

Case Study: How CenturyLink is using its own cloud platform to showcase capabilities to customers

Cloud helps CenturyLink realize internal benefits and organizational agility

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Summary

Catalyst

The cloud is an opportunity for organizations to demonstrate their capabilities, become more agile as a business, and gain efficiencies. For cloud providers, the need to demonstrate credibility is also essential. CenturyLink provides an example of this. Following its acquisitions of Savvis and Tier 3, the company decided to leverage its own cloud platform for internal use with two objectives in mind. First, CenturyLink wanted to realize the internal benefits in regard to organizational agility. Second, it was a good opportunity to serve as a reference customer. It can now more easily embrace agile development, convert applications into microservices, and add mobile capabilities to its applications.

Ovum view

CenturyLink's decision to reference itself shows how cloud providers can demonstrate the viability of their offerings by actually being their own "customer." Its maturity model helps communicate its vision for a continued journey to the cloud to both internal stakeholders and customers. The project has broken down barriers between operations and development, enabling every IT stakeholder to be engaged in real-time dialogue and meet targets of increased operational agility.

Key messages

- CenturyLink's journey has been filled with new terminology and ideas, individuals' professional growth, and a fair share of bumps. Morale has been a focus; change is always a stretching experience for everyone involved.
- The transition has had a major impact on internal organizations in terms of communication, which has now become a higher priority. One of its most successful efforts has been a roadshow, traveling to various locations and creating on-demand content, to help prepare everyone for the change by broadcasting the company's vision and providing a level set on cloud concepts and terminology. It drove conversations at the working level about how the company would accomplish its cloud-centric goal.
- Like many of its customers, CenturyLink had challenges with vendors that had not adapted their licensing policies to a cloud context. Some vendors proved more helpful than others in tackling the issue and helping CenturyLink make the transition to cloud financially viable. This was a key factor in determining which applications would move to the cloud – applications with non-cloud-friendly licensing models would need to be re-factored with cloud-friendly technologies or potentially replaced.
- Moving to an infrastructure-as-a-service (IaaS) cloud model feels similar to a data center migration project. If the assessment is done correctly, testing and preparation are very similar for applications teams. It is more than a data center migration project in the sense that it hange ok? re icating? ould be more apt here? is a change in architecture that allows the organization to change how services are delivered to the end customer.

CenturyLink's journey to the cloud for more agility

Company overview

CenturyLink is a global communications, hosting, cloud, and IT services company. With revenue of about \$18bn, CenturyLink offers network and data systems management, Big Data analytics, and IT consulting, and operates more than 60 data centers in North America, Europe, and Asia.

The business opportunity was twofold

CenturyLink's move to the cloud has two purposes. First, the cloud migration program is part of a larger set of IT strategic initiatives intended to make the business more agile. Second, the company wants to become a reference customer for its own CenturyLink Cloud. More specifically, it aims to speed up server deployments and shift from an operations-centric focus to an engineering-centric focus.

The cloud migration program is also part of the company's efforts to reduce its internal data center footprint. It has already shrunk these data centers from 12 down to three, and sees cloud as a continuation of its efforts to maximize its assets – in this case, to transfer workloads from the data centers used by its internal IT systems to the cloud data centers the company uses to offer its services to the market at large. It focuses on the US right now, and is positioned to deploy globally as business requirements warrant.

CenturyLink's cloud migration plays an important part in its quest to become more agile

The objective of the shift from being operations-focused to engineering-focused is for development, operations, and infrastructure teams to coordinate their efforts to move to a DevOps-enabled, mobile-aware, and microservice-centric IT environment.

After a number of mergers and acquisitions that more than quadrupled its size, the company established an application rationalization program called "cap and grow," working with the business to determine which applications would have strategic value going forward. Applications that underpin declining product sets, or whose functionality overlaps too much with others, are categorized as "cap," with the view to eventually retire them. For example, the company categorized one of its two major billing platforms as such. On the other hand, strategic, "grow" applications receive increased funding to improve and redesign them.

