

Workshop on  
“Harmonization of Web and IPTV technologies”

# Interactive Multimedia Applications based on ITU-T H.762 LIME

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# LIME Background


- Enhanced content / datacasting, interactivity
- Internet ubiquity, faster broadband access
- Early attempts: web browsers in TVs
  - lean forward problem
  - inadequate user interface
- Standards:
  - W3C CSS TV
  - CEA-2014
  - BML: used extensively in Japanese Digital TV (ARIB/ISDB)
  - LIME: ITU-T Recommendation H.762
    - consented in 2009
    - builds on BML
    - targets IPTV

# LIME design considerations:

- (1) Synchronization among multiple sources
- (2) Simplification of navigation (no mouse)
- (3) Rendering tailored to TV

**Contextual Information** →

**Live TV** →



**Group C**

	NET	JPN	DEN	CMR	P	W	D	L	G
Netherlands		1-0	2-0		6	2	0	0	3
Japan	0-1			1-0	3	1	0	1	0
Denmark	0-2			2-1	3	1	0	1	-1
Cameroon		0-1	1-2		0	0	0	2	-2

Menu Standings Players MyPage

Blue Red Green Yellow

# Overview of ITU-T Recommendations for IPTV

## ***Home networking***

H.622.1: Req & Arch for  
IPTV Home networks

## ***Applications and end-systems***

H.750: Metadata for IPTV Services

H.721: IPTV Terminal (Basic)

