Experience with a frozen computational framework from LEP age

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THE IDEA

By the end of the LEP era there was no well established strategy for the long term preservation of the physics results and data processing framework.

This happening at a time before the generalization of the virtualization techniques, several alternatives were studied.

Among them the setup of a dedicated computational cluster to be preserved medium-long tem in its original state that would provide the capability to reanalyse LEP experiments' data in case the LHC results, and in particular the Higgs boson search, indicated that was required.

In 2001 we implemented such strategy for the DELPHI experiment at the Institute of Physics of Cantabria, IFCA, placed in Santander (SPAIN).

This included the setup and testing of **80 identical Linux servers** with the software of the DELPHI collaboration, and the replicated storage of analysis ntuples and code.

At the same time, **all DELPHI data at DST (Data Summary Tapes) level were copied to IFCA and stored in LTO-1 tapes** in a robot, and a catalogue built including information to map the original data location at CERN to the tapes at IFCA.
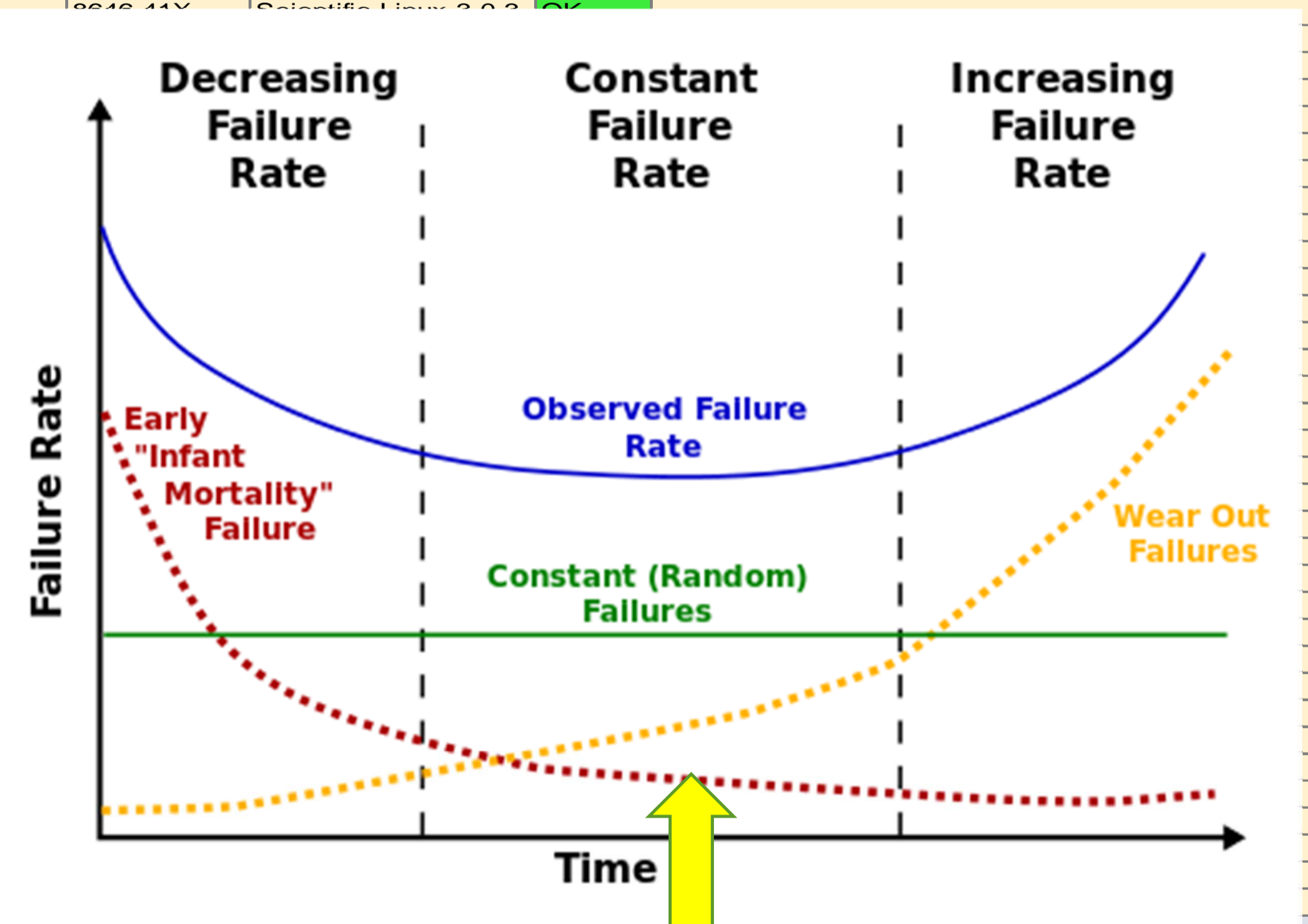
In order to evaluate the feasibility of this approach for the preservation of the analysis capability of the DELPHI data, a protocol was established that involved the periodical restart and testing of the aforementioned servers.

