Unlocking Turnkey 61850 Projects: Part 2 - Programming and FAT

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Introduction to Part 2: Programming and FAT

Unlocking Turnkey 61850 Projects: Part 2 - Programming and FAT

- Introduction to the Session
  - Objectives
  - Connection to 1st Session
    - Fundamental Principles
    - Architectural Insights
    - Device Integration Challenges
    - Best Practices
    - Hard Wired vs 61850
    - Case Study: Campus-wide IEC 61850 Microgrid

Introduction to Part 2: Programming and FAT

Unlocking Turnkey 61850 Projects: Part 2 - Programming and FAT

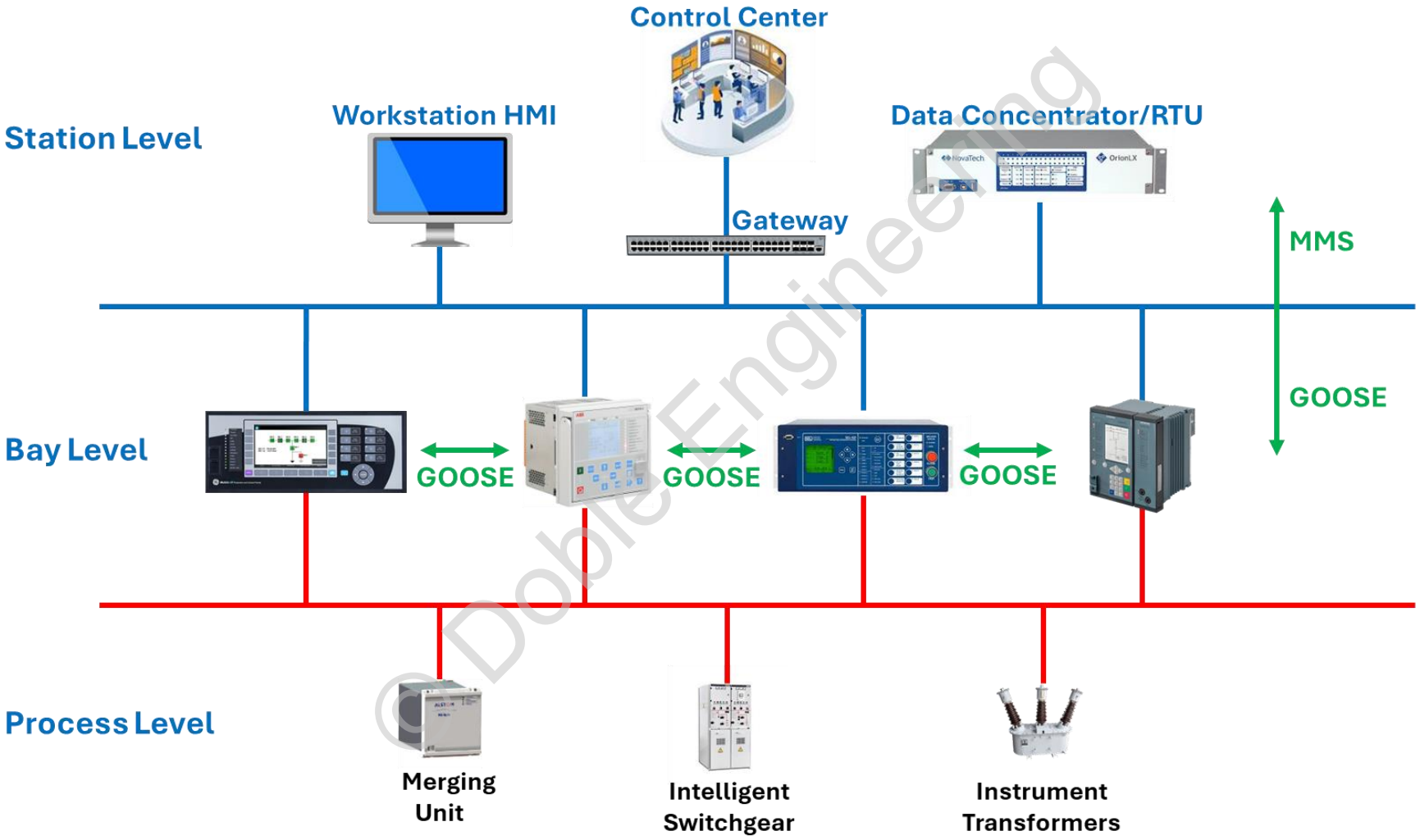
- Overview of Key Topics
  - Programming/Configuration
  - Factory Acceptance Testing (FAT)
  - Greenfield vs Brownfield Projects
  - Case Studies
  - FAT Omissions
  - Enhanced FAT Trade-Offs

