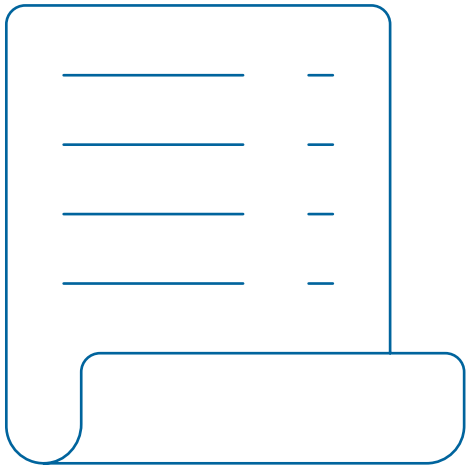
IBM AREMA

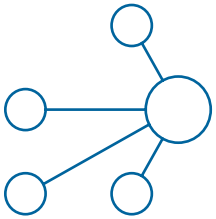
A technology platform to orchestrate cognitive content workflows, agile production, broadcast integration & cloud distribution

Content



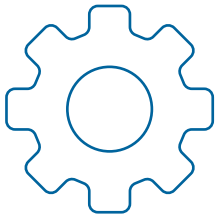
Click to navigate

AREMA usage scenarios



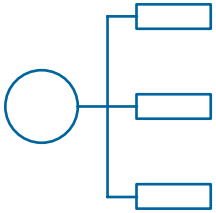
Agile media orchestration

- Media services platform and rule-based technical orchestration layer
- End-to-end file based workflows connecting ingest, production, media asset management archives and multichannel distribution
- > 150 application connectors for transporting, transforming and manipulating media files
- Intuitive workflow builder
- Extensive web-based process and system monitoring
- Media portal for federated search across multiple silos
- Testing automation to facilitate agile and continuous delivery



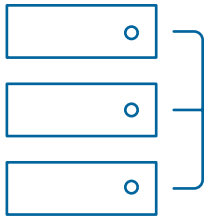
Cognitive process automation

- Content metadata enrichment combining speech to text, visual recognition, OCR, face detection and Watson™ services
- Web-based training environment and cognitive aggregator for domain specific analysis and detection of concepts in video and audio
- Seamless integration of cognitive capabilities into end-to-end media workflows
- Prediction for peak and automated scaling



Hybrid cloud transformation

- Seamless orchestration of end-to-end workflows across on-premise and cloud platforms
- Enabling a microservices-based modular architecture across media & cognitive capabilities
- Lifecycle management across platforms
- Integrating production and archive storage, on-premise & cloud, project parking and PAM
- Fully supportive of DevOps and continuous delivery models
- Hyperscalable



Focus on industries

- Broadcast & media
- Telecommunications
- Automotive
- Security

Agile media orchestration—Introduction

Media enterprises usually are structured in the following layers:
Business applications, such as scheduling and rights management, billing and accounting.

Media applications, such as media asset management systems (MAM, CMS, DAM), news production systems, long form production, play out, archive, web, and so forth.

Media services and infrastructure, such as transcoders, transfer optimizers, Hierarchical Storage Manager (HSM), file systems, video servers, and so on. On the **business side**, business process management (BPM), along with an enterprise services bus (ESB), are the best practices used in order to manage processes that cover several business and media applications, as well as human actors.

On the **technical side**, technological orchestration facilitates integration of all file-based media flows and all diverse media services. It provides specific media and broadcast related features, and offers composed services to upper layers. Technical orchestration enables customers for better resource management and load balancing.

AREMA covers the scope of the technical orchestration layer that takes care of workflows and provides a large set of proven Media Services. Added to this, it also integrates with a set of over 150 existing or integrated third party Media Services, providing extensive monitoring of all processes.

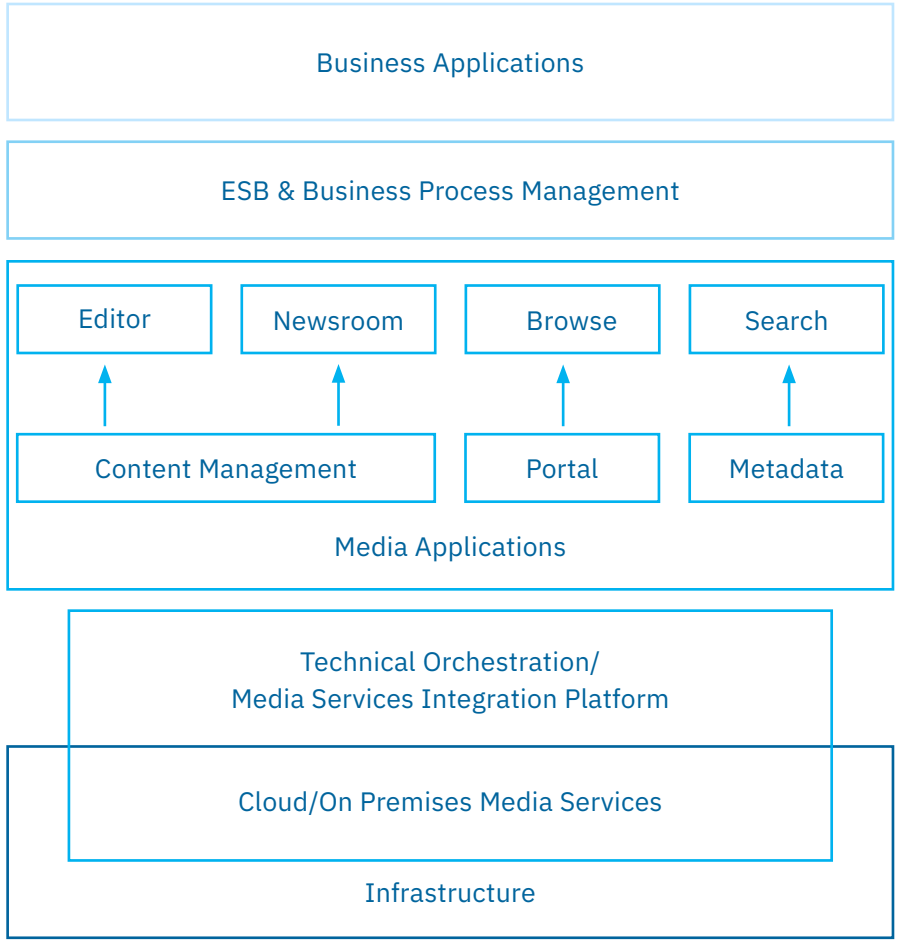
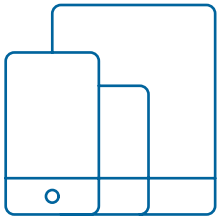


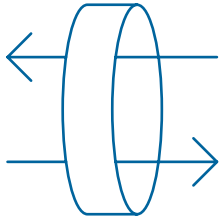
Figure 1: Media Enterprise Application Layers

Agile media orchestration—Benefits



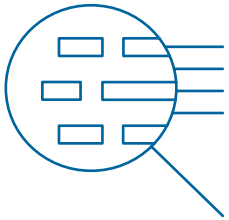
Flexibility:
AREMA enables a high degree of automation to media file based workflows, and is pre-integrated with many video platforms.

- AREMA provides all services required for media file based workflows
- AREMA choreographs workflows with its graphical workflow builder
- AREMA integrates with business process tools like IBM WebSphere® business process manager.



Openness:
AREMA has open interfaces and works with many of the leading media platforms.

- Connects via its web service or FIMS-compliant interface.



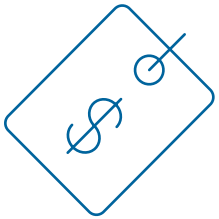
Scalability and stability:
AREMA can be scaled easily to handle very large workloads.

- Built-in mechanisms to ensure high availability and stability
- Minimal manual intervention.

Optimization of storage resources:
AREMA can be used to maintain storage for all MAMs.

- Optimizes the storage usage and its operation.
- Provides specific support for cloud object storage
- Allows hybrid storage environments.

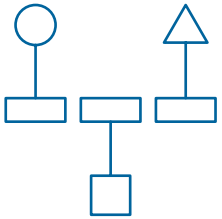
Agile media orchestration—Benefits



Costs

AREMA is built upon standard IT components

- Runs on Linux and Windows
- On bare-metal, virtual machines or Docker, in the cloud or on-premise



