

Presented by

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SCADE for AIRBUS critical avionics systems

Agenda



- Airbus Context
- SCADA use
- Automatic Code Generation

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Strategy for the systems : Make or Buy ?

- AIRBUS has defined a strategy for the development of its Aircraft systems :

- ▶ “Make” or “in house” development :

Systems are designed, developed and manufactured by Airbus internal centre

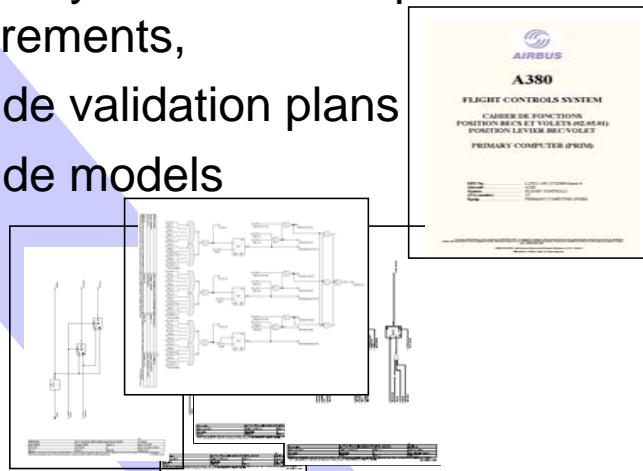
- ▶ “Buy” or “out sourced” development :

Systems are designed and manufactured by system vendor (or sub-contractor)

Systems development overview

- System design :

- ▶ Define system and computer requirements,
- ▶ Provide validation plans
- ▶ Provide models

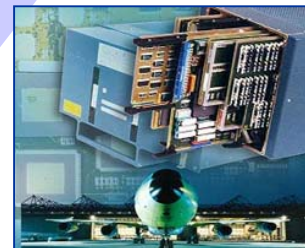


- Test & Simulation :

- ▶ Development simulation
- ▶ Training simulation

- Avionics products manufacturer :

- ▶ Provide hardware equipments
- ▶ Provide software with functional applications



Avionics products overview

Flight Control system :

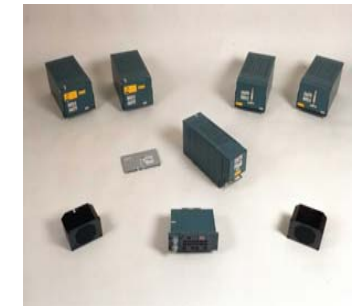
- Flight control Primary computer
- Flight control Secondary computer
- Data Concentrator function
- Backup Control Unit function
- Weight and Balance Backup Computation



A380

Flight Warning system :

- Flight Warning function
- System Data Acquisition
- Ecam Control Panel



A319/A320/A321

Maintenance system :

- Centralised Maintenance function
- Bite function



A400M

Air/Ground Digital communication system :

