BIND 10 Tidbits

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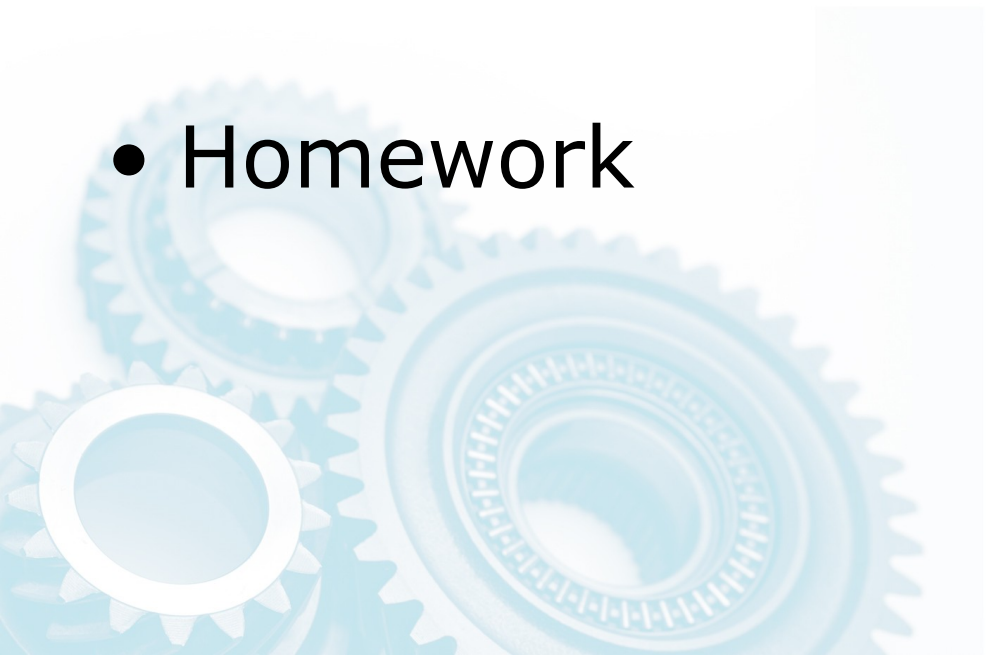
Contents

- Architecture
  (from space)
- DNS Library
  (C++/Python)
- Homework



Architecture

- Cooperating processes
  (vs monolithic system)

BIND 10 Core

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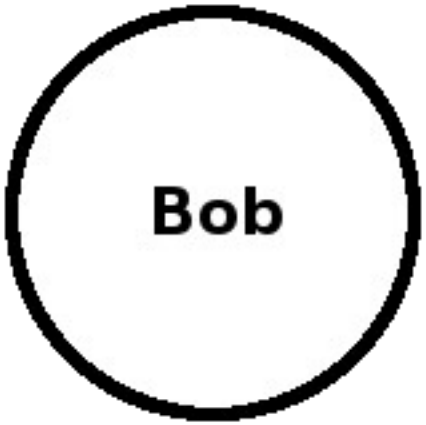

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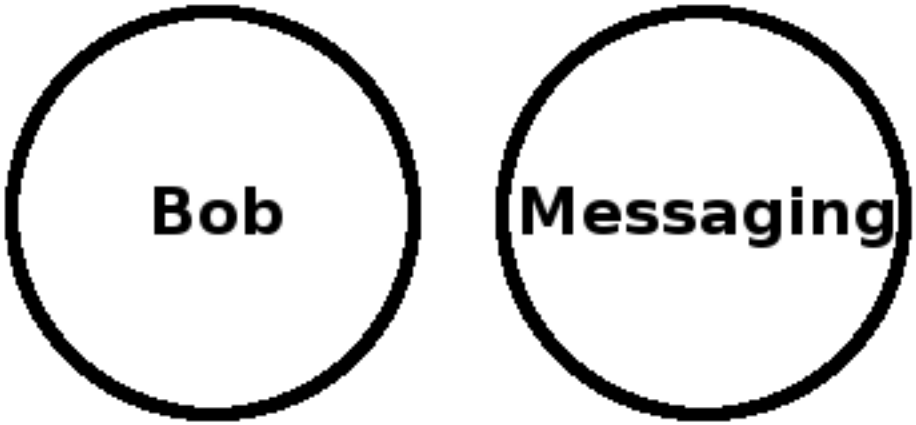

