

IPv6 Industry Survey Report

August 19, 2015



No longer *if* but *when*.

IPv6 deployments are becoming more widespread as organizations face the inevitable depletion of IPv4 address space. Seventy percent of survey respondents have deployed, are deploying or will deploy IPv6 within two years.

Growing acceptance of the need for IPv6.

Our 2015 IPv6 industry survey found that industry opinions about IPv6 are growing more accepting of the necessity and requirements for IPv6 and less questioning of the value and benefits provided. This is our fifth annual survey which followed two prior triennial editions, and results over the years indicate the industry has emerged from the state of denial and inquisitiveness to one of readiness and action.

While technical obstacles and business justification challenges remain, the near exhaustion of IPv4 address space at the second tier of the Internet's addressing authorities has spurred many organization to act. The top tier, the Internet Assigned Numbers Authority, IANA, depleted its space in February, 2011. The second tier, comprised of Regional Internet Registries like ARIN, RIPE and APNIC, have now all but depleted their respective supplies of IPv4 addresses. As the Internet continues to expand, IPv6 addressing will by necessity become more prevalent.

Key survey findings include:

- One-third of survey respondents indicated that they had already deployed IPv6 throughout all or a portion of their networks. Another twenty-three percent are actively deploying IPv6 and fifteen percent plan to deploy within two years.
- IPv6 deployment propensity is directly proportional to network size, with ninety percent of operators of larger networks with over 100,000 IP addresses, actively deploying IPv6, if not already having completed deployment.
- Service providers led deployments with ninety-four percent deploying or having deployed. Enterprises have also been busy with two-thirds of such respondents indicating IPv6 deployment activity.
- Leading benefits of IPv6 deployment include continued global Internet presence as the Internet evolves from a homogenous IPv4 network to a dual protocol IPv4-IPv6 Internet. Other benefits included the potential for innovative applications and support for the Internet of Things (IoT).
- The inability to demonstrate a clear business case was viewed as the leading obstacle, followed by the complexity of infrastructure upgrades and the conversion of existing applications and middleware.

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Introduction

In summer, 2015, BT Diamond IP conducted the fifth annual IPv6 industry survey. The American Registry for Internet Numbers (ARIN) effectively depleted its available IPv4 addresses recently, following RIPE (serving Europe) and APNIC (serving Asia). These three Regional Internet Registries serve nearly ninety percent of the world's population, who now have little to no IPv4 address space available for assignment for IP address expansion requirements.

To help determine the status of IPv6 deployments and attitudes about IPv6, BT Diamond IP recently conducted a web-based IPv6 survey. The survey was completed by sixty-one IT or Operations professionals from around the globe and spanning multiple industries. The survey was posted online and invitations to participate were sent to individuals identified as IT and Operations professionals.

All survey responses were automatically tabulated into a survey tool. Any individual skipped questions were not included in tabulations. Percentages shown in charts may not equal 100 percent due to rounding or to questions enabling multiple answers.

The remainder of this document highlights key findings from our IPv6 survey, including comparisons of results from prior year's surveys as appropriate to illustrate trends. For more information about IPv6, please consult the *Additional Resources* section at the end of this document.

Level of Concern about IPv4

The level of concern about the depletion of IPv4 address space has remained consistent with last year's results as indicated in Figure 1. About 39% indicating "huge concern" in this and the last survey, which reflected a rise from the prior two years since the IANA IP address depletion announcement in 2012. Those expressing moderate concern dropped slightly, contrasted by a modest rise in the level of low concern from this year's survey.

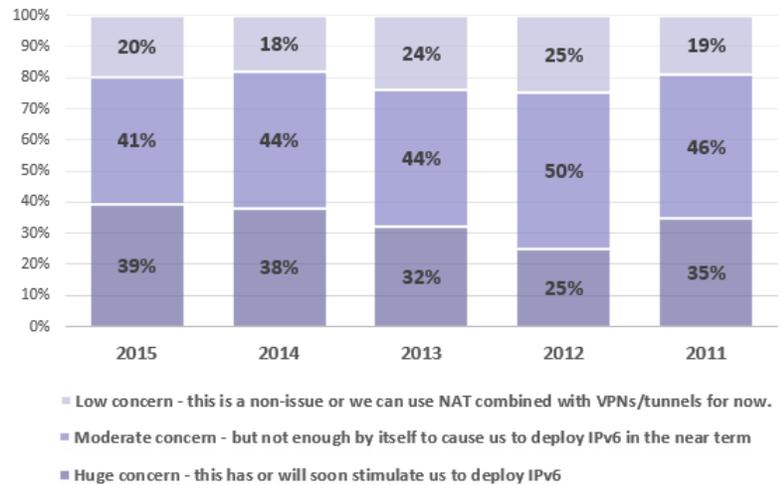


Figure 1: Level of concern regarding IPv4 depletion



“

I think ultimately when we finally get IPv6 everywhere, people will have the flexibility to run end-to-end security and safety. They'll be able to cluster things together and have hubs that manage access to them which we're going to need for the Internet of Things."

Vint Cerf

Google's Chief Internet Evangelist

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IPv6 Deployments

Figure 2 illustrates the level of IPv6 deployment based on this year’s and the prior four years’ survey results. A full one-third of this year’s respondents indicated they have already deployed IPv6 across all or a portion of their respective networks. This is up sharply from 19% of respondents in last year’s survey and has been steadily progressing upward over the last five years. The proportion of respondents who are currently in the process of deploying IPv6 has remained relatively consistent in the mid-twenties while those waiting but planning to deploy within two years has remained below 15% over the past three surveys. The sum of these three deployment-oriented responses, which we’ll collectively categorize as “deployers,” amounts to 70% of all responses.

