Self-Management IN the Future Internet

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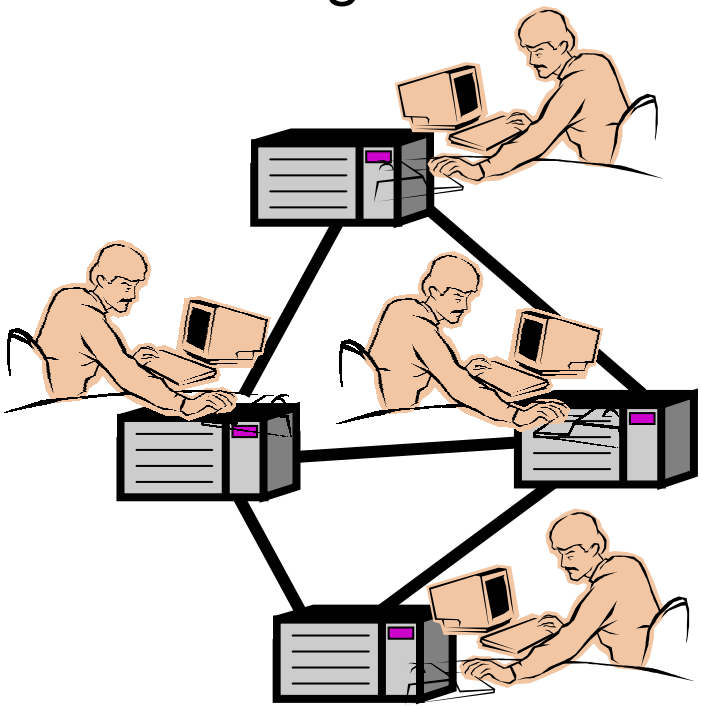
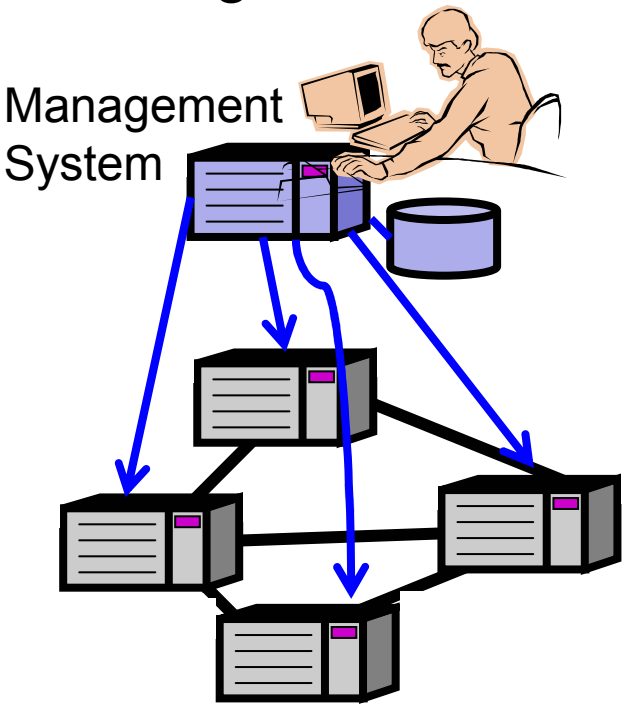
The Evolution of Network Management

