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DENVER, CO
OCTOBER 17-20



ENHANCING THE INTERACTIVE EXPERIENCE

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Smart Recordings: Dynamic Search and Record of Live TV

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Comcast VIPER



DENVER, CO
OCTOBER 17-20

This Session Will Be Interactive!



FXP | touch



- Personalize
- Chat
- Ask questions
- Take notes
- Move to current slide

What dominates Live TV viewing in most US Households?

A

Reality TV

B

Movies

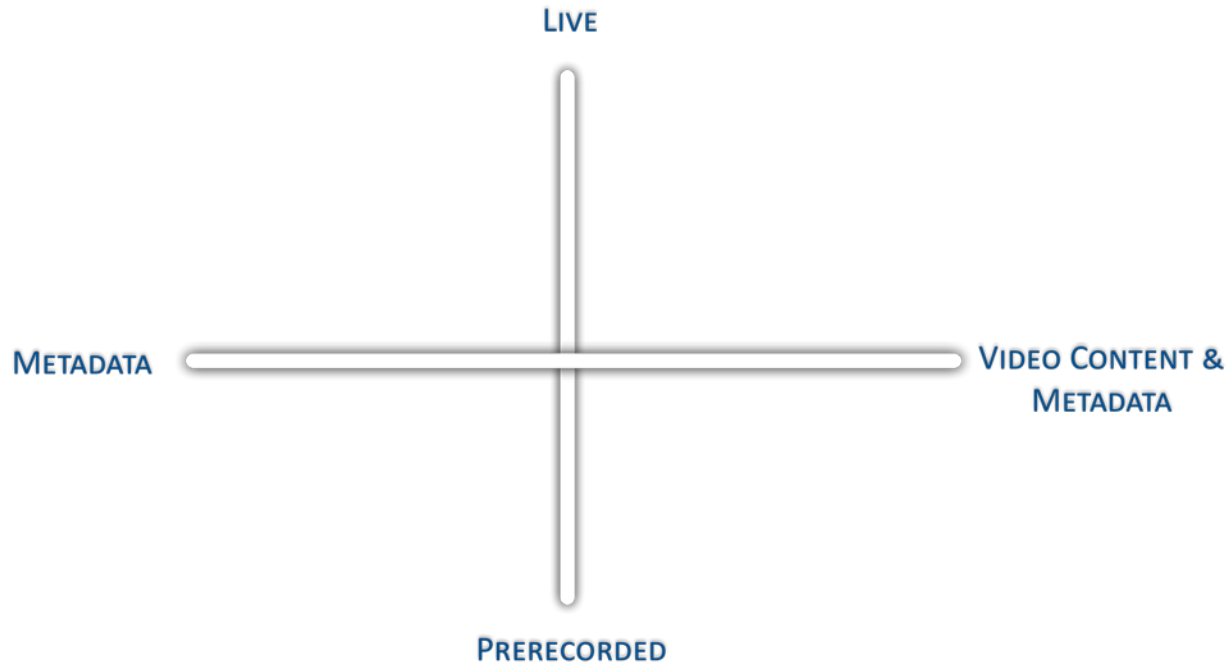
C

Sports & News

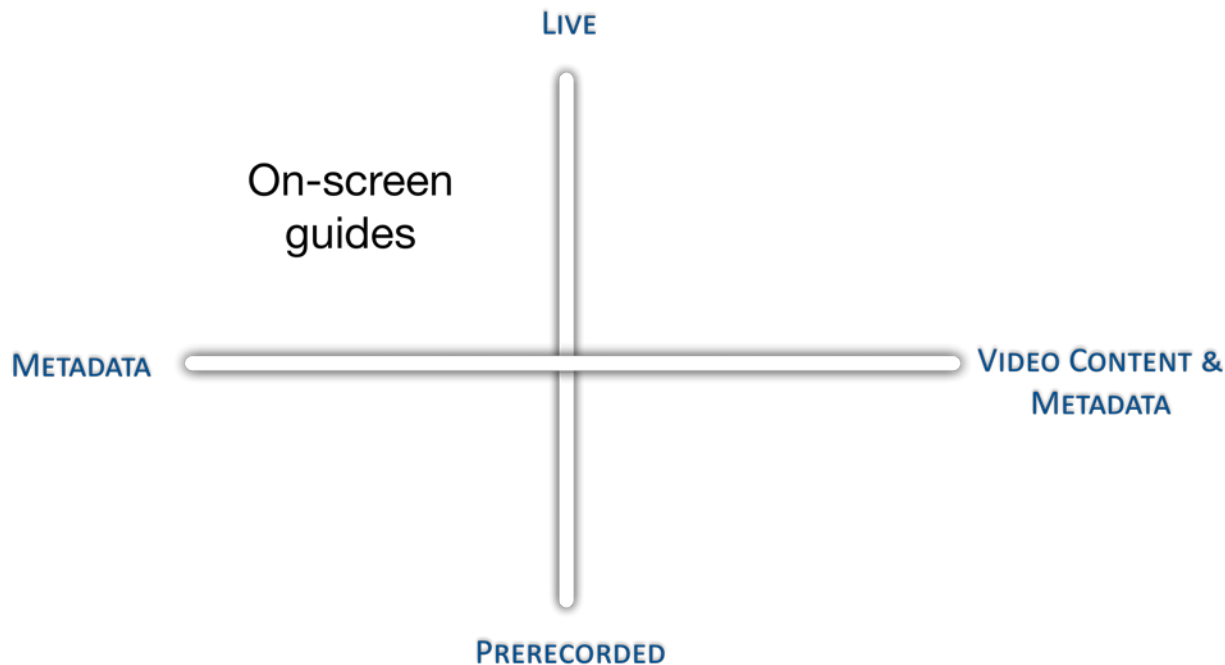
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Talent Shows

