LIMECRAFT

CONNECTED CREATIVITY

The Future of Media Production Technlogy

On embedded metadata and semantic technology

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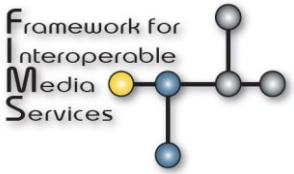


Limecraft creates cutting edge workflow solutions for creative professionals. Re-imagined from the inside out, new ways of collaboration enable the producer to discover new creative opportunities.

Creative professionals need to share information, indifferent of their physical location, language or culture. Paperless workflows are the key to collaboration.

While semantic technology is essential to make abstraction of natural language, embedded metadata is a pre-requisite to enable machine to machine communication and production automation.

Limecraft Flow enables its users to exchange content without the use of any document.


back to the art of
storytelling

Script Writing (Screenplay)

Breakdown

Logging (Continuity)

Informally Structured Workflow

Digital Media Flow

Principal Photography

Post -Production

Key Issues

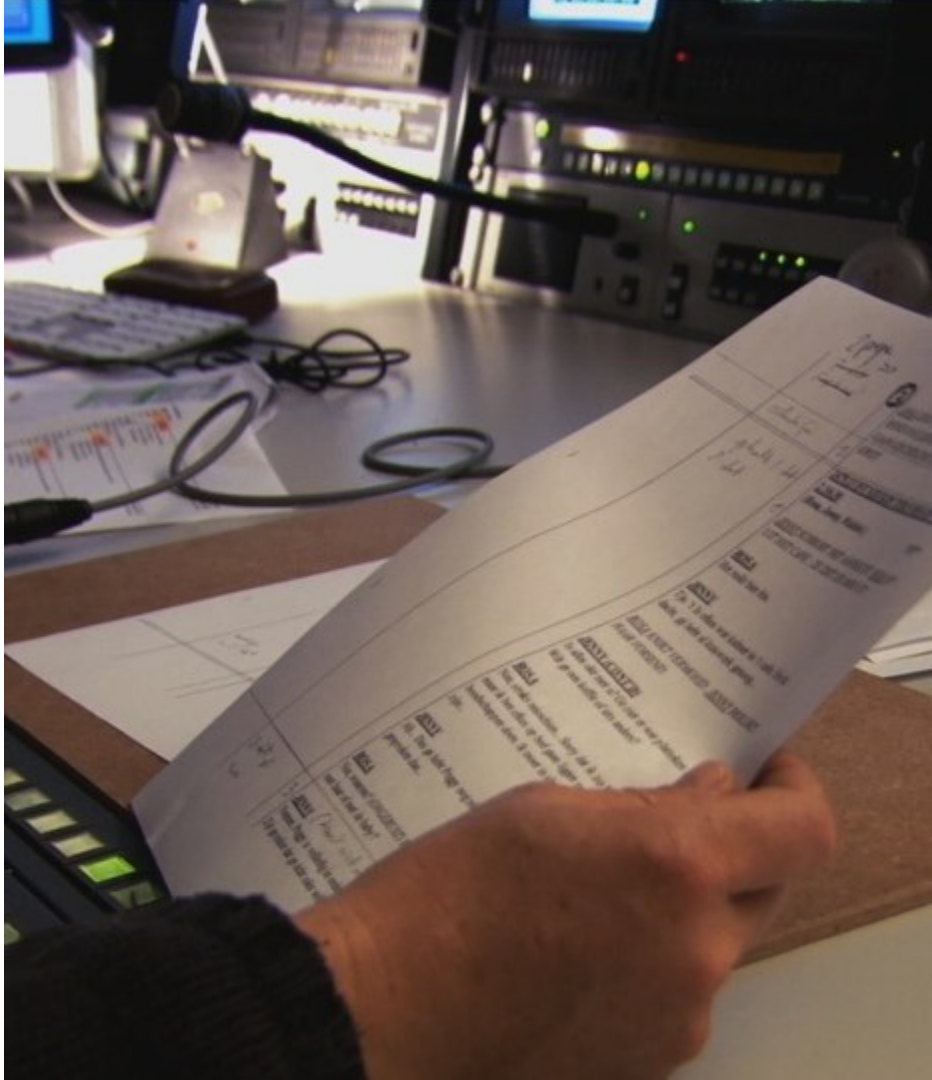
- Document-oriented workflows
- Unstructured information
- Lack of standards

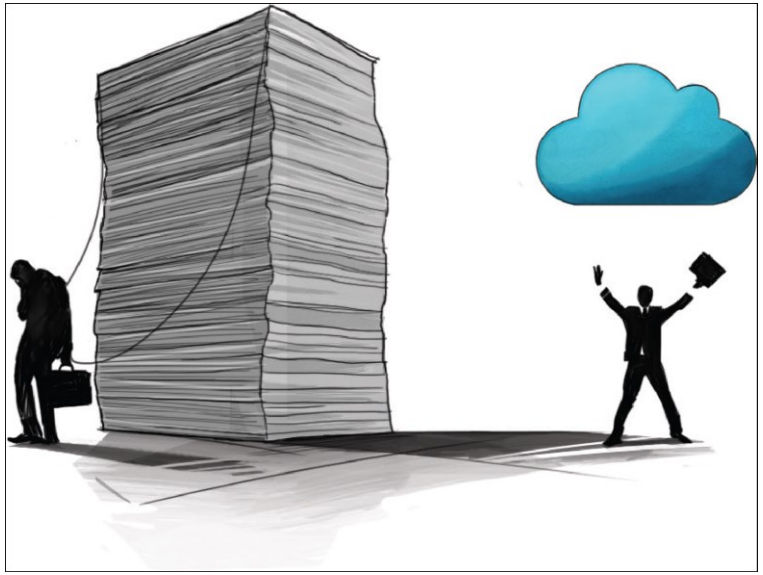
Incurred Problems

- Loss of information
- Re-use is expensive
- Limited collaboration potential

Producer’s requirements

- Delocalisation of Production Operations
- New types of ‘customisable’ products
- New distribution channels (iPad, iPhone)





A paperless workflow is the key to collaboration.

A semantic database replaces all production documents by a flow of structured information.

All users share the same up-to-date set of information and can concurrently modify the production data. Content is more easily exchanged with third parties.

