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From IPv4 to eternity - the High Energy Physics transition to IPv6

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Description of the Work

The requirements for a successful transition to IPv6 on the WLCG production infrastructure are simple to express: namely that the functionality, performance and security of all services must be at least as good as they are today under IPv4.

The HEPiX IPv6 Working Group has been investigating the many issues which feed into the decision on the timetable for a transition to the use of IPv6 in HEP Computing. The activities include the analysis and testing of the readiness for IPv6 and performance of the many different components essential for HEP computing, taking a full systems view of infrastructure and applications. We have been working closely with the HEP experiment collaborations and related IPv6 activities in EGI. The working group is also considering other operational issues such as the implications for security arising from a move to IPv6.

At the time of submission of this abstract we are just starting a survey of all important applications and operational tools. This is restricted to an analysis of the IPv6 readiness of the important WLCG outward-facing services and essential applications and operational tools. In addition to this survey we have already deployed a distributed IPv6 testbed connected to the national research networks that have been providing production IPv6 routing for a few years. At this stage we are starting to test various Grid services to determine their behaviour in a dual stack environment. During 2012 we will need to perform larger-scale tests of the functionality, performance, and security of many different components of WLCG.

Conclusions

The HEPiX IPv6 Working Group has started its work during 2011 and is now ready to do a full survey of the IPv6 readiness of the essential WLCG applications and services. The IPv6 testbed we have built will be expanded in size and complexity during 2012 allowing functionality and performance tests to be carried out. We will need to continue to work closely with related activities in EGI and other infrastructures to allow a decision to be made as to when we can turn on dual-stack services on the production infrastructures and thereby support IPv6-only clients. This work will we hope be of interest to other application communities who are also considering their move to IPv6.

Impact

The decision as to when to support dual stack, IPv6 and IPv4, services needs to take the needs of many stakeholders into account. This will have a major impact on operations, including networking support and the security team, and careful testing and planning is required. For the WLCG community we will also need to involve other Infrastructures such as Open Science Grid in the USA.

For the end user, e.g. HEP physicist, the aim is that the transition will be done in such a way that they don't notice the change. There is an enormous possibility to fail to achieve this!

We still do not know the date at which WLCG will need to support IPv6-only clients but as is often the case this could be sooner than we currently think. We think it is therefore very important to push ahead with the testing and planning during 2012. We may even be ready to turn on dual stack on production services during the LHC shutdown in 2013. The full survey and subsequent testing will inform us as to whether this is possible.

Overview (For the conference guide)

The much-heralded exhaustion of the IPv4 networking address space has finally started. Moving distributed applications to IPv6 involves much more than the routing, naming and addressing solutions provided by the campuses and national networks. Application communities need to perform a full analysis of their applications, middleware and operational tools to determine whether they are IPv6-compliant and establish how much development work is required to update those which are non-compliant. The HEPiX IPv6 Working Group, created in 2011, has been investigating the many issues which feed into the decision on the timetable for the transition to IPv6 and has deployed a distributed IPv6 testbed. This paper presents the work being done by the group in collaboration with WLCG and IPv6 activities in EGI.

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