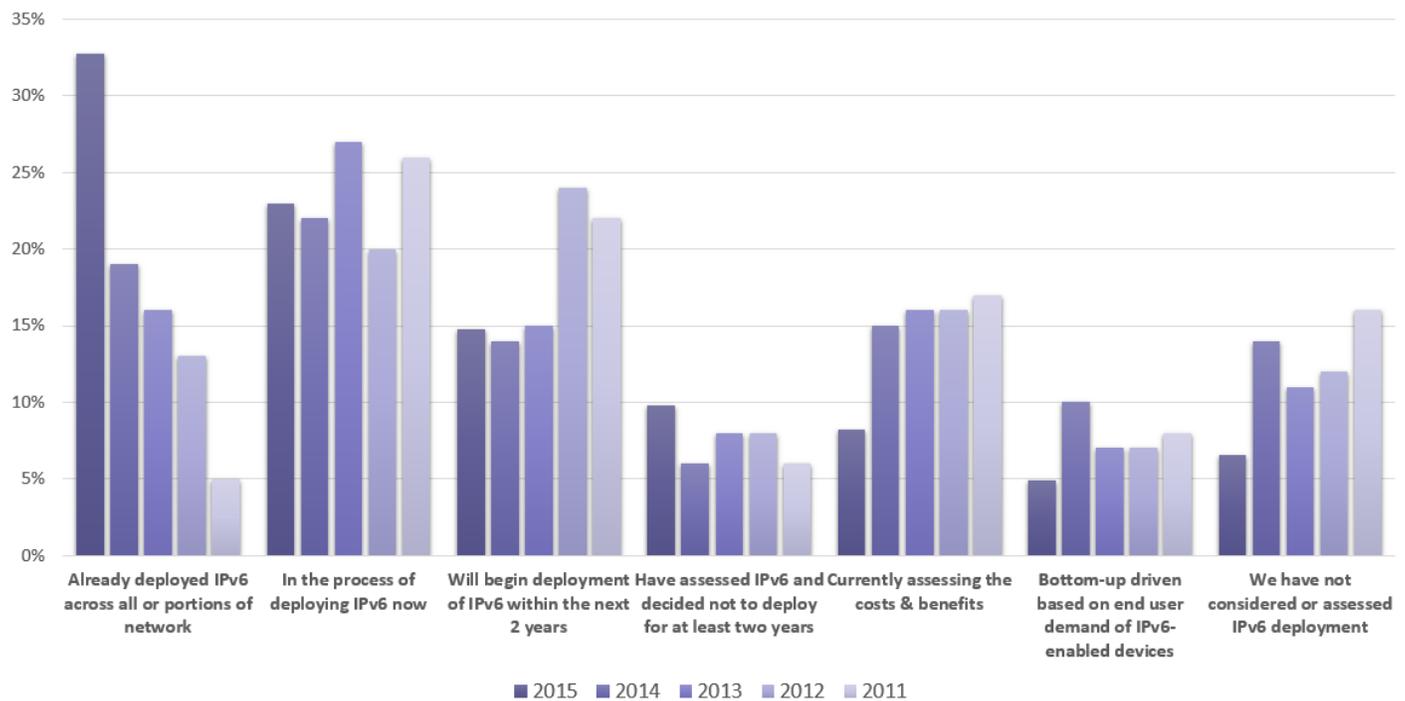


Figure 2: IPv6 Deployment Status, 2011-2015

Under ten percent of respondents have decided not to deploy IPv6 for at least two years, while five percent plan to react to bottom-up end user demand, and seven percent have not even considered IPv6 deployment. These three responses, which we’ll categorize as “non-deployers” amount to 22% of all responses. The remaining responses, those considering but not yet decided amount to eight percent of all responses in 2015.

Exploring further these deployer and non-deployer categories in Figure 3, we see in the chart on the left: deployers by organization type; and on the right: by network size. Ninety-four percent of service providers fall within the deployer category, while six percent are not deploying or are waiting. Two-thirds of respondents indicating they work for an enterprise organization have deployed IPv6, and slightly lower, 63%, of those from governmental organizations so indicated.



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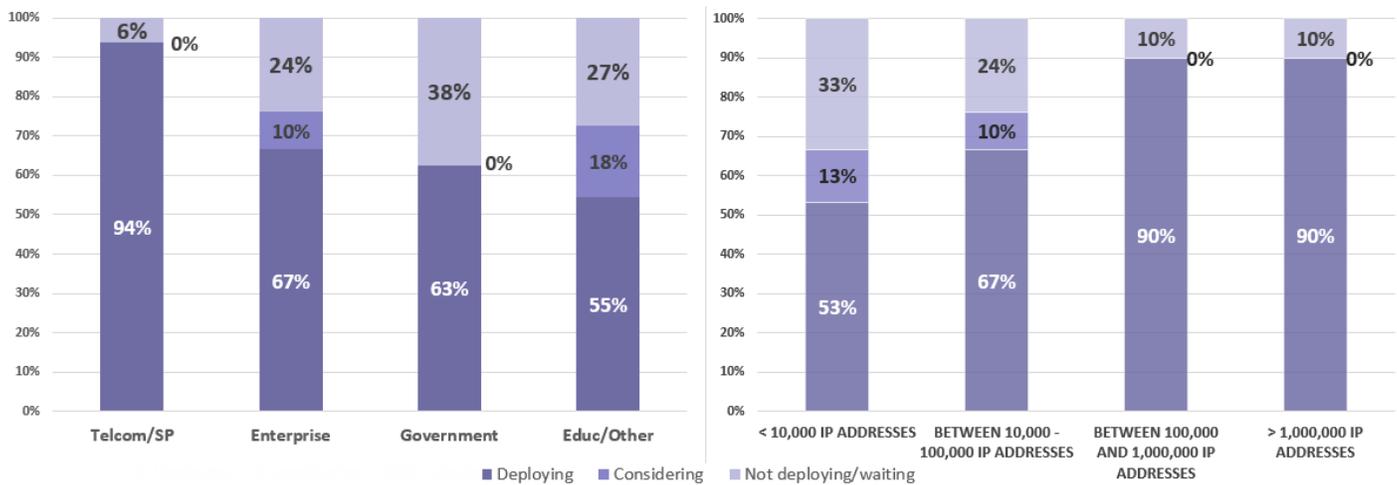


Figure 3: Deployment status among organization type (left) and network size (right)

As might be expected, the proportion of IPv6 deployers grows with network size as illustrated on the right hand chart of Figure 3. Large networks, especially if growing even larger, typically have a larger appetite for IP addresses and a full 90% of those managing IP networks of over 100,000 IP addresses fall within the deployer category. Two-thirds of those of modest sized networks of between 10,000 and 100,000 IP address are deploying, as are just over half of smaller network operators.

