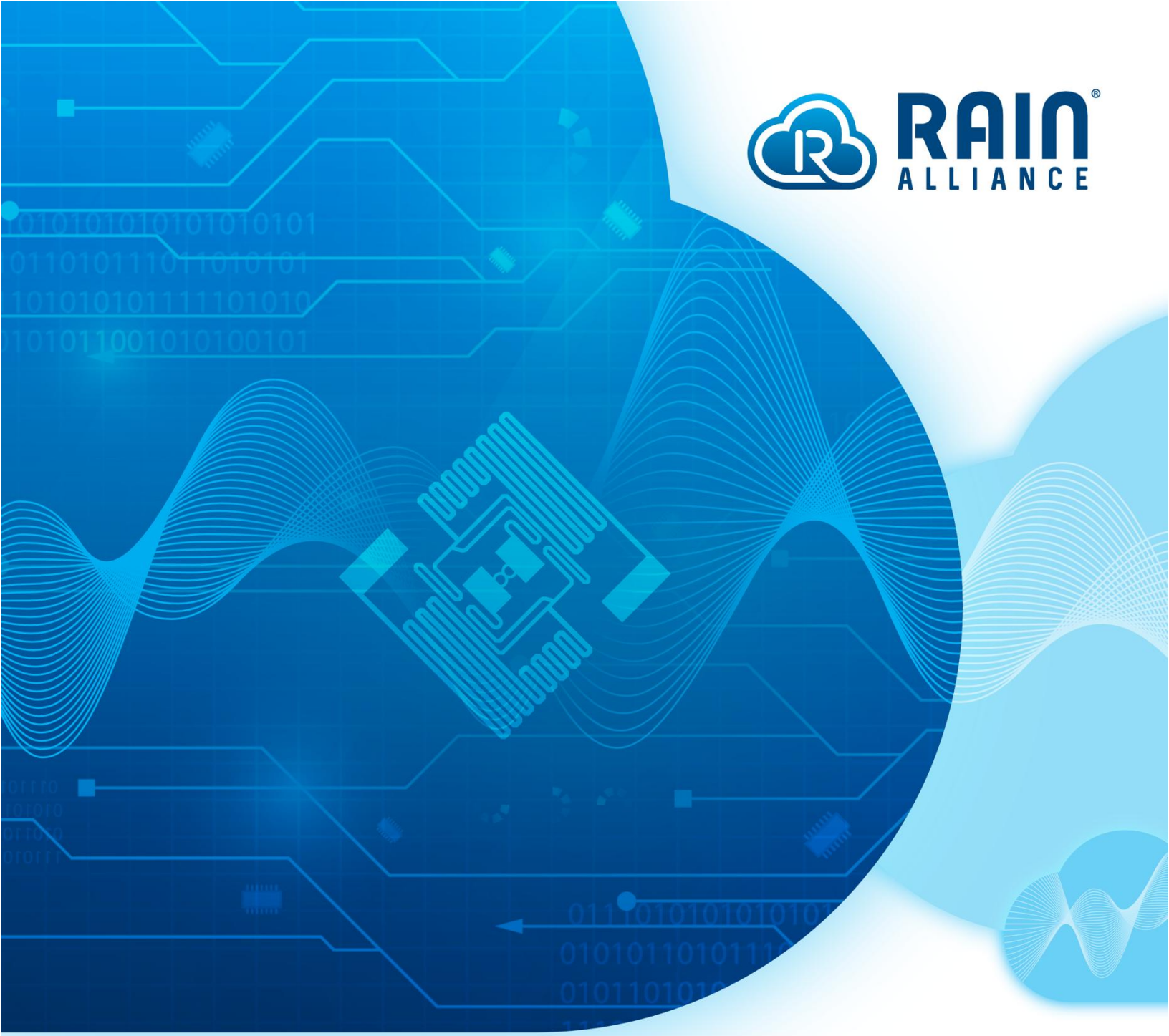

Enhancing Circularity with RAIN RFID-Enabled Digital Product Passports

The RAIN Alliance, is a global member organization representing more than 200 companies across the RAIN RFID ecosystem. As the collective voice of the industry, the RAIN Alliance is actively supporting the Digital Product Passport (DPP) initiative in the European Union. Our mission is to create a smarter and more sustainable world by using RAIN RFID technology to connect trillions of everyday items across their entire lifecycle, simply and inexpensively. We firmly believe that RAIN is the best-positioned data carrier solution for DPPs and is necessary to support the EU's goal of unlocking a circular economy at scale. This document presents our case by highlighting RAIN's differentiating advantages and proposing specific regulatory considerations to ensure the successful implementation of RAIN in the DPP framework.