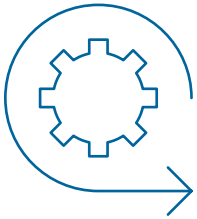
Insight

Dashboards

- Targeted for user groups

Extensive workflow monitoring

- Admins have control



Agility

Customers can create workflows & adapters

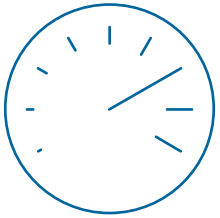
- Own your processes & integrations

Deploy in running system

- Reduce downtimes

Scales from simple to very complex

- Start small but don’t be limited



Speed

Storage aware

- Avoid transfers

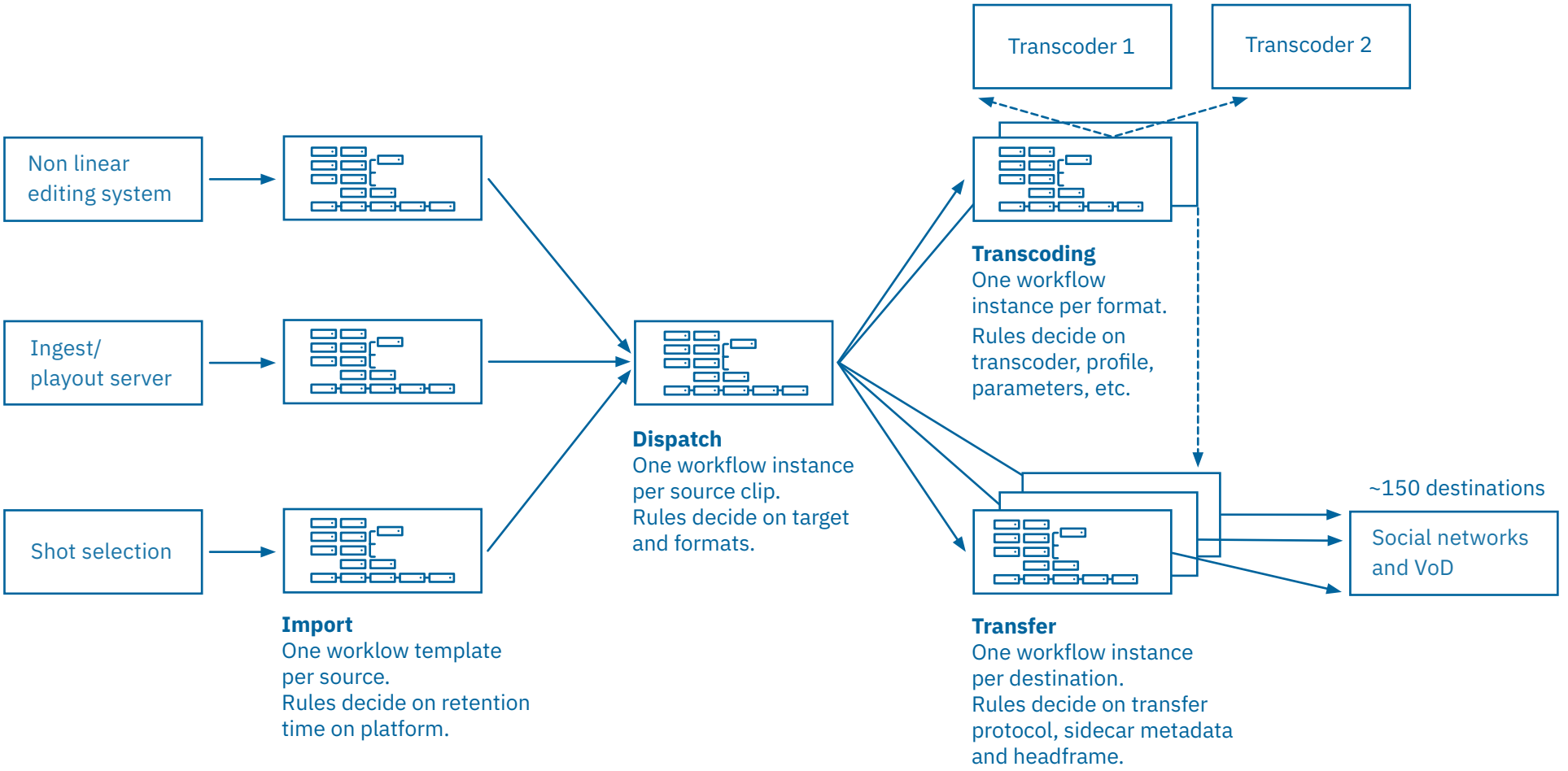
Growing file support

- Avoid serialization

Agile media orchestration—Integrations

Agile media orchestration—Use case

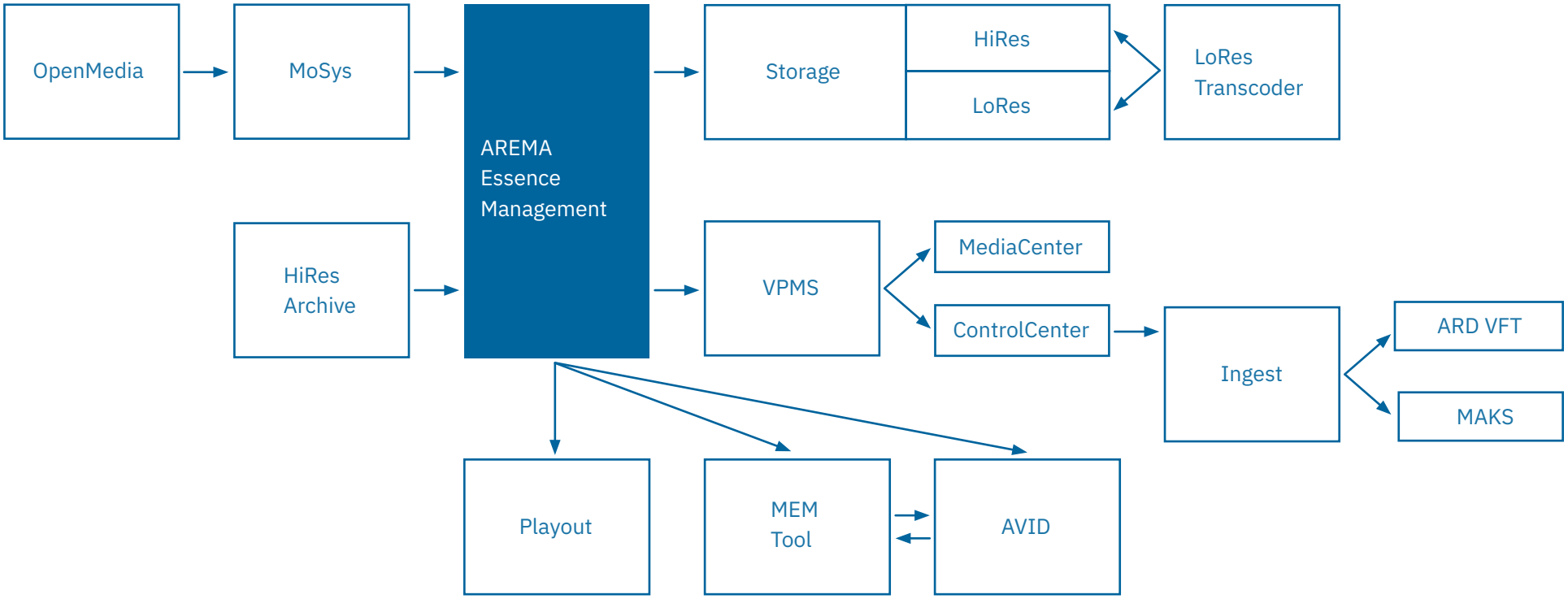
In this use case AREMA is used as media orchestration layer to automate the distribution workflow.



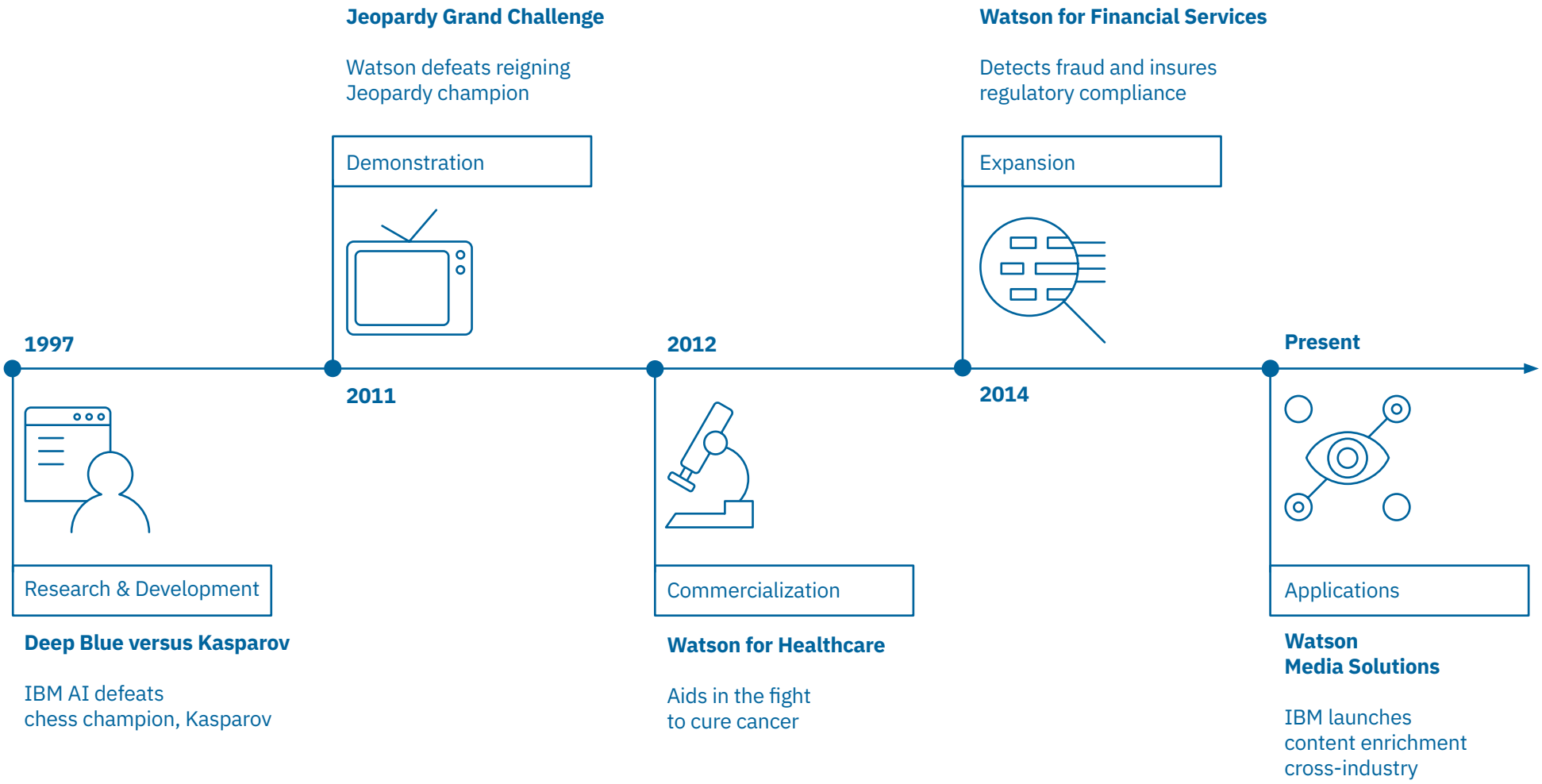
End-to-end file based workflow—Use case

Enterprise-level workflow orchestration (ESB) for media and human processes, interfacing to media creation, production, management and distribution products.

At a public broadcaster in Germany, AREMA is used as a central management system to orchestrate the entire file based media workflow. AREMA connects to all relevant systems from ingest (via production) to playout and archive, either with direct application connectors, or via the media asset management system.



The cognitive era is here and IBM is leading the movement.



Cognitive services for automation

The use of audiovisual information in many different scenarios is increasing exponentially. This huge amount of information can't be processed without automation.
Cognitive services can be used to describe, understand and make use of this information, for example through the automatic generation of highlight clips.
Cognitive services are key to new offerings like recommendation and personalization of content.
Automatic classification of content and matching with personal preferences derived from social media analytics and other data sources are technology enablers for this.
But also the processes around these cognitive services need to be orchestrated and automated to gain efficiency.
AREMA is automating these processes in a flexible and scalable way.

