

GLOBAL IPv6 SERVICE LAUNCH EVENT



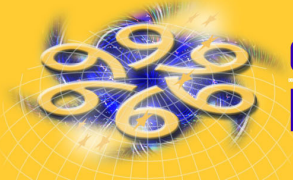
IPv6 in a Global Context

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Distinguished Engineer

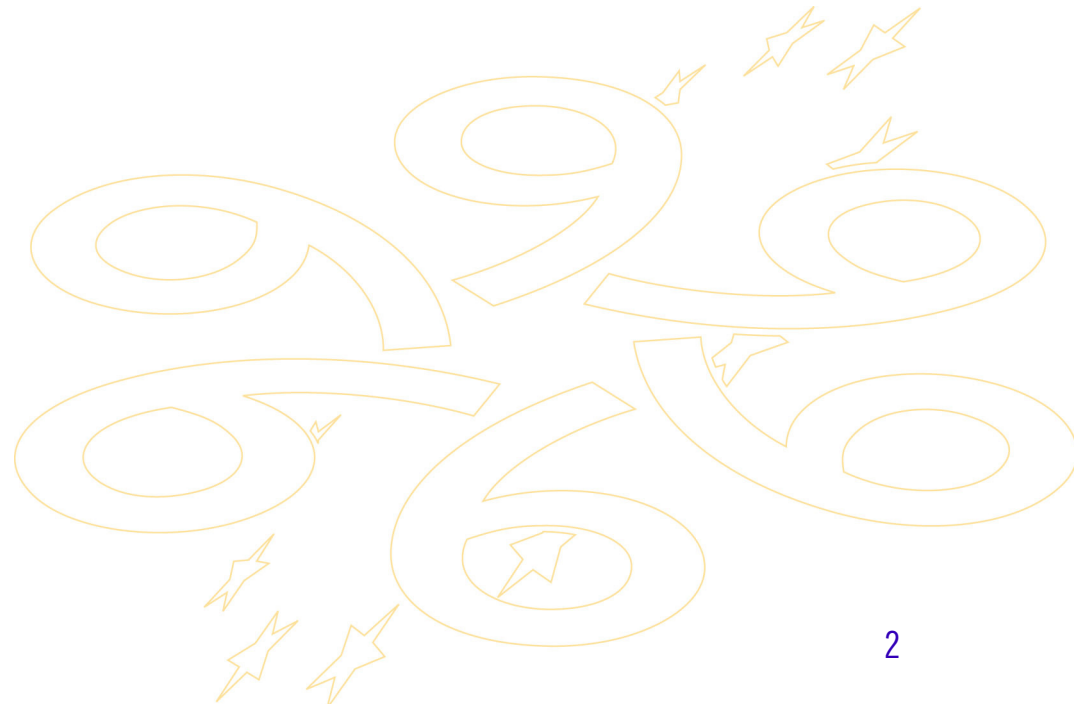
IBM

Brussels, 15-16 January 2004



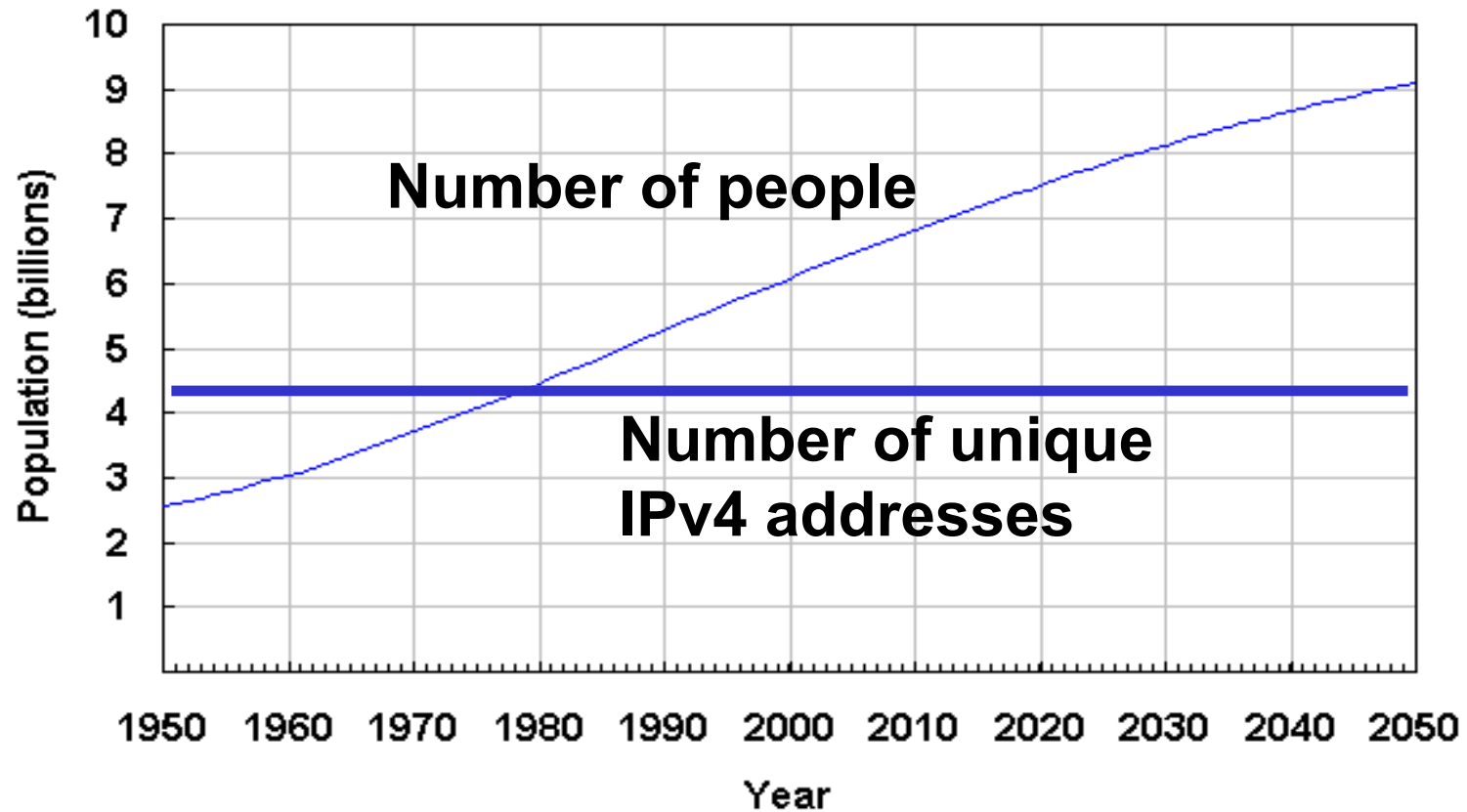
Topics

- Global considerations
- Why IPv4 perpetuates barriers
- How IPv6 will fix this
- Where we are today
 - Close to the tipping point

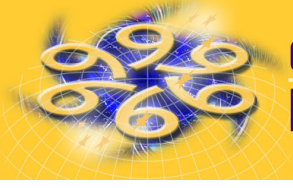




World Population: 1950-2050

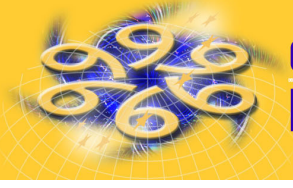


Source: U.S. Census Bureau, International Data Base 5-10-00.



Global considerations

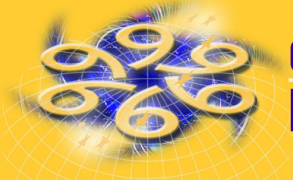
- Is it reasonable to promote a telecommunications technology that allows fewer end system identifiers than there are human beings?
- In the context of resolving the digital divide, the answer is clearly NO
 - Fortunately, the answer is the same whether one uses humanitarian, economic, or purely profit-based arguments
 - From any viewpoint, we should aim at an Internet exceeding ten billion nodes



Why IPv4 perpetuates barriers

- We know from the graph that IPv4 has too few addresses.
- How, then, does the Internet work?
- The answer is that it doesn't, really. Let's go back to Louis Pouzin's work in 1974, credited by Vint Cerf as the intellectual source of the Internet concept...

