$g = d * (p - 0xdeadbeef)$

$eg = ed * (p - 0xdeadbeef)$

$2^{eg} = 2^{ed * (p - 0xdeadbeef)}$

$2^{eg} \bmod n = 2^{ed * (p - 0xdeadbeef)} \bmod n$

$2^{ed * (p - 0xdeadbeef)} = 2^{(1+k*phi(n)) * (p - 0xdeadbeef)}$

$= (2 * 2^{k * phi(n)})^{(p - 0xdeadbeef)}$

$= 2^{(p - 0xdeadbeef)} * 2^{k * phi(n) * (p - 0xdeadbeef)}$

$a^{phi(n)} = 1 \bmod n$

$2^{(p - 0xdeadbeef)} * 2^{k * phi(n) * (p - 0xdeadbeef)} = 2^{(p - 0xdeadbeef)} * 1 \bmod n$

$2^{eg} \bmod n = 2^{(p - 0xdeadbeef)} \bmod n$

$2^{eg} * 2^{0xdeadbeef} \bmod n = 2^{p} \bmod n$

$a^{p} = a \bmod p$

$2^{eg} * 2^{0xdeadbeef} \bmod n = (kp+2) \bmod n$

$2^{eg} * 2^{0xdeadbeef} - 2 \bmod n = kp \bmod n$