

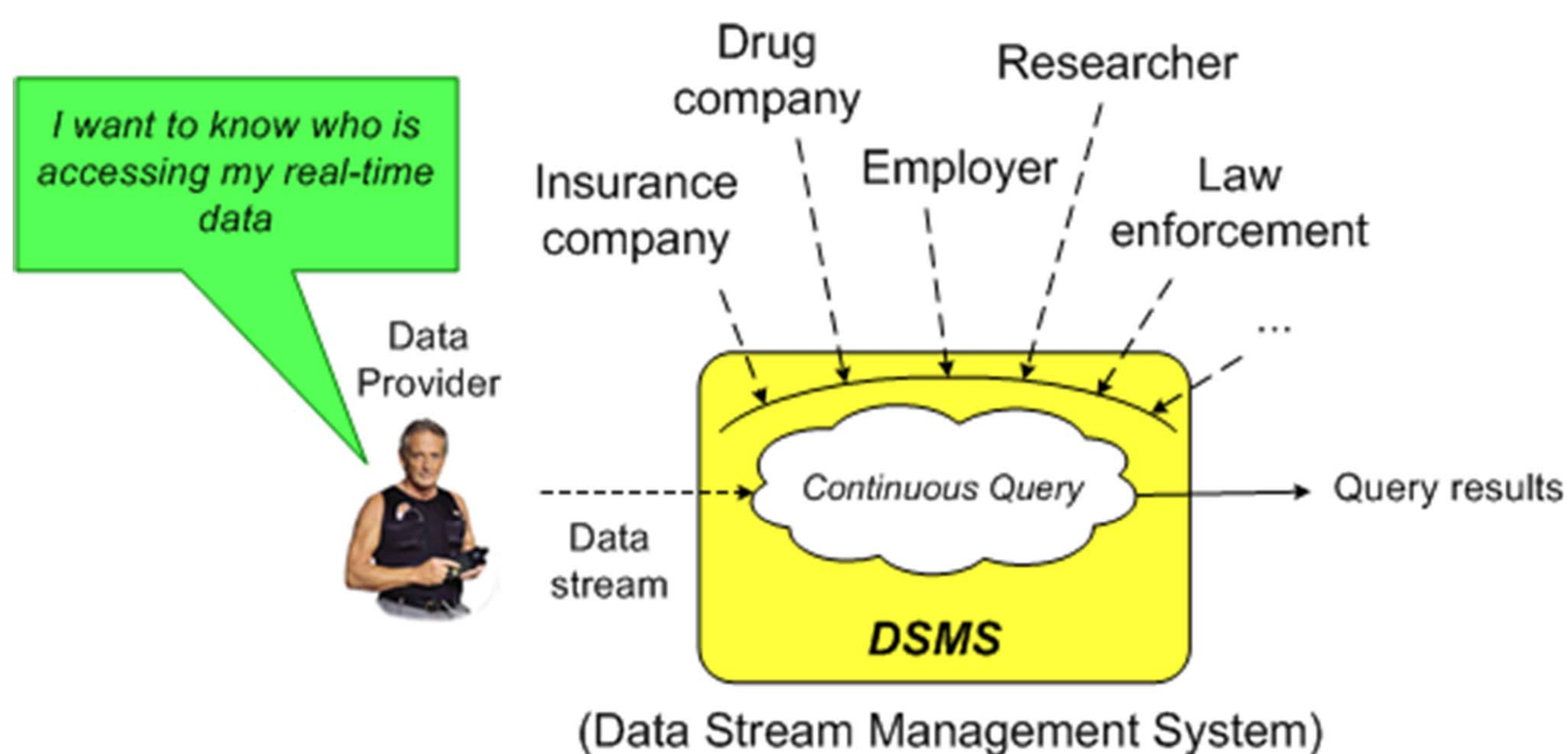
Compliance Auditing in Data Stream Management Systems