- Air Traffic Services Unit
- Air Traffic Communication Function



A330/A340

Agenda

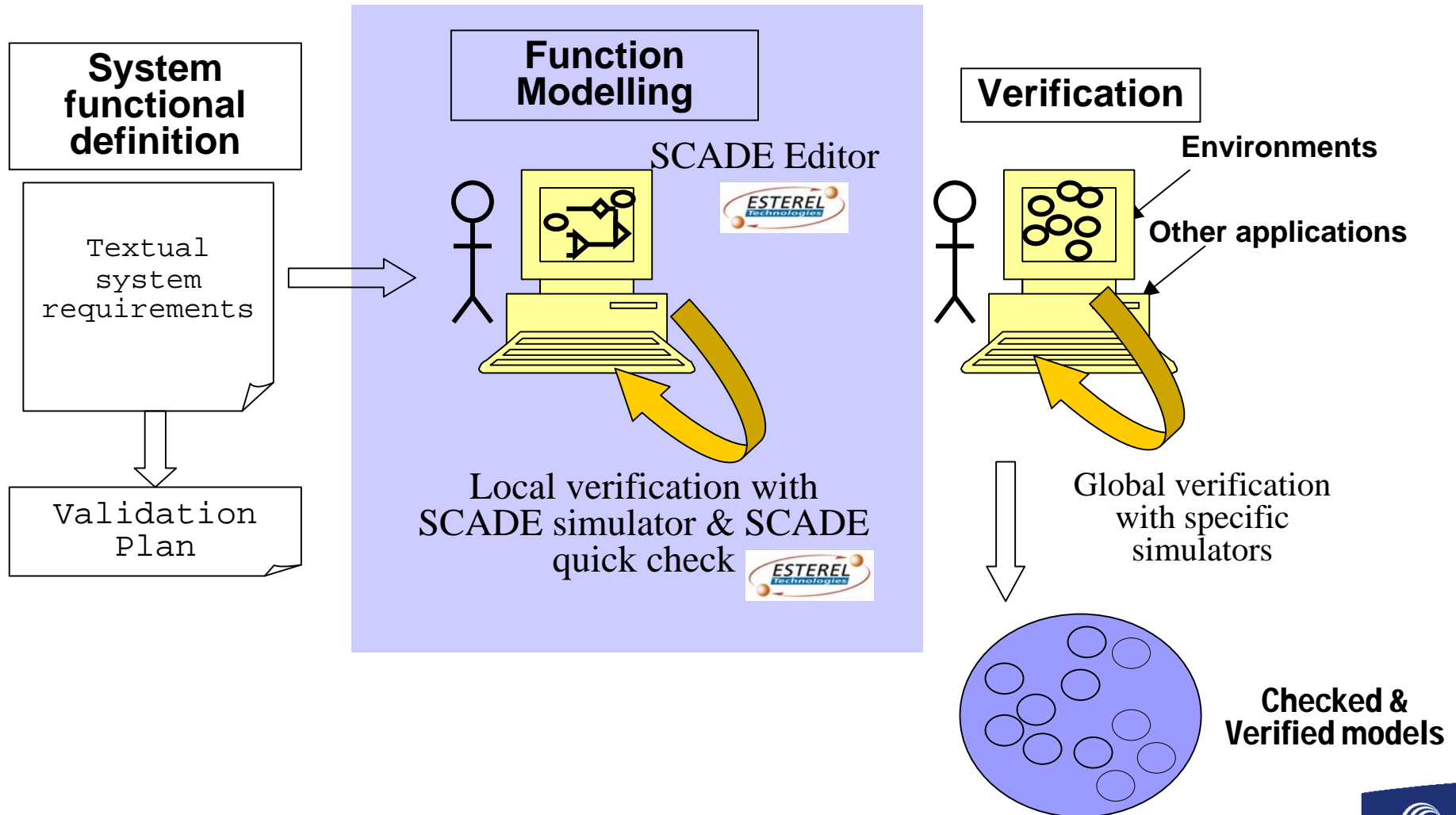


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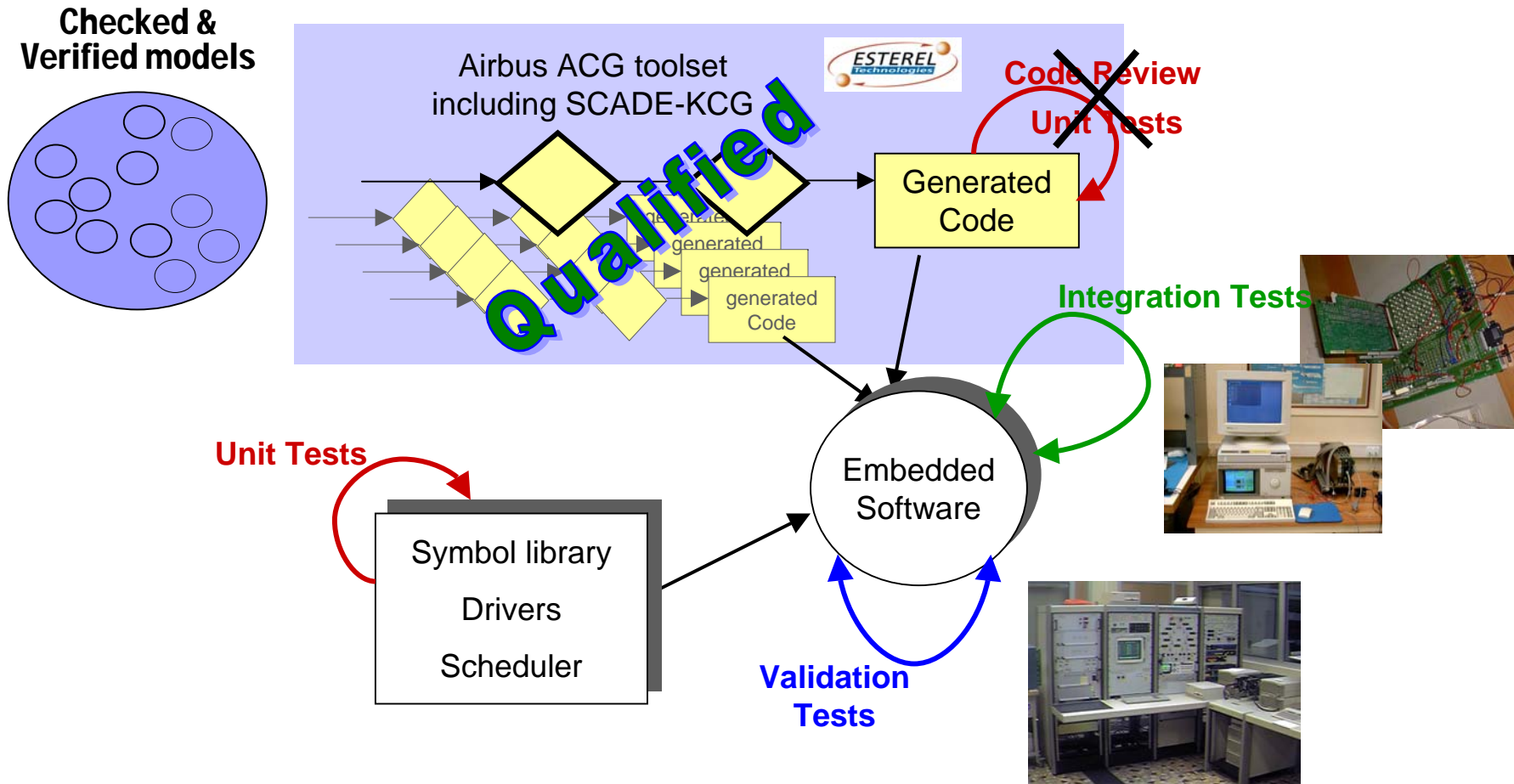
SCADE modelling with SCADE-Suite

At System Design level: Model definition and verification



Software coding & integration

At avionics products manufacturer level: From SCADE model to “code transformation” and “Software integration”



System validation

At Test and Simulation level: Application integration and validation

▶ Unitary validation of applications



Validation Plans

▶ Validation of systems integration



