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**

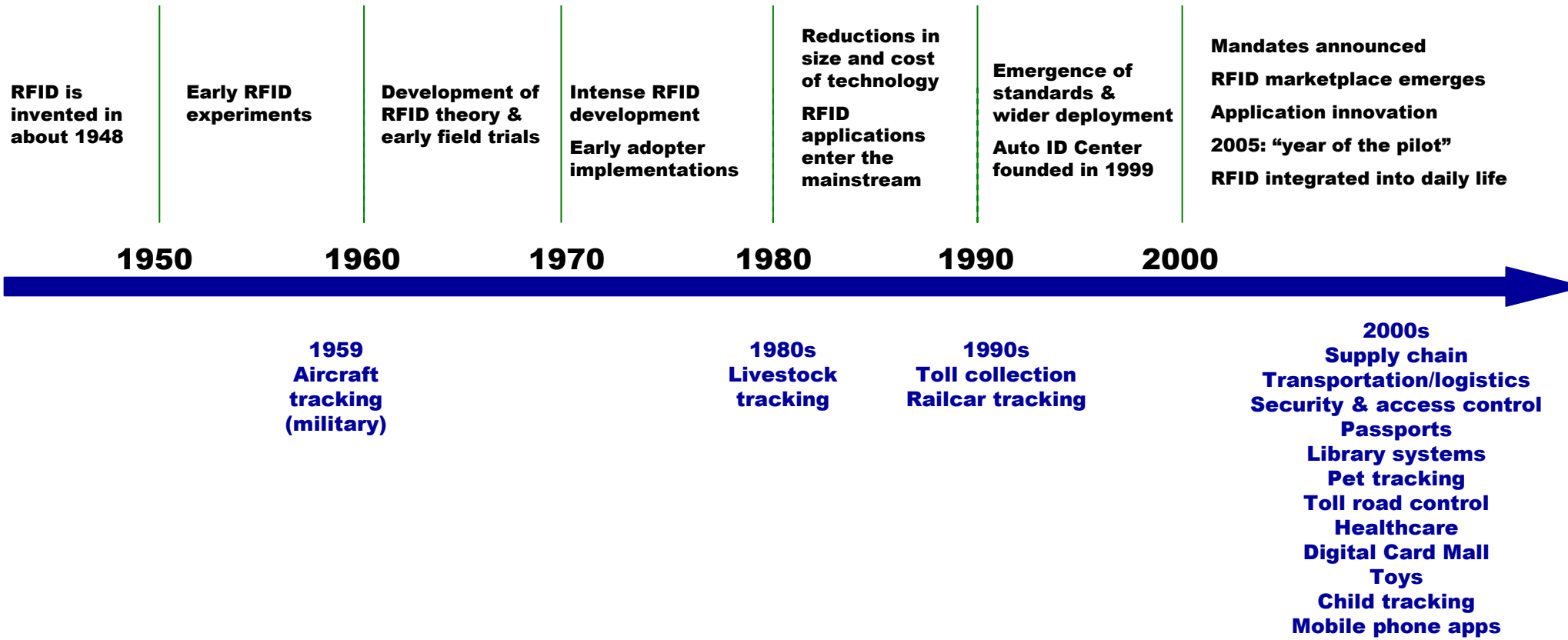
27. Progress of RFID Research