CenturyLink looked at cloud migration as a means to become its own reference customer

The company wanted to serve as its own reference customer to boost its credibility as a cloud service provider. It is using the same standard version of its public and private cloud offering as the one it offers to its customers. The strategy was to adopt public cloud where possible, but the reality is that most applications have some form of regulatory or security requirement that drives the initial migration to the private cloud while they investigate options to migrate to public cloud. In the initial phase approximately a third of the applications were migrated to public cloud and the other two-thirds were migrated to private cloud.

It chose to require applications to use standard operating environments (SOEs) based on CenturyLink Cloud platform blueprints. The objective was to simplify management and more easily take advantage of CenturyLink Cloud platform upgrades. Given the "hybrid" or "bimodal" model of operating in both legacy and cloud environments, technologies and processes such as backup/recovery had to be integrated to different extents to ensure continuity among applications in diverse environments.

Culture and organization, as well as technology, had to change

The move to the cloud was not just about technology. Processes and people were also an essential part of the mix; the culture of the IT organization had to change. To start with, it set aside dedicated resources for the project early on, including an internal champion, namely Odell Riley, VP of corporate services. It formed work groups based on skill sets, with group managers meeting on a daily basis to sync on progress.

There were two sides to the conversation:

- the internal CenturyLink IT team in charge of migrating the company's internal systems to a cloud environment (internal team)
- the CenturyLink Cloud team in charge of CenturyLink's public and private cloud offering that would eventually manage those systems once migrated (cloud team).

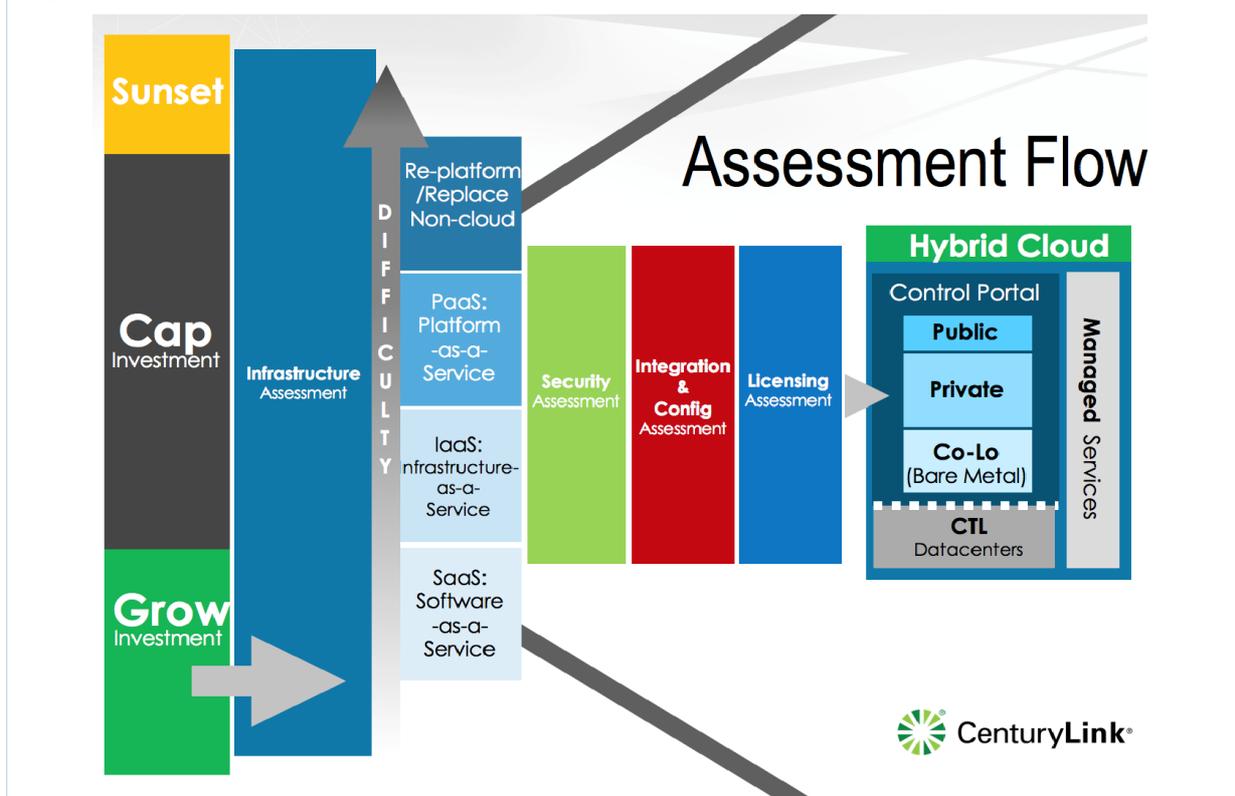
These teams combined application and infrastructure architects, engineering and operations people, security engineers, application developers, and project managers. A new IT role, cloud engineer, was created to coordinate internal and cloud team efforts to cloud-enable applications. The cloud engineers understood both the internal and cloud environments, and played a major role in helping development teams prepare and execute migrations. Developers were responsible for directly engaging their end users to coordinate testing and implementation timelines.

