

Case Study: Hybrid Services at "Chicago 3.0"

Jean Macher

Director, Broadcast Market Development





Produced by SMPTE and SBE with support from the NAB and ATSC









and the support of our host, WETA Television





Event Recording courtesy of the following sponsors:



Panasonic



With the support and generosity of the following sponsors:

































THANK YOU TO THE SMPTE DC, SBE AND NAB TEAM MEMBERS WHO PRODUCED THIS EVENT

Fred Willard Univision
Rick Singer Singer Media Engineering
Skip Pizzi NAB
Tom Hackett Diversified Systems
Melissa Davis Evertz
Louise Shidler Chesapeake Systems

Maciej Ochman CPB

James Snyder US Library of Congress

Nephi Griffith BMG

Greg Smalfelt Ch 16 Fairfax

Alex Snell BCI Digital

Peter Wharton Happy Robotz

Morning Program

8:00 AM - 9:00

9:35 AM - 10:00 AM

10:35 AM - 11:15 AM

11:50 AM - 12:15 PM

12:15 PM - 01:20 PM



Afternoon Program

AIVI	Registration	and	continental	breakia

Welcome from SMPTE, SBE and AES 8:55 AM - 9:00 AM Fred Willard, SBE Washington Kishore Persaud, SBE Baltimore

Introduction 9:00 AM - 9:05 AM Peter Wharton, SMPTE Membership VP

Chris Lane, Chief Engineer, WETA

NextGen TV: Transforming the Consumer Experience 9:05 AM - 9:35 AM Lynn Claudy, SVP Technology, NAB and Chairman, ATSC Board of Directors

Madeleine Noland, President, ATSC

Creating New Opportunities with NextGen TV Joonyoung Park, VP and Fellow, DigiCAP

Improved Television Reception for Consumers Implementing NextGen TV Distribution Systems

Content Reception Enhancements

Richard Lhermitte. VP Solutions and Market Dev. ENENSYS TeamCast

11:15 AM - 11:30 AM Morning Break

Consumer Applications for Combined 5G & NextGen TV Networks Josh Arensberg, M&E Business Development, Verizon Media

11:30 AM - 11:50 AM Case Study: Hybrid Services at "Chicago 3.0"

10:00 AM - 10:35 AM John Lynch, ERI Jeff Andrew, Osborn Engineering

Jean Macher, Harmonic

Buffet Lunch

Benefits of a Converged Broadcast and IP Platform Lynn Claudy, SVP Technology, NAB and Chairman, ATSC Board of Directors

5:00 PM - 6:00 PM

6:00 PM - 8:00 PM

02:20 PM - 03:20 PM

03:25 PM - 03:40 PM

Station Group and Industry Deployment Plans Advanced Capability Implementation Strategies Skip Pizzi, VP Technology Education & Outreach, NAB (Moderator)

Protecting the NextGen TV Consumer

Monetizing the NextGen TV Consumer

Personalizing the Consumer Experience

The Consumer Out-of-Home Experience

01:25 PM - 01:45 PM Advanced EAS and AWARN Capabilities John McCoskey, SpectraRep

01:45 PM - 02:15 PM Addressable Advertising and Analytics

Rick Ducey & Mark Fratrik, BIA

Mark Corl. Triveni Digital

Pete Van Peenan, Pearl TV

Greg Jarvis, Fincons

Afternoon Break

So Vang, NAB

Interactive and Personalized Features

03:40 PM - 04:10 PM Mobile & Automotive Applications and FeMBMS (5G Broadcast)

Michael Bouchard, VP Technology Strategy, ONE Media / Sinclair

Stacey Decker, CTO, Public Media Group Sasha Javid, COO, The Spectrum Co

Cocktail Reception Busboys and Poets

Madeleine Noland, President, ATSC

4:10 PM - 4:35 PM Lynn Claudy, SVP Technology, NAB and Chairman, ATSC Board of Directors

4251 S. Campbell Ave., Shirlington Heavy Hors d'oeuvres and open bar

Thomas Janner, Product Management & R&D Director, Rhode & Schwarz

The ATSC 3.0 Roadmap

The Consumer Technology Roadmap

4:35 PM - 5:00 PM Brian Markwalter, SVP Research and Standards

The Consumer Technology Association

Agenda



Introduction to Chicago 3.0

Principle of ATSC 3.0 Hybrid Services

Implementation of Hybrid Services at Chicago 3.0





Introduction to Chicago 3.0



What is "Chicago 3.0"?



