

RFID Case Study

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26. Outline

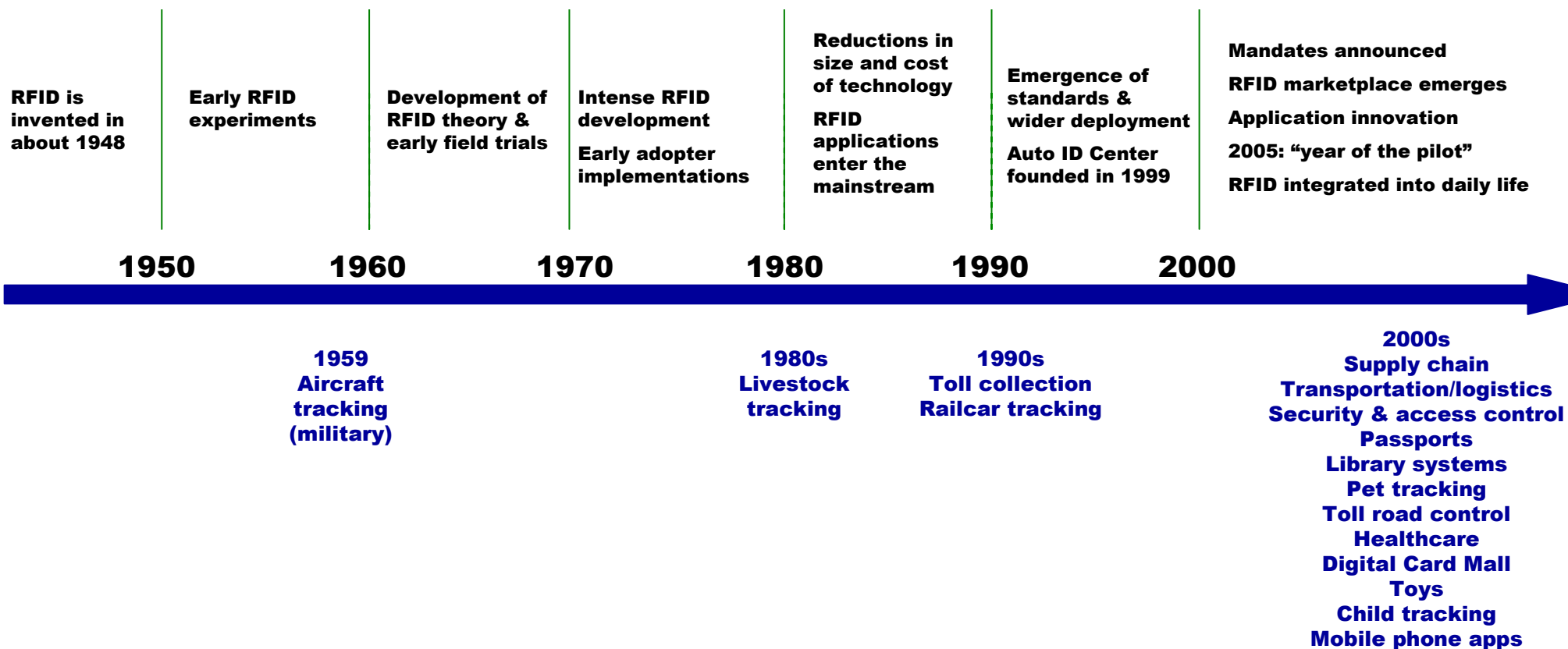
- **Progress of RFID research**
- **RFID background and basics**
- **Evolving coreness of control points**
- **The future of RFID – IP Hourglass analogy**

27. Progress of RFID Research

- **June-September 2004**
 - **Pre-methodology overview of RFID**
 - **Focus on 1st wave applications and ID resolution schemes**
 - **Introduced 2nd wave applications**
- **June-September 2005**
 - **Broaden application scope**
 - **Deeper investigation into individual cases**
 - **Apply methodology to general findings**

