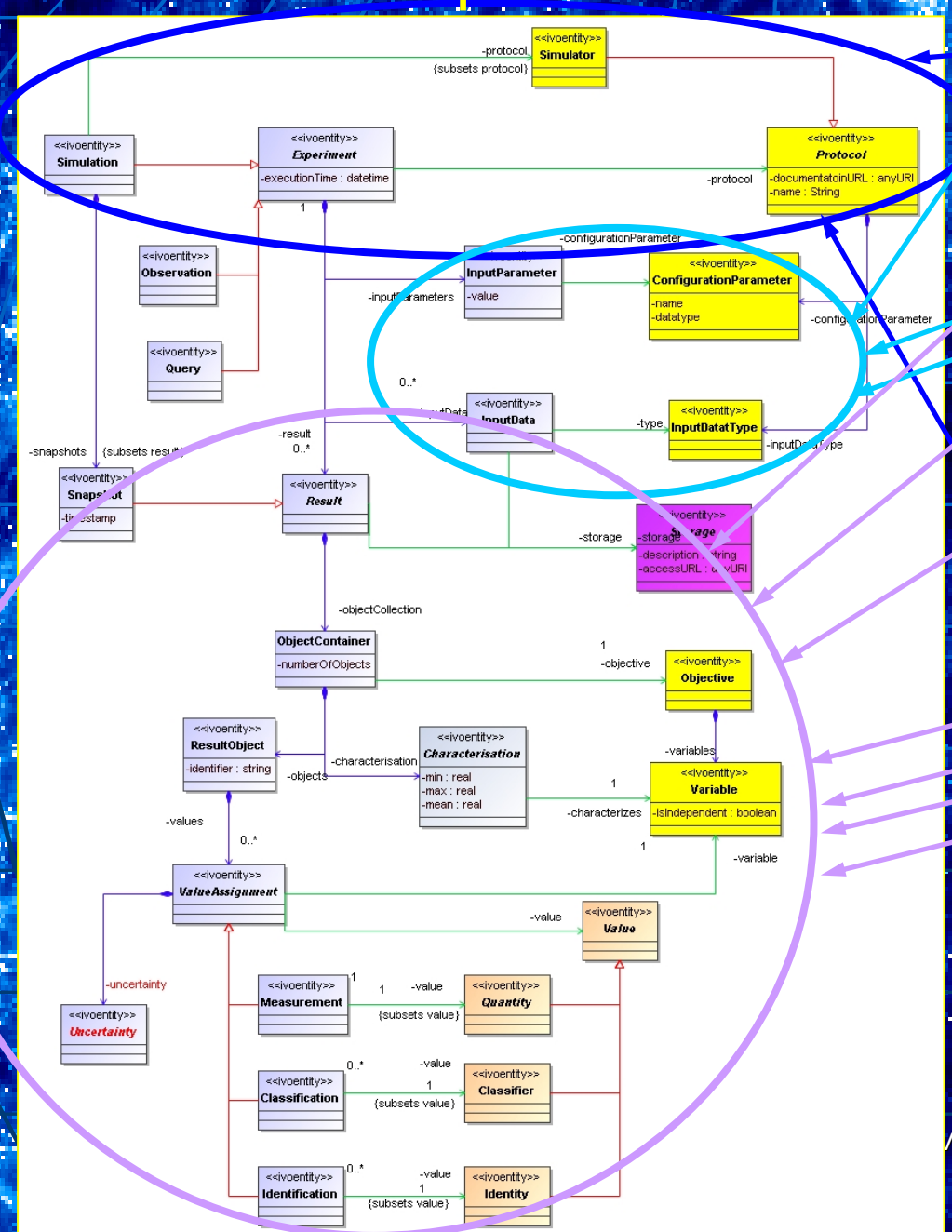
- LEVEL 0. input param., direct outcome of the simulation, returns N-D data;
- LEVEL 1. data extracted or derived from the simulation results: identified objects (halos, galaxy clusters, etc.).
- LEVEL 2. Data derived from another step of post-processing (maps and profiles of quantities), returns 2-D/1-D data;

