Today's Database for Today's TV

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mongoDB

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The consumer TV experience has changed. Gone are the days of the static, single-threaded viewing experience in the living room. Today, consumers have new requirements; they want content on-demand, on their device of choice and on their terms. Given the rise of competitive services from companies like Netflix and pressure on existing revenue streams, service providers (telcos, cable and satellite providers) need to evolve their offerings.

The good news is, they may not need a new business model so much as a new database.

What Do Databases Have To Do With TV?

The database is an oft overlooked component of TV service infrastructure. Traditionally, providers have focused on core network elements, set-top boxes (STBs), customer provisioning, billing systems and other infrastructure. These components are necessary for delivering the service itself but they do not differ-entiate one service from another. They are crucial but no longer strategic. Today, every telco and cable operator can provision a new customer or deliver a basic on-demand service. Providers ought to turn their attention to capabilities that cause customers to sign up, stay or buy more.

The database is a fundamental building block of a competitive TV offering. It can tell providers who's watching what so they know what content agreements to put in place, how to market their services and where to go after new customers. It is not just the billing system of record, but also the timeline of how and when a customer has interacted with her provider—a playbook for the customer service agent.

And today the database can make or break the provider's ability to deliver a personalized, engaging experience; and to cross-sell and upsell complimentary services. While the network has traditionally been the strongest asset for TV providers, companies like Netflix are proving that customer data is the twenty-first century goose that lays the golden egg. And they are using new types of databases to build their services.

FIGURE 1 // CASE STUDIES—BUILT ON MONGODB

Company	Application / Use Case
Ericsson	Multiscreen TV Solution
Vidmind	White-label OTT streaming TV platform
UK Telco	Streaming Video Service
Top 5 North American Telco Vendor	Core TV and Set-Top Box Software
Italian Telco	Streaming Service and Video On-Demand
European Telco and Media Company	Streaming Video Service
South American Telco and Media Company	AAA Server; NPVR

This paper lays out five ways for telcos to modernize their TV services, tells the stories of telcos already taking action (illustrated in Figure 1) and describes how MongoDB can help. Telcos already have a strong base of core assets and relationships, and if they can modernize their services with 21st-century data infrastructure, they will be well-positioned to dominate the consumer viewing experience.

THE USER RULES

The TV market is nothing like it used to be. Here's how it was:

1. **One Game in Town.** The high capital investment required to build out infrastructure meant that there was typically just one option for cable in a given city.[1]

2. **Slow She Goes.** Given the lack of competition, the pace of innovation was slow and steady.

3. **Broadcast.** Shows, movies and events were broadcast live. A user could not record TV nor could she watch something after it aired without buying her own equipment.

4. **One Size Fits All.** With minimal information to draw from, providers had no way to personalize the viewing experience with customized content or recommendations. Everyone got the same thing.

5. **One Device.** There was one way to watch— on the television via the STB. That was it.

6. **Basic User Experience.** Users got a barebones experience. The viewing guide plus some basic descriptions were the menu du jour.

In a matter of years, however, the market has undergone a shakeup, putting the user first. Here's how it is today:

1. **New Game in Town.** The Internet has given rise to a slew of over-the-top (OTT) competitors like Netflix, Amazon and Apple, who can deliver content to anyone anywhere without needing their own infrastructure.

2. **Giddy Up.** The rise in competition has pushed the pace of innovation. OTT providers are building new features, services and even original content at full tilt.

3. **On-Demand Rules.** Broadcast TV remains, but today users can watch content on-demand through a number of channels, like Hulu and YouTube streaming, downloads from Apple iTunes, PayTV on-demand portals and digital video recorders (DVRs). Many users prefer the convenience and instant gratification of on-demand.

4. **Tailored to You.** Amazon crunches billions of user session data points to make intelligent recom- mendations to its user base. On Hulu, "Friends

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[1] Even when telcos began offering TV services in the United States, this simply expanded the competitive pool in a given city, but not enough to significantly change things.

Make it Better" with a feature that uses Facebook to help users discover content based on what their friends are watching. Providers are tapping into mountains of data to deliver a personalized experience to users.