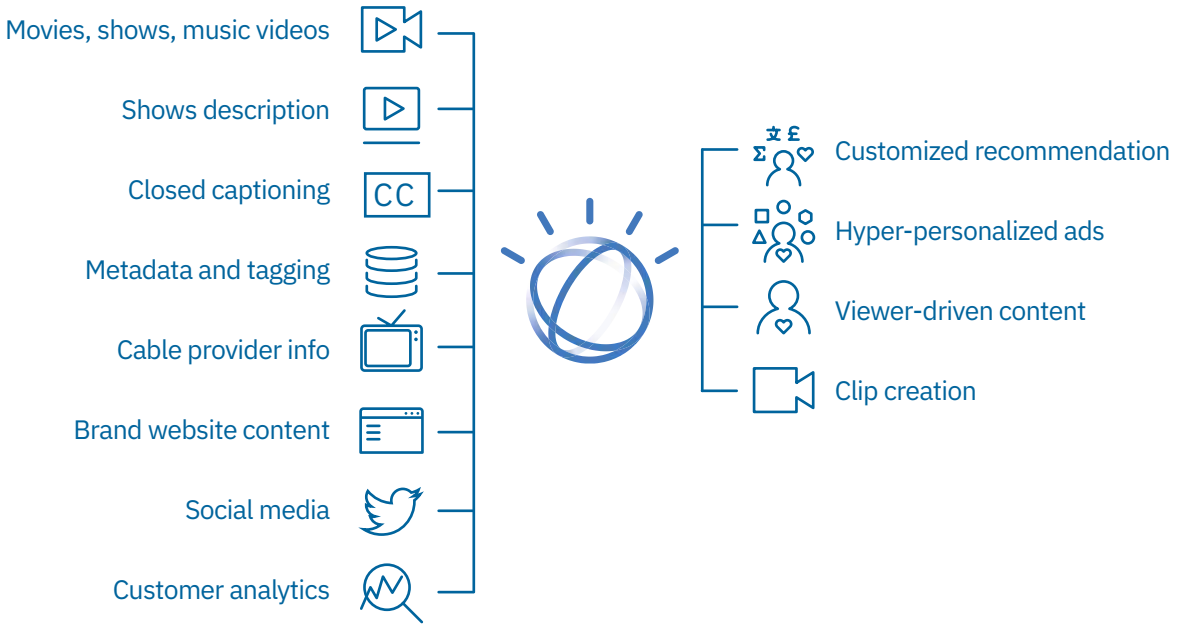


Figure 2: Watson can understand various data sources to generate useful applications

AREMA automates cognitive processes

Cognitive processes combine services and data sources
Today, cognitive services are able to understand, reason and learn audiovisual content. Single services are specialized and focus on one specific information or data source. This is why the results of single services are generic and very often not valuable, since they are lacking the overall context. To generate contextual metadata, the combination of various different cognitive and analytical steps and access to additional data sources can be used to increase relevance and accuracy of the results. This requires a multitude of workflow steps dealing with media processing, transfers and aggregation of cognitive services and the respective results.

Cognitive process automation with AREMA
AREMA is designed to orchestrate and automate cognitive processes with an intuitive workflow builder and an aggregator to combine the results and generate meaningful and accurate annotations.

AREMA is cognitive service agnostic
AREMA is open to support not only IBM® Bluemix APIs and Watson services but also third party services in a best of breed approach.

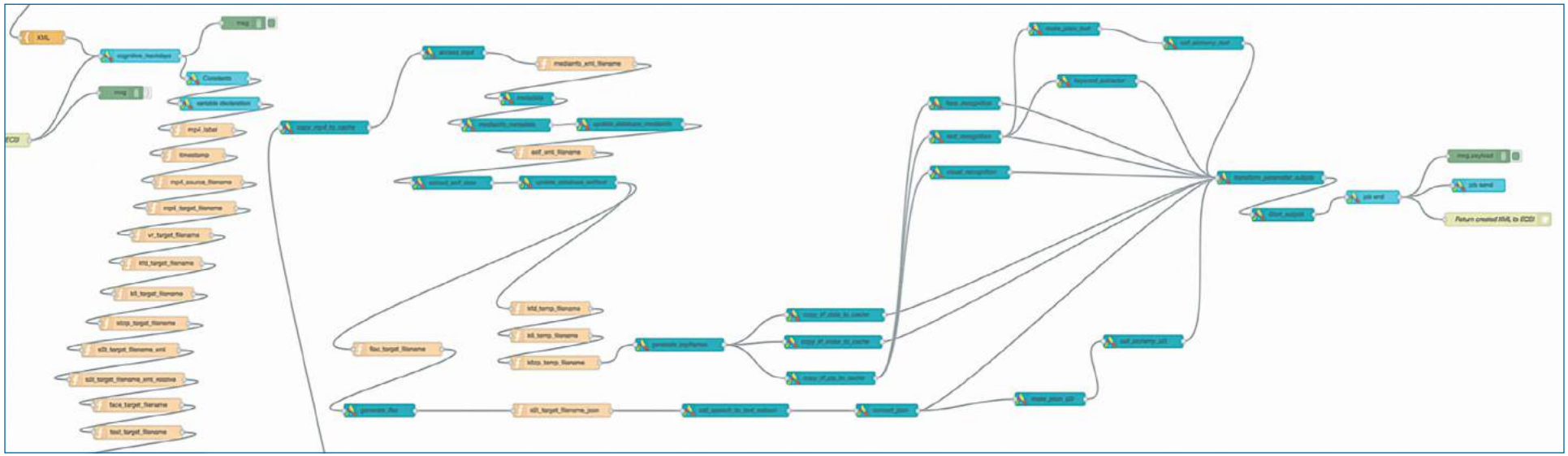


Figure 3: Cognitive workflow built with the AREMA workflow builder

AREMA streamlines the training of cognitive services

To increase the accuracy of the results cognitive services can be trained on a specific domain. This training requires a set of examples that need to be classified as positive or negative, right or wrong.

This training process is usually a task that needs human intervention, is time consuming and repetitive.

While the decision for right or wrong can‘t be automated in this training context, the workflow can be optimized.

AREMA provides a cognitive training portal with a user friendly interface to manage and automate the processing of the training files and to create taxonomies.

This tool is integrated into the annotation workflow to dynamically enrich the training data with freshly ingested content.

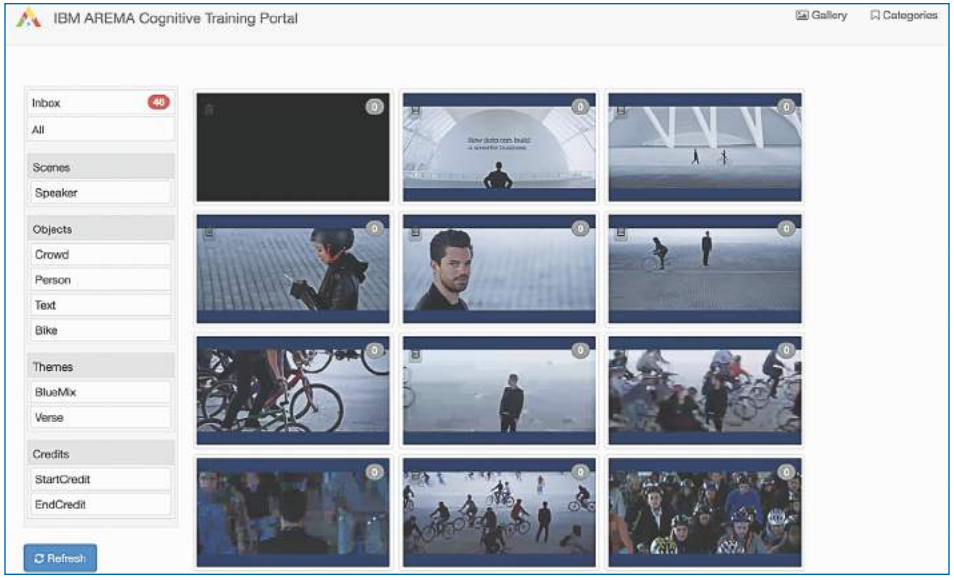


Figure 4: Screenshot AREMA cognitive training portal

Cognitive aggregator for timelines

With the AREMA cognitive aggregator the results of cognitive services can be captured over a period of time and put onto a timeline to understand the development and changes over time. The combination of timelines for different services allow to generate aggregated information to get more meaningful and accurate results.

The AREMA Cognitive aggregator helps with creation of domain specific rules and concepts based on multi-modal analysis results.