- Chicago 3.0 is a consortium of leading broadcast vendors and Weigel Broadcasting Co. to experiment with ATSC 3.0 in a large market environment using a full-power, experimental broadcast TV station.
- Transmissions began in early September 2018 on UHF channel 23 from the Willis (Sears) Tower.
- Trial intends to complement the other ATSC 3.0 trials by focusing on next-gen TV areas not covered by these trials:
 - Definite and validate a "Baseline 3.0 Service" that can deliver over-the-air performance equivalent to today's ATSC 1.0 service in the Chicago environment.
 - Explore the opportunities offered by ATSC 3.0 Hybrid Services.



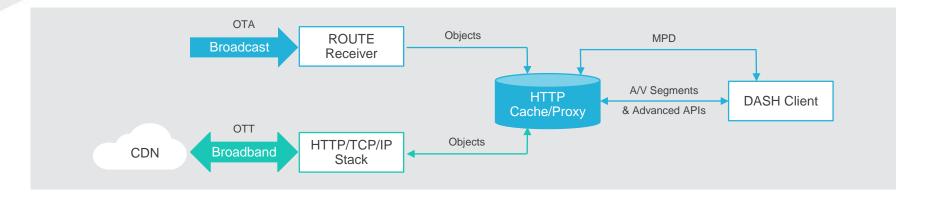


Principle of ATSC 3.0 Hybrid Services



Hybrid Services Definition





DASH can feed both the broadcast over-the-air delivery chain using ROUTE and the over-the-top (OTT) delivery chain using HTTP.

It is possible to use a standard DASH client (designed for OTT) in an ATSC 3.0 receiver. "Re-use" benefit: the DASH advancements made on the OTT side are natively available in ATSC 3.0.

ATSC 3.0 supports the delivery of hybrid services, in which some components of the service are delivered over the air and some components are delivered over a broadband connection.

Synchronization and Latency of the 2 Paths

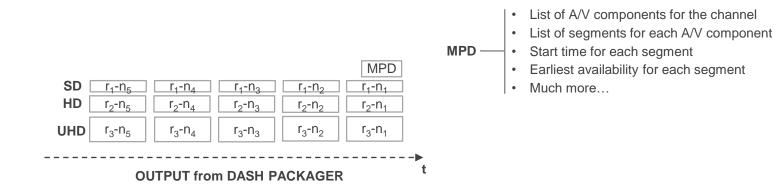


- Hybrid services require tight synchronization between the broadcast and broadband delivery paths.
- Synchronization is enabled by the DASH MPD (Media Presentation Description)
- The MPD provides timing information for the consumption and presentation of A/V segments in the DASH client.
 - Each segment has start time information for the media carried in the segment..
 - Each segment has earliest availability information that defines when the client can request and retrieve the segment via HTTP.

Synchronization and Latency of the 2 Paths

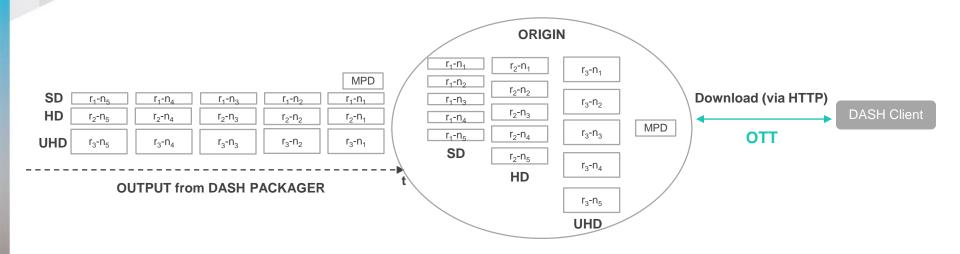


 MPD = "Table of Contents" used by the DASH client to retrieve and play the segmented stream



DASH Synchronization in OTT





- Single presentation timeline enables synchronization across representations
 - Segments with matching start times carry the exact same content
 - Enables simple switching of representations in the client
- Segment earliest availability ("availability start time") is used by client to determine the "live edge"