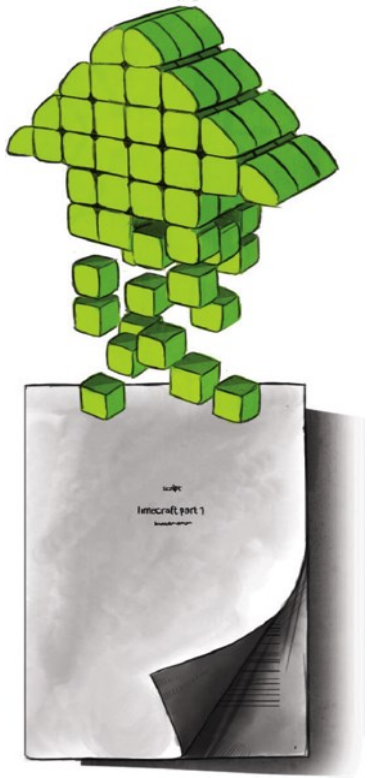
Hide Technical Complexity

Consumer technologies created an enormous proliferation of different file formats. Producers are continuously chasing the compatibility challenge.

The worst of all is that we use little or no standardised metadata, while Embedded metadata is essential to ensure it arrives in the right place and in the right hands.

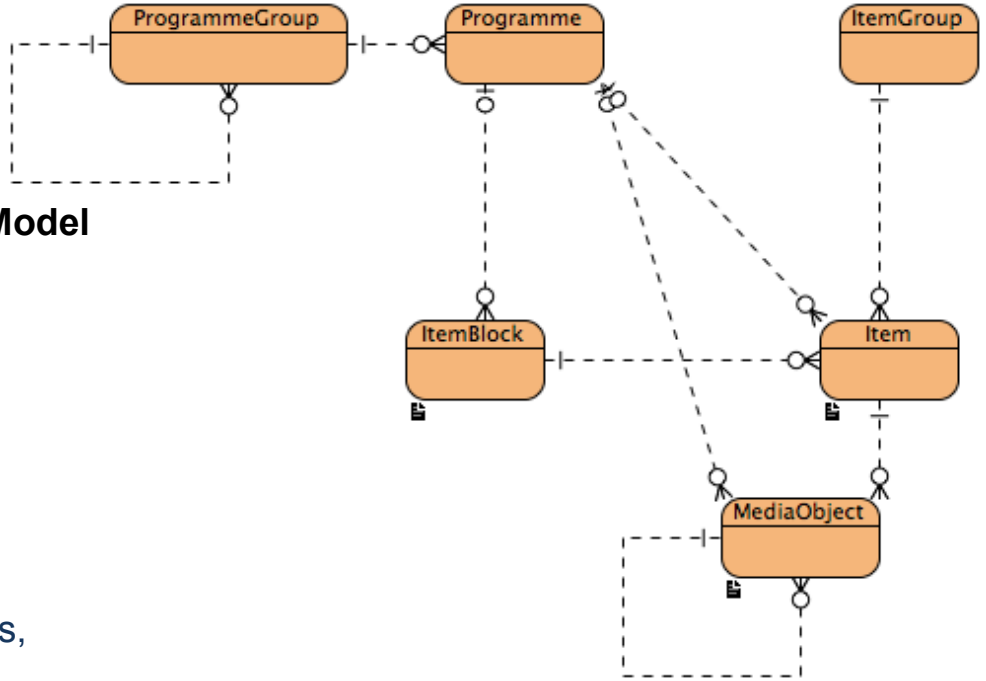
Metadata

Blood and vessels of a production



Paperless production requires:

- Model
- Semantic Technology
- Vocabulary (**EBUCore**, NewsML, MXF DMS-1,…)
- Syntax (XML, KLV)
- Transport protocol



EBU Tech 3351 – Class Conceptual Data Model

Different dimensions or “Business Objects”

- Logistic - Programme(Group)
- Descriptive – Item (Editorial Object)
- Technical - MediaObject

Not only AV objects:

- Persons, organisations, events, locations, concept, camera, lens, etc.

CCDM - a common base for interoperability:

- W3C, FIMS-SOA, etc.

Semantic
Technology

INT. JEEP - FAVORING JOE CHACO **#1**

JOE drives recklessly. ANDI sits next to him, an attractive girl in her mid-twenties. **#2**

ANDI
(shouting) **#3**
How much longer?