- **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

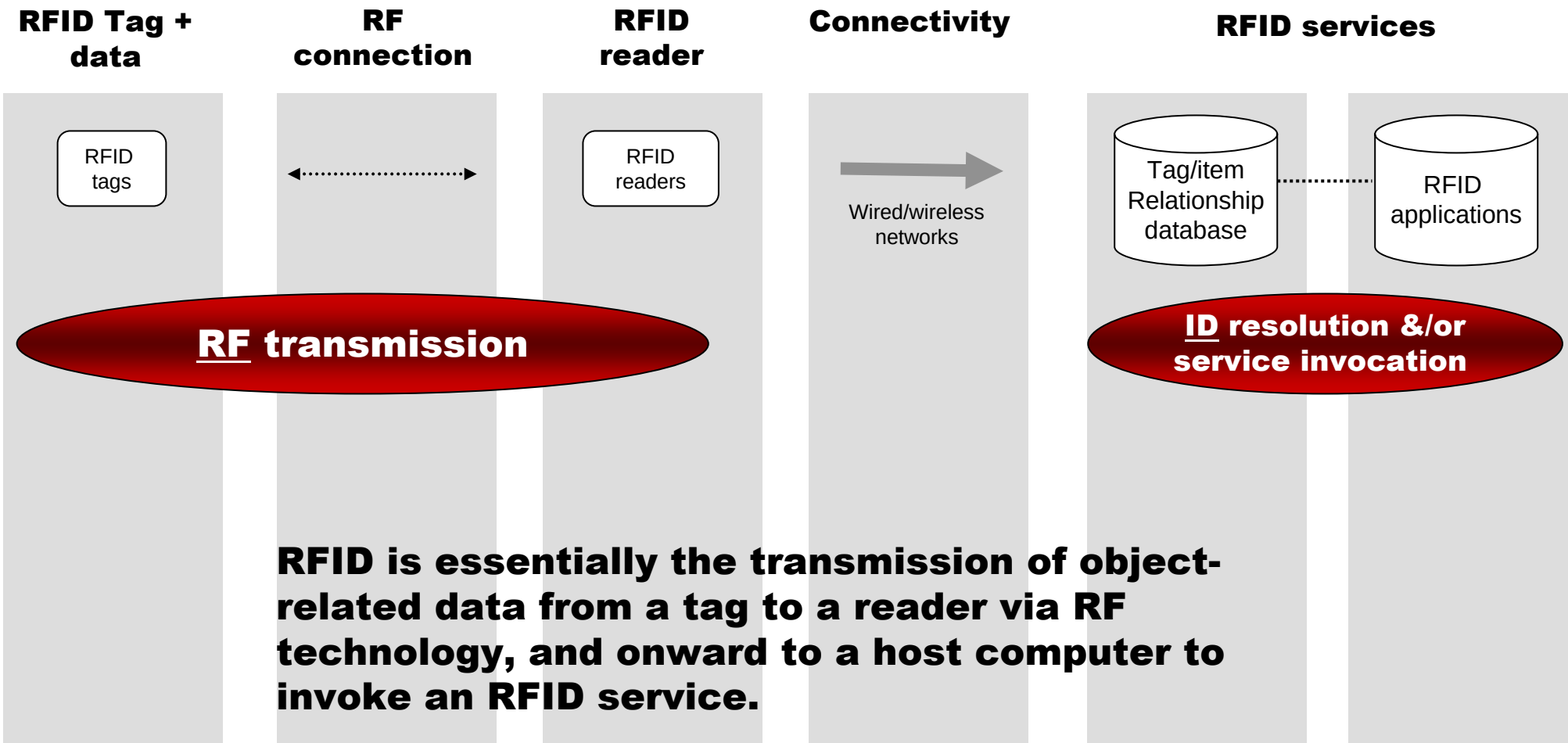
RFID is the "oldest new technology"