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ACG - Key drivers



The main challenges :

- ▶ Flight control for **civil aircraft** need high level of **safety**
- ▶ Certification under the **DO178B** standard
- ▶ New software delivery in **48 hours**
- ▶ Application defined with more than **5000 SCADE nodes**
- ▶ More than **30 software releases** before “Entry Into Service”
- ▶ 30 to **50 years** of maintenance in operational condition
- ▶ Systems global **cost reduction**



Airbus strategy

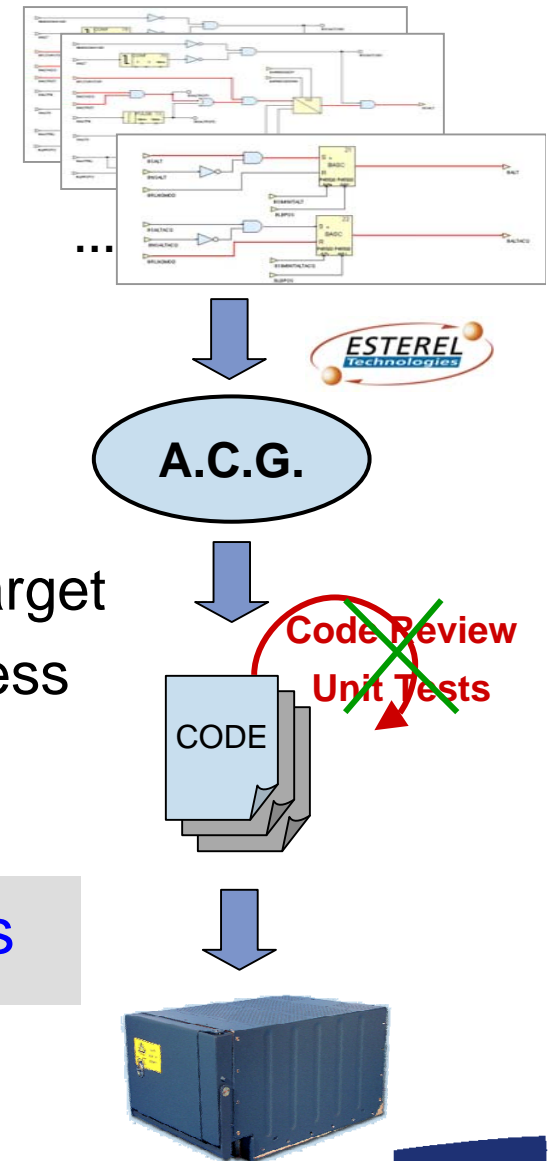
Model Based development and Qualified Automatic Code Generation using in house ACG (strategic internal expertise) and ESTEREL Technologies toolset