Unmanaged Network



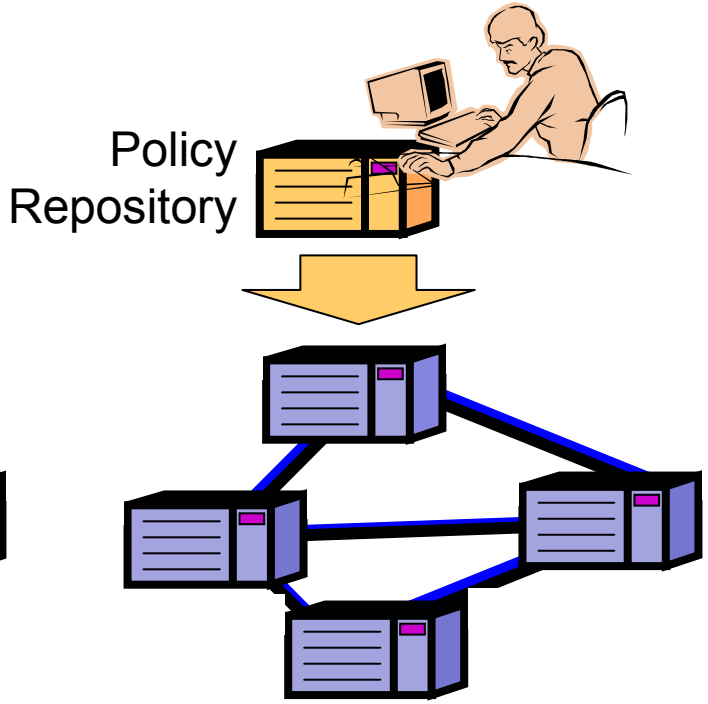
manual configuration of network elements

Conventional Managed Network



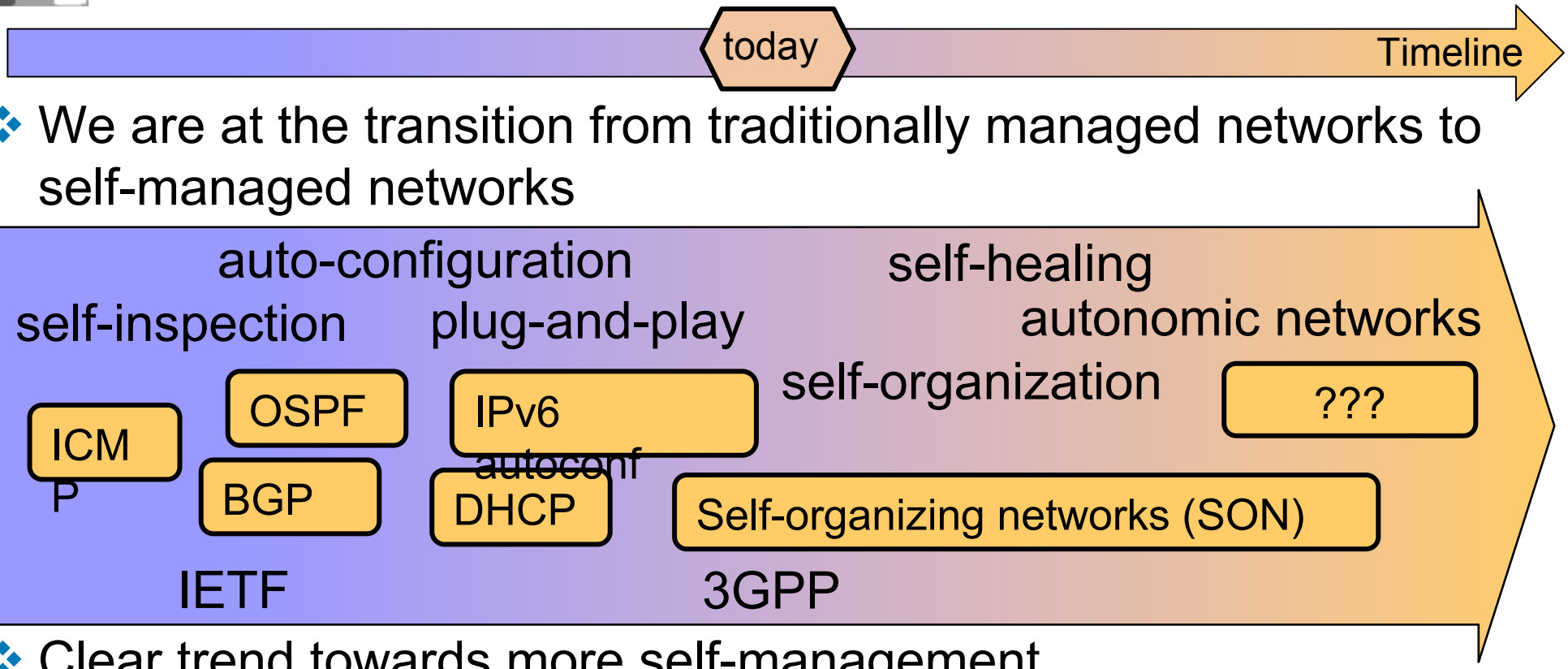
management system interacting with network elements