Programming Overview for IEC 61850 Systems

Configuring Key Components in IEC 61850 Systems

- Introduction to Programming (Configuration) in IEC 61850
  - What is “Programming”
- Critical Components
  - Relays
  - Remote Terminal Units (RTU)
  - Human Machine Interfaces (HMIs)
  - Network Switches

Programming Overview for IEC 61850 Systems

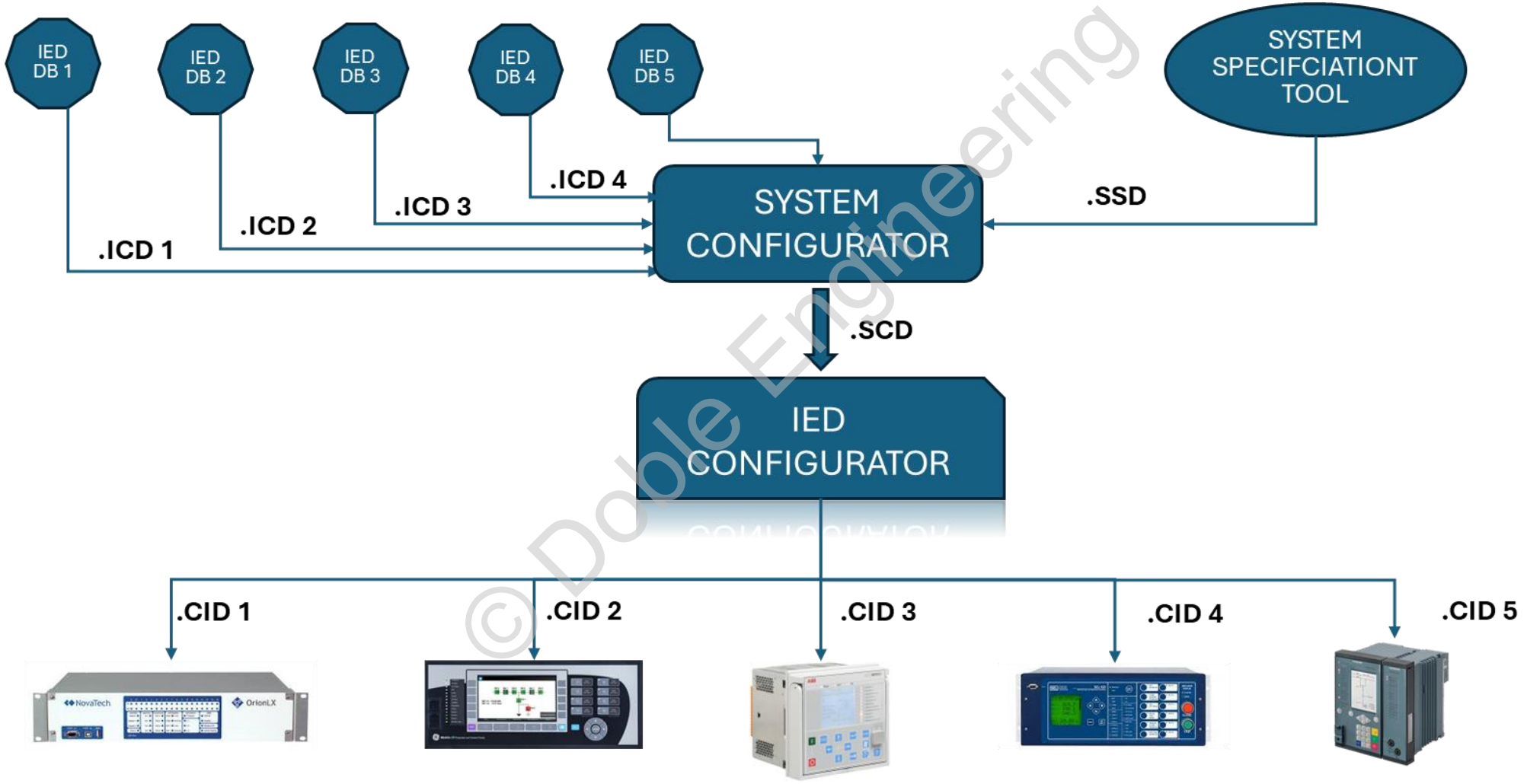


Programming Details for IEC 61850 Systems

Programming Details: Utilizing .ICD, .CID and .SCD Files in IEC 61850 Systems

- Introduction of IEC 61850 Configuration Files
  - IED Capability Description (.ICD)
  - Substation Configuration Description (.SCD)
  - Configuration IED Description (.CID)
- Understanding .ICD Files
- Understanding .SCD Files
- Understanding .CID Files

Detailed Configuration of IEC 61850 Components



