Tech. Topic 4: Multicast Applications

I. Introduction

In this week's technical topic on Advanced Routing, we have four papers[1], [2], [3], [4] as part of the reading list. In this report, we choose to present a review of "An Alternative Paradigm for Scalable On-Demand Applications: Evaluating and Deploying the Interactive Multimedia Jukebox" in detail [1]. In our current days, on-demand applications are in widespread use, particularly services such as pay-per-view (PPV) and video-on-demand (VoD). Therefore, this paper is chosen, because it proposes a balanced alternative to the both aforementioned services, which, at the time, were not practical, or, as the paper indicates, "quickly died away", which is clearly not the case in the modern day.

II. Paper 1 Review: "An Alternative Paradigm for Scalable On-Demand Applications: Evaluating and Deploying the Interactive Multimedia Jukebox"

On-demand applications are applications that are made available to users, whereby they are licensed by a provider. These applications may be hosted on the providers' own web servers, on ISP's , or may be uploaded to the user, and disabled after the on-demand contract expires. In this paper, they propose an alternative paradigm for scalable on-demand applications, particularly the Interactive Multimedia Jukebox (IMJ).

We begin with the abstract. The author mentions how the PPV and VoD services have died away. Since the authors are presenting an alternative, we expect a more detailed explanation of why both aforementioned services have died away, which they provide in the paper.

Then as we move into the introduction, we notice that the beginning is a repetition of what is said in the abstract. Varying the phrasing while maintaining the same thoughts would have been more appropriate. If the readers notice little effort by the author, it often discourages the reader from reading on. The authors mention that PPV and VoD are costly systems; it would present a more comprehensive argument if they mentioned briefly what exactly they meant by costly, ex. costly in terms resources required, even though they go into greater detail later on. More importantly, they mention that the trials to date have suggested that VoD is expensive and has too little demand; it would have been helpful if they had provided some relevant references. The fact that video-on-demand is widely used now-a-days, suggests that not much insight was given in this argument. Therefore, if a more detailed argument had been provided, it would have presented a more compelling argument, which might have held at the time the paper was written. They repeat the lack of explanation, in the same paragraph of the introduction, when they mention the problems that are facing networks; if they had specifically mentioned the problems that particularly affect the system they are proposing, the argument would have been more compelling.

The second paragraph starts with a statement which would have been preferable to start differently. By saying that any viewer is allowed to "watch any other viewer's requested program", the first concern is invasion of privacy, and the first question that pops is "will my identity be known". A clearer statement would have sounded more encouraging, even though they clarify on that later in the paragraph..

The third paragraph of the introduction presents too many ideas, and we feel that there are too many disjoint ideas that are put there together in the same paragraph which probably would have been more useful, and would have presented a better motivation to the proposed system, if organized differently. They discuss what they will be doing throughout the paper, but do not say *why* they will be doing so; it is useful to know the purpose of what will be done in a paper to create a more structured and organized idea of what the author is thinking, and if the reader agrees or can follow with the author's logic. When we read deeper into the paper and refer back to this paragraph, we understand in greater detail what exactly the authors mean in this paragraph, and what seems like an unclear (not so important) idea in this paragraph actually well motivates the proposed system if we fully understand the relevance and importance of this idea.

The authors provide a good analysis of related work. The organization of the sections throughout the paper is very good; in other words, it is a logical progression of ideas that create a clear picture without overwhelming the reader with too much information, or dragging the reader through unnecessary sections which do not present much of contribution to understanding the key concepts.

The discussion of background information is important to build an understanding of the existing services. It builds a motivation to then discuss the jukebox paradigm. Furthermore, they refer to Figure 1 which is a very simple, clear, and relevant figure.

When describing the three properties of the jukebox paradigm, the first property is unclear and can be confusing. As for the second property mentioned, the reader would inquire on whether a priority scheme is used/considered for scheduling; the statement is obscure in that respect. Prioritization of scheduled programs are discussed in detail later on, however, it is always useful to walk the reader through and keep the reader aware. Then, when they discuss the advantages of their jukebox, they

mention that there is an opportunity to implement "better" scheduling policies which is not clear on what they are referring to - how and why would it be better?

Then, they discuss how jukebox is *scalable*. It is very interesting how they present what scalable in the context of VoD would represent, and then use it in near-VoD. Then it is useful how they indicate the diminishing marginal cost, which means that the more viewers I serve, the less additional cost I incur; it is a useful metric to consider. Furthermore, it is interesting how they refer to and makes assumptions for actual user experience and behavior in a casual manner, which is repeated throughout the paper; however, the assumptions are reasonable and they convince us of their logic and make it easy on the reader to buy into their argument. The references to actual usual behavior are also important, because it allows the reader to better relate with the argument.