29. The evolution of RFID networks

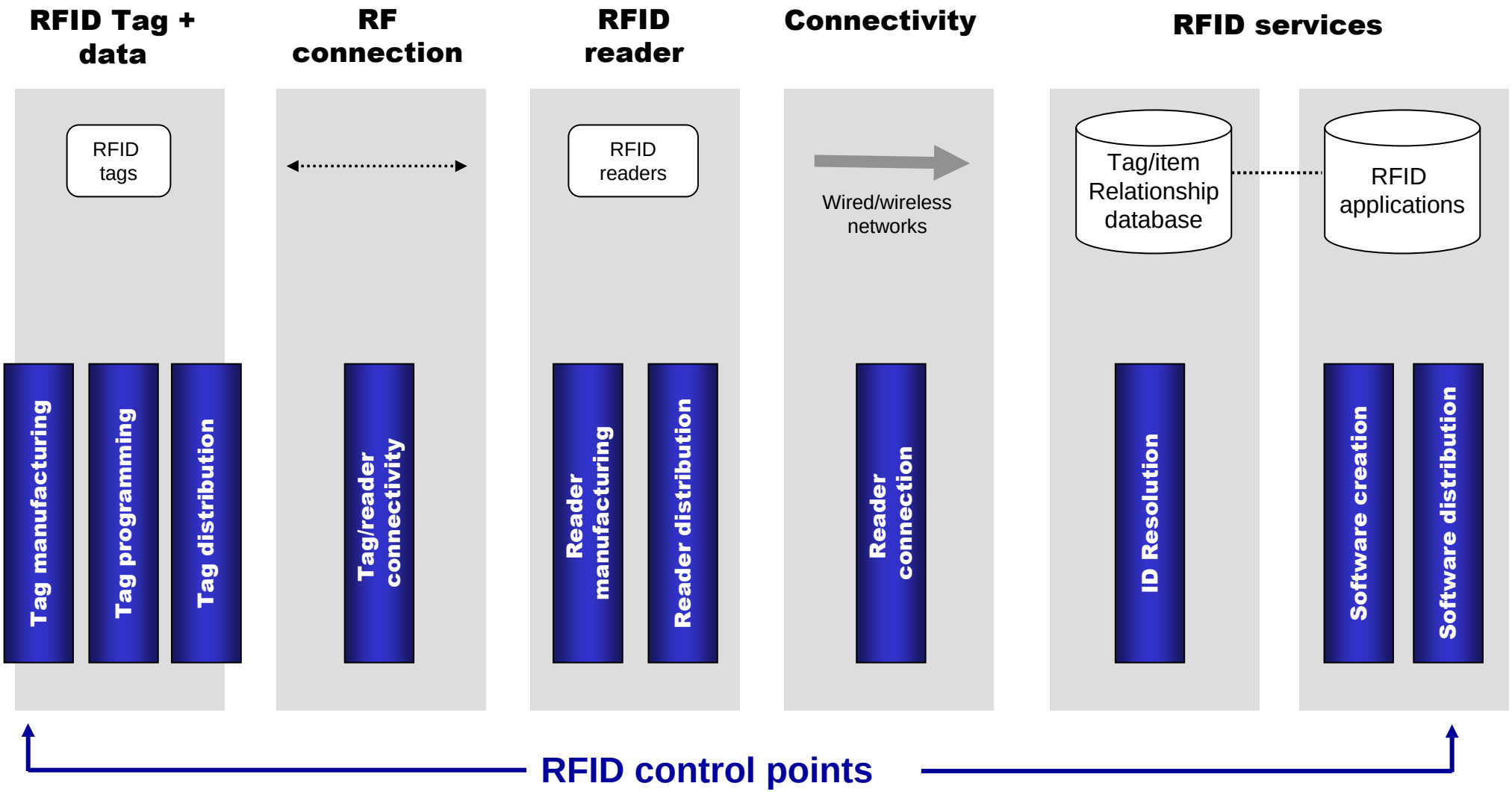
- **Today's RFID technology has a huge legacy in closed loop, highly specialized, and costly applications**
- **RFID has thus evolved into mostly proprietary technology characterized by closed standards[1]**
- **Today's RFID landscape is dominated by islands of single-purpose, custom RFID networks**

