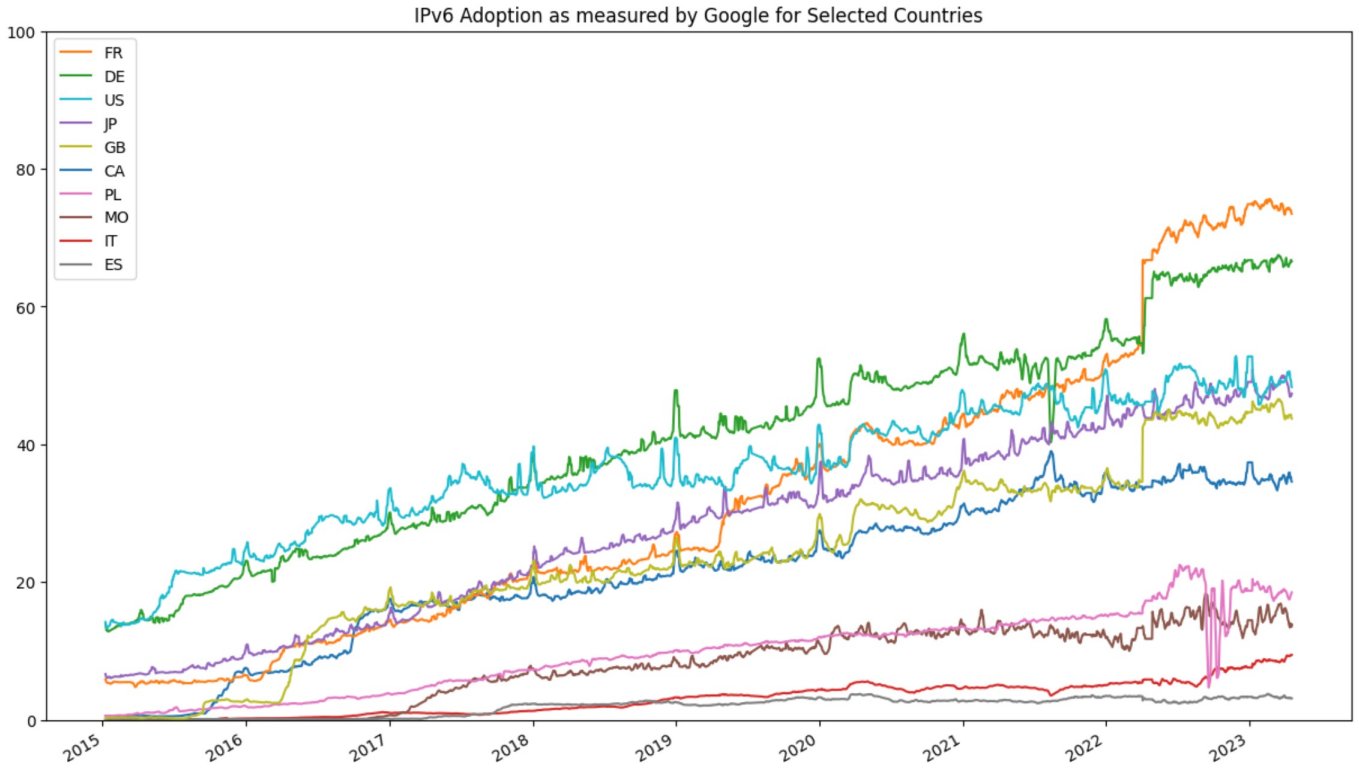
(Enterprise) Applications & IPv6

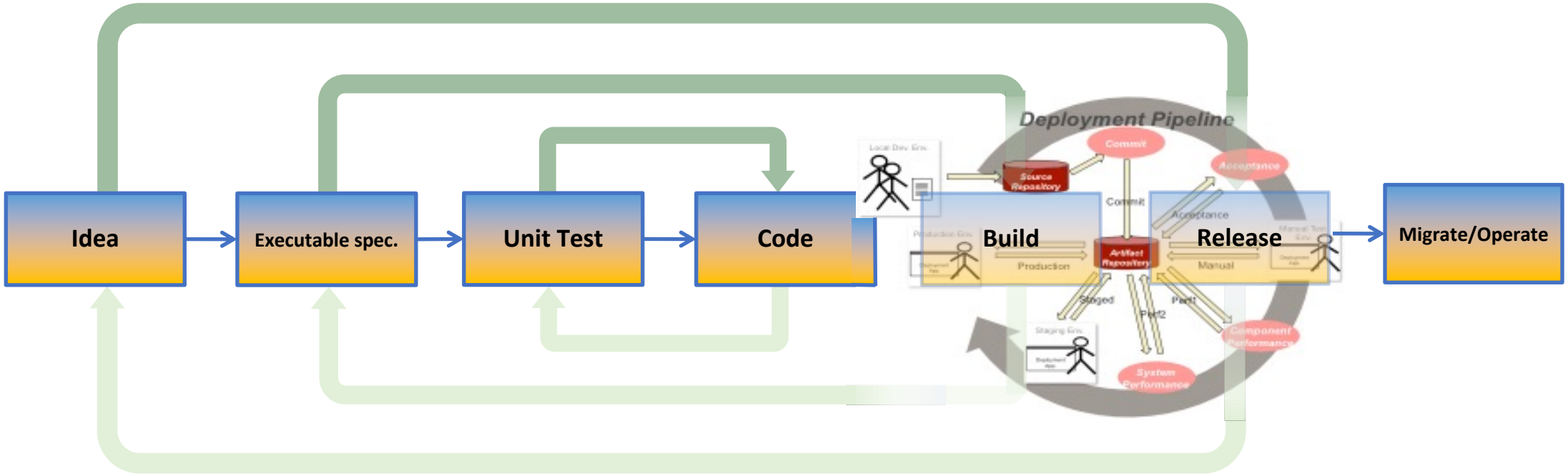
Enterprise and IPv6 Workshop 24 Apr 2023

Despite the opportunities, IPv6 take-up has been slow and has technical, personal and enterprise barriers to adoption



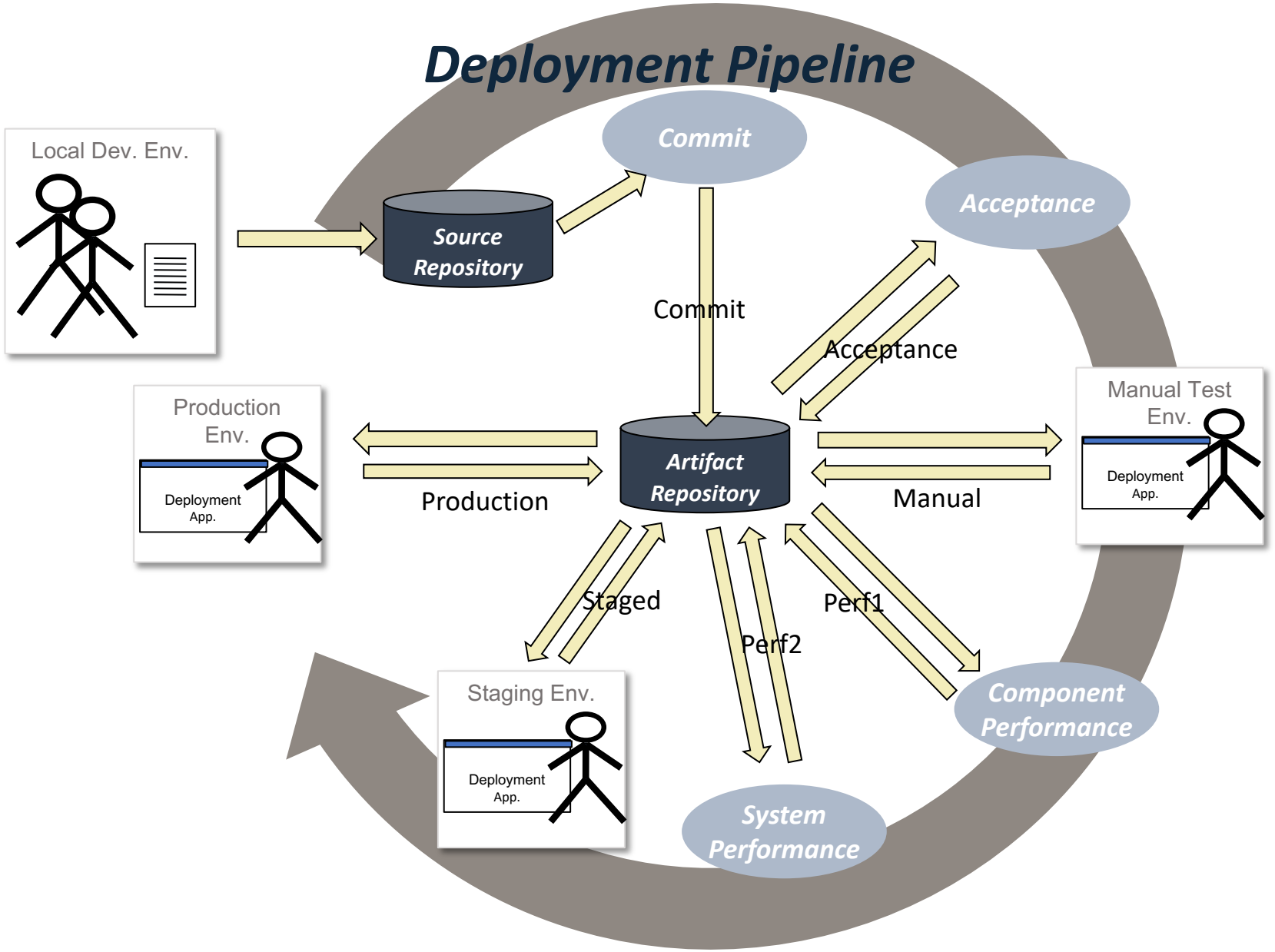
- This graphic, Google's view over time by country, shows that adoption has been variable across countries.
- Even if there are valuable benefits such as better performance, IPv4 is necessary (very few users have only IPv6 connectivity)
- Although this time period covers more than one one application lifetime (7 years on average) there has not been a recent uptick
  - It doesn't look like IPv6 made the agenda for many new or refreshed applications.

