

IoT in Libraries:

1. Definition of IoT

The **Internet of Things (IoT)** refers to a network of physical devices embedded with sensors, software, and connectivity. These devices collect and exchange data over networks, enabling **remote monitoring, analytics, and automated actions**.

Everyday Examples: Smartwatches, Alexa, smart TVs, fitness trackers.

2. RFID vs. IoT: Key Differences

RFID vs. IoT

Aspect	Traditional RFID	IoT-Enabled RFID
Data Storage	Local library system (LMS)	Cloud-based for analysis
Inventory Management	Manual, batch scanning	Real-time, automated
Functionality	Identifies items	Identifies, analyzes, and triggers actions
Example	Self-checkout kiosk	Smart shelf alerts for misplaced books

Core Distinction:

- **RFID** identifies objects.
- **IoT** connects, analyzes, and acts on data.

Analogy:

- Traditional RFID = **Diary** (local records).
- IoT-enabled RFID = **Blog** (networked and shared).

Historical Context: Kevin Ashton coined the term "*Internet of Things*" in 1999 during RFID supply-chain research at MIT's Auto-ID Center. In IoT architecture, RFID occupies the **perception (sensing) layer**.

3. IoT Architecture & Data Flow

Data Flow Chain:

Key Concepts:

- **Edge Computing:** Processes data near the source to reduce latency.
- **Digital Twin:** A virtual model of the physical library space.

Memory Aid: *Sense → Send → Store → Serve*

4. Applications of IoT in Libraries

IoT Applications in Libraries

Domain	IoT Application	Purpose
Collections	Smart shelves, RTLS, robotic sorting	Inventory accuracy, weeding decisions

User Services	Seat finders, smart lockers, auto-release	Enhanced user experience
Preservation	Temp/humidity sensors, alerts	Protect rare materials
Security	People counting, anomaly detection	Risk management (privacy considerations)
Access	Smart locks, mobile credentials	24/7 library operations

Real-World Examples:

- **Singapore National Library Board:** Robotic book sorting, unstaffed branches.
- **NC State Hunt Library "bookBot":** Robotic retrieval of ~1.5 million volumes.

5. Benefits of IoT in Libraries

1. **Efficiency:** Faster circulation, automated inventory.
2. **Data-Driven Decisions:** Insights into space use and collections.
3. **Preservation:** Environmental alerts protect materials.
4. **User Experience:** Self-service, wayfinding.
5. **Sustainability:** Energy savings via smart lighting/HVAC.

6. Challenges of IoT in Libraries

Challenges of IoT in Libraries

Challenge	Description
Privacy	Patron tracking raises ethical concerns; requires compliance.
Interoperability	Vendor lock-in; must integrate with existing ILS (Koha, Alma, SirsiDynix).
Cost	CAPEX (Capital Expenditure): Upfront, one-time investments in physical assets, such as hardware (readers, sensors, gateways). OPEX (Operating Expenditure): Ongoing, day-to-day costs, including cloud subscriptions (SaaS platforms, data storage) and maintenance (software updates, hardware repairs).
Security	Connected devices expand cyberattack surfaces.
Capacity	Libraries often lack in-house technical expertise.