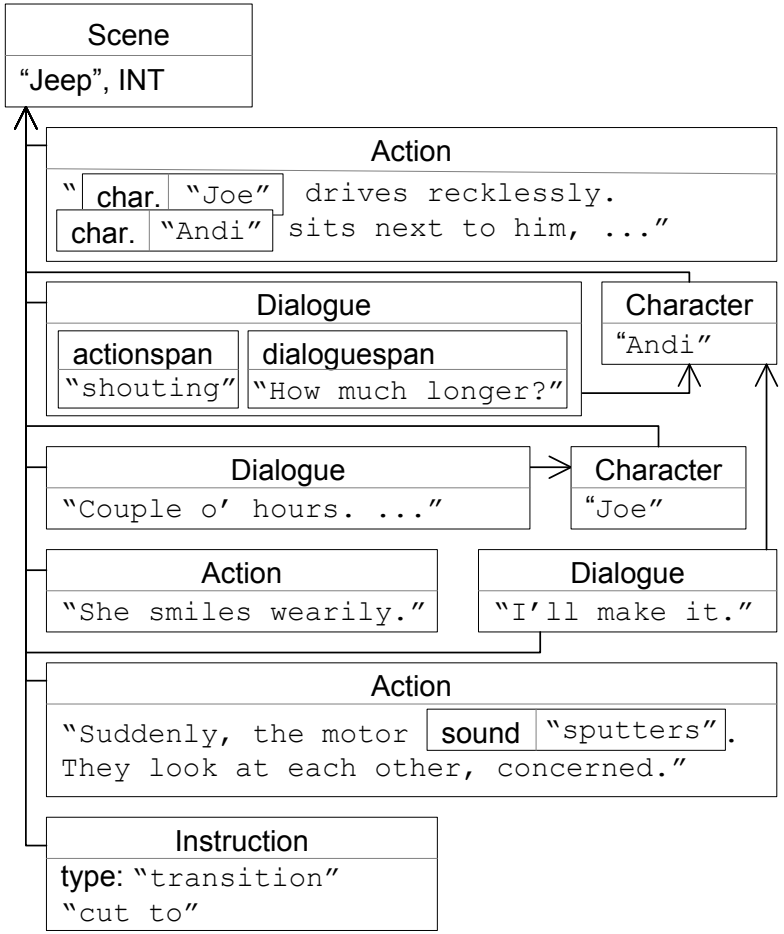
JOE
Couple o' hours. You okay? **#4**

She smiles wearily. **#5**

ANDI
I'll make it. **#6**

Suddenly, the motor SPUTTERS. They look at each other, concerned. **#7**

#8 CUT TO:



```
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    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns="urn:ebu:metadata-schema:ebuCore_2012"
    schema="EBU_CORE_20120817.xsd" version="1.3" dateLastModified="2011-01-31">
  <coreMetadata>
    <title>
      <dc:title>VE Chavez decree #4</dc:title>
    </title>
    <creator entityId="EBUNMSSRVCodeSource:GBRTV">
      <organisationDetails organisationId="EBUNMSSRVCodeSource:GBRTV">
        <organisationName>Reuters Television Ltd</organisationName>
        <details typeLink="addressType:office">
      </organisationDetails>
    </creator>
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      <subjectCode>EBUNMSWebcatCode:AMERICAS</subjectCode>
    </subject>
    <description typeLink="EBUNMSDescription:dopesheet">
    <description typeLink="EBUNMSDescription:shotlist">
    <publisher entityId="EBUProviderCode:EBU">
    <date>
      <created startDate="2011-01-15" startTime="00:00:00Z"/>
      <issued startDate="2011-01-16" startTime="03:47:06Z"/>
      <modified startDate="2011-01-16" startTime="04:38:20Z"/>
    </date>
    <format formatId="EVN_20110116-PNN-0428-528229" formatName="dopesheet">
    <format formatId="EVN_528229_116A0428" formatName="manifestation">
    <identifier typeLabel="itemId">
      <dc:identifier>tag:ebu.ch,2011:528229</dc:identifier>
    </identifier>
    <language typeLink="EBULanguageUsageCode:PartNarrated">
      <dc:language>Spanish</dc:language>
    </language>
    <coverage>
    <rights typeLabel="UsageTerms">
    <publicationHistory>

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    <part partId="EVN_528229_116A0428_Part2_ID">

    <part partId="EVN_528229_116A0428_Part8_ID">

  </coreMetadata>

  <metadataProvider>
</ebuCoreMain>
```

Vocabulary - EBUCore

- Describes the key elements of any “Business Object”
- Backward compatible with Dublin Core
- Extends DublinCore:
  - Fully Declared attributes
  - Enables definition of parts or fragments
  - Specification for technical attributes
  - Value attribution by pointing to external thesauri

-> EBUCore is semantic web compliant!

The use case determines the syntax and the protocol:

Indexing (search, annotation,…)

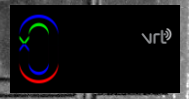
- Out of band
- Accessible without touching the media
- Usually exchanged as a flavour of XML

Machine to machine communication

- Embedded
- Tightly coupled, doesn’t get lost
- Using Key-Length-Value encoding (KLV)

