Solution of WDM (Wiring Diagram Manual) automatic generation

Name of presenter: Zhang Ruyi

Rank/title of presenter: Engineer

Company/organization: China Aero-Polytechnology Establishment(CAPE)

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Agenda

- Manuals used in aviation maintenance
- Difficulties in achieving interactive WDM
- Solution of interactive WDM
- Next step

Manuals used in aviation maintenance

In general, the following manuals are required for the maintenance of aircrafts:

AMM	Aircraft Maintenance Manual : service, operation, functional check, test(operational, functional and system test), checkout,inspection,install/uninstall,repair procedures (Trouble Shooting procedures maybe included)
FIM	Fault Isolating Manual : procedures to analyze, isolate faults
IPC	Illustrated Parts Catalog : detail information for parts and information for effectivity/applicability
SSM	System Schematic Manual : system work logic, assist fault isolation
WDM	Wiring Diagram Manual: all wires/harnesses/cables and electrical/electric equipment Connection logic
SWPM/ESPM	Standard Wiring Practice Manual: information for installation, maintenance and repair for electrical and electronic parts
SRM	Structure Repair Manual: information and basis for dispatch and structure repair
MEL	Minimum Equipment List: information and basis for dispatch when some parts are in fault state

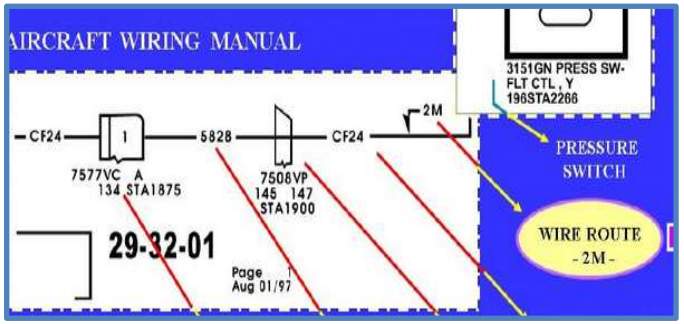
Manuals used in aviation maintenance

These manuals can usually be divided into three categories:

FIM,AMM,SWPM specific working steps/procedures to guide maintenance operator

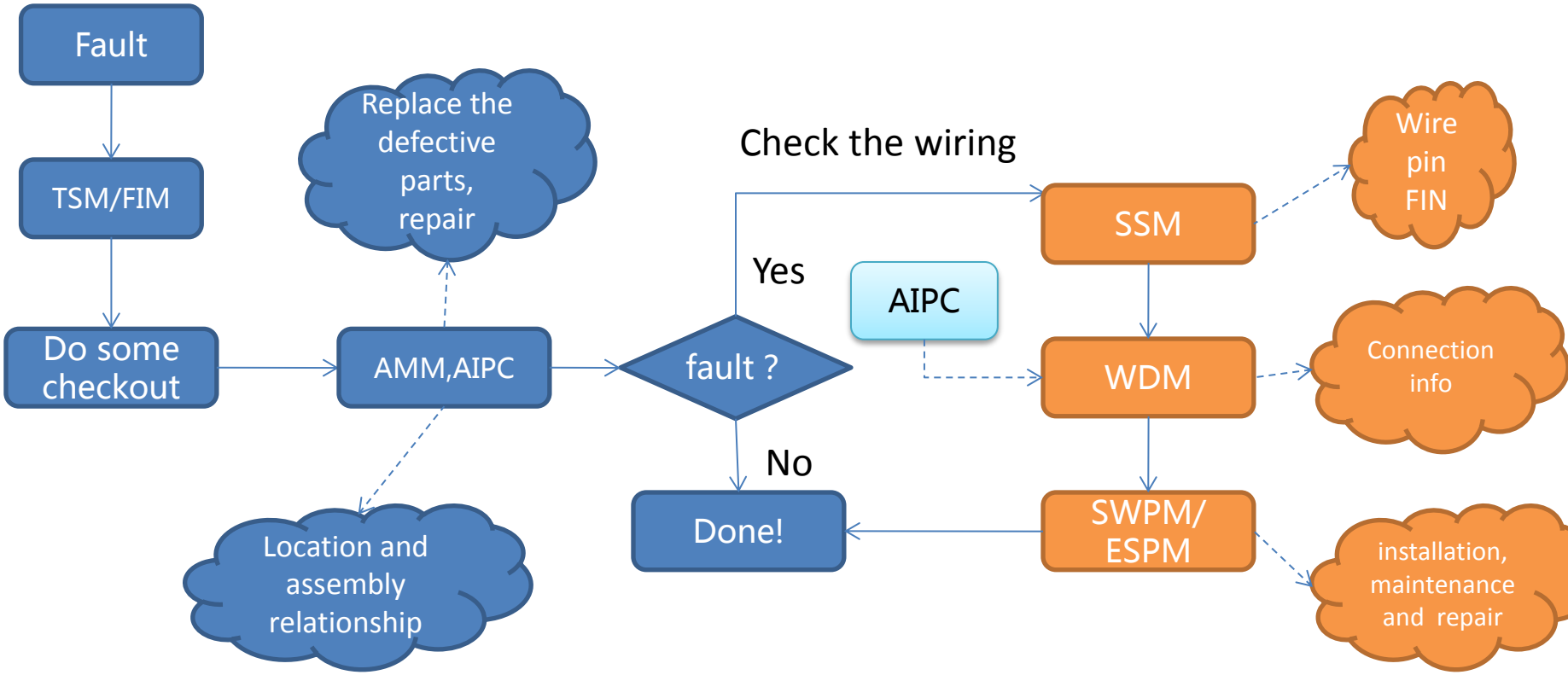
IPC information about part number, name and location relationship and so on