From a geographic perspective, 83% of respondents from Europe are deployers while over two-thirds of those from North America are deployers. Only eight percent of those from Europe are non-deployers, though 26% from North America fall within the non-deployer category.

IPv6 Perceived Value

We asked about participants’ opinions about the value of IPv6 within their organizations and for the Internet at large. Unfortunately, some of these questions were posed in the negative sense in maintaining consistency since our first and ensuing surveys. Thus some of the commentary in this section cancels out the double negative by inferring “most agreed with the affirmative” instead of the technically correct “most disagreed with the negative” format.

For example more respondents disagreed than agreed with the statements that IPv6 has value but does not link to business drivers and that IPv6 does not provide any benefits to my infrastructure or organization. We infer from this that more respondents agreed than disagreed that IPv6 provides benefits and offers business value. On the other hand, more respondents agreed with the statement that IPv6 deployment does not offer a strong enough ROI. We conclude that while respondents recognize benefits and value, these are not yet sufficient to produce a strong return on the investment required for deployment.

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Figure 4 illustrates the overall results regarding the need and value of IPv6. Nearly 70% of respondents strongly agreed or agreed that IPv6 deployment is required to communicate with IPv4 and IPv6 Internet users. Only about 13% strongly disagreed or disagreed with this statement. As a consistency validation, the converse statement that it is not necessary to implement IPv6 yielded nearly proportional contrary results.

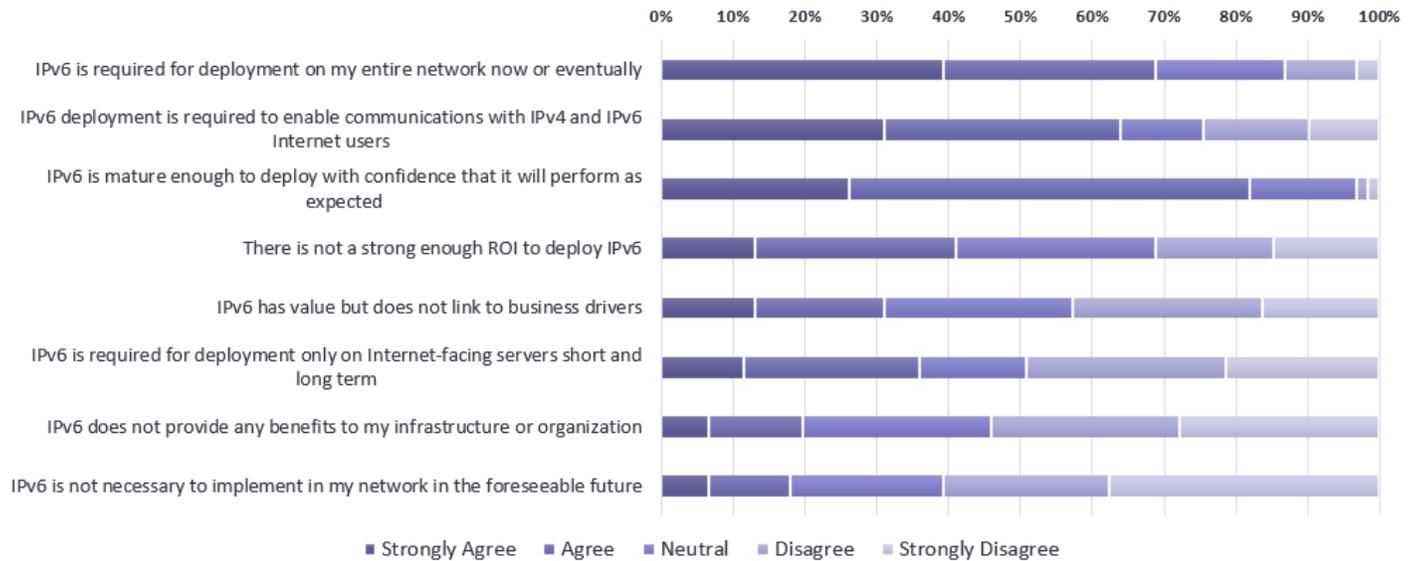


Figure 4: Perceived value of IPv6

Historical perspectives on the value of IPv6 from past surveys are summarized in Figure 5. The rating scale in this figure was devised by assigning values of one to five for strongly disagree, disagree, neutral, agree and strongly agree respectively. Hence a value of “three” indicates a neutral average response, while values above three indicate agreement and below three, disagreement.

