Industrial Control Activities Forecast

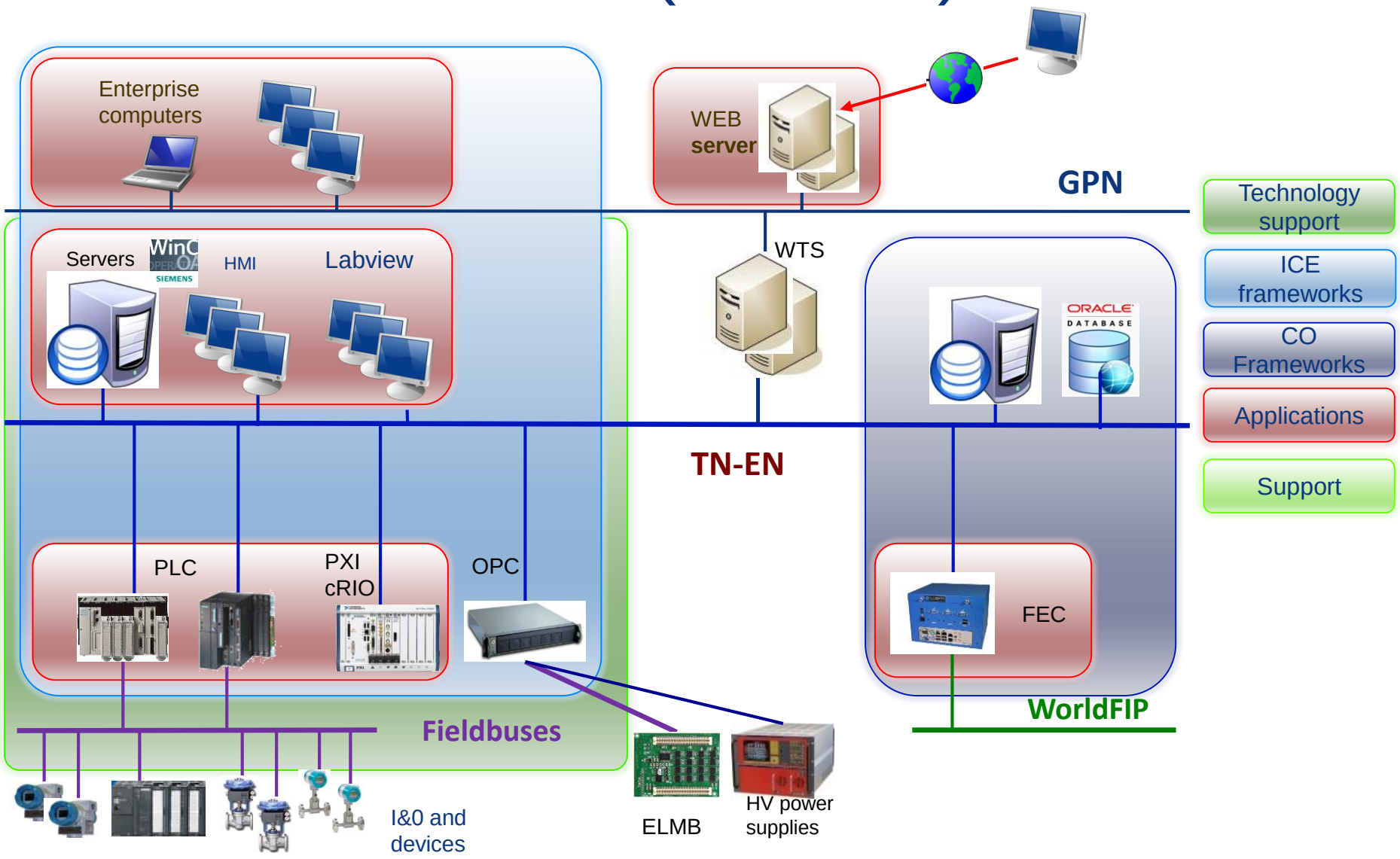
Philippe Gayet on behalf of EN-ICE

LS2 DAYS

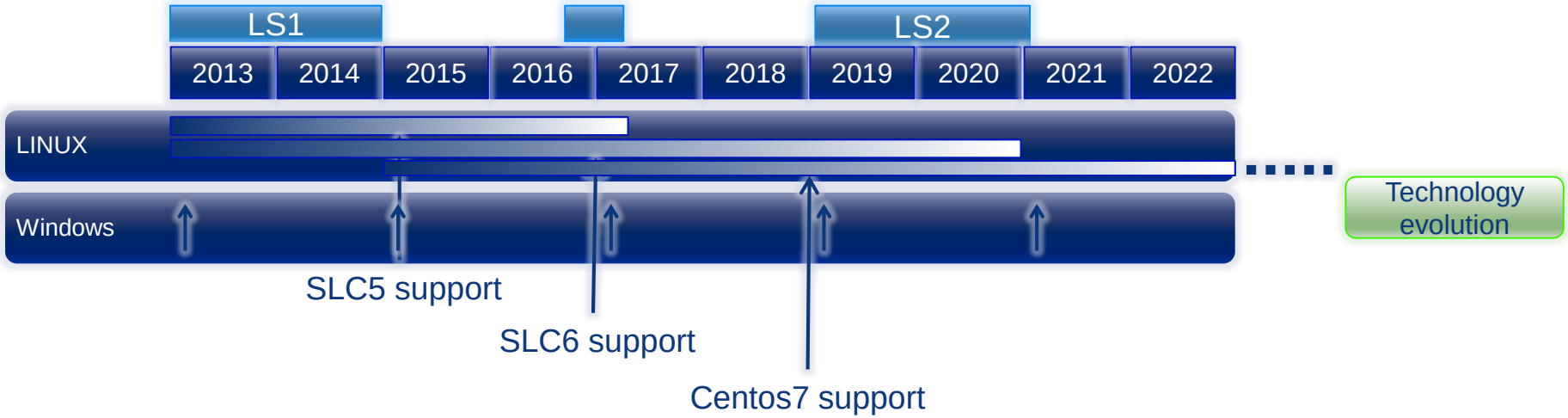
29-30 SEPTEMBER 2015

