Experience from Managing Private PlanetLab Korea

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Abstract

Private PlanetLab Korea is a PlanetLab based testbed for KOREN to create a better environment for Future Internet research in Korea. Beginning with the general introduction of PlanetLab, this paper discusses on the issues has been raised during six months of managing Private PlanetLab Korea. As a conclusion, it proposes the measures to address the issues and fully utilize PPK as a Future Internet testbed.

1. Introduction

PlanetLab is a global network research testbed that enables users to access a large number of computers distributed around the world [1]. As of September 2009, it consists of 1030 nodes at 484 sites in 6 continents [2], and has become a pivotal testbed for Future Internet research. Distributed file systems, network coordinate systems, peer-to-peer systems, distributed hash tables, and many more applications are implemented and run on PlanetLab by thousands of researchers [3]. PlanetLab Central has centralized trust and resource control: all aspects of PlanetLabs such as OS, resource allocation, and access control are managed by PlanetLab Central [4].

Along with the popularity of PlanetLab grew the need to run copies of PlanetLab independent of the original PlanetLab, but augmented with new functionalities. Administrative independence also brings out distributed system issues that are relevant to specific applications. We call such copies Private PlanetLab.

CoreLab in Japan is a private PlanetLab with a focus on experimental virtualization technologies. It runs independent of PlanetLab Central and implements Hosted Virtual Machine Monitor to increase code reusability and flexibility [5]. The exact number of nodes on CoreLab fluctuates, yet remains under 50.

The most prominent Private PlanetLab is OneLab in Europe. As the number of nodes that PlanetLab Central manages grows, so does the management overhead. OneLab is a European Union sponsored project to run an independent PlanetLab for European sites. One of the main goals is to take over the administration burden off PlanetLab Central. It has been up and running since 2002 and now commands all of the nodes in Europe [6]. OneLab and PlanetLab Central are not completely independent of each other. They federate to allow users of the two testbeds to use the other testbed. Federation is a loose association between the PlanetLabs. It is an effective mean of expanding the user base, complying with the bilateral peering solution in order to provide an incentive for users to add resource.

Private PlanetLab Korea (PPK) started in 2008 with a goal of serving the local community. PPK aims to address initial hurdle of registration and language by taking policy independent of PlanetLab Central. Not offering Korean language, PlanetLab Central is not particularly hospitable for users in Korea. Also, its centralized trust and resource control impose a limitation to fully utilize it as a testbed. It is forecasted that by focusing on the local community, PPK will be able to attract more users, thus creating an environment for active participation on Future Internet research in Korea [7].

The contents of this paper will be mainly concentrated on the experiences gained while administrating the PPK. The experiences mentioned in
this paper will work as guidance to contribute to improve and enhance PPK. It is just in its beginning stage, and numerous issues and problems were observed during the six months of administration. However, this unstable phase is the mandatory phase for any systems to build a strong infrastructure. In order for PPK to flourish and contribute to form better research environment in Korea, this phase should be overcome. This paper will be a part of the contribution.

2. PlanetLab Central

Considerations that should be taken into account for servicing PPK can be derived from the history of the PlanetLab Central. The issues on user management policy, stability, security, and legal aspect had been raised. The experience of addressing those issues has become a great asset, serving as the guidance for maintaining PPK.

Along with the growth of need to implement a planetary scale network services, PlanetLab Central was jointly developed by UC Berkeley, Intel DSL, and Princeton in 2002. It began as VServer-based and code-based release in 100 nodes at 42 sites. It initially took user management policy where central administrators manage all users.

Due to the excessive burden on central administrators to manage all users, the initial user management policy was modified into institution-centered user management policy. The alternative policy suggested assigning Principal Investigator (PI) for each approved institutes to manage site node, user, and slice. As a result, the central administrators only have to approve an institute and assign PI for the approved institute, offloading user management works. Additionally, it has become a more convenient service for users: they only have to contact PI in their institute for the account.

The issues on security and stability had been raised in the beginning of PlanetLab Central. They serve as the guidance to prepare forthcoming problems for PPK. In the early phase, it had received several malicious attacks, and complaints from the users were filed. Similarly, when node failed, there was no notification to inform the users of this failure. The users could not use the services without knowing the reason. As a result, the PlanetLab Central modified to have the system to send a node failure notification function.

Some legal issues had been raised by experiments implemented in PlanetLab Central. Some experiments were conducted by indiscriminately downloading files from the internet. In the downloaded files, illegal files such as child porn video were sometimes included in the experimental data. In the United States, it is strictly prohibited to possess such files. Even though it was not intentional, the issues had complicated the use of PlanetLab Central.

Given that it is highly probable for PPK to encounter the abovementioned issues, the issues should be closely observed. The experience of PlanetLab Central should not be overlooked; instead, it should be used as a guidance to address the problems, if similar issues are raised.

