

Ensuring Government Data Integrity: A Case for Dual Redundant Processing

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People have been saying “two heads are better than one” for centuries.¹ The popularity of the saying has inspired hundreds of psychologists to study the truth behind the phrase, leading to a rich and diverse collection of scientific literature on the power of collaboration. They have confirmed that two heads truly are better than one. In particular, collaboration is useful because it increases individuals’ perception,² memory,³ and learning⁴ abilities. There are several theories as to why this is the case, but they are best summarized by C.S. Lewis, who wrote, “Two heads are better than one, not because either is infallible, but because they are unlikely to go wrong in the same direction.”⁵ The same logic follows in computing for mission critical systems. When it comes to collecting, analyzing, and storing vital information, two data centers are better than one.

¹ [https://www.bookbrowse.com/expressions/detail/index.cfm/expression_number/242/two-heads-are-better-than-one#:~:text=It%20is%20believed%20that%20this,Book%20of%20Proverbs%20\(1546\).](https://www.bookbrowse.com/expressions/detail/index.cfm/expression_number/242/two-heads-are-better-than-one#:~:text=It%20is%20believed%20that%20this,Book%20of%20Proverbs%20(1546).)

² <https://www.apa.org/pubs/journals/features/xhp-a0038224.pdf>

³ <https://psycnet.apa.org/doiLanding?doi=10.1037%2Fxl0000037>

⁴ <https://journals.sagepub.com/doi/abs/10.1177/0146167295214009>

⁵ <https://www.goodreads.com/quotes/6657734-two-heads-are-better-than-one-not-because-either-is>

What is a two data center solution?

Software bugs, hardware errors, malware, chip-level vulnerabilities, hackers, and other threats constantly jeopardize data in even the most secure databases. Yet if a government organization experiences a breach or catastrophic loss of their data, this could have disastrous implications for the economy or peoples' privacy. This complex problem requires an innovative solution.

It is of critical importance that government databases remain secure, so they should implement best practice for data security. **Validation Architectures** redundantly process data in multiple data centers so that it can be compared and validated in real-time to protect data integrity. In this way, two or more data centers act as “two heads,” which, of course, are better than one.

This solution follows logically. You would not want your bank to transfer funds without double checking the destination, and you would not want to undergo surgery without a second opinion, so why would you trust just one data center to protect your most important information? But in addition to this natural logic, this solution also follows fundamental principles of computer science for mission critical systems.

There are three basic components of a mission critical system: Reliability, Availability, and Scalability (RAS).

Reliability, Availability, and Scalability (RAS)

“**Reliability** is a measure of how well a system returns the same correct, consistent, and uncorrupted results each time, and relies on the underlying integrity of the database, application, and system components;

Availability is the percent of uptime achieved by the application in servicing users; and

Scalability is the capability to add resources when needed to handle the application load, and to return those resources when no longer needed.”⁶

How is this analogous?

The psychology behind the “two heads are better than one” saying clarifies in exactly what respect more is better. When it comes to people, groups have better perception of external stimuli, capacity to remember information, and to learn. This is analogous to a Best of Both Worlds Architecture, which ensures data centers are maximally reliable, available, and scalable.

Increased Perception

Just like the psychological research into the “two heads” saying suggests that a group of people is better at perceiving external stimuli than one individual, a group of data centers is also more

⁶ Holenstein, Bruce, Holenstein, Paul, and Berutti, Victor. “New Data Integrity Architectures for Mission Critical Systems.” *The Connection*, 2021. <https://connect2nonstop.com/new-data-integrity-architectures-for-mission-critical-systems/>.



accurate than just one. This relates back to the principle of reliability, or the evaluation of a data center's accuracy.

Redundant processing requires each data center to independently review the accuracy of data, greatly increasing the likelihood of catching irregularities. Not only is it useful for processing data, but redundant processing also thwarts hackers. Moreover, they would have to corrupt two or three different systems simultaneously without raising any alarms. If the system is correctly deploying RAS principles, this would be nearly impossible.

More Memory

The research states that more people correlate with an increased capacity to remember information. This is similar to data centers. Redundant processing allows nodes to back each other up, making data constantly available. This is especially useful for protecting data against natural disasters or catastrophic loss in general. No matter what happens to one center, the others will back it up. This ensures business continuity so governments can function even in emergencies.

Better Learning

Groups of people learn better because working in a group actually increases the group's overall capacity to learn. They become more than the sum of their parts. In the same way, more nodes increase the overall capacity of the data center to store and process information. A data center with a greater capacity is advantageous because it can do more. For instance, it can route information to either node, allowing for greater flexibility in data processing, or one can take up the information from the other node if it goes down.

Why Should Government Data Centers Use Dual Redundant Processing?

The purpose of government is to support the people, but this can only happen when data are accurate, accessible, and secure. U.S. departments need to protect against all of the threats, whether they are from home or abroad. Thus, government data centers must be prepared to combat risks that jeopardize voting processes, military services, social services, or veterans' affairs. In doing so, they not only protect the government's ability to function, but also citizens' privacy rights and their rights to conduct business. Secure data centers are of utmost importance to governments.

Conclusion

By applying some of the key principles associated with mission critical applications, data centers can be made more secure and trusted. By using these principles, data centers would be more useful and more protected from:

- Hackers
- Natural disasters
- Catastrophic data loss



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Learn More: For more information on a proof-of-concept implementation of a Validation Architecture implementing RAS for balloting, contact Remark Innovations at information@remarkinnovations.com.

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