

Sen2Extract @ KHEOBS

Access Sentinel-2 Indices
Time Series Within a Few Clicks

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KHEOBS
Khmer Earth Observation Laboratory



Sen2Extract – Terminology



- Sen2Chain
 - Tool to obtain and analyze image products from Sentinel-2.
 - Created in 2017 for the S2-Malaria Project.
 - Developed Espace-Dev (IRD, Univ Reunion, SEAS-OI)
- Sen2Extract
 - Web interface to access Sen2Chain time series.
 - Created in 2019 under the same project.

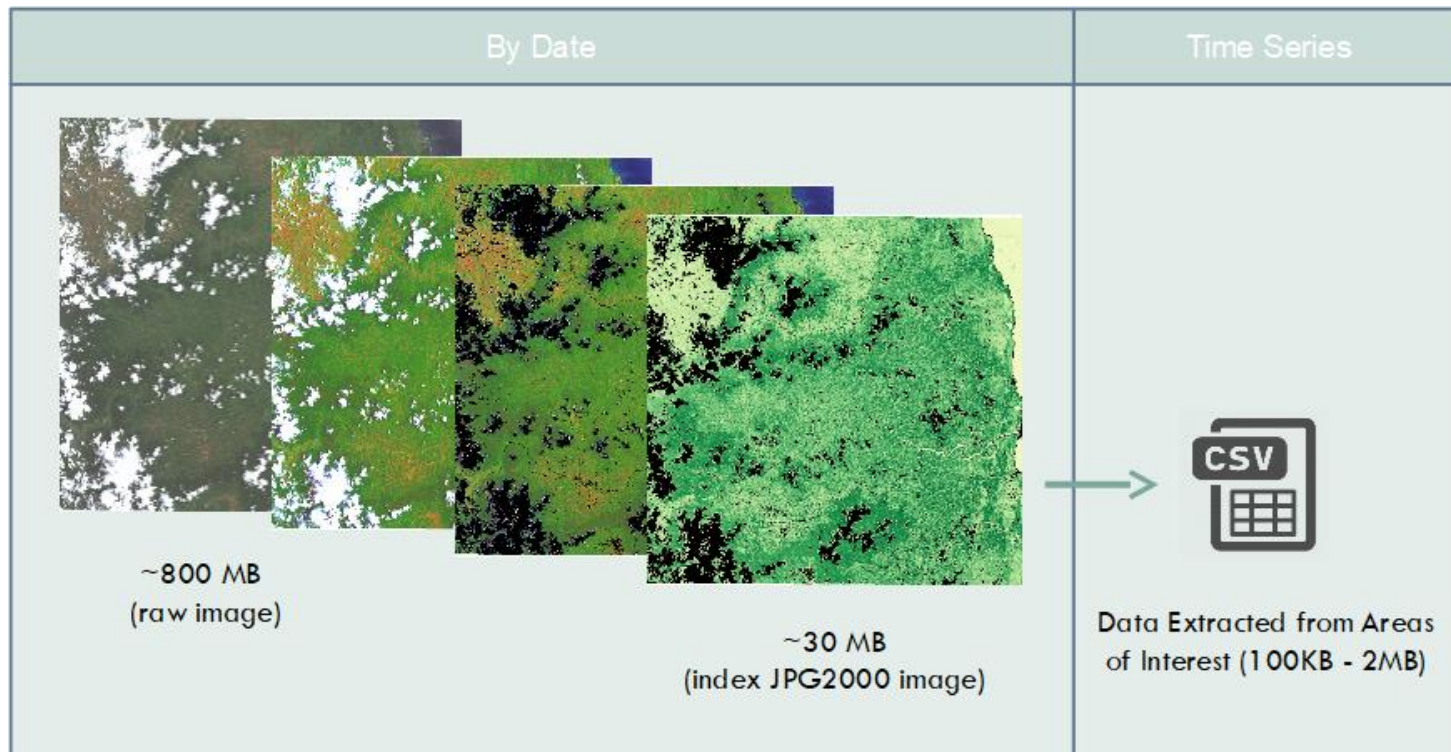
Sen2Extract – Background



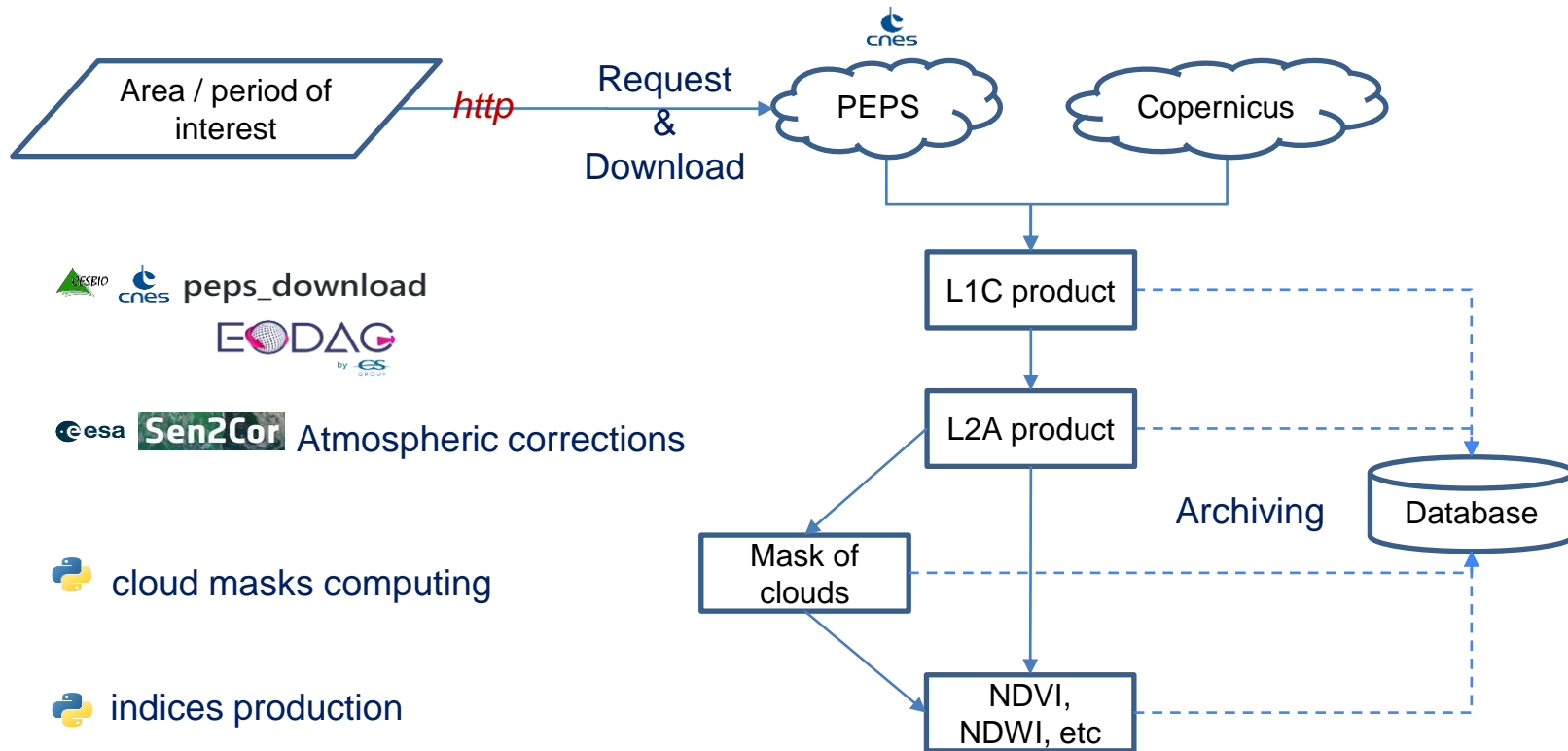
- Need for satellite imagery and data to enrich research and monitoring systems in health.
 - i.e. Indices (NDVI, NDWI, etc), and their time series.
- Accessible satellite technology advancing rapidly.
 - Sentinel-2 (2015)
 - Spatial Resolution of 10m
 - Latency of <2 days
 - Free
- Challenges
 - Image products >800 MB
 - Complex to access and use