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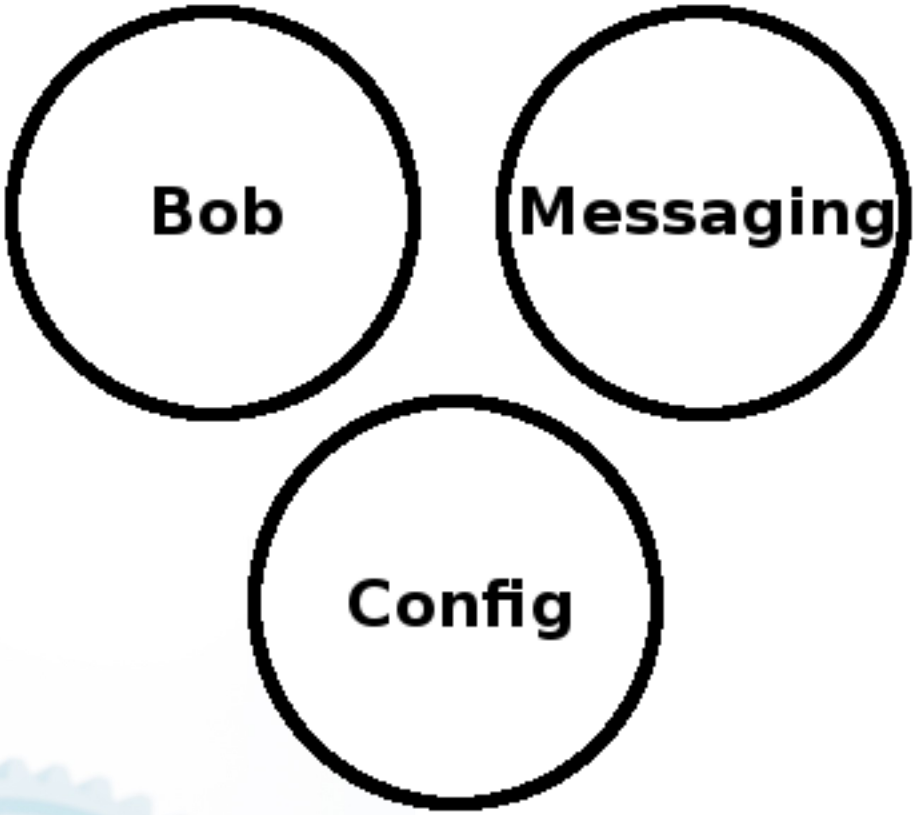

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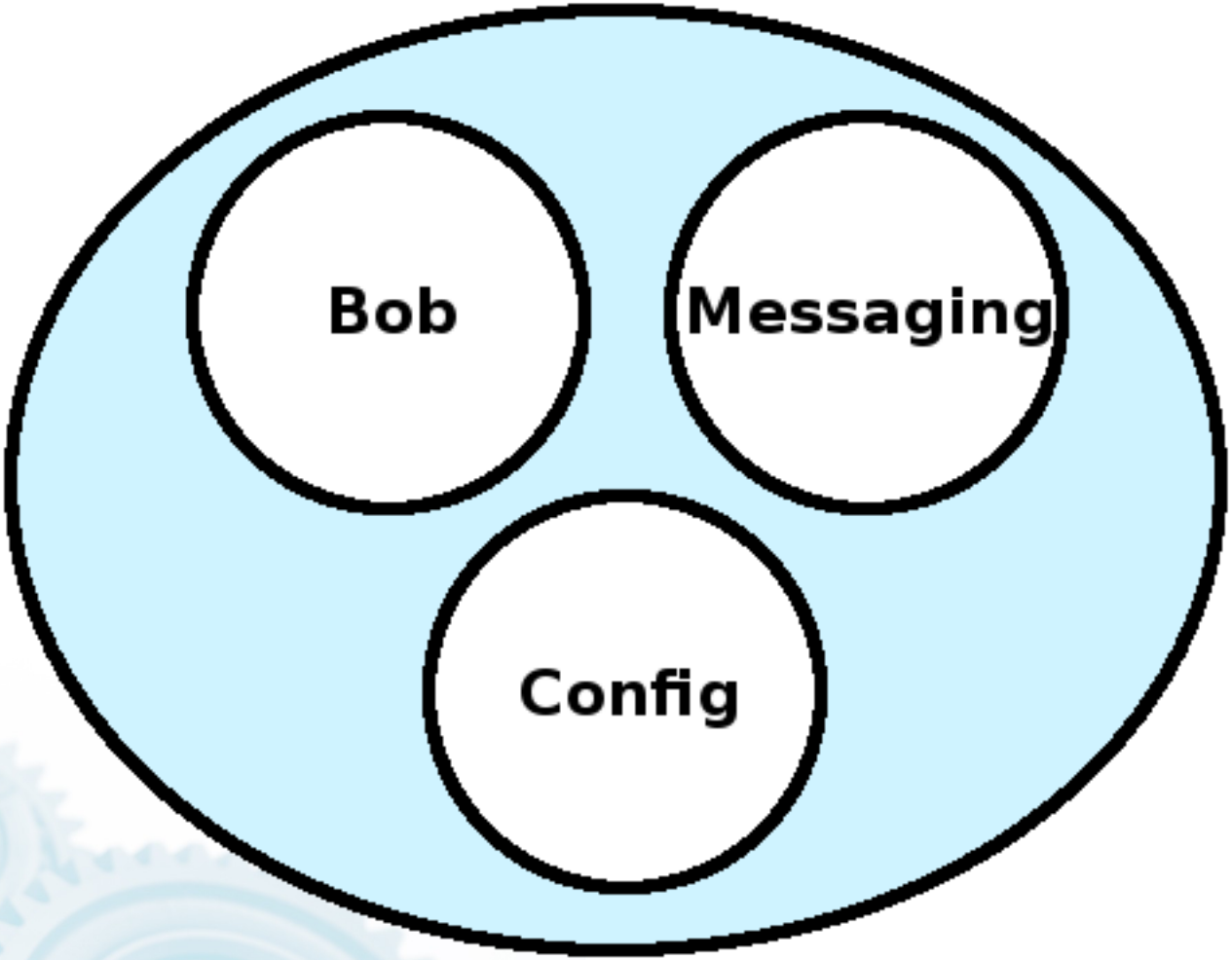