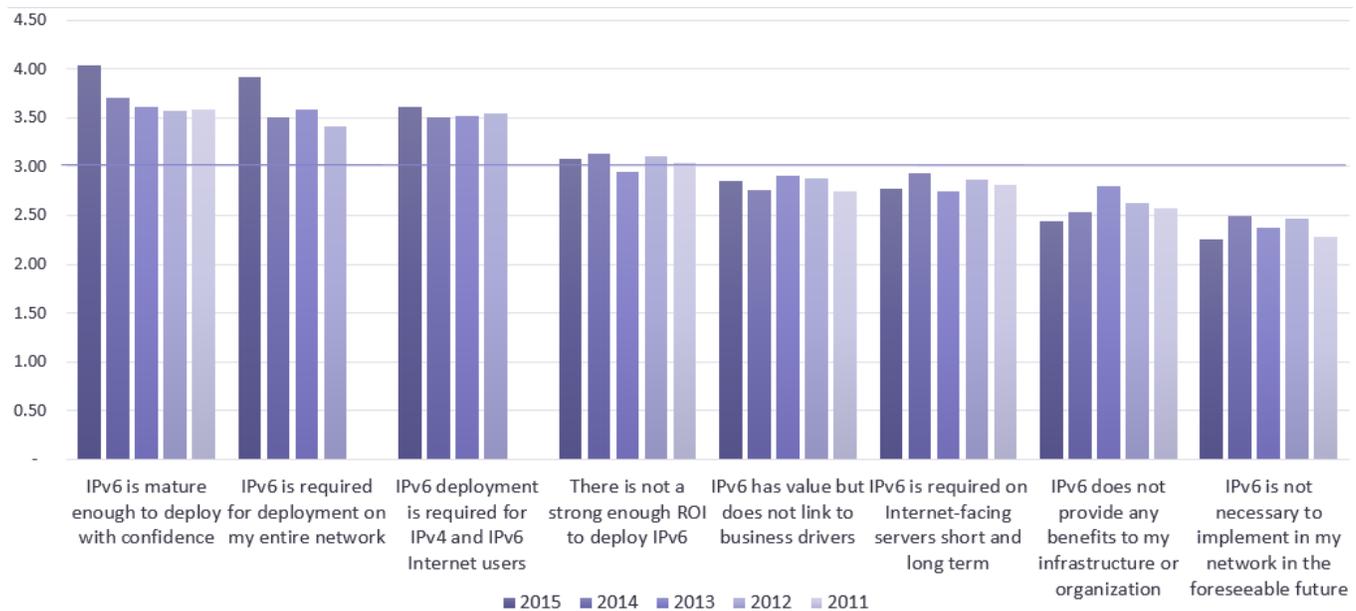


Figure 5: Perceived IPv6 value, historical perspective



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Opinions about IPv6 value have remained relatively steady over the past five surveys in terms of overall agreement and disagreement with value statements, though this year’s survey saw a relatively large jump in affirmative opinions about IPv6’s maturity and necessity.

IPv6 Benefits

Beyond the value IPv6 offers, we asked survey participants about potential benefits to deploying IPv6. Participants were asked to select those features they believed would be beneficial and multiple answers were acceptable. Responses for this year’s survey and last year, when this was a new question, are illustrated in Figure 6. Responses among these two surveys are consistent, other than a relatively large jump in the perceived benefits of continued global Internet presence to support IPv4 and IPv6 users and interestingly, competitive positioning or industry leadership.

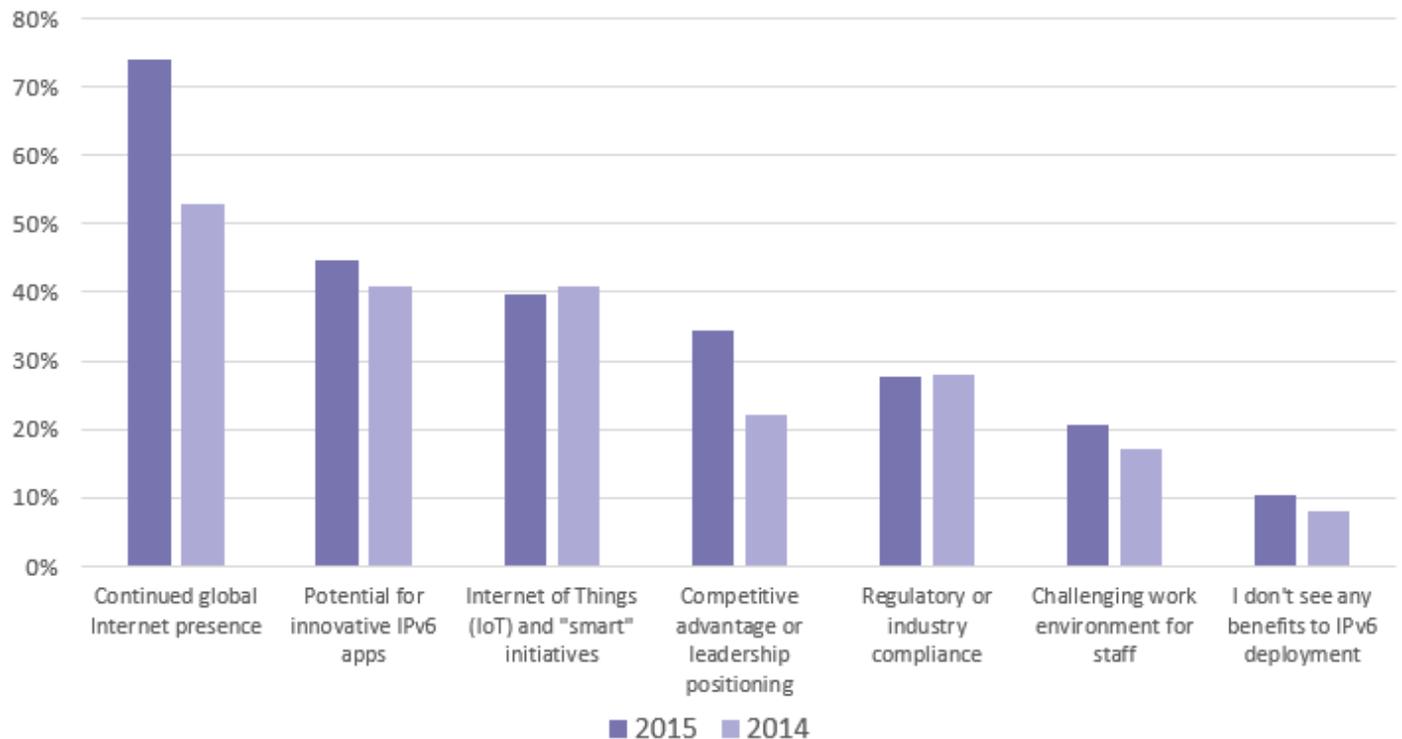


Figure 6: IPv6 perceived benefits, 2014-2015

Figure 7 highlights opinions about IPv6 benefits based on respondents’ deployer/non-deployer categorization as defined earlier. Not surprisingly, deployers selected several IPv6 features as very beneficial, while non-deployers saw few benefits in IPv6 deployment. Over 80% of deployers saw benefits for competitive advantage, IoT initiatives and continued global Internet presence.

