Social, Ethical, and Behavioural Integration in HIDDEN

HIDDEN SSH-CCAM Webinar

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Why SSH matters

Technology alone is not enough…

SSH should **not only be discussed** but experimentally **investigated and validated** through **empirical research** and **user-centered evaluation**

- Interaction with
  - **Diverse user groups** (HIDDEN focus: Vulnerable Road Users, **VRUs**)
  - Different cultural, **cognitive, and behavioural backgrounds** (cf. DFG "Beyond Validation^{AI}*")
  - Human **expectations**, emotions, and trust
- Risks without SSH
  - **Misinterpretation** of system behaviour --> **lack of trust and acceptance**
  - **Exclusion of certain user** groups
  - **Unsafe** interaction patterns
  - **Ethical** and societal **blind spots**
  - **Technology** that is technically functional but **not "human-compatible"**

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*) Source: https://www.thi.de/en/research/beyond-validation-ai/

The HIDDEN SSH Approach

From the proposal document:

support the project achieve its objectives. The consortium recognises the difficulties that may arise from inter-disciplinary collaboration (e.g., different language and terminology, varying methods of work, different levels of scientific understanding, etc.)[27] and will be prepared to tackle them, if needed, in the course of the project.

1.2.4 Social sciences and humanities (SSH)

Social sciences and humanities (SSH) will be **integrated** in various activities in HIDDEN. The project is developing AI-based models and algorithms for CCAM systems which should be **explainable**, **trustworthy** and **human-centric**. This implies heavy involvement of **SSH principles throughout the project**, from **design** and **development** phases till **testing**. HIDDEN work plan facilitates a co-design process, were a continuous collaboration among SSH experts and technical partners is foreseen, while it follows the principles of user-centred design (ISO 9241-210) involving relevant stakeholders early enough through workshops, focus group discussions, or observations in real traffic.

More specifically, in **WP2** in T2.3 the ethical framework and the guidelines for responsible AI practices are provided, in **WP3** in T3.2 the integration of human intelligence through the driver gaze tracking is introduced, in **WP4** in T4.1 the trajectory prediction and in T4.2 the decision-making aligned with human expectations (understandable, human-like, reflecting human psychological capabilities) is developed and in T4.3 the explainability and driver trust building is explored, while in **WP5** in T5.4 the user acceptance, the human-like behaviour of the AVs and the explainability of the HI algorithms are assessed.

In order to have a successful contribution from SSH in the project, collaboration among automotive engineers, AI experts and SSH experts is deemed necessary. For this reason, SSH experts are directly involved in HIDDEN consortium, mainly through **UI, EAIN** and **THI**. In addition, many project partners have access to SSH experts in their Research Centres that could play a consultation role, whereas also external SSH experts will be invited to discuss project findings and support on a voluntarily basis through a dedicated webinar (see section 2.2).

SSH will play an important role in HIDDEN, safeguarding that the project outcome will be **beneficial for the society**, paying particular attention to **vulnerable road users**, while enhancing the understanding of AI-related ethical issues and user needs, together with capabilities, limitations and potential conflicts of AI-based CCAM systems.

The HIDDEN SSH Approach

→ **SSH across the lifecycle of the HIDDEN project**

- **Problem definition**: Societal needs; safety; inclusion
- **Design and development**: Human-centered HMIs; behavioural → prediction models
- **Implementation**: Integration of VRU models; interaction-aware systems
- **Evaluation**: Simulator, VR, and real-world studies; collecting objective + subjective data
- **Impact**: Acceptance; trust; ethical implications

