

PORTALS: HOW DO THEY WORK?  
(an Ingress FAQ)

Additional maintainers have been added. Please be patient while the documentation is updated.  
Thanks!

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## **So what is this game?**

Ingress is sort of a combination of geocaching, “capture the flag”, and foursquare. You’ll use the GPS on your mobile phone to track down “portals”, and then you’ll claim them for your team. Other people will come along and see your portals: teammates can gain resources from your portals, but people from the other team will blow your portals up and lay their own claim. It’s sort of an endless territory war.

Gameplay gets reasonably complex as you build portals up for farming, or link them together to form control regions. It’s kind of awesome to be playing a territory-control game where the thing I’m controlling is my actual city. Of course, playing the game at that level does involve a lot of traveling to reach the portals surrounding the city. But most portals are in interesting locations, so sometimes it’s a good excuse to go exploring. :)

Ingress is also an Alternate Reality Game; there’s an elaborate mythos built up around the alien Shapers who are using subtle mind control for unknown purposes. Some of the videos are very cool, but this document is not about that. This document is about finding portals and making them yours.

## **Where can I find the official documentation?**

The official documentation is at <http://support.google.com/ingress>.

## **This looks like kind of a long document, is there a short version?**

(1) When capturing a portal, it's important to place the resonators widely spaced, far out from the portal. If you do the opposite and place all the resonators on the portal, an attacker's bursters will hit all the resonators at once. Resonators appear on the portal at the same distance you are from the portal -- so, if you're standing 20m away from the portal then resonators will appear 20m away.

(2) At low levels, attacking portals is very difficult. I estimate it would take ~32 L1 bursters to kill a well-constructed L1 portal, and you would have to go stand on each resonator in turn. At high levels, attacking portals is very easy. I estimate it would take 4-5 L8 bursters to kill an (unlinked, unshielded) L8 portal, and as a side effect you would blow up most of the enemy resonators on that block.

(3) For your first few levels, you will be gaining AP by deploying resonators on portals. This is MUCH easier if you have help from a higher-level player. They can blow up the portal and then let you deploy on it.

(4) You can't use any item that is higher than your current level. For example if you have an L2 resonator, you can't put it on a portal until you are level 2.

That's not all you need to know, but I think it covers most of the nonobvious important things.

## **Where can I find portals?**

Portals appear on most public art objects (sculptures, murals, etc) and also on post offices, museums, fire stations, and libraries. Try looking downtown; try looking someplace tourist-y. If you're just starting out, try to find a place with lots of portals close to each other -- you'll have more to do there.

Once you've found a portal, you can "click" it to bring up the portal view, which has buttons like "HACK", "DEPLOY", "RECHARGE", "MOD", and "NAVIGATE".

## **What does the "HACK portal" button do?**

When you "Hack" a portal, you are attempting to get items from it, which will be added to your inventory.

You can hack any portal (friend, neutral, or foe), so long as it is in range. Usually the portal will give you some items. If you try to hack an enemy portal, the portal might zap you for a small amount of damage, but you get +100 AP (100 experience) for audacity.

There are two "cooldowns" when you hack a portal. Any time you hack an un-modified portal, there is a five-minute cooldown before you can hack it again. In addition, when you first hack a portal it starts a four-hour timer. You can't hack the portal more than four times while that four-hour timer is running: after the fourth hack, the portal is said to be "burned out.". But each of these cooldowns only apply to you; they won't stop anyone else from hacking.

There's an inventory limit of 2000 items. If you have more items than that, you can't hack.

Hacking a portal costs 50 XM per level of the portal. If the portal is hostile, there's a chance (50%?) that it will zap you for damage as shown in Appendix 4. The average level of the items you get is MINIMUM(level of portal, level of player). For example, an L3 player hacking an L7 portal will still only get L3 items on average. You can occasionally get items up to 2 levels more than that.

Appendix 5 has some data on exactly what you get from hacking. Interesting fact: when hacking a friendly portal (if you aren't moving too fast), you always get at least one resonator!

The rumor is that hacking enemy portals will get you more bursters than hacking friendly portals.

## **I have too many items!**

If you go into your inventory, there's an option to "Drop" any item. This causes the item to appear on the map so another player can pick them up. This is good if there's a specific other player who wants your items, but it may be bad if there are enemy agents in the area who can use your items against you. Some players may also see this as littering if you do it a lot in a high-traffic area. Dropped items last a few hours on the map, and then they decay automatically.

There's also an option to "Recycle" an item. This converts the item to XM. You get 20XM per level of the recycled item. (Keys and Media give 20XM. Portal shields give 40XM, 80XM, or 100XM respectively. Power cubes only give 20XM per level, which is pretty ironic since you could just use them and get 1000XM per level. Alignment viruses give 100XM.) You don't get very much XM for doing this, but it's a good way to get items out of your inventory without dropping them on the map.

## **What's XM exactly?**

XM is those little dots that appear all over the map. It's used for pretty much everything:

- Hacking a portal: costs 50 XM per level of the portal
- Making a link: costs 250 XM
- Recharging a portal: costs 1000 XM to add 1000 energy to the portal's resonators (divided evenly among all resonators that need it)
- Deploying a resonator: 50 XM per level of the resonator
- Upgrading a resonator: 50 XM per level of the newly added resonator
- Deploying a portal mod: 400, 800, or 1000 XM depending on rarity
- Firing a burster: 50 XM per level of the burster
- Getting zapped by an enemy portal: XM loss as shown in Appendix 3

You can't take any action that would drop you to 0 XM. (In particular, the Jarvis Virus and Ada Refactor cost 1000XM per level of the portal. If you have 6000XM, you're not able to use a virus on a level-6 portal, because that would drop you to 0.)

