GSA Protocols in a Wide-Area Network (WAN) Environment

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Revisions

Date	Revision	Author	Description
02 SEP 2009	0.2	RR	Draft document circulated for comment
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Prepared by Radical Blue Gaming for the Gaming Standards Association

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Acronyms

The following acronyms are used in this document:

- G2S – Game-to-System

- GSA – Gaming Standards Association

- OAC – Operator's Advisory Committee

- RG – Responsible Gaming

- S2S – System-to-System

- TITO – Ticket In Ticket Out

- VLT – Video Lottery Terminal

- WAN – Wide-Area Network

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Background

Project Overview

Following considerable discussion within the GSA committees and the lottery industry as to the viability of G2S in a Wide-Area Network (WAN) environment, Radical Blue Gaming was asked to investigate this problem, in hopes of teasing the issue apart to give GSA and its members a better handle on reasonable solution sets for wide-area implementations.

Rather than starting with experiments (using different types of network communication equipment and trying to guess at a reasonable set of data to simulate), we decided to first explore, understand, and define some actual data requirement scenarios for the lottery environment (what messages are needed/desired, how often do they need to be sent, etc.).

We interviewed several lottery operators (Manitoba, Oregon, Quebec, and WCLC) and system suppliers (IGT, GTech, and TechLink) to get a better understanding of each of their environments, from differing perspectives. What we discovered was that the network connectivity and communication protocols in use today, were developed quite a few years ago, taking advantage of the existing telecommunication technology, with an eye on containing costs.

The original requirements of the lottery world (most of which are still viable today) of reporting daily meters, occasional tilt events, and a dozen or so cash-out ticket transactions per VLT device could be accomplished easily over a slow-speed dial-up connection. However, with the emergence of GSA's new web-based protocols, where many new features have been documented, and with the emergence of responsible gaming initiatives in many of the jurisdictions, the time seems right to move to a new system architecture that embraces these modern ideas and methods.

Why Change Now?

Lottery operators commonly perceive that their current systems are nearing end-of-life, and believe that the time is right for a new system. They are requiring new systems to use GSA protocols for the following reasons:

- They want a future-proof system that can add the new functions they see appearing on the near horizon easily.

- They want to use any vendor's EGMs, anywhere, anytime (no vendor lock-in), and believe a standard protocol that is open to all vendors will help facilitate this.

- A number of lottery operators attended the Gaming Standards Association G2S overview classes that were recently held in Canada. They liked the additional features that are available in G2S and would like to offer some of these features to their customers in the future.

- Responsible Gaming is an emerging requirement, and there is a desire to aim for a standard solution using a GSA protocol. Looking forward, the RG central system should be able to span multiple jurisdictions in an effort to provide an even more satisfactory solution to the gaming public.

- The various lottery organizations are not competitors, and so would like a common solution from which they will all benefit. The GSA OAC is a very good forum for collaboration, and coming up with a common solution that covers both short and long term features.

Objectives

The purpose of this investigation is to understand the functional requirements of lottery operators within a wide-area network setting. Areas of investigation include, but are not limited to:

1) current messaging requirements
   a) meters
   b) vouchers

2) emerging messaging requirements
   a) responsible gaming
   b) code download
   c) player messaging

3) future messaging requirements
   a) Wagering Account Transfer (WAT)
   b) player marketing technologies

Methodology

For this project, we interviewed subject-matter experts from several lottery operators and system manufacturers. Our interviews consisted of questions regarding current functional and regulatory requirements for their system. In addition, interviewees reported on future system requirements.

The current versions of the G2S and S2S protocols were used as reference for this project.

Findings

Common Current Messaging Requirements Across Jurisdictions

A primary objective of our investigation was to understand the messaging *requirements* that are common to all jurisdictions, in an effort to come up with a common model (if possible). We discovered that a nominal number of the messages are *currently* being generated by the retailer locations, and most of these do not have a "real-time" requirement (that is, must reach the central system within several seconds of generation).

All of the current systems must accommodate the following requirements. We, therefore, consider these requirements to be the minimum set of messaging requirements over the WAN.