SSM, WDM No information for specific work, just present the useful information in graphic or tabular format to provide the assistance



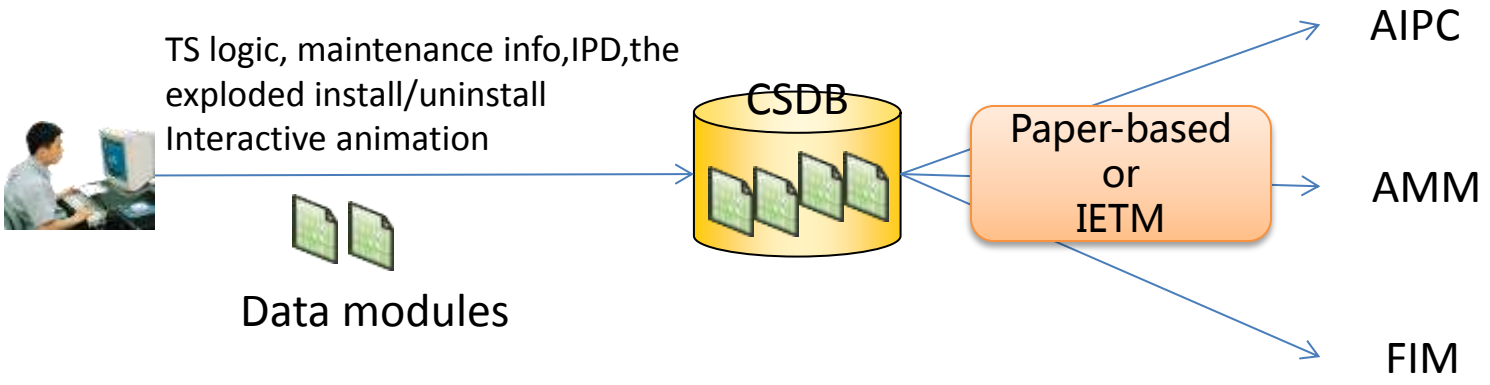
Manuals used in aviation maintenance

In a typical fault isolation scenario, the process for using these manuals :



Manuals used in aviation maintenance

For the first two categories of manuals（ FIM, AMM,SWPM and AIPC ）, manufacturers can conveniently achieve IETM with the Digital and structured data based on S1000D or ATA 2200 as the schemas are easy to understand.

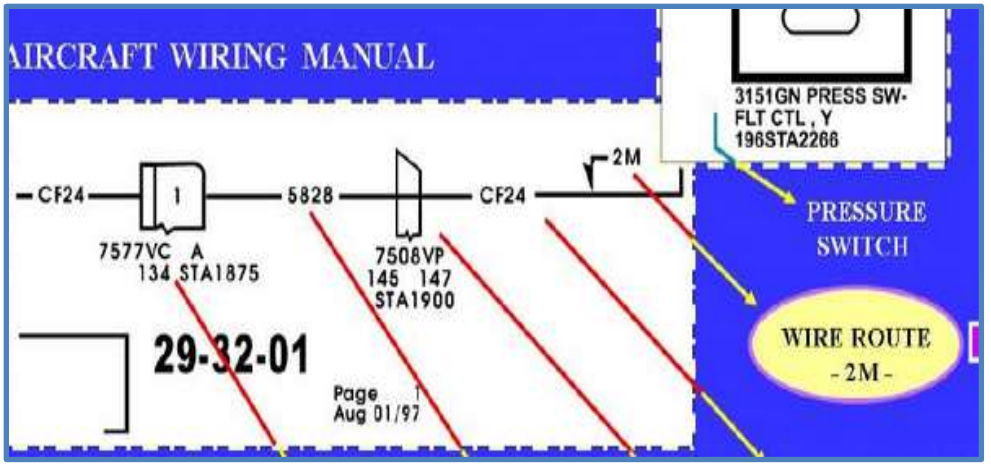


Maintenance personnel can quickly access FIM, AMM, AIPC according to IETM. Greatly improve work efficiency!

Manuals used in aviation maintenance

For the third manuals(SSM,WDM) some manufactures can provide the interactive WDM. However, these IETMs are of low level of structure and poor interaction:

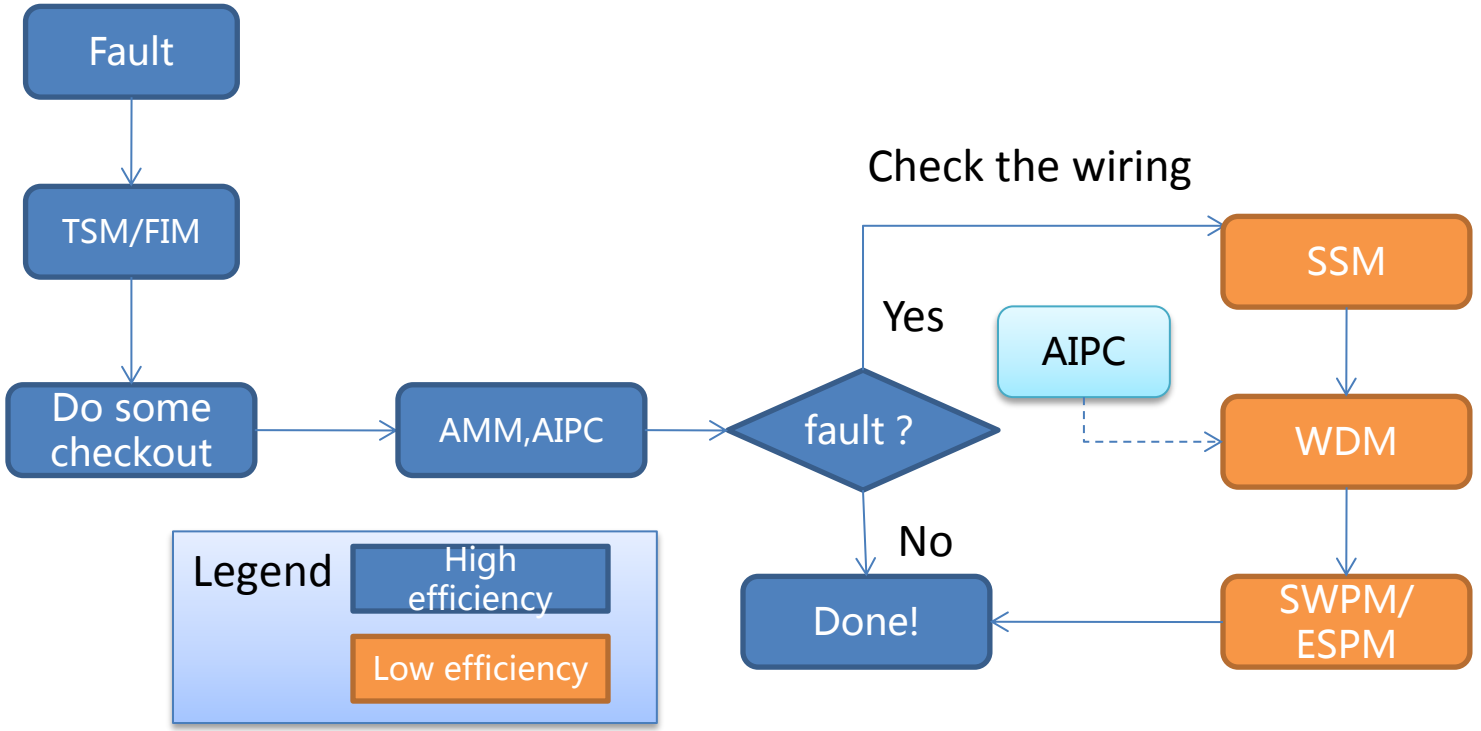
- Basic data are not generated with S1000D wiring data DM, but a kind of customized software
- Difficulty to create
- has a low portability
- Hotspot navigation, search and interactive functions, Network analysis function



Generally, the maintenance personnel use the paper-based SSM, WDM mostly!

Manuals used in aviation maintenance

According to the investigation results, it's of lower efficiency when using WDM than using AMM and FIM/TSM