If you run out of XM, you can't do anything until you collect more.

If you run out of XM due to being zapped by an enemy portal, you also get red static all over your screen.

Most portals have little clouds of XM around them. This XM is shared globally (with a bit of lag). So, if another player (even a player on the other team) picks up a given chunk of XM, everyone else will see the XM is missing there. In fact this is a good way to spot other players, by looking for areas where the XM is gone.

If several players walk together through a cloud of XM, because of lag what usually happens is that everyone gets credit for picking up the XM.

Deploying or upgrading a resonator on a portal will cause it to respawn its cloud of XM. Linking the portal does not seem to do this.

Using a power cube will give you 1000XM per level of the power cube. You can also get a quick XM boost by recycling items (see above section).

## **Okay. So what's this "DEPLOY" button do?**

If a portal is neutral (and if you are sufficiently close to it), you can take control of it for your faction by deploying a resonator on it. You get 125 AP for every resonator you deploy, and claiming a neutral portal gives you a bonus of +500 AP. That's a lot of AP for very little effort, so it's usually very worthwhile to claim neutral portals.

Once you control the portal, you can add more resonators onto it, up to a maximum of 8 resonators per portal. If you put a lot of high-level resonators on a portal, the portal itself will be high-level, which means it will give you high-level items when you hack it. (More specifically: the level of the portal is the sum of the levels of the resonators, divided by 8, rounded down, minimum 1.)

When you deploy a resonator, it gets attached to the portal in one of the eight cardinal directions (N, NE, E, SE, ...). The resonator's distance from the portal is equal to your own distance from the portal when you deploy. You can select a slot to force your client to deploy there, or if you don't select any slot (click on the central portal to deselect) it will choose an empty slot for you. The portal will be slightly harder to attack if your resonators are placed far out from the portal, so try to do that if you think there are enemy agents in the area.

[Aside: How much harder is it to attack, exactly? Well, an L8 burster deals its full damage to anything within 32 meters, and after that it deals half damage or less. If all your resonators are within 32 meters of the portal, an attacker can stand on the portal and do full damage to all your resonators. If your resonators are more than 32 meters away (a perfect deploy is 40 meters), they have to walk around when attacking your portal, or accept that their bursters deal half damage.]

If a portal has all eight resonators attached, you can still use "Deploy" to overwrite a lower-level resonator with your higher-level resonator. If you replace your own resonator, there is no bonus; if you replace someone else's resonator, you get 65 AP. That's not as good as the 125 AP for putting a resonator in an empty slot, but it's still something.

## **What does the "LINK" button do?**

This button, which appears to the left of the other buttons and below the portal photo, lets you connect this portal to some other (friendly) portal that has eight resonators. You must have a

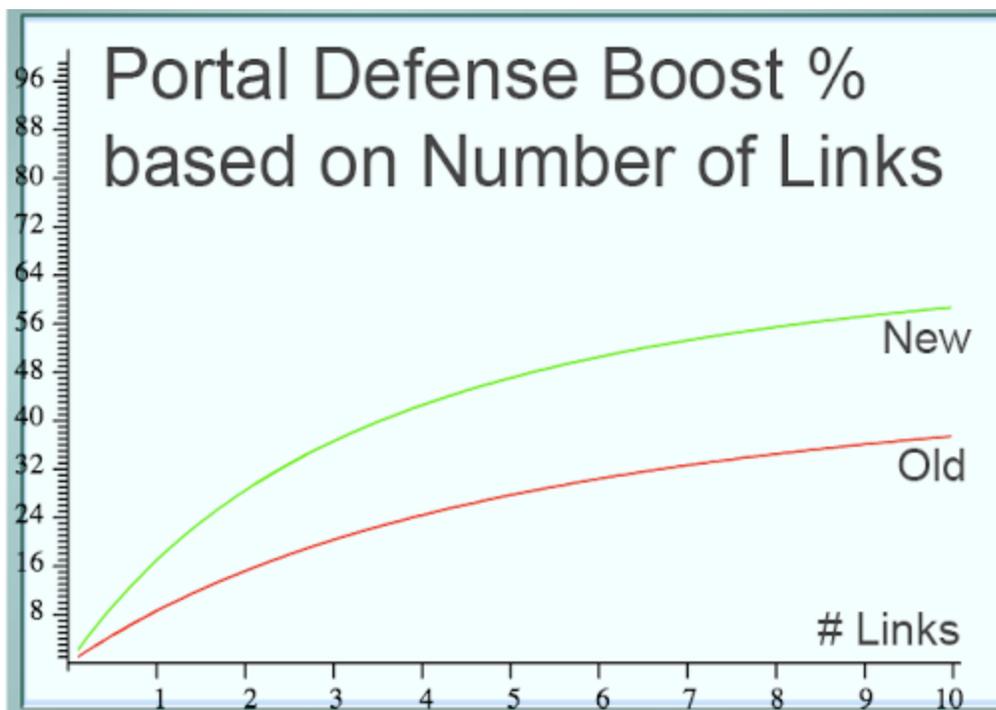
"portal key" from the destination portal, and your source portal (where you are clicking "link") must be high enough level to reach to the destination (see Appendix 2), and your link can't cross any other links. Linking will use up your portal key. You get 313 AP per link you build, but more importantly, if you link three portals in a triangle, you form a control field which is worth 1250 AP.