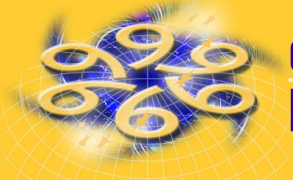




The original Internet concept

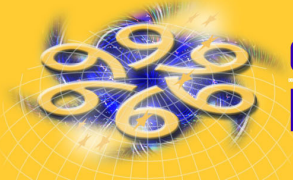
(Known in Pouzin's 1974 work as a "catenet")

- For scalability, we are obliged to build a network of networks.
- Each may use different lower level technology.
- Therefore we need a common layer and common addressing scheme to "allow data networks of widely varying internal operation to be interconnected, permitting users to access remote resources and to permit intercomputer communication across the connected networks" (Cerf, 1978).



Thus IPv4 was designed...

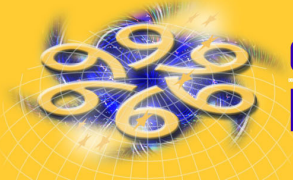
- IP addresses were considered to be split into a network number and a host number
- Network numbers were by definition unique
- Hence the IPv4 Internet (vintage 1983) was by definition transparent from end to end without artificial barriers
 - But in 1994, as an address shortage began to be perceived, private non-unique network numbers were defined
 - A disastrous tactical retreat from the Pouzin/Cerf strategic design



Where the tactical retreat took us...

(No time today for technical details)

- Into a world of unpredictable failures due to network address translation, that help desks cannot fix
- Into a world of work-arounds and kludges that cannot be explained to non-experts
 - Am I the only person who encounters a NAT-induced problem during almost every business trip? Or am I just one of the relatively few able to identify such problems?
- Into a world that encourages walled gardens and information barriers, and discourages innovation



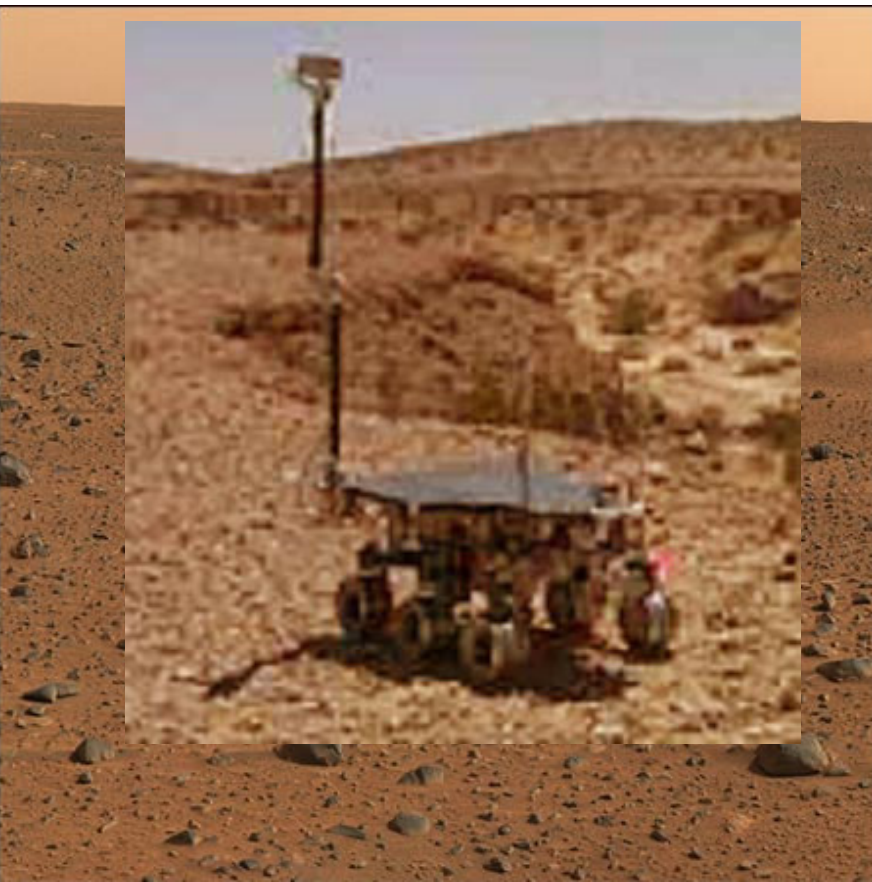
How IPv6 will fix this

- Simple enough: by giving the world enough address space to restore the Pouzin/Cerf model
 - Of course, IPv6 has other important advantages
 - Of course, the need for some barriers in the network (specifically, security barriers) will not go away
- There is no “IPv6 killer application”, but restoring a true Internet will allow another wave of evolution, innovation and creativity