3. Status Quo of PPK

As of September 2009, PPK consists of 8 nodes at 4 sites, two nodes each at NIA, KT, KAIST and GIST [8]. As reflected in number of inquires about PPK, the interest and recognition of PPK has been increased since its establishment in 2008. The prospective users plan to implement experiment mainly on P2P streaming. The researchers who showed interest are the members of ETRI, Pusan National University, Seoul National University, or KAIST. However, there has not been any user actually using PPK as a testbed. Even though this current situation seems to be slightly concerned, the vision of PPK is optimistic, considering that it is in the beginning phase.

The enrollment policy of PPK is independent of that of PlanetLab Central. Different from PlanetLab Central that requires institutes to host two nodes and charges registration fee to non-academic institutes, PPK does not charge any registration fee or require institutes to host any nodes.

<table>
<thead>
<tr>
<th>User Type</th>
<th>PLC</th>
<th>PPK</th>
</tr>
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<tbody>
<tr>
<td>PI</td>
<td>PI</td>
<td></td>
</tr>
<tr>
<td>Technical Contact</td>
<td></td>
<td>Technical Contact</td>
</tr>
<tr>
<td>User</td>
<td>Site User</td>
<td>Center User</td>
</tr>
</tbody>
</table>

Table 1. Differences in User Type between PlanetLab Central and PPK.

Additionally, user classification is slightly different from PlanetLab Central. As shown in Table 1, PPK distinguishes users into PI, Technical Contact, Site User, and Center User, whereas PlanetLab Central distinguishes users into PI, Technical Contact, and User. The PI of PPK has the same role as PlanetLab Central. Also, the Technical Contact who is mainly involved in administering node has the same role.
<table>
<thead>
<tr>
<th>User Type</th>
<th>Role/Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>PI</td>
<td>Manages site node, user, and slice.</td>
</tr>
<tr>
<td>Technical Contact</td>
<td>Manages node.</td>
</tr>
<tr>
<td>Site User</td>
<td>Manages slice.</td>
</tr>
<tr>
<td>Center User</td>
<td>Manages slice.</td>
</tr>
<tr>
<td></td>
<td>Not bound to any PI.</td>
</tr>
</tbody>
</table>

Table 2. Role of each User Type in PPK.

However, PlanetLab Central has only one user type, User, who is in charge of manage his/her slice. And, the User is bound to the specific PI. PPK’s Site User is equivalent to PlanetLab Central’s User. PPK adds Center User as another type of user. It basically has the same role as Site User, but it is managed by central administrators, not by PI. The reason of creating additional user type is to allow individual users to use PPK and to reduce financial burdens for users who are not capable of hosting nodes.

4. Issues

As shown in the status quo of PPK, the fact that no users are using PPK clearly implies that PPK contains some issues that made difficult for users to employ PPK as a testbed. The issues can be easily spotted by just going through emails received from the interested users. Also, it takes only a glance to figure out that the amount of contents in the website is noticeably little. The issues of PPK can be divided into three areas: lack of contents, scale limitations, and security and stability.

4.1 Lack of Contents

PPK, which primarily aims to create more hospitable environment for users in Korea, does not seem to adequately progress to achieve its utmost goal. Users who are willing to implement an experiment in PPK will be disappointed when they first visit PPK websites to look for information related to PlanetLab and PPK. Unable to find any documentation, such as guides, tutorial, manuals, or technical reports, most of the users feel frustrated. Only the more desperate and the more patient users bother to send emails to administrator to solve their setbacks.

One of the most frequently asked questions is related to registration procedure. In these inquires, most of users specifically mention that they cannot find any information that describes the registration procedure. Also, the users complain about the complicated registration procedure of PPK. In users’ perspective, joining PPK seems to be difficult and complicated. The real problem is that PPK website has no documentations. No matter how easy the joining procedure is users will be frustrated when they cannot find any instructions. The administrator of PPK often overlooks to think in users’ point of view.

4.2 Scale Limitation

Another frequently asked question is whether the PPK can accommodate a large scale experiment. Since PPK only has 8 nodes at 4 sites, it is not adequate to host a large scale experiment. Also, it has not been federated with other PlanetLabs: sites only in Korea are available for the users. Thus, users who need to implement a large scale experiment often give up using PPK, after finding out their experiments cannot be implemented in PPK.

Additionally, users who have asked the abovementioned question also asked whether they can get access to global PlanetLab nodes, which provide larger number of nodes. The size of the PPK is not sufficient for many experiments, naturally repelling users in Korea.

4.3 Security and Stability

For security and stability, it would be more understandable to explain by cases. Not many system crashes occurred during six months of administration. There have not been any serious break–ins or malicious attacks to the PPK server. However, there had been some moves that can be considered to be possible break–in attempts, and there was a case that KOREN switch was broken. Latter case brought some complaints from some prospective users.