30. RFID key components

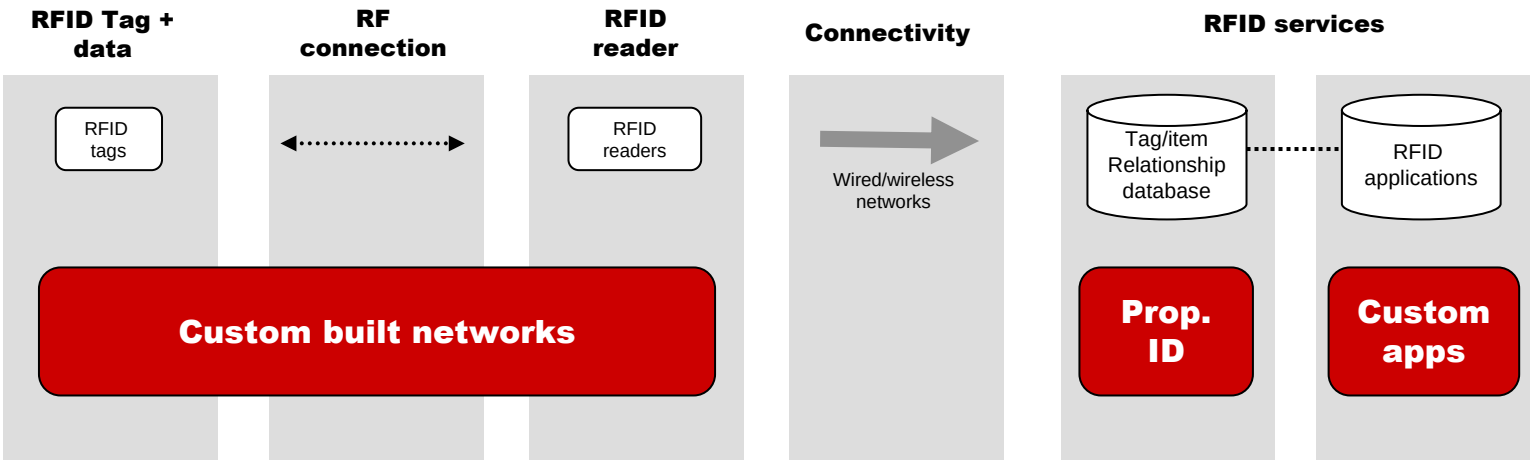


RFID is essentially the transmission of object-related data from a tag to a reader via RF technology, and onward to a host computer to invoke an RFID service.