1. Widespread Industry Adoption and Future Advancements of RAIN

RAIN is an established solution built on global, widely adopted standards, protocols, and guidelines authored by ISO, GS1, and the RAIN Alliance for universal compatibility. It is important to consider the current essential uses of tens of billions of RAIN tags by enterprises today, the rapidly growing adoption of RAIN across various sectors, and the promising horizon shaped by future technological integrations.

- **Extensive integration across major companies worldwide:** Many leading global companies in diverse sectors such as retail, logistics, healthcare, and automotive have adopted RAIN systems as a core component of their operations and sustainability initiatives, underscoring RAIN's proven reliability and scalability.
- **Massive industry adoption in retail and beyond, positioned to scale:** RAIN adoption is surging. RAIN Alliance data shows that 52.8 billion RAIN chips shipped globally in 2024 with projections exceeding 115 billion units by 2028.
- **RAIN RFID in mobile devices will continue to drive RAIN adoption:** As noted in a statement from Qualcomm: "The integration of RAIN technology into mobile devices is rapidly progressing, with the initial rollouts focusing on enterprise mobile devices, expected within a few quarters. Consumer devices equipped with RFID technology are set to follow." This advancement and the rapid progress being made is poised to further RAIN adoption in upcoming years, signaling a transformative shift in how consumers interact with and track products and opening the doors to entirely new RAIN use cases.

2. Unmatched Efficiency in Mass Reading Capabilities with RAIN

RAIN offers exceptional mass reading capabilities, which are essential for implementing large-scale circular economy initiatives such as recycling, reuse, and resale.

- **Long-range, near-simultaneous, bulk reading:** RAIN provides a read range of up to 10 meters and can read up to 1,000 items per second, enabling efficient, automated data capture without line-of-sight requirements.
- **Enables efficiency in mass-scale sorting processes:** The ability to read multiple items simultaneously significantly reduces manual labor and increases efficiency and accuracy in sorting processes, making it easier and more economical to implement large-scale circular economy practices. For example, in textile and tyre recycling, RAIN tags enable automated identification and sorting by sharing details like brand, size, and material composition.

3. RAIN Enables Comprehensive Traceability

RAIN enables comprehensive product traceability from a tagged item's manufacture to that item's end-of-life through RAIN's ability to automatically capture data at every stage of the supply chain. Beyond this fundamental capability, RAIN offers several key advantages for tracking items:

- **Traceability at the individual item level:** RAIN tags give each item a unique identity. Item-level tagging allows automated processes to capture detailed and accurate information about a single product at each level of the value chain. The variety of standard-compliant RAIN tags available on the market ensure technical options are available to meet the needs of both the lowest cost, highest volume (commodity) use-cases and the needs of more specialised applications.
- **Embedded tags enable tracking throughout a product's entire lifecycle:** The growing portfolio and adoption of embedded RAIN tags ensure seamless product tracking from item manufacture to end-of-life. Of the 115 billion tags forecasted to ship in 2028, embedded tags are projected to account for 17-18% of total tag shipments. In sectors like apparel/textiles, the adoption of embedded tags is projected to grow even further to 22-23%.
- **Durable tags ensure data integrity:** Through tailored tag design, RAIN tags can offer superior longevity, withstanding environmental stress, heavy wear and tear, and harsh conditions. They can remain functional after exposure to extreme temperatures, 100+ textile wash cycles, or years of use in tyres, ensuring reliable tracking throughout a product's lifecycle.
- **End-to-end data collection capabilities help businesses meet Ecodesign requirements:** To adhere to the Ecodesign requirements, as outlined in the ESPR (Article 5), companies will need to navigate new strategies for tracking and reporting data. This

marks a significant shift in how businesses approach product information management, and the capabilities of RAIN emerge as a pivotal tool for corporations to efficiently collect and manage the data required across all levels of the value chain, from manufacture to end of life.

4. A Circular Economy and Sustainable Businesses Powered by RAIN

RAIN is crucial for advancing the circular economy and meeting the sustainability goals set out by the ESPR effectively and at-scale.

- **Facilitates end-of-life recycling and material recovery:** Essential for recycling efforts, RAIN tags carry detailed information critical for the efficient sorting, resale, and recycling of materials at the end of a product's life. This capability supports automated processes that are key to a functional circular economy, ensuring materials are reused and repurposed effectively.
- **Extends product and component lifespans:** By enabling strategies like reuse, repair, refurbishing, remanufacturing, and repurposing, RAIN can prolong the operational lifecycle of individual products and their components.
- **Real-time inventory data minimizes waste and overproduction:** By maintaining accurate data on stock levels, locations, and movements with RAIN systems, businesses can significantly reduce overproduction and excess inventory. This helps in adhering to regulations like the ban on destroying unsold goods (ESPR, Chapter VI), fostering a more sustainable production and consumption model.
- **Enables sustainable business models:** RAIN is foundational in supporting sustainable business practices such as product rental or product-as-a-service models. RAIN simplifies product return and redistribution, facilitating efficient product take-back schemes and supporting the infrastructure needed for closed-loop supply chains.