H.770 : IPTV Service discovery

H.761: Ginga-NCL

H.740: Application Event Handling

H.762: LIME

H.763.1: Cascading style sheets for IPTV services

ITU-T H.762  
LIME for IPTV

## ***Architecture, requirements, network***

Y.2007: NGN Capability Set 2

Y.sup5 IPTV Service use cases

Y.sup7 NGN Release 2 Scope

Y.1910 IPTV Functional Arch

Y.1901 IPTV Service Requirements

## ***Quality of Experience***

H.701: Content Error-Recovery

G.1080: IPTV QoE

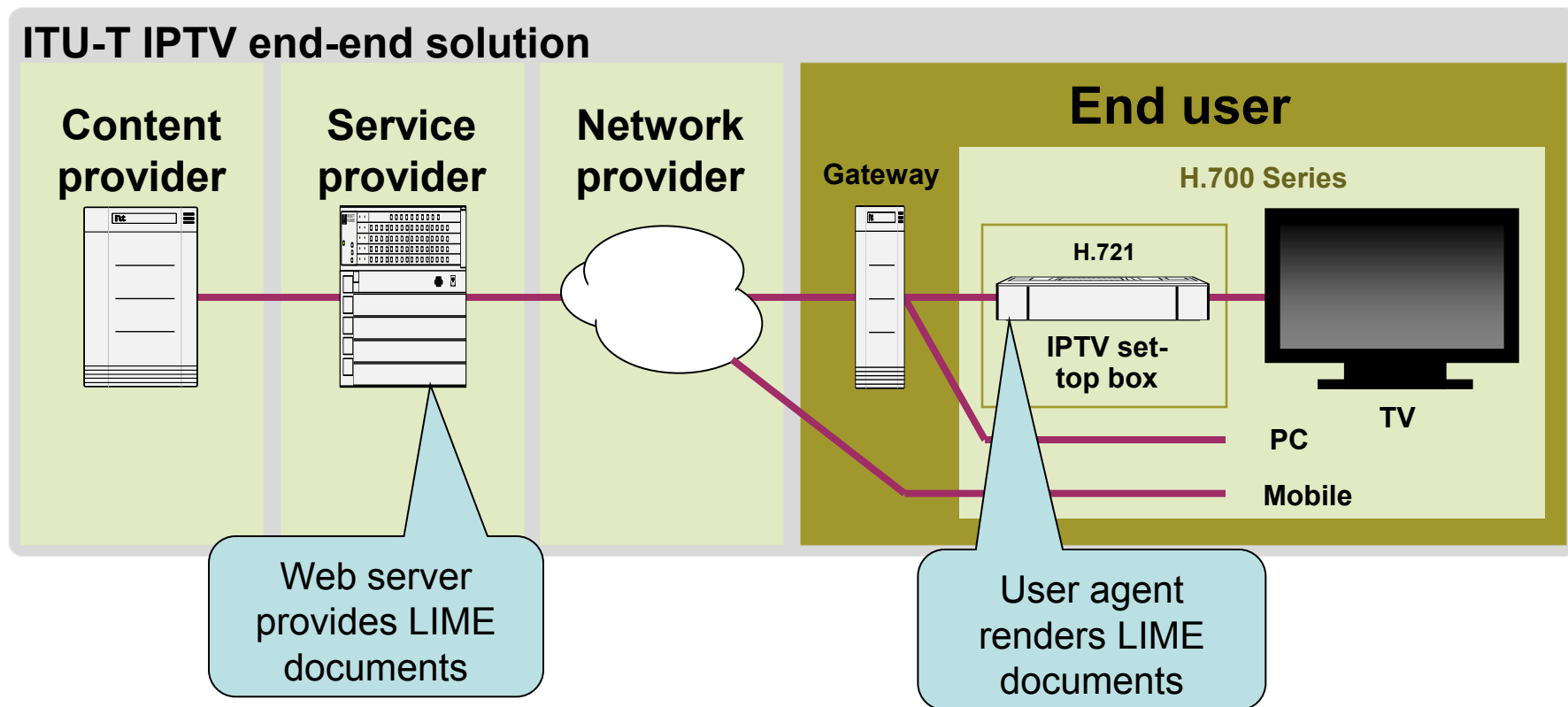
G.1081: Performance Monitoring

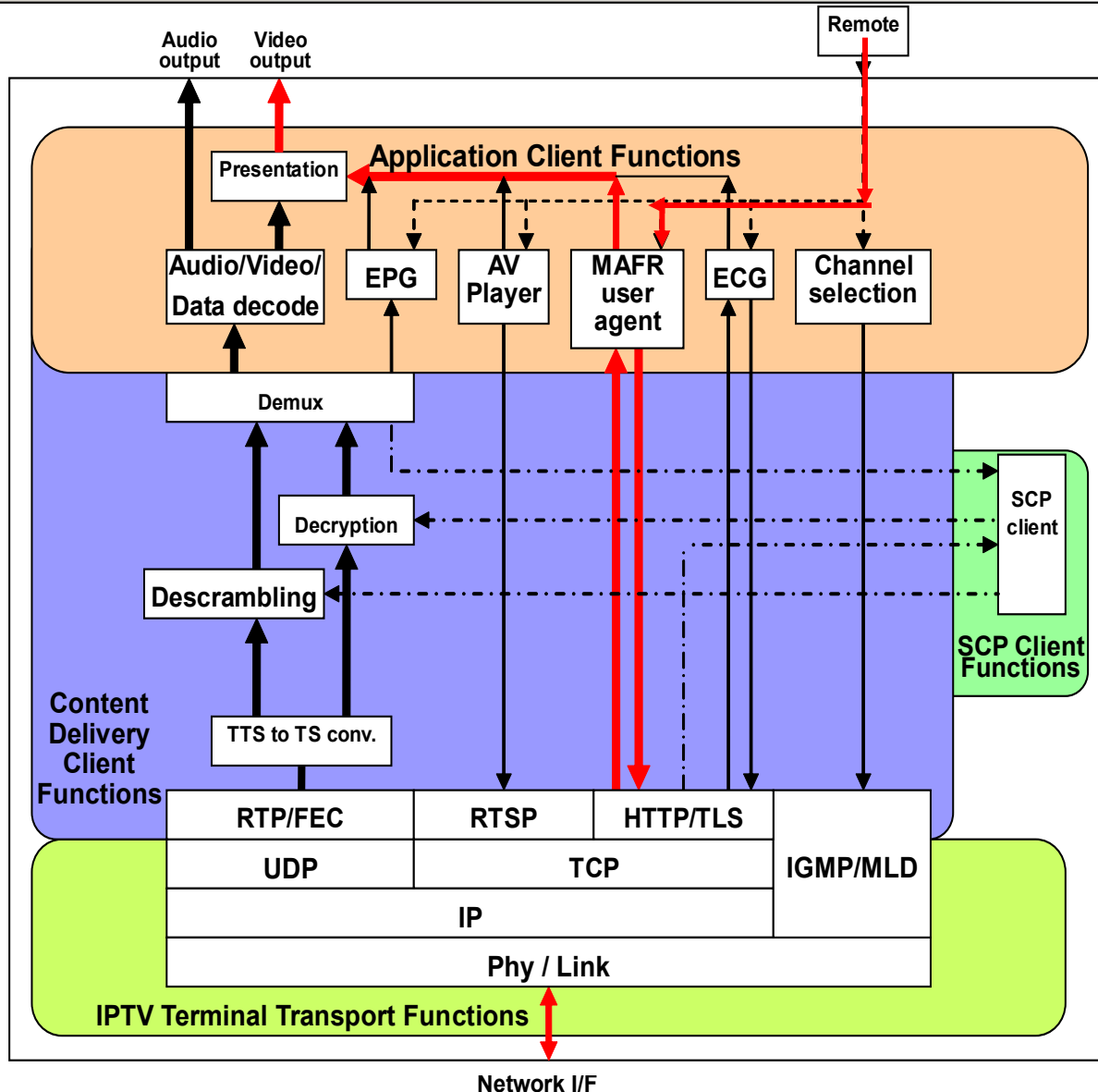
G.1082: Improving robustness of IPTV performance