Factory Acceptance Testing (FAT) for IEC 61850 Systems

Factory Acceptance Testing: Verifying System Integrity and Performance

- Introduction to FAT
  - Purpose and Process
- FAT Procedures and Importance
  - Overview of FAT Steps
  - Signal Injection and Functional Testing
  - Integration Testing
  - Performance Tests
  - Security and Compliance Test
- Documenting the FAT

Greenfield Vs. Brownfield Projects in IEC 61850 Implementations

Greenfield vs. Brownfield: Tailoring IEC 61850 Implementations

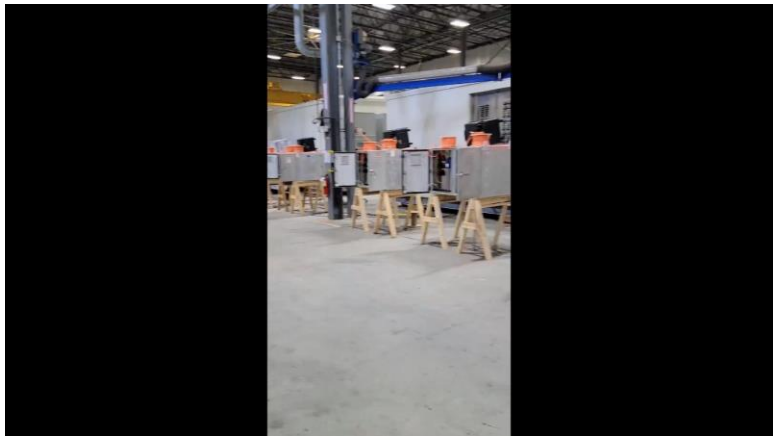
- Introduction
- Greenfield Projects
  - Characteristics and Challenges
  - Strategies for Success
- Brownfield Projects
  - Characteristics and Challenges
  - Strategies for Success
- Comparative Analysis
  - Risk Management
  - Cost Implications