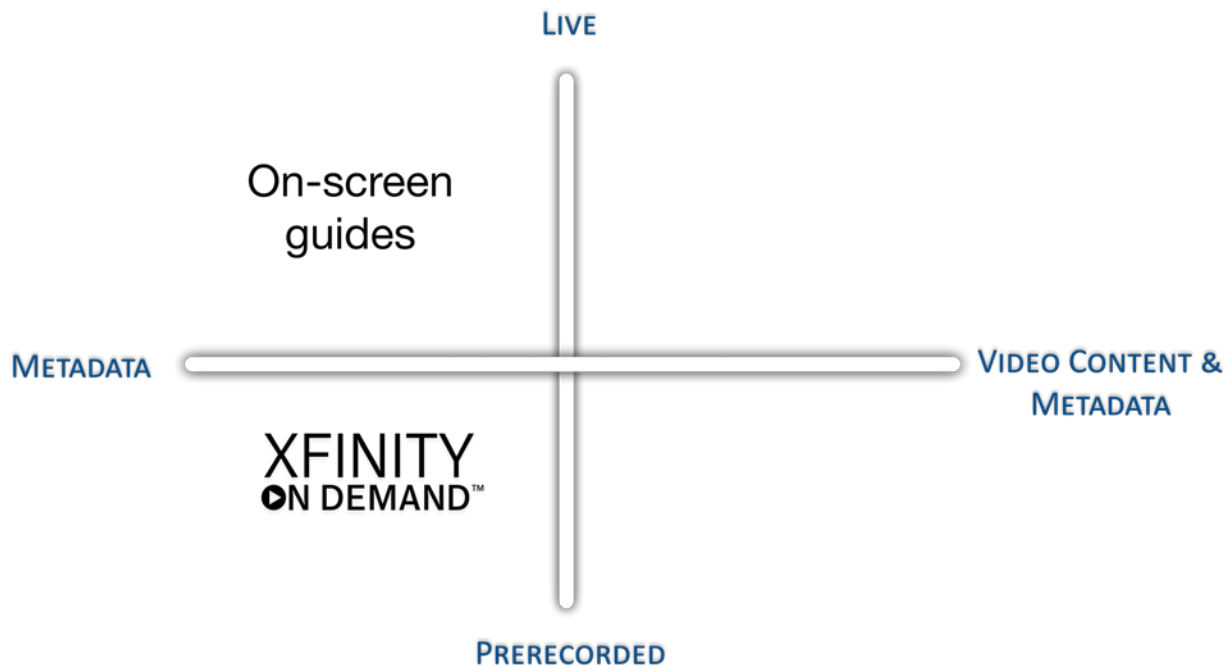
Content Discovery Methods



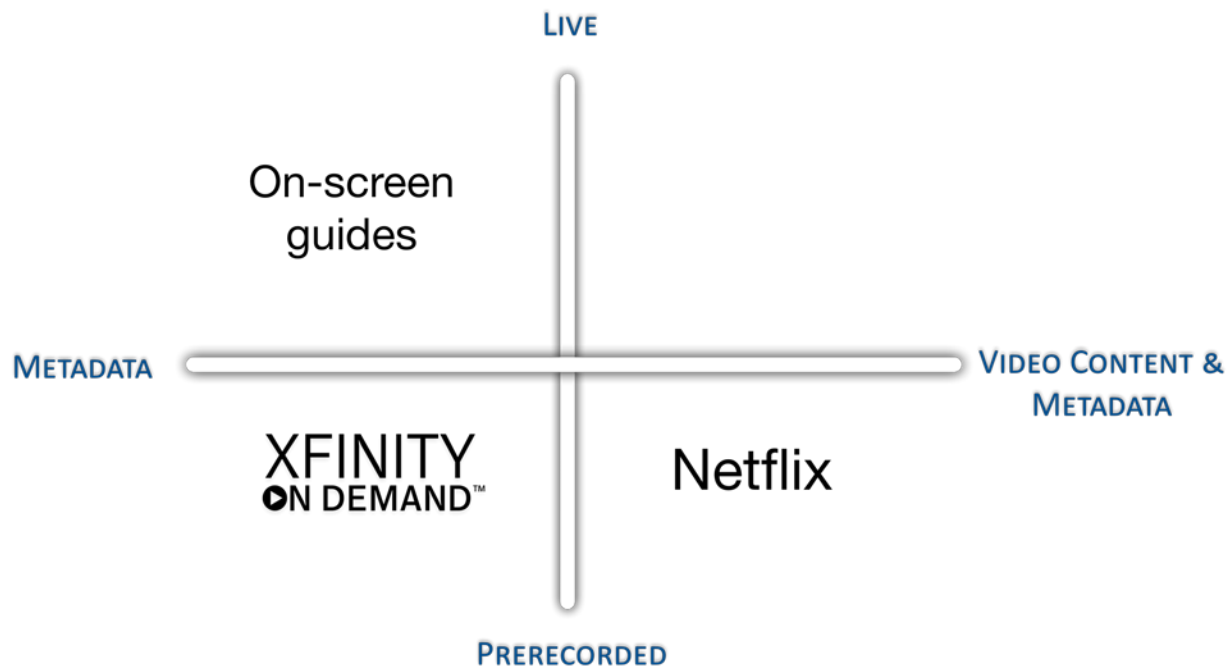
Content Discovery Methods



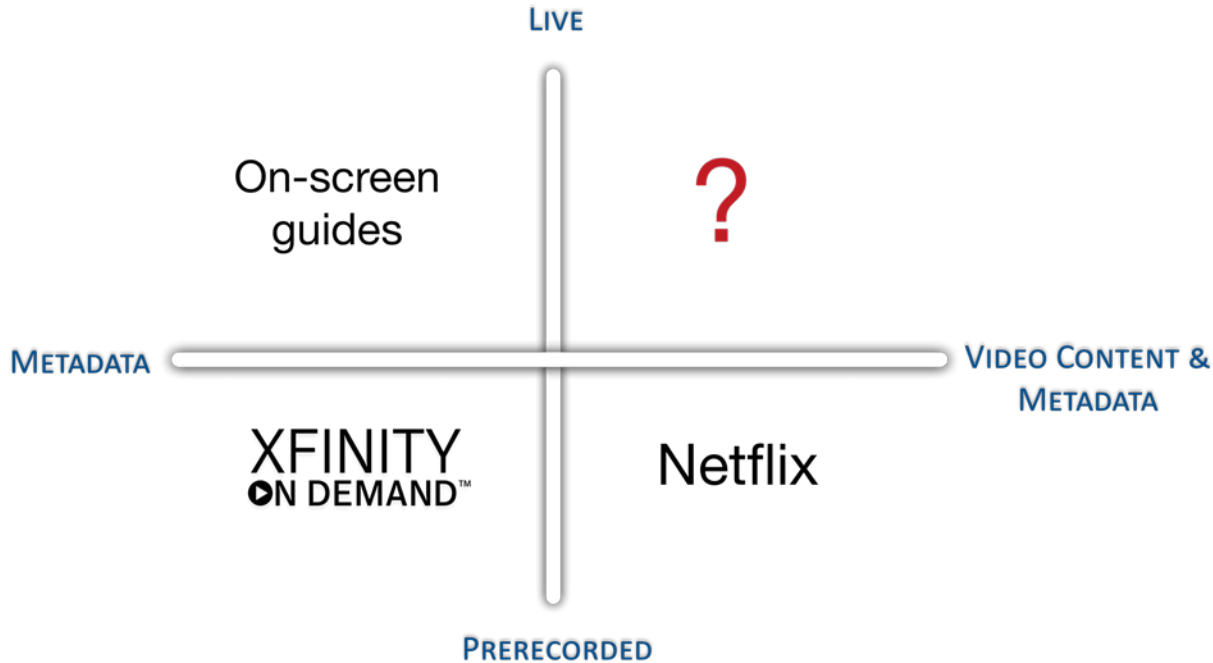
Content Discovery Methods



Content Discovery Methods

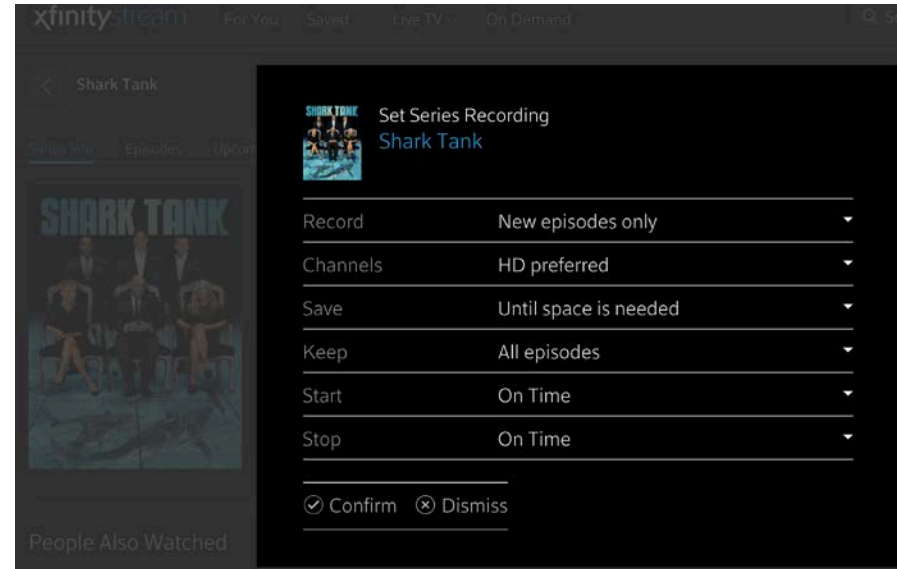


A Gap In Linear Content Discovery



Today's Search and Record Functionality

- ❑ Search across static metadata (title, series, genre, and actors)
- ❑ Record a live program now or schedule future recordings
- ❑ Users know what program is being recorded and when



What If Your TV Could Be Used As a Real-time Search Engine?

- Continuous search of Closed Captioning
- Automated alerts and video clip recordings
- Reduced friction finding content
 - Search all available channels 24/7
- Increased value of bundled content
 - Content surfaced from all channels



Live Guide Alerts

The screenshot shows a TV guide interface for "Today 7/28" with a time slot of "Now - 1:00p". A white notification box with the "xfinity" logo and the text "Live Notification" is overlaid on the guide. The notification contains the text: "Whole Foods" and "Amazon" are on MSNBC right now. Click "Ok" to view. An arrow points from the notification box to the MSNBC channel 765 entry in the guide.