## ***Security and Content Protection***

X.1911 Req & arch for IPTV security

## IPTV domains





International Telecommunication Union

# ITU-T

TELECOMMUNICATION  
STANDARDIZATION SECTOR  
OF ITU

# H.762

(12/2009)

SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

IPTV multimedia services and applications for IPTV –  
IPTV multimedia application frameworks

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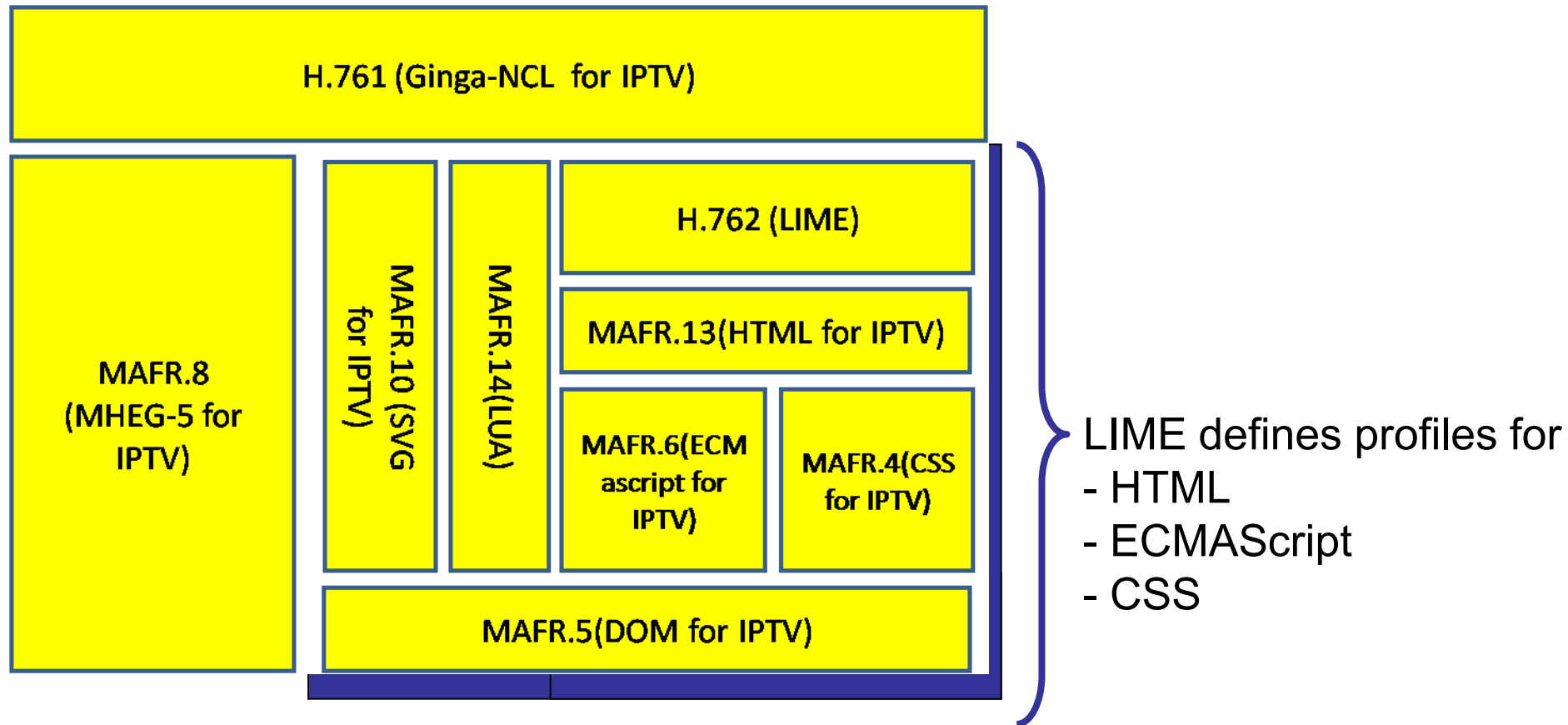
**Lightweight interactive multimedia environment  
(LIME) for IPTV services**

