

Improving IVS communication through a VLBI Operating Center

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Finnish Cyberspace

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Outline

- Actual method of communication
- Proposed VLBI Operating Center (VOC)
- VOC - Proof of concept
- Next step

Current method of communication

- Emails (IVS mail exploders)
 - Need human to extract information
 - Unknown if message reach target audience
 - Limited automation
- Data archiving system and web pages
 - Synchronization issues
 - No traceability
 - Limited automation (scanning data centers for new files).
- Not suitable operational system
 - Schedules submitted 7 days in advance to avoid problems.

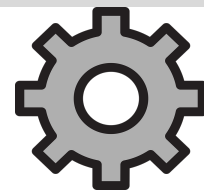
Proposed VLBI Operating Center (VOC)

- Characteristics
 - Fully automated
 - Machine-to-machine data exchange
 - Near real-time two-way communication
 - Traceability of data/information exchange

- VOC components
 1. Database
 2. Web Service (API)
 3. Message broker



- Latest information
 - Sessions
 - Catalogs
 - SEFDs
 - Station availability
- Events
 - Submitted/retrieved files
 - Specific messages
- User credentials/access/roles
- Populated/query using Web Service.



- REST API
- Data exchange using JSON structured messages
 - Users validated using Jason Web Token (JWT)
- Users can query or provide information (including files)
 - Some actions are limited to specific users.
 - Using http (https) get or post
- Generates internal alarms

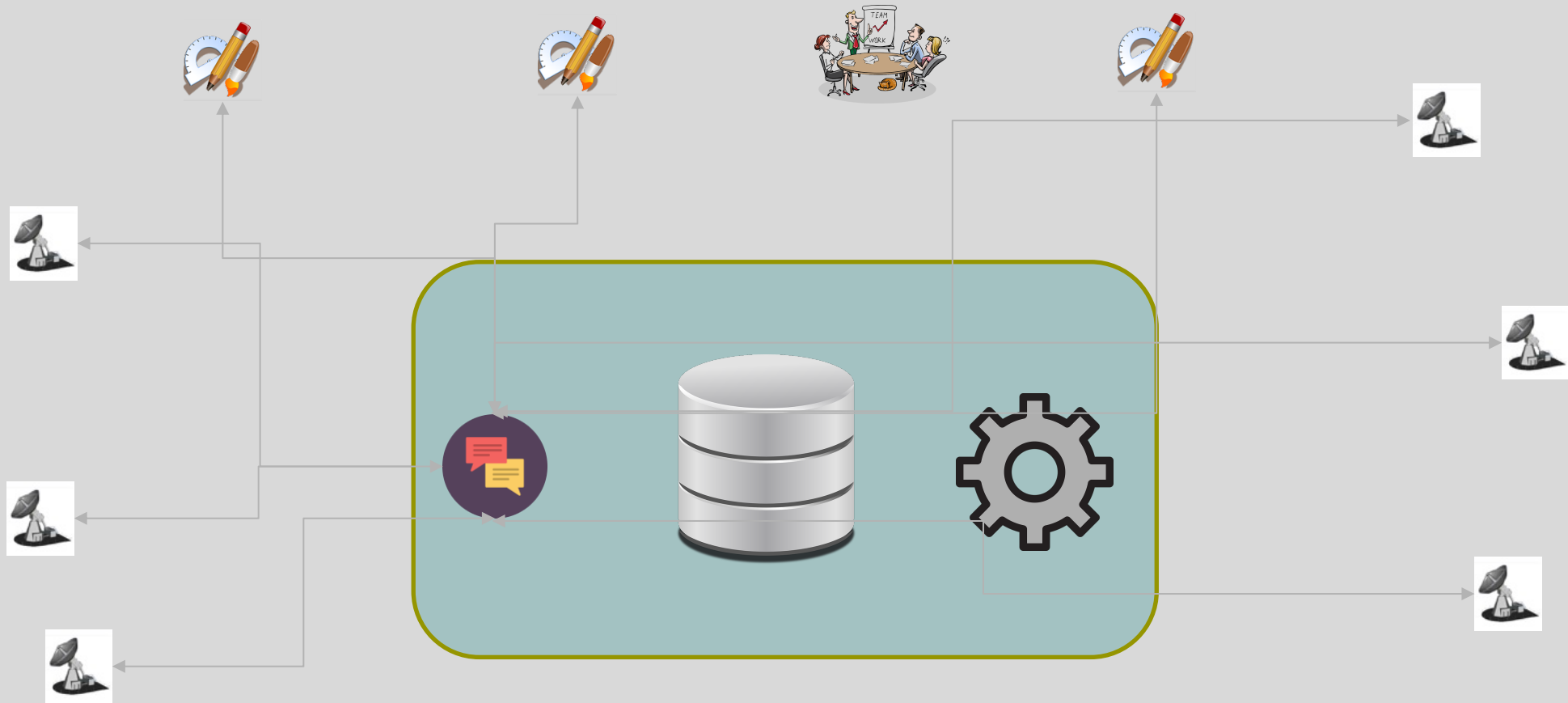
VOC – 3 - Message broker



- Near real-time two-way communication system
- Messages generated by VOC (alarms) or external users
- Dispatches messages using specific rules
 - Messages sent only to relevant users
- Does not contact users
 - Messages stored in the “queue” of each user
 - Users must connect to Message Broker to retrieve/send messages