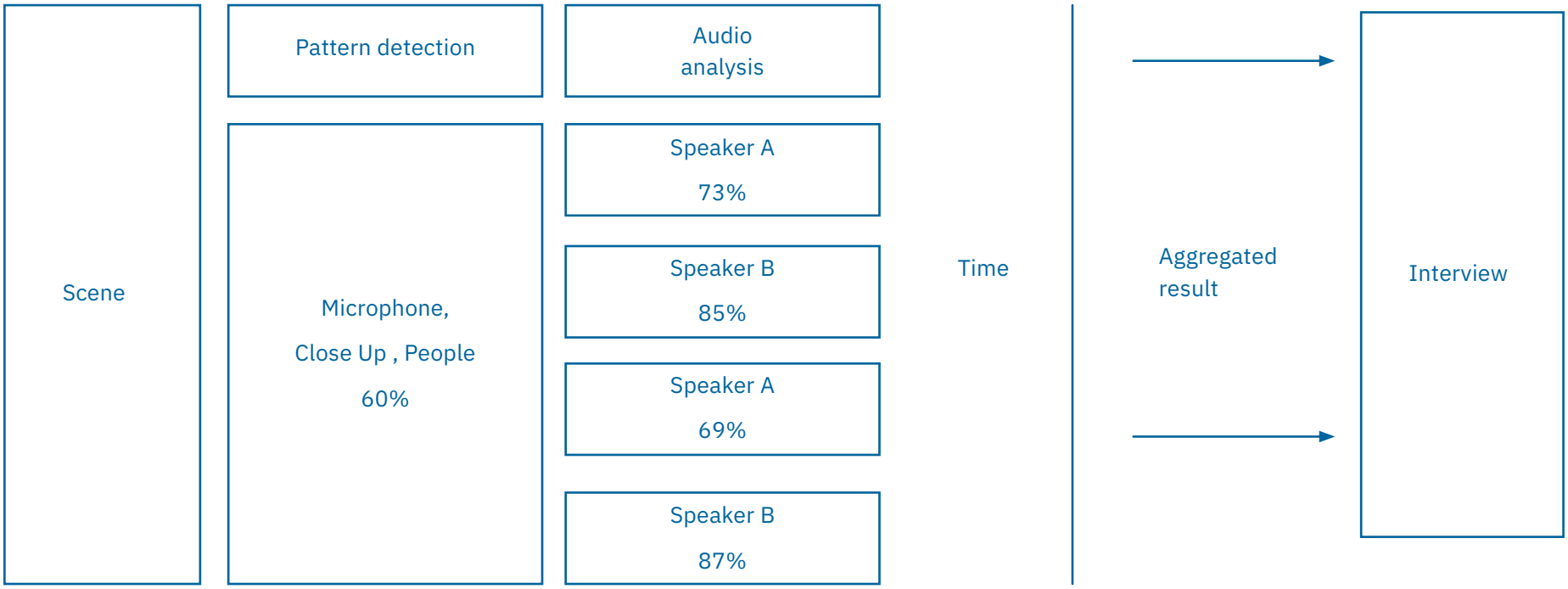


Figure 5: Interview as a result of an aggragated analysis

Content metadata enrichment—Use Case

Automatic content enrichment of 40+ years of soccer content

- Annotation by using a portfolio of cognitive solutions, with AREMA orchestrating all workflow steps required:
  - Audio: Speech-to-text/transcript
  - Audio: Speaker detection
  - Audio: Atmosphere (such as cheers & whistles)
  - Video: Angle/camera & content detection
  - Video: Face & object detection
- All these services were trained on the specific domain.
- Sharpening of results by knowledge of domain and creation of timelines.

Link with game- and player- data

- Optimize content analysis and search based on game and player statistics
- Guided search

Persona-based user experience

- Personalized discovery, suggestions, design, projects

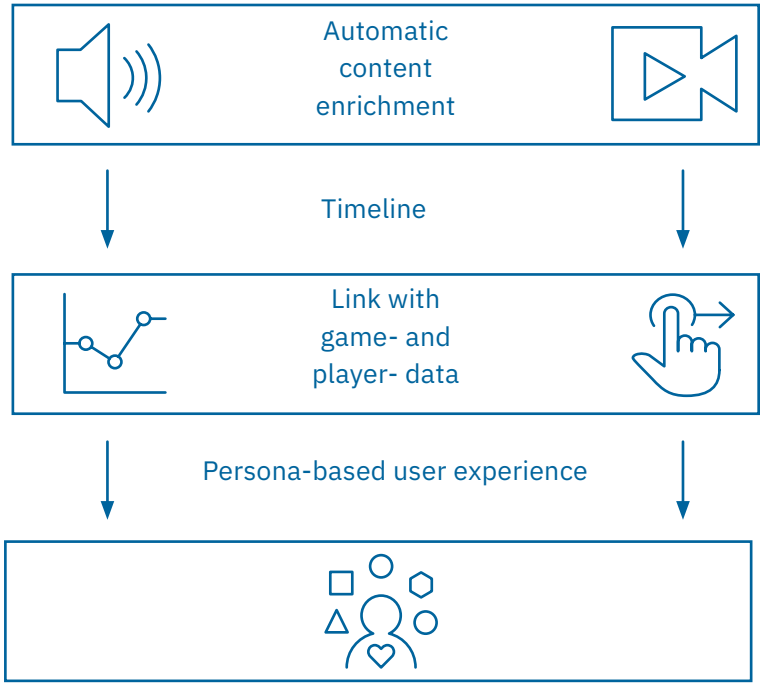


Figure 6: Illustration of the use case results

Automating cognitive processes with AREMA

Automated creation of subtitles for live events	• Speech2Text/also for live streaming content with very low latency
Automated annotation of archive content	• Multi-modal metadata enrichment by using domain trained cognitive services
Faster news production through better search	• Cognitive search optimization
Automated creation of cast list	• OCR for closing credits
Automated scene selection and highlight creation	• Semantic scene detection, image and face recognition, audio mining
Prediction for peak and automated scaling	• Based on the results of the predicted amount of viewers or users through analytical and cognitive services AREMA can scale the required processing power in the cloud automatically and dynamically.

Hybrid cloud transformation introduction

Media distribution and production architecture, technology and workflows have evolved typically in two types of silo, covered by specialized applications, in most media organizations. These are functional and content silos.

Functional silos

Within each functional silo, independent operational workflows and processes are generally established to meet the business objectives. Between each silo there is usually a degree of hand-off and a limited level of technical and operational integration.

Content silos

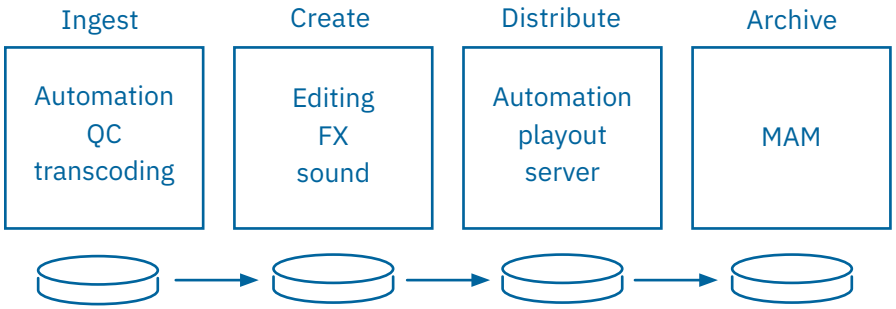


Figure 7: Illustration of functional silos

Content silos are linked to the functional silos as many organizations' output is based on content type and delivery platform. However, the output is usually from the same sourced content. Production teams often produce for one platform or another that is, linear, digital or social, not all. In addition, production teams often focus on one content type such as short-form and long-form, factual and non-factual, scripted and non-scripted.

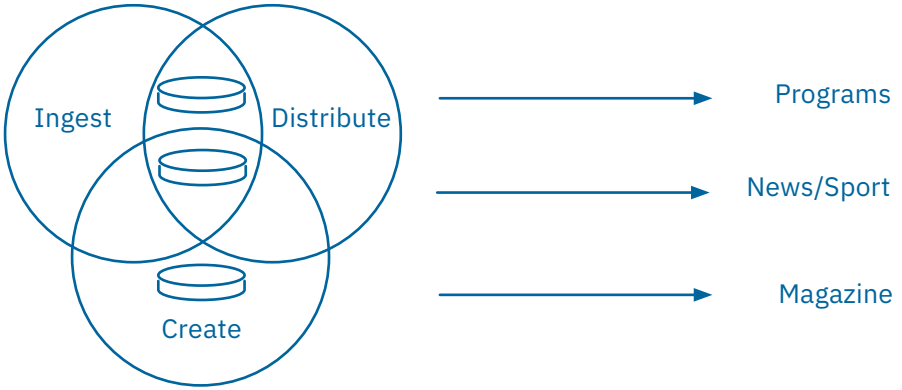


Figure 8: Illustration of content silos

Hybrid cloud transformation—Introduction

The silo architecture leads to operational issues and challenges

- Multiple unconnected metadata (data) sources
- Difficult to source and discover content and the associated rights
- No single source of *truth*—lack of consistent metadata
- Multiple content stores such as video, audio, images
- Duplication of effort and content production by separate teams
- Repetition of processes across separate silos
- Multiple content formats leading to transcoding overheads
- Inefficiency in moving content from one silo to another
- Limited access to content and data
- Complex workflows to support multiple outputs
- Difficult to maintain style and output consistency
- Limited ability to scale and flex according to demand and changing business needs
- Difficult to maintain external structured, unstructured and cognitive data sources to provide recommendations

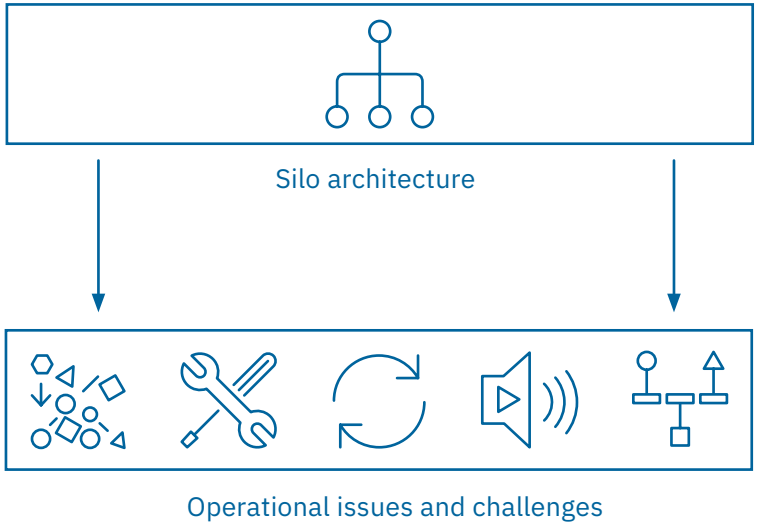


Figure 9: Illustration of issues and challenges of a silo architecture

Hybrid Cloud Transformation—Introduction

Agile platform as a service

AREMA helps to overcome these silos by replacing monolithic architectures with an orchestration of modular services in an integration platform based on business needs. This platform is an arrangement of microservice based architecture and allow the intelligent use both of on premise and cloud based components, composed by agile development and continuous delivery.

The microservices approach leads to very good scalability where an application itself does not need to grow but just the functionality carried out by the service, for example, transcoding.

By using cognitive methods working on both audience insights and content distribution this system can be scaled automatically based on peak prediction, and grow in an organic way.

Automation and unification of content chains

AREMA offers a workflow automation which takes into account the media content, it's rights and royalties and technical and descriptive metadata, but also the system infrastructure, the location of content and systems and the distribution channel characteristics. This can be enriched with cognitive capabilities to monitor the system infrastructure or extend the metadata footprint of content and audience. This is needed to prevent multiple storages, unnecessary transcoding, or transfers while extending the overall environment capabilities in distribution channels, content providers and monetization.

Shift from vertical to horizontal

Whereas specialized applications are still needed for specific business requirements, all of them share functionality both on application and on infrastructure layers. Those central functionalities have to be shared and chosen intelligently from cloud and on premise service repositories. This allows the rapid change of solutions on the presentation layer side, such as asset management, without the need to recreate the infrastructure and redo all processes.

