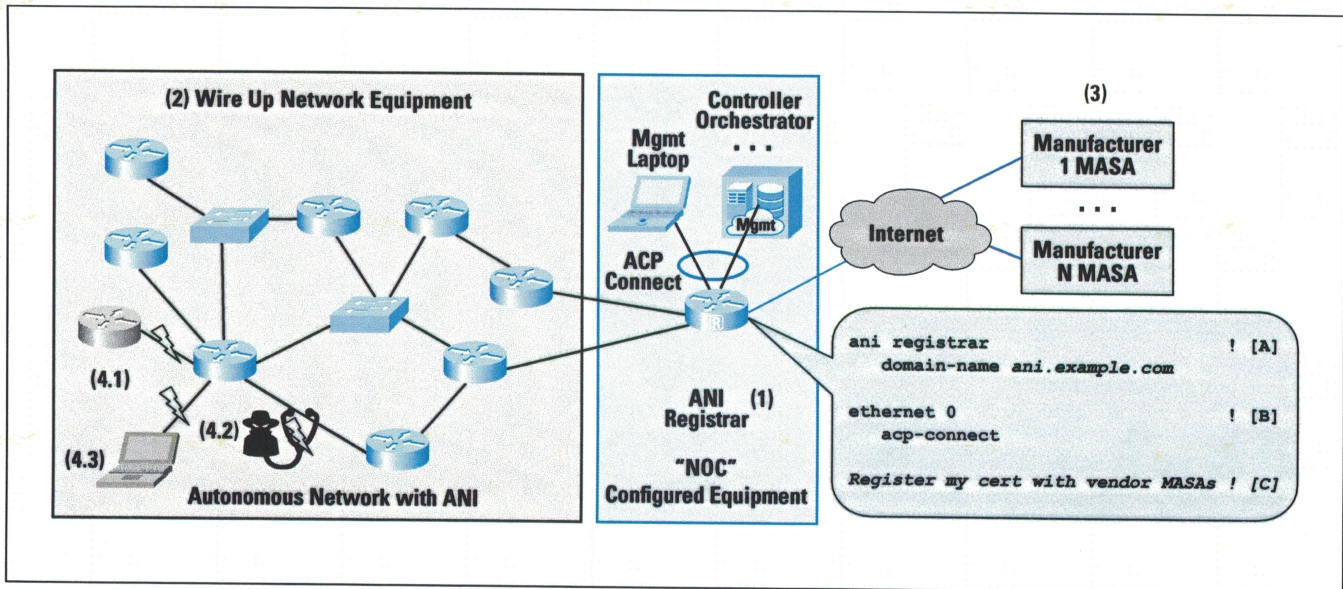


Figure 1: An Example Autonomic Network



This process is more secure and more predictable, but it is a lot more expensive and slower. Eliminating the need for staging is hence one of the main advantages of the autonomic bootstrap process.

With the ANI, the operator only sets up a seed router, called the *ANI registrar*, for example, in a *Network Operations Center* (NOC). The rest is fully automatic and secure, with local installation of new equipment by less-expert personnel ("plug in power cable, plug data cable into any free Ethernet port"). The NOC setup consists of only three simple steps:

- Set up the router labeled (1) as the registrar and assign a name to the ANI.
- Configure some local port(s) to provide link-layer access to the ANI, to connect management equipment such as a laptop for manual access or an SDN controller.
- Register the certificate of the registrar with the *Manufacturer Authorized Signing Authority* (MASA) services of the vendors whose routers and switches are being used in the new network (we will soon describe what that registration does).

Before this seed setup is in place, you may physically interconnect new routers or switches (2), but they will not do anything. When they have connectivity to a configured registrar, they will automatically form an ANI as follows:

Each new ANI device (at that stage called a *pledge*) automatically obtains a connection with the ANI registrar and attempts to enroll, receiving an ANI certificate so that it can participate. But the registrar first needs to prove to the ANI device that it is its "owner." To do that, the registrar communicates (for example over the Internet) with the MASA of the vendor of that device.