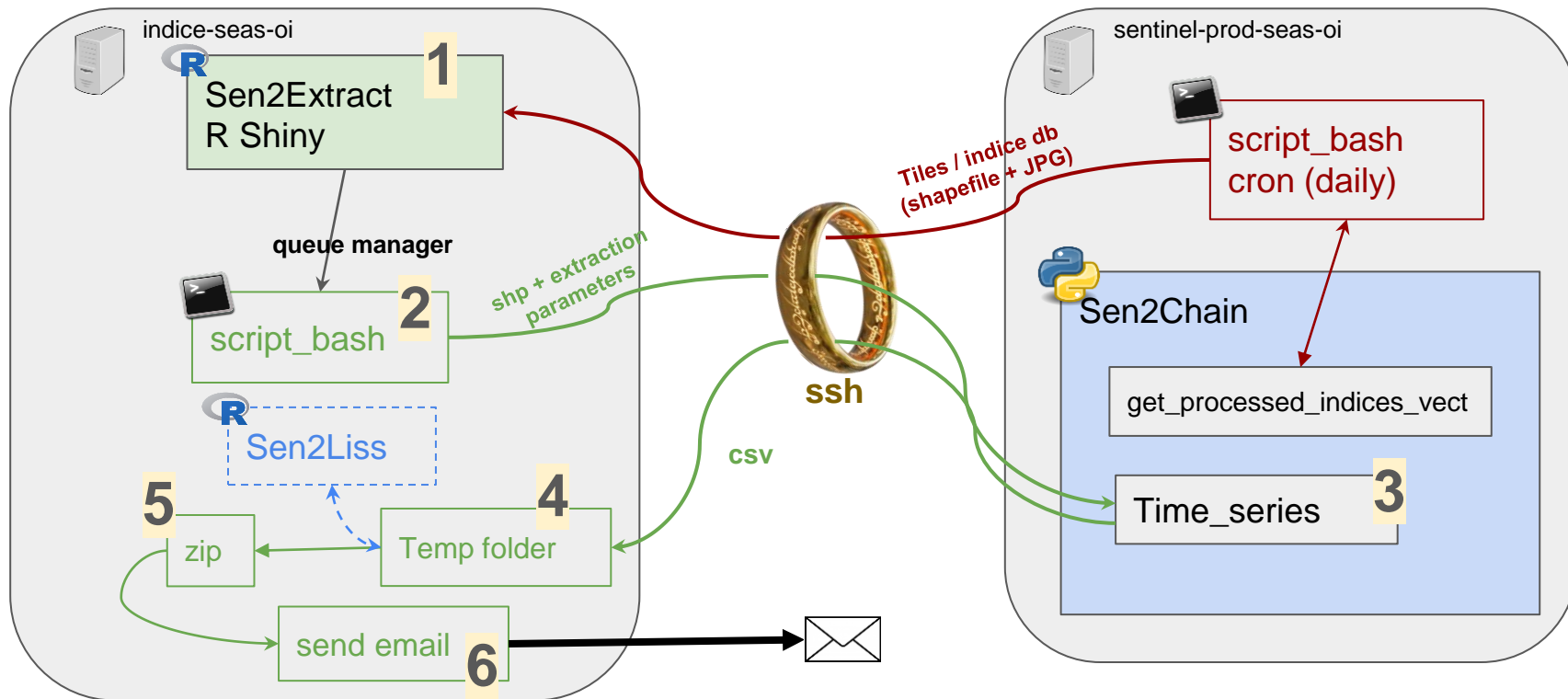
Sen2Extract – Background



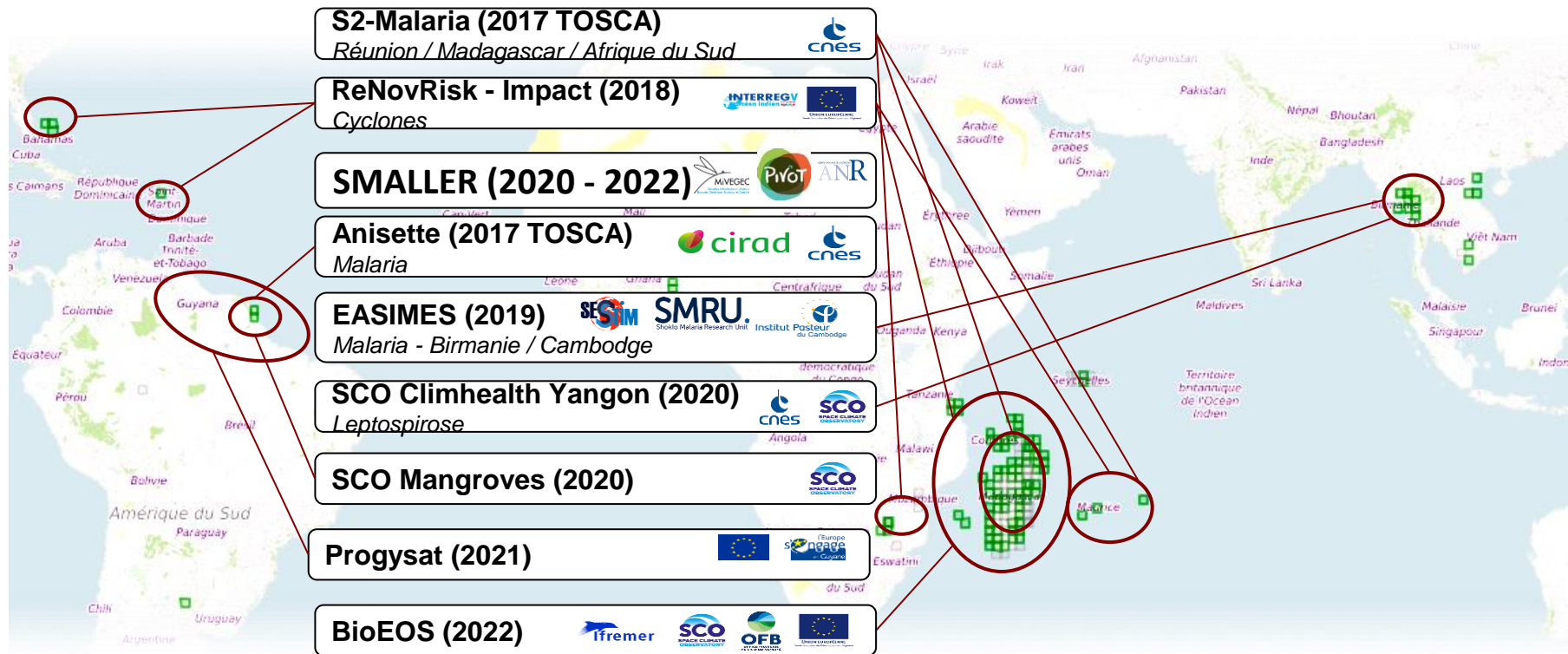
Sen2Extract – Background



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Sen2Extract – Background



Sen2Extract – Motivations



- Geographical Coverage
 - Tile coverage of Cambodia (and Southeast Asia) is Limited.
- Data Accessibility
 - There is a need to view original L1C and L2A products.
- Customization
 - Convenience of performing custom extractions.
- Other Considerations
 - Availability
 - Scalability

Sen2Extract – Challenges



- Resilient Infrastructure
 - Sen2Extract requires considerable manual setup and manual maintenance.
- Accessible Data
 - Downloaded L1C and L2A products are stored privately inside a Linux server.
- Transparent Scheduling
 - Automated downloads (cron jobs) of Sentinel products are difficult to monitor .
- Scalable Technology
 - Communications between servers are reliant on a single point of failure (SSH session).