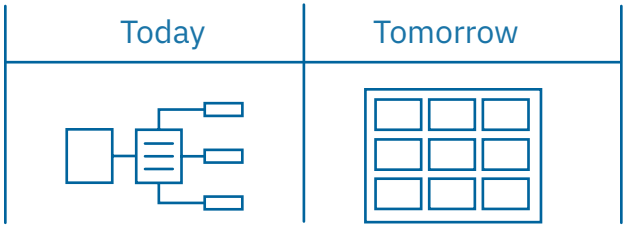


Figure 10: From monolithic structures to microservices

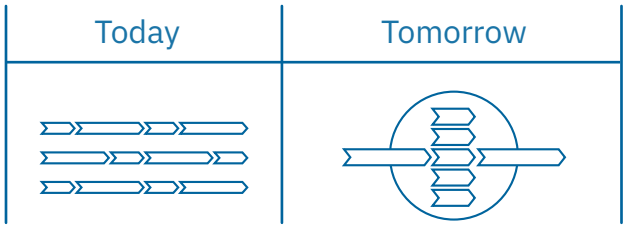


Figure 11: From separated production chains to integrated content chains

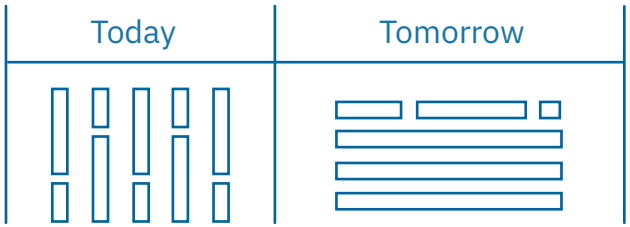
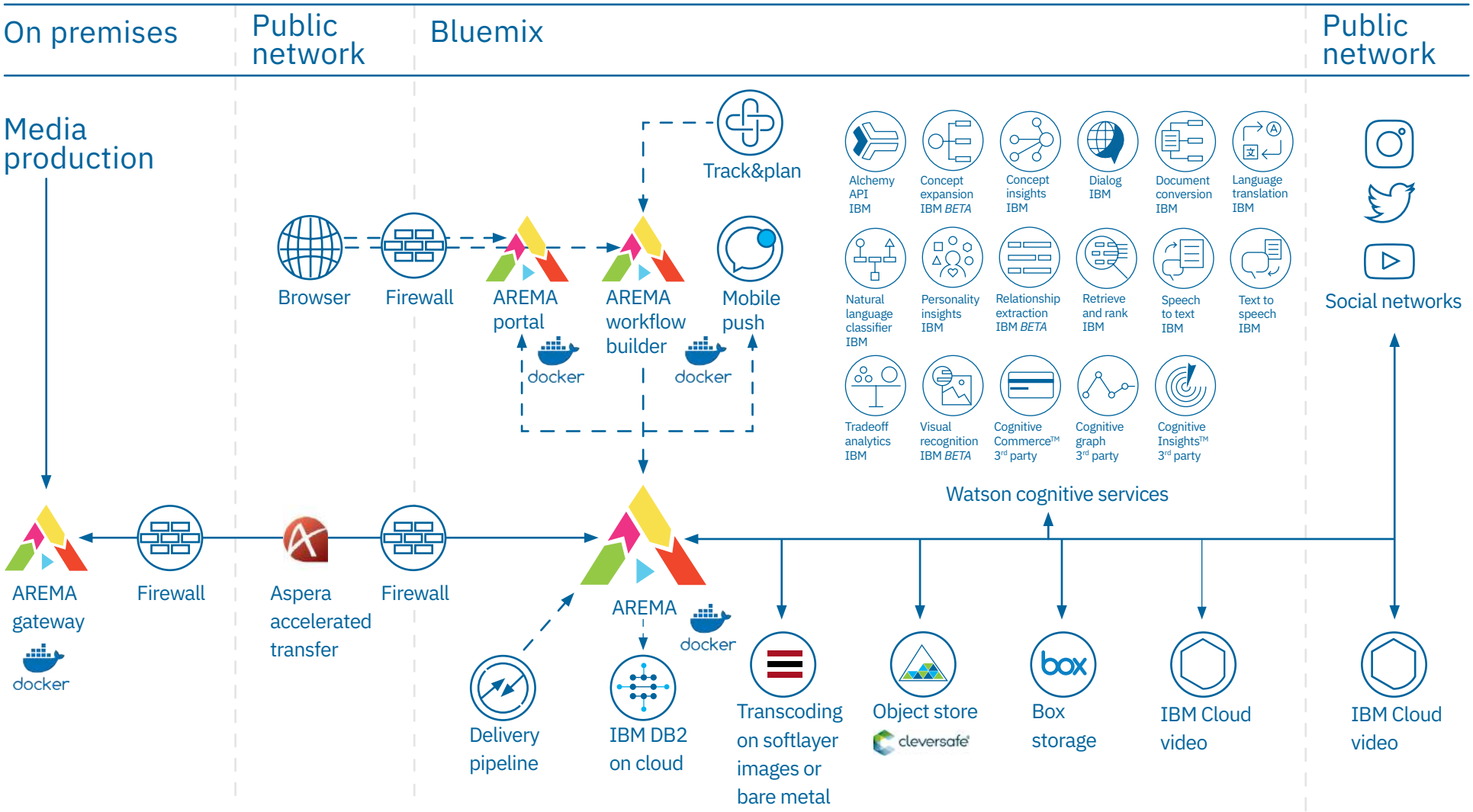


Figure 12:From specialized applications to functional layers

AREMA in the cloud



Hybrid cloud transformation with AREMA

On the storage management side, AREMA offers advanced media essence related features:

- Deep integration with object storage based solutions like AWS or COS
- Multi-tier storage management combining disk, object storage and tape
- Creation of a unified storage bucket behind multiple MAMs
- Cache management based on metadata and not just filename/-path/-extension
- Automatic housekeeping for transfer destinations
- “Timecode aware cache:” caching of partial restore segments so that new requests for a segment may use a previous segment still on disk location as source rather than the full file on tape
- “Look ahead:” look ahead in the job queue to retrieve a larger segment in case there are more partial file restore requests in the queue
- Partial file restore from tape (and partial file copy from disk) for MXF, AVI/MPEG and WAV files
- Usage of linear tape file system (LTFS) or IBM Tivoli Storage Manager (TSM) to control tape drive and tape library. Active management of more than one drive/location/pool.
- Integration of Oracle Frontporch DIVArchive (DIVA) for migration and storage bucket usage

In conclusion: AREMA manages and organizes the whole essence lifecycle.

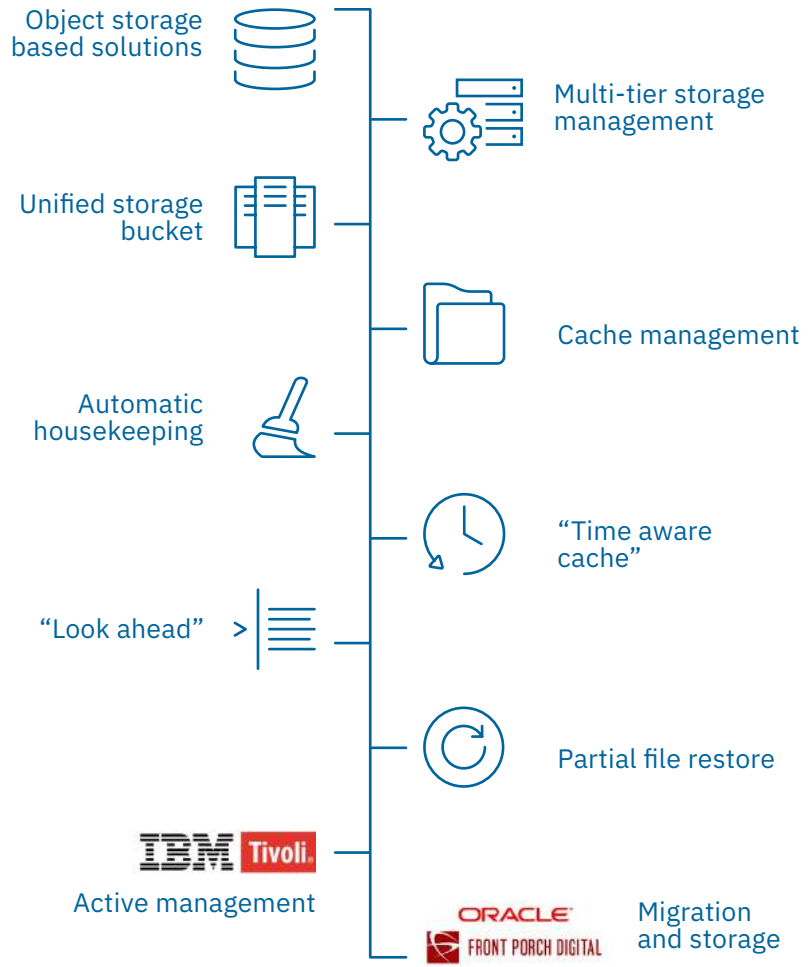


Figure 13: AREMA media essence features

Hybrid cloud transformation—Benefits

- The microservices approach leads to very good scalability where the application itself does not need to grow, but only the functionality carried out by the service. For example, transcoding.
- Essence management abstracts the underlying hardware infrastructure, and allows hybrid and cloud storage architectures. This prevents multiple storage silos, unnecessary transcoding or transfers, and extends the overall environment capabilities to support distribution channels, content providers and monetization.
- Independence from storage, and especially from archives of MAM/CMS, which are:
  - Often proprietary
  - Usually support only one segment of the broadcaster (such as playout, news, online)
- Unified content chains—from acquisition through to production and distribution—allow faster adaptation to changes, and save time and money.
- Access to essences as a service provides open, flexible workflow integration
- Access to essences independent of applications:
  - Different applications can use the same (archived) essences
  - Essence management layer is thinner than MAM/CMS and less error prone
  - In case of a disaster direct/alternative access to essences

