ONTOLOGY FOR MEDIA CREATION
PART 8: INFRASTRUCTURE

VERSION 2.6

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Contents

1 Introduction

What is infrastructure? It is a relatively new term (1875 in French, 1927 in English).[1] At the time of its first usage, what we now think of infrastructure -- railways, telegraph lines, public water systems – was high on lists of national priorities. The word itself comes from Latin *infra*, "below" and either the French *structure*, "manner of building, arrangement of constituent parts" or Latin *structura* "method of building, arrangement."[2]

In the production process, infrastructure components are the underlying systems and framework required for the production of the Creative Work. Infrastructure is generally not specific to a particular Creative Work.

In the early days, the infrastructure for film and television production revolved around physical devices such as cameras, lights, and projectors, and all of the consumable elements (e.g., film reels) required to shoot a production. Modern filmmaking still requires physical infrastructure, some of it very like what has been used in the past (and some of it sharing names if not technology), but it also relies on more and more digital infrastructure (computers, networks, storage systems, etc.). Some of this digital infrastructure is needed for participants to complete their tasks – digital cameras, computers for doing VFX and other graphics work, cloud storage for storing and exchanging video files – and some of it is required to run software-defined workflows (message systems, security components, and so on).

In the digital realm there is some fuzziness between what we define as Services (see ***Part 4: Participants***) and infrastructure. A good rule of thumb is that a Service is told to go do something, and then goes and does it using the inputs, often Assets, provided. It is no different from Person doing the same thing. Infrastructure just sits there until it is used by a Participant performing a Task, often with some Assets involved. A remote desktop is a piece of infrastructure: it needs a Person. A transcoding microservice is a Service: it is told to transcode a piece of video and on its own deals with authentication, authorization, and so on, does its job, and returns the answer.[3]

This Ontology does not go into the details of most pieces of infrastructure. They are components that are required to perform some Tasks, and the detailed models for how they are defined, described, and managed are out of scope for now. The Ontology does give details about infrastructure such as Cameras that is more directly involved in the production process, since their details may have some effect on Tasks other than the one for which they are directly used.

1.1 Scope

There are often hundreds of pieces of Infrastructure that are connected in the production of a Creative Work. Some pieces of Infrastructure are generically recognized as part of the production process, while

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[1] OED, s.v. "infrastructure"

[2] The Romans themselves had no word for what we think of as infrastructure other than Frontinus' *moles necessariae* "necessary structures" (*De Aquis* 16), which is perhaps odd for a culture that contemporary historians said was notable for "aqueducts, paved roads, and drains." (Strabo, *Geographica* 5.3.8 and Dionysius of Halicarnassus, *Roman Antiquities* 3.67.5.)

[3] A traditional MAM with a large API and UI is infrastructure. If that MAM is turned into a set of independent microservices, it is much closer to being a Service.

others are very specific to a particular production or kind of production. It is very difficult, or perhaps impossible, to produce a complete list of all kinds of Infrastructure. This part of the Ontology focuses on a few specific areas:

- Infrastructure that produces information that feeds into parts of the production process where the Infrastructure itself is not present
- Extremely common general Infrastructure concepts
- Infrastructure directly related to software-defined workflows

For the first case we also provide some attributes that allow interaction with other parts of the production. For the other cases, the Ontology presents just terms and their definitions.

1.2 Appropriate Granularity

As with all the components of the Ontology, infrastructure can be defined in varying levels of detail. The ontology generally covers infrastructure at the level of "do I need this?" rather than anything more detailed. Over time, we intend to define some finer-grained aspects of infrastructure, such as assembling a functional camera form a camera body, a lens, and a removable storage device.

1.3 Relationships

Infrastructure is most often related to Tasks. For instance, an editing Task may require a specialized workstation or a particular remote desktop. Shooting a scene requires a camera. Camera Metadata is produced by a Camera. At the level of workflow management, rendering an animation sequence may require that a particular set of compute resources and fast storage is available. All of these can be expressed as relationships between other Ontology components and infrastructure.

1.4 Notational Conventions

In documents generally:

- The definition of a term included in the Dictionary is in bold, followed by the definition, e.g., **Creative Work:** A uniquely identified production.
- When a defined term is used in the text of a document, it is capitalized, for example in "The Production Scene is usually derived from a numbered scene in the Script," Production Scene and Script are defined in the Ontology. (Note, a word that is part of defined term may sometimes be capitalized by itself as a shorthand, e.g., "Scene" may be used to indicate "Narrative or Production Scene.")
- References to other Ontology Documents are in ***bold italic***, e.g., ***Part 3: Assets*** or ***Part 3A: Camera Metadata.***

For Sample Attributes in the concept documents:

- If a data field or attribute is formally defined in this ontology or a connected ontology, it is italicized, e.g., *Setup* as an attribute refers to a defined concept.
- Attribute […] indicates an attribute can appear more than once, e.g., *Identifier* […]

- →Thing means that an attribute is expressed as a relationship to a Thing, e.g., the →*Script* attribute of Creative Work means there is a relationship Creative Work→*Script*
- A combination of the two indicates that the concept can have relationships to a set of things, e.g., →Components […]
- Many elements of the Ontology have a Context element. (See **Part 2: Context**.) Relationships declared in the Context are implied to have the item to which the Context is attached as their starting point, for example, Narrative Location→Context→Narrative Scene.