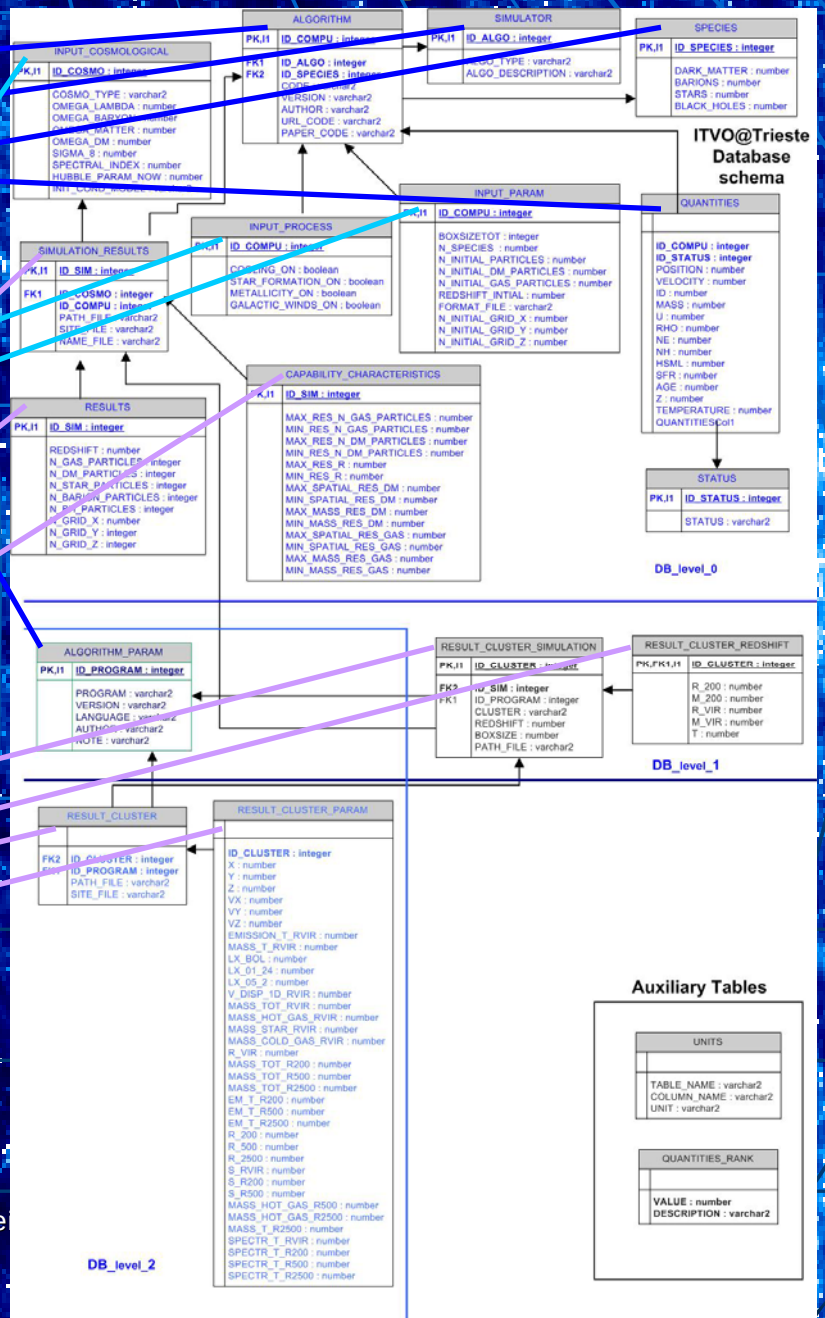
Meta-data Stored in the databases:

- cosmological N-body+SPH simulations performed with **Gadget2** code (http://www.mpa-garching.mpg.de/galform/gadget/index.shtml) in Trieste;
- cosmological N-body+AMR simulations performed with **Enzo** code(http://www.cosmos.ucsd.edu/enzo/) (not downloadable) in Trieste;
- cosmological N-body simulations performed with **Fly** code (www.oact.inaf.it/fly/) in Catania;

DM-Experiment class

ITVO@Trieste





Comparison: DM II / ITVO DB

- Phenomenology class: this information should be add into ITVO DB (type of simulated objects: halos, galaxy clusters, etc.);
- Protocol class: this map the table regarding the description of the algorithm an all the input parameters of the simulation code;
- Experiment class: regard the kind of simulation and all the result properties

Simulation Class – Simulator table

ID_ALGO	ALGO_TYPE	ALGO_DESCRIPTION
1	N-body	N-body particles
2	N-body+SPH	The Lagrangian Smoothed Particle Hydrodynamics
3	N-body+AMR	N-body with Adaptive Mesh Refinament
4	N-body+MESH	N-body with fixed Mesh
5	MESH	Grid
6	AMR	Adaptive Mesh Rafinament

Software class – Algorithm and program table

ID_COMPU	CODE	VERSION	AUTHOR	URL_CODE	PAPER_CODE
1	GADGET-2	2.0	Volker Springel	http://www.mpa-garching.mpg.de/~kdolag/GadgetHowTo/	V. Springel, 2005 MNRAS
2	Enzo	1.0.1	M.Norman, G.Bryan	http://www.cosmos.ucsd.edu/enzo	

