

# ITER Needs for EPICS & Web

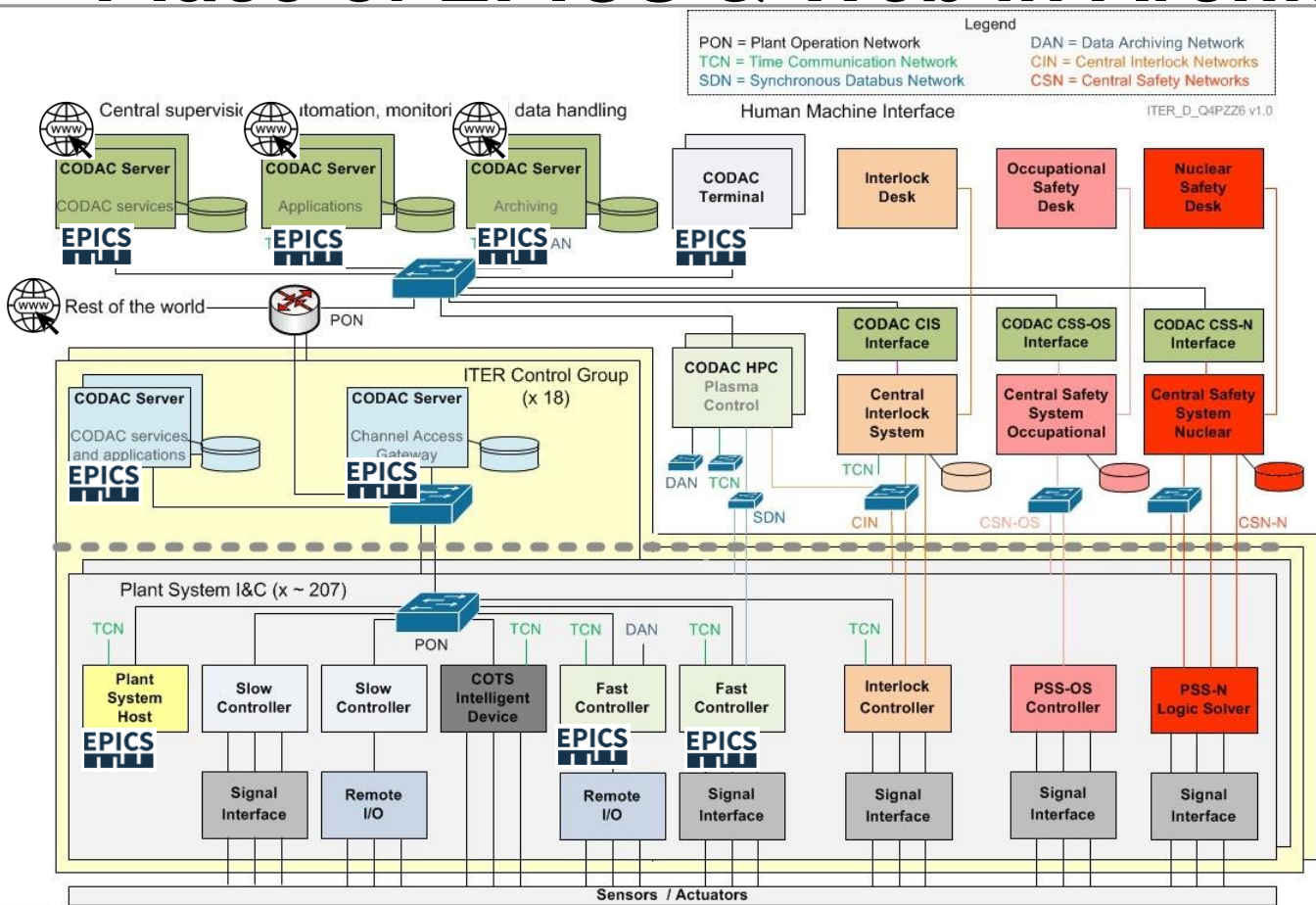
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*Disclaimer: The views and opinions expressed herein do not necessarily reflect those of the ITER Organization*