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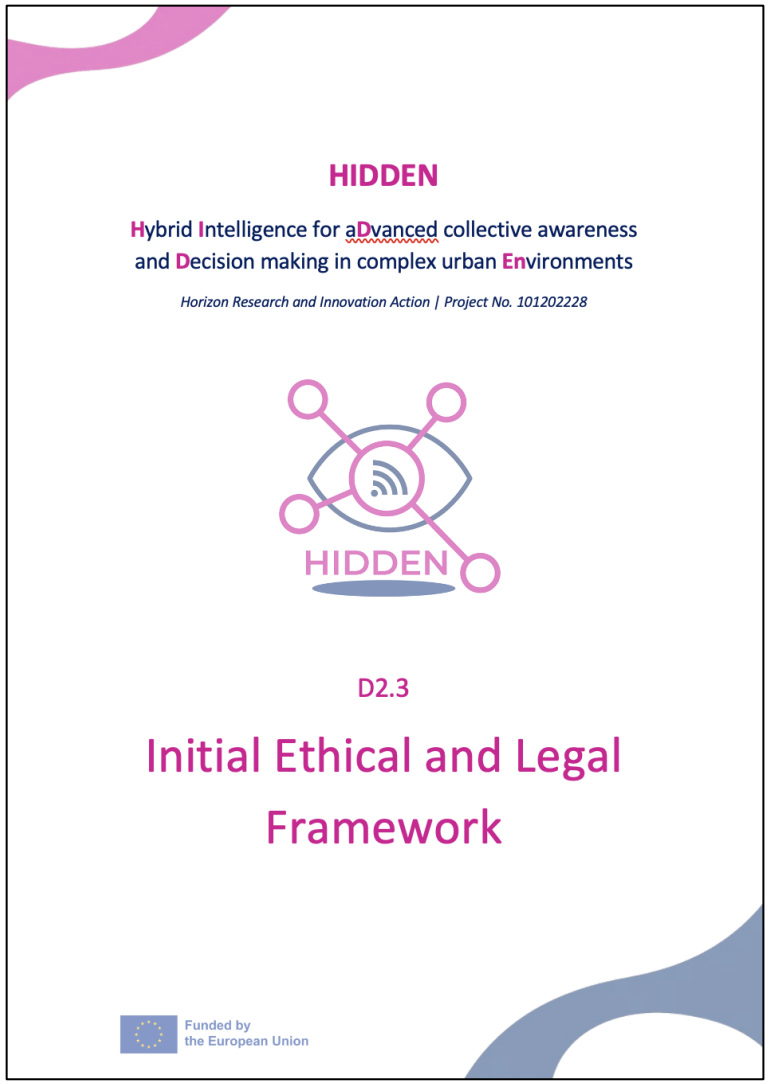
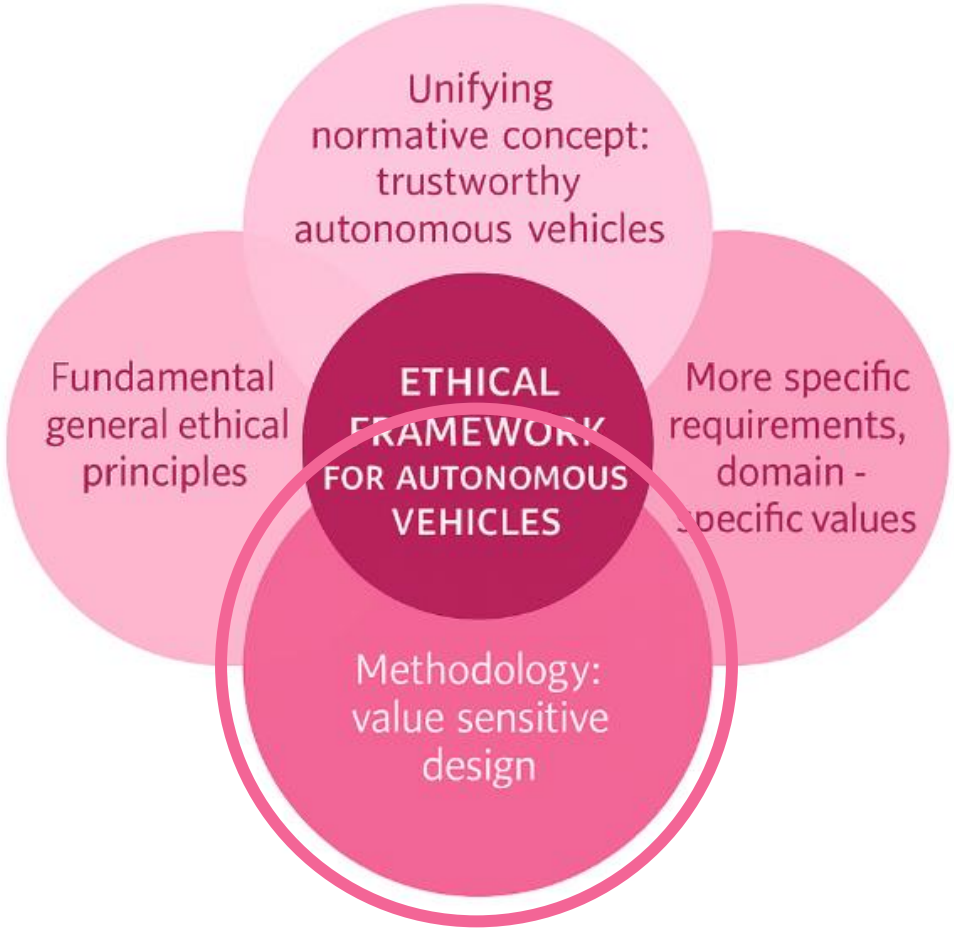
The HIDDEN Ethical Framework