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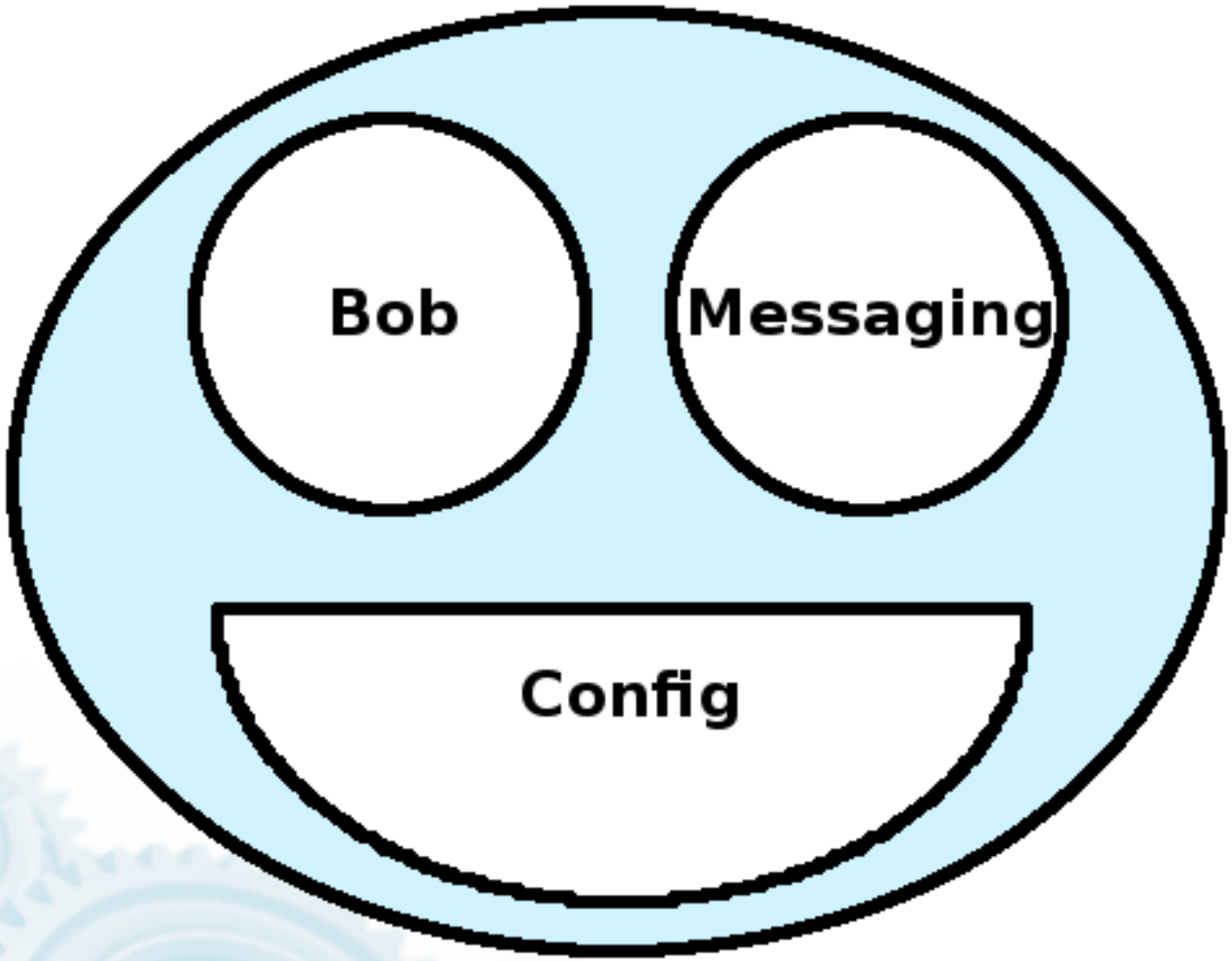

BIND 10 Modules

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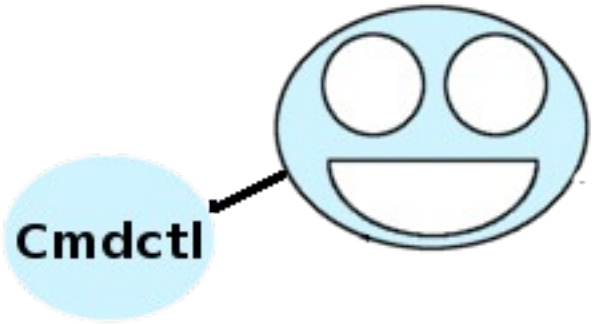

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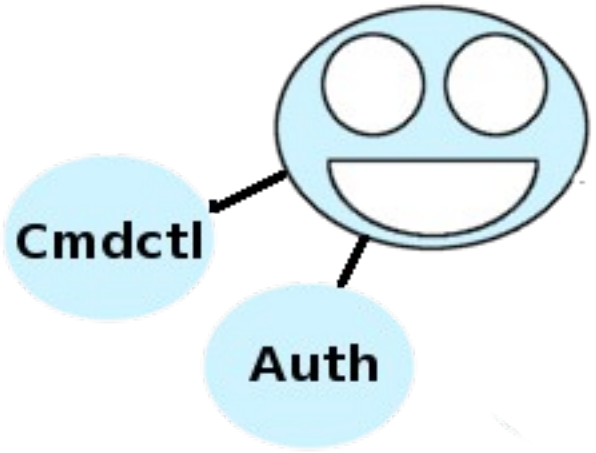