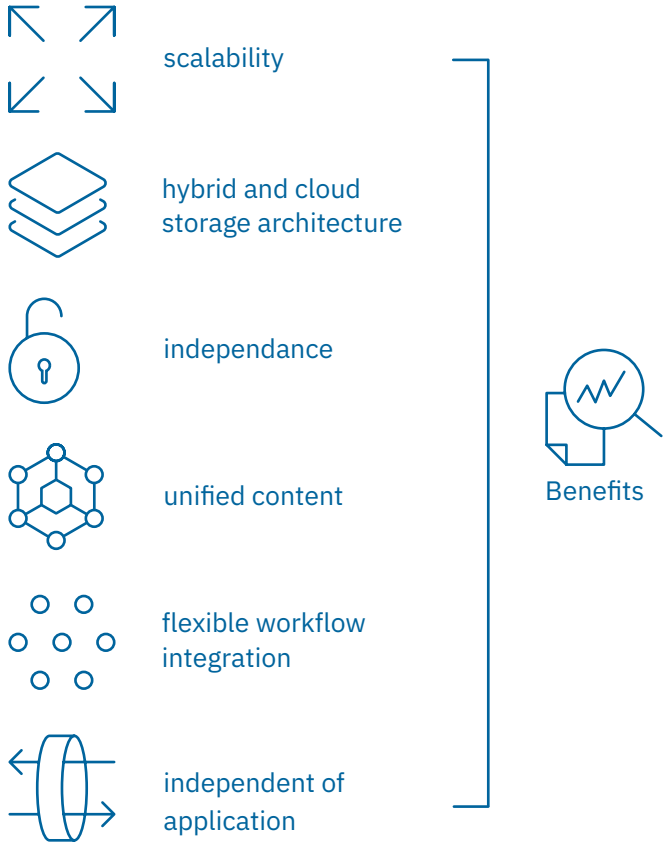
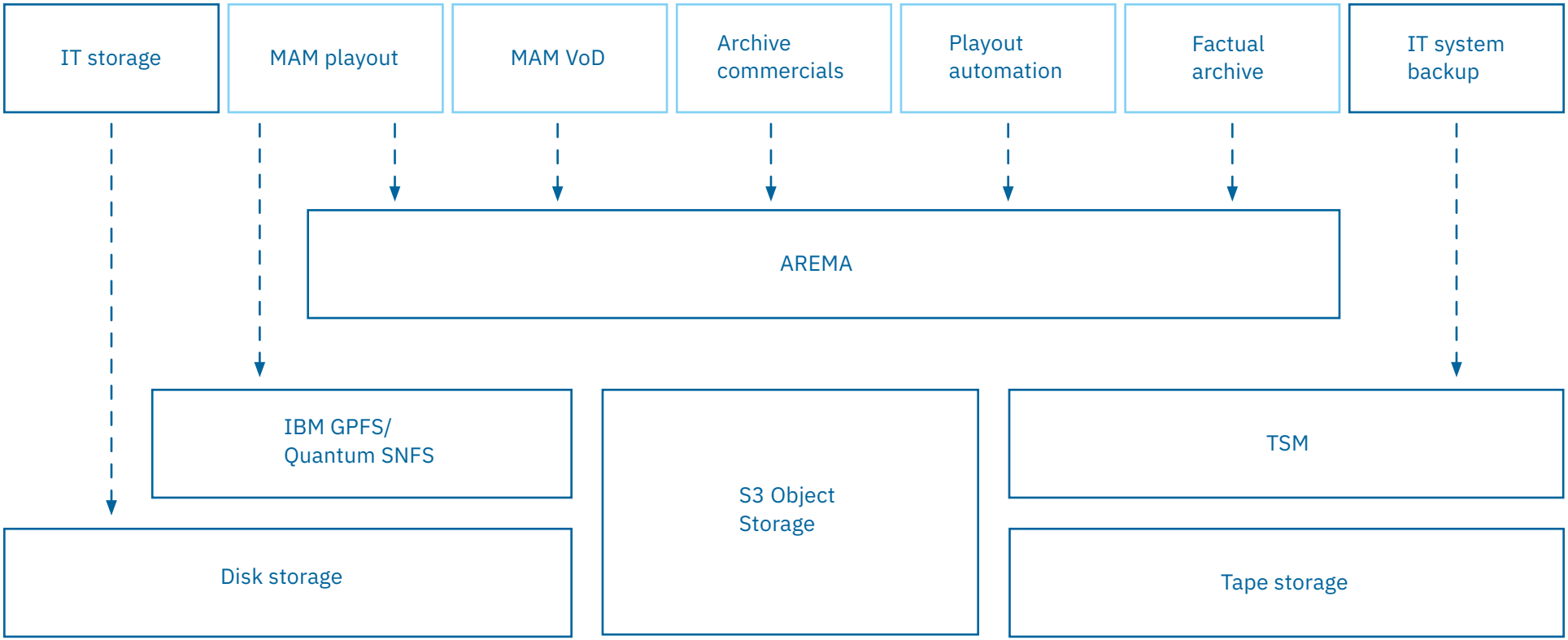


Figure 14: Cloud transformation benefits

Hybrid cloud transformation—Use case

Enterprise-level archive for multiple (multi-tenant) applications including media-aware resource management and partial file restore:



AREMA for broadcast and media companies

IBM AREMA—Next generation media production platform for the cloud and cognitive age

Media industry players are under significant pressure to adapt to changing viewing behavior, new global competitors, and disruptive forces to the traditional industry value chain. Media players need to transition to new platforms to achieve the speed of change required, and to leverage cloud and cognitive technologies to achieve competitive advantage.

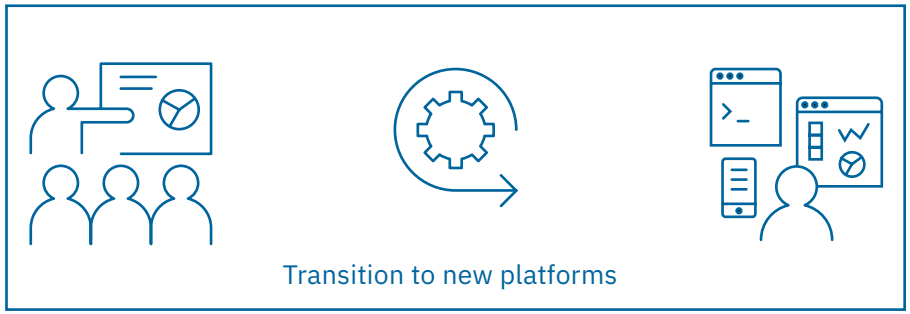
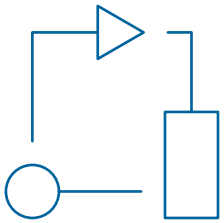


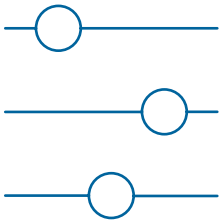
Figure 15: Transition to new platforms

AREMA for broadcast and media companies

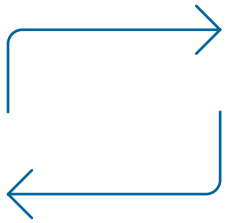
IBM has significant technological capability and many years of experience, combined with unique products and assets. We help media players transition so they can succeed in the next generation media business. Through our AREMA platform, we enable the following opportunities:



Agile media orchestration
With AREMA, media players can orchestrate media-file centric workflows end-to-end from ingest through to production, distribution and archiving. This is achieved in an increasingly complex environment with full transparency and the ability to adapt to evolving needs.



Cognitive process automation
AREMA allows cognitive capabilities from leading video, audio and text analytics to be added seamlessly into existing media workflows. It combines different analytics technologies to provide a training environment in order to achieve the performance and accuracy required for productive use. This allows unprecedented levels of workflow automation while maintaining full transparency and manageability.



Hybrid cloud transformation
Transformation of platforms into the new cloud age requires a hybrid model that integrates legacy environments with new cloud-based services. AREMA provides an end-to-end framework to achieve this integration seamlessly to provide the best of both worlds and to minimize risks.

AREMA for telecommunications

Today, most telecommunications companies are offering additional video streaming and VOD services to their customers.

All media companies need to establish media workflows and platforms that are flexible, scalable, and can be highly automated. AREMA allows them to be integrated into an increasingly complex environment with full transparency and the ability to adapt to evolving needs.

AREMA allows the seamless addition of cognitive capabilities for offering personalized recommendations and providing new insights about the audience. Different analytics technologies are combined, and a training environment is provided in order to achieve the performance and accuracy that is required for specific use cases.

Providing content for streamlining platforms in the new cloud age requires a hybrid model that integrates legacy environments with new cloud-based services. AREMA provides an end-to-end framework to achieve this integration seamlessly to provide the best of both worlds and to minimize risks.

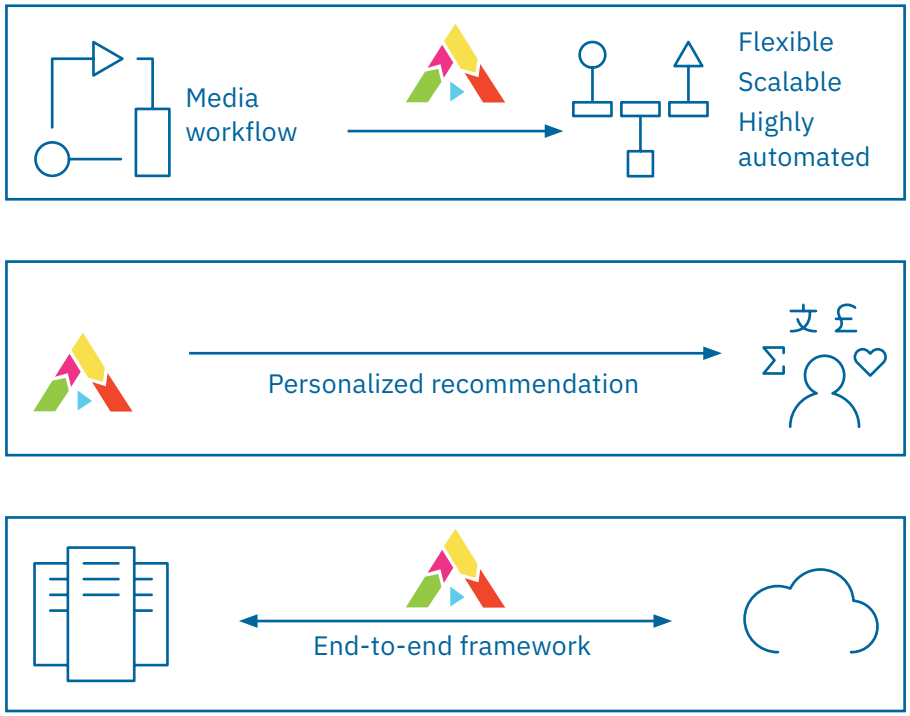


Figure 16: AREMA use cases

AREMA for automotive and industrial

Cameras can capture large amounts of information easily, and are used as highly complex sensors in many IoT scenarios, such as testing ADAS/AD. But audiovisual signals require very sophisticated analytics and are difficult to handle in today‘s workflows.