Proposed ethical framework for AVs (based on the EU AI Act*):



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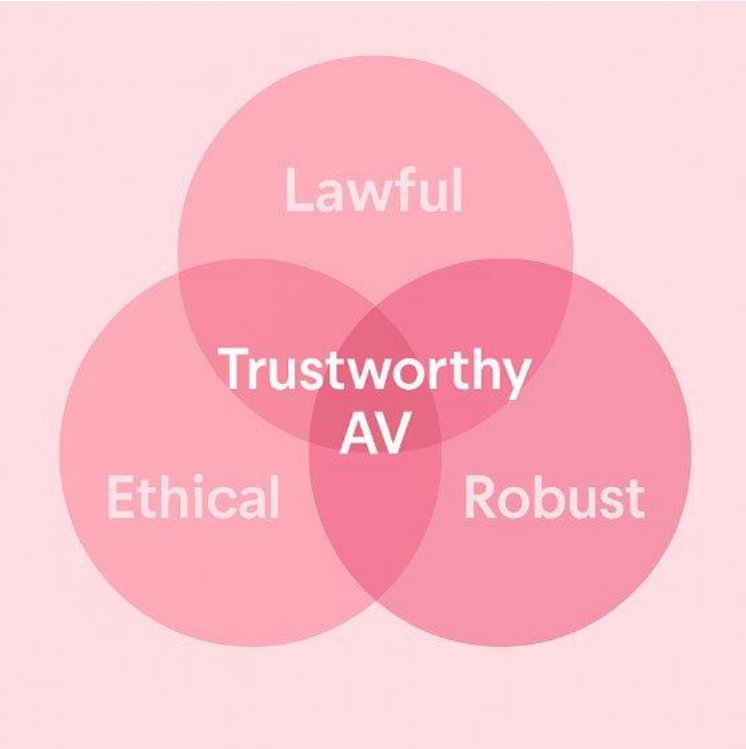
*) Source: https://artificialintelligenceact.eu/

The HIDDEN Ethical Framework

Concept of trustworthy AVs with three main pillars:

- **1. ethical** and **2. legal** dimensions are elaborated and operationalized through fundamental **ethical principles**, **seven key requirements**, **domain-specific values** and specific **legal regulations**.
- **3. robustness** denotes the **capacity of AI-based driving functions** to perform **safely, securely, and reliably** across relevant conditions, including uncertainty, variability of traffic environments, and foreseeable disturbances.