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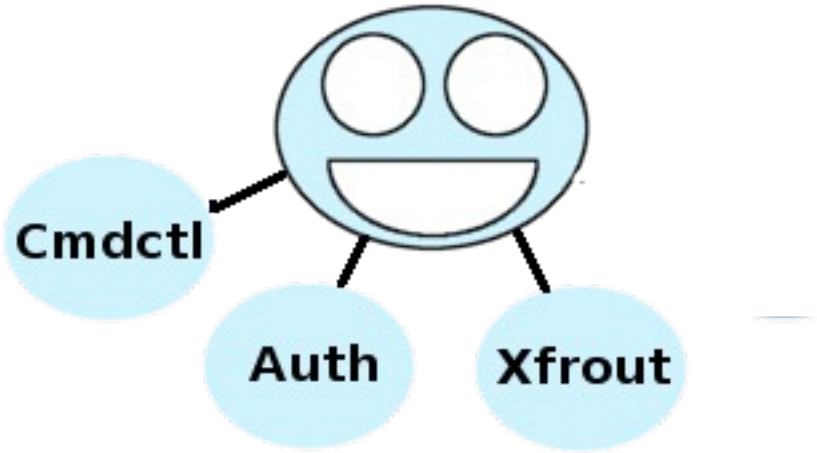

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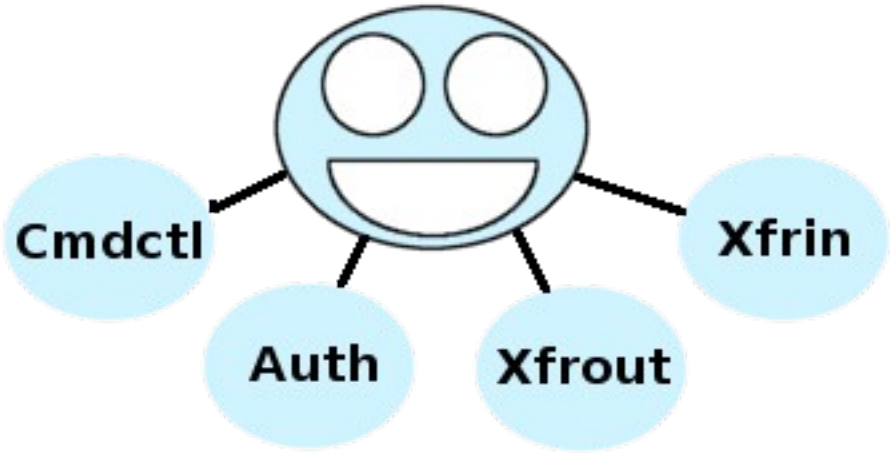

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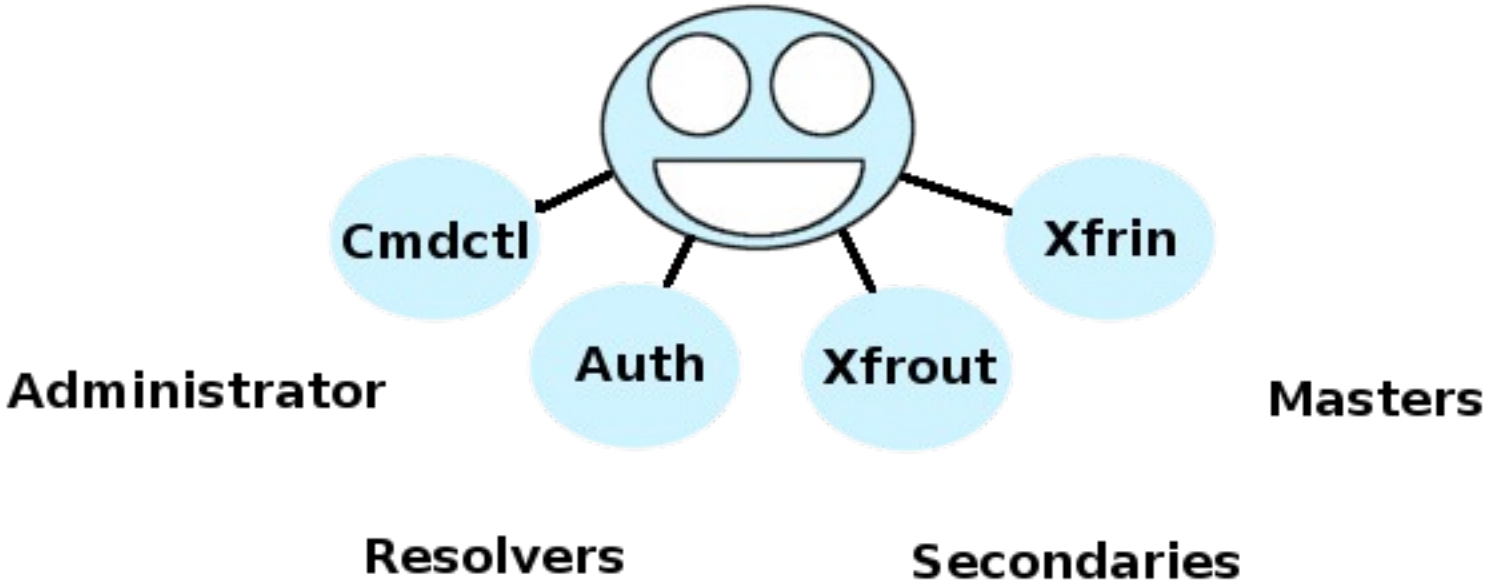

