Towards Transport-Agnostic Middleware

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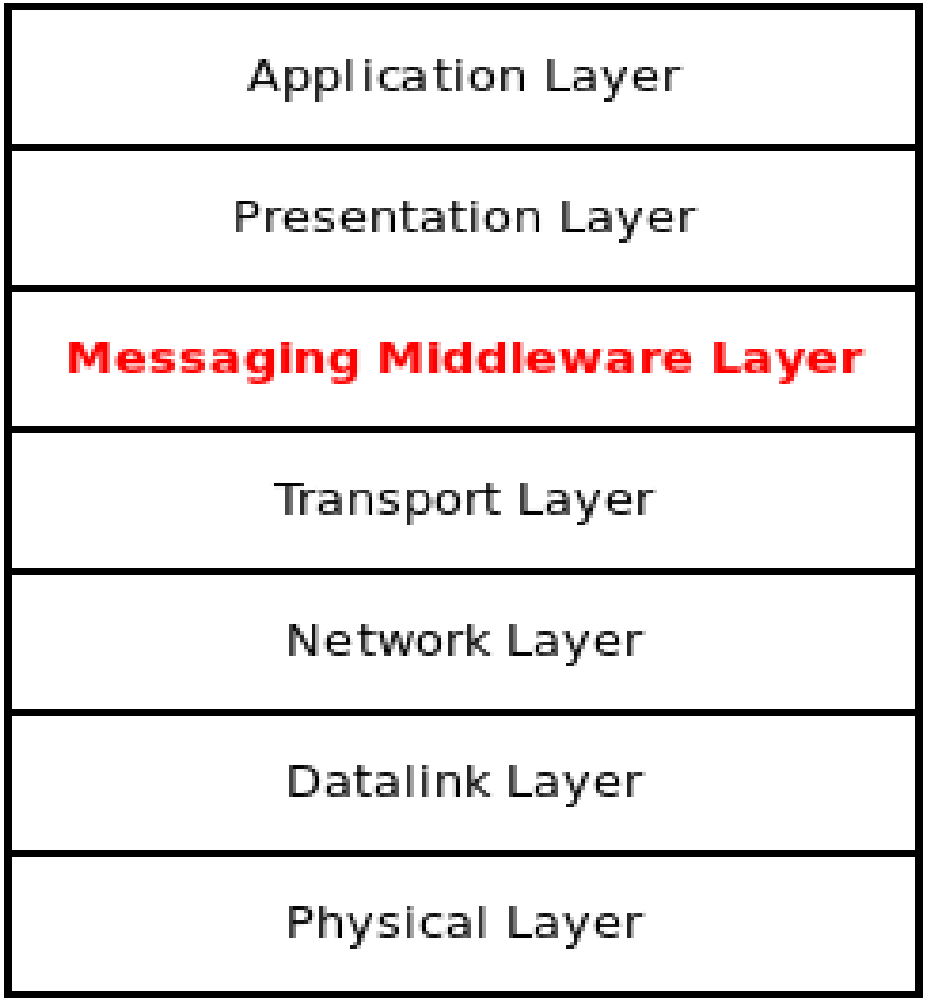
Messaging Middleware

A layer in the network stack
to manage communication
between more than two endpoints.


Application Layer
Presentation Layer
Messaging Middleware Layer
Transport Layer
Network Layer
Datalink Layer
Physical Layer