5. **Many Devices.** The STB is an antique relative to smartphones, tablets, gaming consoles and the other new devices through which users can get content and control their TVs.

6. **Rich User Experience.** Polished apps, instant response times, curated reviews, integration with social networks—this is the new bar for user experience. The Electronic Program Guide is now a relic.

TAKING STOCK

Telcos must take measures to differentiate their TV offerings, or at the very least, make them compelling to 21st-century audiences. Although the health of the market is contested, there is mounting evidence that TV provider revenue is at risk.[2] A new report from MoffettNathanson estimates that the US service providers lost 113,000 TV subscribers in the third quarter of 2013, capping off what analyst Craig Moffett calls the "worst 12 month stretch ever" in the industry's history. Twenty-five percent of customers at Charter Communications do not even want TV, according to Charter CEO Tom Rutledge; they only care about broadband Internet. Cable TV ratings are in a historic slump, with growth numbers consistently below zero.[3]

Even if one does not believe that the TV market will survive, as some do, traditional service provider revenue streams are maturing, and some are in outright decline. Wireless penetration is at or above 100% in industrialized nations.[4] US landline phone penetration has dropped precipitously from 95% in 2003 to 60% in 2013.[5]

Service providers need to find new revenues streams to offset the declines in their core businesses. If nothing else, they must defend and maintain TV revenues.

NOT ALL IS LOST

Although the current trajectory may be anything but confidence-inspiring, service providers have a unique set of assets that can help them both defend their existing TV business and build new ones, too. The most valuable of these is their existing relationships with content providers. User experience is increasingly important, but above all, Bill Gates' observation that "content is king" remains true. Establishing these relationships is a time- and cost-intensive exercise, and service providers have a substantial head start on this relative to OTT competitors.

Second, service providers have customer relationships with nearly every member of the population, while OTT players have only a fraction of the user base. Third, service providers are sitting on heaps of customer data, from viewing habits to demographic information. Finally, although many users are showing a growing appetite for watching content on new devices, the living room is still the best 'lean-back' experience as far as many viewers are concerned. New devices like the Apple TV and Google Chromecast are taking aim at the living room, but for the time being, the incumbents still own it.

If they can leverage these existing assets while also modernizing their offerings, service providers are well-positioned to retain ownership over the consumer viewing experience.

FIVE STEPS TO MAKE TV OFFERINGS BETTER

The following are five ways that service providers can modernize their TV offerings to be competitive.

1. Prioritize On-Demand.

Users are showing that they prefer to watch content on-demand.[6] "Our viewing data shows that the majority of streamers would actually prefer to have a whole season of a show available to watch at their own pace," said Ted Sarandos, chief content officer of Netflix in a statement. The industry has taken note of an increasingly prevalent predilection for so-called

[2] For a detailed analysis of the PayTV market's decline, see: **"TV Is Dying, And Here Are The Stats That Prove It"** from Business Insider

[3] **Business Insider**

[4] See **CTIA**; **Business Insider**; **mobiThinking**

[5] **Centers for Disease Control**

[6] **Nielsen**

'binge watching,' where a user consumes a show in lengthy chunks, episode after episode. That pattern is similar across various styles of shows, including those with audiences that skew male or female, younger or older.[7]

Netflix has taken heed of user preferences. In addition to demonstrating a clear prioritization of its streaming business, it recently became the first major content provider to release an entire season's worth of episodes for a given show at all once.

By contrast, live TV remains the center of service provider offerings. A user turns on her STB and she is taken first to the lowest-numbered live TV channel, not to the on-demand portal. And worse, these portals are slow, klunky and burdened with intrusive advertisements. Service providers should put on-demand first, prioritize development of better portals for the user, and consider how they can leverage their existing content relationships to provide a binge-viewing-compatible experience.

2. Personalize.

A 25-year-old single male in London gets the same experience as a 61-year-old grandmother in Leeds. Why?

Hulu shows its users what their Facebook friends are watching. Amazon recommends content to users based on their past viewing behavior, as well as the past viewing behavior of other users who watch the same things. Netflix has three tabs at the top of the screen: Watch Instantly, Just for Kids and Personalize. That personalize tab takes the user to a short and fun exercise in which she rates movies and TV shows; Netflix then uses the ratings to refine its recommendations for that user.