# Scope

- Web tools are nowadays ubiquitous and can be found in both development (configuration) and runtime environments
- This presentation is about run-time and “post-runtime” data presentation and dissemination, not about configuration tools

# Place of EPICS & Web in Architecture



ITER Needs for EPICS & Web

EPICS Collaboration Meeting June 2019, St Paul-lez-Durance, France

# ITER Constraints

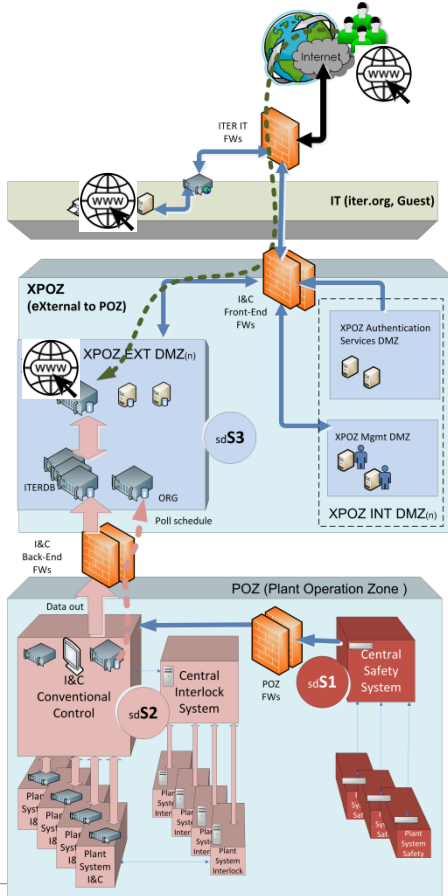
- Nuclear plant network segregation
- Role-based access
- Remote participation

# Network Zoning & Security Degrees

IEC 62645 mapping:

- S1 – Safety systems (POZ)
- S2 – Conventional controls & interlocks (POZ)
- S3 – XPOZ
- Other – IT

Each zone may have multiple specialized networks. Networks can be structured in subnets.



# Classes of Remote Users

- Off-site Research
  - Access to ITER internal resources (IDM, CAD, ...)
  - Access to UDA
  - Access to Scientific Data Center
  - Access to experiment status data for non-operators
  - Limited access to live data
- Off-site Remote Participation Center
  - Access to ITER via dedicated VPN
  - Access to XPOZ (remote participation segment)
  - Access to live data
  - Remote control room setup replicating main control room
- On-site (ITER IT network)
  - (treated same as “off-site research”)

# Why Web Tools?

- Server-side intelligence – easier to control / modify
- No software to manage on user side
- Low learning effort; use out of the box
- Functionality nearly equal to standard desktop environment
- Use of standard protocols / ports – simplifies network setup
- Established mechanisms for user authentication
- ...