DASH Synchronization in ATSC 3.0 OTA

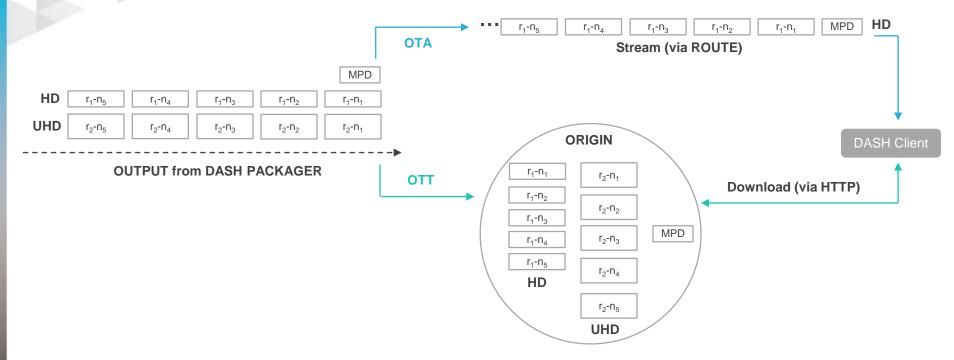




- Synchronization is simple
 - A single representation sent over-the-air
 - Segments are sent in sequential order

DASH Synchronization in Hybrid OTA/OTT





- Same synchronization mechanism as OTT
 - Client can retrieve segments from either delivery paths and place them on the presentation timeline
 - Switching between OTA and OTT inside the same representation is possible





Implementation of Hybrid Services at Chicago 3.0



Cloud Approach

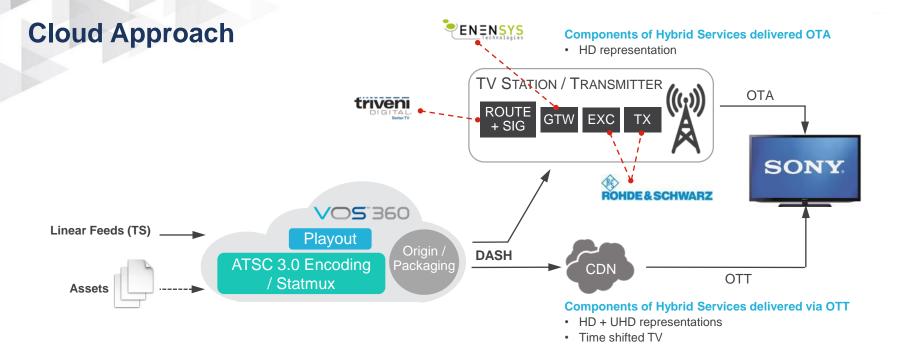


 Implementation of hybrid services based on cloud-based processing and OTT delivery, together with the ATSC 3.0 transmission chain deployed at Chicago 3.0.



- Harmonic's VOS360 SaaS creates a complete DASH service in the cloud, with the full set of representations →delivered over the air and delivered over the top.
 - All A/V segments, plus the MPD describing the complete service, are available on the VOS360 origin server

 The DASH client in the ATSC 3.0 receiver can pull components of the service via the broadband path in the same way that a traditional OTT service is retrieved.



- The ROUTE/signaling server at the TV station also pulls from the origin server, but only the MPD and the components that are configured for OTA transmission.
- The DASH segments for the OTA representation are ROUTE-encapsulated and passed to the rest of the 3.0 transmission chain.

Signaling and Receiver Logic



- Specific signaling is sent over the broadcast path to indicate that the service has components available over broadband.
 - A broadband URL pointing to the VOS360 origin server is added to the SLT (service list table).
 - The SLT is part of the low level signaling that can be acquired quickly by the receiver when doing a channel scan.
- The DASH MPD is added to the SLS (Service Layer Signaling) for the service, ROUTEencapsulated and sent over the broadcast path.
- If the broadband URL is present in the SLT, the DASH client gets the MPD over the Internet. Otherwise it gets the MPD in the broadcast SLS.