AREMA supports various automotive formats (ADTF, MDF or rtMAPS) that are used to extract video and metadata from DAT files recorded via in-car cameras and Controller Area Networks (CAN bus). This enables the building of workflows to capture, store, modify and execute video data synchronously with other such testing data. It also supports functions like CAN message filtering or GPS message interpretation.

AREMA connects to and integrates cognitive services for trainable advanced analytics, such as IBM Watson and IMARS.

At the same time, AREMA manages storage environments by integrating on premise storage for production and archiving, as well as off premise cloud object storage environments.

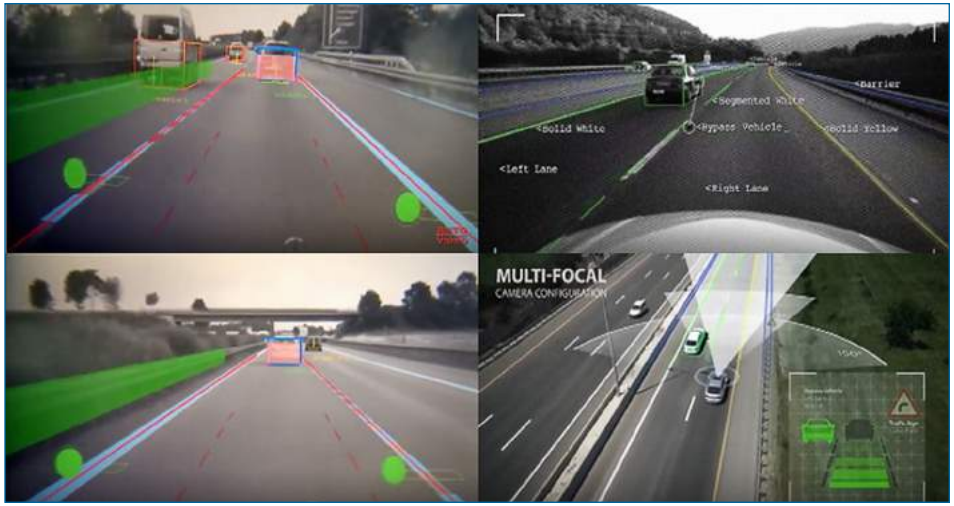
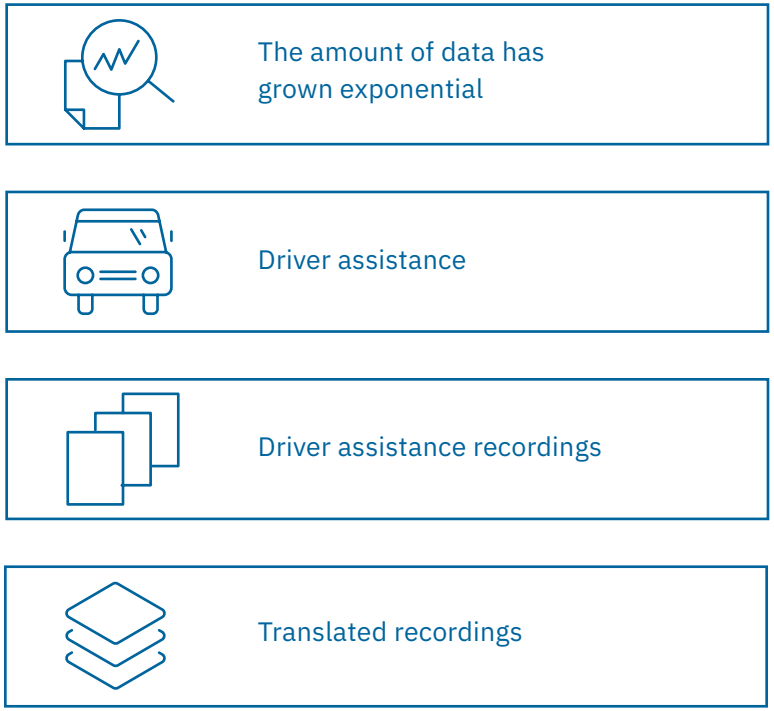


Figure 17: Video and Data overlay

AREMA for automotive and industrial

- The amount of data processed in a vehicle has grown exponentially. In addition to the traditional (such as ECU and sensors) and connected vehicle data, high-resolution camera, lidar and radar systems generate a significant rise in logging data for validation and training purposes. During logging the sensor data is usually stored in formats such as ADTF, MDF or rtMAPS with entropy-based—means lossless—compression, so that the original data can be reconstructed later on.
- Advanced driver assistance systems have to be validated and trained against a set of different conditions and regional-typical assets. Recordings could add up to petabytes in one year.
- All these recordings must be categorized, stored, cut, processed, transcoded and translated into other formats in order to use them efficiently in R&D and testing.

AREMA helps manage and orchestrate all recordings and the related processes.



AREMA for government and security

Video is also used in many security and surveillance situations, with large amounts of video data being captured from body cams, surveillance cameras, or witnesses with mobile devices.

This data needs to be stored and redacted to generate actionable insights. The AREMA platform is built to prequalify, process and manage the storage of such vast amounts of video data.

By connecting to cognitive services and combining multiple advanced analytics solutions in one single workflow, AREMA allows for the gathering of vital information.

Forensic multimedia portal
IBM AREMA supports media sighting by automatic consolidation, cognitive analysis, and presentation.

By combining existing solutions from the video and broadcast environment, portals and analytics solutions, different types of media data are used (audio, video, and image). The data is then screened for potential threats and consolidated into uniform formats. Afterwards, these can be enriched by cognitive methods, such as contextual information or facial recognition. Even speech analysis is possible with AREMA orchestrating metadata.

Figure 18: Video Surveillance material

In the end, the media and the metadata are presented for viewing in a standardized browser based user interface.

AREMA—a scalable and flexible solution

AREMA can be used in small- and large-scale projects due to its service-oriented architecture.

From the automation of specific tasks (like testing or transcoding) up to the automation of a full workflow, from ingest to multichannel distribution, AREMA can orchestrate workflows, integrating with all required media applications.

On the infrastructure side, the same principle applies. AREMA can handle storage infrastructure integration with simple backup devices or cloud storage, and scale up to complex hybrid enterprise storage environments.

AREMA provides scalability and flexibility across those two dimensions.

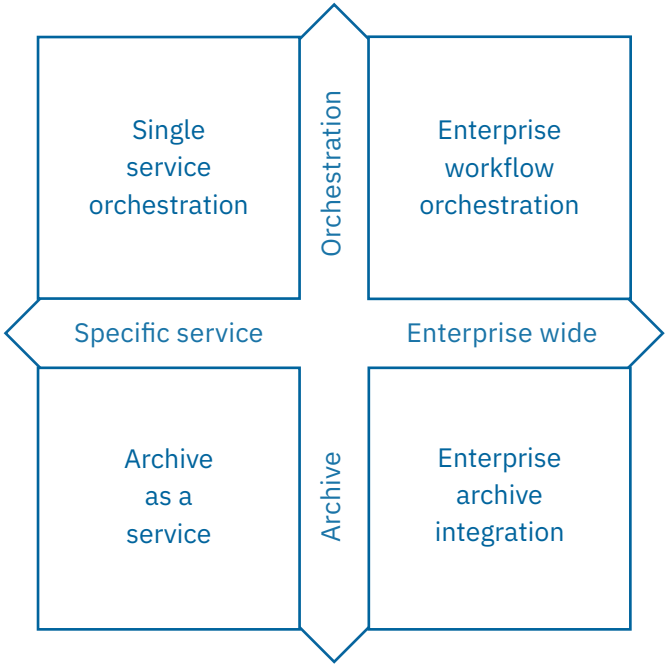
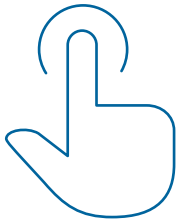


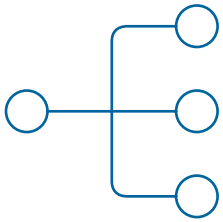
Figure 19: Dimensions of Scale and Complexity with AREMA.

Functional overview

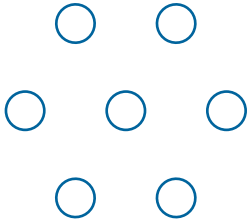
IBM AREMA is a format agnostic media transaction engine that runs over a distributed architecture.



Media transaction engine
Agents carry out specific tasks to manipulate, transform and transport essences. Tasks are defined as jobs. A job-controller (asynchronous media processing engine, or AMPE) controls and monitors the execution of jobs—including ranking and priority. Throughput and transaction speed can be increased by running parallel instances of agents.