ACG - Airbus Know-how

Airbus ACG toolset including SCADE-KCG for all internal avionics embedded software

- ACG toolset are DO178B **qualified**
- Specific AIRBUS internal **expertise** domain
- Delivery of a new software standard in **48 hours**
- Generated code **customized** for the hardware target
- Contribution to a **lean** software production process

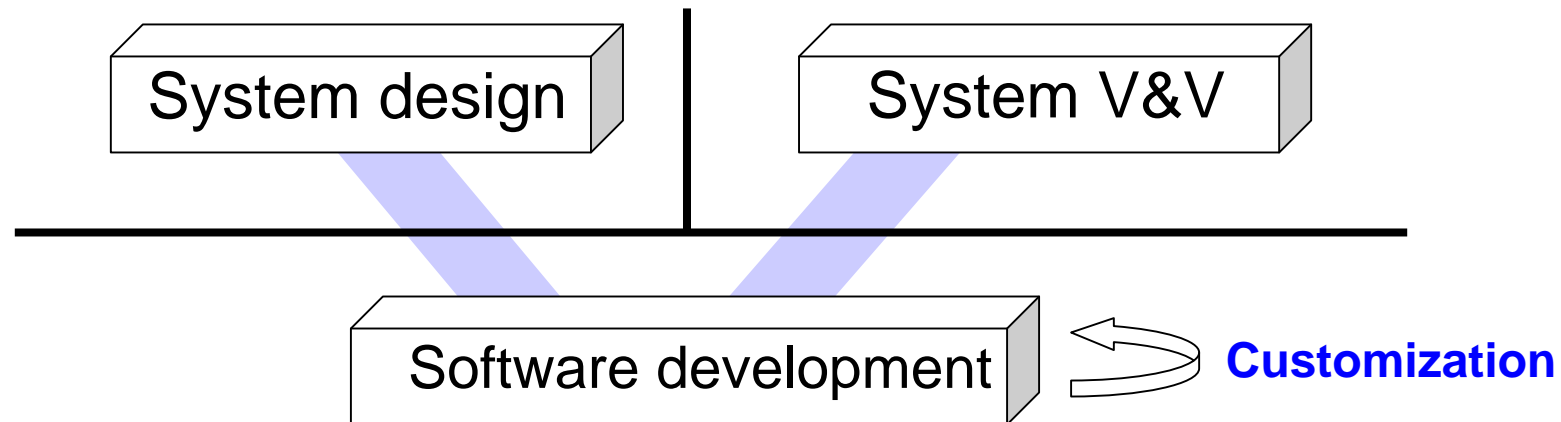
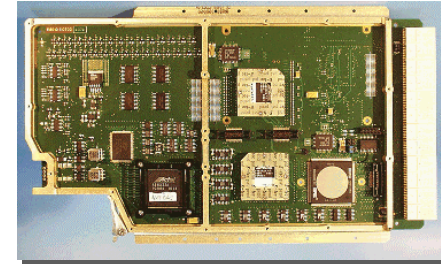
A significant competitive advantage for Airbus