Self-Managed Network



self-managed network elements controlled by policies

Emerging Self-Management



- We are at the transition from traditionally managed networks to self-managed networks
- Clear trend towards more self-management
  - Operators have SON on their technology roadmaps
  - Standard bodies are increasing their related activities
  - . . .

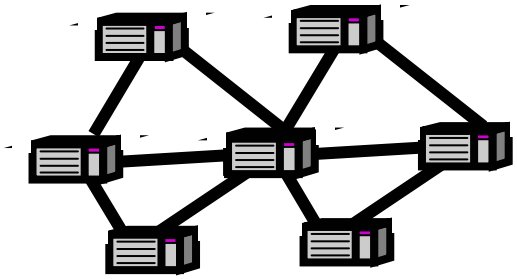
However, ...

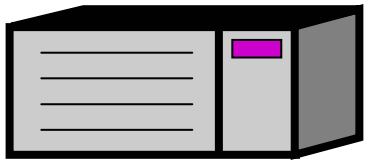
Management is Still Considered an "Add-On"

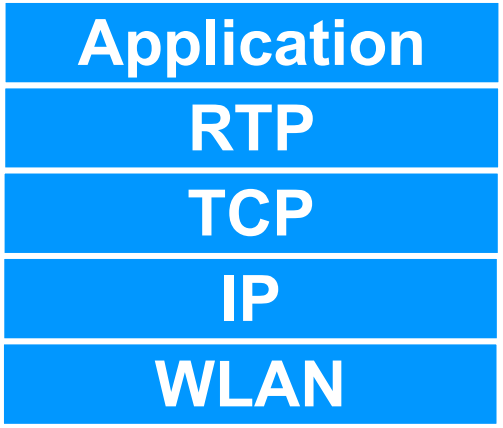
- The typical technology development process has network management capabilities at the very end
  - often the last step before final deployment
  - it gets "***attached***" to the technology
  - it is not an integral part
- This approach does not work well for self-management
  - functions for self-inspection, auto-configuration, etc. are very limited if not designed jointly with new technology
- Self-management functions need to be designed as ***integral part***
  - need to be a "default-on" capability of every network component
  - for a basic example, see IPv6 built-in auto-configuration

How to Integrate Self-Management?

- Every network component should have self-management capabilities
  - **a sub-network**
  - **a network element**
  - **a protocol or a protocol stack**
- Capabilities should at least include
  - **self-inspection**
  - **policy enforcement**
  - **problem reporting**
- Components need means for offering it's functions to other components







Examples

function	sub-network	device	protocol stack
inspection	element and topology detection, link state and traffic load monitoring, …	capability detection, availability check of enabled services, load monitoring, …	connectivity check, congestion monitoring, error statistics, …
policy enforcement	overload behavior, repair strategy, thresholds for fault-tolerance and load control		
problem reporting	reporting of policy violations, node, link, and protocol failures that cannot be repaired		

Postulate

e need a *paradigm shift*
in developing networking technology.

etwork management must move from an add-on
to an *integral part* of all networking components!

here is a *great opportunity* for this.

hen developing the Future Internet
we should apply the new paradigm
from the very beginning!