Semantic Technology

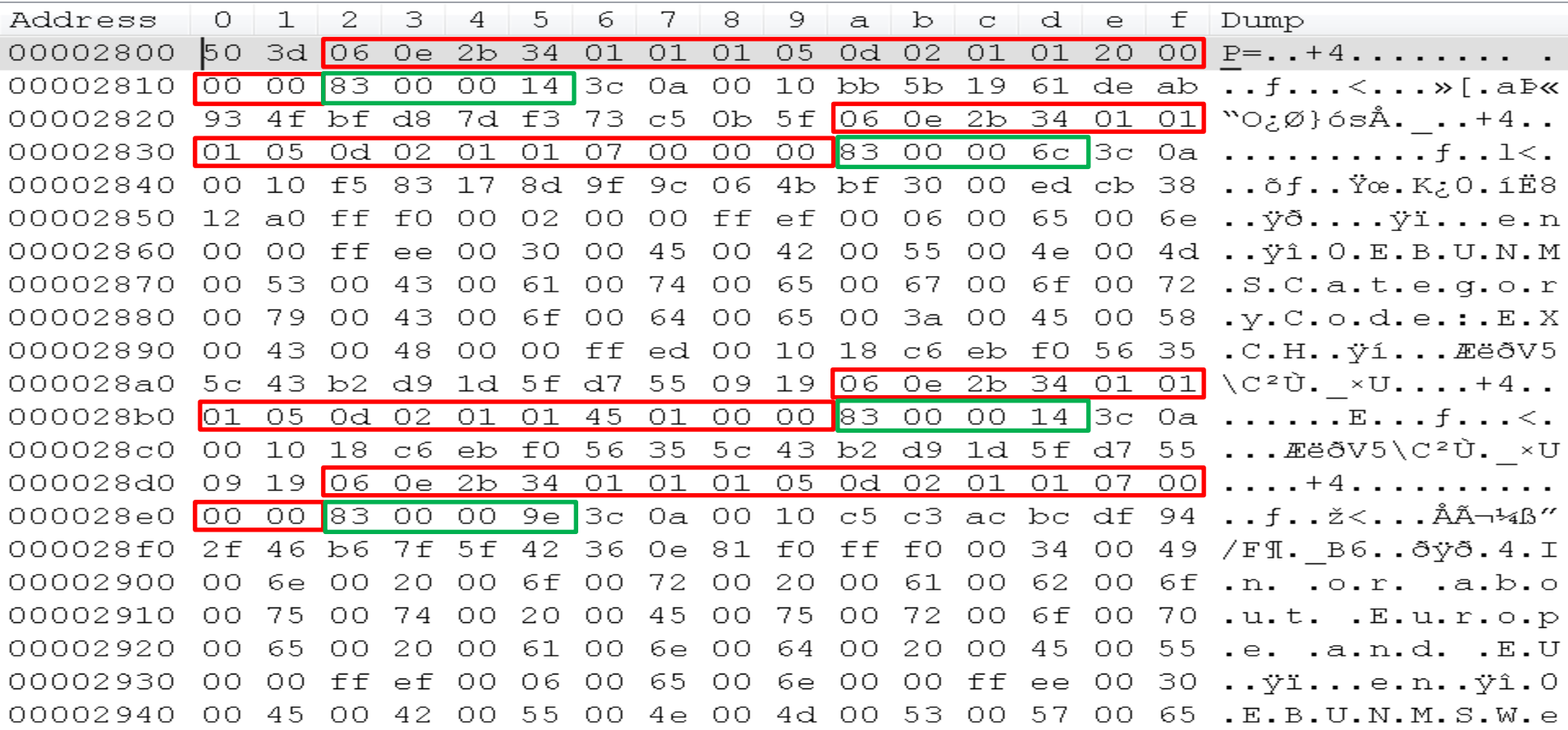
An unconventional Approach



Structure of MXF files is KLV elements

- Key to identify the kind of element
- Length of the value that follows
- Value of the element
- KLV is used for both essence and metadata
  - Typically, for essence a single frame per KLV

EBUCore embedded in MXF



Address	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f	Dump
00002800	50	3d	06	0e	2b	34	01	01	01	05	0d	02	01	01	20	00	P=..+4..... .
00002810	00	00	83	00	00	14	3c	0a	00	10	bb	5b	19	61	de	ab	..ƒ...<...»[.aÞ«
00002820	93	4f	bf	d8	7d	f3	73	c5	0b	5f	06	0e	2b	34	01	01	"O¿Ø}ósÅ._..+4..
00002830	01	05	0d	02	01	01	07	00	00	00	83	00	00	6c	3c	0a	..........ƒ..l<.
00002840	00	10	f5	83	17	8d	9f	9c	06	4b	bf	30	00	ed	cb	38	..õƒ..Ÿœ.K¿0.íË8
00002850	12	a0	ff	f0	00	02	00	00	ff	ef	00	06	00	65	00	6e	..ÿð....ÿï...e.n
00002860	00	00	ff	ee	00	30	00	45	00	42	00	55	00	4e	00	4d	..ÿî.0.E.B.U.N.M
00002870	00	53	00	43	00	61	00	74	00	65	00	67	00	6f	00	72	.S.C.a.t.e.g.o.r
00002880	00	79	00	43	00	6f	00	64	00	65	00	3a	00	45	00	58	.y.C.o.d.e.:.E.X
00002890	00	43	00	48	00	00	ff	ed	00	10	18	c6	eb	f0	56	35	.C.H..ÿí...Æëð V5
000028a0	5c	43	b2	d9	1d	5f	d7	55	09	19	06	0e	2b	34	01	01	\C²Ù._×U....+4..
000028b0	01	05	0d	02	01	01	45	01	00	00	83	00	00	14	3c	0a	......E...ƒ...<.
000028c0	00	10	18	c6	eb	f0	56	35	5c	43	b2	d9	1d	5f	d7	55	...Æëð V5\C²Ù._×U
000028d0	09	19	06	0e	2b	34	01	01	01	05	0d	02	01	01	07	00	....+4..........
000028e0	00	00	83	00	00	9e	3c	0a	00	10	c5	c3	ac	bc	df	94	..ƒ..ž<...ÅÃ¬¼ß"
000028f0	2f	46	b6	7f	5f	42	36	0e	81	f0	ff	f0	00	34	00	49	/F¶._B6..ðÿð.4.I
00002900	00	6e	00	20	00	6f	00	72	00	20	00	61	00	62	00	6f	.n. .o.r. .a.b.o
00002910	00	75	00	74	00	20	00	45	00	75	00	72	00	6f	00	70	.u.t. .E.u.r.o.p
00002920	00	65	00	20	00	61	00	6e	00	64	00	20	00	45	00	55	.e. .a.n.d. .E.U
00002930	00	00	ff	ef	00	06	00	65	00	6e	00	00	ff	ee	00	30	..ÿï...e.n..ÿî.0
00002940	00	45	00	42	00	55	00	4e	00	4d	00	53	00	57	00	65	.E.B.U.N.M.S.W.e

Standardized MXF descriptive metadata exists

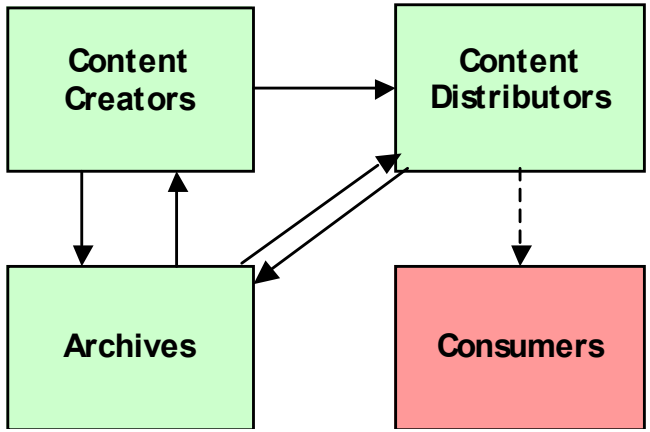
- Descriptive Metadata Scheme-1 (DMS-1)
  - Standardized as SMPTE 380M
  - Production characteristics, rights information, annotations, person and entity identification, …
  - Aligned with MPEG-7, TV-Anytime

- Apart from Panasonic, DMS-1 is hardly used
  - Too complex?
  - No notion of DMS-1 outside of the MXF ecosystem?
  - Hard to obtain a viable and complete mapping?

EBUCore is a pragmatic metadata standard, designed as an interface between production, distribution and archiving applications.

EBUCore was first published in 2000, by EBU and it has been developed since then in close collaboration with a large number of key industry players, icluding IPTC, Sony, Avid, IBM, etc.