Many of CenturyLink's development organizations were resistant to change and had to balance their customer deliverables during the migrations. It was important for all involved to work closely together to ensure teams were getting the information they needed. After some initial applications were successfully migrated to the cloud, support, technical understanding, and communication for the project improved.

Implementation and rollout

CenturyLink began the initial assessment of its cloud options, including both commercially available platforms and internal build options, in January 2013. The decision to migrate to CenturyLink Cloud was finalized and project planning began in 3Q14. The actual procurement and build-out of the CenturyLink Private Cloud (CPC) platform started in 4Q14, followed by application deployments in 1Q15. It implemented multiple applications in multiple migration waves from 2Q15 through to mid-4Q15.

Figure 1: CenturyLink cloud assessment process



Source: CenturyLink

Targeting strategic applications

As a result of its "cap and grow" program the company chose to migrate some of its "strategic/grow" applications that support current and future business priorities. It chose applications running on "strategic" infrastructure platforms, namely x86-based hardware, Windows, and Linux operating systems, as well as SQL Server databases.

CenturyLink found that the straightforward nature of an IaaS migration closely mimicked previous data center moves. Therefore, it did not perform any true "pilot." However, it designated a smaller implementation "wave" with a small number of lower-risk applications for the initial migrations. It developed its own methodology for application assessments and migrations (shown in Figure 1), vetted it with the cloud team, and consulted with a third party to validate it in the early stages of the program.

CenturyLink developed an application assessment process to identify a cloud migration approach

The company used its configuration management database (CMDB) to pull all required information to help with the assessment process. In doing so, it had to capture additional data as well as review and update out-of-date information. It used the information to carry out a basic match of technology and application ecosystem attributes to cloud architecture, then (as shown in Figure 1) completed assessments in the following areas:

- **Security:** Due to the regulated nature of its telecommunication products, the assessment of security led to a more granular review of applications. The assessment started with the relative information security classification (RISC) rating for each application. The security and IT organizations then partnered to conduct a more granular review to validate that the applications were on the correct migration path and the proper security mitigations were defined.
- **Integration/configuration (interfaces):** Although most applications had n-tier technical architectures (segregation of web, application, and database components), which provided flexibility in deploying to the cloud, many of those same applications also had significant interface requirements to other applications that required close inspection to ensure the migration would not create performance issues related to latency between data centers.
- **Licensing:** CenturyLink generally utilizes perpetual licensing models with OS and DB systems, along with pervasive use of open source components. The licensing terms of some of the software it used did not allow it to make the transition easily, if at all. This limited some of its options for cloud migration paths. The company excluded applications with licensing models that were prohibitive, and will consider either replacing those applications or re-factoring them with cloud-friendly software components.