More details about linking portals (thanks to Scootle):

- Maximum of 8 outgoing links from a single Portal (any additional will give a message along the lines of "No Linkable Portals")
- No limit found so far on incoming links to a Portal
- No links can be made from any Portal inside an existing field.
- However, any "corner" Portal of an existing larger field can originate links to Portals inside the field, giving a means to create a "field within a field" that follow this limitation if you originate a link from two corners of a large field to a single portal inside. Examples here:  
<http://imgur.com/iMu2Q>
- If smaller fields are created first, then a larger blanket field is dropped over them, this is all valid.

The link itself can't be attacked, but if either of its portals are badly damaged your link will go down. The official help document says a portal will lose its links when "all eight of its resonators are reduced below the critical health level". This contradicts actual experience in the field, where it has been consistently observed that a portal will lose its links when it has fewer than three (3) resonators left.

Portals take less damage if they have links. Here's an image from a post by Brandon Badger:



How to understand this graph: If you put one link on a portal, the green line says it has like 16 absorption, which means enemy attacks will deal 84% damage. ( $100\% - 16\% = 84\%$ ) If you put six links on a portal, it's around 50 absorption, which means enemy attacks will deal 50% damage.

Note that shields add to this number. If you put six links on and you have 50 absorption worth of shields, that gets you to the max absorption of 95%, which means the portal will only take 5% damage from attacks until they manage to blow off one of your shields. Adding more shields after this will make it even harder for the enemy to blow off enough shields to get your portal below 95%.

Getting to that 95% number is crucial. A portal with 95% absorption is twice as tough as one that has only 90% absorption.

## **Whoa, what's all this about portal keys?**

Sometimes, when you hack a portal, it will give you a portal key for that portal. My theory is that you are very likely to get a portal key if you don't have one yet for that portal, and much less likely to get a portal key if you're already holding one. If you really want multiple copies, you could try dropping all your existing copies of that key before hacking the portal.

When a link between two portals is destroyed, sometimes a portal key will appear next to one of the portals. Presumably this is the portal key that was used to create the link.

The main use of a portal key is to create a link to that portal. (See above.)

Also, if you select a portal key from the "Ops" menu, it will give you a view of the corresponding portal, and also let you spend energy to recharge the portal from a distance. Recharging is slightly less efficient with distance. From reading this spreadsheet, the best way to think about it is that your recharge range is  $250\text{km} * \text{Player Level}$ . At your maximum range, recharge efficiency will be 50%. Recharge efficiency scales up to 100% at range 0.

## **What's this about control fields?**

When three portals are linked to form a triangle, it generates a control field, which gives you +1250 AP. A quick way to gain a lot of AP is to find an area with lots of portals, build them all up to eight resonators, and link them all into triangles.

Control fields also generate "Mind Units" which contribute to your team's global score. The larger the control field (and the more densely populated), the more Mind Units. (Technically the game seems to use an approximation: it multiplies the population density at the portal(s) by the region size. So, large fields over water can be worth a lot of points if the anchoring portals are in

high-population regions. But fields anchored in hard-to-reach places like national parks seem to be worth very few points.)

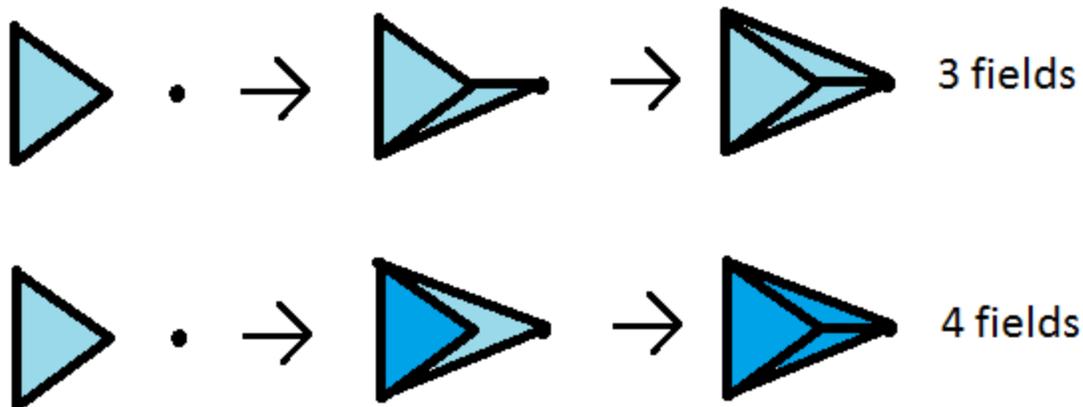
If one control field fully encloses another control field, both fields get credit independently as far as we can tell.

As the portals attached to the control field get damaged, the control field goes all wobbly at the edges. But the field will stay up until one of the three links is destroyed (see above, about destroying links).

### What's the maximum number of control fields I can build in an area?

If your area has  $B$  boundary nodes and  $I$  internal nodes, then if you build it all into triangles you will have  $L = 3*I + 2*B - 3$  links and  $T = 2*I + B - 2$  basic triangles. It's probably possible to prove this using [http://en.wikipedia.org/wiki/Planar\\_graph#Euler.27s\\_formula](http://en.wikipedia.org/wiki/Planar_graph#Euler.27s_formula).