Even the best development models – required to enable fast changes – require several runtime environments



Many legacy components do not have such a flexible delivery model. Some may not even have source code.

- Cycle time up to 2 hours for a large system
  - Including data migration
- The different environments need to be sufficiently similar for tests to be representative.
  - Especially for operational usecases
- External dependencies for the component under development must be reliably simulated and instrumented.
- When used effectively, those building the systems retain responsibility for managing them



IPv6 is a non-urgent issue for most

- No ‘burning platform’/drop dead date, unlike Y2k
- Legacy issues are similar in type to Y2k, if less common
- Some internet natives, notably Meta, have been early adopters,
  - but even there take up has been patchy
  - Success has required a top down awareness and push
- Current growth rates imply 75% IPv6 for some markets are not something to be concerned about in this career
  - This can create some pushback if your dev team is in Spain, or Macau is a major market
- Cloud delivery divisions in particular tend to favour IPv4 reference patterns
  - Finding the IPv6 equivalents is hard
  - Confirming that they work, operate, fail and scale as expected is a new learning curve

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['FR: Dec 2023',
 'DE: Aug 2024',
 'JP: Sep 2027',
 'US: Jul 2028',
 'GB: Aug 2028',
 'CA: Oct 2030',
 'PL: Jan 2046',
 'MO: Oct 2047',
 'IT: May 2089',
 'ES: May 2143']
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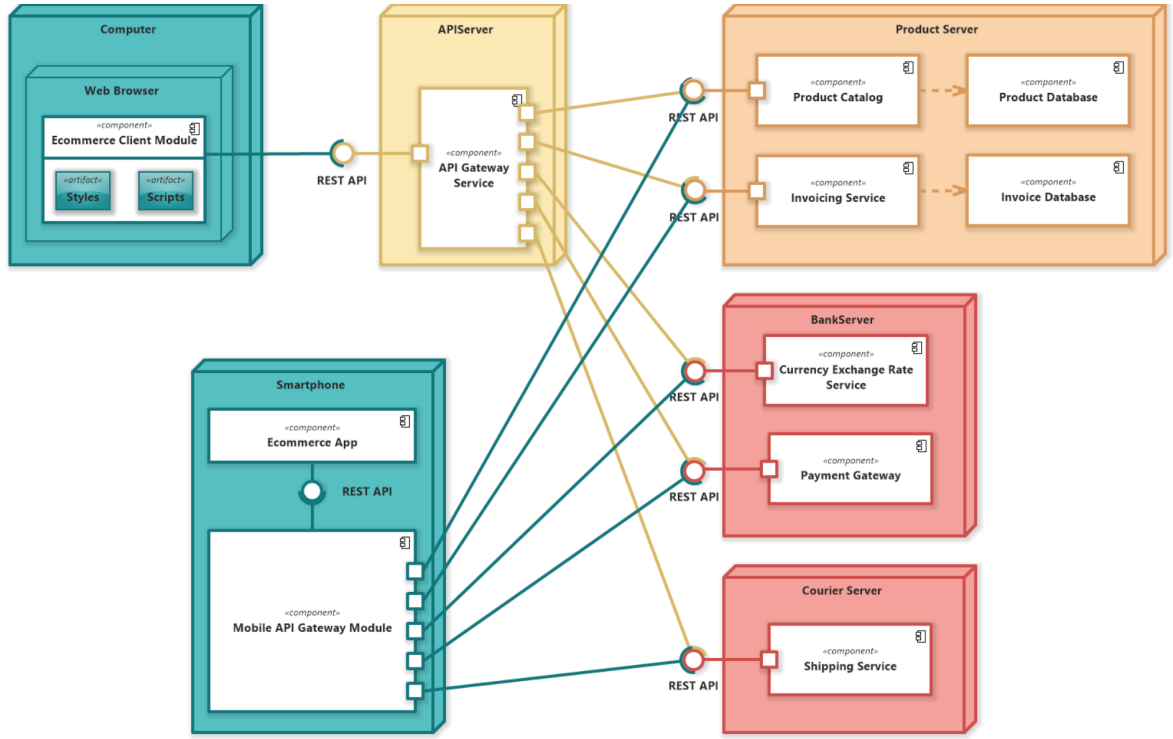
- Containers are becoming the preferred deployment model, but inter-container traffic design patterns are better documented and supported for IPv4
  - Kubernetes addresses this, but that still leaves an extra learning curve on top of a large learning curve
  - Simpler approaches, e.g. K3S, Rancher, Docker Swarm, can shrink the overall learning curve but have IPv6 gaps (or absence)
- Much effort has been put into cloud migration, which requires increased firewall and load balancing techniques as the compute units are small
  - Developers (think that they) understand NAT and firewalls
  - NAT is often the preferred model - even for IPv6!
  - Why increase cost of human capital now?