28. A brief history of RFID

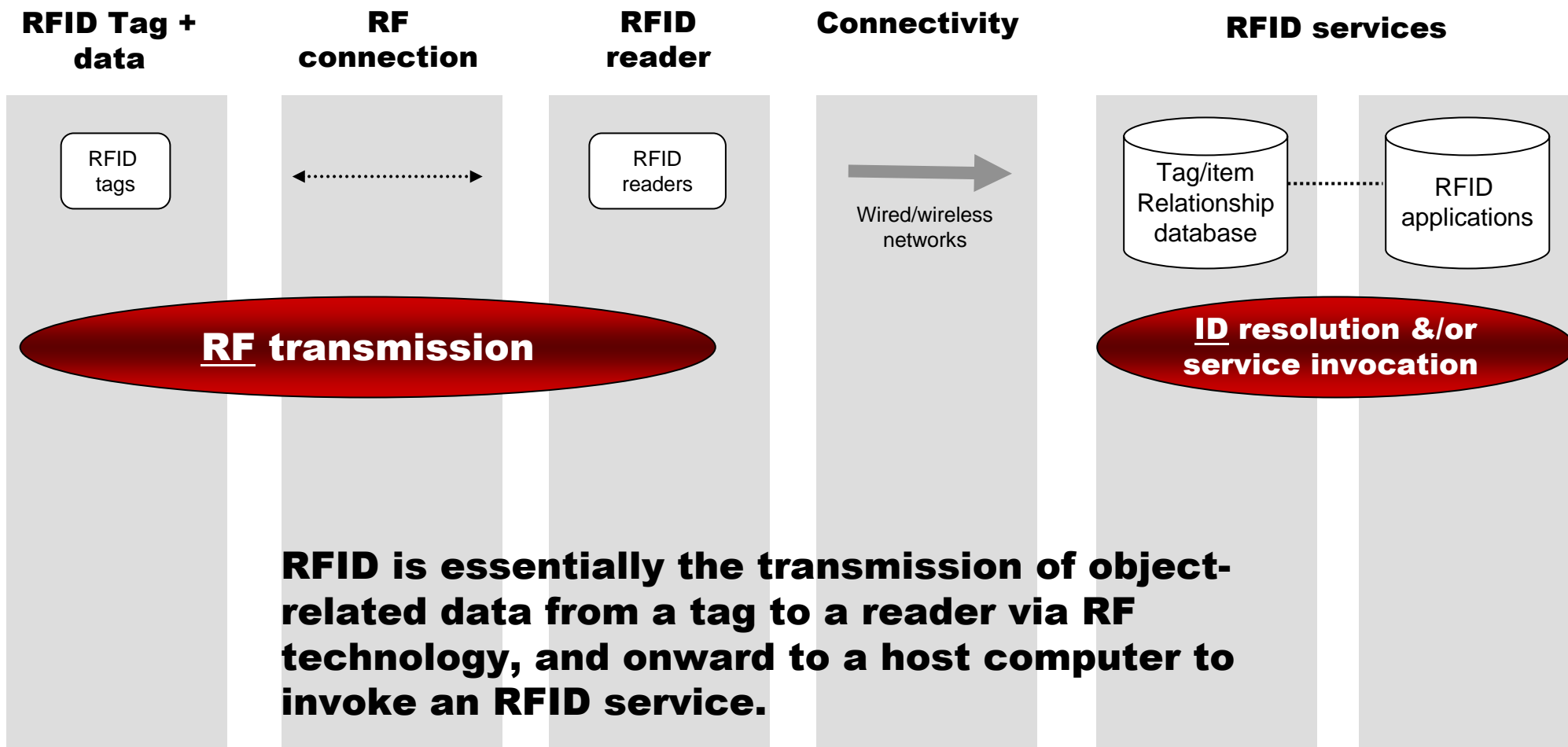
RFID is the "oldest new technology"



