1. **Invention Title.**

Automatic Address Assignment Algorithm

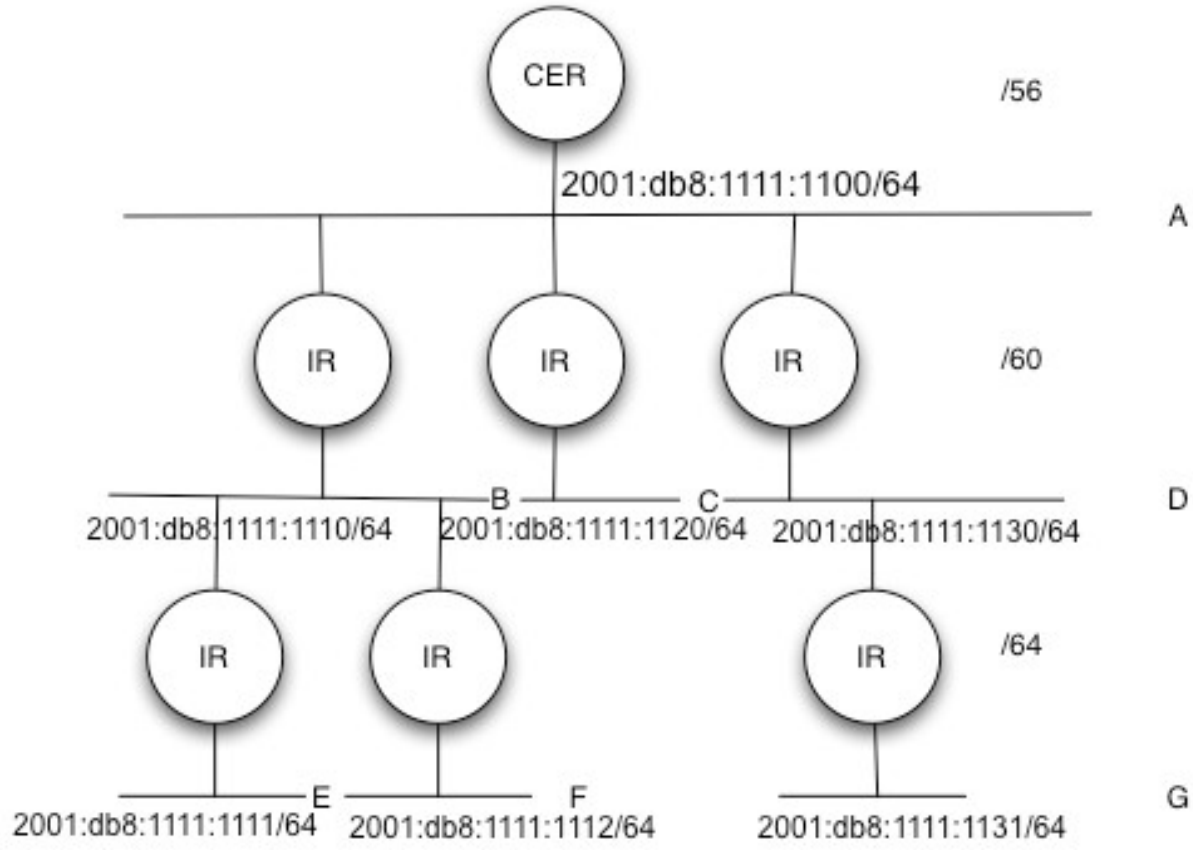
2. **Invention Summary**

This invention describes an algorithm for automatically delegating multiple IPv6 and IPv4 prefixes in a home network.

3. **Invention Description**.

a. Describe the invention in detail.

In a hierarchical network (e.g. http://tools.ietf.org/html/draft-chakrabarti-homenet-prefix-alloc-01), IPv6 prefixes can be assigned by routers receiving a supernet via DHCP, removing a subnet of addresses, and subdelegating the remaining subnets to routers lower in the hierarchy. See the picture below. The example shows a three level hierarchy using four bits per level. Routing is aggregated, so routers only need to install a route to their subdelegated prefixes and a default route pointing to their upstream router.



Our invention is an enhancement to this network architecture. Assuming that multiple IP prefixes (e.g. IPv6 ULA, IPv6 GUA, and IPv4) are distributed via prefix delegation in a three level hierarchy using four bits per level, there will be 8 bits in common at every

router in the hierarchy among all prefixes so distributed. A five level hierarchy will use 16 bits. See the table below.

v4	PD Size	V6 ULA	PD Size	V6 GUA	PD Size
192.168. 1 .0 /24	/ 16	fc00:GID: 00 01 :: /64	/ 56	MSO-56: 00 01 :: /64	/ 56
192.168. 17 .0 /24	/ 20	fc00:GID: 00 11 :: /64	/ 60	MSO-56: 00 11 :: /64	/ 60
192.168. 33 .0 /24	/ 20	fc00:GID: 00 21 :: /64	/ 60	MSO-56: 00 21 :: /64	/ 60
192.168. 49 .0 /24	/ 20	fc00:GID: 00 31 :: /64	/ 60	MSO-56: 00 31 :: /64	/ 60
192.168. 18 .0 /24	/ 24	fc00:GID: 00 12 :: /64	/ 64	MSO-56: 00 12 :: /64	/ 64
192.168. 19 .0 /24	/ 24	fc00:GID: 00 13 :: /64	/ 64	MSO-56: 00 13 :: /64	/ 64
192.168. 50 .0 /24	/ 24	fc00:GID: 00 32 :: /64	/ 64	MSO-56: 00 32 :: /64	/ 64

Given these commonalities, our invention distributes a single IP prefix through this hierarchy using DHCP(v6) Prefix Delegation (RFC 3633) or DHCPv4 subnet delegation (RFC 6656). Using our algorithm, every router in the hierarchy can add additional IPv4 and IPv6 addressing without re-running prefix delegation.

The first IPv6 prefix is distributed as described above. Routers also advertise prefixes they are using via Router Advertisements (RAs). Based on preconfigured defaults (e.g. 8 or 16 bit link ID) and the received RAs, lower-layer routers can automatically allocate their own IPv6 GUA prefix by adding their link ID from the ULA prefix to the first 56 or 48 bits from the GUA prefix.

This approach also works for IPv4. The router can prepend “192.168”, “172.16”, or “10.” to the link ID to calculate the IPv4 subnet, and use the IPv6 prefix size to calculate the IPv4 subnet mask.

b. Why was the invention developed? What problem(s) does the invention solve? How is it better?

In conversations with MSOs, we identified home network addressing to be a significant problem using today’s equipment. Even using products designed to RFC 6204, today’s home routers are not capable of setting up the type of network with multiple routers we expect in the near future. Our invention provides a simplified way of distributing multiple IP prefixes in the home while minimizing DHCP exchanges.

c. Briefly outline the potential commercial value and customers of the invention.

This could become a key feature for all future home routers. It is very likely that MSOs will use this algorithm in some form in the future.

4. **HOW is your invention different from existing products, processes, systems?**

Existing routers use RFC 3633 (IPv6) or RFC 6656 (IPv4) for prefix delegation. There is no thought of using one delegated prefix to provision more than one type of address.