Sen2Extract – Solutions

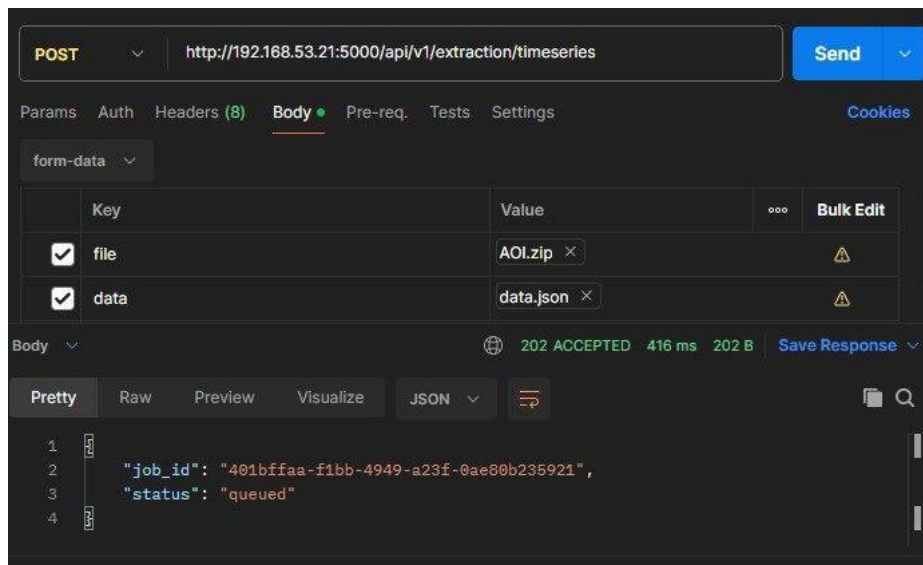


- Resilient Infrastructure - **Docker**
 - Sen2Extract requires considerable manual setup and manual maintenance.
- Accessible Data - **MinIO**
 - Downloaded L1C and L2A products are stored privately inside a Linux server.
- Transparent Scheduling - **Airflow**
 - Automated downloads (cron jobs) of Sentinel products are difficult to monitor .
- Scalable Technology - **Flask**
 - Communications between servers are reliant on a single point of failure (SSH session).

Sen2Extract – Flask



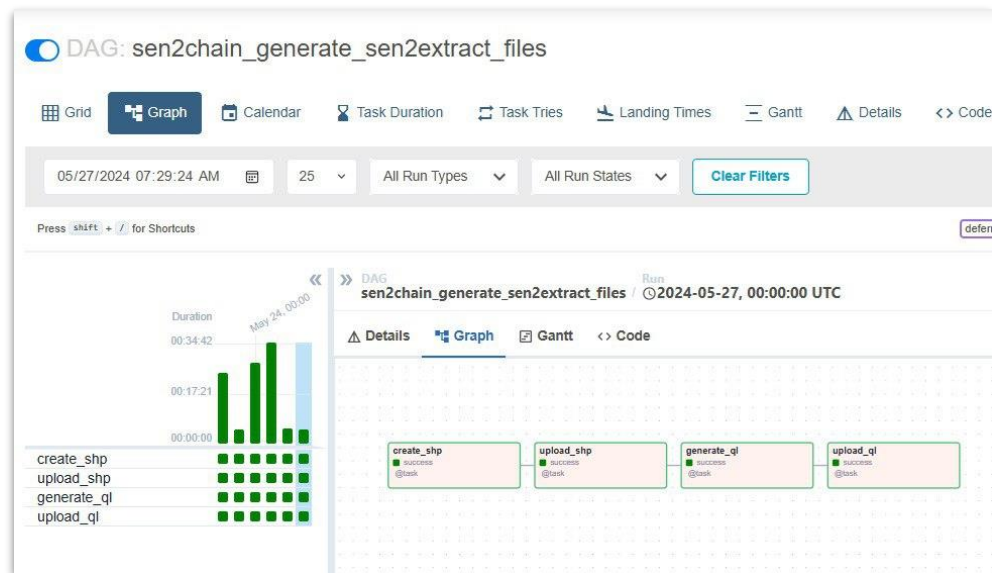
- Web application framework
 - Built in Python
 - Released in 2010
 - Popularity: 11th worldwide*
- Capabilities
 - Easy to learn and write
 - Turns any program into a web service
- Useful for
 - Creating microservices



Sen2Extract – Airflow



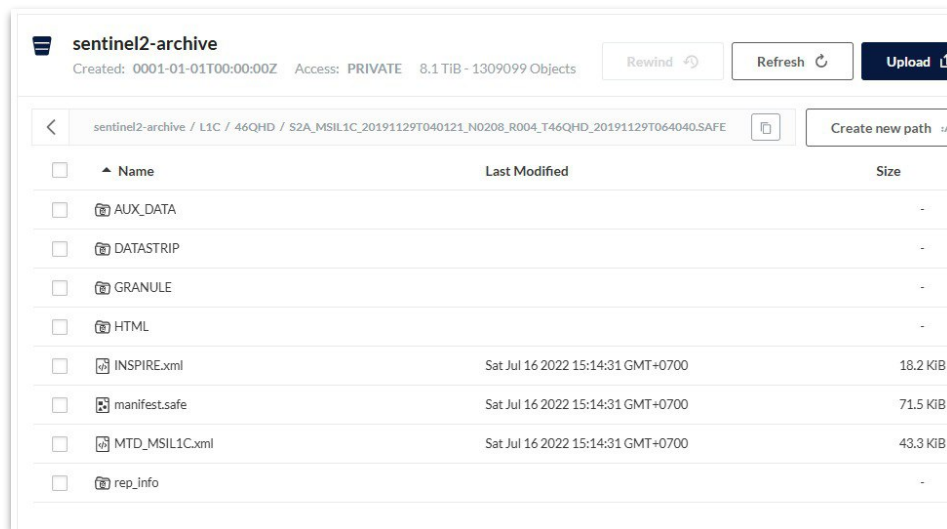
- Task scheduling service
 - Built in Python
 - Released in 2014 by Airbnb
- Capabilities
 - Monitoring and Alerting
 - Built-in secrets management
- Used for
 - Cron alternative