Assessing the outcome

Given that the main objective of the cloud migration project for CenturyLink's internal IT organization was to become a reference customer for its cloud services, the IT organization carried out a post-migration assessment, asserting that:

- It has met its expectations of increased operational agility at the same or lower cost.
- Its costs are in alignment with other best-in-class outsourcing agreements.
- It has reduced server build times from hours of effort/days of elapsed time to minutes, owing to its use of CenturyLink Cloud blueprints-based SOEs.

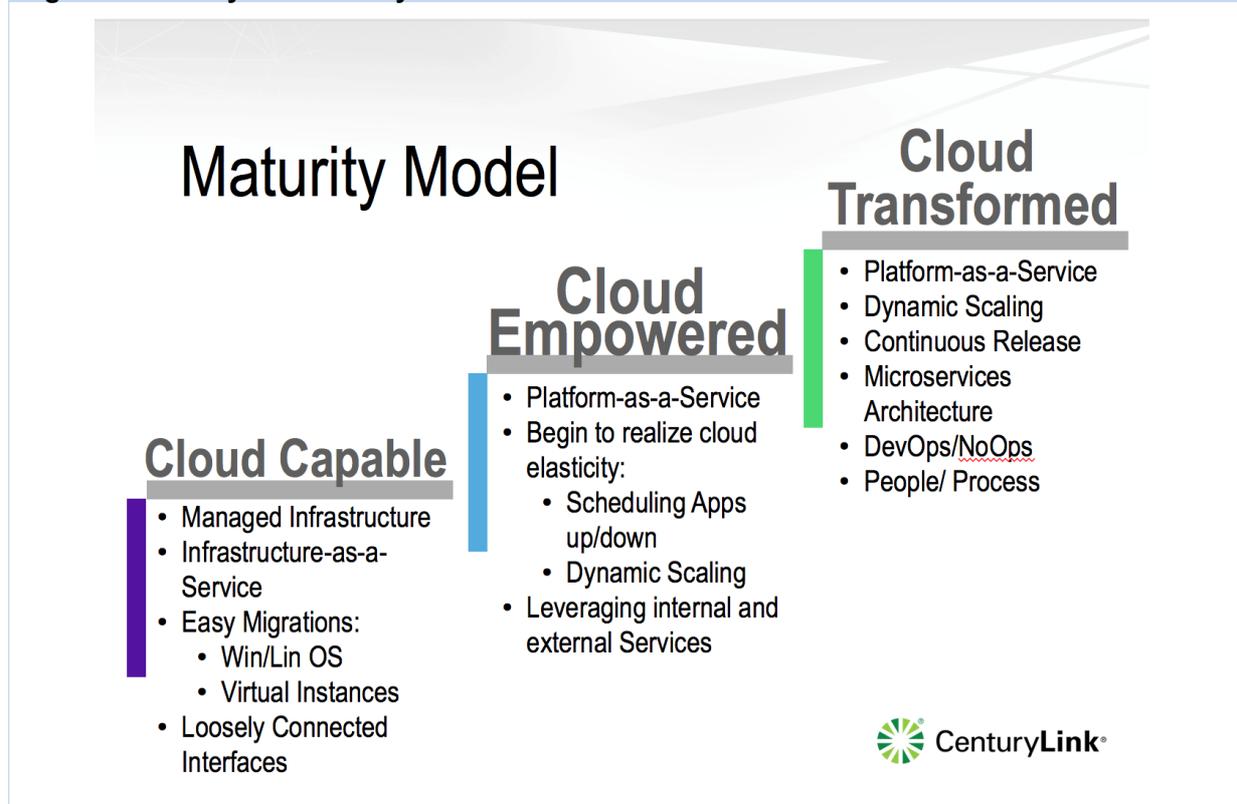
Secondary benefits included the following:

- The program supported CenturyLink's hardware refresh cycle. A standard driver for companies to move to the cloud is to "get out of the hardware business," hence letting the cloud provider be responsible for hardware refreshes.
- It provided an opportunity for security risks to be identified and mitigated across all Open Systems Interconnection (OSI) layers and brought applications to the latest patching levels, putting the company in a better and more sustainable position from a security perspective.