- •New Technology
- •Lower Cost

→ S1000D Wiringdata

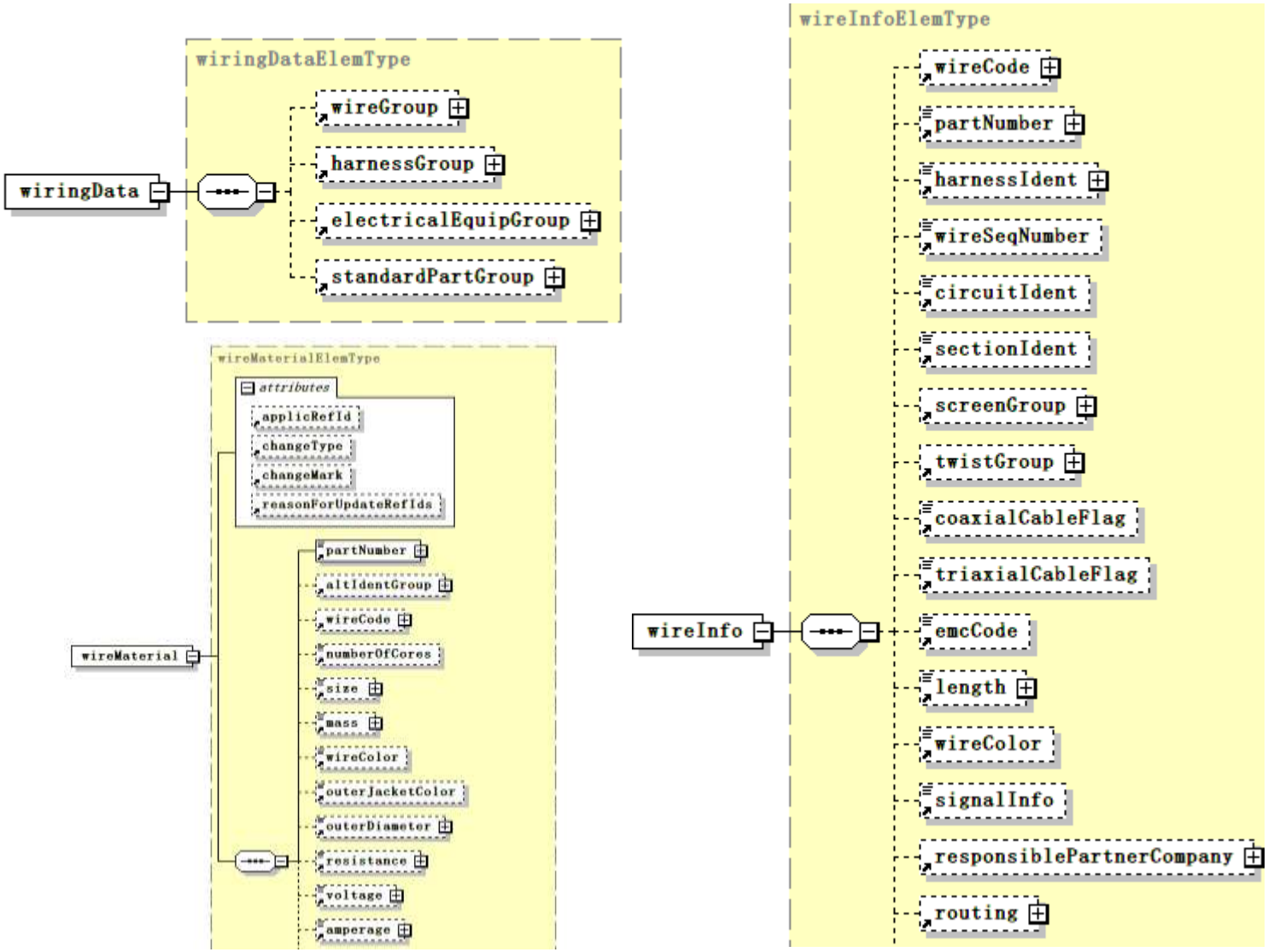
Structured
Digitized
Generalized(Standardized)

Difficulties in achieving interactive WDM

Difficulties :1

- S1000D Wiring data DM has a complex schema structure. Even for a simple circuit diagram, it needs to write a large number of scripts in XML. It’ s very time-consuming!
- Therefore, for the mass/complex wire information, it is almost impossible to write DM directly with a common IETM/XML editor!

Difficulties in achieving interactive WDM



Difficulties in achieving interactive WDM

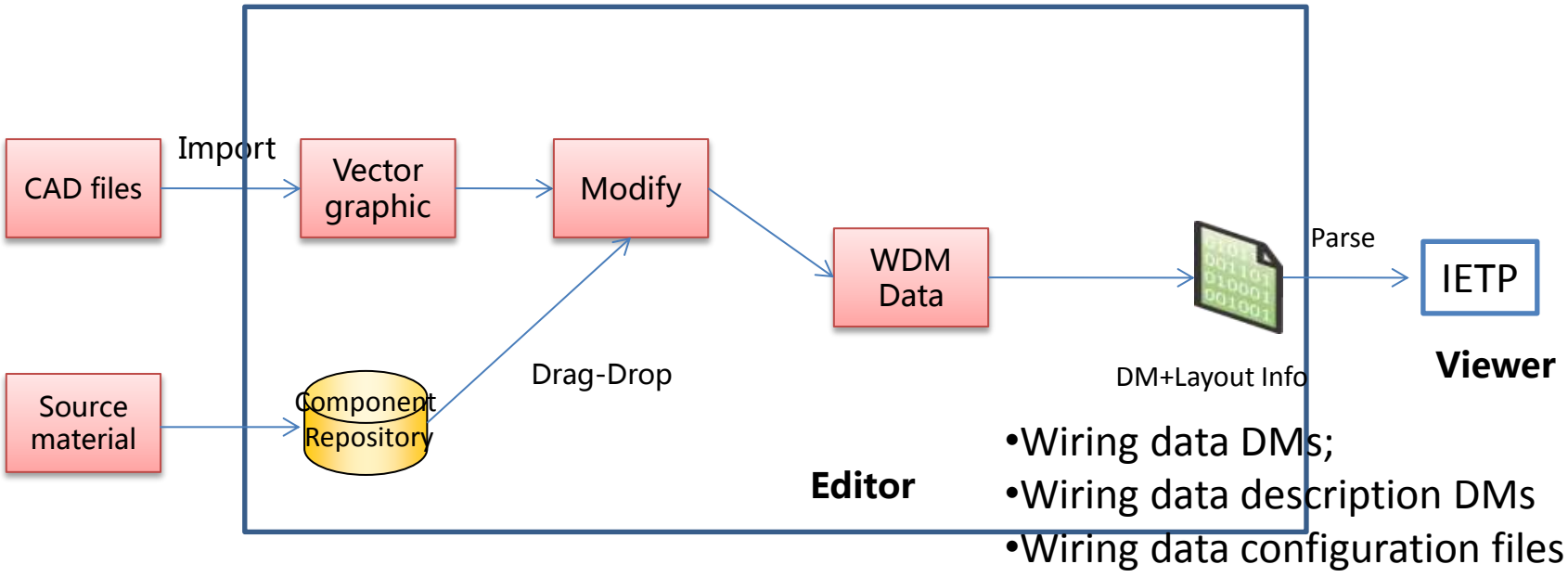
Difficulties :2

- The DM contains mainly the basic information and inter-connection relationship for wire/harnesses, electrical/electric parts and standard parts. No Interface layout , location and size information is included.
- So the Wiring data DMs cannot be presented directly in the IETP viewer.
- And How to maintain consistency when presenting on different IETP viewers?
- For paper-oriented publications:

For page-oriented wiring publications, the information for generated data presentation, eg
harness wire lists, connection lists, is generated from source data, as described above, in a preprocessing. The result of the pre-processing must be stored in data modules.

