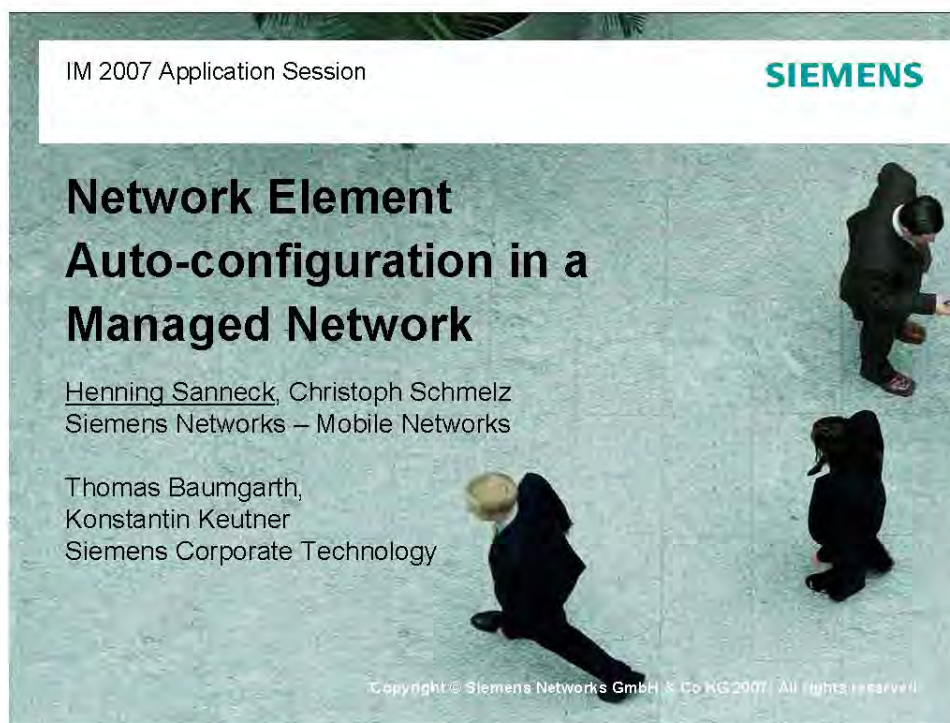


Exhibit 3



Keywords: Auto-configuration; Configuration Management; Management Automation

Abstract. In a “managed network” where the location / point of attachment of network elements (NE) are entirely planned and the NEs are tightly controlled by an element management system, the roll-out of new NEs or changes to the NE HW and SW cause considerable overhead. The overhead is due in large part due to the concurrent processes at the network operator, NE factory and roll-out field service which require extensive interaction. An autoconfiguration method is proposed which is able to decouple the individual roll-out processes, i.e., changes in the NE configuration and association of NE with certain locations can be changed at any time in the roll-out process without incurring additional overhead. This is achieved by an autoconfiguration support system under control of the operator where all data relevant to a to-be-rolled-out NE is stored. When the NE is booting it can retrieve the required configuration and SW which is needed to fulfil the required network function at its point of attachment to the network. Finally it is shown that in a managed network it is advantageous to use the geo-location of a network element as its key identifier in network planning and rollout, rather than a hardware identifier as usually employed in DHCP-based autoconfiguration. This is the case because in a “managed network” it is important that autoconfiguration support is provided for a certain network function at a certain location, rather than autoconfiguration of a certain hardware which is attached at an arbitrary location.

**Network Element (NE) Auto-configuration
in a Managed Network**

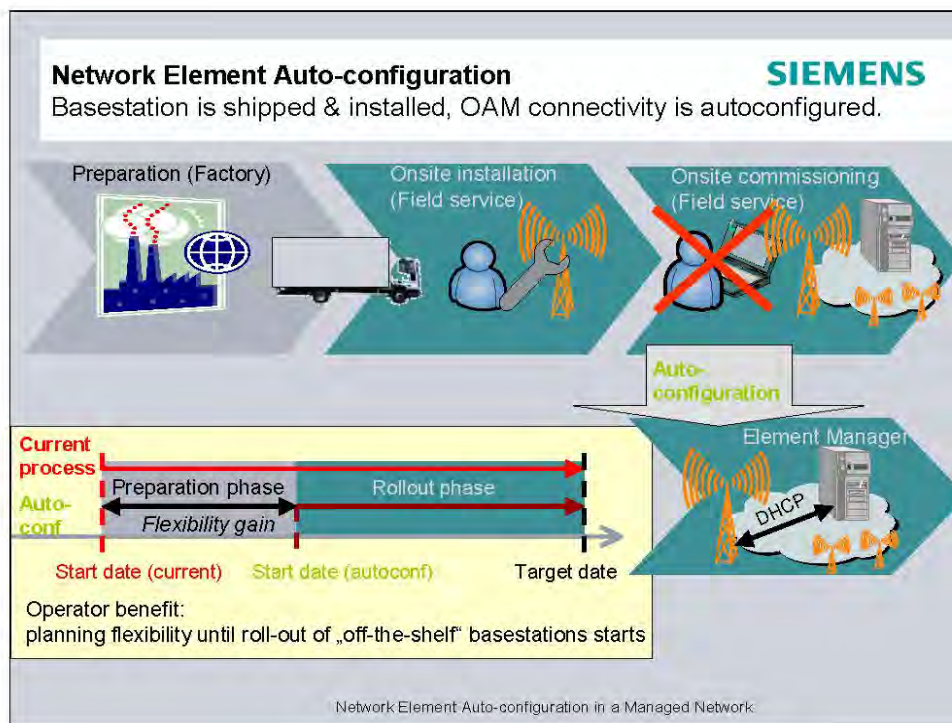
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Outline

- Introduction
- Current NE Rollout Procedure
- Auto-configuration Solution:
 - Characteristics
 - Functional Architecture
- Geo-location-based Auto-configuration
- Solution Benefits

Network Element Auto-configuration in a Managed Network



In (Mobile) Telecommunication Networks, new network elements (NEs) such as wireless base stations or access points

- are deployed in large numbers
- should be “low cost” in terms of deployed software / hardware and service costs
- typically have a rather dynamic roll-out process (i.e., various changes of planning and configuration data during roll-out)

The introduction of these NEs into the network causes considerable overhead in installation preparation, installation and commissioning:

- extensive data exchange between manufacturer and operator
- manual on-site installation and configuration / commissioning activities

In the future, due to higher complexity and heterogeneity of networks and network architectures (2G, 3G, 3G LTE / NGMN, WLAN, WiMAX), and the increasing dynamic of configuration (more frequent changes), the simplicity and rapidity of NE introduction becomes much more important.

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NE Rollout – Framework Conditions

Prior to installation every NE has to be equipped with the appropriate software and "database"[1] (DB). The DB typically consists of three different parts:

- "HW" (NE hardware specific), provided by the manufacturer
- "site" (location-specific) where the NE should be set up, provided by the operator; a subset thereof is the basic O&M connectivity configuration which is required to render the NE "manageable", i.e., that the NE can be reached and controlled from an element management system (EMS)
- "project" (operator-specific) to which the NE belongs, provided by the operator

To guarantee a proper functioning and manageability of the NE it has to be ensured that the DB at the NE and the equivalent DB in the element management system (EMS) configuration management database (CM DB) contain the same information with the same version.

[1] Note that the term "database" refers to the set of configuration data of the NE (e.g., stored in a file) rather than an actual relational or object-oriented database.

Network Element Auto-configuration in a Managed Network

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