However, CenturyLink discovered during the implementation that all applications needed at least some level of remediation or development. As a result, the anticipated quick-hit migrations were costlier than expected. The company uses a full showback model with granular cost information.

Next moves

Figure 2: CenturyLink maturity model



Source: CenturyLink

As shown in Figure 2, CenturyLink has created a maturity model to define the various phases of its move to the cloud that considers the connected nature of the organization's technology, processes, and culture. Overall, it has begun moving out of the initial "cloud capable" phase; some applications, processes, and teams are already at the "cloud empowered" stage, and a few are moving toward the "cloud transformed" stage. These are applications that underpin the latest "strategic services." Customer-facing teams are in charge of their development. Internal IT itself does have some teams at the edge of agile, but it has yet to fully and globally embrace this development methodology. It still has a lot to do at the organization, process, and technology levels to deliver on its DevOps, mobile, and microservice ambitions.

Lessons learned

Find small wins to create momentum and confidence

It is important to start small so that momentum can start quickly and be sustained. CenturyLink's journey has been filled with new terminologies and ideas, and a fair share of bumps. Morale was a focus because there was an expectation of resistance to change – specifically in the development community. Some application teams were unsure of how to move services into the new model, and were reluctant to be early adopters in an unproven environment. CenturyLink had to dispel those concerns and show them how to be successful under the new model. The company established cloud

champions within development teams to help address concerns quickly and escalate delays, which helped build a sense of shared accountability and partnership across internal organizations. Strong director-level involvement in the daily stand-up calls helped remove roadblocks. Success brought about a positive shift in morale, increased confidence, and contributed greatly to the velocity of the program. It refocused people on real issues and dispelled misplaced expectations.

Ensure good lines of communication

Due to the major impact the shift to cloud would have on the organization, CenturyLink decided to prioritize good communication. One of its most successful efforts has been a roadshow, which enabled its internal team to travel to various locations and create on-demand content to broadcast vision and provide a level set on cloud concepts and terminology, and helped prepare stakeholders across the IT organization for the change. The roadshow drove conversations at the working level about how CenturyLink should accomplish its goals.

Break down silos, and keep working at it

The program's initial attempts to break down the barriers between operations and development teams succumbed to traditional processes and mind-sets: people were waiting on things that had already been completed, or did not own problem resolution. As a result, the company changed tack and decided to follow scrum-meeting principles: one voice, one team, no emails – just direct, real-time dialog. This brought everyone involved together.

Application teams have not been used to being as directly involved with monitoring and owning their infrastructure. So CenturyLink currently has its infrastructure teams partnering with application teams, and plans to revisit the role that both teams play as it moves toward a DevOps model in accordance with its defined Cloud Maturity Model.

Many of CenturyLink's IT technical standards and practices have not traditionally been written for speed, but for reliability. The ability to shift quickly in a cloud environment if something does go wrong is allowing the company to rethink its methods and take advantage of agile principles. All of its IT standards and practices are being evaluated for this paradigm.

Ensure alignment with security from the start

The starting point of any cloud migration should be to acknowledge the type of security culture that is prevalent in an organization. For example, many of CenturyLink's telecommunications products are regulated, making CenturyLink a risk-aware company with a security team reporting outside its IT organization. In that context, the business, the IT organization, and the security organization needed to work together to focus on how to overcome risk. For riskier applications, the working group created more granular evaluations of security risk based on the makeup of the application. The working group continues to partner to mitigate risks and secure increasingly sensitive applications and data, with a goal of leveraging public cloud where applicable.