1) An **end-of-day meter set for each VLT** must be sent to the central system each day. Recent activity within the GSA technical committees indicates that the VLT (or site controller) should snapshot the meters at a set time, and then that meter report is conveyed to the central system when possible. [1 message/VLT/day]

2) **VLT door access and significant VLT tilt events** must be sent to the central system (typically, these events can be cached on the site controller if the link to the central system is unavailable). [~24 messages/VLT/day]

3) **Cash-Out Tickets to Central System**

    All VLT payouts are done through a cash-out ticket that is not inserted into another machine, but instead presented to a retailer employee (typically a bartender) for manual redemption. In the future, some jurisdictions may consider TITO, but tickets will only be redeemed within the retail location at which they are issued. The only exception to this is large-win tickets, which are redeemed at a lottery office in some jurisdictions.

    a) Cash-out Tickets are typically transferred after the fact (so they are available by end of day). One jurisdiction (Oregon) requires cash-out tickets to be transferred in real-time, as they can only be redeemed if they are present on the central system.

    b) On a busy day, the load is typically six to 10 cash-out tickets issued by each VLT (5-10 for each site). These 50-100 total tickets are redeemed through the retailer's server/terminal. [~10 issued tickets + 10 redeemed tickets/VLT/day]

Emerging Messaging Requirements

Emerging requirements are additional drivers for a new system. These new functions are more than "nice to have"; they are offered as public services to players in the retail establishments or have dramatic operation efficiency benefit.

1) **Responsible Gaming** – One of the major drivers toward new technology, this feature allows a player to specify a wagering limit (for some interval), review their past activity, and to rely on the system to let them know when they should limit their activity.

   The player's interaction with the RG central system (which may be separate from the lottery central system) may occur through a service window on each VLT, or through a single RG kiosk in the retail establishment. As with player tracking (discussed in the next section), this feature will require a method to correctly identify the player at the VLT. However, the mechanism for that is beyond the scope of this project. An extended discussion of responsible gaming messaging details and possible solutions can be found in the "Analysis and Conclusions" section of this document.

2) **Code Download** – Since most lottery operators have several thousand retail locations, distributed widely across a jurisdiction, code download is a very desirable feature for the new GSA-protocol-based systems. Although most operators believe they won't be changing VLT, note acceptor, or other peripheral code more than one to two times each year, code download over a WAN to all retail locations will dramatically reduce the roll-out time and cost of a software update. Adding GAT functionality to ensure that legitimate code is running on all VLTs, in all locations, will also be a boon to the operation.

3) **Player Messaging** – There is a desire to send messages from the central system to all VLTs, for display to all players. If player messages are sent from the central system to the site controller for later distribution to all VLTs in that site, this feature should only generate one to three messages each day, to each retailer.

4) **Remote Configuration of VLTs** – Updating operating hours, changing games presented to players on a multi-game VLT, and changing active denominations or notes are all examples of functionality that lottery operators would love to control in a distributed fashion from their central system.

Cool Features That Raise the Bandwidth Bar: Future Messaging Requirements

The following items were discussed as "cool features" operators would really like to add one day, when possible. Since they can significantly raise the bandwidth requirement bar, we'll look at the estimated impact of each feature to provide guidance as to their network bandwidth "cost". Optimization may be achieved by balancing the functions between the central system and site controllers, but for this exercise we'll assume a worst case scenario, in which everything goes to the central system. In our estimates we will assume 10 VLTs for each retail establishment, which are open for ~20 hours each day, and we will use 3000 games played each day, for each VLT (reported as the average for a weekend day).

Player Tracking / Management

Traditionally, the retailer locations have been small, intimate locations with the clientele well-known to the employees. For the future, some jurisdictions would like to add ID-based player tracking so they can market to their better players. If all player transactions are sent to the central system, there could be significant overhead on the WAN, but if the card-based activity were managed locally, information on the "better" players could be conveyed to the central system during an end-of-day batch update process.

Service Window Interactions with Players

Not necessarily just for carded players, the vision in some jurisdictions is to provide offers, advertisements, and marketing information to players. In the more aggressive scenarios, the player can purchase non-VLT products (lottery tickets, sporting event tickets, etc.) through the service window and a WAT function that uses credit meter money to electronically purchase the products. If the purchased product is a voucher or ticket, a system would direct the VLT to print the voucher on the VLT printer, using an alternate printer template.

Impact discussion – If the multimedia content were cached and served up locally, the number of purchases each day would probably be less than 5/VLT, or 50 transactions each day, for 10 machines, in one retail establishment. New media content could be downloaded to the local controller (and verified) during hours when the retailer was closed, and the local controller would control the VLTs using the G2S classes already defined. If purchase transactions were managed by the retailer's server, the WAN interactions to the central system could be delayed (as long as the transactions were persisted by the local server).

Central Cash Management

1) **Traditional WAT** (money transferred to VLT and played from credit meter) – A single transfer to the VLT at the start of play session, plus a transfer of any winnings back to the player account at the end of the session, adds four WAT messages for each transfer. If we assume four transfers each hour, for each VLT, and 10 VLTs for each establishment, this feature adds 800 Transactions (3200 messages) per day per retailer.

