

SUPPORT MULTIPLICATION

NEXT GENERATION DEVICE HEALTHCARE

Synopsis

The same issues happen on many devices, because the configuration and usage of devices is often similar. Using a feedback mechanism to rapidly focus on recurring problems provides a large multiplier effect.

The feedback mechanism has multiple stages. The first stage is very quick but requires some manual effort to handle recurrences of the same issue. Additional stages take more time but require less manual effort for recurrences. The final stage requires no manual effort for recurrences of the same issue. The transition between stages is driven by the frequency of incidence of recurrences.

Precedent

Military strategists have shown that a small unit can be enormously effective using a strategy of focusing activity based on intelligence in a tight feedback loop. This is even more effective when combined with weapons that can attack with high precision. The process is called the Boyd loop, and the tactic is called force multiplication

This strategy is even more effective when the tactics and weapons can be modified quickly to adapt to the situation at hand. A versatile "toolkit" of functional units that can be assembled and reassembled quickly to meet varying needs greatly increases the power and effect of the force multiplication.

Detail

In the "war" against support issues, we are facing a steadily growing opponent. The number of devices to support grows as the price of hardware falls and businesses expand their use of computers. The number of support issues grows as new ones appear but old ones don't go away. The number of classes of services to be managed increases as new types of applications is added. At the same time, end users are growing less familiar with the details of their devices, and correspondingly less able to participate in their management and support. They have a growing expectation for devices to act as "appliances" with little or no attention on their part.

This growth will continue, and in fact will accelerate, since it is being fueled by Moore's Law (see this Wikipedia article). In order to prevent a crisis, some sort of effort multiplier has to be part of the support process. Device HealthCare incorporates such a multiplier, called Support Multiplication.

A crude version of support multiplication has been in use for a long time, in the form of support knowledge bases. Once a problem is identified, an entry is made in a database describing its characteristics, its detailed diagnosis, and the steps for its resolution. Support technicians then search this database to find existing information about issues they are addressing. The multiplier effect comes from the fact that once an issue is addressed, the research on how to address it is no longer needed. Since issues usually recur, this can be a powerful multiplier for common issues.

This primitive multiplier has the key elements of the Boyd loop:

Observe: the end user observes what is going on at the device and reports it to the support technician. The support technician can also ask the end user to check specific information and report back.

Orient: the support technician searches the knowledge base and matches the characteristics of the new issue up with the existing data in the knowledge base.

Decide: the support technician decides the best action to take, based on both the observations from the end user and the local information in the knowledge base.

Act: the support technician describes the resolution to the end user, who implements the decision.

The knowledge base also has a mechanism for extension: when an issue is encountered that is not in the knowledge base, it is typically handled by a more senior support technician who addresses it using other means. After review, if the issue is determined to be relevant and reproducible, it is added to the knowledge base

Observe

Observation (detection) is a key strength of Device HealthCare. Instead of a few indirect indicators of device status, Device HealthCare has a rich and deep set of mechanisms for observing and recording device operation. Rather than growing from the needs of the "monitoring" paradigm, these mechanisms were derived from truly useful information sources at a system level. Observation is described in more detail in Support Intelligence.

Orient

Orientation (diagnosis) in Device HealthCare can be done at two levels. The first resembles the "knowledge base" support process described above, where a support technician uses information that is collected at the end user system to diagnose issues. Even with the limitations of knowledge base support, this process has significant advantages:

1. The detection and diagnosis doesn't involve the end user.
2. There is much more information available than in a simple "monitoring" setup.
3. The information is filtered locally, and this filtering mechanism can be controlled remotely to "drill down" on the issue.

The second level reveals the true power of the Device HealthCare. Local higher-level diagnosis is done based on the detection step and a database of known patterns. This happens with no human intervention and requires no external connection. The results can be used for either further automation, or further human-guided action.

Decide

Like orientation, decision on what to do takes place on multiple levels.

1. The simplest (and most labor-intensive) level follows the "knowledge base" support process, where a text database is indexed by keywords and a support technician decides what action to take. Despite the limitations of knowledge base support, Device HealthCare provides the same kinds of advantages for decision that it does for orientation.
2. The next level uses notifications on the server to detect a known diagnosis requiring attention and alert support technicians. A separate text database is indexed by these notifications and describes the steps to address the issue. This process still has the limitation that a person is involved in issue resolution, but it has some major advantages that serve as multipliers, in that the diagnosis is:
 - automated (or "proactive"; no person is involved in detecting the issue)
 - complex (the conditions for diagnosis can be arbitrarily complex and are much deeper than "monitored" conditions)
 - consistent (the expertise to correctly diagnose a complex issue is only needed once, to set up the notification; at that point it is multiplied across the support base)
3. The next level moves the diagnosis conditions right onto the device being supported. Local processing of observed conditions against a database of known patterns provides an immediate diagnosis. This can either be used to alert a support technician or to directly invoke an action. This level has the same advantages of automation and consistency, and in addition, the complexity of the diagnosis is essentially unlimited.

Act

An essential characteristic of the action (issue resolution) component of Device HealthCare is that it occurs at a level close to the operating system. One way to think of this is that anything done by remote control, by definition, is using the operating system to make configuration changes using its graphical user interface. The local software component of Device HealthCare can do the same thing using the direct interface instead, and in fact, has access to a much richer set of controls.