http://indico.cern.ch/event/436424/

ICE Covered Area (not Floe)



Industrial control ecosystem evolution



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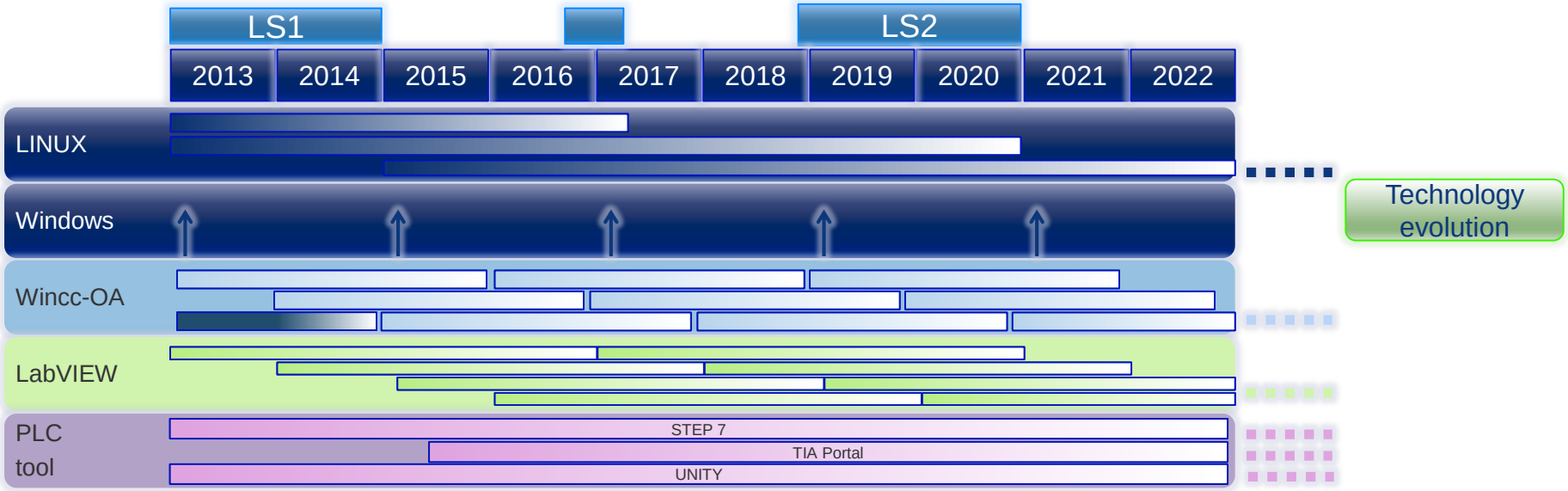