Service providers do not need to reinvent the wheel. They need only replicate it. They should target content and ads to their users based on subscriber-specific data—like prior viewing or even browsing habits— as well as aggregate subscriber viewing data and demographics. They should make it easy and enjoyable for users to rate content.

Additionally, they should put to use the many new sources of data available today, like social media. There are over half a million tweets per day,[8] and as many as 40% are related to television.[9] During the week the finale of Breaking Bad aired, a staggering 9.3

million people either published or saw tweets about the show.[10] Service providers should leverage topics trending in social media, and facilitate better content discovery by telling users what their friends are watching, sharing and commenting on via Facebook.

3. Expand Supported Devices.

OTT providers are the first to make their services available on new devices, like smartphones, tablets and gaming consoles. Netlflix tops 1,000 different device types, for instance. While telcos are understandably reticent about leading users away from the STB, they run the risk of losing the user altogether if they neglect new devices.

Users want to consume content on smartphones and tablets, and industry leaders are taking note. Nielsen, for instance, will begin to include TV viewing on a smartphone or tablet as part of its national TV rankings.[11] According to eMarketer, time spent on mobile devices is surging, and users are actually watching more television programming, just from a growing range of devices and platforms.[12]

Rather than avoiding the issue, service providers should focus on creating apps for new devices and integrating them into existing services. They ought to put their content on iPads. They should make it easy for the user to switch from the TV to the tablet without losing her place. They could even integrate their services into other apps on the device. For instance, they could let users create calendar reminders to watch a live sporting event right from the viewing guide. This is not only likely to make users happy, but can also increase the stickiness of the TV service overall.

4. Improve User Experience.

"The experience of on-demand is atrocious," says user experience consultant Whitney Hess, a long-time cable subscriber. "Navigating the interface is extremely difficult. It takes way too long to retrieve what you're looking for."[13]

Despite a paucity of survey data on the topic, it is no secret that the TV user experience can be frustrating at best and broken at worst. The systems are annoyingly slow to navigate; slow to start up and slow to get from menu to menu. The user is often bombarded with loud and irrelevant ads in the background.

[7] **CNNMoney**, [8] **Twitter S-1**, [9] **Forbes**, [10] **Ryan Holmes**, [11] **The Verge**, [12] **Wall Street Journal**, [13] **CNNMoney**

Content discovery is perhaps the most offensive exercise. Search functionality is often unavailable; when it exists, it typically imposes a hard to use keyboard and spits out confusing results. The information hierarchy is just as bad. A list of categories or options may be a mix of TV channels, topics, lifestyles, free vs. premium, even specific shows, which seem arbitrarily chosen. One cable provider makes the superfluous and unintuitive distinction between 'TV Series' and 'TV Entertainment.' It also distinguishes HD content from standard-definition content, forcing users to browse multiple categories in search of a single program.

By contrast, OTT providers keep things clean. "Netflix is a master at simple, engaging experiences," says user experience designer Catriona Cornett. "They make it fun to discover new content through clever and intuitive movie and TV show organization with a focus on only showing information relevant to the consumer, and highly responsive controls."

On Hulu, you search for the show, and the most recent episode appears first in the results. With Netflix, when you browse through a category, only the most relevant information is displayed, like movie or TV art, title, length, rating, MPAA rating and user reviews. The system progressively reveals more details only after a selection is made, keeping the experience of picking a video distraction-free. There are few subsections to the site. Netflix displays categories based on user data, like viewing history and favorites. A user who watches predominantly foreign films will find that category at the top of her page, while categories frequented less often will make their way to the bottom.

Service providers ought to take a hard look at user experience. They should invest in improving latency and performance; simplifying the user interface by removing ad clutter and unnecessary categorizations; making search work; incorporating personalized recommendations and relevant reviews; and creating an interface that is aesthetically appealing and on par with what users have come to expect.