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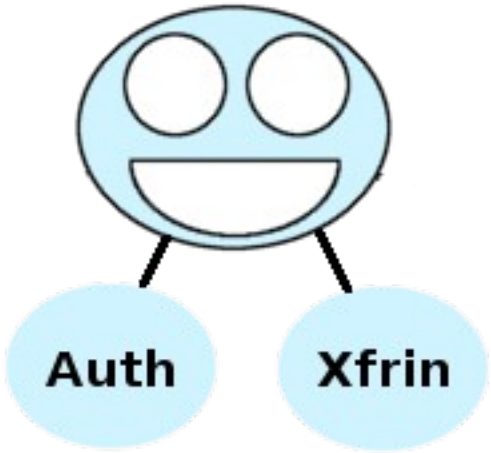

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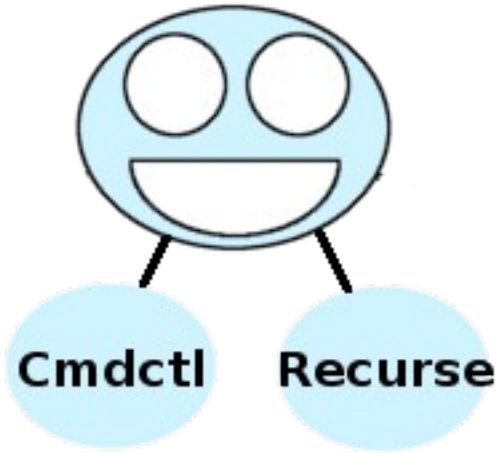
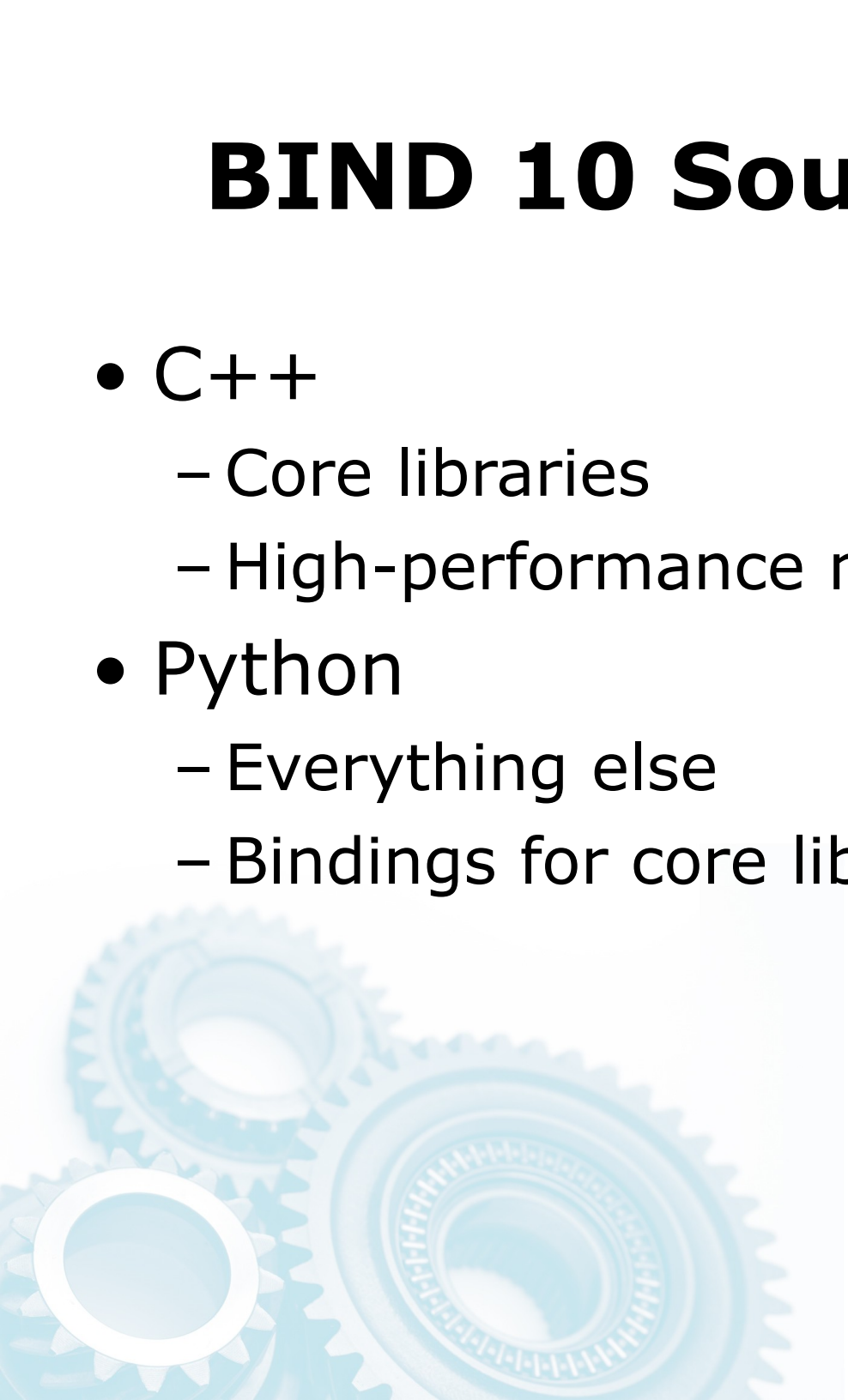