Clean up your configuration management database (CMDB)

Data drove CenturyLink's planning – good data put it on the right path quickly, while bad data sent it in the wrong direction. The program used third parties to help analyze the data. It also learned a lot about how to make the best of this data as the project and the application migrations progressed.

The company had already made efforts to automatically pull configuration and asset data through agents, but still captured some data manually, or had yet to put some agents in place. Based on a detailed application assessment process, the program team worked with the development teams to update the manual data and implement agents to capture information that has proven too difficult for development teams to reliably document in a sustainable manner. This information includes the following:

- number of database links (latency)
- allocated size of the database on disk
- busy period for the application and number of concurrent connections during that period.

However, the CMDB did not capture all the information required. As a result, CenturyLink used SharePoint to create a questionnaire for development teams to fill in some of the blanks, including the following data points:

- third-party tools used
- external interfaces for data loading
- specific application or database security requirements.

Once the additional CMDB data requirements were determined, the schema of the CMDB was extended to accept a load of the data captured in the SharePoint portal for future use.

Pay attention to integration and latency requirements

Application integration and latency requirements can potentially make a cloud migration cost-prohibitive. Integration should be redesigned (e.g. moved from synchronous to asynchronous) if need be. To optimize latency, CenturyLink had to get rid of outdated application designs and properly gauge the proximity that application components required based on the speed of the network and the transaction payload. In those cases where it could not move the back-end database to the cloud, it required that the database remained in the same data center as the application. It used a combination of private cloud and managed services/co-location to keep the application in the same data center.

Standardize

CenturyLink realized early on that an IaaS-centric cloud infrastructure migration is very similar to a data center migration. In both cases, it should be transparent to end users. If preliminary assessments are done correctly, testing and preparation are very similar for applications teams. The cloud migration forced the company to strengthen its standardization efforts. It is now mandatory for new applications, as well as applications that have to be heavily recoded, to adopt standard, cloud-friendly system stacks, which enables them to leverage standard CenturyLink Cloud blueprints. Standardization helps push patching on to the cloud team, and the use of standard blueprints makes it easier for system components to remain up to date.

Adapt to inadequate licensing terms

CenturyLink's Vendor Management Office (VMO) was a part of the internal team and got involved very early on to assess any potential contract impact. For cost-reduction reasons, CenturyLink's policy is to buy perpetual licenses and ride out a version of the software until it is absolutely necessary to upgrade. However, in a cloud context the IT organization is no longer paying directly for licensing in all

cases, and is allowing the cloud provider to do upgrades and manage version control. The problem is that many of its contracts make the transition away from perpetual licenses cost prohibitive due to the sunk costs of the licenses. Uplifting the licenses may be an option in a private cloud context, but this is not always viable due to the vendors requiring the purchase of licenses for the whole private cloud rather than the portion of the cloud that runs the software. Unfortunately, the IT organization quickly realized that most of its suppliers were not ready to talk about licensing in the cloud. Some proved helpful in the end, but not all. The cloud team will manage more of the vendor relationship going forward, with the objective of making the transition as financially painless as possible. CenturyLink's IT organization is also working toward adopting new, more cloud-friendly software as well as open source software to help reduce costs for the long term.

Appendix

Methodology

This independent research report was prepared with the support and approval of CenturyLink, and is based on information provided by CenturyLink.

Further reading

Cloud Strategy Snapshot: Singtel, TE0005-000762 (December 2015)

IT Services Market Forecasts: Cloud Services, 2014–20, PT0071-000001 (December 2015)

Digital Economy 2025: Survey, TE0009-001461 (October 2015)

BT Global Services: From Network to Cloud Services Integrator, IT0022-000473 (October 2015)

When Cloud and Network Converge: Cloud Services Interconnect, TE0005-000727 (July 2015)

Telecoms Cloud Monitor, PT0018-000001 (August 2015)

Wholesaling the Cloud, TE0012-000527 (February 2015)

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