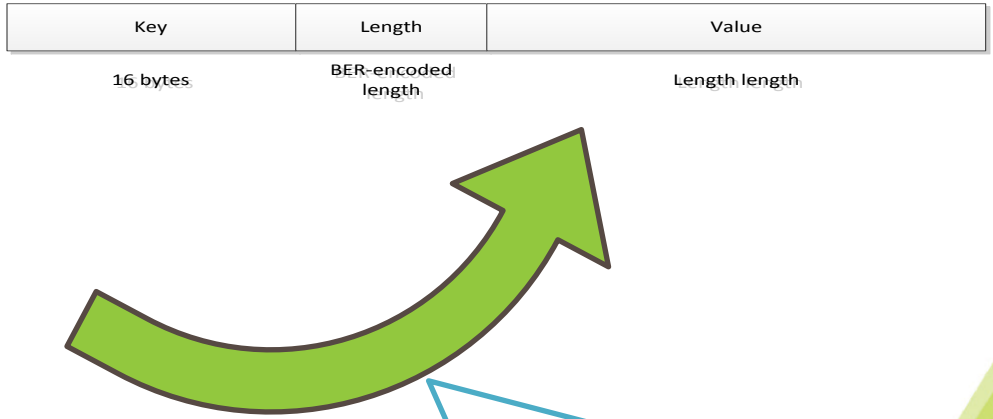
EBUCore has the potential to become the de facto standard in professional media, but it isn't yet.



EBUCore embedded in MXF

```
<?xml version="1.0" encoding="UTF-8"?>
<ebuCoreMain xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:dc=http://purl.org/dc/elements/1.1/
  xmlns="urn:ebu:metadata-schema:ebuCore_2011"
  xmlns:default=http://iptc.org/std/nar/2006-10-01/
  xmlns:ebu=http://ebu.org/nar-extensions/ version="1.3"
  dateLastModified="2011-01-31">
  <coreMetadata>
    <title>
      <dc:title xml:lang="fr-can">Berlin Wall 50th</dc:title>
    </title>
    <alternativeTitle typeLabel="headline">
      <dc:title>Berlin Wall 50th</dc:title>
    </alternativeTitle>
    <creator entityId="EBUNMSSRVCodeSource:TBA"/>
    <subject>
      <dc:subject/>
      <subjectCode>EBUNMSCategoryCode:EXCH</subjectCode>
    </subject>
    <subject>
      <dc:subject>In or about Europe and EU</dc:subject>
      <subjectCode>EBUNMSWebcatCode:EUROPE</subjectCode>
    </subject>
    <description typeLabel="pubStatus">
      <dc:description>NMSStatusCode:TBC</dc:description>
    </description>
    <description typeLink="EBUNMSDescription:dopesheet">
      <dc:description> The Berlin Wall (German: Berliner Mauer) was
        a barrier constructed by the German Democratic Republic
        (GDR, East Germany) starting August 13, 1961, that completely
        cut off West Berlin from surrounding East Germany…
```

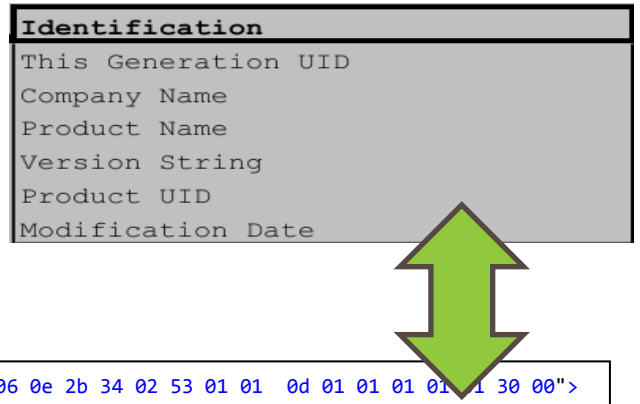
Use KLV to embed metadata



To dump the document as a whole into the KLV value is the worst case scenario

Use the MXF conceptual model

- Elements grouped into logical metadata sets identified by a single key, i.e., “classes”
- Logical metadata sets are reconstructed by means of a dictionary




```
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  <Platform use="optional" type="UTF16String" key="3c 08" globalKey="06 0e 2b 34 01 01 01 02  05 20 07 01 06 01 00 00"/>
</Identification>
```
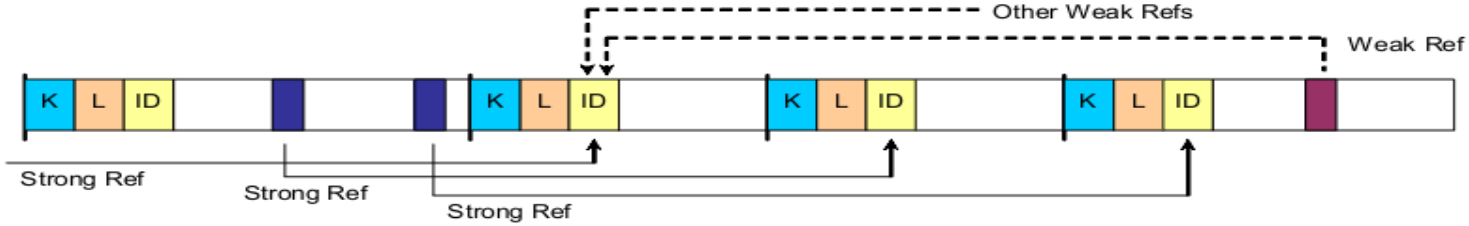
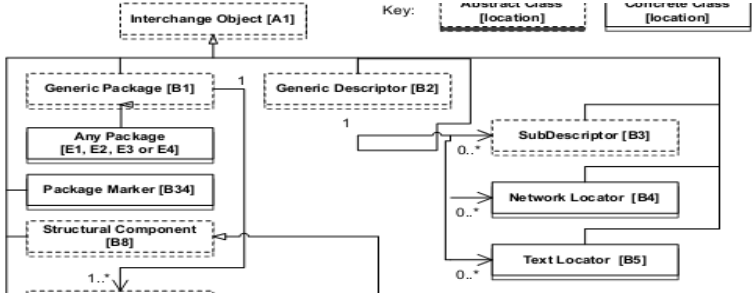
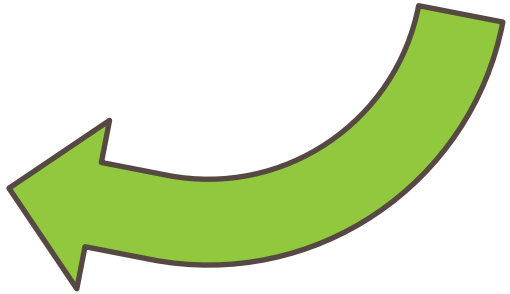

EBUCore in MXF is Semantic Technology on spee

- Metadata sets refer to other sets
- Metadata set can be constructed as trees or grap







