Canonical | AADHAAR | Hewlett Packard Enterprise

Modernizing citizen services through cloud transformation

About Unique Identification Authority of India and HPE

- Unique Identification Authority of India (UIDAI) is a government department dedicated to providing citizens and residents of India with an accessible and secure means to authenticate themselves when accessing government services.
- Hewlett Packard Enterprise (HPE) is a global edge-to-cloud company that specializes in providing infrastructure expertise and resources to companies looking to achieve business outcomes through technology.
- UIDAI enlisted HPE as their managed service provider for a large-scale migration from legacy systems to the cloud.

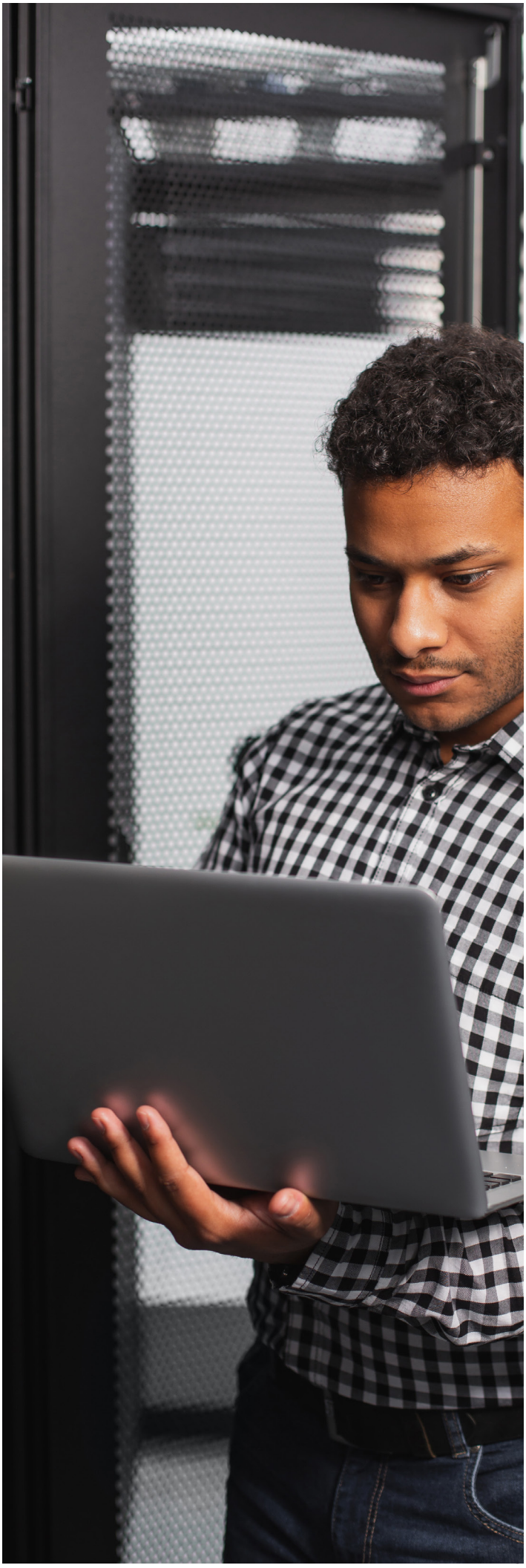
Highlights

- UIDAI and HPE selected Canonical as their partner to deliver an open source transition from a monolithic code base to a microservice-based architecture.
- Canonical's roadmap for delivery presented a clear, multi-year migration plan backed up by open source solutions for bare metal, storage and containers – coordinated by an on-site Canonical engineer.
- With Ubuntu Pro, all parts of UIDAI's Canonical estate receive 10 years of security maintenance.

Delivering first-class digital services to over 1 billion people

India is the most populated country in the world, counting over 1.46 billion inhabitants. As such, providing citizen services is a considerable undertaking, especially given the remoteness of where many citizens live. The digitization of government is incredibly important in ensuring that services can be delivered both efficiently and accessibly, given the size and distribution of India's population.

UIDAI manages Aadhar, a unique identity number that citizens and residents can use to access government, banking and mobile services. As digital government services increase in both popularity and scope, UIDAI enlisted HPE to manage their move away from monolithic legacy infrastructure in order to scale up their service offering and meet increasing demand. UIDAI and HPE wished to base this transformation on open source software, in order to avoid the cost and flexibility constraints of proprietary software. They identified Canonical as the partner who could provide the innovative products needed to run the transition, the design roadmap needed to deliver on expectations, and the expertise required to educate HPE's engineers and empower them to manage the services by themselves in the future.



Challenges

UIDAI intends to expand the range of services it provides to citizens, through creating new applications and enabling new features. Operating digital services at scale on a monolithic code base presents a barrier to scalability and cost–effectiveness. This is because when working with a monolithic code base, all applications rely on a single code base to operate. This creates a snowball effect: a change in one application entails a change in all of them, whilst an error in one application entails an error in all related services.

> *"Monolithic architecture can work well in contexts of high stability and low demand – essentially when you don't need to make regular changes, because you face user demand that is predictable. As UIDAI scales up to offer digital services containing richer features for a wider variety of functions, it became clear that we would face increased user demand, and that our monolithic code base would hold us back."*
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> **SMD Jeelani**
> Director (Operations), UIDAI

UIDAI and HPE were embarking on a full-scale transformation to a microservice architecture, in which applications are broken down into services that can be deployed, maintained and scaled independently. Each application can summon the services it needs to operate, with each service carrying out a specific function. This would empower HPE's engineers to create applications that deliver more advanced functionality to users, free from the complexities that arise from interconnected services on a monolithic codebase.

