Linux in the DX 200 System

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Purpose of this thesis work

- Study how new operating system (Linux) could be integrated to the large existing embedded system with own proprietary operating system (DMX).
- What could be possible applications for the new OS.
- What are the main differencies between proprietary DMX and the Open Source Linux OS.
- And why the new OS is needed in the first place.

➔ Collect all these ongoing studying issues to one document which could be used as an basic introduction for the Linux development in the DX 200 System.

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Introduction to the DX 200 System 1/4

- Development started late 1970's.
- Millions of lines of code made during decades.
- Own proprietary operating system, DMX.
- Own in-house made recovery (high availability) system.
- Multicomputer system.
- Ethernet based message bus for internal messaging.
- Own, mainly in-house made toolset for development work.
- Hardware development has mainly been in-house. Currently, also ATCA based hardware options coming.

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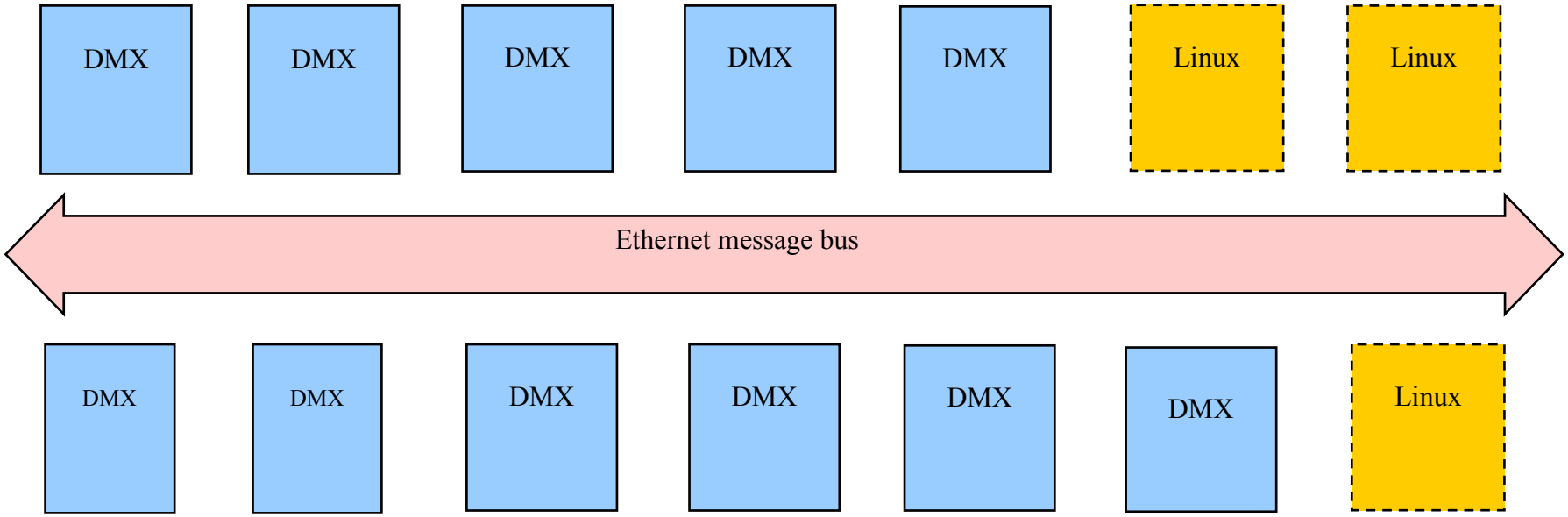
Introduction to the DX 200 System 2/4