Initiative by EBU to provide community with reliable and open-source software to manipulate MXF files

- Handle metadata
- Handle essence and work on conformity of MXF files
- Available as free and open source software
  - First repository: https://github.com/Limecraft/ebu-mxfsdk

Based on BBC libraries libMXF, libMXF++ and bmx

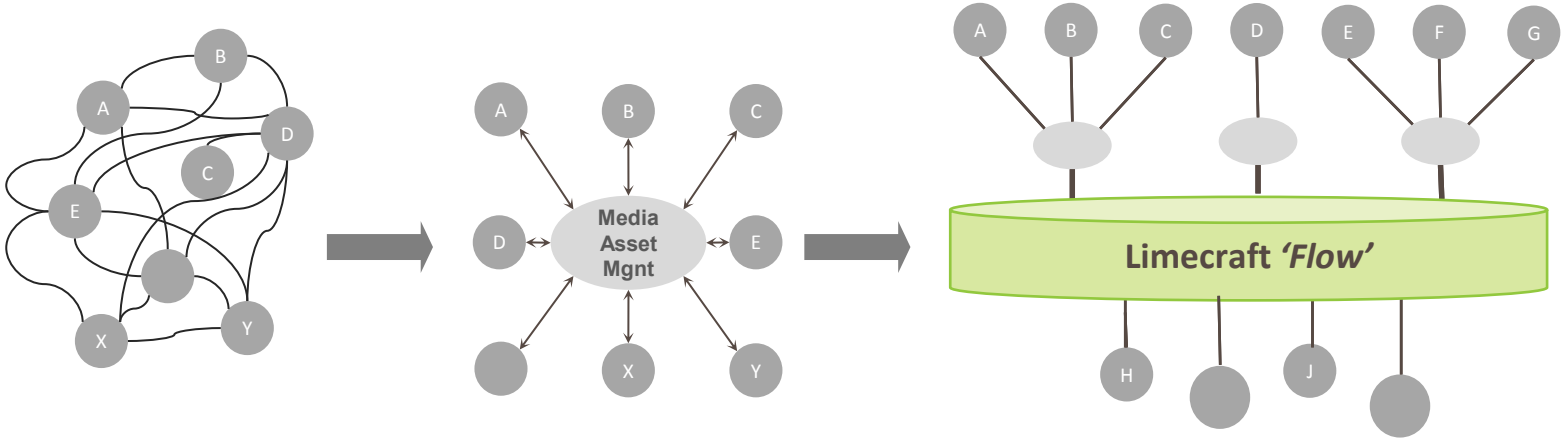
- Reference implementations for MXF app. specs.
  - AMWA AS-02 (Versioning) and
  - AMWA AS-11 (MXF for Contribution)
- Written in C/C++

Features (Dec 2012)

- Mux and de-mux EBUCore metadata in MXF containers
- Content analysis and quality assurance