ICE duty is to keep the Industrial control systems applications resilient to these evolutions

Expected evolution till LS2

- PLC
  - SIEMENS
    - Hardware:
      - Not expected any announcement on S7-300/400 series. Still in production with new models coming during these years.
    - Software:
      - TIA portal can be used from V13 and it is recommended for new projects. Step7 can be still used for legacy or existing projects.
    - Recommendations :
      - S7-200 PLCs phased out. Need upgrade of installations
      - New Hardware S7-1X00 PLCs can be used and are supported by ICE
      - In case of upgrades, please target projects that contain PLCs not compatible with TIA portal
  - SCHNEIDER
    - End of production for the Premium PLCs expected before LS2. (end of support 8 years later)
    - New series Modicon M340 and M580 are available and can be installed at CERN
    - Recommendations:
      - Upgrade the Premium high-end to the new M340/580 PLCs depending on your plant. Guidelines will be provided.
      - Twido PLCs phased out. Need upgrade of installations
      - Analyze your Premium installations and decide on their life expectation about their upgrade
  - **NEW TENDER in 2016 to validate the present choice and/or open to other brands**

Technology evolution

Expected evolution till LS2

- National Instruments
  - LabVIEW
    - Version evolution (1 per year supported 4 years)
    - Future version evolution of LabVIEW has a concern on backward compatibility and may induce additional resources for migration
    - National Instruments is committed to keep LabVIEW in production for the next 20 years
  - PXIe and cRIO
    - PXIe Part of the study of CO3 on new frontend selection
    - NI Linux RT and White Rabbit on PXIe
  - NI Contract renewal foreseen in 2017

Technology evolution

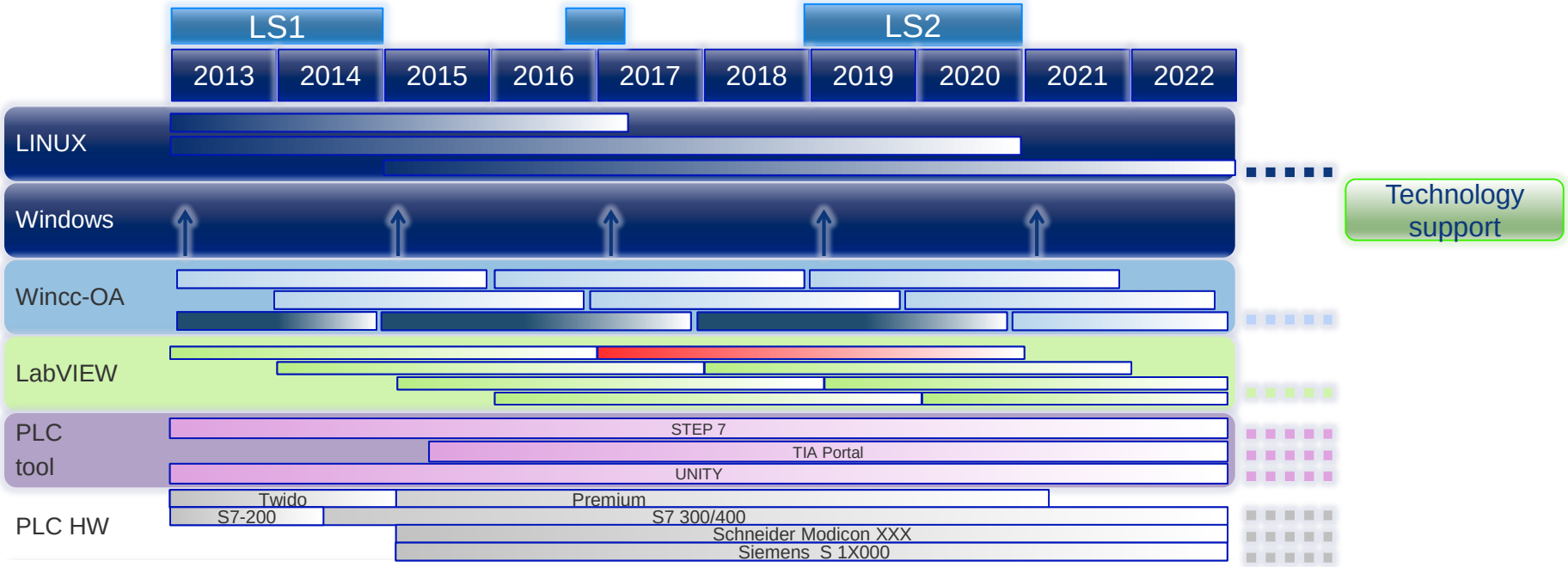
- Siemens/ETM WINCC OA
  - New versions that will probably require OS upgrades
    - EYETS : 3.14 LS2: 3.17
  - Additional functionalities
    - Improvement of performance for the data Archiving and LHC Logging
    - Improvements of the User Interface (Layout management, …)
    - Remote (web) access already available and need to be tested
  - Contract extension for the next 5 years presently under discussion
    - Siemens is committed to keep WINCC OA in production at least for 10 years and to provide support for 20 years

