TRAVEL TECHNOLOGY RESEARCH
FIRST VIEW

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T2RL'S First View is our rapid analysis of breaking news. It helps provide perspective, putting the facts in the context of our wider and deeper knowledge of the market.

Inertia Rules - Not OK

T2R Staff

The Facts

Last week the 6th of June was designated as IP V6 day. A grouping of Internet Service Providers and major content companies joined forces to promote the use of the "new" Internet addressing scheme that could allow every atom on earth to have 100 IP addresses.

The Analysis

The necessity to hold a special promotion for a new IP addressing schema almost twenty years after it was first devised has some resonance for anyone who follows the application of technology to the airline industry. A closer analysis shows that the parallels between development of standards for the airline industry and those for the broader Internet community run deeply indeed.

The airline industry first adopted comprehensive standards for the interchange of information between companies in the late 1940s. This was before electronic computers were available as a commercial tool and most of the standards were applied to teletype messages passed between human operators in the airline companies. Amongst the most significant innovations was the two-letter code by which airline companies could identify themselves succinctly in teletype transmissions. In principle this coding scheme allowed for the identification of 676 separate airlines, although some codes were reserved for special applications and the actual number available was more like 575. Even by the 1960s it was evident that this number would eventually be inadequate and in 1967 the International Civil Aviation organisation (ICAO) started to issue three letter airline codes, which would allow over 17,000 different airlines to be indentified. Sadly, by this time the architecture of the main commercial IT systems in the industry had been established. In the mainframe databases of those days it was very difficult to change the size of a field that was used in many different applications throughout the system and throughout the world. As a result various workarounds were developed. IATA began to allow "controlled duplication" where airlines that were unlikely ever to come into contact, such as a cargo airline in Australia and a charter carrier in Poland, were issued the same two-letter code. Then alphanumeric codes were allowed, followed by numeric-alpha and finally two numerics. The airline industry has squeezed almost forty more years of use from a two-character field that was already known to be obsolete by 1970.

The definition of the Internet Protocol (IP) that underlies all communications on the Internet was first published in a 1974 paper by Vint Cerf and Bob Kahn. The version of IP in most common use today is IPV4, which has an address space of 32 bits that allows for around 4.3 billion unique IP addresses. When it was published in 1981 this was enough for every human on the planet to have an IP address and must have seemed sufficient for any conceivable application. The explosion of the Internet and the applications founded on it meant that by the mid 1990s it was clear that this view was hopelessly optimistic. In 1996 a new version of the Internet Protocol, IPV6, was defined. This has a 128 bit address space and allows the definition of a number of IP addresses that can only sensibly be expressed in scientific notation at 3.4×10^{38} unique addresses. At this point the Internet community had exactly the

same issues that the airlines had in the 1960s. The addressing schema of IPV4 is intimately embedded in all of the infrastructure of the Internet - routers, switches, DNS servers and the very structure of the packets crossing the network. To get around this issue the various stakeholders devised workarounds like Network Address Translation (NAT), IP forwarding and port forwarding. In general these allowed a small number public IP addresses to be shared between multiple users on a private network sitting behind a shared router. Provided the devices on private networks were not able to see each other directly they could have duplicated IPV4 addresses. In this way the Internet community has so far squeezed 16 more years of use from an addressing scheme that was known to be obsolete in 1996.

The technologies of the airline and travel industries often come in for virulent criticism from the so-called Internet generation of technologists. The restrictions inherent in the 1960s architectures of some of the core systems are denigrated as preventing development and holding back the evolution of the business. This is undoubtedly true to a point but the very need for something like World IPV6 day shows that is not the whole story. Holding on to outdated technologies because of sunk costs and the difficulty of moving an entire industry forward in lockstep is by no means confined to the "antiquated" airline and GDS systems.

The Speculation

The parallels between airline network technology and the Internet spark the thought that there may be other examples of technologies that are retained long after superior versions are available. It is not difficult to find examples. The United States introduced colour television long before other countries in the world but as a result it was constrained to use the inferior NTSC system long after European countries had developed the much more capable PAL and SECAM standards. The UK introduced digital audio broadcasting via the DAB system and is now "stuck" with it even though most industry experts agree that it is largely unfit for purpose. On a broader view, the retention of Imperial weights and measures decades after almost the whole world agreed to use metric standards is still causing disasters like the loss of the Mars Climate Orbiter and near tragedies like Air Canada flight 143, "The Gimli Glider".

The fundamental issue that underlies all of these challenges is how to create standards that are open to change and development instead of creating a lock-in to obsolescent technologies. It is a field of study that should be exercising academic experts, not just in computer science but also in mathematics, philosophy and psychology. Isaac Newton famously said that he could see further because he had stood on the shoulders of giants. Continued progress and development in so many fields relies on our ability to do the same. The last thing we need is for the giants to be dragging us back to earth before we can get above shoulder height.