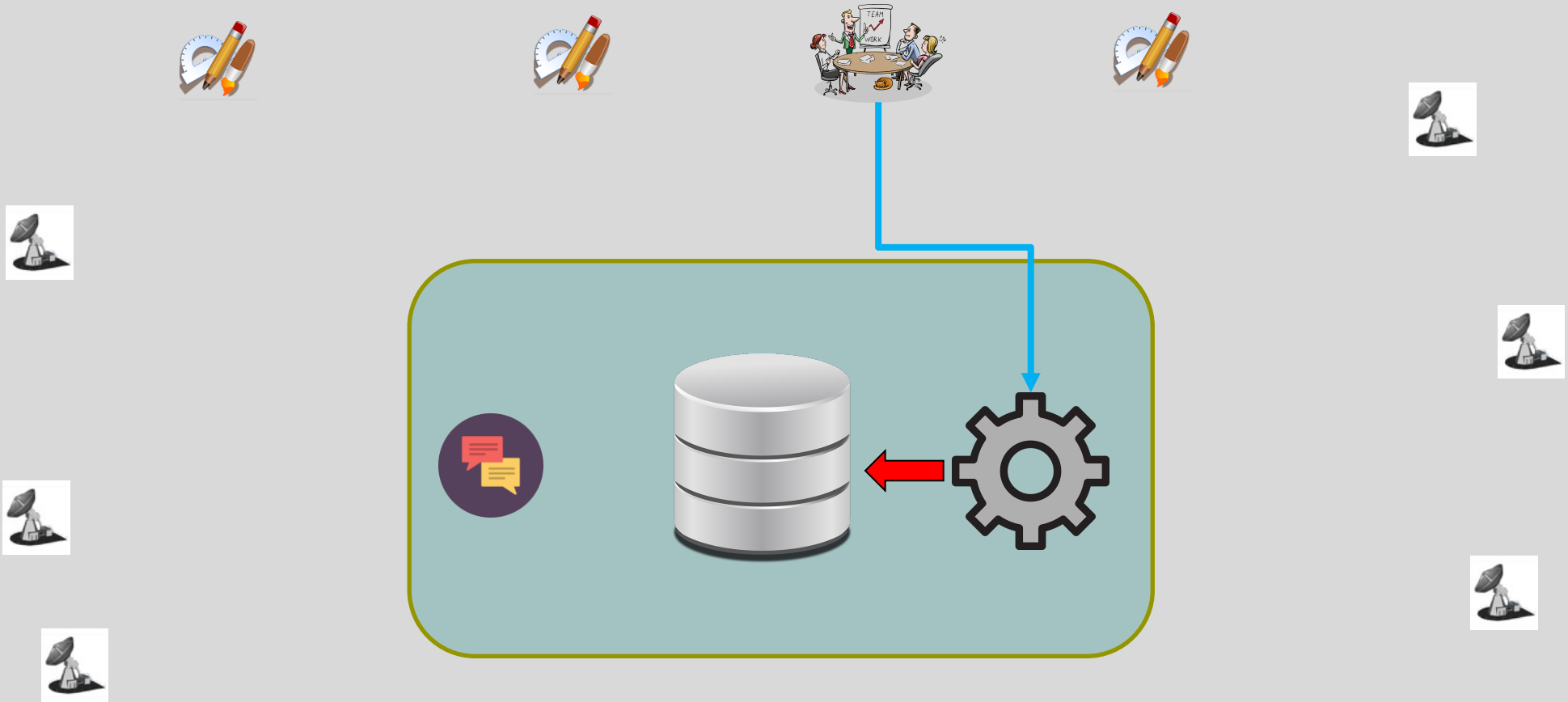
VOC – Updating session

Users connected to VOC



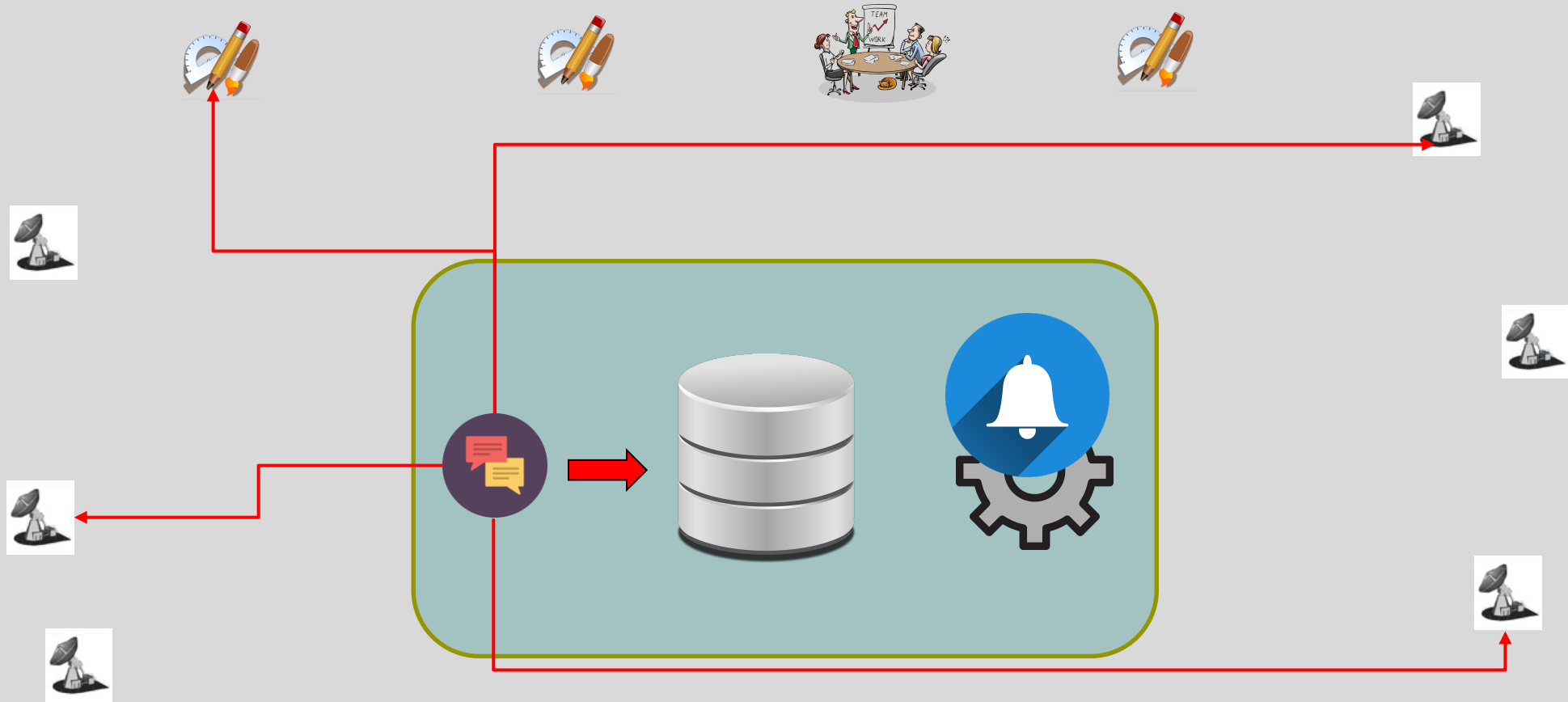
VOC – Updating session

Coordinating Center upload session