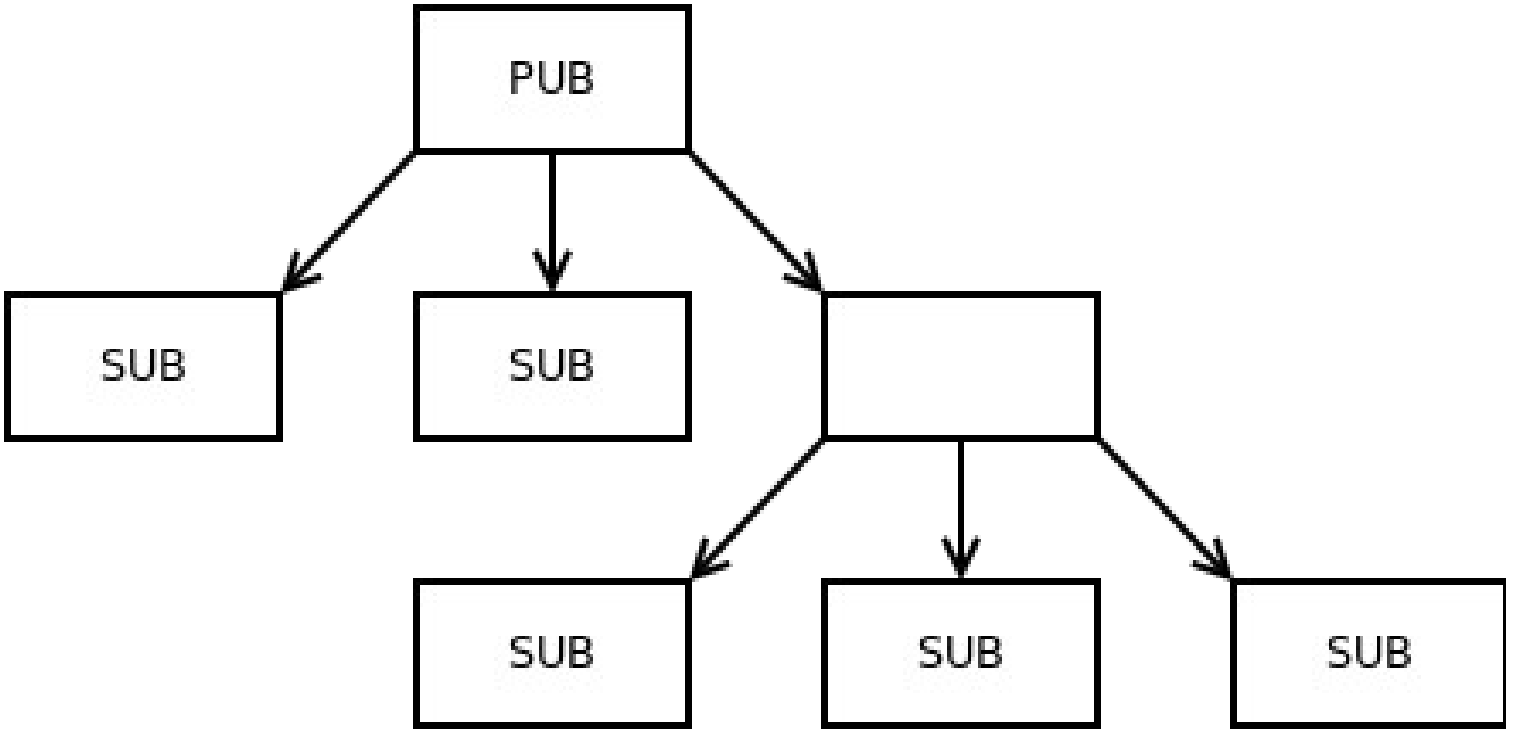
ZeroMQ/nanomsg
1 minute overview

As a layer in the network stack it implements multiple protocols, a.k.a. “messaging patterns”.

- Request/Reply
- Publish/Subscribe
- Pipeline
- Survey
- Et c.