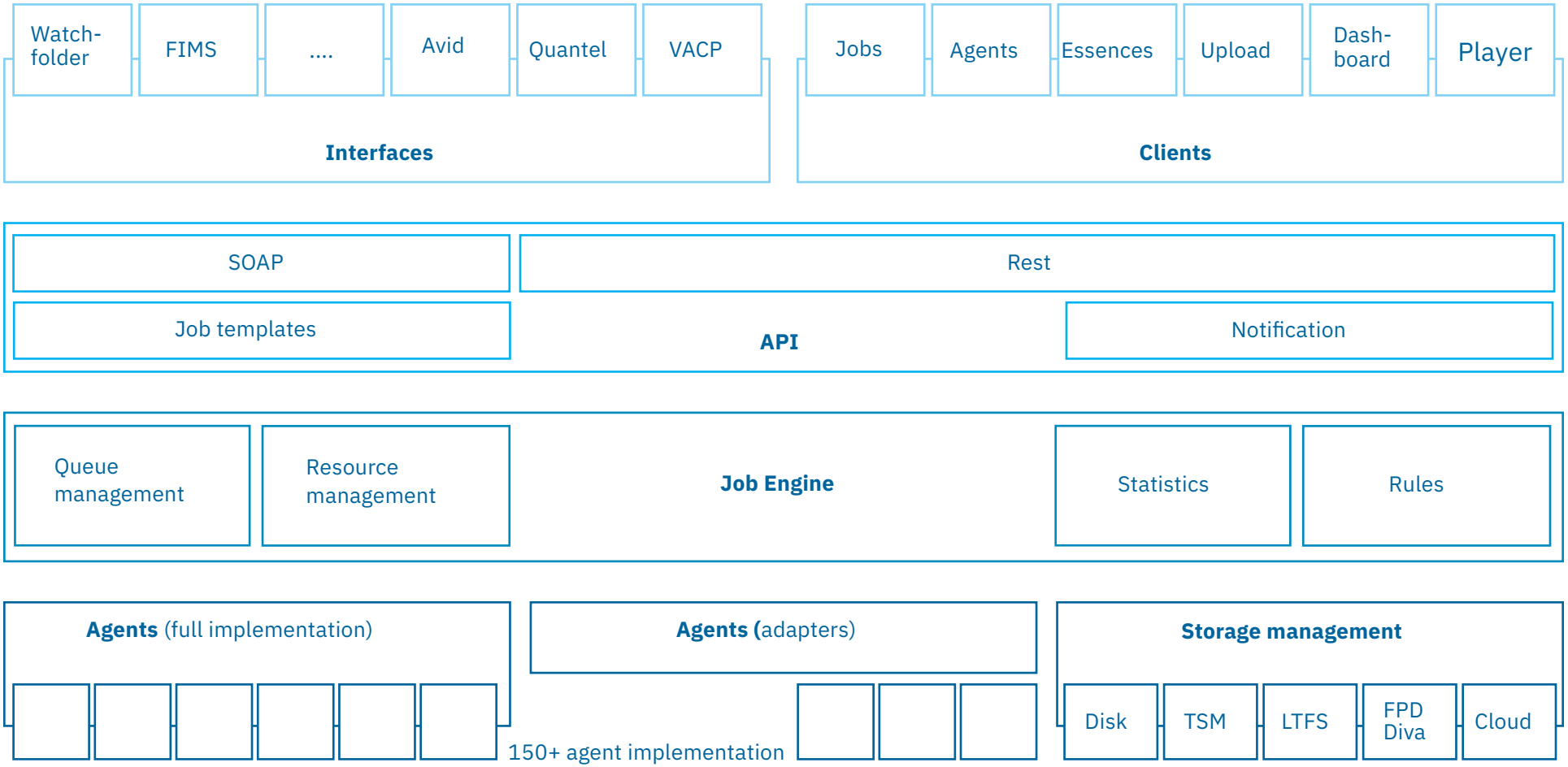


Distributed architecture
Agents can run on multiple hardware units and different operating systems. AREMA server can be distributed over multiple locations.
Server, database and TSM can all run on different hardware units.



Format agnostic
AREMA is fundamentally independent of formats, with agents being specific only with respect to their format functions.

Functional overview



AREMA workflow builder based on Node-RED

AREMA offers a fully graphical workflow builder, based on Node-RED, that uses the flow-based programming paradigm. This provides a flexible, modular, scalable, reusable workflow that is easy for anyone to understand.

The creation of a workflow executed by the AREMA engine is modelled along a *flow* of nodes.

In addition to nodes already included with IBM AREMA, any of the hundreds of nodes for Node-RED can be used. Additionally, custom nodes can be developed using JavaScript language. As a result, any callout or lookup can be added to the workflow creation, in addition to any reporting.

During workflow creation, multiple sets of test input parameters can be attached to the workflow and the result can be sent to AREMA for execution. Ad-hoc and batch workflows can be created, launched and monitored directly from the editor.

Multiple instances of editor—and runtime—instances can be installed on different servers and also on client PCs, including the distribution as docker container.

This provides huge flexibility in terms of redundancy, load balancing and development environments.

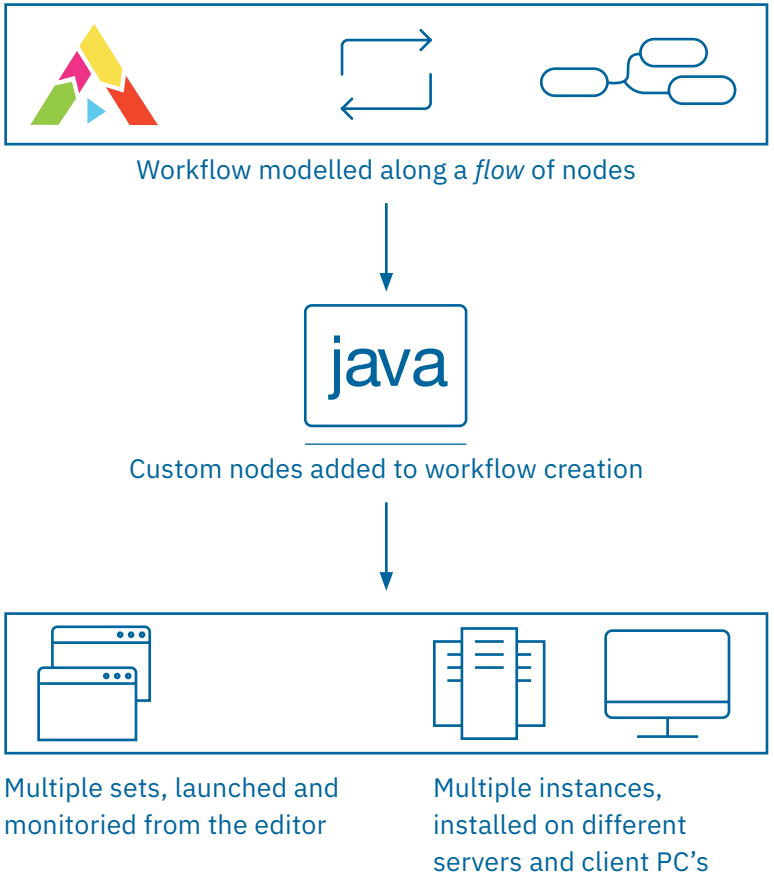
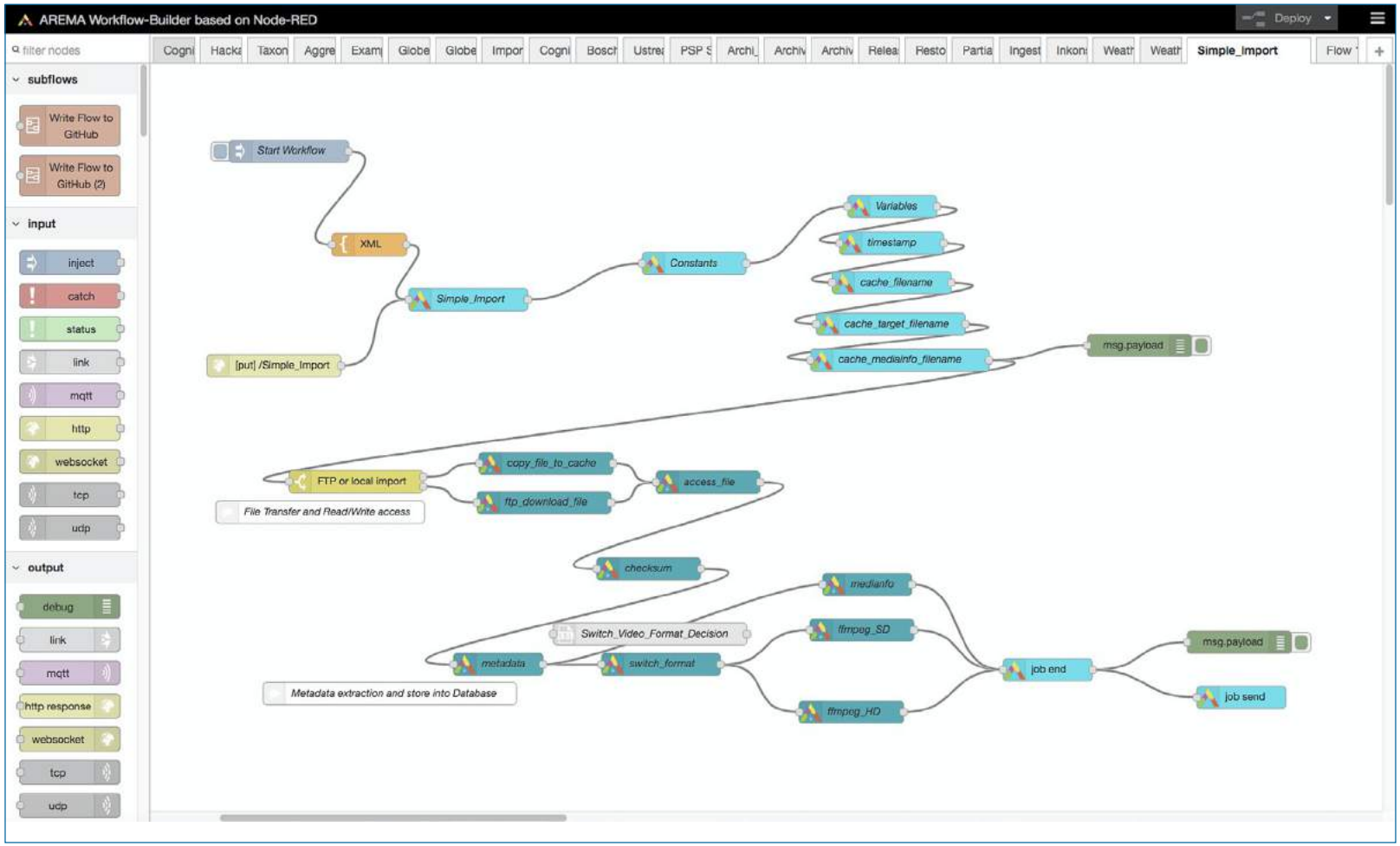


Figure 20: Workflow Orchestration Tools

AREMA workflow builder



Conclusion

IBM AREMA is an ideal solution for companies working with media content in their day-to-day business, and that also need a flexible media content environment that integrates multiple tools, repositories and services, in the cloud and on premise.

AREMA is a sophisticated, multi-function solution that improves the agility and speed of file based media processing and workflows. In doing so, AREMA can safeguard quality and improve efficiency throughout the organization.

It can give better process visibility and insights, workflow orchestration, media essence processing, storage and archiving, while reducing costs.

AREMA can perform cognitive analysis of content by combining multiple Watson services to generate new insights and enable new experiences.