Sen2Extract – MinIO



- Object Storage Database
 - Released in 2016
 - Implements Amazon's AWS S3 protocol
- Capabilities
 - Database-style permissioning
 - Scalable to Exabytes
 - Convert any Linux file system into a database (2022 ver)
- Used for
 - Storing unstructured data



Sen2Extract – Docker



- Software containerization
 - OS virtualization
 - Released in 2013
- Capabilities
 - Packages an application and dependencies automatically.
 - Runs applications in any environment consistently.
- Used for
 - Infrastructure abstraction
 - Eliminates manual setup

A screenshot of the Docker Desktop interface showing a list of containers. The interface includes a search bar, control buttons (Start, Stop, Kill, Restart, Pause, Resume, Remove), and an 'Add container' button. The container list table is as follows:

Name	State	Quick Actions	Stack	Image	Created
kheobs-airflow-initdb-1	exited	[Stop] [Refresh]	kheobs-airflow	kheobs-airflow-initdb	2024-05-24 11:09:47
kheobs-airflow-postgres-1	running	[Stop] [Refresh] [Restart] [Kill]	kheobs-airflow	postgres	2024-05-24 11:09:47
kheobs-airflow-scheduler-1	running	[Stop] [Refresh] [Restart] [Kill]	kheobs-airflow	kheobs-airflow-scheduler	2024-05-24 11:09:47
kheobs-airflow-webserver-1	running	[Stop] [Refresh] [Restart] [Kill]	kheobs-airflow	kheobs-airflow-webserver	2024-05-24 11:09:47
portainer	running	[Stop] [Refresh] [Restart] [Kill]	-	portainer/portainer-ce:latest	2024-05-09 11:09:07
sen2service-redis-1	running	[Stop] [Refresh] [Restart] [Kill]	sen2service	redis	2024-05-24 14:53:58
sen2service-webserver-1	running	[Stop] [Refresh] [Restart] [Kill]	sen2service	sen2service-webserver	2024-05-24 14:53:58
sen2service-worker-1	running	[Stop] [Refresh] [Restart] [Kill]	sen2service	sen2service-worker	2024-05-24 14:53:58