Solution of interactive WDM

process for development of the interactive WDM

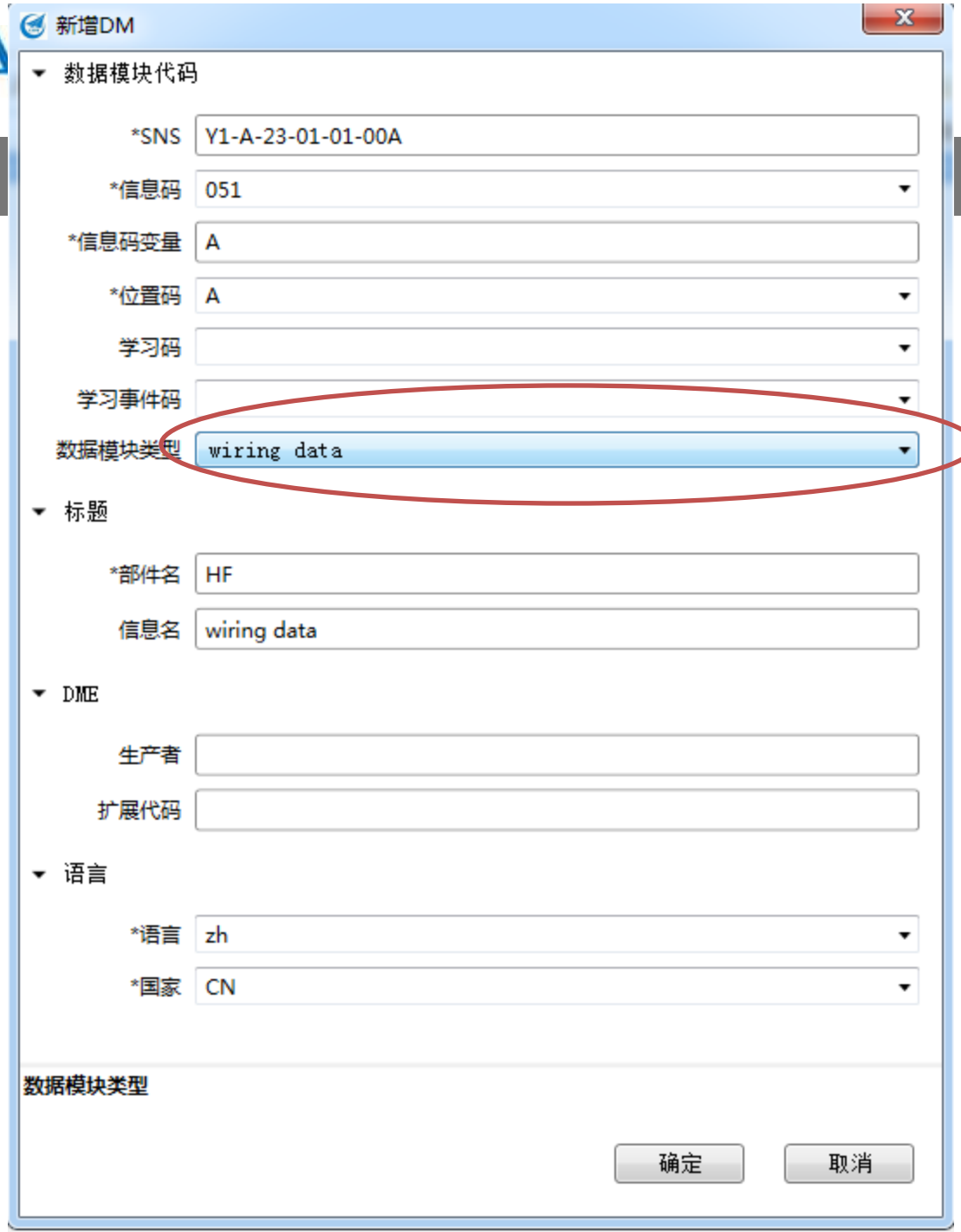


Solution of interactive WDM

Editor:

