UNICOS components and development

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Hardware requirements

- Components of the shelf
  - Fieldbus (PROFIBUS, WORLDFIP, EHTERNET)
  - PLC: SIEMENS, Schneider
  - SCADA
- Communication interfaces based on industrial standard
  - OPEN MODBUS, OPC, etc.
- Independent layer
  - Possible upgrades

Software requirements

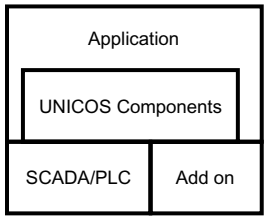
- Control framework
  - Two layers architecture: PLC and SCADA
  - Components: objects, utilities, packages
  - Well defined interfaces
- Open to common accelerator operation tools
  - Post-mortem, logging, alarm, etc.
- Preserve independence of the control layers
  - Different tools for each layers
- Homogeneous production rules for user applications
  - Development method

UNICOS

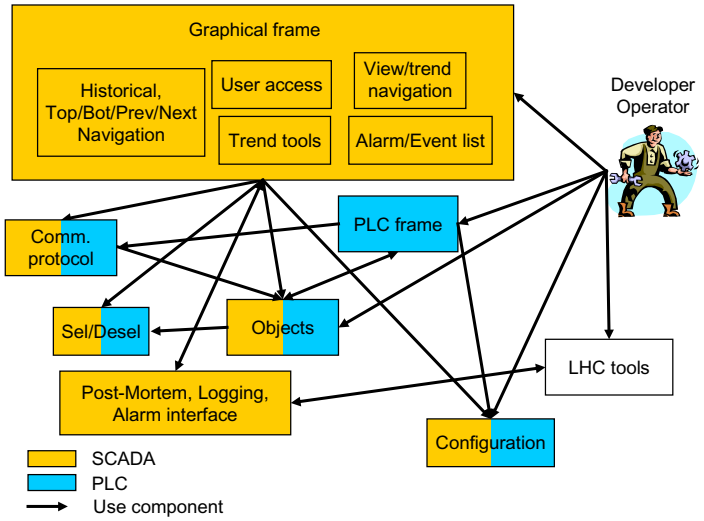
- Open framework for control application development
  - User code
  - New object, new operation concept can be added
- Collection of components with defined interface for operation and development
  - Implemented in SCADA, PLC and in both
  - Object, utility or both
  - Interface components
  - Re-usable
- Method for development of user application
- Homogeneous operational environment
- Collaboration development
  - Sub-contractors (consortium), CERN groups

User application

- Use UNICOS components
- Use SCADA and PLC
  - Tools
  - Utilities
- Other components
- Developer:
  - The objects
  - Architecture:
    - Software/hardware
    - organization of the objects
  - Do the synoptics in the SCADA
  - Implement his user code

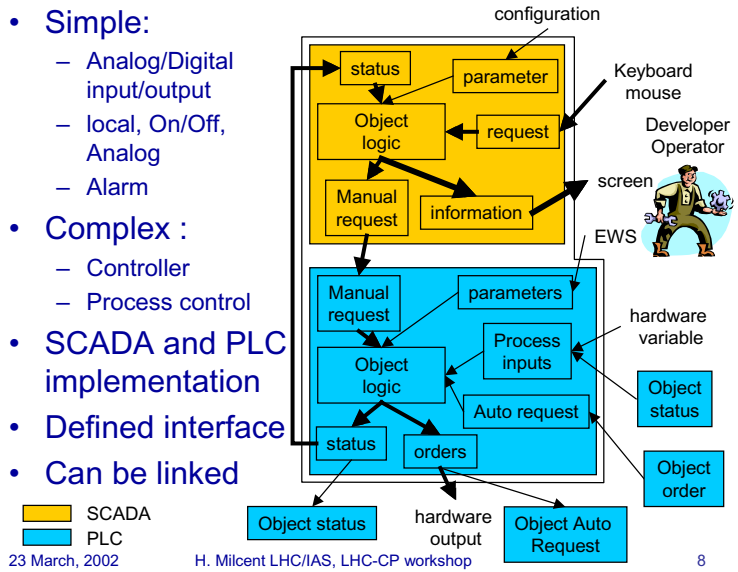


UNICOS components



Object

- Simple:
  - Analog/Digital input/output
  - local, On/Off, Analog
  - Alarm
- Complex :
  - Controller
  - Process control
- SCADA and PLC implementation
- Defined interface
- Can be linked