31. RFID key components – control points



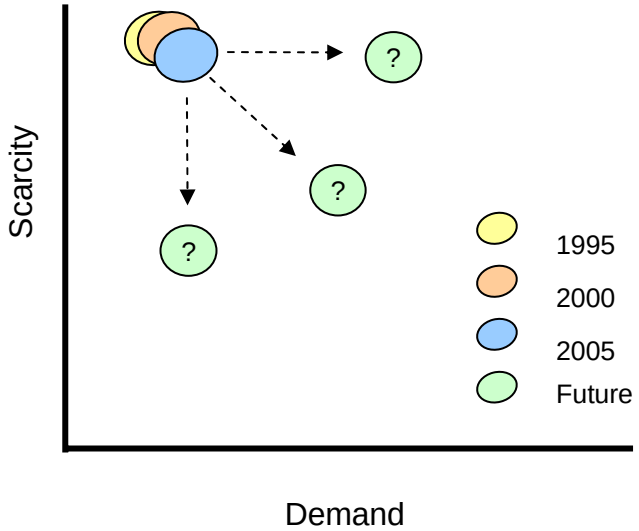
32. Evolving coreness of control points



- **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

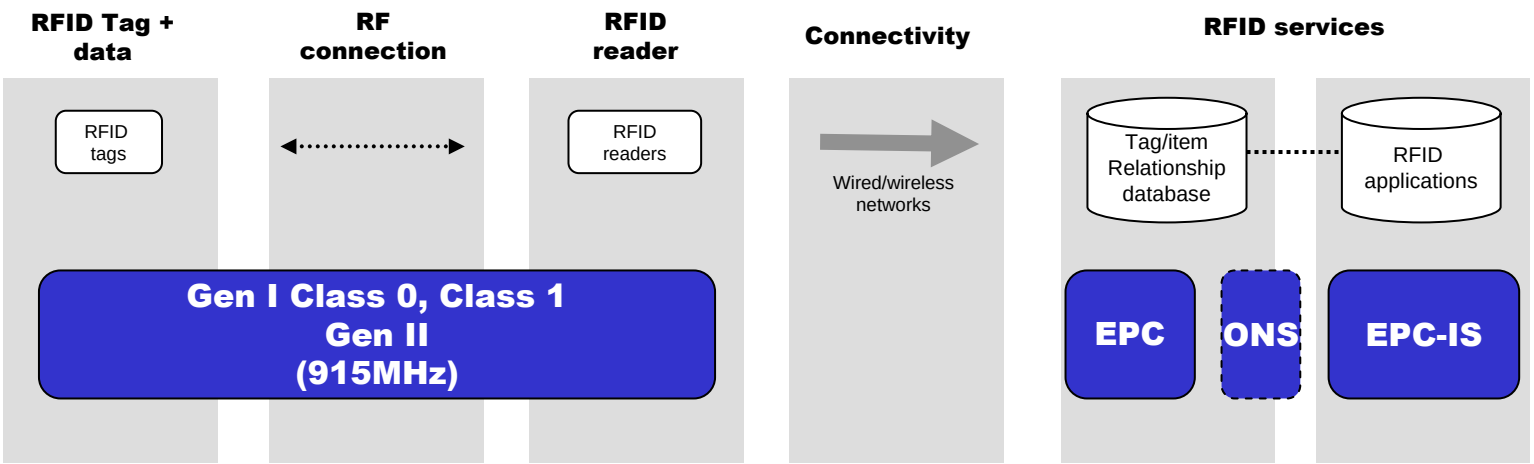
Key trends moving forward



- **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

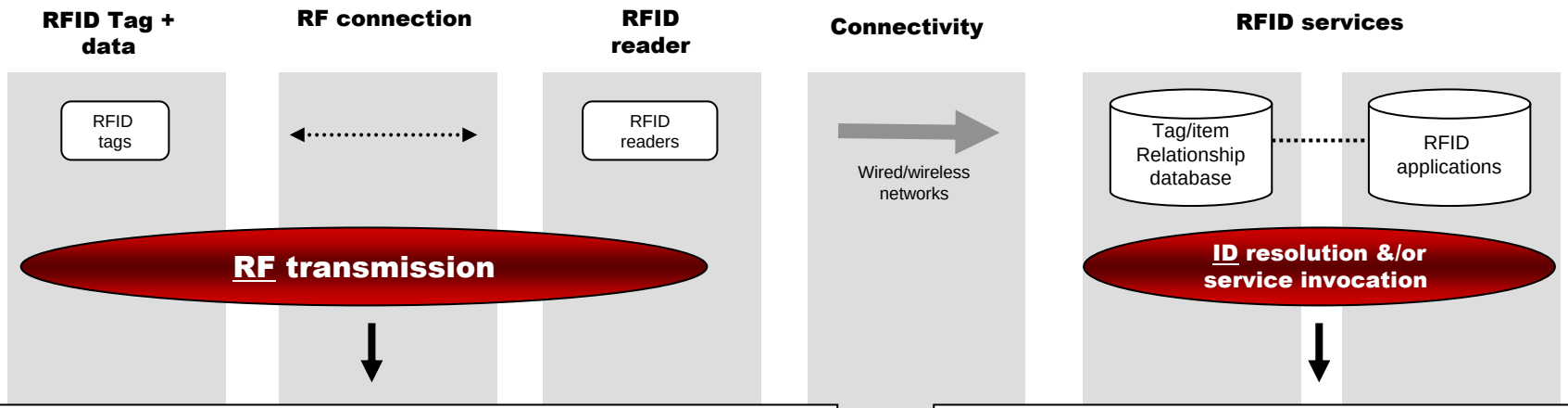


- **The vision is to standardize all RFID technology components and centralize ID resolution**
- **Tags are encoded with an EPC number**
- **Tagged objects pass through standardized networks across the supply chain**
- **Current implementations subscribe to EPC numbering and tag/reader network standards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