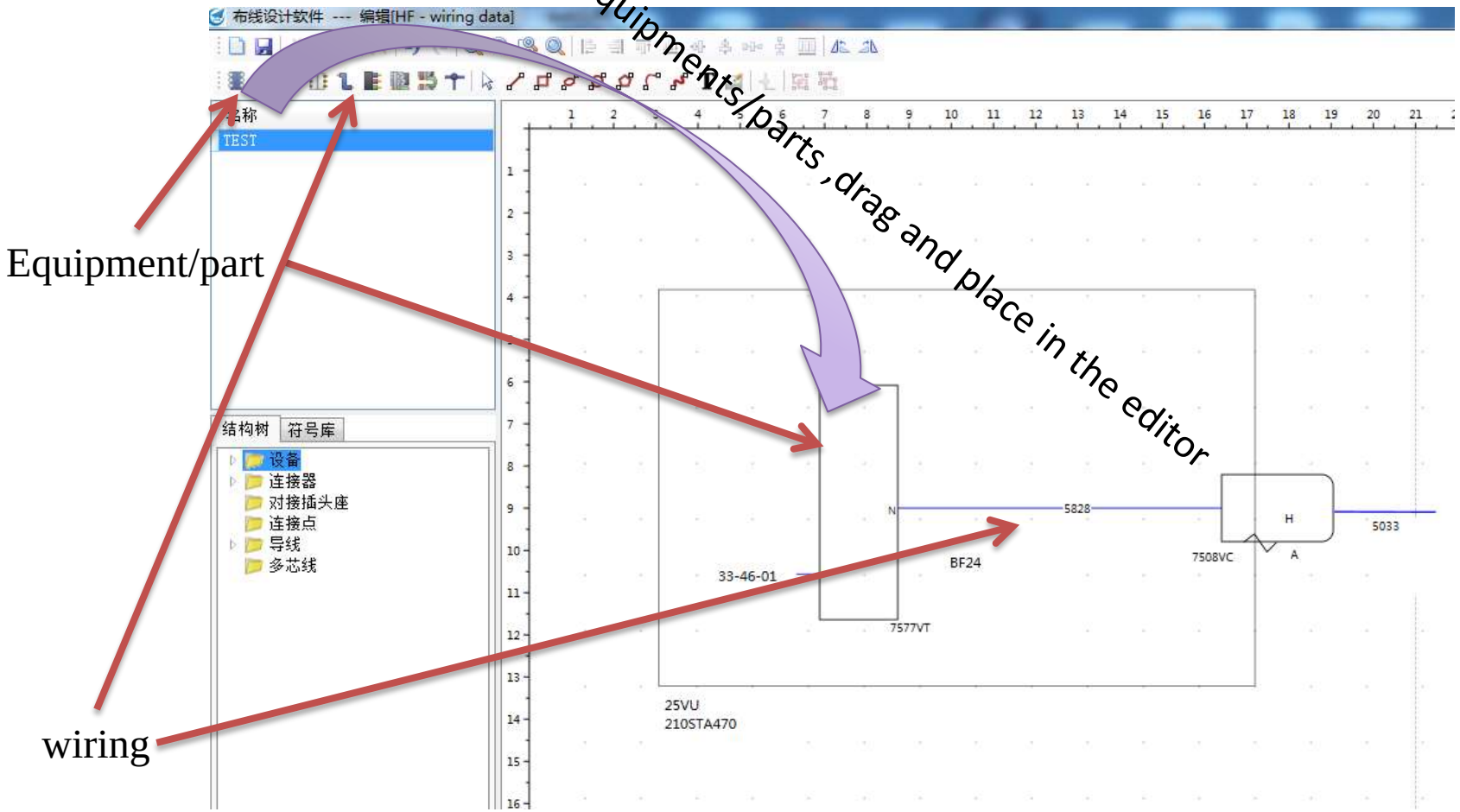
- Interactive WDM Editor is embedded into the common IETM editor;
- In the common IETM editor, create a new data module, and set the data module type as wiring data;
- When the author try to edit the data module, the Interactive WDM Editor is automatically started.
- You can switch between the two modes: Graphical mode and script mode.

Editor :