THE EXPERIENCE

More than 80% of servers installed in 2001...and not maintained... yet in working conditions 12 years later!

Serial Number	Model Type	OS	STATUS	REASON
551667D	8646-41X		KO	DOES NOT START
551668T	8646-41X		KO	DOES NOT START
551669K	8646-41X		KO	POWER SOURCE DOES NOT WORK
551667A	8646-41X		KO	DOES NOT START
551669T	8646-41X		KO	POWER SOURCE DOES NOT WORK
551669L	8646-41X	NO OS	KO	HD FAILURE
551669N	8646-41X		KO	DOES NOT START
551667R	8646-41X		KO	HD FAILURE
551667W	8646-41X	Red Hat 7.3	KO	STOPS AFTER FEW MINUTES
551667OD	8646-41X		KO	DOES NOT START
551670N	8646-41X		KO	DOES NOT START
551670G	8646-41X		KO	DOES NOT START
551667F	8646-41X		KO	DOES NOT START
551666W	8646-41X	Red Hat 7.3	OK	
551668L	8646-41X	Red Hat 7.3	OK	
551669G	8646-41X	Red Hat 7.3	OK	
551668R	8646-41X	Red Hat 7.3	OK	
551670K	8646-41X			
551666N	8646-41X			
551669F	8646-41X			
551668T	8646-41X			
551668C	8646-41X			
551667X	8646-41X			
551666T	8646-41X			
551668H	8646-41X			
551668K	8646-41X			
551670M	8646-41X			
551668M	8646-41X			
551669B	8646-41X			
551668N	8646-41X			
551668F	8646-41X			
551667K	8646-41X			
551668A	8646-41X			
551670H	8646-41X			
551669W	8646-41X			
551669X	8646-41X			
551670F	8646-41X			
551666V	8646-41X			
551667L	8646-41X			
551669M	8646-41X			
551669Y	8646-41X			
551668P	8646-41X	Scientific Linux 3.0.3	OK	
551668Y	8646-41X	Scientific Linux 3.0.3	OK	
551670P	8646-41X	Red Hat 7.3	OK	
551667M	8646-41X	Scientific Linux 3.0.3	OK	
551667G				
551669Z				
551666X				
551668X				
551668D				
551668G				
551667B				
551666Z				
551670R				
551666Y				
551667C				
551666L				
551667P				
551669H				
551667H				
551669P				
551670B				
551669C				
551667T				
551670C				
551668M				
551666P				
551669D				
551667Y				
551668B				
551667V				
551669W				
551669A				
551667N				
551670L				
552064G				
551669R				

Decreasing Failure Rate — Constant Failure Rate — Increasing Failure Rate

Failure Rate / Time

Early "Infant Mortality" Failure — Observed Failure Rate — Wear Out Failures — Constant (Random) Failures

WHERE ARE WE IN THE CURVE?
OBJECTIVE WAS >10% AFTER 20 years
BUT, we believe this is impossible with current equivalent hardware

DST DATA ON LTO TAPES PRESERVED
IN 2009 WE WERE ABLE TO RECOVER AND SEND BACK DATA (LOST) TO CERN
Simple, low cost and effective!!!
BUT, doesn't scale to LHC area

AFTER LHC DATA TAKING IN 2011-2012, THE DISCOVERY OF THE HIGGS BOSON WITH m=126 GeV, AND NO BSM SIGNAL,
IT IS VERY UNLIKELY THAT WE WILL FURTHER REUSE PRESERVED LEP DATA
But if so, the real challenge is the expertise & know-how to reanalyze and exploit these data