Expected evolution till LS2

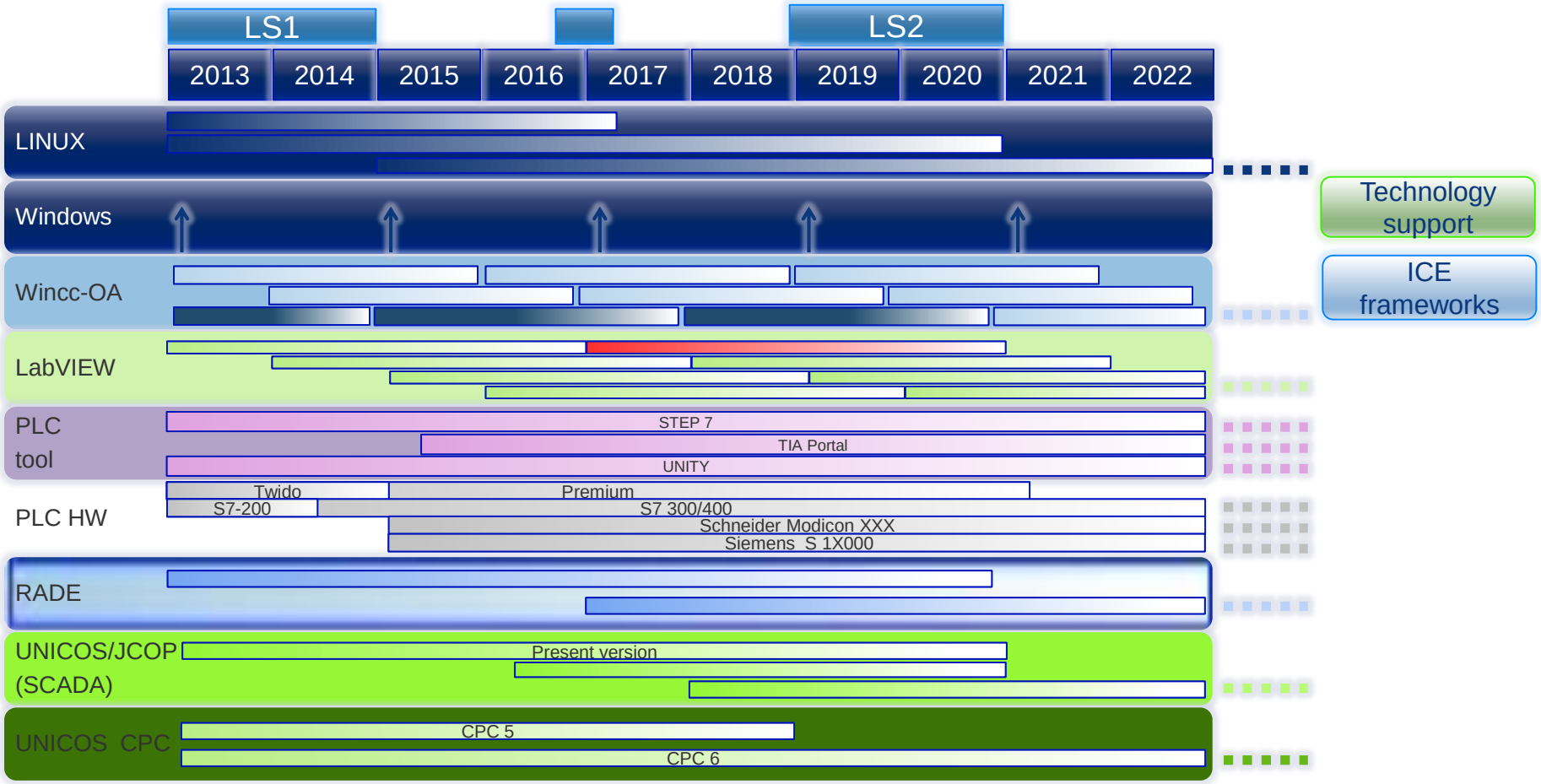
- OPC
  - OPC-DA should phase out for LS2 → OPC: DA->UA Migration
    - OPC server development insourced (JCOP decision) :
      - OPC-UA servers must be written for CAEN, Wiener, ISEG, Siemens TSPP, Schneider TSPP
      - Better integration of OPC-UA with CMW
- CAN
  - Hardware interfaces upgrade
    - Support of SYSTEC USB-CAN and AnaGate Ethernet-CAN gateways
    - Replacement of USB-CAN interfaces to Ethernet-CAN gateway when possible
  - Software Upgrade to use CAN with OPC-UA
  - Evolution of ELMB (to be decided in JCOP workshop)
- DIP
  - API migration to JAVA 8
  - Reinforce DIP Name Server functionality
  - Evolution of the underlying protocol DIM (CERN in house development) to OPC-UA to be discussed in JCOP Workshop
  - Tools to monitor the activity of clients and servers, i.e. the status of the publications