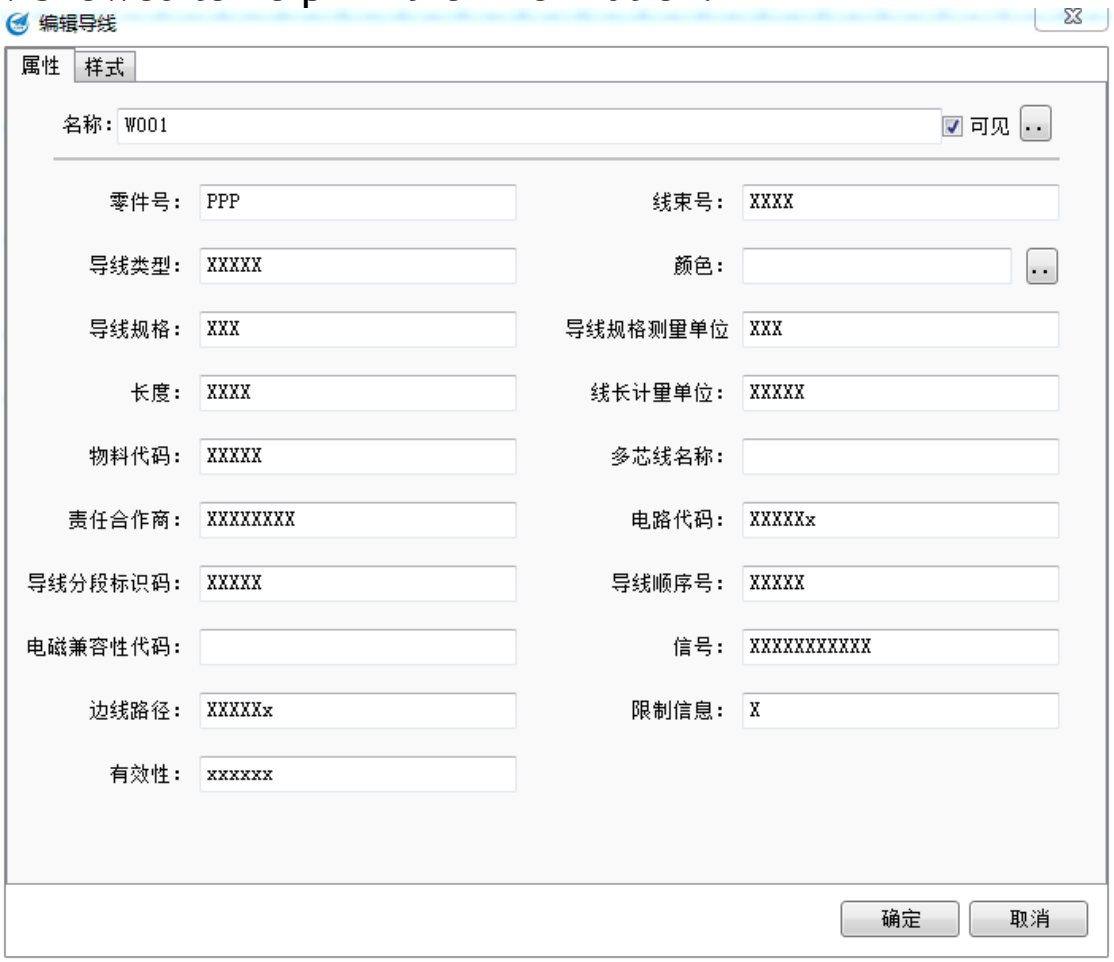
Solution of interactive WDM

Editor :



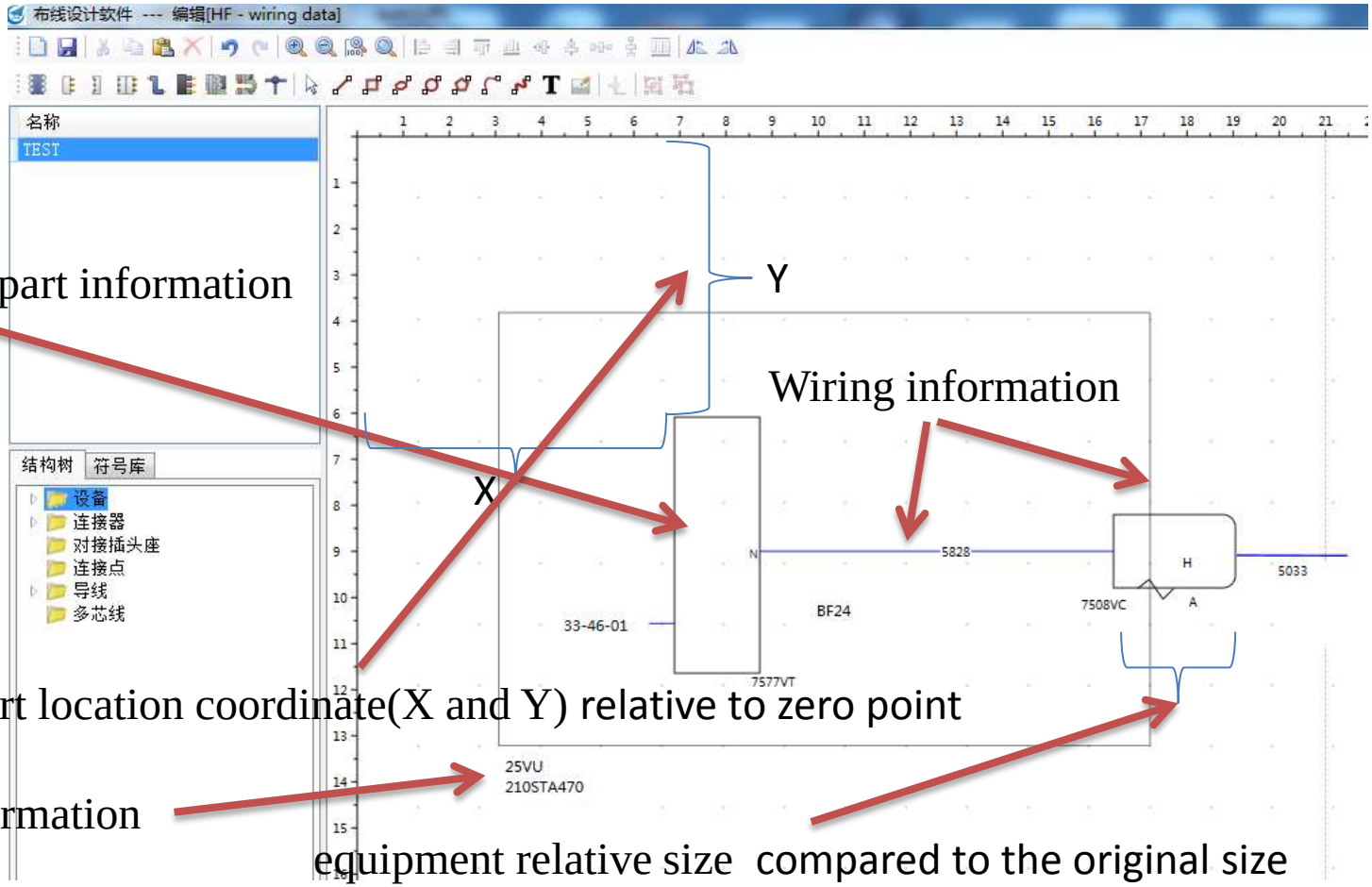
Solution of interactive WDM

Filling some contents: According to S1000D schema, For different equipments/parts, different editing window showed to help fill the information.