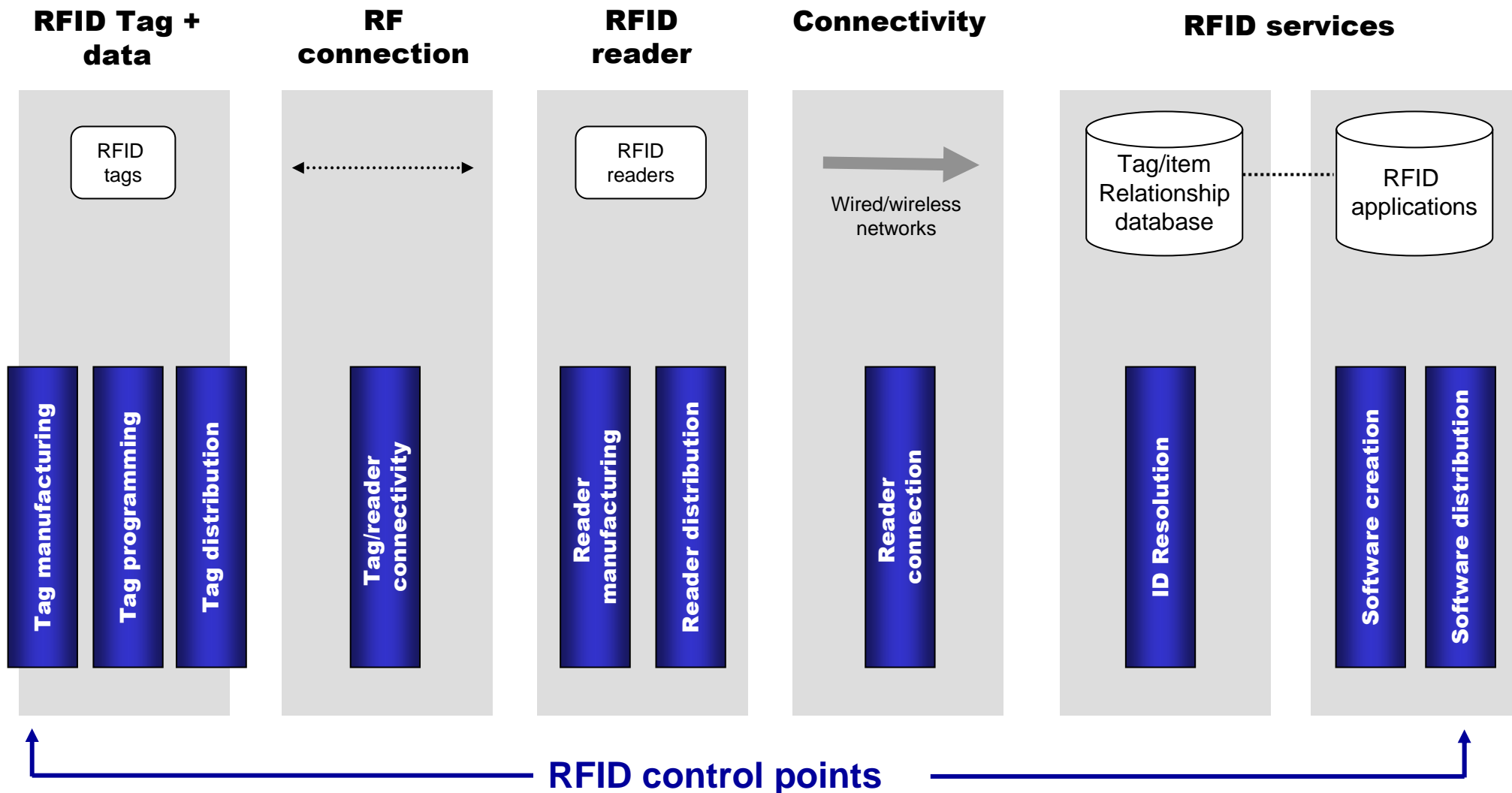
29. The evolution of RFID networks

- **Today's RFID technology has a huge legacy in closed loop, highly specialized, and costly applications**
- **RFID has thus evolved into mostly proprietary technology characterized by closed standards¹**
- **Today's RFID landscape is dominated by islands of single-purpose, custom RFID networks**