2) **Central Cash Account** – If the cash account is centrally located and must be consulted at the start and end of every game play cycle (bet deducts from Central Bank, gameEnd updates Central Bank), estimate four to eight messages for each gamePlay cycle, for each VLT. If an average VLT is played 3000 times a day on a busy day, this one feature will add 120,000 – 240,000 messages per retail establishment.

Wide-Area / Inter-site Progressives

In a traditional progressive system model, the most significant traffic is due to the updates that are sent to the central system whenever a participating game is played on a VLT that contributes to the progressive pool. If we assume that five of the VLTs in the retail establishment are participating in the wide-area progressive, and that 50% of the games played on those machines contribute to the progressive pool, the result is 7,500 Progressive Money Wagered events for each retail location, each day, to report contributions to the progressives.

A second component of the progressive is the periodic updates of the wide-area progressive meters in the establishment (to add in the contributions from all of the other retailers). One update every three minutes from central to all retailers adds 400 additional messages each day, for each participating VLT, or 2,000 total messages (though this would be a good message to distribute through the site controllers).

More Frequent Meter Reports

In some locations, operators can currently request on-demand meter reports from VLTs. Operators would also like more frequent meter reports providing information as to which VLTs and games are more popular at which times of the day (no more frequently than once an hour), but most admit that if the VLT were to provide daily meter reports that summarize performance by game play device (and denomination) within the cabinet, the periodic meter reports might not be necessary for a small, limited-bandwidth retail establishment.

Analysis and Conclusions

If we try to do all classes in the G2S protocol, especially progressives and tournaments, along with streaming advertisements and similar features, there is minimal chance of success using a dial-up connection. As has been observed by several system vendors, there is a lot of dialogue between the VLT and the server in the G2S start-up and remote configuration sequences, so we can upgrade the connection to every site, in every jurisdiction, or come up with a solution in which the real-time messaging benefits of G2S take place over a high-speed local network (VLT to retailer server, also known as the *site controller*), and then a more batch-oriented/summary messaging approach using S2S between the server at the retailer location and one or more central systems that provide jurisdiction-wide control and summarization.

However, if we are careful with our message interactions, there is no reason why G2S would not be viable in this environment.

Some considerations:

We should consider the addition of one or more new classes to the S2S protocol that describe how the central system can send a single message to the retailer's server that causes it to update one, some, or all of the VLTs in the retail establishment that are connected locally to that on-site server. The command structure should be similar to the related G2S command, but the message needs additional information so the central system can direct the site controller to create G2S commands that update all or a subset of the VLTs.

Within the retail establishment, the site controller must evolve from being a ticket redemption terminal with a bit of queuing capability to an actual server that can act as a local G2S host to VLTs (and an S2S Edge server to the central system). In this manner, the features of G2S can be achieved, but in a distributed fashion, to accommodate the communication challenges between the central system (the ultimate authority) and the site controller (the on-site G2S server that can act on the edicts from the central system).

Here are some candidates for the sort of communication described above (directed to some or all VLTs in the retail location):

Manage VLT devices
`getDescriptor`
`get`*`Device`*`Status`
`set`*`Device`*`State`
`set`*`Device`*`Lockout`
	Manage Hours
	`getOperatingHours`
	`setOperatingHours`
		Add New Servers
		Add this new host, with this device ownership.
			Progressives
			Broadcast new value for a progressive.
			Send new aggregate wager meter to central.
			(Single client – process progressive hit.)

Manage VLT Settings
`get`*`Device`*`Profile`
Update this option, set to these values.
	Manage Active Denominations
	`getGameDenoms`
	`setActiveDenoms`
		Code Download
		Manage download packages and modules. Send download scripts.
		Code authentication (GAT)
			Handpaid Wins
			Remote keyoff of a large win (single client).

Subscribe to Events `getSupportedEvents` manage event subscriptions.	Player Messaging Send messages to players.	Custom Printing New Printer Template Custom printing rules (print this document under these conditions).	Bonus Awards Control bonus periods. Award bonuses.
Subscribe to Meters `getMeterInfo` manage meter subscriptions.	Service Window mediaDisplay controls (manage flash objects).	Player Tracking Mgmt Manage player countdown parameters. [Player ratings to central.]	Cashout Tickets Voucher IDs to site. Voucher updates batched to central.