  Contextual relationships that are especially important to the concept being defined are given in the sample attributes tables as C→Thing or C→Thing […] as appropriate. These relationships can just as well be on the object that has the Context. For example, if Narrative Location has "C→Narrative Scene" as an attribute, it is ok to have the relationship directly on the Narrative Location or in its Context, e.g. Narrative Location→Narrative Scene or Narrative Location→Context→Narrative Scene.

  Some implementations (e.g. RDF) place these relationships directly on the class as well as allowing them in Context, and others (e.g. JSON) place all relationship in a Context.

2 Concepts and Terms

2.1 Infrastructure

Infrastructure: The underlying systems and framework required for the production of the Creative Work; it is generally not specific to a particular Creative Work.

Some Infrastructure is oriented towards computers and digital processes, such as Workstation, Cloud, Cloud Storage, and Messaging System. Physical infrastructure, such as Lights and Camera is also essential to the production process. The Ontology and Dictionary include physical infrastructure when it produces something that is communicated through the workflow – the position and settings of Lights are often needed, for example – but generally exclude items such as hammers and tongs.

2.2 Capture Systems and Devices

This section covers Infrastructure that has an influence on subsequent parts of the production, either itself or because of data it produces. Future versions of the Ontology will extend this section, especially for physical infrastructure that generates information that crosses the physical/digital boundary, such as lights and motion capture equipment.

Camera, lens, and recorder are covered in detail in ***Part 3A: Camera Metadata***.

2.2.1 Camera

Camera: A device for recording visual images in the form of photographs, film, or video signals.

The Camera has been Infrastructure since the dawn of filmmaking. Its presence is even felt in the virtual cameras used in fully computer-generated films.

This set of attributes contains details that are specific to the Camera, rather than to any particular use of the Camera.

Sample Attributes for Camera

Attribute	Description
Identifier[]	One or more identifiers for the Camera. This may be a barcode or inventory label.
Camera Make	See **Part 3A: Camera Metadata**
Camera Model	See **Part 3A: Camera Metadata**
Camera UID	See **Part 3A: Camera Metadata**
Camera firmware version	See **Part 3A: Camera Metadata**
Camera Label	See **Part 3A: Camera Metadata**
Custom Data	Anything that is application or workflow dependent that can't be otherwise expressed in the Ontology or needs to be present in a particular format.

2.2.2 Lens

Lens: A device containing a series of curved glass elements used to focus light on the camera imager or film.

A Camera needs something to focus the light. Most Cameras used in production support interchangeable Lenses, so each Lens is maintained as a separate piece of infrastructure.

This set of attributes contains details that are specific to the Lens, rather than to any particular use of the Lens.

Sample Attributes for Lens

Attribute	Description
Identifier[]	One or more identifiers for the Lens. This may be a barcode or inventory label.
Lens Make	See **Part 3A: Camera Metadata**
Lens Model	See **Part 3A: Camera Metadata**
Lens Serial Number	See **Part 3A: Camera Metadata**
Custom Data	Anything that is application or workflow dependent that can't be otherwise expressed in the Ontology or needs to be present in a particular format.

2.2.3 Recorder

Recorder: A device to record to media the images captured by the camera.

This set of attributes contains details that are specific to the Recorder, rather than to any particular use of the Recorder. A Recorder is a special-purpose Storage Device.

Sample Attributes for Recorder

Attribute	Description
Identifier[]	One or more identifiers for the Recorder. This may be a barcode or inventory label.
Recorder Make	See **Part 3A: Camera Metadata**
Recorder Model	See **Part 3A: Camera Metadata**
Recorder Serial Number	See **Part 3A: Camera Metadata**
Custom Data	Anything that is application or workflow dependent that can't be otherwise expressed in the Ontology or needs to be present in a particular format.

2.3 Storage

Data storage is an important part of a digital workflow. Physical storgae (as opposed to cloud or data center) can be treated as a piece of Infrastructure, re-used across many producitons or across parts of the same production.

Storage Device: A physical, often portable, device for storing data.

This includes USB sticks, portable external disk drives, and so on.

Sample Attributes for Storage Device

Attribute	**Description**
Identifier[]	One or more identifiers for the Storage Device. This may be a barcode or inventory label.
Type	USB stick, external drive, etc.
Capacity	Storage capacity of the device
Custom Data	Anything that is application or workflow dependent that can't be otherwise expressed in the Ontology or needs to be present in a particular format.

Notes:

In the current version of OMC, capacity is given as a string, e.g. 1TB, rather than as a typed measurement.