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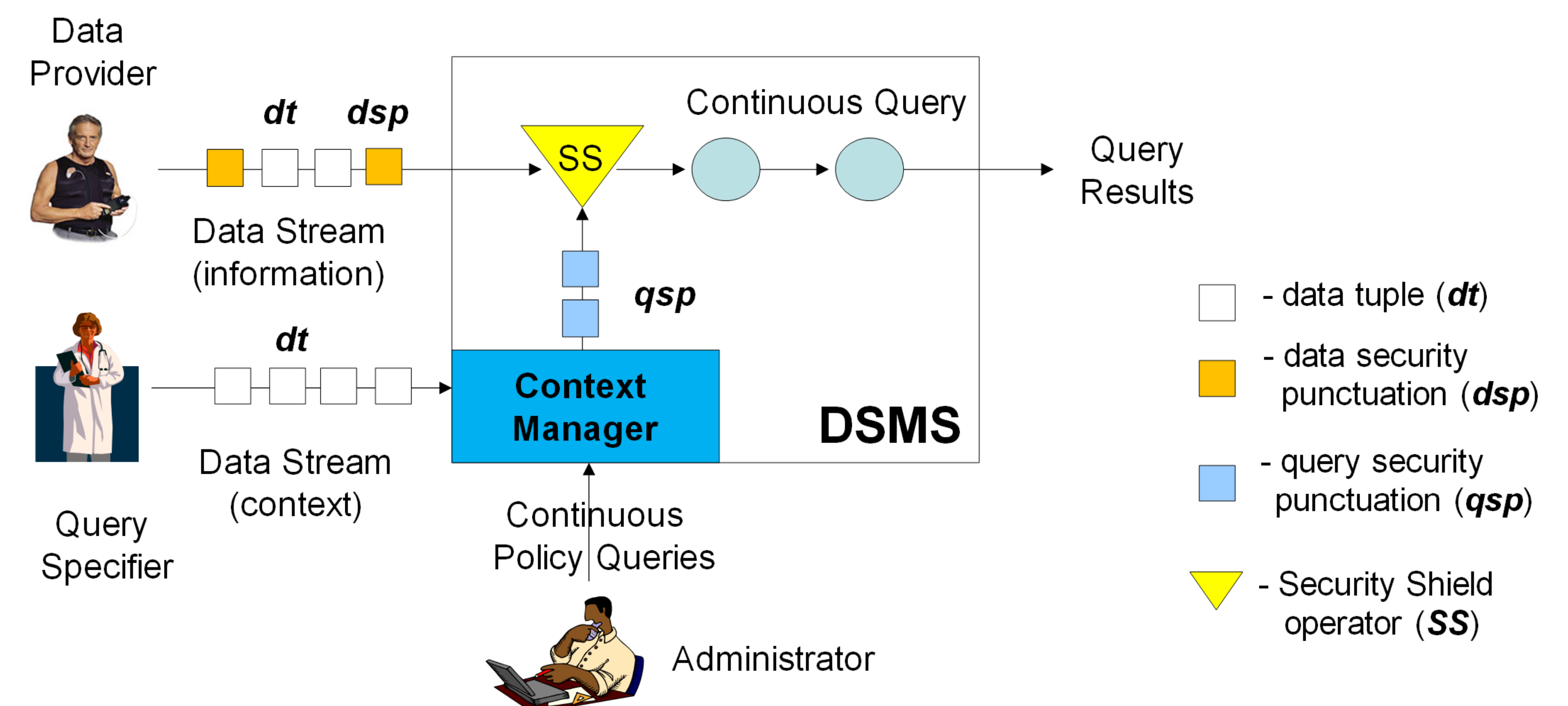
Motivation: Compliance Auditing



Compliance Auditing component in DSMS

- ✓ Enables verification of compliance with policy
- ✓ Determines who accessed designated data, for what purpose, and when
- ✓ Takes a stream-centric approach to auditing
- ✓ Has minimal impact on continuous query processing
- ✓ Tracks disclosures at various granularities of data