Architecture Proposal (A straw man to stimulate discussion)
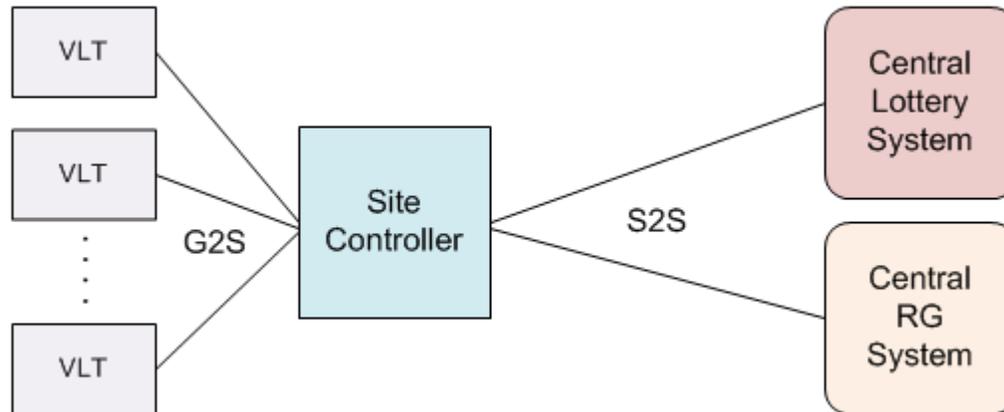
1) Consider using G2S from the site controller to VLT devices.

   a) G2S is an industry standard protocol available to all manufacturers.

   b) Well-documented features help to future-proof the installation.

   c) The overhead of G2S start-up, remote configuration, and download sequences are localized between the VLT devices and the in-store server, so there would be no impact on the limited-bandwidth connection to the central server.

2) Use S2S with proposed extensions from the site controller to the central system.

   a) Site controller can isolate most of the real-time activity from the central system.

   b) Extend S2S so the central system can send general commands to the site controller (see page 11), which are then interpreted by the site controller and communicated to individual VLTs using existing G2S sequences. This requires that the retailer's server have the capabilities.

   c) Separate S2S connections can be used for traditional lottery functions and Responsible Gaming (RG) functions, to accommodate a best-of-breed solution. Both logical connections could share the same physical communication infrastructure. With this strategy in mind, the site controller could be capable of talking to additional central servers, as needed.

3) VLT Requirements

   a) Implement standard G2S, with minimal extensions for Responsible Gaming and Audit Meters (snapshot meter set at specified time, for later pick-up by the site controller).

   b) Some sort of ID reader is needed for Responsible Gaming player identification.

   c) VLT must support `keepAlive` messages to the local server, so it can notify the retailer employee when a VLT stops communicating.

4) Site Controller Requirements

   a) The Site Controller acts as a G2S host to the local VLT devices.

   b) It must be capable of functioning as a ticket redemption terminal, possibly as an RG kiosk as well, or have a separate entry device (or kiosk) to accommodate player RG data entry.

   c) Persistent data store for in-flight voucher transactions, responsible gaming data for in-store and/or recent players, non-VLT purchase transactions that haven't yet cleared to the central server, downloaded code packages, etc. (depends on the level of G2S host support in this server).

   d) Provide limited reporting (such as cash-flow and game performance) on the in-store VLT devices.

   e) Must implement expanded S2S Edge server functionality to interact with central system(s), using the new S2S classes developed for this environment.

Additional Notes on Responsible Gaming:

Since Responsible Gaming is an important new feature in this environment, in this section we summarize the required functions and provide some ideas as to how RG could be accomplished in light of the previous discussion:

1) Consider central system and site controllers working together.

   a) Central system contains the permanent master record – a copy is transferred to the local server when an RG player identifies themselves at a retail location. First activity of the day, the local server gets the latest record from the central system.

   b) Updates occur on the local data store immediately, and are transferred to the central store eventually (same day, but could be within an hour or two).

   c) When a player crests the RG limit, the local server takes appropriate action with in-retailer VLTs, and notifies the central system for jurisdiction-wide intervention.

2) Player must be able to enroll and set/adjust RG limits through the VLT and/or kiosk (VLT may use a service window).

   a) In enrollment, associate ID number with this player, set limits, or set up complete self-exclusion from gaming.

   b) Player must include ID information (such as driver's license number) to uniquely identify themselves.

   c) Limits take effect immediately at local retailer and are transferred to the central system eventually.

3) ID reader required on VLTs – Start session/end session with play activity (similar to player class).

   a) Include capability for VLT to be no-playable without ID present (to accommodate mandatory RG).

4) RG Information may have to be conveyed to other entities in the jurisdiction.

   a) Beyond just the local site and central system(s)?

   b) What's the time requirement and purpose of this distribution?

   c) A multi-provincial system was discussed. Information transferred between jurisdictions, or to a super system, could be a subsequent sweep from the central system (after data is received and processed from the retailer server)

5) RG requires a method to send a message to a player when they are close to their limit, and also a means must exist to halt play on any EGM.