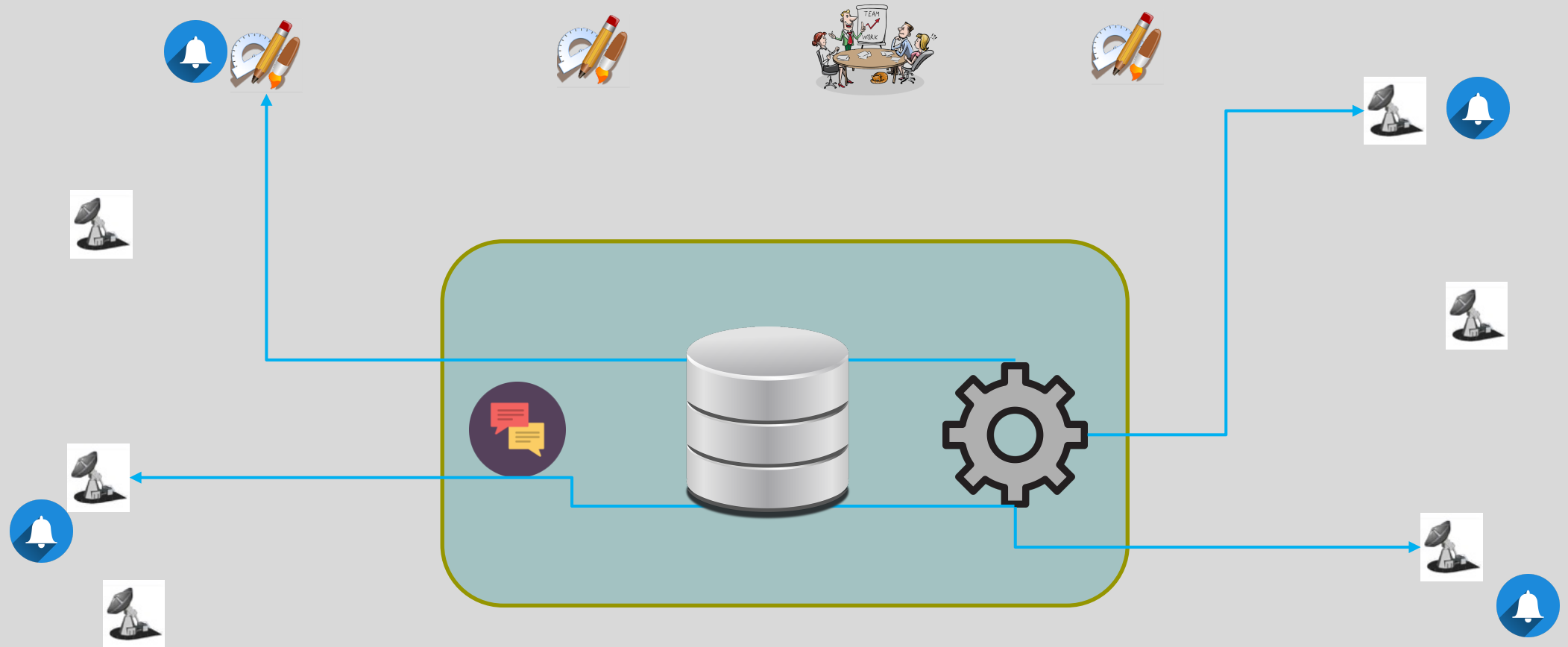
VOC – Updating session

VOC informs specific USERS



VOC – Updating session

USERS download data for session



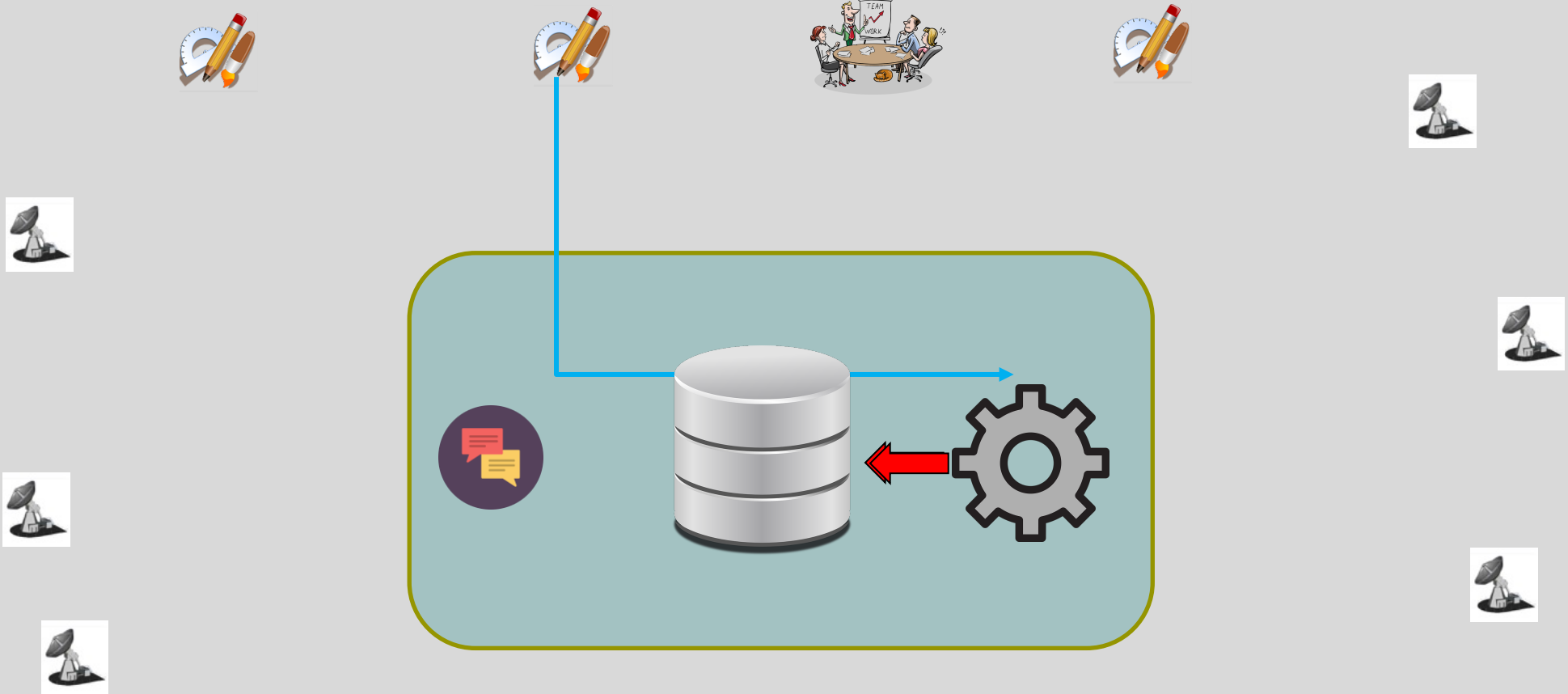
VOC – Uploading schedule