Channel	1:00p	1:30p	2:00p	2:30p	3:00p	3:30p	4:00p	4:30p	5:00p
746	Closing Bell				Fast Money		Mad Money		Shark Tank
747	Bloomberg Markets: Am...				Bloomberg Technology		Charlie Rose		Bloomberg D...
759	Knocked Up								
761	The Real Housewives of New York City	The Real Housewives of New York City			The Real Housewives of New York City		The Real Housewives of New York City		The Real Hous...
762	Emeril's Kitchen		Organized Options		Gourmet Holiday		Emeril's Kitchen		In the Kitchen...
764	Hang 'Em High				Tombstone				
765	MSNBC Live with Ali Velshi		Deadline: White House		MTP Daily		The Beat with Ari Melber		Hardball With...
766	T.I. and Tiny: The Family ...	T.I. and Tiny: The Family ...	Basketball Wives		Basketball Wives		Love & Hip Hop: Hollywood		Black Ink Cre...
767	House of Wax		The Curse of the Cat People		House on Haunted Hill				Kim Novak: Li...
768	Botched		Botched		Botched		Botched		E! News
769	Dharma & Greg	Dharma & Greg	Dharma & Greg	French Kiss					Lethal Weapo...

Video Clip Content Recorded Relevant To Your Interests

The screenshot shows the Xfinity TV interface. At the top, it says "XFINITY TV" and "xfinity". The user is logged in as "christopher_lintz@comcast.com". Below the navigation bar (Guide, Recordings, On Demand), there is a search bar with the text "Search your interests happening NOW on Live TV" and a search input field containing "What is your interest?". Below the search bar, there is a "show my interests (+)" link. The main content area displays a video clip titled "Closing Bell" from CNBC. The clip was added 2 minutes and 5 seconds ago and has a duration of 4 minutes and 24 seconds. The description reads: "We have a news alert on Wal-mart and Amazon right now. Courtney Reagan stepping in with Details. >> Reuters citing a source that Wal-mart is not considering a rival bid for 'Whole Foods'". Below the description, the text "Amazon, Whole Foods" is displayed. A bracket on the left side of the video thumbnail is labeled "video clip recording". Three white arrows point to specific elements: one points to the video thumbnail, another points to the text "Amazon, Whole Foods", and a third points to the search bar area.