UIDAI and HPE required a partner who could meet two challenges: providing the underlying solutions that would support and run a new architecture, and providing expertise through a precise, trustworthy roadmap for delivery. In the words of HPE's solutions architect:

"We needed a partner who could provide a robust, performant set of solutions that would form the basis of our new architecture. However, we needed to do this in an incremental way. From a strategic perspective, we needed to ensure minimal downtime for the citizens, meaning that the roadmap would need to account for the gradual decoupling of applications from a complex codebase. Additionally, our engineers would need time to become proficient with a new architecture – it doesn't happen overnight."

Solution

HPE approached Canonical and invited us to take part in a tendering process, in competition with other well-known open source publishers. UIDAI had decided to use open source solutions for their transition to microservices in order to maximize both cost and operational efficiency. Open source software means freedom from both licensing fees and the constraints of locked-down vendor ecosystems – however, any prospective partner would need to provide a clear, stable roadmap that mapped out exactly how these benefits could be realized.

Canonical presented a comprehensive plan for the remodelling of UIDAI's system architecture, which set clear objectives for each phase of the migration, tied to specific parts of UIDAI's stack. This approach ensured that the process was both iterative and cumulative: iterative because each service would be decoupled, redesigned and redeployed in turn, and cumulative because each deployment would strengthen HPE's knowledge and further speed up the process. A Canonical engineer was deployed to orchestrate each phase of the migration and transfer knowledge to HPE's engineers.

"Canonical presented a clear, well thought-out roadmap for the design and deployment of each phase. It was clear that they had considered the operational impact of undertaking such a large migration, as each phase was designed to act as a foundation for the phase that followed. We started with MaaS (metal-as-a-service) as a means of provisioning our cloud environments in the data centers that HPE built for us. Once we familiarized ourselves with MaaS and conducted a successful pilot deployment, we were ready to move on to storage and containerization. Each step served to increase engineer knowledge at the same time as gradually accelerating the transformation of our infrastructure."

SMD Jeelani
Director (Operations), UIDAI

In addition to providing expertise, Canonical delivered an end-to-end suite of open source solutions, for each part of UIDAI's stack. HPE had already identified upstream open source platforms that they wished to use, which included OpenStack (for a virtualized cloud environment), Ceph (for software-defined, multi-petabyte storage) and Kubernetes (for containerized workload orchestration). Canonical provides charmed, downstream distributions of all three platforms. "Charms" refer to software operators that automate the management and deployment of software. They are language agnostic, meaning that a developer can work in their preferred language, rather than learning a new language for each platform. From a patching and maintenance perspective, UIDAI and HPE decided to add-on Ubuntu Pro – a support subscription that would guarantee updates for their entire Canonical estate for 10 years. HPE's Solutions Architect for UIDAI shared an insight into the decision making process:

"Charmed OpenStack, Charmed Kubernetes and Canonical Ceph helped simplify our workflow. We love the diversity of the open source ecosystem, but we needed to ensure that this didn't entail unnecessary complexity. The fact that all three solutions are maintained by Canonical ensured a layer of interoperability between them – working with the pure upstream distributions would have exposed us to three different update cadences and three different programming languages. The extended support available with Ubuntu Pro ties it all together, with 10 years of patching and maintenance for all Canonical infrastructure – an extremely important benefit given that this migration is a multi-year project."

Results

In partnership with Canonical, UIDAI and HPE have successfully completed the initial phases of the migration. The first deployments served as a proof-of-concept for UIDAI, who were satisfied that the balance between the time committed and the end result was optimal for their needs. As HPE's Solutions Architect noted,

"Canonical's solutions have provided a robust, reliable and accessible foundation. We worked on two initial proofs-of-concept, and there were no major show stoppers. We were able to focus on fine-tuning from an early stage, enabling us to start harnessing the benefits of the technology quickly. The 10 years of support included with Ubuntu Pro ensured that we could keep up the momentum, given that the migration is a long-term process: we needed to minimize updates that might take us off track."

It was highly important that the migration served as an educational process for HPE's engineers, who in the long-term will assume full responsibility for the microservice architecture. Canonical's on-site engineer served as both a project manager and a guide for HPE's engineers. The HPE Solutions Architect assigned to the project shared the following feedback:

"Our Canonical engineer was extremely helpful. He served as a bridge, in a couple of senses. He brought together our project team with Canonical's team of engineers, ensuring that we were able to draw on a wide pool of knowledge and experience. He also serves as a bridge between today and tomorrow: the idea is that our engineers learn from Canonical, in order to fully take the reins in future. At the same time, Canonical was able to learn from us and get a sense of what we needed to do to best work together."

Overall, the migration has begun to bear fruit, with a faster service and greater range of applications already being available to India's citizens. The long-term plan is for the transformation to continue, in order to meet increasing demand for digital identity verification services.

"We still need to migrate 95% of the data, but we're already seeing a transformation in the services we provide to citizens. We're able to scale up more efficiently and we plan to introduce a lot more features and services for the citizens to access. From an operational perspective, we're seeing that it is possible to bring cost-efficiency to a multi-petabyte environment."

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Director (Operations), UIDAI