Solution of interactive WDM

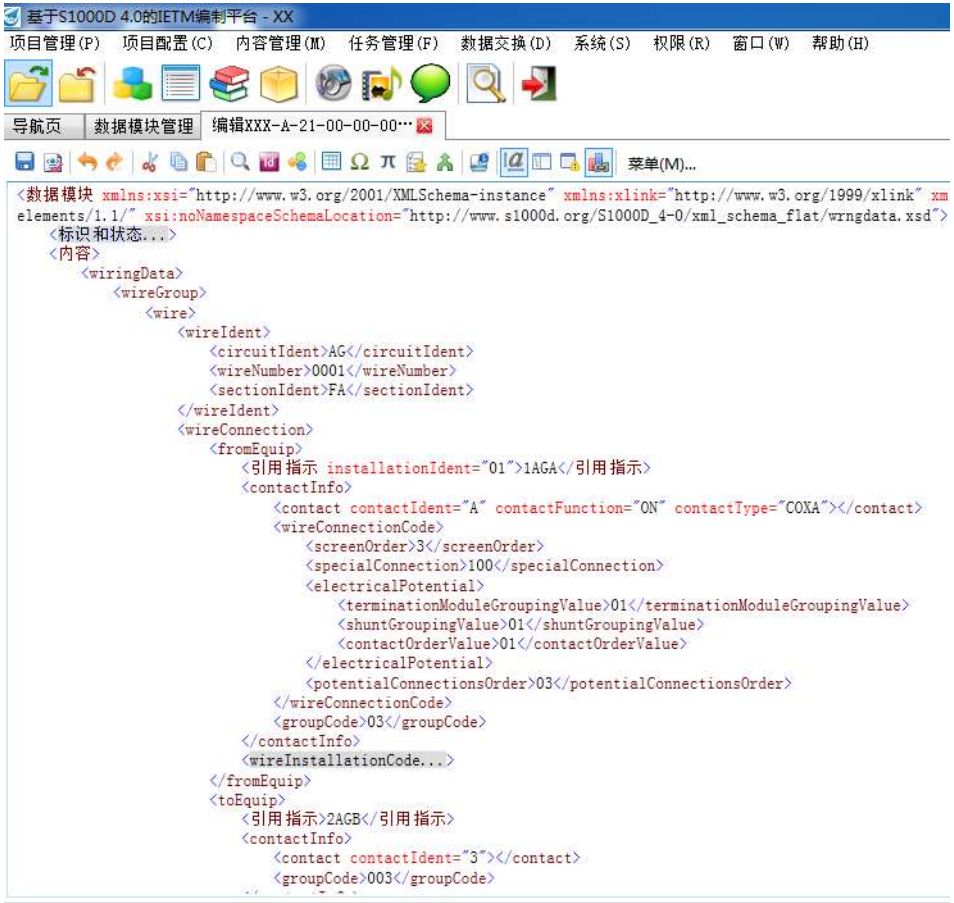
After editing , the system records the following data:



Solution of interactive WDM

You can switch between the two modes: Graphical mode and script mode.

- Graphical mode: What you see is what you get
- Script Mode: More information and more flexible with XML



Solution of interactive WDM

After editing , the system needs to record the following data:

Equipment/part information

Wiring information

Other information

S1000D XML(DM)
- Wiring data DMs;
- Wiring data description DMs

Customized ZIP files

Equipment/part relative size

Equipment/part location coordinate(X and Y)

Layout configuration XML (Non standardized XML)

Next step?

- More interactive: <networkAnalysisCode> ;
  - Describes the behavior of the wire end in the network analysis in relation to other wires via the equipment.
- Wire system tracing simulation(Chapter 6.4);
  - Traces the wires based on the behavior or the position of the switches or relays.
- Electrical/electric parts Repository and related standards/specifications;
- AR/VR+ IETM.
- Intelligent Manufacturing ,China Manufacturing 2025, One Band & One Road strategies + IETM and related technologies.

Next step?

- In China, the government is promoting the strategy of Intelligent Manufacturing ,China Manufacturing 2025, One Band & One Road strategies. With the implementation of these strategies and policies, it has broad prospects for Intelligent maintenance and integrated logistics support for aviation, aerospace, high-speed railway and other equipments. There are huge requirements for management of equipment operating, maintenance and technical manuals.
- We(CAPE) are the authoring and overall management organization of national standards and aviation standards. We are now doing some researches on related researches and product development.
- We also hope to make some deep communication and cooperation with related companies.

Thank you

for your attention!

Questions?

Name: Zhang Ruyi
Phone: +86-10-6165-9066
Mobile: + 86-10-15810539276
Email: jixiezhangruyi@126.com