Object: PLC part (1)

- Process control part
- Two types of data:
  - Status: binary or analog value
  - Event: binary change
    - E.g.: object in auto mode
- Data are time stamped in the PLC:
  - Event: 10msec and 500msec
  - Status: 50msec and 500msec
- Mode management
  - Manual, Auto, Forced, Local
- Activity state
  - On/Off, open/close, position

Object: PLC part (2)

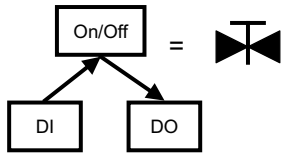
- Interlock status
  - Full stop, temp stop, start interlock, acknowledged
- Warning status
  - Io-error, auto/manual
- Output setting
- Internal ramp and bumpless evolution
- Specific logic

Object: SCADA part

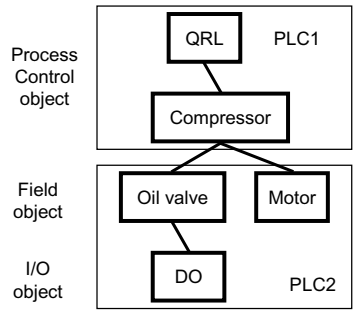
- Supervision part of the object
- SCADA alarm, event
- Diagnostics
- Object presentation:
  - Display element, symbol
  - Faceplate
  - Online trend, historical trend
- Object driving
  - Selection/de-selection
  - Manual order setting
- Color code
  - Static elements
  - Dynamic elements

Object

- Can be linked to form a hardware device



- Hierarchically connected
  - In one or many PLCs
- Distributed in many PLCs



SCADA components

- Development
  - Catalog of object symbols
  - Configuration of the object:
    - alarm, archive, etc.
- Operation: graphical frame
  - Trend windows: pre-defined, configurable
  - Navigation facility for the synoptics
    - Top/bottom/previous/next
    - Historical navigation
    - Hierarchical navigation: windows explorer like
  - Alarm list, event list
    - Filtering, viewer
  - Object list
  - User access right
  - Selection/de-selection

Other components (1)

- Communication protocol
  - Event driven protocol based on Open Modbus TCP
  - Software redundancy supported
  - SCADA-PLC, PLC-PLC
  - Transmission of object event and object status with time stamp from the PLC
  - 1000 events can be buffered in the PLC in case of communication problem with the SCADA
- PLC frame
  - Object organization
  - User defined code
  - Task organization

Other components (2)

- Configuration
  - Unique database for PLC and SCADA configuration
- Interface
  - Post-mortem, alarm, logging, etc.
- Software production tools
  - Template documents for the specification of the control
  - Methodology of software production
    - Application and documentation templates
  - Training

Present status

- Object PLC part and PLC frame
  - Schneider PLC, IEC languages
  - Concept (Quantum PLC), PL7 (Premium PLC) platforms
  - Time stamping:
    - Premium: event: 10msec, status: 50msec
    - Quantum: event and status: 500msec
- Object SCADA part
  - PcVue32 v.7
- SCADA components
  - PcVue32 v.7
- Communication:
  - PLC Schneider and SCADA PcVue32
- Software production tools
  - Excel, word document

Context

Components

Status

Conclusions

Future development

- Migration of the SCADA part to PVSS
  - Study of the feasibility done, waiting site license and collaboration agreements (ETM-Consortium)
  - Planned for Q3 2002
  - Collaboration development with JCOP

  Compatibility of UNICOS and JCOP.
- Interface to post-mortem, logging and alarm
  - Waiting interface definition.
- Communication protocol
  - Study of industrial protocol
    - I/O scan: PLC-PLC
    - OPC when time stamping in the PLC is not required
- Other PLC platform if requested
  - Prototype of some objects in SIEMENS already existing
- Synchronization of the PLC clock with LHC time: 10msec resolution

Context

Components

Status

Conclusions

- Based on components of the shelf and open standard
- Open framework for control application development
  - User code
  - Open to common accelerator operation tools
- Collection of components with defined interface for operation and development
  - Re-use of the components in other application
- New object, new operational concept can be added
  - New release of the framework