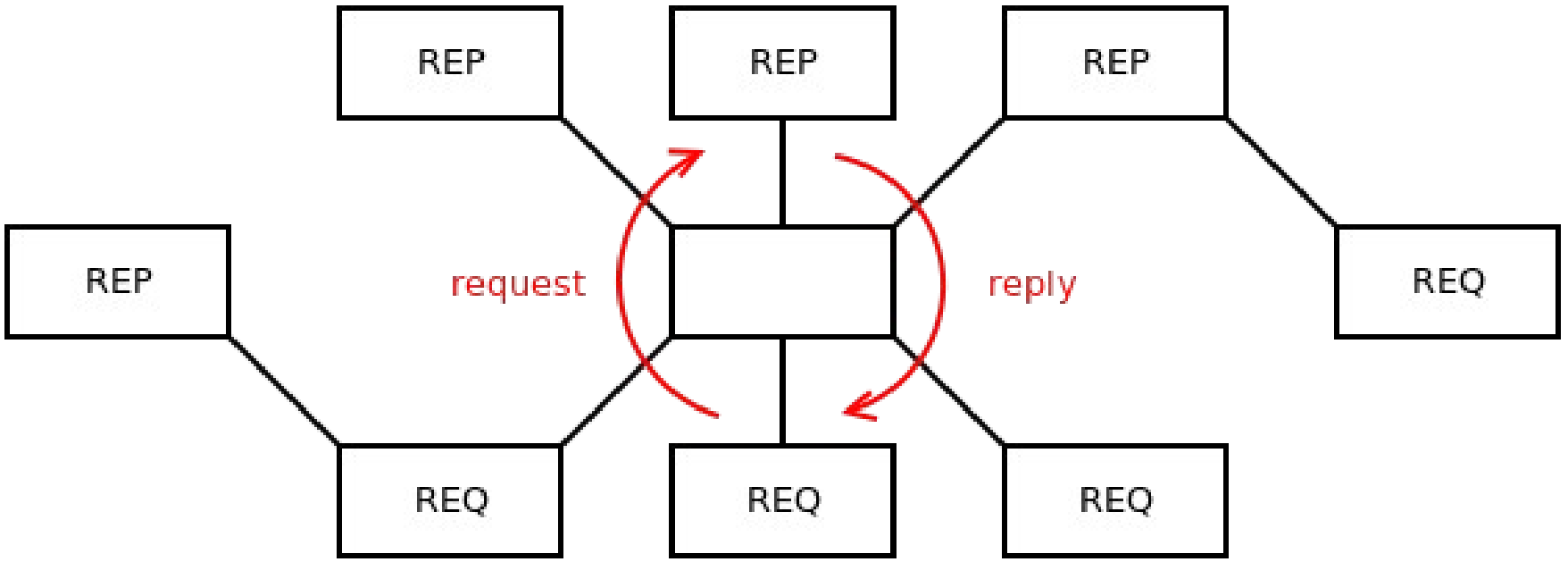
Publish/Subscribe

Distributing data to all interested endpoints



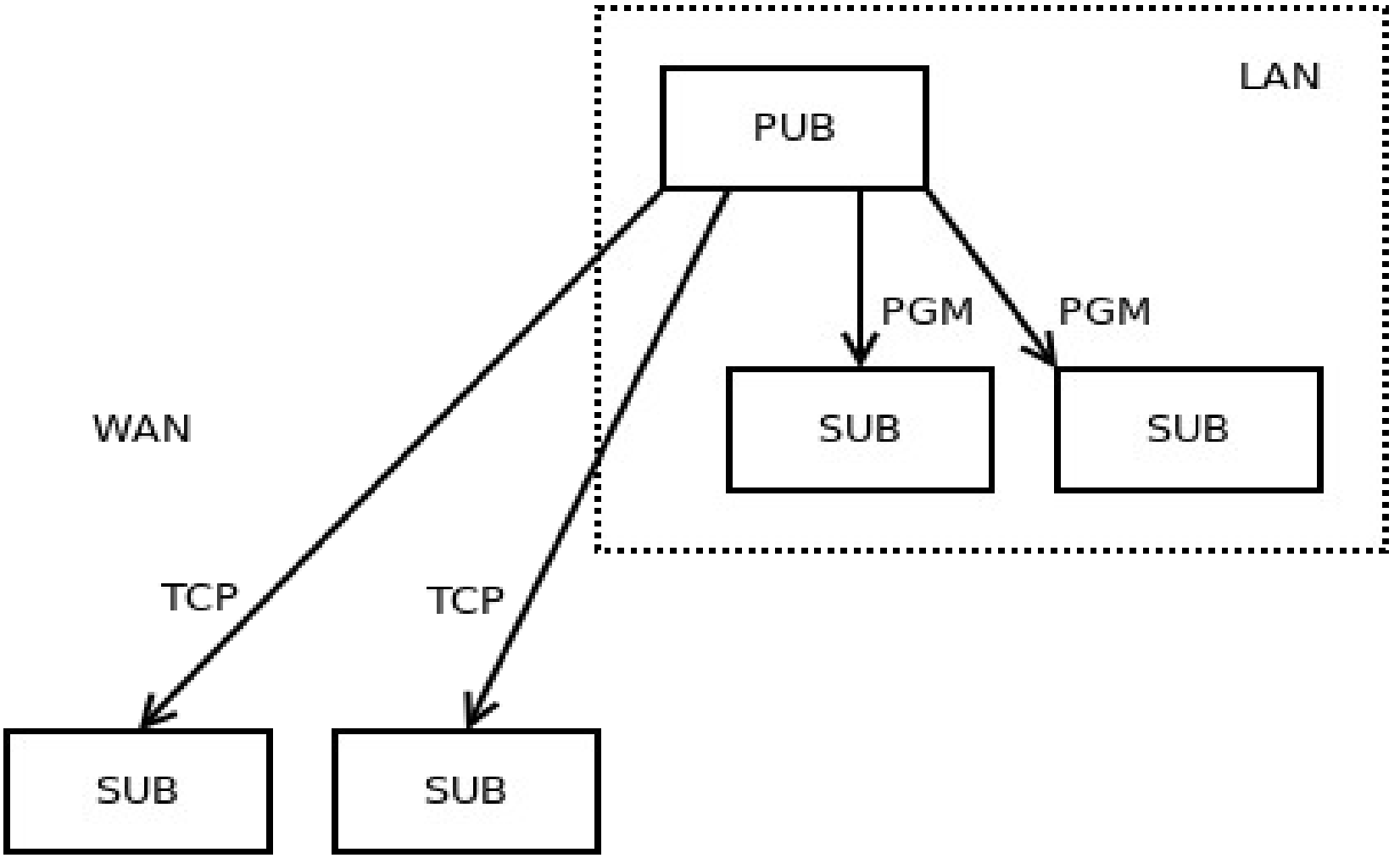
Request/Reply

Load-balancing tasks among stateless workers



What about the transport layer?

It's heterogenous!



Code example

Publisher

```
int main()
{
    int s = nn_socket (AF_SP, NN_PUB);

    nn_bind (s, “tcp://eth0:5555”);
    nn_bind (s, “pgm://eth0;241.0.0.1:5555”);

    while (1) {
        nn_send (s, “ABC”, 3, 0);
        sleep (1);
    }
}
```

Subscriber

```
int main()
{
    int s = nn_socket (AF_SP, NN_SUB);

    nn_connect (s, “tcp://myserver:5555”);

    while (1) {
        char buf [100];
        nn_recv (s, buf, sizeof (buf), 0);
    }
}
```

Why should this group care?

Because it's hard for the application developer to make informed decision about transport protocol to use:

- Reliable or unreliable?
- Unicast of multicast?
- Ordered or unordered?
- Pushback or no pushback?
- Widely used (TCP, UDP) or niche (SCTP)?
- Et c.