Technology evolution

Industrial control ecosystem evolution



Foreseen ICE frameworks versions



Framework Evolution

- JCOP-UNICOS are unified in a single Supervision Framework (name to be chosen)
  - Additional Functionalities
    - Homogenization of alarm display in coherence with LASER
    - Event replay
    - Reporting for all applications (e.g. number of alarms per day, statistics on data rates, etc)
    - Deploy web remote access
    - Long list of minor new functionalities required by our large community of users.
    - New drivers required for legacy or new installations (BACnet, IEC61850, etc)
- UNICOS CPC
  - NO Major Version but :
    - Baseline upgrades of applications (not compulsory but recommended)
    - CPC5 End of Life early LS2 (if not before)
- RADE
  - Upgrade to last version of CERN Middleware and services
  - Automation of deployments
  - New version of RADE compatible to LabVIEW evolution and maximizing backward compatibility will be developed to reduce migration workload

Frameworks

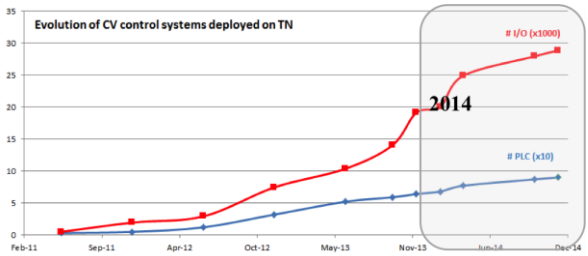
Application developed by ICE (1)

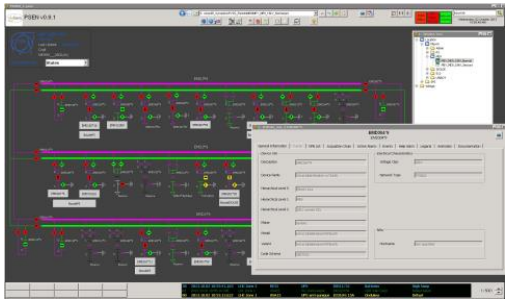
- Cryogenics
  - Migration to M580 (1 FTE for 26 weeks)
    - TS3 : non-critical applications as soon as material is received. A stop of the PLC has to be programmed with operation. (5 week)
    - YETS : critical application without Profibus, to be programmed with operation. Impact on production. (4 week)
    - LS2 : critical application with fieldbus. Needs new Ethernet IP cards (available in 2016) and recommissioning of all I/O on fieldbus. Process to be stopped 2 or 3 days. (17 week)
  - New projects: Redundancy of the LHC warm compressors, Small liquefier for the existing storage tanks, new mobile refrigerator ???
- CIET
  - Introduction of new VFT (Virtual flow meters) devices, study to include PA sensors diagnostics (expert view).
- GCS
  - New or Upgrade of Gas systems
    - Modifications to be done on existing gas systems
    - New gas systems to be developed (list not defined yet by PH-DT)
    - Any new gas systems will be developed with Modicon series (M340/M580) and Ethernet/IP as fieldbus
    - Replacement of existing Premium Schneider PLCs with Modicon series (M340/M580) and Ethernet/IP is considered

Applications

Application developed by ICE (2)