3 Example Terms and Definitions

This section provides a list of some common infrastructure used in film and television productions. The number of kinds of infrastructure will continue to grow, especially as the industry adopts new ways of working (whether socially or technologically driven). The Dictionary portion of the Ontology provides a larger set, which is, of course, not complete. The ones included here are in general use, and the names and definitions should be viewed as an example set of best practices.

This list will be extended as the ontology expands.

Term	Definition
Software-Defined Workflow	A software-mediated system that supports collaboration and allows a set of tasks to be configured, interconnected, and automated.
Workflow Manager	A system that manages and assigns tasks in a production.
Orchestration	The process of configuring, coordinating, and aligning resources with workflow needs.
Orchestration Manager	A system that receives messages from the workflow manager to orchestrate resources to complete tasks in a Software-Defined Workflow.
Cloud	Processing, storage, networks, and other fundamental computing resources provisioned to be made available on demand where the user is able to deploy and run arbitrary software without managing the underlying physical resources.
Public Cloud	Cloud resources provisioned for and available to many unaffiliated organizations and individuals. It is typically owned, managed, and operated by a third party.
Private Cloud	Cloud resources provisioned for exclusive use by a single organization. It may be owned, managed, and operated by the organization, a third party, or some combination of them.
Compute Resource	A system that can run a piece of software.
Workstation	An individual computer, typically high powered and used for the processes like editing or designing 3D models.
Remote Desktop	The use of one machine (a laptop, desktop or thin client) to connect over a network to another, which it controls as if it were local.
Network	The underlying hardware and software used to connect devices, production sites and services.
Private Network	A network provisioned for exclusive use by a single organization. It may be owned, managed, and operated by the organization, a third party, or some combination of them.
Public Network	A network provisioned for and available to many unaffiliated organizations and individuals. It is typically owned, managed, and operated by a third party.

Term	Definition
Cellular Network	A radio data network using 4th, 5th or later generation cellular standards.
Wi-Fi Network	A local wireless network using the Wi-Fi standards.
Ethernet Network	A local wired network using the Ethernet standards.
Fiber Optic Network	A network using optical fiber.
Edge Compute	Compute resources placed at the edge of the cloud or network, and logically close to the user.
Edge Storage	Storage resources placed at the edge of the cloud or network, and logically close to the user. Edge storage can be used to cache data to avoid network latency in data retrieval.
Messaging System	A Message Bus and its associated Message Brokers.
Message	Data sent by an application to one or more recipients that carries a payload.
Message Bus	Infrastructure that provides Message Queues and the ability to create, destroy, connect, and control access to them.
Message Broker	A system component that routes messages.
Message Queue	A queue that accepts messages from a producer and can then deliver them to a consumer.
Message Producer	A message producer sends messages.
Message Consumer	A message consumer receives messages.
Event Queue	A type of queue designed to received large volumes of event notifications.
Electronic Mail System	A system to transmit and receive digital messages between mailboxes.
Remote Procedural Call	A request to perform a given operation on a different computer or address space.
Microservice	A small discrete application that performs one very specific task or operation when called. These are often coupled together to create workflows.
Software Application	A monolithic application typically designed for a particular area of production, such as script markup, picture editorial, or CG modelling.
Machine Learning	Processes and algorithms that enable a computational system to automatically perform a task based on training data.
Artificial Intelligence	The ability of a computational system to autonomously perform tasks commonly associated with intelligent beings.
Storage	A system for storing and retrieving data.

Term	Definition
Database	A system for storing, searching, and retrieving structured data.
Capture Storage	A system for storing and retrieving data from a capture device.
Transient Storage	A system for storing and transferring data between locations.
Working Storage	A system for storing and retrieving data during the production process.
Long-Term Storage	A system for storing and retrieving data after a production is complete.
Production Equipment	Electronic or mechanical equipment used during the on-set or location shooting task.
Production Consumable	A commodity or disposable item that is used during the on-set or location shooting task.

Appendix A External Definitions

These are terms defined elsewhere in the Production Ontology, included here for ease of reference.

Media Creation Context: Informs scope within the construction process of a Creative Work.

See **Part 2: Context**

Asset: A physical or digital object or collection of objects specific to the creation of the Creative Work.

See **Part 3: Assets**

Camera Metadata: Capture-specific details and information about the Camera itself.

See **Part 3A: Camera Metadata**

Participant: The entities (people, organizations, or services) that are responsible for the production of the Creative Work.

See **Part 4: Participants**

Task: A piece of work to be done and completed as a step in the production process.

See **Part 5: Tasks**

Creative Work: A uniquely identified production.

See **Part 6: Creative Works**

Relationship: Describes and defines the connections between elements of the Ontology, such as Assets, Tasks, Participants, and Contexts.

See **Part 7: Relationships**

Infrastructure: The underlying systems and framework required for the production of the Creative Work; it is generally not specific to a particular Creative Work.

See **Part 8: Infrastructure**

Utilities: Common data models and data structures used in multiple places and in multiple ways in a larger system.

See **Part 9: Utilities**

Identifier: An identifier uniquely identifies an entity within a particular scope.

See **Part 9: Utilities**