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Subject: Re: Decimal  
Posted by [mirek](#) on Sat, 02 Aug 2008 12:21:07 GMT  
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Well, here is something to start with

```
#include <Core/Core.h>

using namespace Upp;

double pow2(int x)
{
    double b = 1;
    while(x-->0)
        b *= 2;
    return b;
}

typedef __int128_t int128;

#define I128_10_17 (int128)164(1000000000) * (int128)164(1000000000)

struct Decimal {
    int128 data;

    static int128 e10[38];

public:
    void Add(const Decimal& b) {
        byte sa = data & 15;
        byte sb = b.data & 15;
        data = (~(int128)15 & data) + (~(int128)15 & b.data) | max(sa, sb);
    }
    void Mul(const Decimal& b) {
        byte sa = data & 15;
        byte sb = b.data & 15;
        data = (((~(int128)15 & data) * (~(int128)15 & b.data)) / I128_10_17) | max(sa + sb, 16);
    }

    String ToString() const;
    const char *Scan(const char *s);

    Decimal();
};

int128 Decimal::e10[38];
```

```
Decimal::Decimal()
```

```
{
    static bool init;
    if(!init) {
        int128 q = 1;
        for(int i = 0; i < 38; i++) {
            e10[i] = q;
            q = q * 10;
        }
    }
    data = 0;
}
```

```
String Format128(int128 a)
```

```
{
    RTIMING("Format128");

    if(a < 0)
        a = -a;
    char b[50];
    char *p = b + 50;
    do {
        *--p = a % 10 + '0';
        a = a / 10;
    }
    while(a);
    return String(p, b + 50);
}
```

```
const char *Decimal::Scan(const char *s)
```

```
{
    while(*s == ' ')
        s++;
    bool neg = false;
    if(*s == '-') {
        neg = true;
        s++;
    }
    while(*s == ' ')
        s++;
    if(!IsDigit(*s))
        return NULL;
    data = 0;
    while(IsDigit(*s))
        data = *s++ - '0' + 10 * data;
    int digits = 0;
    if(*s == '.') {
        s++;
    }
}
```

```

while(IsDigit(*s) && digits < 16) {
    data = *s++ - '0' + 10 * data;
    digits++;
}
while(IsDigit(*s)) s++;
}
data *= e10[16 - digits];
if(neg)
    data = -data;
data = (data & ~(int64)15 & data) | digits;
return s;
}

```

```

String Decimal::ToString() const
{
    int digits = data & 15;
    String x = Format128(~(int64)15 & data);
    int n = x.GetLength();
    if(n <= 16)
        return "0." + x.Mid(0, digits);
    return x.Mid(0, n - 16) + "." + x.Mid(n - 16, digits);
}

```

```

Decimal Dec(const char *s)
{
    Decimal d;
    d.Scan(s);
    return d;
}

```

```

inline Decimal operator+(const Decimal& a, const Decimal& b)
{
    Decimal r = a;
    r.Add(b);
    return r;
}

```

```

inline Decimal operator*(const Decimal& a, const Decimal& b)
{
    Decimal r = a;
    r.Mul(b);
    return r;
}

```

```

CONSOLE_APP_MAIN
{
    DUMP(Dec("1.20"));
    DUMP(Dec("1.20") + Dec("2"));
}

```

```

DUMP(Dec("1.02") + Dec("1.005"));
DUMP(Dec("1.02") * Dec("1"));
DUMP(Dec("1.02") * Dec("0.50"));
DUMP(Dec("1.02") * Dec("1.005"));
return;

RDUMP(Format128(I128_10_17));

int64 x = I64(0x1234123412341234);
DUMP(Format64Hex(x & ~(int64)15));
Decimal a;
Decimal b;
a.Add(b);
for(int i = 0; i < 128; i++) {
    LOG(i << ' ' << pow2(i));
}
}

```

Conversions and + work, \* not yet... You will need to adjust typedef for MSC.

Mirek

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