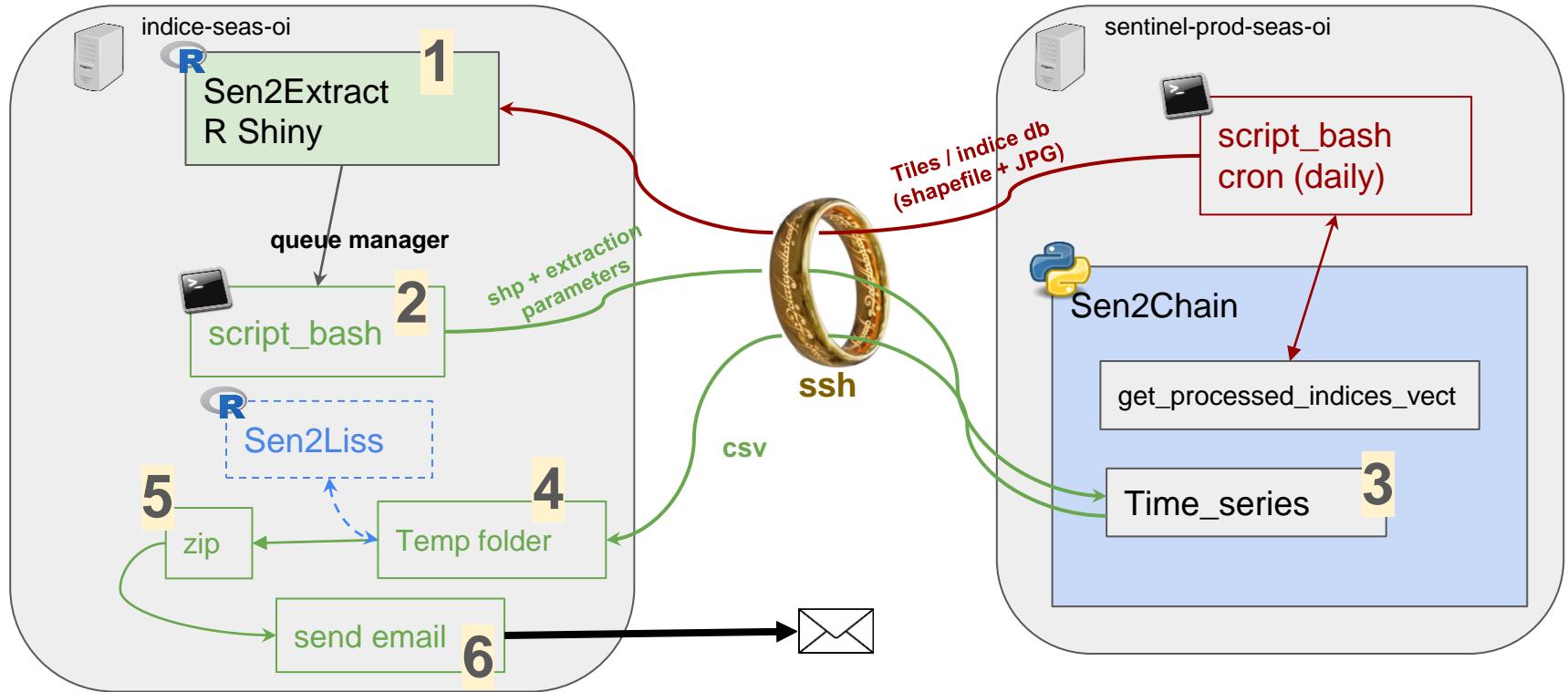
Sen2Extract – Solutions



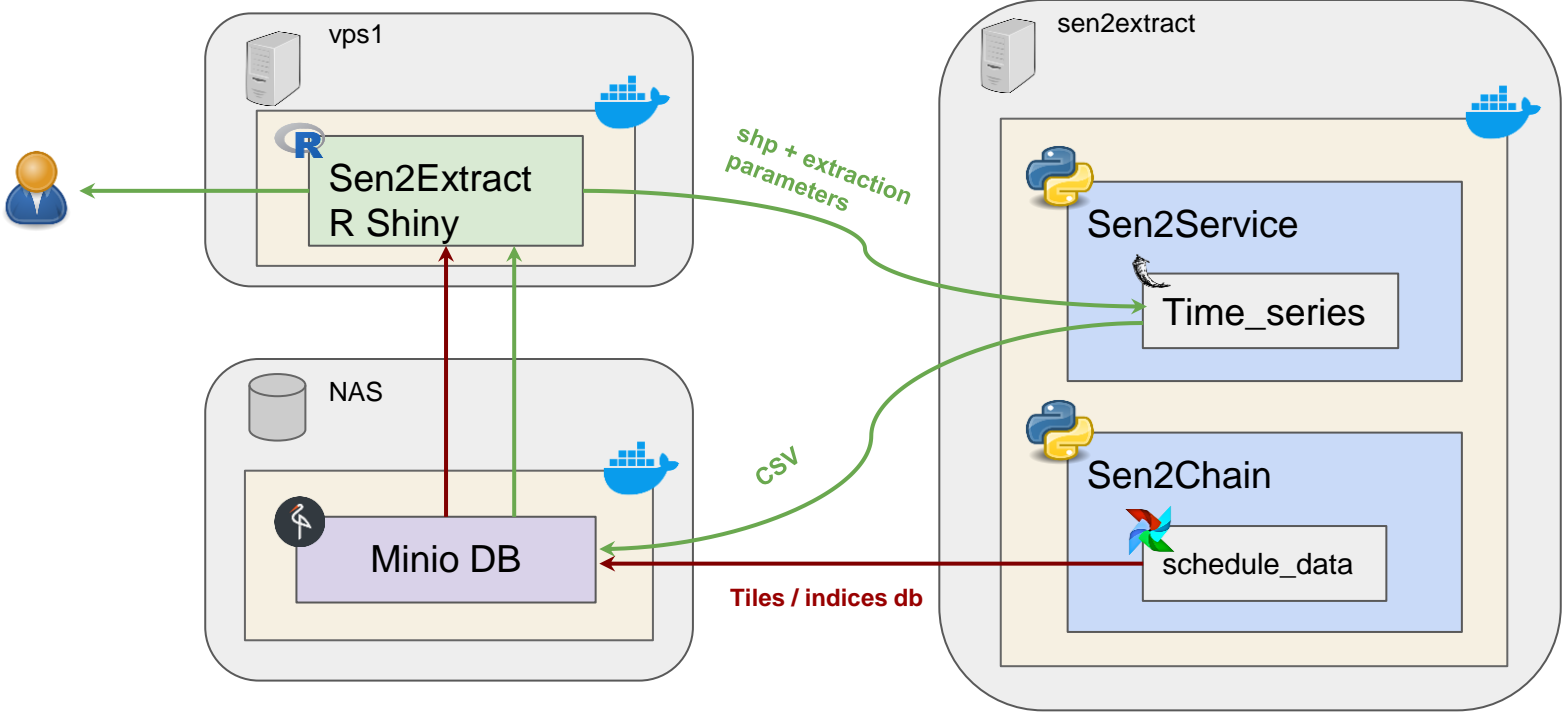
- Resilient Infrastructure
 - Docker
- Accessible Data
 - MinIO
- Transparent Scheduling
 - Airflow
- Scalable Technology
 - Flask