However if you build your fields very carefully, it's possible to have control fields nested within other control fields. Here's a picture, using Resistance fields as an example:



(When building that last edge in the 4-fields example, it will be necessary to link from the outer portal to the inner one. You can't build links starting from the inner portal because it's inside a control field.)

By doing this you can build more than the  $T = 2*I + B - 2$  basic triangles. I believe it's possible to build an additional  $I$  triangles if you're careful and patient about how you do the build.

### What about these other buttons "Recharge" "Mod" and "Target"?

"Recharge" lets you spend your own XM to add energy to the portal's resonators. Note that you

can also do this at long distance if you have a portal key for the portal (select it from the Ops menu). Recharging gives you 10 AP, which is a very small amount of AP but is still nice to have.

Advice for recharging: if a portal is under attack, don't recharge all the resonators on the portal -- that costs lots and lots of XM and will rapidly run you out of powercubes! Pick your favorite resonator, ideally one that's hard to hit, and recharge just that one.

"Mod" lets you apply portal shields and other mods to the portal.

"Target" is used if the portal is far away. You'll get a little orange thing pointing towards the portal, so that you'll know which way to head to get to it. If you have a portal targeted and you get close enough to hack it, you'll automatically enter the detailed view so you can hack.

## **I see some enemy portals on my map. What do I do?**

Enemy portals will zap you once for every time you attack them. They have a chance (50%?) to zap you every time you hack them. If you don't do either of those things, they'll ignore you. Even if you do attack them, low-level portals won't hurt you very badly; you'll probably barely notice. There's a table in the appendix with the exact damage numbers.

So the enemy portals aren't a direct threat to you. However, maybe you wanted to build triangles out of those portals, and for that you need to convert them to your faction. Or maybe you want to prevent the enemy from hacking them to get items. Or maybe you just want to blow up the enemy resonators to gain experience. Any reason works.

Note that you can't actually attack the portal itself. Instead, you're attacking the resonators attached to the portal. When you've blown up all the resonators, the portal will turn back to neutral and you can claim it.

To attack you need items called "XMP Bursters". An XMP Burster is like a bomb which deals damage to all enemy resonators in the area. Each burster can only be fired once. It always deals the most damage at the place you're directly standing, and it deals less damage to resonators that are far away. So try to stand on the enemy resonator you're attacking!

Level-1 bursters are pretty terrible: they have low damage and a very low blast radius. To kill a resonator with a level-1 burster you need to be standing on it (and even then it will take several hits). As you level up, things get better: higher-level bursters have much better damage and also a much higher blast radius. Once you get to level 5 or 6, you'll be attacking one enemy portal and you'll accidentally blow up resonators on some other enemy portal across the street. There are some numbers about this in the appendix.

If you long-press on the map and choose the "Fire XMP" option, it bring you into the fire menu to

fire a burster.

## Bursters: how do they work?

Bursters are the ammunition you use to attack. You can think of them as bombs: they deal the most damage in the center, at the place you were standing when you fired them, and they deal lower damage to things far away.

Things to know about bursters:

- \* When you fire a burster, there's some lag while your phone syncs with the server. Once the burster fires, the damage radiates in all directions from the place you were standing when you fired. In other words, once you fire the burster, you can walk away from the portal and it won't change what happens.

- \* Bursters cost XM to fire, from 50XM for an L1 burster up to 400XM for an L8 burster. You'll lose more XM when the portal you're attacking zaps you. Be prepared!

- \* My guesses for burster damage are in Appendix 3. An L1 burster deals a puny 150 damage; an L8 burster deals 2048 damage.

- \* According to this analysis, burster damage drops off in tiers as you get farther away from the center. Roughly, for every one-fifth of the burster's range you get from the center, the damage drops by half. There's also a random component to the damage: it can be plus or minus one-seventh (14%) of the listed damage.

Distance from center	Damage from L8 burster
0-32	2048 (+/- 14%)
33-65	1024 (+/- 14%)
66-98	512 (+/- 14%)
99-131	256 (+/- 14%)
132-164	128 (+/- 14%)
165-168	64 (+/- 14%)

- \* Long-pressing to fire a burster enters a "mini-game" where the goal is to release the long-press when the circling xm is as close to your arrow as possible. The damage a burster does is increased by up to 20% depending on your result.

- \* In general, it's most efficient to fire your highest-level bursters if you're in a big field full of targets, or if you're attacking something that's far away. If you're just attacking a few resonators and they're right under your feet, that's the time to fire your lower-level bursters.

- \* There are two ways to fire bursters. One option is to use the carousel: fire a burster, watch as it fires off, and when the fire button is selectable again fire another burster. The other option is called chain-firing: go to Ops, select your burster, press Fire, go back to Ops, select another

burst, press Fire again, et cetera. Chain-firing is less powerful than it used to be with recent changes but is still slightly faster (though it puts you at some risk of RSI).

## What about Ultra Strikes?

For a long time, Ultra Strikes were only available to people with the appropriate phone. Recently they've become available to everybody. Ultra Strikes deal much more damage than standard bursters, but with a very limited range.

This post advises: "Pro tip: Fire an Ultra Strike while standing directly on the center of a Portal to maximize the chance of a critical hit taking out a Shield or other Portal Mod. Once the Portal Shields are down, stand directly on a Resonator to maximize the damage and chance of a critical hit on that Resonator in order to take it out."