ID_ PROG.	PROGRAM	VERS.	LAN.	AUTHOR	NOTE
1	Friends-to friends halo finder + spherical overdensity algorithm				Find the radius around the target particle that encompasses an average density equal to virial density
2	mkMaps.cpp + mkFits.pro + radialProf.cpp	1.0	C++	AMEGLIO SILVIA	Generate 36 columns of data to extract the profiles of galaxy clusters

Model: input param., data and configuration

ID_COMPU	BOXSIZETOT	N_SPECIES	ID_SPECIES	ID_ALGO	COOLING_ON	STAR_FORMATION_ON	N_INITIAL_PARTICLES	N_INITIAL_DM_PARTICLES	N_INI_GAS_PART	REDSHIFT_INTIAL	METALLICITY_ON	GALACTIC_WINDS_ON	FORMAT FILE
1	192000	3	7	2	1	1	221184000	110592000	110592000	46	1	1	Gadget
2	80000	2	2	3	0	0	262144000	262144000		50	0	0	HDF5

ID_SPECIES	DARK_MATTER	BARIONS	STARS	BLACK_HOLES
1	1	0	0	0
2	1	1	0	0
3	1	0	1	0
4	0	1	0	0
5	0	1	1	0
6	0	0	1	0
7	1	1	1	0

ID_STATUS	STATUS
1	DARK MATTER
2	STARS
3	BARIONS
4	BLACK HOLES

ID_COSMO	OMEGA_LAMBDA	OMEGA_BARYON	HUBBLE_PARAM_NOW	OMEGA_MATTER	SIGMA_8	SPECTRAL_INDEX	OMEGA_DM	COSMO_TYPE	INIT_COND_MODEL
1	.7	.039	70	.3	.8	1	.261	Standard flat LambdaCDM	
2	.73	.044	71	.27	.94	1	.226	LambdaCDM WMAP 2003	Eisenstain and Hu

Protocol: : Objectives: :variable - Quantities Table

Quantities are input and output parameters
- the choice of which one are calculated are input
- the value of them are output, and are stored in the result file like data

ID COMPU	ID STATUS	POSITION	VELOCITY	ID	MASS	U	RHO	NE	NH	HSML	SFR	AGE	Z	TEMPE RATURE
1	1	2	2	1	1		1							0
1	2	2	2		1		1	1	1	2		1	1	0
1	3	2	2		1		1							0
1	4	0	0	0	0	0	0	0	0	0	0	0	0	0
1	5	2	2		1		1	1	1	2	1	1	1	0
2	1	2	2	0	0	0	1	0	0	0	0	0	0	0
2	3	0	4	0	0	0	3	0	0	0	0	0	0	3

Objects - Results

Snapshot

ID_SIM	ID_COSMO	ID_COMPU	PATH_FILE	SITE_FILE	NAME_FILE	REDSHIFT	N_GAS_PARTICLES	N_DM_PARTICLES	N_STAR_PARTICLES	N_BARION_PARTICLES	N_BH_PARTICLES	N_GRID_X	N_GRID_Y	N_GRID_Z	MAX_RES_N_GAS_PARTICLES	MIN_RES_N_GAS_PARTICLES	MAX_RES_N_DM_PARTICLES	MIN_RES_N_DM_PARTICLES	MAX_RES_R	MIN_RES_R	MAX_SPATIAL_RES_DM	MIN_SPATIAL_RES_DM	MAX_MASS_RES_DM	MIN_MASS_RES_DM	MAX_SPATIAL_RES_GAS	MIN_SPATIAL_RES_GAS	MAX_MASS_RES_GAS	MIN_MASS_RES_GAS
1	1	1	/Run18	OAT	gd2_192_480_102	0									100000	5000	200000	7000	12	7.5								
2	2	2	/mesh1	CINECA	output_z0.0.h5	0						640	640	640														

Other levels of results:

ID_CLUSTER	ID_SIM	CLUSTER	REDSHIFT	BOXSIZE	ID_PROGRAM	PATH_FILE
1	1	clus10075.C1.3.1_035	3.677355	192000	1	/Level_1/z357s35
148	1	clus10087.C1.1.3_055	1.951213	192000	1	/Level_1/z185s55

ID_CLUSTER	R_200	M_200	R_VIR	M_VIR	T
1870	804.210999	1212000000000000	1077.44397	1460000000000000	2.0794
1871	1099.430054	3095000000000000	1460.915039	3641000000000000	3.7666

Conclusions

- Every table of the database schema find its place into the Data Model;
- The Data Model result be more vast than the contents of a single database schema;
- In future will be done comparison with other DB schemas;

Thanks for your attention.