- Although marketeers value more responsive applications, they are not aware that IPv6 could be an enabler.
  - This ought to be a differentiator for CDNs, but it doesn’t seem to be.
- Most languages support IPv6, and OSS components often work, but they are not tested

And the IT will move away from simple models

- The trend is toward self help, so users are not necessarily internal staff
- All components independently deployable
  - This creates functional and operational complexity
  - There are links between backend components
- REST APIs - all load balanced – currently sit in a DC or the cloud
  - For IoT they move to unprotected locations in office, factories, radiology units, wards, etc.
- End points can move between network providers
- STUN/ICE can be very slow for such models and expensive
  - 30s to set up a controller for a device
  - 30% extra development cost
- Unless an 'IPv6 first' design model is used, this will create 'instant legacy'
  - Particularly at risk are organisations with limited internal capability
    - Tend to have a weaker development model
    - No ownership of future problems



- CGNAT is already an issue with such systems
- Operational support is a whole new challenge

These changes in application capability will impact network design and operations, complicating overall delivery/operations. They will be associated with IPv6

The barriers will disappear but can be eased sooner

- The business cases for different stakeholders need to be articulated, quantified and communicated
  - Better user experience
  - Simpler development
  - Better root cause analysis for operations
  - Lower cost internet connections
- IPv6 solutions need to be better documented, including success stories:
  - Development container environments must be first class citizens
  - Opportunities for using IPv6 addresses to support operational usecase challenges cause by NAT
  - Designers/builders/operators need to understand load balancer options throughout the stack better
  - Container aggregation configurations
  - Firewalls and security models (e.g. ‘Zero Trust’ or Object Capability approaches), including articulation of IPv4 risks
  - Source routeing in the application layer
- Sponsors within firms
  - Articulate the potential short and medium term value
  - Show how to manage and avoid costs of migration
  - Celebrate early wins and disseminate the experience.

The End