# ITER Basic Requirements

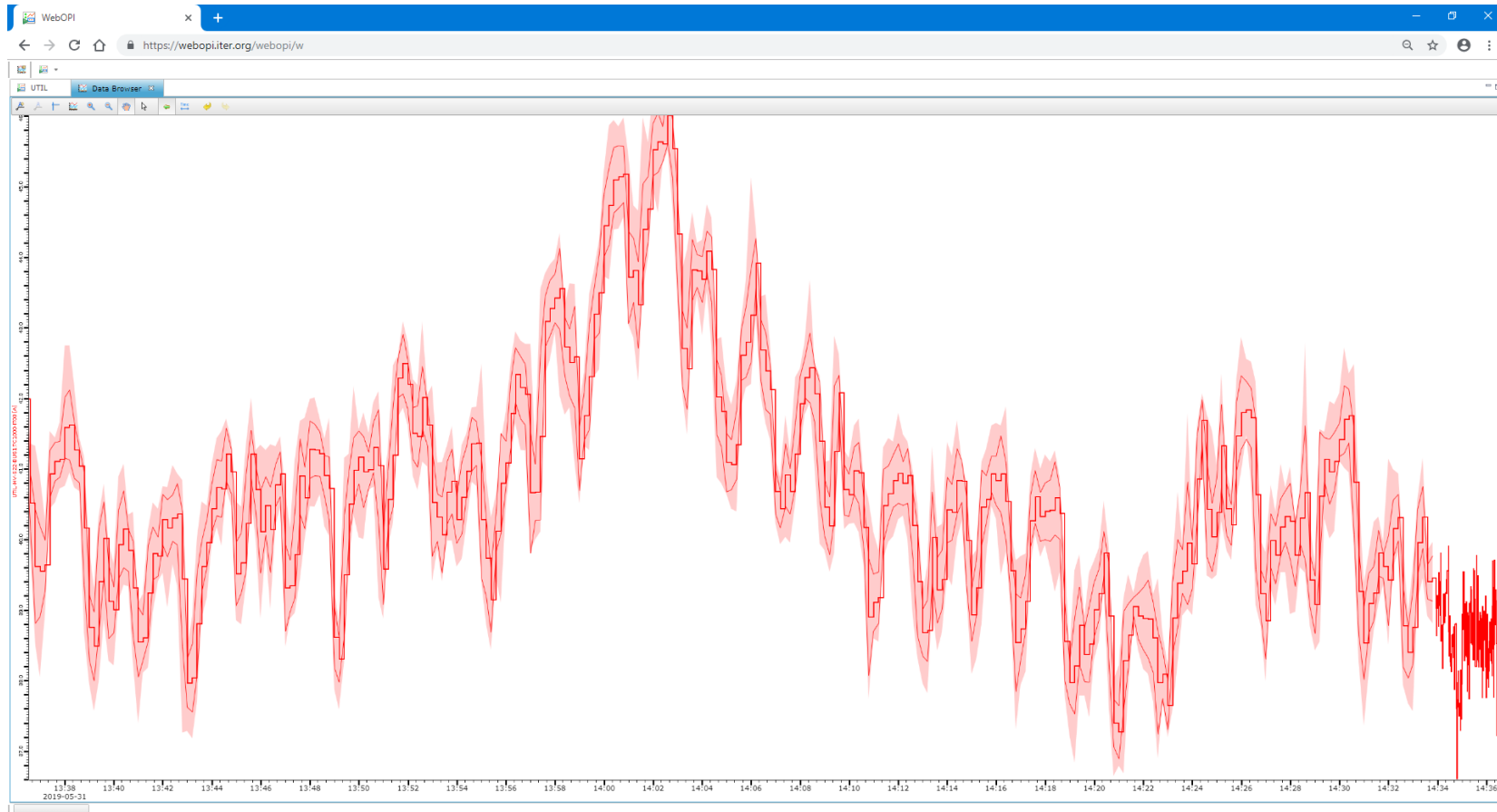
- Live access to run-time data
- Easy access to archived data
- Screen designing capabilities, dashboards
- Rich drawing interface, basic operations
- Scalability
- ...
- ... if possible, avoid writing a yet another tool