5. Iterate Quickly.

Finally, service providers ought to move toward a nimble and iterative approach to TV services. Traditionally, STBs remain in the home for years at a time;

viewing guides and on-demand portals are seldom updated; channel lineups evolve slowly. As previously discussed, service providers have been laggards in supporting new devices and offering personalized recommendations (features considered table stakes for OTT video).

By contrast, companies like Amazon push code multiple times a day. Netflix has written extensively on its work in continuous delivery, automating the process of updating its services and the underlying infrastructure, According to Ben Schmaus, manager of the API platform at Netflix: "To meet demand for new features and to make a growing infrastructure easier to manage, we've been overhauling our dev, build, test, and deploy pipeline with an eye toward a continuous delivery. Being able to deploy features as they're developed gets them in front of Netflix subscribers as quickly as possible rather than having them 'sit on the shelf.'"[14]

The importance of iterating quickly is obvious to many, but bears explaining nevertheless. First, it allows the business to be more responsive to changes in user demand and competitive developments. Second, it makes it possible to fail fast and fail small. That is, if a given change is unsuccessful, less time and money were spent making it (and therefore less time and money were sunk); and it is likely that a minor change can be unwound quickly without major disruption to the business. Finally, as a corollary to the second benefit, constant iteration fosters more experimentation and ideally, more innovation.

To adopt a more iterative path to market, service providers should take a page from the OTT playbook. They should shift as much of the TV product to software versus hardware. The more easily they can update the viewing experience by shipping code instead of provisioning new hardware, the easier it will be to stay nimble. They should adopt agile, flexible development methodologies. They should leverage open-source software (and encourage their vendors to do so) to minimize lock-in, complex sales cycles and cost. Lastly, and more broadly, service providers must ensure that the underlying infrastructure they are using is aligned with the broader business goals described in this section: prioritizing on-demand, personalizing services, expanding the number of supported devices, delivering a better user experience and iterating quickly.

[14] **Netflix**

MONGODB CAN HELP

There are a number of technological components required to deliver a market-leading TV service. The database is at the core, and it can be an enabler —or a blocker—to realizing this goal. The relational databases is a trusted technology with a long-standing place in telecommunications. But despite the many changes in the TV market described earlier in this paper, the relational database has remained essentially the same. A number of service providers have reevaluated its place in the TV stack and are instead using MongoDB, an open-source document database. MongoDB's flexible data model and scalable architecture make it especially well-suited to meet the needs of TV providers.

1. Document Model and On-Demand.

While the relational database models data in rows and columns, MongoDB stores data in binary JSON (BSON) documents. Documents contain one or more fields, and each field contains a value of a specific data type, including arrays, binary data and sub-documents. With this data model, related data are aggregated into a single structure, and it is easy to model hierarchical relationships. This data model maps naturally to on-demand product catalogs and viewing guides.

For this reason, a number of companies—including Vidmind as well as a UK telco and a European telco and media company—are using MongoDB to store the metadata for their content catalogs. A TV show typically comprises multiple seasons, which comprise multiple episodes, each of which has various metadata (e.g., actors, directors, plot summary). This hierarchy can be modeled easily using documents in MongoDB, whereas it easily becomes complex with relational tables.

Moreover, TV shows, movies, live events, on-demand previews all have different metadata. To accommodate this variety in a relational database one would typically have to create multiple tables and manage multiple relationships across those tables; this becomes complex and hard to manage quickly. MongoDB's document model—which allows documents to have different fields—makes it easy to accommodate the variety of content. Lastly, MongoDB provides rich querying and indexing (including search and secondary indexes), which make it easy for users to search, sort and discover the content within the catalog.

2. MongoDB and Personalization.

MongoDB's rich document model makes it easy to store not just basic channel data, but also relevant user metadata (e.g., prior viewing patterns) to improve content personalization. MongoDB provides out-of-the-box analytical capabilities, which make it possible to deliver Amazon-like recommendations to the user without reinventing the wheel. For instance, Ericsson's Multiscreen TV Solution, which is built on MongoDB, enables service providers to monitor and manage content delivery to nearly any type of consumer entertainment device from a central location. Specifically, it collects data on the content customers are browsing and consuming, which can be used to drive a more personalized experience.