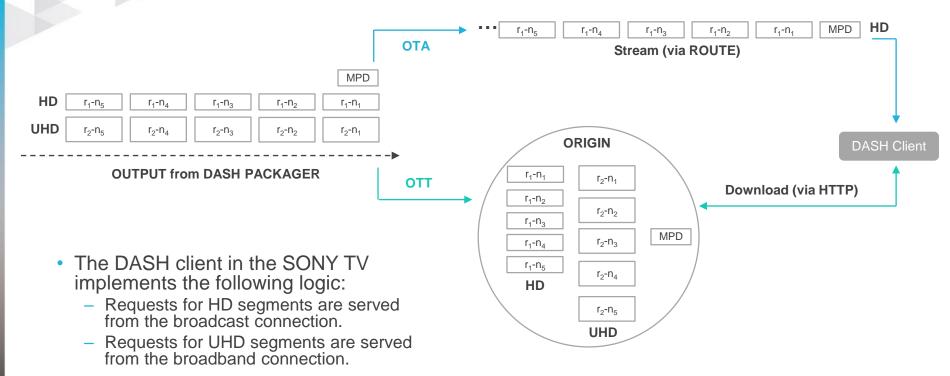
1st Use Case: Occasional UHD Delivery



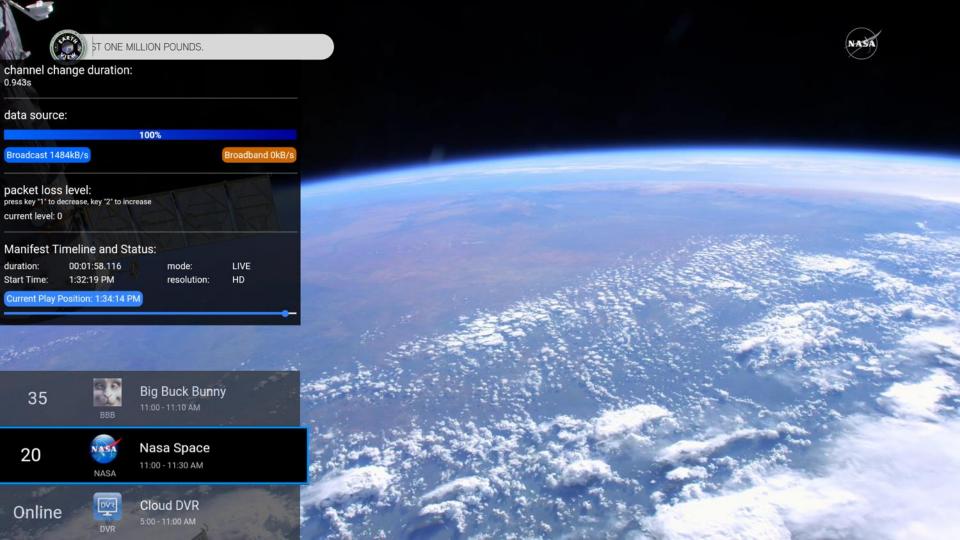
- A hybrid service approach can bring UHD to ATSC 3.0 viewers without overtaxing the spectrum resource.
- A UHD channel is created in Harmonic VOS360 SaaS. The UHD channel is transcoded in HEVC to both a UHD and a full HD representation.
- Triveni Digital's GuideBuilder pulls the MPD and the HD representation for ROUTE encapsulation. GuideBuilder also creates the SLT signaling for the service, including the broadband URL to indicate that the channel is available on VOS360

1st Use Case: Occasional UHD Delivery





- Practical use case: UHD representation only available for some primetime shows
 - OTA only receivers get good HD quality
 - Hybrid receivers with broadband connection get best UHD quality

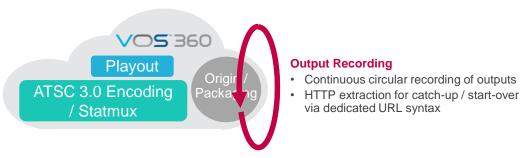




2nd Use Case: Time-Shifted Television



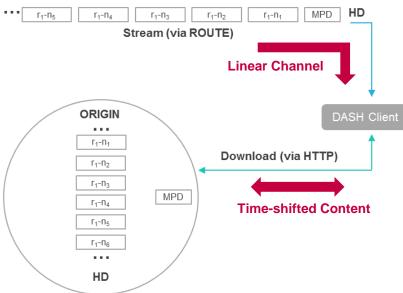
- With ATSC 3.0 and hybrid services, offering time-shifted TV to off-air viewers is possible and straight-forward to implement.
- For the time-shifted TV tests at Chicago 3.0, an HD channel is created in Harmonic VOS360 SaaS. The channel is transcoded in HEVC to a single HD representation.
- VOS360 origin server is configured for a three-day time-shift recording (the depth of this
 continuous recording is configurable) of the channel. The access to the time-shifted
 content is done directly by the DASH client and is entirely URL-based.