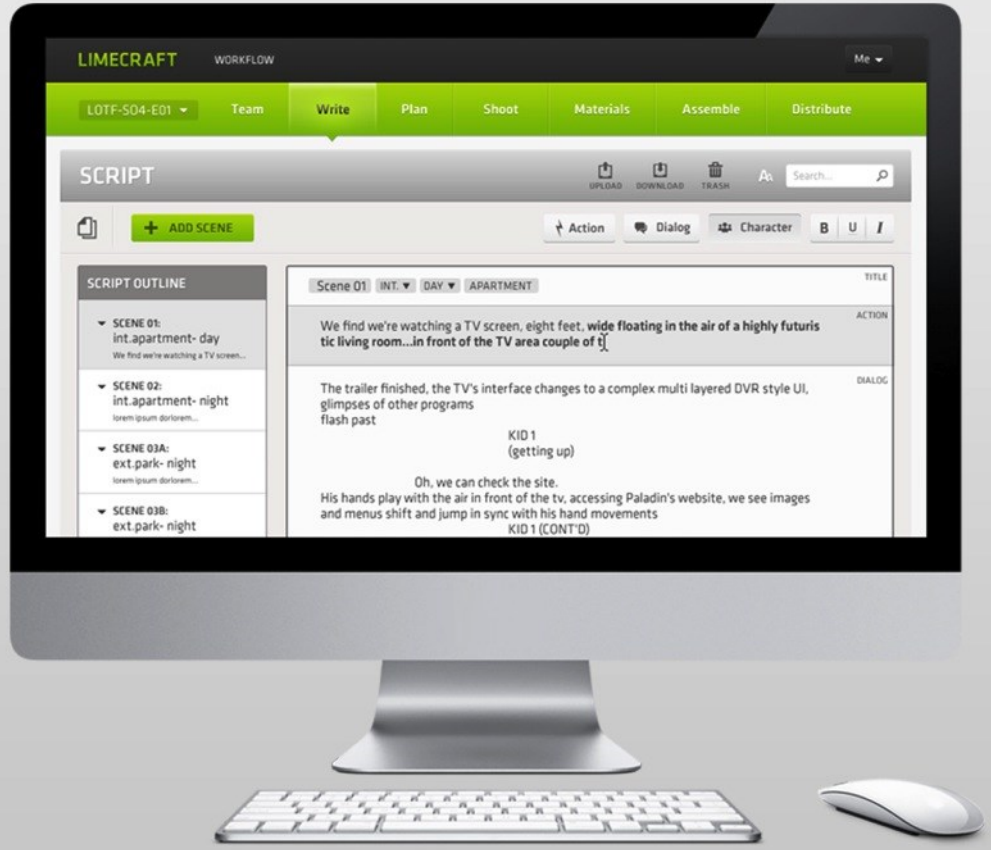
Use Case

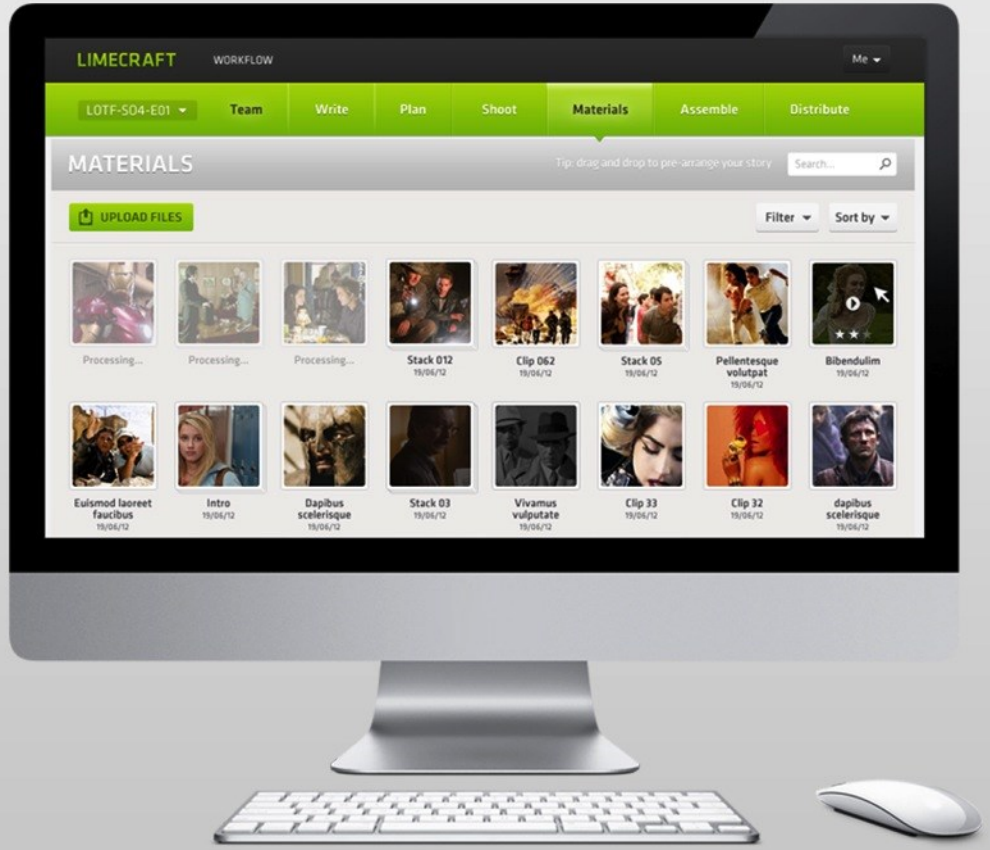
current affairs
6 investigative journalists
13 productions per year
52’ per episode
>5000 hours raw material

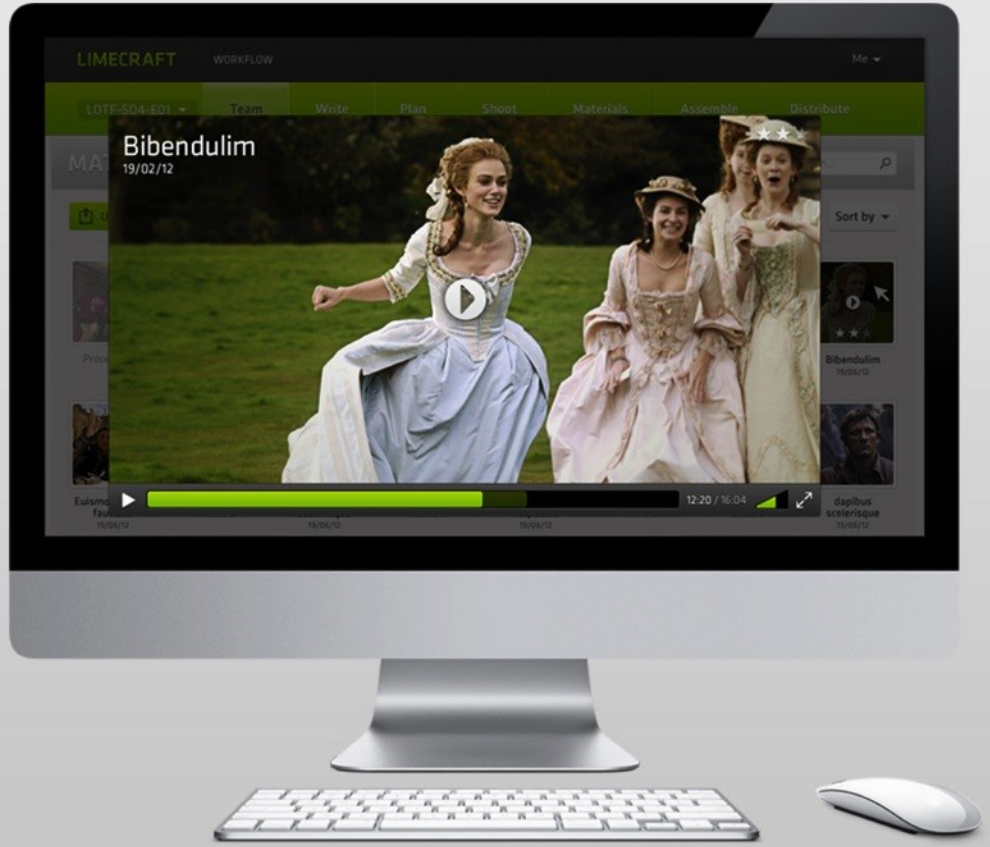


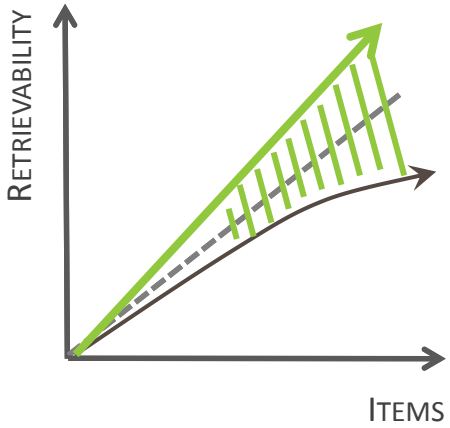
Limecraft Flow – Designed for real-time co-production

- Paperless - all paper documents replaced by **browser-based** applications
- Software as a Service **– anywhere, anytime, any type of device**
- Semantic technologies to make sure different parties easily exchange content
- Embedded metadata – guaranteed delivery between systems
- Connects instead of replacing existing systems