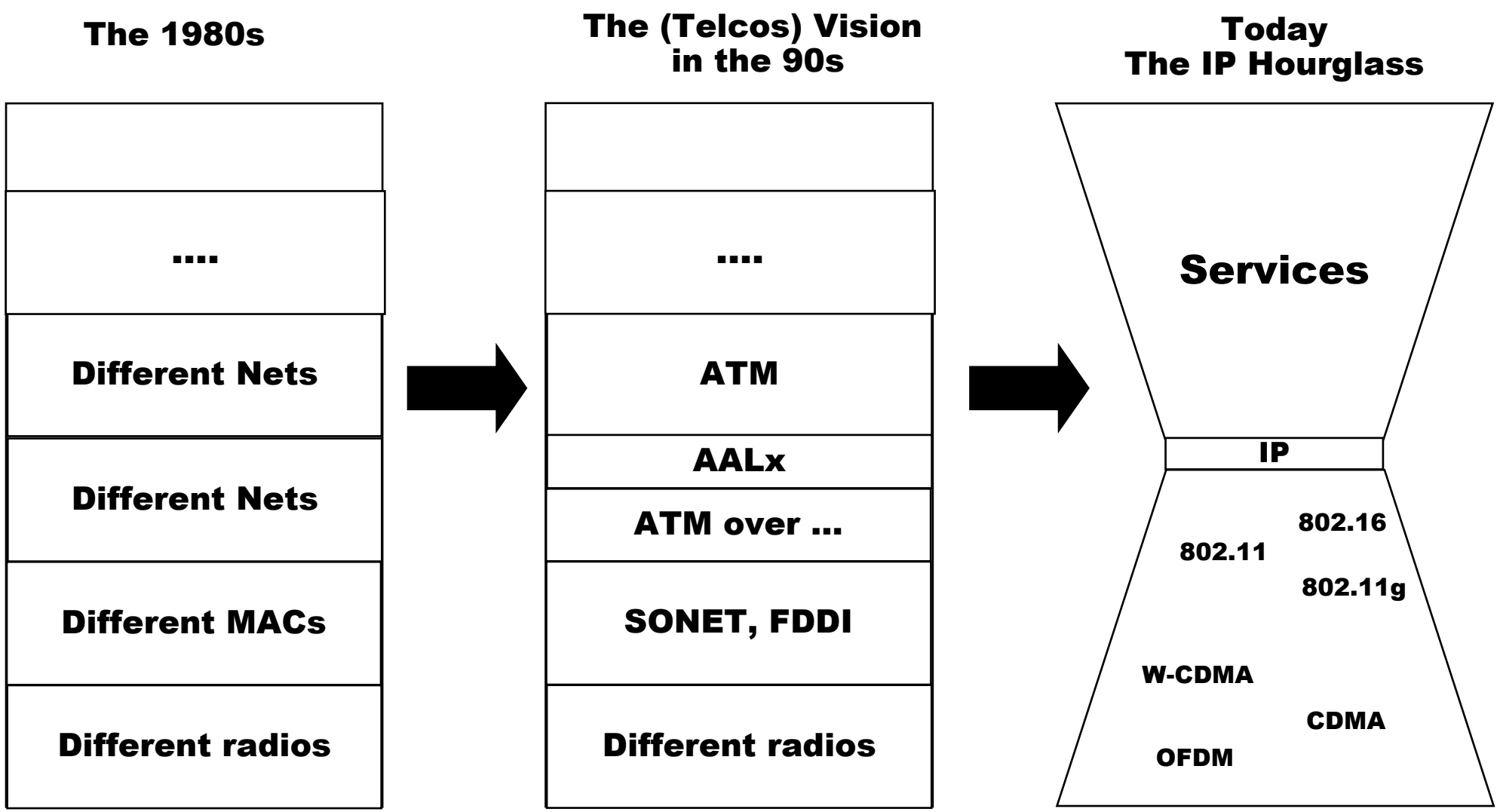
- **Competing supply chain ID**
  - **e.g., Japan's UCode vs EPC**
- **EPC Alternatives**
  - **URL + DNS**
  - **IP address + DNS**
  - **XPath expression + DNS/local query**
- **Proprietary codes**
  - **e.g., DoD's UID + internal registry**
  - **Any internal system**