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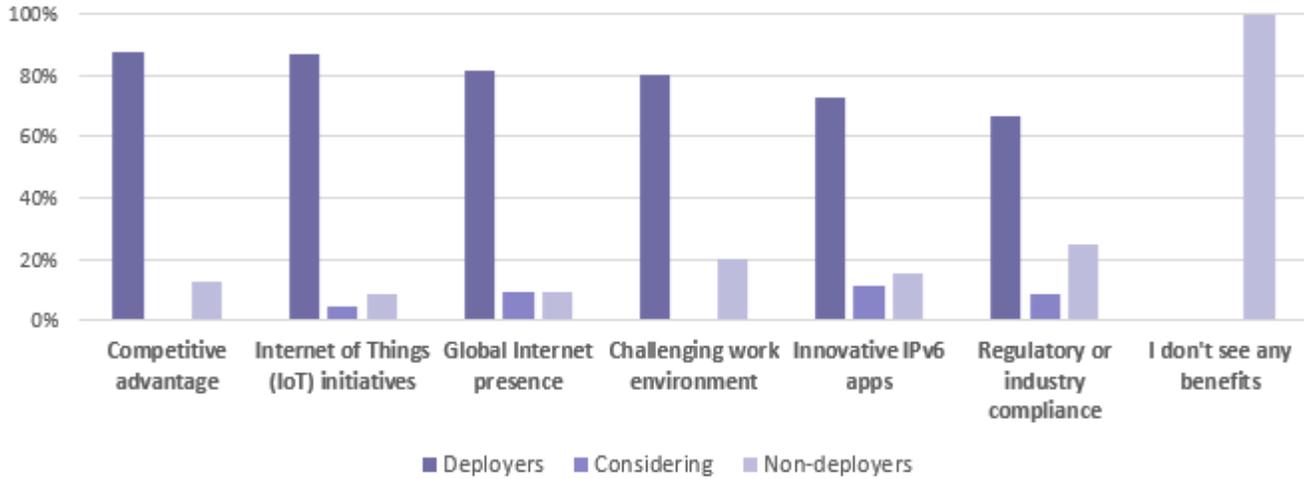


Figure 7: Perceived benefits based on deployer categorization

IPv6 Features

IPv6 offers numerous features, many of which are similar to, though in many cases improved over IPv4. Certainly abundant address space is one obvious feature of particular benefit, and it continues to be the feature receiving top recognition over the past five surveys as illustrated in Figure 8. Security, mobility and IoT facilitation ranked second through fourth this year, with address autoconfiguration, quality of service, extension headers and flow labels rounding out feature favorability respectively. In some sense, this ranking illustrates a shift from favoring protocol mechanics to those of broader IT benefits. This year's survey respondents were decidedly more neutral in their opinions about IPv6 features as favorability trended towards neutral for all except the address capacity feature.

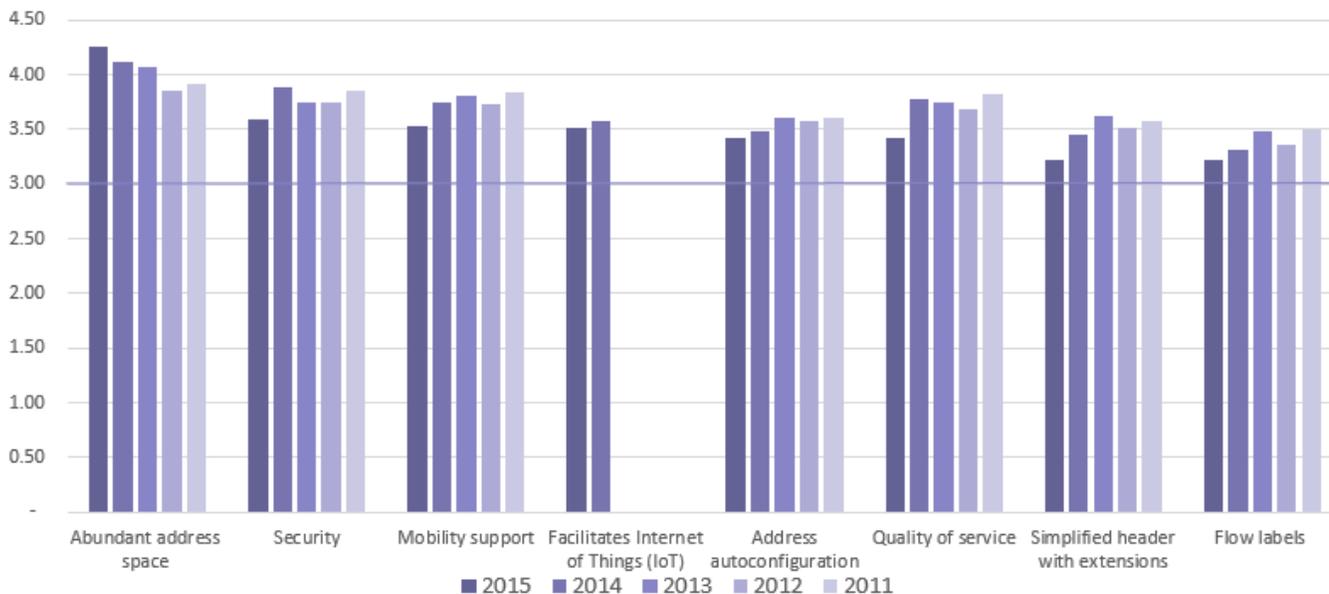


Figure 8: IPv6 feature perceptions

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IPv6 Deployment Approaches

We asked survey participants what techniques they have used or plan to implement in support of IPv6 deployment, for service providers and enterprise respondents. Figure 9 shows responses for this survey contrasted with those from the prior four years' results for service providers. Dual stack in various forms remains the most popular approach again this year, with full IPv6 deployment likewise a favored approach. Note that multiple responses were permitted to these particular questions about deployment techniques, which tends to level out results to some degree.