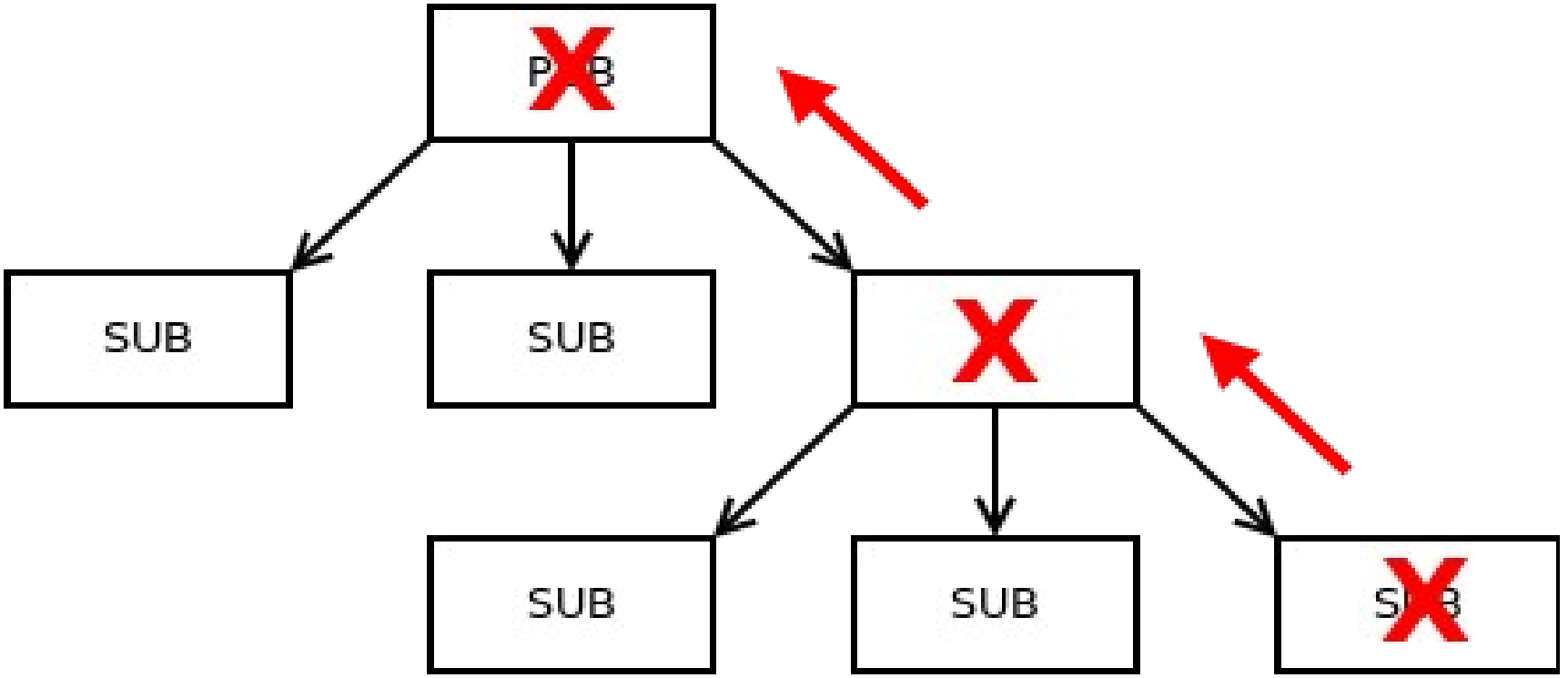
Often, informed decision can't even be made at the development time:

- Developer has little understanding of customer's deployment environment...
- Application is sold to different customers, each having different network...
- Environment is going to change in the future...

Yet, by choosing a “messaging pattern”, developer provides enough information to make an informed decision about transport protocols to use!