Recommendation ITU-T H.762

ITU-T



# MAFR Recommendations





# LIME HTML Extensions

- ***bevent* and *beitem***

Event control. Events sent from the station to the receiver to trigger an action. E.g. synchronize contextual data with main content stream (e.g. sports statistics).

- ***body& invisible***

switches off the document to let main service (usually a TV program) undisturbed

- ***onfocus/onblur* attributes of *div& p& span& object&* address the lack of a mouse**

Elements	Attributes
Core Attributes	
	id
	class
Events Attributes	
	onclick
	onkeydown
	onkeyup
Style Attributes	
	style
Core Modules	
body	%Core.attrib
	%Style.attrib
Text Module	
br	%Core.attrib
	%Style.attrib
div	%Common.attrib
p	%Common.attrib
span	%Common.attrib
Hypertext Module	
a	%Common.attrib

	accesskey
	href
Forms Module	
input	%Core.attrib
	%Events.attrib
	%Style.attrib
	accesskey
	disabled
	readonly
	maxlength
	type
	value
	inputmode
	charactertype
Object Module	
object	%Common.attrib
	data
	type
Intrinsic Events Module	
a&	onblur
	onfocus
body&	onload

	onunload
input&	onfocus
	onblur
	onchange
Metainformation Module	
	name
	content
Scripting Module	
script	src
Style Sheet Module	
link	href
<u>LIME Extension Module</u>	
bevent	id
beitem	id
	type
	onoccur
	es_ref
	message_group
	id
	message_id
	message_version
	module_ref

	language_tag
	time_mode
	object_id
	subscribe
body&	invisible
div&	accesskey
	onfocus
	onblur
p&	accesskey
	onfocus
	onblur
span&	accesskey
	onfocus
	onblur
object&	streamposition
	streamstatus
	remain
	accesskey
	onfocus
	onblur

↗ **Extensions  
(7 elements)**

# LIME Script Profile

Subset of ECMAScript in LIME-script profile  
is limited to eight objects

- *global*
- *Object*
- *Function*
- *Array*
- *String*
- *Boolean*
- *Number*
- *Date*