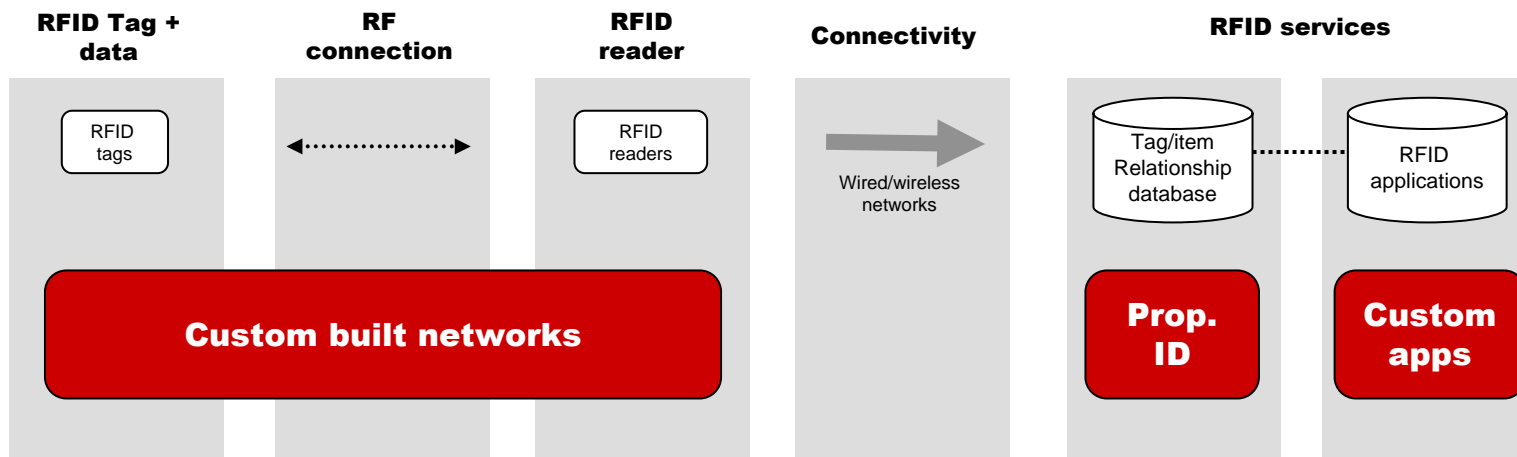
30. RFID key components



31. RFID key components – control points



32. Evolving coreness of control points



- **High scarcity**

- **Most of today's RFID implementations are proprietary, closed-loop (internal) systems**
- **Hardware & software components are application-specific**
- **Control points are vertically integrated & non-interchangeable**

- **Low demand**

- **Demand is growing, but RFID remains immature**
- **Supply chain (EPC) apps have generated hype, but most implementations are slap & ship (minimal compliance)**
- **Most other (non-EPC) implementations remain experimental**
- **Consumer apps on the horizon**