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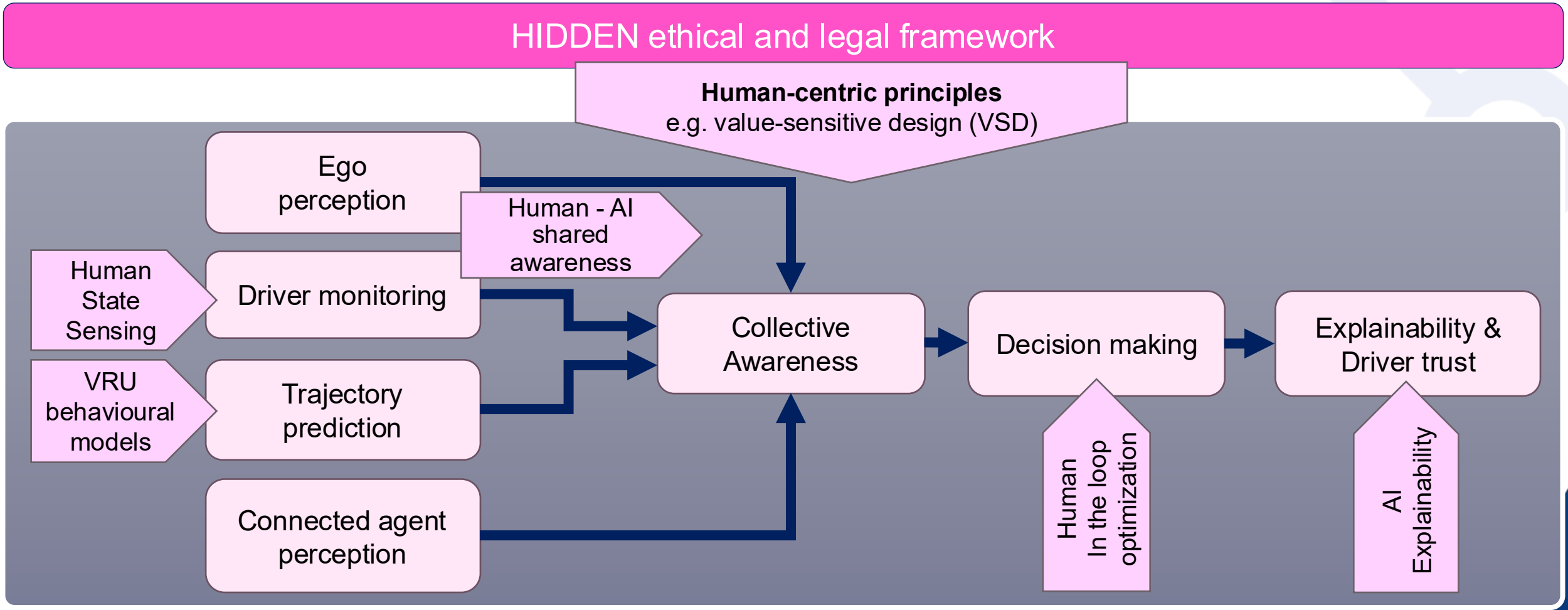
Hybrid Intelligence in HIDDEN