A European telco and media company uses MongoDB to track all user behavior on its streaming service. Vidmind, a white-label OTT streaming TV platform, does too, as does a Top 5 North American telco vendor. A UK telco stores all user profile data in MongoDB for its streaming video service. With MongoDB's native Aggregation Framework, providers can conduct in-place analysis for real-time content personalization. With native MapReduce and integration with Hadoop, providers can conduct deep, offline analytics on user history, demographics and aggregate subscriber viewing behavior to drive more nuanced recommendations. In fact, a rich and flexible user profile system can be used for many other purposes as well, like targeted advertising and viewing restrictions on kids' accounts.

The document model also enables telcos to marry structured data—like channel lineups—and unstructured data—like tweets—into a single data store. Incorporating content trending into the on-demand portal, for instance, is a simple exercise that supports better content discovery but might otherwise require massive schema migrations and downtime with a relational database.

3. Expand Supported Devices.

With a relational database, one has to devote substantial investment to supporting mobile devices, which typically manage data in JSON natively. MongoDB, by contrast, works natively with JSON, which removes a substantial amount of effort and complexity when trying to support new devices. Moreover, MongoDB's dynamic schema (discussed in more detail in #5 below) makes it easy to adapt the data model to support other new devices which might necessitate other data types.

MongoDB was therefore a good fit for Ericsson's Multiscreen TV Solution, as well as a host of other mobile mobile applications unrelated to television at companies like Twitter, Foursquare, and ADP.

4. Improve User Experience.

MongoDB is a high performance database that supports scalability and high availability out of the box. While on its own it is not able to help a telco simplify a cluttered user interface (UI), its flexibility makes it easy to accommodate those types of changes to the UI. Furthermore, MongoDB was designed for cloud and virtualized environments. Native horizontal scaling allows telcos to support millions of users on a single platform with low latency. This also makes it possible to scale quickly during peaks in demand, like the Olympics or the Breaking Bad season finale. Geographic replication allows providers to push local content closer to users, which improves performance. Finally, native high availability enables telcos to maintain the same levels of uptime users have come to expect from them.

For these reasons, a Top 5 North American telco vendor and an Italian telco are using MongoDB to ensure quality of service for TV on-demand.

5. MongoDB is Agile.

Relational databases enforce rigid schemas that require lots of upfront planning and can be complex to change on an ongoing basis. MongoDB, by contrast, employs a dynamic schema that makes it easy to adapt the database in tandem with the application. This means that teams at Vidmind can get started more quickly with less upfront investment. Moreover, it is easier for them to build new features—like a recommendation engine—and iterate on them, to integrate with the latest social network, to support the next tablet and to experiment with entirely new services. The abovementioned European telcos choose MongoDB when taking on streaming video incumbent Netflix because of their ability to move faster with MongoDB. Ultimately, this makes it possible for them to fail fast and small. And it gives service providers a tool they desperately need to ensure that they can become Netflix before Netflix becomes them.

Conclusion

Service providers need to evolve their TV offerings or risk becoming obsolete. Many are already using MongoDB to meet the needs of the modern consumer. Moreover, because MongoDB is a general purpose database, it can be used across the organization for many other use cases like customer experience management, cloud platforms, Internet of Things, context delivery architecture, and many others.

Learn more about how service providers are using MongoDB:

- **White Paper: How a Database Helps Telcos Compete**
- **Datasheet: MongoDB and Telecommunications**
- **Webinar: Best Practices for MongoDB in Today's Telecommunications Market**

Discuss how MongoDB can help you evolve your TV offering with our telecommunications practice: **telecoms@mongodb.com**.

About MongoDB

MongoDB (from *humongous*) is reinventing data management and powering big data as the leading NoSQL database. Designed for how we build and run applications today, it empowers organizations to be more agile and scalable. MongoDB enables new types of applications, better customer experience, faster time to market and lower costs. It has a thriving global community with over 7 million downloads, 150,000 online education registrations, 25,000 user group members and 20,000 MongoDB Days attendees. The company has more than 1,000 customers, including many of the world's largest organizations.

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