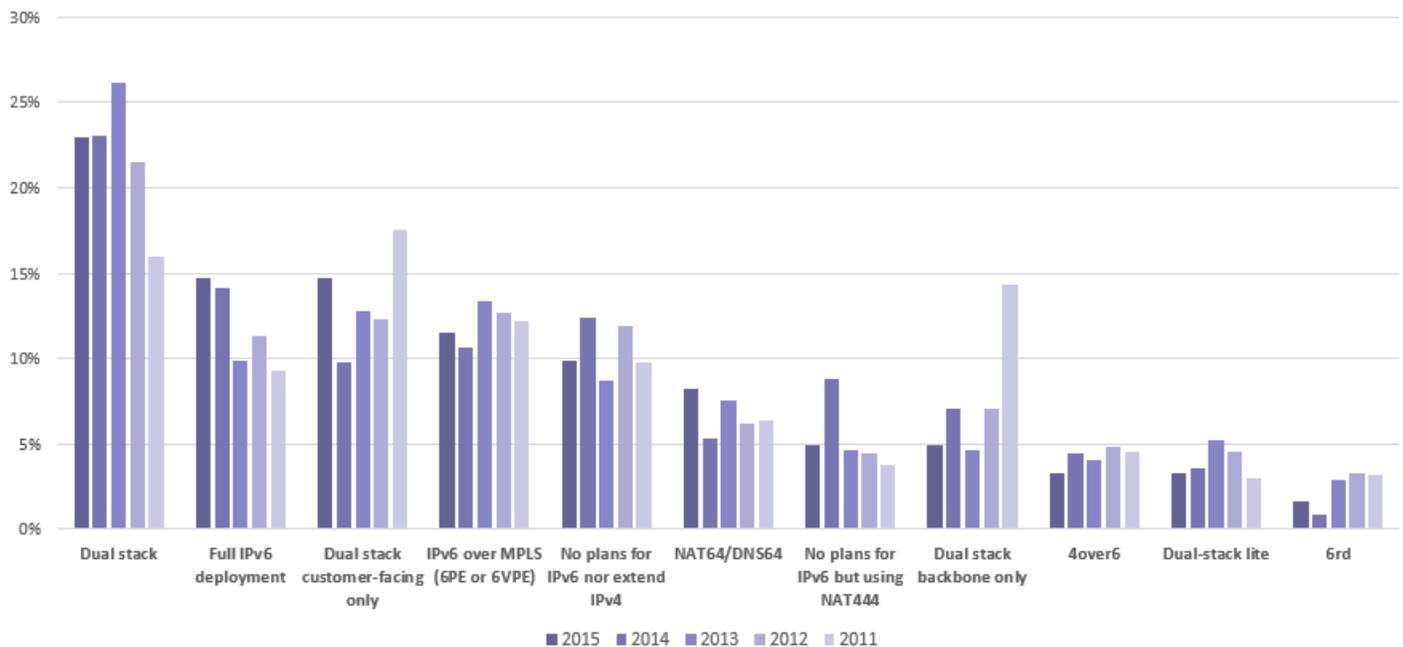


Figure 9: IPv6 deployment approaches for service providers

Like those from service providers, enterprise respondents also favored the dual stack deployment approach to facilitate IPv6 deployment within a native IPv4 network, with full IPv6 deployment coming in second. Deploying IPv6 only on Internet-facing infrastructure continues to diminish in favorability as a deployment approach. This tactic has historically been posited as a good “first step” to deploying IPv6, in order to enable access to Internet-facing applications to all Internet users, whether IPv4 or IPv6. While not explicitly asked in the survey, the reduction in the favorability of this approach could stem from the desire to retain the end-to-end communications model of IPv6 and the relatively small incremental investment required to secure, manage and support the full network on IPv6 as opposed to just the Internet facing services.

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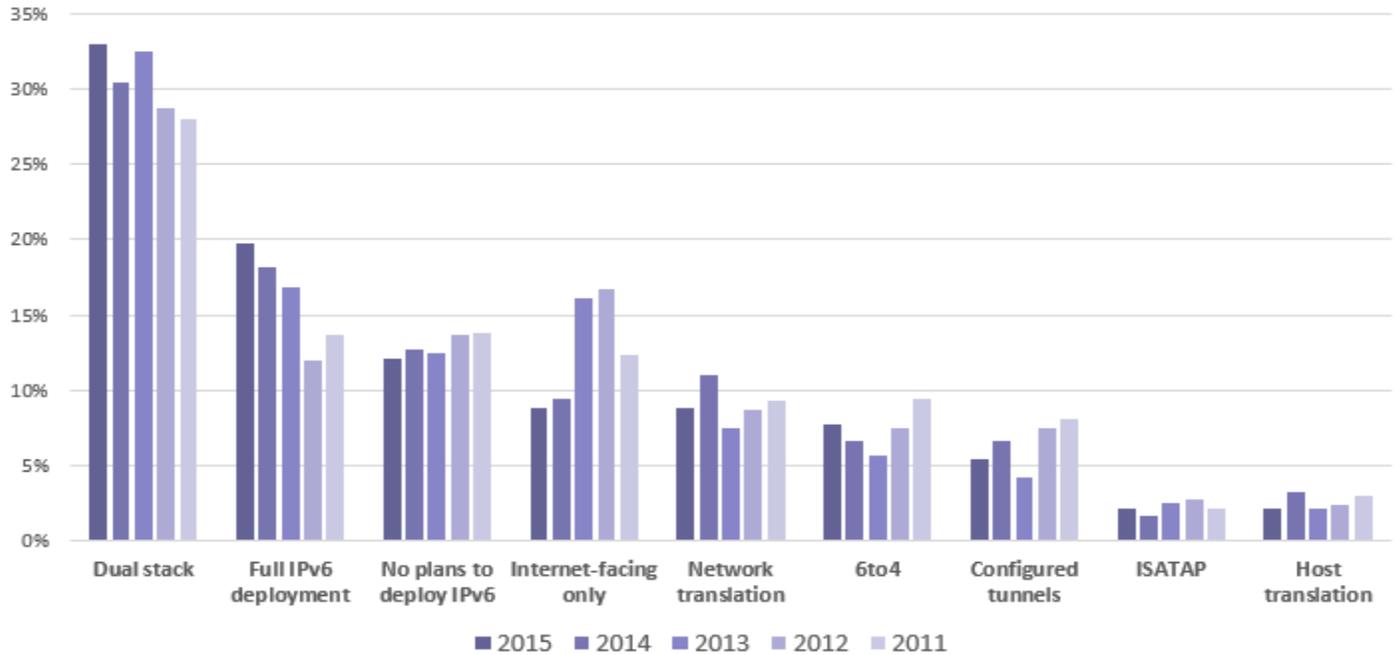


Figure 10: IPv6 deployment approaches for enterprises

IPv6 Deployment Obstacles

We asked survey participants their views on the biggest hurdle to overcoming IPv6 deployment within their respective networks. The inability to demonstrate a strong business case¹ led responses with the complexity of infrastructure upgrades coming in second once again this year. It is certainly possible that such perceived complexity is feeding the perception of high cost and therefore a weak business case. On the revenue side of the equation it may be difficult to quantify, but as the proportion of IPv6 Internet users rises, an organization supporting only IPv4 will not be reachable natively by this growing population. And this could result in fewer contact leads, communications and sales transactions conducted via the web over time.