LIMECRAFT
WORKFLOW
Me
LOTF-S04-E01
Team
Write
Plan
Shoot
Materials
Assemble
Distribute
SCRIPT
UPLOAD
DOWNLOAD
TRASH
Search...
ADD SCENE
Action
Dialog
Character
B
U
I
SCRIPT OUTLINE
SCENE 01:
int.apartment- day
We find we're watching a TV screen...
SCENE 02:
int.apartment- night
lorem ipsum dorlorem...
SCENE 03A:
ext.park- night
lorem ipsum dorlorem...
SCENE 03B:
ext.park- night
Scene 01
INT.
DAY
APARTMENT
TITLE
ACTION
We find we're watching a TV screen, eight feet, wide floating in the air of a highly futuris tic living room...in front of the TV area couple of t
DIALOG
The trailer finished, the TV's interface changes to a complex multi layered DVR style UI, glimpses of other programs
flash past
KID 1
(getting up)
Oh, we can check the site.
His hands play with the air in front of the tv, accessing Paladin's website, we see images and menus shift and jump in sync with his hand movements
KID 1 (CONT'D)


LIMECRAFT
WORKFLOW
Me
LOTF-S04-E01
Team
Write
Plan
Shoot
Materials
Assemble
Distribute
MATERIALS
Tip: drag and drop to pre-arrange your story
Search...
UPLOAD FILES
Filter
Sort by
Processing...
Processing...
Processing...
Stack 012
19/06/12
Clip 062
19/06/12
Stack 05
19/06/12
Pellentesque volutpat
19/06/12
Bibendulim
19/06/12
Euismod laoreet faucibus
19/06/12
Intro
19/06/12
Dapibus scelerisque
19/06/12
Stack 03
19/06/12
Vivamus vulputate
19/06/12
Clip 33
19/06/12
Clip 32
19/06/12
dapibus scelerisque
19/06/12

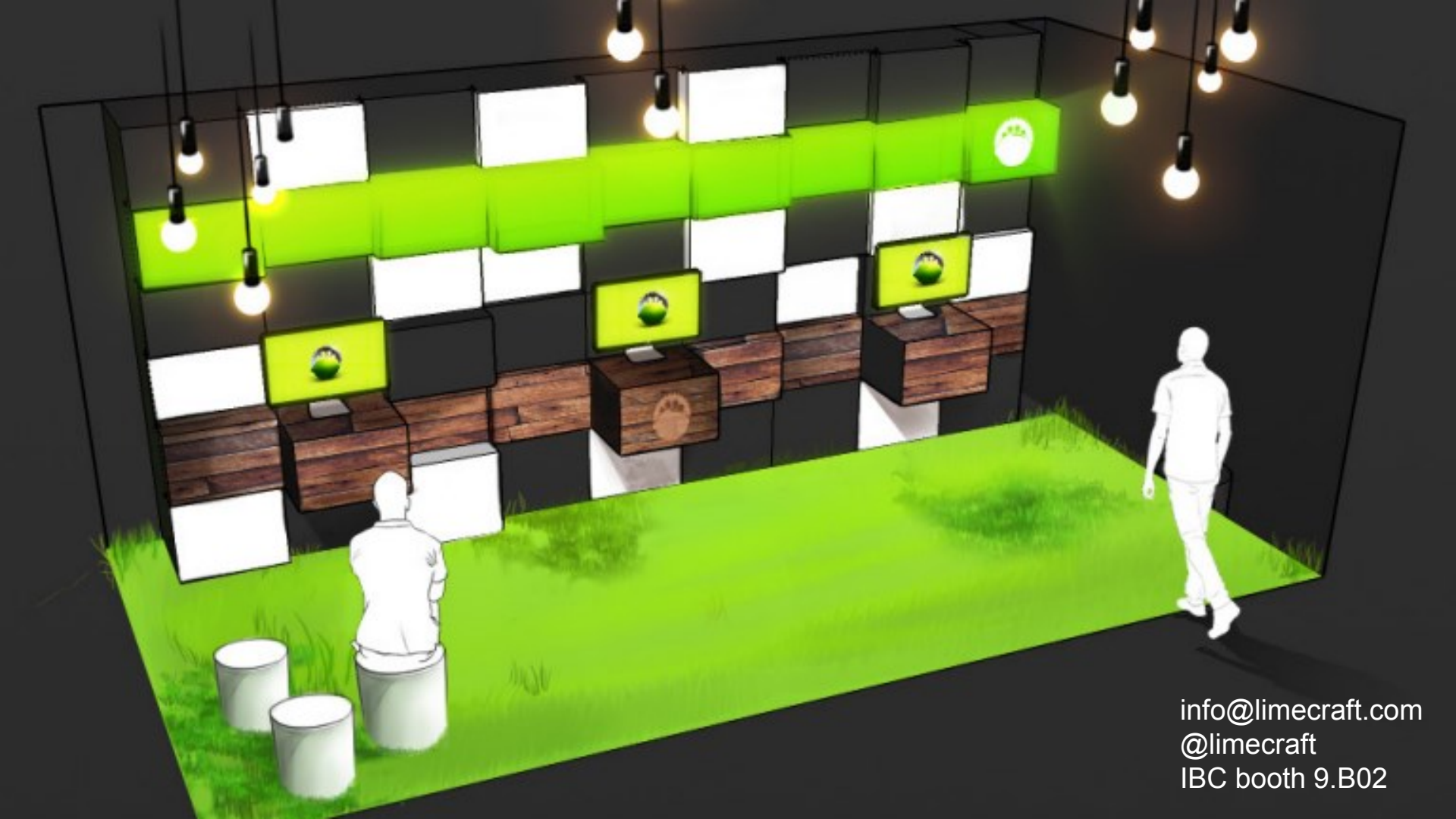

LIMECRAFT
WORKFLOW
Me
LOTF-S04-E01
Team
Write
Plan
Shoot
Materials
Assemble
Distribute
Bibendulim
19/02/12
Sort by
12:20 / 16:04
Bibendulim
dapibus
scelerisque



Conventional Media Asset Management systems are designed to host single-company operations. At larger volumes, the cost per item inflates and it becomes increasingly difficult to retrieve items

Based on semantic technology, Limecraft provides

- solid and reliable infrastructure designed to host large-scale operations whereby the cost per item grows linear
- **Innovative image processing and semantic technologies so items remain retrievable** at large numbers


info@limecraft.com
@limecraft
IBC booth 9.B02