## There are all these new "Mods" now...

Where bursters and resonators have different effects based on level, mods seem to have different effects based on their "rarity". Deploying portal shields costs 400 XM for common, 600 XM for rare, or 1000 XM for very rare. Probably other mods cost the same.

Portal Shields: grant +30, +40, or +60 mitigation depending on rarity. The folks running <http://ipas.graphracer.com/> have done a lot of very careful simulation, and if I'm reading their results correctly, mitigation is a straight-up percentage damage reduction. (So a portal with 40 mitigation will take 40% less damage from attacks.) Mitigation is capped at 95%. (citation)

Note that links also add mitigation to portals, so to make a really strong portal you need the total mitigation from links plus shields to reach 95. Poking at the attack simulator, it looks like this happens when you have 80 points from shields and one link, or 70 points from shields and two links, or 60 points from shields and 3 links, or 50 points from shields and 5 links.

If you're shielding portals, getting to 95% mitigation is really important. A portal with 95% mitigation is twice as tough as one that only has 90% mitigation. Adding more mitigation on top of that is even better, because the enemy will have to throw bursters at the portal until they blow off your shields.

Link Amp: Nearly all link amps are "Rare". Applying one Rare link amp to a portal doubles the link radius; applying two link amps is x2.5 to the link radius; applying three is x2.75; applying four is x3. So the max link radius for an L8 portal is  $655.36 \times 3 = 1966\text{km}$ . The max link radius for one player working alone is  $160 \times 2.5 = 400\text{km}$ .

There also exist "Very Rare" link amps which grant huge increases in portal range -- enough to

link across the ocean. Not much is known about these.

Heat Sink: Common heat sinks give +20% hack speed, which seems to actually mean that it multiplies the five-minute hack window by 0.8, giving four minutes. Rare heat sinks give +50% hack speed. Very-rare heat sinks give +70%. Combining heat sinks is complicated; see this post by Decode Ingress for details.

The main use for a heat sink is that applying one to a portal resets your personal hack timers on that portal -- so you can hack a portal, apply a heat sink, and immediately hack again. This is useful if you're trying to get portal keys.

Multi-Hack: Common multi-hacks give +4 burnout insulation, meaning you can hack the portal four more times within the four-hour limit. Rare multihacks give +8 burnout insulation. Very-rare multi-hacks give +12 burnout insulation. Combining multihacks is complicated; if you add more than one multihack to a portal, the weaker ones will only give half benefit.

Force Amps: Like link amps, these seem to only come in the "Rare" variety although a "Very Rare" version is promised. Applying one force amp to a portal gives it "Force Amp: 2x" which presumably doubles the zap damage. Applying two force amps to a portal gives "Force Amp: 2.5x". I would expect that applying three gives "Force Amp: 2.75x" and four gives "Force Amp: 3x".

Turret: Applying a Rare turret to a portal gives a 30% increase to "Hit Bonus" and also increases "Attack Frequency" from 0x to 2x. I suspect that turrets increase the chance to zap someone who is hacking the portal (normally 50%). I don't know what else they do.

Applying mods: Mods are applied through the "Upgrade" screen. There are four boxes on the top which can hold mods. If you see a mod in the upgrade screen, you can click it to see details such as who owns it and what it's supplying to the portal.

Spotting mods: If you look at a portal carefully you can sometimes see a little sphere around it. This sphere is the shield. If your burster hits the core of the portal, the shield will glow white for a second. If your burster kills a shield, the shield will turn red and do a "popping" animation. It doesn't appear to be possible to spot the other portal mods just by looking, but they do still do death animations when you kill them.

How to kill mods: If your burster hits the core of a portal, there is a small chance (how much?) of killing a portal mod off the portal. This might be affected by mod rarity. It doesn't appear to be affected by burster level. If you really want to kill mods off a portal, one thing you can try is to use the "target" feature to stand just out of range of the portal (generally 80m away) and fire lots of L5 or L6 bursters until the shields go down. (L5 bursters have range 90m and can just barely reach the portal core. L4 bursters have range 72m so they won't work for this.) This will cost a whole lot of bursters, though.

See <http://catalystro.wordpress.com/2013/06/13/5-new-mods-what-we-think-we-know/> for another doc about mods. I've borrowed some of their results to put here.

## What's an "Alignment Virus"?

The "Jarvis Virus" converts a blue portal into a green one; the "Ada Refactor" converts a green portal into a blue one. Either virus can be used by either faction. They can be received from item codes, or they're a "one in a thousand" drop from hacking. They seem to drop from any level portal, not just L8 portals. Using a virus to convert a portal to your faction will give you ownership of all the resonators and mods on the portal. Using a virus to convert a portal to the enemy faction will give ownership of resonators and mods to either "\_\_ADA\_\_" or "\_\_Jarvis\_\_" as appropriate. Using a virus will also break any links or fields on the portal, but you won't get AP for this. Finally it will heal all the resonators to full.

Using a virus appears to cost 1000XM per level of the portal being targeted. A level-6 player has a max of 8000XM, so you might think a level-6 player could flip a level-8 portal. However apparently it's not possible to take an action that would drop you to 0 XM, so in practice it appears you have to be level-7 to flip a level-8 portal. (And you have to be level-6 to flip a level-7 portal, etc.)

Once someone has used a virus on a portal, there's a one-hour cooldown on the portal. If anyone else tries to use a virus on the portal during this duration, the second virus is wasted.

