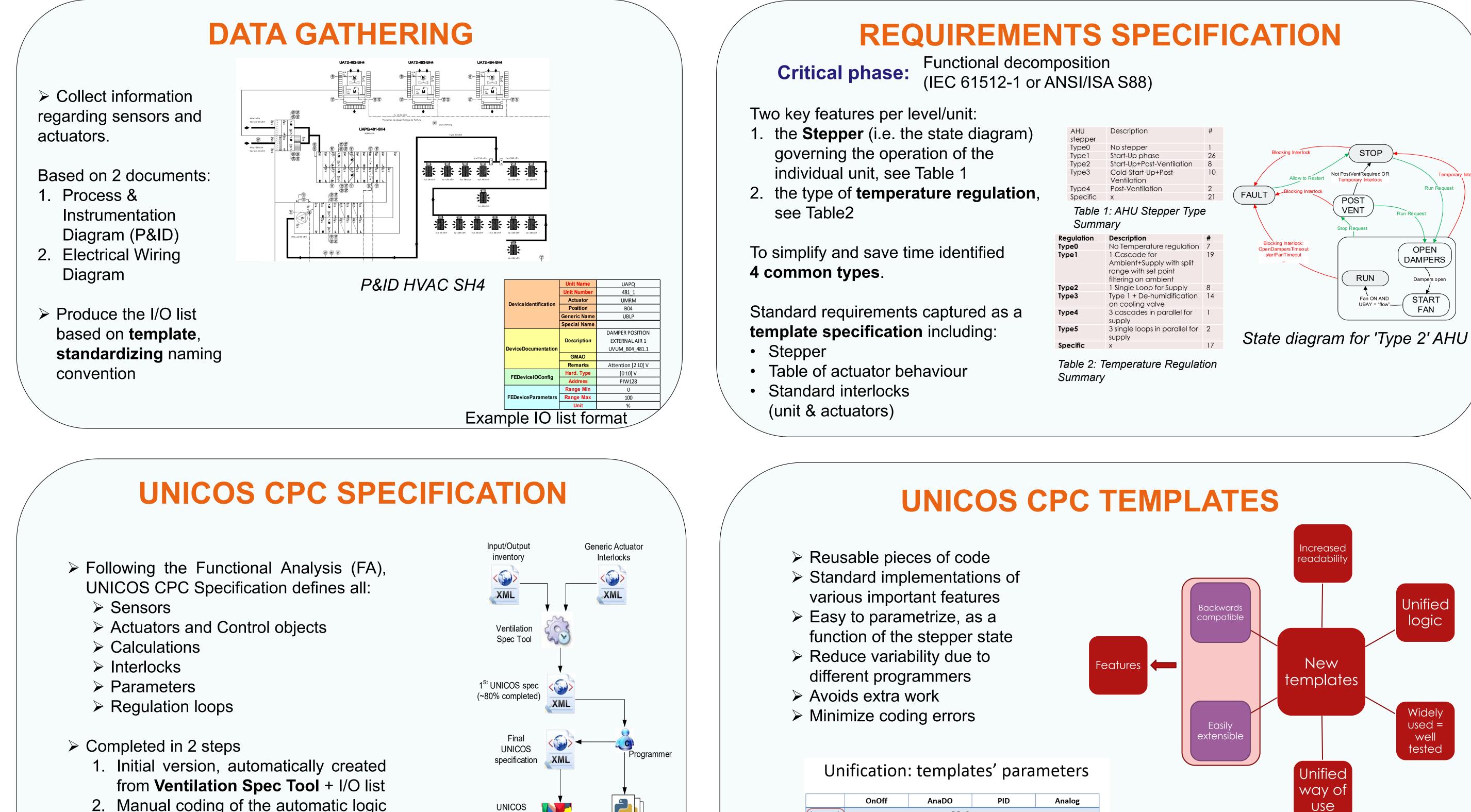
A MODULAR APPROACH TO DEVELOP STANDARDIZED HVAC **CONTROL SYSTEMS WITH UNICOS CPC FRAMEWORK** WEPGF094