Case Studies: Greenfield Implementations

Case Studies: Greenfield IEC 61850 Implementations with FAT

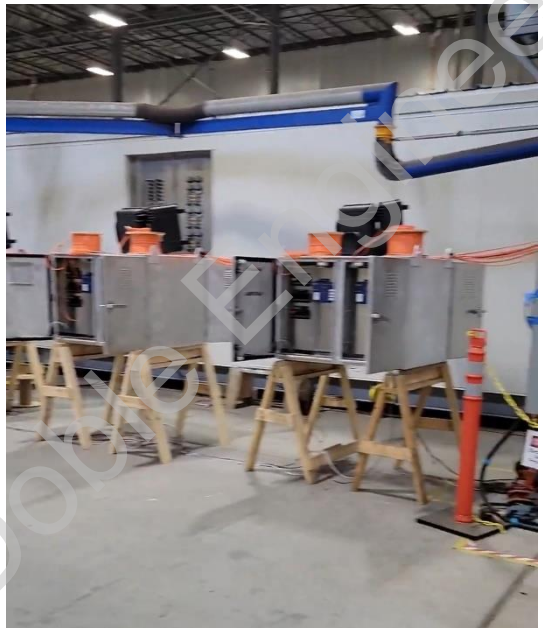
- Introduction to the Case Studies

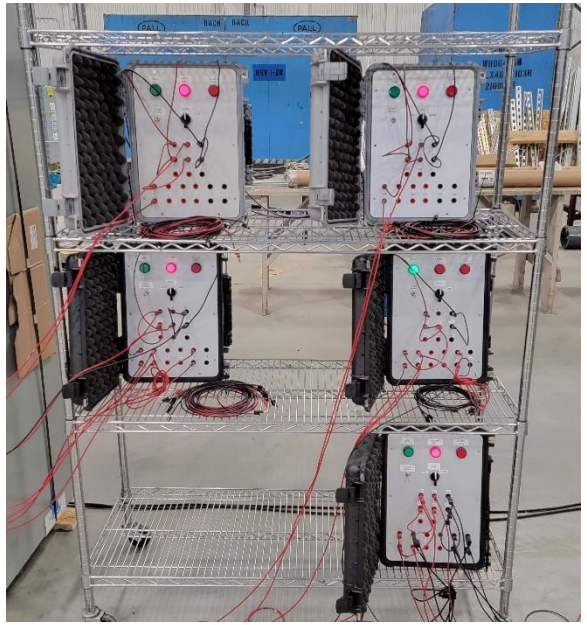
- Greenfield Project Case Study (New Substation)
  - Project Overview
  - FAT Process
  - Challenges and Solutions
  - Outcomes



Case Studies: Greenfield Implementations

Case Studies: Greenfield IEC 61850 Implementations with FAT





Case Studies: Brownfield Implementations

Case Studies: Brownfield IEC 61850 Implementations with FAT

- Introduction to the Case Studies
- Brownfield Project Case Study (Existing Power Plant)
  - Project Overview
  - Challenges and Solutions
  - Outcomes
- Comparative Insights

Case Studies: Brownfield Implementations

Lessons from FAT Negligence

Consequences of Skipping FAT in IEC 61850 Projects

- Introduction to FAT Omission
  - Different Ways this occurs
- Examples of FAT Underutilization
  - Example 1 – Wiring Checkouts at FAT
  - Example 2 – Wiring Checkouts at FAT, Interconnects onsite
  - Example 3 – Software simulation remotely (not with actual equipment), FO Checkouts at FAT
- Lessons Learned

Lessons from FAT Negligence

Example	Decision	Consequences	Financial Impact	Project Delays
1: Substation Project Delays	Chose simple functional FAT in the factory instead of comprehensive FAT including all systems.	Delivered but inactive for months; inadequate testing resources; missed operational deadlines.	Significant cost overruns from delayed testing and additional mobilization.	Missed multiple outage seasons; project timeline significantly extended.
2: Substation Interconnect Failures	Wired interconnects in the field; minimal FAT conducted.	Extended time to complete interconnects; increased price due to double the costs for rework.	Costs doubled due to inadequate initial testing and extensive modifications.	Additional 4-5 months required to complete interconnects and testing.
3: Large-Scale Substation Overhaul	Forewent full FAT for lab simulation; did not fully commission hardware in factory.	Network could not handle the traffic, leading to a major redesign.	Large cost overages due to redesign and delayed deployment.	Project will not meet energization schedules

Evaluating the Trade-offs of Intensive FAT Procedures

Challenges of Intensive Factory Acceptance Testing

- Introduction to Intensive FAT
- Potential Hurdles of Intensive FAT
  - Increased Costs
  - Time Delays
  - Resource Allocation
  - Complexity and Over-Testing
  - Potential for Over-Engineering
  - Project Milestones
- Mitigation Strategies

Final Steps and Deployment from FAT

Final Steps and Deployment in IEC 61850 Projects Post FAT

- Final Revisions Based on FAT Outcomes
  - Overview of Revisions
  - Importance of Revisions

- Deployment Preparation
  - Step-by-Step Deployment
  - Training and Knowledge Transfer

- Deployment Process
  - Step-by-Step Deployment
  - Monitoring and Support

Conclusion and Future Outlook

Conclusion and Looking Ahead to On-Site Testing & Commissioning

- Summary of Key Points
- Implications for Future Projects
- Preview of Part 3: On-Site Testing & Commissioning

Q&A and Discussion

Interactive Q&A

Thank you.