33. Evolving coreness of control points

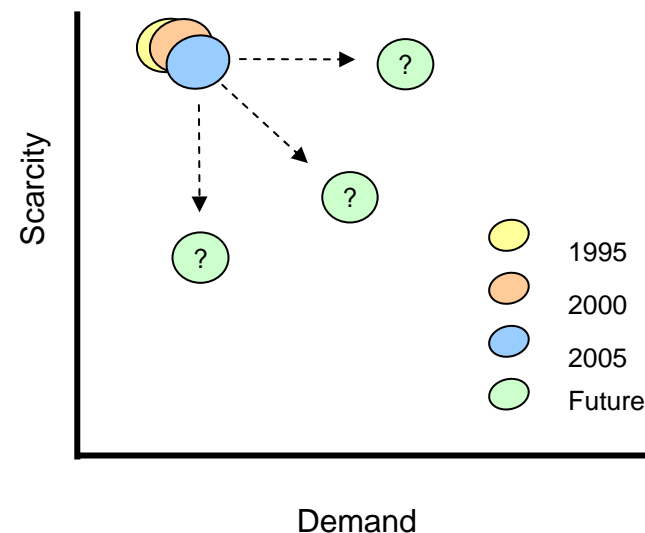
Key trends moving forward

- **EPCglobal Network**

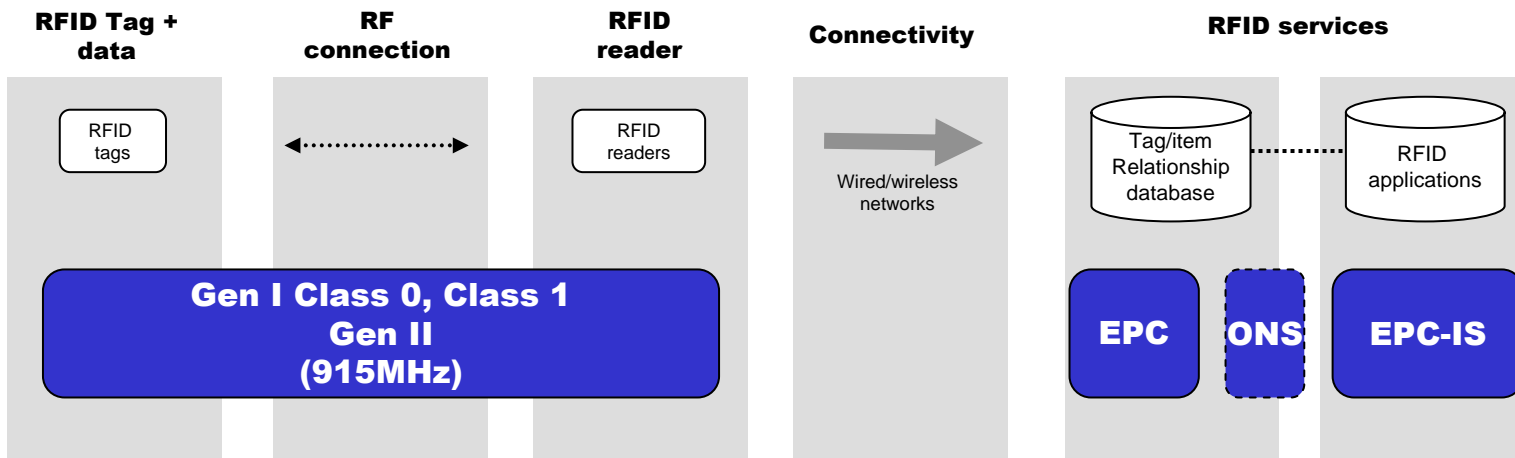
- **Universal standards enable the global supply chain**