This year's results indicated large jumps in concerns about the conversion of existing applications or middleware and the need to train staff. This increasing concern for upgrading middleware and applications implies a progression of thinking "up the stack" to applications, typically an obstacle faced after networking issues have been resolved. And while "staff training" is somewhat ambiguous, the training of a few pilot implementers would be less likely raised as an obstacle than the need to train the entire IT, Operations and support teams. And such broader training would not likely be an initial obstacle in the deployment process but one that would coincide with deployment completion.

¹ BT Diamond IP provides a free online IPv6 ROI tool (<http://tinyurl.com/ipv6-roitool>) for your use in scoping out and quantifying financial costs and benefits to deploying IPv6 within your Internet-facing systems as a first step to deployment.

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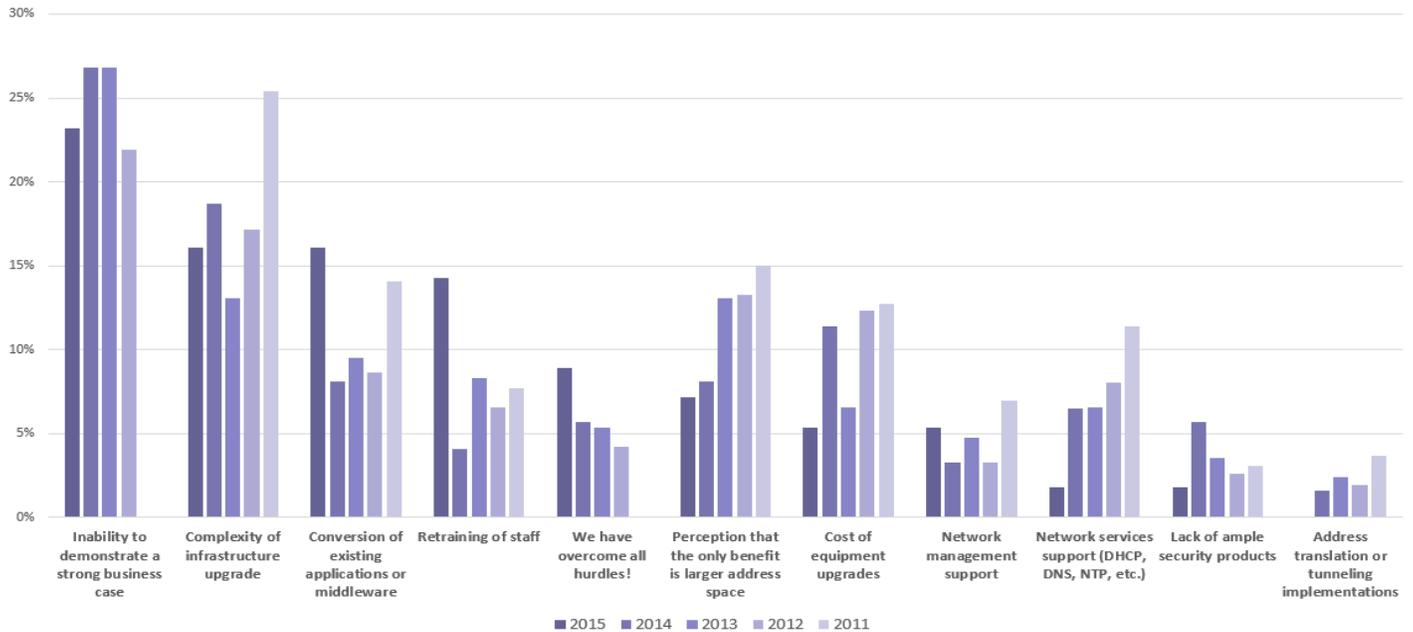


Figure 11: IPv6 deployment obstacles

Non-Deployer IPv6 Support

We asked those classified as non-deployers per our earlier definition what steps if any they were taking to support IPv6 communications. As with prior years' surveys, most respondents indicated they were taking no action since it is deemed unnecessary. The majority of non-deployers responded as such this year as shown in Figure 12. Over a quarter of respondents are relying on their Internet Service Provider to perform protocol translation to supply them only IPv4 packets. Eleven percent are explicitly filtering out IPv6 traffic within their networks and the remaining ten percent are evenly split among supporting tunneling or translation services.

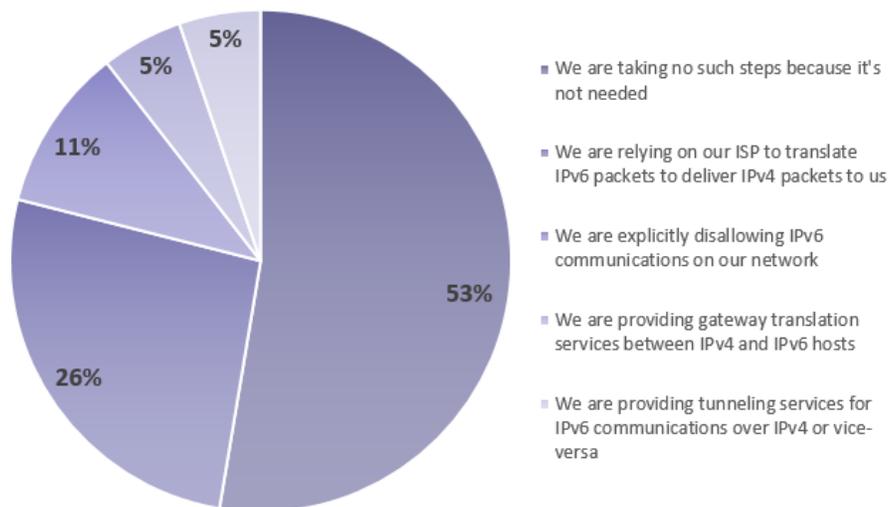


Figure 12: Non Deployer handling of IPv6

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IPv6 Deployment Threshold

We asked survey participants whether they considered a threshold of IPv6 adoption worldwide as a trigger to step up their IPv6 implementation efforts. Given Google’s measurement that over seven percent of users accessing their websites are using IPv6 to do so, the actual IPv6 adoption threshold could be viewed as approaching ten percent. Figure 13 shows a summary of responses for this year’s survey and the prior three years. Generally a plurality of respondents have no threshold and a growing proportion are already deployed or are in progress.