BIND 10 Source Languages

- C++
  - Core libraries
  - High-performance modules
- Python
  - Everything else
  - Bindings for core libraries



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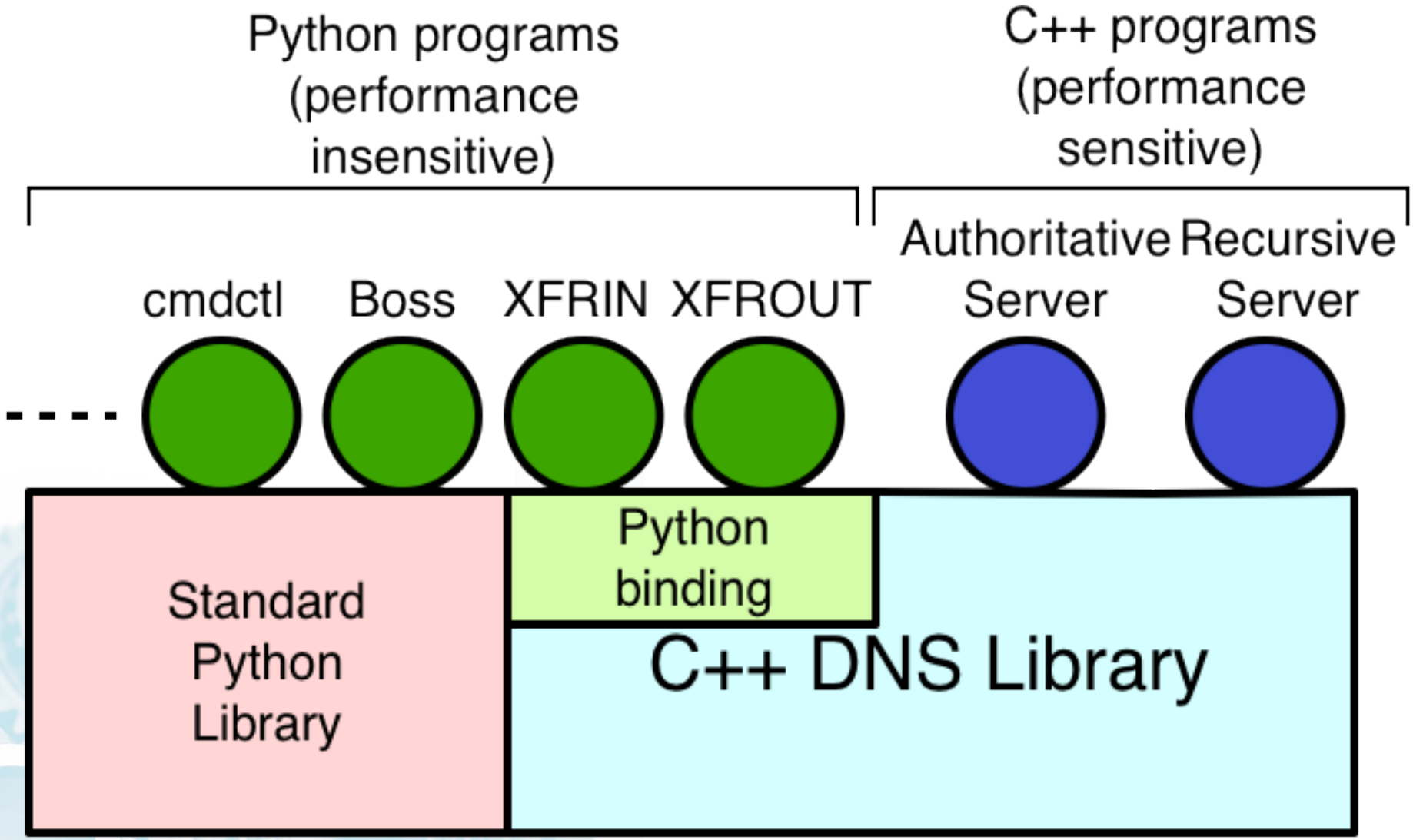

Python Binding Performance

- Goal: fast enough for performance insensitive, production quality apps
  - Should be much faster than script-only implementations
  - Can be much slower than optimized server implementations written in C/C++

Python Binding: Lies

- BIND 10 vs 3 popular libraries
  - Perl Net::DNS, dnspython, dnsruby
    - All script-based (full perl, etc)
- A simple benchmark test
  - For a toy DNS server returning pre-populated responses
    - http://bind10.isc.org/~jinmei/authors/

Python Binding: Benchmark

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Sample Code: BIND10 Python

```
while True:
    (data, fromaddr) = s.recvfrom(4096)
    msg.clear(Message.PARSE)
    Message.from_wire(msg, data)
    msg.make_response()
    if msg.get_rr_count(Section.QUESTION()) != 1:
        msg.set_rcode(Rcode.FORMERR())
    else:
        question = msg.get_question()[0]
        if question.get_name() == authors_name and \
                question.get_class() == authors_rrclass and \
                question.get_type() == authors_rrtype:
            msg.set_header_flag(MessageFlag.AA())
            msg.set_rcode(Rcode.NOERROR())
            msg.add_rrset(Section.ANSWER(), authors_rrset)
        else:
            msg.set_rcode(Rcode.NXDOMAIN())
    renderer = MessageRenderer()
    msg.to_wire(renderer)
    s.sendto(renderer.get_data(), fromaddr)
```