- **Other RFID systems**

- **Non-EPC tag data & resolution schemes**
- **Non-EPC wireless technologies**



34. EPCglobal Network

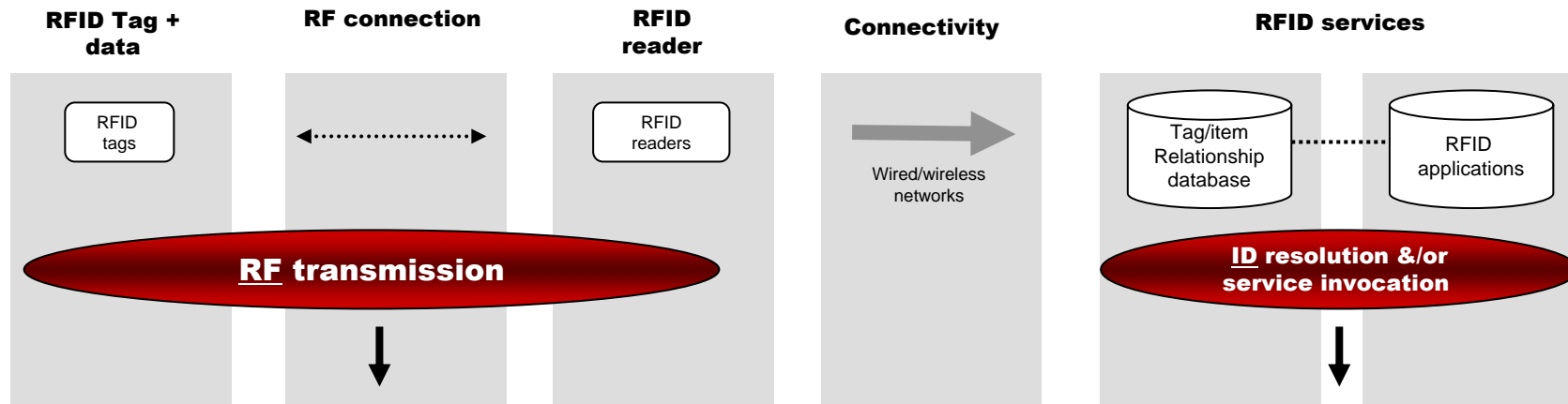


- **The vision is to standardize all RFID technology components and centralize ID resolution**
- **Tags are encoded with an EPC number**
- **Tagged objects pass through standardized networks across the supply chain**
- **Current implementations subscribe to EPC numbering and tag/reader network standards only**
- **The original ONS (Object Naming Service) design is obsolete**

35. EPCglobal Network (con't)

- **The EPC platform was intended to drive adoption of low-cost, passive RFID technology**
- **But demand could stagnate**
 - **Extra cost (to suppliers & DoD)**
 - **Lack of short-term ROI for suppliers**
 - **Efficiencies (out of stocks) not compelling**
 - **Asset management shows higher short-term gains**
 - **Standards are not yet fully defined**
 - **Gen II standards not ratified by ISO**
 - **Standards for 13.56MHz tags not ratified**
 - **Non-retail industry resistance (e.g., healthcare industry)**
 - **Cost/performance profile addresses supply chain needs primarily**

36. Other (non-EPC) RFID systems



Non-EPC RF technologies

- **Custom RFID networks**
 - E.g., 433MHz ISM (industrial, scientific, medical) band
- **Pre-existing short-range wireless networks**
 - E.g., Kidspotter child tracking app uses active Wi-Fi tags
 - MAC address serves as unique identifier
- **NFC (Near Field Communication)**
 - Very short range RFID (13.56MHz, 106/202 kbps, 0-20 centimeter range)
 - Contactless smartcards & mobile phones (50% of phones NFC-enabled by 2009)