# LIMEScript Profile Extensions

## Browser pseudo object functions

EPG functions	
	epgGetEventStartTime()
	epgGetEventDuration()
	epgTune()
	epgTuneToDocument()
	epgIsReserved()
	epgReserve()
	epgCancelReservation()
	epgRecIsReserved()
	epgRecReserve()
	epgRecCancelReservation()
Interaction channel communication-TCP/IP	
	setISPParams()
	getISPParams()
	connectPPP()
	connectPPPWithISPParams()
	disconnectPPP()
	getConnectionType()
	isIPConnected()
	transmitTextDataOverIP ()
Operational control functions	
	reloadActiveDocument
	getNPT()

	getProgramRelativeTime()
	isBeingBroadcast()
	lockModuleOnMemory()
	unlockModuleOnMemory()
	setCachePriority()
	getIRDID()
	getBrowserVersion()
	getProgramID()
	getActiveDocument()
	lockScreen()
	unlockScreen()
	getBrowserSupport()
	launchDocument()
	launchDocumentRestricted ()
	quitDocument()
	getFreeContentsMemory()
	isSupportedMedia()
	detectComponent()
	lockModuleOnMemoryEx()
	unlockModuleOnMemoryEx()
	unlockAllModulesOnMemory()
	getLockedModuleInfo()
	getBrowserStatus()
	isResidentAppVersion()

	isRootCertificateExisting()
	getRootCertificateInfo()
Receiver audio control	
	playRomSound()
Timer functions	
	sleep()
	setInterval()
	clearTimer()
	pauseTimer()
	resumeTimer()
	setCurrentDateMode()
External character functions	
	loadDRCS()
Other functions	
	random()
	subDate()
	addDate()
	formatNumber()
Closed caption display control functions	
	setCCDisplayStatus()
	getCCDisplayStatus()
	getCCLanguageStatus()

**Extensions:  
8 categories**

# LIME CSS Profile

- Extended properties for
  - Color
  - Resolution
  - Aspect ratio
  - Navigation assuming a remote controller