video clip recording

thumbnail snapshot at the time of the match

interests matched on content

dialogue surrounding the match

Receive Alerts • Tune-in Live • Watch Video Clips

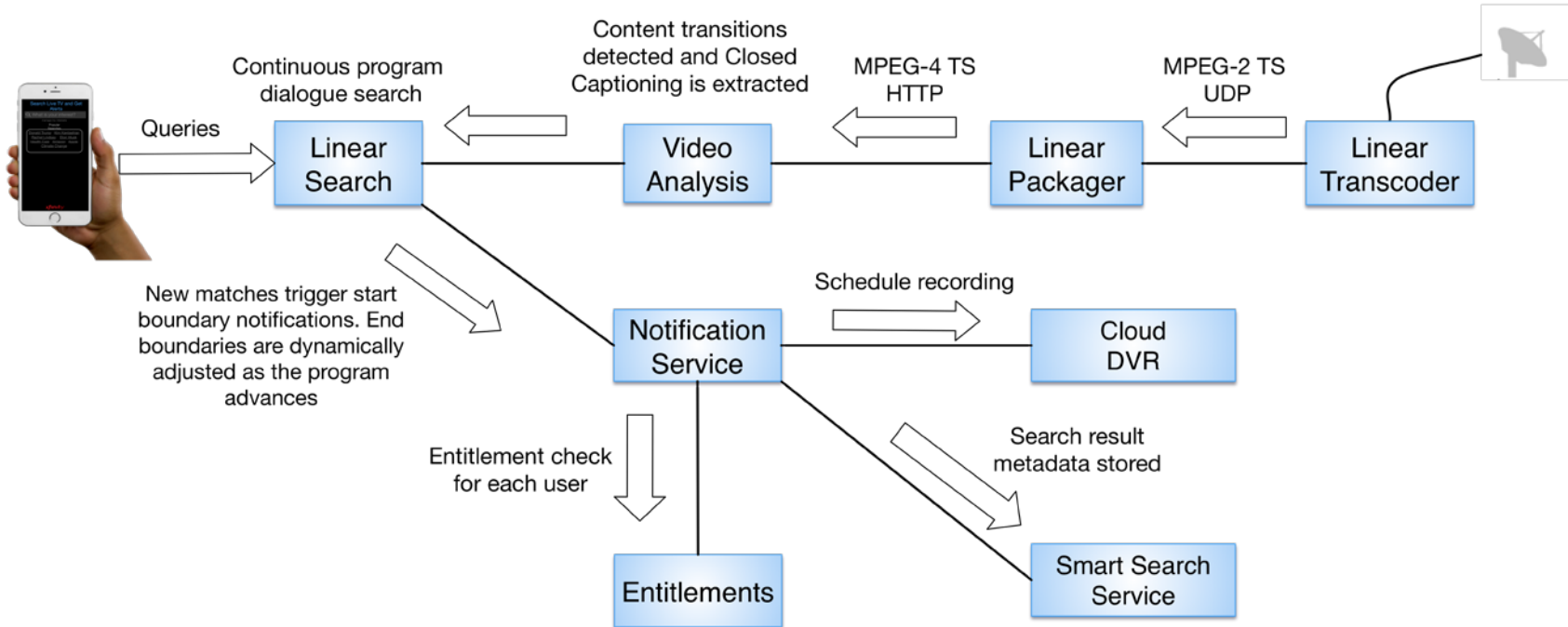


How likely are you to use
linear search guide or mobile
notifications?



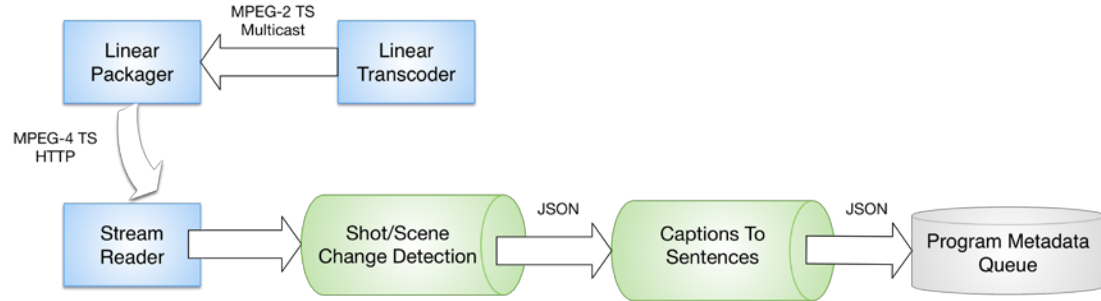
Likely

Logical Architecture



Video Analysis Pipeline

- ❑ Monitors linear manifests
- ❑ New segments analyzed for shot and scene changes
- ❑ Extracts captions and forms sentences
- ❑ Publishes program metadata to queue