ACG – Airbus organization impacts

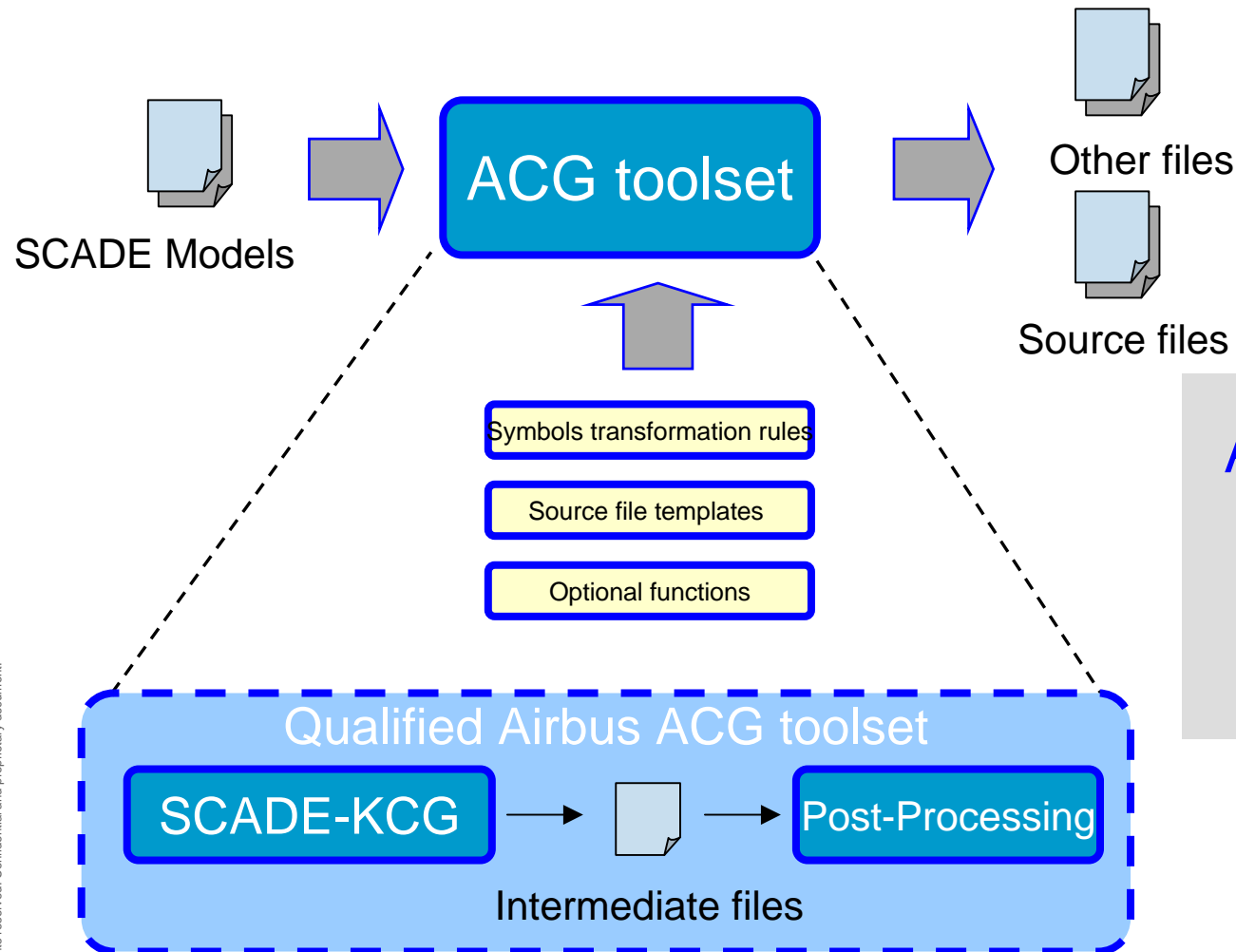
Why code customization ?

- ▶ Specific hardware target
- ▶ Target languages
- ▶ CPU & Compiler usage
- ▶ Capability of verification



Customization should be done without impact on model

ACG tools customization : how ?



Airbus toolset allow to customize source code at software level

Airbus in house avionics software production observed results

- **Several Millions of lines of code** produced for 15 critical avionics software
- **60%** of the embedded software **produced automatically**
- **Time development** (including verification activities) **divided by 3** compared to a process without ACG (observed results for typical modification on FCS software)
- **Never experienced any bug in flight** in our FCS software produced automatically

Thank you for your attention



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