

OpenFHE Code Example

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```
CCParams<CryptoContextCKKSRNS> parameters;  
parameters.SetMultiplicativeDepth(10);  
parameters.SetScalingModSize(50);  
parameters.SetBatchSize(2);
```

Initialization of the security parameters:
MultiplicativeDepth: The number of times a multiplication is possible on the ciphertexts.
ScalingModSize: The bit-length of the scaling factor (determines accuracy of the result)
BatchSize: The length of the input vector.

```
CryptoContext<DCRTPoly> cc = GenCryptoContext(parameters);
```

```
cc->Enable(PKE);  
cc->Enable(KEYSWITCH);  
cc->Enable(LEVELEDSHE);
```

Generation of the CryptoContext. It's the interface to all functions of the OpenFHE library and stores all parameters and the eval key.

```
auto keys = cc->KeyGen();  
cc->EvalMultKeyGen(keys.secretKey);
```

Features we want to be enabled.

Key generation. The eval key is saved in the CryptoContext

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```
std::vector<double> x1 = {0.25, 0.5};  
std::vector<double> x2 = {5.0, 4.0};
```

Initialization of the input vectors

```
Plaintext ptxt1 = cc->MakeCKKSPackedPlaintext(x1);  
Plaintext ptxt2 = cc->MakeCKKSPackedPlaintext(x2);
```

Encoding

```
auto c1 = cc->Encrypt(keys.publicKey, ptxt1);  
auto c2 = cc->Encrypt(keys.publicKey, ptxt2);
```

Encryption

```
auto cAdd = cc->EvalAdd(c1, c2);  
auto cMul = cc->EvalMult(c1, c2);
```

Applying Multiplication and Addition

```
Plaintext result;  
cc->Decrypt(keys.secretKey, cAdd, &result);  
result->SetLength(batchSize);  
std::cout << "x1 + x2 = " << result << std::endl;
```

```
cc->Decrypt(keys.secretKey, cMul, &result);  
result->SetLength(batchSize);  
std::cout << "x1 * x2 = " << result << std::endl;
```

Decrypting and printing the results