Application of the HIDDEN ethical framework



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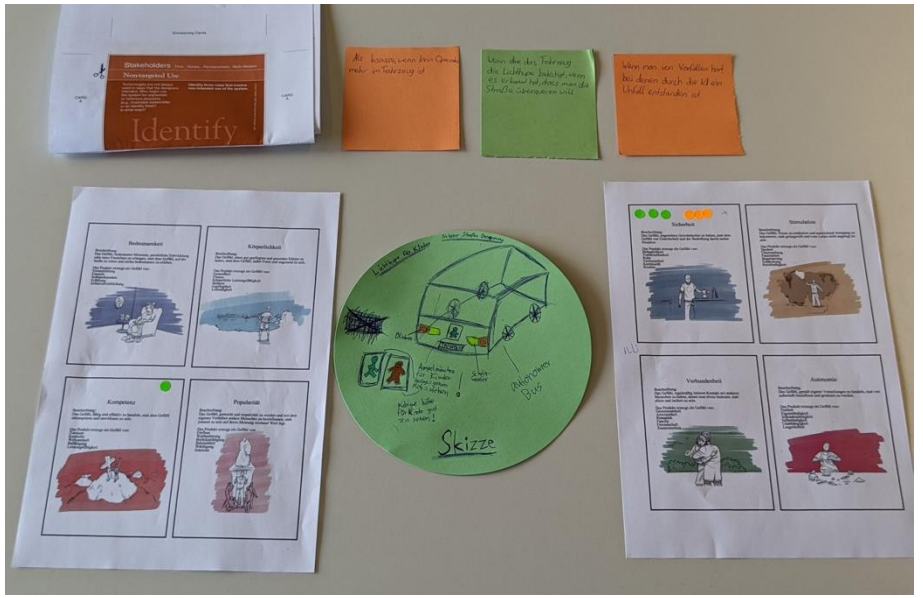
HIDDEN Use Cases/Scenarios

Application of **Value Sensitive Design** in UC1

- Example 1: Girls' Research Camp ("Forscherinnen-Camp"; N=15, age=15-17 years)
  - Mapping of "real" crossing behavior to **Theory of Planned Behaviour** (TPB) and **Pedestrian Behavior Scale** (PBS)
  - **Explainability workshop** with "**Needs Card**s" (Hassenzahl) and "**Envisioning Cards**" (Friedmann)



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HIDDEN Use Cases/Scenarios

Application of **Value Sensitive Design** in UC1

- Example 1: Girls' Research Camp: **P13 "the risk-averse behavioral type" - hesitation**

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HIDDEN Use Cases/Scenarios

Application of **Value Sensitive Design** in UC1

- Example 1: Girls' Research Camp: **P14 "the risk-tolerant behavioral type" - decisive**

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HIDDEN Use Cases/Scenarios

Application of **Value Sensitive Design** in UC1

- Example 2: "School Crossing Study" (examine **pedestrian crossing behaviour** and **group dynamics** near schools; N=29, age=6-10 years)
  - Identify **events**
  - Determine **waypoints**

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The HIDDEN SSH Approach

Take-home message

- **SSH is essential for safety and acceptance of future ADAS systems/AD functions**
- In **HIDDEN**, **SSH** is an **integral** part and implemented **throughout the entire project**
- **HIDDEN** combines the **strengths of human and machine intelligence** through a **Hybrid Intelligence** approach
  - **HIDDEN strengths:** Linking **human behaviour → to technological developments** (AI-focused) and **→ validate** in **real-world** scenarios
  - HIDDEN develops **not "just" technologically advanced CCAM** systems, but deeply align them with **human driving styles**, **ethical principles** and **regulations**

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The HIDDEN SSH Approach

Take-home message (2): But much more needs to be considered… ;-(

- **EU-CEM Handbook** for CCAM (https://www.connectedautomateddriving.eu/wp-content/uploads/2025/05/EU-CEM-Handbook_FINAL_public_version_1.pdf); addresses **human-CCAM interaction** (opinions, expectations, awareness, usage of technology)
- **Standards and regulations**, e.g.:
  - **Human Factors, Ergonomics, and Human State:** ISO 15005; ISO/TR 12204; ISO 21959
  - **Artificial Intelligence, Ethics, and Transparency:** ISO/IEC 22989 and ISO/IEC 23894; IEEE 7000 series (IEEE 7001, IEEE P7001, IEEE P7002)
  - **Testing, Validation, and Performance Assessment:** ISO 34501 to ISO 34505 series; SAE J3018, SAE J3208, and SAE J3237; ISO 22133 and ISO 22737
  - **Cooperative Driving, Taxonomies, and Regulatory:** SAE J3016, SAE J3216, SAE J3251; regulatory frameworks such as UN R 155 and UN R 156; ISO 21434 and ISO/TR 4804
- → summarised in HIDDEN **D6.4 Standards Report**

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Thank you for your attention!

HIDDEN Consortium

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