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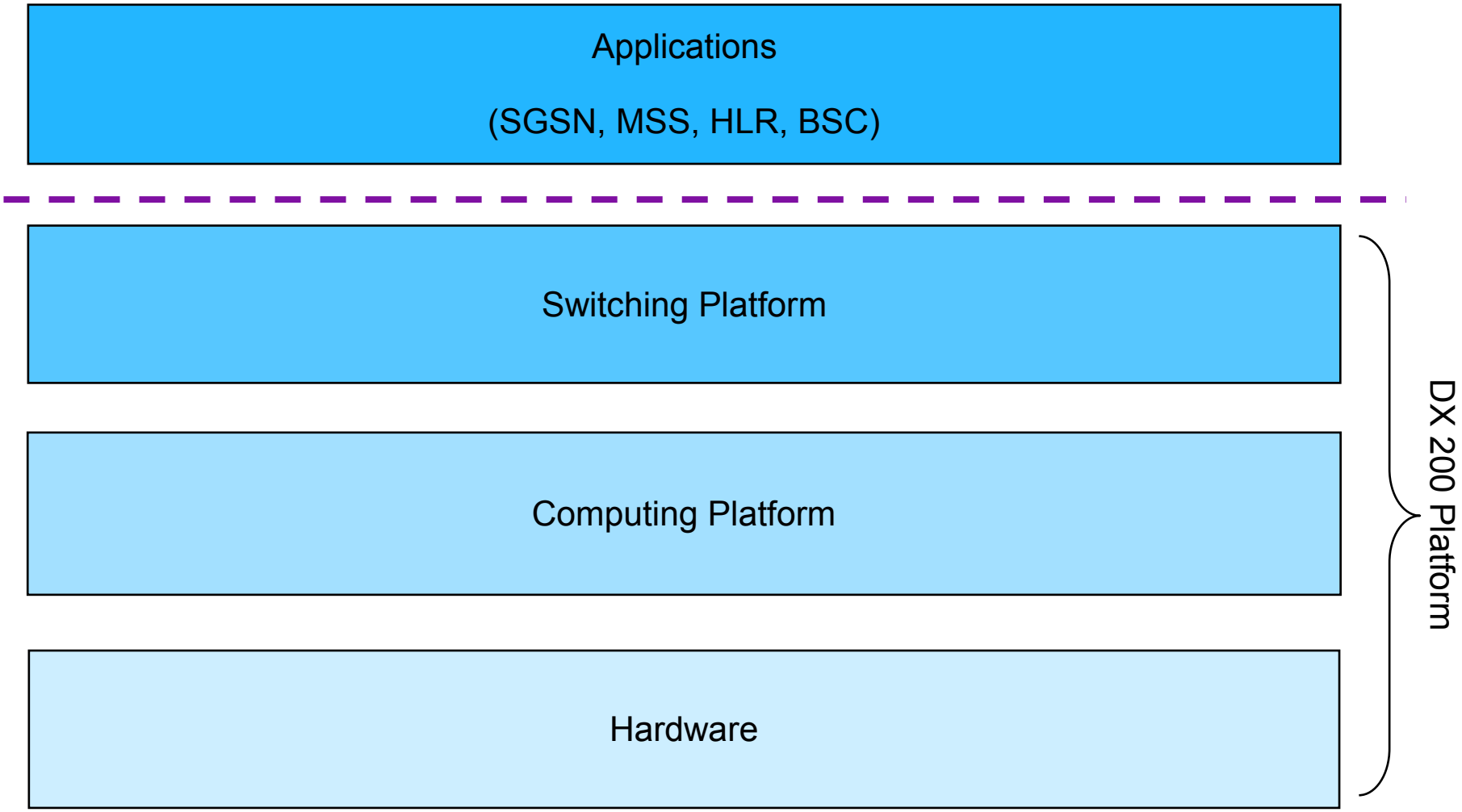

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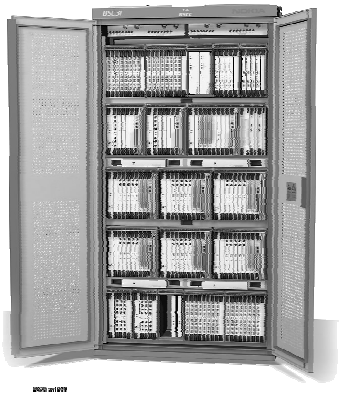
Introduction to the DX 200 System 4/4

In **MSC** (Mobile Switching Center)

In **HLR** (Home Location Register)

In **BSC** (Base Station Controller)



In **SGSN** (Serving GPRS Support Node)

In **SRR** (Service Routing Register)

In **MSS** (MSC Server)

And in many others …

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Current problems/limitations in the DX 200 System

- Single processor operating system.
- Hard to open and use Open Source and 3rd party software.
- No 64-bit support.
- 4GB memory restriction.
- Segmented memory model.
- In-house made software toolset is hard to expand.

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Benefits and pitfalls of Linux in DX 200

+SMP and 64-bit architecture supported in Linux kernel.
+De facto platform for Open Source development.
+Gives opportunities to modify current processes to be more Agile in nature.
+New tools available.
–Security threats.
–R&D infrastructure investments needed.
–Possible license and IPR conflicts.

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Possible solutions to integrate Linux to DX 200

There is three main approaches to bring Linux to DX 200:

1. **Tightly integrated Linux computers**, computers are fully integrated to the DX 200 System. Units could be configured by using the same methods as the DMX units. Messaging is DMX style and the Linux units are supervised and booted by the same methods as the DMX computers. Software packaging is handled in the same way as in the DMX unit.
2. **Loosely coupled Linux computers**, integration to the DX 200 System is defined case by case. There might be common messaging and supervision of computer units in place.
3. **Different servers running on the same hardware**, the systems use same hardware and might have some common interfaces towards each other. O&M interfaces are mediated to be consistent, but otherwise systems are totally independent.

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Chosen implementation - principles

1. Software loading, the basic idea is to use the current code loading mechanism, which is used in the DMX based computers where software is packaged to the operation and maintenance unit's (OMU) disk and is loaded from there.
2. Unit startup, unit start-up is handled with its own software (launcher). After all the binaries have been loaded to the memory, the Linux kernel is started. After that, the launcher starts the programs.
3. Inter process communication, the Ethernet based messaging (EMB) post office is available in all DX 200 computer units, as well as in Linux.
4. Recovery system, every Linux computer executes a distributed part of the recovery system software to integrate the computer with the existing centralized DX 200 recovery system.
5. Linux distribution dependency, all software should be designed and implemented so that there are no dependencies to one or other specific Linux distribution. All code should be generic and no particular kernel features should be used.

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Conclusions

1. Linux should be integrated to the DX 200 Platform system.
2. Tightly integrated Linux computers are the main approach to bring Linux in the existing DX 200 Platform System.
3. Installed network element base is large and this makes evolutionary path from DMX to Linux operating system very attractive. This reduces risk to the operators and as well as also potentially making product more competitive.
4. Different approaches should converge and make this way only one real DX 200 platform available.
5. There is lot of potential study items in Linux area in DX 200 organization.

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Possible further studies

There are several topics which could be interesting to studying further:

1. Linux computing platform in the line card environment.
2. Linux distribution for the DX 200 System.
3. Integration of the DX 200 System and some other system.
4. Organizational effects when opening a closed system.

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