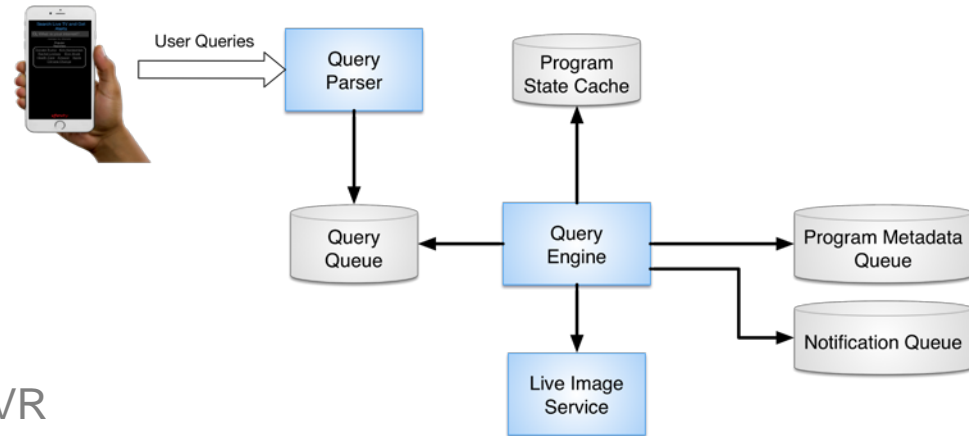


program metadata example

```
{
  "program": "Mad Money",
  "streamName": "CNBC HD",
  "streamId": "8951620516683951163",
  "ebpTime": 1496438204,
  "text": " >> Tesla passes Ford in market value now up over $350 per share
           as it continues an unreal run ahead of the Model 3",
  "shotChange": [1496438204, 1496438208],
  "sceneChange": [1496438212]
}
```

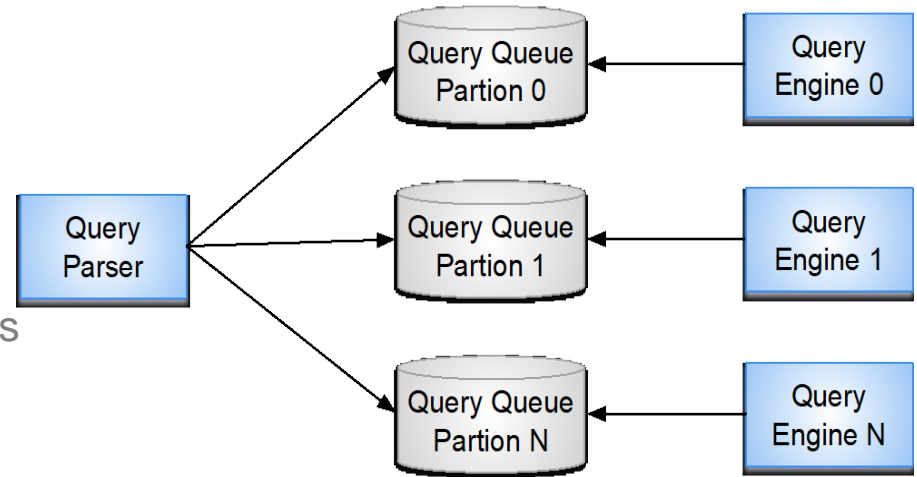
Logical Search and Record Architecture

- ❑ Queries are expanded and written to queue as an intermediate format
- ❑ When a match occurs:
 - ❑ Thumbnail image and dialogue surrounding match are captured
 - ❑ Start boundary determined
 - ❑ All match metadata pushed to notification queue
 - ❑ Notification system schedules cDVR recording