# CS-Studio Web OPI

The screenshot displays the CS-Studio Web OPI interface. At the top, a browser window shows the URL <https://webopi.iter.org/webopi/w>. The main area features a complex industrial layout with various components labeled, including pumps (B01, B02, B03, B04, B05, B06, B07, B08, B09, B10, B11, B12, B13, B14, B15, B16, B17, B18, B19, B20, B21, B22, B23, B24, B25, B26, B27, B28, B29, B30, B31, B32, B33, B34, B35, B36, B37, B38, B39, B40, B41, B42, B43, B44, B45, B46, B47, B48, B49, B50, B51, B52, B53, B54, B55, B56, B57, B58, B59, B60, B61, B62, B63, B64, B65, B66, B67, B68, B69, B70, B71, B72, B73, B74, B75, B76, B77, B78, B79, B80, B81, B82, B83, B84, B85, B86, B87, B88, B89, B90, B91, B92, B93, B94, B95, B96, B97, B98, B99, B100), control panels (PLC001, PLC002, PLC003, PLC004, PLC005, PLC006, PLC007, PLC008, PLC009, PLC010, PLC011, PLC012, PLC013, PLC014, PLC015, PLC016, PLC017, PLC018, PLC019, PLC020, PLC021, PLC022, PLC023, PLC024, PLC025, PLC026, PLC027, PLC028, PLC029, PLC030, PLC031, PLC032, PLC033, PLC034, PLC035, PLC036, PLC037, PLC038, PLC039, PLC040, PLC041, PLC042, PLC043, PLC044, PLC045, PLC046, PLC047, PLC048, PLC049, PLC050, PLC051, PLC052, PLC053, PLC054, PLC055, PLC056, PLC057, PLC058, PLC059, PLC060, PLC061, PLC062, PLC063, PLC064, PLC065, PLC066, PLC067, PLC068, PLC069, PLC070, PLC071, PLC072, PLC073, PLC074, PLC075, PLC076, PLC077, PLC078, PLC079, PLC080, PLC081, PLC082, PLC083, PLC084, PLC085, PLC086, PLC087, PLC088, PLC089, PLC090, PLC091, PLC092, PLC093, PLC094, PLC095, PLC096, PLC097, PLC098, PLC099, PLC100), and storage tanks (MV1, MV2, MV3, MV4, MV5, MV6, MV7, MV8, MV9, MV10, MV11, MV12, MV13, MV14, MV15, MV16, MV17, MV18, MV19, MV20, MV21, MV22, MV23, MV24, MV25, MV26, MV27, MV28, MV29, MV30, MV31, MV32, MV33, MV34, MV35, MV36, MV37, MV38, MV39, MV40, MV41, MV42, MV43, MV44, MV45, MV46, MV47, MV48, MV49, MV50, MV51, MV52, MV53, MV54, MV55, MV56, MV57, MV58, MV59, MV60, MV61, MV62, MV63, MV64, MV65, MV66, MV67, MV68, MV69, MV70, MV71, MV72, MV73, MV74, MV75, MV76, MV77, MV78, MV79, MV80, MV81, MV82, MV83, MV84, MV85, MV86, MV87, MV88, MV89, MV90, MV91, MV92, MV93, MV94, MV95, MV96, MV97, MV98, MV99, MV100). The interface also includes a navigation menu at the bottom with buttons for HOME, UTIL, and a grid of equipment types (BA, CA, DW, FW, HE, HV, HW, IP, LV1, LV2, LV3, MV, NG, PHV, PMV, RPC, S15, SPA, SPB). A status panel on the right shows a list of events, including a red alert for PLC001 (B20\_B91) presenta a E. (02:47:27) and a yellow alert for B07-B002 (Pulsatore) triggered on 05-30-19.

# CS-Studio Web Data Browser



# CS-Studio Web Tools

- (+) Part of standard CODAC software stack
- (+) Reuse of existing screens (some tweaks are needed)
- (+) EPICS connection out of the box
- (+) Access to source code + community
- (?) Too operator-oriented, no dashboards
- (?) Scalability
- (?) Support and future. ITER has to maintain its own branch and fixes

Status: baseline, but needs to be complemented with other functions

# W7-X DAVInCI

W7-X CoDaC v2.1.2

Help Screenshot

Drag new plots from here onto the screen

Remove all plots

Global display options:

Relative times Dark theme

Large labels

Configuration presets:

Load from file Save to file

Load from common presets

Available Monitoring Information:  
(drag a signal onto a plot to visualize it)

- W7-X Demo
- W7-X
  - AAQ Trim Coils
  - ACM Control Coils
  - CBG ECRH
    - ECRH\_A1\_B1\_Bolo\_Rf\_f
    - ECRH\_A1\_B1\_Ib\_Ic\_IGip
    - ECRH\_A1\_B1\_Ub\_Uc
    - ECRH\_A1\_I\_IonGetterPump\_operational
    - ECRH\_A1\_I\_IonGetterPump\_pulsed
    - ECRH\_A1\_T\_Collector\_Shaft
    - ECRH\_A5\_B5\_Bolo\_Rf\_f
      - Bolo\_A5 [kW]
      - Bolo\_B5 [kW]
      - F\_A5 [V]
      - F\_B5 [V]
      - Rf\_A5 [kW]
      - Rf\_B5 [kW]
  - ECRH\_A5\_B5\_Ib\_Ic\_IGip