Sample Code: dnspython

```
while True:
    (data, fromaddr) = s.recvfrom(4096)
    request = message.from_wire(data)
    response = message.make_response(request)
    if len(request.question) != 1:
        response.set_rcode(rcode.FORMERR)
    else:
        question = request.question[0]
        if question.name == authors_name and \
                question.rdclass == authors_rrclass and \
                question.rdtype == authors_rrtype:
            response.set_rcode(rcode.NOERROR)
            response.flags = response.flags | flags.AA
            response.answer.append(authors_rrset)
        else:
            response.set_rcode(rcode.NXDOMAIN)
    s.sendto(response.to_wire(), fromaddr)
```

Sample Code: Net::DNS

```
for (;;) {
    my $buf;
    $sock->recv($buf, 4096);
    my ($packet, $err) = new Net::DNS::Packet(\$buf, 0);
    my @questions = $packet->question;
    $packet->header->qr(1);
    if (@questions != 1) {
        $packet->header->rcode("FORMERR");
    } else {
        $packet->header->aa(1);
        if ($questions[0]->qname eq $authors_name &&
            $questions[0]->qtype eq $authors_rrtype &&
            $questions[0]->qclass eq $authors_rrclass) {
           foreach my $answer_rr (@authors_rrs) {
              $packet->push("answer", $answer_rr);
           }
        } else {
           $packet->header->rcode("NXDOMAIN");
        }
    }
    $sock->send($packet->data);
}
```

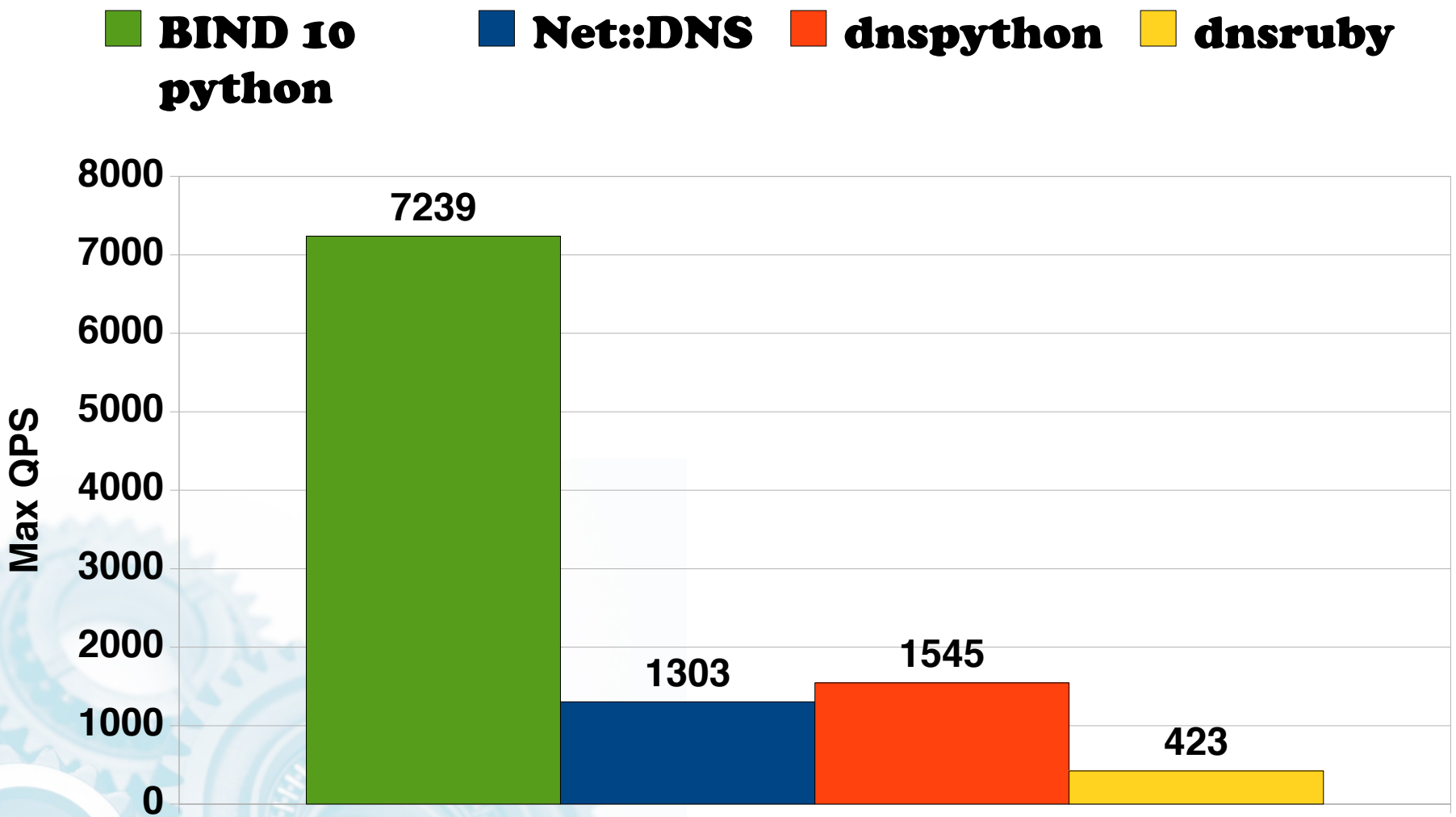
Sample Code: dnsruby

```
loop do
  data, fromhost = s.recvfrom(4096)
  msg = Dnsruby::Message::decode(data)
  if msg.header.qdcount != 1
    msg.header.rcode = Dnsruby::RCode.FORMERR
  else
    question = msg.question[0]
    if question.qname == authors_name and
        question.qclass == authors_rrclass and
        question.qtype == authors_rrtype
      msg.header.rcode = Dnsruby::RCode.NOERROR
      msg.header.qr = 1
      authors_rrs.each do |rr|
        msg.add_answer(rr)
      end
    else
      msg.header.rcode = Dnsruby::RCode.NXDOMAIN
    end
  end
  s.send(msg.encode(), 0, fromhost[3], fromhost[1])
end
```