Query Partitioning

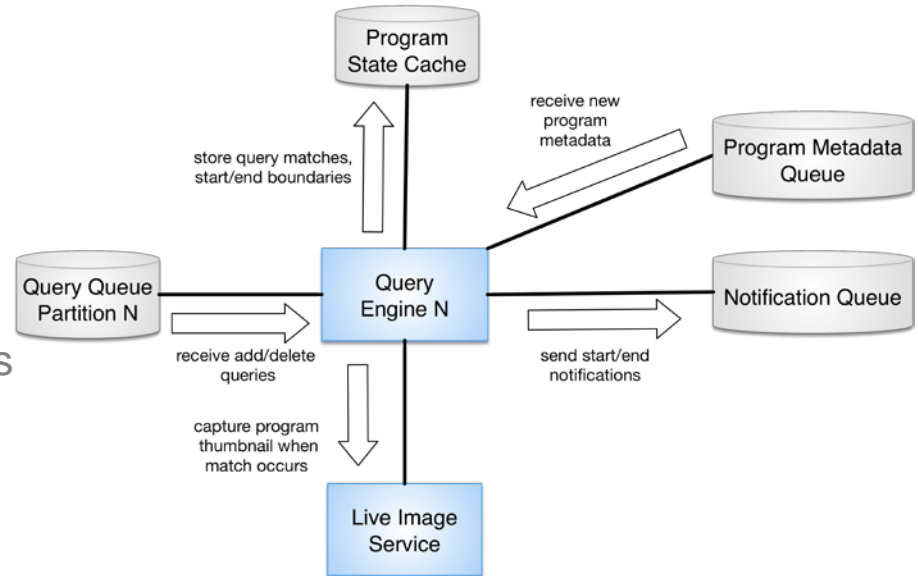
- ❑ Provides Query Engine parallelism (query bound)
- ❑ Partitions are persistent stores for a subset of queries
- ❑ Duplicate queries routed to same partition
 - ❑ One-to-many relationship of queries to users



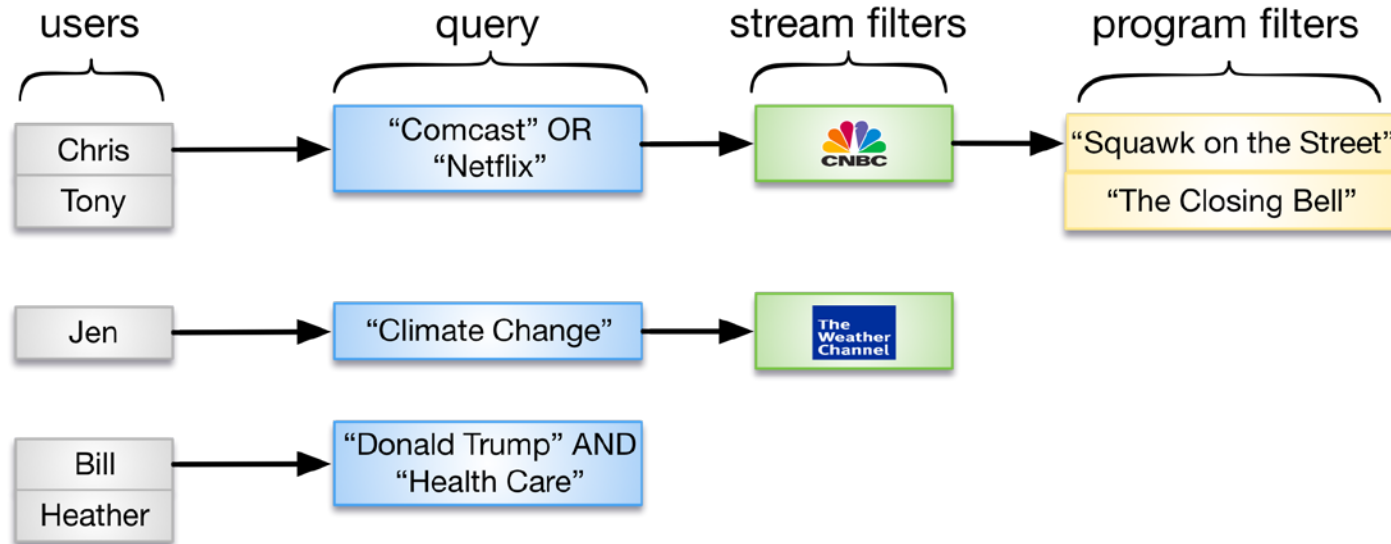
Partition ID = Hash(Query) % Total Partitions

Query Engines

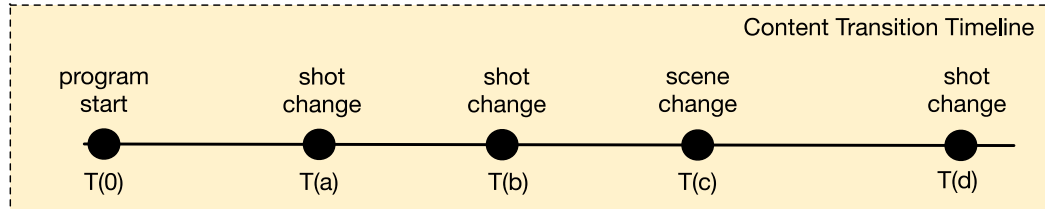
- ❑ Horizontally scaled by query partition & consumed linear streams
- ❑ Continuous stream search on new dialogue
- ❑ Program transcript search
 - ❑ Queries added during program
 - ❑ Proximity and other complex queries require querying past dialogue
- ❑ Program State Cache
 - ❑ Matched queries on program
 - ❑ Start/end boundaries