Operations Center generate schedule



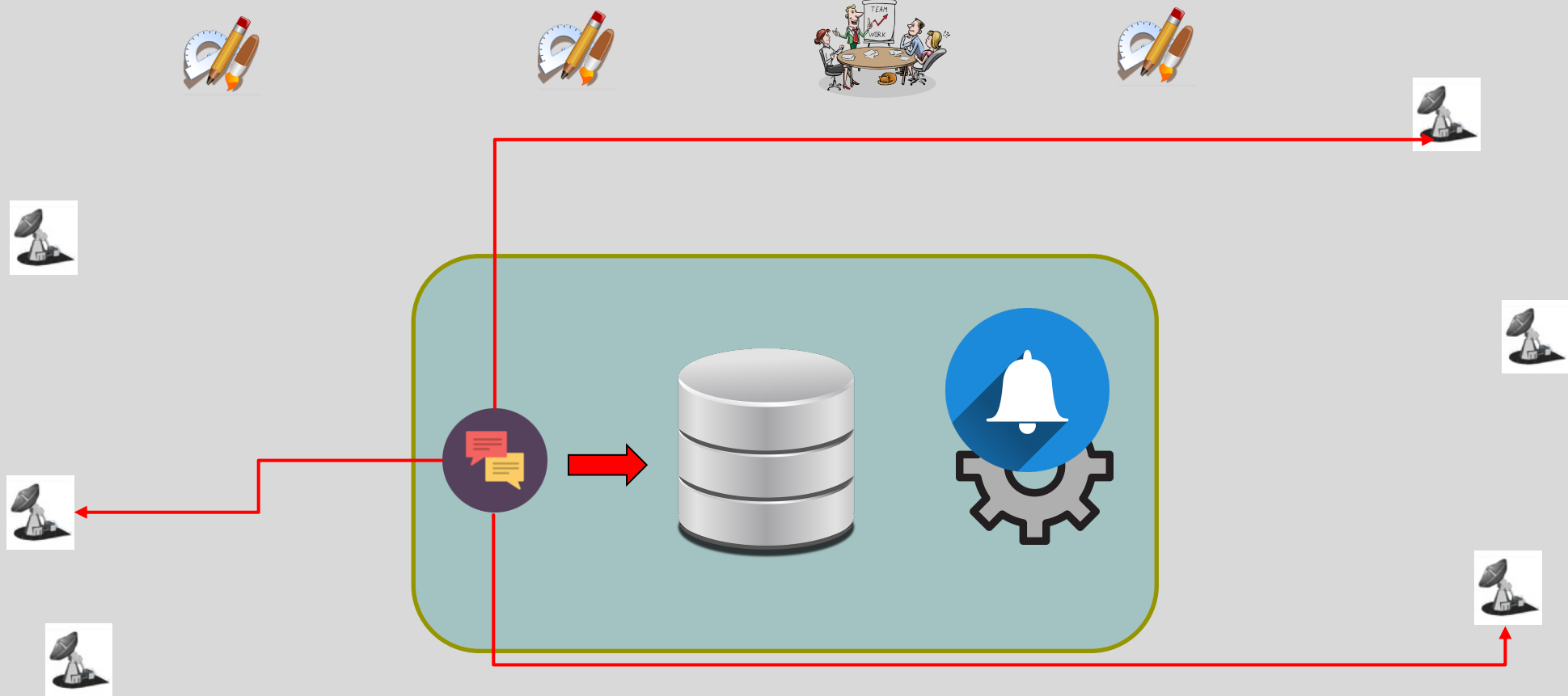
VOC – Uploading schedule

Operations Center upload schedule



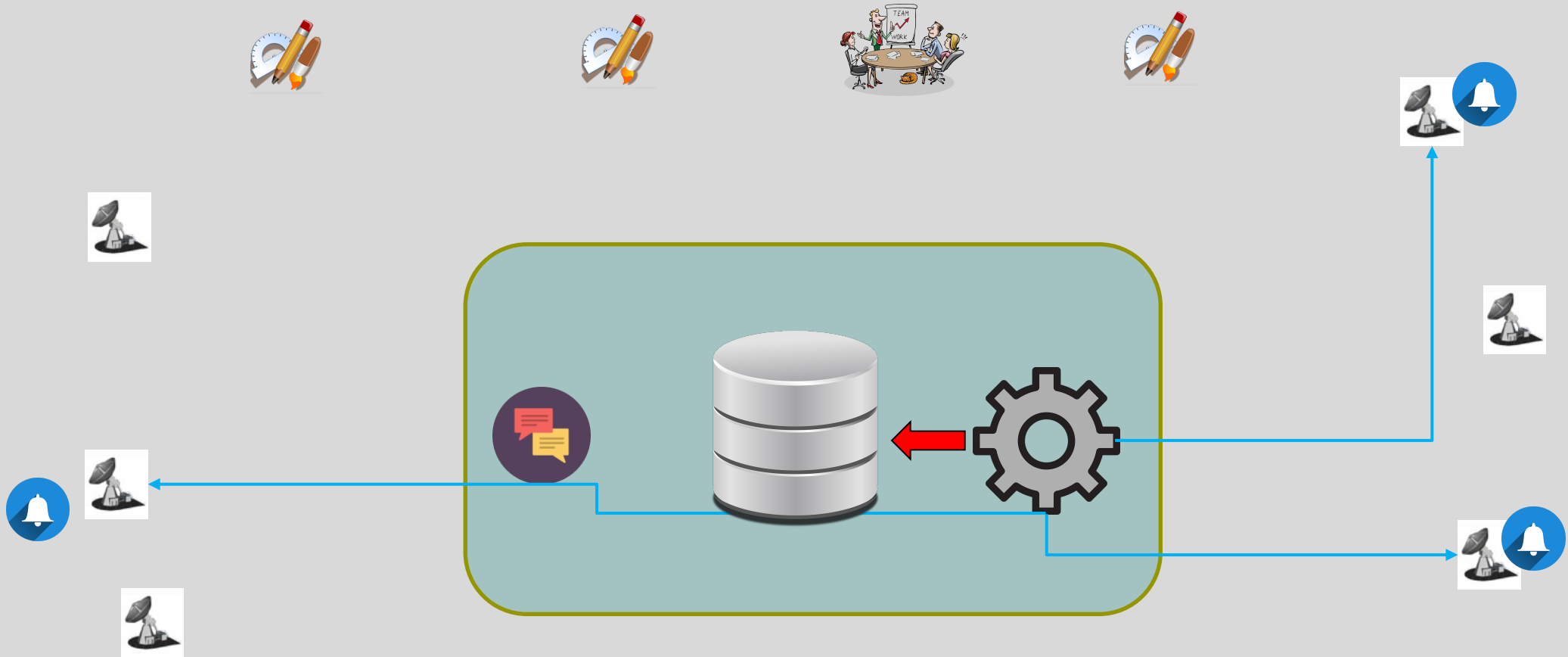
VOC – Uploading schedule

VOC informs specific USERS