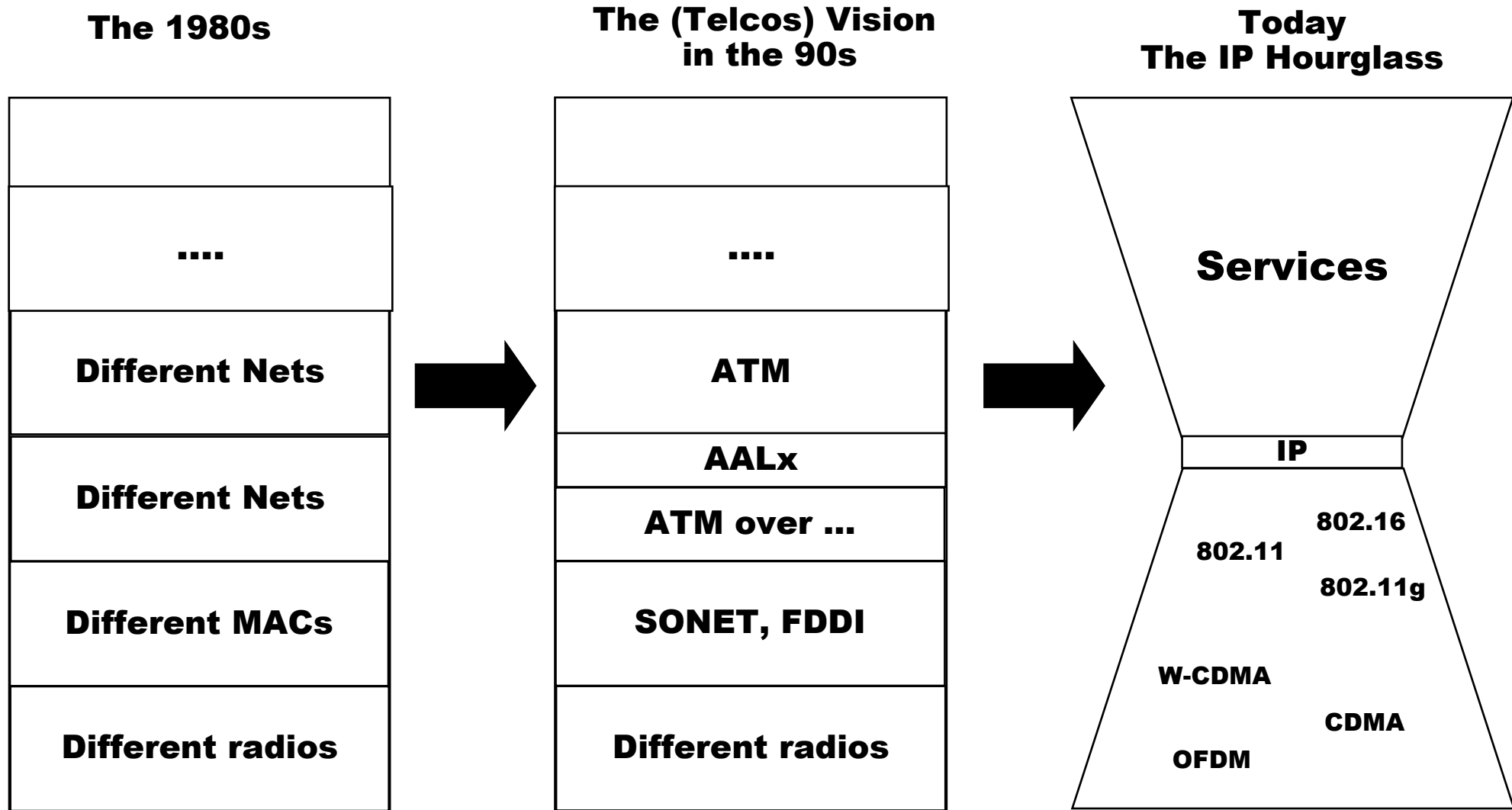
Non-EPC tag data & ID resolution schemes

- **Competing supply chain ID**
 - e.g., Japan's UCode vs EPC
- **EPC Alternatives**
 - URL + DNS
 - IP address + DNS
 - XPath expression + DNS/local query
- **Proprietary codes**
 - e.g., DoD's UID + internal registry
 - Any internal system