Query Engine: Stream and Program Filtering



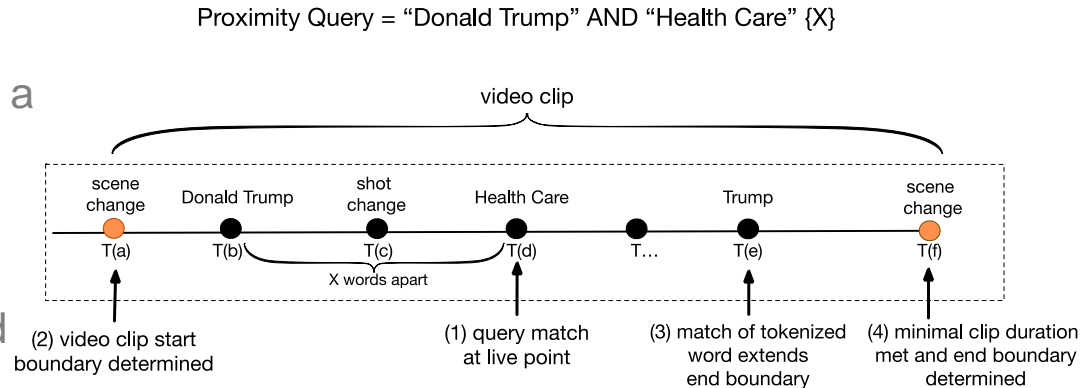
Query Engines: Content Transition Timelines



- Built from program metadata & maintained for each program
- Used to define start/end boundaries for a video clip
- Scene changes preferred over shot changes
- Provides a smoother viewing experience for video clips

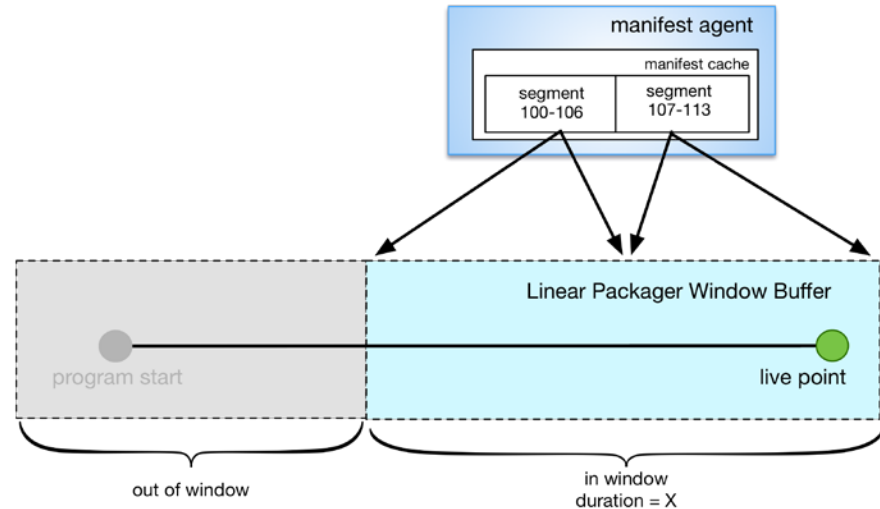
Query Engines: Content Transitions for Video Clip Boundaries

- ❑ Start boundary
 - ❑ Use timestamp in-front of sentence and attempt to find a previous scene/shot change
- ❑ End boundary (dynamically adjusts)
 - ❑ Minimum clip duration
 - ❑ Tokenized query terms found will extend the boundary
 - ❑ End on future scene/shot change



Support for Back-in-time Recordings

- ❑ A rolling window of manifests behind live point are cached
- ❑ Cached manifests contain segment URLs behind the live point
- ❑ Requests to record outside the window default to oldest segment in window



How likely are you to use linear search and record?



The Next Leap for Linear TV and DVR Service

- Live TV notifications allow for immediate viewing
- Recorded video clips capture your interests 24/7 on any channel
- Less friction finding linear content
- More value from bundled content

Would this service influence your decision when choosing a video provider?



On a scale of 1-5, how would you rate this presentation?



1-5



MAKE A COMMENT

TAP THE COMMENT ICON TO
POST A COMMENT





QUESTION & ANSWER

TAP THE QUESTION MARK ICON
TO SUBMIT A QUESTION



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THANK YOU!

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