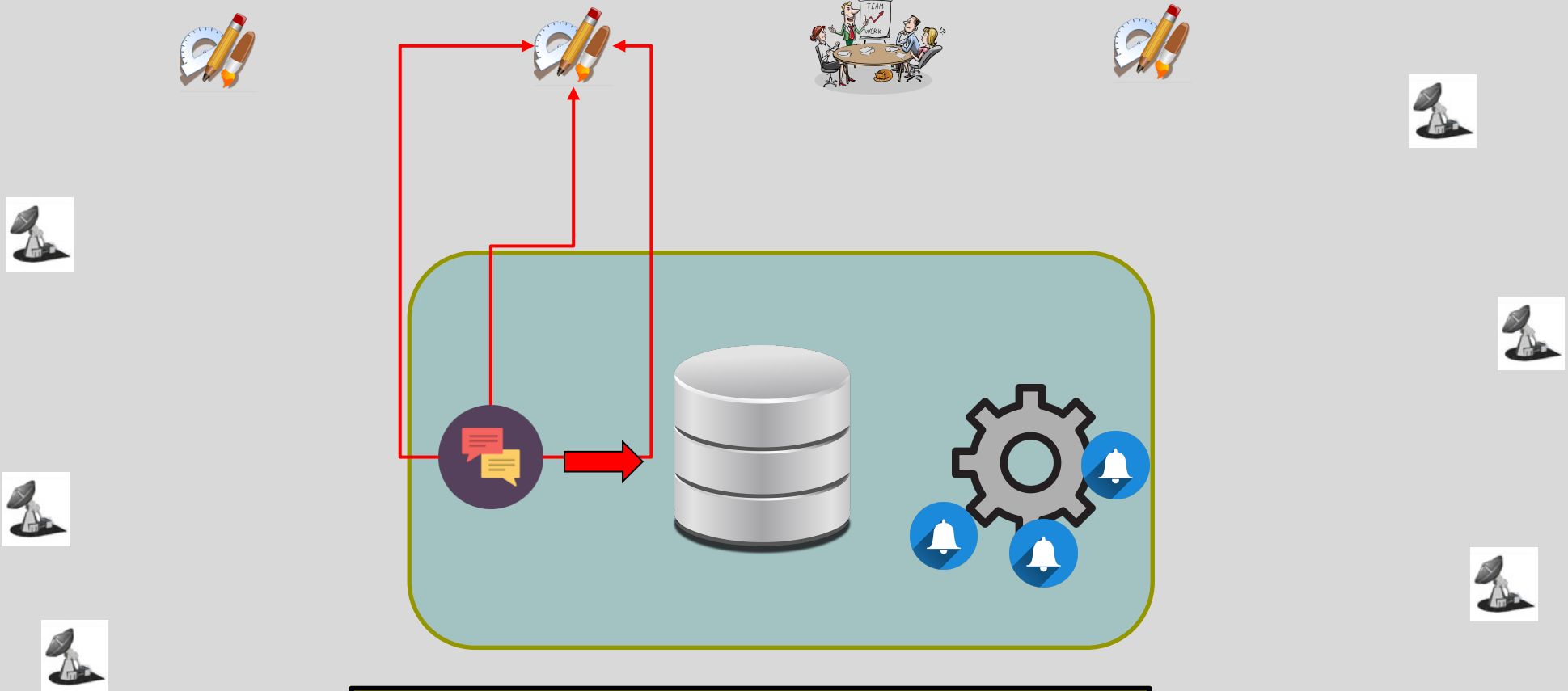


VOC – Uploading schedule

STATIONS download schedule



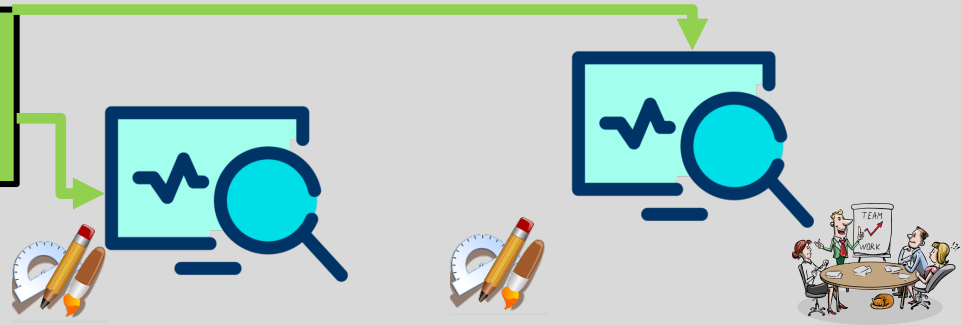
VOC – Uploading schedule



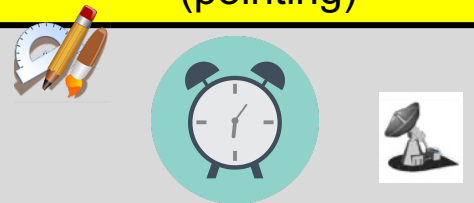