W. Booth[#], B. Bradu, E. Blanco, M. Quilichini, M. Bes, M. Zimny, R. Barillere (CERN, Geneva, Switzerland)

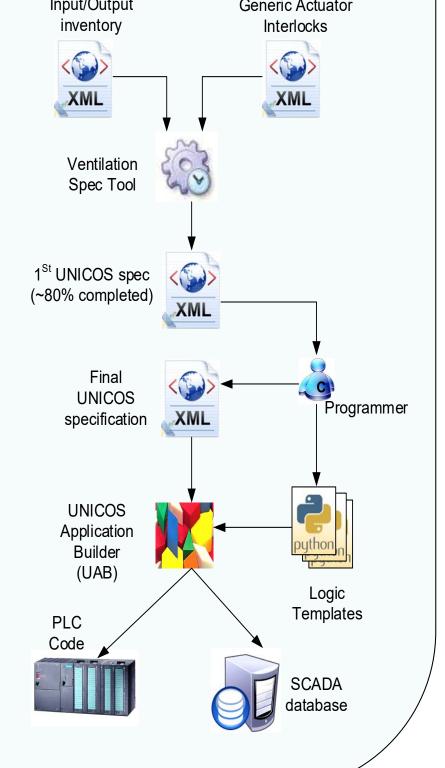
ABSTRACT

At CERN there are currently 200 ventilation air handling units in production, used in many different applications, including building ventilation, pressurization of safe rooms, smoke extraction, pulsion/extraction of experimental areas (tunnel, cavern, etc.), and the ventilation of the computing centre. The PLC applications which operate these installations are currently being revamped to a new framework (UNICOS CPC). This work began 3 years ago, and we are now in a position to standardize the development of these HVAC applications, in order to reduce the cost of initial development (including specification and coding), testing, and long-term maintenance of the code. In this paper we will discuss the various improvements to the process, and show examples, which can thus help the community develop HVAC applications. Improvements include templates for the "Functional Analysis" specification document, standardized HVAC devices and templates for the PLC control logic, and automatically generated test documentation, to help during the Factory Acceptance Test (FAT) and Site Acceptance Test (SAT) processes.



Lparam1

- 2. Manual coding of the automatic logic of the actuators and units



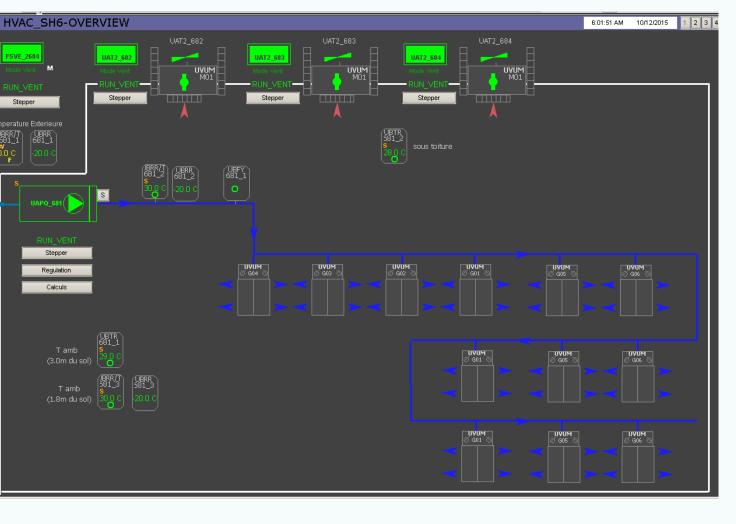
Lparam2	Condition ON		condition	Х
Lparam3	Condition OFF		Positioning	
Lparam4	х	Global positioning condition		
Lparam8	Features			
	4			
		LogicDeviceDefinitio CustomLogicParameter		
Parameter1 T	Parameter2 Parameter3 Pa		s neter6 ▼ Parameter7 ▼ Parameter	8 Parameter9 Parameter10

DB_Stepper

Advantages of new user templates

SCADA SYNOPTICS

- Using Siemens WinCC OA
- > Based on P&ID and internal standards
- Additional input from operator
- > Also usually require a local Panel Touch (using Siemens WinCC TIA Portal)



Synoptic Overview HVAC SH6

TESTING

Implementation and Testing take approximately same time! Needed:

Better quality control

Repeatability, from 1 version to the next

Coherence between applications

Developed:

> Test catalog:

> Automatically generate 90% of cases

Test Environments

- > Factory Acceptance Testing (FAT), in the lab
 - > Simulator: facilitates testing
 - Debugging
 - Verification of implementation of the AF
 - Early changes with operator

Site Acceptance Testing (SAT)

- Parameter adjustment for plant dynamics
- Functional validation

Name	UAPQ_481_AL6		
Description	PROBLEME TEMPS D'OUVERTURE REGISTRES		
FA Condition	Open Dampers Delay 180 s		
Code Condition (for reference only)	DB_GRAPH_UAPQ.OPEN_DAMPERS_AR.X OR DB_GRAPH_UAPQ.OPEN_DAMPERS_AN.X		
Туре	FS		
Master	UAPQ_481		
Folio	4.10		
Threshold			
Delay	UAPQ_481_AL6Dt		
CCC Alarm	UAPQ_481_CCC_MAJ		
Alarm activation	OK		
Alarm Action	ОК		
Date	22/05/2015		
Responsible			
Remarks			

Example of an alarm for a particular unit, with requirements, completed during FAT testing

CONCLUSION

A noticeable improvement of the process of developing HVAC control systems with the UNICOS CPC framework has been done. This comprises improved templates for creating the requirements (Functional Analysis), implementing the PLC code (using user templates), and testing (using the commissioning file). However, there is still room for improvement such as enhancing the process to automatically generate more code, directly from the requirements if possible, and generate the SCADA synoptics directly from the P&IDs. Also the IO list could be generated automatically from the wiring diagram itself, thus simplifying the design process yet further. With these additional improvements, coding errors would be drastically reduced, and the effort required to develop the control system minimized.