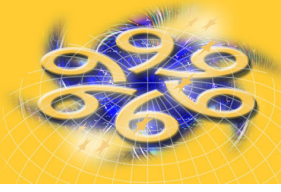


Planet with only IPv4

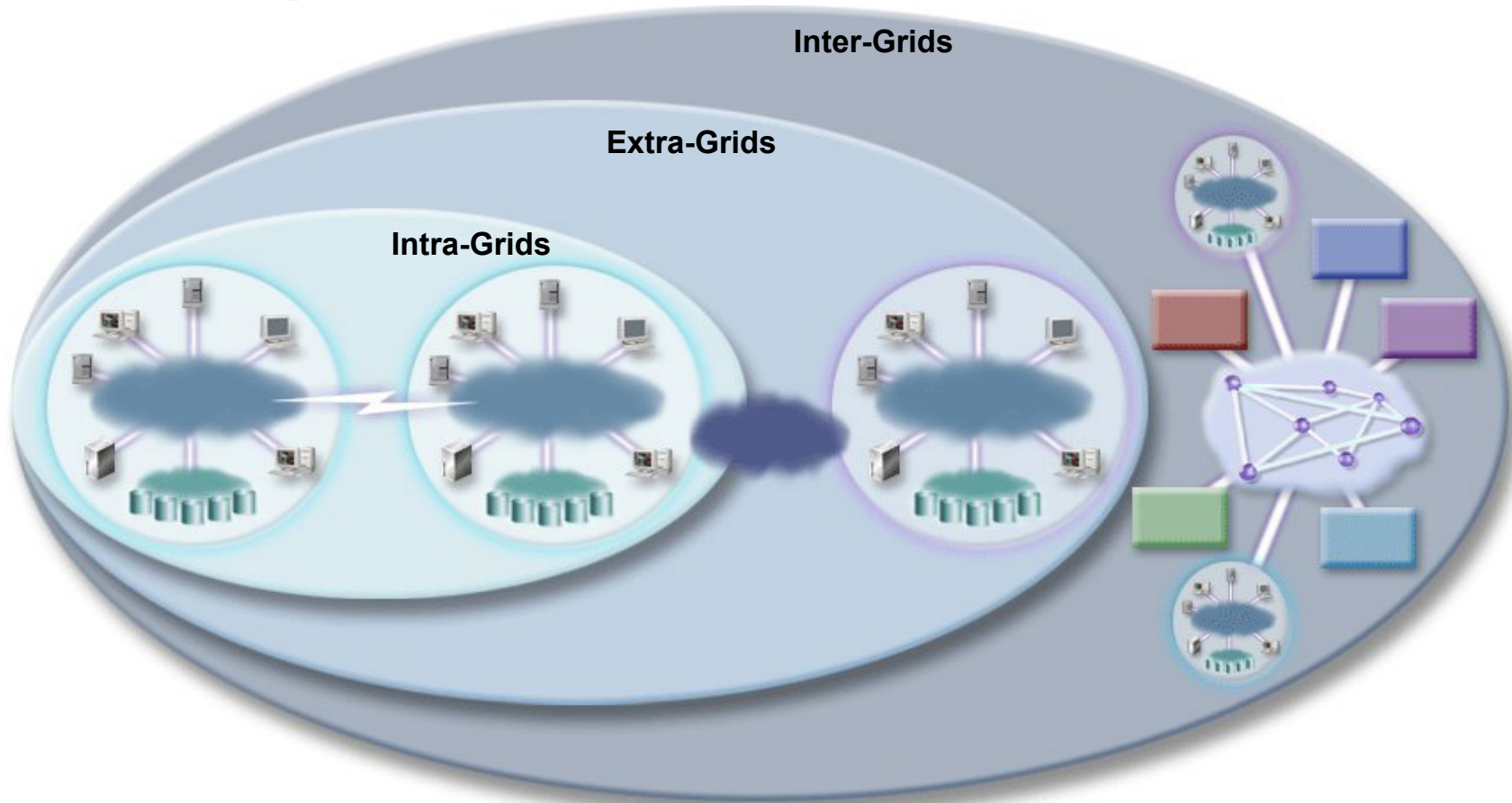


Planet with IPv6

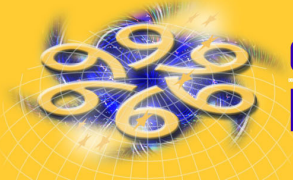




An example: Grids

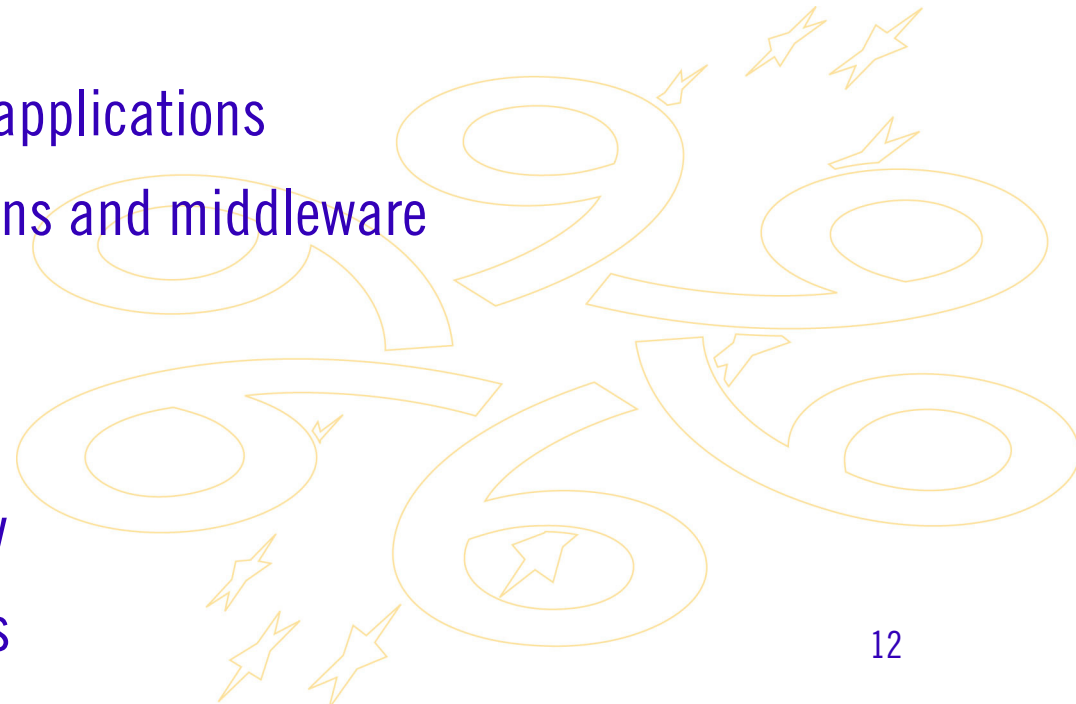


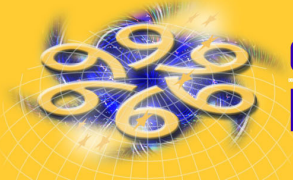
Cannot reasonably build a global InterGrid without global addressing



Where we are today

- IPv6 is a mature technology
 - Stable base standards (still being polished, but so is IPv4)
 - Stable basic products (router & operating system support)
 - Emerging ISP support
 - A large stable of public domain applications
 - Emerging commercial applications and middleware
- IPv6 is a committed technology
 - Required for full 3G deployment
 - Required by the defense industry
 - Required by emerging economies





Close to the tipping point

- IPv6 is mature and committed
- Emerging markets and economies need it
- Further scaling of distributed IT in the developed countries needs it
- Further innovation needs it
- A chicken and egg problem remains, and the way forward is to provide IPv6 service and applications for a critical mass of users
- As with the Internet and the Web, the R&D community must lead the way