Benchmark Setups

- Measured max possible QPS of each implementation
  - By sending a high rate of queries until the target drops them
  - Run on Jinmei's laptop:-)

Benchmark Results



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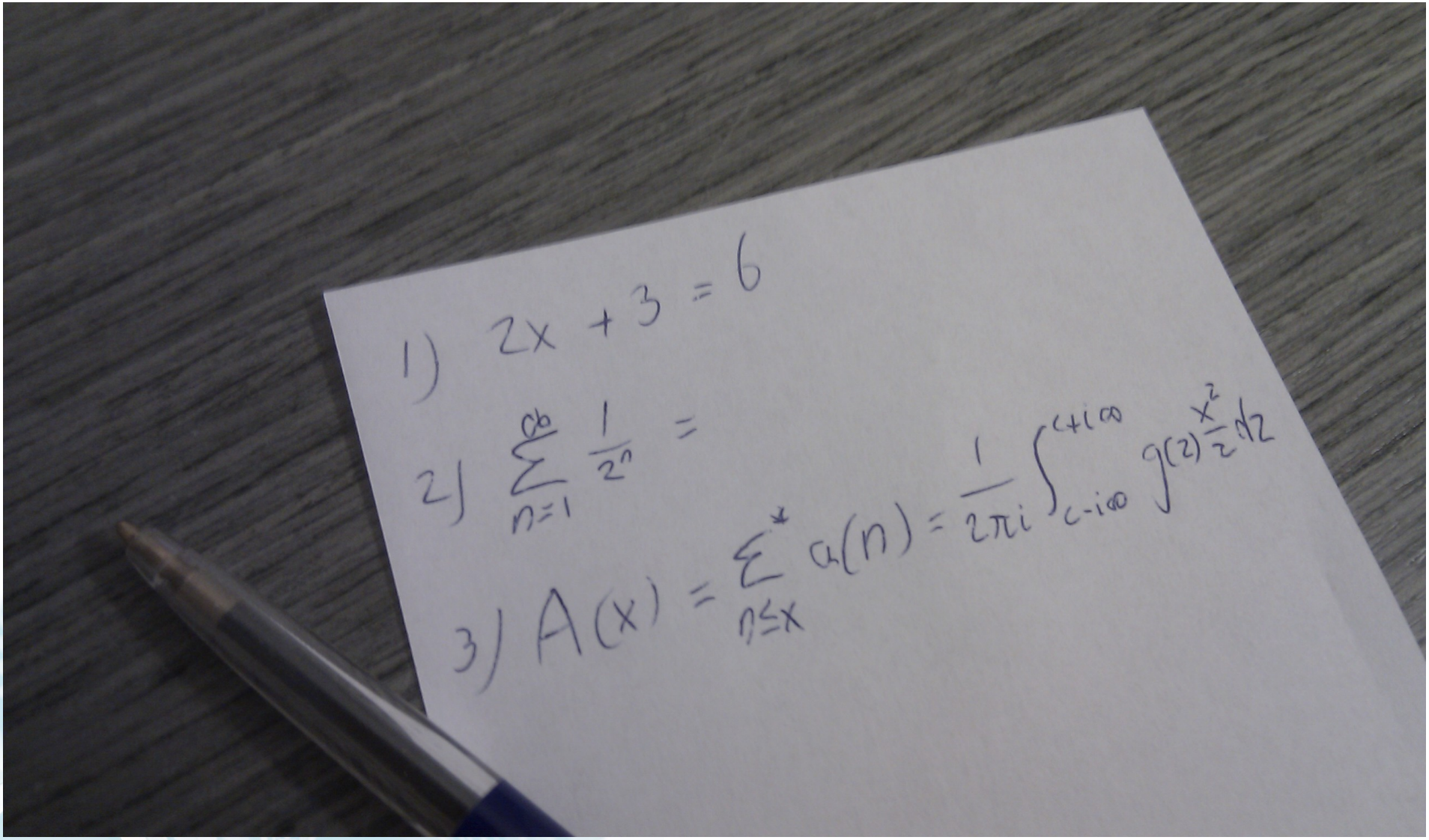
Homework


1) $2x + 3 = 6$
2) $\sum_{n=1}^{\infty} \frac{1}{2^n} =$
3) $A(x) = \sum_{n \le x}^{*} a_1(n) = \frac{1}{2\pi i} \int_{c-i\infty}^{c+i\infty} g(z) \frac{x^z}{z} dz$

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jelte@isc.org