37. The future of RFID networks?

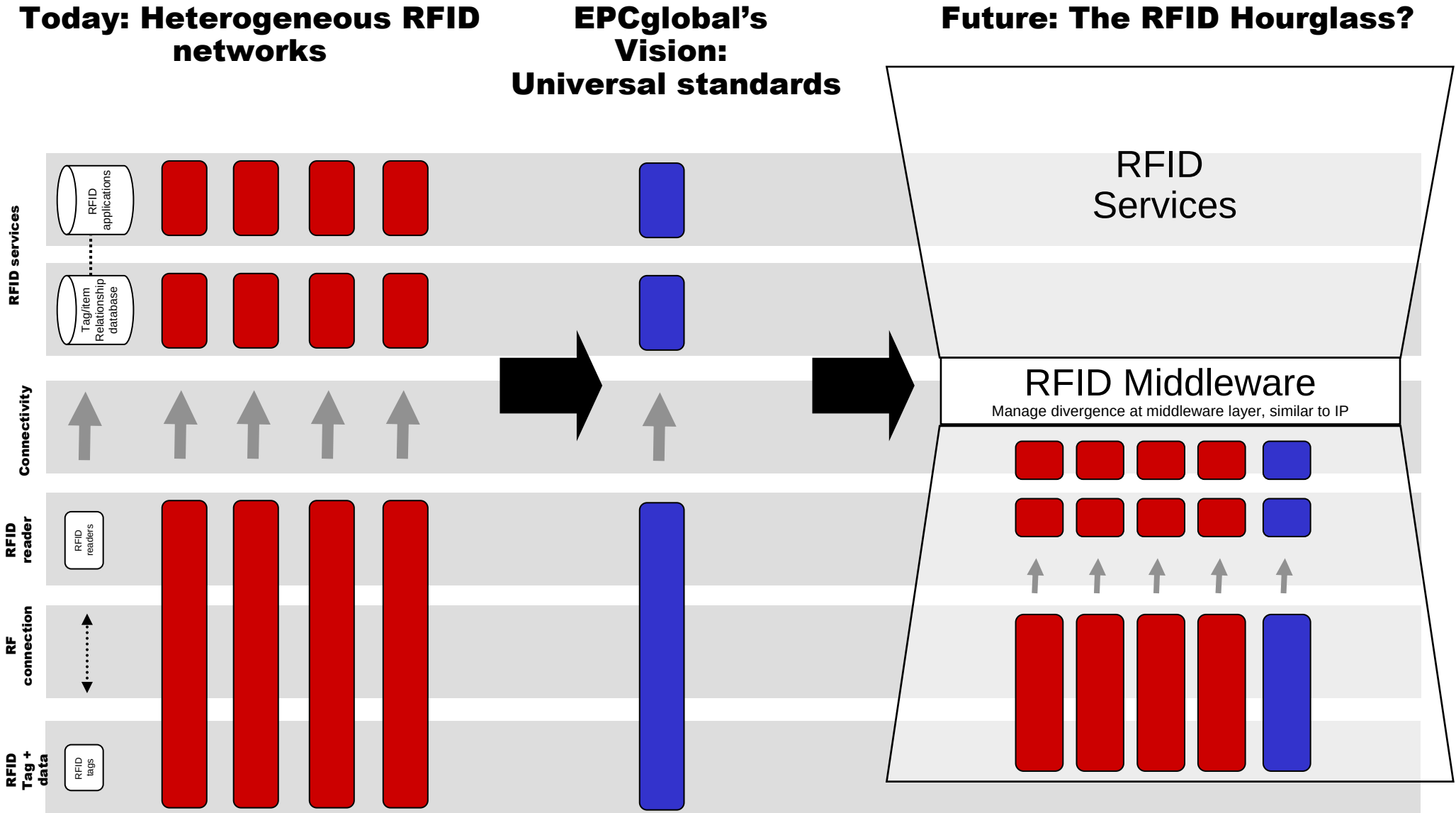
- **The RFID landscape will remain heterogeneous**
  - **Multiple ID schemes**
  - **Multiple wireless networks**
  - **Multiple application platforms**

- **How can multiple RFID systems be managed?**
  - **The IP Hourglass analogy**

38. The future of RFID – IP Hourglass analogy



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)?