Example

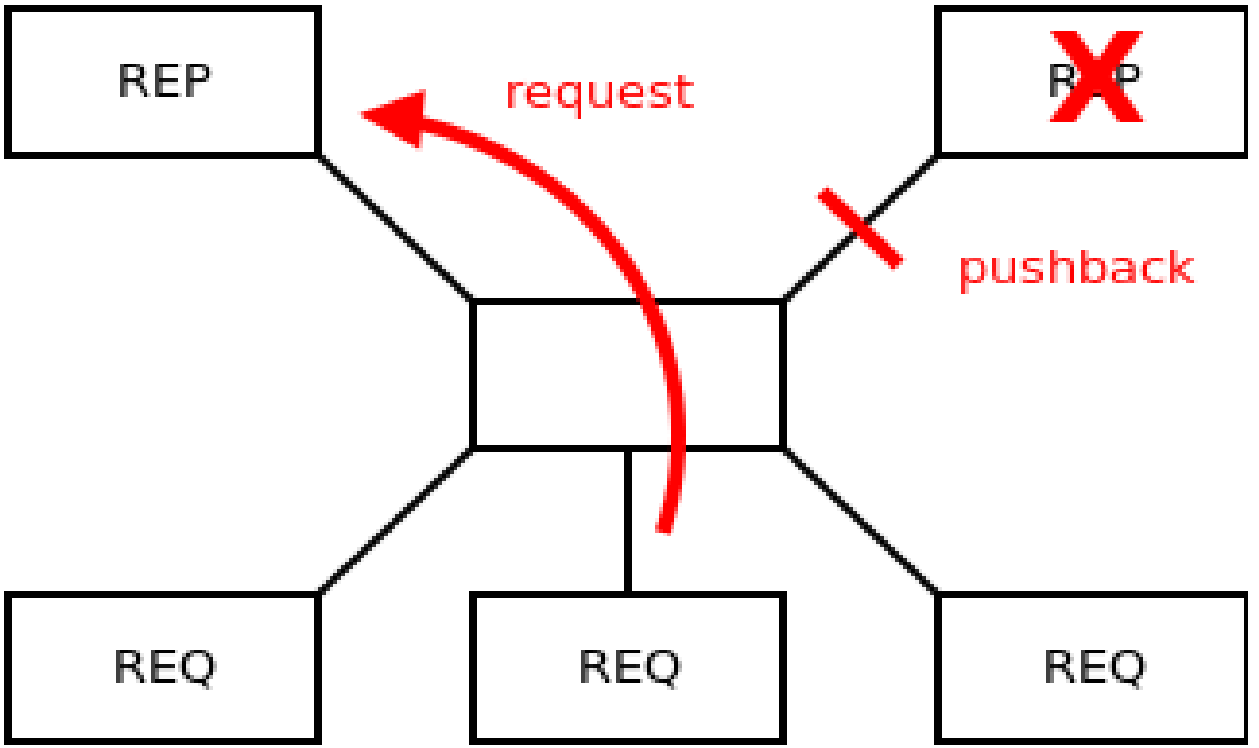
Publish/Subcribe pattern requires transport layer not to be reliable. Reliability would mean that a single slow or dead subscriber can stop the entire distribution tree.



Preferred transport protocol is **UDP** or **DCCP**.