Uses for an alignment virus:

- \* Convert an enemy portal into a friendly portal so you can hack it for items. If it's in the middle of an enemy farm, this will break all its links, which makes the nearby portals a bit easier to kill.
- \* Convert a friendly portal into an enemy portal to break all the links, if one of the links was getting in your way. This is useful if a friendly link is preventing you from building a large field.
- \* Convert a friendly portal into an enemy portal to break all the links, and then kill it and rebuild all the links to get lots of AP for field creation.
- \* Convert a friendly portal into an enemy portal, wait an hour, then convert it back to a friendly portal, to take ownership of all the resonators and allow your allies to deploy more L8 resonators on the portal. For example, if you have four L8 allies, they could deploy four L8 resonators, you could convert the portal twice, and then they could deploy four more L8 resonators to make an L8 portal.
- \* Convert a friendly portal into an enemy portal to stop enemy agents from killing it, if it's a portal you can hack a lot more easily than they can.
- \* Use a virus on a portal just before an anomaly event, then fortify it; for the next hour, enemy agents won't be able to take control of the portal.

Here's a video of an alignment virus in use. The video doesn't seem to show the links breaking; this is a display error.

Recycling an alignment virus gives 100 XM.

## **What do I do if I think there's an enemy agent nearby?**

If you're looking at your map, and suddenly there are more enemy resonators (or fewer friendly resonators) than you expect, it probably means there's an enemy agent nearby. If you see a portal being captured, you can inspect the portal and find the name of the agent who captured it.

One option is to look around and find the person staring at their phone, then walk up and say hello. Sometimes they're friendly! But sometimes this is a little weird, so don't do it unless you're sure it will be a positive interaction.

It's usually a bad idea to attack enemy portals when there's an agent there defending them. But it can be useful to defend your own portals when an agent is attacking them. The way to do this is to drop fresh new resonators (and shields) on portals that are under attack. It will cost your opponent a lot of bursters to attack each of your resonators separately. If you time this very well, you can drop resonators on portals that have just gone neutral, which gets you the 500 AP bonus as well.

On the other hand, try not to be the schmuck who's firing bursters at a portal while the enemy drops more resonators on it. This is expensive, it feeds them experience, and it often fails to get the portal.

Remember that attacking portals is very expensive, because it costs XM to fire bursters and then it costs more XM when the portal returns fire. If you're defending a group of portals, it's really useful to make sure there's no XM on the ground for the attacker to refuel with.

Sometimes when other agents take an action, it can take time for the updates to reach your phone. If you think your phone is out of sync, there's a "Force Sync" button in the "Ops" menu, under "Device". (Or you can just restart Ingress.)

## **How long do my portals last? Can I make them last longer?**

Resonators decay by 25% every 24 hours. This seems to happen exactly 24 hours after the portal was first claimed. So if you claim a portal for your team at 8am on Monday, and if the portal stays owned by your team until 8am on Tuesday, then at 8am on Tuesday all of the resonators on that portal lose 25% of their energy, and show as 75% charged..

You can use the "Recharge" button to recharge your portal's resonators. If you have a portal key, you can use it from your inventory to recharge the portal from long distance.

You probably don't want to recharge all your portals all the time. Recharge the important ones -- the ones with good resonators or good links. For the rest, it's easier to let them decay and rebuild them when you need them.

Your resonators are easiest to kill when the enemy is standing on them. If you stand at maximum range from the portal and deploy your resonators from there, then your resonators will be spaced far out from the portal, and it will be harder for the enemy to hit them all with a single XMP Burster.

If some of your resonators happen to be someplace your opponents can't stand on (like over water, or inside buildings), that makes them much harder to kill. High-level resonators are harder to kill than low-level resonators, so try to put your best resonators in places where the enemy can't stand.

You can apply portal shields to a portal using the "Upgrade" menu. Portal shields add mitigation; links also add mitigation. For more information, see the above section on portal shields. For a portal with at least five links, you can reach the maximum of 95% damage reduction when you have at least 50 points of mitigation from shields. But note that getting hit by bursters will knock off mods, so adding more shielding past 50 could allow your portal to have 95% damage reduction even after getting a shield knocked off.

Of course, if the enemy is firing high-level bursters, they can blow up your resonators no matter what. But you might as well make it expensive for them.

## **What's a "farm"?**

A farm is a collection of high-level portals which you can hack to get good items.

Farms are very important! Your agents need a steady stream of items to conquer territory. If your faction doesn't build farms regularly in your city, your high-level agents will run out of good items and your faction will start losing.

Things to know about portal farms:

- \* Think about the circuit you will walk (or bike, or drive) when farming your portals. Portals take 5 minutes to cool down, so it's nice if your circuit takes about that long to travel. If it takes longer and hits a lot more portals, that's good too.

- \* Building your portal farm will require several agents to come together and put their best resonators on each portal. This takes effort, so it's best to do it somewhere enemy agents don't go very often. If you have a cluster of portals that haven't been attacked in a while, maybe it's worth getting people together and making it a farm.

- \* There's no additional benefit to hacking a portal above your level. If you're L6, then hacking an L6 portal is just as good as hacking an L8 portal. It's the high-level players that benefit from seeking out the best portal farms.

- \* Know the agent levels you need to build a portal farm:

  - \*\* Building an L6 portal requires four L6 agents, or two L7 agents, or an L6 and an L8.