VOC informs Operations Center

VOC – Observation

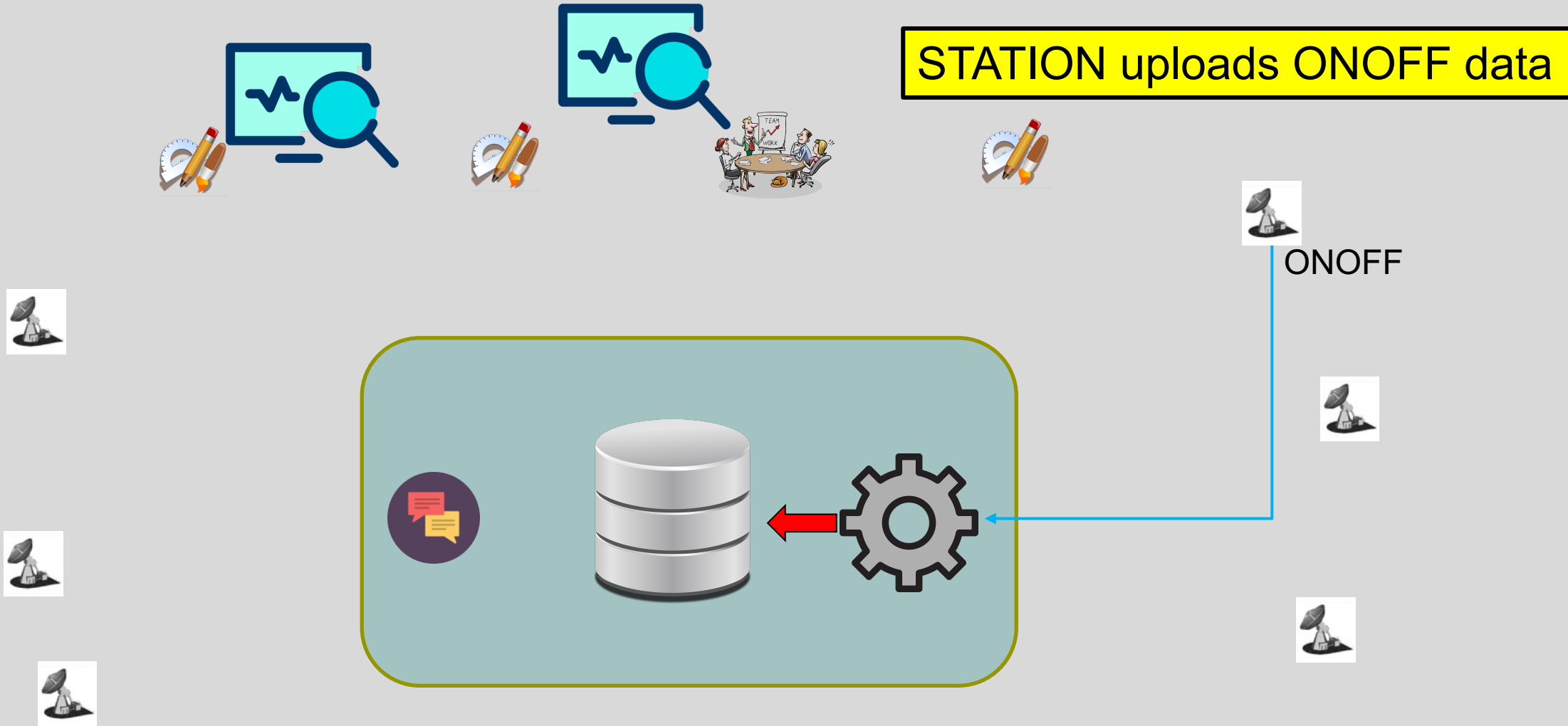
Dashboards used to monitor session



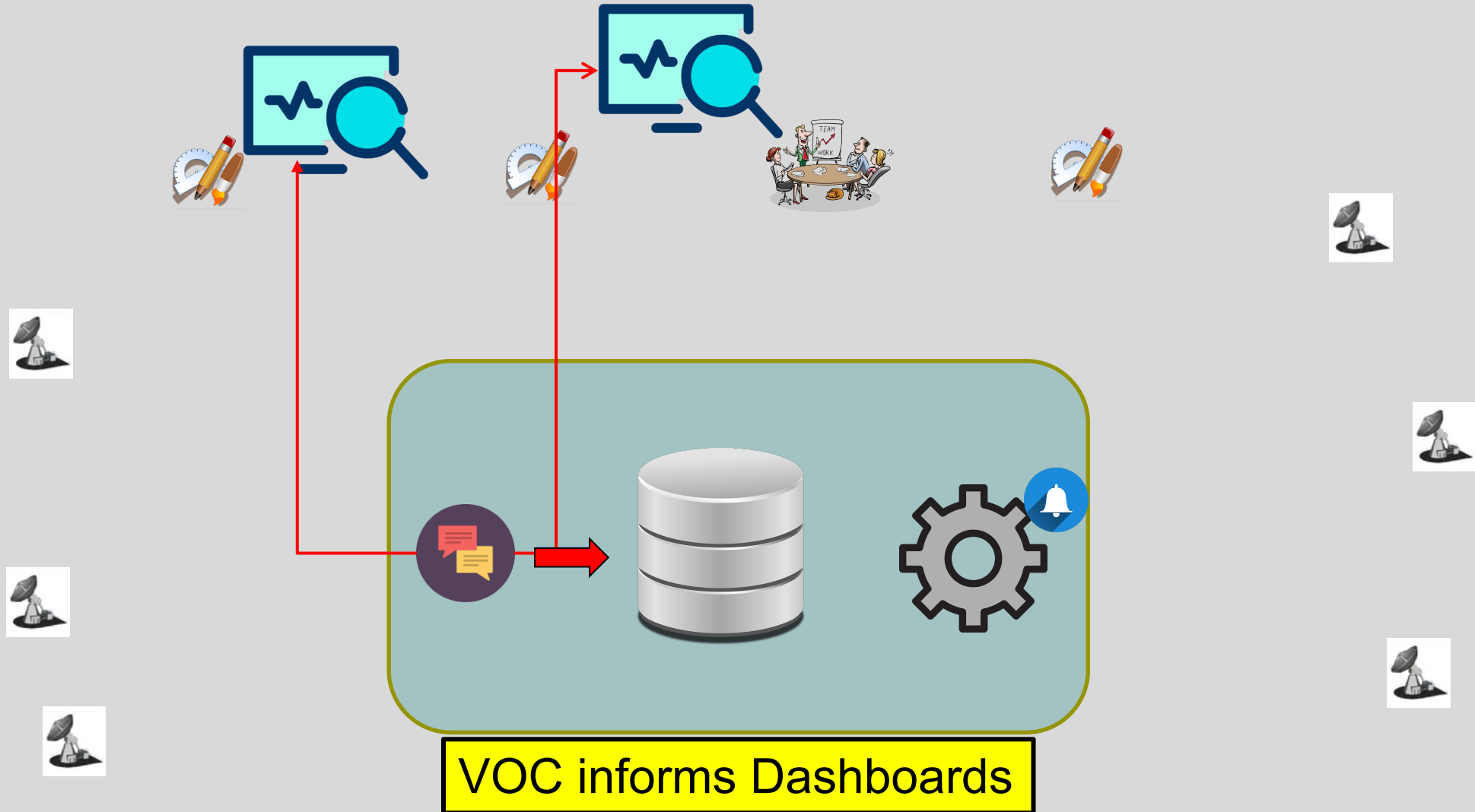
STATION prepares session (pointing)