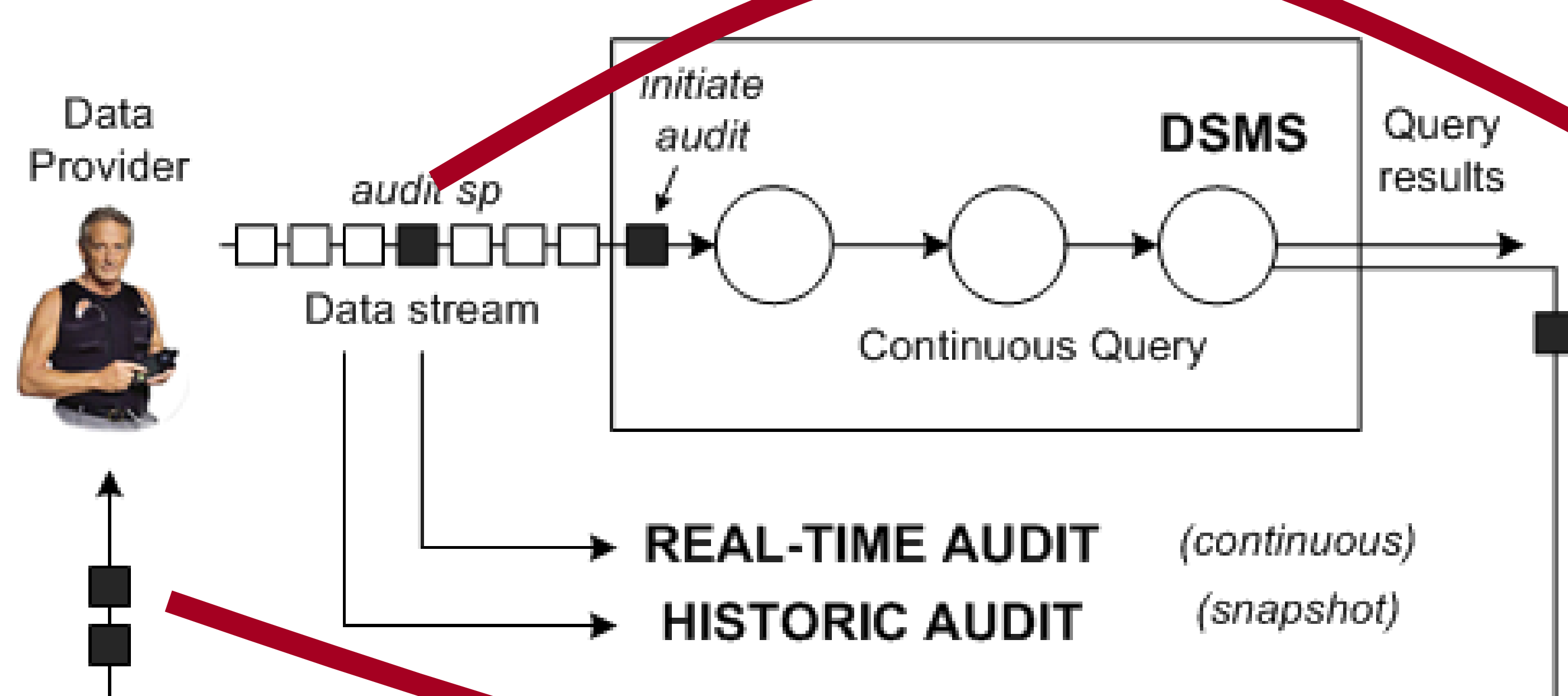
Stream-Sentric Approach to Security



Access Control Mechanism in DSMS

- ✓ Uses security punctuation mechanism
- ✓ Supports dynamic security changes for both data and queries
- ✓ Security processing is combined with regular query processing

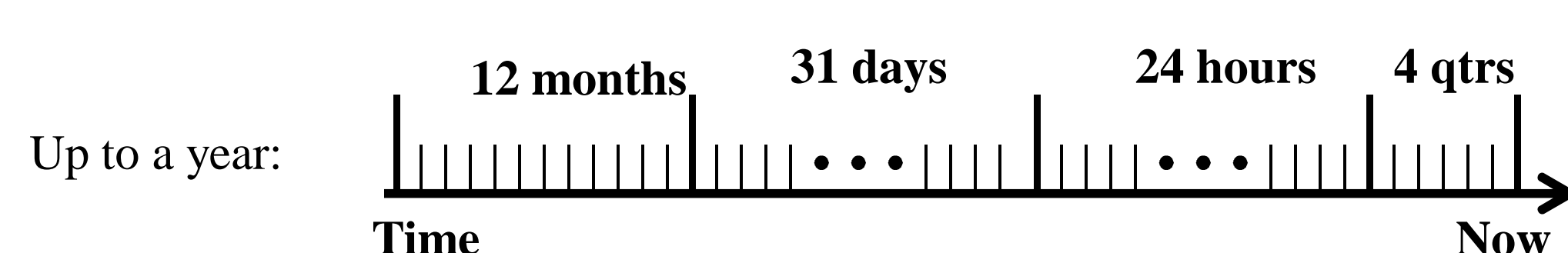
StreamAudit System



Audit:

- 100% accurate for current and recent past information (Audit Window)
- Outside of Audit Window the system returns **approximate audit response**
- Approximation is based on **Tilted Time Window Data Structure**

Tilted Time Window



Security Metadata

General Security Punctuation Schema

Type (pt)	Data Description Part (ddp)	Security Restriction Part (srp)	sign	Time-stamp (ts)	Enforcement (et)	AUDIT PART
dsp / qsp	Stream(s), Tuple(s), Attribute(s) ...	Access Control Model Type & Value	+ / -	🕒	I / D	

Audit Part

TRADITIONAL SP	Audit Description Part (adp)	Audit Window (aw)	Audit Control Flag (acf)
	Stream(s), Tuple(s), Attribute(s) ...	Single Scan / Infnty / [3 min]	r / c / p

null / sp / RE

Audit Response Metadata

Query (qid)	Data Security (dsp)	Query Security (qsp)	Query Context (context)	Time-stamp (ts)
QID	dsp	qsp	context	🕒