5. Ensuring Authenticity and Privacy with RAIN

RAIN tags can be a valuable tool for ensuring product authenticity and protecting consumer privacy, assisting enterprises, consumers, and governments alike.

- **Anti-counterfeiting measures ensure authenticity:** Embedded cryptographic RAIN tags can be used to guarantee that each DPP is linked to a genuine item. This prevents counterfeiting and maintains the authenticity and integrity of product information, thus protecting brand value, ensuring consumer safety, and securing the supply chain.
- **Multi-layered security protects data and user privacy:** RAIN tags are designed with robust privacy protection features. Standardized methods exist today for short-range mode, which only allows data transmission within a certain range, which allow to lock the tag, to respond only to authenticated readers, or to kill the tag entirely.

6. Specific Regulatory Asks

The RAIN Alliance firmly believes that RAIN technology is uniquely positioned to meet the EU's goals for Digital Product Passports with its unparalleled advantages in traceability and circularity. As EU legislators continue developing the DPP framework, we urge the adoption of technology-neutral, forward-thinking policies that recognize RAIN's proven capabilities, build on industry legacy systems that support the tens of billions of RAIN tags already in the market and do not block their growth and future innovations.

- **Enable companies already using RAIN technology to extend its use to DPP:** Where companies already use RAIN technology, for example for inventory management or other operational purposes, they should be able to extend this use to DPP, rather than being required to adopt alternative data carrier technologies.
- **Ensure flexibility at product-group level on the number of data carriers used for DPPs:** The needs of each industry differ, and data carrier technologies are not one-size-fits-all but often complement each other by serving distinct use cases. For example, for **tyres**, the industry has invested for several years in developing RAIN technology ISO standards to use the technology as data carrier and has also developed its own already functional data space, the GDSO, making this a full solution fit for purpose in the frame of the EU DPP. To complement it, when needed, for specific use cases a copy of the RAIN identifier can be provided to display DPP public information. In this regard, designating RAIN technology as the data carrier for tyres is key to provide regulatory certainty, consolidate the investments already made by the industry, and support further investments across the value chain. This would enable the automation of important operations, thereby accelerating the transition towards a more circular economy. However, for **textiles**, multiple data carriers should be allowed in the early years of DPP. RAIN technology is essential for enabling automated sorting and recycling of textiles at scale and cannot be effectively replaced by any other data carrier. Textile brands should therefore not be required to choose one data carrier but should be allowed and strongly incentivised to adopt RAIN alongside other data carriers.
- **Prioritise industry adoption and existing investments in DPP data carrier decisions:** When determining which data carriers should be used for DPP for each product group, industry adoption and already made investments must be a primary factor. Requirements should not go against the industry but build on technologies already deployed at scale.
- **Implement item-level serialization to enhance product traceability:** Rather than requiring DPPs on a SKU or batch level, the RAIN Alliance advocates item-level serialization to enable precise tracking and management of individual products throughout their lifecycle.
- **Optimize data carrier requirements to ensure scalability and fair technology access:** The data carrier shall contain, at a minimum, a unique identifier, with additional product information made accessible via external systems (e.g. cloud-based services). Requirements should not mandate the storage of extensive data on the data carrier itself,

in order to preserve cost-effective scalability and technology neutrality. Nothing in this provision shall prevent the use of data carriers with greater storage capacity where appropriate to the use case.

- **Require information necessary to unlock a circular economy:** We urge policymakers to mandate that DPPs include end-of-life and sorting information, which is important for consumers, and especially vital to sorters and recyclers enabling accessibility, consistency of recycled materials for manufacturers. We believe effective large-scale sorting will depend heavily on RAIN technology, but businesses must supply the necessary data to ensure efficient recycling processes to enable an efficient and scalable circular economy.
- **Adopt a future-proof DPP system that allows for innovation, such as item ownership data models:** We urge that DPP standards remain flexible and adaptable, ensuring they support, rather than hinder, the discovery of new use cases and market innovations for DPP. Item ownership is a key use case adjacent to DPP's circularity focus that we believe will provide value to consumers in the future. For example, the owner of a lost dog wearing a DPP-enabled collar should be able to have the collar's unique identifier resolve to them, rather than the collar's manufacturer or retail purchase location. As envisioned by the ESPR, the DPP system should be agile and market-driven, evolving in line with emerging business models, markets, and innovations to maximize benefits.

By embracing RAIN technology as a cornerstone technology for DPPs, the European Commission can accelerate the transition to a more transparent, efficient, and circular economy, setting a global standard for sustainable product management.