37. The future of RFID networks?

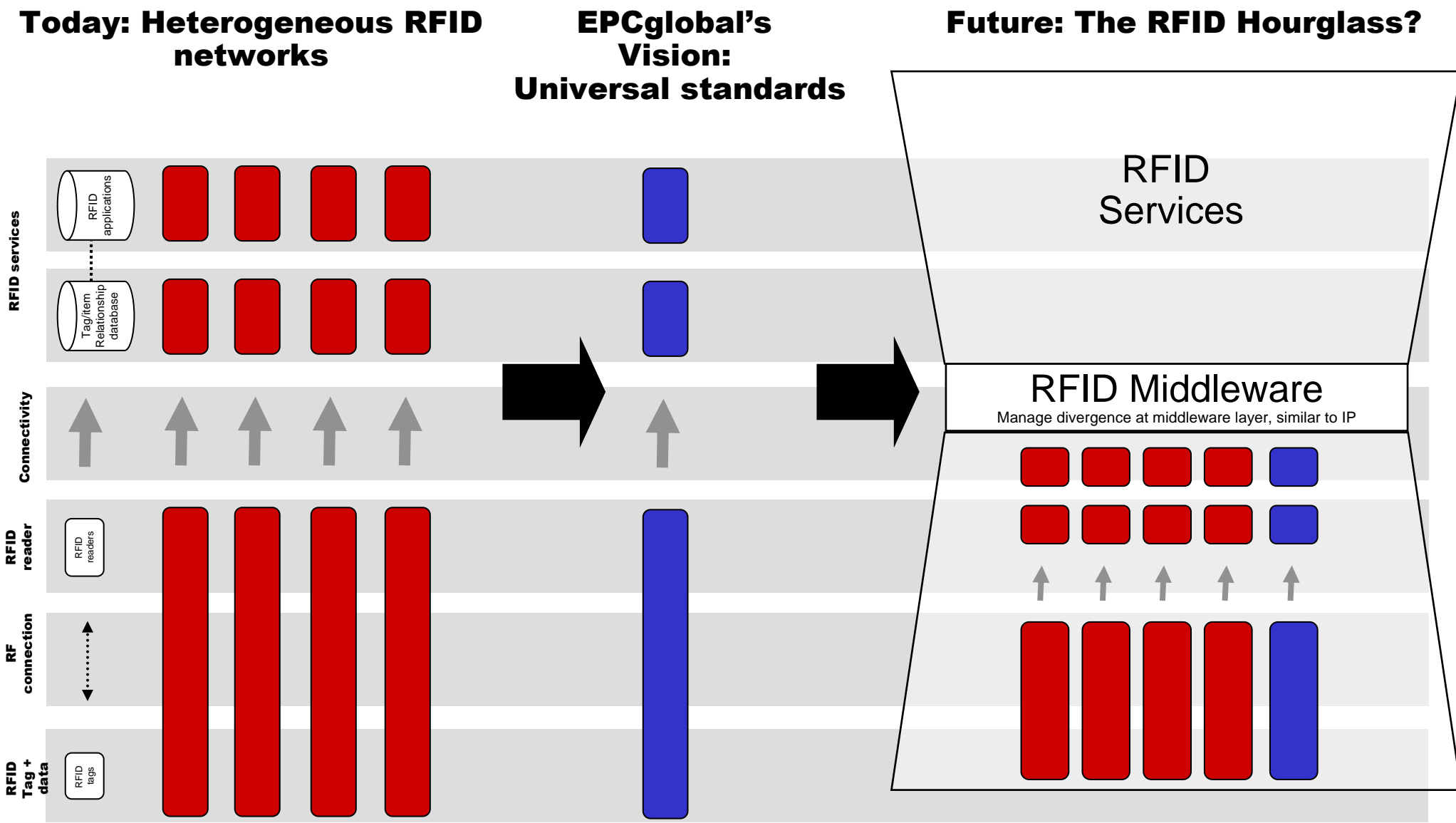
- **The RFID landscape will remain heterogeneous**
 - **Multiple ID schemes**
 - **Multiple wireless networks**
 - **Multiple application platforms**
- **How can multiple RFID systems be managed?**
 - **The IP Hourglass analogy**

38. The future of RFID – IP Hourglass analogy



with the ATMForum as the controlling body

39. The future of RFID – IP Hourglass analogy



40. The future of RFID – IP Hourglass analogy

How does the hourglass model apply to RFID?

- **Who is the next IP-like player, i.e., who will be the Cisco of RFID?**
- **Who will be the IETF of the RFID world?**
- **Are certain constructs in EPCglobal accelerating this trend?**
 - **E.g., licensing/registration scheme (imagine similar scheme had been in place for IP)**
- **Will this trend accelerate through increased usage of other radios and tagging techniques (even re-used ones such as IMEIs)?**