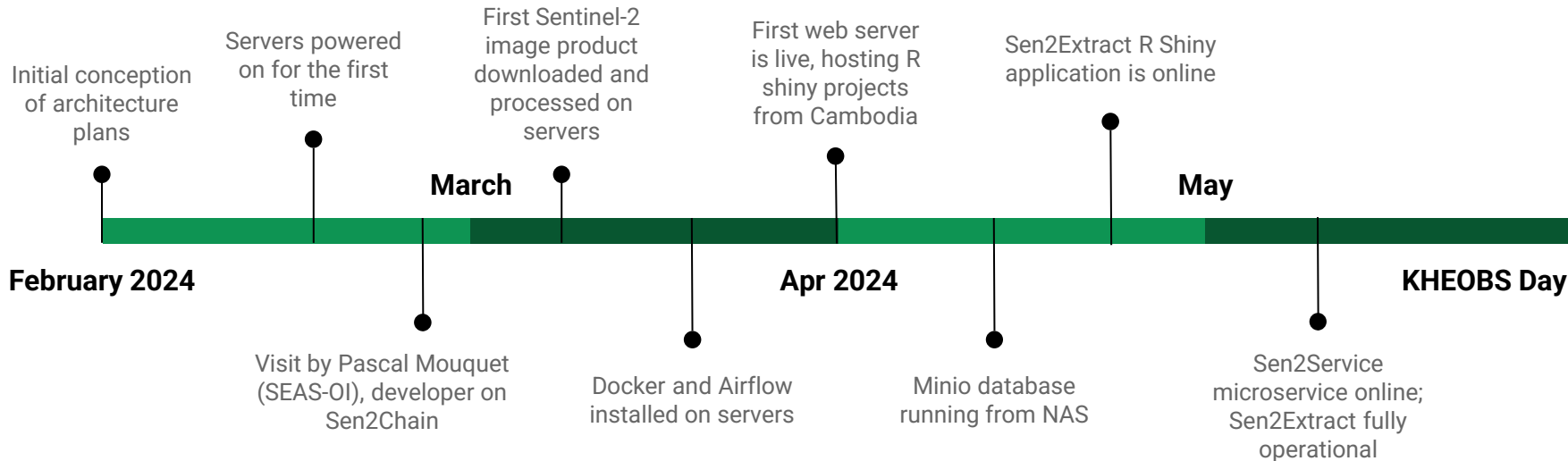
Sen2Extract – SEAS-OI



Sen2Extract – KHEOBS



Sen2Extract – Milestones



Sen2Extract – Acknowledgements



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- Network Management and Server Installation
 - Hongly Kheang, e-Learning Center, ITC
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Sen2Extract – Demo



<https://sen2extract.kheobs.org>