  - \*\* Building an L7 portal requires three L8 agents, or two L8 and two L7, or lots of L7 (seven).

  - \*\* Building an L8 portal requires eight L8 agents.

- \* One way to build a farm is to spread the word that a given region needs to be a farm, and let people drop by and contribute resonators when they can. This only works if there really aren't any enemy agents anywhere nearby.

- \* Another way is to have a portal-farming party: get your agents to meet near a restaurant or bar, grab some food or drinks, build some portals and all farm them together.

- \* In the process of farming, inevitably someone will link all the portals together, which adds to their defense.

## **What should I know about attacking a portal farm?**

Attacking a portal farm can be very easy or very hard, depending on the amount of XM available and on the amount of shielding the portals have.

Firing bursters requires a lot of XM, and the portals will be zapping you for more XM every time you fire, so you'll quickly run out. One approach I like is to walk through a cloud of XM as I fire. So I'll fire a burster, get zapped until I redscreen, then walk just enough to pick up 400 more XM, fire again... Of course this only works if there aren't any enemy agents picking up all my XM.

If there's no XM handy, you can recycle items in order to throw bursters. Recycling three L7 items will give you 420XM, which is just enough to fire one L8 burster.

Another solid approach is to chain-fire bursters: go to Ops, select burster, push fire, repeat as fast as you can. This lets you fire more bursters before you get zapped to 0 XM.

If you pile three or four agents in a car, and drive slowly past the farm throwing bursters, that actually seems to work pretty well at refilling your XM. It's also a lot faster than walking.

If a portal has lots of links and shields, you might just not be able to kill it. There are reports of people firing L8 bursters from point-blank range and doing 1% damage. If you see this happening, it means you need to decrease the portal's defense. You can do this either by killing the portals it's linked to, or by popping the shields. Rumor claims that there's like a 5% chance for any burster to kill a shield. Rumor also claims that this is independent of level, so you could throw cheap low-level bursters until the shields are popped. If there are just one or two well-shielded portals, you could also just save those for last, and hope that the splash damage from all your attacks on other portals will kill the shields.

### **I got some sort of “Media” thing from hacking.**

Allegedly, if you read the whatever-it-is carefully, you can get an “access code” out of it. If you enter the access code into the box in your “Ops” screen, it will give you a small amount of AP, plus some free items.

In practice, by the time you get the media item and decipher it, the folks on Decode Ingress will have already extracted the code and distributed it to all their followers. So the media is sort of interesting for flavor, but has no real in-game use.

### **So, uh, these codes you're talking about...**

The best source I know for this is <http://decodeingress.wordpress.com>. They post codes, and they also post about how they found the codes. Most codes seem to “expire” after a certain number of players have cashed them in, so you'll have to be quick if you want to get loot out of this.

## **Okay. So how can I help with all this?**

Sad but true: you won't have much impact on the game until you've gained some levels. Level 5 or Level 6 are where you start getting access to weapons that do real damage to resonators. Before that time, your goal is to gain AP and level up. After that time, your goal is to play strategically: destroy the enemy's high-level portals, and connect up with allied agents to build (and farm) high-level portals of your own. Building a Level 8 farm requires eight Level 8 agents, so you'll probably get very interested in recruiting other players and helping them reach Level 8.

Your area probably has a Google+ group for your faction. (If it doesn't, you should start one!) They might be a little cautious about trusting you until they're certain you're not an enemy spy, but they can also be a huge help in leveling.

So far as making a difference in the global plot: as things stand so far, you're going to have to travel. Gain some levels and collect some equipment, and watch <https://plus.google.com/u/1/+NianticProject/posts>. Periodically they'll announce the location of the next big conflict between Resistance and Enlightenment.

These events may start happening more commonly (and in more regions simultaneously) in future. Right now, it's in one region at a time.

## **It sounds like I should try to gain some levels.**

The appendix has some numbers about what actions will give you experience points.

At level 1 and 2, the only good way to gain experience is to drop resonators on friendly or neutral portals. (And you can build triangles if the portals are really close together.) It's very helpful if you can get a higher-level agent to blow up portals so you can claim them.

As you reach higher levels, you'll be able to walk into a field of enemy portals and drop bursters to blow them all up. This will get you a lot of experience very fast, but you should really try to claim the portals too -- don't just leave them for the enemy to reclaim.

## **Can I share this document with people?**

This document is the second link on Google if you search for “ingress faq”. You’re welcome to share it with anyone by mailing them the link (or by telling them to search for it). Pushing the blue “share” button in the top right of the screen won’t have any effect, though.

## **Appendix 1: How do I gain experience?**

In this game, experience is called “AP” (“Action Points”).

Here’s how you gain AP:

Placing a resonator: 125 AP

Destroying a resonator: 75 AP

Upgrading a resonator (replacing someone else’s resonator with yours): bonus 65 AP

Creating a link: 313 AP

Destroying a link: 187 AP

Creating a control field: 1250 AP

Destroying a control field: 750 AP

Applying a portal mod: bonus 125 AP

Placing the first resonator on a portal: bonus 500 AP

Placing the eighth resonator on a portal: bonus 250 AP

Hacking an enemy portal: bonus 100 AP

Recharging a portal: bonus 10 AP

Portal submission approved: 1000 AP

Portal photo accepted: 500 AP

Edit of portal Location, Name, or information approved: 200 AP

Redeem passcodes: 50 to 1500 AP, depending on code

For resonators, links, and control fields, the player who destroys it gets 60% of the AP you got for creating it.