Different example

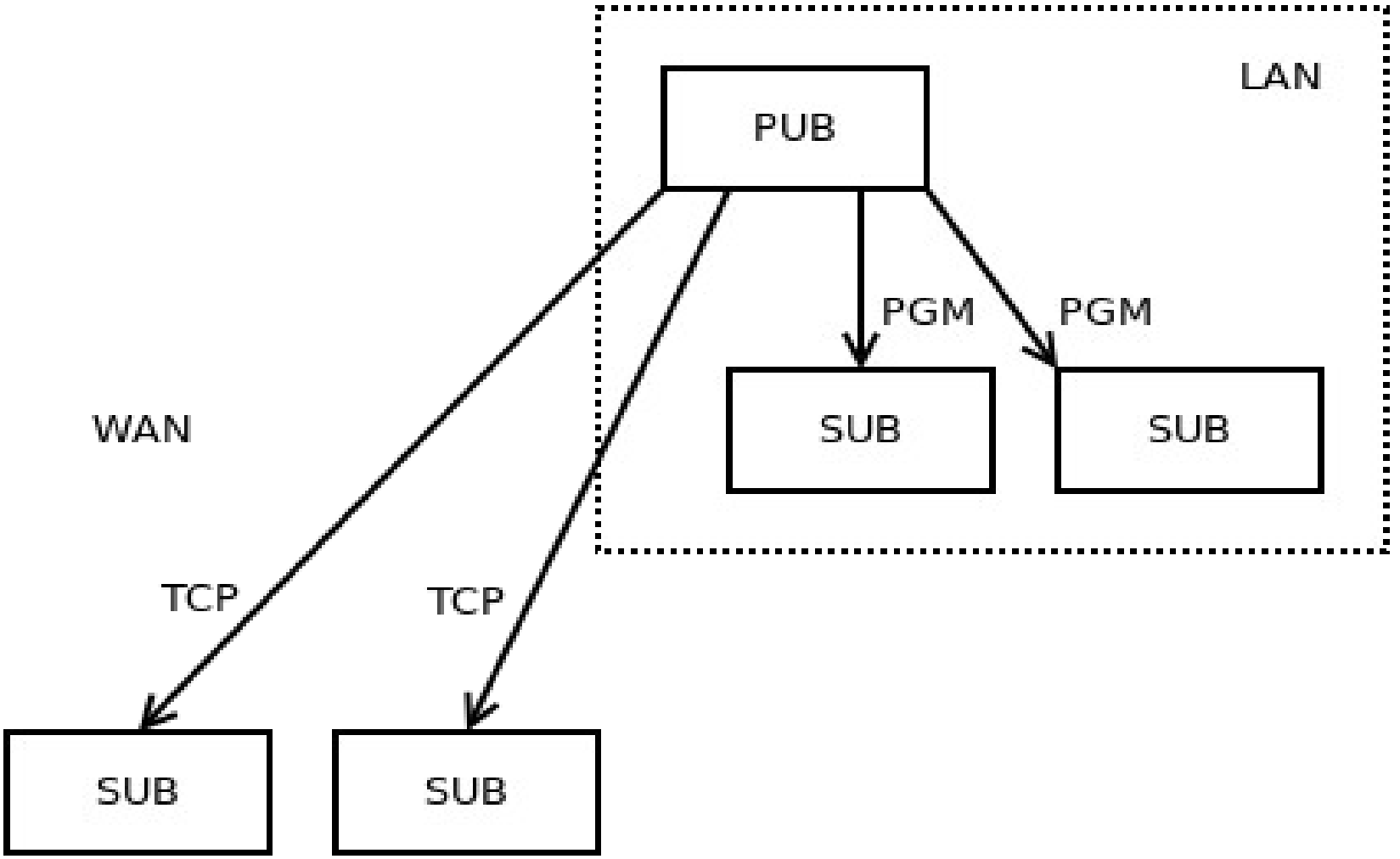
Request/Reply pattern requires transport layer to exercise pushback. That way the tasks can be redirected from overloaded workers to underutilised workers.



Preferred transport protocol is **TCP** or **SCTP**.

What are the implications?

Back to the heterogenous example:



No need to specify the transport protocol:

Publisher

```
int main()
{
    int s = nn_socket (AF_SP, NN_PUB);

    nn_bind (s, “eth0:NYSE-stock-quotes”);

    while (1) {
        nn_send (s, “ABC”, 3, 0);
        sleep (1);
    }
}
```

Subscriber

```
int main()
{
    int s = nn_socket (AF_SP, NN_SUB);

    nn_connect (s, “myserver:NYSE-stock-quotes”);

    while (1) {
        char buf [100];
        nn_recv (s, buf, sizeof (buf), 0);
    }
}
```

What we get is clean mechanism vs. policy separation!

Developer specifies the mechanism:
"NYSE stock quote feed is to use the Publish/Subscribe pattern."

```
int main()
{
    int s = nn_socket (AF_SP, NN_PUB);

    nn_bind (s, "eth0:NYSE-stock-quotes");

    while (1) {
        nn_send (s, "ABC", 3, 0);
        sleep (1);
    }
}
```

Mechanism is specified via transport-agnostic API.

Administrator specifies the policy:
"NYSE stock quote feed is to use PGM on the LAN and TCP over the WAN."

```
NYSE-stock-quotes:
    LAN: pgm
    WAN: tcp
```

Policy is specified via transport-aware network configuration tools.

Questions?

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