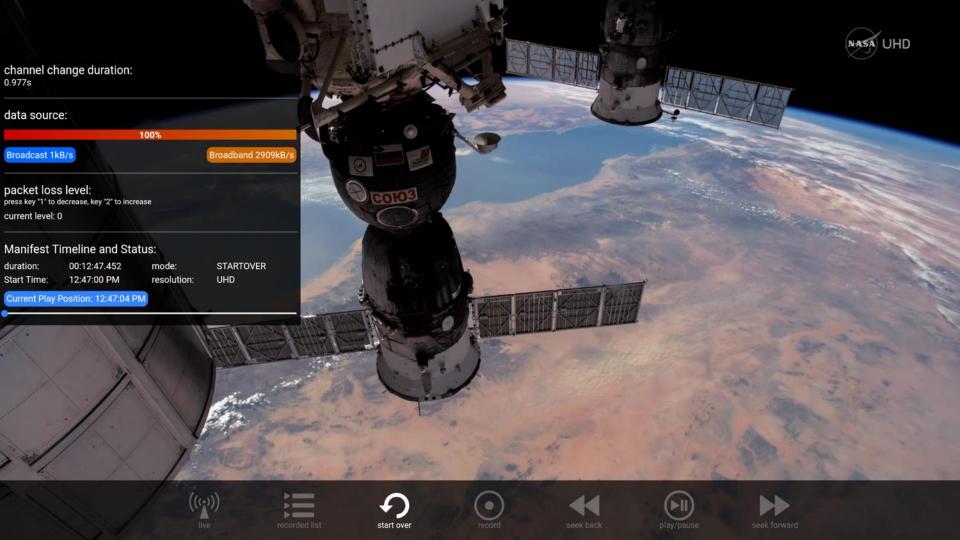
2nd Use Case: Time-Shifted Television

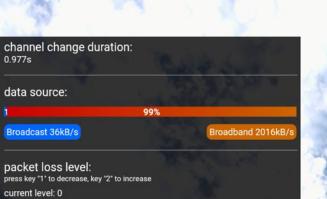
harmonic

- The Sony ATSC 3.0 receiver takes advantage of the broadband connection to add time-shifted TV capabilities to the OTA channel:
 - The DASH client retrieves the linear HD segments from the broadcast connection.
 - Requests for time-shifted content are served by VOS360 from the broadband connection via normal HTTP-based OTT streaming.



- Start-over URL example: http://vos360.net/Content/DASH/StartOver/channel(myChannel,myStartTime)/manifest.mpd
- Time-shifted TV can be implemented in a broadcaster provided application.
 - Implementing it in a broadcaster app has the benefit of making time-shifted TV available across all the devices that support the ATSC 3.0 application runtime environment.





Manifest Timeline and Status:

00:00:13.763 mode: duration: Start Time: 1:23:33 PM

resolution:

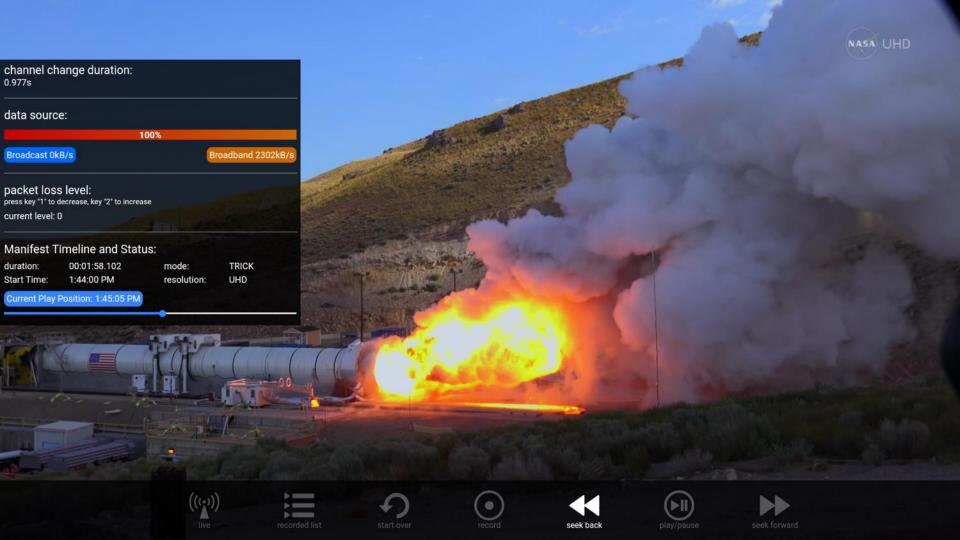
CATCHUP UHD

Current Play Position: 1:23:37 PM

start time: 1:23:33 PM duration: 15.286s Available Now!



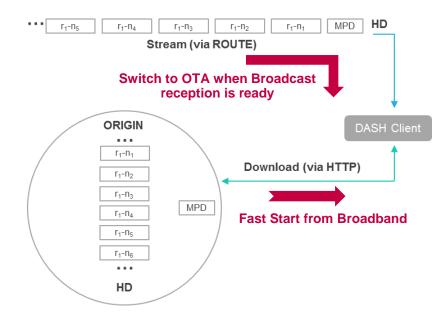
start time: 1:19:14 PM duration: 11.757s
Available Now!



3nd Use Case: Accelerated Channel Change

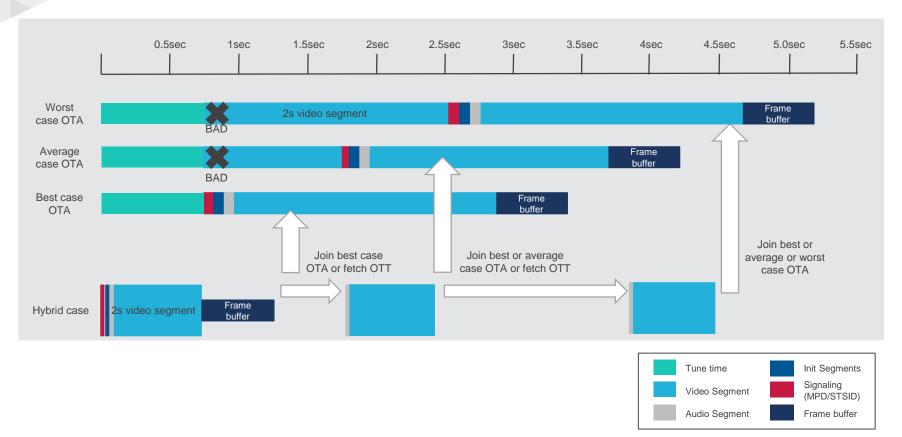


- Steps when a ATSC 3.0 receiver with only a broadcast connection changes channel:
 - tunes to the new channel
 - retrieve the SLS and initialize ROUTE
 - wait for the next DASH A/V segments to start in the broadcast
- The Sony ATSC 3.0 TV with both the broadcast and broadband connection can fast-track the retrieval of the MPD and the first A/V segments.
 - Use the broadband URL in the SLT to pull the MPD and the first A/V segments from the internet
 - In parallel retrieve SLS and wait for the first OTA segments
 - Once the first OTA segments are received, A/V segments are served from the broadcast connection.



Accelerated Channel Change Actual results

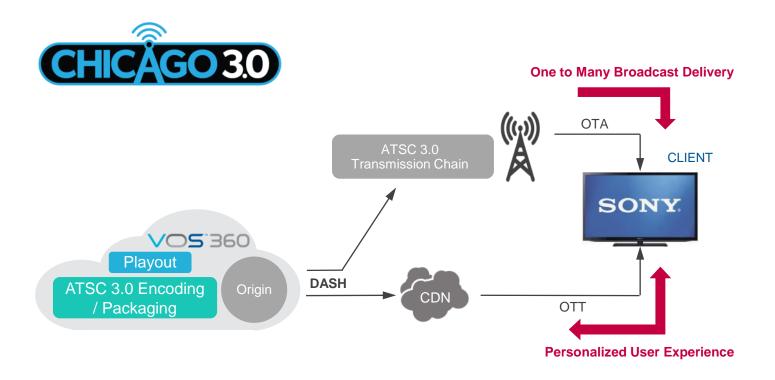






Final Thoughts







Thank You.