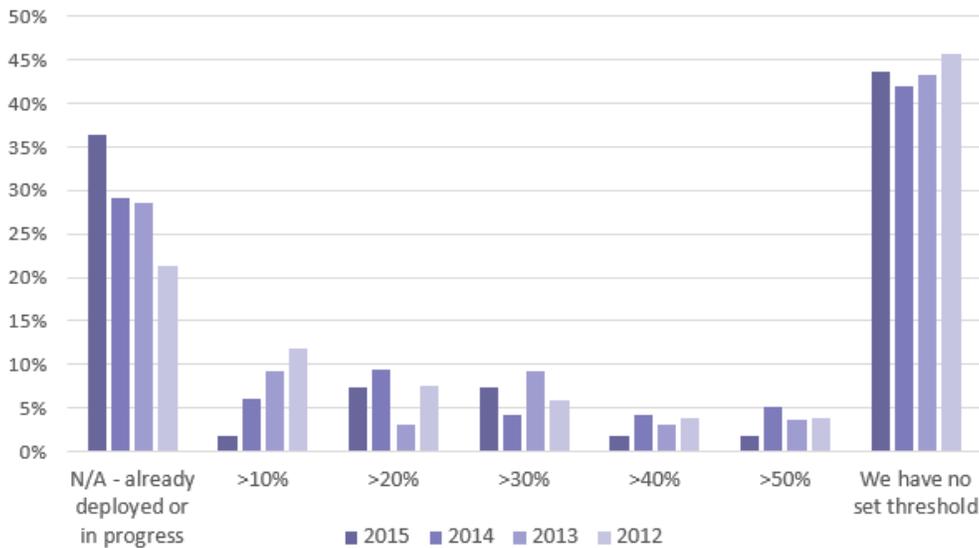


Figure 13: IPv6 deployment threshold

Survey Demographics

Figure 14 illustrates key demographics for respondents from this year’s survey. As with prior years, participants from North America far outnumbered other geographies, with those from Europe coming in consistently around twenty percent year over year. Network sizing likewise yields about two thirds of participants’ networks supporting over 100,000 IP addresses or 30,000 subscribers.

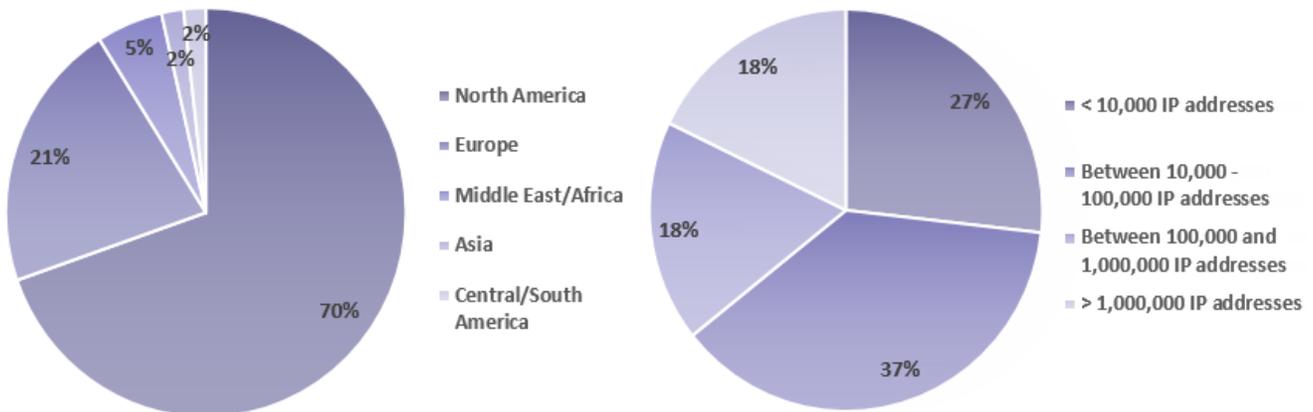


Figure 14: Survey participants' location (left) and network size (right)

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Conclusions

IPv6 deployment is gaining momentum with a higher proportion of respondents having deployed IPv6 than in past survey results. Attitudes are shifting based on what seems to be a more thorough understanding of IPv6 and its practical benefits, value, and challenges, although part of this could admittedly be resignation to the inevitable necessity of IPv6. In any case, survey respondents acknowledged that IPv6 will likely enable networking capabilities unrealizable with IPv4.

For example, as one survey respondent noted: “There will be no ‘Internet of Things’ without IPv6!” And the Internet of Things (IoT) refers to the extension of today’s Internet beyond connectivity and interaction among traditional user-operated devices like PCs, tablets, phones and like types of devices into the realm of connectivity and interaction with non-user operated devices such as sensors, monitors and remotely controllable devices. Internet-enabling such “unmanned” devices allows these devices to autonomously report updates, status changes, events, or to perform actions commanded by users or other devices via the Internet or private IP networks. We’ve already seen IoT capabilities deployed in parcel tracking applications, surveillance cameras, thermostats, automobiles, fitness devices and much more, and these are the early days of IoT implementations.

Even if IoT offers no benefits for your organization, it’s indisputable that more and more organizations are deploying IPv6, changing the face of the Internet to a dual-protocol IPv4-IPv6 Internet. Certainly organizations that rely on Internet communications for ubiquitous global access to resources, collaboration, or commerce should seriously consider starting to plan for IPv6 deployment if they haven’t done so already.

Additional Resources

If you’re wondering how to get started with IPv6 or if you’d like to learn more about IPv6, BT offers several resources for more information about IPv6:

- www.ipv6.bt.com – BT’s IPv6 resources site
- www.bt.com/diamondip - BT Diamond IP site – click the *White papers and webinars* tab to access several white papers and webinar recordings related to IPv6.
- <http://tinyurl.com/ipv6-tools> – Free online IPv6 tools including a subnet calculator, address planner, IPv6 needs assessment, and an ROI calculator (to address that business case obstacle!)
- <http://www.internetociety.org/deploy360/ipv6/> - Internet Society IPv6 resources

Offices worldwide

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