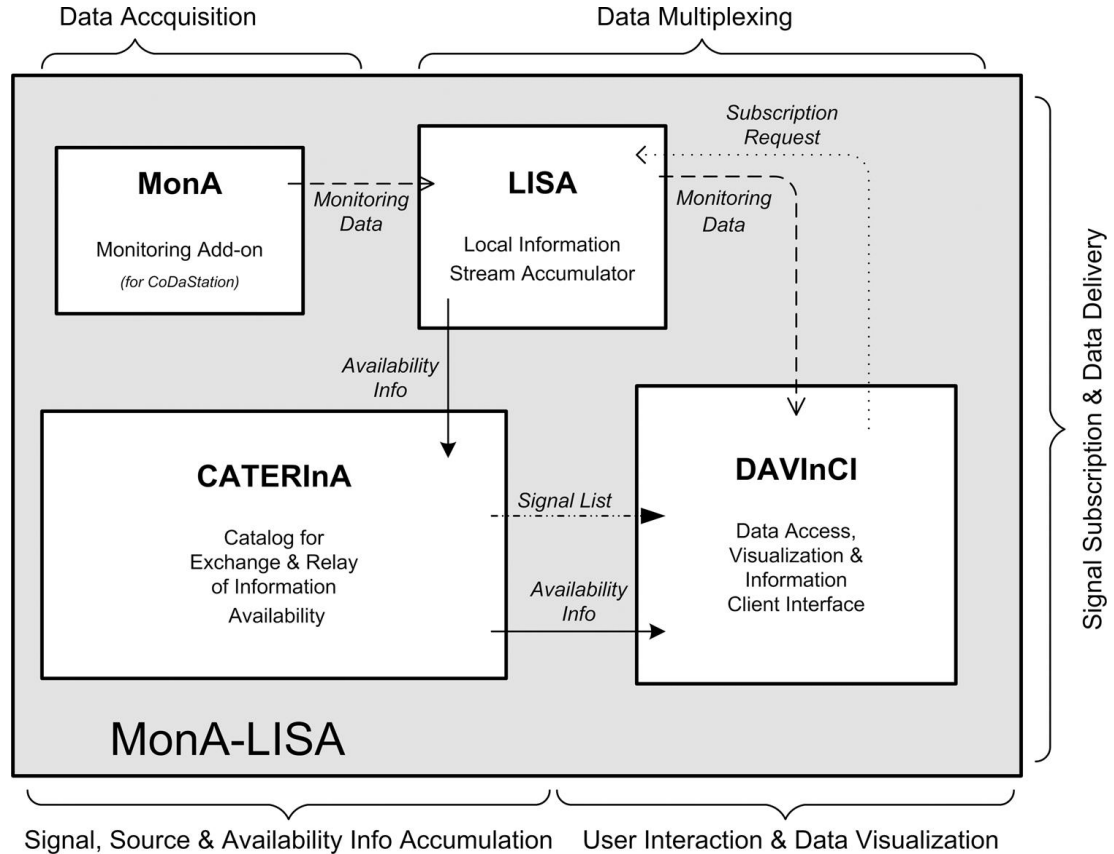
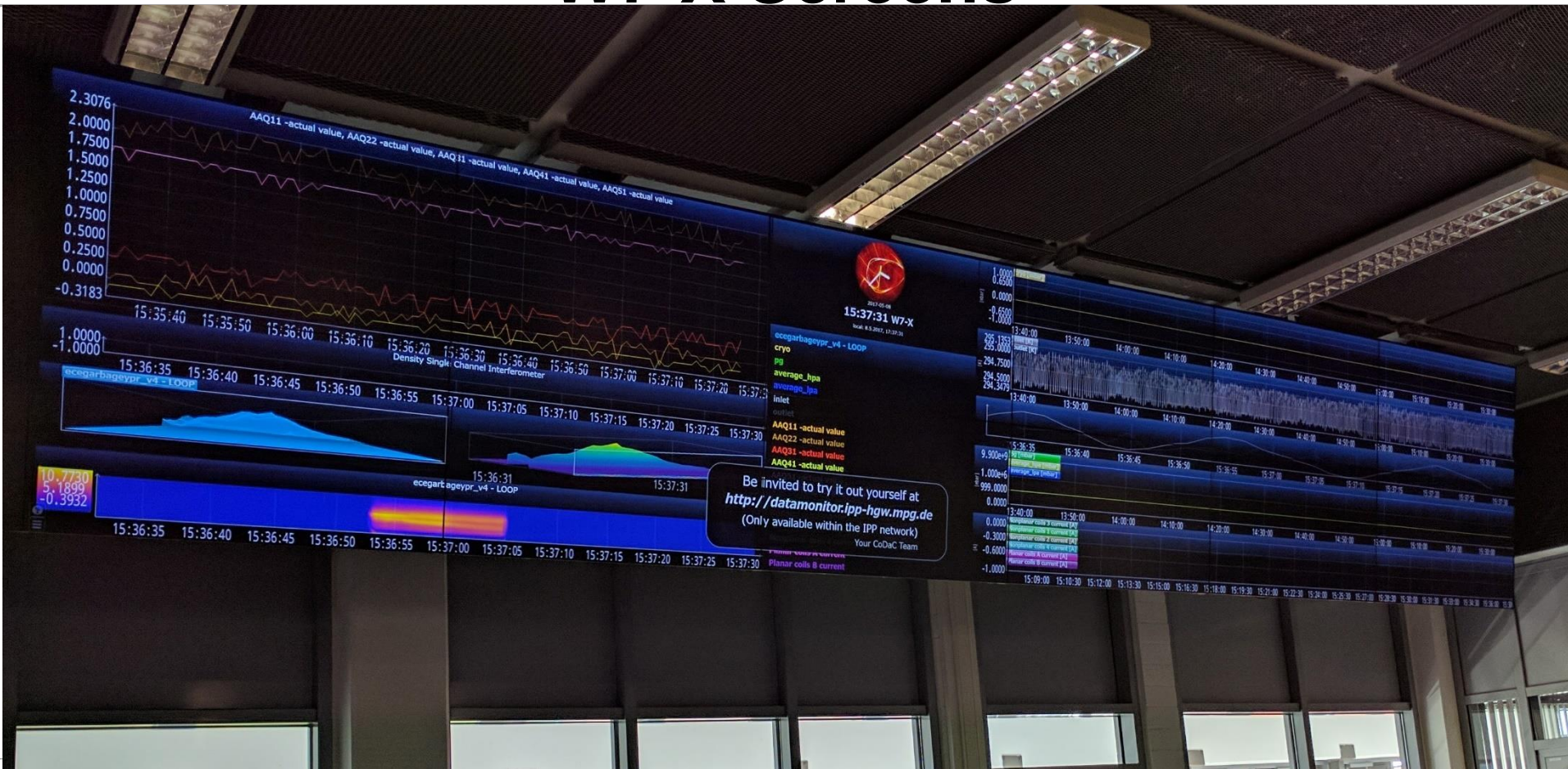


Image credit: Dumke, 11<sup>th</sup> IAEA TM on Control, DAQ & RP, 2017



# W7-X Screens



ITER Needs for EPICs & Web

# W7-X Tools

- (+) Modern, nice look & feel
- (+) Functionality, user-defined screens
- (+) Scalability
- (?) No EPICS or UDA connectors
- (?) Portability
- (?) Access to source code

Status: demo version installed at ITER, evaluation on-going

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# Other Candidates?

# Conclusion

- Web tools to navigate EPICS and other machine data are clearly needed
- CS-Studio is a baseline but has limitations
- Studies ongoing