When KOREN switch was broken, the PPK server could not receive and respond to the external requests. In other words, the website did not work, and the emails from users did not reach to the administrator. When KOREN switch was not functioning around a month, users could not communicate with administrators. Users, who did not know about the status of KOREN switch, wondered, if not condemned, why the administrators did not respond to their inquiries. Among the users, the more persistent users bothered to find email address of PPK administrator by searching Google.

In June 2009, daily logs of PPK showed some irregular messages that imply that there were several possible break–ins to PPK. The unknown IP address tried to log in to PPK server through SSH more than 600 times a day. This kind of messages had appeared
in the daily log for few days, and SSH configuration has to be modified to disallow all IP other than IP address in KAIST. But, this measure is only a tentative measure, and more concrete measure has to be taken as soon as possible to enhance stability and security of PPK.

5. Future Directions

Over six months of administration period, the issues are identified. The issues had to be solved immediately to attract researchers interested in using PPK as a testbed. The question of how to improve PPK to attract more users to PPK was naturally raised. The improvements suggested in this paper mainly concentrated in solving aforementioned issues: creating user–friendly environment, and increasing facilities to accommodate large scale experiments

5.1 User–friendly Environment

To form a user–friendly environment, it is imperative to have user–interactive components. That is to say that they should be able to obtain information about joining procedures from the PPK website. In other words, they should be able to get information about PPK itself. Rather than interacting with the administrator, the users should be actively interacting with the PPK website.

Documentations should be the main media through which users gain information about PPK and PlanetLab. In fact, current PPK does not contain any documentation, which naturally resulted in no interactions between users and PPK website. In fact, there already exists a manual, which is titled “PlanetLab User Manual,” and is written in Korean by Keon Jang and Shinae Woo. This manual has step–by–step explanations about registration procedures. The first step to take is to upload this manual.

In addition to uploading PPK manual, translating some of the documents in PlanetLab Central into Korean will also contribute to form a user–friendly website. Translated documents definitely will be more convenient for Korean users to comprehend the information about PlanetLab. Since their comprehension increases by reading documents in Korean, they would have better understanding of PPK and PlanetLab, which will result in less trouble using PPK. Additionally, uploading some of presentation files and papers related to PPK and PlanetLab would also enforce the contents of PPK website.

Enabling users to interact each other will also shape user–friendly environment. For users, personal experiences would be the greatest asset to use PPK. Sometimes, user instructions and guides are too vague to follow, or not applicable to solve their problems. These questions might only be answered by users who experienced the same troubles. However, by opening threaded discussions, the users can interact with each other asking and answering questions that is not on the documentation. By opening a space for sharing users’ personal experience, users would feel easier to approach to PPK.

5.2 Facility

To accommodate large–scaled experiments, it is urgent to increase facilities of PPK. In other words, eight PPK nodes in Korea seem to be too small to attract research efforts. To accomplish the expansion of scale, two methods seem to be practical. One is to physically increase the nodes in Korea, and the other one is to federate with PlanetLabs.

PPK plans to increase its number of sites from 4 to 20, and to increase its number of nodes from 8 to 50 during 2009. With a help of government sponsor, it would be easier and less financially tight to increase the facilities. Also, KOREN members can assist in increasing the nodes and sites.

Federation of other private PlanetLabs or PlanetLab Central would result in more apparent effects than physically increasing facilities. Other private PlanetLabs such as Japan’s CORE, China’s 6PlanetLab, and Europe’s OneLab2, have much greater scale of facility than that of PPK. Each of them consists of more than 50 nodes at over 10 sites. If the PPK can be federated with other private PlanetLabs, it would be a great advantage for hosting large scale experiment in Korea. Also, federating PPK with PlanetLab Central will greatly increase its scale. There was a case of OneLab, PlanetLab in Europe, which federated with PlanetLab Central in its early stage and expanded its size afterward. However, the question of whether other PlanetLabs want to be federated with PPK is still doubtful, due to PPK’s small size. For PPK, it would be more likely to succeed if it follows OneLab’s precedence.

6. Summary

This paper begins with the introduction of PlanetLab Central and Private PlanetLab Korea. PlanetLab Central does not provide a particularly hospitable environment for users in Korea. To attract more Korean users, PPK applies different user classification and enrollment
policy. However, others issues—including lack of contents in PPK website, scale, and system stability—hold back the interested users in Korea. In order for PPK to flourish, it is imperative to take actions to attract more users. First, the website of PPK should have more contents related to PPK, including user manual and user community. PPK also should expand its scale by increasing number of nodes in Korea and federating with other private PlanetLabs. With these actions taken, PPK will play an important role in creating an environment for implementing experiments on Future Internet research.

7. Acknowledgement

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8. Reference