When the authors discuss the parameters that affect the type of service that viewers can expect, they discuss the number of viewers and the number of channels as the defining parameters of QoS. However, if we are to consider one of the main advantages of jukebox mentioned by the authors, which is that "viewers may be satisfied with something that is already playing or scheduled to start soon", then an additional parameter that would be of concern should be the necessary variety of dedicated channels. For example, if the genres of particular programs fit into categories which are less than or equal to the number of channels provided, then it would be meaningful for the user to watch what is already being played or scheduled, because what is playing will most likely fit the viewer's taste. However, when the authors soon after discuss the possible scheduling policies, it becomes somewhat reasonable to generally consider the number of channel and viewers.

It is mentioned that "as more subscribers join a service, additional channels can be added". It seems that the process of adding channels is taken lightly by the authors, which may not be such an easy process to do.

Discussing the possible scheduling policies was extremely useful. It helps the reader put the ideas into perspective as well as understand the usefulness and applicability of the proposed system. In my opinion, the content-based scheduling policy appears to be the most realistic and practical given the advantages and motivation for the proposed scheme. When discussing the service provider scheduling scheme, the use of existing, efficient scheduling algorithms would come to mind. The authors address realistic and practical concerns of each policy, as well as briefly discuss the pros and cons of each approach. They present convincing arguments for each policy.

We notice that there are spacing issues.

Figure 2 is an unnecessary repetition of Figure 1. The position of the jukebox paradigm can be explained briefly in one sentence without the need for a figure. Furthermore, the position of the jukebox can vary based on the scheduling policy it follows and to what degree the parameters are set.

When the authors discuss the architecture for a jukebox system, when describing the network component of the jukebox system, the authors are clear on the current (at-the-time) conditions of the network. It is useful to state the current affairs, because it gives future readers a better understanding or perspective on what motivated the proposed solutions and how reasonable or motivated it was given the at-the-time state of affairs.

The authors then define what they mean exactly by the number of *channels* which is also very useful.

A description of the jukebox system prototype was very clear and detailed and necessary.

The tracking usage in the IMJ is a contribution to the proposed system. As mentioned earlier, this should have been more carefully discussed in the introduction of this paper.

In Table 2, the use of quantile breakdown provided a detailed insight into the data. In Figure 6, the graphs are not very clear, particularly the x-axis. The graphs are explained in the text, but it would be helpful if the figures were self-explicit. Better labeling of the x-axis is required.

Then, the authors discuss the simulation of the proposed system and present the simulation parameters in Table 3. Some parameters are not well-understood or self-explicit. The authors should have briefly discussed the use or meaning of the parameters. Figure 8 and 9 are interesting figures. Figure 8 is intuitive but clear. Figure 9 was less intuitive but provided clear and interesting insight; it shows analytical analysis of relevant data.

The assumption that users are well behaved is a common assumption that is made. Discussing the potential for research which addresses this assumption would be useful. Later on they discuss how, in the simulations, they schedule the alternative request with the shortest waiting time. We understand that it is difficult to find a metric which evaluates a viewer being presented with alternative options. The assumption made makes the evaluation process simpler, and it seems that it removes from the reliability of the results. The authors later on discuss the reliability of the assumption that they made, and present a convincing argument. Figure 11 was an excellent way of presenting an evaluation of a hard metric.

When discussing providing interactivity using jukebox services, and particularly on limited interactivity as one of the two types of interactions, the last sentence seems like a generalization "is only useful for large systems where interactivity is expected to occur frequently". For full interactivity, the second method of buffering data on a viewers memory seems like a reasonable solution in our current days where memory is available.

The authors later address a distributed approach to their proposed system, which is interesting to know. Furthermore, discussing service pricing was an important concern to mention and presents a commercial motivation/solution to the proposed

system. Finally, they mention the short-comings of their research and that particular testing is required for the authors to answer a particular question.

As a final evaluation of this paper, I think it is an interesting, practical paper. The authors do not present a novel idea, but they provide an interesting twist or modification to an existing idea to present a practical, commercial solution. The paper was well organized and understandable, although the introduction is not very clear.

There are a few English mistakes in the paper and misspelled words, such as a "large numbers of customers", "The scheduler receivers viewer request", and "is only useful for large systems were interactivity is expected to occur frequently".

REFERENCES

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