- Cooling and ventilation (5 FTE per year)
  - Pursue the program of migration toward UNICOS of existing installation
    - 100 applications already in operation
    - 43 potential consolidation projects on which 35 are approved by CV
  - Include 15 new Projects (
  - Migration program expected to extend till LS3





Applications

- Electrical Infrastructure
  - Finalisation of PSEN
    - Disaster recovery center
  - RTU replacement project Decision in December
  - Oscillo-perturbography using LabVIEW, and cRIO
    - Scalability test (50+ systems)
    - Mass deployment from now to LS2

- SURVEY (0.4 FTE)
  - Likely to develop the inclination sensors devices

Application developed by ICE (3)

- QPS
  - Upgrade of IPQ, IPD and IT protection systems: new signals, re-configuration of field-bus networks, new API for QPS client
  - Deployment of protection systems for 11 T magnets: new signals, re-configuration of field-bus networks, new API for QPS client (not yet clear whether 11T magnets will be installed during LS2)
  - (Induced task but not really LS2 activity): Test benches SM18 and B180: in case we connect to standard QPS supervision (not foreseen at the start-up)
- PIC/WIC
  - Nothing foreseen on PIC so far.
  - WIC: 7 New applications:
    - Transfer lines Linac4 - PSB (Booster),Transfer lines PSB – PS, TT2, TT10, AD (Experimental area), SM18/FAIR, depending on the final solution chosen.
- DSS
  - Re-engineering of the application components according to ICE standard
  - Deployment of the reengineered systems

Applications

Application developed by ICE (4)

- LabVIEW Applications
  - Post Mortem/Hardware Commissioning ACCTEST integration (13 applications) and configuration database
  - LINAC 4 emittance measurement
  - TIM Survey multi alignment system (PXI)
  - HLS system, robot controlled
  - PXI-Spectrum
  - HTS cable test system in SM18, HTS magnet tests system in Cluster D, SM18
  - RP-TIM Tunnel Inspection system (to equip 4 trains)
  - RF cavity test applications
  - Magnet test applications
  - Vacuum applications
  - ISOLDE Off-line separator application renovation
  - …

Applications

User applications support known today

- Cryogenics experimental areas
  - Development of several installations
  - CPC5 re-engineering applications
- Vacuum
  - Co-development of the VAC UNICOS package (need to establish a clear project roadmap)
  - Support deployment of UNICOS applications
- LHC Experiments
  - RACK Control to be refurbished (collaboration with EN-EL)
  - PH-DT
    - CPC5 re-engineering applications & Deployment of the re-engineering project (could be done before LS2)
    - Detector cooling
      - Need to define Support for CO@ cooling
      - Quid of CFC cooling that are approaching obsolescence???
- TE- ABT : Hardware and timing for PS kicker systems upgrade
- TE-EPC : migration to UNICOS
- …

Support

Improved Services

- SCADA Applications Service
  - Review of current architecture for each of the application domains in view of improving them for operation/maintenance/performance
  - Reduce further version upgrade impact.
    - Ultimate goal : upgrade fully transparent for critical applications
  - Automated Application migration tools
- PLC Tools & Services
  - Monitoring of all PLCs by agent to improve diagnostics
  - PLC deployments with New Version control tool
  - Asset management of PLC and PXI components in INFOR EAM
- Data analytics tools to assist the operators/engineers in collaboration with IT and BE-CO:
  - Alarm analysis, cryogenics oscillations, etc…
  - Data analytics as a service
- Consultancy
  - Advanced control (regulation tuning, MBPC,…), Formal validation and Simulation

Support

Summary

- No technological revolution but permanent evolution
  - No major end of life issues even in the HL-LHC perspective
  - Please follow the recommendations.
- No Major Framework evolution for UNICOS/JCOP more uncertainties for LabVIEW that may impact RADE and applications
  - Use the frameworks they will make you life easier in case of technological evolutions
  - Follow the supported versions
  - ICE may handle the migration of your applications or assist your group using the standard tools in the migration process
- (Too?)Many applications to be developed for various groups or by equipment groups that need our support.
  - If you feel that you need support please contact us ASAP.
  - Some projects need decisions
  - Additional request from this workshop have to be evaluated
  - Close collaboration with equipment group are mandatory to establish early and adapted planning
  - Careful resources planning and optimization needed to complete the picture.
- Technical Evolutions need to be approved in Ad Hoc Committees : CO3 or JCOP

Thank you for your partnership!!