VOC – Observation

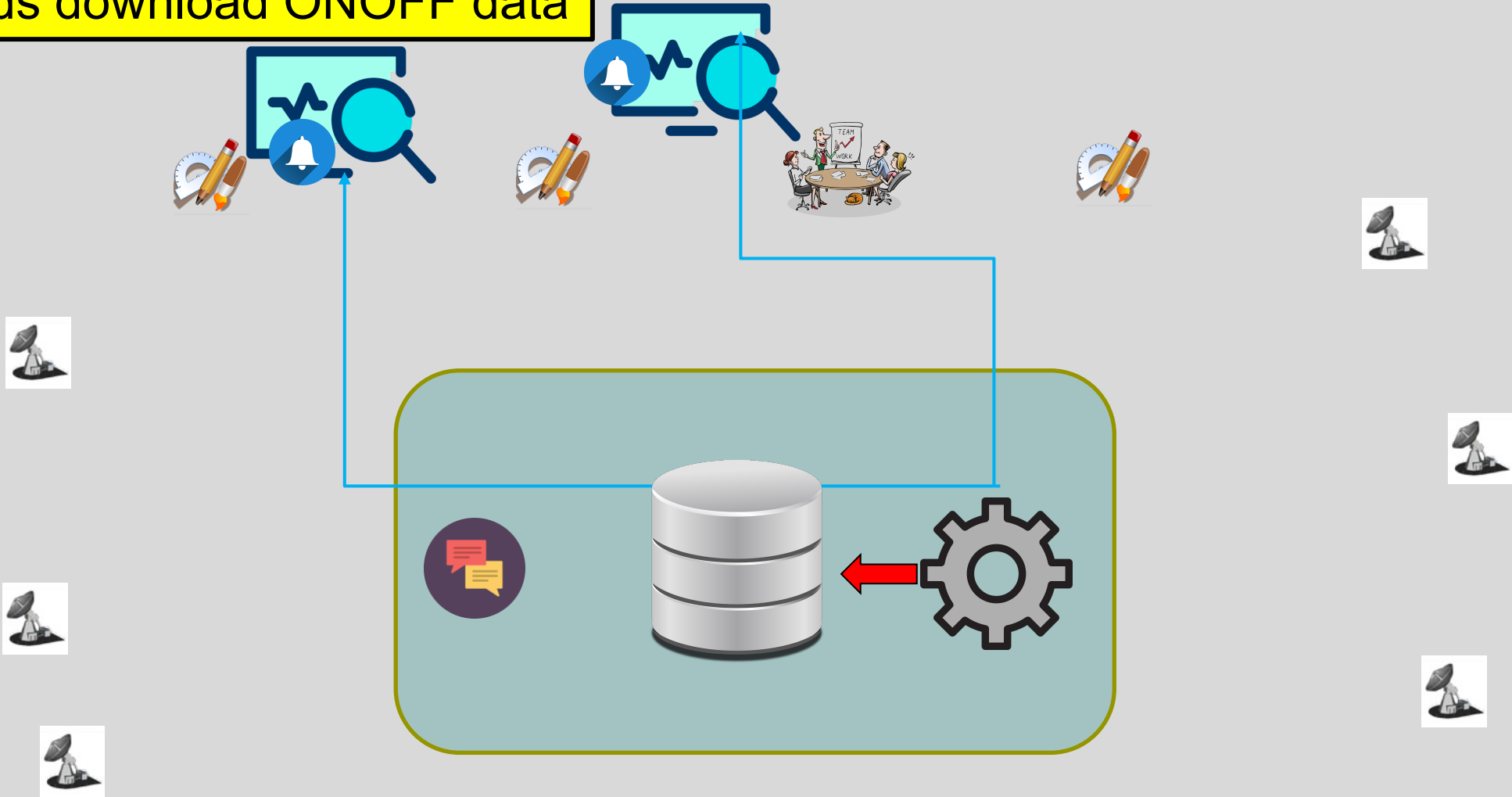


VOC – Observation

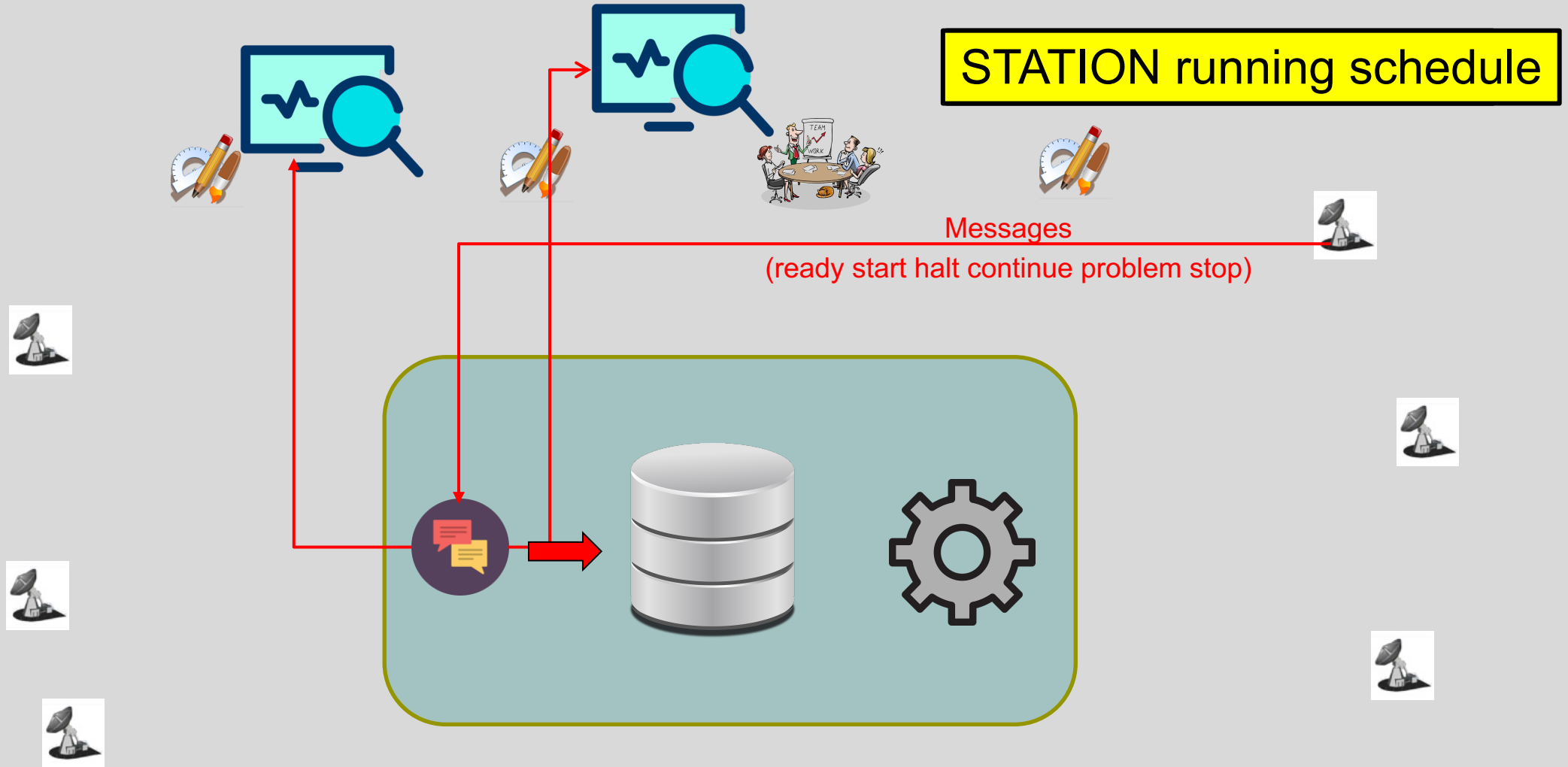


VOC – Observation

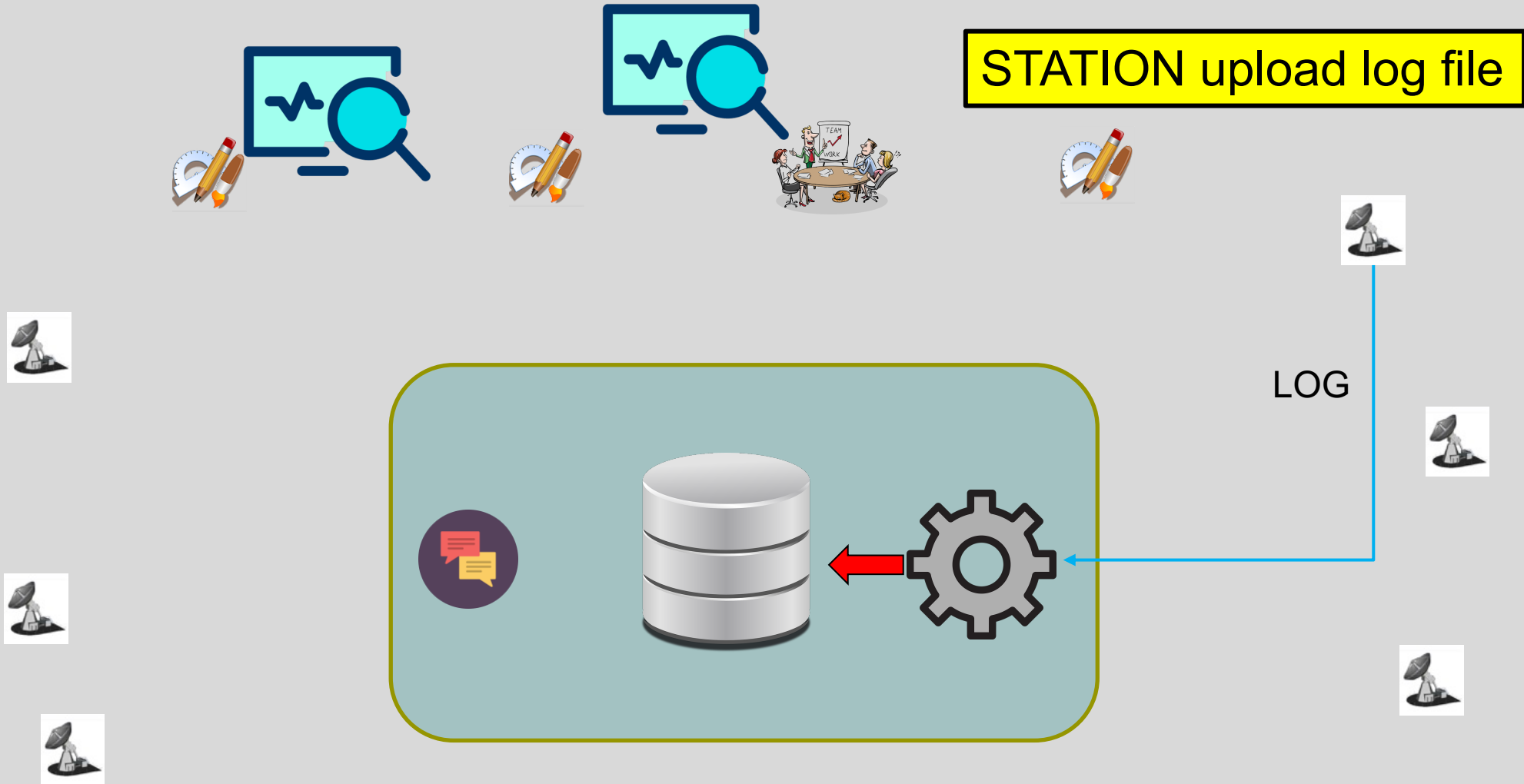
Dashboards download ONOFF data



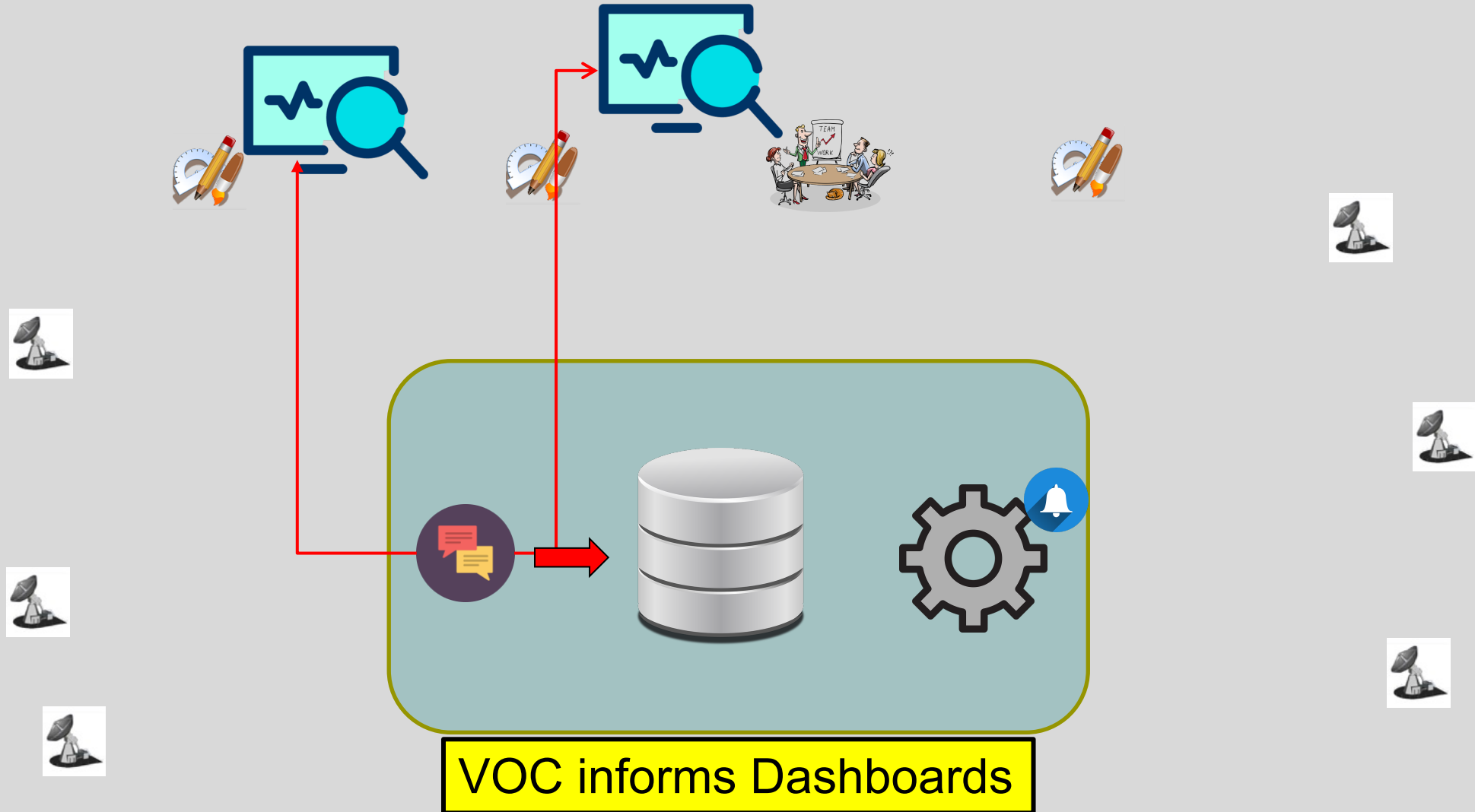
VOC – Observation



VOC – Observation



VOC – Observation



Proof of concept - VOC

- Linux server (Ubuntu)
- MariaDB
- Web Service
 - Python using FastAPI
 - Data exchange using JSON
- Message Broker
 - RabbitMQ
 - Defined specific message structure
 - Defined dispatching rules

Proof of concept – DEMO applications

- Coordinating Center
 - Create/update session
- Operations Center
 - Retrieve data for generating schedule
 - Submit schedule
- Station
 - Message listener with manual or automatic action
 - Message publisher (scan, source, problems, ...)
 - Data uploader (SEFDs, log)
- Dashboard
 - Session viewer

Proof of concept – DEMO applications

VLBI dashboard V0.1

TST074

Stations:

Start time: Starting in 2 hours and 11 minutes

Schedule:

Station Monitoring

Station	Sched	SEFD	Scans	Status
Gs	None	<input type="text" value="2022-03-15 12:56"/>	10	<input type="text"/>
K2	V1.0	<input type="text" value="2022-03-15 12:51"/>	10	<input type="text"/>
Mg	V1.0	<input type="text" value="2022-03-15 12:56"/>	10	<input type="text"/>
Wf	None	<input type="text" value="2021-10-26 15:31"/>	10	<input type="text" value="13:09:11 - URGENT: power outage"/>

2022-03-15 13:13:44 UTC

- Define some protocols
 - Data exchange
 - Messages
- Improve validations
 - No QC in present version
- Improve station module
 - FS listener
- Cluster of VOC
 - Synchronization