This direct control is much more consistent and efficient than depending on the end user to resolve issues, and is much less invasive and troublesome than having a support technician use remote control for issue resolution. Most issue resolution can take place without disturbing the end user.

In a similar fashion to observation and orientation, resolution takes place on two levels.

1. A support technician can use a general mechanism to apply a change.

2. The change can be applied locally, without intervention by a support technician, right on the device being supported.

Any combination of these aspects of Device HealthCare provides Support Multiplication. Clearly, the greatest multiplier effect happens when an issue is in the database of known patterns, so that the Orientation (diagnosis), Decision, and Action (resolution) can all take place using local processing, without involving either the end user or a support technician.

Feedback

The feedback process in Device HealthCare is an important part of Support Multiplication. In that sense, it shares the same general goals and methods of the feedback process in the "knowledge base" support process, but that is where the similarity ends. The Device HealthCare feedback process is particularly unique, and reflects the structure of the decisions making process. The feedback happens in stages:

1. The first stage is configuring local observations to gather more specific information on an issue. The observation mechanism is flexible and powerful, and can drill down on specific data based on what is needed.
2. The next stage is configuring a notification on the server based on a sequence of conditions that define a known issue. This detection can be arbitrarily complex, based on the information that reaches the server. This stage immediately provides Support Multiplication with improved automation, efficiency, and consistency of diagnosis, and is relatively quick and simple to implement.
3. The next stage is setting up a text entry describing the steps needed to respond to the notification and resolve the issue. These can involve the end user, or involve the use of remote control, but the most powerful response is configuring the support engine on the device to address the issue. The power of this method is described in more detail in Pantographic Support.
4. The next stage is configuring completely local processing of the detection and resolution set up in the previous two stages. This can be much more powerful than those two stages, based on the rich and extensive set of information available, and the presence of a fully general programming engine to process them. This stage requires more time to implement and deploy, but provides the largest Support Multiplication by locally automating the entire support sequence.

Benefit

Support Multiplication is without a doubt the most important single principle of Device HealthCare.

For a support service organization, it provides immediate tangible benefits:

- **Scalability:** Every stage in the feedback loop increases the total number of support issues a single support technician can address. The last stage provides the largest multiplier, but each stage improves the ratio.
- **Reliability:** Powerful detection mechanisms combined with automation of complex diagnosis ensure that issues are more reliably detected and addressed. This avoids the situation where issues cause cascaded problems by going unnoticed until their effects are catastrophic. The result is a much more reliable, stable operating environment for end users.
- **Consistency:** The incorporation of detection and diagnosis into automated and semi-automated processes means that the expertise of the most senior support staff is shared across all end users, rather than just being focused on the ones who need it most critically. This results in a higher overall level of service and expertise for all end users, giving them a better and more consistent support experience.
- **Responsiveness:** All stages of the feedback loop improve both the initial response time and the overall resolution time of each support issue.
- **Proactively:** Automation of the detection and diagnosis of issues increases the likelihood that they are addressed before they come to the attention of the end user, providing an unheard of level of attention and service.
- **Adaptiveness:** The feedback loop automatically concentrates on the issues that are most frequent, and therefore most important to end users. This self-organizing behavior quickly optimizes for maximum results with a fixed set of support resources.

Uniqueness

A multiplier effect of fixed resources is the "holy grail" of any support organization. Therefore, to varying extents, every organization or vendor will claim, truthfully, that they provide a support multiplier.

There are a few main reasons why the Support Multiplication of Device HealthCare stands in a class by itself:

- **Scale of multiplier:** Since the end result for critical issues is complete automation of the support process, the multiplier is enormous. Other vendors typically offer scripts as proof of their "support automation", but these scripting "solutions" lack critical capabilities that are requirements for a true large-scale Support Multiplier:
- They lack the generalized flow control needed to manage the true complexities encountered in real life. The simple conditional processing they supply looks great in a demo, but falls apart in actual use.
 1. They have no integrated error reporting and status mechanism. At best, they can report "success" or "failure", and at worst, they just fail silently with only secondary indications of their failure. This is consistent with a design where they are just "pushed out" as extended tools, rather than being integrated into a feedback loop that can quickly converge on real Support Multiplication.
 2. They have no real local existence on the device, and therefore don't have many of the associated characteristics, such as versioning and a cache. They are really managed more like server-side utility scripts that are fetched and run blindly on the device, rather than integrated extensions that are part of the device management tool.

In essence, the "scripting" capabilities are more like macro-language processors that give a support technician more flexibility in applying some higher-level operations needed to address issues. So, they are definitely useful, but fall short of providing Support Multiplication.

- **Depth of tools:** Since other offerings are typically built on top of a "monitoring" engine, their access to information and control is somewhat superficial, and is based on information available through WMI and the Windows Event system. This greatly restricts the amount of meaningful diagnosis and resolution that can happen without access to window messages, registry changes, file system operations, network device operations, operating system status interfaces, and user interface mechanisms.
- In addition, the resolution side is usually restricted to what can be done using WMI or a COM interface. This completely eliminates the vast array of solutions that must be implemented through lower-level access to the operating system interface. Some systems extend their reach through the use of executable scripts, but those have their own limitations as described above.

Feedback loop: This is a key part of Device HealthCare where no other offering even comes close. There is simply nothing available that incorporates the multi-stage feedback mechanism that locally optimizes the rapid development of enormous Support Multiplication.