# LIME CSS Profile

## Properties

### Selector

\*

E

E:focus

E:active

E.myclass

#myid

### Media type

@media

### Box model

Margin

padding-top

padding-right

padding-bottom

Padding-left

border—width

border-style

### Background

background-image

background-repeat

### Font

font-family

font-size

font-weight

### Text

text-align

letter spacing

white-space

### Pseudo class/ Pseudo element

:active

:focus

## Visual formatting model

position

left

top

width

height

z-index

line-height

display

### Other visual effects

visibility

overflow

### Extensions

clut

color index

background-color-index

border-top-color-index

border-right-color-index

border-bottom-color-index

border-left-color-index

resolution

display-aspect-ratio

grayscale-color-index

nav-index

nav-up

nav-down

nav-left

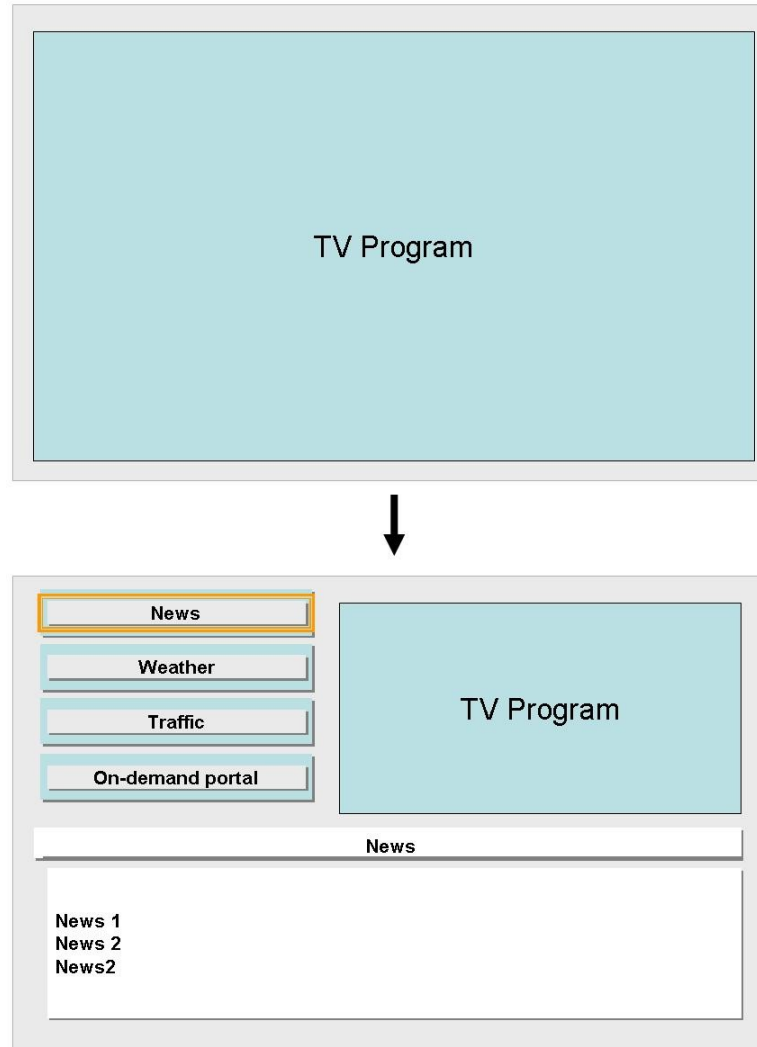
nav-right

used-key-list

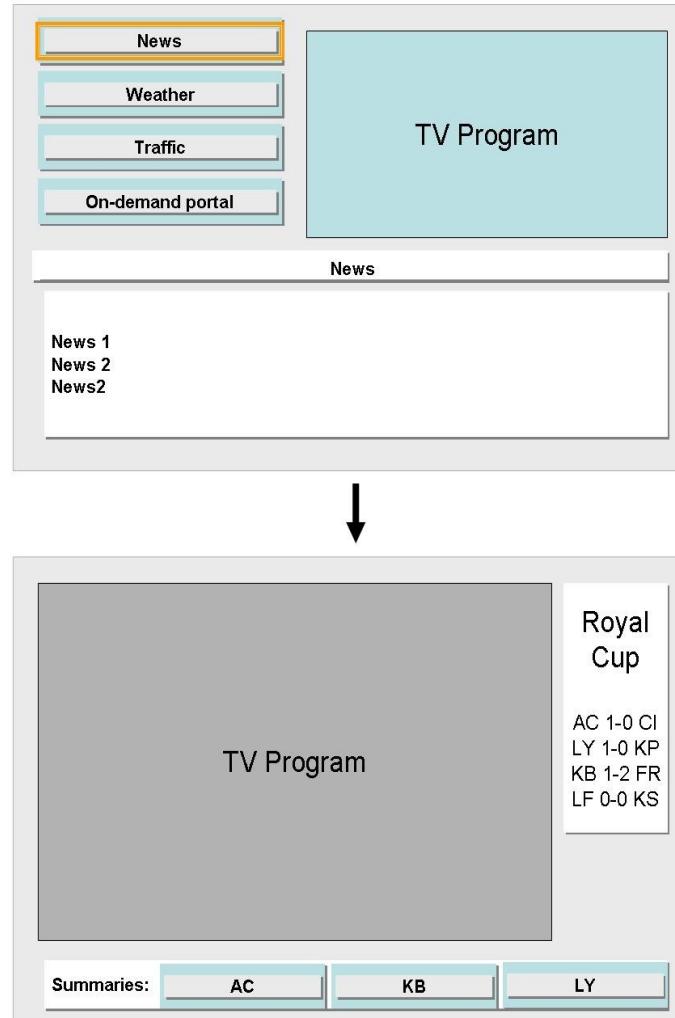
# LIME Examples







LIME datacasting example  
Transition from Linear TV to Datacasting



Transition from a Linear TV program to another program while datacasting is enabled

# Conclusions

- LIME design requirements targeted specifically at IPTV
- LIME profiles address:
  - Presentation restrictions (e.g. color, font appropriate for displaying on a TV)
  - Navigation without a spatial UI device
  - Synchronization of contextual data with IPTV content
- LIME is lightweight yet powerful enough