The portal-shield, first-resonator, last-resonator, and hack-an-enemy-portal bonus do not grant this 60%.

If you use an “Alignment Virus” (ADA Refactor or Jarvis Virus) to capture a portal, you get no AP credit for any links or fields that were destroyed as a result.

## Appendix 2: Leveling 1-8

Player Level	AP required	Max XM	Best Portal	Portal Range
1	0	3000	1	160m
2	2500	4000	1.5	810m
3	20000	5000	2.5	6.25km
4	70000	6000	3.5	24.01km
5	150000	7000	4.0	40.96km
6	300000	8000	4.75	81.45km
7	600000	9000	5.125	110.38km
8	1200000	10000	5.625	160.18km

“AP required” is the number of experience points you need to reach that level.

“Max XM” is the most XM you can hold at once.

“Best Portal” is the highest-level portal you can build by yourself, following the rules about how many resonators of a given level you can place on a portal. For example, if you’re level 5, the best you can do is to build a portal with L5x2, L4x4, L3x2, for an average level of 4.0.

Portal levels get rounded down to the nearest integer for purposes of hacking and zapping, but the fractional level is used for computing link distance.

“Portal Range” is the link distance of your best portal. It’s calculated as  $160m * (\text{BestPortal})^4$ .

In addition to all this, note that you can’t use any resonator or burster that is higher level than you, so gaining levels gives you the ability to use better equipment.

Also, the math for hacking uses  $\text{MIN}(\text{your\_level}, \text{portal\_level})$ , so gaining levels gives you the ability to get higher-level gear from higher-level portals.

### Appendix 3: Leveling 9-16

(info copied from <http://decodeingress.me/2014/05/06/scanner-v1-51-0-update/>)

Player Level	AP Required	Badges 1	Badges 2	Max XM
9	2.4M	1 gold	4 silver	10900
10	4M	2 gold	5 silver	11700
11	6M	4 gold	6 silver	12400
12	8.4M	6 gold	7 silver	13000
13	12M	1 platinum	7 gold	13500
14	17M	2 platinum	--	13900
15	24M	3 platinum	--	14200
16	40M	2 black	4 platinum	14400

The pattern to "Max XM" is that level 9 gives you +900 max xm, then level 10 gives +800, then +700, etc.

### Appendix 3: Resonator and Burster Stats

Item Level	Burster XM Cost	Burster Damage	Burster Range	Resonator XM Cost	Resonator HP	Resonator Limit
1	50	157	42m	50	1000	8
2	100	266	48m	100	1500	4
3	150	480	58m	150	2000	4
4	200	750	72m	200	2500	4
5	250	1000	90m	250	3000	2
6	300	1250	112m	300	4000	2
7	350	1575	138m	350	5000	1
8	400	2048	168m	400	6000	1

Burster XM Cost is the cost to fire a single burster (from here).

Burster Damage is my guess for the damage a burster would deal to an unshielded resonator at point-blank range. The Copenhagen Resistance has some great graphs of burster damage measurements.

Burster Range is the max range of the burster. Damage falls off exponentially as you get farther from the center; at max range the damage is 1/32 of the max damage, or around 3%. (Thanks to Ssergni for finding this.)

Resonator XM Cost is the cost to put a resonator on a portal (using either "Deploy" or "Upgrade").

Resonator HP is the amount of damage a resonator can take before dying.

Resonator Limit is the max number of resonators of that level a single agent can deploy on a portal. (Note that an alignment virus will let you exceed these limits.)

#### Appendix 4: More numbers about portals

Portal Level	Damage If It Zaps You	Zap Range	Cost To Hack	Link Range
1	75	40m	50	160m
2	125	45m	100	2.56km
3	175	50m	150	12.96km
4	238	55m	200	40.96km
5	300	60m	250	100km
6	400	65m	300	207.36km
7	500	70m	350	384.16km
8	625	75m	400	655.36km

“Damage If It Zaps You” is just XM loss.

“Cost To Hack” is  $50 \times \text{Level}$ . (If you hack a hostile portal you will also take zap damage.)

“Link Range” here is for a portal with all eight resonators at that level.

“Zap Range” is how far the portal can reach to zap you if you damage its resonators with a burster. (If you hack an enemy portal, you will always be within Zap Range.)

When in doubt, you can check your distance to a portal using the “Target” option.

<http://members.ping.de/~sven/ingress.html> is a portal stat calculator.

## **Appendix 5: Items From Hacking**

I went and hacked a bunch of friendly L6 portals and recorded the result.

<https://docs.google.com/spreadsheet/ccc?key=0AielrgzQC4gydFBveUk3dUV4a1BGSnY4QVISYXB1NUE#gid=0>

Here's what I got: hacking an L6 portal (as an L6 player), you can expect to get 1.4 resonators and 1.4 bursters on average. The resonators will be mostly L6, with a small number L5 or L7, and a tiny number L8. The bursters will also range from L5 to L8 but there will be more variance.

For fancier items, an agent named Dariusz Rootek did some analysis:

[https://docs.google.com/document/d/1c5r9lhczDyYXk\\_o9dEMIFBu\\_QR-XuHnHcS\\_yfFtL6LY/edit](https://docs.google.com/document/d/1c5r9lhczDyYXk_o9dEMIFBu_QR-XuHnHcS_yfFtL6LY/edit)